

CONTENTS

INTRODUCTION	1
Background.....	1
Scope of Work	1
Project Team.....	1
Limitations / Difficulties Encountered	1
REGULATORY BACKGROUND	2
Legislation.....	2
Planning Policy and Development Control.....	2
Guidelines and Technical Standards	2
RECEIVING ENVIRONMENT	3
Study Area	3
Baseline Study Methodology	3
Sources of Information	3
Existing Water Management	3
Proposed Development	9
Rainfall and Climate	10
Soils and Geology.....	10
Surface Water – Hydrology.....	10
Groundwater – Hydrogeology	11
Sensitive Receptors.....	17
IMPACT ASSESSMENT	17
Evaluation Methodology.....	17
Construction Stage Impacts	18
Operation Stage Impacts	19
Post – Operational Stage Impacts	20
Summary of Unmitigated Impacts	20
Unplanned Events.....	21
‘Do-nothing Scenario’	21
Cumulative Impacts	21



MITIGATION MEASURES	22
Operation Stage	22
Post - Operational Stage	24
RESIDUAL IMPACT ASSESSMENT	24
Operational Stage	24
Post - Operational Stage	24
MONITORING	24

TABLES

Table 7-1 Pumping Volumes from Quarry Sump.....	5
Table 7-2 Discharge Licence Emission Limit Values	6
Table 7-3 Discharge Water Quality Results.....	7
Table 7-4 Monthly Rainfall Averages (mm) 1981-2010 for Rossmore	10
Table 7-5 Summary of Groundwater Levels for May 2019 to June 2021	14
Table 7-6 Domestic Well Survey.....	16
Table 7-7 Matrix Used to Assess Potential Impacts	17
Table 7-8 Magnitude of Potential Hydrological and Hydrogeological Impacts.....	18
Table 7-9 Magnitude of Potential Hydrological and Hydrogeological Impacts.....	21

FIGURES

Figure 7-1 Water Features and Quarry Discharge.....	25
Figure 7-2 Bedrock Aquifer Map	25
Figure 7-3 Aquifer Vulnerability Map.....	25
Figure 7-4 GSI Groundwater Well Location.....	25
Figure 7-5 Groundwater Well Survey	25
Figure 7-6 Groundwater Monitoring Locations.....	25

APPENDICES

Appendix 7-A EU Directives / National Legislation and Regulations /Guidelines / Technical Standards	27
Appendix 7-B Discharge Licence WP(W)10/18	30
Appendix 7-C Discharge Water Quality Results	31
Appendix 7-D Enviropak Wastewater Treatment System.....	32
Appendix 7-E Groundwater Level Data	33

INTRODUCTION

Background

- 7.1 This section of the EIAR provides a description of the surface water and groundwater conditions in application area of the site within the context of the regional setting and assesses the potential impacts of the proposed development (continuance of use of the existing quarry to the permitted extraction level of -40mOD) will have on surface water and groundwater. Mitigation measures, if required, are proposed.
- 7.2 Available information on the hydrology and hydrogeology of the Rossmore area and its surrounds was collated and evaluated.
- 7.3 A detailed project description is included in Chapter 2 of this EIAR.

Scope of Work

- 7.4 The scope of this EIAR section includes:
- an assessment of the existing surface water and groundwater conditions within the application area of the site;
 - an assessment of the potential impact of the proposed development on surface water and groundwater;
 - a recommendation of mitigation measures to reduce or eliminate any potential impacts (where necessary).

Project Team

- 7.5 This section of the EIAR was prepared by SLR Consulting Ireland. The project team consists of:
- Dominica Baird BSc, MSc, CGeol, EurGeol,
 - Peter Glanville BA, PhD, PGeo, EurGeol, and
 - Clodagh Gillen BSc, MSc

Limitations / Difficulties Encountered

- 7.6 The assessment of the hydrological and hydrogeological environment is based on visual observations from site visits, monitoring information available, published information and discussions with personnel employed on site. No specific difficulties were encountered in the preparation of this section.

REGULATORY BACKGROUND

Legislation

7.7 The key European Directives / European Union Legislation which apply to this Chapter of the EIAR and the hydrology and hydrogeology assessment presented herein are:

- Environmental Impact Assessment Directive (2011/92/EU); and
- Directive of the European Parliament and of the Council amending Directive 2011/92/EU on assessment of effects of certain public and private projects on the environment (2014/52/EU).

Other European Directives to which this EIAR makes reference, or has had regard, are listed in **Appendix 7-A**.

7.8 Irish Government Acts, National Legislation and Regulations which apply to this Chapter of the EIAR and the hydrology and hydrogeology assessment presented herein are also listed in **Appendix 7-A**.

7.9 Most notably, under Regulation 4 of the Groundwater Regulations 2010, a duty is placed on public authorities to promote compliance with the requirements of the regulations and to take all reasonable steps including, where necessary, the implementation of programmes of measures, to:

- “(a) prevent or limit, as appropriate, the input of pollutants into groundwater and prevent the deterioration of the status of all bodies of groundwater;*
- (b) protect, enhance and restore all bodies of groundwater and ensure a balance between abstraction and recharge of groundwater with the aim of achieving good groundwater quantitative status and good groundwater chemical status by 2015 or, at the latest, by 2027;*
- (c) reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order to progressively reduce pollution of groundwater;*
- (d) achieve compliance with any standards and objectives established for a groundwater dependent protected area included in the register of protected areas established under Regulation 8 of the 2003 Regulations [S.I. No. 722 of 2003] by not later than 2015, unless otherwise specified in the Community legislation under which the individual protected areas have been established.”*

Planning Policy and Development Control

7.10 The following Planning Policy and Development Control relating to water at the site in this EIAR is set out in the:

- Cork County Development Plan 2015-2021.

Guidelines and Technical Standards

7.11 The following key guidelines apply to this hydrology and hydrogeology assessment:

- Institute of Geologists of Ireland. Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements, April 2013; and

- National Roads Authority, 2008. Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.

7.12 Additional guidelines and technical standards which apply to this Chapter of the EIAR and the hydrology and hydrogeology assessment presented herein are listed in **Appendix 7-A**.

RECEIVING ENVIRONMENT

Study Area

7.13 For the purposes of this assessment, the study area comprises the application site the surrounding area up to 5 km radius around the site boundary. Unmitigated potential impacts on hydrology and hydrogeology are considered for the initial assessment, before appropriate mitigation measures for the potential impacts identified are discussed, and the identified potential impacts reassessed assuming the identified mitigation measures in place.

Baseline Study Methodology

7.14 Existing information on the geology, hydrogeology and hydrological features of the Rossmore area and its surrounds was collated and evaluated.

7.15 The methodology involved in the assessment of the hydrology and hydrogeology at the site can be summarised as follows:

- A desk study, in which existing publicly available data and relevant regional data sources for the area were examined;
- Available environmental information for the site provide by Kilsaran;
- Site walkover survey and local well survey in vicinity of the site; and
- The analysis of the information gathered.

Sources of Information

7.16 The following sources of information have been consulted in order to investigate the hydrogeology and hydrology of the area surrounding the application site:

- The Environmental Protection Agency for Ireland website (www.epa.ie) for maps and environmental information;
- Geological Survey of Ireland website (www.gsi.ie);
- Groundwater Protection Schemes. Department of the Environment and Local Government, Environmental Protection Agency, and Geological Survey of Ireland, 1999; and
- Water Maps, Water Framework Directive online mapping (www.wfdireland.ie).

Existing Water Management

7.17 A site visit was undertaken by SLR's hydrologist to inspect the site and water management measures and also to undertake a local well survey.

- 7.18 The site is located adjacent to the transitional waters of Cork Harbour and there are saline water ingresses to the site along the southern face of the quarry during high tide conditions in the harbour. The groundwater ingress occurs along fractures in the limestone bedrock and some minor groundwater ingress along the boundary with the estuary was evident during the site visit within the quarry. All waters are collected in the quarry sump which is located at the eastern edge of the quarry void. The location of the sump is shown in **Figure 7-1**. The existing site layout map is shown in **Figure 2-1**.
- 7.19 The sump located in the south-east corner of the quarry deals with all the water sources arising in the quarry void, the water in the sump is therefore a mix of groundwater, clean storm water runoff and saline water intrusion.
- 7.20 Storm water runoff from site yard / working area does not go directly to the quarry sump, this water percolates naturally to the ground. Some water from the impermeable block yard area and hardstanding in the refuelling enters a sump and is pumped to a small freshwater pond to the north of the site, as shown in **Figure 2-1**. This pond is upgradient of from the rest of the site and is recharged from the surface water runoff and recycling of the water from the dust suppression system.
- 7.21 Kilsaran operate an Environmental Management System (EMS) at the site, see Chapter 2 of this EIAR.

Site Discharge

- 7.22 Water is currently discharging from the quarry site at Rossmore under a Discharge Licence, Ref. No. WP(W)10/18, see **Appendix 7-B**. The water from the quarry sump located on the eastern edge of the quarry floor and is discharged to groundwater via nearby ponds, see **Figure 7-1**.
- 7.23 Condition 2.2 of the discharge licence covers the following site activities:
- Concrete and concrete products manufacturing;
 - Quarrying and extraction activities including washings from aggregate crushing and sorting; and
 - Ground/surface water arisings from quarrying activities below the water table.
- 7.24 The discharge point is into a series of groundwater ponds in a worked-out sand and gravel pit where material was extracted from below the water table. There is no overflow from the ponds directly to the waters of Cork harbour North Channel.
- 7.25 The discharge water is pumped from the quarry sump using two pumps which operate automatically on high and low-level sensors in the sump. One pump operates continuously at approximately 700m³/h while the second pump usually only operates for 5 to 6 hours a day during high tide conditions in the estuary.
- 7.26 Summary pumping volumes from the quarry sump are shown in **Table 7-1** below.

Table 7-1
Pumping Volumes from Quarry Sump

Pump	Running Time	Pumped Volume (hr.)	Discharge Volume
Pump 1	24 hr/d	700 m ³ /hr	16,800 m ³ /d
Pump 2	6 hr/d	700 m ³ /hr	4,200 m ³ /d
Total Maximum Daily Discharge Volume			21,000 m³/d

- 7.27 During low tide conditions in the harbour there is little or no water ingress to the quarry along the southern face of the quarry; during high tide conditions in the estuary the second pump is required to maintain water levels in the sump and the quarry.
- 7.28 At present the groundwater is being dewatered to facilitate the working of the quarry and to maintain dry working conditions on the quarry floor. Groundwater is pumped from the sump in the quarry and the groundwater is maintained at c. -21 mOD which is below the current quarry floor level of -20m OD. The dewatering has resulted in a drawdown of the groundwater level around the quarry void. The existing quarry is permitted to extract to a level of -40 m AOD, i.e. 20 metres below the current quarry floor level.
- 7.29 Deepening of the quarry to the permitted quarry floor level is not expected to substantially increase the dewatering requirements, as there are expected to be fewer fractures in the bedrock at depth which could act as flow paths for water.
- 7.30 In January 2003, when the quarry floor was at approximately -7m AOD (the current quarry floor is at -20m AOD) the quarry void sump and off-site discharge point were at the current location. A pond which was present to the south of the quarry in January 2003 has since been removed and water that was fed to this pond from the yard area was diverted to a pond in the north of the quarry.

Surface Water

- 7.31 There is no uncontrolled discharge of water from the quarry site to any surface watercourse, and there is no direct discharge from the freshwater pond to any surface watercourse either.
- 7.32 Rainfall across the site infiltrates naturally to the ground and recharges the underlying groundwater. The groundwater recharge is largely diffuse and there is no single point of recharge to the underlying groundwater for the site.
- 7.33 Groundwater and saline water ingress along the southern face of the quarry void is directed to the sump in the south-eastern corner of the quarry floor; this water is clean and does not come into contact with any surface water runoff from the quarry. A constructed bund separates storm surface water runoff from the quarry void and groundwater in the quarry sump.
- 7.34 There is a paved block yard area at the site. Storm runoff from the block yard is collected in a series of drainage gullies and goes to a local sump where it is collected, and the initial settlement of fines is provided for. From the sump the treated water is pumped to the freshwater pond at the site where it is reused.
- 7.35 There is an impermeable hard standing area for refuelling which goes to a hydrocarbon separator and then to the sump for the block yard, before being pumped to the freshwater pond.

- 7.36 There are a number of paved areas at the site around the concrete production facility and block yard and any rain which falls on these paved areas is managed and directed to the sump beside the block yard.

Quarry Discharge Water Quality - SW2

- 7.37 The discharge from the site is regulated by a Section 4 discharge licence (ref. no. WP(W)10/18, see **Appendix 7-B**) to discharge to groundwater. The discharge licence sets out the discharge Emission Limit Values (ELV), see **Table 7-2** below. There is no discharge volume limit stated in the licence, however, Condition 2.3 states that pumping from the quarry will be managed to ensure that there is no overflow from the ponds directly to the waters of Cork harbour North Channel.

Table 7-2
Discharge Licence Emission Limit Values

Parameter	Unit	ELV	Commencement date	Monitoring Frequency
pH	pH units	6.0 – 9.5	01/04/2019	Quarterly
Total Heavy Metals (Ba, Cd, Cr, Cu, Hg, Ni,	mg/L	1	01/04/2019	Quarterly
Chromium VI	mg/L	0.15	01/04/2019	Quarterly
Phenols (as Total C)	mg/L	1.0	01/04/2019	Quarterly
Total BTEX	mg/L	0.5	01/04/2019	Quarterly
Mineral Oils	mg/L	1.0	01/04/2019	Quarterly

- 7.38 The discharge from the site is the groundwater from the quarry sump which includes some saline water from the estuary which enters the quarry void via fractures in the bedrock along the southern face of the quarry.
- 7.39 The discharge from the quarry sump to the ponds at monitoring location SW2, see **Figure 7-1**, has been monitored on a monthly basis since by Kilsaran since they acquired the quarry in 2014 up to March 2019. Since April 2019 monitoring for water quality has been carried out on a quarterly basis as per the monitoring frequency set out in the discharge licence.
- 7.40 Quarry sump water quality results are shown in **Table 7-3** and the laboratory reports are included in **Appendix 7-C**. The water samples were tested at BHP Laboratories. The results were compared with the 2019 EQS regulations.

Table 7-3
Discharge Water Quality Results

Parameter	Units	Discharge Licence ELV	Q2 2019 11/04/2019	Q3 2019 11/07/2019	Q4 2019 24/10/2019	Q1 2020 16/01/2020	Q2 2020 20/05/2020	Q3 2020 23/07/2020	Q4 2020 23/10/2020	Q1 2021 19/01/2021
BTEX Compounds	mg/l	0.5	<0.001	<0.001	<0.001	<0.001	0.009	<0.001	<0.001	<0.001
Chromium (VI) - Total	mg/l	0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Phenols	mg/l	1	0.008	<0.003	<0.001	<0.001	<0.002	<0.001	<0.001	0.002
Barium - Total	mg/l	1	0.025	0.041	1.5	0.034	1.3	0.037	0.052	0.034
Cadmium - Total	mg/l	1	0.00015	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium - Total	mg/l	1	0.076	<0.05	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005
Copper - Total	mg/l	1	0.014	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Mercury - Total	mg/l	1	0.0011	<0.0005	<0.0005	<0.0003	<0.0003	<0.0003	<0.003	<0.0025
Nickel - Total	mg/l	1	0.0018	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	0.14
Mineral Oils (>C₁₀-C₄₀)	mg/l	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pH	pH units	6.0 - 9.5	8.60	7.87	7.44	7.80	7.59	7.49	7.26	7.1
Temperature (Field)	°C	Na.	12.0	15.7	12.4	11.9	14.4	18.3	12.0	11.1

- 7.41 The discharge water quality results were in compliance with the Discharge Licence ELVs for all parameters except for Barium in Q4 2019 and Q2 2020 which was recorded at 1.5 mg/l and 1.3 mg/l respectively, where the ELV is set at 1 mg/l, see **Table 7-3** above.
- 7.42 The two Barium values recorded in in exceedance of the ELV are significantly higher than the other values recorded and may be outlier values or due to a lab error. Continued monitoring of the discharge in Q3 2020, Q4 2020 and Q1 2021 has confirmed barium levels well below the ELV of 1 mg/l.

Concrete Production

- 7.43 Readymix concrete production is an established process at the site and both readymix and blocks have been produced at the site for the past 20 years.
- 7.44 Surface water runoff from the readymix concrete production area, including truck and readymix plant washout goes to a pond at the batching plant where the water is recycled / reused in the readymix process. The pond is a closed system and all water is recycled / reused.

Water Supply

- 7.45 The Kilsaran site and most local residences are supplied with potable water from a public scheme operated by Cork County Council. A well survey was carried out in the vicinity of the quarry and the results are detailed in

7.46 Table 7-6 below.

7.47 Water for on-site concrete production and dust suppression is sourced from the freshwater pond at the site.

Fuel Management

7.48 There are a number of existing pollution control measures in place at the site, they are:

- i.** All fuel storage tanks and refuelling bowsters used at the site are bunded;
- ii.** There is an impermeable hard stand area for refuelling and runoff from the hard stand area goes to a hydrocarbon separator;
- iii.** Spill Kits are maintained on site to tackle any accidental spillages of hydrocarbons;
- iv.** The discharge is pumped from the quarry floor to the pond and therefore the pump can be switched off to prevent any accidental discharges from the site in the event of a spillage or leak at the site; and
- v.** The inlets for the pumps at the quarry sump are below the water surface and therefore if there are any hydrocarbons on the water (arising from an accidental spillage on site) they will remain on the surface and will not be discharged of site. Any hydrocarbons present can then be removed from the surface of the sump and disposed of at a licenced facility.

7.49 Fuel required by site plant and front-end loaders is stored at existing fuel storage facilities located in the yard area; the fuel is bunded in tanks which are fully covered and enclosed. There is an impermeable hard stand area for refuelling runoff from which goes to a hydrocarbon separator.

7.50 There is a small fuel double skinned fuel bowser at the site for the refuelling of plant located on the quarry floor. The bowser is filled on site at the refuelling area and then used in the quarry void to refuel the plant. The bowser is stored adjacent to the bunded fuel storage area when not being used.

7.51 There is a workshop at the site for the maintenance of plant and machinery, all oils and lubricants including waste materials are stored undercover in the workshop.

Wastewater

7.52 There is an existing Enviropak Wastewater Treatment System with percolation area at the site. Treated water percolates naturally to the ground from the percolation area. Details of the wastewater treatment system including a service report and service agreement are included in **Appendix 7-D**.

Proposed Development

7.53 The proposed development will consist of continuance of use of the existing quarry development within an overall application area of c.24.7 hectares; extraction to the level of -40m below Ordnance Datum, previously permitted under Plan. Ref. 03/4570; final restoration of the quarry void area and an area of 3.8 hectares to the north adjacent to the public road. Permission is also being sought for an extension to the existing operating hours for the readymixed concrete plant, for out of hours operation of the plant up to a maximum of 40 occasions per year, to supply critical and strategic building / infrastructure / maintenance projects whose construction requires supply of concrete outside normal plant operating hours.

7.54 A detailed project description is included in Chapter 2 of this EIAR.

Rainfall and Climate

- 7.55 The Average Annual Rainfall (AAR) in the area around Rossmore is c. 1,049 mm/yr. for the period 1981-2010 (Met Éireann, 2016). The monthly average rainfall values for the period 1981-2010 are shown in **Table 7-4** below.

Table 7-4
Monthly Rainfall Averages (mm) 1981-2010 for Rossmore

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
110	80	83	67	69	69	70	84	84	118	104	110

Soils and Geology

- 7.56 The Environmental Protection Agency (EPA) website publishes soil and subsoil maps created by the Spatial Analysis Unit and Teagasc in collaboration with the Geological Survey of Ireland. The soils and subsoils are discussed in detail in Section 6 of this EIAR.
- 7.57 The soils and most of the overburden at the site have been removed in the past to facilitate extraction. Teagasc soil mapping shows the soils in area around the quarry are deep and well drained Acid Brown Earths and brown podzols, shallow and well drained Rendzinas and Lithosols, and shallow peaty soils along the foreshore area, see **Figure 6-2**. The overburden material is described as Sandstone Glacial Till with areas along the foreshore where bedrock is near the surface, see **Figure 6-3**.

Local Bedrock Geology

- 7.58 The GSI geology map Sheet 22 (East Cork – Waterford) shows geological faults running north south in the vicinity of the site, see **Figure 6-4**.
- 7.59 The northern part of the site is underlain by the Carboniferous Clashavodig Limestone Formation, while the section where the quarry void is located in the Carboniferous Little Island Formation which is comprised of massive and crinoidal fine Limestone.

Surface Water – Hydrology

Catchments

- 7.60 The site is within the Lee, Cork Harbour and Youghal Bay Water Framework Directive (WFD) catchment (Code 19). The site is located in the Tibbotstown River WFD Sub-Basin. The Tibbotstown River flows through Carrigtohill and goes to Cork Harbour to the North of the site and Fota Island; due to local topography around the site, any surface water runoff from the area around the site will go directly to Cork harbour and not to the Tibbotstown River first.
- 7.61 There is currently a licenced discharge from the site which goes to groundwater.

Surface Water Bodies

- 7.62 The closest surface water body to the site is Rossmore Bay estuary (within the Cork Harbour), which is located along the southern boundary of the site. The Tibbotstown River is located approximately

1km to the north of the quarry; there is no surface water connection between the site and the Tibbotstown River.

- 7.63 There is a surface water pond located in the northern part of the site, see **Figure 7-1**. Surface water runoff from the yard area and block yard at the site goes to this pond. This pond is used for the readymix plant at the site.
- 7.64 The site is located adjacent to the transitional waters of Cork Harbour and there are saline water ingresses to the site along the southern face of the quarry during high tide conditions in harbour. The water ingress occurs along fractures in the limestone bedrock.
- 7.65 During low tide conditions in the harbour there is little or no water ingress to the quarry along the southern face of the quarry.
- 7.66 There are a number of ponds located c. 500 m to the south-east of the site into which the licenced discharge water flows.

Flooding

- 7.67 The Office of Public Works (OPW) is the government agency with statutory responsibility for flooding in Ireland. The OPW website (www.floodmaps.ie) indicates that there are no recorded flood events in the vicinity of the site from the Rossmore Bay estuary.
- 7.68 The OPW modelled coastal and tidal flood events (www.floodinfo.ie) does not show the Quarry being flooded during a High Probability flood event in Cork Harbour. A High Probability coastal/tidal flood events have approximately a 1-in-a-10 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 10%.
- 7.69 The OPW modelled Medium Probability coastal / tidal flood event, has approximately a 1-in-a-200 chance of occurring or being exceeded in any given year, referred to as an Annual Exceedance Probability (AEP) of 0.5%, and the OPW mapping shows the site flooding via the south east corner of the site where there is a low point in the embankment between the quarry and the estuary. Kilsaran have an emergency contingency plan in place to temporarily raise this area of the site using materials and machinery available on site, in the highly unlikely circumstance that such a flooding event is forecast.

Groundwater – Hydrogeology

Aquifer Characteristics

- 7.70 According to the GSI, the bedrock is classified as a Regionally Important Aquifer which is karstified and dominated by diffuse flow (Rkd), see **Figure 7-2**. A regionally important aquifer is a bedrock aquifer unit capable of supplying regionally important abstractions (e.g. large public water supplies), or 'excellent' yields (>400 m³/d). The continuous aquifer unit generally has an area of >25 km².
- 7.71 Karstification most often occurs in the upper bedrock layers and along certain fractures, fissures and joints, at the expense of others.
- 7.72 The vulnerability at the proposed development is extreme (X), with rock near the surface or karst, as shown on **Figure 7-3**.

Groundwater Body

- 7.73 The quarry is located within the Midleton Groundwater Body (GWB), referring to the Dinantian Carboniferous limestone bedrock units. The GWB has an area of 130 km² and the site is located to

the south of the GWB. A description of the GWB is published by the GSI. The pure unbedded limestones of this GWB are highly productive. There are numerous surface karst features in these limestones. Transmissivity in the pure unbedded limestones can range up to a few thousand m²/d. Groundwater gradients within the pure unbedded limestones are low, around 0.001-0.002. There are a large number of wells with Excellent (>400 m³/d) and Good (100-400 m³/d) yields occurring in this GWB.

- 7.74 Storativity is low in this GWB. Most groundwater flow may occur in an epikarstic layer a couple of metres thick and in a zone of interconnected solutionally-enlarged fissures and conduits that extends approximately 30m below this. However deeper flows can occur. These rocks are devoid of intergranular permeability.

Groundwater Flow

- 7.75 Because of the high frequency of fissures in this region, overall groundwater flow is thought to be diffuse, although solutionally enlarged conduits and cave systems occur. Groundwater flow occurs in an upper shallow highly karstified weathered zone of a few metres thick in which groundwater moves quickly in rapid response to recharge. Below this is a deeper zone where there are two components to groundwater flow. Groundwater flows through interconnected, solutionally enlarged conduits and cave systems that are controlled by structural deformation. In addition, there is a more dispersed slow groundwater flow component in smaller fractures and joints outside the larger conduits. Generally, this connected fractured zone extends to about 30 mbgl in pure limestone, however in the pure bedded limestones of the South Munster region, deep inflows from major zones of fissuring have been encountered to 40-50 mbgl.
- 7.76 The water table is generally within 10m of the surface, except for the more elevated parts of the limestone aquifers, and the typical annual fluctuation of the water table ranges up to 6 or 7m. Groundwater is generally unconfined. The highly permeable aquifer supports a regional scale flow system. Regional groundwater flow is towards the surface water channels to the south west of the body.
- 7.77 Karst features such as cave systems, sinking streams, springs, swallow holes and other collapse features are common in this GWB.

Groundwater Flow Direction

- 7.78 The regional groundwater flow direction in the area is expected to be from higher ground to the north towards the coast to the south. Localised groundwater flow directions within the quarry will be impacted by the drawdown caused by the pumping regime.

Karst

- 7.79 No significant karst features have been encountered at the quarry.
- 7.80 The GSI database shows the closest karst features are two landforms east to north-east of the quarry. Goat Hole cave is located approximately 1.3km to the north to north-east, and a spring is located approximately 1.6km east of the quarry in Ballintubbrid West. This spring may be a discharge for the Carrigtohill sink stream.

On Site Hydrogeological Investigations

- 7.81 Hydrogeological investigations were undertaken in 2003 at the quarry to determine groundwater conditions at the site, as part of the 2003 EIS. A series of groundwater wells were drilled with depths ranging from -4.4m AOD to -45.9m AOD. Groundwater contours measured in 2002 indicate

that localised groundwater flow in the quarry was towards the sump in the south-eastern corner of the quarry, as expected.

- 7.82 The 2003 investigation boreholes comprise two pumping wells, six groundwater level monitoring wells and eight temporary monitoring wells. A copy of the borehole logs and borehole locations are included in Error! Reference source not found..
- 7.83 Geophysics surveys were also carried out at the site in 2003 and the results of the surveys indicate the presence of different weathered zones in the limestone bedrock. Summary maps were produced from the geophysical survey results which indicate a number of interpreted fissure zones running in a north-south direction through the site. A number of the borehole logs show Limestone weathering at - 34mAOD; however, weathering was not recorded in borehole MWA2, in the south-central area, or at borehole MWA3, in the north central area. The data from the borehole logs indicates that the weathered zone at c. -34mAOD recorded in a number of boreholes is not continuous across the site.
- 7.84 Pumping tests were carried out in 2003 on borehole PWA2 which extended to -44.4 mAOD and at the quarry sump for the EIS. The pumping test were undertaken in the weathered zone (below - 34mAOD and assessed water inflows in the zone of weathered limestone. As such the results from the pump test are considered to represent the worst case scenario for groundwater ingress to the quarry during extraction to a depth of -40mAOD.
- 7.85 The groundwater level at the start of the pumping test was at - 4.42 mAOD and fell by c. 4 m over the course of the pumping test. The 2003 EIS states that the results from the pumping test indicated that deepening the quarry below the weathered zone at approximately -34m AOD would result in an additional inflow of c. 1,000 m³/d to the quarry which would need to be managed; the additional inflow would result in an increase of c. 25% to c. 5,000 m³/d.
- 7.86 As noted above, the identified weathered zone at -34m in a number of boreholes is not continuous across the quarry, and so the estimated additional groundwater inflow of c. 1,000 m³/d is considered to be an upper limit. Additionally, the borehole logs presented in Error! Reference source not found. show that an inflow of an estimated 20 – 40 l/s was reported during drilling at PWA2. This water inflow was not reported at other boreholes, further indicating that the water bearing fractures with associated groundwater inflow encountered at -34m AOD at PWA2 is not continuous across the quarry.

On Site Water Levels

- 7.87 Four replacement groundwater monitoring wells, GW1, GW2, GW3, and GW4, were installed at the site in 2019 and the groundwater levels were monitored since May 2019. The locations of the four monitoring wells at the site are shown in **Figure 7-6**.
- 7.88 Groundwater levels in the boreholes have monitored on a weekly basis from May 2019 to present. The results can be seen in **Diagram 7-1**. A summary table (
- 7.89 **Table** 7-5) outlines the maximum, minimum, average and range of measurements. Groundwater level data is presented in **Appendix 7-E**.

Diagram 7-1
Groundwater levels May 2019 to June 2021

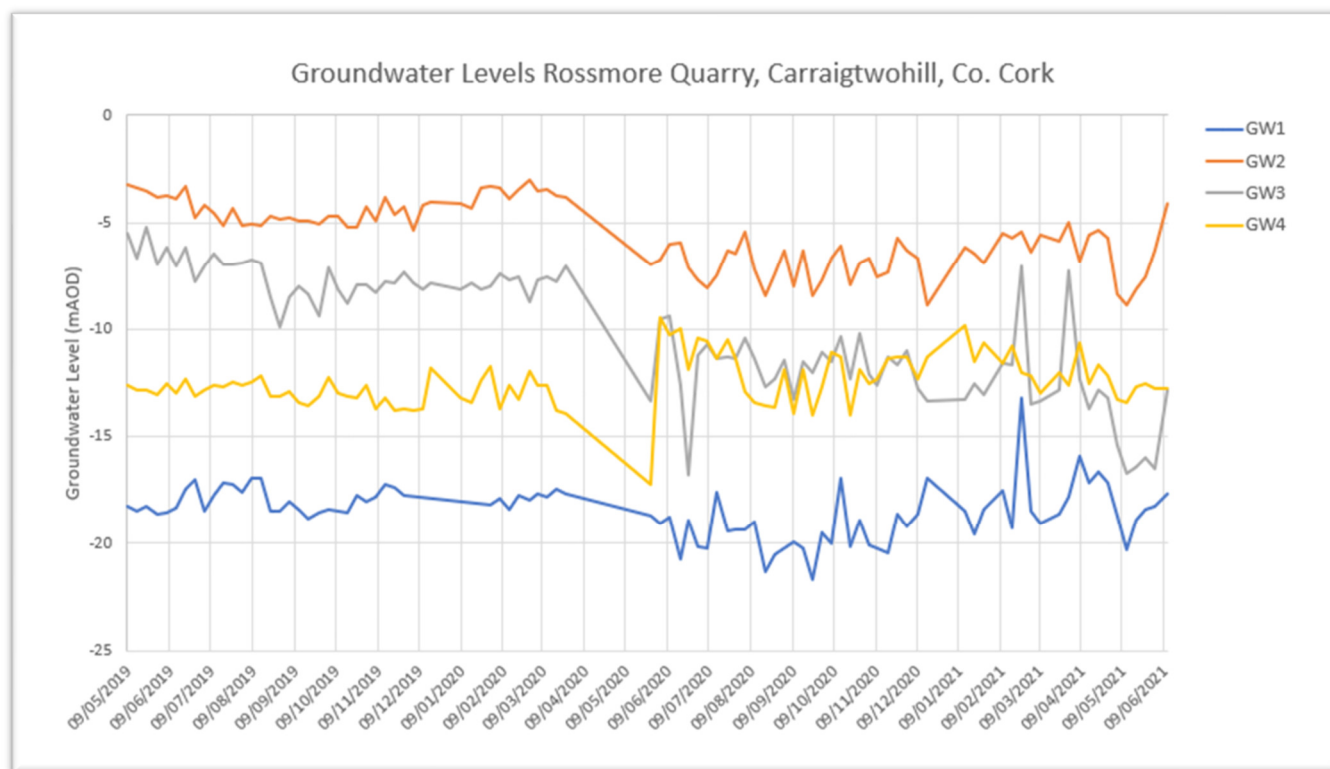


Table 7-5
Summary of Groundwater Levels for May 2019 to June 2021

	Elevation of Water (mAO)			
	GW1	GW2	GW3	GW4
Max	-16.92	-3.04	-5.22	-11.7
Min	-18.8	-5.36	-9.89	-13.9
Average	-17.92	-4.25	-7.57	-12.94
Range	1.88	2.32	4.67	2.2

Local Water Supplies

- 7.90 There are no Public/Group Water Supply Scheme boreholes in the vicinity of the quarry and there are no surface water abstractions for group schemes in the vicinity of the site either.
- 7.91 The GSI well database shows the closest well (borehole number 1707SWW047) is approximately 0.7km north of the proposed extraction area, see **Figure 7-5**. The borehole has a poor yield of 21.8m³/d only.

- 7.92 Boreholes included on the GSI database to the south of the estuary consist of monitoring wells on the Cork County Council landfill. The only residential properties in the vicinity of the quarry are located to the north (and upgradient) along the local road.
- 7.93 Irish Water supplies dwellings in the area around the site with a mains water supply from Tibbotstown Public Water Supply (PWS) scheme. The Tibbotstown PWS scheme supplies Carrigtohill and the also the Barryscourt and Rossmore area where the Kilsaran site is located.
- 7.94 The Tibbotstown scheme draws raw water from a stream and small reservoir located approximately 5km to the north of the site. The Tibbotstown scheme is also supplemented by raw water from the Owennacurra River to the north of Midleton. The site at Rossmore is not located within in the raw water supply area for the Tibbotstown PWS scheme.
- 7.95 The 2003 EIS identified five local wells within 1km of the quarry, with the closest well located approximately 350m north of the site. The water level in the well was previously measured at 2.4m AOD (4.1m bgl). Water levels were taken from four other domestic and farm wells in the area, with water levels ranging from 3.82 to -1.24m AOD.

Well Survey

- 7.96 A domestic well survey in the vicinity of the quarry was carried out on 11th October 2018. The domestic well survey was carried out by SLR's hydrogeologist, Dominica Baird.
- 7.97 The aerial photograph for the area surrounding the site indicates the presence of numerous one-off houses in the vicinity, particularly along the road to the north of the quarry. Residence locations were numbered within 500m of the quarry sump (see **Figure 7-5**). The locations of wells identified during the previous survey were also surveyed. A door-to-door survey was undertaken. Where householders were not available for interview during the survey, a letter was left at the house.
- 7.98 The results of the survey are summarised in **Table 7-6**. Interviews were carried out at residential properties R2 / Well 30, R5, R8, Well 4 and Well 2. Well 30 and Well 4 were identified and dipped. Well 4 consisted of a shallow hand dug well approximately 5m deep which was found to be dry, and Well 30 reported water at 6.8 mbgl.
- 7.99 Information from the households indicates that the vast majority of properties in the area are supplied from the mains.

Table 7-6
Domestic Well Survey

Well Number	Location	Property Type	Owner Interview / Letter	Outcome
Properties within 500m of Quarry Sump				
R1	North of quarry	Cluster of residential properties	Interview with R2	Mains supply
R2	North of quarry	Established, with farm	Interview with Mr Sheehan	Owner of Well 30 (marked on map) Well used for both domestic and agricultural supply. Groundwater level at 6.8m bgl. Pump installed in well.
R3	North of quarry	Residential, appeared unoccupied	Letter	Assume mains supply
R4	North of quarry	Residential	Letter	Assume mains supply
R5	North of quarry	Residential	Interview with Ms O'Donovan	Mains supply
R6	Agricultural buildings, no residential buildings noted	Non residential	-	
R7	North of quarry	Residential	Letter	Assume mains supply
R8	North east of quarry	Residential	Interview with Mr Carney	Mains supply, stated no wells on the road other than at Mr Sheehan's farm
R9	North east of quarry	Residential	Interview with R8	Mains supply
R10	North east of quarry	Residential	Interview with R8	Mains supply
Wells greater than 500m from sump				
Well 4	North west of quarry	Residential	Interview with daughter of householder	Mains supply, former groundwater on property supply borehole is dry. The groundwater borehole consists of a shallow chamber approx. 5m deep.
Well 1	North west of quarry	Residential	Letter	Mains supply
Well 2	North west of quarry	Residential	Letter	Mains supply
Well 3	North west of quarry	Residential	Interview with householder	Mains supply, formerly had groundwater well. More than 10 years ago the well was decommissioned and connection mains supply organised by the quarry. Well 1 and Well 2 were also replaced by mains supply by quarry.

Well Number	Location	Property Type	Owner Interview / Letter	Outcome
Well A	South west of quarry	Farm	No access	No access
Well 43	North east of quarry	Residential	Letter	Understood to be mains supply (R8)

Sensitive Receptors

7.100 The following sensitive receptors have been identified in the receiving environment:

- Great Island Channel SAC (Rossmore Bay) adjacent to the quarry;
- Groundwater supply wells in the surrounding area, upgradient of the quarry; and
- Regionally important limestone aquifer.

IMPACT ASSESSMENT

Evaluation Methodology

7.101 The impacts on the local surface water and groundwater environment of the proposed quarry deepening are assessed in this section.

7.102 The methodology applied here is a qualitative risk assessment methodology in which the probability of an impact occurring and the magnitude of the impact, if it were to occur, are considered. This approach provides a mechanism for identifying the areas where mitigation measures are required, and for identifying mitigation measures appropriate to the risk presented by the development. This approach allows effort to be focused on reducing risk where the greatest benefit may result.

7.103 The assessment of risk is based on the matrix outlined in **Table 7-7** below.

Table 7-7
Matrix Used to Assess Potential Impacts

Probability of Occurrence	Magnitude of Potential Impacts			
	Severe	Moderate	Mild	Negligible
High	High	High	Medium	Low
Medium	High	Medium	Low	Near Zero
Low	Medium	Low	Low	Near Zero
Negligible	Low	Near Zero	Near Zero	Near Zero

7.104 The assessment of likely magnitude of potential impacts in relation to hydrogeology and hydrology is assessed in accordance with criteria detailed in **Table 7-8** below.

Table 7-8
Magnitude of Potential Hydrological and Hydrogeological Impacts

Magnitude	Potential Impact
Negligible	No alteration or very minor changes with no impact to watercourses, hydrology, hydrodynamics, erosion and sedimentation patterns; No alteration to groundwater recharge or flow mechanisms; and No pollution or change in water chemistry to either groundwater or surface water.
Mild	Minor or slight changes to the watercourse, hydrology or hydrodynamics; Changes to site resulting in slight increase in runoff well within the drainage system capacity; Minor changes to erosion and sedimentation patterns; and Minor changes to the water chemistry of surface runoff and groundwater. .
Moderate	Some fundamental changes to watercourse, hydrology or hydrodynamics; Changes to site resulting in an increase in runoff within system capacity; Moderate changes to erosion and sedimentation patterns; and Moderate changes to the water chemistry of surface runoff and groundwater.
Severe	Wholesale changes to watercourse channel, route, hydrology or hydrodynamics; Changes to site resulting in an increase in runoff with flood potential Significant changes to erosion and sedimentation patterns; and Major changes to the water chemistry or hydro-ecology.

- 7.105 In addition to their nature and significance, the potential impacts will be assessed in terms of their duration, whether they are direct or indirect impacts. Any cumulative impact of the potential impacts will be assessed.
- 7.106 The following sections identify the potential impacts of the development on the hydrogeological and hydrological environments. It also assesses the likelihood of occurrence of each identified impact in accordance with **Table 7-8**. It should be noted that the impacts are initially assessed with no mitigation or design measures incorporated to reduce the risk.

Construction Stage Impacts

- 7.107 The site is an existing quarry that will continue to be worked within the existing extraction area to the permitted level of -40m AOD and therefore there will be no construction stage activities at the site associated with the proposed development.

Direct Impacts

- 7.108 There will be no direct impacts associated with a construction stage as the site is an existing quarry.

Indirect Impacts

- 7.109 There will be no indirect impacts associated with a construction stage as the site is an existing quarry.

Operation Stage Impacts

Direct Impacts

- 7.110 The continued use of the quarry will result in extraction to the existing permitted level of -40m AOD. The current quarrying is being carried out below the groundwater table, with drawdown to -20m AOD. During the operation stage, the groundwater levels may be reduced to -40m AOD in the application area. The results of a geophysics survey and drilling previously carried at the site in 2003 indicated a weathered zone in places in the quarry at (on average) -34m AOD, it is noted the weathered zone is not continuous across the quarry at this depth. Therefore, groundwater inflows may need to be managed at depth. Whilst most karst features are expected in the upper 30m, karstification can however extend to depth within this groundwater body.
- 7.111 The original groundwater levels across the site appear to have been locally altered due to the existing development, with drawdown occurring to the south-eastern corner of the site. Development of the quarry to the permitted level of -40m AOD is likely to result in steeper groundwater gradients and may extend the zone of influence of the drawdown. This, in turn, could impact on the groundwater levels in the nearby groundwater supply wells.
- 7.112 Without mitigation, the probability of the proposed additional groundwater drawdown impacting on existing water supplies is considered to be **'low'** during the operational stage, as no impact to date has been noted. The magnitude of such an impact would be considered to be **'moderate'** as the local supply wells are distant from the quarry and all upgradient of the quarry void. Most local residents are provided for by mains water, as confirmed in a recent well survey. The overall risk to remaining water supply wells, without mitigation, is **'low'**.
- 7.113 The probability of the proposed additional groundwater volumes entering the excavation at depth is considered to be **'medium'** during the operational stage, due to the potential presence of a weathered zone at -34m AOD identified from the geophysical survey, which has been shown not to be continuous across the quarry. The magnitude of such an impact is considered to be **'mild'** as there would be an increase in groundwater levels in the quarry void. Therefore, the overall risk from increased volume of water, without mitigation, is **'low'**. It is noted that groundwater which is intercepted at the quarry and pumped to the pond (under the existing discharge licence) then seeps through the ground naturally back into the estuary.
- 7.114 During the operation stage of the proposed quarry deepening, there is a risk of groundwater pollution in the bedrock aquifer from the following potential sources:
- accidental spillage of fuels and lubricants from plant or machinery; and
 - increase in suspended solids and potential for contaminated runoff entering groundwater during the operation of the quarry.
- 7.115 Without mitigation, the probability of occurrence of spillage of fuels, lubricants and other potentially contaminative liquids (contaminated runoff) entering the bedrock aquifer is considered to be **medium** during the operation stage. However, any impacted groundwater will be captured by the pumping at the quarry sump where any contamination of groundwater can be intercepted. The magnitude of such an impact is considered to be **'mild'**. Therefore, the overall risk to groundwater, without mitigation, is **'low'**.
- 7.116 Without mitigation, suspended solids in runoff could enter groundwater in the bedrock and the impact on groundwater quality would be **'low'** as the water will be passed through the quarry sump

and pond which will both provide a level of treatment. The magnitude of the potential impact on groundwater is considered to be '**negligible**'. Therefore, the overall risk is '**near zero**'.

- 7.117 There is currently no direct discharge from the site to any surface water course, and there will continue to be no discharge to surface water during the continued operation of the quarry; therefore, there are no potential impacts on surface water quality or quantity arising during the operation of the quarry.

Indirect Impacts (if any)

- 7.118 There are no anticipated indirect impacts from the continued operation of the quarry at the site.

Post – Operational Stage Impacts

Direct Impacts

- 7.119 During the post-operational stage, the quarry void will be allowed to flood back to the original predevelopment groundwater level at the void which will probably be at a level of 1m-2m AOD. The water body in the void is expected to have some salinity from water intrusion from the estuary. Surface water runoff from the remainder of the site which is above the groundwater level will either evaporate or infiltrate naturally to the ground, or will runoff to the flood quarry void. The remainder of the site which is not flooded, i.e. above 1m-2m AOD will be retained for concrete manufacturing activities subject to ongoing planning permission. Existing bunded fuel storage and hydrocarbon interceptors will remain in operation at this ancillary area.
- 7.120 Without mitigation, the probability of surface water runoff causing deterioration in groundwater quality in the quarry void is considered to be **low** during the post-operational stage. The magnitude of any impact on groundwater quality is considered to be '**mild**'. Therefore, the overall risk to groundwater, without mitigation, is '**low**'.
- 7.121 There will be no discharge from the site to any surface water course, and therefore there are no potential impacts on surface water quality or quantity at the post operational stage.

Indirect Impacts (if any)

- 7.122 There are no indirect impacts anticipated.

Summary of Unmitigated Impacts

- 7.123 A summary of the unmitigated risk and magnitude of potential impacts are presented in **Table 7-9** below, and indicates that if no mitigation measures are applied, there is potential for the continued operation of the quarry to cause a direct and adverse impact on the environment particularly groundwater levels and by an increased risk of pollution.

Table 7-9
Magnitude of Potential Hydrological and Hydrogeological Impacts

Potential Impact	Spatial Impact, Duration, Direct/Indirect	Probability of Occurrence	Magnitude of Impact	Significance of Impact	Mitigation Required?
Groundwater					
Local groundwater supplies	Local, Long-Term and Direct	Low	Moderate	Low	Yes
Additional groundwater to quarry	Local, Short Term, Direct	Medium	Mild	Low	Yes
Contamination of groundwater from leaks and accidental spillages	Local, Short Term, Direct	Medium	Mild	Low	Yes
Impact of suspended solids in runoff on groundwater quality	Local, Short Term, Direct	Low	Negligible	Near Zero	No
Post operational impact on groundwater quality	Local, Short Term, Direct	Low	Mild	Low	Yes

Unplanned Events

- 7.124 It is highly unlikely that any unplanned events within the application site would result in a noticeable impact on the hydrology and hydrogeology. Accidents could result in the spillage of fuel, which has been considered in the assessment above.

'Do-nothing Scenario'

- 7.125 If the proposed development is not permitted, the site will be restored as there will be no economic reserves and quarrying and ancillary activities will cease.

Cumulative Impacts

- 7.126 There will be a cumulative impact on groundwater levels with the adjoining Lagan Rossmore Quarry immediately to the east of the site. The dewatering of groundwater is occurring on both quarries simultaneously.
- 7.127 The assessment of operational impacts outlined above states that without mitigation, the probability of the proposed additional groundwater drawdown impacting on existing water supplies is considered to be '**low**' during the operational stage. No impact to date has been noted on any adjoining wells. The magnitude of such an impact would be considered to be '**moderate**' as the local supply wells are distant from the quarry and all upgradient of the quarry void. Most local residents are provided for by mains water, as confirmed in a recent well survey. The overall risk to remaining water supply wells, without mitigation, is '**low**'.

- 7.128 Therefore, it is considered that as the local residents are distant to the quarry void sump, and the fact that they are provided with a mains supply, then any cumulative impacts on groundwater levels with the adjoining Lagan quarry will be 'low'.

MITIGATION MEASURES

Operation Stage

- 7.129 The proposed continuance of use of the quarry to the existing permitted level of -40m AOD is referred to here as the operation stage.
- 7.130 Mitigation measures are already in place at the site to ensure there is no adverse impact on groundwater quality during the operation of the quarry; the existing mitigation measures at the site are outlined below.
- 7.131 In addition to the existing mitigation measures at the site a number of additional measures are proposed here which arise out of this impact assessment.
- 7.132 The existing mitigation measures are designed to reduce any potential adverse impacts on the receiving environment to acceptable low levels or near zero; these measures were designed to either reduce the likelihood of an event occurring, or reduce the magnitude of the consequences on the receiving environment if the event were to occur.
- 7.133 The additional mitigation measures proposed here are required to reduce potential impacts identified in this impact assessment to acceptable levels with a low risk to the receiving environment. These measures are designed to either reduce the likelihood of an event occurring or reduce the magnitude of the consequences if the event does occur.
- 7.134 Kilsaran operate an Environmental Management System (EMS). The EMS will continue to be implemented at the site.

Existing Measures

- 7.135 Existing measures are in place at the site to mitigate any potential adverse impacts from quarrying and the processing of stone, readymix concrete production and block making at the quarry on groundwater quality.
- 7.136 A hydrocarbon separator has been installed at the refuelling area.
- 7.137 The existing measures at the site are set out here:
- There is no discharge from the quarry to any surface water course;
 - There is no direct discharge of surface water runoff at the site to the freshwater pond;
 - Storm surface water runoff from the quarry void percolates naturally to the ground on the floor of the void. A berm prevents any storm runoff going directly to the channel along the southern edge of the quarry floor which goes directly to the sump;
 - Prevent storm surface water runoff from the quarry void going directly to the groundwater sump at the site;
 - Fuel at the site is stored in a covered and bunded fuel tank;
 - There is an impermeable hard stand area for refuelling which drains to a recently installed hydrocarbon separator;

- Oils, lubricants and waste oils are stored undercover in the workshop;
- Maintenance and repairs are undertaken, whenever possible, in the covered work shop;
- Undertaking regular visual inspection and testing of the integrity of tanks, drums, banded pallets and double skinned containers;
- Ensuring all vehicle re-fuelling is undertaken on paved / hardstand areas, regardless of whether from existing fuel tanks or from mobile double-skinned fuel bowser;
- Ensuring all plant is regularly maintained and inspected daily for leaks of fuel, lubricating oil or other contaminating liquids / liquors;
- Traffic management system at the site to reduce conflicts between vehicles, and the potential risk of collisions and associated fuel spills or oil leaks; and
- Enforce speed limits across the site to further reduce the likelihood and significance of collisions.
- A spill kit (with containment booms and absorbent materials) is available on-site to contain / stop the migration of any accidental spillages, should they occur;
- There is a wheel wash for vehicles exiting the site to prevent mud and debris being carried onto the public road; and
- Continued regular monitoring and review of the discharge water quality will indicate the effectiveness of pollution control and water management systems at the site.

7.138 These mitigation measures will continue to be implemented at the site during the development of the quarry to the permitted level of -40 mOD.

Proposed Measures

7.139 In addition to the existing mitigation measures outlined above, the following proposed measures will be implemented during the quarry operational stage:

- A groundwater level monitoring program of the water supply well W30 identified during the recent well survey will be implemented, to ensure there is no impact on this well due to the continued operation of the quarry to the permitted level of -40mOD. The well W30 was confirmed to be operational during the well survey. If, in the unlikely event, that this supply well is impacted by the continued operation of the quarry, an alternative water supply will be provided.
- Water management: if a karst feature or conduit is encountered measures will be put in place to manage or reduce any additional inflows of groundwater to the quarry void, either by grouting the conduit or directing the flow to the quarry sump and discharging to ground through the existing licensed discharge point.

7.140 Taken together, the existing and proposed mitigation measures will reduce any potential adverse impacts identified, specifically:

- Impact on local groundwater supplies from 'low' to 'near zero';
- Additional groundwater ingress to quarry from 'low' to 'near zero'; and
- Contamination of groundwater from 'low' to 'near zero'.

7.141 The existing and proposed mitigation measures outlined above will be implemented throughout the operational stage of the quarry.

Post - Operational Stage

- 7.142 The restoration scheme for the quarry includes the removal of all plant and machinery. Any potential contamination sources (i.e. fuel, lubricants) will be removed. On this basis, the potential adverse impact of contamination of groundwater will be reduced from 'low' to 'near zero'.

RESIDUAL IMPACT ASSESSMENT

Operational Stage

- 7.143 Provided the existing mitigation measures at the site are maintained, and the proposed mitigation measures outlined here are implemented, there will be no significant residual impacts with respect to groundwater during the continued operation of the quarry. As there are no potential impacts arising in relation to surface water, there will be no residual impact on surface water.

Post - Operational Stage

- 7.144 There will be no significant residual impacts with respect to groundwater and/or surface water during the post-operational stage.

MONITORING

- 7.145 The following monitoring activities will be carried out to demonstrate that the development will not have an adverse impact on the surrounding water environment.
- i. The discharge water quality will be monitored as per the conditions attached to the existing discharge licence;
 - ii. The discharge flow will be monitored on a continuous basis;
 - iii. Groundwater level monitoring will be continued in the existing groundwater monitoring wells;
 - iv. Groundwater level monitoring will be undertaken at the third-party well W30 and this will be included in the groundwater level monitoring programme.

FIGURES

Figure 7-1
Water Features and Quarry Discharge

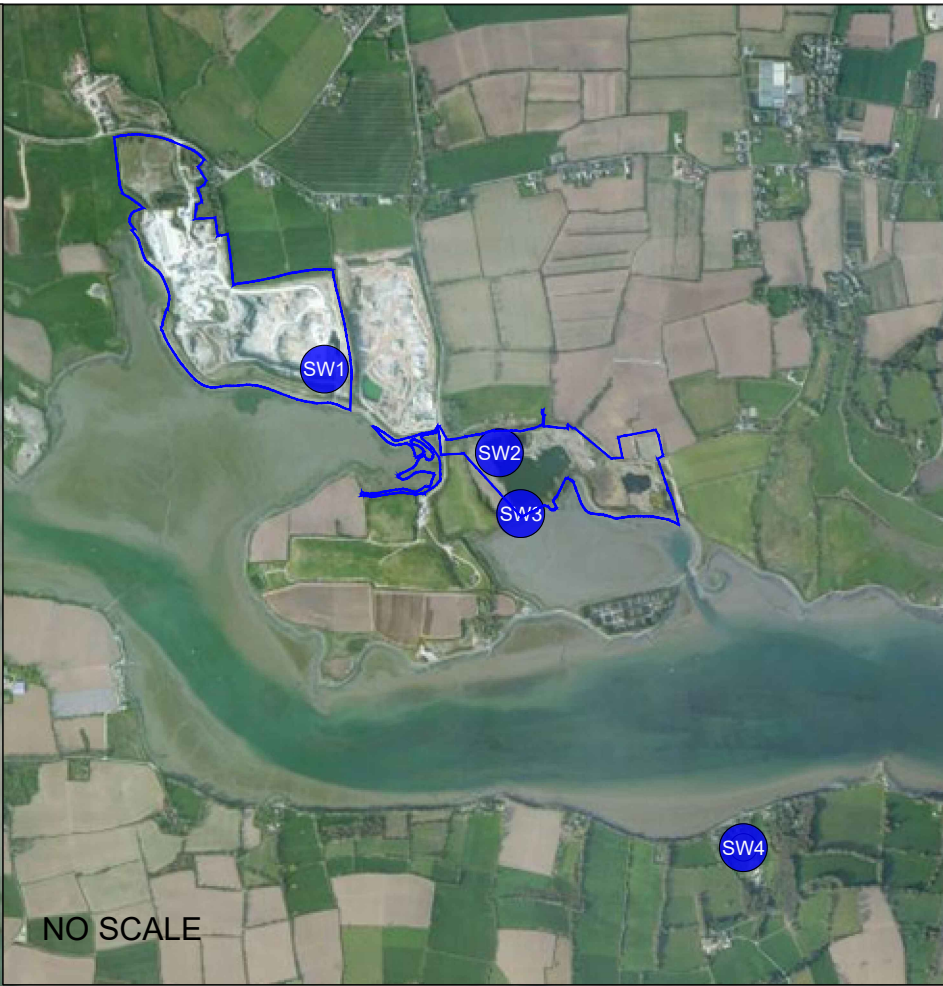
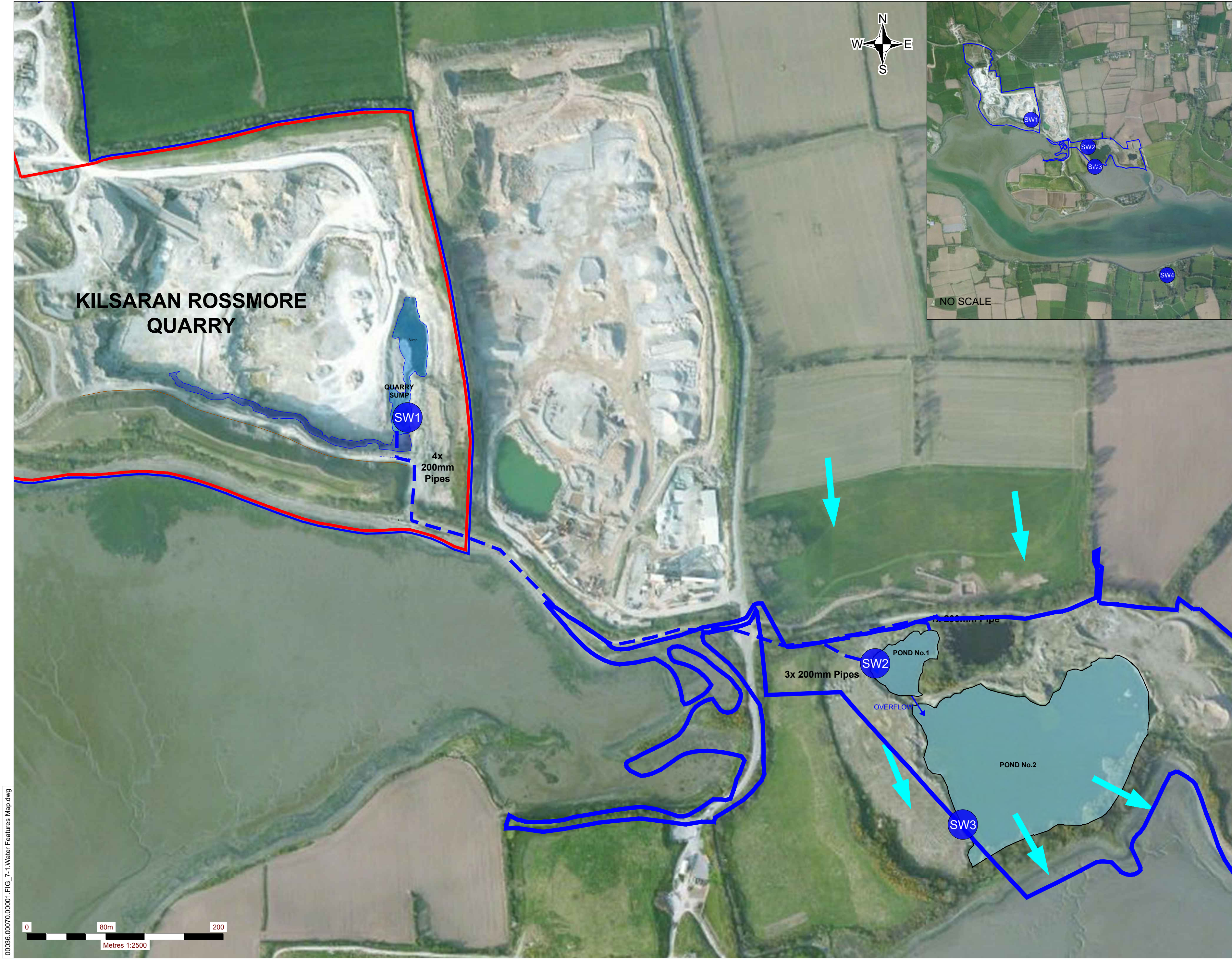
Figure 7-2
Bedrock Aquifer Map

Figure 7-3
Aquifer Vulnerability Map

Figure 7-4
GSI Groundwater Well Location

Figure 7-5
Groundwater Well Survey

Figure 7-6
Groundwater Monitoring Locations



NOTES

1. EXTRACT FROM BING MAPS - AERIAL IMAGE.

2. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND.

LEGEND

APPLICANTS LAND INTEREST

SUBSTITUTE CONSENT APPLICATION AREA (c.24.7ha)

DISCHARGE LINE FROM QUARRY SUMP


SW2


DISCHARGE POINT AND MONITORING LOCATION SW2

SW1

SURFACE WATER QUALITY MONITORING LOCATIONS

REGIONAL GROUNDWATER FLOW DIRECTION (INFERRED)


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KILSARAN CONCRETE
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

ROSSMORE QUARRY,
CARRIGTWOHILL, CO. CORK

QUARRY DISCHARGE LOCATION

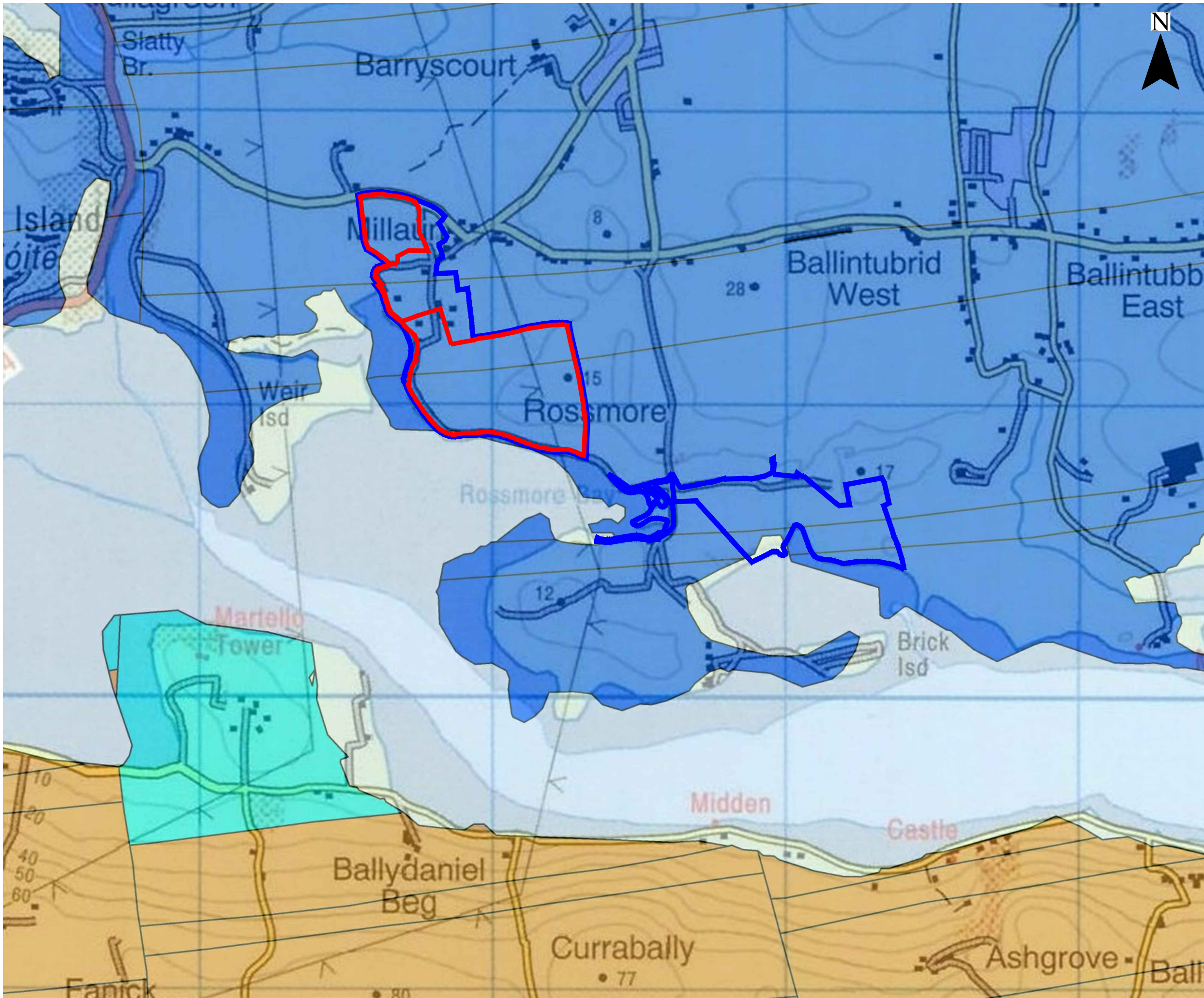
FIGURE 7-1

Scale
1:2,500 @ A2

Date
JUNE 2021

00036.00070.00001.FIG_7-1.Water Features Map.dwg

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NOTES

1. EXTRACT FROM 1:50,000 O.S DISCOVERY MAP NO. 80, 81 & 87.

2. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND.

LEGEND

APPLICANTS LAND INTEREST

PLANNING APPLICATION AREA (c.24.7 ha)

Bedrock Aquifer Map

Source: GSI

Regionally Important Aquifer - Karstified diffuse (Rkd)

Locally Important Aquifer - Karstified (Lk)

Locally Important Aquifer - Moderately productive in local zones (LI)

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KILSARAN CONCRETE
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

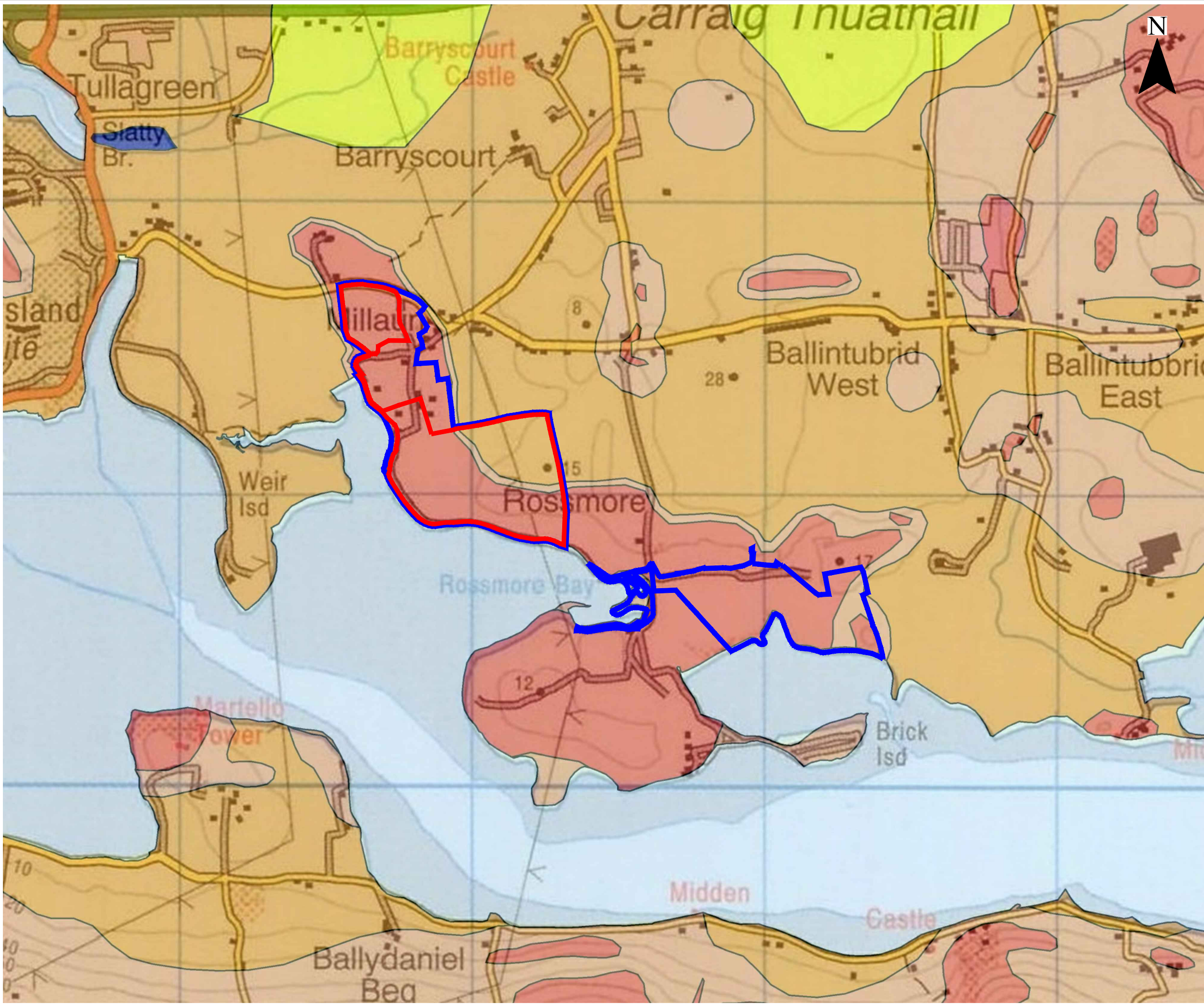
ROSSMORE QUARRY,
CARRIGTOHILL, CO. CORK

BEDROCK AQUIFER MAP

FIGURE 7-2

Scale 1:12,500 @ A3 Date JULY 2021

00036.00070.00001.FIG_7-3.Groundwater Vulnerability Map.dwg



NOTES

1. EXTRACT FROM 1:50,000 O.S. DISCOVERY MAP NO. 80, 81 & 87.

2. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND.

LEGEND

APPLICANTS LAND INTEREST

PLANNING APPLICATION AREA (c.24.7 ha)

Groundwater Vulnerability Classification
Source: GSI 2013

Rock near surface or karst - X

Extreme - E

High - H

Medium - M

Low - L

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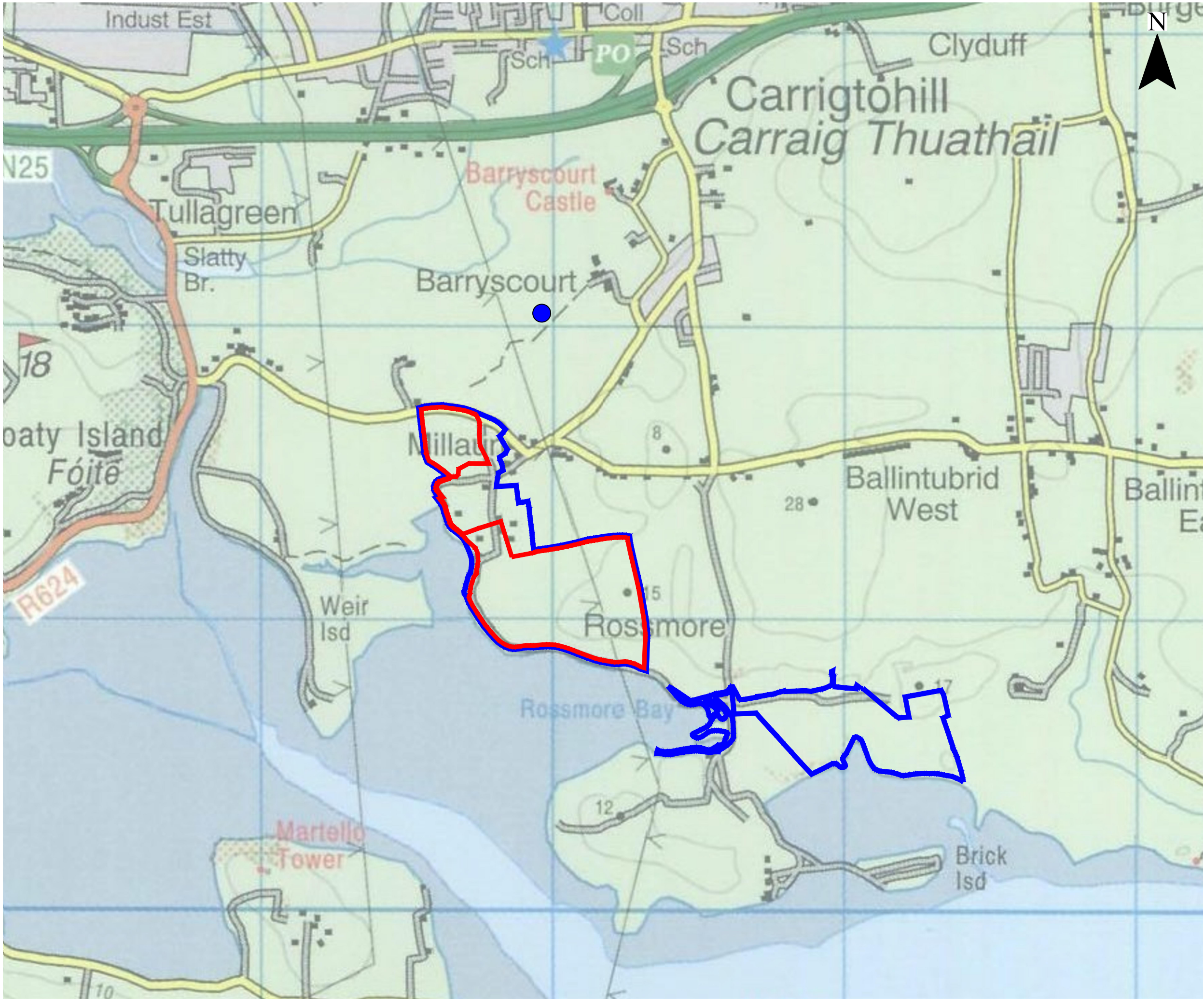
ROSSMORE QUARRY,
CARRIGTOHILL, CO. CORK

GROUNDWATER VULNERABILITY MAP

FIGURE 7-3

Scale
1:12,500 @ A3

Date
JULY 2021



NOTES

1. EXTRACT FROM 1:50,000 O.S DISCOVERY MAP NO. 80, 81 & 87.

2. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND.

LEGEND

APPLICANTS LAND INTEREST

PLANNING APPLICATION AREA (c.24.7 ha)

WELL AT BARRYSCOURT(GSI No. 1707SWW047)

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SLR

SLR CONSULTING IRELAND
7 DUNDUM BUSINESS PARK
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KILSARAN CONCRETE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

ROSSMORE QUARRY,
CARRIGTOHILL, CO. CORK

GROUNDWATER WELLS MAP

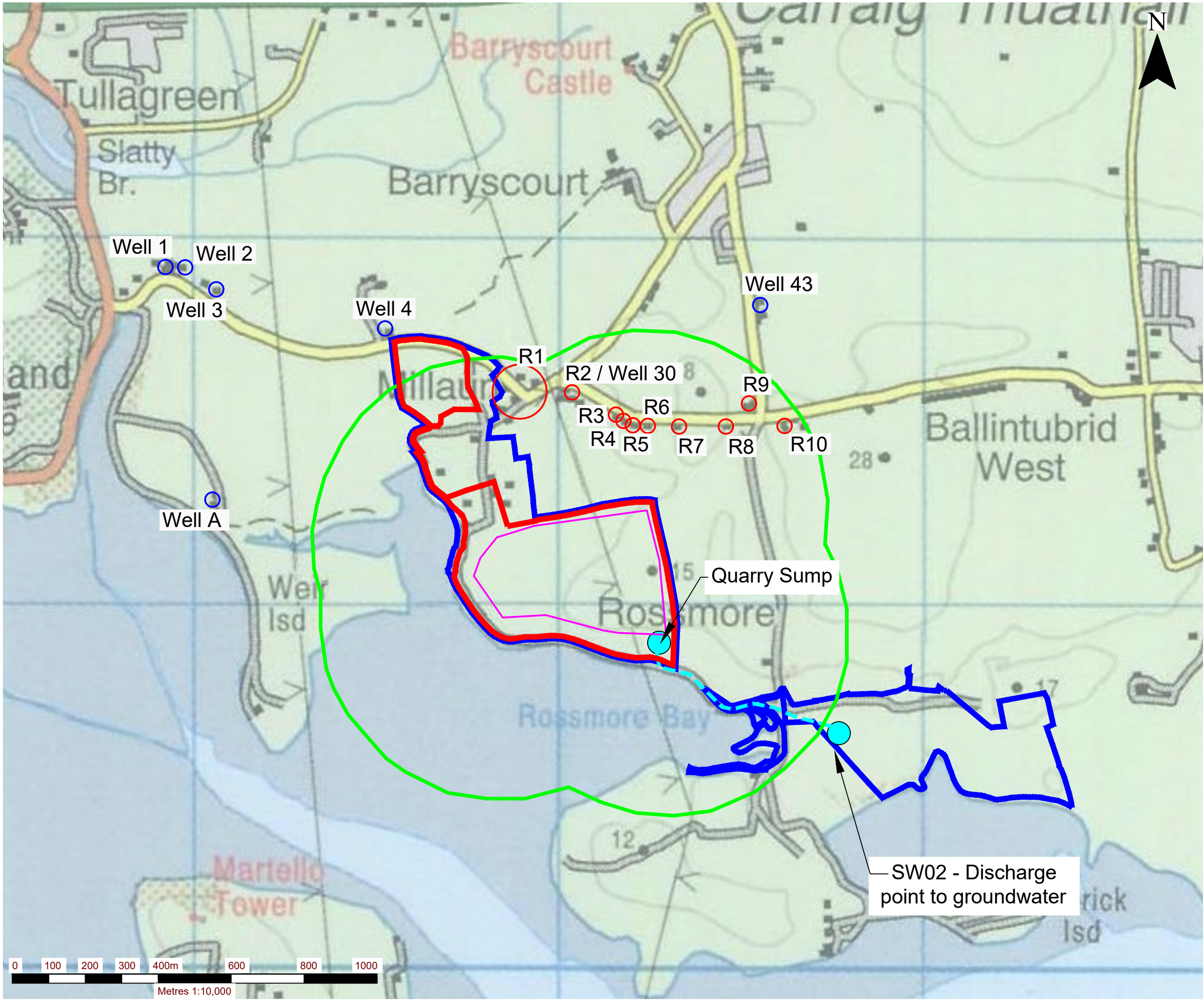
FIGURE 7-4

Scale
1:12,500 @ A3

Date
JUNE 2021

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00036.00070.00001.FIG_7-4.Groundwater Wells Map.dwg



NOTES

1. EXTRACT FROM 1:50,000 O.S DISCOVERY MAP NO. 80, 81 & 87.

2. ORDNANCE SURVEY IRELAND LICENCE NO. CYAL50167032 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND.

LEGEND

	APPLICANTS LAND INTEREST
	PLANNING APPLICATION AREA (c.24.7 ha)
	SAMPLE LOCATION
	PIPED DISCHARGE ROUTE
	EXTENT OF QUARRY VOID
	500m STANDOFF TO QUARRY VOID

Piercetown, Dunboyne, Co. Meath
www.kilsaran.ie T:01 802 6300

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KILSARAN CONCRETE
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

ROSSMORE QUARRY,
CARRIGTOHILL, CO. CORK

GROUNDWATER WELL SURVEY

FIGURE 7-5

Scale 1:10,000 @ A3	Date JUNE 2021
------------------------	-------------------

00036.00070.00001.FIG_7-5.Water Features Map.dwg

00036.00070.00001.FIG_7-6.Groundwater Monitoring Wells.dwg



NOTES

1. BASED ON EXTRACT FROM 1:2500 O.S.I MAP NO. 6386A 6386B 6386C AND 6386D.

2. ORDNANCE SURVEY IRELAND LICENCE NO. **CYAL50167032** (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND.

LEGEND

- LAND INTEREST BOUNDARY
- APPLICATION APPLICATION AREA (c.24.7 ha)
- RESIDENTIAL PROPERTY LOCATION
- EXISTING SCREENING BERM
- GROUNDWAETR MONITORING WELL (GW)

'Orthomosaic produced from Aerial Photography flown MAY 2018 by SLR Consulting Ireland (IAA Permit No. 150052) www.slrconsulting.com Tel: +353-1-2964667. Orthomosaic produced using Ground Control Points. Related to Irish Transverse Mercator Coordinate System and OS Malin Head Level Datum.

The accuracy of the orthomosaics and the digital elevation models (DEM) strongly depends on the flight height, lighting conditions, availability of textures, image quality, overlap, and type of terrain. Contours / 3D data relates to the surface model and not terrain levels. Typical accuracies: E: 0.05 m; N:0.05 m; Levels: 0.30 m. All Dimensions and Levels are to be checked on site.

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Kilsaran

Piercetown, Dunboyne, Co. Meath
www.kilsaran.ie T:01 802 6300

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**KILSARAN CONCRETE
ENVIRONMENTAL IMPACT ASSESSMENT REPORT**

ROSSMORE QUARRY,
CARRIGTOHILL, CO. CORK

GROUNDWATER WELL LOCATIONS

FIGURE 7-6

Scale
1:2,500 @ A3

Date
JUNE 2021

APPENDICES

Appendix 7-A

EU Directives / National Legislation and Regulations / Guidelines / Technical Standards

European Directives

- Environmental Impact Assessment. Directive (2011/92/EU) on the assessment of the effects of certain public and private projects on the environment;
- Environmental Impact Assessment Directive (2014/52/EU) on the assessment of the effects of certain public and private projects on the environment;
- Water Framework Directive (2000/60/EC);
- Groundwater Directive (2006/118/EC);
- Flooding Directive (2007/60/EC)
- Integrated Pollution and Prevention Control Directive (2008/1/EC); and
- The management of waste from extractive industries (2006/21/EC).

Irish Government Acts, National Legislation and Regulations

- S.I. No. 349 of 1989, European Communities (Environmental Impact Assessment) Regulations, and subsequent amendments (S.I. No. 84 of 1994, S.I. No. 352 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001);
- The Planning and Development Acts, 2000 to 2009, The Planning and Development (Amendment) Act 2010, S.I. 600 of 2001 Planning and Development Regulations and subsequent amendments including, S.I. No. 364 of 2005 and S.I. 685 of 2006.

National legislation on the protection of the water environment. Since 2000 water management in EU member states has primarily been directed by the Water Framework Directive (2000/60/EC) and the associate ‘daughter’ Groundwater Directive (2006/118/EC). Irish legislation implementing these, and other relevant directives currently includes:

- S.I. No. 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010 and amendments (S.I. No. 389 of 2011 and S.I. No. 149 of 2012);
- European Union (Drinking Water) Regulations 2014 (S.I. No. 122 of 2014);
- S.I. No. 278 of 2007 European Communities (Drinking Water) (No. 2) Regulations;
- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009 and amendment (S.I. No. 327 of 2012);
- S.I. No. 684 of 2007 Waste Water Discharge (Authorisation) Regulations, 2007, as amended (S.I. No. 231 of 2010);
- S.I. No. 122 of 2010 European Communities (Assessment and Management of Flood Risks) Regulations 2010;
- S.I. No. 457 of 2008 European Communities (Environmental Liability) Regulations which bring into force the European Liability Directive (2004/35/EC);
- European Union (Planning and Development) (Environmental Impact Assessment) (No. 2) Regulations 2018 (S.I. No. 404 of 2018);
- Local Government (Water Pollution) Acts 1977 to 1998;
- European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988);

- European Communities (Quality of Shellfish Waters) Regulations, 2006 (S.I. No. 268 of 2006) and amendments (S.I. No. 55 and 464 of 2009), and;
- Bathing Water Quality Regulations, 2008 (S.I. No. 79 of 2008) and amendments (S.I. No. 351 of 2011 and S.I. No. 163 of 2016);

Guidelines

- CIS (2007). Common Implementation Strategy (CIS) for the Water Framework Directive (2000/60/EC) Guidance on preventing or limiting direct and indirect inputs in the context of the Groundwater Directive 2006/118/EC. Guidance Document No. 17.
- CIS (2010). Common Implementation Strategy (CIS) for the Water Framework Directive (2000/60/EC). Guidance on risk assessment and the use of conceptual models for groundwater. Guidance document No. 26.
- DEHLG (2004). National Urban Waste Water Study. National Report.
- DEHLG (2009). Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities.
- DELG/EPA/GSI (1999). Groundwater Protection Schemes. Document prepared jointly by the Geological Survey of Ireland (GSI), the Environmental Protection Agency, and the Department of Environment, Heritage and Local Government.
- EPA (Draft May 2017) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- EPA (2010b). Methodology for Establishing Groundwater Threshold Values and the Assessment of Chemical and Quantitative Status of Groundwater, Including and Assessment of Pollution Trends and Trend Reversal.
- EPA (2011). Guidance on the Authorisation of Discharges to Groundwater. Version 1, December 2011.
- EPA (2003). Towards Setting Guideline Values for the Protection of groundwater in Ireland. Interim Report.
- EPA (2006). Ireland Water Framework Directive Monitoring Programme.
- Fitzsimons, V., Daly, D. and Deakin, J. (2003). Draft GSI guidelines for assessment and mapping of groundwater vulnerability to contamination. Groundwater Chapter, Geological Survey of Ireland.
- GSI (2006). Criteria used in aquifer classification. 1Available from <http://www.gsi.ie/Programmes/Groundwater/Aquifer+Classification.htm>
- IGI (2007). Guidelines on Water Well Construction. Available from <http://www.igi.ie/assets/files/Water%20Well%20Guidelines/Guidelines.pdf>
- Kilroy, G., Dunne, F., Ryan, J., O'Connor, A., Daly, D., Craig, M., Coxon, C., Johnston, P. and Moe, H. (2008). A Framework for the Assessment of Groundwater – Dependent Terrestrial Ecosystems under the Water Framework Directive. Environmental Research Centre Report Series No. 12.
- Institute of Geologists of Ireland, 2007. Recommended collection, presentation and interpretation of geological and hydrogeological information for quarry developments.

Technical Standards

- British Standards (2015). Code of Practice for Ground Investigations BS5930:2015;.
- CIRIA (2007). The SuDS Manual. (C697). CIRIA publication, February 2007.

Appendix 7-B **Discharge Licence WP(W)10/18**

Comhairle Contae Chorcaí Cork County Council

An Stiúrthóireacht Comhshaoil,
Inis Cara, Co. Corcaigh P31 X738.
Fón: (021) 4532700 • Faics: (021) 4532727
Suíomh Gréasáin: www.corkcoco.ie
Environment Directorate,
Inniscarra, Co. Cork P31 X738.
Tel. No. (021) 4532700 • Fax No. (021) 4532727
Web: www.corkcoco.ie



Kilsaran Concrete t/a Kilsaran Build
Peter Glanville
SLR Consulting
7 Dundrum Business Park, Windy Arbou
Dublin 14

12 MAR 2019

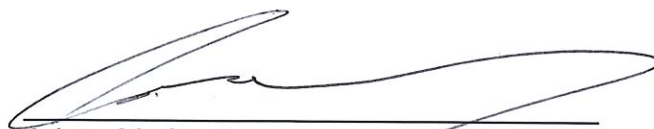
RE: Application for Licence Register Number WP(W)10/18

A Chara,

I refer to your application for a Licence under the Water
Pollution Act received on 05/12/2018

Please find enclosed Licence issued as a result of your application. I
draw your attention to the notes on the decision to grant regarding the
appeal of the decision.

Is Mise le Meas,


Adam McCarthy

Environment Department



c.c. Alan Costello, Cork County Council, Inniscarra
c.c. South Western Regional Fisheries Board, Macroom
c.c. Executive Engineer, Cork County Council, 3

CORK COUNTY COUNCIL

LOCAL GOVERNMENT (WATER POLLUTION) ACTS 1977 AND 1990

Licence to discharge Trade Effluent or Sewage Effluent to Waters

Reference **TO / Kilsaran Concrete t/a Kilsaran Build**
No. In
WP(W)10/18 Piercetown
Dunboyne
Co. Meath

The Council of the County of Cork, in exercise of the powers conferred on it by the Local Government (Water Pollution) Acts, 1977 to 2007, as amended, hereby **GRANTS** a Licence, Reference Number WP(W)10/18

To **Kilsaran Concrete t/a Kilsaran Build**
Piercetown
Dunboyne
Co. Meath

To Discharge **Trade effluent arising from quarrying operations including the quarrying, the crushing and screening of stone, readymix concrete production and block production**

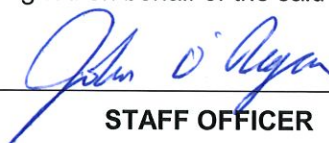
To (River) **Groundwater**

Located at **Rossmore, Carrigtohill, Co. Cork**

subject to the Conditions set out in the schedule attached hereto. It should be noted that a person shall not be entitled solely by reason of a licence to make, cause or permit a discharge to a sewer.

**ENVIRONMENT
DEPARTMENT,
ROOM FF14,
CORK COUNTY COUNCIL,
INNISCARRA,
CO CORK.**

Signed on behalf of the said Council,


STAFF OFFICER

Dated this 8th day of March, 2019

NOTE:

An appeal against a decision made by a Sanitary Authority under Section 4, Section 16 and Section 17 of the Act of 1977, may be made to An Bord Pleanala under Section 20 of the Act, as inserted by Section 15 of the Local Government (Water Pollution) (Amendment) Act, 1990 within one month of the date of the Licence.

Appeals should be addressed to THE SECRETARY, AN BORD PLEANALA, 64 Marlborough Street, Dublin 1, and will be invalid unless accompanied by an additional fee of €126.00.

A request for an oral hearing shall be accompanied by an additional fee of €63.00.

A party to an appeal shall give to An Bord Pleanala any document, information or evidence in his possession or procurement, which An Bord Pleanala consider necessary for the purpose of determining the appeal.



**Cork
County Council**
Comhairle Contae Chorcaí

**Environment Directorate,
Inniscarra,
Co. Cork**

**License to Discharge a Trade Effluent to Water.
Issued under Section 4 of the Local Government (Water Pollution) Acts
1977 to 2007**

WP (W) 10/18

**Kilsaran Concrete t/a Kilsaran Build
Piercetown
Dunboyne
Co. Meath**

**Discharge from:
Kilsaran Quarry
Rossmore
Carrigtohill
Co. Cork**

Schedule

Wastewater Discharges shall take place only as specified in the licence application **WP (W) 10/18** as modified and/or controlled by this licence and subject to the requirements of law. Any changes in the nature or quantity of any emission shall require the Licensee to notify the Licensing Authority and in the case of any material change for the Licensee to request a review or obtain a new licence as may be determined by the Licensing Authority prior to any such change being made. The Licensing Authority shall determine whether any change is material or not.

This licence supersedes all previous licenses and correspondence issued in respect of the facility under the terms of the Local Government Water Pollution Act 1977 to 2007.

In the event of the licence being transferred to another party or company the applicant shall notify the Licensing Authority of this fact and shall also provide the details of the new licence holder prior to the transfer of the licence.

1 WASTEWATER MANAGEMENT & POLLUTION CONTROL

- 1.1. The Licensee shall employ the best available techniques in the avoidance, minimisation, treatment and disposal of wastewaters produced on site
- 1.2. Standard operating procedures shall be prepared in respect of wastewater control and treatment systems to assist personnel with responsibilities for the operations of such systems and plant. These procedures shall be retained on site for inspection and submitted to the Licensing Authority on request.
- 1.3. The Licencee shall ensure that a documented Accident Prevention and Control Procedure is in place that addresses the hazards on-site, particularly in relation to the prevention of accidents with a possible impact on the environment. The Licencee shall ensure that this procedure shall be reviewed annually by a competent person and updated as necessary, and shall maintain written proof of all such reviews and shall make them available to the Licensing Authority on request.
- 1.4. Employees with responsibilities in wastewater control and treatment shall receive training adequate to enable them to execute their tasks in relation to pollution control. These records shall be retained on site for auditing by the Licensing Authority.
- 1.5. No substances listed in Table 12 of Schedule 6 of the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009) shall be discharged from this site.
- 1.6. Within three months of the date of issue of this licence, a risk assessment of all site fuel storage, handling facilities and emergency response protocols shall be undertaken by a competent person. This assessment will have regard to *Wetstock Reconciliation at Fuel Storage Facilities- An Operator's Guide*, Health and Safety Authority, 2013 and *Design, construction, modification, maintenance and decommissioning of filling stations*, 4th edition, Association for Petroleum and Explosives Administration (APEA) and Energy Institute, 2018.

Reason: For the management of wastewater and prevention of pollution on the site

2 CONTAMINATED WASTE WATERS

- 2.1. All contaminated wastewater including surface water runoff arising from the operation of Kilsaran Concrete t/a Kilsaran Build at Rossmore, Carrigtohill,, Co. Cork shall be collected and discharged to ground waters (Midleton IE_SW_G-058) as indicated on drawings and maps which accompanied this application.
- 2.2. WP(W)10/18 authorizes the discharge of a trade effluent arising from the following activities:
- 2.2.1. Concrete and concrete products manufacturing
 - 2.2.2. Quarrying and extraction activities , inc. washings from aggregate crushing and sorting
 - 2.2.3. Void ground/surface water arising from quarrying activities below water table
- 2.3. Pumping from the quarry sump shall be managed and restricted so that water shall not overflow from the final surface water feature (referred to as 'Pond No. 3' in application documents) to Cork Harbour North Channel.
- 2.4. The licensee shall agree with the Licensing Authority an effluent monitoring point, representative of the final discharge. Safe access and egress shall be provided and maintained to this sampling point which shall be clearly identified with a permanent sign 'SW-01'. Samples taken from SW-01 shall be assumed to be representative of the discharge to ground water unless the contrary can be shown.
- 2.5. The licensee shall establish a monitoring programme for the parameters listed in Table 1 at the required frequency. Grab samples shall be taken of the discharge at SW01. This monitoring programme shall commence on 01/04/2019, and quarterly thereafter.

Table 1: Effluent Monitoring

Parameter	Unit	ELV	Commencement date	Monitoring Frequency
pH	pH units	6.0 – 9.5	01/04/2019	Quarterly
Total Heavy Metals (Ba, Cd, Cr, Cu, Hg, Ni,	mg/L	1	01/04/2019	Quarterly
Chromium VI	mg/L	0.15	01/04/2019	Quarterly
Phenols (as Total C)	mg/L	1.0	01/04/2019	Quarterly
Total BTEX	mg/L	0.5	01/04/2019	Quarterly
Mineral Oils	mg/L	1.0	01/04/2019	Quarterly

- 2.6. Test methods used by the Licensee for the monitoring of the nature of the discharge shall be derived from Standard Methods For the Examination of Water and Wastewater (APHA, AWWA, WEF).
- 2.7. In the event of malfunction or breakdown of the pollution abatement equipment, or, any other incident on site which may give rise to water pollution, the Licensee shall immediately report the incident to the Licensing Authority by telephone (**021 4532700**) and shall confirm the communication in writing within twenty four hours, or by email environment.licences@corkcoco.ie

Reason: To control the emissions prior to discharge

3 GROUNDWATER

- 3.1. An area shall be clearly delineated for the washing of readymix plant and truck washouts. Wash water shall pass through a series of settlement chambers with the final chamber discharging to 'Pond 2'.
- 3.2. All fuels, chemicals, lubricants and concrete additives shall be stored in a clearly delineated bunded area, impervious to water and any material stored within. Storage areas shall be bunded to a volume 110% of the volume of the largest tank. All inlets, outlets, vent pipes, valves and gauges shall be within the bunded area.
- 3.3. Within 3 months of the date of issue of this licence, and every five years thereafter, all bunds and drum/tank storage areas shall be certified as being in compliance with condition 3.2 by a Chartered Engineer. The licensee shall maintain copies of such certification and shall make them available to the Licensing Authority on request.
- 3.4. The domestic wastewater treatment plant shall be operated and maintained in accordance with manufacturers recommendations and evidence of a maintenance agreement shall be made available on request.

Reason: To protect groundwaters from polluting matter

4 RESPONSIBLE PERSON

- 4.1 The Licensee shall ensure that a person or persons is/are available at all times to give relevant information on emissions to the Licensing Authority. The Licensee shall identify to the Licensing Authority each such person.

5 MONITORING

- 5.1. The Licensee shall grant immediate and unhindered access to the site and any portion of the pollution abatement equipment to any authorized personnel representing any body having statutory responsibility for water pollution control, at all times, to carry out such inspections monitoring and investigations as the body deems necessary. The Licensing Authority may install such equipment as may be necessary to collect this information at the Licensee's premises. The cost of this work will be borne by the Licensee
- 5.2. The Licensee shall keep records of all monitoring carried out and shall retain such records for a minimum period of five years. The Licensee shall submit to the Licensing Authority at quarterly intervals the result of all monitoring relating to the previous quarter, together with any other records relating to pollution control which may be required by the Licensing Authority.
- 5.3. Any non-compliance with the terms of the licence shall be highlighted and the reason why this occurred shall be stated. The measures taken to ensure non-recurrence of the non compliance shall also be outlined.
- 5.4. All submitted reports shall be signed by the Licensee's plant manager or other senior officer designated by the company.

Reason: To provide for adequate monitoring

6 POLLUTION CONTROL EQUIPMENT

- 6.1 The Licensee shall initiate an approved maintenance programme for all such plant in use in the treatment process or in pollution control.
- 6.2 Oil/water separators, washdown and silt trap separators shall be inspected at least monthly and cleaned at a minimum annual basis. Wastes from all pollution abatement equipment shall be removed by licensed waste disposal contractors only.
- 6.3 Spill trays shall be provided for all vehicle maintenance operations. Plant and equipment waste maintenance materials (e.g. oil filters, used hydraulic fluids etc.) shall be stored in a secure bunded area while awaiting recovery/disposal
- 6.4 All production operatives and their supervisors shall be trained to operate/deploy pollution control equipment, and of their reporting obligations. Evidence of such training shall be made available on request by the Licensing Authority.

Reason: To provide for the operation and maintenance of pollution abatement equipment

7 CONTRIBUTIONS

- 7.1 The Licensee shall pay to the Licensing Authority such annual contributions towards the cost of monitoring the discharge as the Licensing Authority considers necessary for the performance of its duties under this Act as follows:-
 - a) Not later than September 30th 2019 the Licensee shall pay to the Licensing Authority a contribution of not less than € 1150.
 - b) In subsequent years the Licensee shall pay to the Licensing Authority an annual amount of not less than €1150 updated in accordance with the Consumer Price Index from the date of the grant of this licence to the value pertaining at the time of payment of each annual contribution.
 - c) Notwithstanding the foregoing, the rate of contribution each year shall take account of the actual costs of monitoring as incurred by the Licensing Authority in the previous year and as estimated for the next year.

Reason: To provide for the sampling and implementation of licence

Appendix 7-C Discharge Water Quality Results

Client: Kilsaran Concrete LtdPiercetown
Dunboyne
Co. Meath

BHP Ref. No: 19/04/1438
Quote Ref: QM003721
Order No: To Follow
Sales Order: 58431
Date Received: 11/04/2019
Date Sampled: 11/04/2019
Date Completed: 25/04/2019
Sample Type: Surface Water

 Testing
 Analysing
 Consulting


BHP Laboratories

New Road

Thomondgate

Limerick

Tel: +353 61 455399

Fax: +353 61 455261

Email: johnohalloran@bhp.ie

FTAO: James Kelliher
Site: Rossmore Quarry
BHP Ref: Quarterly_Surface Water
Client Ref: SW2

Test		Units	Results	Customer Limits	Date Analysed	Method
BTEX Compounds	*	mg/L	<0.001		23/04/2019	1760
Chromium (VI) - Total		-	<0.05		19/04/2019	BHP AC 095
Total Phenols		mg/L	0.008		23/04/2019	BHP AC 044
Barium (Total as Ba)	*	mg/L	0.025		17/04/2019	1450
Cadmium (Total as Cd)	*	mg/L	0.00015		17/04/2019	1450
Chromium (Total as Cr)	*	mg/L	0.076		17/04/2019	1450
Copper (Total as Cu)	*	mg/L	0.014		17/04/2019	1450
Mercury (Total as Hg)	*	mg/L	0.0011		17/04/2019	1450
Nickel (Total as Ni)	*	mg/L	0.0018		17/04/2019	1450
Mineral Oils (>C ₁₀ -C ₄₀)	*	mg/L	<0.01		25/04/2019	1670
pH		pH Units	8.60		11/04/2019	BHP AC 067
Temperature - Field		°C	12.0		11/04/2019	BHP AC 067

Authorised by:
Dervla Purcell**Date Authorised:**

25/04/2019

Laboratory Manager**Additional Information: (Opinions, where stated, are not covered by accreditation)**

Acc.: INAB Accredited

ND: None detected in volume analysed

^ Potable water matrix

* Subcontracted to an approved accredited laboratory

** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~: Sample Condition : ACCEPTABLE

TEST REPORT NO: 166826**Client:** Kilsaran Concrete LtdPiercetown
Dunboyne
Co. Meath

BHP Ref. No: 19/07/1499
Quote Ref: QM003858
Order No: To Follow
Sales Order: 63488
Date Received: 11/07/2019
Date Sampled: 11/07/2019
Date Completed: 22/07/2019
Sample Type: Surface Water



Testing
Analysing
Consulting

**BHP Laboratories**

New Road

Thomondgate

Limerick

Tel: +353 61 455399

Fax: +353 61 455261

Email: johnhalloran@bhp.ie

FTAO: James Kelliher
Site: Rossmore Quarry
BHP Ref: Quarterly_Surface Water
Client Ref: SW2

Test	Units	Results	Customer Limits	Date Analysed	Method
BTEX Compounds *	mg/L	<0.001		18/07/2019	1760
Chromium (VI) - Total	-	<0.05		16/07/2019	BHP AC 095
Total Phenols	mg/L	<0.003		22/07/2019	BHP AC 044
Barium (Total as Ba) Acc.	mg/L	0.041		15/07/2019	BHP AC 129
Mercury (Total as Hg) *	mg/L	<0.0005		18/07/2019	1450
Mineral Oils (>C ₁₀ -C ₄₀) *	mg/L	<0.01		18/07/2019	1670
pH	pH Units	7.87		11/07/2019	BHP AC 067
Temperature - Field	°C	15.7		11/07/2019	BHP AC 067
Copper (Total as Cu) Acc.	mg/L	<0.025		15/07/2019	BHP AC 129
Cadmium (Total as Cd) Acc.	mg/L	<0.005		15/07/2019	BHP AC 129
Chromium (Total as Cr) Acc.	mg/L	<0.005		15/07/2019	BHP AC 129
Nickel (Total as Ni) Acc.	mg/L	<0.01		15/07/2019	BHP AC 129

Authorised by:
Dervla Purcell**Date Authorised:** 23/07/2019**Laboratory Manager****Additional Information:**(Opinions, where stated, are not covered by accreditation)**Acc.:** INAB Accredited**ND:** None detected in volume analysed**^** Potable water matrix***** Subcontracted to an approved accredited laboratory****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.**~ :** Sample Condition : ACCEPTABLE

TEST REPORT NO: 171722**Client:** Kilsaran Concrete LtdPiercetown
Dunboyne
Co. Meath
BHP Ref. No: 19/10/2767
Quote Ref: QM003858
Order No: To Follow
Sales Order: 70001
Date Received: 24/10/2019
Date Sampled: 24/10/2019
Date Completed: 04/11/2019
Sample Type: Surface Water

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455399
Fax: +353 61 455261
Email: dervlapurcell@bhp.ie
FTAO: James Kelliher
Site: Rossmore Quarry
BHP Ref: Quarterly_Surface Water
Client Ref: SW2

Test	Units	Results	Customer Limits	Date Analysed	Method
BTEX Compounds *	mg/L	<0.001		01/11/2019	1760
Chromium (VI) - Total	-	<0.05		25/10/2019	BHP AC 095
Total Phenols	mg/L	<0.001		29/10/2019	BHP AC 044
Mercury (Total as Hg) *	mg/L	<0.0005		31/10/2019	1450
Mineral Oils (>C ₁₀ -C ₄₀) *	mg/L	<0.01		04/11/2019	1670
pH	pH Units	7.44		24/10/2019	BHP AC 067
Temperature - Field	°C	12.4		24/10/2019	BHP AC 067
Copper (Total as Cu) Acc.	mg/L	<0.025		30/10/2019	BHP AC 129
Cadmium (Total as Cd) Acc.	mg/L	<0.005		30/10/2019	BHP AC 129
Chromium (Total as Cr) Acc.	mg/L	<0.005		30/10/2019	BHP AC 129
Nickel (Total as Ni) Acc.	mg/L	<0.01		30/10/2019	BHP AC 129
Barium (Total as Ba) Acc.	mg/L	1.5		30/10/2019	BHP AC 129

Authorised by:
Dervla Purcell**Date Authorised:** 05/11/2019**Laboratory Manager****Additional Information:**(Opinions, where stated, are not covered by accreditation)**Acc.:** INAB Accredited**ND:** None detected in volume analysed**^** Potable water matrix***** Subcontracted to an approved accredited laboratory****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.**~ :** Sample Condition : ACCEPTABLE

TEST REPORT NO: 175028**Client:** Kilsaran ConcretePiercetown
Dunboyne
Co. Meath
BHP Ref. No: 20/01/1400
Quote Ref: QM003858
Order No: To Follow
Sales Order: 74553
Date Received: 16/01/2020
Date Sampled: 16/01/2020
Date Completed: 27/01/2020
Sample Type: Surface Water

Testing
Analysing
Consulting

BHP Laboratories
New Road
Thomondgate
Limerick
Tel: +353 61 455399
Fax: +353 61 455261
Email: dervlapurcell@bhp.ie
FTAO: James Kelliher
Site: Rossmore Quarry
BHP Ref: Quarterly_Surface Water
Client Ref: SW2

Test	Units	Results	Customer Limits	Date Analysed	Method
BTEX Compounds *	mg/L	<0.001		24/01/2020	1760
Chromium (VI) - Total	-	<0.05		23/01/2020	BHP AC 095
Total Phenols	mg/L	<0.001		27/01/2020	BHP AC 044
Mineral Oils (>C ₁₀ -C ₄₀) *	mg/L	<0.01		23/01/2020	1670
pH	pH Units	7.80		16/01/2020	BHP AC 067
Temperature - Field	°C	11.9		16/01/2020	BHP AC 067
Copper (Total as Cu) Acc.	mg/L	<0.025		21/01/2020	BHP AC 129
Cadmium (Total as Cd) Acc.	mg/L	<0.005		21/01/2020	BHP AC 129
Chromium (Total as Cr) Acc.	mg/L	<0.005		21/01/2020	BHP AC 129
Nickel (Total as Ni) Acc.	mg/L	<0.01		21/01/2020	BHP AC 129
Barium (Total as Ba) Acc.	mg/L	0.034		21/01/2020	BHP AC 129
Mercury (Total as Hg)	mg/L	<0.0003		21/01/2020	BHP AC 136

Authorised by:
Dervla Purcell**Date Authorised:** 27/01/2020**Laboratory Manager**

Additional Information: (Opinions, where stated, are not covered by accreditation)

Acc.: INAB Accredited

ND: None detected in volume analysed

^ Potable water matrix

* Subcontracted to an approved accredited laboratory

** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

TEST REPORT NO: 193628

Client: Kilsaran Concrete
 Piercetown
 Dunboyne
 Co. Meath

BHP Ref. No: 21/01/1292
Quote Ref: QM006457
Order No: To Follow
Sales Order: 99188
Date Received: 19/01/2021
Date Sampled: 19/01/2021
Date Completed: 26/01/2021
Sample Type: Surface Water



**Testing
 Analysing
 Consulting**



BHP Laboratories
 New Road
 Thomondgate
 Limerick
 Tel: +353 61 455399
 Fax: +353 61 455261
 Email: dervlapurcell@bhp.ie

FTAO: James Kelliher
Site: Rossmore Quarry
BHP Ref: Quarterly_Surface Water
Client Ref: SW2

Test	Units	Results	Customer Limits	Date Analysed	Method
BTEX Compounds *	mg/L	<0.001		25/01/2021	1760
Chromium (VI) - Total Acc.	mg/L	<0.05		23/01/2021	BHP AC 095
Total Phenols	mg/L	0.0020		26/01/2021	BHP AC 044
Mineral Oils (>C ₁₀ -C ₄₀) *	mg/L	<0.01		25/01/2021	1670
pH	pH Units	7.10		19/01/2021	BHP AC 067
Temperature - Field	°C	11.1		19/01/2021	BHP AC 067
Copper (Total as Cu) Acc.	mg/L	<0.025		22/01/2021	BHP AC 129
Cadmium (Total as Cd) Acc.	mg/L	<0.005		22/01/2021	BHP AC 129
Chromium (Total as Cr) Acc.	mg/L	<0.005		22/01/2021	BHP AC 129
Nickel (Total as Ni) Acc.	mg/L	0.014		22/01/2021	BHP AC 129
Barium (Total as Ba) Acc.	mg/L	0.034		22/01/2021	BHP AC 129
Mercury (Total as Hg)	mg/L	<0.0025		22/01/2021	BHP AC 136

Authorised by:

Dervla Purcell

Date Authorised: 27/01/2021

Laboratory Manager

Additional Information:(Opinions, where stated, are not covered by accreditation)

Acc.: INAB Accredited

ND: None detected in volume analysed

^ Potable water matrix

***** Subcontracted to an approved accredited laboratory

****** This sample has been analysed outside recommended stability times. It is therefore possible that the results provided may be compromised.

~ : Sample Condition : ACCEPTABLE

Appendix 7-D Enviropak Wastewater Treatment System



FM Environmental Service Report

File Copy

No:

44177

PHONE NO:

DATE OF SERVICE

21/10/14

CLIENT ORDER NO.

CLIENT NAME

Kilsaran Concrete

JOB No

28265

Existing Contract

Yes



No

TYPE OF SERVICE 1-PS

☐

2-STP

☐

3-GG

☐

4-BIOFILTER

☒

TYPE OF PLANT

VESI + FE

SERIAL NO.

PLANT LOCATION

Kilsaran plant.

CONTACT

ENSURE THAT ALL WORK ACTIVITY IS CARRIED OUT IN COMPLIANCE WITH FM ENVIRONMENTAL'S H&S POLICIES, PROCEDURES AND RISK ASSESSMENT
ACKNOWLEDGEMENT BY FME ENGINEER ☒

Electrical Checks

Insulation Reading 1 2
Inspection of Product 1 ☒ 2 ☒

Hour Run

High Level Alarm

Cable Damage

Overload Setting ☒

Current Drawn

Control Panel

Indicating Lights

Timers

Heaters ☒

Fuses ☒

Relay ☒

Switches ☒

Mechanical Checks

Check Lower Seal ☒

Oil Level ☒

Stator Housing ☒

Volute Casing ☒

Impeller ☒

Bearings ☒

Pipe Work ☒

Drive Belts

Pulleys

Drive Wheels

Coupling

Gear Box

Replacement Pump

Assessments

Settlement Test

DO Test Reading

Final Effluent Check ☒

Media Bio Growth ☒

Desludging Required Yes ☐ No ☒

Material Used

1

2

3

4

5

6

7

8

Engineers Recommendations Second unit (at old offices) not in use anymore.

Action Taken / Work Completed I checked the unit mechanically, electrically and for proper operation - working fine. NRV on FE pump unlocked. Additional irrigation holes drilled to lower the level inside the gutter.

Customer Signature: Sam Slem

FM Engineer Signature/s: Aleksander Bogun

Payment Received Yes ☒ No ☒ Amount £/€

Time of Arrival

Time of Departure

Date 21/10/14



FM ENVIRONMENTAL LTD. Greenbank Industrial Estate, Newry, BT34 2QX. N. Ireland

Telephone +44 (0) 28 302 66616 Fax +44 (0) 28 302 63233

email sales@fmenvironmental.com Website www.fmenvironmental.com





The Drain Man Ltd

Barrymore House , Carrigtwohill , Co. Cork

Mobile: (086 7807004)

Email: john@thedrainman.ie

V.A.T No 3197383DH

Service Agreement

Invoice Address

Site Address

Name: Kildaran Quarry	Name: Kilsaran Quarry ,
Address: Carrigtwohill Co Cork	Carrigtwohill , Co Cork
Tel No:021 4883120	Tel No:021 4883120
E-mail:	Start Date : 1/11/18
Our Ref	Expiry Date: 1/11/19

Plant Type	AERATION PLANT
Contract Period	12 MONTH
Contract Cost	1 visits per year @ €805.00 TOTAL €805.00

On acceptance of this agreement, The Drain Man Ltd will provide the following Services .

Service Plant ; Check electrical control panel, check airblower and change air filter, check aeration chamber and complete a cone test, check sludge return pump and waste valves and check outlet pumps.

Empty Tank and provide Disposal Cert

. The Agreement will come into force when this form has been completed and returned to The Drain Man Ltd,

3. The agreement will then continue, provided the subsequent year's fee has been paid on or before the renewal date, or until either party gives the other one month notice- in writing – for cancellation.

4. This service agreement is subject to the same terms and conditions as set out by The Drain Man Ltd

Notes:

1. A Service report will be sent to you after each visit confirming the satisfactory completion of each service. If any work is necessary outside the scope of the Service Agreement, it will be indicated in the service report. An Estimate will be given for the additional work on your request. Any additional work only is carried out on your specific written instructions.

2. As it is normally not necessary for anyone to be at home/on site in order for our engineer to carry out a service, please indicate if there are any access problems of which we should be aware.

I hereby enter into a Service Agreement with The Drain Man Ltd involving the work and conditions as set out above.

Client Name: Kilsaran Quarry .

Signature:

Date:

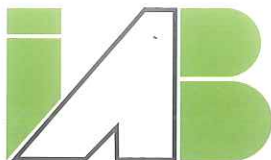
.....

John Cal Mc Grath

The Drain Man Ltd


13/11/18

**IRISH
AGRÉMENT
BOARD**



BUILDING PRODUCT CERTIFICATION

CERTIFICATE No. 00/0109

Cork Waste Water Treatment Units
Cloverhill, Ballymartle, Riverstick, Co. Cork

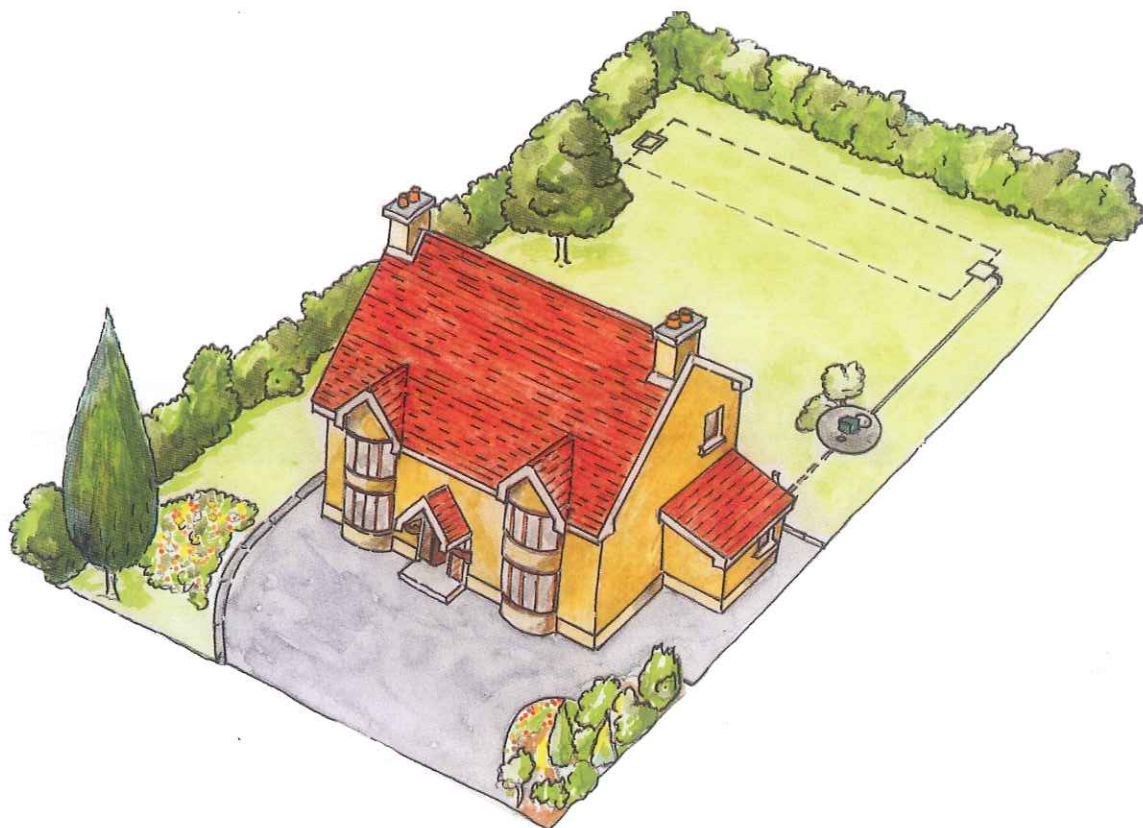
Tel: 021-4771000 Fax: 021:4771015

Approved Agents for : Enviropak

The Irish Agrément Board is designated by Government to issue European Technical Approvals.

Irish Agrément Board Certificates establish proof that the certified products are 'proper materials' suitable for their intended use under Irish site conditions, and in accordance with the **Building Regulations 1997**.

The Irish Agrément Board operates in association with the **National Standards Authority of Ireland (NSAI)** as the National Member of UEAtc.



PRODUCT DESCRIPTION

This Certificate relates to Enviropak Domestic Unit Sewage Treatment Plant for Single Dwellings.

USE

The product is for use in sewage treatment systems and for sewage collection systems designed in accordance with BS 6297: 1983 *Code of practice for design and installation of small sewage treatment works and cesspools* for the

collection of domestic sewage and for the separation and partial digestion of suspended matter.

MANUFACTURE AND MARKETING

The product is manufactured and marketed by:

Simon Allen Ltd. T/A Enviropak,
Kilcannon Industrial Estate, Enniscorthy
Co. Wexford, Republic of Ireland.
Tel: (054) 36900 Fax: (054) 36788

PART

1

CERTIFICATION

1.1 ASSESSMENT

In the opinion of the Irish Agrément Board (IAB), the Enviropak Domestic Unit Sewage Treatment Plant for

Single Dwellings is satisfactory for the purpose defined above, and meets the requirements of the Building Regulations 1997 as indicated in Section 1.2 of this Certificate.

1.2 BUILDING REGULATIONS 1997

Requirement:

D1 & D3 - MATERIALS AND WORKMANSHIP.

D3 – The Enviropak Domestic Unit Sewage Treatment Plant for Single Dwellings as certified in this Irish Agrément Board Certificate, is comprised of "proper materials" and is fit for its intended use (see Part 4 of this Certificate).

D1 – The Enviropak Domestic Unit Sewage Treatment Plant for Single Dwellings used in accordance with this Irish Agrément Board Certificate, meets the requirements for materials and workmanship.

PART H - DRAINAGE AND WASTE DISPOSAL

H1 Drainage Systems:

The Enviropak Domestic Unit Sewage Treatment Plant for Single Dwellings is easily installed and incorporated into soil percolation or waste water treatment systems to meet Building Regulation requirements.

H2 Septic Tanks

The Enviropak Domestic Unit Sewage Treatment Plant for Single Dwellings has been designed for use in waste water treatment systems, for the collection and treatment of domestic waste water when installed in accordance with the recommendations of BS 6297: 1983: *Code of practice for design and installation of small sewage treatment works and cesspools* and this Irish Agrément certificate.

The quality of treated waste water from the Enviropak Domestic Unit Sewage Treatment Plant for Single Dwellings exceeds that of the effluent from a septic tank and will meet the Building Regulation requirements.

Information on the design capacity, ventilation, safety and location requirements is given in this Irish Agrément Board Certificate (see sections 2.4, 3.2 and 4.6 of this certificate). The Enviropak Domestic Unit Sewage Treatment Plant for Single Dwellings can be used in domestic situations where septic tank systems are not acceptable, where sites do not comply with the recommendations of S.R.6. 1991 *Septic Tank Systems, Recommendations for Domestic Effluent Treatment and Disposal from a single Dwelling House* and/or where septic tank systems have been known to fail.

PART

2

TECHNICAL SPECIFICATION AND CONTROL DATA

2.1 DESCRIPTION

System Details

The Enviropak domestic unit sewage treatment plant for single house dwellings is a combined aerobic/anaerobic system and consists of an outer precast concrete tank and an inner polyethylene tank that is bolted to the base of the outer tank. The outer tank has a diameter of 2.3 m and a height of 2.3 m. Top water level is at about 1.4 m above the base (See Fig. 1). All liquid wastewater from the household (bathroom, toilet, kitchen and laundry) is treated. The clean, clear liquid is then automatically discharged by way of electric pump to the designated area.

The inner vessel is of rotationally moulded polyethylene. It has a diameter of 1.1 m and a height of 1.9 m. Top water level is at about 1.4 m above the tank base. The annular space between the two tanks accommodates:

- a clarifier, and
- a small suspended polypropylene sump (containing the system discharge pump) at the outlet side of the system.

The inlet pipe diameter is 100 mm while the system outlet pipe diameter is 25 mm. Internal pipework is generally 100 mm dia. uPVC except for the air supply which is 12 mm dia. The control system and air blower are enclosed within a plastic housing bolted to the top cover of the outer tank. A vent pipe is fitted in the cover.

Waste Treatment is carried out in three stages:

Stage 1:

Raw or untreated waste water from the dwelling first enters the outer tank where the solids are digested under anaerobic conditions and allowed to settle with the 'supernatant' liquor discharging to the inner tank via an aperture (100 mm dia.) located 600 mm above the base of the inner tank. As the walls of the inner tank extend above top water level floating solids are retained within the outer tank. The outer tank zone has a capacity of 3m³ and approximately 35% of the BOD concentration is removed at this stage.

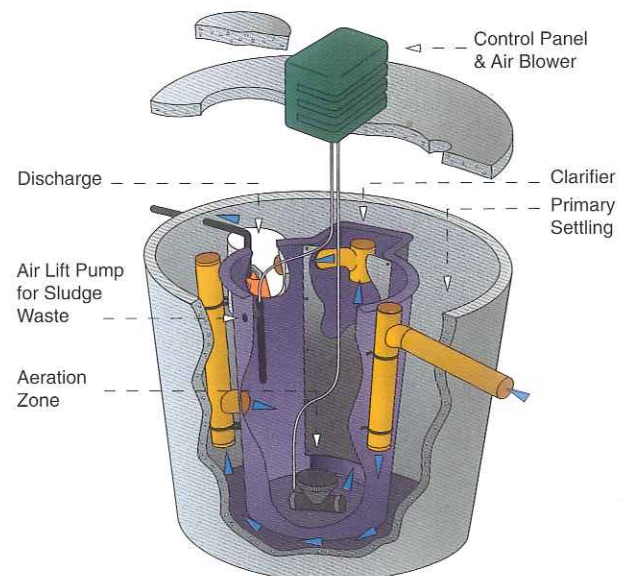


Fig. 1. Section of Enviropak Treatment Plant.

Stage 2:

The inner tank (about 1.5m³) allows the settled liquor to be biologically oxidised using an aeration system. The aeration system is comprised of a small 71 W double diaphragm air blower (80 l/min) and a rubber membrane fine bubble diffuser, which is fixed to the base of the inner tank.

Stage 3:

The liquor then passes into a clarifier (0.5m² surface area) via an opening near the base of the inner tank. The clarifier is part-hopper in shape containing both vertical and sloping walls (60°), and this encourages the biological solids to separate from the bulk liquor and fall back to the aeration zone. The concentration of biological solids can be controlled by solids withdrawal to the septic tank zone (using an airlift mechanism controlled by a time clock).

The supernatant liquid from the clarifier passes into the pump sump via a 100 mm dia. uPVC pipe. The pump duty is 4m³/h (with a 6 m head) and its motor is rated at 300 W. The pump transfers the treated waste water to the disposal location which may be a sub-surface percolation/irrigation system or a water course.

The Enviropak unit is designed for below ground installation and the outer tank is supplied with a precast concrete cover to permit inspection and maintenance.

The system is supplied with float switch operated alarms that indicate both pump failure and high water level.

2.2 MANUFACTURE

The outer precast concrete cylindrical tank is manufactured in a single pour from steel fibre reinforced concrete and the cover is manufactured from conventional reinforced concrete. The tank cover is sealed to the tank with tox seal compound. A polypropylene sump houses the system discharge pump. All metal fixings are in stainless steel. The tanks are fitted with two 1.7 ton capstan lifting anchors and the covers with stainless steel dowel/handles.

PRODUCT RANGE:

The tanks are designed to collect the waste water and sewage from dwellings having the populations shown in Table 1.

ANCILLARY ITEMS:

Concrete Inspection Hatch
Polypropylene Tank Dividers
Polybutylene Air Supply Lines
71W air blower pump
300 W Submersible pump
Electrical control panel float switch and alarm
Connections and ventilating pipes
uPVC inlet and outlet sockets
uPVC underground drain pipes and fittings
Connection to vitrified clay pipes
Connections and ventilating pipes
Tox seal compound for cover

All components in contact with effluent are made of Concrete, uPVC, Polypropylene, Polyethylene or Stainless steel.

Table 1: Enviropak Domestic Unit Sewage Treatment Plant - basic information

Outer concrete tank unit size (litre)	3000
Internal polyethylene separation tank (litre)	1640
Population served	6 - 8
Weight (tonnes)	6
Inlet pipe depth (mm) [top of tank to centre line of pipe]	400
Outlet pipe depth (mm) [top of tank to centre line of pipe]	650
Overall height (mm)	2300
Diameter (mm)	2300
Desludge volume (m ³)	3
Air Pump Rating Single phase (W)	71
Discharge Pump Rating 3 phase (W)	300
Approx. daily power consumption kWh/day)	1.78

QUALITY CONTROL

Quality control includes wall thickness checks on concrete components, and the checking of bought-in components against specification. Each completed unit is checked and test-run for one hour to ensure that it is mechanically sound.

2.3 DELIVERY, STORAGE AND MARKING

The tanks are completed ready for delivery at the manufacturer's works. The Enviropak unit must be lifted with slings at the points recommended by the manufacturer. Off-loading must be carefully supervised using chains, steel cables or lifting bars rated in excess of 3.5 tonnes. Lifting equipment should be selected by taking into account the unit weight dimensions and the distance of lift required (the weight of each unit empty is given in Table 1) and should conform with the requirements of the *Safety, Health and Welfare at Work Act, 1989*. The manufacturer's instructions must be followed to avoid damage to the tanks during off-loading and placing in the excavation. A crane or other suitable lifting equipment must be employed.

The product bears the marketing company's name, labels denoting the inlet and outlet, a list of all the items supplied, installation and operating instructions, the product specification code, serial number and the inspection date. An external label indicates the IAB identification mark incorporating the certificate number.

2.4 INSTALLATION PROCEDURE

2.4.1 GENERAL

Simon Allen Ltd. provide a service for the design, site survey and installation of Enviropak units. They will also advise clients of the installation requirements, or provide supervision of installations carried out by others.

Electrical connections to the Enviropak domestic unit from the control box must be carried out by a competent person using material suitable for the purpose.

Electrical connections must be in strict accordance with the manufacturers instructions and must comply with 'The National Rules For Electrical Installations' (ETCI), published by the 'Electro-Technical Council of Ireland' (Document No. ET101/1991: AJ/1997).

Cables must be protected from accidental damage by a suitable conduit or other means of protection. The electrical control panel and housing must be sited adjacent to the unit for accessibility but not so close that the panel and Enviropak tank contents (effluent) can be touched simultaneously. The panel must be protected from accidental damage by vehicles.

The Enviropak domestic unit must not be installed in areas liable to localised flooding without adequate protection as specified by the manufacturer.

It is essential to take precautions to prevent damage by site traffic. Superimposed loads from vehicles etc. should not be permitted within a distance equal to the depth of excavation, unless suitable structural protection is provided. A suitable fence should be installed to prevent vehicles and farm animals from approaching too close to the unit.

Enviropak units are installed partly buried so that the rim of the unit is 25 mm above ground level. The excavation must be large enough for easy placement of the unit, permit subsequent backfilling and to allow timbering and sheeting as required to meet the requirements of The Safety, Health and Welfare at Work Act, 1989 (See Fig. 2).

The bottom of the excavation should be level and covered with sand. Any large stones, boulders etc. must be removed from the bearing layer prior to installation to prevent damage to the tank bottom when installed. The excavation must also be free of water. When installed the top flange of the Enviropak domestic unit must be level to within 5 mm and backfilled with gravel.

The backfill must be carefully consolidated around the Enviropak unit, with all large stones /boulders removed to ensure even transfer of ground loads and to prevent localised stress concentrations. The Enviropak units should

be ballasted with water keeping the water level just above the backfill level as work progresses.

Pipe Connections

The tank is connected to 100 mm PVC-U pipes as required at the inlet. For other types of pipe such as vitrified clayware etc. suitable adapters are used with short lengths of PVC-U pipe as necessary. A short length of pipe with flexible joints must be used adjacent to the Enviropak units to allow for differential movement between the Enviropak units and adjacent pipe runs. Suitable 25 mm adaptors should be connected to the outlet pipe.

2.4.2 LOCATION

The Enviropak domestic unit location should be chosen so that adequate access is available for safe installation and subsequent maintenance and desludging of the unit. Desludging should be carried out by means of a desludging tanker which requires access to within 30m of the unit. The minimum separation distances from the Enviropak domestic unit and the effluent percolation system are given in Table 2. Ventilation must be provided in accordance with the Building Regulations 1997.

Table 2

FEATURE	MINIMUM SEPARATION (m)	
	Enviropak Recommendations	
	Enviropak unit	Irrigation Area
Dwelling served	5 ⁽¹⁾	5 ⁽³⁾ -10
Adjacent dwelling	10 ⁽¹⁾	5 ⁽³⁾ -10
Wall	3 ⁽¹⁾	3
Road	3 ⁽¹⁾	3
Site boundary	3 ⁽¹⁾	3
Potable water source	10	20 – 100 ⁽²⁾
Watercourse	5	5

- (1) The depth of the excavation to accommodate the Enviropak unit must be taken into account when determining these distances. The separation distance should be such that the excavation does not undermine adjacent buildings, boundaries, roads or walls. This distance should not be less than 1.5 times the excavation depth.
- (2) This separation distance should not be less than 20 metres but in the case of very free draining soils or gravels a minimum distance of 40 metres should be maintained. The irrigation area should be downhill of any nearby well. Where this is not possible a separation distance of at least 100 metres must be maintained.
- (3) These minimum permissible distances are for guidance and have been established on the basis of performance tests on the Enviropak Domestic Unit Sewage Treatment Plant in use and subject to normal loading but each site should be assessed on its own merits. However, where the site permits, irrigation areas should be located at greater separation distances from the dwelling. Also, where practical, on sloping sites the irrigation area should be down slope from the dwellings.

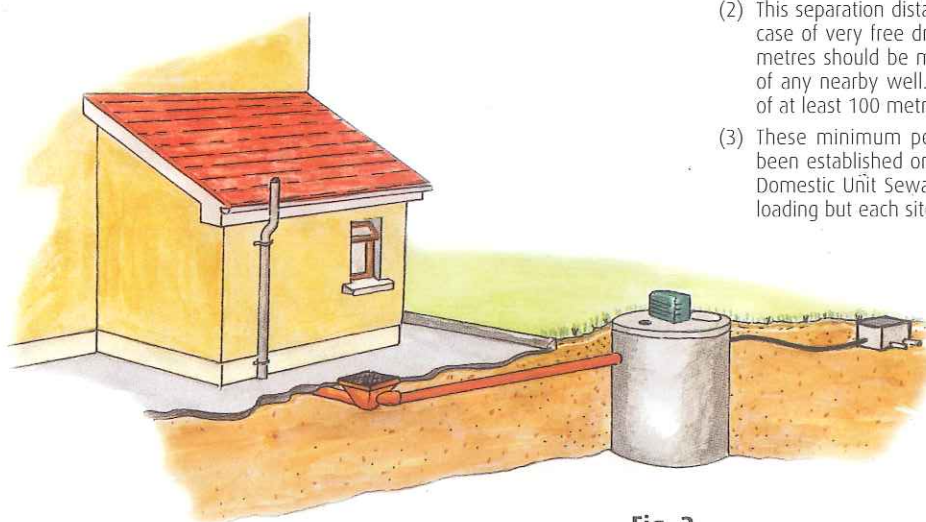


Fig. 2.

2.4.3 TREATED WASTE WATER DISPOSAL

General Principles

The Enviropak domestic unit sewage treatment plant for single dwellings produces fully treated water, (BOD < 20, suspended solids < 30), which is more easily absorbed into soil strata than septic tank effluent.

There are three possible methods for disposal of treated waste water

- Sub-Surface irrigation, or
- Raised percolation bed, or
- Discharge to surface water, either directly or following a polishing filter. (A licence must be obtained from the local authority if this option is chosen).

In the event of the site failing the 'T' test it may be necessary to construct a raised percolation area.

In any event a site suitability report including a detailed visual inspection of the site, inspection of a trial hole for soil profile, depth of water table, and percolation value, should be carried out together with reference to local knowledge as appropriate. This report should be used to ascertain the size and type of percolation required.

The results of this assessment will enable the selection of the most suitable method for disposing of the final treated effluent, having regard to soil type, irrigation characteristics, water table level and other factors. The disposal method will be either to sub-surface irrigation, raised percolation area or direct to surface waters by licence, which should be obtained from the local authority.

Guidance for sizing of the percolation area is set out in Table 3. Treated waste water is discharged from the Enviropak domestic unit by pumping.

**Table 3: Guidance for sizing of percolation area
(in linear metres of irrigation pipe)
Percolation Value ('T' Value)**

Population Served	less than 10	10-15	15-30	30-60	Greater than 60
6	15m	18m	24m	48m	72m
8	20m	24m	32m	64m	108m

(a) Sub-surface irrigation

Where sub-surface irrigation is to be used the extent of the treated waste water disposal area will be based on the results of percolation tests.

The treated waste water discharges, by pump, into a network of perforated 110mm diameter pipes laid in stone filled trenches (see Fig. 3). The objective is to spread the effluent as evenly as possible over the required land area, thus minimising the possibility of the ground becoming over-saturated.

The discharge from the Enviropak domestic unit has minimal suspended solids and is therefore much more readily absorbed than septic tank effluent. The extent of

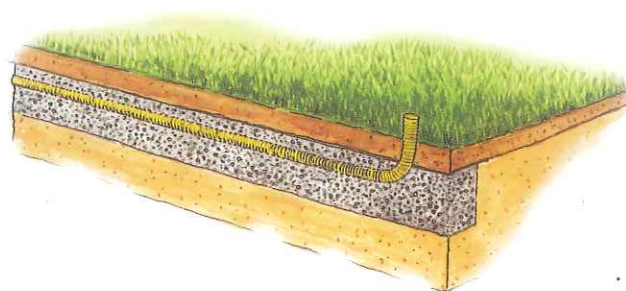


Fig. 3. Section through Percolation Distribution Trench.

the irrigation system may be determined by the site assessment, taking into account the soil type and percolation test results, as well as the population to be served; (See table 3). These values are given for guidance only and should be discussed in detail with the site surveyor.

The irrigation area will be equivalent to the linear pipe length as shown in Table 3 above (assuming 1 metre wide trenches).

Trenches are generally 300-1000mm wide with the pipes laid on 250mm of clean 15-25mm stone and covered with a polyethylene or geo-textile soil barrier. Layout of the trenches will be determined by site topography, the overall fall of the pipes should be not more than 1 in 200. The pipes should be at least 1 metre above the highest water table level or fissured rock strata.

(b) Raised percolation bed

Where the irrigation pipes have to be above existing ground level; e.g. thin topsoil's and /or rock or water table close to the surface, a raised or banked-up irrigation system may be suitable. It is generally similar to sub-surface irrigation. (See Figure 4).

(c) Discharge to a watercourse

Where poor soil percolation or other factors make a sub-surface irrigation system impractical, discharge to a watercourse may be considered. This will require a license from the local authority, setting the minimum acceptable discharge quality. The treated wastewater is filtered through a layer of sand or topsoil before passing to the watercourse.

Access to all effluent percolation systems should be provided at the end of each irrigation or filter trench via a suitably constructed inspection chamber.

In respect of sizing of percolation areas and minimum separation distances, the recommendations of the EPA Waste Water Treatment Manuals should also be consulted.

Further treatment

In some instances (e.g. proximity to a drinking water source), the effluent may require "polishing" before discharge to reduce coliform bacteria levels. A commonly used method is to pass the discharge through a sand filter. Where this further treatment is required the discharge from the Enviropak domestic unit is pumped to the filter using an effluent pump set capable of discharge in 180 litre

doses. Polishing filters can be partly or wholly above ground, soil covered or open; a typical filter serving a four-person household would have a plan area of 8-20m², depending on design and type of sand used.

N.B. Disinfection systems may also be used in consultation with the manufacturer.

2.5 Commissioning

Commissioning by a competent person should be carried out after installation and this service is available from the installer or designated service provider.

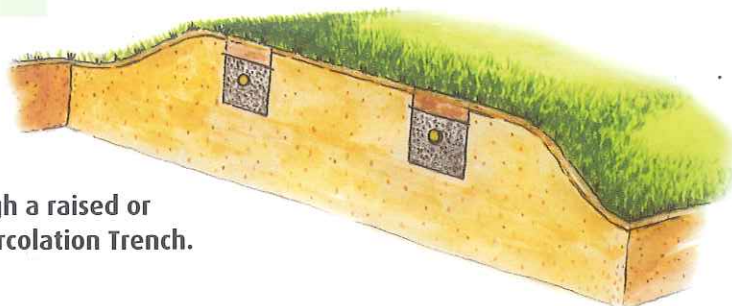


Fig. 4. Section through a raised or banked-up Percolation Trench.

PART

3

DESIGN DATA

3.1 GENERAL

The Enviropak domestic unit is suitable for the collection and treatment of domestic sewage and should be installed in accordance with the manufacturer's instructions and to conform with the recommendations of BS 6297: 1983 *Code of practice for the design installation of small sewage treatment works and cesspools*. It is important that the loadings are based on the maximum population to be served.

Enviropak domestic units should be sited in accordance with the relevant Building Regulations.

Ground water and flood levels should always be below plant outlet level.

The discharge from the Enviropak domestic unit must be to a suitable sub-soil irrigation system, raised percolation bed, or watercourse to the requirements of the Local Authority.

The effluent resulting from the sewage treated by the Enviropak domestic unit will normally be within Royal Commission Standard (i.e. suspended solids content less than 30 mg per litre and Biochemical Oxygen Demand (BOD) less than 20 mg per litre) provided that the hydraulic and BOD loadings are within the limits recommended by the manufacturer for the unit installed (200 litres per head per day and 60 grammes per head per day, respectively). Under certain unusual conditions the resulting effluent may not be within Royal Commission Standards. This is normal for any biological sewage treatment process, and can be caused by unusual hydraulic or BOD loading, weather conditions, contamination by grease, or poisoning of microbiological fauna or flora by chemicals or antibiotics.

The Enviropak domestic unit has a holding capacity for 36 hours to cater for breakdown.

3.2 DESIGN BASIS

The sizes and relevant dimensions of the Enviropak domestic unit covered by the Irish Agrément Board certificate are shown in Table 1.

System Alarm - Water level

All units are fitted with a warning device, connected to an alarm. This alarm system will be activated by a power surge, power failure or blockage within the unit.

3.2.1 WASTE WATER QUALITY

Table 4: Treated waste water characteristics:

	Standard*
pH	6-9
Biochemical Oxygen Demand	< 20 mg/l
Suspended Solids	< 30 mg/l
Ammonia	< 20 mg/l N
Nitrate	32mg/l N
Total Phosphorus	16.5mg/l P
E. coli (by soil treatment or disinfection)	

* These figures can be improved as an option by a special design – details on request from the manufacturer.

A short period of acclimatisation must be allowed after commissioning of the unit before a full level of treatment can be expected. This period is generally a few weeks and is normal for any biological treatment plant.

4.1 ENVIRONMENTAL ASSESSMENT

The treated waste water from a number of working installations has been comprehensively monitored for 12 months. The test results show that values stated for the parameters listed in Table 4 are consistently achievable over a range of operating conditions.

4.2 STRENGTH

The manufacturer's design has been assessed as satisfactory. The tank has adequate resistance to withstand impacts during handling and placing and should prove satisfactory when installed in accordance with this Certificate.

The manhole covers are suitable for pedestrian traffic.

4.3 LIQUID WATER PENETRATION

The tank with its pipe connections, when correctly installed, has been assessed as fully capable of preventing seepage either into or from the surrounding soil. The pipe joints, when correctly made, will be watertight.

4.4 DURABILITY

The Enviropak domestic unit when installed, used and maintained in accordance with the requirements of this Irish Agrément Board certificate, will have a life in excess of 40 years in normal soil conditions. Sites with aggressive soil conditions such as landfill sites or sulphate bearing soils will require an appropriate cement type and content, reinforcement type and concrete strength as specified by the manufacturer.

4.5 CLEANING AND MAINTENANCE

Cleaning and maintenance should be carried out in accordance with the Operation and Maintenance Instructions supplied by Simon Allen Ltd. T/A Enviropak. The manufacturers also provide a maintenance contract.

Summary of maintenance instructions

The Enviropak domestic unit is desludged by a suction tanker. Care must be taken to avoid damage by the hose nozzle. The primary settlement zone only must be desludged in accordance with the manufacturer's recommendation. For the average dwelling this may require cleaning once every 12 months.

4.6 SAFETY

4.6.1 SAFETY OF PERSONNEL

The tank cover is securely fixed to prevent unauthorized access. The cover must not be left off an unattended tank. The manufacturer provides a locking device to the cover to ensure that it can not be removed without the key. Tanks are potentially dangerous, particularly when being desludged. Desludging must never be carried out alone. Tank entry should not be attempted except by trained personnel. Naked flames, which can cause explosions, must not be used in the vicinity of the tanks.

All Enviropak domestic units should be located, positioned and marked to prevent superimposed loading or accidental impact by vehicles.

4.6.2 SAFETY OF SYSTEM

The Enviropak domestic unit has a holding capacity of 36 hours to cater for breakdown. All Enviropak domestic units are fitted with a warning and alarm system. The alarm will be activated by a power surge, power failure or blockage within the unit.

4.7 TESTS AND ASSESSMENTS WERE CARRIED OUT TO DETERMINE

- Watertightness.
- Strength of covers.
- Resistance of units to hydrostatic and ground pressure.
- Resistance to flotation
- Environmental performance

4.8 OTHER INVESTIGATIONS

- (i) Existing data on the history of use of previous installations.
- (ii) The manufacturing process was examined including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.
- (iii) Site visits were conducted to assess the practicability of an installation.
- (iv) A user survey and visits to established sites were conducted to evaluate environmental performance in use.
- (v) To date no failures of the product in use have been reported to the IAB.

5.1 CONDITIONS OF CERTIFICATION

The National Standards Authority of Ireland ("NSAI") following consultation with the Irish Agrément Board ("IAB") has assessed the performance and method of installation of the product/process and the quality of the materials used in its manufacture and certifies the product/process to be fit for the use for which it is certified provided that it is manufactured, installed, used and maintained in accordance with the descriptions and specifications set out in this certificate and in accordance with the manufacturer's instructions and usual trade practice. This certificate shall remain valid so long as:

- (a) the specification of the product is unchanged;
- (b) the Building Regulations, 1997 and any other regulation or standard applicable to the product/process, its use or installation remain unchanged;
- (c) the product continues to be assessed for the quality of its manufacture and marking by NSAI;
- (d) no new information becomes available, which in the opinion of the NSAI would preclude the granting of the certificate;
- (e) the product or process continues to be manufactured, installed, used and maintained in accordance with the description, specifications and safety recommendations set out in this certificate.

5.2 The IAB mark and certification number may only be used on or in relation to products/processes in respect of which a valid certificate exists. If the certificate becomes invalid, the certificate holder must not use the IAB mark and certification number and must remove them from products already marked.

5.3 In granting this certificate, the NSAI makes no representation as to:

- (a) the presence or absence of patent rights subsisting in the product/process; or
- (b) the legal right of the certificate holder to market, install or maintain the product/process; or
- (c) whether individual products have been manufactured or installed by the certificate holder in accordance with the descriptions and specifications set out in this certificate.

5.4 This certificate does not comprise installation instructions and does not replace the manufacturer's directions or any professional or trade advice relating to use and installation which may be appropriate.

5.5 Any recommendations contained in this certificate relating to the safe use of the certified product or process are preconditions to the validity of the certificate. However, the NSAI does not certify that the manufacture or installation of the certified product or process in accordance with the descriptions and specifications set out in this certificate will satisfy the requirements of the Safety, Health and Welfare at Work Act, 1989 or of any other current or future statute or current or future common law duty of care owed by the manufacturer or by the certificate holder.

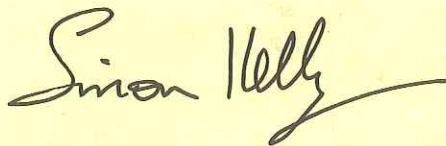
5.6 The NSAI is not responsible to any person or body for loss or damage, including personal injury, arising as a direct or indirect result of the use of this product or process.

5.7 Where reference is made in this certificate to any Act of the Oireachtas, regulation made thereunder, statutory instrument, code of practice, national standards, manufacturer's instructions or similar publication, it shall be construed as reference to such publication in the form in which it is in force at the date of this certification.

THE IRISH AGRÉMENT BOARD

This Certificate No. 00/0109 is accordingly granted to Simon Allen Ltd. T/A Enviropak on behalf of The Irish Agrément Board.

Date of Issue: July 2000



Signed: _____
Chief Executive, NSAI

Readers may check that the status of this Certificate has not changed by contacting the Irish Agrément Board, NSAI, Glasnevin, Dublin 9, Ireland.

Telephone: (01) 807 3800.
Telefax: (01) 807 3842.



BUILDING PRODUCT CERTIFICATION

**Irish Agrément Board,
NSAI,
Glasnevin,
Dublin 9.
Ireland.**

**Telephone: (01) 807 3800.
Telefax: (01) 807 3842.**

Appendix 7-E Groundwater Level Data

Date	Measured Depth to Water (m)				Elevation of Water (mAOD)			
	GW1	GW2	GW3	GW4	GW1	GW2	GW3	GW4
09/05/2019	11.46	7	8.56	20.95	-18.28	-3.24	-5.47	-12.64
16/05/2019	11.66	7.15	9.77	21.15	-18.48	-3.39	-6.68	-12.84
23/05/2019	11.42	7.32	8.31	21.14	-18.24	-3.56	-5.22	-12.83
30/05/2019	11.76	7.56	10.08	21.33	-18.58	-3.8	-6.99	-13.02
06/06/2019	11.7	7.49	9.26	20.84	-18.52	-3.73	-6.17	-12.53
13/06/2019	11.53	7.65	10.13	21.25	-18.35	-3.89	-7.04	-12.94
20/06/2019	10.6	7.06	9.24	20.61	-17.42	-3.3	-6.15	-12.3
27/06/2019	10.21	8.54	10.9	21.46	-17.03	-4.78	-7.81	-13.15
04/07/2019	11.65	7.95	10.16	21.17	-18.47	-4.19	-7.07	-12.86
11/07/2019	10.9	8.31	9.54	20.94	-17.72	-4.55	-6.45	-12.63
18/07/2019	10.31	8.91	10.04	20.96	-17.13	-5.15	-6.95	-12.65
25/07/2019	10.4	8.12	10.08	20.8	-17.22	-4.36	-6.99	-12.49
01/08/2019	10.8	8.9	10.01	20.9	-17.62	-5.14	-6.92	-12.59
08/08/2019	10.1	8.79	9.86	20.76	-16.92	-5.03	-6.77	-12.45
15/08/2019	10.1	8.9	9.95	20.51	-16.92	-5.14	-6.86	-12.2
22/08/2019	11.66	8.48	11.6	21.45	-18.48	-4.72	-8.51	-13.14
29/08/2019	11.68	8.6	12.98	21.4	-18.5	-4.84	-9.89	-13.09
05/09/2019	11.2	8.51	11.61	21.2	-18.02	-4.75	-8.52	-12.89
12/09/2019	11.6	8.67	11.1	21.74	-18.42	-4.91	-8.01	-13.43
19/09/2019	11.98	8.69	11.47	21.84	-18.8	-4.93	-8.38	-13.53
26/09/2019	11.73	8.8	12.48	21.4	-18.55	-5.04	-9.39	-13.09
03/10/2019	11.58	8.47	10.18	20.54	-18.4	-4.71	-7.09	-12.23
10/10/2019	Blasting	8.43	11.23	21.27		-4.67	-8.14	-12.96
17/10/2019	11.7	9	11.9	21.4	-18.52	-5.24	-8.81	-13.09
24/10/2019	10.9	9	11	21.5	-17.72	-5.24	-7.91	-13.19
31/10/2019	11.2	8	11	20.9	-18.02	-4.24	-7.91	-12.59
07/11/2019	11	8.7	11.4	22	-17.82	-4.94	-8.31	-13.69
14/11/2019	10.4	7.59	10.9	21.5	-17.22	-3.83	-7.81	-13.19
21/11/2019	10.58	8.42	10.97	22.07	-17.4	-4.66	-7.88	-13.76
28/11/2019	10.94	7.99	10.41	22.01	-17.76	-4.23	-7.32	-13.7
05/12/2019	- ramp was	9.12	10.94	22.08		-5.36	-7.85	-13.77
12/12/2019	- ramp was	7.94	11.24	22		-4.18	-8.15	-13.69
18/12/2019	- ramp was	7.82	10.91	20.14		-4.06	-7.82	-11.83
09/01/2020	- ramp was	7.9	11.21	21.49		-4.14	-8.12	-13.18
16/01/2020	- ramp was	8.12	10.94	21.76		-4.36	-7.85	-13.45
23/01/2020	- ramp was	7.14	11.21	20.71		-3.38	-8.12	-12.4
30/01/2020	11.33	7.04	11.05	20.01	-18.15	-3.28	-7.96	-11.7
06/02/2020	11.04	7.12	10.51	22.01	-17.86	-3.36	-7.42	-13.7
13/02/2020	11.58	7.64	10.82	20.91	-18.4	-3.88	-7.73	-12.6
20/02/2020	10.91	7.24	10.63	21.6	-17.73	-3.48	-7.54	-13.29
28/02/2020	11.14	6.8	11.82	20.28	-17.96	-3.04	-8.73	-11.97
05/03/2020	10.82	7.28	10.81	20.91	-17.64	-3.52	-7.72	-12.6
12/03/2020	10.98	7.25	10.62	20.91	-17.8	-3.49	-7.53	-12.6
19/03/2020	10.61	7.51	10.86	22.1	-17.43	-3.75	-7.77	-13.79
26/03/2020	10.82	7.61	10.16	22.21	-17.64	-3.85	-7.07	-13.9
27/05/2020	11.90	10.70	16.40	25.51	-18.72	-6.94	-13.31	-17.20
03/06/2020	12.20	10.50	12.62	17.80	-19.02	-6.74	-9.53	-9.49
10/06/2020	11.95	9.80	12.45	18.60	-18.77	-6.04	-9.36	-10.29

Date	Measured Depth to Water (m)				Elevation of Water (mAOD)			
	GW1	GW2	GW3	GW4	GW1	GW2	GW3	GW4
18/06/2020	13.90	9.70	15.70	18.30	-20.72	-5.94	-12.61	-9.99
24/06/2020	12.10	10.90	19.90	20.20	-18.92	-7.14	-16.81	-11.89
01/07/2020	13.30	11.50	14.31	18.70	-20.12	-7.74	-11.22	-10.39
08/07/2020	13.42	11.80	13.77	18.90	-20.24	-8.04	-10.68	-10.59
15/07/2020	10.80	11.22	14.45	19.70	-17.62	-7.46	-11.36	-11.39
23/07/2020	12.60	10.10	14.40	18.80	-19.42	-6.34	-11.31	-10.49
29/07/2020	12.50	10.20	14.44	19.70	-19.32	-6.44	-11.35	-11.39
05/08/2020	12.51	9.22	13.50	21.22	-19.33	-5.46	-10.41	-12.91
12/08/2020	12.17	10.93	14.43	21.72	-18.99	-7.17	-11.34	-13.41
19/08/2020	14.47	12.23	15.77	21.84	-21.29	-8.47	-12.68	-13.53
26/08/2020	13.67	11.18	15.44	21.94	-20.49	-7.42	-12.35	-13.63
02/09/2020	13.37	10.11	14.53	20.22	-20.19	-6.35	-11.44	-11.91
09/09/2020	13.11	11.73	16.37	22.22	-19.93	-7.97	-13.28	-13.91
16/09/2020	13.37	10.11	14.63	20.22	-20.19	-6.35	-11.54	-11.91
23/09/2020	14.87	12.17	15.12	22.31	-21.69	-8.41	-12.03	-14.00
30/09/2020	12.64	11.44	14.15	20.97	-19.46	-7.68	-11.06	-12.66
07/10/2020	13.17	10.41	14.62	19.37	-19.99	-6.65	-11.53	-11.06
14/10/2020	10.11	9.84	13.43	19.63	-16.93	-6.08	-10.34	-11.32
21/10/2020	13.34	11.71	15.41	22.33	-20.16	-7.95	-12.32	-14.02
28/10/2020	12.07	10.63	13.27	20.19	-18.89	-6.87	-10.18	-11.88
04/11/2020	13.23	10.41	15.16	20.83	-20.05	-6.65	-12.07	-12.52
10/11/2020	13.41	11.33	15.71	20.62	-20.23	-7.57	-12.62	-12.31
18/11/2020	13.62	11.12	14.41	19.67	-20.44	-7.36	-11.32	-11.36
25/11/2020	11.82	9.47	14.73	19.62	-18.64	-5.71	-11.64	-11.31
02/12/2020	12.41	10.08	14.11	19.61	-19.23	-6.32	-11.02	-11.30
09/12/2020	11.77	10.44	15.88	20.63	-18.59	-6.68	-12.79	-12.32
16/12/2020	10.08	12.67	16.42	19.61	-16.90	-8.91	-13.33	-11.30
13/01/2021	11.67	9.91	16.36	18.17	-18.49	-6.15	-13.27	-9.86
20/01/2021	12.72	10.21	15.64	19.79	-19.54	-6.45	-12.55	-11.48
27/01/2021	11.57	10.67	16.11	18.91	-18.39	-6.91	-13.02	-10.60
10/02/2021	10.67	9.30	14.67	19.90	-17.49	-5.54	-11.58	-11.59
17/02/2021	12.44	9.47	14.74	19.12	-19.26	-5.71	-11.65	-10.81
24/02/2021	6.39	9.19	10.11	20.36	-13.21	-5.43	-7.02	-12.05
03/03/2021	11.62	10.17	16.57	20.45	-18.44	-6.41	-13.48	-12.14
10/03/2021	12.21	9.37	16.44	21.28	-19.03	-5.61	-13.35	-12.97
24/03/2021	11.83	9.61	15.96	20.32	-18.65	-5.85	-12.87	-12.01
31/03/2021	11.01	8.76	10.39	20.94	-17.83	-5.00	-7.30	-12.63
07/04/2021	9.05	10.62	15.40	18.93	-15.87	-6.86	-12.31	-10.62
14/04/2021	10.33	9.34	16.78	20.88	-17.15	-5.58	-13.69	-12.57
21/04/2021	9.80	9.10	15.90	19.95	-16.62	-5.34	-12.81	-11.64
28/04/2021	10.30	9.50	16.30	20.45	-17.12	-5.74	-13.21	-12.14
05/05/2021	11.90	12.10	18.50	21.60	-18.72	-8.34	-15.41	-13.29
12/05/2021	13.49	12.65	19.84	21.75	-20.31	-8.89	-16.75	-13.44
19/05/2021	12.10	11.90	19.52	21.00	-18.92	-8.14	-16.43	-12.69
26/05/2021	11.55	11.32	19.10	20.85	-18.37	-7.56	-16.01	-12.54
02/06/2021	11.45	10.08	19.58	21.10	-18.27	-6.32	-16.49	-12.79
11/06/2021	10.82	7.90	15.90	21.10	-17.64	-4.14	-12.81	-12.79