WASTE RECOVERY SERVICES (FERMOY) LTD.

Licence No. W0107-01

ANNUAL ENVIRONMENTAL REPORT

2016

Prepared By: Adrian Dunlea.

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1 INTRODUCTION

1.1 Reporting Period

The following is the annual report (AER) for the period January 2016 to December 2016 for the Waste Transfer/Recycling Facility operated by Waste Recovery Services (Fermoy) Ltd. (WRS) at Cullenagh, Fermoy, County Cork. The contents of this report are as specified in Schedule F of Waste licence W0107-01 granted on 18th of April 2002.

1.2 Waste Activities Carried Out.

WRS are licensed by the Environmental Protection Agency (EPA) to carry out waste activities in a non-hazardous waste transfer station. The facility is licensed to accept non hazardous waste (commercial, industrial and construction and demolition waste). Hazardous or liquid wastes are not accepted. Facility. The activities authorised by the licence are in Table 1.1 and 1.2.

Table 1.1 Licensed Waste Recovery Activities,

Third Schedule **Class 12. Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.** This activity is limited to the transfer of non-recoverable waste into jumbo skips for transfer to landfill. **Class 13. Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.** This activity is limited to the temporary storage of non-recoverable wastes prior to dispatch to landfill.

Table 1.2 Licensed Waste Disposal Activities

Fourth Schedule

Class 3. Recycling or reclamation of metals and metal compounds:

This activity is limited to the recovery and temporary storage of metal waste separated from waste accepted at the facility.

Class 4. Recycling or reclamation of other inorganic materials:
This activity is limited to the recovery and temporary storage of timber waste and of construction and demolition wastes accepted at the facility.

Class 13. Storage of waste intended for submission to any activity referred to in a Preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced:

This activity is limited to the storage of materials on site prior to recovery at the facility or removal to a recovery facility off-site

1.3 Site Infrastructure & Development

1.3.1 Site Infrastructure

The facility comprises a site office, weighbridge, process sheds, workshop and temporary storage areas as well as a waste water and storm water management system. The operational area is separated into three sections:

1. Waste Transfer Area.
2. Construction & Demolition Area.
3. Timber Segregation & Shredding Area.

1.3.2 Waste Handling & Processing Capacity

The processing capacity each sections are outlined in Tables 1.3, 1.4 and 1.5.

Table 1.3 Equipment in Waste Transfer Area

Equipment Type	Equipment Use	Rate of Tonnes Per Hour	Daily Tonnage Capacity - 10 Hour Day >>	Weekly Processing Capacity - 6 Days a Week	Annual Processing Capacity 51 Weeks
Ejector Trailer / Walking Floor, Cat Excavator, New Holland Skid Steer S160	Loading & Sorting Waste, Transport of Waste Materials	20	200	1,200.00	61,200.00
		Tonnes	**Tonnes**	**Tonnes**	**Tonnes**

Table 1.4 Equipment in Construction & Demolition Area

Equipment Type	Equipment Use	Rate of Tonnes Per Hour	Daily Tonnage Capacity - 10 Hour Day >>	Weekly Processing Capacity - 6 Days a Week	Annual Processing Capacity 51 Weeks
Trommel Screener & Picking Station, Manitou Telescopic loader, Tipper Lorries	Screening Waste, Sorting & Segregating Waste. Loading & Sorting Waste. Transport of Waste Materials	40.00	400.00	2,400.00	122,400.00
		Tonnes	**Tonnes**	**Tonnes**	**Tonnes**

Table 1.5 Equipment in Timber Segregation & Shredding area

Equipment Type	Equipment Use	Rate of Tonnes Per Hour	Daily Tonnage Capacity - 10 Hour Day >>	Weekly Processing Capacity - 6 Days a Week	Annual Processing Capacity 51 Weeks
2 Wood Shredders, One Loading Shovel & Terex Material Handler, Walking Floor.	Shredding, Loading Wood & Woodchip	20	240	1,440.00	73,440.00
		Tonnes	**Tonnes**	**Tonnes**	**Tonnes**

2 WASTE ACTIVITES

The waste categories and quantities that can be accepted at the Facility are in Schedule A (Table 2) of the waste licence (See Table 2.1):

Table 2.1 Waste types and quantities permitted by waste license

Waste Type	Maximum Tonnes Per annum
Commercial	3000
Industrial	1700
Construction and Demolition	1800
Total	**6500**

The types of wastes received and quantities (tonnes) of waste received and dispatched at the site during 2016 are given in Table 2.2.

Table 2.2 Wastes Received and Dispatched from the 1st January – 31st December 2016

This information is commercially sensitive. If you require details please contact Waste Recovery Services on 025 – 31055 with you name, company name, address and email and telephone numbers and we will respond to all queries in due course

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2.1 Waste recovered at the site

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A copy of the PRTR is included in Appendix 1.

3 SUMMARY OF RESULTS AND INTERPRETATION OF ENVIRONMENTAL DATA

Foul Water Monitoring

Foul water monitoring was carried out quarterly at one location (FW-1), which is shown on Figure 2.1. FW-1 is located at the foul water holding tank which contains water from the process shed. The holding tank is emptied regularly and the contents are sent to the Fermoy Waste Water Treatment Plant. All of the parameters analysed complied with the Emission Limit Values (ELV) as set out in the Licence.

Groundwater Monitoring

Groundwater monitoring was carried out quarterly at six monitoring wells, as shown on Figure 2.1. Groundwater monitoring wells BH-1 and BH-3 are within the facility, whilst the other wells (Dunlea, O'Riordan, O'Leary and Coughlan) are at private residences in the vicinity of the facility. It is likely that BH-3 and O'Leary's are either upgradient of the facility or not in the same catchment. BH-1, Dunlea's Well and O'Riordan's Well are down gradient whilst Coughlan's Well is possibly side downgradient of the facility.

The licence does not specify any ELVs or Trigger Levels and for interpretation purposes the results have previously been compared to the Interim Guideline Values (IGV) for groundwater published by the Agency. The results are now also compared to the Threshold Values for groundwater (TV) quality introduced by the European Communities Environmental Objectives (Groundwater) Regulations 2010 S.I. No. 9 of 2010.

The IGV levels represent typical background or unpolluted conditions; however levels higher than the IGV can occur naturally, depending on the local geological and hydrogeological conditions. While the TVs are more appropriate for large scale abstraction wells used for potable supply, they can be used to assess the significance of contamination where present in groundwater. Because not all parameters monitored have been assigned TVs, the relevant IGVs continue to be used for comparative purposes.

Quarter 1

In Q1, the pH levels in all wells were below the IGV range with the exception of O'Riordan's Well, which is fitted with a water treatment unit, the pH levels in all of the samples were lower than the IGV range. The low pH is considered to be naturally occurring. Electrical conductivity values were below IGV/GTV in all wells.

- BH-1 had elevated concentrations of chloride, orthophosphate, manganese and total coliforms which exceeded their respective IGV limits and also exhibited elevated concentrations of Ammonia (as NH4) which exceeded the TV.
- BH-3 had elevated concentrations of chloride, orthophosphate, manganese and total coliforms which exceeded their respective IGV limits.
- O'Leary's Well had elevated concentrations of orthophosphate and total coliforms which exceeded their respective IGV limits.
- O'Riordan's Well had elevated concentrations of manganese, potassium, total coliforms and E-Coli which exceeded their respective IGV limits.
- Coughlan's Well had elevated concentrations of orthophosphate and total coliforms which exceeded their respective IGV limits.
- Dunlea's Well had elevated concentrations of chloride, orthophosphate, manganese, potassium and total coliforms which exceeded their respective IGV limits. It also had a sulphate concentration which exceeded the TV.

Quarter 2

In Q2, the pH levels in all wells were below the IGV range.

- BH-1 had elevated concentrations of potassium and total coliforms which exceeded their respective IGV limits and also elevated concentrations of ammonia (as NH4) which exceeded the TV.
- BH-3 had elevated concentrations of total coliforms which exceeded the respective IGV limit.
- O'Leary's Well had elevated concentrations of copper and total coliforms which exceeded their respective IGV limits.
- O'Riordan's Well had elevated concentrations of total coliforms which exceeded the IGV limit and also an elevated concentration of ammonia (as NH4) which exceeded the TV.
- Coughlan's Well had elevated concentrations of total coliforms and E-Coli which exceeded their respective IGV limits.
- Dunlea's Well had elevated concentrations of potassium, total coliforms and E-Coli which exceeded their respective IGV limits.

Quarter 3

In Q3, the pH levels in all wells were below the IGV range.

- BH-1 had elevated concentrations of potassium and total coliforms which exceeded their respective IGV limits and also elevated concentrations of ammonia (as NH4) which exceeded the TV.
- BH-3 had elevated concentrations of total coliforms which exceeded their respective IGV limits.
- O'Leary's Well had elevated concentrations of copper, zinc, total coliforms and E-Coli which exceeded their respective IGV limits.
- O'Riordan's Well had elevated concentrations of potassium and total coliforms which exceeded their respective IGV limits and also elevated concentrations of ammonia (as NH4) which exceeded the TV.
- Coughlan's Well had elevated concentrations of total coliforms which exceeded the IGV limit.
- Dunlea's Well had elevated concentrations of potassium and total coliforms which exceeded their respective IGV limits.

Quarter 4

In Q4, the pH levels in all wells with the exception of O'Riordans Well were below the IGV minimum range. The total coliforms concentrations in all wells except BH-3 were above the IGV limit.

- BH-1 had elevated concentrations of potassium and manganese which exceeded their respective IGV limits and ammonia (as NH4) which exceeded the TV.
- BH-3 had elevated concentrations of chloride and manganese which exceeded their respective IGV limits.
- O'Leary's Well had elevated concentrations of orthophosphate and E-Coli which exceeded their respective IGV limits.
- O'Riordan's Well had elevated concentrations of potassium and manganese which exceeded their respective IGV limits.
- Dunlea's well had elevated concentrations of chloride, manganese, orthophosphate and potassium and which exceeded their respective IGV limits and sulphate which exceeded both IGV the TV.

Percolation Testing

The discharge to the percolation area (P1) was monitored on a quarterly basis for BOD, suspended solids and mineral oil. There were no exceedances of the Trigger Levels for any of these parameters.

Dust

Dust monitoring was carried out on three occasions at the three monitoring points specified in the Licence and shown on Figure 2.1. The dust deposition limit for this site is set at 350 mg/m^2/day.

August 2016

The results for the three monitoring locations D-1, D-2 and D-3 were below the dust deposition limit.

September 2016

The results at one of the three monitoring locations (D-2) was below the dust deposition limit. The results for D-1 and D-3 (663 mg/m^2/day and 506 mg/m^2/day respectively) exceeded the dust deposition limit, however, the inorganic particulate faction of the samples, which is representative of site activities were 182 mg/m^2/day and 167 mg/m^2/day respectively which is below the limit.

November/December 2016

The results for two of the three monitoring locations D-1 and D-2 were below the dust deposition limit. The results for D-3 (677 mg/m2/day) exceeded the dust deposition limit, the inorganic particulate faction of the samples which is representative of site activities was 354 mg/m^2/day which is also above the limit.

WRS have since installed a new dust suppression system to help to reduce the level of dust pollution across the site and neighbouring area as a result of site based activities. Future monitoring will confirm the effectiveness of this system.

Noise

Noise monitoring was carried out annually at the monitoring points specified in the Licence. The noise levels complied with the ELV set out in the Licence.

3.1 Review of Nuisance Controls

Nuisance controls are reviewed on weekly basis.

4 REPORTED COMPLAINTS AND INCIDENTS

There were no reported complaints 2016.

There was two incidents where dust monitoring results for September and November / December exceeded the deposition limit of 350mg/m^2/day.

5 RESOURCE AND ENERGY CONSUMPTION

The main resources consumed at the facility during the reporting period were electricity, diesel, and lubricants. A summary of the significant resources consumed are in Tables 5.1 and Table 5.2.

Table 5.1 Principal areas of energy and resources usage January 2016 – December 2016

Area of Use	Purpose	Principal Resource Consumed
Site Plant/Vehicles	Moving and processing of Waste	Diesel, Lubricants
Offices and Sheds	Management of Yard and The facility management	Electricity and Water

Table 5.2 Available data on quantities of Energy and Resources used for January 2016 – December 2016

Resource	Consumption for Reporting Period - 2016
Site Management	
Electricity	44,621 Units
Site Plant	
Green Diesel	50,000 Litres (Est)
Lubricants	2,621.78
Grease	185 Kgs

6 ENVIRONMENTAL OBJECTIVES & TARGETS FOR 2016

Table 6.1 Progress on Objectives for site improvement for 2016

Project	Status
1. Dust Emissions / Monitoring	On going
2. Noise Emissions / Monitoring	On going
3. Ground Water / Monitoring	On going
4. Foul Water / Monitoring	On going

7 ENVIRONMENTAL OBJECTIVES & TARGETS FOR 2017

Table 7.1 Objectives and Targets for 2017

Objective	Target	Responsibility	Timescale
Assess and reduce where possible all dust emissions.	Not to exceed 350 mg/m^2/day in order to reduce the possibility of causing dust deposition nuisance beyond site boundary.	Adrian Dunlea	Ongoing
Assess and reduce where possible all site noise emissions.	Not to exceed 55 db(a) L_{AEq} (30 minutes) during day time and not to exceed 45 db(a) L_{AEq} (30 minutes) during night at noise monitoring locations in order to reduce the possibility of causing noise nuisance at noise sensitive locations beyond the site boundary.	Adrian Dunlea	Ongoing
Assess and monitoring groundwater quality at the site and in the immediate vicinity of the site	No pollution of groundwater due to site activities.	Adrian Dunlea	Ongoing
Assess and monitoring waste water emissions from the site.	Compliance with emission limits as required by schedule C4 of W0107-01.	Adrian Dunlea	Ongoing

8 NEW PROCEDURES PUT IN PLACE DURING 2016

No new procedures were put in place during 2016.

9 MANAGEMENT AND STAFFING STRUCTURES

The management and staffing structures in place at WRS (Table 8.1) ensures clear communication of environmental policy and responsibility for environmental management on-site. A critical part of this management system is the provision of health and safety and environmental training to all staff members to ensure that all staff members from management to operatives are aware of their responsibilities and best practice to ensure the firm meets its environmental obligations.

Table 9.1 Management Structure

Position	**Name**
General Manager	John Dunlea
Facility Manager / Site Manager / Environmental Manager	Adrian Dunlea
Deputy Facility Manager / Financial Manger / Administration / Logistics etc	Shane Dunlea

10 PUBLIC INFORMATION PROGRAMME

WRS have developed and implemented a communications procedure as part of the site EMS. In accordance with Condition 2.4 of the waste licence this procedure ensures that members of the public can obtain relevant information, at all reasonable times, concerning the environmental performance of the facility.

11 FINANCIAL PROVISION

An environmental liabilities risk assessment and site closure report have been prepared and submitted to the Agency. These reports contain proposals for financial provision which have been agreed by the Agency.

Adrian Dunlea
Environmental Manager
Waste Recovery Services (Fermoy) Ltd

APPENDIX 1

2016 PRTR

Environmental Protection Agency

Guidance to completing the PRTR workbook

PRTR Returns Workbook

Version 1.1.19

REFERENCE YEAR	2016

1. FACILITY IDENTIFICATION

Parent Company Name	Waste Recovery Services (Fermoy) Limited
Facility Name	Waste Recovery Services (Fermoy) Limited
PRTR Identification Number	W0107
Licence Number	W0107-01

Classes of Activity

No.	class_name
-	Refer to PRTR class activities below

Address 1	Cullenagh
Address 2	Fermoy
Address 3	
Address 4	
	Cork
Country	Ireland
Coordinates of Location	-8.30669 52.1138
River Basin District	IESW
NACE Code	3832
Main Economic Activity	Recovery of sorted materials
AER Returns Contact Name	Adrian Dunlea
AER Returns Contact Email Address	a.dunlea@wrs.ie
AER Returns Contact Position	Adrian Dunlea
AER Returns Contact Telephone Number	02531055
AER Returns Contact Mobile Phone Number	
AER Returns Contact Fax Number	02531528
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	25
User Feedback/Comments	..
Web Address	wrs.ie

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
50.1	General
50.1	General

3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)

Is it applicable?	
Have you been granted an exemption ?	
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

4. WASTE IMPORTED/ACCEPTED ONTO SITE

Guidance on waste imported/accepted onto site

Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ?	Yes

This question is only applicable if you are an IPPC or Quarry site

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
Poilutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

Additional Data Requested from Landfill operators

For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:

Landfill: Waste Recovery Services (Fermoy) Limited

Please enter summary data on the quantities of methane flared and / or utilised	T (Total) kg/Year	M/C/E	Method Used		Facility Total Capacity m3 per hour	
			Method Code	Designation or Description		
Total estimated methane generation (as per site model)	0.0				N/A	
Methane flared	0.0				0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	0.0				N/A	

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this only concerns

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION A : PRTR POLLUTANTS

RELEASES TO LAND					Please enter all quantities in this section in KGs		
POLLUTANT		METHOD			QUANTITY		
			Method Used				
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO LAND					Please enter all quantities in this section in KGs		
POLLUTANT		METHOD			QUANTITY		
			Method Used				
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

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APPENDIX 2.

2016 MONITORING RESULTS

2a - GROUNDWATER LABORATORY REPORTS
2b – FOUL WATER LABORATORY REPORTS
2c – PERCOLATION AREA LABORATORY REPORTS
2d – DUST MONITORING REPORTS

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

O'Callaghan Moran & Associates
Unit 15
Melbourne Business Park
Model Farm
Cork
Ireland

Attention :	Neil Sandes
Date :	25th February, 2016
Your reference :	16-182-01
Our reference :	Test Report 16/4834 Batch 1
Location :	WRS
Date samples received :	12th February, 2016
Status :	Final report
Issue :	2

Eight samples were received for analysis on 12th February, 2016 of which eight 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.

Compiled By:

Phil Sommerton BSc
Project Manager

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes
JE Job No.: 16/4834

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-6	7-10	11-15	16-20	21-25	26-30	31-35	36-39			LOD/LOR	Units	Method No.
Sample ID	BH-1	BH-3	OLEARY	ORIORDAN	COUGHLAN	DUNLEA	PERC	FOUL					
Depth													
COC No / misc													
Containers	V H P G	V H G	V H P G	V H P G	V H P G	V H P G	V P BOD G	H P BOD G					
Sample Date	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016					
Dissolved Barium #	46	46	9	27	8	58	-	-			<3	ug/l	TM30/PM14
Dissolved Boron	26	32	<12	76	51	75	-	-			<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-			<0.5	ug/l	TM30/PM14
Dissolved Calcium #	38.3	38.3	5.1	6.4	8.7	82.0	-	-			<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	6.3	<1.5	<1.5	<1.5	<1.5	-	-			<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	39	7	<7	<7	-	-			<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20	<20	<20	<20	<20	<20	-	-			<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM30/PM14
Dissolved Magnesium #	5.5	5.4	2.9	2.4	2.0	16.3	-	-			<0.1	mg/l	TM30/PM14
Dissolved Manganese #	212	210	12	437	42	4811	-	-			<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1	<1	-	-			<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	<2	5	2	7	-	-			<2	ug/l	TM30/PM14
Dissolved Potassium #	3.0	2.9	0.8	182.8_{AA}	0.9	8.1	-	-			<0.1	mg/l	TM30/PM14
Dissolved Sodium #	25.3	25.4	9.0	14.1	9.6	31.6	-	-			<0.1	mg/l	TM30/PM14
Dissolved Zinc #	<3	<3	49	8	6	<3	-	-			<3	ug/l	TM30/PM14
Total Phosphorus	54	52	74	37	62	88	-	-			<5	ug/l	TM30/PM14
Mineral Oil (C10-C40) #	-	-	-	-	-	-	<10	-			<10	ug/l	TM5/PM30
Fats Oils and Grease #	-	-	-	-	-	-	-	4520			<10	ug/l	TM5/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/TM36/PM30
Aromatics													
>C5-EC7 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/TM36/PM30
MTBE #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
Benzene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
Toluene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12

Please see attached notes for all abbreviations and acronyms

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes
JE Job No.: 16/4834

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-6	7-10	11-15	16-20	21-25	26-30	31-35	36-39			LOD/LOR	Units	Method No.
Sample ID	BH-1	BH-3	OLEARY	ORIORDAN	COUGHLAN	DUNLEA	PERC	FOUL					
Depth													
COC No / misc													
Containers	V H P G	V H G	V H P G	V H P G	V H P G	V H P G	V P BOD G	H P BOD G					
Sample Date	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016					
Ethylbenzene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
o-Xylene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
Sulphate #	89.98	90.26	7.56	14.57	13.26	214.28	-	-			<0.05	mg/l	TM38/PM0
Chloride #	48.8	48.5	12.3	15.6	12.2	41.3	-	-			<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	12.5	22.0	7.5	11.3	5.5	6.6	-	-			<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-			<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4 #	0.09	0.09	0.15	<0.06	0.10	0.17	-	-			<0.06	mg/l	TM38/PM0
Nitrate as N #	2.83	4.97	1.69	2.56	1.24	1.49	-	-			<0.05	mg/l	TM38/PM0
Nitrite as N #	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	-	-			<0.006	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	0.33	<0.03	<0.03	0.09	<0.03	0.08	-	20.38			<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	0.42	<0.03	0.03	0.11	<0.03	0.10	-	26.25			<0.03	mg/l	TM38/PM0
Anionic Surfactants	-	-	-	-	-	-	-	0.6			<0.2	mg/l	TM33/PM0
BOD (Settled) #	-	-	-	-	-	-	<1	54			<1	mg/l	TM58/PM0
COD (Settled) #	-	-	-	-	-	-	-	423			<7	mg/l	TM57/PM0
Dissolved Oxygen	10	10	10	8	10	8	-	-			<1	mg/l	TM59/PM0
Electrical Conductivity @25C #	375	382	110	585	121	677	-	-			<2	uS/cm	TM76/PM0
pH #	5.24	5.24	5.83	7.63	5.77	6.18	-	7.49			<0.01	pH units	TM73/PM0
Total Organic Carbon #	7	2	<2	4	2	3	-	-			<2	mg/l	TM60/PM0
Total Suspended Solids #	-	-	-	-	-	-	<10	122			<10	mg/l	TM37/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 16/4834						

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.: 16/4834

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
AA	x5 Dilution

JE Job No: 16/4834

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
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
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.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
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			
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	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	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			

JE Job No: 16/4834

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
TM59	Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter	PM0	No preparation is required.				
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.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

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Certificate No.: **2013471**
Job Ref: **16B08232**
Sample Ref No.: LSN **1G/40659**
Page No.: **1 of 6**
Date Received: **11/02/2016**
Date Reported: **16/02/2016**

CERTIFICATE OF ANALYSIS

GW - BH-1 - 16-182-01 - 11/02/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **11/02/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **11/02/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	201	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

All tests are carried out according to our INAB schedule of accreditation.

Comments, opinions, grades and interpretations expressed herein are outside this current scope of INAB accreditation. The Laboratory has tested the material/items supplied by the customer as sampled in accordance with the customers own requirements.

Signed for and on behalf of Exova (Ireland) Ltd.

Michelle Everard
B.Sc (Biosciences)
Supervisor Microbiology Division

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Certificate No.: **2013471**
Job Ref: **16B08232**
Sample Ref No.: LSN **1G/40660**
Page No.: **2 of 6**
Date Received: **11/02/2016**
Date Reported: **16/02/2016**

CERTIFICATE OF ANALYSIS

GW - BH-3 - 16-182-01 - 11/02/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **11/02/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **11/02/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	41	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Certificate No.: **2013471**
Job Ref: **16B08232**
Sample Ref No.: LSN **1G/40661**
Page No.: **3 of 6**
Date Received: **11/02/2016**
Date Reported: **16/02/2016**

CERTIFICATE OF ANALYSIS

GW - O'Leary - 16-182-01 - 11/02/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **11/02/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **11/02/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	201	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Certificate No.: **2013471**
Job Ref: **16B08232**
Sample Ref No.: LSN **1G/40662**
Page No.: **4 of 6**
Date Received: **11/02/2016**
Date Reported: **16/02/2016**

CERTIFICATE OF ANALYSIS

GW - O'Riordan - 16-182-01 - 11/02/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **11/02/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **11/02/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	78	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	2	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Michelle Everard
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Certificate No.: **2013471**
Job Ref: **16B08232**
Sample Ref No.: LSN **1G/40663**
Page No.: **5 of 6**
Date Received: **11/02/2016**
Date Reported: **16/02/2016**

CERTIFICATE OF ANALYSIS

GW - Coughlan - 16-182-01 - 11/02/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **11/02/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **11/02/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	8	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Client: **Neil Sandes**
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Certificate No.: **2013471**
Job Ref: **16B08232**
Sample Ref No.: LSN **1G/40664**
Page No.: **6 of 6**
Date Received: **11/02/2016**
Date Reported: **16/02/2016**

CERTIFICATE OF ANALYSIS

GW - Dunlea - 16-182-01 - 11/02/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **11/02/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **11/02/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	32	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

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ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.183T

Jones Environmental Laboratory

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O'Callaghan Moran & Associates
Unit 15
Melbourne Business Park
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Ireland

Attention :	Neil Sandes
Date :	26th May, 2016
Your reference :	16-182-01
Our reference :	Test Report 16/8985 Batch 1
Location :	WRS
Date samples received :	17th May, 2016
Status :	Final report
Issue :	1

Eight samples were received for analysis on 17th May, 2016 of which eight 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.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes
JE Job No.: 16/8985

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

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	19-23	24-27			LOD/LOR	Units	Method No.
Sample ID	BH-1	BH-3	OLeary	ORiordan	Coughlan	Dunlea	Perc	Foul					
Depth													
COC No / misc													
Containers	H P G	H P G	H P G	H P G	H P G	H P G	V P BOD G	H P BOD G					
Sample Date	16/05/2016	16/05/2016	16/05/2016	16/05/2016	16/05/2016	16/05/2016	16/05/2016	16/05/2016					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Liquid					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	17/05/2016	17/05/2016	17/05/2016	17/05/2016	17/05/2016	17/05/2016	17/05/2016	17/05/2016					
Dissolved Copper #	<7	<7	66	30	11	<7	-	-			<7	ug/l	TM30/PM14
Total Dissolved Iron #	27	<20	<20	<20	<20	<20	-	-			<20	ug/l	TM30/PM14
Dissolved Potassium #	14.4	2.9	0.8	1.7	0.8	8.9	-	-			<0.1	mg/l	TM30/PM14
Dissolved Sodium #	29.8	32.4	8.4	14.7	8.6	32.5	-	-			<0.1	mg/l	TM30/PM14
Dissolved Zinc #	10	<3	78	18	18	4	-	-			<3	ug/l	TM30/PM14
Mineral Oil (C10-C40) #	-	-	-	-	-	-	<10	-			<10	ug/l	TM5/PM30
Fats Oils and Grease	-	-	-	-	-	-	-	<10			<10	ug/l	TM5/PM30
Ammoniacal Nitrogen as N	-	-	-	-	-	-	-	5.74			<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	0.57	0.03	<0.03	0.21	<0.03	0.11	-	-			<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4	-	-	-	-	-	-	-	7.39			<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	0.73	0.04	<0.03	0.27	<0.03	0.14	-	-			<0.03	mg/l	TM38/PM0
Anionic Surfactants	-	-	-	-	-	-	-	6.2_{AA}			<0.2	mg/l	TM33/PM0
BOD (Settled)	-	-	-	-	-	-	-	145			<1	mg/l	TM58/PM0
BOD (Settled) #	-	-	-	-	-	-	<1	-			<1	mg/l	TM58/PM0
COD (Settled)	-	-	-	-	-	-	-	347			<7	mg/l	TM57/PM0
Dissolved Oxygen	8	11	9	6	9	6	-	-			<1	mg/l	TM59/PM0
Electrical Conductivity @25C #	465	503	115	163	131	696	-	-			<2	uS/cm	TM76/PM0
pH	-	-	-	-	-	-	-	7.37			<0.01	pH units	TM73/PM0
pH #	6.06	6.03	5.82	5.51	5.83	6.10	-	-			<0.01	pH units	TM73/PM0
Total Suspended Solids	-	-	-	-	-	-	-	152			<10	mg/l	TM37/PM0
Total Suspended Solids #	-	-	-	-	-	-	<10	-			<10	mg/l	TM37/PM0

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 16/8985						

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.: 16/8985

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
AA	x10 Dilution

JE Job No: 16/8985

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
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	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	PM0	No preparation is required.				
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	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.				

JE Job No: 16/8985

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
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM59	Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

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Certificate No.: **2099980**
Job Ref: **16E09692**
Sample Ref No.: LSN **1K/11132**
Page No.: **1 of 6**
Date Received: **16/05/2016**
Date Reported: **18/05/2016**

CERTIFICATE OF ANALYSIS

GW - BH-1 - 16-182-01 - 16/05/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **16/05/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **16/05/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	308	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

All tests are carried out according to our INAB schedule of accreditation.

Comments, opinions, grades and interpretations expressed herein are outside this current scope of INAB accreditation. The Laboratory has tested the material/items supplied by the customer as sampled in accordance with the customers own requirements.

Signed for and on behalf of Exova (Ireland) Ltd.

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NCEA Food Tech.
Manager Microbiology Division

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Certificate No.: **2099980**
Job Ref: **16E09692**
Sample Ref No.: LSN **1K/11133**
Page No.: **2 of 6**
Date Received: **16/05/2016**
Date Reported: **18/05/2016**

CERTIFICATE OF ANALYSIS

GW - BH-3 - 16-182-01 - 16/05/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **16/05/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **16/05/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	36	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Signed for and on behalf of Exova (Ireland) Ltd.

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Certificate No.: **2099980**
Job Ref: **16E09692**
Sample Ref No.: LSN **1K/11134**
Page No.: **3 of 6**
Date Received: **16/05/2016**
Date Reported: **18/05/2016**

CERTIFICATE OF ANALYSIS

GW - O'Leary - 16-182-01 - 16/05/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **16/05/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **16/05/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	48	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Certificate No.: **2099980**
Job Ref: **16E09692**
Sample Ref No.: LSN **1K/11135**
Page No.: **4 of 6**
Date Received: **16/05/2016**
Date Reported: **18/05/2016**

CERTIFICATE OF ANALYSIS

GW - O'Riordan - 16-182-01 - 16/05/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **16/05/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **16/05/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	4	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Certificate No.: **2099980**
Job Ref: **16E09692**
Sample Ref No.: LSN **1K/11136**
Page No.: **5 of 6**
Date Received: **16/05/2016**
Date Reported: **18/05/2016**

CERTIFICATE OF ANALYSIS

GW - Coughlan - 16-182-01 - 16/05/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **16/05/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **16/05/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	308	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	25	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Certificate No.: **2099980**
Job Ref: **16E09692**
Sample Ref No.: LSN **1K/11137**
Page No.: **6 of 6**
Date Received: **16/05/2016**
Date Reported: **18/05/2016**

CERTIFICATE OF ANALYSIS

GW - Dunlea - 16-182-01 - 16/05/16

Date Sampled:
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **16/05/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **16/05/2016**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	8	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	1	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Signed for and on behalf of Exova (Ireland) Ltd.

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Attention :	Neil Sandes
Date :	12th September, 2016
Your reference :	16-182-01
Our reference :	Test Report 16/13759 Batch 1
Location :	WRS
Date samples received :	1st September, 2016
Status :	Final report
Issue :	1

Six samples were received for analysis on 1st September, 2016 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.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes
JE Job No.: 16/13759

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-4	5-8	9-12	13-16	17-20	21-24					LOD/LOR	Units	Method No.
Sample ID	BH-1	BH-3	OLEARY	ORIORDAN	COUGHLAN	DUNLEA							
Depth													
COC No / misc													
Containers	H P G	H P G	H P G	H P G	H P G	H P G							
Sample Date	31/08/2016	31/08/2016	31/08/2016	31/08/2016	31/08/2016	31/08/2016							
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water							
Batch Number	1	1	1	1	1	1							
Date of Receipt	01/09/2016	01/09/2016	01/09/2016	01/09/2016	01/09/2016	01/09/2016							
Dissolved Copper #	7	<7	99	17	<7	<7					<7	ug/l	TM30/PM14
Total Dissolved Iron #	71	<20	<20	<20	<20	<20					<20	ug/l	TM30/PM14
Dissolved Potassium #	20.3	1.9	0.7	196.2 AA	0.7	8.1					<0.1	mg/l	TM30/PM14
Dissolved Sodium #	35.3	43.6	8.4	17.2	8.3	32.2					<0.1	mg/l	TM30/PM14
Dissolved Zinc #	32	9	142	23	19	7					<3	ug/l	TM30/PM14
Ammoniacal Nitrogen as N #	1.37	<0.03	0.05	0.30	<0.03	0.07					<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	1.77	<0.03	0.07	0.39	<0.03	0.09					<0.03	mg/l	TM38/PM0
Dissolved Oxygen	19	9	8	6	7	7					<1	mg/l	TM59/PM0
Electrical Conductivity @25C #	592	615	115	684	105	695					<2	uS/cm	TM76/PM0
pH #	6.41	6.53	5.93	7.24	5.47	6.20					<0.01	pH units	TM73/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: O'Callaghan Moran & Associates

Matrix : Liquid

Reference: 16-182-01

Location: WRS

Contact: Neil Sandes

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
16/13759	1					Liquid Samples were received at a temperature above 9°C.

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.: 16/13759

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
AA	x5 Dilution

JE Job No: 16/13759

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
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	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	PM0	No preparation is required.				
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	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			

JE Job No: 16/13759

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
TM59	Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

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Client: **Neil Sandes**
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Model Farm Road
Cork

Certificate No.: **2202205**
Job Ref: **16H21412**
Sample Ref No.: LSN **1O/42958**
Page No.: **1 of 6**
Date Received: **31/08/2016**
Date Reported: **02/09/2016**

CERTIFICATE OF ANALYSIS

GW - BH-1

Date Sampled: **31/08/2016**
Time Sampled: **10.15**
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **31/08/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **31/08/2016**
Sample No: **1**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	34,480	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

All tests are carried out according to our INAB schedule of accreditation.

Comments, opinions, grades and interpretations expressed herein are outside this current scope of INAB accreditation. The Laboratory has tested the material/items supplied by the customer as sampled in accordance with the customers own requirements.

Signed for and on behalf of Eurofins Cork Limited.

Peter Piggott
NCEA Food Tech.
Manager Microbiology Division

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Client: **Neil Sandes**
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Certificate No.: **2202205**
Job Ref: **16H21412**
Sample Ref No.: LSN **1O/42959**
Page No.: **2 of 6**
Date Received: **31/08/2016**
Date Reported: **02/09/2016**

CERTIFICATE OF ANALYSIS

GW - BH-3

Date Sampled: **31/08/2016**
Time Sampled: **10.45**
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **31/08/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **31/08/2016**
Sample No: **2**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	13	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Signed for and on behalf of Eurofins Cork Limited.

Peter Piggott
NCEA Food Tech.
Manager Microbiology Division

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Client: **Neil Sandes**
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Certificate No.: **2202205**
Job Ref: **16H21412**
Sample Ref No.: LSN **1O/42960**
Page No.: **3 of 6**
Date Received: **31/08/2016**
Date Reported: **02/09/2016**

CERTIFICATE OF ANALYSIS

GW - O'Leary

Date Sampled: **31/08/2016**
Time Sampled: **10.00**
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **31/08/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **31/08/2016**
Sample No: **3**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	4,640	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	5	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Signed for and on behalf of Eurofins Cork Limited.

Peter Piggott
NCEA Food Tech.
Manager Microbiology Division

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Certificate No.: **2202205**
Job Ref: **16H21412**
Sample Ref No.: LSN **1O/42961**
Page No.: **4 of 6**
Date Received: **31/08/2016**
Date Reported: **02/09/2016**

CERTIFICATE OF ANALYSIS

GW - O'Riordan

Date Sampled: **31/08/2016**
Time Sampled: **12.00**
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **31/08/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **31/08/2016**
Sample No: **4**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	13	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

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Signed for and on behalf of Eurofins Cork Limited.

Peter Piggott
NCEA Food Tech.
Manager Microbiology Division

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Client: **Neil Sandes**
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Certificate No.: **2202205**
Job Ref: **16H21412**
Sample Ref No.: *LSN* **1O/42962**
Page No.: **5 of 6**
Date Received: **31/08/2016**
Date Reported: **02/09/2016**

CERTIFICATE OF ANALYSIS

GW - Coughlan

Date Sampled: **31/08/2016**
Time Sampled: **10.30**
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **31/08/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **31/08/2016**
Sample No: **5**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	5	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

All tests are carried out according to our INAB schedule of accreditation.

Comments, opinions, grades and interpretations expressed herein are outside this current scope of INAB accreditation. The Laboratory has tested the material/items supplied by the customer as sampled in accordance with the customers own requirements.

Signed for and on behalf of Eurofins Cork Limited.

Peter Piggott
NCEA Food Tech.
Manager Microbiology Division

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Client: **Neil Sandes**
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Certificate No.: **2202205**
Job Ref: **16H21412**
Sample Ref No.: *LSN* **1O/42963**
Page No.: **6 of 6**
Date Received: **31/08/2016**
Date Reported: **02/09/2016**

CERTIFICATE OF ANALYSIS

GW - Dunlea

Date Sampled: **31/08/2016**
Time Sampled: **11.15**
Sample Type: **WATER - ENVIRONMENTAL**

Category: **MICRO**
Date Testing Initiated: **31/08/2016**
Sample Condition: **Satisfactory**
Order No.: **16-182-01**
Date Received: **31/08/2016**
Sample No: **6**

Test	Result	Unit	Method	Comments	Est.
Total Coliform Count-Colilert	235	MPN/100ml	MTC12/MDW Part 4D (2009)		
E.COLI Count - Colilert	<1	MPN/100ml	MTC12/MDW Part 4D (2009)		

All tests are carried out according to our INAB schedule of accreditation.

Comments, opinions, grades and interpretations expressed herein are outside this current scope of INAB accreditation. The Laboratory has tested the material/items supplied by the customer as sampled in accordance with the customers own requirements.

Signed for and on behalf of Eurofins Cork Limited.

Peter Piggott
NCEA Food Tech.
Manager Microbiology Division

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Exova Jones Environmental

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Unit 15
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Model Farm
Cork
Ireland

Attention :	Neil Sandes
Date :	12th December, 2016
Your reference :	16-182-01
Our reference :	Test Report 16/17623 Batch 1
Location :	WRS
Date samples received :	25th November, 2016
Status :	Final report
Issue :	1

Eight samples were received for analysis on 25th November, 2016 of which eight 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.

Compiled By:

Phil Sommerton BSc
Project Manager

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes
JE Job No.: 16/17623

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-6	7-12	13-18	19-24	25-30	31-36	37-42	43-46			LOD/LOR	Units	Method No.
Sample ID	BH-1	BH-3	O LEARY	O RIORDAN	COUGHLAN	DUNLEA	PERC	FOUL					
Depth													
COC No / misc													
Containers	V H P G	V H P G	V H P G	V H P G	V H P G	V H P G	V P BOD G	H P BOD G					
Sample Date	23/11/2016 11:15	23/11/2016 11:00	23/11/2016 10:15	23/11/2016 10:45	23/11/2016 10:30	23/11/2016 11:30	23/11/2016 12:30	23/11/2016 12:00					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Liquid					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	25/11/2016	25/11/2016	25/11/2016	25/11/2016	25/11/2016	25/11/2016	25/11/2016	25/11/2016					
Dissolved Barium #	33	40	9	17	7	56	-	-			<3	ug/l	TM30/PM14
Dissolved Boron	65	24	<12	105	52	73	-	-			<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-			<0.5	ug/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	-	-			<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	25	17	9	<7	-	-			<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20	<20	<20	<20	<20	<20	-	-			<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM30/PM14
Dissolved Magnesium #	7.6	8.6	2.8	2.9	1.8	16.1	-	-			<0.1	mg/l	TM30/PM14
Dissolved Manganese #	3925	197	17	961	43	4724	-	-			<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1	<1	-	-			<1	ug/l	TM30/PM14
Dissolved Nickel #	4	2	<2	7	3	7	-	-			<2	ug/l	TM30/PM14
Dissolved Potassium #	17.4	2.1	0.8	186.4 AA	1.0	8.1	-	-			<0.1	mg/l	TM30/PM14
Dissolved Sodium #	24.7	30.2	7.7	16.1	8.4	29.6	-	-			<0.1	mg/l	TM30/PM14
Dissolved Zinc #	26	10	29	13	21	4	-	-			<3	ug/l	TM30/PM14
Total Phosphorus	83	30	64	41	35	65	-	-			<5	ug/l	TM30/PM14
Mineral Oil (C10-C40)	-	-	-	-	-	-	<10	-			<10	ug/l	TM5/PM30
Fats Oils and Grease	-	-	-	-	-	-	-	<10			<10	ug/l	TM5/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/TM36/PM30/PM12
Aromatics													
>C5-EC7 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/TM36/PM30/PM12
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/TM36/PM30/PM12
MTBE #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM31/PM12
Benzene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM31/PM12
Toluene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM31/PM12
Ethylbenzene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM31/PM12

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes
JE Job No.: 16/17623

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-6	7-12	13-18	19-24	25-30	31-36	37-42	43-46			LOD/LOR	Units	Method No.
Sample ID	BH-1	BH-3	O LEARY	O RIORDAN	COUGHLAN	DUNLEA	PERC	FOUL					
Depth													
COC No / misc													
Containers	V H P G	V H P G	V H P G	V H P G	V H P G	V H P G	V P BOD G	H P BOD G					
Sample Date	23/11/2016 11:15	23/11/2016 11:00	23/11/2016 10:15	23/11/2016 10:45	23/11/2016 10:30	23/11/2016 11:30	23/11/2016 12:30	23/11/2016 12:00					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Liquid					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	25/11/2016	25/11/2016	25/11/2016	25/11/2016	25/11/2016	25/11/2016	25/11/2016	25/11/2016					
m/p-Xylene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM31/PM12
o-Xylene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM31/PM12
Sulphate #	118.1	105.3	7.1	15.2	10.9	179.8	-	-			<0.5	mg/l	TM38/PM0
Chloride #	30.0	59.8	11.1	15.7	9.9	37.7	-	-			<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	7.1	17.6	12.0	14.4	9.2	14.6	-	-			<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-			<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4 #	<0.06	<0.06	0.08	<0.06	<0.06	0.09	-	-			<0.06	mg/l	TM38/PM0
Nitrate as N #	1.60	3.97	2.72	3.25	2.07	3.29	-	-			<0.05	mg/l	TM38/PM0
Nitrite as N #	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	-	-			<0.006	mg/l	TM38/PM0
Ammoniacal Nitrogen as N	-	-	-	-	-	-	-	4.25			<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	0.61	<0.03	<0.03	0.36	<0.03	0.06	-	-			<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4	-	-	-	-	-	-	-	5.47			<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	0.78	<0.03	<0.03	0.46	<0.03	0.08	-	-			<0.03	mg/l	TM38/PM0
Anionic Surfactants	-	-	-	-	-	-	-	0.7			<0.2	mg/l	TM33/PM0
BOD (Settled)	-	-	-	-	-	-	-	2			<1	mg/l	TM58/PM0
BOD (Settled) #	-	-	-	-	-	-	<1	-			<1	mg/l	TM58/PM0
COD (Settled)	-	-	-	-	-	-	-	84			<7	mg/l	TM57/PM0
Dissolved Oxygen	6	11	11	9	8	8	-	-			<1	mg/l	TM59/PM0
Electrical Conductivity @25C #	592	497	111	643	126	690	-	-			<2	uS/cm	TM76/PM0
pH	-	-	-	-	-	-	-	7.70			<0.01	pH units	TM73/PM0
pH #	6.01	6.01	6.07	7.37	5.79	6.20	-	-			<0.01	pH units	TM73/PM0
Total Organic Carbon #	7	3	<2	<2	5	5	-	-			<2	mg/l	TM60/PM0
Total Suspended Solids	-	-	-	-	-	-	-	<10			<10	mg/l	TM37/PM0
Total Suspended Solids #	-	-	-	-	-	-	<10	-			<10	mg/l	TM37/PM0

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 16/17623						

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.: 16/17623

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 accreditation applies to surface water and groundwater and usually 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.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

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.
SA	ISO17025 (SANAS) accredited - South Africa.
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
AA	x5 Dilution

JE Job No: 16/17623

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
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. Including determination of	PM30/PM12	CWG GC-FID	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	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			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
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			
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			

JE Job No: 16/17623

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	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	PM0	No preparation is required.				
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	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM59	Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter	PM0	No preparation is required.				
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.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

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Sean O'Callaghan
O'Callaghan Moran & Associates
Unit 15 Melbourne Business Park
Model Farm Road
Cork
REPUBLIC OF IRELAND

Report number : AR-16-IS-009614-01

PO Number **16-182-01**

Authorised by: **Niall O Mahony, Senior Laboratory Technician**
Authorisation Date: **30-Nov-2016**

Certificate Of Analysis

Received Date: 23-Nov-2016
Analysis Start Date: 23-Nov-2016

Sample number	Batch Number	Sample Description	Test (Method)	Result
472-2016-00037479	BH-1	Water		
			Coliforms 37°C SOP 1.1188	6 cfu/100 ml
			Escherichia coli SOP 1.1188	0 cfu/100 ml
472-2016-00037480	BH-3	Water		
			Coliforms 37°C SOP 1.1188	0 cfu/100 ml
			Escherichia coli SOP 1.1188	0 cfu/100 ml
472-2016-00037481	O'Leary	Water		
			Coliforms 37°C SOP 1.1188	12 cfu/100 ml
			Escherichia coli SOP 1.1188	12 cfu/100 ml
472-2016-00037482	O'Riordan	Water		
			Coliforms 37°C SOP 1.1188	3 cfu/100 ml
			Escherichia coli SOP 1.1188	0 cfu/100 ml
472-2016-00037483	Coughlan	Water		
			Coliforms 37°C SOP 1.1188	19 cfu/100 ml
			Escherichia coli SOP 1.1188	0 cfu/100 ml
472-2016-00037484	Dunlea	Water		
			Coliforms 37°C SOP 1.1188	21 cfu/100 ml
			Escherichia coli SOP 1.1188	17 cfu/100 ml

Unless stated, all results are expressed on a sample as received basis.
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Opinions and/or interpretations within this report are outside our accreditation scope.
* Indicates that this parameter is not included in the INAB accreditation schedule for the laboratory.

Key: cfu colony forming units
< denotes less than
> denotes greater than
~ estimated value

Jones Environmental Laboratory

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

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O'Callaghan Moran & Associates
Unit 15
Melbourne Business Park
Model Farm
Cork
Ireland

Attention :	Neil Sandes
Date :	25th February, 2016
Your reference :	16-182-01
Our reference :	Test Report 16/4834 Batch 1
Location :	WRS
Date samples received :	12th February, 2016
Status :	Final report
Issue :	2

Eight samples were received for analysis on 12th February, 2016 of which eight 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.

Compiled By:

Phil Sommerton BSc
Project Manager

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes
JE Job No.: 16/4834

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-6	7-10	11-15	16-20	21-25	26-30	31-35	36-39			LOD/LOR	Units	Method No.
Sample ID	BH-1	BH-3	OLEARY	ORIORDAN	COUGHLAN	DUNLEA	PERC	FOUL					
Depth													
COC No / misc													
Containers	V H P G	V H G	V H P G	V H P G	V H P G	V H P G	V P BOD G	H P BOD G					
Sample Date	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016					
Dissolved Barium #	46	46	9	27	8	58	-	-			<3	ug/l	TM30/PM14
Dissolved Boron	26	32	<12	76	51	75	-	-			<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-			<0.5	ug/l	TM30/PM14
Dissolved Calcium #	38.3	38.3	5.1	6.4	8.7	82.0	-	-			<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	6.3	<1.5	<1.5	<1.5	<1.5	-	-			<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	39	7	<7	<7	-	-			<7	ug/l	TM30/PM14
Total Dissolved Iron #	<20	<20	<20	<20	<20	<20	-	-			<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM30/PM14
Dissolved Magnesium #	5.5	5.4	2.9	2.4	2.0	16.3	-	-			<0.1	mg/l	TM30/PM14
Dissolved Manganese #	212	210	12	437	42	4811	-	-			<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1	<1	-	-			<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	<2	5	2	7	-	-			<2	ug/l	TM30/PM14
Dissolved Potassium #	3.0	2.9	0.8	182.8_{AA}	0.9	8.1	-	-			<0.1	mg/l	TM30/PM14
Dissolved Sodium #	25.3	25.4	9.0	14.1	9.6	31.6	-	-			<0.1	mg/l	TM30/PM14
Dissolved Zinc #	<3	<3	49	8	6	<3	-	-			<3	ug/l	TM30/PM14
Total Phosphorus	54	52	74	37	62	88	-	-			<5	ug/l	TM30/PM14
Mineral Oil (C10-C40) #	-	-	-	-	-	-	<10	-			<10	ug/l	TM5/PM30
Fats Oils and Grease #	-	-	-	-	-	-	-	4520			<10	ug/l	TM5/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/TM36/PM30
Aromatics													
>C5-EC7 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	<10	<10	-	-			<10	ug/l	TM5/TM36/PM30
MTBE #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
Benzene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
Toluene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12

Please see attached notes for all abbreviations and acronyms

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes
JE Job No.: 16/4834

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-6	7-10	11-15	16-20	21-25	26-30	31-35	36-39			LOD/LOR	Units	Method No.
Sample ID	BH-1	BH-3	OLEARY	ORIORDAN	COUGHLAN	DUNLEA	PERC	FOUL					
Depth													
COC No / misc													
Containers	V H P G	V H G	V H P G	V H P G	V H P G	V H P G	V P BOD G	H P BOD G					
Sample Date	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016	11/02/2016					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016	12/02/2016					
Ethylbenzene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
m/p-Xylene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
o-Xylene #	<5	<5	<5	<5	<5	<5	-	-			<5	ug/l	TM36/PM12
Sulphate #	89.98	90.26	7.56	14.57	13.26	214.28	-	-			<0.05	mg/l	TM38/PM0
Chloride #	48.8	48.5	12.3	15.6	12.2	41.3	-	-			<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	12.5	22.0	7.5	11.3	5.5	6.6	-	-			<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-			<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4 #	0.09	0.09	0.15	<0.06	0.10	0.17	-	-			<0.06	mg/l	TM38/PM0
Nitrate as N #	2.83	4.97	1.69	2.56	1.24	1.49	-	-			<0.05	mg/l	TM38/PM0
Nitrite as N #	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	-	-			<0.006	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	0.33	<0.03	<0.03	0.09	<0.03	0.08	-	20.38			<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	0.42	<0.03	0.03	0.11	<0.03	0.10	-	26.25			<0.03	mg/l	TM38/PM0
Anionic Surfactants	-	-	-	-	-	-	-	0.6			<0.2	mg/l	TM33/PM0
BOD (Settled) #	-	-	-	-	-	-	<1	54			<1	mg/l	TM58/PM0
COD (Settled) #	-	-	-	-	-	-	-	423			<7	mg/l	TM57/PM0
Dissolved Oxygen	10	10	10	8	10	8	-	-			<1	mg/l	TM59/PM0
Electrical Conductivity @25C #	375	382	110	585	121	677	-	-			<2	uS/cm	TM76/PM0
pH #	5.24	5.24	5.83	7.63	5.77	6.18	-	7.49			<0.01	pH units	TM73/PM0
Total Organic Carbon #	7	2	<2	4	2	3	-	-			<2	mg/l	TM60/PM0
Total Suspended Solids #	-	-	-	-	-	-	<10	122			<10	mg/l	TM37/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 16/4834						

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.: 16/4834

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
AA	x5 Dilution

JE Job No: 16/4834

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
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
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.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
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			
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	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	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			

JE Job No: 16/4834

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
TM59	Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter	PM0	No preparation is required.				
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.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

Jones Environmental Laboratory

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O'Callaghan Moran & Associates
Unit 15
Melbourne Business Park
Model Farm
Cork
Ireland

Attention :	Neil Sandes
Date :	26th May, 2016
Your reference :	16-182-01
Our reference :	Test Report 16/8985 Batch 1
Location :	WRS
Date samples received :	17th May, 2016
Status :	Final report
Issue :	1

Eight samples were received for analysis on 17th May, 2016 of which eight 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.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes
JE Job No.: 16/8985

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

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	19-23	24-27			LOD/LOR	Units	Method No.
Sample ID	BH-1	BH-3	OLeary	ORiordan	Coughlan	Dunlea	Perc	Foul					
Depth													
COC No / misc													
Containers	H P G	H P G	H P G	H P G	H P G	H P G	V P BOD G	H P BOD G					
Sample Date	16/05/2016	16/05/2016	16/05/2016	16/05/2016	16/05/2016	16/05/2016	16/05/2016	16/05/2016					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Liquid					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	17/05/2016	17/05/2016	17/05/2016	17/05/2016	17/05/2016	17/05/2016	17/05/2016	17/05/2016					
Dissolved Copper #	<7	<7	66	30	11	<7	-	-			<7	ug/l	TM30/PM14
Total Dissolved Iron #	27	<20	<20	<20	<20	<20	-	-			<20	ug/l	TM30/PM14
Dissolved Potassium #	14.4	2.9	0.8	1.7	0.8	8.9	-	-			<0.1	mg/l	TM30/PM14
Dissolved Sodium #	29.8	32.4	8.4	14.7	8.6	32.5	-	-			<0.1	mg/l	TM30/PM14
Dissolved Zinc #	10	<3	78	18	18	4	-	-			<3	ug/l	TM30/PM14
Mineral Oil (C10-C40) #	-	-	-	-	-	-	<10	-			<10	ug/l	TM5/PM30
Fats Oils and Grease	-	-	-	-	-	-	-	<10			<10	ug/l	TM5/PM30
Ammoniacal Nitrogen as N	-	-	-	-	-	-	-	5.74			<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as N #	0.57	0.03	<0.03	0.21	<0.03	0.11	-	-			<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4	-	-	-	-	-	-	-	7.39			<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	0.73	0.04	<0.03	0.27	<0.03	0.14	-	-			<0.03	mg/l	TM38/PM0
Anionic Surfactants	-	-	-	-	-	-	-	6.2_{AA}			<0.2	mg/l	TM33/PM0
BOD (Settled)	-	-	-	-	-	-	-	145			<1	mg/l	TM58/PM0
BOD (Settled) #	-	-	-	-	-	-	<1	-			<1	mg/l	TM58/PM0
COD (Settled)	-	-	-	-	-	-	-	347			<7	mg/l	TM57/PM0
Dissolved Oxygen	8	11	9	6	9	6	-	-			<1	mg/l	TM59/PM0
Electrical Conductivity @25C #	465	503	115	163	131	696	-	-			<2	uS/cm	TM76/PM0
pH	-	-	-	-	-	-	-	7.37			<0.01	pH units	TM73/PM0
pH #	6.06	6.03	5.82	5.51	5.83	6.10	-	-			<0.01	pH units	TM73/PM0
Total Suspended Solids	-	-	-	-	-	-	-	152			<10	mg/l	TM37/PM0
Total Suspended Solids #	-	-	-	-	-	-	<10	-			<10	mg/l	TM37/PM0

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 16/8985						

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.: 16/8985

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
AA	x10 Dilution

JE Job No: 16/8985

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
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	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	PM0	No preparation is required.				
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	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.				

JE Job No: 16/8985

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
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM59	Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

Jones Environmental Laboratory

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O'Callaghan Moran & Associates
Unit 15
Melbourne Business Park
Model Farm
Cork
Ireland

Attention :	Neil Sandes
Date :	12th September, 2016
Your reference :	16-182-01
Our reference :	Test Report 16/13759 Batch 1
Location :	WRS
Date samples received :	1st September, 2016
Status :	Final report
Issue :	1

Two samples were received for analysis on 1st September, 2016 of which two 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.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes
JE Job No.: 16/13759

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	25-30	31-35										
Sample ID	PERC	FOUL										
Depth												
COC No / misc												
Containers	V P BOD G	H P BOD G										
Sample Date	31/08/2016	31/08/2016										
Sample Type	Ground Water	Liquid										
Batch Number	1	1										
Date of Receipt	01/09/2016	01/09/2016										

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Mineral Oil (C10-C40)	<10	-									<10	ug/l	TM5/PM30
Fats Oils and Grease	-	<10									<10	ug/l	TM5/PM30
Ammoniacal Nitrogen as N	-	4.27									<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4	-	5.50									<0.03	mg/l	TM38/PM0
Anionic Surfactants	-	2.4_{AA}									<0.2	mg/l	TM33/PM0
BOD (Settled)	-	4									<1	mg/l	TM58/PM0
BOD (Settled) #	4	-									<1	mg/l	TM58/PM0
COD (Settled)	-	131									<7	mg/l	TM57/PM0
pH	-	7.95									<0.01	pH units	TM73/PM0
Total Suspended Solids	-	28									<10	mg/l	TM37/PM0
Total Suspended Solids #	<10	-									<10	mg/l	TM37/PM0

Client Name: O'Callaghan Moran & Associates

Matrix : Liquid

Reference: 16-182-01

Location: WRS

Contact: Neil Sandes

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
16/13759	1					Liquid Samples were received at a temperature above 9°C.

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.: 16/13759

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
AA	x5 Dilution

JE Job No: 16/13759

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
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	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	PM0	No preparation is required.				
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	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			

JE Job No: 16/13759

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
TM59	Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

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O'Callaghan Moran & Associates
Unit 15
Melbourne Business Park
Model Farm
Cork
Ireland

Attention :	Neil Sandes
Date :	12th December, 2016
Your reference :	16-182-01
Our reference :	Test Report 16/17623 Batch 1
Location :	WRS
Date samples received :	25th November, 2016
Status :	Final report
Issue :	1

Eight samples were received for analysis on 25th November, 2016 of which eight 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.

Compiled By:

Phil Sommerton BSc
Project Manager

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes
JE Job No.: 16/17623

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	37-42	43-46									LOD/LOR	Units	Method No.
Sample ID	PERC	FOUL											
Depth													
COC No / misc													
Containers	V P BOD G	H P BOD G											
Sample Date	23/11/2016 12:30	23/11/2016 12:00											
Sample Type	Ground Water	Liquid											
Batch Number	1	1											
Date of Receipt	25/11/2016	25/11/2016											
Ammoniacal Nitrogen as N	-	4.25									<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4	-	5.47									<0.03	mg/l	TM38/PM0
Anionic Surfactants	-	0.7									<0.2	mg/l	TM33/PM0
BOD (Settled)	-	2									<1	mg/l	TM58/PM0
BOD (Settled) #	<1	-									<1	mg/l	TM58/PM0
COD (Settled)	-	84									<7	mg/l	TM57/PM0
pH	-	7.70									<0.01	pH units	TM73/PM0
Total Suspended Solids	-	<10									<10	mg/l	TM37/PM0
Total Suspended Solids #	<10	-									<10	mg/l	TM37/PM0
Mineral Oil (C10-C40)	<10	-									<10	ug/l	TM5/PM30
Fats Oils and Grease	-	<10									<10	ug/l	TM5/PM30
											<5	ug/l	TM36/PM12
											<5	ug/l	TM36/PM12
											<5	ug/l	TM36/PM12
											<5	ug/l	TM5/PM30
											<10	ug/l	TM5/PM30
											<10	ug/l	TM5/PM30
											<10	ug/l	TM5/PM30
											<10	ug/l	TM5/TM36/PM30/PM12
											<5	ug/l	TM36/PM12
											<5	ug/l	TM36/PM12
											<5	ug/l	TM36/PM12
											<5	ug/l	TM5/PM30
											<10	ug/l	TM5/PM30
											<10	ug/l	TM5/PM30
											<10	ug/l	TM5/PM30
											<10	ug/l	TM5/TM36/PM30/PM12
											<10	ug/l	TM5/TM36/PM30/PM12
											<5	ug/l	TM31/PM12
											<5	ug/l	TM31/PM12
											<5	ug/l	TM31/PM12
											<5	ug/l	TM31/PM12

Client Name: O'Callaghan Moran & Associates
Reference: 16-182-01
Location: WRS
Contact: Neil Sandes

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 16/17623						

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.: 16/17623

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 accreditation applies to surface water and groundwater and usually 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.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

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.
SA	ISO17025 (SANAS) accredited - South Africa.
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
AA	x5 Dilution

JE Job No: 16/17623

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
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. Including determination of	PM30/PM12	CWG GC-FID	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	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			
TM33	Determination of Anionic surfactants by reaction with Methylene Blue to form complexes which are analysed spectrophotometrically. (MBAS)	PM0	No preparation is required.				
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			
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.				
TM37	Modified USEPA 160.2 .Gravimetric determination of Total Suspended Solids. Sample is filtered and the resulting residue is dried and weighed.	PM0	No preparation is required.	Yes			

JE Job No: 16/17623

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	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	PM0	No preparation is required.				
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	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.				
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.	Yes			
TM59	Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter	PM0	No preparation is required.				
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.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

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www.cityanalysts.ie

Customer

Sean Moran

O'Callaghan Moran
Unit 15
Melbourne Business Park
Model Farm Road
Co Cork

Certificate Of Analysis

Job Number: 16-20753
Issue Number: 1
Report Date: 9 September 2016

Site: 16-182-01WRS
PO Number: 16-182-01
Date Samples Received: 01/09/2016

Please find attached the results for the samples received at our laboratory on 01/09/2016.

Should you have any queries regarding the report or require any further services, we would be happy to discuss your requirements. For additional information about the company please log-on to our website at the above address.

Thank you for choosing City Analysts Limited. We look forward to assisting you again.

Authorised By: 

Caitlin Quinn
Deputy Quality Manager

Authorised Date: 9 September 2016

Notes:

Results relate only to the items tested.
Information on methods of analysis and performance characteristics is available on request.
Any opinions or interpretations indicated are outside the scope of our INAB accreditation.

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Certificate Of Analysis

Customer

Sean Moran

O'Callaghan Moran
Unit 15
Melbourne Business Park
Model Farm Road
Co Cork

Report Reference: 16-20753

Report Version: 1

Site: 16-182-01WRS

Sample Description: D-1

Sample Type: Misc

Lab Reference Number: 330865

Date of Sampling: 31/08/2016

Date Sample Received: 01/09/2016

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
Dust					
D/D	07/09/2016	Dusts Inorganic	7.74	mg/m2/day	-
D/D	07/09/2016	Dusts Organic	10.27	mg/m2/day	-
D/D	07/09/2016	Dusts Total	18.01	mg/m2/day	-

Comments

30days 31.08.2016

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.
NAC & ATC - No abnormal change and acceptable to customers.
TVC - Total viable count
Site D = Analysed at City Analysts Dublin. Site S = Analysed at City Analysts Shannon

City Analysts Limited,
Pigeon House Road,
Ringsend,
Dublin 4.

Tel: (01) 613 6003
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Email:
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Certificate Of Analysis

Customer

Sean Moran

O'Callaghan Moran
Unit 15
Melbourne Business Park
Model Farm Road
Co Cork

Report Reference: 16-20753

Report Version: 1

Site: 16-182-01WRS

Sample Description: D-2

Sample Type: Misc

Lab Reference Number: 330866

Date of Sampling: 31/08/2016

Date Sample Received: 01/09/2016

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
Dust					
D/D	07/09/2016	Dusts Inorganic	5.89	mg/m2/day	-
D/D	07/09/2016	Dusts Organic	3.42	mg/m2/day	-
D/D	07/09/2016	Dusts Total	9.31	mg/m2/day	-

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.
NAC & ATC - No abnormal change and acceptable to customers.
TVC - Total viable count
Site D = Analysed at City Analysts Dublin. Site S = Analysed at City Analysts Shannon

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Ringsend,
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www.cityanalysts.ie

Certificate Of Analysis

Customer

Sean Moran

O'Callaghan Moran
Unit 15
Melbourne Business Park
Model Farm Road
Co Cork

Report Reference: 16-20753

Report Version: 1

Site: 16-182-01WRS

Sample Description: D-3

Sample Type: Misc

Lab Reference Number: 330867

Date of Sampling: 31/08/2016

Date Sample Received: 01/09/2016

Site / Method Ref.	Analysis Start Date	Parameter	Result	Units	PV Value (Drinking Water Only)
Dust					
D/D	07/09/2016	Dusts Inorganic	2.36	mg/m2/day	-
D/D	07/09/2016	Dusts Organic	3.42	mg/m2/day	-
D/D	07/09/2016	Dusts Total	5.78	mg/m2/day	-

Comments

30days 31.08.2016

= INAB Accredited, U = UKAS Accredited, * = Subcontracted

Note:
PV Value is the parametric value, taken from European Communities, (Drinking Water) Regulations, 2014. S.I. No. 122 of 2014 and relates only to drinking water samples.
For queries on results, please contact us within two weeks of the report date to ensure that we can accommodate your query as samples cannot be stored indefinitely.
NAC & ATC - No abnormal change and acceptable to customers.
TVC - Total viable count
Site D = Analysed at City Analysts Dublin. Site S = Analysed at City Analysts Shannon

ANALYSIS REPORT

CUSTOMER:	**O' CALLAGHAN MORAN & ASSOCIATES**	**SAMPLE TYPE:**	**BERGERHOFF DUST DEPOSITION**
ADDRESS:	Unit 15 Melbourne Business Park, Model Farm Road, Cork	**CONDITION OF SAMPLE ON RECEIPT:**	Satisfactory
		DATE SAMPLED:	30 Days
REPORT TO:	**NEIL SANDES**	**DATE RECEIVED:**	04 October 2016
SAMPLED BY:	NEIL SANDES	**DATE ANALYSED:**	07 – 18 October 2016
SAMPLING PT:	**16-182-01 - WRS**	**DATE REPORTED:**	01 November 2016
ORDER NO:		**WORK NO.:**	**36213 C**

TABLE OF RESULTS – DUST ANLAYSIS (F)

METHOD:	LAB REF	YOUR REF:	**TOTAL PARTICULATES** mg/m2/day	**INORGANIC PARTICULATES** mg/m2/day
SCP 039	C16-Oct 031	D-1	663	182
SCP 039	C16-Oct 032	D-2	270	79
SCP 039	C16-Oct 033	D-3	506	167

Dr Conor Murphy
Deputy Chemistry Laboratory Manager

Index to symbols used:

*	Analysis is not INAB accredited.
(F)	Analysis carried out at our Farranfore Laboratory.

- **The results relate only to the items tested.**
- **Opinions and interpretations expressed herein are outside the scope of INAB accreditation.**
- **The analysis report shall not be reproduced except in full without written approval of the laboratory.**
- **Sampling time is outside the scope of this test. This time is used to calculate the results.**

COMMENT:
D-1 – C16-Oct 031

The collector gauge contained water and a large amount of green particulates and algae growth. Also some vegetation was noted in the collector gauge. The dried dish contained a large amount of green particulates and algae growth. The ashed dish contained a large amount of brown/grey residue. The ashed residue underwent effervescence on addition of acid indicating the presence of carbonate in the residue.

COMMENT:
D-3 – C16-Oct 033

The collector gauge contained water and a considerable amount of brown particulates and algae growth. The dried dish contained a considerable amount of green brown particulates and algae growth. The ashed dish contained a considerable amount of brown/grey residue. The ashed residue underwent no effervescence on addition of acid indicating the absence of carbonate in the residue.

ANALYSIS REPORT

CUSTOMER:	**O' CALLAGHAN MORAN & ASSOCIATES**	**SAMPLE TYPE:**	**BERGERHOFF DUST DEPOSITION**
ADDRESS:	Unit 15 Melbourne Business Park, Model Farm Road, Cork	**CONDITION OF SAMPLE ON RECEIPT:**	Satisfactory
		DATE SAMPLED:	10 November – 12 December 2016
REPORT TO:	**NEIL SANDES**	**DATE RECEIVED:**	19 December 2016
SAMPLED BY:	NEIL SANDES	**DATE ANALYSED:**	23 December 2016 – 18 January 2017
SAMPLING PT:	**WRS**	**DATE REPORTED:**	19 January 2017
ORDER NO:		**WORK NO.:**	**36851 C**

TABLE OF RESULTS – DUST ANLAYSIS (F)

METHOD:	LAB REF	YOUR REF:	**TOTAL PARTICULATES** mg/m2/day	**INORGANIC PARTICULATES** mg/m2/day
SCP 039	C16-Dec 560	D-1	92	55
SCP 039	C16-Dec 561	D-2	74	28
SCP 039	C16-Dec 562	D-3	677	354

Ruth Murphy
Chemistry Laboratory Manager

Index to symbols used:

*	Analysis is not INAB accredited.
(F)	Analysis carried out at our Farranfore Laboratory.

- **The results relate only to the items tested.**
- **Opinions and interpretations expressed herein are outside the scope of INAB accreditation.**
- **The analysis report shall not be reproduced except in full without written approval of the laboratory.**
- **Sampling time is outside the scope of this test. This time is used to calculate the results.**

COMMENT:

D-3 - C16-Dec 562

The collector gauge contained water and a large amount of brown particulates and algae residue. The dried dish contained a considerable amount of brown particulates and algae residue.
The ashed dish contained a considerable amount of brown particulates and algae residue. The ashed residue underwent no effervescence on addition of acid indicating the absence of carbonate in the residue.

APPENDIX 3.

NOISE MONITORING REPORT

dBA
damian brosnan acoustics

2016 annual noise compliance survey at Waste Recovery Services, Cullenagh, Fermoy, Co. Cork

Licence ref. W0107-01

Client **Waste Recovery Services**

Prepared by **Damian Brosnan BSc MSc MIOA MIEI**

Report no	Date	Status
064.2.1	16.12.16	Draft issue
064.2.2	13.04.17	Release 1

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Damian Brosnan – assisting clients since 2001

damian brosnan acoustics is part of the DixonBrosnan Group

Contents

Summary

On 02.12.16, Damian Brosnan Acoustics carried out the 2016 annual environmental noise survey in the vicinity of the Waste Recovery Services facility at Cullenagh, Fermoy, Co. Cork. The survey is a requirement of waste licence W0107-01 issued by the Environmental Protection Agency in respect of the facility. Operations proceeded at the facility throughout the survey.

Facility noise emissions did not contribute to noise levels measured at two specified noise stations. It is concluded that site emissions were markedly lower than the 55 dB daytime noise limit specified in waste licence W0107-01. No tones or impulses were detected in facility emissions, thus complying with condition 6.4 of the waste licence.

1 Introduction

1.1 Damian Brosnan Acoustics was instructed by Waste Recovery Services (WRS) to carry out the 2016 annual environmental noise survey in the vicinity of their waste management facility at Cullenagh, Fermoy, Co. Cork. The survey is a requirement of waste licence W0107-01 issued by the Environmental Protection Agency in respect of the facility. The objectives of the survey were as follows:

- To undertake noise monitoring in accordance with *International Standard ISO 1996-2 Acoustics – Description, measurement and assessment of environmental noise, Part 2: Determination of environmental noise levels* (2007) and Environmental Protection Agency document *NG4 Guidance note for noise: Licence applications, surveys and assessments in relation to scheduled activities* (2012).
- To measure noise levels at two stations specified in licence W0107-01 and shown in **appendix 1**.
- To assess measured levels in the context of noise limit specified in the licence, reproduced in **appendix 2**.

1.2 The noise survey was undertaken Friday 02.12.16 while facility operations were in progress. As the facility does not operate during evening or night-time hours, the survey was confined to daytime hours. Survey methodology, equipment specifications and weather conditions are listed in **appendix 3**.

1.3 WRS waste processing operations, involving mobile plant and the processing line, were in progress from approximately 1030 h. Limited operations occurred prior to 1030 h. Throughout the survey, emissions arose from sporadic vehicle movements through the site entrance.

2 Results

2.1 Noise data recorded are presented in **appendix 4**, and summarised in **table 1** below. Frequency spectra and time history profiles are shown in **appendix 5**. Tabulated frequency data are presented in **appendix 6**.

Table 1: Noise data summary.

Station	MP1	MP2
Period	Day	Day
Ambient $L_{Aeq\ 30\ min}$ (dB)	52-58	54
Facility specific $L_{Aeq\ 30\ min}$ (dB)	<44	<45
Tone objectively detected	x	x
Tone attributable to facility	x	x
Facility audibly tonal	x	x
Facility audibly impulsive	x	x
Facility rated $L_{Req\ 30\ min}$ (dB)	<44	<45
Limit (dB)	55	55
Compliance	✓	✓

2.2 $L_{Aeq\ 30\ min}$ levels measured at MP1 at the site entrance were 52-58 dB. These values were influenced chiefly by intermittent traffic on the adjacent public road, distant M8 traffic, and sporadic vehicle movements through the WRS gate. Apart from onsite truck movements, WRS emissions were not audible. It is concluded that facility emissions were less than measured $L_{AF90\ 30\ min}$ levels (41-44 dB), and therefore in compliance with the 55 dB daytime limit specified in licence W0107-01.

2.3 WRS emissions were occasionally slightly audible at station MP2 to the south, although they did not contribute to the 54 dB $L_{Aeq\ 30\ min}$ level measured which was dominated by road traffic. Facility emissions therefore did not exceed the 55 dB daytime limit.

2.4 WRS operations did not give rise to tones or impulses at either of the monitoring stations, thus complying with condition 6.4 of the waste licence. Energy detected in the 80 and 160 Hz third octave bands at MP2 during the period 1107-1137 h was traced to operation of a grass mower at the adjacent golf course.

3 Conclusions

3.1 WRS noise emissions did not contribute to $L_{Aeq\ 30\ min}$ or $L_{AF90\ 30\ min}$ levels measured at the two stations. It is concluded that site emissions were markedly lower than the 55 dB daytime noise limit specified in waste licence W0107-01.

3.2 No tones or impulses were detected in facility emissions, thus complying with condition 6.4 of the waste licence.

Appendix 1: Noise stations

Station	ITM NGR*	Location	Propagation route terrain
MP1	578856 595838	WRS facility gate	Free field; line of sight to weighbridge area partially screened by brow of access lane; terrain falling source-receiver; route over paved ground & leylandii.
MP2	579034 595625	20 m W of gate to detached dwelling 170 m SE of main WRS building	Free field; line of sight almost entirely obstructed by vegetation; terrain gently falling source-receiver; route over pasture & hedgerows

*Not verified onsite.

Appendix 2: W0107-01 noise conditions

6.4. There shall be no clearly audible tonal component or impulsive component in the noise emissions from the activity at the noise sensitive locations.

C.1 Noise Emissions: (Measured at the monitoring points indicated in Table D.1.1).

Day dB(A) L_{Aeq}(30 minutes)	Night dB(A) L_{Aeq}(30 minutes)
55	45

Table D.1.1 Noise, groundwater, foul water and dust monitoring locations

Noise Stations	Groundwater Stations	Foul Water Stations	
MP1[Note1]	GW1 (Borehole of John Dunlea)	FW1[Note1]	
MP2[Note1]	GW2[Note1]		
	GW3[Note1]		
	Private wells (Condition 9.4.4)		
	P1 (Emissions to percolation area)[Note1]		

D.3 Noise

Table D.3.1 Noise Monitoring Frequency and Technique

Parameter	Monitoring Frequency	Analysis Method/Technique
$L(A)_{EQ}$ [30 minutes]	Annual	Standard[Note 1]
$L(A)_{10}$ [30 minutes]	Annual	Standard[Note 1]
$L(A)_{90}$ [30 minutes]	Annual	Standard[Note 1]
Frequency Analysis(1/3 Octave band analysis)	Annual	Standard[Note 1]

Note 1: "International Standards Organisation. ISO 1996. Acoustics - description and Measurement of Environmental noise. Parts 1, 2 and 3."

Appendix 3: Survey details

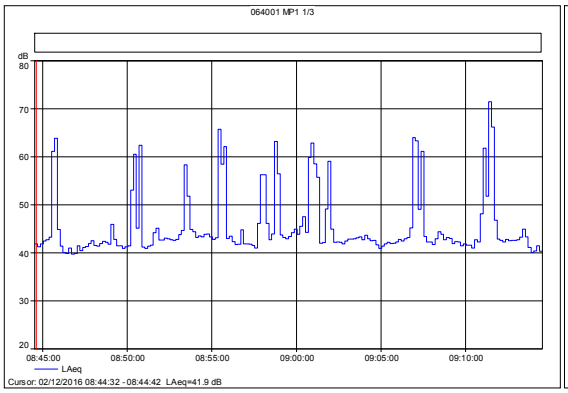
File	Project ref.	064
	Client	Waste Recovery Services
	Location	Cullenagh Fermoy
	Stations	Onsite: - Offsite: MP1 MP2
	Purpose	Waste licence compliance survey
	Comment	Facility operating
Event	Period	Daytime
	Date	02.12.16
	Day	Friday
	Time	0800-1300
	Operator	Damian Brosnan BSc MIOA MIEI
	Sound level meter	2250
Conditions	Cloud cover	Varying 20-90 %
	Precipitation	0 mm
	Temperature	5 rising to 7 °C
Wind	Direction	E
	Speed	0-1 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250
	Instrument serial no.	2506594
	Microphone serial no.	2529531
	Application	BZ7224 Version 2.5
	Bandwidth	Broadband & 1/3 octaves
	Max. input level	141.16 dB
	Broadband weightings	Time: Fast Frequency: AC
	Spectrum weightings	Time: Fast Frequency: Z
	Windscreen correction	UA-1650
	Sound field correction	Free-field
	UKAS calibration	08.02.16
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Onsite calibration	Time	02/12/2016 08:43:36
	Type	External
	Sensitivity	45.97 mV/Pa
	Post survey check	93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	1723667
	UKAS calibration	05.02.16
	Calibrating laboratory	Bruel & Kjaer Denmark
	Calibration certificate	Available on request
Uncertainty	Instrumentation	±1 dB (IEC 61672:2002 Class 1)
	External	±0-3 dB (station & weather dependent, estimated)
	Total	±5 dB (estimated, including expanded uncertainty)
Methodology	Standards	ISO 1996 (2003 & 2007) EPA NG4 (2016)
	Microphone positions	Free field, 1.5 m above ground level
	Intervals	30 min logging at 10 s

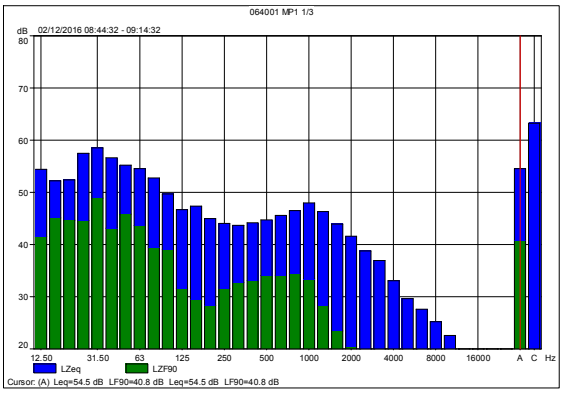
Appendix 4: Noise data

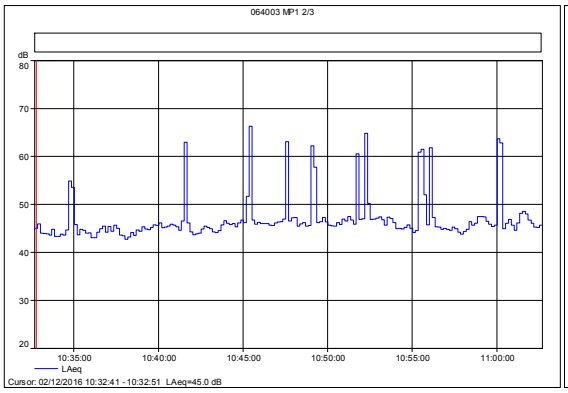
Station	Date	Time	Wind vector	$L_{Aeq\ 30\ min}$ dB	$L_{AF10\ 30\ min}$ dB	$L_{AF90\ 30\ min}$ dB	Specific $L_{Aeq\ 30\ min}$ dB
MP1	02.12.16	0844-0914	+	55	48	41	<41
	Facility: Sporadic vehicle movements through entrance dominant when present. Sporadic truck operations onsite slightly audible, including weighbridge idling. **Extraneous**: Occasional passing road traffic dominant when present. Distant M8 traffic continuously audible at low level to SE. Bird song/calls and aircraft. **Specific $L_{Aeq\ T}$ determination**: LAeq influenced by passing traffic. L90 influenced by M8. Possible only to conclude internal site operations <L90.						
MP1	02.12.16	1032-1102	+	52	48	44	<44
	Facility: As previous, although plant activity now slightly audible more regularly. **Extraneous**: As previous. **Specific $L_{Aeq\ T}$ determination**: As previous.						
MP1	02.12.16	1143-1213	+	58	50	43	<43
	Facility: Sporadic vehicle movements through entrance dominant when present. Processing operations continuously slightly audible. **Extraneous**: As previous. **Specific $L_{Aeq\ T}$ determination**: As previous.						
MP2	02.12.16	0955-1025	x	54	49	44	<44
	Facility: Truck and plant activity occasionally slightly audible. **Extraneous**: Occasional passing road traffic dominant when present, particularly local vehicle intrusion at 1003. Distant M8 traffic continuously quite audible to SE. Bird song/calls and aircraft. **Specific $L_{Aeq\ T}$ determination**: Occasionally slightly audible, thus <L90.						
MP2	02.12.16	1107-1137	x	54	55	45	<45
	Facility: As previous. **Extraneous**: As previous. Grass mower operating at adjacent golf course continuously clearly audible to 1115, dominating soundscape. **Specific $L_{Aeq\ T}$ determination**: As previous.						
MP2	02.12.16	1220-1250	x	54	47	42	<42
	Facility: As previous, with processing operations faintly audible. **Extraneous**: Occasional passing road traffic dominant when present. Distant M8 traffic continuously quite audible to SE. Bird song/calls and aircraft. **Specific $L_{Aeq\ T}$ determination**: As previous.						

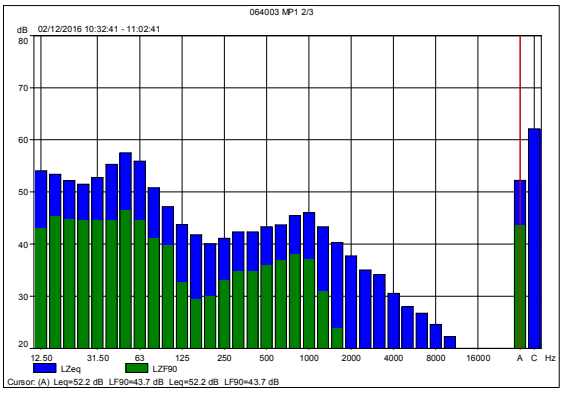
Wind vector: See final appendix. **Specific L_{Aeq}**: Level considered attributable to source under consideration, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra, spectral statistics and near field correction if applicable. **Audibility scale**: Inaudible; faintly audible; slightly audible; audible at low level; quite audible; clearly audible; dominant; intrusive; excessive.

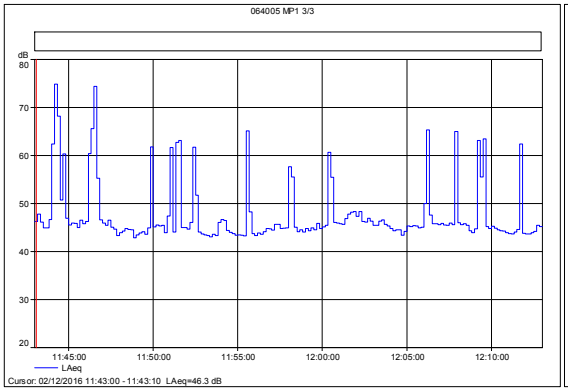
Appendix 5: Profiles & spectra

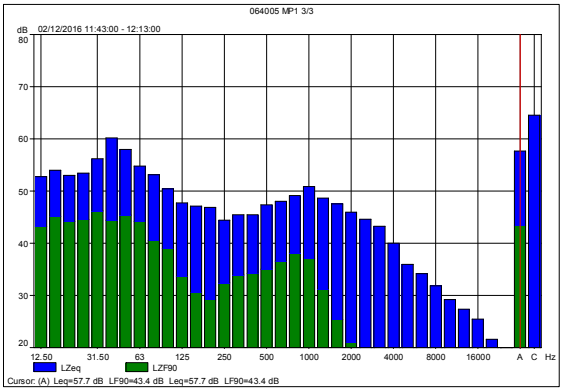


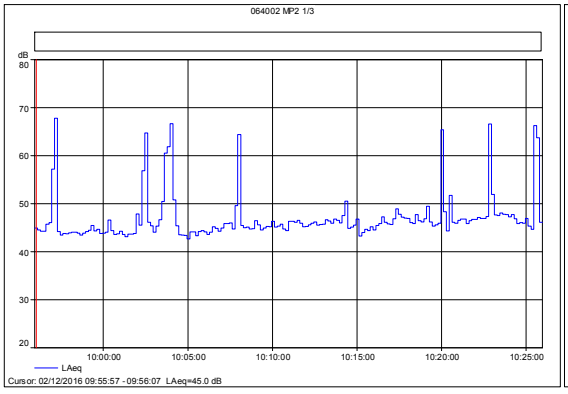


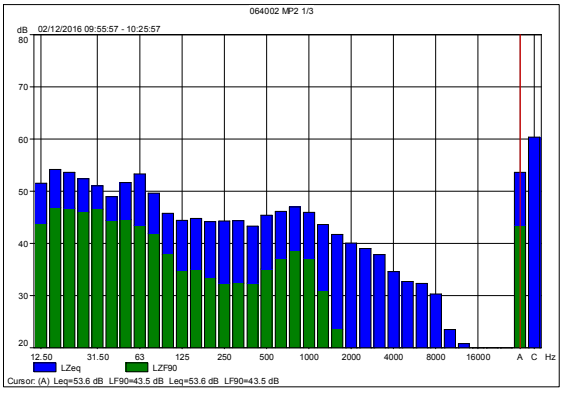


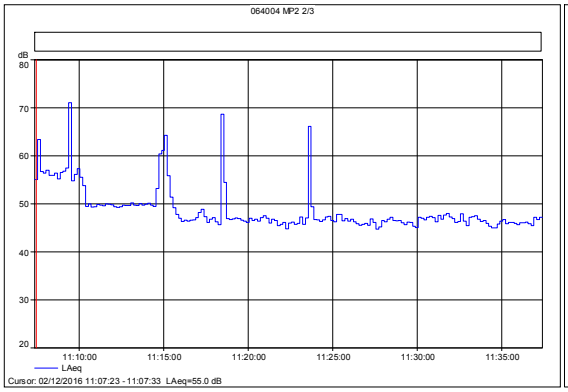


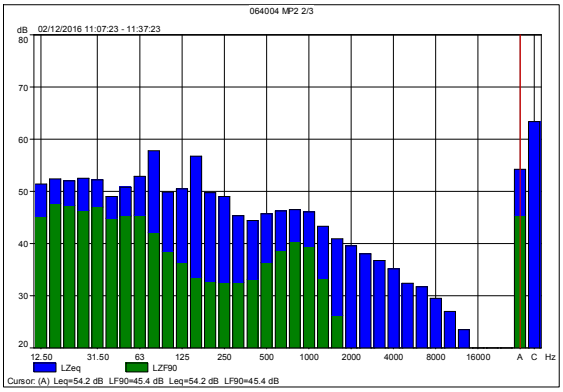


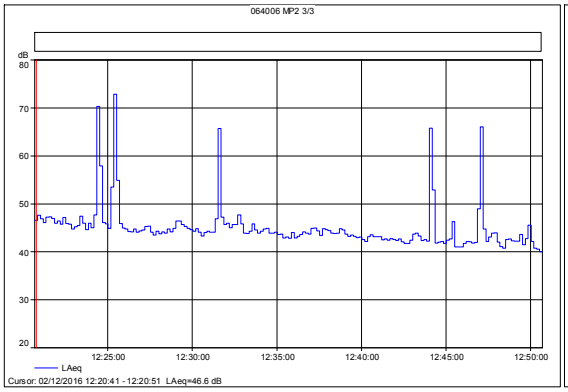


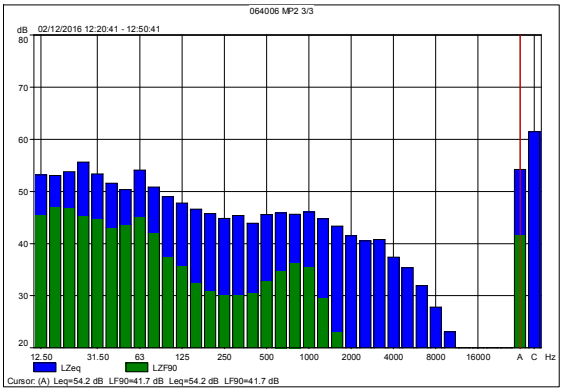





064004 MP2 2/3
dB
80
70
60
50
40
30
20
11:10:00
11:15:00
11:20:00
11:25:00
11:30:00
11:35:00
LAeq
Cursor: 02/12/2016 11:07:23 - 11:07:33 LAeq=55.0 dB


064004 MP2 2/3
dB 02/12/2016 11:07:23 - 11:37:23
80
70
60
50
40
30
20
12.50
31.50
63
125
250
500
1000
2000
4000
8000
16000
A C Hz
LZeq
LZF90
Cursor: (A) Leq=54.2 dB LF90=45.4 dB Leq=54.2 dB LF90=45.4 dB


064006 MP2 3/3
dB
80
70
60
50
40
30
20
12:25:00
12:30:00
12:35:00
12:40:00
12:45:00
12:50:00
LAeq
Cursor: 02/12/2016 12:20:41 - 12:20:51 LAeq=46.6 dB


064006 MP2 3/3
dB 02/12/2016 12:20:41 - 12:50:41
80
70
60
50
40
30
20
12.50
31.50
63
125
250
500
1000
2000
4000
8000
16000
A C Hz
LZeq
LZF90
Cursor: (A) Leq=54.2 dB LF90=41.7 dB Leq=54.2 dB LF90=41.7 dB

Appendix 6: Frequency data

Frequency data are tabulated over as required by Environmental Protection Agency document *NG4 Guidance note for noise: Licence applications, surveys and assessments in relation to scheduled activities* (2012). $L_{Zeq\ 30\ min}$ spectra are tabulated over. Spectra are shown in **appendix 5**.

Tonality may be assessed using level differences suggested by annex D of *International Standard ISO 1996-2 Acoustics – Description, measurement and assessment of environmental noise, Part 2: Determination of environmental noise levels* (2007) as follows:

- 15 dB in the third octave bands 25-125 Hz.
- 8 dB in the third octave bands 160-400 Hz.
- 5 dB in the third octave bands 500-10000 Hz.

Level differences in the 10-160 Hz range which exceed the above criteria will not be of tonal significance if L_{Zeq} values in those bands are lower than hearing threshold levels as follows:

Band (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
L_{Zeq} (dB)	92	87	83	74	64	56	49	43	42	40	38	36	34

No tones were detected. Energy detected in the 80 and 160 Hz third octave bands at MP2 during the period 1107-1137 h was traced to operation of a grass mower at the adjacent golf course.

Band (Hz)	MP1			MP2		
	1/3	2/3	3/3	1/3	2/3	3/3
	$L_{Zeq\ 30\ min}$	$L_{Zeq\ 30\ min}$	$L_{Zeq\ 30\ min}$	$L_{Zeq\ 30\ min}$	$L_{Zeq\ 30\ min}$	$L_{Zeq\ 30\ min}$
12.50	54	54	53	52	51	53
16	52	53	54	54	52	53
20	52	52	53	54	52	54
25	57	51	53	52	52	56
31.50	59	53	56	51	52	53
40	57	55	60	49	49	52
50	55	57	58	52	51	50
63	55	56	55	53	53	54
80	53	51	53	50	58	51
100	50	47	50	46	50	49
125	47	44	48	44	50	48
160	47	42	47	45	57	47
200	45	40	47	44	50	46
250	44	41	44	44	49	45
315	44	42	45	44	45	45
400	44	42	45	43	44	44
500	45	43	47	45	46	46
630	46	44	48	46	46	46
800	46	45	49	47	46	46
1000	48	46	51	46	46	46
1250	46	43	49	44	43	45
1600	44	40	48	42	41	43
2000	42	38	46	40	40	42
2500	39	35	45	39	38	41
3150	37	34	43	38	37	41
4000	33	31	40	35	35	37
5000	30	28	36	33	32	35
6300	28	27	34	32	32	32
8000	25	25	32	30	29	28
10000	23	22	29	23	27	23
12500	20	19	27	21	24	20
16000	16	14	25	16	20	16
20000	12	10	22	12	14	11
A	55	52	58	54	54	54

Appendix 7: Glossary

Ambient	Total noise environment at a location, including all sounds present.
A-weighting	Weighting or adjustment applied to sound level to approximate non-linear frequency response of human ear. Denoted by suffix A in parameters such as $L_{Aeq\,T}$, $L_{AF10\,T}$, etc.
Background level	A-weighted sound pressure level of residual noise exceeded for 90 % of time interval T. Denoted $L_{AF90\,T}$.
Broadband	Noise which contains roughly equal energy across frequency spectrum. Does not contain tones, and is generally less annoying than tonal noise.
Decibel (dB)	Unit of noise measurement scale. Based on logarithmic scale so cannot be simply added or subtracted. 3 dB difference is smallest change perceptible to human ear. 10 dB difference is perceived as doubling or halving of sound level. Examples of decibel levels are as follows: 20 dB: very quiet room; 30-35 dB: night-time rural environment; 55-65 dB: conversation; 80 dB: busy pub; 100 dB: nightclub. **Throughout this report noise levels are presented as decibels relative to 20 µPa**.
Fast response	0.125 seconds response time of sound level meter to changing noise levels. Denoted by suffix F in parameters such as $L_{AF10\,T}$, $L_{AF90\,T}$, etc.
Free field	Noise environment away from all surfaces other than ground ie. outside near field.
Frequency	Number of cycles per second of a sound or vibration wave. Low frequency noise may be perceived as hum, while whine represents higher frequency. Range of human hearing approaches 20-20,000 Hertz.
Hertz (Hz)	Unit of frequency measurement.
Impulse	Noise which is of short duration, typically less than one second, sound pressure level of which is significantly higher than background.
Interval	Time period T over which noise parameters are measured at position. Denoted by T in $L_{Aeq\,T}$, $L_{AF90\,T}$, etc.
$L_{Aeq\,T}$	Equivalent continuous sound pressure level during interval T, effectively representing average A-weighted noise level of ambient noise environment.
L_{AF}	Sound pressure level averaged over one second, and changing each second in fluctuating noise environment.
$L_{AF10\,T}$	Sound pressure level exceeded for 10% of interval T, usually used to quantify traffic noise.
$L_{AF90\,T}$	Sound pressure level exceeded for 90% of interval T, usually used to quantify background noise. May also be used to describe noise level from continuous steady or almost-steady source, particularly where local noise environment fluctuates.
$L_{Req\,T}$	Rating noise level, derived from $L_{Aeq\,T}$ plus specified adjustments for tonal and impulsive characteristics. Equivalent to $L_{Ar\,T}$ used by EPA.
Masking	The rendering inaudible of one noise source by another noise source(s) which may be louder, or may contain significant acoustic energy in the same part of the frequency spectrum. In the latter case, any tone(s) in the original source emissions may become inaudible.
Near field	Noise levels recorded near walls or other surfaces, artificially increased due to reflections. Levels near walls may be increased by up to 3 dB, and up to 6 dB near corners. Free field conditions may be achieved by maintaining separation distance of at least 3.5 m from walls.
Noise sensitive location	Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.
1/3 octave band	Frequency spectrum may be divided into octave bands. Upper limit of each octave is twice lower limit. Each octave may be subdivided into thirds, allowing greater analysis of tones.
Residual level	Noise level remaining when specific source is absent or does not contribute to ambient.

Specific level	$L_{Aeq\,T}$ level produced by specific noise source under consideration during interval T, measured directly or by estimation or calculation.
Tone	Character of noise caused by dominance of one or more frequencies which may result in increased noise nuisance.
Wind vector	May be positive (+), negative (-), neutral (0) or crosswind (x). Positive wind vector blows from source to receptor, within angular range of ±45°, creating conditions more favourable to propagation. During certain conditions, this range may increase to ±60° by day and ±90° at night. Negative wind vector occurs when receptor is upwind of source. Neutral vector arises during still conditions, or upwind when in close proximity to source. Crosswinds typically result in negative vector.
Z-weighting	Standard weighting applied by sound level meters to represent linear scale. Denoted by suffix Z in parameters such as $L_{Zeq\,T}$, $L_{ZF90\,T}$, etc. used to describe 1/3 octave band levels in frequency spectra.

In this report units are generally presented using US National Institute Of Standards & Technology guidelines.