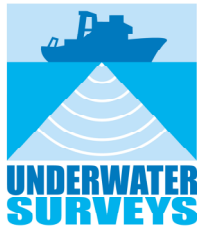


**FEL 3 FOR THE DEEPENING OF BERTHS
203 AND 205 AT PIER 2
DURBAN CONTAINER TERMINAL
PROJECT No 1370**

MULTIBEAM BATHYMETRIC SURVEY BERTHS 203, 204, 205,
TURNING BASIN AND PROPOSED DUMP SITE

SURVEY OPERATIONS & RESULTS REPORT



Underwater Surveys (Pty) Ltd

(Project No.: 12/016)



**ZAA Engineering Projects & Naval
Architecture (Pty) Ltd**

(Ref No: J1370)

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REVISION LOG

Rev	Date	Reason For Issue	ORIG	CHK	APP	APP
1	April '12	Final Report issued to Client	AJM	ADM	PV	
0	April '12	Draft Report for internal review	AJM	ADM	PV	n/a
			Underwater Surveys			ZAA

SUMMARY OF SITE CONDITIONS

SITE LOCATION

Durban Harbour Survey Area

Berths 203, 204 & 205, Turning Basin and part of channel to exit the harbour

Approximate centre of survey area:

GRID (Lo.84/31)	Easting = -2510.00m	Northing = 3306327.00m
GEOGRAPHIC (WGS84)	Lat = 29° 52' 32.2" S	Long = 31° 03' 33.5"E

Dump Site Survey Area

Part of existing and proposed new dump sites.

Approximate centre of survey area:

GRID (Lo.84/31)	Easting = -12032.00m	Northing = 3307498.00m
GEOGRAPHIC (WGS84)	Lat = 29° 53' 10.1" S	Long = 31° 07' 28.4"E

BATHYMETRY

Berths 203, 204 & 205, Turning Basin and Channel

A total of 4 801 472 points make up the 0.5m x 0.5m grid of the harbour survey area as defined in the original scope of work.

Minimum depth in survey area: 0.26 metres below CD

Maximum depth in survey area: 18.34 metres below CD

Dump Site

A total of 67 197 points make up the 10m x 10m grid of the dump site survey area.

Minimum depth in survey area: 68.13 metres below CD

Maximum depth in survey area: 90.40 metres below CD

The general trend within the surveyed area is a gently sloping seabed with depths increasing from the north-west towards the south-east.

Sandbank Survey Area (Additional Scope of Work added on site)

The outline of the sandbank was surveyed to a target depth of -2.0m CD.

Although shallower depths are shown, these were encountered on the steep sandbank slope where it was considered unsafe due to risk of damage to the sub-surface survey sensor.

Lot 10 Dock and Channel Survey Area (Additional Scope of Work added on site)

The area in and around Lot 10 Dock was surveyed to beyond 50m around the dock, revealing depths much shallower than the -12m CD depth required for floating caissons.

The channel from Lot 10 Dock to the turning basin at the container berths has the required depth of -12m CD and is wide enough all the way through to the turning basin. Approximately 200m from the Lot 10 Dock the depths become shallower than -12m CD and continue decreasing all the way into Lot 10 Dock where the depths are in the region of -8m CD.

SEABED HAZARDS AT LOCATION

There is isolated debris (mostly tyres) to be found across the survey area as is normal in any harbour environment. However, none of these are considered hazardous to the dredging operations. Within the survey area there are plenty of dredging scour marks present. Significant objects to be noted are listed in the results section of this report.

CONTENTS

SUMMARY OF SITE CONDITIONS

1. INTRODUCTION	8
1.1. GENERAL PROJECT DESCRIPTION	8
1.2. SCOPE OF WORK	9
1.3. DEFINITION OF SURVEY AREAS	9
1.4. DELIVERABLES	11
2. EQUIPMENT AND PERSONNEL	12
2.1. VESSEL	12
2.2. EQUIPMENT	13
2.3. PERSONNEL	13
3. SUMMARY OF EVENTS	14
4. SURVEY METHODOLOGY	17
4.1. SURVEY	17
4.2. NAVIGATION SYSTEM	17
4.2.1. Primary Positioning – RTK GPS System	17
4.2.2. QINSy QPS v8 - Navigation System	20
4.3. BATHYMETRY	20
4.3.1. Sonar Calibration	21
4.4. GYRO COMPASS AND MOTION REFERENCE UNIT	22
5. SURVEY CONTROL	23
5.1. UNITS	23
5.2. GEODETIC PARAMETERS	23
5.3. VERTICAL DATUM	23
6. RESULTS	24
6.1. GENERAL	24
6.2. PROCESSING PROCEDURES	24
6.3. DURBAN HARBOUR SURVEY AREAS	24
6.3.1. Berth 203,204,205 and Surrounds – Original SOW	25
6.3.2. Lot 10 Dock & Channel and Sandbank Perimeter – Additional SOW	26
6.3.3. Seabed Hazards	27
6.4. DUMP SITE SURVEY AREA	28

APPENDICES

APPENDIX A	VESSEL OFFSET DIAGRAM
APPENDIX B	SOUND VELOCITY PROFILES
APPENDIX C	QINSY SETUP PARAMETERS
APPENDIX D	PATCH TESTS
APPENDIX E	CONTROL POINT LAYOUT
APPENDIX F	DAILY PROGRESS REPORTS
APPENDIX G	CHARTS

LIST OF FIGURES

FIGURE 1.1:	HARBOUR SURVEY LOCATION	8
FIGURE 1.2:	DURBAN HARBOUR AND DUMP SITE FINAL SURVEY AREAS	11
FIGURE 2.1:	SURVEY VESSEL "BLUE DOLPHIN"	12
FIGURE 4.1:	LOCATION OF RTK BASE STATION	18
FIGURE 4.2:	QPS QINSY SURVEY ACQUISITION SOFTWARE	20
FIGURE 4.3:	RESON SEABAT 8101 HEAD BEING MOUNTED ON POLE	21
FIGURE 6.1:	DURBAN HARBOUR SURVEY COVERAGE	25
FIGURE 6.2:	DUMP SITE SURVEY COVERAGE	28

LIST OF TABLES

TABLE 1-1	REVISED DUMP SITE COORDINATES (WG31)	10
TABLE 2-1	PERSONNEL	13
TABLE 4-1	SURVEY CONTROL POINTS SUPPLIED BY CLIENT	17
TABLE 4-2	GPS RTK INTEGRITY CHECKS ON BC1	19
TABLE 4-3	SONAR CALIBRATION VALUES USED FOR DATA ACQUISITION	21
TABLE 4-4	SONAR CALIBRATION RESULTS	22
TABLE 5-1	WORKING SPHEROID & PROJECTION PARAMETERS	23
TABLE 6-1	LOT 10 DOCK CHANNEL CENTRE LINE	26
TABLE 6-2	SEABED TARGETS - WITHIN ORIGINAL SCOPE OF WORK AREA	27



CHARTING INDEX

Drawing No.	Drawing Title	Scale
12-016_ZAA_HBR_BATHY_CD_DCT1370	BATHYMETRIC SURVEY - Durban Harbour Area	1:7 500
12-016_ZAA_DUMP_BATHY_CD_DCT1370	BATHYMETRIC SURVEY - Dump Site Area	1:7 500

NOTE: All charts are plotted on A1 paper size at the scale specified above.

1. INTRODUCTION

1.1. GENERAL PROJECT DESCRIPTION

Transnet is planning the deepening of Berths 203 to 205 on Pier 2 in the Durban Harbour Container Terminal. ZAA Engineering Projects & Naval Architecture (Pty) Ltd (ZAA) have been contracted to undertake the feasibility study for the proposed project.

As part of the study Underwater Surveys (Pty) Ltd, (UWS) of Cape Town, South Africa, were contracted by ZAA to provide bathymetric survey services within the specified project area. The survey areas, located within the harbour area, are defined by the green boundary in Figure 1.1 below.



Figure 1.1: Harbour Survey Location

This report presents the operational procedures, survey methodology, data acquisition systems and results obtained for the Durban Harbour Bathymetric Survey, conducted between 30th March and 8th April 2012. Additional digital data is provided on CD with this report.

1.2. SCOPE OF WORK

The purpose of the survey was to obtain bathymetric data required by ZAA to conduct a feasibility study for the proposed dredging operation and associated activities within the Durban Harbour area. The main objective of the survey was to acquire detailed bathymetric data to produce a high resolution digital terrain model (DTM) and bathymetric charts for the specified survey areas.

The general scope of work can be summarised as follows:

- Acquisition of detailed bathymetric data, using multibeam echo-sounder equipment, to establish the seabed topography within the specified survey areas and to identify and delineate any irregularities.

In consideration of the water depths within the respective survey areas, the following survey data requirements were specified:

Harbour Survey Area:

- 100% Seabed Bathymetry Coverage (MBES) – 0.5m x 0.5m grid resolution

Dump Site Survey Area:

- 100% Seabed Bathymetry Coverage (MBES) – 10.0m x 10.0m grid resolution

1.3. DEFINITION OF SURVEY AREAS

The following survey areas were specified by ZAA:

- Durban Harbour Survey Area, including:
 - Berths 203 to 205 (proposed dredge area)
 - Turning Basin
 - Part of navigation channel towards harbour entrance
- Offshore Dump Site for dredging material, located approximately 11km due east from the harbour entrance

NOTE: The original dump site survey area was revised while on site. The survey was performed over an area, defined by the below coordinates (as supplied by the Client Representative), which includes part of the existing dump site as well as part of the proposed new dump site.

Table 1-1 Revised Dump Site Coordinates (WG31)

Point	Y (m)	X (m)
1	-11569.00	3305937.00
2	-13793.00	3307227.00
3	-12181.00	3309319.00
4	-9960.00	3308030.00

ZAA also requested the following areas to be surveyed in addition to the original work scope and survey areas as defined above:

- Sandbank Survey Area:
 - Between Berths 203 to 205 and the Maydon Quay
 - Surveyed to a depth of -2m CD

- Lot 10 Dock and Channel Survey Area,
 - Channel from the main Turning Basin to Lot 10 Dock
 - Area around the Lot 10 Dock.

The purpose of the sandbank survey as discussed with the on-site Client Representative was to determine the position and it was agreed to target the -2m CD depth contour to define the sandbank perimeter. Although shallower depths were recorded in places this was due to the steep nature of the sandbank. However, since the MBES transducer is deployed at a draft of approximately 1m it was deemed too risky to extend survey coverage any shallower.

The purpose of the additional survey for the Lot 10 Dock was to determine the depths in the immediate vicinity of the dock and to identify a suitable route for towing-out of caissons from the dock, along the channel on the western side of the sandbank to the turning basin for eventual deployment at Berths 203, 204 and 205. Since the caissons will have a floating depth of approximately 11m, it was requested to locate the channel with water depths of -12m CD and deeper.

Figure 1.2 below shows the final scope of work for the harbour area and the dump site as decided and agreed upon on site.

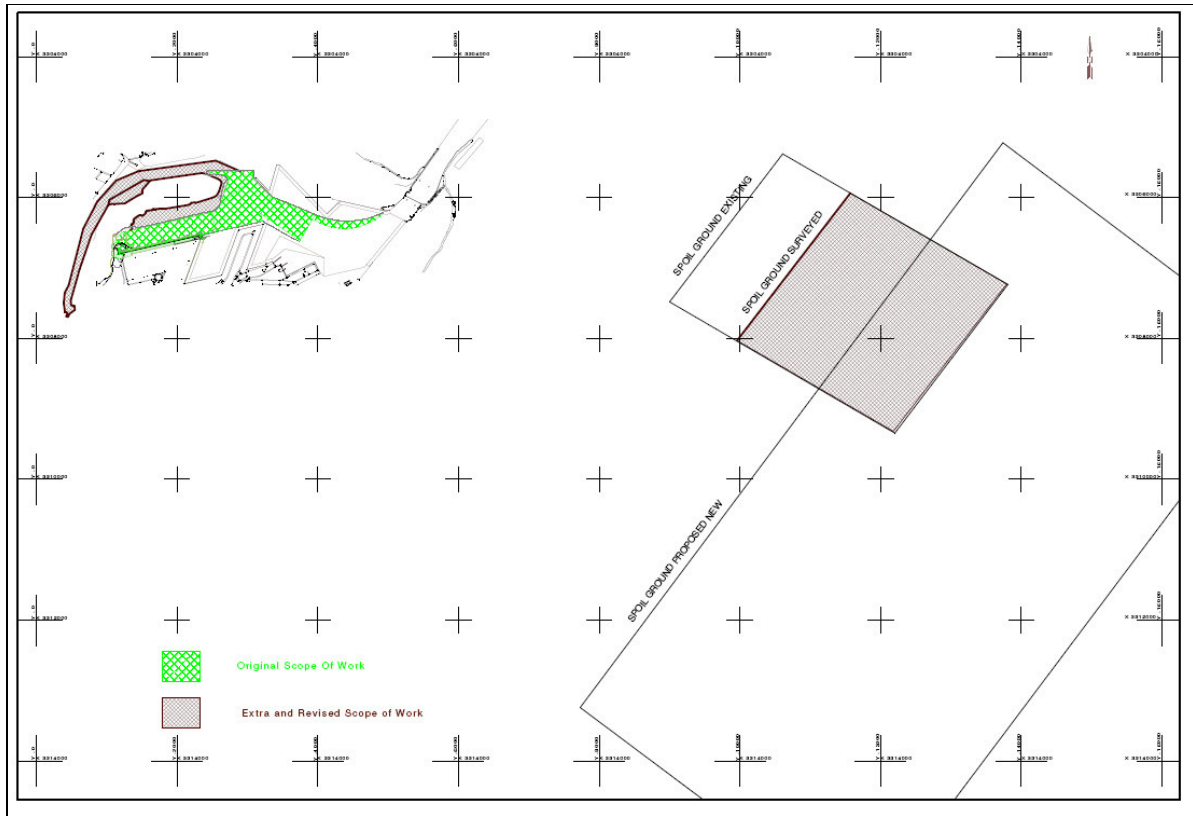


Figure 1.2: Durban Harbour and Dump Site Final Survey Areas

1.4. DELIVERABLES

A comprehensive survey operations and results report, supported by bathymetric charts, were requested by the Client.

In addition the final processed bathymetric point data was required in ASCII XYZ format as follows:

- Harbour Survey Area – at 0.5m x 0.5m grid intervals (bin size)
- Dump Site Survey Area – at 10m x 10m grid intervals (bin size)

2. EQUIPMENT AND PERSONNEL

2.1. VESSEL

The 6.2m ski-boat, “Blue Dolphin”, was utilised for multibeam bathymetric data acquisition during this survey. “Blue Dolphin” is a road transportable butt-cat, based in Cape Town, South Africa. The vessel is equipped with twin Yamaha 70hp outboard motors and has a purpose built over-the-stern multibeam sonar pole mount. Power for equipment is provided by a 3.0 KVa inverter petrol generator.



Figure 2.1: Survey Vessel “Blue Dolphin

NOTE: This vessel is ideal for shallow water inshore surveys, where water depths range between 2m and 40m. Although not ideal, it can be utilised for surveys in deeper waters, but very good weather conditions are required. The sea conditions experienced offshore Durban and the water depths of between 70m and 90m within the Dump Site Survey Area were considered to be at the extreme operational limit of the vessel.

2.2. EQUIPMENT

The following survey equipment was utilised during the field data acquisition campaign:

Positioning:	Leica GS10 RTK System
Navigation / QC:	QINSy v8.00
Data Acquisition:	QINSy v8.00
Motion Sensor:	Coda F185 Attitude and Positioning Unit
Sounding System:	Reson SeaBat 8125 Multibeam System (harbour areas) Reson SeaBat 8101ER Multibeam System (dump site) Reson SVP15 Sound Velocity Profiler
Power:	220Vac from 3.0KVa Generator

The following resources was utilised during the data processing and interpretation:

Processing / QC:	QINSy v8.00 QLOUD v2.2.0.0
Charting:	Model Maker v7.10

2.3. PERSONNEL

The project personnel are detailed in Table 2-1 below:

Table 2-1 Personnel

Position	Name
Senior Surveyor	Andrew McClement
Skipper / Surveyor	Andrew Matthew
Area Surveyor - Onshore	Pierre Vrey
Project Manager - Onshore	Stuart Hanslo
ZAA Client Representatie / Logistic Support	Michael Baleta

3. SUMMARY OF EVENTS

For full details of survey activities during the project refer to the Daily Survey Reports presented in Appendix F to this report. The following is a brief summary of the main events:

All times are referenced to South African local time (GMT +2 hours).

23/03/2012

Complete preparations in readiness for departure on 24th March 2012 (i.e. agreed date for commencement of mobilisation).

Instructed by ZAA not to proceed with planned mobilisation due to a delay in approval of HSE documentation by Transnet.

24/03/2012 – 27/03/2012

UWS vessel, equipment and personnel on standby in Cape Town while resolving issues with HSE documentation.

Receive go-ahead from ZAA to proceed with mobilisation.

28/03/2012 – 29/03/2012

UWS survey vessel, equipment and personnel travel from Cape Town to Durban.

30/03/2012

Install all survey equipment on survey vessel "Blue Dolphin".

UWS personnel attended preliminary HSE induction at the Transnet induction offices at 15h30.

UWS on standby awaiting client to supply onshore survey control points.

01/04/2012

Launch survey vessel.

Wet test all survey equipment in the harbour area – system fully operational, with all sensor offsets and geodetic parameters checked.

Perform patch test calibration to obtain initial patch test values.

02/04/2012

UWS personnel attended a further induction at the Transnet induction offices at 09h00.

Survey control points to be used physically pointed out by land surveyor Craig Davies and coordinates supplied between 15h00 to 16h00.

On further investigation UWS personnel discovered that the supplied coordinates was referenced to the incorrect geodetic datum (i.e. Cape Datum, LO31) and not the geodetic system specified for the project (i.e. WGS84, Projection LO31).

03/04/2012

UWS personnel receive converted coordinates and MSL heights at 12h00.

Perform control point checks onto a TSM and then proceeded to set out a control point MT1 on a building at the Port Control Millennium Tower to gain the telemetry range that would be required to carry out the harbour survey and the dump site survey, approximately 10km offshore.

04/04/2012

Set-up RTK base station at the control point MT1 on the Bluff.

Checks carried out on TSM and supplied control points to verify positioning accuracy.

Establish control point BC1 in the Durban Marina for the purposes of carrying out daily pre- & post-survey base station checks.

Commence with multibeam bathymetric survey along Berths 203 to 205 and channel area.

05/04/2012

Continue with multibeam bathymetric survey in the harbour area.

Original scope of work completed at 13h00.

Commence with additional scope of work in the harbour area.

Sandbank survey area completed at 17h30.

06/04/2012

Continue with additional scope of work in the harbour area.

Lot 10 Dock and channel survey area completed at 10h00.

Blue Dolphin returned to mooring at Durban Marina.

Remove Reson SeaBat 8125 MBES system.

Install Reson SeaBat 8101 MBES system required in the deeper water at the dump site.

Installation and testing of SeaBat 8101 MBES system completed at 13h00.

Attempt to exit Durban Harbour for Dump Site survey, but turn back due to weather / sea conditions and return to mooring at Durban Marina.

07/04/2012

Exit Durban Harbour and head for Dump Site area, but turn back due to excessive swell and wind chop and resultant risk of damage to the survey equipment on-board.

Return to mooring at Durban Marina and secure vessel - weather standby.

08/04/2012

Transit from Durban Harbour to Dump Site survey area.

Despite marginal sea and weather conditions acquire multibeam bathymetric data over Dump Site survey area between 08h00 and 14h45.

Transit to the Durban Harbour and ran patch test calibration for Reson SeaBat 8101 system.

Return to mooring at 16h30.



Inform Client Representative of Dump Site survey progress.

Client Representative advised that the Dump Site survey coverage was adequate and instructed UWS to proceed with demobilisation at 18h30.

09/04/2012

UWS personnel demobilised all sensitive survey equipment from vessel and packed them into the transit boxes.

Blue Dolphin recovered from the Durban Marina and prepared for journey back to Cape Town.

The RTK base station could not be accessed due to it being a public holiday.

10/04/2012 – 11/04/2012

Demobilise the RTK base station and depart Durban at 09h00 on 10th April 2012.

Travel from Durban to Cape Town, with stop-over in Bloemfontein.

Arrive back at UWS base in Cape Town at 20h30 on 11th April 2012.

4. SURVEY METHODOLOGY

4.1. SURVEY

Prior to the commencement of operations, all equipment was installed on the vessel, tested and calibrated. All sensor offsets relative to the vessel's COG were previously measured using a total station and independently checked using metal-tape measurements. These offsets were entered into the project database. Appendix A contains the vessel offset diagram.

Background charts were loaded into the navigation software and displayed on the navigation PC screen as a guide to the helmsman during data acquisition.

No specific line plan was run for the survey areas. 100% Data coverage, at the specified grid resolution was achieved by overlapping adjoining swath tracks and filling in of gaps where required.

4.2. NAVIGATION SYSTEM

4.2.1. Primary Positioning – RTK GPS System

A Leica system G10 Real Time Kinematic (RTK) GPS was used as the primary surface positioning system for the survey. The system consists of two real time kinematic dual frequency receivers and two real time radio data transceivers. Using a dedicated coordinated base station onshore, base observations were transmitted to the rover system onboard the survey vessel. A horizontal and vertical accuracy of better than 3cm can be expected at a 95% confidence level.

The RTK system was referenced to existing onshore survey control points that were supplied by ZAA, via Transnet's registered local Land Surveyor. These points were previously used for other harbour surveys and are located along Berths 101 to 103. The point numbers correspond to the bollard numbers along the quay, but are set-back approximately 20m from the quay edge, along the fence of the container terminal. They are studs set in concrete marked with yellow paint.

The following coordinates, referenced to the Hartebeesthoek 94 Datum / LO31 grid projection (WG31) and heights relative to the Mean Sea Level (MSL) vertical datum were supplied to UWS:

Table 4-1 Survey Control Points supplied by Client

Station	Y	X	Levelled Heights (MSL)
20R	-3099.294	330678.090	2.985
1R	-2982.608	3306994.360	2.995
2R	-2985.288	3306987.031	2.997
33R	-3181.374	3306455.583	2.973

The RTK base station was installed on a control point, MT1, established by UWS survey personnel. To obtain the required line-of-sight telemetry coverage for the harbour and dump site survey areas, this point was located on the roof of the Generator Building next to the Millennium Tower on the Bluff. The following coordinates and height was established, relative to the supplied control points along Berths 101 to 103, using RTK GPS:

MT1 Easting = -5560.83m
 Northing = 3306296.896m
 Height = 80.22m (above Chart Datum)

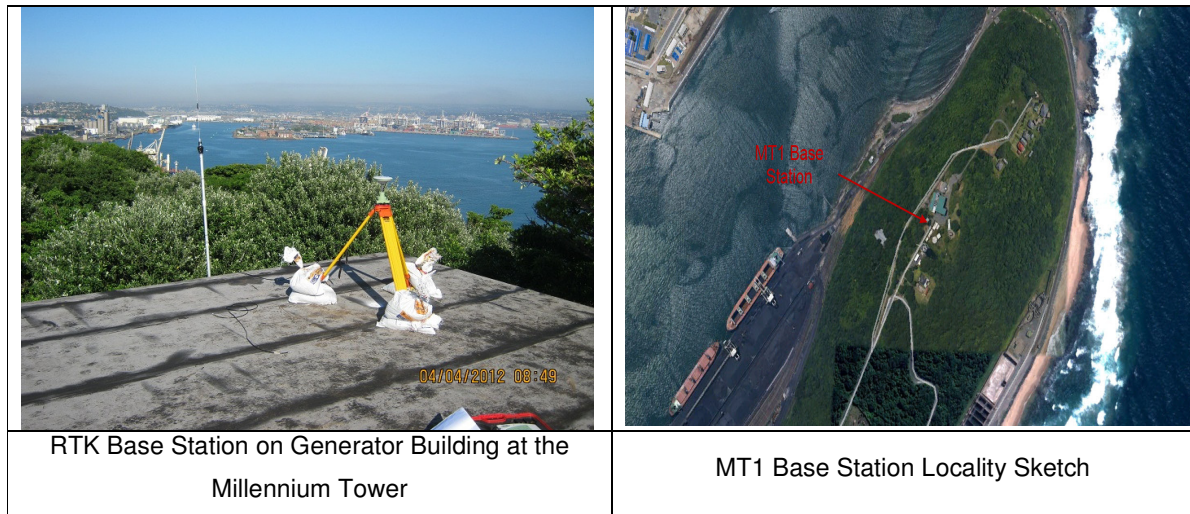


Figure 4.1: Location of RTK Base Station

The coordinates and height of an additional control point, BC1, was established at the Durban Marina. This point was required to carry out daily pre- and post-survey RTK integrity checks.

BC1 Easting = -2022.61m
 Northing = 3304896.52m
 Height = 3.36m (above Chart Datum)

After installation of the RTK base station equipment at control point MT1, verification of positioning accuracy was done by checking the position read by the RTK rover unit on the supplied control points. Very good agreement was observed between the RTK fix position and the supplied coordinates, thus confirming accurate positioning relative to Client-supplied survey control.

A difference of approximately 10cm was observed between the published X coordinate and the RTK fix position at TSM 692N1. Although this should have no impact on the current survey, it is mentioned here for completeness and future reference.

Details of the establishment of points MT1 and BC1 and checks are presented in Appendix E.

During the bathymetric survey additional checks were made at the start and end of each day to ensure that there had been no disruption to the RTK base station during the survey:

Table 4-2 GPS RTK Integrity Checks on BC1

Date	Time	Fix	Y	X	Ht (CD)	dy	dx	dht
Base Station	MT1	Actual	-5560.830	3306296.896	80.220			
BC1		Actual	-2022.611	3304896.523	3.356			
4 th April	12h55	BC1- Fix 1	-2022.607	3304896.519	3.359	-0.004	0.004	-0.003
4 th April	17h36	BC1- Fix 2	-2022.605	3304896.523	3.371	-0.005	0.000	-0.015
5 th April	06h16	BC1- Fix 3	-2022.594	3304896.524	3.361	-0.016	-0.001	-0.005
5 th April	17h20	BC1- Fix 4	-2022.610	3304896.509	3.362	0.016	0.015	-0.001
6 th April	06h15	BC1- Fix 5	-2022.595	3304896.508	3.340	-0.015	0.015	0.016
6 th April	13h10	BC1- Fix 6	-2022.604	3304896.530	3.363	-0.006	-0.007	-0.007
7 th April	06h20	BC1- Fix 7	-2022.599	3304896.524	3.343	-0.012	-0.001	0.013
8 th April	06h15	BC1- Fix 8	-2022.592	3304896.505	3.339	-0.018	0.018	0.017
8 th April	15h00	BC1- Fix 9	-2022.601	3304896.519	3.374	-0.009	0.004	-0.018

4.2.2. QINSy QPS v8 - Navigation System

The Dutch company QPS's QINSy software package was used for navigation control, data acquisition and processing of all external sensor data. QINSy Version 8.00.2011.09.02 was utilised for online acquisition and processing, together with Qcloud v2.2.0.0 (Build 2010.03.23.1).

QINSy uses WGS-84 for GPS position calculation, with 'online' transformation to local datum's in real-time through user-defined datum shift parameters. Vessel and antenna offsets can also be entered into the system to allow specific positioning datum selection. Quality control of all positioning system components (GPS, Sonar, Gyro etc.) is continuous, with data logged to hard drive, and saved in real time to on-screen visible DTMs displayed for the operator.



Figure 4.2: QPS QINSy Survey Acquisition Software

QINSy database set-up parameters for both SeaBat 8125 and SeaBat 8101 configuration are presented in Appendix C of this report.

4.3. BATHYMETRY

Bathymetric data was acquired using Reson SeaBat 8125 multibeam sonar for inside the harbour and the Reson SeaBat 8101 multibeam sonar for the dump site area.

The sonar head was deployed on a very rigid stern-mounted pole that is stabilised with a waterline bracket. The sonar equipment was interfaced with the navigation computer for data control and precise time tagging. 1PPS timing was obtained from a NMEA ZDA time message provided by a CSI Wireless

DGPS MAX receiver and a RESON PPS box. For heave, pitch, and roll compensation, a Coda F185 attitude and positioning unit was used.



Figure 4.3: Reson SeaBat 8101 Head being mounted on pole

Calibrations for speed of sound were carried out at least once a day or with a change of survey area, by taking velocity cast prior to survey activity, using a Reson SVP-15 sound velocity profiler. The sound velocity profile data was entered into the acquisition system and applied online during the survey.

Sound velocity profile data is presented in Appendix B.

4.3.1. Sonar Calibration

To accurately measure the seafloor, the measurements made by the multibeam sonar must be relative to the true vertical as reported by the motion sensor and the heading as reported by the gyro. During installation it is not possible to obtain perfect alignment of the sonar on the measured zero axis. Therefore a standard calibration routine (Patch Test) was performed to obtain values for Roll, Pitch, and Yaw mounting angles of the sonar head. For the purpose of this survey the sonar head was mounted looking vertically down.

Alignment corrections known from previous patch test calibrations onboard the Blue Dolphin were applied online during the data acquisition.

Table 4-3 Sonar Calibration Values used for Data Acquisition

SYSTEM	LATENCY	ROLL	PITCH	YAW
SeaBat 8125 & 8101	N/A due to 1PPS Timing	-0.92°	+6.30°	+1.68°

An initial patch test calibration was performed on 01st April 2012 to verify the existing calibration results applied online during data acquisition. Further patch test calibrations were performed on a daily basis prior to commencement of multibeam data acquisition. Relative correction values were derived and applied to the acquired MBES data during post-processing of the data for each day.

The final alignment corrections for the various Patch Test calibrations performed throughout the survey are shown in the table below.

Table 4-4 Sonar Calibration Results

DATE	LATENCY	ROLL	PITCH	YAW	Comment
01/04/2012	N/A due to PPS Timing	-0.140 ^o	+6.250	-1.59 ^o	Test equip and calibrate-8125
04/04/2012	N/A due to PPS Timing	-0.050 ^o	+6.010 ^o	-1.680 ^o	Survey in Hbr-8125
05/04/2012	N/A due to PPS Timing	-0.050 ^o	+5.620 ^o	-0.85 ^o	Survey in Hbr-8125
06/04/2012	N/A due to PPS Timing	-0.060 ^o	+6.310 ^o	-1.660 ^o	Survey in Hbr-8125
08/04/2012	N/A due to PPS Timing	-0.380 ^o	+7.200 ^o	-1.790 ^o	Survey Dump Site-8101

Details of daily patch test results (relative corrections) that were applied during processing are presented in Appendix D.

4.4. GYRO COMPASS AND MOTION REFERENCE UNIT

A Coda F185 attitude and positioning unit was used during this survey to correct the bathymetry data for heading and motion.

The sensor was installed on the Blue Dolphin's deck inside the cabin, as close as possible to the vessel's approximate centre of gravity. The gyro was aligned as close as possible to the vessels centreline using plumb lines.

5. SURVEY CONTROL

5.1. UNITS

Linear units are meters.

Angular units are degrees (^o), Grid

Times are South African local time (UTC plus 2 hours)

5.2. GEODETIC PARAMETERS

Positions were computed on the **WGS84** spheroid. The projection used was the **Gauss Conform LO31, Central Meridian 31°E**.

Spheroid and projection parameters are as follows:

Table 5-1 Working Spheroid & Projection Parameters

Working Spheroid		Working Projection	
Datum:	Hartebeesthoek 94	Projection:	Gauss Conform LO 31 °
Spheroid:	WGS84	Latitude of Origin:	0 ° 00' 00" N
Semi-major, a:	6 378 137.0m	Longitude of Origin	31 ° 00' 00" E
Semi-Minor, b:	6 356 752.3m	False Easting:	0.0m
Flattening, 1/f:	298.25722	False Northing:	0.0m
		Scale Factor at CM:	1.000

5.3. VERTICAL DATUM

All depths were recorded using the height from the RTK system and were therefore collected relative to Chart Datum (CD). Chart Datum for Durban is 0.900m below Mean Sea Level (MSL). All depths in this report are shown relative to CD, except where stated or for benchmark information.

6. RESULTS

6.1. GENERAL

The multibeam bathymetric data for the areas inside the Durban Harbour was acquired between 04th and 06th April 2012 using the Reson SeaBat 8125 MBES system. The data for the offshore Dump Site was acquired on 08th April 2012 using the Reson SeaBat 8101 MBES system.

6.2. PROCESSING PROCEDURES

All data was processed and QC'd in the UWS office in Cape Town after completion of the field data acquisition. Processing was undertaken by Andrew Matthew and Andrew McClement, using QPS QLOUD version 2.2.0.0 (Build 2010.03.23.1) and QPS QINSy version 8.00 (Build 2009.11.01.1).

Processing involved replaying of all acquired DB files with the relative Patch Test calibration corrections applied. This was followed by importing the replayed QPD files, created in QINSy, into QLOUD and trimming them to the boundary of the survey areas.

The data was then filtered for Brightness and Colinearity and an IHO Special Order filter was applied. The data was then manually checked and all remaining spikes removed. All validated data was exported to QINSy's Sounding Grid utility. Finally the processed data was exported as ASCII points and GeoTIFF images.

The Model Maker software package was used for all contouring and charting.

6.3. DURBAN HARBOUR SURVEY AREAS

The figure below shows the total survey coverage for the specified areas inside the Durban Harbour.

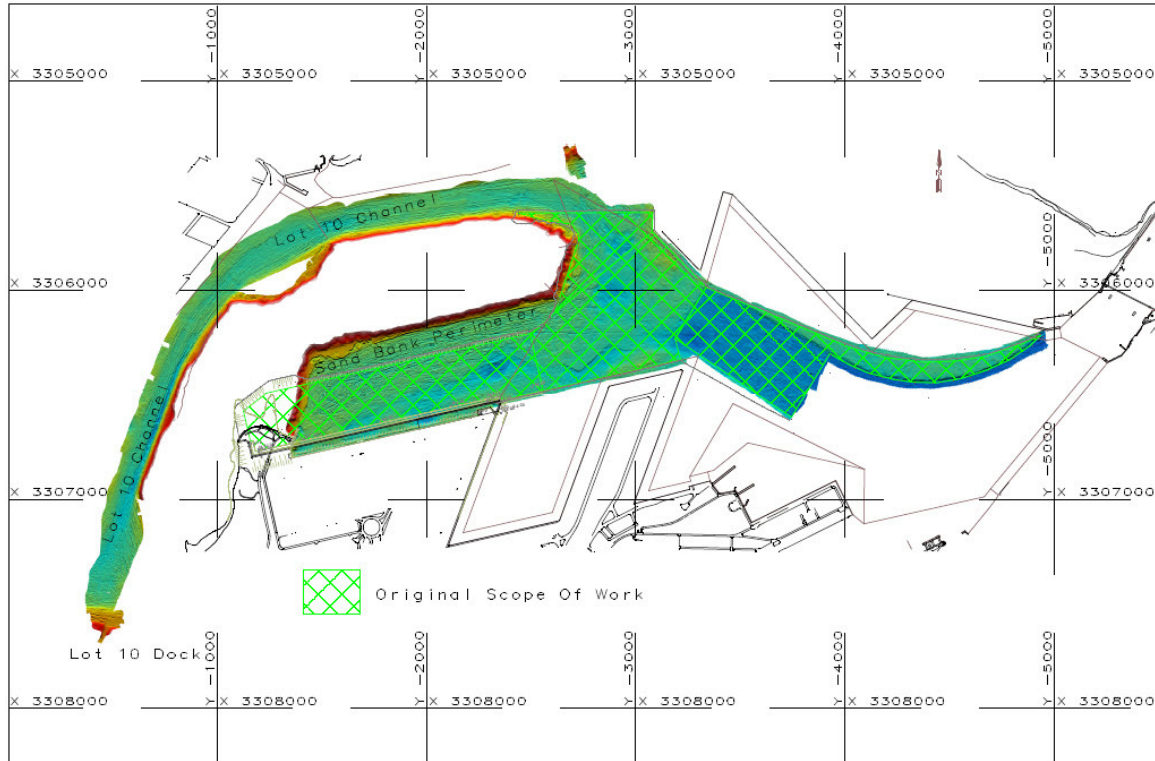


Figure 6.1: Durban Harbour Survey Coverage

6.3.1. Berth 203,204,205 and Surrounds – Original SOW

Full coverage was achieved at 0.5m x 0.5m bin size for all areas surveyed.

A total of 4 801 472 points make up the 0.5m x 0.5m grid for the original scope of work survey area.

Minimum depth in survey area: 0.26 metres below CD

Maximum depth in survey area: 18.34 metres below CD

A bathymetric chart was produced as an A1 sheet at a scale of 1:7,500. Contours are shown at 1.0m intervals and are overlaid on colour-scaled GeoTIFF backgrounds representing depths. This chart is included in Appendix G to this report. A digital version of the data in XYZ point data format, exported at 0.5m x 0.5m grid intervals, is provided on the accompanying data CD.

6.3.2. Lot 10 Dock & Channel and Sandbank Perimeter – Additional SOW

Full coverage was achieved at 0.5m x 0.5m bin size for all areas surveyed.

A total of 3 721 211 points make up the 0.5m x 0.5m grid for this additional survey area.

Minimum depth in survey area: 0.08 metres above CD

Maximum depth in survey area: 16.98 metres below CD

The water depth along the channel from the main turning basin towards the Lot 10 Dock is in excess of the required -12m CD until approximately 200m from the dock, where it becomes shallower. Water depth in and around Lot 10 Dock is in the region of -8m CD.

The approximate centre line of the identified channel is as follows:

Table 6-1 Lot 10 Dock Channel Centre Line

C/L Pt No	Y	X	Chainage	Depth Description
0	-452.961	3307659.746	0	Shallower than -12m CD
1	-476.367	3307613.466	51.862	Shallower than -12m CD
2	-474.771	3307532.078	133.265	Shallower than -12m CD
3	-456.152	3307467.18	200.781	Shallower than -12m CD
4	-480.024	3307369.568	301.27	Deeper than -12m CD
5	-578.988	3306948.981	733.343	Deeper than -12m CD
6	-740.567	3306496.559	1213.753	Deeper than -12m CD
7	-837.515	3306254.19	1474.792	Deeper than -12m CD
8	-991.015	3306036.058	1741.52	Deeper than -12m CD
9	-1140.476	3305878.518	1958.677	Deeper than -12m CD
10	-1435.358	3305733.097	2287.467	Deeper than -12m CD
11	-1742.358	3305660.386	2602.961	Deeper than -12m CD
12	-2126.109	3305599.794	2991.466	Deeper than -12m CD
13	-2356.36	3305575.557	3222.988	Deeper than -12m CD
14	-2582.571	3305583.636	3449.343	Deeper than -12m CD
15	-2707.794	3305636.149	3585.133	Deeper than -12m CD
16	-2812.821	3305720.979	3720.138	Deeper than -12m CD

This data is represented on the same bathymetric chart produced for the original scope of work and described above. The chart is included in Appendix G to this report. In addition a separate digital version of the data in XYZ point data format, exported at 0.5m x 0.5m grid intervals, is provided on the accompanying data CD.

6.3.3. Seabed Hazards

There is isolated debris to be found across the survey area as is normal in any harbour environment, however these pose no significant hazard to navigation or dredging.

A few unidentified objects are present near the western end of Berth 203 and also a few others scattered across the survey area. The table below lists these objects to be noted.

Table 6-2 Seabed Targets - within original scope of work area

Description	Y(m)	X(m)	L x W x H (m)
Three unidentified objects in a row all +/- 2mx2m	-1439.8	3306561.5	3 objects
Suspected Tyre	-1454.2	3306577.6	3.0 x 3.0 x 0.8
Unidentified Object – possible tyre	-1438.3	3306600.7	2.0x2.0 x 0.7
Unidentified Object	-1487.9	3306503.9	3.0 x 2.0 x 1.0
Unidentified Object	-1489.5	3306533.9	2.0 x 2.0 x 1.0
Possible Tyre	-1755.6	3306285.1	3.0x3.0x0.7
Possible Tyre	-2299.3	3306361.7	3.0x3.0x0.6
Possible Tyre	-3264.7	3305.934.0	2.5x2.5x0.6
Possible Tyre	-3224.8	3305.829.3	2.5x2.5x0.8

There are other smaller insignificant objects within the area, but these are of no consequence to the data.

6.4. DUMP SITE SURVEY AREA

The figure below shows the data coverage for the Dump Site area acquired during one full day of survey.

NOTE: Although weather and water depth conditions were not ideal for the vessel and system setup the data, processed to a grid resolution of 10m x 10m, is considered to be of acceptable quality.

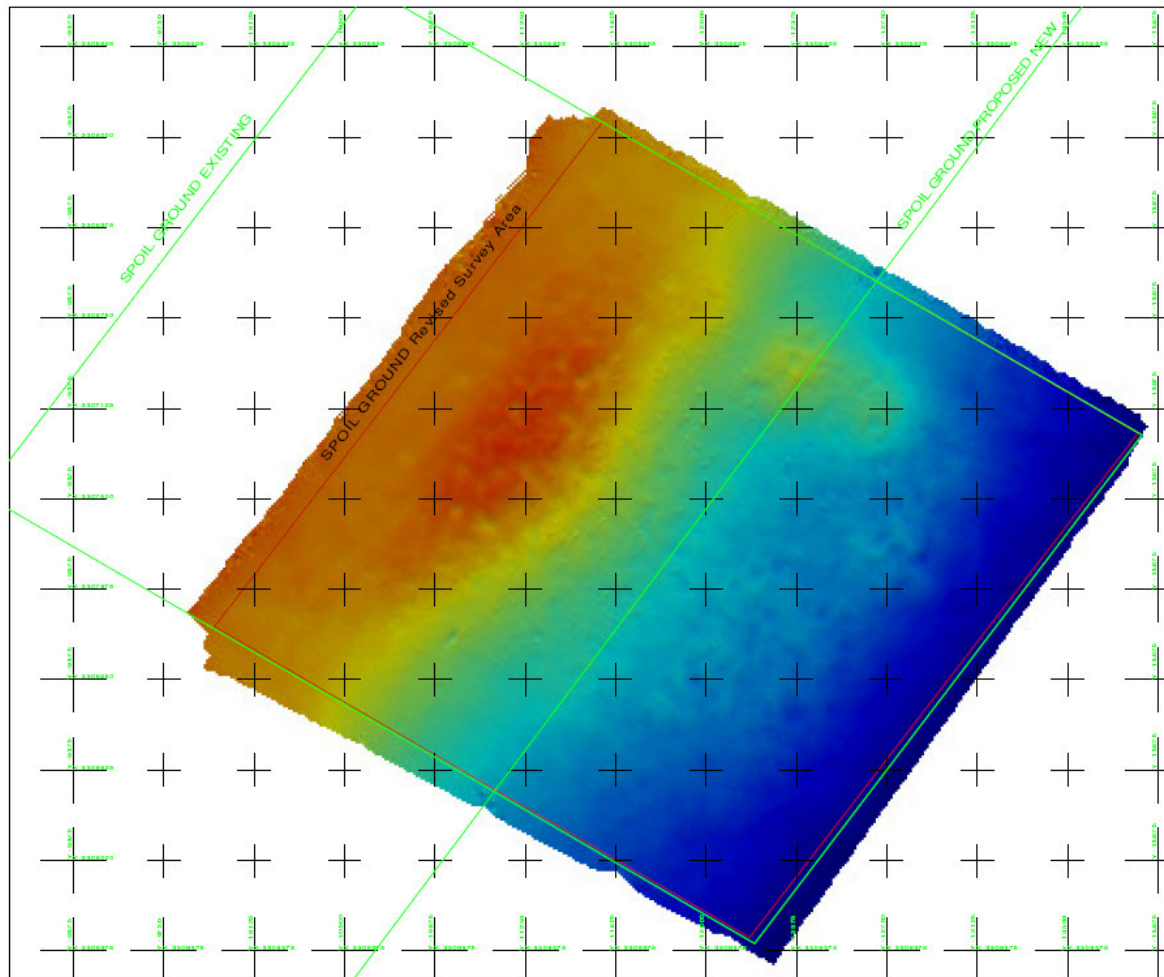


Figure 6.2: Dump Site Survey Coverage

There was a total of 67 197 points to make up the 10m x 10m grid of the survey area.

Minimum depth in survey area: 68.13 metres below CD

Maximum depth in survey area: 90.40 metres below CD

The general trend within the surveyed area is a gently sloping seabed with depths increasing from the north-west towards the south-east.



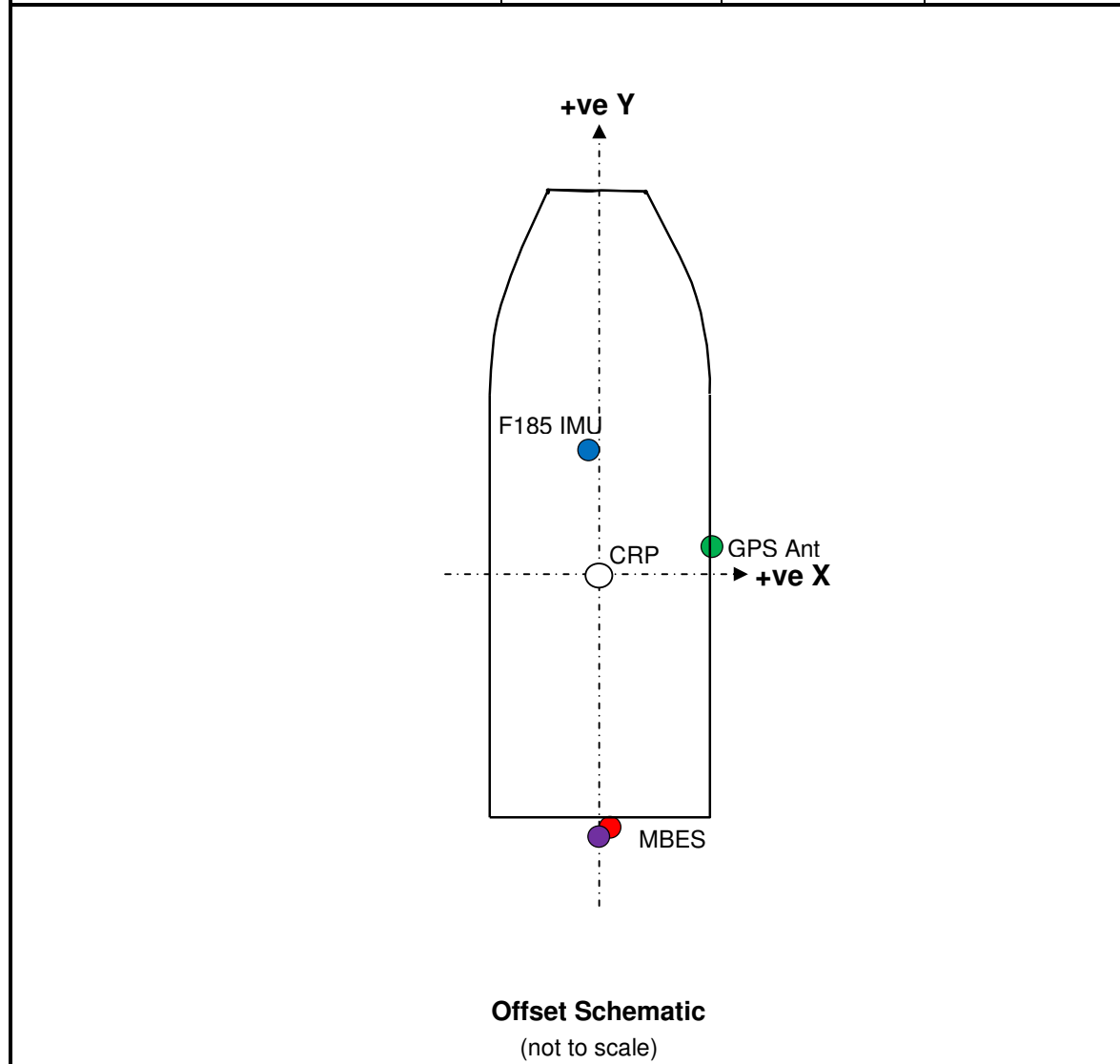
The results are presented as a single A1 size Bathymetric Chart at 1:7,500 scale. Contours are shown at 1.0m intervals and are overlaid on a colour-scaled GeoTIFF background representing depths. This chart is included in Appendix G to this report. In addition a digital version of the data in XYZ point data format, exported at 10m x 10m grid intervals, is provided on the accompanying data CD.



APPENDIX A VESSEL OFFSET DIAGRAM

BLUE DOLPHIN SURVEY SENSOR OFFSETS

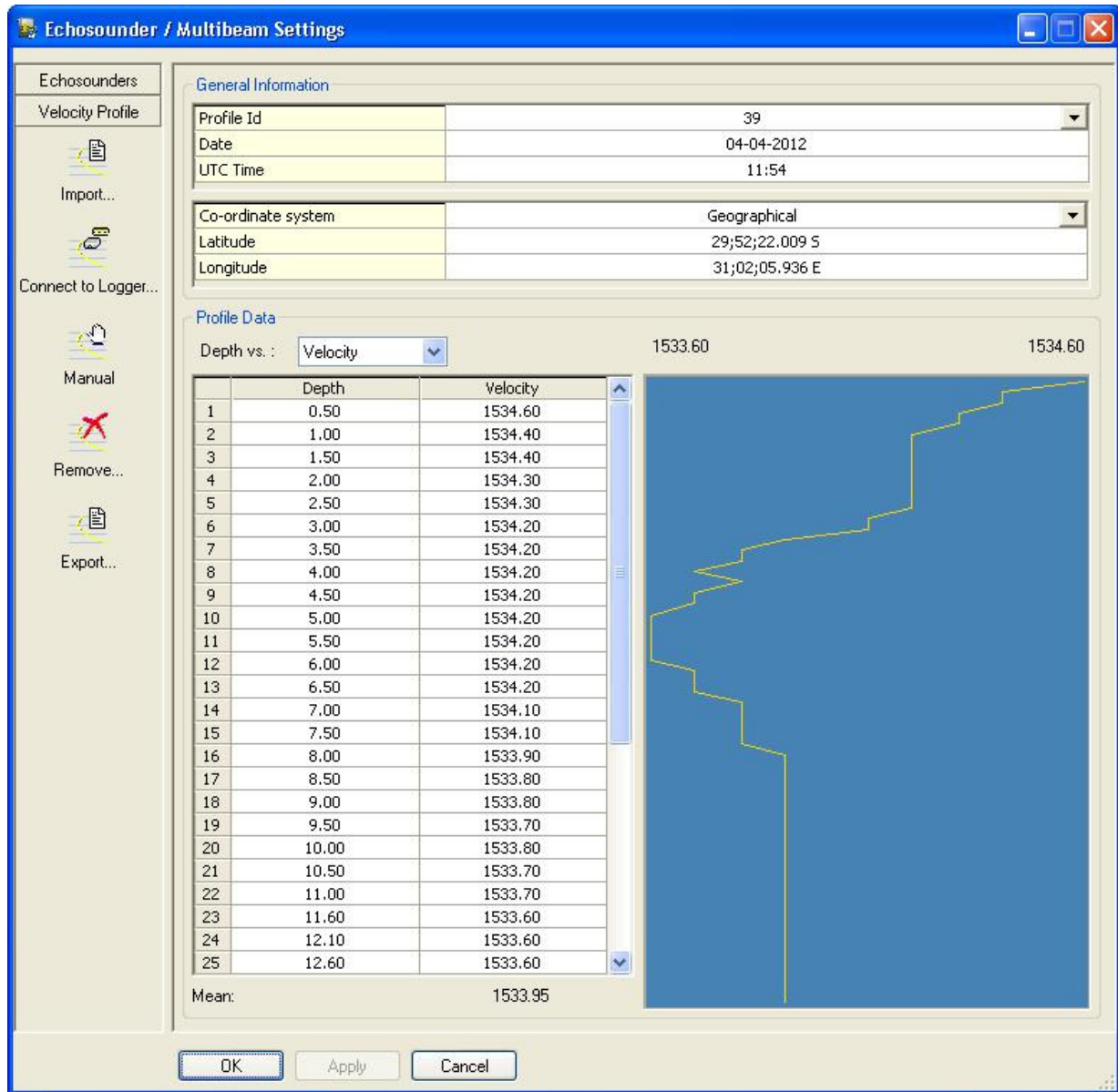
Offset / Sensor	X Offset (+ve starboard)	Y Offset (+ve forward)	Z Offset (+ve upward)
Common Reference Point (CRP) ○	0.000m	0.000m	0.000m
GPS Antenna ●	0.925m	0.210m	+2.061m
F185 IMU ●	-0.043m	+1.372m	+0.040m
Reson SeaBat 8125 Transducer ●	+0.030m	-2.331m	-0.894m
Reson SeaBat 8101 Transducer ●	+0.000m	-2.440m	-0.963m
Water Line ○	0.000m	0.000m	+0.070m





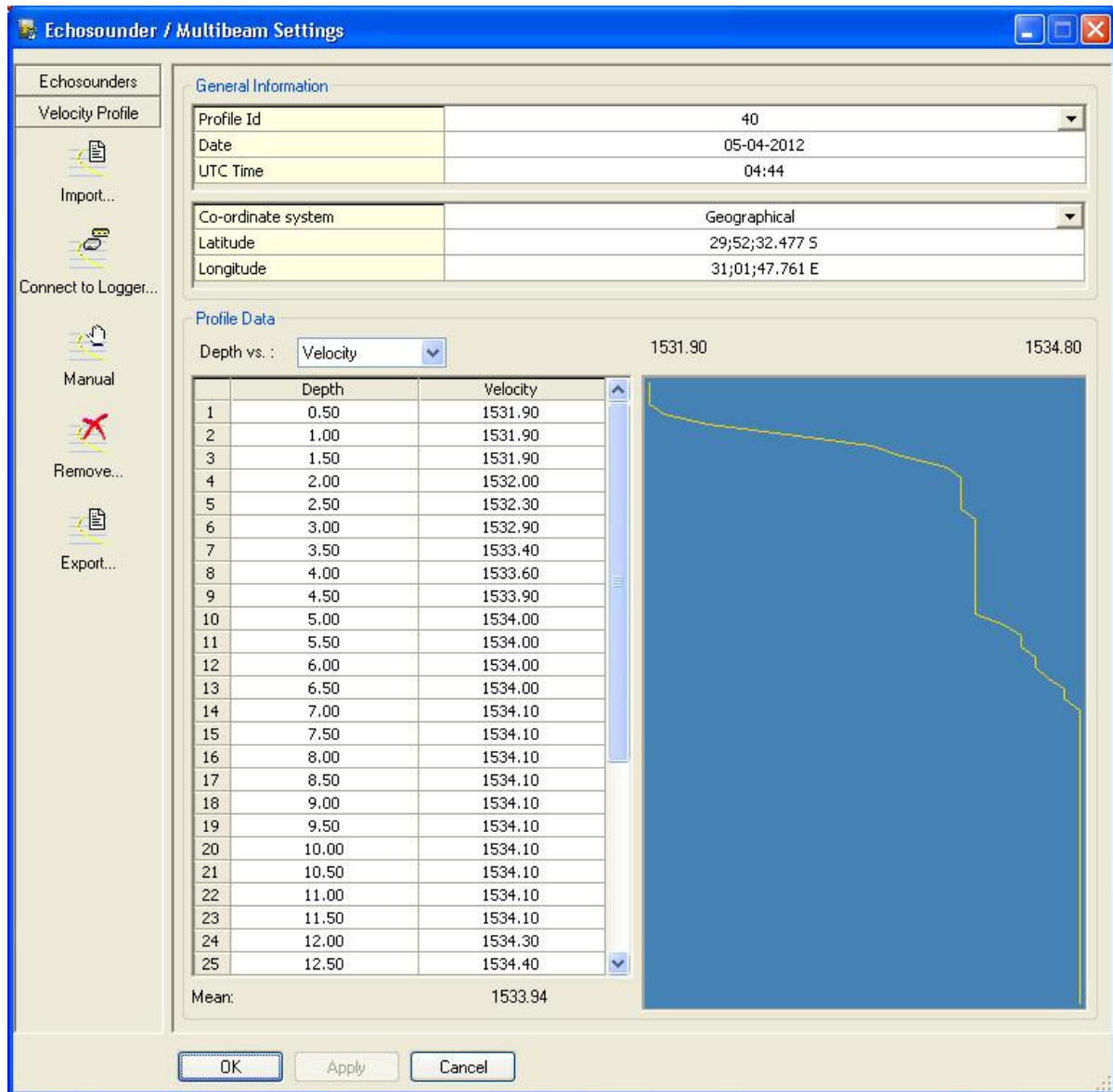
APPENDIX B SOUND VELOCITY PROFILES

SVP 04 APRIL 2012 @ 13H54 LT

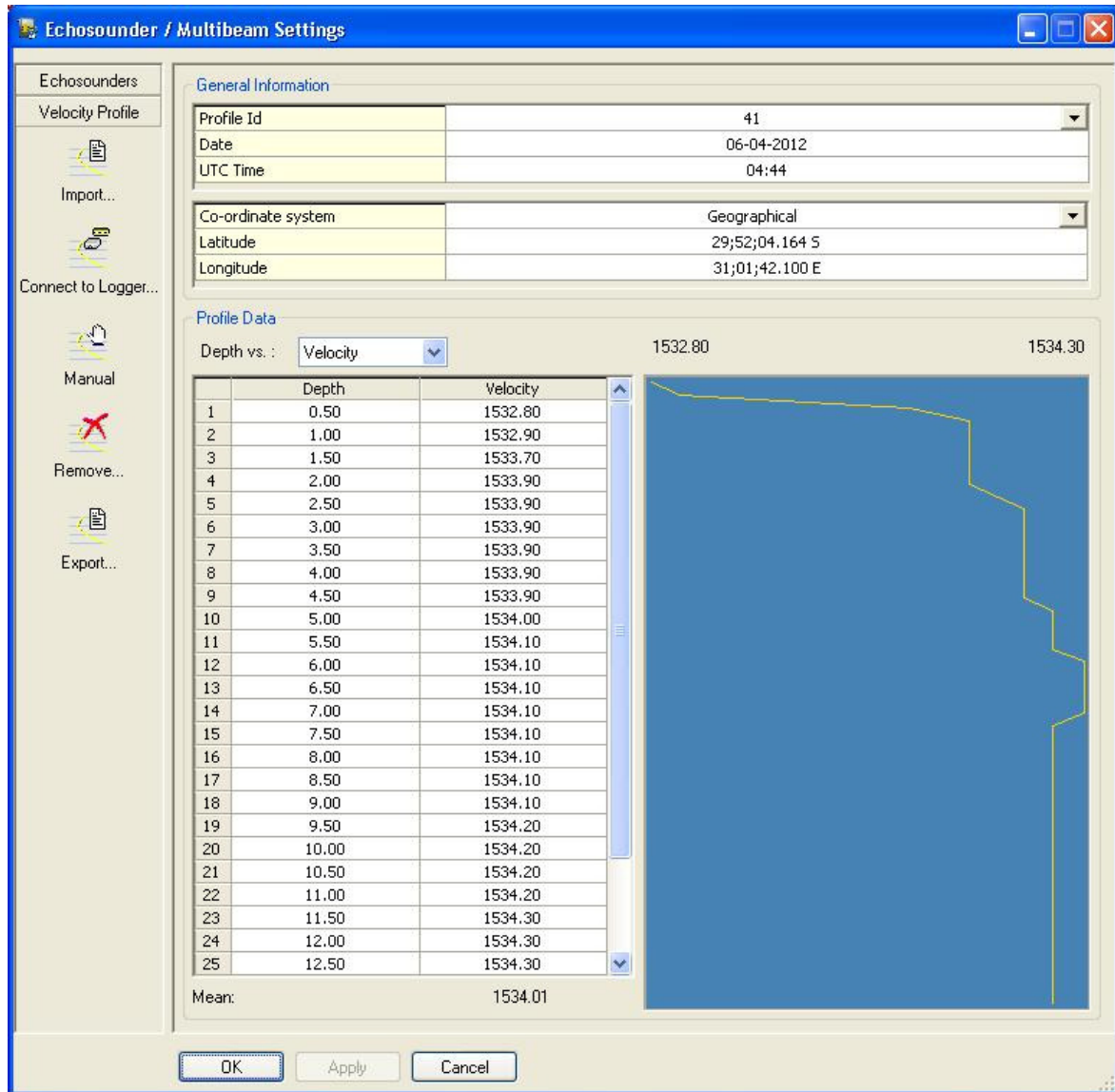




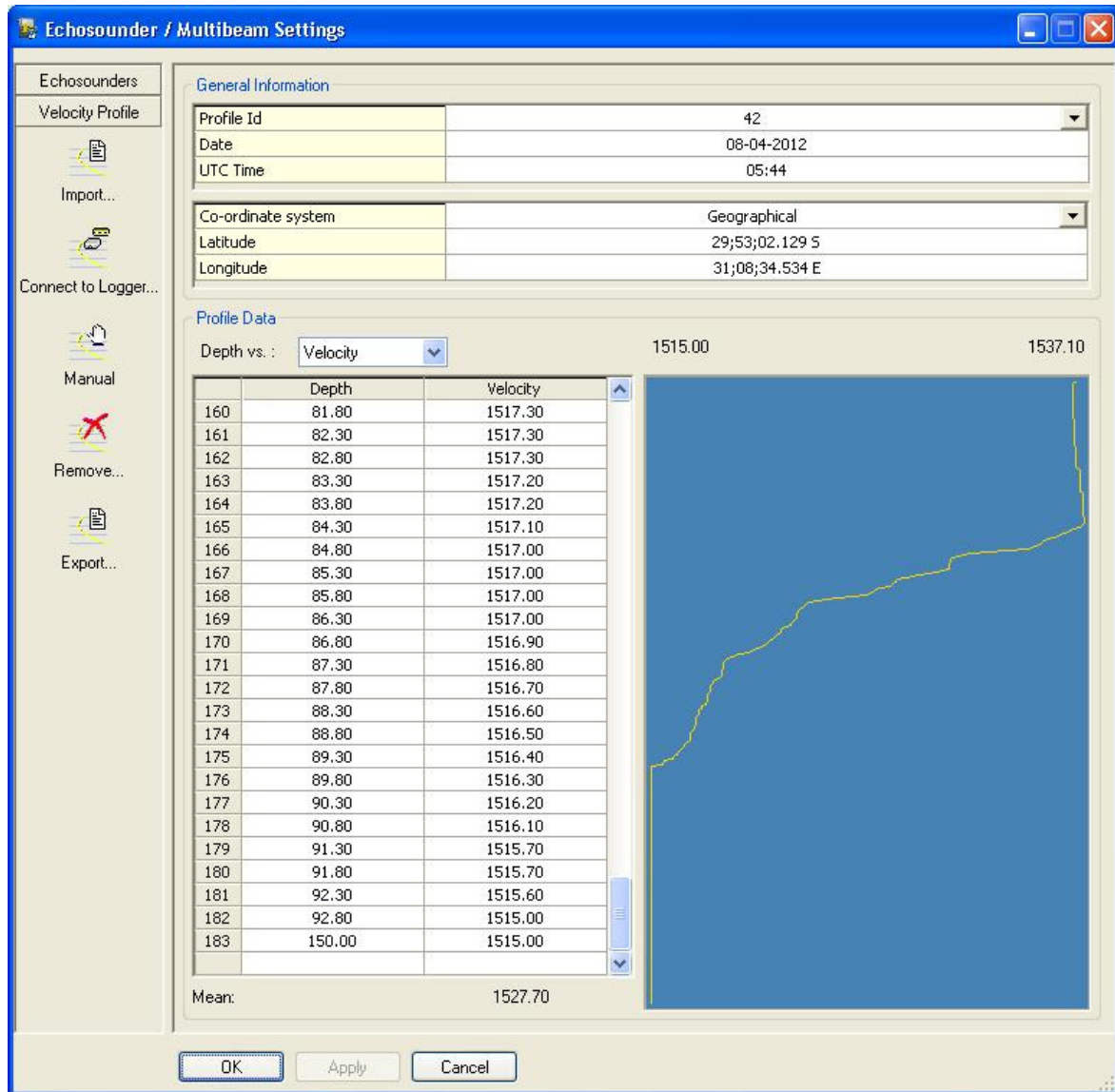
SVP 05 APRIL 2012 @ 06H44 LT



SVP 06 APRIL 2012 @ 06H44 LT



SVP 08 APRIL 2012 @ 07H44 LT





APPENDIX C QINSy SETUP PARAMETERS



QINSy Configuration for Reson MBES 8125 onboard the Blue Dolphin

DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8125\RAW\Durban-1370 DCT 02042012\DatabasPage 1 of 9

SURVEY DEFINITIONS

General Definitions

Line sequence number	: 1
Line description	:
<hr/>	
UTC to GPS time correction	: 15.00 s
<hr/>	
Survey Unit Name	: Meters
Conversion factor to metres	: 1.00000000

Geodetic Definitions

Magnetic Variation Information

Undefined

Datum Definitions

Survey Datum	: WGS84
Spheroid name	: WGS 1984
Semi-major axis (a)	: 6378137.000 m
Semi-minor axis (b)	: 6356752.314 m
Conversion factor to metres	: 1.000000
Inverse flattening (1/f)	: 298.25722356
First eccentricity squared (e**2)	: 0.00669438
Second eccentricity squared (e***2)	: 0.00673950

Datum Shift Definitions

Undefined

Height Datum Definition

Vertical datum	: WGS84
Height file	: N/A
Height level	: No Level Correction
Height file	: N/A
Height offset	: 0.000 m

MSL model	: Horizontal Datum
MSL file	: N/A
MSL level	: No Level Correction
MSL file	: N/A
MSL offset	: 0.000 m
MSL st.dev.	: 0.000 m

DTM mode	: Absolute DTM's
DTM datum	: WGS84
DTM file	: N/A
DTM level	: No Level Correction
DTM file	: N/A
DTM offset	: 0.000 m



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8125\RAW\Durban-1370 DCT 02042012\Databas\Page 2 of 9

Projection Definition

Projection type	:	004
Projection name	:	Transverse Mercator (South Oriented)
Conversion factor to metres	:	1.000000
Latitude of grid origin	:	0;00;00.00000 N
Longitude of grid origin	:	31;00;00.00000 E
Grid Easting at grid origin	:	0.0000 E
Grid Northing at grid origin	:	0.0000 N
Scale factor at longitude of origin	:	1.00000000000

Local Construction Grid Definition

Not Applicable

Offset Convention

Offset mode	:	Rectangular
Offset distances units	:	m
Offset angles units	:	Degrees

OBJECT DEFINITIONS

General Summary Information

Number of survey vessels or objects	:	1
Number of relay vessels or buoys	:	0
Number of external network nodes	:	0
Number of datums/spheroids defined	:	1

Vessel Definitions

BD					
Streamers	:	0	Gun arrays	:	0
Buoys	:	0	Echosounders	:	0
Satellite receivers	:	0	USBL systems	:	0
Network nodes	:	5	Pitch/Roll/Heave sensors		
Correction to GMT	:	0.00 h			
Correction to master vessel's time	:	0.000000 s			
Height above draft reference	:	0.000 m			
BD CoG					

Point	X	Y	Z	Pen	Fill	Style
1	-1.4	-2.3	0.0	Up	On	Solid
2	-1.4	2.5	0.0	Down	On	Solid
3	0.0	3.9	0.0	Down	On	Solid
4	1.4	2.5	0.0	Down	On	Solid
5	1.4	-2.3	0.0	Down	On	Solid



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8125\RAW\Durban-1370 DCT 02042012\Databas\Page 3 of 9

Gun Array Definitions

NETWORK DEFINITIONS

Fixed Node Definitions

Variable Node Definitions

BD CoG

Object location : BD
 X (Stbd = Positive): : 0.000 m
 Y (Bow = Positive): : 0.000 m
 Z (Up = Positive): : 0.000 m

GPS ANT

Object location : BD
 X (Stbd = Positive): : 0.925 m
 Y (Bow = Positive): : 0.210 m
 Z (Up = Positive): : 2.061 m

F180

Object location : BD
 X (Stbd = Positive): : -0.043 m
 Y (Bow = Positive): : 1.372 m
 Z (Up = Positive): : 0.040 m

8125 head

Object location : BD
 X (Stbd = Positive): : 0.030 m
 Y (Bow = Positive): : -2.331 m
 Z (Up = Positive): : -0.894 m

water line

Object location : BD
 X (Stbd = Positive): : 0.000 m
 Y (Bow = Positive): : 0.000 m
 Z (Up = Positive): : 0.070 m

Observation Definitions

Gyro : Bearing (True)
 "At" node : BD CoG
 "To" node 1 :
 Measurement unit code : Degrees
 System description : F180 - HDG
 Propagation speed : 0.0000000000 m/s
 Lanewidth on baseline : 0.0000000000 m/s
 Scale factor : 1.0000000000
 Fixed system (C-O) : 0.00000000 °
 Variable (C-O) : 0.000000 °
 A-priori SD : 0.50 °
 Quality indicator : No quality info recorded



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8125\RAW\Durban-1370 DCT 02042012\Databas\Page 4 of 9

Reference Station Definitions

SYSTEM DEFINITIONS

Gyro Compass

F180 - HDG

Interfacing

Type	:	Gyro Compass			
Driver	:	NMEA Compass (\$--HDT)			
Executable and Cmdlir	:	DrvGyroNMEA.exe 8			
Port	:	7			
Baud rate	:	9600	Data bits	:	8
Parity	:	None	Stop bits	:	1
Update rate	:	0.000 s	Latency	:	0.000 s
Number of slots	:	0			

Connected Observations

Gyro : Bearing (True)

Connected Nodes

BD CoG : BD



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8125\RAW\Durban-1370 DCT 02042012\Databas\Page 5 of 9

Pitch Roll Heave Sensor

F180 - Motion

Interfacing

Type	:	Pitch Roll Heave Sensor	
Driver	:	TSS DMS R-P-H	
Executable and Cmdlir	:	DrvTSSNew.exe	
Port	:	6	
Baud rate	:	38400	Data bits : 8
Parity	:	None	Stop bits : 1
Update rate	:	0.000 s	Latency : 0.000 s

Number of slots : 0

System Parameters

F180 - Motion

Object	:	BD
Location on object (Lever arm)	:	F180
PRH sensor reference number	:	1
Rotation convention pitch	:	Positive bow up
Rotation convention roll	:	Positive heeling to starboard
Angular variable measured	:	HPR (roll first)
Angular measurement units	:	Degrees
Sign convention heave	:	Positive upwards
Measurement units heave	:	Meters
Conversion factor to degrees decimal	:	1.000
Conversion factor to metres	:	1.000
Quality indicator type pitch and roll	:	No quality info recorded
Quality indicator type heave	:	No quality info recorded
Description of quality indicator type	:	
X (Stbd = Positive):	:	-0.0430 m
Y (Bow = Positive):	:	1.3720 m
Z (Up = Positive):	:	0.0400 m
A-priori SD	:	0.0100 m
(C-O) pitch offset	:	0.0000 °
(C-O) roll offset	:	0.0000 °
(C-O) heave offset	:	0.0000 m
Heave time delay	:	0.0000 s
Heave filter length	:	20.0000 s
SD roll and pitch	:	0.0500 °
SD heave (fixed)	:	0.0500 m
SD heave (variable)	:	0.0500 %
SD roll offset	:	0.0500 °
SD pitch offset	:	0.0500 °
SD heave offset	:	0.0500 m

Description of pitch, roll and heave system

F180 - Motion

PPS System

PPS

Interfacing

Type	:	PPS System	
Driver	:	NMEA ZDA PPS (COM1)	
Executable and Cmdlir	:	DrvPpsZDA.exe 1	
Port	:	5	
Baud rate	:	9600	Data bits : 8
Parity	:	None	Stop bits : 1
Update rate	:	0.000 s	Latency : 0.000 s

Number of slots : 0



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8125\RAW\Durban-1370 DCT 02042012\Databas\Page 6 of 9

Output System

81P Time Stamp

Interfacing

Type	:	Output System			
Driver	:	Seabat 8000 Series UTC Synchroniser			
Executable and Cmdlir	:	DrvSeabatSynch.exe			
Port	:	3			
Baud rate	:	115200	Data bits	:	8
Parity	:	None	Stop bits	:	1
Update rate	:	1.000 s	Latency	:	0.000 s
Number of slots	:	0			

Offset System

Offset System

Interfacing

Type	:	Offset System
Driver	:	Unknown driver (0)
Executable and Cmdlir	:	



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8125\RAW\Durban-1370 DCT 02042012\Databas\Page 7 of 9

Multibeam Echosounder

8125

Interfacing

Type : Multibeam Echosounder
 Driver : Reson Seabat 81xx/900x (Network) XTF
 Executable and Cmdlir : DrvSeabatSocket.exe RAW
 Port : 1032 Latency : 0.000 s

Number of slots : 0

System Parameters

Node name : 8125 head -
 X (Stbd = Positive): : 0.030 m
 Y (Bow = Positive): : -2.331 m
 Z (Up = Positive): : -0.894 m
 A-priori SD : 0.010 m
 Description : 8125
 Object : BD
 Number of transducers : Single
 Transducer node TX : 8125 head
 Heading offset : 1.680 °
 Roll offset : -0.920 °
 Pitch offset : 6.300 °

Unit is roll stabilized : No
 Unit is pitch stabilized : No
 Unit is heave compensated : No
 Beam steering (flat transducer) : No
 Beam angle width along : 1.500 °
 Beam angle width across : 1.500 °
 Maximum number of beams per ping : 240
 Use sound velocity from unit : Yes

Slot : 1

SD type : Pulse, Sampling
 SD pulse length : 0.150 ms
 SD sampling length : 0.050000 m
 SD roll offset : 0.050 °
 SD pitch offset : 0.050 °
 SD heading offset : 0.500 °
 SD roll stabilization : 0.000 °
 SD pitch stabilization : 0.000 °
 SD heave compensation : 0.000 m
 SD sound velocity : 0.050 m/s



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8125\RAW\Durban-1370 DCT 02042012\Databas\Page 8 of 9

Position Navigation System

RTk

Interfacing

Type	:	Position Navigation System	
Driver	:	Leica 1200 series ASCII	
Executable and Cmdlir	:	DrvQPSTerminatedUI.exe LEICA_1200_ASCII PPS	
Port	:	4	
Baud rate	:	9600	Data bits : 8
Parity	:	None	Stop bits : 1
Update rate	:	0.000 s	Latency : 0.000 s

Number of slots : 1

Satellite System Definition

Position datum	:	WGS84
Satellite system name	:	WGS84

Satellite Receiver Definition

Receiver number	:	0
Receiver description	:	
Node identifier	:	GPS ANT
Object location	:	BD
X (Stbd = Positive):	:	0.925 m
Y (Bow = Positive):	:	0.210 m
Z (Up = Positive):	:	2.061 m
A-priori SD	:	0.010 m

SD latitude	:	0.500 m
SD longitude	:	0.500 m
SD height	:	1.000 m

Horizontal datum	:	WGS84
Vertical datum	:	WGS84
Height file	:	N/A
Height level	:	No Level Correction
Height file	:	N/A
Height offset	:	0.000 m

Connected Observations

Connected Nodes

Computed Attitude

Computed Attitude BD

Interfacing

Type	:	Computed Attitude
Driver	:	Unknown driver (0)
Executable and Cmdlir	:	



Sidescan Sonar

8125 SSS

Interfacing

Type : Sidescan Sonar
 Driver : Reson Seabat 81xx/900x (Network) XTF-Snippets
 Executable and Cmdlir : DrvSeabatSocket.exe RAW
 Port : 1033 Latency : 0.000 s
 Number of slots : 0

System Parameters

Manufacturer : Reson
 Model : Reson 8125
 Number of beams : 1
 Number of channels : 2
 Associated multibeam system : 8125
 Object location : BD
 Use sound velocity from unit : Yes

Node name : BD CoG
 Orientation : Port
 Sidescan Sonar Channel: : 0
 Slot ID : 0
 Roll offset : 0.000 °
 Pitch offset : 0.000 °
 Heading offset : 0.000 °
 Frequency : 100.000 kHz
 Number of beams : 1
 Horizontal beam width : 1.000 °
 Vertical beam width : 40.000 °
 Vertical tilt angle : 10.000 °

Node name : BD CoG
 Orientation : Starboard
 Sidescan Sonar Channel: : 1
 Slot ID : 0
 Roll offset : 0.000 °
 Pitch offset : 0.000 °
 Heading offset : 0.000 °
 Frequency : 100.000 kHz
 Number of beams : 1
 Horizontal beam width : 1.000 °
 Vertical beam width : 40.000 °
 Vertical tilt angle : 10.000 °



QINSy Configuration for Reson MBES 8101 onboard the Blue Dolphin

DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8101\RAW\Durban Dump Site 060412\Database\2012\Page 1 of 9

SURVEY DEFINITIONS

General Definitions

Line sequence number	:	1
Line description	:	
<hr/>		
UTC to GPS time correction	:	15.00 s
<hr/>		
Survey Unit Name	:	Meters
Conversion factor to metres	:	1.00000000

Geodetic Definitions

Magnetic Variation Information

Undefined

Datum Definitions

Survey Datum	:	WGS84
Spheroid name	:	WGS 1984
Semi-major axis (a)	:	6378137.000 m
Semi-minor axis (b)	:	6356752.314 m
Conversion factor to metres	:	1.000000
Inverse flattening (1/f)	:	298.25722356
First eccentricity squared (e**2)	:	0.00669438
Second eccentricity squared (e'***2)	:	0.00673950

Datum Shift Definitions

Undefined

Height Datum Definition

Vertical datum	:	WGS84
Height file	:	N/A
Height level	:	No Level Correction
Height file	:	N/A
Height offset	:	0.000 m

MSL model	:	Horizontal Datum
MSL file	:	N/A
MSL level	:	No Level Correction
MSL file	:	N/A
MSL offset	:	0.000 m
MSL st.dev.	:	0.000 m

DTM mode	:	Absolute DTM's
DTM datum	:	WGS84
DTM file	:	N/A
DTM level	:	No Level Correction
DTM file	:	N/A
DTM offset	:	0.000 m



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8101\RAW\Durban Dump Site 060412\Database\2012Page 2 of 9

Projection Definition

Projection type	: 004
Projection name	: Transverse Mercator (South Oriented)
Conversion factor to metres	: 1.000000
Latitude of grid origin	: 0;00;00.000000 N
Longitude of grid origin	: 31;00;00.000000 E
Grid Easting at grid origin	: 0.0000 E
Grid Northing at grid origin	: 0.0000 N
Scale factor at longitude of origin	: 1.00000000000

Local Construction Grid Definition

Not Applicable

Offset Convention

Offset mode	: Rectangular
Offset distances units	: m
Offset angles units	: Degrees

OBJECT DEFINITIONS

General Summary Information

Number of survey vessels or objects	: 1
Number of relay vessels or buoys	: 0
Number of external network nodes	: 0
Number of datums/spheroids defined	: 1

Vessel Definitions

BD						
Streamers	: 0	Gun arrays	: 0			
Buoys	: 0	Echosounders	: 0			
Satellite receivers	: 0	USBL systems	: 0			
Network nodes	: 5	Pitch/Roll/Heave sensors				
Correction to GMT	: 0.00 h					
Correction to master vessel's time	: 0.000000 s					
Height above draft reference	: 0.000 m					
BD CoG						
Point	X	Y	Z	Pen	Fill	Style
1	-1.4	-2.3	0.0	Up	On	Solid
2	-1.4	2.5	0.0	Down	On	Solid
3	0.0	3.9	0.0	Down	On	Solid
4	1.4	2.5	0.0	Down	On	Solid
5	1.4	-2.3	0.0	Down	On	Solid



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8101\RAW\Durban Dump Site 060412\Database\2012Page 3 of 9

Gun Array Definitions

NETWORK DEFINITIONS

Fixed Node Definitions

Variable Node Definitions

BD CoG

Object location	:	BD	
X (Stbd = Positive):	:		0.000 m
Y (Bow = Positive):	:		0.000 m
Z (Up = Positive):	:		0.000 m

GPS ANT

Object location	:	BD	
X (Stbd = Positive):	:		0.925 m
Y (Bow = Positive):	:		0.210 m
Z (Up = Positive):	:		2.061 m

F180

Object location	:	BD	
X (Stbd = Positive):	:		-0.043 m
Y (Bow = Positive):	:		1.372 m
Z (Up = Positive):	:		0.040 m

8101 head

Object location	:	BD	
X (Stbd = Positive):	:		0.000 m
Y (Bow = Positive):	:		-2.440 m
Z (Up = Positive):	:		-0.963 m

water line

Object location	:	BD	
X (Stbd = Positive):	:		0.000 m
Y (Bow = Positive):	:		0.000 m
Z (Up = Positive):	:		0.070 m

Observation Definitions

Gyro	:	Bearing (True)
"At" node	:	BD CoG
"To" node 1	:	
Measurement unit code	:	Degrees
System description	:	F180 - HDG
Propagation speed	:	0.0000000000 m/s
Lanewidth on baseline	:	0.0000000000 m/s
Scale factor	:	1.0000000000
Fixed system (C-O)	:	0.00000000 °
Variable (C-O)	:	0.000000 °
A-priori SD	:	0.50 °
Quality indicator	:	No quality info recorded



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8101\RAW\Durban Dump Site 060412\Database\2012\Page 4 of 9

Reference Station Definitions

SYSTEM DEFINITIONS

Gyro Compass

F180 - HDG

Interfacing

Type	:	Gyro Compass			
Driver	:	NMEA Compass (\$--HDT)			
Executable and Cmdline	:	DrvGyroNMEA.exe 8			
Port	:	7			
Baud rate	:	9600	Data bits	:	8
Parity	:	None	Stop bits	:	1
Update rate	:	0.000 s	Latency	:	0.000 s
Number of slots	:	0			

Connected Observations

Gyro : Bearing (True)

Connected Nodes

BD CoG : BD



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8101\RAW\Durban Dump Site 060412\Database\2012Page 5 of 9

Pitch Roll Heave Sensor

F180 - Motion

Interfacing

Type	:	Pitch Roll Heave Sensor		
Driver	:	TSS DMS R-P-H		
Executable and Cmdline	:	DrvTSSNew.exe		
Port	:	6		
Baud rate	:	38400	Data bits	:
Parity	:	None	Stop bits	:
Update rate	:	0.000 s	Latency	:
				8
				1
				0.000 s
Number of slots	:	0		

System Parameters

F180 - Motion

Object	:	BD
Location on object (Lever arm)	:	F180
PRH sensor reference number	:	1
Rotation convention pitch	:	Positive bow up
Rotation convention roll	:	Positive heeling to starboard
Angular variable measured	:	HPR (roll first)
Angular measurement units	:	Degrees
Sign convention heave	:	Positive upwards
Measurement units heave	:	Meters
Conversion factor to degrees decimal	:	1.000
Conversion factor to metres	:	1.000
Quality indicator type pitch and roll	:	No quality info recorded
Quality indicator type heave	:	No quality info recorded
Description of quality indicator type	:	
X (Stbd = Positive):	:	-0.0430 m
Y (Bow = Positive):	:	1.3720 m
Z (Up = Positive):	:	0.0400 m
A-priori SD	:	0.0100 m
(C-O) pitch offset	:	0.0000 °
(C-O) roll offset	:	0.0000 °
(C-O) heave offset	:	0.0000 m
Heave time delay	:	0.0000 s
Heave filter length	:	20.0000 s
SD roll and pitch	:	0.0500 °
SD heave (fixed)	:	0.0500 m
SD heave (variable)	:	0.0500 %
SD roll offset	:	0.0500 °
SD pitch offset	:	0.0500 °
SD heave offset	:	0.0500 m
Description of pitch, roll and heave system	:	

F180 - Motion



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8101\RAW\Durban Dump Site 060412\Database\2012Page 6 of 9

PPS System

PPS

Interfacing

Type	:	PPS System			
Driver	:	NMEA ZDA PPS (COM1)			
Executable and Cmdline	:	DrvPpsZDA.exe 1			
Port	:	5			
Baud rate	:	9600	Data bits	:	8
Parity	:	None	Stop bits	:	1
Update rate	:	0.000 s	Latency	:	0.000 s
Number of slots	:	0			

Output System

81P Time Stamp

Interfacing

Type	:	Output System			
Driver	:	Seabat 8000 Series UTC Synchroniser			
Executable and Cmdline	:	DrvSeabatSynch.exe			
Port	:	3			
Baud rate	:	115200	Data bits	:	8
Parity	:	None	Stop bits	:	1
Update rate	:	1.000 s	Latency	:	0.000 s
Number of slots	:	0			

Offset System

Offset System

Interfacing

Type	:	Offset System		
Driver	:	Unknown driver (0)		
Executable and Cmdline	:			



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8101\RAW\Durban Dump Site 060412\Database\2012Page 7 of 9

Multibeam Echosounder

8101

Interfacing

Type	: Multibeam Echosounder		
Driver	: Reson Seabat 81xx/900x (Network) XTF		
Executable and Cmdline	: DrvSeabatSocket.exe RAW		
Port	: 1032	Latency	: 0.000 s
Number of slots	: 0		

System Parameters

Node name	: 8101 head -		
X (Stbd = Positive):	: 0.000 m		
Y (Bow = Positive):	: -2.440 m		
Z (Up = Positive):	: -0.963 m		
A-priori SD	: 0.010 m		
Description	: 8101		
Object	: BD		
Number of transducers	: Single		
Transducer node TX	: 8101 head		
Heading offset	: 1.680 °		
Roll offset	: -0.920 °		
Pitch offset	: 6.300 °		

Unit is roll stabilized	: No		
Unit is pitch stabilized	: No		
Unit is heave compensated	: No		
Beam steering (flat transducer)	: No		
Beam angle width along	: 1.500 °		
Beam angle width across	: 1.500 °		
Maximum number of beams per ping	: 101		
Use given sound velocity	: 1485.00 °		

Slot	: 1		
------	-----	--	--

SD type	: Pulse, Sampling		
SD pulse length	: 0.150 ms		
SD sampling length	: 0.050000 m		
SD roll offset	: 0.050 °		
SD pitch offset	: 0.050 °		
SD heading offset	: 0.500 °		
SD roll stabilization	: 0.000 °		
SD pitch stabilization	: 0.000 °		
SD heave compensation	: 0.000 m		
SD sound velocity	: 0.050 m/s		



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8101\RAW\Durban Dump Site 060412\Database\2012Page 8 of 9

Position Navigation System

RTk

Interfacing

Type	: Position Navigation System		
Driver	: Leica 1200 series ASCII		
Executable and Cmdline	: DrvQPSTerminatedUI.exe LEICA_1200_ASCII PPS		
Port	: 4		
Baud rate	: 9600	Data bits	: 8
Parity	: None	Stop bits	: 1
Update rate	: 0.000 s	Latency	: 0.000 s
Number of slots	: 1		

Satellite System Definition

Position datum	: WGS84
Satellite system name	: WGS84

Satellite Receiver Definition

Receiver number	: 0	
Receiver description	:	
Node identifier	: GPS ANT	
Object location	: BD	
X (Stbd = Positive):	:	0.925 m
Y (Bow = Positive):	:	0.210 m
Z (Up = Positive):	:	2.061 m
A-priori SD	:	0.010 m
SD latitude	:	0.500 m
SD longitude	:	0.500 m
SD height	:	1.000 m
Horizontal datum	: WGS84	
Vertical datum	: WGS84	
Height file	: N/A	
Height level	: No Level Correction	
Height file	: N/A	
Height offset	:	0.000 m

Connected Observations

Connected Nodes

Computed Attitude

Computed Attitude BD

Interfacing

Type	: Computed Attitude		
Driver	: Unknown driver (0)		
Executable and Cmdline	:		



DbSetup: J:\Dbn Hbr_ZAA\Processing\DBN DTC 1370\8101\RAW\Durban Dump Site 060412\Database\2012\Page 9 of 9

Sidescan Sonar

8101 sss

Interfacing

Type : Sidescan Sonar
 Driver : Reson Seabat 81xx/900x (Network) XTF-Snippets
 Executable and Cmdline : DrvSeabatSocket.exe RAW
 Port : 1033 Latency : 0.000 s

Number of slots : 0

System Parameters

Manufacturer : Reson
 Model : Reson 8125
 Number of beams : 1
 Number of channels : 2
 Associated multibeam system : 8101
 Object location : BD
 Use sound velocity from unit : Yes

Node name : BD CoG
 Orientation : Port
 Sidescan Sonar Channel: : 0
 Slot ID : 0
 Roll offset : 0.000 °
 Pitch offset : 0.000 °
 Heading offset : 0.000 °
 Frequency : 100.000 kHz
 Number of beams : 1
 Horizontal beam width : 1.000 °
 Vertical beam width : 40.000 °
 Vertical tilt angle : 10.000 °

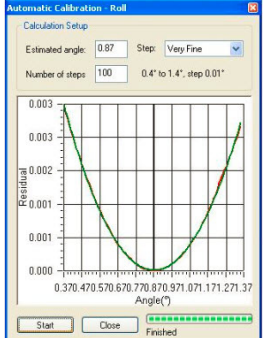
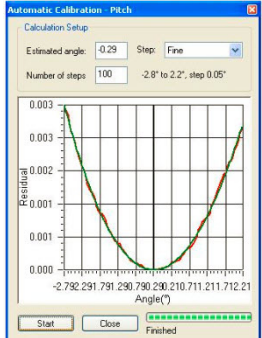
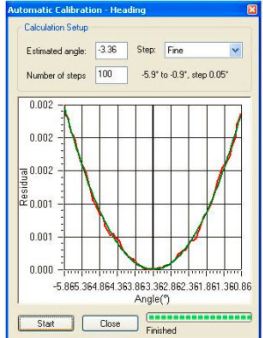
Node name : BD CoG
 Orientation : Starboard
 Sidescan Sonar Channel: : 1
 Slot ID : 0
 Roll offset : 0.000 °
 Pitch offset : 0.000 °
 Heading offset : 0.000 °
 Frequency : 100.000 kHz
 Number of beams : 1
 Horizontal beam width : 1.000 °
 Vertical beam width : 40.000 °
 Vertical tilt angle : 10.000 °

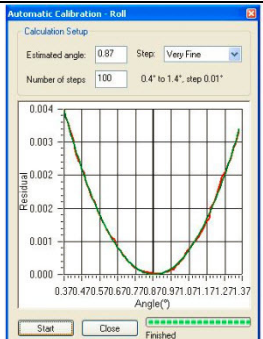
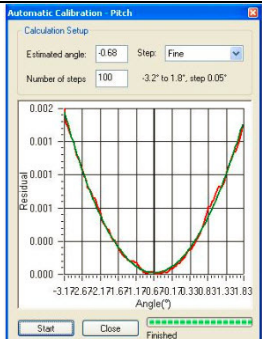
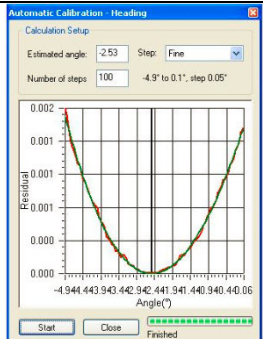


APPENDIX D PATCH TESTS



The following patch test results were applied relatively to the online acquisition database during processing of each days data.

PATCH TEST CALIBRATION – 04 April 2012			
Sonar Alignment Value	ROLL	PITCH	YAW
Online Acquisition	-0.92°	+6.30°	+1.68°
Patch Test Result (relative correction)	+0.87°	-0.29°	-3.36°
Final Alignment Value	-0.05°	+6.01°	-1.68°
QINSy Patch Test Calc			

PATCH TEST CALIBRATION – 05 April 2012			
Sonar Alignment Value	ROLL	PITCH	YAW
Online Acquisition	-0.92°	+6.30°	+1.68°
Patch Test Result (relative correction)	+0.87°	-0.68°	-2.53°
Final Alignment Value	-0.05°	+5.62°	-0.85°
QINSy Patch Test Calc			



PATCH TEST CALIBRATION – 06 April 2012			
Sonar Alignment Value	ROLL	PITCH	YAW
Online Acquisition	-0.92°	+6.30°	+1.68°
Patch Test Result (relative correction)	+0.86°	+0.01°	-3.34°
Final Alignment Value	-0.06°	+6.31°	-1.66°
QINSy Patch Test Calc			

PATCH TEST CALIBRATION – 08 April 2012			
Sonar Alignment Value	ROLL	PITCH	YAW
Online Acquisition	-0.92°	+6.30°	+1.68°
Patch Test Result (relative correction)	+0.54°	+0.90°	-3.47°
Final Alignment Value	-0.38°	+7.20°	-1.66°
QINSy Patch Test Calc			



APPENDIX E CONTROL POINT LAYOUT



All Coordinates are in WG31
 Craig Davies Supplied Control points on Behalf of Transnet/ZAA

Station	E	N	Lev Hts MSL
20R	-3099.294	330678.090	2.985
1R	-2982.608	3306994.360	2.995
2R	-2985.288	3306987.031	2.997
33R	-3181.374	3306455.583	2.973

TSM and Other Control Points

Published coordinates	E	N	Lev Hts MSL
TSM 692N1	-4230.201	3305813.513	1.786
UWS 1	-4808.075	3306154.681	2.732
ASP1	-4912.705	3306131.997	2.721
Set out Points			
BC1	New Point		
MT1	New Point		

Surveys and Land Information
 UWS1 was setout from ASP1 (Base Station Set Up and Checked).
 ASP1 Supplied from independent source.

RTK Checks on surrounding Control points While Set up on Supplied 20R

Station	E	N	RTK Ht MSL	dE	dN	dH	Ht CD
20R	Base Station Set Up						(+0.9m)
1R	-2982.619	3306994.370	2.989	0.011	-0.010	0.006	3.895
2R	-2985.303	3306987.045	2.976	0.015	-0.014	0.021	3.897
33R	-3181.358	3306455.572	2.957	-0.016	0.011	0.016	3.873
TSM and Other Control Points							
TSM 692N1	-4230.191	3305813.609	1.806	-0.010	-0.096	-0.020	2.686
UWS 1	-4808.072	3306154.757	2.776	-0.003	-0.076	-0.044	3.632
Set out Points							
BC1	-2022.611	3304896.523	2.456				3.356
MT1	-5560.830	3306296.896	79.321	Point to be used for Base Station			80.221

Used through out Survey of both Harbour Aand Dump site

WG31	E	N	ht - CD
MT1	-5560.830	3306296.896	80.221

Base station Setup at MT1	E	N	Ht - CD	dE	dN	dH
Base at MT1	-5560.830	3306296.896	80.220			
Base Check 1R	-2982.609	3306994.371	3.876	0.001	-0.011	0.019
Base check 33R	-3181.365	3306455.574	3.867	-0.009	0.009	0.006
Base check on TSM 692N1	-4230.188	3305813.615	2.710	-0.013	-0.102	-0.024
Base Check On ASP1	-4912.683	3306132.071	3.690	-0.022	-0.074	-0.069

Base Station Control point

Date	Time	Fix	y	x	CD	dy	dx	dht
		Base at MT1	-5560.830	3306296.896	80.220			
		BC1	-2022.611	3304896.523	3.356			
04th March	12h55	Check Fix 1	-2022.607	3304896.519	3.359	-0.004	0.004	-0.003
4th March	17h36	Check Fix 2	-2022.605	3304896.523	3.371	-0.005	0.000	-0.015
5th March	06h16	Check Fix 3	-2022.594	3304896.524	3.361	-0.016	-0.001	-0.005
5th March	17h20	Check Fix 4	-2022.610	3304896.509	3.362	0.016	0.015	-0.001
6th March	06h15	Check Fix 5	-2022.595	3304896.508	3.340	-0.015	0.015	0.016
6th March	13h10	Check Fix 6	-2022.604	3304896.530	3.363	-0.006	-0.007	-0.007
7th March	06h20	Check Fix 7	-2022.599	3304896.524	3.343	-0.012	-0.001	0.013
8th March	06h15	Check Fix 8	-2022.592	3304896.505	3.339	-0.018	0.018	0.017
8th March	15h00	Check Fix 9	-2022.601	3304896.519	3.374	-0.009	0.004	-0.018



APPENDIX F DAILY PROGRESS REPORTS



UNDERWATER SURVEYS (PTY) LTD

DAILY SURVEY REPORT

FROM: UNDERWATER SURVEYS (PTY) LTD		UWS Proj: 12/016
TO: Wanda Ellison	ZAA Engineering Projects & Naval Architecture (Pty) Ltd	
COPY: Michael Baleta		DATE: 28/03/12
COPY: Stuart Hanslo	UWS	
COPY: Pierre Very	UWS	DPR No: 1
PROJECT: Durban Harbour - Bathymetric Survey		

Local Time		OPERATIONS
FROM	TO	
Wednesday 28/03/2012		
05h15	21h30	Andrew McClement and Andrew Matthews travel with boat and equipment from Cape town to Bloemfontein
Thursday 29/03/2012		
06h00	16h30	Andrew McClement and Andrew Matthews travel with boat and equipment from Bloemfontein to Durban
17h00	18h00	Travel from Bloemfontein to Durban Marina and secure for the night in Durban boat owners association yard.

TIME SUMMARY Hr.h	HOURS		
MOB\DEMOB	48		
STANDBY			
OPERATIONAL	0		
EXTRA WORK at CLIENT REQUEST	0		
STANDBY on additional work at CLIENT REQUEST	0		

Comments - UNDERWATER SURVEYS

Andrew McClement and Andrew Matthews are the UWS survey personnel for this project
 Still waiting for the control points from ZAA to base the survey on.

Signed: Andrew McClement *[Signature]*

Comments - CLIENT

Signed: Michael Baleta *[Signature]*




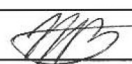
UNDERWATER SURVEYS (PTY) LTD

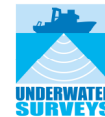
DAILY SURVEY REPORT

FROM:	UNDERWATER SURVEYS (PTY) LTD	UWS Proj:	12/016
TO:	Wanda Ellison ZAA Engineering Projects & Naval Architecture (Pty) Ltd	DATE:	30/03/12
COPY:	Michael Baleta	DPR No:	2
COPY:	Stuart Hanslo UWS		
COPY:	Pierre Very UWS		
PROJECT:	Durban Harbour - Bathymetric Survey		

Local Time		OPERATIONS
FROM	TO	
Friday 30/03/2012		
07h30	12h30	Mobilise boat with all survey kit and dry test onshore
10h00	11h30	Andrew McClement meets with Michael Baleta of ZAA and Lee of Transnet to discuss HSE docs.
12h30	13h40	Launch boat and moor in Durban Marina.
14h30	16h00	UWS Personnel go to ZAA offices in Dbn Hbr and sort out HSE docs with michael Baleta and then move to Transnet Induction offices for Induction.
16h00	17h00	Return to Guest house and unpack all empty boxes and store all spare equipment.

TIME SUMMARY Hr.h	HOURS
MOB\DEMOB	60
STANDBY	
OPERATIONAL	0
EXTRA WORK at CLIENT REQUEST	0
STANDBY on additional work at CLIENT REQUEST	0

Comments - UNDERWATER SURVEYS	
UWS Still waiting for Control Points to be used for the survey.	
Signed: Andrew McClement 	
Comments - CLIENT	
Signed: Michael Baleta 	





UNDERWATER SURVEYS (PTY) LTD

DAILY SURVEY REPORT

FROM: UNDERWATER SURVEYS (PTY) LTD	UWS Proj: 12/016
TO: Wanda Ellison ZAA Engineering Projects & Naval Architecture (Pty) Ltd	
COPY: Michael Baleta	DATE: 31/03/12
COPY: Stuart Hanslo UWS	
COPY: Pierre Very UWS	DPR No: 3
PROJECT: Durban Harbour - Bathymetric Survey	

Local Time	OPERATIONS	
FROM	TO	
		Saturday 31/03/2012
07h30	17h30	Heavy rain prevents all testing of survey equipment onboard Blue Dolphin. Survey boat.
		Recce of area around harbour carried out. By vehicle

TIME SUMMARY Hr.h	HOURS
MOB\DEMOB	60
STANDBY	24
OPERATIONAL	0
EXTRA WORK at CLIENT REQUEST	0
STANDBY on additional work at CLIENT REQUEST	0

<p>Comments - UNDERWATER SURVEYS Rain prevents start up of the onboard generator and no wet test can be done. UWS Still waiting for Control Points to be used for durban Harbur survey.</p>	Signed: Andrew Mcclement 
<p>Comments - CLIENT</p>	Signed: Michael Baleta 



UNDERWATER SURVEYS (PTY) LTD

DAILY SURVEY REPORT

FROM: UNDERWATER SURVEYS (PTY) LTD	UWS Proj: 12/016
TO: Wanda Ellison ZAA Engineering Projects & Naval Architecture (Pty) Ltd	DATE: 01/04/12
COPY: Michael Baleta	DPR No: 4
COPY: Stuart Hanslo UWS	
COPY: Pierre Very UWS	
PROJECT: Durban Harbour - Bathymetric Survey	

Local Time		OPERATIONS
FROM	TO	
		Sunday 01/04/2012
08h30	13h30	Take Blue Dolphin out into the durban harbour and wet test all equipment. All fully operational, Also carry out calibration on the F180 motion sensor and the MBES patch test calibration.
15h00	16h00	Process Patch test data and check sample data. All good, and systems ready for survey ops.

TIME SUMMARY Hr.h	HOURS
MOB/DEMOB	60
STANDBY	48
OPERATIONAL	0
EXTRA WORK at CLIENT REQUEST	0
STANDBY on additional work at CLIENT REQUEST	0

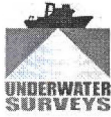
Comments - UNDERWATER SURVEYS

UWS Still waiting for Control Points to be used for durban Harbur survey.

Signed: Andrew McClement

Comments - CLIENT

Signed: Michael Baleta



UNDERWATER SURVEYS (PTY) LTD

DAILY SURVEY REPORT

FROM:	UNDERWATER SURVEYS (PTY) LTD	UWS Proj:	12/016
TO:	Wanda Ellison ZAA Engineering Projects & Naval Architecture (Pty) Ltd		
COPY:	Michael Baleta	DATE:	02/04/12
COPY:	Stuart Hanslo UWS		
COPY:	Pierre Very UWS	DPR No:	5
PROJECT:	Durban Harbour - Bathymetric Survey		

Local Time		OPERATIONS
FROM	TO	
		Monday 02/04/2012
09h00	10h30	UWS personnel attend induction at Transnet Health and Safety office
		Standingby for control points to continue survey
14h30	16h00	Meet with Craig Davies to discuss control points in Dbn Hbr area. He also took us to Berths 101 to 103 and showed control points.
16h00	17h00	Take GPS standalone positions on 1R, 2R 4R, 33R points to check supplied coords.
17h30	18h30	Compare coords with Supplied coords- Find Supplied Coords to be Cape datum Coords.

TIME SUMMARY Hr.h	HOURS
MOBIDEMOB	60
STANDBY	60
OPERATIONAL	0
EXTRA WORK at CLIENT REQUEST	0
STANDBY on additional work at CLIENT REQUEST	0

Comments - UNDERWATER SURVEYS

UWS receive control point coords from Craig Davies but find them to be in Cape Datum and not WG31 as required for the survey survey.

Signed: Andrew McClement *[Signature]*

Comments - CLIENT

Signed: Michael Baleta *[Signature]*



UNDERWATER SURVEYS (PTY) LTD

DAILY SURVEY REPORT

FROM: UNDERWATER SURVEYS (PTY) LTD	UWS Proj: 12/016
TO: Wanda Ellison ZAA Engineering Projects & Naval Architecture (Pty) Ltd	DATE: 03/04/12
COPY: Michael Baleta	
COPY: Stuart Hanslo UWS	DPR No: 6
COPY: Pierre Very UWS	
PROJECT: Durban Harbour - Bathymetric Survey	

Local Time		OPERATIONS
FROM	TO	
Tuesday 03/04/2012		
07h30	08h45	Meet with Michael Baleta and go to Millenium Tower to discuss Base station setup with the Port Captain. It is decided to put Base Staion on Building alogside Millenium tower
09h00	10h00	Meet With Building supervisor Vinesh and discuss Base Station Set up. <i>TNPA Maintenance Supervisor - Vinesh Naideoo</i>
12h30		Receive control points converted to WG31
13h00	13h45	Buy Supplies for Base station Set up.
13h45	16h30	Check control points while setting up base station on control point 20R, and then set out BC1 and MT1 for survey control during the project.
16h30	18h00	Recover base station and prepare the equipment for base station setup on Building at Millenium Tower.
		<i>* Port Captain -> Deputy Harbour Master Alish Simeath</i>

TIME SUMMARY Hr.h	HOURS
MOB\DEMOB	60
STANDBY	60
OPERATIONAL	12
EXTRA WORK at CLIENT REQUEST	0
STANDBY on additional work at CLIENT REQUEST	0

Comments - UNDERWATER SURVEYS

UWS receive control points converted to WG31
 Set out control point, check control against TSM mark and set out points for base station(MT1) and base station check point(BC1).

Signed: *AMS*
 Andrew McClement

Comments - CLIENT

Signed: *MBaleta*
 Michael Baleta



UNDERWATER SURVEYS (PTY) LTD

DAILY SURVEY REPORT

FROM: UNDERWATER SURVEYS (PTY) LTD	UWS Proj: 12/016
TO: Wanda Ellison ZAA Engineering Projects & Naval Architecture (Pty) Ltd	DATE: 04/04/12
COPY: Michael Baleta	
COPY: Stuart Hanslo UWS	DPR No: 7
COPY: Pierre Very UWS	
PROJECT: Durban Harbour - Bathymetric Survey	

Local Time		OPERATIONS
FROM	TO	
Wednesday 04/04/2012		
07h30	10h30	Drive to millenium Tower, set up Base Station, secure Base station.
10h30	12h00	Carry out checks on Control points on Berth 101 and at NSRI building area.
12h00	13h00	Return to Millenium tower to change Easting coordinate..
13h00	13h45	Travel to Dbn Marina and take BD out into Survey area, take SV profile and begin bathy survey,
13h45	17h30	Run lines along Quay 203 to 205 and in turnig basin and run patch test.

TIME SUMMARY Hr.h	HOURS
MOB/DEMOB	60
STANDBY	60
OPERATIONAL	24
EXTRA WORK at CLIENT REQUEST	0
STANDBY on additional work at CLIENT REQUEST	0

Comments - UNDERWATER SURVEYS

Base station setup with AC power.
 All control points and checks completed, now all work on water to be completed.
 Received picture of the sandbank area to be covered- Will do what we can safely +2m water depth is the shallowest we will attempt.

Signed:
Andrew McClement

Comments - CLIENT

Signed:
Michael Baleta



UNDERWATER SURVEYS (PTY) LTD

DAILY SURVEY REPORT

FROM:	UNDERWATER SURVEYS (PTY) LTD		UWS Proj:	12/016
TO:	Wanda Ellison	ZAA Engineering Projects & Naval Architecture (Pty) Ltd	DATE:	05/04/12
COPY:	Michael Baleta		DPR No:	8
COPY:	Stuart Hanslo	UWS		
COPY:	Pierre Very	UWS		
PROJECT:	Durban Harbour - Bathymetric Survey			

Local Time		OPERATIONS
FROM	TO	
Thursday 05/04/2012		
06h00	07h30	Take boat out of Dbn Marina to channel area and take SVP and inut into survey software.
07h30	10h00	Run survey lines along berths 203 to 205 against quay wall before vessels come in alongside.
10h00	10h35	Return to Dbn Marina to refuel and collect client rep Michael Baleta.
10h35	12h15	Sail out to Turning basin and complete data acquisition in this area as well as out channel corner
12h15	12h35	Return to Dbn Marina and drop off Michael Baleta.
12h35	15h30	Run survey lines around sand bank area for the added on scope of work to define -2m CD depth
15h30	16h00	Return to Marina while filling in data holes en route.
16h00	16h15	Meet with Michael to discuss further extra scope of work from Lot 10 to turning basin area.
		This to survey the proposed channel for Calson Tow.
16h15	17h00	Refuel boat and secure boat for night, take a base check on BC1 control point.
17h00	18h00	collect supplies for next day and receive Dump site coordinates to be covered.

TIME SUMMARY Hr.h	HOURS	
MOB/DEMOB	80	
STANDBY	38	
OPERATIONAL	80	
EXTRA WORK at CLIENT REQUEST	0	
STANDBY on additional work at CLIENT REQUEST	0	

Comments - UNDERWATER SURVEYS

Original Harbour SOW completed, also complete added on SOW of the Sand bank boundary 2m CD depth.
 Receive Jpeg with new SOW for Lot 10 to Turning basin channel area.
 Also received coordinates of the reduced area required to be surveyed in the dump site areas

Signed: Andrew McClement

Comments - CLIENT

Signed: Michael Baleta



UNDERWATER SURVEYS (PTY) LTD

DAILY SURVEY REPORT

FROM: UNDERWATER SURVEYS (PTY) LTD	UWS Proj: 12/016
TO: Wanda Ellison ZAA Engineering Projects & Naval Architecture (Pty) Ltd	DATE: 06/04/12
COPY: Michael Baleta	
COPY: Stuart Hanslo UWS	DPR No: 9
COPY: Pierre Very UWS	
PROJECT: Durban Harbour - Bathymetric Survey	

Local Time		OPERATIONS
FROM	TO	
Friday 06/04/2012		
06h00	06h45	Take boat out of Dbn Marina to channel Lot 10 area and take SVP and input into survey software.
06h45	10h00	Run survey lines along channel to the Lot 10 dock and around lot 10 Dock until channel is clearly identified.
10h00	12h00	Swap out the Reson 8125 MBES for the 8101 MBES for the deeper waters of the dump site.
12h00	13h00	Take BD out of harbour, but wind and chop to bad to carry out any survey, test 8101 in the Harbour
13h00	14h00	Return to Mooring secure BD and standby for survey tomorrow morning.

TIME SUMMARY Hr.h	HOURS
MOB/DEMOB	60
STANDBY	36
OPERATIONAL	72
EXTRA WORK at CLIENT REQUEST	0
STANDBY on additional work at CLIENT REQUEST	0

Comments - UNDERWATER SURVEYS

Complete added scope of work, identify 12 m channel into Lot 10 dock and survey area around Lot 10.
 Sent Jpeg of Survey data to Michael baleta.

Signed: *Andrew McClelland*
Andrew McClelland

Comments - CLIENT

Signed: *Michael Baleta*
Michael Baleta



UNDERWATER SURVEYS (PTY) LTD

DAILY SURVEY REPORT


FROM: UNDERWATER SURVEYS (PTY) LTD	UWS Proj: 12/016
TO: Wanda Ellison ZAA Engineering Projects & Naval Architecture (Pty) Ltd	DATE:07/04/12
COPY: Michael Baleta	
COPY: Stuart Henslo UWS	DPR No: 10
COPY: Pierre Very UWS	
PROJECT: Durban Harbour - Bathymetric Survey	

Local Time		OPERATIONS
FROM	TO	
Saturday 07/04/2012		
06h00	07h30	Take the Blue Dolphin out of Durban Hbr in an attempt to survey the Dump site. The big swell and wind chop make it impossible for any survey to take place.
		identified.
07h30	17h00	Standingby on weather and water conditions outside durban Harbour

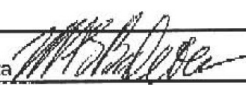
TIME SUMMARY Hr.h	HOURS		
MOB/DEMOB	80		
STANDBY	36		
OPERATIONAL	84		
EXTRA WORK at CLIENT REQUEST	0		
STANDBY on additional work at CLIENT REQUEST	0		

Comments - UNDERWATER SURVEYS

Weather conditions make it dangerous for the Survey equipment onboard.

Signed: 
 Andrew McClement

Comments - CLIENT

Signed: 
 Michael Baleta



UNDERWATER SURVEYS (PTY) LTD

DAILY SURVEY REPORT


FROM: UNDERWATER SURVEYS (PTY) LTD	UWS Proj: 12/016
TO: Wanda Ellison ZAA Engineering Projects & Naval Architecture (Pty) Ltd	DATE:08/04/12
COPY: Michael Baleta	
COPY: Stuart Hanslo UWS	
COPY: Pierre Very UWS	DPR No: 11
PROJECT: Durban Harbour - Bathymetric Survey	

Local Time		OPERATIONS
FROM	TO	
Sunday 08/04/2012		
06h00	15h40	Start out to Dump site, take SVP, acquire data for the revised dump area to be surveyed, Carry out patch test calibration and then return to mooring.
15h40	16h45	Back up all data , secure boat and send email, and leave message with Client rep to inform on status of job , and also request to demobilise all equipment and boat.
07h30	17h00	on status of job , and also request to demobilise all equipment and boat.
18h30		Receive permission to demobilise all equipment and boat.

TIME SUMMARY Hr.h	HOURS
MOB/DEMOB	60
STANDBY	36
OPERATIONAL	96
EXTRA WORK at CLIENT REQUEST	0
STANDBY on additional work at CLIENT REQUEST	0

Comments - UNDERWATER SURVEYS

Although dump site was surveyed , weather conditions were not good , and this had an effect on the data captured. There will be some motion in the data.
 Full revised dump site was covered although there are some holes due to RTK drop outs.

Signed: Andrew McClement 

Comments - CLIENT

Signed: Michael Baleta 



UNDERWATER SURVEYS (PTY) LTD

DAILY SURVEY REPORT


FROM: UNDERWATER SURVEYS (PTY) LTD		UWS Proj: 12/016
TO: Wanda Ellison	ZAA Engineering Projects & Naval Architecture (Pty) Ltd	
COPY: Michael Baleta		DATE: 09/04/12
COPY: Stuart Hanslo	UWS	
COPY: Pierre Very	UWS	DPR No: 12
PROJECT: Durban Harbour - Bathymetric Survey		

Local Time		OPERATIONS
FROM	TO	
Monday 09/04/2012		
08h00	11h00	Remove all survey equipment from vessel for trip back to Cpt.
14h30	16h00	Recover Blue dolphin from water, pack equipment and secure boat for the night.
16h00	17h30	Pack Vehicle ready for departure on the 10th April 2012


TIME SUMMARY Hr.h	HOURS	
MOB/DEMOB	72	
STANDBY	36	
OPERATIONAL	96	
EXTRA WORK at CLIENT REQUEST	0	
STANDBY on additional work at CLIENT REQUEST	0	

Comments - UNDERWATER SURVEYS

Packed and ready to travel back to Cpt early tomorrow morning
 Still have to demob the Base station early tomorrow morning pack up, and then collect boat and leave durban enroute to Cpt.

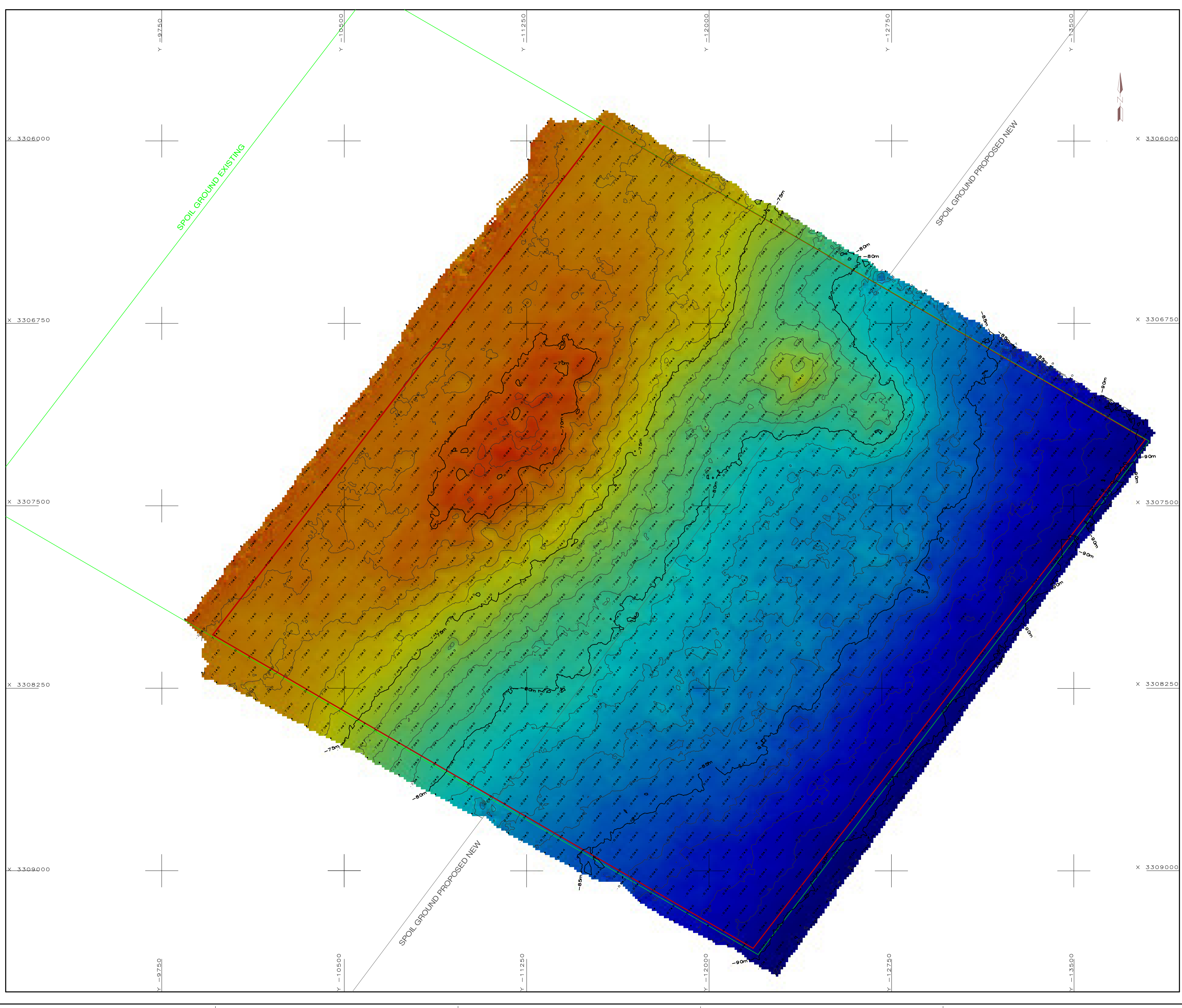
Signed: 
 Andrew McClement

Comments - CLIENT

Signed: 
 Michael Baleta



APPENDIX G CHARTS



LEGEND:

- EXISTING DUMP SITE BOUNDARY
- PROPOSED DUMP SITE BOUNDARY
- WORK SCOPE AREA
- MAJOR CONTOUR EVERY 5M
- MINOR CONTOUR EVERY 1M
- SOUNDINGS

COLOUR SCALE

-60.00
-67.00
-74.00
-81.00
-88.00
-95.00

CHART DATUM

NOTES:

- BOUNDARIES OF SURVEYED AREAS SUPPLIED BY CLIENT

GEODEIC PARAMETERS:

HORIZONTAL COORDINATE SYSTEM

GEODEIC DATUM HARTEBEESTHOEK (WGS 84)

ELLIPSOID WGS 84

Semi major axis 6378137.00

Inverse Flattening 298.257223563

PROJECTION Gauss Conformal LO 31

Central Meridian (CM) 31° East

Latitude of Origin 0°00' North

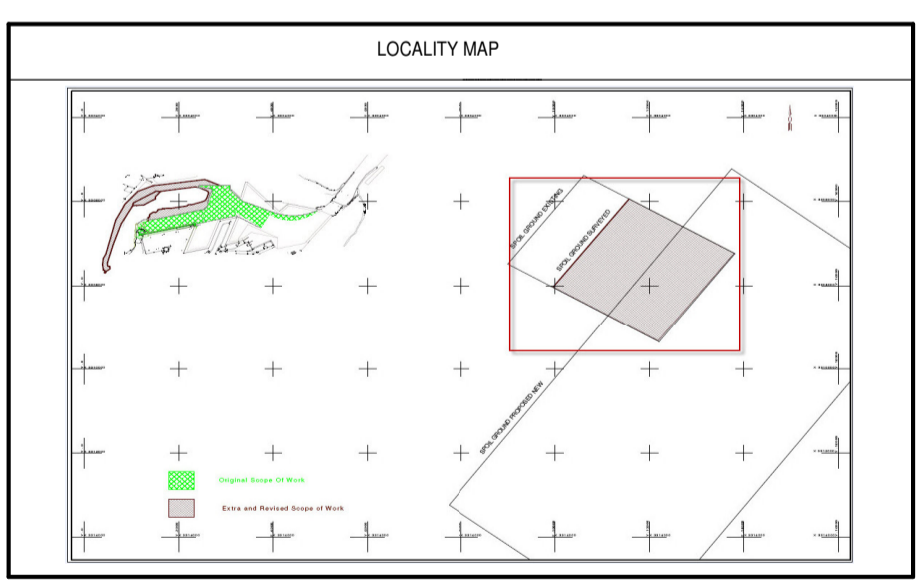
False Easting 5000 m

False Northing 1000 m

Scale factor at CM 1.0

VERTICAL DATUM CHART DATUM (Port) - 0.9m Below MSL

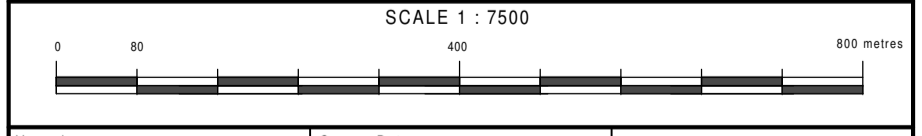
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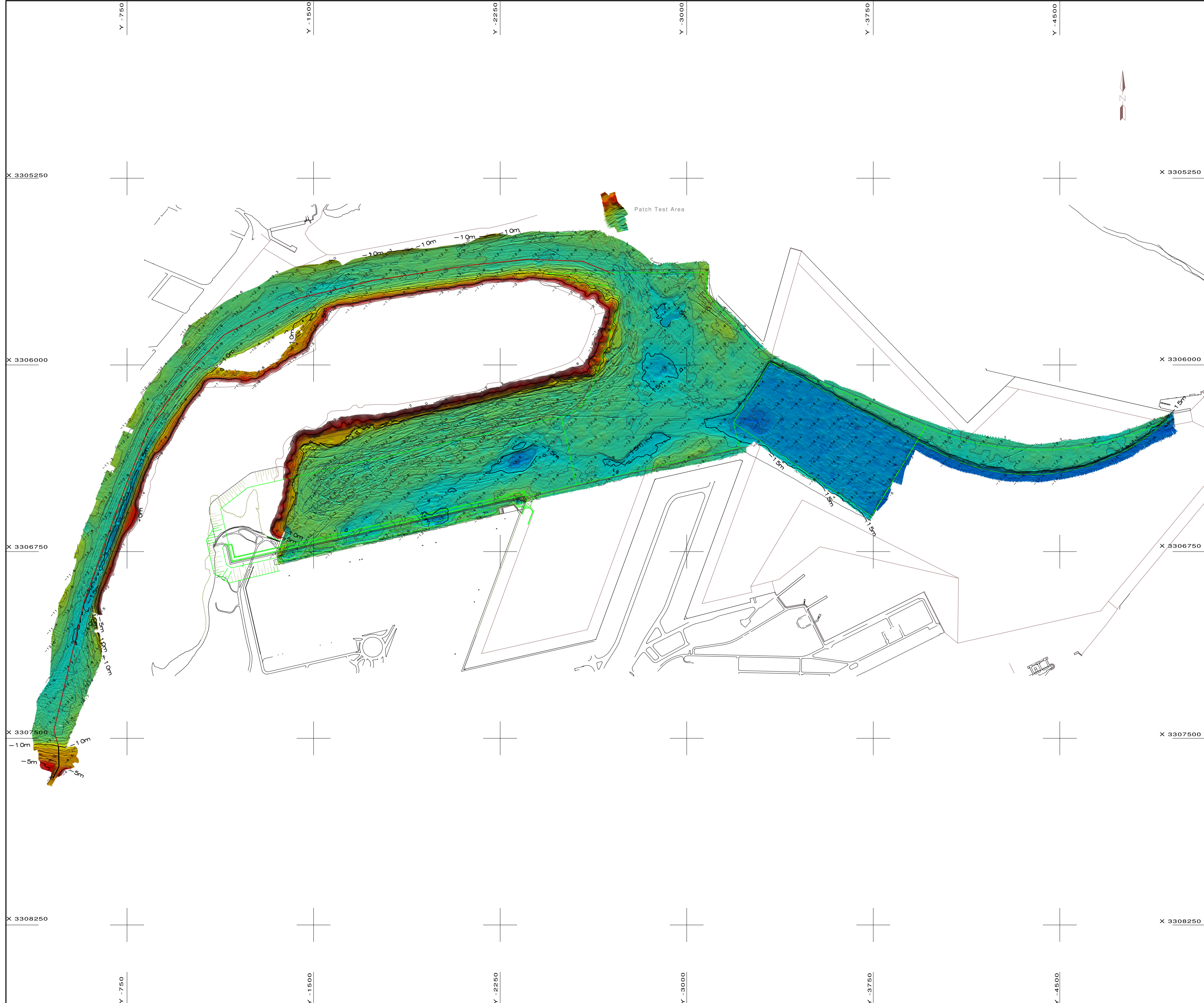
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 Muzenbergh, 7465, South Africa
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 E-mail: info@underwatersurveys.com







BATHYMETRIC SURVEY
 Dump Site
 1) Part Existing and Part Proposed Spoil Areas



Vessel:	BLUE DOLPHIN	Survey Date:	APRIL 2012	Project Ref:	12/016
Issue No.:	1	Date:	25-04-2012	Interpr:	ADM
			FINAL	Drawn:	AM
				Chkd:	PV
				Appr:	SH
Contract No.:	Drawing No.:		Chart:	Encl:	
	12-016 ZAA DUMP_BATHY_CD_DCT1370		2 of 2		



LEGEND:

-  WORK SCOPE AREA
-  MAJOR CONTOUR EVERY 5M
-  MINOR CONTOUR EVERY 1M
-  SOUNDINGS
-  LOT 10 CHANNEL CL < 12M
-  LOT 10 CHANNEL CL > 12M

COLOUR SCALE

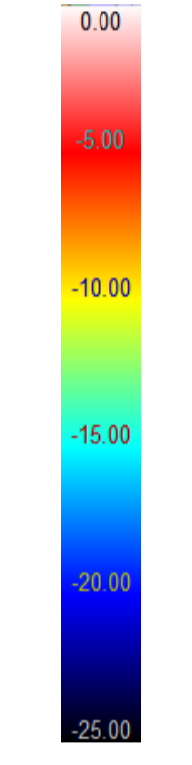


CHART DATUM

NOTES:

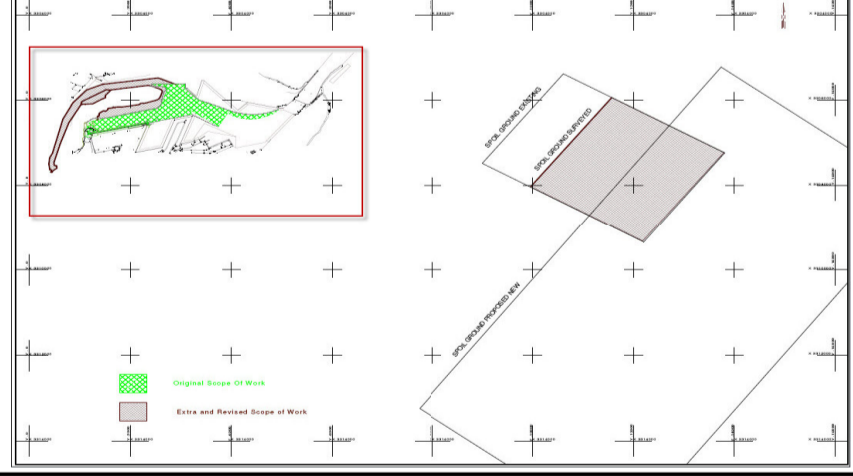
1. BOUNDARIES OF SURVEYED AREAS SUPPLIED BY CLIENT

GEODETTIC PARAMETERS:

HORIZONTAL COORDINATE SYSTEM
 GEODETTIC DATUM : HARTEBEESTHOEK (WGS 84)
 ELLIPSOID : WGS 84
 Semi major axis : 6378137.00
 Inverse flattening : 298.257223563
PROJECTION : Gauss Conform LO 31
 Central Meridian (CM) : 31° East
 Latitude of Origin : 0°00' North
 False Easting : 0.00 m
 False Northing : 0.00 m
 Scale factor at CM : 1.0
VERTICAL DATUM : CHART DATUM- (Port) - 0.9m Below MSL

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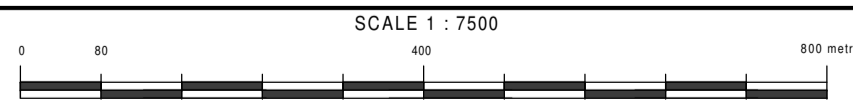
LOCALITY MAP



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BATHYMETRIC SURVEY
 Durban Harbour Areas
 1) Berths 203 to 205, Turning Basin and part of Channel
 2) Sand Bank Perimeter
 3) Lot 10 Dock and channel to the Turning Basin



Vessel:	BLUE DOLPHIN	Survey Date:	APRIL 2012	Project Ref:	12/016
Issue No.:	1	Date:	25-04-2012	Description:	FINAL
Drawn:	ADM	Checked:	ADM	Appr:	SP
Contract No.:		Drawing No.:	10-016_ZAA_HR_BATH_CD_DCT1070	Chart:	1 of 2
				Encl:	