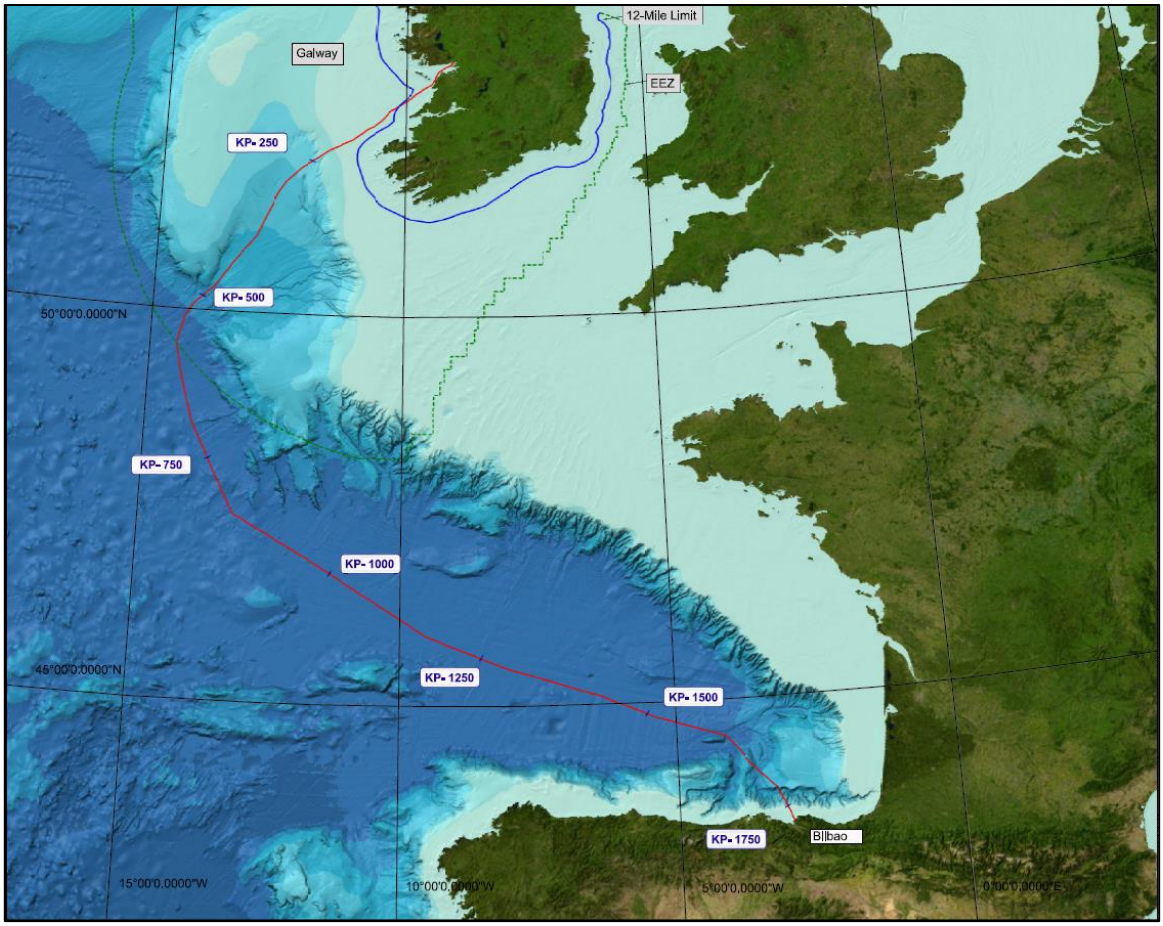

WINS System

Specifications for Cable Installation

July 2018

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1. CABLE INSTALLATION

The Cable Installation is comprised of a number of elements which include;

- Beach / Foreshore Access
- The Landfall at Ballyloughane (HDD)
- Cable Installation on the Beach
- Offshore Cable Installation

This is a general Method Statement. When a Contractor is appointed a specific Method Statement will be prepared and this will be discussed with the Underwater Archaeology Unit, Natural Parks and Wildlife Service and Galway City Council, prior to commencement. It is planned to carry out the work in early Summer of 2019.

2. BEACH / FORESHORE ACCESS

There will be a requirement for equipment and plant access to the beach for;

- Excavation and backfill of a pit at the end of the Horizontal Directional Drill.
- Pulling the cable ashore.
- Pulling the cable plough to trench and bury the cable from the end of the Horizontal Directional Drill out to the Low Water Line.

The plant will involve;

- A tracked excavator or JCB for the Trial Pits, for the reception pit at the end of the Horizontal Directional Drill and for pulling the cable ashore.
- A tracked low-pressure dozer for pulling the cable plough.

It is proposed that these will gain access to the beach via the existing concrete slipway approximately 130 metres southeast of the line of the cable, adjacent to the car parking area. Existing public access arrangements to the general foreshore area shall not be impeded by plant or materials used in connection with the works and all necessary precautions shall be put in place to protect foreshore users and the public in accordance with relevant Health and Safety Legislation.

3. CABLE LANDFALL AT BALLYLOUGHANE

The proposed landfall is located approximately mid-way along Ballyloughane Strand. The shoreline is in the form of a stable sandy beach with a low stub wall protecting a footway which defines the sea-land boundary. Inland of the footway there is a grass strip which separates the footway from end-on parking bays and a local road. Taking the features of the shoreline into account it is planned that the shore-end will be installed by means of a Horizontal Directional Drill which will be carried out in advance of the cable lay.

3.1 Horizontal Directional Drill (HDD)

It is planned that the drilling will be located in the "green area" immediately east of the public road. The drill-casing will commence in a pit 1.5m below ground level and this will enable it to cross 2.5 metres depth below the road and well below the existing beach level at the shoreline. This form of installation will avoid any excavation or damage to the shoreline and will ensure that nothing is done which would exacerbate the stability of the shoreline.

The drill-casing will extend well beyond the shore-line and the shelving beach adjacent to it and will terminate in the flat sandy foreshore at a depth of 1.5m below beach level approximately 170 metres from the shoreline. A schematic diagram of the HDD is shown in Figure 1.

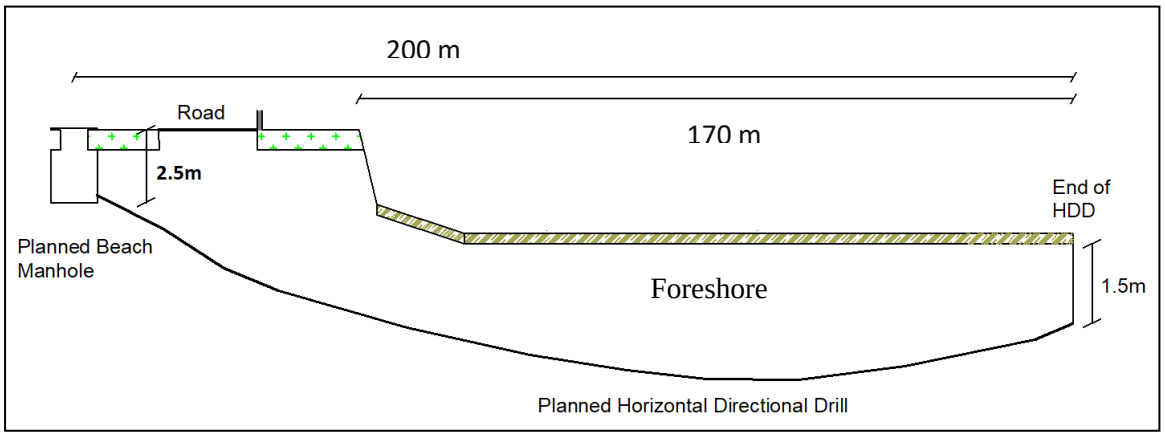

Figure 1. Schematic of Horizontal Directional Drill

Data pertaining to the Horizontal Directional Drill is as follows;

- Length of Horizontal Directional Drill –Approximately 200m
- Internal diameter of Drill-Casing – 109mm.
- Drill-Casing Material S-135 High Strength Steel.

- Length of individual Drill-Casing Pipes – 6.1m.
- Entry Angle – Less than 10°.
- Descent Angle – Less than 15°
- Ascent Angle – Less than 15°.
- Exit Angle – Less than 10°.
- Composition of drilling fluid – 60 to 70kg Bentonite per 1m³ of water.
- Maximum volume of drilling fluid in casing – 1.9 m³.
- Expected drilling rate – Approx. 100m/day.
- Planned working hours – 12 hours/day

3.1.1 Site Preparation & HDD Rig Set Up

The procedure to be followed consists of three stages.

- A perimeter fence will be set up and the drill pit site will be clearly signposted informing the general public of the work in progress while limiting access to the site.
- The minimum area necessary will be utilised to reduce the impact of the works.
- All the equipment necessary for the drill pit and drill rig installation will be transported to the site pending the excavation of the pit and the final positioning of all necessary tools and equipment.
- The pit will be dug and lined with geotextile and polyethylene sheet to prevent any seepage of drilling fluids into the surrounding soil.

3.1.2 HDD Operations

The drilling process will be closely monitored and logs will be kept over the entire duration of the operations. The drill design will be followed so that the achievable drill will be within acceptable tolerances. The bore alignment will follow the reference alignment shown on the plans and will be accurate to within the following tolerances:

- Installation of the horizontal directional drill will be within 1 m of the centreline of bore indicated on the drawings at the bore entry.

- Installation of the horizontal directional drill will be within 3 m of the centreline of bore indicated on the drawings for the entire length of the bore.
- The bore exit angle will be maintained at ten (10) degrees or flatter.

3.1.3 Drill Head Tracking System

The method employed to monitor the progress of the HDD necessitates the use of wire-line connected transmitter system in order to provide sufficient data so that the drill bit's relative position is real-time recorded throughout the entire drilling operation. A non-magnetic sonde will be installed on an adaptor casing following the mud motor attachment in the bore and wire-lined back to the HDD Rig. This sonde is responsible for transmitting a signal to provide real-time information regarding the drill bit's azimuth, vertical distance from the receiver (which is translated as depth) as well as its coordinates (latitude – longitude). All information transmitted is constantly displayed in a remote monitor mounted on the HDD machine so that the operator is always aware of the precision of the bore's progress.

3.1.4 Drilling Fluid/Bentonite

Bentonite is commonly used as drilling mud to lubricate and cool cutting tools, to remove cuttings and help prevent blowouts. Bentonite is a ground naturally occurring clay. It is inorganic, non-toxic, non-irritating. It has a specific gravity of approximately 2.4 and comes in the form of a grey powder. It expands when wet and, when mixed with water at a concentration of the order of 60-70kg of bentonite powder per m^3 of water, it takes on the characteristics of a gel. Bentonite is widely used in the construction industry as a drilling fluid, as a lining for the base of landfills and for the construction of curtain walls to waterproof below-grade excavations.

3.1.5 Drilling Fluid Containment

It is planned to use a "drill & leave" scenario using steel drill casing pipes and then leaving them in place. When the HDD reaches its target length it is proposed to excavate a small reception pit on the beach. It is planned to clean out and flush the

steel drill casing with water prior to this. Whilst it is anticipated that no bentonite will escape from the HDD bore which will be 1.5m below the sand surface, any residue which may escape will be very little and will be contained in the reception pit. All necessary precautions shall be put in place to protect other foreshore users in accordance with relevant Health and Safety Legislation with temporary fencing, barriers and signage in place around the location of the reception pit. The minimum area necessary will be utilised to reduce the impact of the works.

3.1.6 On-Shore Sludge Removal

The volume of fluids and cuttings produced during the HDD process will be removed from the on-shore drilling pit at regular intervals by way of sludge pumps and sent to the recycling unit positioned alongside the drilling pit. Solids can be optically assessed with accuracy after the fluid turbidity clears and the volume of fluids can be also calculated. All residue will be disposed of in accordance with the requirements of Galway City Council.

3.1.7 Proving of the HDD Pipe Bore

Once the HDD pipe is installed, it will be tested through its entire length to prove the minimum internal diameter required and to ensure that no abnormalities, which may affect the future cable landing, are existent. After the pipe inspection, a messenger line (3/8” wire rope) will be installed and a cap will be fitted on the end to prevent the ingress of any sediment and/or debris.

3.1.8 Completion of Advance Works

The installation of the messenger line marks the completion of the Advance Works seaward of the High-Water Line. The reception pit on the beach will be backfilled carefully using the excavated material.

3.1.9 Site Restoration

On completion of the drilling operations, a Beach Manhole will be constructed in the vicinity of the drilling pit and the site will be restored to its prior condition. All materials and equipment will be removed and the site area will be cleaned and reinstated to its original condition. This will include the following:

- Remove all debris and project related material from the site at the completion of the work.
- Remove all evidence of machinery presence and reinstate the ground to its original condition.
- Replant any and all vegetation damaged during the drilling operations.
- Repair any damage to structures such as kerbs, fences, walls, gates, etc.

3.1.10 Beach Manhole

The beach manhole is to be constructed in the grassed area east of the road at Ballyloughane. The Beach Manhole will be 3m long x 2m wide x 2m deep and is to be constructed in reinforced concrete. Only the manhole cover will be visible at the surface once the construction is complete.

4. CABLE INSTALLATION ON THE BEACH AND INSHORE

The cable installation from the end of the HDD out to the low water line will be installed by a cable plough at low tide. The cable will be floated ashore from a Shallow Draft cable Lay Vessel (Figure 3) using rigid inflatable boats (ribs) and buoys at high tide. Once the tide ebbs, the end of the HDD duct will be exposed and the cable will be inserted in the HDD duct and pulled into the Beach Manhole where it will be secured. A cable plough (Figure 2) will then be pulled by a low-pressure dozer from the end of the HDD duct out to the Low Water Line with the cable being inserted and buried as the plough moves seaward. Target Burial Depth is 1.5 metres. At the Low Water Line the dozer will be uncoupled from the cable plough and will then reverse towards the shoreline in the same track and will backfill the plough trench by back-blading towards the shore in advance of the flood tide. Beach disturbance will be minimal and the surface will be naturally reinstated by wave action as the tide comes in.

Figure 3. Typical Shallow Draft Lay Vessel

Figure 2. Typical Plough Installation

The cable plough will then be attached to the Shallow Draft Lay Vessel and the deployment and burial of the subsea cable will continue to the 15 metre depth contour where the Main Lay Vessel will take over.

This method has previously been used for the installation of the ESAT 2 cable at Sandymount and for Hibernia – Segment D at Sutton and proved to be quite successful and to have minimal impact.

5. OFFSHORE CABLE INSTALLATION

5.1 Pre-Lay Grapnel Run

A Pre-Lay Grapnel Run will be undertaken prior to commencement of Main-Lay. This activity is to ensure that the planned line of the cable is clear of seabed debris which may include chains, steel cables, anchors nets etc. The swathe of the grapnel is less than 1 metre wide and there will be minimal disturbance of the sea-bed during the debris clearance operation. All debris recovered from the sea-bed will be hauled on board and subsequently disposed of onshore in a safe and environmentally approved manner. The PLGR vessel will use a DGPS positioning system. The route followed by the PLGR will be as close as practicable to the selected Route Position List and always within the swathe of the route survey.

5.2 Cable Installation

The Main Lay vessel will pick up the end of the cable for the Inshore Section and this will then be jointed to the main cable on board the Main Lay Vessel. The jointing process takes approximately 18-24 hours to complete including tests of the cable system.

The Main Lay Vessel will then proceed to deploy and bury the cable in the seabed using a sea-plough. The sea-plough is towed by the Main Lay Vessel and is designed to bury the cable at a depth which will be secure from fishing activities.

The sea-plough uses a minimally invasive plough-share to create a furrow in the seabed approximately 750mm in width. As the plough moves forward the cable is placed in the bottom of the furrow which backfills with the natural movement of sediment on the seafloor.

Typical ploughing speed is less than 1 knot and is dependent on the stiffness of the seabed sediment. There is no significant noise generation during ploughing operations. Cable installation by plough produces only a minor plume of suspension of seabed sediments in

the water column and this is transient and localised due to the nature of the ploughing and natural backfill activities.

Beyond the 1500 metre water-depth the cable will be surface laid on the sea-floor whilst taking care to avoid hard rock outcrops and hydrodynamic conditions such as submarine landslides and sediment flows. Surface laying is where the submarine cable is laid onto the surface of the seabed. This procedure is carried out in water where the cable cannot, or is not required to be buried (e.g. in areas where the seabed is too hard for the burial tool, or at a water depth greater than 1500 metres off the Continental Shelf)

While surface laying, the cable is deployed according to the seabed profile, cable type, and bottom characteristics with the intention that the cable moulds itself to the bottom contours. Real-time cable slack calculations will be used to monitor and control the cable deployment by onboard Cable Engineers during the installation. By utilizing cable slack management techniques during the surface laying operations, the onboard cable engineers will ensure that there is enough cable to allow for the conforming of the system to the various undulations and features on the seabed.

Subsea Cable installation will be performed by a single, purpose-built vessel. The plan is that the cable will be laid and plough-buried, where practicable, in a single operation. The vessel will lay cable on a 24 hour per day basis and a full operational crew will be on duty at all times. A sketch which illustrates the Main Lay cable installation is presented in Figure 4.

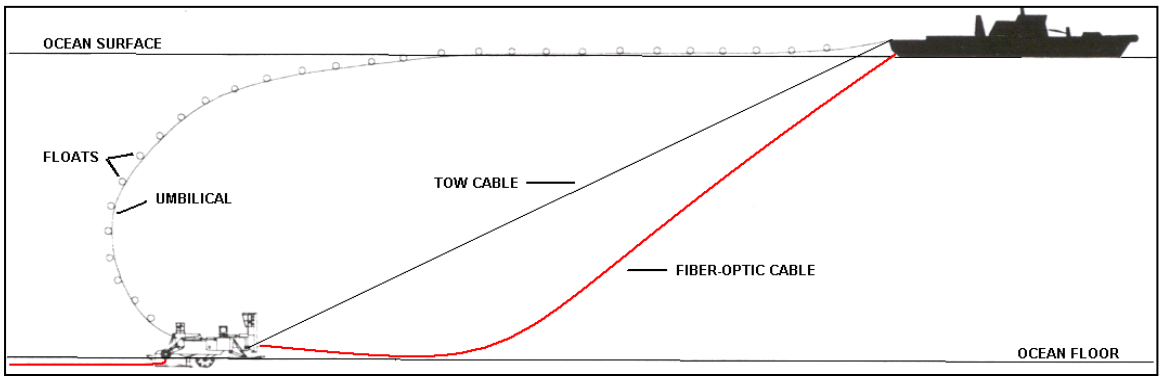

Figure 4. Cable Installation and Plough Burial

5.3 Burial Depth

The target burial depth for the WINS cable systems is 1.5 metres. In areas of stiff soil, the actual burial depth may be reduced but is planned to be still at a depth which will be protect the cable from fishing operations and generally not less than 0.4 to 0.6 metres. Over areas of sensitive reef, the cable will be surface laid.

5.4 Post Lay Operations

Following main lay operations, post lay inspection and burial may be carried out in certain areas to inspect the proper laying and burial of the cable in the seabed. A post-lay burial operation may be performed in order to supplement the burial operations in the following instances:

- Planned recoveries of the burial tool, e.g. ploughshare change locations
- Initial and final splice positions within the buried sections – Post-Lay Inspection and Burial is planned for the initial splice location between the Pre-Lay Shore End and main lay section of the cable to 1.5 metre target burial depth
- Unplanned recoveries due to burial tool breakdown, weather delay, etc.
- Surface-laid sections due to sea-plough malfunction where the plough is not brought back on board.
- Water depths or seabed types that exceed the operational limits of the sea-plough

5.5 ROV Operations

In limited areas requiring Post-Lay burial, a separate Remotely Operated Vehicle (ROV) is utilized. The ROV typically uses a jetting burial tool to bury the cable to the required depth. The seabed is emulsified in the localised region of the burial and a narrow trench is formed. The ROV burial system slowly moves along the seabed on the required cable track cutting a trench into which the cable is placed. The seabed sediment is displaced temporarily to form the trench during the burial operation and then naturally allowed to re-form and 'backfill' the trench after the passage of the ROV's burial tool. It should be noted that the surrounding seawater is used for the jetting system, i.e. nothing alien is introduced into the environment. The burial tool does not remove any seabed materials

from the area. The ROV burial operation is controlled from the main vessel and monitored in real time using high definition video cameras mounted on the ROV.

5.6 Cable Crossings

All crossings of in-service subsea cables are in deep water (>2000m) negating the need for plough up / plough down activities, guard vessels, post lay inspection and burial and associated weather delays and potential for cable damage during installation. ICPC Recommendations for cable crossings of this type will apply.

6. SAFETY CONSIDERATIONS FOR FORESHORE USERS

Key points relating to mitigation of Safety Risks associated with the installation of the WINS subsea cable system inside the 12 mile limit are as follows:

- Subsea Cable installation, exclusive of post-lay burial if this is required, will extend over a 3 to 4 day period.
- Main Lay Vessel speed will be of the order of 1 knot.
- The vessel will comply fully with all requirements of the International Regulations for Preventing Collisions at Sea.
- Prior to commencement of cable installation, the Dept. of Housing, Planning and Local Government will be notified of the planned start and the estimated completion dates for the operation.
- The Galway Port Harbourmaster will be informed of the Plan of Work and of the planned start and estimated completion dates for the operation.
- The Coastguard will be notified of the Plan of Work and of the planned start date and estimated completion dates for the operation.
- Representatives of the local fishing fleets will be contacted and made aware of planned operations. Arrangements will be put in place to provide next-day position forecast throughout the cable-installation period.
- Arrangements will be made for the publication of a formal Marine Notice through the Marine Safety Directorate and the notice will provide vessel details together with a general description of operations and approximate dates of commencement and completion.
- A local marine notice giving vessel details together with a general description of operations and approximate dates of commencement and completion will be published.

7. MARINE ARCHAEOLOGY

A Marine Archaeology Report which has been prepared by Geomara Ltd. A copy of the report is presented in Appendix 3.

The following mitigation recommendations are presented in connection with the proposed cable:

1. *It is recommended that all sites of cultural heritage interest included in this report are avoided.*
2. *In light of the seven sites identified at or around Ballyloughane beach, including a possible old quay and some ship timbers, the cable installation from the end of the HDD out to the low water line should be subject to archaeological monitoring*
3. *Archaeological analysis of the geophysical and bathymetric pre-installation surveys should be undertaken to both confirm the locations of the wreck sites within the survey corridor and also to identify any potential unrecorded seabed and sub-seabed maritime archaeological features. Where the location of the one wreck (W09510) site directly on the cable route is confirmed the cable should be re-routed to avoid it or additional unforeseen wrecks.*
4. *Archaeological monitoring of the pre-lay grapnel run should be undertaken in order to identify any previously unrecorded features.*
5. *It is recommended that procedures should be put in place to ensure that any previously unrecorded cultural heritage assets encountered during the project should be assessed by a suitably qualified archaeologist and avoided by the cable laying operations*
6. *Should the proposed cable route be subject to further revision, details of these revisions should be forwarded to the project archaeologist for assessment*
7. *On completion of the cable installation a report will be produced summarising all archaeological aspects of the project and submitted to DAHG and the National Museum of Ireland*

8. ENVIRONMENTAL AND ECOLOGICAL MITIGATION

A Natura 2000 Impact Statement and Ecological Impact Assessment was prepared for the pre-installation survey and main lay activities. The assessment was carried out by Altemar Ltd and a copy of the Statement is presented in full in Appendix 4 and 5.

Mitigation measures have been developed to minimise the ecological impacts of the project, not only in relation to Natura 2000 Annex habitats and species, but also additional species and habitats of conservation importance that have been recorded in the area. They are outlined in the following sections.

8.1 Timing of Cable Lay

The assessment of environmental factors within the landfall area was critical to the timing of the project and mitigation of impacts on species of conservation importance. The primary conservation interest of the SPA at the landfall is over-wintering birds. The cable lay is to be carried out in summer, after all over-wintering birds have left and prior to the arrival of species for the overwintering season. Terns are also listed as a conservation interest and are not located in the vicinity of the proposed cable route.

Works Date:

Site Investigations April 2019

Shore-End Installation June 2019

Main-Lay June - August 2019

Harbour Seals will be at breeding sites during summer months. The cable survey is at minimum 1.5km from the nearest breeding site.

As discussed with Inland Fisheries Ireland the proposed cable laying timeline (July 2019) will coincide with the main salmon run returning through Galway Bay into the River Corrib catchment for the purposes of spawning. The salmon smolt run is from mid-April to the end of May (outside the timeline of the proposed cable laying works). There is no significant noise generation during ploughing operations. As the cable installation by plough is relatively slow it produces only a minor plume of suspension of seabed sediments in the water column and this is transient and localised due to the nature of the

ploughing and natural backfill activities. The cable laying operation from Ballyloughane Beach to the Aran Islands should only take approximately three days.

8.2 Laying Procedure

Subtidal burial of the cable will involve the use of a marine plough. Ploughing entails disturbing a wedge of seabed and the placing of the cable within the wedge in one pass. The seabed backfills passively over the laid cable.

As outlined by OSPAR (2012) "As far as the burial technique is concerned, installation via jetting by means of sledge or ROV or use of a plough involves the lowest environmental impacts. Jetting fluidises the seabed using high power jets, and material may suspend to the water column for prolonged periods (a number of hours), and have the capacity to be transported over longer distances, increasing the number of potential receptors. Ploughing usually entails lifting a wedge of seabed and the seabed backfills over the laid cable. The level of sediment disturbance is, therefore, lower using ploughing compared to jetting techniques."

8.3 Construction phase Terrestrial HDD

It is proposed to use a Horizontal Directional Drill (HDD) to travel under the car park, beach wall, drift line, cobble upper shore and into the upper intertidal. The following will need to be provided or confirmed to the project ecologist prior to HDD commencement:

a) Supervision and Notification

An ecologist with previous experience with HDD operations in the intertidal/subtidal should observe all works from planning, initial site setup to reinstatement. NPWS and IFI should be notified of pending operations at least 1 week before operations commence and of any breaches of compliance. An Ecological Clerk of Works report should be submitted to IFI/NPWS.

b) Timing of drill

It is estimated that the HDD will take one day to drill the duct for the cable. The timing of the HDD in the intertidal should be that no water is over the drill head during drilling. This would mean that the drill should be done on a receding tide to

that there would not be water in the vicinity of the bore. This would allow for observation of the drill progress by the ecologist and the rapid completion of the operation in a single tide.

c) Frac-out Contingency Plan

A Frac-out Contingency Plan should be discussed with the ecologist before works commence. The HDD operators will be need to be equipped with a tracked hydraulic excavator, straw or hay bales, stakes to secure bails, silt fence, sand bags, shovels, pumps, and any other materials or equipment necessary to contain and clean up inadvertent releases.

d) Corrective Actions for an Inadvertent Release

In the event of an inadvertent release to the surface, the following actions will be taken:

· If the release is large, mud circulation will cease immediately. If the spill is small to moderate, the contractor will continue circulation in order to maintain pressure in the hole.

· Maintaining circulation will also be necessary if the native material does not have the frictional characteristics necessary to maintain hole stability without the presence of mud provided under pressure.

In all cases, the contractor will also proceed as follows:

- Contain any drilling fluid that has surfaced.
- Notify all on-site representatives.
- Reduce circulation pressure and evaluate the circumstances leading to circulation loss to determine if the fracture can be sealed.
- Thicken the drilling fluid to attempt to seal off the location of the release as reasonably practical.

e) Containment of Drilling Fluid Release

Immediately following the detection of any inadvertent drilling fluid release, containment and clean-up operations shall commence. For releases on land, Contractor shall use straw bales, silt fences, sand bags and earth berms to prevent fluid from migrating or flowing from the immediate area of the discharge. If the volume released is too small for containment measures or, if the release occurs in an environmentally sensitive area where release of containments can cause additional damage, the receiving area will be allowed to dry naturally. If there is a threat to a sensitive resource, or a threat to public safety, HDD activities will cease immediately until a plan to proceed is discussed.

Other containment measures include the following:

- Additional berms may be constructed around the release area as directed by the Engineer In Charge to prevent release of materials.

- If the amount of fluid released is large enough to prevent practical collection, the affected area will be diluted with fresh water and allowed to dry. Measures will be implemented (berm, silt fence, and/or hay bale installation) to prevent silt laden water from flowing into the sea.
- If hand tools cannot contain a small on-land release, small collection sumps may be constructed to pump the released material into the mud processing system.

The decision to proceed with the drilling operation will be at the sole discretion of the Engineer In Charge after all practical methods to seal off the location of the discharge have been attempted. Underwater releases are not expected as HDD operations in the intertidal will be carried out in the dry.

f) Clean-up of Releases

The clean-up shall commence after the release is contained. Clean-up shall include removal of all visible drilling fluid located in accessible areas. Removal methods will vary based on the volume of the release and the site specific conditions. Removal equipment may include vacuum trucks, loader and back hoe buckets, small pumps, shovels and buckets. After removal of the released drilling fluid, the release area will be reinstated as close to the original condition as possible.

g) Notification

In the event of a frack-out NPWS and IFI should be informed immediately.

8.4 Machinery

The presence of machinery on the intertidal could pose a threat of pollution. Toilet facilities will need to be provided on site. In order to minimise the risk of pollution, the following should take place:

1. All machinery should only be fuelled on the hard stand area of a car park or road, at least 10m from a drain or gulley.
2. All waste from the beach manhole operations should be removed from the site.
3. Any fluid leaks/spills should be cleaned up immediately.

8.5 Intertidal

As was seen during the fieldwork, the beach at which the intertidal ploughing is to be carried out on is moderately exposed. This can be seen by the evidence of 10m wide storm beach and the presence of a concrete wall at the top of the shore. Even though the construction phase of the project is outside overwintering bird season and during the summer when there is increased human visitor activity on the beach, disturbance of resident birds, summer visiting birds, otters and harbour seals may occur and the integrity of these conservation interests must be maintained.

As a result mitigation of impacts in the intertidal should concentrate on minimising disturbance.

The proposed route is within a popular beach which will have increased activity during summer months. As a result the presence of additional personnel on the shore during summer would not be thought to cause a significant additional disturbance. However, the presence of machinery and digging generated noise could cause a localised disturbance to bird populations. In order to minimise disturbance of the intertidal habitat and species the following mitigation measures would be carried out:

1. An ecologist would be onsite for the HDD, ploughing and back blading process in order to minimise disturbance and ensure site integrity is maintained. If roosting birds are present on the shore, the cable lay should be postponed until the birds depart, without provocation.

2. Drift lines in close proximity to the proposed route would contain the highest proportion of potential food source for bird species. If present, these should be avoided by machinery and personnel.

3. Noise generated from machinery could cause a disturbance. The bucket of the digger used in gaining access to the HDD should have teeth, so as to minimize scraping of metal against the cobble or boulders (if present).

4. The cable route on the shore should be plough buried on a receding tide, as soon as practical to go along the upper shore. This is to ensure all operations are done within one tide. Operations must be completed before an incoming tide when many of the birds return to feed. This should result in the cable route being imperceptible following a single or several tidal cycles.

5. The HDD operations in the intertidal will take one day and should commence under the intertidal element, on a receding tide when the area above the HDD has no water and should be completed within one tidal cycle. HDD operations in the intertidal should not be carried out while the HDD is covered with water, so that any potential leak of bentonite can be easily seen on the sand surface, isolated and cleaned.

6. Any temporary access arrangements or structures that are put in place to allow machinery access to the beach area should be prepared in consultation with an ecologist and the site should be fully reinstated post works.

8.6 Reinstatement

Reinstatement of the intertidal habitat should be carried out to pre-construction conditions. Any concerns in relation to the trenching process or resulting reinstatement of the habitat to pre-construction conditions will be raised with NPWS by the project ecologist prior to the removal of personnel from the site. A report on the trenching and reinstatement of the intertidal habitat, with imagery, will be submitted by the project ecologist to NPWS within 1 week of the completion of works.

8.7 Subtidal

Mitigation impacts are primarily concerned with the construction phase of the project as minimal impacts are foreseen during the operation phase, with the exception of human intervention in relation to a break or fault in the cable. Impacts in a decommissioning stage are similar to those of the construction phase. Repairing the cable may involve several scenarios, from *insitu* repair with divers to the use of a grapnel to lift the cable on board so that repairs can be carried out at sea. As a result the following mitigation measures would be enforced during construction, repair and decommissioning.

1. Under no circumstance should seals hauled out in the area be disturbed such that they enter the water. This is unlikely, as this area is not recognised as a haul out area. Cable laying is to be carried out outside of breeding and haul out areas, but will be carried out during haul out period. A MMO will be onboard the vessel at all times in Irish waters to enforce mitigation measures. “Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters” will be applied to ensure noise introduced into the marine environment have minimum effect.

2. No hydroacoustics are to be used during the cable lay so as to limit disturbance to cetaceans.

3. Additional permissions would be sought from NPWS in the case of repair/removal of the cable etc. prior to carrying out works.

4. In order to ensure the integrity of Annex habitats and additional habitats and species of conservation importance are retained in the vicinity of the planned project a marine ecologist should be onsite during all intertidal works including the final making good of site, including back filling, beach manhole completion and removal of machinery. The ecologist should also ensure that birds of conservation importance roosting on the shore should not be disturbed during works.

5. Mitigation measures will include the presence of a MMO onboard the vessel. The purpose of the MMO is to ensure that there is no disturbance of seal /cetacean populations, to ensure that the vessel stays within 250m of the cable route and that vessel generated noise is restricted to engines and winches only.

6. On approaching the landfall area the cable ship should approach its closest point to shore at the lower end of an incoming tide. No discharges from the vessel including should be made from the ship 5km of landfall. The MMO/ecologist should ensure that mitigation measures are carried out. Sufficient resources should be made immediately available on the vessel to deal with accidental oil spills including hydraulic hoses bursting etc. and reported to the on board ecologist.

7. Laying of the cable should be carried out in calm weather to ensure that there is no risk of vessel grounding. The vessel should not carry out the landfall operations in strong northerly winds (>force 3) due to the presence of intertidal reef to the south.

8. The cable lay vessel should at all times be within 500m of the cable lay route in order to minimise disturbance of breeding birds in the surrounding SPA's

8.8 Post-lay Monitoring

Given the location of the cable, buried in marine sediments or the small footprint it creates across reef areas, monitoring of the cable would pose more of an impact on the marine environment than just leaving the cable *in-situ* unmonitored. Underwater cables by their nature are passive on/within the seabed. It is would not be expected that the cable will move, deteriorate or impact on marine/intertidal habitats over time, unless impacted by anthropogenic /storm influence. Problems, if they arise would be expected to result in a loss of signal and subsequent location of the break/damage and repair.

Monitoring of the intertidal could take place to assess the levels of sediment cover over the cable across the intertidal. However, the plough method ensures effective burial and reinstatement within one or several tides depending on weather conditions.

8.9 Ecological supervision

In order to ensure the integrity of Annex habitats and additional habitats/species of importance are retained in the vicinity of the planned project, the following is recommended:

a) An ecologist should be onsite for the initial set up of HDD machinery and commencement of drill.
b) An aquatic ecologist should be onsite to observe the HDD drill operations to ensure that no bentonite escapes into the intertidal/marine environment.
c) An ecologist should be onsite to observe the making good of site, including back filling of drill pit and removal of machinery Images should be taken of the process and submitted to NPWS as part of an ecological report.

8.10 Marine Mammal Observer

A MMO shall be present during marine survey and ship cable laying to minimise any impact on marine mammals in compliance with the requirements of NPWS (2014) “Guidance to Manage the Risk to Marine Mammals from Man-Made Sound Sources in Irish Waters”.