Gas Networks Ireland

Strategic Gas Emergency Reserve – Marine Site Investigation (SI) Works

Assessment of Impacts on the Maritime Usage (AIMU) Report

RSK General Notes

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1 Introduction

1.1 Overview

Following a review carried out by The Department of the Environment, Climate and Communications (DECC) of the Security of Energy Supply of Ireland's Electricity and Gas Systems, there is need to improve the resilience of Ireland's natural gas supplies and infrastructure in the event of a disruption to the country's natural gas supplies for the short to medium term.

Energy Security in Ireland (ESI) to 2030 outlines a comprehensive strategy aimed at ensuring energy security throughout the current decade while facilitating a sustainable transition towards a carbon-neutral energy system by 2050.

Action 17 of ESI proposes the implementation of a "Strategic Gas Emergency Reserve to protect Ireland in the event of a gas supply disruption as Ireland makes a secure transition to a majority renewable energy".

In January 2025, the Government of Ireland issued the "Programme for Government 2025 – Securing Ireland's Future" which included the commitment that the government will "Take all necessary action to ensure and protect Ireland's energy security".

In March 2025, the Government of Ireland gave approval to proceed with the development of a State-led strategic gas emergency reserve. The delivery of a temporary gas reserve is deemed critical to Ireland's energy security as we continue to transition to indigenous, clean renewable energy.

Based on the above decision, Gas Networks Ireland (GNI) propose to construct a receiving terminal and jetty to accommodate a Floating Storage and Regasification Unit (FSRU), which will allow for the importation of and storage of Liquified Natural Gas (LNG) within Ireland's jurisdictional waters. The FSRU will be connected to the national grid network for injection in case of a supply emergency.

GNI intends to apply to the Maritime Area Regulatory Authority (MARA) for a Maritime Usage Licence (MUL) to conduct marine Site Investigations (SI) and environmental surveys within the Shannon Estuary adjacent to the townlands of Shannakea Beg, Cahiracon, Foynes Island, Leahys and Corgrig.

This report has been prepared as part of the MUL application process. The proposed works are designed to provide high quality baseline data that will contribute to site selection and any subsequent design, EIAR, and Appropriate Assessment, undertaken for the Strategic Gas Emergency Reserve (SGER) Project; in the event that a site is taken forward to the planning/consenting stage.

1.2 Purpose of The Report

This document has been prepared by RSK Environment Ltd. on behalf of GNI in support of the MUL Application to MARA. The scale and complexity of an AIMU should reflect the scale and complexity of the project. This purpose of the AIMU report is to analyse the likely (positive and negative) effects on the receiving environment for the proposed site survey and investigation works and to identify how mitigation will be implemented to minimise adverse impacts. The objective of the proposed activities/works is to provide high quality baseline data that can contribute to a reliable basis for site

selection and any subsequent design, Environmental Impact Assessment Report (EIAR) and Appropriate Assessment Natura Impact Statement (NIS) for the SGER Project should the development be taken forward to the planning/consenting stage.

1.3 Statement of Authority

This report has been prepared by RSK on behalf of GNI. The technical competence of the authors is outlined below:

[redacted] is Technical Director within the International Projects Group Marine Team in RSK. He has over 20 years of experience in marine environmental surveying and consulting. He holds an honours degree in Marine Biology and Oceanography and a Masters in Marine Resource Development and Protection. He has particular experience in marine ecology surveys, and the subsequent analysis and reporting of marine survey data for EIA projects, including Appropriate Assessment and Annex IV species reports.

[redacted] is a Senior Marine Consultant within the International Projects Group Marine Team in RSK. She has over 10 years of experience in the marine ecology field. She holds an honours degree in Marine Science and a Masters in Biology. She has contributed to numerous marine environmental projects including Appropriate Assessments, Natura Impact Statements and EIAR chapters.

2 Project Description

2.1 Site Location

The proposed MUL Area covers an area of 11.19km^2 and extends from the townland of Shannakea Beg along the Clare coast to Cahiracon (Ed Killadysert), across the Shannon Estuary to Shannon Foynes Island and along the Limerick coast to the townland of Leahys and Corgrig (Figure 2.1). The works described in this application relates solely to the SI / sampling works within the proposed MUL Area. (Figure 2.2 and Figure 2.3). Marine SI is required to inform preliminary design and facilitate environmental assessment in advance of Planning for the SGER project. Site investigations are to be completed over two phases, with Phase 1 being used to determining the optimum location of the SGER and Phase 2 being used at a later date to coordinate with the detailed design stage.

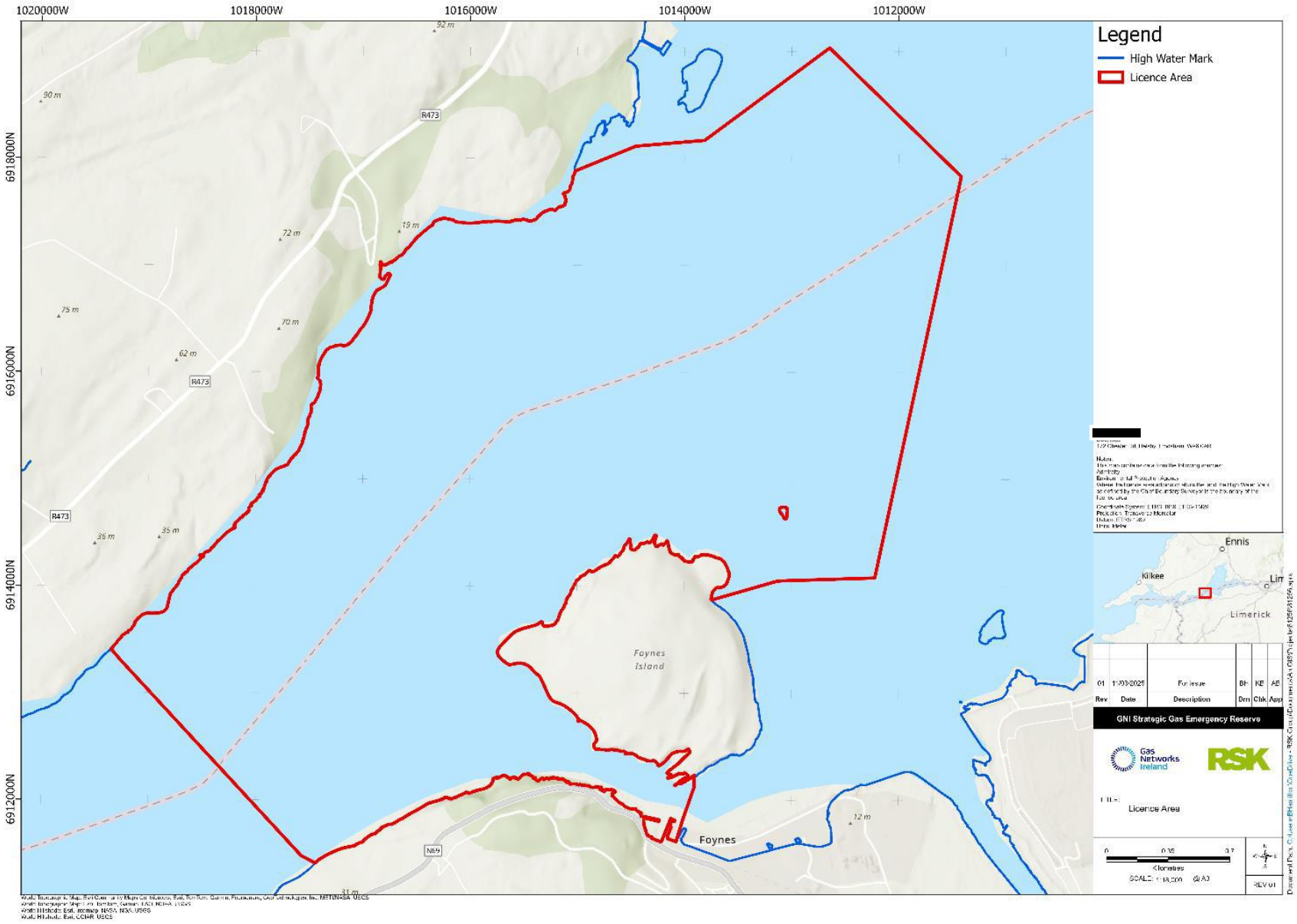

Figure 2.1
Proposed MUL Area

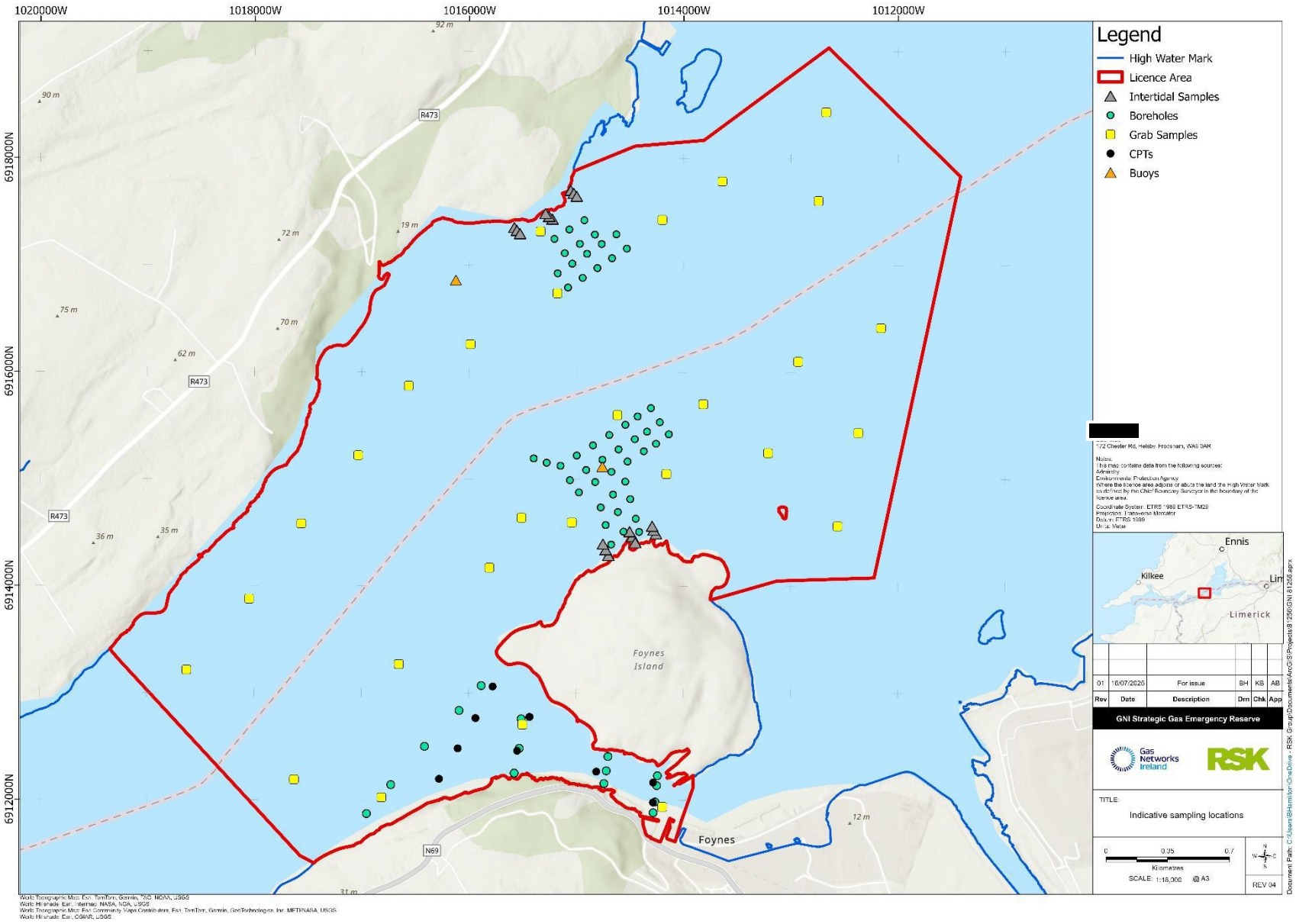

Figure 2.2
Indicative sampling locations

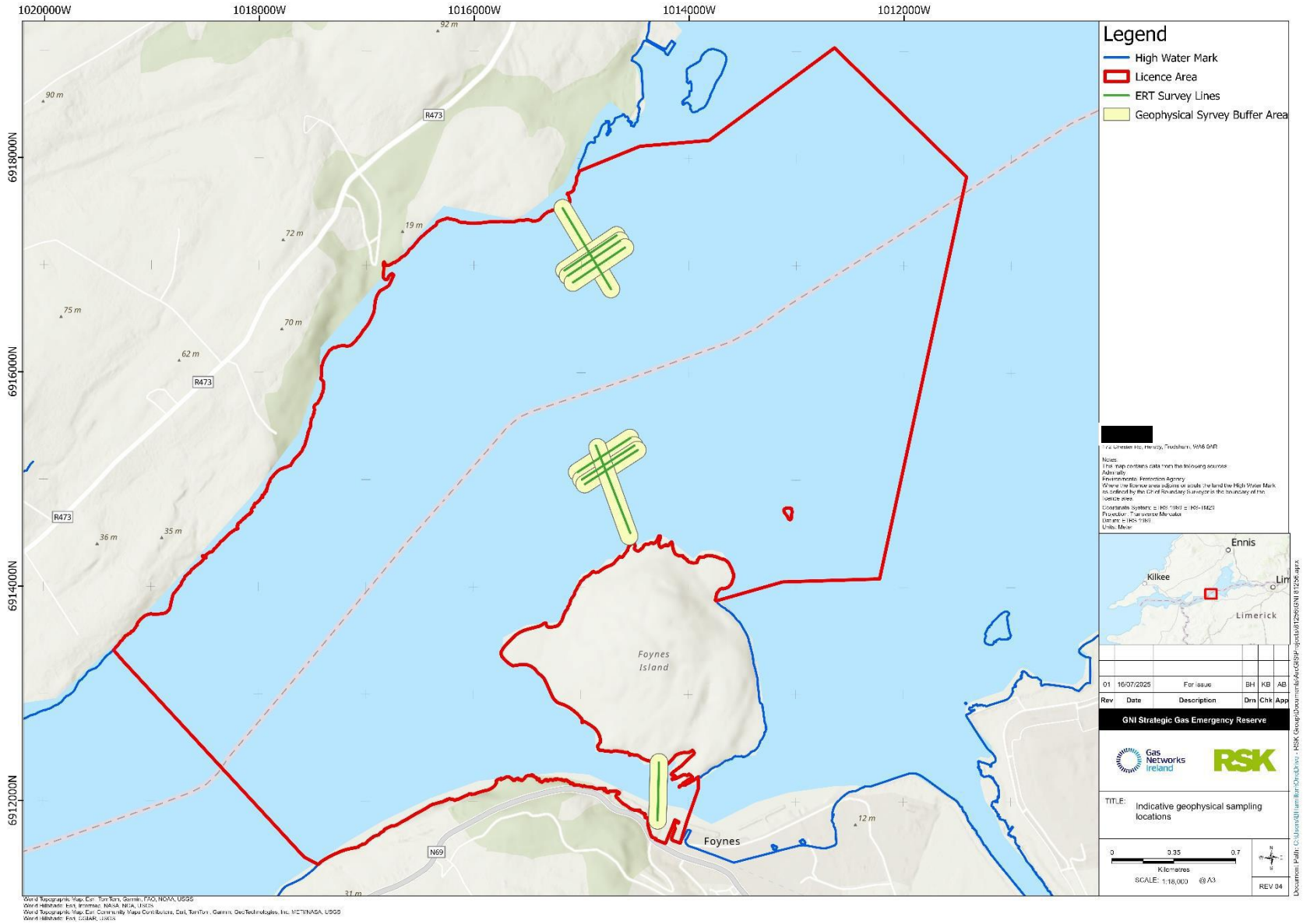

Figure 2.3

Indicative Geophysical Survey and Electrical Resistivity Tomography (ERT) electrode deployment locations

2.2 Description of The Works

2.2.1 Overview

The objective of the proposed surveys is to provide high-quality data that can contribute to a reliable baseline for site selection and subsequent project design and development as well as informing the EIA. As such, the following survey investigations are considered necessary and detailed further in Table 2.1:

- Drop-down camera survey
- Geophysical survey, including:
  - Magnetometer
  - Sub-bottom profiler (SBP)
  - Side-scan sonar (SSS)
  - Multibeam Echo Sounder (MBES)
  - Marine Refraction Seismic
  - Marine Electrical Resistivity Tomography (ERT)
- Boreholes
- Cone penetration tests (CPTs)
- Grab samples
- Surface water samples
- Intertidal walkover survey
- Intertidal core samples
- Archaeological surveys and other investigations (i.e. underwater inspections, walkovers, metal detectors, dive surveys).
- Deployment of metocean monitoring buoys to collect physical oceanographic data.

These works are collectively referred to as the Site Investigation (SI) works throughout this report.

Indicative sampling locations within the proposed MUL Area are designed to inform a potential jetty and vessel, with the addition of potential pipeline route options from the southwest side of Foynes Island to the mainland. It should be noted that all locations shown for sampling within the proposed MUL Area are indicative and may be subject to a degree of change on-site.

The following drawings have been prepared in support of the Maritime Usage Licence application to the MARA:

- Proposed Licence Area Map
- Proposed Grab Sample Locations Map
- Proposed Borehole Locations Map
- SI Indicative Table of Coordinates

The exact technical specification of the equipment to be used will not be known until the survey contract has been awarded. However, descriptions of typical equipment and survey parameters have been used within this report.

Predicted time and footprint for the activities are presented in Table 2.2. 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 borehole locations and quantities.

There will be no permanent structures and all site investigation works will be temporary in nature. The moving marine plant will remain on site for the duration of the works.

2.2.2 SI Schedule

The intention is to begin SI activities as soon as feasible following MUL award. Timing of the SI activities is dependent on many factors including weather, tidal flows, availability of vessels and the grant of the MUL. The granting of the MUL will have a direct effect on the timing of SI activities. The duration of the phase 1 SI works is approximately 16 weeks and are currently scheduled for Q3 2025. Phase 2 SI works (if required) will be carried out at a later date to coordinate with the detailed design stage which is dependent on consenting for the main project. The proposed licence duration is for 5 years to account for potential delays in the consenting process.

Table 2.1
Description of proposed works

Survey	Method	Method detail	Sampling Effort
Geophysical	Side Scan Sonar (SSS)	SSS surveys are used to determine sediment characteristics and seabed features. The EdgeTech 4205 may be taken as an indicative example of an SSS device and for these surveys will have a potential operating frequency range of approximately 300/600kHz in the offshore area and 600/900kHz in the shallower nearshore area with sound pressure levels of 220-230dB re1µPa @1m. The SSS will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SSS may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Magnetometer	A magnetometer is used to identify magnetic anomalies and hazard mapping for metal obstructions, shipwrecks and unexploded ordnance on the surface and in the shallow sub-surface. The Geometrics G-882 can be taken as an indicative equipment example. It is a passive device (i.e. it does not emit any sound waves into the marine environment) the sensor responds to local variability in magnetic field. The magnetometer will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	Magnetometer survey may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) – Parametric Sub Bottom Profiler	SBP is used to develop an image of the subsurface, identifying different strata encountered in the shallow sediments. The Innomar "standard" Sub-Bottom Profiler is an indicative example of a parametric system with a primary and secondary frequency range of 85-115kHz and 2-22kHz, respectively, and sound pressure levels of up to 232 dB (typically operated at <200dB) re1µPa @ 1m, which would be used in both nearshore and offshore areas. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Parametric Sub Bottom Profiler may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) - Boomer	The Applied Acoustics AA301 is an indicative example of a boomer, the instrument consists of a piezo electric plate transducer mounted on a surface tow catamaran frame. Reflected sound signals are recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m). The Boomer SBP operates in a frequency range of 0.5 kHz to 5 kHz, with sound pressure levels in the range of 205-211dB re1µPa @ 1m which would be used in the nearshore shallower area. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Boomer may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom	The applied Acoustics Dual 400 Tip is an indicative example of a sparker	SBP Sparker may be undertaken

Survey	Method	Method detail	Sampling Effort
	Profiling (SBP) - Sparker	system used in sub-bottom profiling. Reflected sound signals are recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m) or a multi-channel hydrophone such as the Geometrics GeoEel LH-16™ Digital Streamer. The sparker source has a frequency range of between 0.4-5kHz and a recorded sound pressure of 203dB re1µPa @1m. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Multibeam Echo Sounder (MBES)	A bathymetric survey will be conducted using multibeam echo sounders. These systems may be mounted on a dedicated survey vessel or towed behind a smaller vessel, depending on site conditions and water depths. Multibeam systems emit wide acoustic signals to generate high-resolution images, creating three-dimensional maps of the seabed. Line spacing will be between 5 and 20m, depending on depth. The operating frequencies emitted from MBES will be 300-700 kHz, with a peak operating frequency of approximately 400kHz. Exposure time is approx. 0.05 ms per 1 ms for multibeam operating with 200-400 kHz, or 0.05 per 0.3 ms for higher frequencies (>400 kHz). Sound pressure levels will be approximately 215-220dB re 1µPa @ 1m.	MBES may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Marine Refraction Seismic	Marine refraction surveys use controlled seismic sources, such as air guns or weight drops, to generate seismic waves that travel through sediment and rock layers. Arrays of hydrophones or geophones deployed on the seabed record the refracted seismic waves as they bend and travel along subsurface interfaces. By analysing the travel times and velocities of these refracted waves, detailed models of sediment thickness, bedrock depth, and structural features can be developed. Airgun impulse energy is mostly concentrated within low frequencies, with peak frequencies between 5 and 90kHz. Source levels are predicted to be within the range of 186-220dB re 1µPa @1m.	Marine Refraction Seismic may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
	Marine Electrical Resistivity Tomography (ERT)	ERT surveys are conducted to investigate the electrical properties of subsurface sediments and rocks. The technique involves deploying a series of electrodes along the seabed, either towed or fixed. As a non-invasive, non-seismic geophysical method, marine ERT produces no significant underwater noise and has minimal environmental impact.	Maximum **20 ERT lines** of 315m length line with diameter of 20mm. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
Marine Environmental / Ecological	Benthic ecology samples (including subtidal and	Identify benthic communities and habitats at the site. Subtidal sample locations may be subject to drop down video in advance of sampling, intertidal sample locations may be subject to walkover/drone survey in advance of sampling.	There will be up to **30 no.** dedicated subtidal benthic ecology grab sampling locations within the proposed MUL Area and multiple samples (max 4) may

Survey	Method	Method detail	Sampling Effort
	intertidal habitats surveys)		be taken at each location. Samples would be of volume 0.1 m^2. There will be up to **30 no**. dedicated intertidal coring /grab locations if shoreline conditions allow for sediment sampling.
Archaeological	Walkover	Intertidal walkover to be undertaken at low tide to assess for the presence of sensitive archaeological features. Survey methodology may also involve the use of a metal detector along the foreshore. Pending the results of geophysical surveys there may be a requirement for further archaeological surveys (i.e. underwater video, dive surveys, etc.)	To be confirmed pending the results of the geophysical surveys.
Geotechnical	Drop-down video	Drop-down video survey to inspect the seabed and identify any reef structures in the vicinity without disturbance to the seabed.	There will be up to **30 transects** of up to 30 m each using a drop down camera and video surveillance.
	Boreholes	Boreholes may be up to 50 m below bed level but some may be terminated if sufficient bedrock is encountered. The boreholes will be carried out using sonic methods through the seabed sediment, with rotary coring used to advance through the bedrock. The typical frequencies emitted from rotary drilling are between 0.001-0.120kHz and a recorded sound pressure of approximately 145dB re1µPa @1m. Marine rotary drilling involves rotating a drill bit attached to a drill string and applying downward pressure to cut through the rock formations. Geotechnical sampling tools, including push and piston samples, can then be deployed into the ground to recover intact material. All drilling equipment used will follow the ISO and API technical specifications for drilling equipment. All boreholes will be drilled from a jack-up barge to maintain stability when drilling. Each location would require the 4 legs to penetrate the seabed and cause a temporary disturbance on each occasion. Each leg is typically less than 1m^2 in footprint.	A maximum of **80 no**. boreholes of a diameter of 300 mm will be required within the proposed MUL Area.
	Cone penetration tests (CPTs)	CPTs are to progress to a maximum depth of 20m but will be terminated when bedrock is encountered. In the CPT, an instrumented electronic probe (cone penetrometer) is situated at the front end of a string of steel rods that are hydraulically pushed into the ground at a constant rate of 20mm/s to measure soil response, geo-stratigraphy, and engineering	**80 no. CPTs** will be conducted of a diameter of 44mm. 60 of the CPTs will be at borehole locations to clear for unexploded ordnance (UXOs) and 20 as standalone

Survey	Method	Method detail	Sampling Effort
		parameters. A CPT vehicle or hydraulic ram set are often used to provide the reaction and pushing force. The equipment used will conform to relevant international standards, such as ISO, ensuring consistent and reliable geotechnical data.	investigation sites.
	Grab samples	Grab samples using 0.1 m^2 grabs will be collected for grading, loss on ignition and assessment of benthic community.	A maximum of **50 no**. grab samples of volume 0.1 m^2 will be collected within the proposed MUL Area.
	Metocean monitoring buoys	Metocean monitoring buoys are floating sensors with an anchorage system secured on the seabed. The buoys record various metocean conditions through the following monitoring equipment: • Conductivity, Temperature, Depth Sensors • Optical Salinity Sensor • Acoustic Doppler Current Profiler (ADCPs operating in the range of 600 Khz or 1 Mhz will be used. The instrument emits low amplitude "pings" of sound at a sampling rate of 1-minute average every 10 minutes. These pings will be emitted in a narrow sound beam (typically a few degrees in width) with a typical echo intensity profile of 80 dB (+/- 1.5 dB)) • Optical or Electrochemical Dissolved Oxygen Sensor • pH Sensor/Probe • Turbidity sensor • Turbidity meter/sediment trap. Metocean monitoring buoys will be anchored with two anchors per buoy. Anchors will have a maximum footprint of 4m^2 each.	**2 buoys** will be placed within the study area initially, with the possibility for **up to a further 4**.

Table 2.2
Predicted time and footprint of each survey activity

Survey Activity	Total time for activity	Maximum number of samples	Footprint per sample (m^2)	Maximum total footprint per activity (km^2)
Geophysical survey	Up to 4 months	SSS, Magnetometer, SBP 20 m spacing of main lines and 100 m spacing of cross lines with 25% overlap onto neighbouring lines MBES: 5 -20 m line spacing	-	Area up to 2.155
Marine refraction seismic	Up to 4 months	20 m line spacing	-	Area up to 2.155
ERT	Up to 4 months	20 maximum ERT lines	6.3	0.0000063
Marine Environmental / Ecological	Up to 4 months	120 subtidal (30 no. grab locations with max 4 samples taken at each location) 120 intertidal (30 no. grab locations with max 4 samples taken at each location)	0.1	0.000024
Geotechnical: Drop down video	Up to 4 months	30 transects	30	0.0009
Geotechnical: Boreholes	Up to 4 months	80	0.071	0.00000568

Survey Activity	Total time for activity	Maximum number of samples	Footprint per sample (m^2)	Maximum total footprint per activity (km^2)
CPTs	Up to 4 months	80	0.00152	0.0000001216
Jack-up barge leg	Up to 4 months	640 legs*	1	0.00064
Geotechnical: Grab samples	Up to 4 months	50	0.1	0.000005
Metocean monitoring buoy anchors	Maximum of 24 months (2 years)	12 anchors	4	0.000048

** 80 Borehole locations and 80 CPT locations x 4 legs*

2.3 General Survey Requirements

All appointed survey contractors shall obtain and comply with all necessary marine operational permits including routine and customary vessel/crew/equipment clearances from Customs Agencies, Port Authorities, Marine Survey Office, etc. This will include adherence to all major international shipping conventions adopted by the International Maritime Organization (and the International Labour Organization) concerning maritime safety and pollution prevention.

2.3.1 Quality Assurance

Each of the appointed survey contractors shall comply with the following as a minimum:

- Quality and Environmental Management Systems based on ISO9001:2015 and ISO14001
- Provision of site and activity specific Method Statements for all the marine operations within their scope
- Provision of Quality Management Plans for all the marine operations.

2.3.2 Health & Safety

Health, safety, environment, and welfare considerations will be a priority in the evaluation of possible contractors for the various survey scopes and will be actively managed during the survey work.

Appointed contractors will be required to comply with all legislation relevant to the activities within their scope of work, such as the Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005) and Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007), as amended.

Project / survey specific Health, Safety and Environment (HSE) plans will be put in place which will form part of the project / survey execution plans.

2.3.3 Working Hours

The working hours for the SI works are proposed to be up to 24 hours per day, seven days a week. It is anticipated that the main SI works will be carried out over a period of approximately four months including mobilisation and demobilisation. While metocean monitoring buoy deployment will be for period of up to two years, the devices will be autonomous apart from maintenance visits every two to four months. Such maintenance visits will occur during daylight hours only.

Weather conditions and/or sea-state will impact on the working hours, and it may be necessary to temporarily suspend operations when adverse weather conditions and/or sea-state are encountered or forecast. As such, survey plans will remain flexible to take advantage of optimal weather windows. Similarly, equipment or vessel maintenance and repair may impact on the SI works resulting in changes to the survey schedule.

2.3.4 Environmental Procedures

Environmental procedures to be followed by the appointed survey contractors are detailed within Section 7 of this report.

2.3.5 Vessels

All vessels will be fit for purpose, certified and capable of safely undertaking all required survey work. Marine vessels will be governed by the provisions of the Sea Pollution Act 1991, as amended. In addition, all vessels will adhere to published guidelines and best working practices such as: the National Maritime Oil/HNS Spill Contingency Plan (NMOSCP), Marine Pollution Contingency Plan (MPCP), Chemicals Act 2008 (No. 13 of 2008), Chemicals (Amendment) Act 2010 (No. 32 of 2010) and associated regulations.

Vessels shall have a Health, Safety and Environmental Managements system which should conform to the requirements of the latest International Maritime Organisation (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or continental / EEZ waters to be operated in.

The SI works will be undertaken from vessels in accordance with the relevant guidelines required to manage the risk to marine mammals from man-made sound sources in Irish waters (NPWS, 2014).

3 Needs and Alternatives

3.1 Site Development

GNI propose to construct a receiving terminal and jetty to accommodate a FSRU, which will allow for the importation of and storage of LNG within Ireland's jurisdictional waters. The FSRU will be connected to the national grid network for injection in case of a supply emergency.

The current proposal relates solely to the SI works that are required to provide high quality data in order to inform site selection and associated project design and development for the project. The SI works are to be completed over two phases, with Phase 1 being used to determining the optimum location of the SGER and Phase 2 being used at a later date to coordinate with the detailed design stage.

3.2 Project Needs

During 2022 and 2023, the DECC reviewed a range of Ireland's energy security policies and subsequently published 'Energy Security in Ireland to 2030 – Energy Security Package' in November 2023. Analysis showed that Ireland must enhance its resilience in the event of a disruption to the country's national gas supplies. Policy makers decided that a disruption to Ireland's supplies of gas is an unlikely, but high impact event, and a disruption would lead to unacceptably high economic and social costs. Action 17 of the Energy Security Package seeks to address the risk to the security of Ireland's gas supply through the implementation of a state-led Strategic Gas Emergency Reserve. In line with the Government decision to develop a Strategic Gas Emergency Reserve, and as a final part of the review of Ireland's energy security, the DECC, in consultation with the gas transmission system operator (GNI), is completing further studies to support this review. The implementation of a Strategic Gas Emergency Reserve is on a transitional and temporary basis for use in the event of a disruption to natural gas supplies. GNI is undertaking a rigorous assessment, and a number of solutions are currently under consideration, some of which may include the potential for onshore and offshore facilities. The information collated and gathered from this assessment will be returned to Government to help inform the decision-making process.

To finalise the proposal for the Strategic Gas Emergency Reserve, DECC has instructed GNI to acquire additional information and data which it cannot obtain through publicly available sources inferring the requirement of the SI works for the project.

4 Planning and Development

4.1 Marine Area Planning (MAP) Act

The Maritime Area Planning Act (2021) provides a legislative framework for a new streamlined development consent process for activities in Ireland's marine area. The Bill establishes a new legal framework for the maritime area, replacing the existing foreshore, planning and environmental processes with a single streamlined consent process.

4.2 EIA Directive

4.2.1 Overview

In accordance with Directive 2011/92/EU, as amended by Directive 2014/52/EU (hereafter, the EIA Directive), projects that are likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location must be subject to an EIA.

The Maritime Area Planning Act, 2021 (as amended) established the Maritime Area Regulatory Authority (MARA). One of the functions of MARA is to consider licence applications and the granting of licences. For a licence application, the MARA is required to carry out a screening for environmental impact assessment (EIA) in accordance with Section 117(5)(a) of the Act having regard to Schedules 5 and 7 to the Planning and Development Regulations 2001 (as amended).

EIA Screening is the process of deciding whether a development requires an EIA to be carried out. The EIA Screening exercise first assesses the development to ascertain if it is subject to Mandatory EIA, using classifications defined in the EIA Directive (projects listed in Annex I of the EIA Directive are subject to an EIA). If the project is not listed in Annex I, and no mandatory EIA is required, the EIA Screening process progresses to consider projects listed under Annex II of the EIA Directive. Projects listed in Annex II of the EIA Directive are subject to an EIA if (i) they exceed certain thresholds (set out in Annex II and by each Member State); or (ii) if they do not meet or exceed the threshold, but where the project is deemed likely to have significant environmental effects, with regards to the project's scale, nature, location, and context. Such projects need to be assessed on a case-by-case basis. EU Guidance on EIA Screening states that whilst Member States may set thresholds or criteria for the purpose of determining which projects are to be assessed on the basis of their environmental effects, they "should not be required to examine projects below those thresholds or outside those criteria on a case-by-case basis".

Section 172 of the Planning and Development Act 2000 (as amended), sets out the statutory basis for the requirements for environmental impact assessment. Annexes I and II of the EIA Directive have been transposed into Irish legislation through the Planning and Development Regulations 2001 (as amended). Regulation 93 and Schedule 5 of the Regulations prescribe classes of development for which EIA is required. Furthermore, if a project is a type of project listed in Schedule 5 but does not equal or exceed the relevant quantity, area of other limit specified, that project may be considered a "sub-threshold" development and should therefore be screened for EIA to determine whether the project is likely to have a significant effect on the environment.

An MUL cannot be granted for a maritime usage to which an EIA applies. Therefore, where a project requires an EIA, the applicant must apply for a Maritime Area Consent (MAC).

4.2.2 Schedule 5, Part 1 Consideration

Schedule 5 Part 1 of the Planning and Development Regulations 2001 (as amended) sets out a number of classes of development that require mandatory EIA. The SI works, as set out in Section 2, do not fall under any of the classes as set out in Schedule 5 Part 1 and therefore mandatory EIA is not required.

4.2.3 Schedule 5, Part 2 Consideration

Schedule 5 Part 2 of the Planning and Development Regulations 2001 (as amended) sets out classes of development for which EIA must be carried out where such development would equal or exceed, as the case may be, any relevant quantity, area or other limit specified or, where no quantity, area or other limit is specified in the Part in respect of the development concerned. The SI works, as set out above, do not fall under any of the classes as set out in Schedule 5 Part 2.

In line with the Office of the Planning Regulator (OPR, 2021) Practice Note PN02 Environmental Impact Assessment Screening, if a project 'is not of a class of development in Schedule 5, Parts 1 and 2, it is not "sub-threshold" development, and no EIA or EIA Screening is required.'

4.3 Habitats and Birds Directives

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) provides protection for habitats and species of European importance; Council Directive 79/409/EEC (the Birds Directive) aims to protect all 500 wild bird species naturally occurring in the European Union (EU). Areas designated for protection under the Habitats Directive are described as Special Areas of Conservation (SAC) and those designated under the Birds Directive, as Special Protection Areas (SPA) and the sites are known collectively as Natura 2000 sites. As each member of the EU is required to designate areas in their jurisdiction, the establishment of this network of Natura 2000 sites under Articles 3 to 9 of Directive 92/43EEC is the key measure to protect nature and biodiversity in the EU.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to have a significant effect on or to adversely affect the integrity of Natura 2000 sites. Article 7 of the Habitats Directive extends the scope of its articles 6(3) and 6(4) to the Birds Directive.

The Habitats and Birds Directives have been transposed into Irish Legislation under the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended.

The impact(s) from the works in relation to the Habitats and Birds Directives are separately discussed in the following reports:

- Supporting Information for the Screening for Appropriate Assessment (SISAA)
- Natura Impact Statement (NIS)

4.4 Water Framework Directive (WFD)

Since 2000, the Water Framework Directive (WFD) [Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 Establishing a Framework for Community Action in the Field of Water Policy] has been a key piece of European Union legislation designed to protect and enhance the quality of Europe's waters. Its primary objective is to ensure that all surface waters, groundwater, transitional, and coastal waters achieve "good status", encompassing both ecological and chemical health. An objective of the WFD is to achieve the protection of aquatic ecology and habitats, drinking resources and

bathing waters through river basin management planning and monitoring. This objective is summarised as Good Ecological Status (GES) or Good Ecological Potential (GEP) for artificial or heavily modified water bodies.

Water management under the WFD is organised at the river basin level, with Member States required to develop River Basin Management Plans (RBMPs) every six years. These plans involve monitoring, pollution control, and measures to restore degraded water bodies. The directive also emphasises pollution prevention by regulating hazardous substances, controlling diffuse pollution from agriculture and industry, and implementing sustainable abstraction policies.

With the mitigation measures proposed as part of the works (see Section 7) and considering the limited nature, scale, size, and duration of the SI works there will not be deterioration in WFD GES in any water body and the works will not impact on achieving or maintaining WFD GES.

4.5 Marine Strategy Framework Directive (MSFD)

The Marine Strategy Framework Directive (MSFD) (2008) (Directive 2008/56/EC) is European legislation, which aims to protect the marine environment. It requires the application of an ecosystem-based approach to the management of human activities, enabling a sustainable use of marine goods and services. The MSFD Directive aims to ensure clean, healthy, and productive oceans and seas with sustainable use of the marine environment for current and future generations.

To implement the Directive each member state is required to:

- describe what they consider is a clean, healthy, and productive sea i.e., GES
- monitor and assess the quality of their seas against GES
- ensure they take appropriate action by 2020 to maintain or achieve GES.

Good Environmental Status is key to compliance with the MSFD Directive and is described by the following 11 Descriptors:

- D1 Biodiversity
- D2 Non-indigenous species
- D3 Population of commercial fish/shellfish
- D4 Elements of marine food webs
- D5 Eutrophication
- D6 Sea floor integrity
- D7 Alteration of Hydrographical conditions
- D8 Contaminants
- D9 Contaminants in fish and seafood for human consumption
- D10 Marine Litter
- D11 Introduction of energy, including underwater noise.

The basic principle of Good Environmental Status is to ensure sustainable use of marine resources. When assessing a project against MSFD requirements it is assessed on its impact on the descriptors listed above. A project may not improve Good Environmental Status, but it should not have a permanent negative impact on any criteria and is required to be assessed against each of the MSFD Good Environmental Status Descriptors.

Four of the above descriptors are particularly relevant to the SI works, namely: D1 Biodiversity; D6 Sea floor integrity, and D11 Introduction of energy, including underwater noise.

With the mitigation measures proposed as part of the works and considering the limited nature, scale, size, and duration of the SI works there will not be deterioration in MSFD GES and the works will not impact on achieving or maintaining MSFD GES.

Table 4.1
MSFD Analysis

Descriptor	Analysis	Assessment
D1 Biodiversity	As concluded within this report, in addition to the SISAA. NIS and Annex IV Risk Assessment prepared for this project, no potential for significant impact on biodiversity was recorded.	No potential for significant impact.
D2 Non-indigenous species	No element of the proposed project has been identified that has the potential to introduce or spread non-indigenous species.	No potential for impact.
D3 Population of commercial fish/shellfish	Some commercial fishing occurs within the proposed project area. While disturbance to commercial fisheries activity may occur, this disturbance will be of a temporary nature and will not have a significant impact on commercial fishery activity in the area.	No potential for significant impact.
D4 Elements of marine food webs	No project related impacts with the potential to impact food webs or affect long-term abundance and/or reproduction of species is considered possible.	No potential for impact.
D5 Eutrophication	No impacts relative to eutrophication are possible.	No potential for impact.
D6 Sea floor integrity	The SI works involve interaction with the sea floor. Given the small-scale nature of the SI works, no potential for significant impact was identified.	No potential for significant impact.
D7 Alteration of Hydrographical conditions	The proposed project does not have the potential to cause any hydrographical changes.	No potential for impact.
D8 Contaminants	The proposed project has the potential to cause sediment resuspension, which could result in resuspending contaminants. Due to the short term and small-scale nature of the works, no potential for significant impact was identified.	No potential for significant impact.
D9 Contaminants in fish and seafood for human consumption	The proposed project does not have the potential to add to or alter contaminants in the seafloor.	No potential for impact.
D10 Marine litter	The proposed project does not have the potential to lead to marine littering.	No potential for impact.
D11 Introduction of energy, including underwater noise	The survey works have been identified as potential for introduction of underwater noise. Given the small-scale nature of the survey works with the implementation of proposed mitigation, no potential for significant impact was identified.	No potential for significant impact.

4.6 Statement of Consistency with the National Maritime Planning Framework (NMPF)

The NMPF establishes Overarching Marine Planning Policies (OMPPs) that govern all marine activities and developments. These policies address aspects such as biodiversity, coastal and island communities, and infrastructure. The survey works will be used to inform the EIAR and Appropriate Assessment of the Strategic Gas Emergency Reserve development. While this MUL application relates only to marine survey works, it is an objective of the NMPF to support the development of natural gas storage, where appropriate, in the context of the outcome from review of the security of Ireland's electric and natural gas supplies. Notably, Natural Gas Storage Policy 1 is deemed of relevance to the SI works and associated project. Natural Gas Storage Policy 1 states that;

"*Subject to assessments required for the protection of the environment, and only where in keeping with the outcome of the review of the security of energy supply of Ireland's electricity and natural gas systems (which is being carried out by Department of the Environment, Climate and Communications), natural gas storage proposals should be supported.*"

The proposed SI works are deemed to have minimal impact on these overarching policies. Nevertheless, an analysis of these policies in relation to the proposed SI works has been conducted and is presented in Table 4.2. This table demonstrates compliance with the NMPF and concludes that the proposed SI works align fully with the objectives and policies of the NMPF, with no aspects of the SI works conflicting with these policies.

It has been assessed that, due to the temporary and small-scale nature of the works, there will be no impact on planning and development in the area.

Table 4.2
Assessment of compliance with the NMPF

Biodiversity and Protected Marine Sites	
Biodiversity	The SI works is supported by the following documents: • Supporting Information for Screening for Appropriate Assessment (SISAA) • Annex IV Risk Assessment • Assessment of Impact on Maritime Usage Report (AIMU) • Natura Impact Statement (NIS) The conclusion of the NIS, Annex IV Risk Assessment and AIMU is that impacts on biodiversity can be ruled out with mitigation measures in place.
Protected Marine Sites	The conclusion of the NIS, Annex IV Risk Assessment and AIMU is that impacts on protected marine sites can be ruled out with mitigation measures in place.
Non-indigenous Species	The SISAA and AIMU did not identify any potential for the introduction of non-indigenous species.
Water Quality	The SISAA and AIMU did not identify potential significant impacts on water quality.
Seafloor and Water Column Integrity	The scale and scope of the SI works does not have the potential to impact Seafloor and Water Column Integrity as documented in this AIMU.
Marine Litter	The scale and scope of the SI works does not have the potential to intentionally or accidentally contribute to the impacts on marine litter

Biodiversity and Protected Marine Sites	
	policy as documented in this AIMU.
Underwater Noise	The conclusion of the NIS, Annex IV Risk Assessment and AIMU is that impact relating to underwater noise can be ruled out with mitigation measures in place.
Air quality	Not relevant: The SI works do not have the potential to impact air quality.
Climate Change	Not relevant: The SI works do not have the potential to impact climate change.
Economic – Thriving Maritime Economy	
Co-existence	No potential for significant impact. The proposed works are temporary in nature. While disturbance to commercial fisheries activity may occur, this disturbance will be of a temporary nature and will not have a significant impact on commercial fishery activity in the areas. No other significant activities have been identified.
Environmental – Ocean Health	
Infrastructure	No potential for impact on the infrastructure policy. No permanent infrastructure is proposed.
Social – Engagement with the sea	
Access	No access issues have been identified.
Employment	Not applicable. It is considered the Employment Policy 1 is not relevant to the proposed SI works.
Heritage assets	A review of the Historic Environment Viewer and National monument service wreck viewer (Accessed March 2025) indicated the presence of a single known (physical) wreck within the study area which comprises a modern metal wreck (W10603) located on the west shoreline of Foynes Island. There are no potential for impacts to known cultural heritage sites arising from the proposed Marine SI works with mitigation measures in place.
Rural, Coast, and Island Communities	This policy is not considered relevant to the proposed project.
Seascape and Landscape	The SI works will be temporary in nature with no permanent impact on seascape.
Social Benefits	No impact possible.
Transboundary	No transboundary effects are possible.

5 Baseline Information for Assessment of Impacts

This section contains a summary of environmental baseline for the proposed MUL Area . The level of detail presented is proportional to the scale and nature of the proposed SI activities.

5.1 Land and Soils

The main land cover type in relation to the SI works is expected to be artificial substances, constituting of industrial, commercial and transport units. Forest areas may also be located in proximity to the proposed MUL Area interspersed by agricultural land and pastures.

Soil types in proximity to the proposed MUL Area is anticipated to be composed of urban areas, calcerous brown earth soil, tidal marsh, Limestone till and bedrock outcrops.

5.2 Water

The following waterbodies are located within or within proximity the proposed MUL Area with their overall WFD status provided (2016-2021):

- Lower Shannon Estuary Transitional - Good
- Foynes Harbour Transitional - High
- Ballylongford - Good
- Upper Shannon Estuary - Poor
- Deel Estuary - Moderate
- Fergus Estuary - Moderate
- Foynes_010 - Poor
- Mouth of the Shannon - Good
- Ballylongford - Good
- Shanagolden - Good

The noted waterbodies are within or hydrologically lined to SAC and SPA designated sites.

There are no bathing waters that may be impacted by the SI works. The closest is Cappagh Pier, Kilrush located approximately 24km west of the proposed MUL Area.

5.3 Biodiversity

5.3.1 European Sites (SAC's and SPA's)

The License Area overlap two European sites (Figure 5.1): the Lower River Shannon Special Area of Conservation (SAC) (002165) and the River Shannon and River Fergus Estuaries Special Protection Area (SPA) (004077).

The qualifying interests of the Lower River Shannon SAC are as follows:

- sandbanks which are slightly covered by sea water all the time [1110]
- estuaries [1130]
- mudflats and sandflats not covered by seawater at low tide [1140]
- coastal lagoons [1150]
- large shallow inlets and bays [1160]

- reefs [1170]
- perennial vegetation of stony banks [1220]
- vegetated sea cliffs of the Atlantic and Baltic coasts [1230]
- Salicornia and other annuals colonising mud and sand [1310]
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
- Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
- water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
- Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]
- alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae)* [91E0]
- freshwater pearl mussel (*Margaritifera margaritifera*) [1029]
- Sea lamprey (*Petromyzon marinus*) [1095]
- Brook lamprey (*Lampetra planeri*) [1096]
- River lamprey (*Lampetra fluviatilis*) [1099]
- Atlantic salmon (*Salmo salar*) [1106]
- common bottlenose dolphin (*Tursiops truncatus*) [1349]
- otter (*Lutra lutra*) [1355].

The qualifying interests of the River Shannon and River Fergus Estuaries SPA are as follows:

- cormorant (*Phalacrocorax carbo*) [A017] (breeding and wintering)
- whooper swan (*Cygnus cygnus)* [A038] (wintering)
- light-bellied brent goose (*Branta bernicla hrota)* [A046] (wintering)
- shelduck (*Tadorna tadorna)* [A048] (wintering)
- wigeon (*Anas Penelope)* [A050] (wintering)
- teal (*Anas crecca)* [A052] (wintering)
- pintail (*Anas acuta)* [A054] (wintering)
- shoveler (*Anas clypeata)* [A056] (wintering)
- scaup (*Aythya marila)* [A062] (wintering)
- ringed plover (*Charadrius hiaticula)* [A137] (wintering)
- golden plover (*Pluvialis apricaria)* [A140] (wintering)
- grey Plover (*Pluvialis squatarola)* [A141] (wintering)
- lapwing (*Vanellus vanellus)* [A142] (wintering)
- knot (*Calidris canutus)* [A143] (wintering)
- dunlin (*Calidris alpina)* [A149] (wintering)
- black-tailed godwit (*Limosa limosa)* [A156] (wintering)
- bar-tailed godwit (*Limosa lapponica)* [A157] (wintering)
- curlew (*Numenius arquata)* [A160] (wintering)
- redshank (*Tringa totanus)* [A162] (wintering)
- greenshank (*Tringa nebularia)* [A164] (wintering)
- black-headed gull (*Chroicocephalus ridibundus)* [A179] (wintering)
- wetlands [A999].

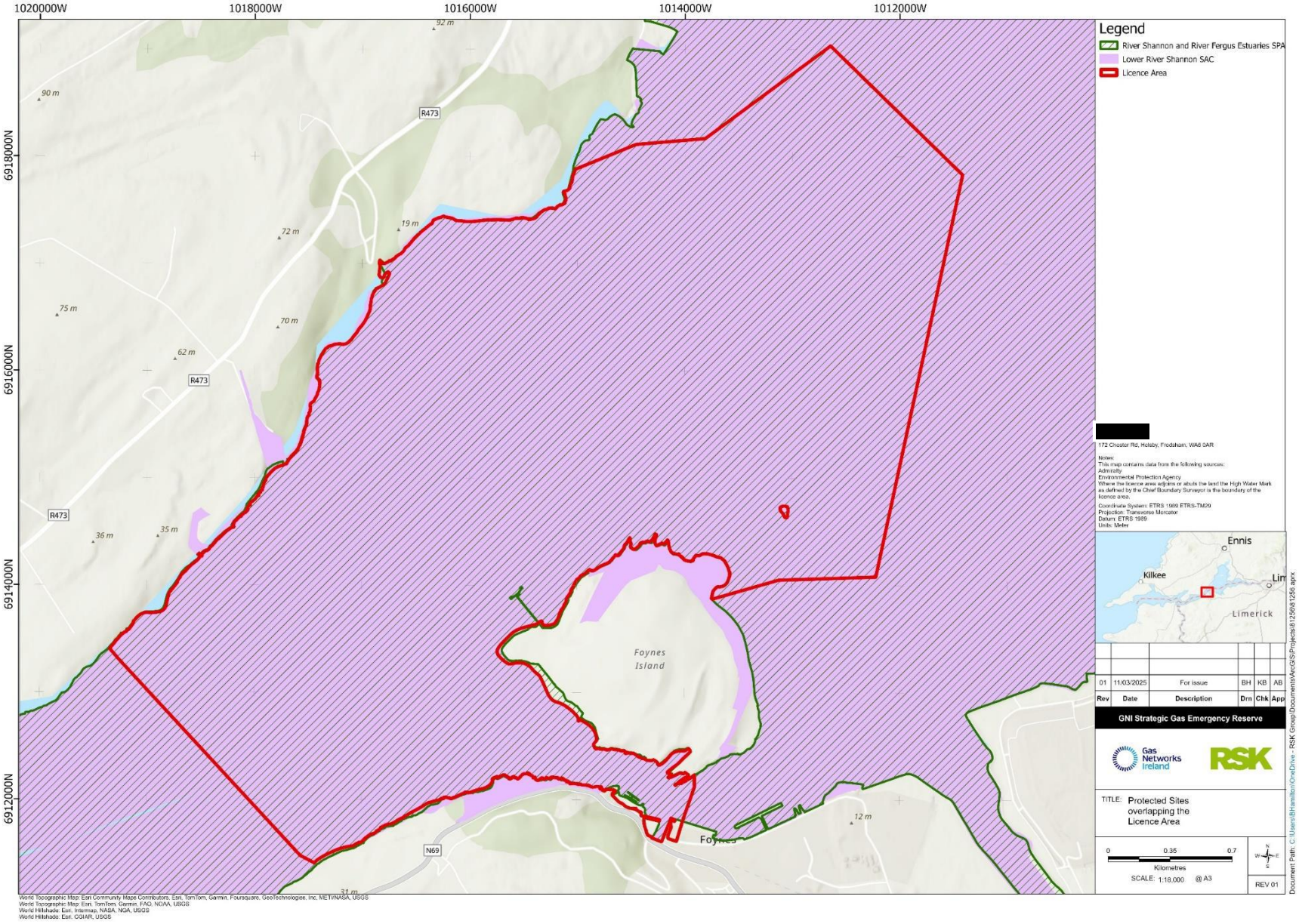

Figure 5.1

Protected areas in proximity to the proposed MUL Area.

Potential impacts on these European sites are considered more thoroughly within Appendix A - Statement to inform Screening for Appropriate Assessment (SISAA) report and Appendix B – Natura Impact Statement, which have been prepared alongside this AIMU. The NIS concluded that the proposed works will not adversely affect the integrity of any European site.

There are also records of sightings of Annex IV species within the proposed MUL Area . A separate Annex IV risk assessment has been prepared (Appendix C) to support this application to assess potential impacts on Annex IV species. Based on the Annex IV species risk assessment, it is concluded that the SI works comply with the system of strict protections afforded by Article 12, 13 and 16 of the Habitats Directive, transposed into Irish law by Regulations 51, 52 and 54 of the Regulations, as amended, and therefore no derogation under article 54 of the Regulations will be required.

5.3.2 Benthic Habitats

The substrate in the proposed MUL Area is dominated by fine sandy habitat with depths up to 50 m below chart datum and provides a number of typically estuarine seabed habitats. The Lower River Shannon SAC includes designation for several protected habitats, such as reefs, mudflats, and sandflats not covered by seawater at low tide (Figure 5.2).

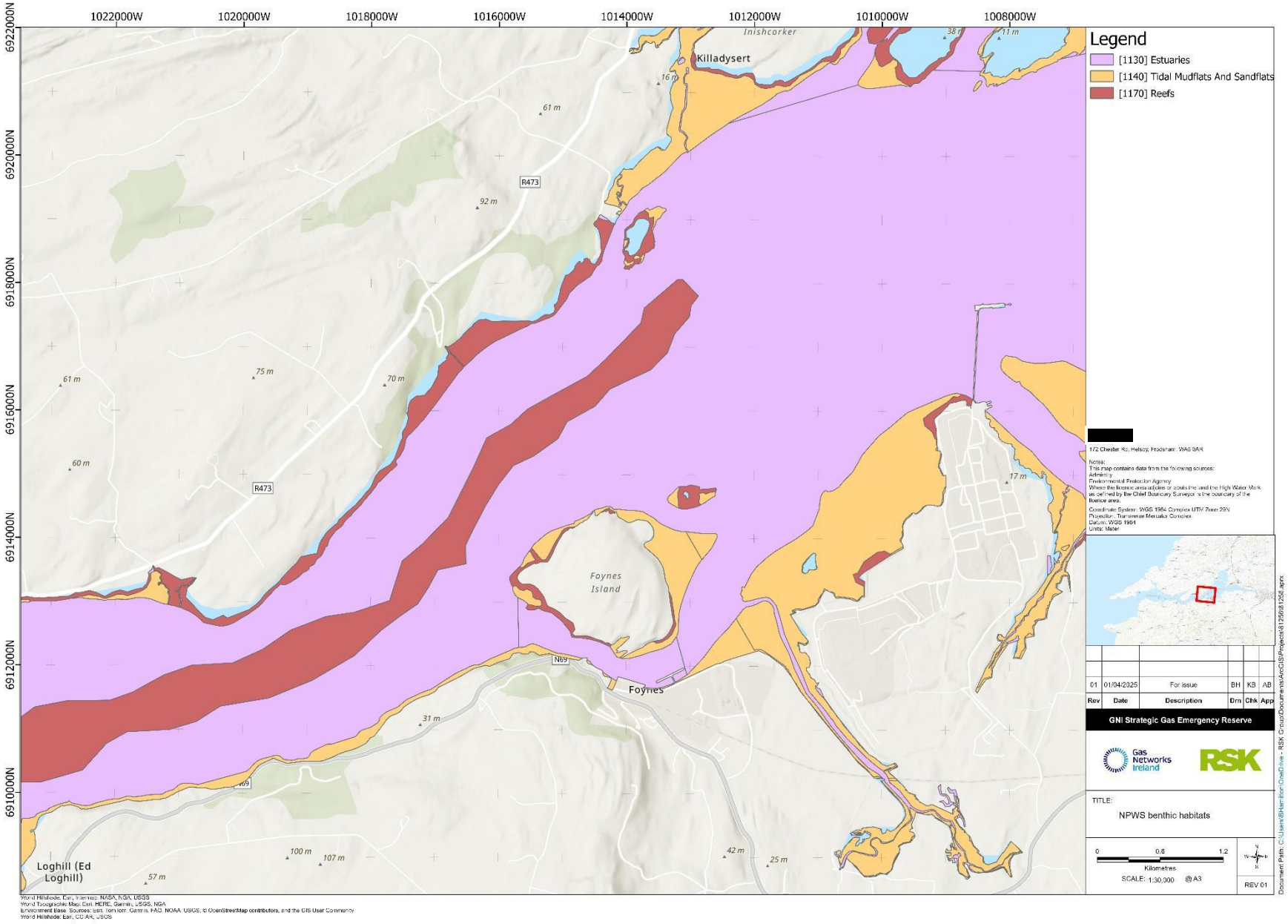

Figure 5.2
NPWS benthic habitat mapping within the vicinity of the proposed MUL Area

5.3.3 Marine Mammals

Bottlenose dolphin (*Tursiops truncatus*) are a QI of the Lower River Shannon SAC, within which the proposed SI works will occur. Bottlenose dolphins are present throughout the year and are genetically discrete compared to bottlenose dolphins found elsewhere in Irish waters due to geographical and social isolation (Mirimin et al., 2011) and that the estuary is an important calving area (MERC, 2021). The population is estimated at around 145 individuals with only 80 adults (Baker et al., 2018 in MERC, 2021). This small, genetically discrete population is vulnerable to even small increases in adult mortality or a reduction in reproduction rates (Blásquez et al., 2020 in MERC, 2021). An overview of existing data on bottlenose dolphin populations in the Lower Shannon Estuary shows that there is a well-known hotspot for the species in the waters off Moneypoint Power Station (MERC, 2021). Rogan et al. (2000) recorded bottlenose dolphins in the estuary all year round with a peak from May to September and noted the presence of neo-natal calves from July to September as evidence of a well-defined breeding season in the Shannon Estuary. There have been a total of 19 dolphin sightings within the last 12 months along the Shannon Estuary, concentrated in the area of the Shannon Ferry route, with 3 dolphin sighted within approximately 3 km of the proposed MUL Area (IWDG, 2025). Hence, there is potential for them to overlap with SI works.

Very few sightings of harbour porpoise (*Phocoena phocoena*) have been recorded within the Shannon Estuary (IWDG, 2025). There was one sighting adjacent to Moneypoint in 2018 (IWDG), and strandings have been recorded as far up the estuary as Foynes (O'Callaghan et al., 2021). Violent interactions have been recorded between bottlenose dolphins and harbour porpoise (Ross and Wilson., 1996; Gross et al., 2020) and suggested reasons for this aggression include interspecies territoriality, defence of group members, food competition, feeding interference and object-orientated play (Gross et al., 2020). Two sightings of harbour porpoise occurred within the past 12 months, located at the entrance of the Shannon Estuary off Aill Na Brun (IWDG, 2025). From the lack of recorded sightings of harbour porpoise within the Shannon Estuary, it is likely that they largely avoid the area. As a result, spatial overlap with harbour porpoise individuals from other SACs within foraging range is considered highly unlikely, and SACs with harbour porpoise as a QI are not considered relevant for ex situ effects within the Shannon.

Telemetry data indicates that harbour seal (*Phoca vitulina*) foraging trips in the south-west of Ireland extend no further than 20 km from haul-out sites (Cronin et al., 2008). No sightings of harbour seal have been recorded in the Shannon Estuary within the last 12 months (IWDG, 2025). The closest European site designated for harbour seal is the Kenmare River SAC, located more than 85 km from the proposed MUL Area . It is therefore highly unlikely that harbour seals from this SAC will be present within the Shannon Estuary and therefore SACs with harbour seal as a QI are not considered relevant for ex situ effects.

Grey seals (*Halichoerus grypus*) have been recorded undertaking foraging trips over hundreds of kilometres, although the mean distance travelled in a telemetry study carried out in 2011 for NPWS was 50.85 km (Cronin et al., 2011). NPWS-funded aerial thermal-imaging of seal in Ireland (Morris and Duck, 2019) shows very low usage of the Shannon Estuary by both harbour seal and grey seal, indicating that the estuary is not likely to be an important area for hauling out. No sightings of grey seals have been recorded in the Shannon Estuary within the last 12 months (IWDG, 2025). The closest European site

designated for grey seal is the Blasket Islands SAC, more than 110 km distance from the proposed MUL Area by sea. While it is possible that individuals from the Blasket Islands population may be present in the Shannon Estuary, it is considered unlikely that the proposed MUL Area represents an important foraging ground and as a result SACs with grey seal as a QI are not considered relevant for ex situ effects.

Otter (*Lutra lutra*) are a designated feature of the Lower River Shannon SAC and inhabit coastal sites where there is suitable habitat, food availability, and shelter for resting and breeding. The population was estimated to be 140 (+/- 12 individuals) in 2006. The shoreline of the Shannon Estuary, including through the proposed MUL Area, is designated as potential otter habitat.

Four Annex IV turtle species known to occur in Ireland include the leatherback turtle (*Dermochelys coriacea*), Kemp's Ridley turtle (*Lepidochelys kempii*), loggerhead turtle (*Caretta caretta*) and hawksbill turtle (*Eretmochelys imbricata*). Leatherback turtles have been recorded along the west coast of Ireland and within the Lower Shannon Estuary (at Ballylongford (1970) and at Kilkee (IWDG, 2025)); however, no sightings of leatherback turtles have occurred in the proposed MUL Area within the last 12 months (IWDG, 2025). Kemps Ridley have been recorded along the west coast at Banna Strand in Co. Kerry (approximately 40 km south-west). This is beyond the proposed surveys boundary with no suspected impacts from the proposed surveys; there have additionally been no recorded sightings of Kemps Ridley turtles and Loggerhead turtles in the Shannon Estuary within the last 12 months (IWDG, 2025), and therefore no significant impacts are expected. One record of hawks bill has been recorded in the south of Ireland at Cork Harbour as bycatch, no records have been noted along the west coast or in close proximity to the proposed MUL Area. Of the turtle species noted in Ireland, Leatherback turtles have the potential to utilise the Lower River Shannon Estuary based on historical records, but as these counts only amount to one or two individuals across many years it is unlikely that they will be present within the proposed MUL Area during the proposed SI works.

Basking sharks (*Cetorhinus maximus*) tend to arrive in Irish waters during spring, with numbers peaking in May and June. There have been several sightings of this species in proximity to the Shannon Estuary over the past 12 months, with recordings concentrated to Aill Na Brun and Derrynadivva (IWDG, 2025). Given the lack of sightings within the estuary itself, it is unlikely basking sharks will be present within the proposed MUL Area during the SI works.

5.3.4 Fish

5.3.4.1 Migratory Fish

The Lower Shannon Estuary is used by several of Ireland's native diadromous fish species as they pass through to or from freshwater spawning grounds or use the area for feeding during maturation. These species include twaite shad (*Allosa fallax fallax*), sea lamprey, river lamprey and Atlantic salmon.

Inland Fisheries Ireland conducted fish stock surveys in the Lower Shannon Estuary in October 2017, recording generally low abundance for most species, with the exception of four species: sprat (*Sprattus sprattus*), common goby (*Pomatoschistus microps*), sand goby (*Pomatoschistus minutus*) and flounder (*Platichthys flesus*) (Coyne et al, 2018). This was consistent with the previous two surveys in 2014 and 2008. Overall, the Shannon Estuary was given a status of "good" for fish populations, an improvement on the previous surveys.

5.4 Fisheries and Aquaculture

Several commercial fisheries activities occur within the Shannon Estuary. Local licensed fishing vessels most frequently partake in pot fishing, gillnets and tangle nets (Shannon Estuary Strategic Integrated Framework Plan, 2013). Licenced aquaculture areas are also known to overlap with the proposed MUL Area. Shrimp fishing also takes place within the later summer and early spring, some of which launches from Tarbert within the proposed MUL Area . Several sections of the Shannon Estuary are also designated under the Shellfish Waters Directive, although not any areas overlap with the proposed MUL Area. The nearest designated shellfish waters are the West Shannon Ballylongford Shellfish Waters located approximately 22km west of the proposed MUL Area.

5.5 Air Quality

Based on recent monitoring undertaken surrounding the proposed MUL Area , nitrogen oxide (NO_2) and sulphur oxide (SO_2) emissions are below the limits of WHO guidelines.

Fine Particulate Matter ($PM_{2.5}$) and Coarse Particulate Matter (PM_{10}) are further below the statutory limits for the protection of human health and WHO guidelines.

Although there are no statutory limits for dust deposition in Ireland, guidance on dust deposition defines nuisance levels dust at 350 mg/m_2/d. Levels of dust deposition in and around the proposed MUL Area are expected to be significantly below this threshold.

5.6 Noise and Vibration

In the terrestrial environment, noise is dominated by road traffic noise, with contributions from other industrial and human noise sources (e.g., port activities) in proximity to the proposed MUL Area . Baseline noise monitoring undertaken as part of the Capacity Extension at Shannon Foynes concluded noise levels during daytime periods within the port itself are within the range 35 – 49dBA during daytime periods, and 32 – 49dBA during night-time periods.

The proposed MUL Area lies within a busy estuarine environment; existing baseline underwater noise levels are elevated in the presence of shipping traffic. Such noise sources attenuate in the environment rapidly due to absorption.

5.7 Landscape and Seascape

The SI works are proposed to occur within the Shannon Integrated Coastal Management Zone (ICMZ). The presence of the estuary is a defining characteristic of the area, with the landscape itself largely of an enclosed farm type, specifically a hedgerow dominant landscape.

The proposed works are also located within the Shannon Estuary and Tralee Bay Seascape Character Area (SCA). The area includes the Shannon Estuary, the mouth of the Shannon, Tralee Bay and extends offshore for 12 nautical miles. The coastline is diverse; the cliffs and coastline along the mouth of the Shannon include dramatic cliffs and sea stacks whilst the southern part of Tralee Bay at Mount Brandon is framed by cliffs and the second highest mountain in Ireland.

5.8 Shipping and Navigation

Passenger vehicle densities around the proposed MUL Area is expected to be high. Cargo and Tanker Vessel Density maps (EMODnet Vessel Density Map, https://emodnet.ec.europa.eu/en/human-activities) of the area further show a high density of vessels operating around Foynes Island. In terms of sailing activity, mapping shows that there is no significant sailing vessel density in the area.

5.9 Marine Archaeology and Cultural Heritage

A review of the Historic Environment Viewer and National monument service wreck viewer (accessed March 2025) indicated the presence of a single known (physical) wreck within the study area which comprises a modern metal wreck (W10603) located on the west shoreline of Foynes Island (ADCO, 2025).

5.10 Population and Human Health

The SI works are not located within any townlands. However, the proposed MUL boundary extends from the townland of Shannakea Beg along the Clare coast to Cahiracon (Ed Killadysert), across the Shannon Estuary to Shannon Foynes Island and along the Limerick coast to the townland of Leahys and Corgrig. Foynes town is relatively small, with a population of approximately 520 people (as of 2016 census), a 4.2% decrease since 2011. The town is dominated by Foynes Port and associated marine related industry, with little residential or recreational uses apparent. The area surrounding Foynes has a number of major industry sites and major employers. These include major multinationals as well as Irish businesses operating in the food, electronics and commodities sectors.

The baseline health and wellbeing of the population in the town of Foynes is shown by the Census of Ireland 2016 results. Of the total population of 946 in the Shanagolden electoral division, 15 people stated that their health was either bad or very bad in 2016. This represents 1.6% of the population. In the same electoral division, 30.4% of the population were aged between 0 and 14 and 33.6% were aged over 65. The average age in Foynes is 40.4 and 52% of residents are over 40 years old.

5.11 Major Accidents and Disasters

The Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations, 2015 (the COMAH regulations) lay down the rules for the prevention of major accidents involving dangerous substances and seek to limit, to the greatest practicable extent, the consequences for human health and the environment of such accidents. The overall objective is to provide a high level of protection in a consistent and effective manner.

This is achieved through tiered controls on the operators of those establishments that are subject to the Regulations: the controls are more onerous where the quantities of dangerous substances present are greater.

Within the proposed MUL Area, two establishments fall within the scope of COMAH regulations:

- Atlantic Fuel Supply Company Ltd. (Upper Tier)
- Exolum Shannon Ltd. (Lower Tier)

A number of natural disasters may impact the SI works, these include:

- Flooding

- Severe weather

Utilities failure, maritime disasters (i.e. oil spill) and industrial accidents may also impact the SI works.

5.12 Climate

The Climate Action Plan (CAP) 2025 sets out the Government of Irelands ongoing, urgent response to the climate crisis. The SI works will not have any significant emissions that would impact the local climate and Irelands response to the climate crisis.

5.13 Wast

No waste will be generated from the SI works, therefore no storage and/or disposal will be required.

5.14 Material Assets

Material Assets are defined as “resources that are valued and that are intrinsic to specific places”.

There is an electricity cable crossing the navigation channel to the west of the port, which provides power to Foynes Island from the mainland. There are no other known utilities in close proximity to the proposed MUL Area .

6 Assessment of Potential Impacts

6.1 Land and Soils

All boreholes and CPTs will be drilled from a jack-up barge with four legs, causing some potential disturbance to terrestrial land and soils for samples that are located in close proximity to the Mean High Water (MHW) line. Each leg is typically less than 1 m^2 in footprint. With the mitigation measures proposed as part of the works and considering the limited scale, size, and duration of the disturbance from the SI works, there will be no likely significant effects on land and soils. No samples will be taken above the MHW line.

6.2 Water

There is some potential for adverse impacts on marine waters during the SI works. The geotechnical investigation works may give rise to a potential pollution risk arising from disturbance of contaminated sediment creating underwater plumes. Plumes of fine sediment carrying suspended silt and/or contaminants can potentially cause deterioration of water quality, with subsequent negative impacts on downstream aquatic habitats and communities, and the species which depend upon them (e.g., fish, foraging birds, resident dolphin etc.).

The SI works are within the Lower Shannon Estuary which flows into the Atlantic to the west. The SI works are not anticipated to result in a significant amount of disturbance of sediments given the predominant substrate type in the estuary and the relatively small footprint of the equipment and number of stations proposed.

If any small amount of silt and/or contaminants does enter the estuary system, this is not anticipated to be in large enough quantities to significantly impact water quality or aquatic habitats/species. Best practice methods and embedded mitigation measures will ensure that significant impacts on surface waters do not arise during the works. Therefore, given the nature, scale, size, and duration of the SI works, the magnitude of impacts on water are not deemed significant.

6.3 Biodiversity

6.3.1 European Sites

The proposed marine SI works will take place within the Lower River Shannon SAC and the Shannon, the River Shannon and Fergus Estuaries SPA. As such, there is the potential for the SI works to have direct impacts on these designated sites. The drilling of boreholes has the potential to cause an impact within a small geographical area, altering baseline conditions. However, it is expected that any impacts will be temporary and reversible after works have been completed. It is unlikely that any major impacts will be experienced if appropriate mitigation measures are put in place.

A document providing Supporting Information for Screening for Appropriate Assessment (SISAA) has been prepared and is submitted with the application for a Marine Area Usage Licence.

From the findings of the Screening exercise, the possibility of Likely Significant Effects upon two of the European sites scoped into the appraisal cannot be excluded in the absence of further evaluation and analysis and quite likely the application of mitigation measures, as a result of the proposed project

alone and in combination with the other projects considered.

- The possibility of likely significant Habitat Loss effects cannot be discounted without further evaluation and analysis.
- The possibility of likely significant Underwater Noise and Disturbance effects cannot be discounted without further evaluation and analysis.

Having regard to the methodology employed and the findings of the screening stage exercise, it was concluded that an appropriate assessment of the implications of the proposed development is required, in view of designated site conservation objectives and in combination with any other relevant plans or projects. As such, a Natura Impact Statement (NIS) has been prepared for the Marine SI works (Appendix B).

6.3.2 Benthic habitats

The SI works will interact directly with benthic habitat, causing some permanent loss and disturbance of habitat for benthic species. Due to the small-scale and temporary nature of this impact on the seabed, it is assessed that there will be no significant impact on benthic biodiversity in the proposed MUL Area. See Figure 5.2 for benthic habitat types in the vicinity of the proposed MUL Area.

6.3.3 Marine Mammals

The SI works, particularly the noise generated by geophysical survey activities has the potential to disturb or injury marine mammals, which are sensitive to underwater noise. However, the small scale and temporary nature of the SI works mean that any impacts are expected to be short term. Overall, significant impact is expected to be unlikely with the implementation of mitigation measures as outlined in Section 7 and in Appendix C.

6.3.4 Fish

It is possible that the SI works could cause impact to fish, including migratory species depending on the months that survey activities are conducted. Due to the small scale and temporary nature of the SI works, it is assessed that there will be no impact on fish species. However, the small scale and temporary nature of the SI works mean that any impacts are expected to be short term. Overall, significant impact is expected to be unlikely with the implementation of mitigation measures as outlined in Section 7.

6.4 Fisheries and Aquaculture

While disturbance to commercial fisheries activity may occur, this disturbance will be of a temporary nature, and it has been assessed that it there will not be significant impact on commercial fishery activity in the proposed MUL Area. The measurements contractor will be responsible for ensuring that survey activities do not interfere with fishery and/or aquaculture grounds. All buoys must be carefully positioned, securely moored, and equipped with appropriate lighting and signalling to minimise navigational risks.

6.5 Air Quality

While emissions to air as a result of vessel exhausts is unavoidable, the level of such emissions would not be significantly above background levels in this area and would not have the potential to lead to Air Quality standards being exceeded. As a result, it is assessed that there will be no impact on air quality in the area.

6.6 Noise and Vibration

Noise will be generated from survey vessels, movement of equipment, sonic drilling, metocean monitoring buoys (specifically ACDPs)and geophysical survey methods which could impact marine mammals and fish. However, the noise generated is expected to be outside of the hearing range of noise-sensitive fish species. Noise from geophysical surveys has the potential to cause disturbance or injury to marine mammals. Due to the temporary nature of the SI works and with the implementation of the mitigation measures as outlined in Section 7, significant impact on marine mammals from underwater noise is assessed as being unlikely.

6.7 Landscape and Seascape

As a result of the works, there will be a short-term presence of the jack-up barge and survey vessel(s) conducting the SI works. This will be temporary, with no permanent impact on landscape or seascape as a result of the SI works. it is assessed that there will be no significant impact on landscape and seascape in the proposed MUL Area.

6.8 Shipping and Navigation

The temporary addition of the survey vessel(s) and infrastructure to the area could result in an impact on shipping and navigation in the area. However, given the temporary nature of the works, there will be no permanent impact as a result of the works. With the implementation of the mitigation measures as described in Section 7, it is assessed that there will be no significant impact on shipping and navigation in the area. The measurements contractor will be responsible for ensuring that survey activities do not interfere with navigation channels. All buoys must be carefully positioned, securely moored, and equipped with appropriate lighting and signalling to minimise navigational risks. The contractor should consult with the port authority or pilot to ensure compliance with local maritime navigation requirements.

6.9 Marine Archaeology and Cultural Heritage

Two wrecking events were recorded at or close to Foynes; a sailing boar wreck “near Foynes Island” in 1788 and the Castleragget in 1833 also near Foynes Island. A single known wreck, noted as a modern metal wreck was identified for the archaeological study area located on the west shoreline of Foynes Island (ADCO, 2025). No impact to known cultural heritage sites is expected from the geotechnical survey, there may however be potential direct / negative impact to unknown archaeological deposits or structures.

Archaeological licensing / consent is required for the marine geophysical survey and the data arising from the geophysical survey is to be subject to archaeological review / interpretation by a maritime archaeologist (ADCO, 2025)

6.10 Population and Human Health

As a result of the works, it is assessed that there will be no potential for impact on population and human health in the area.

6.11 Major Accidents and Disasters

While a risk of an accidental vessel collision or fuel spill is unavoidable, the addition of the vessel traffic, jack-up barge and metocean monitoring buoys associated with the SI works is not considered a significant risk. With the mitigation measures implemented as outlined in Section 7, it is assessed that there will be no significant risk of major accidents and disasters.

6.12 Climate

Other than indirect impacts on climate change resulting from the use of vessel fuel, there is no potential for impact on climate.

6.13 Waste

As a result of the works, it is assessed that there will be no potential for impact on waste in the proposed MUL Area.

6.14 Material Assets

As a result of the works, it is assessed that there will be no potential for impact on material assets in the proposed MUL Area.

6.15 Interactions

Possible interactions between environmental aspects arising from the SI works have been considered to determine impacts in combination. The potential for interaction between all aspects is summarised as a matrix in Table 6.1. The subsequent sections describe the nature and significance of potential interactions.

Table 6.1
Interaction matrix

	Land and Soils	Water	Biodiversity	Fisheries and Aquaculture	Air quality	Noise and Vibration	Landscape and Seascape	Shipping and Navigation	Marine Archaeology and Cultural Heritage	Population and Human Health	Major Accidents and Disasters	Climate	Waste	Material Assets
Land and Soils														
Water	X													
Biodiversity	X	X												
Fisheries and Aquaculture		X	X											
Air quality			X											
Noise and Vibration			X	X										
Landscape and Seascape														
Shipping and Navigation					X	X								
Marine Archaeology and Cultural Heritage	X						X							
Population and Human Health		X		X	X	X	X	X						
Major Accidents and Disasters								X						
Climate														
Waste														
Material Assets	X	X	X	X										

6.15.1 Land and Soils

Water: There is a potential interaction between Land and Soils and Water. During borehole and grab sampling, sediment will potentially become suspended in the water column. Currents and tides are expected to carry any disturbed sediment, likely beyond the proposed MUL Area. However, the amount of sediment suspended in the water column is expected to be relatively minor and the interaction will be short-term, allowing conditions to return to baseline when works are complete.

Biodiversity: As aquatic and avian ecology depends on surface water quality, there is a potential interaction between Land, Soil and Biodiversity. During drilling, seabed sediment can temporarily be released and suspended, which could negatively impact local water quality and its dependant habitats and aquatic ecology. Due to its localised negative impact, risk to biodiversity is considered low and mitigation measures have been proposed. The benthic ecology could also be potentially impacted by the proposed SI works. As sampling methods include drilling on the seabed and potential disturbance around the sampling stations/sites, the resulting sediment resuspension could affect the benthic ecology in the area. However, any disturbance is expected to be relatively minor as the suspended sediment will quickly disperse given the strong currents in the area. Sedimentary benthic habitats identified within the survey area are widespread and common I the area. Any disturbance is not expected to have an effect on the wider population of benthic fauna.

Marine Archaeology and Cultural Heritage: Land and Soil environmental aspects could potentially interact with Marine Archaeology and Cultural Heritage as sediment disturbance could potentially impact unknown archaeology. Areas of archaeological significance will be identified through archaeological survey and assessment and monitoring and examination will be put in place during the SI works. Prehistoric and recent sites, and fish traps of cultural importance have been located in the wider area of Foynes. Foynes area's archaeological records a high cultural potential for the Island, thus appropriate mitigation measures to protect archaeological and cultural significant sites and material, will be put in place.

Material Assets: The navigation channel between Foynes Island and the mainland is crossed by a power cable. The foreshore has been extensively assessed, and no impacts are anticipated on the utilities as a result of the SI works.

6.15.2 Water

Biodiversity: Designated sites are present in the proposed SI area. These water dependant protected sites and key species, such as estuaries, mud and sand flats, Atlantic salmon, sea lamprey, eel and smelt, may be affected by the SI works. Even if it is unlikely that significant impacts will arise, minor interactions could occur. Thus, appropriate mitigation measures are recommended to ensure minimal interaction between water quality and biodiversity.

Fisheries and Aquaculture: Due to the temporary nature, size and distance between the proposed MUL Area and shellfish waters, no impacts are expected. However, interactions can be expected between water quality and fisheries and aquaculture surrounding Foynes Island, hosting a diversity of resident and migratory fish species (i.e. Atlantic salmon, river and sea lamprey). As the SI works are largely limited to the foreshore, interactions are expected to be minimal. Mitigation measures have been established to reduce and address potential interactions between fisheries and aquaculture and

water quality.

Population and Human Health: SI works will be carried in an area away from Foynes town, implying little interaction between water quality and population and human health. Water quality can interact with use of water dependent leisure activities around the Foynes Yacht club. Established mitigations should ensure that there are no significant impacts on population and human health.

Material Assets: Sampling has the potential to disturb sediment and disperse them in the water column. However, due to the minor volume of the dispersed sediment and dispersive nature of the currents, no significant impacts are expected on water quality.

6.15.3 Biodiversity

Fisheries and Aquaculture: There are four designated shellfish waters in the Shannon estuary, however none are in the foreshore boundary where the SI will take place. Equally, no licenced aquaculture is located in the working area; the closest being 800m away from the area. Shrimp fishing takes place early spring and summer. Sea and river lamprey use the Shannon estuary for spawning and migration within the later summer and early spring. These areas are not expected to be significantly impacted as the scale of work is small and the dispersive nature, sediments will be quickly dispersed.

Air Quality: Small plant machinery will temporary be used for SI. Little interaction is expected between biodiversity and air quality. Continuous air monitoring (NO_2, SO_2, Fine Particulate Matter ($PM_{2.5}$), Coarse Particulate Matter (PM_{10}) and Total Particulate Matter (General Dust) are carried out by the EPA. No significant impacts are expected from air particles on biodiversity as the SI work are in a small scale and limited to plant machinery.

Noise and Vibration: It is very likely that noise and vibration will interact with biodiversity. Protected species and marine mammals are expected to be impacted by underwater noise resulting from plant equipment movement, sediment sampling and geophysical survey. Noise and vibration can also interact with the larger area beyond the proposed MUL Area. Annex IV Species Risk Assessment, Appendix C and Section 7 outlines mitigations measures to be implemented to lessen any impacts.

Other species especially fish such as Atlantic salmon, sea and river lamprey, are sensitive to rapid change of pressure, particle motion and not sound pressure. No detonation is planned and geophysical surveys are thus not expected to have significant negative impact to fish.

Material Assets: Interactions between Biodiversity and Coastal Physical processes are expected, as the SI have the potential to displace sediments. However, the amount of sediment is anticipated to be minimal and not have significantly effects on the normal sediment transport regimes in the area and benthic ecology. Thin layers of smothering due to the displaced sediment are unlikely due to strong currents in the area. As the benthic habitats identified within the SI area, are widespread and common to the region, disturbances are not expected to have significant impacts on the wider population of benthic fauna and effects on sedimentary habitats will be minor.

6.15.4 Fisheries and Aquaculture

Noise and Vibration: Noise and Vibration for the SI works are likely to increase existing underwater noise levels. Impacts are however considered low, as their presence will be local and temporary. Moreover, marine species such as Atlantic salmon, river lamprey, sea lamprey, smelt and eel, are unlikely to be affected by the noise level.

Population and Human Health: Potential interaction between Fisheries and Aquaculture and population and human health can be expected dependant if the SI works impact the quality of shellfish. Water quality assessment and mitigation measure will be applied to ensure minimal interaction on population and health.

Material Assets: Potential interaction between Fisheries and Aquaculture and Coastal Processes can be expected, due to minor disturbances around borehole / sampling stations, loss of substratum and / or smothering. However, significant impacts are unlikely given the dispersive nature of the current in the area.

6.15.5 Air Quality

Shipping and Navigation: The SI works will involve mobilisation and demobilisation of marine plant at the Foynes port. Such activities are not expected to reduce air quality and no significant increase of emissions and dust are anticipated.

Population and Human Health: Transport required as part of the SI works is minimal, limiting emissions and air quality impacts. Negligeable impacts on population and human health are expected.

6.15.6 Noise and Vibration

Shipping and Navigation: The SI works will require traffic and transport and mobilisation and demobilisation of marine plant from the port of Foynes to the proposed MUL Area. As the Foynes port is an operationally busy port, these proposed activities are not expected to significantly increase baseline noise levels.

Population and Human Health: The SI works will take place away from habitation areas, in the Shannon estuary. Increase in noise levels confined to the foreshore area are not expected to negatively interact with population and human health.

6.15.7 Landscape and Seascape

Marine Archaeology and Cultural Heritage: Temporary and short term impact is expected from presence of marine plant for SI works. Negligeable impacts are anticipated on marine archaeology and cultural heritage.

Population and Human Health: Presence of marine plant during SI works close to the Foynes Port, are expected to interact with the visual factor to the population. Impacts will however be temporary and are not anticipated to have permanent impacts on population and human health, as the vessels used for the SI works are comparably smaller than large cargo vessels navigating in the area.

6.15.8 Shipping and Navigation

Population and Human Health: To ensure safety and avoid disruption to commercial and industrial activities, a marine notice will be issued. Moreover, necessary health and safety procedures, including cognisance of marine safety will also be applied by the Marine SI contractors. Negligeable interaction is expected between shipping and navigation and population and human health.

Major Accidents and Disasters: The SI works have the potential to impact on major accidents and disasters as the SI works is located in a busy navigational area. The SI works will be temporary and mitigation measures will be implemented to ensure minor interactions.

7 Summary of Mitigations

This AIMU report assesses potential impacts from the SI works on the environment. Mitigation measures described in this section are designed to eliminate likely significant effects or reduce such effects to an acceptable level. The recommended mitigation measures and monitoring programmes, as listed within Table 7.1 below, will be fully implemented as described during the SI works.

Table 7.1

Recommended mitigation measures and monitoring programmes

Receptor	Potential Impact	Summary of Proposed Mitigation
Land and Soils	Impact on marine sediments	• No mitigation measures are required for land and soils as the works are deemed to have negligible to minor impacts.
Water Quality	Impact on water quality Introduction of INNS	• All equipment shall be cleaned and checked before use on site. • Refuelling will occur offsite where possible. • Any oil/fuel stored on site will be kept in adequate storage for containment of any potential spills or leaks. • A spill response kit will be available onsite and accessible for control of pollution incidents. • Spill response kit will be regularly inspected and replaced immediately if used. • Toolbox talks prior to work commencing will communicate to staff and contractors regarding refuelling procedures and procedures in the event of a spill.
Biodiversity	Impact on designated sites Impact on benthic ecology/habitats Impact on marine mammals Impact on fish	• In alignment with NPWS guidance, a mitigation zone of 500 m radius will be implemented for marine mammals. Geophysical survey works will not commence if marine mammals are within this zone. • No mitigation measures are required for benthic ecology or fish as the works are deemed to have negligible to minor impacts.

Receptor	Potential Impact	Summary of Proposed Mitigation
Fisheries and Aquaculture	Accidental spills from plan equipment may cause a negative impact on water quality and therefore on shellfish waters and aquaculture	• Implementation of Water Quality mitigation measures
Air Quality	Impact on air quality	• No mitigation measures are required for air quality as the works are deemed to have negligible or minor impacts.
Noise and Vibration	Impact on marine mammals Impact on fish	• In alignment with NPWS guidance, a mitigation zone of 500 m radius will be implemented for marine mammals. SBP and marine refraction seismic survey works will not commence if marine mammals are within this zone. • Soft start procedures will be used, when necessary, upon starting SBP and marine refraction seismic activities. • No mitigation measures are required for fish as the works are deemed to have negligible or minor impacts.
Landscape and Seascape	Impact of jack-up barge on landscape and visual	• No mitigation measures are required for landscape and seascape as the works are deemed to have negligible or minor impacts.
Shipping and Navigation	Injury and/or death of staff undertaking the marine SI Injury and/or death of port staff or crew of ship Collision of sampling vessels and other vessels Sampling vessels running aground Striking or disruption of utilities (e.g., gas mains, electricity cables, water mains) under the seabed during borehole drilling.	• To ensure safety for the duration of the SI, effective communication between ship operators, port staff and sampling staff will be prioritised. • In the unlikely event of each of the following impacts, appropriate planning, mitigation and safety procedures, will be implemented • The receptor sensibility and the magnitude of the impacts are anticipated to be medium. Impacts are expected to be minor. • A Marine Notice will be issued prior to the SI works to make operators

Receptor	Potential Impact	Summary of Proposed Mitigation
		aware of safety procedures. The Marine SI contractor will have all necessary health and safety procedures in place before commencement of the SI works. • The jack up barge and metocean monitoring buoys will be positioned outside of navigation channels with appropriate lighting and signalling to mitigate risks to navigation.
Marine Archaeology and Cultural Heritage	Potential for discovery of material of archaeological/historical significance Impacts on cultural heritage	• Marine geophysical and archaeological surveys, along with assessments of terrestrial, intertidal, and underwater areas, will be carried out to detect potential anomalies or features of archaeological significance. • Pre-disturbance inspection will be carried if any potential features are detected. • It is recommended that archaeological monitoring of sites are to be conducted by licenced and experienced maritime personnel (Section 5 of National Monuments Act (2004 Amendment)). Monitoring of seabed and intertidal disturbances will be carried out during works. • Marine works should include a timescale which should be made available to archaeologist with sufficient notice. • Licence applications should be in place in advance of commencement of SI works. • In the event of discovery of archaeological material, all geotechnical work should cease in the immediate area to allow archaeologist to record any such

Receptor	Potential Impact	Summary of Proposed Mitigation
		material. • A suitable archaeological team are to be on standby at the site to identify if the material is of archaeological significance. Such material is to be removed. • Secure site offices should be provided, where excavation is required. • Cost of excavation, post-excavation analysis and conservation testing should be made available.
Population and Human Health	Interaction with water quality Interaction with Fisheries and Aquaculture Interaction with Air quality Interaction with Noise and Vibration Interaction with Landscape and Seascape Interaction with Shipping and Navigation	• No mitigation measures are required for landscape and seascape as the works are deemed to have negligible or minor impacts.
Major Accidents and Disasters	Injury and/or death of staff undertaking the marine SI Injury and/or death of port staff or crew of ship Collision of sampling vessels and other vessels Sampling vessels running aground Striking or disruption of utilities (e.g., gas mains, electricity cables, water mains) under the seabed during borehole drilling	• In order to make mariners aware of the operations, a Marine Notice will be issued in advance of the SI works. • The Marine SI Contractor will have all the necessary health and safety procedures in place, including cognisance of maritime safety.
Climate	Impact on climate goals	• The SI works will not have any significant emissions that would have a significant impact on the local climate. • Use of natural resources and energy will be restricted to the powering of the marine plant for the SI which will be fit for purpose and subject to the best practice measures.
Waste	Impacts on human heath	• No waste will be generated as part

Receptor	Potential Impact	Summary of Proposed Mitigation
		of the SI works.
Material Assets	Impact of site works on traffic and transport Disturbance of utilities in area Coastal Processes – impact on tidal flows, waves, and sediment transport Shellfish Waters – proximity of works to shellfish waters	• No mitigation measures are required for Material Assets as the SI are deemed to have negligible or minor impacts.

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9 Appendix A – Supporting Information for Screening for Appropriate Assessment

Gas Networks Ireland

Strategic Gas Emergency Reserve – Marine Site Investigation (SI) Works

Supporting Information for Screening for Appropriate Assessment (SISAA) Report

RSK General Notes

Project No.: 81256

Title: Strategic Gas Emergency Reserve – Supporting Information for Screening for Appropriate Assessment (SISAA) Report

Client: GNI

Date: 25 July 2025

Office: Helsby

Status: Rev04

Author	[redacted]	**Technical reviewer**	[redacted]
Signature	[redacted]	Signature	[redacted]
Date	17 July 2025	Date	17 July 2025
Project manager	[redacted]	**Quality reviewer**	[redacted]
Signature	[redacted]	Signature	[redacted]
Date	25/07/2025	Date	25/07/2025

Contents

1 Introduction

1.1 Overview

Following a review carried out by the Department of the Environment, Climate and Communications (DECC) of the Security of Energy Supply of Ireland's Electricity and Gas Systems, there is need to improve the resilience of Ireland's natural gas supplies and infrastructure in the event of a disruption to the country's natural gas supplies for the short to medium term.

Energy Security in Ireland (ESI) to 2030 outlines a comprehensive strategy aimed at ensuring energy security throughout the current decade while facilitating a sustainable transition towards a carbon-neutral energy system by 2050.

Action 17 of ESI proposes the implementation of a "Strategic Gas Emergency Reserve to protect Ireland in the event of a gas supply disruption as Ireland makes a secure transition to a majority renewable energy".

In January 2025, the Government of Ireland issued the "Programme for Government 2025 – Securing Ireland's Future" which included the commitment that the government will "Take all necessary action to ensure and protect Ireland's energy security".

In March 2025, the Government of Ireland gave approval to proceed with the development of a State-led strategic gas emergency reserve. The delivery of a temporary gas reserve is deemed critical to Ireland's energy security as we continue to transition to indigenous, clean renewable energy.

Based on the above decision, Gas Networks Ireland (GNI) proposes to construct a receiving terminal and jetty to accommodate a Floating Storage and Regasification Unit (FSRU), which will allow for the importation of and storage of Liquified Natural Gas (LNG) within Ireland's jurisdictional waters. The FSRU will be connected to the national grid network for injection in case of a supply emergency. The project will involve the construction of a receiving terminal and jetty to accommodate the FSRU. Depending on the site chosen, there may be capital dredging required.

GNI intends to apply to the Maritime Area Regulatory Authority (MARA) for a Maritime Usage Licence (MUL) to conduct marine Site Investigations (SI) and environmental surveys within the Shannon Estuary adjacent to the townlands of Shannakea Beg, Cahiracon, Foynes Island, Leahys and Corgrig.

This report has been prepared as part of the MUL application process. The proposed works are designed to provide high quality baseline data that will contribute to site selection and any subsequent design, EIAR, and Appropriate Assessment, undertaken for the Strategic Gas Emergency Reserve (SGER) Project; in the event that a site is taken forward to the planning/consenting stage.

1.2 Purpose of the report

This document has been prepared by RSK Environment Ltd. on behalf of GNI in support of the Maritime Usage Licence Application to the MARA. The goal of this report is to provide supporting information necessary for the MARA to reach a Screening for Appropriate Assessment (AA) Determination. . Under Section 177U (5) of the Planning and Development Act 2000 (as amended), the competent authority shall determine that an AA of a proposed development is not required if it can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other

plans or projects, will have a significant effect on a European site. This report contains an analysis on whether the works are likely to have a significant effect on a European site/s in view of the site's conservation objectives. The results of the site survey and investigation work will also be used to provide baseline data for any subsequent Environmental Impact Assessment Report (EIAR) and Appropriate Assessment Natura Impact Statement (NIS) should the development be taken forward to the planning/consenting stage.

1.3 Statement of Authority

This report has been prepared by RSK on behalf of GNI. The technical competence of the authors is outlined below:

[redacted] is Technical Director within the International Projects Group Marine Team in RSK. He has over 20 years of experience in marine environmental surveying and consulting. He holds an honours degree in Marine Biology and Oceanography and a Masters in Marine Resource Development and Protection. He has particular experience in marine ecology surveys, and the subsequent analysis and reporting of marine survey data for EIA projects, and AA and Annex IV species reports.

[redacted] is a Senior Marine Consultant within the International Projects Group Marine Team in RSK. She has over 10 years of experience in the marine ecology field. She holds an honours degree in Marine Science and a Masters in Biology. She has contributed to numerous marine environmental projects including AA Screening, Natura Impact Statements and EIAR chapters.

This Supporting Information for Screening for Appropriate Assessment (SISAA) report has been prepared in compliance with the legislative and policy requirements described below.

1.4 Legislation

1.4.1 European Legislation

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) provides protection for habitats and species of European importance; Council Directive 79/409/EEC (the Birds Directive) aims to protect all 500 wild bird species naturally occurring in the European Union (EU). Areas designated for protection under the Habitats Directive are described as Special Areas of Conservation (SAC) and those designated under the Birds Directive, as Special Protection Areas (SPA) and the sites are known collectively as Natura 2000 sites (see Section 1.4.2.5). As each member of the EU is required to designate areas in their jurisdictions, the establishment of this network of Natura 2000 sites under Articles 3 to 9 of Directive 92/43/EEC is the key measure to protect nature and biodiversity in the EU.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to have a significant effect on or to adversely affect the integrity of Natura 2000 sites. Article 7 of the Habitats Directive extends the scope of its articles 6(3) and 6(4) to the Birds Directive.

Article 6(3) establishes the requirement for Appropriate Assessment (AA):

"Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the

site's conservation objectives. Considering the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the public."

Further detail on the stages of AA is provided in Section 3.2 of this report.

Each Natura 2000 site has assigned Conservation Objectives (COs) and a list of Qualifying Interests (QI). The CO concept appears in the eighth recital of Directive 92/43/EEC which reads: "whereas it is appropriate, in each area designated, to implement the necessary measures having regard to the conservation objectives pursued". Article 1 then explains that "conservation means a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status".

The National Parks and Wildlife Service (NPWS) has established COs for each Natura 2000 site in Ireland. These are published on their website. NPWS advise in the general introductory notes of their site-specific conservation objectives (SSCO) series publications, that an appropriate assessment based on their "published conservation objectives will remain valid even if the CO targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out".

NPWS advise that to assist in that regard, it is essential that the date and version are included when objectives are cited.

1.4.2 National Legislation

1.4.2.1 Maritime Area Planning Act

The Maritime Area Planning Act, 2021 (as amended) established the Maritime Area Regulatory Authority (MARA). One of the functions of MARA is to consider licence applications and the granting of licences.

Schedule 7 of the Maritime Area Planning Act, 2021 (as amended) lists maritime usages which may be undertaken in the maritime area pursuant to licence. Of relevance to this site investigation project are the following items within Schedule 7:

3. Marine environmental surveys for the purposes of site investigation or in support of an application under Part XXI of the Act of 2000.

5. The installation of non-permanent platforms, pontoons, or slipways.

6. The deposit of any substance or object, either in the sea or on or under the seabed, from-

a) a vehicle, vessel (including a craft capable of travelling on, in or under water, whether or not self-propelled), boat, aircraft or marine structure (other than a pipeline).

7. The use of a vehicle, vessel (including a craft capable of travelling on, in or under water, whether or not self-propelled), boat, aircraft, marine structure (other than a pipeline) or floating container to remove any substance or object from the seabed.

11. The deposit, construction or removal of any mooring not requiring authorisation under any other enactment.

12.

a) The removal of beach material from, or the disturbance of beach material in, the maritime area otherwise than in the course of the ordinary or reasonable recreational enjoyment of the maritime area.

b) In this paragraph, "beach material" means sand, clay, gravel, shingle, stones, rocks, mineral substances, seashells, coral and maerl and any flora, in or on the surface of the seabed or suspended in the water of the maritime area, and includes outcrops of rock or any other mineral substance above the surface of the seabed.

GNI is applying to MARA for the grant of a licence for the above Schedule 7 usages, as more fully described in Section 2 of this report.

1.4.2.2 Requirements in Relation to Appropriate Assessment

The following definitions in relation to AA are included in Section 2(1) of the Maritime Area Planning Act, 2021 (as amended):

"screening for appropriate assessment" shall be construed in accordance with, as appropriate—

a) section 177U of the Act of 2000, or

b) (b) Part 5 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011)

"appropriate assessment" shall be construed in accordance with, as appropriate—

a) section 177V of the Act of 2000, or

b) Part 5 of the European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477 of 2011);

where the Act of 2000 refers to the Planning and Development Act 2000 (as amended).

The European Communities (Birds and Natural Habitats) Regulations 2011 have also been amended.

Under Section 112 of the Maritime Area Planning Act, 2021 (as amended), MARA has been designated as a competent authority for the purposes of Part 5 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011); and appropriate assessments to which that Part applies.

MARA is required to carry out a screening for AA in accordance with Section 117(4)(a) of the Act.

Where MARA determines that an AA is required it shall carry out the AA in accordance with Section 117(7)(a) of the Act.

1.4.2.3 Screening Out for AA

Under Section 177U (5) of the Planning and Development Act 2000 (as amended), the competent authority shall determine that an AA of a proposed development **is not required** if it can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.

Under Regulation 42(7) of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) the public authority shall determine that an AA of a project **is not required** where the plan or

project is not directly connected with or necessary to the management of the site as a European Site and if it can be excluded on the basis of objective scientific information following screening that the project, individually or in combination with other plans or projects, will have a significant effect on a European site.

1.4.2.4 Screening In for AA

Under Section 177U (4) of the Planning and Development Act 2000 (as amended), the competent authority shall determine that an AA of a proposed development **is required** if it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.

Under Regulation 42(6) of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) the public authority shall determine that an AA of a plan or project **is required** where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it cannot be excluded, on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site.

Where the competent authority determines that an AA is required, they shall make a determination under Article 6.3 of the Habitats Directive as to whether or not the proposed development would adversely affect the integrity of a European site and an appropriate assessment shall be carried out by the competent/ public authority before consent is given for the proposed development (see Section 177V(1) of the Planning and Development Act 2000 (as amended) and Regulation 42(11) European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

1.4.2.5 European Sites and Natura 2000 Sites

The term European site is defined in the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) as:

"European Site" means—

a) a candidate site of Community importance,

b) a site of Community importance,

c) a candidate special area of conservation,

d) a special area of conservation,

e) a candidate special protection area, or

f) a special protection area.

The term Natura 2000 site is defined in the same Regulations as:

"Natura 2000" means the European network of SACs under the Habitats Directive and SPAs under the Birds Directive, provided for by Article 3(1) of the Habitats Directive and, for the purposes of these Regulations, includes European Sites.

The two terms are often used interchangeably. For the purposes of this report, the term European site is used.

2 Project Description

2.1 Site Location

The proposed MUL Area covers an area of 11.19km^2 and extends from the townland of Shannakea Beg along the Clare coast to Cahiracon (Ed Killadysert), across the Shannon Estuary to Shannon Foynes Island and along the Limerick coast to the townland of Leahys and Corgrig (Figure 2.1). The works described in this application relates solely to the SI / sampling works within the proposed MUL Area (Figure 2.2 and Figure 2.3). Marine SI is required to inform preliminary design and facilitate environmental assessment in advance of Planning for the SGER project. Site investigations are to be completed over two phases, with Phase 1 being used to determining the optimum location of the SGER and Phase 2 being used at a later date to coordinate with the detailed design stage.

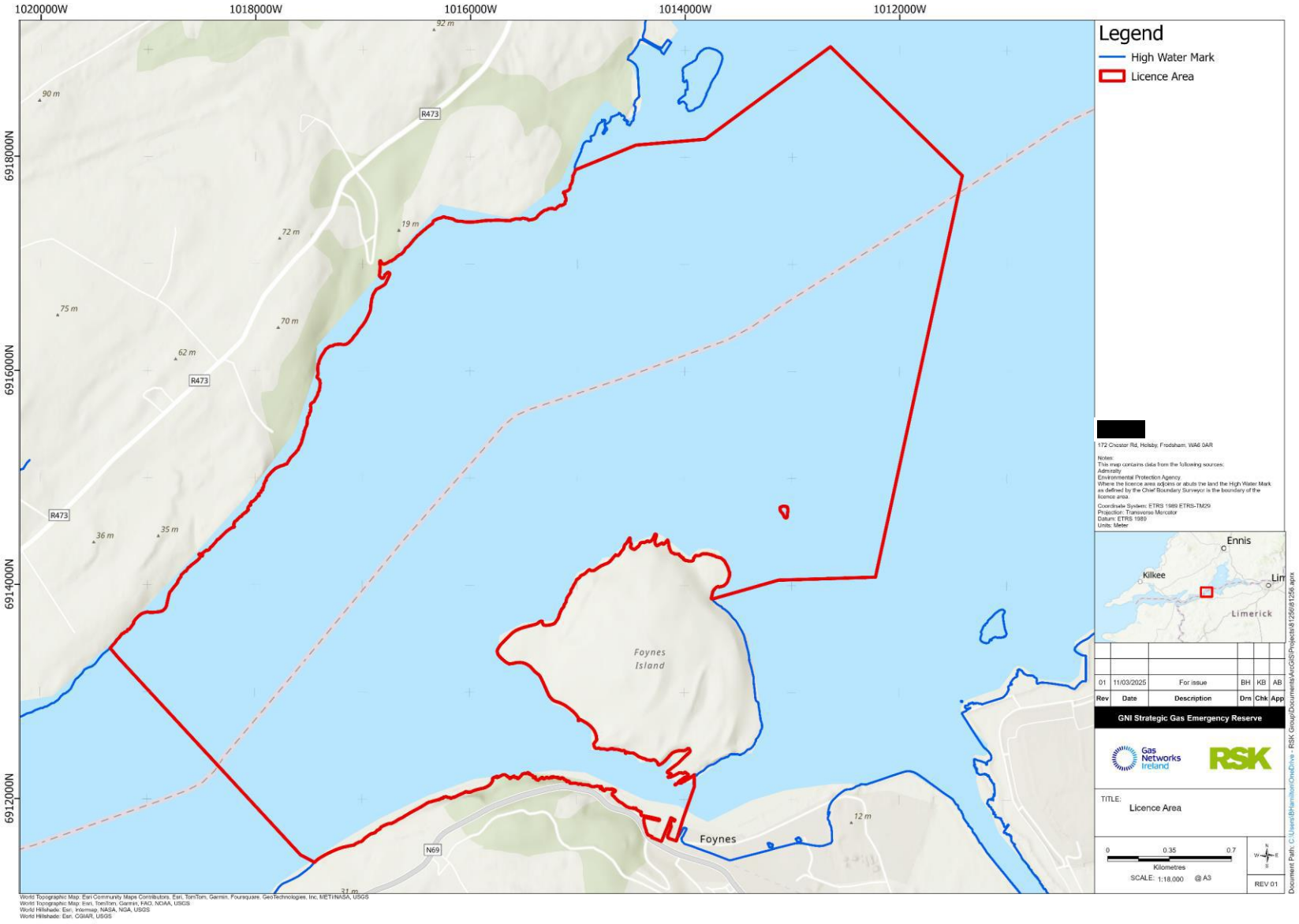

Figure 2.1
Proposed MUL Area

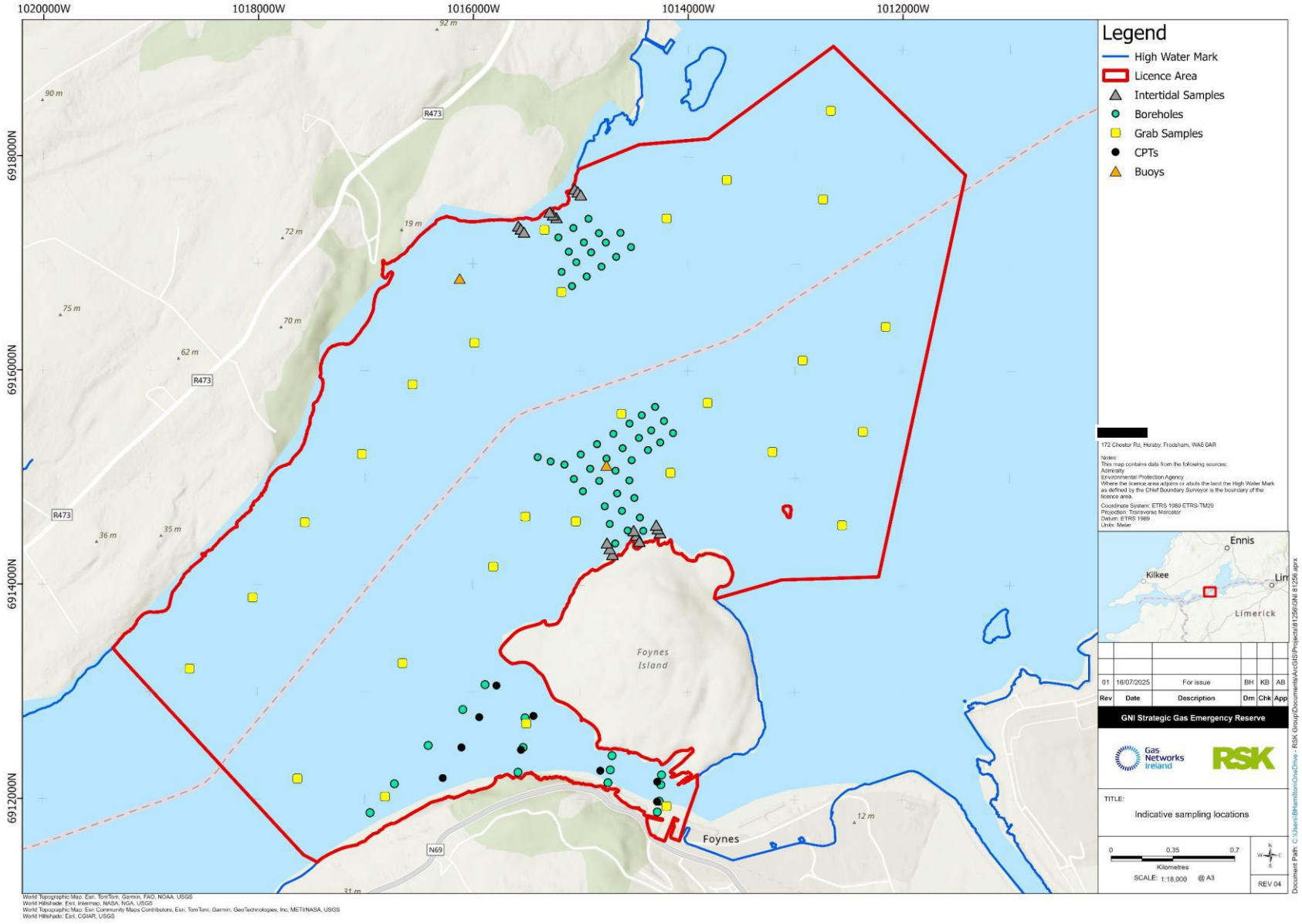

Figure 2.2
Indicative sampling location

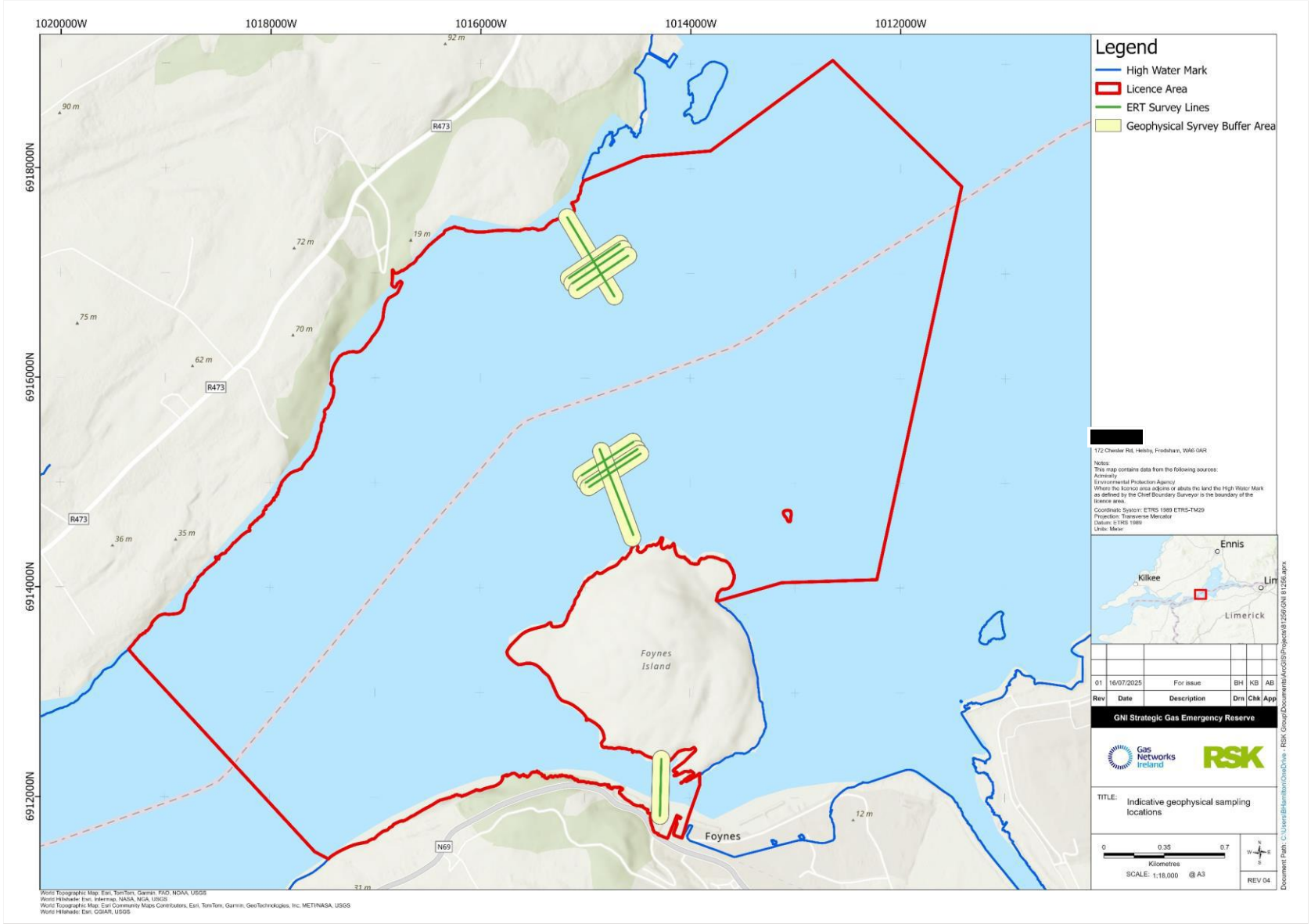

Figure 2.3

Indicative Geophysical Survey and Electrical Resistivity Tomography (ERT) electrode deployment locations

2.2 Description of the Works

2.2.1 Overview

The objective of the proposed surveys is to provide high-quality data that can contribute to a reliable baseline for site selection and subsequent project design and development as well as informing the EIA. As such, the following survey investigations are considered necessary and detailed further in Table 2.1:

- Drop-down camera survey
- Geophysical survey, including:
  - Magnetometer
  - Sub-bottom profiler
  - Side-scan sonar
  - Multibeam Echo Sounder (MBES)
  - Marine Refraction Seismic
  - Marine Electrical Resistivity Tomography (ERT)
- Boreholes
- Cone penetration tests (CPTs)
- Grab samples
- Surface water samples
- Intertidal walkover survey
- Intertidal core samples
- Archaeological surveys and other investigations (i.e. underwater inspections, walkovers, metal detectors, dive surveys).
- Deployment of metocean monitoring buoys to collect physical oceanographic data.

These works are collectively referred to as the Site Investigation (SI) works throughout this report.

Indicative sampling locations within the proposed MUL Area are designed to inform a potential jetty and vessel, with the addition of potential pipeline route options from the southwest side of Foynes Island to the mainland. It should be noted that all locations shown for sampling within the proposed MUL Area are indicative and may be subject to a degree of change on-site.

The following drawings have been prepared in support of the Maritime Usage Licence application to the MARA:

- Proposed Licence Area Map
- Proposed Grab Sample Locations Map
- Proposed Borehole Locations Map
- SI Indicative Table of Coordinates

The exact technical specification of the equipment to be used will not be known until the survey contract has been awarded. However, descriptions of typical equipment and survey parameters has been used within this report.

Predicted time and footprint for the activities are presented in Table 2.2. 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 borehole locations

and quantities.

There will be no permanent structures and all site investigation works will be temporary in nature. The moving marine plant will remain on site for the duration of the works.

2.2.2 SI Schedule

The intention is to begin SI activities as soon as feasible following MUL award. Timing of the SI activities is dependent on many factors including weather, tidal flows, availability of vessels and the grant of the MUL. The granting of the MUL will have a direct effect on the timing of SI activities. The duration of the phase 1 SI works is approximately 16 weeks and are currently scheduled for Q3 2025. Phase 2 SI works (if required) will be carried out at a later date to coordinate with the detailed design stage which is dependent on consenting for the main project. The proposed licence duration is for 5 years to account for potential delays in the consenting process.

Table 2.1
Description of proposed works

Survey	Method	Method detail	Sampling Effort
Geophysical	Side Scan Sonar (SSS)	SSS surveys are used to determine sediment characteristics and seabed features. The EdgeTech 4205 may be taken as an indicative example of an SSS device and for these surveys will have a potential operating frequency range of approximately 300/600kHz in the offshore area and 600/900kHz in the shallower nearshore area with sound pressure levels of 220-230dB re1µPa @1m. The SSS will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing	SSS may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Magnetometer	A magnetometer is used to identify magnetic anomalies and hazard mapping for metal obstructions, shipwrecks and unexploded ordnance on the surface and in the shallow sub-surface. The Geometrics G-882 can be taken as an indicative equipment example. It is a passive device (i.e. it does not emit any sound waves into the marine environment) the sensor responds to local variability in magnetic field. The magnetometer will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	Magnetometer survey may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) – Parametric Sub Bottom Profiler	SBP is used to develop an image of the subsurface, identifying different strata encountered in the shallow sediments. The Innomar "standard" Sub-Bottom Profiler is an indicative example of a parametric system with a primary and secondary frequency range of 85-115kHz and 2-22kHz, respectively, and sound pressure levels of up to 232 dB (typically operated at <200dB) re1µPa @ 1m, which would be used in both nearshore and offshore areas. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Parametric Sub Bottom Profiler may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) - Boomer	The Applied Acoustics AA301 is an indicative example of a boomer, the instrument consists of a piezo electric plate transducer mounted on a surface tow catamaran frame. Reflected sound signals are recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m). The Boomer SBP operates in a frequency range of 0.5 kHz to 5 kHz, with sound pressure levels in the range of 205-211dB re1µPa @ 1m which would be used in the nearshore shallower area. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Boomer may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) -	The applied Acoustics Dual 400 Tip is an indicative example of a sparker system used in sub-bottom profiling. Reflected sound signals are	SBP Sparker may be undertaken across the proposed MUL Area to

Survey	Method	Method detail	Sampling Effort
	Sparker	recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m) or a multi-channel hydrophone such as the Geometrics GeoEel LH-16™ Digital Streamer. The sparker source has a frequency range of between 0.4-5kHz and a recorded sound pressure of 203dB re1µPa @1m. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Multibeam Echo Sounder (MBES)	A bathymetric survey will be conducted using multibeam echo sounders. These systems may be mounted on a dedicated survey vessel or towed behind a smaller vessel, depending on site conditions and water depths. Multibeam systems emit wide acoustic signals to generate high-resolution images, creating three-dimensional maps of the seabed. Line spacing will be between 5 and 20m, depending on depth. The operating frequencies emitted from MBES will be 300-700 kHz with a peak operating frequency of approximately 400kHz. Exposure time is approx. 0.05 ms per 1 ms for multibeam operating with 200-400 kHz, or 0.05 per 0.3 ms for higher frequencies (>400 kHz). Sound pressure levels will be approximately 215-220dB re 1µPa @ 1m.	MBES may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Marine Refraction Seismic	Marine refraction surveys use controlled seismic sources, such as air guns or weight drops, to generate seismic waves that travel through sediment and rock layers. Arrays of hydrophones or geophones deployed on the seabed record the refracted seismic waves as they bend and travel along subsurface interfaces. By analysing the travel times and velocities of these refracted waves, detailed models of sediment thickness, bedrock depth, and structural features can be developed. Airgun impulse energy is mostly concentrated within low frequencies, with peak frequencies between 5 and 90kHz. Source levels are predicted to be within the range of 186-220dB re 1µPa @1m.	Marine Refraction Seismic may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
	Marine Electrical Resistivity Tomography (ERT)	ERT surveys are conducted to investigate the electrical properties of subsurface sediments and rocks. The technique involves deploying a series of electrodes along the seabed, either towed or fixed. As a non-invasive, non-seismic geophysical method, marine ERT produces no significant underwater noise and has minimal environmental impact.	Maximum **20 ERT lines** of 315m length line with diameter of 20mm. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
Marine Environmental / Ecological	Benthic ecology samples (including subtidal and intertidal	Identify benthic communities and habitats at the site. Subtidal sample locations may be subject to drop down video in advance of sampling, intertidal sample locations may be subject to walkover/drone survey in advance of sampling.	There will be up to **30 no.** dedicated subtidal benthic ecology grab sampling locations within the proposed MUL Area and multiple samples (max 4) may be taken at each location.

Survey	Method	Method detail	Sampling Effort
	habitats surveys)		Samples would be of volume 0.1 m^2. There will be up to **30 no**. dedicated intertidal coring /grab locations if shoreline conditions allow for sediment sampling.
Archaeological	Walkover	Intertidal walkover to be undertaken at low tide to assess for the presence of sensitive archaeological features. Survey methodology may also involve the use of a metal detector along the foreshore. Pending the results of geophysical surveys there may be a requirement for further archaeological surveys (i.e. underwater video, dive surveys, etc.)	To be confirmed pending the results of the geophysical surveys.
Geotechnical	Drop-down video	Drop-down video survey to inspect the seabed and identify any reef structures in the vicinity without disturbance to the seabed.	There will be up to **30 transects** of up to 30 m each using a drop down camera and video surveillance.
	Boreholes	Boreholes may be up to 50 m below bed level but some may be terminated if sufficient bedrock is encountered. The boreholes will be carried out using sonic methods through the seabed sediment, with rotary coring used to advance through the bedrock. The typical frequencies emitted from rotary drilling are between 0.001-0.120kHz and a recorded sound pressure of approximately 145dB re1µPa @1m. Marine rotary drilling involves rotating a drill bit attached to a drill string and applying downward pressure to cut through the rock formations. Geotechnical sampling tools, including push and piston samples, can then be deployed into the ground to recover intact material. All drilling equipment used will follow the ISO and API technical specifications for drilling equipment. All boreholes will be drilled from a jack-up barge to maintain stability when drilling. Each location would require the 4 legs to penetrate the seabed and cause a temporary disturbance on each occasion. Each leg is typically less than 1m^2 in footprint.	A maximum of **80 no**. boreholes of a diameter of 300 mm will be required within the proposed MUL Area.
	Cone penetration tests (CPTs)	CPTs are to progress to a maximum depth of 20m but will be terminated when bedrock is encountered. In the CPT, an instrumented electronic probe (cone penetrometer) is situated at the front end of a string of steel rods that are hydraulically pushed into the ground at a constant rate of 20mm/s to measure soil response, geo-stratigraphy, and engineering parameters. A CPT vehicle or hydraulic ram set are often used to provide	**80 no. CPTs** will be conducted of a diameter of 44mm. 60 of the CPTs will be at borehole locations to clear for unexploded ordnance (UXOs) and 20 as standalone investigation sites.

Survey	Method	Method detail	Sampling Effort
		the reaction and pushing force. The equipment used will conform to relevant international standards, such as ISO, ensuring consistent and reliable geotechnical data.	
	Grab samples	Grab samples using 0.1 m^2 grabs will be collected for grading, loss on ignition and assessment of benthic community.	A maximum of **50 no**. grab samples of volume 0.1 m^2 will be taken within the proposed MUL Area.
	Metocean monitoring buoys	Metocean monitoring buoys are floating sensors with an anchorage system secured on the seabed. The buoys record various metocean conditions through the following monitoring equipment: • Conductivity, Temperature, Depth Sensors • Optical Salinity Sensor • Acoustic Doppler Current Profiler (ADCPs operating in the range of 600 Khz or 1 Mhz will be used. The instrument emits low amplitude "pings" of sound at a sampling rate of 1-minute average every 10 minutes. These pings will be emitted in a narrow sound beam (typically a few degrees in width) with a typical echo intensity profile of 80 dB (+/- 1.5 dB)) • Optical or Electrochemical Dissolved Oxygen Sensor • pH Sensor/Probe • Turbidity sensor • Turbidity meter/sediment trap. Metocean monitoring buoys will be anchored with two anchors per buoy. Anchors will have a maximum footprint of 4m^2 each.	**2 buoys** will be placed within the study area initially, with the possibility for **up to a further 4**.

Table 2.2
Predicted time and footprint of each survey activity

Survey Activity	Total time for activity	Maximum number of samples	Footprint per sample (m^2)	Maximum total footprint per activity (km^2)
Geophysical survey	Up to 4 months	SSS, Magnetometer, SBP 20 m spacing of main lines and 100 m spacing of cross lines with 25% overlap onto neighbouring lines MBES: 5 -20 m line spacing	-	Area up to 2.155
Marine refraction seismic	Up to 4 months	20 m line spacing	-	Area up to 2.155
ERT	Up to 4 months	20 maximum ERT lines	6.3	0.0000063
Marine Environmental / Ecological	Up to 4 months	120 subtidal (30 no. grab locations with max 4 samples taken at each location) 120 intertidal (30 no. grab locations with max 4 samples taken at each location)	0.1	0.000024
Geotechnical: Drop down video	Up to 4 months	30 transects	30	0.0009
Geotechnical: Boreholes	Up to 4 months	80	0.071	0.00000568
CPTs	Up to 4 months	80	0.00152	0.0000001216

Survey Activity	Total time for activity	Maximum number of samples	Footprint per sample (m^2)	Maximum total footprint per activity (km^2)
Jack-up barge leg	Up to 4 months	640 legs*	1	0.00064
Geotechnical: Grab samples	Up to 4 months	50	0.1	0.000005
Metocean monitoring buoy anchors	Maximum of 24 months (2 years)	12 anchors	4	0.000048

** 80 Borehole locations and 80 CPT locations x 4 legs*

2.3 General Survey Requirements

All appointed survey contractors shall obtain and comply with all necessary marine operational permits including routine and customary vessel/crew/equipment clearances from Customs Agencies, Port Authorities, Marine Survey Office, etc. This will include adherence to all major international shipping conventions adopted by the International Maritime Organization (and the International Labour Organization) concerning maritime safety and pollution prevention.

2.3.1 Quality Assurance

Each of the appointed survey contractors shall comply with the following as a minimum:

- Quality and Environmental Management Systems based on ISO9001:2015 and ISO14001
- Provision of site and activity specific Method Statements for all the marine operations within their scope
- Provision of Quality Management Plans for all the marine operations.

2.3.2 Health & Safety

Health, safety, environment, and welfare considerations will be a priority in the evaluation of possible contractors for the various survey scopes and will be actively managed during the survey work.

Appointed contractors will be required to comply with all legislation relevant to the activities within their scope of work, such as the Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005) and Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007), as amended.

Project / survey specific Health, Safety and Environment (HSE) plans will be put in place which will form part of the project / survey execution plans.

2.3.3 Working Hours

The working hours for the SI works are proposed to be up to 24 hours per day, seven days a week. It is anticipated that the main SI works will be carried out over a period of approximately four months including mobilisation and demobilisation. While metocean monitoring buoy deployment will be for period of up to two years, the devices will be autonomous apart from maintenance visits every two to four months. Such maintenance visits will occur during daylight hours only.

Weather conditions and/or sea-state will impact on the working hours, and it may be necessary to temporarily suspend operations when adverse weather conditions and/or sea-state are encountered or forecast. As such, survey plans will remain flexible to take advantage of optimal weather windows. Similarly, equipment or vessel maintenance and repair may impact on the SI works resulting in changes to the survey schedule.

2.3.4 Environmental Procedures

Environmental procedures to be followed by the appointed survey contractors are detailed within Section 7 of the accompanying AIMU report.

2.3.5 Vessels

All vessels will be fit for purpose, certified and capable of safely undertaking all required survey work. Marine vessels will be governed by the provisions of the Sea Pollution Act 1991, as amended. In addition, all vessels will adhere to published guidelines and best working practices such as: the National Maritime Oil/HNS Spill Contingency Plan (NMOSCP), Marine Pollution Contingency Plan (MPCP), Chemicals Act 2008 (No. 13 of 2008), Chemicals (Amendment) Act 2010 (No. 32 of 2010) and associated regulations.

Vessels shall have a Health, Safety and Environmental Management system which should conform to the requirements of the latest International Maritime Organisation (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or continental / EEZ waters to be operated in.

The SI works will be undertaken from vessels in accordance with the relevant guidelines[1] required to manage the risk to marine mammals from man-made sound sources in Irish waters (DAHG, 2014).

[1] Relevant guidance may include the incorporation of the methods outlined in the following text, additional activity-specific mitigation is outlined in Section 6 and within the guidance document (DAHG, 2014). A3: Avoid critical habitats for marine mammals, A4: Avoid operations during key periods of species life cycles, A5: Avoid time periods when effective impact mitigation is not possible, A6: Risk minimisation measures, including minimisation of duration over which sound producing activity takes place, and minimise sound pressure and exposure levels delivered into the environment (i.e., lower impact methods), clear ramp-up procedure, bubble curtain implementation (where relevant), use of dedicated Marine Mammal Observer (MMO) (where relevant).

3 Methodology

3.1 Appropriate Assessment Guidance

This report has been completed in consideration of the EU and national guidance documents that pertain in relation to Member States' fulfilling their requirements under the EU Habitats Directive, with particular reference to Article 6(3) and 6(4) of that Directive. The methodology followed in relation to this SISAA has had regard to the following guidance:

- EC (2000). Communication from the Commission on the Precautionary Principle. Office for Official Publications of the European Communities, Luxembourg
- EC (2002). Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission
- EC (2007). Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC. European Commission
- DoEHLG (2009, rev. 2010). Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government;
- EC (2013). Interpretation Manual of European Union Habitats. Version EUR 28. European Commission, Luxembourg
- EC (2018). European Commission Notice C (2018) 7621 'Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC', Office for Official Publications of the European Communities, Luxembourg
- OPR (2021). Practice Note PN01: Appropriate Assessment Screening for Development Management. Office of the Planning Regulator, Dublin Ireland
- EC (2021). European Commission Notice C (2021) 6913 'Assessment of plans and projects in relation to Natura 2000 sites – Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC', Office for Official Publications of the European Communities, Luxembourg.

3.2 Stages of Appropriate Assessment

The AA is a four-stage process with tests at each stage. The four stages are shown in Figure 3.1 below. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

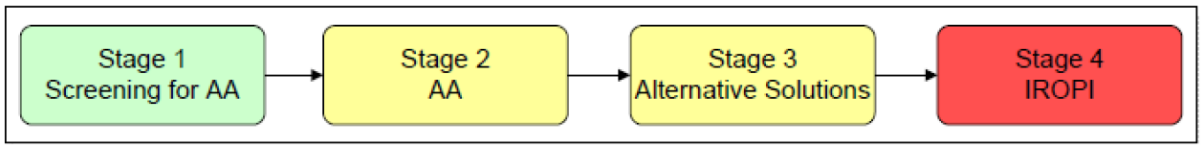

Figure 3.1
Four Stages of Appropriate Assessment

Stages 1-2 deal with the main requirements for assessment under Article 6(3) of the Habitats Directive. Stage 3 may be part of the Article 6(3) Assessment or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

The screening for AA carried out by the public authority/ competent authority (Stage 1), will determine whether an AA (Stage 2) of the proposed project is required. Stage 2 is required if it cannot be excluded, on the basis of the objective information provided at Stage 1, that the proposed project, individually or in combination with other projects or plans, will have a significant effect on a European site, in view of the site's conservation objectives. In this case, a Natura Impact Statement (NIS) must be prepared to assist the public authority/competent authority to conduct the Stage 2 AA. If it is not possible during Stage 2 to reduce impacts to acceptable, non-significant levels by avoidance and/or mitigation, Stage 3 of the process must be undertaken which is to objectively assess whether alternative solutions exist by which the objectives of the plan or project can be achieved. If alternative solutions exist that do not have negative impacts on European sites; they should be adopted regardless of economic considerations. The process must then return to Stage 2, as any alternative proposal must be subject to a Stage 2 AA before it can be subject to the Article 6(4) test. If it can be demonstrated that all reasonable alternatives have been considered and assessed, the AA progresses to Stage 4. This final stage is undertaken when it has been determined that negative impacts on the integrity of a European site will result from a plan or project and there are no alternative solutions. At Stage 4 of the AA process, it is the characteristics of the plan or project itself that will determine whether or not the competent authority can allow it to progress. This is the determination of Imperative Reasons for Overriding Public Interest (IROPI).

While there is no prescribed form or content for reporting (DoEHLG, 2009) the methodology and format adopted in this report has been in accordance with the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC, 2021) and the European Commission Guidance 'Managing Natura 2000 sites' (EC, 2018), guidance prepared by the NPWS (DoEHLG, 2009) and by the Office of the Planning Regulator (OPR, 2021).

As per DoEHLG (2009):

"The first test is to establish whether, in relation to a particular plan or project, appropriate assessment is required."

In summary, the test for the screening for AA is to assess, in view of objective scientific information, if the proposed development, individually or in combination with other plans/projects is likely to have a significant effect on a European site. The precautionary-principle approach is required, meaning decisions must avoid deterioration and disturbances that could significantly impact the site's integrity, even where there is uncertainty regarding a likely effect. Under the Habitats Directive, a plan or project cannot be authorised if there remains reasonable scientific doubt that it will adversely affect the integrity of a European site. If there are any significant, potentially significant, or uncertain effects, it will be necessary to proceed to AA and submit an NIS.

3.3 Stage 1 Screening / Test of Significance

This process identifies whether the proposed development is directly connected to or necessary for the management of a European site(s) and identifies whether the development is likely to have significant impacts upon a European site(s) either alone or in combination with other projects or plans.

The screening for AA will incorporate the following steps:

1. determining whether a project or plan is directly connected with or necessary to the conservation management of any European sites;
2. describing the project or plan;
3. identifying the European sites potentially affected by the project or plan;
4. identifying and describing any potential effects of the project or plan on European sites, alone, in combination and cumulatively with other plans/projects;
5. determining the likelihood of significant effects on European sites.

The output from this stage is a determination for each European site(s) of the likelihood of not significant, significant, potentially significant, or uncertain effects. The latter three determinations will cause that site to be brought forward to Stage 2.

3.4 Desk Study

Information on the receiving environment was analysed to determine the potential for significant effects to qualifying interests (QI) of the European sites with established connectivity to the works (see Section 4.4). The following publications and data sources were reviewed:

- Environmental Protection Agency (EPA) online interactive mapping tools (https://gis.epa.ie/EPAMaps) and (https://www.catchments.ie/maps/) for water quality data including surface and ground water quality status, and river catchment boundaries
- Information on ranges of mobile QI populations in Volume 1 of NPWS' Status of EU Protected Habitats and Species in Ireland (NPWS, 2019), and associated digital shapefiles obtained from the NPWS Research Branch
- Inland Fisheries Ireland mapping (http://wfdfish.ie/)
- BirdWatch Ireland (https://birdwatchireland.ie/)
- Mapping of European site boundaries and Conservation Objectives for relevant sites, available online from the NPWS included site synopsis, Natura 2000 Data form and Conservation Objective Supporting Documents where available (https://www.npws.ie/protected-sites)
- Distribution records for QI of European sites held online by the National Biodiversity Data Centre (NBDC) (www.biodiversityireland.ie)
- Geohive online Environmental Sensitivity Mapping tool (https://airomaps.geohive.ie/ESM/)
- Geological Survey Ireland (GSI) (https://www.gsi.ie/en-ie/Pages/default.aspx)
- Local surveys of flora, fauna, and habitat available using the Heritage Councils mapping website (https://heritagemaps.ie/WebApps/HeritageMaps/index.html)
- Ordnance Survey of Ireland maps and aerial photography (https://osi.ie).

The identification of relevant European sites to be included in this report was based on the criteria provided in OPR (2021), namely:

- any European site within or immediately adjacent to the project area
- identification of European sites where a Source-Pathway-Receptor (S-P-R) link exists, explained in Section 3.5.

3.5 Identification of Relevant European Sites

3.5.1 Source-Pathway-Receptor Model

The identification of relevant European sites to be included in this report was based on the identification of the 'zone of influence' of the proposed survey works using a Source-Pathway-Receptor (S-P-R) model where:

- a 'source' is defined as the individual element of the proposed works that has the potential to impact on a European site, its qualifying features, and its COs
- a 'pathway' is defined as the means or route by which a source can affect the ecological receptor
- a 'receptor' is defined as QI of SACs or SPAs for which COs have been set for the European site(s) being assessed.

An S-P-R model is a standard tool used in environmental assessment. For an effect to be likely, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism results in no likelihood for the effect to occur. The S-P-R model was used to identify a list of European sites, and their QIs, to which the proposed works are potentially linked. These are termed as 'relevant' sites/QIs throughout this report.

3.5.2 Zone of Influence

Determination of the project's zone of influence was achieved by assessing the project's requirements and deliverables against the ecological receptors within the project footprint, in addition to the ecological receptors that could be connected to and subsequently impacted by the project through abiotic and biotic vectors.

The proximity of the works to European sites, and more importantly, QIs of the European sites, is of importance when identifying likely significant effects. In accordance with the OPR AA Screening Guidelines (2021), the S-P-R model has been used to identify the zone of influence to ensure that relevant European sites are identified. The S-P-R model minimises the risk of overlooking distant or obscure effect pathways, while also avoiding an over reliance on buffer zones (e.g., 15 km), within which all European sites should be considered. This approach follows the DoEHLG 2009 guidance on AA which states that:

"For projects, the distance could be much less than 15 km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects" (DoEHLG, 2009; p.32, para 1).

The zone of influence of the works on mobile species (e.g., birds, mammals, and fish), and static species and habitats (e.g., saltmarshes, woodlands, and flora) is considered differently. Mobile species have 'range' outside of the European sites in which they are QI. The range of mobile QI species varies considerably, from several metres (e.g., in the case of whorl snails *Vertigo* spp.), to hundreds of kilometres (in the case of migratory wetland birds). A project's zone of influence may extend well beyond the project boundary and can impact or have an effect on static species and habitats remote from the proposed works; for example, where an aquatic QI habitat or plant is located many kilometres downstream from a pollution source. In particular, hydrological linkages between the proposed works and European sites (and their QIs) can occur over significant distances; however, any effect will be site-specific depending on the receiving water environment and nature of the potential impact.

To this end, the zone of influence for this project extends outside of the immediate proposed MUL Area to include ecological receptors connected to the SI works through proximity and connectivity through features such as watercourses and waterbodies in addition to potential connectivity through land and air. See Section 4.4 for the identification of relevant European sites.

4 Identification of Relevant European Sites

4.1 Assessment of Connectivity

Connectivity is identified via the S-P-R model which identifies the potential impact pathways such as land, air, hydrological pathways etc., which may support direct or indirect connectivity between the SI works (source) and European sites and their QIs (receptors).

Where it is evident that there is no connectivity between the SI works and receptors (i.e., European sites and/or habitats and species for which the sites are selected), the receptors are excluded from the AA process. Where connectivity exists between the SI works and receptors, these receptors are taken forward to the assessment of likely significant effects (Section 5.2).

4.2 Identification of Potential Receptors

Receptors with the potential to be affected by the SI works are:

- QI habitats of European sites within the proposed MUL Area, or within an area likely to be affected by the SI works
- QI species of the European sites within or immediately adjacent to the proposed MUL Area
- mobile QI species to forage or transit into the proposed MUL Area or an area likely to be affected by the SI works (ex situ effects).

Following identification of potential sources of impact, the potential for a pathway to various receptors is considered, followed by the identification of relevant European sites.

4.3 Identification of Potential Sources of Impacts

Identification of a risk of impact does not constitute a prediction that it will occur or, if it does occur, that there is an intrinsic likelihood that it will result in ecological or environmental damage or that it will cause or create a significant effect on the European sites in question. The level and significance of the effect depends upon the magnitude, duration or intensity of the impacts ensuing from the proposal and the existence of a credible or tangible S-P-R link between the SI works and the European sites. It is also determined by the extent of the exposure to the risk and the characteristics of the receptor.

When assessing impact, the QI habitats and species are only considered receptors where a credible or tangible S-P-R link exists between the SI works and the receptor. In order for an impact to occur there must be a risk initiated by having a ‘source’ - the origin of potential impacts (e.g., near stream construction works), an impact pathway - the means by which the effect reaches the receptor (air, water, or ground) between the source and the receptor (e.g., a watercourse which connects the development site to the site designated for the protection of a receptor) and a 'receptor' (e.g., a protected species associated aquatic or riparian habitats). If the source, pathway, or receptor is absent, no linkage exists and thus, there will be no potential for an impact to be transmitted.

The potential impacts arising from the SI works have been identified as follows:

- Noise, vibration, lighting, and human presence-related species disturbance

- Habitat loss or disturbance
- Increased Suspended Sediment Concentrations (SSC)
- Underwater noise (Injury and/or displacement of Annex II marine mammals, otter, and fish from underwater noise and/or the presence of increased marine traffic (visual))
- Entanglement (Injury and/or disturbance of Annex II marine mammals, otter and fish from towed gear and seabed gear)
- Accidental pollution event
- Collision with survey vessels.

Table 4.1 identifies the SI works associated with each impact, and the receptors with the potential to be affected.

Table 4.1
Source-Pathway-Receptor assessment for the works

Impact	Potential source of Impact	Description of Effect Pathway	Relevant Receptors
Noise, vibration, lighting, and human presence-related species disturbance	Jack-up barge and vessel activity associated with the SI works.	Potential for direct impacts by disturbing species, leading to displacement from the area.	Otter, marine mammals, birds
Habitat loss, alteration, and fragmentation.	Interactions with the seabed resulting from geotechnical surveys, deployment of seabed equipment, and marine environmental sediment sampling.	Potential for direct effects on sensitive habitats and indirect effects to species which rely on those habitats for feeding and/or breeding.	Marine habitats, marine mammals, otter, fish, birds
Increased Suspended Sediment Concentrations (SSC).	Interactions with the seabed resulting from geotechnical surveys, deployment of seabed equipment, and marine environmental sediment sampling	Potential for direct effects on sensitive habitats and indirect effects to species which rely on those habitats for feeding and/or breeding.	Marine habitats, marine mammals, otter, fish, birds
Underwater noise, including injury and or displacement of Annex II marine mammals, otter, and fish from underwater noise and/or the presence of increased marine traffic (visual).	Noise emissions and increased marine traffic from survey equipment and vessels associated with the SI works. May cause injury and/or displacement of Annex II marine mammals, otter, and fish.	Potential for direct effects on species in the marine environment including injury, disturbance and/or displacement.	Marine mammals, otter, fish, birds
Entanglement, including injury and/or disturbance of Annex II marine mammals, otter, and fish from the presence of towed gear and seabed gear.	Risk of entanglement from the towed and seabed equipment associated with the geophysical and geotechnical survey works. May cause injury and/or displacement of Annex II marine mammals, otter, and	Potential for direct effects on species in the marine environment including injury, disturbance and/or displacement.	Marine mammals, otter, fish birds

Impact	Potential source of Impact	Description of Effect Pathway	Relevant Receptors
	fish.		
Accidental pollution event.	Jack-up barge and vessel activity associated with the SI works.	Potential for direct effects on marine habitats and species, and indirect effects through contamination of supporting habitats.	Marine habitats, marine mammals, otter, fish, birds
Collision with survey vessels	Vessel activity associated with the SI works.	Potential for direct effects to large species in the marine environment.	Marine mammals, otter

4.4 Identification of Relevant European sites

Using the S-P-R model to identify the zone of influence for each impact as outlined in Table 4.1, the following summarises the zone of influence of the SI works within which relevant European sites will be selected:

- those which occur within or immediately adjacent to the proposed MUL Area boundary (Figure 4.1)
- the water body within which the proposed surveys will be undertaken to capture any hydrological linkages (i.e., the Shannon Estuary)
- foraging ranges of relevant QI species (i.e., potential for ex situ effects).

The Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (004077) are within / immediately adjacent to the SI works area and extend throughout most of the Shannon Estuary, therefore both sites will be considered in this SISAA. The potential for connectivity with receptors from other European sites is considered in the proceeding sections.

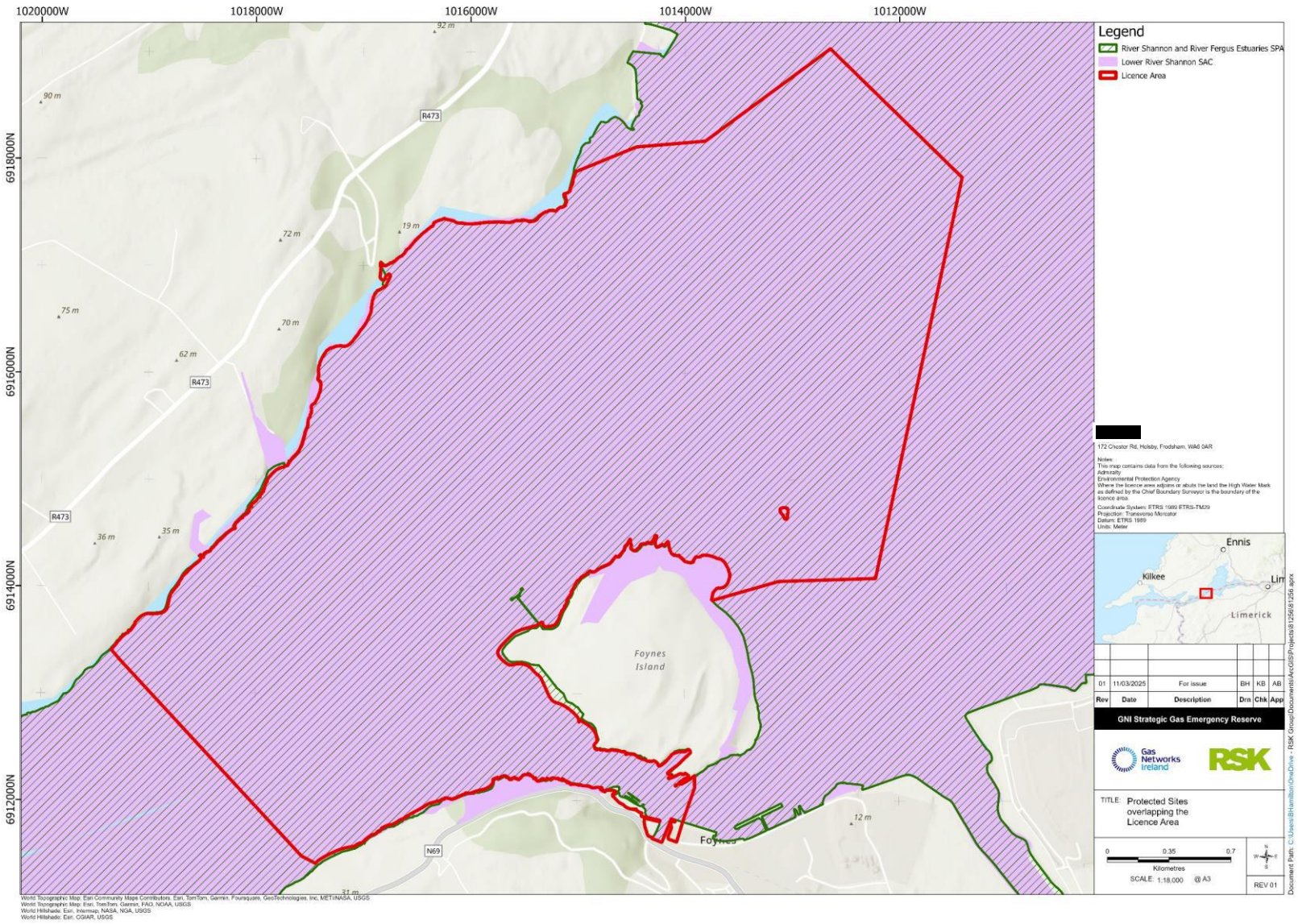

Figure 4.1

Protected areas in proximity to the proposed MUL Area

4.4.1 Potential for Connectivity with ex situ Annex II Marine Mammals

4.4.1.1 Cetaceans

Bottlenose dolphin (*Tursiops truncatus*) is a QI of the Lower River Shannon SAC, within which the proposed SI works will occur. Bottlenose dolphins in the River Shannon are present throughout the year and are genetically discrete compared to bottlenose dolphins found elsewhere in Irish waters due to geographical and social isolation (Mirimin et al., 2011) and that the estuary is an important calving area (MERC, 2021). The population is estimated at around 145 individuals with only 80 adults (Baker et al., 2018 in MERC, 2021). This small, genetically discrete population is vulnerable to even small increases in adult mortality or a reduction in reproduction rates (Blásquez et al., 2020 in MERC, 2021). An overview of existing data on bottlenose dolphin populations in the Lower Shannon Estuary shows that there is a well-known hotspot for the species in the waters off Moneypoint Power Station (MERC, 2021). Rogan et al. (2000) recorded bottlenose dolphins in the estuary all year round with a peak from May to September and noted the presence of neo-natal calves from July to September as evidence of a well-defined breeding season in the Shannon Estuary. There has been a total of 19 recorded dolphin sightings within the last 12 months along the Shannon Estuary, concentrated in the area of the Shannon Ferry route, with 3 dolphin sighted within approximately 3 km of the proposed MUL Area (IWDG, 2025). Hence, there is potential for them to overlap with SI works.

Although common bottlenose dolphin individuals within the Shannon estuary are likely to be part of the resident population, there is the potential for connectivity with other SACs for which bottlenose dolphin are qualifying interests. A screening distance of 200 km is suggested for considering potential ex-situ connectivity for this species. 200 km has regularly been used as a screening distance for ex-situ connectivity for similar screenings as it represents a realistic expected foraging distance for small coastal cetacean species. Projects that have implemented the same screening distance include Cenos Offshore Windfarm, Salamander Offshore Windfarm and Stromar Offshore Windfarm. As such, three additional SACs are considered screened in for potential ex-situ connectivity for bottlenose dolphin as listed in Table 4.2.

Table 4.2
SACs with bottlenose dolphin as QI within 200 km of the proposed MUL Area

SAC	Distance (km)
Slyne Head Peninsula	160
West Connacht Coast	165
Slyne Head Islands	167

Very few sightings of harbour porpoise (*Phocoena phocoena*) have been recorded within the Shannon Estuary (IWDG, 2025). There was one sighting adjacent to Moneypoint in 2018 (IWDG), and strandings have been recorded as far up the estuary as Foynes (O'Callaghan et al., 2021). Violent interactions have been recorded between bottlenose dolphins and harbour porpoise (Ross and Wilson., 1996; Gross et al., 2020) and suggested reasons for this aggression include interspecies territoriality, defence of group members, food competition, feeding interference and object-orientated play (Gross et al., 2020). Two sightings of harbour porpoise occurred within the past 12 months, located at the entrance of the Shannon Estuary off Aill Na Brun (IWDG, 2025). From the lack of recorded sightings of harbour porpoise within the Shannon Estuary, it is likely that they largely avoid the area. As a result, spatial overlap with harbour porpoise individuals from other SACs within foraging range is considered highly unlikely, and SACs with harbour porpoise as a QI are not considered relevant for ex situ effects within the Shannon.

4.4.1.2 Pinnipeds

Telemetry data indicates that harbour seal (*Phoca vitulina*) foraging trips in the south-west of Ireland extend no further than 20 km from haul-out sites (Cronin et al., 2008). No sightings of harbour seal have been recorded in the Shannon Estuary within the last 12 months (IWDG, 2025). The closest European site designated for harbour seal is the Kenmare River SAC, located more than 85 km from the proposed MUL Area. It is therefore highly unlikely that harbour seals from this SAC will be present within the Shannon Estuary and therefore SACs with harbour seal as a QI are not considered relevant for ex situ effects.

Grey seals (*Halichoerus grypus*) have been recorded undertaking foraging trips over hundreds of kilometres, although the mean distance travelled in a telemetry study carried out in 2011 for NPWS was 50.85 km (Cronin et al., 2011). NPWS-funded aerial thermal-imaging of seals in Ireland (Morris and Duck, 2019) shows very low usage of the Shannon Estuary by both harbour seal and grey seal, indicating that the estuary is not likely to be an important area for hauling out. No sightings of grey seals have been recorded in the Shannon Estuary within the last 12 months (IWDG, 2025). The closest European site designated for grey seal is the Blasket Islands SAC, more than 110 km distance from the proposed MUL Area by sea. While it is possible that individuals from the Blasket Islands population may be present in the Shannon Estuary, it is considered unlikely that the proposed MUL Area represent an important foraging ground and as a result SACs with grey seal as a QI are not considered relevant for ex situ effects.

4.4.2 Potential for Connectivity with ex-situ Annex IV turtles and basking shark

Four Annex IV turtle species known to occur in Ireland include the leatherback turtle (*Dermochelys coriacea*), Kemp's Ridley turtle (*Lepidochelys kempii*), loggerhead turtle (*Caretta caretta*) and hawksbill turtle (*Eretmochelys imbricata*)[2]. Leatherback turtles have been recorded along the west coast of Ireland and within the Lower Shannon Estuary (at Ballylongford (1970) and at Kilkee (IWDG, 2025)); however, no sightings of leatherback turtles have occurred in the proposed MUL Area within the last 12 months

[2] https://www.npws.ie/legislation accessed 30/05/2024.

(IWDG, 2025). Kemps Ridley have been recorded along the west coast at Banna Strand in Co. Kerry (approximately 40 km south-west). This is beyond the proposed surveys boundary with no suspected impacts from the proposed surveys; there have additionally been no recorded sightings of Kemps Ridley turtles and Loggerhead turtles in the Shannon Estuary within the last 12 months (IWDG, 2025), and therefore no significant impacts are expected. One record of hawksbill has been recorded in the south of Ireland at Cork Harbour as bycatch, no records have been noted along the west coast or in close proximity to the proposed MUL Area. Of the turtle species noted in Ireland, leatherback turtles have the potential to utilise the Lower River Shannon Estuary based on historical records, but as these counts only amount to one or two individuals across many years it is unlikely that they will be present within the proposed MUL Area during the proposed SI works.

Basking sharks (*Cetorhinus maximus*) tend to arrive in Irish waters during spring, with numbers peaking in May and June. There have been several sightings of this species in proximity to the Shannon Estuary over the past 12 months, with recordings concentrated to Aill Na Brun and Derrynadivva (IWDG, 2025). Given the lack of sightings within the estuary itself, it is unlikely basking sharks will be present within the proposed MUL Area during the SI works.

4.4.3 Potential for Connectivity with ex situ Annex II Migratory Fish

The Lower Shannon Estuary is used by several of Ireland's native diadromous fish species as they pass through to or from freshwater spawning grounds or use the area for feeding during maturation. These species include twaite shad (*Allosa fallax fallax*), sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*) and Atlantic salmon (*Salmo salar*).

Inland Fisheries Ireland conducted fish stock surveys in the Lower Shannon Estuary in October 2017, recording generally low abundance for most species, with the exception of four species: sprat (*Sprattus sprattus*), common goby (*Pomatoschistus microps*), sand goby (*Pomatoschistus minutus*) and flounder (*Platichthys flesus*) (Coyne et al, 2018). This was consistent with the previous two surveys in 2014 and 2008. Overall, the Shannon Estuary was given a status of "good" for fish populations, an improvement on the previous surveys.

4.4.4 Potential for Connectivity with ex situ Birds

Certain species of seabird can forage considerable distances from their colonies (Woodward et al., 2019), however, given the limited size, scale and duration of the proposed surveys, it is considered unlikely that there is a reasonable impact pathway to SPAs beyond the immediate proposed MUL Area, as it becomes increasingly unlikely that individuals from distant SPAs will be present. Seabirds are more likely to forage in the open sea where they can access the rich foraging habitat of continental shelf waters (Cummins et al., 2019), as opposed to foraging within estuaries or harbours where availability of fish prey may be more limited.

Wintering waders and wildfowl tend to be sedentary once they arrive in their over-wintering areas; often only moving short distances between roosting and feeding areas. Therefore, it is considered unlikely that wintering birds from other SPAs will travel to/from the Shannon Estuary to feed or roost. As a result, no additional SPAs are considered relevant for ex situ effects.

4.5 Relevant European Sites

Based on the S-P-R model, connectivity has been established between the SI works and the following European sites:

- Lower River Shannon SAC
- River Shannon and River Fergus Estuaries SPA
- Slyne Head Peninsula SAC
- West Connacht Coast SAC
- Slyne Head Islands SAC.

These European sites are the only sites considered to be within the zone of influence of the SI works.

Table 4.3 lists the QI of these European sites, while Figure 4.1 shows the location of the SI works relative to these European sites.

Table 4.3
European sites selected for assessment

European Site	Qualifying Interests for which site has been selected[2]	Proximity to Proposed MUL Area
Lower River Shannon SAC (002165)	Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons* [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonizing mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty, or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) * [91E0] Freshwater pearl mussel (*Margaritifera margaritifera)* [1029] Sea lamprey [1095] Brook lamprey (*Lampetra planeri)* [1096] River lamprey [1099] Atlantic salmon [1106] Common bottlenose dolphin [1349] Otter [1355]	0 km (proposed works take place within and immediately adjacent to the SAC)

European Site	Qualifying Interests for which site has been selected[2]	Proximity to Proposed MUL Area
River Shannon and River Fergus Estuaries SPA (004077)	Cormorant (*Phalacrocorax carbo)* [A017] (breeding and wintering) Whooper swan (*Cygnus cygnus)* [A038] (wintering) Light-bellied Brent goose (*Branta bernicla hrota*) [A046] (wintering) Shelduck (*Tadorna tadorna*) [A048] (wintering) Wigeon (*Anas penelope*) [A050] (wintering) Teal (*Anas crecca*) [A052] (wintering) Pintail (*Anas acuta*) [A054] (wintering) Shoveler (*Anas clypeata*) [A056] (wintering) Scaup (*Aythya marila*) [A062] (wintering) Ringed plover (*Charadrius hiaticula*) [A137] (wintering) Golden plover (*Pluvialis apricaria*) [A140] (wintering) Grey plover (*Pluvialis squatarola*) [A141] (wintering) Lapwing (*Vanellus vanellus*) [A142] (wintering) Knot (*Calidris canutus*) [A143] (wintering) Dunlin (*Calidris alpina*) [A149] (wintering) Black-tailed godwit (*Limosa limosa*) [A156] (wintering) Bar-tailed godwit (*Limosa lapponica*) [A157] (wintering) Curlew (*Numenius arquata*) [A160] (wintering) Redshank (*Tringa totanus*) [A162] (wintering) Greenshank (*Tringa nebularia*) [A164] (wintering) Black-headed gull (*Chroicocephalus ridibundus*) [A179] (wintering) Wetlands and Waterbirds [A999]	0 km (proposed works take place within and immediately adjacent to the SPA)
Slyne Head Peninsula SAC	Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120] Machairs (*in Ireland) [21A0] Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-*	160 km

European Site	Qualifying Interests for which site has been selected[2]	Proximity to Proposed MUL Area
	Nanojuncetea [3130] Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. [3140] European dry heaths [4030] Juniperus communis formations on heaths or calcareous grasslands [5130] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) [6510] Alkaline fens [7230] Bottlenose dolphin (*Tursiops truncatus*) [1349] Petalwort (*Petalophyllum ralfsii*) [1395] Slender Naiad (*Najas flexilis*) [1833]	
West Connacht Coast SAC	Bottlenose dolphin (*Tursiops truncatus*) [1349] Harbour porpoise (*Phocoena phocoena*) [1351]	165 km
Slyne Head Islands	Reefs [1170] Bottlenose dolphin (*Tursiops truncatus*) [1349] Grey seal (*Halichoerus grypus*) [1364]	167 km

[2] Asterisk indicates a priority habitat under the Habitats Directive.

4.6 Conservation Objectives

The integrity of a European site (referred to in Article 6(3) of the EU Habitats Directive) is determined based on the conservation status of the QIs of these sites.

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status areas designated as SAC and SPA. The government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological

integrity of these sites.

Favourable conservation status of a habitat is achieved when:

- its natural range and area it covers, are stable or increasing within that range
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The specific conservation objectives for each European site in Ireland are available on www.npws.ie. These have been accessed for the sites listed in Table 4.3 above on 10/03/2025.

Site specific and detailed conservation objectives documents were available for all sites:

- Lower River Shannon SAC (002165). Published 7 August 2012;
- River Shannon and River Fergus Estuaries SPA (004077). Published 17 September 2012;
- Slyne Head Peninsula SAC (002074). Published 5 February 2015;
- West Connacht Coast SAC (002998). Published 17 January 2025;
- Slyne Head Islands SAC (00328). Published 17 December 2024.

5 Supporting Information for Screening for Appropriate Assessment

5.1 Management of European Sites

The SI works are not directly connected with or necessary to the management of any European site(s).

5.2 Assessment of Likely Significant Effects

This section determines whether the impacts identified in Section 4.3 could have significant effects on the qualifying interests (QI) of the European sites identified in Section 4.4 in view of the conservation objectives of the sites. As described in Section 4.3, the potential impacts arising from the proposed works are as follows:

- Noise, vibration, lighting, and human presence-related species disturbance.
- Habitat loss or disturbance
- Increased Suspended Sediment Concentrations (SSC)
- Underwater noise (Injury and/or displacement of Annex II marine mammals, otter, and fish from underwater noise and/or the presence of increased marine traffic (visual))
- Entanglement (Injury and/or disturbance of Annex II marine mammals, otter and fish from towed gear and seabed gear)
- Accidental pollution event
- Collision with survey vessels.

5.3 Lower River Shannon SAC (002165)

The SAC is selected for the protection of populations of the following aquatic, or in the case of otter semi-aquatic, species:

- freshwater pearl mussel (*Margaritifera margaritifera*) [1029]
- sea lamprey (*Petromyzon marinus*) [1095]
- brook lamprey (*Lampetra planeri*) [1096]
- river lamprey (*Lampetra fluviatilis*) [1099]
- Atlantic salmon (*Salmo salar*) (only in fresh water) [1106]
- bottlenose dolphin (*Tursiops trucatus*) [1349]
- otter (*Lutra lutra*) [1355].

5.3.1 Noise, vibration, lighting, and human presence-related species disturbance

The Lower Shannon Estuary is a busy shipping area, handling up to 1,000 ships carrying 12 million tons of cargo per annum (Clare County Council, 2023). Animals within the area are likely to be habituated to marine traffic, and the increase in vessel traffic as a result of the SI works is very low and temporary. It is considered unlikely that there will be any significant disturbance to marine species as a result of the presence of survey vessels. The presence of the jack-up barge will introduce artificial light to the area while SI works happen during the hours of darkness. This impact will be temporary and is not expected

to result in any impacts beyond the SI works campaign. Therefore, further assessment of this impact is not considered necessary.

Underwater noise impacts are considered in Section 5.3.4.

5.3.2 Habitat Loss or Disturbance

In the vicinity of the proposed MUL Area, the SAC boundary extends from the high water mark out into the marine area away from the land. Of the 14 Annex I habitat types selected for protection as part of the Lower River Shannon SAC (see Table 4.3), 11 are categorised as being 'Coastal and Halophytic' in their distributions, while the remaining three habitats are categorised as freshwater, grasslands, and forests. The distribution of all annexed habitats within the SAC are presented in the conservation objectives document (NPWS, 2012a). The marine based geotechnical works may impact on annexed habitats within the SAC. The distribution of the following habitats may occur within the area where the marine elements of the SI works will occur:

- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Reefs [1170]

As identified in Table 4.1, there is the potential for loss and/or disturbance to these marine habitats as a result of the sediment sampling methods. In addition to direct habitat loss when taking samples, there will also be temporary habitat loss due to the four feet of the jack-up barge used to conduct sampling, as well as temporary placement of equipment associated with seismic surveys and the anchoring of metocean monitoring buoys.

The substrate in the proposed MUL Area is dominated by fine sandy habitat with water depths up to 30 m below chart datum. The Lower River Shannon SAC has one or more Annex I Marine Habitats as QIs that are potentially overlapping with the proposed MUL Area. These protected habitats include reefs, estuaries, and mudflats and sandflats not covered by seawater at low tide (Table 4.3).

There is uncertainty as to whether or not significant habitat loss or alteration effects within the Estuaries [1130] and Reefs [1170] QIs are likely, without the implementation of mitigation measures. In light of this there is, similarly, uncertainty about habitat fragmentation impacts. In circumstances where there are any significant, potentially significant, or uncertain effects, further assessment of this impact is considered necessary.

5.3.3 Increased Suspended Sediment Concentrations

The deposition arising from the drilling of the geotechnical marine boreholes and from the other sediment sampling methods has the potential to result in indirect effects of Annex I habitats associated with increased SSC and smothering that may undermine the conservation objectives of benthic habitats. There is potential for limited SSC within the immediate footprint of the sediment sampling but due to the small number of sites, relative footprint and limited duration of the SI works, SSC from seabed sampling is expected to be negligible. Increased SSC and smothering may also occur from other activities such as positioning of equipment on the seabed (e.g., jack-up barge legs, equipment

associated with seismic survey methods and metocean monitoring buoy anchors). The sediment type noted within the proposed MUL Area is noted as sand (fine to medium) with mixed sediment (INFOMAR, 2025). This sediment type typically falls out of suspension quite rapidly and as the works will take place in the Lower Shannon Estuary this would aid in the rapid dispersal of any suspended sediments due to the water depth, tidal influence, the nature of the estuary and currents near the proposed MUL Area. Therefore, it is not anticipated that SSC will be in large enough quantities to significantly impact the Annex I habitats (e.g., estuaries and reef) in the area. Additionally, best practice methods will ensure sediment mobilisation is kept to minimal levels during the SI works. Therefore, further assessment of this impact is not considered necessary.

5.3.4 Underwater Noise

As identified in Table 4.1, there is potential for effects as a result of the underwater noise emitted by the SI works.

When assessing the potential impact of underwater noise sources on the marine environment a range of variables such as source level, frequency, duration, and directivity influence received sound levels. Increasing the distance from the sound source usually results in attenuation with distance. The factors that affect the way noise propagates underwater include: water column depth, pressure, temperature gradients, salinity, as well as water surface and seabed type and thickness. When sound encounters the seabed the amount of noise/sound reflected back depends on the composition of the seabed, i.e., mud or other soft sediment will reflect less than rock. The water depth in the vicinity of the proposed MUL Area ranges up to 50 m below chart datum, with a mixed substrate type, of muds, sands, coarse gravels, and exposed bedrock. All factors listed above reduce the propagation of the sound, decreasing the zone of influence of the geophysical survey.

The active acoustic instruments, such as those proposed on this survey, operate by emitting extremely short pulses and are mostly directional or omni-directional (e.g., sparker) (Ruppell et al, 2022). The range of the geophysical equipment will be limited principally by water depth and attenuation particularly of high frequency sources such as SBP systems. Coupled with the narrow beam angle and short duty cycles (‘on’ for microseconds or milliseconds per second) means that surveying sonars have relatively low acoustic impact.

5.3.4.1 Cetaceans

Auditory injury in cetaceans can be defined as a permanent threshold shift (PTS) leading to non-reversible auditory injury, or as a temporary threshold shift (TTS) in hearing sensitivity, which can have negative effects on the ability to use natural sounds (e.g., to communicate, navigate, locate prey) for a period of minutes, hours, or days. With increasing distance from the sound source, where it is audible to the animal, the effect is expected to diminish through identifiable stages (i.e., PTS or TTS in hearing, avoidance, masking, reduced vocalisation) to a point where no significant response occurs. Factors such as local propagation and individual hearing ability can influence the actual effect (Department of Arts, Heritage and the Gaeltacht (DAHG), 2014).

Should the noise levels from sources exceed the thresholds, there is the potential for underwater noise

generated during the geophysical and seismic survey to result in injury and/or disturbance to bottlenose dolphin associated with the SAC in the vicinity of the SI works.

Cetacean species can be split into functional hearing groupings, according to their frequency-specific hearing sensitivity (Southall et al., 2019). Bottlenose dolphins are considered a high frequency cetacean (HF). As noted in Section 4.4.1, it is unlikely that harbour porpoise will be active within the estuary.

Continuous sources (i.e., survey vessels) are shown as almost 20 dB lower than the continuous noise threshold. Taking this and directionality into account there is no significant risk to marine mammals or fish from continuous noise.

As there is the potential for disturbance and/or displacement of bottlenose dolphin of the Lower River Shannon SAC due to geophysical and seismic survey noise sources in the absence of mitigation measures, further assessment of this impact is considered necessary.

5.3.4.2 Otter

Due to a lack of studies on the underwater hearing of Eurasian otter (*Lutra lutra*), sea otters (*Enhydra lutris*) are typically references as a proxy. Sea otters are not considered sensitive to underwater noise as the species are primarily adapted to hearing airborne sounds and are not specialized for detecting signals in background noise (Ghoul & Reichmuth, 2016), therefore underwater anthropogenic noise impacts are not considered further for otters.

5.3.5 Accidental Pollution Event

The SI works will result in a slight increase in vessel traffic within the proposed MUL Area for the temporary duration of the SI works. Although the increase is slight, this could in theory increase the potential risk of an accidental release of pollutants (e.g., fuels, oils, and lubricants) to the marine environment, which has the potential to result in toxic effects to Annex I benthic habitats and, consequently, on Annex II species that rely on these habitats for food.

The proposed MUL Area lies within a busy shipping area where many commercial and recreational vessels operate. Given that the survey would amount to, at most, one jack-up barge, six metocean monitoring buoys, and one additional vessel operating in the area during the SI works period, the likelihood of a collision resulting in a pollution event is considered insignificant. The survey vessel will use diesel or petrol fuel, will not use heavy fuel oil, and will operate at a low speed. As vessels are required by law to adhere to regulations governing accidental leakages and spillages similarly the likelihood of such an occurrence is considered very unlikely. In addition, all substances handled and/or used whilst undertaking the works are required to be handled, used, stored, and documented in accordance with assessments and the Chemicals Act 2008 (No. 13 of 2008) and Chemicals (Amendment) Act 2010 (No. 32 of 2010) and associated Regulations.

Given the nature of the works, the limited scale and duration, and the insignificant increase in vessel activity, it is considered highly unlikely that there will be a pollution incident, e.g., accidental spills of small quantities of fuel. As such, the possibility for impacts on protected species from accidental pollution events associated with the proposed works can be excluded from further consideration.

5.3.6 Collision with Survey Vessels

Vessel strikes have been known to cause mortality in marine mammals (Laist et al., 2001) as well as injuries from non-lethal collisions (Laist et al., 2001; Van Waerebeek et al., 2007). Injuries from such collisions can be divided into two broad categories: blunt trauma from impact and lacerations from propellers. Injuries may result in individuals becoming vulnerable to secondary infections or predation.

It is expected that a maximum of one vessel will be operating at any one time within the proposed MUL Area. Due to the nature of the works, the vessels conducting discrete sampling would be travelling directly to sampling locations and then remaining stationary during sampling while vessels conducting the geophysical survey will move in slow and predictable line patterns.

The Lower Shannon Estuary is a busy shipping area (Clare County Council, 2023). Marine mammals in the area are likely to be habituated to marine traffic, and the temporary addition of a single vessel operating at either low speeds or stationary for the proposed works is unlikely to constitute a significant increase in vessel activity given the levels of vessel activity typical for the area. As such, the possibility for impacts on marine mammal features from collisions with survey vessels can be excluded from further consideration.

5.3.7 Invasive Species

All vessels have the potential to introduce invasive non-native species. The vessel to be used during the proposed works will already be operating within Irish waters, meaning there is no risk of invasive non-native species introduction. All equipment will be cleaned and checked prior to deployment and will only be used for the duration of the SI works. Therefore, potential impacts from invasive species introduced as a result of the works can be excluded from further consideration.

5.3.8 Risk of Entanglement

All towed equipment and seabed gear has the potential to pose an entanglement risk to marine fauna. However, the equipment to be used during the proposed works will be closely monitored and managed, with all gear inspected prior to deployment and only used for the temporary duration of the SI works. Given these controls and the temporary nature of the activity, the potential for entanglement-related impacts is considered negligible. Therefore, potential impacts from entanglement introduced as a result of the works can be excluded from further consideration.

5.4 River Shannon and River Fergus Estuaries SPA (004077)

The SPA is selected for the protection of 21 populations of seabirds and wildfowl, 20 of which are migratory, non-breeding overwintering populations. The QIs waterbird species of the site and their ecological requirements are listed in Table 5.1. It is assumed that the species listed below represent those likely to be most impacted by the works. Potential impacts to other bird species would, therefore, be considered lesser.

Table 5.1
River Shannon and River Fergus Estuaries SPA QI species and their ecological requirements

Species	Food/prey requirements	Primary supporting habitat within site
Cormorant	Highly specialised	Sheltered & shallow subtidal over sand and mud flats
Whooper swan	Wide	Lagoon and associated habitats, Intertidal mudflats and shallow subtidal
Light-bellied -brent goose	Highly Specialised	Intertidal mud and sand flats
Shelduck	Wide	Intertidal mud and sand flats Shallow subtidal
Wigeon	Narrower	Intertidal mud and sand flats and sheltered and shallow subtidal
Teal	Wide	Intertidal mud and sand flats and sheltered and shallow subtidal
Pintail	Wide	Shallow subtidal
Shoveler	Wide	Lagoon, brackish and freshwater lakes plus intertidal mud and sand flats
Scaup	Wide	Subtidal
Ringed plover	Wide	Intertidal mud and sand flats
Golden plover	Wide	Intertidal mud and sand flats
Grey plover	Wide	Intertidal mud and sand flats
Lapwing	Wide	Intertidal mud and sand flats
Knot	Narrower	Intertidal mud and sand flats
Dunlin	Wide	Intertidal mud and sand flats
Black-tailed Godwit	Wide	Intertidal mud and sand flats
Bar-tailed godwit	Wide	Intertidal mud and sand flats
Curlew	Wide	Intertidal mud and sand flats
Redshank	Wide	Intertidal mud and sand flats
Greenshank	Wide	Intertidal mud and sand flats
Black-headed gull	Wide	Intertidal flats and sheltered and shallow subtidal

5.4.1 Noise, vibration, lighting, and human presence-related species disturbance

As shown in Table 5.1, the species associated with the SPA rely primarily on tidal, intertidal and estuarine habitats for foraging. Within the proposed MUL Area, the habitats are largely terrestrial above the high water mark and marine below the high water mark. The two areas of concentrated study at Cahiracon and Foynes Island, in particular, are characterised by rocky shoreline with little to no intertidal area (see Figure 5.1). Therefore, the species associated with the SPA are unlikely to utilise the habitats within the proposed MUL Area when their preferred habitats are available elsewhere within the SPA. As such, it is concluded that the QI species of the SPA are unlikely to be present within the proposed MUL Area during SI works in significant numbers or for sustained periods of time, making exposure to

significant disturbance or displacement as a result of the temporary presence of vessels or structures associated with the SI works improbable. Therefore, further assessment of this impact is not considered necessary.

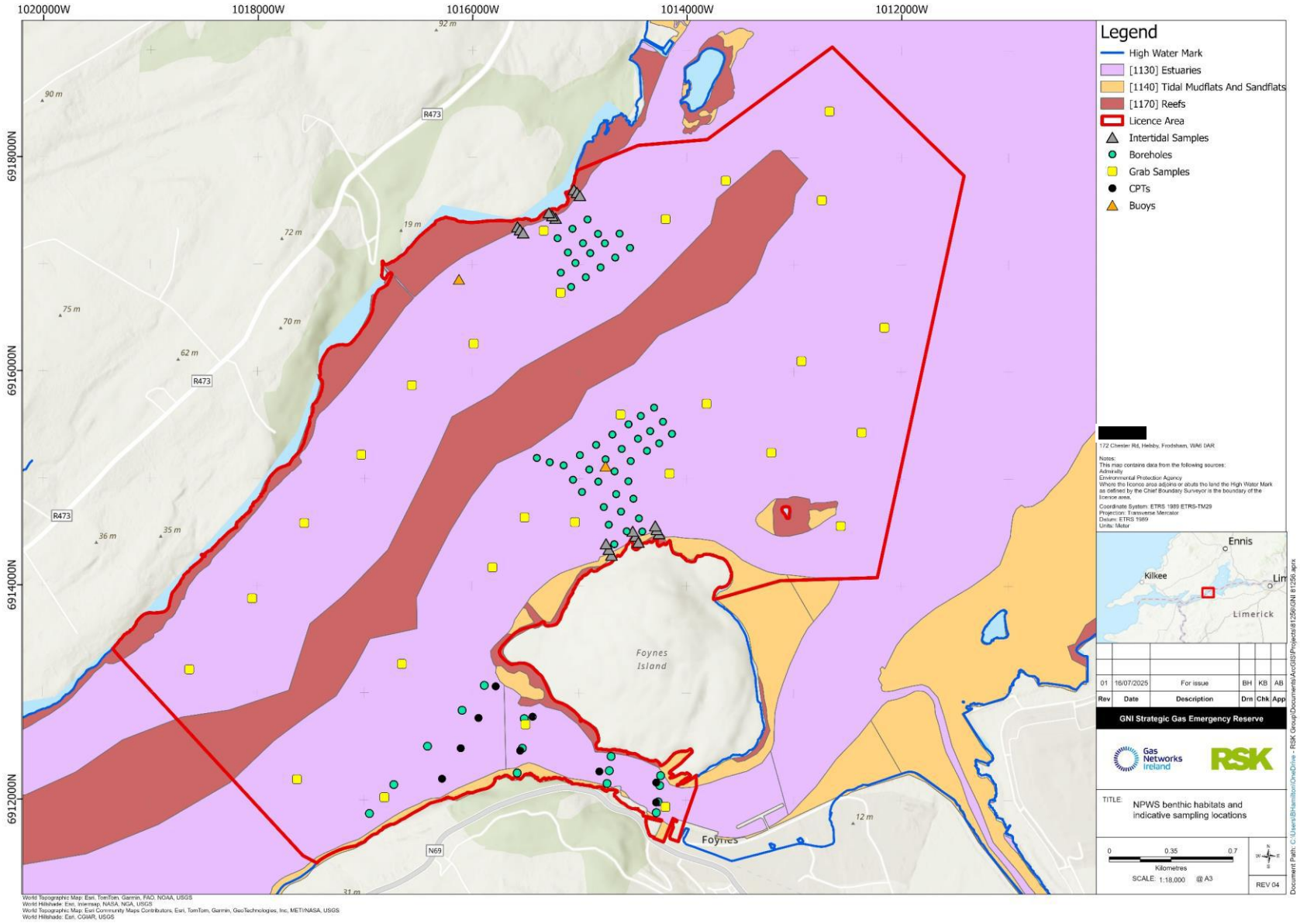

Figure 5.1
Benthic habitats of relevance to the SI works (NPWS, 2021b)

5.4.2 Habitat Loss or Disturbance

The SPA is designated for wetlands habitat. Because there is no wetland habitat within the proposed MUL Area, it is not anticipated that the SI works will have any significant impact on this designated habitat.

NPWS mapping of bird roost sites within the Shannon (NPWS, 2012b) indicates that there are two small (<50 individuals) roosting sites within the proposed MUL Area on the southwest tip of Foynes Island and on Sturamus Island to the east of Foynes Island.

Given the vessel traffic levels experienced around Foynes, the temporary addition of the SI works vessels and equipment is not anticipated to be significantly different from background levels of disturbance for roosting birds in the southwest of Foynes Island. Given the temporary nature and spacing of sampling around Sturamus Island, it is similarly anticipated that there will be no significant impact on roosting birds at that site. Therefore, roosting habitat will not be significantly impacted by the SI works.

As mentioned previously, the proposed MUL Area is largely terrestrial and marine habitat, with little intertidal habitat. Therefore, it is considered that significant habitat loss or alteration impacts on the area of wetland habitat is not likely.

Due to the conclusion that significant habitat loss or alteration is not considered likely as a result of the SI works, further assessment of this impact is not considered necessary.

5.4.3 Increased Suspended Sediment Concentrations

As discussed in Section 5.3.3, the SI works have the potential to cause temporary increases in suspended sediment concentrations. This could potentially lead to indirect effects on SPA QI species due to the smothering of fish prey species and increases in turbidity. However, due to the limited and temporary nature of sampling, it is considered that significant impacts are unlikely. Therefore, further assessment of this impact is not considered necessary.

5.4.4 Underwater Noise

Little evidence exists of impacts to diving seabirds from acoustic survey activities. Given the limited extent of sound-producing activity and as the majority of QI bird species at this SPA are not divers (with the exception of cormorant and scaup), it is considered that there is a very low likelihood of interaction between underwater noise sources and diving birds. Therefore, further assessment of this impact is not considered necessary.

5.4.5 Accidental Pollution Event

While water quality is not a conservation objective, it is considered that maintaining water quality is essential for supporting the ecology and functioning of the SPA. As discussed in Section 0, due to the limited and temporary nature of the SI works, it is considered unlikely that there will be a pollution event. Therefore, further assessment of this impact is not considered necessary.

5.5 Sites with potential ex-situ connectivity

Slyne Head Peninsula SAC (002074), West Connacht Coast SAC (002998) and Slyne Head Islands SAC (00328) have been screened in for potential ex-situ connectivity for bottlenose dolphin [1349], which are a qualifying interest of each site. It is possible that individuals associated with these SACs could travel to the proposed MUL Area and be exposed to potential project impacts.

As there is the potential for disturbance and/or displacement of QI species of the Lower River Shannon SAC due to geophysical survey noise sources in the absence of mitigation measures, the potential for impact on individuals travelling to the proposed MUL Area from potentially connected SACs cannot be ruled out and further assessment is considered necessary. The potential impact on marine mammals is underwater noise, as described in Section 5.3.4.

5.6 In-combination Effects

As part any SISAA, other relevant projects and plans in the region must also be considered for the possibility of the proposed project having significant effects on European sites when combined with existing, ongoing, or foreseeable future plans or projects, even in the case that the SI works have no anticipated significant effects when assessed in isolation. The in-combination assessment is scoped regarding the site-specific pressures and threats identified for the protected sites identified in Table 4.3.

5.6.1 Plans

The plans that are considered in-combination with the survey works proposed within the Shannon Estuary include:

- Clare County Development Plan (2023-2029)
- Kerry County Development Plan (2022-2028)
- Limerick County Development Plan (2022-2028)
- National Biodiversity Action Plan (2023-2020).

There are no anticipated in-combination effects from plans and therefore in-combination effects are not considered for further assessment.

5.6.2 Projects

Other marine projects, when considered in-combination with the SI works, could potentially give rise to either direct or indirect impacts. A search of planning authority applications and foreshore/MUL applications which could interact with the proposed surveys (within 10k m) was conducted using the planning authority websites (i.e., My Plan.ie, EIA planning portal which include applications from Clare Co. Co. planning website, Kerry Co. Co. planning website, An Bord Pleanála (ABP) website and Department of Housing and Local Government and Heritage (DHPLG) website). Several projects were identified as having the potential for overlap with the proposed works (Table 5.2).

Table 5.2
Applications with potential to interact with the proposed MUL Area, their current application status, and the assessed potential for cumulative effects

Application	Project	Status	Potential for Cumulative Effects
LIC230008	EBS Moneypoint surveys	Determined	This proposal has been supported by documents relevant to appropriate assessment which identified that the proposed SI works would not have potential to give rise to likely significant effects upon the Lower River Shannon SAC, or any other relevant European sites. On this basis it is considered that the proposed SI works would have no potential to act in-combination with this project.
LIC230014	Shannon Foynes Port Company	Determined	This application was subject to appropriate assessment as part of the submission. This assessment concluded that subject to the implementation of mitigation measures at construction stage, principally to avoid the potential for pollution and associated water quality and habitat deterioration effects, there would be no adverse impacts upon any European sites as a result of the development. However, if the works were to happen concurrently with the proposed SI works, there is the possibility of cumulative visual disturbance, underwater noise, suspended sediment concentration, and water quality impacts on QI species. The SI activities associated with LIC230014 are expected to be completed prior to the proposed SI activities.
LIC230004	Aughinish Alumina Ltd	Determined	This application was subject to appropriate assessment as part of the submission. This assessment concluded that subject to the implementation of mitigation measures, there would be no adverse impacts upon any European sites as a result of the SI works. On this bases it is considered that the proposed SI works would have no potential to act in combination with this project.
MAC20230032	Net Zero Energy Project 4 Limited	Applied	The proposed project is set to deploy up to 300MW of floating solar photovoltaic (PV) units and ancillary infrastructure including mooring systems, inter-array cabling and export cables off the coast of Killadysert and nearby islands. At the time of this application, no project description details or impact assessments are available to determine the possibility of cumulative impact potential.

Application	Project	Status	Potential for Cumulative Effects
MUL240034	Gas Networks Ireland, Shannon Estuary	Applied	This proposal has been supported by documents relevant to appropriate assessment which identified that the proposed survey activity would not have potential to give rise to likely significant effects upon the Lower River Shannon SAC, or any other relevant European sites. On this basis it is considered that the proposed SI works would have no potential to act in-combination with this project.

Considering the level of activity in the vicinity along with the limited and temporary nature of the SI works, with no permanent or continuous impacts, it is considered that the SI works will not have any likely significant cumulative impacts with other plans or projects in the area with the exception of the case of possible overlap with the Shannon Foynes Port Company works (LIC230014). Therefore, further assessment of in-combination effects for the Lower River Shannon SAC cannot be ruled out.

6 Summary and Conclusions

A summary of the findings of the preceding section is presented in Table 6.1.

Table 6.1
Summary of SISAA

Impact	Further assessment required per site (Y/N)				
	Lower Shannon SAC (002165)	River Shannon and River Fergus Estuaries SPA (004077)	Slyne Head Peninsula SAC (002074)	West Connacht Coast SAC (002998)	Slyne Head Islands SAC (000328)
Noise, vibration, lighting and human presence-related species disturbance	N	N	n/a	n/a	n/a
Habitat loss, alteration, and disturbance	**Y**	N	n/a	n/a	n/a
Increases suspended sediment concentrations	N	N	n/a	n/a	n/a
Underwater noise	**Y**	N	Y	Y	Y
Accidental pollution event	N	N	n/a	n/a	n/a
Collision with survey vessels	N	n/a	N	N	N
Risk of Entanglement	N	n/a	N	N	N
Invasive species	N	N	n/a	n/a	n/a
In-combination effects	**Y**	N	N	N	N

6.1 Conclusions

This report has been prepared to provide a sufficient level of information for MARA to complete a Screening for AA of the potential for likely significant effects on European sites, in view of their conservation objectives, arising from the proposed SI works either individually or in combination with other plans or projects. The likely significant effects have been considered in the context of the European sites potentially affected, their QIs and their conservation objectives, through the application of the S-P-R model, which considered the potential extent of effects from the SI works and the potential in-combination effects with other plans or projects. The overall findings are as follows:

- The SI works are not connected with or necessary to the management of the nature conservation interest of any European site.
- The likelihood of significant effects on the conservation goals of the identified European sites from **noise, vibration, lighting and human presence-related species disturbance** from the SI works can be safely excluded.
- The likelihood of significant effects on the conservation goals of the identified European sites from **habitat loss, alteration and disturbance** from the SI works cannot be safely excluded.
- The likelihood of significant effects on the conservation goals of the identified European sites from **increased suspended sediment concentrations** from the SI works can be safely excluded.
- The likelihood of significant effects on the conservation goals of the identified European sites from **underwater noise** from the SI works cannot be safely excluded.
- The likelihood of significant effects on the conservation goals of the identified European sites from **accidental pollution events** from the SI works can be safely excluded.
- The likelihood of significant effects on the conservation goals of the identified European sites from **collision with survey vessels** from the SI works can be safely excluded.
- **Entanglement with marine survey equipment** from the SI works can be safely excluded.
- The likelihood of significant effects on the conservation goals of the identified European sites from **invasive species** from the SI works can be safely excluded.
- The likelihood of significant effects on the conservation goals of the identified European sites from the SI works **in combination with other plans and projects** for the area cannot be safely excluded.

It is our opinion, therefore, that there is a need to advance the AA process further to NIS stage.

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10 Appendix B – Natura Impact Statement

Gas Networks Ireland

Strategic Gas Emergency Reserve – Marine Site Investigation (SI) Works

Natura Impact Statement (NIS)

RSK General Notes

Project No.: 81256

Title: Strategic Gas Emergency Reserve – Site Investigation (SI) Works: Assessment of Impacts on the Maritime Usage (AIMU) Report

Client: GNI

Date: 25 July 2025

Office: Helsby

Status: Rev04

Author	[redacted]	**Technical reviewer**	[redacted]
Signature	[redacted]	Signature	[redacted]
Date	17 July 2025	Date	17 July 2025
Project manager	[redacted]	**Quality reviewer**	[redacted]
Signature	[redacted]	Signature	[redacted]
Date	25/07/2025	Date	25/07/2025

Contents

1 Introduction

1.1 Overview

Following a review carried out by the Department of the Environment, Climate and Communications (DECC) of the Security of Energy Supply of Ireland's Electricity and Gas Systems, there is need to improve the resilience of Ireland's natural gas supplies and infrastructure in the event of a disruption to the country's natural gas supplies for the short to medium term.

Energy Security in Ireland (ESI) to 2030 outlines a comprehensive strategy aimed at ensuring energy security throughout the current decade while facilitating a sustainable transition towards a carbon-neutral energy system by 2050.

Action 17 of ESI proposes the implementation of a "Strategic Gas Emergency Reserve to protect Ireland in the event of a gas supply disruption as Ireland makes a secure transition to a majority renewable energy".

In January 2025, the Government of Ireland issued the "Programme for Government 2025 – Securing Ireland's Future" which included the commitment that the government will "Take all necessary action to ensure and protect Ireland's energy security".

In March 2025, the Government of Ireland gave approval to proceed with the development of a State-led strategic gas emergency reserve. The delivery of a temporary gas reserve is deemed critical to Ireland's energy security as we continue to transition to indigenous, clean renewable energy.

Based on the above decision, Gas Networks Ireland (GNI) proposes to construct a receiving terminal and jetty to accommodate a Floating Storage and Regasification Unit (FSRU), which will allow for the importation of and storage of Liquified Natural Gas (LNG) within Ireland's jurisdictional waters. The FSRU will be connected to the national grid network for injection in case of a supply emergency. The project will involve the construction of a receiving terminal and jetty to accommodate the FSRU. Depending on the site chosen, there may be capital dredging required.

GNI intends to apply to the Maritime Area Regulatory Authority (MARA) for a Maritime Usage Licence (MUL) to conduct marine Site Investigations (SI) and environmental surveys within the Shannon Estuary adjacent to the townlands of Shannakea Beg, Cahiracon, Foynes Island, Leahys and Corgrig.

This report has been prepared as part of the MUL application process. The proposed works are designed to provide high quality baseline data that will contribute to site selection and any subsequent design, EIAR, and Appropriate Assessment, undertaken for the Strategic Gas Emergency Reserve (SGER) project; in the event that a site is taken forward to the planning/consenting stage.

1.2 Purpose of the report

This document has been prepared by RSK Environment Ltd. on behalf of GNI in support of the Maritime Usage Licence Application to the MARA. A Supporting Information for Screening for Appropriate Assessment (SISAA) report was prepared for the SI works and identified the presence of European sites within the potential Zone of Influence (ZoI) of the SI works. The SISAA concluded that the potential for

the SI works to cause Likely Significant Effects (LSEs) cannot be ruled out on two accounts. Specifically, it identified that the works have the potential to contribute to habitat loss, alteration, fragmentation in the Lower River Shannon Special Area of Conservation (SAC) (002165). The SISAA also concluded that the SI works will introduce subsea noise that has the potential to impact on bottlenose dolphin that are a QI species of the Lower River Shannon SAC (002165). Mitigation measures to avoid adverse impacts are therefore required. As such, the SISAA concludes that a Natura Impact Statement (NIS) be prepared to assist the Maritime Area Regulatory Authority (MARA), the competent authority, in conducting an Appropriate Assessment (AA) should they agree with the findings of the SISAA.

The purpose of this NIS is to provide MARA with information for the purposes of Article 6 of the Habitats Directive on the implications of the SI works, on its own or in combination with other plans or projects, for one or more than one European site, in view of the conservation objectives of the site or sites. This NIS will assist MARA in determining whether or not the SI works will adversely affect the integrity of the site(s) concerned. This NIS provides an overview of the marine SI works proposed to be undertaken in support of the Maritime Usage Licence Application to MARA. The Maritime Usage Licence Application is for site survey and investigation works to inform site selection and engineering design. The results of these surveys will also provide baseline data for any subsequent Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR) should the development be taken forward to the planning/consenting stage.

This assessment has been carried out in accordance with the legal context as outlined in Section 1.4.

1.3 Statement of Authority

This report has been prepared by RSK on behalf of the GNI. The technical competence of the authors is outlined below:

[redacted] is Technical Director within the International Projects Group Marine Team in RSK. He has over 20 years of experience in marine environmental surveying and consulting. He holds an honours degree in Marine Biology and Oceanography and a Masters in Marine Resource Development and Protection. He has particular experience in marine ecology surveys, and the subsequent analysis and reporting of marine survey data for EIA projects, AA and Annex IV species reports.

[redacted] s a Senior Marine Consultant within the International Projects Group Marine Team in RSK. She has over 10 years of experience in the marine ecology field. She holds and honours degree in Marine Science and a Masters in Biology. She has contributed to numerous marine environmental projects including AA Screening, Natura Impact Statements and EIAR chapters.

This Supporting Information for Screening for Appropriate Assessment (SISAA) report has been prepared in compliance with the legislative and policy requirements described below.

1.4 Legislation

1.4.1 European Legislation

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) provides protection for habitats and species of European importance; Council Directive 79/409/EEC (the Birds Directive) aims to protect all 500 wild bird species naturally occurring in the European Union (EU). Areas designated for protection under the Habitats Directive are described as Special Areas of Conservation (SAC) and those designated under the Birds Directive, as Special Protection Areas (SPA) and the sites are known collectively as Natura 2000 sites (see Section 1.4.2.5). As each member of the EU is required to designate areas in their jurisdictions, the establishment of this network of Natura 2000 sites under Articles 3 to 9 of Directive 92/43EEC is the key measure to protect nature and biodiversity in the EU.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to have a significant effect on or to adversely affect the integrity of Natura 2000 sites. Article 7 of the Habitats Directive extends the scope of its articles 6(3) and 6(4) to the Birds Directive.

Article 6(3) establishes the requirement for Appropriate Assessment (AA):

“Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site’s conservation objectives. Considering the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the public.”

Further detail on the stages of AA is provided in Section 3.2 of this report.

Each Natura 2000 site has assigned Conservation Objectives (COs) and a list of Qualifying Interests (QI). The CO concept appears in the eighth recital of Directive 92/43/EEC which reads: “whereas it is appropriate, in each area designated, to implement the necessary measures having regard to the conservation objectives pursued”. Article 1 then explains that “conservation means a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status”.

The National Parks and Wildlife Service (NPWS) has established COs for each Natura 2000 site in Ireland. These are published on their website. NPWS advise in the general introductory notes of their site-specific conservation objectives (SSCO) series publications, that an appropriate assessment based on their “published conservation objectives will remain valid even if the CO targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out”.

NPWS advise that to assist in that regard, it is essential that the date and version are included when objectives are cited.

1.4.2 National Legislation

1.4.2.1 Maritime Area Planning Act

The Maritime Area Planning Act, 2021 (as amended) established the Maritime Area Regulatory Authority (MARA). One of the functions of MARA is to consider licence applications and the granting of licences.

Schedule 7 of the Maritime Area Planning Act, 2021 (as amended) lists maritime usages which may be undertaken in the maritime area pursuant to licence. Of relevance to this site investigation project are the following items within Schedule 7:

3. Marine environmental surveys for the purposes of site investigation or in support of an application under Part XXI of the Act of 2000.

5. The installation of non-permanent platforms, pontoons, or slipways.

6. The deposit of any substance or object, either in the sea or on or under the seabed, from-

a) a vehicle, vessel (including a craft capable of travelling on, in or under water, whether or not self-propelled), boat, aircraft or marine structure (other than a pipeline).

7. The use of a vehicle, vessel (including a craft capable of travelling on, in or under water, whether or not self-propelled), boat, aircraft, marine structure (other than a pipeline) or floating container to remove any substance or object from the seabed.

11. The deposit, construction or removal of any mooring not requiring authorisation under any other enactment.

12.

a) The removal of beach material from, or the disturbance of beach material in, the maritime area otherwise than in the course of the ordinary or reasonable recreational enjoyment of the maritime area.

b) In this paragraph, "beach material" means sand, clay, gravel, shingle, stones, rocks, mineral substances, seashells, coral and maerl and any flora, in or on the surface of the seabed or suspended in the water of the maritime area, and includes outcrops of rock or any other mineral substance above the surface of the seabed.

GNI is applying to MARA for the grant of a licence for the above Schedule 7 usages, as more fully described in Section 2 of this report.

1.4.2.2 Requirements in Relation to Appropriate Assessment

The following definitions in relation to AA are included in Section 2(1) of the Maritime Area Planning Act, 2021 (as amended):

"screening for appropriate assessment" shall be construed in accordance with, as appropriate—

a) section 177U of the Act of 2000, or

b) (b) Part 5 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011)

"appropriate assessment" shall be construed in accordance with, as appropriate—

a) section 177V of the Act of 2000, or

b) Part 5 of the European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477 of 2011);

where the Act of 2000 refers to the Planning and Development Act 2000 (as amended).

The European Communities (Birds and Natural Habitats) Regulations 2011 have also been amended.

Under Section 112 of the Maritime Area Planning Act, 2021 (as amended), MARA has been designated as a competent authority for the purposes of Part 5 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011); and appropriate assessments to which that Part applies.

MARA is required to carry out a screening for AA in accordance with Section 117(4)(a) of the Act.

Where MARA determines that an AA is required it shall carry out the AA in accordance with Section 117(7)(a) of the Act.

1.4.2.3 Screening Out for AA

Under Section 177U (5) of the Planning and Development Act 2000 (as amended), the competent authority shall determine that an AA of a proposed development **is not required** if it can be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.

Under Regulation 42(7) of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) the public authority shall determine that an AA of a project **is not required** where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it can be excluded on the basis of objective scientific information following screening that the project, individually or in combination with other plans or projects, will have a significant effect on a European site.

1.4.2.4 Screening In for AA

Under Section 177U (4) of the Planning and Development Act 2000 (as amended), the competent authority shall determine that an AA of a proposed development **is required** if it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.

Under Regulation 42(6) of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) the public authority shall determine that an AA of a plan or project **is required** where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it cannot be excluded, on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site.

Where the competent authority determines that an AA is required, they shall make a determination under Article 6.3 of the Habitats Directive as to whether or not the proposed development would adversely affect the integrity of a European site and an appropriate assessment shall be carried out by the competent/ public authority before consent is given for the proposed development (see Section

177V(1) of the Planning and Development Act 2000 (as amended) and Regulation 42(11) European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

1.4.2.5 European Sites and Natura 2000 Sites

The term European site is defined in the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) as:

"European Site" means—

a) a candidate site of Community importance,

b) a site of Community importance,

c) a candidate special area of conservation,

d) a special area of conservation,

e) a candidate special protection area, or

f) a special protection area.

The term Natura 2000 site is defined in the same Regulations as:

"Natura 2000" means the European network of SACs under the Habitats Directive and SPAs under the Birds Directive, provided for by Article 3(1) of the Habitats Directive and, for the purposes of these Regulations, includes European Sites.

The two terms are often used interchangeably. For the purposes of this report, the term European site is used.

2 Project Description

2.1 Site Location

The proposed MUL Area covers an area of 11.19km^2 and extends from the townland of Shannakea Beg along the Clare coast to Cahiracon (Ed Killadysert), across the Shannon Estuary to Shannon Foynes Island and along the Limerick coast to the townland of Leahys and Corgrig (Figure 2.1). The works described in this application relates solely to the SI / sampling works within the proposed MUL Area (Figure 2.2 and Figure 2.3). Marine SI is required to inform preliminary design and facilitate environmental assessment in advance of Planning for the SGER project. Site investigations are to be completed over two phases, with Phase 1 being used to determining the optimum location of the SGER and Phase 2 being used at a later date to coordinate with the detailed design stage.

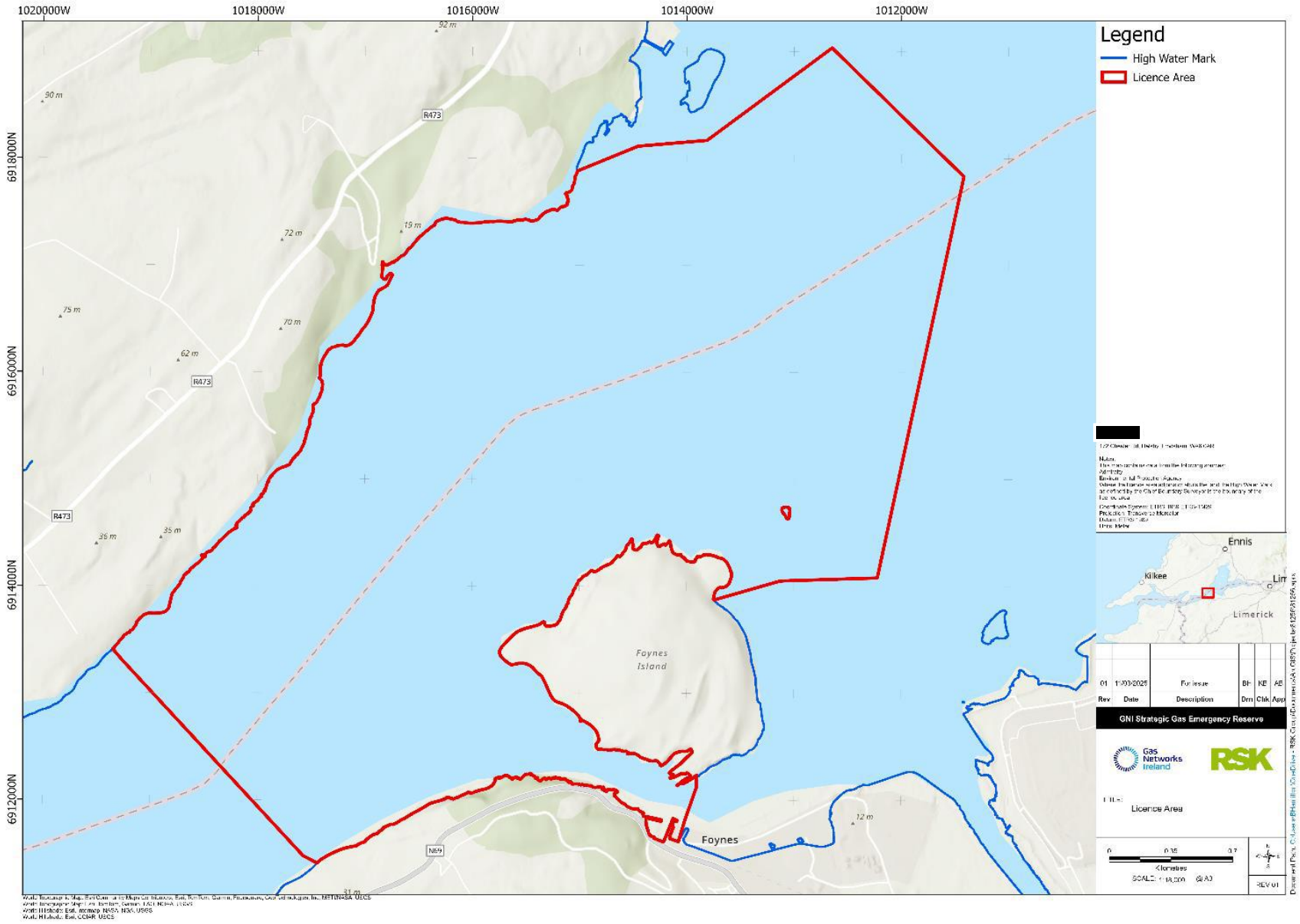

Figure 2.1
Proposed MUL Area

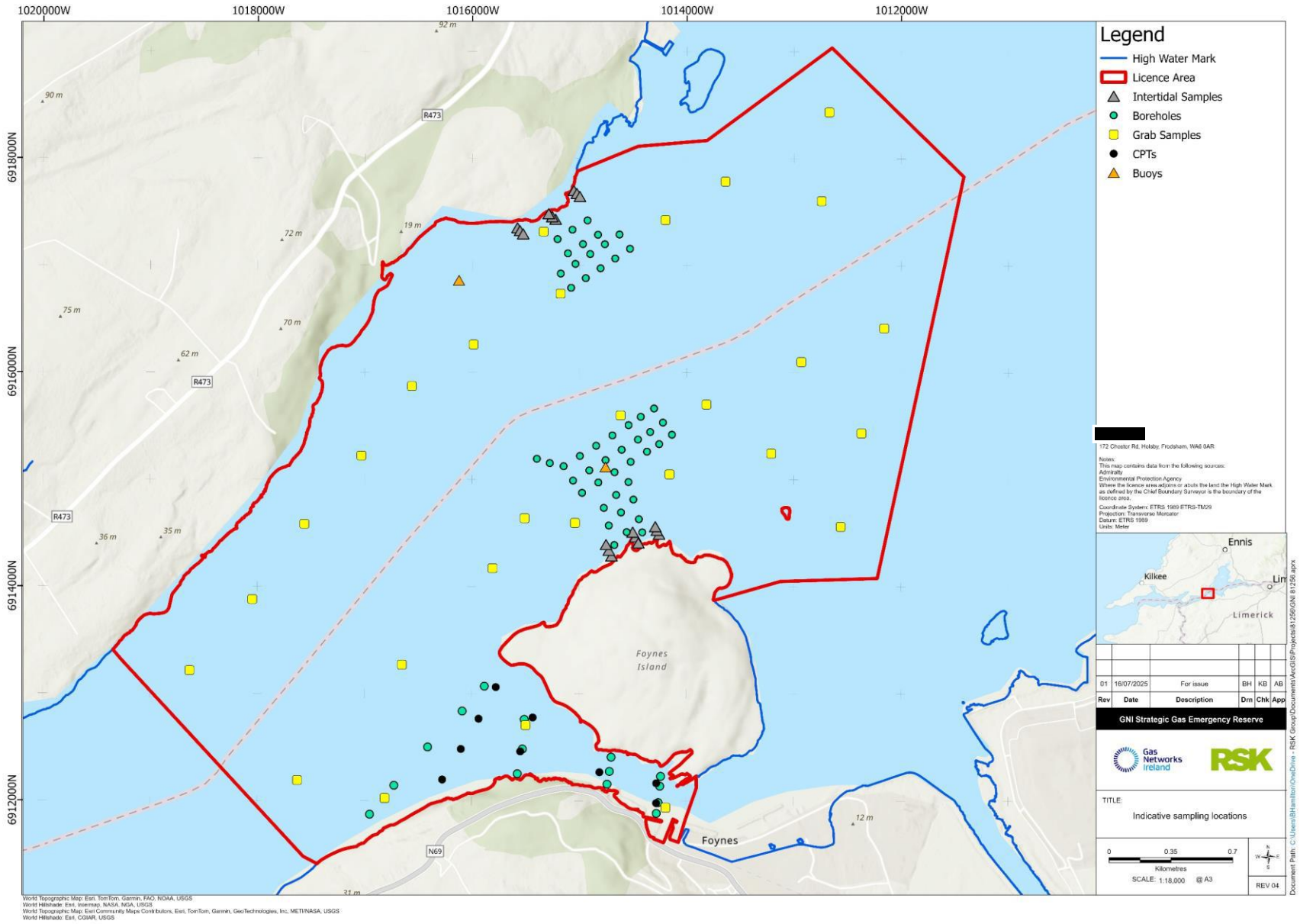

Figure 2.2
Indicative sampling locations

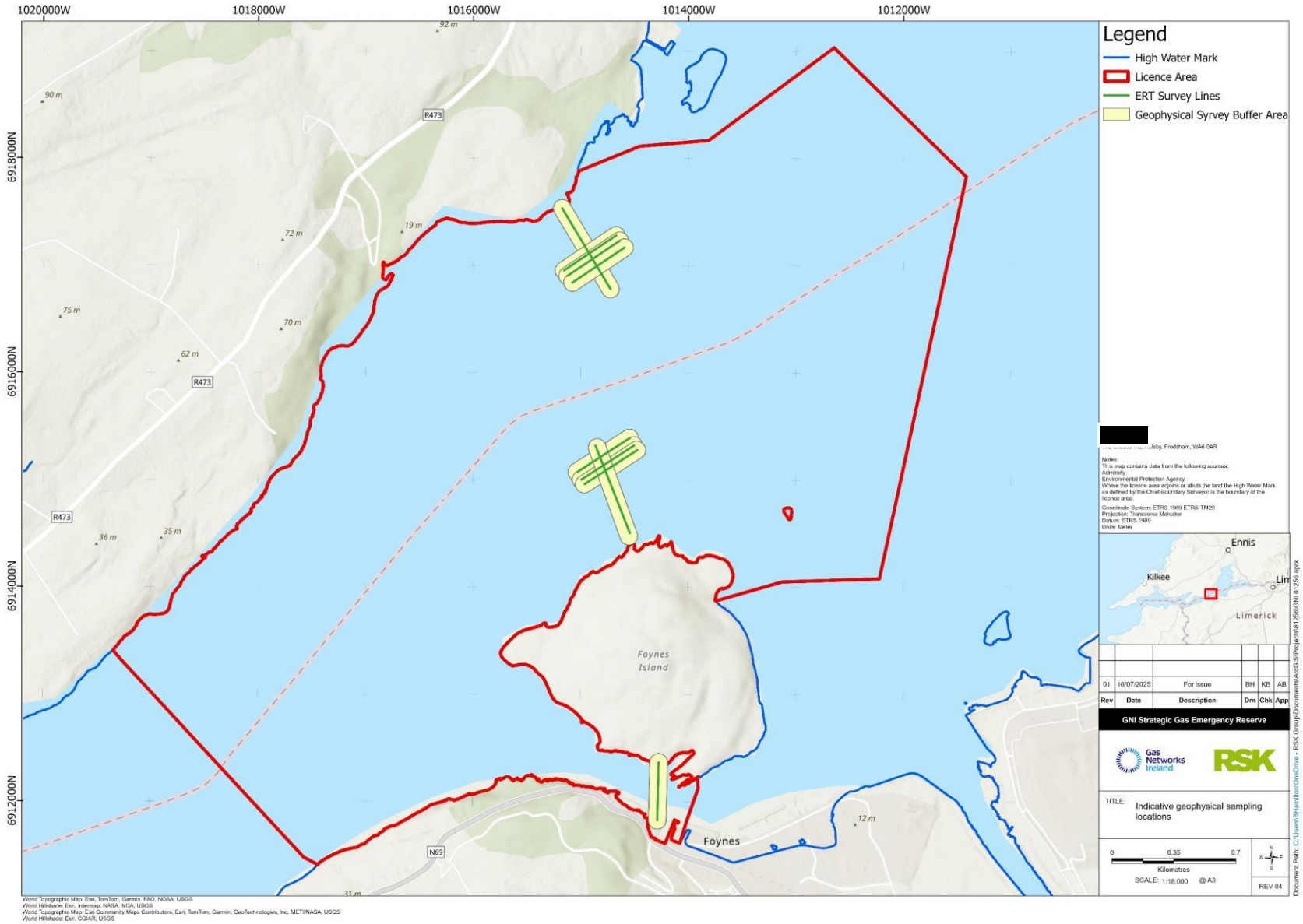

Figure 2.3

Indicative Geophysical Survey and Electrical Resistivity Tomography (ERT) electrode deployment locations

2.2 Description of the Works

2.2.1 Overview

The objective of the proposed surveys is to provide high-quality data that can contribute to a reliable baseline for site selection and subsequent project design and development as well as informing the EIA. As such, the following survey investigations are considered necessary and detailed further in **Table 2.1**:

- Drop-down camera survey
- Geophysical survey, including:
  - Magnetometer
  - Sub-bottom profiler (SBP)
  - Side-scan sonar (SSS)
  - Multibeam Echo Sounder (MBES)
  - Marine Refraction Seismic
  - Marine Electrical Resistivity Tomography (ERT)
- Boreholes
- Cone penetration tests (CPTs)
- Grab samples
- Surface water samples
- Intertidal walkover survey
- Intertidal core samples
- Archaeological surveys and other investigations (i.e. underwater inspections, walkovers, metal detectors, dive surveys).
- Deployment of metocean monitoring buoys to collect physical oceanographic data.

These works are collectively referred to as the Site Investigation (SI) works throughout this report.

Indicative sampling locations within the proposed MUL Area are designed to inform a potential jetty and vessel, with the addition of potential pipeline route options from the southwest side of Foynes Island to the mainland. It should be noted that all locations shown for sampling within the proposed MUL Area are indicative and may be subject to a degree of change on-site.

The following drawings have been prepared in support of the Maritime Usage Licence application to the MARA:

- Proposed Licence Area Map
- Proposed Grab Sample Locations Map
- Proposed Borehole Locations Map
- SI Indicative Table of Coordinates

The exact technical specification of the equipment to be used will not be known until the survey contract has been awarded. However, descriptions of typical equipment and survey parameters has been used within this report.

Predicted time and footprint for the activities are presented in Table 2.2. 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 borehole locations

and quantities.

There will be no permanent structures and all site investigation works will be temporary in nature. The moving marine plant will remain on site for the duration of the works.

2.2.2 SI Schedule

The intention is to begin SI activities as soon as feasible following MUL award. Timing of the SI activities is dependent on many factors including weather, tidal flows, availability of vessels and the grant of the MUL. The granting of the MUL will have a direct effect on the timing of SI activities. The duration of the phase 1 SI works is approximately 16 weeks and are currently scheduled for Q3 2025. Phase 2 SI works (if required) will be carried out at a later date to coordinate with the detailed design stage which is dependent on consenting for the main project. The proposed licence duration is for 5 years to account for potential delays in the consenting process.

Table 2.1
Description of proposed works

Survey	Method	Method detail	Sampling Effort
Geophysical	Side Scan Sonar (SSS)	SSS surveys are used to determine sediment characteristics and seabed features. The EdgeTech 4205 may be taken as an indicative example of an SSS device and for these surveys will have a potential operating frequency range of approximately 300/600kHz in the offshore area and 600/900kHz in the shallower nearshore area with sound pressure levels of 220-230dB re1µPa @1m. The SSS will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SSS may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Magnetometer	A magnetometer is used to identify magnetic anomalies and hazard mapping for metal obstructions, shipwrecks and unexploded ordnance on the surface and in the shallow sub-surface. The Geometrics G-882 can be taken as an indicative equipment example. It is a passive device (i.e. it does not emit any sound waves into the marine environment) the sensor responds to local variability in magnetic field. The magnetometer will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	Magnetometer survey may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) – Parametric Sub Bottom Profiler	SBP is used to develop an image of the subsurface, identifying different strata encountered in the shallow sediments. The Innomar "standard" Sub-Bottom Profiler is an indicative example of a parametric system with a primary and secondary frequency range of 85-115kHz and 2-22kHz, respectively, and sound pressure levels of up to 232 dB (typically operated at <200dB) re1µPa @ 1m, which would be used in both nearshore and offshore areas. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Parametric Sub Bottom Profiler may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) - Boomer	The Applied Acoustics AA301 is an indicative example of a boomer, the instrument consists of a piezo electric plate transducer mounted on a surface tow catamaran frame. Reflected sound signals are recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m). The Boomer SBP operates in a frequency range of 0.5 kHz to 5 kHz, with sound pressure levels in the range of 205-211dB re1µPa @ 1m which would be used in the nearshore shallower area. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Boomer may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) -	The applied Acoustics Dual 400 Tip is an indicative example of a sparker system used in sub-bottom profiling. Reflected sound signals are	SBP Sparker may be undertaken across the proposed MUL Area to

Survey	Method	Method detail	Sampling Effort
	Sparker	recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m) or a multi-channel hydrophone such as the Geometrics GeoEel LH-16™ Digital Streamer. The sparker source has a frequency range of between 0.4-5kHz and a recorded sound pressure of 203dB re1µPa @1m. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Multibeam Echo Sounder (MBES)	A bathymetric survey will be conducted using multibeam echo sounders. These systems may be mounted on a dedicated survey vessel or towed behind a smaller vessel, depending on site conditions and water depths. Multibeam systems emit wide acoustic signals to generate high-resolution images, creating three-dimensional maps of the seabed. Line spacing will be between 5 and 20m, depending on depth. The operating frequencies emitted from MBES will be 300-700 kHz, with a peak operating frequency of approximately 400kHz. Exposure time is approx. 0.05 ms per 1 ms for multibeam operating with 200-400 kHz, or 0.05 per 0.3 ms for higher frequencies (>400 kHz). Sound pressure levels will be approximately 215-220dB re 1µPa @ 1m.	MBES may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Marine Refraction Seismic	Marine refraction surveys use controlled seismic sources, such as air guns or weight drops, to generate seismic waves that travel through sediment and rock layers. Arrays of hydrophones or geophones deployed on the seabed record the refracted seismic waves as they bend and travel along subsurface interfaces. By analysing the travel times and velocities of these refracted waves, detailed models of sediment thickness, bedrock depth, and structural features can be developed. Airgun impulse energy is mostly concentrated within low frequencies, with peak frequencies between 5 and 90kHz. Source levels are predicted to be within the range of 186-220dB re 1µPa @1m.	Marine Refraction Seismic may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
	Marine Electrical Resistivity Tomography (ERT)	ERT surveys are conducted to investigate the electrical properties of subsurface sediments and rocks. The technique involves deploying a series of electrodes along the seabed, either towed or fixed. As a non-invasive, non-seismic geophysical method, marine ERT produces no significant underwater noise and has minimal environmental impact.	Maximum **20 ERT lines** of 315m length line with diameter of 20mm. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
Marine Environmental / Ecological	Benthic ecology samples (including subtidal and intertidal	Identify benthic communities and habitats at the site. Subtidal sample locations may be subject to drop down video in advance of sampling, intertidal sample locations may be subject to walkover/drone survey in advance of sampling.	There will be up to **30 no.** dedicated subtidal benthic ecology grab sampling locations within the proposed MUL Area and multiple samples (max 4) may be taken at each location.

Survey	Method	Method detail	Sampling Effort
	habitats surveys)		Samples would be of volume 0.1 m^2. There will be up to **30 no**. dedicated intertidal coring /grab locations if shoreline conditions allow for sediment sampling.
Archaeological	Walkover	Intertidal walkover to be undertaken at low tide to assess for the presence of sensitive archaeological features. Survey methodology may also involve the use of a metal detector along the foreshore. Pending the results of geophysical surveys there may be a requirement for further archaeological surveys (i.e. underwater video, dive surveys, etc.)	To be confirmed pending the results of the geophysical surveys.
Geotechnical	Drop-down video	Drop-down video survey to inspect the seabed and identify any reef structures in the vicinity without disturbance to the seabed.	There will be up to **30 transects** of up to 30 m each using a drop down camera and video surveillance.
	Boreholes	Boreholes may be up to 50 m below bed level but some may be terminated if sufficient bedrock is encountered. The boreholes will be carried out using sonic methods through the seabed sediment, with rotary coring used to advance through the bedrock. The typical frequencies emitted from rotary drilling are between 0.001-0.120kHz and a recorded sound pressure of approximately 145dB re1µPa @1m. Marine rotary drilling involves rotating a drill bit attached to a drill string and applying downward pressure to cut through the rock formations. Geotechnical sampling tools, including push and piston samples, can then be deployed into the ground to recover intact material. All drilling equipment used will follow the ISO and API technical specifications for drilling equipment. All boreholes will be drilled from a jack-up barge to maintain stability when drilling. Each location would require the 4 legs to penetrate the seabed and cause a temporary disturbance on each occasion. Each leg is typically less than 1m^2 in footprint.	A maximum of **80 no**. boreholes of a diameter of 300 mm will be required within the proposed MUL Area.
	Cone penetration tests (CPTs)	CPTs are to progress to a maximum depth of 20m but will be terminated when bedrock is encountered. In the CPT, an instrumented electronic probe (cone penetrometer) is situated at the front end of a string of steel rods that are hydraulically pushed into the ground at a constant rate of 20mm/s to measure soil response, geo-stratigraphy, and engineering parameters. A CPT vehicle or hydraulic ram set are often used to provide	**80 no. CPTs** will be conducted of a diameter of 44mm. 60 of the CPTs will be at borehole locations to clear for unexploded ordnance (UXOs) and 20 as standalone investigation sites.

Survey	Method	Method detail	Sampling Effort
		the reaction and pushing force. The equipment used will conform to relevant international standards, such as ISO, ensuring consistent and reliable geotechnical data.	
	Grab samples	Grab samples using 0.1 m^2 grabs will be collected for grading, loss on ignition and assessment of benthic community.	A maximum of **50 no**. grab samples of volume 0.1 m^2 will be collected within the proposed MUL Area.
	Metocean monitoring buoys	Metocean monitoring buoys are floating sensors with an anchorage system secured on the seabed. The buoys record various metocean conditions through the following monitoring equipment: • Conductivity, Temperature, Depth Sensors • Optical Salinity Sensor • Acoustic Doppler Current Profiler (ADCPs operating in the range of 600 Khz or 1 Mhz will be used. The instrument emits low amplitude "pings" of sound at a sampling rate of 1-minute average every 10 minutes. These pings will be emitted in a narrow sound beam (typically a few degrees in width) with a typical echo intensity profile of 80 dB (+/- 1.5 dB)) • Optical or Electrochemical Dissolved Oxygen Sensor • pH Sensor/Probe • Turbidity sensor • Turbidity meter/sediment trap. Metocean monitoring buoys will be anchored with two anchors per buoy. Anchors will have a maximum footprint of 4m^2 each.	**2 buoys** will be placed within the study area initially, with the possibility for **up to a further 4**.

Table 2.2
Predicted time and footprint of each survey activity

Survey Activity	Total time for activity	Maximum number of samples	Footprint per sample (m^2)	Maximum total footprint per activity (km^2)
Geophysical survey	Up to 4 months	SSS, Magnetometer, SBP 20 m spacing of main lines and 100 m spacing of cross lines with 25% overlap onto neighbouring lines MBES: 5 -20 m line spacing	-	Area up to 2.155
Marine refraction seismic	Up to 4 months	20 m line spacing	-	Area up to 2.155
ERT	Up to 4 months	20 maximum ERT lines	6.3	0.0000063
Marine Environmental / Ecological	Up to 4 months	120 subtidal (30 no. grab locations with max 4 samples taken at each location) 120 intertidal (30 no. grab locations with max 4 samples taken at each location)	0.1	0.000024
Geotechnical: Drop down video	Up to 4 months	30 transects	30	0.0009
Geotechnical: Boreholes	Up to 4 months	80	0.071	0.00000568
CPTs	Up to 4 months	80	0.00152	0.0000001216

Survey Activity	Total time for activity	Maximum number of samples	Footprint per sample (m^2)	Maximum total footprint per activity (km^2)
Jack-up barge leg	Up to 4 months	640*	1	0.00064
Geotechnical: Grab samples	Up to 4 months	50	0.1	0.000005
Metocean monitoring buoy anchors	Maximum of 24 months (2 years)	12 anchors	4	0.000048

** 80 Borehole locations and 80 CPT locations x 4 legs*

2.3 General Survey Requirements

All appointed survey contractors shall obtain and comply with all necessary marine operational permits including routine and customary vessel/crew/equipment clearances from Customs Agencies, Port Authorities, Marine Survey Office, etc. This will include adherence to all major international shipping conventions adopted by the International Maritime Organization (and the International Labour Organization) concerning maritime safety and pollution prevention.

2.3.1 Quality Assurance

Each of the appointed survey contractors shall comply with the following as a minimum:

- Quality and Environmental Management Systems based on ISO9001:2015 and ISO14001
- Provision of site and activity specific Method Statements for all the marine operations within their scope
- Provision of Quality Management Plans for all the marine operations.

2.3.2 Health & Safety

Health, safety, environment, and welfare considerations will be a priority in the evaluation of possible contractors for the various survey scopes and will be actively managed during the survey work.

Appointed contractors will be required to comply with all legislation relevant to the activities within their scope of work, such as the Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005) and Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007), as amended.

Project / survey specific Health, Safety and Environment (HSE) plans will be put in place which will form part of the project / survey execution plans.

2.3.3 Working Hours

The working hours for the SI works are proposed to be up to 24 hours per day, seven days a week. It is anticipated that the main SI works will be carried out over a period of approximately four months including mobilisation and demobilisation. While metocean monitoring buoy deployment will be for period of up to two years, the devices will be autonomous apart from maintenance visits every two to four months. Such maintenance visits will occur during daylight hours only.

Weather conditions and/or sea-state will impact on the working hours, and it may be necessary to temporarily suspend operations when adverse weather conditions and/or sea-state are encountered or forecast. As such, survey plans will remain flexible to take advantage of optimal weather windows. Similarly, equipment or vessel maintenance and repair may impact on the SI works resulting in changes to the survey schedule.

2.3.4 Environmental Procedures

Environmental procedures to be followed by the appointed survey contractors are detailed within Section 6.

2.3.5 Vessels

All vessels will be fit for purpose, certified and capable of safely undertaking all required survey work. Marine vessels will be governed by the provisions of the Sea Pollution Act 1991, as amended. In addition, all vessels will adhere to published guidelines and best working practices such as: the National Maritime Oil/HNS Spill Contingency Plan (NMOSCP), Marine Pollution Contingency Plan (MPCP), Chemicals Act 2008 (No. 13 of 2008), Chemicals (Amendment) Act 2010 (No. 32 of 2010) and associated regulations.

Vessels shall have a Health, Safety and Environmental Managements system which should conform to the requirements of the latest International Maritime Organisation (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or continental / EEZ waters to be operated in.

The SI works will be undertaken from vessels in accordance with the relevant guidelines[1] required to manage the risk to marine mammals from man-made sound sources in Irish waters (DAHG, 2014).

[1] Relevant guidance may include the incorporation of the methods outlined in the following text, additional activity-specific mitigation is outlined in Section 6 and within the guidance document (DAHG, 2014). A3: Avoid critical habitats for marine mammals, A4: Avoid operations during key periods of species life cycles, A5: Avoid time periods when effective impact mitigation is not possible, A6: Risk minimisation measures, including minimisation of duration over which sound producing activity takes place, and minimise sound pressure and exposure levels delivered into the environment (i.e., lower impact methods), clear ramp-up procedure, bubble curtain implementation (where relevant), use of dedicated Marine Mammal Observer (MMO) (where relevant).

3 Methodology

3.1 Appropriate Assessment Guidance

This report has been completed in consideration of the EU and national guidance documents that pertain in relation to Member States' fulfilling their requirements under the EU Habitats Directive, with particular reference to Article 6(3) and 6(4) of that Directive. The methodology followed in relation to this report has had regard to the following guidance:

- EC (2000). Communication from the Commission on the Precautionary Principle. Office for Official Publications of the European Communities, Luxembourg
- EC (2002). Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission
- EC, (2007). Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC. European Commission
- DoEHLG (2009, rev. 2010). Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government;
- EC (2013). Interpretation Manual of European Union Habitats. Version EUR 28. European Commission, Luxembourg
- EC (2018). European Commission Notice C (2018) 7621 'Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC', Office for Official Publications of the European Communities, Luxembourg
- OPR (2021). Practice Note PN01: Appropriate Assessment Screening for Development Management. Office of the Planning Regulator, Dublin Ireland
- EC (2021). European Commission Notice C (2021) 6913 'Assessment of plans and projects in relation to Natura 2000 sites – Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC', Office for Official Publications of the European Communities, Luxembourg.

3.2 Stages of Appropriate Assessment

The AA is a four-stage process with tests at each stage. The four stages are shown in Figure 3.1 below. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

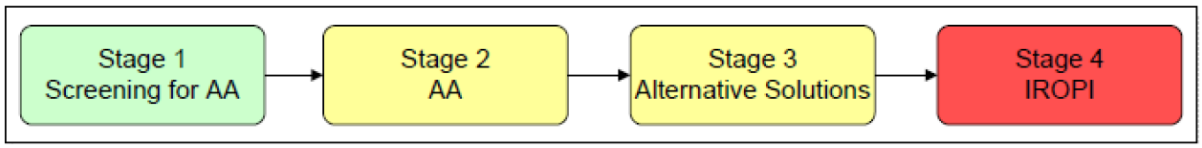

Figure 3.1
Four Stages of Appropriate Assessment

Stages 1-2 deal with the main requirements for assessment under Article 6(3) of the Habitats Directive. Stage 3 may be part of the Article 6(3) Assessment or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

The screening for AA carried out by the public authority/ competent authority (Stage 1), will determine whether an AA (Stage 2) of the proposed project is required. Stage 2 is required if it cannot be excluded, on the basis of the objective information provided at Stage 1, that the proposed project, individually or in combination with other projects or plans, will have a significant effect on a European site, in view of the site's conservation objectives. In this case, a Natura Impact Statement (NIS) must be prepared to assist the public authority/competent authority to conduct the Stage 2 AA. If it is not possible during Stage 2 to reduce impacts to acceptable, non-significant levels by avoidance and/or mitigation, Stage 3 of the process must be undertaken which is to objectively assess whether alternative solutions exist by which the objectives of the plan or project can be achieved. If alternative solutions exist that do not have negative impacts on European sites; they should be adopted regardless of economic considerations. The process must then return to Stage 2, as any alternative proposal must be subject to a Stage 2 AA before it can be subject to the Article 6(4) test. If it can be demonstrated that all reasonable alternatives have been considered and assessed, the AA progresses to Stage 4. This final stage is undertaken when it has been determined that negative impacts on the integrity of a European site will result from a plan or project and there are no alternative solutions. At Stage 4 of the AA process, it is the characteristics of the plan or project itself that will determine whether or not the competent authority can allow it to progress. This is the determination of Imperative Reasons for Overriding Public Interest (IROPI).

While there is no prescribed form or content for reporting (DoEHLG, 2009) the methodology and format adopted in this report has been in accordance with the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC, 2021) and the European Commission Guidance 'Managing Natura 2000 sites' (EC, 2018), guidance prepared by the NPWS (DoEHLG, 2009) and by the Office of the Planning Regulator (OPR, 2021).

As per DoEHLG (2009):

"The first test is to establish whether, in relation to a particular plan or project, appropriate assessment is required."

In summary, the test for the screening for AA is to assess, in view of objective scientific information, if the proposed development, individually or in combination with other plans/projects is likely to have a significant effect on a European site. The precautionary-principle approach is required, meaning decisions must avoid deterioration and disturbances that could significantly impact the site's integrity, even where there is uncertainty regarding a likely effect. Under the Habitats Directive, a plan or project cannot be authorised if there remains reasonable scientific doubt that it will adversely affect the integrity of a European site. If there are any significant, potentially significant, or uncertain effects, it will be necessary to proceed to AA and submit an NIS.

3.3 Stage 1 Screening / Test of Significance

This process identifies whether the proposed development is directly connected to or necessary for the management of a European site(s) and identifies whether the development is likely to have significant impacts upon a European site(s) either alone or in combination with other projects or plans.

The screening for AA will incorporate the following steps:

1. determining whether a project or plan is directly connected with or necessary to the conservation management of any European sites
2. describing the project or plan
3. identifying the European sites potentially affected by the project or plan
4. identifying and describing any potential effects of the project or plan on European sites, alone, in combination and cumulatively with other plans/projects
5. determining the likelihood of significant effects on European sites.

The output from this stage is a determination for each European site(s) of the likelihood of not significant, significant, potentially significant, or uncertain effects. The latter three determinations will cause that site to be brought forward to Stage 2.

3.4 Desk Study

Information on the receiving environment was analysed to determine the potential for significant effects to qualifying interests (QI) of the European sites with established connectivity to the work. The following publications and data sources were reviewed:

- Environmental Protection Agency (EPA) online interactive mapping tools (https://gis.epa.ie/EPAMaps) and (https://www.catchments.ie/maps/) for water quality data including surface and ground water quality status, and river catchment boundaries
- Information on ranges of mobile QI populations in Volume 1 of NPWS' Status of EU Protected Habitats and Species in Ireland (NPWS, 2019), and associated digital shapefiles obtained from the NPWS Research Branch
- Inland Fisheries Ireland mapping (http://wfdfish.ie/)
- BirdWatch Ireland (https://birdwatchireland.ie/)
- Mapping of European site boundaries and Conservation Objectives for relevant sites, available online from the NPWS included site synopsis, Natura 2000 Data form and Conservation Objective Supporting Documents where available (https://www.npws.ie/protected-sites)
- Distribution records for QI of European sites held online by the National Biodiversity Data Centre (NBDC) (www.biodiversityireland.ie)
- Geohive online Environmental Sensitivity Mapping tool (https://airomaps.geohive.ie/ESM/)
- Geological Survey Ireland (GSI) (https://www.gsi.ie/en-ie/Pages/default.aspx)
- Local surveys of flora, fauna, and habitat available using the Heritage Councils mapping website (https://heritagemaps.ie/WebApps/HeritageMaps/index.html)
- Ordnance Survey of Ireland maps and aerial photography (https://osi.ie).

The identification of relevant European sites to be included in this report was based on the criteria provided in OPR (2021), namely:

- any European site within or immediately adjacent to the project area
- identification of European sites where a Source-Pathway-Receptor (S-P-R) link exists, explained in Section 3.5.

3.5 Identification of Relevant European Sites

3.5.1 Source-Pathway-Receptor Model

The identification of relevant European sites to be included in this report was based on the identification of the 'zone of influence' of the proposed SI works using a Source-Pathway-Receptor (S-P-R) model where:

- a 'source' is defined as the individual element of the proposed works that has the potential to impact on a European site, its qualifying features, and its COs
- a 'pathway' is defined as the means or route by which a source can affect the ecological receptor
- a 'receptor' is defined as QI of SACs or SPAs for which COs have been set for the European site(s) being assessed.

An S-P-R model is a standard tool used in environmental assessment. For an effect to be likely, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism results in no likelihood for the effect to occur. The S-P-R model was used to identify a list of European sites, and their QIs, to which the proposed works are potentially linked. These are termed as 'relevant' sites/QIs throughout this report.

3.5.2 Zone of Influence

Determination of the project's zone of influence was achieved by assessing the project's requirements and deliverables against the ecological receptors within the project footprint, in addition to the ecological receptors that could be connected to and subsequently impacted by the project through abiotic and biotic vectors.

The proximity of the works to European sites, and more importantly, QIs of the European sites, is of importance when identifying potentially likely significant effects. In accordance with the OPR AA Screening Guidelines (2021), the S-P-R model has been used to identify the zone of influence to ensure that relevant European sites are identified. The S-P-R model minimises the risk of overlooking distant or obscure effect pathways, while also avoiding an over reliance on buffer zones (e.g., 15 km), within which all European sites should be considered. This approach follows the DoEHLG 2009 guidance on AA which states that:

"For projects, the distance could be much less than 15 km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects" (DoEHLG, 2009; p.32, para 1).

The zone of influence of the works on mobile species (e.g., birds, mammals, and fish), and static species and habitats (e.g., saltmarshes, woodlands, and flora) is considered differently. Mobile species have 'range' outside of the European sites in which they are QI. The range of mobile QI species varies considerably, from several metres (e.g., in the case of whorl snails Vertigo spp.), to hundreds of kilometres (in the case of migratory wetland birds). A project's zone of influence may extend well beyond the project boundary and can impact or have an effect on static species and habitats remote from the proposed works; for example, where an aquatic QI habitat or plant is located many kilometres downstream from a pollution source. In particular, hydrological linkages between the proposed works and European sites (and their QIs) can occur over significant distances; however, any effect will be site-specific depending on the receiving water environment and nature of the potential impact.

To this end, the zone of influence for this project extends outside of the immediate proposed MUL Area to include ecological receptors connected to the SI works through proximity and connectivity through features such as watercourses and waterbodies in addition to potential connectivity through land and air. See Section 4.4 for the identification of relevant European sites.

4 Stage Two Appraisal to Inform an Appropriate Assessment of Implications on European Sites

4.1 Conclusions of the SISAA Report

The Supporting Information for Screening for Appropriate Assessment (SISAA report) was completed in compliance with EU and Irish law and the relevant European Commission and national guidelines to determine whether or not Likely Significant Effects on any European site could be excluded as a result of the proposed SI works.

The proposed SI works, as stated in the SISAA, are not directly connected with or necessary to the management of any European site.

The possibility of significant effects was considered using a source-pathway-receptor model, where 'Source' was defined as the individual elements of the proposed works that have the potential to affect the identified ecological receptors both within the European site and outside of it based on site connectivity. 'Pathway' was defined as the means or route by which a source can affect the ecological receptor. 'Ecological receptor' was defined as the Special Conservation Interests (for SPAs) or Qualifying Interests for which conservation objectives have been set for the European sites under consideration. Each element can exist independently however an effect is created when there is a linkage between the source, pathway and receptor

The SISAA report concluded that it could not be ruled out that the proposed SI works had the potential to give rise to likely significant effects on conservation objectives of European sites. These sites and receptors are being carried forward to Stage 2 assessment. Possible direct and indirect effects resulting from the proposed SI works, either alone or in combination with other projects, were identified as:

- Habitat loss, alteration, and disturbance of Annex I habitats of the Lower River Shannon SAC
- Underwater noise on Annex II QI species of the Lower River Shannon SAC, Slyne Head Peninsula SAC, West Connacht Coast SAC and Slyne Head Islands SAC.

The location of the relevant European sites in relation to the SI works proposed MUL Area is shown in Figure 4.1. Table 4.1 identifies the SI works associated with each impact, and the receptors with the potential to be affected. The conservation objective of the Lower River Shannon SAC is to maintain the favourable conservation condition of the 14 no. Annex I habitat types in the SAC, as defined by a range of attributes and targets; and of 7 no. Annex II species in the SAC, as defined by a range of attributes and targets. The conservation objective of the Slyne Head Peninsula SAC, West Connacht Coast SAC and Slyne Head Islands SAC relevant to these works are to maintain the favourable conservation condition of the bottlenose dolphin for which the sites are designated. Table 4.2 lists the relevant sites' qualifying interests and their attributes and targets.

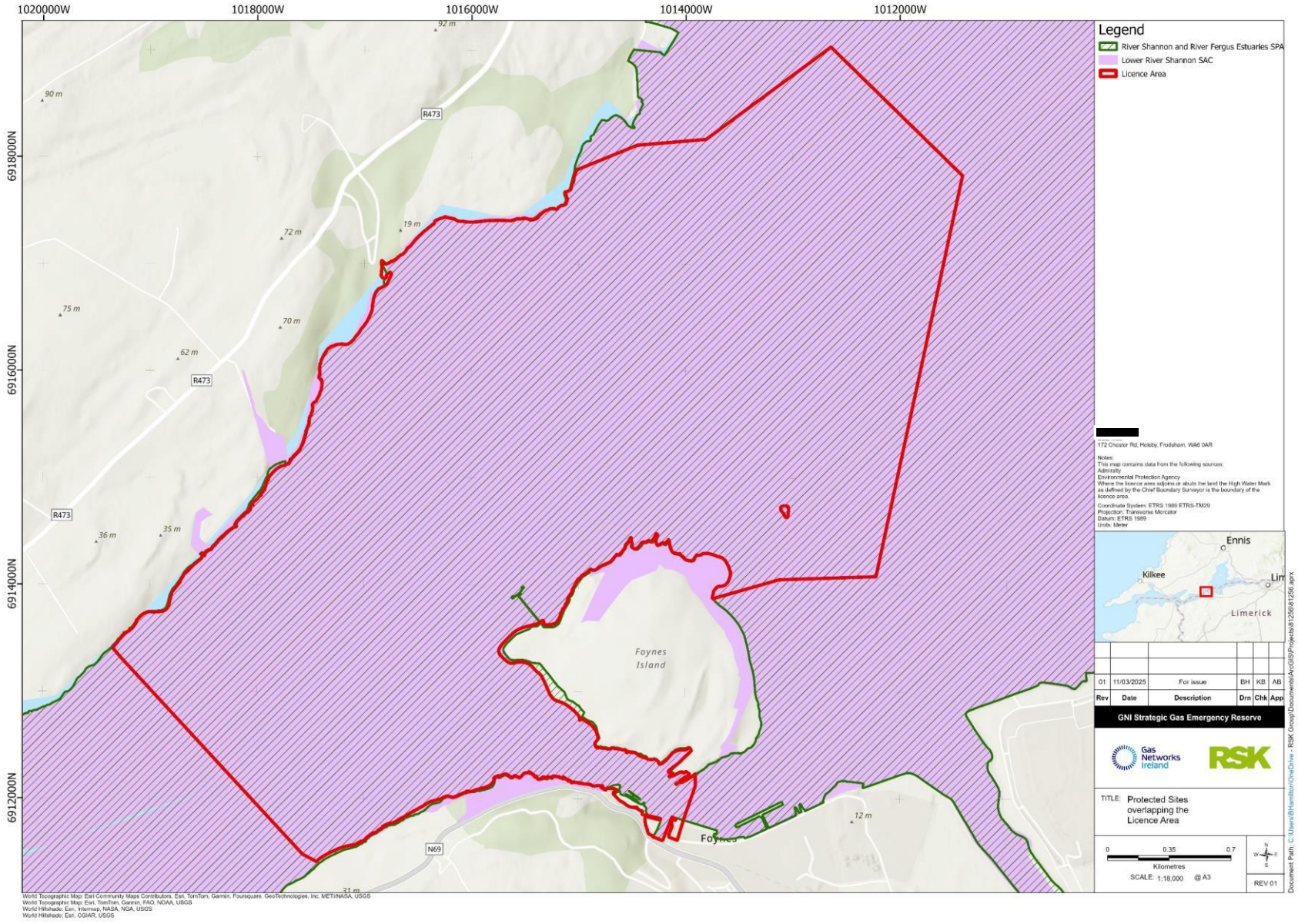

Figure 4.1

Protected areas in proximity to the Licence Area

Table 4.1
Source-Pathway-Receptor assessment for the works

Impact	Potential source of Impact	Description of Effect Pathway	Relevant Receptors
Noise, vibration, lighting, and human presence-related species disturbance	Jack-up barge and vessel activity associated with the SI works.	Potential for direct impacts by disturbing species, leading to displacement from the area.	Otter, marine mammals, birds
Habitat loss, alteration, and fragmentation.	Interactions with the seabed resulting from geotechnical surveys, deployment of seabed equipment, and marine environmental sediment sampling	Potential for direct effects on sensitive habitats and indirect effects to species which rely on those habitats for feeding and/or breeding.	Marine habitats, marine mammals, otter, fish, birds
Increased Suspended Sediment Concentrations (SSC).	Interactions with the seabed resulting from geotechnical surveys, deployment of seabed equipment, and marine environmental sediment sampling	Potential for direct effects on sensitive habitats and indirect effects to species which rely on those habitats for feeding and/or breeding.	Marine habitats, marine mammals, otter, fish, birds
Underwater noise, including injury and or displacement of Annex II marine mammals, otter, and fish from underwater noise and/or the presence of increased marine traffic (visual).	Noise emissions and increased marine traffic from survey equipment and vessels associated with the SI works. May cause injury and/or displacement of Annex II marine mammals, otter, and fish.	Potential for direct effects on species in the marine environment including injury, disturbance and/or displacement.	Marine mammals, otter, fish, birds
Entanglement, including injury and/or disturbance of Annex II marine mammals, otter, and fish from the presence of towed gear and seabed gear.	Risk of entanglement from the towed and seabed equipment associated with the geophysical and geotechnical survey works. May cause injury and/or displacement of Annex II marine mammals, otter, and	Potential for direct effects on species in the marine environment including injury, disturbance and/or displacement.	Marine mammals, otter, fish birds

Impact	Potential source of Impact	Description of Effect Pathway	Relevant Receptors
	fish.		
Accidental pollution event.	Jack-up barge and vessel activity associated with the SI works.	Potential for direct effects on marine habitats and species, and indirect effects through contamination of supporting habitats.	Marine habitats, marine mammals, otter, fish, birds
Collision with survey vessels	Vessel activity associated with the SI works.	Potential for direct effects to large species in the marine environment.	Marine mammals, otter

Table 4.2
Qualifying Interests and Conservation Objectives of the European Sites considered

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
Lower River Shannon SAC		
Sandbanks which are slightly covered by sea water all the time [1110]	Habitat distribution	The distribution of sandbanks is stable, subject to natural processes
	Habitat area	The permanent habitat area is stable or increasing, subject to natural processes
	Community distribution	Conserve the following community type in a natural condition: Subtidal sand to mixed sediment with *Nephtys spp*. community complex
Estuaries [1130]	Habitat area	The permanent habitat area is stable or increasing, subject to natural processes
	Community Distribution	Conserve the following community types in a natural condition: Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Estuarine subtidal muddy sand to mixed sediment with gammarids community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys spp*. community complex; Fucoid-dominated intertidal reef community complex; Faunal turf-dominated subtidal reef community; and Anemone-dominated subtidal reef community
Mudflats and sandflats not covered by seawater at low tide [1140]	Habitat Area	The permanent habitat area is stable or increasing, subject to natural processes
	Community Distribution	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates spp*. community; and Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex
Coastal lagoons* [1150]	Habitat Area	Area stable or increasing, subject to natural processes. Favourable reference area 33.4ha- Shannon Airport Lagoon 24.2ha; Cloonconeen Pool 3.9ha; Scattery Lagoon 2.8ha; Quayfield and Poulaweala Loughs 2.5ha
	Habitat Distribution	No decline, subject to natural processes

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	Salinity Regime	Median annual salinity and temporal variation within natural ranges
	Hydrological regime	Annual water level fluctuations and minima within natural ranges
	Barrier: connectivity between lagoon and sea	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management
	Water quality: chlorophyll a	Annual median chlorophyll a within natural ranges and less than 5µg/L
	Water quality: Molybdate Reactive Phosphorus (MRP)	Annual median MRP within natural ranges and less than 0.1mg/L
	Water quality: Dissolved Inorganic Nitrogen (DIN)	Annual median DIN within natural ranges and less than 0.15mg/L
	Depth of macrophyte colonisation	Macrophyte colonisation to maximum depth of lagoons
	Typical plant species	Maintain number and extent of listed lagoonal specialists, subject to natural variation
	Typical animal species	Maintain listed lagoon specialists, subject to natural variation
	Negative indicator species	Negative indicator species absent or under control
Large shallow inlets and bays [1160]	Habitat Area	The permanent habitat area is stable or increasing, subject to natural processes
	Community Distribution	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates spp*. community; Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys spp*. community complex; Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone- dominated subtidal reef community; and Laminaria-dominated community complex
Reefs [1170]	Habitat Distribution	The distribution of Reefs is stable, subject to natural processes

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	Habitat Area	The permanent habitat area is stable, subject to natural processes.
	Community Distribution	Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone- dominated subtidal reef community; and Laminaria- dominated community complex.
Perennial vegetation of stony banks [1220]	Habitat Area	Area stable or increasing, subject to natural processes, including erosion and succession
	Habitat Distribution	No decline, or change in habitat distribution, subject to natural processes
	Physical structure: functionality and sediment supply	Maintain the natural circulation of sediment and organic matter, without any physical obstructions
	Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
	Vegetation composition: typical species and sub-communities	Maintain the typical vegetated shingle flora including the range of sub-communities within the different zones
	Vegetation composition: negative indicator species	Negative indicator species (including non-natives) to represent less than 5% cover
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	Habitat length	Area stable or increasing, subject to natural processes, including erosion. For sub- sites mapped: Kilbaha- 4.1km; Ladder Rock- 1.0km; Moyarta- 0.9km; Lisheencrony- 1.1km; Burrane- 0.2km; Kerry Head- 33.4km; Ballybunion- 15.6km; Kilclogher- 4.9km; Loop Head- 6.1km
	Habitat Distribution	No decline, or change in habitat distribution, subject to natural processes
	Physical structure: functionality and hydrological regime	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures
	Vegetation structure: zonation	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession
	Vegetation structure: vegetation height	Maintain structural variation within sward
	Vegetation composition: typical species and sub-communities	Maintain range of sub- communities with typical species listed in the Irish Sea cliff survey (Barron et al., 2011)

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	Vegetation composition: negative indicator species	Negative indicator species (including non-natives) to represent less than 5% cover
	Vegetation composition: bracken and woody species	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath to be less than 10%. Cover of woody species on grassland and/or heath to be less than 20%
Salicornia and other annuals colonizing mud and sand [1310]	Habitat Area	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle - 0.005ha; Inishdea, Owenshere - 0.003ha; Knock - 0.029ha; Querin - 0.185ha; Rinevilla Bay - 0.001ha
	Habitat Distribution	No decline, or change in habitat distribution, subject to natural processes
	Physical structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions
	Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
	Physical structure: flooding regime	Maintain natural tidal regime
	Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
	Vegetation structure: vegetation height	Maintain structural variation within sward
	Vegetation structure: vegetation cover	Maintain more than 90% of area outside creeks vegetated
	Vegetation composition: typical species and sub-communities	Maintain the presence of species-poor communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)
	Vegetation structure: negative indicator species- *Spartina anglica*	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	Habitat Area	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 6.774ha; Barrigone, Aughinish- 10.288ha; Beagh- 0.517ha; Bunratty- 26.939ha; Shepperton, Fergus Estuary- 37.925ha; Inishdea, Owenshere- 18.127ha; Killadysert,

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
		Inishcorker- 2.604ha; Knock- 0.576ha; Querin- 3.726ha; Rinevilla Bay- 11.883ha
	Habitat Distribution	No decline or change in habitat distribution, subject to natural processes.
	Physical structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions
	Physical structure: creeks and pans	Maintain creek and pan structure, subject to natural processes, including erosion and succession
	Physical structure: flooding regime	Maintain natural tidal regime
	Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
	Vegetation structure: vegetation height	Maintain structural variation within sward
	Vegetation structure: vegetation cover	Maintain more than 90% of the saltmarsh area vegetated
	Vegetation composition: typical species and sub-communities	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)
	Vegetation structure: negative indicator species- *Spartina anglica*	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Habitat Area	Area increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 4.193ha; Barrigone, Aughinish- 2.407ha; Bunratty- 0.865ha; Inishdea, Owenshere- 11.609ha; Killadysert, Inishcorker- 0.705ha; Knock- 0.143ha, Querin- 0.008ha; Rinevilla Bay- 2.449ha
	Habitat Distribution	No decline, or change in habitat distribution, subject to natural processes
	Physical structure: sediment supply	Maintain natural circulation of sediments and organic matter, without any physical obstructions
	Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	Physical structure: flooding regime	Maintain natural tidal regime
	Vegetation structure: zonation	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
	Vegetation structure: vegetation height	Maintain structural variation within sward
	Vegetation structure: vegetation cover	Maintain more than 90% of area outside creeks vegetated
	Vegetation composition: typical species	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)
	Vegetation structure: negative indicator species - *Spartina anglica*	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	Habitat Area	Area stable or increasing, subject to natural processes
	Habitat Distribution	No decline, subject to natural processes
	Hydrological regime: river flow	Maintain appropriate hydrological regimes
	Hydrological regime: tidal influence	Maintain natural tidal regime
	Hydrological regime: freshwater seepages	Maintain appropriate freshwater seepage regimes
	Substratum composition: particle size range	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles)
	Water quality: nutrients	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition
	Vegetation composition: typical species	Typical species of the relevant habitat sub-type should be present and in good condition
	Floodplain connectivity	The area of active floodplain at and upstream of the habitat should be maintained
	Riparian habitat	The area of riparian woodland at and upstream of the bryophyte-rich sub-

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
		type should be maintained
Molinia meadows on calcareous, peaty, or clayey-silt-laden soils (*Molinion caeruleae*) [6410]	Habitat Area	Area stable or increasing, subject to natural processes
	Habitat Distribution	No decline, subject to natural processes
	Vegetation structure: broadleaf herb: grass ratio	Broadleaf herb component of vegetation between 40 and 90%
	Vegetation structure: sward height	30-70% of sward between 10 and 80cm high
	Vegetation composition: typical species	At least 7 positive indicator species present, including 1 "high quality" species
	Vegetation composition: notable species	No decline, subject to natural processes
	Vegetation composition: negative indicator species	Negative indicator species collectively not more than 20% cover, with cover by an individual species less than 10%. Non-native invasive species, absent or under control
	Vegetation composition: negative indicator moss species	Bog mosses (*Sphagnum spp*.) not more than 10% cover; hair mosses (*Polytrichum spp*.) not more than 25% cover
	Vegetation structure: woody species and bracken (*Pteridium aquilinum*)	Cover of woody species and bracken not more than 5% cover
	Physical structure: bare ground	Not more than 10% bare ground
*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	Habitat Area	Area stable or increasing, subject to natural processes, at least c.8.5ha for sites surveyed
	Habitat Distribution	No decline
	Woodland size	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size
	Woodland structure: cover and height	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi- mature trees and shrubs; and well-developed herb layer
	Woodland structure:	Maintain diversity and extent of community types

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	community diversity and extent	
	Woodland structure: natural regeneration	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy
	Hydrological regime: flooding depth/height of water table	Appropriate hydrological regime necessary for maintenance of alluvial vegetation
	Woodland structure: dead wood	At least 30m³/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)
	Woodland structure: veteran trees	No decline
	Woodland structure: indicators of local distinctiveness	No decline
	Vegetation composition: native tree cover	No decline. Native tree cover not less than 95%
	Vegetation composition: typical species	A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix spp*) and, locally, oak (*Quercus robur*) and ash (*Fraxinus excelsior*)
	Vegetation composition: negative indicator species	Negative indicator species, particularly non-native invasive species, absent or under control
Freshwater pearl mussel (*Margaritifera margaritifera)* [1029]	Distribution	Maintain at 7km.
	Population size	Restore to 10,000 adult mussels
	Population structure: recruitment	Restore to least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length
	Population structure: adult mortality	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution
	Habitat extent	Restore suitable habitat in more than 3.3km (see map 15) and any additional stretches necessary for salmonid spawning
	Water quality: macroinvertebrate and	Restore water quality- macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	phytobenthos (diatoms)	
	Substratum quality: filamentous algae (macroalgae), macrophytes (rooted higher plants)	Restore substratum quality- filamentous algae: absent or trace (<5%)
	Substratum quality: sediment	Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment
	Substratum quality: oxygen availability	Restore to no more than 20% decline from water column to 5cm depth in substrate
	Hydrological regime: flow variability	Restore appropriate hydrological regimes
	Host fish	Maintain sufficient juvenile salmonids to host glochidial larvae
Sea lamprey (*Petromyzon marinus*) [1095]	Distribution: extent of anadromy	Greater than 75% of main stem length of rivers accessible from estuary
	Population structure of juveniles	At least three age/size groups present
	Juvenile density in fine sediment	Juvenile density at least 1/m²
	Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds
	Availability of juvenile habitat	More than 50% of sample sites positive
Brook lamprey (*Lampetra planeri)* [1096]	Distribution	Access to all water courses down to first order streams
	Population structure of juveniles	At least three age/size groups of brook/river lamprey present
	Juvenile density in fine sediment	Mean catchment juvenile density of brook/river lamprey at least 2/m²
	Extent and distribution of spawning habitat	No decline in extent and distribution of spawning bed
	Availability of juvenile habitat	More than 50% of sample sites positive

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
River lamprey (*Lampetra fluviatilis)* [1099]	Distribution	Access to all water courses down to first order streams
	Population structure of juveniles	At least three age/size groups of river/brook lamprey present
	Juvenile density in fine sediment	Mean catchment juvenile density of river/brook lamprey at least 2/m^2
	Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds
	Availability of juvenile habitat	More than 50% of sample sites positive
Atlantic salmon (*Salmo salar*) [1106]	Distribution: extent of anadromy	100% of river channels down to second order accessible from estuary
	Adult spawning fish	Conservation Limit (CL) for each system consistently exceeded
	Salmon fry abundance	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling
	Out-migrating smolt abundance	No significant decline
	Number and distribution of redds	No decline in number and distribution of spawning redds due to anthropogenic causes
	Water quality	At least Q4 at all sites sampled by EPA
Common bottlenose dolphin (*Tursiops truncatus*) [1349]	Access to suitable habitat	Species range within the site should not be restricted by artificial barriers to site use
	Habitat use: critical areas	Critical areas, representing habitat used preferentially by bottlenose dolphin, should be maintained in a natural condition.
	Disturbance	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site
Otter [1355]	Distribution	No significant decline
	Extent of terrestrial habitat	No significant decline. Area mapped and calculated as 596.8ha above high water mark (HWM); 958.9ha along river banks/ around ponds
	Extent of marine habitat	No significant decline. Area mapped and calculated as 4,461.6ha

Relevant Qualifying Interests for which site has been selected[2]	Attribute	Relevant Conservation objectives
	Extent of freshwater (river) habitat	No significant decline. Length mapped and calculated as 500.1km
	Extent of freshwater (lake/lagoon) habitat	No significant decline. Area mapped and calculated as 125.6ha
	Couching sites and holts	No significant decline
	Fish biomass available	No significant decline
	Barriers to connectivity	No significant decline
Slyne Head Peninsula SAC		
Common bottlenose dolphin	Access to suitable habitat	Species range within the site should not be restricted by artificial barriers to site use.
	Disturbance	Human activities should occur at levels that do not adversely affect the Bottlenose Dolphin population at the site.
West Connacht Coast SAC		
Common bottlenose dolphin	Access to suitable habitat	Species range within the site should not be restricted by artificial barriers to site use.
	Disturbance	Human activities should occur at levels that do not adversely affect the Bottlenose Dolphin population at the site.
Slyne Head Islands SAC		
Common bottlenose dolphin	Access to suitable habitat	Species range within the site should not be restricted by artificial barriers to site use.
	Disturbance	Human activities should occur at levels that do not adversely affect the Bottlenose Dolphin population at the site.

[2] Asterisk indicates a priority habitat under the Habitats Directive.

5 Likely Significant Effects Identified in Screening for Appropriate Assessment

Of the potential impact sources and pathways as identified in Table 4.1, the SISAA concluded that the potential for impact on European sites from the following could not be ruled out and required further assessment:

- Habitat loss or disturbance
- Underwater noise
- In-combination effects.

5.1 Habitat Loss or Disturbance

In the vicinity of the proposed MUL Area, the Lower River Shannon SAC boundary extends from the high water mark out into the marine area away from the land. Of the 14 Annex I habitat types selected for protection as part of the Lower River Shannon SAC (see Table 4.2), eleven are categorised as being 'Coastal and Halophytic' in their distributions, while the remaining three habitats are categorised as freshwater, grasslands, and forests. The distribution of all annexed habitats within the SAC are presented in the conservation objectives document (NPWS, 2012a). The marine based geotechnical works may impact on annexed habitats within the SAC. The distribution of the following habitats may occur within the area where the marine elements of the SI works will occur:

- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Reefs [1170].

As identified in Table 4.1, there is the potential for loss and/or disturbance to these marine habitats as a result of geotechnical sampling. In addition to direct habitat loss when taking samples, there will also be temporary habitat loss due to the four feet of the jack-up barge used to conduct sampling, the anchoring of the metocean monitoring buoys and placement of seabed equipment during some geophysical surveys.

The substrate in the proposed MUL Area is dominated by fine sandy habitat with water depths up to 50 m below chart datum. The Lower River Shannon SAC has Annex I Marine Habitats as qualifying interests that overlap the proposed MUL Area. These protected habitats include reefs, estuaries, and mudflats and sandflats not covered by seawater at low tide (Table 4.2).

The vast majority of the sampling will occur in area consisting of mud and mixed sediment. Very few samples may occur within Annex I Mudflats and sandflats not covered by seawater at low tide habitat. Sampling will avoid the known subtidal reef in the deepest waters in the centre of the estuary as well as intertidal reef to either side of the Cahiracon point and along the west side of Foynes Island. It is noted that the entire proposed MUL Area is mapped as being Annex I Estuaries habitat, therefore all sampling will occur within this habitat.

The feet of the jack-up rig from which the works will take place will cover an area of 1 m^2 each (for a combined total of 4 m^2), while the boreholes themselves will be drilled within a steel casing 300 mm in diameter. Table 5.1 shows the estimated maximum number of boreholes within each Annex I habitat based on NPWS habitat mapping of the SAC (Figure 5.1, NPWS, 2012b). It is noted that since the entire proposed MUL Area is mapped as Annex I estuaries habitat, there is a redundant count of the five samples that may occur within mudflats and sandflats, meaning that the total area affected for each habitat type can be considered an absolute maximum based on final siting of the sampling locations.

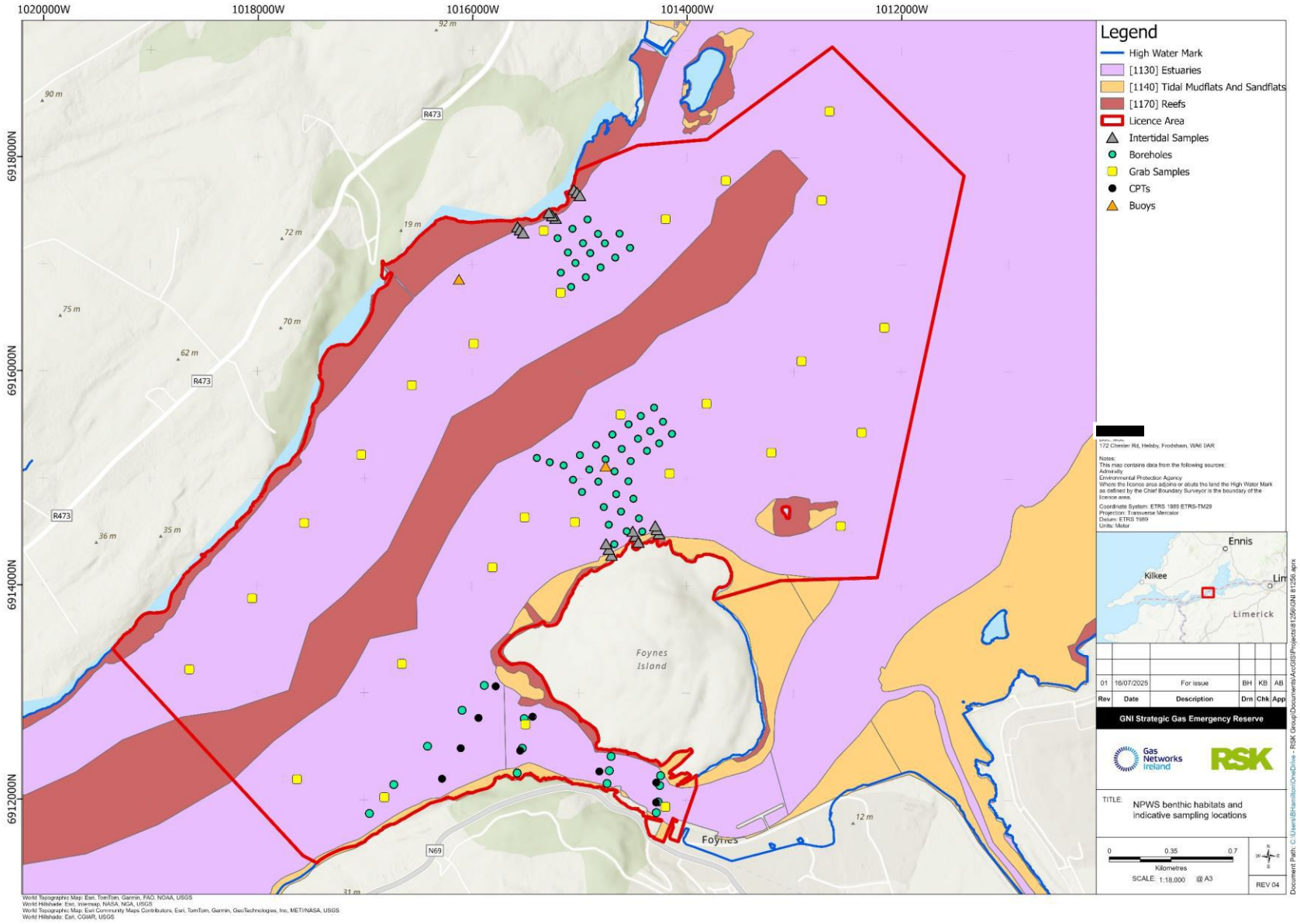

Figure 5.1
Benthic habitats of relevance to the SI works (NPWS, 2021b)

Table 5.1
Predicted areas of Annex I habitats within the Lower River Shannon

Annex I habitat	Maximum No boreholes proposed	Total area of proposed boreholes (m^2)	Total cumulative area of jack-up barge feet (m^2)	Total area affected (m^2)	Total Annex I Habitat within SAC (ha)	Percentage of total area affected (%) [Boreholes only]
Estuaries [1130]	75	5.35	640	645.35	24,273	0.0000027 [0.00000002]
Mudflats and sandflats [1140]	5	0.35	20	20.35	8,808	0.00000023 [0.000000004]
Reefs [1170]	0	0	0	0	21,421	0

As shown in Table 5.1, the total impact area of the boreholes will be extremely small and represent an extremely small proportion of the total area of the relevant Annex I habitats within the SAC. In addition, no permanent losses of relevant Annex I habitats are expected to arise as a result of the SI works. The vast majority of the area affected will be from the jack-up barge feet with a significantly smaller area being impacted by the 300 mm diameter boreholes.

The impacts associated with the jack-up barge feet will be temporary in nature and will not create any long term impact on the seabed beyond the period of deployment. These potential impacts are anticipated to be similar to those of a boat anchor within the relevant habitats and will not cause any non-temporary or large scale alterations to the habitat. As such, it is considered that the proposed use of the jack-up barge and associated feet will not give rise to any significant loss of habitat within the Lower River Shannon SAC.

Each borehole sample will involve the disturbance of seabed 300 mm in diameter. Direct disturbance will be temporary in nature as is it anticipated that the removed habitat will be quickly and naturally filled by surrounding sediment following completion of sampling. For all habitat types affected by borehole sampling, the area over which effects will occur are extremely small in the context of the areas of relevant Annex I habitat supported by the SAC, being an extremely small percentage (<0.0001%), as listed inTable 5.1.

The proposed use of anchors for the metocean monitoring buoys will be of a footprint area up to 4 m^2 per anchor, for a total of two anchors per buoy, equating to a total maximum footprint of 48 m^2. These anchors will be exclusively within Annex I estuaries habitat [1130]. This gives a total percentage area affected of 0.0000002% of estuary habitat within the SAC. Similarly to the jack-up barge feet, associated impacts will be temporary in nature and will not create any long term impact on the seabed beyond the period of deployment. These potential impacts are anticipated to be similar to those of a boat anchor within the relevant habitats and will not cause any non-temporary or large scale alterations to the

habitat. As such, it is considered that the proposed use of the anchors will not give rise to any significant loss of habitat within the Lower River Shannon SAC.

The placement of temporary survey equipment on the seabed during some geophysical surveys is likewise expected to be localised and temporary in nature, disturbing a very small proportion of the seabed surface.

Such small-scale and temporary effects are not considered representative of an adverse impact upon the integrity of the qualifying features of the European site. It is not predicted that such effects could give rise to any wider impacts to the favourable structure and functioning of the wider area of Annex I or wetlands qualifying habitats.

As such, it is considered that the temporary impacts associated with borehole creation, metocean monitoring buoy anchoring and deployment of seabed equipment associated with geophysical surveys within areas of Annex I habitat within the Lower River Shannon SAC would not give rise to a significant habitat loss effect upon the European site.

Proposed grab and intertidal core sampling will involve the removal of a maximum of 0.1 m^2 surface area of material from each sample location. It is considered that such small-scale sampling area will have no potential to give rise to significant effects upon any Annex I habitat within the SAC. Likewise, the cone penetration tests will be of a diameter of 44 mm, meaning that these samples will also be of such small scale to have no potential significant effects on any Annex I habitat within the SAC.

On the basis of the assessment presented here, it is considered that the SI works will not have potential to give rise to any adverse impacts upon the integrity of European sites through habitat loss. This conclusion is made without the consideration of applying any mitigation measures.

5.2 Underwater Noise

As listed in Table 4.1, noise-generation resulting from the SI works has the potential to affect some marine species that are QI species of a European site. The SISAA concluded that it could not be ruled out that there may be significant effects from the noise generated by the geophysical surveys on the common bottlenose dolphin as a QI of the following sites:

- Lower River Shannon SAC
- Slyne Head Peninsula SAC
- West Connacht Coast SAC
- Slyne Head Islands SAC.

Very few sightings of harbour porpoise (*Phocoena phocoena*) have been recorded within the Shannon Estuary (IWDG, 2025). There was one sighting adjacent to Moneypoint in 2018 (IWDG), and strandings have been recorded as far up the estuary as Foynes (O'Callaghan et al., 2021). Violent interactions have been recorded between bottlenose dolphins and harbour porpoise (Ross and Wilson., 1996; Gross et al., 2020) and suggested reasons for this aggression include interspecies territoriality, defence of group members, food competition, feeding interference and object-orientated play (Gross et al., 2020). Two sightings of harbour porpoise occurred within the past 12 months, located at the entrance of the Shannon Estuary off Aill Na Brun (IWDG, 2025) . From the lack of recorded sightings of harbour porpoise

within the Shannon Estuary, it is likely that they largely avoid the area. As a result, spatial overlap with harbour porpoise individuals from other SACs within foraging range is considered highly unlikely, and SACs with harbour porpoise as a QI are not considered relevant for ex situ effects within the Shannon.

Underwater noise is a temporary effect, with noise levels dropping near-instantly to pre-existing levels upon the cessation of noise sources. The natural soundscape of the Shannon Estuary is considered to be noisy – a mix of biological sound such as fish and marine mammals , current flow and turbulence, rain and wind/storm noise, and noise from human activities such as shipping and leisure activities.

When assessing the potential impact of underwater noise sources on the marine environment a range of variables such as source level, frequency, duration, and directivity influence received sound levels. Increasing the distance from the sound source usually results in attenuation with distance. The factors that affect the way noise propagates underwater include; water column depth, pressure, temperature gradients, salinity, as well as water surface and seabed type and thickness. When sound encounters the seabed the amount of noise/sound reflected back depends on the composition of the seabed, i.e., mud or other soft sediment will reflect less than rock. The water depth within the proposed MUL Area ranges up to 50 m below chart datum with a mixed substrate type, of muds, sands, coarse gravels, and exposed bedrock. All factors listed above reduce the propagation of the sound, decreasing the zone of influence of the geophysical survey.

Auditory injury in cetaceans can be defined as a permanent threshold shift (PTS) leading to non-reversible auditory injury, or as a temporary threshold shift (TTS) in hearing sensitivity, which can have negative effects on the ability to use natural sounds (e.g., to communicate, navigate, locate prey) for a period of minutes, hours, or days. With increasing distance from the sound source, where it is audible to the animal, the effect is expected to diminish through identifiable stages (i.e., PTS or TTS in hearing, avoidance, masking, reduced vocalisation) to a point where no significant response occurs. Factors such as local propagation and individual hearing ability can influence the actual effect (Department of Arts, Heritage and the Gaeltacht (DAHG), 2014). The underwater noise threshold levels for marine mammals as given in international guidance is shown in Table 5.2Table 5.2. The expected sound properties of the relevant survey activities are presented in Table 5.3.

Table 5.2
TTS- and PTS-onset thresholds for marine mammals exposed to non-impulsive noise

Marine mammal hearing group	TTS onset: SEL (weighted) dB re 1 µPa2s	PTS onset: SEL (weighted) dB re 1 µPa2s
Low frequency cetaceans (baleen whales)	179	199
High frequency cetaceans (most dolphin species)	178	198
Very high frequency cetaceans (harbour porpoise)	153	173
Phocid carnivores (seal species)	181	201
Other Carnivores (otters)	199	219

Table 5.3
Expected noise parameters for survey activities

Survey activity	Frequency range (kHz)	Peak frequency (kHz)	Source level (dB re 1 µPa)
ADCP	600 - 1000	Variable	80 (+/- 1.5)
Rotary drilling	0.001- 0.120	0.045	145
SSS	300/600kHz (offshore area) 600/900kHz (shallower nearshore area)	Variable	220-230
SBP	85-115 (primary) 2-22 (secondary)	Variable	232
MBES	300 - 700	400	215-220
Marine refraction seismic	0 - 10	0.005 and 0. 113	182-220

The ADCP devices on the metocean monitoring buoys do produce some lower frequency sounds that are within the hearing range of high-frequency marine mammal species, such as harbour porpoise. The

proposed ADCP device installation will be temporary in nature and will emit a narrow sound beam (typically a few degrees in width) with a typical echo intensity profile of 80 dB (+/- 1.5 dB). This falls below the TTS and PTS threshold for all species. Therefore, the potential impact on protected species is considered to be negligible. Therefore, the potential impact on protected species is considered to be very low. As such, the possibility for impacts on protected species from underwater noise associated with ADCPs can be excluded from further consideration.

The type of coring and/or drilling proposed as well as the size of the boreholes mean that sound levels from the activity is unlikely to exceed previously recorded level of similar setups with source levels of 130-147dB SPL1 (re 1 µPa) (Erbe & McPherson, 2017; MR, M, M, & I, 2010). Recent measurements of geotechnical drilling in shallow waters (Huang Long-Fei et al. 2023) recorded an SPL of 155.9 dB re 1µPa rms @ 1 m at a peak frequency of 45 Hz. These levels are below the source levels of even quiet vessels and at modest ranges of c. 100 m, below the commonly used 160dB SPL2 limit for behavioural effect for marine mammals. Considering that the weighted source level of the drilling/boring (147dB SPL) is below the TTS or PTS onset levels for all marine mammal species as listed in Table 5.2., it is extremely unlikely that the drilling/boring could cause hearing impact on marine mammals.

The geophysical survey will utilise active acoustic instruments. Active acoustic instruments, such as those proposed on this survey, operate by emitting extremely short pulses and are mostly directional or omni-directional (e.g., sparker) (Ruppell et al, 2022). The range of the geophysical equipment will have a range limited principally by water depth and attenuation particularly of high frequency sources. Coupled with the narrow beam angle and short duty cycles (‘on’ for microseconds or milliseconds per second) means that surveying sonars have relatively low acoustic range.

The SSS and MBES are higher frequency acoustic survey methods, with acoustic ranges above the hearing sensitive range for marine mammals, therefore not considered a risk for disturbance.

The SBP and marine refraction seismic survey methods fall within the sensitive hearing range of marine mammals and exceed the onset levels for TTS and PTS for marine mammals. Since the noise levels from these sources exceed TTS and PTS thresholds, there is the potential for underwater noise generated during the SBP and marine refraction seismic surveys to result in injury and/or disturbance to bottlenose dolphin in the vicinity of the SI works. The estimated zone of audibility for all species is largest for these low-frequency sources, which propagate over longer distances relative to the rapidly attenuating high frequencies. Thus marine mammals, if very close to the survey vessel during site investigations may lead to disturbance and, at worse, auditory injury. As such, impacts from this source are considered to have potential to give rise to auditory injury to common bottlenose dolphin.

Adverse effects upon QI common bottlenose dolphin associated with the Lower River Shannon SAC, Slyne head Peninsula SAC, West Connacht Coast SAC and Slyne Head Islands SAC as a result of underwater noise and vibrational effects cannot be excluded in the absence of mitigation measures in respect of the proposed SBP and marine refraction seismic surveys only.

5.3 In-combination Effects

As part any AA process, other relevant projects and plans in the region must also be considered for the

possibility of the proposed project having significant effects on European sites when combined with existing, ongoing, or foreseeable future plans or projects, even in the case that the SI works have no anticipated significant effects when assessed in isolation. The in-combination assessment is scoped regarding the site-specific pressures and threats identified for the protected sites identified in Table 4.2.

5.3.1 Plans

The plans that are considered in-combination with the SI works proposed within the Shannon Estuary include:

- Clare County Development Plan (2023-2029)
- Kerry County Development Plan (2022-2028)
- Limerick County Development Plan (2022-2028)
- National Biodiversity Action Plan (2023-2030).

There are no anticipated in-combination effects from plans and therefore in-combination effects are not considered for further assessment.

5.3.2 Projects

Other marine projects, when considered in-combination with the proposed survey activities, could potentially give rise to either direct or indirect impacts. A search of planning authority applications and foreshore/MUL applications which could interact with the proposed surveys (within 10 km) was conducted using the planning authority websites (i.e., My Plan.ie, EIA planning portal which include applications from Clare Co. Co. planning website, Kerry Co. Co. planning website, An Bord Pleanála (ABP) website, Department of Housing and Local Government and Heritage (DHPLG) website and the MARA website). Several projects were identified as having the potential for overlap with the proposed works (Table 5.4).

Table 5.4
Applications with potential to interact with the proposed MUL Area, their current application status, and the assessed potential for cumulative effects

Application	Project	Status	Potential for Cumulative Effects
LIC230008	EBS Moneypoint surveys	Determined	This proposal has been supported by documents relevant to appropriate assessment which identified that the proposed SI works would not have potential to give rise to likely significant effects upon the Lower River Shannon SAC, or any other relevant European sites. On this basis it is considered that the proposed SI works would have no potential to act in-combination with this project.
LIC230014	Shannon Foynes Port Company	Determined	This application was subject to appropriate assessment as part of the submission. This assessment concluded that subject to the implementation of mitigation measures at construction stage, principally to avoid the potential for pollution and associated water

Application	Project	Status	Potential for Cumulative Effects
			quality and habitat deterioration effects, there would be no adverse impacts upon any European sites as a result of the development. However, if the works were to happen concurrently with the proposed SI works, there is the possibility of cumulative visual disturbance, underwater noise, suspended sediment concentration, and water quality impacts. The SI activities associated with LIC230014 are expected to be completed prior to the proposed SI activities.
LIC230004	Aughinish Alumina Ltd	Determined	This application was subject to appropriate assessment as part of the submission. This assessment concluded that subject to the implementation of mitigation measures, there would be no adverse impacts upon any European sites as a result of the SI works. On this bases it is considered that the proposed SI works would have no potential to act in combination with this project.
MAC20230032	Net Zero Energy Project 4 Limited	Applied	The proposed project is set to deploy up to 300MW of floating solar photovoltaic (PV) units and ancillary infrastructure including mooring systems, inter-array cabling and export cables off the coast of Killadysert and nearby islands. At the time of this application, no project description details or impact assessments are available to determine the possibility of cumulative impact potential.
MUL240034	Gas Networks Ireland, Shannon Estuary	Applied	This proposal has been supported by documents relevant to appropriate assessment which identified that the proposed survey activity would not have potential to give rise to likely significant effects upon the Lower River Shannon SAC, or any other relevant European sites. On this basis it is considered that the proposed SI works would have no potential to act in-combination with this project.

Considering the level of activity in the vicinity along with the limited and temporary nature of the SI works, with no permanent or continuous impacts, it is considered that the SI works will not have any cumulative impacts with other plans or projects in the area with the exception of the case of possible overlap with the Shannon Foynes Port Company works (LIC230014). Appropriate Assessment informed by an NIS concluded that this development would not adversely affect any European site following the implementation of mitigation measures. Given that there are no anticipated LSEs from these proposed SI works also, it can be concluded that if the projects happened concurrently, the significance of potential effects would still not be considered to be high enough to potentially impact conservation

objectives of the relevant designated sites and receptors.

As such, it is considered that the proposed SI works would have no potential to give rise to any in-combination effects alongside the proposed Shannon Foynes Port Company works.

6 Mitigation Measures

The proposed SI works will incorporate a range of measures to safeguard the environment within the Lower River Shannon SAC and to address the following identified potential effects upon the integrity of the following European sites:

- Adverse water quality and habitat deterioration and oiling effects arising through pollution events upon the following European Sites:
    - Lower River Shannon SAC.
- Adverse underwater noise and vibration effects upon marine mammals, including common bottlenose dolphin upon the following European Sites:
    - Lower River Shannon SAC
    - Slyne Head Islands SAC
    - West Connacht Coast SAC
    - Slyne Head Peninsula SAC.

The proposed factored in measures and mitigation measures are set out in Table 6.1.

Table 6.1
Embedded measures and mitigation measures reducing potential impacts

Receptor	Potential Impact	Summary of Proposed Mitigation
Water	Impact on water quality Introduction of INNS	• All equipment shall be cleaned and checked before use on site. • Refuelling will occur offsite where possible. • Any oil/fuel stored on site will be kept in adequate storage for containment of any potential spills or leaks. • A spill response kit will be available onsite and accessible for control of pollution incidents. • Spill response kit will be regularly inspected and replaced immediately if used. • Toolbox talks prior to work commencing will communicate to staff and contractors regarding refuelling procedures and procedures in the event of a spill.
Underwater Noise and Vibration	Impact on marine mammals Impact on fish	The proposed SI works will incorporate a range of measures to safeguard the environment and potential impacts to marine mammals and fish. The impact of greatest concern to these receptors is underwater noise and vibration from the noise-generating survey activities with the potential to harm or disturb (SBP and marine refraction seismic survey); this will be mitigated as follows: • Survey Marine Mammal Mitigation Plan: The following mitigation measures will be employed. These mitigation measures are in line with best practice guidance (NPWS, 2014): • A qualified Marine Mammal Observer (MMO) will be on board the survey vessel to monitor marine mammal activity and log all events;

Receptor	Potential Impact	Summary of Proposed Mitigation
		• Pre-start monitoring: relevant operations shall not commence if marine mammals are detected within a 500 m radial distance of the vessel (a conservative range which accounts for the maximum likely zone of influence for potential injury from geophysical surveys (SBP) of 130 m); • Survey operations shall only commence in daylight hours where effective visual monitoring by the MMOs has been achieved. Where effective visual monitoring is not possible, the sound-producing activities shall be postponed until effective visual monitoring has been completed; • Ramp Up: Following the pre-start monitoring, a ramp-up procedure will take place or a period of 20 minutes for all relevant survey equipment; • Where the duration of a survey line or station change will be greater than 40 minutes, the activity shall, on completion of the line/station being surveyed, either shut down and undertake a full pre-start monitoring and ramp-up procedure or reduce the sound energy output to a lower state with an output peak SPL of 165-170 dB re 1µPa @1m, and then undertake the full ramp up procedure; • If there is a break in sound output for a period of 5 – 10 minutes the MMO will be required to check that no marine mammals are observed within the monitored zone prior to recommencement of the sound sources at full power. Where a marine mammal is observed within the 500 m monitored zone during such a break, then all pre-start monitoring and a subsequent ramp-up

Receptor	Potential Impact	Summary of Proposed Mitigation
		procedure shall recommence as in a normal start-up operation; and • If there is a break in sound output for a period greater than 10 minutes, then all pre-start monitoring and a subsequent ramp-up procedure will be undertaken.

7 Summary and Conclusions

7.1 Screening for Appropriate Assessment

Having regard to the relevant legislation and the methodology followed, supporting information for Screening for Appropriate Assessment (the SISAA report) was presented to evaluate whether or not the Proposed Project is likely to have an adverse effect on the integrity of any European sites.

LSEs could not be excluded at stage 1 screening for one European site, without further analysis or the application of measures intended to avoid or reduce the harmful effects of the proposed site survey activities on the sites concerned. The potential effects that could not be excluded were:

- the possibility of loss or disturbance of Annex I habitats of the Lower River Shannon SAC
- the possibility of injury or disturbance to marine mammal qualifying interests of the Lower River Shannon SAC
- the possibility for in-combination effects on qualifying interests of the Lower River Shannon SAC.

The screening within this NIS identified and screened in a further range of SACs with cetacean species as qualifying interests within 200 km of the proposed MUL Area. These sites being:

- Slyne Head Peninsula SAC
- West Connacht Coast SAC
- Slyne Head Islands SAC.

The potential impacts and Europeans sites listed above where therefore considered within the stage two appraisal within this NIS.

7.2 Natura Impact Statement

Further assessment, as presented in Section 5.1 provided certainty beyond reasonable scientific doubt that the proposed SI works would not give rise to adverse effects upon the integrity of the relevant European sites via loss of disturbance of Annex I habitats of the Lower River Shannon SAC.

The assessment within this NIS determined that the proposed SI works could have potential for adverse impacts upon the integrity of the following European sites due to underwater noise and vibration impacts upon common bottlenose dolphin in the absence of mitigation measures:

- Lower River Shannon SAC
- Slyne head Peninsula SAC
- West Connacht Coast SAC
- Slyne Head Islands SAC.

The mitigation measures that will be put in place, as outlined in Section 6, will effectively mitigate potential adverse impacts from underwater noise and vibration and ensure no adverse effect on the integrity of any European site.

Accordingly, for the reasons set out in detail, in the light of the best scientific knowledge in the field, all aspects of the proposed SI works which, by themselves, or in combination with other plans or projects,

may affect the relevant European Sites have been considered. The SISAA report and this NIS contain information which the MARA may consider in making their own complete, precise and definitive findings and conclusions and upon which the public authority is capable of determining that all reasonable scientific doubt has been removed as to the effects of the proposed development on the integrity of the relevant European sites.

In the light of the conclusions of the assessment which it shall conduct on the implications for the European sites concerned, the relevant public authority is enabled to ascertain that the proposed site survey activities will not adversely affect the integrity of any European site.

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11 Appendix C – Annex IV Species Risk Assessment

Gas Networks Ireland

Strategic Gas Emergency Reserve – Marine Site Investigation (SI) Works

Risk Assessment for Annex IV Species

RSK General Notes

Project No.: 81256

Title: Strategic Gas Emergency Reserve – Site Investigation (SI) Works: Assessment of Impacts on the Maritime Usage (AIMU) Report

Client: GNI

Date: 25 July 2025

Office: Helsby

Status: Rev04

Author	[redacted]	**Technical reviewer**	[redacted]
Signature	[redacted]	Signature	[redacted]
Date	17 July 2025	Date	17 July 2025
Project manager	[redacted]	**Quality reviewer**	[redacted]
Signature	[redacted]	Signature	[redacted]
Date	25/07/2025	Date	25/07/2025

Contents

1 Introduction

1.1 Overview

Following a review carried out by The Department of the Environment, Climate and Communications (DECC) of the Security of Energy Supply of Ireland's Electricity and Gas Systems, there is need to improve the resilience of Ireland's natural gas supplies and infrastructure in the event of a disruption to the country's natural gas supplies for the short to medium term.

Energy Security in Ireland (ESI) to 2030 outlines a comprehensive strategy aimed at ensuring energy security throughout the current decade while facilitating a sustainable transition towards a carbon-neutral energy system by 2050.

Action 17 of ESI proposes the implementation of a "Strategic Gas Emergency Reserve to protect Ireland in the event of a gas supply disruption as Ireland makes a secure transition to a majority renewable energy".

In January 2025, the Government of Ireland issued the "Programme for Government 2025 – Securing Ireland's Future" which included the commitment that the government will "Take all necessary action to ensure and protect Ireland's energy security".

In March 2025, the Government of Ireland gave approval to proceed with the development of a State-led strategic gas emergency reserve. The delivery of a temporary gas reserve is deemed critical to Ireland's energy security as we continue to transition to indigenous, clean renewable energy.

Based on the above decision, Gas Networks Ireland (GNI) propose to construct a receiving terminal and jetty to accommodate a Floating Storage and Regasification Unit (FSRU), which will allow for the importation of and storage of Liquified Natural Gas (LNG) within Ireland's jurisdictional waters. The FSRU will be connected to the national grid network for injection in case of a supply emergency.

GNI intends to apply to the Maritime Area Regulatory Authority (MARA) for a Maritime Usage Licence (MUL) to conduct marine Site Investigations (SI) and environmental surveys within two areas of the Shannon Estuary adjacent to the townlands of Shannakea Beg, Cahiracon, Foynes Island, Leahys and Corgrig.

This report has been prepared as part of the MUL application process. The proposed works are designed to provide high quality baseline data that will contribute to site selection and any subsequent design, EIAR, and Appropriate Assessment, undertaken for the Strategic Gas Emergency Reserve (SGER) Project; in the event that a site is taken forward to the planning/consenting stage.

1.2 Purpose of this report

Cetaceans, marine turtles, and otters are afforded protections under Annex IV of the Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna). The EC (Birds and Natural Habitats) Regulations 2011 (as amended) (hereafter referred to as "the Regulations") transpose the Habitats Directive (92/43/EEC) into Irish law.

Regulation 51 of the Regulations sets out the system of strict protection for animals; under this

regulation it is an offence to:

- Deliberately capture or kill any specimen of these species in the wild
- Deliberately disturb these species particularly during the period of breeding, rearing, hibernation and migration
- Deliberately take or destroy eggs of these species in the wild
- Damage or destroy a breeding or resting place of such animal, or
- Keep, transport, sell, exchange, offer for sale or offer for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive.

It is therefore an offence to capture, kill or disturb deliberately a single cetacean, marine turtle or otter in Irish waters, or to damage/destroy an otter or marine turtle's breeding or resting place in Ireland, without a derogation licence first obtained from the Minister in accordance with Regulation 54 of the Regulations.

This document has been prepared by RSK Environment Ltd. on behalf of GNI in support of the Maritime Usage Licence Application to the MARA. This report contains an assessment of the likely effects for the proposed SI works on Annex IV species in accordance with Regulation 54.

1.3 Statement of Authority

This report has been prepared by RSK on behalf of GNI. The technical competence of the authors is outlined below:

[redacted] is Technical Director within the International Projects Group Marine Team in RSK. He has over 20 years of experience in marine environmental surveying and consulting. He holds an honours degree in Marine Biology and Oceanography and a Masters in Marine Resource Development and Protection. He has particular experience in marine ecology surveys, and the subsequent analysis and reporting of marine survey data for EIA projects, including Appropriate Assessment and Annex IV species reports.

[redacted] is a Senior Marine Consultant within the International Projects Group Marine Team in RSK. She has over 10 years of experience in the marine ecology field. She holds an honours degree in Marine Science and a Masters in Biology. She has contributed to numerous marine environmental projects including Appropriate Assessments, Natura Impact Statements and EIAR chapters.

2 Project Description

2.1 Site Locations

The proposed MUL Area covers an area of 11.19km^2 and extends from the townland of Shannakea Beg along the Clare coast to Cahiracon (Ed Killadysert), across the Shannon Estuary to Shannon Foynes Island and along the Limerick coast to the townland of Leahys and Corgrig (Figure 2.1). The works described in this application relates solely to the SI / sampling works within the proposed MUL Area (Figure 2.2 and Figure 2.3). Marine SI is required to inform preliminary design and facilitate environmental assessment in advance of Planning for the SGER project. Site investigations are to be completed over two phases, with Phase 1 being used to determining the optimum location of the SGER and Phase 2 being used at a later date to coordinate with the detailed design stage.

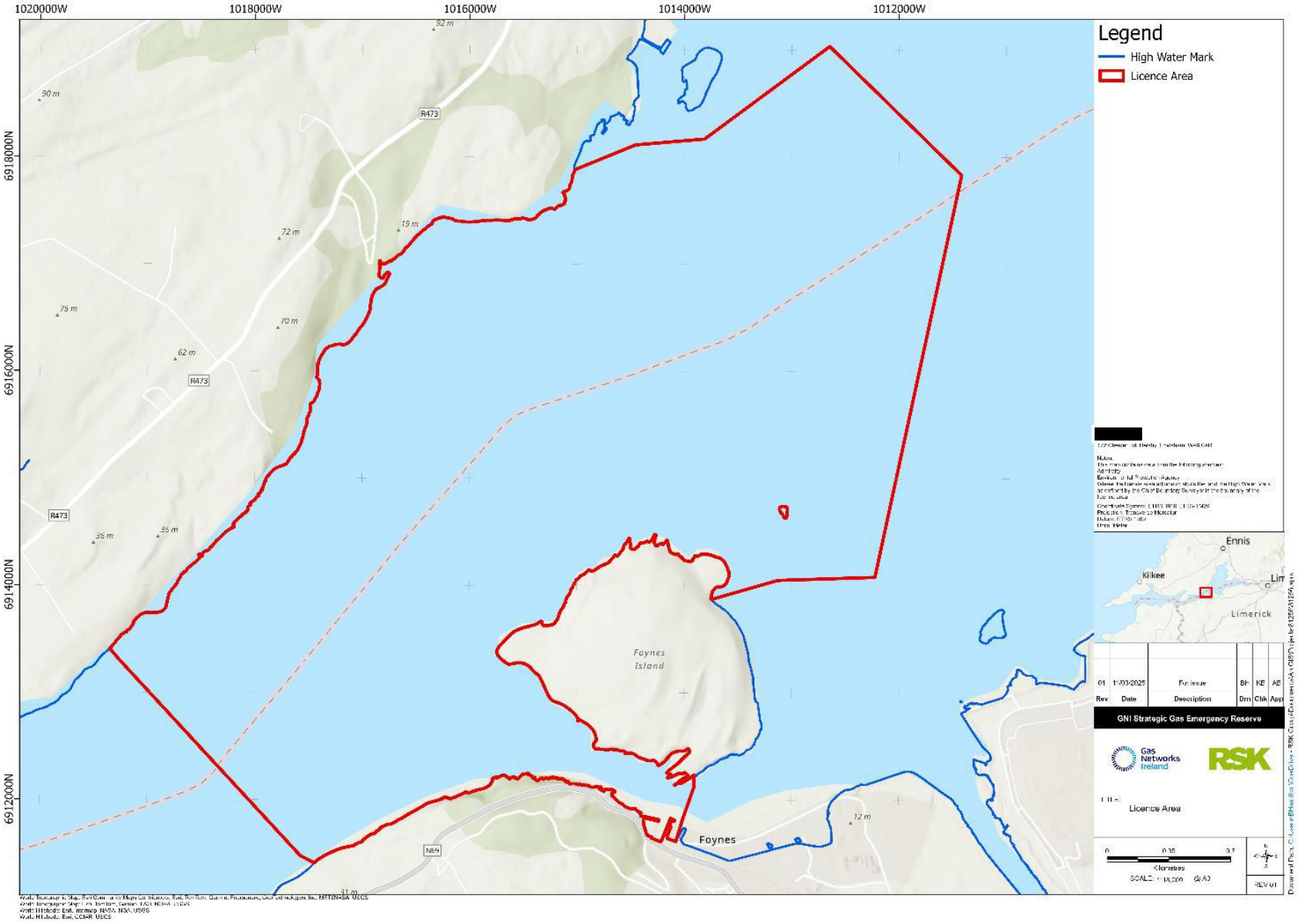

Figure 2.1
Proposed MUL Area

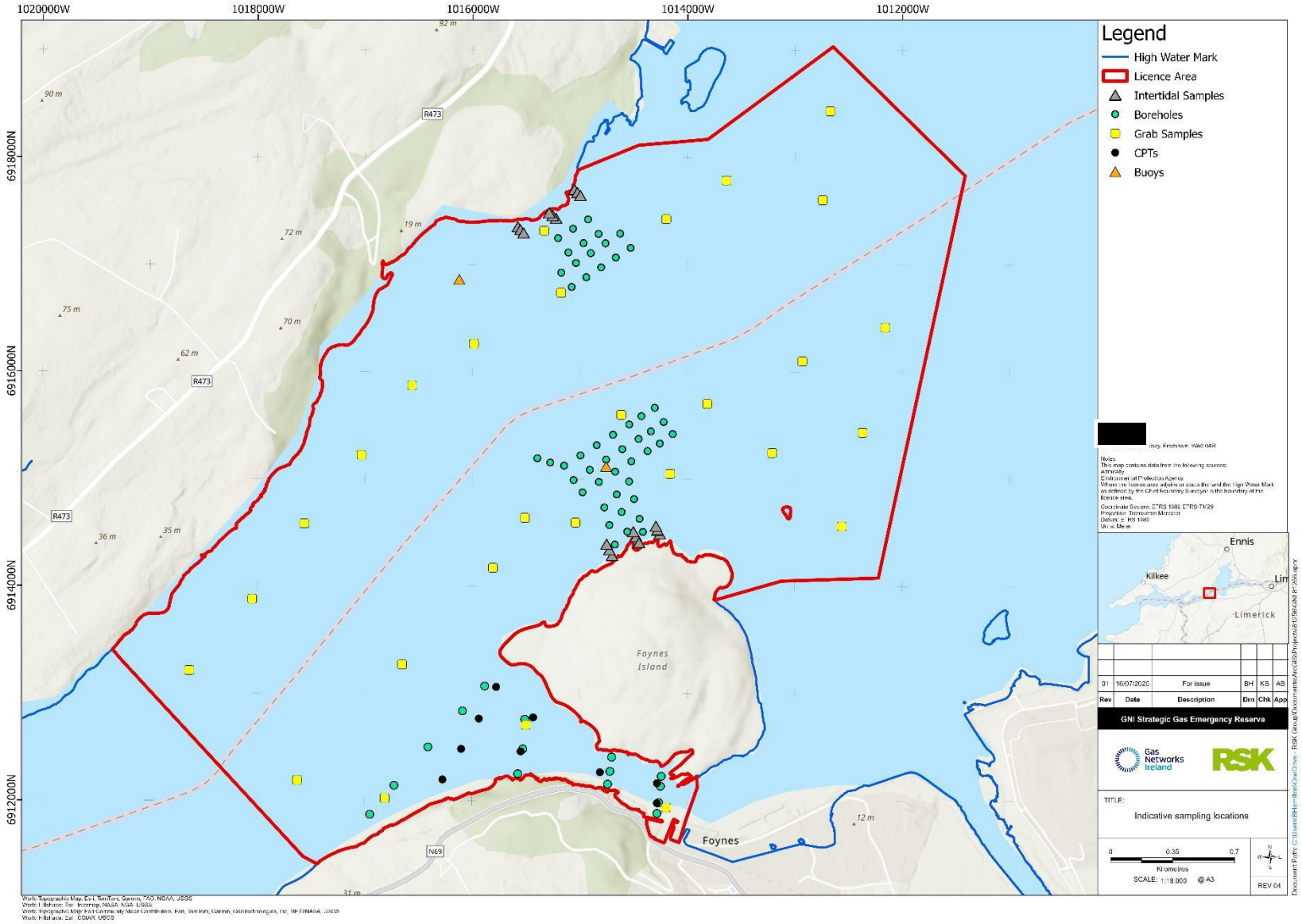

Figure 2.2
Indicative sampling locations

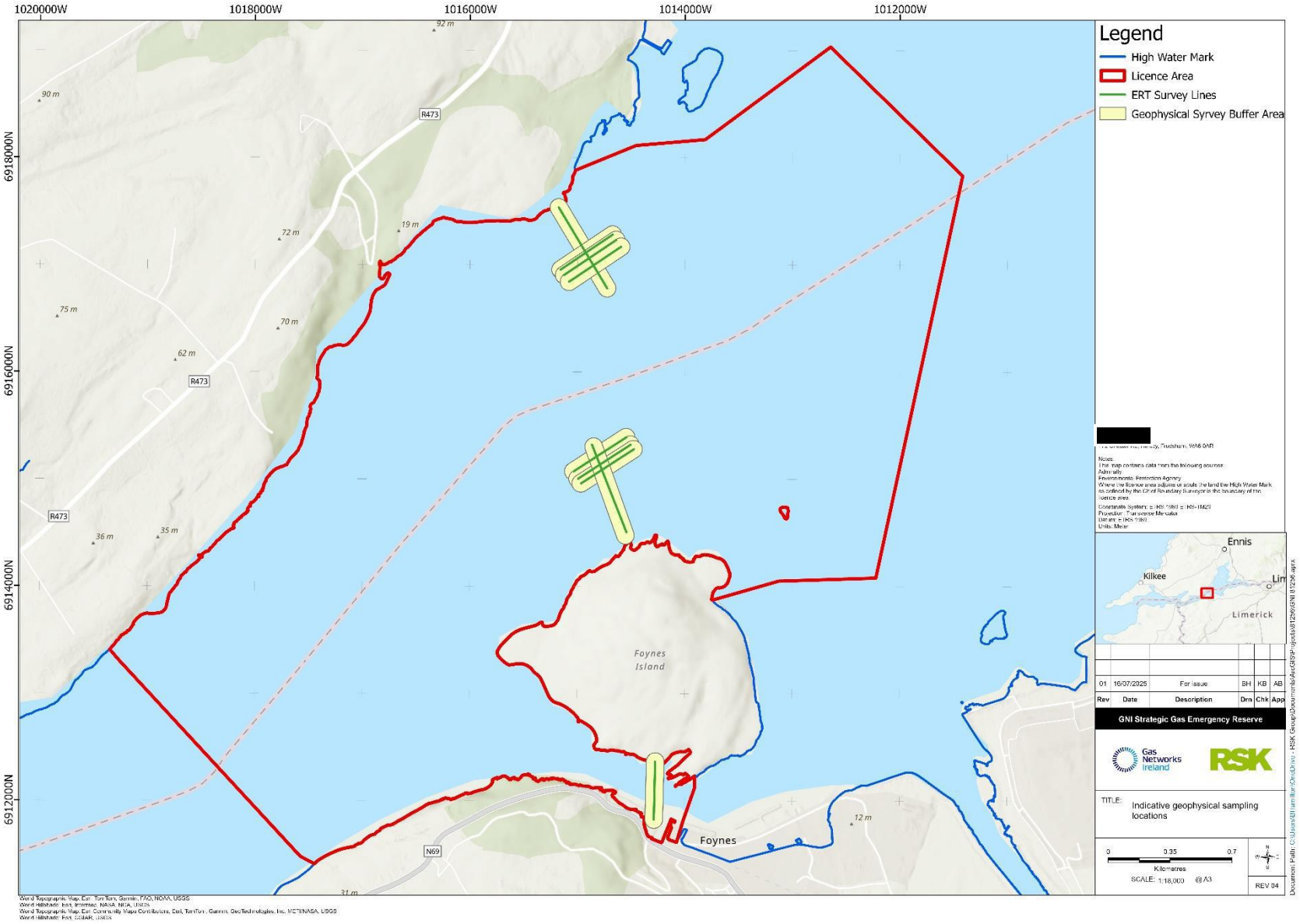

Figure 2.3

Indicative Geophysical Survey and Electrical Resistivity Tomography (ERT) electrode deployment locations

2.2 Description of the works

2.2.1 Overview

The objective of the proposed surveys is to provide high-quality data that can contribute to a reliable baseline for site selection and subsequent project design and development as well as informing the EIA. As such, the following survey investigations are considered necessary and detailed further in Table 2.1 :

- Drop-down camera survey
- Geophysical survey, including:
  - Magnetometer
  - Sub-bottom profiler (SBP)
  - Side-scan sonar (SSS)
  - Multibeam Echo Sounder (MBES)
  - Marine Refraction Seismic
  - Marine Electrical Resistivity Tomography (ERT)
- Boreholes
- Cone penetration tests (CPTs)
- Grab samples
- Surface water samples
- Intertidal walkover survey
- Intertidal core samples
- Archaeological surveys and other investigations (i.e. underwater inspections, walkovers, metal detectors, dive surveys).
- Deployment of metocean monitoring buoys to collect physical oceanographic data.

These works are collectively referred to as the Site Investigation (SI) works throughout this report.

Indicative sampling locations within the proposed MUL Area are designed to inform a potential jetty and vessel, with the addition of potential pipeline route options from the southwest side of Foynes Island to the mainland. It should be noted that all locations shown for sampling within the proposed MUL Area are indicative and may be subject to a degree of change on-site.

The following drawings have been prepared in support of the Maritime Usage Licence application to the MARA:

- Proposed Licence Area Map
- Proposed Grab Sample Locations Map
- Proposed Borehole Locations Map
- SI Indicative Table of Coordinates

The exact technical specification of the equipment to be used will not be known until the survey contract has been awarded. However, descriptions of typical equipment and survey parameters has been used within this report.

Predicted time and footprint for the activities are presented in Table 2.2. 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 borehole locations and quantities.

There will be no permanent structures and all site investigation works will be temporary in nature. The moving marine plant will remain on site for the duration of the works.

2.2.2 SI Schedule

The intention is to begin SI activities as soon as feasible following MUL award. Timing of the SI activities is dependent on many factors including weather, tidal flows, availability of vessels and the grant of the MUL. The granting of the MUL will have a direct effect on the timing of SI activities. The duration of the phase 1 SI works is approximately 16 weeks and are currently scheduled for Q3 2025. Phase 2 SI works (if required) will be carried out at a later date to coordinate with the detailed design stage which is dependent on consenting for the main project. The proposed licence duration is for 5 years to account for potential delays in the consenting process.

Table 2.1
Description of proposed works

Survey	Method	Method detail	Sampling Effort
Geophysical	Side Scan Sonar (SSS)	SSS surveys are used to determine sediment characteristics and seabed features. The EdgeTech 4205 may be taken as an indicative example of an SSS device and for these surveys will have a potential operating frequency range of approximately 300/600kHz in the offshore area and 600/900kHz in the shallower nearshore area with sound pressure levels of 220-230dB re1µPa @1m. The SSS will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SSS may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Magnetometer	A magnetometer is used to identify magnetic anomalies and hazard mapping for metal obstructions, shipwrecks and unexploded ordnance on the surface and in the shallow sub-surface. The Geometrics G-882 can be taken as an indicative equipment example. It is a passive device (i.e. it does not emit any sound waves into the marine environment) the sensor responds to local variability in magnetic field. The magnetometer will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	Magnetometer survey may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) – Parametric Sub Bottom Profiler	SBP is used to develop an image of the subsurface, identifying different strata encountered in the shallow sediments. The Innomar "standard" Sub-Bottom Profiler is an indicative example of a parametric system with a primary and secondary frequency range of 85-115kHz and 2-22kHz, respectively, and sound pressure levels of up to 232 dB (typically operated at <200dB) re1µPa @ 1m, which would be used in both nearshore and offshore areas. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Parametric Sub Bottom Profiler may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom Profiling (SBP) - Boomer	The Applied Acoustics AA301 is an indicative example of a boomer, the instrument consists of a piezo electric plate transducer mounted on a surface tow catamaran frame. Reflected sound signals are recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m). The Boomer SBP operates in a frequency range of 0.5 kHz to 5 kHz, with sound pressure levels in the range of 205-211dB re1µPa @ 1m which would be used in the nearshore shallower area. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	SBP Boomer may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Sub-Bottom	The applied Acoustics Dual 400 Tip is an indicative example of a sparker	SBP Sparker may be undertaken

Survey	Method	Method detail	Sampling Effort
	Profiling (SBP) - Sparker	system used in sub-bottom profiling. Reflected sound signals are recorded using a separate hydrophone such as the Applied acoustics HYD-360/08 (50m) or a multi-channel hydrophone such as the Geometrics GeoEel LH-16™ Digital Streamer. The sparker source has a frequency range of between 0.4-5kHz and a recorded sound pressure of 203dB re1µPa @1m. The SBP will be towed behind a small survey vessel using 20 m spacing of main lines and cross lines at 100 m spacing.	across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Multibeam Echo Sounder (MBES)	A bathymetric survey will be conducted using multibeam echo sounders. These systems may be mounted on a dedicated survey vessel or towed behind a smaller vessel, depending on site conditions and water depths. Multibeam systems emit wide acoustic signals to generate high-resolution images, creating three-dimensional maps of the seabed. Line spacing will be between 5 and 20m, depending on depth. The operating frequencies emitted from MBES will be 300-700 kHz with a peak operating frequency of approximately 400kHz. Exposure time is approx. 0.05 ms per 1 ms for multibeam operating with 200-400 kHz, or 0.05 per 0.3 ms for higher frequencies (>400 kHz). Sound pressure levels will be approximately 215-220dB re 1µPa @ 1m.	MBES may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 10 days.
	Marine Refraction Seismic	Marine refraction surveys use controlled seismic sources, such as air guns or weight drops, to generate seismic waves that travel through sediment and rock layers. Arrays of hydrophones or geophones deployed on the seabed record the refracted seismic waves as they bend and travel along subsurface interfaces. By analysing the travel times and velocities of these refracted waves, detailed models of sediment thickness, bedrock depth, and structural features can be developed. Airgun impulse energy is mostly concentrated within low frequencies, with peak frequencies between 5 and 90kHz. Source levels are predicted to be within the range of 186-220dB re 1µPa @1m.	Marine Refraction Seismic may be undertaken across the proposed MUL Area to a suitable percentage coverage. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
	Marine Electrical Resistivity Tomography (ERT)	ERT surveys are conducted to investigate the electrical properties of subsurface sediments and rocks. The technique involves deploying a series of electrodes along the seabed, either towed or fixed. As a non-invasive, non-seismic geophysical method, marine ERT produces no significant underwater noise and has minimal environmental impact.	Maximum **20 ERT lines** of 315m length line with diameter of 20mm. This activity is anticipated to occur within daylight hours over a period of up to 8 days.
Marine Environmental / Ecological	Benthic ecology samples (including subtidal and	Identify benthic communities and habitats at the site. Subtidal sample locations may be subject to drop down video in advance of sampling, intertidal sample locations may be subject to walkover/drone survey in advance of sampling.	There will be up to **30 no.** dedicated subtidal benthic ecology grab sampling locations within the proposed MUL Area and multiple samples (max 4) may

Survey	Method	Method detail	Sampling Effort
	intertidal habitats surveys)		be taken at each location. Samples would be of volume 0.1 m^2. There will be up to **30 no**. dedicated intertidal coring /grab locations if shoreline conditions allow for sediment sampling.
Archaeological	Walkover	Intertidal walkover to be undertaken at low tide to assess for the presence of sensitive archaeological features. Survey methodology may also involve the use of a metal detector along the foreshore. Pending the results of geophysical surveys there may be a requirement for further archaeological surveys (i.e. underwater video, dive surveys, etc.)	To be confirmed pending the results of the geophysical surveys.
Geotechnical	Drop-down video	Drop-down video survey to inspect the seabed and identify any reef structures in the vicinity without disturbance to the seabed.	There will be up to **30 transects** of up to 30 m each using a drop down camera and video surveillance.
	Boreholes	Boreholes may be up to 50 m below bed level but some may be terminated if sufficient bedrock is encountered. The boreholes will be carried out using sonic methods through the seabed sediment, with rotary coring used to advance through the bedrock. The typical frequencies emitted from rotary drilling are between 0.001-0.120kHz and a recorded sound pressure of approximately 145dB re1µPa @1m. Marine rotary drilling involves rotating a drill bit attached to a drill string and applying downward pressure to cut through the rock formations. Geotechnical sampling tools, including push and piston samples, can then be deployed into the ground to recover intact material. All drilling equipment used will follow the ISO and API technical specifications for drilling equipment. All boreholes will be drilled from a jack-up barge to maintain stability when drilling. Each location would require the 4 legs to penetrate the seabed and cause a temporary disturbance on each occasion. Each leg is typically less than 1m^2 in footprint.	A maximum of **80 no**. boreholes of a diameter of 300 mm will be required within the proposed MUL Area.
	Cone penetration tests (CPTs)	CPTs are to progress to a maximum depth of 20m but will be terminated when bedrock is encountered. In the CPT, an instrumented electronic probe (cone penetrometer) is situated at the front end of a string of steel rods that are hydraulically pushed into the ground at a constant rate of 20mm/s to measure soil response, geo-stratigraphy, and engineering	**80 no. CPTs** will be conducted of a diameter of 44mm. 60 of the CPTs will be at borehole locations to clear for unexploded ordnance (UXOs) and 20 as standalone

Survey	Method	Method detail	Sampling Effort
		parameters. A CPT vehicle or hydraulic ram set are often used to provide the reaction and pushing force. The equipment used will conform to relevant international standards, such as ISO, ensuring consistent and reliable geotechnical data.	investigation sites.
	Grab samples	Grab samples using 0.1 m^2 grabs will be collected for grading, loss on ignition and assessment of benthic community.	A maximum of **50 no**. grab samples of volume 0.1 m^2 will be collected within the proposed MUL Area.
	Metocean monitoring buoys	Metocean monitoring buoys are floating sensors with an anchorage system secured on the seabed. The buoys record various metocean conditions through the following monitoring equipment: • Conductivity, Temperature, Depth Sensors • Optical Salinity Sensor • Acoustic Doppler Current Profiler (ADCPs operating in the range of 600 Khz or 1 Mhz will be used. The instrument emits low amplitude "pings" of sound at a sampling rate of 1-minute average every 10 minutes. These pings will be emitted in a narrow sound beam (typically a few degrees in width) with a typical echo intensity profile of 80 dB (+/- 1.5 dB)) • Optical or Electrochemical Dissolved Oxygen Sensor • pH Sensor/Probe • Turbidity sensor • Turbidity meter/sediment trap. Metocean monitoring buoys will be anchored with two anchors per buoy. Anchors will have a maximum footprint of 4m^2 each.	**2 buoys** will be placed within the study area initially, with the possibility for **up to a further 4**.

Table 2.2
Predicted time and footprint of each survey activity

Survey Activity	Total time for activity	Maximum number of samples	Footprint per sample (m^2)	Maximum total footprint per activity (km^2)
Geophysical survey	Up to 4 months	SSS, Magnetometer, SBP 20 m spacing of main lines and 100 m spacing of cross lines with 25% overlap onto neighbouring lines MBES: 5 -20 m line spacing	-	Area up to 2.155
Marine refraction seismic	Up to 4 months	20 m line spacing	-	Area up to 2.155
ERT	Up to 4 months	20 maximum ERT lines	6.3	0.0000063
Marine Environmental / Ecological	Up to 4 months	120 subtidal (30 no. grab locations with max 4 samples taken at each location) 120 intertidal (30 no. grab locations with max 4 samples taken at each location)	0.1	0.000024
Geotechnical: Drop down video	Up to 4 months	30 transects	30	0.0009
Geotechnical: Boreholes	Up to 4 months	80	0.071	0.00000568

Survey Activity	Total time for activity	Maximum number of samples	Footprint per sample (m^2)	Maximum total footprint per activity (km^2)
CPTs	Up to 4 months	80	0.00152	0.0000001216
Jack-up barge leg	Up to 4 months	640 legs*	1	0.00064
Geotechnical: Grab samples	Up to 4 months	50	0.1	0.000005
Metocean monitoring buoy anchors	Maximum of 24 months (2 years)	12 anchors	4	0.000048

** 80 Borehole locations and 80 CPT locations x 4 legs*

2.3 General Survey Requirements

All appointed survey contractors shall obtain and comply with all necessary marine operational permits including routine and customary vessel/crew/equipment clearances from Customs Agencies, Port Authorities, Marine Survey Office, etc. This will include adherence to all major international shipping conventions adopted by the International Maritime Organization (and the International Labour Organization) concerning maritime safety and pollution prevention.

2.3.1 Quality Assurance

Each of the appointed survey contractors shall comply with the following as a minimum:

- Quality and Environmental Management Systems based on ISO9001:2015
- Provision of site and activity specific Method Statements for all the marine operations within their scope
- Provision of Quality Management Plans for all the marine operations.

2.3.2 Health & Safety

Health, safety, environment, and welfare considerations will be a priority in the evaluation of possible contractors for the various survey scopes and will be actively managed during the survey work.

Appointed contractors will be required to comply with all legislation relevant to the activities within their scope of work, such as the Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005) and Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007), as amended.

Project / survey specific Health, Safety and Environment (HSE) plans will be put in place which will form part of the project / survey execution plans.

2.3.3 Working Hours

The working hours for the SI works are proposed to be up to 24 hours per day, seven days a week. It is anticipated that the main SI works will be carried out over a period of approximately four months including mobilisation and demobilisation. While metocean monitoring buoy deployment will be for period of up to two years, the devices will be autonomous apart from maintenance visits every two to four months. Such maintenance visits will occur during daylight hours only

Weather conditions and/or sea-state will impact on the working hours, and it may be necessary to temporarily suspend operations when adverse weather conditions and/or sea-state are encountered or forecast. As such, survey plans will remain flexible to take advantage of optimal weather windows. Similarly, equipment or vessel maintenance and repair may impact on the SI works resulting in changes to the survey schedule.

2.3.4 Environmental Procedures

Environmental procedures to be followed by the appointed survey contractors are detailed within the Appropriate Assessment report.

2.3.5 Vessels

All vessels will be fit for purpose, certified and capable of safely undertaking all required survey work. Marine vessels will be governed by the provisions of the Sea Pollution Act 1991, as amended. In addition, all vessels will adhere to published guidelines and best working practices such as: the National Maritime Oil/HNS Spill Contingency Plan (NMOSCP), Marine Pollution Contingency Plan (MPCP), Chemicals Act 2008 (No. 13 of 2008), Chemicals (Amendment) Act 2010 (No. 32 of 2010) and associated regulations.

Vessels shall have a Health, Safety and Environmental Managements system which should conform to the requirements of the latest International Maritime Organisation (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or continental / EEZ waters to be operated in.

The SI works will be undertaken from vessels in accordance with the relevant guidelines required to manage the risk to marine mammals from man-made sound sources in Irish waters (NPWS, 2014).

3 Risk Assessment for Annex IV Species

3.1 Legislative Context

Under Article 12 and 13 of the Habitats Directive, Member States must establish systems of strict protection for animal and plant species which are particularly threatened, and which are listed on Annex IV of the Directive. Article 16 provides for derogations from these legal protections under certain, specific, circumstances. Article 12, 13 and 16 of the Habitats Directive are transposed into Irish law by Regulations 51, 52 and 54 of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended.

Annex IV species are afforded strict protection throughout their range, both inside and outside of designated protected areas. It is an offence to:

- Deliberately capture or kill any specimen of these species in the wild
- Deliberately disturb these species particularly during the period of breeding, rearing, hibernation and migration
- Deliberately take or destroy eggs of these species in the wild
- Damage or destroy a breeding or resting place of such an animal[1]
- Deliberately pick, collect, cut, uproot, or destroy any specimen of [plant] species in the wild
- Keep, transport, sell, exchange, offer for sale or offer for exchange any specimen of [animal or plant] species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Directive[2].

The granting of another statutory consent (e.g., planning permission; MARA licence) does not remove the obligation to obtain a derogation licence in the event of the consented works being likely to not conform with the strict protections afforded to Annex IV species. As such, an application for derogation may have to be made to the Minister for Housing, Local Government & Heritage via the National Parks and Wildlife Service (NPWS) under Regulation 54, in addition to an application for development consent. If satisfied that an application meets the criteria for derogation, the Minister may grant a derogation licence, which may be subject to such conditions, restrictions, limitations, and requirements as the Minister considers appropriate, and these will be specified in the licence.

3.2 Methodology

This risk assessment for Annex IV species has had regard to the following guidance:

- European Commission (2021) Guidance document on the strict protection of species of community interest under the Habitats Directive. C. (2021) 7301 final. Brussels
- Mullen, E., Marnell, F. & Nelson, B. (2021) Strict Protection of Animal Species. National Parks and Wildlife Service Guidance Series, No. 2. National Parks and Wildlife Service, Department of Housing. Local Government and Heritage
- NPWS (2021) Guidance on the Strict Protection of Certain Animal and Plant Species under the

[1] Including any action resulting in damage to, or destruction of, a breeding or resting place of an animal. Breeding or resting places are protected even when the animals are not using them.
[2] National Parks and Wildlife Service (2021) Guidance on the Strict Protection of Certain Animal and Plant Species under the Habitats Directive in Ireland

Habitats Directive in Ireland. National Parks and Wildlife Service Guidance Series, No. 2. Department of Housing. Local Government and Heritage.

- Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (2014, Department of Arts, Heritage and the Gaeltacht)
- Department of Housing, Local Government and Heritage (2025) Applications for Regulation 54 Derogations for Annex IV species, Guidance for Applicants

This risk assessment for Annex IV species broadly follows the methodology structure outlined in NPWS (2021), as follows:

- Use existing information to determine the probability of the protected species being present in the area affected by the works
- Ecological survey, if required
- Examination of impacts and mitigation measures and satisfactory alternatives (if required). For each species or species group, an assessment was made against each of the strict protections considering project details and the available evidence base for each species.

If the examination of impacts concludes that the SI works will not conform with the strict protections afforded to Annex IV species, then an application will be made for a derogation licence under Regulation 54 of the Regulations.

3.3 Relevant Annex IV Species

3.3.1 Cetaceans

Bottlenose dolphin (*Tursiops truncatus*) are a QI of the Lower River Shannon SAC, within which the proposed SI works will occur. Bottlenose dolphins are present throughout the year and are genetically discrete compared to bottlenose dolphins found elsewhere in Irish waters due to geographical and social isolation (Mirimin et al., 2011) and that the estuary is an important calving area (MERC, 2021). The population is estimated at around 145 individuals with only 80 adults (Baker et al., 2018 in MERC, 2021). This small, genetically discrete population is vulnerable to even small increases in adult mortality or a reduction in reproduction rates (Blásquez et al., 2021 in MERC, 2021). An overview of existing data on bottlenose dolphin populations in the Lower Shannon Estuary shows that there is a well-known hotspot for the species in the waters off Moneypoint Power Station (MERC, 2021). Rogan et al. (2000) recorded bottlenose dolphins in the estuary all year round with a peak from May to September and noted the presence of neo-natal calves from July to September as evidence of a well-defined breeding season in the Shannon Estuary. There have been a total of 19 dolphin sightings within the last 12 months along the Shannon Estuary, concentrated in the area of the Shannon Ferry route, with 3 dolphin sighted within approximately 3 km of the proposed MUL Area (IWDG, 2025). Hence, there is potential for them to overlap with SI works.

Very few sightings of harbour porpoise (*Phocoena phocoena*) have been recorded within the Shannon Estuary (IWDG, 2025). There was one sighting adjacent to Moneypoint in 2018 (IWDG), and strandings have been recorded as far up the estuary as Foynes (O'Callaghan et al., 2021). Violent interactions have been recorded between bottlenose dolphins and harbour porpoise (Ross and Wilson., 1996; Gross et al., 2020) and suggested reasons for this aggression include interspecies territoriality, defence of group members, food competition, feeding interference and object-orientated play (Gross et al., 2020). Two

sightings of harbour porpoise occurred within the past 12 months, located at the entrance of the Shannon Estuary off Aill Na Brun (IWDG, 2025). From the lack of recorded sightings of harbour porpoise within the Shannon Estuary, it is likely that they largely avoid the area.

3.3.2 Pinnipeds

Telemetry data indicates that harbour seal (*Phoca vitulina*) foraging trips in the south-west of Ireland extend no further than 20 km from haul-out sites (Cronin et al., 2008). No sightings of harbour seal have been recorded in the Shannon Estuary within the last 12 months (IWDG, 2025). The closest European site designated for harbour seal is the Kenmare River SAC, located more than 85 km from the proposed MUL Area. It is therefore highly unlikely that individuals will overlap with the SI works.

Grey seals (*Halichoerus grypus*) have been recorded undertaking foraging trips over hundreds of kilometres, although the mean distance travelled in a telemetry study carried out in 2011 for NPWS was 50.85 km (Cronin et al., 2011). NPWS-funded aerial thermal-imaging of seal in Ireland (Morris and Duck, 2019) shows very low usage of the Shannon Estuary by both harbour seal and grey seal, indicating that the estuary is not likely to be an important area for hauling out. No sightings of grey seals have been recorded in the Shannon Estuary within the last 12 months (IWDG, 2025). Additionally, the closest European site designated for grey seal is the Blasket Islands SAC, located approximately 112 km by sea from the proposed MUL Area. It is therefore considered unlikely that individuals will overlap with the SI works; the proposed MUL Area are not likely to represent an important foraging ground and as a result SACs with grey seal as a QI are not considered relevant for ex situ effects.

3.3.3 Otter

Otter (*Lutra lutra*) are a designated feature of the Lower River Shannon SAC and inhabit coastal sites where there is suitable habitat, food availability, and shelter for resting and breeding. The population was estimated to be 140 (+/- 12 individuals) in 2006. The shoreline of the Shannon Estuary, including through the proposed MUL Area, is designated as potential otter habitat.

3.3.4 Basking Shark and Reptiles

Basking sharks (*Cetorhinus maximus*) tend to arrive in Irish waters during spring, with numbers peaking in May and June. There have been several sightings of this species in proximity to the Shannon Estuary over the past 12 months, with recordings concentrated to Aill Na Brun and Derrynadivva (IWDG, 2025). However, sightings of basking shark within shallow estuarine environments is considered rare and, indeed, there have been no records of sightings within the Shannon estuary itself (IWDG, 2025). Therefore, it is unlikely basking sharks will be present within the proposed MUL Area during the SI works.

Four Annex IV turtle species known to occur in Ireland include the leatherback turtle (*Dermochelys coriacea*), Kemp's Ridley turtle (*Lepidochelys kempii*), loggerhead turtle (*Caretta caretta*) and hawksbill turtle (*Eretmochelys imbricata*). Leatherback turtles have been recorded along the west coast of Ireland and within the Lower Shannon Estuary (at Ballylongford (1970) and at Kilkee (IWDG, 2025)); however, no sightings of leatherback turtles have occurred in the proposed MUL Area within the last 12 months (IWDG, 2025). Kemps Ridley have been recorded along the west coast at Banna Strand in Co. Kerry (approximately 40 km south-west). This is beyond the proposed surveys boundary with no suspected

impacts from the proposed surveys; there have additionally been no recorded sightings of Kemps Ridley turtles and Loggerhead turtles in the Shannon Estuary within the last 12 months (IWDG, 2025), and therefore no significant impacts are expected. One record of hawks bill has been recorded in the south of Ireland at Cork Harbour as bycatch, no records have been noted along the west coast or in close proximity to the proposed MUL Area. Of the turtle species noted in Ireland, Leatherback turtles have the potential to utilise the Lower River Shannon Estuary based on historical records, but as these counts only amount to one or two individuals across many years it is unlikely that they will be present within the proposed MUL Area during the proposed SI works.

3.3.5 Bats

The proposed MUL Area has low suitability for bats, largely attributed to the absence of preferred bat habitats (e.g. woodland, hedgerows, freshwater) or roost sites. Considering this has been concluded the SI works will have no impact on bats and they are therefore not considered further within this report.

4 Examination of Impacts to Strict Protections

4.1 Cetaceans and Pinnipeds

Potential impacts to cetaceans, and on the strict protections afforded to these species, associated with the SI works are:

- Noise, vibration, lighting, and human presence-related species disturbance
- Underwater noise generated during the geophysical, seismic, sonic drilling and geotechnical surveys resulting in injury and/or displacement
- Accidental pollution events
- Collision risk with survey vessels, resulting in injury
- Entanglement risk with towed and seabed equipment.

4.1.1 Noise, vibration, lighting, and human presence-related species disturbance

The Lower Shannon Estuary is a busy shipping area, handling up to 1,000 ships carrying 12 million tons of cargo per annum (Clare County Council, 2023). Animals within the area are likely to be habituated to marine traffic, and the increase in vessel traffic as a result of the SI works is very low and temporary. It is considered highly unlikely that there will be any significant disturbance to marine species as a result of the presence of survey vessels. The presence of the jack-up barge will introduce artificial light to the area while SI works happen during the hours of darkness, but this impact will be temporary and is not expected to result in any impacts beyond the SI works campaign. Therefore, it is considered that no derogation is required and the proposed SI works will not offend the system of strict protections of Annex IV species under Article 12 of the Habitats Directive.

Underwater noise impacts are considered below.

4.1.2 Underwater noise

There is potential for effects as a result of the underwater noise emitted by the SI works.

When assessing the potential impact of underwater noise sources on the marine environment a range of variables such as source level, frequency, duration, and directivity influence received sound levels. Increasing the distance from the sound source usually results in attenuation with distance. The factors that affect the way noise propagates underwater include; water column depth, pressure, temperature gradients, salinity, as well as water surface and seabed type and thickness. When sound encounters the seabed the amount of noise/sound reflected back depends on the composition of the seabed, i.e., mud or other soft sediment will reflect less than rock. The water depth within the proposed MUL Area ranges up to 50 m below chart datum with a mixed substrate type, of muds, sands, coarse gravels, and exposed bedrock. All factors listed above reduce the propagation of the sound, decreasing the zone of influence of the geophysical surveys, seismic and sonic drilling.

Auditory injury in cetaceans can be defined as a permanent threshold shift (PTS) leading to non-reversible auditory injury, or as a temporary threshold shift (TTS) in hearing sensitivity, which can have negative effects on the ability to use natural sounds (e.g., to communicate, navigate, locate prey) for a period of minutes, hours, or days. With increasing distance from the sound source, where it is audible to the animal, the effect is expected to diminish through identifiable stages (i.e., PTS or TTS in hearing,

avoidance, masking, reduced vocalisation) to a point where no significant response occurs. Factors such as local propagation and individual hearing ability can influence the actual effect (Department of Arts, Heritage and the Gaeltacht (DAHG), 2014). The underwater noise threshold levels for marine mammals as given in international guidance is shown in Table 4.1 As noted in Section 3.3.1, it is unlikely that harbour porpoise will be active within the estuary, but bottlenose dolphins (high frequency cetacean species) can be expected to be present. The expected sound parameters of the relevant survey activities are presented in Table 4.2.

Table 4.1

TTS- and PTS-onset thresholds for marine mammals exposed to non-impulsive noise

Marine mammal hearing group	TTS onset: SEL (weighted) dB re 1 µPa2s	PTS onset: SEL (weighted) dB re 1 µPa2s
Low frequency cetaceans (baleen whales)	179	199
High frequency cetaceans (most dolphin species)	178	198
Very high frequency cetaceans (harbour porpoise)	153	173
Phocid carnivores (seal species)	181	201
Other Carnivores (otters)	199	219

Table 4.2

Expected noise parameters for survey activities based on typical equipment and noise ranges

Survey activity	Frequency range (kHz)	Peak frequency (kHz)	Source level (dB re 1 µPa)
ADCP	600 - 1000	Variable	80 (+/- 1.5)
Rotary drilling	0.001- 0.120	0.045	145
SSS	300/600kHz (offshore area) 600/900kHz (shallower nearshore area)	Variable	220-230
SBP	85-115 (primary) and 2-22 (secondary)	Variable	232

Survey activity	Frequency range (kHz)	Peak frequency (kHz)	Source level (dB re 1 µPa)
MBES	300 - 700	400	215-220
Marine refraction seismic	0 - 10	0.005 and 0. 113	182-220

The ADCP devices on the metocean monitoring buoys do produce some lower frequency sounds that are within the hearing range of high-frequency marine mammal species, such as harbour porpoise. The proposed ADCP device installation will be temporary in nature and will emit a narrow sound beam (typically a few degrees in width) with a typical echo intensity profile of 80 dB (+/- 1.5 dB). This falls below the TTS and PTS threshold for all species. Therefore, the potential impact on protected species is considered to be negligible. As such, the possibility for impacts on protected species from underwater noise associated with ADCPs can be excluded from further consideration.

The type of coring and or drilling proposed as well as the size of the boreholes mean that sound levels from the activity is unlikely to exceed previously recorded level of similar setups with source levels of 130-147dB SPL1 (re 1 µPa) (Erbe & McPherson, 2017; MR, M, M, & I, 2010). Recent measurements of geotechnical drilling in shallow waters (Huang Long-Fei et al. 2023) recorded an SPL of 155.9 dB re 1µPa rms @ 1 m at a peak frequency of 45 Hz. These levels are below the source levels of even quiet vessels and at modest ranges of c. 100 m, below the commonly used 160dB SPL2 limit for behavioural effect for marine mammals. Considering that the weighted source level of the drilling/boring (147dB SPL) is below the TTS or PTS onset levels for all marine mammal species as listed in Table 4.1, it is extremely unlikely that the drilling/boring could cause hearing impact on marine mammals.

The geophysical survey will utilise active acoustic instruments. Active acoustic instruments, such as those proposed on this survey, operate by emitting extremely short pulses and are mostly directional or omni-directional (e.g., sparker) (Ruppell et al, 2022). The range of the geophysical equipment will have a range limited principally by water depth and attenuation particularly of high frequency sources. Coupled with the narrow beam angle and short duty cycles ('on' for microseconds or milliseconds per second) means that surveying sonars have relatively low acoustic range. The SSS and MBES, in particular, are higher frequency acoustic survey methods, with acoustic ranges above the hearing sensitive range for marine mammals, therefore not considered a risk for disturbance.

The SBP and marine refraction seismic survey methods fall within the sensitive hearing range of marine mammals and exceed the onset levels for TTS and PTS for marine mammals. Since the noise levels from these sources exceed TTS and PTS thresholds, there is the potential for underwater noise generated during the SBP and marine refraction seismic surveys to result in injury and/or disturbance to bottlenose dolphin in the vicinity of the SI works. The estimated zone of audibility for all species is largest for these low-frequency sources, which propagate over longer distances relative to the rapidly attenuating high frequencies. Thus marine mammals, if very close to the survey vessel during site investigations may lead to disturbance and, at worse, auditory injury. As such, impacts from SBP and marine refraction seismic are considered to have potential to give rise to auditory injury to common

bottlenose dolphin.

Adverse effects upon QI common bottlenose dolphin associated with the Lower River Shannon SAC, Slyne head Peninsula SAC, West Connacht Coast SAC and Slyne Head Islands SAC as a result of underwater noise and vibrational effects cannot be excluded in the absence of mitigation measures in respect of the proposed SBP and marine refraction seismic surveys only.

Continuous sources (i.e., survey vessels) are shown as almost 20 dB lower than the continuous noise threshold. Taking this and directionality into account there is no significant risk to marine mammals or fish from continuous noise.

In the absence of mitigation measures, geophysical surveys, seismic surveys, sonic drilling, and noise sources have the potential to disturb or displace Annex IV bottlenose dolphins.

4.1.3 Accidental Pollution Risk

The SI works will result in a slight increase in vessel traffic within the proposed MUL Area for the temporary duration of the SI works. Although the increase is slight, this could in theory increase the potential risk of an accidental release of pollutants (e.g., fuels, oils, and lubricants) to the marine environment, which has the potential to result in toxic effects to Annex I benthic habitats and, consequently, on Annex IV cetacean species that rely on these habitats for food.

The proposed MUL Area lies within a busy shipping area in which a lot of commercial and recreational vessels operate. Given that the survey would amount to, at most, one jack-up barge and one additional vessel operating in the area during the SI works period, the likelihood of a collision resulting in a pollution event is considered insignificant. The survey vessel will be diesel or petrol, will not use heavy fuel oil, and will operate at a low speed. As vessels are required by law to adhere to regulations governing accidental leakages and spillages similarly the likelihood of such an occurrence is considered very unlikely. In addition, all substances handled and/or used whilst undertaking the works are required to be handled, used, stored, and documented in accordance with assessments and the Chemicals Act 2008 (No. 13 of 2008) and Chemicals (Amendment) Act 2010 (No. 32 of 2010) and associated Regulations.

Given the nature of the works, the limited scale and duration, and the insignificant increase in vessel activity, it is considered highly unlikely that there will be a pollution incident, e.g., accidental spills of small quantities of fuel. As such, the possibility for impacts on Annex IV protected species from accidental pollution events associated with the proposed works can be excluded from further consideration.

4.1.4 Risk of Collision

Vessel strikes have been known to cause mortality in marine mammals (Laist et al., 2001) as well as injuries from non-lethal collisions (Laist et al., 2001; Van Waerebeek et al., 2007). Injuries from such collisions can be divided into two broad categories: blunt trauma from impact and lacerations from propellers. Injuries may result in individuals becoming vulnerable to secondary infections or predation.

It is expected that a maximum of one vessel will be operating at any one time within the proposed MUL Area. Due to the nature of the works, the vessels conducting discrete sampling would be travelling directly to sampling locations and then remaining stationary during sampling while vessels conducting

the survey works will move in slow and predictable line patterns.

The Lower Shannon Estuary is a busy shipping area (Clare County Council, 2023). Marine mammals in the area are likely to be habituated to marine traffic, and the temporary addition of a single vessel operating at either low speeds or stationary for the proposed works is unlikely to constitute a significant increase in vessel activity given the levels of vessel activity typical for the area. As such, the possibility for impacts on cetaceans from collisions with survey vessels can be excluded from further consideration.

4.1.5 Risk of entanglement

There is potential for entanglement of marine fauna—including marine mammals, otters, fish, and diving birds—associated with the use of towed geophysical arrays (e.g. for seismic, MBES, and ERT surveys) and the deployment, recovery, and repositioning of seabed equipment such as seismic sensors. When assessing the potential impact of entanglement on the marine environment a range of variables should be considered, including the length of equipment, deployment methods and length of time in survey area. If seabed sensors are connected via cables rather than being individual nodes with acoustic release, this increases the potential entanglement risk, particularly for more mobile and inquisitive species like cetaceans and seals. However, given the short-term and localised nature of the proposed works, the low profile and limited vertical extent of deployed equipment, and the active management and monitoring of gear during operations, the overall risk of entanglement is considered negligible. As such, potential impacts from entanglement can excluded from further consideration.

4.2 Otter

The presence of otters is assumed, but the proposed SI works wouldn't have potential to give rise to any significant impacts to otter, as these areas are already subject to some levels of human disturbance and are part of much larger areas of suitable habitat for the species in the wider area, with coastal territories between 2km and 10km of shoreline. As such, the SI works will have extremely limited potential to impact upon terrestrial resting and breeding locations for otter.

4.3 Basking Shark and Reptiles

It is unlikely basking sharks and turtle species will be present within the proposed MUL Area during the SI works. As such, the possibility for impacts on these species can be excluded from further consideration.

5 NPWS Assessment

1. Do individuals or populations of Annex IV species occur within the proposed area?

Bottlenose dolphin are the most frequently recorded Annex IV species adjacent to the proposed MUL Area, whilst few sightings of harbour porpoise exist. Otters also occur at the site, alongside seals in low numbers; it is unlikely that marine turtles and basking shark will occur at the site.

2. Is the plan or project likely to result in death, injury or disturbance of individuals?

The activities proposed during SI works comprise boring, cone penetration tests, grab sampling, intertidal walkover and core sampling, ADCP, side-scan sonar, magnetometer and sub-bottom profiler surveys. It is possible that noise generated will be capable of causing disturbance or temporary hearing injury to a marine mammal without mitigation.

The project may cause injury and disturbance without the proposed mitigation, as impacts including noise associated with the project may travel a short distance potentially exposing a suite of Annex IV species to the activity. The risk of injury in the marine environment is considered moderate.

3. Is it possible to estimate the number of individuals of each species that are likely to be affected?

Abundance estimates for bottlenose dolphins within the Lower River Shannon SAC are available. The most recent estimate was carried out between June and September 2022 by Berrow et al. (2022) who provided a final best estimate of 116 ± 9 with a CV 0.08 and 95% Confidence Intervals of 103 to 122. However not all the Shannon dolphins use the inner estuary, and it is more likely a sub-set of 30 to 40 individuals may be exposed to the SI works. Seals occur in low numbers within the Shannon Estuary. Otters are also likely to occur in small numbers; other species (i.e., basking shark and marine turtles) are unlikely to be present.

4. Will individuals be disturbed at a sensitive location or sensitive time during their life cycle?

The proposed geophysical, seismic, sonic drilling and geotechnical survey works are scheduled to be carried out for a duration of up to four months. Bottlenose dolphins occur all year around with calving peaking late summer. Recent acoustic monitoring within the Shannon estuary suggested autumn was the highest predicted foraging period at Foynes Island. Seals and otters also occur year-round in small numbers.

5. Are the impacts likely to focus on a particular section of the species' population, e.g., adults vs. juveniles, males vs. females?

Bottlenose dolphin calves may be exposed to site investigations if born while the SI works are occurring. Immatures and dependant calves would also be exposed when present in the area.

6. Will the plan or project cause displacement from key functional areas, e.g., for breeding, foraging, resting or migration?

The area, although regularly visited by bottlenose dolphins, is not a critical habitat. It was concluded that the proposed SI works will not lead to any significant disturbance of Annex IV species known to occur in the area. Small numbers of seals may occur in the vicinity of the site but they are accustomed to human activities and are unlikely to be affected.

7. How quickly is the affected population likely to recover once the plan or project has ceased?

Any disturbance occurring with the proposed mitigation in place would be short term and local to the proposed MUL Area and not lead to any long term impacts.

6 Mitigation measures

The proposed SI works will incorporate a range of measures to safeguard the environment and potential impacts to Annex IV species. The impact of greatest concern for Annex IV species, specifically marine mammals, was determined in this assessment to be underwater noise and vibration from the noise-generating survey activities with the potential to harm or disturb marine mammals (SBP and marine refraction seismic survey); this will be mitigated as follows:

- Survey Marine Mammal Mitigation Plan: The following mitigation measures will be employed. These mitigation measures are in line with best practice guidance (NPWS, 2014):
    - A qualified Marine Mammal Observer (MMO) will be on board the survey vessel to monitor marine mammal activity and log all events;
    - Pre-start monitoring: relevant operations shall not commence if marine mammals are detected within a 500 m radial distance of the vessel (a conservative range which accounts for the maximum likely zone of influence for potential injury from geophysical surveys (SBP) of 130 m);
    - Survey operations shall only commence in daylight hours where effective visual monitoring by the MMOs has been achieved. Where effective visual monitoring is not possible, the sound-producing activities shall be postponed until effective visual monitoring has been completed;
    - Ramp Up: Following the pre-start monitoring, a ramp-up procedure will take place or a period of 20 minutes for all relevant survey equipment;
    - Where the duration of a survey line or station change will be greater than 40 minutes, the activity shall, on completion of the line/station being surveyed, either shut down and undertake a full pre-start monitoring and ramp-up procedure or reduce the sound energy output to a lower state with an output peak SPL of 165-170 dB re 1µPa @1m, and then undertake the full ramp up procedure;
    - If there is a break in sound output for a period of 5 – 10 minutes the MMO will be required to check that no marine mammals are observed within the monitored zone prior to recommencement of the sound sources at full power. Where a marine mammal is observed within the 500 m monitored zone during such a break, then all pre-start monitoring and a subsequent ramp-up procedure shall recommence as in a normal start-up operation; and
    - If there is a break in sound output for a period greater than 10 minutes, then all pre-start monitoring and a subsequent ramp-up procedure will be undertaken.

7 Conclusions

The potential for injury or disturbance to occur to Annex IV species consequent of the SI works in the absence of mitigation measures is considered to be moderate. The impact with the greatest risk as highlighted by this assessment was determined to be underwater noise and vibration from the SBP and marine refraction seismic survey activities. However, given the temporary nature of the works and with the implementation of the mitigation measures outlined in Section 6, it is considered that the potential impacts resulting from the SI works will be sufficiently reduced such that they will not give rise to significant impacts relating to species protected under Annex IV of the Habitats Directive.

Specifically, the SI works will not impact any of the Annex IV species ability to maintain its population on a long-term basis as a viable element of its natural habitats, nor will the natural range of the species be reduced or likely to be reduced for the foreseeable future as a result of the SI works. The habitat available to Annex IV species will also continue to be sufficiently large to maintain populations on a long-term basis.

Following the assessment of the evidence base and available information on relevant Annex IV species, it is concluded that the SI works comply with the system of strict protections afforded by Article 12, 13 and 16 of the Habitats Directive, transposed into Irish law by Regulations 51, 52 and 54 of the Regulations, as amended, and therefore no derogation under article 54 of the Regulations will be required.

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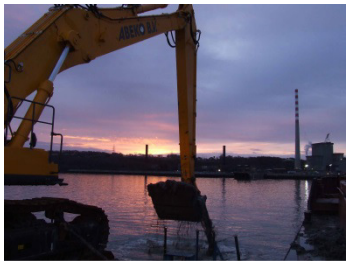
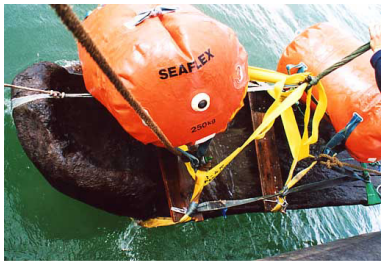
12 Appendix D – Archaeological Impact Assessment

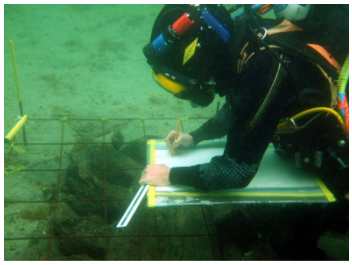
Leading Maritime Archaeology

Archaeological Impact Assessment
Strategic Gas Emergency Reserve
Marine Site Investigation

Cahiracon and Foynes Island

Shannon Estuary
Co. Clare and Co. Limerick



Archaeological Impact Assessment
Strategic Gas Emergency Reserve
Marine Site Investigation

Cahiracon and Foynes Island

Shannon Estuary
Co. Clare and Co. Limerick

24th July 2025

Project Director [redacted]

ADCO, Beverley Studios, Church Terrace, Bray, Co. Wicklow www.adco-ie.com

CONTENTS

LIST OF ABBREVIATIONS

ADCO	The Archaeological Diving Company Ltd
ACA	Architectural Conservation Area
AIA	Archaeological Impact Assessment
CD	Chart Datum
DHLGH	Department of Housing, Local Government, and Heritage.
DAU	Development Applications Unit
E	Easting
N	Northing
EIS	Environmental Impact Statement
EIAR	Environmental Impact Assessment Report
GNI	Gas Networks Ireland
HSE	Health and Safety Executive (UK)
HSA	Health and Safety Authority (Ireland)
HWM	High Water Mark
ITM	Irish Transverse Mercator
LCCC	Limerick City and County Council
LWM	Low Water Mark
MARA	Maritime Area Regulatory Authority
MUL	Maritime Usage Licence
NOD	Nicholas O'Dwyer (Consulting Engineers) Ltd.
NGR	National Grid Reference
NIAH	National Inventory of Architectural Heritage
NMI	National Museums of Ireland
NMS	National Monuments Service
OD	Ordnance Datum
OS	Ordnance Survey
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
SSDE	Surface Supplied Diving Equipment
SFPC	Shannon Foynes Port Company
SGER	Strategic Gas Emergency Reserve
SI	Site Investigation
SMR	Sites and Monuments Record
UAIA	Underwater Archaeological Impact Assessment
UAU	The Underwater Archaeology Unit

EXECUTIVE SUMMARY

The Archaeological Diving Company Ltd (ADCO) was appointed by Nicholas O'Dwyer Ltd., consulting engineers on behalf of Gas Networks Ireland (GNI), to undertake an Archaeological Assessment for advance Marine Site Investigation and Environmental Survey as part of the proposed Strategic Gas Emergency Reserve (SGER) project.

The proposed MUL boundary for Marine Site Investigation and Environmental Survey covers an area of 11.19km^2. It extends from the townland of Shannakea Beg, along the Clare coast to Cahiracon (Ed Killadysert), across the Shannon Estuary to Shannon Foynes Island, and along the Limerick coast to the townland of Leahys. Geotechnical data will be gathered form the following areas within the MUL boundary:

- intertidal and sub-tidal areas, on the north side of the estuary, off Cahiracon, and
- intertidal and sub-tidal areas surrounding the eastern half of Foynes Island; extending between Leak Point (to the north), Battery Point (to the west), and Barneen Point (to the south). The area also encompasses the southern shoreline of the estuary, extending from the Historic Harbour at Shannon Foynes Port, to a point *c.* 1km west-southwest of Poultallin Point.

Marine Benthic Surveys are also to be completed as part of the SI work and a series of grab samples will be recovered from the above marine areas. Provision for additional grab samples, to be recovered from the wider estuary (within the MUL boundary) has also been made.

The proposed works are designed to provide high quality baseline data that will contribute to site selection and any subsequent design, EIAR, and Appropriate Assessment, undertaken for the SGER project; in the event that one of the sites is taken forward to the planning/consenting stage. An application to MARA for a maritime usage license (MUL) to conduct this work is being made by Gas Networks Ireland.

The archaeological assessment, which is based on a desktop review of existing archival and published information, sets out the principal potential impacts and archaeological mitigation required for the proposed Site Investigation.

The current assessment indicates the presence of a range of prehistoric and more recent archaeological sites within the wider area at Foynes. In addition, a number of fish weir/traps and historical navigational aids are present on the OS Historic Maps for the areas under assessment (Cartographic Features F01-F06). Moreover, the existing archaeological record demonstrates a high potential for and Foynes Island, with a list of known sites located within

the townland and upon the island. As a result, the foreshore/intertidal areas under assessment should be regarded as retaining a high potential.

A Marine Geophysical Survey of the SI boundary areas is to take place prior to the proposed Marine Site Investigation. The geophysical survey will cover the full area of the development footprint under water, where accessible, and be carried out to the specification provided in this report; ensuring that the data gathered is to a sufficient resolution/density for reliable archaeological interpretation to take place. Archaeological licensing/consent will be required for the marine geophysical survey. In addition, underwater inspection of any anomalies/features arising from the Marine Geophysical Survey, deemed to be of archaeological interest, may be required.

In the event that features of archaeological/historic significance are encountered as part of the inspections, avoidance of those features will be recommended.

Archaeological Monitoring of the Marine Site Investigation is also recommended. The archaeological monitoring is to be carried out by experienced maritime personnel (licence eligible); monitoring all riverbed/ intertidal disturbances arising from the proposed SI works. No intertidal/riverbed/seabed disturbances are to take place unless an archaeologist is present to monitor the operation.

Recommendations are subject to the approval of the National Monuments Service (NMS) at the Department of Housing, Local Government, and Heritage (DHLGH).

LIST OF FIGURES

LIST OF PLATES

1.0 INTRODUCTION

The Archaeological Diving Company (ADCO) Ltd. was appointed by Nicholas O'Dwyer (NOD) Ltd., on behalf of Gas Networks Ireland (GNI), to undertake a desk-based archaeological impact assessment for Marine Site Investigation (SI) as part of the proposed Strategic Gas Emergency Reserve (SGER) project (Figures 1-3).

Marine SI is required to inform preliminary design and facilitate environmental assessment in advance of Planning for the SGER project. Site investigation is to be completed over two (2) phases, with Phase 1 determining the optimum location of the SGER.

The proposed activities covered under the MUL are summarised below:

1). Benthic Surveys

- Up to 30nr. drop-down camera transects (each up to 30m length) to visually assess benthic habitats and identify potential reef structures.
- Up to 30nr. benthic grab samples to evaluate seabed ecology and sediment characteristics.

2). Marine Geophysical Surveys

- Magnetometer survey.
- Sub-bottom profiler.
- Side-scan sonar.
- Bathymetric survey (using single or multibeam echo sounders).

To be completed using 20m line-spacing and 100m cross-lines.

3). Phase 1- Geotechnical and Environmental Site Investigations[1]

- Up to 60nr. marine boreholes.
- 80nr. cone penetration tests (CPTs); 60nr. at borehole locations to clear for UXO and 20nr. as standalone investigation locations.
- Up to 50nr. seabed grab samples.
- 30nr. surface water samples.
- Intertidal sediment cores at eighteen (18) locations across six (6) transects for sediment chemistry and ecological assessment.

4). Phase 2- Geotechnical Investigations

Subject to site selection, an allowance has been made for an additional 20nr. marine boreholes to inform the detailed design stage of the project.

5). Archaeological Survey, Assessment, and Monitoring

Onsite archaeological requirements will include:

- Intertidal and subtidal surveys, including metal-detection, located with the vicinity of the proposed Marine Site Investigation; informed by results of the Marine Geophysical Survey.
- Archaeological Monitoring of the Marine Site Investigation works.

6). Metocean Monitoring

- Deployment of two (2) wave buoys or sensors.

[1] While the locations of 64nr. boreholes and 28nr. grab samples are presented, a contingency of up to 80nr. boreholes and 50nr. grab samples is included as part of the Marine SI.

- Allowance for the deployment of four (4) additional buoys, each equipped with environmental monitoring instruments, including:
  - Conductivity, Temperature, and Depth (CTD) sensors
  - Optical salinity sensors
  - Acoustic Doppler Current Profilers (ADCP)
  - Dissolved oxygen (DO), pH, turbidity, and sediment sensors

The above proposed activities are essential to understanding the physical, ecological, and archaeological context of the proposed development area; ensuring that any future project planning is informed by comprehensive and site-specific environmental data.

The MUL red-line boundary, which encompasses a *c.* 11.19km^2 section of the Shannon Estuary, comprises a wider environmental study area within which non-disturbance video surveys (drop-down camera) are to be deployed and a number of grab samples are to be recovered. These surveys will recover ecological information on the benthic community and reef structures. It is anticipated that seabed imagery will be captured along a series of 30m-long video transects, numbering up to thirty (30) transects in total.

Prior to commencement of the Marine SI, a Marine Geophysical Survey is to be undertaken, with the resulting data gathered at a resolution suitable for both archaeological and geological data interpretation.

The archaeological assessment, which is based on a desktop review of existing archival and published information, addresses the known and potential archaeological environment; assesses the actual and proposed impacts on that environment from the SI works programme; and makes recommendations to resolve any further archaeological requirement/s prior to the SI works programme commencing.

An Underwater Archaeological Impact Assessment (UAIA) is also to be undertaken in order to inform the project EIAR. The UAIA will absorb the findings from the Marine Geophysical survey and related archaeological work (including underwater inspection, as/when required), the results of the Marine SI works, and the findings from any intertidal surveys (including metal-detection) that are carried out as part of the pre-planning phase of the SGER project.[2]

[2] Underwater inspections are to be carried by a suitably qualified maritime archaeological dive team, using SSDE, in accordance with HSA/HSE regulations for inshore diving.

2.0 MARINE SITE INVESTIGATION[3]

Marine Site Investigation is required as part of the proposed Strategic Gas Emergency Reserve project, gathering geotechnical and ecological information from a number of areas within the Shannon Estuary (Figure 3). The MUL application covers an 11.19km^2 area, the coordinates for which are provided below in Table 1.

Point	Coordinate [ITM]	Point	Coordinate [ITM]
1	521666.95E, 652942.45N	8	524624.42E, 653476.37N
2	523262.79E, 655102.38N	9	524961.46E, 652187.11N
3	524675.35E, 655766.22N	10	524960.63E, 652123.29N
4	525781.39E, 656303.53N	11	524893.99E, 651940.99N
5	526519.62E, 655565.15N	12	524826.20E, 651948.26N
6	526001.68E, 653296.42N	13	522809.36E, 651720.36N
7	525678.59E, 653187.58N	14	522726.62E, 651766.51N

Table 1: Marine SI boundary areas identified for the proposed development.

The Phase 1 scope of Marine SI works assumes the requirement for sixty (60) marine boreholes (drilled to a maximum depth of 50m), eighty (80) cone penetration tests (CPTs), thirty (30) subtidal grab samples, sixteenth (16) intertidal grab samples, and thirty (30) surface water samples (Figure 3).

A second phase of Marine SI will be carried out, gathering data from an additional twenty (20) boreholes at the chosen SGER terminal location. These additional boreholes will be used to coordinate with the detailed design stage.

It is understood that the boreholes are to progress to a point 50m depth below bed level. However, in the event that sufficient bedrock is encountered, some boreholes may be terminated before the above target depth has been reached.

Plant identified for this work includes a works-platform (jack-up barge) and suitable tender vessel (tug/workboat). This barge-type is typically supported on four (4) spud-legs with a leg typical diameter of 1m.

Site work is anticipated to take place over a 4-month period, operating on a 24/7 schedule.

[3] Based on information forwarded by NOD.

3.0 ASSESSMENT METHODOLGY

The desktop assessment includes a review of historic mapping, which can reveal the development of the landscape over time; an examination of existing archival information at the DHLGH (NMS) and the National Museum of Ireland (NMI) in relation to the known archaeological objects, features, and sites of archaeological and architectural interest; and a review of archaeological work conducted in the vicinity of the project area, from published and unpublished sources. This information combines to establish a baseline data source, the principal findings of which are presented Section 4.0 of this report.

3.1 Consultations

A desk study of cartographic and archival information has been completed. This includes, but is not limited to the following consultations:

- *Cartographic sources*, including Admiralty Charts, Ordnance Survey First and Second Edition maps, Geological mapping (GSI). Historic and current topographical maps represent very important sources that can reveal the progress of natural erosion and human development across a landscape/seascape over time. Such mapping in Ireland is metrically accurate from the mid-late nineteenth century.
- The *Irish Antiquities Division of the National Museum of Ireland* (NMI) retains an extensive archive of small finds and objects discovered across Ireland and reported to the Museum and its predecessors since the nineteenth century. It represents a critical resource for archaeological research, where registered objects are recorded by townland in the Topographical Files. For the present project, the following townlands were assessed: Leahys, Foynes, Foynes Island, Shannakea, and Cahiracon.
- *Department of Culture, Heritage and the Gaeltacht* (DCHG) *Sites and Monuments Record files*. The information, which is also filed according to townland, provides details relating to specific monuments and sites of archaeological importance that survive or whose site area is recorded. The record generally includes only sites that pre-date *c.* 1750 AD.
- *DHLGH's Historic Shipwreck Inventory files* and *Places and Ports archive*. This information relates to the archives maintained by the National Monuments Section's Underwater Archaeology Unit for shipwreck and other maritime sites of archaeological interest. The information is located with reference to the nearest topographic locator, such as a town or headland, as well as site-specific grid coordinates where known.
- *National Inventory of Architectural Heritage* provides an online register of historic buildings and features/street furniture that retain architectural interest and is maintained by the DHLGH's architectural section. The Inventory is organized by place and townland. The Inventory complements the archaeological inventories by including buildings and features that date from the eighteenth century and more recently.
- *Excavations Bulletin* is an annual published list of licensed archaeological intervention work conducted across Ireland. It is arranged by county and then by townland and is currently completed to 2011.
- Relevant published sources.
- Relevant unpublished sources.
- Online sources.

3.2 Legislation

The following legislation, standards and guidelines were considered and consulted for the purposes of the assessment:

- Advice Notes on Current Practice (in preparation of Environmental Impact Statements), 2003, EPA;
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 2000 and the Local Government (Planning and Development) Act 2000;
- Frameworks and Principles for the Protection of the Archaeological Heritage, 1999, (formerly) Department of Arts, Heritage, Gaeltacht and Islands;
- Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes, NRA;
- Guidelines on the information to be contained in Environmental Impact Statements, 2022, EPA;
- Heritage Act, 1995;
- National Monuments Acts, 1930-2004;
- Planning and Development (Strategic Infrastructure) Bill, 2006;
- Strategic Environmental Assessment (SEA) Pack, 2010 EPA;
- In the absence of a specific Code of Practice between the Marine Industry and the Minister of Housing, Local Government, and Heritage, the following Codes of Practice that exist between industry and the Minister were consulted: Bord Gáis Éireann (2002); Coillte (no date); EirGrid (2009); ESB Networks (2009), Irish Concrete Federation (2009), National Roads Authority (no date), Railway Procurement Agency (2007).

The following county and local development plans were considered and consulted for the purposes of this evaluation:

- Clare County Heritage Plan 2024-2030
- Clare County Heritage Plan 2023-2029
- Limerick Heritage Plan 2017-2030
- Limerick County Development Plan 2022-2028

3.3 Classification of Impacts

Impact/effect categories will typically have regard to those set out in the '*Guidelines on the information to be contained in Environmental Impact Statements', 2022*, EPA; 'Advice notes on Current Practice (in preparation of Environmental Impact Statements), 2003, EPA; Strategic Environmental Assessment (SEA), 2010; and Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes, no date, National Roads Authority.

Impacts are generally categorised as either being a direct impact, an indirect impact or as having no predicted impact:

> **Direct impact** occurs when an item of archaeological or architectural heritage is located within the footprint of the proposed development and entails the removal of part, or all, of the monument or feature.
>
> **Indirect impact** may be caused where a feature or site of archaeological or architectural interest is located in close proximity of the proposed development.
>
> **No predicted impact** occurs when the proposed development option does not adversely or positively affect an archaeological or architectural heritage site.

These impact categories are further assessed in terms of their quality i.e. positive, negative, neutral (or direct and indirect).

> **Negative Impact** is a change that will detract from or permanently remove an archaeological or architectural monument from the landscape.
>
> **Neutral Impact** is a change that does not affect the archaeological or architectural heritage.
>
> **Positive Impact** is a change that improves or enhances the setting of an archaeological or architectural monument.

A significance rating for these impacts is then given i.e. slight, moderate, significant or profound.

> **Profound** applies where mitigation would be unlikely to remove adverse effects. This is reserved for adverse, negative effects only. These effects arise where an archaeological or architectural site is completely and irreversibly destroyed by a proposed development.
>
> **Significant** is an impact that, by its magnitude, duration or intensity alters an important aspect of the environment. An impact like this would be where the part of a site would be permanently impacted upon leading to a loss of character, integrity and data about the archaeological or architectural feature/site.
>
> **Moderate** is a moderate direct impact that arises where a change to the site is proposed which, though noticeable, is not such that the archaeological integrity of the site is compromised and which is reversible. This arises where an archaeological or architectural feature can be incorporated into a modern day development without damage and that all procedures used to facilitate this are reversible.
>
> **Slight** is an impact that causes changes in the character of the environment that are not significant or profound and do not directly impact or affect an archaeological or architectural feature or monument.
>
> **Imperceptible** is an impact capable of measurement but without noticeable consequences.

In addition, the duration of Impacts is assessed and has been sub-divided into the following categories:

- **Temporary Impact**, where an Impact lasts for one year or less
- **Short-term Impacts**, where an Impact lasts one to seven years
- **Medium-term Impact**, where an Impact lasts seven to fifteen years
- **Long-term Impact**, where an Impact lasts fifteen to sixty years.
- **Permanent Impact**, where an Impact lasts over sixty years.

Limitations

The current report is based solely on a desktop review/study, the assessment being carried out in advance of any onsite archaeological assessments that are to take place pre-planning.[4]

[4] A series of archaeological assessments, including an UAIA, are to be carried out as part of the project EIAR.

4.0 RECEIVING ENVIRONMENT

4.1 Shannon Estuary[5]

The Shannon estuary is the largest inlet located along the Irish coastline and constitutes an exposed inter-tidal zone around 200km in length (combined length of both sides of the river). The estuary is part of a dynamic landscape that includes raised bogland, freshwater fens, salt marshes and intertidal mudflats.

Estuarine environments are sensitive to sea-level change and large areas of prehistoric foreshore have been submerged by relatively small fluctuations in that level. The inter-tidal environment provides for an extremely rich archaeological holding content and archaeological/palaeo-environmental evidence of Mesolithic, Neolithic, Bronze Age and post-medieval date has been recovered from the Shannon. Moreover, large sections of the estuary provide suitable environmental conditions for the preservation of archaeological material along its intertidal zone, where deep deposits of estuarine mud provide an anaerobic environment within which archaeological material is preserved. Indeed, areas of submerged Neolithic forest have been identified, buried deep within the estuarine clays.

Research conducted in the 1990s highlighted the archaeological importance of the Shannon estuary since earliest times.[6] The work conducted by the Discovery Programme focused attention upon the role that the estuary played in providing economic potential in terms of coastal exploitation for fishing and communications since the later Mesolithic period, before people exploited the landscape directly for agrarian production. The study area was concentrated on the intertidal mudflats on the Fergus and Meelick rivers, and around Carrigdirty, Co. Limerick (upriver from the present survey area).

While the distribution of known medieval and early modern/nineteenth-century fortifications along the estuary was well known, the research work brought attention to the archaeological potential of the larger estuary area; highlighting as-yet undocumented foreshore areas and their potential retain relict fish weirs and old piers as intertidal features that can hold significant and early phases of use.

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[5] Where relevant, information has been included from ADCO's previous assessments at Foynes, these include Rex Bangerter and Niall Brady, 'Archaeological and Architectural Assessment, Foynes, Co. Limerick, Shannon Foynes Port Land Reclamation', ADCO Ltd; unpublished report 2010 and EIS Chapter 13, *Archaeology and Cultural Heritage, Shannon Foynes Port Land Reclamation project* and Rex Bangerter, 'Archaeological Impact Assessment, Capacity Extension and Harbour Development Project, Shannon Foynes Port, Foynes, Co. Limerick', ADCO Ltd; unpublished report 2018 and EIS Chapter 14, *Archaeology and Cultural Heritage, Capacity Extension at Shannon Foynes.*

[6] Aidan O'Sullivan, *Foragers, Farmers and Fishers in a Coastal Landscape: an Intertidal Archaeological Survey of the Shannon Estuary*, Discovery Programme Monograph 5 (Dublin, 2001).

In the vicinity of Foynes Harbour, the estuary measures 3.9km in width (max.). Foynes Island, located to the south, and Robertstown River, to the east, has resulted in the creation of a broad channel (*c.* 530m width) that flows past the southern and western extents of the island. The area between Aughinish and Durnish Point is characterised by extensive intertidal mudflats, with an intertidal exposure of up to 900m, to the east of the Roberstown River. Between the Port of Foynes and Foynes Island, the opposing intertidal zones measures between *c.* 52m and *c.* 121m in exposure. To the north, extensive intertidal mudflats (estuarine silts) extend to either side of Cahiracon Point, measuring between *c.* 100m and *c.* 180m in exposure at Low Water.

4.2 Cahiracon

Cahriracon (*Cathir a Dhá Chon*, 'The fort of the Pair of Hounds') is situated in the Parish of Kilfiddane, Barony of Clonderalaw, Co. Clare. It is located directly opposite Foynes Island, on the north side of the Shannon Estuary, where it fronts onto a *c.* 2.2km-long section of shoreline. Carboniferous siltstone, siltstone, and mudstone comprise the underlying bedrock across the nearshore area. Low-lying cliffs, formed of glacial till (boulder clay), with frequent sections of exposed bedrock, delineate the upper foreshore; beneath which shingle deposits extend seaward up to *c.* 25m. Deep deposits of estuarine silt form intertidal mudfats that extend to the LWM.

The most notable structure within the townland is Cahiracon House (NIAH 20406901), which forms an imposing Georgian structure, positioned close to the shore, with grounds that include some 900m of waterfrontage. In 1712 the Earl of Thomond leased the lands comprising Cahiracon, to Angel Scott in perpetuity. In 1781, Captain James Scott married Anne Bindon and Cahiracon House was constructed shortly thereafter (*c.* 1790); the Scotts residing at Cahiracon until the mid-nineteenth century. The Vandeleur family lived at Cahiracon House for a short time the early 1900s, prior to the house being bought by the Maynooth Mission to China in 1920, and later sold (by them) to the Salesian Sisters of St John Bosco in 1962.

The Parliamentary Gazetteer of 1846 refers to Cahiracon, noting that:[7]

> …the property of John Scott, Esq., [lies within] one of the most beautiful and romantic demesnes on either the Fergus or the Shannon…The inhabitants of the parish enjoy the facilities of water-communication with Limerick and the ocean, and will reap some advantages from the improvements effected by the Shannon Navigation Commissioners.

[7] *The Parliamentary Gazetteer of Ireland: Adapted to the New Poor-Law, Franchise, Municipal and Ecclesiastical Arrangements, and Compiled with a Special Reference to the Lines of Railroad and Canal Communication as Existing in 1844-45*, London: A. Fullarton, 1846.

A nineteenth century quay/pier (NIAH 20405903), located towards the eastern extent of the townland, is one of the 'improvements' referred to above, work on the structure being completed *c.* 1830: '…the quay presenting a front to the river of 250 feet, having 21 feet depth of water at high spring-tides, and having a lay-bye in its rear, affording excellent shelter for small craft.'[8]

A reference to Cahiracon is also provided in Lewis's *Topographic Dictionary of Ireland* (1837), under Kilfidane, and notes that in 'about 1780, an East India fleet took refuge in the Shannon, with an encampment formed in the deer-park of Cahiracon'.[9]

The existing archaeological record suggests that medieval and earlier activity was prominent within the western half of the townland, where a cluster of ringforts can be observed. A series of *fualchta fiadha*, five in number, are also present nearby, highlighting exploitation of this coastal location in prehistory.

A medieval tower house (RMP CL069-018----) is also recorded at a point roughly mid-point of the townland, close to the shoreline, although its exact location remains unclear. Field inspection of the foreshore/nearshore area in 1994, by Martin Breen and Ristéard UaCróinín, encountered some dressed limestone masonry on the foreshore, at a point roughly 200m south of Cahiracon House.[10] In addition, the low cliff-face above was noted to contain a significant amount of mortar/broken stone. The jamb for a sixteenth-century square-headed window was also recorded nearby. Moreover, it was observed that the historic seawall, constructed in the late nineteenth century to protect Cahiracon House, included dressed limestone pieces; likely constituting masonry re-use from the aforementioned tower house.

4.3 Foynes Island

Foynes Island comprises a small, oval-shaped, landmass located to the north of Shannon Foynes Port. The island measures 1.4km length (northwest-northeast) and 1.2km in width (east-west). It is composed of carboniferous siltstone and shale deposits, the strata from which have formed outcrops of shelving bedrock along its shoreline, predominantly to the north and south. Low-lying cliffs delineate the east and western shorelines. Glacial till (boulder clay) is exposed along the upper foreshore, giving way to overlying deposits of estuarine silt, located towards the low water mark.

[8] *Shannon Navigation, Report of the Commissioners for Improving the Navigation of the Shannon, ordered by the House of Commons*, 1843.
[9] Samuel Lewis, *A topographic Dictionary of Ireland comprising the several Counties, Cities, Boroughs, Corporate, Market, and Post Towns with Historical and Statistical Descriptions* (London, 1837).
[10] Martin Breen and Ristéard UaCróinín, *Some Towerhouses of East Corca Baiscinn and the Shannon Estuary Part II (Concluded)* in The Other Clare, Vol. 27, 2013.

A disused Oil Jetty projects *c.* 200m from the north shoreline, at a point 268m east of Battery Point; this structure being in use up until late 1970's. A 21m-long open pile boat jetty is also located on the southwest side of the island, immediately to the south of Barneen Point. This structure facilitates local access to the island (residents of Barneen House and Monare House), replacing an earlier, nineteenth-century, masonry quay that is located on the upper foreshore at a point *c.* 58m to the east.

The island is subdivided into a patch-work of fields that retain much of the layout as depicted on the OS historic mapping, although some are now less subdivided. These were predominantly used for rough-pasture until the mid-1950s. In the 1990s, approximately 50% of the available land was subject to afforestation (mixed woodland species); approximately 10% having already been under native woodland.

A range of archaeological sites are identified on Foynes Island. The presence of six (6) *fualchta fiadha* or spreads of burned stone material, indicate a distinct prehistoric horizon of activity that is concentrated in the centre and along the north shore of the Island. These are a commonly occurring site and represent cooking and related activities, which are often associated with nearby settlements but can also occur in isolation, suggesting the re-use of more general hunting or fishing sites. The clustering of *fulachta fiadha* on Foynes Island carries the attention westwards along the estuary for prehistoric activity that has been identified on the tidal mudflats to the east at Carrigdirty, and to the north along the Fergus Estuary.[11]

The Napoleonic era battery on Foynes Island reflects the degree to which the landing place at Foynes was regarded with some importance in the past. The battery site (LI 010-001) was an earthwork construction that held six 24-pound cannon and formed part of the wider network of defences along the estuary.[12] The battery was considered capable of commanding the full width of the river at this point, which is a mile wide from Battery Point across to the Co. Clare shore.

4.4 Foynes Harbour

Foynes lies on the south side of the Shannon estuary, west of Aughinish, Co. Limerick. The presence of Foynes Island (*Oileán Fainge*), some 330m to the North presents a wide channel

[11] Aidan O'Sullivan, *Foragers, farmers and fishers in a coastal landscape: an Intertidal Archaeological Survey of the Shannon Estuary'*, Discovery Programme Monograph 5., (Dublin 2002), pp55, 93
[12] Paul Kerrigan, *Castles and Fortifications in Ireland, 1485-1945* (Collins Press, Cork 1995), p. 211.

and a most suitable anchorage with protection from the winds, but with a strong ebb flow. Indeed an entry in Lewis's *Topographic Dictionary of Ireland* (1837) observes that:

> This place *[Foynes Island]* has been recommended by Capt. Mudge, the Government engineer, as affording extensive and secure anchorage for shipping, and consequently as a proper situation for the construction of docks and quays; at present it is seldom resorted to by mariners, but the steamers plying between Limerick and Kilrush call off the island to take up passengers. There was formerly a battery of *24*-guns on the island, erected for the protection of the shipping trade of the river. On the south side is a handsome marine villa, the summer residence of the Earl of Dunraven; and there are several neat cottage residences in different parts of the island.[13]

The suitability of establishing a harbour at Foynes was assessed by F. Burgoynes, Harry D. Jones, and Richard Griffith, as part of the 1837 Commission for the Improvement of the River Shannon. Following the commission's findings, harbour works began in 1846 with the construction of a masonry quay and associated breakwater. By 1885, an act of parliament initiated the transfer of ownership of Foynes Harbour from the Commissioners of Public Works to a newly established board of trustees; the Foynes Harbour Trustees. Transfer was completed in 1890 and several infrastructural improvements to the harbour area followed. A new timber jetty was constructed (sometime before 1898), extending from the terminus of the masonry quay, and concrete-built spur was added in 1915; positioned parallel to the original quayside. Further development took place in 1933 with the construction of a new jetty, designed to cater for larger vessels, up to 8,000 tons. Around this time the port also became the European base for a transatlantic flying-boat service, which operated out of Foynes for the following decade. The existing East Jetty was established in 1968 and subsequently extended on its west side in 1984. Sizeable reclamation of the foreshore was undertaken as part of the above developments, approximately 153m (max.) north-south by 800m east-west area being reclaimed. The original shoreline is denoted by the aforementioned floodwater embankments which are still remain *in situ*.

Today Foynes forms a linear settlement with the continuation of house-building along much of the N69 and new housing developments established on the south side of the conurbation. Shannon Foynes Port commands much of the shoreline, comprising a general-purpose terminal that caters for dry-bulk, break-bulk, liquid, and project cargoes. The port complex comprises of the West Quay, completed in 1999 (271m length), the East Jetty (295m length), associated warehousing, port services, and oil-dolphins located to the east of the site (Plate 2). Reclamation of the intertidal foreshore behind Berth 6, on the east side of the East Jetty, was completed in 2012. Reclamation of the intertidal foreshore behind Berth 5 was completed in 2024.

[13] Samuel Lewis, *A topographic Dictionary of Ireland comprising the several Counties, Cities, Boroughs, Corporate, Market, and Post Towns with Historical and Statistical Descriptions* (London, 1837).

Further development is also proposed by the SFPC with the plans for a new Deepwater Terminal, located on the north side of Foynes Island. Site investigation (SI), to inform preliminary design and facilitate environmental assessment, in advance of Planning and Foreshore applications for this project has recently been completed.[14]

4.5 Cartographic Information

The earliest map that depicts the River Shannon area surrounding Foynes is from the Down Survey Mapping of 1656–58; *Barony of Connello* (Plate 1). While this map depicts Foyne's Island and the adjacent shoreline, no cartographic indicators of development within the area are shown. In contrast, the neighbouring *Parish of Loughill* is shown to contain a series of clearly defined field boundaries, along with a church, tower house, and number of dwelling houses that surround the settlement of '*Loughill'.*

On the Clare side of the Estuary, the barony level map for Clonderalaw (*Clanderlagh*) is not preserved with the Down Survey mapping, having been destroyed in 1711. However, reference the townland of '*Cahirdecon*' is included on the county level map. No structures are depicted for the adjacent shoreline, but and an ecclesiastical site at *Kilfaddon* (now the parish of Coolmeen) is shown (Plate 2).

The first detailed mapping for the areas under assessment was produced by the Ordnance Survey of Ireland in the nineteenth century. As such, it is the OS First (1844) and the subsequent OS 25-inch (1898) map editions that are subject to discussion in this report, with particular reference to the following cartographic areas:

- Cahiracon Point; shoreline extending to the east and west.
- Foynes and its shoreline (Historic Harbour to Poultallin Point).
- Foynes Island; north and south shoreline.

4.5.1 **OS First Edition (1844) map**; Figures 4-5, Plates 3-8

<u>Cahiracon shoreline</u>

The shoreline, extending either side of Cahiracon Point, is depicted as low-lying cliffs behind which lie large sections of native woodland interspersed with scrubland. Shingle deposits, leading onto wide expanses of intertidal mudflats are depicted below.

Cahiracon Point is shown as a rocky promontory (shelving bedrock) that extends *c.* 140m to the Low-water mark (LWM). The outcrop measures *c.* 50m width. To the northeast, a broad expanse of intertidal foreshore is present, measuring *c.* 543m in length by *c.* 170m (max.) in

[14] Archaeological and environmental assessment, as part of a future EAIR submission for the Foynes Deepwater Terminal project, is also ongoing, to which ADCO are appointed Project Archaeologist.

width (at Low Water). The northeast limit of this area is defined by a *c.* 95m-long projection of land, to the immediate west of which a small stream is shown, transecting the foreshore to discharge at the LWM. Moving further to the northwest (*c.* 450m), an L-shaped pier/quay structure (Cahiracon Pier, NIAH 20405903) is shown, extending from the upper foreshore to the LWM (Plate 3). The pier measures *c.* 161m in length, with a quayside section that measures *c.* 65m in length. The structure, which is located opposite Inishmurry Island, dates to the 1830s and was constructed following recommendations made by the Commissioners for improvement of navigation on the Shannon.

A sizeable inlet is located on the southwest side of Cahiracon Point, forming an expanse of intertidal foreshore, annotated '*Mud*', that measures *c.* 996m in length (northeast-southwest) and *c.* 300m in width to Low-water. A tidal fish-trap (CF01), annotated '*Weir*', is located within this area, *c.* 320m southeast of Cahiracon Point (Figure 4, Plate 4). The weir extends *c.* 54m, in a southeast direction, from the lower part of the shingle deposit that comprises the upper foreshore. The terminus, where the fish are trapped/ collected, measures c. 21m in length by c. 9m in width.

A small stream discharges at a point roughly mid-way along this intertidal area and large estate house (annotated '*Cahiracon Ho.*'; NIAH 20406901), associated buildings, formal grounds, and walled garden are situated to either side of the waterway's approach to the upper foreshore (Plate 5; item A). A short distance (c. 27m) to the south of Cahiracon House, a small '*Boat Slip*' and associated '*Signal Pole'* are depicted (Plate 5; Item B).

Foynes Island

The foreshore on the north side of the island is depicted as a board inertial area that extends a distance of *c.* 1.1km between Leck Point, to the east, and Battery Point (annotated '*Site of Battery*') to the west; the battery (RMP LI010-001) being positioned at the apex of a broad promontory on the northwest side of the island (Figure 5). A trigonometrical point (triangulation station) is also shown at this location, annotated number '*43*'. The uppermost part of the foreshore, for much of the shoreline, is shown as a shingle-type deposit (*c.* 25m width), below which intertidal mudflats are present (ranging in width between *c.* 78m and *c.* 174m). To the east, bedrock extends in a northeast direction, with three bedrock spurs forming '*Leck Point'*. Another, smaller, spur of shelving bedrock is located *c.* 180m to the west of the aforementioned headland. A short distance (19m) to the east of this bedrock, a fish-weir/trap (annotated 'Weir') is present; depicted as a linear structure that extends from the upper foreshore, in a northwest direction, for a distance of *c.* 53m (CF02) (see Figures 4 and 7, Plate 6).

An expanse of shingle is shown surrounding the northwest promontory, extending up to *c.* 100m before reaching the Low Water mark. This deposit is also shown to comprise much of the foreshore on the west side of Foynes Island.

The southern side of the island is similarly characterised by shelving bedrock, single deposits and expanses of inertial mudflats (Figure 5). Across its southwestern extent, low-lying cliffs and shelving bedrock give way to a series of inlets and corresponding bedrock spurs. Two large residential structures, including a formal garden, are shown to occupy the land behind (annotated '*Foynes Ho.*'). The south-eastern part of the island is annotated '*Gammarel Point*', situated roughly opposite Durnish Point on the east side of Foynes (Figure 5). An area of shingle (*c.* 360m-long) is shown surrounding Gammerel Point, extending *c.* 60m from the upper foreshore to the Low Water mark. Moving northeast, a large expanse of inertial mud-flat (annotated '*Mud*'), extends *c.* 620m from the east side of the island. An additional section of intertidal shingle and mud is located immediately to the south of the greater intertidal expanse, forming a linear feature measuring *c.* 714m length (northeast-southwest) by c. 140m in width (northwest-southeast).

Foynes and adjoining shoreline

The OS First Edition map (1844) depicts Foynes village as a linear development of detached and semi-detached dwellings situated either side of a roadway (now part of the N69) which runs close to the upper foreshore on the south side of the river estuary (Figure 5). A '*Post Office*' and '*Police Barracks*' are depicted to the west of the settlement, and a '*National School'* is shown *c.* 200m to the southwest. A small quay structure, annotated '*Quay*', is shown on the upper foreshore, between the main street and the aforementioned post office; depicting the foreshore prior to the development of Foynes harbour in the late 1840s.

The inter-tidal zone adjacent to Foynes Village is depicted as a wide expanse of estuarine mudflats; forming an intertidal foreshore that extends between *c.* 121m and *c.* 350m in width.

A '*Weir*' is shown running roughly north-south from the Low Water Mark, located parallel (west) to a small river that has cut a channel through the inter-tidal zone (CF07) (Figure 10, Plate 7). This structure measures approximately 170m in length and has two (2) equidistant arms that protrude at right angles from the west side of the structure; measuring *c.* 25m in length. This tidal fish-trap represents a sizable endeavour and highlights the exploitation of the estuarine environment as a natural resource in the nineteenth century; being one of many such sites observed along the Shannon estuary.

To the west of Foynes, the foreshore running between '*Foynes Rock*' and Poultallin Point is largely depicted as shingle, measuring up to *c. 7*5m in width; the area of mudflats being

relatively narrower (measuring between *c.* 20m- *c.* 50m width) than elsewhere along the coastline. The nearshore area comprises woodland (Poulatallin Woods), within which a series of pathways are depicted.

Immediately downstream (west) of Poultallin Point, the mudflats occupy a larger area of the intertidal foreshore, increasing to *c.* 110m, before narrowing once more to *c.* 20m. A linear fish-trap (CF03), annotated '*Weir*', extends north-northwest to south-southeast across the shingle and terminates just before reaching the mudflats (Plate 8, Figure 5).

4.5.2 OS 25-inch Edition (1898) map; Figures 6-9, Plates 9-17

Cahiracon shoreline

While much of the shoreline remains unchanged from that depicted on the OS Frist Edition map, there are some noteworthy alterations (Figure 6). Firstly, a shingle causeway is now shown extending in a southeast direction across inertial foreshore (mudflats) at a location *c.* 190m south of Cahiracon House (Plate 9; Item A). In addition, a section of foreshore, adjacent to Cahiracon House, has been subject to reclamation (Plate 9; Item B); where a '*Quay*' was marked on the earlier map. The reclamation area measures *c.* 38m in width by *c.*100m length and is retained by a sea-wall, measuring *c.* 163m in length. Neither of these features is annotated on the 25-inch map.

Cahiracon House (NIAH 20406901) is now shown to be significantly extended on it southern side, its footprint being almost doubled. However, the formal gardens, previously depicted, are no longer shown, being replaced by a cleared field with a few bushes and small trees.
A flood embankment and sea-wall is shown, delineating the upper foreshore towards the north-eastern extent of Cahiracon Td (Plate 10; Item A). The embankment bounds a pasture field, within which a number of drainage ditches are shown running along its centre. A small rectangular structure to the southwest is also depicted, annotated '*Sheepfold*'.

A short distance to the north, the L-shaped pier/quay (Cahiracon Pier, NIAH 20405903), previously observed on the First Edition Map (positioned at the boundary between Cahiracon Td. and Cappanavarnoge Td.), is now shown in much greater detail (Plate 10; Item B). A series of '*Mooring Posts*' are now included, totally fourteen in number, and a set of masonry steps are also depicted at the northern end of the quay. A small rectangular building is located at the other end of the quay, and a *c.* 18m-long '*Gangway*' structure is shown extending (southeast direction) from the seaward side the quay.

The fish-trap (CF01), as depicted on the Frist Edition map, is no longer shown. As such, no cartographic features of interest are depicted on the 25-inch edition map for the section of intertidal foreshore falling within the area subject to the proposed Marine SI at Cahiracon.

Foynes Island

The north shoreline retains much of the cartographic character depicted on the previous map edition, comprising a rocky shoreline, giving way to shingle and intertidal mudflats. Moreover, the present-day shoreline varies little from shoreline topography presented on the either of the historic map editions (Figure 7).

The northwest promontory is now annotated '*Battery Point*' and the adjacent gun battery (RMP LI010-001) annotated '*Battery (Site of)*'. In addition, a *c.* 90m section of embankment if shown on the seaward side of the gun battery. The fish-weir/trap annotated '*Salmon Weir*' (CF02; Figure 7) is located close to the location of the fish-weir depicted on the OS First Edition map (Plate 11). However, the orientation (north-south) and length (66m) differ, suggesting that this feature may be replacement to that previously indicated. Another fish-trap (CF03) is also shown on the 25-inch map, positioned on the west side of the island, annotated '*Salmon Weir'* (Figure 8, Plate 12). The fish-trap measures *c.* 55m in length and has a v-shaped basket/trap at its seaward terminus, measuring *c.* 23m length x *c.* 10m width at its opening.

Shelving bedrock forms a rocky cliff that extends *c.* 390m to the south of the aforementioned fish-trap. No intertidal zone is depicted for this section of shoreline. In contrast, the shoreline extending between the fish-trap and Battery Point (*c.* 731m) includes shingle deposits along the upper foreshore, giving way to estuarine silt (mudflats) down to the LWM.

The southern shoreline at Gammarel Point, as depicted on 25-inch map, largely corresponds to that of the present-day, with foreshore/intertidal areas being comparable in nature/extent; the inclusion of a linear section of exposed bedrock (*c.* 136m-long) that runs eastward along the uppermost part of foreshore, being the only exception to this. However, the most noticeable cartographic change along the southern shore is the addition of '*Monare*' House and its grounds; a county house built in the 1850's for Sir Stephen Edward De Vere of Currgah Chase, Adare (Member of Parliament for Limerick 1854-59) (Plate 13). A stone built quay (annotated '*Quay*') is also included, positioned on the upper foreshore at a location *c.* 100m east of Barneen Point, opposite to '*Barneen*' House (formerly annotated '*Foynes Ho.*').

Foynes and adjoining shoreline

The OS 25-inch Edition Map (1898) depicts significance development within Foynes. Of particular note is the establishment of a harbour area to the northwest, completed in 1853 (Figure 8, Plates 14-15). This includes a *c.* 100m-long masonry quayside, delineating the east side of the harbour (orientated north-south), a dog-legged pier structure that extends from the quay's terminus, and the insertion of a *c.* 104m-long breakwater that extends eastward from the west side of the harbour. A small '*Slip'* is also positioned at the southwest corner of the

inner harbour. Development of the port, form the 1960's onward, greatly altered the shoreline depicted, significant development having extended between Foynes Rock and Durnish Point.

Minimal cartographic changes to the shoreline extending between Foynes Rock and Poultallin Point (and beyond) are observed; the shingle deposits forming the upper foreshore and the estuarine mudflats that lead to the LWM being shown with a slightly reduced extent. However, three (3) noteworthy cartographic features (CF04-CF06) are present in-channel, located within the waters between Poultallin Point and Battery Point (Figures 8-9). These constitute nineteenth century navigation aids to assist sailing vessels on approach to Foynes Harbour. The two navigation marks located on the north side of the approach channel are annotated '*Buoy (Black)*', indicating the position of a submerged hazard and direction of safe water. The other navigation mark is located on the south side of the channel, *c.* 197m to the northwest of Poultallin Point. This mark is annotated '*Buoy (Red)*', indicating safe water along a port side approach to the harbour.

4.6 Topographic Archive

The topographic archives held at the National Museum of Ireland contain lists of artefacts held at the museum or previously seen at the museum and returned to owner. The Museum's files present an accurate catalogue of objects reported to that institution from 1928. There is a computerised database of finds from the 1980s onwards. They are categorised by their location into county and further into townland, town, city, street or river where they come from. There are rarely any grid co-ordinates to precisely locate find-spots. The find-spots of artefacts can be an important indication of the archaeological potential of the related or surrounding area. The information is ordered according to townland. In assessing the information for the Marine SI areas, the following townlands were considered: Foynes, Foynes Island; Durnish, Corgrig, Ballynacragga North, Leahys, Cahiracon, and Shannakea Beg.

A single object is noted in the records of the National Museum of Ireland for these townlands. A long narrow axe-head made from silicified black mudstone, typical of the 'Clare Shales' of Cos. Clare and Limerick, and which outcrop at the east end of Foynes Island was recorded from the central area of Foynes Island. The axe head is 17.7cm long, 5cm wide at its blade, and up to 2.3cm thick. It is in private possession and represents a typical tool for cutting wood during early prehistory.

Two (2) further prehistoric finds are listed for the wider area, within the parish of Kilfiddane (Moy Td., Co. Clare) and the Robertstown (Fawnamore Td., Co. Limerick), comprising a bronze socketed-spearhead (Reg. no. 1443:310) and a polished stone axe-head fragment (Reg no. 2008:74), respectively.

4.7 Known Sites and Monuments

The Record of Monuments and Places (RMP) is a list of archaeological sites based on the Sites and Monuments Record (SMR) files, maintained by the National Monuments Section at the DHLGH. SMR entries include detailed descriptions of archaeological sites based on site visits and historic studies and associated mapping where available. The SMR focuses on sites that are pre-1700AD in date. While later buildings are not well represented in the archive, all structures that are more than 100 years old are considered as archaeological sites today.

Twelve (12) RMP sites are listed for the townland of Cahiracon, although only four (4) are located in proximity to the Marine SI area. These include three (3) ringforts (Raths) and the site of a medieval tower house. Seven (7) sites are listed for Foynes Island, although only three (3) are located in proximity to the areas under assessment. One (1) site is listed for the southern shoreline, running between Foynes Harbour and Poultallin Point, and relates to the excavation of a charcoal rich pit feature, thought to be related to a *Fulachta Fiadh.* These sites range in date from the prehistoric to post medieval period and highlight the longevity of human activity within the area; see Table 2 below and Figure 10. A full entry list of the RMP sites within the wider vicinity of the Marine SI areas is provided in Appendix 1 of this report.

RMP Number	Location [NGR/Townland]	Site Type	Distance to nearest Marine SI item
CL069-015----	522773E, 655412N Cahiracon	Ringfort; Rath	1km northwest of intertidal core sample.
CL069-016----	522831E, 655044N Cahiracon	Ringfort; Rath	946m northwest of subtidal grab sample.
CL069-018----	523151E, 654832N Cahiracon	Castle; unclassified	606m northwest of subtidal grab sample.
CL069-030----	522635E, 654708N Cahiracon	Ringfort; Rath	799m north-northwest of subtidal grab sample.
LI 010-001----	523904E, 652905N; Foynes Island	Battery, site of	60m southeast of intertidal core sample; northwest side of Foynes Island (Battery Point)
LI 010-109----	524226E, 652963N; Foynes Island	Fulachta Fiadh, possible	332m east-southeast of intertidal core sample.
LI 010-110001-	524456E, 652790N; Foynes Island	Fulachta Fiadh	518m northeast of subtidal grab sample.
LI 010-110002-	524509E, 652759N; Foynes Island	Fulachta Fiadh, possible	545m northeast of subtidal grab sample.
LI 010-111----	524649E, 652739N; Foynes Island	Fulachta Fiadh, possible	445m northeast of subtidal grab sample.
LI 010-112001-	524670E, 653296N; Foynes Island	Fulachta Fiadh	482m southeast of subtidal grab sample.
LI 010-112002-	524662E, 653245N; Foynes Island	Fulachta Fiadh	450m southeast of subtidal grab sample.
LI 010-148---	523511E, 651795N; Leahys	Pit; charcoal rich	446m southeast of subtidal grab sample.

Table 2: Known sites and monuments listed in the RMP within a 1km radius of the Marine SI areas under assessment.

4.8 Shipwreck Inventory

The Historic Shipwreck Inventory maintained by the DHLGH is a list of recorded instances of wrecking since 1750. The details provided describe the type of vessel, the journey it foundered on, and information on the ultimate plight of the vessel and its crew, where possible. In describing the wrecking event, the records will locate the incident in relation to the nearest headland or other topographic marker where known. This is not however a record of where the wreckage lies, since the historic records generally only deal with the vessel before it sunk. Such finer details emerge from other sources, such as fishermen's records of snag points and diver records of sites located underwater. These are included in the Inventory wherever possible but it is true to say that most entries lack this final level of data. While the Inventory provides a record of wrecking incidents since 1750, it does not claim to be a comprehensive record for earlier events, and therefore the medieval and prehistoric periods are not represented in this archive.

The shipwrecks recorded for the Shannon estuary have been examined.[15] Where it is possible to approximate the location of ship-wrecking events, one observes a fairly even distribution along both north and south shores of the estuary, with a particular concentration at Kilrush, no doubt because of the extensive fishing port that Kilrush represents. In assessing the pattern of wrecking at Foynes, the following topographical markers were noted: Durnish Point, Gammarel Point, Foynes Rock, Leck Point, Poultallin Point, and Cahiracon Point.

There are two (2) references to wrecking events at or close to Foynes. A sailing boat whose name was not recorded was reported as having wrecked 'near Foynes Island' on 12th August 1788. The boat was carrying three men form Limerick when it overturned in a squall. Two of the men drowned. The *Castleragget* was a turf-boat journeying from Limerick in October 1833 when she was hit by a brig near Foynes Island. Nine people died. A single known (physical) wreck is identified for the study area and comprises a modern metal wreck (W10603) located on the west shoreline of Foynes Island (Figure 8 and Figure 10, Plate 16).

4.9 National Inventory of Architectural Heritage

The National Inventory of Architectural Heritage (NIAH) is a county-by-county database that identifies, records, and evaluates the post-1700 architectural heritage of Ireland as an aid to the protection and conservation of the nations' built heritage. The NIAH surveys provide the basis for the recommendations of the Minister for the DHLGH to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).

[15] Breen and Callaghan, *The Archaeology of Post-medieval Shipwrecks, Harbours and Lighthouses*, 2001, in 'Farmers, Forgers and Fishermen on the Shannon Estuary', Aiden O'Sullivan (Ed.), pp.233-251, RIA publication, 2001.

Only one (1) NIAH site is located in proximity to the Marine SI at Cahiracon, positioned *c.* 800m to the west-southwest. The entry relates to Cahiracon House (NIAH 20406901), comprising a Georgian Manor House, built *c.* 1790, and later extended in the late 1800s and early 1990s; see Plate 5 and Plate 9.

No sites are listed for Foyens Island, although the two (2) historic properties and the probable remains of an associated masonry quay, located on the south side the island, would most certainly warrant inclusion; see Plate 13.

A total of Seventeen (17) entries are located on the south side of the estuary study area, comprising the Foynes Island Marine SI boundary, of which twelve (12) relate to dwellings and associated structures within Foynes. Two (2) sites relate to nineteenth century dwellings (NIAH 21829001 and 21901001) located close to the shoreline within Leahys Td. A nineteenth century road marker, positioned on the north side of the N69 is also included (NIAH 21901001). One (1) entry directly relates to the development of the port in the 1840s (NIAH 21829004; Historic Harbour, Plates 14-16), the rest relating to the development of the settlement of Foynes in the mid- to late nineteenth century.

The above sites are included within Figure 10 and are fully listed in Appendix 1 (NIAH) of this report.

4.10 Licensed Archaeological Work

The *excavations bulletin* provides annual published and online summary of accounts of archaeological excavations undertaken throughout Ireland.[16] Summaries may also be submitted for inter-tidal survey, underwater assessments, and the archaeological monitoring of marine/riverine dredging works. The majority of the entries relate to development-led archaeological work. Appendix 1 lists the entries relating to the townlands surrounding the assessment area, comprising: Aughinish Island, Aughinish West, Ballynacragga, Cahiracon, Corgrig, Durnish, Foynes Harbour and Leahys.

Eight (8) sites of archaeological significance are listed and include: a Bronze Age stone fort (entry: 1975-0025), a Medieval Tower House and Bawn (entry: 1974-0028), an Enclosure site (entry: 1996: 0232, RMP: LI010-014), an Early Christian Ringfort (entry: 2004-0975, RMP LI010:082), and a series of *Fulachta Fiadh* and associated burnt mounds that were encountered as part of archaeological investigations carried for the Bord Gáis Energy Pipeline to the West (entries: 2002:017, 119-0123, and 0126) . These latter observations complement the series of burned stone spreads observed on Foynes Island and serve to highlight further

[16] Isabel Bennett (ed.) Excavations Bulletin: Summary Accounts of Archaeological Excavations in Ireland (various dates; also online at www.excavations.ie).

the prehistoric dimension that exists along this wider shoreline. Two entries relate to archaeological monitoring that has taken place within the estuary at or close to Foynes, but in neither instance have materials of interest been observed. One entry (02E0469) refers to monitoring of backhoe dredging associated with the laying of a section of gas pipeline across the River Shannon between Leahys townland, Co. Limerick, and Shanakea townland, Co. Clare. The second entry (02E1767) relates to archaeological monitoring of maintenance dredging works at Foynes Port and is the first reference to licensed archaeological work occurring close to the areas under assessment. This project noted a series of previous dredging projects, including capital dredging within the port area but these projects took place before the need to archaeologically monitor such work, and no materials of archaeological significance were reported.

In 2010, ADCO carried out, on behalf of the Shannon Foynes Port Company Ltd (SFPC), an archaeological and architectural assessment as an Environmental Impact Assessment (EIA) for the Cultural Heritage and Architectural Heritage section of the project Environmental Impact Statement (EIS) for the Shannon Foynes Port Land Reclamation project.[17] This work was undertaken in February 2011, under licence from the DCHG (now DHLGH); licence numbers 10D033, 10R092.

The study area comprised the quayside, foreshore, and subtidal portion of a 290m (east-west) by 85m (north-south) area located immediately adjacent to the existing East Jetty at Shannon Foynes Port; this area being subject to proposed foreshore reclamation to improve storage and handling facilities for bulk operations within the port. The proposed work would effectively seal the existing seabed with fill material and represented a direct impact on the existing foreshore surfaces. Proposed dredging activity associated with this work also represented a direct impact on the buried sediments of the foreshore, which has the potential to expose previously unseen material of archaeological significance.

The on-site assessment was comprehensive and extended outside the confines of the proposed reclamation impact zone. The assessment noted that there is an inherent archaeological potential associated with the foreshore areas surrounding the River Shannon Estuary. However, this potential had been limited for the section of foreshore under assessment; extensive foreshore reclamation undertaken at Foynes in the 1960s having served to remove much of the potential historical and archaeological material that may have been present along the original shoreline. In addition, the data review and interpretation of

[17] Rex Bangerter and Niall Brady, 'Archaeological and Architectural Assessment, Foynes, Co. Limerick, Shannon Foynes Port Land Reclamation', ADCO Ltd; unpublished report 2010 and EIS Chapter 13, Archaeology and Cultural Heritage, Shannon Foynes Port Land Reclamation project.

both the geophysical and geotechnical investigations did not yield any evidence to suggest the presence of archaeological horizons lying exposed within the proposed reclamation area. Despite this, the potential of buried *in situ* archaeologically remained. Therefore, ADCO recommended that all ground disturbances associated with the development were archaeologically monitored and that any stonework of architectural interest identified as part of the assessment be recovered for re-use in an appropriate location in future development within the Port.

The reclamation project commenced in 2015 with the infilling of an area of foreshore located behind Berth No. 6; undertaken under LCCC Planning Permission 12/212. Localised dredging was also undertaken to facilitate the reclamation works. Archaeological monitoring of this work was undertaken by Shanarc Ltd. in October of that year, Licence No.:15E0051. No archaeologically significant material, deposits, or structures were encountered as part of that monitoring process. In fulfilment of the EIS recommendation, architectural recording of a series of worked stone pieces from the adjacent flood embankment was completed as part of the construction phase archaeological mitigation. A total of seventy-three (73) pieces of worked stone were recoded, with nine (9) pieces being subject to recovery and possible re-use.

Another programme of archaeological monitoring was also completed within the port area in 2015, undertaken by Rubicon Heritage Services Ltd. at the Argosea Warehouse site, Foynes Harbour, Durnish Td.; Licence No. 14E0397. This work was commissioned by Punch Consulting Engineers on behalf of Argosea Services Ltd. The development involved the construction of five covered, bulk and general storage, warehouses and associated site works. No archaeological features or deposits were revealed during the monitoring of this endeavour.

In 2017, ADCO completed an Archaeological Assessment for the Cultural Heritage Section of the Environmental Impact Assessment Report (EIAR) for the proposed Capacity Extension and Harbour Development project within Shannon Foynes Port.[18] This project proposed the construction of a new jetty structure between the existing East Jetty and West Quay, within Shannon Foynes Port, and the development of lands to the southeast of the port estate, within Durnish Townland. The onsite archaeological work was undertaken between February 2017 and February 2018, under licence from the DCHG (now DHLGH); licence numbers 17D0017, 17R0012.

[18] Rex Bangertrer, 'Archaeological Impact Assessment, Capacity Extension and Harbour Development Project, Shannon Foynes Port, Foynes, Co. Limerick, 17D0017, 17R0012', ADCO unpublished report 12th April 2018 and Chapter 14, Archaeology and Cultural Heritage, pp.14.1-14.29 in Capacity Extension at Shannon Foynes, Environmental Impact Assessment Report (EIAR), Volume 4, RPS Group.

Desktop assessment indicated the presence of a range of prehistoric and more recent archaeological sites within the wider area of Foynes Port, including the site of two (2) fish traps to the east at Durnish Point, which have been recorded on Ordnance Survey maps since the nineteenth century (one of which is referenced as CF07 this report). However, no known archaeological sites or features were within the proposed port development areas.

The onsite assessment was comprehensive and comprised the systematic non-disturbance assessment of the areas surrounding the proposed construction impacts associated with the port development; extending significantly beyond the identified limits of each of those impacts. While no features of archaeological or historical significance were encountered within the immediate port development area, a series fishtrap structures were discovered as part of the intertidal field-walking of the foreshore adjacent to the Durnish development land. These archaeological sites were located outside any impact area associated with the port expansion project, but once again serve to highlight the archaeological potential of the foreshore areas surrounding Foynes.

Following grant of approval for the Capacity Extension and Harbour Development project, construction works were progressed in 2022.[19] As part of the archaeological mitigation requirement, as set out in the project EIAR, the following pre-disturbance archaeological work was carried out by ADCO in July 2022 (DHLGH licence numbers 22D0023 and 22R0088)[20]:

- Pre-disturbance survey of a *c.* 100m section of nineteenth century quay-wall (West Pier) from the historic harbour at Foynes (NIAH 21829004) to provide a permanent, metrically accurate, record of the structure.
- Archaeological inspection of foreshore (on suitable Low Water) to assess the current archaeological potential of the intertidal foreshore within the historic harbour and the East Jetty/West Quay construction area; subsequent to the primary surveys carried out by ADCO in 2017.

Piling works between the East Jetty and West Pier commenced in late January 2023 and was completed in 2024. ADCO was appointed to provide archaeological monitoring during construction, in the event that any associated dredging is required as part of these works; this monitoring was carried out under DHLGH licence number 22E0021.

Most recently, ADCO carried out archaeological monitoring of Advance Marine Site Investigation works for the proposed Foynes Island Deepwater Terminal project, a

[19] ABP Grant of Permission 301561-18, issued 28.12.2018.
[20] Rex Bangerter, 'Archaeological Survey and Recording, West Pier, Foynes Historic Harbour and East Jetty Area, 22D0023, 22R0088', ADCO unpublished report 4th August 2022, Rex Bangerter, 'ADCO Memorandum, Archaeological Inspection of Foreshore Reclamation Area at Berth Number 5, Shannon Foynes Port', issued 4th August 2022, and Rex Bangerter, Capacity Extension and Habour Development Project, Archaeological Monitoring, Foreshore Reclamation (Berth 5) East Jetty, Shannon Foynes Port, Co. Limerick, 22E0201 Etc., 22D0023 Ext., 22R088 ext., ADCO unpublished report 18th October 2024.

development to which ADCO are appointed Project Archaeologist. The morning work was carried out under DHLGH licence number 24E1282.[21]

4.11 Conclusion

Examination of the nineteenth-century cartographic sources has provided good insight into the intertidal and nearshore areas surrounding the Marine SI locations. Assessment of other desktop material has also sought to highlight the archaeological potential and historic value associated with these areas and the broader environment.

Maritime activity within the estuary is documented from early prehistoric times. The study of the wider estuary indicates that Foynes, to the south, and Cahiracon, to the north, both being situated within low-lying sheltered shorelines that provide an ideal situation for early human activities. The presence of remains on Foynes Island, Cahiracon to the north, and Aughinish to the east, as well as a series of former fish weirs, reinforces this observation. In addition, a cluster of *Fulachta Fiadh and* ringfort sites, located within the western half of Cahiracon Td., highlights continued activity from prehistory, the early medieval period, and later. In addition, consideration should be given to the presence of submerged landscapes, including dateable organic material; these layers likely remaining buried at depth within the estuarine deposits of the Shannon.

An inherent archaeological potential can be considered for the intertidal and riverbed/seabed areas within the River Shannon Estuary. Moreover, given the relatively un-developed nature of the foreshore/shoreline adjacent to Cahiracon Td. and surrounding Foynes Island, this potential is amplified.

A number of archaeological mitigation measures are required in advance of the Marine SI works taking place and these are detailed in Sections 5 and 6 of this report.

5.0 PROPOSED IMPACTS[22]

A series of direct, localised, foreshore/riverbed impacts will take place as part of the proposed Marine Site Investigation works. The Marine SI works anticipates the requirement for sixty (60) marine boreholes (drilled to a maximum de pth of 50m), eighty (80) cone penetration tests (CPTs), thirty (30) subtidal grab samples, sixteen (16) intertidal core samples,

[21] Post-excavation/specialist analysis required before final reporting is completed for this project.
[22] This section does not purport to relate to precise engineering details but is rather an attempt to understand the nature of the impact on the potential archaeological environment, based on the supplied data.

and thirty (30) surface water grab samples (Figure 10).[23] It is anticipated that a further twenty (20) boreholes at the chosen SGER terminal location will also be carried out.

It is understood that the boreholes (*c.* 300mmØ) are to progress to a point 50m depth below bed level. However, in the event that sufficient bedrock is encountered, some boreholes may be terminated before the above target depth has been reached.

Primary impacts will arise from the boreholes themselves, with secondary impacts relating to positioning of the works-platform (jack-up barge); where the spud-legs make contact with the riverbed/foreshore. Archaeological mitigation arising from these impacts is presented in Table 3 (below) and in section 7.0. There are no impacts to known cultural heritage sites arising from the proposed Marine SI works.

Site/ Area	Potential Impacts	Archaeological Mitigation
Marine SI, Cahiracon and Foynes	• No impact to known cultural heritage sites. • Potential, direct, negative impact to any unrecorded archaeological deposits or structures buried within the foreshore/riverbed.	• Marine Geophysical Data review to identify any features/anomalies of archaeological potential. • Pre-disturbance underwater/intertidal inspection of any features/anomalies deemed to be of archaeological interest. • Where features of archaeological/historic significance are positively identified, avoidance of those features is recommended. • Archaeological Monitoring of the SI works.

Table 3: Impacts to potential archaeological features, deposits, and/or material arising from the proposed Marine Site Investigation.

6.0 MARINE GEOPHYSICAL SURVEY

A Marine Geophysical Survey will take place prior to the Marine Site Investigation taking place. The geophysical survey will cover the full area of the Marine SI footprint under water, where accessible, and be carried out to the specification provided in Appendix 2 of this report; ensuring that the data gathered is to a sufficient resolution/density for reliable archaeological interpretation to take place.

Archaeological licensing/consent is required for the marine geophysical survey and the data arising from the Marine Geophysical Survey is to be subject to archaeological review/ interpretation by a maritime archaeologist that is suitably qualified and approved, by the DHLGH, for undertaking such work.

[23] A contingency for up to sixty (60) marine boreholes and fifty (50) subtidal grab samples is also included.

7.0 ARCHAEOLOGICAL MITIGATION

7.1 Pre-disturbance Measures

Archaeological survey and assessment of the intertidal areas associated with proposed Marine Site Investigation will be required. In addition, underwater inspection of any anomalies/features of archaeological interest arising from the Marine Geophysical Survey is to take place. In the event that features of archaeological/historic significance are encountered as part of the inspections, avoidance of those features will be recommended.

7.2 During Marine SI Works

Archaeological Monitoring of the Marine Site Investigation is recommended. The archaeological monitoring is to be carried out by experienced maritime personnel; monitoring all intertidal/riverbed/seabed disturbances arising from the proposed SI works. No disturbances are to take place unless an archaeologist is present to monitor the operation. The following will be made available to the monitoring archaeologist by NOD, GNI, and the appointed geotechnical contractor:

- Position fixes in Lat/Long and ITM for data the archaeologists require to be logged.
- Vessel/platform track plots and fixes showing the locations of logged data in hard copy and digital format.
- Access to the Works Platform for observation purposes.
- On-board wet tank for temporary storage of archaeological material recovered during the monitoring process.
- A secure wet tank, placed in an on-shore facility, to store any artefacts or other archaeological material recovered during the monitoring process.

7.3 Management Measures

ARCHAEOLOGICAL MONITORING. Archaeological monitoring in accordance with the terms of Section 5 of the National Monuments Act (2004 Amendment) is recommended. The monitoring archaeologist will be situated so that he/she is able to view the SI works in a practicable and safe manner. In addition, they will be allowed to inspect and retrieve, for examination purposes, any material that becomes exposed and is of interest during the sampling process. The archaeologist will have a direct communication with the barge master and the lead person (supervisor) carrying out the geotechnical work. These measures will ensure that any sub-surface remains of archaeological or historic value are dealt with in an appropriate archaeological manner. The monitoring work should be undertaken by an experienced and suitably qualified (licence eligible) maritime archaeologist retained by NOD/GNI and working under licence from the National Monuments Service at the DHLGH.

THE TIME SCALE for the Marine Site Investigation phase should be made available to the archaeologist with sufficient notice provided.

LICENCE APPLICATIONS take a minimum of four (4) working weeks to be processed by the DHLGH, and the archaeologist cannot be present on site until the licences are granted. Licence applications require contact details for the MUL holder/ project sponsor and any associated planning reference number/s (where applicable). Since 2017, Excavation Licence applications must be accompanied by a statement from the client on client letterhead that confirms 'that sufficient funds and other facilities are available to [the archaeologist] to complete the archaeological excavation, post-excavation, and preliminary and final reports (including specialist reports)'.

SUFFICIENT NOTICE. It is essential for the developer to give sufficient notice to the archaeologist/s in advance of the SI works commencing. This will allow for prompt arrival on site to monitor the ground disturbances. As often happens, intervals may occur during the marine projects. In this case, it is also necessary to inform the archaeologist/s as to when ground disturbance works will recommence.

DISCOVERY OF ARCHAEOLOGICAL MATERIAL. In the event of archaeological features or material being uncovered during the Marine SI works, the geotechnical works should cease in the immediate area to allow the archaeologist to inspect any such material.

ARCHAEOLOGICAL MATERIAL. Once the presence of archaeologically significant material is established, full archaeological recording of such material may be warranted. If it is not possible for the works to avoid the material, full excavation would then be recommended. The extent and duration of excavation would be a matter for discussion between the client and the statutory authorities.

ARCHAEOLOGICAL TEAM. It is recommended that the core of a suitable archaeological team be on standby to deal with any such rescue excavation. This would be complemented in the event of a full excavation. Given the maritime nature of the project, the archaeological team must include underwater/dive inspection capability operating in accordance with HSE/HSA Diving at Work regulations.

SECURE SITE OFFICES and facilities should be provided on or near those sites where excavation is required.

ADEQUATE FUNDS to cover excavation, post-excavation analysis, and any testing or conservation work required should be made available.

PLEASE NOTE: The above mitigation/ recommendations are based on the information supplied for the proposed Marine Site Investigation, Strategic Gas Emergency Reserve (SGER) Project, Shannon Estuary, Co. Limerick. Should any alteration occur, further mitigation may be required.

PLEASE NOTE: Mitigation subject to the approval of The Department of Housing, Local Government, and Heritage (DHLGH).

8.0 ACKNOWLEDGEMENTS

Thanks are extended to [redacted](Senior Environmental Consultant, NOD) and to Gas Networks Ireland. The report has been written by [redacted] (ADCO Director). The Marine Geophysical Survey specification in Appendix 2 was written by [redacted] (ADCO Director). The NMI Topographic Archive was searched by [redacted] (ADCO Senior Archaeologist).

Appendix 1: Known Archaeological and Architectural Heritage Records for Cahiracon, Foynes Island, and Foynes

[Sites located within 1.5km radius of identified Marine SI Areas]

Topographical Files, National Museum of Ireland

Reference No.	Classification	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
Record	Stone axehead; polished	Foynes Island	Long narrow axehead polished on its cutting edge. Made from silicified black mudstone, typical of the 'Clare Shales' of Cos. Clare and Limerick, and which outcrop at the east end of Foynes Island (identified by Dr. J. Jackson 1986). L 17.7cm, W of blade 5cm, max T. 2.3cm. In private possession. (Find location identified in centre of Island on its southerly side; c. 1cm south of the island on OS sheet 10).	n/a	n/a	*c.* 197m northeast of the Foyens Island Marine SI boundary.

Register of Monuments and Places

RMP No	Classification	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
LI 010-001	Battery, site of	Foynes Island	Kerrigan: this was an earthwork battery for six 24-pounders; remains of the battery survive. www.clarelibrary.ie	523904	652905	Immediately adjacent to the Foyens Island Marine SI boundary.
LI 010-002	Ringfort, Rath	Leahys	Located in an undulating pasture field, on east-facing slope of a low rise. Circular area (34m diameter) enclosed by earthen bank (internal height 1.3m, external height 1.8m) with external fosse (width 2m, depth 0.50m).	524122	650613	1.5km south of the Foyens Island Marine SI boundary.
LI 010-004	Ringfort, Rath	Leahys	Located in a pasture field, on a north-facing slope. Circular area (27.8m N-S) enclosed by earth-and-stone bank (internal height 0.40m, external height 1.9m) with external fosse (width 1.5m, depth 0.20m). Site covered by dense undergrowth and trees.	524482	650973	897m south of the Foyens Island Marine SI boundary
LI 010-005	Ringfort, Rath	Ballynacragga	Located in an undulating pasture field, mixed with marshy areas and rock outcrops. Roughly circular area (32.1m N-S, 28.9 m E-W) enclosed by two concentric earth-and-stone banks with intervening fosse.	524668	650688	1.46km south of the Foyens Island Marine SI boundary
LI 010-006	Ringfort, Rath	Ballynacragga	Located in a pasture field, near foot of steep East-facing slope. Roughly circular area (32m N-S; 24m from bank to field boundary E-W) enclosed by earthen bank with external fosse. Because of fall in ground on west side, the enclosure is cut into the hill-slope and this is reflected in the profile of the enclosing element: on west side bank is high internally (1.7m) but shallow externally	525157	650638	1.26km southeast of the Foyens Island Marine SI boundary

RMP No	Classification	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
			(0.45m) with the external fosse also cut into the hillside (0.7m depth, 2.25m width); on east the side the enclosing element is covered by dense overgrowth. It has a low internal height and steep external height, falling to a shallow fosse. Enclosing element truncated by north-south field boundary.			
LI 010-007	Tower House	Corgrig	In area of dense overgrowth today but situated beside a small stream, two blocks of fallen masonry lying on either side of a culverted stream; a Geraldine castle described in 1583 as large and excellent, it fell into ruins in the mid-17th century	525620.	651090	1km east-southeast of the Foyens Island Marine SI boundary.
LI 010-009	Enclosure	Durnish	In rough terrain with limestone outcrops, a roughly oval area measuring 26m by 23m is enclosed by collapsed stone wall, 50cm high.	525978	651402	1.3km east of the Foyens Island Marine SI boundary.
LI 010-109	*Fulachta Fiadh* complex, possible	Foynes Island	Within a coniferous plantation, the landowner reported a scatter of burnt material revealed during planting.	524226	652963	102m south-southeast of the Foyens Island Marine SI boundary.
LI 010-110001	*Fulachta Fiadh*	Foynes Island	Within a coniferous plantation, a kidney-shaped mound of burned material was recorded measuring 8.5m by 9.6m and 70cm high.	524456	652790	314m northeast of the Foyens Island Marine SI boundary.
LI 010-110002	*Fulachta Fiadh*, possible	Foynes Island	Within a coniferous plantation, the landowner reported a scatter of burnt material revealed during planting.	524509	652759	309m northeast of the Foyens Island Marine SI boundary.
LI 010-111	*Fulachta Fiadh*, possible	Foynes Island	Within a coniferous plantation, the landowner reported a scatter of burnt material revealed during planting, measuring 15m by 30m in size.	524649	652739	400m northeast of the Foyens Island Marine SI boundary.
LI 010-112001	*Fulachta Fiadh*, possible	Foynes Island	Within a coniferous plantation, on a north-facing slope. According to landowner a spread of burnt material (*c.* 15m *x* c. 10m) was revealed when the area was prepared for planting.	524670	653296	206m south of the Foyens Island Marine SI boundary.
LI 010-112002	*Fulachta Fiadh*, possible	Foynes Island	Within a coniferous plantation, on a north-facing slope. According to landowner a spread of burnt material (*c.* 15m *x* c. 10m) was revealed when the area was prepared for planting.	524662	653245	223m south of the Foyens Island Marine SI boundary.
LI 010-135	*Fulachta Fiadh*	Ballynacragga	A multi-phase fulacht fia excavated by Emer Dennehy (02E0849) and described as 'a sub-oval mound, measuring 12m north-south by 9.2m by 0.8m deep; it was composed of burnt sandstone in a brown matrix. The mound overlay three intercutting troughs, a pot-boiler and a small pit. Four hearth sites were also identified. Three phases of archaeological activity were present. Phase I began with the excavation of a rectangular trough measuring 3.5m north-west/ south-east by 1.5m by 0.5m deep. It was associated with a small hearth site. A loose, linear, sandstone	524297	651160	992m south of the Foyens Island Marine SI boundary.

RMP No	Classification	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
			revetment, 2.5m long, was situated to the north of the trough; presumably it functioned to retain the mound material. Phase II was marked by the excavation of a subcircular trough measuring 1.6m east-west by 1.3m by 0.43m deep. This trough was associated with a large hearth site measuring 1.7m north-south by 0.8m. A pot-boiler (1.14m by 1.04m by 0.13m deep) and a small pit were also identified beneath the mound. These are associated with either Phase I or Phase II, but no closer time frame could be reached. By the start of Phase III all other excavated features on-site were abandoned and backfilled with the main mound material. The trough associated with this phase was sub-oval, measuring 2.7m north-south by 2.5m, and was 0.6m deep; it was fed by an underlying natural spring. Analysis of the fills indicates that the trough was left open on abandonment, with the spring in its base creating optimum conditions for peat formation. The size of the troughs and hearths indicates several episodes of prolonged and intensive use of the site. No artefacts were retrieved from the excavation of the site, but a small bone sample was recovered from the Phase II trough. A pollen core was taken from the peat formation in the base of the Phase III trough.'			
LI 010-137	Burnt Mound	Leahys	Burnt mounded excavated under licence 02E0900 and described as a shallow mound of burnt clay and heat-shattered stone measuring 9.85m x 9.25m. Despite recent disturbance the mound reached a maximum height of 0.75m. The burnt stone itself was noteworthy, as the local geological deposits included a large band of shale, which had been used in the mound. At least two phases of site activity and mound construction were visible. A relatively thick deposit of mid-brown/black clay and burnt stone lay directly above the natural geological deposits, although this was visible only at the limit of the excavation, suggesting that most of this phase of activity fell outside the excavated area. There was no evidence of a hearth or trough associated with this area of the site. Slightly overlapping this layer was a stony, dark brown/grey clay deposit, presumably roughly contemporaneous. Immediately above these layers was evidence of the second phase of activity. This partially overlay the earlier phase, but its focus was farther east. A possible pit or trough was observed, cutting into the earlier layers. This was 0.94m wide and 0.17m deep. The northern edge of the cut was relatively steep, with straight sides, and boulders obscured the southern edge.	524453	650727	1.14km south of the Foyens Island Marine SI boundary.
LI010-148	Pit; charcoal rich	Leahys	A pit excavated by Ken Wiggins (02E0302) and described as 'a pit 1.1m long, 1m wide and 0.3m deep. The fill was crumbly, dark grey/brown, charcoal-rich clay containing numerous burnt stone	523517	6517925	269m south of the Foyens Island Marine SI boundary.

RMP No	Classification	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
			fragments. The northern side of the pit was cut by a drain aligned north-east to south-west. The excavated length of the drain was 3.4m, and it was 0.8-0.9m wide and 0.15m deep. The fill was soft, grey, silty clay with no inclusions; toward the northern end the feature contained a number of flat limestone packing stones. Two stake-holes were found in the subsoil on either side of the drain, measuring 70mm by 60mm by 55mm deep and 50mm by 45mm by 60mm deep. No other in situ material was found on the site. The presence of burnt stone material in the pit fill indicates that the feature was related to a fulacht fiadh.'			
LI009-018	Standing Stone	Leahys	In grounds of golf course, atop low E-W ridge. Irregularly shaped upright stone (H 1.35m; 0.44m x 0.23m) which comes to a pointed top. May possible have been put in this position when golf course landscaped.	523384	6551563L	482m south of the Foyens Island Marine SI boundary.
LI009-011	Enclosure	Leahys	Atop low rise, in undulating pasture. Formerly embanked circular enclosure (diam. c. 30m) now truncated on W and S sides by field boundaries; enclosing earth-and-stone bank (int. H 0.35m; ext. H 1.3m) survives NW->SE, with external fosse (D 0.6m; Wth 3m) and counterscarp bank (H 0.2m; Wth 3.2m) NE->ESE. Breaks in inner bank at SE (Wth 2m) and N (Wth 2m). Entire site is overgrown by trees and bushes.	522832	651175	758m south-southwest of the Foyens Island Marine SI boundary.
LI009-012	Ringfort; Rath	Leahys	In undulating pasture, on N bank of stream. Oval area (c. 40m E-W; c. 30m N-S) enclosed by earthen bank (int. H 0.9m; ext. H 2.1m) with external fosse (D 0.7m; Wth 2.4m), and by counterscarp bank (ext. H 0.3m) SW->W. Entire monument overgrown by trees and bushes and interior is inaccessible.	523086	651276	548m south of the Foyens Island Marine SI boundary.
LI009-013	Ringfort; Rath	Leahys	In area of rough pasture and marsh, on SW side of stream. Circular area (diam. c. 25m) enclosed by earth-and-stone bank (int. H 1.05m; ext. H 1.5m), with external fosse (D 0.4m; Wth 2.6m) SW->SE. Enclosing bank abutted by field boundaries at SW, SE, and N. Interior and enclosing element are covered by dense overgrowth. A scarped edge (H c. 0.55m) extends out from enclosing element at W for 11.8m before turning at right angle to S and running a further 17.4m where it is terminated by E-W field boundary, forming raised rectangular annex.	52350	651053	858m south-southwest of the Foyens Island Marine SI boundary.
CL059-029	Ringfort; Rath	Balinacragga	Description currently not available.	524165	656640	1.1km northwest of the Cahiracon SI boundary.
CL059-031	Ringfort; Rath	Cahiracon	Description currently not available.	524448	656302	665m north-northeast southwest of the Cahiracon SI

RMP No	Classification	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
						boundary.
CL059-032	Ringfort; Rath	Balinacragga	Description currently not available.	524469	656538	863m north-northeast southwest of the Cahiracon SI boundary.
CL069-026002	*Fulachta Fiadh*	Cahiracon	Description currently not available.	522726	65588	722m southeast of the Cahiracon SI boundary.
CL069-026001	*Fulachta Fiadh*	Cahiracon	Description currently not available.	522670	65519	744m southeast of the Cahiracon SI boundary.
CL069-015	*Fulachta Fiadh*	Cahiracon	Description currently not available.	522776	655418	592m northwest of the Cahiracon SI boundary.
CL069-016	Ringfort; Rath	Cahiracon	Description currently not available.	522832	655039	456m west of the Cahiracon SI boundary.
CL069-018	Castle; unclassified	Cahiracon	The precise location of this castle is unknown and the coordinates provided here should only be considered indicative.	523149	654832	284m south-southwest of the Cahiracon SI boundary.
CL069-022	*Fulachta Fiadh*	Cahiracon	Description currently not available.	522184	654547	1.1km southwest of the Cahiracon SI boundary.
CL069-023	Burnt Mound	Cahiracon	Description currently not available.	522436	654936	849m west-southwest of the Cahiracon SI boundary.
CL069-024	*Fulachta Fiadh*	Cahiracon	Description currently not available.	522532	655168	750m west of the Cahiracon SI boundary.
CL069-025	*Fulachta Fiadh*	Cahiracon	Description currently not available.	522592	655259	702m west-northwest of the Cahiracon SI boundary.
CL069-027	Road/trackway	Cahiracon	Topsoil-stripping in connection with the Bord Gáis Éireann Pipeline to the West (BGE 3/37/10) revealed a culvert and associated road. The road was excavated in 2002 (Licence no. 02E0940). It was orientated NW-SE and the exposed section	522592	655259	812m west-southwest of the Cahiracon SI boundary.

RMP No	Classification	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
			measured 16m x 4.7m. No dating evidence is available but the road is likely to be post AD 1700 in date.			
CL069-030	Ringfort; Rath	Cahiracon	At a spot height (75m OD), on the SW end of prominent ridge (long axis NE-SW), in pasture with excellent views in all directions, particularly across the Shannon Estuary NE-SE including Foynes Island to SE. A subcircular area (31m NE-SW; 33m NW-SE) defined by a low sod-covered earthen bank (int. H 0.25m; ext. H 0.35m; Wth at top 2m; overall Wth 6.1m) SW-NNE and reduced to scarp (Wth 3.9m; H 0.8m) NNE-SW. A short portion of a fosse (Wth 5.35m; D 0.05m) is visible at N. The interior is grass covered with a very gentle SE-facing slope. The concrete base of trigonometric point is located c. 11m to N and a farm trackway is c. 11m to NW.	522639	654711	730m southwest of the Cahiracon SI boundary.

National Inventory of Architectural Heritage

Reg. No.	Classification/ Rating	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
20406901	*Cahiracon House;* detached house Regional importance; architectural, artistic, technical	Cahiracon	Detached five-bay three-storey over basement late-Georgian house, built c. 1790, with limestone cut-stone projecting Ionic porch to centre. Three-bay two-storey over basement flanking wings with full-height canted bay windows, lean-to conservatory to left hand side and two-bay single-storey bay to right hand side, added 1873. Five-bay single-storey return, added c. 1990, to accommodate use as convent and school. Hipped and pitched roofs with rendered chimneystacks and moulded eaves courses. Rendered and cut-limestone walls with string courses. Timber sliding sash windows. Flight of limestone steps leading to entrance. Detached five-bay single-storey limestone cut-stone gate lodge with pedimented central breakfront. Cut-limestone piers with cast-iron gates and railings.	523177	655029	90m west-southwest of the Cahiracon SI boundary.
20405903	Quay/Wharf Regional importance; architectural, technical	Cahiracon	L-plan cut-limestone quay wall, built c. 1820, with cut-stone and cast-iron bollards. Altered, c. 1970, to accommodate use as pier.	524858	655029	556m north-northeast of the Cahiracon SI boundary.
21829001	*Ardanoir House;* detached house Regional importance; architectural	Leahys	Detached two-storey house, built c. 1870. Pitched slate roof. Square-headed window openings with timber sash windows. Ardanoir House, which means Golden Height or the Height of Gold, is an important house architecturally and historically within Foynes. It was formely the home of William Smith O'Brien's daughter Charlotte Grace O'Brien, the famous poet and humanitarian.	524388	652057	82m south of the Foynes Island SI boundary.

Reg. No.	Classification/ Rating	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
21829002	Monument Regional importance; artistic, historical, social	Leahys	Cut limestone Celtic Revival high cross style monument, erected c. 1900, having inscribed triangular plinth and recessed panels to cross. Situated on a hill overlooking Foynes Harbour. The inscription reads: 'To the dear memory of Stephen Edmond Spring Rice born in Limerick 31 August 1814 died at sea 9 May 1865. The tenants on the Mount Trenchard and Ballycormick estates raised this cross of love gratitude and admiration.' This monument was erected to the memory of Stephen Edmond Spring Rice (1814-1865) who died at sea. He was the eldest son of Thomas Spring Rice (1780-1866), Lord Monteagle. Stephen never succeeded to the estate and title as he died at sea, a year before Tomas died. He managed the Mount Trenchard estate while his father pursued a political career. Stephen is now remembered as a liberal Protestant landlord who favoured Catholic Emancipation. Prominently sited to the west of Foynes, the cross forms a local landmark in the area. Finely carved, the monument is a notable example of late nineteenth- early twentieth-century stone masonry.	524534	651935	92m south of the Foynes Island SI boundary.
21829003	Saint Patrick's Saw Mill, Miller's House; now SFPC office Regional importance; architectural, artistic	Leahys	Detached four-bay two-storey with dormer attic former saw mill and mill house, built in 1863, having return to rear (south) elevation. Pitched slate roof with brick eaves course and brick chimneystacks. Timber bargeboards to dormer windows. Roughly dressed limestone walls having brick stringcourse. Square-headed openings with bipartite one-over-one pane timber sliding sash windows and limestone sills. Square-headed openings to dormer attic having timber casement windows. Square-headed opening to ground floor with one-over-one pane timber sliding sash window and limestone sill. Square-headed door opening to east elevation having brick *voussoirs*, double-leaf glazed doors and balcony with concrete consoles and cast-iron railings. Square-headed opening having inscribed limestone lintel and glazed over-light over half-glazed timber panelled door. Square-headed opening to west elevation with timber battened door. Formerly part of a saw mill complex, this building retains much of its original fabric and presents a well composed architectural design to the streetscape. It was built by the architect William Fogarty. It was originally an agent's house constructed for Thomas Spring Rice, 1st Baron Monteagle of Mount Trenchard. The combination of red brick dressings and limestone walls combine to give a very pleasing textural and chromatic effect. Evidence of high quality workmanship can be seen in the stone detailing and brickwork execution. The surviving inscribed lintel to the door opening is an interesting historical artefact.	524701	651820	31m south of the Foynes Island SI boundary.

Reg. No.	Classification/ Rating	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
21829004	Harbour/dock/port Regional importance; architectural, technical	Corgrig	T-plan limestone pier with harbour, built in 1847. Ashlar walls and copings having recent metal railings. Concrete surface to pier and concrete ramp to west. Painted stone and cast-iron mooring posts to west and north elevations. The pier, which is still in use, attests to the proficiency of marine architects and engineers in the nineteenth century. It was erected as a part of a famine relief scheme and was a joint undertaking by the Spring Rice Family and the Commissioners of Public Works each of whom shared the cost of its construction, £10,000. It is an integral part of Foynes's architectural and social heritage, having played a significant role in the economic development of the local community.	524767	651851	Immediately adjacent to the Foynes Island SI boundary.
21829005	Hotel; former Regional importance; architectural, artistic	Corgrig	Detached gable-fronted two-bay three-storey former railway hotel, built c. 1870, having two-bay four-storey extension with viewing gallery to west, two-bay two-storey addition to west and four-bay two-storey addition to south. External metal staircase to west elevation. Pitched slate roof with timber bargeboards finals and rendered chimneystacks. Pitched slate roof to additions having rendered chimneystacks. Flat roof to extension. Rendered walls. Square-headed openings having two-over-two pane timber sliding sash windows and concrete sills. Round-headed opening with spoked fanlight over half-glazed timber panelled double-leaf doors. Square-headed opening to east elevation having glazed over-light over timber panelled door. Square-headed opening to west addition with render architrave over double-leaf timber panelled door with glazed over-light and flanking sidelights having timber panelled risers. Pair of square-profile limestone piers to north with carved panels, plinths and ornate caps. Decorative cast-iron railings set in limestone plinths terminating in second pair of square-profile rusticated limestone piers.	524833	651731	106m southeast of the Foynes Island SI boundary.
21829006	Railway Station; former Regional importance; architectural, artistic, scientific, technical	Corgrig	Detached four-bay two-storey former railway station, built between 1856-58, having shallow projecting centre-bay, gable-fronted projecting end-bay, five-bay single-storey wing to east and gable-fronted train shed to rear (north) elevation. Hipped and pitched slate roofs with rendered chimneystacks and timber bargeboards. Train shed having pitched corrugated-iron roof and timber battened cladding to gables. Snecked limestone walls having tooled limestone quoins, plinth course and benchmark to front elevation. Rendered walls to rear elevation. Camber-headed openings with cut limestone *voussoirs*, keystones, sills and six-over-six pane timber sliding sash windows. Camber-headed openings to first floor, gable-fronted projection having cut limestone voussoirs, keystones, sills and two-over-two pane timber sliding sash windows. Square-headed opening to first	524871	651796	113m southeast of the Foynes Island SI boundary.

Reg. No.	Classification/ Rating	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
			floor, centre-bay with limestone sill and two-over-two pane timber sliding sash window. Square-headed opening to first floor and west elevation, first floor, having limestone sills and tripartite two-over-two pane timber sliding sash windows with flanking one-over-one pane timber sliding sash windows. Recessed square-headed openings to rear having painted stone sills and six-over-six pane timber sliding sash windows. Camber-headed opening with tooled limestone block-and-start surround and half-glazed timber panelled door with flanking sidelights. Limestone steps to entrance. Camber-headed opening to wing, front elevation having tooled limestone block-and-start surround and multiple-pane glazed over-light over double-leaf timber panelled doors. Limestone steps to entrance. Recessed square-headed openings to rear having multiple-pane glazed over-lights over timber panelled doors. Snecked limestone wall to wing, east elevation with limestone copings having camber-headed pedestrian entrance with timber battened door. Limestone platform to north. Single-bay single-storey outbuilding to north-west having replacement tiled roof and cut limestone chimneystack. Camber-headed window opening with limestone block-and-start surround and sill.			
21829007	Fountain Regional importance; artistic, social	Corgrig	Freestanding limestone Celtic high cross style fountain, built *c.* 1910. Cut limestone stepped base with square-profile basin, now blocked up, surmounted by rock-faced plinth with cast-iron spout to west elevation. Carved Celtic cross with inscribed limestone plaques. Inscription reads: 'This fountain is erected in grateful recognition of the numerous benefits conferred on his native country on the poor and on this neighbourhood by Sir Stephen Edward De Vere Bart, statesman, philanthropist, poet, through whose generous aid and zealous co-operation in conjunction with contributions from others the Catholic Church of Foynes was built. Died 10 November 1904 Aged 92 Years'.	524865	651730	c
21829008	Signal Box Regional importance; artistic, social	Corgrig	Detached single-bay two-storey signal box, built c. 1900. Pitched slate roof with timber bargeboards, finials and brick chimneystack. Brick walls, brick plinth course and metal external staircase to east elevation. Timber battened walls to east and west gables. Square-headed openings having fixed windows to first floor. Camber-headed openings with brick *voussoirs*, label mouldings, terracotta sills and fixed windows. Square-headed openings to east elevation having timber battened doors. This well maintained attractive signal box retains much of its original form and fabric and forms an integral part of the Foynes Railway Station complex.	524911	651753	161m east-southeast of the Foynes Island SI boundary.

Reg. No.	Classification/ Rating	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
21829009	Water Tower; cast-iron Regional importance; artistic, social	Corgrig	Freestanding cast-iron water tower, erected in 1892. Comprising Doric style columns joined by metal braces supporting rectangular-plan tank with raised panels and maker's name: 'H. Graham 1892 Waterford'. This water tank forms part of a group of related railway structures including the station and signal tower. Constructed in materials characteristic of such functional structures of its time, it is distinguished by the decorative raised panels to the tank.	524911	651753	179m east-southeast of the Foynes Island SI boundary.
21829010	Post Office & Bank; former Regional importance; architectural, artistic, social	Corgrig	Detached H-plan seven-bay two-storey former post office and bank, built c. 1910, having recent extensions to rear (north) elevation. Hipped slate roof with rendered chimneystacks, overhanging eaves and timber brackets. Roughcast rendered walls to first floor having rusticated limestone quoins. Rusticated coursed limestone walls to ground floor with rusticated plinth course. Bipartite square-headed openings to projecting end-bays, first floor having rusticated limestone block-and-start surrounds, mullions, sills and four-over-four pane timber sliding sash windows. Tripartite square-headed openings to centre-bay, first floor and projecting end-bays, ground floor with rusticated limestone block-and-start surrounds, mullions, sills and four-over-four pane timber sliding sash windows. Quadripartite square-headed openings to centre-bay, ground floor having rusticated limestone block-and-start surrounds, mullions, sills and four-over-four pane timber sliding sash windows. Round-headed opening to centre-bay with rusticated limestone surround and inset square-headed multiple-pane fixed window and square-headed opening having multi pane over-light over timber panelled door. Square-headed openings to projecting end-bays with multiple-pane over-lights over timber panelled doors. Designed by William Clifford Smith, this building is a particularly attractive example of early twentieth-century Arts and Crafts style architecture, of which the projecting bays and overhanging eaves are characteristic features. Its form as well as its size and scale, mark it out in the streetscape. The long rectangular H-plan form is emphasised by the overhanging eaves and tripartite and quadripartite windows, which underscore the horizontal planes. The rusticated limestone walls to the ground floor contrast with the rendered upper floor and interest to the façade	524954	651725	215m east-southeast of the Foynes Island SI boundary.
21829011	House & former shop Regional importance; architectural, artistic	Corgrig	Detached four-bay two-storey former house and shop, built c. 1930, having shopfront to front and recent multiple-bay single-storey extensions to east elevation. Now in use as restaurant. Hipped slate roof having rendered chimneystacks, cast-iron roof-lights and overhanging eaves. Lined-and-ruled rendered walls	524989	651720	241m east-southeast of the Foynes Island SI boundary.

Reg. No.	Classification/ Rating	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
			with render quoins and plinth course. Square-headed openings to first floor having bipartite one-over-one pane timber sliding sash windows, shouldered render surrounds and render sill course. Square-headed openings to ground floor with shouldered render surrounds, concrete sills and timber casement windows. Square-headed opening having render surround and timber panelled door. Shopfront comprising timber fascia and square-headed curved multi pane display windows. Square-headed opening with half-glazed timber panelled door. This building retains much of its original fabric and presents a well composed façade to the streetscape. The fenestration to the upper floor combines to give a very pleasing symmetry. The Shannon House is a good example of the tradition of combined dwelling and shop and contributes to the streetscape and architectural heritage of Foynes.			
21829012	House & former shop Regional importance; architectural, artistic	Corgrig	End-of-terrace three-bay two-storey house and former shop, built c. 1930, having render shopfront and projecting end-bay to front (south) elevation. Half-hipped slate roof with rendered chimneystacks and render eaves course. Roughcast rendered walls having render plinth course and moulded stringcourse to recessed bay. Square-headed openings with two-over-two pane timber sliding sash windows and painted stone sills. Square-headed opening to west elevation having two-over-two pane timber sliding sash window with cast-iron sill guard. Square-headed opening having multiple-paned over-light over timber battened door. Shopfront comprising fascia with raised lettering, moulded consoles supporting heavy cornice. Square-headed display opening having multiple-paned over-lights over tripartite fixed window. Square-headed opening having multiple-paned over-light over half-glazed timber battened door. The projecting end-bay and decorative render shopfront distinguish this building in the streetscape. The ornamental render detailing and sash windows further mark it out and add artistic interest to the site.	525012	651705	273m east-southeast of the Foynes Island SI boundary.
21829013	House & former shop Regional importance; architectural, artistic	Corgrig	End-of-terrace three-bay two-storey house and shop, built c. 1930, having shopfront to front (south) elevation. Pitched slate roof with brick chimneystacks. Rendered walls. Square-headed openings having bipartite one-over-one pane timber sliding sash windows and painted stone sills. Square-headed opening with glazed over-light over timber panelled door. Shopfront comprising timber fascia with raised lettering and cornice. Square-headed display window. Square-headed opening having replacement glazed door.	525054	651693	312m east-southeast of the Foynes Island SI boundary.

Reg. No.	Classification/ Rating	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
			Joyce's shop is situated at the end of a terrace with a similar roof line and profile. It plays an important role in creating the streetscape and has retained many notable features such as its shopfront and bipartite timber sliding sash windows.			
21829014	House & Shopfront Regional importance; architectural, artistic	Corgrig	Terraced three-bay two-storey house and shop, built c. 1930, having render shopfront to front (south) elevation. Pitched slate roof with brick chimneystack. Rendered walls. Square-headed openings having bipartite one-over-one pane timber sliding sash windows and painted stone sills. Square-headed opening with glazed over-light over timber panelled door. Shopfront comprising fascia with raised lettering and cornice. Square-headed display window. Square-headed opening having replacement glazed door. M. A. Nolan's is part of a terrace of similar structures yet it is distinguished as a building, which has retained its character and form over the years. Though no longer used as a shop the shopfront remains virtually intact and, as a result, enlivens the modest façade. It plays a positive role in the architectural heritage of Foynes.	525063	651690	315m east-southeast of the Foynes Island SI boundary.
21829017	House & former shop Regional importance; architectural, artistic	Corgrig	Detached three-bay two-storey house and shop, built c. 1900, having render shopfront to front (south) elevation. Now in use as public house. Hipped and pitched slate roof with rendered chimneystacks. Snecked rusticated limestone walls with tooled limestone quoins. Square-headed openings to first floor having tooled limestone block-and-start surrounds, limestone sills and bipartite one-over-one pane timber sliding sash windows. Shopfront comprising pilasters with scrolled consoles, fascia and moulded cornice. Square-headed display openings having inset camber-headed tripartite fixed windows with painted brick risers. Square-headed opening having glazed over-light over double-leaf timber panelled doors and flanking pilasters.	525139	651658	709m east-southeast of the Foynes Island SI boundary.
21901001	*Cushowen House;* detached house Regional importance; architectural	Leahys	Detached four-bay two-storey Edwardian style house, built c. 1910, with single-bay single-storey side addition and extensions to rear. Hipped and pitched slate roof with overhanding eaves and exposed brackets. Rendered chimneystacks. Rendered walls on plinth. Square-headed window openings with rendered surrounds. Continuous sill course to ground floor. Set back from road in its own gardens. Cushowen House is an important house in the architecture of Limerick County. It was possibly designed by the architect William Clifford Smith and forms part of the collection of Edwardian houses built at that time in the city and the county. Its Edwardian features are enhanced by the simple window openings with	523634	652013	94m south-southwest of the Foynes Island Marine SI boundary.

Reg. No.	Classification/ Rating	Townland	Description	Easting	Northing	Distance to nearest Marine SI Area
			overhanging roof and the continuous sill couse cum platband on the ground floor. All of these features including the grounds combine to make this house a significant building in the architectural heritage of Limerick.			
21901002	Milestone Regional importance; architectural, Social	Leahys	Freestanding triangular-profile limestone milestone, erected c. 1870, having inscribed lettering and chamfered cap. Milestone reads: 'Limerick 23 / Foynes 1 / Loughill 4'. This simple piece of masonry served an important practical function in the days when signposts were rare. It is well maintained and is a significant survival of street furniture.	523927	652067	134m south of the Foynes Island Marine SI boundary.

Historic Shipwreck Inventory

Name	Location	Date	Description	Easting	Northing	Location in relation to development
Unknown	near Foynes Island	12/08/1788	The boat was carrying three men form Limerick when it overturned in a squall. Two of the men drowned.	n/a	n/a	unknown
Castleragget	near Foynes Island	10/1833	A turf boat journeying from Limerick when she was hit by a brig. Nine people died.	n/a	n/a	Unknown
Unknown; Wreck Number W10603	Foynes Island	----	Metal-wreck visible on west shoreline of Foynes Ialnd.	524284	652526N	550m southeast of Foreshore Boundary at Terminal location.

Licensed Archaeological work

Source: Excavations Bulletin [www.excvations.ie]

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
1974:0025	Ringforts, two	Aughinish Island	Both sites were of similar construction, consisting of an internal and external revetment of limestone slabs and rubble core. Both measured 35m across and neither showed evidence of an accompanying ditch. Site 1 was built directly on bedrock and so no post-holes were evident. However, there was evidence of levelling and clearance of the jagged bed-rock in one area suggesting a house site. Two large rock-cut pits were also uncovered. Traces of an occupation layer were found underlying the	528283	653624	Outside

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			internal wall collapse, which produced coarse pottery, a heavily corroded iron bridle bit, a bronze chisel and pin and two saddle querns. The pin and bit are suggested to be of Halstatt C context; the chisel is of Downs type, and the pottery compares well with wares from LBA sites such as Rathgall and Lough Eskragh. It would seem that the site was built and occupied exclusively during the Late Bronze Age. At Site 2, 200 metres Se of site 1 the plan of a circular house 8m in diameter was found, along with pits and some entrance features, which produced coarse pottery of the type found at Site 1. It would, then, also appear to date to the late Bronze Age. Remains of a small rectangular stone-walled structure measuring 5m x 4m partly overlaid the collapsed fort wall but was not directly dated. It compares with a structure excavated by Mrs. Hickey (site 27 below). Excavated by Eamonn Kelly.			
1974:0028	Tower house, bawn	Aughinish Island	The castle itself dates to the late 16th-early 17th centuries and is set in a roughly circular enclosure, indicated by a low ridge showing in the grass. A preliminary trial trench was cut on the northern side of the site and this revealed the base of the bawn wall. The wall, which was well-built, averaged 2.20m in thickness and was built directly on the limestone bedrock. It was roughly circular in plan with no evidence of towers. An entrance to the bawn area was found on the southern side; it is about 3.0m wide and well cobbled with small rounded stones. To the east of the castle, a portion of the bawn wall appears to have been built on an artificially constructed 'platform' of loose stones and earth. This 'platform' which is approx. 1.0m high, would have been necessary to make this area level with the adjacent field. No evidence was found of a ditch outside the wall. An interesting feature uncovered by the excavation, was a square-built structure, 3.40m x 3.40m, situated in the northern area of the bawn, interpreted as the base for a domed oven, of the type found on medieval sites. Considerable area-excavation was carried out within the bawn, and thirty-one skeletons were uncovered, the majority being young children and babies. Finds from the site include: animal bone; sherds of late and post-medieval pottery; a wide range of iron objects; clay-pipe fragments; a blue glass bead; a bronze disc-headed pin, and an Irish halfpenny dating to the reign of Charles 11(1683). Excavated by Ann Lynch.	528289	653637	Outside

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
96E168	Enclosure	Aughinish West	Much of the site had been levelled in antiquity and the only extant feature was the truncated remains of a low enclosing bank that would have had a diameter of 35-40m. The interior of the site was generally flat but was very heavily overgrown until recent times. A stone wall/field boundary ran through the southern half of the site. Trenches with a combined area of 87.4m2 were opened to determine the exact nature and extent of any possible subsurface archaeological deposits or features. The only feature uncovered was a shallow linear trench located immediately inside the bank, in a localised area. No finds or other material of archaeological interest were recovered from the excavated areas. Excavated by Martin Byrne.	527584	652275	Outside
02E0119	Burnt spread	Cahiracon	This site was examined as part of Bord Gáis Éireann's Pipeline to the West. A spread of burnt stone was identified during monitoring by Ken Wiggins of topsoil-stripping in an area of bogland (see No. 64, *Excavations 2002*, 02E0119). The spread, which consisted of heat-cracked stones and charcoal flecks in a matrix of white clay, was amorphous in shape with maximum dimensions of 4m by 5.5m. Unfortunately, despite being marked off according to the agreed protocols, the site was destroyed by pipeline construction before archaeological excavation took place. The evidence of observations made before the intended excavation suggests that the deposits were the remains of a burnt spread or *fulacht fiadh*. A large number of archaeological sites were excavated in the vicinity during this project, and it appears that this site was one element of a well-preserved prehistoric landscape.	522437	654935	Outside
02E0137	*Fulacht Fiadh*	Cahiracon	The site was exposed during monitoring of topsoil-stripping along Section 3 of the Bord Gáis Éireann Pipeline to the West, from Goatisland, Co. Limerick, to Gort, Co. Galway, c. 200m west of the main Kildysart to Shannakea Beg Road. A large horseshoe-shaped mound, with an area of 19.5m north–south by 9m available for excavation, was exposed within the Bord Gáis Éireann wayleave. The mound had a maximum depth of 0.72m, with a peat covering of up to 0.52m over most of the site. Six phases of activity were identified at the site, with two associated wooden troughs. Trough 1 was sub-rectangular, 2.2m by 1.44m by 0.2m deep, and lined with alder planks; only three base planks remained preserved. Trough 2 was not excavated owing to the constraints of the Bord Gáis Éireann wayleave at this location. A channel was excavated connecting the two troughs, showing	522532	655166	Outside

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			a requirement for the moving of liquid. Two groups of pegs were identified to the south and west that may have functioned as fish-drying/curing racks or in activity associated with textile production. After a period of abandonment Trough 1 was rebuilt, this time using oak as base and side planks. Two firing areas from this period were identified in the mound. The site was again abandoned for an extended period, allowing for the regrowth of peat. Activity started again at the site with the construction of a large stone platform, 4m east–west by 3.24m, which backfilled Trough 1 and the channel connecting it to Trough 2. This shows a change of use at the site, focusing on the unexcavated Trough 2. This was the final use of the fulacht fiadh, with peat regrowing across the area. The land was extensively drained for agricultural use within the last twenty years. The detailed construction of the two-phased Trough 1 and the channel connecting the two troughs indicates a high level of social and community organisation. It also illustrates that there was a considerable amount of forethought and planning before the start of building. The function of the site is not clearly discernible, although the shallow depth of Trough 1 indicates that it could not have been used for cooking. We can therefore only conclude that the fulacht may have been used in the processing of textiles such as wool/flax or animal skins. Approximately 20% of the site remains unexposed, with results still pending for environmental sampling, tree species identification and radiocarbon dates.			
02E0138	*Fulacht Fiadh*	Cahiracon	This site was exposed during monitoring of topsoil-stripping along the route of the Bord Gáis Éireann Pipeline to the West. The fulacht lies on the top of a north-west-facing slope, in an elevated, shallow, U-shaped valley. Water would naturally accumulate in the base of the valley, making this an ideal location for a fulacht fiadh. This site is one of a complex of four fulachta fiadh identified on this section of the pipeline, including No. 119, *Excavations 2002* (02E1137) and No. 122, *Excavations 2002* (02E0952, BGE 3/37/7–8). A medieval culvert and road were also identified in the immediate area. A total of 89 contexts were identified during the work on the fulacht, which can be divided into six main phases of activity. Phase I is represented by the initial build-up of peat before fulacht construction. Phase II (a) is marked by the excavation of a pot-boiler, which	522592	655255	Outside

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			measured 0.96m north–south by 1.95m and had a depth of 0.32m.This was in use during the same time period as a number of structural features, which were concentrated in the south-western quadrant of the site. Phase II (b) is represented by the excavation of a second pot-boiler, which cuts the first. It measured 0.58m north–south by 0.42m with a depth of 0.32m. Material from this feature was thrown directly to the south. Phase III (a) is marked by the excavation of a large trough through the infilled second pot-boiler. The trough measured 2.36m north–south by 1.41m with a depth of 0.63m. It is associated with a hearth site in the south-eastern quadrant. Phase III (b) is represented by a period of abandonment during which the layers within the trough became quite topsoil-like. Phase IV is identified by the construction of a third pot-boiler, measuring 1m north–south by 0.28m with a depth of 0.19m. This feature was abandoned with the burnt stones from its final use left in situ. Phase V is marked by the construction of a second trough, measuring 3.21m north-west/south-east by 2.45m and with a depth of 0.45m. During its use the trough was deliberately shortened by being partially backfilled with redeposited natural. Phase VI is represented by modern disturbance during which two large field drains were excavated across the surface of the mound. At this time land reclamation activities took place, resulting in the truncation of the southern and eastern part of the mound. This fulacht fiadh is a complex, multi-phase site consisting of a large oval mound associated with three pot-boilers and two large troughs. All of the features, with the exception of the second trough, show evidence of a single phase of use before abandonment. The shortening and reuse of the second trough may indicate a change in function or a scaling down of the user community.			
02E0302	Pit	Leahys	The pit lay on elevated ground c. 200m south of the Shannon. The pit was 1.1m long, 1m wide and 0.3m deep. The fill was crumbly, dark grey/brown, charcoal-rich clay containing numerous burnt stone fragments. The northern side of the pit was cut by a drain aligned north-east to south-west. The presence of burnt stone material in the pit fill indicates that the feature was related to a *fulacht fiadh*, for which no other evidence was revealed. Excavated by Ken Wiggins	523586	651443	Outside

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
02E0940	Watercourse; medieval culvert	Cahiracon	The medieval culvert and associated road were exposed during monitoring of topsoil-stripping along Section 3 of the Bord Gáis Éireann Pipeline to the West, from Goatisland, Co. Limerick, to Gort, Co. Galway. A total of 23 contexts were excavated, with no finds recorded. The site was north-west of the R473, the main road between Kildysart and Shannakea. The culvert ran north–south across the site and measured 11.5m by 1.77m; the side walls were constructed of sandstone or ashlar to a depth of 0.4m, forming a linear, open-sided box. The walls supported the culvert roof, which was constructed of thin slate flagstones and had a springing height from base to ceiling of 1.3m. Unlike the stone from the side walls, the slate was neither cut nor shaped. This semi-elliptical arch was held in place by a lime-and-sand mortar. The culvert ran to either side of the late medieval road, and the north and south ends had been purposefully blocked with stone similar to that used in the roof construction. Its location not in a cut but in the base of a stream bed means that it would have served to channel stream water underneath the road. The road ran north-west/south-east across the site and measured 16.25m by 4.7m; it continued away from the site in both directions but was obscured by topsoil and vegetation. To the south-east a modern bóthairín (small road) followed the course of the medieval road, connecting the site to the R473. The road was initially constructed from a layer of highly compacted gravel, 4.7m wide, that formed the original surface, with a central depth of 0.09m, tapering to 0.03m at the edges. The slate used for the construction of the road and the culvert was the predominant stone in the area, indicating that the materials were sourced locally. It is assumed that after construction the road was in constant use, and it is during this time that mud and silt accumulated on the surface until it was resurfaced with flat slate pieces, measuring 0.02–0.4m. This upper surface was incomplete and had been disturbed before recording. After the resurfacing the road fell into disuse. In historical records the medieval road is present on the first-edition, 1842, OS map but absent from the third edition in the 1920s. This indicates construction before 1842 and an end of use and maintenance before the 1920s.	522466	654971	Outside
02E0952	*Fulacht Fiadh*	Cahiracon	This site was exposed during monitoring of topsoil-stripping along the route of Section 3 of the Bord Gáis Éireann Pipeline to the West, which extended from Goatisland, Co. Limerick, to Gort, Co. Galway. The site was in the base of a shallow, elevated bowl valley within sight of the Shannon Estuary. The mound was horseshoe shaped, measuring 11.5m north–south	522670	655519	Outside

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			by 10.75m, with a single rectangular timber trough. There were seven identified phases, with 64 contexts excavated. A pre-fulacht build-up of peat constituted the initial phase on the site. The construction of the trough was included in the second phase of site activity. It was made from split oak planks, with alder pegs hammered into the four corners to hold the side planks in place, and measured 2.3m east–west by 1.27m by 0.56m deep. A timber platform was constructed to the south of the trough. The trough was filled with water and was fed from a spring directly to the west. A thin layer of sand had been spread in the base of the cut, on which the base oak planks were laid. A build-up of organic material in the fulacht mound marked the third phase and indicated that the site was abandoned for an indeterminate period of time. In Phase 4 the trough was halved in size, with a sandstone platform being laid down in the western half. This signified a possible change in function and provided a stable work platform for the trough owing to the covering of the previous platform. There is no mound material from this phase within 2m of the trough in any direction, indicating a desire to keep the immediate work area clear. The fifth phase of activity was identified by a hearth found on the eastern side of the mound above Phase 4 material. This phase encompassed a longer period of time than Phase 4, because of a larger accumulation of mound material. The trough was then filled with burnt wood in a deliberate and symbolic act, ending site use. The final two phases of the history of the site comprised the build-up of post-fulacht peat and modern disturbance such as gravel field drains. Pending radiocarbon results for the alder pegs from the trough will provide a date for the construction of the trough and therefore an initial date for site activity. Further analysis of the redeposited burnt wood will give a date for the final use of the area. BGE 3/37/8 On the north-facing cusp of a low-lying hill 180m downslope from fulacht fiadh BGE 3/37/7 (above), this site sloped east–west and had restricted views in all directions bar north. The fulacht fiadh consisted of a D-shaped compact mound of heat-shattered sandstone, limestone and ore residue in a charcoal-enriched matrix overlying an L-shaped trough. Five phases of use were identified. The mound measured 9.3m north–south			

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			by 4m, with an average depth of 0.3m. The ground level of the natural beneath the mound appeared to have been deliberately reduced to provide a contained work area/surface for the fulacht fiadh. Excavation of the site indicated that the mound extends eastward beneath the sod and outside the limit of the Bord Gáis wayleave. Phase I concerned the trough, which was originally L-shaped, measuring 2.5m north–south by 1.7m, with an average depth of 0.72m. Only one episode of activity can be directly related to the trough at this stage and consisted of burnt material and ore by-products, illustrating the use of the site specifically for metalworking activities. Phase II started with the recutting and shortening of the trough. The trough was shortened using slate flags to define the edges; it is now linear with rounded terminals, measuring 1.8m north– south by 1m. The trough was lined with charcoal and fired to considerable heat, resulting in the scorching of the flags. After this use the trough was backfilled and abandoned. Phase III began with the excavation of a large pot-boiler (0.8m by 1.15m by 0.25m) through the eastern protrusion of the original, L-shaped trough. It contained a single fill of 40% burnt sandstone in a black silt–clay matrix. This was also the main mound deposit, indicating that the period of use of this pot-boiler was quite substantial. Phase IV was an abandonment phase illustrated by sod regrowth. Phase V consisted of alternate layers of burning and smelting within the mound and was not associated with any of the cut features. It appears that this fulacht fiadh would have fulfilled an industrial purpose related to metalworking activities. It is clear that the original use of the trough posed difficulties and problems to the user community, resulting in the necessity to shorten the trough and line it with stones. By reducing the size of the trough and limiting the area of the fire, a more intensive channelling of the heat source would have been achieved, providing better working conditions. At no point would the site have fulfilled a domestic purpose, and at no point would either the trough or the pot-boiler have retained water.			
02E0469	Estuary seabed	Leahys, Co. Limerick–Shanakea, Co. Clare	A submarine section of gas pipe was laid across the River Shannon, between Leahys townland, Co. Limerick, and Shanakea townland, Co. Clare. The total length of underwater pipeline was c. 2km. Monitoring of the dredging operation observed no archaeological deposits or artefacts. Monitored	523121	651908	Outside

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			by Graham Hull.			
02E0849	Fulacht fiadh	Leahys	The site was on the north-facing cusp of a steep hill and was one of a complex of three *fulachta fiadh* on the hilltop. The site was a sub-oval mound, measuring 12m north–south by 9.2m by 0.8m deep; it was composed of burnt sandstone in a brown matrix. The mound overlay three intercutting troughs, a pot-boiler and a small pit. Four hearth sites were also identified. Three phases of archaeological activity were present. No artefacts were retrieved from the excavation of the site, but a small bone sample was recovered from the Phase II trough. A pollen core was taken from the peat formation in the base of the Phase III trough. Excavated by Emer Dennehy	524298	651153	Outside
02E0900	Burnt mound	Leahys	The excavated deposit was a shallow mound of burnt clay and heat-shattered stone measuring 9.85m by 9.25m. At least two phases of site activity and mound construction were visible. A possible pit or trough was observed, cutting into the earlier layers. Excavated by Kate Taylor and Martin Jones.	524454	650728	Outside
02E1151	Burnt spread	Cahiracon	This site was examined as part of Bord Gáis Éireann's Pipeline to the West. It lay in flattish bogland at the base of a gently sloping hill to the east. No water source was noted in the vicinity. A probable burnt spread, measuring c. 8m by 6m, was identified during monitoring. Investigation suggested a possible thickness for the spread of c. 0.15m. Unfortunately, owing to unauthorised pipe-trenching and general construction activity, the site was badly truncated. The remaining area of the site had maximum dimensions of 7m by 3.1m. Two archaeological features remained: a small burnt spread and a pit that was slightly truncated by a post-medieval field drain. Oval in plan, with almost straight sides, the pit had an irregularly concave profile and a flat base. It measured 1.4m by 0.9m and was 0.4m deep. Three deposits were recorded within the pit. The primary deposit was a thin layer of oxidised silty sand, with a large amount of charcoal. This deposit was found solely beneath a layer of thin sandstone slabs at the base of the pit. The slabs (secondary deposit) were put together to form a subrectangular platform, possibly to facilitate a roasting function. In the north-western edge of the pit, four of the stones were layered on top of each other in a herringbone fashion to form a possible standing/sitting work platform. The tertiary fill of the pit was a black/brown silty loam, with around 40% heat-shattered sandstone and charcoal flecking throughout. This final deposit, which backfilled the pit, was typical of burnt-mound material. A small number of unburnt bone fragments were recovered from the base of pit;	522186	655542	Outside

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			however, given the proximity of the drain, these may have been intrusive. It is thought that the feature may have functioned as a roasting pit. The remaining burnt spread material was identified 1m from the pit. Amorphous in shape, the spread extended beyond the excavated area to the south-east; however, pipeline construction prevented further investigation in this direction. The maximum remaining dimensions were 1.9m by 1m, and the deposit was 0.03m thick. The spread material was grey/black silty clay with around 30% heat-shattered sandstone and a moderate occurrence of charcoal flecking throughout.			
02E1767	Monitoring of dredging	Foynes Harbour	Monitoring of maintenance dredging at Foynes Port took place from 7 to 14 December 2002. Previously, the port had been dredged as part of a capital expansion scheme in 1999, and maintenance dredging was undertaken in 2001, both without archaeological monitoring. The 2002 dredging operations were designed to remove estuarine silts and debris that had accumulated since the completion of the previous dredging campaigns. Nothing of archaeological interest was observed. Monitored by Kieran Campbell	525846	651839	Adjacent
04E1306	Miscellaneous features	Aughinish	SMR Li 10:82. Test-trenching undertaken adjacent to a ringfort in advance of a gas pipeline construction project did not uncover any archaeological features or finds. Monitoring was subsequently undertaken during the gas-line construction phase and four small-scale sites were uncovered during monitoring. Site 1 comprised two pits cut into orange subsoil and connected by a 0.03m-deep shallow linear depression. Both pits contained iron slag, clay lining from the furnace pits and iron bloom in the fills and this indicates that the pits were associated with ironworking. An Early Medieval dating was suggested. Site 2 was a thin spread of shell over an area measuring 17m by 8m. The shell species included cockle, periwinkle, mussel and some oyster. Modern pottery sherds and clay-pipe fragments were found among the shell. The site was in close proximity to the estuary and the shell may have been introduced to the site as part of soil improvements where seaweed was spread as a fertiliser. Site 3a was a sub-circular pit with some bone fragments in the basal fill. A large flat stone occupied part of the base on the north end. The pit fill was charcoal-enriched brown/black soil with some burnt bone, seashell and a burnt hazelnut shell	527813	652742	Outside

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			fragment. Five pieces of flint debitage were found at the base of the fill and Beaker pottery sherds were found throughout. The pottery was broken in antiquity and may have been deposited in the pit as some type of ritualistic gesture. Site 3b contained pits similar to post-pits and may indicate a settlement of unknown date in the area outside the pipeline wayleave. Site 4 was a paved area found at the edge of the wayleave and this continued into the baulk. Eight flat stones extended over an area measuring 0.92m by 0.29m. Ash and charcoal flecks were visible on the east side. Oxidised and charcoal-flecked soil was visible 0.54m to the west. The site was probably a hearth. Excavated by Rose Cleary.			
07E0805	Landscape	Island Mac Téige, Aughinish West and Glenbane West	Geophysical survey carried out in 2007 (07R0105). Identified a number of anomalies in the form of linear features, possible pits and a large curving ditch. Test excavation revealed ten linear features in Fields 1, 4, 6, 9, 18, 19 and 20. A burnt spread was noted in Field 3. Probable post-medieval burning was visible in Field 6. A small area of burning was also noted in Field 13 and cultivation activity was noted in Fields 1, 2, 6, 7, 9 and 18–20. Excavated by Nikolah Gilligan.	577621	651488	Outside
07E1114	No archaeological significance	Durnish	Topsoil-stripping of land exposed natural bedrock below a thin covering of sod. Excavated by Ross MacLeod.	525919	651732	Outside
10D033, 10R092	Intertidal and Subtidal areas	Foynes Harbour	Environmental Impact Assessment for the Cultural Heritage Section of the Environmental Impact Assessment for the Shannon Foynes Port Land Reclamation project. Archaeological assessment of a 290m (east-west) by 85m (north-south) section of intertidal and sub-tidal foreshore, located immediately adjacent to the existing East Jetty, was undertaken. A marine geophysical survey of the proposed reclamation area was carried out by Hydrographic Surveys Ltd. in January 2011. The survey extended outside the identified works footprint and included use of both side-scan sonar and two-fish magnetometer. The geophysical data was subsequently assessed, prior to undertaking on-site assessment, with a view to highlighting any anomalies that might retain archaeological potential. The geophysical survey identified a total of twenty (20) side-scan sonar anomalies for the area under reclamation, and a further twenty for those seabed areas located to the north and south of the East Jetty structure (outside the works area). Those anomalies located within the reclamation area	525431	651953	Within [in part] the Foynes Island SI Boundary

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			were subject to on-site archaeological inspection, these induced: SS20_01, SS20_03, SS20_04 and anomalies SS18_1 to SS18_17. The latter anomalies, located approximately 50m east of the viaduct, being of particular interest as the anomaly set forms two parallel runs on the side-scan imagery. However, inspection at each target location did not reveal features of archaeological significance. Anomaly SS 20_04 proved to be of modern origin (car tire) and no targets were identified at the locations given for anomalies SS20_01, SS20_03 or SS18_1 to ss18_17. In those instances where no side-scantarget was present, it is likely that the anomaly represented a portable object that has moved subsequent to the gathering of the original geophysical data. The on-site assessment was undertaken at Low Water (LW) and comprised of field-walking the inter-tidal and upper foreshore areas, coupled with a wadded/ snorkel survey of the sub-tidal zone (max. water depth 500mm at LW). In addition, two (2) areas of archaeological potential (AP 1 & AP2), identified from cartographic sources as part of the desktop study, were inspected. The areas are indicated as fish weirs on OS First and 25-inch edition mapping for the area. AP1 is located 148m east of the proposed reclamation area with AP2 located 350m to the east. Visual inspection confirmed that no above surface indicators of these sites remain. However, it is possible that *in-situ* elements of these structures may remain sub-surface, buried within the estuarine mudflats that form the foreshore at these locations. The archaeological assessment was comprehensive and extended beyond the site boundaries identified for the proposed project. In addition, an architectural survey was undertaken in tandem with the on-site assessment. This was carried out by Brian O'Carroll Ltd., Conservation Architects, and comprised a visual and photographic record of the shore based elements of the port. The results of the architectural survey are appended to this report. The assessment was carried out under licence on 23rd February 2011; license numbers 10D033, 10R092.			
15E0051	Intertidal Forehore	Foynes Harbour	Archaeological monitoring of reclamation works of 2.49 ha of land at the East Jetty in Foynes Harbour, Co. Limerick was conducted from 3 March to 28 October 2015, in accordance with conditions set out by Limerick City and County Council with regards to Planning Ref. 12/212. The archaeological brief comprised monitoring of the	525375	651872	Outside

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			reclamation works, and archaeological and architectural recording of a stone revetment at the port. All of the site works, whether in the maritime environment or on land, were archaeologically monitored, and all excavated material was visually checked for potential artifacts immediately following excavation. Site works comprised demolition of the existing causeway, two small-scale areas of dredging (on both sides of the sheet pile running parallel to the existing jetty) and infilling. No features of archaeological significance were identified during these works. A geotextile membrane was laid on the mud and gravel surface, and overlaid with hardcore to infill the jetty. A stone revetment that runs along the shoreline directly south of the East Jetty was identified in the Environmental Impact Assessment as containing several pieces of worked stone which appeared to be from demolished structures. Such stones were recorded and those that were removed in the course of the works were stored for possible future re-use.			
17D0017, 17D0012	Terrestrial, intertidal foreshore, and subtidal riverbed.	Corgrig, Foynes, Foynes Harbour, Durnish	Archaeological assessment was undertaken as an Environmental Impact Assessment for the Cultural Heritage Section of the Environmental Impact Assessment Report for the proposed Capacity Extension and Harbour Development project within Shannon Foynes Port. The project comprises the construction of a new jetty between the existing East Jetty and West Quay, within Shannon Foynes Port, and the development of lands to the south-east of the port estate, within Durnish Townland. The study area encompassed subtidal, inter-tidal, and terrestrial components that extend across three areas of the project design, namely: • Area 1, a 145m (north-south) x 38m area of inter-tidal foreshore located to the west of West Quay. • Area 2, a 130m (north-south) x 237m area of inter-tidal foreshore and sub-tidal riverbed located between/behind the existing East Jetty and West Quay. • Area 3, a 797m (north-south) x 547m parcel of land (Durnish Td.) located immediately to the south-east of the eastern limit of the existing boundary of the port estate. The proposed jetty extension works will include: the removal and relocation of the existing small-craft landing pontoon to an area identified on the west side of the existing West Quay; construction of an open pile jetty structure, with suspended concrete deck, between the west terminus of the East Jetty and the east terminus of West Quay, tying-into same; and a	56239	651561	Outside

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			transition slab to provide access from the open pile jetty structure to the Berth 5 reclamation area (this reclamation being a previously permitted development). These foreshore development areas are located within a Special Area of Conservation and have also been subject to classification as a Natural Heritage Area. Both areas lie adjacent to a Special Protection Area that encompasses the wider River Shannon Estuary. The development of the land adjacent to the port estate, in Durnish Townland, is to comprise the in-filling of the existing greenfield site with imported fill material, raising ground levels above the floodplain to facilitate the insertion of warehousing, storage and other port-related infrastructure. The archaeological assessment is based on a desktop review of existing archival and published information, interpretation of the results of geotechnical site investigations works undertaken for the project, and an on-site inspection of the relevant green-field, foreshore, quayside, and underwater areas. The desktop assessment indicates the presence of a range of prehistoric and more recent archaeological sites within the wider area of Foynes Port, including the site of two fish traps to the east at Durnish Point, which have been recorded on Ordnance Survey maps since the 19th century. However there are no known archaeological sites or features within the present port development areas. The onsite assessment was comprehensive and comprised the systematic non-disturbance assessment of the areas surrounding the proposed construction impacts associated with the port development (Areas 1-3), extending significantly beyond the identified limits of each of those impacts. The assessment provides a thorough background to the maritime landscape present, records the general topography of the areas under assessment, assesses the potential of deposits from those areas to retain archaeological material, and identifies any material, features or structures of archaeological or historic significance that are present. Visual inspection of the Durnish greenfield site and the inter-tidal foreshore areas within the port was undertaken on 13 February 2018. The underwater assessment of the sub-tidal area between the East Jetty and West Quay was carried out on 16 February 2017.			
22D0023	Historic Harbour, Intertidal	Foynes	In fulfilment of the recommendations, as outlined in the UAIA/EIAR, and conditions of the subsequent ABP Grant of Permission regarding Cultural Heritage, the following items	524839	651820	Within the Foynes Island SI Boundary

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
	Foreshore		archaeological mitigation items were competed pre-construction: • Pre-disturbance survey of a *c.* 100m section of nineteenth century quay-wall (West Pier) from the historic harbour at Foynes (NIAH 21829004) to provide a permanent, metrically accurate, record of the structure. • Archaeological inspection of foreshore (on suitable Low Water) to assess the current archaeological potential of the intertidal foreshore within the historic harbour and the East Jetty/West Quay construction area; subsequent to the primary surveys carried out by ADCO in 2017.			
22E0021	Intertidal Forehore	Foynes	The construction of a new jetty structure between the existing East Jetty and West Quay, within Shannon Foynes Port, was an integral part of the Vision 2041 Strategic Development for the Port. The development was subject to EIAR as part of the Shannon Foynes Capacity Extension and Harbour Development Project, to which ADCO were appointed Project Archaeologist.[1] The project was subsequently approved by ABP in 2018, Grant of Permission ABP-301561-18.[2] ADCO also contributed to the High Level Construction Environmental Management Plan for the port extension project.[3] As part of the jetty extension project, reclamation of the foreshore behind Beth 5 was also undertaken. An excavation Licence, to cover archaeological monitoring was in place for the duration of the reclamation works. In the event that the excavation of foreshore deposits was to become necessary, this work would be subject to full archaeological monitoring until such time as it was fully completed. The monitoring protocol was enacted in February 2023 (16th-19th), where localised excavation of the foreshore was required to facilitate the insertion of a sheet pile anchor-wall. No material of archaeological or historical significance was observed as part of the monitoring process, the dredging work, in the most part, removing foreshore deposits that proved to be of modern origin. An excavation licence was	525242	651864	Outside

[1] [redacted], 'Archaeological Impact Assessment, Capacity Extension and Harbour Development Project, Shannon Foynes Port, Foynes, Co. Limerick, 17D0017, 17R0012', ADCO unpublished report 12th April 2018 and Chapter 14, Archaeology and Cultural Heritage, pp.14.1-14.29 in Capacity Extension at Shannon Foynes, Environmental Impact Assessment Report (EIAR), Volume 4, RPS Group.
[2] Reclamation work completed under previously permitted development under LCCC planning permission 12/212.
[3] Archaeological Management Plan, Section 4.7 in 'Capacity Extension at Shannon Foynes, High Level Construction Environmental Management Plan CEMP)', RPS.

Licence	Classification	Townland	Description	Easting	Northing	Location to nearest Marine SI Area
			active for the remainder of the reclamation project, but no further archaeological presence was required; the works being at an advanced stage and not requiring any additional interventions to the foreshore.			
24E1282	Intertidal Forehore, Riverbed	Foynes, Foynes Island	Archaeological Monitoring of Site investigation (SI) was undertaken to inform preliminary design and facilitate environmental assessment in advance of Planning and Foreshore applications for the Foynes Deepwater Terminal Project. The onsite phase of this project has been completed and archaeological reporting is currently underway.	524022 525613	653176 652302	Within the Foynes Island SI Boundary Outside

Appendix 2: Marine Geophysical Survey specification, Cahiracon and Foynes Island Marine SI.

[redacted] **12/03/2025**

Purpose of survey

The marine geophysical survey will cover the full area of the Marine SI footprint under water where accessible.

The desired outcomes of this survey are:

- Identify and map potential geohazards
- Identify and map potential archaeological sites and features
- Facilitate the development of a ground model in support of the wider design
- Provide data and information in support of Environmental Impact Assessment

The specification is to match or exceed the proposals outlined in:

- Ruth Plets, Justin Dix, Richard Bates, *Marine geophysics data acquisition, processing and interpretation. Guidance Notes,* English Heritage, 2013.

Suite of instruments to be deployed

- GNSS positioning
- Motion Reference Unit
- Multibeam Echosounder
- Sound Velocity Profiler
- Sub-bottom Profiler, chirp
- Side-scan Sonar, dual frequency, low and high
- Magnetometer, caesium
- Navigation, acquisition and processing suite
- Post-processing navigation suite
- Charting software

Surveyor

- Competent and experienced marine hydrographer

Survey vessel

- Dept of Marine licensed survey vessel capable of accessing all project areas at High Water

Project constraints

- Calm weather, cruising speed at less than 4 knots

Proposed tracklines

- Main lines: 20 m spacing in shallow water, increasing to not more than 50m spacing in deeper water.
- Cross lines: 100m spacing.
- Additional infill lines in shallow areas to allow for full device-suite coverage at 100% and greater; no data gaps.

Archaeological licensing/consent

- Application will be informed by project method statement, for which the marine hydrographer will provide the following:
- Name of marine hydrography company
- Confirmation of equipment-suite deployment, equipment brands and proposed operating frequencies
- Project drawing showing proposed survey tracklines
- Project survey schedule
- Proposed survey vessel, if known

Archaeological data review

The following data sets and reports are required to permit an archaeological interpretations review and report to be completed:

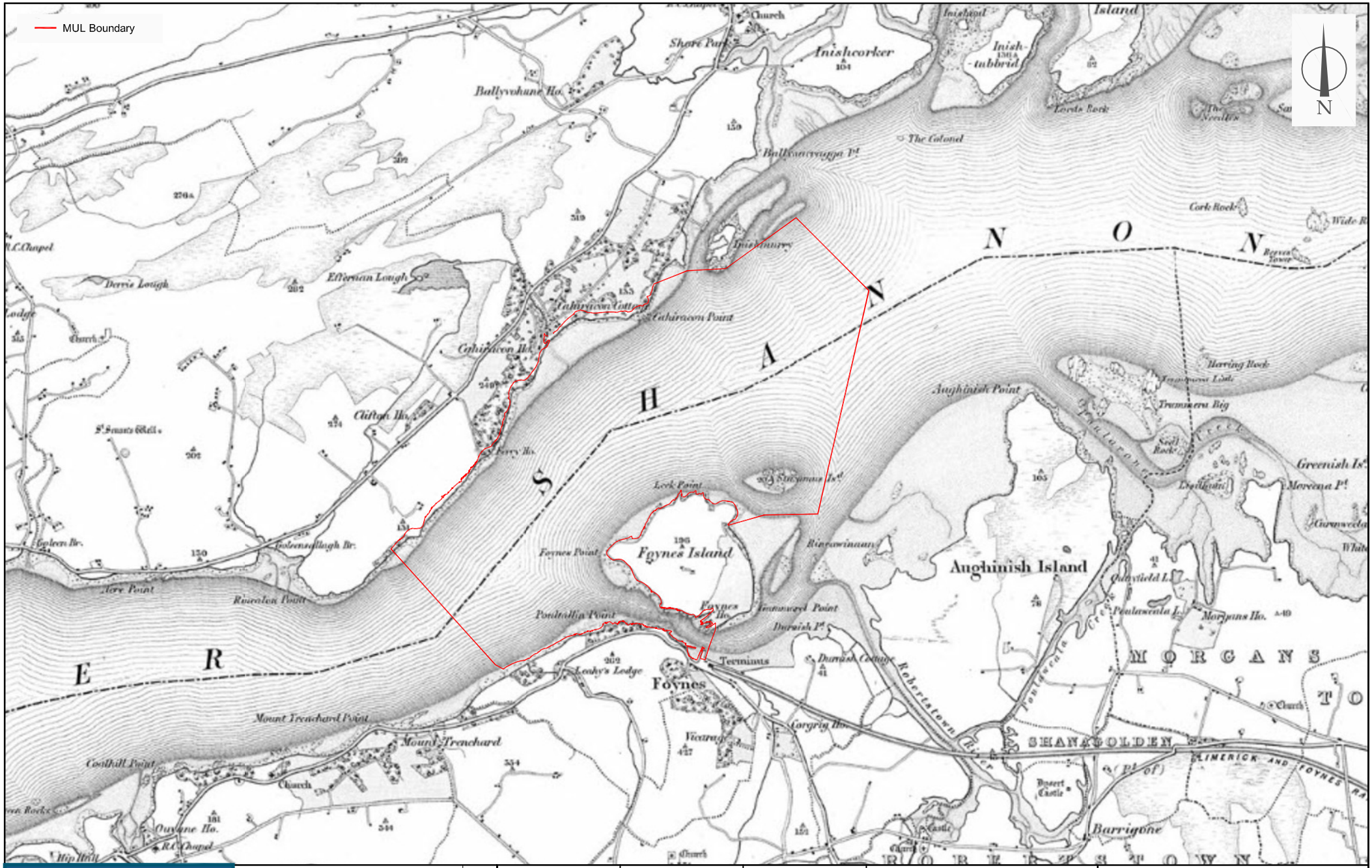
- Multibeam bathymetry, as high resolution GeoTIFF
- Side-scan sonar as XTF files corrected for layback for replay in CODA Survey Engine
- Side-scan sonar geo-referenced MOSAIC files
- Magnetometer as geo-referenced Magnetometer Intensity Map
- Sub-bottom profiler as SGY files for replay in CODA Survey Engine
- Survey device tracklines as SHAPE files
- Picked targets grouped into class and presented as CSV file/s with coordinates for: side-scan sonar; magnetometer and sub-bottom profile
- Marine hydrographer's report and mapping (minimum as Draft version) as PDF

ADCO	**Notes** Source: Main- OS Discovery Series (1:50,000) Mapping Left- Google Satellite Image (captured April 2020)	A4	**Job/Exc No.** ADCO25/011	**Compiled by** [redacted]	**CAD reference** SGER-Foynes
			Date 22.06.25	**Scale** 1:50,000/ 1:30,000	**Drawing No.** Figure 1

Client
Nicholas O'Dwyer/ Gas Networks Ireland

Project
Strategic Gas Emergency Reserve

Title
Figure 1- Location and extent of MUL Boundary identified for the Strategic Gas Emergency Reserve Project.



ADCO	**Notes** Source: Virtual Record Treasury of Ireland, Ref. No. LBC OS1 /142, Map of the Area around Foynes, at a Scale of 1Inch to 1mile (1:63,360), Colonel Henry James for the Ordnance Survey of Ireland.	A4	**Job/Exc No.** ADCO25/011	**Compiled by** [redacted]	**CAD reference** SGER-Foynes	**Client** Nicholas O'Dwyer/ Gas Networks Ireland
			Date 22.06.25	**Scale** 1:50,000	**Drawing No.** Figure 2	**Project** Strategic Gas Emergency Reserve

Title
Figure 2- Extract from nineteenth-century OS map (1862) with location and extent of MUL Boundary for the Strategic Gas Emergency Reserve Project superimposed.

POINT	ITM	
01	521666.95	652942.45
02	523262.79	655101.17
03	524674.74	655766.19
04	525781.39	656303.53
05	526519.62	655565.15
06	526001.68	653296.42
07	525678.59	653187.58
08	524621.88	653479.22
09	524962.28	652188.93
10	52496.96	652122.07
11	524895.31	651939.76
12	524828.29	651944.06
13	522809.36	651720.36
14	522728.20	651764.59

Marine Borehole
Subtidal Grab Sample
Intertidal Sediment Core
Wave Buoy
MUL Boundary
MHWS
Shannon SPA
Shannon SAC

N

1 2 3 4 5 6 7 8 9 10 11 12 13 14

ADCO

Notes

64nr. Marine Boreholes
28nr Subtidal Grab Samples
18nr. Intertidal Sediment Cores

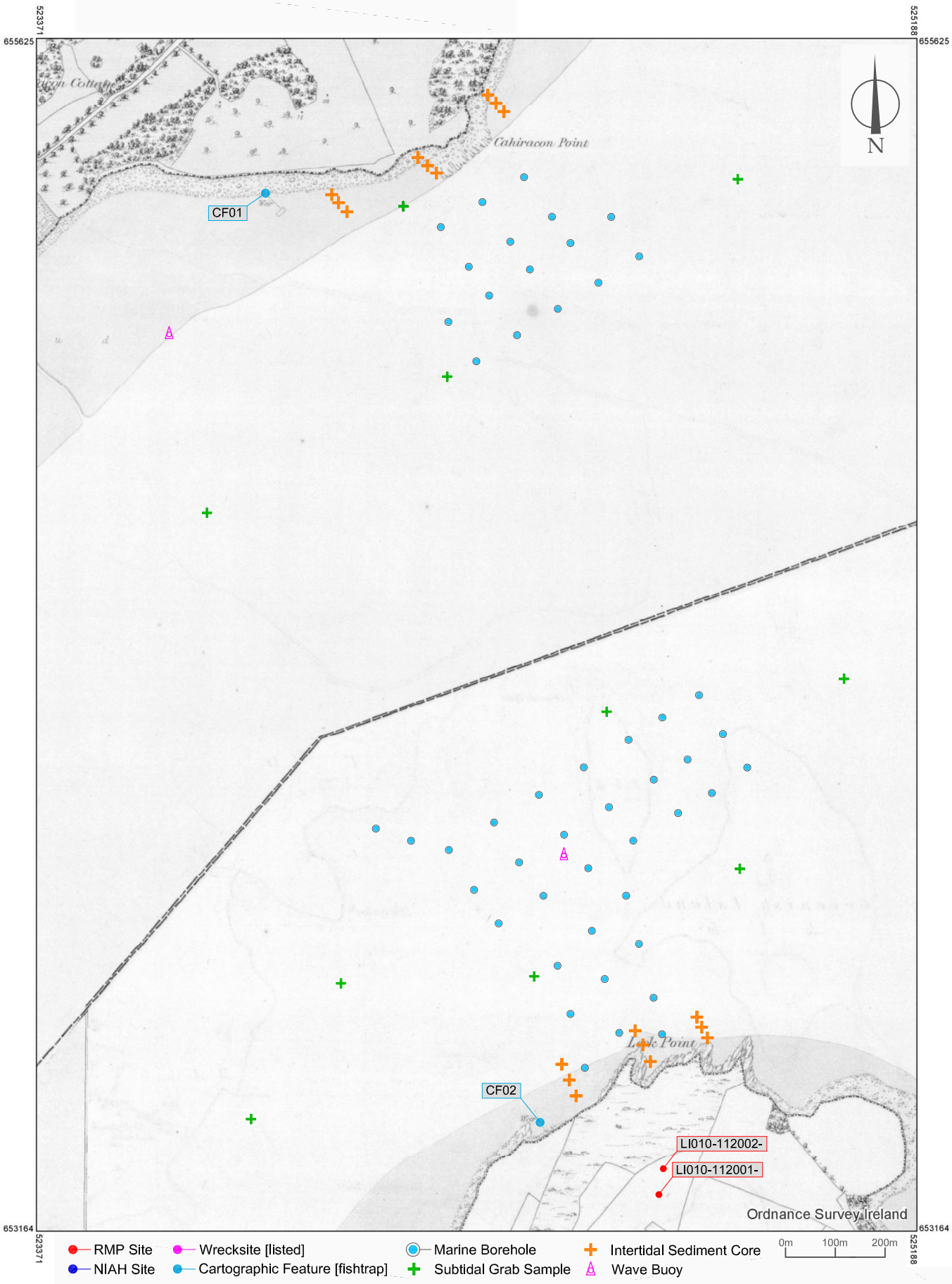
Source: Indicative Marine Site Investigation locations provided by NOD.

A3

Title
Figure 3- Map showing MUL Boundary extent for the Strategic Gas Emergency Reserve Project.

Client
Nicholas O'Dwyer/ Gas Networks Ireland

Project	Job/Exc No.	Compiled by	CAD reference	Date	Scale	Drawing No.
Strategic Gas Emergency Reserve	ADCO25/011	[redacted]	SGER-Foynes	24.07.25	1:20,000	Figure 3



ADCO

Client
Nicholas O'Dwyer/ Gas Networks Ireland

Notes
Source:
OSi Historic Map Archive [Tailte Eireann]

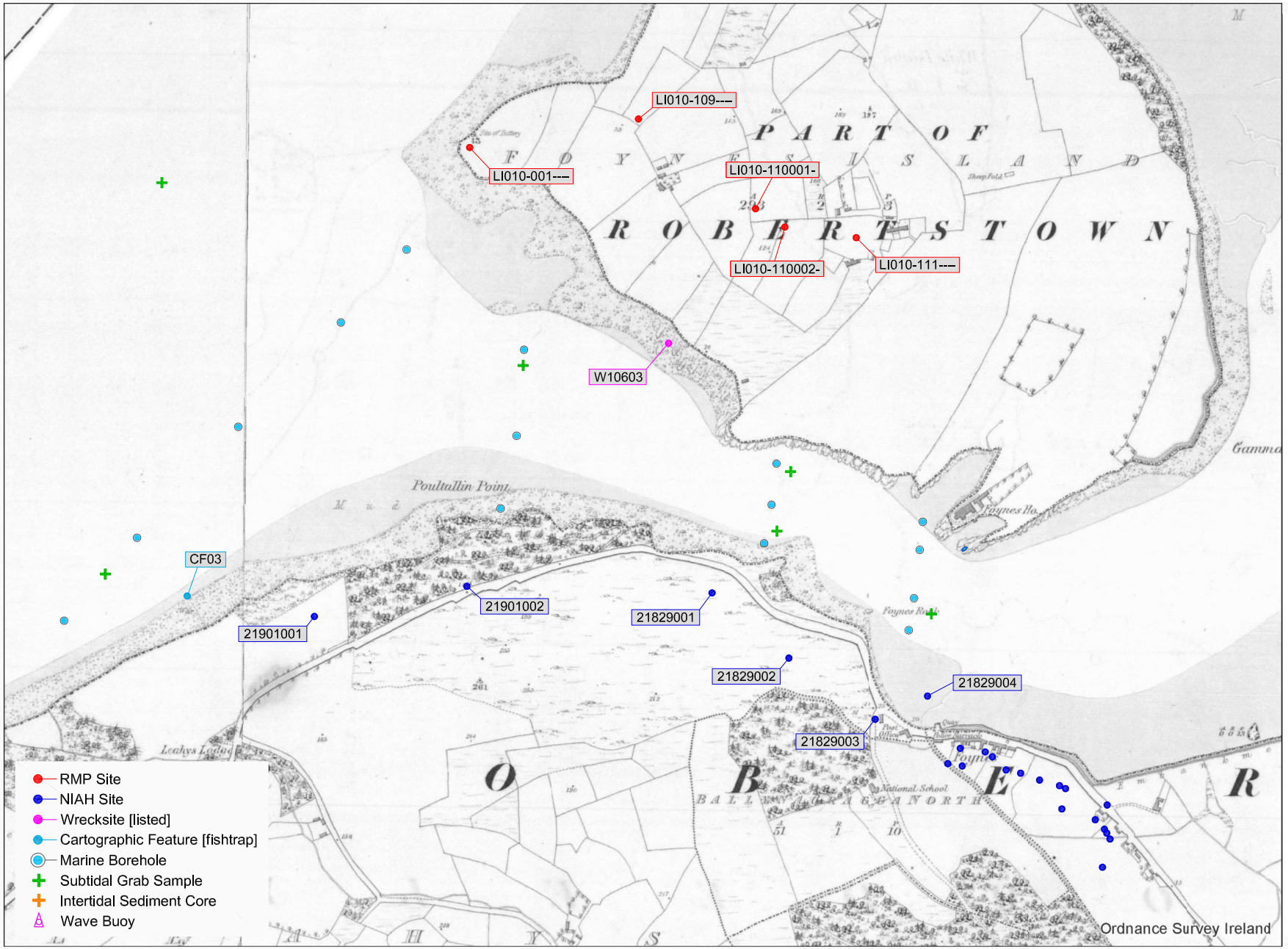
Tailte Éireann

NIAH Sites- Limerick Sheet 10/
NMS database [maps.archaeology.ie]
Wreck Sites- NMS Wreck Viewer
[dahg.mpas.arcgis.com]

A4

Title
Figure 4- Extract from OS First Edition Map (1844) with proposed Marine Site Investigation, to the north of Foynes Island, and surrounding Cultural Heritage sites superimposed.

Project	Job/Exc No.	Compiled by	CAD reference	Date	Scale	Drawing No.
Strategic Gas Emergency Reserve	ADCO25/011	[redacted]	SGER-Foynes	24.07.25	1:5000	Figure 4



Tailte Éireann

CENTRE COORDINATES:
ITM 523889,653254

PUBLISHED: 22/06/2025
ORDER NO.: 50474178_1

MAP SERIES: 25 Inch Raster
MAP SHEETS: LK010-05

N

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Ireland.
D08F6E4

www.tailte.ie

0m 100m 200m

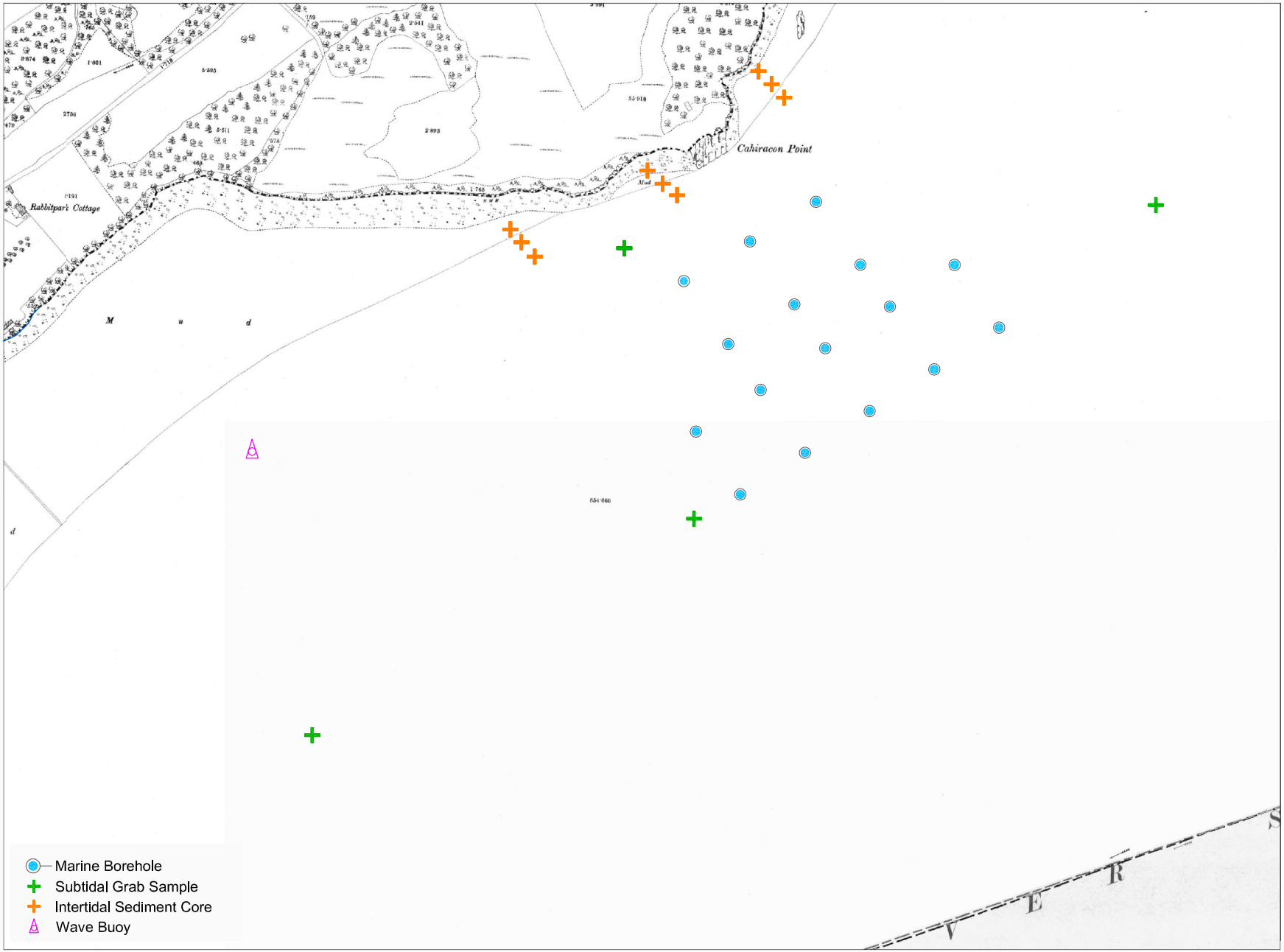
ADCO

Notes
Source:
Map- OSi Historic Map Archive [Tailte Eireann]
RMP/NIAH Sites- Limerick Sheet 10/ NMS database [maps.archaeology.ie]
Wreck Sites- NMS Wreck Viewer [dahg.mpas.arcgis.com]

A4

Job/Exc No.	Compiled by	CAD reference	Client
ADCO25/011	[redacted]	SGER-Foynes	Nicholas O'Dwyer/ Gas Networks Ireland
Date	**Scale**	**Drawing No.**	**Project**
24.07.25	1:11,000	Figure 5	Strategic Gas Emergency Reserve

Title
Figure 5- Extract from OS First Edition Map (1844) with proposed Marine Site Investigation, on south and west sides of Foynes Island, and surrounding Cultural Heritage sites superimposed.



Tailte Éireann

CENTRE COORDINATES:
ITM 524162,654981

PUBLISHED: 05/03/2025

ORDER NO.: 50452782_4

MAP SERIES: 25 Inch Raster

MAP SHEETS: CE069-04

N

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D08F6E4

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0m 50m 100m

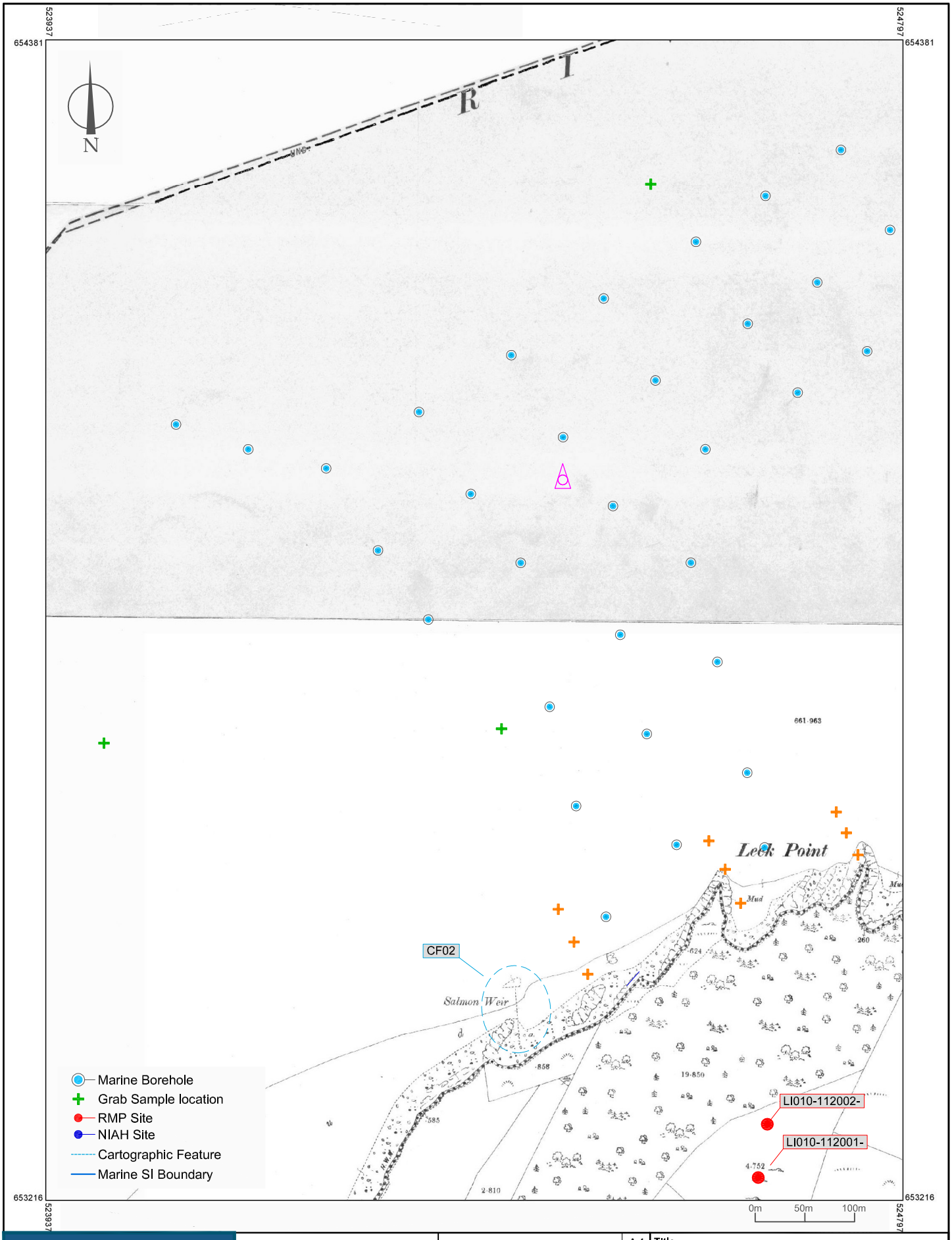
ADCO

Notes
- 16Nr. Boreholes
- 9Nr. Intertidal Sediment Cores
- 4Nr. Subtidal Grab Samples

Source: Map- OSI Historic Map Archive [Tailte Eireann]

A4

Job/Exc No. ADCO25/011	**Compiled by** [redacted]	**CAD reference** SGER-Foynes	**Client** Nicholas O'Dwyer/ Gas Networks Ireland	**Title** Figure 6- Extract from OS 25-inch Edition Map (1898) with proposed Marine Site Investigation, to the south of Cahiracon Point, superimposed.
Date 26.06.25	**Scale** 1:7250	**Drawing No.** Figure 6	**Project** Strategic Gas Emergency Reserve	



ADCO

Client
Nicholas O'Dwyer/ Gas Networks Ireland

Notes
Source:
OSi Historic Map Archive [Tailte Eireann]

Tailte Éireann

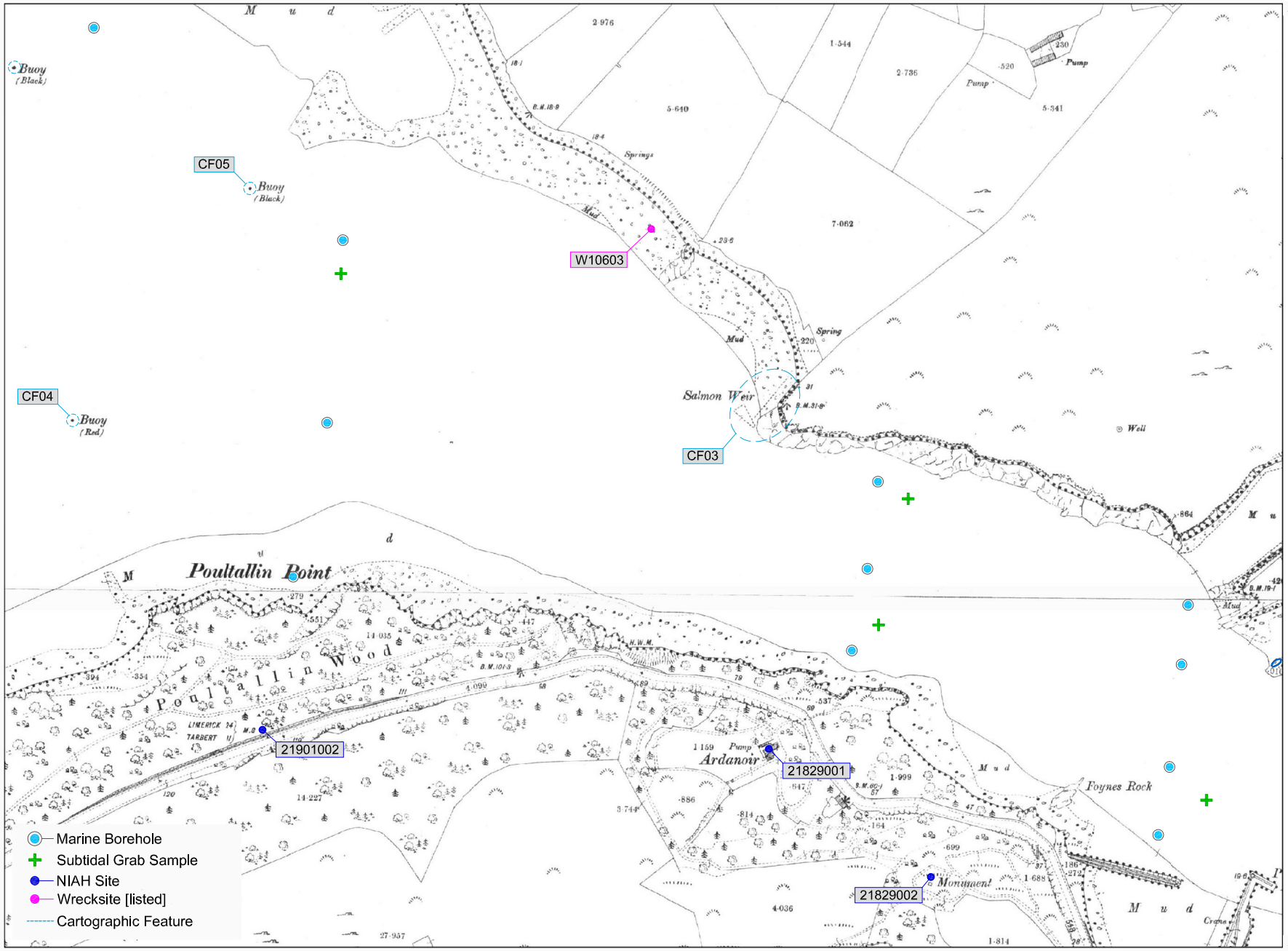
- 19Nr. Boreholes
- 19Nr. Grab Samples

NIAH Sites- Limerick Sheet 10/
NMS database [maps.archaeology.ie]
Wreck Sites- NMS Wreck Viewer
[dahg.mpas.arcgis.com]

A4

Title
Figure 7- Extract from OS 25-inch Edition Map (1898) with proposed Marine Site Investigation, to the north of Foynes Island, superimposed.

Project	Job/Exc No.	Compiled by	CAD reference	Date	Scale	Drawing No.
Strategic Gas Emergency Reserve	ADCO25/011	[redacted]	SGER-Foynes	24.07.25	1:5000	Figure 7



Tailte Éireann

CENTRE COORDINATES:
ITM 524269,652308

PUBLISHED: 05/03/2025
ORDER NO.: 50452782_1

MAP SERIES: 25 Inch Raster
MAP SHEETS: LK010-05

N

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Dublin 8,
Ireland.
D08F6E4

www.tailte.ie

0m 50m 100m

ADCO

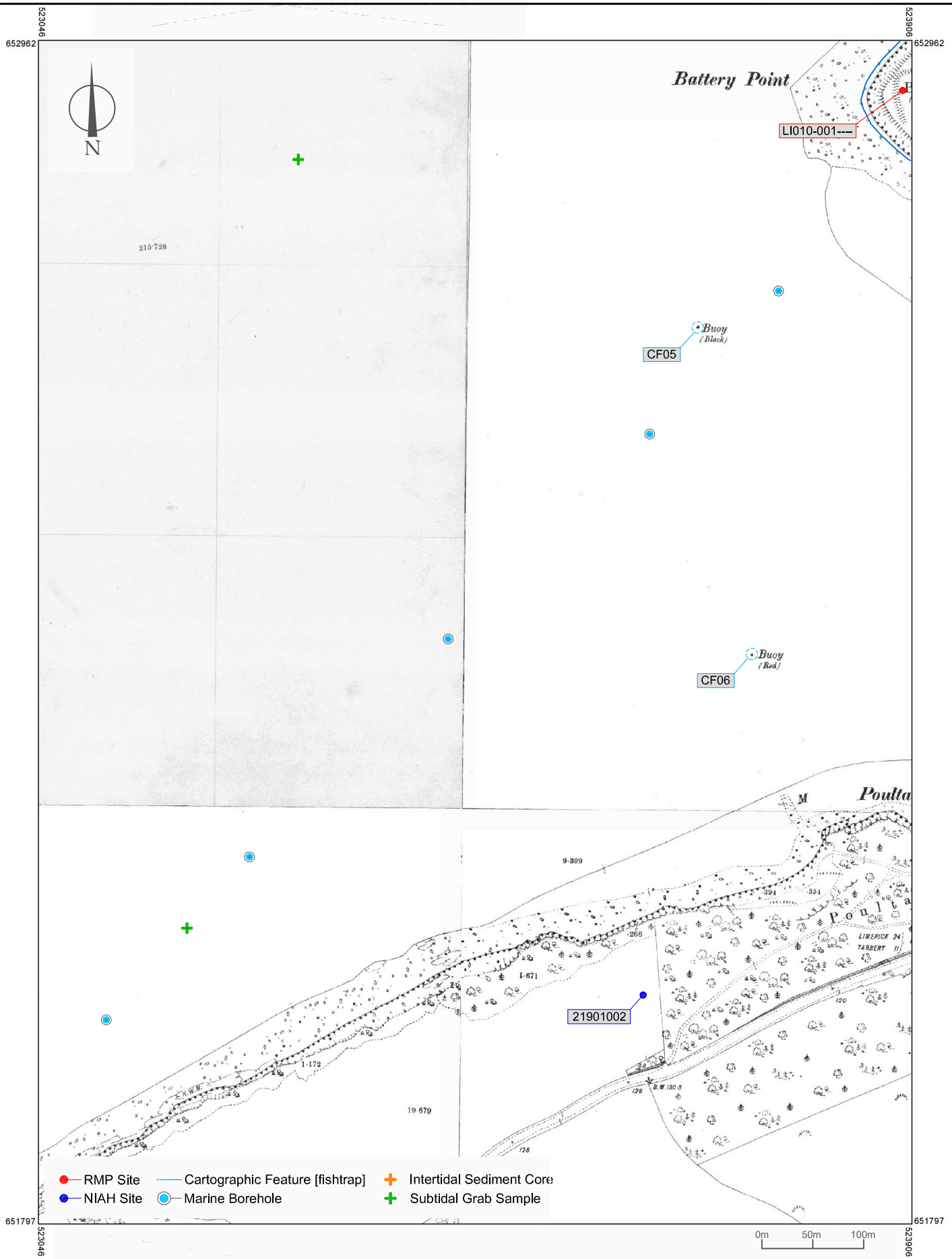
Notes
- 11Nr. Boreholes
- 4Nr. Subtidal Grab Samples

Source: Map- OSi Historic Map Archive [Tailte Eireann]
NIAH Sites- Limerick Sheet 10/ NMS database [archaeology.ie]
Wreck Sites- NMS Wreck Viewer [dahg.mpas.arcgis.com]

A4

Job/Exc No. ADCO25/011	**Compiled by** [redacted]	**CAD reference** SGER-Foynes	**Client** Nicholas O'Dwyer/ Gas Networks Ireland
Date 22.06.25	**Scale** 1:5000	**Drawing No.** Figure 8	**Project** Strategic Gas Emergency Reserve

Title
Figure 8- Extract from OS 25-inch Edition Map (1898) with proposed Marine Site Investigation, on the south side of Foynes Island, superimposed.



ADCO

Client
Nicholas O'Dwyer/ Gas Networks Ireland

Notes
Source:
OSi Historic Map Archive [Tailte Eireann]

Tailte Éireann

- 6Nr. Boreholes
- 3Nr. Intertidal Sediment Cores
- 2Nr. Subtidal Grab Samples

NIAH Sites- Limerick Sheet 10/
NMS database [maps.archaeology.ie]
Wreck Sites- NMS Wreck Viewer
[dahg.mpas.arcgis.com]

A4

Title
Figure 9- Extract from OS 25-inch Edition Map (1898) with proposed Marine Site Investigation, to the southwest of Foynes Island, superimposed.

Project	Job/Exc No.	Compiled by	CAD reference	Date	Scale	Drawing No.
Strategic Gas Emergency Reserve	ADCO25/011	[redacted]	SGER-Foynes	24.07.25	1:5000	Figure 9

ADCO

RMP Site
NIAH Site
Wrecksite [listed]
Cartographic Feature
MUL Boundary
Marine Borehole [64Nr.]
Intertidal Sediment Core [18Nr.]
Subtidal Grab Sample [24Nr.]
Wave Buoy

Source: Google Satellite Image captured 04.2022

A4

Title
Figure 10- Aerial Images of Shannon Estuary at Foynes with location of proposed Marine Site Investigation superimposed.

Client
Nicholas O'Dwyer/ Gas Networks Ireland

Project	Job/Exc No.	Compiled by	CAD reference	Date	Scale	Drawing No.
Strategic Gas Emergency Reserve	ADCO25/011	[redacted]	SGER-Foynes	24.07.25	1:17,500	Figure 10

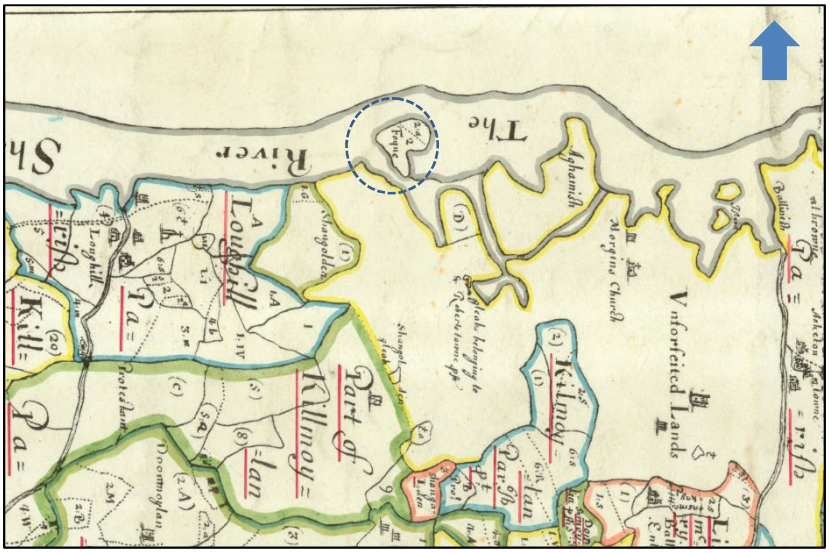


Plate 1: Extract from the Down Survey Mapping of 1656-58; *Barony of Connello (*source: downsurvey.tcd.ie/down-survey-maps).

Plate 2: Extract from the Down Survey Mapping of 1656-58; *County Clare (*source: downsurvey.tcd.ie/down-survey-maps).

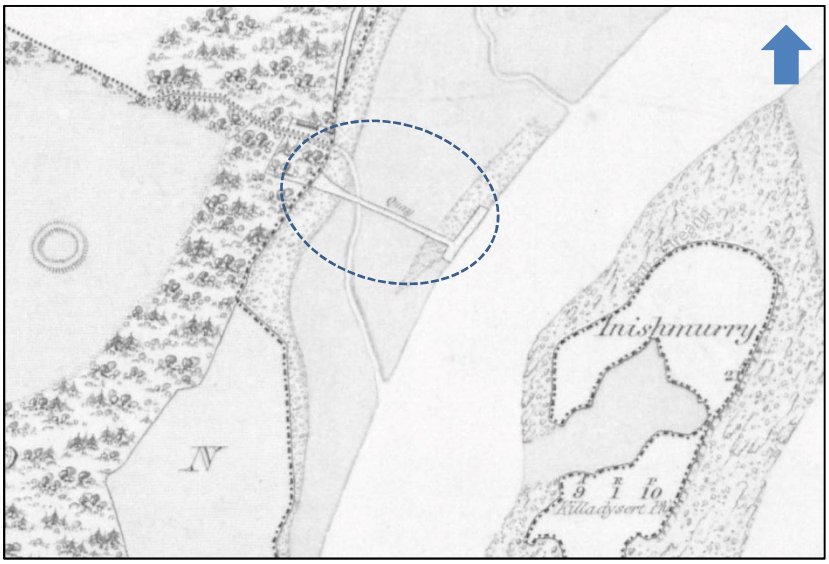


Plate 3: Extract from OS First Edition map with Cahiracon Pier (NIAH 20405903) highlighted (source: Tailte Éireann).

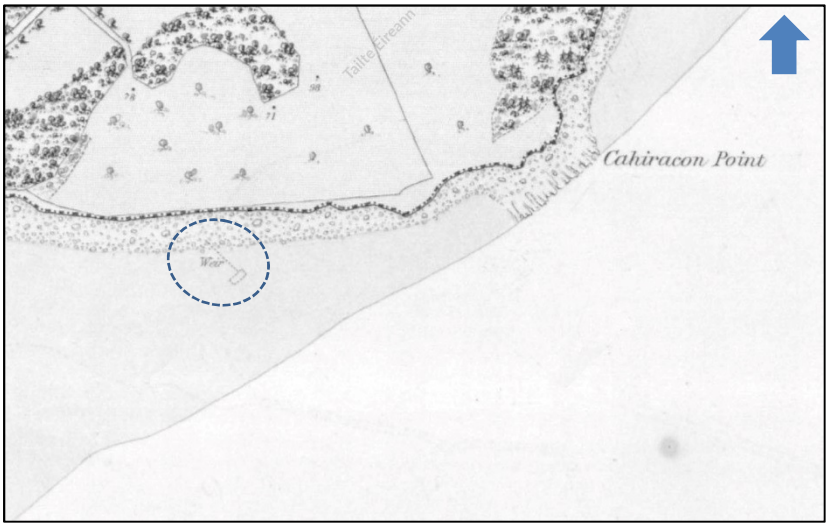


Plate 4: Extract from OS First Edition map with fish-trap CF01 highlighted; *c.* 330m west of Cahiracon Point (source: Tailte Éireann).

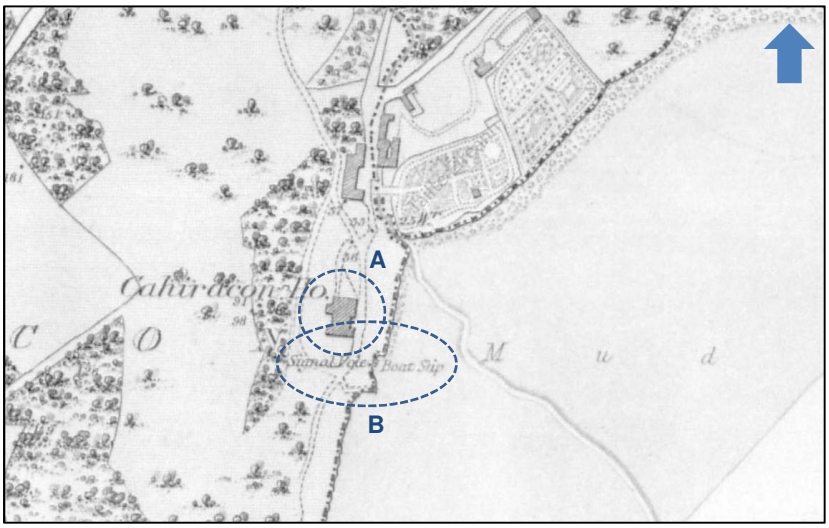


Plate 5: Extract from OS First Edition map with Cahiracon House (NIAH 20406901) and adjacent Boat Slip highlighted (source: Tailte Éireann).

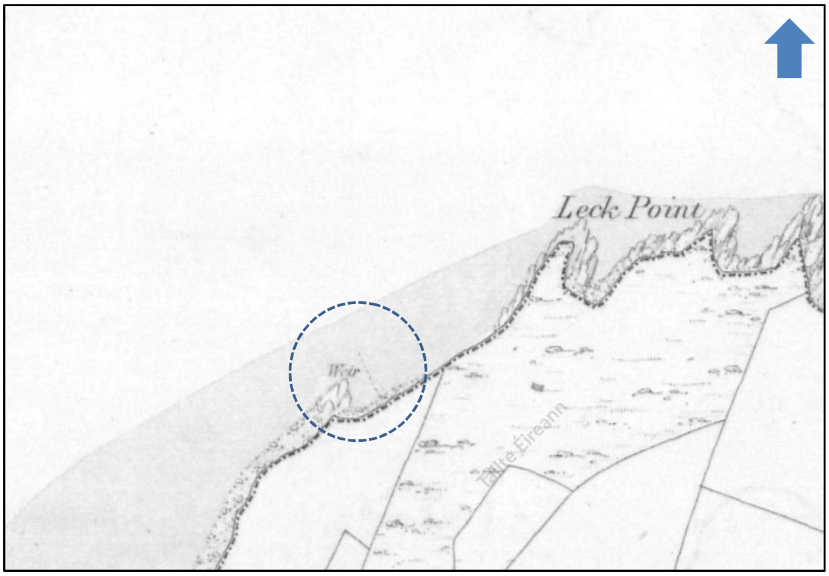


Plate 6: Extract from OS First Edition map with fish-trap CF02 highlighted; *c.* 200m west of Leck Point (source: Tailte Éireann).

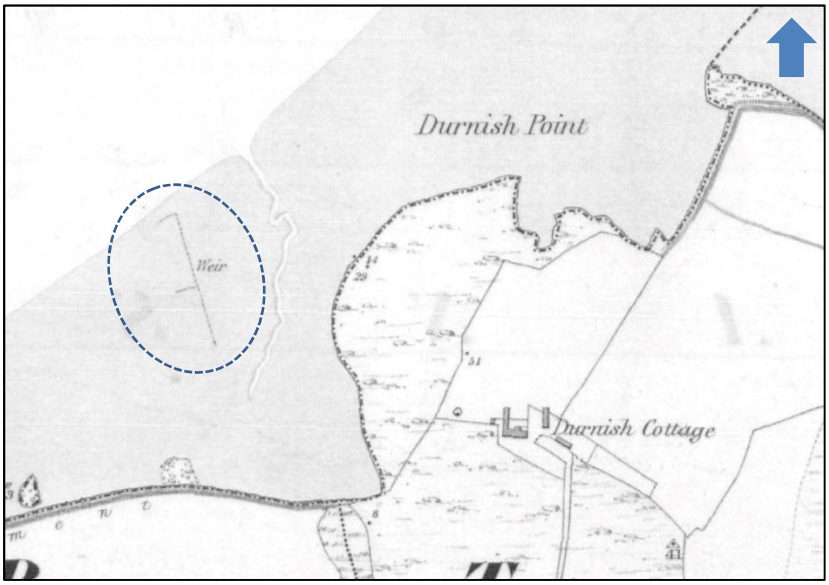


Plate 7: Extract from OS First Edition map with fish-trap CF07 highlighted; *c.* 344m west of Durnish Point (source: Tailte Éireann).

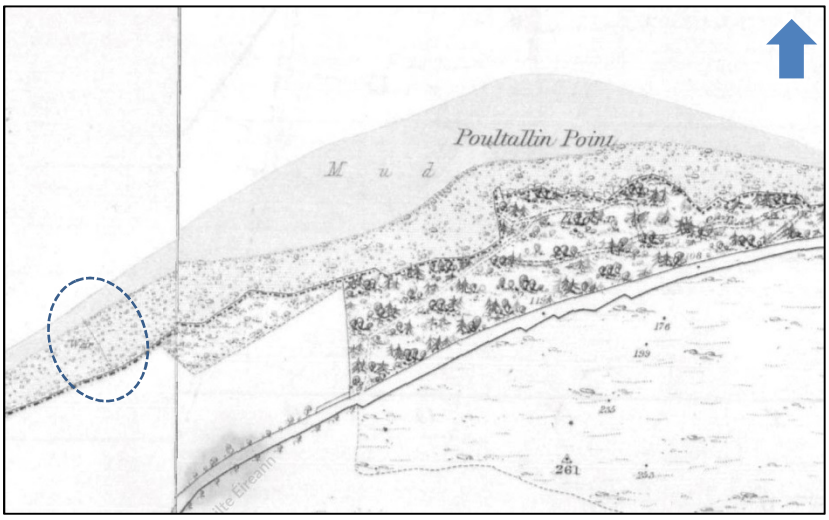


Plate 8: Extract from OS First Edition map with fish-trap CF03 highlighted; *c.* 600m west of Durnish Point (source: Tailte Éireann).

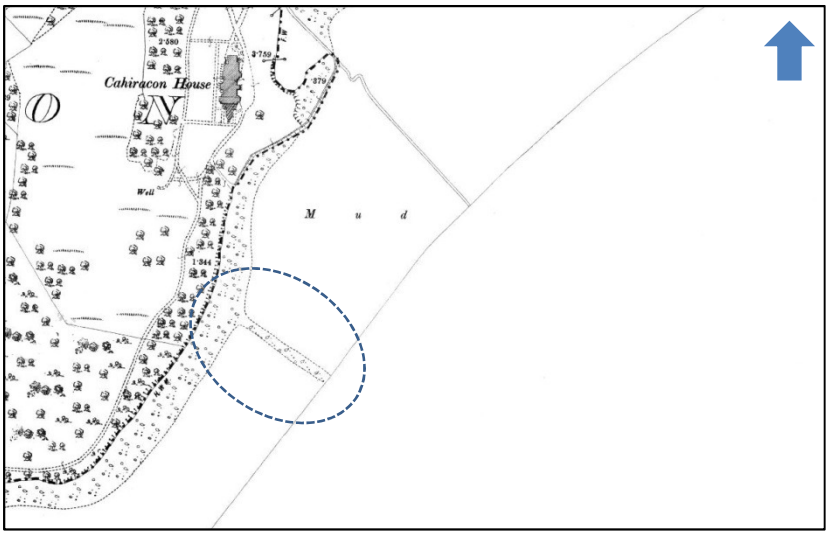


Plate 9: Extract from OS 25-inch Edition map shingle causeway to Low Water highlighted (source: Tailte Éireann).

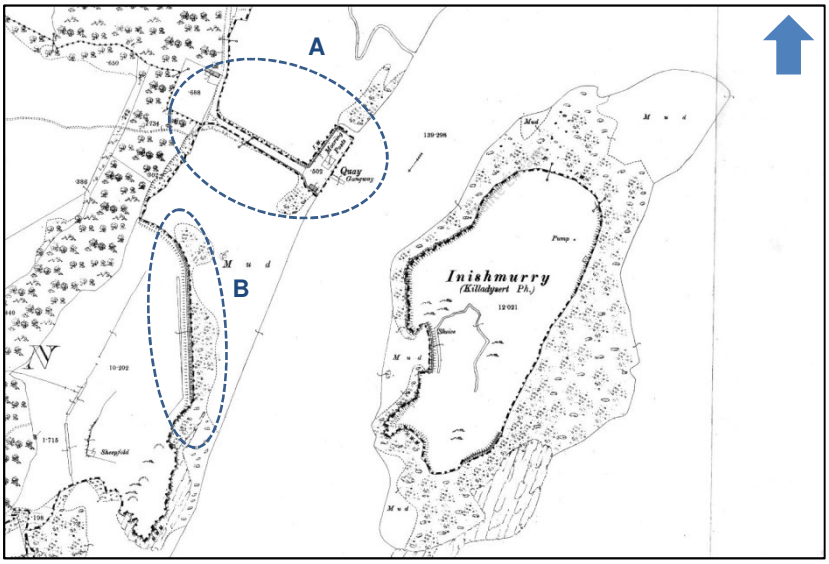


Plate 10: Extract from OS 25-inch Edition map with Cahiracon Pier [A] and adjacent sea-wall [B] highlighted (source: Tailte Éireann).

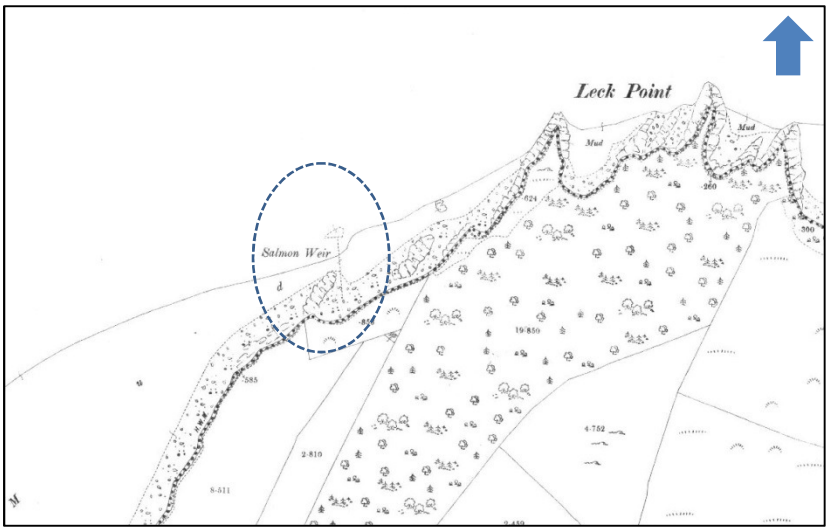


Plate 11: Extract from OS 25-inch Edition map with fish-trap CF02 highlighted; *c.* 220m west of Leck Point (source: Tailte Éireann).

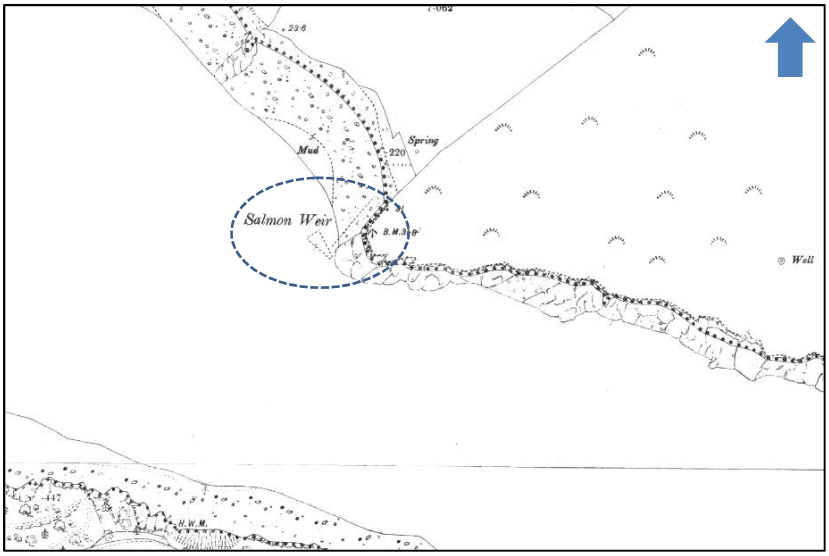


Plate 12: Extract from OS 25-inch Edition map with fish-trap CF04 highlighted; *c.* 720m west of Battery Point (source: Tailte Éireann).

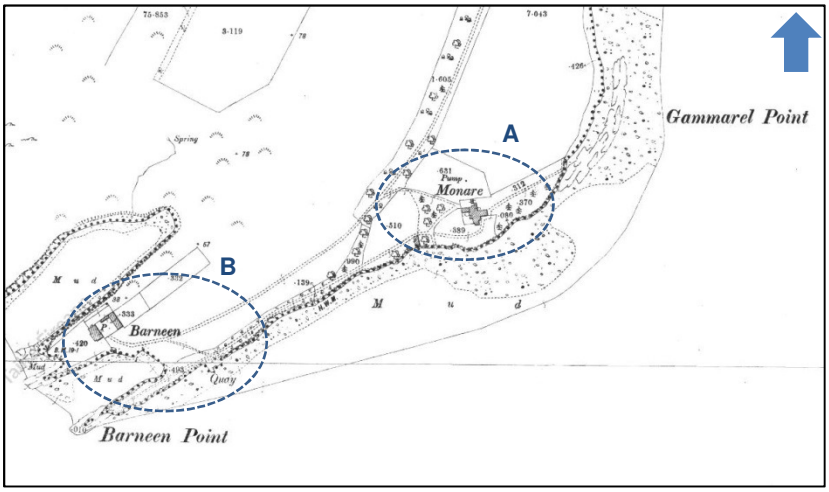


Plate 13: Extract from OS 25-inch Edition map with Monare House [A] and Barneen House and Quay highlighted [B] (source: Tailte Éireann).

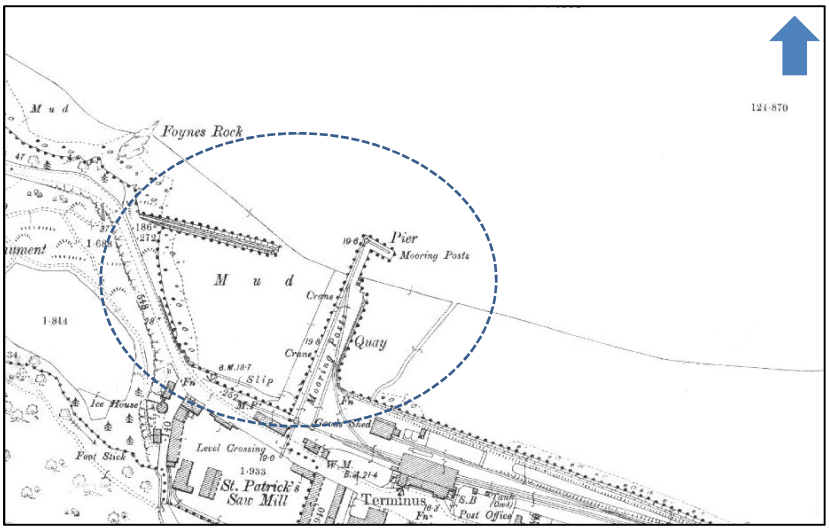


Plate 14: Extract from OS 25-inch Edition map with Foynes Historic Harbour highlighted (source: Tailte Éireann).

Plate 15: Nineteenth-century photograph (east-facing) of inner part of the historic harbour area at Foynes; note boat-slipway in foreground (source: Limerick County Archive).

Plate 16: Nineteenth-century photograph (east-facing) of the historic harbour at Foynes; note breakwater in foreground (source: Limerick County Archive).

Plate 17: Modern wreck (W10603) located on the intertidal foreshore on the west side Foynes Island; *c.* 537m south of Battery Point (source: NMS map viewer; aerial imagery).

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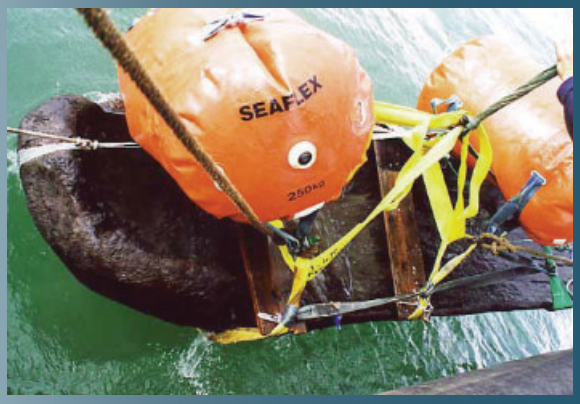

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