Environmental Impact Assessment Report

Volume 4

Appendix 19.5 Contamination Risk Assessment

TOBIN
CONSULTING ENGINEERS
BUILT ON KNOWLEDGE

Codling Wind Park Ltd.

Codling Wind Park

Contamination Risk Assessment Report

TOBIN CONSULTING ENGINEERS
Excellence in Engineering

www.tobin.ie

Document Control Sheet	
Document Reference	CRA
Client:	Codling Wind Park Ltd.
Project Reference	11078

Rev	Description	Author	Date	Reviewer	Date	Approval	Date
D01	First issue	LMG	05/07/2023	MG	26/10/23	JD	10/11/23
D02	Second issue	MG	27/05/2024	JD	27/05/24	ST	27/05/24
D03	Third issue	MG	03/07/2024	JD	05/07/24	ST	05/07/24
D04	Final	MG	26/07/2024	JD	30/07/24	ST	30/07/24

ENVIRONMENT I.S. EN ISO 14001:2015 NSAI Certified
HEALTH & SAFETY I.S. ISO 45001:2018 NSAI Certified
QUALITY I.S. EN ISO 9001:2015 NSAI Certified
ACEI ASSOCIATION OF CONSULTING ENGINEERS OF IRELAND
ENGINEERS IRELAND CPD ACCREDITED EMPLOYER

Table of Contents

Appendices

List of Tables

List of Figures

Executive Summary

A desk-based study, site investigation (SI) and risk assessment was carried out to determine the potential for contamination for the onshore substation and associated infrastructure as part of the onshore elements of the Codling Wind Park.

The onshore substation site area was created by reclaiming land from the Liffey Estuary in the late 1990's to early 2000's when the Poolbeg peninsula was already heavily industrialised. Site investigations identified that the geology of the site comprises Made Ground overlying sand and gravel, overlying glacial till and limestone bedrock. No significant soil or groundwater contamination was encountered on the onshore substation. Stockpiles deposited on the onshore substation site will require removal prior to development in accordance with the Waste Management Act 1996 as amended. A review of the soil screening criteria indicates that the site is suitable for the proposed end use.

Based on groundwater monitoring, the sand and gravels on the Poolbeg peninsula are brackish and considered to be in hydraulic continuity with the Liffey Estuary and tidally influenced.

The landfall area was reclaimed in the 1970s and early 1980s. During the recent SI works in the landfall area, mixed waste material was encountered to an average depth of 5 m. Waste soil and waste material excavated will require removal in accordance with the Waste Management Act 1996 as amended. Geo-environmental samples collected from the landfall site show that a number of samples have elevated PAHs, heavy metals and asbestos. However, a review of the soil screening criteria indicates that the site is suitable for the proposed industrial end use. Waste material encountered will require removal in accordance with the Waste Management Act 1996 as amended.

The groundwater at the landfall area recorded some elevated metals, however concentrations are representative of a saltwater environment.

Contamination indicator gases (methane, carbon dioxide, carbon monoxide) were elevated in two monitoring locations at the landfall. The appointed contractor for the tunnel installation works will produce risk assessments to address ground gas during construction, for approval with the Applicant.

1. INTRODUCTION

1.1 Project Contractual Basis

Codling Wind Park Limited (hereafter 'the Applicant') is proposing to develop the Codling Wind Park (CWP) Project, which is located in the Irish Sea approximately 13 - 22 km off the east coast of Ireland, at County Wicklow.

TOBIN were commissioned by the Applicant to carry out a Contamination Risk Assessment (CRA) for Onshore Transmission Infrastructure (OTI) and landfall (landward of the high water mark (HWM) of the CWP Project. This assessment considers both permanent and temporary works associated with the OTI and landfall, which are situated on the Poolbeg Peninsula.

1.2 Project Objectives and Scope of Work

This report is a CRA of the existing land contamination risks and potential land contamination risks associated with the onshore development area at Poolbeg.

The onshore development area incorporates the entire footprint of the OTI and landfall, including associated temporary works that will form the onshore boundary for the development consent application.

This CRA presents the findings of a detailed desk-based assessment. The objectives of the risk assessment are:

- To determine source-pathway-receptor linkages associated with the proposed future use of the onshore development area;
- To determine risk-based soil and groundwater remediation criteria, where required, for use in the design of the onshore development area; and,
- To determine contamination mitigation measures required to ensure the onshore development area is suitable for its intended end-use.

The risk assessment is based on the TOBIN Geologist's understanding of the onshore development area. The scope of works includes:

- Preparation of a CRA report in accordance with the Poolbeg West Planning Scheme 2019 - Policy IU11;
- Preparation of a CRA Report in accordance with Environmental Protection Agency (EPA) "Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites" 2013 (hereafter referred to as EPA Guidance.);
- A review of published information showing previous and current site use;
- A site walkover carried out by TOBIN on the 28 June 2022, 5 May 2023 and 1 August 2023;
- Development of a preliminary conceptual site model;
- Review of Causeway Geotech SI works 2018, 2022, 2023 and 2024; and

This risk assessment has been conducted in accordance with best practice in Ireland and uses nationally and internationally accepted human health and environmental risk assessment protocols (see references for supporting technical documents). While the CRA is only required for areas within the Poolbeg SDZ, the onshore substation and ESBN cable network is also discussed.

1.3 GUIDANCE

Presently, the EPA Guidance (EPA, 2013) is the sole guidance document for the assessment of land contamination in Ireland. This guidance document is targeted toward sites operating under an EPA regulated license, such as Industrial Emissions Licensing (IEL) facilities, Integrated Pollution Control (IPC) sites and Integrated Pollution Prevention Control (IPPC) facilities. The document presents a summary of a stage-based process to be followed and the documents to be produced at each stage.

In the absence of statutory or regulatory guidance on the assessment of land contamination in Ireland, this CRA has been prepared in accordance with the EPA Preliminary Site Assessment template which is located with the EPA Guidance (EPA, 2013).

This CRA was prepared in accordance with the Poolbeg West Planning Scheme 2019 - Policy IU11.

1.4 PERSONNEL INVOLVED

The TOBIN personnel who worked on the development of the CRA are summarised in **Table 1-1**.

Table 1-1: List of personnel involved in the development of the CRA.

Personnel	Experience
John Dillon B.Sc., M.Sc., PGeo	John is a chartered geologist and lead geologist working on the development of the CRA for the landfall and OTI of the CWP Project. John has 20 years' experience working in hydrogeology, water resources, contaminated land, water and soil quality and soil waste management.
Michelle Gaffney B.Sc.	Michelle has five years' experience working in hydrogeology, contaminated land, water and soil quality and soil waste management.
Laura McGrath, B.Sc., M.Sc., PGeo	Laura is a chartered geologist and has seven years' experience working in hydrogeology, water resources, contaminated land, water and soil quality and soil waste management.

2. SOURCES OF INFORMATION

2.1 Environmental Baseline Information

A desk study was undertaken to ascertain the geological, hydrological and hydrogeological baseline environment. To establish this, the following sources of information were reviewed:

- Aerial photography – Ordnance Survey of Ireland (OSI) GeoHive Map Viewer;
- Dublin City Council 2019 Tier 1 Environmental Risk Assessment Historical Landfill at Shelley Banks, Co. Dublin;
- EPA - EPA Maps online dataset of environmental information on the area including:
  - EPA Maps;
  - Water; and
  - Environment and Wellbeing, Clean Water and Health;
- Geological Survey of Ireland (GSI) - Geological maps relative to onshore development area produced by the GSI (accessed May 2024);
- GSI, Dublin Urban Groundwater Body (GWB): Summary of Initial Characterisation. Groundwater Bodies.
- National Parks and Wildlife Service (NPWS) - Proposed / Designated National Heritage Area (NHA), Special Protection Area (SPA), Special Area of Conservation (SAC) Sites;
- OSI - Current and historical Ordnance Survey (OS) maps including:
  - Ordnance Survey of Ireland (OSI) Dublin 1:2500 maps – 1938-1988
  - Historical maps (1837-1842 and 1888-1913) available for the Onshore ~Development Area at 1:2,500 and 1: 10,560 scales available in **Appendix 19.6** ; and
  - Recent aerial photography (1995, 2000, 2005);
- Ground Investigation data relevant to the study area which include:
  - Causeway Geotech SI, was undertaken for a separate development on behalf of L&M Keating at the location of onshore substation (Berth 47a) in December 2018.
  - Causeway Geotech SI, 2022, specifically undertaken for the CWPL.
  - Causeway Geotech SI, 2023 to 2024, specifically undertaken for the CWPL.

2.2 Assessment Limitations

TOBIN has prepared this report for the sole use of CWPL. No other warranty, express or implied, is made as to the professional advice included in this report or other services provided by TOBIN. The conclusions and recommendations contained in this report are based upon information provided by others and the assumption that all relevant information has been provided by those bodies from whom it has been requested. Information obtained from third parties has not been independently verified by TOBIN, unless otherwise stated in this report.

The methodology adopted and the sources of information used by TOBIN in providing its services are outlined in this report. The SI works used to complete the CRA were undertaken between 2018-2024 and focused on the infrastructure footprint. This CRA report is based on the conditions encountered and the information available during that period. The SI was focused on a broad assessment of the subsoil quality across the site where infrastructure is proposed and where access was available.

The boundaries of the GSI mapping currently do not extend to Dublin Port or the onshore development area. This limitation arises as some of the current GSI mapped extents correspond to the 6inch or 25inch OSI maps, which do not reflect the more recent reclaimed nature of the Poolbeg Peninsula. For example, the soils and subsoils are classified based on the site-specific information obtained during the 2018-2024 SI works.

Limited access was available to the landfall berm for site investigations (SI) due to the presence of Japanese Knotweed. However, it has been assumed that the material is historical Made Ground/waste and is similar to the wider landfall site.

3. SITE DESCRIPTION

3.1 OVERVIEW OF SITE LOCATION

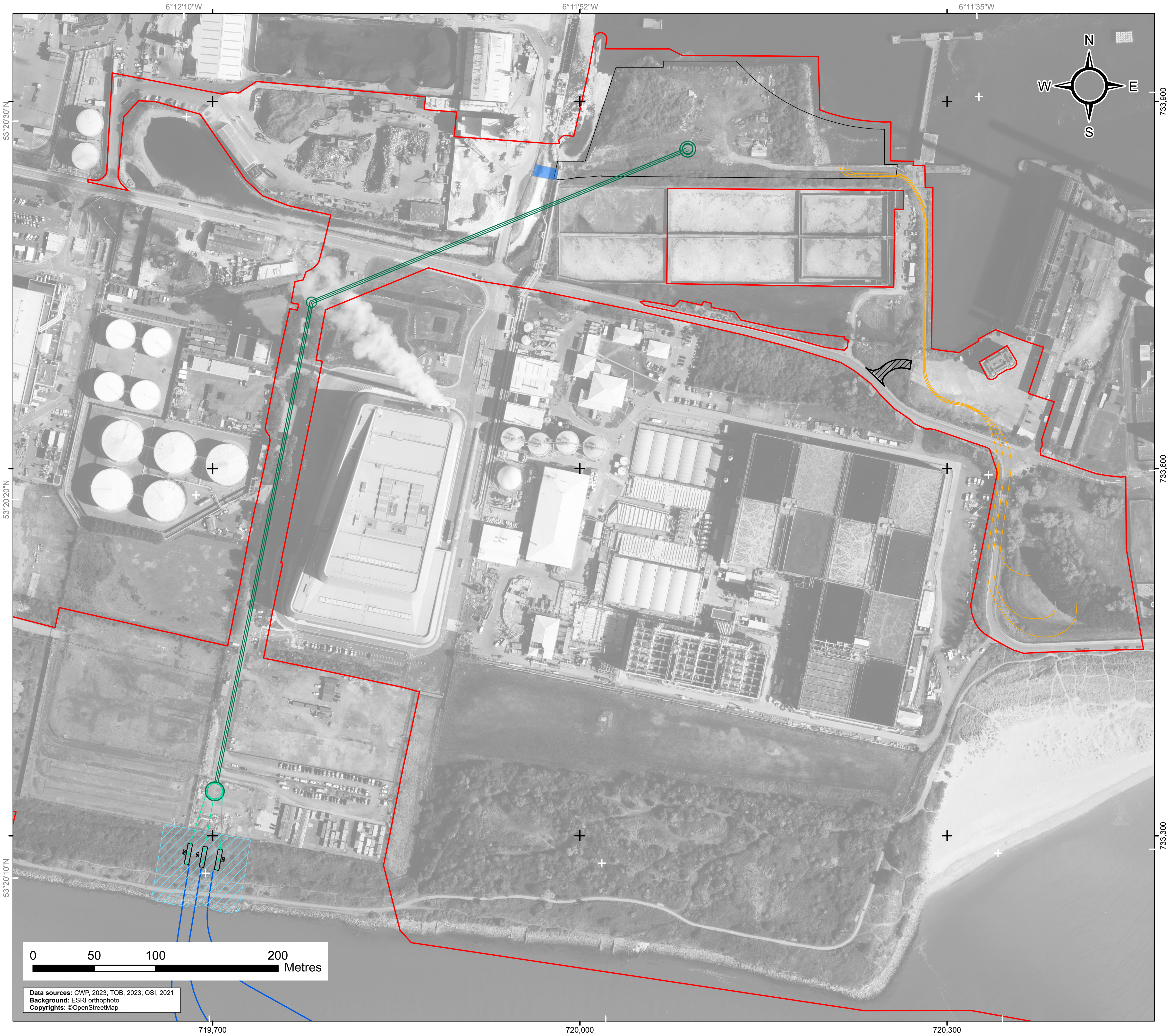
The OTI is situated on the Poolbeg Peninsula and includes the transition joint bays (TJBs), the onshore export cables, the onshore substation and the Electricity Supply Board Networks (ESBN) network cables to connect the onshore substation to the Poolbeg 220kV substation.

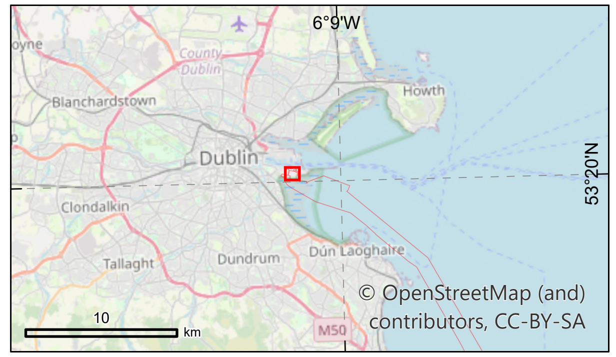
This CRA also addresses the potential impacts of the works at the landfall (landward of the HWM), where the offshore export cables are brought onshore and connected to the onshore export cables at the TJBs.

The onshore development area on the Poolbeg Peninsula is outlined in **Figure 3-1.** This area includes the entire footprint of the OTI and associated temporary works. This area will form the onshore planning application boundary for the future planning application.

3.2 DESCRIPTION OF THE LANDFALL AND OTI

A description of the landfall, OTI and the current associated land uses are outlined in the sections below.





Legend

- Planning application boundary
- Onshore substation boundary (operational)
- Offhore export cable
- Transition joint bay (TJB)
- Onshore export cable TJB connection
- Onshore export cable
- ESBN network cable
- Landfall works above the HWM
- Access bridge to onshore substation
- Temporary site access to construction compound C and onshore substation

codling wind park

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Appendix 19.5
Figure 3.1
Onshore development area

CWP doc. number: CWP-TOB-ENG-08-01-MAP-1786

Internal descriptive code: PB - PAB..OECs.3PB.Opt8..OnLoD..TJBs6..OnCs.TJBs6.T.SHAFT.. OnC.LF4.to.SS.PP.T..SS.PP.PL..SS.PP.BRIDGE..ENC.. WEST.RoW.COMP.C - - (ORT.BS.21..EIAR.Vol.04.Ch.19.Ap.05.FIG.03.01)

Size: A3

Scale: 1:3,000

CRS: EPSG 2157

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/08/15	SP	DM/EA	ES

3.2.1 *Landfall*

Works are required at the landfall to bring the offshore export cables through the intertidal area within Dublin Bay, to a location where they are connected to the onshore export cables. The location of the landfall is indicated on **Figure 3-1** above. The landfall site is currently utilised as a storage area and occasionally as construction compounds. The area is predominantly comprised of hardstanding.

Landfall works include works above and below the HWM and works that span the HWM. This CRA addresses the works that will take place above and that span the HWM. These key works are listed below:

Landfall works above the HWM include:

- Temporary facilities for the landfall work forming part of Construction Compound A (Compound A);
- TJB construction, within which the offshore export cables are jointed to the onshore export cables;
- Offshore export cable duct installation works between the TJBs and the HWM, will involve open cut trenching;
- Cable pull through the pre-installed cable ducts;
- Vehicle and pedestrian access between Compound A and the intertidal area; and

Landfall works that span the HWM include:

- Offshore export cable duct installation works across the HWM will involve open cut trenching;
- Cable pull through the pre-installed cable ducts;
- Works to temporarily remove and reinstate the existing coastal revetment; and
- Vehicle and pedestrian access between Compound A and the intertidal area.

The techniques used to install the offshore export cable ducts between the TJBs and the intertidal area involve open cut trenching, with further detail provided in **Chapter 4 Project Description** of the Environmental Impact Assessment Report (EIAR).

Once operational, there will be minimal above ground infrastructure associated with the landfall.

3.2.2 *Onshore Export Cable*

Three onshore export cable circuits will connect to the offshore export cables at the TJBs and will transfer the electricity onwards to the onshore substation. A tunnel boring method to install the onshore export cables between the landfall and the onshore substation is summarised below with further detail provided in **Chapter 4 Project Description**.

For installation of the onshore export cable, the onshore export cable will be routed north, approximately 0.7 km across the Poolbeg Peninsula, to the proposed onshore substation. Two tunnel drives are expected to be required to complete the works. The first tunnel drive will commence from a launch shaft at the onshore substation site for a distance of approximately 330 m to a reception shaft on Shellybanks Road. The second tunnel drive will commence from a launch shaft within the main compound area for a distance of approximately 410 m to the reception shaft on Shellybanks Road, equating to a total tunnel length of 740 m.

3.2.3 Onshore Substation

The onshore substation site is currently accessed from an existing site entrance from the Pigeon House Road, in close proximity the ESB Poolbeg Generating Station. The onshore substation site is currently unused land on the southern bank of the Liffey Estuary, which was reclaimed by Dublin Port Company in the late 1990's/ early 2000's and is surrounded on three boundaries by water and also by a mixture of industrial uses.

Immediately to the south the onshore substation site is the Ringsend Wastewater Treatment Plant (WWTP) and Pigeon House Road, beyond which lies the Irishtown Nature Park and Dublin Bay. To the east of the onshore substation site, is the now decommissioned Pigeon House Power Station, Pigeon House Harbour, the former Pigeon House Hotel, and beyond this, the Great South Wall. Immediately to the west of the onshore substation site is a cooling water discharge channel associated with the nearby Dublin Waste to Energy facility and the Electricity Supply Board (ESB) Dublin Bay Power Plant. This channel separates the site from the existing Ecocem cement manufacturing facility and a metal recycling facility, which regularly utilise the quayside for vessel deliveries. Located approximately 330 m north of the onshore substation site, across the River Liffey, is the Irish Ferries Dublin Port terminal.

The location of the onshore substation site is presented in **Figure 3-1**.

The onshore substation site is currently unused and includes areas of hardstand and waste material. It is a rectangular, approximately 1.4ha site, which has become partly recolonised by scrub and plants. It is predominantly flat and has two large stockpiles, one in the east of the site and one in the west of the site. Both stockpiles contain scrub and bush as well as waste material.

Once operational, the onshore substation will be a gas insulated switchgear (GIS) design, where the high voltage (HV) equipment is designed to be insulated and cooled by pressurised gas.

In summary, the onshore substation will include:

- Perimeter structures including upgraded revetements and coastal retaining walls
- Land reclamation for the ESB building
- Raised site platform
- One GIS building
- One ESB GIS building
- One ESB MV building
- Three Shunt reactors (incorporated within the GIS building)
- One Statcom building

- Three Harmonic filters
- Upgrades to the existing access road from Pigeon House Road to the site entrance
- New bridge to provide vehicle access across the cooling water discharge channel
- New internal access road layout within the site boundary
- Car parking
- Drainage infrastructure
- Security and lighting

3.2.4 ESBN Network Cables

Three onshore export cable circuits will connect from the onshore substation to the Poolbeg 220kV substation, which will then transfer the electricity onwards to the national grid. The ESBN Network cable route is predominantly along existing access routes, roads and road margins.

The ESBN network cables will consist of two separate sections, with two distinct installation methods;

- Section A which consists of cables installed by means of a standard open cut trench arrangement (265 m in length); and
- Section B which consists of cables installed by means of HDD (135 m in length);.

Once operational, there will be minimal above ground infrastructure associated with the ESBN network cables.

3.2.5 Construction Compounds

There are four temporary construction compounds required to facilitate the construction activities for the landfall and OTI (Compounds A-D) as outlined in **Figure 3-2**.

<u>Compound A</u>

Compound A will be located south of the Dublin Waste to Energy facility and will be accessed from the Shellybanks Road (see **Figure 3-2**). It will be established at the commencement of OTI construction works and will be in place for a period of approximately 30 months.

Compound A is a temporary construction compound and will be used as a support area and storage facility for the landfall works. It will also be used to support the installation of the onshore export cables. It will operate as a hub for the onshore construction works as well as acting as a staging post and secure storage for equipment and component deliveries. The area of Compound A will be approximately 19,800 m^2.

<u>Compound B</u>

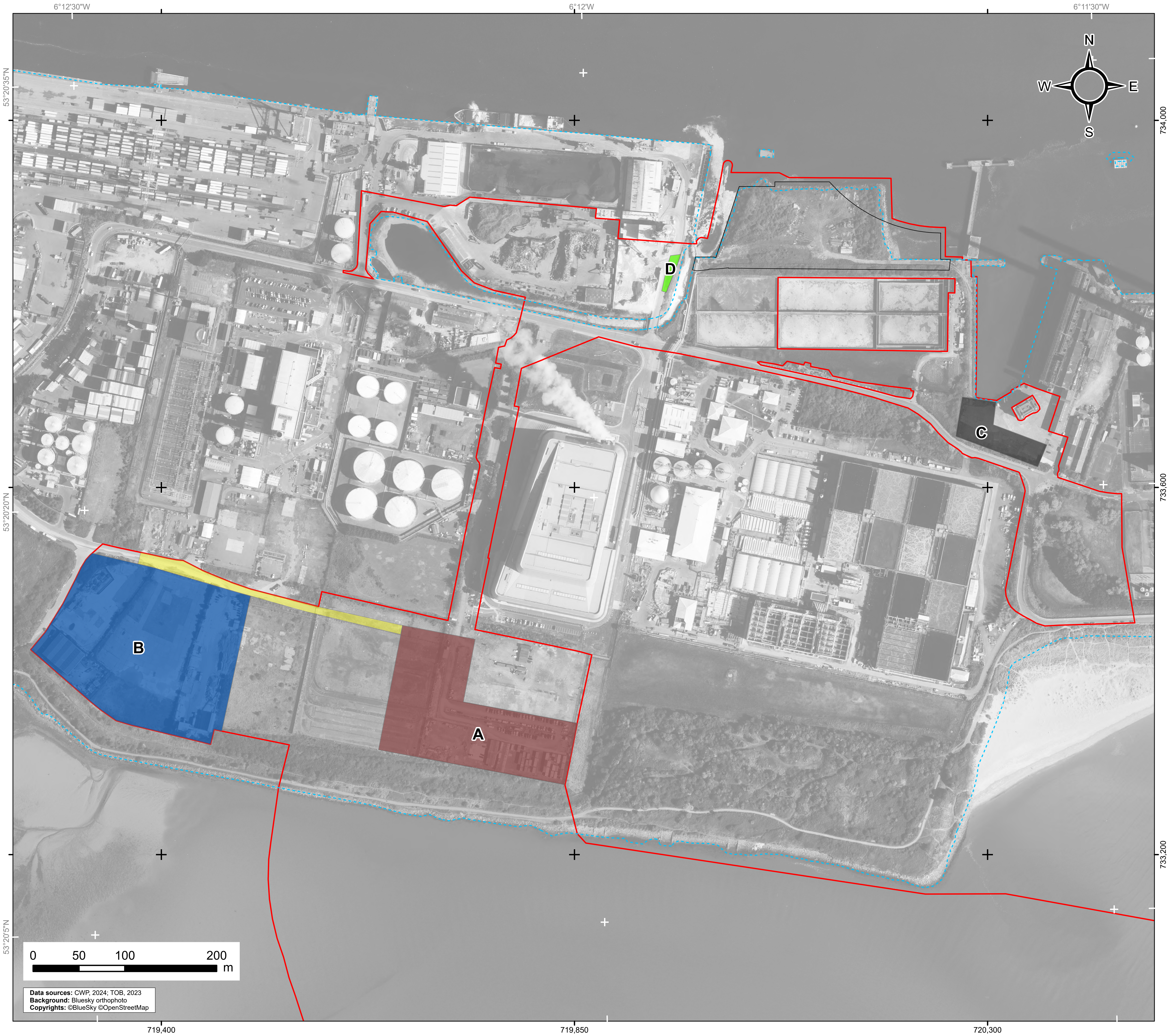
A temporary construction compound/laydown area for general cable route and onshore substation construction activities. The area of this compound will be approximately 32,300 m^2.

<u>Compound C</u>

A temporary construction compound for the onshore substation site. Contractor welfare facilities will be located in this compound as well as some material storage space. The area of this compound will be approximately 3,350m^2.

Compound D

A temporary construction compound and laydown area to facilitate the construction of the bridge over the cooling water channel. The area of this compound will be approximately 360 m^2.



Legend

- Planning application boundary
- Onshore substation boundary (operational)
- High water mark

Construction compounds

- Construction compound A
- Construction compound B
- Construction compound C
- Construction compound D
- Temporary access route for construction compound A and B

codling wind park

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Appendix 19.5
Figure 3.2
Locations of construction compounds A-D

CWP doc. number: CWP-TOB-ENG-08-01-MAP-1787

Internal descriptive code: PB - PAB..SS.PP.PL..COMPs.CONSTRUCT.FOR.CONSENTS ..RoW.COMPs.AB - HWM - (ORT.BS.21..EIAR.Vol.04.Ch.19.Ap.05.FIG.03.02)

Size: A3

Scale: 1:4,000

CRS: EPSG 2157

Rev.	*Updates*	*Date*	*By*	*Chk'd*	*App'd*
A	First issue	2024/05/10	SP	DM/EA	ES

3.3 SITE WALKOVER

TOBIN carried out a number of site walkovers on the 28 June 2022, 5 May 2023 and 1 August 2023;

The aim of the site walkovers was to:

- Become familiar with the site and surrounding area;
- Identify locations of previous SIs; and
- Identify potential sources of contamination.

The area at landfall between the TJBs and HWM, consists of two pre-existing berms. The first (hereafter referred to as the 'front berm'), closest to the HWM, is approximately +8.00 m ordnance datum (OD). A depression separates this from a second, slightly taller berm (hereafter referred to as the 'rear berm'), within which the TJBs will be located. This rear berm, approximately +9.00 Mod and is understood to have been created during the development of the adjacent hardstanding area.

The site walkovers identified the onshore substation site as a location which consists of hardcore material, but which has partly become recolonised by grass, various plants and scrub. Abandoned materials and construction and demolition (C&D) waste was present throughout the site. Materials at the site include concrete piping, plastic piping, hardcore, pallets, metal railings, rubble, steel storage containers, concrete slabs and disused gravels.

Two large soil stockpiles are also present and include a large, raised stockpile approximately 2m - 3m in height in the east and west of the site which comprises both natural and man-made materials. Numerous boreholes with raised red covers and blue covers were identified, on the site.

3.4 SURROUNDING LAND USE

The surrounding land on the Poolbeg Peninsula is used for industrial activities and includes Ecocem Ireland, Hammond Land Metal Recycling, ESB Dublin Bay Power Plant, All Away Waste, Dublin Waste to Energy facility Ringsend WWTP and the ESB Poolbeg Generating station. Smaller businesses in the area include The Sin Eaters Pigeon House Lab, Celtic Anglian Water, City Analysts Limited and Alan Doyle Car Mechanic.

A number of licenced sites are located in the surrounding area and are described in the sections below.

3.4.1 Licensed Sites

Based on the EPA Maps (EPA, 2024), there are eleven EPA licensed sites within 2km of the onshore development area. These include eight IE licensed facilities and three IPC licensed sites These are listed in **Table 3-1**.

Table 3-1: List of EPA Licensed Sites within 2km of the onshore development area boundary

Industry	Licence Type	Location	Distance to Site
Brooks Thomas Limited	IPC	Upper Mayor Street, Dublin 1, Dublin	Approximately 2.4 km west of the onshore substation & approximately 1.8 km west of the onshore export cable.
Everlac Paints Limited	IPC	8 Hanover Quay, Dublin 2, Dublin	Approximately 2.4 km west of the onshore substation & approximately 1.7 km west of the onshore export cable.
Irish Tar & Bitumen Suppliers	IPC	Alexandra Road, Dublin 1	Approximately 1.1 km north-northwest of the onshore substation
Van Leer Ireland Ltd.	IEL	Cranmer Lane, Beggars Bush, Dublin 4, Dublin	Approximately 2.2 km west of the proposed landfall & approximately 1.9 km west of the onshore export cable.
Indaver Ireland Limited (Tolka Quay Road), Dublin Port	IEL	Dublin Port, Dublin 1	Approximately 1.1 km north-northwest of the onshore substation
Electricity Supply Board (North Wall)	IEL	North Wall Generating Station, Alexandra Road, Dublin 1	Approximately 1.2 km north-northwest of the onshore substation
Dublin Port Company	IEL	Port Centre, Alexandra Road, Dublin 1	Approximately 720 north-northeast of the onshore substation
The Hammond Lane Metal Company Limited	IEL	Pigeon House Road, Dublin 4	Immediately west of the onshore substation
Synergen Power Limited	IEL	Dublin Bay Power Plant, Pigeon House Road, Ringsend, Dublin 4	Immediately south of the onshore substation
Dublin Waste to Energy Limited	IEL	Pigeon House Road, Poolbeg Peninsula, Dublin 4	Immediately south of the onshore substation
Electricity Supply Board (Poolbeg)	IEL	ESBN Poolbeg Generating Station, Pigeon House Road, Ringsend, Dublin 4	Approximately 320 m east of the onshore substation, 0.1km east of ESBN network cable.

3.4.2 *Wastewater Discharges*

There are seven wastewater discharge locations within 2 km of the onshore development area including five urban wastewater emission points which are used as storm water overflow locations, one primary effluent emission point and one Section 4 discharge licence.

A primary effluent discharge point is one in which wastewater which has undergone primary stage treatment is discharged to surface water and a Section 4 discharge licence is one which is issued under Section 4 of the Local Government (Water Pollution) Act 1977, as amended in 1990, in respect of the discharge of trade effluent to surface water or groundwater. All locations discharge to surface water, primarily within the Liffey estuary (EPA, 2024).

The emission locations and types are summarised in **Table 3-2**.

Table 3-2: List of EPA licensed wastewater discharge locations within 2km of the OTI

Emission Type	Emission ID	Location	Distance to Site
Urban wastewater emission point- Storm Water Overflow	TPEFF0700D0034SW163	c. 50m north of London Bridge on the River Dodder	1.96km SSW
Urban wastewater emission point- Storm Water Overflow	TPEFF0700D0034SW153		
Urban wastewater emission point- Storm Water Overflow	TPEFF0700D0034SW095	c. 20m west of Poolbeg Quay apartments on the Toll Bridge Road (R131)	1.21km W
Urban wastewater emission point- Storm Water Overflow	TPEFF0700D0034SW213	c. 35m northeast of the entrance to the ESBN Dublin Bay Power Plant	0.35km W
Urban wastewater emission point- Storm Water Overflow	TPEFF0700D0034SW221	c. 70m from the entrance to the onshore substation	0.07km E
Section 4 Discharge	LDW/001/93	ESBN - Poolbeg, Irishtown, Dublin 4	0.38km E
Primary Effluent Emission Point	TPEFF0700D0034SW001	Within the cooling water outfall, north of the Poolbeg Tank Farm	0.83km E

4. STUDY AREA SITE HISTORY

The site history was determined based on a review of publicly available historical maps and aerial photography from the Ordnance Survey of Ireland (OSI) which are available to view on the OSI GeoHive Map Viewer (OSI, 2024). The onshore development area and wider port area are reclaimed since the 1960s.

The onshore substation site was reclaimed between 1999 and 2003. The land was raised by a series of natural soils and Made Ground material during this period. Some stockpiled material was placed on the site around 2005. However, the site has remained relatively unused in recent years.

A Tier 1 Environmental Risk Assessment was conducted by DCC in 2019 on the landfill site at Shelley Banks, known as the former Ringsend Urban Landfill site. The former Ringsend Urban Landfill site is located on public land overlooking South Dublin Bay and Shelley Banks Beach and can be accessed from Pigeon House Road via a public walkway. The former Ringsend Urban Landfill site is primarily within Irishtown Nature Park; however, the precise boundaries are unknown. Some areas of waste are known to occur within Compound A, based on site investigations undertaken as part of this project.

The Ringsend Urban Landfill site was operated by DCC during a building boom in the 1970's where construction and demolition (C&D) rubble, and industrial and commercial waste was deposited and operated as a land-raised scheme. The majority of the waste was reportedly sourced from the redevelopment of Wood Quay during the 1970's. It is understood to have closed in 1978. DCC has placed the site on the Section 22 register (Ref: S22-02333) in accordance with the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations, 2008.

A shallow clay capping was reported to have been placed on top of the interred waste extending to the top of the rock armour on the eastern and southern boundary between 1978 and 1980. In the early 1980's, DCC and local residents began establishing the Irishtown Nature Park by planting seeds, trees and tall grasses across the elevated landform, encompassing the former landfill location to the east of Compound A.

The former landfill comprises part of the coastline and was previously exposed to the sea, due to coastal erosion, mainly during high spring tide events. No evidence of organic waste or other waste was noted during the site walkovers within the onshore development area boundary. Significant erosion of the former landfill clay barrier previously occurred when high tides breached the rock armour causing waste to be released into the South Dublin Bay area in recent years. It is believed that this occurred to the east of the landfall boundary.

Along a section of the southern landfill perimeter (i.e. within the Irishtown Nature Park), the rock armour and other erosion control infrastructure (i.e., concrete groins) has lost integrity. This has resulted in waste material being exposed in the bank up to 4.5 m above the top of the rock armour.

The surface area of the landfill site is approximately 500 m from east to west and 50-100 m from north to south. It is estimated that the waste body amounts to 160,000 m^3 in volume.

The historical maps have been referenced to a basemap using historical features which are still in the same location today. Although these hand-drawn maps are considered to be accurate, it must be noted that the location of historical features should be considered indicative.

Aerial photography imagery has also been geo-referenced onto a base map and the position of features on these images is considered more accurate as the majority of them overlap with existing features.

The historical maps are presented in **Appendix 19.6 , Chapter 19 Land, Soils and Geology** and a summary of the site history is presented in **Table 4-1**: Summary of historical activities relative to the onshore components: landfall, onshore export cable, onshore substation **.**

Table 4-1: Summary of historical activities relative to the onshore components: landfall, onshore export cable, onshore substation and surrounding land use.

Date	Land Use at Landfall	Landuse adjacent to Landfall and onshore export cable	Land Use at the onshore substation	Landuse adjacent to onshore substation
1837-1842	The landfall site is located in a natural sandy area. A water feature is present between the landfall site and a wall identified as South Wall. This wall connects the mainland with the Pigeon House harbour, Pigeon House Fort and Poolbeg Light House.	The overall area is predominantly sand and water with some features along the South Wall, namely the Pigeon House harbour and Pigeon House Fort which contains a barracks, officers' quarters and a hospital.	The onshore substation site is located in a natural sandy area which is bounded to the south by a harbour wall.	The overall area is predominantly sand and water with some features along the South Wall, namely the harbour and Pigeon House Fort which contains a barracks, officers' quarters and a hospital.
1869			The onshore substation site is located in a natural sandy area which is bounded to the south by a harbour wall. Area is marked as an oyster bed and some areas above the low tide mark	Quay wall to the south and harbour present
1897-1913	There is no change in the site use. The water feature has been redirected southwards and a part of it flows through the north-eastern section of the landfall site.	The Pigeon House harbour was reclaimed and used as outfall works operated by Dublin Corporation. Pigeon House Fort is more industrialised with tanks and chimneys present as well as the Electricity Works also operated by Dublin Corporation. An isolation hospital and rifle range are located to west and targets for the range are located to the north and east of the Compound A site.	There is no change in the land use.	The Pigeon House harbour was reclaimed and used as outfall works operated by Dublin Corporation. Pigeon House Fort is more industrialised with tanks and chimneys present as well as the Electricity Works also operated by Dublin Corporation. An isolation hospital and rifle range are located to west and targets for the range are located to the north and east of the Compound A site.

Date	Land Use at Landfall	Landuse adjacent to Landfall and onshore export cable	Land Use at the onshore substation	Landuse adjacent to onshore substation
1830s -1930s	There is no change in the land use.	Additional buildings including a convent and catholic chapel are identified within the isolation hospital grounds, now identified as a tuberculosis hospital. The Dolphin cooling water intake is present north of the Electricity Works. The rifle range is not labelled on the map.		
1910s-1930's			There is no change in the land use.	Additional buildings including a convent and catholic chapel are identified within the isolation hospital grounds, now identified as a tuberculosis hospital. The Dolphin cooling water intake is present north of the Electricity Works. The rifle range is not labelled on the map.
1966			There is no change in the land use.	Additional buildings to the south and southwest which show the development of Dublin port area.
1995	The land at the landfall site has been reclaimed and appears to be colonised by vegetation.	The land on the peninsula is reclaimed, developed and predominantly industrialised.	There is no change in the land use.	The land on the peninsula is reclaimed, developed and predominantly industrialised
1999 - 2003	The landfall site appears to be used for construction material storage.	The outfall works to the south of the onshore substation have been replaced by the stormwater tanks for Ringsend WWTP.	The onshore substation site is being built by reclaiming land.	The outfall works to the south of the onshore substation have been replaced by the stormwater tanks for the Ringsend WWTP. Coastal walkway is evident on the 1995 maps linking Sandymount to Irishtown Park

Date	Land Use at Landfall	Landuse adjacent to Landfall and onshore export cable	Land Use at the onshore substation	Landuse adjacent to onshore substation
2004 - 2006	The landfall site is no longer used for storage and appears to be covered by hardcore.	There is no significant change in the surrounding land use.	The onshore substation site build is completed and appears to be hardstanding. A possible spoil heap is present along the eastern planning application boundary and a second on the western planning application boundary.	There is no significant change in the surrounding land use.
2011 - 2013	Space has been cleared on the landfall site and hardcore placed.	There is no significant change in the surrounding land use.	Plant colonisation of the onshore substation site is established. Some scrub is observed and spoil heaps along the boundaries are increasing.	There is no significant change in the surrounding land use.
2013 - 2018	The southwest of the landfall site is used as a carpark and the remainder is used as construction material and vehicles storage.	There is no significant change in the surrounding land use.	The onshore substation site is representative of what it looks like at present. It appears to be used for storage of metal containers and other large industry related items. The onshore substation site is greener with recolonisation of bare ground. Scrub and small trees are more abundant.	There is no significant change in the surrounding land use.

5. ENVIRONMENTAL SETTING

5.1 REGIONAL HYDROLOGY

The River Liffey flows in a west to east direction to the north of the site. The Dodder is the only river waterbody within 2km of the onshore development area and flows in a general south to north direction into the Liffey Estuary approximately 2.1km west of the onshore development area.

5.2 REGIONAL GEOLOGY

5.2.1 Regional Soils and Superficial Deposits

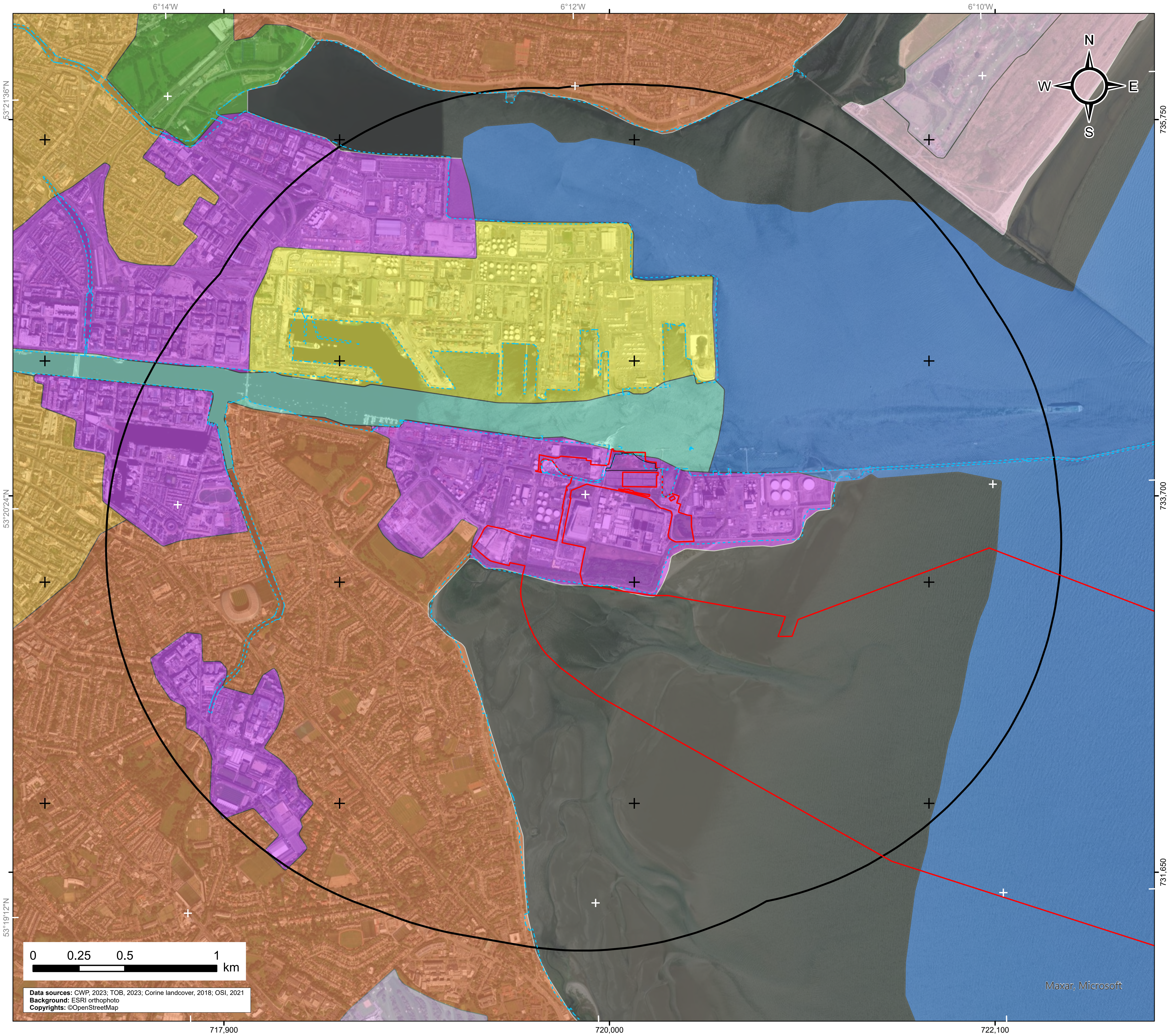
The dominant Teagasc soil type within 2km of the onshore development area is classified as Made Ground. There are isolated areas of undifferentiated alluvium and beach sand and gravel approximately 1.6km southwest of the site (GSI, 2024). The CORINE[1] land use in the vicinity of the site are presented in **Figure 5-1**. The quaternary sediments are material which has been deposited over the past 2.6 million years and underlie the Teagasc soils. Quaternary sediments are not mapped for the majority of the area around the onshore development area. There are areas of Urban sediments, indicating Made Ground, to the south of the site and areas of gravelly alluvium and marine beach sands located approximately 1.3km southwest of the onshore development area (GSI, 2024).

5.2.2 Regional bedrock

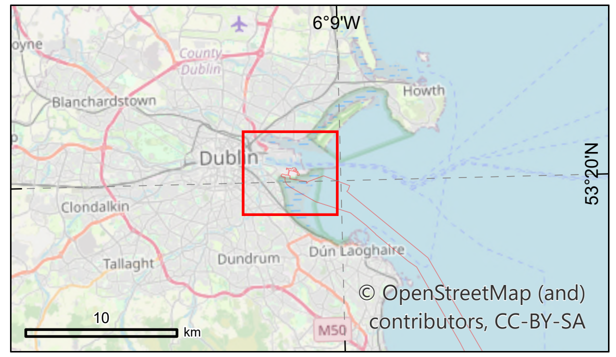
The bedrock underlying the site is the Lucan Formation and is described as dark limestone and shale. The Lucan Formation is located >30 mbgl. According to the GSI database, there are no bedrock structural features, faults or bedrock outcrops within 2km of the onshore development area. Additionally, there are no karst features identified within this area (GSI, 2024).

The SEA Environmental Report accompanying the Dublin Docklands Masterplan (2008), states that the limestone in the area varies from weak to very strong limestone bedrock.

[1] CORINE (Coordination of Information on the Environment) – Land Cover dataset available from www.epa.ie



Data sources: CWP, 2023; TOB, 2023; Corine landcover, 2018; OSI, 2021
Background: ESRI orthophoto



Legend

- Planning application boundary
- Onshore substation boundary (operational)
- 2 km buffer from the onshore development area
- High water mark

Corine land cover 2018

- Beaches, dunes, sands
- Continuous urban fabric
- Discontinuous urban fabric
- Estuaries
- Green urban areas
- Industrial or commercial units
- Intertidal flats
- Port areas
- Salt marshes
- Sea and ocean
- Sport and leisure facilities

codling wind park

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Appendix 19.5
Figure 5.1
Corine land cover

CWP doc. number: CWP-TOB-ENG-08-01-MAP-1788

Internal descriptive code: DU.BAY - PAB..PB.RLB.BUFF.2km..SS.PP.PL - HWM..CORINE - (SAT..EIAR.Vol.04.Ch.19.Ap.05.FIG.05.01)

Size: A3

Scale: 1:20,000

CRS: EPSG 2157

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/08/15	SP	DM/EA	ES

5.3 REGIONAL HYDROGEOLOGY

The GSI classify aquifers based on the groundwater resource potential, groundwater flow type and attenuation potential. The boundaries of the classified GSI mapping do not extend to Dublin Port or the onshore development area. There is one area of “unclassified” aquifer on Poolbeg Peninsula, but the area is limited and provides no hydrogeological classification for the associated aquifer.

The dark limestone and shale of the Lucan Formation beneath the onshore development area and wider study area, is classified by the GSI as a Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones (LI). As such, the aquifer underlying the Poolbeg Peninsula can also be classified as a locally important aquifer (LI). The Locally Important Gravel Aquifer is located 0.9 km west of the onshore export cable (GSI, 2024).

5.3.1 Sensitive receptors- groundwater abstractions

There are no recorded abstractions within the onshore development area or on the Poolbeg peninsula. Groundwater underlying the site is brackish and not of a potable water quality.

It is noted that there are no group scheme and public supply source protection areas or group water scheme abstraction points mapped within 2km of the onshore development area (GSI, 2024).

5.3.2 Sensitive receptors - groundwater dependent terrestrial ecosystems

The National Parks and Wildlife Service (NPWS,2024) does not classify any groundwater dependent terrestrial ecosystems (GWDTE) within 2km of the onshore development area. No GWDTE were identified within the onshore development area during the site walkovers.

6. SITE INVESTIGATION

6.1 BACKGROUND

Two site investigations were undertaken on behalf of the Applicant, within the onshore development area through 2022 and 2024. These were undertaken by Causeway Geotech Ltd. SI included drilling of boreholes, excavation of trial pits & slit trenches, soil sampling, groundwater sampling, groundwater monitoring and laboratory testing. SI locations at the landfall and onshore export cables are shown in **Figure 6-1** and **Figure 6-2** and SI locations at the onshore substation and ESBN Network Cables are shown in **Figure 6-3**.

A previous SI was undertaken within the onshore substation site in December 2018, on behalf of L&M Keating. The results from the 2018 SI have been incorporated into this section of the CRA. The results of these SI events (2018, 2022, 2023 and 2024) were used to inform the geological and hydrogeological environment for the onshore development area.

6.2 OVERVIEW OF SITE INVESTIGATION

The SI was designed to meet the objectives of an exploratory / main investigation, as defined by BS10175:2011 Investigation of Potentially Contaminated Sites: Code of Practice (BSI). SI results are included in **Volume 3**, **Appendix 19.2** to **Appendix 19.4**, **Chapter 19 Land, Soils and Geology** of the Environmental Impact Assessment Report (EIAR). SI works focused on areas of excavation such as the landfall, onshore export cables and onshore substation site.

6.2.1 Site Investigation-Landfall and Onshore Export Cable Route

The locations of SI undertaken by Causeway Geotech in the area of the landfall and onshore export cable in 2022, 2023 and 2024 are shown in **Figure 6-1** and **Figure 6-2** .

The 2022 landfall and onshore export cable SI comprised:

- 2 boreholes by sonic drilling methods;
- 2 standpipe installation in two boreholes; and
- Soil testing.

The 2023/2024 landfall and onshore export cable SI comprised:

- 12 boreholes – rotary drilling method;
- 5 groundwater and gas standpipe installations;
- 18 machine dug trial pits/silt trenches; and
- Soil and groundwater testing.

6.2.2 Site Investigation – Onshore Substation and ESBN Network Cables

The locations of the SI undertaken by Causeway Geotech within and in direct proximity to the onshore substation site and ESBN network cables are presented in **Figure 6-3**.

The 2018 SI were undertaken at the onshore substation site prior to the CWP Project and included five boreholes all drilled to a depth of 20m (BH01 to BH05), each with a groundwater monitoring installation, and eight trial pits excavated to a maximum depth of 3.6m across the site. This SI also included groundwater sampling (Causeway Geotech, 2018).

The 2022 SI undertaken at the onshore substation site and ESBN network cable comprised:

- 6 boreholes – light cable percussion method and sonic drilling method;
- 6 groundwater standpipe installation in six boreholes;
- 3 gas standpipe installations in three boreholes;
- 11 machine dug trial pits;
- Seasonal groundwater level monitoring;
- 3 rounds of groundwater quality monitoring; and
- Soil testing.

The 2023/2024 SI undertaken at the onshore substation site and ESBN network cable comprised:

- 4 boreholes – light cable percussion method and sonic drilling method;
- 10 machine dug trial pits/slit trenches;
- Seasonal groundwater level monitoring;
- 3 rounds of groundwater quality monitoring; and
- Soil testing.

6.2.3 Soil and Groundwater Testing

6.2.3.1 Soil testing

As part of the SI's carried out by Causeway Geotech (2022 and 2023), soil and groundwater samples were collected and submitted to Chemtest, an accredited and certified laboratory, for metals, total petroleum hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene and Xylene (BTEX), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and asbestos.

A standard soil sampling approach was adopted throughout the duration of the SI works. Discrete soil samples were taken from trial pits and boreholes at changes in stratum.

Soil samples were collected by geologists using disposable gloves in accordance with Causeway Geotech field procedures into clean laboratory-supplied containers appropriate for the intended analysis. Samples were transported in cool boxes to the UKAS accredited laboratory. Soil samples were submitted to Chemtest in the UK for analysis.

A modified Rilta suite of analysis was carried out on all chemical test samples. The modified RILTA suite included testing for a range of determinants, including:

- Metals;
- Speciated total petroleum hydrocarbons (TPH);
- Speciated polycyclic aromatic hydrocarbons (PAH);
- BTEX compounds;
- Volatile Organic Compounds (VOCs);
- Semi-Volatile Organic Compounds (SVOCs);
- Polychlorinated biphenyls (PCBs);

- Phenols;
- Organic matter and Total Organic Carbon (TOC);
- Cyanides;
- Asbestos screen;
- Sulphate and sulphur;
- pH; and
- Waste acceptance criteria (WAC) testing.

A total number of 27 No. soil samples were collected at the onshore substation and 51 No. sample results were collected from the landfall and onshore export cable route.

In addition, it is noted that 23 No. soil samples were undertaken as part of SI 2018 and were available to review. These samples results are summarised in **Appendix A**.

6.2.3.2 Groundwater testing

Individual groundwater strikes, along with any relative changes in water levels as works proceeded, are presented on the exploratory borehole logs for each location. Monitoring of the installed standpipes indicates a seasonal and tidal variation in groundwater level.

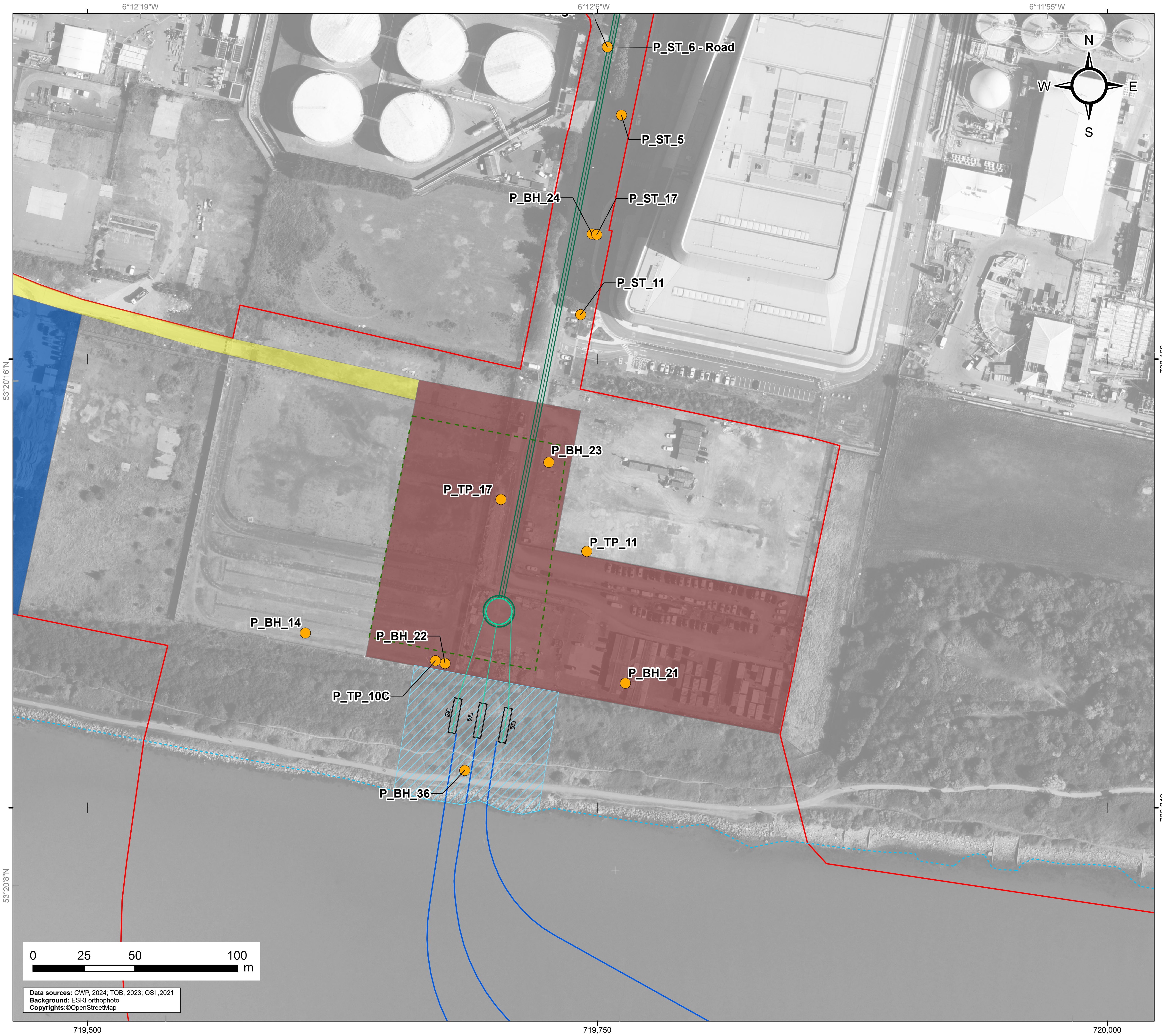
Eight groundwater monitoring rounds were undertaken by Causeway Geotech in P-BH-14, P-BH-21-P-BH23 (landfall locations), P-BH-15-P-BH-17, P-BH-20, P-BH 29 (onshore substation locations), and P-BH- 24, P-BH25 P-BH 27 (onshore export cable).

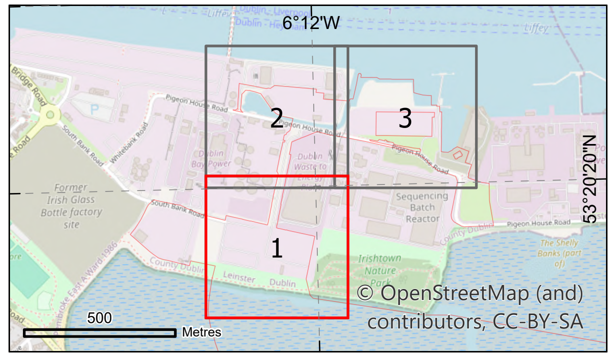
The 2018 boreholes - (BH01-BH05) were also monitored manually for recording of water levels between May 2022 and September 2023 (**Chapter 19 Land Soils and Geology - Appendix 19.2)**, with two readings in December 2018 provided in the 2018 SI Report (**Chapter 19 Land Soils and Geology - Appendix 19.4**).

Monitoring installations in both subsoils and bedrock were equipped with pressure transducers for automatic recording of water levels in boreholes BH01, BH03, BH15 and BH20 (onshore substation) and BH22-BH23 (landfall) and BH25, BH27 and BH29 (Cable Route) in the period between October 2022 and September 2023.

Results of the groundwater level monitoring indicates that the groundwater levels within the onshore development area are tidally influenced.

A number of elevated anions and cations concentrations were detected in all monitoring locations indicating the brackish nature of the groundwater. Previous groundwater monitoring (CG, 2018) also indicated that the groundwater is brackish on the onshore substation site.





Legend

- Planning application boundary
- High water mark
- Geotechnical investigations - 2022/2023
- Offshore export cable
- Onshore export cable TJB connection
- Onshore export cable
- Landfall works above the HWM
- Transition joint bay (TJB)
- Temporary tunnel shaft compound

Construction compounds

- Construction compound A
- Construction compound B
- Temporary access route for construction compound A and B

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Appendix 19.5
Figure 6.1
Geotechnical investigation within the onshore development area: landfall and onshore export cables
Page 1 of 3

CWP doc. number: CWP-TOB-ENG-08-01-MAB-1789

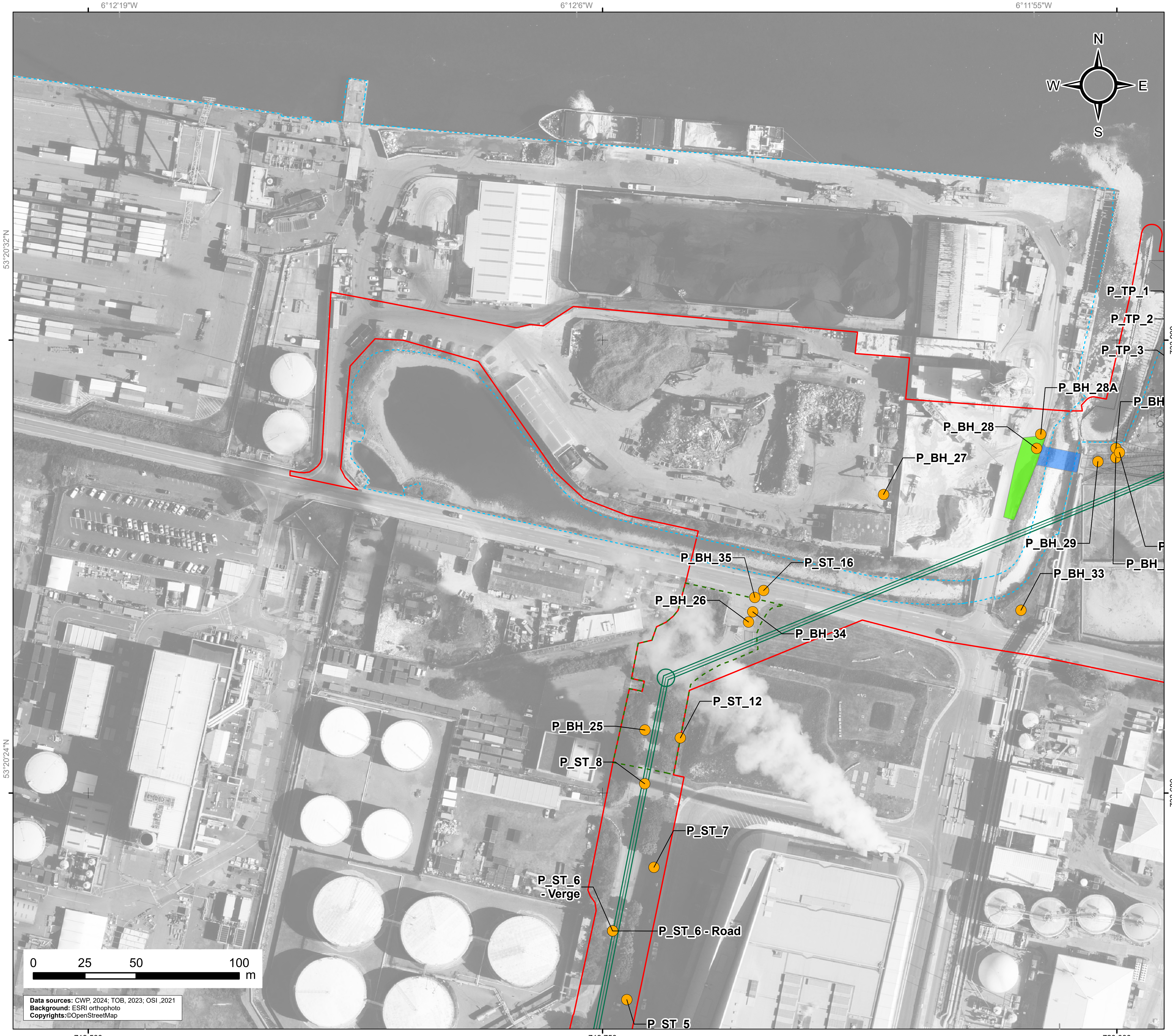
Internal descriptive code: PB - PAB..OECs.3PB.Opt8.OnLoD..TJBs6..LoD..OnCs.TJBs6.T.SHAFT..OnC.LF4.to.SS.PP.T..SS.PP.PL..SS.PP.LO.CIV..SS.PP.BRIDGE..ENC..COMPs.CONSTRUCT.FOR.CONSENTS..COMPs.T..COMPs.ENC..RoW.COMPs.AB - ESBN.CIR.BREAK.GIS.4..HWM..S.GEOTECH.REAL - (ORT.BS.21..EIAR.Vol.04.Ch.19.Ap.05.FIG.06.01)

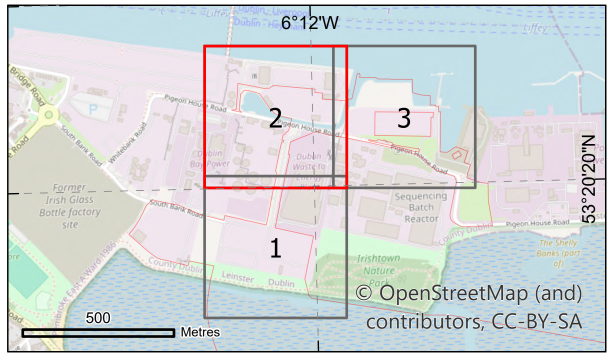
Size: A3

Scale: 1:1,800

CRS: EPSG 2157

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/08/15	SP	DM/EA	ES





Legend

- Planning application boundary
- Onshore substation electrical layout
- High water mark
- Geotechnical investigations - 2022/2023
- Onshore export cable
- Access bridge to onshore substation
- Temporary tunnel shaft compound

Construction compounds

- Construction compound D

codling wind park

Project: Codling Wind Park

Contractor: TOBIN

Website: www.tobin.ie

Appendix 19.5
Figure 6.2
Geotechnical investigation within the onshore development area: onshore export cables
Page 2 of 3

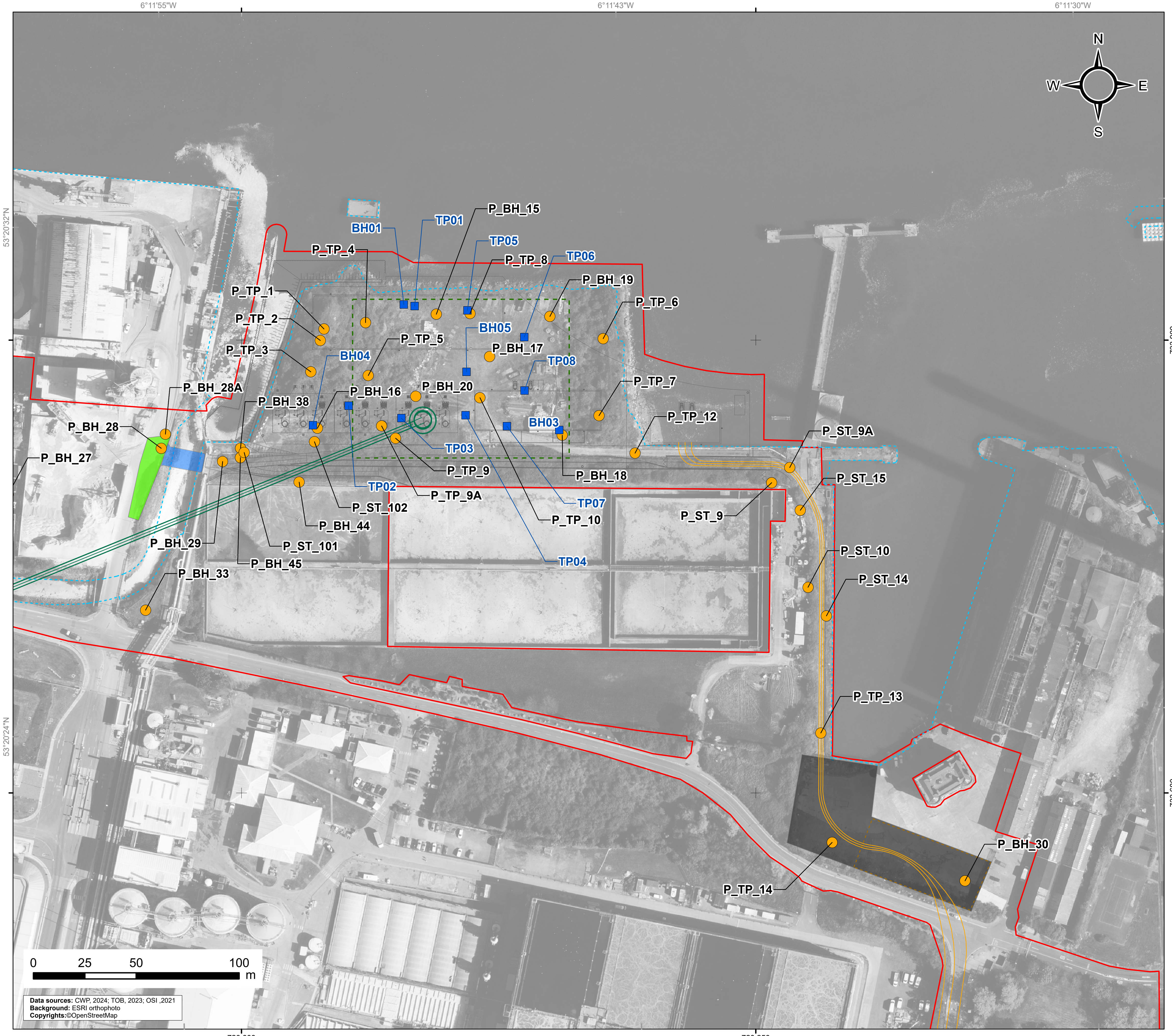
CWP doc. number: CWP-TOB-ENG-08-01-MAB-1789

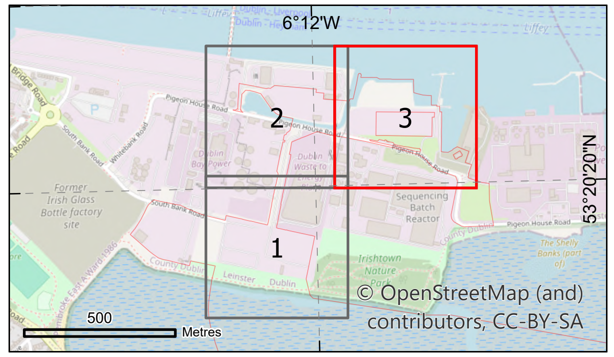
Internal descriptive code:

Size: A3
Scale: 1:1,800

CRS: EPSG 2157

Rev.	*Updates*	*Date*	*By*	*Chk'd*	*App'd*
00	Final for issue	2024/08/15	SP	DM/EA	ES





Legend

- Planning application boundary
- Onshore substation electrical layout
- High water mark
- Geotechnical investigations - 2018
- Geotechnical investigations - 2022/2023
- Onshore export cable
- ESBN network cable
- Access bridge to onshore substation
- Temporary tunnel shaft compound
- Temporary HDD compound (ESBN network cables)

Construction compounds

- Construction compound C
- Construction compound D

Project: Codling Wind Park	Contractor: TOBIN Website: www.tobin.ie

Appendix 19.5
Figure 6.3
Geotechnical investigation within the onshore development area: onshore substation and ESBN network cables
Page 3 of 3

CWP doc. number: CWP-TOB-ENG-08-01-MAB-1789

Internal descriptive code:	*Size:* A3 *Scale:* 1:1,800	*CRS:* EPSG 2157

Rev.	*Updates*	*Date*	*By*	*Chk'd*	*App'd*
00	Final for issue	2024/08/15	SP	DM/EA	ES

6.3 SITE SPECIFIC GEOLOGY

6.3.1 Site geology at the landfall and onshore export cable route

According to the Causeway Geotech (2022,2023 and 2024) reports, the soils and subsoils at the comprises of the following:

- Two dominant layers of Made Ground, these are:
    - A layer encountered throughout the site up to a depth of 7.0 mbgl and consisting of light grey to greyish brown silty sand and gravel with brick and shell fragments, root and rootlets and occasional concrete and plastic pieces; and
    - A second layer encountered in the centre of the landfall site (Compound A) up to a depth of 5 mbgl and overlying the first layer. It consists of landfilled waste with high organic content, fragments of plastic, glass, red brick, concrete, timber, steel wire, ceramic tile and bituminous macadam (bitmac).

Natural soils at the landfall site were identified through boreholes BH14, BH21, BH23 and BH36 ranging from a depth of 4.4 mbgl to >30.0 mbgl. Using Borehole 14 as an example, the soils in these boreholes consist of:

- A sand and gravel layer overlying a thick clay layer, with the sand and gravel layer located between 4.40 mbgl (0.09 mOD) to 15.85mbgl (-11.36 mOD). This layer is generally characterised as loose to medium dense brown to grey silty fine to coarse sand. The gravel is very dense yellowish brown very sandy silty subrounded fine to coarse gravel.
- The density of the sand and gravel increases with depth. The clay layer is described as firm to stiff greenish grey laminated clay which becomes very stiff with depth. The clay is present between 15.85 mbgl (-11.36 mOD) and 26 mbgl (-25.51 mOD).
- BH21, BH23 and BH36 also reveal similar information about the soil composition at the landfall site.

6.3.2 Site Geology at the Onshore Substation and ESBN Network Cables

SI works were undertaken at the onshore substation and ESBN network cables in 2018, 2022 and 2023 and 2024. A summary of the ground types encountered in the boreholes during SI is listed below, in approximate stratigraphic order:

- Made Ground (gravel surface and C&D fill);
- Marine beach deposits overlying Port Clay;
- Glacial Till: stiff to very stiff brown/grey sandy gravelly clay encountered across the site;
- Underlying port clay greater than 30mbgl; and
- Bedrock (Limestone): Rockhead was encountered at depths > 37.5m bgl comprising dark grey limestone.

The 2018, 2022, 2023 and 2024 SI Reports indicate that the soils and subsoils at the onshore substation and ESBN network cables comprise of two dominant layers of Made Ground.

The Made Ground material was identified in the onshore substation site to a depth of up to 7 mbgl and consisting of grey to brownish grey, loose to medium dense sandy gravel overlying firm to stiff dark brown to black gravelly sandy clay. Anthropogenic material comprising pieces of wood, plastic, rubber, concrete, cardboard and plastic sheets was identified within or below the Made Ground clay layer.

Natural soils at the onshore substation were identified from the boreholes up to a depth of 39 mbgl in BH15 in the north of the site and up to a depth of 37.5 mbgl in BH20 in the centre of the site. They consist of:

- A thick sand and gravel layer overlying a thick clay layer. The sand and gravels were generally described as loose to medium dense brown to grey silty fine to coarse sand and gravel with seashell fragments in the upper sections of the layer and bands of silt at deeper depths. The sand and gravels become dark grey and denser with depth and had a thickness of approximately 8.6 m to 16.0 m; and
- The clay layer was described as firm to stiff greyish to dark brown laminated clay which becomes very stiff with depth. The clay has a proven thickness of approximately 16.4 m to 22.5 m.

6.3.3 Groundwater monitoring data

Groundwater flow is tidally driven due to the site's proximity to the Liffey Estuary and Dublin Bay. Groundwater monitoring standpipes and piezometers were installed during the borehole drilling works for the Causeway Geotech SI (2018 to 2023) and will be used for future monitoring of groundwater levels and quality below the onshore development area.

Boreholes from the 2018 SI were monitored on the 3 and the 10 of December 2018 and boreholes from the 2022 SI were monitored on the 11 May 2022. Groundwater monitoring of these boreholes is ongoing. The groundwater monitoring installations are summarised in **Table 6-1** below, outlining the minimum and maximum groundwater levels recorded across the monitoring period.

Table 6-1: Summary of groundwater monitoring installations

Borehole ID	Date	Location	Strata Monitored	Groundwater Level (mbgl)
BH01	2018	onshore substation	Sand and gravel	2.70 – 4.10
BH02	2018	onshore substation	Made Ground + sand and gravel	1.92 – 3.10
BH03	2018	onshore substation	Sand and gravel	2.26 – 3.50
BH04	2018	onshore substation	Made Ground + sand and gravel	2.18 – 3.73
BH05	2018	onshore substation	Made Ground + sand and gravel	1.99 – 3.54
P-BH-15-S	2022	Onshore substation	Made Ground	3.00

Borehole ID	Date	Location	Strata Monitored	Groundwater Level (mbgl)
P-BH-15-D	2022	Onshore substation	Bedrock	Blocked
P-BH-16-S	2022	Onshore substation	Made Ground	Dry
P-BH16-D	2022	Onshore substation	Made Ground + sand and gravel	2.66
P-BH-17	2022	Onshore substation	Sand and gravel	2.15
P-BH-20-S	2022	Onshore substation	Made Ground	Dry
P-BH-20-D	2022	Onshore substation	Bedrock	2.50
P-BH-14	2022	Landfall	Made Ground + sand and gravel	3-4.1
P-BH-21	2023	Landfall	Made Ground + sand and gravel	4.0- 4.2
P-BH-22	2023	Landfall	Made Ground	4.1- 4.7
P-BH-23	2023	Landfall	Made Ground	4.65
P-BH-24	2023	Onshore export cables	Sand	3.3
P-BH-25	2023	Onshore export cables	Made Ground +sand and gravel	4.0
P-BH-36	2023	Walkway along shoreline	Made Ground	3.5

6.3.4 Gas Monitoring Data

Gas monitoring at the landfall site was undertaken at 4(no.) gas monitoring points. The parameters monitored were oxygen, carbon dioxide, carbon monoxide and methane. Contamination indicator gases (methane, carbon dioxide, carbon monoxide) were elevated in BH22 and BH23 (which are located within Compound A). Ground gases were not encountered in BH25 or BH29.

Gas monitoring at the substation site was undertaken at 4 (no.) gas monitoring locations. The parameters monitored were oxygen, carbon dioxide, carbon monoxide and methane. None of the contamination indicator gases (methane, carbon dioxide, carbon monoxide) were elevated.

7. PRELIMINARY CONCEPTUAL SITE MODEL

A preliminary geo-environmental site model/Conceptual Site Model (CSM) has been derived based on the above reviewed information, and consists of three parts i.e., source, pathway, receptors to explain the potential for contamination to exist at the onshore development area, how it may be mobilised and what human or environmental features it may impact on.

The CSM of the onshore substation and onshore export cable route is presented in a cross-sectional view in **Plate 7-1**. The CSM of the landfall is presented in **Plate 7-2**. The cross-section runs N to S across the landfall area, and NW-SE direction through the onshore substation site incorporating the existing material on site, location of boreholes and groundwater levels.

Chemicals likely to be encountered on the onshore development area are listed in **Table 7-1**. The potential contamination sources include:

- The stone and soil materials used to reclaim the lands within the onshore development area;
- Existing waste material deposited during reclamation activities within the onshore development area; and
- Existing stockpile materials.

The onshore development area has a long history of industrial use and was reclaimed through infilling, included MSW waste and C&D waste. Limited detections of TPHs and PAHs were detected in the 2018, 2022 and 2023 SI. Asbestos was detected in the 2022 and 2023 SI.

Table 7-1: Potential chemicals based on site history

Potential contaminants
Asbestos
Hydrocarbons (PAHs/TPH/PCB)
Sulphates
Heavy metals
Ammonia/Leachate

The potential pathways include:

- Horizontal movement of groundwater off-site;
- Vertical movement of groundwater on-site; and
- Percolation of natural recharge into the contaminated Made Ground and then into the sand and gravel.

Due to the historical infill, soils and groundwater in the infill area, may be contaminated with a variety of organic and inorganic pollutants due to historic waste disposal. The CWP Project will remain in commercial / industrial use once operational. There are no residential areas within 250m of the site. The potential receptors include:

- Site users during the construction, operational and maintenance and decommissioning phases of the CWP Project;

- The sand and gravel subsoils;
- Groundwater in the sand and gravels subsoils; and
- The Liffey Estuary surface water body.

The most sensitive on-site users i.e. construction and operational site workers. The underlying groundwater in the soil and bedrock is brackish and, therefore, not suitable for consumption. There are no residents on the OTI area.

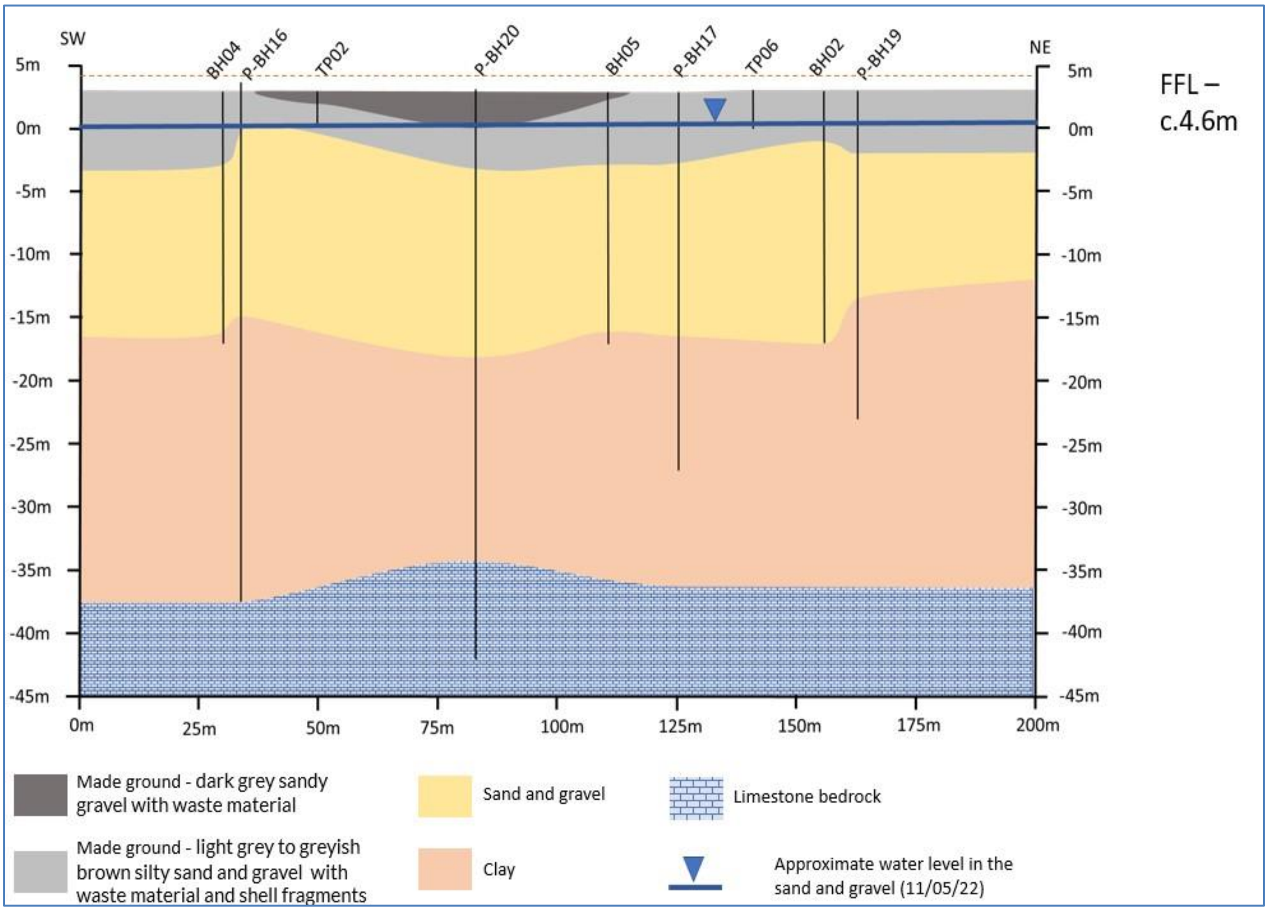


Plate 7-1 Conceptual site model – onshore substation and onshore export cable route

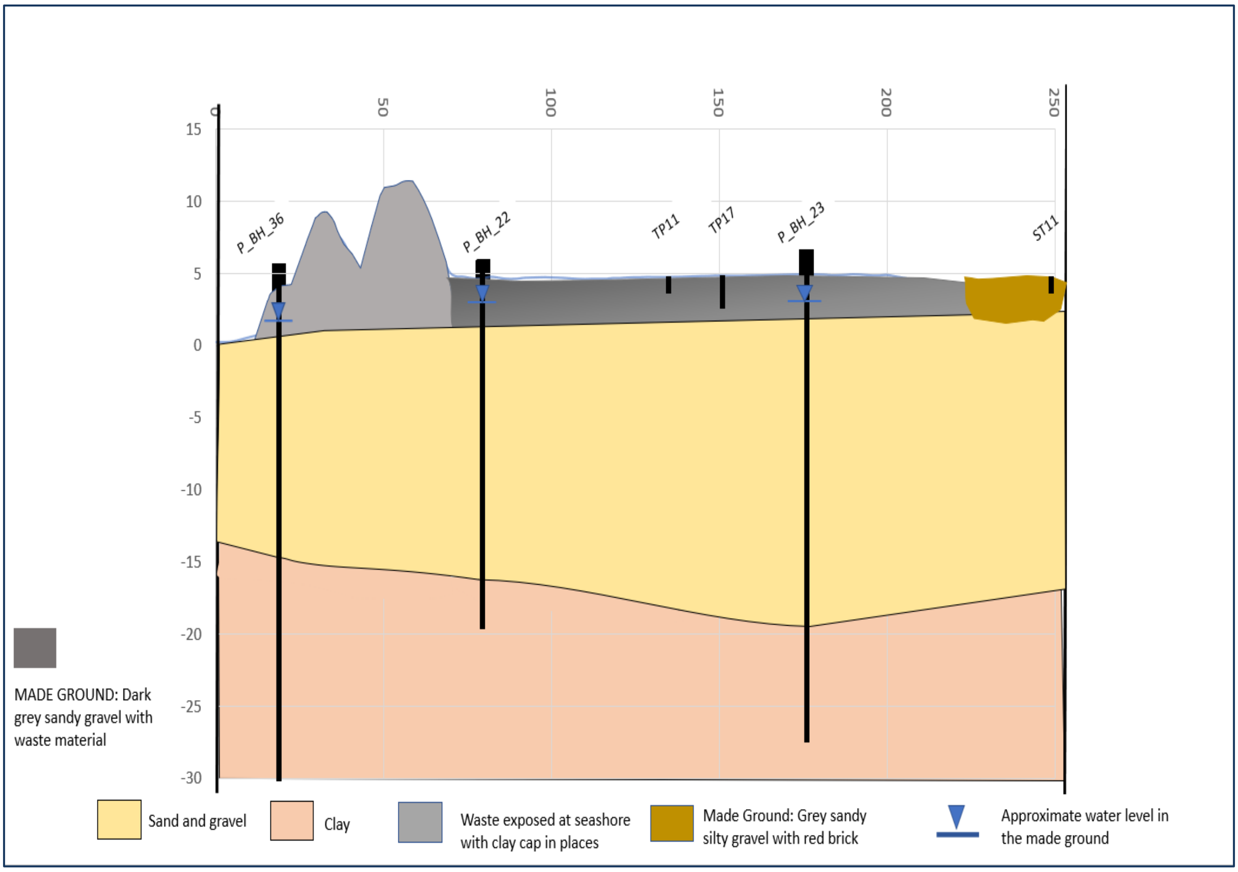


Plate 7-2 Conceptual Site Model - Landfall

8. GENERIC QUANTITATIVE RISK ASSESSMENT

8.1 INTRODUCTION

The assessment below addresses Soils (**Section 8.2**) and Groundwater (**Section 8.3**) and Gas (**Section 8.4**) separately. For example, laboratory soil test results have been compared against published generic screening criteria (GSC). It is necessary for the adopted GSC to be appropriate and suitable for the conceptual exposure. Soil GSC are typically for six land use types based on the Category 4 Screening Level (C4SL) guidance, including:

- Residential with private gardens where homegrown produce may be cultivated and consumed
- Residential without private gardens where no homegrown produce is assumed
- Commercial and industrial settings.
- Public open spaces comprising parkland
- Public open spaces in close proximity to residential property. and
- Allotments.

Conceptually, the commercial land use scenario is appropriate for the OTI.

8.2 SOILS GQRA

Land contamination can affect the health of people living, working, visiting or otherwise present on a site. The risk assessment process is used to establish whether there is an unacceptable risk to humans (CL:AIRE, 2023)[2]. Analytical soil, and groundwater results have been assessed in the context of a generic quantitative risk assessment (GQRA) for the site. As part of the GQRA process, data was screened against GSC protective of human health in an industrial/commercial setting.

The assessment is based on the fate and transport of chemicals in the environment and a generic conceptual model for site conditions and human behaviour for those potentially living/ working on contaminated sites over long time periods (EA, 2009b). The GSC are based on exposure pathways (ingestion (outdoor soil, indoor dust, homegrown vegetables and soil attached to homegrown vegetables), dermal contact (outdoor soil and indoor dust) and inhalation (outdoor dust, indoor dust, outdoor vapours and indoor vapours). The presence and/or significance of each of the potential exposure pathways is dependent on the land use being considered. The model uses standard land use scenarios. Commercial scenarios include community open space with soil track-back to form indoor dust.

GSC are criteria derived using largely generic assumptions about the characteristics and behaviour of soil contaminants, pathways and receptors. These assumptions will be conservative in a defined range of conditions. A number of scenarios were derived including residential and commercial end use. Typical commercial end use would include Retail, Commercial and Industrial Estates.

[2] https://www.claire.co.uk Info-ra2-2

The generic criteria apply to the potential land use that is perceived as potentially the greatest risk to human health. The perceived risk from the various land uses is recognized in the order in which the land uses are listed above. The potential risk factors for individual metals varies depending on the potential exposure scenarios associated with that potential land use, thus the potential exposure factors drive the underlying science behind the science utilise to generate the LQM/CIEH S4ULs - Generic Assessment Limit Values. Utilising the most applicable land use scenario (allotments) in the absence of the main associated exposure pathways would result in a flawed assessment of the risk to human health.

In terms of waters, appropriate GSC were selected based on the site's environmental setting. The risk to waters was assessed based on the risk to groundwater bodies and surface water.

The potential suitability for soil and assessment with respect to the OTI was completed by assessing the laboratory soil sample analysis results from 2018, 2022 and 2023 against appropriate GSC.

The GSC limit values are used to compare the concentration of specific contaminants and to screen the potential risk associated with future excavation, management and/or re-use of the soils within the onshore development area.

The commercial land use scenario was determined to be the most suitable land use scenario for the landfall and OTI and forms a conservative assessment.

The GSC used for the onshore development area included the following:

- The Suitable 4 Use Levels (S4ULs) for Commercial Site Use[3];
- The CL:AIRE Soil Guideline Values for Commercial Site Use[4]; and
- The Category 4 Screening Levels (C4SLs) for Commercial Site Use[5].

8.2.1 Soils assessment for the landfall and onshore export cable

An assessment of the soils data from the SI's for the landfall and onshore export cable route against the relevant GSC is detailed below. Refer to **Appendix A** for the tabulated soil results.

8.2.1.1 Metals

Elevated metals (compared to natural material) were detected in 14 No. of 51 No. soil samples and are likely to have originated from the historical industrial activities in the area. However, the metal concentrations were all below the GSC and indicate that the soil samples are suitable for commercial end use. The only exception was lead at ST11 (2,300 mg/kg). The GSC for lead is 1,100 mg/kg for commercial end use. All other soil metal concentrations are below the GSC.

[3] Nathanail, C.P. et al., 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment, Land Quality Press, Nottingham.
[4] Contaminated Land: Applications in Real Environments (CL:AIRE), 2023. Soil Guideline Values - Soil Guideline Value Reports. Available at: https://www.claire.co.uk/information-centre/water-and-land-library-wall/44-risk-assessment/178-soil-guideline-values,.
[5] Harries, N. et al., 2014. Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, Final Project Report (Revision 2) Final. Contaminated Land: Applications in Real Environments (CL:AIRE). Available at: https://www.claire.co.uk/projects-and-initiatives/category-4-screening-levels.

8.2.1.2 Asbestos

There are no GSCs in relation to asbestos. Where asbestos is detected within the excavation areas, asbestos will be removed in accordance with the Waste Management Regulations. Asbestos was detected in 5 No. of 51 No. samples collected.

Asbestos was detected at the landfall and along the onshore export cable route as detailed in **Table 8-1.**

Table 8-1 Asbestos detections

Site Investigation ID	Sample depth	Location
P-ST06	0.5m;	Onshore export cable
TP-17	3m	Landfall
P-BH-36	3m	Landfall
P-BH-22	5.5m	Landfall
P-BH-14	1.5m	Landfall

Asbestos concentrations are between 0.001% and 0.005%. Based on the low levels encountered, the material would be classified as non-hazardous.

8.2.1.3 Hydrocarbons

Elevated hydrocarbon (compared to natural material) was detected in soil samples in 2023 and are likely to have originated from the historical industrial activities associated with the wider area.

BTEX levels were below laboratory detection limits with the exception of low concentrations at P-BH-22 (1m depth). The concentrations did not exceed the GSC and were within the acceptable limits for commercial land use.

No VOCS were encountered on site and therefore are no exceedances of the GSCs. Low level concentrations of SVOCs were detected in P-ST-04, P-ST-14, P-BH-22 and P-BH-24 however there are no exceedances of the GSCs.

28 No. of the 51 No. samples for (sum of 17) PAHs were above detection limits (2mg/kg) with site concentrations varying from <2 to 270 mg/kg. However, hydrocarbon and PAH concentrations indicate that the soil samples are suitable for a Commercial end use.

8.2.1.4 Phenols

There are no Phenol concentrations in excess of the corresponding screening values.

8.2.1.5 Cyanides

There are no Phenol concentrations in excess of the corresponding screening values.

Based on a review of the data, the soils from within the onshore development area would be suitable for the proposed industrial land use.

8.2.2 Onshore Substation

8.2.2.1 Metals

Elevated metals (compared to natural soil material) were detected in the 2022/2023 soil samples and are likely to have originated from the historical industrial activities associated with the wider area. However, the metal concentrations indicate that there were no exceedances of the GSCs and that soil samples are suitable for a commercial end use.

8.2.2.2 Asbestos

Minor levels of asbestos were detected in two of the eight samples taken from within the stockpiles in 2022. Asbestos was detected was in the form of fibres or clumps of chrysotile and amosite. Asbestos concentrations are between 0.001% and 0.002%. No asbestos was encountered outside of the stockpiles on the onshore substation site. Where asbestos is detected within the proposed excavation areas, soils from these areas are to be moved off-site.

No asbestos was detected during the 2018 SI on the onshore substation site. Based on the low levels encountered it is likely the stockpile material would be classified as non-hazardous.

8.2.2.3 Hydrocarbons

Elevated hydrocarbon (compared to natural material) was detected in soil samples in 2018 and 2022. The elevated concentrations are likely to have originated from the historical industrial activities associated with the wider area.

No elevated BTEX, SVOCs or VOCS were encountered on site. All BTEX, SVOCs or VOCS are below their respective GSC.

8 No. of the 14 samples for sum of 17 PAHs were above detection limits with site concentrations varying from <1 to 58 mg/kg. However, hydrocarbon and PAH concentrations indicate that the soil samples are suitable for a Commercial/industrial end use – i.e., onshore substation.

8.2.2.4 Phenols

None of the reported phenol concentrations are in excess of the corresponding detection limits.

8.2.2.5 Cyanides

No total cyanide contamination was detected in any of the sediment samples scheduled for analysis.

8.3 GROUNDWATER

In terms of groundwater, appropriate GSC were selected based on the conceptual site model CSM. There are no groundwater abstractions on the OTI or within 1km of the OTI. Groundwater data was screened using available criteria, according to the following hierarchy:

- European Communities Environmental Objectives (Groundwater) Regulations, 2010 (Statutory Instrument No. 9 of 2010 as amended);

  European Communities Environmental Objectives (Drinking Water) Regulations, (Statutory Instrument No. 106 of 2007 as amended);
- World Health Organisation, 2005, Petroleum Products in Drinking Water, Background document for development of WHO Guidelines for Drinking-water Quality; and
- SoBRA Generic Assessment Criteria for Groundwater Vapour Risk Assessment
- US Environmental Protection Agency, 2011, Regional Screening Levels (RSLs) for tap water at consumer's tap, November 2011.

There were a number of elevated metal and salt concentrations recorded in the 2022/2023 SI results. Elevated chloride, sulphate, sodium, boron and manganese concentrations were encountered as well as elevated electrical conductivity. Groundwater concentrations are similar to those seen in saltwater, indicating saltwater influence from the Irish Sea. Groundwater quality is similar on the landfall and onshore substation site. Although the groundwater is brackish, groundwater results are compared to the groundwater regulations S.I. No. 9/2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010.

8.3.1 Metals and Inorganics

Elevated concentrations included chloride, sulphate, sodium, boron and manganese as well as elevated electrical conductivity. However, these were present in concentrations similar to those seen in saltwater, indicating the groundwater is brackish. Previous groundwater monitoring indicates groundwater is brackish on the onshore substation site and not suitable for a drinking water abstraction.

Elevated nitrite concentrations were detected in P-BH-23 on 15 March 2023. Elevated concentrations of aluminium, arsenic and lead were detected in P_BH-21 on 16 May 2022.

Elevated concentrations of ammonium were detected in all boreholes with the highest concentrations detected in P-BH14, P-BH-21 and P-BH23. Elevated concentrations of ammonium are indicative of a source of organic material as noted in the borehole and trial pit logs at the landfall site.

8.3.2 Hydrocarbons

Concentrations of PAHs, BTEX compounds and VOCs were below their respective limits of detection. There were no elevated concentrations of hydrocarbons concentrations in the groundwater samples.

8.3.3 VOCs

Volatile contaminants in groundwater have the potential to cause risk to human health via volatilisation and migration of vapours into overlying buildings or outdoor air space followed by inhalation. Where the Conceptual Site Model (CSM) identifies this contaminant linkage as being of possible concern it is usually necessary to assess the risks arising from this pathway further to determine whether these are acceptable or not. One VOC screening method (SoBRA, 2017[6]) that can be used is to compare the measured concentrations of volatile contaminants in groundwater with suitable GSCs.

VOCs were not detected in any of the other groundwater monitoring boreholes in 2022/2023. No SVOCs were detected in groundwater above laboratory MDLs. No VOCs or SVOCs exceed the GSCs.

8.3.4 Phenols

Phenols were not detected in any groundwater monitoring boreholes.

8.4 Ground Gas

The main pathway considered for landfill gas migration is through the subsoil. Another relevant pathway is underground services, including pipelines and their wayleaves, drainage systems and manholes. In addition, landfill gas can migrate from the site when dissolved in groundwater (EPA, 2007)[7].

Human Presence is considered to be the principal sensitive receptor in respect of landfill gas due to the potential for the build-up of gas within confined areas. Levels of landfill gas peak in the years following closure (c. early 1980s) and reduce over the decades post closure. The landfill generation rate (k) determines the rate of methane generation for the mass of waste in the landfill. Degradation is faster where sufficient moisture and nutrients are available.

The CIRIA C665 document provides guidance on the collection of relevant and valid data that will allow an accurate description of soil gases to be made; a rigorous consistent and transparent assessment of the risks posed by soil gas to be undertaken which in conjunction with relevant British Standard Guidance BS8485:2015+A1:2019 (Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings) will allow an appropriate strategy for remedial works to be developed should they be required.

8.4.1 Gas – Onshore substation site

Gas monitoring was undertaken at 4 No. gas monitoring points at the onshore substation site (P-BH-15, P-BH-16, P-BH-20 and P-BH-29). The parameters monitored were oxygen, carbon dioxide, carbon monoxide and methane. None of the contamination indicator gases (methane, carbon dioxide, carbon monoxide) were elevated. Oxygen concentrations were within normal parameters i.e. 20% to 20.5%.

[6] Society of Brownfield Risk Assessment (2017) Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater Version 1.0
[7] EPA (2007) Code Of Practice Environmental Risk Assessment for Unregulated Waste Disposal Sites

8.4.2 Gas - Landfall site

Gas monitoring was undertaken at 4 (No.) gas monitoring points (P-BH-21, P-BH-22, P-BH-23 and P-BH-25). The parameters monitored were oxygen, carbon dioxide, carbon monoxide and methane. Contamination indicator gases (methane, carbon dioxide, carbon monoxide) were elevated in BH22 and BH23 (which are located within Compound A). Elevated Methane levels of 6% (P-BH-23) to 20% (P-BH-22) were recorded on the landfall site. Methane levels in the remaining monitoring points were below the threshold of 1%. Oxygen was at a sufficient percentage, c. 20.5%. The quantity/flow of landfall gas is limited due to the passage of time, with open ventilation occurring at the landfall site, i.e area is not capped with a low permeability layer.

As part the landfall site is an historical waste disposal area, the generation of gases has reduced over the last 50-60 years. The natural geology is conducive to the breakdown of organic material and gas movement.

9. WASTE CLASSIFICATION

Excavated material will be generated during the construction phase. The estimated figure for excavated materials requiring export offsite for recovery/disposal during the construction phase is approximately 165,299 tonnes. This assumes that all this excavated material is not reused on site and would require offsite recovery/disposal.

Table 9-1: Summary of Estimated soil and aggregate material requiring export off-site (tonnes)

Aggregate and Soil (Excavated Material) Exported Off-Site	Tonnes
Landfall: TJB excavation, TJB connection to tunnel shaft and access road around TJBs	21,577
Landfall: open cut excavation from rear to front berm and access ramp	17,171
Onshore export cable: tunnel (inc. shaft excavation, compound clearance and tunnel bore arisings)	40,554
Onshore substation and ESBN network cables	85,997
Overall Total	165,299

9.1 WASTE ACCEPTANCE CRITERIA

Waste Acceptance Criteria (WAC) as detailed in Council Decision 2003/33/EC are only applicable to material if it is to be disposed of as a waste at a landfill facility. The WAC data is considered in combination with the waste classification outlined in above allows the most suitable waste category to be applied to the material tested. The potentially applicable waste categories are summarised in **Table 9-2**. For stone and soil material (17 05 04) Waste Acceptance Criteria (WAC) is required for disposal. WAC as detailed in Council Decision 2003/33/EC are only applicable to material if it is to be disposed of as a waste at a landfill facility. The WAC data considered in combination with the waste classification outlined in above allows the most suitable waste category to be applied to the material tested.

Soils from the asbestos areas would require disposal at a Category C2 - Non-Haz Landfill. Due to the history of infilling, any soil removal will potentially entail disposal at an Inert (B1) to Hazardous (D). Natural soils and some Made Ground may be suitable for disposal at Class A facility. Elevated total organic carbon (>5%) was detected in two samples from P_BH20 on site and is likely to reflect the presence of organic material. 4

Table 9-2: Potential Waste Categories for Disposal/Recovery

Waste Category	Classification Criteria
Category A Unlined Soil Recovery Facilities	Soil and Stone only which are free from anthropogenic materials such as concrete, brick, timber. Soil must be free from “contamination” e.g. Total BTEX 0.05mg/kg, Mineral Oil 50mg/kg, Total PAHs 1mg/kg, Total PCBs 0.05mg/kg and No Asbestos Detected

Waste Category	Classification Criteria
Category B1 Inert Landfill	Reported concentrations within inert waste limits, which are set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002). Results also found to be non-hazardous using the HWOL6 application.
Category B2 Inert Landfill	Reported concentrations greater than Category B1 criteria but less than i.e., IMS Hollywood Landfill acceptance criteria, as set out in their Waste Licence W0129-02. Results also found to be non-hazardous using the HWOL application.
Category C Non-Haz Landfill	Reported concentrations greater than Category B2 criteria but within non-Haz landfill waste acceptance limits set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002). Results also found to be non-hazardous using the HWOL application.
Category C 1 Non-Haz Landfill	As Category C but containing < 0.001% w/w asbestos fibres.
Category C 2 Non-Haz Landfill	As Category C but containing >0.001% and <0.01% w/w asbestos fibres
Category C 3 Non-Haz Landfill	As Category C but containing >0.01% and <0.1% w/w asbestos fibres.
Category D Hazardous Treatment	Results found to be hazardous using HWOL Application or above non-Haz criteria.
Category D 1 Hazardous Disposal	Results found to be hazardous due to the presence of asbestos. (>0.1%).

The excavation and disposal of waste is required at the onshore substation, mainly associated with the existing C&D stockpiles. The waste at the onshore substation is predominantly C&D (17 09 04 mixed construction and demolition wastes).

Soil WAC testing on the onshore substation site indicated the material is classified as inert stone and soil (category B1/B2 material). The volume of stone and soil material is estimated at 85,997 tonnes. The material is likely to be suitable for reuse on site subject to achieving the required geotechnical and environmental standards.

Where Made Ground is encountered on the landfall launch shaft, the material is a mix of C&D, soil, and organic material. Due to the >2% waste material at the launch shaft, material is expected to be disposed of as 17 09 04 (mixed construction and demolition wastes) or 20 03 99 (municipal waste not otherwise specified). The volume of C&D/municipal waste material (in the Made Ground) associated with the excavation of the tunnel shaft at the landfall (launch shaft) is estimated at c. 1,620 tonnes. The front and rear berms (c. 17,117 tonnes) is assumed to comprise a mix of C&D material 17 09 04 (mixed construction and demolition wastes) and stone and soil (17 05 04).

10. SUMMARY

A desk-based study, SI and risk assessment were carried out to determine the potential for contamination for the onshore substation and associated infrastructure, as part of the onshore elements of the CWP Project .

The onshore substation site area was created by reclaiming land from the Liffey Estuary in the late 1990's to early 2000's when the Poolbeg peninsula was already heavily industrialised. Site investigations identified that the geology of the site comprises Made Ground overlying sand and gravel, overlying glacial till and limestone bedrock. No significant soil or groundwater contamination was encountered on the onshore substation site. Stockpiles deposited on the onshore substation site will require removal prior to development in accordance with the Waste Management Act 1996 as amended. A review of the soil screening criteria indicates that the site is suitable for the proposed end use.

Based on groundwater monitoring, the sand and gravels on the Poolbeg peninsula are brackish and considered to be in hydraulic continuity with the Liffey Estuary and are tidally influenced.

The landfall area was reclaimed in the 1970s and early 1980s. During the recent SI works in this area, mixed waste material was encountered to a depth of 5 m. Waste soil and waste material excavated will require removal in accordance with the Waste Management Act 1996 as amended. Geo-environmental samples collected from the landfall site show that a number of samples have elevated PAHs, heavy metals and asbestos. However, a review of the soil screening criteria indicates that the site is suitable for the proposed industrial end use. Waste material encountered will require removal in accordance with the Waste Management Act 1996 as amended.

The groundwater at the landfall area recorded some elevated metals, however concentrations are representative of a saltwater environment.

Contamination indicator gases (methane, carbon dioxide, carbon monoxide) were elevated in two monitoring locations at the landfall. The appointed contractor for the tunnel installation works will produce risk assessments to address ground gas during construction, for approval with the Applicant

11. GLOSSARY AND ABBREVIATIONS

Glossary	Meaning
The Applicant	The developer, Codling Wind Park Limited (CWPL).
Aquifer	A permeable geological stratum or formation that can both store and transmit water in significant quantities.
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
C4SL	Category 4 screening levels - Soil screening values
CL:AIRE	Contaminated Land: Applications In Real Environment
Compound A	A temporary construction compound, support area and storage facility for the landfall works and to support the installation of the onshore export cables. It will operate as a hub for the onshore construction works as well as acting as a staging post and secure storage for equipment and component deliveries.
Compound B	A temporary construction compound/laydown area for general cable route and onshore substation construction activities.
Compound C	A temporary construction compound for the onshore substation site. Contractor welfare facilities will be located in this compound as well as some material storage space.
Compound D	A temporary construction compound and laydown area to facilitate the construction of the bridge over the cooling water channel.
CSM	Conceptual site model
Decommissioning phase	Phase during which the decommissioning activity for the offshore / onshore transmission infrastructure for the Codling Wind Park (CWP) Project will take place.
Environmental Impact Assessment (EIA)	A systematic means of assessing the likely significant effects of a proposed project, undertaken in accordance with the EIA Directive and the relevant Irish legislation.
Environmental Impact Assessment Report (EIAR)	The report prepared by the Applicant to describe the findings of the EIA for the CWP Project.
EQS	Environmental quality standards
ESB Networks (ESBN)	Owner of the electricity distribution system in the Republic of Ireland, responsible for carrying out maintenance, repairs and construction on the grid.
ESBN network cables	Three onshore export cable circuits connecting the onshore substation to the proposed ESBN Poolbeg substation, which will then transfer the electricity onwards to the national grid.
Export Cables	The cables, both onshore and offshore, that connect the offshore substations with the onshore substation.
Generating Station	Comprising the wind turbine generators (WTGs) and inter array cables (IACs) and the interconnector cables.
Groundwater	That part of the subsurface water that is in the saturated zone, i.e., below the water table.
GQRA	Generic Quantitative Risk Assessment

Glossary	Meaning
Groundwater	That part of the subsurface water that is in the saturated zone, i.e., below the water table
High Water Mark (HWM)	The line of high water of ordinary or medium tides of the sea or tidal river or estuary.
Horizontal directional drilling (HDD)	HDD is a trenchless drilling method used to install cable ducts beneath the ground through which onshore export cables from can be pulled. HDD enables the installation of cables beneath obstacles such as roads, waterways and existing utilities.
Landfall	The point at which the offshore export cables are brought onshore and connected to the onshore export cables via the transition joint bays (TJB). For the CWP Project, the landfall works include the installation of the offshore export cables within Dublin Bay out to approximately 4 km offshore, where water depths that are too shallow for conventional cable lay vessels to operate.
Landfill	A site used for the deposit of waste on to or under land.
Limestone	A sedimentary rock consisting chiefly of calcium carbonate ($CaCO_3$), primarily in the form of the mineral calcite. It is mostly formed by the accumulation of calcareous shells, cemented by calcium carbonate precipitated from solution.
Offshore export cables	The cables which transport electricity generated by the WTGs from the offshore substations (OSSs) to the TJBs at the landfall.
Onshore development area	The entire footprint of the OTI and associated temporary works that will form the onshore boundary for the planning application.
Onshore export cables	The cables which transport electricity generated by the WTGs from the TJBs at the landfall to the onshore substation.
Onshore substation	Site containing electrical equipment to enable connection to the national grid.
Onshore substation site	The area within which permanent and temporary works will be undertaken to construction the onshore substation.
Onshore transmission infrastructure (OTI)	The onshore transmission assets comprising the TJBs, onshore export cables and the onshore substation. The EIAR considers both permanent and temporary works associated with the OTI.
PAHs	polycyclic aromatic hydrocarbons
Parameters	Set of parameters by which the CWP Project is defined and which are used to form the basis of assessments.
Planning application boundary	The area subject to the application for development consent, including all permanent and temporary works for the CWP Project.
PCBs	polychlorinated biphenyls
Poolbeg 220kV substation	This is the ESBN substation that the ESBN network cables connect into, from the onshore substation. This substation will then transfer the electricity onwards to the national grid.
S4ULs	Suitable 4 Use Levels – Soil screening values
Subsoil	The material between the topsoil and the bedrock.

Glossary	Meaning
SVOCs	Semi-Volatile Organic Compounds
Temporary HDD compound	The areas within the onshore development area that will house HDD entry or exit pits as well as associated plant, equipment and facilities.
Till	Unsorted glacial deposits consisting of boulders and cobbles mixed with very finely ground-up rock such as sand, silt or clay.
Transition joint bay (TJB)	This is required as part of the OTI and is located at the landfall. It is an underground bay housing a joint which connects the offshore and onshore export cables.
VOCs	Volatile Organic Compounds
WAC	Waste acceptance criteria
Wind turbine generator	All the components of a wind turbine, including the tower, nacelle, and rotor.

12. REFERENCES

Causeway Geotech, 2018. Dublin Port Berth 47a– Ground Investigation, Report No. 18-1287, Final for Issue

Causeway Geotech, 2022. Codling Wind Park – Poolbeg, Report No. 21-1443C, Final Report

Causeway Geotech, 2023-2024. Codling Wind Park – Poolbeg, Interim Report

Dublin City Council 2019 Tier 1 Environmental Risk Assessment Historical Landfill at Shelly Banks, Co. Dublin.

Dublin Docklands Development Authority. Dublin Docklands Area Master Plan 2008. Available from https://www.dublindocklands.ie/masterplan-2008.

Environmental Protection Agency, 2013. Guidance on the management of Contaminated Land and Groundwater at EPA licensed sites. Available at: https://www.epa.ie/our-services/compliance--enforcement/waste/contaminated-land/, Accessed: 05/05/2024

Environmental Protection Agency 2023. National Waste Statistics releases for 2021 reference year.

Environmental Protection Agency, 2024. EPA Maps. Available at: https://gis.epa.ie/EPAMaps/, Accessed: 05/05/2024

Geological Survey of Ireland, 2003. Dublin GWB: Summary of Initial Characterisation. Available at:https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx, Accessed: 05/05/2024

Geological Survey of Ireland., 2024. Department of Communication, Energy and Natural Resources: Online Mapping. https://www.gsi.ie/Mapping.htm.

National Parks and Wildlife Service, 2024. NPWS Designations Viewer. Available at: https://www.npws.ie/maps-and-data, Accessed: 05/05/2024

Ordnance Survey Ireland, 2024. GeoHive spatial data www.geohive.ie.

TOBIN, 2021. Biodiversity Poolbeg Baseline Report, Doc No: CWP-CWP-CON-04-01-02-03-REP-0002

Appendix A SUMMARY TABLES AND LAB RESULTS

Onshore substation site - soils					
Parameter	**Units**	**Generic Screening Levels**	**No. Exceedances**	**Max**	**Min**
Asbestos Identification	%	Non detection	2	Chrysotile and Amosite	Not detected
Total Asbestos	%		2	0.002%	<0.001%
Moisture	%		0	48	3
pH			0	11.10	8.80
Boron (Hot Water Soluble)	mg/kg		0	5.70	<LOD
Sulphate (2:1 Water Soluble) as SO4	g/l		0	1.90	<LOD
Sulphur (Elemental)	mg/kg		0	22	<LOD
Cyanide (Total)	mg/kg		0	0.50	<LOD
Sulphide (Easily Liberatable)	mg/kg		0	400	3.70
Sulphate (Total)	%		0	0.19	<LOD
Sulphate (Total)	mg/kg		0	1,900	<LOD
Iron (Total)	mg/kg		0	12,000	6100
Arsenic	mg/kg	640	0	32	1.70
Barium	mg/kg	625	0	170	<LOD
Cadmium	mg/kg	220	0	0.83	<LOD
Chromium	mg/kg		0	30	2.70
Molybdenum	mg/kg		0	2	<LOD
Antimony	mg/kg		0	2.10	<LOD
Copper	mg/kg	68000	0	180	1.40
Mercury	mg/kg	58	0	0.71	<LOD
Nickel	mg/kg		0	33	2.30
Lead	mg/kg	1100	0	850	2
Selenium	mg/kg	13000	0	0.99	<LOD
Vanadium	mg/kg		0	31	11
Zinc	mg/kg	730000	0	530	10
Chromium (Trivalent)	mg/kg	8600	0	30	2.70

Onshore substation site - soils					
Parameter	Units	Generic Screening Levels	No. Exceedances	Max	Min
Organic Matter	%		0	13	<LOD
Total Organic Carbon	%		0	7.40	0.37
Mineral Oil (TPH Calculation)	mg/kg		0	190	<LOD
Aliphatic TPH >C16-C21	mg/kg		0	12	<LOD
Aliphatic TPH >C21-C35	mg/kg		0	140	<LOD
Aliphatic TPH >C35-C44	mg/kg		0	160	<LOD
Total Aliphatic Hydrocarbons	mg/kg		0	190	<LOD
Aromatic TPH >C16-C21	mg/kg		0	16	<LOD
Aromatic TPH >C21-C35	mg/kg		0	290	<LOD
Aromatic TPH >C35-C44	mg/kg		0	110	<LOD
Total Aromatic Hydrocarbons	mg/kg		0	310	<LOD
Total Petroleum Hydrocarbons	mg/kg		0	450	<LOD
Phenanthrene	mg/kg		0	1.80	<LOD
Fluoranthene	mg/kg		0	2.70	<LOD
Pyrene	mg/kg		0	2.60	<LOD
Benzo[a]anthracene	mg/kg		0	1.40	<LOD
Chrysene	mg/kg		0	1.40	<LOD
Benzo[b]fluoranthene	mg/kg		0	1.80	<LOD
Benzo[k]fluoranthene	mg/kg		0	0.62	<LOD
Benzo[a]pyrene	mg/kg	360000	0	1.50	<LOD
Indeno(1,2,3-c,d)Pyrene	mg/kg		0	0.79	<LOD
Benzo[g,h,i]perylene	mg/kg		0	1.00	<LOD
Naphthalene	mg/kg		0	10	<LOD
Acenaphthylene	mg/kg		0	2.20	<LOD
Acenaphthene	mg/kg		0	1.10	<LOD
Fluorene	mg/kg		0	1.10	<LOD
Phenanthrene	mg/kg		0	6.00	<LOD
Benzo[j]fluoranthene	mg/kg		0	1.40	<LOD

Onshore substation site - soils					
Parameter	Units	Generic Screening Levels	No. Exceedances	Max	Min
Anthracene	mg/kg		0	1.20	<LOD
Fluoranthene	mg/kg		0	6.70	<LOD
Pyrene	mg/kg		0	5.90	<LOD
Benzo[a]anthracene	mg/kg		0	3.00	<LOD
Chrysene	mg/kg		0	2.90	<LOD
Benzo[b]fluoranthene	mg/kg		0	4.40	<LOD
Benzo[k]fluoranthene	mg/kg		0	1.50	<LOD
Benzo[a]pyrene	mg/kg	36000	0	3.30	<LOD
Indeno(1,2,3-c,d)Pyrene	mg/kg		0	1.80	<LOD
Dibenz(a,h)Anthracene	mg/kg		0	0.70	<LOD
Benzo[g,h,i]perylene	mg/kg		0	2.20	<LOD
Total Of 17 PAH's	mg/kg		0	54	<LOD
Cresols	mg/kg		0	0.10	<LOD
Total Phenols	mg/kg	3200	0	0.37	<LOD

*<LOD = less than limit of detection

S4UL (Suitable 4 Use Levels)
CL:AIRE Soil Guideline Values
C4SL - Commercial site use

Landfall and Cable route summary - soils						
Determinands	Units	LOD	Generic Screening Levels	No of exceedances	Min	MAX
ACM Type		N/A				
Asbestos by Gravimetry	%	0.001		5	<0.001	0.005
Total Asbestos	%	0.001		5	<0.001	0.005
Moisture	%	0.02		0	0.7	31.0
pH		4		0	48	9.6
Boron (Hot Water Soluble)	mg/kg	0.4		0	0.4	8.3
Sulphate (2:1 Water Soluble) as SO4	g/l	0.01		0	0.0	1.7
Sulphur (Elemental)	mg/kg	1		0	1.1	1400
Cyanide (Total)	mg/kg	0.5	168	0	5	5
Sulphide (Easily Liberatable)	mg/kg	0.5		0	1.4	260
Sulphate (Total)	%	0.01		0	0.0	1.0
Sulphate (Total)	mg/kg	100		0	260	10000
Arsenic	mg/kg	0.5	640	0	2.7	30
Barium	mg/kg	0	625	0	6	470
Cadmium	mg/kg	0.1	190	0	0.1	1.8
Chromium	mg/kg	0.5		0	4.3	33
Molybdenum	mg/kg	0.5	17700	0	0.5	5.1
Antimony	mg/kg	2	7350	0	2.1	96
Copper	mg/kg	0.5	68,000	0	2.2	340
Mercury	mg/kg	0.05	58	0	0.1	1.2
Nickel	mg/kg	0.5	983	0	5.5	41
Lead	mg/kg	0.5	1,100	1	6.3	2300
Selenium	mg/kg	0.25	12,000	0	0.3	1.5
Zinc	mg/kg	0.5	730,000	0	21	860
Chromium (Trivalent)	mg/kg	1	8600	0	4.3	33
Chromium (Hexavalent)	mg/kg	0.5		0	0.0	0.0
Organic Matter	%	0.4		0	0.5	21.0
Total Organic Carbon	%	0.2		0	0.3	12.0
Mineral Oil (TPH Calculation)	mg/kg	10		0	18.0	18.0
Aliphatic TPH >C5-C6	mg/kg	1		0	0.0	0.0
Aliphatic TPH >C6-C8	mg/kg	1		0	0.0	0.0

Landfall and Cable route summary - soils						
Determinands	Units	LOD	Generic Screening Levels	No of exceedances	Min	MAX
Aliphatic TPH >C8-C10	mg/kg	1	7,780	0	0.0	0.0
Aliphatic TPH >C10-C12	mg/kg	1	2,000	0	3.6	16.0
Aliphatic TPH >C12-C16	mg/kg	1	9,690	0	1.5	10.0
Aliphatic TPH >C16-C21	mg/kg	1	58,800	0	2.4	43.0
Aliphatic TPH >C21-C35	mg/kg	1	648,000	0	9.1	52.0
Aliphatic TPH >C35-C44	mg/kg	1	648,000	0	1.3	2.7
Total Aliphatic Hydrocarbons	mg/kg	5		0	7.8	120.0
Aromatic TPH >C5-C7	mg/kg	1		0	0.0	0.0
Aromatic TPH >C7-C8	mg/kg	1		0	0.0	0.0
Aromatic TPH >C8-C10	mg/kg	1	3,460	0	2.3	2.3
Aromatic TPH >C10-C12	mg/kg	1	16,200	0	2.5	2.5
Aromatic TPH >C12-C16	mg/kg	1	36,200	0	1.5	8.6
Aromatic TPH >C16-C21	mg/kg	1	26,600	0	3.7	620.0
Aromatic TPH >C21-C35	mg/kg	1	28,400	0	3.0	180.0
Aromatic TPH >C35-C44	mg/kg	1	28,400	0	2.1	15.0
Total Aromatic Hydrocarbons	mg/kg	5		0	24.0	710.0
Total Petroleum Hydrocarbons	mg/kg	10		0	17.0	830.0
Organotin (total as TBTO)	µg/kg	10		0	0.0	0.0
Dibutyl Tin	µg/kg	10		0	0.0	0.0
Tetrabutyl Tin	µg/kg	10		0	0.0	0.0
Tributyl Tin	µg/kg	10		0	0.0	0.0
Triphenyl Tin	µg/kg	10		0	0.0	0.0
Monobutyl Tin	µg/kg	10		0	0.0	0.0
Benzene	µg/kg	1	95000	0	1.7	2.2
Toluene	µg/kg	1	4,400,000	0	190.0	190.0
Ethylbenzene	µg/kg	1	2,800,000	0	0.0	0.0
m & p-Xylene	µg/kg	1	3,500,000	0	0.0	0.0
o-Xylene	µg/kg	1	2,600,000	0	0.0	0.0
Methyl Tert-Butyl Ether	µg/kg	1		0	0.0	0.0
N-Nitrosodimethylamine	mg/kg	0.5		0	0.0	0.0
Phenol	mg/kg	0.5	760	0	0.0	0.0
2-Chlorophenol	mg/kg	0.5	3,500	0	0.0	0.0
Bis-(2-Chloroethyl)Ether	mg/kg	0.5		0	0.0	0.0

Landfall and Cable route summary - soils						
Determinands	Units	LOD	Generic Screening Levels	No of exceedances	Min	MAX
1,3-Dichlorobenzene	mg/kg	0.5	30	0	0.0	0.0
1,4-Dichlorobenzene	mg/kg	0.5	4,400	0	0.0	0.0
1,2-Dichlorobenzene	mg/kg	0.5	2,000	0	0.0	0.0
2-Methylphenol	mg/kg	0.5	160,000.0	0	0.0	0.0
Bis(2-Chloroisopropyl)Ether	mg/kg	0.5		0	0.0	0.0
Hexachloroethane	mg/kg	0.5	20.9	0	0.0	0.0
N-Nitrosodi-n-propylamine	mg/kg	0.5		0	0.0	0.0
4-Methylphenol	mg/kg	0.5	162,000	0	0.0	0.0
Nitrobenzene	mg/kg	0.5		0	0.0	0.0
Isophorone	mg/kg	0.5		0	0.0	0.0
2-Nitrophenol	mg/kg	0.5		0	0.0	0.0
2,4-Dimethylphenol	mg/kg	0.5	15,700	0	0.0	0.0
Bis(2-Chloroethoxy)Methane	mg/kg	0.5		0	0.0	0.0
2,4-Dichlorophenol	mg/kg	0.5	3420	0	0.0	0.0
1,2,4-Trichlorobenzene	mg/kg	0.5	220	0	0.0	0.0
Naphthalene	mg/kg	0.5	193	0	0.0	0.0
4-Chloroaniline	mg/kg	0.5		0	0.0	0.0
Hexachlorobutadiene	mg/kg	0.5	30.7	0	0.0	0.0
4-Chloro-3-Methylphenol	mg/kg	0.5		0	0.0	0.0
2-Methylnaphthalene	mg/kg	0.5		0	0.0	0.0
4-Nitrophenol	mg/kg	0.5		0	0.0	0.0
Hexachlorocyclopentadiene	mg/kg	0.5		0	0.0	0.0
2,4,6-Trichlorophenol	mg/kg	0.5	3850.0	0	0.0	0.0
2,4,5-Trichlorophenol	mg/kg	0.5		0	0.0	0.0
2-Chloronaphthalene	mg/kg	0.5	370.0	0	0.0	0.0
2-Nitroaniline	mg/kg	0.5		0	0.0	0.0
Acenaphthylene	mg/kg	0.5	83200.0	0	0.0	0.0
Dimethylphthalate	mg/kg	0.5		0	0.0	0.0
2,6-Dinitrotoluene	mg/kg	0.5	1850.0	0	0.0	0.0
Acenaphthene	mg/kg	0.5	83700.0	0	0.9	0.9
3-Nitroaniline	mg/kg	0.5		0	0.0	0.0
Dibenzofuran	mg/kg	0.5		0	0.0	0.0
4-Chlorophenylphenylether	mg/kg	0.5		0	0.0	0.0
2,4-Dinitrotoluene	mg/kg	0.5	3720.0	0	5.2	5.2

Landfall and Cable route summary - soils						
Determinands	Units	LOD	Generic Screening Levels	No of exceedances	Min	MAX
Fluorene	mg/kg	0.5	63000.0	0	0.0	0.0
Diethyl Phthalate	mg/kg	0.5	144000.0	0	0.0	0.0
4-Nitroaniline	mg/kg	0.5		0	0.0	0.0
2-Methyl-4,6-Dinitrophenol	mg/kg	0.5		0	0.0	0.0
Azobenzene	mg/kg	0.5		0	0.0	0.0
4-Bromophenylphenyl Ether	mg/kg	0.5		0	0.0	0.0
Hexachlorobenzene	mg/kg	0.5	104.0	0	0.0	0.0
Pentachlorophenol	mg/kg	0.5	399.0	0	0.0	0.0
Phenanthrene	mg/kg	0.5	21900.0	0	0.7	6.2
Anthracene	mg/kg	0.5	523000.0	0	0.5	1.0
Carbazole	mg/kg	0.5		0	0.0	0.0
Di-N-Butyl Phthalate	mg/kg	0.5	15400.0	0	0.7	3.3
Fluoranthene	mg/kg	0.5	22600.0	0	0.8	7.6
Pyrene	mg/kg	0.5	54200.0	0	0.6	6.8
Butylbenzyl Phthalate	mg/kg	0.5		0	0.0	0.0
Benzo[a]anthracene	mg/kg	0.5	167.00	0	0.6	3.1
Chrysene	mg/kg	0.5	346.00	0	0.6	3.4
Bis(2-Ethylhexyl)Phthalate	mg/kg	0.5		0	2.6	2.6
Di-N-Octyl Phthalate	mg/kg	0.5	49100.0	0	0.0	0.0
Benzofluoranthene	mg/kg	0.5	44.3	0	0.8	4.1
Benzo[k]fluoranthene	mg/kg	0.5	1170.0	0	0.6	1.4
Benzo[a]pyrene	mg/kg	0.5	35.2	0	0.7	3.8
Indeno(1,2,3-c,d)Pyrene	mg/kg	0.5	501.0	0	0.6	1.7
Dibenz(a,h)Anthracene	mg/kg	0.5		0	0.0	0.0
Benzo[g,h,i]perylene	mg/kg	0.5		0	0.6	2.2
Naphthalene	mg/kg	0.1	193.0	0	0.1	3.6
Acenaphthylene	mg/kg	0.1	83200.0	0	0.1	2.4
Acenaphthene	mg/kg	0.1	83700.0	0	0.1	3.0
Fluorene	mg/kg	0.1	63000.0	0	0.1	6.6
Phenanthrene	mg/kg	0.1	21900.0	0	0.1	51.0
Anthracene	mg/kg	0.1	523000.0	0	0.1	5.9
Fluoranthene	mg/kg	0.1	22600.0	0	0.1	53.0
Pyrene	mg/kg	0.1	54200.0	0	0.2	41.0

Landfall and Cable route summary - soils						
Determinands	Units	LOD	Generic Screening Levels	No of exceedances	Min	MAX
Benzo[a]anthracene	mg/kg	0.1	167.0	0	0.1	16.0
Chrysene	mg/kg	0.1	346.0	0	0.1	19.0
Benzofluoranthene	mg/kg	0.1	44.3	0	0.2	21.0
Benzo[k]fluoranthene	mg/kg	0.1	1170.0	0	0.1	7.9
Benzo[a]pyrene	mg/kg	0.1	35.2	0	0.1	16.0
Indeno(1,2,3-c,d)Pyrene	mg/kg	0.1		0	0.1	9.5
Dibenz(a,h)Anthracene	mg/kg	0.1		0	0.1	1.9
Benzo[g,h,i]perylene	mg/kg	0.1		0	0.1	8.0
Coronene	mg/kg	0.1		0	0.0	0.0
Total Of 17 PAH's	mg/kg	2		0	4.3	270.0
Total PCBs (7 Congeners)	mg/kg	0.1		0	0.0	0.0
Total Phenols	mg/kg	0.1		0	0.1	0.2
SVOC TIC	mg/kg	N/A		0	0.0	0.0

Groundwater Results - April 2023.

			P_BH14	P_BH15	P_BH16	P_BH17	P_BH20
Determinands	**Units**	**GTV**					
pH			6.6	7.2	7.4	7.5	7.5
Electrical Conductivity	µS/cm	800	15000	44000	40000	30000	28000
Colour	Hazen unit		3.0	14	3.0	4.0	8.0
Odour			odourless	no odour	no odour	no odour	no odour
Chloride	mg/l	24	4500	18000	13000	10000	10000
Fluoride	mg/l		0.35	0.49	0.71	0.70	0.70
Ammonium	mg/l	0.065	58	1.9	2.3	3.2	3.2
Nitrite	mg/l	0.375	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Nitrate	mg/l	37.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphate	mg/l	187.5	700	2400	1800	1500	1500
Cyanide (Total)	mg/l		0.34	< 0.050	< 0.050	< 0.050	< 0.050
Sodium	mg/l		3200	11000	6800	5400	5400
Aluminium (Dissolved)	µg/l	150	10	< 5.0	< 5.0	< 5.0	< 5.0
Arsenic (Dissolved)	µg/l	7.5	1.2	2.6	1.2	0.71	0.75
Boron (Dissolved)	µg/l		2500	4400	3300	2800	2900
Chromium (Dissolved)	µg/l	37.5	< 0.50	< 0.50	< 0.50	6.6	< 0.50
Copper (Dissolved)	µg/l		< 0.50	< 0.50	< 0.50	2.9	1.7
Iron (Dissolved)	µg/l		28	< 5.0	< 5.0	< 5.0	< 5.0
Mercury (Dissolved)	µg/l	0.75	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Manganese (Dissolved)	µg/l		1500	2500	2300	3800	3700
Nickel (Dissolved)	µg/l		31	10	9.0	16	15
Lead (Dissolved)	µg/l	7.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Antimony (Dissolved)	µg/l		0.53	3.5	0.88	< 0.50	< 0.50
Selenium (Dissolved)	µg/l		< 0.50	1.0	0.63	0.62	0.65
Cadmium (Dissolved)	µg/l	5	< 0.08	< 0.08	0.12	0.37	0.41
Total Organic Carbon	mg/l		77	2.9	2.2	2.2	2.1
Dichlorodifluoromethane	µg/l		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chloromethane	µg/l		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Vinyl Chloride	µg/l	0.375	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Bromomethane	µg/l		< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Chloroethane	µg/l		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Trichlorofluoromethane	µg/l		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzene	µg/l	0.75	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
1,2-Dichloroethane	µg/l	2.25	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Trichloroethene	µg/l	7.5	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
1,2-Dichloropropane	µg/l		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

			P_BH14	P_BH15	P_BH16	P_BH17	P_BH20
Determinands	**Units**	**GTV**					
Dibromomethane	µg/l		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Bromodichloromethane	µg/l	15	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
cis-1,3-Dichloropropene	µg/l		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	525	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Trans-1,3-Dichloropropene	µg/l		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l		< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Tetrachloroethene	µg/l	7.5	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
1,3-Dichloropropane	µg/l		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Ethylbenzene	µg/l		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
m & p-Xylene	µg/l		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
o-Xylene	µg/l		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
1,2,3-Trichlorobenzene	µg/l		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Methyl Tert-Butyl Ether	µg/l	10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenol	µg/l		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Phenanthrene	µg/l		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Anthracene	µg/l	0.075	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chrysene	µg/l		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate	µg/l	6	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Di-N-Octyl Phthalate	µg/l		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[b]fluoranthene	µg/l	0.075	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[k]fluoranthene	µg/l	0.075	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[a]pyrene	µg/l	0.0075	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene	µg/l	0.075	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dibenz(a,h)Anthracene	µg/l		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Benzo[g,h,i]perylene	µg/l	0.075	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
4-Nitrophenol	µg/l		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Naphthalene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Acenaphthylene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Acenaphthene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Fluorene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Phenanthrene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Anthracene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Fluoranthene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Pyrene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[a]anthracene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

			P_BH14	P_BH15	P_BH16	P_BH17	P_BH20
Determinands	**Units**	**GTV**					
Chrysene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[a]pyrene	µg/l	0.0075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	µg/l	0.075	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Of 16 PAH's	µg/l	0.075	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Demeton-O	µg/l		< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Heptachlor	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Aldrin	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Heptachlor Epoxide	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Gamma-Chlordane	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Alpha-Chlordane	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Endosulfan I	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
4,4-DDE	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Dieldrin	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Endrin	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
4,4-DDD	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Endosulfan II	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Endrin Aldehyde	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
4,4-DDT	µg/l		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
SVOC TIC	µg/l		None Detected	None Detected	None Detected	None Detected	None Detected

www.tobin.ie

TOBIN Consulting Engineers @tobinengineers

Galway
Fairgreen House,
Fairgreen Road,
Galway,
H91 AXK8,
Ireland.
Tel: +353 (0)91 565 211

Dublin
Block 10-4,
Blanchardstown Corporate Park,
Dublin 15,
D15 X98N,
Ireland.
Tel: +353 (0)1 803 0406

Castlebar
Market Square,
Castlebar,
Mayo,
F23 Y427,
Ireland.
Tel: +353 (0)94 902 1401

Limerick
Unit 4, Crescent Court,
St Nessan's Road, Dooradoyle,
Limerick
V94V298
Ireland
Tel: +353 (0)61 976 262

Sligo
The Gateway Building, Floor 3
Northwest Business Park
Collooney, Sligo
F91W40H
Ireland
Tel: +353 (0)71 9318 844