

APPENDIX 2.3 – REQUIREMENTS TO SURVEY RESULTS

CONTENTS

1.	GENERAL	3
2.	SURVEY DATA	3
3.	SURVEY CHARTS	3
4.	SURVEY REPORT	8

1. GENERAL

Contractor shall deliver to Purchaser a series of charts of data acquired during the Survey (the "**Survey Charts**"), a complete narrative report on the Survey, including recommended routes for the submarine cables (the "**Survey Report**"), and the raw survey data records collected during the Survey (the "**Survey Data**") (collectively ("**Survey Results**").

Purchaser will use the Survey Results to procure specific cable by type and other plant and to plan the subsequent marine installation operations. The Survey Results shall therefore support the subsequent operations, including but not limited to:

- justify the recommended route for the cable;
- carry out a burial assessment survey;
- carry out route clearance operations;
- installation of the shore end sections;
- perform a pre-lay grapnel run;
- simultaneous laying and burial of the main sea section; and
- post lay burial operations.

The bathymetric and geophysical data collected shall be presented in a smooth, corrected format, which will enable the Purchaser to engineer and install the cable.

Purchasers minimum requirements to the Survey Results are set out in the following sections:

- (a) for Survey Data in section 2
- (b) for Survey Charts in section 3
- (c) for Survey Report in section 4

2. SURVEY DATA

All raw data records shall be delivered to a nominated Purchaser's Representative on acceptance of the Survey Report.

3. SURVEY CHARTS

The processing of Survey Data and map production shall be performed onboard the Vessel to clearly illustrate survey results and optimize the evaluation of the topographic conditions to ensure that the optimal final corridor is surveyed.

3.1 General Requirements to Survey Charts

3.1.1 Chart Title and Legend

Each Survey Chart shall clearly show in the border or in the title box:

- (i) the chart number
- (ii) issue number
- (iii) the name of the survey

- (iv) the date of the survey
- (v) chart scale
- (vi) chart datum and projection
- (vii) sounding units
- (viii) contractor name and logo
- (ix) vessel name
- (x) Purchaser's name(s) and logo(s); and
- (xi) any other information deemed appropriate.

A box or space of similar size of the title box shall be left blank for installation information.

A kilometre scale, subdivided into tenths, shall be shown on each chart.

A visual chart index showing the location of each chart along the route shall be provided.

3.1.2 Projection, datum, scale and graticule

Contractor shall apply the following specifications to the Survey Charts:

Item	Requirement:
Projection	Universal Transverse Mercator
Datum	WGS 84
Scale of charts when printed on Standard A0 size paper	
Main Route	1:10,000
Punch-out position and near shore	1:5,000
Pipeline crossings	1:5,000
In service cable crossings	1:5,000
Overview	1:150,000
Overview	1:500,000
Graticule	Full graticule for UTM grid
	Tick marks for latitude and longitude

3.1.3 Information on cables and pipelines

All information on cables (in service and out of service) and pipelines etc. shall be depicted on all Survey Charts. For cables, method of detection or, if not detected, source of data, shall be shown.

3.1.4 Height of grid co-ordinate numbers

On all charts the grid co-ordinate numbers shall be 3 mm in height.

3.1.5 Key plan chart

A single chart of the whole route shall be produced on the most suitable scale, which will serve as a key plan for all the charts.

All charts shall be sequentially numbered.

3.1.6 Draft and final Survey Charts

The Contractor shall provide one set of draft Survey Charts for approval and one set of the final Survey Charts, which shall be the property of the Purchaser. The Survey Charts shall also be provided in an agreed electronic format attached to the electronic Survey Report as set out in section 4.3.3.

3.1.7 Issue numbers

The first draft Survey Charts shall be issue 0. Any subsequent amendments shall reflect a change of the issue together with a margin note of the amendment performed.

3.2 Main Route Charts

The specific requirements for Survey Charts covering the cable route is set out in this section 3.2

The Contractor shall propose a way of presentation which shall be subject to the approval of Purchaser. Purchaser has free choice of form of presentation.

3.2.1 Definition of Strips

The Survey Charts shall include horizontal strips detailing the following specific information:

1st strip	(Top) Bathymetry and cable route. Depth contours, UTM grid, geographical grid intersects, KP markers, north arrow.
2nd strip	Seabed features and shallow geology. Survey corridor, UTM grid, geographical grid intersects, KP markers, seabed features (obstacle, sample, wreck, other significant targets), side scan coverage, land contours, cables, north arrow etc.
3rd strip	Seabed classification. Geological seabed conditions based on Side scan sonar results.
4th strip	Route seabed index. Estimations of seabed trenching conditions.
5th strip	Seabed and geological profile with a vertical scale of normally 1:400, KP marker, depth scale in meters, seabed contour/profile, geological details, annotation of sample number etc.
6th strip	Slope/gradient along the cable route XYZ, data to be presented, highlighting critical slope angles. Slope to be based on a 10 m running interval.
7th and 8th strip	Plough assessment survey/Depth of burial. To be graduated with horizontal lines for future use during a plough assessment survey or depth of burial profile.

3.2.2 Legend

The legend shall include but not be limited to:

- Depth contour every 5 m (fat line)
- Depth contour every 1 m (thin line)
- Route incl. KP markers
- National boundaries (territorial waters, EEZ etc. according to public charts)
- Theoretical side scan limits
- Match line for overlapping charts
- Cables according to public navigational charts and/or other sources
- Cable/pipeline detected
- Geological boundary
- Boulder fields
- Outcropping crystalline bedrock
- Geological sample
- Buoy according to sea charts
- Boulder cluster
- Boulder > 1.0 m
- Boulder 0.5 – 1.0 m
- Object with identifier no.
- Point with detected cable/debris/pipeline
- Wreck with identifier no.
- Land contour (taken from digital database with suitable resolution or navigational charts)
- Debris area
- Restricted areas
- Common shipping lanes according to national navigational charts

3.2.3 Depiction of Data

The Contractor shall propose a method of depicting acquired data. In particular, consideration must be given to the method of depicting the different sea bed materials.

Contractor shall have received Purchaser's approval as to depiction of data before the Survey commences.

3.2.4 Geographical co-ordinates, UTM and Kilometre Points (KP's)

All listings, for whatever purpose, are to be by geographical and UTM co-ordinates and with KP's.

Kilometre points shall be shown on all strips and indicated in the upper margins as convenient. The origin of the kilometre points is to be agreed with the Purchaser before the Survey commences.

Under no circumstances is any data to be tabulated by kilometre points or UTM only.

3.2.5 Depiction of Route and Recommended Cable Route

The final selected route for the Survey shall be indicated as a faint horizontal centre line.

The Contractor's recommended cable route line is to be shown on the Survey Charts in a faint but distinctive manner.

3.2.6 Alter Course (AC) Points and UTM Zone Shifts

Alter course positions shall be shown as a simple unnumbered symbol, such as a short dash perpendicular to the course line. A circle shall not be used.

At all alter course positions which involve the strip to be re-orientated about the grid, a suitable overlap (500 metres) between adjoining sections shall be made. This shall also be applied at UTM zone shifts. When such reorientation occurs it is generally preferable to start a new Survey Chart. In any case not more than one reorientation shall be shown on any one Survey Chart. Where a reorientation occurs on a Survey Chart a space of 5 mm shall be made between sections.

3.2.7 Bathymetric and Geological Profile

The bathymetric and geological profile shall be presented with the mean seabed line displayed at approximately half height. The profile depicted shall be the centre line of the route revised during the Survey, not the tentative route for Survey provided by Purchaser.

The geological profile shall depict the sub-seabed geology as found on the Survey with actual depths and type of surficial sediment, and any other features such as gas blanking.

3.2.8 Bathymetric Contouring

Where possible and practicable contouring shall be at one metre intervals. Any variation from this shall only be at the written agreement of the Purchaser.

3.3 Punch-out Positions and Near Shore Charts

Survey Charts for the near shore route shall depict:

- (a) bathymetric contours;
- (b) seabed features;
- (c) recommended cable route;
- (d) punch out points;
- (e) full coastline;
- (f) topographical features; and
- (g) seamarks

Data on (e)-(g) shall be acquired from the appropriate national land surveying/mapping agency.

3.4 Pipeline and In Service Cable Crossing Charts

At pipeline and in service cable crossings, additional charts is required. The composition shall be the same as for main route survey charts, except that the crossing point shall be orientated at the chart midpoint and the scale shall be 1:5,000.

3.5 Overview Charts

A series of overview charts on a scale of 1:150,000 and 1:500,000 showing the whole route shall be produced. The charts shall be marked with latitude and longitude scales at 5' (minute) intervals and the UTM grid at 10,000 metre intervals.

The overview charts shall show:

- (a) the base route;
- (b) coastline where appropriate;
- (c) significant features as found during the Survey; and
- (d) prominent navigational features (traffic routing zones, main navigational marks, pipelines, platforms, cables, etc.) within 30 kilometres from the base route.

4. SURVEY REPORT

4.1 Content of the Survey Report

4.1.1 Main Report

The Survey Report shall include but not be limited to the following items:

- (a) Scope of work undertaken.
- (b) Discussion of results, including descriptions, distribution and thickness of seabed sediments observed and the overall geology of the route.
- (c) Table of grain sizes for describing sediments and seabed materials.
- (d) Tabulated list of all sonar contacts and isolated features found (this shall be organised into columns showing geographical and grid co-ordinates, kilometre points if applicable, dimensions, type of contact and chart number applicable. Each contact shall be numbered).
- (e) Tabulated list of cables and pipelines as taken from, and referred to, charted sources. Where these are also sonar contacts, reference shall be made to the contact number.
- (f) Tidal current information at 10 km intervals along the route. (This shall be obtained from published sources with interpolations as necessary. The Purchaser and Contractor shall discuss and agree to a method for displaying this information). If there are significant variations of tidal current information between the locations, the intervals shall be reduced to reflect this. This information is required for installation planning and maintenance purposes.
- (g) A general description and overview of the area in which the work was performed. This description shall include:
 - (i) Descriptions and limits of territorial waters and exclusive economic zones/continental shelves.
 - (ii) Coastal features.
 - (iii) Identified sand banks and sand wave areas.

- (h) List of route co-ordinates in geographical (WGS 84).
- (i) Route summary, including any information considered to be of value to cable route engineering and installation.
- (j) Operational summary.
- (k) Navigation report.
- (l) Fishing activity observed.
- (m) Shipping activity observed, including vessels at anchor and on passage.
- (n) Any other offshore activities observed, including dredging, dumping, drilling, construction, etc.

The above information shall to the furthest extent possible be categorised according to Survey Chart number (or chart limits) to facilitate an organised review of the Survey Charts.

4.1.2 Main Report Appendices

Contractor shall include the following information as appendices to the main Survey Report, preferably as a separate volume:

- (a) Full technical information of vessels and equipment used.
- (b) List of key personnel employed and their responsibilities.
- (c) A log/diary to indicate significant field activities from mobilisation to demobilisation, including equipment breakdown time.
- (d) A summary of equipment breakdown/repairs.
- (e) Bibliography of all references.

4.1.3 Pipeline Crossings Reports

At pipeline crossings separate brief additional reports are required. The content of such reports shall include:

- (a) an overview of the immediate area;
- (b) summary of findings in the crossing area supported as appropriate with side-scan, sub-bottom profiler and/or magnetometer records;
- (c) a navigation report; and
- (d) a copy of the appropriate 1:5,000 Survey Chart.

Purchaser will advise the full content and numbers of these reports.

4.2 Issue numbers

The first draft Survey Report shall be issue 0.

Any subsequent amendments shall reflect a change of the issue number together with a margin note of the amendment performed.

4.3 Delivery of the Final Survey Report

Contractor shall deliver the Survey Report as a narrative report to supplement and explain thoroughly the data presented on the Survey Charts.

Contractor shall deliver:

- (a) 1 hard copy of the Survey Report, including Survey Charts
- (b) 3 electronic copies of the Survey Report, including Survey Charts and Survey Data, delivered on 3 separate SSD hard drives.

4.3.2 Final Survey Report, hard copy

The hard copy of the Survey Report shall include paper copies of each Survey Chart as separate volumes.

The hard copy shall be compiled in A4 ring binders and Survey Charts shall be unfolded. The contents shall be:

- Type written
- Pages numbered consecutively
- Each page shall have an issue number

4.3.3 Final Survey Report, electronic

The final Survey Report shall be provided electronically in a format to be agreed with Purchaser.

Survey Data, Survey Charts, and the route position lists of the recommended cable route shall be provided together with the electronic Survey Report as set out below.

Survey Data:

- Swathe Bathymetry - XYZ files in ASCII format.
- Side-scan sonar, sub-bottom profiler, and multi-/singlebeam echosounding data - HPGL file (universal plotter language).
- Side-scan sonar, sub-bottom profiler data - ISIS (digital registration system).

Recommended cable route including KP-positions:

- Route position list of the recommended cable route, including confirmed or recommended punch-out positions, with KP-positions shall be provided in XML, PDF, TZX, KML and XLSX format.
- Route positions list of the recommended cable routes, including confirmed or recommended punch-out positions and all other observed obstacles in the areas surveyed with adjacent KP-points shall be provided in both XML, PDF, TZX, KML and XLSX format.

The electronic final Survey Charts files shall be subdivided into layers, which will typically include:

- Base charts
- Chart updates (wrecks, revised shipping lanes etc.)
- Bathymetry data

- Geology data
- Purchaser's tentative cable route as provided in Appendix 2.1 (Route Position Lists)
- All routes as surveyed
- Contractor's recommended cable route, including punch-out positions.