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Preliminary Site Assessment

Site 23 Bedford Row - Francis Street 38 kV (September 2011)

Electricity Supply Board

Project number: PR-427640_ACM_RP_ENV_010_4

24 January 2020

Quality Information

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herein are based on the guidance values available at the time this Report was prepared, however, no liability by AECOM can be accepted for the retrospective effects of any changes or amendments to these values.

The opinions expressed in this report and the comments and recommendations given are based on a desk assessment of readily available information and an initial site reconnaissance by an AECOM employee. At this stage intrusive investigations have yet to be undertaken at site to establish actual ground and groundwater conditions and to provide data for an assessment of the geo-environmental status of the site.

Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

Where assessments of works or costs identified in this Report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

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Certain statements made in the Report that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the Report, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. AECOM specifically does not guarantee or warrant any estimate or projections contained in this Report.

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ABBREVIATIONS

AECOM	AECOM Ireland Limited
APEC	Area of Potential Environmental Concern
bgl	Below Ground Level
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CSM	Conceptual Site Model
ESB	Electricity Supply Board
EPA	Environmental Protection Agency
GSI	Geological Survey Ireland
IEL	Industrial Emissions Licence
IPC	Integrated Pollution Control
ITM	Irish Transverse Mercator
km	Kilometre
kV	Kilovolt
LAB	Linear Alkyl Benzene
m OD	Metres above Ordnance Datum
NHA	Natural Heritage Areas
NAPL	Non-Aqueous Phase Liquid
NPWS	National Park and Wildlife Service
NWCPO	National Waste Collection Permit Office
OECD	Organisation for Economic Co-operation and Development
OPW	Office of Public Works
OSI	Ordnance Survey Ireland
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCOC	Potential Constituents of Concern
pNHA	Proposed Natural Heritage Area
PSA	Preliminary Site Assessment
RFP	Request for Proposal
SAC	Special Area of Conservation
SDS	Safety Data Sheet
SIDS	Screening Information Datasets
SPA	Special Protection Area
TPH	Total Petroleum Hydrocarbons
WAC	Waste Acceptance Criteria
WFD	Water Framework Directive

EXECUTIVE SUMMARY

Introduction

AECOM Ireland Limited (AECOM) completed a Preliminary Site Assessment (PSA) of a cable fluid leak location at a joint in the circuit located on John's Lane East immediately north of Christchurch Cathedral, Dublin 8 (the site).

ESB Networks operates and maintains a network of High Voltage (HV) underground cables of over 1,600 kilometres (km) across Ireland, of which approximately 175 km are insulated by a cable fluid. The majority of the fluid filled cables are located in urban settings across Dublin City and Cork City. The remainder are located outside these areas with limited numbers of fluid filled cables in other counties.

The length of each cable route varies and cable routes frequently extend across county boundaries. The cable fluid acts as an electrical insulator and aids the conduction of heat away from the conductor allowing the cable to be run more efficiently. Fluid filled cables are largely located in urban/suburban areas and so are particularly vulnerable to third party interference or damage. Over time cables can develop leaks due to corrosion / fracture/ defects in the cable sheath and in joints and terminations. When such leaks occur there is potential for pollution to occur to surface water, groundwater, soils and ecology.

A leak was identified by Electricity Supply Board (ESB) at this site in 2009 (month unknown) and repaired in September 2011. AECOM understand that the fluid type lost from the cable was a low viscosity blend of linear alkyl benzene (LAB).

Objective

The assessment reported herein comprises the first step of Stage 1: Site Characterisation & Assessment – Preliminary Site Assessment (PSA) and was carried out in accordance with *EPA Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (July 2013),* and specifically the Guideline Template for Preliminary Site Assessment Report. This guidance draws on the *EPA Code of Practice (CoP), Code of Reference for Unregulated Waste Disposal Sites (2007*) and *UK Environment Agency, Model Procedures for the Management of Land Contamination, Contaminated Land Report (CLR) 11 (September 2004).*

In terms of the data requirement for PSA reports, both the EPA CoP and CLR 11 outline that the findings of this initial risk assessment stage are largely based on desk-study information and a site walkover to identify potential pollutant linkages, which are then evaluated using appropriate criteria.

As such, the objective of the PSA reported herein is to:

- Identify potential contamination sources (i.e. the cable fluid), pathways (i.e. breathing in vapours, movement through made ground / soil) and receptors (i.e. who/what will be affected) and the likely interactions between each element;
- Assess the potential severity of the hazard and the sensitivity of the receptor (ranging from minor to severe);
- Assess the likelihood that a risk will occur (ranging from unlikely to high likelihood); and
- Develop a preliminary conceptual site model (CSM) based on an overall assessment of each of these elements above.

The preliminary CSM will then be used to identify potential risks to human health (site users and/or nearby residents) and controlled waters (i.e. groundwater and surface water) which may be associated with a fluid leak from the identified location. It should be noted that this stage of the risk assessment process is based mostly on qualitative information sources and identification of a potential risk at this stage does not necessarily indicate the presence of a risk, but rather the need for further assessment.

A table cross referencing the template headings from the EPA Guidance Template and where the corresponding information is reported herein is presented in Appendix B.

Assessment Findings

Based on the findings of the desktop study, the overall environmental sensitivity of the site is considered to be moderate. Identified sensitive receptors within 1 km of the site include:

- The River Liffey located 170 m north of the site, although this may be protected by low permeability clay deposits which are likely to be encountered beneath the site;
- The Poddle river located approximately 400 m west of the site, although this may be protected by low permeability clay deposits which are likely to be encountered beneath the site; and
- The groundwater aquifer beneath the site, although this may also be protected by low permeability clay deposits, likely to be encountered beneath the site.

It is estimated that 5,396 litres of cable fluid (Linear Alkyl Benzene (T 3788)) was released between 2009 and September 2011. Due to its high biodegradability, it is considered that LABs are of less concern for adverse environmental impact than other hydrocarbon fluids. A summary of the source audit findings is as follows:

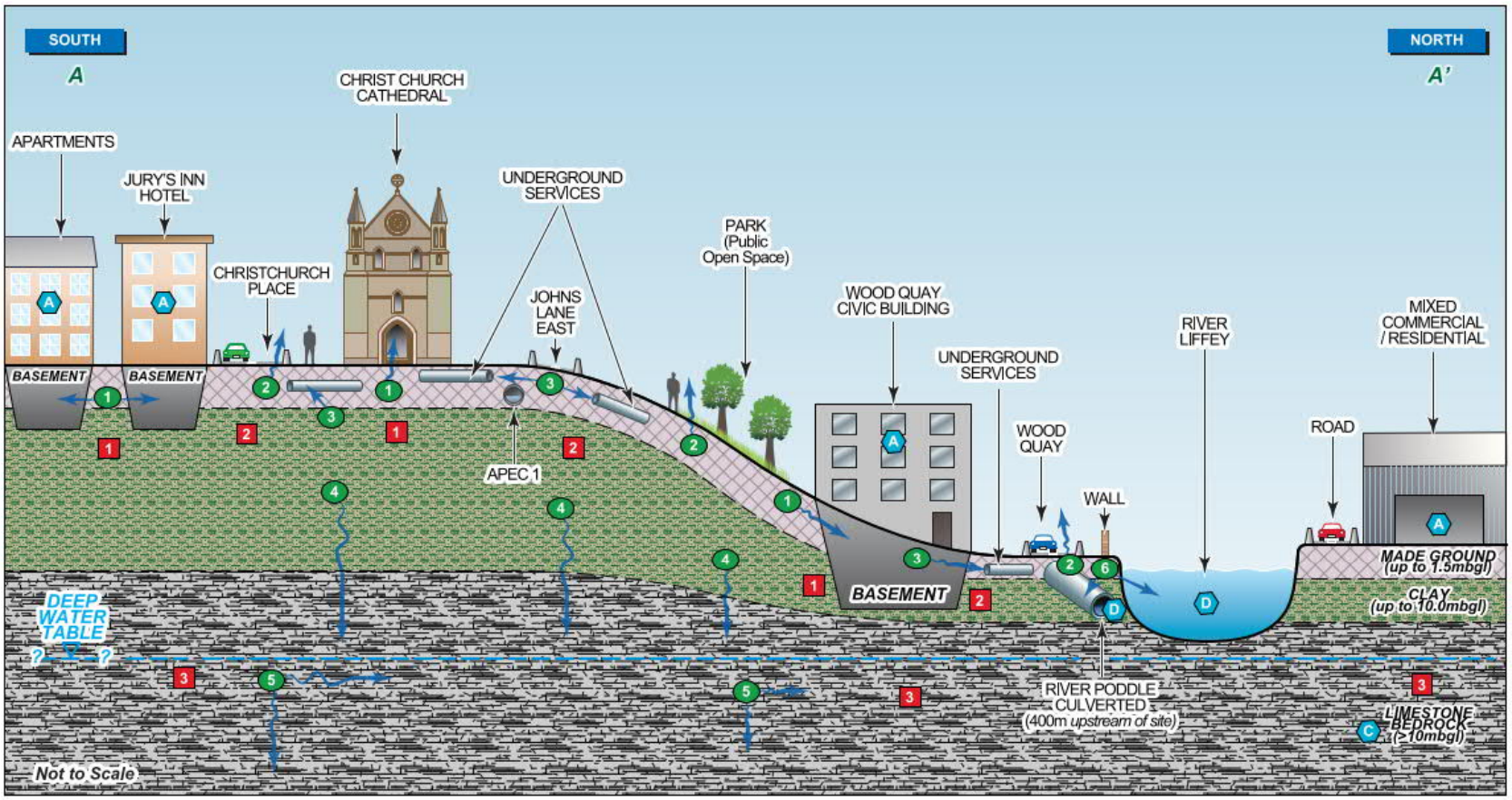
Area of Potential Environmental Concern

Number	APEC	Potential Contaminants of Concern	Potential Media Impacted
1	Leak at (23) Bedford row - Francis Street 38 kV (September 2011)	LABs	Soil Groundwater Surface Water Ground Gas

The preliminary conceptual site model developed for the site looked at potential source-pathway-receptor linkages identified during the assessment works and identified a moderate risk to site users due to the potential for ground gas generation resulting from degradation of LAB NAPL (if present).

Risks associated with other potential source-pathway-receptor linkages were considered to be very low to low.

The risk assessment completed herein is preliminary in nature as it can only be based on an evaluation of qualitative data sources (i.e. not on intrusive site investigation works). Consequently, identification of potential risk does not necessarily indicate a risk to a receptor, rather that further assessment may be required to investigate assumptions made in the CSM and quantify whether a potential risk actually exists. Generally, where a low or very low risk has been identified further assessment may not be deemed necessary to assess a particular SPR linkage, although further assessment may be deemed to be required to investigate CSM assumptions where the potential risk is considered to be low or very low due to the sensitivity of the receptor.



SOURCES

1. GROUND GAS
2. NON-VOLATILE CONTAMINANTS IN SOIL
3. CONTAMINANTS IN GROUNDWATER

PATHWAYS

1. GROUND GAS MIGRATION
2. DERMAL CONTACT / DUST INGESTION
3. PERMEATION OF AND MIGRATION ALONG EXISTING UNDERGROUND SERVICES
4. LEACHING FROM SOIL TO GROUNDWATER
5. VERTICAL & HORIZONTAL MIGRATION OF CONTAMINATED GROUNDWATER
6. MIGRATION & LEACHING TO SURFACE WATER

RECEPTORS

- A RESIDENTIAL / COMMERCIAL SITE USERS
- B SHALLOW GROUNDWATER
- C BEDROCK GROUNDWATER
- D SURFACE WATER

NOTES:

FOR INFORMATION

ELECTRICITY SUPPLY BOARD

SITE 23
Inchicore
Marrowbone Lane 38 kV

FIGURE 3
CONCEPTUAL SITE MODEL

AECOM

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EPA Contaminated Land and Groundwater Risk Assessment Methodology

Table 1 EPA Methodology

Stage	Methodology	Report Reference	Report Date	Status
Stage 1: Site Characterisation and Assessment				
1.1	Preliminary Site Assessment	PR-427640_ACM_RP_ENV_010	24 January 2020	Final
1.2	Detailed Site Assessment			
1.3	Quantitative Risk Assessment			
Stage 2: Corrective Action and Feasibility Design				
2.1	Outline Corrective Action Strategy			
2.2	Feasibility Study and Outline Design			
2.3	Detailed Design			
2.4	Final Strategy and Implementation Plan			
Stage 3: Corrective Action Implementation and Aftercare				
3.1	Enabling Works			
3.2	Corrective Action Implementation and Verification			
3.3	Aftercare			

Source: EPA Guidance on the Management of Contaminated Land at EPA Sites

1. Introduction

AECOM Ireland Limited (AECOM) is pleased to present this preliminary site assessment (PSA) completed on behalf of Electricity Supply Board (ESB) for a site on John's Lane East immediately north of Christchurch Cathedral, Dublin 8 (the site).

This report was commissioned by ESB under a request for proposal (RFP) issued on 26 June 2019 (Ref. Qd-354120-01R460_002-001-001) and carried out in accordance with AECOM proposal reference: PR-427640_ACM_PL_ENV_001_3, dated 03 July 2019. AECOM understand that ESB has undertaken these works on behalf of ESB Networks.

1.1 Project Background

ESB Networks operates and maintains a network of High Voltage (HV) underground cables of over 1,600 kilometres (km) across Ireland, of which approximately 175 km are insulated by a cable fluid. The majority of the fluid filled cables are located in urban settings across Dublin City and Cork City. The remainder are located outside these areas with limited numbers of fluid filled cables in other counties.

The length of each cable route varies and cable routes frequently extend across county boundaries. The cable fluid acts as an electrical insulator and aids the conduction of heat away from the conductor allowing the cable to be run more efficiently. Fluid filled cables are largely located in urban/suburban areas and so are particularly vulnerable to third party interference or damage. Over time cables can develop leaks due to corrosion/fracture/defects in the cable sheath and in joints and terminations. When such leaks occur, there is potential for pollution to occur to surface water, groundwater, soils and ecology.

A leak was identified by Electricity Supply Board (ESB) at this site in 2009 (month unknown) and repaired in September 2011. AECOM understand that the fluid type lost from the cable was a low viscosity blend of linear alkyl benzene (LAB).

The site location is presented in Figure 1 and the site layout showing the site is presented in Figure 2.

1.2 Project Objective

The assessment reported herein comprises the first step of Stage 1: Site Characterisation & Assessment – Preliminary Site Assessment (PSA) and was carried out in accordance with *EPA Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (July 2013),* and specifically the Guideline Template for Preliminary Site Assessment Report. This guidance draws on the *EPA Code of Practice (CoP), Code of Reference for Unregulated Waste Disposal Sites (2007*) and *UK Environment Agency, Model Procedures for the Management of Land Contamination, Contaminated Land Report (CLR) 11 (September 2004).*

In terms of the data requirement for PSA reports, both the EPA CoP and CLR 11 outline that the findings of this initial risk assessment stage are largely based on desk-study information and a site walkover to identify potential pollutant linkages, which are then evaluated using appropriate criteria.

As such, the objective of the PSA reported herein is to:

- Identify potential contamination sources (i.e. the cable fluid), pathways (i.e. breathing in vapours, movement through made ground / soil) and receptors (i.e. who/what will be affected) and the likely interactions between each element;
- Assess the potential severity of the hazard and the sensitivity of the receptor (ranging from minor to severe);
- Assess the likelihood that a risk will occur (ranging from unlikely to high likelihood); and
- Develop a preliminary conceptual site model (CSM) based on an overall assessment of each of these elements above.

The preliminary CSM will then be used to identify potential risks to human health (site users and/or nearby residents) and controlled waters (i.e. groundwater and surface water) which may be associated with a fluid leak from the identified location. It should be noted that this stage of the risk

assessment process is based mostly on qualitative information sources and identification of a potential risk at this stage does not necessarily indicate the presence of a risk, but rather the need for further assessment.

A table cross referencing the template headings from the EPA Guidance Template and where the corresponding information is reported herein is presented in Appendix B.

2. Scope of Work

To achieve the above objective, the following scope of work was undertaken:

- A site walkover by AECOM staff (completed on 09 July 2019);
- A desktop review of site history to identify areas of potential environmental concern (APEC);
- A desktop review of publicly available information regarding the site's environmental setting and sensitivity, including:
  - Geological Survey of Ireland (GSI) Groundwater Public Viewer Maps (https://dcenr.maps.arcgis.com/apps/MapSeries), accessed 08 July 2019;
  - EPA Geoportal Site (https://gis.epa.ie/EPAMaps), accessed 08 July 2019;
  - EPA Incidents Database (https://www.epa.ie/newsandevents/incidents/recent/), 08 July 2019;
  - Ordnance Survey of Ireland (OSI) (http://geohive.ie), accessed 08 July 2019;
  - Glucksman Map Library, Trinity College, Dublin, accessed 18 July 2019;
  - Office of Public Works (OPW) Flood Maps (http://www.floodinfo.ie), accessed 08 July 2019;
  - National Parks and Wildlife Service (NPWS) (http://webgis.npws.ie/npwsviewer/), accessed 08 July 2019;
  - National Waste Collection Permit Office (NWCPO) website (http://www.nwcpo.ie/), accessed 08 July 2019 ;
- A review of information provided by ESB in the RFP; and
- Data assessment and reporting.

3. Environmental Setting

3.1 Topography

The site is located at an elevation of approximately 18 m above ordnance datum (m OD). The land to the north slopes down towards the River Liffey, while the land to the east, south and west remains relatively flat.

3.2 Geology

Teagasc Soils Map indicates the site locally is overlain by made ground. The underlying Quaternary geology recorded by the GSI is identified as 'Urban Sediment'.

The GSI Bedrock Geology Map (scale 1:100,000) indicates the site is underlain by a dark fine-grained limestone and shale of the Lucan formation. No geological features are noted within the surrounding area.

Many geotechnical borehole records are available from the GSI database which are located within 1 km of the site. The two closest boreholes to the site are located within 10 to 20 m of the identified cable joint leak, immediately north of Christchurch Cathedral and John's Lane East.

The first was drilled using rotary core techniques as part of the Dublin Underground environmental impact statement site investigation and is recorded as BH30 (R7412/B156811). This borehole was drilled to a recorded depth of 42.3 m below ground level (bgl). There was no soil recovery from the drilling from ground level to 7 m bgl however; a dark brown slightly sandy slightly gravelly clay was

recorded between 7-10.5 m bgl. Bedrock was encountered during drilling at a recorded depth of 10.5 m bgl.

The second borehole was drilled using shell and auger percussion techniques as part of the Patricks Street Sewer site investigation and is recorded as R863/B62093. This borehole was drilled to a recorded depth of 10.5 m below ground level (bgl). Fill material and made ground was recorded from 0 - 1.5m bgl, overlying a stiff to very stiff brown gravelly sandy clay to a depth of 3.7 m bgl. Beneath the clay a very stiff brown to black Boulder Clay and clay is recorded to a depth of 9.85 m bgl. Bedrock was encountered during drilling at a recorded depth of 9.85 m bgl.

3.3 Hydrology

3.3.1 Surface Water Features

The site lies within the lower catchment of the River Liffey and Dublin Bay, which covers an area of 1624 km^2.

The closest surface water body to the site is the River Liffey, located approximately 170 m north of the site. The River Liffey flows into South Dublin Bay (an SAC). This comprises the following protected sites:

- South Dublin Bay Special Area of Conservation (SAC) (Site Code 000210);
- South Dublin Bay and River Tolka Special Protection Area (SPA) (Site Code 004024); and
- South Dublin Bay proposed Natural Heritage Area (pNHA) (Site Code 000210).

The River Poddle is located approximately 400 m west of the site and traverses heavily urbanised areas of Templeogue, Kimmage, Harold's Cross, Crumlin and Temple Bar; it is culverted for several sections of its course. The Poddle is culverted at this point and flows in a northerly direction entering the River Liffey approximately 400 m northwest of the site.

Given its proximity to the site, the River Liffey is considered to be the most sensitive surface water receptor.

3.3.2 Surface Water Quality

The most significant surface water feature in the vicinity of the site is the River Liffey and estuary. The Water Framework Directive (WFD) status of both the upper and lower sections of the estuary (classified as a Transitional Water Body) is 'Moderate' and is characterised as being 'at risk' of not meeting its WFD objectives. The most recent reported EPA water quality status of the River Liffey (monitoring station 'Island bridge UCD boat club) is a Q Value of 3 and a rating 'Poor'.

The WFD status of the Poddle River is characterised as at risk of not achieving good status. The most recent reported EPA water quality status of the Poddle River (monitoring station 'The Priory' Kimmage Road) is a Q Value of 3 and a rating 'Poor'.

3.3.3 Flooding

According to OPW Flood Maps, the site does not lie within the "River – Low Probability", "River – Medium Probability" or "River – High Probability" modelled extent of land that might be flooded by rivers in a moderate to very extreme event.

Parts of the surrounding area located within a 1 km radius to the northwest and southeast of the site lie within the "River – Low Probability", "River – Medium Probability" and "River – High Probability" indicating that flooding by rivers may occur during moderate to very extreme event in these areas.

The site is not in close proximity to the extent of land affected by coastal flood events.

3.4 Hydrogeology

According to the GSI, the bedrock aquifer beneath the site is classified as a Locally Important Aquifer that is moderately productive in local zones. The soil permeability in the surrounding area is low; consequently the groundwater recharge in this aquifer is estimated by the GSI to be approximately 60

millimetres/year (mm/yr) and is likely to be confined to the made ground due to the presence of a 2 m thick stiff to very stiff brown gravelly sandy clay unit below made ground and above the boulder clay identified from borehole logs at the site.

Regional groundwater flow direction is likely to be to the north towards the River Liffey. A more detailed site assessment would be required to assess the local groundwater flow regime.

According to the GSI wells and springs database, there are no springs but two groundwater wells located within 1 km of the site. The first is located approximately 300 m to the northeast of the site and is recorded with a 'good yield of 114 m^3/day but its use is unknown. The other well is located approximately 700 m to the northwest of the site and is recorded as industrial use with a 'good' yield of 393 m^3/day.

The site is not mapped as being located within a Source Protection Area for either a public water supply or a group water supply scheme.

3.4.1 Groundwater Vulnerability

The GSI National Groundwater Vulnerability Mapping identified that the groundwater under the site was of moderate vulnerability. However, some spatial variation in groundwater vulnerability is seen in the greater surrounding area of the site where approximately 60 m south of the site the groundwater is of low vulnerability while approximately 72 m north the groundwater is of high/extreme vulnerability.

3.4.2 Groundwater Quality

Groundwater beneath the site is part of the Dublin Groundwater Body (IE_EA_G_008) which, according to the WFD Ireland website, is classified as having 'Good' status and is characterised as being not at risk.

3.5 Natural Habitats and Protected Species

South Dublin Bay, which is approximately 4 km east of the site, is an SAC, SPA and pNHA. Site Codes for each of these protected areas are provided in Section 3.3.1.

3.6 Regulatory Database Search

3.6.1 National Waste Collection Permit Office

The National Waste Collection Permit Office (NWCPO) website was reviewed to identify authorised waste facilities within the jurisdiction of Dublin City County Council that are also near the site. The NWCPO website indicated that there is one waste facility within a 1 km of the site as summarised in Table 2 below.

Table 2 Dublin City County Council Waste Facilities within 1 km of the site

Authorisation Number	Facility Name	Location	Waste Activity
WFP-DC-11-0028-02	Mitchell Taylor Exports Limited	Newmarket, Dublin 8	Edible oil and fat

3.6.2 Storm Water Discharges

Eight Irish Water storm water overflow discharge locations have been identified within 1 km of the site (on the southern side of the River Liffey), as summarised in Table 3 below.

Table 3 Storm Water Discharges

Emission ID	Name	Register No.
TPEFF0700D0034SW023	Ringsend	D0034-01
TPEFF0700D0034SW029	Ringsend	D0034-01
TPEFF0700D0034SW061	Ringsend	D0034-01

Emission ID	Name	Register No.
TPEFF0700D0034SW062	Ringsend	D0034-01
TPEFF0700D0034SW085	Ringsend	D0034-01
TPEFF0700D0034SW086	Ringsend	D0034-01
TPEFF0700D0034SW042	Ringsend	D0034-01
TPEFF0700D0034SW079	Ringsend	D0034-01

3.6.3 EPA IE, IPC and Waste Licensing

The EPA database of IE, IPC and Waste licences was consulted and no active licensed facilities were identified within 1 km of the site.

According to the EPA website, there is one Section 4 discharge[1] to water within 1 km of the site (PCLW/001/15), located on Kevin Street.

There have been no reported environmental incidents within 1 km of the site since at least 2010 according to the EPA website.

3.7 Environmental Sensitivity

The overall environmental sensitivity of the site is considered to be moderate. Identified sensitive receptors within 1 km of the site include:

- The River Liffey located 170 m north of the site, although this may be protected by low permeability clay deposits which are likely to be encountered beneath the site;
- The Poddle river located approximately 400 m west of the site, although this may be protected by low permeability clay deposits which are likely to be encountered beneath the site; and
- The groundwater aquifer beneath the site, although this may also be protected by low permeability clay deposits, likely to be encountered beneath the site.

4. Source Audit Findings

4.1 Site Description

The site is situated on John's Lane East, immediately north of Christchurch Cathedral in Dublin City Centre to the south of the River Liffey. The leak site was located along a 400 m long section of a 38 kV cable running from Bedford Row to Francis Street. The cable was installed in 1967 and is 1.4 km in its entire length (see Figure 2). The location of the leak at cable joint (UG5827-UG5809) is situated immediately adjacent to the northern side of Christchurch Cathedral and approximately 170 m south of the River Liffey at Wood Quay. It is estimated that fluid loss from the cable was 5,396 litres up to that date when it was repaired in September 2011.

No evidence of impact from the cable fluid release was noted during the site walkover. With the exception of a park area to the north the leak site itself and wider area is urbanised and generally paved, and as such, there were no visible signs of contamination. There were no visual signs of any surface staining or vegetation dieback in the park area immediately north of the leak location.

4.2 Surrounding Land Use

Land use in the immediate vicinity of the site is predominantly commercial with some residential, as summarised in Table 4 below.

[1] Section 4 discharges to water to support the characterisation of waterbodies for the 2nd Cycle of River Basin Management Planning. This dataset takes in account, among other datasets, the Section 4s dataset developed in 2005 as Point Source Pressures for the Article 5 Characterisation and Risk Assessment Report for the Water Framework Directive 2000/60/EC; (European Communities (Water Policy) Regulations 2003 (SI 722 of 2003)).

Table 4 Adjacent Land Use

Site Boundary	Land Use
North	The site is bounded to the north by a park (green landscaped area) which extends for 50 m after which is Dublin City Council offices. There is an underground car park located beneath these offices. There also appears to be a creche area located within the office campus. The River Liffey is located 170 m north of the site.
East	To the east of the site is Fishamble Street followed by Lord Edward Street and then Dame Street. The land use around this area is a mixture of commercial and residential apartments (Temple Bar area) with Dublin Castle located to the southeast; off Lord Edward Street.
South	Christchurch Cathedral is located immediately south of the site. The cathedral is known to have below ground crypts. Beyond Christchurch Cathedral and High Street are several commercial and residential buildings, some of which could potentially have basements.
West	To the west are Winetavern Street and Cross Lane. Beyond this is St. Audoen's Church, with land use further west primarily residential with some commercial. St. Audoen's primary school is located 170 m to the west.

4.3 Historic Site Review

4.3.1 Historic Maps and Aerial Photograph Review

A review of historical maps and aerial photographs available from OSI, Glucksman Map Library (Trinity College Dublin) and Google Earth was completed. A summary of the findings is presented in Table 5.

Table 5 Historic Map and Aerial Photograph Review

Year	Description
1837 to 1842 (OSI)	The site is present on an unnamed lane that runs east to west. The site is bordered to the south by Christchurch Cathedral. To the east is Fishamble Street that runs north to south. To the west of the site is Winetavern Street which also runs north to south. North of the site is a development that is labelled as St John's. Beyond this is a development named as Wood Quay, adjacent to the River Liffey. Christchurch place is located to the south, with High Street to the west and Castle Street to the east. Dublin Castle is located to the southeast of the site.
1888 to 1913 (OSI)	The lane above the leak location is now named as John's Lane. The development to the north of the site is shown as a Fire Brigade Station and Corporation Depot (Water Works). There is an Engineering works located to the northeast on Fishamble Street. To the north on Wood Quay (crossing the Liffey) is Richmond Bridge. There is a tramway that runs from Christ Church Place east down Lord Edward Street. St. Michael's Hill is to the west from Winetarven Street to Christ Church Place. St. Audoen's church is located to the west approximately 200 m from the site. St. Nicholas' Church (in ruins) is to the south of Christ Church place.
1864 (Five feet to one statute mile) Trinity Maps	Immediate north of the site is St. John's church beyond which is a corporation yard and a fire brigade station, and then Wood Quay and the River Liffey. The land in the surrounding area has been developed for residential and commercial purpose. To the west is St. Audeon's church.
1892 (Five feet to one statute mile) Trinity Maps	Lord Edward Street is now present to the east of the site, a development was demolished to make way for the new street. There is a graveyard along with a parochial school and tailors institute shown immediately to the north of the site in place of St John's church which is no longer present. A tramway runs from Christ Church Place eastwards down Lord Edward Street and Dame Street.
1907-08 (Five feet to one statute mile) Trinity Maps	The landuse to the north of the site is generally commercial shown as a mission hall and local corporation waterworks offices and department. There is an engineering works to the northeast of the site across Fishamble Street. To the west St. Audeon's church now also contains a graveyard and a school.
1936 (1:1,000) Trinity Maps	There are no major changes in this historical map compared to the previous one other than the relabelling of the lane on which the site is located as John's Lane East, and Richmond Bridge is now labelled as O'Donovan Rossa Bridge.
1970 (1:1,000)	The office of the Revenue Commissioners is located to the east on Lord Edward Street. There are three factories all located to the northwest along Merchants Quay and two to the

Year	Description
Trinity Maps	southwest off High Street. There are no other major changes compared to the previous historical maps.
1980-83 (1:1,000) Trinity Maps	There are no major changes compared to the previous historical maps.
1995 (1:1,000) Trinity Maps	There are no major changes compared to the previous historical maps.
1995 (OSI)	The earliest aerial photography is from 1995 and the site is located within a heavily developed area. The site is much the same as current day with Dublin City Council offices located to the north and a mixture of commercial and residential buildings to the south, east and west.
2000 (OSI)	No major changes are apparent since 1995.
2005 (OSI)	No major changes are apparent since 2000.
2012 (Google Earth)	No changes appear to have occurred since 2005.

4.4 Potential Sources

4.4.1 Cable Fluid Source

Information on the potential fluid released was provided in the ESB RFP document. Typically, fluid filled cables are installed in trenches approximately 1.2 m deep, 1.1 m wide and the depth to the top of the cable is typically 0.9 m – 1 m. The cables are typically surrounded by 0.35 m of sand and then the trench is backfilled with either clause 804 fill or trench arisings.

Based on information from the GSI, it is likely that the cable on this site is installed within sand and backfilled with made ground, therefore leaked fluid is likely to have migrated through either the sand surround or made ground (if sufficient permeability).

It is estimated that 5,396 litres of cable fluid was released between 2009 and September 2011. As the leak size is greater than the circuit volume (4,725 litres), it is assumed that the original fluid that was present when the cable was installed has been replaced.

It is assumed, based on records provided to AECOM by ESB, that the fluid lost was 'T 3788' manufactured by H&R ESP Ltd of Milton Keynes in the UK. T 3788 is a low viscosity blend of linear alkyl benzenes (LABs), CAS # 67774-74-7.

4.4.1.1 Physical and Chemical Properties

LABs have side alkyl chains of 10-13 carbon atoms in length attached to a benzene ring. The alkyl chain may be attached to the benzene ring at any position except the terminal (end) position. As LABs are a mixture, their precise physico-chemical properties are dependent upon the components of the mixture, but they are generally colourless, oily liquids, less dense than water, with very low aqueous solubility and low volatility. Their potential spreading in the ground will therefore be similar to other light non-aqueous phase liquids (LNAPL) but with very little mass loss due to volatilisation or dissolution.

Information relating to the nature and toxicity of linear alkyl benzenes has been primarily sourced from the following documents:

1. Safety Data Sheet (SDS) for T 3788;
2. European Union Risk Assessment Report, Benzene, C10-13 alkyl derivatives, 20 June 1997; and
3. Organisation for Economic Co-operation and Development (OECD) Screening Information Datasets (SIDS) Initial Assessment Reports for High Production Volume Chemicals, United Nations Environment Programme, Chemicals Branch, May 2002.

Table 6 summarises the basic physical and chemical properties of LABs.

Table 6 Linear Alkyl Benzene Physical and Chemical Properties

Property	Description
Molecular Weight	239-243 g/mol
Melting Point	<-70^{o}C
Boiling Point	251-320^{o}C @ 1 atm (OECD)
Vapour Pressure @ 25^{o}C	6.5 x 10^{-5} kPa (OECD)
Aqueous Solubility	0.041 mg/L (OECD)
Henry's Law Constant	9.34 x 10^{-4} atm-m^3/mol (OECD)
Density	0.86 @ 20^{o}C
Flash Point	140^{o}C
Explosive Properties	None

LAB (C12) has a calculated octanol-water partition coefficient (Koc) of 2.2x10^4 and is classified by the EU risk assessment as a high adsorptive substance.

4.4.1.2 Degradation

The OECD SIDS (2002) review concluded that LABs undergo "rapid primary biodegradation in natural waters and complete mineralisation by micro-organisms under aerobic conditions". A measured half-life in water of four to nine days was reported. Microorganisms in sewage sludge and soil were reported to rapidly and completely biodegrade LABs. Anaerobic biodegradation was inferred to occur, but at a slow rate.

Degradation in soil is expected to occur but to be slower than in surface water due to the much slower mixing and the limited availability of oxygen. Where oxygen is available, aerobic degradation would occur at the fringes of a body of LNAPL in the soil/groundwater, producing elevated carbon dioxide levels in the soil and potentially elevated alkalinity in the groundwater.

In the absence of oxygen, anaerobic degradation may occur by methanogenesis or by reduction of sulphate, nitrate, ferric iron (Fe^{3+}) and manganese (Mn^{3+}). These processes could lead to reducing conditions in the groundwater, with depleted concentrations of sulphate (SO_4^-) and nitrate (NO_3^-) and increased concentrations of dissolved methane (CH_4), ferrous iron (Fe^{2+}) and dissolved manganese (Mn^{2+}). Such conditions would be expected to occur close to the LNAPL body and locally downgradient. With increased distance from the LNAPL, mixing with the surrounding groundwater and aeration from seasonal fluctuations and groundwater recharge would gradually allow ambient (most likely oxidised) conditions to be re-established.

4.4.1.3 Toxicity

According to the OECD review, LABs were assessed to be not acutely toxic to human health. Data from repeat exposure, reproductive and genotoxicity studies also indicated a low potential for toxic effects. The OECD concluded that "Linear alkyl benzenes do not present any significant acute or sub-chronic health effects by various exposure routes. LAB is not teratogenic (i.e. causing birth defects) and does not produce selective reproductive toxicity."

Laboratory studies have shown that repeated exposure to LABs may be irritating to the skin, and the SDS recommends the use of gloves when handling LABs. The low vapour pressure of LABs limits the potential for exposure via inhalation, and this is not expected to be a significant exposure route at normal temperatures.

Eco-toxicity studies reviewed by the OECD found no acute toxic effects on aquatic species tested at concentrations up to and exceeding solubility limits. The only exception to this was for the water flea Daphnia magna. No data was available regarding terrestrial eco-toxicity studies.

Due to its high biodegradability and rapid metabolism, the OECD concluded that LABs were of little concern for adverse environmental impact. The OECD and EU review of LABs both concluded that LABs were a low priority for further investigation.

4.4.1.4 Conclusion

Based on the above, underground leakage of LABs is not likely to lead to significant issues from dissolved hydrocarbons or vapours. The main concern from LABs is expected to be the potential for them to migrate and spread as a LNAPL, downwards through unsaturated soil that is present and then laterally in the vicinity of the groundwater table. The extent of LNAPL migration will depend on the properties of the surrounding soil and on the saturation and pressure distribution within the LNAPL. These in turn would depend on the quantity of cable fluid lost and the timescale over which the leakage occurred. Vapour impacts are considered to be unlikely, but degradation of the cable fluid may lead to the generation of ground gas (including carbon dioxide and methane) and affect groundwater chemistry in the vicinity and locally downgradient of the LNAPL.

4.4.2

4.4.2 Potential Off-Site Sources of Contamination

Based on a review of historic maps and the current site setting, land use surrounding the site has been principally commercial with residential mix beyond, since the 1800s. The following potential current off-site sources of contamination have been identified as part of the assessment works completed:

- Fill materials (constituting made ground) present in the surrounding area; and
- Fuel / chemicals (e.g. for back-up generators) which may be present in commercial units including hotels and large apartment blocks adjacent to the site.

4.5 Source Audit Summary

Based on the assessment works completed, the primary Area of Potential Environmental Concern (APEC) for this site comprises the leak location identified by ESB. This is presented in Figure 2 and a description is provided in Table 7.

Table 7 Area of Potential Environmental Concern

Number	APEC	Potential Contaminants of Concern	Potential Media Impacted
1	Leak at (23) Bedford row - Francis Street 38 kV (2009 - September 2011)	LABs	Soil Groundwater Surface Water Ground Gas

Other potential off-site sources have also been identified based on the type of activity. However, no information is available for these sites therefore the only APEC assessed herein is the leak site beneath John's Lane East adjacent to Christ Church Cathedral.

5. Conceptual Site Model

A preliminary Conceptual Site Model (CSM) has been developed identifying potential contaminant sources, contaminant migration pathways and potential receptors.

In the context of land contamination, there are three essential elements to any risk:

- A **source** – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters;
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body; and

- A **pathway** – a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of contaminant–pathway–receptor is described as a pollutant linkage. The preliminary CSM was developed to describe viable source-pathway-receptor (SPR) linkages for the site, which are presented in Table 12 below.

By considering potential SPR linkages, an assessment of the human health and environmental risks is made with reference to the significance and degree of the risk. The risk assessment has been undertaken with reference to BS10175-2011 + A2 2017 and CIRIA Document C552: 'Contaminated Land Risk assessment - A Guide to Good Practice' (2001).

The preliminary risk assessment completed for this site is based on consideration of whether a potential source of contamination can reach a receptor, and hence whether it is of major or minor significance. Considering that assessment works are still at preliminary stage and no intrusive investigation work has been completed, development of the preliminary CSM and assessment of potential risk is based on information provided by ESB on the nature of the leak, and on the AECOM site reconnaissance and desk based study. As such, only a qualitative assessment can be made around potential risks to receptors. This means that identification of potential risk does not necessarily indicate a risk to a receptor, rather that further assessment may be required to investigate assumptions made in the CSM and quantify whether a potential risk actually exists.

5.1 Qualitative Risk Assessment Methodology

A qualitative risk assessment has been carried out by assessing the severity of the potential consequence, taking into account both the potential severity of the hazard and the sensitivity of the target, based on the categories given in 8 below.

Table 8 Potential Hazard Severity Definition

Category	Definition
Severe	Acute risks to human health, catastrophic damage to buildings/property, major pollution of controlled waters.
Medium	Chronic risk to human health, pollution of sensitive controlled waters, significant effects on sensitive ecosystems or species, significant damage to buildings or structures.
Mild	Pollution of non-sensitive waters, minor damage to buildings or structures.
Minor	Requirement for protective equipment during site works to mitigate health effects, damage to non-sensitive ecosystems or species.

The likelihood of an event (probability) takes into account both the presence of the hazard and target and the integrity of the pathway and has been assessed based on the categories given in 9 below.

Table 9 Probability of Risk Definition

Category	Definition

High likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor.
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term.
Low likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable.

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard as shown in the table below.

Table 10 Level of Risk for Potential Hazard Definition

	Potential Severity			
Probability of Risk	Severe	Medium	Mild	Minor
High	Very high	High	Moderate	Low/Moderate
Likely	High	Moderate	Low/Moderate	Low
Low	Moderate	Low/Moderate	Low	Very low
Unlikely	Low/Moderate	Low	Very low	Very low

A description of the levels of risk outlined in Table 10 is provided in the following table:

Table 11 Description of the Classified Risks and Likely Action Required

Level of Risk	Description
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in substantial liability. Urgent investigation and remediation are likely to be required.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term.
Moderate Risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild, if realised.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

5.2 Preliminary CSM Assumptions

Based on the findings of the desktop study and information provide in the RFP by ESB, the following assumptions were made in development of the CSM:

- The fluid assumed (based on records provided) to have leaked from the cable is a Linear Alkyl Benzene (LAB), product T 3788;
- The geology beneath the site is assumed to comprise approximately 1.5 m of made ground underlain by a stiff to very stiff clay up to a depth of 3.7 m bgl and stiff to very stiff Boulder Clay extending further to a depth of approximately 10 m bgl. Limestone bedrock is assumed to be present at a depth of approximately 10 m bgl;
- Groundwater is not assumed to be present at relatively shallow depths within the made ground as it is recorded at the site as being only 1.5m in thickness and is situated at an elevated position at the top of the slope above the River Liffey;
- It is assumed that there is no direct connection between the site and surface water bodies;
- Other below ground utilities including mains water are assumed to be present in the vicinity of the site; and
- It is assumed that industrial/commercial buildings adjacent to the site have basements.

The preliminary CSM is presented graphically in Figure 3.

Table 12 Conceptual Site Model

Source	Pathway	Receptor	Severity	Likelihood	Potential Risk	Discussion
LABs	Inhalation of vapours which have migrated from the ground to above ground buildings.	Site users in a commercial/low to high density residential scenario.	Mild	Low Likelihood	Low	LAB is assumed as the cable fluid used. The low vapour pressure of LABs limits the potential for exposure via inhalation, and this is not expected to be a significant exposure route at normal temperatures.
LABs	Soil and dust ingestion from near surface soils. Dermal contact with near surface soils. Inhalation of fugitive dust from near surface soils. Ingestion of soils via consumption of vegetables grown in near surface soils.	Site users in a commercial/low to high density residential with plant uptake scenario.	Minor	Unlikely	Very Low	Given the likely depth to the cable, surface soils are unlikely to be affected and exposure via these pathways is not considered likely.
		Intrusive site workers.	Minor	Likely	Low	Given the relatively low toxicity of LABs (assessed to be not acutely toxic), and likely short duration and infrequency of such events, this pathway is not considered to represent a significant health risk.
LAB (NAPL)	Migration of ground gas generated from the degradation of the cable fluid to above ground buildings.	Site users in a commercial/low to high density residential scenario.	Severe	Low Likelihood	Moderate	If a significant source of LAB NAPL is present on groundwater, there is potential for ground gas to be generated from degradation processes. The likelihood of ground gas being generated in significant quantities is considered to be low, however given the potential severity of the impact, further assessment would be required to fully evaluate this potential risk.
LAB (NAPL)	Permeation of LAB NAPL through plastic water supply pipes.	Site users in a commercial/low to high density residential with plant uptake scenario.	Medium	Unlikely	Low	Public water mains likely to be present in the vicinity of the leak, servicing commercial and residential properties have the potential to be impacted. However, the WHO drinking water guideline (DWG) for the relevant aromatic fraction[2] is 0.09 mg/l and as the solubility limit of LAB is 0.041 mg/L (OECD) i.e. less than the DWG, LAB cannot dissolve into the water supply above this level. Furthermore, water will be moving rapidly in the pipe under pressurised conditions making it unlikely to reach the solubility limit. ESB has consulted with Irish Water (statutory body responsible for water supply) regarding the potential risk for cable fluid present in the vicinity of water supply pipes. Following review of their records, AECOM understands that Irish Water do not have concerns regarding impact of

[2] Petroleum Products in Drinking-water, Background document for development of WHO Guidelines for Drinking-water Quality, 2008

Source	Pathway	Receptor	Severity	Likelihood	Potential Risk	Discussion
						water supplies from cable fluid leaks. It is therefore considered that the potential risk of a pollutant linkage being present is low.
LAB (NAPL)	Migration of potential contaminants along preferential flow pathways such as underground services and permeable backfill around the electricity cable.	Nearby surface water bodies including the River Liffey and the Poddle River.	Mild	Low Likelihood	Low	It is understood that the leak at this location was repaired in September 2011. Given the eight year period since this leak was repaired it is likely that NAPL released from the cable has stabilised over the intervening period and the risk to surface water bodies is considered to be low. Further assessment would be required to fully evaluate this potential risk.
LAB (NAPL)	Migration of potential contaminants along preferential flow pathways such as underground services and permeable backfill around the electricity cable, and consequently vapour inhalation and / or ingestion, dermal contact.	Site users in a commercial/high density residential with plant uptake scenario.	Minor	Likely	Low	Likely to be services present in the vicinity of the leak given the urban setting. As the soil / made ground around the leak is generally clay, the leaking fluid will likely have migrated mainly along any permeable backfill around the cable. The solubility of LAB is low and it is likely to absorb strongly to made ground and clay surrounding the leak location. Consequently, the potential for migration over significant distances is considered to be low.
LAB (NAPL)	Migration in saturated and unsaturated soil.	Groundwater beneath the site.	Mild	Low Likelihood	Low	Considering the volume of cable fluid released, it is considered likely that shallow groundwater beneath the site could be impacted if present. However, given the elevated position of the site at the top of the hill above the River Liffey, the shallow made ground (0 - 1.5 m bgl), and the 2 m thickness of stiff to very stiff gravelly sandy clay overlying 6 m of stiff to very stiff boulder clay known from drilling logs at the site, it is unlikely that there is significant shallow groundwater present at the site. The stiff clay overlying the bedrock would also restrict vertical movement of impact to the limestone aquifer. Due to its high biodegradability and rapid metabolism, the OECD concluded that LABs were of little concern for adverse environmental impact. Further assessment would be required to fully evaluate this potential risk.
Dissolved phase leaching from LAB NAPL or from soils containing LAB NAPL	Leaching from soil to groundwater. Vertical and horizontal migration of contaminants through groundwater. Horizontal migration of contaminants through groundwater to nearby surface water receptors.	Groundwater in superficial deposits beneath the site.	Mild	Low Likelihood	Low	The solubility of LAB is low, therefore it is considered that the potential for dissolved phase impact from the presence of NAPL is considered to be low.

Source	Pathway	Receptor	Severity	Likelihood	Potential Risk	Discussion
LAB (NAPL)		Groundwater in limestone bedrock aquifer beneath the site.	Mild	Low Likelihood	Low	Information on the local geology indicates the presence of underlying stiff clay, which would reduce vertical migration of groundwater to the bedrock aquifer.
		Nearby surface water bodies including the Rivers Poddle and Liffey.	Mild	Low Likelihood	Low	The volume of cable fluid released could cause major pollution of the Poddle River and River Liffey. The potential risk to the these surface water bodies via this pathway is considered low given the low potential risk of LAB leaching from soils to groundwater and then migration through groundwater to surface waters. Further assessment would be required to fully evaluate this potential risk.

6. Conclusions

AECOM completed a Preliminary Site Assessment of a cable fluid leak location at John's Lane East immediately north of Christchurch Cathedral, Dublin 8. The objective of the works was to identify potential risks to human health and the environment that may be associated with a fluid leak from the identified location.

Based on the findings of the desktop study, the overall environmental sensitivity of the site is considered to be moderate. Identified sensitive receptors within 1 km of the site include:

- The River Liffey located 170 m north of the site, although this may be protected by low permeability clay deposits which are likely to be encountered beneath the site;
- The Poddle river located approximately 400 m west of the site, although this may be protected by low permeability clay deposits which are likely to be encountered beneath the site; and
- The groundwater aquifer beneath the site, although this may also be protected by low permeability clay deposits, likely to be encountered beneath the site.

It is estimated that 5,396 litres of cable fluid (Linear Alkyl Benzene (T 3788)) was released between 2009 and September 2011. Due to its high biodegradability, it is considered that LABs are of less concern for adverse environmental impact than other hydrocarbon fluids. A summary of the source audit findings is as follows:

Table 13 Area of Potential Environmental Concern

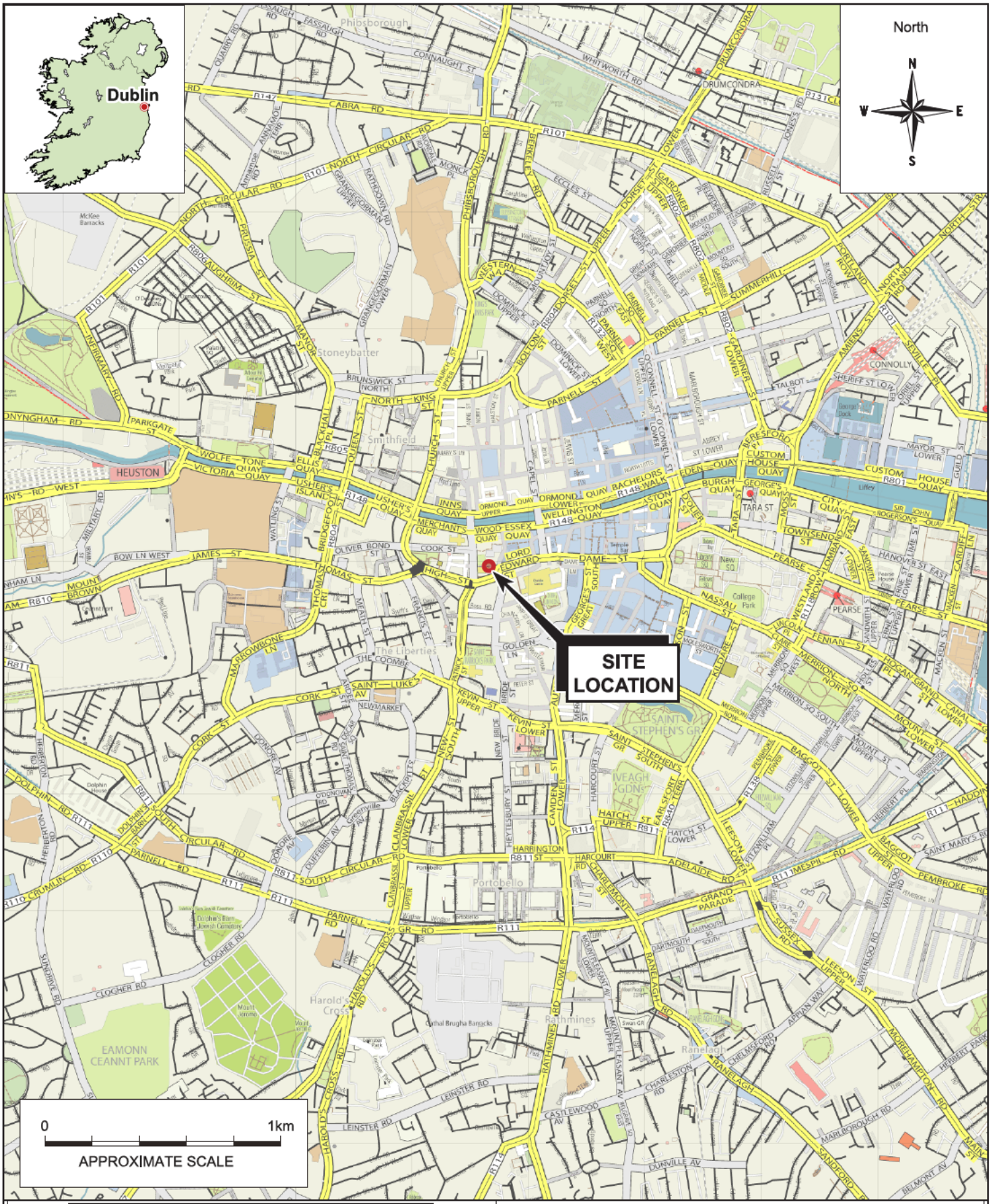
Number	APEC	Potential Contaminants of Concern	Potential Media Impacted
1	Leak at (23) Bedford row - Francis Street 38 kV (2009 - September 2011)	LABs	Soil Groundwater Surface Water Ground Gas

The preliminary CSM developed for the site looked at potential source-pathway-receptor linkages identified during the assessment works and identified a moderate risk to site users due to the potential for ground gas generation resulting from degradation of LAB NAPL (if present).

Risks associated with other potential source-pathway-receptor linkages were considered to be very low to low.

The risk assessment completed herein is preliminary in nature as it can only be based on an evaluation of qualitative data sources (i.e. not on intrusive site investigation works). Consequently, identification of potential risk does not necessarily indicate a risk to a receptor, rather that further assessment may be required to investigate assumptions made in the CSM and quantify whether a potential risk actually exists. Generally, where a low or very low risk has been identified further assessment may not be deemed necessary to assess a particular SPR linkage, although further assessment may be deemed to be required to investigate CSM assumptions where the potential risk is considered to be low or very low due to the sensitivity of the receptor.

Figures



Client

ELECTRICITY SUPPLY BOARD

Location

SITE 23
Bedford Row
Francis Street 38 kV

Drawing Title

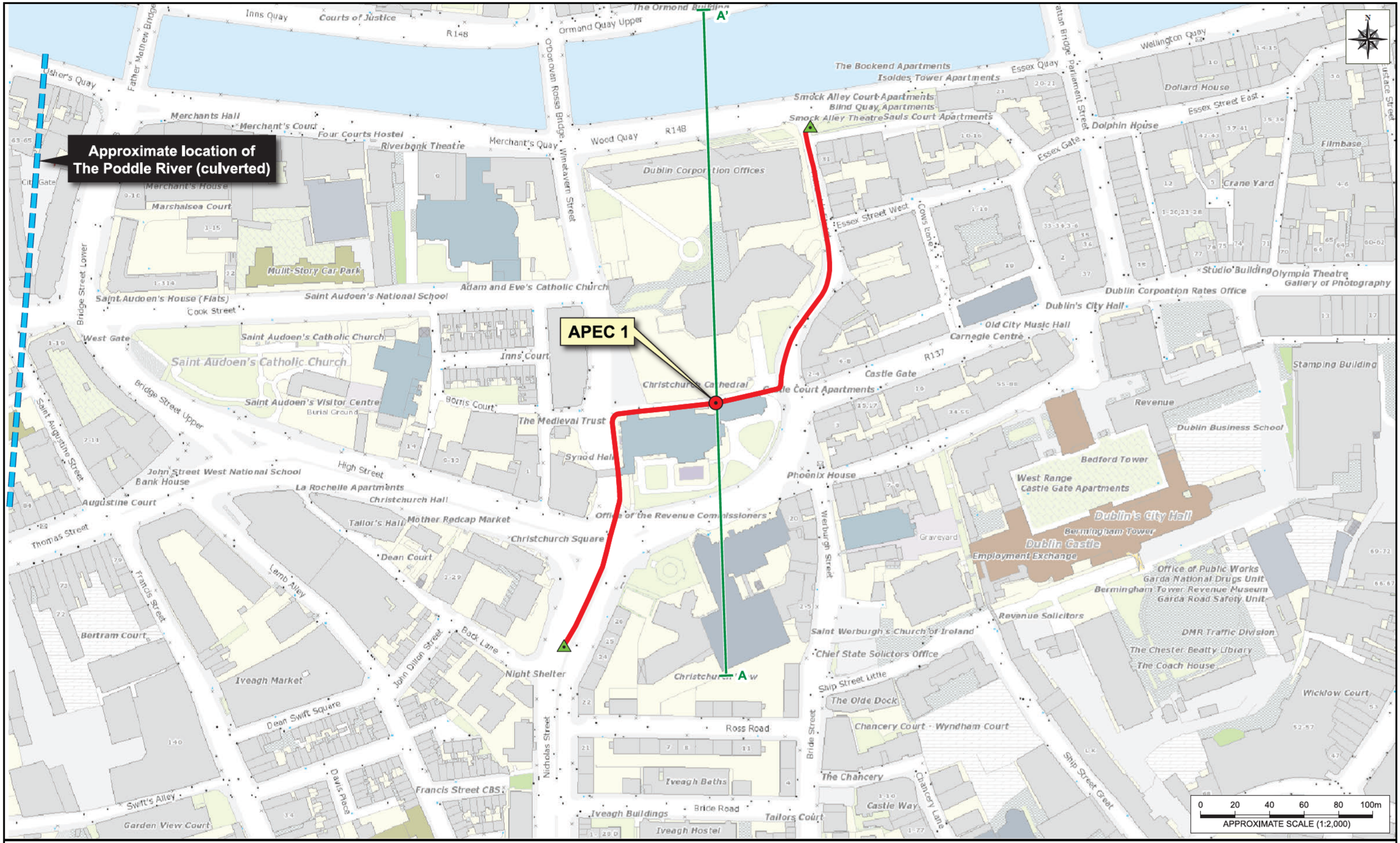
FIGURE 1 - SITE LOCATION MAP

AECOM

4TH FLOOR, ADELPHI PLAZA, ADELPHI CENTRE, GEORGE'S STREET UPPER,
DUN LAOGHAIRE, CO. DUBLIN, IRELAND. T+353 (0)1 238 3100, F +353 (0)1 238 3199

DRAWN	ILLUSTRATED	CHECKED	APPROVED	DATE
RH		CC	DM	AUG 19

SCALE	Job No.	REV.
N.T.S	60610407	0



KEY:

- Leak Location
- 200 m marker from Leak Location
- Joint Section of Leak
- A—A' CSM Cross Section

Rev	Date	Detail	Made	Chk'd	App'd

Status: FOR INFORMATION

NOTES:

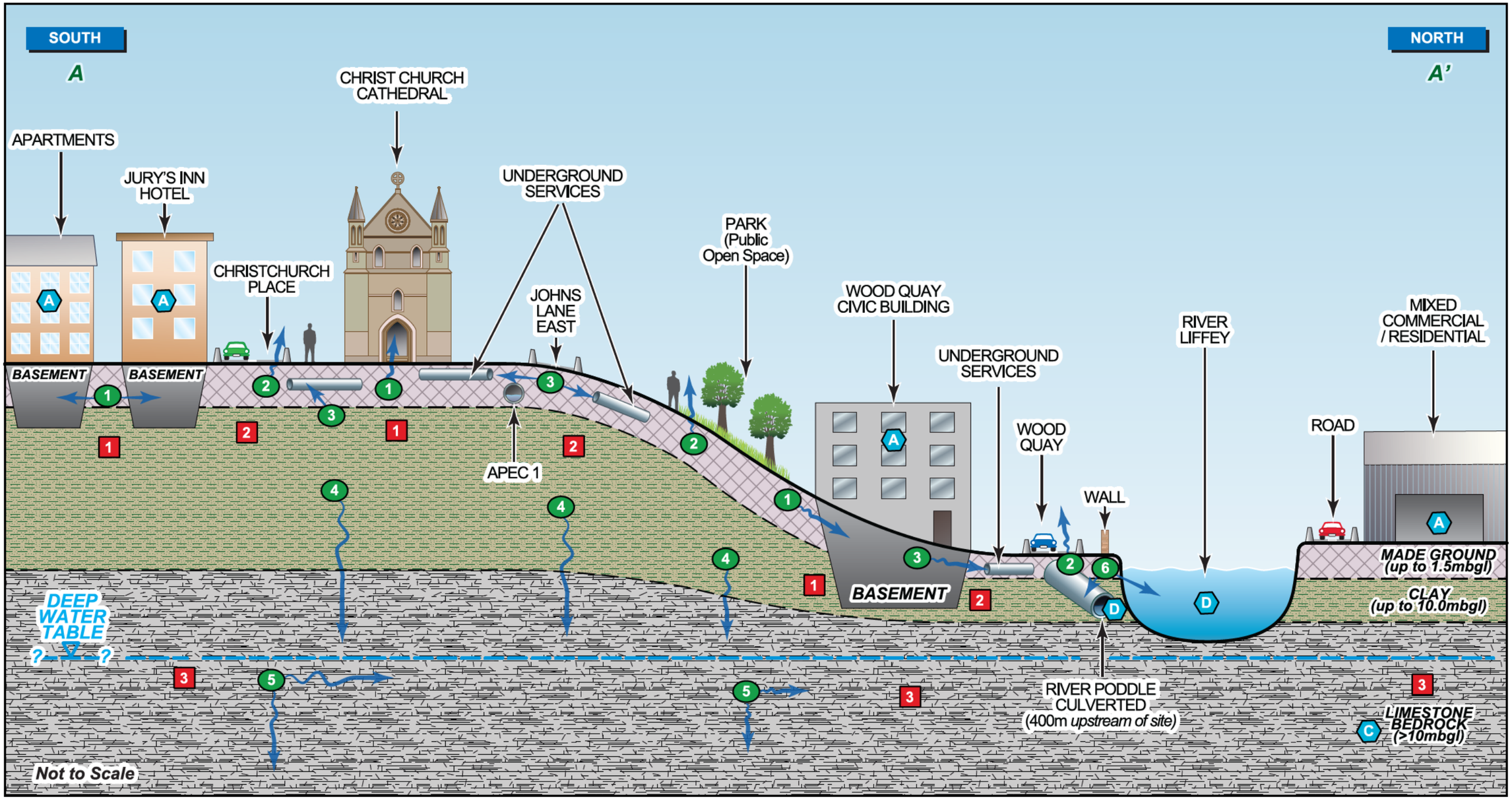
Client: ELECTRICITY SUPPLY BOARD

Location: **SITE 23** Inchicore Marrowbone Lane 38 kV

Title: FIGURE 2 SITE LAYOUT PLAN

AECOM
4th Floor, Adelphi Plaza, Adelphi Centre, George's Street Upper, Dun Laoghaire, Co. Dublin, Ireland.
Tel: +353 (0) 1 293 3200
Fax: +353 (0) 1 293 3201
www.aecom.com

Design: ESB		Drawn: RDH	
Chk'd: CC		App'd: DM	
Date: AUG 2019		Scale: As Shown	
Project No. 60610407	Drg No. 2	Stat. -	Rev: 0



SOURCES

1. GROUND GAS
2. NON-VOLATILE CONTAMINANTS IN SOIL
3. CONTAMINANTS IN GROUNDWATER

PATHWAYS

1. GROUND GAS MIGRATION
2. DERMAL CONTACT / DUST INGESTION
3. PERMEATION OF AND MIGRATION ALONG EXISTING UNDERGROUND SERVICES
4. LEACHING FROM SOIL TO GROUNDWATER
5. VERTICAL & HORIZONTAL MIGRATION OF CONTAMINATED GROUNDWATER
6. MIGRATION & LEACHING TO SURFACE WATER

RECEPTORS

- A. RESIDENTIAL / COMMERCIAL SITE USERS
- B. SHALLOW GROUNDWATER
- C. BEDROCK GROUNDWATER
- D. SURFACE WATER

Rev	Date	Detail	Made	Chk'd	App'd

Status: FOR INFORMATION

NOTES:

Client: ELECTRICITY SUPPLY BOARD

Location: **SITE 23** Inchicore Marrowbone Lane 38 kV

Title: FIGURE 3 CONCEPTUAL SITE MODEL

AECOM
4th Floor, Adelphi Plaza, Adelphi Centre, George's Street Upper, Dun Laoghaire, Co. Dublin, Ireland.
Tel: +353 (0) 1 293 3200
Fax: +353 (0) 1 293 3201
www.aecom.com

Design: ESB	Drawn: RDH		
Chk'd: CC	App'd: DM		
Date: AUG 2019	Scale: As Shown		
Project No. 60610407	Drg No. 3	Stat. -	Rev: 0

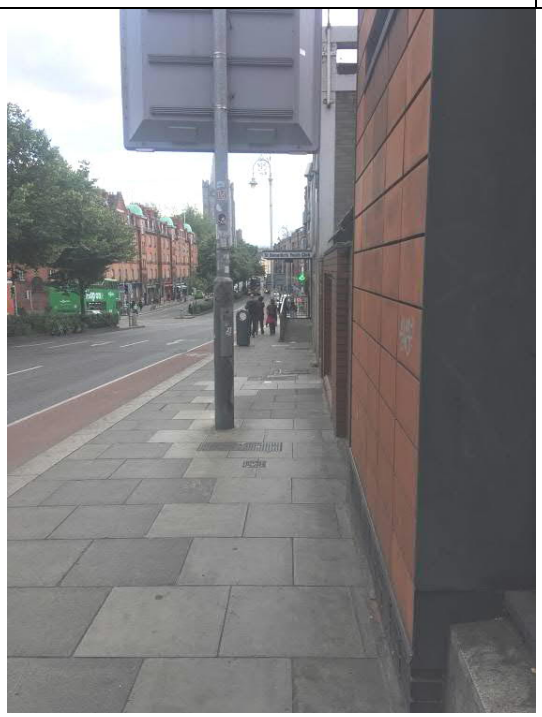
Appendix A Photographic Log

AECOM

PHOTOGRAPHIC LOG

Client Name: ESB	**Site Location:** Site: 23 Bedford Row - Francis Street 38 kV	**Project No.** PR-427640

Date:
11 July 2019



Description

South of the 200 m marker from the indicative leak location a youth club is located.

Date:
11 July 2019

Description:

Facing north, towards Christchruch Square. Properties to the east on Nicolas Street are residential. An apartment complex is noted with confirmed underground basement parking.

AECOM

PHOTOGRAPHIC LOG

Client Name: ESB	**Site Location:** Site: 23 Bedford Row - Francis Street 38 kV	**Project No.** PR-427640

Date:
11 July 2019

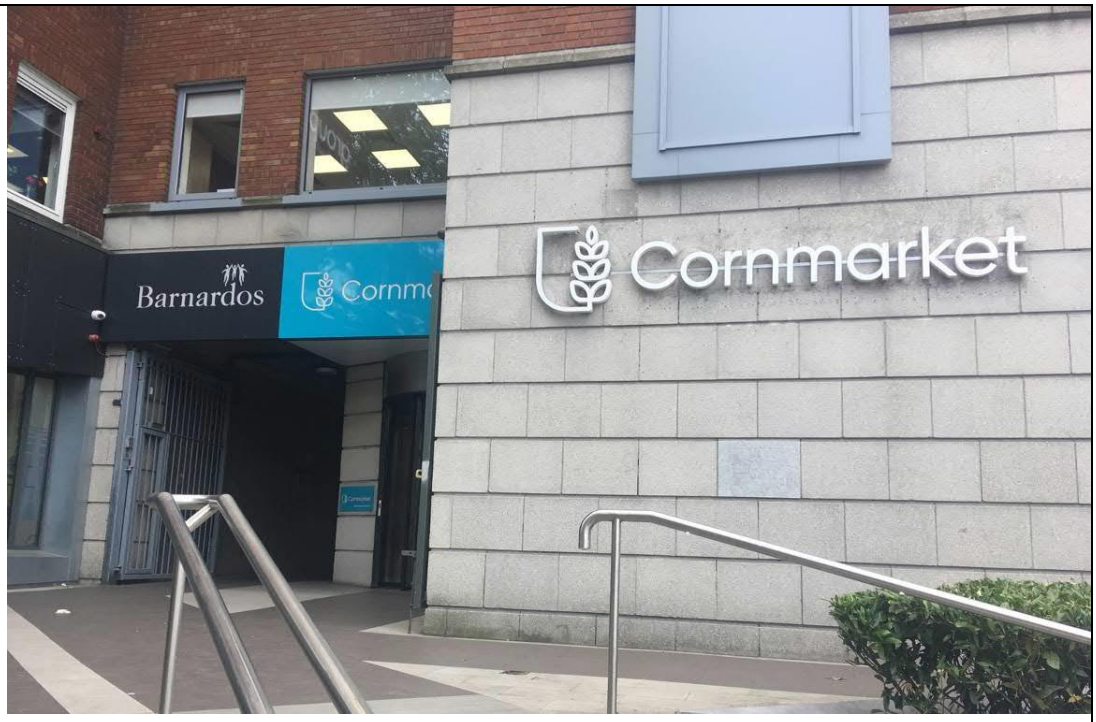
Description

Apartment complex on the eastern corner of Christchurch square; between High Street and R137, with confirmed basement parking.

Date:
11 July 2019

Description:

A commercial development is located to the west of Christchruch Square.



AECOM

PHOTOGRAPHIC LOG

Client Name: ESB	**Site Location:** Site: 23 Bedford Row - Francis Street 38 kV	**Project No.** PR-427640

Date:
11 July 2019

Description

Board Gas Networks Ex Zone 2 signage noted below the commercial development to the west of Christchurch Square. Two locations are noted along high street.

Date:
11 July 2019

Description:

Facing north along Winetavern Street. To the north, a noticeable down gradient is seen from Christchruch square towards Wood Quay.

AECOM

PHOTOGRAPHIC LOG

Client Name: ESB	**Site Location:** Site: 23 Bedford Row - Francis Street 38 kV	**Project No.** PR-427640

Date:
11 July 2019

Description

Facing South across Christchurch Square.

Date:
11 July 2019

Description:

Facing west along Winetavern Street. Dublinia, a museum and coffee shop is located.

AECOM

PHOTOGRAPHIC LOG

Client Name: ESB	**Site Location:** Site: 23 Bedford Row - Francis Street 38 kV	**Project No.** PR-427640

Date:
11 July 2019

Description

Public open space located north of the indicative leak location.

Date:
11 July 2019

Description:

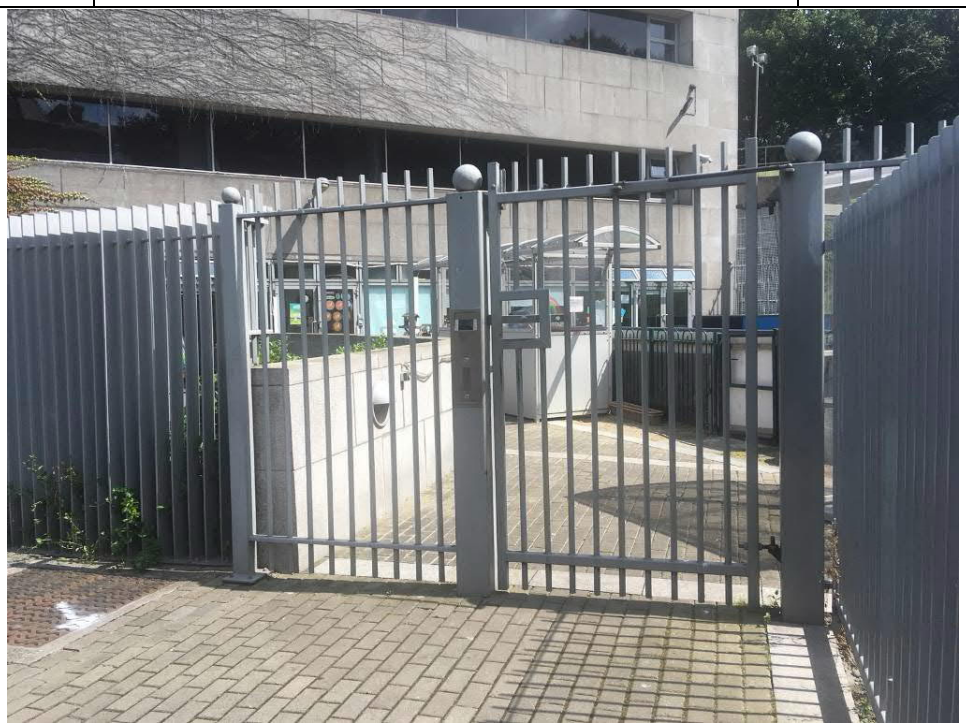
Public open space north of the indicative leak location.

AECOM

PHOTOGRAPHIC LOG

Client Name: ESB	**Site Location:** Site: 23 Bedford Row - Francis Street 38 kV	**Project No.** PR-427640

Date:
11 July 2019



Description

Location of a children crèche/nursery north of the site. Park of Dublin Corporation Offices.

Date:
11 July 2019

Description:

Public open space, location of the indicative leak location.

AECOM

PHOTOGRAPHIC LOG

Client Name: ESB	**Site Location:** Site: 23 Bedford Row - Francis Street 38 kV	**Project No.** PR-427640

Date:
11 July 2019

Description

Facing north along Fishamble Street. Mixed use residential and commercial cafes and bars. Downward gradient towards the Quay.

Date:
11 July 2019

Description:

Facing north along Fishamble Street. Mixed use residential and commercial cafes and bars. Downward gradient towards the Quay.

AECOM

PHOTOGRAPHIC LOG

Client Name: ESB	**Site Location:** Site: 23 Bedford Row - Francis Street 38 kV	**Project No.** PR-427640

Date:
11 July 2019

Description

Basement beneath Dublin Corporation Offices. Entrance on Fishamble Street.

Date:
11 July 2019

Description:

Location of eircom and water mains on Fishamble Street.

AECOM

PHOTOGRAPHIC LOG

Client Name: ESB	**Site Location:** Site: 23 Bedford Row - Francis Street 38 kV	**Project No.** PR-427640

Date:
11 July 2019

Description

Open public space within Christchurch, south of the site.

Appendix B PSA Template Report Table of Contents Cross Reference

EPA Template Table of Contents	Production Area Preliminary Site Assessment Report
Executive Summary	Executive Summary
1. Introduction	Section 1
1.1 Project Contractual Basis & Personnel Involved	Section 1
1.2 Background Information	Section 1.1
1.3 Project Objectives	Section 1.2
1.4 Scope of Works	Section 2
2. Source Audit Findings	Section 4
2.1 Current Site Operations	Section 4.1 to Section 4.2
2.2 Previous Site Operations	Section 4.3
2.3 Chemicals of Potential Concern	Section 4.4
3. Site Environmental Setting	Section 3
3.1 General Introduction	Section 3
3.2 Regional Geology and Hydrogeology	Section 3.2 and Section 3.4
3.3 Site Geology and Hydrogeology	Section 3.2 and Section 3.4
3.4 Summary of Previous Site Sampling and Monitoring Data	Not Applicable
4. Summary and Conclusions	Section 6
4.1 Summary and Conclusions	Section 6
4.2 Recommended Way Forward	Separate Cover Letter
5. References	Throughout Text