Chapter 7:

Land and Soils

7.0 Land and Soils

7.1 Introduction

This chapter has been prepared by John Considine, BE, MIStructE, MIEI, CEng, FConsEIM, Chartered Engineer of Barrett Mahony Consulting Engineers.

This section of the EIAR assesses the impacts of the Proposed Strategic Housing Development (Alterations to Phase 1 Residential and Proposed Phase 2 Residential Development) at the Frascati Centre, Frascati Road, Blackrock, Co. Dublin (formerly known as Frascati Shopping Centre), on the land and soils in the area. This section should be read in conjunction with the architectural drawings for the development & the project description sections of this EIAR. The proposal relates to alterations to the Phase 1 permission for 45 no. apartments (Reg. Ref.: D17A/0950 & ABP Ref.: 300745-18), from second to fourth floor level of the rejuvenated Frascati Centre. The proposed development also includes the provision of 57 no. additional apartments, as an extension of the Phase 1 permission, located above the existing / permitted podium car park to the north west of the centre, as a Phase 2 residential development. The subject application therefore relates to a total of 102 no. residential units.

A soils, geology and hydrogeology chapter were included with the previous EIS for the rejuvenation project and a Lands and Soils Chapter in the EIAR for the Phase 1 residential development. The proposed development does not involve any construction works below ground floor level and therefore will not have any impact on land and soils.

Where '**Existing**' is referred to in the text below it refers to the site prior to 2020 and includes the recent Frascati Shopping Centre Rejuvenation works which have been assessed in a separate previously submitted Report.

7.2 Study Methodology

This section was prepared in accordance with the Guidelines on the Information to be Contained in Environmental Impact Statements (EPA 2015 (draft)) and Advice Notes for Preparing Environmental Impact Statements (EPA 2015 (draft)). A geotechnical site investigation has been previously carried out and submitted for the existing site works.

The following sources of information were used in the completion of this assessment:

- Site Visit
- Site Investigation Report
- Geological Survey of Ireland (GSI) online maps and databases
- ECFRAMS Flood Mapping from OPW
- EPA online maps and databases
- Topographical Survey
- Local authority record drawings

7.3 The Existing Receiving Environment

The subject site is located at the Frascati Centre, Frascati Road (N31), Blackrock, Co. Dublin (formerly known as Frascati Shopping Centre). The site is currently occupied by the Frascati Shopping Centre which occupies approximately 2.24 hectares of the total site footprint area of 2.7 hectares. The Frascati Centre is a two storey building made up of retail & restaurant space.

The site is bounded to the northeast by the Frascati Road and along the other boundaries principally by the back gardens of suburban housing at Frascati Park and George's Avenue. The Lisalea Apartments bound the site along part of its northern boundary.

The recent rejuvenation project provided for the improvement of the current retail space within the centre, along with the inclusion of additional retail services floor space, the provision of additional café / restaurant floor space and the provision of new / replacement car parking spaces.

Excavations and fillings have been carried out over 10,500 sq.m approximately of the site area (32% approximately of the area) to allow the construction of a basement car park level at between +13.70m and +14.00m OD, designated Level -1. This comprises of two car park areas, one area to the front of the building under the new retail and the second, a half-basement parking area with a car park deck over on the north side of the Centre. Both areas were previously at–grade car parking. New services infrastructure was also implemented as part of this development and involved excavation of trenches for pipe and duct laying. These works were implemented in accordance with the parent permission, Reg. Ref.: D14A/0134, and subsequent amendments of that permission, which was subject to an EIS and therefore are not revisited in this chapter.

The construction of the structural elements of the Phase 1 residential permission commenced in March 2020, under Reg. Ref.: Reg. Ref.: D17A/0950 & ABP Ref.: 300745-18. This application was accompanied by an EIAR and a Land and Soils Chapter prepared by BMCE, The proposed alterations to the Phase 1 residential units relate to non-structural elements, primarily relating to the internal layout of units and external finishes / winter gardens, and do no impact on the lands and soils assessment of the permitted development.

Topography:

A topographical survey was undertaken for the works to the existing Frascati Shopping Centre Rejuvenation works and was included in that submission.

7.3.1 Bedrock Geology

The bedrock geology of this area is of the Siluro-Devonian granitic rocks with the site located in the Type 2p microcline porphyritic area. The bedrock is identified as granite with muscovite phenocrysts. Refer to Figure 7.1 below. To the north of the site there is an area of Limestone, indicated in blue. Bedrock was located approximately 7.5m below ground level. Shallow or exposed bedrock is located immediately to the west and northwest of the site with some rock exposures or shallow rock present in nearby Blackrock Park.

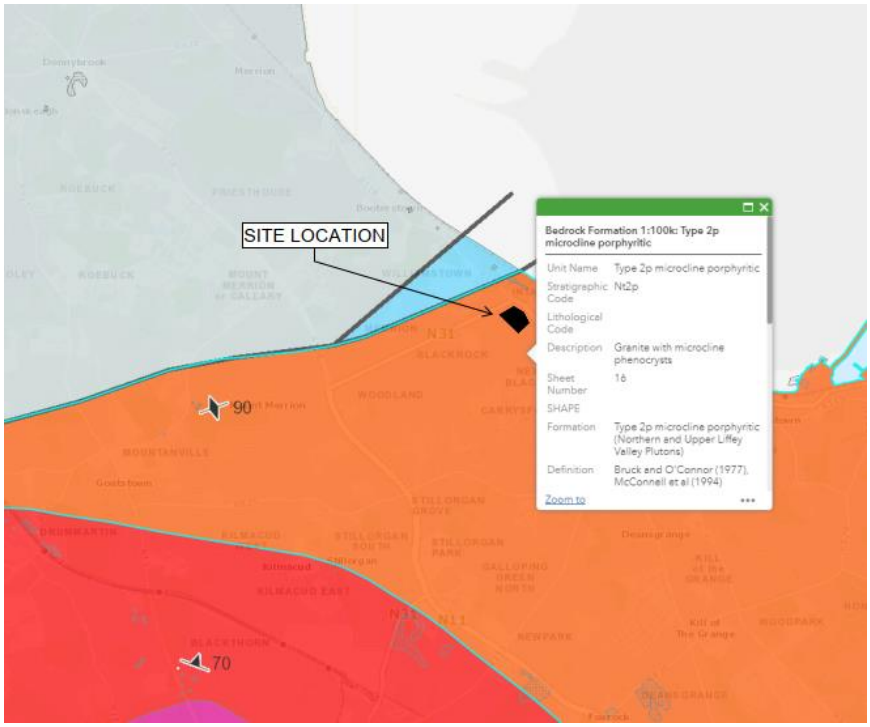

Figure 7.1 – Bedrock Mapping of Area by GSI

7.3.2 Subsoil (Quaternary) Geology

The quaternary period is the most recent stage of the geological time period. It marks the period of the Ice Age and the postglacial period which extends to the present day. Most surface deposits were deposited in the Quaternary Period and provide the parent materials for the soils in the area.

Most sediments of the Quaternary period were deposited during the Ice Age itself either directly from the huge ice sheets or by meltwater from the sheets as they melted. Ice sheets would have slowly eroded the underlying bedrock producing sediment. This sediment may include particles of all sizes ranging from clay to boulder and which when spread over the surface by glacial ice, takes the form of till (boulder clay). Alternatively, sediment may be carried and sorted by meltwater and deposited as sand and gravel, with silt and clay deposited separately in lake systems or carried away to the sea. Glacial deposits therefore contain fragments of the type of bedrock over which the ice originally passed.

A site survey was performed for the existing development. No groundwater was observed during the trial pits, which is referenced in the Ground Investigations Report attached in Appendix 7.1.

7.3.3 Soils

The GSI soils map indicates the predominant soil type in the development area to be till derived from limestones. An extract from the GSI soils map relevant to Frascati is detailed in Figure 7.2 below.

Teagasc soil maps classify soils beneath the majority of the site as Urban, Figure 7.3.

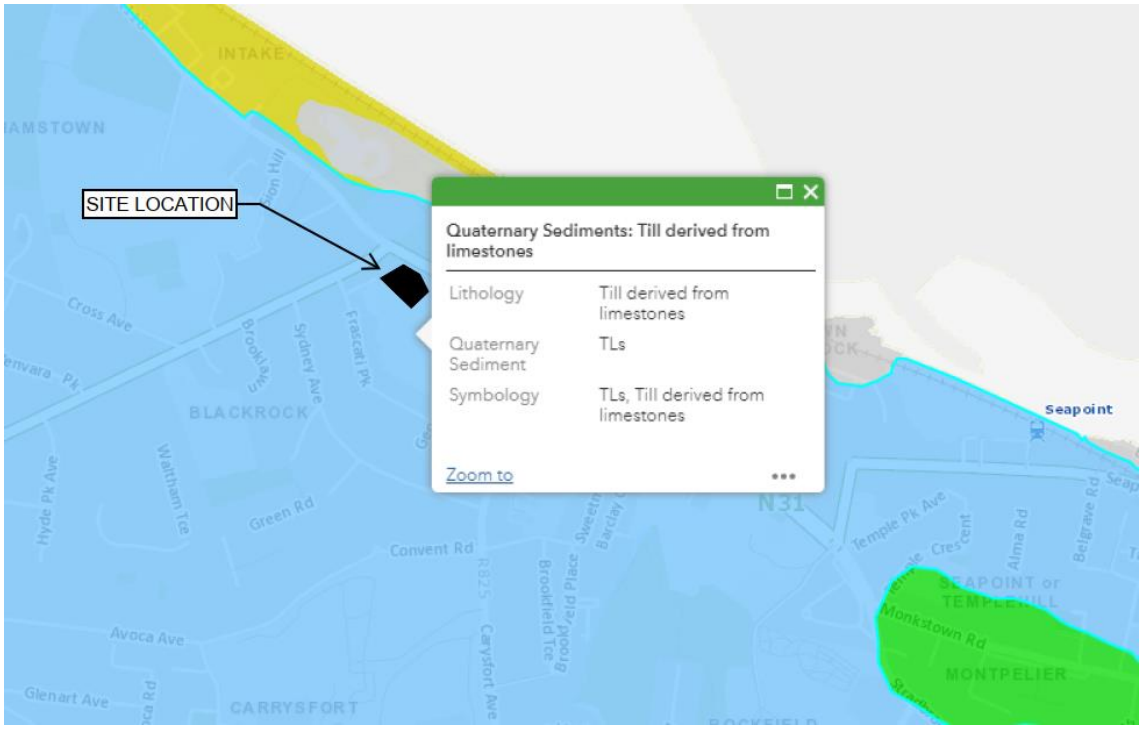

Figure 7.2 – Extract from GSI Quaternary Mapping – Till Derived from Limestones.

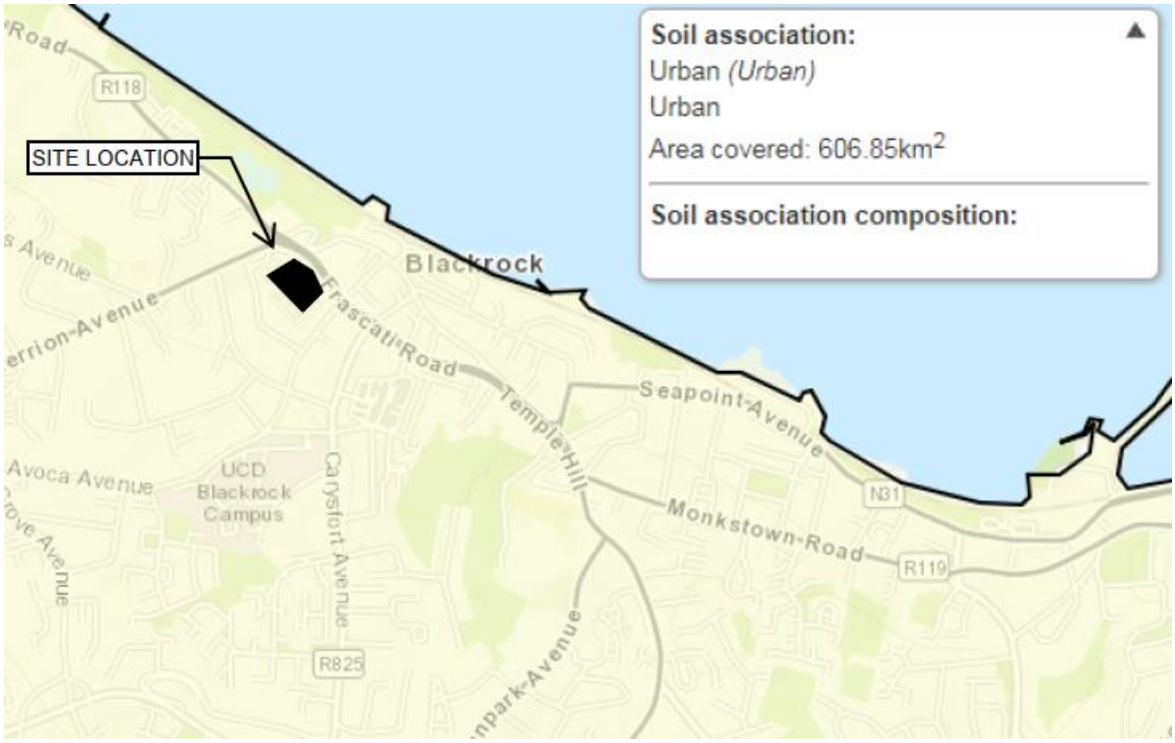

Figure 7.3 – Extract from Teagasc Soil Map.

7.3.4 Hydrogeology

Regional Hydrogeology:

Groundwater can be defined as water that is stored in, or moves through, pores and cracks in sub soils. Aquifers are rocks or deposits that contain sufficient void spaces, and which are permeable enough to allow water to flow through them in significant quantities. The potential of the rock to store and transport water is governed by permeability, of which there are two types, intergranular and fissure permeability.

Intergranular permeability is found in sediments, sands, gravels and clays. Fissure permeability is found in bedrock, where water moves through (and is stored in) cracks, fissures, planes and solution openings.

When considering groundwater, it is important to consider the underlying geology, its complexity including faults, the large amounts of water and rainfall available for recharge and the overlying Quaternary deposits. The bedrock geology of this area is defined Figure 7.1 as granite with microcline porphyritic. The bedrock mapping for the area as defined in the GSI is included as above.

The Geological Survey of Ireland has devised a system for classifying the aquifers in Ireland based on the hydrogeological characteristics, size and productivity of the groundwater resource. The three main classifications are Regionally Important Aquifers, Locally Important Aquifers and Poor Aquifers.

In Figure 7.4 the site area is classified by the GSI as a Poor Aquifer which is generally unproductive except for local zones and the site consists primarily of Till (TLs) with no karst features in this area.

There are no groundwater wells or springs recorded on the GSI Groundwater Data Viewer mapping on or near the site. Granites with this aquifer classification typically exhibit low storability.

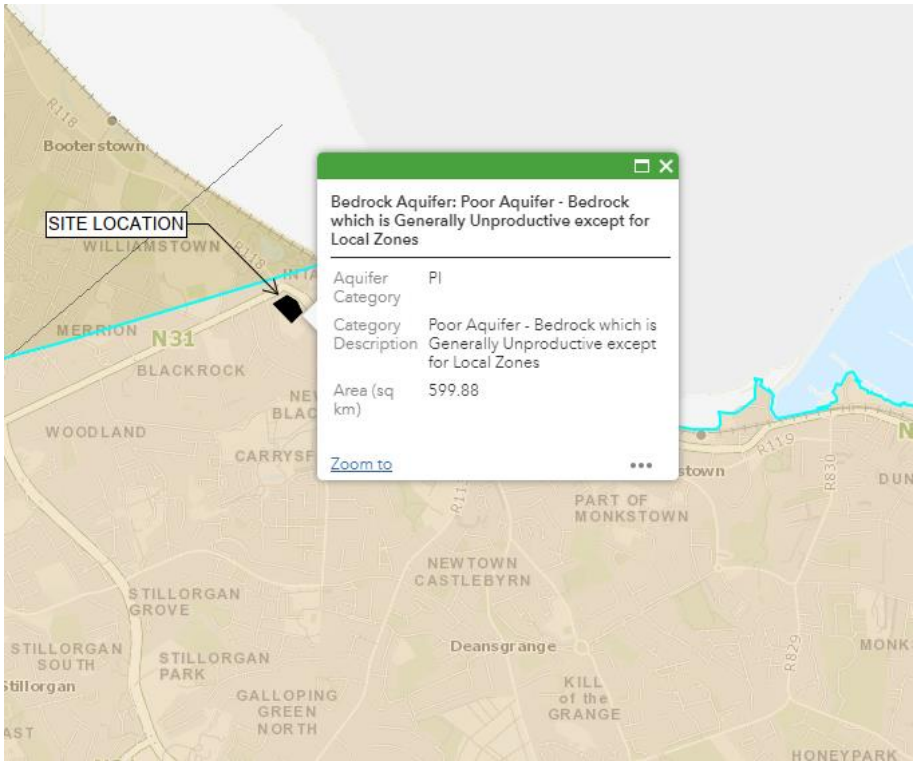

Figure 7.4 – Extract from GSI Groundwater Aquifers – Bedrock Poor Aquifer

Groundwater Vulnerability:

Aquifer or groundwater vulnerability is a relative measure of the ease with which the groundwater could be contaminated by human activity and depends on the aquifer's intrinsic geological and hydrogeological characteristics. The vulnerability is determined by the permeability of any overlying deposits. For example, bedrock with a thick, low permeability, clay-rich overburden is less vulnerable than bedrock with a thin, high permeability, gravelly overburden.

Groundwater vulnerability categories are defined by the GSI as:

- X - Extreme rock at or near surface or karst
- E - Extreme
- H - High
- M - Moderate
- L - Low

These categories are used for mapping purposes and in the assessment of risk to ground waters. The classifications are based on the thickness and permeability of the sub-soils overlying the aquifer. The GSI has classified the aquifer vulnerability underlying the site into two classes in Figure 7.5 & Figure 7.6. "M" (moderate) which infers the bedrock is at a depth of 10m below moderately permeable till and "H" (high) which infers groundwater or bedrock is present within 3 to 4m of the surface below moderately permeable till.

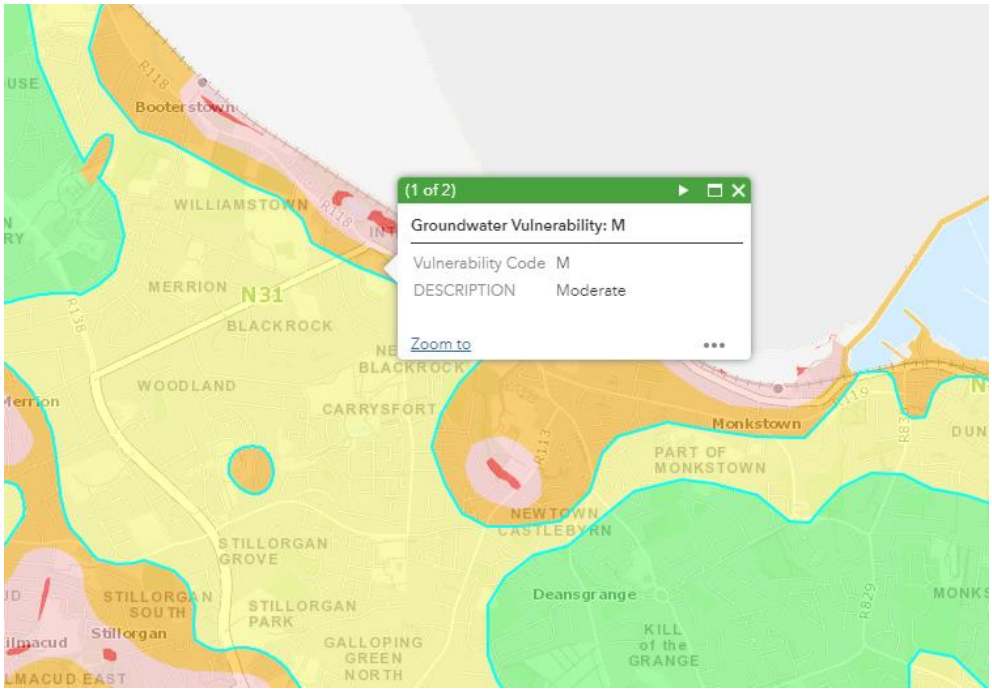

Figure 7.5 – Extract from GSI Ground Water Data – Site has "M" Vulnerability = "Medium"

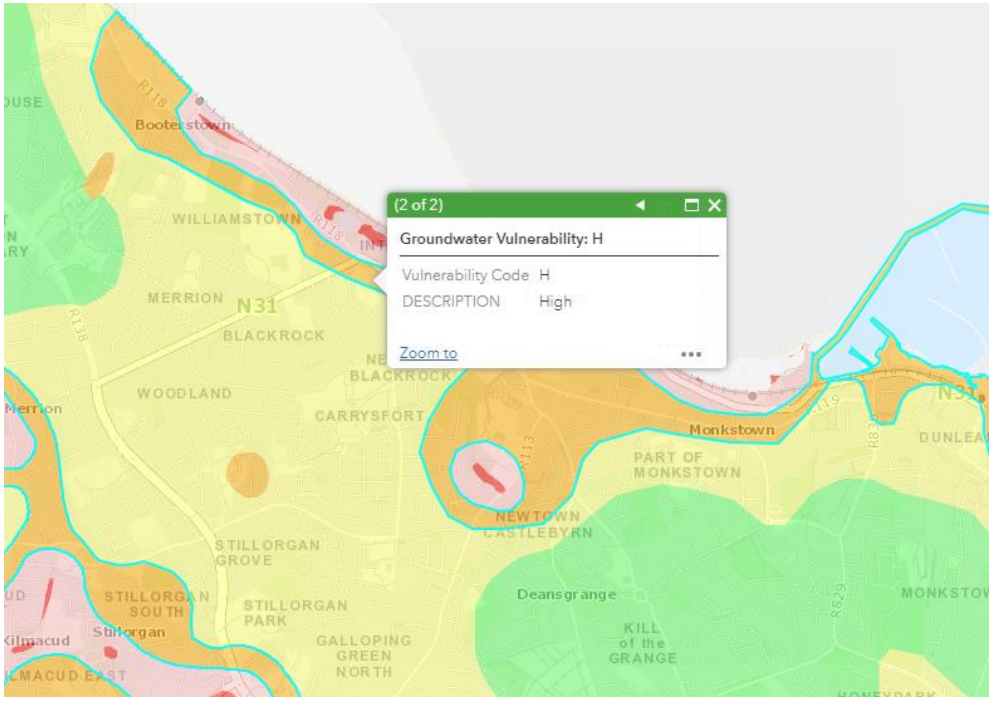

Figure 7.6 – Extract from GSI Ground Water Data – Site has "H" Vulnerability = "High"

Local groundwater usage and source protection area:

The GSI online map does not identify any significant or notable abstraction wells within the vicinity of the proposed development. No groundwater protection zones are marked in proximity to the site.

Recharge:

Effective rainfall is the amount of rainfall available as either recharge to ground or run-off to surface water after evaporation or taken up by plants and is 417mm/yr. The recharge coefficient, which is the proportion of effective rainfall to recharge groundwater, is estimated at 20% on the site. Recharge is the amount of rainfall that replenishes the aquifer, it is a function of the effective rainfall, the permeability and thickness

of the subsoil and the aquifer characteristics. According to GSI the maximum recharge capacity to the bedrock is 100 mm/yr across the site.

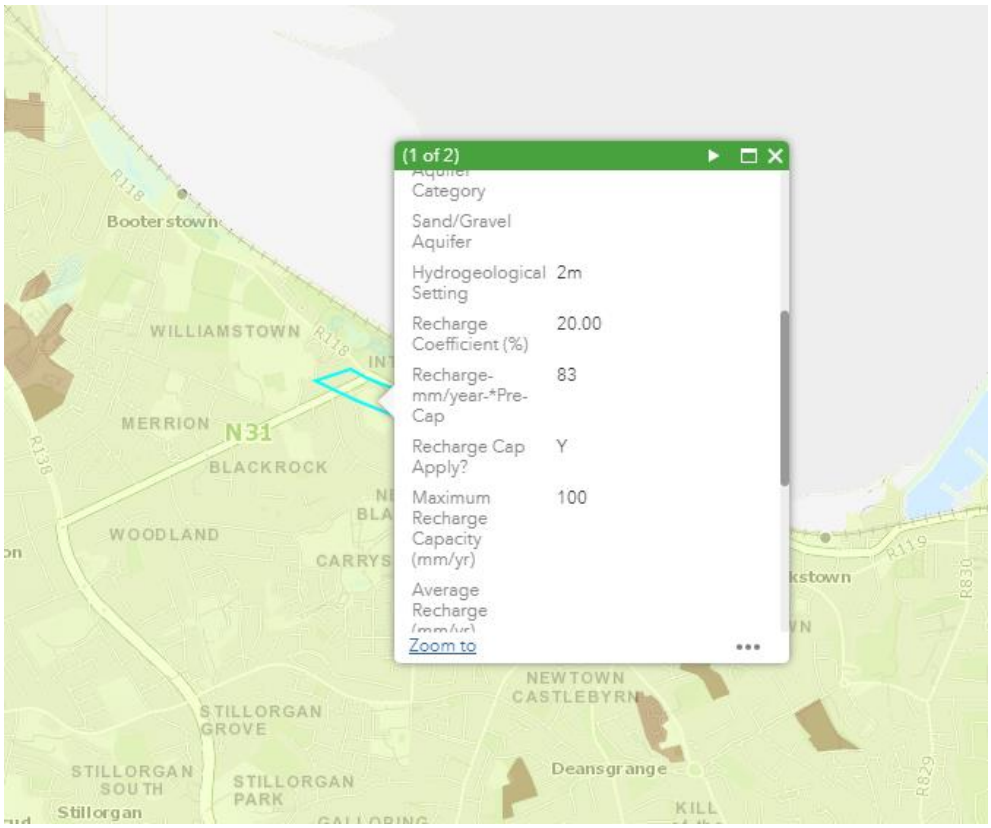

Figure 7.7 – Extract from GSI Groundwater Recharge Map

Site Hydrogeology:

The characteristics of the underlying granite bedrock and local topography appear to have a strong influence in the hydrogeology of the site. Groundwater is likely present within the upper levels of the bedrock with no groundwater present within the subsoils. Groundwater flows follow the topographical relief of the area and generally flow towards the sea, close by.

Groundwater Quality:

Under the requirements of the Water Framework Directive, the Dublin groundwater body was classified as having an overall good status for water quality and quantity 2010-2015. However, it is classified as 'at risk' of not achieving at least good ecological or good chemical status/potential by 2015. No site-specific water quality data is available from the site investigation.

Groundwater Flood Risk:

Groundwater flooding can occur during lengthy periods of heavy rainfall, typically during later winter/early spring when the groundwater table is already high. If the groundwater level rises above surface level, it can pond at local points and cause periods of flooding.

7.4 Characteristics of the Proposed Development

Consideration of the Characteristics of the Proposed Development allows for a projection of the 'level of impact' on any particular aspect of the proposed environment that could arise. For this chapter the potential impact on land and soils is discussed.

The proposal relates to alterations to the Phase 1 permission for 45 no. apartments (Reg. Ref.: D17A/0950 & ABP Ref.: 300745-18), from second to fourth floor level of the rejuvenated Frascati Centre.

The proposed development also includes the provision of 57 no. additional apartments, as an extension of the Phase 1 permission, located above the existing / permitted podium car park to the north west of the centre, as a Phase 2 residential development. The subject application therefore relates to a total of 102 no. residential units.

The proposed alterations to the 45 no. apartments (Block A and B) and associated development, permitted under the Phase 1 residential development, includes the following:

- Internal rationalisation of the permitted units, including changes in overall unit size and internal layouts, and associated external alterations including the provision of winter gardens.
- Provision of an external walkway connection between the Phase 1 and Phase 2 residential blocks at second floor level.
- The refuse, car and cycle parking facilities permitted at lower ground floor level will be altered to cater for the additional residential units, including the introduction of a barrier control system.
- The main entrance to the Phase 1 residential scheme from Frascati Road will serve both the permitted and proposed units.
- A concierge facility room to serve the overall residential development is proposed at second floor level near the main core of Phase 1, with an associated minor reduction in the area of the permitted communal terrace at second floor level.
- The communal open space for Phase 1 and 2 will be accessible to all residents.
- Alterations to the cycle parking provision at lower ground floor / basement level and at the first-floor level podium car park.

The Phase 2 proposal consists of 20 no. studios, 22 no. 1 beds and 15 no. 2 beds (57 no. apartments) in three no. blocks (Block D, E & F), arranged around a central communal courtyard space, above the existing and permitted podium car park to the north west of the centre. Block D is a five storey block, Block E is a part two to part four storey block and Block F is a part two to part three storey block, all above three levels of podium / basement car park. Balconies / winter gardens are provided to all apartments (on the north western, north eastern, south western elevations and into the internal courtyard) and access to the blocks is via stair / lift cores and an external walkway fronting the communal courtyard. A roof terrace is also proposed at fifth floor level of Block E.

The proposal includes the allocation of 57 no. car parking spaces at lower ground floor level and 214 no. bicycle parking spaces at lower ground and surface level for the 102 no. residential units. The proposal includes alterations to existing surface car parking to provide additional landscaping and bicycle spaces, a bin storage area and stair / lift cores are proposed within the existing / permitted basement / podium car parks below the Phase 2 residential units, and the proposal includes all associated ancillary site development works. The proposal also includes alterations to the location of 30 no. permitted cycle parking spaces associated with the rejuvenation of the Frascati Centre, Reg. Ref.: D14A/0134, as amended.

The proposal is an extension of the existing / rejuvenated Frascati Centre and will be constructed almost entirely over the existing structure and therefore the proposed new development will have no increase in the building footprint.

The basement area, which will accommodate the car parking area for the residential units, has been constructed and the replacement car parking for the retail floor space in an additional podium level has been approved as part of the Phase 1 residential permission, with alterations proposed to facilitate the Phase 2 residential proposals.

As part of the proposed development, localised and limited strengthening works of existing column foundations and approximately 12 no. additional foundations for new columns are required. The 12-no. new column foundation locations are all located within the existing footprint of the existing car park. The size and depths of the new foundations are also similar to the existing foundation sizes and depths.

7.5 Potential Impact on the Proposed Development

The predicted impacts of the proposed development with regard to the land and soil environment will be assessed for the construction and operational phases.

7.5.1 Construction Phase

The proposed works are on top of the existing shopping centre (Phase 1- permitted) and the car park building and involve only minor excavations for buried services and foundations. These minor works are limited to the upper layers of the ground. Bedrock was located 7.5m below ground level. Due to the limited nature of the proposed foundations and the presence of the existing foundations, it is not envisaged that the new foundations will have any effect on the land and soil of the surrounding environment. There is no rock excavation associated with the proposed residential extension works outlined above.

During the construction phase, a limited amount of fuels and hazardous materials will be used to fuel vehicles and plant machinery, which will also have the potential to impact the soil environment if not stored and used in an environmentally sound manner.

7.5.2 Operational Phase

When completed the development should have no significant effect on the soil or groundwater conditions in the area. The area is already currently almost totally covered by hardstanding and the proposed development will have no significant effect in this regard i.e. no net increase in hardstanding.

7.5.3 'Worst Case' Scenario

Under a '*worst case'* scenario, i.e. without construction related mitigation measures outlined below, the accidental release of diesel fuel or similar hazardous material occurs on site during the construction phase, through the failure of secondary containment or a materials handling accident on the site. If this were to occur over open ground, then these materials could infiltrate through the soil contaminating the soil zone and any underlying groundwater. Appropriate remediation measures would be required depending on the nature and extent of any contamination caused under such a scenario. Potential remediation measures may include the excavation and treatment of contaminated soil and in-situ remediation techniques.

7.6 Potential Cumulative Impacts

The permitted upgrade works to Blackrock Shopping Centre (Planning Reg. Ref.: D17A/0644) are at an advanced stage and are expected to be largely complete once Phase 2 residential development commences on site. However, the potential impact from the construction of the Phase 2 development has been assessed in conjunction with the potential impact of the Phase 1 residential development construction.

Given the scale of the proposed development, and the capacity of the surrounding environment to accommodate a development of this nature, it is not likely to give rise to any significant effects cumulatively or, in combination with, other developments in the area.

7.7 'Do-Nothing' Impact

Under a '*do-nothing'* scenario there would be no change to the soil environment at the application site.

7.8 Avoidance, Remedial and Mitigation Measures

7.8.1 Construction Phase

In order to minimise the impact of construction on the site's soils and geology the following mitigation measures should be implemented:

L&S01: Construction Stage Measures to be Implemented:

- In order to prevent the accidental release of hazardous materials (fuels, paints, cleaning agents, etc.) during construction site activity all hazardous materials should be stored within secondary containment designed to retain at least 110% of the storage contents. Temporary bunds for oil/diesel storage tanks should be used on the site during the construction phase of the project. Safe materials handling of all potentially hazardous materials should be emphasised to all construction personnel employed during this phase of the project. Measures will be implemented throughout the construction stage to minimise the risk of contamination of the soil from accidental oil and petrol leakage from site plant. Bunding of storage areas and refueling areas will be incorporated into the site compound. The bund walls will be designed to the appropriate level to ensure no over-spilling occurs in the event of an accidental spillage. All lock up/storage areas will have a metal or concrete leak proof floor. Any accidental chemical spillages should be cleaned up and disposed of in an approved landfill site in accordance with the chemical manufacturer's recommendations.
- Sediment runoff will be minimised by standard engineering measures including sediment skirts around soil stockpiles, sediment retention barriers in surface water drains and the use of adequate construction roads.

7.8.2 Operational Phase

As noted in 7.5.2 the proposed development should have no significant impact on soil or groundwater in the area and so no operational mitigation measures are required. Once the development is completed, risks to the land and soils will be from pollutants deriving from the use of the proposed development and/or contaminated surface water run-off.

7.9 Predicted Impact of the Proposed Development

Construction Phase:

Due to the implementation of the remedial or reductive measures described above, the proposed development will not give rise to significant adverse impacts with regard to land and soils. Any impacts during the construction phase are likely to be only short term in duration.

Operational Phase:

No significant impacts are predicted for the operational phase.

7.10 Monitoring

Monitoring during the construction phase is recommended, in particular in relation to the following:

- Adequate protection of any topsoil stockpiled for re-use.
- Adequate protection from contamination of soils for removal.
- Monitoring of surface water discharged to the existing culverted watercourse that crosses the site.
- Monitoring cleanliness of the adjoining road network.
- Monitoring measures for prevention of oil and petrol spillages.
- Dust control by dampening down measures as & when required by unusually dry weather conditions.

The Construction Management Plan (CMP) submitted with the application covers these mitigation measures in more detail and will be subject to review and update by the contractor and agreement with the Planning Authority prior to commencement of development.

7.11 Reinstatement

None envisaged.

7.12 Interactions

None envisaged.

7.13 Difficulties Encountered in Compiling

None.

7.14 References

- Guidelines on the information to be contained in Environmental Impact Statements (EPA 2002) and Advice Notes on Current Practice in the preparations of Environmental Impact Statements (EPA 2003).
- The Geotechnical Site Investigation Report for the Site by Site Investigations Ltd.
- The National Bedrock Map produced by the Geological Survey of Ireland.

APPENDIX 7.1- Site Investigation Report

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Newcastle, Co Dublin.
Tel: 01 601 5175 / 5176 | Fax: 01 601 5173
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GROUND INVESTIGATIONS IRELAND LTD

FRASCATTI SHOPPING CENTRE

GROUND INVESTIGATION REPORT

DOCUMENT CONTROL SHEET

Engineer	Waterman Moylan
Project Title	Frascatti Shopping Centre
Project No	5464-11-15
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	C Finnerty	F McNamara	F McNamara	Dublin	5th January 2016

Frascatti Shopping Centre - Ground Investigation Report

Contents

1.0 Preamble

On the instructions of Barrett Mahony Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., in November 2015 at the site of the proposed extension to the Frascatti Shopping Centre in Blackrock Co. Dublin.

2.0 Overview

2.1 Background

It is proposed to construct a new extension with basement and associated access roads and car parking at the proposed site. The site is currently occupied by the existing shopping centre and a car park.

2.2 Purpose and Scope

The purpose of the site investigation was to investigate subsurface soil conditions by means of window sample boreholes and environmental laboratory testing. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 4 No. Window Sample boreholes to a maximum depth of 3.1m BGL
- Environmental Laboratory testing
- Report with recommendations

3.0 Subsurface Exploration

3.1 General

During the ground investigation in November 2015 a programme of window sampling was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during drilling.

3.2 Window Sample Boreholes

The window sampling was carried out by mechanically driving a steel tube with a cutting edge and a plastic liner with a 50kg weight in 1.0m intervals to recover environmental soil samples for laboratory testing. Each location was sampled and logged by an Engineering Geologist and the window sample records are provided in Appendix 5 of this Report.

The above notes outline the procedures used in this site investigation and are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:1999 + A2:2010.

3.3 Laboratory Testing

Waste Acceptance Criteria (WAC) test samples were selected and sent to Jones Environmental laboratory in the UK for the Rialta Suite.

The results of the laboratory testing are included in Appendix 7 of this Report.

4.0 Findings

4.1 Ground Conditions

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the trial pit and borehole logs included in the appendices of this report.

The sequence of strata encountered were variable across the site and are generally consisted of;

- Made Ground
- Cohesive Deposits

Made Ground: Made Ground was encountered in the majority of exploratory holes and was present to a depth of between 1.1m and 3.0m BGL. The Made Ground deposits were described as *brown/grey mottled red and white slightly sandy Gravel with brick fragments* or as *brown sandy gravelly Clay with fragments of plastic and wood.*

Cohesive Deposits: Cohesive Deposits were encountered below the Made Ground to a maximum depth of at 3.0m BGL. The cohesive deposits were described as *Stiff brown slightly sandy gravelly CLAY with occasional cobbles* however it should be noted that no insitu testing was carried out to confirm the strength of these deposits.

4.2 Groundwater

No groundwater strikes were noted during the investigation however we would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the time of year, rainfall nearby construction and other factors.

5.0 Recommendations and Conclusions

5.1 General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes.

The results of the Rialta Suite analysis are presented with the individual parameter limits for "Inert" "Non Hazardous" and "Hazardous" as outlined within European Council Directive 1999 131/EC Article 16 Annex II, "Criteria and procedures for the acceptance of waste at landfills". This testing indicates the samples are inert, any spoil disposed of offsite should be sent to a licenced landfill.

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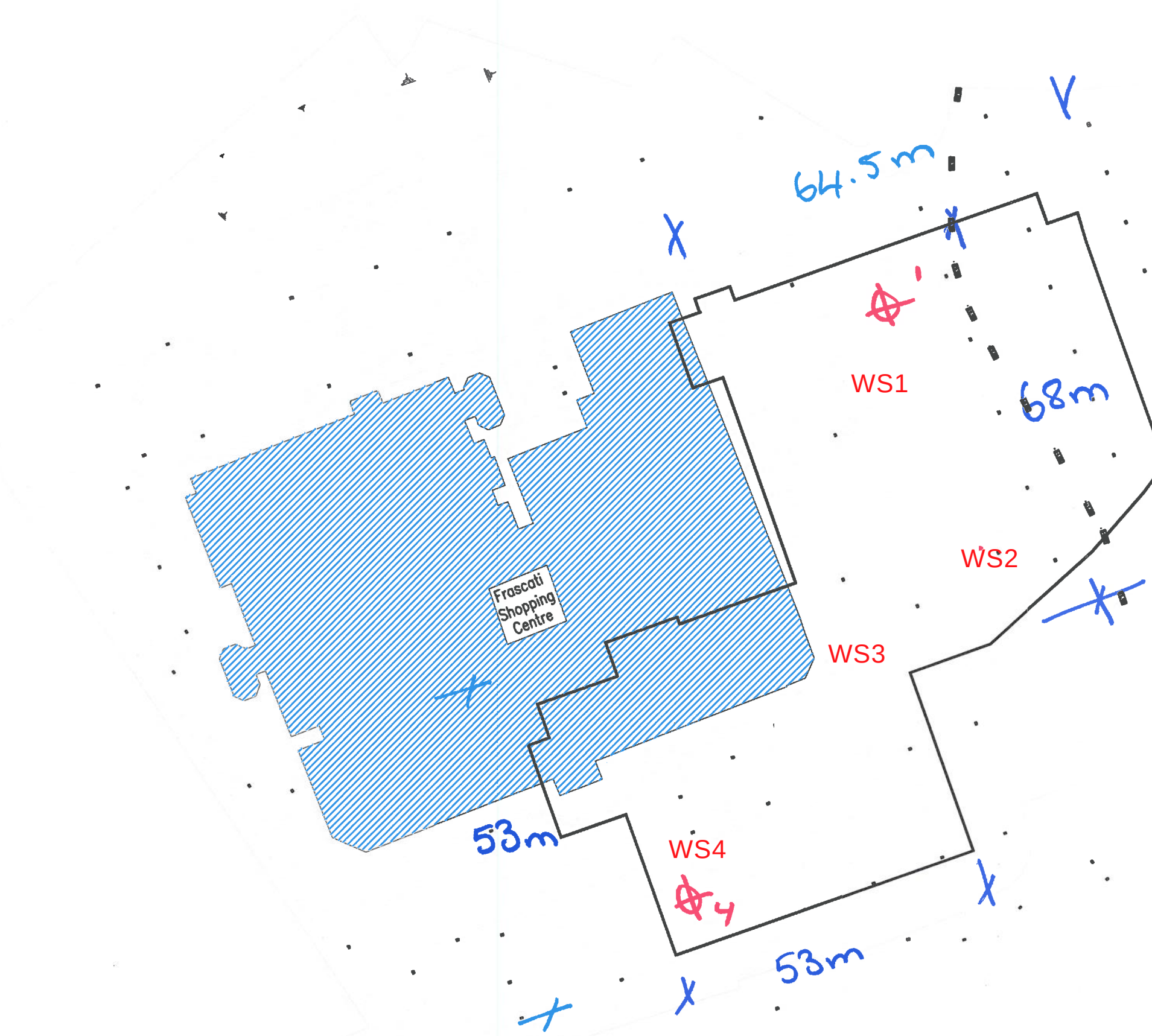
Appendix 1: Site Location Plan

Ground Investigation Location Plan
Frascatti Shopping Centre



	Depth of Dig
①	1.13m
②	1.09m
③	2.085m
④	2.385m

Appendix 2: Window Sample Records

WINDOW SAMPLE RECORD

Project Name: Frascati Centre Blackrock **Hole ID:** WS1

Client:
Consultant: Barrett Mahony
Location: Blackrock
Date: 10/11/2015
Rig used: Window Sampler

Co-ordinates: -
-
Elevation: -
Project no. 5464-11-15
Logged by: S. Connolly

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Depth	Result	Water Depth	Date
MADE GROUND consisting of black Tarmacadam		0.10						
MADE GROUND consisting of brown/grey mottled red and white slightly sandy Gravel with fragments of brick		1						
Stiff brown slightly sandy slightly gravelly CLAY with rootlets		1.10						
		2						
Dark brown/black slightly sandy gravelly CLAY		2.60						
End of Window sample at 3.00 m		3.00						
		4						

Remarks:

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WINDOW SAMPLE RECORD

Project Name: Frascati Centre Blackrock **Hole ID:** WS2

Client:
Consultant: Barrett Mahony
Location: Blackrock
Date: 10/11/2015
Rig used: Window Sampler

Co-ordinates: -
-
Elevation: -
Project no. 5464-11-15
Logged by: S. Connolly

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Depth	Result	Water Depth	Date
MADE GROUND consisting of black Tarmacadam		0.10						
MADE GROUND consisting of brown/grey mottled red and white slightly sandy Gravel with brick fragments Poor recovery between 0.70-1.0m BGL		1						
		1.10						
MADE GROUND consisting of brown sandy gravelly Clay with fragments of plastic and wood Poor recovery bretween1.60-2.0m BGL and 2.6-3.0m BGL		2						
		3.00						
End of Window sample at 3.00 m		4						

Remarks:

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WINDOW SAMPLE RECORD

Project Name: Frascati Centre Blackrock **Hole ID:** WS2A

Client:
Consultant: Barrett Mahony
Location: Blackrock
Date: 10/11/2015
Rig used: Window Sampler

Co-ordinates: -
-
Elevation: -
Project no. 5464-11-15
Logged by: S. Connolly

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Depth	Result	Water Depth	Date
MADE GROUND consisting of brown/grey motted red and white slightly sandy Gravel Poor recovery between 0.60-1.0m BGL		0.60						
End of Window sample at 1.00 m		1						
		2						
		3						
		4						

Remarks:

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WINDOW SAMPLE RECORD

Project Name: Frascati Centre Blackrock **Hole ID:** WS3

Client:
Consultant: Barrett Mahony
Location: Blackrock
Date: 10/11/2015
Rig used: Window Sampler

Co-ordinates: -
-
Elevation: -
Project no. 5464-11-15
Logged by: S. Connolly

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Depth	Result	Water Depth	Date
MADE GROUND consisting of black Tarmacadam								
MADE GROUND consisting of brown/grey mottled red and white slightly sandy gravelly Clay with fragments of brick and cement Poor recovery between 0.55-1.0m BGL and 1.3-2.0m BGL		0.22						
MADE GROUND consisting of brown slightly sandy gravelly Clay with fragments of cement and brick		2.16						
Stiff dark brown/black slightly sandy gravelly CLAY		2.40						
End of Window sample at 3.00 m		3.00						

Remarks:

GROUND INVESTIGATIONS IRELAND
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WINDOW SAMPLE RECORD

Project Name: Frascati Centre Blackrock **Hole ID:** WS4

Client:
Consultant: Barrett Mahony
Location: Blackrock
Date: 10/11/2015
Rig used: Window Sampler

Co-ordinates: -
-
Elevation: -
Project no. 5464-11-15
Logged by: S. Connolly

Strata Description	Legend	Depth	Level (mOD)	Samples / tests: Type	Depth	Result	Water Depth	Date
MADE GROUND consisting of black Tarmacadam								
MADE GROUND consisting of brown slightly sandy slightly gravelly Clay with fragments of cement and brick		0.30						
MADE GROUND consisting of brown/grey mottled white and red slightly sandy Gravel with fragments of brick and cement		1.20						
End of Window sample at 2.51 m		2.51						

Remarks:

GROUND INVESTIGATIONS IRELAND
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Frascati Centre Blackrock – Window Sample Photos

WS1

WS2


Frascati Centre Blackrock
Engineer
Barrett Mahony
Contractor
Ground Investigations Ireland Ltd.
HOLE ID: WS 2A
FROM: 0·0 m
TO: 1·0 m
BOX NO. 1 of 1
DATE: 10/11/15

WS2A


Frascati Centre Blackrock
Engineer
Barrett Mahony
Contractor
Ground Investigations Ireland Ltd.
HOLE ID: WS 3
FROM: 0·0 m
TO: 3·0 m
BOX NO. 1 of 1
DATE: 10/11/15

WS3


Frascati Centre Blackrock
Engineer
Barrett Mahony
Contractor
Ground Investigations Ireland Ltd.
HOLE ID: WS 4
FROM: 0·0 m
TO: 2·51 m
BOX NO. 1 of 1
DATE: 10/11/15

WS4

Appendix 3: Laboratory Test Records

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

4225

Attention :	Conor Finnerty
Date :	10th December, 2015
Your reference :	15/11/5464
Our reference :	Test Report 15/16171 Batch 1
Location :	Frascati Centre Blackrock
Date samples received :	12th November, 2015
Status :	Final report
Issue :	2

Six samples were received for analysis on 12th November, 2015 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Where Waste Acceptance Criteria Suite (EC Decision of 19 December 2002 (2003/33/EC)) has been requested, all analyses have been performed using the relevant EN methods where they exist.

Compiled By:

Phil Sommerton BSc
Project Manager

Client Name: Ground Investigations Ireland
Reference: 15/11/5464
Location: Frascati Centre Blackrock
Contact: Conor Finnerty
JE Job No.: 15/16171

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18					LOD/LOR	Units	Method No.
Sample ID	WS1	WS2	WS3	WS3	WS4	WS4							
Depth	0.00-1.00	1.00-2.00	1.00-2.00	2.00-3.00	1.00-2.00	2.00-3.00							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	10/11/2015	10/11/2015	10/11/2015	10/11/2015	10/11/2015	10/11/2015							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	12/11/2015	12/11/2015	12/11/2015	12/11/2015	12/11/2015	12/11/2015							
Antimony	2	4	2	2	2	1					<1	mg/kg	TM30/PM15
Arsenic #	<0.5	19.1	1.1	14.4	12.5	11.9					<0.5	mg/kg	TM30/PM15
Barium #	42	207	69	59	70	72					<1	mg/kg	TM30/PM15
Cadmium #	<0.1	2.4	<0.1	1.2	1.9	1.4					<0.1	mg/kg	TM30/PM15
Chromium #	80.0	61.9	56.1	36.5	52.1	38.5					<0.5	mg/kg	TM30/PM15
Copper #	15	47	51	25	24	19					<1	mg/kg	TM30/PM15
Lead #	<5	305	46	223	42	26					<5	mg/kg	TM30/PM15
Mercury #	<0.1	0.7	<0.1	0.3	<0.1	<0.1					<0.1	mg/kg	TM30/PM15
Molybdenum #	0.1	4.0	<0.1	4.5	5.6	3.9					<0.1	mg/kg	TM30/PM15
Nickel #	32.2	57.1	40.2	30.0	44.8	33.3					<0.7	mg/kg	TM30/PM15
Selenium #	<1	2	<1	1	2	1					<1	mg/kg	TM30/PM15
Zinc #	67	236	89	83	105	75					<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	0.09	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	0.23	0.03	<0.03	<0.03	<0.03					<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	0.07	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	1.57	0.04	<0.03	<0.03	<0.03					<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	0.15	0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	2.51	0.10	<0.03	<0.03	<0.03					<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	2.06	0.10	<0.03	<0.03	<0.03					<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	0.63	0.07	<0.06	<0.06	<0.06					<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	0.98	0.08	<0.02	<0.02	<0.02					<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	1.42	0.11	<0.07	<0.07	<0.07					<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	0.90	0.08	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	0.60	0.06	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	0.12	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	0.51	0.07	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
Coronene	<0.04	0.12	<0.04	<0.04	<0.04	<0.04					<0.04	mg/kg	TM4/PM8
PAH 6 Total #	<0.22	5.94	0.42	<0.22	<0.22	<0.22					<0.22	mg/kg	TM4/PM8
PAH 17 Total	<0.64	11.96	0.78	<0.64	<0.64	<0.64					<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	1.02	0.08	<0.05	<0.05	<0.05					<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	0.40	0.03	<0.02	<0.02	<0.02					<0.02	mg/kg	TM4/PM8
Benzo(j)fluoranthene	<1	<1	<1	<1	<1	<1					<1	mg/kg	TM4/PM8
PAH Surrogate % Recovery	109	103	106	107	110	102					<0	%	TM4/PM8
Mineral Oil (C10-C40)	<30	<30	60	<30	<30	<30					<30	mg/kg	TM5/PM16

Client Name: Ground Investigations Ireland
Reference: 15/11/5464
Location: Frascati Centre Blackrock
Contact: Conor Finnerty
JE Job No.: 15/16171

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18					LOD/LOR	Units	Method No.
Sample ID	WS1	WS2	WS3	WS3	WS4	WS4							
Depth	0.00-1.00	1.00-2.00	1.00-2.00	2.00-3.00	1.00-2.00	2.00-3.00							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	10/11/2015	10/11/2015	10/11/2015	10/11/2015	10/11/2015	10/11/2015							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	12/11/2015	12/11/2015	12/11/2015	12/11/2015	12/11/2015	12/11/2015							
TPH CWG													
Aliphatics													
>C5-C6 #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>C6-C8 #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>C10-C12 #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					<0.2	mg/kg	TM5/PM16
>C12-C16 #	<4	<4	<4	<4	<4	<4					<4	mg/kg	TM5/PM16
>C16-C21 #	<7	<7	<7	<7	<7	<7					<7	mg/kg	TM5/PM16
>C21-C35 #	<7	<7	32	<7	<7	<7					<7	mg/kg	TM5/PM16
>C35-C40 #	<7	<7	28	<7	<7	<7					<7	mg/kg	TM5/PM16
Total aliphatics C5-40	<26	<26	60	<26	<26	<26					<26	mg/kg	TM5/TM36/PM12/PM16
>C6-C10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>C10-C25	<10	<10	<10	<10	<10	<10					<10	mg/kg	TM5/PM16
>C25-C35	<10	<10	33	<10	<10	<10					<10	mg/kg	TM5/PM16
Aromatics													
>C5-EC7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>EC7-EC8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>EC10-EC12	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					<0.2	mg/kg	TM5/PM16
>EC12-EC16	<4	<4	<4	<4	<4	<4					<4	mg/kg	TM5/PM16
>EC16-EC21	<7	<7	<7	<7	<7	<7					<7	mg/kg	TM5/PM16
>EC21-EC35	<7	70	96	<7	<7	<7					<7	mg/kg	TM5/PM16
>EC35-EC40	<7	17	95	<7	<7	<7					<7	mg/kg	TM5/PM16
Total aromatics C5-40	<26	87	191	<26	<26	<26					<26	mg/kg	TM5/TM36/PM12/PM16
Total aliphatics and aromatics(C5-40)	<52	87	251	<52	<52	<52					<52	mg/kg	TM5/TM36/PM12/PM16
>EC6-EC10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM36/PM12
>EC10-EC25	<10	<10	<10	<10	<10	<10					<10	mg/kg	TM5/PM16
>EC25-EC35	<10	48	104	<10	<10	<10					<10	mg/kg	TM5/PM16
MTBE #	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM31/PM12
Benzene #	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM31/PM12
Toluene #	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM31/PM12
Ethylbenzene #	43	<5	<5	56	<5	48					<5	ug/kg	TM31/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM31/PM12
o-Xylene #	37	<5	<5	40	<5	36					<5	ug/kg	TM31/PM12
PCB 28 #	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 52 #	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 101 #	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 118 #	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 138 #	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 153 #	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
PCB 180 #	<5	<5	<5	<5	<5	<5					<5	ug/kg	TM17/PM8
Total 7 PCBs #	<35	<35	<35	<35	<35	<35					<35	ug/kg	TM17/PM8

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 15/11/5464
Location: Frascati Centre Blackrock
Contact: Conor Finnerty
JE Job No.: 15/16171

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18					LOD/LOR	Units	Method No.
Sample ID	WS1	WS2	WS3	WS3	WS4	WS4							
Depth	0.00-1.00	1.00-2.00	1.00-2.00	2.00-3.00	1.00-2.00	2.00-3.00							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	10/11/2015	10/11/2015	10/11/2015	10/11/2015	10/11/2015	10/11/2015							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	12/11/2015	12/11/2015	12/11/2015	12/11/2015	12/11/2015	12/11/2015							
Natural Moisture Content	2.1	43.2	5.5	17.7	18.0	14.5					<0.1	%	PM4/PM0
Moisture Content	2.1	30.2	5.2	15.0	15.2	12.7					<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3					<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #		-	-	-		-					<0.0015	g/l	TM38/PM20
Chromium III	80.0	61.9	56.1	36.5	52.1	38.5					<0.5	mg/kg	NONE/NONE
Sulphate as SO4 (2:1 Ext) #	0.0146	-	-	-	<0.0015	-					<0.0015	g/l	TM38/PM20
Total Organic Carbon #	<0.02	2.46	0.22	1.09	0.69	0.56					<0.02	%	TM21/PM24
pH #	9.15	8.15	9.13	9.95	8.86	9.17					<0.01	pH units	TM73/PM11
Mass of raw test portion	0.0937	0.1249	0.1053	0.1034	0.104	0.1026						kg	NONE/PM17
Mass of dried test portion	0.09	0.09	0.09	0.09	0.09	0.09						kg	NONE/PM17

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 15/11/5464
Location: Frascati Centre Blackrock
Contact: Conor Finnerty
JE Job No.: 15/16171

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18					LOD/LOR	Units	Method No.
Sample ID	WS1	WS2	WS3	WS3	WS4	WS4							
Depth	0.00-1.00	1.00-2.00	1.00-2.00	2.00-3.00	1.00-2.00	2.00-3.00							
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T							
Sample Date	10/11/2015	10/11/2015	10/11/2015	10/11/2015	10/11/2015	10/11/2015							
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1	1							
Date of Receipt	12/11/2015	12/11/2015	12/11/2015	12/11/2015	12/11/2015	12/11/2015							
Dissolved Antimony #	<0.002	<0.002	0.004	<0.002	<0.002	<0.002					<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	<0.02	<0.02	0.04	<0.02	<0.02	<0.02					<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	<0.0025	<0.0025	0.0071	<0.0025	0.0049	0.0027					<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	<0.025	<0.025	0.071	<0.025	0.049	0.027					<0.025	mg/kg	TM30/PM17
Dissolved Barium #	<0.003	0.048	0.021	<0.003	<0.003	<0.003					<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	<0.03	0.48	0.21	<0.03	<0.03	<0.03					<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005					<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005					<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	0.0038	<0.0015	<0.0015	<0.0015					<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	0.038	<0.015	<0.015	<0.015					<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007					<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07					<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	0.007	<0.005	<0.005	<0.005					<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	0.07	<0.05	<0.05	<0.05					<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	<0.002	0.002	0.018	0.029	0.005	0.012					<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	<0.02	<0.02	0.18	0.29	0.05	0.12					<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	<0.002	0.007	<0.002	<0.002	<0.002	<0.002					<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	<0.02	0.07	<0.02	<0.02	<0.02	<0.02					<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003					<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03					<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	0.003	0.004	0.004	<0.003	0.003	0.004					<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	<0.03	0.04	0.04	<0.03	0.03	0.04					<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	<0.00001	<0.00001	0.00069	<0.00001	0.00009	0.00010					<0.00001	mg/l	TM61/PM38
Mercury Dissolved by CVAF #	<0.0001	<0.0001	0.0069	<0.0001	0.0009	0.0010					<0.0001	mg/kg	TM61/PM38
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	mg/kg	TM26/PM0
Fluoride	<0.3	<0.3	<0.3	0.3	0.4	0.5					<0.3	mg/l	TM27/PM0
Fluoride	<3	<3	<3	<3	4	5					<3	mg/kg	TM27/PM0
Chloride	0.3	1.7	1.5	0.7	0.6	0.6					<0.3	mg/l	TM27/PM0
Chloride	<3	17	15	7	6	6					<3	mg/kg	TM27/PM0
Sulphate	3.86	0.91	19.18	14.98	5.35	4.59					<0.05	mg/l	TM27/PM0
Sulphate	38.6	9.1	191.7	149.7	53.5	45.9					<0.5	mg/kg	TM27/PM0
Mass of raw test portion	0.0937	0.1249	0.1053	0.1034	0.104	0.1026						kg	NONE/PM17
Leachant Volume	0.896	0.865	0.884	0.886	0.886	0.887						l	NONE/PM17
Eluate Volume	0.86	0.8	0.88	0.72	0.85	0.89						l	NONE/PM17
Dissolved Organic Carbon	<2	22	5	<2	2	3					<2	mg/l	TM60/PM0
Dissolved Organic Carbon	<20	220	50	<20	20	30					<20	mg/kg	TM60/PM0
pH	8.00	7.91	8.89	7.78	7.95	7.95					<0.01	pH units	TM73/PM0
Total Dissolved Solids #	28	208	85	59	78	55					<10	mg/l	TM20/PM0
Total Dissolved Solids #	280	2080	850	590	780	550					<100	mg/kg	TM20/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 15/11/5464
Location: Frascati Centre Blackrock
Contact: Conor Finnerty
JE Job No.: 15/16171

Report : MURPHY

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18										
Sample ID	WS1	WS2	WS3	WS3	WS4	WS4										
Depth	0.00-1.00	1.00-2.00	1.00-2.00	2.00-3.00	1.00-2.00	2.00-3.00										
COC No / misc																
Containers	V J T	V J T	V J T	V J T	V J T	V J T										
Sample Date	10/11/2015	10/11/2015	10/11/2015	10/11/2015	10/11/2015	10/11/2015										
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil										
Batch Number	1	1	1	1	1	1										
Date of Receipt	12/11/2015	12/11/2015	12/11/2015	12/11/2015	12/11/2015	12/11/2015										
											Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.
Solid Waste Analysis																
Total Organic Carbon #	<0.02	2.46	0.22	1.09	0.69	0.56					3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	0.080	<0.025	<0.025	0.096	<0.025	0.084					6	-	-	<0.025	mg/kg	TM31/PM12
Sum of 7 PCBs #	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035					1	-	-	<0.035	mg/kg	TM17/PM8
PAH Sum of 6 #	<0.22	5.94	0.42	<0.22	<0.22	<0.22					-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	<0.64	11.96	0.78	<0.64	<0.64	<0.64					100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate																
Arsenic #	<0.025	<0.025	0.071	<0.025	0.049	0.027					0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium #	<0.03	0.48	0.21	<0.03	<0.03	<0.03					20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005					0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium #	<0.015	<0.015	0.038	<0.015	<0.015	<0.015					0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07					2	50	100	<0.07	mg/kg	TM30/PM17
Mercury #	<0.0001	<0.0001	0.0069	<0.0001	0.0009	0.0010					0.01	0.2	2	<0.0001	mg/kg	TM61/PM38
Molybdenum #	<0.02	<0.02	0.18	0.29	0.05	0.12					0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel #	<0.02	0.07	<0.02	<0.02	<0.02	<0.02					0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead #	<0.05	<0.05	0.07	<0.05	<0.05	<0.05					0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony #	<0.02	<0.02	0.04	<0.02	<0.02	<0.02					0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03					0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc #	<0.03	0.04	0.04	<0.03	0.03	0.04					4	50	200	<0.03	mg/kg	TM30/PM17
Chloride	<3	17	15	7	6	6					800	15000	25000	<3	mg/kg	TM27/PM0
Fluoride	<3	<3	<3	<3	4	5					10	150	500	<3	mg/kg	TM27/PM0
Sulphate as SO4	38.6	9.1	191.7	149.7	53.5	45.9					1000	20000	50000	<0.5	mg/kg	TM27/PM0
Total Dissolved Solids #	280	2080	850	590	780	550					4000	60000	100000	<100	mg/kg	TM20/PM0
Dissolved Organic Carbon	<20	220	50	<20	20	30					500	800	1000	<20	mg/kg	TM60/PM0
Mass of raw test portion	0.0937	0.1249	0.1053	0.1034	0.104	0.1026					-	-	-		kg	NONE/PM17
Dry Matter Content Ratio	95.8	72.0	85.2	86.9	86.2	87.5					-	-	-	<0.1	%	NONE/PM4
Leachant Volume	0.896	0.865	0.884	0.886	0.886	0.887					-	-	-		l	NONE/PM17
Eluate Volume	0.86	0.8	0.88	0.72	0.85	0.89					-	-	-		l	NONE/PM17
Mineral Oil (C10-C40)	<30	<30	60	<30	<30	<30					-	-	-	<30	mg/kg	TM5/PM16
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					-	-	-	<0.1	mg/kg	TM26/PM0

Client Name: Ground Investigations Ireland
Reference: 15/11/5464
Location: Frascati Centre Blackrock
Contact: Conor Finnerty

Matrix : Solid

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	EPH Interpretation
15/16171	1	WS1	0.00-1.00	1-3	No interpretation possible
15/16171	1	WS2	1.00-2.00	4-6	PAH's
15/16171	1	WS3	1.00-2.00	7-9	Possible tarmac/bitumen
15/16171	1	WS3	2.00-3.00	10-12	No interpretation possible
15/16171	1	WS4	1.00-2.00	13-15	No interpretation possible
15/16171	1	WS4	2.00-3.00	16-18	No interpretation possible

Client Name: Ground Investigations Ireland
Reference: 15/11/5464
Location: Frascati Centre Blackrock
Contact: Conor Finnerty

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

Any questionable sample will automatically be assumed to have breached the Waste Limit and further testing may be required.

Signed on behalf of Jones Environmental Laboratory:

Ryan Butterworth
Asbestos Team Leader

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Analysis	Result
15/16171	1	WS1	0.00-1.00	2	18/11/2015	**Mass of Dry Sample**	54.6 (g)
					20/11/2015	**General Description (Bulk Analysis)**	Soil/Stone
					20/11/2015	**Asbestos Containing Material**	None
					20/11/2015	**Asbestos Containing Material (2)**	None
					20/11/2015	**Asbestos Screen**	NAD
					20/11/2015	**Asbestos Screen (2)**	NAD
					20/11/2015	**Asbestos Level**	NAD
					20/11/2015	**Waste Limit**	<0.1%
15/16171	1	WS2	1.00-2.00	5	18/11/2015	**Mass of Dry Sample**	41.5 (g)
					20/11/2015	**General Description (Bulk Analysis)**	Soil/Stone
					20/11/2015	**Asbestos Containing Material**	None
					20/11/2015	**Asbestos Containing Material (2)**	None
					20/11/2015	**Asbestos Screen**	NAD
					20/11/2015	**Asbestos Screen (2)**	NAD
					20/11/2015	**Asbestos Level**	NAD
					20/11/2015	**Waste Limit**	<0.1%
15/16171	1	WS3	1.00-2.00	8	18/11/2015	**Mass of Dry Sample**	48.6 (g)
					20/11/2015	**General Description (Bulk Analysis)**	Soil/Stone
					20/11/2015	**Asbestos Containing Material**	None
					20/11/2015	**Asbestos Containing Material (2)**	None
					20/11/2015	**Asbestos Screen**	NAD
					20/11/2015	**Asbestos Screen (2)**	NAD
					20/11/2015	**Asbestos Level**	NAD
					20/11/2015	**Waste Limit**	<0.1%
15/16171	1	WS3	2.00-3.00	11	18/11/2015	**Mass of Dry Sample**	48.3 (g)
					20/11/2015	**General Description (Bulk Analysis)**	Soil-Silt/Sand/Brick/Stone
					20/11/2015	**Asbestos Containing Material**	None
					20/11/2015	**Asbestos Containing Material (2)**	None
					20/11/2015	**Asbestos Screen**	NAD
					20/11/2015	**Asbestos Screen (2)**	NAD
					20/11/2015	**Asbestos Level**	NAD
					20/11/2015	**Waste Limit**	<0.1%
15/16171	1	WS4	1.00-2.00	14	18/11/2015	**Mass of Dry Sample**	44.6 (g)
					20/11/2015	**General Description (Bulk Analysis)**	Soil-Silt/Sand/Brick/Stone
					20/11/2015	**Asbestos Containing Material**	None

Client Name: Ground Investigations Ireland
Reference: 15/11/5464
Location: Frascati Centre Blackrock
Contact: Conor Finnerty

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Analysis	Result
15/16171	1	WS4	1.00-2.00	14	20/11/2015	**Asbestos Containing Material (2)**	None
					20/11/2015	**Asbestos Screen**	NAD
					20/11/2015	**Asbestos Screen (2)**	NAD
					20/11/2015	**Asbestos Level**	NAD
					20/11/2015	**Waste Limit**	<0.1%
15/16171	1	WS4	2.00-3.00	17	18/11/2015	**Mass of Dry Sample**	48.4 (g)
					20/11/2015	**General Description (Bulk Analysis)**	Soil-Silt/Sand/Brick/Stone
					20/11/2015	**Asbestos Containing Material**	None
					20/11/2015	**Asbestos Containing Material (2)**	None
					20/11/2015	**Asbestos Screen**	NAD
					20/11/2015	**Asbestos Screen (2)**	NAD
					20/11/2015	**Asbestos Level**	NAD
					20/11/2015	**Waste Limit**	<0.1%

Client Name: Ground Investigations Ireland
Reference: 15/11/5464
Location: Frascati Centre Blackrock
Contact: Conor Finnerty

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 15/16171						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/16171

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 15/16171

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM12/PM16	CWG GC-FID			AR	Yes
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified USEPA 8163. Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes

JE Job No: 15/16171

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

JE Job No: 15/16171

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AR	Yes
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.			AR	Yes
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
NONE	No Method Code	NONE	No Method Code			AR	Yes
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				

JE Job No: 15/16171

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	

Appendix - Methods used for WAC (2003/33/EC)

Leachate tests	
10l/kg; 4mm	I.S. EN 12457-2:2002 Specified particle size; water added to L/S ratio; capped; agitated for 24 ± 0.5 hours; eluate settled and filtered over 0.45 µm membrane filter.
Eluate analysis	
As	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ba	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cd	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cr total	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cu	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Hg	I.S. EN 13370 rec. EN 1483 (CVAAS)
Mo	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ni	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Pb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Sb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Se	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Zn	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Chloride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Fluoride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Sulphate	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Phenol index	I.S. EN 13370 rec. ISO 6439 (4-Aminoantipyrine spectrometic methods after distillation)* (BY HPLC - Jones Env)
DOC	I.S. EN 1484
TDS	I.S. EN 15216
Compositional analysis	
TOC	I.S. EN 13137 Method B: carbonates removed with acid; TOC by combustion.
BTEX	GC-FID
PCB7**	I.S. EN 15308 analysis by GC-ECD.
Mineral oil	I.S. EN 14039 C10 to C40 analysis by GC-FID.
PAH17***	I.S. EN 15527 PAH17 analysis by GC-MS
Metals	I.S. EN 13657 - Aqua regia digestion: EN ISO 11885 (ICP-OES)
Other	
Dry matter	I.S. EN 14346 sample is dried to a constant mass in an oven at 105 ± 3 °C; Method B Water content by direct Karl-Fischer-titration and either volumetric or coulometric detection.
LOI	I.S. EN 15169 Difference in mass after heating in a furnace up to 550 ± 25 °C.
ANC	CEN/TS 15364 Determined by amouns of acid or base needed to cover the pH range

Notes:

*If not suitable due to LOD, precision, etc., any other suitable method can be used, e.g. AFS, ICP-MS

**PCB-28, PCB-52, PCB-101, PCB-118, PCB-138, PCB-153 and PCB-180

***Naphthalene, Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Benzo(a)pyrene, Chrysene, Coronene, Dibenzo(a,h)anthracene, Fluorene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Phenanthrene and Pyrene.