Verde Environmental Consultants

Preliminary Site Assessment Report for Finglas Road, Dublin 11

ESB Site Ref: 15
Finglas – Merville 38kV

March 2020

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LIMITATION

This report represents the results of a site inspection and desk study research conducted at the above referenced site. Best practice was followed at all times and within the limitations stated. This report is the property of Verde Environmental Consultants Limited (Verde) and cannot be used, copied or given to any third party without the explicit prior approval or agreement of Verde.

This report is intended as a preliminary stage assessment of the site in question and, as such, all assessments and analysis of the environmental aspects of the site, whilst based of the best-available data and information, are theoretical and conservative in nature. Any risks identified within this report are entirely potential in nature and based on the most-conservative risk analysis scenario and the available information. This is in-keeping with best practice guidelines and does not necessarily reflect the actual environmental scenario on site. Further environmental information, as it becomes available, would likely change the assessments and analysis contained within this report.

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EXECUTIVE SUMMARY

This preliminary environmental site assessment consists of a review of the potential environmental impacts associated with a hydrocarbon leak from a power cable on Finglas Road, Finglas West, Dublin 11 (ESB Ref.: 15). There was an approximate volume of 6,215 litres of cable fluid consisting of linear alkyl benzene mixed with mineral oil lost to ground from the leak on Finglas Road at an approximate rate of 1,036L/month for six months. The leak began in August 2014 and was repaired in February 2015.

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The known leak point (ESB Ref. 15) is located on the road close to the western edge of a central reservation just north of a busy roundabout on the R135. The roundabout is approximately 930m south east (Dublin side) of the M50 (exit 5). The R135 is a major route into the City and the roundabout facilitates access to Dublin City (straight through) as well as to a residential area to the west (via Casement Road) and a mixed commercial/residential area to the east (via R104). The nearest residential property is located 50m downgradient of the leak point. There is no physical evidence of hydrocarbon contamination on the surface in terms of oil odours/staining or impact to vegetation.

Bedrock beneath the site comprises dark grey limestones of the Lucan Formation (known colloquially as Calp Limestone), which is overlain by subsoils comprising tills derived from limestone, gravels derived from limestone and further deposits of made ground. The vulnerability is Extreme indicating shallow rock in the area of the leak showing a potential connection to the underlying bedrock aquifer.

The nearest surface watercourse is Bachelors Stream, which appears to have its source adjacent to the leak location. From here the stream flows to the south east and is partially culverted beneath the Finglas Road. This stream drains into the River Tolka at a confluence approximately 2.5m to the south east of the leak location, which in turn drains to Dublin Bay approximately 6.5km to the south east.

Considering the immediate proximity of the culverted Bachelors Stream to the leak point, it appears there may be hydrogeological pathways connecting the project area to the Tolka River and potentially to connected protected areas in the Dublin Bay area.

At the time of reporting, Irish Water have examined all available drinking water quality sample data and have concluded that there is no evidence that COPCs from the leak site have infiltrated the local drinking water supply. This evaluation is based on a review of all samples taken from customer-points, between 2014 and 2019; which showed no evidence that the COPCs (PAHs and Benzenes) were present in the water supply at levels above drinking water standards (PAHs: 0.1µg/L; Benzene: 1.0µg/L). These results (which are from samples taken at the customer tap) would not indicate that leaks from oil filled cables have contaminated the drinking water supply for these areas, or at least to an extent where any contamination arising has resulted in a breach of the parametric value for PAHs and Benzene (Appendix F).

Based on the known cable leak point, Contaminants of Potential Concern (COPCs) fate and transport and hydrogeological desk study information the CSM has the following initial key findings for human health and environmental risks;

There is a Low risk posed by LAB and MO from contact with suspected contamination in the soil and groundwater through;

- direct dermal/inhalation and ingestion contact to residents or other building users;
- ingestion contact with suspected contamination in the soil and groundwater through permeation of contamination through plastic water pipes or through low-pressure infiltration of possible soil contamination into water pipes via nearby breaks or leaks;
- dermal/inhalation and ingestion pathways to construction workers, which can be managed by appropriate use of PPE and H&S procedures;

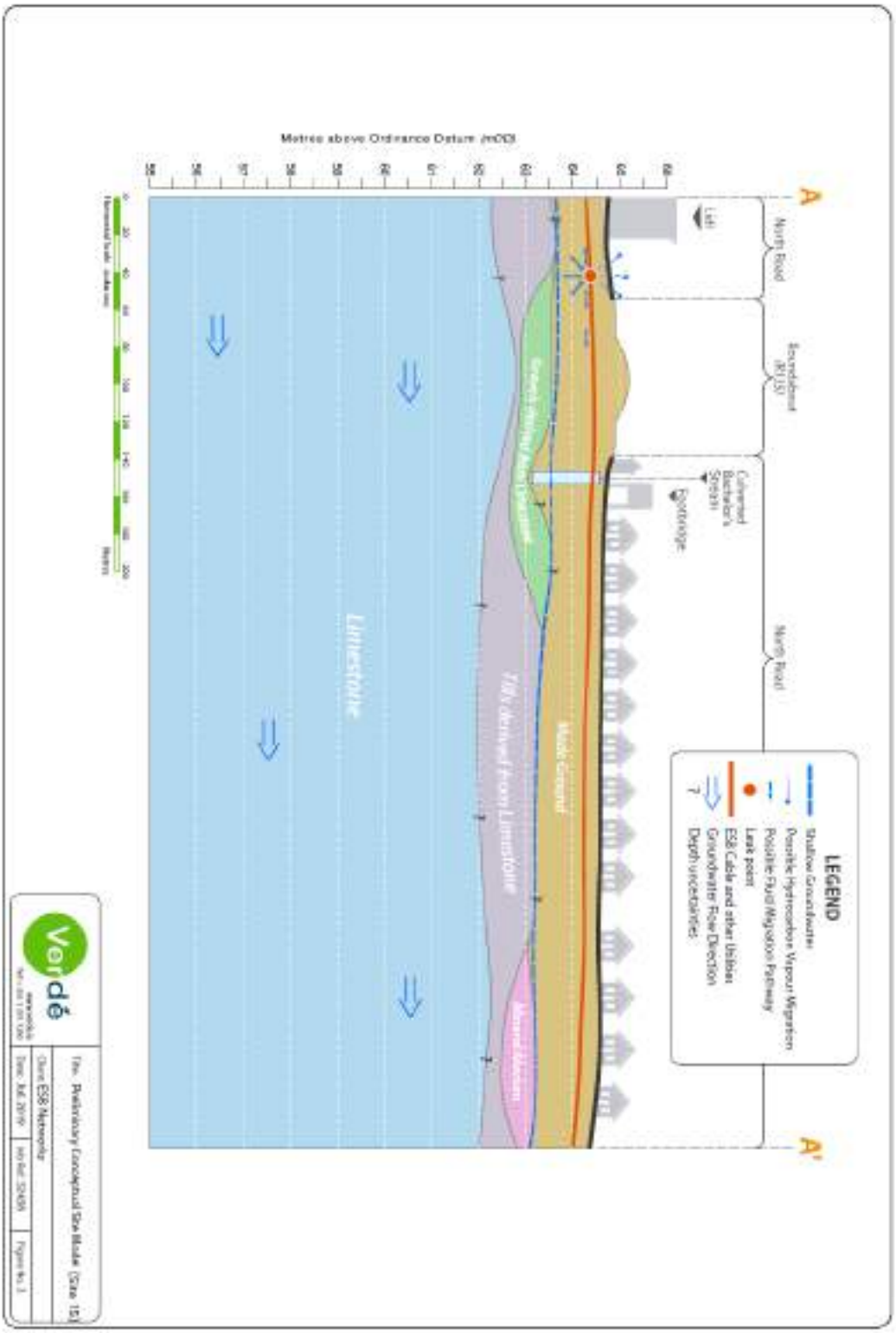
There is a Low/Moderate risk posed by LAB and MO in suspected contamination in the soil and groundwater through;

- hydrocarbon vapours in preferential pathways such as services ducts to residents or other nearby building users;
- Leaching to shallow groundwater given the contaminant properties of low mobility and high sorption to soil, with shallow groundwater unlikely to be a viable groundwater resource in the residential urban setting.

There is a Moderate risk posed by LAB and MO in suspected contamination in the soil and groundwater through;

- hydrocarbon migration to the adjacent watercourse given the short distance to Bachelors Stream.
- hydrocarbon migration to the underlying aquifer given the possible connection to shallow groundwater through shallow rock in the area indicated by the Extreme vulnerability.

Figure 3 – Conceptual Site Model



EPA Contaminated Land & Groundwater Risk Assessment Methodology		Report Reference	Report Date	Status
STAGE 1: SITE CHARACTERISATION & ASSESSMENT				
1.1	**PRELIMINARY SITE ASSESSMENT**	Preliminary Report, Verde, Ref: 52458	6th March 2020	Final
1.2	**DETAILED SITE ASSESSMENT**			
1.3	**QUANTITATIVE RISK ASSESSMENT**			
STAGE 2: CORRECTIVE ACTION FEASIBILITY & DESIGN				
2.1	**OUTLINE CORRECTIVE ACTION STRATEGY**			
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2.3	**DETAILED DESIGN**			
2.4	**FINAL STRATEGY & IMPLEMENTATION PLAN**			
STAGE 3: CORRECTIVE ACTION IMPLEMENTATION & AFTERCARE				
3.1	**ENABLING WORKS**			
3.2	**CORRECTIVE ACTION IMPLEMENTATION & VERIFICATION**			
3.3	**AFTERCARE**			

1. INTRODUCTION

1.1. PROJECT CONTRACTUAL BASIS AND PERSONNEL INVOLVED

Verde Environmental Consultants, (Verde) was commissioned by ESB Engineering & Major Projects to undertake Preliminary Risk Assessments at six locations where there are leaks of cable fluids. This report focuses on a hydrocarbon leak from a 38 kV power cable running beneath or adjacent to the R135 road (Finglas Road) in Dublin 11. (ESB Ref: 15 Finglas – Merville).

A site visit was undertaken by an experienced Verde Environmental Consultant on 10th July 2019 to examine the area of the known cable leak point and to record evidence of contamination and relevant observations with regard to surrounding land use and sensitive human health and environmental receptors.

A site location map for the leak point is presented in Figure 1 with a detailed map on the cable route and leak location presented in an ESB map in Appendix A.

1.2. BACKGROUND INFORMATION

The ESB cable fluid acts as an electrical insulator and aids the conduction of heat away from the conductor allowing the cable to operate 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 cable 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 contamination to occur and impact upon surface water, groundwater, soils and ecology.

This preliminary environmental site assessment consists of a review of the potential environmental impact associated with a known hydrocarbon leak that occurred from a buried power cable located close to a roundabout on the R135, approximately 930m south of exist 5 on the M50 (ESB Ref: 15). It is estimated that 6,215 litres (l) of cable fluid, consisting of linear alkyl benzene (LAB) mixed with mineral oil, was lost to ground from the leak. The rate of leakage is estimated to be 1,036l per month over a six month period from August 2014 until the repair date in February 2015.

Details on the physical and chemical aspects of the hydrocarbon products used as insulating fluids in the cable are discussed in Section 2.3 below.

1.3. PROJECT OBJECTIVES

The project objective was to determine the potential risks to human health and the environment at the leak location and potential areas of impact. As requested by ESB, a risk-based approach has been applied to this assessment. This risk-based approach is also recommended in best practice documents produced by the Environmental Protection Agency (Agency) on Management of Contaminated Land & Groundwater at EPA Licenced Sites published in 2013. Note, however, that the leak site in question is not an EPA-licensed site. Although the scope of this guidance specifically applies to licensed sites, the approach presented is consistent with UK and mainland European best-practice guidance in the assessment and management of potentially contaminated land. It is therefore considered to be a robust basis for the assessment of the subject site.

This report has been prepared in accordance with the Agency guideline reporting template for Preliminary Site Assessments under the EPA Contaminated Land & Groundwater Risk Assessment

Methodology.

1.4. SCOPE OF WORKS

In order to complete the assessment and to meet the objectives of the brief, the following scope of works was completed:

- A desk study review of available historical, geological, hydrogeological and environmental sensitivity information for the site. The desk study includes an assessment of historical land uses. Information on site utility services from various providers was examined. Detailed maps on cable routes with indicative leak locations and likely joint sections of leaks was provided by the ESB and taken into consideration.
- Site walkover to establish as much information as possible regarding site operations, surrounding activities and land use, observed evidence of contamination and remedial measures.
- Preparation of report in accordance with best practice guidance, including description of desk study findings and site walkover observations and a preliminary conceptual model for the site.

1.5. SCOPE OF ANALYSIS AND CONCLUSIONS

This report is intended as a preliminary stage assessment of the site in question and, as such, all assessments and analysis of the environmental aspects of the site, whilst based of the best-available data and information, are theoretical and conservative in nature. Any risks identified within this report are entirely potential in nature and based on the most-conservative risk analysis scenario and the available information. This is in-keeping with best practice guidelines and does not necessarily reflect the actual environmental scenario on site. Further environmental information, as it becomes available, would likely change the assessments and analysis contained within this report.

As such, the reader is encouraged to view the findings, conclusions and recommendations contained within this report as the most-conservative, theoretically possible environmental scenario; and not necessarily the actual scenario currently persisting on the site question.

2. SOURCE AUDIT FINDINGS – PRODUCTION & OPERATIONAL HISTORY

2.1. CURRENT SITE OPERATIONS

The known leak point (ESB Ref. 15) is located on the road close to the western edge of a central reservation just north of a busy roundabout on the R135. The roundabout is approximately 930m south east (Dublin side) of the M50 (exit 5). The R135, also referred to as the Finglas Road, is one of the main arterial roads into Dublin City Centre. The road links Dublin City Centre with the M50 and M2. The roundabout facilitates access to Dublin City (straight through when travelling south from M50) as well as to a residential area to the west (via Casement Road) and a mixed commercial/residential area to the east (via R104, also known as St. Margaret's Road). Photographs of the site of the known leak are provided in Appendix C.

The ground immediately adjacent to the leak point is flat though there is a regional slope in elevation to the south along the R135 (towards Tolka River Valley). The road surrounding the roundabout appears slightly elevated and a downward slope in ground levels was noted to the R104 and to the access road to residential estates to the west. A large Lidl store is located immediately to the northeast of the roundabout (at corner of R135 and R104) and there are several service boxes and manholes located adjacent to the low perimeter wall. These include a small grey box labelled "Live Electricity" and a larger green box (230 V AC). These features are indicated on Photographs 3 and 4.

There is evidence of a narrow trench having been cut into the road at the leak point. Some dead grass occurs at the southern tip of the central reservation (close to indicated leak position) though it is unclear whether this is due to contamination or other causes. Apart from the repaired trench shown in Photo 2, there were no other indications that a leak had occurred. The central reservation is approx. 10m wide at the point just north of the roundabout at the leak location. A green margin is located to the west of the northern carriageway (approx. 10m away from reservation). A low wall with steel railings separates the green margin/verge from a green and wooded area that is associated with the residential estate to the west (Casement Road). The width of the grass verge is circa. 4m as it approaches the roundabout. Just inside the wall of the estate (in the green area beneath perimeter trees), there are further services boxes up against the wall including a small grey box labelled "Danger – Keep Away". There are four adjacent manhole covers (rectangular) with the following warning imprinted on the covers "Danger – Electrical Cable". These are indicated in Photographs 5 and 6.

A walkover was completed along the cable route to the north and no evidence of hydrocarbon contamination was observed (as far as the traffic lights approx. 250m north of roundabout). The cable is understood to be buried below the western margin of the northbound lanes within the R135.

Moving south, the cable is located within the western margin of the R135 (northbound lane) until it reaches the roundabout referred to above and the known leak point. At this point the cable line crosses the roundabout to the east and leaves the R135, travelling southward along a residential road (North Road). A further branch continues southwards though its location is within Mellowes Park, a green amenity area to the west of the R135 that is accessed from Casement Road. There was no evidence of leaks observed along sections within North Road or Mellowes Park.

Bachelors Stream, a tributary of the Tolka River, rises at a location just west of the roundabout. The stream is now culverted (underground) at this location. During the walkover, a concrete chamber was observed just north of junction of the access from the roundabout to Casement Road. This is a presumed access point to the stream. The stream crosses to the east of the R135 just south of the roundabout and continues in a southerly direction on a course that runs along the area between the R135 and the North Road (behind back gardens along the North Road). During the site walkover, the

stream was not observed though aerial photographs indicate its course by a line of trees. It is understood that much of the stream's route is culverted as it follows the course of the R135 before discharging to the Tolka River some 2.5km to the south

2.2. PREVIOUS SITE OPERATIONS

It is evident from aerial photographs that the R135 was under construction in or around 1995. The roundabout is yet to be constructed and at that time, the North Road (and McKee Avenue) was the main arterial route into Dublin. Historic maps including the Cassini Map (1830-1940) clearly indicate the presence of Bachelors Stream. North Road and McKee Avenue were also in place and existing houses are constructed fronting off the new road with back gardens extending west to stream and to what is now the route of R135. By 1995 much of the surrounding land use is as it is today with residential development to the west and south east of the R135 and with mixed industrial/commercial development to the northeast. The cable is known to have been installed in 1967, and hence, was installed along the North Road (R135 road south of roundabout location was not constructed at the time). The area north of where the roundabout is today, the previous route of road (North Road), corresponds to where R135 is today.

2.3. CONTAMINANTS OF POTENTIAL CONCERN (COPC)

The fluid in the power cable is a mixture of two components Mineral Oil and Linear Alkyl Benzenes (T3788). Material Safety Data Sheets (MSDS) for the fluids are included in Appendix D and further detail on their physical, fate and transport and toxicological properties provided below.

2.3.1 Linear Alkyl Benzenes

Linear Alkyl Benzene is a benzene compound with a side alkyl chain of 10-13 carbon atoms in length. The following presents relevant information on its Fate and Transport in the environment.

- low solubility, which means it doesn't mix with water easily;
- low to moderate volatility with the MSDS providing that the compound should not present an inhalation hazard under ambient conditions and that exposure to vapour or oil mists may irritate the mucous membranes and cause dizziness, headaches and nausea;
- Strongly absorbs to soil and combined with its low solubility and high viscosity means it generally has low mobility in the water environment;
- Its preference in soil will be to remain as free product or sorb to soil with a smaller proportion in the vapour phase;
- It will form a Light Non-Aqueous Phase Liquid (LNAPL) on water;
- It is readily biodegradable under aerobic conditions in both water and soil, with a half life in soils of 15.3 days and less than 28 days in water. Half-life is the time required for a quantity to reduce to half of its initial value (REACH database, 2011);
- Does not bio accumulate;

- The Predicted No Effect Concentration (PNEC) is the concentration of a chemical which marks the limit below which; no adverse effects of exposure in an ecosystem are measured. LAB is toxic to the water environment with a PNEC aqua (freshwater) of 0.001mg/l: PNEC soil terrestrial organisms of 0.329mg/kg and PNEC sediment of 1.65mg/kg for freshwater sediment and 0.165mg/kg for marine sediments (REACH database, 2011).

2.3.2 Mineral Oil

In scientific terminology, the term mineral oil tends to be nonspecific in that it can refer to a substance which contains varying substances depending on its manufacture process.

Mineral oils are manufactured from petroleum with about 10-25% comprising of additives which can include antioxidants, metal deactivators, detergents, dispersants, corrosion inhibitor etc. Their composition will also have changed over time, and in the context of cable fluid, will vary according to when the cable was installed. In summary, the following characteristics have been identified:

- Physical properties can vary widely being defined by the crude oil source, carbon number distribution, boiling range and viscosity.
- Mineral oils are refined from petroleum crude oils, and are complex mixtures of straight- and branched chain paraffinic, naphthenic, and aromatic hydrocarbons with 15 or more carbons and boiling points in the range of 300°C to 600°C.
- Are insoluble in water and alcohol, but soluble in benzene, chloroform, ether, carbon disulfide and petroleum ether. They have ranging viscosities.
- Mineral oils from paraffinic crude oils are characterised by high wax content, high natural viscosity index, and relatively low aromatic hydrocarbon content. Naphthenic crude oils are generally low in wax content and relatively high in cyclo-paraffins and aromatic hydrocarbons. All crude oils contain some polycyclic aromatic hydrocarbons, and the proportions and types of these compounds in the finished mineral oils are determined primarily by the refining process.
- In the past, many mineral oils were only mildly refined and contained significant levels of polycyclic aromatic hydrocarbons (PAHs). Acid treatment was initially used to remove PAHs and other impurities and to improve the technical properties of the finished oils. In recent decades, acid treatment has largely been replaced by extensive refining with solvent extraction and/or hydro-treatment, which has further reduced the level of PAHs and other contaminants.
- In conclusion to the above, due to mineral oils likely varying composition, its physical, fate and transport and toxicological properties are best determined through consideration of the TPH CWG framework which characterises petroleum hydrocarbons according to the number of carbons. For a mineral oil, carbon fractions of C15 and above are relevant and PAHs. Additives may also be wide ranging and so their characteristics can be determined by the presence of analysed volatile and semi-volatile organic compounds.
- Mineral oil as represented by TPH hydrocarbon fractions of C15 and greater have a very low mobility and low degradation half lives. They therefore have the potential to persist in the environment.

- The longer carbon chain lengths also mean that mineral oil will have a relatively low volatility, with carbon fractions of greater than C16 not being considered to be volatile.
- The MSDS for Masse 106 (the Mineral Oil leaked from the cable) has identified that the product if it enters soil will be absorbed to soil particles and so will not be mobile. It has the potential to bio-accumulate. The MSDS also identifies that the product is expected to be non-toxic to aquatic organisms and that toxicologically it is not toxic and not carcinogenic. However more recently studies such as those for TPH CWG, have published health criteria values for carbon range C16-35 and along with potential additives potential impacts to human health and the environment will need to be considered.

3. SITE ENVIRONMENTAL SETTING

3.1. GENERAL INTRODUCTION

The precise location of the leak appears to be on the north bound carriageway close to the western edge of central reservation just north of the busy roundabout on the R135. The roundabout is approximately 930m south east (Dublin side) of the M50 (exit 5). The R135, also referred to as the Finglas Road, is one of the main arterial roads into Dublin City Centre. The road links Dublin City Centre with the M50 and M2. The roundabout facilitates access to Dublin City (straight through when travelling south from M50) as well as to a residential area to the west (via Casement Road) and a mixed commercial/residential area to the east (via R104, also known as St. Margaret's Road). Photographs of the site of the known leak are provided in Appendix C.

The land use in the area is primarily a mixture of residential and commercial. The nearest residential property is located 50m downgradient of the leak point. There are areas of open space and amenity designated in the surrounding area.

There are two surface watercourses within 3km of the area of interest. Bachelors Stream appears to rise in the area adjacent to the leak point. This stream flows in a southerly direction and is culverted beneath the Finglas Road approximately 0.55km to the south of the site. Bachelor's Stream drains into the River Tolka at a confluence approximately 2.5km to the south east of the site where the R135 meets the R103. The River Tolka flows in an easterly direction eventually draining into Dublin Bay approximately 6.5km to the south east. Under the Water Framework Directive, the River Tolka, including Bachelors Stream, has been assigned "Bad" status and has also been categorised as being at risk of deteriorating in the future, as presented in the Water Framework Directive River Body report in Appendix E.

There is a spring present 0.84km to the northwest of the site. This spring is named St. Patricks Well and there is no further information on this spring. It is expected that the residential properties in the vicinity are connected to the mains water supply as there appears to be no domestic wells noted in the area.

3.2. SITE HISTORY

Primary sources used to research the history of the site included available extracts from historical Ordnance Survey Ireland (OSI) maps, aerial photographs and planning information from Myplan.ie.

The maps consulted include the OSI 6-inch historic maps from 1837 to 1842, the OSI 25-inch historical maps surveyed between 1888 and 1913 and the OSI 6-inch Cassini map surveyed in early 20th century. Table 3.1 below gives further details of the site history and the land use of the surrounding area.

Table 3.1 – Site History

History	**National Monuments Service:** There are three monuments located within 1km of the leak site. Two are located approximately 0.82km to the south of the site. The first is a natural spring enclosed within a railing and embellished with a monument to St Patrick, murals and a grotto. The waters were thought to cure sore eyes and inveterate ulcers. The second is remnants of what are believed to be the historic town defences. The northern section of 'King William's Rampart' forms a boundary wall to the

	present Vicarage garden and the southern boundary of the car park. The southern portion of 'King William's Rampart' lies south of Cappagh Road. Traditionally associated with King William, who is said to have camped in Finglas after the Battle of the Boyne, 1690. Investigations by OPW of the site uncovered 15th-century pottery which suggests that the ramparts may be the remains of a stockade built to protect the manorial estate founded by Archbishop Comyn in 1181. Test excavations in 1995 confirmed that the rampart continued along the northern perimeter of the present site. Archaeological deposits with a date range of 14th-17th centuries were built up around it. The third monument of significance is a 17th century house located along Cardiff Castle Road approximately 0.92km to the south of the site.
	Historic Mapping: OSI 6-inch map (Black and White) (1837-1842): From this map the land appears to be largely undeveloped greenfields. The leak point is situated on the intersection of two roads, one is in the position of the current North Road and the other is in the place of the current R104 to the east of the leak site. There is a gravel pit located to the south east of the leak site. It is evident from this map that there is an unnamed stream located immediately to the south west of the site flowing in the approximate direction and course of the current Bachelors Stream. OSI 25-inch map (Black and White) (1888-1913): From this map it is apparent that the land was being devolved in the area of the intersection. There are several buildings, probable dwellings, marked on the map to the west of the leak site. The stream flowing southward to the west of the leak site appears to be traversed with bridges to a number of these buildings. Cassini 6 inch (1830-1930): This map shows that the area of development is extending southwards along the North Road toward Finglas town centre. Several bridges now cross the stream to the west of the leak site.
Aerial Photos	Aerial Photo 1995: The area of the leak site is under development in this photograph. The roundabout is not present in the image however the area surrounding the intersection appears to be cleared in preparation for construction. Bachelors stream appears to be culverted beneath the Finglas Road approximately 0.55km south of the leak site. The surrounding area appears largely similar to its current layout of residential properties and commercial/industrial premises to northeast. Aerial Photo 2000: The road layout, positions of residential and commercial properties remains largely similar to current times. The notable change from the previous image is that the roundabout is in place and the R135 south of the roundabout appears to be constructed. Aerial Photo 2005: The road layout, position of residential and commercial properties reflects that of the present day. There is now a footbridge crossing over the R135 Finglas Road to the south of the leak site.

	Aerial Photo 2012: The site, road network and residential properties appear to resemble the current layouts.

3.3 REGIONAL GEOLOGY AND HYDROGEOLOGY

Bedrock beneath the site comprises dark grey limestones of the Lucan Formation (known colloquially as Calp Limestone) which is overlain subsoils comprising tills derived from limestone, gravels derived from limestone and further deposits of made ground (Teagasc). The closest surface water course is Bachelors Stream, culverted beneath the Finglas Road and draining into the Tolka River located approximately 2.5km to the southeast of the site. The Tolka flows in an easterly direction, discharging to Dublin Bay approximately 6.5km to the south east of the site.

The following information sources were consulted as part of this desk-based research and the relevant information has been compiled in Table 3.2 below.

- Dublin City Council (Planning and Environment Sections)
- Ordnance Survey Ireland (historic map series)
- National Monuments Service (protected structures)
- Dept. of the Environment, Community and Local Government
- Geological Survey of Ireland
- Environmental Protection Agency data bases
- National Parks and Wildlife Services
- Office of Public Works (flood maps)

Table 3.2 – Site Physical Setting

Feature	Details & Comments
Topography	The site is gently sloping to the south towards the River Tolka with the regional topography of the area sloping gently to the south east toward Dublin Bay.
Geology	**Overburden:** The GSI and Agency databases describe the soils surrounding site as Made Ground with the site of the leak being classed as having rock near or at the surface with shallow well drained mineral soils. The subsoils in the area consisting of tills derived from limestone with a pocket of gravels derived from limestone.
	Solid Geology: The site is underlain by Calp limestones of the Lucan Formation. The Lucan Formation comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey.
Hydrogeology	**Regional Classification:** According to the GSI the Lucan Formation below the area of interest is classified as

	a Locally Important aquifer, bedrock which is moderately productive only in local zones. This type of bedrock aquifer unit is typically capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or 'good' yields (100-400 m^3/d). Groundwater flow occurs predominantly through fractures, fissures and joints (secondary permeability). This type of aquifer typically has a limited and relatively poorly connected network of fractures, fissures and joints, giving a low fissure permeability which tends to decrease further with depth. A shallow zone of higher permeability may exist within the top few metres of more fractured/weathered rock, and higher permeability may also occur along fault zones. These zones may be able to provide larger 'locally important' supplies of water. In general, the lack of connection between the limited fissures results in relatively poor aquifer storage and flow paths that may only extend a few hundred metres.
	Vulnerability: The vulnerability rating for the aquifer beneath the site is classified as Extreme indicating that bedrock can be encountered at or near the ground surface. There is areas s of high to moderated vulnerability areas adjacent to the leak site.
	Groundwater Body: Under the Water Framework Directive (WFD) the groundwater body beneath the site is Dublin Urban (code: IE_EA_G_005) and is classed as having Good status.
	Well Search: There is a spring present 0.84km to the southwest of the site. This spring is named St. Patricks Well and there is no further information on this spring.
Hydrology	**Surface Water Courses/Abstractions:** There are two surface watercourses within 3km of the area of interest. Bachelors Stream appears to have its source approximately 46m to the south east of the leak location. From here the stream flows to the south east and is culverted beneath the Finglas Road. This stream drains into the River Tolka at a confluence approximately 2.5km to the south east of the site, The River Tolka flows in an easterly direction eventually draining into Dublin Bay approximately 6.5km to the south east.
Protected Areas	**Royal Canal Proposed Natural Heritage Area (pNHA)** The closest protected area to the site is the proposed natural heritage area of the Royal Canal (*site code: 002103*) located approximately 2.5km to the south of the site.
	South Dublin Bay and River Tolka Estuary Special Protection Area (SPA) The boundary of this area (*site code: 004024*) is located approximately 6.5km to the south east of the project area. This SPA occupies a substantial part of Dublin Bay and comprises extensive intertidal flats which support wintering waterfowl which are part of the overall Dublin Bay population.
	North Dublin Bay (SAC) The boundary of the North Dublin Bay Special Area of Conservation (SAC) (*site code: 000206*) is located approximately 8km to the south east of the site.

Flooding	According to OPW flood mapping the site appears to be at risk of fluvial flooding in extreme events. There is also an area of land to the west of the site which is at risk of pluvial flooding in extreme events.
Zoning	The primary adjacent land use in the area is residential. There is residential land to the immediate east with a large area of employment/enterprise marked further to the east. To the east of the site there is a green area which is bordered by a residential area further to the west. There are small areas of open space and public amenity designated through out the area.

3.4 SITE GEOLOGY AND HYDROGEOLOGY

There is no site investigation data available from the site location.

The details of the typical cable and trench dimensions for fluid filled cable include the following;

- Depth to the base of trench 1200mm
- Depth to top of cable 900mm-1000mm
- Thickness of sand surrounding cable 350mm
- Width of trench 1100mm
- Backfill can be either arisings or Clause 804.

The permeable made ground surrounding the leak site is likely to contain perched groundwater which will be likely to reach rock which is shallow in the leak site indicated by the Extreme Vulnerability GSI classification, as presented in the conceptual site model in Figure 3. It is possible that the underlying limestone bedrock aquifer is connected to the perched system in this area.

Topography in the area as obtained from the GSI database shows the leak point is located at approximately 65metres ordnance datum (mOD) with the Tolka River downgradient at approximately 20mOD. The topographic contours are orientated approximately east to west which infers that the groundwater flow direction is likely to be in a southerly flow direction, as presented in Figure 2 and within the CSM in Figures 3 and 4.

3.5 SUMMARY OF PREVIOUS SITE SAMPLING AND MONITORING DATA

The made ground within the cable trench is reported to be up to 1.2m deep and contained sand and backfill material. The underlying soils and subsoils are not classified by their permeability due to the underlying rock being less than 3m below ground level. The surrounding areas have been classed as having low permeability soils.

At the time of reporting, Irish Water have examined all available drinking water quality sample data and have concluded that there is no evidence that COPCs from the leak site have infiltrated the local drinking water supply. This evaluation is based on a review of all samples taken from customer-points, between 2014 and 2019; which showed no evidence that the COPCs (PAHs and Benzenes) were present in the water supply at levels above drinking water standards (PAHs: 0.1µg/L; Benzene: 1.0µg/L). These results (which are from samples taken at the customer tap) would not indicate that leaks from oil filled cables have contaminated the drinking water supply for these areas, or at least to an extent where any contamination arising has resulted in a breach of the parametric value for PAHs

and Benzene (Appendix F).

There is no available soil/vapour or groundwater quality information from the area in the vicinity of the cable leak point. There are no groundwater abstractions or monitoring wells in the vicinity of the leak point. A summary of the Environmental and Human Health Pollutant Linkages for the COPCs (TPH fractions, BTEX compounds, Speciated PAHs, SVOCs, VOCs) in relation to the known leak point details and available desk study information is presented in Section 4.0 and summarised below.

For the COPC the following can be determined;

- **Linear Alkyl Benzenes (LAB)** is of low mobility and strongly absorbs to soil. It has low to moderate volatility and will remain largely as free product or sorb to soil/fill material. It is readily biodegradable in aerobic conditions and does not bio-accumulate.
- **Mineral Oils** are refined from petroleum crude oils and are complex mixtures of straight- and branched hydrocarbons and are insoluble in water. Mineral oil with hydrocarbon fractions of C15 and greater have a very low mobility and low degradation half lives. They therefore have the potential to persist in the environment. The longer carbon chain lengths also mean that mineral oil will have a relatively low volatility.

4 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

4.1 PRELIMINARY QUALITATIVE RISK ASSESSMENT (PQRA)

4.1.1 Risk Assessment Methodology

Currently there is no specific legislation addressing contaminated land in Ireland and therefore this report has been prepared considering the most relevant guidance published by the Irish Environmental Protection Agency (Agency) and the UK Environment Agency (EA) guidance, specifically as follows:

1. Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites, EPA 2013;
2. Model Procedures for the Management of Land Contamination – Contaminated Land Report (CLR 11), UK EA 2004.

Both approaches advocate a risk-based assessment when dealing with contaminated land and groundwater issues and this is considered as best practice.

Current surface water and groundwater pollution legislation is taken into account for these assessments as required under the Water Framework Directive, Directive 2000/60/EC, that was adopted in 2000 as a single piece of legislation covering rivers, lakes, groundwater and transitional (estuarine) and coastal waters and includes heavily modified and artificial waterbodies. Its objectives are to prevent further deterioration of and to protect, enhance and restore the status of all bodies of water with the aim of achieving at least good status.

It was given effect in Ireland under the European Communities (Water Policy) Regulations 2003 as amended, the European Communities Objectives (Surface Waters) Regulations 2009, as amended and the European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended. These Water Policy Regulations govern the shape of the WFD characterisation, monitoring and status assessment programmes.

A critical element of the risk assessment process is the establishment of a Conceptual Site Model (CSM) for the land and groundwater environment. A CSM describes the potential sources of contamination at a site, the migration pathways it may follow and the receptors it could impact. If complete source-pathway-receptor scenarios exist, then there is a potential pollutant linkage that needs to be characterised and assessed (via formal risk assessment). The CSM is updated as more information is gathered from subsequent desk studies and site investigations with a preliminary CSM presented in Figures 3 and 4.

4.2 OUTLINE SITE CONCEPTUAL MODEL

On the basis of the desk study and site walkover, a number of possible pollutant linkages have been identified for this site. Based on available information the outline site conceptual model is presented in Tables 4.1 below which considers possible pollutant linkages for the site.

Table 4.1 – Outline Site Conceptual Model (Environmental and Human Health)

Source	Pathway	Receptor	Potential Pollutant Linkage (Y/N)	Discussion
Human Health				
Historical leaks of cable fluid from underground electricity cable comprising of an approximate volume of 6,215 litres of linear alkyl benzene (LAB) mixed with mineral oil (MO) August 2014 to February 2015. PCOCs include: TPH fractions, BTEX compounds, Speciated PAHs Mineral Oil SVOCs VOCs	LAB and MO volatilisation from soil, groundwater and LNAPL into soil pore spaces (Vapour Phase in unsaturated soils), upward migration into houses & other properties to indoor air and then inhalation.	Residents & other commercial or retail building users	Y	There are residential properties approximately 50m to the south east and downgradient of the leak. Vapour phase migration will be preferential potentially along utility service runs and through more permeable made ground soils and or sand/gravel fractions of soils if present.
	LAB and MO partitioning to soil (sorbed phase), groundwater (dissolved phase) and as NAPL (free phase). Then direct dermal contact/ingestion of soils and or dusts, inhalation of soil dusts / ingestion of home grown produce.	Residents & other commercial or retail building users	Y	There are residential properties approximately 50m to the south east and downgradient of the leak. The cable source of leak is at a depth of 0.9m and so direct contact and ingestion pathways are unlikely to be viable unless groundwater levels are near ground surface bringing contamination upwards into shallow soils where direct contact is possible.
	LAB and MO partitioning to soil (sorbed phase), groundwater (dissolved phase) and as NAPL (free phase). Then permeation through plastic potable water supply pipes and ingestion.	Nearby residents	Y	The water supply pipes could potentially run through contaminated zones. LAB and MO have the potential to permeate through the wall of plastic supply pipes and also through joins and gaskets. An internet search has not identified proven instances where this has occurred elsewhere. Any permeating compounds would be diluted depending on water flows in the pipe. A WHO drinking water standard for hydrocarbons >C10 is 0.09mg/l which exceeds the LAB theoretical solubility limit of 0.041mg/l. So, unless NAPL is present within the pipe then this WHO drinking water standard would not be exceeded.

	LAB and MO volatilisation from soil, groundwater and LNAPL into soil pore spaces (Vapour Phase in unsaturated soils), upward migration to outdoor air and then inhalation	Workers undertaking any subsurface works	Y	Unlikely to be significant as workers exposed in outdoor air where vapours cannot accumulate to high concentrations. Also, risks are localised areas of contamination which can be managed with the correct PPE and H&S procedures.
	LAB and MO partitioning to soil (sorbed phase), groundwater (dissolved phase) and as NAPL (free phase). Then direct dermal contact/ingestion of soils and or dusts, inhalation of soil dusts	Workers undertaking any subsurface works	Y	Unlikely to be significant as contamination is likely to be localised and can be managed with the correct PPE and H&S procedures.
Environmental – Water Receptors				
Historical leaks of cable fluid from underground electricity cable comprising of an approximate volume of 6,215 litres of linear alkyl benzene (LAB) mixed with mineral oil (MO) August 2014 to February 2015. PCOCs include: TPH fractions, BTEX compounds, Speciated PAHs Mineral Oil SVOCs VOCs	LAB and MO partitioning to soil (sorbed phase) and as NAPL in soil pore spaces, that then can leach downwards to groundwater in shallow made ground and glacial till soils	Shallow groundwater	Y	LAB and MO present in soils as sorbed and NAPL phases can leach downwards with infiltrating rainwater and soil water movements to groundwater. In groundwater will form LNAPL due to low solubility. There may also be limited dissolved concentrations.
	LAB and MO direct downward migration as NAPL until reaches shallow groundwater where forms LNAPL and with a limited dissolved plume based on low solubilities, then lateral migrations towards surface waters	River Tolka and its tributary Bachelors Stream	Y	The apparent source of Bachelors Stream is located adjacent to the leak point, draining into the River Tolka at their confluence 2.5km to the south east of the site. The short distance to the stream means this linkage is possible due to the lateral migration of perched groundwater at the base of the made ground.
	LAB and MO migration downwards through glacial till to Limestone bedrock aquifer and then lateral migration	Limestone bedrock aquifer / Groundwater Users	Y	There are no known recorded domestic groundwater abstraction wells located within a 1km radius of the leak. The surrounding properties are serviced by mains water. Due to the extreme vulnerability in the area, there is a possible linkage between the groundwater in the underlying aquifer and the perched groundwater in the

				made ground.

4.3 POLLUTANT LINKAGE ASSESSMENT

As outlined in Tables 4.1 above, several possible pollutant linkages were identified, which have been further risk assessed with reference to BS10175:2011 and CIRIA Document C552: Contaminated Land Risk assessment 'A Guide to Good Practice'. The risk assessment has been carried out by assessing the severity of the potential consequences, taking into account both the potential severity of the hazard and the sensitivity of the target, based on categories given in Table 4.2 below.

Table 4.2 - Potential Hazard Severity Definition

CATEGORY	DEFINITIONS
Severe	Acute risks to human health, catastrophic damage to buildings, major risk to an environmental receptor such as a river
Medium	Chronic risk to human health, pollution of sensitive environmental receptor, significant damage to buildings and 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 Table 4.3 below.

Table 4.3 - Probability of Risk Definition

CATEGORY	DEFINITIONS
High likelihood	Pollutant linkages 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 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 presented in Table 4.4 below.

Table 4.4 - Level of Risk for Potential Hazard Definition

PROBABILITY OF RISK	POTENTIAL SEVERITY			
	Severe	Medium	Mild	Minor
High likelihood	Very high	High	Moderate	Low/Moderate
Likely	High	Moderate	Low/Moderate	Low
Low likelihood	Moderate	Low/Moderate	Low	Very low
Unlikely	Low/Moderate	Low	Very Low	Very low

The assessment is discussed below in terms of plausible pollutant linkages.

The pollutant linkages of Linear Alkyl Benzene and Mineral Oil in the shallow soils/groundwater and nearby receptors are summarised in Tables 4.5 below.

Table 4.5 - Pollutant Linkage Assessment for Linear Alkyl Benzene and Mineral Oil

Source	Pathway	Receptor	Severity	Likelihood	Risk Level	Comments
Human Health						
Historical leaks of cable fluid from underground electricity cable comprising of an approximate volume of 6,215 litres of linear alkyl benzene (LAB) mixed with mineral oil (MO) August 2014 to February 2015.	LAB and MO volatilisation from soil, groundwater and LNAPL into soil pore spaces (Vapour Phase in unsaturated soils), upward migration into houses & other properties to indoor air and then inhalation	Residents & other commercial or retail building users	Medium	Low Likelihood	Low/Moderate	LAB & MO have the potential to migrate along preferential pathways such as service trenches. Outside of preferential pathways, contamination will strongly sorb to soil, has low mobility, readily biodegrades under aerobic conditions in both soil and water and does not exist readily in the vapour-phase, consequently the risk to nearby residents is low/moderate with a residual risk associated with mineral oil.
PCOCs include: TPH fractions, BTEX compounds, Speciated PAHs Mineral Oil SVOCs	LAB and MO partitioning to soil (sorbed phase), groundwater (dissolved phase) and as NAPL (free phase). Then direct dermal contact/ingestion of soils and or dusts, inhalation of soil dusts / ingestion of home grown produce	Residents & other commercial or retail building users	Medium	Unlikely	Low	The cable source of leak is at a depth of 0.9m and so direct contact and ingestion pathways are unlikely to be viable unless groundwater levels are near ground surface or capillary action brings contamination upwards into shallow soils where direct contact is possible.

VOCs	LAB and MO partitioning to soil (sorbed phase), groundwater (dissolved phase) and as NAPL (free phase). Then permeation through plastic potable water supply pipes and ingestion	Nearby residents and other users of the water mains	Medium	Unlikely	Low	Water supply pipes could potentially be present next to power cable with the leaked cable fluid that has the potential to permeate plastic water supply pipes. With the exception of NAPL presence, the risk is unlikely to cause actual harm to health because any permeating contaminants would be diluted by water flows in the water supply pipe and the dissolved concentrations will be less than WHO drinking water threshold guidelines due to low solubility limits. Also, Irish Water reviews of sampling data and subsequent risk assessments suggest that there has been no impact to potable water pipes based on the absence of COPC detections and the high-pressure nature of supply pipes. Risk rating may change if evidence of dynamic hydrological regime is observed or significant free phase product is observed proximal to pipe.
	LAB and MO volatilisation from soil, groundwater and LNAPL into soil pore spaces (Vapour Phase in unsaturated soils), upward migration to outdoor air and then inhalation	Workers undertaking any subsurface works	Medium	Unlikely	Low	Risk to workers from localised areas of contamination and vapours is unlikely due to low volatility and exposure in outdoor air, if it does occur it will be short term and can be managed with the correct PPE and H&S procedures.

	LAB and MO partitioning to soil (sorbed phase), groundwater (dissolved phase) and as NAPL (free phase). Then direct dermal contact/ingestion of soils and or dusts, inhalation of soil dusts	Workers undertaking any subsurface works	Medium	Unlikely	Low	Risk to workers from localised areas of contamination will be short term and can be managed with the correct PPE and H&S procedures.

Environmental – Water Receptors						
Historical leaks of cable fluid from underground electricity cable comprising of an approximate volume of 5,170 litres of linear alkyl benzene (LAB) mixed with mineral oil (MO) August 2014 to February 2015. PCOCs include: TPH fractions, Speciated PAHs Mineral Oil SVOCs, VOCs,	LAB and MO partitioning to soil (sorbed phase) and as NAPL in soil pore spaces, that then can leach downwards to groundwater in shallow made ground and glacial till soils	Shallow groundwater	Mild	Likely	Low/Moderate	Low/Moderate risk due to alkyl benzene contamination strongly absorbs to soil, has low mobility, readily biodegrades in aerobic conditions in both soil and water. Mineral oil is less biodegradable therefore has a greater tendency to accumulate and may present a greater risk. Shallow groundwater in made ground and glacial till unlikely to be used as an actual resource due low water volumes and location in a residential urban area. Overall risk is low/moderate.
	LAB and MO direct downward migration as NAPL until reaches shallow groundwater where forms LNAPL and with a limited dissolved plume based on low solubilities, then lateral migrations towards surface waters	River Tolka and its tributaries	Medium	Likely	Moderate	Has the potential to migrate in shallow groundwater in made ground. The contamination will strongly sorb to soil, has low mobility, readily biodegrades in both soil and water. There was a significant loss (6,215L) from the cable which is likely to be transmitted to the environmental receptor adjacent to the leak point the risk is moderate.
	LAB and MO migration downwards through glacial till to Limestone bedrock aquifer and then lateral migration	Limestone bedrock aquifer / Groundwater Users	Medium	Likely	Moderate	Due to the extreme vulnerability in the area, there may be a linkage between the groundwater in the underlying aquifer and the perched groundwater in the made ground. Given that there are no known groundwater users in the area the risk is moderate.

4.4 SUMMARY OF PQRA

A desktop study and site walkover were conducted at the Fingal Road site in Fingal West, Dublin 11 where there was a volume of 6,215 litres of linear alkyl benzene mixed with mineral oil lost from a cable leak at an approximate rate of 1036L/month for 6 months. The leak began in August 2014 and was repaired in February 2015. Results of the PQRA are summarised below:

4.4.1 Human Health:

- There is a potential Low/Moderate risk posed by LAB and MO vapours in suspected contamination in the soil and groundwater through preferential pathways such as services ducts to residents or other building users;
- There is a potential Low risk posed by LAB and MO from contact with suspected contamination in the soil and groundwater through direct dermal/inhalation and ingestion contact to residents or other building users;
- There is potential Low risk posed by LAB and MO contact from ingestion contact with suspected contamination in the soil and groundwater through permeation of contamination through plastic water pipes;
- There is a potential Low risk to construction workers from dermal/inhalation and ingestion pathways which can be managed by appropriate use of PPE and H&S procedures.

4.4.2 Environmental:

- There is a potential Low/Moderate risk posed by LAB and MO to shallow groundwater from suspected contamination in the shallow made ground and glacial till subsoils given the contaminant properties of low mobility and high sorption to soil, with shallow groundwater unlikely to be a viable groundwater resource in the residential urban setting.
- There is a potential Moderate risk posed by LAB and MO to the River Tolka and its tributaries, namely Bachelors Stream, from the suspected contamination given the contaminant properties of low mobility and high sorption to soil along with the partially culverted nature of Bachelors Stream.
- There is a potential Moderate risk posed by LAB and MO to the underlying Limestone Bedrock Aquifer given the Extreme vulnerability indicating shallow to outcropping rock in the area.

4.5 SUMMARY AND CONCLUSIONS

This preliminary environmental site assessment consists of a review of the potential environmental impacts associated with a hydrocarbon leak from a power cable on Finglas Road, Finglas West, Dublin 11 (ESB Ref.: 15). There was an approximate volume of 6,215 litres of cable fluid consisting of linear alkyl benzene mixed with mineral oil lost to ground from the leak on Finglas Road at an approximate rate of 1036L/month for six months. The leak began in August 2014 and was repaired in February 2015.

The known leak point (ESB Ref. 15) is located on the road close to the western edge of central reservation just north of a busy roundabout on the R135. The roundabout is approximately 930m

south east (Dublin side) of the M50 (exit 5). The R135 is a major route into the City and the roundabout facilitates access to Dublin City (straight through) as well as to a residential area to the west (via Casement Road) and a mixed commercial/residential area to the east (via R104). There is no physical evidence of hydrocarbon contamination on the surface in terms of oil odours/staining or impact to vegetation.

The site is underlain by the locally important dark Calp limestones of the Lucan Formation. The vulnerability is Extreme indicating shallow rock in the area of the leak showing a potential connection to the underlying bedrock aquifer.

The nearest surface watercourse is Bachelors Stream which appears to have its source adjacent to leak location. From here the stream flows to the south east and is partially culverted beneath the Finglas Road. This stream drains into the River Tolka at a confluence approximately 2.5m to the south east of the site which drains to Dublin Bay approximately 6.5km to the south east.

Considering the immediate proximity of the culverted Bachelors Stream to the leak point, it appears there may be hydrogeological pathways connecting the project area to the Tolka River and potentially to connected protected areas in the Dublin Bay area.

Based on the known cable leak point, COPC fate and transport and hydrogeological desk study information the CSM has the following initial key findings for human health and environmental risks;

There is a Low risk posed by LAB and MO from contact with suspected contamination in the soil and groundwater through;

- direct dermal/inhalation and ingestion contact to residents or other building users;
- ingestion contact with suspected contamination in the soil and groundwater through permeation of contamination through plastic water pipes or through low-pressure infiltration of possible soil contamination into water pipes via nearby breaks or leaks;
- dermal/inhalation and ingestion pathways to construction workers, which can be managed by appropriate use of PPE and H&S procedures;

There is a Low/Moderate risk posed by LAB and MO in suspected contamination in the soil and groundwater through;

- hydrocarbon vapours in preferential pathways such as services ducts to residents or other nearby building users;
- Leaching to shallow groundwater given the contaminant properties of low mobility and high sorption to soil, with shallow groundwater unlikely to be a viable groundwater resource in the residential urban setting.

There is a Moderate risk posed by LAB and MO in suspected contamination in the soil and groundwater through;

- hydrocarbon migration to the adjacent watercourse given the short distance to Bachelors Stream.
- hydrocarbon migration to the underlying aquifer given the possible connection to shallow groundwater through shallow rock in the area indicated by the Extreme vulnerability.

In order to further develop the conceptual site model and investigate the identified potential risks to sensitive receptors further investigation has been recommended in the form of site investigation, as previously referenced.

5 REFERENCES

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Respectfully submitted

On behalf of Verde Environmental Consultants

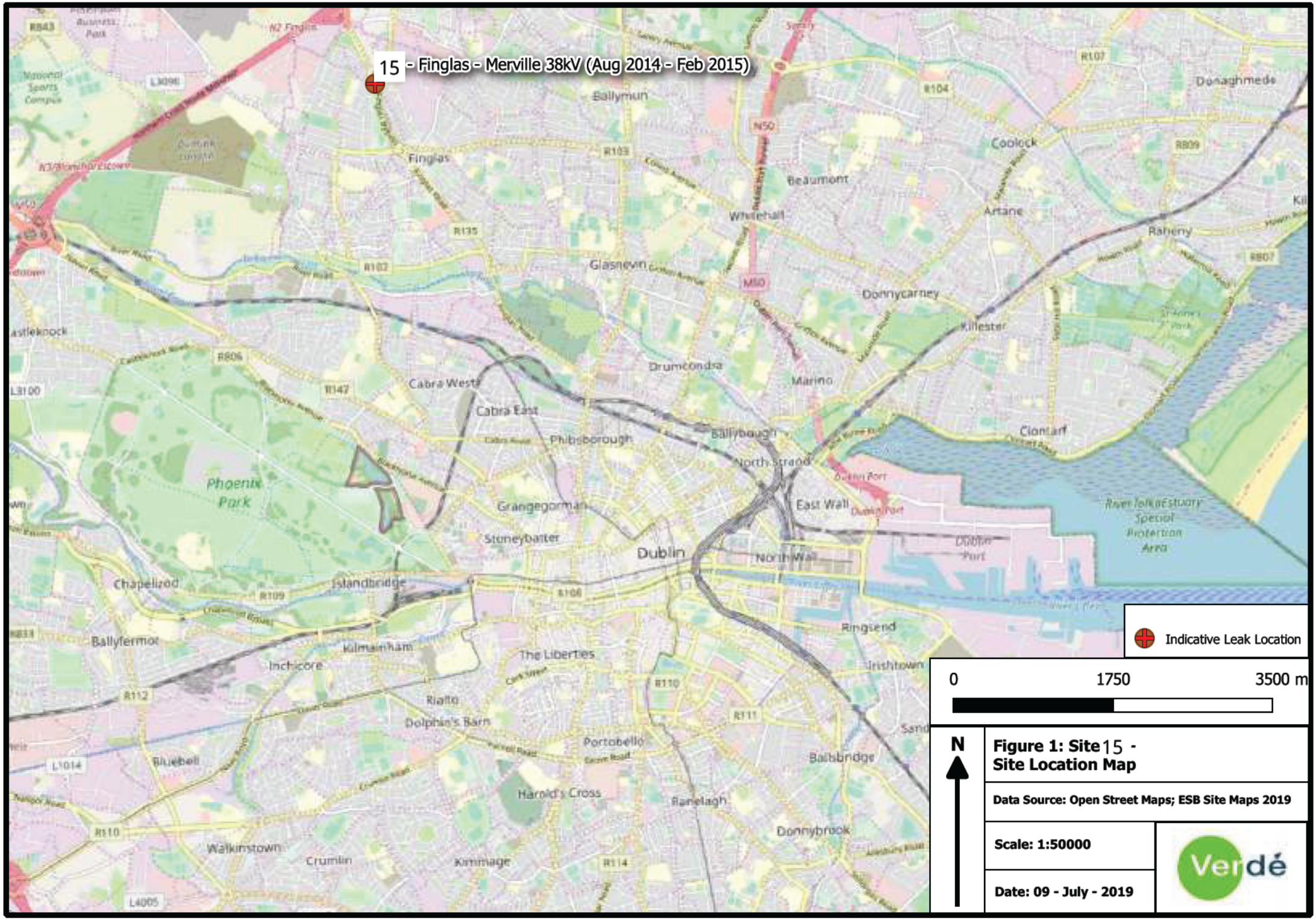
[redacted]

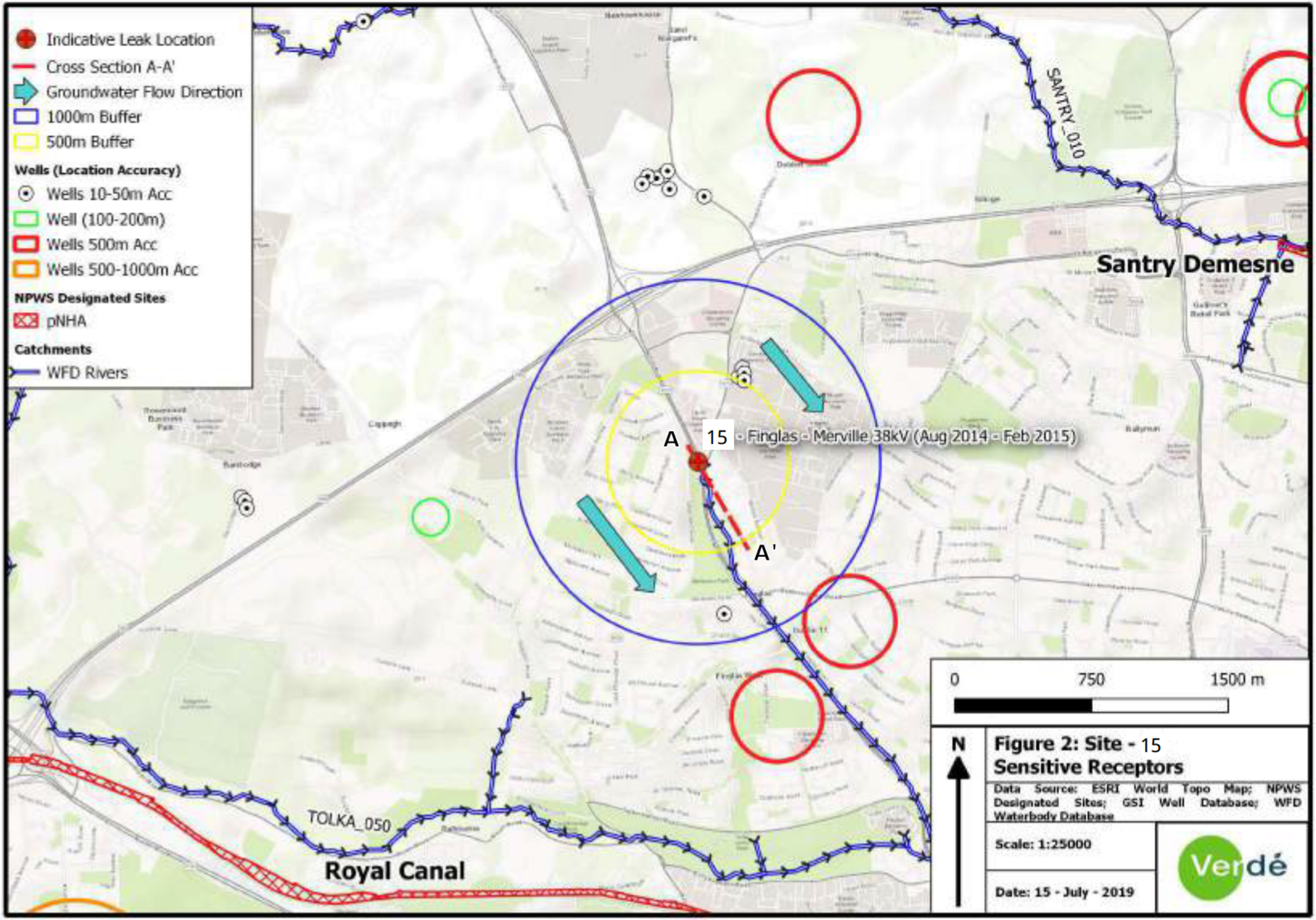
Principal Environmental Consultant

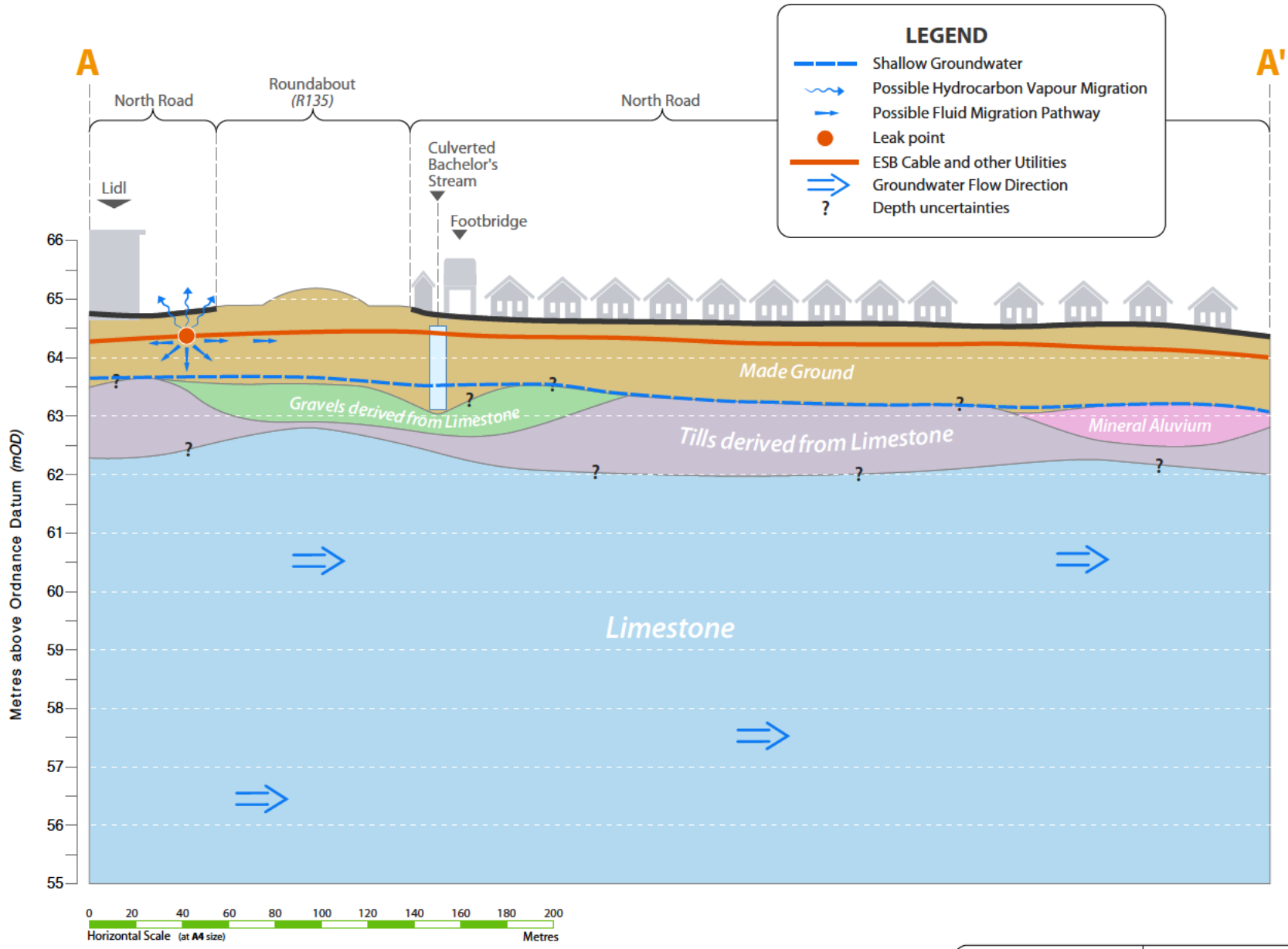
[redacted]

Project Director

FIGURES


15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
Indicative Leak Location
0
1750
3500 m
N
Figure 1: Site 15 - Site Location Map
Data Source: Open Street Maps; ESB Site Maps 2019
Scale: 1:50000
Date: 09 - July - 2019
Verdé


Indicative Leak Location
Cross Section A-A'
Groundwater Flow Direction
1000m Buffer
500m Buffer
Wells (Location Accuracy)
Wells 10-50m Acc
Well (100-200m)
Wells 500m Acc
Wells 500-1000m Acc
NPWS Designated Sites
pNHA
Catchments
WFD Rivers
A
15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
A'
SANTRY_010
Santry Demesne
TOLKA_050
Royal Canal
0
750
1500 m
N
Figure 2: Site - 15
Sensitive Receptors
Data Source: ESRI World Topo Map; NPWS Designated Sites; GSI Well Database; WFD Waterbody Database
Scale: 1:25000
Date: 15 - July - 2019
Verdé



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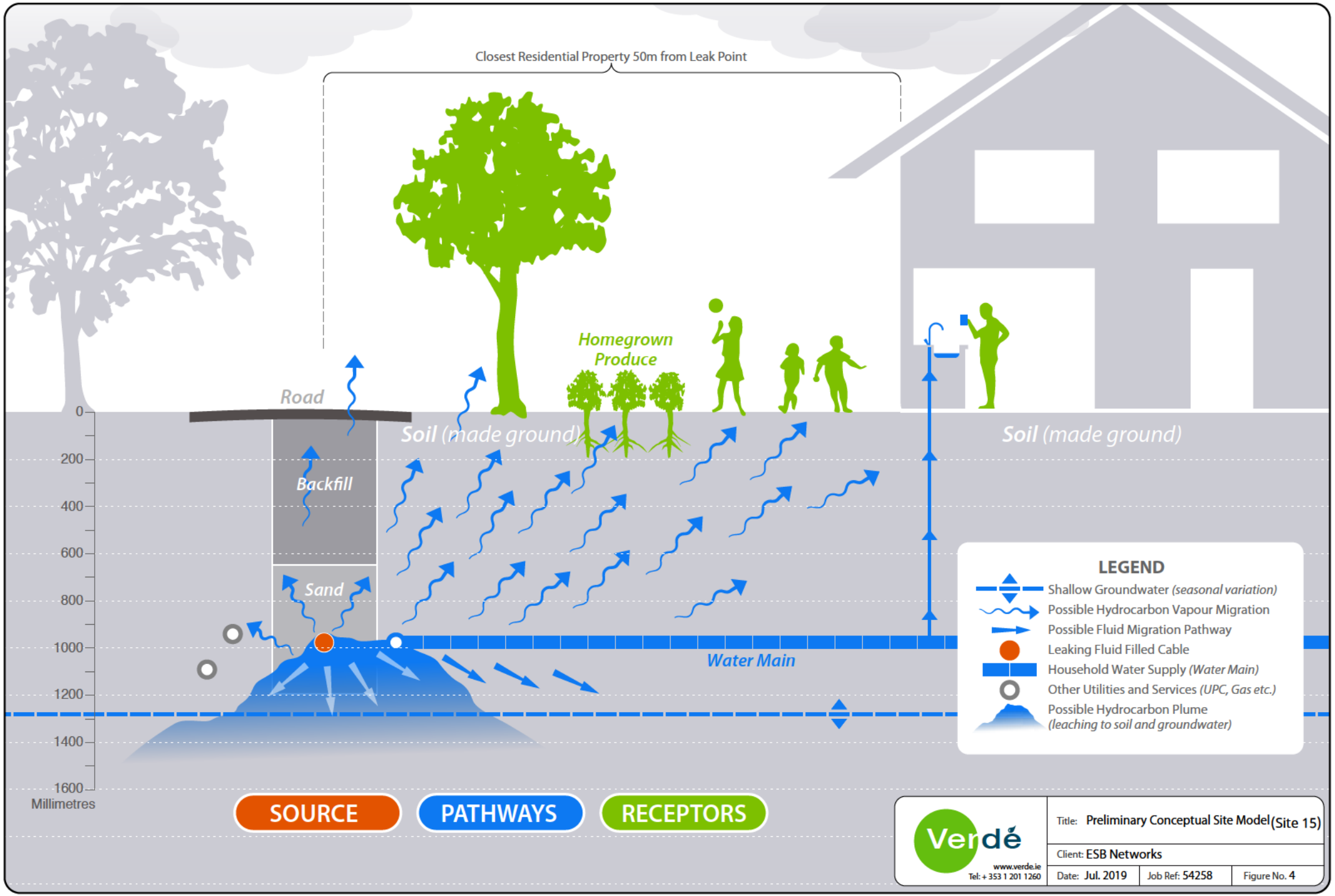
Title: Preliminary Conceptual Site Model (Site 15)

Client: ESB Networks

Date: Jul. 2019 | Job Ref: 52458 | Figure No. 3



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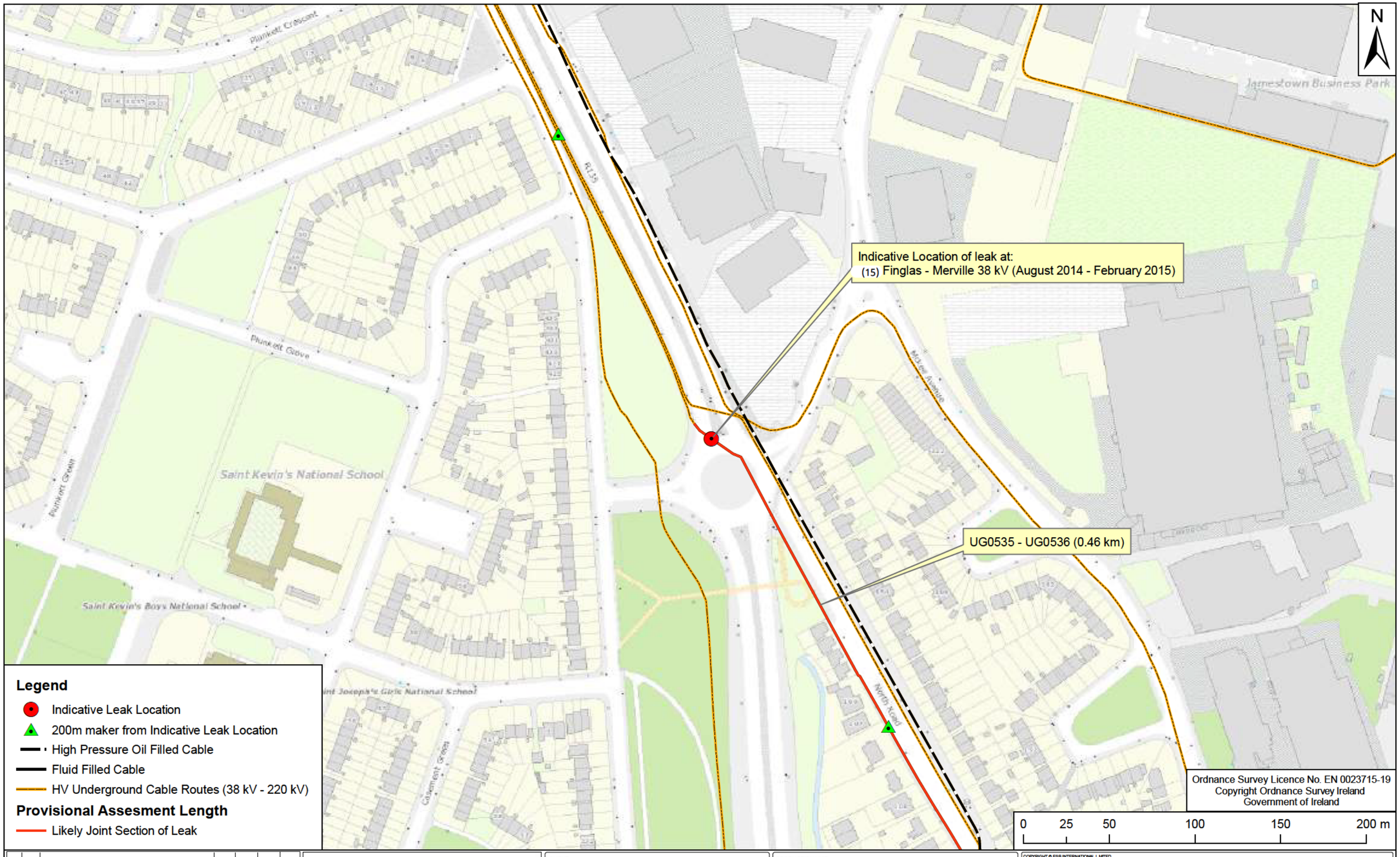
Title: Preliminary Conceptual Site Model (Site 15)
Client: ESB Networks
Date: Jul. 2019 | Job Ref: 54258 | Figure No. 4

APPENDIX A

ESB SITE LAYOUT PLAN WITH INDICATIVE CABLE FLUID LEAKAGE LOCATION



Legend

- Indicative Leak Location
- 200m maker from Indicative Leak Location
- High Pressure Oil Filled Cable
- Fluid Filled Cable
- HV Underground Cable Routes (38 kV - 220 kV)

Provisional Assesment Length

- Likely Joint Section of Leak

0 25 50 100 150 200 m

REV	DATE	REVISION DESCRIPTION	DRN	PROD	VER	APP
2	28/06/19	REFINEMENT OF SPATIAL DATA	T.O'R	T.O'R	J.F	A.M.C
1	26/06/19	ADDITIONAL SPATIAL INFORMATION ADDED	T.O'R	T.O'R	J.F	A.M.C
0	26/06/19	REQUEST FOR PROPOSAL	T.O'R	T.O'R	J.F	A.M.C

CLIENT APPROVAL ☐ PLANNING ☐ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

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CLIENT: ESB Networks

PROJECT:

CONTRACT

PRODUCTION UNIT: Civil & Environmental Engineering

DRAWING TITLE: Indicative Cable Fluid Leakage Locations & Cable Sections (15) Finglas - Merville 38 kV (August 2014 - February 2015)

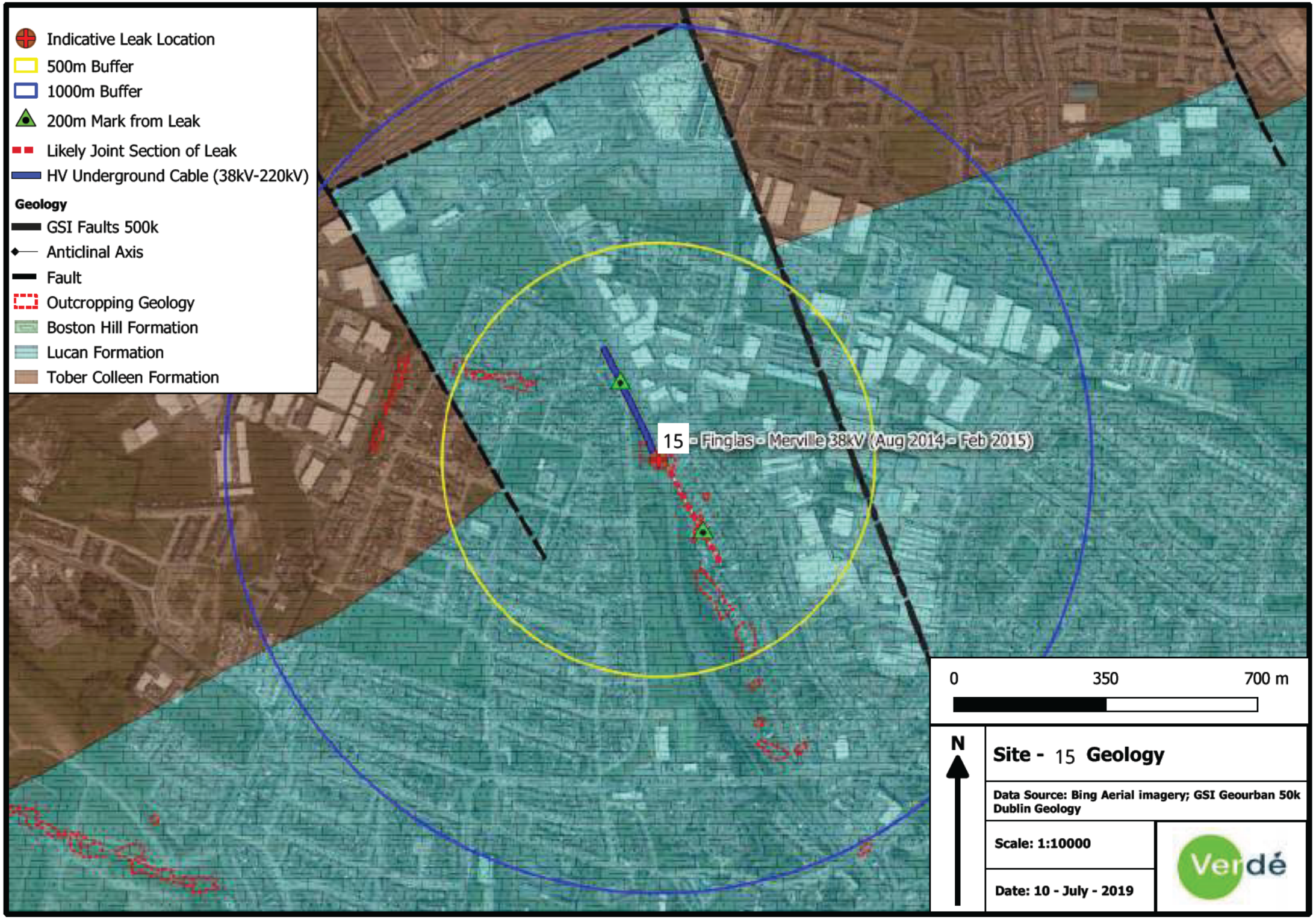
DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
T.O'Rourke	T.O'Rourke	J. Fitzpatrick	A.M. Casey	28/06/2019

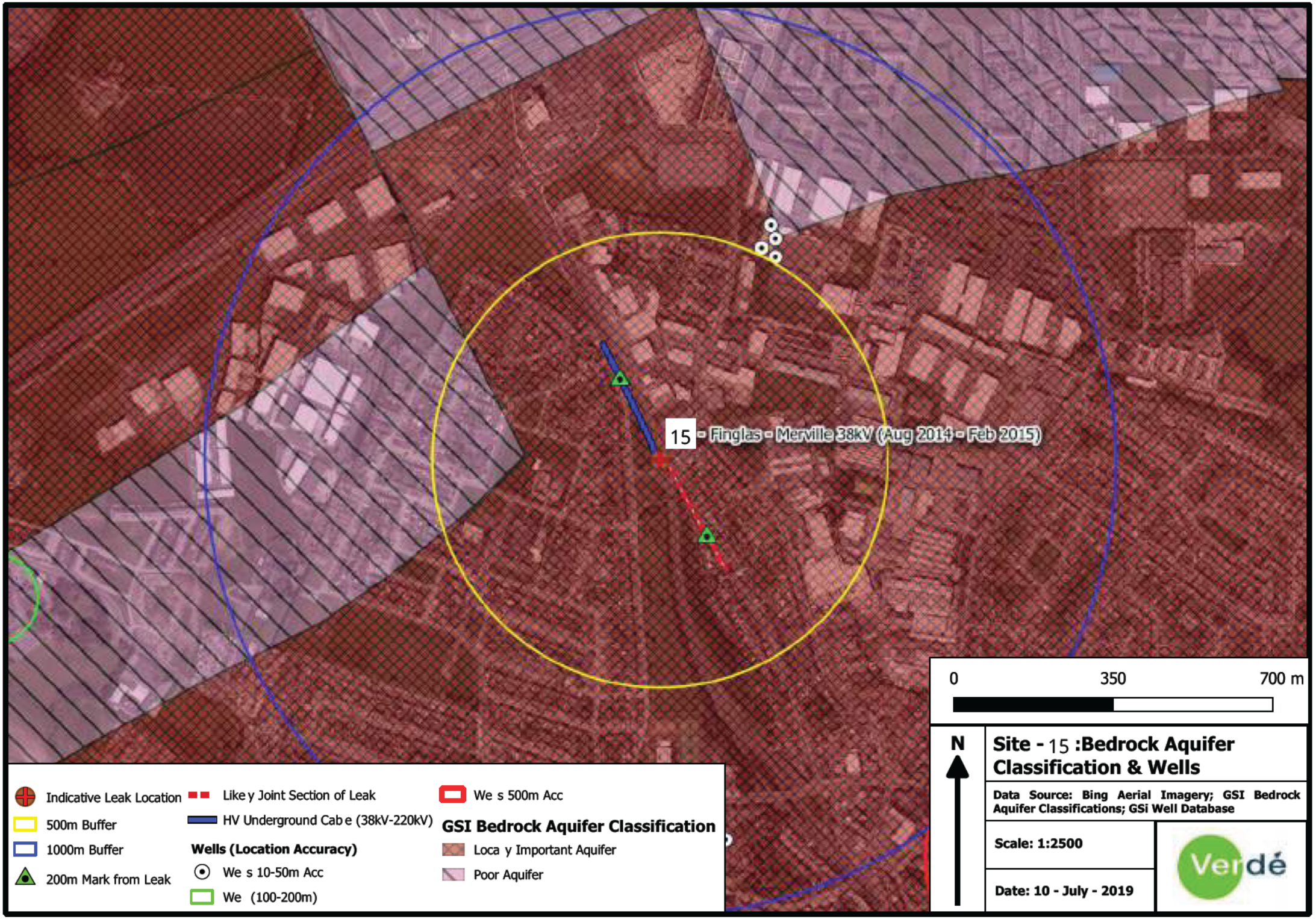
CLIENT REF.	Revision	NO. OF SHEETS	SIZE	SCALE
00-00	2	1 of 1	A3	1:2,000

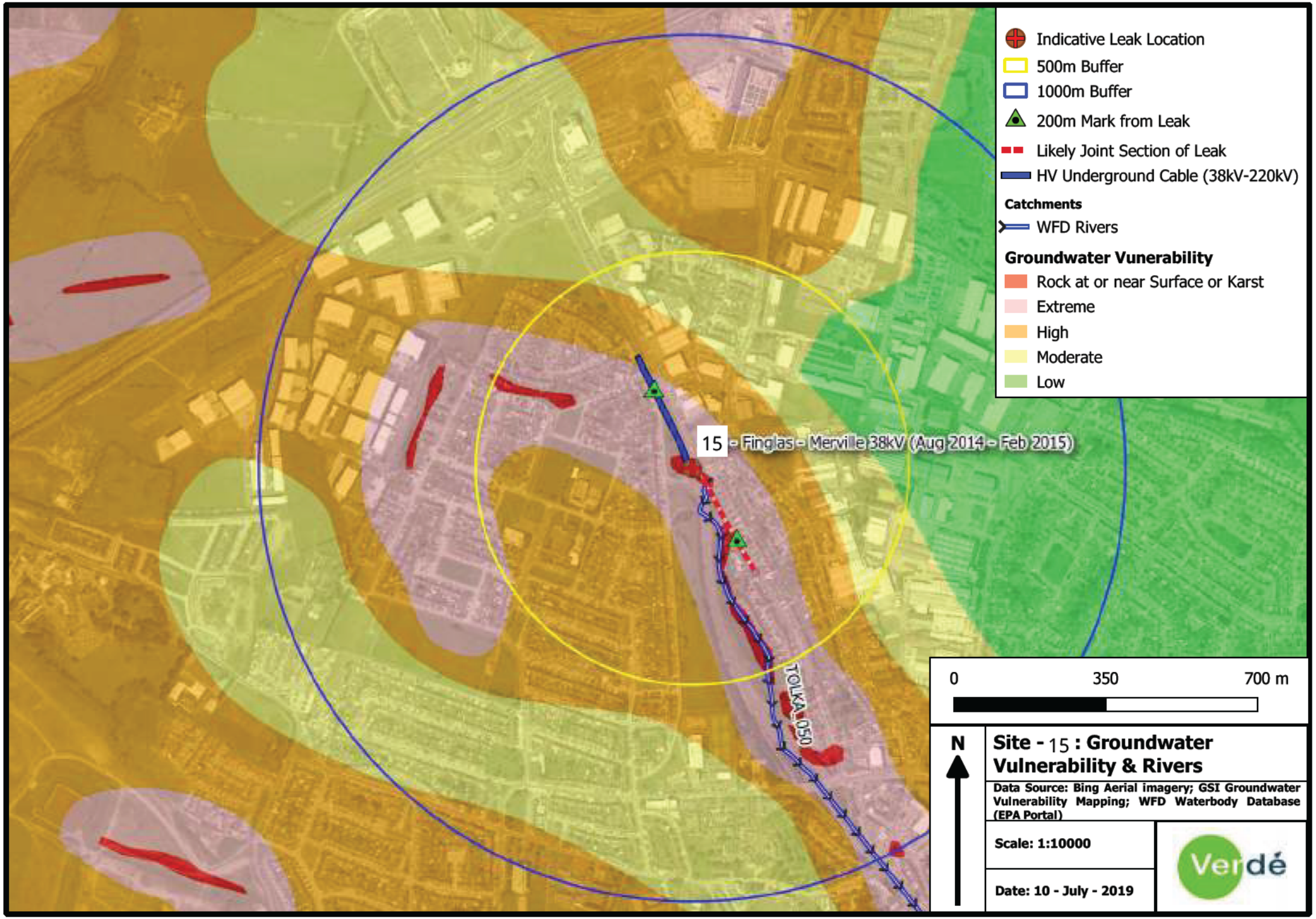
DRAWING NUMBER: QD-354120-01-D460-001-019-002

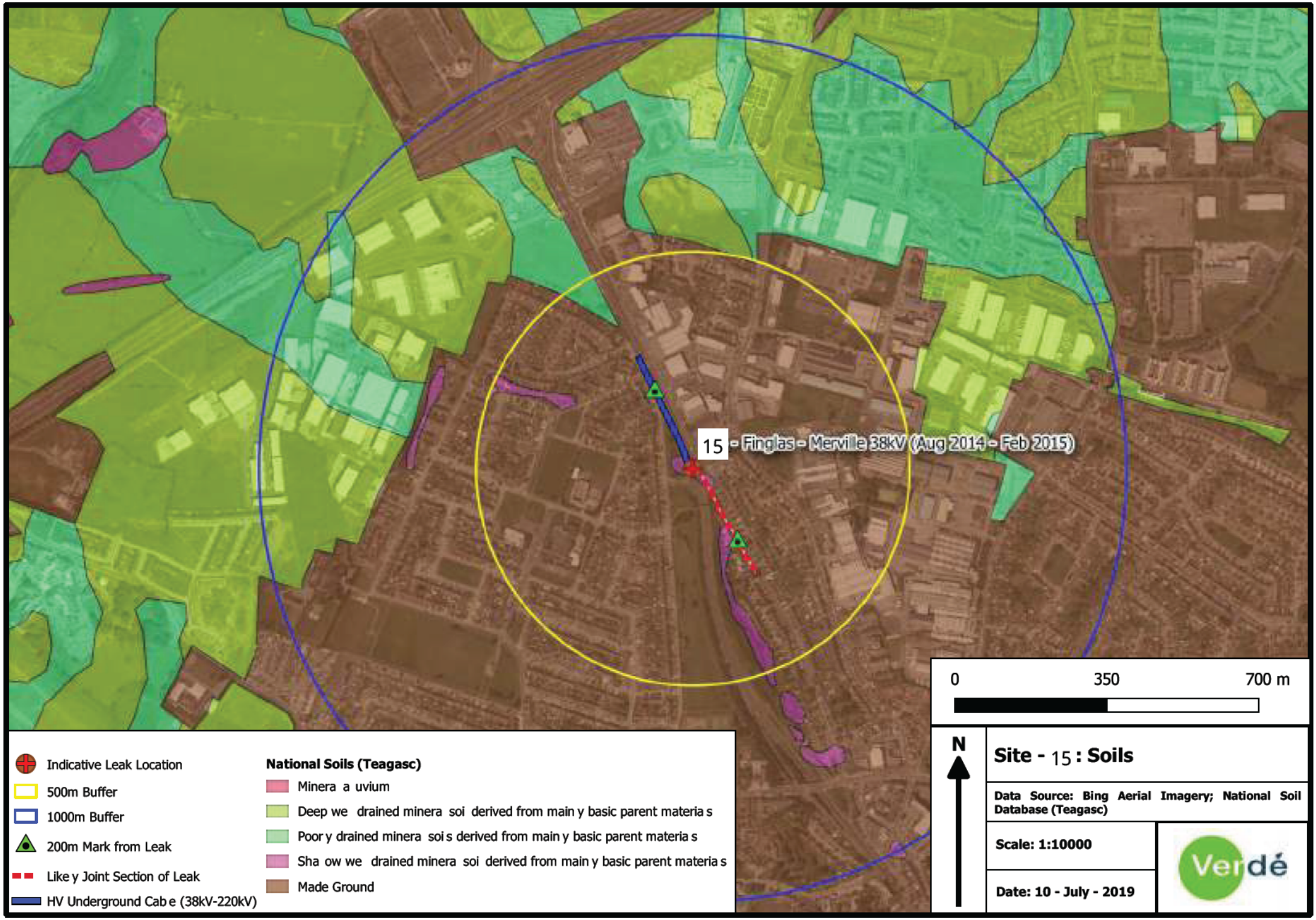
APPENDIX B

DESK STUDY MAPS

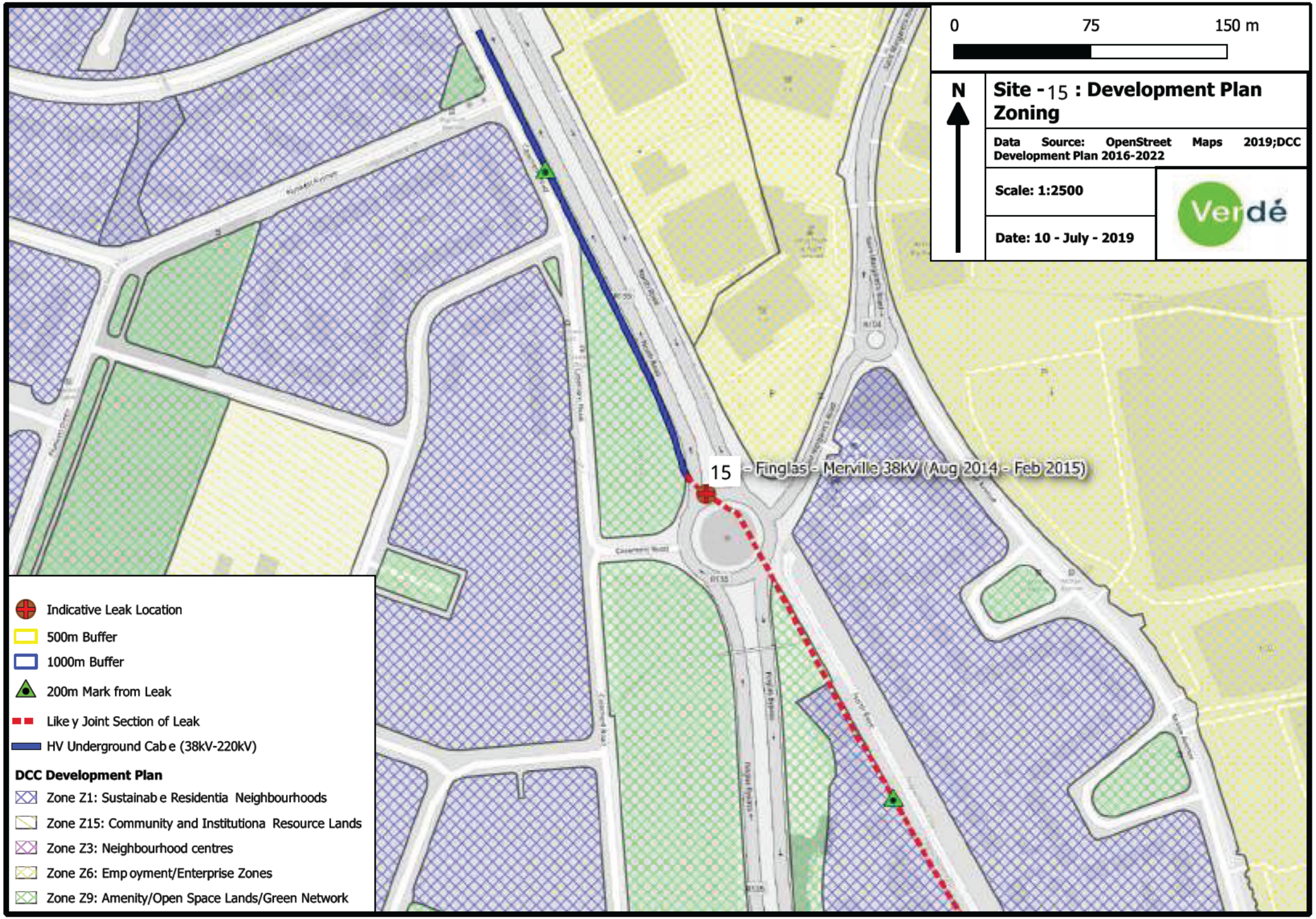

Indicative Leak Location
500m Buffer
1000m Buffer
200m Mark from Leak
Likely Joint Section of Leak
HV Underground Cable (38kV-220kV)
Geology
GSI Faults 500k
Anticlinal Axis
Fault
Outcropping Geology
Boston Hill Formation
Lucan Formation
Tober Colleen Formation
15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
0
350
700 m
N
Site - 15 Geology
Data Source: Bing Aerial imagery; GSI Geourban 50k Dublin Geology
Scale: 1:10000
Date: 10 - July - 2019
Verdé

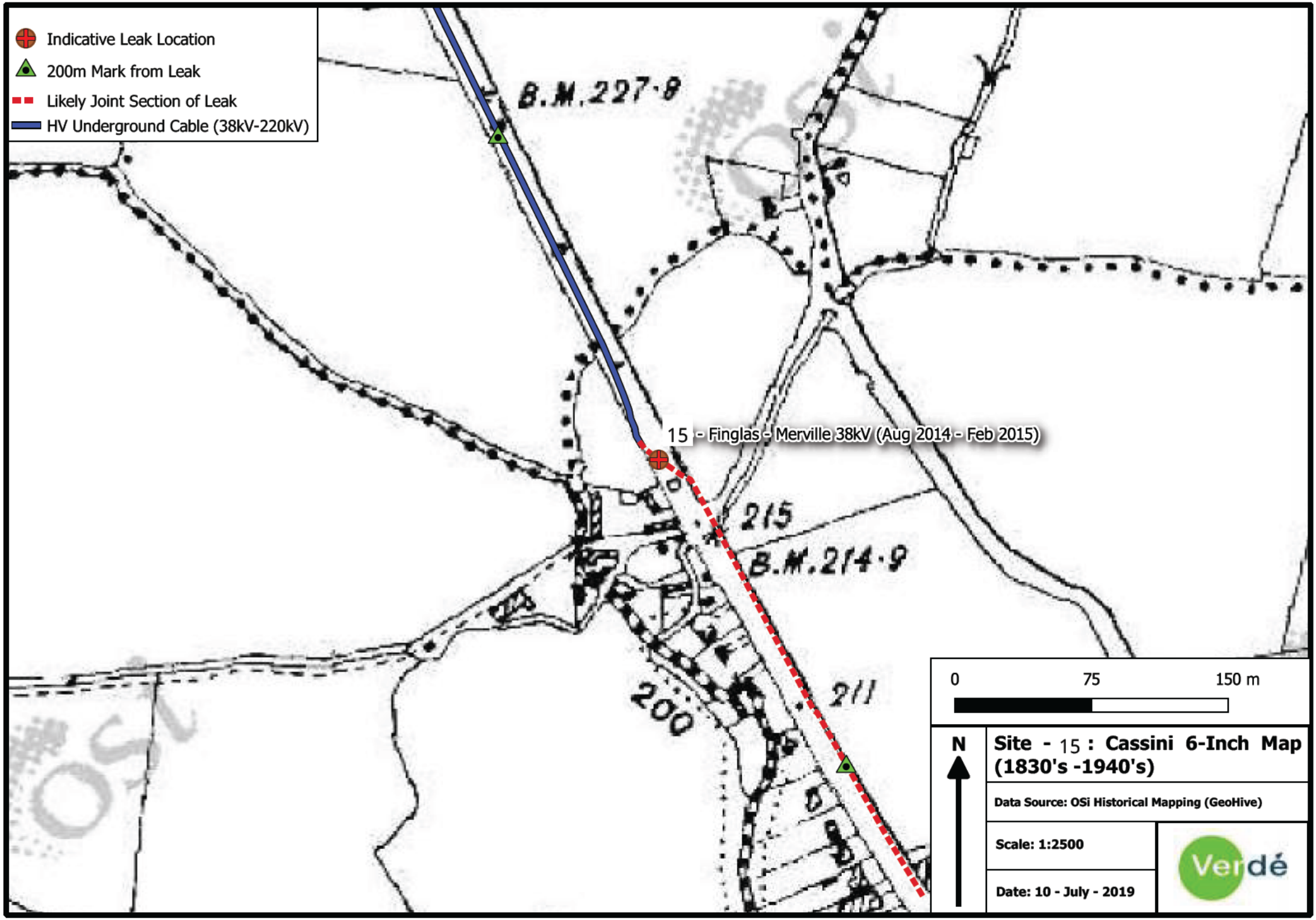

15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
Indicative Leak Location
500m Buffer
1000m Buffer
200m Mark from Leak
Likely Joint Section of Leak
HV Underground Cable (38kV-220kV)
Wells (Location Accuracy)
Wells 10-50m Acc
Wells (100-200m)
Wells 500m Acc
GSI Bedrock Aquifer Classification
Locally Important Aquifer
Poor Aquifer
0
350
700 m
N
Site - 15 :Bedrock Aquifer Classification & Wells
Data Source: Bing Aerial Imagery; GSI Bedrock Aquifer Classifications; GSi Well Database
Scale: 1:2500
Date: 10 - July - 2019
Verdé

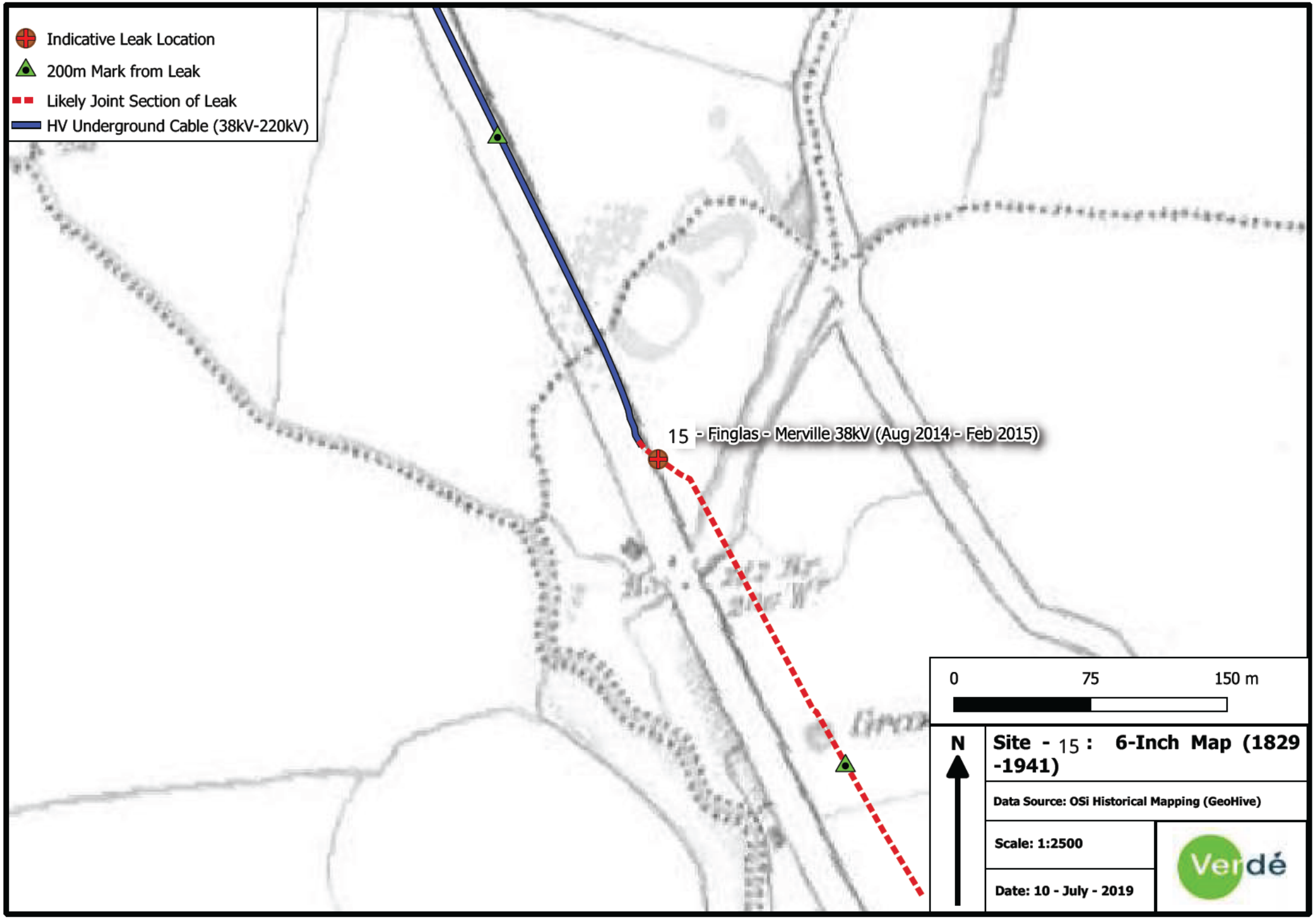

Indicative Leak Location
500m Buffer
1000m Buffer
200m Mark from Leak
Likely Joint Section of Leak
HV Underground Cable (38kV-220kV)
Catchments
WFD Rivers
Groundwater Vunerability
Rock at or near Surface or Karst
Extreme
High
Moderate
Low
15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
TOLKA 050
0
350
700 m
N
Site - 15 : Groundwater Vulnerability & Rivers
Data Source: Bing Aerial imagery; GSI Groundwater Vulnerability Mapping; WFD Waterbody Database (EPA Portal)
Scale: 1:10000
Date: 10 - July - 2019
Verdé

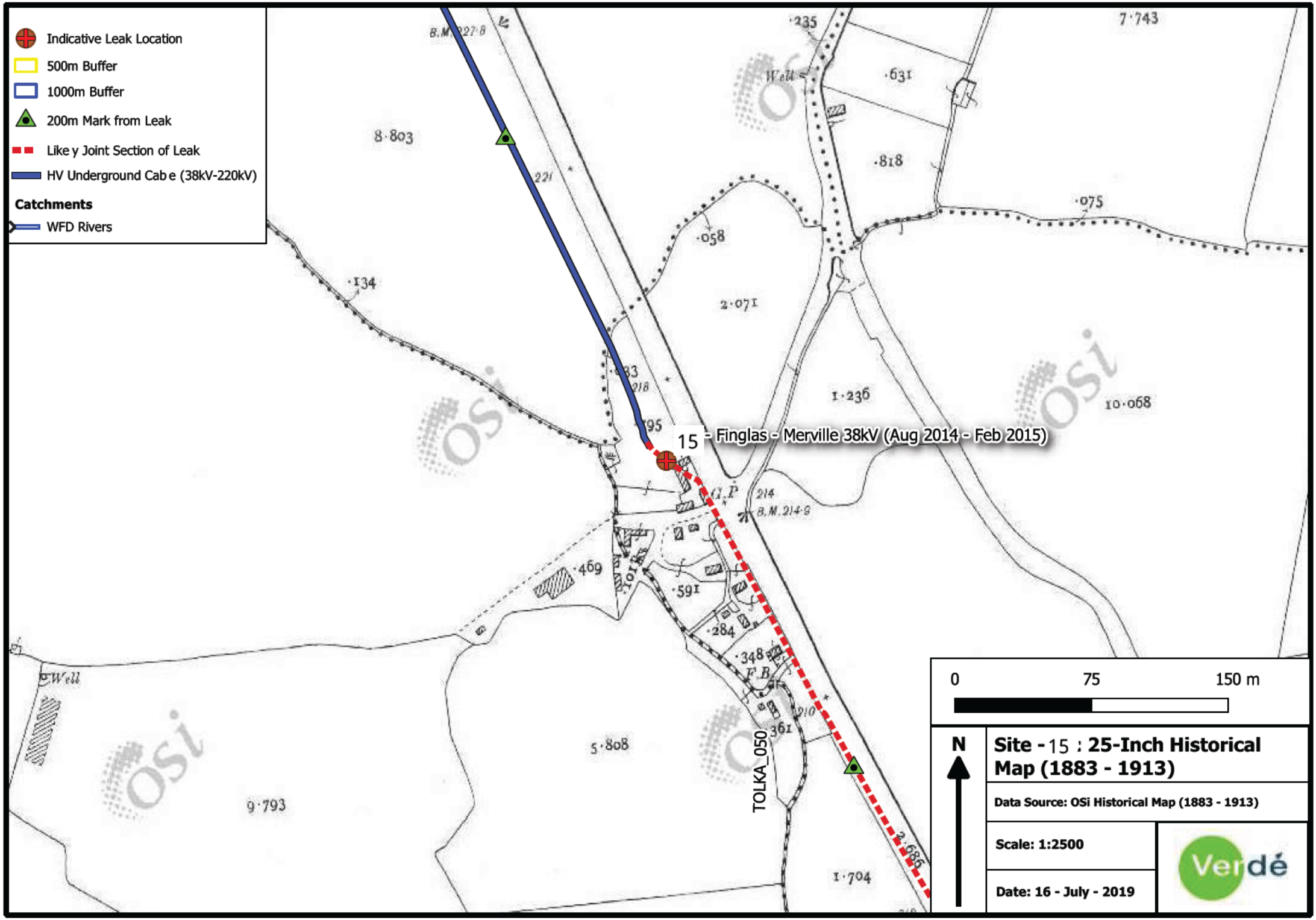

15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
Indicative Leak Location
500m Buffer
1000m Buffer
200m Mark from Leak
Like y Joint Section of Leak
HV Underground Cab e (38kV-220kV)
National Soils (Teagasc)
Minera a uvium
Deep we drained minera soi derived from main y basic parent materia s
Poor y drained minera soi s derived from main y basic parent materia s
Sha ow we drained minera soi derived from main y basic parent materia s
Made Ground
0
350
700 m
N
Site - 15 : Soils
Data Source: Bing Aerial Imagery; National Soil Database (Teagasc)
Scale: 1:10000
Date: 10 - July - 2019
Verdé

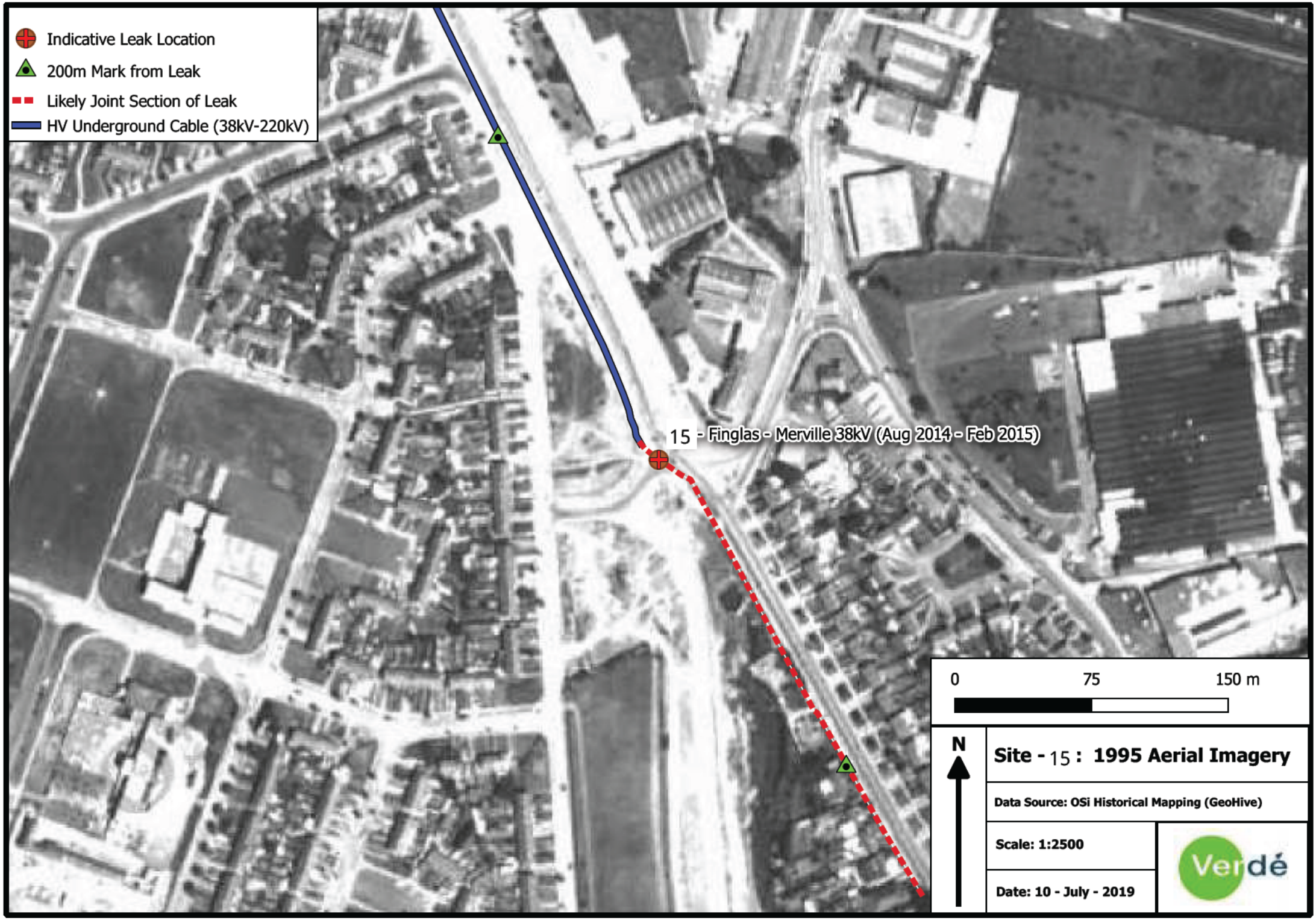

Indicative Leak Location
500m Buffer
1000m Buffer
200m Mark from Leak
Like y Joint Section of Leak
HV Underground Cab e (38kV-220kV)
GSI Soil Permeability
High
Low
Not app icab e, DTB<3m
0
350
700 m
N
Site - 15 : Soil Permeability
Data Source: Bing Aerial Imagery; GSI (Sub)Soil Permeability Mapping
Scale: 1:10000
Date: 10 - July - 2019
Verdé
15
- Finglas - Merville 38kV (Aug 2014 - Feb 2015)


0
75
150 m
N
Site - 15 : Development Plan Zoning
Data Source: OpenStreet Maps 2019;DCC Development Plan 2016-2022
Scale: 1:2500
Date: 10 - July - 2019
Verdé
15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
Indicative Leak Location
500m Buffer
1000m Buffer
200m Mark from Leak
Like y Joint Section of Leak
HV Underground Cab e (38kV-220kV)
DCC Development Plan
Zone Z1: Sustainab e Residentia Neighbourhoods
Zone Z15: Community and Institutiona Resource Lands
Zone Z3: Neighbourhood centres
Zone Z6: Emp oyment/Enterprise Zones
Zone Z9: Amenity/Open Space Lands/Green Network


Indicative Leak Location
200m Mark from Leak
Likely Joint Section of Leak
HV Underground Cable (38kV-220kV)
B.M.227·8
15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
215
B.M.214·9
200
211
0
75
150 m
N
Site - 15 : Cassini 6-Inch Map (1830's -1940's)
Data Source: OSi Historical Mapping (GeoHive)
Scale: 1:2500
Date: 10 - July - 2019
Verdé


Indicative Leak Location
200m Mark from Leak
Likely Joint Section of Leak
HV Underground Cable (38kV-220kV)
15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
0
75
150 m
N
Site - 15 : 6-Inch Map (1829 -1941)
Data Source: OSi Historical Mapping (GeoHive)
Scale: 1:2500
Date: 10 - July - 2019
Verdé


Indicative Leak Location
500m Buffer
1000m Buffer
200m Mark from Leak
Like y Joint Section of Leak
HV Underground Cab e (38kV-220kV)
Catchments
WFD Rivers
15
- Finglas - Merville 38kV (Aug 2014 - Feb 2015)
TOLKA_050
0
75
150 m
N
Site - 15 : 25-Inch Historical Map (1883 - 1913)
Data Source: OSi Historical Map (1883 - 1913)
Scale: 1:2500
Date: 16 - July - 2019
Verdé


Indicative Leak Location
200m Mark from Leak
Likely Joint Section of Leak
HV Underground Cable (38kV-220kV)
15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
0
75
150 m
N
Site - 15 : 1995 Aerial Imagery
Data Source: OSi Historical Mapping (GeoHive)
Scale: 1:2500
Date: 10 - July - 2019
Verdé


Indicative Leak Location
200m Mark from Leak
Likely Joint Section of Leak
HV Underground Cable (38kV-220kV)
15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
0
75
150 m
N
Site - 15 : 2000 Aerial Imagery
Data Source: OSi Historical Mapping (GeoHive)
Scale: 1:2500
Date: 10 - July - 2019
Verdé


Indicative Leak Location
200m Mark from Leak
Likely Joint Section of Leak
HV Underground Cable (38kV-220kV)
15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
0
75
150 m
N
Site - 15 : 2005 Aerial Imagery
Data Source: OSi Historical Mapping (GeoHive)
Scale: 1:2500
Date: 10 - July - 2019
Verdé


Indicative Leak Location
200m Mark from Leak
Likely Joint Section of Leak
HV Underground Cable (38kV-220kV)
15 - Finglas - Merville 38kV (Aug 2014 - Feb 2015)
0
75
150 m
N
Site - 15 : Digital Globe Aerial Imagery
Data Source: OSi Historical Mapping (GeoHive)
Scale: 1:2500
Date: 10 - July - 2019
Verdé

APPENDIX C

SITE PHOTOGRAPHS

Photo 1: View of roundabout looking south along R135. Location of roundabout is approximately 920m from M50 (Junction 5). Indicative location of leak is beneath road adjacent to RHS of northern margin of central reservation.

Photo 2: View of trench repair works completed on road at suspected location of leak.

Photo 3 and 4: Kiosks and service manholes adjacent to boundary with Lidl car park at junction of R104 exit of roundabout (western exit)

Photo 5 and 6: Grey ESB box labelled “Danger – Keep Away” and access to cabling in ground at location within green associated with Casement Road residential estate. Ground covers are imprinted with warning “Danger – electrical cables”. Roundabout in background. Leak location is circa. 10m to east of this location.

Photo 7: Chamber suspected to be associated with the culverted Bachelors Stream. The chamber is located at the junction of Casement Road with roundabout access (just east of roundabout, approximately 60m west of identified leak point. Source of river is known to be adjacent to roundabout.

Photo 8: View to north along R135 with signs for M50 in background. Cable route is along pavement on LHS of northbound carriageway.

Photo 9: View to north of roundabout from pedestrian overpass. Likely joint section of leak crosses from left to right side of R135 above, just on far side of roundabout. It skirts far side of roundabout and veers down North Road (not in shot but to RHS above).

Photo 10: Looking south from pedestrian overpass of R135, just south of roundabout. HV Underground Cable (38 kV - 220 kV) is routed through Mellowes Park which bounds the western side of R135. Ground elevation in park is noticeably higher. Bachelors Stream is to the east of the R135 and flowing in a southerly direction from roundabout. Stream could not be accessed. Known that most of along stream route is culverted.

Photo 11: North Road at base of pedestrian overpass. This is location where suspected leak section has crossed R135 and is routed along North Road. No indication of leaking was observed at the surface along this section. Bachelor Stream is downgradient of the cable along a section of North Road where the cable is located within the pavement and the stream is located behind the back gardens of houses along North Road. The stream was not observed during walkover (either culverted or no access possible).

APPENDIX D

MSDS FOR COPC

MATERIAL SAFETY DATA SHEET

1: IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name: T 3788

Application: Hollow-core Energy Cable Saturant

Company: H&R ESP Ltd.

Address: Matrix House
North 4th Street
Milton Keynes, MK9 1NJ
United Kingdom

Telephone: +44 (0)1908 351 111 Fax: +44 (0)1908 351122

2: COMPOSITION / INFORMATION ON INGREDIENTS

Composition: Low viscosity compound based on a blend of linear alkyl benzenes that have side alkyl chains of 10 – 13 carbon atoms in length.

Synonyms: Linear Alkyl Benzenes
Alkyl C10-C13, benzenes
Benzene, C10-13-alkyl-deriv.
Detergent Alkylate

Composition	EINECS number	CAS number	Symbol letters	Risk numbers	Concentration range
C10 – C13 Linear Alkyl Benzenes	267-051-0	67774-74-7	Not regulated		100%

All constituents of this product are listed in EINECS (European Inventory of Existing Commercial Chemical Substances) or ELINCS (European List of Notified Chemical Substances) or are exempt.

3: HAZARDS IDENTIFICATION

Classification of preparation: This product is not classified as a dangerous substance / preparation in accordance with The Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 (CHIP3).

Physical and Chemical Properties: Not classified as flammable, but will burn. Avoid contact with strong oxidisers.

Health Effects

Skin:	Contact with the skin may cause irritation. Prolonged or repeated skin contact may cause drying of the skin, progressing to dermatitis. Symptoms may include itching, discolouration, swelling and blistering.
Eyes:	Contact with the eyes may cause irritation. Symptoms may include reddening, swelling and impaired vision.
Ingestion:	Ingestion of small amounts may cause nausea and vomiting.
Inhalation:	Due to low volatility, this product should not present an inhalation hazard under ambient conditions. Exposure to vapour or mineral oil mists may irritate the mucous membranes and cause dizziness, headaches and nausea.

Environmental Effects

No specific hazards under normal use conditions.

4: FIRST AID MEASURES

Inhalation:	Remove from further exposure. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance and call a doctor. If breathing has stopped, administer artificial respiration.
Skin contact:	Remove contaminated clothing and wash affected skin with soap and water. If persistent irritation occurs, obtain medical attention. If high pressure injection injuries occur, obtain medical attention immediately.
Eye contact:	Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.
Ingestion:	Wash out mouth with water and obtain medical attention. DO NOT INDUCE VOMITING.

5: FIRE FIGHTING MEASURES

Suitable extinguishing media:	Carbon dioxide (CO_2), dry chemical, foam or water spray.
Unsuitable extinguishing media:	Do not use water jets.
Special exposure hazards:	Combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates and gases, including carbon monoxide, and unidentified organic and inorganic compounds.
Special protective equipment:	Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Spilt product presents a significant slip hazard. Remove any sources of heat.
Environmental Precautions:	Prevent from spreading or entering into drains, sewers and watercourses by using inert absorbent material or other appropriate barriers. Inform local authorities if this cannot be prevented.
Methods for cleaning up:	Absorb liquid with inert absorbent material. Sweep up and remove to a suitable, clearly marked container for disposal in accordance with local and national regulations

7: HANDLING AND STORAGE

Handling:	Do not eat, drink or smoke whilst using this product. To avoid the possibility of skin disorders repeated or prolonged contact with products of this type must be avoided. It is essential to maintain a high standard of personal hygiene.
Storage:	Store in a cool place away from sources of heat and out of direct sunlight to avoid pressure build up. Do not store near oxidisers.

Handling and Storage Materials and Coatings

Suitable:	Carbon steel, baked epoxy or Phenolic coatings, aluminium.
Unsuitable:	Natural rubber, Butyl rubber

8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Limits:	Not established.
Engineering control measures:	Use of local exhaust ventilation is recommended whenever this product is used in a confined space, is heated above ambient temperatures, or is agitated.
Hygiene measures:	Wash hands before eating, drinking, smoking and using the toilet. Gloves should be washed before being removed.
Respiratory Protection:	Normally not required if adequate ventilation is in place. Where concentrations in air may exceed the limits given in this section, it is recommended to use a half mask respirator to protect from over exposure by inhalation. Suitable filter material depends on the amount and type of chemicals being handled, but filter material suitable for organic vapours may be considered for use.
Hand Protection:	When handling this product it is recommended to wear chemical resistant gloves. Suggested materials for protective gloves include: PVC, Neoprene or similar.
Eye Protection:	Wear eye protection such as safety glasses, chemical goggles, or face shield if engineering controls or work practices are not adequate to prevent eye contact. Have suitable eye wash water available.

Skin Protection:	Wear impervious protective clothing to prevent skin contact. Selection of protective clothing may include gloves, apron, boots, and complete facial protection depending on operations conducted.

9: PHYSICAL AND CHEMICAL PROPERTIES

General Information

Appearance:	Clear, colourless liquid
Odour:	Mild petroleum odour

Health, safety and environmental information

pH:	Not determined
Boiling point/range:	280℃
Flash point:	>135℃
Flammability:	Non flammable
Explosive properties:	Not explosive
Oxidising properties:	Not applicable
Vapour pressure at 20℃:	<0.02 kPa
Density:	0.86 g/cm^{-3} at 20℃ typical
Solubility in water:	Insoluble
Kinematic Viscosity at 20℃:	4.0 – 4.5 cSt (4.0 – 4.5 mm^2/s) typical
Vapour density (Air=1):	>1
Evaporation rate:	Not determined

Other information

Pour point:	-60℃ typical
Expansion coefficient:	0.0007 /℃ typical
Neutralisation value:	0.03 mg KOH g^{-1} maximum

10: STABILITY AND REACTIVITY

Chemical stability:	This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure and will not polymerise.
Conditions to avoid:	Temperatures above 140℃
Materials to avoid:	Strong oxidising agents, such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, peroxides etc, as this may present an explosion hazard.
Hazardous decomposition products:	Carbon monoxide and irritant fumes may be generated if this product is burned in an enclosed space.

11: TOXICOLOGICAL INFORMATION

Basis for assessment:	Toxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the toxicology of similar products.
Acute toxicity:	Oral LD50 expected to be >5000 mg/kg (rat) Inhalation LC50/4hr expected to be >1.8 mg/l (rat) Dermal LD50 expected to be >2000 mg/kg (rabbit)
Corrosivity/irritation:	
Eye:	May be slightly irritant
Skin:	May be slightly irritant
Respiratory tract:	If mists are inhaled, slight irritation of the respiratory tract may occur
Skin sensitisation:	Not expected to be a skin sensitiser
Repeated-dose toxicity:	Prolonged and/or repeated contact may lead to irritation and possibly dermatitis, especially under conditions of poor personal hygiene.
Mutagenicity:	Not expected to be a mutagen.
Carcinogenicity:	Not expected to be a carcinogen.
Reproductive toxicity:	The preparation has not been assessed at all for this end-point, so its hazardous property in this regard is not known.

12: ECOLOGICAL INFORMATION

Basis for assessment:	Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products.
Ecotoxicity:	Poorly soluble mixture. Product is not expected to be ecotoxic to fish/daphinia/algae, or sewage bacteria. This preparation is expected to be removed in a wastewater treatment facility
Mobility:	Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.
Persistence and degradability:	Readily biodegradable. Soils degradation – half life approx. 15 days. Natural waters degradation – half life approx. 4 – 9 days.
Bioaccumulative potential:	May have the potential to bioaccumulate

13: DISPOSAL CONSIDERATIONS

Disposal must be in accordance with local and national legislation.

Unused Product:	Dispose of through an authorised waste contractor to a licensed site. May be incinerated.
Used/Contaminated Product:	Dispose of through an authorised waste contractor to a licensed site. May be incinerated.
Packaging:	Dispose of through an authorised waste contractor. May be steam cleaned and recycled.

14: TRANSPORT INFORMATION

This product is not classified as dangerous for transport.

15: REGULATORY INFORMATION

Classification/Symbol: Not Regulated

This preparation is not classified as Dangerous according to EU Directives

This safety data sheet is intended to assist in compliance with the following UK legislation:

- Chemicals (Hazard Information and Packaging for Supply) Regulations 2002
- Control of Substances Hazardous to Health Regulations 2002.
- Health and Safety at Work, etc. Act 1974.
- Environmental Protection Act 1990
- Environmental Protection (Duty of Care) Regs. 1991
- COSHH essentials: Easy steps to control chemicals. Control of Substances Hazardous to Health Regulations

Further Guidance
The following guidance notes are available from HMSO or HSE.

Occupational exposure limits (EH 40). Effects of mineral oil on the skin (SHW 397).
Preventing dermatitis at work (INDG 233)
A step by step guide to COSHH assessment (HSG 97)
Assessing and managing risks at work from skin exposure to chemical agents (HSG 205)
The selection, use and maintenance of respiratory protective equipment: A practical guide (HSG 53)
Relevant EC Directives:

- Dangerous Substances Directive (DSD)
- Dangerous Preparations Directive (DPD)
- Safety Data Sheets Directive (SDSD)
- Health & Safety Framework Directive

16: OTHER INFORMATION

This data sheet was prepared in accordance with Commission Directive 2001/58/ECand SI 2002 No. 1689 (CHIP 3)

Key References:

- Chemicals (Hazard Information and Packaging for Supply) Regulations 2002
- The compilation of safety data sheets. Approved Code of Practice (third edition)
- Approved supply list (7th Edition). Information approved for the classification and labelling of substances and preparations dangerous for supply. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002
- Approved classification and labelling guide. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002. Guidance on regulations (Fifth edition).
- EH40/2005 Workplace Exposure Limits 2005
- COSHH essentials: Easy steps to control chemicals. Control of Substances Hazardous to Health Regulations
- European Inventory of Existing Commercial Substances (EINECS)

The data and advice given apply when the product is sold for the stated application or applications. The product is not sold as suitable for any other application. Use of the product for applications other than as stated in this sheet may give rise to risks not mentioned in this sheet. You should not use the product other than for the stated application or applications without seeking advice from us.

If you have purchased the product for supply to a third party for use at work, it is your duty to take all necessary steps to secure that any person handling or using this product is provided with the information in this sheet.

If you are an employer, it is your duty to tell your employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken.

We believe, in good faith and to the best of our knowledge that the preceding information is accurate. However, we give no guarantee or warranty in this respect. The information provided herein may not be adequate for all individuals and/or all situations. The purchaser/user of the product remains responsible for storing, using or dealing with the product safely and in accordance with all applicable laws and regulations.

Safety Data Sheet
(93/112/EC)

Date of edition: October 1995

1. Identification of Substance/Preparation and Company

Product name:
Masse 106
Supplier:
FELTEN & GUILLEAUME Energietechnik AG
Schanzenstraße 24-30
51063 Köln
Emergency telephone number: 0221/676-3333

2. Composition/Information on Ingredients

Blend of highly refined mineral oils and additives.
On the basis of available information, the components of this preparation are not expected to impart hazardous properties to this product.

3. Hazards Identifikation

Human Health Hazards

If swallowed, aspiration into the lungs may cause chemical pneumonitis.
Prolonged or repeated exposure may give rise to dermatitis.
No specific hazards under normal use conditions.

Safety hazards

The preparation contains mineral oil, for which an exposure limit for oil mist applies.

Environmental hazards

Avoid spillage.
The product is not readily biodegradable.

4. First Aid Measures

Inhalation

Remove to fresh air.
If breathing but unconscious, place in the recovery position.
If breathing has stopped, apply artificial respiration.
Medical attention is to be obtained immediately.

Skin

Remove contaminated clothing and wash affected skin with soap and water.

If high pressure injection injuries occur, obtain medical attention immediately.

Eye

Rinse immediately with plenty of water for ar least 10 minutes and seek medical advice.

Ingestion

Do not induce vomiting.
Aspiration into the lungs may occur directly or following ingestion. This can cause chemical pneumonitis which may be fatal.
If breathing but unconscious, place in the recovery position.
If breathing has stopped, apply artificial respiration.
Medical attention is to be obtained immediately.

Advice to physicians

Treat symptomatically

5. Fire Fighting Measures

Extinguishing media

Foam, dry chemical powder, carbon dioxide, sand or earth.

Safety Data Sheet
(93/112/EC)

Date of edition: October 1995

Product name: Masse 106

5. Fire Fighting Measures (continued)

Unsuitable extinguishing media

Do not use water in a jet

Specific hazards

- Combustion is likely to give rise to a complex mixture of gases and airborne particulates, including carbon monoxide, oxides of sulphur and unidentified organic and inorganic compounds.

6. Accidental Release Measures

Personal precautions

Ventilate contaminated area thoroughly.

Minimise contact with skin.

Environmental precautions

Prevent further leakage or spillage and prevent from entering drains.

Prevent from spreading or entering into drains, ditches or rivers by using sand, earth or other appropriate barriers.

Clean-up methods

Absorb or contain liquid with sand, earth or spill control material.

Shovel into a suitable, clearly marked container for disposal or reclamation in accordance with local regulations.

7. Handling and Storage

Handling

When using do not eat or drink.

When handling product in drums, safety footwear should be worn and proper handling equipment should be used

Prevent spillages.

Storage

Keep container tightly closed and in a well ventilated place. Avoid direct sunlight, heat sources and strong oxidising agents.

Recommended materials: mild steel, high density polyethylene for containers or container linings.

8. Exposure Controls/Personal Protection

Engineering control measures

Use only in well ventilated areas.

Occupational exposure standards

Component name	Limit type	Value/Unit	Other information
Oil mist	8 h TWA	5 mg/m³	ACGIH
	10 min STEL	10 mg/m³	ACGIH

Respiratory Protection

Not normally required.

If oil mist cannot be controlled, a respirator fitted with an organic vapour cartrige combined with a particulate prefilter should be used.

Hand Protection

PVC or nitril rubber gloves if splashes are likely to occur and if applicable.

Eye Protection

Safety spectacles

Body Protection

Minimise all forms of skin contact.

Safety Data Sheet
(93/112/EC)

Date of edition: October 1995

Product name: Masse 106

8. Exposure Controls and Personal Protection (continued)

Hygiene measures

Don't keep oily rags in your pockets.

Wash hands before eating and drinking.

9. Physical and Chemical Properties

form	liquid	
colour	yellow	
pourpoint	< -60°C	DIN ISO 3016
flashpoint	145°C	DIN 51758
flammability - lower limit (vol%)	0,6	
flammability - upper limit (vol%)	6,5	
vapour pressure (20°C)	< 0,01 hPa	
density (15°C)	888 kg/m³	DIN 51757
solubility in water (20°C)	negligible	
n-octanol/water partition coeff	na	
kinematic viscosity (40°C)	8,5 mm²/s	DIN 51562

10. Stability/Reactivity

Stability

stable under normal use conditions

Materials to avoid

strong oxidising agents

Hazardous decomposition products

Hazardous decomposition products are not expected to form during nonnal storage.

11. Toxicological Information

Toxicological Data:

Acute toxicity - oral

LD 50 is expected to be > 2000 mg/kg.

Irritation of skin, irritation of eye

The product is expected to be slightly irritant.

Sensitisation of skin

The produkt is not expected to be a skin sensitiser.

Prolonged and/or repeated contact

Prolonged/repeated contact may cause defatting of the skin, which can lead to dermatitis and may make the skin more susceptible to irritation and penetration by other materials.

Carcinogenicity

Product is based on mineral oils of types shown to be non-carcinogenic in animal skin-painting studies. Other components are not known to be associated with carcinogenic effects.

Other information

Aspiration into the lungs may occur directly or following ingestion. This can cause chemical pneumonitis which may be fatal.

Information given is based on a knowledge of the toxicology of similar products.

Safety Data Sheet
(93/112/EC)

Date of edition: October 1995

Product name: Masse 106

12. Ecological Information

Basis for assessment

Information given is based on data on the components and the ecotoxicology of similar products.

Mobility

Product floats on water. It is liquid under most environmental conditions.
If it enters soil, it will be adsorbed to soil particles and will not be mobile.
Product has the potential to bioaccumulate.

Ecotoxicity

Product is expected to be practically non-toxic to aquatic organisms, LC/EC50 > 100 mg/L.

13. Disposal Considerations

Product

Precautions: Dispose to licensed disposal contractor.
Waste disposal Nr. (D): 54106

Container disposal

Drain container thoroughly.
Dispose to licensed disposal contractor.

Recomanded cleaning procedure

Cleaning by disposal contractor

14. Transport Information

Product is not dangerous for conveyance under UN, IMO, ADR/RID and IATA/ICAO codes. (According ADR/RID regulations from 1.1.1995)

15. Regulatory Information

Classification

The Product is not classified as dangerous under EC criteria.

16. Other Information

Additional informations

Concawe Report 5/87 Health Aspects of Lubricants.

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should therefore not be construed as guaranteeing any specific property of the product.

Material Safety Data Sheet

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

Material Name : **Shell Diala Cable Oil**
Uses : Insulating oil.
Product Code : 001D8369

Manufacturer/Supplier : **Shell UK Oil Products Limited**
PO BOX 3
Ellesmere Port
CH65 4HB
United Kingdom

Telephone : +44 (0) 151-350-4000
Fax : +44 (0) 151-350-4000
Email Contact for MSDS : If you have any enquiries about the content of this MSDS please email lubricantSDS@shell.com

Emergency Telephone Number : +44-(0) 151-350-4595

2. HAZARDS IDENTIFICATION

EC Classification : Harmful.

Health Hazards : Repeated exposure may cause skin dryness or cracking. Harmful: may cause lung damage if swallowed.

Signs and Symptoms : If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Ingestion may result in nausea, vomiting and/or diarrhoea.

Safety Hazards : Not classified as flammable but will burn.
Environmental Hazards : Not classified as dangerous for the environment.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Preparation Description : Alkyl benzene.

Hazardous Components

Chemical Identity	CAS	EINECS	Symbol(s)	R-phrase(s)	Conc.
Benzene, C10-C13 alkyl derivitives	67774-74-7	267-051-0	Xn	R65; R66	90.00 - 100.00 %

Additional Information : Refer to chapter 16 for full text of EC R-phrases.

4. FIRST AID MEASURES

Inhalation	:	No treatment necessary under normal conditions of use. If symptoms persist, obtain medical advice.
Skin Contact	:	Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available. If persistent irritation occurs, obtain medical attention.
Eye Contact	:	Flush eye with copious quantities of water. If persistent irritation occurs, obtain medical attention.
Ingestion	:	If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (37° C), shortness of breath, chest congestion or continued coughing or wheezing.
Advice to Physician	:	Treat symptomatically. Potential for chemical pneumonitis. Consider: gastric lavage with protected airway, administration of activated charcoal. Call a doctor or poison control center for guidance.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Specific Hazards	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Unidentified organic and inorganic compounds.
Suitable Extinguishing Media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media	:	Do not use water in a jet.
Protective Equipment for Firefighters	:	Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

6. ACCIDENTAL RELEASE MEASURES

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. See Chapter 13 for information on disposal. Observe the relevant local and international regulations.

Protective measures	:	Avoid contact with skin and eyes. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers.
Clean Up Methods	:	Slippery when spilt. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly.
Additional Advice	:	Local authorities should be advised if significant spillages

cannot be contained.

7. HANDLING AND STORAGE

General Precautions	:	Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Handling	:	Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment should be used.
Storage	:	Keep container tightly closed and in a cool, well-ventilated place. Use properly labelled and closeable containers. Storage Temperature: 0 - 50°C / 32 - 122°F The storage of this product may be subject to the Control of Pollution (Oil Storage) (England) Regulations. Further guidance maybe obtained from the local environmental agency office.
Recommended Materials	:	For containers or container linings, use mild steel or high density polyethylene.
Unsuitable Materials	:	PVC.
Additional Information	:	Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion. Exposure to this product should be reduced as low as reasonably practicable. Reference should be made to the Health and Safety Executive's publication "COSHH Essentials".

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

Occupational Exposure Limits

Exposure Controls	:	The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate ventilation to control airborne concentrations. Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.
Personal Protective Equipment	:	Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.
Respiratory Protection	:	No respiratory protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material. If engineering controls do not maintain airborne

		concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for combined particulate/organic gases and vapours [boiling point >65 °C (149 °F)] meeting EN141.
Hand Protection	:	Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: PVC, neoprene or nitrile rubber gloves. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.
Eye Protection	:	Wear safety glasses or full face shield if splashes are likely to occur. Approved to EU Standard EN166.
Protective Clothing	:	Skin protection not ordinarily required beyond standard issue work clothes. It is good practice to wear chemical resistant gloves.
Monitoring Methods	:	Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Environmental Exposure Controls	:	Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Colourless. Liquid at room temperature.
Odour	:	Slight hydrocarbon.
pH	:	Not applicable.
Initial Boiling Point and Boiling Range	:	> 280 °C / 536 °F estimated value(s)
Pour point	:	< -60 °C / -76 °F Data not available
Flash point	:	Typical 140 °C / 284 °F (PMCC / ASTM D93)
Upper / lower Flammability or Explosion limits	:	Typical 1 - 10 %(V)
Auto-ignition temperature	:	> 320 °C / 608 °F
Vapour pressure	:	< 0.5 Pa at 20 °C / 68 °F (estimated value(s))
Density	:	Typical 857 kg/m3 at 20 °C / 68 °F
Water solubility	:	Negligible.
n-octanol/water partition coefficient (log Pow)	:	> 6 (based on information on similar products)
Kinematic viscosity	:	Typical 4.2 mm2/s at 40 °C / 104 °F
Vapour density (air=1)	:	> 1 (estimated value(s))
Evaporation rate (nBuAc=1)	:	Data not available

10. STABILITY AND REACTIVITY

Stability	:	Stable.
Conditions to Avoid	:	Extremes of temperature and direct sunlight.
Materials to Avoid	:	Strong oxidising agents.
Hazardous Decomposition Products	:	Hazardous decomposition products are not expected to form during normal storage.

11. TOXICOLOGICAL INFORMATION

Basis for Assessment	:	Information given is based on data on the components and the toxicology of similar products.
Acute Oral Toxicity	:	Expected to be of low toxicity: LD50 > 5000 mg/kg , Rat Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.
Acute Dermal Toxicity	:	Expected to be of low toxicity: LD50 > 5000 mg/kg , Rabbit
Acute Inhalation Toxicity	:	Not considered to be an inhalation hazard under normal conditions of use.
Skin Irritation	:	Expected to be slightly irritating. Repeated exposure may cause skin dryness or cracking.
Eye Irritation	:	Expected to be slightly irritating.
Respiratory Irritation	:	Inhalation of vapours or mists may cause irritation.
Sensitisation	:	Not expected to be a skin sensitiser.
Repeated Dose Toxicity	:	Not expected to be a hazard.
Mutagenicity	:	Not considered a mutagenic hazard.
Carcinogenicity	:	Components are not known to be associated with carcinogenic effects.
Reproductive and Developmental Toxicity	:	Not expected to be a hazard.
Additional Information	:	Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal. ALL used oil should be handled with caution and skin contact avoided as far as possible.

12. ECOLOGICAL INFORMATION

Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products.

Acute Toxicity	:	Poorly soluble mixture. May cause physical fouling of aquatic organisms. Expected to be practically non toxic: LL/EL/IL50 > 100 mg/l (to aquatic organisms) (LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract).
Mobility	:	Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.
Persistence/degradability	:	Expected to be inherently biodegradable.
Bioaccumulation	:	Has the potential to bioaccumulate.
Other Adverse Effects	:	Product is a mixture of non-volatile components, which are not

expected to be released to air in any significant quantities. Not expected to have ozone depletion potential, photochemical ozone creation potential or global warming potential.

13. DISPOSAL CONSIDERATIONS

Material Disposal	:	Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses.
Container Disposal	:	Dispose in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
Local Legislation	:	Disposal should be in accordance with applicable regional, national, and local laws and regulations. EU Waste Disposal Code (EWC): 13 03 08 synthetic insulating and heat transmission oils. Classification of waste is always the responsibility of the end user. Hazardous Waste (England and Wales) Regulations 2005.

14. TRANSPORT INFORMATION

ADR
This material is not classified as dangerous under ADR regulations.

RID
This material is not classified as dangerous under RID regulations.

ADNR
This material is not classified as dangerous under ADNR regulations.

IMDG
This material is not classified as dangerous under IMDG regulations.

IATA (Country variations may apply)
This material is not classified as dangerous under IATA regulations.

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

EC Classification	:	Harmful.
EC Symbols	:	Xn Harmful.
EC Risk Phrases	:	R65 Harmful: may cause lung damage if swallowed. R66 Repeated exposure may cause skin dryness or cracking.
EC Safety Phrases	:	S62 If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

Chemical Inventory Status

EINECS	:	All components listed or polymer exempt.
TSCA	:	All components listed.
Classification triggering components	:	Contains alkyl benzene derivatives.
Other Information	:	Environmental Protection Act 1990 (as amended). Health and Safety at Work Act 1974. Consumers Protection Act 1987. Control of Pollution Act 1974. Environmental Act 1995. Factories Act 1961. Carriage of Dangerous Goods by Road and Rail (Classification, Packaging and Labelling) Regulations. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002. Control of Substances Hazardous to Health Regulations 1994 (as amended). Road Traffic (Carriage of Dangerous Substances in Packages) Regulations. Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations. Road Traffic (Carriage of Dangerous Substances in Road Tankers in Tank Containers) Regulations. Road Traffic (Training of Drivers of Vehicles Carrying Dangerous Goods) Regulations. Reporting of Injuries, Diseases and Dangerous Occurrences Regulations. Health and Safety (First Aid) Regulations 1981. Personal Protective Equipment (EC Directive) Regulations 1992. Personal Protective Equipment at Work Regulations 1992.

16. OTHER INFORMATION

R-phrase(s)

R65	Harmful: may cause lung damage if swallowed.
R66	Repeated exposure may cause skin dryness or cracking.

MSDS Version Number	:	1.0
MSDS Effective Date	:	16.09.2010
MSDS Revisions	:	A vertical bar (|) in the left margin indicates an amendment from the previous version.
MSDS Regulation	:	Regulation 1907/2006/EC
MSDS Distribution	:	The information in this document should be made available to all who may handle the product.
Disclaimer	:	This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

APPENDIX E

WATER FRAMEWORK DIRECTIVE RIVER AND GROUNDWATER BODY MAPS

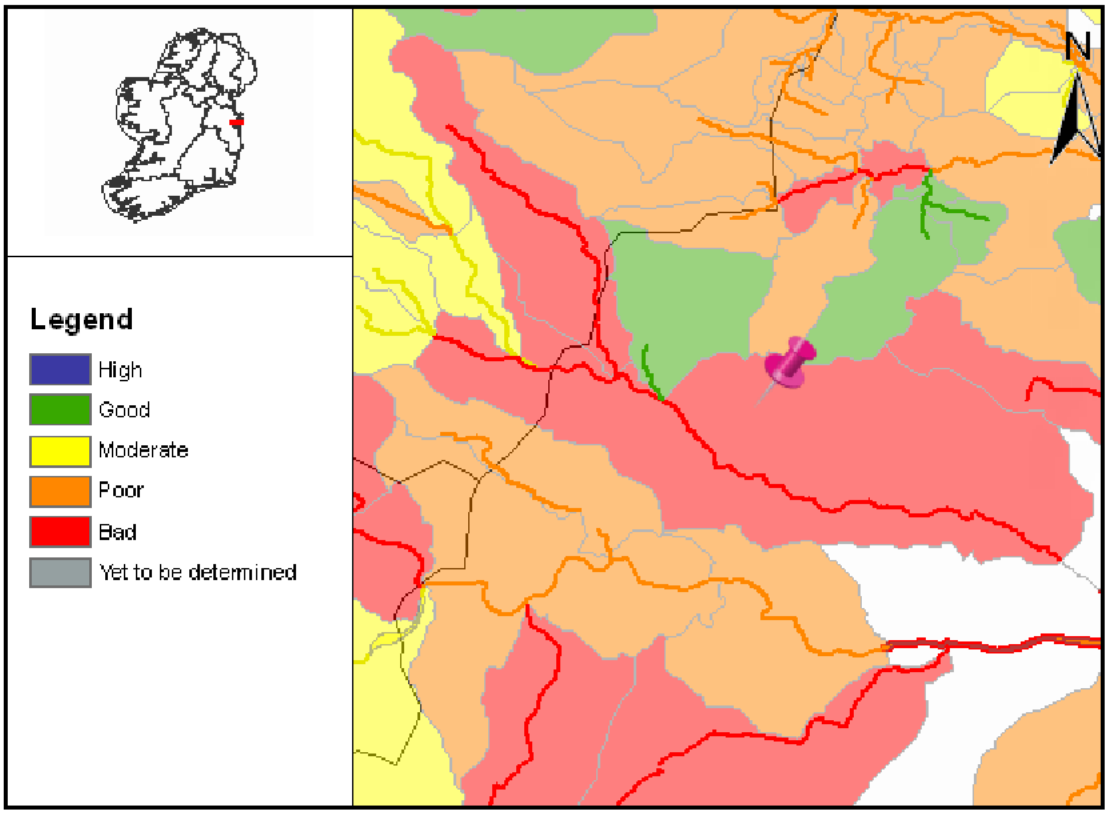
water matters

Status Report

Water Management Unit:	IE_EA_Tolka
WaterBody Category:	River Waterbody
WaterBody Name:	Tolka Lower
WaterBody Code:	IE_EA_09_1868
Overall Status Result:	Bad
Heavily Modified:	No

Report data based upon final RBMP, 2009-2015.

The information provided above is a summary of the principal findings related to the selected waterbody. Further details and explanation of individual elements of the report are outlined in the following pages.



Date Report Created 08/07/2019

water matters

Status Report

Water Management Unit:	IE_EA_Tolka
WaterBody Category:	River Waterbody
WaterBody Name:	Tolka Lower
WaterBody Code:	IE_EA_09_1868
Overall Status Result:	Bad
Heavily Modified:	No

Report data based upon final RBMP, 2009-2015.

	Status Element Description	Result
	Status information	
Q	Macroinvertebrate status	Bad
PC	General physico-chemical status	Moderate
FPQ	Freshwater Pearl Mussel / Macroinvertebrate status	N/A
DIA	Diatoms status	N/A
HYM	Hydromorphology status	N/A
FIS	Fish status	Poor
SP	Specific Pollutants status (SP)	N/A
ES	Overall ecological status	Bad
CS	Overall chemical status (PAS)	n/a
EXT	Extrapolated status	N/A
MON	Monitored water body	YES
DON	Donor water bodies	N/A

n/a - not assessed

Status
By 'Status' we mean the condition of the water in the waterbody. It is defined by its chemical status and its ecological status, whichever is worse. Waters are ranked in one of 5 status classes: High, Good, Moderate, Poor, Bad. However, not all waterbodies have been monitored, and in such cases the status of a similar nearby waterbody has been used (extrapolated) to assign status. If this has been done the first line of the status report shows the code of the waterbody used to extrapolate.

You can read more about status and how it is measured in our RBMP Document Library at www.wfdireland.ie (Directory 15 Status).

Date Report Created 08/07/2019

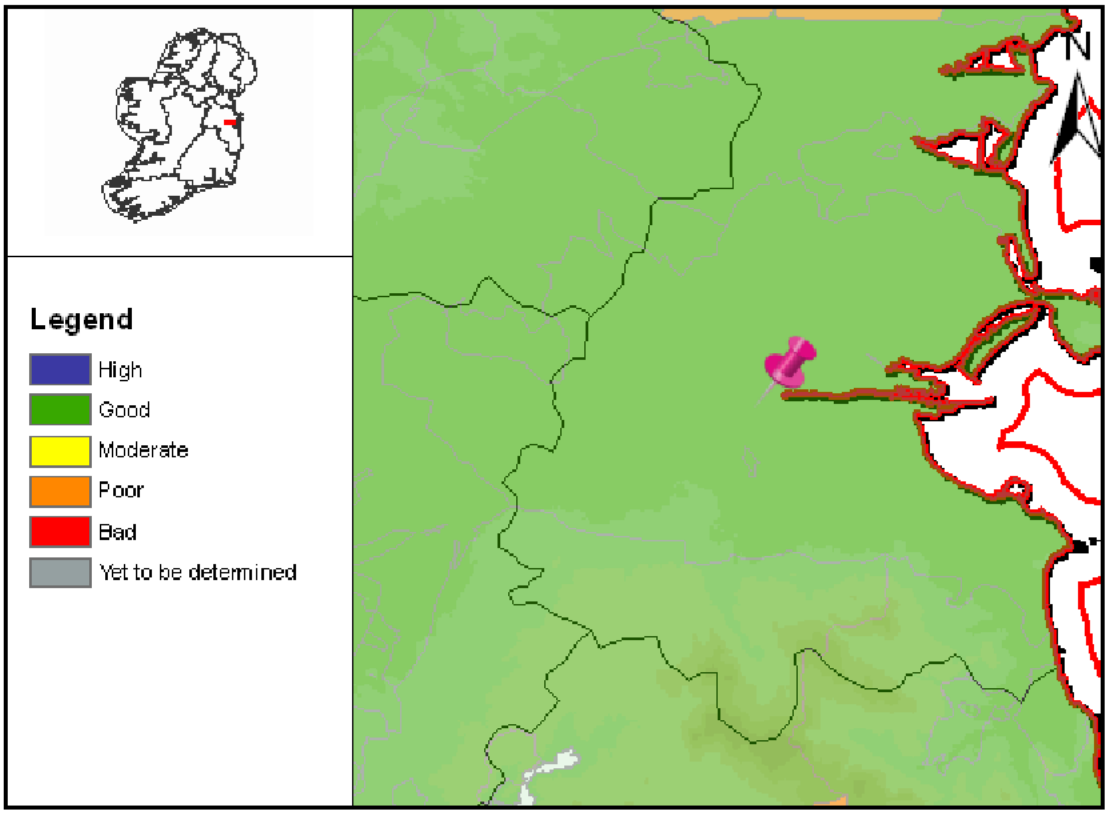
water matters

Chemical and Quantitative Status Report

Water Management Unit:	N/A
WaterBody Category:	Groundwater Waterbody
WaterBody Name:	Dublin Urban
WaterBody Code:	IE_EA_G_005
Overall Status Result:	Good
Heavily Modified:	No

Report data based upon final RBMP, 2009-2015.

The information provided above is a summary of the principal findings related to the selected waterbody. Further details and explanation of individual elements of the report are outlined in the following pages.



Date Report Created 08/07/2019

water matters

Chemical and Quantitative Status Report

Water Management Unit:	N/A
WaterBody Category:	Groundwater Waterbody
WaterBody Name:	Dublin Urban
WaterBody Code:	IE_EA_G_005
Overall Status Result:	Good
Heavily Modified:	No

Report data based upon final RBMP, 2009-2015.

	Status Element Description	Result
	Status information	
INS	Status associated with saline intrusion into groundwater	N/A
DWS	Status associated with exceedances of water quality above specific standards	N/A
DS	Chemical status of groundwater due to pressure from diffuse sources of pollution	N/A
CLS	Chemical status of groundwater due to pressure from contaminated soil or land.	N/A
MS	Chemical status of groundwater due to pressure from mine sites (active or closed).	N/A
UAS	Chemical status of groundwater due to pressures from urban areas	N/A
GWS	General groundwater quality status	N/A
RPS	Status associated with MRP loading to rivers	N/A
TNS	Status associated with nitrate loading to transitional and coastal waters	N/A
SWS	Overall status associated with nutrient loadings to rivers and transitional and coastal waters	N/A
SQS	Status associated with dependant surface water quantitative status	N/A
GDS	Groundwater dependant terrestrial ecosystems status	N/A
QSO	Quantitative status overall	Good
CSO	Chemical status overall	Good
OS	Overall status	Good

Date Report Created 08/07/2019

GS -HC : Good status High Confidence
GS- LC : Good status Low Confidence
n/a - not assessed

Status
By 'Status' we mean the condition of the water in the waterbody. It is defined by its chemical status and quantitative status, whichever is worse. Groundwaters are ranked in one of 2 status classes: Good or Poor.

You can read more about status and how it is measured in our RBMP Document Library at www.wfdireland.ie (Directory 15 Status).

APPENDIX F

IRISH WATER RISK ASSESSMENT CORRESPONDENCE

From: [redacted]
Sent: Wednesday 19 February 2020 12:34
To: [redacted] (ESB Networks)
Cc: HQDWcompliance ; [redacted] ; [redacted]
Subject: RE: ESB enquiry regarding risk to water supply from cable fluid leaks

Dear [redacted]

Further to your query (within the attached email), we have examined the locations within your interactive map and cross referenced against the results from our regulatory monitoring programme for **Total Polyaromatic Hydrocarbons** (Total PAHs) and **Benzene**, from 2014 to date. Without knowing the exact chemical composition of the oil used to fill ESB cables, these are the closest parameters we can find from our monitoring programme that would be representative of potential oil contamination.

For the relevant supplies within the Greater Dublin Area, we have recorded zero exceedances of the parametric value (i.e. legally allowable limit) for Total PAHs (which is 0.1µg/L) and Benzene (which is 1µg/L) within this period. The same is true for the Cork City area.

A summary of these results are collated in the following table

Location Assessed	**Number of Samples tested for PAH**	**Number of exceedances for PAH**	**Number of Detections* for PAH**	**Number of Samples tested for Benzene**	**Number of exceedances for Benzene**	**Number of Detections* for Benzene**
Greater Dublin Area	981	0	15 (Range detected 0.01-0.04µg/L)	980	0	2 (Range detected 0.1-0.4µg/L)
Cork City	61	0	1 (Result: 0.02µg/L)	61	0	0

* **Detections** – where the result was above the limit of detection for the test in question, i.e. the test returned an actual concentration of the analyte

These results (which are from samples taken at the customer tap) would not indicate that leaks from oil filled cables have contaminated the drinking water supply for these areas, or at least to an extent where any contamination arising has resulted in a breach of the parametric value for PAHs and Benzene.

Notwithstanding what these results indicate, oil contamination in drinking water is a **serious public health matter**, and every effort should be made to ensure the likelihood of oil leaks from ESB cables coming into contact with water pipes is minimised to the **lowest possible extent**. Whilst our water mains are pressurised, should pressure levels drop for any reason (nearby burst for example),

contaminated groundwater could potentially infiltrate into our mains. Benzene in particular could also pose a risk to our PVC and Polyethylene pipes.

I trust this analysis and commentary is sufficient for your risk assessment.

Regards,

[redacted]
Drinking Water Compliance Lead
Environmental Regulation

Uisce Éireann
Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1
Irish Water
Colvill House, 24-26 Talbot Street, Dublin 1, Ireland

[redacted]