MARINE USAGE LICENCE PROJECT DESCRIPTION

GREATER DUBLIN DRAINAGE PROJECT

10028814-RPS-MO-XX-RP-N-RP0080
GDD MUL PROJECT DESCRIPTION
S3 P03
29.08.2025

Document status

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S3 P03	Final	SL/RS	AE	DC	29/08/2025

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1 INTRODUCTION

1.1 Project Description

The Greater Dublin Drainage (GDD) project is the development of a new regional wastewater treatment facility and associated infrastructure to serve the population of Dublin and parts of Kildare and Meath.

The proposed scheme involves a new 14.6km orbital sewer running from Blanchardstown to a proposed new wastewater treatment plant (WwTP) in Clonshagh located to the east of Dublin Airport. From the WwTP a further 5.4km length of outfall pipeline connects to a 6km long marine outfall to transport the treated wastewater offshore.

Core elements of the GDD project, indicated in **Figure 1-1** below, comprise the following:

- **1km Orbital Sewer** – Gravity Main 1 from Blanchardstown to Abbotstown Pumping Station (PS);
- **Abbotstown PS** – to be located in the grounds of the Sport Ireland Campus;
- **5.3km Orbital Sewer** – Rising Main from the PS to Dubber Odour Control Facility;
- **9.3km Orbital Sewer** – Gravity Main 2 from Dubber to GDD WWTP;
- **500,000 PE Wastewater Treatment Plant (WwTP)** and **Sludge Hub Centre (SHC)** to be located at Clonshaugh;
- **5km Land-Based Outfall Pipeline** linking the proposed Regional WwTP to the marine outfall;
- **6km Marine Outfall** pipeline to a discharge point located approx. 1km north-east of Ireland's Eye; and,
- **North Fringe Sewer (NFS) Diversion** – diversion of an existing trunk sewer to the GDD WwTP site.

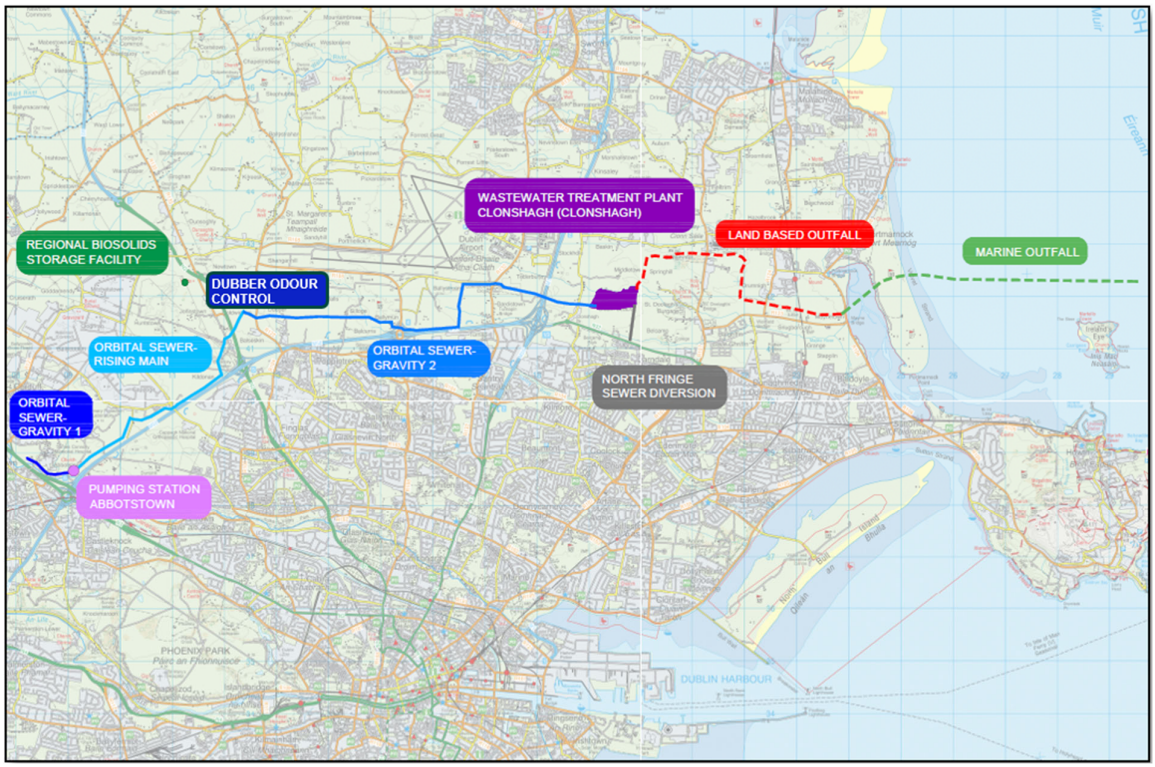


Figure 1-1 Core Elements of the GDD Project

Construction methods for the GDD project pipeline consist of a combination of both tunnelled and open cut for terrestrial sections of pipeline and tunnelled and dredged methods for marine based sections of pipeline.

This Maritime Usage Licence Application (MULA) is required to undertake site investigations (hereafter referred to as the SI works), within Baldoyle Bay and the Irish Sea. These SI works, which are discussed in more detail in Section 2.2 below, are required to inform detailed engineering design of the marine elements of the GDD project and to provide baseline data for any subsequent environmental monitoring. Information collected by the SI works will support the overall GDD project in its aim to upgrade and provide additional wastewater infrastructure for the Greater Dublin Area. Therefore, this MUL represents a critical step towards meeting the current and future wastewater treatment demand within the Greater Dublin Area.

1.2 Accompanying Reports

The Maritime Usage Licence Application (MULA) consists of the following documents and reports:

- Maritime Usage Licence Application Form;
- Project Description including drawings;
- Assessment of Impact on the Maritime Usage (AIMU);
- Supporting Information for Screening for Appropriate Assessment (SISAA);
- Risk Assessment for Annex IV Species;
- Subsea Noise Technical Report;
- Natura Impact Statement (NIS).

1.3 Purpose of the Report

This report has been prepared by Mott MacDonald RPS (MMRPS), on behalf of Uisce Éireann, to provide information on the SI Works proposed to be undertaken for the GDD project in support of the MULA to MARA. This document provides a detailed description of the methods, equipment and quantities for proposed activities, and will be used to inform the above-mentioned reports.

2 PROJECT DESCRIPTION

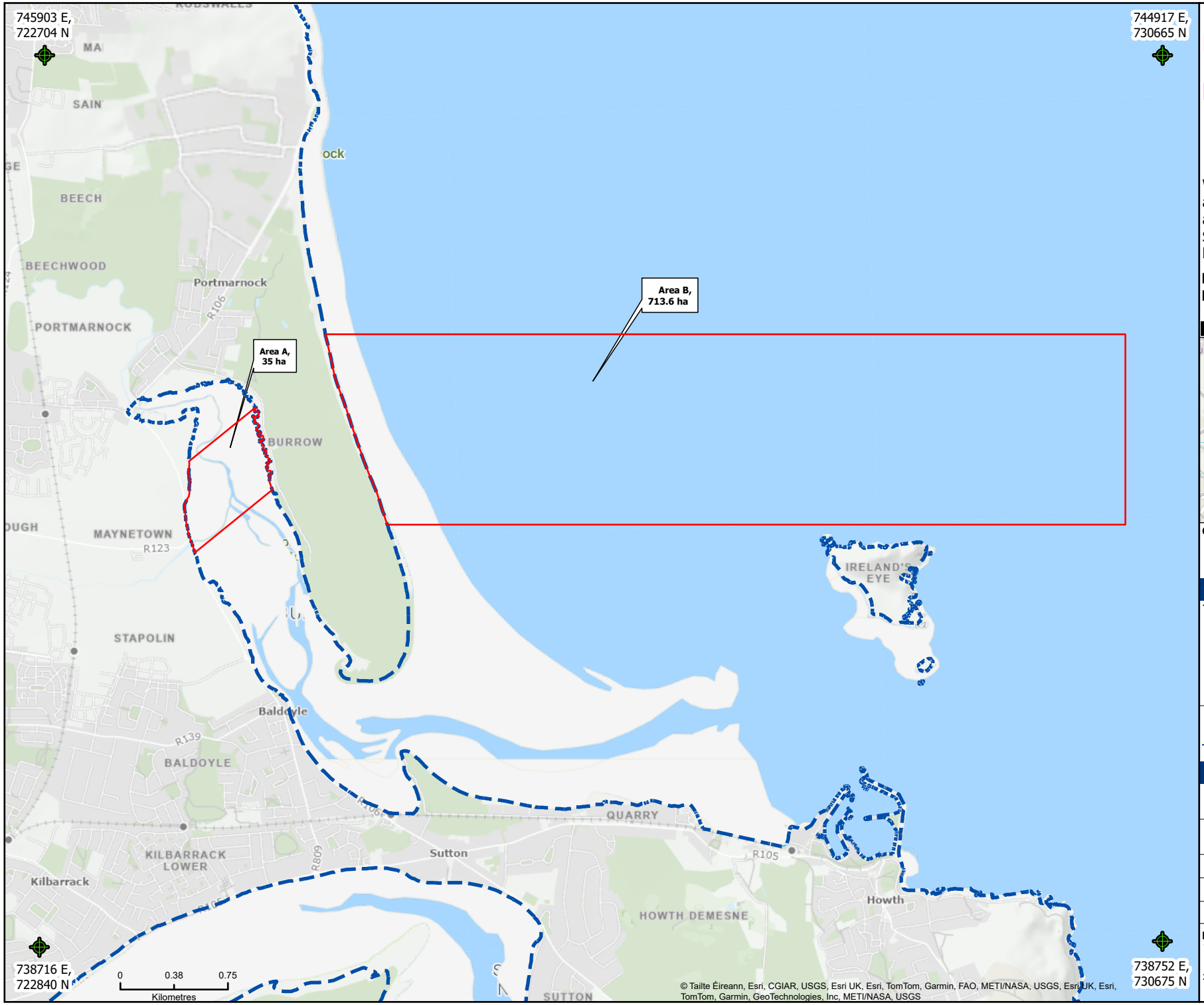
2.1 Site Location

The geographical area of the SI works is located off the east coast of Ireland. The SI works boundary is provided in **Figure 2-1** and will be referred to as the MUL Area throughout the application documents. The MUL Area predominately follows the route of the marine outfall pipeline within Baldoyle Bay and the Irish Sea.

The MUL Area comprises two areas, one within Baldoyle Bay (Area A) and the other (Area B) extending east from Portmarnock Beach into the Irish Sea. The total combined MUL Area encompasses an area of 748.6 ha. Area A is within Baldoyle Bay between the high water mark (HWM) running adjacent to the R106 on the west of Baldoyle Bay and the HWM on the east of Baldoyle Bay adjacent to the Portmarnock Golf Club. This encompasses an area of 35 ha. Area B extends east into the Irish Sea from the HWM at Portmarnock Beach. This encompasses an area of 713.6ha. Area A and Area B are illustrated in **Figure 2-1**, however, throughout the application documents, these will be referred to as Baldoyle Bay and Irish Sea, respectively.

The SI works will comprise geophysical, bathymetric, geotechnical and environmental surveys, and the proposed locations of these surveys area shown in **Figure 2-2**, **Figure 2-3**, and **Figure 2-4**, respectively. It should be noted that all locations shown are provisional only and subject to change on-site due to the presence of obstructions/refusals at individual locations.

The location of the proposed marine outfall pipe is also included on these drawings for context, however, for the avoidance of doubt, no construction works associated with the marine outfall are included under this MULA.



Legend

- Maritime Usage Licence Area
- High Water Mark (HWM)
- Townlands Boundaries

Where the licence area adjoins or abuts the land the High Water Mark as defined by the Chief Boundary Surveyor is the boundary of the licence area

MARA File Reference No:
PA/MUL/022

N

Client

Uisce Éireann Irish Water

Greater Dublin Drainage

Title Figure 2-1

Proposed MUL Map

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Issue Details

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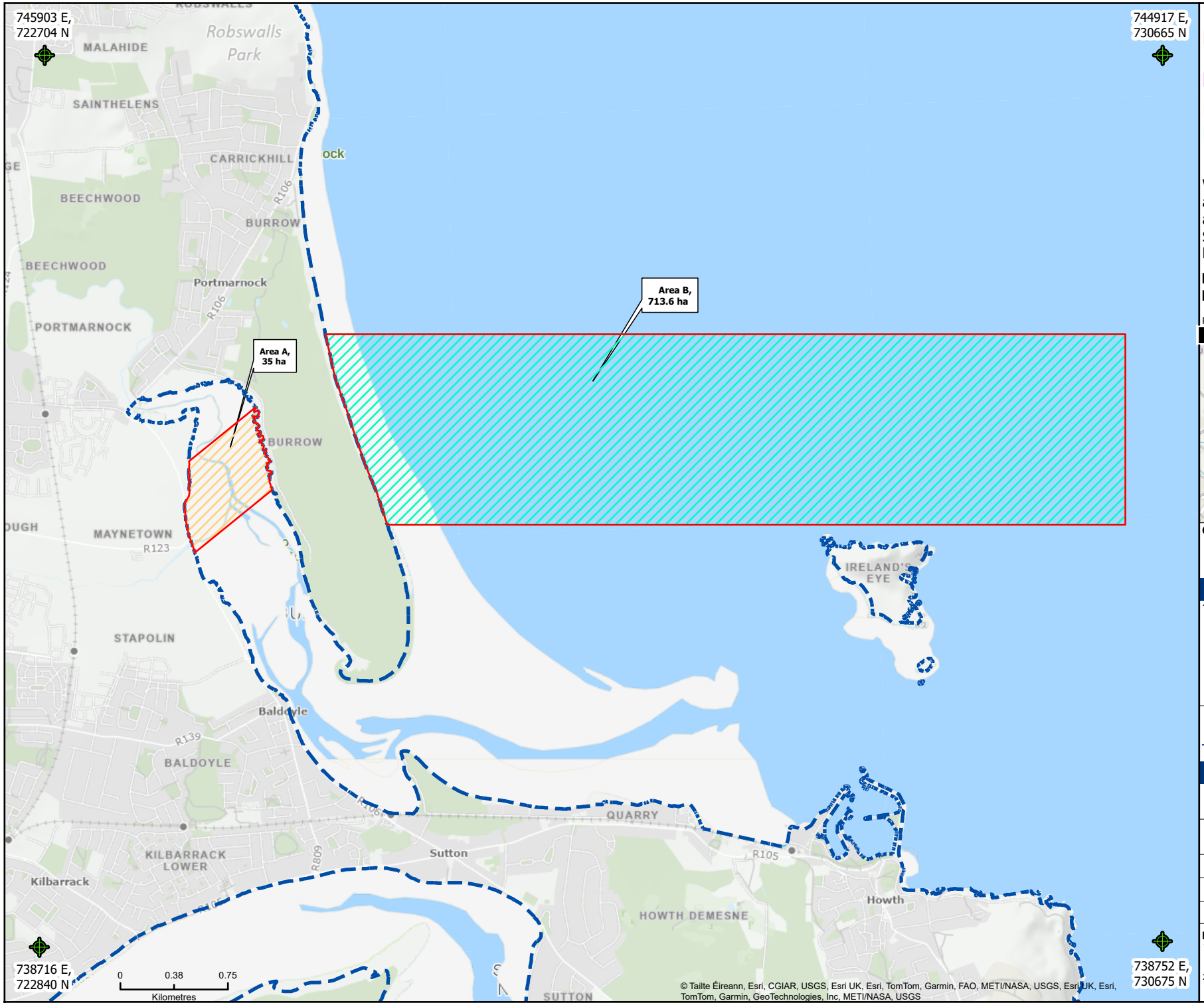

Legend

- Maritime Usage Licence Area
- High Water Mark (HWM)
- Townlands Boundaries
- Proposed Bathymetry Survey and Proposed Geophysical Survey
- Proposed Bathymetry Survey

Where the licence area adjoins or abuts the land the High Water Mark as defined by the Chief Boundary Surveyor is the boundary of the licence area

MARA File Reference No: PA/MUL/022

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Prepared by:

[redacted]

Client

Uisce Éireann Irish Water

Greater Dublin Drainage

Title

Figure 2-2

Proposed Bathymetric and Geophysical Survey Locations

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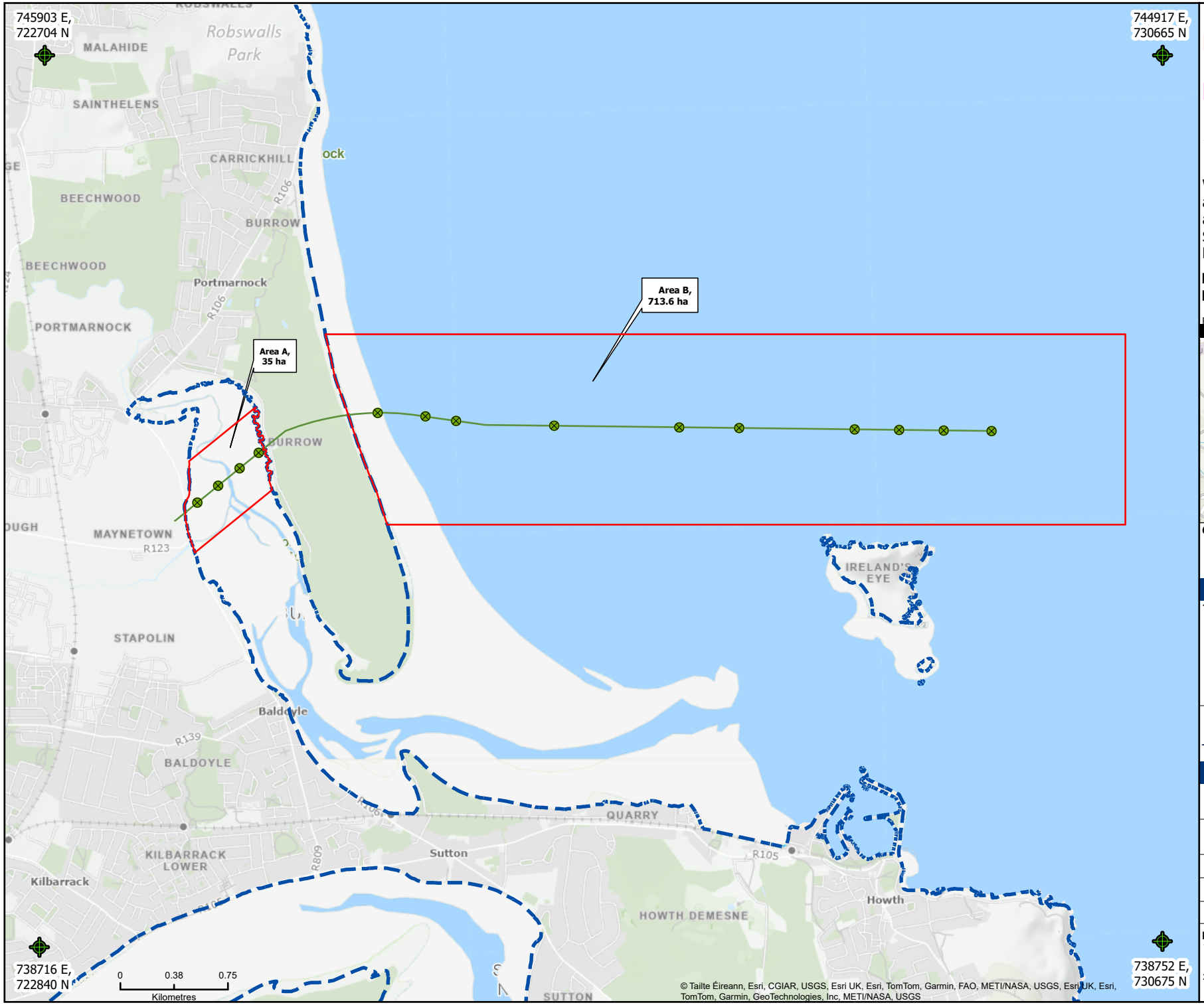

Legend

- Maritime Usage Licence Area
- High Water Mark (HWM)
- Townlands Boundaries
- Proposed Borehole Locations
- Marine Outfall Pipeline

Where the licence area adjoins or abuts the land the High Water Mark as defined by the Chief Boundary Surveyor is the boundary of the licence area

MARA File Reference No: PA/MUL/022

N

Prepared by: [redacted]

Client

Uisce Éireann Irish Water

Greater Dublin Drainage

Title

Figure 2-3

Proposed Geotechnical Survey Locations

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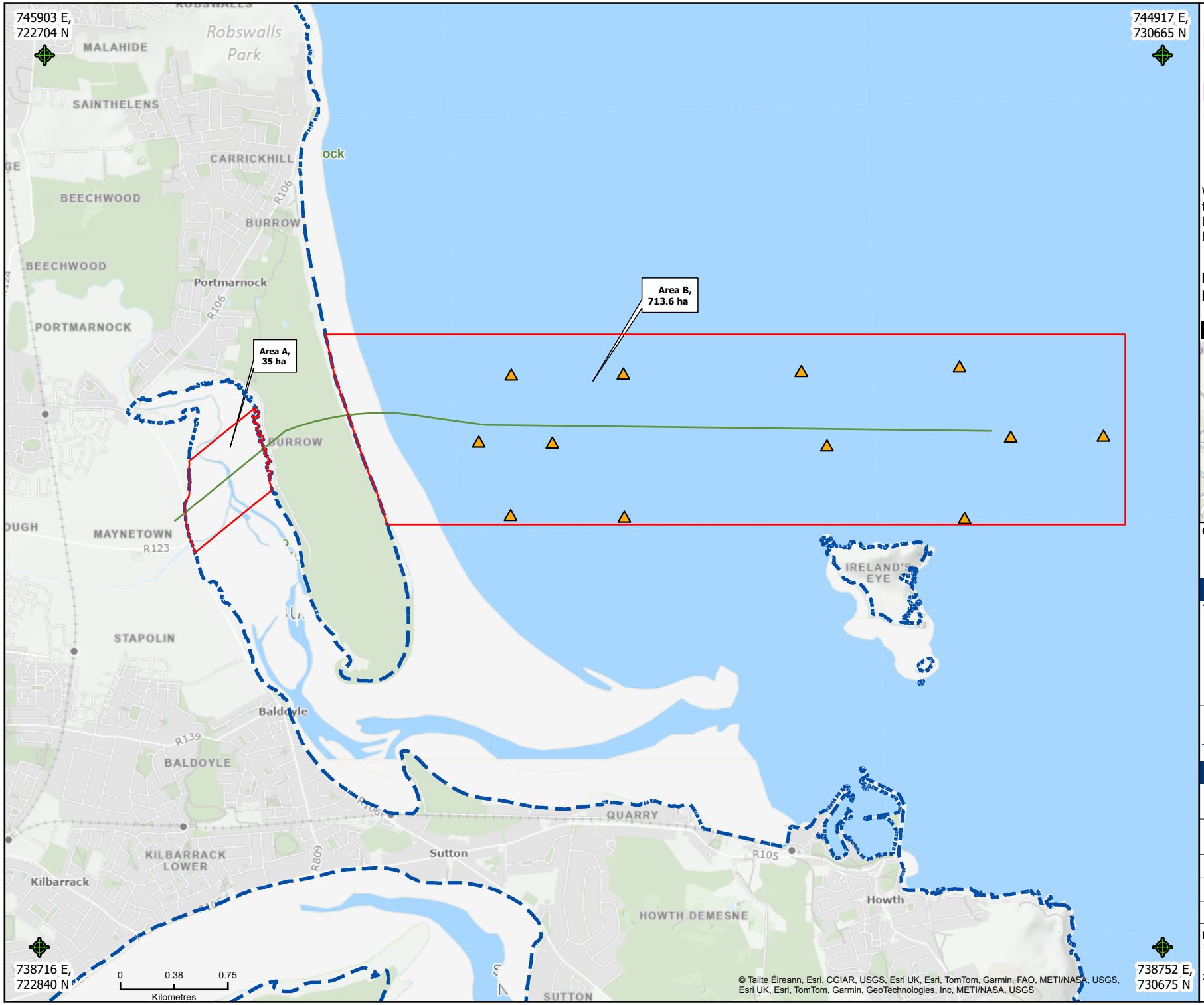

Legend

- Maritime Usage Licence Area
- High Water Mark (HWM)
- Townlands Boundaries
- Marine Outfall Pipeline
- Grab Samples

Where the licence area adjoins or abuts the land the High Water Mark as defined by the Chief Boundary Surveyor is the boundary of the licence area

MARA File Reference No:
PA/MUL/022

N

Client

Uisce Éireann Irish Water

Greater Dublin Drainage

Title

Figure 2-4

Proposed Environmental Survey Locations

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2.2 Description of the SI Works

2.2.1 Overview

In order to provide a reliable basis for design and development, the following surveys and investigations are required. The aim of the SI works is to acquire data to a high quality and specification for the site as summarised below and described in the following sections.

Uisce Éireann are seeking a MUL for a period of five years from the date of the granting of any licence. Although the majority of the SI works are expected to take 8 weeks to complete, bathymetric surveys may be repeated yearly to ensure that seabed conditions have not changed prior to construction.

The following drawings have been prepared in support of the Maritime Usage Licence to the Maritime Area Regulatory Authority (MARA) and are provided above:

- Proposed Licence Area Map - 10028814-RPS-ZZ-XX-DR-N-DR2220
- Proposed Geotechnical Survey Locations - 10028814-RPS-ZZ-XX-DR-N-DR2221
- Proposed Geophysical and Bathymetric Survey Locations – 10028814-RPS-ZZ-XX-DR-N-DR2222
- Proposed Environmental Survey Locations - 10028814-RPS-ZZ-XX-DR-N-DR2223

It is noted that the requirement for additional and more refined works may arise as the SI works progress and are analysed. This may include areas of particular interest using more targeted techniques and/or refined sampling locations and quantities.

An overview of SI works is presented below for each of the two areas, followed by a more detailed breakdown of the proposed survey elements in **Table 2-1**. It should be noted that the information provided in this table lists the proposed activities. Where possible and efficient to do so, activities will be grouped together and undertaken as part of one survey campaign. For example, the bathymetric survey campaign will likely involve one vessel undertaking the multi-beam echosounder (MBES) side scan sonar (SSS) and magnetometer surveys.

2.2.1.1 Baldoyle Bay

Geophysical and bathymetric SI works within Baldoyle Bay will comprise:

- Land-based techniques such as seismic refraction, ground-penetrating radar (GPR) or electrical resistivity tomography (ERT),
- Marine (boat-based) surveys comprising bathymetric techniques (multibeam echosounder (MBES), sidescan sonar (SSS)) and geophysical techniques (sub-bottom profiler (SBP) and ultra-high resolution seismic (UHRS) boomer or spark). Geomagnetic surveying using a magnetometer will also be undertaken. Positioning information will be provided via an ultra-short baseline (USBL) system.

Geotechnical SI works within Baldoyle Bay will comprise:

- 4No. boreholes (rotary core) which will be undertaken within the intertidal zone (i.e. below the HWM) and accessed from the land side. Rotary core boreholes will be taken using a drilling rig, and cone penetration testing (CPT) will be undertaken within the boreholes.

No intrusive environmental sampling (intertidal cores or grab sampling) is required within Baldoyle Bay.

2.2.1.2 Irish Sea

Bathymetric SI works in the Irish Sea will comprise:

- Marine (boat-based) survey: MBES, SSS. Positioning information will be provided via a USBL system.
- A magnetometer survey will also be undertaken.

Geotechnical SI works in the Irish Sea will comprise:

- Boreholes (rotary core) undertaken from a survey vessel or a jack-up barge, and CPT investigations within the boreholes.

Environmental SI works in the Irish Sea will comprise:

- Drop-down video (DDV) and benthic grab sampling
- Water sampling, including Conductivity, Temperature and Depth (CTD) Measurements.

Table 2-1 Proposed SI works Activities

Survey Type	Survey Elements (indicative equipment)	Indicative Equipment (where applicable)	MUL Area Applicable to Survey Type	
			Baldoyle Bay	Irish Sea
Land-based Geophysical Surveys (below HWM, undertaken at Baldoyle Bay at Low Tide)	Seismic refraction, ground penetrating radar (GPR) or Electrical Resistivity Tomography (ERT)	See Section 2.2.3	Yes	N/A
	Topographical land surveying techniques.	See Section 2.2.3	Yes	N/A
Marine Bathymetric surveys (undertaken from survey vessel)	Multi Beam Echosounder (MBES)	Kongsberg EM2040, R2Sonic 2024	Yes	Yes
	Side Scan Sonar (SSS)	Edgetech 4200, Klein 3900	Yes	Yes
Marine Geophysical Surveys (undertaken from survey vessel)	Sub-bottom profiler (SBP)	Either chirper (Edgetech 3100) or parametric (Innomar SES-2000)	Yes	N/A
	Ultra-High Resolution Seismic (UHRS), boomer or sparker	Applied Acoustics CSP-S, Dura-Spark	Yes	N/A
Marine Geomagnetic Surveys (undertaken from survey vessel, no acoustic signal)	Magnetometer	Geometrics G-882	Yes	Yes
Marine Geotechnical Surveys (undertaken from survey vessel(s) or jack-up barge; JUB)	Rotary core boreholes	Drill rig and JUB / drilling vessel (see Section 2.2.6)	N/A	Yes
	Cone penetration testing (CPT) at borehole locations.	Cone penetrometer	N/A	Yes
Land-based Geotechnical Surveys (below HWM, accessed from land and undertaken using a rig)	Rotary core boreholes	Tracked drilling rig (see Section 2.2.7)	Yes	N/A
	Cone penetration testing (CPT) at borehole locations.	Cone penetrometer	Yes	N/A
Marine Environmental Surveys (undertaken from survey vessel)	Drop-down video (DDV) and/or Remotely Operated Vehicles (ROV) survey.	Camera system	N/A	Yes
	Grab sampling	Hamon / Day / Van Veen Grab ($0.1m^2$)	N/A	Yes
	Water Quality Samples, including Conductivity, Temperature and Depth (CTD) Measurements.	CTD profiler and Niskin bottler sampler	N/A	Yes

2.2.2 Estimated Project Schedule/ Programme

Uisce Éireann propose to begin survey activities as soon as feasible following license award, with a phased programme of investigations, capitalising on suitable weather windows and vessel availability over this time period. This phased approach will progress the overall development towards detailed design stage. The exact survey schedule is dependent on the availability of the supply chain and therefore exact timelines for the surveys cannot be determined in advance of securing a MUL.

The programme of works for the SI works will be dependent upon award of the MUL and the appointment and availability of survey contractors. Based on the proposed scope of works to be conducted, it is expected that the full suite of SI works will take up to 8 weeks to complete, with bathymetry surveys to be repeated yearly for five years, to ensure that sediment depths have not changed prior to construction. It is likely that the 8 weeks of activities will take place at different times throughout the licence duration, based on weather conditions and contractor availability.

The estimated timeframes are subject to change based on variables such as weather conditions, unforeseen seabed conditions, unforeseen obstructions, etc.

Mobilisation location will be dependent on the survey contractor, who may choose to mobilise from their home port, port of previous job or local port. The local port options for mobilisation, for example, could include Dublin, Dún Laoghaire, Howth or Malahide depending on vessel size and marine traffic restrictions.

2.2.3 Surveying Periods

Surveys will be conducted during daylight hours, seven days a week and subject to tidal conditions.

2.2.4 Land-based Geophysical Surveys

Conventional land-based geophysical surveys will be undertaken within Baldoyle Bay during low tide. These geophysical surveys will include seismic refraction (dB190) and/or electrical resistivity (dB N/A) to profile geological features and map depth to rock.

Conventional land-based topographical techniques may also be required within Baldoyle Bay during low tide to obtain seabed levels during low tide. Traditional land surveying techniques will involve the deployment of personnel and land surveying equipment. This can include the setting up of a survey station (e.g., tripod and total station) from which accurate measurements and levels can be taken. Similarly, more mobile surveying equipment can be used to accurately map the ground. These units can consist of handheld devices, backpacks, or hand-held pole mounted Global Navigation Satellite Systems (GNSS) devices.

Land-based geophysical surveys will be carried out in Baldoyle Bay during periods of low tide with the use of bog mats to minimise ground disturbance. It is assumed at present that 2 lines of bog mats, both 1m in width, will be used to form a track for the wheels of vehicles which will be to assist in surveys within the bay. At present it is assumed that 650m of track will be installed for the duration of the surveys.

2.2.4.1 Seismic Refraction

The seismic refraction method utilizes the refraction of seismic waves as they pass through various rock or soil layers to analyse underground geological conditions and structures.

Method: Seismic refraction profiles will be conducted using onshore survey tools during low tide. A sound source (typically a sledgehammer striking a metal plate) will generate compressional wave energy. These refracted waves will be captured by a series of geophones and logged on a digital seismograph. The locations and elevations of the geophones will be documented using GPS technology.

Figure 2-5 Geometrics Geode Seismograph

Indicative Equipment:

- Geophone Arrays:
  - Geosense 4.5 Hz Geophones
  - Mark Products L-28LB Geophone
  - Geospace GS-11D Geophone
- Digital Seismographs
  - Geometrics Geode Seismograph (see **Figure 2-5)**
  - Seistronix RAS-24
  - ABEM Terraloc Pro:

Location: Refraction Seismic methods may be undertaken along the banks of the Baldoyle Bay Estuary within “Area A” in Dwg Ref: 10028814-RPS-ZZ-XX-DR-N-DR2222.

2.2.4.2 Ground Penetrating Radar

Ground Penetrating Radar (GPR) utilizes the reflection of electromagnetic waves as they are returned by rock or soil layers to analyse underground geological conditions and structures.

Method: GPR will be completed during low tide in the intertidal zone. A GPR trolley will be pushed over the area to be scanned or a GRP array will be towed using an ATV and the results analysed by a technician to determine subsurface characteristics.

Indicative Equipment:

- IDS GeoRadar Stream X Towed GPR System (see **Figure 2-6**)
- IDS GeoRadar Stream DP GPR System
- Leica DS2000 GPR System (see **Figure 2-7**)

Figure 2-6 Stream X Towed GPR System

Figure 2-7 Leica DS2000 GPR Trolley

Location: GPR methods may be undertaken along the banks of the Baldoyle Bay Estuary within “Area A” in Dwg Ref: 10028814-RPS-ZZ-XX-DR-N-DR2222.

2.2.4.3 Electrical Resistivity Tomography (ERT)

ERT is a geophysical imaging technique used to map **subsurface resistivity variations** by injecting electrical current into the ground and measuring the resulting voltage differences.

Method: ERT will be completed during low tide in the intertidal zone. Electrodes are inserted into the ground and linked to a resistivity meter via cables and a switch box. The system injects current and measured voltage between the pairs. This is repeated for many combinations.

Typical Equipment: WERT-60/120/4B

Location: ERT may be undertaken along the banks of the Baldoyle Bay Estuary within “Area A” in Dwg Ref: 10028814-RPS-ZZ-XX-DR-N-DR2222.

2.2.5 Marine Geophysical and Bathymetric Surveys

Marine geophysical and bathymetric surveys will be undertaken within the Baldoyle Bay MUL Area at high tide, and within the Irish Sea MUL Area. Sub-bottom profiling will not be carried out in the Irish Sea MUL Area as there is already sufficient sub-surface sediment data for the area based on previous surveys conducted.

The geophysical and bathymetric survey scope is intended to provide seabed and sub-seabed information to assist in the design, and construction phases of the project. It is therefore foreseen to gather, as a minimum, detailed information on:

- Bathymetry data;
- Seabed conditions and hazard identification;
- Seismostratigraphic units and terrain models.

The foreseen scope of works will consist of primarily non-intrusive survey methods, in that they will not physically interact with the seabed. The exact geophysical and bathymetric equipment details will be confirmed following the procurement of a survey contractor. The assessment of the impacts of the SI works set out in this MULA is based on standard survey equipment that is expected to meet the survey specifications. Appointed survey contractors will be required to use equipment which aligns with the parameters of the standard equipment described and assessed in this MULA in order to ensure that no greater environmental impacts than those assessed in this MULA will arise.

2.2.5.1 Vessels

At the time of this application specific details of the survey vessels are not available as they are subject to a procurement process. The geophysical, bathymetric and geotechnical marine surveys will involve the deployment of dedicated marine spreads suitable for the scope of work required, the water depth expected, and the anticipated seabed conditions. The final details of equipment to be deployed are not yet confirmed, however, standard equipment proposed to meet the survey specifications is described in

the following sections and has been assessed in this MULA. This information is considered adequate to enable the likelihood and significance of any related environmental impacts of each of the survey activities to be determined on a conservative basis. Appointed survey contractors will be required to use equipment which aligns with the parameters of the standard equipment described below and assessed in this MULA in order to ensure that no greater environmental impacts than those assessed in this MULA will arise.

All survey vessels will be fit for purpose, will possess all relevant classification certificates, and will be capable of safely undertaking the survey work required. Health, safety, environment, and welfare considerations will be a priority and will be actively managed. Vessels will comply with all applicable MARPOL requirements including vessel-based spill response planning. Appointed survey contractors will be required to comply with all legislation and license conditions relevant to the activities within their scope of work including the provision of marine mammal observers (MMOs) where relevant to the activity scope. Prior to survey mobilization all statutory safety roles will be appointed and responsibilities assigned, and project/ survey-specific HSE plans will be approved for implementation as part of project execution planning.

Survey vessels will conform to the following minimum requirements as appropriate:

- Compliance with Safety of Life at Sea (SOLAS), International Maritime Organization (IMO), and national requirements for operating within Irish territorial waters;
- Compliance with applicable MARPOL requirements;
- Station-keeping and sea-keeping capabilities required to safely carry out the proposed survey activities;
- Calibrated equipment and spares with tools as necessary to undertake all specified works;
- Endurance to undertake the required survey works (e.g. in respect of fuel, water, stores, etc.);
- Sufficient qualified staff to allow the survey operations to be carried out efficiently (typically 24-hour continuous for offshore survey, 12-hour for nearshore survey) including anticipated requirements for marine mammal observers as appropriate; and
- Adequate accommodation and crew welfare facilities.

Typical vessels for geophysical and bathymetric surveys will be circa 10 – 20m in length. See **Figure 2-8** as an example of a geophysical and bathymetric survey vessel. A smaller nearshore vessel may be required to complete surveys in Baldoyle Bay area, such a vessel is illustrated in **Figure 2-9**.

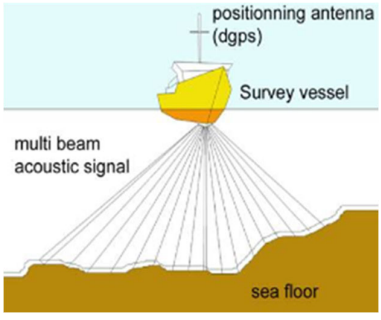
Figure 2-8 Typical Geophysical and Bathymetric Survey Vessels

Figure 2-9 Typical Nearshore Geophysical and Bathymetric Survey Vessel

2.2.5.2 Baldoyle Bay - High Tide

2.2.5.2.1 Multibeam Echosounder (MBES)

MBES will be used to map bathymetry within the MUL Area. MBES surveys are non-intrusive and do not physically interact with the seabed. Full 100% coverage of the area concerned associated with the survey and area classification will be required. Surveys shall identify the level, nature, and detailed coverage of the seabed to ensure identification of features on the seabed within the area shown, identify potential large upstanding archaeological features and guide habitat mapping with the backscatter function if available. Processing of data sets shall include processing for archaeological indicators. The area shall be surveyed in such a way as to produce a comprehensive data set required to enable the generation of multiple sections through the survey area in any direction.



Method: A remote sensing acoustic device which will be either attached to the vessel(s) hull at the bow or mounted on a side pole.

Indicative Equipment:

- Kongsberg EM2040
- R2 Sonic 2024 (see **Figure 2-10** or similar.

Swath width: Swath width will be optimised to provide 100% seafloor coverage with typical swath widths of 3 to 6 times water depth depending on arrangement of equipment hardware.

Figure 2-10 MBES R2Sonic 2024

Location: MBES survey may be performed within Baldoyle Bay at high tide within the area illustrated in “Area A” in Dwg Ref: 10028814-RPS-ZZ-XX-DR-N-DR2222.

2.2.5.2.2 Side Scan Sonar (SSS)

Method: A submerged acoustic device (SONAR – Sound Navigation & Ranging) for imaging areas of the seafloor will be either hull mounted or towed.

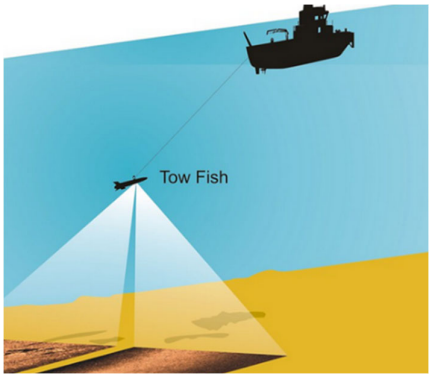


Figure 2-11 Edgetech 4200 SSS

Indicative Equipment:

- Edgetech 4200;
- Klein Hydro Scan 3900; or similar.

Swath width: For towed SSS the swath width is constant as the towfish keeps a constant elevation above the sediment, for hull mounted options the swath width will be based on the water depth encountered. A 100% overlap between each swath is envisaged (200% coverage).

Location: SSS survey may be performed within Baldoyle Bay at high tide within the area illustrated in “Area A” in Dwg Ref: 10028814-RPS-ZZ-XX-DR-N-DR2222.

2.2.5.2.3 Sub-bottom Profiling

A typical sub bottom profiling (SBP) survey is completed using single or multi-channel seismic reflection systems such as a Chirper or Parametric system (using pure tone pulses or sweeps). Sub bottom profiling over the site and specified runs is yet to be determined.

The geophysical SBP survey shall identify the bed level and the nature, thickness, and location of the sub surface strata to rock head.

The survey shall include both items detailed below:

1. Completion of specified runs.
2. Completion of a Free Line Survey.

Method: SBP are acoustic devices for acoustic imaging of sections of the seabed. The images produced are used to produce profiles beneath the seafloor, enabling delimitation of major sedimentary interfaces. They are either mounted on the vessel / pole or towed behind the vessel. The depth of penetration will vary with sediment type, but penetration in unconsolidated sediment (i.e. not rock) will often be 5 to 50 m (fine clay – coarse sand). The spatial (i.e. depth) resolution is on the order of 1-10 cm.

Indicative Equipment:

- Edgetech 3100;
- Edgetech 3300 (see **Figure 2-12** right);
- Innomar medium 100 (Parametric sytem).

Swath width: n/a

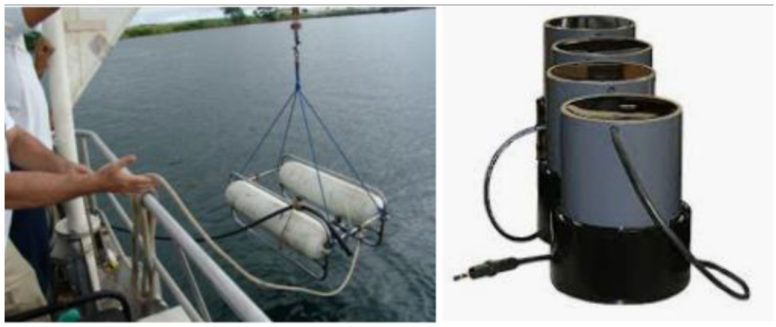


Figure 2-12 Left - Applied Acoustics AA300 being deployed & Right - Typical Hull Mounted SBP - Edgetech 3300

Location: SBP survey will be performed within Baldoyle Bay at high tide within the area illustrated in “Area A” in Dwg Ref: 10028814-RPS-ZZ-XX-DR-N-DR2222.

2.2.5.2.4 Magnetometer

The magnetometer survey will be undertaken at suitable line spacing to ensure complete coverage of the seabed for archaeological purposes (and in line with UAU guidelines), i.e., identify large metal debris or metallic archaeological remains.

Method: Magnetometers provide information on embedded magnetic/ferrous objects such as cable crossings, debris and potentially UXO’s. They are towed from the vessel.

Indicative Equipment:

- Geometrics G-882 caesium vapour magnetometer – see **Figure 2-13**.
- Marine Magnetics SeaSPY,
- G-Tec Magwing System,or similar.

Figure 2-13 Geometrics G-882

Survey spacing: Line spacing will be dependent on water depth encountered, with additional runs of higher density line spacing within areas where any magnetic signal is recorded.

Location: Magnetometer surveys will be performed within Baldoyle Bay at high tide within the area illustrated in “Area A” in Dwg Ref: 10028814-RPS-ZZ-XX-DR-N-DR2222.

2.2.5.2.5 Ultra High Resolution Seismic (UHRS)

UHRS is a geophysical method that uses sound waves to image subsurface structures.

Method: A **seismic source** (e.g., sparker or boomer) emits acoustic pulses into the water. These pulses travel through the water and into the seabed acquiring data, often up to 100 m below the sediment surface (limited by bedrock depth). The spatial (i.e. depth) resolution is on the order of 20-50 cm.

Indicative Equipment:

- Applied Acoustics, Dura-Spark or similar (**Figure 2-12** left)
- 400 Joule Generic sparker
- **Location**: UHRS surveys will be performed within Baldoyle Bay at high tide within the area illustrated in “Area A” in Dwg Ref: 10028814-RPS-ZZ-XX-DR-N-DR2222.

2.2.5.2.6 Ultrashort Baseline (USBL) – Acoustic Positioning System

An ultrashort baseline acoustic positioning system is a highly accurate and precise method of underwater acoustic positioning. It determines the orientation and position of the transponders relative to the transceiver and can be used during the set up and positioning of other geophysical, bathymetric and geotechnical survey equipment.

Figure 2-14 Applied Acoustics EasyTrak Nexus Model

Method: The system consists of a transceiver unit (on the vessel) and a transponder (on the tracked equipment). The transceiver unit emits acoustic signals, which are picked up by the transponders and a response is sent back to the transceiver and used to determine the position of the tracked equipment by using the phase and timing information in the received signal.

Indicative Equipment:

- Applied Acoustics EasyTrak Nexus Model EZT-2691 (**Figure 2-14**)
- Sonardyne Ranger 2
- Kongsberg HiPAP.

Location: Coincident with all geophysical and bathymetric surveys using towed equipment including magnetometer surveys.

2.2.5.3 Irish Sea

MBES, SSS and USBL will be required in the Irish Sea to map the bathymetry and sediment surface. Refer to the above sections for details on equipment.

2.2.6 Marine Geotechnical Surveys

The aim of the geotechnical survey is to provide sufficient geotechnical data to allow the characterisation of the sub-seabed strata and composition of the seabed and the level of rock head (including follow on coring to confirm rock head).

Normal industry standards for performance of all positioning, drilling, sampling, SPT testing, CPTu testing, laboratory testing and analysis and reporting will apply. Material sampling, in situ testing, data logging, laboratory testing and reporting (factual and interpretative) will be required.

The works will include the following:

- Sampling/ coring boreholes at 10 locations to a maximum of 30m investigation depth below seabed level;
- Cone Penetration Testing – CPT conducted in the locations of boreholes.

The indicative quantities given above relate to the requirements for the preliminary geotechnical campaign, the final quantity, location, and specification of equipment will be determined following interpretation of the bathymetric survey data and considering environmental constraints (i.e., proximity to sensitive receptors). The final proposed locations will be subject to environmental conditions.

Indicative Quantity: 10No. within the Irish Sea.

Method: A drill head is lowered to the seabed from the drilling platform (where used) via a drill string. The drill head penetrates the seabed via rotation of the drill string and the application of a downward pressure. Soils and rock samples are then retrieved for laboratory testing via the drill string.

Sample Diameter: Up to 102mm.

Depth: Up to 20m below the seabed, or refusal.

Indicative Equipment:

- Camacchio 205 or Comacchio 602 drill rigs using traditional drill string or a triple core barrel system (e.g., Geobor 'S') and associated ancillary equipment (water bowser, air compressor).
- Eijelkamp Fraste CRS XL 140 Duo unit – dual purpose rig for soil and rock sampling

Figure 2-15 Jack Up Barge (JUB)

For investigations at all borehole locations where there is sufficient depth of water (draft) to deploy a jack-up barge, the drill rig and equipment can be mounted on a jack up barge and boreholes completed from this barge during any phase of the tide. A tug will be required to tow the JUB into and from position, and a rigid inflatable boat (RIB) will be used to transfer personnel to and from the JUB as required.

Vessels transferring personnel or positioning the JUB will operate for a short period of time, transiting to and from survey locations.

Location: Indicative geotechnical locations for the boreholes are illustrated in **Figure 2-3**. The final borehole locations will be determined on site. The micro siting of individual geotechnical site investigation locations will take into consideration environmental constraints such as the position of sensitive habitats or archaeological features

2.2.6.1 Cone Penetration Testing (CPT)

Indicative Quantity: 10 CPT

Method: Cone Penetration Test (CPT) using a cone penetrometer deployed from a works vessel or jackup barge. An example of a suitable vessel for this scope would be a shallow draft anchor handling tug or a utility type vessel such as that shown in **Figure 2-15** or similar.

Sample Diameter: 32 mm (standard cone diameter)

Depth: CPT up to 6m depth, or refusal

Indicative Equipment: The exact equipment to be used will be confirmed following a tender process to procure the site investigation contractor.

Location: Cone Penetration Testing will be performed at representative locations within the development area -Refer to Dwg Ref: 10028814-RPS-ZZ-XX-DR-N-DR2221.

2.2.7 Land-based Geotechnical Surveys

To complete the 4No. boreholes within Baldoyle Bay, it will be necessary to use land-based methods. For geotechnical investigations located within Baldoyle Bay, where sufficient time is available between inundation by tides, a tracked borehole / CPT rig or Sonic Rig will be deployed from land to complete the borehole during suitable tidal conditions. To facilitate investigations during periods of low tides, bog mats may be used by plant and machinery to provide stability and support for machinery and vehicles, in addition to minimising ground disturbance. The implementation of bog mats during geotechnical investigations is illustrated in **Figure 2-16**. It is assumed at present that a 500m track will be established using bog mats of dimensions 1m long, 5m wide and 0.1m deep.

Figure 2-16 Site Investigations using Bog Mats

2.2.8 Marine Environmental Surveys

The aim of the proposed environmental surveys is to collect preconstruction baseline data. Environmental surveys are proposed in the Irish Sea within Area B. This will include a benthic sampling programme using grab sampling and video or still photographs.

Detailed marine environmental surveys were carried out along the proposed outfall pipeline route in 2013, 2017 and 2023. The following investigations are proposed at 8 key locations, which have been sampled during previous survey campaigns.

- Drop-down video (DDV): This may include a video line along the whole of the proposed marine outfall route, in addition to DDV at grab sampling locations.
- Benthic grab sampling at 12 stations. Up to 3 x 0.1m^2 grab samples for macrofauna analysis and 1 x 0.1m^2 grab sample for particle size analysis (PSA), organic matter analysis and sediment chemistry analysis.

- Water quality profiling and sampling may be undertaken at 12 stations, at 2 depths, with samples taken for analysis of metals SO4, Nitrate, Nitrite, Si, Phosphorus, TOC and Chlorophyl A, if required.

2.2.8.1 Drop-down Video

Where deemed necessary by the marine ecologist, a DDV high-resolution system will be deployed from a suitable vessel to characterise the flora and fauna at each survey location. This activity will be passive and non-intrusive and will not interact with the seabed. The DDV may require a 100 m transect to be conducted with still images taken at 10m intervals. The video footage will be analysed in real time and an assessment on the suitability of the survey station for grab sampling will be made.

A video line along the proposed marine outfall route may be undertaken, in order to confirm the seabed habitats present.

The exact camera system to be used is subject to appointment of survey contractor, however, the DDV survey will be non-intrusive in nature.

2.2.8.2 Grab Sampling

Superficial sediment/ benthic seabed samples will be obtained using grab samplers deployed from the survey vessel. Grab samplers employ mechanical force to close opposing steel clam shells which in turn scoop up superficial samples of seabed sediments and benthic material. Samplers operate to a seabed depth not exceeding 0.5m and sample over an area of 0.1m^2 with recovery of approximately 0.015 m^3 (~15 litres) of material. Three grab samples will be collected at each location for faunal analysis and a fourth for sediment physicochemical analysis (PSA, organics and sediment contaminant analyses). Faunal grab samples will be sieved on a 1 mm mesh sieve and preserved in 5-10% buffered formalin for analysis in a laboratory.

Different types of grab samplers are available according to the types of seabed conditions expected. Day and Van Veen type grab samplers are suited to general seabed conditions and Hamon type grab samplers are suited to the recovery of mixed and coarser sediments. While all types of grab samplers may be deployed in the proposed surveys across the MUL Area according to expected site-specific conditions, the principles of operation are the same.

Proposed grab sampling locations are presented in the drawings in Appendix A. Final sampling locations will be subject to the analysis of bathymetric survey findings with respect to anticipated geology and any identified anomalies (e.g., uncharted marine archaeology features, potential UXO, etc.).

2.2.8.3 Water Profiling / Sampling

Water profiling and sampling will be taken at various locations within the Irish Sea MUL Area, although these will likely coincide with benthic grab locations. As further information from the bathymetric campaigns is analysed, sampling locations may change to reflect changes to the potential locations.

Each water sample shall be analysed for the following: conductivity, temperature, pH, dissolved oxygen and turbidity. Where suitable, parameters will be tested in situ to receive accurate data. A Niskin bottle (or similar) will be used to obtain a sufficient sample of water at the surface (< 1m depth) and a second sample just above the seabed (~1m) for the subsequent chemical analysis.

Water quality sampling may take place at any time over the lifetime of the MUL. Where deemed necessary, samples will be taken once in each season, i.e., summer, autumn, winter and spring.

Conductivity, Temperature, Depth (CTD) water measurements shall be taken at a number of locations. The CTD unit will be deployed from the survey vessel into the water column. Depending on conditions up to three measurements at each location may be taken, i.e. near surface, mid-water, and near-seabed. Measurements shall be taken only after stabilisation of the temperature at each location. At each location conductivity and temperature shall be recorded every hour during a complete semi-diurnal tidal cycle. A CTD profile shall be produced for each location.

2.2.8.4 Survey Vessels

The following survey vessels can be utilised for the environmental surveys:

- Seekat
- Panalia
- Sharpshooter
- Ros Aine

Figure 2-17 below shows an example environmental survey vessel and associated equipment.

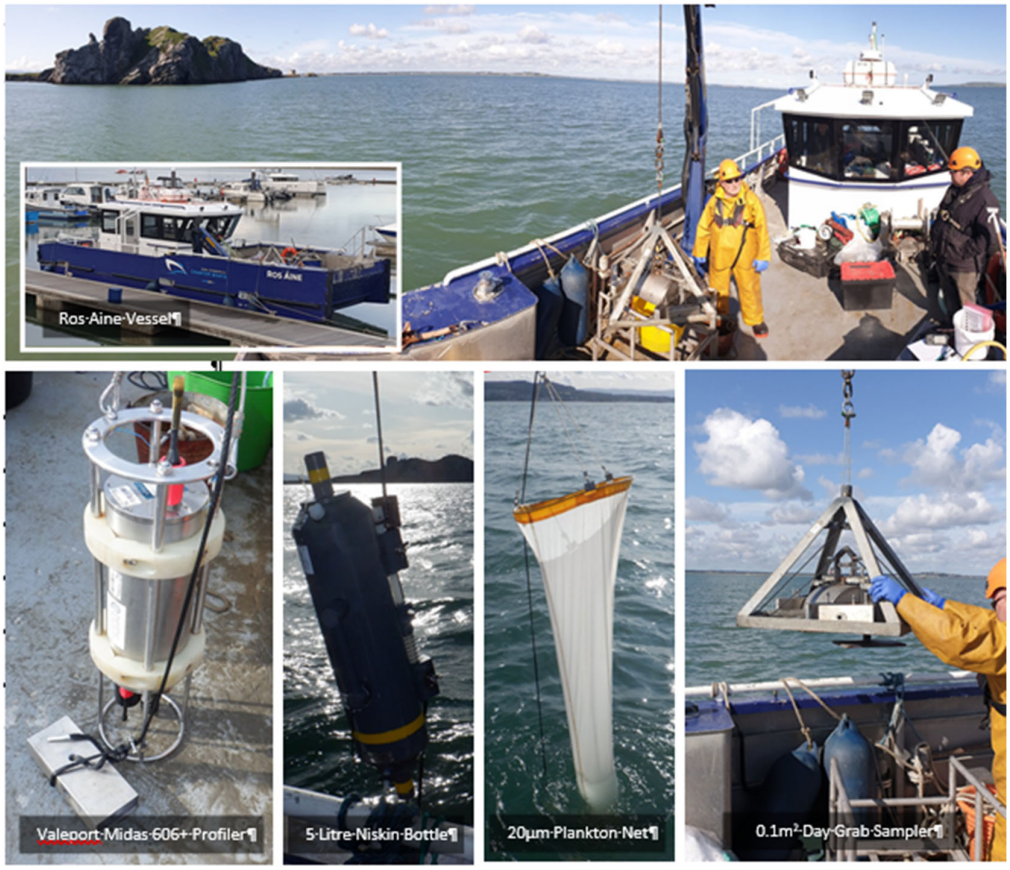


Figure 2-17 Typical environmental survey vessel and equipment

2.3 Safety, Health, Environment & Quality Management

The survey contractor will be contractually required to maintain and operate ISO-accredited or compliant Safety, Health, Environmental and Quality (SHEQ) management systems for the duration of its contractual obligations regarding the described survey scopes. Reports and other submissions shall be provided as and when required for review and approval by law and/or by employer's representative to ensure safe and secure operations and worksites.

2.4 Summary of Marine Survey Noise Generation Sources

A summary of the noise sources, for the main activities proposed to be undertaken as part of the project surveys is included in **Table 2-2** (see Subsea Noise Technical Report for further details).

Table 2-2 Noise Characteristics of Standard Survey Equipment

Geophysical or Bathymetric Survey Type	Equipment Name (Typical)	Frequency Band	Impulsive / Non-Impulsive	Sound Level (dB re 1 µPa @ 1m)	Source Model Details
Multibeam Echo Sounder (MBES) – depth & bathymetry	Kongsberg EM2040, R2Sonic 2024	200–400 kHz	Non-impulsive after 10-25 m*	190 dB SPL (ping rate dependent, equivalent spherical level)	Source levels based on von Hann windowed FM or CW pulses at max SPL as given by manufacturer.
Side Scan Sonar (SSS) Sediment surface characterisation	Edgetech 4200, Klein 3900	100–900 kHz	Non-impulsive after 10-25 m*	165 dB SPL (ping rate dependent, equivalent spherical level)	Source levels based on von Hann windowed FM or CW pulses at max SPL as given by manufacturer.
Sub-bottom Profiler, Parametric Under surface – shallow - cables	Innomar medium	Parametric: 2-22 kHz & 85-115 kHz	Non-impulsive after 10 m*	206 dB SPL (ping rate and depth dependent, off-axis level)	Source levels based on von Hann windowed FM or CW pulses at max SPL as given by manufacturer
Sub-bottom Profiler, Chirper/pinger Under surface – shallow - cables	Edgetech 3100	Chirp: 2–20 kHz	Non-impulsive after 10 m*	183 dB SPL (ping rate and depth dependent, off-axis level)	Source levels based on von Hann windowed FM or CW pulses at max SPL as given by manufacturer.
Magnetometer - arch	Geometrics G-882	Passive (no acoustic output)	N/A	N/A	Passive towfish; magnetic gradiometer or total field sensor
USBL Positioning System Understand positioning – active when towfish are deployed	Sonardyne Ranger 2, Kongsberg HiPAP	8–40 kHz	Non-impulsive after 10-25 m*	190 dB SPL (ping rate adjusted)	Generic USBL based on models from Edgetech, ORE offshore, Sonardyne & Ixblue
Seismic Reflection (Sparker, for deep subsurface imaging to >50 m, if needed)	Applied Acoustics CSP-S, Dura-Spark	630 – 3600 Hz	Non-impulsive after 10 m*	184 dB SPL 220 dB Lpk	Generic model based on GeoSource and Applied Acoustics models at 400 J, 1 pulse per second
Seismic Reflection (Boomer, for deep subsurface imaging to >50 m, if needed)	GeoForce, GeoBoomer	160 – 16,000 Hz	Non-impulsive after 10 m*	177 dB SPL 219 dB Lpk	Generic model based on Applied Acoustics, Geoforce and GeoBoomer models at 400 J, 1 pulse per second

Geophysical or Bathymetric Survey Type	Equipment Name (Typical)	Frequency Band	Impulsive / Non-Impulsive	Sound Level (dB re 1 µPa @ 1m)	Source Model Details
Sonic drilling	Camacchio 205, Comacchio 602, Eijelkamp Fraste CRS XL 140 Duo unit	50 – 16,000 Hz	Non-impulsive	189 dB SPL	Based on recorded levels from sonic coring of up to 0.102 m diameter
Rotary Coring (incl. CPT)		10 – 160,000 Hz	Non-impulsive	150 dB SPL	Based on recorded levels from drills of up to 0.102 m diameter

*Using criteria for impulsiveness as laid out in UWN modelling report section 2.1

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