Survey Report

SAND SOURCE Surveys

FOR Mombasa Port Development Project Phase 2

For

JAPAN PORT CONSULTANTS LTD.
AND
BAC/GKA JV COMPANY LTD.

Version: 1

Project Date: 15TH October to 15th December 2016.

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Abbreviation & Acronym

The following list of abbreviations and acronyms may be present within the document:

ASCII	American Standard Code for information Interchange
BM	Benchmark
CD	Chart Datum
CRP	Common Reference Point (Datum) of the survey vessel
CTDS	Conductivity, Temperature, Depth and Salinity (to compute VoS)
DA	Data Acquisition (CODA DA System).
DGPS	Differential Global Positioning System
ES	Echo Sounder
GMT	Greenwich Mean Time
GPS	Global Positioning System
kHz	Kilo Hertz
KP	Kilometre Point
L.A.T.	Lowest Astronomical Tide
m	metres
m/s	metres per second
M/B	Motor Boat
M/V	Motor Vessel
SBES	Single Beam Echo Sounder
SBP	Sub-Bottom Profiler
SVP	Sound Velocity Probe
UTM	Universal Transverse Mercator
VoS	Velocity of Sound in Seawater
WD	Water Depth

1. INTRODUCTION

InfraEnergy Services Limited was contracted by **Japan Port Consultant** to conduct a bathymetric and seismic survey on south Coast of Mombasa for sand search.
This report details general survey operations, findings and procedures, personnel, equipment, equipment calibrations and results

The survey was conducted from the vessel Unique Surveyor' between 15th Oct 2016 and 15th Dec 2016
This report describes the survey results for the Bathymetry and Seismic profiling in survey area.

1.1. Scope of Work

The Scope of the Bathymetric and Seismic Profiling Surveys is summarized below. The bathymetric map are prepared with scales of 1:2,500 as directed by Client.

Scope of work		
	Line Spacing	**Survey Area**
Bathymetric & Seismic Survey	50m (Main line) 75m (cross line)	Mombasa port channel and coast on southern side from 30 mtr to 100 mtr depth contour

Table 1: Scope of work

2. PERSONNEL AND EQUIPMENT

2.1. Personnel

The personnel onboard Unique Surveyor and at office was:

Survey personal	
Name	**Designation**
Rajeev Bakshi	Survey Party Chief
Ajit P	Hydrographic Surveyor
Jinesh	Geophysicist
S Verma	Senior Technician
Reporting personal	
Name	**Responsibilities**
Rajeev Bakshi	Reporting
Yogesh	Data Processing, Interpretation, Charting and Reporting
Ginesh	Reporting, Seismic Interpretation and presentation

Table 2: Survey personnel

2.2. Equipment

The following survey and reporting equipment was used on the project onboard survey boat Unique Surveyor

2.2.1. Positioning Systems

Navigation and Positioning System		
Description	**Unit**	**Model**
C Nav	1	3050
Navigation Software	1	Qinsy
Gyro Compass	1	TSS Meridian Surveyor

Table 3: Positioning system

2.2.2. Analogue Systems

Analogue Systems		
Echo sounder System		
Description	**Unit**	**Model**
Echosounder/multibeam	1	Kongsberg EA 400/EM3002
Heave Compensator	1	DMS3-05
Transducer	2	EA 400
Sub Bottom Profiler System		
Description	**Unit**	**Model**
Transmitter	1	Geopulse 5430A
Receiver	1	Geopulse 5210A
Transducer	1	Geopulse 132B
Acquisition Unit	1	CODA DA 2000
Recorder	1	Hard disk drive
Sonar System		
Description	**Unit**	**Model**
Side scan Sonar	1	edgetech
Sound Velocity System		
Description	**Unit**	**Model**
SVP	1	AML Minos

Table 4: Analogue systems

2.2.3. Processing and Reporting System

Processing and reporting systems		
Description	**Unit**	**Model**
Computer	2	Windows OS with 4GB Ram
Bathymetric Processing	1	Qinsy Processing
Sub Bottom Profiler Processing	1	Coda Geosurvey 6.2N

Table 5: Processing and reporting systems

3. OPERATION AND SURVEY PROCEDURES

3.1. Summary of activities

The vessel, MV Unique Surveyor was mobilized with the survey equipment from Comarco Yard from 03rd - 09th Oct 2014. The analogue instruments were installed, and tested while the vessel was in Comarco Base.

DGPS positioning accuracy and Gyro verification was carried out when the vessel was moored adjacent to the Berth 19. two bollards on berth 19 were used for these verification .Bar Checks on the Dual frequency echo sounder were conducted together with SVP sound velocity dips on every subsequent day. Reports of DGPS verification and gyro verification are supplied with this survey report in Appendix M and N

On 15th Oct boat has started survey on sand search area,The area to be surveyed was divided up into 2 section i.e. northern section and southern section, the northern section was surveyed only for main lines running north south and the southern section was also surveyed with cross lines running 75 mtr spacing,

All Bathymetry and seismic profiling had been completed by the end of the 15th December 2016. Following a day of Data QC to ensure coverage, after that boat was standby on decision from client till 18th Dec and the boat was demobilized on 19th dec

The summary of activities is tabulated as follows:

Summary of activities	
Description	**Survey Date**
Mobilisation Personnel to Mombasa	Oct 02nd -3rd 2016
Installing Survey Equipment on the Vessel	Oct 4 th -5 th 2016
Calibrations of Gyro and DGPS	Oct 6 th 2016
Sub bottom verification and test lines	Oct 7 th 2016
Installation of MBES sensors	Oct 8th -9th 2016
Started survey	Oct 10th 2016
Completed survey	Oct 12th 2016
Data QC	Oct 13th 2016
Processing	Oct 14th -22nd
Boat proceed to sand search survey	Oct 16th 2016
Completed survey work	Dec 15 2016
Standby for decision from client to demob	Dec 16th and 17th 2016
Demobilization of equipment and personnel	Dec 18th AND 19th 2016

Table 6: Summary of activities

Refer to Daily Status Reports in **Appendix E** for details.

3.2. Survey Procedures

3.2.1. DGPS Positioning Systems

Differential Global Positioning System (DGPS) was used throughout the survey period. The DGPS for positioning of the Unique surveyor was provided by the C Nav 3050 DGPS system. the SF2 diffrential signals were subscribed from Cnav for accurate positioning throughout the project.

Spec sheet of C Nav 3050 is attached with equipment specification at Appendix G

The Global Positioning System (GPS) is a satellite based positioning system utilizing the current constellation of 24 satellites that provide the required 4 or more satellites coverage necessarily for accurate positioning 24 hours per day, 365 days per year.

Each satellite broadcasts orbit ephemeral information to earth stations in two PRN ranging codes, Coarse/Acquisition Code (C/A-code) and Precise or Protected Code (P-code) on two frequencies (L1 and L2). The C/A-code is transmitted on L1 carrier only. This is an unencrypted code available to all general GPS users. The P-code is encrypted thus making it available only to authorised (primarily military) users. En-crypted P-code is often called the Y-code.

In principle, differential GPS is a positioning technique where range differences from satellite vehicles to the known reference stations are observed and later transmitted as pseudo-range corrections (PRN) via geo-stationary satellite (nor-mally Inmarsat) to mobile GPS receivers. In practice, the sequence of operation is more complex and involves a series of quality control procedure to monitor quality and integrity of signal transmitted by the satellite vehicles and reference stations.

The major components of DGPS unit is that when in this mode it provides the most precise accuracy. Typically this is 1.5cm + 1ppm 95% accuracy for horizontal. When signal lock is not solid with the C Nav GPS unit, the unit reverts to a normal DGPS mode where horizontal accuracy is quoted as <0.6m with 95% accuracy.

SF 2 (PPS) satellite navigation is a technique used based on the use of carrier phase measurements of the GPS, GLONASS and/or Galileo signals where a single reference station provides the real-time corrections of even to a centimeter level of accuracy. When referring to GPS in particular, the system is also commonly referred to as Carrier-Phase Enhancement, CPGPS

"Normal" satellite navigation receivers compare a pseudorandom signal being sent from the satellite with an internally generated copy of the same signal. Since the signal from the satellite takes time to reach the receiver, the two signals do not "line up" properly, the satellite's copy is delayed in relation to the local copy. By progressively delaying the local copy more and more, the two signals will eventually line up properly. That delay is the time needed for the signal to reach the receiver, and from this the distance from the satellite can be calculated.

The accuracy of the resulting range measurement is generally a function of the ability of the receiver's electronics to accurately compare the two signals. In general receivers are able to align the signals to about 1% of one bit-width. For instance, the C/A signal sent on the GPS system sends a bit every 1/10th of a microsecond, so a receiver is accurate to 1/100th of a microsecond, or about 3 metres in terms of distance. The military-only P(Y) signal sent by the same satellites is clocked ten times as fast, so with similar techniques the receiver will be accurate to about 30 cm. It is important to note that other effects introduce errors much greater than this, and accuracy based on an uncorrected C/A signal is generally about 15 m.

SF 2 singnals follows the same general concept, but uses the satellite's carrier as its signal, not the messages contained within. The improvement possible using this signal is potentially very high if one continues to assume a1% accuracy in locking. For instance, the GPS C/A signal broadcast in the L1

signal changes phase at 1.023 MHz, but the L1 carrier itself is 1575.42 MHz, over a thousand times faster. This corresponds to a 1% accuracy of 19 cm using the L1 signal, and 24 cm using the lower frequency L2 signal.

3.2.2. Data Logging Systems

Differentially corrected GPS position data from the DGPS system was output to the Qinsy navigation software package. These co-ordinates were then transformed from WGS-84 spheroid into UTM grid coordinates. Qinsy is an integrated navigation, data software and post processing system.

The computer displays these co-ordinates together with any offset position, off-track, along-track distances, distance and bearing to targets vessel speed and quality of position, together with output from peripheral devices i.e. dual frequency echo sounder sounding output.

Other facilities available to the user are the ability to fix and record raw data, convert readily between different spheroids and projections, draw charts and compare positions with secondary navigation systems if any. Qinsy has many offline line editor functions, including the ability to import digitized databases, easily created run line grids for use in real time displays.

Real time data is logged and saved as db files and automatically saved to raw data directories on closing logging, this within the project database. The video displays provide a constant visual aid for navigation and give a graphical view of the Vessel position in relation to the location target. The Vessel position was logged every fix by either time, distance interval, or demand.

3.2.3. Gyro Compass Heading Sensor

The Meridian gyrocompass used was established parallel to the vessel centerline and taped to prevent movement.. The gyrocompass was allowed to wind up for 2 hours before readings were taken. A check calibration was carried out with the vessel parallel to the wharf azimuth at berth no 19 on 6th Oct in presence of Client . The Gyrocompass correction was less than 0.5 degree. The gyrocompass continually monitors vessel heading during data collection. High specification surveys require a gyrocompass due to its accuracies that can be delivered and its immunity to varying magnetic fields. The Meridian gyrocompass updates at a rate of 1 Hz.

3.2.4. Multibeam echo sounder

EM 3002 single head multibeam echosounder was used to obtain swath bathymetry , prior to use the same was calibrated for heave roll and pitch

3.2.5. Side scan sonar

Edgetech 4200 FS duel frequency side scan sonar was used for litology and scanning of survey area, entire area was scanned on a range of 75 mtr keeping the fish height 7 mtr from seabed.

3.2.6. Echo Sounder

An EA 400 dual frequency echo sounder was used to obtain single-beam bathymetry data on the vessel. The ODOM echo sounder is dual-frequency with 24 kHz and 200 kHz.

Measured depths are recorded digitally and as echogram history. The echo sounder is also interfaced to the navigation computer with digital bathymetric data recorded along with the navigation data.

At all times a heave compensator was interfaced to the echo sounder so that the digitized bathymetric data is corrected for any heaving motions of the vessel. These are displayed in real time on the navigation display.

Water depth measurement is dependent on the speed at which the transmitted sound waves travel

through the water column. Accurate determination of the speed of sound through water under local conditions is vital.

The recording parameters used in the survey were:
The speeds of sound measured prior to the survey are given below:

Output Frequency	:	24 KHz and 200 KHz
Recording Scale	:	10 or 20 meters
Transducer Draught	:	1.20 meter

3.2.7. Sub-bottom Profiler

A sub bottom profiler is an acoustic equipment which is capable of penetrating near-surface sedimentary layers and provides detailed high resolution images thereof. The amount of sub bottom penetration is controlled primarily by the sediment type. Sub-seabed penetration may be restricted depending on the geology and water depth within the Survey area.

Applications of the sub bottom (SBP) include mapping of the soil boundaries and geological relations in the uppermost layers of the seabed, the assessment of soil type and the localization of buried objects and pipelines.

The sub-bottom profiler equipped on the MV Alpha 300 consisted of a Geopulse pinger system comprising a side mounted Geopulse transducer with digital logging via the CODA DA acquisition system. The Positioning string was sent from Qinsy to the CODA DA acquisition system.

The raw sub-bottom signals were recorded digitally by the CODA Octopus recording system. All the sub-bottom data was recorded onto hard drive in .cod format. Data was then transferred at the end of each day's operations to hard drive and taken to office for processing and interpretation with the office CODA Processing System.

The data recording parameters were as follows:

SBP Data recording parameters	
Record Sweep Length	50 to 70 ms
Recording Delay	1 ms
Frequency	3.5 KHz
Record Format	CODA format .cod
Trigger	Internal
Back up format	Hard drive

Table 7: SBP data recording parameters

3.3. System Calibrations

3.3.1. Gyro Calibration

A survey gyro calibration was performed on 6th October on board Unique Surveyor whilst the vessel was alongside at Berth 19. Bearing of berth was derived using admiralty navigation chart for verification of survey gyro.

Calibration was done by taking offsets from the wharf line to the centerline aft and bow points of the survey boat. While the Gyrocompass was being read at the same time as the offsets were being measured with 2 sets of tapes to the centerline vessel points. Azimuth of berth was taken from admirality chat was -: 239.95°

The vessel was released or tightened on it's lead and aft ropes until tape offsets to stern and bow centerline points were the same. Once the vessel heading was steady, Gyro readings over 5 minutes were observed, and varied by a maximum of 1.6 Degree.
Logged gyrocompass readings showed a mean reading of 239.96° (vessel head was pointing towards KOT)

The results of the gyrocompass calibrations are summarized as follows:

Gyro Calibration		
Calc. Vessel Hdg	**Mean Gyro Obs.**	**C-O**
239.80°	239.96°	-1.6°

Table 8: Gyro calibration

This correction value was later input to the online navigation computer and used throughout the entire survey. The corrected Gyrocompass output agreed to within 2° of the recently swung vessel compass

3.4. DGPS Checks

As the system used throughout the survey was Cnav 3050 DGPS subscribed with SF 2 signals , there were a number of checks that were available and conducted. The vessel was tied up at KPA jetty. Initially on system start up, the base station was set up at the wharf on on one bollard at south end of berth 19 and observed the position for 5 minute, after that the gps anteena was set on second bollard and again an observation for 5 min was carried out , mean of coordinates were noted down and grid distance was compared with the tape measure ment .

A report for DGPS verification generated using Position Fix module of Qinsy survey software is attached to this report as **Appendix H**

3.5. Sound Velocity Data

An AML Minos CTDS system was used to determine the speed of sound within the water column of the survey area for input into the MBES AND usbl system. Sound velocity observations were recorded at a minimum of 1 m intervals. Sound velocity graph for the each observation are placed at **Appendix D** to this report

4. PROCESSING AND REPORTING

4.1. Navigation Processing

Real time of navigation and bathymetric data was acquired using Qinsy software and was preliminarily processed onboard the survey vessel to allow for an early evaluation and detection of any acquisition problem.

The data post processing was undertaken by processors in the Infra Office, using the Qinsy software processing module.

Navigation data used fixed offsets from the vessel datum for all sensors, and either vessel heading or course-made-good depending on environmental conditions and the equipment for which the track data was being produced.

4.2. Bathymetry Processing

Tidal data used in the reduction of raw bathymetry to Chart datum was downloaded from http://www.ioc-sealevelmonitoring.org , the auto tide gauge is installed in the port on fishry jetty Near COMARCO yard. A difference of tidal height was observed between actual tide and tide data from this tide gauge, a detailed investigation was carried out and a report of tide comparision was submitted to client with the survey report of phase 2 survey

The reduced bathymetric data was contoured at 1.0 m intervals utilizing Processing software and charts were produced utilizing AutoCAD at 1:2500 scale with Microstation

4.3. Subbottom Profiler Data Processing

Sub Bottom features were processed and interpreted using Coda Geosurvey Processing Software. Time variant gain and frequency filtering was done to the data to improve the signal to noise ratio. The depth to the reflectors were tagged manually. The depths of reflector to the seabed were estimated by converting two way time (TWT) acoustic events to depth (D) using an assumed velocity (V) of 1600 m/s. Major and minor reflectors are charted on both cross sections and the plan isopach charts.

4.4. Reporting

All drawings are in AutoCAD (*.dwg) format. The report is in acrobat reader (*.pdf) format. As specified in the scope of work and/or as agreed with client during kick off for the different data outputs of both cross sections and charts, we have produced the main set of different chart for bathymetry, seabed features, cross section and mosaic .

Bathymetry contours has been provided on bathymetry charts itself in 1:2500 scale. Contours are generated on 1 mtr interval

For the shallow Seismic survey of the survey area, two 1:2500 charts have been produced. The charts containing isopach map for the interpreted major and minor reflectors.

Cross section maps for both bathymetric and interpreted seismic data as referred above are at 1:2000 scale. The required cross section at 100 meter spacing at north south direction along the main survey lines has been provided. The profile chart set showing seabed, main and minor reflector has been provided on a scale of 1:2000(horizontal) and 10:1 vertical.

A list of drawings been provided along with this report is placed on **Appendix G**

5. GEODECTIC PARAMETERS AND UNITS

5.1. Horizontal Datum

The horizontal datum used on this survey was WGS 84. All co-ordinate data in this project, projection or geographical is related to this datum.

Primary positioning for the project used GPS satellite derived positioning together with land survey control

points established prior to acquisition. The spheroid and Datum, and Satellite Datum are the same for the survey. No datum transformation parameters are required to shift the satellite datum to local datum.

5.1.1. Spheroid and Datum

Spheroid	:	WGS 84
Datum	:	WGS 84
Semi major axis (a)	:	6 378 137.000 m
Semi minor axis (b)	:	6 356 752.314 m
Inverse flattening (1/f)	:	298.257223563
Eccentricity^2 (e^2)	:	0.081 819 190 842 622

5.1.2. Projection

Projection	:	Universal Transverse Mercator (UTM)
Zone	:	37 South
Longitude of Central Meridian	:	39° E
Latitude of Origin Projection	:	0° N
False Easting	:	500 000 m
False Northing	:	10000000 m
Scale Factor	:	0.9996
Units	:	International Metres
Convergence	:	World Standard
Unit of Measure	:	International Metres

5.2. Vertical Datum

Tide from KMFRI auto tide guage establised in port was used for reduction , data was downloaded from http://www.ioc-sealevelmonitoring.org

The tide gauge is establised by University of Hawai and being managed by KMFRI ,

5.3. Units

Project Survey Units	
Type	**Unit**
Time	Local Time (GMT +03:00 hours). Navigation data was logged in GMT + 00:00 hours.
Linear units	International Metres (m).
Velocity	Metres per second (m/s).
Angular units	Degrees, Minutes, Seconds (° ‘ “).

Table 9: Project Survey Units

6. BATHYMETRY AND SUBSEABED CONDITIONS

6.1. Bathymetry

Devices of bathymetric acquisition (multi beam echo sounder) were calibrated using bar check and the soundings were tide reduced. As echo sounder require accurate speed of sound velocities to be entered in the instrument or the software to compensate for the normal refraction that affects the calculation of true depths.

Bathymetry acquired within the survey limit generally revealed an uneven seabed throughout the survey area. In some places abrupt depth variations were observed within the survey area. The water depths mentioned in this report were reduced to Chart Datum. The water depths observed within the survey limit are summarised below.

Maximum water depth: 145.7 m
Minimum Water depth: 7.4 m

6.2. Subseabed Features

The acquired data were processed with the post processing software CODA Geosurveys. A standard sound velocity of 1600m/sec was used for all the sub-bottom profiler data acquisition and shallow stratigraphic interpretation purposes.

The sub-bottom profiler echo signals are digitally processed. Gain and frequency filtering was applied to the data. The signal amplitude is the product of the acoustic impedance, which means the product of density and sound velocity. The areas where there are strong reflectors represent high acoustic impedance and which shows the presence of sub-seabed stratigraphic unit.

Special attention is paid to interpreting the pseudo layers, which are visible at twice the water depth. Lines on the echo plots at this depth are called the first multiple, which is the signal, reflected by the water surface and travelling a second time through the water column before being reflected on the seabed again and are not to be confused with a sub-seabed reflector.

Different sub surface layers were identified and marked using the tagging option in the interpretation software. These layers were later on exported as ASCII text files (Easting, Northing and Depth below sea bed) for plotting and charting

The final results in the form of profiles and isopach were analysed in detail and interpretations made. No geological information about the survey area was available for a possible correlation of the results derived from the analysis of sub-bottom profiler data. The results given below are the logical assumptions based purely on the sub-bottom profiler data and a general view of the survey area. Further geological / geotechnical investigations should be carried out before arriving at meaningful conclusions.

Area of disturbed seabed, area of drag marks, area of sand ripples, area of boulders, scar marks, drag marks, corals, localised sediment dumps and outcrops were observed within the surveyed area.

Sub-bottom profiler data and sonar example are provided at Geophysical survey report placed at **Appendix B**

APPENDIX A – LOCATION MAP

APPENDIX B – GEOPHYSICAL SURVEY REPORT

EXECUTIVE SUMMARY

Survey Location: Southern cost of Mombasa, Offshore Kenya.

Survey Date: 14th October to 6th December 2016

Site Assessments

Majority of sand areas were observed at south side of the survey area. The sub-bottom profiler data reveals that penetration increases at some places of the southern area and that indicates the presence of clay content in the sediments. Areas of disturbed seabed, areas of drag marks were also observed in southern part that could be due to the dredging activities.

The northern side of the survey area mainly consists of corals, eroded corals / boulders and out crops of rocks/cemented sediments. Some sandy areas / sand ripples are also observed in this area. However absence of sub bottom profiler penetration in these areas indicates the presence hard strata (coral / rocks / cemented sediments). However, very thin layer of sand above the hard strata may be possible.

In general, most of the sandy areas observed within the survey area are interrupted by hard sediment outcroppings.

Possible ship wrecks were observed in two locations, one was observed about 20 m outside of the survey limit.

Seafloor Sediments: Three (3) types of seabed sediments were interpreted within the surveyed area, as follows:

Type 1: Low to medium reflectivity seabed, interpreted to comprise variably sandy SILT, localised sediments.

Type 2: Medium reflectivity seabed, interpreted to comprise varialbly eroded corals associated with boulders.

Type 3: Medium to high reflectivity seabed, interpreted to comprise variably coral and outcrops associated with boulders.

Water Depths: Bathymetry acquired within the survey limit generally revealed an uneven seabed throughout the survey area. In some places abrupt depth variations were observed within the survey area. The water depths mentioned in this report were reduced to Chart Datum. The water depths observed within the survey limit are summarised below.

Maximum water depth: 145.7 m
Minimum Water depth: 7.4 m

Seafloor Features: Area of disturbed seabed, area of drag marks, area of sand ripples, area of boulders, scar marks, drag marks, corals, localised sediment dumps and outcrops were observed within the surveyed area.

Sonar Contacts: Ninety three (93) sonar contacts were observed within the surveyed area.

Existing Infrastructure: No existing infrastructures were observed with in the survey limit.

Shallow Geology: Unit A was the shallowest geological unit identified from the SBP data and was bound by the seabed on the top and reflector R1 at the bottom.

Unit A interpreted to be comprised of silt, locally unconsolidated sediments (possible variation in grain size), and the thickness of the unit is varied form 0.0 m to 30.3 m, in most of the areas it was observed to be absent.

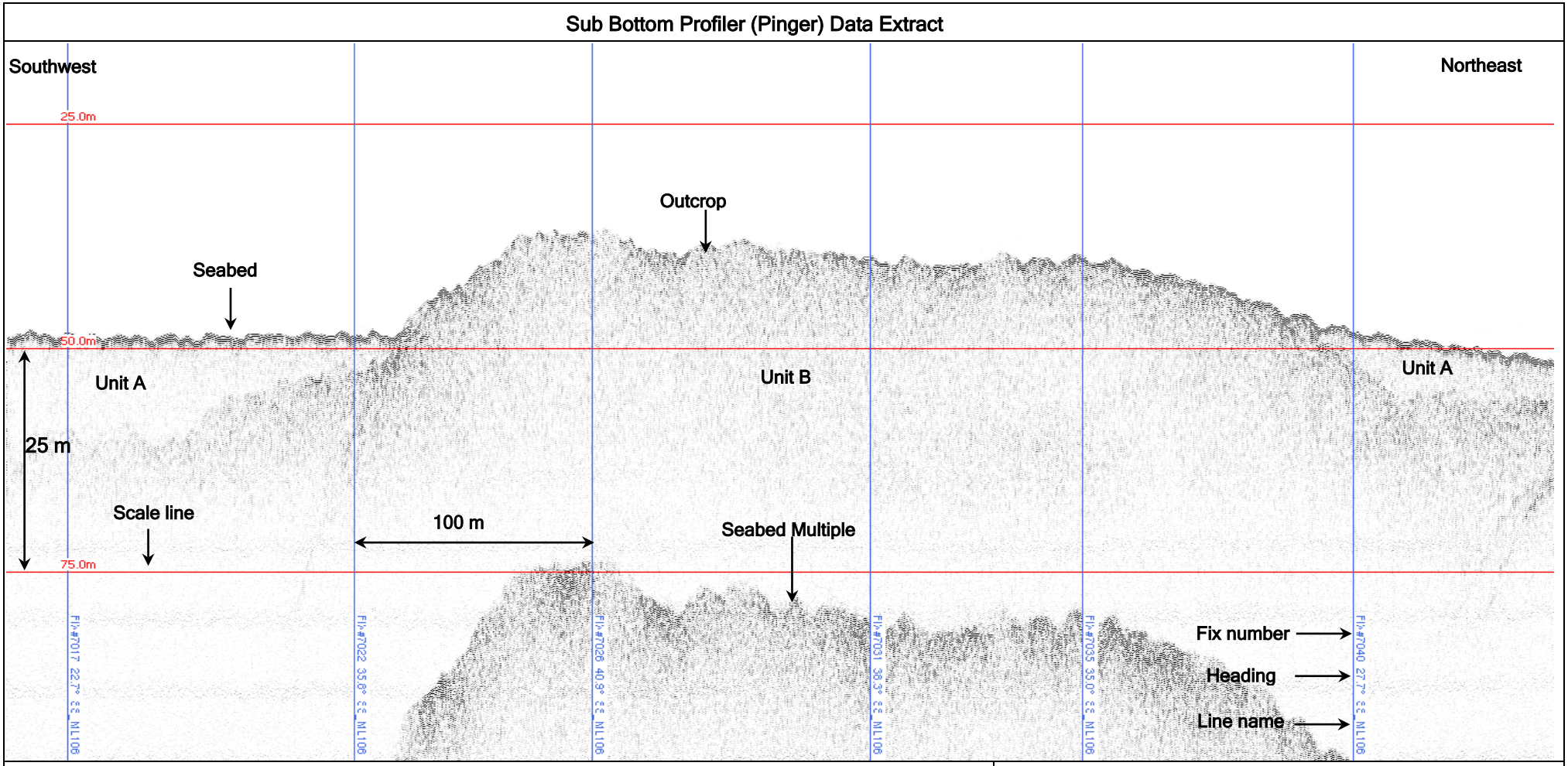
Unit B interpreted to be comprised consolidated /cemented sediments. The unit is bound by reflector R1 at the top and bottom was not observed with in the sweep range due to lack of wave penetration.

List of Charts

The charts listed below table are associated with this report. The charts have been compiled on A0 size paper with a horizontal scale 1:2500.The charts contain the survey results within the survey limit.

- Bathymetry & Contours Chart
- Seabed Features Chart
- Geological Profile Chart
- Mosaic Chart
- Vessel GPS Track Chart

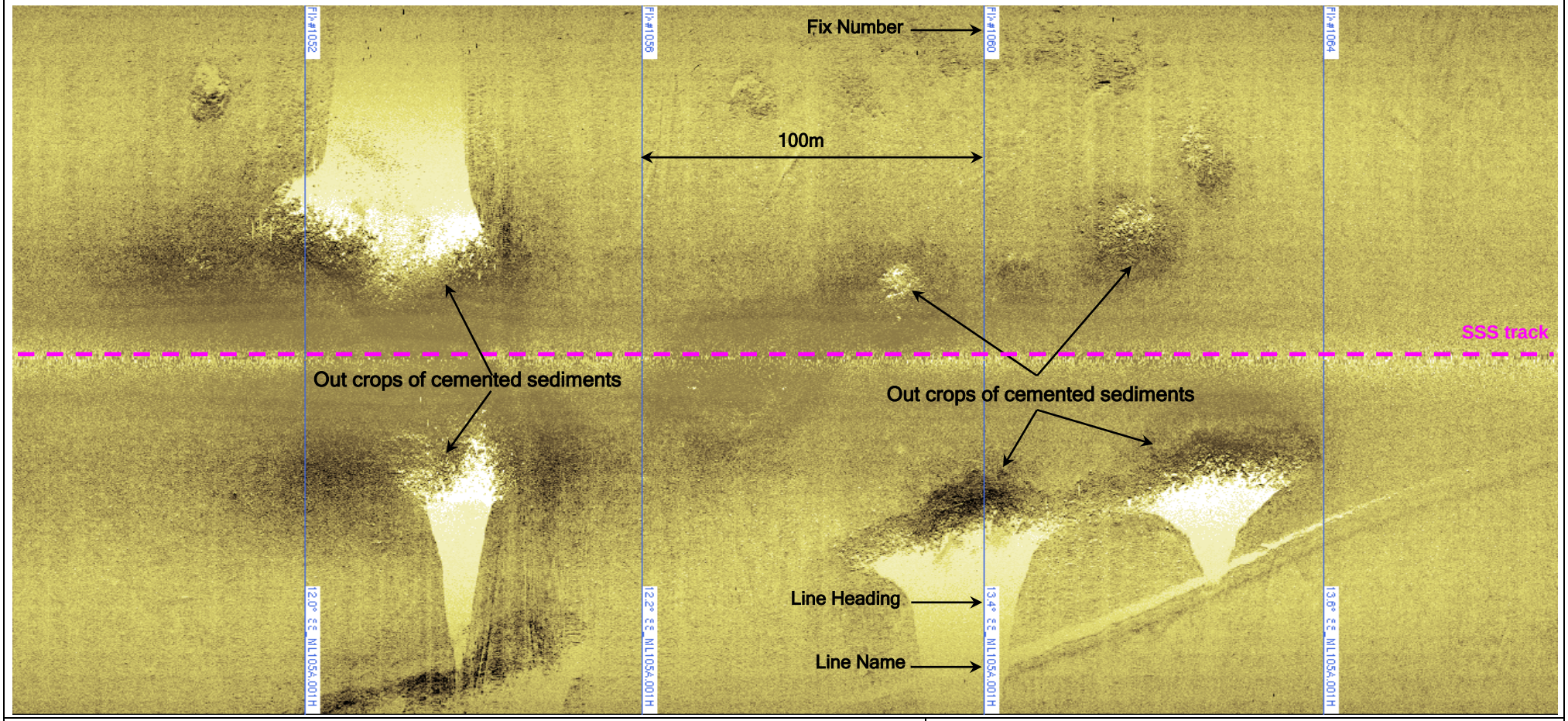
List of Charts		
Chart Title	**Drawing Number**	**Chart No.**
Bathymetry & Contours Chart	INF-JPC-BA-001	01 of 13
Bathymetry & Contours Chart	INF-JPC-BA-002	02 of 13
Bathymetry & Contours Chart	INF-JPC-BA-003	03 of 13
Bathymetry & Contours Chart	INF-JPC-BA-004	04 of 13
Bathymetry & Contours Chart	INF-JPC-BA-005	05 of 13
Bathymetry & Contours Chart	INF-JPC-BA-006	06 of 13
Bathymetry & Contours Chart	INF-JPC-BA-007	07 of 13
Bathymetry & Contours Chart	INF-JPC-BA-008	08 of 13
Bathymetry & Contours Chart	INF-JPC-BA-009	09 of 13
Bathymetry & Contours Chart	INF-JPC-BA-010	10 of 13
Bathymetry & Contours Chart	INF-JPC-BA-011	11 of 13
Bathymetry & Contours Chart	INF-JPC-BA-012	12 of 13
Bathymetry & Contours Chart	INF-JPC-BA-013	13 of 13
Seabed Features Chart	INF-JPC-SF-001	01 of 13
Seabed Features Chart	INF-JPC-SF-002	02 of 13
Seabed Features Chart	INF-JPC-SF-003	03 of 13
Seabed Features Chart	INF-JPC-SF-004	04 of 13
Seabed Features Chart	INF-JPC-SF-005	05 of 13
Seabed Features Chart	INF-JPC-SF-006	06 of 13
Seabed Features Chart	INF-JPC-SF-007	07 of 13
Seabed Features Chart	INF-JPC-SF-008	08 of 13
Seabed Features Chart	INF-JPC-SF-009	09 of 13
Seabed Features Chart	INF-JPC-SF-010	10 of 13
Seabed Features Chart	INF-JPC-SF-011	11 of 13



Survey Location: Mombasa, Off shore Kenya

Figure 1: SBP Data Extract - Line Name: SS_ML106

SSS Data Extract



Survey Location: Mombasa, Off shore Kenya

Figure 7: SSS Data Extract - Out crops of cemented sediments