

## 7 WATER

### 7.1 INTRODUCTION

This section of the EIS has been compiled by TOBIN Consulting Engineers to address the characterisation of the water environment within and surrounding the subject site. The water environment provides a description of the surface water environment and the sub-terrain groundwater environment.

Mullaghcrone Quarry is located approximately 1 km to the southeast of Donore Village. The location of the quarry in relation to its surrounding environment and the regional surface water drainage is shown on Figure 7.1.

Roadstone Ltd is seeking a waste licence within the site. This EIS is prepared to assess the potential and predictable impact of continuing infilling, within Mullaghcrone Quarry. It is proposed to infill material at the site, with infilling continuing 30m above the watertable.

#### 7.1.1 Study Methodology

This section of the EIS has been compiled by TOBIN Consulting Engineers to address the water environment within and surrounding the subject site. The water environment is divided into a description of the surface water environment and the sub-terrain groundwater environment.

This report has been prepared using the recommendations set out in the EPA document 'Guidelines on Information to be contained in Environmental Impact Statements' (2002). The guidelines and recommendations of the Institute of Geologists of Ireland (IGI) publication 'Geology in Environmental Impact Statements – A Guide, 2003' was also taken into account in the preparation of this Chapter.

The site is located, in a semi-rural to industrial area within the townland of Cruicerath and Platin, approximately 1 km to the southeast of Donore Village, Co. Meath. The application area occupies 15.3 ha within an overall landholding of 93.8 hectares.

The assessment of the water environment consisted of:

- A desk study of available information;
- A review of site specific investigations, relating to surface water and groundwater;
- A site walk-over of the site and surrounding area;
- Groundwater quality monitoring;
- Hydrogeological testing and assessment;
- Surface water quality monitoring and flow measurements; and
- Interpretation of all data.

Information retained by the Geological Survey of Ireland (GSI), the Office of Public Works (OPW) and Environmental Protection Agency (EPA) was accessed to provide the hydrological and hydrogeological setting of the site. Relevant documents and datasets used to provide the setting of the site included EPA Water Quality Data, topography maps, and GSI Hydrogeological Data.

### 7.1.2 Survey Constraints

In terms of available information for Mullaghcrone Quarry, significant information and data was available from published information sources at the outset of the assessment by TOBIN Consulting Engineers.

The surface water environment is characterised by flow hydraulics/hydrometrics and existing water quality. However the groundwater environment is naturally more difficult to characterise owing to the subterranean nature of flow.

Previous hydrogeological studies by TOBIN Consulting Engineers (2003) and John Barnett & Associates 2008 (now SLR Consulting) have determined the direction of groundwater flow within the surrounding region. The drilling of boreholes and subsequent water level monitoring was undertaken with the objective of calculating the groundwater flow direction underlying the site. The aquifer is heterogeneous in nature, in that its hydraulic properties vary laterally and vertically within the rock mass. The heterogeneity is influenced by the relatively permeable areas of the jointing/fracturing of the rock and relatively impermeable areas where the rock mass is intact. The degree of interconnectivity of the joints/fractures also influences the heterogeneity.

The complexity of the hydrogeological setting of the aquifer was carefully assessed. The impact assessment has taken account of the data available and the water level analysis.

In terms of site investigations and data collection, TOBIN Consulting Engineers consider that sufficient information is available to characterise the water environment and to determine the potential impact of the development. No seasonal constraints were encountered.

## 7.2 EXISTING ENVIRONMENT

The purpose of this section is to describe:

The surface water environment;

- Surface water features and regional drainage;
- Assessment of hydrometric data;
- Surface water abstractions within the catchment of the site; and
- Surface water quality.

The groundwater environment:

- Hydrogeological setting of the site;
- Localised hydrogeological aspects of the site and surrounds;
- Groundwater abstractions, both industrial and private;
- Piezometry and groundwater flow regime; and
- Groundwater vulnerability.

### 7.2.1 Surface Water Environment

#### 7.2.1.1 Surface Water Catchments

##### Surface Water Drainage

The natural surface water drainage pattern, in the environs of Mullaghcrone Quarry, is shown on Figure 7.1.

There is no surface water features located within the boundary of the proposed site, and there is no visible off-site surface water drainage from the site. A number of quarry settlement ponds are located to the north of the site.

On a regional scale, Mullaghcrone Quarry is situated within the surface water catchment area of the River Nanny. The catchment divide between the River Nanny and the River Boyne occurs to the north of Mullaghcrone Quarry.

The overall River Nanny catchment comprises 250km<sup>2</sup> of land. The main channel of the River Nanny flows immediately to the south of Duleek and the proposed site. The total surface water flow in the River Nanny is fed from two principle sources, surface water run-off from lands within the catchment area and groundwater baseflow.

The presence of dissolution features within the bedrock (karst features) in townlands of Cruicerath and Platin, coupled together with the relative absence of surface water drainage features in the area, suggests that all water falling on the site infiltrates into the bedrock and is transmitted to discharge points at lower elevation (surface watercourses).

A review of Ordnance Survey maps and geological information for the area indicates that there is a 'swallow hole' within the townland of Cruicerath and 'springs' within the townland of Platin, which are karst features indicating the presence of fractures and/or solution features within the rock.

#### Hydrometric Data

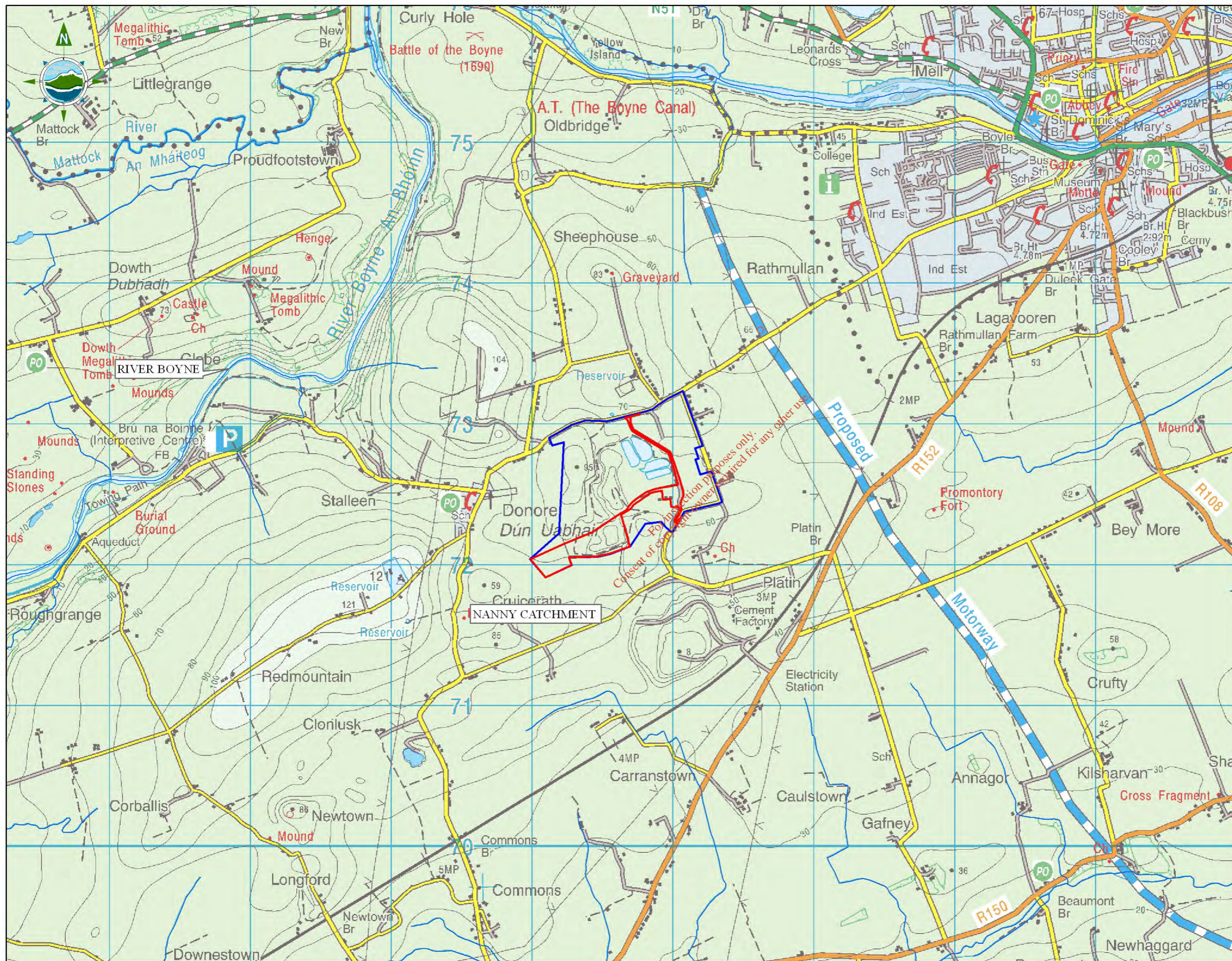
The Office of Public Works (OPW) maintains a number of hydrometric stations in County Meath. The nearest hydrometric stations to Mullaghcrone Quarry on the River Nanny are located in the environs of the village of Duleek, one upstream of the village and two downstream.

The lowest flow on the River Nanny, within the time period 1995 to 1999, was in July 1996, when the mean monthly flow gauge was recorded as 0.089m<sup>3</sup>/sec (7,690m<sup>3</sup>/day). The lowest flow recorded on the River Nanny at Duleek is 0.04m<sup>3</sup>/sec or 3,500m<sup>3</sup>/day.

This is an extremely low flow with respect to the size of the River Nanny and suggests that during prolonged dry periods the groundwater baseflow from the aquifer is very low. This would suggest that there is very low storage capacity and high permeability in the bedrock, whereby rainwater travels quickly from recharge points to discharge points.

The highest flows on the River Nanny, within the time period 1995 to 1999, was in February 1995, when the mean monthly flow gauge was recorded as 7.37m<sup>3</sup>/sec (636,770m<sup>3</sup>/day). This high flow data represents the highest flow at this location. As there are no surface water features on the site at Mullaghcrone Quarry, or off-site runoff, there will be no impact from the proposed development on the River Nanny or its tributaries.





**Legend**

- Activity Boundary
- Land Ownership Boundary
- River



- NOTES**
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  2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
  3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
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Issue	Date	Description	By	Chkd
A	11-06-14	Issued	A.G.	J.D.

Client:  
**ROADSTONE LTD**

Project:  
**MULLAGHRONE WASTE LICENCE**

Title:  
**SURFACE WATER FEATURES MAP**

Scale @ A3: 1:25,000

Prepared by: A. Gruschka    Checked: J. Dillon    Date: Jun 2014

Project Director: D. Grehan

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Drawing No.: **Figure 7.1 B**



### 7.2.1.2 Surface Water Quality

The EPA monitors the quality of Ireland's surface waters and assesses the quality of watercourses in terms of 4(no.) quality classes; 'unpolluted' (Class A), 'slightly polluted' (Class B), 'moderately polluted' (Class C), and 'seriously polluted' (Class D). These water quality classes and the water quality monitoring programme are described in the EPA publication 'Water Quality in Ireland, 2003'.

The water quality assessments are largely based on biological surveys. Biological Quality Ratings or Biotic Indices (Q values) ranging from Q1 to Q5 are defined as part of the biological river quality classification system. The relationship of these indices to the water quality classes defined above, are set out in Table 7.1 below.

**Table 7-1 Relationship between Biotic Indices and Water Quality Classes**

Biotic Index	Quality Status	Quality Class
Q5, 4-5, 4	Unpolluted	Class A
Q3-4	Slightly Polluted	Class B
Q3, 2-3	Moderately Polluted	Class C
Q2, 1-2, 1	Seriously Polluted	Class D

The EPA conducts an ongoing monitoring programme of water quality in the River Nanny and wider catchment. Sampling is conducted in summer months for a number of reasons. These include: (a) the macro-invertebrate fauna of rivers are theoretically under the greatest ecological pressure from pollution, because of reduced flows and higher temperatures (McGarrigle et al. 2003); and (b) some macro-invertebrate larvae may not be recorded in freshwater systems during winter months<sup>7</sup>.

The nearest EPA Water Quality Measuring point on the River Nanny to Mullaghcrone Quarry is located at the Bridge northeast of Bellewstown House (Station 0500).

Water sampling is conducted at 4 No. monitoring stations on the main Nanny River, two upstream and two downstream of the subject site. The most recent and historical biotic indices at each of the quality monitoring stations situated on the Nanny River are presented in Table 7.2 below.

<sup>7</sup> Macro-invertebrate life cycles often involve an over-wintering strategy



**Table 7-2 EPA Monitoring – Biotic Indices**

Station No.	Location and Distance from site	1998	2001	2005	2008	2010
Nanny River						
0110	East Br Kentstown (Upgradient)	Q2-3	Q2-3	Q2-3	Q2-3	Q3
0280	Br d/s Nanny Br	Q 3-4	Q 3-4	Q4	Q4	Q3-4
0500	NE of Bellewstown House	Q 3-4	Q 3-4	Q 3-4	Q 3	Q3-4
0700	Br in Julianstown	Q 3-4	Q 3	Q 3-4	Q3-4	Q 3

The data indicates that the River Nanny water quality at Station 0500 has been recorded as slightly to moderately polluted (Q value of 3 & 3-4). According to the EPA data, the Nanny River was in a generally unsatisfactory ecological condition when sampled in 2010. Ecological status was Poor in the upper (0040, 0110) and lower (0700) reaches and moderate elsewhere (0280, 0500). Upgrade works at the Duleek Waste Water Treatment for a new wastewater treatment plant were completed in 2011.

As there is no surface water drainage from the site, it was not possible to obtain samples to determine site-specific water quality. All water percolates to groundwater within the site and in the surrounding area. All available data for hydrometric stations in the environs of the proposed waste licence site was obtained to determine flows and water levels on the River Nanny. All data obtained from the EPA Hydrometric Station Register are detailed in Table 7.2 above.

The European Communities Directive 2000/60/EC, which established a framework for community action in the field of water policy (commonly known as the WFD), requires 'good status' for all European waters by 2015 and where relevant deferred deadlines of 2021 and 2027. This is to be achieved through a system of river basin management planning and extensive monitoring. In 2004, a characterisation and analysis of all River Basin Districts (RBD) in Ireland was undertaken as required by Article 5 of the WFD. In this characterisation study, the impacts of a range of pressures were evaluated including diffuse and point pollution, water abstraction and morphological pressures (e.g. water regulation structures). The purpose of this exercise was to identify water bodies at risk of failing to meet the objectives of the WFD by 2015, 2021 and 2027. Measures to address and alleviate these pressures are to be included in a formal programme of measures to be submitted to the European Commission. In relation to protected areas under the WFD, it indicates the following:

- There are no 'Registered Protected Areas' (RPA) nutrient sensitive rivers at or downstream of the proposed development



- There are RPA habitat rivers at or downstream of the proposed development and
- There are no RPA nutrient sensitive lakes and estuaries at or downstream of the proposed development;

Based on the available information, the Nanny catchment is 'at Poor Status' in relation to Surface Water. It is proposed to restore the River Nanny to good status by 2027. Based on the available information, the groundwater is 'at Poor Status'. It is proposed to restore the groundwater to good status by 2027. The main pressures on the River Nanny are agricultural (ERBD, 2010).

## 7.2.2 Groundwater

### 7.2.2.1 Aquifer Potential and Characteristics

Reference to the aquifer map for County Meath, prepared as part of the Meath Groundwater Protection Scheme, indicates that the Clonlusk Formation, the Platin Formation and the Mullaghfin Formation are classified as a Regionally Important Aquifer, where groundwater flow is predominantly through fractures and fissures (Rkd). The presence of karst features in the vicinity of the site, and recorded from exposed quarry faces, suggests that the bedrock is fractured.

The limestones underlying this area have a very low primary permeability (intergranular permeability). However based on the information available from Mullaghcrone Quarry and nearby Platin Quarry, the limestones appear to have undergone karstification, which results in an enhanced secondary permeability.

The term 'Karst' applies to the phenomena produced by the solution of calcium based rocks by groundwater flow, expressed through the formation of openings or voids, such as fissures, voids, caves or collapse features such as swallow holes and resulting in a groundwater flow regime characterised by locally high permeability, high flow rates as well as complicated conduit/fissure flow regimes dominating, rather than intergranular porosity flow. This karstification often has a surface expression in the form of distinctive topography and/or drainage pattern. However, for the purpose of this investigation the term 'karst' is applied only to the phenomena of the dissolution of the limestone bedrock and the creation of a fissure flow regime (secondary permeability) in the bedrock.

The large dewatering programme within Platin Quarry, immediately to the south of Mullaghcrone Quarry, is considered to have a significant impact on the watertable in this area. The Mullaghcrone Quarry site is considered to be within the zone of contribution for the dewatering undertaken within Platin Quarry. This means that all water percolating to ground is transmitted towards Platin Quarry and pumped out to discharge. At present, Platin Quarry dewateres 4,400m<sup>3</sup>/day-6,300m<sup>3</sup>/day to maintain a 0m OD groundwater level and Irish Cement Ltd. have been granted planning permission to excavate bedrock to a final floor level of -20mOD. Platin Quarry is licenced to discharge 28,000 m<sup>3</sup>/day of water. The Platin Quarry groundwater abstraction is carried out in accordance with its planning permissions and its IPPC licence. Groundwater is used to supply the cooling tower for use in the factory. Groundwater not used for cooling is discharged via the common effluent pipe to the River Nanny. The rate at which the Platin Quarry is dewatered varies with the amount of rainfall.



### Localised Groundwater Environment

The limestones in the area around Mullaghcrone Quarry display a number of karst conduits, particularly at shallow levels, where solution features are generally filled with clay and bedrock rubble. The Ordnance Survey maps record some karst features close to the quarry, with the townlands of Cruicerath and Platin.

Groundwater flow direction based on hydrogeological studies and groundwater monitoring programmes (SLR, 2008; WYG, 2009) is towards Platin Quarry to the south east. Groundwater levels are monitored as part of the planning permission for Platin Quarry.

ICL has kindly provided the results of historical groundwater level monitoring in the surrounding area (SLR, 2009). The location of these wells is shown on Figure 7.2, and their groundwater levels are shown on Table 7.3 below.

**Table 7.3: Groundwater Levels at Platin Quarry on 08 November 2007 (Provided By ICL 2008/SLR, 2009)**

Well Number	Groundwater Elevation (mOD)	Well Number	Groundwater Elevation (mOD)
BH03	16.27	BH18	7.81
BH08	16.50	BH20	25.11
BH09	19.62	BH29	21.82
BH10	91.5	BH40	19.57
BH11	15.12	BH41	9.60
BH12	18.61	BH42	14.19
BH16	1.73		

Within the Mullaghcrone Quarry site, the lowest elevation to which quarrying has continued is approximately 24m OD (Malin Head). This quarry floor is to the north of the proposed waste licence area. A borehole was previously drilled on this floor. The static water level in the borehole was measured at 13m below ground level, which equates to an elevation of approximately 10m OD. It is known that the watertable in the region is impacted by the major dewatering programme undertaken within the Platin Quarry site, where quarrying has continued below Ordnance Datum and has been granted permission to lower to -20m OD. Based on the above information the groundwater table underneath the deposition area is approximately 10.5m OD and groundwater flow direction is to the south east. As groundwater levels are controls by the abstraction at Platin Quarry, the groundwater levels are similar at present.

All water infiltrating to ground flows towards the south and is considered to be dewatered by operations at Platin Quarry. All water abstracted at Platin Quarry is ultimately discharged to the River Nanny, under permission by Meath County Council/EPA.

### 7.2.2.2 Groundwater Vulnerability

Groundwater vulnerability represents the intrinsic geological and hydrogeological characteristics that determine how easily groundwater may be contaminated by human activities. Vulnerability depends on the quantity of contaminants that can reach the groundwater, the time taken by water to infiltrate to the watertable and the attenuating capacity of the geological deposits through which the water travels.

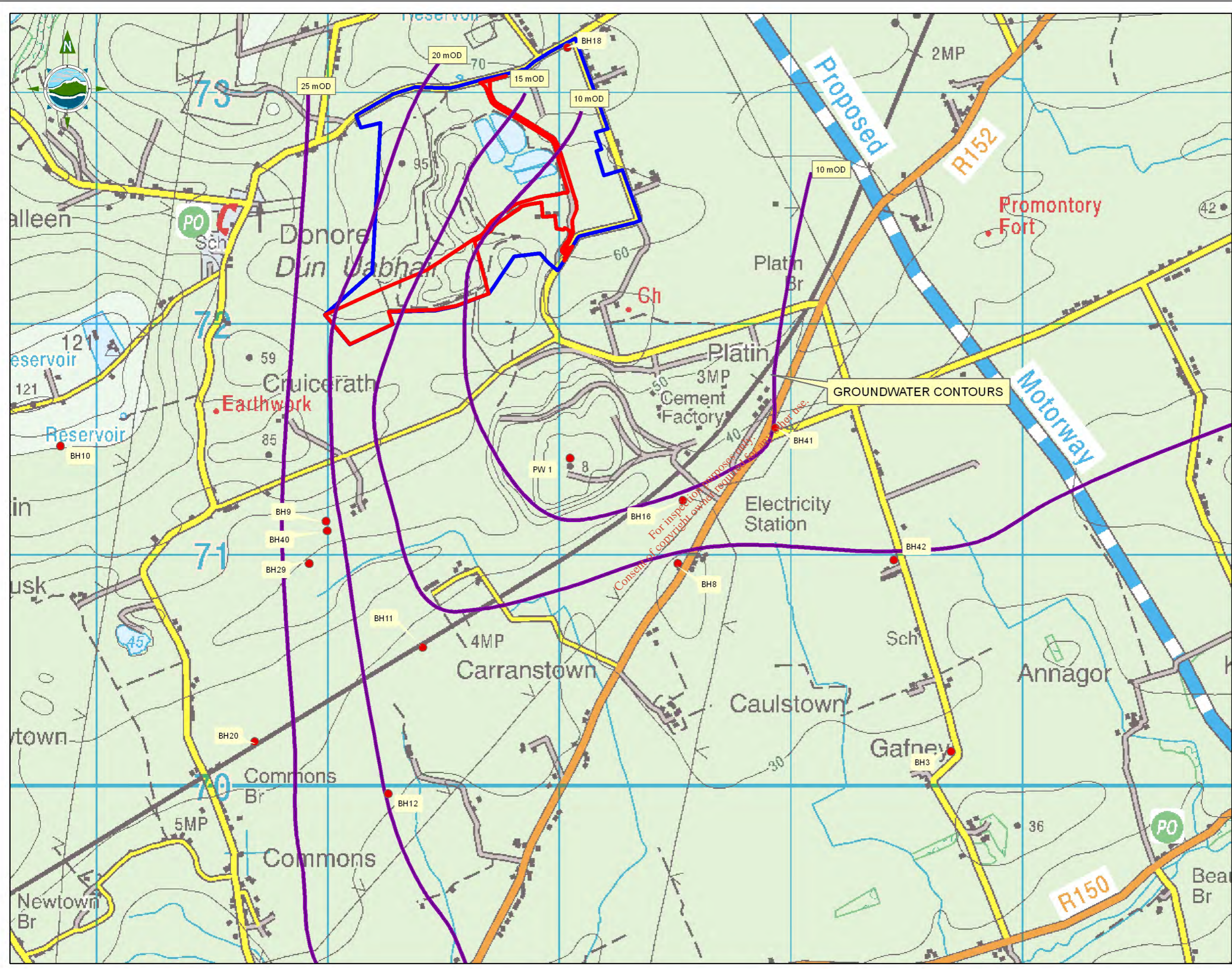
These factors are controlled by the types of subsoils that overlie the groundwater, the way in which the contaminants recharge the geological deposits (whether point or diffuse) and the unsaturated thickness of geological deposits from the point of contaminant discharge.

According to the groundwater vulnerability map for County Meath, the vulnerability rating within the proposed site is Extreme Vulnerability, due to the degree of rock outcrop. According to the site investigation the subsoil thickness in the surrounding area is variable, ranging from 0m to 3m. Therefore the groundwater vulnerability rating of Extreme would appear correct.

The GSI aquifer classification of the underlying bedrock is that of a regionally important fissured aquifer (Rkd) and hence the resource protection rating of the aquifer is Rkd/E (Regionally Important fissured aquifer with an Extreme Vulnerability)

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**Legend**

- Activity Boundary
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Issue	Date	Description	By	Chkd.
A	11-06-14	Issued	A.G.	J.D.

Client: ROADSTONE Ltd

Project: MULLAGHCRONE WASTE LICENCE

Title: BOREHOLE LOCATION AND GROUNDWATER CONTOUR MAP

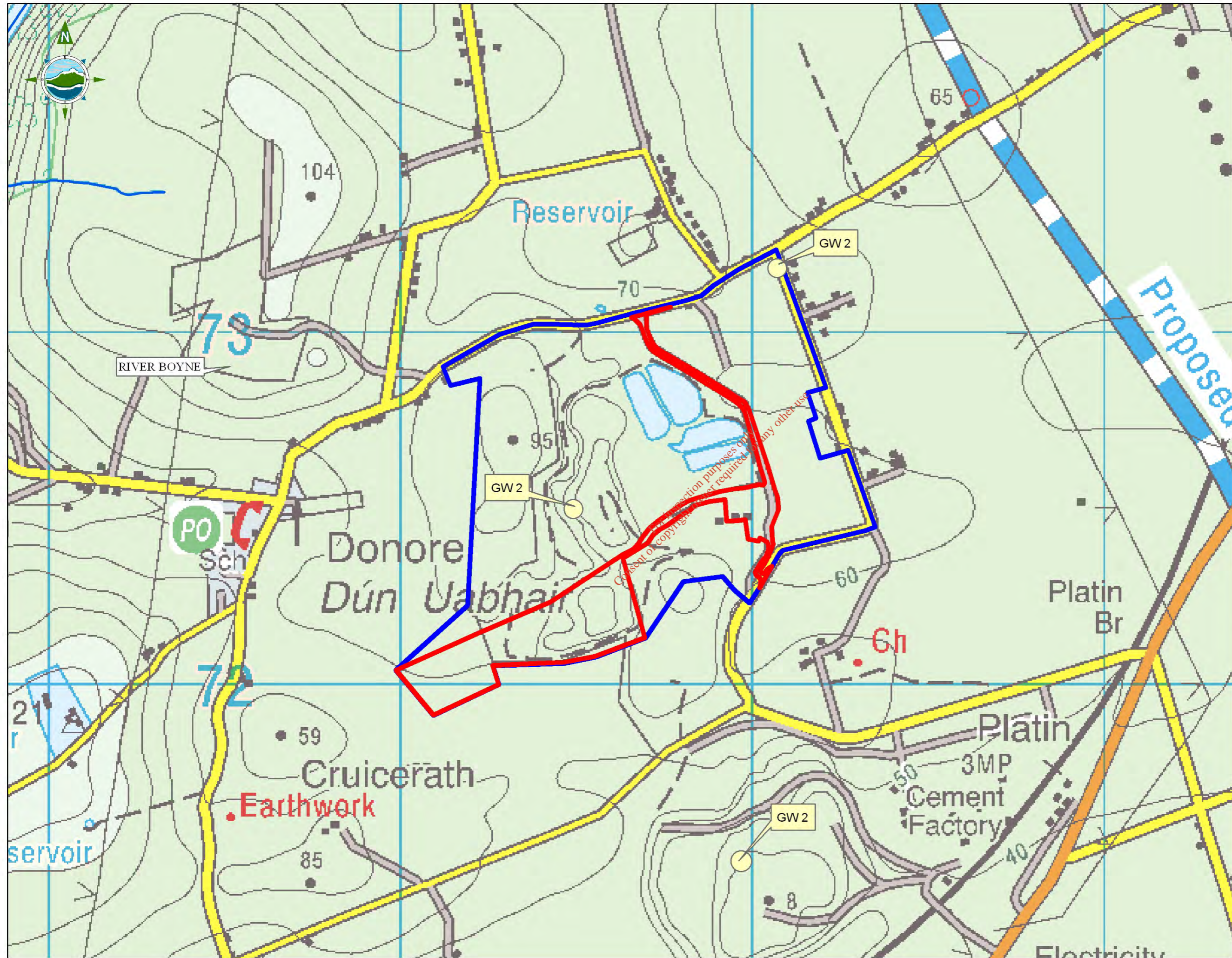
Scale @ A3: 1:15,000

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A.Gruschka	J.Dillon	June 2014
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Issue	Date	Description	By	Chkd
A	11-06-14	Issued	A.G.	J.D.

Client:  
**ROADSTONE LTD**

Project:  
**MULLAGHRONE WASTE LICENCE**

Title:  
**BOREHOLE LOCATION MAP**

Scale @ A3: 1:10,000

Prepared by: A.Gruschka  
Checked: J.Dillon  
Date: Jun 2014

Project Director: D. Grehan

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Drawing No.: **Figure 7.3** Issue: **B**



### 7.2.2.3 Groundwater flow direction/Groundwater Usage

As part of previous hydrogeological investigations a well audit of existing wells within 500m of the proposed site activity boundary was undertaken in April 2007 by TOBIN Consulting Engineers, an SLR Hydrogeological report to Meath County Council in 2009 and ongoing monitoring and information provided by Irish Cement Limited (ICL) and Indaver.

Platin Quarry, operated by Irish Cement Ltd. (ICL) and Indaver undertake groundwater level monitoring. One of these wells is within the Mullaghcrone Quarry site boundary, and several are close to it. ICL has kindly provided the results of historical groundwater level monitoring. The location of these wells is shown on Figure 7.2, and their groundwater levels are shown on Table 7.3 above.

The well audit indicates that groundwater usage within 500m of the quarry is relatively low, with no boreholes/wells recorded in use. The limited groundwater abstraction is possibly due to the deep groundwater table underlying the area and the associated high pumping costs. The vast majority of existing dwellings to the north, west and northwest of the site rely on the East Meath Drogheda & South Louth Water Scheme to meet their potable water requirements. The proposed site is not located within the source protection zone for Kiltrough PWS or any other public water supply in the area.

### Groundwater Quality

The groundwater in Co. Meath is predominantly calcium carbonate type water, which results from the movement of groundwater through the till, sand and gravels and bedrock limestone that dominate the county. The groundwater in the county is generally hard (251-350mg/l CaCO<sub>3</sub>) to very hard (>350mg/l CaCO<sub>3</sub>). Softer waters are found where the Namurian Shales occur (GSI 1998).

As part of this EIS study a number of samples were taken at the site and in the surrounding area to characterise the groundwater in the area and establish a baseline for future comparison.

Groundwater monitoring results were made available from the pumping well GW1 in ICL Platin Quarry for June and December 2010 and sampling of BH18 to the northeast of the site was conducted in January 2011. Samples were taken in specialised containers and delivered to the laboratory on the day of sampling. It was hoped to sample an additional well (GW3) upgradient of the site however this was inaccessible at the time of writing. A sample of GW3 will be taken prior to the operation of the waste licence facility. The analysis showed the groundwater in the area to be of moderate to good quality.

Table 7.4 summarises the water chemistry of the area, with the lab results included in Appendix 7.1.

Table 7.4 Groundwater Chemistry in the Mullaghcrone Area

Parameters	Units	Drinking water Regulations SI 106 of 2007	Downgradient Borehole		Upgradient Borehole
			PW1 (ICL site)	PW1 (ICL site)	BH 18 (GW 2)
Lab ID					
Sample Date			Jun-10	Dec-10	Jan -11
pH	units	6-9	-	-	7.15
Conductivity	µS/cm	1500	-	-	466
Chloride	mg/l	250	31.01	29.24	34.7
Nitrate	mg/l	50	4.35	4.75	12.4
Sulphate	mg/l	250	21.49	24.68	54.1
Calcium	mg/l	-	85.2	103.8	32.4
Magnesium	mg/l	-	15.79	-	5.62
Potassium	mg/l	-	3.79	5.33	0.98
Sodium	mg/l	200	16.89	16.85	7.12
Total Ammonia as NH3-N	mg/l	0.3	0.01	0.011	-
Nitrite	mg/l	0.5	0.007	<0.002	-
Cadmium	ug/l	5	<0.09	<0.09	<1
Cobalt	ug/l	-	<0.02	0.04	-
Copper	ug/l	2000	0.3	0.6	<1
Iron (total)	ug/l	200	32.3	10.4	5
Lead	ug/l	25	0.06	0.1	<1
Manganese	ug/l	50	6.4	2.2	6
Nickel	ug/l	20	<0.14	0.2	<1
Tin	ug/l	-	<2.8	<2.8	-
Zinc	ug/l	-	-	-	<1
Arsenic	ug/l	10	-	-	<1
Faecal Coliforms	Cfu/100ml	0	-	-	4
Hydrocarbons					
>C12-C16 mg/l	mg/l	-	-	-	<0.001
>C16-C21	mg/l	-	-	-	<0.001
>C21-C40	mg/l	-	-	-	<0.001
Petroleum Range Organics	mg/l	-	-	-	<0.001
Diesel Range Organics	mg/l	-	-	-	<0.001
BTEX Compounds	mg/l	0.001	-	-	<0.001



In general the groundwater quality of the underlying aquifer is good. Results would indicate that some organic contamination (possibly from septic tanks or more likely from agriculture) is occurring within underlying aquifer. Low levels of faecal coliforms were occasionally detected in the water quality results.

The majority of homes in Donore village are served by the public sewerage scheme, with a number of individual houses treated by private and individual septic tanks. The type of tanks used to treat the effluent is variable, based on the age of the domestic dwellings. Two EPA Licenced facilities are in downgradient of the site, namely Irish Cement IPPC (P0030-3) and Indaver Waste Licence (W0167-01). Additional groundwater monitoring is conducted downgradient of the Site at EPA Licenced sites (W0167-02 and P0030-03). The downgradient monitoring is compliant with the conditions of the licenced sites.

A number of potential contaminant sources are associated with agricultural practices. Landspreading of farmyard wastes and/or artificial fertilisers, in an uncontrolled manner, where the nutrient requirements of the crop are exceeded, may also pose a risk of contamination.

Infiltration of contaminating substances through the ground and into the groundwater can potentially occur where spillages occur on pervious areas, or where underground services leak. Bunding and the secure storage of liquids on impervious hardstanding ground reduce the risk of soil and groundwater contamination.

Groundwater quality at the adjoining Platin Quarry and Indaver are monitored bi-annually in accordance with IPPC Licence Reg. No. P0030-03 and W0167-02. The groundwater abstracted from Platin Quarry is good, indicating no impact from the existing Licenced facilities, quarry or Waste Permit areas.

### 7.3 CHARACTERISTICS OF THE DEVELOPMENT

The proposed development will be located within Mullaghcrone Quarry. Water management procedures and environmental compliance measures will be maintained or enhanced dependent on statutory requirements.

The existing infrastructure within the quarry will be maintained and improved to ensure that the proposed waste licence operation does not impinge on the surrounding environment.

This development proposal is seeking to infill soil and stones and recovery of C&D material within Mullaghcrone Quarry. It is proposed to infill to a depth of between 5m and 40m with soil and stones.

The proposed waste licence facility will not operate below the local groundwater watertable. The investigations undertaken as part of the baseline assessment were required for environmental characterisation, but also to determine if the existing methods of water management could be used in the future to control, manage and treat the water inflows and water capture within the site and to discharge this water to the receiving environment without adverse impact.

## 7.4 POTENTIAL IMPACTS

Mullaghcrone Quarry has operated a number of C&D and soil and stones waste permit facilities since 2004. The proposed development is consistent with operations currently undertaken within the site and it is not proposed to alter the C&D processing or screening methods or the soil and stones (waste permit expired) methodology at the site.

The operation of waste licence activities within the quarry will not result in any workings below the watertable. The proposed waste licence has the potential to alter the surface water drainage at the site. It is proposed to deal with this issue by the installation of toe drains and settlement ponds for storm water flow. The settlement ponds will treat the storm water and thereafter slowly infiltrate to groundwater.

### Extreme Rainfall Capture

An important factor in relation to water, is the control and management of rainwater falling within the proposed site, especially during extreme climatic conditions. When the infilling continues the water will need to be drained to collection sumps where the rainwater can dissipate to ground.

In order to quantify the volume of captured rainwater that may occur within the site, extreme rainfall data for the Cruicerath and Platin, Donore area was assessed. For the purpose of this study an extreme rainfall event of 2 hours duration, for a 30-year return period, was used. The rainfall occurring across the site for this 2 hour storm event with a 30 year return period is 32 mm of rain. The extreme rainfall event is assumed to occur during winter months, when evaporation and plant transpiration are lowest. This is considered to be the worst-case scenario in terms of the volume of water to be dealt within the site.

The total volume of water falling within the waste licence area (11.7 hectares) is calculated as 3744 m<sup>3</sup> over a 2 hour period. It is proposed to locate a surface water storage pond to the east of the waste licence area to cater for storm water events.

It should be noted that the calculations are based on conditions at maximum infill. Therefore, the calculation indicates the volumes of water to be dealt during the worst-case scenario situation, i.e. largest storm event at maximum infill. In reality the water management within the site will be phased throughout the development of the waste licence. Average rainfall recharge will amount to approximately 3.4 m<sup>3</sup>/hr.

The potential impact on private wells is an important factor to be considered in the development. However, based on the information available, the risk to the private wells is considered to be negligible as there are no private wells located between the proposed waste licence area and the ICL groundwater abstraction point at Platin Quarry P0030-03. Therefore the risk to private boreholes is negligible. On going monitoring of Platin indicates the good water quality downgradient of the proposed waste licence area.

The main water source for the East Meath Water Supply Scheme is the abstraction from the River Boyne at Roughgrange. It is considered that there is no credible risks of impact on this abstraction source as a result of infilling the quarry void or the operation of the C&D facility.

The movement of vehicles within the quarry represent a potential risk to groundwater, from potential leakages or spillages of fuel or oil to ground. This potential impact is assessed as low and is addressed in the mitigation measures and through operational procedures already in place.

## 7.5 MITIGATION MEASURES

Roadstone Ltd. has invested in significant infrastructure and operational and environmental procedures to ensure that the proposed operation does not adversely impinge on the surrounding environment.

Roadstone will continue to utilise all required infrastructure and operate 'good housekeeping' procedures if the proposed development is granted a waste licence.

The mitigation measures to be adopted during the lifetime of the waste licence facility have been designed to take into account the nature of water and the environment. The main concerns are the potential of any impact on groundwater in the environs of the site.

All vehicles using the site will be required to pass through a wheelwash located towards the east of the site. This infrastructure will be utilised to ensure the vehicles do not cause soiling of roads.

All potentially polluting materials will be contained within bunded areas, to ensure full containment in the event of total cumulative failure of tanks.

To minimise any impact on the underlying subsurface strata and the groundwater from material spillages all fuel oils, etc. used during operations are stored within bunded areas. The design (volume and construction) of all bunds conform to standard bunding specifications. The retention capacity of bunded areas is 110% of the capacity of the largest tank or drum to be stored within the bunded area.

Spill kits are retained on site to ensure that all potential spillages or leakages are dealt with immediately and staff are trained in their proper use. The servicing of vehicles on site is confined to designated and suitably protected areas; which are located either inside the garage building or on the concrete apron at the front of this building. As outlined in Section 7 an oil interceptor system is used to ensure that any fugitive emissions are prevented from entering watercourses. Wastewater produced on site is held in storage tanks and removed from site by an approved and licensed contractor to a licensed treatment facility.

### Surface Water

The total volume of water falling within Area 1 and Area 2 of the waste licence area (11.7 hectares) is calculated as 3744 m<sup>3</sup> over a 2 hour period. It is proposed to locate a surface water storage pond to the east of the waste licence area to cater for storm water events. Surface water captured on site will percolate back to ground at this location.

### Groundwater

The groundwater underlying the proposed facility will be flow in the same dewatering towards Platin Quarry, therefore, in net terms, there is no change to the overall hydrological balance. Due to the relatively small area of the proposed waste licence facility and given the nature of the proposed waste licence activities, in relation to the overall catchment, the impact on the regional hydrological and hydrogeological regimes is considered low. The monitoring programme undertaken in the quarry and



the proposed site will determine any changes. The monitoring results will be contained in the Environmental Report issued each year and will be made available to interested parties.

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## 8 AIR QUALITY

### 8.1.1 Introduction

This section addresses the Air Quality of the environment in terms of dust emissions and assesses the potential impacts of the proposed development on the existing environment.

All developments, including waste licence facilities, have the potential to adversely affect air quality in the surrounding area of operations. Currently in Ireland there are no statutory limits for dust deposition from waste licence facilities. However, in recent years the TA Luft/VDI 2119/Bergerhoff Method of dust emission monitoring has become the most commonly used method. This method involves using a direct collection pot to standardised dimensions of either glass or plastic. The system benefits from being a direct collection method i.e. less transferring of material and consequent reduction in sampling errors. This method is defined as an internationally recognised standard and has been adopted by the Environmental Protection Agency (EPA) as the method of choice for licenced facilities.

Department of Environment, Heritage and Local Government (DoEHLG) Guidelines recommend that the TA Luft total dust deposition limit value (soluble and insoluble) of 350 milligram per square metre per day be adopted at site boundaries near waste licence facilities.

### 8.1.2 Existing Environment

Baseline dust monitoring on site and in the vicinity of sensitive receptors is available for 2012-2013. The locations of the Dust Monitoring Locations are shown on Figure 8.1. Dwellings are located outside the southern and western site boundaries separated from the site by areas of agricultural land. These results are used to identify existing dust deposition levels within the vicinity of the proposed development.

Total dust deposition was measured using the Bergerhoff gauges specified in the German Engineering Institute VDI 2119 document entitled "Measurement of Dustfall using the Bergerhoff Instrument (Standard Method)." Dust gauges are set up approximately 2m above the ground surface and the jars were left open for one month.

The description of each monitoring location is presented in Table 8.1 overleaf and shown on Figure 8.1.

**Table 8.1 Description of monitoring locations**

Sample Reference	Monitoring Locations
D1	Within site boundary to north west of site
D2	To the northeast of the site
D3	At the south western site boundary
D4	At north western site boundary

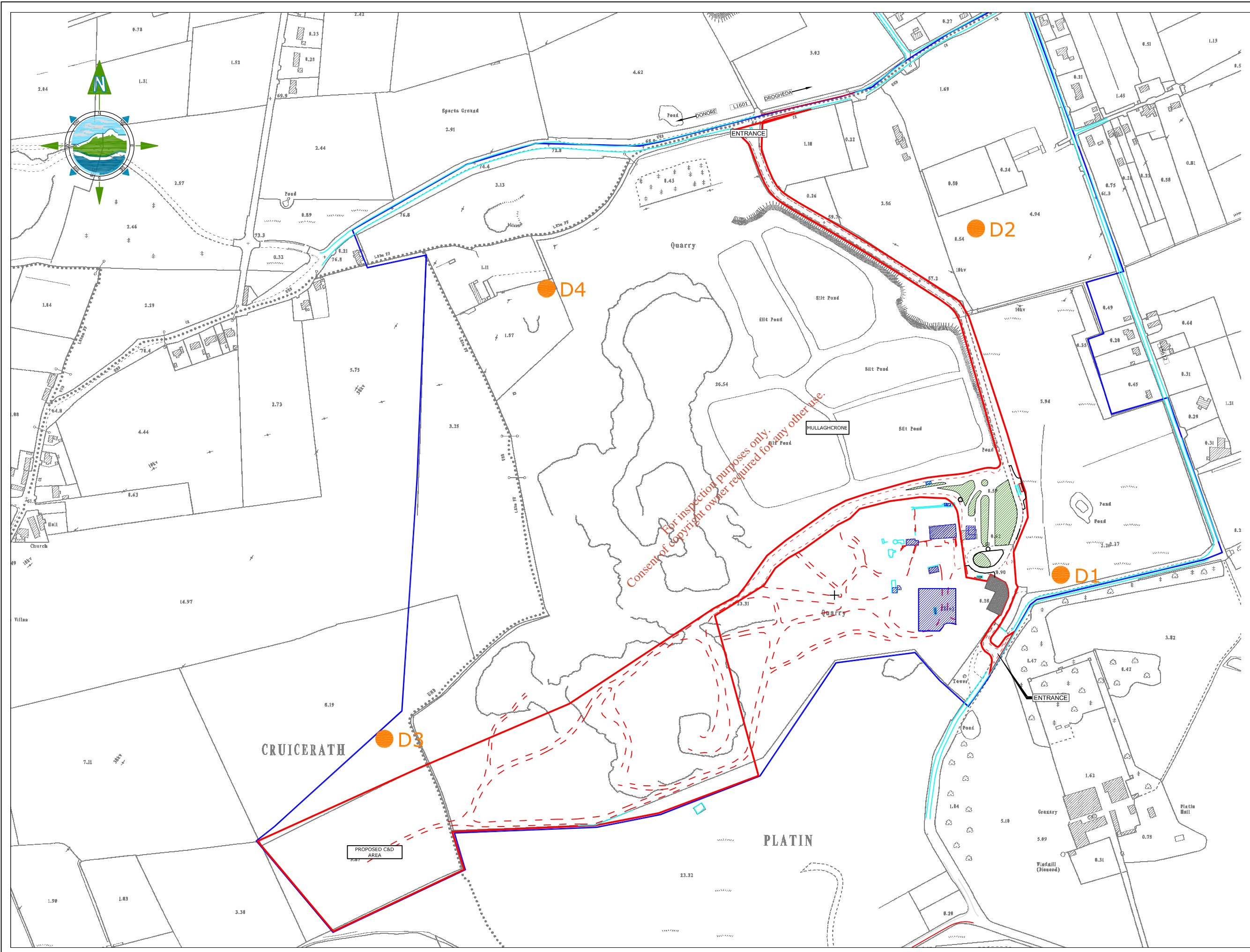
Results for the 2012-2013 monitoring period are shown below in Table 8.2.

**Table 8.2 Results of Total Dust Deposition**

Mullaghcrone Dust Deposition 2013					
	D1	D2	D3	D4	Limit
Jan-12	104.9	165.7	218.8	106.8	350
Feb-12	254.8	301.5	102.5	137.8	350
Mar-12	60.6	55	58.3	60.2	350
Apr-12	47.8	157.9	258.4	249.8	350
May-12	120.1	202.3	318.4	177.6	350
Jun-12	87.2	92.6	259.3	302.2	350
Jul-12	25.2	48.3	153.6	187.6	350
Aug-12	304	315	93	267.2	350
Sep-12	81	71	95	100	350
Oct-12	79.8	179.4	222.3	284.2	350
Nov-12	87	279	136	157.9	350
Dec-12	61	51	23	148	350
Jan-13	76	84	147	101	350
Feb-13	65	92	97	143	350
Mar-13	87	33	81	88	350
Apr-13	68	56	52	138	350
May-13	60	241	73	188	350
Jun-13	120	67	155	108	350
Jul-13	44	83	48	109	350
Aug-13	62	39	81	91	350
Sep-13	78	34	56	238	350
Oct-13	95	65	60	101	350
Nov-13	42	41	45	130	350
Dec-13	60	203	85	259	350

It can be seen from Table 8.2 that all dust-monitoring locations are below the compliance threshold limit of 350mg/m<sup>2</sup>/day, when measured using the TA Luft Bergerhoff Method.





**GENERAL LEGEND**

LAND OWNERSHIP BOUNDARY	ACTIVITY BOUNDARY
PUBLIC ROAD	EXISTING INTERNAL HAUL ROAD
EXISTING SITE STRUCTURES	EXISTING HARDSTAND
DUST MONITORING POINT	NOISE MONITORING POINT

- NOTES**
- FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
  - ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
  - ENGINEER TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
  - ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD
  - OS DISCOVERY SHEET NO: 43

50m 0 50m 100m 150m

Issue	Date	Description	By	Chkd.
B	12.06.14	ISSUED FOR PERMIT REVIEW	MN	JD

Client:  
**ROADSTONE Ltd.**

Project:  
**MULLAGHCRONE WASTE LICENSE APPLICATION**

Title:  
**ENVIRONMENTAL MONITORING LOCATIONS**

Scale @ A3: **1:5,000**

Prepared by: **M. Nolan**    Checked: **J. Dillon**    Date: **Jun 2014**

Project Director: **D. Grehan**

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Drawing No.: **FIGURE 8.1**    Issue: **B**

### 8.1.3 Potential Impacts

The nature and particle size of the materials being handled at the site have a fundamental influence on their tendency to be broken down and to generate fugitive dust emissions. It is also dependent on material density and to some extent particle shape.

Experience of soil recovery and C&D facilities indicate that mechanical activity is the most significant factor in material erosion and dust generation. However, the effect of wind and high ambient temperatures are also important factors in dust generation and migration. Problems may arise when all these factors arise simultaneously.

Potential sources of dust from the proposed facility can be categorised under the following headings. These are:

- Point Source – where dust is generated by activities such as loading, dozers, earth-moving plant, processing screens, crushers and conveyor transfer points.
- Line Source – where dust is generated by activities identified above along well-defined haul roads and open conveyors.
- Dispersed Source – where dust is generated by activities such as exposed surfaces, uncontrolled placement of these soils and general activity. Stockpiles are also considered to be a dispersed dust source.

The amount of dust capable of being dispersed to a particular location during windy conditions is related to several factors including:

- Distance from source to receptor.
- Prevailing weather conditions.
- Intervening topography between source and receptor.

As dust travels downwind from the source it initially disperses outwards and upwards and then progressively falls to the ground surface. Larger particles will fall first and therefore will not migrate as far as the smaller particles. The concentration of dust therefore reduces very quickly from the emission source. Most emitted dust is in fact deposited close to its source, generally within a distance of a few tens of metres.

### Predicted Dust Emissions

It is anticipated that with the implementation of the suggested mitigation measures, dust emissions will continue to be within the recommended limit value of 350mg/m<sup>2</sup>/day at all dust monitoring locations when measured using the TA Luft/VDI 2119/Bergerhoff Method.

#### 8.1.4 Mitigation Measures

Dust emissions from the proposed development will be kept within the recommended limit value at all monitoring locations and all reasonable steps will be taken as far as is practical to minimise dust emissions.

In summary the following mitigation measures are proposed:

- Heavy Goods Vehicles (HGV's) exiting the site will pass through the established wheelwash. This ensures that dust emissions are not generated from the tyres of vehicles emanating from the quarry and proposed waste licence area. It also ensures that they do not carry excess soil and material onto the public road network.
- The provision of on-site speed limits will prevent unnecessary generation of fugitive dust emissions.
- An on-site water sprinkler system will be used to ensure that all internal hauls roads and access routes are sprayed with water in periods of dry weather to help suppress dust emissions.
- Minimising drop heights of material.
- Access routes will be regularly inspected and cleaned when necessary.
- A complaints register is maintained on-site and any complaints relating to dust emissions will be immediately dealt with.

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## 9 CLIMATE

### 9.1.1 Introduction

In this section a general overview of the climate in the Meath region and more specific meteorological data for the lands at the Mullaghcrone Quarry, Donore, County Meath is outlined. Information on rainfall and potential evapotranspiration for the area is provided. This is based on information obtained from the Meteorological Service. Wind speed and orientation is also detailed.

All meteorological data contained in this report has been received from Met Éireann. This information is adjusted when necessary to take into account the proposed site's location and elevation. All calculations detailed in the report are advised methods as described by Met Éireann personnel.

### 9.1.2 Existing Environment

Over the summer months the influence of anti-cyclonic weather conditions results in dry continental air interspersed by the passage of Atlantic frontal systems. During much of the winter period the climate is characterised by the passage of Atlantic low-pressure weather systems and associated frontal rain belts from the west. Occasionally the establishment of a high-pressure area or anticyclone over Ireland results in calm conditions and during the winter months these are characterised by clear skies and the formation of low-level temperature inversions with light wind conditions at night time. Long spells of dry weather are relatively rare but should continental air masses or anticyclones persist over Ireland a period of drought conditions may occur which could last up to two or three weeks.

#### Rainfall Stations

There are a number of rainfall measuring stations throughout the country. These stations measure the daily rainfall in millimetres (mm). A number of these also measure additional parameters such as soil moisture, temperature, humidity, etc.

#### Synoptic Stations

Synoptic stations are those, which observe and record all the surface meteorological data. These observations include rainfall, temperature, wind speed and direction, relative humidity, solar radiation, clouds, atmospheric pressure, sunshine hours, evaporation and visibility. They report a mixture of snapshot hourly observations of the weather known as synoptic observations, and daily summaries of the weather known as climate observations. There are 15 synoptic stations located throughout Ireland.

#### 9.1.2.1 Rainfall

There is no meteorological data specific to the existing site. In order to give reliable climatic data on a particular area a weather station should be within 10km of the site and in operation for at least 30 years. A climate station is located at Duleek (Duleek Gauging Station) approximately 3.5km south of the proposed site. This climate station has been in operation since 1949. The nearest synoptic station is at Dublin Airport Synoptic Station and this is located approximately 30km south of the waste licence site.

Specifics of these measuring stations relative to the proposed site are outlined in Table 9.3.

**Table 9.1 Designated Meteorological Stations for Mullaghcrone Quarry**

Location	Grid Reference	Elevation (m O.D. MH)	Rainfall	Distance from site
Mullaghcrone Quarry	O 048 686	79		-
Duleek (G.S.)	O 047 682	29	792	3
Dublin Airport Synoptic Station	O 169 434	71	733	30

In the site area, approximately 53% of the total annual rainfall is recorded during the winter period (October – March). This amount of precipitation (including snow) will normally be associated with more prolonged Atlantic frontal weather depressions passing over the region compared to the summer.

**Table 9.2 Average Monthly and Annual Precipitation (mm)**

Location	Duleek (G.S.)
January	79
February	57
March	61
April	55
May	58
June	58
July	55
August	69
September	71
October	78
November	71
December	81
Annual mm	793

### Evapotranspiration and Effective Rainfall

The nearest meteorological station with evapotranspiration measuring equipment is located at the Dublin Airport Synoptic Station. Evapotranspiration is the return of water vapour to the atmosphere by evaporation from land and by the transpiration of plants, generally measured from a short-grass covered surface (such as a permanent pasture) adequately supplied with water. Evaporation is the return of water vapour to the atmosphere by evaporation from a free water surface such as a pan of water, known as a “Class A Pan”, fitted with a depth measuring gauge. The evapotranspiration figures for the Dublin Airport Synoptic Station are detailed in Table 9.2.

It can be noted that evapotranspiration is very low during winter months, when plant growth is minimal. The vast majority of evapotranspiration during winter months is attributable to direct evaporation from ground surfaces. During summer months the rate of evapotranspiration increases and often exceeds



the monthly rainfall. This is due to increased free evaporation from the surface and from transpiration from leaves and plants.

Using the rainfall data calculated for the proposed site in Table 9.3 and the potential evapotranspiration data for the nearest synoptic station, i.e. Dublin Airport Synoptic Station, the effective rainfall for the subject site can be calculated. Table 9.3 shows the effective rainfall to the site. Any rain falling on the site will infiltrate to the ground, evaporate from the surface or become surface water runoff.

**Table 9.3 Hydrological Data for the Site**

Month	Rainfall (mm)	Potential Evapo-transpiration (mm)	Actual Evapo-transpiration (mm) (PE x 0.92)	Effective Rainfall / Potential Recharge(mm)
January	79	9.1	8.2	70.8
February	57	20.9	18.8	38.2
March	61	39.1	35.2	25.8
April	55	60.8	54.7	0.3
May	58	82.7	74.4	-16.4
June	58	93.8	84.4	-26.4
July	55	90.5	81.5	-26.5
August	69	73	65.7	3.3
September	71	50.1	45.1	25.9
October	78	25	22.5	55.5
November	71	9.9	8.9	62.1
December	81	5.5	5.0	76
Total	792	560.4	504.4	358

The surface water runoff drainage system is discussed in more detail within the water section of this report.

### Wind

The closest synoptic weather station with the capability of measuring wind and that has been in operation for at least 30 years is the Dublin Airport Synoptic Station, which is approximately 30km south of the existing quarry.

The wind rose for the Dublin Airport Synoptic Station shows that the prevailing winds are from the southeast (Refer to Appendix 9.1). The mean wind speed at the Dublin Airport Synoptic Station is 10 knots (5.4m/s). This value is also applied to the proposed site.

### *9.1.3 Potential Impacts*

On a local, regional and global scale, the climate will not be altered by the activities of the waste licence. The waste licence industry (soil and stones, C&D) is not a significant industrial generator of greenhouse gases. There will be no net contribution to greenhouse gas emissions. Therefore, this industry will not be impacted by the limits of greenhouse emissions under the Kyoto protocol.

The waste licence area will not create any temperature inversions, alter any current wind circulation patterns nor affect the sunshine or any other climatic factors in the area beyond the site boundaries of the proposed site.

### *9.1.4 Mitigation Measures*

As there will be no significant impact on the local or global climate, there are no mitigation measures proposed other than the operation of the facility to DoEHLG and EPA guidelines.

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## 10 NOISE & VIBRATION

### 10.1 INTRODUCTION

This section deals with the noise and vibration impacts for the proposed development at Mullaghcrone Quarry, Donore, County Meath. TOBIN Consulting Engineers carried out an environmental noise assessment survey on 18<sup>th</sup> August 2010. The purpose of the study is to:

- Establish the existing noise levels generated;
- Project and assess future noise levels generated by continuing Waste License activity and the proposed waste license; and
- Specify appropriate ameliorative measures where deemed necessary.

Various standards and guideline documents covering the impact of external noise sources and the introduction of industrial and construction noise have been used in this assessment. The standards and guidelines appropriate for this assessment are the: World Health Organisation's (WHO) *Guidelines for Community Noise* (1999), BS5228 *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise* (2009), and BS4142 *Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas* (1997) and the EPA *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)* (2012).

The assessment procedure involves determining noise levels likely to be generated by the facility, comparing these with measured baseline conditions, and with other sources of existing impact in the area, and assessing this effect in the context of the duration of the project and other relevant factors. To provide comparisons with baseline conditions, surveys of background noise levels around the site have been carried out. Noise monitoring results are also included for the existing C&D facility and adjacent quarry.

#### Acoustic Terminology

Sound is simply the pressure oscillations that reach our ears. These are characterised by their amplitude, measured in decibels (dB), and their frequency, measured in Hertz (Hz). Noise is unwanted or undesirable sound, it does not accumulate in the environment and is normally localised. Environmental noise is normally assessed in terms of A-weighted decibels, dB (A), when the 'A-weighted' filter in the measuring device elicits a response, which provides a good correlation with the human ear.

The criterion for environmental noise control is one of annoyance or nuisance rather than damage. In general a noise level is liable to provoke a complaint whenever its level exceeds by a certain margin the pre-existing noise level or when it attains an absolute level. A change in noise level of 3 dB (A) is 'barely perceptible'; while an increase in noise level of 10 dB (A) is perceived as a twofold increase in loudness.

Typical ranges of noise levels are presented in Table 10.1 overleaf to compare against the baseline noise levels measured.

**Table 10.1 Typical ranges of noise levels**

Sound levels in decibels dB (A)	Description of Activity
0	Absolute silence
25	Very Quiet room
35	Rural night time setting with no wind
55	Day time, busy roadway 0.5km away
70	Busy Restaurant
85	Very busy pub, voice has to be raised to be heard
100	Disco or rock concert
120	Uncomfortably loud, conversation impossible
140	Noise causes pain in ears

## 10.2 EXISTING ENVIRONMENT

Mullaghcrone Quarry is located in a semi-rural to industrial area in the townland of Cruicerath and Platin, which is approximately 600m to the east southeast of Donore Village. Donore is located approximately 40km north of Dublin City Centre, between the M1 National Motorway and the N2 National Primary Routes. The Village is situated approximately 18km from Navan, 4km from Drogheda and 18km from Balbriggan. Mullaghcrone Quarry is accessed from local county roads (L1061 & L5612) and the quarry lies approximately 1km to the east of the village of Donore.

The Mullaghcrone site has been operated for rock extraction since the original planning permission was granted by Meath County Council in 1978. The effects of noise and vibration as pertain to the proposed activities, are examined in this assessment.

Noise monitoring at N1 to N4 was conducted as part of the waste permit, previously granted by Meath County Council at Mullaghcrone Quarry, demonstrated that all noise levels measured were below 55 LA<sub>eq</sub> over that past 6-7 years.

### 10.2.1 Baseline Noise Survey

A baseline noise survey was carried out on 18<sup>th</sup> August 2010 in order to quantify the noise climate in the area of the existing Mullaghcrone Quarry, County Meath. Six noise monitoring locations were assessed in this regard. The noise survey was undertaken so as to quantify existing noise levels in the area, and to quantify potential impact of the waste license, on the local noise climate.

### 10.2.2 Methodology

A Larson Davis 824 Type 1 sound level meter was used to monitor noise levels. Monitoring and interpretation of acquired data was carried out in line with the following standards:

The following conditions were adhered to in undertaking the survey:

- Measurement of noise levels was undertaken using Type 1 instrumentation;

- Cognisance was taken of the EPA's 'Environmental Noise Survey Guidance Document' 2003;
- The survey was carried out in accordance with ISO 1996 Acoustics - Description and Measurement of Environmental Noise: Parts 1/2/3.
- British Standard: BS 7445 Part 1: (ISO 1996-1: 1982) *Description and measurement of Environmental Noise Part 1. Guide to quantities and procedures.*
- British Standard: BS 7445 Part 2: (ISO 1996-2: 1987) *Description and measurement of Environmental Noise Part 2. Guide to the acquisition of data pertinent to land use*
- British Standard: BS 7445 Part 3: (ISO 1996-3: 1987) *Description and measurement of Environmental Noise Part 3. Guide to application of Noise limits.*

30 minute noise surveys were carried out during the daytime period at all noise monitoring locations described below. Night period noise was not assessed, as there is no existing/expected requirement for night period operations.

### 10.2.3 Noise Monitoring Locations

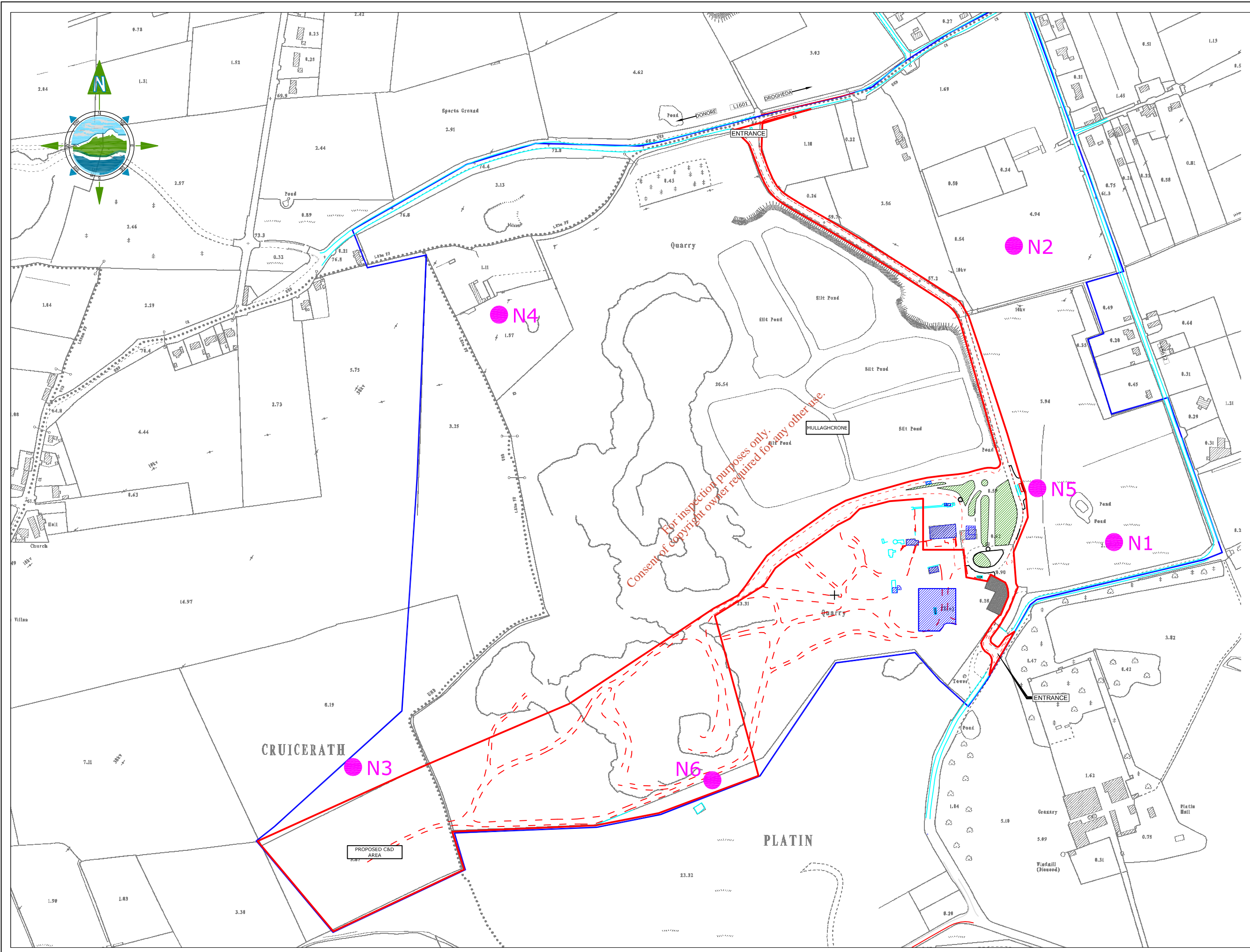
Six noise monitoring locations were assessed. These are N1 to N6 as per Figure 10.1.

- N1 is located at the southeast section of the site.
- N2 is located in the northeast section of the site.
- N3 is located in the southwest section of the site.
- N4 is located in the northwest section of the site.
- N5 is located adjacent to the weighbridge and operations offices within the site. (As per Fig 10.1)
- N6 is located along the southern site boundary, adjacent to the proposed C&D site.

At each of the monitoring locations the following data was recorded:

- $L_{(A)eq}$ : Equivalent Continuous A-weighted Sound Level. The continuous steady noise level, which would have the same total A-weighted acoustic energy as the real fluctuating noise measured over the same period of time.
- $L_{(A)10}$ : The noise level that is equalled or exceeded for 10% of the measurement period.
- $L_{(A)90}$ : The noise level that is equalled or exceeded for 90% of the measurement period.





**GENERAL LEGEND**

LAND OWNERSHIP BOUNDARY	ACTIVITY BOUNDARY
PUBLIC ROAD	EXISTING INTERNAL HAUL ROAD
EXISTING SITE STRUCTURES	EXISTING HARDSTAND
DUST MONITORING POINT	NOISE MONITORING POINT

- NOTES**
- FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
  - ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
  - ENGINEER TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
  - ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD
  - OS DISCOVERY SHEET NO: 43

Scale: 0 50m 100m 150m

Issue	Date	Description	By	Chkd.
B	12.06.14	ISSUED FOR PERMIT REVIEW	MN	JD

Client: ROADSTONE Ltd

Project: MULLAGHCRONE WASTE LICENSE APPLICATION

Title: NOISE MONITORING LOCATIONS

Scale @ A3: 1:5,000

Prepared by: M. Nolan  
Checked: J. Dillon  
Date: June 2014

Project Director: D. Grehan

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Drawing No.: **FIGURE 10.1 B**

### 10.2.4 Baseline Survey Results

The results of the baseline survey are as described in Table 10-2 below.

**Table 10-2 Mullaghcrone Quarry Noise Monitoring Results 2010**

Location	Time	L <sub>Aeq</sub> dB	L <sub>A10</sub> dB	L <sub>A90</sub> dB	Weather	Notes
<b>N1</b>	09:11	46.5	49	42.4	Calm/dry	Passing road traffic, aircraft overhead, foliage noise, birdsong, quarry occasionally audible. No tonal noise detected.
<b>N2</b>	09:52	44.3	46.8	37.8	Calm/dry	Distant Traffic, quarry workings and haul road traffic audible. No tonal noise detected.
<b>N3</b>	11:21	41.9	43.7	36	Calm/dry	Quarry audible, slight breeze, distant traffic and adjoining Irish Cement activities audible. No tonal noise detected.
<b>N4</b>	10:39	45.4	47.2	40	Calm/dry	Quarry, breeze, distant agricultural machinery and house alarm audible. No tonal noise detected.
<b>N5</b>	08:35	54.8	56.7	49.3	Calm/dry	Trucks at weighbridge & internal haul road, Quarry operation audible. No tonal noise detected.
<b>N6</b>	11:57	49.5	52.4	40.3	Calm/dry	Activities on adjoining Irish Cement site audible, Breeze audible. No tonal noise detected.

Noise monitoring results are available for 2012 and 2013 and included below in Table 10-3. No evening work is undertaken at the existing C&D permit or proposed Waste Licence facility.

Table 10-3 Mullaghcrone Quarry Noise Monitoring Results 2011-2013

	L <sub>Aeq</sub> dB	L <sub>A10</sub> dB	L <sub>A90</sub> dB
<b>N1</b>			
2013	53.4	55.7	48.1
2012	46.4	48.7	42.2
2011	52.3	53.8	44.1
<b>N2</b>			
2013	54.3	61.9	46.9
2012	45.1	47.8	38.4
2011	47.9	51.4	42.6
<b>N3</b>			
2013	54.9	58.0	47.2
2012	40.6	43	36
2011	50.1	52.7	42.1
<b>N4</b>			
2013	51.2	56.4	42.0
2012	50.9	52.8	47.8
2011	44.6	48.8	41.2

### 10.3 TARGET CRITERIA

#### 10.3.1 Noise:

The waste license operation will be a daytime activity with no Sunday work. For outdoor noise at residential properties the basic criterion for day-time noise levels normally lies in the range of 45 - 55 dB (A) (Ref. EPA's *Guidance Note For Noise In Relation to Scheduled Activities*, 1995). For this proposed operation the day-time noise levels shall be kept below a L<sub>eq</sub> 1 hour value of 55 dB (A) at all sensitive residences.

### 10.4 POTENTIAL IMPACT

For deposition operations such as the soil and stones restoration; noise predictions for the operational phase of the activity have been made by using the BS 5228 standard. By using typical plant (earth



movers, HGV's) as input for these calculations and taking local geography into account accurate noise impact assessments have been compiled.

The plant considered and the predicted noise impact at the closest sensitive receptors (domestic dwellings) arising from the proposed works are as described in Table 10-4 below.

**Table 10-4 Mullaghcrone Quarry predicted noise impact**

BS5228 Calculations	Estimated Waste license noise levels at varying distances LAeq 1 hour		
	Plant	400m	525m
Dump Truck	51	48	43
Road Lorry	32	29	24
Crusher	52	49	44
Tracked Excavator	47	44	39
<b>Combined Level LAeq 1hour</b>	<b>52</b>	<b>49</b>	<b>45</b>

Predicted noise levels have been assessed using the methodology described in BS: 5228: Noise and control on construction and open sites, 1997. Predictions are based on typical equipment used during expected activities on site. Predictions are based on a LAeq1hour value with all machinery listed above operating for a continual period of 1 hour.

This may be considered a worst-case scenario as machinery may operate for shorter periods and may not work simultaneously. Additionally, calculations are based on minimum distances between site activities and the nearest noise sensitive locations.

The closest sensitive receptors to the proposed area of works are a row of newly build detached homes to the northwest of the quarry. These houses are closest to noise monitoring location N3.

Noise levels at location N3 are as per Table 10-2 and are inclusive of noise from all current activity on site at present. The cumulative worst case scenario noise impact at the closest sensitive receptor to this point will be 52dB LAeq. This is below the target criterion of 55dB LAeq for day time activity. No evening or night period works are proposed.

Noise monitoring at N1 to N4 was conducted as part of the waste permit, previously granted by Meath County Council at Mullaghcrone, demonstrated that all noise levels were below 55LAeq over that past 6-7 years.

## 10.5 MITIGATION MEASURES

With regard to construction activities, all plant items used during the construction phase should comply with standards outlined in 'European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1998. Reference should be made to BS5228: Noise control on construction and open sites, which offers detailed guidance on the control of noise from construction activities.

It is proposed that various practices be adopted during construction, including:

- Appointing a site representative responsible for matters relating to noise;
- Establishing channels of communication between the contractor/developer, Local Authority and residents;

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These may include:

- Selection of plant with low inherent potential for generation of noise and/or vibration;
- Siting of noisy plant as far away from sensitive properties as permitted by site constraints.
- Anti vibration mounts on reciprocating plant.

## 10.6 RESIDUAL IMPACT

All measurements were conducted in general accordance with standard requirements indicated in ISO (1996) and NG4 (2012). Noise levels are predicted to be comfortable within the applicable target criterion of 55dB  $L_{Aeq}$  daytime. There is no significant vibration impact associated with the proposed activities. As such the predicted residual impact is expected to be a slight, long term noise impact. Site activities will be effectively managed to ensure that all potential noise and vibration impacts are minimised to acceptable levels. There are no significant adverse or unacceptable noise or vibration impacts predicted at local sensitive receptors or on local livestock in the vicinity of the site as a result of the proposed waste license. The measurements indicate the facility will not to exceed  $L_{Aeq}$  T 30 min of 55 dB(A) daytime. . No evening or night-time work is planned for the facility.

## 11 MATERIAL ASSETS

### 11.1 INTRODUCTION

Material assets are those resources available to the local community. This section focuses on the impact of the working of the Mullaghcrone Waste Licence application on waste production, treatment and disposal.

The use of the local road network, which is a significant consideration on material assets, is dealt with specifically in Section 13 of this EIS.

### 11.2 WASTE PRODUCTION, TREATMENT AND DISPOSAL

#### 11.2.1 Introduction

This section considers the solid waste that will be generated during the operation of the site.

#### 11.2.2 Characteristics of the Proposed Development

This section summarises the characteristics of the site that are relevant to the consideration of waste management.

##### 11.2.2.1 Waste Acceptance Procedures

The proposed waste acceptance procedures are outlined in Section 2 of the Environmental Impact Statement. Prior to any material being accepted at the site, a contract will have to be entered into by the developer/builder and Roadstone Ltd. to ensure that the following is agreed between the parties:

1. Only segregated waste is delivered to the site;
2. Only wastes of the classes specified are to be delivered to site; and
3. Penalties and actions should the above conditions not be met.

The material delivered to the site for recycling will be examined on entry into the site. This will ensure that only segregated waste as per the waste permit is brought to the site. If this is not the case, it will be returned to its source for segregation or sent to a licensed landfill. The cost of this will be charged to the customer at a premium price to ensure that this does not occur again.

Following inspection, the material will be stockpiled according to type. Once sufficient volume of material is on-site a mobile crusher, already operating on-site, will be used to process the material.

All customer records are kept on file for 5 years as per Roadstone ISO 9001:2000 certification.

A record of all material arriving at the facility, including the following information:

- Date;
- Time;
- Owner Truck;
- Truck Licence Plate No.;
- Type of Material;



- Origin of Material;
- Quantity of Material

All imported materials will be inspected as it enters the site. It will also be inspected when tipped in the C&D Processing Area and Soil and stones area.

On arrival, the haulage trucks will be inspected at the weighbridge. As discussed in Section H.2 above, The Deputy Facility Manager/Machine Operative will inspect each load, as it is being deposited, to ensure the material is fully compliant with the Waste Licence. If the material is non-compliant, the Deputy Facility Manager/Machine Operative will insist that the material is reloaded onto the haulage truck and removed from the site, for authorised disposal elsewhere.

Once the haulage trucks deposit their material, the excavator will shift the inert material, from where it is deposited by the haulage trucks, and spread it over the area of the deposition site, in compliance with the Waste Licence Application Drawings. If waste objects are identified within the inert material, whilst moving/reclaiming the material, which are not compliant with the Waste Licence they will be removed and transported to the Waste Quarantine area.

#### **11.2.2.2 Waste Handling**

The Waste Facility proposed under this Licence Application, is a very simple 'Material Recovery Facility'. The proposed works involve the acceptance of inert Construction & Demolition material and the importation of soil and stones for restoration/reclamation.

#### **Waste Quarantine Areas**

If inappropriate material is identified during inspection, it will be removed to a waste quarantine area before removal from site to an appropriate waste licence facility. It is proposed to use skips on an existing hardstand area for storage of quarantine rejected waste.

#### **Laboratory Testing**

Laboratory testing of soil, surface water and groundwater will be undertaken off-site at an ILAB/UKAS accredited laboratory. Any validation testing and laboratory testing required to confirm classification of waste as inert will also be undertaken by the same laboratory. All samples taken on-site will be forwarded to the laboratory and test results will typically be forwarded to site within ten working days.

#### *11.2.3 Potential Impact of the Proposed Development*

There is the potential for impacts to arise from importation of inappropriate materials and accidental spills on site. Examples of this would be poor housekeeping, or loss of containment. The impacts in any event are unlikely to be significant. A good environmental management system is already in place to prevent and to react to any potential situations that may arise.

The loss of containment of fuel presents a potential impact on soil and or ground water. Due to the small quantities and types of fuel to be used at the site coupled with over 40 years of experience at Mullaghcrone quarry, the risk of loss of containment or oil spill is considered to be low.

## 12 CULTURAL HERITAGE, ARCHAEOLOGY & ARCHITECTURAL HERITAGE

### 12.1 INTRODUCTION

The application area is located within the existing Roadstone quarry site at Mullaghcrone, Donore, Co. Meath. The existing site is located in the townlands of Platin and Cruicerath, which is approximately 0.6km - 1.15km south-east of Donore Village, County Meath. The site boundary is within the south-western area of Mullaghcrone Quarry (see Figs. 12.1 and 12.2). The application area consists of a large rectangular area (11.7 hectares), bordered by a soil and stones landscaping/restoration area to the south (Irish Cement area) and by quarry activities to the north. Agricultural land forms the western boundary of the site. The proposed application is for a 1,200,000 m<sup>3</sup> waste license (soil and stones,) to restore the area to a maximum elevation of 83mOD. Material will be transported to the site along two local access routes. The northern route, the Donore Road, extends from the M1 Rathmullan interchange west to the quarry entrance. The southern route extends from the M1 Platin interchange, south along the Duleek road and then along the Platin to Cruicerath road to the southern entrance.

An established waste permit facility operation is already in place at Mullaghcrone Quarry under the previous waste permits, with all the necessary infrastructure and environmental management measures in place to minimise the environmental impacts of such an operation.

#### Outline of Scope of Works

This report has been undertaken to assess impacts on the cultural heritage of the proposed waste licence facility described above. A wide variety of papers, cartographic, photographic and archival sources were consulted. All the lands of the proposed development and the surrounding area were visually inspected.

This study is an assessment of the known or potential cultural heritage resource within a specified area consisting of a collation of existing written and graphic information in order to identify the likely context, character, significance and sensitivity of the known or potential resource using an appropriate methodology (EPA 2002 and 2003). The items of cultural heritage assessed in this study are confined to material assets.

The study involved detailed investigation of the cultural heritage including the archaeological, structural and historical background of the proposed development site and the surrounding area up to 500m from the development (see Fig. 12.1). This area was examined using information from the:

- Record of Monuments and Places (RMP) of County Meath;
- Meath County Development Plan 2007-13, including the Record of Protected Structures;
- Topographical and Correspondence files and finds list of the National Museum of Ireland;
- Aerial photographs;
- Previous excavation reports;
- Cartographic; and
- Documentary sources.

A field assessment was carried out on the 5<sup>th</sup> October 2010 to identify and assess any known archaeological sites and structures and previously unrecorded features and possible finds within the

proposed application area and local access routes. No significant changes have occurring since the waste licence application was lodged in 2011.

An impact assessment and mitigation strategy has been prepared. An impact assessment is undertaken to outline potential adverse impacts that the proposed development may have on the cultural resource, while a mitigation strategy is designed to avoid, reduce or offset such adverse impacts.

### **Consultations**

In the course of producing this document consultations were carried out with the National Monuments Section of the Department of the Environment, Heritage and Local Government and all issues raised have been addressed by the assessment.

## **12.2 BASELINE DATA: THE EXISTING CULTURAL HERITAGE ENVIRONMENT**

### **The Landscape**

The site is situated in north-east Co. Meath to the south-east of the village of Donore and directly south of the Rathmullan to Donore road. It is situated between 60-90m in flat to undulating lowland. The soil of the development area is a grey brown. The bedrock is limestone and calcareous shale (Gardiner and Radford 1980; McConnell and Gatley 2006).

### **Historical and archaeological development of the study area**

The following is a brief summary of the archaeological and historical development of the study area and the main types of sites and monuments that are known from the surrounding landscape. The information is drawn from the assessment. It is intended to indicate the types of sites and monuments known to be present in the study area as well as the pattern of landholding and to place this material in its cultural heritage context. The development is situated in the parishes of Donore and Duleek and the barony of Lower Duleek.

### **Prehistoric Period**

There are no prehistoric sites or monuments known from the study area. However a Neolithic house (Ref 04E1551) was found 2km to the south in Carranstown townland during archaeological monitoring in 2003. The site consists of a rectangular area measuring 7.6m x 4.8m defined by foundation trenches for wooden walls.

Bronze Age material has been found 1km to the south of the proposed development in Carranstown where a series of Fulachta Fiadha (03E0790 and 05E1324) have been found along the northern bank of a stream. North of this a Bronze Age barrow (03E1347) and additional Fulachta Fiadha (02E1306) have been found and a Ring-ditch was uncovered in 2004 (04E0714). This indicates substantial prehistoric activity in the study area.

### **Early Medieval Period**

By the eighth century AD the Southern Ui Neill had become overlords of the Kingdom of Brega, extending over Meath, North Dublin and South Louth and ruled the vassal septs of the Luigni, Gailenga and the Ciannachta, who occupied the study area (Byrne 2001, 68-9). The Ciannachta occupied land



on both sides of the River Boyne and are noted in the Annals from the sixth century. Byrne suggests that they had come from Co. Derry and had been settled on lands conquered by the Ui Neill.

Classically settlement in the Early Medieval period is indicated by the presence of enclosed farmsteads known as ringforts. However, there are no definite ringforts recorded in the study area. An unclassified earthwork in Cruicerath townland (ME027-002---) is the only site that could plausibly be a ringfort.

### **Medieval Period**

The first appearance of the Anglo-Normans in the study area was in 1171 when Milo de Cogan plundered Duleek but was driven off by the Vikings of Dublin. In the following year King Henry II granted the Kingdom of Meath to Hugh de Lacy to hold as King Murrough O Melaghlin, King of Meath, had held it (Otway-Ruthwen 1980, 52). De Lacy established a manor at Duleek and constructed a motte castle. In 1182 de Lacy granted the church of St. Cianan of Duleek and its lands to the Priory of Llanthony Secuna of Gloucester. The lands of Duleek Abbey included Platin townland in which the application area is situated.

Sir John D'Arcy was appointed Lord Chief Justice of Ireland by King Edward II in 1328. He married Lady Jane Burke (De Burgo), daughter of the Earl of Ulster and his son William D'Arcy, made his seat at Platten (Platin). The Darcy's occupied Platin until c.1690. When Simon Flemyng, Baron of Slane, died in 1370 he possessed the manor of Dyuelek (Duleek) which was inherited by his son Stephen Flemyng (*Calendar of Patent Rolls A.D. 1370-1374*, 247).

### **Medieval Settlement**

The process of sub-infeudation is normally associated with the construction of timber castles, known as Motte and Baileys. These earthwork fortifications were used to house and defend the Norman lords and their retinues while they set about the process of pacifying and organizing their new fiefs. Hugh de Lacy's motte castle was situated in Commons townland to the north-east of Duleek, but does not survive.

Manorialism describes the organisation of the feudal rural economy and society characterised by the vesting of legal and economic power in a Lord supported economically from his own direct landholding and from the obligatory contributions of a legally subject part of the peasant population under his jurisdiction. In Ireland the Lord's Manor House was also sometimes enclosed by a rectangular moat and these sites are referred to as moated sites. They are a useful indicator of Anglo-Norman settlement. However, there are no moated sites known within the study area.

### **The Later Medieval Period**

The fifteenth century was characterised by the decline of Anglo-Norman power in Ireland which had been ebbing since the early fourteenth century. Part of the response to this was the construction of masonry Tower Houses which sprang up after King Henry VI introduced a building subsidy of £10 in 1429 (Sweetman 1999, 137). There are no surviving tower houses in the study area but the Darcy castle at Platin was presumably a tower house.

### **The Post-Medieval Period**

Until 1540 the manor of Newton (Newtown) comprising the manors of Carreston (Carranstown) and Platen (Platin) was part of the Monastery of Duleek which belonged to Llanthony Abbey. Carreston was

let to Richard Bysset and Platen was let to William Darcy (MacNiocaill 1992, 31, 32). The Civil Survey of 1656 records that in 1640 Nicholas Darcy of Platten had Great Carranstowne (Carranstown), and Platen (Platin) which contained a castle. Cruicerath was held by Stephen Cormacke and Staleing (Stalleen) was held Charles Lord Viscount Moore (Simington 1940). On 19 December 1641 the Old English of the Pale met at Nicholas Darcey's house at Platin to write a petition of grievances to King Charles I and a statement of why they had risen in rebellion (Clarke 2000, 188-9). By the later nineteenth century Cruicerath was held by the Netterville family and Platin was held by the Gradwell family (Source, Co. Meath Landowners 1873-5).

## Structures

### Protected Structures

The Record of Protected Structures in the Meath County Development Plan 2013-19 was examined. There are three Protected Structures in the study area.

1. MH020-113 R 14402003 Donore Parochial House  
Cruicerath Donore Parochial House Detached three-bay two-storey parochial house, built c.1840, with gabled bay and gablet. Pitched slate roofs with red brick chimney stacks. Square limestone walls with carved limestone plaque.
2. MH020-114 R 14402002 Saint Mary's Roman Catholic Church  
Cruicerath Donore Church (R.C. ) Detached gable-fronted church, built c.1840, flanked by recessed bays. Four-bayside elevations to the nave. ashlar limestone gate piers surmounted by cast-iron finials, with pair of cast-iron gates. Former school to site.
3. MH020-112 R 14402001 Detached House Stalleen Donore House (detached )  
Detached four-bay two-storey house, built c.1880, with gabled porch. Hipped slate roof with render brick chimney stacks. Rubble limestone walls with dressed stone quoins having red walls to porch.

The closest Protected Structure, the Donore Parochial House, is situated more than 490m north-west from the proposed development. The structures are too distant to be directly or indirectly impacted by the proposed development.

### National Inventory of Architectural Heritage (NIAH)

The NIAH prepared by the DEHLG was examined at [www.buildingsofireland.ie](http://www.buildingsofireland.ie). There are no additional structures in the study areas listed in the Inventory.

### Non-designated Structures

Non-designated structures within 100m of the application area and along the site access road indicated on the 1909 edition of the OS six inch map were visited. There are no structures on the 1909 edition within 100m of the application area. There are two access roads that lead to and from the site. The northern access road, the Donore Road, extends from the M1 Rathmullan interchange west to the quarry entrance. The southern access extends from the M1 Platin interchange, south along the Duleek road and then along the Platin to Cruicerath road. There are no structures situated along the southern

access route. There are four structures along the Donore Road that are indicated with numbers and arrows on Fig. 12.3 and are described below.

1. Single storey L-shaped cottage with five visible windows and three chimneys. Close to the road but protected by a stone wall (see Fig. 12.4).
2. One storey cottage with five windows, two chimneys and a porch. Set back from the road and protected by a concrete wall (see Fig. 12.5).
3. Two storey four bay house with two chimneys. Close to the road but protected by a stone wall (see Fig. 12.6).
4. Two storey two bay house with entrance porch. Set well back from the road (see Fig. 12.7).

Structures 2, 3 and 4 are situated close to the road but are within a 50km speed limit zone and are protected by stone or concrete walls. Structure 1 is within the 80km zone and is protected by a concrete wall.

## Impacts

### Direct impacts

There are no designated or non-designated structures situated in the application area.

### Indirect impacts

There are no impacts on designated structures. There are four non-designated structures indicated on the 1909 OS mapping along the Donore road site access route. However these structures are within either 50km or 80km speed limit zones and are protected by stone or concrete walls, so that traffic does not represent a potential indirect impact.

## Archaeological Assessment

### Cartographic Sources

The Down Survey of 1654, Ordnance Survey 1<sup>st</sup> and 3<sup>rd</sup> edition six inch maps of the area were examined. This analysis did not indicate any previously unrecorded archaeological sites or monuments in the application area.

### Place name evidence

Carranstown	<i>Originally Curranstown, town of the Currans</i>
Cruicerath	Fort of the Cruise family.
Donore	The fort of pride
Platin	A small plateau or green
Stalleen	Little overhanging rock, craggy steep, precipice



The English translations of the townland names of the study area presented above are based on Joyce 1870 and the Placenames Database of Ireland. The fort of Cruise family may be the earthwork site ME027-002---- in Cruicerath townland. There are no other cultural heritage sites indicated.

### **Aerial Photographs**

Examination of the Ordnance Survey 1995, 2000 and 2005 series orthophotos as well as imagery from Google Earth did not indicate any additional sites.

### **National Museum of Ireland**

Examination of the finds registers and topographical files held by the National Museum of Ireland revealed that no artefact discoveries from the study area have been reported to the National Museum.

### **Other sources**

Examination of archaeological corpus works on prehistoric artefacts (Harbison 1969, Eogan 1965, 1983, 2000, Kavanagh 1991, Simpson 1990), and pottery (O'Riordain and Waddell 1993) and Iron Age material (Raftery 1984) did not reveal any additional material.

### **Previous excavations**

Examinations of the *Excavations Bulletin* indicated that there have been two archaeological excavations carried out in the study area. They are summarised.

#### **1. Cruicerath/Donore/Platin/Stalleen**

Possible prehistoric landscape  
304650 272519  
07E1028

The bundled wastewater collection system is a development by Meath County Council to upgrade the sewerage network in Donore and seven other towns and villages in County Meath. Donore will have 3320 linear metres of network pipe trench excavated through four townlands over approximately seven months. A total of c. 3185m of trench will be excavated along existing roads, with the remaining 135m running along a gravel road. The wastewater treatment plant in Stalleen will also be extended and an outflow pipe will be constructed to the Boyne River. The development area is considered archaeologically significant because it is located within the Archaeological Ensemble of the Bend of the Boyne UNESCO World Heritage Site (UNESCO WHC No. 659).

Monitoring in 2007 consisted of a single engineer's test-pit; nothing of archaeological significance was observed. Works will continue in 2008.

#### **2. Cruicerath**

Medieval  
30540 27140  
03E0264

A programme of excavation was undertaken within the proposed westward extension of Platin Quarry in the townland of Cruicerath, located in north-east Co. Meath. The site is to the west of the present Irish Cement Ltd. quarry at Platin, 5km to the south-west of Drogheda and 3km north-north-east of Duleek.

Topsoil removal was monitored (licence number 02E1716). The site was identified as a series of linear features associated with several pits. These features were associated with sherds of medieval pottery. It is suggested that the site comprises a truncated medieval settlement. The entire site is contained within a rectangular area 50m east-west by 20m and is located on a level area at the top of a south-facing slope.

Excavation was carried out between February and April 2003. Approximately 530 sherds of medieval pottery were recovered from ten features. No stratigraphic relationship can be formed between many of the features recorded. The depth of topsoil overlying this site was very shallow (maximum 0.2m), which has undoubtedly led to disturbance/truncation due to modern agricultural practices. However, the features all respect a common orientation. Two structures, three ditches, three irregular pits and a fulacht fiadh-type trough were excavated.

Structure 1 encloses a rectangular area c. 20m north-south by c. 9.5m. The main element of this feature has been interpreted as a 'drip trench', measuring 0.6-1.3m in width and c. 0.5m in depth. The trench contained five fills, which in turn contained various artefacts (iron, pottery and flint are all represented), the majority of which are medieval pottery sherds. No structural evidence was identified, therefore it is suggested that the feature has been heavily truncated by agricultural activity. It is possible that the structures constructed on this site comprise turf/sod-built walls, which have not been preserved. A shallow hearth (0.14m) to the north of this structure was also identified.

Structure 2 consists of a linear feature similar to the 'drip trench', comprising part of Structure 1; it is F-shaped in plan and is aligned east-west. It measures 14.2m east-west by c. 7m. Two phases have been identified. The first is a U-shaped cut (6m by 0.5m by 0.2m maximum) aligned east-west and forming the small bar of the 'F' shape. This is cut by a later, less regular, shallow cut (1.2-0.1m in width and 0.18-0.06m in depth). The fills of this feature contained medieval pottery.

Also found were ditches filled with various silts and the very occasional sherd of medieval pottery. The profile of these ditches was predominantly V-shaped, and measured c. 1.5m maximum in width and c. 0.5m in depth. They formed boundaries between the structures and also formed the northern limit of the site.

Three features provisionally interpreted as pits have been recorded. They contained stone, charcoal and pottery. They had a maximum length of c. 8.2m and depth of c. 0.4m.

A fulacht fiadh-type trough measuring 1.7m by 0.52m by 0.21m was aligned north-east/south-west. It had vertical edges and a flat base and contained burnt-spread material. No other burnt-spread material was identified on-site.

Initial analysis of the morphology of the features recorded shows some similarities with other medieval rural settlement sites, although detailed comparisons have not yet been undertaken. The material recovered from the site, in particular the pottery sherds, has been provisionally dated to the 13th/14th centuries. No earlier or later pottery has been recovered from the sealed

contexts on the site. This indicates the strong possibility that the site fell into disuse after the 14th century.

### **Field Inspection**

Field inspection was carried out on the 5 October 2010. This involved an inspection of all the lands included within the application area and the immediate surrounding area. The application area consists of a sub-rectangular field (Area 1, see Fig. 12.2) at south-west and the quarry void (Area 2) at east. The surface of Area 1 has been raised by the addition of 5-10m depth of soil and stones (see Figs. 8 and 9). There is no cultural heritage material visible at ground level in Area 1. Area 2 is the large quarry void which has been partially filled with inert material (see Figs 12.10 and 12.11). There is no cultural heritage material visible at ground level in Area 1 or Area 2.

## 12.3 SIGNIFICANT IMPACTS

### **Direct impacts**

The development will have no direct impact on any known items of cultural heritage, archaeological sites, monuments or artefacts or designated or undesignated structures.

### **Indirect impacts**

The development will have no indirect impacts on any known items of cultural heritage, archaeological sites, monuments or artefacts or designated or undesignated structures.

### **Interaction with other impacts**

No interactions were identified during the assessment.

### **'Do nothing' impact**

If the proposed development were not to proceed there would be no negative impact on the cultural heritage.

### **'Worst case' impact**

In the worst case scenario, the proposed development might disturb previously unknown deposits or artefacts without preservation by record taking place.

## 12.3 MITIGATION MEASURES

### **Direct impacts**

No direct impacts warranting specific mitigation were identified during the course of the cultural heritage assessment

### **Indirect Impacts**

No indirect impacts warranting specific mitigation were identified during the course of the cultural heritage assessment



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