



ESB Engineering and Major Projects

Carrickmines - Poolbeg (Site ID 41)

Preliminary Environmental Site Assessment

602749 – R02 (01)

DECEMBER 2019





EXECUTIVE SUMMARY

Following the submission of a proposal of works (reference: 602749, dated October 2019), RSK Ireland Limited (RSK) was instructed by ESB International Ltd in October 2019 to carry out a Preliminary Environmental Site Assessment (PSA) at the site of an historic fluid filled cable leak at a location approximately 10m to the north of the junction of Foster Avenue and The Fosters, Booterstown, Blackrock, Dublin 4 (the site). The site of the leak has been assigned a site ID number 41.

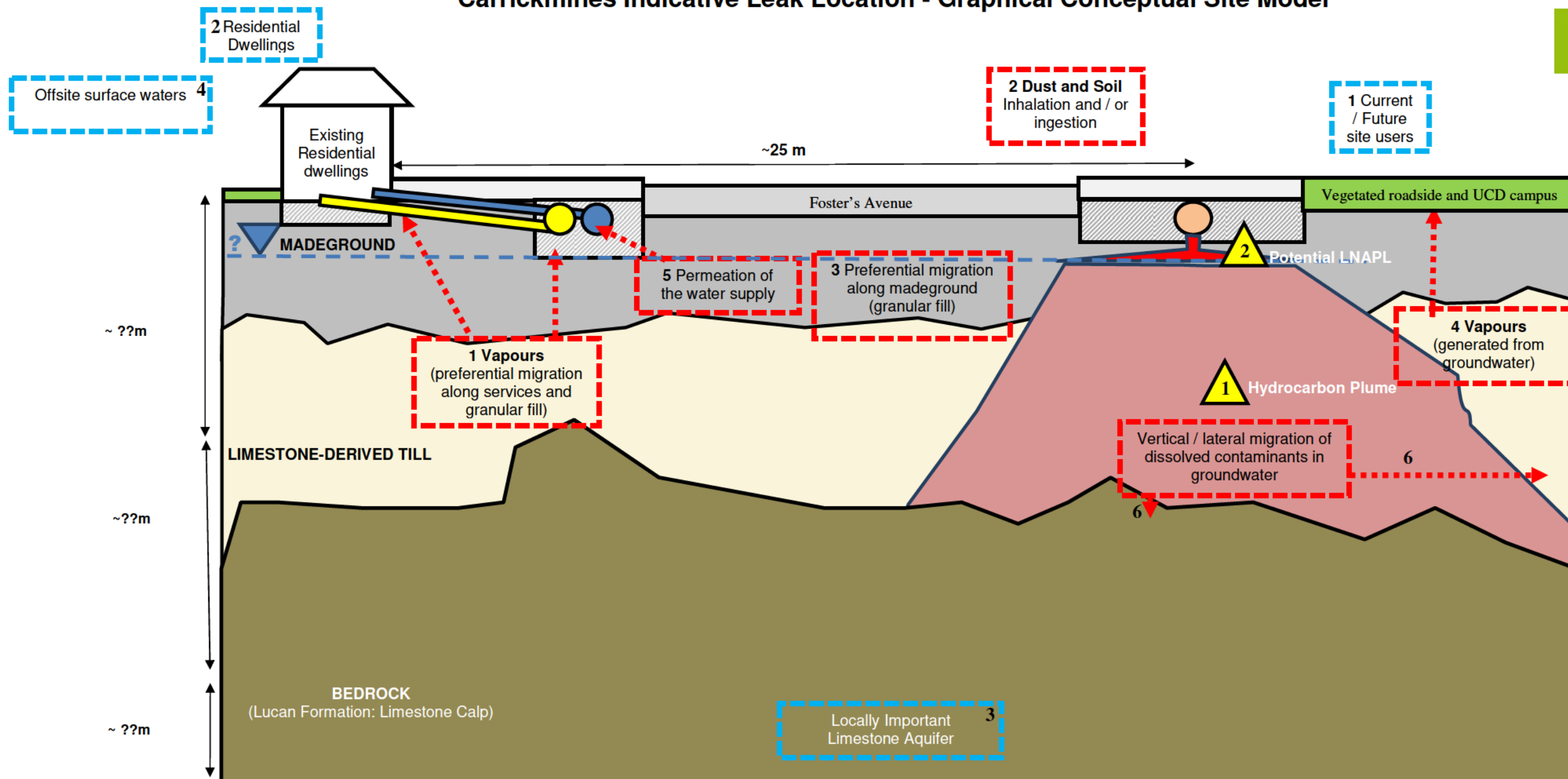
Historic information confirms that the area of the site was for agricultural land use until at least 1888. There has been a lane or road in the current location of Fosters Avenue since at least 1842. The site and immediate surrounding area are currently developed as residential with a university campus to the north.

The site is the location of a leakage of cable fluid from a high voltage (HV) underground cable which occurred in February 2008. It is RSKs understanding that the fluid contained Linear Alkyl Benzene (LAB) and that the total fluid loss was approximately 590 litres.

The aim of the PSA is to assess potential impacts to human health and the environment from the leaked fluid, establish any potential environmental liabilities associated with contamination issues at the site due to leaked insulating fluids, to include a detailed source audit and desk-based hydrogeological assessment.

The initial CSM has identified potential pollutant linkages with a risk class of **LOW or VERY LOW** for all identified potential pollution linkages.

Carrickmines Indicative Leak Location - Graphical Conceptual Site Model



Potential Sources	Potential Pathways	Potential Receptors	Key:
Hydrocarbon Plume	Preferential migration along services	Current / Future site users	Municipal services
Potential LNAPL	Dust and/or soil inhalation and/or ingestion	Residential dwellings	Fluid filled cable
	Preferential migration through made ground (granular fill)	Locally Important Limestone Aquifer	Mains water service
	Vapour migration in groundwater	Offsite surface waters	Garden/soft landscaping
	Permeation of the water supply		Potential perched water level
	Vertical / lateral migration of dissolved contaminants in groundwater		Footpath
			Made ground
			Granular fill



EPA Contaminated Land & Groundwater Risk Assessment Methodology	Report Reference	Report Date	Status
STAGE 1: SITE CHARACTERISATION & ASSESSMENT			
1.1	PRELIMINARY SITE ASSESSMENT ██████████	602749 R02 20/12/2019	FINAL
1.2	DETAILED SITE ASSESSMENT		
1.3	QUANTITATIVE RISK ASSESSMENT		
STAGE 2: CORRECTIVE ACTION FEASIBILITY & DESIGN			
2.1	OUTLINE CORRECTIVE ACTION STRATEGY		
2.2	FEASIBILITY STUDY & OUTLINE DESIGN		
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		



RSK GENERAL NOTES

Project No.: 602749 – R02 (01)

Title: Preliminary Environmental Site Assessment: Carrickmines - Poolbeg (Site I.D. 41)

Client: ESB Engineering and Major Projects

Date: 20th December 2019

Office: Dublin

Status: **FINAL**

Document Production/Approval Record

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Approved by (consultant)	██████████		20/12/19	Managing Director	10

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Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Ireland Ltd.



LIMITATIONS

All objectives and outlined scope of works contained within the proposal of works (proposal reference 602749, dated October 2019) have been achieved and completed.

The comments given in this report and the opinions expressed are based on the information reviewed. However, there may be conditions pertaining at the site that have not been disclosed by the investigation and therefore could not be taken into account.

This report is subject to the RSK Ireland Limited service constraints given in Appendix A.

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Appendix D: Material safety data sheets

1 INTRODUCTION

1.1 Project Contractual Basis and Personnel Involved

Following the submission of a proposal of works (reference: 602749, dated October 2019), RSK Ireland Limited (RSK) was instructed by ESB Engineering and Major Works in October 2019 to carry out a Preliminary Environmental Site Assessment (PSA) at the site of an historic fluid filled cable leak at a location approximately 10m to the north of the junction of Foster Avenue and The Fosters, Booterstown, Blackrock, Dublin 4 (the site). The site of the leak has been assigned a site ID number 41.

This report has been compiled by Brian Cronin BSc, MSc, MIEI (Graduate Consultant with 2 years of experience). The site walkover was also completed by Brian Cronin.

This report is subject to the RSK service constraints given in Appendix A.

1.2 Background Information

The site is the location of a leakage of cable fluid from a high voltage (HV) underground cable which occurred in February 2008. It is RSKs understanding that the fluid contained in the cable is Linear Alkyl Benzene (LAB) and that the total fluid loss was approximately 590 litres. It is also RSKs understanding that no previous investigations or monitoring has been undertaken at the subject site. The site location is shown on Figure 1.

The aim of the preliminary site assessment (PSA) is to assess potential impacts to human health and the environment from the leaked fluid, establish any potential environmental liabilities associated with contamination issues at the site due to leaked insulating fluids, undertake a detailed source audit and desk-based hydrogeological assessment.

1.3 Project Objectives

RSK will assess potential impacts associated with legacy cable fluid loss at the site. The PSA will determine the potential risks to human health and the environment at the leak location and potential areas of impact. The risk-based approach applied will be consistent with Irish regulations as well as the best practice document Guidance on the Management of Contaminated Land and Groundwater at EPA Licenced site. In addition, risks will be assessed in accordance with CIRIA C552 and the outcome of the risk assessment will be used to determine any further actions that may be required to further inform the risk assessment.

The objectives of this assessment are to:

- Design a conceptual site model (CSM) for the site based on a review of historical information, environmental setting and a site walkover; and

- Obtain and review sufficient information regarding ground conditions from which risks to end-users and the environment can be assessed.

1.4 Scope of Work

A scope of work has been devised to meet the objectives set out in section 1.3. The scope of works for the assessment included:

- A desk-based assessment to include a review of geological, hydrogeological and hydrological information and historical plans and completion of a site walkover;
- Review of information held by the Ordnance Survey of Ireland (OSI), Geological Survey of Ireland (GSI), Office of Public Works (OPW), Environmental Protection Agency (EPA), and Local Authority (Dublin City Council); and
- Produce an initial Conceptual Site Model (CSM) to identify and assess any potential pollution linkages assuming the ongoing commercial land use.

2 SOURCE AUDIT FINDINGS – PRODUCTION AND OPERATIONAL HISTORY

2.1 Current Site Activities

The site of the historic cable leak is located in the vicinity of a footpath adjacent to the Foster Avenue and located approximately 10 m to the north of The Fosters, Booterstown, Blackrock, Dublin 4.

2.2 Previous Site Operations

A review of the site history was undertaken by assessing the available historical maps and aerial photos available from the Ordnance Survey of Ireland (OSI) geohive public viewer <http://map.geohive.ie/mapviewer.html>.

The earliest available online OSI map dating from 1837-1842 (Figure 3) shows that the site is located along an unmarked road or lane in the location where Foster Avenue is found today. The surrounding land use is primarily agricultural use, with some residential land use in Booterstown, approximately 1 km east of the site. Booterstown is relatively undeveloped with most residential properties found on just one street – Merrion Avenue.

The OSI online map from 1888-1913 (Figure 4) shows almost no development at the site since the 1837-1842 map, the area remains unchanged. There is relatively little development of Booterstown since the 1837–1842 map. Blackrock, beyond Booterstown to the east, is significantly urbanised.

The OSI aerial photos from 1995 to 2012 have also been reviewed. The resolution of the photography is poor, and it is not possible to identify building or property use. The area has now been significantly developed, resembling the current state of the site and surrounding area. The surrounding land use appears to be predominantly residential, with the University College Dublin (UCD) campus immediately to the northwest of the site. There appear to be some warehouses approximately 100 m south of the leak location. In general, little change is noted from 1995 to the present day on the site and surrounding area.

2.3 Chemicals of Potential Concern

As previously mentioned the site is the location of a historical leak of insulating fluid from a HV cable. Therefore, the main chemicals/contaminants of potential concern (COPC) at the site are the hydrocarbons comprising the insulating fluid which leaked. The fluid used to insulate the cables comprised Linear Alkyl Benzene (LAB).

LAB is a clear, colourless liquid with a mild petroleum odour. The European Chemicals Bureau produced a European Risk Assessment report with regards to LAB in 1999 ⁽²⁾. The risk assessment concluded that there was a high margin of safety with regards to indirect human exposure via the environment, that LAB is not carcinogenic and is not toxic nor harmful. The overall result of the risk assessment was that 'there is at present

no need for further information and/or testing of for risk reduction measures beyond those which are being applied already’.

The identified COPC are outlined in Table 2.1.

Table 2-1: Contaminants of potential concern

Potential Sources	COPC
HV Cable insulating fluid leak 2010	Linear Alkyl Benzene (LAB) Poly Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH) and Semi-Volatile Organic Compounds (SVOCs)

The properties of LAB as identified in the material safety data sheet (Appendix D) are outlined below;

LAB;

- Physical State : Liquid
- Colour : Colourless
- Odour : Odourless
- Boiling Point/range : 278 – 316 0C
- Flash Point (Close Cup) (0C.) : 140
- Vapour Density : 8.4 (Air = 1)
- Vapour Pressure @ 25 0C : 0.01 mmHg
- Evaporation Rate : NA
- Specific Gravity : 0.866 (Water = 1)
- pH : NA
- Solubility in Water : Insoluble
- Kinematic Viscosity : 4.0 – 4.5 mm²/s

It should be noted that anecdotal information suggests that dissolved phase LAB has previously been identified in surface water samples recovered from surface waters adjacent to LAB spill locations and therefore the anecdotal information indicates that LAB may have at least limited solubility potential under certain conditions.

3 SITE ENVIRONMENTAL SETTING

3.1 General Introduction

The site is located at Fosters Avenue, Booterstown, Blackrock, Dublin 4. The site is located approximately 2 km south of Dublin City Centre. The site is centred on Irish Grid reference O 19254 29543 at an altitude of approximately 29 m above ordnance datum.

A site walkover survey was carried out by RSK on 6th November 2019. The findings are summarised below. The site walkover photographs are included in Appendix B.

The indicative leak is located on Fosters Avenue, in a predominantly residential area of Booterstown, adjacent to the University College Dublin (UCD) campus. The indicative leak location is approximately 10 m north of the junction with The Fosters. Detached properties with front and rear gardens are located approximately 10m to the south, UCD campus bounds the leak location to the north. Fosters Avenue is also lined by mature trees, a band of grassed soft landscaping separates the footpath from the residential properties on the south side of Fosters Avenue. A band of grassed soft landscaping and a public walkway separates the footpath from UCD campus on the north side of Fosters Avenue.

The R138 dual carriageway is located approximately 150m to the east of the site. The surrounding area is predominantly residential to the south and parkland associated with the UCD campus to the north.

3.2 Regional Geology and Hydrogeology

3.2.1 Geology

Information from the Geological Survey of Ireland (GSI) online mapping public viewer <https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228> indicates that the solid geology underlying the site is Calp, of the Lucan Formation, as shown in Figure 3.1 below. The Lucan formation comprises dark grey to black limestone and shale.

The superficial geology underlying is described as made ground overlying till derived from limestone.

The GSI has published borehole and trial pit records on-line. Although there are no available borehole/trial pits records for the subject site.

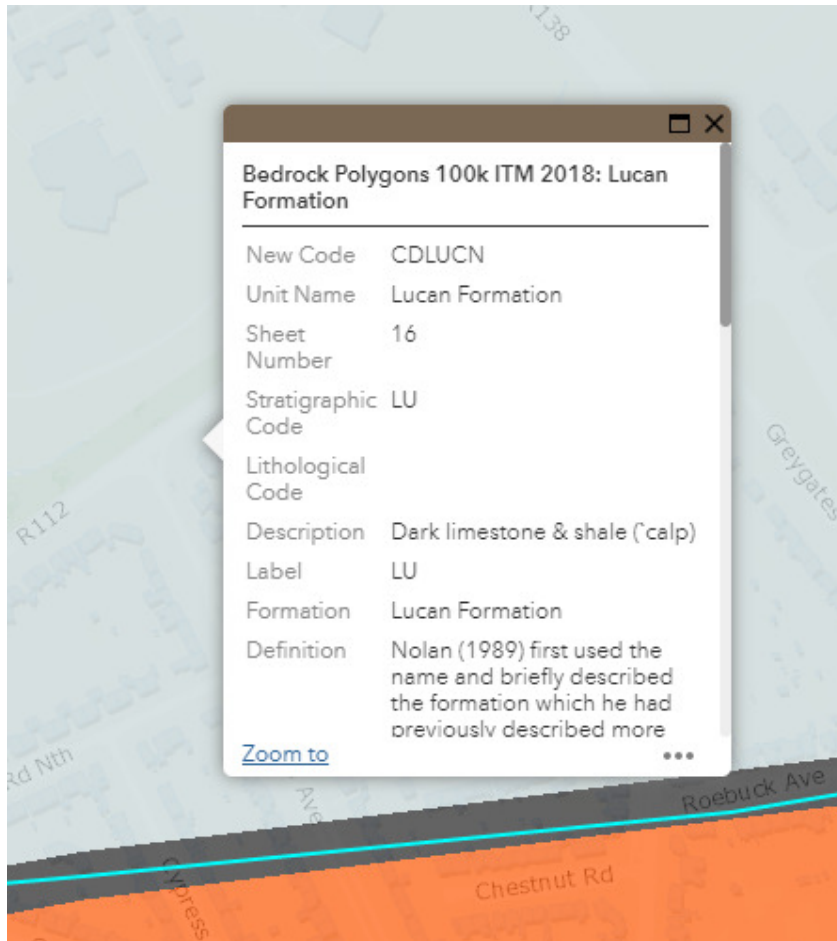


Figure 3.1 Bedrock Geology Underlying Site

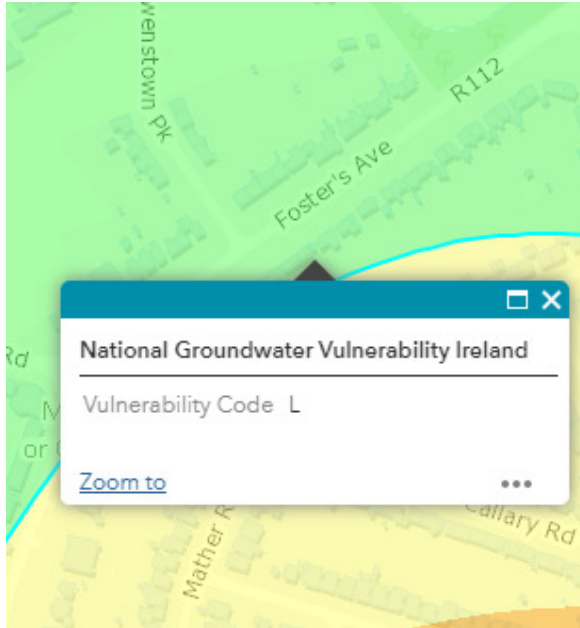
3.3 Hydrogeology

3.3.1 Aquifer characteristics

Information from the GSI Groundwater public viewer website <http://spatial.dcenr.gov.ie/imf/imf.jsp?site=Groundwater> indicates that the underlying bedrock is categorised as a locally important aquifer, that is an aquifer which is productive only in local zones. It is anticipated that perched groundwater may be encountered in more permeable horizons within any made ground and superficial deposits.

Groundwater vulnerability is classified as Low at the site (see Figure 3.2 below). The EPA categorise the groundwater body as not at risk and water framework directive (WFD) monitoring (2010-2015) ranks the water quality as good.

Figure 3.2 Groundwater Vulnerability at the Site



3.3.2 Groundwater abstractions

The GSI public viewer indicates that there are no groundwater abstractions within 1km of the site. The closest groundwater abstraction is located approximately 1.4 km north of the site. The well use is described as “other”. Yields are 95.9 m³/day. The site is not located in a source protection area.

3.4 Hydrology

3.4.1 Surface watercourses

EPA mapping (available at <https://gis.epa.ie/EPAMaps/>) has been reviewed to identify potential receptor surface watercourses. The nearest surface watercourse to the site is an unnamed stream located 800m north west of the site, within the UCD campus. Another unnamed stream is located approximately 1km north east of the site flowing in a south west to north east direction. The Priors Stream flows in a south to northeast direction, approximately 1.0 km southeast of the site. The Elm Park Stream is located approximately 1.1km north of the site flowing in a west to east direction.

The EPA do not have data on the map viewer for any water quality data for any of these watercourses

3.4.2 River Basin Management Plan

River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The Water Maps viewer (available at <http://www.wfdireland.ie/maps.html>) is an integral part of the River Basin Management Plan and provides access to information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland.

There is no information for a river basin waterbody underlying the site. The groundwater body underlying the site is listed as Waterbody Dublin Urban and its status is described as good, however it is described as being at risk.

3.4.3 Site Drainage

The majority of the site is sealed with tarmac and/or concrete. From reviewing the available information on site, all local surface water drainage is assumed to discharge to the municipal drainage system on Fosters Avenue.

Drawings from Irish Water indicate there are two stormwater gravity mains on Fosters Avenue which both run west to east. The first stormwater drain runs from the western extent of the study area, along Fosters Avenue to 22 Fosters Avenue where it diverts south-east to join the stormwater drain from The Fosters. The second storm water drain starts at 8 Fosters avenue, runs north-east to the end of Fosters Avenue and then north across Stillorgan Road. The drainage drawing can be found in Figure 6.

3.4.4 Flood Risk

The Office of Public Works (OPW) interactive flood maps, available at <https://www.floodinfo.ie/map/floodmaps/>, has one record from 10th June 1963 of a flood event at the eastern end of Fosters Avenue at the junction with Stillorgan Road. It is noted that 12 inches of rain were recorded over a 24 hour period

The OPW Flood Map resource was consulted for additional information on the probability of a flood event occurring at the site in any given year. However, no information is available for this location..

3.5 EPA Licensed IPPC / Section 4 Discharges / Waste Facilities

Information from the EPA website <https://gis.epa.ie/EPAMaps/> indicates that there are no IPPC facilities, section 4 discharges or licensed waste facilities located within 1 km of the site.

3.6 Sensitive land uses

A 2km buffer zone for sensitive land uses has been used as RSK considers it reasonable to assume that significant impact is unlikely to receptors where surface water or groundwater migration is a potential pathway at this distance.

A search carried out using the National Parks and Wildlife website (<http://www.npws.ie/>) for the presence of any designated sites identified South Dublin Bay Special Area of

Conservation (SAC), South Dublin Bay and River Tolka Estuary Special Protection Area (SPA) and South Dublin Bay proposed Natural Heritage Area (pNHA) all located 1.8 km east of the site. In addition the Grand Canal pNHA is located approximately 1.7 km to the north west. Proposed Natural Heritage Areas (pNHAs) were published on a non-statutory basis in 1995; they have not been statutorily proposed or designated but are of significance for wildlife and habitats.

3.7 Local Authority Information

RSK have requested information from Dun Laoghaire Rathdown Council on 7th November 2019 regarding any pertinent environmental issues that they are aware of on or adjacent to the subject site. Dun Laoghaire Rathdown Council acknowledged RSK's request for information and advised the information would be sent in due course. No information had been received at the time of reporting.

4 CONCEPTUAL SITE MODEL

4.1 Summary: Initial Conceptual Model

The information presented in Sections 2 and 3 has been used to compile an initial conceptual model. The identified potential sources of contamination, associated contaminants and receptors have been considered with plausible pathways that may link them. The resulting potential pollutant linkages are considered in Section 4.1.4.

4.1.1 Summary of potential contaminant sources

Potential sources and contaminants of concern are summarised in Table 4.1 below.

Table 4.1: Potential sources and types of contamination

Potential sources	Contaminants of concern
On-site	
Historic leak of HV cable insulating fluids	LAB insulating oil and potential breakdown products

4.1.2 Sensitive receptors

Sensitive receptors at the site include:

- Current / future site users.
- Neighbouring site users and surrounding areas.
- Groundwater in bedrock.
- Sensitive land uses.

Please note that construction workers have not been identified in the conceptual model as receptors because risks are considered to be managed through health and safety procedures as required in the Safety, Health and Welfare at Work (Construction) Regulations 2013.

4.1.3 Summary of plausible pathways

The plausible pathways are summarised below:

- Migration of hydrocarbon vapours in any permeable soils or along existing service runs from natural deposits or made ground.
- Vertical and lateral migration via groundwater.
- Preferential migration of contaminants in groundwater via underground service corridors.
- Permeation of water supply pipes.
- Inhalation of hydrocarbon vapours.

- Direct contact via soil and dust ingestion/inhalation from near surface soils and dermal contact with near surface soils.

4.1.4 Potentially complete pollutant linkages

The outline conceptual model and an estimate of the risk associated with each linkage is summarised in Table 4.2 below. The risk classification has been undertaken in accordance with CIRIA C552 (Rudland et al., 2001), a summary of which is included in Appendix C.

Table 4.2: Risk estimation for potentially complete pollutant linkages

Potential source	Possible pathway	Potential receptor	Likelihood	Severity	Risk and justification
<u>Onsite</u> Contamination associated with historic leakage of HV cable insulating fluid containing LAB.	Inhalation of hydrocarbon vapours	Current / future site users & occupants of adjacent sites	Unlikely	Medium	<p>Low</p> <p>The insulating fluid has a low volatility. The vapour pressure of LAB is 0.013 hPa @ 25oC</p> <p>There are no buildings built over the cable route reducing risks to residential and commercial human health receptors.</p> <p>The leak of insulating fluid occurred in the roadway or adjoining pathway and most likely in granular materials used in the construction. The granular material in the road and path construction pack will likely act as a preferential pathway for any vapours formed.</p> <p>In addition, the spillage occurred over 11 years ago, and the most volatile fractions of the fluid are likely to have partitioned and dissipated.</p>
	Direct dermal contact or ingestion of hydrocarbons	Current / future site users & occupants of adjacent sites	Unlikely	Medium	<p>Low</p> <p>The area of the insulating oil leak is under hard standing. Areas of soft landscaping adjacent to public pathways and on private property are unlikely to be impacted.</p>

Potential source	Possible pathway	Potential receptor	Likelihood	Severity	Risk and justification
	Permeation of water supply pipes	Current / future site users & occupants of adjacent sites	Unlikely	Medium	<p>Low</p> <p>Water will be moving rapidly and at high pressure in water supply pipes making it unlikely that permeation of the pipes will occur in significant or harmful concentrations.</p> <p>In addition, the WHO drinking water guideline value for EC10–EC12, EC12 – 16 aromatic fractions are 0.09 mg/l(2); however, as the solubility limit of LAB is 0.041 mg/L (OECD), it is not possible for the LAB to dissolve into the water supply above this concentration, therefore, the drinking water guideline value cannot be exceeded.</p>
	Vertical and lateral migration	Surface Waters / Underlying locally important aquifer	Low likelihood	Mild	<p>Low</p> <p>It is unlikely that the site will be hydrogeologically connected to identified surface waters located >800m from the site and if we assume that they are it is highly unlikely that dissolved contamination at the site of the leak will affect surface waters given the processes of dispersion, and biodegradation that will occur to any dissolved contamination over this distance.</p> <p>Vertical migration to the locally important aquifer in the Calp will be impeded by the limestone till overburden.</p> <p>In addition, as detailed in section 3.3.2 there are no abstractions identified within 1km of the site.</p>
	Vertical migration and Lateral migration in groundwater and surface waters	Sensitive land uses within 2km of site	Unlikely	Mild	<p>Very Low</p> <p>South Dublin Bay SAC and pNHA and South Dublin Bay and River Tolka Estuary SPA are located 1.8 km to the east of the site. No plausible pathways via groundwater and or surface water from the site are considered to exist.</p>

4.2 Risk Evaluation

Only potential source contamination related to the historic leak of HV cable insulating fluid containing LAB oil has been considered.

The initial CSM has identified potential pollutant linkages with a risk class of **LOW** or **Very LOW** for all identified pollution linkages.

5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Historic information confirms that the area of the site was for agricultural land use until at least 1888. There has been a lane or road in the current location of Fosters Avenue since at least 1842. The site and immediate surrounding area are currently developed as suburban residential with a university campus to the north.

The site is the location of a leakage of cable fluid from a high voltage (HV) underground cable which occurred in February 2008. It is RSKs understanding that the fluid contained Linear Alkyl Benzene (LAB) and that the total fluid loss was approximately 590 litres.

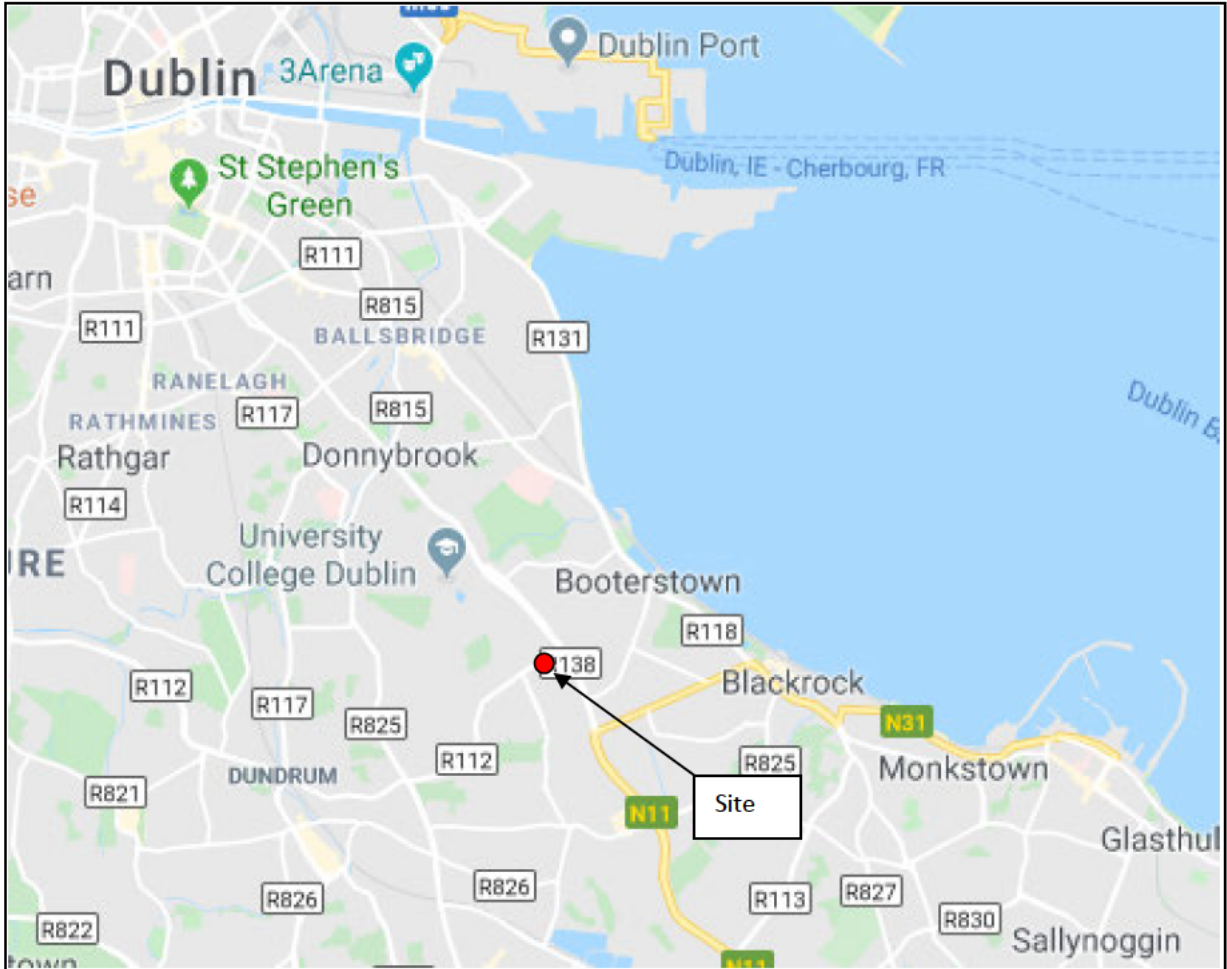
The aim of the PSA is to assess potential impacts to human health and the environment from the leaked fluid, establish any potential environmental liabilities associated with contamination issues at the site due to leaked insulating fluids, to include a detailed source audit and desk-based hydrogeological assessment.

The initial CSM has identified potential pollutant linkages with a risk class of **LOW or VERY LOW** for all identified potential pollution linkages.

6 REFERENCES

1. Petroleum Products in Drinking Water, Background Document for development of WHO guidelines for Drinking-water quality, 2008
2. European Chemicals Bureau. European Union Risk Assessment Report for Benzene C₁₀-₁₃ Alkyl Derivs, June 1997
3. CIRIA, C552, Contaminated Land Risk Assessment. A Guide to Good Practice , 2001.

FIGURES



Prepared For: ESB Engineering and Major Projects

Project: Site # 41 – Carrickmines - Poolbeg

Drawing Title: Figure 1 Site Location



Source: Google
Date: 13/11/2019



Figure 41

Legend
 ● Indicative Leak Location
 ~ Low Pressure Fluid Filled Cable

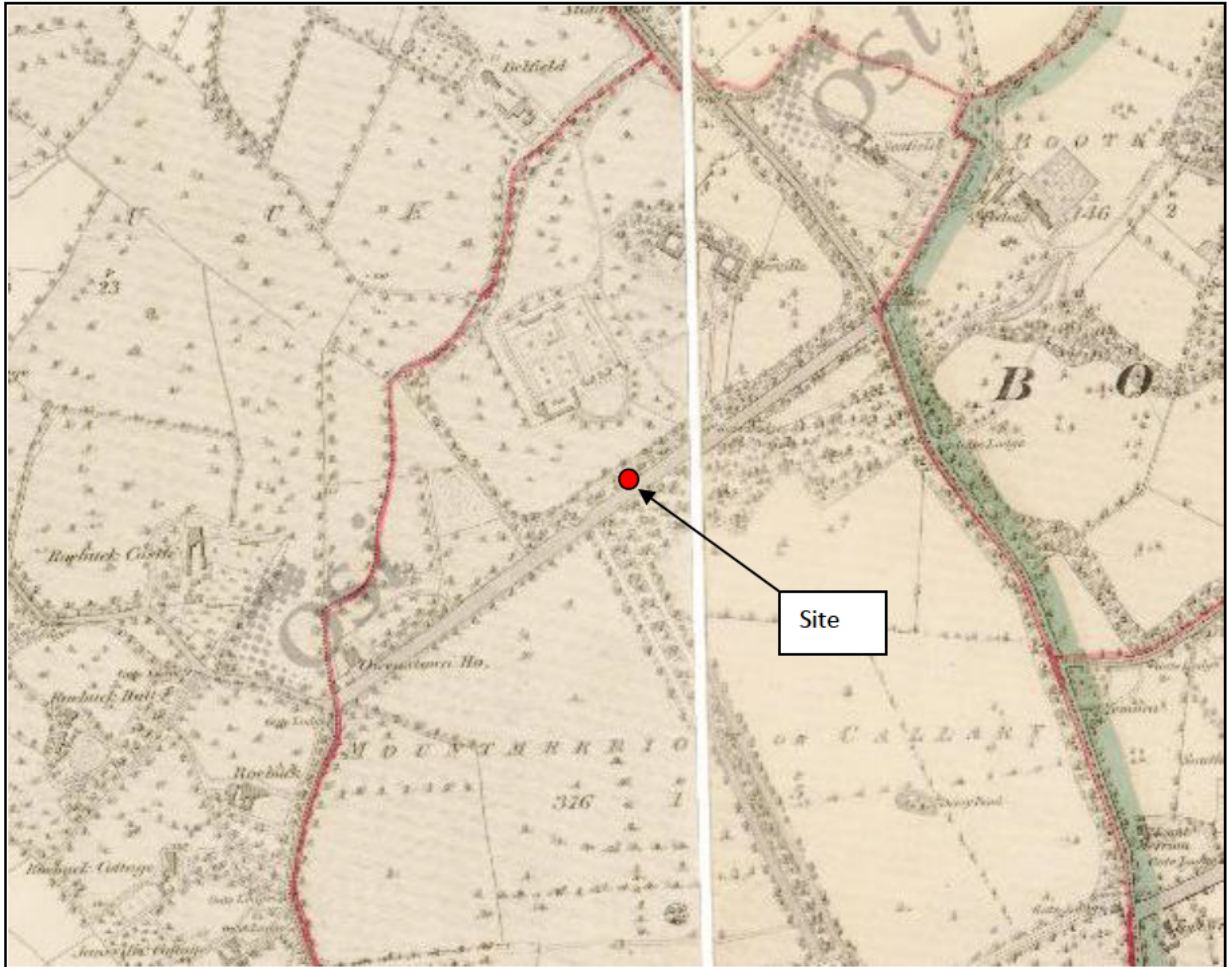
Prepared For: ESB Engineering and Major Projects

Project: Site # 41 – Carrickmines - Poolbeg

Drawing Title: Figure 2 Site Layout Plan

RSK

Source: ESB Networks
 Date: 07/11/2019



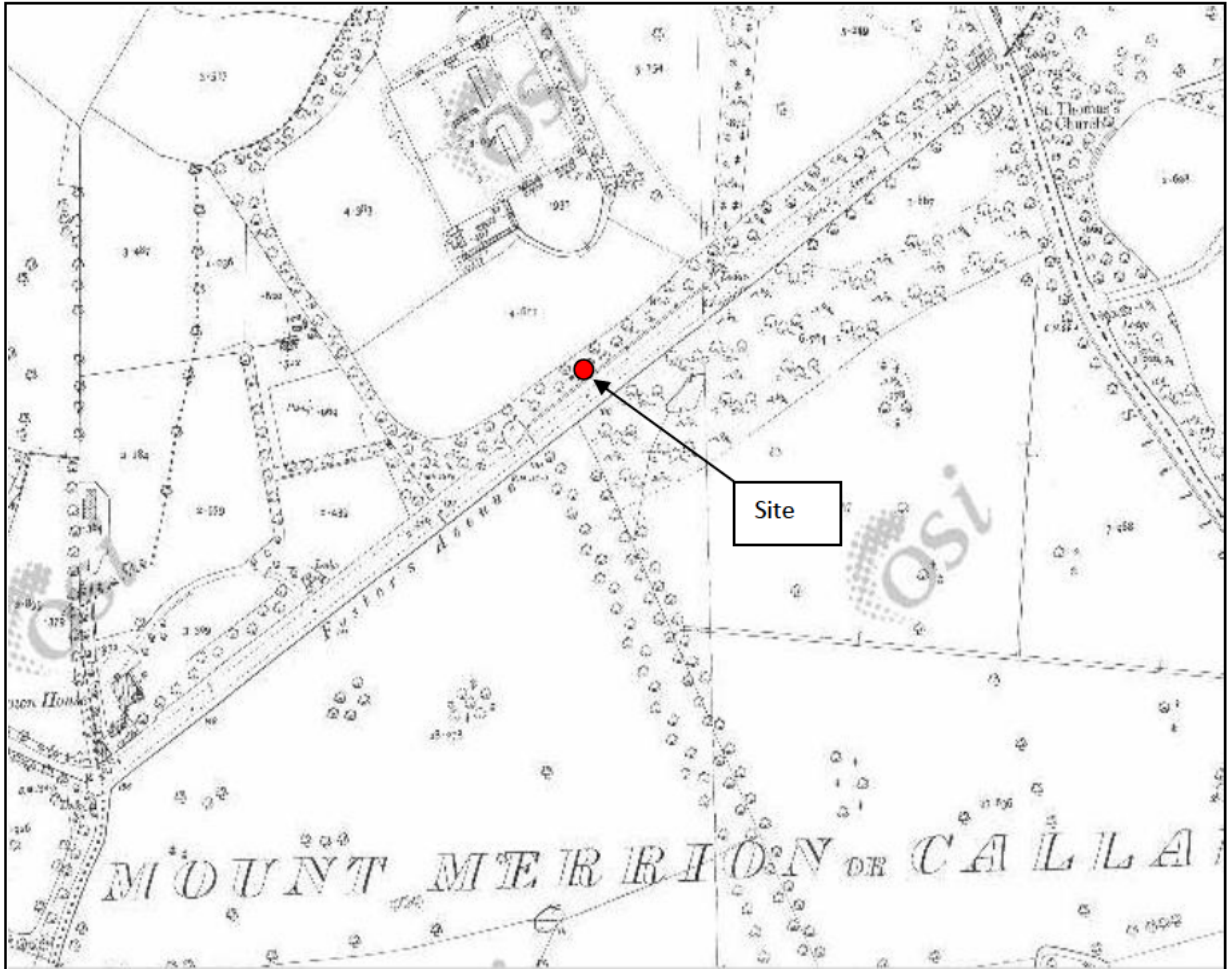
Prepared For: ESB Engineering and Major Projects

Project: Carrickmines - Poolbeg

Drawing Title: Figure 3 - OSI Historic Map 1837-1842

RSK

Source: OSI (accessed via GeoHive)
Date: 07/11/2019



Prepared For: ESB Engineering and Major Projects

Project: Site # 41 - Carrickmines - Poolbeg

Drawing Title: Figure 4 OSI Historic Map 1888-1913

RSK

Source: GeoHive
Date: 07/11/2019



Prepared For: ESB Engineering and Major Projects

Project: Site # 41 – Carrickmines - Poolbeg

Drawing Title: Figure 5 GSI Aerial Photo 1995

The logo for RSK, consisting of the letters 'RSK' in a bold, green, sans-serif font.

Source: GeoHive
Date: 06/11/2019



11/8/2019 3:55:15 PM

© Ordnance Survey Ireland | © Ordnance Survey Ireland |

Legend

<p>Stormwater Gravity Mains (Irish Water Owned)</p> <ul style="list-style-type: none"> — Surface <p>Stormwater Gravity Mains (Non-Irish Water Owned)</p> <ul style="list-style-type: none"> — Surface <p>Storm Manholes</p> <ul style="list-style-type: none"> — Cascade — Catchpit — Hatchbox — Lamphole — Standard — Other; Unknown <p>Storm Inlets</p> <ul style="list-style-type: none"> — Gully — Standard — Other; Unknown 	<p>Storm Fittings</p> <ul style="list-style-type: none"> — Vent/Col — Other; Unknown <p>Storm Discharge Points</p> <ul style="list-style-type: none"> — Outfall — Overflow — Soakaway — Other; Unknown — Storm Culverts — Storm Clean Out <p>Sewer Gravity Mains (Irish Water owned)</p> <ul style="list-style-type: none"> — Combined — Foul — Overflow — Unknown 	<p>Sewer Gravity Mains (Non-Irish Water owned)</p> <ul style="list-style-type: none"> — Combined — Foul — Overflow — Unknown <p>Sewer Pressurised Mains (Irish Water owned)</p> <ul style="list-style-type: none"> — Combined — Foul — Overflow — Unknown <p>Sewer Pressurised Mains (Non-Irish Water owned)</p> <ul style="list-style-type: none"> — Combined — Foul — Overflow — Unknown
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Irish Water gives this information as to the position of its underground network as a general guide only on the understanding that it is based on the best available information provided by each Local Authority in Ireland. It should not be relied upon in the event of excavations or other works being carried out in the vicinity of the network. The onus is on the parties carrying out the works to ensure the exact location of the network is identified prior to mechanical works being carried out. Service pipes are not generally shown but their presence should be anticipated.



"Gas Networks Ireland (GNI), their affiliates and assigns, accept no responsibility for any information contained in this document concerning location and technical designation of the gas distribution and transmission network ("the information"). Any representations and warranties express or implied, are excluded to the fullest extent permitted by law. No liability shall be accepted for any loss or damage including, without limitation, direct, indirect, special, incidental, punitive or consequential loss including loss of profits, arising out of or in connection with the use of the information (including maps or mapping data). NOTE: DIAL BEFORE YOU DIG Phone 1850 427 747 or e-mail dg@gasnetworks.ie - The actual position of the gas/electricity distribution and transmission network must be verified on site before any mechanical excavating takes place. If any mechanical excavation is proposed, hard copy maps must be requested from GNI re gas. All work in the vicinity of the gas distribution and transmission network must be completed in accordance with the current edition of the Health & Safety Authority publication, 'Code of Practice For Avoiding Danger From Underground Services' which is available from the Health and Safety Authority (1890 28 93 89) or can be downloaded free of charge at www.hsa.ie."

Prepared For: ESB Engineering and Major Projects

Project: Site #41 - Carrickmines - Poolbeg

Drawing Title: Figure 6 Drainage



Source: Irish Water
Date: 07/11/2019



APPENDIX A

SERVICE CONSTRAINTS

RSK ENVIRONMENT LIMITED SERVICE CONSTRAINTS

1. This report (the "Services") was compiled and carried out by RSK Ireland Limited (RSK) for ESB International Ltd (the "client") in accordance with the terms of a contract between RSK and the "client", dated October 2019. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. **Any such party would be** well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date hereof, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.
8. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.



APPENDIX B PHOTOGRAPHS



PHOTOGRAPHIC LOG

Client Name:

ESB Engineering and Major Projects

Site Location:

Carrickmines - Poolbeg

Site walkover

Photo No.
1**Date:**
November
2019**Direction Photo taken:**

East

Description:

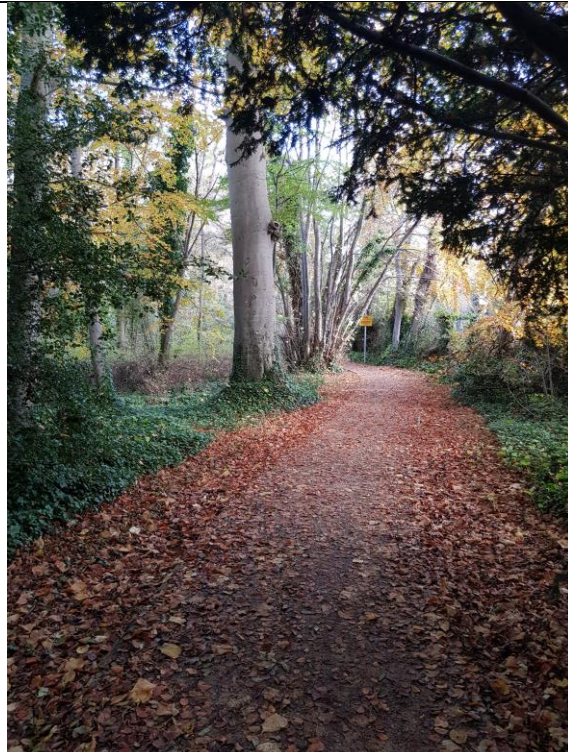
View of Fosters Avenue. A vegetated area at the edge of UCD campus can be seen on the left of the photo and residential properties can be seen in the background on the far right of the photo.

**Photo No.**
2**Date:**
November
2019**Direction Photo taken:**

East

Description:

View of the vegetated area immediately north of and adjacent to Fosters Avenue. From this point of view, Fosters Avenue is to the right (out of view) and UCD campus is to the left (out of view).





PHOTOGRAPHIC LOG

Client Name:
ESB Engineering and Major Projects

Site Location:
Carrickmines - Poolbeg

Site walkover

Photo No.
3

Date:
November
2019

Direction Photo taken:
Northeast

Description:
Open green space on UCD
campus, north of Fosters
Avenue



Photo No.
4

Date:
October
2019

Direction Photo taken:
Southeast

Description:
Junction of Fosters Avenue
and Stillorgan Road. This
forms the eastern extent of
the site



Client Name:

ESB Engineering and Major Projects

Site Location:

Carrickmines - Poolbeg

Site walkover

Photo No.
5**Date:**
November
2019**Direction Photo taken:**

Southwest

Description:Residential properties
south of Fosters Avenue**Photo No.**
6**Date:**
October
2019**Direction Photo taken:**

Southeast

Description:Entrance to one non-
residential property on
Fosters Avenue. Property
could not be identified but
from aerial photography
there appear to be
warehouses on the site.

APPENDIX C

RISK ASSESSMENT METHODOLOGY

CLR11 outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. Under CLR11, three stages of risk assessment exist: preliminary, generic quantitative and detailed quantitative. An outline conceptual model should be formed at the preliminary risk assessment stage that collates all the existing information pertaining to a site in text, tabular or diagrammatic form. The outline conceptual model identifies potentially complete (termed possible) pollutant linkages (source–pathway–receptor) and is used as the basis for the design of the site investigation. The outline conceptual model is updated as further information becomes available, for example as a result of the site investigation.

Production of a conceptual model requires an assessment of risk to be made. Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk. RSK has adopted guidance provided in CIRIA C552 for use in the production of conceptual models.

The likelihood of an event can be classified on a four-point system using the following terms and definitions based on CIRIA C552:

- **Highly likely:** the event appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution
- **Likely:** it is probable that an event will occur or circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term
- **Low likelihood:** circumstances are possible under which an event could occur, but it is not certain even in the long term that an event would occur and it is less likely in the short term
- **Unlikely:** circumstances are such that it is improbable the event would occur even in the long term.

The severity can be classified using a similar system also based on CIRIA C552. The terms and definitions relating to severity are:

- **Severe:** short term (acute) risk to human health likely to result in ‘significant harm’ as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. Short-term risk to an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in ‘Draft Circular on Contaminated Land’, DETR 2000)
- **Medium:** chronic damage to human health (‘significant harm’ as defined in ‘Draft Circular on Contaminated Land’, DETR 2000), pollution of sensitive water resources, significant change in an ecosystem or organism forming part of that ecosystem (note definition of ecosystem in ‘Draft Circular on Contaminated Land’, DETR 2000)

- Mild: pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures or the environment
- Minor: harm, not necessarily significant, but that could result in financial loss or expenditure to resolve. Non-permanent human health effects easily prevented by use of personal protective clothing. Easily repairable damage to buildings, structures and services.

Once the likelihood of an event occurring and its severity have been classified, a risk category can be assigned using the table below.

		Consequences			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low likelihood	Moderate	Moderate/Low	Low	Very Low
	Unlikely	Moderate/Low	Low	Very Low	Very Low

Definitions of these risk categories are as follows together with an assessment of the further work that may be required:

- Very high: there is a high probability that severe harm could occur or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability; urgent investigation and remediation are likely to be required.
- High: harm is likely to occur. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required. Remedial works may be necessary in the short term and are likely over the long term.
- Moderate: it is possible that harm could arise, but it is unlikely that the harm would be severe and it is more likely that the harm would be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term.
- Low: it is possible that harm could occur, but it is likely that if realised this harm would at worst normally be mild.
- Very low: there is a low possibility that harm could occur and if realised the harm is unlikely to be severe.



APPENDIX D

MATERIAL SAFETY DATA SHEETS



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 (CO₂), 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

<u>Personal Precautions:</u>	Spilt product presents a significant slip hazard. Remove any sources of heat.
<u>Environmental Precautions:</u>	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.
<u>Methods for cleaning up:</u>	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

<u>Handling:</u>	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.
<u>Storage:</u>	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

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

8: EXPOSURE CONTROLS / PERSONAL PROTECTION

<u>Occupational Exposure Limits:</u>	Not established.
<u>Engineering control measures:</u>	Use of local exhaust ventilation is recommended whenever this product is used in a confined space, is heated above ambient temperatures, or is agitated.
<u>Hygiene measures:</u>	Wash hands before eating, drinking, smoking and using the toilet. Gloves should be washed before being removed.
<u>Respiratory Protection:</u>	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.
<u>Hand Protection:</u>	When handling this product it is recommended to wear chemical resistant gloves. Suggested materials for protective gloves include: PVC, Neoprene or similar.
<u>Eye Protection:</u>	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/cm³ at 20 °C typical
Solubility in water: Insoluble
Kinematic Viscosity at 20 °C: 4.0 – 4.5 cSt (4.0 – 4.5 mm²/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

<u>Basis for assessment:</u>	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.
<u>Acute toxicity:</u>	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)
<u>Corrosivity/irritation:</u>	
<u>Eye:</u>	May be slightly irritant
<u>Skin:</u>	May be slightly irritant
<u>Respiratory tract:</u>	If mists are inhaled, slight irritation of the respiratory tract may occur
<u>Skin sensitisation:</u>	Not expected to be a skin sensitiser
<u>Repeated-dose toxicity:</u>	Prolonged and/or repeated contact may lead to irritation and possibly dermatitis, especially under conditions of poor personal hygiene.
<u>Mutagenicity:</u>	Not expected to be a mutagen.
<u>Carcinogenicity:</u>	Not expected to be a carcinogen.
<u>Reproductive toxicity:</u>	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

<u>Basis for assessment:</u>	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.
<u>Ecotoxicity:</u>	Poorly soluble mixture. Product is not expected to be ecotoxic to fish/daphnia/algae, or sewage bacteria. This preparation is expected to be removed in a wastewater treatment facility
<u>Mobility:</u>	Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.
<u>Persistence and degradability:</u>	Readily biodegradable. Soils degradation – half life approx. 15 days. Natural waters degradation – half life approx. 4 – 9 days.
<u>Bioaccumulative potential:</u>	May have the potential to bioaccumulate

13: DISPOSAL CONSIDERATIONS

Disposal must be in accordance with local and national legislation.

<u>Unused Product:</u>	Dispose of through an authorised waste contractor to a licensed site. May be incinerated.
<u>Used/Contaminated Product:</u>	Dispose of through an authorised waste contractor to a licensed site. May be incinerated.
<u>Packaging:</u>	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/EC and 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.