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ESB Networks Historic Cable Fluid Losses: Preliminary Site Assessment

Location 28: Blackrock – Ringsend 38 kV - November 2011

Prepared for

ESB Networks
Engineering Major Projects
One Dublin Airport Central
Dublin Airport
Cloghran
Co. Dublin

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EXECUTIVE SUMMARY

This report presents a preliminary site assessment (PSA) of the potential environmental impacts associated with the historic loss of cable fluid from a section of underground cable located within Ringsend Park, Irishtown, Dublin 4. ESB records indicate that 10,702 litres of cable fluid (linear alkyl benzenes) leaked into the ground from the subject section of cable over a period of 14 months between October 2010 and November 2011.

The PSA was performed with reference to the EPA's 2013 publication "*Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites*". The EPA's guidance document outlines a staged and risk-based approach to contaminated land and groundwater assessment, with the PSA being the first stage in the process. By its nature the PSA stage is precautionary and conservative, aiming to identify those potential "pollutant linkages" where more detailed assessment is required.

Generally, more detailed assessment is only necessary where the assessed risk to a potential receptor is moderate, high or very high. However, in cases where the potential receptor is particularly sensitive, more detailed assessment may be recommended even if the assessed risk is low.

The findings of the preliminary site assessment can be summarised as follows:

- The leak location is in Ringsend Park, Irishtown, Dublin 4. The River Liffey lies approximately 200m north of the leak location and South Dublin Bay, which is designated a Special Protection Area (SPA)[1] and a Special Area of Conservation (SAC)[2], lies approximately 1 km south-east of the leak location;
- The topography in the vicinity of the leak location is flat; there is no discernible topographic gradient;
- The overburden geology is inferred to comprise unspecified urban deposits (made ground) over marine beach sands (the area of Ringsend Park is understood to have been reclaimed during the late 19th or early 20th century). Based on our understanding of the local geology, the beach sands are underlain by glacial till (silty clay). The bedrock geology underling the leak location is mapped by the GSI as dark limestone and shale known as "Calp" limestone;
- The groundwater body in the limestone bedrock underlying the area is classified as "locally important" from a productivity perspective. Its current Water Framework Directive (WFD) status is "good", and the associated risk classification is "not at risk" of achieving its WFD objectives. Vulnerability of the bedrock aquifer from a contamination standpoint is "low" in the area of interest, indicating that bedrock is relatively deep. Groundwater flow direction in the overburden and the bedrock aquifer can be expected to be generally towards the north-east;

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[1] South Dublin Bay and River Tolka Estuary SPA – site code 004024

[2] South Dublin Bay SAC – site code 000210

- The key receptors potentially at risk of impact from the subject leak are considered to be the River Liffey and South Dublin Bay, flora and fauna dependent on these water bodies, the bedrock aquifer underlying the area, and water mains in the vicinity of the leak location (if present);
- Users of Ringsend Park are not considered to be at risk of impact from the subject leak due to the absence of any viable exposure pathways linking the source to this group of receptors.

A preliminary risk assessment was completed that considered the potential risk posed by the subject leak on the identified potential receptors. The findings of this preliminary risk assessment are summarised in the following table:

Receptor	**Risk Category**	**Comment**
River Liffey and Dublin Bay (a SAC, SPA) including ecosystems dependent on these water bodies	Low	No preferential pathways linking the leak location to the River Liffey or South Dublin Bay have been identified. It is understood that ESB has received no reports of pollution of the River Liffey or South Dublin Bay that could be linked to the subject loss of cable fluid.
Water mains/ Water supply	Low	Whilst the potential for organic compounds to permeate water mains is known (in particular plastic water pipes and the joints of other types of water pipes), the potential for linear alkyl benzenes to permeate water mains was not established during the PSA. The risk category assumes that cable fluid may be present as residual LNAPL in the water main trench and that there is potential for it to permeate water pipes. However, the low solubility of linear alkyl benzenes and the expected low rate of permeation are such that they are unlikely to impact water quality in the pipes.
Bedrock aquifer	Low	The bedrock is classified by the GSI as a “locally important” aquifer. Vulnerability rating is “low” close to the leak location. Furthermore, the water table in the Made Ground and/or beach sands is expected to be shallow, reducing the potential for downward migration of cable fluid to the bedrock aquifer. No preferential pathways potentially linking the leak location to the aquifer have been identified.

With regard to the risk to the River Liffey, Dublin Bay and their ecosystems, although the risk category from the PSA is low, more detailed assessment is recommended to confirm this. Further investigation of the risk to water mains and the bedrock aquifer is not considered necessary.

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1 INTRODUCTION

1.1 Project Background

Geosyntec Consultants Ltd (Geosyntec) is pleased to present the Electricity Supply Board (ESB) this Preliminary Site Assessment (PSA), which relates to the potential environmental impacts associated with the historic loss of cable fluid from a section of fluid-filled cable located in Irishtown, Dublin 4. The alignment of the subject section of cable and the approximate location of the historic loss of cable fluid is illustrated in ESB Drawing Number QD-354120-01-D460-001-045-000 (Figure 1).

The PSA was completed in accordance with Geosyntec proposal reference 190607 dated June 2019, which was authorised by the ESB on 1st July 2019. The PSA was led by Mr Graham Webb, who is an environmental engineer with over 25 years' relevant experience, and Mr Jim Wragg, who is a contaminant hydrogeologist with over 30 years' relevant experience.

ESB Networks operates and maintains a network of High Voltage (HV) underground cables of over 1,600 km across Ireland, of which approximately 205 km (175 km operational) are insulated by a cable fluid. The majority of these fluid-filled cables are located in urban settings across Dublin city and Cork city. The cable fluid acts as an electrical insulator and aids the conduction of heat away from the conductor allowing the cable to be operated more efficiently. The cables are vulnerable to third party interference or damage, and over time, cables can develop leaks due to defects developing in the cable sheath and in joints and terminations. When such leaks occur, there is potential for pollution to arise.

In the case of the section of fluid-filled cable that is the subject of this PSA, ESB records indicate that 10,702 litres of cable fluid leaked into the ground from the cable over a 14-month period between October 2010 and November 2011.

1.2 Objective and Scope of Work

The primary objective of the PSA was to complete a preliminary assessment of the potential types, locations, extent and significance of environmental impacts associated with the subject historic cable fluid loss. The PSA was performed with reference to the EPA's 2013 publication "*Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites*". This PSA report is based on the EPA's guideline template report for PSAs, which is linked to the above-mentioned 2013 guidance.

The EPA's 2013 guidance document outlines a staged approach to contaminated land and groundwater assessment, with the PSA being the first stage in the process. During the PSA stage, the guidance requires the assessor to identify environmental "receptors" - including groundwater and surface water bodes and flora and fauna dependent on them as well as people - who are potentially at risk from the source of contamination, and to qualitatively assess the risk to each environmental receptor by considering the viability of each source-pathway-receptor "pollutant linkage". Those pollutant linkages where there is considered to be a moderate or high risk of impact from the source of contamination, or where the receptor is particularly sensitive, are identified through this process. These pollutant linkages are then carried forward to the next stage of the process during which more detailed assessment can be completed. Given the above, the PSA stage of the process is precautionary and conservative in nature.

Generally, more detailed assessment is only necessary where the assessed risk to a potential receptor is moderate, high or very high. However, in cases where the potential receptor is particularly sensitive, more detailed assessment may be recommended even if the assessed risk is low.

The PSA for the subject loss of cable fluid was based on a desk study of publicly available information and information provided by the ESB, a walkover survey of the immediate vicinity of the cable within approximately 200 metres of the location of the historic loss of cable fluid, and a reconnaissance of the surrounding area.

Information for the desk study element of the PSA was obtained from the following sources:

- Ordnance Survey Ireland (OSI) website (www.osi.ie): historic maps, historic aerial images, recent "street-view" map;
- Environmental Protection Agency (EPA) websites (www.epa.ie and www.catchments.ie): locations of EPA-licensed facilities, locations of Natura 2000 sites and National Heritage Areas (NHAs), information on groundwater and surface water quality, including Water Framework Directive (WFD) classifications;
- Geological Survey of Ireland (GSI) website (www.gsi.ie): overburden and bedrock geology, information on groundwater resources and groundwater vulnerability;
- Office of Public Works (OPW) website (www.opw.ie): flood risk;
- National Waste Collection Permit Office (NWCPO) website (www.nwcpo.ie): register of companies holding waste facility permits or certificates of registration issued by local authorities;
- ESB records outlining the location of the cable fluid loss, the volume of fluid lost and the period over which the fluid loss occurred;
- Safety Data Sheets (SDSs) provided by the ESB for the cable fluids understood to have been used in the subject cable at the time of the cable fluid loss.

The walkover survey and reconnaissance of the area surrounding the subject section of cable was completed by Mr Graham Webb of Geosyntec on 26th July 2019.

During the walkover survey and reconnaissance, information on the following aspects were recorded:

- The environmental setting, with regard to local topography, surface water drainage and the proximity of local surface water courses;
- Land use, in particular the proximity of residential properties and other potentially sensitive land uses close to the subject section of cable;

- The proximity of the subject section of cable to other below-ground infrastructure, such as water mains, gas mains and sewers;
- Distressed vegetation, which may be indicative of subsurface contamination.

Central to the PSA was the development of a preliminary Conceptual Site Model, which presents potential source-pathway-receptor (SPR) linkages identified during the PSA, and a preliminary assessment of the risk posed to identified human or environmental receptors from residual cable fluid potentially remaining in the vicinity of the subject section of cable.

2 DETAILS OF LOSS EVENT

2.1 Introduction

In the case of the section of fluid-filled cable that is the subject of this PSA, ESB records indicate that 10,702 litres of cable fluid leaked into the ground from the cable over a 14-month period between October 2010 and November 2011. The type of fluid understood to have been present in the cable is identified in ESB records as linear alkyl benzenes.

2.2 Properties of Cable Fluid

The properties of the linear alkyl benzenes understood to have been used in the subject section of cable over the period of the leak, based on information contained within the Safety Data Sheets provided by ESB, are as follows:

- Boiling point: 280°C
- Flash point: >135°C
- Flammability: Non flammable
- Explosive properties: Not explosive
- Vapour pressure: <0.02 kPa at 20°C
- Density: 0.86 g/cm^3 at 20°C
- Solubility in water: Negligible
- Kinematic Viscosity: 4.2 mm^2/s typical

In their 2010 publication "*Classification of Hazardous and Non-Hazardous Substances in Groundwater*", the EPA classifies all petroleum hydrocarbon compounds listed in the document, including linear alkyl benzenes, as hazardous in groundwater. However, this is on the basis that they are former List I substances and it is stated in the document that these classifications are "under review". Based on the methodology outlined in the above-mentioned publication (which is based on the persistence, toxicity and potential to bioaccumulate of the substance in the environment) and publicly-available information on their properties, Geosyntec has concluded that linear alkyl benzenes should be classified as non-hazardous in groundwater.

2.3 Fate & Transport of Cable Fluid

The fate and transport of cable fluid entering the subsurface during and following the subject leak can be expected to be controlled by the following factors:

- The blend of alkyl benzene compounds that make up the cable fluid are less dense than water;
- The cable fluid has a low water solubility (< 1 mg/l);
- The compounds in the cable fluid are semi or non-volatile;
- The compounds present in the cable fluid can be expected to biodegrade but at rates that are controlled by the surface area of the fluid in the subsurface (i.e. in the form of a light non-aqueous phase liquid or LNAPL), its solubility where in contact with groundwater, the availability of electron acceptors and the presence of appropriate microbial populations.

Following creation of a breach in the cable structure, the conceptual model of the dispersion of the cable fluid into the subsurface at the subject location can be described as follows:

- As the cable fluid is less dense than water it will tend to migrate into the pore spaces in the sand bedding around the cable and downward under the force of gravity until it reaches either a water table or low permeability horizon, such as natural silt or clay at the base of the cable trench (if present);
- The cable fluid will tend to spread laterally whilst:
  - There is a driving head provided by leakage of further cable fluid;
  - There is a path of relatively low resistance, e.g. the sand bedding around the cable, potentially permeable fill material in other service trenches that the cable trench intersects, or permeable horizons in the overburden.

The migration potential of the cable fluid released to the subsurface as a result of the subject leak is discussed in more detail in Section 4.

3 SITE ENVIRONMENTAL SETTING

3.1 Proximity of Site to Designated Ecologically Sensitive Areas

The National Parks and Wildlife Service on-line mapping tool was consulted to check if the leak location lies close to ecologically sensitive areas. The coastal area of South Dublin Bay, which lies approximately 1 km south-east of the leak location, is a Special Area of Conservation under the EU Habitats Directive (SAC – site code 000210), and a Special Protection Area under the EU Birds Directive (SPA – site code 004024).

3.2 Surrounding Land Use & Field Observations

The leak location is situated adjacent to a paved footpath within Ringsend Park in Irishtown, Dublin 4. A manhole cover was observed in the footpath close to the leak location, which was indicated to be associated with a public sewer. Whilst the alignment of the inferred sewer was not clear from field observations, it is considered likely that it follows the line of the above-mentioned footpath – i.e. approximately parallel with the subject cable.

Land use in the vicinity of the leak location is public amenity space. To the north of the leak location is an all-weather sports pitch, beyond which is an area of maintained grassland with mature trees, beyond which is an area of residential housing. The closest residential property is approximately 80m north of the leak location. To the east, south and west of the leak location are further areas of maintained grassland within Ringsend Park, some of which are used as sports pitches. There is a small children's play area approximately 40m south-west of the leak location.

No evidence of stressed vegetation or die-back was observed in the vicinity of the leak location or along the cable route at the time of the walkover survey.

The earliest historic map available from the OSI's website is dated 1837 – 1842 and shows that at that time the leak location was within an area of tidal estuary linked to the River Liffey and Dublin Bay. The townland of Ringsend is shown on this map approximately 300m west of the leak location, and the townland of Irishtown is shown approximately 200m to the south. On a later map dated 1888-1913, the area of Ringsend Park appears to have been reclaimed from the Liffey Estuary. No development is indicated in this area, which is labelled "South Wall Intake". Residential housing is shown to the north of this area close to the River Liffey, and also to the south-west.

The earliest aerial image available from OSI's website (other than 19th century historical maps) is dated 1995. The layout of the area on that map is similar to that observed today.

Based on information from the EPA's and NWCPO's websites there are no facilities within a 1 km radius of the leak location that operate under an Industrial Emissions licence, an Integrated Pollution Control licence, a Waste licence or a Waste Facility Permit.

3.3 Topography & Surface Water

The leak location lies at an elevation of approximately 5m above Ordnance Datum. The topography of the surrounding area is flat with no discernible topographical gradient.

The closest surface water body to the leak location is the River Liffey, which lies approximately 200m north of the leak location and flows to the east into Dublin Bay. The WFD status of this section of the River Liffey is "moderate" for the monitoring period 2010-2015 and it is classified as "at risk" of not meeting WFD objectives. The River Dodder lies approximately 500m west of the leak location at its closest point, and flows generally northward, discharging into the River Liffey adjacent to the East Link bridge. South Dublin Bay, which is designated a SAC and a SPA, is located approximately 1 km south-east of the leak location. The status of South Dublin Bay under the WFD classification system is currently "good" and its risk classification is "not at risk" of achieving good status.

The vicinity of site is not vulnerable to flooding according to OPW online flood maps.

3.4 Geology & Hydrogeology

The overburden geology underlying the leak location is indicated by the GSI to comprise unspecified urban deposits (i.e. made ground). These deposits are likely to be underlain by marine beach sands and glacial till (silty clay) based on the overburden geology indicated on GSI maps for Irishtown and central Dublin. The bedrock geology underling the leak location is mapped by the GSI as dark limestone and shale known as "Calp" limestone.

The groundwater body (GWB) underlying the leak location and the surrounding area is known as the Dublin GWB. This GWB covers an area of approximately 837 km^2 extending west from the Dublin coastline to the village of Kilmeage in Co. Kildare and extending from Malahide in north Co. Dublin to the southern limits of Dublin city. The GSI classifies the Dublin GWB as a "locally important aquifer". Such aquifers are generally moderately productive only in local zones. Groundwater flow direction in the bedrock aquifer (and also in the overburden) can be expected to be generally towards the east or north-east in the vicinity of the leak location.

The vulnerability of the bedrock aquifer in the vicinity of the leak location (from a water quality perspective) is classified by the GSI as "low" which suggests that bedrock is relatively deep and/or the overburden is extensive and potentially of low permeability.

A search of the GSI's online database indicates the presence of two groundwater wells within a 1 km radius of the leak location. The nearest is located 800m south-east close to the Aviva stadium and was installed in 1989. The well is indicated to be 45m deep with rock encountered at 7.5m, and to have a yield of 22 m^3/day. The second well is 900m west of the site at Grand Canal Dock and was installed in 1938 for industrial purposes. The well was drilled to a depth of 10m and may be installed in the overburden as depth to rock is not indicated. The recorded yield for this well is 262 m^3/day.

The EPA is responsible for classifying GWBs in Ireland in terms of water quality and their ability to meet objectives set out in the WFD. Based on the most recent round of EPA monitoring (2010 – 2015), the status of the Dublin GWB was categorised as "good" and it was categorised as "not at risk" with regard to achieving WFD objectives.

4 CONCEPTUAL SITE MODEL

4.1 Introduction

For the purposes of this PSA, it has been assumed that the top of the fluid filled cable is buried at a depth of 0.9 – 1.1m bgl within a backfilled trench that is around 1.2m deep. The trench backfill is assumed to comprise a 0.35 m deep sand layer (0.85m bgl) above which is selected excavated material.

For the purposes of the PSA, strata adjacent to and below the cable trench have been assumed to comprise either:

- Low permeability silty clay dominated fill material associated with reclamation of the area; or,
- Granular fill materials associated with reclamation of the area; or,
- Granular materials associated with the beach deposits; or,
- Granular fill materials associated with trench backfill for other underground services that intersect the route of the fluid filled cable.

It has also been assumed that perched groundwater may periodically be present within the cable trench, if the surrounding fill material has low permeability.

4.2 Source & Potential Migration Pathways

If the fill material in the vicinity of the leak location has low permeability, cable fluid lost to ground can be expected to have spread laterally within the permeable sand bedding within the cable trench. If the cable trench intersects more permeable material, this could result in cable fluid migrating from the line of the cable trench and along a different route or routes.

We have developed a series of indicative estimates for the subject leak location under different ground condition scenarios, with regard to the extent of cable fluid migration. These estimates have assumed that the cable is installed within a 0.35m thick sand bedding and surround layer in a trench 1.1m wide.

- In the case where (i) the trench is cut through silt or clay-dominated material, (ii) the sand bedding is dry, (iii) the cable fluid saturation reaches 40% residual saturation of the pore space in the sand bedding, and (iv) the cable fluid does not migrate into the overlying back-fill material, the theoretical length of trench impacted by LNAPL migration is 347m. Given that the topography in the vicinity of the leak location is flat, there appears to be potential for cable fluid to migrate along the sand bedding towards both the east and west from the leak location;
- In the event that the base of the trench contains perched water then this would lower the LNAPL saturation in the sand layer surrounding the cable. This could result in LNAPL migration through the back-fill material above the sand bedding layer, but only if it is sufficiently permeable. The thickness of LNAPL-saturated soils will likely be less under

this scenario than that outlined above, but the cable fluid may spread further. If a 40% residual cable fluid saturation is assumed in relatively permeable backfill material over a 0.2m thickness, this would lead to a theoretical length of trench impacted by cable fluid of 608m;

- The third scenario considered herein is where the cable trench near the leak point passes through predominantly granular material. Here a more radial spreading of the cable fluid could occur. If a 0.2m deep soil zone is impacted with a LNAPL saturation of 40% then the theoretical radius of cable fluid LNAPL impact away from the release would be 15m;
- The cable fluid may have some semi-volatile components (alkyl benzenes) and as such will generate a modest vapour pressure. However, given the absence of potential confined spaces in the vicinity of the leak location, this is not considered a viable exposure pathway;

- Cable fluid has the potential to migrate from the source to underneath confined spaced receptors (such as building cellars), either in LNAPL form or via migration in the dissolved phase in groundwater flow following dissolution from the LNAPL. Given the absence of buildings in the vicinity of the leak location or close to the cable route in the area of the leak, there is no need to assess this pathway in the subject case.

In addition to the above scenarios, the following potential migration pathways were considered as part of the PSA, but they were not carried forward to the preliminary risk assessment because the source-pathway-receptor (SPR) linkage was not considered viable:

- Soil and dust ingestion from near-surface soils;
- Dermal contact with near-surface soils;
- Inhalation of fugitive dust from near-surface soils; and
- Ingestion of soils via consumption of vegetables grown in near-surface soils.

4.3 Potential Receptors

With the above migration pathways in mind, the River Liffey and South Dublin Bay including dependent ecosystems, and groundwater in the bedrock aquifer underlying this area, appear to be the key environmental receptors potentially at risk of impact from the leak of cable fluid from this location. The potential for cable fluid (or some of its constituent compounds) to permeate buried water mains close to the leak location (if present) and impact water quality in the water mains also needs to be considered; however, the low solubility of these compounds and the low rate of permeation are such that they are unlikely to impact water quality in the pipes.

Whilst users of Ringsend Park close to the leak location may be considered potential receptors, there is not considered to be an exposure pathway linking the source to this group of potential receptors. This assumes the existing grass cover (and inferred uncontaminated topsoil layer) in the vicinity of the leak location remains in place.

Groundworks contractors performing future tasks in the vicinity of the leak location (including workers entering the sewer manhole observed close to the leak location) could also be considered potential receptors, via direct contact, inhalation and ingestion pathways. However, it has been assumed that the potential risks posed to future groundworks contractors would be adequately mitigated through effective health and safety planning and work control procedures at the time the works are being carried out. As a result, groundworks contractors have not been considered potential receptors in the preliminary risk assessment presented in the following section.

5 PRELIMINARY RISK ASSESSMENT

The key potential source-pathway-receptor (SPR) linkages associated with the subject loss of cable fluid are presented in this section, together with a preliminary assessment of the risk posed to the identified receptors. The preliminary risk assessment is based on the methodology outlined in CIRIA C552 (2001) "*Contaminated Land Risk Assessment – A Guide to Good Practice*". This methodology requires the classification of the magnitude of the **consequence** (severity) of a risk occurring, and the **probability** of a risk occurring. The risk assessment methodology is summarised in Tables 1 – 4 below.

The potential consequences of contamination risks occurring are classified in accordance with Table 1.

Table 1: Classification of Consequence

Classification	Definition of Consequence
Severe	• Short-term (acute) risk to human health likely to result in significant harm. • Short-term risk of pollution of sensitive water resource. • Catastrophic damage to buildings/property. • A short-term risk to a particular ecosystem, or organism forming part of such ecosystem.
Medium	• Chronic damage to human health. • Pollution of sensitive water resources. • A significant change in a particular ecosystem, or organism forming part of such ecosystem.
Mild	• Pollution of non-sensitive water resources. • Significant damage to crops, buildings, structures and services. • Damage to sensitive buildings/structures/services or the environment.
Minor	• Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. • Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.) • Easily repairable effects of damage to buildings, structures and services.

The probability of contamination risks occurring are classified in accordance with Table 2.

Table 2: Classification of Probability

Classification	Definition of Probability
High Likelihood	Circumstances are such that an event appears very likely in the short-term or almost inevitable in the long-term; or there is already evidence that such an event has occurred.
Likely	Circumstances are such that such an event is not inevitable, but is possible in the short-term and is likely over the long-term.
Low Likelihood	Circumstances are such that it is by no means certain that an event would occur even over a longer period, and it is less likely in the short-term.
Unlikely	Circumstances are such that it is improbable that an event would occur even in the very long-term.

For each viable SPR linkage, the potential risks are evaluated, as presented in Table 3.

Definitions of the risk categories, together with the investigatory and remedial actions that may be necessary in each case are presented in Table 4.

Table 3: Risk Matrix

		Severe	Medium	Mild	Minor
Probability	High likelihood	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate risk	Low risk
	Low likelihood	Moderate risk	Moderate risk	Low risk	Very low risk
	Unlikely	Low risk	Low risk	Very low risk	Very low risk

Table 4: Definition of Risk Categories and Likely Actions Required

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

The key potential SPR linkages associated with the subject loss of cable fluid are presented in Table 5 below, together with a preliminary assessment of the risk posed to the identified receptors in each case, in line with the above methodology.

Table 5: Preliminary Risk Assessment for Location 28

Source	Potential Pathway	Receptor	Consequence	Probability	Risk Category	Comment
Loss of cable fluid (linear alkyl benzenes) over a 14-month period during the period October 2010 – November 2011 (estimated 10,702 litres).	Predominantly lateral migration of cable fluid from the leak location along the cable trench, and/or through granular fill material, potentially followed by migration along other preferential pathways (e.g. other in-filled services trenches that intersect the cable trench.	River Liffey and Dublin Bay (a SAC, SPA) including ecosystems dependent on these water bodies	Medium	Unlikely	Low	No preferential pathways linking the leak location to the River Liffey or South Dublin Bay have been identified. It is understood that ESB has received no reports of pollution of the River Liffey or South Dublin Bay that could be linked to the subject loss of cable fluid.
	Predominantly lateral migration of cable fluid from the leak location along the cable trench, and/or through granular lenses within the overburden, and subsequent migration into backfilled trenches containing water mains (if present). Permeation of constituents of the cable fluid through the walls or joints of the water mains.	Water mains/ Water supply	Medium	Unlikely	Low	Whilst the potential for organic compounds to permeate water mains is known (in particular plastic water pipes and the joints of other types of water pipes), the potential for linear alkyl benzenes to permeate water mains was not established during the PSA. The risk category assumes that cable fluid may be present as residual LNAPL in the water main trench and that there is potential for it to permeate water pipes. However, the low solubility of linear alkyl benzenes and the expected low rate of permeation are such that they are unlikely to impact water quality in the pipes.

Table 5: Preliminary Risk Assessment for Location 28

Source	Potential Pathway	Receptor	Consequence	Probability	Risk Category	Comment
(as above)	Vertical migration of cable fluid via permeable lenses in the overburden and/or via granular material in in-filled services trenches to groundwater in the bedrock aquifer, followed by dissolution of cable fluid and generation of a dissolved-phase plume of alkyl benzenes in the bedrock aquifer.	Bedrock aquifer	Mild	Low Likelihood	Low	The bedrock is classified by the GSI as a "locally important" aquifer. Vulnerability rating is "low" close to the leak location. Furthermore, the water table in the Made Ground and/or beach sands is expected to be shallow, reducing the potential for downward migration of cable fluid to the bedrock aquifer. No preferential pathways potentially linking the leak location to the aquifer have been identified.

6 CONCLUSIONS

The following conclusions have been drawn based on the information reviewed and observations made during this PSA:

- The leak location is within an area of reclaimed land in Ringsend Park, Irishtown, Dublin 4. The River Liffey lies approximately 200m north of the leak location and South Dublin Bay, which is designated a SPA and a SAC, lies approximately 1 km south-east of the leak location;
- The topography in the vicinity of the leak location is flat; there is no discernible topographic gradient;
- The key receptors potentially at risk of impact from the subject leak are considered to be the River Liffey and South Dublin Bay, flora and fauna dependent on these water bodies, the bedrock aquifer underlying the area, and water mains in the vicinity of the leak location (if present);
- Following the preliminary risk assessment methodology outlined in CIRIA publication C552 (2001), the appropriate risk category for these potential receptors and the associated SPR linkages are considered to be:
    - River Liffey & Dublin Bay SAC/SPA - Low
    - Water mains - Low
    - Bedrock aquifer - Low

Although the risk category is low, more detailed assessment of the risk to the River Liffey, Dublin Bay and their associated ecosystems is recommended to confirm the findings of the risk assessment. Further investigation of the risk to water mains and the bedrock aquifer is not considered necessary.

* * * * * * *

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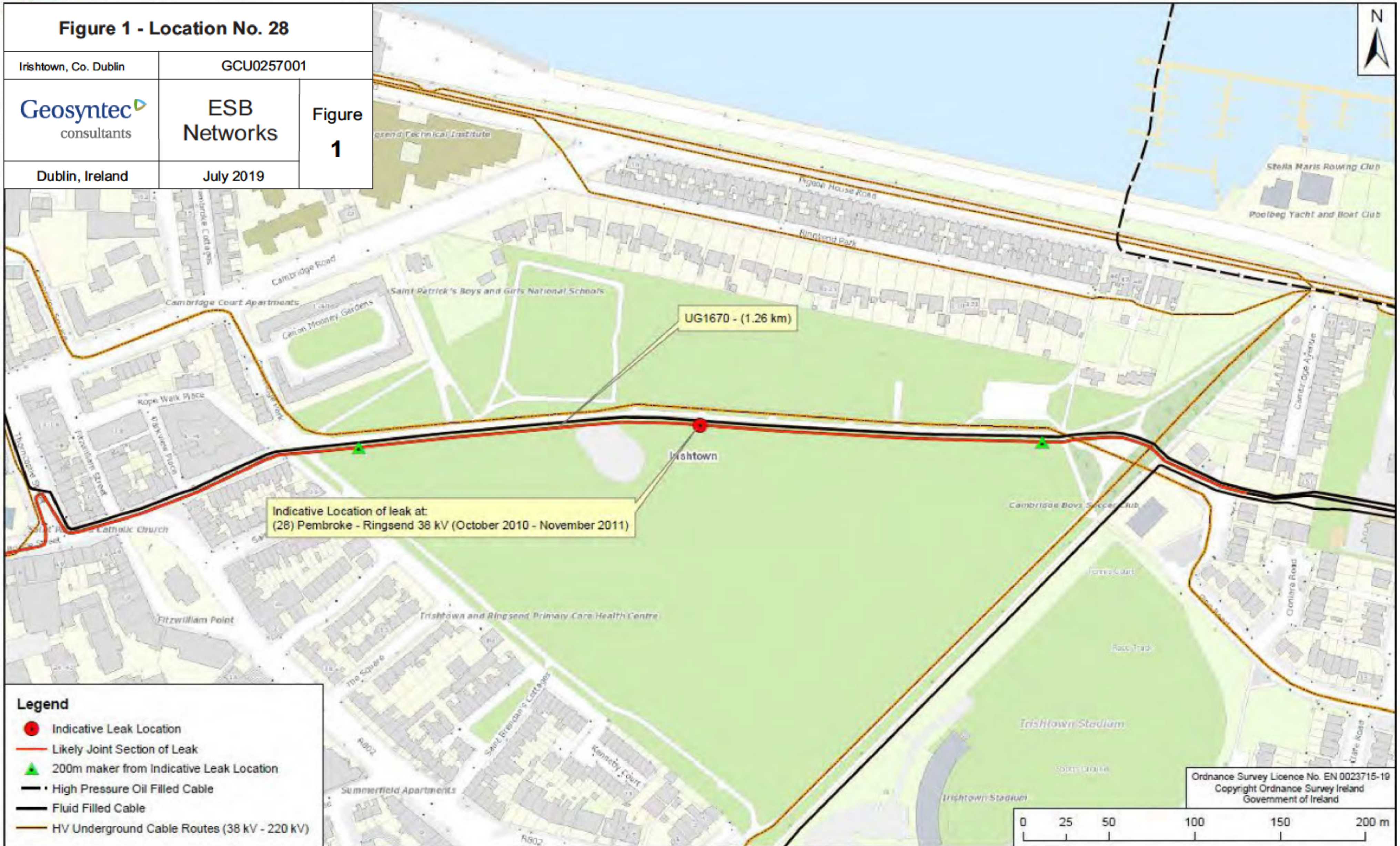
F I G U R E S

Figure 1 - Location No. 28

Irishtown, Co. Dublin	GCU0257001	
Geosyntec consultants	ESB Networks	Figure 1
Dublin, Ireland	July 2019	



Legend

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

REQUEST FOR PROPOSAL	T.O'R T.O'R J.F A.M.C
REVISION DESCRIPTION	DRN PROD VER APP
CLIENT APPROVAL	PLANNING TENDER CONSTRUCTION AS-BUILT

Engineering and Major Projects, One Dublin Airport Central, Dublin Airport, Cloghran, Co. Dublin, K67 XF72, Ireland.

Energy for generations

CLIENT:	ESB Networks
PROJECT:	P.R.A.
CONTRACT:	
PRODUCTION UNIT:	Civil & Environmental Engineering
DRAWING TITLE:	Indicative Cable Fluid Leakage Locations & Cable Sections (28) Pembroke - Ringsend 38 kV (October 2010 - November 2011)

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
T.O'Rourke	T.O'Rourke	J. Fitzpatrick	A.M. Casey	24/07/2019

CLIENT REF.	Revision	NO. OF SHEETS	SIZE	SCALE
00-00	0	1 of 1	A3	1:2,000

DRAWING NUMBER: QD-354120-01-D460-001-045-000

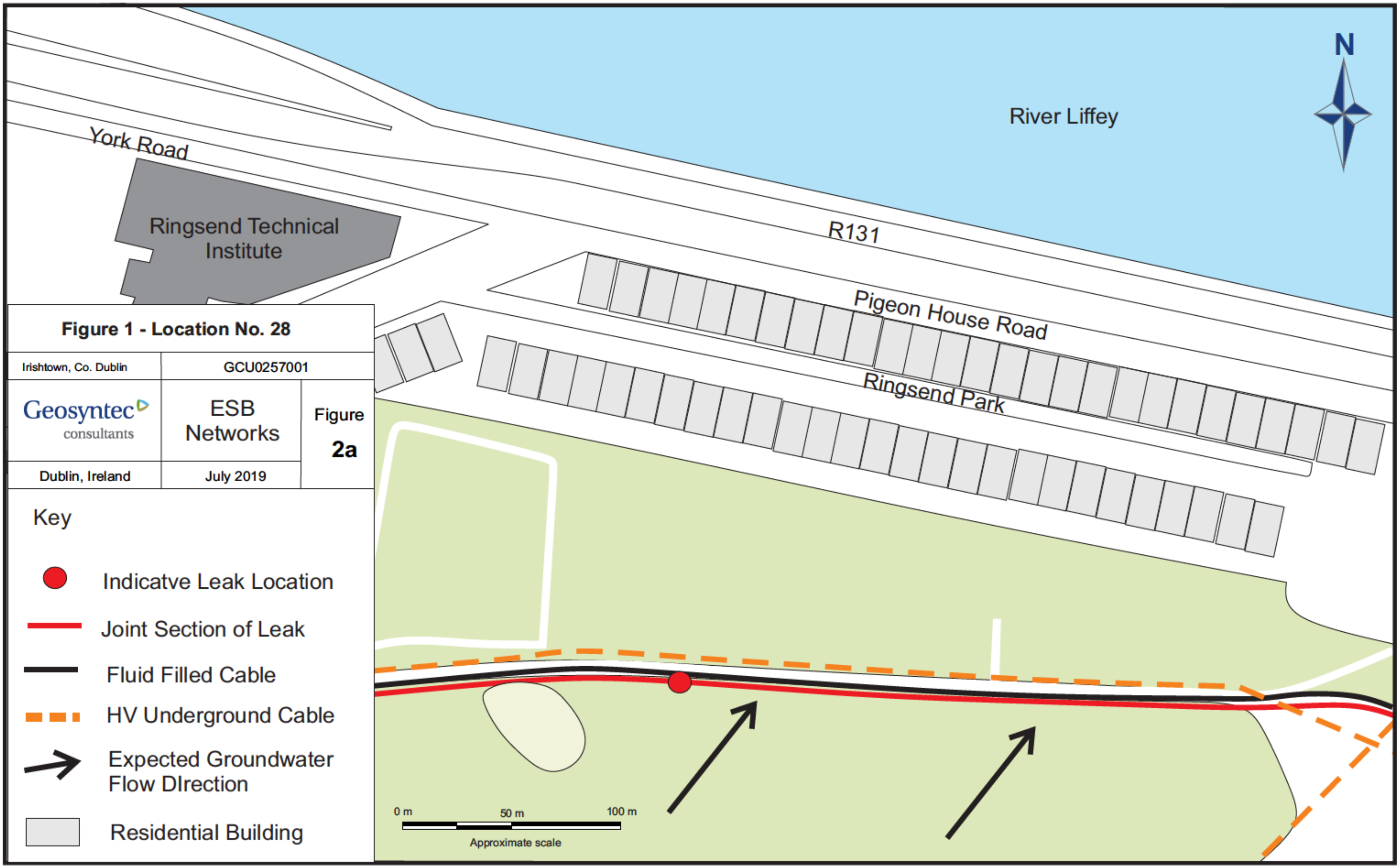
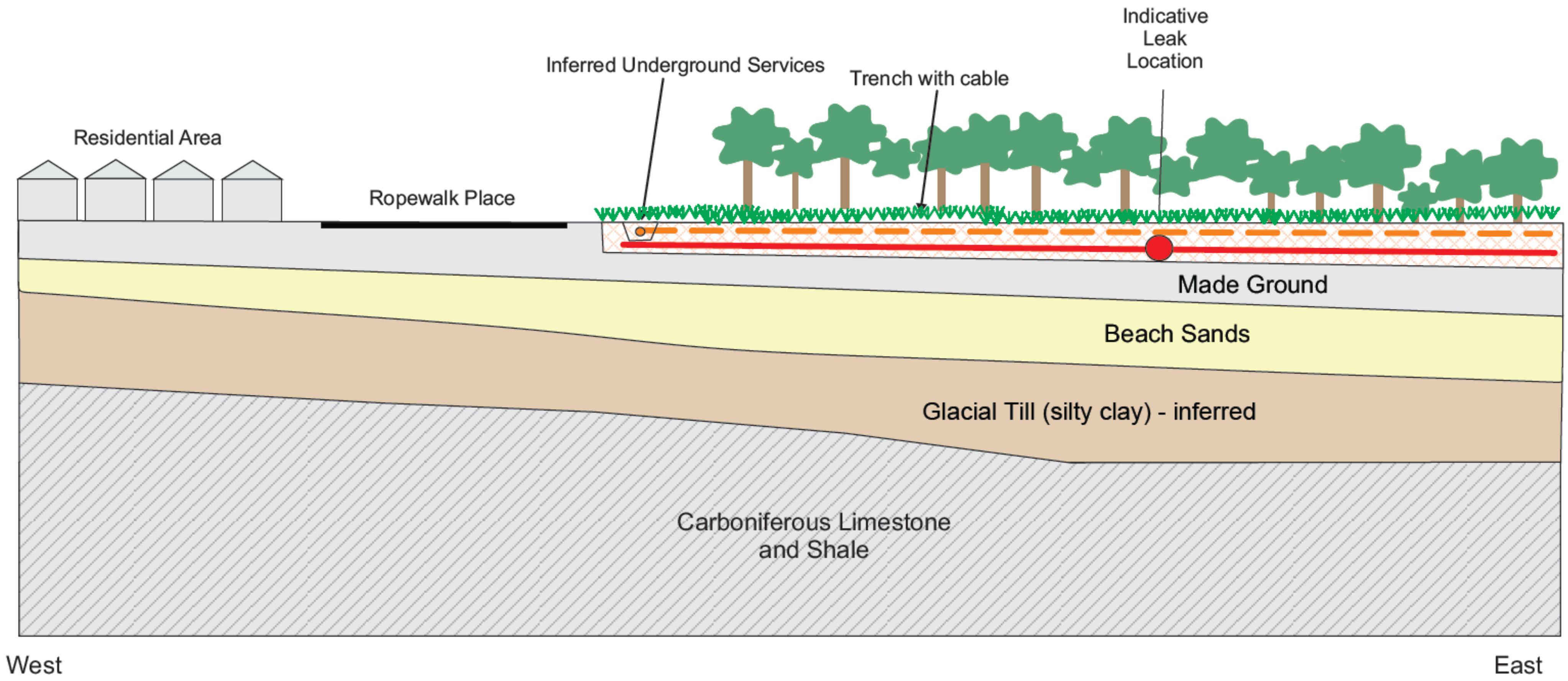


Figure 1 - Location No. 28
Irishtown, Co. Dublin
GCU0257001
Geosyntec consultants
ESB Networks
Figure 2a
Dublin, Ireland
July 2019
Key
Indicatve Leak Location
Joint Section of Leak
Fluid Filled Cable
HV Underground Cable
Expected Groundwater Flow DIrection
Residential Building
N
River Liffey
York Road
Ringsend Technical Institute
R131
Pigeon House Road
Ringsend Park
0 m
50 m
100 m
Approximate scale



Location 7 - Preliminary Conceptual Site Model		
Irishtown, Dublin 4	GCU0257001	
Geosyntec consultants	ESB Networks	Figure **2b**
Dublin, Ireland	July 2019	

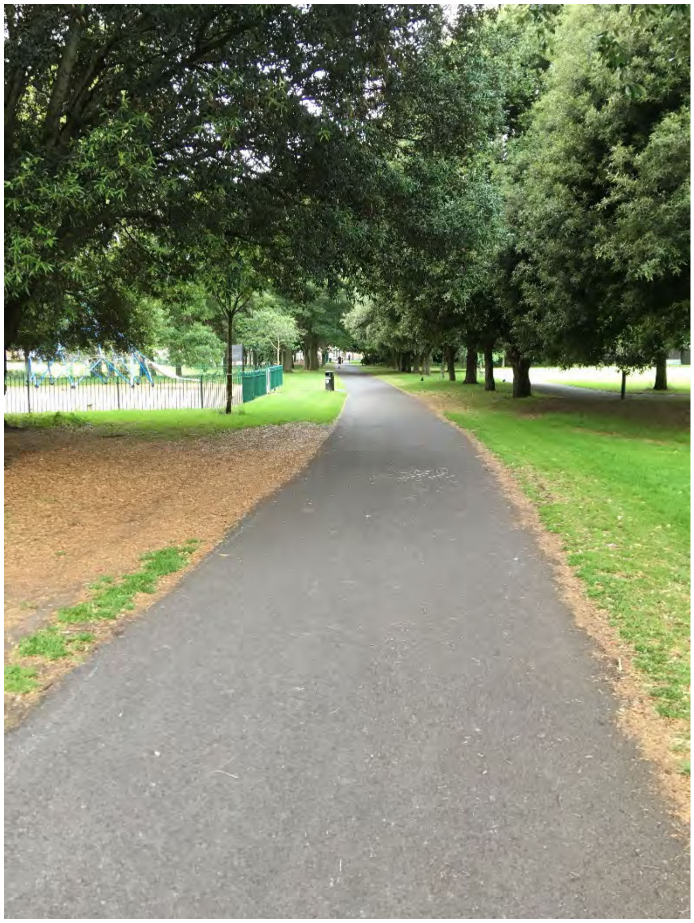
Geosyntec consultants

Appendix A - Photolog

A P P E N D I X A

Photograph 1 – View east from leak location

Photograph 2 – View west from leak location



Photograph 3 – View west past playground

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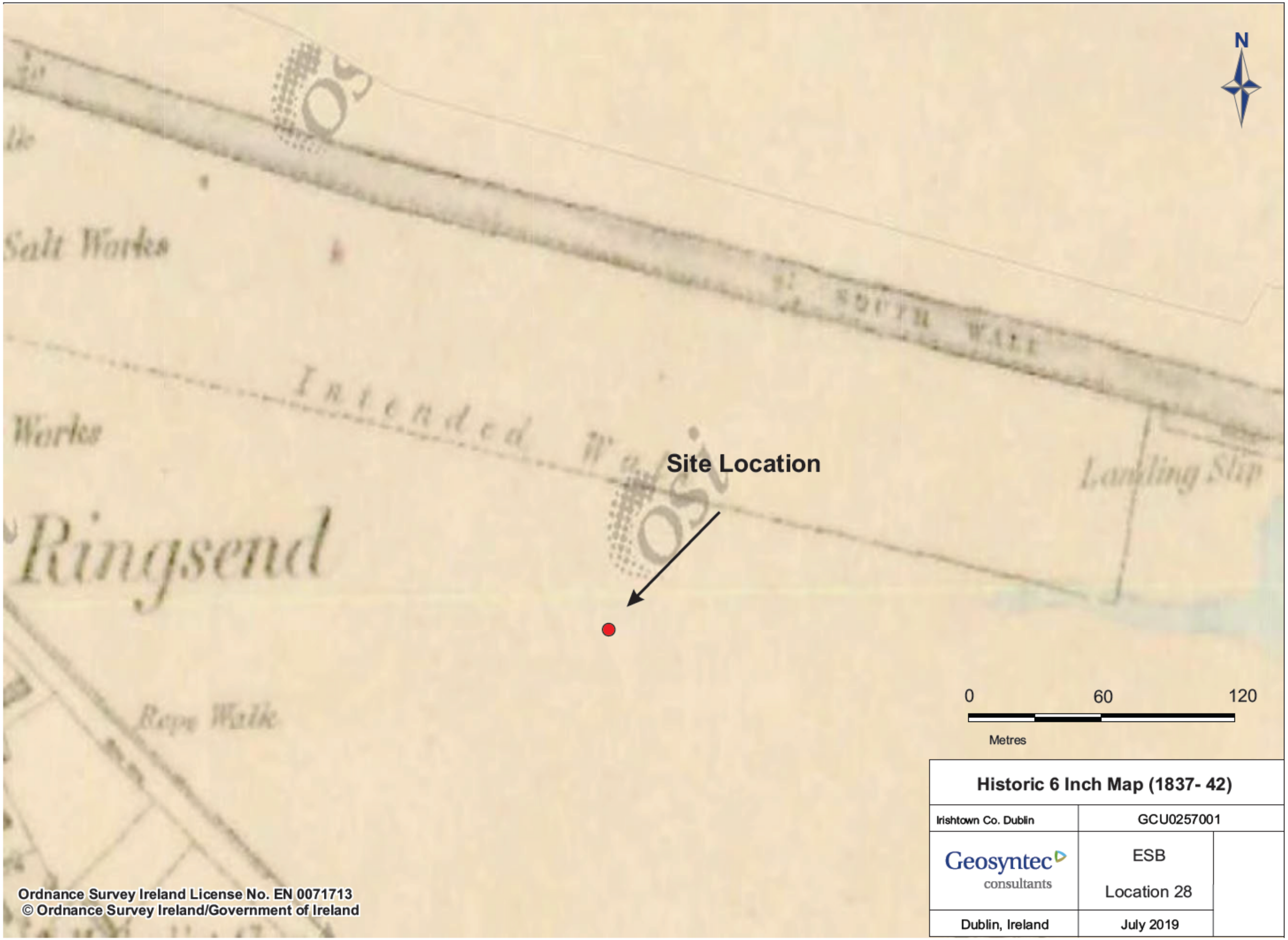
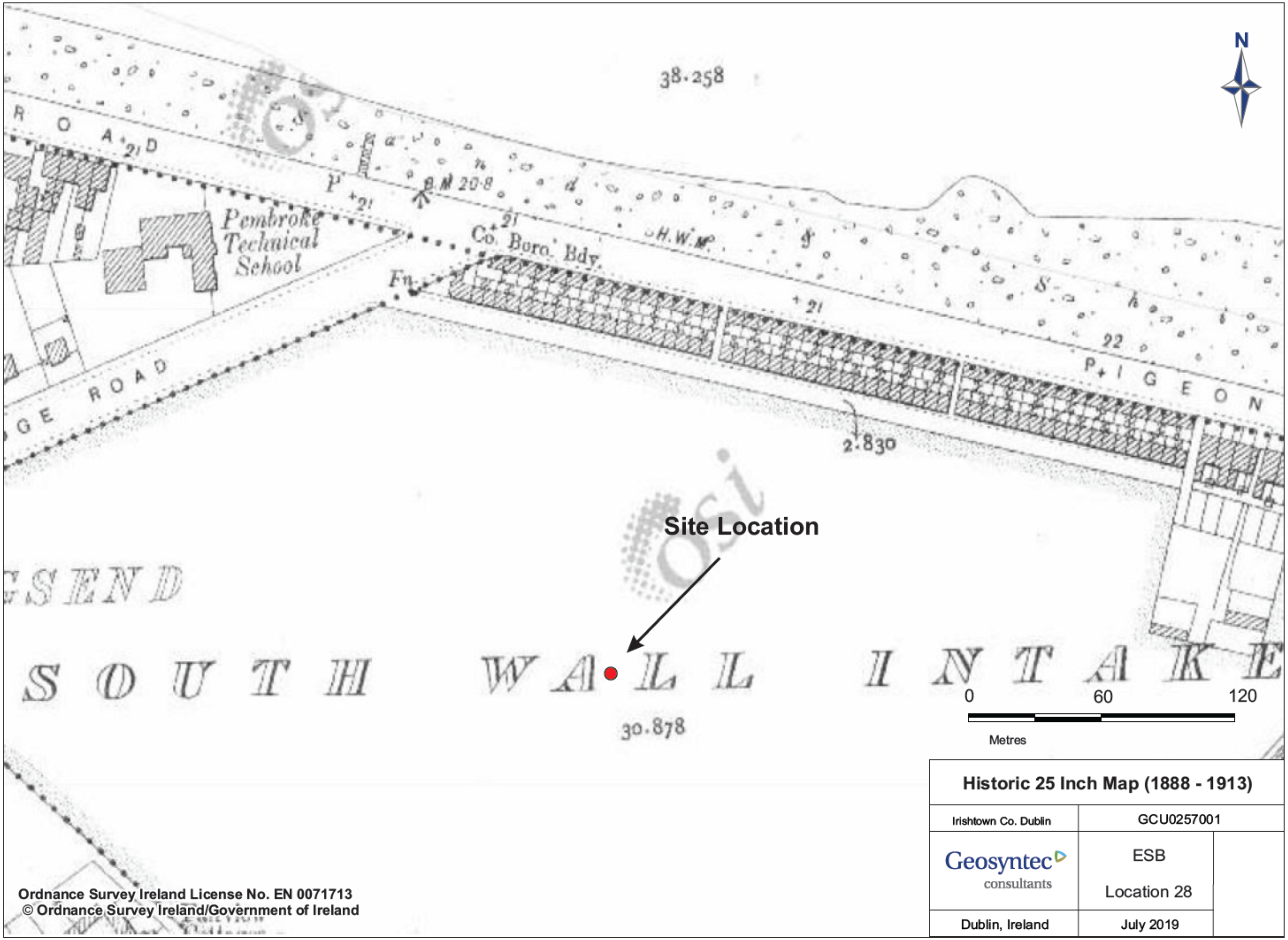
Appendix B – Historical Maps and Aerial Images

A P P E N D I X B



Historic 6 Inch Map (1837- 42)	
Irishtown Co. Dublin	GCU0257001
Geosyntec consultants	ESB Location 28
Dublin, Ireland	July 2019



Historic 25 Inch Map (1888 - 1913)

Irishtown Co. Dublin	GCU0257001
Geosyntec consultants	ESB Location 28
Dublin, Ireland	July 2019

Present Day Aerial Image	
Irishtown Co. Dublin	GCU0257001
Geosyntec consultants	ESB Location 28
Dublin, Ireland	July 2019

Appendix C – Safety Data Sheet for Cable Fluid

A

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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°C
Flash point:	>135°C
Flammability:	Non flammable
Explosive properties:	Not explosive
Oxidising properties:	Not applicable
Vapour pressure at 20°C:	<0.02 kPa
Density:	0.86 g/cm^{-3} at 20°C typical
Solubility in water:	Insoluble
Kinematic Viscosity at 20°C:	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°C typical
Expansion coefficient:	0.0007 /°C 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°C
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 (7^{th} 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.

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.

Material Safety Data Sheet

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.

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