



WINS System

Specifications for Pre-installation Survey

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MDM

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1. General requirements for a geophysical survey for archaeological purposes:

1.1 Side Scan Sonar:

- For archaeological purposes, the Side Scan Sonar will have an operational frequency of 410/500 kHz.
- Side scan will be set at 50m survey line spacing
- This will not be slant-range corrected
- There will be 100% coverage of sites and therefore overlap of areas may be required.

It is proposed that in shallow water (0-15 metre water depth) the line spacing may be reduced to 25 metres. In deeper water the line spacing may be increased to 150 metres whilst maintaining the requisite seabed coverage.

1.2 Magnetometer:

- A magnetometer will always be used in tandem with side scan sonar
- Proton or caesium magnetometer will be used as well as, again, using 50m side spacing
- This will be used with DGPS

1.3 Sub-bottom profiler:

Sub bottom profile information shall be required for the both the inshore and shallow water sections of the route. Sub bottom profile data shall be acquired on all lines of the proposed line plan so that an accurate interpretation of the geology can be obtained. Details of the preferred line plan can be found in Section 3.2.

The Survey Contractor shall recommend sub bottom profiling equipment that typically resolves to twenty centimetres (0.2m) within the top three metres (3m) of

the seabed. The equipment shall be capable of penetrating to a minimum of six metres (6m) in suitable seabed conditions. The Survey Contractor shall state the resolution of the proposed system for the survey.

Vessel mounted sensors shall be fully compensated for heave. In water sensors shall be dynamically positioned and steered along the predefined survey lines using industry standard techniques. In water depth less than one hundred metres (100m), fish positioning may be determined, at the discretion of the Client Representative, using fixed layback to counteract poor acoustic positioning, however in this case a suitable Non- Conformance Report shall be raised.

The system shall be capable of providing data in both digital and analogue form.

- If using a sub-bottom profiler then the Chirp system is the preferred one as this gives the ultimate resolution

- This will be used in conjunction with DGPS

2. Data management:

Track plots will also be recorded. Track plots will be superimposed onto a locational chart

All geophysical survey will be carried out by suitably qualified personnel. Preferably they will also have underwater archaeological experience. If this is not possible then the results must be viewed by a qualified archaeologist with experience in underwater archaeology.

A copy of the original data/traces as well as the interpreted results of the geophysics will be sent to the Underwater Archaeological Unit of DCHG. Further archaeological mitigation may be required once the data has been reviewed by DCHG.

Vessels will not travel faster than 4-5 knots when carrying out surveys.

2.1 Overlap

In order to ensure data continuity, the following overlaps between survey regions are to be established as a minimum;

- Landfall Site Survey to Diver Swim Survey – 50m overlap
- Diver Swim Survey to Small Boat Survey – 50m overlap
- Small Boat Survey to Offshore Survey – 500m overlap

3. Landfall Site Survey & Site Investigations

A non-intrusive topographic survey of the beach along the line of the proposed cable route is required from the shoreline to the low water mark.

Site Investigations will consist of;

- 3 No. Trial Pits on the beach (2.5m depth, excavated and immediately reinstated by JCB)
- Bar probes on the beach (effectively non-intrusive investigation)
- Bar probes from the Low Water Line to the 3 metre contour (effectively non-intrusive investigation)

3.1 Beach Trial Pits

The sampling required on the beach will involve 3 No. Trial Pits at 50m centres starting seaward of the High-Water Mark.

The 3 No. Trial Pits will be excavated, logged, photographed and backfilled in a single intertidal period of less than 1 hour. The trial pits will be backfilled with the original excavated materials in the sequence in which they are excavated.

A summary Method Statement for excavation of the 3 Trial Pits is as follows;

3 No. Trial Pits – JCB or equivalent small mechanical excavator.

- Maximum depth of 2.5m.
- Excavate sand and place to one side.
- Excavate substrate and place separate from sand.
- Measure, log and photograph each Trial Pit.
- Backfill in sequence compacting with bucket of back-hoe as the backfilling proceeds.

3.2 Bar probes

The bar probes on the beach and out to the 3m contour are simply to prove the depth of sand, gravel or soft material and are effectively non-intrusive.

3.3 Diver Swim Survey

The Diver Swim Survey will extend from the low water line outward to the small boat survey limits in accordance with the defined overlaps. A diver swim rope with 25m gradations will be positioned along the route. Dive lines will be configured to provide representative coverage across the entire survey corridor (nominally spaced at 125m).

Bathymetry will be measured by diver depth gauge at each 25m gradation. Geomorphology will be determined by underwater video along the length of the diver swim rope. The diver video will be undertaken along each line in the survey swathe; divers will use a dive slate or other clearly written method to indicate Kilometre Point (KP) and water depth at the specified gradations along the rope.

Tie-lines will be nominally spaced at 125m parallel to shore and will verify primary survey data within the Diver Swim area. Bathymetry and seabed composition are to be noted along tie-lines. A minimum of 2 tie-lines will be performed.

The Diver Swim Survey will also investigate and identify any obstacles found during the Small Boat Survey up to safe diving limits. Two spot dives will be considered part of the standard scope of work.

Survey Area	Depth Range	Corridor	Min. # of Lines
Diver Swim	0 (LAT) to 3m	250m	5

Table 1. *Diver Swim Survey Requirements*

The Diver Swim Survey will comply with the requirements of the Underwater Archaeology Unit of the Department of Arts, Heritage & the Gaeltacht.

4. Small Boat Survey

The area extending seaward from the 3m water depth contour and inshore of the safe working draft limits of the primary survey vessel will be accurately surveyed with a small craft using Multibeam Echosounder (MBES), sidescan sonar and sub-bottom profile equipment.

Sub-bottom profile equipment will be able to discern the nature and density of the upper 3 metres of seabed, and will be used on a non-interfering basis with other sounding systems. Tie-lines will be performed to verify primary survey data and will have a nominal spacing of 10 times the primary line spacing with a minimum of two tie-lines. A minimum of seven survey lines, based upon the Survey RPL, is required.

Features such as shallow reefs, surge channels, debris fields, archaeological features or anything that could be a hazard to the cable or installation team will be noted. General reconnaissance of the survey corridor beyond the planned survey lines and tie-lines may be necessary to describe the seabed as accurately as possible.

A diver swim survey (spot dive) may be required to investigate and identify any obstacles or archaeological features found during the small boat survey up to safe diving limits. A line plan showing number of survey lines as a function of depth will be provided prior to start of survey operations.

Survey Area	Depth Range	Corridor	Min. # of Lines	Min. Overlap	Max. Speed
Small Boat	3m to 15m	500m	7	SSS: 100% MBES Bathy: 20%	4 knots

Table 2. Small Boat Survey Requirements

5. Offshore Survey

A continuous bathymetric swathe (Multibeam Echosounder), along with side scan sonar imagery and sub-bottom profile will be obtained, centred on the preliminary route and along all wing lines needed to complete the corridor coverage. A minimum depth accuracy of 0.5% is required.

Sub-bottom equipment will be able to discern the nature and density of upper 3m of seabed, and is to be used on a non-interfering basis with other sounding systems. Additional sounding lines may be necessary to identify any obstacles or archaeological features that may be encountered, and/or to meet the overlap and corridor requirements.

Survey Area	Depth Range	Corridor	Min. # of Lines	Min. Overlap	Max. Speed
Offshore	> 15m	500m	3	SSS: 100% MBES Bathy:20%	4 knots

Table 3. Offshore Survey Requirements

6. Seabed Sampling

Seabed sampling will be required at locations covered by the Small Boat and Shallow Water Surveys.

A minimum of two attempts will be made at each sampling location to acquire a suitable seabed sample. If an acceptable sample is achieved on the first attempt, there is no need to perform a second attempt.

An acceptable sample is defined as;

- Grab Sample – recovery of approximately a full bucket of soils. Recovery of rocks and/or large size granular material will be taken as indication of a hard seabed and be deemed an acceptable sample.
- Gravity Core – recovery of no less than a 2m deep core of soil. If stiff or hard soils are encountered below 1m of seabed and are clearly indicated in the sample, a 1m+ soil sample will be deemed acceptable. Any sample site yielding less than 1m of recovery must be investigated a second time unless there is obvious damage to the coring equipment indicating a hard or rocky substrate.
- CPT – Penetration to the 2m target, but a maximum of 3m below seabed. Any push resulting in less than 2m penetration will warrant a second attempt.

Survey Area	Depth	Type	Avg. Spacing	No. of Samples
Small Boat	3 – 15 m	Grab Sampler	1 per 500 m	8
Offshore	> 15m	Gravity Corer (GC) or Cone Penetrometer (CPT) Grab Sampler (After GC/CPT Failure)	1 per 5km	45

Table 4. Seabed Sampling Requirements

The site investigations seaward of the 15m contour will be undertaken from a larger sea-going vessel. The site investigations in the area from the Low Water Line to the 15m contour will be undertaken from a small vessel having the appropriate draft.

The marine survey and site investigations will be undertaken in compliance with best practice and having regard for the protection of marine mammals.

The marine survey and site investigations will be undertaken along the route line shown on the Foreshore Licence Map Drawings. However, a 500m wide route corridor is shown to allow for local diversions in the event of obstructions or other routing considerations.

The schedule of Site Investigations is set out in Table 5.

Survey Area	Depth	Type	Avg. Spacing
Landfall	HWM - LWM	Trial Pit	1 per 55 m
Landfall	HWM - LWM	Bar Probing	1 per 25 m
Diver Swim	0 – 3m Water Depth	Bar Probing & Diver	1 per 25 m

Table 5. *Site Investigation Schedule*

The overall scope of the Site Investigations is as follows

- Trial Pits 3 No. on the beach
- Bar Probes 24 No. on the beach
- Bar Probes 20 No. from Low Water to the 3.0m contour
- Grab Samples 6 No. from the 3m to the 15m contour
- Gravity Cores or
Cone Penetration Tests 45 No. from the 15m contour to the
12-Mile Limit

The Survey Control Measures prescribed in the Appropriate Assessment Screening Report (attached as Appendix 3) will be adhered to.

7. Survey Equipment Parameters

7.1 Equipment and Procedures

The marine survey will be carried out in compliance with the “*Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters,*” and with the “*General Requirements for a Geophysical Survey for Archaeological Purposes,*” and in accordance with the Survey Control Measures prescribed in the Appropriate Assessment Screening Report (attached as Appendix 3).

The survey equipment acoustic properties have the following characteristics;

Equipment Type	Frequency (Energy level in dB re 1 µPa)
Dual Frequency Single Beam Echosounder – Reson Navisound 420 or equivalent	33 and 210kHz (168 – 174)
Dual Frequency Side Scan Sonar - Edgetech 4200 Sidescan Towfish or equivalent	100 and 400kHz (226 effective) 100/400 kHz and 300/600 kHz
Sub-bottom Profiler - Geoacoustics 4 x 4 Hull-mounted SBP Pinger System or equivalent	3 – 7.5kHz (-225)

Table 6. *Equipment Acoustic Properties*

In the case of the Small Boat Survey the survey line spacing will be set at 50m for the Side Scan Sonar. In deeper water the spacing will increase.

Specific soft-start procedures (to comply with the “*Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters*”) will be developed and incorporated in the project execution plan before mobilisation.

The duration of noise-generating surveys will be reduced to the minimum necessary to collect results of sufficient quality.

The survey will be undertaken by a specialist survey vessel having experience of marine survey and having approved appropriate survey equipment.

Details of the survey vessel and of the survey equipment to be used will be made available prior to commencement of the survey. The data to be provided will include;

- Name of vessel
- Name of Captain
- Name of Client's Representative
- Contact details for the vessel
- Details of Multi-Beam Equipment including;
- The sound intensity, the frequency of pitch and the tone or bandwidth for the Echo Sounder, the Side Scan Sonar and the Sub-Bottom Profiler.