MWP

Flood Risk Assessment

Steeven's Lane 110kV Substation

The Electricity Supply Board (ESB)

June 2026

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Project No.	Doc. No.	Rev.	Date	Prepared By	Checked By	Approved By	Acceptance Code / Status
27057	ZZ-ZZZ-RP-MWP-CE-6011	A	04/05/2026	GJ	CA	MF	P1 / S

MWP, Engineering and Environmental Consultants
Address: Park House, Bessboro Road, Blackrock, Cork, T12 X251, Ireland

www.mwp.ie

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Acronyms & Terms

AEP	Annual Exceedance Probability
CFRAMS	Catchment Flood Risk Assessment and Management Study
DTM	Digital Terrain Model
EPA	Environmental Protection Agency
FFL	Finished Floor Level
FRA	Flood Risk Assessment
FSR	Flood Studies Report
FSU	Flood Studies Update
HEP	Hydrological Estimation Point
HEFS	High End Future Scenario
LAP	Local Area Plan
mOD	Metres Above Ordnance Datum
MRFS	Mid-Range Future Scenario
MWP	Malachy Walsh & Partners
OPW	Office of Public Works
OPW CSFE	OPW Community-Scale Flood Extents
PSFRM	The Planning System and Flood Risk Management Guidelines, November 2009
SAAR	Standard Average Annual Rainfall

1. Introduction

This Flood Risk Assessment (FRA) has been prepared by Malachy Walsh and Partners (MWP) Consulting Engineers to support a planning application being made by the Electricity Supply Board (ESB) for a new development at Steeven's Lane, Dublin 8.

The project for which planning consent is being sought is called " Steeven's Lane 110kV Substation" (hereafter referred to as the "Proposed Development") and includes approximately 1.5 km of underground electrical cabling connecting the proposed substation into the existing Francis Street – Heuston Square 110 kV underground cable, which runs along Bow Lane West. The Proposed Development will provide additional network capacity, relieve loading on existing substations in the area, and enhance overall security and resilience of supply.

The objective of this report is to assess the flood risk associated with the site of the proposed substation development, thus inform the design and ensure there are no adverse effects as a result of the development. This report intends to facilitate a greater understanding of the hydrological characteristics of the area and the potential flood levels within the site. This will include the following key aspects:

1. Collect, collate, and review the available data regarding the study area such as topography, hydrogeological data, or geological characteristics,
2. Review the existing information regarding flood risk in the area, such as historic flood events or predictive mapping,
3. Identify the flooding sources and mechanisms at the site,
4. Appraise the availability and accuracy of the existing information regarding the site,
5. Establish what Flood Zone the proposed development is located within,
6. If appropriate, recommend mitigation measures to prevent any increase in flood risk within the site or externally in the wider area.

This report has been prepared in accordance with *The Planning System and Flood Risk Management – Guidelines for Planning Authorities, November 2009* – published by the Office of Public Works (OPW) and the Department of Environment, Heritage, and Local Government (DEHLG). Flood Risk Assessments are carried out at different scales by different organisations. The hierarchy of assessment types are Regional (RFRA), Strategic (SFRA) and Site-specific (FRA). This report is site-specific.

2. Development Setting

2.1 Site Location and Context

The proposed development comprises the construction of a 110kV substation at a site fronting onto Steeven's Lane, Dublin 8, together with associated underground grid connection works located within the Diageo site complex and the public road network along Bow Lane West, St. James's Street, and Echlin Street, Dublin 8.

The substation site is located within lands associated with the Diageo complex and fronts onto Steeven's Lane. The surrounding area is characterised by a mix of industrial, commercial, institutional, and residential land uses. Steeven's Lane forms the western boundary of the site and accommodates pedestrian, cyclist, Luas Red Line, and limited vehicular movements. The wider area includes the Diageo Guinness Brewery lands, residential developments, commercial premises, and healthcare facilities, including St. James's Hospital.

The associated underground grid connection works extend from the proposed substation site through lands within the Diageo complex and along sections of the public road network comprising Bow Lane West, St. James's Street, and Echlin Street.

The primary hydrological feature within the area is the River Liffey, which is located approximately 330m north of the site, and separated by the St. James's Gate / Diageo complex. The Camac River is located approximately 250m to the west, flowing in a southwest - northeast direction along the western boundary of St. Patrick's University Hospital before converging with the River Liffey near Heuston Train Station.

Figure 2-1 illustrates the site location in the wider Dublin context and also indicates the relationship of the site to the surrounding hydrological network, including the River Liffey and Camac River catchments.

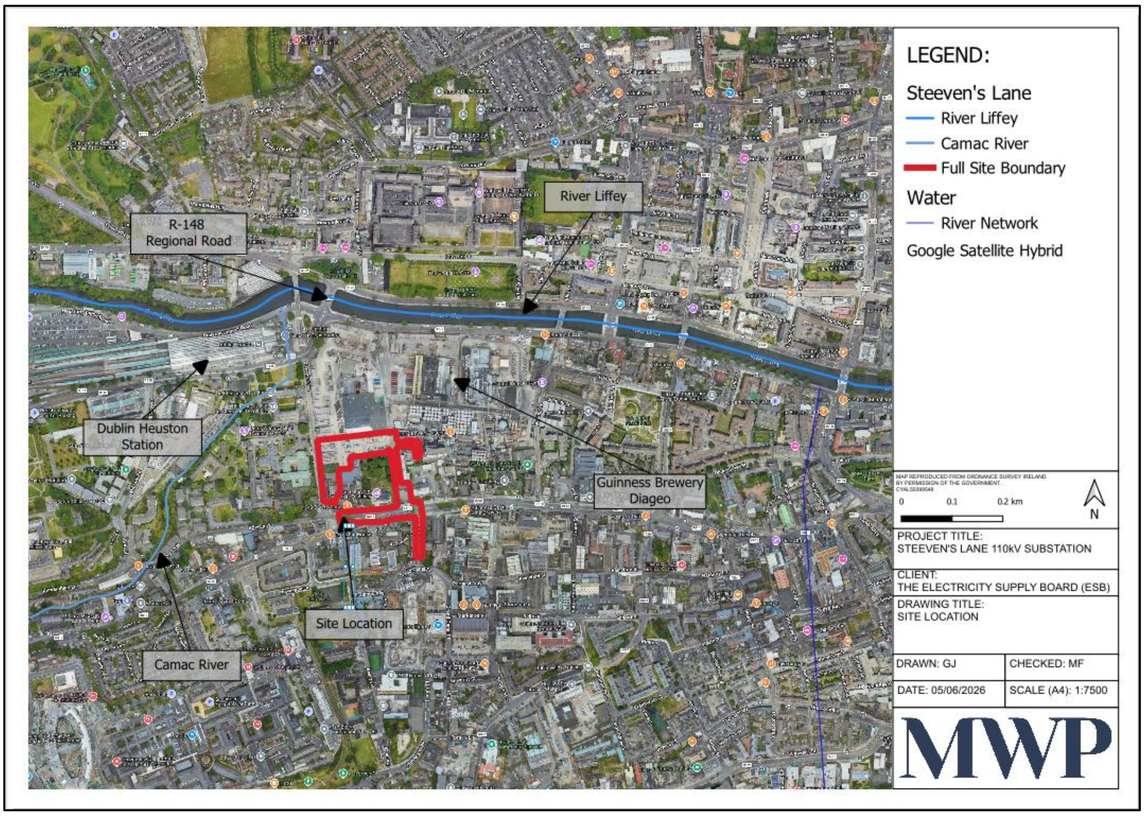

Figure 2-1: Proposed Site Location

3. Characteristics of Proposed Development

The characteristics of the proposed development are fully described in the Planning and Environmental Considerations Report (PECR) and the Outline Construction Environmental Management Plan (oCEMP) accompanying this planning application, and this Flood Risk Assessment (FRA) should be read in conjunction with those documents. In addition, full details of the proposed design, layout, elevations, sections, and associated site development works are provided within the planning drawings.

A summary of the proposed development is provided below to set the context and aid clarity.

3.1 Proposed Substation Development

The Proposed Development will consist of a 110 kV / MV electrical substation and will include the following elements:

- Demolition of all existing buildings on site including a former office building, warehouse and storage shed;
- The construction of 110 kV / MV substation compound with the following electrical plant within the substation:
    - A two storey 110 kV / MV Gas Insulated Switchgear (GIS) building (c. 559 m^2; 14.1 m in height);
    - Two 110 kV / MV transformers in transformer bays (c. 5.75 m in height) and surrounding fire walls (c. 6.1 m high) and associated electrical equipment;
    - All associated and ancillary site development and infrastructural works, including site clearance, demolition of existing western boundary wall and gates, provision of new boundary treatments and gates along the western site boundary, replacement of the existing retaining wall along the northern and northeastern site boundary, provision of new boundary treatments along the southern and south eastern site boundary, site services including electrical circuits, lighting, telecommunications, drainage and boundary treatments.

3.2 Proposed Connection to Electricity Grid

The Proposed Development will also involve the installation of six 110 kV underground cable (UGC) circuits connecting the proposed Steevens Lane 110 kV substation to key locations, including:

- loop-in connection joint bays on the existing Francis Street – Heuston Square 110 kV circuit at Bow Lane West and Echlin Street/James's Street,
- Diageo's proposed 110 kV substation, (subject to separate SID application), and
- Ducting for future use at St. James's Gate Medical car park, north of James's Street.

And the installation of 14 circuit MV UGC between the proposed substation and Bow Lane West.

The combined total length of the circuits is approximately 1.5 km, and they will be installed as either double or single circuits.

Figure 3-1 shows the Proposed Development footprint and illustrates the positions of the Proposed Development components and infrastructure within the development boundary.

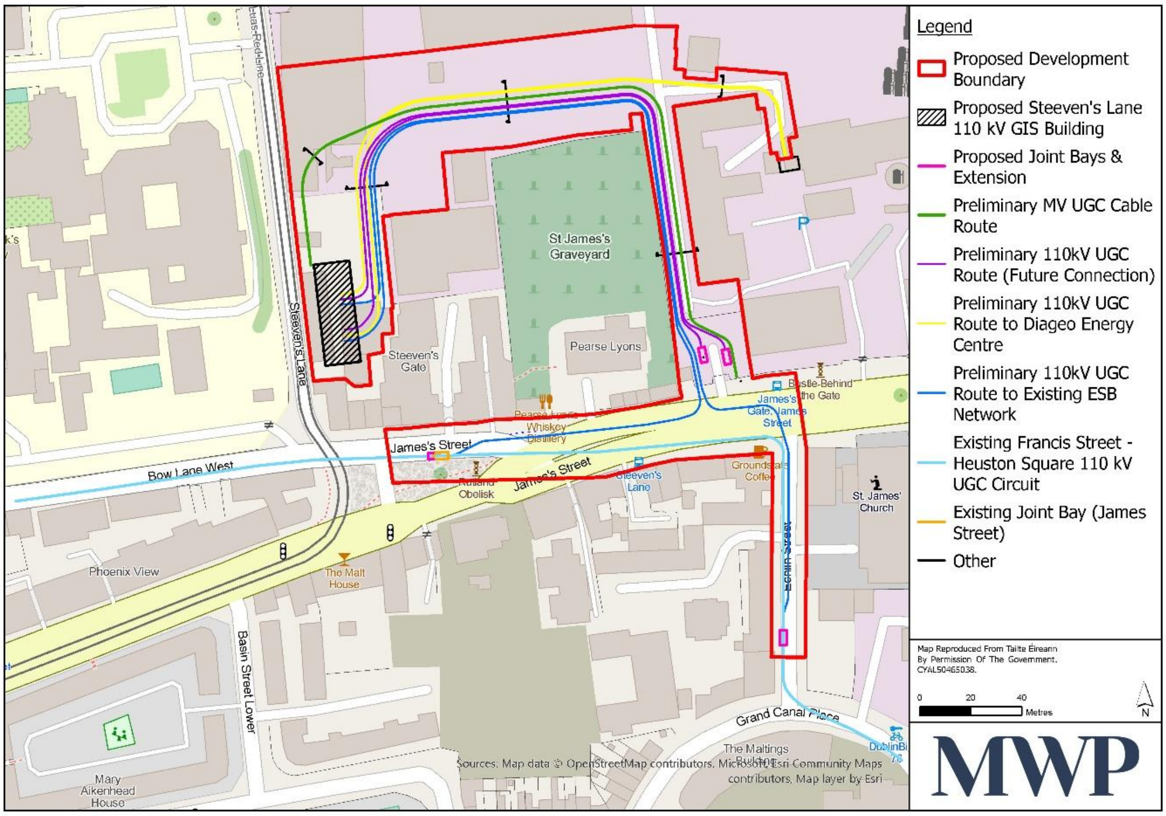

Figure 3-1: Proposed Development Footprint within the development boundary

4. Methodology & Report Structure

In the Flood Risk Management Guidelines document, the likelihood of a flood occurring is established through the identification of Flood Zones which indicate a high, moderate or low risk of flooding from fluvial or tidal sources, with various development types categorised into three Vulnerability Classifications. These classifications and other elements of the Flood Risk Management Guidelines are outlined in further detail in Section 5.

This report has been prepared generally in accordance with the stages of assessment outlined in the Guidelines, with the corresponding report structure as follows:

1. Provide an overview of the Planning System and Flood Risk Management Guidelines, as described in Section 5,
2. Complete a desktop review to characterise the site, as described in Section6,
3. Compile and review the available information regarding the flood history and existing flood risk in the area, as described in Section 7,
4. Appraise the availability and accuracy of the existing information regarding the site, as described in Section 8,
5. Identify the Flood Zone that the development is located within, as described in Section 9,
6. Conclude on the key items in relation to the flood risk at the site and if appropriate, recommend mitigation measures to prevent any increase in flood risk within the site or externally in the wider area, as described in Section 10.

5. The Planning System & Flood Risk

5.1 Overview of Guidelines

"The Planning System and Flood Risk Management: Guidelines for Planning Authorities", published in November 2009, describes flooding as a natural process that can occur at any time and in a wide variety of locations. The Guidelines describe good flood risk practice in planning and development management and seek to integrate flood risk management into the planning process, thereby assisting in the delivery of sustainable development. Planning authorities are directed to have regard to the Guidelines in the preparation of Development Plans and Local Area Plans, and for development management purposes. For this to be achieved, flood risk must be assessed as early as possible in the planning process.

Paragraph 1.6 of the Guidelines states that the core objectives are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface run-off;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure that the requirements of the EU and national law in relation to the natural environment and nature conservation are complied with at all stages of the flood risk management.

The guidelines aim to facilitate "*the transparent consideration of flood risk at all levels of the planning process, ensuring a consistency of approach throughout the country".* The Guidelines work on a number of key principles including:

- Adopting a staged and hierarchical approach to the assessment of flood risk;
- Adopting a sequential approach to the management of flood risk, based on the frequency of flooding (identified through Flood Zones) and the vulnerability of the proposed land use.

5.2 Flood Risk

In order to manage flood risk, it is important to understand what the term "flood risk" implies and to define the components of flood risk in order to apply the principles of the DEHLG Flood Risk Management Guidelines.

Flood risk is generally accepted to be a combination of the likelihood of flooding and the potential consequences arising, and is normally expressed in terms of the following relationship:

Flood risk = Likelihood of flooding x Consequence of flooding

Flood risk is assessed using the source – pathway – receptor model as illustrated in Figure 5-1:.

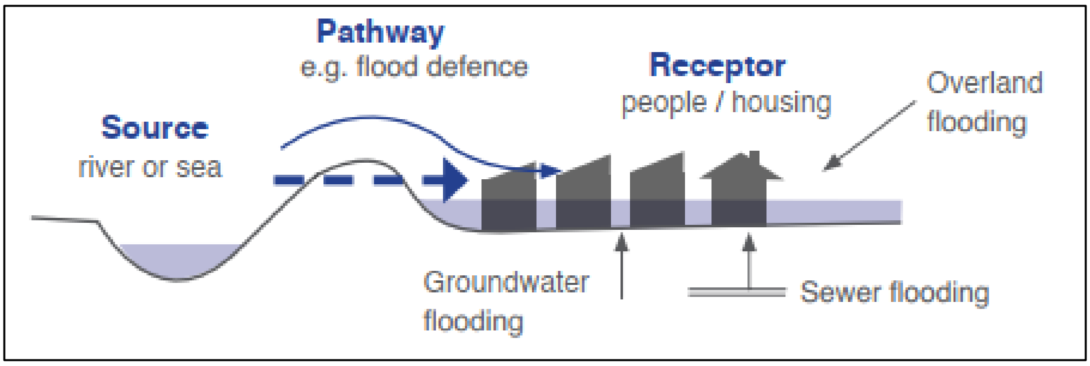

Figure 5-1: Source-Pathway-Receptor Model (PSFRM Paragraph 2.18)

Principal sources of flooding are intense or prolonged rainfall or higher than normal sea levels while the most common pathways are rivers, drains, sewers, overland flow, and river and coastal flood plains and their defence assets. Receptors can include people, their property and the environment. All three elements must be present for flood risk to arise. Mitigation measures, such as defences or flood resilient construction, have little or no effect on sources of flooding but they can block or impede pathways or remove receptors.

Flood risk assessments require identification and assessment of all three components:

- The probability and magnitude of the source(s) (e.g. high river levels, sea levels and wave heights);
- The performance and response of pathways and barriers to pathways such as floodplain areas and flood defence systems, and
- The consequences to receptors such as people, properties and the environment.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk.

5.3 The Staged Approach

The Guidelines recommend a staged approach to be adopted to ensure that only such an appraisal or assessment as is needed for the purposes of decision making at the various plan levels is undertaken. The stages include:

Stage 1: Flood Risk Identification – To identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and LAP's or a proposed development site that may warrant further investigation at the appropriate lower-level plan or planning application levels. If the Planning Authority considers that there is potential flood risk issue, then Stage 2 shall be entered into.

Stage 2: Initial Flood Risk Assessment – To confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped; and

Stage 3: Detailed Flood Risk Assessment – To assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a hydraulic model or a river or coastal cell across a wide enough area to appreciate the catchment wide impacts and hydrological processes involved.

5.4 Climate Change

Climate change can be expected to generally increase flood risk and consequences of flooding. Due to the uncertainty associated with the potential effects of climate change, the Guidelines recommend that a precautionary approach to dealing with climate change is adopted and provide the following examples:

- Recognising that increased rainfall or tide events may result in significant changes to the flood extent, and therefore adopting a cautious approach to zoning land in these potential transitional areas;
- Ensuring that any flood protection structure such as flood defences, land-raising, or raised floor levels, are at a sufficient level to cope with the effects of climate change over the lifetime of the development which they are intended to protect; and
- Ensuring that any flood protection structure and the development which it protects are capable of adaption to the effects of climate change when there is more certainty about the effects and still time for such adaption to be effective.

5.5 Vulnerability of Developments

The Guidelines have outlined three Vulnerability Classes for developments based on the proposed land use and type of development. These classifications and particular examples of development types which would be included in each classification are summarised as follows:

- **Highly Vulnerable Development:** This would include emergency services, hospitals, schools, residential institutions, dwelling houses, essential infrastructure, water & sewage treatment, etc.
- **Less Vulnerable Development:** Retail, leisure, commercial, industrial buildings, local transport infrastructure, etc.
- **Water Compatible Development:** Docks, marinas, and wharves, amenity and open space, outdoor sports and recreation and essential facilities such as changing rooms, etc.

The Guidelines also include a matrix of vulnerability versus flood zone to differentiate between developments which are appropriate in various flood zones and those which require a Justification Test. This table is reproduced as Table 5.1 below.

Table 5.1: Vulnerability Matrix (PSFRM Paragraph 3.6)

Vulnerability Class	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable Development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less Vulnerable Development	Justification Test	Appropriate	Appropriate
Water-Compatible Development	Appropriate	Appropriate	Appropriate

5.6 Flood Zones

In the Planning System and Flood Risk Management Guidelines document, the likelihood of a flood occurring is established through the identification of Flood Zones which indicate a high, moderate or low risk of flooding from fluvial or tidal sources. Table 5.2 below indicates the definition of Flood Zones as well as the implications for planning.

An example indicative flood zone map extract which shows the extents of each flood zone in a location is provided in Figure 5-2:. It is important to note that the Flood Zones do not take other sources of flooding, such as groundwater or pluvial into account, so an assessment of risk arising from such sources should also be made, where appropriate.

Table 5.2: Flood Zone Definitions & Parameters

Flood Zone	Description & Summary of Planning Implications
Zone A High probability of flooding	More than 1% probability (1 in 100) for river flooding and more than 0.5% probability (1 in 200) for coastal flooding. Most types of development would be considered inappropriate in this zone.
Zone B Moderate probability of flooding	0.1% to 1% probability (between 1 in 100 and 1 in 1,000) for river flooding and 0.1% to 0.5% probability (between 1 in 200 and 1 in 1,000) for coastal flooding. Highly vulnerable development, such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses and primary strategic transport and utilities infrastructure, would generally be considered inappropriate in this zone.
Zone C Low probability of flooding	This zone defines areas with a low risk of flooding from rivers and the coast (i.e. less than 0.1% probability or less than 1 in 1,000). Development in this zone is appropriate from a flooding perspective (subject to assessment of flood hazard from sources other than rivers and the coast).

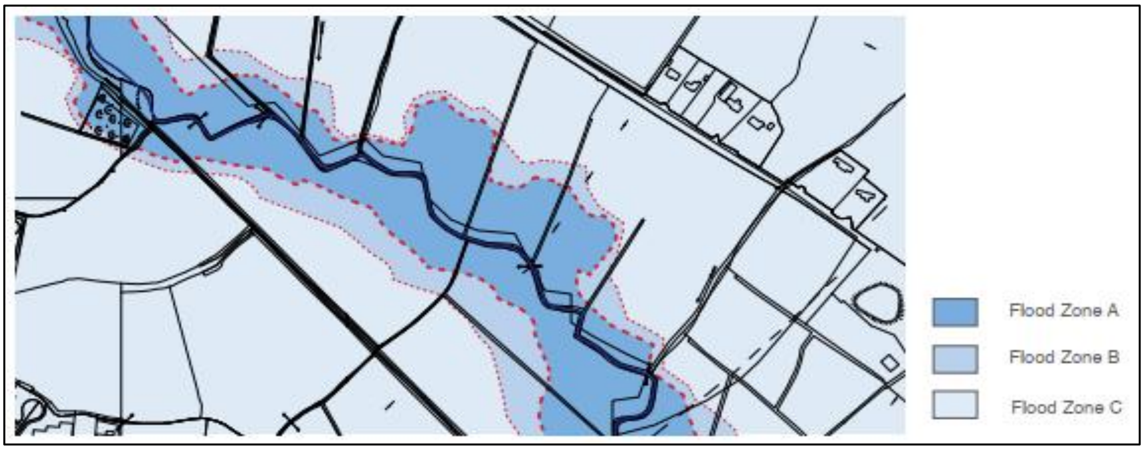

Figure 5-2: Example of Flood Zone Mapping (PSFRM Paragraph 2.23)

6. Site Characterisation

6.1 Topography & Slope

The initial assessment of the topography and slope of the site utilised the contour data provided in the Ordnance Survey Ireland (Osi) Discovery Series Maps, which indicated that both the site and a large portion of the surrounding area lies within the 30mOD contour line. Further clarity on this was gathered through the use of a combination of a site specific topographical survey, and LiDAR data compiled by the OPW.

The topographical data was gathered by Murphy Geospatial in early 2024, and covers the northern half of the redline boundary, including the site of the proposed substation (Figure 6-1:).The LiDAR consisted of Digital Terrain Model (DTM) and Digital Surface Model (DSM) files, as shown in Figure 6-2: and Figure 6-3:, which contain Irish Public Sector Data (Geological Survey Ireland & the Office of Public Works) licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence. The LiDAR was used to provide additional clarity on points in which limited topographical information was available.

As indicated in these, there is a strong correlation between the LiDAR and topographical points, with both datasets showing that the site is slightly sloped, with the terrain shown to rise from north to south.. A step in the ground elevation of the site is observed in both datasets, approximately 55m south of the northern boundary of the site, with this most evident in the topographical survey. The DSM indicates that the land to the north of the site is predominately flat with few structures, while a greater concentration of structures is shown to the south and east of the proposed works.

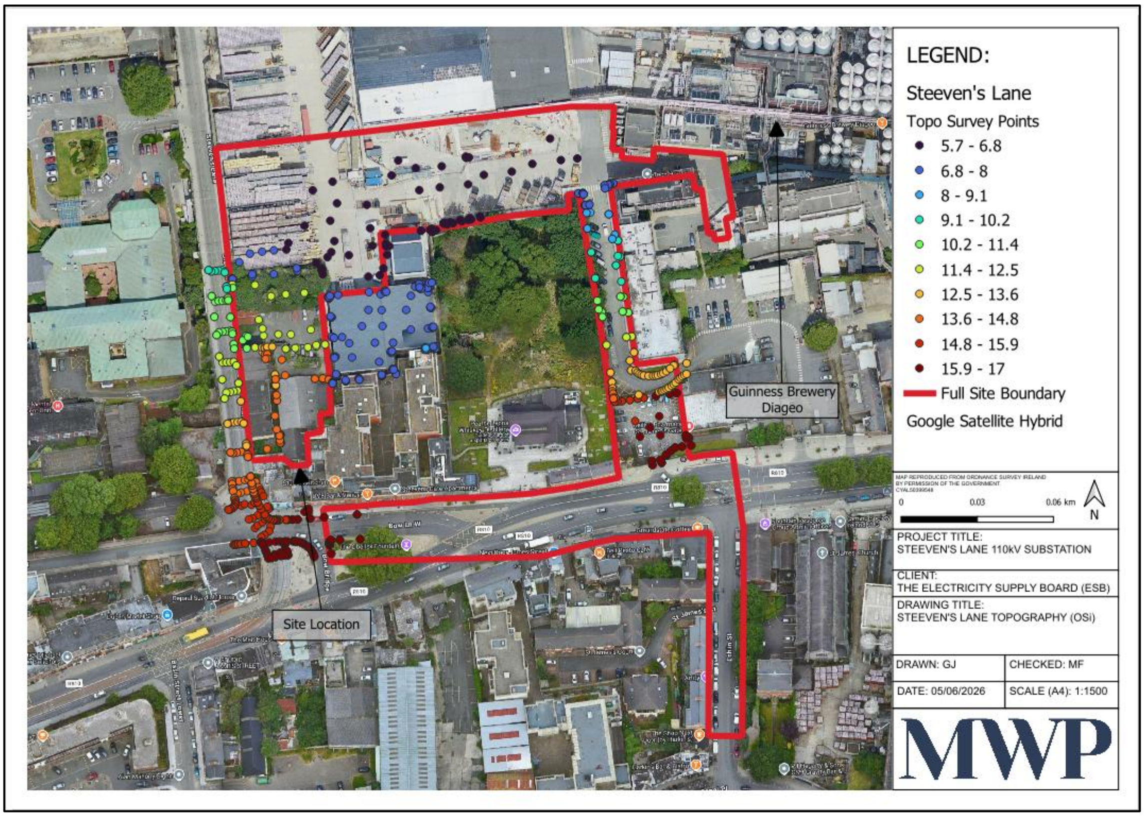

Figure 6-1: Topographic Survey Points

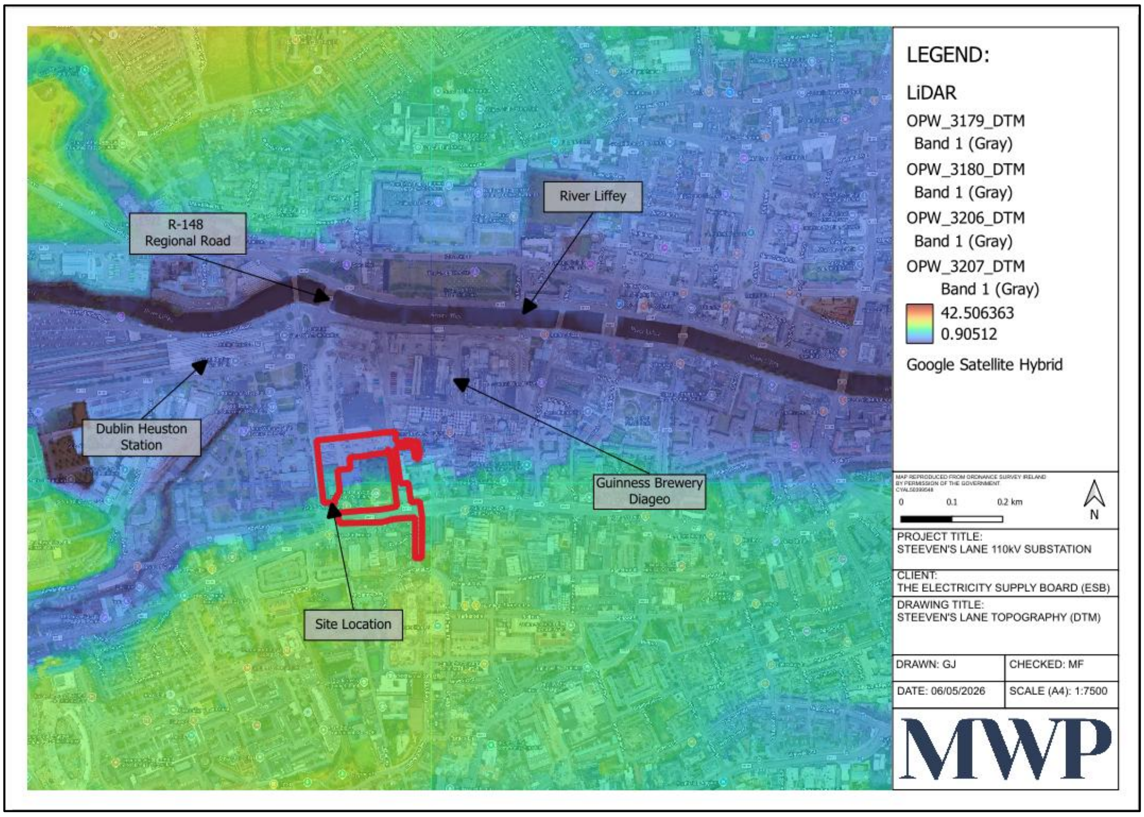

Figure 6-2: DTM Data

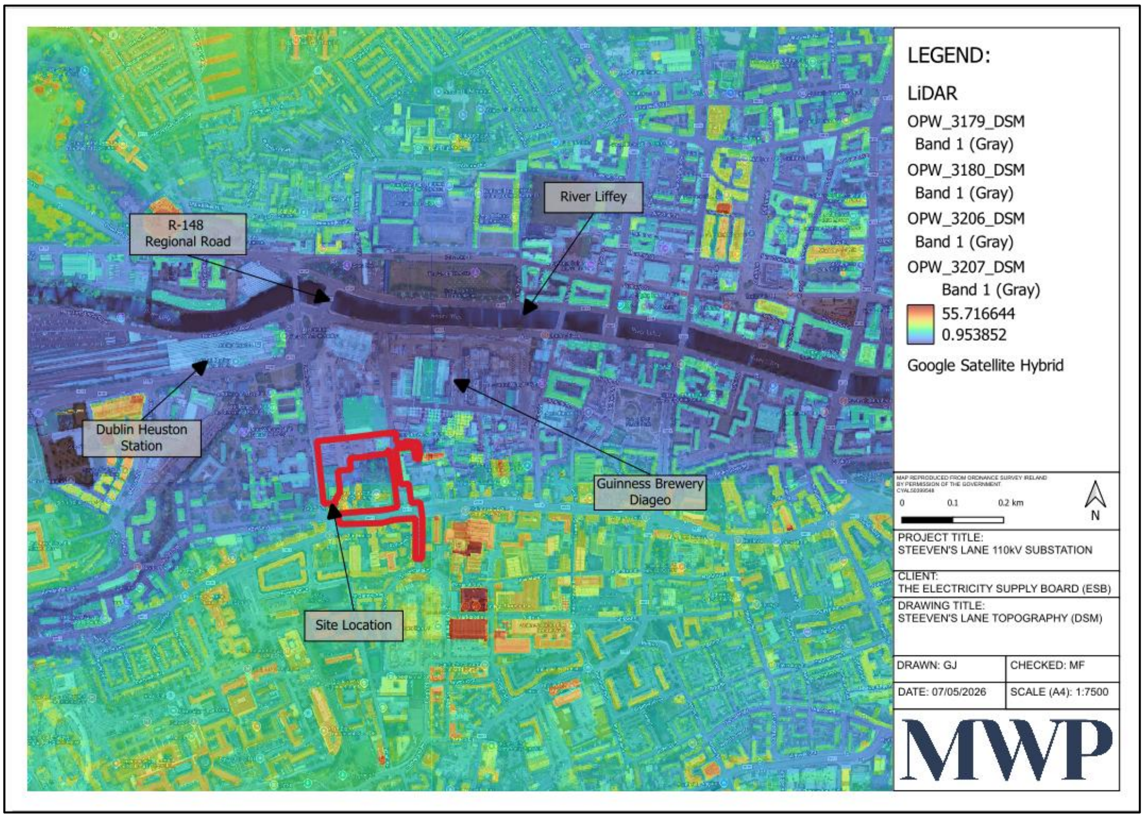

Figure 6-3: DSM Data

6.2 Historical Mapping

To identify whether there have been any noticeable changes to the site over time, historic mapping data was used. This was sourced from the publicly available Tailte Éireann Irish Townland and Historical Map Viewer Geohive website, with the 6 Inch First Edition (1829 - 1834) maps used and compared to available Google Earth aerial mapping data. The 6-Inch First Edition Colour Maps were produced between 1829 and 1841, with the survey taking place from 1829 to 1834, and printing occurring from 1829. These were later followed by the 25-Inch Black and White Maps which were surveyed from 1863 to 1924 and provide a greater degree of detail than the original versions.

The comparison of both the modern (Figure 6-4) and historic (Figure 6-5: and Figure 6-6:) mapping data shows that, the most significant changes within the study area are observed between the creation of the 6" and 25" maps, with few alterations between the 2014 and 2024 aerial images. These primarily relate to the construction of Dublin Heuston Train Station to the northwest, and the development of the St. James Gate / Diageo complex to the north and northeast of the study area. In each of the maps assessed, the area to the south of the site is shown to be developed land, primarily comprising residential buildings. No significant changes to the River Liffey are noted within these maps.

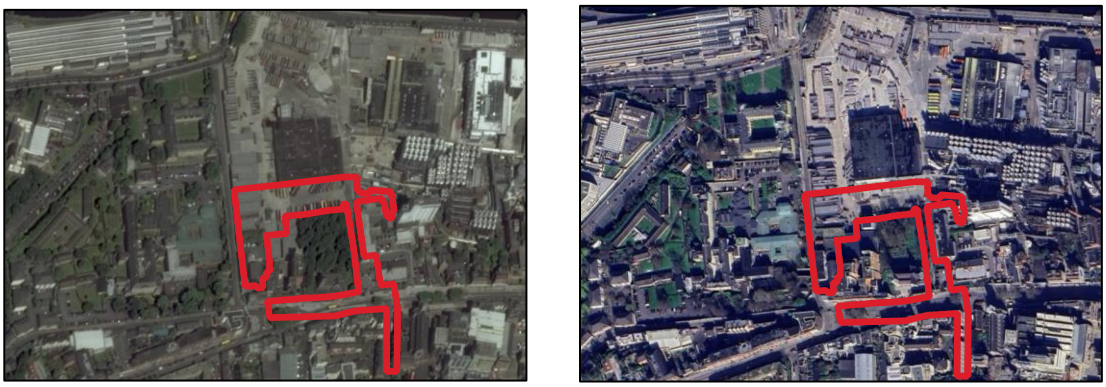

Figure 6-4: Comparison of Aerial Imagery from 2014 (Left) to 2024 (Right)

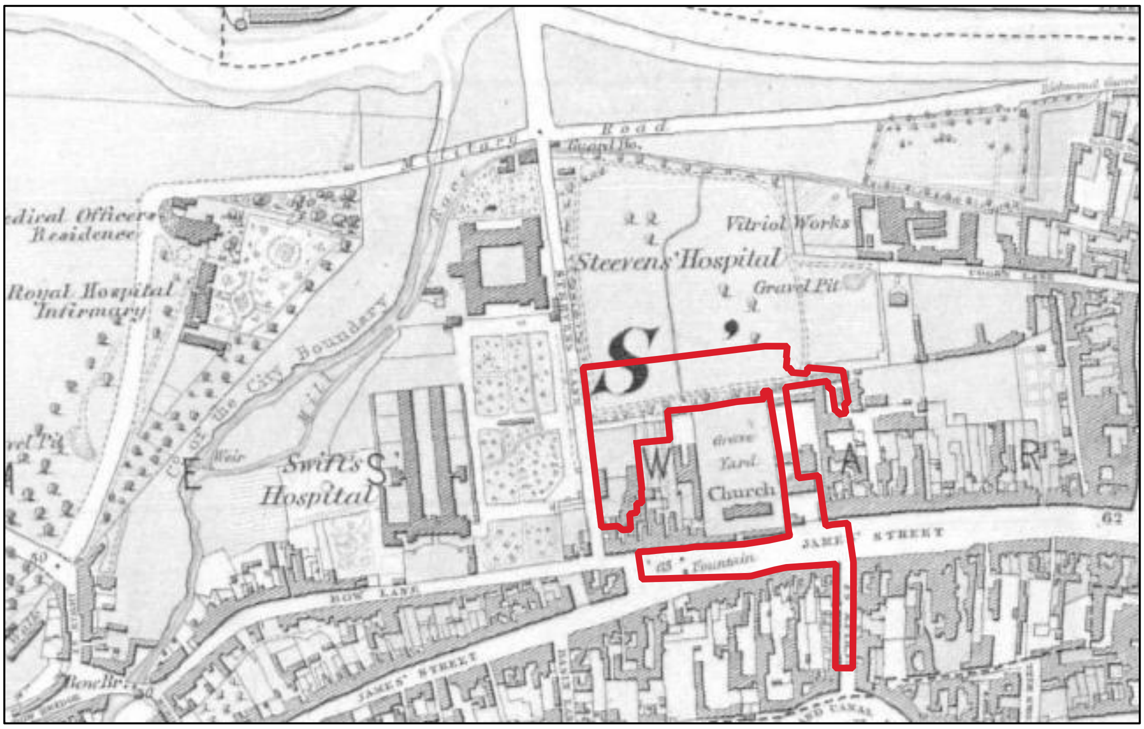

Figure 6-5: 6" First Edition Maps

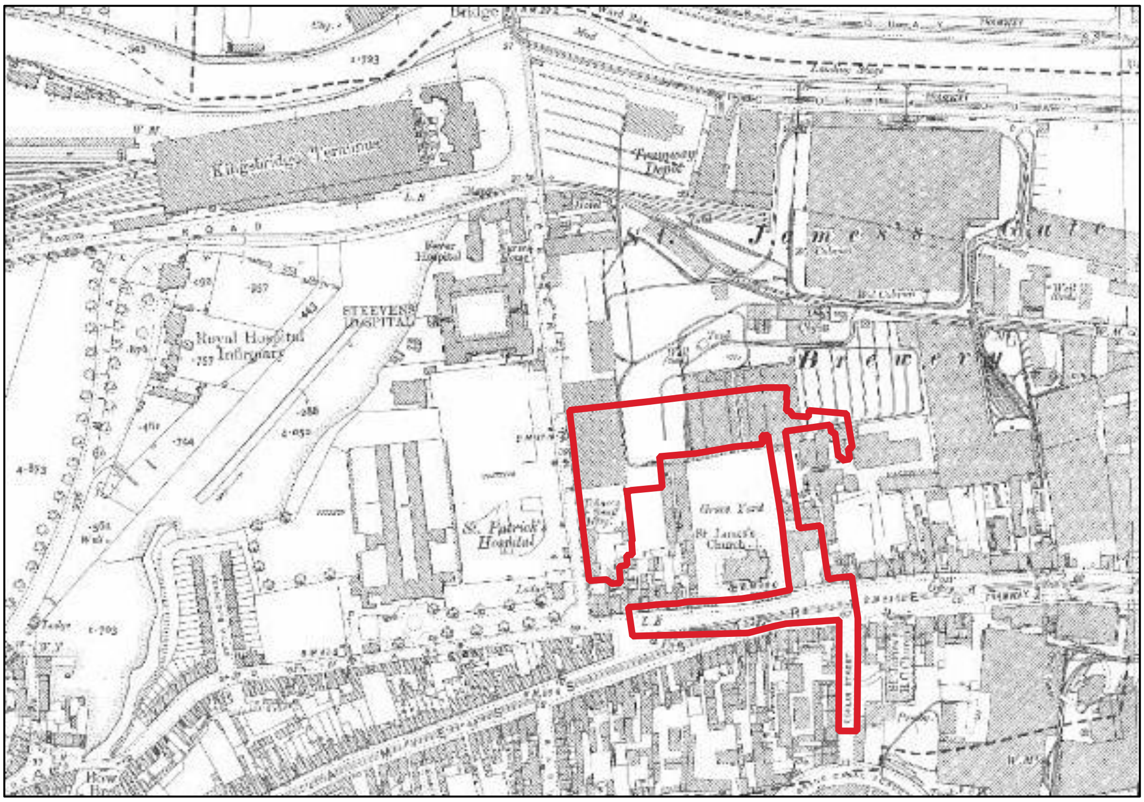

Figure 6-6: 25" Second Edition Maps

6.3 Soils

As part of the examination of the characteristics of the site, the soil and quaternary sediments were assessed using data provided by Teagasc and Geological Survey Ireland (GSI), with this then verified through intrusive site investigation works. This shows that the soil within the site area is dominated by Made ground (Figure 6-7), bordered to the north by Alluvial Mineral which is shown to be located beneath the extents of the River Liffey.

A similar configuration is observed within the quaternary sediment data (Figure 6-8:), which shows the site to be situated over Urban material, with areas of alluvial and gravelly alluvial materials noted to the west, north, and east of the site. A band of Tills Derived from Limestones approximately 110m wide and 600m long is shown to run east to west to the south of the site, with Urban material again noted to the south of this. The presence of Alluvium soils can be an initial indicator of an area which has been subject to flooding in the geological past but cannot be used to determine flood risk to an area. The closest alluvial material to the site is situated approximately 90m northwest of the site, along the right bank of the Camac watercourse, and does not intersect with the site boundary.

The cable percussive boreholes carried out at the site confirmed the present of made ground, and recorded fill material to 7.5m below ground level in both boreholes. This comprises a mix of granular and cohesive soils with inclusions of red brick, concrete, timber, and mortar. This was noted to be underlain by very stiff brown sandy slightly gravelly silty clay with low cobble content.

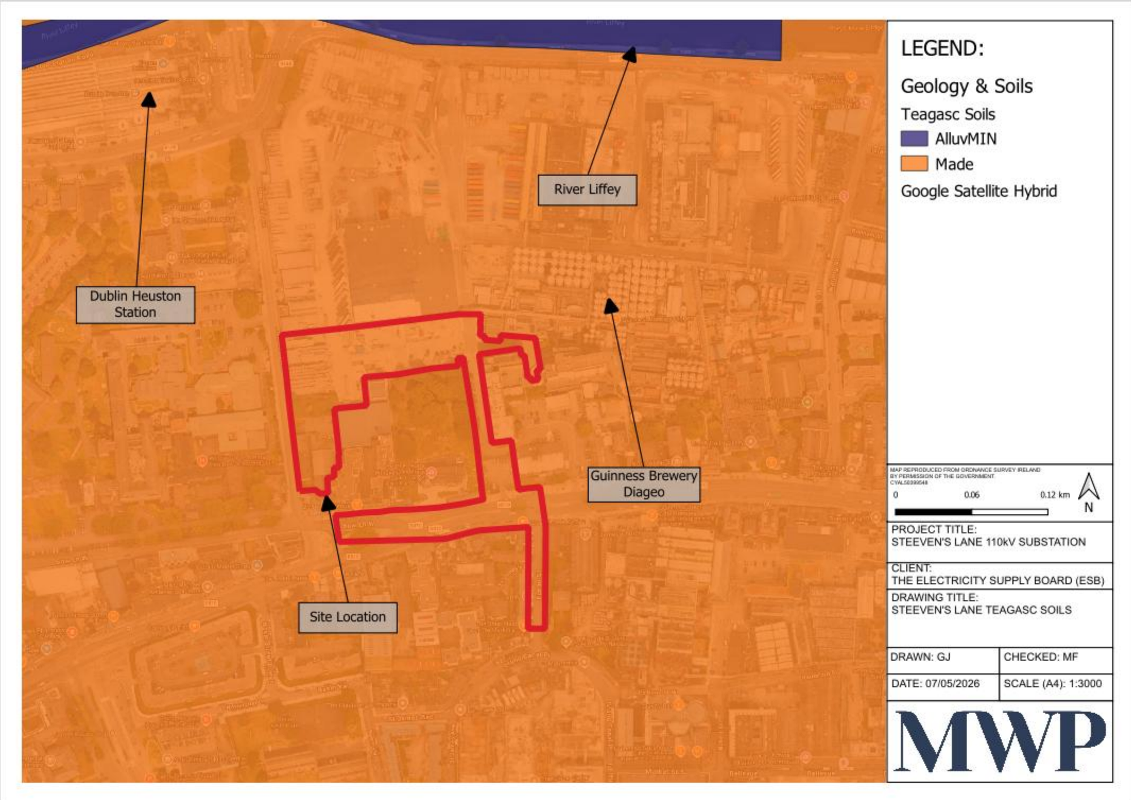

Figure 6-7: Teagasc Soil Data

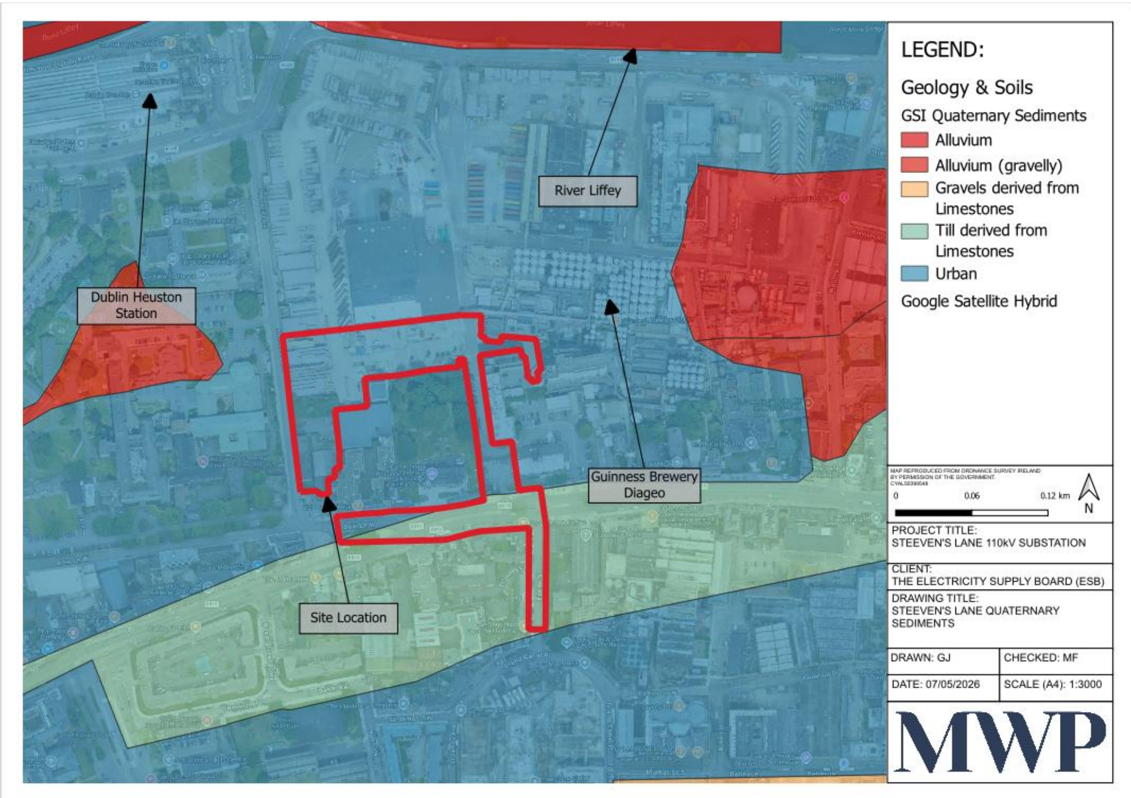

Figure 6-8: Quaternary Data

6.4 Hydrology & Hydrogeology

6.4.1 Hydrology & Catchment Description

The main hydrological feature of the study area is the River Liffey, which flows from west to east, approximately 320m north of the site. A second smaller watercourse – the Camac River – is present to the west of the site. The Camac River flows from south to north, and converges with the River Liffey at a point approximately 320m north of the site, to the west of Dublin Heuston Train Station. This is one of the main tributaries of the River Liffey within Dublin City, and corresponds to FSU Ungauged Catchment Node 09_1872_9. The contributing catchment area to this point is 53.5km2, the extent of which is shown in Figure 6-9:.

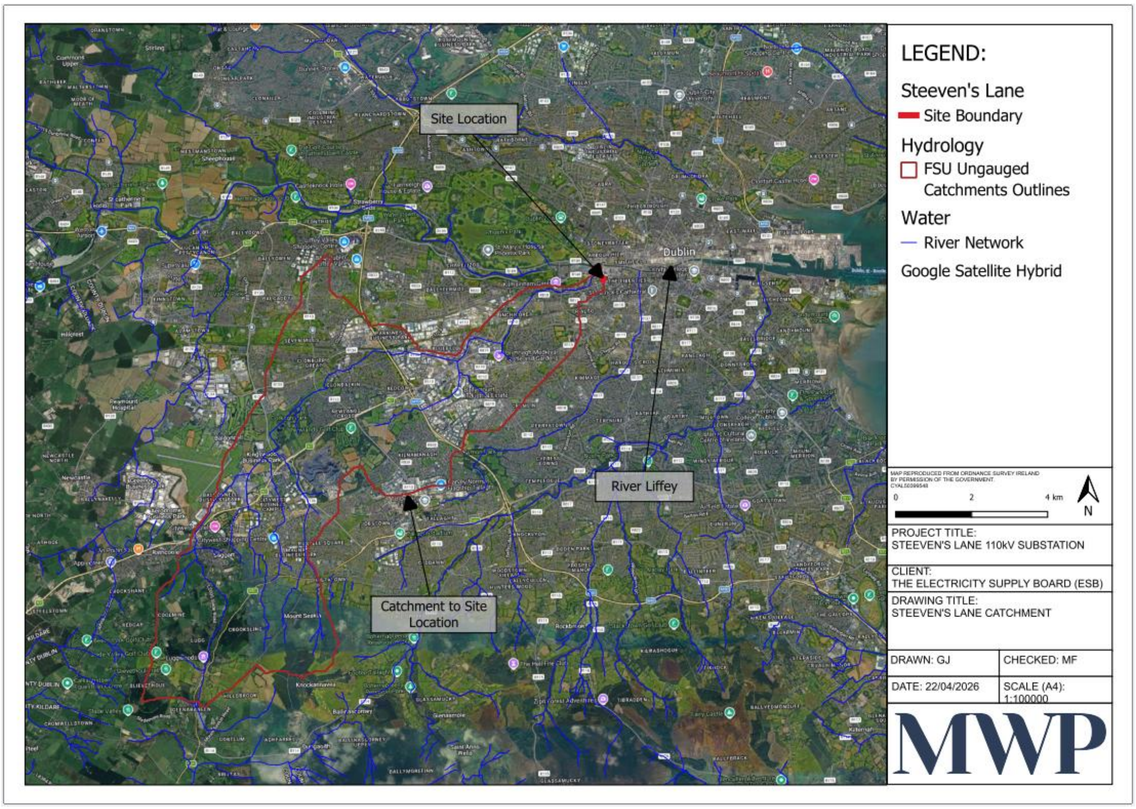

Figure 6-9: Catchment to the Site

6.4.2 Hydrogeology

According to data provided in the GSI groundwater subsoil permeability map, which classifies how water can infiltrate downwards into the surface at a given point with relative ease, the study area is located within an area of low subsoil permeability (Figure 6-10:). This corresponds to an area of moderate groundwater vulnerability at the location of the proposed substation works, which transitions to an area of low vulnerability approximately 50m south of the site, along the proposed cable installation route (Figure 6-11:).

As shown in Figure 6-12: and Figure 6-13, the entirety of the study area is underlain by a bedrock layer of the Lucan Formation of Dark Limestone and Shale, which comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones. The site is also situated above a *"Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones"*.

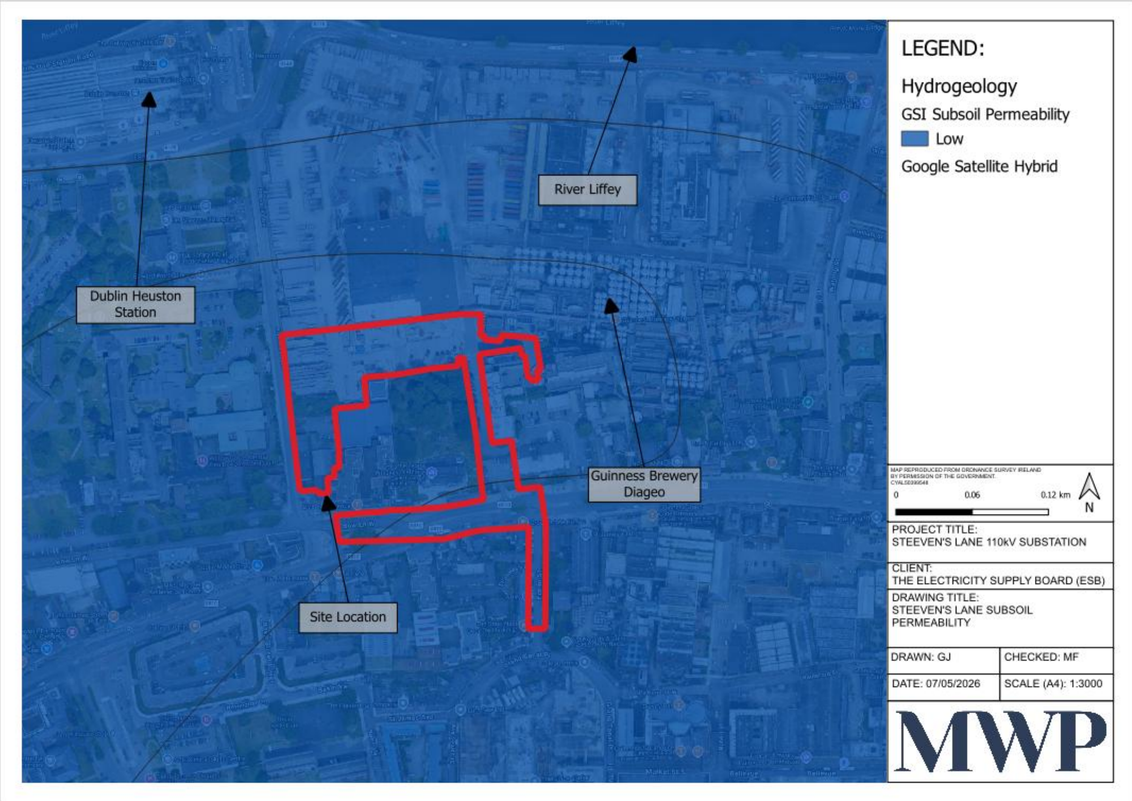

Figure 6-10: Subsoil Permeability

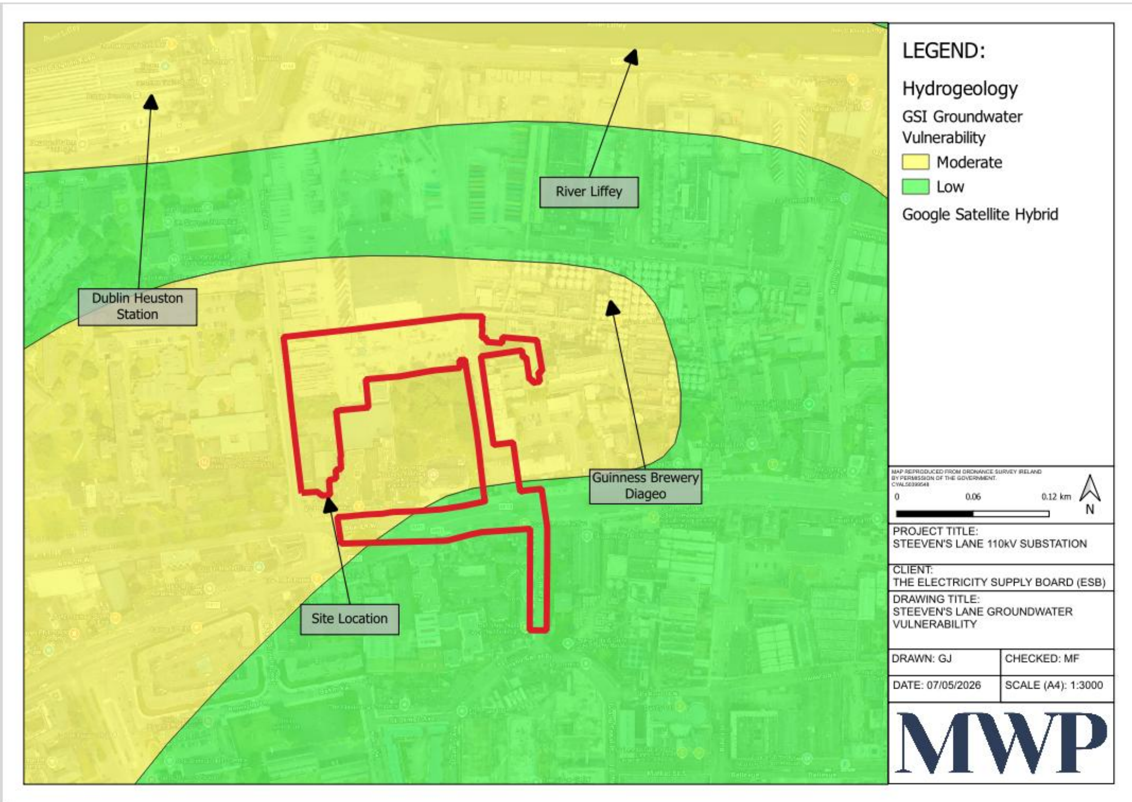

Figure 6-11: Groundwater Vulnerability

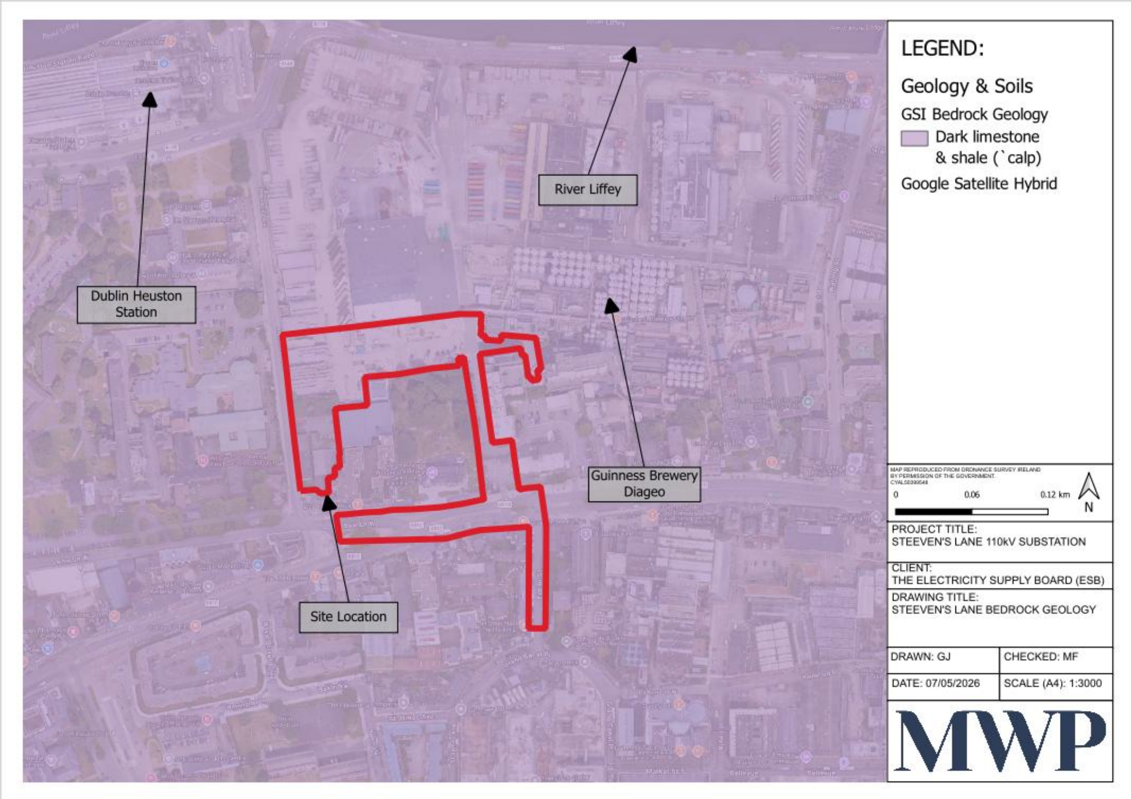

Figure 6-12: Bedrock Geology

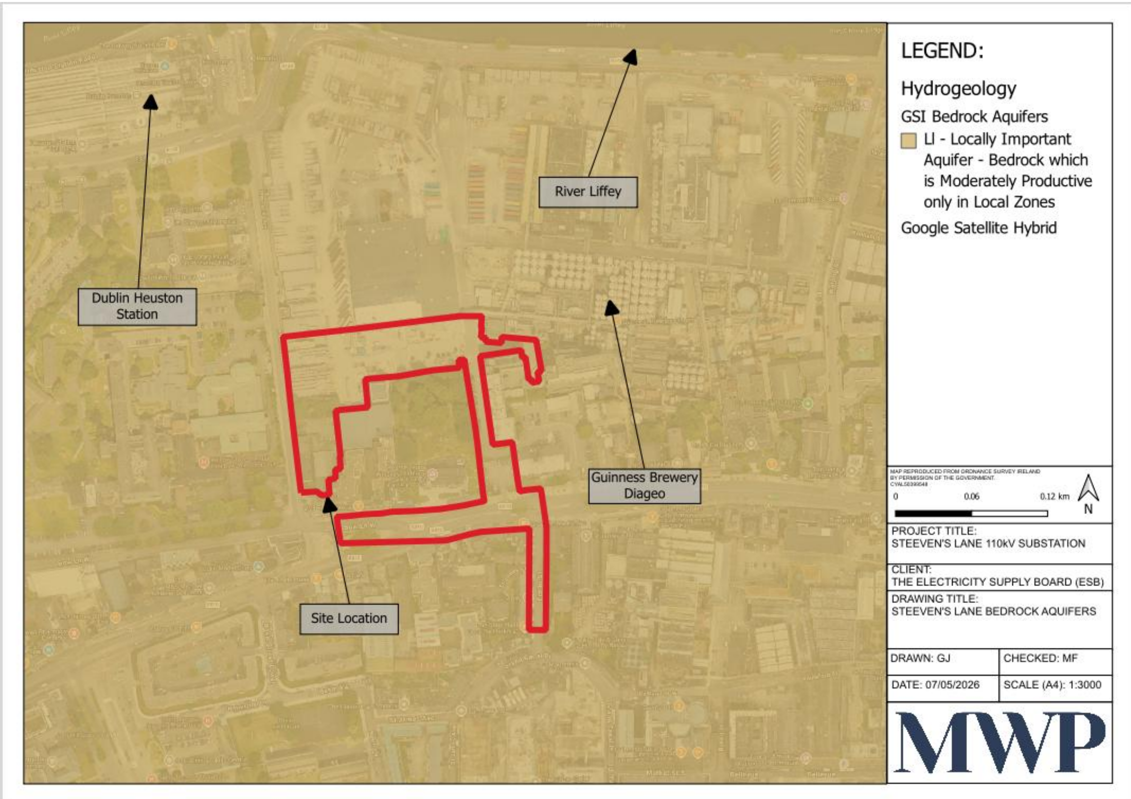

Figure 6-13: Bedrock Aquifers

7. Flood Risk Identification (Stage 1)

7.1 Overview

As discussed during the Site Characterisation Section of this report, possible sources of flood risk were identified using the GSI Geology and Hydrogeology Maps, the Teagasc Soil Maps, and the EPA Watercourse Maps. This identified that the proposed substation development is within an estuarine area, with a single watercourse to the west.

In addition to this, the following sources shall be examined in order to identify possible sources of flood risk at the site:

- Elevation & Terrain Mapping
- Flood History - Examination of available information on the OPW website (www.floodinfo.ie)
- OPW Community-Scale Flood Extents (OPW CSFE)
- National Indicative Fluvial Mapping (NIFM)
- National Coastal Flood Hazard Mapping (NCFHM)
- OPW Arterial Drainage Scheme & Drainage Districts
- GSI Winter 2015/2016 Surface Water Flooding
- GSI Predictive & Historic Groundwater Flood Mapping
- Internet Searches

7.2 Elevation & Terrain Mapping

In addition to the Ordnance Survey Discovery Maps and OPW LiDAR assessed during the site characterisation section of this report, the topography and elevation data for the site was assessed through the use of available survey data which was captured for the site. This was sourced from BlueSky, who captured the image in 2016. The previous assessment of historic mapping showed few alterations around the site between 2014 and 2024, and as such the 2016 survey is understood to be representative of the current site.

An extract of this LiDAR data, with the associated contours, is provided in Figure 7-1:. As with the previous assessment, this was used alongside the topographical data, with the topographical data used to validate the LiDAR, and the LiDAR then providing additional clarity in areas where limited topographical information is available, such as along the southern-most extent of the redline boundary. Overall, a strong correlation between the LiDAR and topographical points was noted.

The survey data assessed shows the elevation of the existing site within the redline boundary ranging from 5.71mOD to 18.8mOD, with the site sloping from south to north, and the highest point shown to be located along the southern extent of the cable route. There is one area of significant topographical change observed, with a step of approximately 4.5m observed between the Diageo lands and the site of the proposed substation structure. The majority of the lands south of this are shown to be at a similar elevation to the site of the structure, and range from 11mOD to 18mOD, while the portion of the site to the north ranges from 5.7 to 6.9mOD. The majority of the site is shown to lie between the 10mOD and 12.5mOD contour lines, which correlates with the previous assessment of the topography and slope of the site using the OSi and OPW LiDAR mapping data.

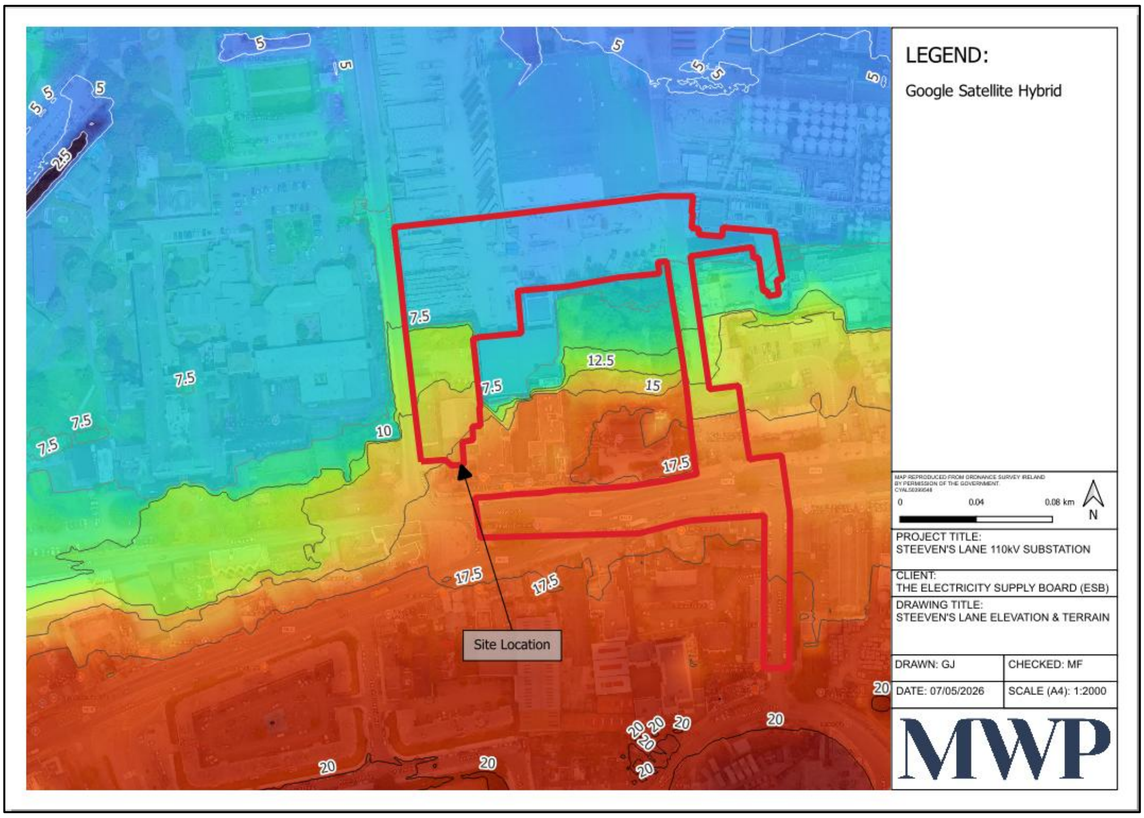

Figure 7-1: Elevation Data at the Site

7.3 Historic Flooding: OPW Local Area Reports

Information regarding the flooding history of the site in question and the surrounding area was obtained from the OPW via the *floodinfo.ie* website which utilises interactive mapping to provide data on historic flooding. These events are derived from available flood information documentation including flood event reports, news articles, archive information and photos.

As shown in Figure 7-2:, 19 flood event nodes, which relate to both single and recurring events, have been recorded within a 2km radius of the study area. It should be noted that no flood event is noted within the boundary of the site itself. The past flood events are summarised as follows:

- Flood ID: 287 – Clanbrassil Street – 10th June 1963

  Information on this event is provided by a number of newspaper articles, and a Dublin City Council memo. These note the flooding to be the result of widespread thunderstorms, with significant rainfall causing the watercourses within the city to exceed the capacity of their banks. This was shown to primarily affect areas to the east and southeast of Dublin City, such as Merrion Square, Mount Merrion, Blackrock, and Sandyford, with the study area not impacted.

- Flood ID: 661 – Marrowbone Lane – 20th January 1941

  This flood event relates to the flooding of the River Poddle, and is recorded in correspondence to the City Engineer. In this, a report to the City Engineer noted that overtopping of the banks occurred as a result of the dumping of garden waste in the watercourse.

- Flood ID: 669 / 670 / 671 / 672 – Turvey Avenue / Carrickfoyle / Kearns Place / Bow Bridge – Recurring

The above four recuring flood events relate to flooding of the Camac River, which is located to the west of the study area. Details of these events are provided by a Surveyor's Report, which notes that the Camac would periodically overtop its banks, leading to the flooding of and damage to nearby properties. This report recommends a survey and examination of the watercourse is carried out, in order to prevent adverse effects on flood extents in the area following a proposed development within the catchment.

- Flood ID: 1998 – Limekiln Lane – 24th August 1905

  Information on this event is available through the Dublin Corporation Engineering Department Drainage Division Report on the River Poddle, dated 1986. This notes that both blockages, and the low capacity of a number of culverts on the watercourse have led to flooding in the area.

- Flood ID: 3267 – Limekiln Lane – 2nd September 1931

  Information on this event is available through the Dublin Corporation Engineering Department Drainage Division Report on the River Poddle, dated 1986. This notes that both blockages, and the low capacity of a number of culverts on the watercourse have led to flooding in the area.

- Flood ID: 11563 – Bow Lane, Kilmainham – 24th October 2011

  Information on this event is provided through an OPW report, which contains information extracted from a Flood Data Collection Form submitted to The Office Of Public Works (OPW) by Consultants working on the Eastern River Basin District (RBD) Catchment Flood Risk Assessment and Management (CFRAM) Project.
  This flood occurred as a result of the Camac River overtopping its banks at a heavily canalised location. This corresponded to a maximum flood depth of 0.4m, with typical values of 0.15m, and resulted in damage to the basement of a residential property.

- Flood ID: 11603 – Hardold's Cross – 23rd October 2011

  As with the previous event, information on this event is provided through an OPW report, which contains information extracted from a Flood Data Collection Form submitted to The Office Of Public Works (OPW) by Consultants working on the Eastern River Basin District (RBD) Catchment Flood Risk Assessment and Management (CFRAM) Project.
  This flood occurred as a result of the River Poddle overtopping its banks at the location of a culvert with sufficient capacity. This corresponded to a maximum flood depth of 1.5m, with typical values of 0.5m, and resulted the loss of life of one person, and damage to numerous properties and roads.

- Flood ID: 11620 – Kearns Place – 24th October 2011

  As with the previous event, information on this event is provided through an OPW report, which contains information extracted from a Flood Data Collection Form submitted to The Office Of Public Works (OPW) by Consultants working on the Eastern River Basin District (RBD) Catchment Flood Risk Assessment and Management (CFRAM) Project.
  This flood occurred as a result of the Camac River overtopping its banks at a heavily canalised location. This corresponded to a typical flood depth of 0.15m, and resulted in damage to numerous residential properties, and a local road.

- Flood ID: 11622 – Lady's Lane, Kilmainham – 23rd October 2011

  As with the previous event, information on this event is provided through an OPW report, which contains information extracted from a Flood Data Collection Form submitted to The Office Of Public Works (OPW) by Consultants working on the Eastern River Basin District (RBD) Catchment Flood Risk Assessment and Management (CFRAM) Project.

This flood occurred as a result of the Camac River overtopping its banks. This corresponded to a maximum flood depth of 2m, and resulted in damage to numerous residential properties.

- Flood ID: 11681 – Aisling Hotel, Parkgate Street – 24th October 2011

  As with the previous event, information on this event is provided through an OPW report, which contains information extracted from a Flood Data Collection Form submitted to The Office Of Public Works (OPW) by Consultants working on the Eastern River Basin District (RBD) Catchment Flood Risk Assessment and Management (CFRAM) Project.
  This flood occurred as a result of overland flow on Conyngham Road following heavy rainfall, which then pooled in front of the Aisling Hotel. This corresponded to a typical flood depth of 0.15m, and resulted in damage to the ground floor of the hotel and the adjacent Luas Red Line.

- Flood ID: 11688 – Bridgewater Quay Apartments, Islandbridge – 24th October 2011

  As with the previous event, information on this event is provided through an OPW report, which contains information extracted from a Flood Data Collection Form submitted to The Office Of Public Works (OPW) by Consultants working on the Eastern River Basin District (RBD) Catchment Flood Risk Assessment and Management (CFRAM) Project.
  This flood occurred as a result of the surface water runoff from Pheonix Park flowing onto South Circular Road and into the Bridgewater Quay Apartment Complex. This corresponded to a maximum flood depth of 0.05m, with typical values of 0.01m, and resulted in damage to the ground floor apartments a bridge wall.

- Flood ID: 11961 – Wexford Street – 25th July 2013

  This event is detailed in an Irish Times article. Flooding was observed following localised heavy rainfall during an Orange Met Éireann Weather Alert.

- Flood ID: 13040 – Dublin City – 6th January 2014

  No information is available regarding this flood on the floodinfo.ie website.

- Flood ID: 13583 – Dublin City – 22nd November 2017

  No information is available regarding this flood on the floodinfo.ie website.

- Flood ID: 13093 –Dublin City – 3rd February 2014

  No information is available regarding this flood on the floodinfo.ie website.

- Flood ID: 14077 – Dublin City – 14th June 2016

  No information is available regarding this flood on the floodinfo.ie website.

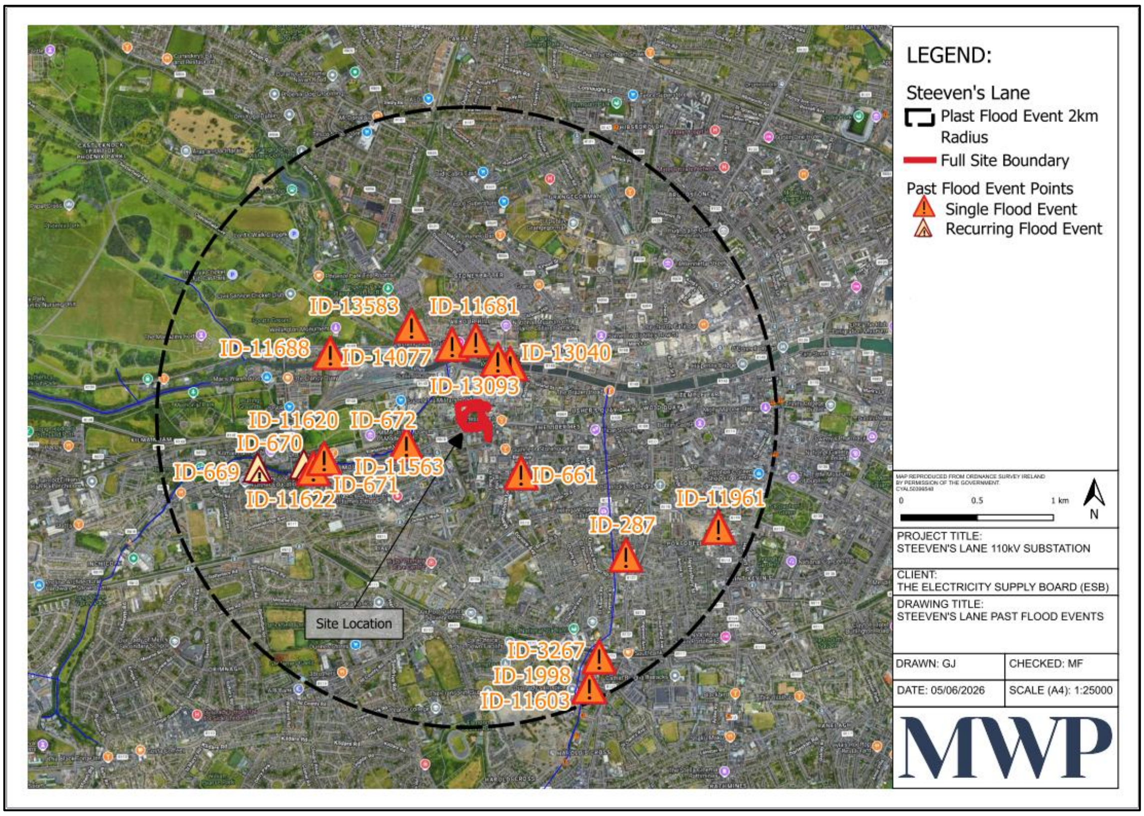

Figure 7-2: Past Flood Events

7.4 OPW Community-Scale Flood Extents

In order to meet the requirements of Article 6 of the European Communities (Assessment and Management of Flood Risks) Regulations 2010 to 2015 (the "Regulations") (implementing Directive 2007/60/EC), the OPW have produced Community-Scale Flood Extents (CSFE). These maps are suitable for community-level assessments, and show the modelled extent of land that might be impacted by either coastal or fluvial flooding during a theoretical or 'design' flood event with an estimated probability of occurrence. The OPW has subsequently published Flood Maps for each area which refer to flood event probabilities in terms of a percentage Annual Exceedance Probability, or 'AEP'. This represents the probability of an event of this severity occurring in any given year. They are also commonly referred to in terms of a return period (e.g. the 100-year flood).

The OPW's updated Community-scale Flood Maps are effectively a combination of the following datasets:

- CFRAM 2018 - This data was produced for the 300 'Areas of Further Assessment' (AFAs), as identified under the first cycle of the EU 'Floods' Directive [2007/60/EC] and designated under the Preliminary Flood Risk Assessment. Data was also produced for other reaches between the AFAs and down to the sea that are referred to as 'Medium Priority Watercourses' (MPWs). River reaches that have been modelled are indicated by the CFRAM Modelled River Centrelines dataset.
- National Flood Map Reviews - Updates and revisions take place to the community-scale flood maps on an ongoing basis, where evidence is presented of a change in physical conditions, a detection of errors or based on other specific evidence. More information can be found on the OPW's Flood Map Review Page, https://www.floodinfo.ie/map-review/.

- **Completed Flood Relief Schemes** - Updates and revisions take place to the community-scale flood maps where a Flood Relief Scheme has been completed. More information can be found on the OPW's Flood Relief Scheme Information Summary Page, https://www.floodinfo.ie/scheme-info/.

The Liffey and Dublin Bay area, which includes Steeven's Lane, is covered within Eastern Catchment Flood Risk Assessment Study (CFRAMS)Unit of Management 09, and as such, it is understood that the data presented for this region as part of the OPW CSFE was originally produced under the Eastern CFRAMS study. This was an extensive Catchment-based Flood Risk Assessment and Management Study for the Liffey-Dublin Bay Catchment, which was carried out by the OPW in conjunction with RPS, with maps subsequently published from this, prior to its inclusion in the OPW SCFM. The CFRAMS maps provide data for 10, 100, and 1000-year return period floods for both current and mid-range future scenarios, where the midrange future scenario accounts for the effects of climate change and associated sea level rise.

The flood extents for the 1% AEP (100-year flood) and 0.1% AEP (1000-year flood) Present Day Scenario (Current Scenario) fluvial flood events are illustrated below in Figure 7-3, with the corresponding Mid-Range Future Scenario (MRFS) shown in Figure 7-4. These maps indicate the flood extents along the left and right banks or both the Camac River and the River Liffey. In these, 1% AEP Current Scenario flood extents from both watercourses are shown to extend to within 130m of the site boundary, with this reducing to 70m in the MRFS. The 0.1% flood extents are shown to extent to within closer proximity to the site, with the Current Scenario flood extents and the MRFS reaching a maximum of within 40m of the site boundary. In each of these fluvial scenarios, the flood extents are not anticipated to insect with the site of the proposed development.

The flood extents for the 0.5% AEP (200-year flood) and 0.1% AEP (1000-year flood) Present Day Scenario (Current Scenario) coastal flood events are illustrated below in Figure 7-5, with the corresponding Mid-Range Future Scenario (MRFS) shown in Figure 7-6:. In these, 0.5% AEP Current Scenario flood extents are shown to originate from the northeast, as a result of the coastal influence on the River Liffey. This extends to within 120m of the site boundary, with this reducing to 70m in the MRFS. The 0.1% flood extents are shown to extent to within closer proximity to the site, with the Current Scenario flood extents within 110m of the site, and the MRFS reaching a maximum of 70m from the site boundary. In each of these coastal scenarios, the site of the proposed development is not shown to be vulnerable to flooding.

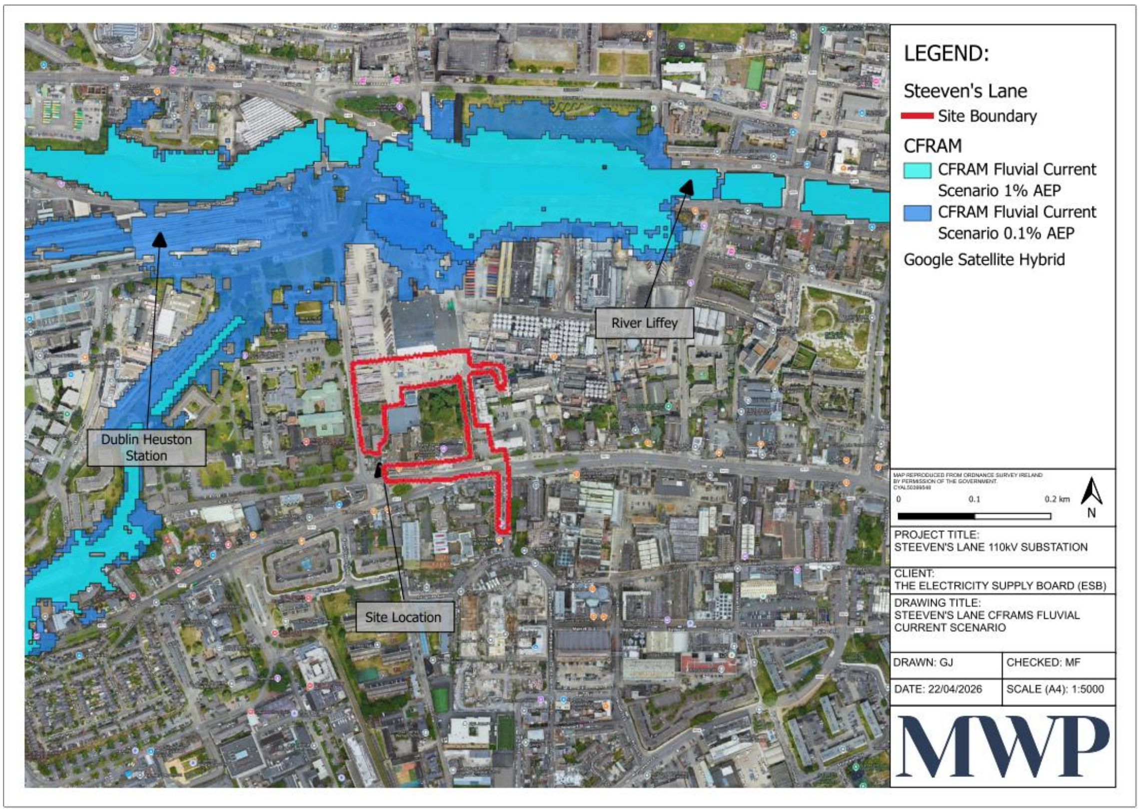

Figure 7-3 - CFRAM Fluvial Current Scenario Flood Extents

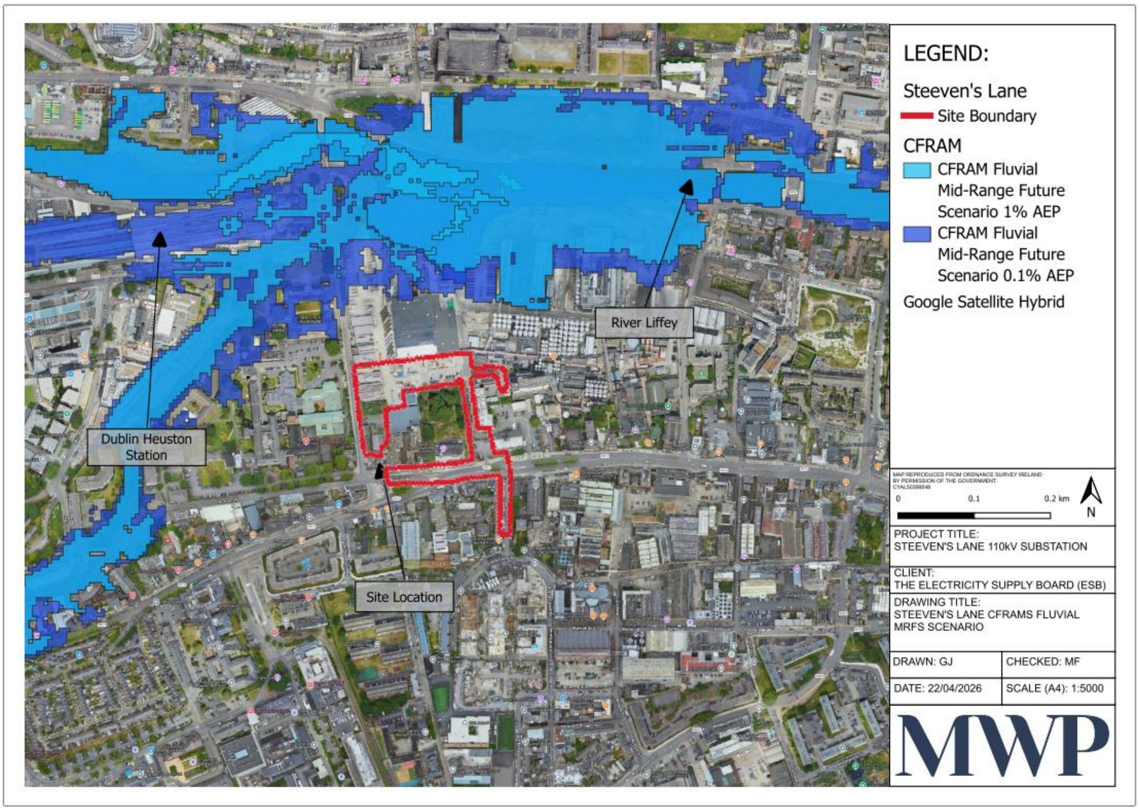

Figure 7-4 - CFRAM Fluvial MRFS Flood Extents

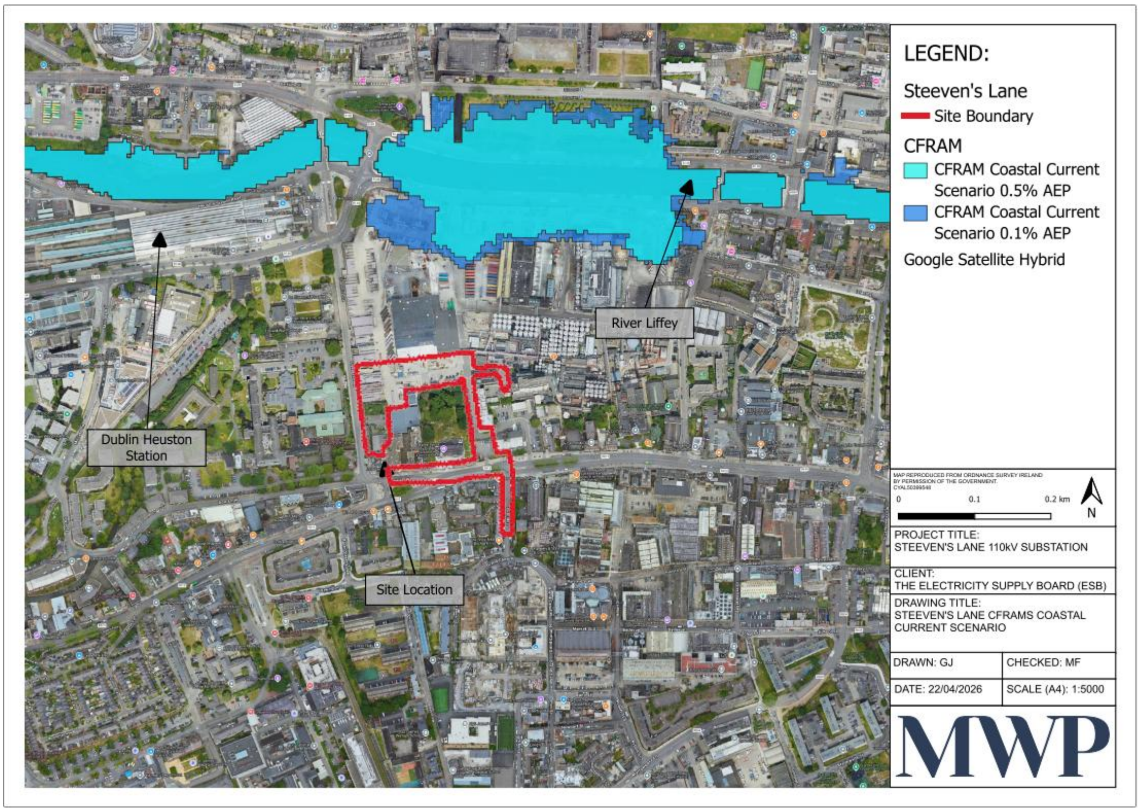

Figure 7-5 - CFRAM Coastal Current Scenario Flood Extents

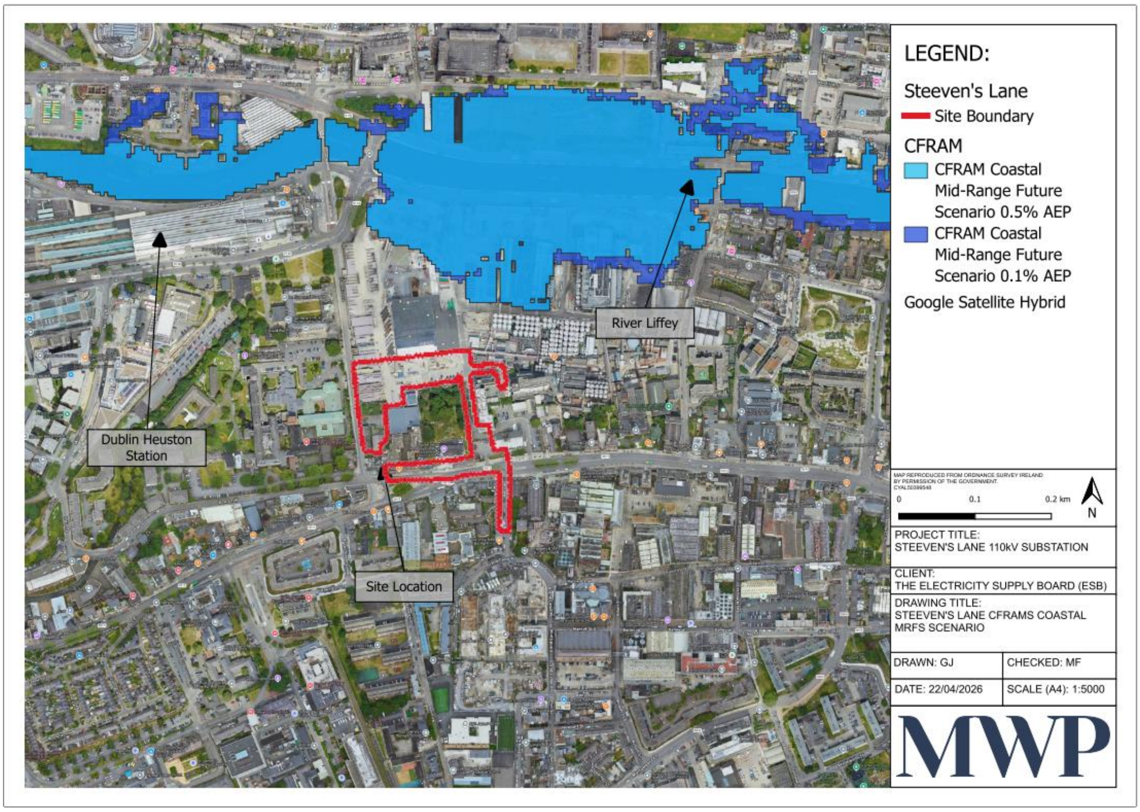

Figure 7-6: CFRAM Coastal MRFS Flood Extents

7.5 National Coastal Flood Hazard Mapping (NCFHM)

This data was created by the OPW as part of the National Coastal Flood Hazard Mapping project in 2021. The estimated extreme water level outputs from Phase 1 of the Irish Coastal Wave and Water Level Modelling Study were used as input water level data for this project, which informed the resulting mapping. In the context of tidal flooding, the flood map below indicates the extent of flooding for 200-year and 1000-year return period floods for both the current scenario as shown in Figure 7-7: . The extents for the MFRS event are shown in Figure 7-8.

These maps indicate that, while coastal flooding is present to the north of the site, the site itself is not vulnerable to flooding in the scenarios assessed. Flood water for the 0.5% AEP is shown to have a similar extent to that shown in the OPW CSFE mapping, and extends to within 120m of the site in the Current Scenario or 110m in the MRFS. This is shown to increase to within 110m of the site for the 0.1% AEP Current Scenario or 100m from the site for the 0.1% AEP MRFS event. As this originates from the northeast, the local road network from which the site is accessed, is also not anticipated to be vulnerable to flooding in the events assessed.

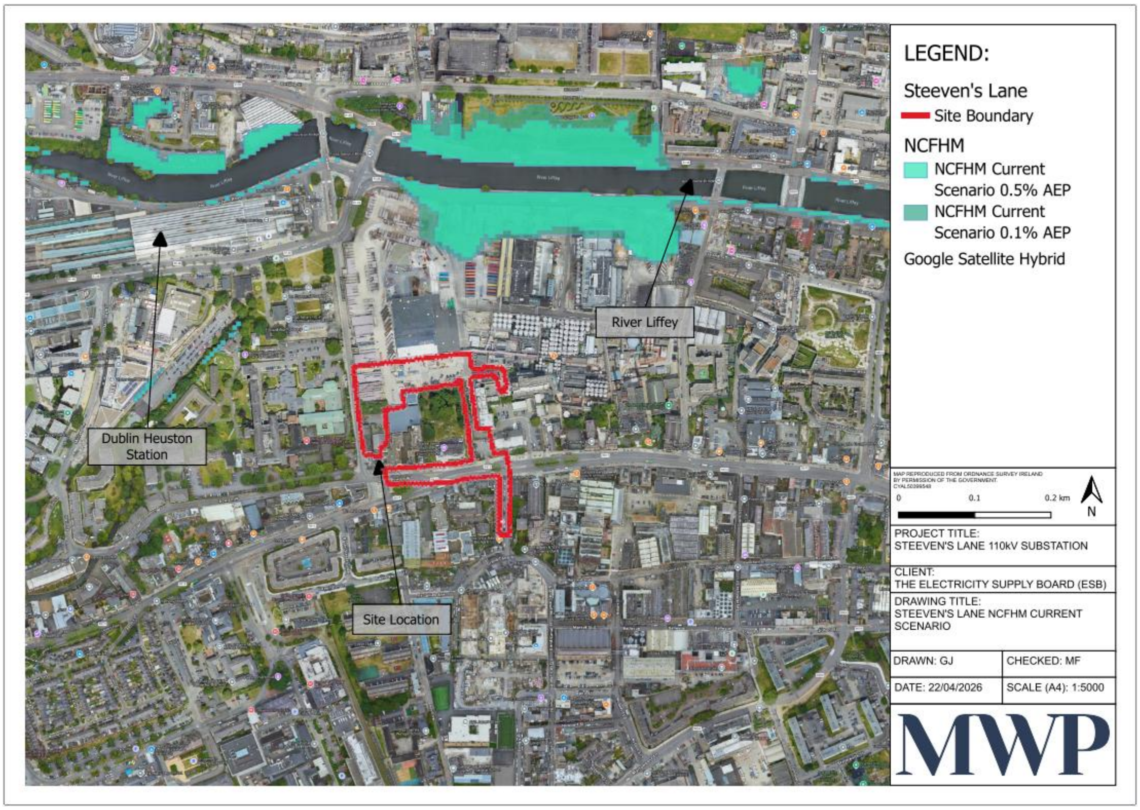

Figure 7-7: NCFHM Current Scenario Flood Extents

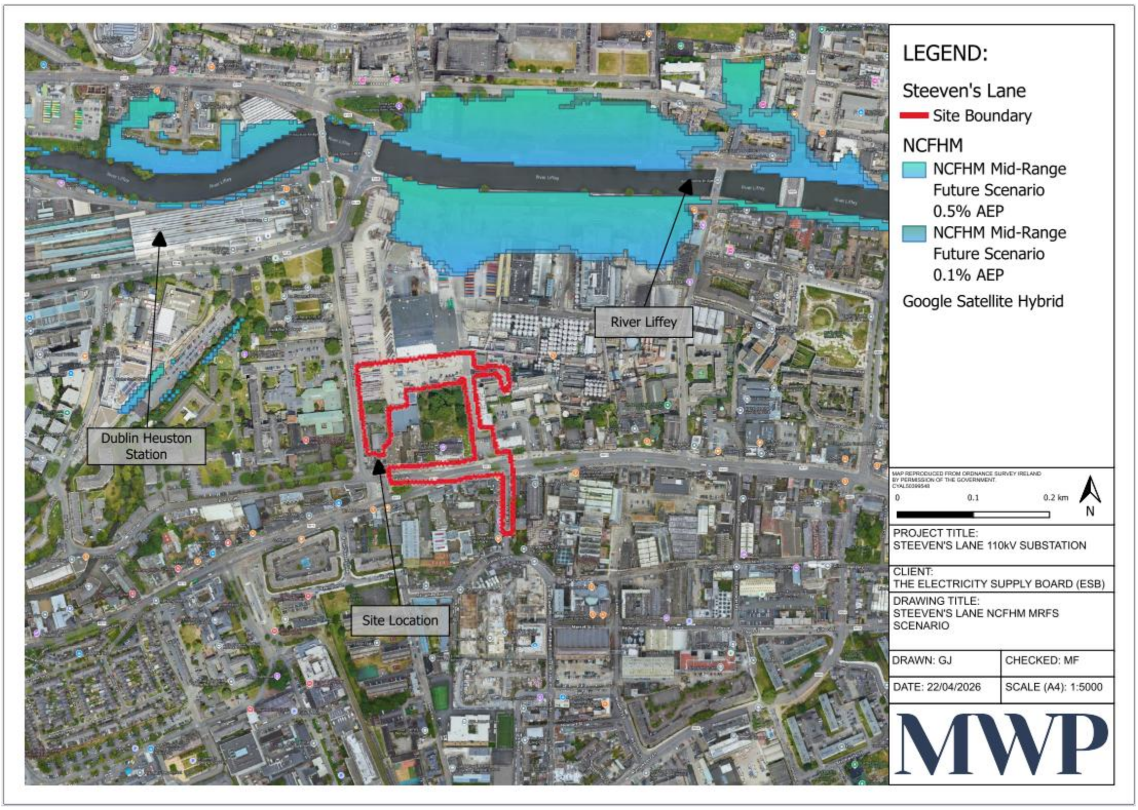

Figure 7-8: NCFRM MRFS Flood Extents

7.6 National Indicative Fluvial Mapping (NIFM)

The National Indicative Fluvial Flood Maps have been produced for catchments greater than 5Km² in areas for which flood maps were not produced under the National Catchment Flood Risk Assessment and Management Programme (CFRAM) and should be read within this context. These maps are not the best achievable representation of projected flood extents, such as those that could be generated through detailed hydraulic modelling and are only indicative of the predicted flood extent of any given probability at any particular location. They should not be used for local decision-making or any other purpose without verification and seeking the advice of a suitable professional.

The flood maps may be used in the Stage 1 Flood Risk Assessment (Flood Risk Identification), and thus within this preliminary assessment of flood risk, to identify areas where further assessment would be required if development is being considered within or adjacent to the flood extents shown on the maps. Similarly, the maps may be used to identify whether flood risk might be a relevant issue when considering a planning application, or when discussing a potential application at pre-planning stage. Local site inspections, and / or making use of the knowledge of staff familiar with a particular area, are essential to determine if the maps for a given area are reasonable.

For the purposes of flood zoning, or making decisions on planning applications, it is strongly recommended that a Stage 2 Flood Risk Assessment (Initial Flood Risk Assessment), as set out in the Planning System and Flood Risk Management Guidelines, is undertaken (where there are proposals for zoning or development, and where the area may be prone to flooding, as described above). These maps are 'predictive' flood maps showing indicative areas predicted to be inundated during a theoretical fluvial flood event with an estimated probability of occurrence, rather than information for actual floods that have occurred in the past, which is presented, where available, on the 'past' flood maps.

As the site is included within both the OPW CSFE and the CFRAM study, NIFM maps at this location are not available, and therefore the NIFM has not been considered for this assessment.

7.7 GSI Groundwater & Surface Water Mapping

The Geological Survey of Ireland host a national database of Groundwater Flooding Probability Maps, flood extents of the Winter 2015/2016 Surface Water Flooding event and Maximum Historic Groundwater Flooding extents. The Winter 2015/2016 Surface Water Flooding map shows fluvial (rivers) and pluvial (rain) floods, excluding urban areas, during the winter 2015/2016 flood event. While there is no groundwater flooding indicated in the study area or the surrounding land, it should be noted that this does not necessarily mean that flooding of these types does not exist in the area.

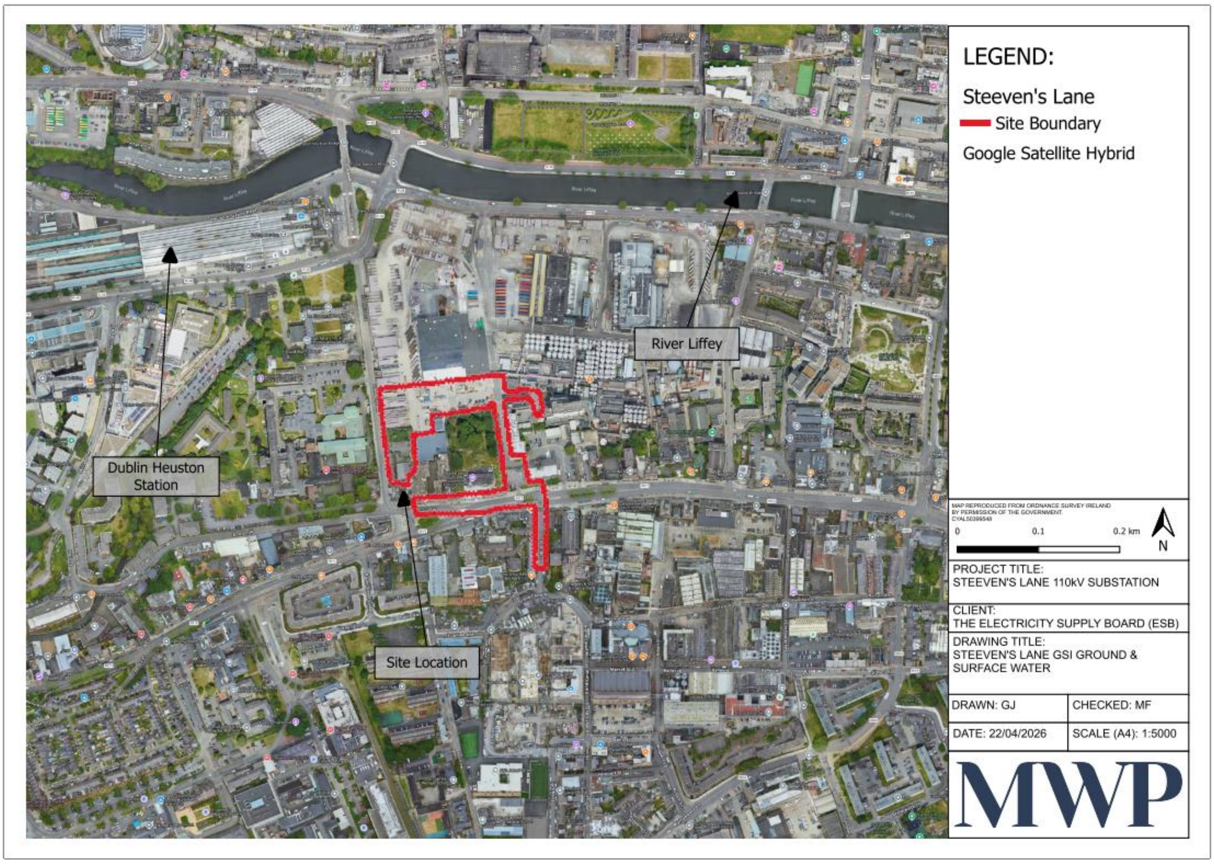

Figure 7-9: GSI Ground & Surface Water Mapping

7.8 OPW Arterial Drainage Scheme & Drainage Districts

The OPW Arterial Drainage Schemes (ADS) were carried out under the Arterial Drainage Act, 1945 to improve land for agricultural and to mitigate flooding by ensuring the 3-year flood was retained in bank. Rivers, lakes, weirs, and bridges were modified to enhance conveyance, embankments were built to control the movement of flood water, and various other work was carried out under Part II of the Arterial Drainage Act, 1945. The OPW has a statutory duty to maintain these schemes.

Similarly, Drainage Districts were carried out by the Commissioners of Public Works under a number of drainage and navigation acts from 1842 to the 1930s to improve land for agriculture and to mitigate flooding. Channels and lakes were deepened and widened, weirs removed, embankments constructed, bridges replaced or modified, and various other work was carried out. The purpose of the schemes was to improve land for agriculture, by lowering water levels during the growing season to reduce waterlogging on the land beside watercourses known as callows. Drainage Districts cover approximately 10% of the country, typically the flattest areas. Local Authorities are charged with responsibility to maintain Drainage Districts. The Arterial Drainage Act, 1945 contains a number of provisions for the management of Drainage Districts in Part III and Part VIII of the act.

A map of the areas in proximity to the site which were included with the ADS and Drainage Districts is provided in Figure 7-10:, which indicates that the study area has not been included within the ADS.

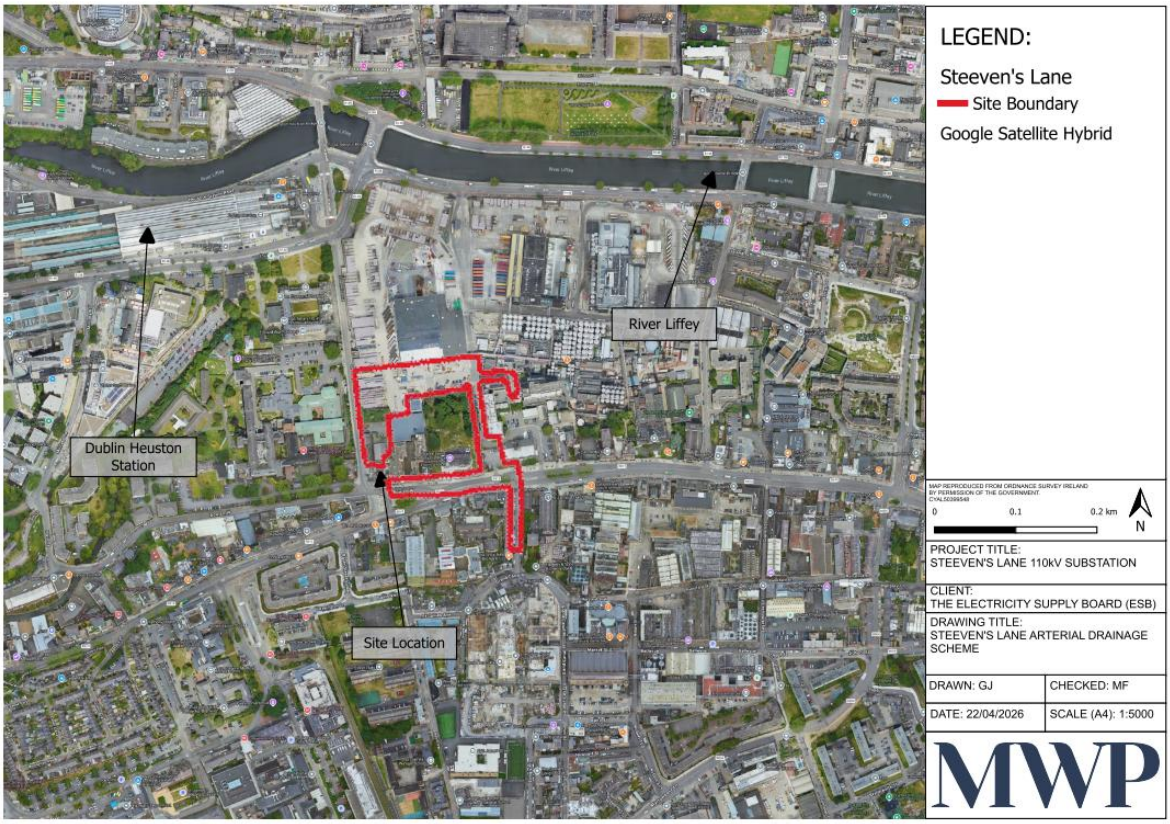

Figure 7-10: Arterial Drainage Scheme

7.9 Land Use & Zoning

As previously discussed, the site of the proposed works comprises a brownfield site, which is partially under industrial use. The lands within the northern extent of the redline boundary are currently in use as part of the Diageo/St. James Gate Brewery, with the lands to the south of this consisting of a large existing hard standing area and the local road network. The land-use zoning associated with this area is set-out under the Dublin City Development Plan 2022-2028, which was adopted on the 2nd of November 2022 and came into effect on the 14th of December 2022.

Under the Plan (Figure 7-11), the site of the proposed Steeven's Lane substation structure is zoned as *Z4: Key Urban Villages/Urban Villages - To provide for and improve mixed-services facilities*, with the cable routes associated with the works shown to cross through *Z7: Employment (Heavy) - To provide for the protection and creation of industrial uses, and facilitate opportunities for employment creation including Port Related Activities*, *Z5: City Centre - To consolidate and facilitate the development of the central area, and to identify, reinforce, strengthen and protect its civic design character and dignity*, and unzoned lands along the public road.

In addition to the land zoning, the Plan also details flood risk and surface water management for the areas covered by the Plan. This is detailed in Section 9, which notes that in 2018, Dublin City Council worked with the OPW to complete a CFRAM programme for the major rivers and coastal areas of Dublin City. This work ultimately informed the implementation of flood protection and alleviation measures on the River Camac which is located approximately 250m west of the site.

Within Section 9, the requirement is also set out for site-specific flood risk assessments to be carried out for all developments under SI15 of the Dublin City Development Plan 2022-2028. These are to be completed in accordance with the The Planning System and Flood Risk Management - Guidelines for Planning Authorities, November 2009 (PSFRM), apply the sequential approach, and use the Justification Test for Plan Making where necessary.

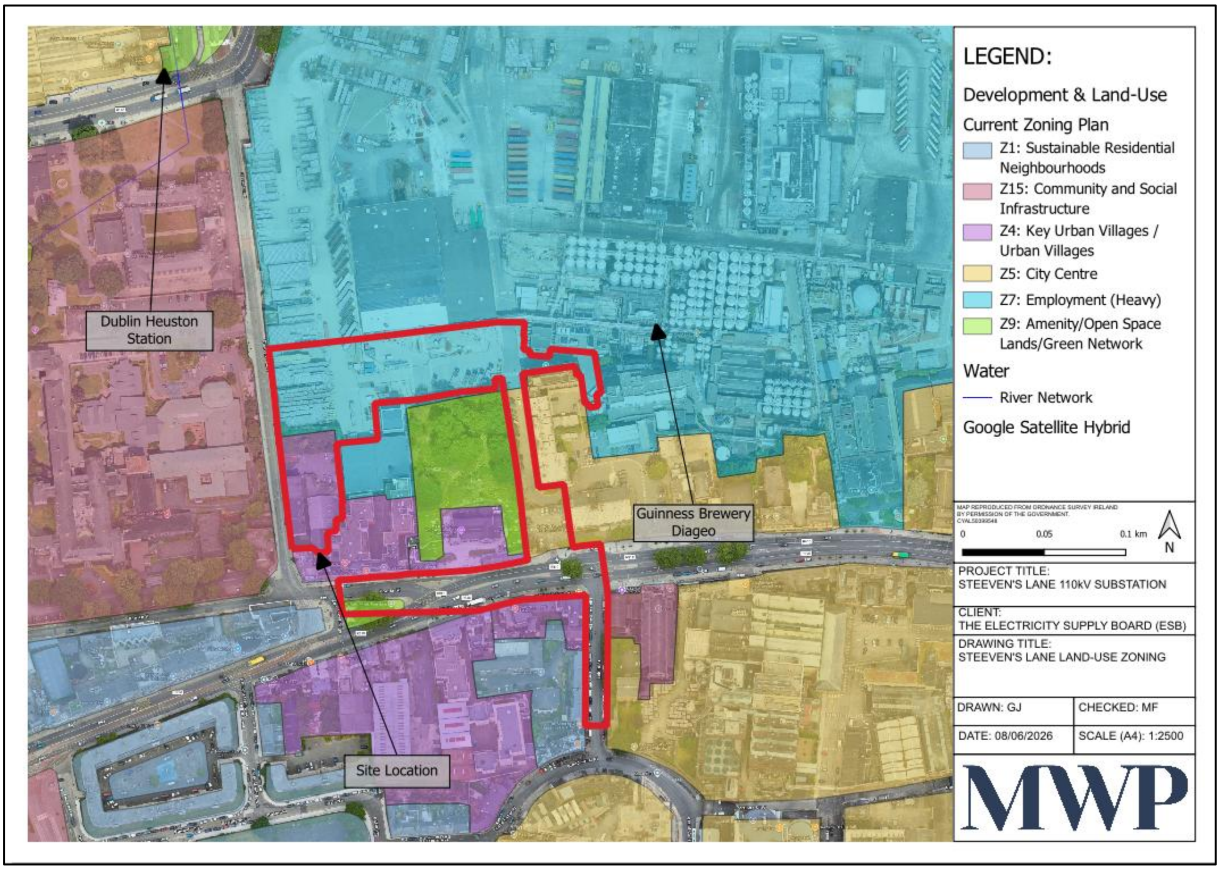

Figure 7-11: Land-Use & Zoning

7.10 Dublin City Council Strategic Flood Risk Assessment

The Dublin City Development Plan 2022-2028 also includes a Strategic Flood Risk Assessment (SFRA) which considers climate change and resultant increases in rainfall intensity, changed rainfall patterns, and increased risk from fluvial and coastal flooding. The SFRA has been prepared in accordance with the Planning System and Flood Risk Management Guidelines (2009) to provide a broad assessment of all types of flood risk to inform strategic land-use planning decisions.

The SFRA sets-out both the requirements and recommended approach for flood risk assessments, as well as including Flood Zone maps, and detailing the appropriate measures for developments which are located within areas of flood risk. In this, the area in question is captured under Area 4, with the SFRA recommending that risk be assessed based on a fully undefended scenario, given the unknown standard of defences in the area. The maps produced for this indicate the site to be in Flood Zone C, with the extents of Flood Zones A and B shown to be limited in this region. This indicates that the site in question is not located within an area of flood risk, with the predictive flood extents not shown to intersect with the site boundary. Therefore, in accordance with the Plan, development is appropriate within this region.

7.11 Internet Searches

In addition to the resources discussed previously, an internet search was conducted to gather information about whether the site was affected by flooding previously. The information returned as a result of this reinforced the above data, and reported flooding in nearby locations, but did not indicate a history of flooding within the site boundary.

This search also returned information regarding a proposed flood alleviation scheme for the Camac River, which is located to the west of the site. The Camac Flood Alleviation Scheme is a full catchment study which includes both the river itself, and its tributaries, as well as the pipes that feed them, from the source of the watercourse near Saggart Hill to its outfall to the River Liffey at Dublin Heuston Train Station. This scheme is currently undergoing preliminary design, however as noted previously, although the site is within the catchment of this watercourse, it is not indicated to be affected by fluvial flooding originating from the Camac River.

7.12 Stage 1 Summary

The above Stage 1 FRA has identified no potential flood risk at the site in question. In order to validate these findings, a Stage 2 FRA will be carried out to provide a more comprehensive assessment of the flood risk in the area, and to verify the conclusions of the Stage 1 FRA.

8. Initial Flood Risk Assessment (Stage 2)

8.1 Overview

The purpose of Initial Flood Risk Assessment is primarily to ensure that the relevant flood risk sources are identified so that they can be addressed, and appropriate mitigation measures recommended, where relevant. The potential sources of flooding and their relevance to the flood risk to the site are outlined in the following subsections.

8.2 Flooding Sources

8.2.1 Fluvial Flooding

Fluvial flooding occurs when the capacity of a river channel is exceeded and water flows onto the adjacent land or floodplain. The main watercourses within proximity of the site are the Camac River, and the River Liffey, which the Camac River discharges into, at a point to the north of the site.

The available data indicates that the proposed site and the watercourse adjacent to it were covered within the CFRAMS study, with the data from this presented as part of the OPW CSFE, and as such indicative fluvial extents under the NIFM are not available. The CFRAM data indicates that the proposed site is not anticipated to be within the 1% AEP or 0.1% AEP flood extents for either the present day or mid-range future scenarios. The predictive flood extents shown to remain 40m from the site boundary in a 0.1% MRFS fluvial flood event, and therefore, the site is not believed to be vulnerable to fluvial flooding.

8.2.2 Pluvial Flooding

Overland flow or pluvial flooding occurs when rainfall intensity exceeds the infiltration capacity of the ground. The excess water flows overland to the nearest watercourse or piped drainage system. Intense rainfall events can result in ponding in low areas or upstream of physical obstructions. Overland flow is most likely to occur following periods of sustained and intense rainfall when the ground surface becomes saturated.

The existing site is a brownfield site, with the proposed development not corresponding to any significant increase in hardstanding area associated with the construction of the proposed substation. Furthermore, it is also proposed to carry out a drainage design for the site as part of the proposed works, which will ensure that no adverse effect on flood risk is observed elsewhere as a result of development at the site. Therefore, pluvial flooding does not require further consideration in this report.

8.2.3 Coastal & Estuarine Flooding

Estuarial or tidal flooding is caused by higher-than-normal sea levels which occur primarily due to extreme high tides, storm surges, wave action or due to high river flows combining with high tides. As outlined in the Stage 1 assessment and indicated on the associated CFRAM and NCFHM flood extent maps, potential for flooding of this type was not identified, despite the proximity of the site to Dublin Bay.

The available CFRAM and NCFHM data indicates that, although coastal flooding is predicted along the banks of the River Liffey to the north of the site, the site itself is not shown to be impacted by coastal flooding in the current and mid-range future scenarios for either 0.5% AEP or 0.1% AEP events. Predictive water levels calculated as part of the CFRAMS studies, provide a water maximum water surface elevation of 3.48mOD for a 0.1% AEP event – based on the available topographical data which shows the existing ground level of the site to be in the range of 5.71mOD to 18.8mOD, the site is not shown to be vulnerable to coastal flooding.

Furthermore, the step in levels observed within the topographical data indicates that the site of the substation structure, specifically, ranges from 11.4mOD to 14.2mOD currently. Although this is proposed to be reduced to a range of 11.1mOD to 12.6mOD as part of the development at this location, the site remains approximately 8m above the estimated 0.1% AEP present day flood level.

8.2.4 Groundwater Flooding

Groundwater flooding occurs when the water table rises to the level of the ground surface due to rainfall and flows out over the surface. Groundwater flooding occurs relatively slowly and generally poses a low hazard to people. However, it should be noted that ground water level on this site will be equivalent to the sea level at any given point in time and will vary accordingly. There is also no known history of such an occurrence in the vicinity of the site and for these reasons this source of flooding will not be considered further in this report.

8.2.5 Localised Urban Flooding

There is no report of flooding of this type within the site boundary. Therefore, this source of flooding will not be considered further in this report.

8.3 Appraisal of Availability & Accuracy of Existing Information

As part of the completion of the Stage 2 Flood Risk Assessment, the availability and accuracy of existing data regarding the site was assessed to ensure that there was sufficient information for the purpose of providing an accurate appraisal of the flood risk to the site. This is summarised as follows:

- Information regarding fluvial flood extents at the site are available through the Eastern Catchment Flood Risk Assessment Study (CFRAMS) mapping, with this including predictive flood levels for the site at a number of nodes on both the River Liffey and Camac River watercourse. This allows for further clarity in the assessment of the vulnerability of the site to fluvial flooding originating from these watercourses,
- Coastal flood extents within the area are available though both the CFRAMS and the National Coastal Flood Hazard Mapping (NCFHM) for both current and mid-range future scenarios. These flood extents in conjunction with topographic survey can be used to determine areas susceptible to coastal flooding,
- LiDAR data which was captured in 2016 and topographical survey data gathered by Murphy Geospatial in early 2024 are both available for the site, and are understood to provide an accurate portrayal of the elevation of the current site. Contour information across the site is illustrated in this, providing clarity on the ground elevation in the site, in comparison to the predictive water surface elevation data gathered for the various flood events assessed,
- The accuracy of the LiDAR was further verified through a comparison of the data along the banks of the watercourse with the publicly available cross-sectional survey data. As part of the Eastern CFRAMS, data was collected on the Camac River and River Liffey which includes hydrographic survey of the river channel. Open channel and structure cross sections for these watercourses are publicly available to download from *Floodinfo.ie.* The survey indicates that the level of the bank of the Camac River ranges from 5.48mOD to 6.11mOD along the right bank, from Dublin Heuston Train Station to a point directly west of the site. Similarly, the right bank of the River Liffey is shown to correspond to levels of approximately 2.53mOD directly north of the site. An examination of the LiDAR at these locations, shows there to be a difference of approximately 0.03m higher than the OPW survey data on average. Therefore, this verifies that there is a strong correlation between the LiDAR and the cross-sectional survey data.

Therefore, based on the above assessment, it has been concluded that the available data is sufficient for the purpose of assessing the flood risk at the site. This shall be used to determine the Flood Zones which the site is situated in, and identify potential mitigation measures where appropriate, as detail below in Section 9.

8.4 Stage 2 Summary

Based on the above Initial Flood Risk Assessment, which examined fluvial, pluvial, coastal and estuarine, groundwater, and localised urban flooding, it is evident that the site is not vulnerable to any of the aforementioned flooding mechanisms. Both present day and mid-range future scenarios were assessed, with the outputs of this found to be consistent with the Stage 1 assessment.

In accordance with the Planning System and Flood Risk Management Guidelines (2009), these findings are used to inform the flood zone classification of the site, and to guide the development of appropriate site-specific flood risk mitigation measures, as set out in Section 9.

9. Impact of Flooding on Development

9.1 Flood Zone Identification

9.1.1 Flood Risk & Vulnerability at Site

The above assessment has determined that the site is not influenced by either fluvial or tidal flooding mechanisms, following an assessment of 1% Annual Exceedance Probability (AEP), 0.5% AEP, and 0.1% AEP data from both the Eastern Catchment-based Flood Risk Assessment and Management Study for the Liffey-Dublin Bay Catchment Identification of Flood Zone, and the National Coastal Flood Hazard Mapping (NCFHM). These datasets were produced using a national Digital Terrain Model (DTM), integrating OPW owned and licensed elevation data.

This data shows flood extents originating to the west from the Camac River, and to the north from the River Liffey and Dublin Bay, with both fluvial and coastal flood mechanisms shown to be present to the north and west of the site. However, the site itself is shown to not be vulnerable to flooding in any of the events assessed. No flood extents are predicted to extend to within less than 40m of the site, with the access point of the site and the local road network indicated to be outside of the area of flood risk.

In line with the Planning System and Flood Risk Management Guidelines (2009), developments are classified according to vulnerability based on proposed land use. The construction and operation of the proposed substation development, and the associated works, are classified as Highly Vulnerable Development, as it relates to essential infrastructure, and as such The Guidelines specify that such developments may only be considered within Flood Zone C. The detailed flood mapping and site topography described above will be used to confirm the site's flood zone classification and to inform appropriate flood risk mitigation measures, as outlined in Section9.1.2.

9.1.2 Identification of Flood Zone

As previously discussed in Section5.6, the Flood Risk Management Guidelines defines three flood zone types as follows:

- *Flood Zone A* – where the probability of flooding from rivers and the sea is highest,
- *Flood Zone B* – where the probability of flooding from rivers and the sea is moderate,
- *Flood Zone C* – where the probability of flooding from rivers and the sea is low.

The CFRAMS and National Coastal Flood Hazard Mapping have been examined in detail to determine which flood zones this site lies within. As per the Planning and Flood Risk Management Guidelines 2009, the flood zones are defined without taking the effects of future climate change into account.

Both the CFRAMS and NCFHM are considered to be reliable datasets for the purpose of identifying flood zones, with the latter derived from advanced coastal modelling by the OPW, and the former created using hydrodynamic modelling, which is based on calculated design river flows and extreme sea levels, surveyed channel cross-sections, river and coastal structures, Digital Terrain Models, and other relevant datasets such as land use and data on past floods for model calibration.

Of the two mapping sets assessed, the CFRAM mapping is considered to provide a more conservative assessment of coastal flooding in the area, with the coastal flood extents portrayed in this shown to extend closer to the proposed site. Therefore, given the greater spatial extent of the CFRAM mapping, these extents are used as the final basis for flood zone classification at the site, consistent with the guidance that the more conservative (larger) flood extents should inform development decisions. This approach ensures that the site's flood risk is appropriately characterised with due regard for the worst-case flood hazard. The overall Flood Zone map for the current scenario is presented in Figure 9-1:, and is predominately based on fluvial flood extents, which are shown to be the dominant flood mechanism in this location.

As indicated in the below maps, and as discussed previously, the site of the proposed substation development, the access point of the site, and the local road network are indicated to be located outside of the 0.1% AEP flood extents, and as such, are situated in an area of low flood risk. Therefore, it has been determined that the site corresponds to Flood Zone C, and as such, construction of "Highly Vulnerable Developments" is appropriate under the Guidelines.

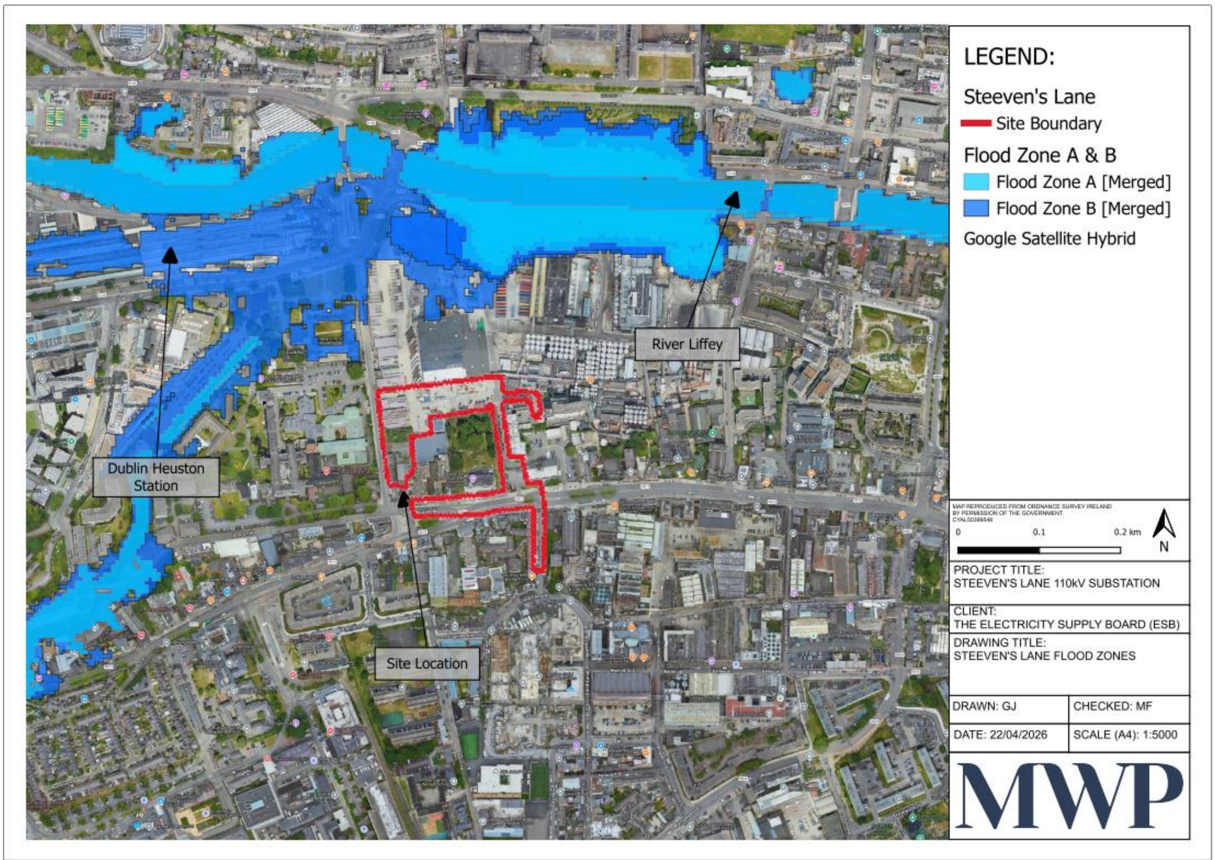

Figure 9-1: Flood Zone A & B Extents

9.2 Estimation of Flood Levels

As previously discussed, the Eastern Catchment Flood Risk Assessment Study data is available in close proximity to the study area. As part of this study, in addition to maps, the CFRAM data has also produced predictive flood levels for various different node locations along the watercourses adjacent to the site. The maps associated with this are provided in Figure 9-2: for fluvial data, and Figure 9-3 for coastal data, with the water surface elevations for the nodes in closest proximity to the site summarised in Table 9.1 below.

As shown in this, fluvial and coastal flooding along the extents of the River Liffey are predicted to reach levels of 3.36mOD and 3.48mOD respectively for a 0.1% AEP event. This is expected to increase to 6.09mOD for a 0.1% AEP fluvial event along the Camac River. The available topographical data indicates that the coastal and fluvial flooding originating to the north of the site does not extend past the 5mOD contour line, which is consistent with the predictive flood levels. Similarly, the fluvial flood extents originating from the Camac River to the west are not anticipated to extend past the 6.7mOD contour line on the LiDAR imagery.

The existing topography of the site indicates that ground levels in this area range from 11.5mOD to 18.8mOD, with a low-point point directly inside the entrance shown to have an elevation of approximately 11.1mOD.The local road from which the site is accessed, is also shown to correspond to a surface elevation of approximately 10mOD to the north of the entrance to the site, with the ground and the local road network shown to rise to the south.

Additionally, the proposed Finished Flood Level (FFL) of the building, as indicated in the planning drawings package, is shown to correspond to a level of 12.8mOD. Based on this, a freeboard of greater than 6m is available from the 0.1% AEP fluvial flood level to the existing ground level of the proposed site. While the OPW's Mid-Range Future Scenario (MRFS) projects a sea level rise of approximately 0.5 meters by 2100, the elevation data of the existing site indicates that a freeboard will still be available to the development in this scenario. Therefore, the site is not anticipated to be vulnerable to flooding in the events in question.

Furthermore, of the overall site area of approximately 1.73ha, 0.232ha is required for the development of the Substation structure, with the remainder corresponding to the area required for the installation of underground cables and associated infrastructure for the development. As the overall site is outside of the predictive flood events assessed, and the majority of the works relate to the installation of underground cables, it is not anticipated that this development will increase either flood risk or flood levels elsewhere.

Table 9.1: CFRAM Predicted Water Surface Elevation

Node	Fluvial		Coastal	
	1% AEP: Current Scenario	0.1% AEP: Current Scenario	0.5% AEP: Current Scenario	0.1% AEP: Current Scenario
09LIFF00469	2.99 mOD	3.36 mOD	3.24 mOD	3.46 mOD
09LIFF00508	3.11 mOD	3.51 mOD	-	-
09CAMM00027I	4.37 mOD	6.09 mOD	-	-
09LIFF00513	-	-	3.27 mOD	3.48 mOD

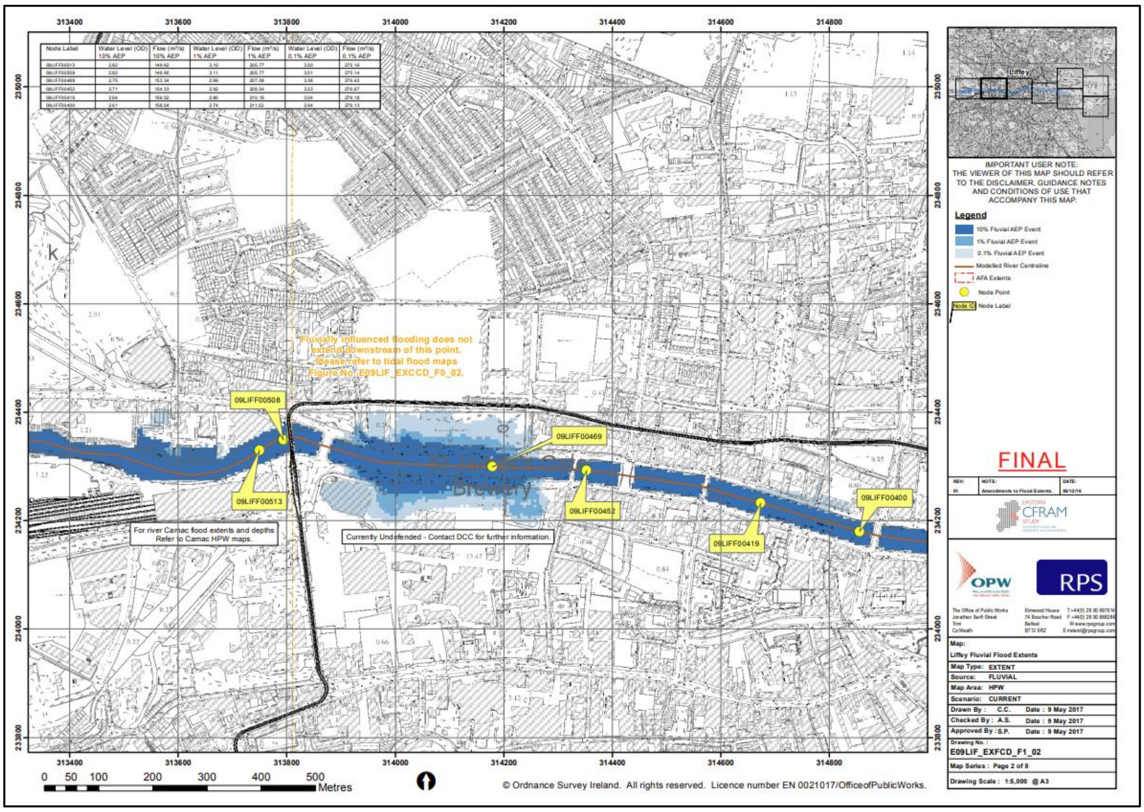

Figure 9-2: CFRAM Fluvial Nodes

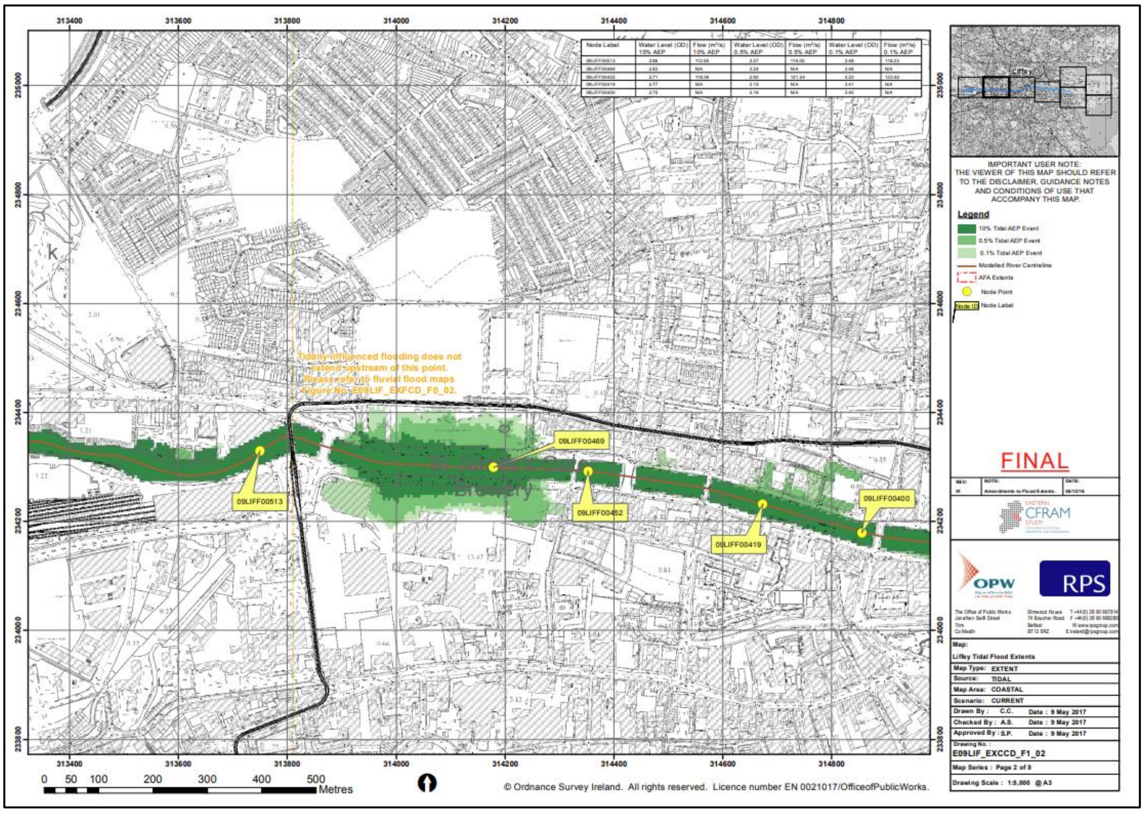

Figure 9-3: CFRAM Coastal Nodes

10. Conclusions and Recommendations

Following the completion of the above Flood Risk Assessment, the conclusions and recommendations of this report are as follows:

1. This report has been prepared in the context of The Planning System and Flood Risk Management - Guidelines for Planning Authorities, November 2009 (PSFRM), published by the Office of Public Works and the Department of Environment, Heritage and Local Government.
2. The aim of the proposed development is to construct a new 110kV Electrical Substation and associated electrical infrastructure, including a Gas Insulated Switchgear (GIS) building, transformers, and associated plant and equipment. Works will also include all ancillary infrastructure required to facilitate the operation of the substation, including site clearance, demolition of existing structures, internal access arrangements, underground cabling within the site, drainage infrastructure, and boundary treatments.
3. Following the completion of both the Stage 1 and Stage 2 assessment, the site was found to be vulnerable to neither fluvial nor coastal flooding.
4. The site of the proposed substation was found to lie within Flood Zone C, which is defined by the Flood Risk Management Guidelines as:
    a. Flood Zone C (low probability): Areas within which there is a less than 0.1% AEP flood risk. This is shown to correspond to the entire site, which lies outside the predictive 0.1% AEP fluvial and coastal flood extents for both current and mid-range future scenarios. Works comprising "Highly Vulnerable Development" are considered suitable for development within Flood Zone C.
5. Given that the development relates to the construction and operation of an electrical substation, which is essential infrastructure, the development is classified as "Highly Vulnerable Development" under the Guidelines. Therefore, development of infrastructure of this kind is only considered to be acceptable within Flood Zone C.
6. Flood level assessments indicate that a 0.1% AEP coastal flood event corresponds to 3.48mOD, rising to 6.09mOD for a 0.1% AEP fluvial flood event to the west of the site. This is lower than the existing ground level of both the site and the local road from which it is accessed from, with the FFL of the proposed development shown to be 12.8mOD. Therefore, a freeboard to the development of greater than 6m is anticipated.
7. As discussed previously, the overall site boundary has an area of approximately 1.73ha. Of this, 0.232ha is required for the development of the Substation structure, with the remainder corresponding to the area required for the installation of underground cables and associated infrastructure for the development. As the overall site is outside of the predictive flood events assessed, and the majority of the works relate to the installation of underground cables, it is not anticipated that this development will cause an adverse effect on flood risk elsewhere.

MWP

ENGINEERING AND ENVIRONMENTAL CONSULTANTS

Cork

Park House,
Bessboro Road,
Blackrock, Cork
T: 021 453 6400
E: info@mwp.ie

Tralee

Reen Point,
Blennerville, Tralee,
Co. Kerry
T: 066 712 3404
E: tralee@mwp.ie

Limerick

The Elm Suite, Loughmore
Centre, Raheen Business
Park, Limerick
T: 061 480 164
E: limerick@mwp.ie

Galway

Unit 27, Top Floor
Briar Hill Business Park,
Galway,
T: 091 399 633
E: info@mwp.ie

London

2 Exchange Tower,
1-2 Harbour Exchange
Square, London
T: 0044 20 7253 0893
E: mail@mwalsh.co.uk