



# Waste Soils Recovery Facility, Midleton, Co. Cork Attachment-4-8-1-Operational Report

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# 1 INTRODUCTION

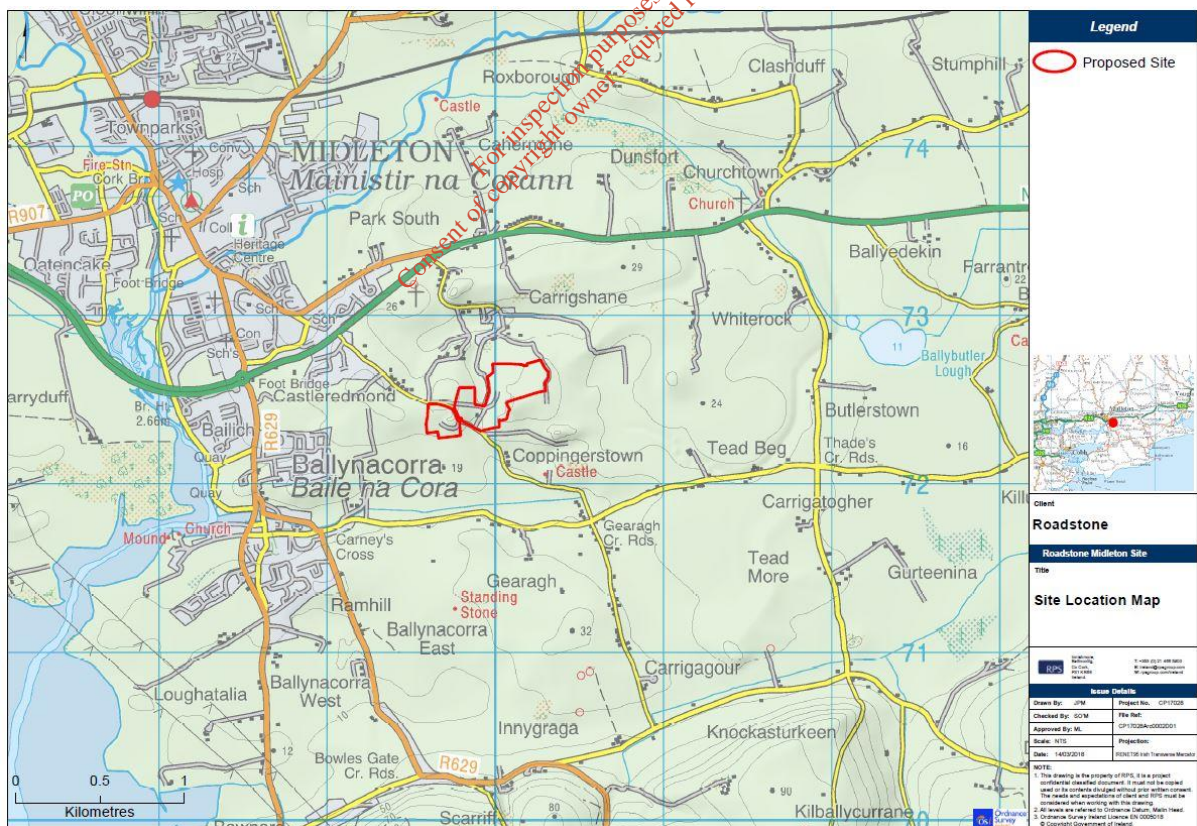
RPS has prepared this operational report, on behalf of Roadstone Limited, as part of an application to the Environmental Protection Agency for a Waste Licence for a Waste Soils Recovery Facility in Midleton, Co. Cork. The Waste Licence is to allow the import of inert soil and stones material in order to fill quarry voids, it is proposed to restore the land to agricultural use following importation of approximately 1.4M m<sup>3</sup> of material.

Planning Consent was granted by Cork County Council for the proposed Waste Soils Recovery Facility in September 2019; the application included an Environmental Impact Assessment Report (EIAR) and Appropriate Assessment Screening Report.

## 1.1 SITE LOCATION AND CONTEXT

The subject site is situated in the townlands of Castleredmond, Carrigshane and Coppingerstown to the south west of Midleton, Co. Cork. It is located approximately 800m south of the N25 and is accessed from the L-3626 also known as Rocky Road, which is a local access road which travels southeast from the N25 serving areas of ribbon residential dwellings and the Midleton Downs residential estate as well as agricultural lands on either side of the road.

Figure 1.1: Site Location



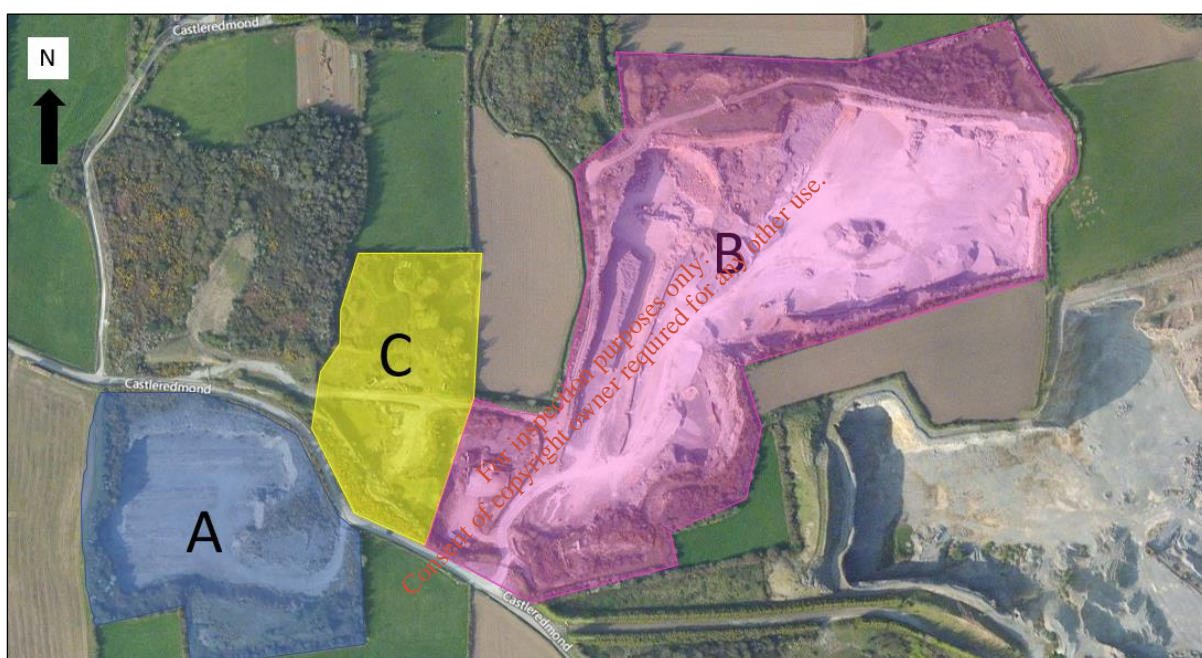
The site comprises an existing operational quarry (permitted at the site under Cork County Council Reg. Ref. 06/10088 and An Bord Pleanála Reference PL04.224250) of approximately 15.7Ha which is nearing exhaustion of material for extraction.

Quarrying activity has been underway at the site since before 1963. Much of the quarry has now been worked out with only a few years of extraction material remaining. For ease of reference in the report, the site has been sub-divided into three separate and identifiable zones, Zones A, B and C which are at various stages of quarrying completion. These are identified on **Figure 1.2** below.

Zone A, which is located to the southwest of the L-3626 comprises approximately 3.2ha of land where all extraction has been completed.

Zones B and C are located to the northeast of the L-3626. Zone B is an active quarry where limestone extraction is still underway but is largely complete. Extraction is yet to be completed at Zone C. Part of Zone C is currently utilised for general circulation, storage and ancillary quarrying activities. The ongoing quarrying activities include blasting, processing, crushing and screening.

**Figure 1.2: Zones A, B & C**



Another quarry in the ownership of the applicant is located to the south east of the subject site as can also be partially seen on **Figure 1.2** known as Coppingerstown Quarry. This quarry is also currently active. It does not form part of the proposed soils recovery facility site or application.

A number of drawings which have been included in Attachment-3-2-1 are referenced in the following sections. A schedule of the drawings is included below:

Title	Drawing Ref.	Rev.
Site Location Map	WL0001	P01
Existing Site Layout with Contours	WL0002	P01
Proposed Site Layout Cover Sheet	WL0003	P01
Proposed Site Layout (1 of 4)	WL0004	P01
Proposed Site Layout (2 of 4)	WL0005	P01
Proposed Site Layout (3 of 4)	WL0006	P01

Title	Drawing Ref.	Rev.
Proposed Site Layout (4 of 4)	WL0006	P01
Proposed Site Layout – Hardstanding Area and Proposed Drainage	WL0008	P01
Cross-Section Locations	WL0009	P01
Cross-Sections (1 of 4)	WL0010	P01
Cross-Sections (2 of 4)	WL0011	P01
Cross-Sections (3 of 4)	WL0012	P01
Cross-Sections (4 of 4)	WL0013	P01
Phase 1 - Backfilling Plans	WL0014	P01
Phase 2 - Backfilling Plans	WL0015	P01
Phase 3 - Backfilling Plans	WL0016	P01
Proposed Environmental Monitoring Locations	WL0017	P01
Proposed Restoration Plan – Phase 1 (Zone A)	2021.5.01	C
Proposed Restoration Plan – Phase 2 (Zone B and Zone C) Wheelwash Retained	2021.5.02	C
Proposed Restoration Plan – Overall Completed Phase 1 and Phase 2 Wheelwash Facility Retained	2021.5.03	C
Proposed Restoration Plan – Phase 2 (Zone B and Zone C) Wheelwash Removed	2021.5.04	C
Proposed Restoration Plan – Overall Completed Phase 1 and Phase 2 Wheelwash Facility Removed	2021.5.05	C

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## 2 SITE DESCRIPTION

### 2.1 ACCESS

There are two vehicular access points from the L-3626 into Midleton Quarry landholding which are currently used; 1 no. to Zone A and 1 no. to Zones B and C. The access to Zones B and C is currently in operation for extraction purposes. It is proposed to utilise both these access points for the infilling and landscaping processes.

There is another access to Zones B and C from the L-3626 on the west of Zone C, through adjacent land in the ownership of the Applicant which is not subject to this subject development.

The L-3626 currently accommodates two-way traffic allowing entry and exit to these points. The speed limit on this road is 50km/h from approximately the junction with the N25 as far as approximately the entrance to Zone A, and from this location east the speed limit is 80km/h.

### 2.2 BOUNDARIES AND LAND USE / COVER

Site boundaries consist of chainlink and stockproof fencing, sod and stone ditches and hedgerows comprising a mix of gorse, hawthorn, ivy and other species. Some earthen berms / banks have been positioned inside the roadside boundaries together with planting such as hawthorn and tall trees which have provided additional screening to the site for the quarrying activities.

The majority of the site has no vegetation due to the quarrying land use. There are pockets of scrub like vegetation and poor grassland at the edges of Zones A and B, while the majority of Zone C is entirely vegetated with scrub such as gorse, hawthorn and bracken as quarrying has not yet commenced in this area.

### 2.3 DEPTHS TO QUARRY FLOOR

Zone A where quarrying is completed comprises a void approximately 15m deep. The quarry floor lies at approximately 22mOD while the original ground levels around this zone vary from 37 to 30mOD.

Zone B quarry where extraction is ongoing has a quarry floor at approximately 9mOD which is above the water table as permitted under Reg. Ref. 06/10088 and An Bord Pleanála Reference PL04.224250. Cliff faces and benches in Zone B range from approx. 15mOD to 43mOD.

When extraction in Zone C is completed the quarry floor will be approximately 9mOD.

### 2.4 SERVICES AND ON-SITE STRUCTURES

Overhead electricity cables traverse the site in a northwest to southeast direction across Zones A and C. A gas main is located approximately 415m to the east of the subject site.

There are no buildings in Zones A or C. In Zone B there is a concrete loading bay which will be removed prior to completion of current extraction works in Zone B, as well as several smaller concrete structures such as a pumphouse which shall be retained.

Water for dust suppression and the wheel wash will be sourced from an on-site well (PW1) which is already in use for this purpose as part of the existing quarry operation.

Welfare facilities and the wheelwash currently on site are served by a borehole on site pumping groundwater to a tank. An existing pipe under the L-3626 provides water to Zone A. Wastewater from welfare facilities is collected by a licensed operator as required while water from the wheelwash is recycled for re-use.

There are three existing oil tanks currently on site that will be removed in advance of the importation of any soil and stone waste material.

## 2.5 PROXIMITY TO RESIDENCES

There are residential dwellings to the northwest of the site along the L-3626, the closest of which is approximately 100m to the northwest of Zone A with improved agricultural grassland in between. There is a cluster of individual detached dwellings and farmyards to the north of Zones B and C, the closest of which is approximately 120m north of the site. There also are several detached dwellings and farmyards located to the south east of the site along the L-3626. The closest residence to the south east is approximately 230m from the subject site.

## 2.6 WATERCOURSES, BEDROCK AND AQUIFERS

There are no watercourses traversing the site. The closest stream is Ballynacorra stream over 500m to the south. Rainfall / surface water soaks naturally to the ground and there are no discharge points within the site. The site is not located within a flood zone and no flood events have been recorded on the OPW flood website for the site. There are no known historical pollution incidents associated with the site.

The bedrock on the site comprises limestone with no known karst features within the site itself. However, there is a cave located to the north of Zone B.

The site lies within a regionally important karstified aquifer which does not form part of a drinking water protection area. The site has an extreme groundwater vulnerability rating – 'X' (Rock at or near surface) as topsoil and subsoils have been removed from most of the site.

## 2.7 DRAINAGE

Surface water across the entire site currently infiltrates to ground naturally. Due to the provision of the proposed link track and hardstanding area however, it is proposed to install a drainage system to collect surface water from the new track and hardstanding areas. This network of pipes including silt traps shall drain surface water to a new soakaway located south of the existing entranceway to Coppingerstown Quarry. A new car parking area and a dedicated machinery refuelling area which will also serve as an overnight plant parking area, will drain to a full retention oil interceptor prior to



discharge to ground via a soakaway. It is proposed to pass the discharge from the oil interceptor through a constructed wetland prior to release into the soakaway.

The proposed wheel wash apparatus is a closed system which shall recycle water insofar as possible. Any additional spray or water which leaves the trucks once they leave the apparatus shall be collected in the proposed new surface water collection system.

## 2.8 ANCILLARY BUILDINGS AND FACILITIES

The ancillary buildings and facilities required for the operation of the soils recovery facility are listed below. These are temporary facilities only to be provided for the duration of the soils recovery activities and will be removed from site as part of the final restoration works. Some of these items are already in place for the quarrying activity and will be utilised for and retained for the duration of recovery activities also.

- Site security facilities;
- Site office / staff welfare facilities;
- New wheelwash and weighbridge; and
- Quarantine area for any imported material suspected of being contaminated or unsuitable for acceptable at the facility. This will comprise of a covered concrete slab area.

The site is already secure at all perimeters with a combination of chainlink and stockproof fencing, established hedgerows and sod and stone walls. These will be maintained until the recovery activities are complete and the site final restoration is complete. The existing site security will remain in situ including CCTV and gates, as well as the existing site office and portable welfare facilities.

It is proposed to provide a new weighbridge, wheelwash, car parking and a quarantine area to the southeast of Zone B, adjacent to the link track to Coppingerstown Quarry thereby enabling use of the infrastructure for operations in both quarries (both recovery and quarrying) to increase efficiency of the overall business. A wheelwash is also proposed at Zone A.

## 2.9 MONITORING

Noise, dust and groundwater monitoring are currently carried out at the facility in accordance with the existing permission for this development. There are a number of on-site groundwater monitoring wells.

Further details of the historic monitoring results as well as the baseline monitoring undertaken are included as part of the Environmental Impact Assessment Report (EIAR) that accompany this application, more recent waste quality results for local wells are presented in Appendix A of this report.

## 3 EXISTING SITE CONDITION

### 3.1 SITE DESCRIPTION AND TOPOGRAPHY

The site, situated approx. 2.1km southeast of Midleton town centre, has an area of 15.7Ha (within which approx. 9ha of extraction area will be backfilled) within a total landholding area of 46.6Ha in the ownership of the applicant. As the quarrying activity will be ongoing at the same time as the infill (until permitted reserves are exhausted), the whole landholding area is described below in order to consider potential interaction with current operations.

Further details on the site condition are available Chapter 11 'Hydrology, Hydrogeology and Flood Risk' of the EIAR which was prepared by Hydro-Environmental Services on behalf of Roadstone Limited.

The quarry has been worked extensively in the past, and the site includes large excavated areas (to circa. 9mOD), an open first bench which is currently being quarried (top level at approx. 21mOD) (Zone B), quarry workings are predominately in the centre and northeast of the site. The site also contains undeveloped sections which remain densely vegetated in the far north and north-western corner of the site (Zone C).

The boundaries of the quarry site have an elevation range of 36-38m OD on the eastern boundary, reflecting an approximately natural elevation of the pre-development site. There is also a smaller separate extraction area on the southwest of the site which is accessed through a separate site entrance from the public road. This smaller extraction area has an area of 1.3ha and a current floor level of 22 - 23m OD. Extraction is completed in this area.

Within the overall landholding to the southeast of the site there is a separate quarry which is referred to as Coppingerstown Quarry. Coppingerstown Quarry has an extraction area of approximately 27Ha with the current floor level at 8 - 9m OD. A small aggregate processing plant is located to the south of the extraction area.

The floor levels of all the extraction areas within the site and overall landholding of the applicant are above the local groundwater table. There are no discharges from the site or overall landholding.

Landuse in the surrounding area is largely agricultural with scattered rural pattern of residential dwellings along the N22 which runs immediately to the north of the site and along other local roads to the south and east of the site.

### 3.2 SITE GEOLOGY

From inspections of the quarry faces, the exposed rock is relatively clean and with no significant weathering except for the upper 5 -7 metres.

However, north-south veining and joint sets are visible in the vertical faces of the quarry, with some fractures evident also. Some of the fractures are clay filled.

To investigate the geological and hydrogeological conditions below the existing quarry floor, 22 no. 4" blast hole drilling investigation points were completed between 15<sup>th</sup> and 16<sup>th</sup> November 2017.

The drilling results are variable. While many holes show solid limestone, and dust returns, with little fracturing, there are also several holes that suggest there are larger discrete fractures/conduits beneath the quarry floor.

There is a large area with clay filled fractures/cavities in the center of the quarry floor at drill locations EH4, EH6, and EH15. These clay filled fractures/cavities were encountered between 5-15mbgl and 22-28mbgl (meters below ground level). The eastern half of the quarry floor comprises relatively solid and dry limestone.

In addition, a total of 6 no. monitoring wells were drilled around the perimeter of the extraction area within the overall landholding. The drilling encountered weak to strong grey limestone which was found to be either slightly weathered or fractured to some extent in the majority of the wells. Soft brown clay infill was noted at many of the weathered/fractured sections

### 3.3 REGIONAL AND LOCAL HYDROLOGY

Regionally, the site is located in the Owennacurra River surface water catchment within the South Western River Basin District.

The Owennacurra River flows through Midleton town, approx. 1.5km to the west of the site. Downstream of Midleton town this watercourse is referred to as the Ballynacorra River which flows into Cork Harbour further south.

In terms of mapped local hydrology, the northern section of the site is located in the Dungourney River catchment which flows in a westerly direction approx. 1.9km north of the site. The Dungourney River discharges into the Owennacurra River at Midleton town.

The southern section of the site drains to an unnamed stream but which is referred to on EPA mapping as the West Ballynacorra Stream. The source of the West Ballynacorra Stream is a karst spring which is in the most south-eastern part of the applicant's landholding. The West Ballynacorra Stream flows westerly and discharges into the Ballynacorra River estuary.

Other than the West Ballynacorra Stream, there are no other natural surface water features within the site or near the boundary of the site.

#### 3.3.1 Site and Local Hydrogeology

As stated above the site is underlain by a Regionally Important karstified Aquifer (Rkd). There is no significant karstified rock features/weathering in the quarry walls of the site. The main karst feature within the vicinity of the site is a small spring in the southern corner of the landholding.

As noted above, to investigate the geological and hydrogeological conditions below the existing quarry floor, 22 no. 4" blast hole drilling investigation points were completed. In addition, 6 no.

monitoring wells were drilled around the periphery of the current extraction areas within the overall landholding.

The drilling results were variable, and while many holes show solid rock, with little water inflow, there are also several holes with significant groundwater strikes that suggest there are larger discrete pathways of groundwater flow beneath the quarry. Clay in-filled fractures and cavities with large inflows would be consistent with karstified limestone.

Based on the reduced groundwater levels (m OD), the groundwater flow direction in the area of the quarry is to the west / southwest. This is consistent with the local hydrology of the area which is towards the estuary of Ballynacorra River/estuary which exists to the southwest of the site.

The variation in groundwater levels at the site during the monitoring period (January – June 2018) was between 1.5 – 2m which would be typical of high productive Regionally Important Aquifer where gradients would be typically more subdued.

### 3.3.2 Groundwater Quality

Groundwater sampling was completed at the on-site monitoring wells (MW2<sup>1</sup> – MW6) and at a production well (PW1) in the Coppingerstown Quarry and also at a number of local wells (following a further information request received from Cork County Council on 20<sup>th</sup> May 2019).

The groundwater flow direction at the site is to the west / southwest and therefore monitoring well MW6 is directly up-gradient of the site, while MW3, MW2 and MW5 are directly down-gradient of it. MW3, MW4 and PW1 are either to the north or south and are across gradient to the site.

The results are shown in **Table 1 of Appendix D.3** of the EIAR and additional monitoring at the local wells is presented in the Further Information Request Response (Planning Ref: 19/04719) included in Appendix A of this report; the results are compared with the relevant groundwater regulation values (S.I. No. 9 of 2010) and drinking water regulation values (S.I. No. 122 of 2014).

There were three exceedances with respect to the drinking water regulation values and these were for Total Coliforms in MW1, Enterococci in MW5 and a minor exceedance of Nitrate in MW4 (53.16mg/l). There were two exceedances with respect to the groundwater regulation values and this was for nitrate in MW3 in both sampling events, which exists to the north (across-gradient) of the site.

Nitrate was also relatively elevated in MW6 which is also likely due to agricultural practices such as fertiliser / slurry spreading on the lands surrounding the site. Ortho-phosphate was also elevated in MW3 and MW4 which suggests a fertilizer/slurry source. The presence in enterococci in MW5 also suggests a slurry source (animal waste).

The elevated level of Total Coliforms at MW1 suggests that this particular sample point was contaminated shortly before sampling as nitrate was also slightly elevated in MW1. There was no detection of coliforms in any of the other samples which might indicate a chemical fertilizer rather than manure/slurry or it may indicate that the groundwater vulnerability is not overly high locally.

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<sup>1</sup> Sampling of MW1 was not completed due to low groundwater volumes.

Overall the groundwater quality is typical of a karstified aquifer where the main landuse is agriculture. Variable groundwater quality is often a characteristic of this aquifer type. There are no residual impacts to groundwater or surface water quality anticipated during the restoration period and post restoration.

Groundwater sampling was completed at the local wells on June 6<sup>th</sup>, 2019. Raw water samples were taken from garden taps using best practice sampling methods.

Total coliforms were detected in all wells except Well 7, E.Coli and/or Enterococci were detected in Well 2, Well 5, Well 8 and Well 9, with significant contamination in Well 2, Well 8 and Well 9. Elevated chloride was present in some wells, although neither the Drinking Water nor Groundwater Regulations were exceeded. The natural background concentration in this area will be elevated due to the proximity of the coast. Nitrate was elevated (exceeding the Groundwater Regulations) in Well 2, Well 3, Well 4 and Well 7 which is likely due to agricultural practices.

The groundwater quality within the Quarry site was better (in terms of microbial contamination in particular) suggests that the elevated concentrations in the local wells are related to sources not associated with the quarry (i.e. farming or septic tank related).

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## 4 RESTORATION PROPOSALS

It is proposed to profile the imported soils material according to a site-specific landscape plan and to return the site to agricultural use. In order to provide an economical and practical land package for modern day agricultural use, it is not proposed to restore field boundaries to those represented in historical mapping.

It is proposed to undertake restoration on a phased basis involving grass seeding of restored areas to reduce the effects of soil erosion, windblown dust, to aid ground stabilisation and as an effective means of weed control.

### 4.1 MATERIALS AND ACTIVITIES

The proposed backfilling of the quarry void using inert soil and stone material comprises the following classes of waste activity in accordance with the Waste Management Acts 1996 – 2015:

- Class No. R5 - recycling and reclamation of other inorganic materials, which includes soil cleaning resulting in recovery of the soil and recycling of inorganic construction materials (Principal Activity). This activity is limited to the recovery of inert soil and stone through deposition, for the purposes of improvement or development of land.
- Class No. R13 (storage of waste pending any of the operations R1 to R12). This activity will be limited to the storage of imported wastes for recovery purposes at the facility (e.g. stockpiles of inert soil).

### 4.2 NATURE OF IMPORTED MATERIAL

Material proposed to be imported to the site comprises inert soil and stones which fall under the List of Waste (LoW) category of 17 05 04. This material largely originates from excavations accommodating large scale infrastructural or other construction works. Material may be accepted from both greenfield and brownfield sites, in line with strict waste acceptance procedures as outlined in Attachment-4-3-3.

The estimated total volume of material to be imported to the site is approximately 1.4M m<sup>3</sup> (2.52M tonnes) (Zone A = 100,000m<sup>3</sup> approx, Zone B = 1,140,000m<sup>3</sup> approx. and Zone C = 147,000m<sup>3</sup> approx.).

The estimated annual intake is approx. 300,000 tonnes (166,666m<sup>3</sup> approx.) per annum. This annual importation rate is less than the combined currently permitted extraction rates from both Midleton Quarry and the adjacent Coppingerstown Quarry of 500,000 tonnes per annum (approx. 208,333m<sup>3</sup>).

## 5 SITE OPERATIONS

### 5.1 SITE MANAGEMENT

Roadstone has an established Environmental Management System (EMS). Roadstone regards environmental protection management as an integral and essential part of good business practice. They are committed to achieving and maintaining a high standard of environmental quality in all of their operations.

Roadstone are committed to providing the necessary information, training and equipment to enable their employees to carry out their duties safely and in an environmentally responsible manner. All staff and persons working for and/or on behalf of Roadstone are made aware of the Environment Policy.

A facility manager will be appointed by Roadstone to ensure that the Environmental Management System, Environmental Objectives & Targets and the Environmental Monitoring Plan are fully implemented.

The EMS shall include 'Environmental Monitoring Programme' for the monitoring of water, dust and noise, and will be revised subject to compliance with any conditions attached to any decision to grant planning permission and a Waste Management Licence for the proposed soil recovery facility.

#### 5.1.1 Waste Acceptance Procedures

Soil and stone waste material shall only be accepted on site in line with strict waste acceptance procedures as outlined in Attachment 4.3.3.

#### 5.1.2 Record Keeping

Full and complete records pertaining to the Soil Recovery Facility will be maintained, including a log of intake and deliveries, documentation relating to planning, health and safety, environmental monitoring, the environmental management system (EMS), etc.

The record keeping process will be revised to deliver compliance with any conditions attached to any decision to grant planning permission and a Waste Management Licence for the proposed SRF.

The Facility Manager will maintain, at the site office, detailed records of all materials, waste and otherwise, brought to the site and the material removed from the site. Site records will always be available for inspection.

#### 5.1.3 Emergency Response Plans

The EMS shall include relevant Emergency Response Procedures including a Spillage Response Procedure.

## 5.2 REMOVAL OF MATERIALS OFF-SITE

It is only intended to accept inert soil and stone material which has been considered suitable in accordance with waste acceptance procedures and onsite verification checks. In accordance with the site procedures, all waste being delivered to site will have to go through a pre-approval stage. In addition, every load arriving on site will be inspected at different stages when it moves through the site. Non-compliant material shall be rejected. It may be the case that some non-inert waste (metal or wood) may inadvertently be accepted in tipped loads of otherwise inert soil and stone material. This material will also be separated and placed in the quarantine area or in appropriate skips pending removal off-site by a suitably licensed contractor. This material shall be segregated where practical to facilitate treatment options higher in the waste hierarchy for individual material streams.

The main waste streams generated by the licensable and associated activities will be from the office and welfare facilities. This office waste will be segregated and collected by a suitably licensed contractor as required for reuse, recycling, recovery or disposal as appropriate. The effluent from the portaloo shall be routinely collected by an appropriately licensed contractor.

## 5.3 PHASING

It is proposed to commence importation of fill material in Zone A. Once sufficient material has been deposited to broadly tie in with the surrounding contours, topsoil will be placed to facilitate final landscaping and restoration of the site.

Quarrying and extraction is currently still ongoing in Zone B and once complete, extraction will then move to Zone C allowing importation and backfilling of Zone B. Finally, Zone C shall be backfilled.

Landscaping and restoration of the furthermost areas of Zone B will be possible while extraction or importation works are underway in Zone C. The remainder of final required landscaping (Zone B and all of Zone C) will commence once all importation activities have been completed.

## 5.4 WORKING HOURS

Current operational hours for extraction activities at the site comply with Condition No. 7 as set out in the grant of permission for Reg. Ref. 06/10088 (ABP PL04.244250). It is proposed that working hours for the backfill operations will be the same as those set out and currently operational, i.e. Monday to Friday 07.00 to 18.00, and 07.00 to 14.00 on Saturday. No operations shall take place on Sundays or Public Holidays.

## 5.5 ACCESS ARRANGEMENTS

It is proposed that all HGVs carrying imported material will approach the site from the N25 and L-3626. All HGVs will enter the site at the main access point to Zone B to access a weighbridge. In the first phase of infilling (in Zone A), trucks will then exit via the same access, turn west and enter Zone A to deposit the imported material. The trucks will be required to return to the weighbridge in the northern lands before exiting the site completely and travelling west towards the N25 again. The weighbridge will be more conveniently located for the infilling of Zones B and C thereby reducing the



number of localised turning movements. A new wheel wash will be installed in each of Zones A and B.

The access point to Zones B and C is sufficient to cater for ongoing extraction together with importation. New post and chainlink fencing will be provided on the north-western side of the access while on the southeast, the existing hedgerow and vegetation shall be lowered,

Within the site, existing haul roads across the rock surface will be used as appropriate for the infilling activities. It is also proposed to connect Midleton Quarry with the adjacent Coppingerstown Quarry in order to optimise infrastructural requirements such as access to a wheel wash, weighbridge and welfare facilities at both quarries. The proposed connection will run in the same general location as an existing track with some of the footprint of the current track being set out for site services including weighbridge, wheel wash and office.

## 5.6 LIFETIME OF THE DEVELOPMENT

The applicant has applied for permission with a duration of 18 years which allows for approximately years of importation and 3 no. years of monitoring. Chapter 7 (Traffic) of the EIAR sets out two separate scenarios which portray possible lifetimes of the development. In summary however, the proposed and likely scenario utilises at least 50% of trucks for both importing and extraction the full 166,666m<sup>3</sup> (300,000 tonnes) annual intake of soil to occur which will result in a duration of approximately 8.4 years for the full soil recovery works. The worst-case scenario separates all backfilling and extraction truck movements, meaning the annual intake of soils will be approximately 91,450m<sup>3</sup> (164,610 tonnes) which will result in an extended duration of approximately 15.3 years for the full soil recovery works.

Extraction of the remaining stone at Midleton Quarry is dependent on a number of factors including demand for the material. Nonetheless extraction is permitted until 2023. After that period, in theory, the importation of soils will then be able to increase to 166,666m<sup>3</sup> (300,000 tonnes) however this is unlikely to occur due to ongoing extraction from Coppingerstown Quarry and the requirement to balance total HGV numbers to 172 movements. Additionally, there is a requirement to allow for market fluctuations as experienced in Ireland over the last decade in the construction sector in particular.

## 5.7 ENERGY REQUIREMENTS

In terms of energy requirements, electricity is required only for the water supply, welfare facilities and security such as CCTV and lighting only in the area of the proposed link road to Coppingerstown Quarry. The only additional requirement for energy is in the form of fuel for plant operating on the site. No fuel storage is proposed within the application site. An existing bunded fuel store owned and operated by the applicant at the neighbouring Coppingerstown Quarry will serve the proposed materials recovery operations also.

## 5.8 ABATEMENT SYSTEMS

There is an existing fixed water spray system in use for dust suppression associated with the existing quarrying activities. The coverage will be increased to cover appropriate sections of the site roads. A mobile waste bowser will also be used to mitigate dust generation during dry weather conditions.

As outlined in Section 2.7, it is proposed to install new surface water drainage infrastructure. This shall include an oil interceptor.

### 5.8.1 Oils and Fuel Spillages

Proposed mitigation measures are as follows:

- All on site refuelling will be completed in a designated area and from a mobile double skinned fuel bowser.
- There will be no on-site storage of fuels permitted at the site.
- All plant and machinery will be serviced off-site before being mobilised to site, and regular leak inspections will be completed during the backfilling works.
- Surface water collected from the parking area and refuelling area will drain to a full retention oil interceptor prior to discharge to ground via a soakaway. It is also proposed to pass the discharge from the oil interceptor through a constructed wetland prior to release into the soakaway.
- No substantial plant maintenance will be completed on site, any broken-down plant will be removed from site to be fixed.
- An emergency spill kit with oil boom, absorbers etc. will be kept on site for use in the event of an accidental spill.

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## APPENDIX A

### Further Information Request Response – Baseline Water Quality (Planning Ref: 19/04719)

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Date: 18<sup>th</sup> June 2019  
Our Ref: P1416-4-0002

**Roadstone Ltd**  
Carrigtwohill Quarry  
Ballintuber,  
Carrigtwohill,  
Co. Cork

**Attn: Mr. Pat Gibney**

Dear Pat,

**Re: Proposed Inert Soil Waste Recovery Facility at Midleton Quarry, Co. Cork – Further Information Request Response (Planning Ref: 19/04719)**

---

## 1.0 Introduction

Hydro-Environmental Services (HES) was commissioned by Roadstone Ltd to respond to a further information request issued by Cork County Council on 20<sup>th</sup> May 2019 regarding a proposed inert soil waste recovery at Midleton Quarry, Midleton, Co. Cork.

This letter report provides a response to Item 2. The other items in the RFI are dealt with separately by others.

### Item 2

*“There is no evidence in the EIAR of the background baseline water quality monitoring of the 9 local wells that have been identified within 500m of the site. Without this baseline, it is difficult to determine the actual impact of the activities of the development on the local wells in the area. Please submit details of same”.*

## 2.0 Response

Raw water sampling of the private wells identified in the EIAR was undertaken by HES on 6<sup>th</sup> June 2019. It was not possible to locate the owner of Well 6 and therefore this well was not sampled. Well 6 is located upgradient of the proposed development (in terms of groundwater flow direction) and therefore cannot be impacted by the proposed development.

Location details of the wells sampled are shown below in **Table A**. A well location map is shown as **Figure A**. Results of the sampling are shown in **Table 1** attached below.

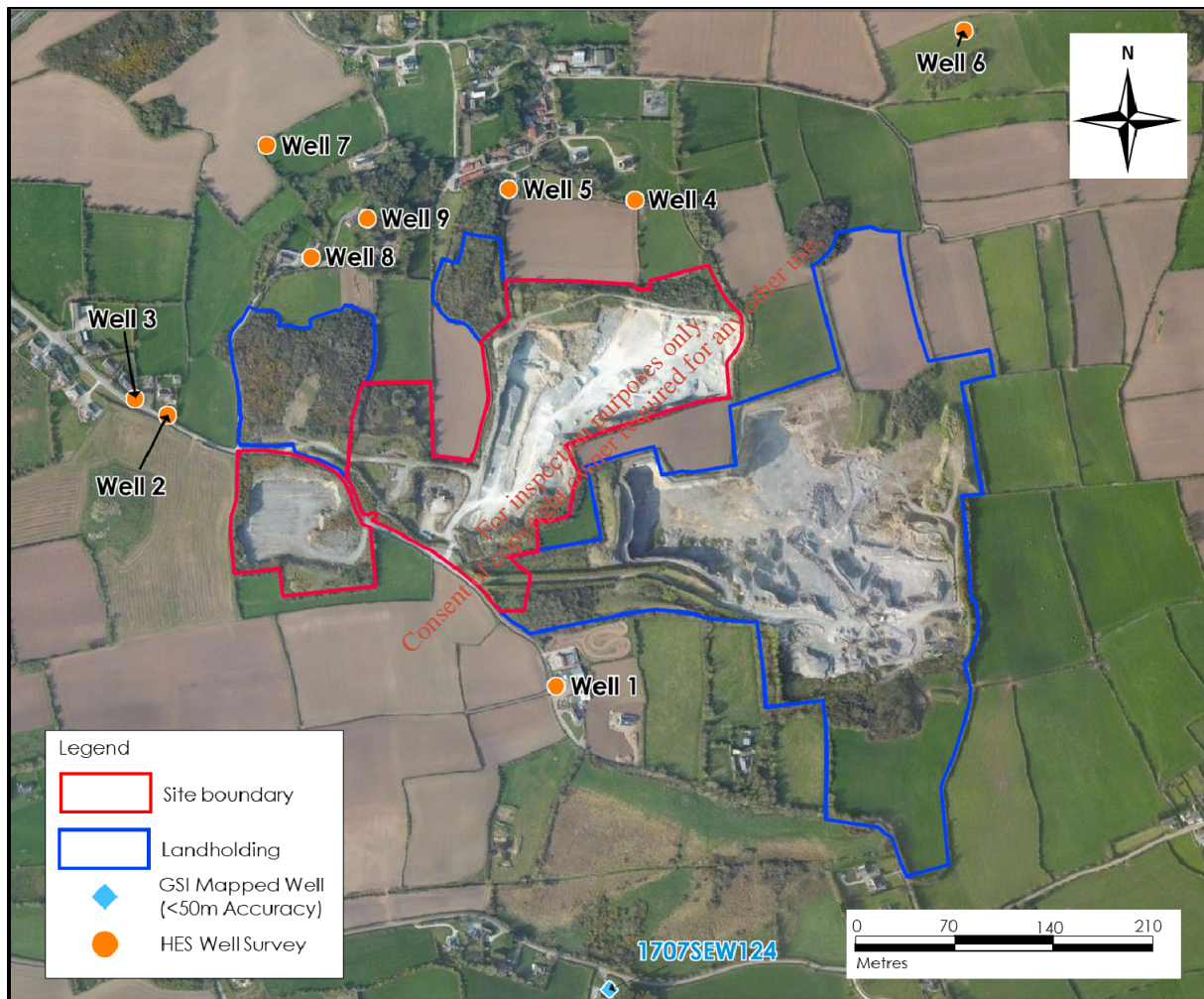
In addition, the on-site monitoring wells at the proposed development site (MW17-01 – MW17-06), as shown on **Figure B**, were re-sampled as part of this RFI response (although this was not requested) and these results are attached below in **Table 2**. These wells were previously sampled during the preparation of the EIAR on 08<sup>th</sup> March 2018, and these original data are included in **Table 2** for comparison to current data.

For the third party well sampling, groundwater samples were taken from garden taps. Raw water taps (untreated water) were identified and were left run for 15 minutes prior to sampling. Best practice sampling methods were employed (i.e. tap nipple sterilisation, sterile gloves, appropriate sampling bottles with preservative and delivery to accredited laboratory on the same day as sampling).

Laboratory certificates of analysis for all samples are attached as **Appendix I**.

**Table A: Details of Third-Party Wells Sampled on 06/06/2019**

Well ID	Address	Easting/Northing
Well 1	Rockyroad	190050/72147
Well 2	Rockyroad	189504/72526
Well 3	Rockyroad	189458/72549
Well 4	Carrigshane	190169/72830
Well 5	Carrigshane	189991/72845
Well 7	Carrigshane	189648/72906
Well 8	Uamhanna	189710/72748
Well 9	Uamhanna	189790/72803



**Figure A:** Location of Third-Party Wells Identified in the EIAR



**Figure B:** Location of Quarry On-site Monitoring Wells

Resulting laboratory data for private well analyses indicates that there was no non-compliance [relative to Drinking Water limits from SI 122 of 2014] of chemical parameters, but there was non-compliance in the third-party wells relating to microbial contamination.

Total coliforms were detected in all wells except Well 7. E. Coli and/or Enterococci were detected in 4 no. of the wells (Well 2, Well 5, Well 8 and Well 9). The contamination was very significant in some cases (i.e. Well 2, Well 8 and Well 9).

Elevated chloride (albeit at drinking water compliant levels) was present in some wells. The natural background groundwater chloride concentration in this area appears to be around 30mg/L due to the proximity to the coast. Anything higher may suggest a relatively local organic contamination source such as a septic tank or farm waste.

However, the karstic nature of the limestone aquifer in this area means sources of microbial contamination can be remote from the well (>1km away or more) due to the potential for long, but rapid, regional groundwater flows. Other indicator parameters such as elevated chloride may be absent as a result of this.

Nitrate is elevated in many of the wells which is likely due to local agricultural practices. There were no exceedances of the EU drinking water regulations (of 50 mg/L NO<sub>3</sub>). Although, nitrate levels in Well 2 (48.7 mg/L NO<sub>3</sub>) and Well 3 (also 48.7 mg/L NO<sub>3</sub>) are just below the drinking water regulation value of 50mg/L. Nitrates, in combination with microbial detections suggest a potential localised contamination source.

The groundwater quality in the Midleton Quarry monitoring wells was overall much better, particularly for E Coli microbial contamination. However, elevated concentrations of nitrate and chloride and in some cases ortho-phosphate were also detected in the quarry monitoring wells. Elevated concentrations occurred in both upstream and downstream monitoring wells which shows the sources are off-site to the quarry (i.e. farming or septic tanks related).

E. Coli were only detected in one monitoring well and that was MW17-05. The lack of microbial contamination [other than total coliforms] in the development site monitoring wells would suggest that the microbial contamination in the third-party wells is likely to be septic tanks or other local sources proximal to the individual wells.

A copy of the certificate of analysis for each of the third-party wells was posted to the relevant well owner. Any non-compliance with EU drinking water regulation standards (S.I. 122 of 2014) was outlined and identified in the letter. Where water quality issues arose (discussed above), the well owner was advised to contact a reputable water treatment company for advice.

For the private wells where there was gross microbial contamination (Well 2, Well 8 and Well 9), the advice given to the landowner was to discontinue the use of the well altogether until potential sources of contamination such as septic tanks are identified. Where septic tanks are identified up-gradient of wells, the recommended course of action is to permanently discontinue the use of the well.

### **Impact Assessment**

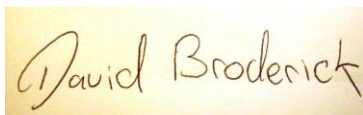
As outlined in the EIAR, the proposed development comprises importing inert soil and stone to infill the existing quarry void. Infilling of the site with inert soil will pose a low risk to groundwater quality (and downstream features such as local groundwater wells) as no harmful contaminants will be present.

The drinking water quality issues identified in the third-party well sampling are mainly microbial in nature and appear to be septic tank or farm related. The proposed development will not have any effect on groundwater quality in terms of microbial or organic contamination as no such sources will be present on-site.

### **Closure**

We trust the above response meets your requirements. Please contact the undersigned if you have any questions regarding the above.

Yours sincerely,



David Broderick  
Hydrogeologist - (BSc, H. Dip Env Eng, MSc)

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## Tables

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**Table 1**  
**Third Party Well Sampling Results**  
**Roadstone, Midleton Quarry, Co. Cork**

Parameter	Units	Well 1 06/06/2019	Well 2 06/06/2019	Well 3 06/06/2019	Well 4 06/06/2019	Well 5 06/06/2019	Well 7 06/06/2019	Well 8 06/06/2019	Well 9 06/06/2019	Drinking Water Regs (S.I. 122 of 2014)	Groundwater Regs (S.I. 9 of 2010)	EPA Interim Guideline Values
Alkalinity	mg/L CaCO <sub>3</sub>	246	247	271	268	258	277	261	334	-	-	No abnormal change
Ammonia N	mg/l NH <sub>3</sub> -N	0.019	<0.005	0.011	0.005	0.006	<0.005	<0.005	0.008	0.3	0.175	0.15
Arsenic (Dissolved)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0018	0.01	0.075	0.01
Calcium	mg/L	110	110	110	23	110	1.4	110	120	-	-	200
Chloride	mg/L	<b>96</b>	27	<b>31</b>	<b>64</b>	<b>33</b>	26	30	<b>46</b>	250	187.5	30
Coliforms Total	cfu/100ml	<b><u>165</u></b>	<b><u>&gt;201</u></b>	<b><u>201</u></b>	<b><u>14</u></b>	<b><u>9</u></b>	0	<b><u>&gt;201</u></b>	<b><u>43</u></b>	0	-	0
Conductivity at 20C	µs/cm	736	527	558	681	557	524	507	682	2500	1875	1000
Copper (Dissolved)	mg/L	<0.003	0.006	0.005	0.004	<0.003	0.005	0.004	0.017	2	1.5	0.03
Total Dissolved Solids	mg/L	455	348	362	431	378	352	323	439	-	-	-
E. coli	cfu/100ml	0	<b><u>&gt;201</u></b>	0	0	0	0	<b><u>&gt;201</u></b>	<b><u>18</u></b>	0	-	0
Enterococci	cfu/100ml	0	<b><u>1733</u></b>	0	0	<b><u>9</u></b>	0	<b><u>23</u></b>	<b><u>46</u></b>	0	-	0
Hardness Total	mg/L as CaCO <sub>3</sub>	<b>330</b>	<b>300</b>	<b>300</b>	62	<b>290</b>	4	<b>280</b>	<b>330</b>	-	-	200
Iron (Dissolved)	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.2	-	0.2
Magnesium (Dissolved)	mg/L	13.4	3.7	3.6	1.2	5.1	<0.3	2.8	6.8	-	-	50
Manganese (Dissolved)	mg/L	0.0021	<0.001	0.0022	<0.001	<0.001	<0.001	<0.001	0.0013	0.05	-	0.05
Nickel (Dissolved)	mg/L	<0.0005	0.0005	0.0005	<0.0005	0.0029	<0.0005	<0.0005	0.0013	0.02	0.015	0.02
Nitrate	mg/L as NO <sub>3</sub> N	7.1	11	11	9.8	7.8	9.2	2.6	6.5	-	-	-
Nitrate	mg/L as NO <sub>3</sub>	<b>31.4</b>	<b>48.7</b>	<b>48.7</b>	<b>43.4</b>	<b>34.5</b>	<b>40.7</b>	11.5	<b>28.8</b>	50	37.5	25
Nitrite	mg/L as NO <sub>2</sub> N	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-
Nitrite	mg/L as NO <sub>2</sub>	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	0.5	0.375	0.2
pH	pH Units	7.5	7.4	7.3	7.3	7.4	7.5	7.5	7.3	6.5 - 9.5	-	6.5-9.5
Phosphate (Ortho)	mg/L as P	0.009	0.01	0.006	<0.005	0.006	0.005	0.009	<b>0.178</b>	-	0.035	0.03
Phosphorus (Total)	mg/L as P	<0.01	<0.01	0.08	<0.01	0.01	<0.01	<0.01	0.17	-	-	-
Potassium (Dissolved)	mg/L	3.7	1.6	1.1	0.9	1.9	<0.2	0.9	<b>17.1</b>	-	-	5
Sodium (Dissolved)	mg/L	52.1	12.8	13.6	<b>162.1</b>	16.5	147.3	21.8	27.3	200	150	150
K:Na Ratio	-	0.07	0.13	0.08	0.01	0.12	0.001	0.04	0.63			
Total Suspended Solids	mg/L	<5	<5	<5	<5	<5	<5	<5	<5	-	-	-
Sulphate	mg/L as SO <sub>4</sub>	22	12	14	17	17	11	12	19	250	187.5	200
Turbidity	NTU	0.1	1.3	0.4	0.2	0.6	0.5	1.5	0.2	-	-	-

\* Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report (EPA, 2003)

NAC - No abnormal change

**Bold** - exceeds IGV value

**Bold and italics** - exceeds GW Regs (SI 9 of 2010) TV value

**Bold Underlined** - exceeds Drinking Water Reg (SI 122 of 2014) parameter value

**Table 2**  
**Groundwater Monitoring Well Sampling Results**  
**Roadstone, Middleton Quarry, Co. Cork**

Parameter	Units	PW1 08/03/2018	MW1 30/05/2019	MW2 08/03/2018	MW2 30/05/2019	MW3 08/03/2018	MW3 30/05/2019	MW4 08/03/2018	MW4 30/05/2019	MW5 08/03/2018	MW5 30/05/2019	MW6 08/03/2018	Drinking Water Regs (S.I. 122 of 2014)	Groundwater Regs (S.I. 9 of 2010)	EPA Interim Guideline Values
Alkalinity	mg/L CaCO3	220	203	183	165	298	275	184	166	333	213	300	-	-	No abnormal change
Ammonia N	mg/l NH3-N	<0.02	<0.005	<0.02	0.007	0.02	0.008	0.04	<0.005	0.03	<0.005	0.02	0.3	0.175	0.15
Arsenic (Dissolved)	mg/L	<0.0010	0.0002	<0.0010	<0.0002	<0.0010	<0.0002	<0.0010	<0.0002	<0.0010	0.0002	<0.0010	0.01	0.075	0.01
Calcium	mg/L	90.9	83	72.3	76	127	130	75.3	91	68.1	39	104	-	-	200
Chloride	mg/L	<b>185.1</b>	30	21.7	25	26.1	24	27.4	34	<b>104.9</b>	<b>38</b>	<b>89.5</b>	250	187.5	30
Coliforms Total	cfu/100ml	0	<b>&gt;2,420</b>	0	0	0	0	0	<u>7</u>	0	<u>5</u>	0	0	-	0
Conductivity at 20C	µs/cm	966	428	393	389	634	603	457	502	747	530	790	2500	1875	1000
Copper (Dissolved)	mg/L	<0.009	<0.003	<0.009	<0.003	<0.009	<0.003	<0.009	<0.003	<0.009	<0.003	<0.009	2	1.5	0.03
Total Dissolved Solids	mg/L	458	223	320	214	342	286	184	288	318	343	382	-	-	-
E. coli	cfu/100ml	0	0	0	0	0	0	0	0	0	0	0	0	-	0
Enterococci	cfu/100ml	0	0	0	0	0	0	0	0	0	<b>96</b>	0	0	-	0
Hardness Total	mg/L as CaCO3	<b>296</b>	<b>220</b>	190	200	<b>344</b>	<b>350</b>	<b>220</b>	<b>260</b>	176	110	<b>246</b>	-	-	200
Iron (Dissolved)	mg/L	<0.23	<0.02	<0.23	<0.021	<0.23	<0.02	<0.23	<0.02	<0.23	<0.02	<0.23	0.2	-	0.2
Magnesium (Dissolved)	mg/L	15.5	3.9	2.1	2.8	4.6	5	5.8	8.1	4.1	2.7	8.1	-	-	50
Manganese (Dissolved)	mg/L	<0.007	0.007	<0.007	<0.001	0.009	0.0013	<0.007	0.0013	0.01	0.0083	0.015	0.05	-	0.05
Nickel (Dissolved)	mg/L	<0.003	0.0079	<0.003	<0.0005	<0.003	0.0021	<0.003	0.0013	0.005	0.0033	0.011	0.02	0.015	0.02
Nitrate	mg/L as NO3N	3.3	5.7	3.9	7	9.5	8.5	8.1	12	3.1	1.8	6.4	-	-	-
Nitrate	mg/L as NO3	14.6	<b>25.25</b>	17.2	<b>31</b>	<b>41.9</b>	<b>37.6</b>	<b>35.5</b>	<b>53.16</b>	13.5	7.9	<b>28.2</b>	50	37.5	25
Nitrite	mg/L as NO2N	<0.01	<0.005	<0.01	<0.005	<0.01	<0.005	<0.01	<0.005	<0.01	<0.005	0.01	-	-	-
Nitrite	mg/L as NO2	<0.05	<0.016	<0.05	<0.016	<0.05	<0.016	<0.05	<0.016	<0.05	<0.016	<0.05	0.5	0.375	0.2
pH	pH Units	7.5	7.6	7.6	7.5	7.3	7.2	7.5	7.4	7.7	7.9	7.4	6.5 - 9.5	-	6.5-9.5
Phosphate (Ortho)	mg/L as P	<0.02	0.01	<0.02	0.01	<b>0.12</b>	<b>0.032</b>	<b>0.06</b>	<b>0.046</b>	<0.02	<0.005	<0.02	-	0.035	0.03
Phosphorus (Total)	mg/L as P	<0.10	0.43	<0.10	<0.01	0.48	0.34	13.5	0.82	0.84	0.32	4.1	-	-	-
Potassium (Dissolved)	mg/L	4.39	1.2	2.92	3.7	0.64	0.7	1.4	1.7	2.87	1.8	2.79	-	-	5
Sodium (Dissolved)	mg/L	88.1	19.5	9.6	14.8	10.2	13.3	13.2	21.4	81.1	92.1	50.4	200	150	150
Total Suspended Solids	mg/L	<5	300	3	10	108	72	5948	325	1892	245	7954	-	-	-
Sulphate	mg/L as SO4	44.5	11	8.2	8.4	23.8	17	32.5	27	71.1	23	43.2	250	187.5	200
Turbidity	NTU	1.21	164	19.1	3.4	92.4	45.7	8459	130	2574	2100	7126	-	-	-

\* Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report (EPA, 2003)

NAC - No abnormal change

**Bold** - exceeds IGV value

**Bold and italics** - exceeds GW Regs (SI 9 of 2010) TV value

**Bold Underlined** - exceeds Drinking Water Reg (SI 122 of 2014) paramter value

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## Appendix I Laboratory Reports

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**ENVIRONMENTAL LABORATORY SERVICES**  
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Blackrock,  
Cork  
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Tel: +353 21 453 6141  
Fax: +353 21 453 6149  
Web: [www.elsltd.com](http://www.elsltd.com)  
email: [info@elsltd.com](mailto:info@elsltd.com)



<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156219 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156219/001
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	31/05/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	31/05/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Courier
<b>Customer Ref</b>	Midleton - MW1	<b>Date of Report</b>	12/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		>2420	MPN/100ml	INAB	
<i>Analyst Micro Comment: Over 0-2420 Range. Result &gt;2420</i>									
<i>Analyst Micro Comment: The start date for this micro test is 31/05/19.</i>									
E. Coli			MIC133	0		0	MPN/100ml	INAB	
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		1	MPN/100ml	INAB	
<i>Analyst Micro Comment: The start date for this micro test is 31/05/19.</i>									
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		<0.005	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		<0.006	mg/l NH4	INAB	
Nitrate as N			EW175	0.15		5.7	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		0.010	mg/l P	INAB	
Chloride mg/L			EW175	1.0		30	mg/L	INAB	
Sulphate mg/L			EW175	1.0		11	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		220	mg/L CaCO3	INAB	
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		7.0	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		<0.2	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		83	mg/L	INAB	
Copper-Dissolved			EW188	0.003		<0.003	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		3.9	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		7.9	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		1.2	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		19.5	mg/L	INAB	
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		300	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.6	pH Units	INAB	
Conductivity @20 DegC			EW153	25		428	uscm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		203	mg/L CaCO3	INAB	

**Total Dissolved Solids (TDS)**

Signed :

**Tunde Gaspar-Technical Manager**

12/06/2019

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email: [info@elsltd.com](mailto:info@elsltd.com)



<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156219 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156219/001
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	31/05/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	31/05/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Courier
<b>Customer Ref</b>	Midleton - MW1	<b>Date of Report</b>	12/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Total Dissolved Solids (TDS)</b>									
	Total Dissolved Solids (TDS)		EW046	15		223	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
	Total Phosphorus-TP		EW146	0.01		0.43	mg/l P	INAB	
<b>Turbidity</b>									
	Turbidity		EW136	0.1		164.0	NTU		

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email: [info@elsltd.com](mailto:info@elsltd.com)



<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156219 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156219/002
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	31/05/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	31/05/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Courier
<b>Customer Ref</b>	Midleton - MW2	<b>Date of Report</b>	12/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
	Total Coliforms		MIC133	0		0	MPN/100ml	INAB	
	E. Coli		MIC133	0		0	MPN/100ml	INAB	
<b>Enterococci (IH)</b>									
	Enterococci		MIC183A	0		0	MPN/100ml	INAB	
<b>Gallery Plus-Suite A</b>									
	Ammonia as N		EW175	0.005		0.007	mg/l N	INAB	
	Ammonium as NH4 (calc)		EW175	0.006		0.009	mg/l NH4	INAB	
	Nitrate as N		EW175	0.05		7.0	mg/l N	INAB	
	Nitrite as N		EW175	0.005		<0.005	mg/l N	INAB	
	Phosphate (Ortho/MRP) as P		EW175	0.005		0.010	mg/l P	INAB	
	Chloride mg/L		EW175	1.0		25	mg/L	INAB	
	Sulphate mg/L		EW175	1.0		8.4	mg/L	INAB	
<b>Metals-Dissolved</b>									
	Hardness-Dissolved		EW188	3.0		200	mg/L CaCO3	INAB	
	Iron-Dissolved		EW188	20		21	ug/L	INAB	
	Manganese-Dissolved		EW188	1.0		<1.0	ug/L	INAB	
	Arsenic-Dissolved		EW188	0.2		<0.2	ug/L	INAB	
	Calcium-Dissolved		EW188	1.0		76	mg/L	INAB	
	Copper-Dissolved		EW188	0.003		<0.003	mg/L	INAB	
	Magnesium-Dissolved		EW188	0.3		2.8	mg/L	INAB	
	Nickel-Dissolved		EW188	0.5		0.5	ug/L	INAB	
	Potassium-Dissolved		EW188	0.2		3.7	mg/L	INAB	
	Sodium-Dissolved		EW188	0.5		14.8	mg/L	INAB	
<b>Suspended Solids</b>									
	Suspended Solids		EW013	5		10	mg/L	INAB	
<b>Titralab</b>									
	pH		EW153	0.0		7.5	pH Units	INAB	
	Conductivity @20 DegC		EW153	25		389	uscm-1@20	INAB	
	Alkalinity Total (R2 pH4.5)		EW153	10		165	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
	Total Dissolved Solids (TDS)		EW046	15		214	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
	Total Phosphorus-TP		EW146	0.01		<0.01	mg/l P	INAB	
<b>Turbidity</b>									

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156219 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156219/002
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	31/05/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	31/05/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Courier
<b>Customer Ref</b>	Midleton - MW2	<b>Date of Report</b>	12/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Turbidity</b>									
	Turbidity		EW136	0.1		3.4	NTU	INAB	

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156219 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156219/003
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	31/05/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	31/05/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Courier
<b>Customer Ref</b>	Midleton - MW3	<b>Date of Report</b>	12/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		0	MPN/100ml	INAB	
E. Coli			MIC133	0		0	MPN/100ml	INAB	
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		0	MPN/100ml	INAB	
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		0.008	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		0.010	mg/l NH4	INAB	
Nitrate as N			EW175	0.05		8.5	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		0.032	mg/l P	INAB	
Chloride mg/L			EW175	1.0		24	mg/L	INAB	
Sulphate mg/L			EW175	1.0		17	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		350	mg/L CaCO3		
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		1.3	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		<0.2	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		130	mg/L		
Copper-Dissolved			EW188	0.003		<0.003	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		5.0	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		2.1	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		0.7	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		13.3	mg/L	INAB	
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		72	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.2	pH Units	INAB	
Conductivity @20 DegC			EW153	25		603	uscm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		275	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
Total Dissolved Solids (TDS)			EW046	15		286	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
Total Phosphorus-TP			EW146	0.01		0.34	mg/l P	INAB	

**Turbidity**

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156219 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156219/003
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	31/05/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	31/05/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Courier
<b>Customer Ref</b>	Midleton - MW3	<b>Date of Report</b>	12/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Turbidity</b>									
	Turbidity		EW136	0.1		45.1	NTU	INAB	

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156219 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156219/004
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	31/05/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	31/05/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Courier
<b>Customer Ref</b>	Midleton - MW4	<b>Date of Report</b>	12/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		7	MPN/100ml	INAB	
E. Coli			MIC133	0		0	MPN/100ml	INAB	
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		0	MPN/100ml	INAB	
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		<0.005	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		<0.006	mg/l NH4	INAB	
Nitrate as N			EW175	0.05		12	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		0.046	mg/l P	INAB	
Chloride mg/L			EW175	1.0		34	mg/L	INAB	
Sulphate mg/L			EW175	1.0		27	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		260	mg/L CaCO3	INAB	
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		1.3	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		<0.2	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		91	mg/L	INAB	
Copper-Dissolved			EW188	0.003		<0.003	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		8.1	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		1.3	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		1.7	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		21.4	mg/L	INAB	
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		325	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.4	pH Units	INAB	
Conductivity @20 DegC			EW153	25		502	uscm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		166	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
Total Dissolved Solids (TDS)			EW046	15		288	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
Total Phosphorus-TP			EW146	0.01		0.82	mg/l P	INAB	
<b>Turbidity</b>									

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156219 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156219/004
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	31/05/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	31/05/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Courier
<b>Customer Ref</b>	Midleton - MW4	<b>Date of Report</b>	12/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Turbidity</b>									
	Turbidity		EW136	0.1		130.0	NTU	INAB	

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156219 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156219/005
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	31/05/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	31/05/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Courier
<b>Customer Ref</b>	Midleton - MW5	<b>Date of Report</b>	12/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		5	MPN/100ml	INAB	
E. Coli			MIC133	0		0	MPN/100ml	INAB	
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		96	MPN/100ml		
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		<0.005	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		<0.006	mg/l NH4	INAB	
Nitrate as N			EW175	0.25		1.8	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		<0.005	mg/l P	INAB	
Chloride mg/L			EW175	1.0		38	mg/L	INAB	
Sulphate mg/L			EW175	1.0		23	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		110	mg/L CaCO3	INAB	
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		8.3	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		0.2	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		39	mg/L	INAB	
Copper-Dissolved			EW188	0.003		<0.003	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		2.7	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		3.3	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		1.8	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		92.1	mg/L		
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		245	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.9	pH Units	INAB	
Conductivity @20 DegC			EW153	25		530	uscm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		213	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
Total Dissolved Solids (TDS)			EW046	15		343	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
Total Phosphorus-TP			EW146	0.01		0.32	mg/l P	INAB	
<b>Turbidity</b>									

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12/06/2019

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156219 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156219/005
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	31/05/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	31/05/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Courier
<b>Customer Ref</b>	Midleton - MW5	<b>Date of Report</b>	12/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Turbidity</b>									
	Turbidity		EW136	0.1		2100.0	NTU		

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/001
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 1	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		165	MPN/100ml	INAB	
<i>Analyst Micro Comment: The start date for this micro test is 06/06/19</i>									
E. Coli			MIC133	0		0	MPN/100ml	INAB	
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		0	MPN/100ml	INAB	
<i>Analyst Micro Comment: The start date for this micro test is 07/06/19.</i>									
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		0.019	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		0.024	mg/l NH4	INAB	
Nitrate as N			EW175	0.15		7.1	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		0.009	mg/l P	INAB	
Chloride mg/L			EW175	1.0		96	mg/L	INAB	
Sulphate mg/L			EW175	1.0		22	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		330	mg/L CaCO3	INAB	
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		2.1	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		<0.2	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		110	mg/L	INAB	
Copper-Dissolved			EW188	0.003		<0.003	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		13.4	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		<0.5	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		3.7	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		52.1	mg/L	INAB	
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		<5	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.5	pH Units	INAB	
Conductivity @20 DegC			EW153	25		736	uscm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		246	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
Total Dissolved Solids (TDS)			EW046	15		455	mg/L	INAB	

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email: [info@elsltd.com](mailto:info@elsltd.com)



<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/001
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 1	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
	Total Phosphorus-TP		EW146	0.01		<0.01	mg/l P	INAB	
<b>Turbidity</b>									
	Turbidity		EW136	0.1		0.1	NTU	INAB	

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/002
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 2	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		>201	MPN/100ml	INAB	
<i>Analyst Micro Comment: Over 0-201 Range. Result &gt;201</i>									
E. Coli			MIC133	0		>201	MPN/100ml	INAB	
<i>Analyst Micro Comment: Over 0-201 Range. Result &gt;201</i>									
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		1733	MPN/100ml		
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		<0.005	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		<0.006	mg/l NH4	INAB	
Nitrate as N			EW175	0.15		11	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		0.010	mg/l P	INAB	
Chloride mg/L			EW175	1.0		27	mg/L	INAB	
Sulphate mg/L			EW175	1.0		12	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		300	mg/L CaCO3	INAB	
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		<1.0	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		<0.2	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		110	mg/L		
Copper-Dissolved			EW188	0.003		0.006	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		3.7	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		0.5	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		1.6	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		12.8	mg/L	INAB	
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		<5	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.4	pH Units	INAB	
Conductivity @20 DegC			EW153	25		527	uscm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		247	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
Total Dissolved Solids (TDS)			EW046	15		348	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/002
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 2	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
	Total Phosphorus-TP		EW146	0.01		<0.01	mg/l P	INAB	
<b>Turbidity</b>									
	Turbidity		EW136	0.1		1.3	NTU	INAB	

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/003
		<b>Date of Receipt</b>	06/06/2019
		<b>Date Started</b>	06/06/2019
<b>Tel No</b>	058 44122	<b>Received or Collected</b>	Hand
<b>Customer PO</b>	P1416-4	<b>Date of Report</b>	14/06/2019
<b>Quotation No</b>	QN009187	<b>Sample Type</b>	Ground Waters
<b>Customer Ref</b>	Midleton Well 3	<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		201	MPN/100ml	INAB	
E. Coli			MIC133	0		0	MPN/100ml	INAB	
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		0	MPN/100ml	INAB	
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		0.011	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		0.015	mg/l NH4	INAB	
Nitrate as N			EW175	0.05		11	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		0.006	mg/l P	INAB	
Chloride mg/L			EW175	1.0		31	mg/L	INAB	
Sulphate mg/L			EW175	1.0		14	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		300	mg/L CaCO3	INAB	
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		2.2	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		<0.2	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		110	mg/L	INAB	
Copper-Dissolved			EW188	0.003		0.005	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		3.6	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		0.5	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		1.1	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		13.6	mg/L	INAB	
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		<5	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.3	pH Units	INAB	
Conductivity @20 DegC			EW153	25		558	uscm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		271	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
Total Dissolved Solids (TDS)			EW046	15		362	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
Total Phosphorus-TP			EW146	0.01		0.08	mg/l P	INAB	
<b>Turbidity</b>									

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/003
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 3	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Turbidity</b>									
	Turbidity		EW136	0.1		0.4	NTU	INAB	

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email: [info@elsltd.com](mailto:info@elsltd.com)



<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/004
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 4	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		14	MPN/100ml	INAB	
E. Coli			MIC133	0		0	MPN/100ml	INAB	
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		0	MPN/100ml	INAB	
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		0.005	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		0.007	mg/l NH4	INAB	
Nitrate as N			EW175	0.005		9.8	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		<0.005	mg/l P	INAB	
Chloride mg/L			EW175	1.0		64	mg/L	INAB	
Sulphate mg/L			EW175	1.0		17	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		62	mg/L CaCO3	INAB	
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		<1.0	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		<0.2	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		23	mg/L	INAB	
Copper-Dissolved			EW188	0.003		0.004	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		1.2	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		<0.5	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		0.9	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		162.1	mg/L	INAB	
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		<5	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.3	pH Units	INAB	
Conductivity @20 DegC			EW153	25		681	uscm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		268	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
Total Dissolved Solids (TDS)			EW046	15		431	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
Total Phosphorus-TP			EW146	0.01		<0.01	mg/l P	INAB	
<b>Turbidity</b>									

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/004
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 4	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Turbidity</b>									
Turbidity			EW136	0.1		0.2	NTU	INAB	

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/005
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 5	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		9	MPN/100ml	INAB	
E. Coli			MIC133	0		0	MPN/100ml	INAB	
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		9	MPN/100ml		
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		0.006	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		0.008	mg/l NH4	INAB	
Nitrate as N			EW175	0.25		7.8	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		0.006	mg/l P	INAB	
Chloride mg/L			EW175	1.0		33	mg/L	INAB	
Sulphate mg/L			EW175	1.0		17	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		290	mg/L CaCO3	INAB	
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		<1.0	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		<0.2	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		110	mg/L		
Copper-Dissolved			EW188	0.003		<0.003	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		5.1	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		2.9	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		1.9	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		16.5	mg/L	INAB	
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		<5	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.4	pH Units	INAB	
Conductivity @20 DegC			EW153	25		557	uscm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		258	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
Total Dissolved Solids (TDS)			EW046	15		378	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
Total Phosphorus-TP			EW146	0.01		<0.01	mg/l P	INAB	
<b>Turbidity</b>									

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/005
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 5	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Turbidity</b>									
	Turbidity		EW136	0.1		0.6	NTU	INAB	

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/006
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 7	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		0	MPN/100ml	INAB	
E. Coli			MIC133	0		0	MPN/100ml	INAB	
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		0	MPN/100ml	INAB	
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		<0.005	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		<0.006	mg/l NH4	INAB	
Nitrate as N			EW175	0.25		9.2	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		0.005	mg/l P	INAB	
Chloride mg/L			EW175	1.0		26	mg/L	INAB	
Sulphate mg/L			EW175	1.0		11	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		4.0	mg/L CaCO3	INAB	
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		<1.0	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		<0.2	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		1.4	mg/L	INAB	
Copper-Dissolved			EW188	0.003		0.005	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		<0.3	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		<0.5	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		<0.2	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		147.3	mg/L	INAB	
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		<5	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.5	pH Units	INAB	
Conductivity @20 DegC			EW153	25		524	uscm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		277	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
Total Dissolved Solids (TDS)			EW046	15		352	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
Total Phosphorus-TP			EW146	0.01		<0.01	mg/l P	INAB	
<b>Turbidity</b>									

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/006
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 7	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Turbidity</b>									
	Turbidity		EW136	0.1		0.5	NTU	INAB	

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/007
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 8	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		>201	MPN/100ml	INAB	
	<i>Analyst Micro Comment: Over 0-201 Range. Result &gt;201</i>								
E. Coli			MIC133	0		>201	MPN/100ml	INAB	
	<i>Analyst Micro Comment: Over 0-201 Range. Result &gt;201</i>								
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		23	MPN/100ml		
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		<0.005	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		<0.006	mg/l NH4	INAB	
Nitrate as N			EW175	0.15		2.6	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		0.009	mg/l P	INAB	
Chloride mg/L			EW175	1.0		30	mg/L	INAB	
Sulphate mg/L			EW175	1.0		12	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		280	mg/L CaCO3	INAB	
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		<1.0	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		<0.2	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		110	mg/L		
Copper-Dissolved			EW188	0.003		0.004	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		2.8	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		<0.5	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		0.9	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		21.8	mg/L	INAB	
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		<5	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.5	pH Units	INAB	
Conductivity @20 DegC			EW153	25		507	usecm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		261	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
Total Dissolved Solids (TDS)			EW046	15		323	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									

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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/007
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 8	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
	Total Phosphorus-TP		EW146	0.01		<0.01	mg/l P	INAB	
<b>Turbidity</b>									
	Turbidity		EW136	0.1		1.5	NTU	INAB	

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Signed :

**Tunde Gaspar-Technical Manager**

14/06/2019

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- 6."\*" Indicates sub-contract test
- 7.Where the date of sampling has not been provided,sample stability times cannot be assessed. It is therefore possible that the results provided may be compromised



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<b>Contact Name</b>	David Broderick	<b>Report Number</b>	<b>156663 - 1</b>
<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/008
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 9	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Coliforms</b>									
Total Coliforms			MIC133	0		43	MPN/100ml	INAB	
E. Coli			MIC133	0		18	MPN/100ml	INAB	
<b>Enterococci (IH)</b>									
Enterococci			MIC183A	0		46	MPN/100ml		
<b>Gallery Plus-Suite A</b>									
Ammonia as N			EW175	0.005		0.008	mg/l N	INAB	
Ammonium as NH4 (calc)			EW175	0.006		0.010	mg/l NH4	INAB	
Nitrate as N			EW175	0.25		6.5	mg/l N	INAB	
Nitrite as N			EW175	0.005		<0.005	mg/l N	INAB	
Phosphate (Ortho/MRP) as P			EW175	0.005		0.178	mg/l P	INAB	
Chloride mg/L			EW175	1.0		46	mg/L	INAB	
Sulphate mg/L			EW175	1.0		19	mg/L	INAB	
<b>Metals-Dissolved</b>									
Hardness-Dissolved			EW188	3.0		330	mg/L CaCO3	INAB	
Iron-Dissolved			EW188	20		<20	ug/L	INAB	
Manganese-Dissolved			EW188	1.0		1.3	ug/L	INAB	
Arsenic-Dissolved			EW188	0.2		1.8	ug/L	INAB	
Calcium-Dissolved			EW188	1.0		120	mg/L		
Copper-Dissolved			EW188	0.003		0.017	mg/L	INAB	
Magnesium-Dissolved			EW188	0.3		6.8	mg/L	INAB	
Nickel-Dissolved			EW188	0.5		1.3	ug/L	INAB	
Potassium-Dissolved			EW188	0.2		17.1	mg/L	INAB	
Sodium-Dissolved			EW188	0.5		27.3	mg/L	INAB	
<b>Suspended Solids</b>									
Suspended Solids			EW013	5		<5	mg/L	INAB	
<b>Titralab</b>									
pH			EW153	0.0		7.3	pH Units	INAB	
Conductivity @20 DegC			EW153	25		682	uscm-1@20	INAB	
Alkalinity Total (R2 pH4.5)			EW153	10		334	mg/L CaCO3	INAB	
<b>Total Dissolved Solids (TDS)</b>									
Total Dissolved Solids (TDS)			EW046	15		439	mg/L	INAB	
<b>Total Phosphorus &amp; Orthophosphate-TP/OP</b>									
Total Phosphorus-TP			EW146	0.01		0.17	mg/l P	INAB	

**Turbidity**

Signed :

14/06/2019

**Tunde Gaspar-Technical Manager**

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<b>Address</b>	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	<b>Sample Number</b>	156663/008
<b>Tel No</b>	058 44122	<b>Date of Receipt</b>	06/06/2019
<b>Customer PO</b>	P1416-4	<b>Date Started</b>	06/06/2019
<b>Quotation No</b>	QN009187	<b>Received or Collected</b>	Hand
<b>Customer Ref</b>	Midleton Well 9	<b>Date of Report</b>	14/06/2019
		<b>Sample Type</b>	Ground Waters
		<b>Condition on receipt</b>	Satisfactory

**CERTIFICATE OF ANALYSIS**

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
<b>Turbidity</b>									
	Turbidity		EW136	0.1		0.2	NTU	INAB	

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Signed :

14/06/2019

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