

8th September 2026

Maritime Area Regulatory Authority,
2nd Floor, Menapia House,
Drinagh Business Park,
Drinagh, Wexford,
Y35 RF29

MOR Environmental Ref: E2068

Re: MUL LIC230013 – Request for Amendment to Specific Condition 28 – Attachment 3.4: Risk Assessment for Annex IV Species

1 Introduction

The proposed Material Amendment to MUL LIC230013, the removal of Specific Condition 28, does not change the Risk Assessment for Annex IV Species, which was submitted as part of the original MUL application.

This proposed Material Amendment seeks to (only) remove Specific Condition 28:

“28. Fish spawning and nursery grounds

(i) The Holder shall not undertake the Permitted Maritime Usage between 1st November and 31st January annually, to ensure least disturbance to known fish spawning along the survey route.

Reason: To ensure protection of the marine environment”

The proposed amendment does not involve any change to:

- The nature or extent of the permitted maritime usage;
- The survey methodologies or equipment;
- The location or duration of activities;
- The mitigation measures previously assessed; or,
- The project description previously considered within the existing assessment framework for MUL LIC230013.

The proposed amendment does not introduce any new impact pathway or alter the conclusions of the original Risk Assessment for Annex IV Species. The conclusions of the original assessment, therefore, remain unchanged. For the avoidance of doubt, as per the Habitats Directive, there are no fish designated as Annex IV species within Ireland.

For completeness, the previously submitted Risk Assessment for Annex IV Species is included in this attachment; please see below.

1.1 Statement of Authority

This document was reviewed and approved by Ms Amelia Keane, Principal Consultant – Ecologist. Amelia is a full member of the Chartered Institute of Ecology and Environmental Management ('CIEEM') and has over 7 years' experience working in the ecological consultancy sector, including habitat surveys and appraisals and special protected species surveys in support of Appropriate Assessments.

Annex IV Species Risk Assessment

Geotechnical Investigation at proposed 250m ORE capable Quay Extension at the Port of Waterford, Belview, Co. Kilkenny

**On behalf of
Port of Waterford**



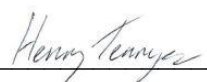


Ground Floor – Unit 3
Bracken Business Park
Bracken Road, Sandyford
Dublin 18, D18 V32Y
Tel: +353- 1- 567 76 55
Email: enviro@mores.ie

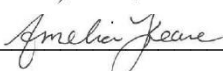
Title: Annex IV Species Risk Assessment, Geotechnical Investigation at proposed 250m ORE capable Quay Extension at the Port of Waterford, Belview, Co. Kilkenny, Port of Waterford

Job Number: E2068

Prepared By: Henry Tennyson

Signed: 

Checked By: Amelia Keane

Signed: 

Approved By: Kathryn Broderick

Signed: 

Revision Record

Issue No.	Date	Description	Remark	Prepared	Checked	Approved
01	19/10/23	Annex IV Risk Assessment	FINAL	HT	AK	KB

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the Port of Waterford, Belview, Co. Kilkenny
Port of Waterford****Contents**

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APPENDICES

Appendix A: Site Layout Drawing

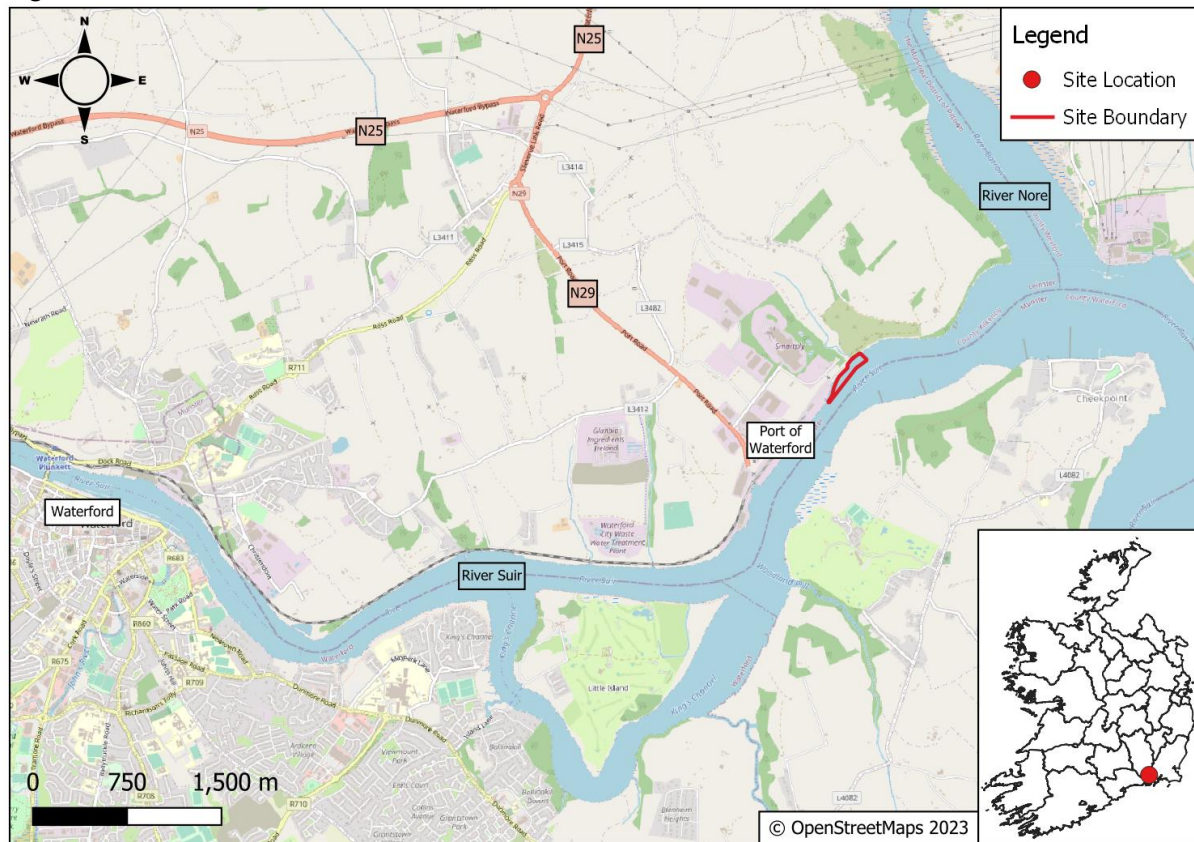
Appendix B: Preliminary Method Statement for Geotechnical Investigations

1 INTRODUCTION

Malone O'Regan Environmental (MOR) have been commissioned by the Port of Waterford ('the Applicant') to undertake an Annex IV Species Risk Assessment to assess the likely significant effects, if any, of the proposed geotechnical investigation required to support the design of a proposed 250m Offshore Renewable Energy (ORE) capable quay extension ('the proposed works') in the River Suir at the Port of Waterford, Belview, Co. Kilkenny (OSI Reference ITM 666422; 613637) on any Annex IV species.

The proposed works will be located on a site in the River Suir that is ca. 2.48 hectares (ha) in size and borders the townland of Gorteens, Co. Kilkenny, ca. 5.3km east of Waterford City and is shown in Figure 1-1 ('the Site').

Figure 1-1: Site Location



1.1 Statement of Authority

The report was reviewed and approved by Ms. Kathryn Broderick, Principal Environmental Consultant. Kathryn has over 6 years' experience working in the ecological consultancy sector, including the preparation of Appropriate Assessments, habitat surveys and specialist protected species surveys.

1.2 Regulatory Context

The Wildlife Act (1976) and its amendments – 2000, 2005, 2010 and 2012 – provide for the protection of all cetaceans as well as grey seal (*Halichoerus grypus*) and common seal (*Phoca vitulina*). This act applies to the entire area of Irish territorial waters (12 nautical miles).

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna better known as 'The Habitats Directive' provides the framework for legal protection for habitats and species of European importance.

Articles 12, 13 and 16 of the Habitats Directive (92/43/EEC) set out that Member States must establish strict systems of protection for flora and fauna that are considered particularly threatened and are listed as Annex IV of the Habitats Directive. Article 12, 13 and 16 of the Habitats Directive have been transposed into Irish law by Regulations 51, 52 and 54 of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended.

These Regulations provide for the protection of Annex IV species and as such it is an offence to:

- Deliberately capture or kill any specimen of these species in the wild;
- Deliberately injure (except when hunting under such licence) a protected species;
- Deliberately disturb these species particularly during the period of breeding, rearing, hibernation, and migration;
- Deliberately take or destroys eggs of those species from the wild;
- Damage or destroy a breeding site or resting place of such an 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.

Under Article 16 of the Habitats Directive, a derogation licences may be granted by the Minister, which would allow otherwise illegal activities to go ahead provided that:

- There is no satisfactory alternative; and,
- The action authorised will not be detrimental to the maintenance of the population of the species concerned at a Favourable Conservation Status in their natural range.

According to the Habitats Directive, favourable conservation status is achieved when:

- Population data on the species concerned indicate that it is maintaining itself.
- The natural range of the species is neither being reduced or likely to be reduced for the foreseeable future; and,
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

It should be noted that the granting of another statutory consent (i.e., a licence or lease) does not remove the obligation to obtain a derogation licence should one be required. As such, an application for derogation to the National Parks and Wildlife Service (NPWS) may be required under Regulation 54, in addition to a licence or lease application. 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.

Additionally, the following guidance documents were adhered to for the preparation of this Risk Assessment:

- Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters' [1]; and,
- The protection of marine European Protected Species from injury and disturbance: Guidance for the marine area in England and Wales and the UK offshore marine area' was published in 2010 by the JNCC, Natural England and the Countryside Council for Wales (now Natural Resources Wales) [2].

1.3 Relevant Annex IV Species

All species listed under Annex IV of the Habitats Directive with the potential to be impacted by the proposed works will be fully assessed.

The Annex IV species that occur in Ireland [3] that will have been identified as relevant to this risk assessment include:

- Otter;
- All Irish cetaceans (whales, dolphins, and porpoise);
- All Irish bat species; and,
- All marine turtles.

Other non-Annex IV species have also been included in this risk assessment to ensure no adverse effects occur to any protected species, which include pinnipeds (seals) and basking sharks.

2 METHODOLOGY

2.1 Desk Based Studies

A desk-based review of information sources was completed, which included the following sources of information:

- Review of aerial maps of the Site and surrounding area;
- The National Parks and Wildlife Service (NPWS) website was consulted regarding the most up to date detail on conservation objectives for the Natura 2000 sites relevant to this assessment [4];
- The Kilkenny County Council Planning Portal to obtain details about existing / proposed developments in the vicinity of the Site [5];
- The Waterford County Council Planning Portal to obtain details about existing / proposed developments in the vicinity of the Site [6];
- The Wexford County Council Planning Portal to obtain details about existing / proposed developments in the vicinity of the Site [7];
- The Department of Housing, Local Government and Heritage's planning portal – the National Planning Application Database to obtain details about existing / proposed developments in the vicinity of the Site [8];
- The Irish Whale and Dolphin Group's sightings portal to obtain information about recent sightings in the vicinity of the Site [9];
- The National Biodiversity Data Centre (NBDC) website was consulted regarding species distributions [10]; and,
- The EPA Maps website was consulted to obtain details about watercourses in the vicinity of the Site [11].

3 DESCRIPTION OF THE PROJECT

3.1 Site Context

The Site is located in an area adjacent to the shoreline within the River Suir in an area ca. 2.48 ha in size. This area is located within the area adjacent to the active Port of Waterford. The Site is access via Belview Port of Waterford, which is off the N29 national road.

Figure 3-1: Site Context and Overview



3.2 Watercourses within the Vicinity of the Site

The Site is situated within the Suir WFD Catchment [Catchment_ID: 16] and the Blackwater[Kilmacow]_SC_010 subcatchment [Subcatchment_ID: 16_29] [11].

The Site is located within one (1No.) watercourse and there are one (1No.) hydrological features of note within close proximity to the Site.

1. River Suir

The Site is located within the River Suir known as the Lower Suir Estuary by the EPA [11]. This river flows in a northeast direction for ca. 1.5km and then converges with the River Barrow and forms the Barrow Suir Nore Estuary according to the EPA [11]. This watercourse then flows south into the Waterford Harbour ca.12.6km downstream and then the Eastern Celtic Sea a further ca. 6.5km downstream.

The Site is located within a section of the River Suir that forms part of the Lower River Suir SAC and flows into the River Barrow and River Nore SAC ca.1.1km downstream.

Under the Water Framework Directive (WFD) 2000/60/EC, the EPA classifies the status and the risk of not achieving good water quality status for all waterbodies in Ireland [11]. According to the river waterbody WFD 2016-2021, the most up-to-date data at the time of writing this report, the water quality within the River Suir (Lower Suir Estuary), the Barrow Suir Nore

Estuary and Waterford Harbour are all considered to be ‘moderate’ and ‘at risk’ of not receiving ‘good’ water quality [11]. The Eastern Celtic Sea is considered to have ‘high’ water quality and is considered ‘not at risk’ [11].

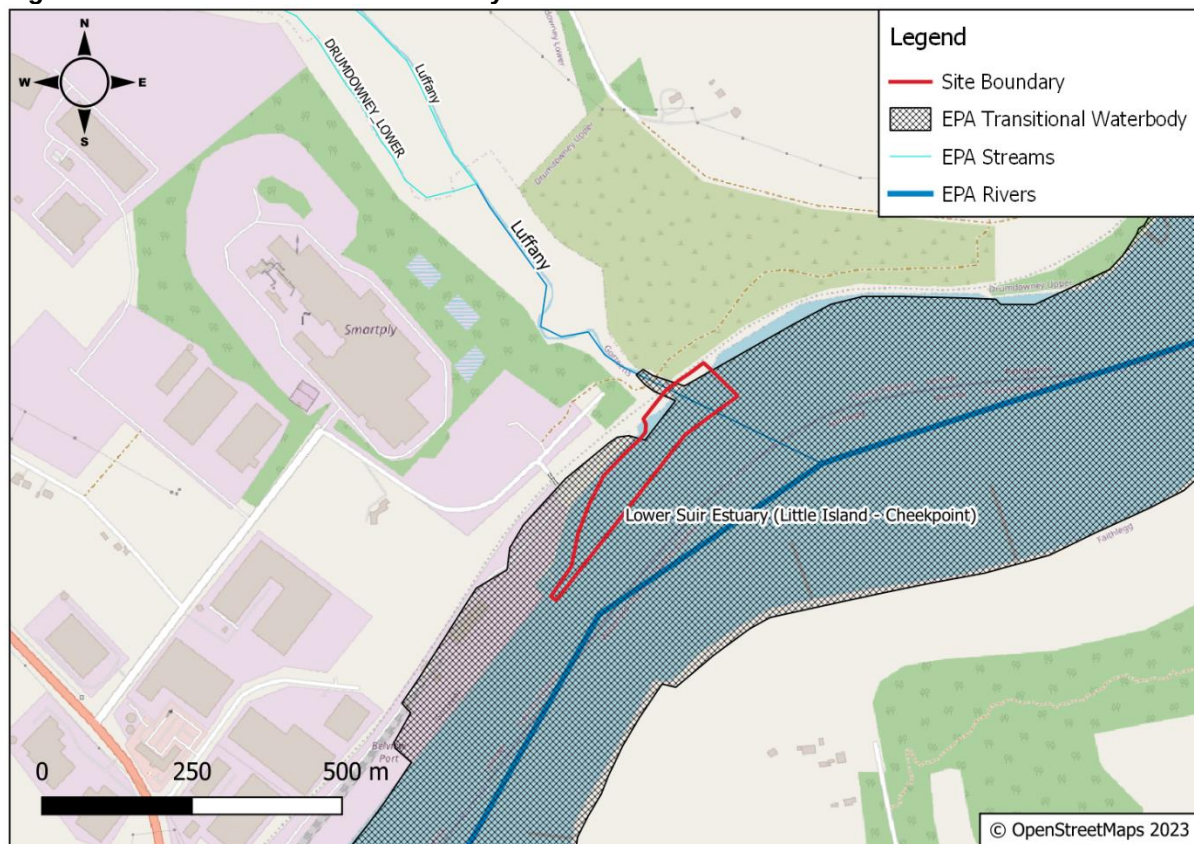
2. Luffany River

The confluence of the Luffany River and the River Suir is located adjacent to the Site boundary, as shown below in Figure 3-2.

Under the Water Framework Directive (WFD) 2000/60/EC, the EPA classifies the status and the risk of not achieving good water quality status for all waterbodies in Ireland (EPA, 2022). According to the river waterbody WFD 2016-2021, the water quality within the Luffany River is considered to be ‘under review,’ and the status of this river is considered ‘moderate’ [11].

The location of the key surface water features in the vicinity of the Site are illustrated in Figure 3-2 below.

Figure 3-2: Watercourses in the Vicinity of the Site



3.3 Description of the Proposed Development

The Applicant intends to apply for a licence to carry out specified maritime usages in the maritime area for a geotechnical site investigation at the proposed ORE berth location at the Port of Waterford. The site investigation will consist of:

- Drilling ca. ten (10No.) boreholes ca. 200mm in diameter;
- Drilling ca. ten (10No.) coreholes ca. 200m in diameter; and,
- Associated sampling and testing.

The proposed borehole and corehole locations are illustrated Appendix A.

Boreholes will provide the required information about the overburden soils essential to the design of the structural piling system, the fendering system and the construction of the

revetment. The equipment for excavating boreholes will be a cable percussive drilling rig such as a Dando 2000/3000. The borehole is advanced through a casing, 200mm in diameter, by using a cutting tool.

Coreholes will result in the recovery of a length of rock between two and four metres in length and 150mm to 200mm in diameter. The rock will undergo a suite of laboratory tests to determine strength, fractures and other geological information which will allow the wharf substructure (i.e., the piles) to be designed. The equipment used for extracting coreholes will include a GEO 205 drill rig or similar using triple tube core drilling techniques and air-mist coolant. The corehole is advanced using a diamond drill.

All equipment that will be used for the drilling work will be placed on a barge. All drilling works will be through the river into underlying soils and rock. Access to the Site will be from Belview Port.

Further details are provided in the preliminary method statement in Appendix B.

3.4 Drilling Noise Level

The noise generated from the proposed drilling is difficult to predict as it will be influenced by a variety of factors such as the nature of the riverbed, i.e., whether drilling will be sediment or bedrock.

Drilling is defined as a non-pulse sound type [12]. Drilling is generally acknowledged to produce moderate levels of continuous omnidirectional sound at low frequency (several tens of Hz to several thousand Hz and up to ca. 10 kHz) [12]. Drilling can produce underwater pressure levels generally within the 145-190 dB re 1µPa @ 1m [12].

3.5 Construction Procedure

During the proposed works potential environmental impacts will be short-term and localised. Nonetheless, all works will comply with the relevant legislation, construction industry guidelines and best practice in order to reduce potential environmental impacts associated with the works. Where remaining potential impacts have been identified, additional mitigation measures will be employed to reduce, as far as practicable potential impacts.

The following guidance will be referred to and will be followed during the proposed works to prevent environmental pollution that may occur within the area:

- C532 – Control of Water Pollution from Construction, Guidance for Consultants and Contractors [13];
- C584 – Coastal and Marine Environmental Site Guide for Protection of Water Quality and in turn Aquatic Life, During the Construction Phase of the Works [14];
- C741 - Environmental Good Practice on Site (4th edition) [15];
- C744 – Coastal and Marine Environmental Site Guide (2nd Addition) [16]
- Guidance for the Treatment of Otters Prior to the Construction of National Road Schemes [17];
- BS 5930: 2015 – Code of Practice for Ground Investigations; and,
- All works will be undertaken in accordance with the Inland Fisheries Ireland (IFI) 'Requirements for the Protection of Fisheries Habitat during Construction and Development' [18].

It is anticipated that the works will take approximately three (3No.) weeks to complete. Works will take place from 08:00 to 17:00 Monday to Friday and 08:00 to 13:00 on Saturday. No works will take place on Sundays or at night-time.

3.6 Monitoring Works

An Ecological Clerk of Works (ECoW) / suitably qualified Marine Mammal Observer (MMO) will inspect the Site in advance of works commencing and will undertake Site inspections as required during the works to ensure that they are completed in accordance with the mitigation measures detailed within this Risk Assessment, the Non-statutory Environmental Report (NSER) and the Stage 2: Appropriate Assessment – Natura Impact Statement (NIS).

The ECoW / MMO will also either deliver or provide the resident engineer with sufficient environmental information to deliver a Site induction to all personnel working onsite.

4 RISK ASSESSMENT

4.1 Baseline Information

Irish waters are home to and refuge for a number of Annex IV species including ca. 26 species of cetaceans [19], four (4No.) out of the seven (7No.) species of sea turtles and the European otter.

Ireland's location on the continental shelf and the North Atlantic Current offers these species a diverse range of suitable habitats to support their distribution and abundance. However, rare deep diving species are unlikely to be found within the vicinity of the Site due to the shallow estuarine nature of the proposed works.

The following information provides baseline information on the relevant Annex IV species and non-Annex IV species included in this risk assessment was prepared using information gathered during the desk-based and field-based studies.

4.1.1 Annex IV Species

4.1.1.1 Cetaceans

There are at least twenty-six (26No.) species of cetaceans in Irish waters [19]. Some of these species are commonly sighted around the coasts of Ireland, while others have only been recorded as strandings and are possibly vagrants to Irish waters [20].

It is estimated that between ten (10No.) and twelve (12No.) cetacean species can be found in Ireland year-round, while a further six (6No.) species are seasonal visitors to Irish waters and seven (7No.) species are classified as rare visitors or vagrants to Irish waters [21]. Table 4-1 provides a summary of distribution and abundance of cetaceans in Ireland.

All cetaceans are protected under the Wildlife Act 1976 / 2000, EU Habitats Directive (92/43/EEC) Annex IV and the Whale Fisheries Act 1937. Additionally, cetaceans are also protected under a number of international agreements such as the Bonn Convention, CITES, OSPAR and ICRW Convention [22].

Table 4-1: Cetaceans recorded in Irish Waters

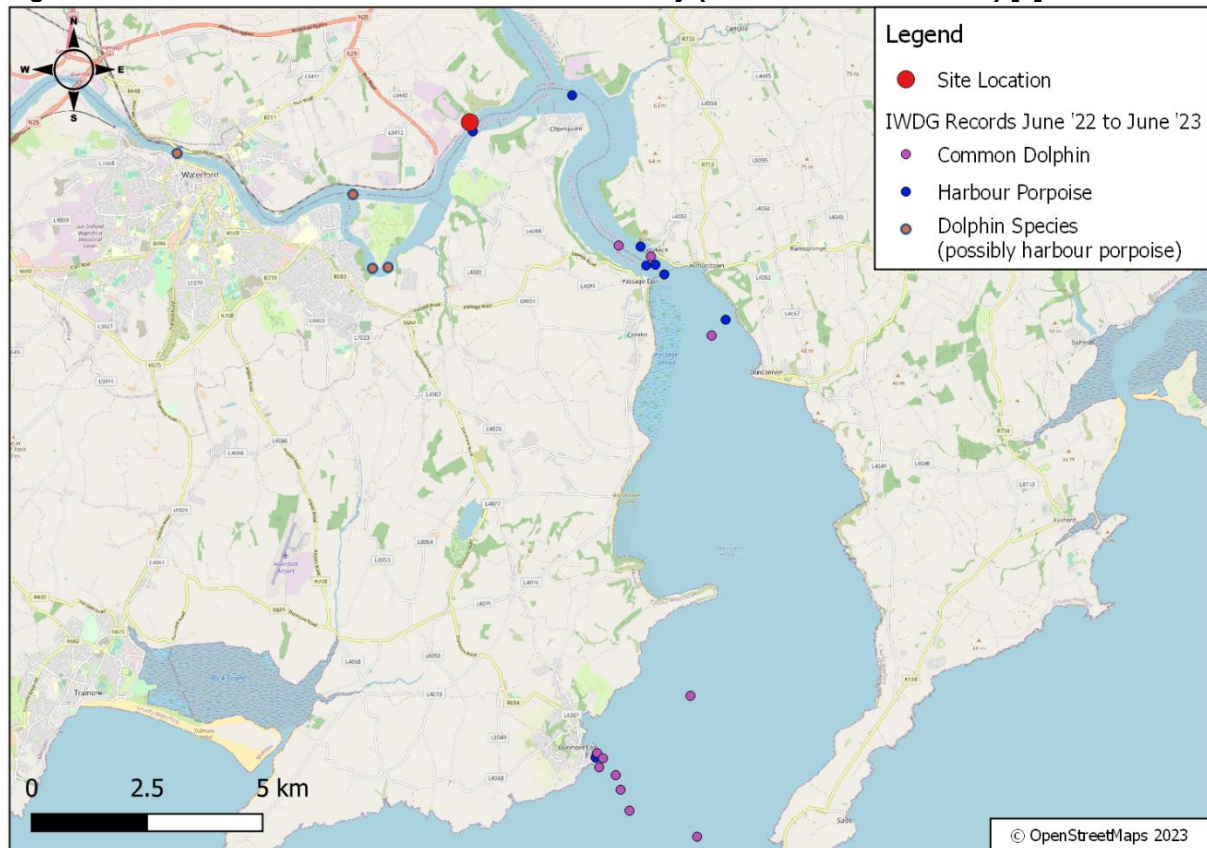
Common Name	Scientific Name	Occurrence	IUCN Red List Status ¹
Dolphins & Porpoise			
Atlantic white-sided dolphin	<i>Lagenorhynchus acutus</i>	Year-round	Least Concern
Bottlenose dolphin	<i>Tursiops truncatus</i>	Year-round	Least Concern
Common dolphin	<i>Delphinus delphis</i>	Year-round	Least Concern
Harbour porpoise	<i>Phocoena phocoena</i>	Year-round	Least Concern
Risso's dolphin	<i>Grampus griseus</i>	March - July	Least Concern
Striped dolphin	<i>Stenella coeruleoalba</i>	May – Sep	Least Concern
White-beaked dolphin	<i>Lagenorhynchus albirostris</i>	Year-round	Least Concern
Baleen Whales			

¹ [The IUCN Red List of Threatened Species](#)

Common Name	Scientific Name	Occurrence	IUCN Red List Status ¹
Blue whale	<i>Balaenoptera musculus</i>	July – March	Endangered
Bowhead whale	<i>Balaena mysticetus</i>	Rare / vagrant	Least Concern
Fin whale	<i>Balaenoptera physalus</i>	Year-round	Vulnerable
Humpback whale	<i>Megaptera novaeangliae</i>	May – August	Least Concern
Minke Whale	<i>Balaenoptera acutorostrata</i>	Year-round	Least Concern
Northern right whale	<i>Eubalaena glacialis</i>	Rare / vagrant	Critical
Sei whale	<i>Balaenoptera borealis</i>	Year-round	Endangered
Toothed Whales			
Beluga whale	<i>Delphinapterus leucas</i>	Rare / vagrant	Least Concern
Blainville's beaked whale	<i>Mesoplodon densirostris</i>	Rare – vagrant	Least Concern
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	May – August	Vulnerable
False killer whale	<i>Pseudorca crassidens</i>	June – Nov	Near Threatened
Gervais' beaked whale	<i>Mesoplodon europaeus</i>	Rare / Vagrant	Least Concern
Killer whale	<i>Orcinus orca</i>	Year-round	Unknown / Data Deficient
Long-finned pilot whale	<i>Globicephala melas</i>	Year-round	Least Concern
Northern bottlenose whale	<i>Hyperoodon ampullatus</i>	May – August	Near Threatened
Pygmy sperm whale	<i>Kogia breviceps</i>	Rare / vagrant	Least Concern
Sowerby's beaked whale	<i>Mesoplodon bidens</i>	Year-round	Unknown / Data Deficient
Sperm whale	<i>Physeter macrocephalus</i>	Year-round	Vulnerable
True's beaked whale	<i>Mesoplodon mirus</i>	Year-round	Least Concern

At the time of writing this report, the most up to date records available from the Irish Whale and Dolphin Group (IWDG) sighting portal [9] shows two (2No.) cetacean species, common dolphin (*Delphinus delphis*) and harbour porpoise (*Phocoena phocoena*), recorded within the Waterford Estuary between June 2022 and June 2023. In total nineteen (19No.) sightings were reported within the Waterford Estuary during this period, as shown in Figure 4-1. Additionally, there were four (4No.) sightings that were not identified to species level and record as 'dolphin species (possibly harbour porpoise)'.

Given the records of cetaceans within the vicinity of the Site, this application will further assess the potential impacts of the proposed works on cetaceans.

Figure 4-1: Cetacean records in the Waterford Estuary (June 2022 – June 2023) [9]

4.1.1.2 Otters

Otters are a protected species under the EU Habitats Directive (92/43/EEC) Annex IV. Additionally, otters are also protected under Annex II of the EU Habitats Directive, the Wildlife Act 1976/2000, the BERN convention and CITES [23]. Otters are listed as a near threatened species by the IUCN [24]. This species is commonly found in several habitats across Ireland including coastal areas (estuaries, sea inlets and bays), freshwater watercourses, riparian woodland, marshes / swamps, lakes, and ponds, all of which can be found within the vicinity of the Site.

The NBDC holds several records for otters within the vicinity of the Port of Waterford, the NBDC have thirty-three (33No.) records counts for otters for the 2km grid for which the proposed works will take place (NBDC Grid Square: S61R) [10].

A targeted otter survey was undertaken on the 19th of April 2023 by two (2No.) MOR ecologists at low tide when the mudflats were fully exposed and accessible. A majority of the Site is consistently covered by water; however, areas of mudflats and stonewalls / rock located within the northern section of the Site.

The survey identified otter footprints in the mudflat leading towards the Luffany Stream (see Figure 4-2). No holt or couches were noted as part of the completed survey and given the lack of suitable habitat for holting / couching; the Site was considered unsuitable for these purposes. Furthermore, the River Suir offers suitable prey species for foraging otter.

It should be noted that otter are currently utilising areas of the River Suir within close proximity to the active Belview Port. Therefore, it can be concluded that these otters are habituated to anthropogenic activities. Overall, it is concluded that the Site is not suitable for holting / couching otter but does provide commuting and foraging habitat for this species.

Figure 4-2: Otter Survey Results

This application will further assess the potential impacts of the proposed works on otters.

4.1.1.3 Marine Turtles

Marine turtles are the only reptiles found in Irish waters, however, only one (1No.) species is observed frequently enough to be considered a regular visitor to Irish waters – the leatherback turtle (*Dermochelys coriacea*).

Leatherback turtles are known to have atypical migration patterns and breed in warm tropical climates and during the summer months are known to forage in temperate waters for jellyfish and sea squirts, like Irish waters [25].

The NBDC holds historical information on leatherback sighting around the Irish coast, these records show the nearest sighting of a leatherback was over 8km southwest of the Site in 1984 [10]. The most recent sighting of a leatherback turtle in the vicinity of the Waterford Estuary was located off the east coast of Hook Head, Co. Wexford, ca.17km southwest, on 11th August 2012.

Loggerhead turtles have also been recorded in low abundances along the southeast coast of Ireland, the most recent recording of a loggerhead turtle in the southeast of Ireland was recorded on 20th December 2015 east of the Saltee Islands, Co. Wexford [10].

There have been no sightings of marine turtles within the vicinity of the Site. Additionally, no marine turtles have been recorded by the IWDG in the past 12 months in the southeast of Ireland [9]. However, two (2No.) records of leatherback turtles were recorded in County Clare and County Cork on the 24th September and 17th September 2022, respectively.

Therefore, this application will not assess the potential impacts to turtles given the low numbers recorded over the past 50 years in the Waterford Estuary, it is highly unlikely that turtles will occur within the vicinity of the Site. Therefore, it can be concluded that given the rarity and lack of records of marine turtles within the vicinity of the Site and in the Waterford

Estuary, there will be no significant disturbances, injuries or mortality events associated with the proposed works on marine turtles. Additionally, there will be no destruction or impacts to suitable breeding or resting sites for marine turtles.

4.1.1.4 Bats

In Ireland, there are eleven (11No.) recorded bat species, nine (9No.) of which are considered resident and two (2No.) which are considered vagrants (see Table 4-2 below).

Table 4-2: Status of Irish Bat Species

Bat Species		Irish status	European Status
Common Name	Scientific Name		
Resident Bat Species			
Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>	Least Concern	Least Concern
Brown Long-eared Bat	<i>Plecotus auritus</i>	Least Concern	Least Concern
Common Pipistrelle	<i>Pipistrellus pipistrellus</i>	Least Concern	Least Concern
Lesser Horseshoe Bat	<i>Rhinolophus hipposideros</i>	Least Concern	Near Threatened
Whiskered Bat	<i>Myotis mystacinus</i>	Least Concern	Least Concern
Daubenton's Bat	<i>Myotis daubentonii</i>	Least Concern	Least Concern
Leisler's Bat	<i>Nyctalus leisleri</i>	Least Concern	Least Concern
Nathusius' Pipistrelle	<i>Pipistrellus nathusii</i>	Least Concern	Least Concern
Natterer's Bat	<i>Myotis nattereri</i>	Least Concern	Least Concern
Vagrants			
Brandt's bat	<i>Myotis brandtii</i>	Data Deficient	Least Concern
Greater Horseshoe Bat	<i>Rhinolophus ferrumequinum</i>	Data Deficient	Near Threatened

Bats are social animals, and most species congregate in large colonies during the later spring / summer. These colonies consist mostly of females, with some juvenile males from the previous year. Male bats normally roost individually or in small groups meeting up with the females in the late autumn, when it is time to mate. In summer, bats seek warm dry roosts in which they can give birth and suckle their young. In winter, they seek out places with a constant low temperature and high humidity where they can become torpid and hibernate during adverse weather conditions. However, bats do not hibernate continuously during winter and will awake and hunt during mild nights when there are insects available and it is energetically advantageous to forage [26]. Bats will utilise caves, tree, and buildings with suitable features for roosting to roost within.

The NBDC provide a habitat suitability index for the nine (9No.) resident bat species within Ireland [10]. The habitat suitability index identifies the geographical areas that are suitable for individual species and ranges from 0 to 100, with 100 being the most favourable to bats. The Site itself is located within the River Suir and as such, according to the NBDC, there are no habitat suitability indices provided for this area [10]. The habitat suitability index for the area located north of the Site is considered to be high (Score: 36.44 – 58.56). Overall, it is

considered that given the fact that the Site is located within the River Suir, there are no onsite habitats or suitable features for roosting bats.

Some bats are known to forage over waterways, Daubenton's bat, however, these bats tend to require slow moving waters as they forage for insects a few centimetres above the surface of the water. It should be noted that this section of the River Suir is ca. 330m in width and is subject to tidal water movements and has a high flow of water. It is not considered that this section of the river would have slow-moving or still waters that would be suitable for foraging bats. Furthermore, following a review of the NBDC there were no records held for any bat species within 2km of the Site within the last ten (10No.) years (Grid Codes: S61L, S61M, S61R and S61X) [10]. Therefore, it is concluded that the Site is not considered to be suitable for roosting bats and is considered suboptimal for foraging bat species.

However, it should be noted that the proposed works will only take place between the proposed working hours of 08:00 and 17:00 hours Monday to Friday inclusive, 08:00 and 13:00 hours on Saturdays, and as such no works will be carried out at night, thereby limiting the noise effects on nocturnal species, such as bats.

Therefore, this application will not assess the potential impacts on bats as there will be no significant impacts, disturbances, injuries, or mortality events associated with the proposed works on bats.

4.1.2 Non-Annex IV Species

4.1.2.1 Pinnipeds

Ireland is home to two (2No.) pinniped species, the grey seal (*Halichoerus grypus*) and the harbour seal (*Phoca vitulina*). These species are not listed as Annex IV species under the EU Habitats Directive; however, they are listed as Annex II and Annex V species under the Habitats Directive and are also protected under the Wildlife Act 1976/2000 and the Bern Convention [27].

The NBDC holds records of grey seal ca. 1km downstream of the Site, while the nearest NBDC record of harbour seal is off the east coast of Hook Head [10]. Both species of seal are known to have colonies located around the southeast coast of Ireland including in the Slaney River Valley SAC and the Saltee Islands SAC [4].

This application will further assess the potential impacts of the proposed works on pinnipeds.

4.1.2.2 Basking Sharks

Basking sharks (*Cetorhinus maximus*) are also not listed as an Annex IV species in the Habitats Directive; however, they are protected under the Wildlife Act 1976 / 2000, Bonn Convention, CITES and OSPAR.

Basking sharks are not marine mammals and therefore not within the *Mammalia* class but are in fact part of the *Chondrichthyes* class of species, containing cartilaginous fish.

This species is known to be in high abundances during the summer months feeding on plankton off the coast of Ireland. There are records on the IWDG sighting portal of basking sharks within the vicinity of the Waterford Estuary in March and April in 2022, >21km downstream of the Site, however, there were no records of this species travelling up the estuary [9].

Basking sharks are known to occur in areas of open ocean and along coastal areas; however, only in occasional instances do basking sharks enter brackish waters similar to those within the vicinity of the Site. Therefore, given the location of the Site and the lack of records of basking sharks using the upper stretches of the Waterford Estuary, it is considered unlikely that basking sharks occur within the vicinity of the Site due the lack of suitable area for the filter feeding of plankton.

As such, this application will not assess the potential impacts on basking sharks as there will be no significant impacts, disturbances, injuries, or mortality events associated with the proposed works on basking shark.

4.2 Summary of Potential Impacts

Based on the nature of the proposed works, the following sections describe potential impacts that may occur in the absence of appropriate mitigation measures to the Annex IV species and non-Annex IV species that have been brought forward for further consideration (cetaceans, otter, pinnipeds).

4.2.1 Annex IV Species

4.2.1.1 Cetaceans

Cetaceans are known to rely heavily on sound as a form of communication, navigation, defensive mechanism and for foraging, while helping the marine mammal to comprehend surroundings and social structures. Echolocation is an important method for predator avoidance, navigation, foraging and communication. Cetaceans emit a series of short impulsive sounds (e.g., clicks) and examine the reflected echoes back to them to help determine map their surrounding environment.

Anthropogenic sound has the ability to reduce the efficiency and range of echolocation and can affect cetaceans in a various way, depending on a host of factors including age of the individual, intensity of the sound, distance from source and frequency of the sound emitted [1]. High sound pressure levels also have the ability to cause behavioural changes, auditory injuries, physical injuries and even death.

Individual cetaceans can experience identical sounds in different ways, hearing ability tends to decline with both age and exposure to harmful sound sources [1]. These effects on cetaceans can be classified into two different groups [28]:

- 1) Temporary Threshold Shift (TTS) – may result in a reduction in hearing sensitivity but is not permanent; and,
- 2) Permanent Threshold Shift (PTS) – may result in auditory injuries and in some cases can lead to death.

Marine mammals in Ireland can be grouped into five categories based on audiometric data, comparative anatomy, and the scientific studies [1, 28, 29]. Table 4-2 shows the hearing range of marine mammals that have the potential to occur within the vicinity of the Waterford Estuary based data collected from the IWDG sighting portal and NPWS.

Table 4-3: Cetacean hearing groups [1, 28, 29]

Cetacean Groups	Estimate Hearing Range	Examples (see Southall, et al., for full list)
Low frequency	7 Hz to 35 kHz	Minke whale, Fin whale,
Mid-frequency	150 Hz to 160 kHz	Dolphin species
High frequency	275 Hz to 160/180 kHz	Harbour porpoise

For each of the above groups, the proposed noise levels that would cause either TTS and / or PTS to individuals exposed to non-pulse sources (single or multiple discrete sound event within 24hrs – i.e., drilling) are outlined below in Table 4-3.

Table 4-4: Sound Pressure Level injury criteria [11, 21]

Cetacean Groups	Injury Criteria (non-pulse)	
	Temporary Threshold Shift	Permanent Threshold Shift
Low frequency	120 – 160 dB	230 dB
Mid-frequency	90 – 200 dB	230 dB
High frequency	90 – 170 dB	230 dB

As discussed in Section 3.4, the noise generated from such drilling is difficult to predict as it would be influenced by a variety of factors such as the nature of the riverbed i.e., whether drilling is into bedrock or not. However, drilling is considered to be less impactful on the aquatic environment but is understood to produce moderate levels of continuous omnidirectional sound at low frequency (several tens of Hz to several thousand Hz and up to c.10 kHz). Source sound pressure levels have generally been reported to lie within the 145-190 dB re: 1 μ Pa range [12]. While this has the potential to be within the TTS threshold for cetaceans, it is not considered to be within the PTS threshold.

However, it should be noted that the drilling of the boreholes and coreholes will be short in temporal (three (3No.) weeks) and spatial scale (ca. 200mm in diameter each). In addition, drilling will not be carried out at night. This will leave significant downtime for cetaceans to pass the Site, should species be migrating through the area. Furthermore, there will be downtime between the drilling of individual boreholes, coreholes and dynamic probes which will also provide an opportunity for cetaceans to pass the Site, and the proposed works will not result in any physical impediment / barrier to passage through the estuary for any cetacean species.

Furthermore, it is considered that the process of getting the barge in place and setting up the drilling equipment at the set locations would be expected to deter marine mammals from entering the immediate area of the works. Additionally, cetaceans are highly mobile species, and it would be expected that any species within the vicinity of the Site would leave the area of the proposed works [30].

Therefore, the impacts of the proposed works would be considered to be negligible on cetacean species given the short nature, low frequency, and highly localised area of the works. Nonetheless, precautionary mitigation measures will be put in place to prevent any impact on cetaceans within the vicinity of the Site, see Section 4-3.

4.2.1.2 Otters

As previously mentioned, otters have been recorded within the immediate vicinity of the Site and therefore there is potential for otter to be present within the vicinity of the Site during the proposed works. Otters are known to have acute sense of sight, smell, and hearing for which they rely on for traveling through muddy water and for foraging [31].

Potential impacts that are likely to occur to this species are not as well studied as cetaceans and pinnipeds which also have been recorded within the vicinity of the Site. Therefore, the levels of TTS and PTS for this species are not known. Therefore, taking a precautionary approach, it is considered that the noise from the proposed works will have the potential to adversely affect otter.

The proposed works are anticipated to take three (3No.) weeks, which could be considered a disturbance to the foraging area of otter within the vicinity of the Site. However, it should be noted that the works will be limited to the proposed working hours 08:00 and 17:00 hours Monday to Friday inclusive, 08:00 and 13:00 hours on Saturdays, and as such no works will be carried out at night, thereby limiting the noise effects on crepuscular species, such as otter.

Furthermore, there will be downtime between the drilling of individual boreholes, coreholes and dynamic probes which will also provide an opportunity for otter to pass the Site, and the proposed works will not result in any physical impediment / barrier to passage through the estuary for any otters.

In addition, it should be noted that due to the fact that the Site is located within the waters immediately adjacent to an existing port, it is anticipated that the area is currently subjected to anthropogenic noise from port related activities. Therefore, it can be concluded that otter within the vicinity of the Site are subject to anthropogenic noise sources. As such, given the evidence of otter within the immediate vicinity of the Port, it can be concluded that these otter are habituated to anthropogenic noise.

Also, it is considered that the process of getting the barge in place and setting up the drilling equipment at the set locations would be expected to deter otter from entering the immediate area of the works. Additionally, otter are highly mobile species, and given the abundance of suitable habitat located within the Waterford Estuary, it would be expected that any otter potentially disturbed by the proposed works would move to more suitable areas.

Therefore, the impact of the proposed works would be considered to be negligible based on the short nature, low frequency, and highly localized area of the works. Nonetheless precautionary mitigation measures will be put in place to prevent any impact on cetaceans within the vicinity of the Site, see Section 4-3.

4.2.2 Non-Annex IV Species

4.2.2.1 Pinnipeds

Both the grey seal and the harbour seal can be found across all coastal Irish waters, from estuarine waters that are close to human activity to undisturbed islands and the continental shelf [32]. Like cetaceans, pinnipeds have evolved to produce a variety of sounds which are critical for both social and reproductive interactions [28]. Unlike cetaceans, pinnipeds spend their time either at sea and on land, and thus produce sounds in both water and air.

Pinnipeds, like cetaceans, are sensitive to sound and can be affected by high sound pressure levels. However, pinnipeds are affected by both in water sound and in air sound at different levels, as shown in Table 4-5.

Table 4-5: Pinniped Hearing Groups [28]

Pinniped Groups	Estimate Hearing Range	Examples (see Southall, et al., for full list)
Pinnipeds in Water	75 Hz to 75 kHz	Grey Seal and Harbour Seal
Pinnipeds in Air	75 Hz to 30 kHz	

For each of the above groups, the proposed noise levels that would cause either TTS and / or PTS to individuals exposed to non-pulse sources (single or multiple discrete sound event within 24hrs – i.e., drilling) are outlined below in Table 4-6.

Table 4-6: Sound Pressure Level Injury Criteria for Pinnipeds [28]

Pinniped Groups	Injury Criteria (non-pulse)	
	TTS	PTS
Pinnipeds in Water	212 dB	218 dB
Pinnipeds in Air	144.5 dB	149 dB

British Standard (BS) 5228-1:2009+A1:2014 presents a sound level of 74dB (A) at 10m for ground investigation drilling using a cable percussion drilling rig. Also, according to the 'Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters' drilling can produce underwater pressure levels within the 145-190 dB re 1µPa @ 1m [12]. Therefore, at these levels, it is not anticipated that the proposed works will result on TTS or PTS for pinnipeds as a result of underwater or ambient noise.

As stated in section 4.2.1.1, the drilling will be short in temporal and spatial scale, and drilling will not be carried out at night, which will leave significant downtime for pinnipeds to pass the Site, should species be migrating through the area. Furthermore, there will be downtime between the drilling of individual boreholes, coreholes and dynamic probes which will also provide an opportunity for pinnipeds to pass the Site, and the proposed works will not result in any physical impediment / barrier to passage through the estuary for any pinnipeds species.

Furthermore, it is considered that the process of getting the barge in place and setting up the drilling equipment at the set locations would be expected to deter marine mammals from entering the immediate area of the works. Additionally, pinnipeds are highly mobile species, and it would be expected that any species within the vicinity of the Site would leave the area of the proposed works [30]. Therefore, the impacts of the proposed works would be considered to be negligible on both grey seals and harbour seals given the short nature, low frequency, and highly localised area of the works.

Nonetheless, precautionary mitigation measures will be put in place to prevent any impact on pinnipeds within the vicinity of the Site, see Section 4.3.

4.3 Mitigation Measures

4.3.1 Marine Mammal Observer (MMO)

Based on the potential impacts to Annex IV species and non-Annex IV species, a suitably qualified marine mammal observer (MMO) shall be appointed to monitor for marine mammals and otter as per the measures recommended for drilling in the 'Guidance to Manage the Risk to Marine Mammal from Man-made Sound Sources in Irish Waters' [12]. The MMO will log all relevant events using standardised data forms prepared by the Department of Arts, Heritage and the Gaeltacht (DAHG).

Prior to the commencement of any works and any equipment starting, a pre-start monitoring procedure will be undertaken. Given the depth of water within the vicinity of the Site is less than 200m in depth, the pre-start monitoring will initiate at least 30 minutes prior to the start time. A monitoring zone will be employed of 500m in radial distance from the sound source. Should otter or marine mammals be identified within the monitoring zone, works will be delayed until these species have not been sighted for 30 minutes within the monitoring zone. The MMO will use a range finder to determine the distance of marine mammals from the sound source. Following the pre-start monitoring, works will commence.

Where visual observations are not possible due to sea state or weather conditions, a Passive Acoustic Monitoring (PAM) system and experienced operator will be employed to undertake the pre-start monitoring.

As per the guidelines, once the drilling works have fully commenced, there is not requirement to halt the procedure if weather conditions deteriorate or due to a lack of daylight or if otter / marine mammals enter the monitoring zone. However, should drilling operations pause for a period of 30 minutes or more than a full pre-start monitoring procedure will be required prior to drilling activity.

4.3.2 Reporting

Operations and mitigation should be fully reported to the DHLGH to facilitate reporting under Article 17 of the European Commission Habitats Directive and future improvements to guidance.

4.3.3 Otter Specific Mitigation

Given the known presence of otters within the immediate vicinity of the Site, it is proposed that additional mitigation measures be put in place to ensure that otters are not impacted during the proposed works. These measures include:

- In advance of the works commencing, a pre-commencement otter survey will be undertaken along the shoreline to ensure no otter holts are located within 150m;
- In advance of works, all Site personnel will receive a Site induction or toolbox talk which will include reference to measures detailed in the CEMP;
- Activities onsite to occur only during permitted hours;
- All plant where possible shall be low noise rated;
- Onsite policy for all plant and equipment, including Site delivery vehicles, to power off rather than to be left with idling engines;
- All plant will be in a fit condition for use, to prevent the addition of noise from maintenance issues;
- Management of deliveries and vehicles to minimise vehicles idling onsite;
- Careful selection of quiet plant and machinery to undertake the required work, where available; and,
- Handling of all materials will take place in a manner which minimises noise emissions.

4.4 NPWS Assessment Criteria

In addition to the above risk assessment, the following assessment criteria as outlined in the 'Guidance to Manage the Risk to Marine Mammal from Man-made Sound Sources in Irish Waters' [12] has been completed.

1. Do individuals or populations of marine mammal species occur within the proposed area?

The likelihood of cetaceans being within the Site is very low, given the shallow water depth and close proximity of the Site to the active Belview Port. Although cetaceans have been recorded within the Waterford Estuary, their abundance has been generally low and furthermore, cetaceans are highly mobile.

There are no important haul out sites for harbour or grey seals located within the Site or within close proximity to the Site. However, it is considered possibly that seals could foraging within the River Suir within the vicinity of the Site.

Otter are known to occur within the vicinity of the Site. However, these otters are subject to anthropogenic noise sources from port related activities, and therefore, it can be concluded that these otters are habituated to anthropogenic noise.

Cetaceans, pinnipeds and otter are all highly mobile species.

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

For drilling works, such as the proposed works, the underwater source sound pressure levels have generally been reported to lie within the 145-190 dB re: 1 µPa range [12]. According to these SPL, the proposed works are unlikely to cause death to any marine mammal species

due to the fact that these levels are not within the PTS threshold. However, the works do that the potential to result in injury (TTS) or disturbance to marine mammals located within the immediate vicinity of the Site in the absence of mitigation measures.

Furthermore, it should be noted that the PTS and TTS thresholds for otter are not known, therefore, taking a precautionary approach in the absence of mitigation measures it is considered that there is potential for damage to occur to otter.

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

No abundance estimates for cetaceans, pinnipeds or otter in the Belview Port, or the adjacent waters are available. The presence of cetaceans are occasionally recorded primarily in the Waterford Estuary downstream of the Site; however, recent records have identified possibly harbour porpoise upstream of the Site.

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

The timing of the drilling works will be reliant on the timing of the grant of the Licence Application. Therefore, this could expose some cetaceans, pinnipeds and otters which may lead to negative effects.

However, there are no known seal pupping sites or calving areas for cetaceans located within the vicinity of the Site. In addition, otter holts have not been identified within the vicinity of the Site.

Furthermore, these species are all highly mobile and are likely to forage over a wide area therefore it is considered likely that should these species be disturbed by the proposed works, these species will move to suitable habitat in the wider area. In addition, the proposed works will be short-term and localised in nature. Therefore, it is considered that any disturbances to species will be short term and negligible.

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

There is no data to suggest that any particular marine mammal gender or age group are more likely to occur within the vicinity of the Site compared to other genders or ages. Therefore, all genders and age groups must be expected to occur.

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

Although cetaceans and pinnipeds have been reported within the wider area, these species have not been recorded within the Site and it is considered that the Site does not provide any habitats of importance for these species.

The Site is located within the Lower River Suir SAC, which is designated for otter; however, the Site is located adjacent to the existing and active Belview Port. It is assumed that the proposed works will not displace otter from any key functional areas. This assumption is based on the fact that otter located within the vicinity of the Site are subject to anthropogenic noise sources from port related activities and are habituated to anthropogenic noise. Although the proposed works are anticipated to take three (3No.) weeks, which could be considered a disturbance to the foraging area of otter within the vicinity of the Site, it should be noted that the works will be limited to the proposed working hours 08:00 and 17:00 hours Monday to Friday inclusive, 08:00 and 13:00 hours on Saturdays, and as such no works will be carried out at night, thereby limiting the noise effects on crepuscular species, such as otter.

It is therefore considered unlikely that the proposed works will displace otter from any key functional areas given the location of the Site within the active port area and the fact that works will not take place during the peak activity hours for otter.

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

Any disturbance of marine mammals, if it occurs, will be very short term (three (3No.) weeks) and will recover within a very short period with the recommended mitigation in place.

5 CONCLUSION

The assessment of the proposed works that have the potential to impact both Annex IV species and other marine mammals within the vicinity of the Site (pinnipeds and basking sharks) is based on a worst-case scenario and it can be concluded that the proposed works would not have an effect on either any marine mammals based on:

- The implementation of the mitigation measures listed in Section 4.3 would reduce any potential effects (physical or auditory) on marine mammals within the vicinity of the Site;
- The proposed works being short-term (three (3No.) weeks), localised and within an area of existing high marine traffic; and,
- Marine mammals recorded within the vicinity of the Site are highly mobile and would likely leave the vicinity of the Site during the setting up of equipment.

Therefore, the proposed works will not significantly affect any Annex IV species or other marine mammals within the vicinity of the Site, and it is considered that a derogation license would not be required for the proposed works.

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APPENDICES

APPENDIX A

**BOREHOLE /
COREHOLE CO-ORDINATES**

BH 1 / CH 1 E 266435.2168 N 113429.1219
BH 2 / CH 2 E 266466.7254 N 113501.8833
BH 3 / CH 3 E 266500.3719 N 113577.0874
BH 4 / CH 4 E 266529.5586 N 113581.8649
BH 5 / CH 5 E 266553.0895 N 113643.6120
BH 6 / CH 6 E 266597.6736 N 113668.2627
BH 7 / CH 7 E 266638.5441 N 113720.5109
BH 8 / CH 8 E 266677.6178 N 113769.4727

BOREHOLE CO-ORDINATES

BH 9 E 266517.8176 N 113618.8365
BH10 E 266596.6604 N 113708.3039

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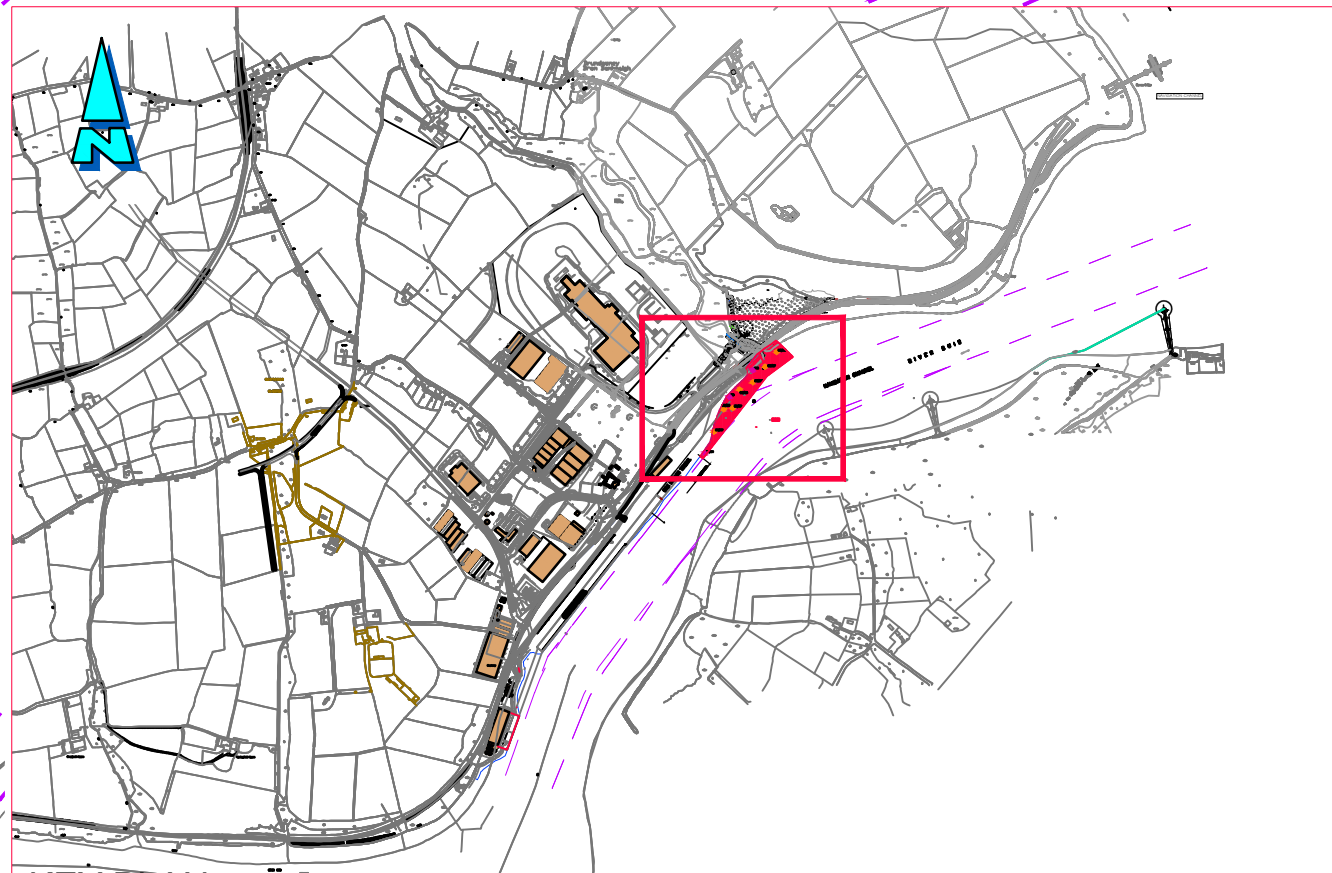
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NOTED OTHERWISE.
4. THE CONTRACTOR SHALL CHECK ALL
DIMENSIONS PRIOR TO
COMMENCEMENT OF CONSTRUCTION.
DISCREPANCIES SHALL BE REPORTED
TO THIS OFFICE IN WRITING.
5. THIS DRAWING TO BE READ IN
ACCORDANCE WITH ALL RELEVANT
ENGINEERS' DRAWINGS AND
SPECIFICATIONS.

NAVIGATION CHANNEL

- PROPOSED BOREHOLE LOCATIONS
(200mm Ø MIN)
- PROPOSED BOREHOLE / COREHOLE
LOCATIONS
(200mm Ø MIN)



KEY PLAN

DON'T SCALE DIMENSIONS

P Application for a Maritime
Usage Licence under the
Maritime Area Planning Act
2021

20.10.2023 SD ES ES

THIS DRAWING TO BE USED FOR
PLANNING PURPOSES ONLY

ADR
MALONE O'REGAN
CONSULTING ENGINEERS

3-4 Canada Street
Waterford
Co. Waterford.
X91 V52K
Tel: +353 51 876 855
Email: waterford@moroe.ie
Web: www.maloneoregan.com

Offices also in:
DUBLIN : Tel: +353 1 260 2655 Email: dublin@moroe.ie
GALWAY: Tel: +353 91 531 069 Email: galway@moroe.ie
LONDON: Tel: +44 208 5281685 Email: london@moroe.ie

Client **PORT OF WATERFORD
COMPANY**

Job **BELVIEW PORT MASTER PLAN
DELIVERY PROJECT
SITE INVESTIGATION WORKS**

Drawing
SITE INVESTIGATIONS LOCATION PLAN

Job No **W20088** Drg No **MA 803** Stage **PL** Revision **P** Scale **A3 1:2500**

APPENDIX B



250m ORE Capable Quay Extension at Belview Port

Geotechnical Investigations

Date: May 2023
Job No: W20088

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INTRODUCTION

The Geotechnical Investigations at Belview Port will involve mobilising a jack up marine plant which will be assembled alongside the existing quay structure in a suitable area. The Cable Percussive and Rotary Drilling Rigs will be crane lifted onto the barge and secured to the deck which will act as a work platform for the drilling works over water. Boreholes and coreholes will be carried out in accordance with the attached method statements by a trained geotechnical crew under the supervision of the specialist company's Geotechnical Engineer. The works are limited to the specific exploratory hole locations envisaged to have a limited impact on the surrounding area with the specified. As the proposed plant involves the use of a jack up barge, the use of anchors or casting ropes other than for the safety boat is not anticipated. Very limited impact on the river bed is expected with openings limited to 50 to 200mm diameter and no spoil mounds generated as all works will be contained within metal casings. On completion of the works all plant and equipment will be returned to the quay and craned off the jack up barge which will then be disassembled and demobilised from site. The field works are anticipated to be completed in a five week period, subject to tidal movements and weather conditions.

Typical equipment and rig details for the below listed plant are included in the preliminary method statements in the following sections of this document;

- Data Sheet for Edgetch 3100P proposed to be used for the geophysical survey
- Data Sheet for proposed Cable Percussive Boring Rig (Dando 2000/3000)
- Data Sheet for proposed Rotary Coring Rig (Boart Longyear Delta Base 520)
- Details of proposed Dynamic Probing Rig (Archway Competitor 130)
- Method Statements for the above mentioned items

PRELIMINARY METHOD STATEMENT – LIGHT CABLE PERCUSSIVE BORING

INTRODUCTION

Work will be undertaken to conform to the current BS 5930 and BS 1377 standards, BDA 'Code of Safe Drilling Practice' and 'Guidance Notes for the Safe Drilling of Landfills and Contaminated Land' as appropriate and the contract specification.

INITIAL LOCALTION

The drilling rig will be set up in a manner that is safe for operating personnel. In particular the vicinity will be checked for any obvious signs of services or other hazards. Where appropriate harris fencing will be used to surround the mobilisation and assembly area. Other signage will be provided as required.

Equipment arisings and spoil will be placed so as not to present a hazard to the operatives or the general public.

The borings will be numbered precisely as outlined by the engineer on the drilling instructions.

BORING EQUIPMENT AND DIAMETER OF BORING

Boring will normally be carried out using a cable percussion rig such as a Dando 2000/3000 rig or similar, and tools, such as shells, clay cutters or chisel and sinker bars, as required. Spill kits shall accompany the rig for all works over water. Refuelling and storage of fuel for the rig shall be limited to small individual containers of maximum 25 litres each and shall be undertaken in a fully controlled manner.

The minimum diameter of borings or internal diameter of casing will be 150mm and the maximum will be 200mm.

Where borings are of such depth that the advancement of a casing may become impracticable or where hard strata and obstructions are likely to be met, additional strings of casing of sufficient diameter to complete the work will be provided.

The diameter and depth of boring and the diameter and depth of all casing will be noted on the Daily Report.

WATER IN BORING AND OBSTRUCTIONS

Water will not be added unless specific permissions is given by the geotechnical specialist.

For conditions where the addition of water is permitted the driller will use the minimum amount of water necessary for advancing the boring.

In boring where hard strata or obstructions are encountered the driller will continue boring using chisel or similar approved tool for a minimum approved time (normally of 1 hour) in an attempt to penetrate the hard strata or obstruction.

BEST PRACTICE FOR SAMPLING

The preparation for the methods of taking sampling, together with their size, presentation and handling will be in accordance with British Standards BS 5930: 1981 – Code of Practice for Site Investigations.

Samples will be returned to the site office or to a safe store protected from the weather and from high or low temperatures, at the end of each shift. All samples will be protected at all times from temperatures below 5 and above 25 degrees Celsius, and from wetting or drying out due to weather exposure.

SAMPLING AND TESTING INTERVAL AND RECORDING

At each stage in soil type or change in consistency a small disturbed sample will be taken.

Sampling will be in accordance with drilling instructions issued.

The depths from which all samples are taken will be recorded on the Daily Reports.

For “undisturbed” samples the levels at the top and at the bottom of sample, and the length of sample obtained will be given or “not recovered”. A small disturbed sample will be taken from the shoe.

For “bulk disturbed” samples the limits of the samples zone will be recorded.

For SPT’s the full length of the drive will be recorded together with non recovered samples being noted.

In inspection pits a “small disturbed” sample will be taken at each change in soil type or 0.5m intervals whichever is closest. Bulk disturbed samples of granular materials or major units will be taken.

IN SITU TESTING AND MEASUREMENTS

The Standard Penetration Test (SPT) will be carried out as per BS 1377: 1990.

The SPT assembly will be lowered to the base of the hole and then any penetration due to self-weight will be recorded.

During the SPT the blows for two increments of 75mm, or the penetration after 25 blows will be recorded as the seating drive. The seating drive will be terminated after 150mm penetration or 25 blows whichever is reached first and the test drive will then be started.

After the seating drive of the SPT blows for four increments of 75mm will be recorded as the test drive. The test drive will be terminated after 300mm penetration or a total of 50 blows in the test drive, whichever is reached first and the penetration and blows and for each increment will be recorded. In the case of weak rocks a total of 100 blows for a test drive will be recorded.

A small disturbed sample from the split spoon sampler will be taken, or a bulk disturbed sample of the soil in the zone of the test if no split spoon sample is available.

DANDO 2000 MK2 AND 3000 MK2



A Geotechnical shell and auger drill rig with a host of new features carefully designed to complement the reliable, versatile nature of the tried and tested Dando 2000 and 3000.

New, more powerful clutch - Gives the driller a more responsive "snappy" feel

Improved winch guarding

Electric mast raising system - For faster, safer raising of the rig

Increased engine silencing

Composite, maintenance free crown sheave with a new sheave material -

allowing for longer life without the need for maintenance or greasing

Emergency stop button



**DANDO DRILLING
INTERNATIONAL LTD**

Dando 2000/3000 Mk 2**Specification details**

Complete mobile drilling rig for operating percussion drilling tools and casing, sampling and testing equipment. Suitable for towing behind Landrover or light truck.

The mk 2 features a new clutch, giving an improved snatch capability to the rig.

Full clutch and winch guards are fitted as standard.

GENERAL SPECIFICATIONS

	2000	3000
Engine Power	18 hp (13kW) @ 1800 rpm	20 hp (15kW) @ 1600 rpm
Winch (Single Line Pull)	2000 kgf	3000 kgf
Drilling Depths and Diameters	6 inch to 250ft (150mm) (75m) 15 inch to 150ft (380mm) (45m)	6 inch to 300ft (150mm) (90m) 18 inch to 175ft (460mm) (55m)

NOTE: The maximum drilling capacity is dependent on drilling conditions and type and size of tools. The figures given provide a general guide only.

	2000	3000
Derrick Working Height under sheaves	5.2m	5.2m
Overall Height derrick erected	6.65m	6.55m
Derrick loading	6000kg	9000kg
Travelling Dimensions - length	7.5m	8.5m

Shipping Specification - Engine and Winch Unit

LENGTH: 2.44m(8'0") WIDTH: 1.62m(5'3")

HEIGHT: 1.38m(4'6")

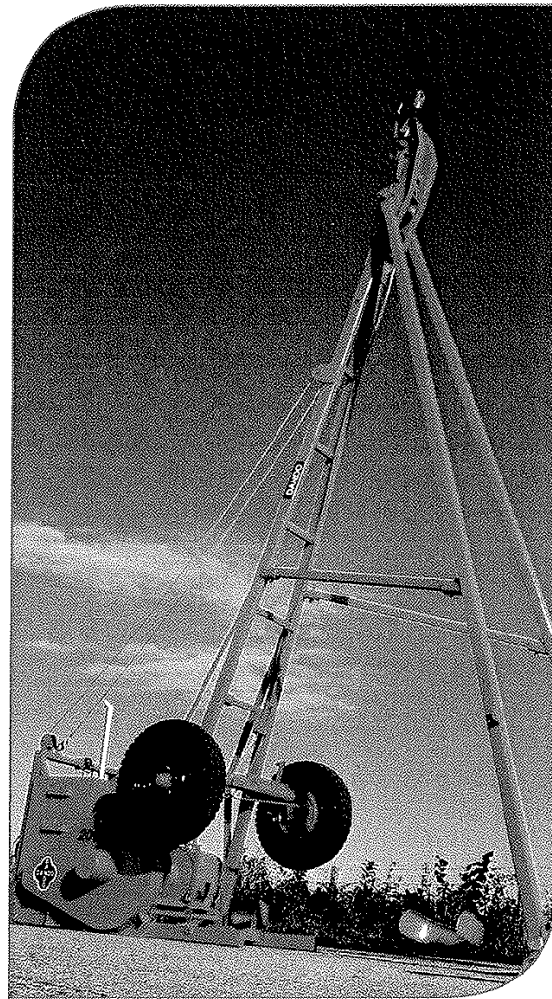
Shipping Specification - Mast Unit

LENGTH: 6.7M (21'9") WIDTH: 1.8m(2'9")

HEIGHT: 1.10m(1'6")

An independent electrically operated winch with remote cable control is fitted to the Sampson post so that the derrick legs can be raised and lowered safely.

Also including removable mud guards and overrun braking mechanism incorporating towing eye and parking brake lever.

**DANDO DRILLING
INTERNATIONAL LTD**

Dando Drilling International Limited, Old Customs House, Wharf Road, Littlehampton, West Sussex BN17 5DD, England
Telephone: +44 (0) 1903 731312 Fax: +44 (0) 1903 730305 E-mail: info@dando.co.uk Website: www.dando.co.uk

PRELIMINARY METHOD STATEMENT – ROTARY DRILLING

INTRODUCTION

All foreman drillers will be suitable trained and experienced. Work will be undertaken to conform to the current BS 5930 and BS 1377 standards, BDA 'Code of Safe Drilling Practice' and 'Guidance Notes for the Safe Drilling of Landfills and Contaminated Land' as appropriate and the contract specification.

The geotechnical engineer will issue written instructions for each borehole before it is started.

INITIAL LOCALTION

The drilling rig will be set up in a manner that is safe for operating personnel. In particular the vicinity will be checked for any obvious signs of services or other hazards.

Equipment arisings and spoil will be placed so as not to present a hazard to the operatives or the general public.

The borings will be numbered precisely as outlined by the engineer.

Rotary drilling will be undertaken using a top drive Deltbase 520 or Soil Mech Rotary Rig.

A crane shall be utilised to lift the rotary rig onto the deck of the jack up platform. The rig shall then be chained / welded to the deck of the jack up platform.

Spill kits shall be carried by all rigs.

Fuel shall be limited to 25 litre containers and spill trays utilised when refuelling. No fuel will be stored on board the marine plant.

TYPES OF DRILLING

Rotary drilling will be carried out into the bedrock. Open hole drilling may be carried out where core drilling is not required. Borehole size will vary depending on the requirement of the project but will generally be a minimum of 150mm diameter and a maximum of 190mm in overburden. In rock the borehole size shall be approximately 100mm diameter. Typical depths for rotary drilling shall be 0 to 30m below ground level and will be determined by the geotechnical engineer.

Rotary core drilling will normally be carried out with diamond or tungsten carbide tipped bits which will be suitable for the percentage core recovery and diameters specified.

Where rotary drilling is required within weathered rock strata which include friable or soft layers, softer lenses within solid rock, or other than solid continuous strata, the driller will bring to site suitable well maintained equipment to produce cores in such strata as to meet the recovery requirements and the specification.

The drilling fluid will normally be potable water or reservoir water.

Rotary core drilling will produce cores of circular cross section of the nominal specified diameter throughout the core length. The type and state of the drill bit, feed rates and management of the drill will be such that the specified core recovery in any single run can be obtained where the condition of the rock permits.

The depth of the start and finish of the core run, the depth to the base of the casing and the diameters of the core and casing will be recorded, together with the water level whenever practicable. The flush returns, loss of flush and condition of core bit and barrel, core recovery and possible location of any core losses will also be recorded. For any overwater boreholes it is intended that the flush returns are released directly into the reservoir.

Where it is necessary to provide rock by open hole drilling from ground level or by rotary core drilling, then the rock will be proved to 1.5m depth or as otherwise instructed by the Engineer.

The core will be extruded in the same direction as it entered the barrel, without vibration and in a manner to prevent disturbance. The cores will be extruded directly into the core box or into a correctly sized detachable channel.

After extrusion all cores will be wrapped/taped in mylar and will immediately be placed in core boxes to prevent damage to the cores.

CORE BOXES, PACKAGING ARRANGEMENT, LABELLING, STORING

Core boxes will be soundly constructed in timber in other approved material, fitted with stout carrying handles, fastening and hinged lids.

Cores will be placed in the box with the shallowest core to the top left hand corner, the top being considered adjacent to the hinged section.

Depth will be indicated by durable markers at the end of each drill run. The depth at the beginning and end of each channel in the core box will likewise be labelled. Where 100% recovery has not been achieved, core spacer pieces clearly indicating the missing lengths will be placed in the boxes.

IN SITU TESTING AND MEASUREMENTS

The Standard Penetration Test (SPT) will be carried out as per BS 1377: 1990.

The SPT assembly will be lowered to the base of the hole and then any penetration due to self-weight will be recorded.

During the SPT the blows for two increments of 75mm, or the penetration after 25 blows will be recorded as the seating drive. The seating drive will be terminated after 150mm penetration or 25 blows whichever is reached first and the test drive will then be started.

After the seating drive of the SPT blows for four increments of 75mm will be recorded as the test drive. The test drive will be terminated after 300mm penetration or a total of 50 blows in the test drive, whichever is reached first and the penetration and blows and for each increment will be recorded.

A small disturbed sample from the split spoon sampler will be taken.

The details of the SPT will be recorded on the Daily Report. The size and depth of casing and depth of water will be recorded. The number of blows for each of the 75mm increments will be recorded together with the sample length. If the full penetration is not obtained, then the number of blows and actual penetration for the increment will be recorded.

During the normal boring operations when groundwater is encountered the depth and point of entry will be noted and operations stopped for not more than 20 minutes and the depth from ground level to water level recorded at five minute intervals. The boring will then be continued unless otherwise instructed. The depth at which casing seals off the entry of water will be recorded.

If groundwater occurs as a slow seepage then the level will be noted and the boring continued.

Water levels will be recorded at the beginning and end of each shift.

At each occasion groundwater is recorded the depth of hole and sizes of casing will be noted.

Field permeability tests will be carried out under the direction of the Engineer. A record of each test will be made on the Daily Report.

For periods where the rig is unattended / outside of work shift, then the rig shall be left standing in a manner that does not allow tidal variation to influence the works. Where a jack up is involved this will require jacking the work platform to a height beyond the influence of the tides / swell / waves.

DeltaBase 520

Technical Data Sheet



Release Date Feb 25th, 2008

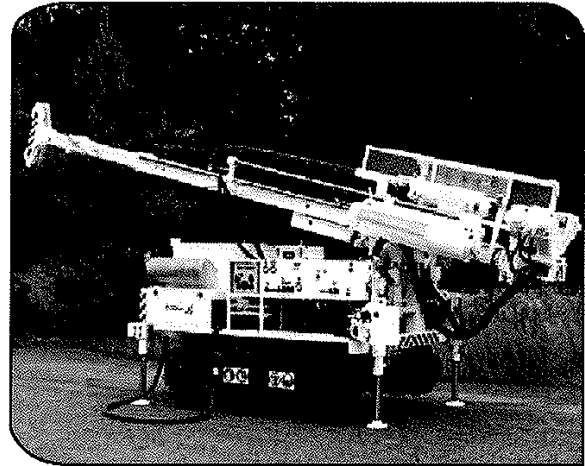
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PRODUCT OVERVIEW

The DeltaBase 520 is a compact and lightweight multipurpose drill rig designed for geotechnical investigation, construction and exploration drilling. Its ability to perform a variety of different types of drilling makes the DB520 a valuable asset to any drill fleet.

Features:

- Fast and easy changes between wireline coring, DTH drilling, flush rotary and auger drilling
- Automatic SPT equipment with digital blow counter
- Hydraulic mast raising and independent hydraulic jacks for fast rig mobilization
- Standard safety features including an interlocked safety cage and low speed, low torque rotation for safer rod management
- Hydraulic make and break rod clamps



STANDARD DRILLING SYSTEMS

	METRIC SYSTEM	US CUSTOMARY SYSTEM
CORE DRILLING		
NO / NO2" / NV / NV2"	210 m	690 ft
HO / HV	150 m	490 ft
PO / PV	100 m	330 ft
SQ	60 m	196 ft
ROTARY DRILLING (TRICONE)		
Hole diameter - 216 mm (8.5 in)	120 m	390 ft
AUGER DRILLING		
Hole diameter - 150 mm	15-20 m	49-65 ft
DTH DRILLING PACKAGE		
Maximum Size DTH Hammer	98 mm (3 7/8") @ max 17,2 m ³ / min @ max 24 bar	
Maximum Depth Capacity	200 m	656 ft
Recommended Hole Size	115 mm	4.5 in
Maximum Hole Size	127 mm	5 in
Recommended Rod Size	76,1 mm	3 in

DTH SHOCK ABSORBER FOR ROTARY HEAD INCLUDED

Notes: Air compressor must be selected according to hammer used.

In-line oiler and shock absorber are required for DTH drilling.

DeltaBase 520

Technical Data Sheet



Release Date: Feb 25th, 2008

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TECHNICAL SPECIFICATIONS

	METRIC SYSTEM	US CUSTOMARY SYSTEM
PRIME MOVER		
Standard	Deutz D914L04 air cooled engine, COM III	
Fuel	Diesel	
No. of Cylinders	4	
Swept Volume	4,31 l	263 cu. in
Power	53 KW @ 2300 rpm	71 hp @ 2300 rpm
Fuel Tank Capacity	60 l	16 gal
Specific Fuel Consumption	225 g/kWh	
Standard engine for work up to	1000 m @ 30°C 1700 m @ 0°C without power loss	
PRIME MOVER FOR HIGHER AMBIENT TEMPERATURE OR HIGHER ELEVATIONS - OPTIONAL EQUIPMENT		
Engine	Deutz BF4L914 air cooled engine, COM II	
Fuel	Diesel	
No. of Cylinders	4, turbocharged	
Swept Volume	4,31 l	263 cu. in
Power	72,4 kW @ 2300 rpm	97 hp @ 2300 rpm
Fuel Tank Capacity	60 l	16 gal
Specific fuel consumption	223 g/kWh	
Maximum altitude without power loss	53 kW - 1000 m @ 60°C, 2000 m @ 50°C, 3000 m @ 35°C, 4000 m @ 25°C, 5000 m @ 10°C	
ROTARY HEAD DD52		
Low Gear	4890-977 Nm / 48-25 rpm	3606-720 lb-ft / 48-250 rpm
High Gear	1859-371 Nm / 140-740 rpm	1371-273 lb-ft / 140-740 rpm
Bore - Inside Diameter	62 mm	2.44 in
Flushing Head - Inside Diameter	22 mm	0.87 in
Rotation Motors	Danfoss - variable / reversible with pressure remote	
Top drive Flange	2 3/8" API Reg PIN	
Floating spindle and flushing head included		
Hydraulic motor at max/min displacement, diesel engine at 2200 rpm		
Gear Ratio - 1 st	7.68 : 1	
- 2 nd	2.92 : 1	
Rotary Head Carriage with side shift		

DeltaBase 520

Technical Data Sheet



Release Date Feb 25th, 2008

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TECHNICAL SPECIFICATIONS

	METRIC SYSTEM	US CUSTOMARY SYSTEM
HYDRAULIC SYSTEM		
Primary Pump	Parker bent axis, fixed displacement	
Maximum Flow	66 lpm @ 2200 rpm	17.5 gpm @ 2200 rpm
Maximum Pressure	250 bar	3626 psi
Secondary Pump	Cassappa gear pump	
Maximum Flow	59 lpm @ 2200 rpm	15.5 gpm @ 2200 rpm
Maximum Flow (2nd)	48 lpm @ 2200 rpm	12.5 gpm @ 2200 rpm
Maximum Pressure	175 bar	2538 psi
Oil Tank Capacity	200 l	53 g
DRILL MAST AND FEED SYSTEM		
Feed Stroke	3400 mm	11.2 ft
Feed Speed - up	21 m/min	69 ft/min
- down	34 m/min	111 ft/min
Fast Feed Speed - up	48 m/min	157 ft/min
- down	75 m/min	246 ft/min
Pull Down Force	25 kN	5620 lbf
Pull Back Force	38 kN	8550 lbf
Drilling Inclination	45° horizontal to 90° vertical down	
Mast Dump	500 mm	1.6 ft
Rod Length	3000 mm max	9.84 ft max
MAIN WINCH SH220		
Line Pull	20 kN	4500 lbf
Line Speed	44 m/min	114 ft/min
Cable Length, 12 mm	30 m	98.4 ft
ROD CLAMPS		
Maximum Diameter	220 mm	8.6 in
Maximum Clamping Capacity	175 kN	4500 lbf
Maximum Breaking Torque	20,5 kNm	15120 lb ft

DeltaBase 520

Technical Data Sheet



Release Date: Feb 25th, 2008

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TECHNICAL SPECIFICATIONS

	METRIC SYSTEM	US CUSTOMARY SYSTEM
UNDERCARRIAGE		
Type	Crawler mounted triple grouser steel tracks	
Maximum Driving Speed	1,5 km/h	1.0 mph
Axis Distance	1715 mm	67.5 in
Maximum Ground Pressure	0,053 MPa	7.7 psi
Climbing Capacity	(Grade ability 60%) approximately 30°	
Optional Undercarriage	Trailer Mounted, Skid Mounted	
MAST EXTENSION FOR LONGER ROD PULL		
Maximum Rod Pull	2 x 3 m (6 m)	19.7 ft
Fitted onto standard mast to pull 6 m rod		
Rod Storage Rack	30 pieces of 76 mm rods	
Towing Hook on Rear of Rig		
Air Connection on Rear of Rig for DTH Compressor		
OPTIONAL EQUIPMENT		
WIRELINE WINCH		
Line Pull	6,5 kN	1461 lbf
Line Speed	100 m/min	328 ft/min
Cable Length 6 mm	250 m	820 ft
MUD PUMP DP100		
Continuous Flow	90 l/min	23.7 gpm
Maximum Flow	100 l/min	26.4 gpm
Pressure	30 bar	435 psi
MUD PUMP DP200		
Continuous Flow	160 l/min	42 gpm
Maximum Flow	180-200 l/min	47-53 gpm
Pressure	30 bar	435 psi
Flushing Head with 42 mm ID Included		
FMC PUMP L0918		
Flow	100 l/min	26 gpm
Pressure	45 bar	652 psi

DeltaBase 520

Technical Data Sheet



Release Date Feb 25th, 2008

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TECHNICAL SPECIFICATIONS

METRIC SYSTEM		US CUSTOMARY SYSTEM
SPT (STANDARD PENETRATION TEST) AUTO HAMMER		
Impact Rate	1-30 bpm	
Travel Length	762 mm	30 in
Hammer Weight	63,5 kg	140 lb
CENTRALIZER - ROD GUIDE		
Exchangable Inserts for Rods	76, 89, 114, 127, 140, 168, 193, 220 mm (Choose required sizes)	
OIL LINE LUBRICATOR FOR DTH DRILLING		
Oil Tank Capacity	20 l	5.3 gal
HIGH TEMPERATURE OIL COOLER		
Upgraded oil cooler for ambient temperature over 35° C (95° F)		
NIGHT LIGHTS		
No. of Pieces	4	
JAW BODY FOR CLAMP AND BREAK OUT FOR CORING		
Jaw Plates for Coring	BQ / BW	
(choose required sizes)	NQ / NW	
	HQ / HW	
	PW	
MIST PUMP		
Flow	30 l/min	8 gpm
Pressure	200 bar	2900 psi
ACCESSORIES		
Auxiliary Work Vice	180 mm wide, 220 mm long, 120 mm deep clamp, rotating mounting base and separate rod support work bracket	
Remote Control	Radio remote control for driving	
Auxiliary Diesel Filling Pump	Electric powered diesel filling pump	
Data Logger Couplings	3 Couplings for data logger (feed pressure, rpm, mud pump pressure)	
Instrument Vandal Covers	Lockable covers for control panels and instruments	
Rubber Crawler Pads	Full set (76 pcs)	
Tool Box	With necessary set of tools for basic maintenance and lubrication	
Environmental oil in hydraulic system		

DeltaBase 520

Technical Data Sheet



Release Date Feb 25th, 2008

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DIMENSIONS AND WEIGHTS*

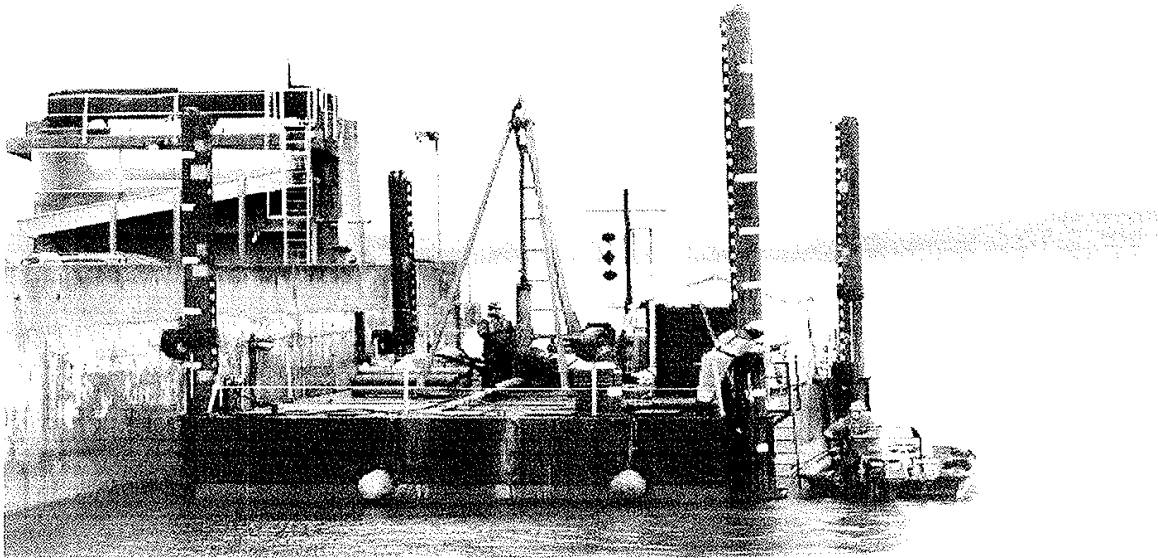
WEIGHT	
Operational Weight = 6500 kg (14330 lb) (approx.)	Consisting of:
Dry Weight = 6200 kg (13670 lb)	Diesel Power Unit Group DEUTZ D914L04 4.10 litre 4 cylinder
	Hydraulic Module
	Main Winch c/w Cable
	Hydraulic Mast Raising (Independent)
	Lower Mast Assembly
	Levelling Jacks (Hydraulic)
	Rotary Head
	Crawler - triple grouser type
	Battery
	Foot Clamp and Breaking Clamp
MEASUREMENTS	
UNDERCARRIAGE Width = 1900 mm (74.8 in) Pad width = 300 mm (11.8 in) Weight = 1035 kg (2280 lb) SPT Hammer weight = 63,5 kg (140 lb) Drop stroke = 760 mm Total weight = 180 kg (397 lb)	

* Dimensions and weights may vary depending on options and should be checked before starting an operation.

Boart Longyear is constantly striving to improve its products and must therefore, reserve the right to change designs, materials, specifications and price without notice.

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JACK UP BARGE



The typical pontoon may be made up of 2 main saddle pontoons with two more floatation tanks and a bridge that joins all together which gives a working deck area of 67 sq.m. With 4 x 18m spud legs this allows it to work in depths of up to 15 metres. Twin rams on each leg give a stroke of 1.53 metres and this can give a payload of up to 13 tons. The Hydraulics is worked by two power packs which provide maximum reliability and rapid movement of the rams.

Dimensions & Specifications:

Deck Area	11m x 6m
Moulded Depth	2m
Legs	4 x 18m
Rams	Two per leg 1.53m stroke
Power pack	Twin Diesel with twin pump
Deck Load	12 tones approx.
Total Buoyancy	15 tons
Year Built	1999 (refurbished in 2008)
Dead Weight	26 tons with legs