Marshall Yards Development Company Limited

Large-Scale Residential Development at Ballybin Road, Ratoath,Co. Meath

Infrastructure Design Report (Planning Submission)

2334-DOB-XX-SI-RP-C-0001

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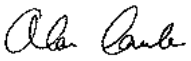
Author:	Alan Lambe	Signed:	

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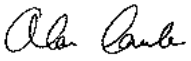
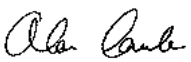
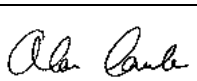
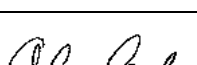
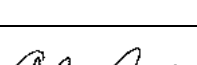
S2.P01	12.03.2024	Issue 1	Client, Design Team	1E	
S2.P02	20.03.2024	Issue 2	Client, Design Team	1E	
S2.P03	27.03.2024	Issue 3	Meath County Council	2 + 1E	
S2.P04	07.06.2024	Issue 4	Client, Design Team	2 + 1E	
S2.P05	17.06.2024	Issue 5	Meath County Council	1E	

Contents

1 Introduction

Donnachadh O'Brien & Associates Consulting Engineers Ltd. (DOBA) have been instructed by the Client, Marshall Yards Development Company Limited, to prepare an Infrastructure Design Report (IDR) to accompany a planning submission to Meath County Council (MCC) for the proposed Large Scale Residential Development (LRD) on lands at Ballybin Road, Ratoath, Co. Meath. This Infrastructure Design Report is structed as follows;

- **Section 2** summarises the attributes of the **Existing Site**,
- **Section 3** provides a description of the **Proposed Development**,
- **Section 4** addresses **Surface Water** in terms of existing and proposed and demonstrates compliance with the requirements of Meath County Council (MCC). This section demonstrates how the proposed development has adopted a Nature Based SuDS (NBS) focused approach to surface water disposal on site through the provision of bioretention tree pits, filter drains and unlined permeable paving (as Source Control SuDS) and finally detention basins with supplementary underground attenuation tanks with associated hydrobrakes and a full retention interceptor are proposed. The proposed design shall achieve a 2-stage surface water treatment process which intercepts surface water run-off and treats the water by filtration and treatment through natural material prior to discharging to the Broadmeadow Stream,
- **Section 5** addresses existing and proposed **Wastewater Drainage** arrangements,
- **Section 6** addresses the existing and proposed **Water Supply** proposals to the development, and finally,
- **Section 7** outlines the **Roads Infrastructure** arrangements for the proposed development and describes the existing infrastructure, pre-planning consultations held with MCC Transportation Department and proposed development access.

2 Existing Site

The existing site is predominantly a greenfield site in agricultural use with 2 existing detached dwellings and agricultural buildings as illustrated in **Figure 1** below. The site is bound to the west and north by the existing Fox Lodge Woods / Manor residential development, to the east by agricultural lands and also the Ballybin Road and to the south by the R125. The existing private dwellings on the site are served by 2 no. existing vehicular accesses – one off the R125 roundabout to the south of the site and one off the Ballybin Road. The site topography is gently sloping from west to east with existing levels extending from ca. +82.50m along the western boundary to +77.50m along the eastern boundary. The existing site is illustrated on Engineering drawings C-0001, C-0002 & C-0003.

Figure 1 Site Location (Source: Google Maps)

3 Proposed Development Description

The proposed development is at a site with a total area of 5.48 hectares principally located at Main Street/R125 and Ballybin Road, Ratoath, Co. Meath. The total site contains a proposed residential development site with an area of 3.66 hectares (bisected by a proposed realigned Ballybin Road) and a proposed infrastructural development site with an area of 1.82 hectares (principally for road and related works, water services and open space amalgamation). The site is generally bound by: Fox Lodge Woods and Fox Lodge Manor to the west and north; existing agricultural lands and residential development to the north and east; existing Ballybin Road and Moulden Bridge to the east; and Main Street/R125 and Jamestown Road/L1016 to the south. The site also incorporates parts of: the existing Ballybin Road (north and west of Moulden Bridge), Main Street/R125, Jamestown Road/L1016 and green open space in Fox Lodge Manor.

The proposed development principally consists of the demolition of 2 No. dwellings (594 square metres gross floor area combined) and 1 No. agricultural shed (988.7 square metres gross floor area) and the construction of 141 No. residential dwellings with a gross floor area of 12,428 square metres in buildings of 2 No. and 3 No. storeys. The dwellings include 117 No. houses (57 No. 2-bed, 52 No. 3-bed, 7 No. 4-bed and 1 No. 5-bed) and 24 No. maisonette/duplex units (18 No. 1-bed and 6 No. 3-bed).

The development also proposes a reconfiguration of the road layout at the south (Main Street/R125 and Jamestown Road/L1016) and east (Ballybin Road) of the site. Specifically, it is proposed to demolish/remove the existing 5-arm roundabout and to replace same with a new 4-arm signalised junction and reconfigured access to the existing Ratoath Childcare site. The new junction arrangement will facilitate a proposed realignment of the southern section of the existing Ballybin Road (approximately 172 metres) as the northern arm of the new signalised junction and a revised entrance for the existing dwelling to the north-east of the site at Ballybin Road (known as 'Fox Lodge Farm', Eircode A84 KF97). The proposed road infrastructure works also include: road markings, traffic signals, traffic signage, footpaths and cycle infrastructure.

The development also proposes:

- 2 No. new multi-modal accesses onto the proposed realigned Ballybin Road to serve the bisected residential site;
- 2 No. pedestrian accesses onto Main Street/R125 and 1 No. pedestrian access onto the realigned Ballybin Road;
- Relocation of existing eastbound bus stop at Main Street/R125 approximately 130 metres to the west;
- Repurposing of the closed section of Ballybin Road as a pedestrian/cycle greenway;
- Internal roads and footpaths;

- 228 No. car parking spaces;
- Cycle parking spaces;
- Hard and soft landscaping, including public open space, communal amenity space and private amenity space (as rear gardens and terraces/balconies facing multiple directions);
- Demolition of the wall at the north-west corner of the site interfacing with Fox Lodge Manor and the amalgamation of existing public open in the estate and proposed public open space;
- Boundary treatments;
- Public lighting;
- Rooftop PV panels;
- 2 No. ESB sub-stations; and
- All other associated site and development works above and below ground.

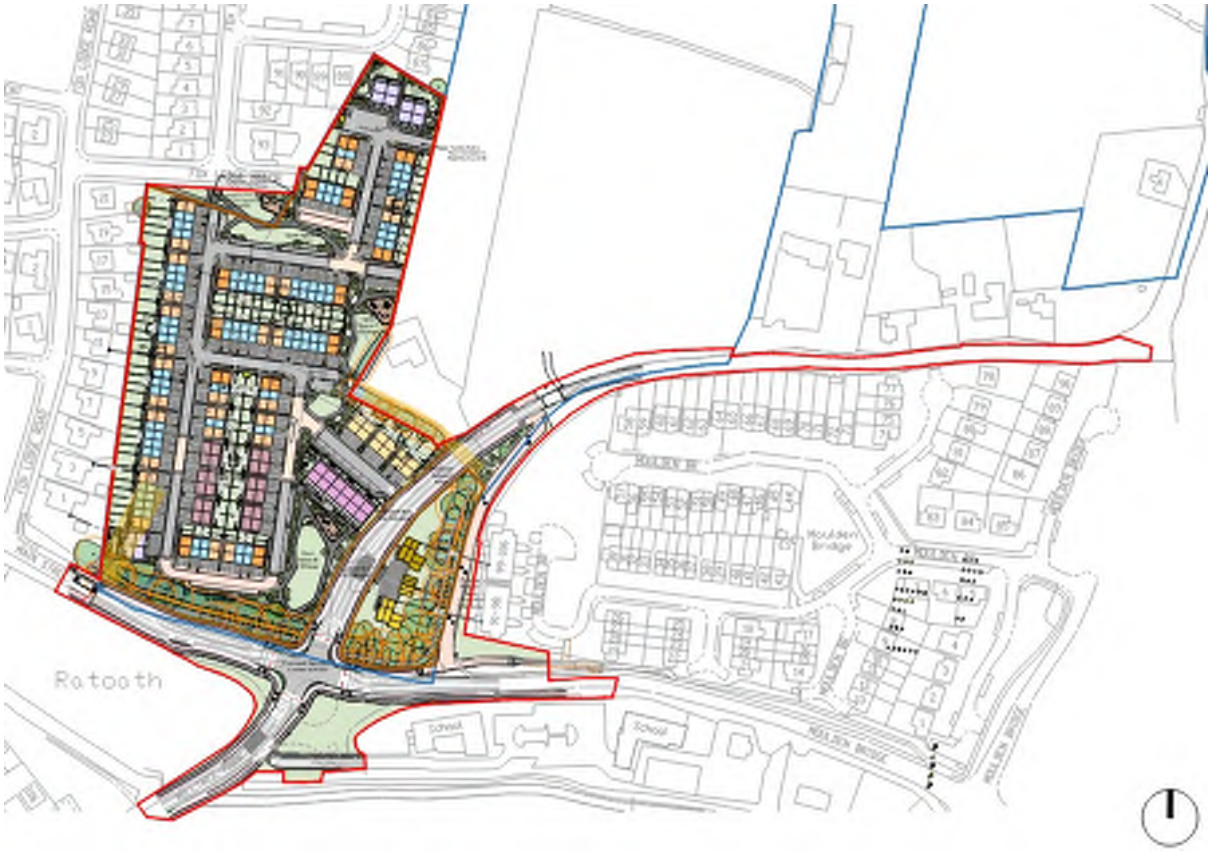


Figure 2 Proposed development (source: JFA)

4 Surface Water

The structure of this section of the report is as follows;

- **Section 4.1** summarises the **Existing Surface Water Infrastructure** located on and adjacent to the proposed development,
- **Section 4.2** outlines the proposed **Surface Water Strategy,**
- **Section 4.3** summarises the Applicant's Responses to the **MCC Surface Water/ SuDS Specification**,
- **Section 4.4** summarises the **Planning Stage Ground Investigations** carried out to date,
- **Section 4.5** estimates the **Greenfield Run-Off Rate** in accordance with the IH24 method,
- **Section 4.6** describes the proposed surface water outfall to the **Broadmeadow Stream**,
- **Section 4.7** provides the proposed **SuDS Strategy** including SuDS Hierarchy, proposed SuDS elements, SuDS treatment train and **Section 4.8** outlines the **Maintenance Regime** for the proposed SuDS features. This section also outlines the rationale for providing or not providing various SuDS measures across the site with a focus on Nature Based SuDS (NBS) measures,
- **Section 4.9** demonstrates how the proposed scheme complies with the requirements of the **Greater Dublin Regional Drainage Study** Criterion 1 through 4 namely River Water Quality Protection, River Protection Regime, Level of service (Flooding) for the site and River flood protection,
- **Section 4.10** describes the **Proposed Surface Water Piped Network Design Parameters**, and finally,
- **Section 4.11** summarises the findings of the **Site-Specific Flood Risk Assessment** (SSFRA) prepared by DOBA and submitted separately with this Application.

4.1 Existing Surface Water

The local topography of the application site is gently sloping from west to east towards the Ballybin Road. The primary surface water discharge on site is to ground. An existing field boundary drain discharges from west to east within the site and appears to receive some runoff from the existing agricultural lands and private dwellings prior to discharging to a piped network discharging towards the Ballybin Road.

4.2 Proposed Surface Water Drainage Strategy

The design and management of surface water for the proposed development will comply with the policies and guidelines outlined in the Meath County Development Plan (2021-2027) and the CIRIA SuDS Manual. A 20% climate change factor will be included for the design of the surface water network in accordance with the requirements of MCC.

4.3 Local Authority Consultations

The Applicant formally engaged with the Meath Co. Co. Water Services Department (MCC WSD) regarding the proposed development as summarised in **Table 1** below:

Table 1 Applicant's engagement with MCC WSD

Engagement with MCC WSD	Applicant's Responses to MCC Comments
S247 Meeting with MCC WSD dated 02.10.2023	Refer to **Appendix F**
LRD Meeting with MCC WSD dated 29.04.2024 (LRD Opinion and Record of Meeting issued on 24.05.2024)	Refer to **Appendix G**
Meeting with MCC WSD to review LRD Meeting comments dated 10.05.2024	Refer to **Appendix G**

4.4 Planning Stage Ground Investigations

The ground investigations (GI) have been completed on site and show gravelly CLAYS across the site. Infiltration testing yielded extremely poor infiltration rates. The GI report is included in **Appendix A** of this Infrastructure Design Report. A summary of the tests are included below.

Trial Pits up to 3.5m BEGL: The ground conditions encountered in the trial pits were generally consistent. Topsoil to a depth of 0.20m overlying Soft to Firm to Stiff to Very Stiff sandy slightly gravelly CLAY with high cobble and low boulder content.

BRE Digest 365 soakaway tests: Infiltration tests in accordance with BRE Digest 365 were carried out in the trial pits TP02, TP07 and TP12 (in proposed open space areas). The soakaway tests either

failed or yielded extremely poor infiltration results due to an insufficient fall in the water level in the tests. As such, infiltration SuDS techniques are not feasible on this site.

Boreholes were carried out on site up to 8.70m in depth. Groundwater was struck at 2.20m BEGL in BH03 and 2.80m BEGL in BH05. As such, the highest recorded groundwater level on site has been calculated at approx. +75.90m. The base of the proposed SuDS features will be designed 1m above this level to allow for any infiltration available on the site.

4.5 Estimation of Proposed Greenfield Runoff Rate

In accordance with the IH24 method, the greenfield runoff for existing undeveloped sites measuring less than 50Ha can be estimated adopting the following formula and the total permissible outflow has been calculated in **Table 2** below based on a Soil Type 2 and Soil Type 1 combination in accordance with TII DN-DNG-03064 Table 5/1, where $Qbar_{rural}(m^3/s)=0.00108x(Area)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

The strategy for the development site allows for a restricted outfall of 2.0 l/s/Ha from the site itself, prior to discharging to the road drainage network, which was requested by MCC WSD during a meeting on the 10th May 2024.

Table 2 Qbar calculation

Standard Average Annual Rainfall (SAAR)	846	mm
Soil Index	0.285	
Total Drained Area	3.782	Hectares (ha)
Storm Return Period	100	Years
Permissible Outflow per hectare, QBAR	2.0	l/s/ha
*** Total Permissible Outflow**	8.07	l/s

An extract from the Flood Studies Report Winter Rain Acceptance Potential Map confirming a SOIL Type 2 is included in Figure 3 below**:**

Figure 3 Extract from the Flood Studies Report Winter Rain Acceptance Potential Map

4.6 Proposed Surface Water Drainage Outfall

Further to Section 4.1 above, the proposed surface water drainage outfall from the development site is to the south via a new 375mm dia. surface water sewer connection to the existing Broadmeadow Stream as illustrated on DOBA Engineering drawing 2334-DOB-XX-SI-DR-C-0201. The discharge for the surface water drainage associated with the realigned Ballybin Road will discharge to an existing 300mm diameter pipe as per the current Ballybin Road drainage strategy as illustrated on drawing 2334-DOB-XX-SI-DR-C-0202.

4.7 Proposed SuDS Strategy

4.7.1 Proposed SuDS Hierarchy

The SuDS hierarchy outlined in **Table 3** below has been considered for this site in accordance with the requirements of MCC Water Services;

Table 3 SuDS Hierarchy

Sustainable Urban Drainage System	Regional Control	Source Control	Site Control	Other	Proposed for the Scheme (Y/N)	Rationale for the provision or otherwise of proposed SuDS measures
Nature Based SuDS (NBS)						
Constructed Wetlands	●				N	It is not proposed to provide a constructed wetlands at this stage of the design given the minimal space to implement the same. It is proposed to provide storage via underground attenuation tanks instead.
Retention Pond	●				N	It is not proposed to provide a retention pond at this stage of the design given the minimal space to implement the same. It is proposed to provide storage via underground attenuation tanks instead.
Bioretention Areas		●			Y	Bioretention areas shall be utilised throughout the proposed development
Bioswales		●			N	Bioswales are not proposed as a source control NBS SuDS measures for this project and instead the SuDS design has opted to use a Detention Pond and tree pits.
Rain Gardens		●			Y	Raingardens shall be adopted within the proposed development with surface water discharge from backyards conveyed to the same.
Green Roofs		●			N	Not proposed as part of this development as there are other alternative viable Nature Based SuDS solutions available to the Applicant.
Blue Roofs		●			N	
Green Walls		●			N	Not proposed as part of this development as there are other alternative viable Nature Based SuDS solutions available to the Applicant.
Tree Pits		●			Y	Tree Pits are proposed as source control NBS SuDS measures for this project.
Infiltration System SuDS						
Unlined tree pits-trenches		●			Y	Tree Pits are proposed as source control NBS SuDS measures for this project. They will be left unsealed to utilise any available infiltration.
Unlined permeable paving		●			Y	Tree Pits are proposed as source control NBS SuDS measures for this project. They will be left unsealed to utilise any available infiltration.
Infiltration trenches		●			N	Ground investigations returned unfavourable rates of infiltration on site and hence filtration system SuDS shall be incorporated

Filtration System SuDS (in the absence of infiltration system SuDS shall be adopted)						
Filter Drains		●			Y	Ground investigations returned unfavourable rates of infiltration on site and hence filtration system SuDS shall be incorporated.
Filter Strips		●			Y	Ground investigations returned unfavourable rates of infiltration on site and hence filtration system SuDS shall be incorporated. Filter strips will be utilised in the private curtilage.
Lined Permeable Paving		●			N	
Detention Systems SuDS						
Detention Basin			●		Y	Online Detention basins shall be provided as detention-based Suds. Underground attenuation tanks are required prior to the controlled discharge of surface water from the development to the existing surface water drainage to the south of the subject site. The attenuation tanks will be proceeded by all of the nature-based SuDS features noted above. The size of the underground tanks shall be limited through the provision of hydro-brake flow restricting devices in each of the sub-catchments upstream to delay the time of entry into the surface water system.
Lined Underground Attenuation Tank			●		Y	
Over-sized pipes			●		N	
Proprietary Treatment Systems						
Petrol/ oil separators				●	Y	A bypass oil/petrol interceptor shall be provided prior to discharge
Rainwater Harvesting		●			N	It is not proposed to provide rainwater harvesting as part of the proposed development as there are other alternative viable SuDS solutions available to the Applicant.

4.7.2 Proposed Treatment Strategy

Figure 4 below illustrates the minimum 2 stage treatment strategy proposed for the development and associated SuDS hierarchy.

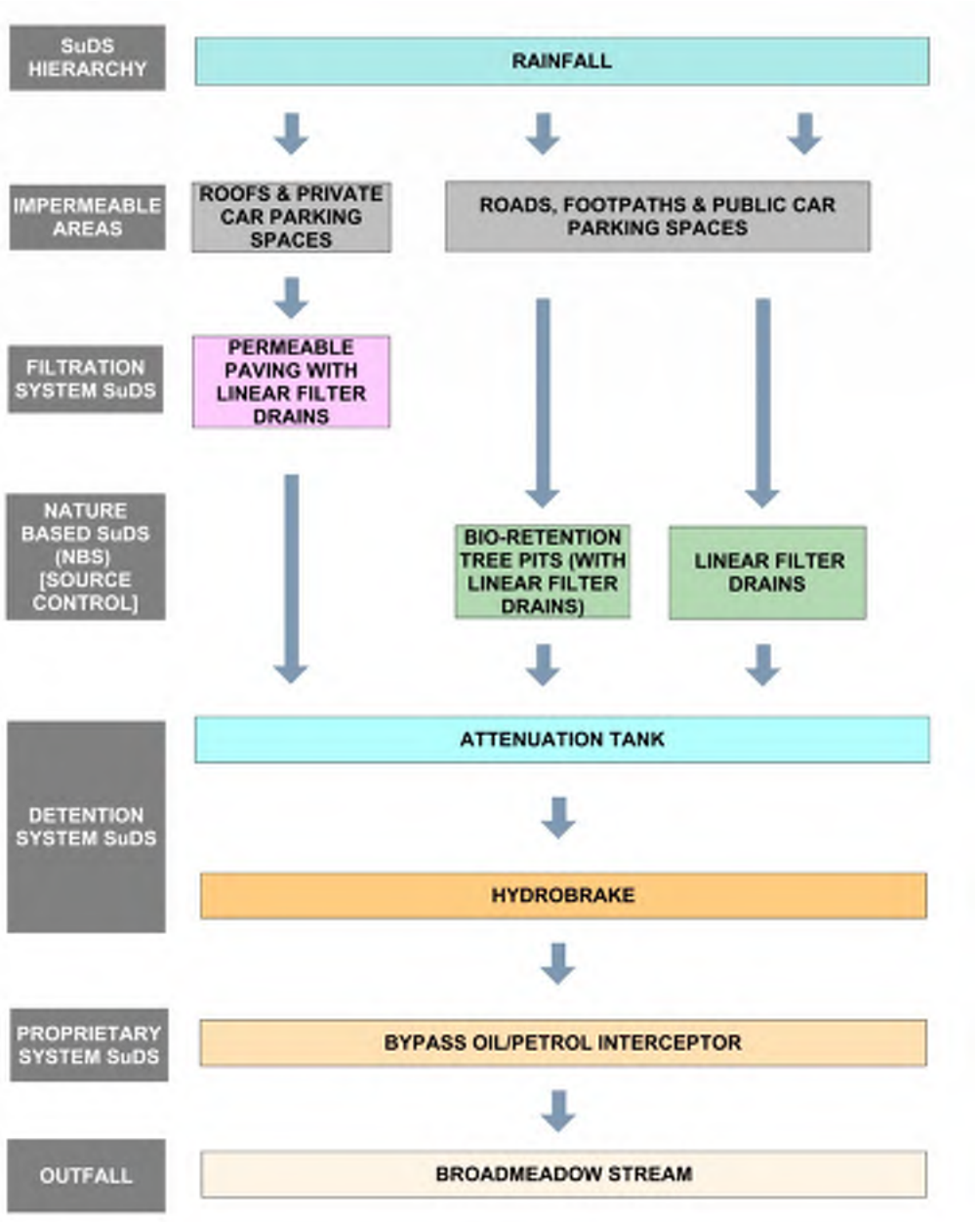


Figure 4 Proposed Treatment Train

4.8 Proposed SuDS Features & Associated Management/ Maintenance

4.8.1 Nature Based SuDS

4.8.1.1 Tree Pits (Source Control)

TABLE 19.3 Operation and maintenance requirements for trees (after CRWA, 2009)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets and outlets	Inspect monthly
Occasional maintenance	Check tree health and manage tree appropriately	Annually
	Remove silt build-up from inlets and surface and replace mulch as necessary	Annually, or as required
	Water	As required (in periods of drought)
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

4.8.2 Filtration System SuDS

4.8.2.1 Filter Drains (Source Control)

TABLE 16.1 Operation and maintenance requirements for filter drains

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

4.8.2.2 Permeable Paving (Source Control)

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

4.8.3 Detention System SuDS

4.8.3.1 Detention Basins

TABLE 22.1 Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

4.8.3.2 Attenuation Tank (Site Control)

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

4.8.4 Proprietary Treatment Systems

4.8.4.1 Petrol/ oil separators

TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

4.9 Proposed Design of Sustainable Drainage System

The design of sustainable drainage systems, as per Chapter 6 of the Greater Dublin Strategic Drainage Study (GDSDS), is set out below and describes the performance of the proposed surface water drainage system when measured against the relevant GDSDS drainage criterion, namely

- Criterion 1 – River Quality Protection
- Criterion 2 – River Regime Protection
- Criterion 3 – Level of Service (flooding) for the Site
- Criterion 4 – River Flood Protection

The requirements of SuDS are typically addressed through the provision of

- Interception Storage
- Treatment Storage *(not required if interception storage is provided)*
- Attenuation Storage
- Long Term Storage *(not required if growth factors are not applied to Q_{bar} when designing attenuation storage)*

In accordance with MCC requirements, a Climate Change factor of 20% will be applied to the design of the surface water system.

4.9.1 River Quality Protection

4.9.1.1 Objective

Interception storage of at least 5mm, and preferably 10mm, of rainfall where run-off to the receiving water can be prevented.

4.9.1.2 Proposal

The 10mm rainfall event on site will be intercepted without discharging to the public system. **Table** is a summary of the required and provided interception volumes in each of the sub-catchments. Sub Catchment 5 is the existing public road (R125) which appears to have no interception or attenuation at present. We are improving this current scenario by providing interception and attenuation.

Table 4 Summary of interception volumes per sub-catchment

Sub-Catchment Reference	Interception required (m^3)	Interception provided (m^3)
1	114	155
2	74	135
3	33	38
4	104	150
5	53	10
6	18	24

The detailed interception calculations are provided within **Appendix B** of this report.

4.9.2 River Regime Protection

4.9.2.1 Objectives

2.1 Discharge rate equal to 1-year Greenfield site peak runoff rate or 2 l/s/Ha, whichever, is the greater. Site critical duration storm to be used to assess attenuation volume.
2. 2 Discharge rate equal to 1 in 100-year Greenfield site peak run off rate. Site critical duration storm to be used to assess attenuation storage volume.

4.9.2.2 Proposals

The surface water network has been designed to comply with these sub-criteria. Qbar discharge rates for the proposed site have been calculated in accordance with GDSDS based on the following calculation:

$$QBAR_{rural} = 0.00108AREA^{0.89}SAAR^{1.17}SOIL^{2.17}$$

As noted in Section 4.5 above, Qbar for the proposed development site has been calculated to restrict the discharge to the existing watercourse to 2 l/s/Ha as per the request by MCC WSD during the meeting on the 10th May 2024. The final discharge to the watercourse has been calculated as 8.07 l/s. The residential development site has also been restricted to 2 l/s/Ha prior to discharging to the road drainage network as requested by MCC. The 2 no. stand-alone detached dwellings have been restricted to 1 l/s per dwelling as part of the overall design.
The portion of the R125 being upgraded as part of the signalised junction and also the realigned portion of the Ballybin Road have been incorporated into the proposed SW network and attenuation calculations and have been restricted to 2 l/s/Ha. The existing roads appear to be unattenuated, as such, the proposed drainage network improves the existing scenario (existing un-attenuated discharge from the R125 has been calculated as 22.5 l/s during a 1 year storm event). The drainage sub catchments are illustrated on drawing 2334-DOB-XX-SI-DR-C-0200. The surface water runoff from the site to the existing surface water networks will be restricted via flow control devices fitted to the discharge manholes.
A 2l/s/ha rate corresponding to 90% soil type 2 and 10% Soil type 1 (FSR WRAP map included in **Figure 3** above) was used to calculate the discharge rate.

4.9.3 Level of Service (flooding) for the Site

4.9.3.1 Objectives

- *No flooding on site except where specifically planned flooding is approved. Summer design storm of 15 or 30 minutes are normally critical.*
- *No internal property flooding. Planned flood routing and temporary flood storage accommodation on site for short high intensity storms. Site critical duration events.*
- *No internal property flooding. Floor levels at least 500mm above Maximum River level and adjacent on-site storage retention.*
- *No flooding of adjacent urban areas. Overland flooding managed within the development.*

4.9.3.2 Proposal

Engineering calculations included in **Appendix B** demonstrate that no pluvial out-of-manhole flooding of the proposed surface network occurs for storms up to and including a 1 in 100 Year plus 20% Climate Change. Therefore, no pluvial out-of-manhole flooding of the site, internal properties or adjacent urban areas occurs. Pipe sizes and gradients have been designed so as to achieve self-cleansing velocities as per the requirements of the Building Regulations Part 'H'. The lowest proposed floor level is set at 500mm above the highest water level in the attenuation tank within each sub-catchment. In the event of a storm exceeding a 1:100 Year plus 20% Climate Change and the outfall becoming blocked, a high-level overflow is to be installed on the outfall manholes of each catchment. The outfall to the existing watercourse is set to a level above the 1,000-year CFRAM level to allow a fee draining discharge during storm events.

4.9.4 River Flood Protection

4.9.4.1 Objectives

- *Long-term floodwater accommodated on site for development runoff volume is in excess of the Greenfield volume. Temporary flood storage drained by infiltration on a designated flooding area brought into operation by extreme flood events only. 100-year, 6-hour duration storm to be used for assessment of the additional volume of runoff.*
- *Infiltration storage provided equal in volume to long term storage and usually designed to operate fort all events.*
- *Maximum discharge rate of Q_{bar} or 2 l/s/Ha, whichever is the greater, for all attenuation storage where separate long-term storage cannot be provided.*

4.9.4.2 Proposals

As noted above, the proposed Q_{bar} for the overall site is **8.07 l/s** and as the surface water run-off generated on site does not exceed Q_{bar}, there is no requirement for long-term storage to limit the impact on the receiving watercourse.

4.10 Proposed Piped Surface Water Network Design Parameters

The surface water piped network and associated attenuation design calculations have been prepared using Infodrainage Network Design Computer software by Innovyze. The proposed surface water drainage system has been designed in accordance with I.S. EN 12056: 2000 'Gravity Drainage Systems inside Buildings', I.S. EN 752: 2017 'Drain & Sewer Systems outside Buildings', 'The Greater Dublin Region Code of Practice for Drainage Works', the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS) and the Building Regulations Technical Guidance Document Part H applying the following parameters.

Surface water drainage design method	Modified Rational Method
Storm Return period (years)	1 in 5 year
Allowable outflow (l/s)	8.07 l/s
Flooding Period	1 in 30 Year and Up to and including a 1 in 100 Year + 20% CC
Standard Annual Average Rainfall (SAAR) (mm)	846 (from Met Eireann)
M5-60 rainfall depth (mm)	15.1
Ratio, r	0.275
Allowance for Climate Change (%)	20%
Minimum self-cleansing velocity (m/s)	0.75
Pipe roughness (mm)	0.6
Run-off coefficients	
Soft landscaped areas	28.5% (90% Soil Type 2 and 10% Soil Type 2)
External hardstanding	80%
Roof Areas	95%

Refer to **DOBA Engineering drawings 2334-DOB-XX-SI-DR-C-0200 series** relating the proposed development's surface water drainage network.

4.11 Flood Risk

A Site-Specific Flood Risk Assessment (SSFRA) has been prepared by DOBA and submitted with the Application documentation (2334-DOB-XX-SI-RP-C-0002_S2.P04) which summarises that the proposed residential portion of the development is situated within **Flood Zone C** and is not at risk of flooding arising from Tidal, Fluvial, Pluvial, Groundwater or Human / Mechanical Error sources.

5 Wastewater Drainage

5.1 Existing Wastewater Drainage

The UÉ public maps indicate an existing 225mm wastewater drainage network along the Ballybin Road approx. 365m to the east of the proposed application site. The CoF letter issued by UÉ confirms that a connection to the existing infrastructure is feasible.

5.2 Irish Water Pre-Connection Enquiry and Confirmation of Feasibility

The Applicant has liaised with Irish Water (IW) in relation to the proposed development and submitted a pre-connection enquiry (PCE) to which IW responded. The Connection & Developer Services (CDS) Response states that a wastewater connection is "*feasible subject to upgrades*" and "*Approximately 365m of gravity network extension (225mm sewer) will be required for the connection to the Uisce Éireann wastewater network as per the applicant layouts. These extension works are not currently on the Uisce Éireann investment plan therefore, the applicant will be required to fund these local network upgrades. The fee will be calculated at connection application stage.*

There is sufficient storage capacity at Moulden Bridge WWPS (Wastewater Pumping Station) to accommodate this development. Uisce Eireann are currently carrying out a detailed assessment on the operational functionality (Mechanical and Electrical) of the WWPS. This detailed assessment will be completed by Q4 2024 (this may be subject to change), and any operational upgrade requirements (If any) will be known at this stage.

The applicant will be required to fund a relevant portion of these mechanical and electrical upgrades (If required). The fee will be calculated at Connection Application Stage." The Confirmation of Feasibility is included in **Appendix C** of this report.

5.2.1 Statement of Design Acceptance

The applicant has received a Statement of Design Acceptance from Uisce Eireann for the proposed development and a copy of the same is included in **Appendix D** of this report.

5.3 Proposed Wastewater Drainage

Wastewater will be collected via a main wastewater drainage network located around the proposed development and shall discharge by gravity to the Existing Wastewater 225mm Dia Network located along the Ballybin Road approx. 365m to the east of the site. The wastewater sewer network is illustrated on **Engineering C-0300 drawing series** and has been designed in accordance with the principles and methods set out in Irish Water's Code of Practice for Wastewater Infrastructure IW-CDS-5030-03, IS EN 752 Drain & Sewer Systems outside Buildings, IS EN 12056 Gravity Drainage

Systems inside Buildings and the Building Regulations Technical Guidance Document Part H Drainage & Wastewater. The estimated peak Wastewater loading generated by the proposed development's Dry Weather Flow is estimated at 0.66 l/s while the Design Wastewater Flow of 6DWF is 3.97 l/s as illustrated in **Table 5** below. Engineering calculations have been included in **Appendix E**.

Table 5 Proposed Post-Development Wastewater Flows

RESIDENTIAL						
Proposed Development Foul Flows						
Use Type	**No. of Units**	**Occupancy Rate (persons/ dwelling)**	**Population (P)**	**Loading (l/ person/ day)**	**Daily Loading (l/ day)**	**Daily Loading (l/s)**
Residential	141	2.7	381	150	57105	0.66
Dry Weather Flow (1 DWF)						**0.66**
Total Proposed Peak Foul Flow (6 DWF) *						**3.97**

6 Water Supply

6.1 Existing Water Supply

The UÉ public maps indicate an existing 150mm stub off an existing 355mm HDPE public watermain along the southern boundary of the application site. The CoF letter from UÉ confirms a connection to the existing network is feasible without upgrades.

6.2 Irish Water Pre-Connection Enquiry

DOBA have liaised with Irish Water (IW) in relation to the proposed development and submitted a pre-connection enquiry to which IW responded with a Confirmation of Feasibility (CoF). The Connection & Developer Services (CDS) Response noted that a new water connection is *"Feasible without infrastructure upgrade by Irish Water" and "Connection is feasible to the 355mm main to the South of the subject site."*. The Confirmation of Feasibility is included in **Appendix C** of this report.

6.2.1 Uisce Eireann Statement of Design Acceptance

The applicant has received a Statement of Design Acceptance from Uisce Eireann for the proposed development and a copy of the same is included in **Appendix D** of this report.

6.3 Proposed Water Supply

The proposed water supply networks within the subject site will include a 150mm dia. watermain with 100mm dia. loops, associated connections, valves, hydrants, meters etc. designed in accordance with Irish Water's Code of Practice for Water Infrastructure IW-CDS-5020-03/ Standard Details and the Department of the Environment's Building Regulations "Technical Guidance Document Part B Fire Safety". The site watermain network will adequately serve the firefighting requirements with Fire Hydrants provided on the loop main in accordance with Part B of the Building Regulations. The proposed watermains are illustrated on the **DOBA Engineering C-0400 drawing series**.

Table 6 Post-Development Peak Water Demand

RESIDENTIAL **Proposed Development Water Demand**								
Use Type	**No. of Units**	**Occupancy Rate (persons / dwelling)**	**Population (P)**	**Per Capita Consumption (l/ person/ day)**	**Average Daily Domestic Demand (l/ day)**	**Average Daily Domestic Demand (l/s)**	**Average Day/peak week Demand (l/s)**	**Peak hour water demand (l/s)**
Residential	141	2.7	381	150	57150	0.66	0.83	4.13
Peak Hour Water Demand								**4.13**

Total Proposed Peak Water Demand	**4.42**

7 Roads Infrastructure

The structure of this section of the report is as follows;

- **Section 7.1** outlines the **existing road infrastructure** present adjacent to the proposed development,
- **Section 7.2** describes the **proposed development access** through the provision of a new access off the realigned Ballybin Road and also describes the works to replace the existing roundabout along the R125 with a new 4 arm signalised junction,
- **Section 7.3** summarises the **attributes of the internal streets design**,
- **Section 7.4** describes the **vehicle autotracks** carried out across the proposed development for passengers 4x4s, Fire Tender and Refuse vehicles,
- **Section 7.5** summarises the findings of the **Transport Assessment** completed by the Applicant's Traffic Engineers, Systra,
- **Section 7.6** describes the **Stage 1 Road Safety Audit** completed by Traffico

7.1 Existing Roads Infrastructure

As noted in Section 1, the subject site is located on lands adjacent to the R125 and the Ballybin Road in Ratoath, Co. Meath. The existing private dwellings on the site are served by 2 no. existing vehicular accesses – one off the R125 roundabout to the south of the site and one off the Ballybin Road. The Existing Site is illustrated on **DOBA Engineering drawing C-0001, C-0002 & C-0003.**

7.2 Local Authority Consultation

The Applicant formally engaged with the Meath Co. Co. Transportation Department (MCC TD) regarding the proposed development as summarised in **Table 7** below:

Table 7 Applicant's engagement with MCC TD

Engagement with MCC TD	Applicant's Responses to MCC Comments
S247 Meeting with MCC TD dated 02.10.2023	Refer to **Appendix F**
LRD Meeting with MCC WSD dated 29.04.2024 (LRD Opinion and Record of Meeting issued on 24.05.2024)	Refer to **Appendix G and H**

7.3 Proposed Development Access & Sightlines

The traffic surveys completed for the Transport Assessment prepared by Systra for the proposed development highlighted that the existing roundabout along the R125 to the south of the site is currently operating over capacity and creates queuing along the western arm of the R125 in excess of 250m to 300m during the AM peak in particular. As such, a new signalised junction is proposed to

replace the existing roundabout to the south of the site, including a relocated entrance for the Ratoath Childcare facility, to improve the traffic flows in the area and to facilitate the proposed residential dwellings. In addition, the existing Ballybin Road is to be realigned through the application site to create a 4th arm of the signalised junction following comments from Meath Co. Co. in relation to safety concerns associated with the existing Ballybin Road / R125 junction. The new development shall be accessed off the re-aligned portion of the Ballybin Road via a new priority junction designed in accordance with the Cycle Design Manual 2023 as illustrated in **Figure 5** below. The proposed access location has been designed to comply with DMURS through the provision of 49m sightlines in both directions. A separate access is proposed for the 2 no. detached units proposed to the east of the realigned Ballybin Road which is also in compliance with DMURS and the Cycle Design Manual. The new signalised junction and the realigned Ballybin Road shall be fully coordinated with the proposed Ratoath Pedestrian and Cycle Scheme (permitted via the Part VIII planning process). Systra have provided a design for the new signalised junction which is included in the Transport Assessment document which is being submitted as part of the planning documents. The development access and proposed signalised junction layout are illustrated on the **DOBA Engineering C-0500 and C-0600 drawing series.**

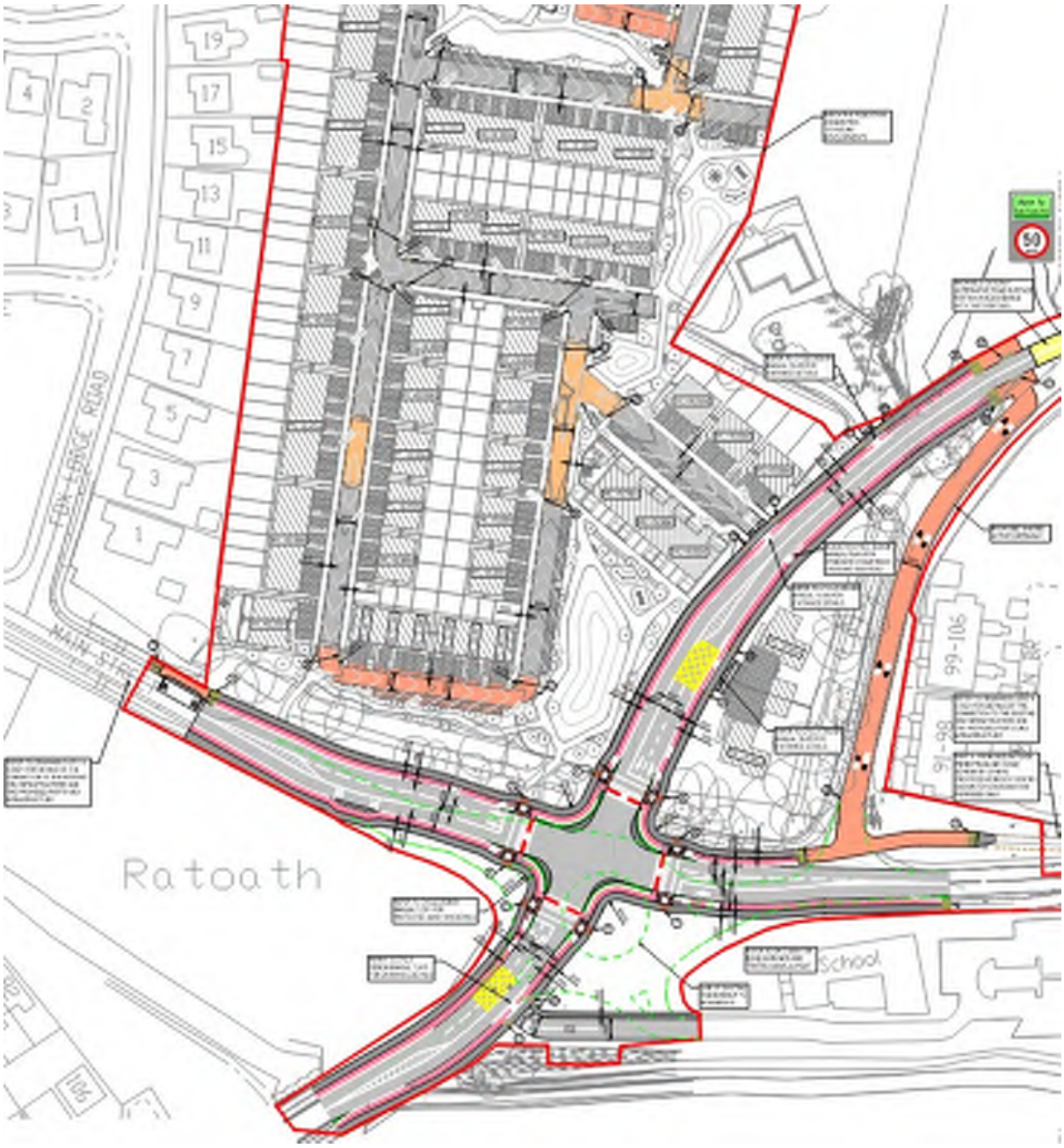


Figure 5 Proposed priority Junction (source: DOBA)

7.4 DMURS Statement of Consistency & Street Audit

The proposed infrastructure to serve the development has been designed in accordance with the Design Manual for Urban Roads and Streets (DMURS) and is illustrated on the **Engineering C-0500 drawing series**. The proposed scheme provides a roads hierarchy including 6.0m wide link streets and 5.5m wide local streets with 2.0m raised footpaths and also a 6.0m shared surface / Home Zone Street (incorporating a 4.8m carriageway with 1.2m wide pedestrian refuge). Psychological and

physical traffic calming measures have been adopted within the proposed site layout to balance the functional needs of various carriageway users in particular Vulnerable Roads Users (VRUs) as follows;

- The creation of a self-regulating street environment through the introduction of shared surfaces, on-street parking, reduced corner radii and reduced visibility splays,
- Limiting straight sections of roads to a maximum of 70m through the introduction of horizontal deflections coupled with vertical deflections in the form of raised table tops where required,
- The use of minimal signage and line markings along internal streets with such treatments used sensitively throughout and predominantly at key nodes and transition areas with adjoining streets,
- The provision of footpath widths no less than 1.8m are proposed throughout the scheme with tie-ins provided to existing external pedestrian routes,
- Appropriate clear unobstructed visibility splays are provided at all internal roads,
- Well designed and frequently provided pedestrian crossing facilities are provided along key travel desire lines throughout the scheme. All uncontrolled crossings are provided with either dropped kerbs and tactile paving or flat raised table top treatments thereby allowing pedestrians to informally assert a degree of priority,
- All uncontrolled informal pedestrian crossing facilities will be a minimum of 2.0m wide coupled with tactile paving and dropped kerbs,
- The materials used in shared surface areas will be varied to indicate that the carriageway is an extension of the pedestrian domain,
- At any flat table pedestrian crossing/traffic calming traffic table treatments, different surface material treatments are proposed to alert and subsequently influence driver behaviour and associated vehicle speeds,
- Kerb heights will be maintained at 75mm internally within the development,
- Cyclists will share the internal roads with other road users,
- In accordance with DMURS, the perpendicular parking spaces are a minimum of 5.0m long by 2.5m wide, and finally,
- Planned VRU connectivity to the adjacent existing VRU infrastructure.

In addition to the above, a DMURS Street Design Audit has been carried out by DOB&A and is included in **Appendix I** of this report.

7.5 Vehicle Autotracks

The Applicant has prepared vehicle autotracks for Passenger 4x4s, Fire Tender and Refuse vehicles accessing the proposed development which have been illustrated on Engineering drawing series 2334-DOB-XX-SI-DR-C-0700, 0701 and 0702 submitted with the Planning Application.

7.6 Transport Assessment & MMP

A Transport Assessment and Mobility Management Plan have been prepared by Systra and are submitted as part of the Planning documents.

7.7 Stage 1 Road Safety Audit

A Stage 1 Road Safety Audit has been completed by Traffico. The recommendations from Traffico have been adopted in the planning application drawings and the auditors signed designer's Feedback Form has been attached in **Appendix J**.

Appendix A Ground Investigations

IGSL Ltd

Residential Development at Ratoath

Geotechnical Interpretative Report

Project No. 24972

January 2024

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FOREWORD

The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards

The ground investigation works for this project (**Residential Development at Ratoath**) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as Engineers Ireland Specification for Ground Investigation (2nd Ed, 2016), BS 5930 (2015+A1:2020) and BS 1377 (Parts 1 to 9) and the following European Norms:

- EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- EN ISO 14688-1:2017 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- EN ISO 14688-2:2017 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Principles for a classification
- EN ISO 14689-1:2017 Geotechnical Investigation and Testing – Identification, description & classification of rock

The Eurocode 7, Part 2 – Ground Investigation and Testing GI specification shall be read in conjunction with the Specification and Related Documents for Ground Investigation in Ireland, 2nd Edition, published by Engineers Ireland in 2016.

It is stated in the project specification document (reference DOBA2334) that the project specification shall be the Site Investigation Steering Group's Specification for Ground Investigation published by Thomas Telford Services Limited in 1993, with information, amendments, and additions as described in the Schedules.

Reporting

No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations. The engineering logs (refer to the factual reports referenced in the bibliography) provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction, mining works or karstification below or close to the site.

This report has been prepared for Donnachadh O'Brien & Associates and the information should not be used without their prior written permission. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

1. INTRODUCTION

IGSL Limited has undertaken a programme of geotechnical site investigation works at a greenfield site off the L5018 Ballybin Road, Ratoath, Co. Meath for Donnachadh O;'Brien & Assocaties [DOBA] on behalf of their client, Marshall Yards Limited. The investigative works were positioned across two large grass fields.

The Site Investigation was undertaken to determine the soil conditions for the purposes of foundation design for new housing units and to determine the percolation characteristics of the ground for surface water disposal.

Figure 1 – Site Location Plan (intrusive GI locations plotted)

Fig 1 reproduced from Google Earth Professional 7/2022

The investigation comprised cable percussion boring, trial pitting, dynamic probing, plate bearing testing (CBR) and soakaway testing to BRE365. The investigations were executed in accordance with BS 5930, Code of Practice for Site Investigations (BS 5930:2015 +A1:2020) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing and supervised by an IGSL geotechnical engineer.

Geotechnical, chemical and environmental laboratory testing was scheduled on a range of soil samples. The geotechnical soil testing included moisture contents, Atterberg Limits and particle size distribution [PSD] testing in addition to quick undrained triaxial testing. Suites of both chemical testing and environmental testing were undertaken on soils.

This report presents an evaluation of the ground and groundwater conditions and an assessment of the key geotechnical issues.

2. FIELDWORKS

2.1 General

The geotechnical investigation works were carried out in September and October 2023. The site works comprised the following:

- Cable Percussion Boring (5 No.)
- Trial Pits (12 No.)
- Dynamic Probes (8 No.)
- Plate Bearing Tests (4 No.)
- Soakaway Tests (3 No.)
- Surveying of Exploratory Hole Locations

2.2 Cable Percussion Boreholes

Cable percussive boring (200mm diameter) methods were deployed at five locations [BH_] using a Dando 2000 rig. The boreholes extended to depths of between 8.70m and 3.20m. At all locations, boring commenced through hand-dug service inspection pits. Disturbed bulk samples were recovered at 1m intervals or change of strata during boring and these are denoted 'B' on the engineering logs. An undisturbed thin-walled sample was recovered from BH05 at 1.0m bgl and this is denoted 'U' on the relevant log.

Standard Penetration Tests (SPT's) were performed in the boreholes and given the nature of the soils, a solid cone was used. It is noted that the SPT N-Values reported are the number of blows for 300mm increment penetration (e.g. BH01 at 1.0m where N=11). These exclude the seating blow values, which represent the initial 150mm depth of penetration. Where partial penetration was achieved during testing, the number of blows is shown for the actual penetration depth achieved (e.g. BH03 at 3.0m where N=50/75mm). In accordance with Eurocode 7, the SPT hammer has been calibrated and the energy ratio (Er) value is incorporated on the engineering logs. Calibration certificates for SPT hammers (presented in Appendix 1 of the factual report) can be cross-referenced using the assigned hammer code noted on the individual driller logs. It is highlighted that the SPT N-Values reported on the engineering logs are uncorrected for energy ratio.

A groundwater monitoring standpipe was installed in borehole BH03. The standpipe consisted of 50mm diameter HDPE pipework with proprietary 1mm slots and incorporated a pea gravel filter pack and cement / bentonite grout seal. A headwork cover was fixed in place.

Descriptions of the soils encountered, in-situ tests undertaken and samples recovered are presented on the borehole records in Appendix 1 of the factual report. Details of groundwater strikes and hard strata boring (i.e. chiselling) are also presented on the aforementioned records.

2.3 Trial Pits

Trial pitting was performed at twelve locations across the site. The trial pits were excavated, logged and sampled under the direction of an IGSL geotechnical engineer in accordance with BS 5930 (2015+A1:2020). Bulk samples (B) (typically 20 to 30kg) were taken as the pits progressed.

The bulk samples were placed in heavy-duty polyethylene bags. The trial pits were backfilled with the as-dug arisings and reinstated to the satisfaction of IGSL's site geotechnical engineer. The trial pit logs and photos are presented in Appendix 2 of the factual report and include descriptions of the soils encountered, groundwater conditions and stability of the pit sidewalls.

2.4 Dynamic Probing

In-situ "Heavy" dynamic probing (DPH) was performed at eight locations using a Dando Terrier crawler rig. The probing unit meets the requirements of BS 1377, Part 9 (1990) and IS EN 1997-2:2007. The probing rig utilized a 50kg drop weight and 500mm drop height with a 60° cone. In accordance with the standards, the number of blows required to drive the cone each 100mm

increment into the sub-soil was recorded. Probing is generally terminated when blow counts, N_{100} values, exceed 25, in order to avoid damage to equipment. The probe records are presented in Appendix 3 of the factual report and include blow-counts in both numerical and graphical format.

2.5 Plate Load Testing

Plate load tests were caried out at four locations at a consistent depth of 0.40m below ground level [bgl]. The plate tests were positioned in pits TP01 (CBR01), TP03 (CBR02), TP05 (CBR03) and TP10 (CBR04). The plate testing was undertaken to evaluate the modulus of sub-grade reaction (Ks) and equivalent CBR value. A 450mm diameter plate was used for the tests with kentledge provided by a mechanical excavator. Two load cycle tests were performed and the load / settlement plots, Ks and equivalent CBR values are presented in Appendix 4 of the factual report.

2.6 Soakaway Tests (to BRE 365)

Three number infiltration tests were performed to assess the suitability of the sub-soils for dispersion of storm water through a soakaway system. The infiltration tests were each performed in accordance with BRE Digest 365 'Soakaway Design'. The tests were undertaken adjacent to TP02 (SA02), TP07 (SA07) and TP12 (SA12). To obtain a measure of the infiltration rate of the sub-soils, water was poured into each test pit, with records taken of the fall in water level against time. Following the first soak cycle, the procedure was repeated to ensure saturation of the sub-soils. The infiltration rate is the volume of water dispersed per unit of exposed area per unit of time, and is generally expressed as metres / minute or metres / second. Designs are based on the slowest infiltration rate, which is generally calculated from the final soak cycle. The soakaway design logs are presented in Appendix 5 of the factual report.

2.7 Surveying of Exploratory Hole Locations

Following completion of the exploratory works, surveying was carried out using GPS techniques. Co-ordinates (x, y) were measured to Irish Transverse Mercator and ground levels (z) established to Malin Head. The co-ordinates and ground levels are shown on the exploratory hole logs with locations shown on the exploratory hole plans in Appendix 1.

3. LABORATORY TESTING

Geotechnical laboratory testing was performed at IGSL's INAB-accredited laboratory in accordance with the methods set out in BS1377; British Standard Methods of Test for Soils for Civil Engineering Purposes; British Standards Institute:1990. The laboratory applies best practice management systems as per International Standard IS EN ISO/IEC 17025. The geotechnical testing included moisture contents, Atterberg Limits, particle size distribution [PSD] and quick undrained triaxial testing. The results from geotechnical testing on selected cable percussion borehole and trial pit soil samples are presented in Appendix 6 of the factual report.

Chemical analysis to BRE SD1 Greenfield Site (Suite B) was scheduled on two recovered soil samples. The chemical results are presented in Appendix 7 of the factual report. Soil samples were selected from pits for specialist geo-environmental assessment using the *Rilta* Suite of environmental testing. The results are also presented in the Chemtest report in the aforementioned Appendix 7.

4. DESK STUDY

Reference to the OSI nineteenth and early twentieth century drawings shows little change when compared to the present-day field boundary system (See Figure 2). Despite the encroachment of residential development from the west (namely Fox Lodge Manor), both the western hedgeline and the eastern boundary along Ballybin Road remain largely unaffected.

Figure 2 – Juxtaposed OSI drawing dated 1829-1842 and OSI aerial image (MapGenie Imagery (2013-2018))

Taken from OSI 'Townland and Historical Map Viewer'

The Quaternary Soils plot for the area (Figure 3 - retrieved from GSI website) reaffirms the findings of the investigation and highlights the underlying clay-dominant till derived from the ubiquitous Carboniferous Limestone of the area.

Figure 3 – Quaternary Soils Plot for the Ratoath Site

Map Key	**Ag**	- Alluvium
	TLs	- Till derived from Limestones

Reference to the GSI map for the area (Figure 4, 1:100,000 Solid Geology series) shows that the site is underlain by Lower Carboniferous, Lucan Formation. The Lucan Formation (Nolan 1986, 1989) forms the bulk of the basinal rocks throughout the geologically termed 'Dublin Basin', and is characterised by graded, intraclastic skeletal packstone/grainstone interbedded with anoxic calcareous mudstone / black shale, laminated calcisiltite and argillaceous micrite (i.e. impure limestone with clay minerals).

Its base is defined by the first appearance of thick graded beds of limestone, and a marked decrease in the proportion of interbedded shale, compared with the underlying Tober Colleen Formation. The Lucan Formation is widely known as the Calp Limestone (Marchant and

Sevastopulo, 1980) but is also referred to as the Upper Dark Limestone and has long been a source of building materials and aggregate for Dublin. The Calp is largely undifferentiated geologically.

A borehole verified by the Geological Survey Ireland appears on the map shown in Figure 4. The GSI website does not make available the log other than to note that the borehole ended at 5.10m bgl encountering "CLAY (Loam)".

Figure 4 - Bedrock Geological Map for the Ratoath Site (retrieved from the GSI website)

Key: **LU** = Lucan Formation

5. GROUND CONDITIONS & GROUNDWATER

5.1 Ground Profile – Superficial Deposits

The following is a summary of the ground conditions encountered across the site.

TOPSOIL

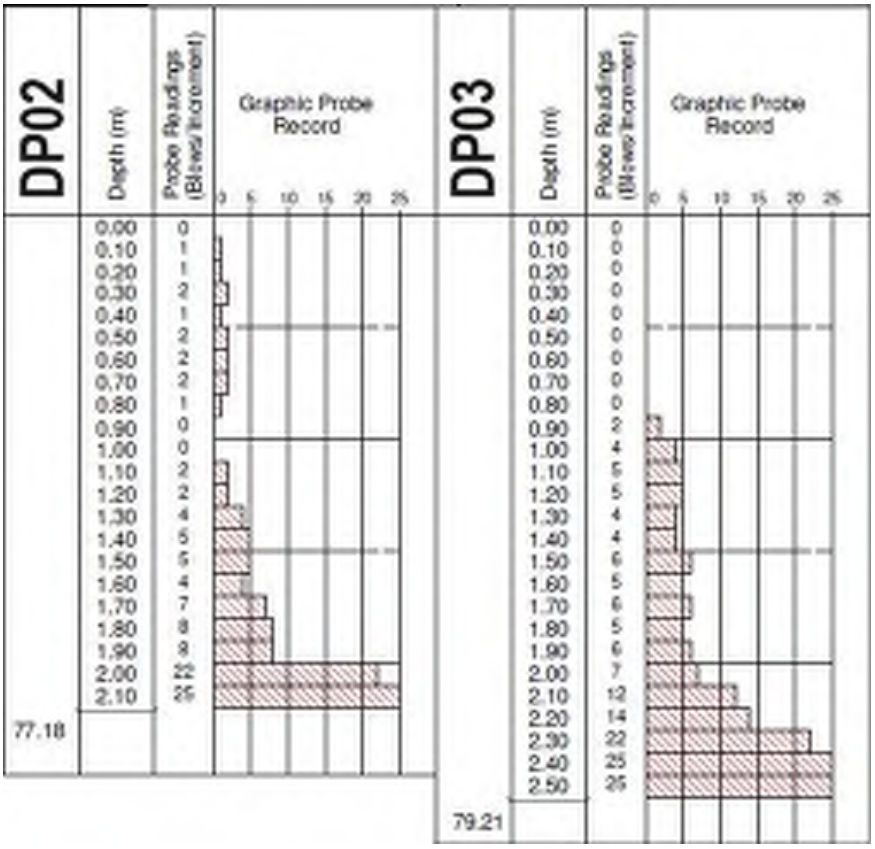
- Where topsoil was encountered, it was found to be between 0.10m and 0.20m thick in the boreholes and between 0.20 and 0.25m in the trial pits. There was one exception in trial pit TP11 where 0.40m of topsoil was reported. The topsoil was logged as 'soft brown sandy gravelly CLAY with rootlets and a low cobble content'.

SUBSOIL

- Beneath the topsoil, generally a transition to firm and firm to stiff CLAY was met. However, in the case of trial pits TP02, TP03, TP06, TP07, TP09 and TP10 there was described an intervening soft to firm layer of brown slightly sandy gravelly CLAY. It persisted to a depth range of between 0.60m to 1.0m bgl.

- Dynamic probes undertaken close to the aforementioned pits show some softening to depths ranging 0.60m to 0.90m. Most notable soft zones were recorded at both DP02 and DP03, positioned close by pits TP04 and TP03. The dynamic probe blowcounts are shown in Figure 5. DP02 suggests softening to ca. 1.10m bgl.

Figure 5 – Dynamic Probe blowcounts from DP02 (TP04) and DP03 (TP02) showing low / inconsistent N100 blowcount profiles from ground level to ca. 0.90 – 1.10m bgl.



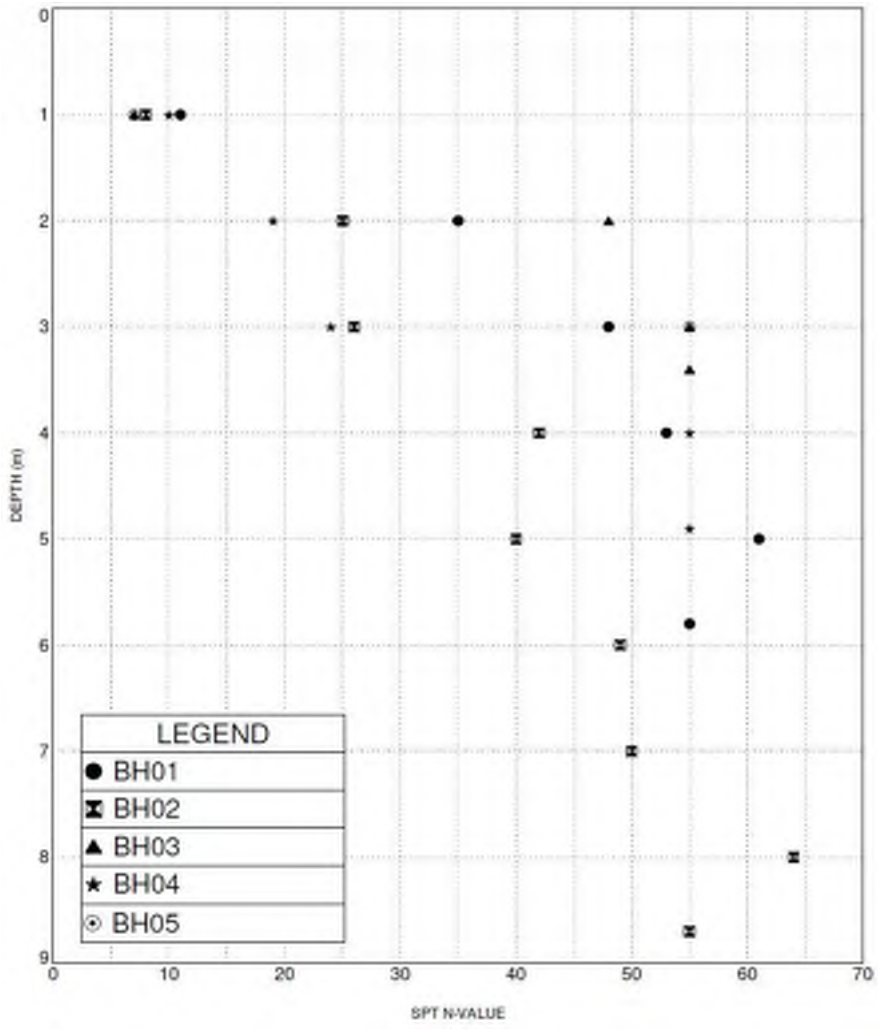
GLACIAL DEPOSITS

- Regarding the transition to firm and firm to stiff soils, trial pits largely herald firm and firm to stiff deposits from 1.0m, in some cases from 0.60m bgl. SPT N-values recorded in boreholes suggest a soft to firm mantle of indigenous CLAY extends into the first SPT test drive at 1.0m. By the second test drive (at 2.0m bgl), based on SPT N-values, the soils appear to be uniformly stiff to very stiff in consistency.

- Probes terminated at depths ranging 2.10m to 2.90m with steady increases in blowcounts notable from 1.50m to 1.70m across all probes. This is likely to correspond to the entry of increasingly stiff over-consolidated glacial till, intercepted shy of the dark grey till which was found in the majority of pits from ca. 2.0m bgl.

As mentioned previously, in-situ testing was undertaken during the construction of the five drillholes. The standard penetration test [SPT] allows for an appraisal of the ground stiffness. An SPT data plot showing N-Vales against depth is shown in Figure 6. It highlights the initially soft to firm nature of soils in test drives in shallow clay overburden (at 1.0m). 'Low strength' deposits are those where N values of <10 blows are present.

Figure 6 – SPT Plot versus Depth for Cable Percussion Boreholes



Figures 7A & 7B – Sidewall profile and spoil heap photographed during trial pitting at TP01. **Fig 7A** Firm becoming firm to stiff brown sandy gravelly CLAY with a medium cobble content from 0.20m to 2.10m underlain by a stiff greyish brown sandy gravelly CLAY with cobbles and boulders. Stiff to very stiff dark grey sandy gravelly CLAY with cobbles and boulders enters the stratigraphy from 2.50m to the eventual end depth of 3.50m bgl. The pit remained dry. **Fig 7B** Spoil.

Fig 7A

Fig 7B

5.2 Bedrock

Consultation of the GSI map for the area suggests the bedrock underlying the site is that of the Lucan Formation limestone and shales (See Section 4). Rotary drilling was not undertaken as part of the project.

5.3 Groundwater

Water ingress was noted in TP07 and TP11 towards their respective bases at 2.50m – both of these were located towards the eastern extent of the site. In the case of TP11, positioned close to the eastern Ballybin Road field boundary, the soils from 0.40m to 1.90m were reported as being moist throughout trial pitting. Minor sidewall collapse was also noted in TP11.

A similarly shallow water strike was intercepted in BH03, the borehole close by both TP07 and TP11. The water strike was measured at 2.40m, rising to 2.10m after a 20 minute observation period. Water was also noted post-drilling works in nearby BH05. Groundwater, although not met during boring, was dipped in the completed borehole at 2.80m – the borehole measuring an end depth of 3.20m bgl.

There was one other water strike encountered on the site during boring. This was reported in the deepest borehole, BH02, in the northern section of the site. The water strike was reported at 8.40m, and rose to 6.80m after 20minutes. In the absence of rock coring, the intensity of this measured strike, coupled with the depth of the strike, it is likely that this depth corresponds to local rockhead level. This remains unproven however.

Table 1 outlines where water was met in each of the exploratory holes. The potential does exist for there to be seasonal changes in groundwater level. The works were carried out during late summer 2023. A standpipe installed in BH03 will allow for ongoing monitoring.

Table 1 – Water measurements in on-site exploratory holes

	Exploratory Hole No.	Water Struck **m bgl**	Stratum Description	Rate of Flow	Remarks / Stratum of water ingress (m OD)
Cable Percussion Boreholes	BH02	**8.40**	Very stiff black slightly sandy very gravelly silty CLAY with some cobbles and occasional boulders	Rapid – water rose to **6.80m** in 20min	Water was noted at **6.70m** bgl in the borehole upon removal of the drill casing (28-09-23)
	BH03	**2.40**	Dense grey clayey/silty sandy fine to coarse angular GRAVEL with occasional cobbles	Slow – water rose to **2.10m** in 20min	Water was noted at **2.20m** bgl in the borehole upon removal of the drill casing (03-10-23) Standpipe installed (Response zone 1.0-3.40m)
	BH05	**-**	-	-	Water was noted at **2.80m** bgl in the borehole upon removal of the drill casing (04-10-23)

Trial Pits	TP07	**2.50**	Stiff greyish brown sandy gravelly CLAY with a medium cobble content and low boulder content	Moderate	Pit noted stable to 2.30m
	TP11	**2.50**	Stiff dark brownish grey sandy gravelly slightly silty CLAY with a high cobble and a low boulder content	Moderate	Pit ended due to slow progress and minor sidewall collapse

6. GROUND ASSESSMENT & ENGINEERING RECOMMENDATIONS

6.1 General

In light of the ground investigation findings, the following geotechnical issues are developed and discussed:

- Foundations
- Ground Bearing Slab
- Groundwater / Infiltration
- Slopes / Batters
- Pavement Construction
- Buried Concrete
- Waste Acceptance Criteria [WAC] & Environmental Testing - *Soils destined for Landfill*

6.2 Foundations

The ground investigations demonstrate a sequence of largely firm and firm to stiff soils mantling the site from c0.60m to 1.0m. There were instances of soft or low strength soils extending to c1.10m but these were generally localised, being found in only one or two pits / probes. Overall, the findings from trial pits, boreholes and probes suggests a firm to stiff CLAY underlies the site, strengthening to consistently stiff and very stiff soils from 1.50m to 2.0m bgl. Highlighting this, probes terminated at depths between 2.10m and 2.90m. Removal of the uppermost compressible CLAY where it exists, should reveal firm and firm to stiff soils at depths of the order of 0.60m to 1.10m.

The depth to the basal dark grey very stiff and stiff CLAY horizon varied little across the site ranging from 2.0m to 2.90m in trial pits and 1.80m to 2.50m in boreholes. Interestingly, rather than a stiff CLAY till, a gravel layer was intercepted towards the base of both boreholes BH03 and BH05 from 2.30m and 3.0m. In both cases, it appears the gravels hosted groundwater with occurrences logged in both bores. These two holes lie in proximity to both TP07 and TP11 where water strikes were recorded at their respective bases (at 2.50m).

Where the very stiff and stiff grey brown, occur (often deep-seated CLAY) is met, a safe or allowable bearing capacity of the order of 250kPa could be adopted. However, ahead of encountering this layer, a firm to stiff brown natural CLAY deposit is present. The firm / stiff brown sandy gravelly CLAY, at depths of 0.60m to 1.0m, should offer a safe or allowable capacity of 150kPa. At bearing pressures of this magnitude, settlement (immediate elastic and long-term consolidation) would be expected to be <10mm.

During construction, it would be important to have excavations on the site examined by a suitably qualified geotechnical engineer / engineering geologist to assess the selected subgrade is capable of the imposed loadings. Use of lean mix or low grade concrete to build up to the underside of pads / footings may be required locally where low strength ground conditions are encountered (as highlighted by both DP02 & DP03).

6.3 Ground Bearing Slab

Assuming the presence of a natural stratigraphy, given the occasionally soft to firm soils in the uppermost stratigraphy, the use of a geotextile separating layer should be considered to prevent mixing of upper soils and placed SR21 Annex E compliant hardcore.

The hardcore fill materials should be placed in layers (nominally 225mm thick) and compacted with a smooth drum roller having a mass per metre width of roll >5400 kg. The compacted hardcore would be expected to achieve a CBR value of 15% (or Ks of not less 75 MPa/m) as determined by plate test method. To monitor compaction of the hardcore, plate tests are recommended at a frequency of 1 per 1000m^2 per lift or layer. The tests (two load cycles) should be carried out in accordance with BS 1377 by an experienced geotechnical technical and accredited laboratory.

Granular fill materials (i.e. T0 Struc, T1 Struc, T2 Perm and T3 Blind) to be used at the proposed build footprints should be sourced from an established quarry (having NSAI Certification). The granular fill hardcore materials should meet each of the properties in SR21:2014+A1+2016 (set out in Tables E.1, E.2 and E.3 of Annex E of SR21;2014+A1;2016). Where significant depth of granular fill is required to achieve the finished floor level, T0 Structural fill is recommended followed by T1 Structural (layer thickness nominally 200mm). The granular fill or 'hardcore' should be rigorously tested (independent of the quarry source) to ensure that it meets the physical, durability, chemical and mineralogical characteristics as set out in the aforementioned Annex E of SR 21;2014+A1;2016. Independent testing on samples of the proposed source hardcore is strongly recommended at least 3 weeks in advance of the material being used on the site. As a minimum, particle size gradings, chemical tests and geological classification / simplified petrology are advised to initially 'screen' the material and assess compliance with Annex E, SR21;2014+A1;2016. Once the hardcore materials are approved, then testing at a frequency of 1 per 1000m^3 would be reasonable.

Compaction / Placement of imported granular fill or hardcore will need to achieve low air voids (<5%) and ensure that settlement is not an issue. In the case of T0 layer thickness, the number of roller passes and mass per metre and width of roll should meet the guidelines in I.S. 888:2016 *Annex B: Compaction requirements for unbound mixtures Table B.1*. If using a smooth drum roller (without vibration) with a mass per metre of roll of not less than 5400 kg, a maximum compacted T0 layer thickness of 150mm can be placed at any one time.

6.4 Groundwater / Infiltration

The permeability of the CLAY (or lack thereof) should limit the ingress of groundwater where excavations are formed solely in the fine soils. Therefore, shallow temporary excavation should generally see an absence of water ingress in natural deposits. Deeper-seated water entry was observed in the pits (TP07 & TP11) and boreholes during their construction, from 2.40m bgl in BH03.

Should water be encountered during deeper digs / excavations it is likely that de-watering will be required through a combination of strategic sump pumping and / or perimeter drains. As mentioned in Section 5.3, the potential does exist for there to be seasonal changes in groundwater level. The works were carried out during early autumn 2023. It may be the case that the various waterbodies at depth are subject to seasonal variations. Readings could be taken at BH03 to assess equilibrated water levels.

Three soakaway tests were conducted on the site. The tests were carried out in the overburden soils within open excavations. The test pits were excavated into the indigenous firm and firm to stiff brown sandy gravelly CLAY with cobbles. The impermeable nature of the soils may account for the negligible to non-existent infiltration rates obtained.

It is likely that such soils would not be suitable for conventional soakaways being classified as offering only very low to practically impermeable natural infiltration (Table 2).

Table 2 – Measured infiltration rates (f) expressed as exposed area (metre) per unit time (minute)

Soakaway Test No.	Depth of Test (m bgl)	*f* (m/min)	*f* (m/sec)
TP/SA02	1.50	0.000014 m/min	2.33E -07 m/sec
TP/SA07	2.0	0.0 m/min	0.0 m/sec
TP/SA12	1.50	0.0 m/min	0.0 m/sec

6.5 Slopes / Batters

A maximum temporary slope angle of 1V to 1.5H (33º) is anticipated for batters constructed within the upper medium strength fine grained soils. A slope angle of 1V to 2H (26°) should be appropriate for long term batters in the same soils. Minor instability was noted during pitting at TP11 with slight sidewall collapse at depth in what were termed "moist" soils. This may suggest groundworks towards the east and southeast of the site will encounter more trying groundworks conditions with a higher groundwater table. Where deep excavation works are required in the superficial deposits, the use of trench box support is advised. In addition, the uppermost fine subsoils will be susceptible to softening and degradation and surface water or groundwater ingress can lead to a significant reduction in shear strength. Perched water can exist locally and this should be considered in risk assessments for excavations.

Site operatives or personnel should not enter unsupported excavations and should be informed of potential risks. Where site operatives or engineering staff work in close proximity to temporary slopes or batters, these should be inspected and approved by a suitably experienced civil engineer, preferably with geotechnical experience. Where there is a risk of spalling of battered slopes, the use of a geogrid is recommended. The geogrid should be anchored at the top and bottom of the ridge face to contain particles such as gravel, cobbles and / or boulders that may become dislodged.

6.6 Pavement Construction

Four plate load tests were conducted on the shallow subsoils at depths of 0.40m bgl. The plate load test permits an assessment of the in-situ stiffness of the upper soil. The test results are reported in Appendix 4 of the factual report and are summarised below in Table 3. Equivalent CBR values 0.8 to 7.5% were determined on the initial loading cycles (Cycle 1) with values of 2.4 and 11.2% on the reload cycles (Cycle 2). It should be noted that each plate load test was conducted on brown sandy gravelly cobbly CLAY soils.

Table 3 – Equivalent CBR % Values obtained in Plate Bearing Testing

Test No.	Depth	CBR at Load Cycle (%)	CBR at Re-Load (%)
CBR 01	0.40	7.5	11.2
CBR 02	0.40	1.0	2.4
CBR 03	0.40	0.8	4.6
CBR 04	0.40	2.1	3.9

Based on the plate load test results, and in accordance with the Design Guidance for Road Pavement (HD 25-26/10:2010), a CBR design value of <2% is recommended for the near surface soils in their current state. Ahead of road construction, and following static compaction of the soils, a further set of plate testing (450 or 600mm diameter) should be undertaken to assess the improvement in stiffness of the formation. Given the moderate improvement seen in testing (from load to reload), if the same test levels are again adopted it is likely that some improvement will be achieved.

Assuming a design CBR value of 2% for the upper soils then a minimum 6F capping thickness of 500 to 600mm and a sub-base thickness (UGM) of 150mm is recommended to support the road pavements.

If or where very low strength subgrade occurs (CBR <1%) either geogrid reinforcement or the use of starter material (Class 6A / 6B) could be considered to provide a suitable foundation layer especially for access or haul / spine roads if they traverse low strength subgrades. Such a mechanically stabilized layer could consist of a layer of geogrid with 500 to 600mm of granular fill (well graded aggregate with maximum particle size of 75mm). Where geogrid is not utilized then approximately

500mm build-up of Class 6A / 6B starter layer material could be considered in conjunction with a capping layer (Class 6F capping in line with Series 600 of TII SRW). This should provide a satisfactory foundation layer to adequately support the subbase / pavement (150mm of unbound granular material (UGM) in accordance with Table 2.1 of CC-SPW-00800 (TII August 2022). The aforementioned Class 6A / 6B material could be used in conjunction with ca. 300mm of 6F capping material. This should provide a robust foundation layer.

The time of year will play a role in sub-grade strength especially during winter or early spring where heavy rainfall would cause degradation / wash-out of the formation. Oppositely, in summer, the performance of the soil subgrade may be significantly improved dependent on moisture content levels in the upper soil. If there are particular concerns regarding the condition of the formation soils, then additional plate bearing tests should be considered during construction to verify or validate the stiffness / density of the formation soils and adequate capping thickness.

The durability of the capping material should be confirmed as capping will be exposed to the elements (especially if the works are undertaken during the winter / spring period). It is important that argillaceous sedimentary rocks (i.e. muddy limestone, calcareous mudstone, shale, etc.) are not used as capping or as a starter layer. These have high potential to give rise to degradation (i.e. poor durability and soundness) and slaking and therefore would not be suitable.

All granular fills / unbound granular mixtures (UGM) used in pavement construction should be tested and approved in advance of being used in pavement construction. They should meet the compositional, chemical and soundness requirements as prescribed in the TII publication entitled Road Pavements – Unbound and Hydraulically Bound Mixtures (CC-SPW-00800 – dated August 2022).

Compaction / Placement of imported granular fill or hardcore will need to achieve low air voids (<5%) and ensure that settlement is not an issue. The number of roller passes and mass per metre and width of roll should meet the guidelines in I.S. 888:2016 Annex B: Compaction requirements for unbound mixtures Table B.1. It is recommended to use a smooth drum roller (without vibration) with a mass per metre of roll of not less than 5400kg. Unbound mixtures should not be laid in layers greater than 150mm if using this compaction method.

6.7 Buried Concrete

The chemical analysis tests on natural soil samples (BRE SD1 analysis suite) show pH (2.5:1) values ranging from 8.2 to 8.7. The sulphate aqueous extract (SO_4) results from trial pit samples determined values of 10 and 200mg/l. This would suggest the 'as-received' soil samples tested could be categorised as BRE Class DS-1.

Table C1 ACEC for greenfield sites in BRE SD 1 (2005) can be used in the selection and design of concrete. If mobile groundwater conditions prevail at the site and given the pH values obtained from the testing, then ACEC class AC-1^{d} would be expected to be appropriate for buried concrete in the soils. In line with I.S. EN 206-1:2013, concrete could be manufactured to Class XA1 where founded or positioned in the upper soils (Class XA1 being ≥ 2000 and ≤ 3000 SO_4^{2-} mg/kg).

6.8 Waste Acceptance Criteria [WAC] & Environmental Testing – *Soils destined for Landfill*

Two soil samples from trial pits were analysed for their compliance to the criteria set out in the 2002 European Landfill Directive (2003/33/EC). The two samples met the criteria and would therefore be accepted by an inert landfill.

The results obtained from testing of the inert samples were compared to the published limits set out in the EPA Guidance on waste acceptance criteria at authorized soil recovery facilities (EPA, 2020). Table 4 highlights where the more stringent trigger level exceedance was observed for Total

Polychlorinated biphenyls [PCBs] content in the sample from TP06. This highlights the ineligibility of this sample for acceptance at an EPA Soil Recovery Facility.

Table 4 – Elevated Total PCBs values (EPA Guidance Document on Soil Recovery Facilities) for the soil sample from TP06 at 0.70m (Exceedance in red font)

Parameter	EPA Guidance Document Limit	TP06 0.70m
Total PCBs	**0.05mg/kg**	*0.081*

In relation to the sample from TP01 (0.50m), there were no exceedances reported in Total Organic Carbon [TOC] or in any of the organic compounds. Regarding its total metal concentration, the EPA Guidance document employs a set of specific metal trigger limits to each of seven geochemical domains across the country. Depending on the domain in which the accepting recovery site falls, there are specific limits prescribed for certain metals. In order to further analyse the soils suitability for acceptance at an EPA recovery facility, the domain of the receiving facility would have to be known. For the purposes of this report, given the Quaternary soils map for the site (Figure 3) indicates Carboniferous Limestone derived till, the maximum concentrations and / or trigger levels in soil and stone for soil recovery facilities in Geochemical Domain 2 (Carboniferous limestone and related rocks) are applied.

Analysis of the sample from TP01 (0.50m) showed the nickel metal concentration to exceed that which is published for Geochemical Domain 2 (See Table 5). A nickel content of 63mg/kg was detected. Such a concentration would preclude it from being accepted at a Geochemical Domain 2 facility where the defined trigger limit of 61.9mg/kg exists.

No asbestos was detected in screens ran on the two soil samples.

Table 5 – Elevated nickel content (EPA Guidance Document on Soil Recovery Facilities) for TP01 soil sample applying Geochemical Domain 2 values (Exceedance in red font)

Metal Parameter	EPA Guidance Document Limit (Geochemical Domain 2)	TP01 0.50m
Nickel (Ni)	**61.9mg/kg**	*63*

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Appendix 1

Exploratory Hole Location Plans

DWG01 – DWG02


24972 - Residential Development at Ratoath
Exploratory Hole Location Plan - DWG01
Legend
Cable Percussion Borehole
Dynamic Probe
Trial Pit
Trial Pit w/ Soakaway Test (to BRE365)
Trial Pit w/ CBR
DP01
TP/CBR01
BH01
DP02
TP04
DP03
TP03/CBR02
TP/SA02
BH02
Google Earth
Image © 2023 Airbus
N
80 m


24972 - Residential Development at Ratoath
Exploratory Hole Location Plan - DWG02
Legend
Cable Percussion Borehole
Dynamic Probe
Trial Pit
Trial Pit w/ Soakaway Test (to BRE365)
Trial Pit w/ CBR
TP05/CBR03
DP04
TP06
DP05
TP/SA07
TP08
BH03
BH04
DP08
TP11
TP10/CBR04
DP07
TP09
DP06
BH05
TP/SA12
Google Earth
Image © 2023 Airbus
80 m
N

IGSL Ltd

Residential Development at Ratoath

Ground Investigation Report
FACTUAL

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June 2024

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APPENDICES

FOREWORD
The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards
The ground investigation works for this project (**Residential Development at Ratoath**) have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as Engineers Ireland Specification for Ground Investigation (2nd Ed, 2016), BS 5930 (2015+A1:2020) and BS 1377 (Parts 1 to 9) and the following European Norms:

- EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- EN ISO 14688-1:2017 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- EN ISO 14688-2:2017 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Principles for a classification
- EN ISO 14689-1:2017 Geotechnical Investigation and Testing – Identification, description & classification of rock

The Eurocode 7, Part 2 – Ground Investigation and Testing GI specification shall be read in conjunction with the Specification and Related Documents for Ground Investigation in Ireland, 2nd Edition, published by Engineers Ireland in 2016.

It is stated in the project specification document (reference DOBA2334) that the project specification shall be the Site Investigation Steering Group's Specification for Ground Investigation published by Thomas Telford Services Limited in 1993, with information, amendments, and additions as described in the Schedules.

Reporting
No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations. The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points. Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction, mining works or karstification below or close to the site.

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Boring Procedures
Where required, 'shell and auger' or cable percussive boring technique is employed as defined by Section 6.3 of IS EN ISO 22475-1:2006. The boring operations, sampling and in-situ testing meet with the recommendations set out in IS EN 1997-2:2007 and BS 1377:1990 and EN ISO 22476-3:2005. The shell and auger boring technique allows for continuous sampling in clay and silt above the water table and sand and gravel below the water table (Table 2 of IS EN ISO 22475-1:2006).

It is highlighted that some disturbance and variation is unavoidable in particular ground (e.g. blowing sands, gravel / cobble dominant glacial deposits etc). Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

In-Situ Testing
Where required, Standard Penetration Tests (SPT's) are conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio (E_r). A calibration certificate is available upon request. The E_r is defined as the ratio of the actual energy E_{meas} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Soil Sampling
Three categories of sampling methods are outlined in EN ISO 22475-1:2006. The categories are referenced A, B and C for any given ground conditions and are shown in Tables 1 and 2 of EN ISO 22475-1:2006. Reference should be made to EN 1997-2:2002 for guidelines on sample class and quality for strength and compressibility testing. Samples of quality classes 1 or 2 can only be obtained by using Category A sampling methods.

Class 1 thin wall undisturbed tube samples (UT100) were obtained in fine grained soils and strictly meet the requirements of EN 1997-2:2002 and EN ISO 22475-1:2006. Soil samples for laboratory tests are divided into five classes with respect to the soil properties that are assumed to remain unchanged during sampling, handling transport and storage. The minimum sample quality required for testing purposes to Eurocode 7 compatibility (EN 1997-2:2002) is shown in Table A.

Table A – Details of Sample Quality Requirements

EN 1997 Clause	Test	Minimum Sample Quality Class
5.5.3	Water Content	3
5.5.4	Bulk Density	2
5.5.5	Particle Density	N/S
5.5.6	Particle Size Analysis	N/S
5.5.7	Consistency Limits	4
5.5.8	Density Index	N/S
5.5.9	Soil Dispersivity	N/S
5.5.10	Frost Susceptibility	N/S
5.6.2	Organic Content	4
5.6.3	Carbonate Content	3
5.6.4	Sulphate Content	3
5.6.5	pH	3
5.6.6	Chloride Content	3
5.7	Strength Index	1
5.8	Strength Tests	1
5.9	Compressibility Tests	1
5.10	Compaction Tests	N/S
5.11	Permeability	2

N/S – not stated. Presume a representative sample of appropriate size.

Samples recovered from trial pits or trenches meet the requirements of IS EN ISO 22475-1. It is highlighted that unforeseen circumstances such as variations in geological strata may lead to lower quality sample classes being obtained.

Groundwater
The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for

any one water strike. Where possible, drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

Engineering Logging

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2017 and IS EN ISO 14688-2:2017. Rock weathering classification conforms to IS EN ISO 14689-1:2017 along with discontinuities (bedding planes, joints, cleavages, faults etc) as classified in Section 6.4 of IS EN ISO 14689-1:2017 and Annex C of same. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Where peat has been encountered, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 and Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986.

Retention of Samples

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material will be discarded. Unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

1. INTRODUCTION

IGSL Limited has undertaken a programme of geotechnical site investigation works at a greenfield site off the L5018 Ballybin Road, Ratoath, County Meath for Donnachadh O;'Brien & Assocaties [DOBA] on behalf of their client, Marshall Yards Development Company Limited. The investigative works were positioned across two large grass fields.

The site investigation was undertaken to determine the soil conditions for the purposes of foundation design for new housing units and to determine the percolation characteristics of the ground for surface water disposal.

Figure 1 – Site Location Plan (intrusive GI locations plotted)

Fig 1 reproduced from Google Earth Professional 7/2022

The investigation comprised cable percussion boring, trial pitting, dynamic probing, plate bearing testing (CBR) and soakaway testing to BRE365. The investigations were executed in accordance with BS 5930, Code of Practice for Site Investigations (BS 5930:2015 +A1:2020) and EN 1997-2 Eurocode 7 Part 2 Ground Investigation & Testing and supervised by an IGSL geotechnical engineer.

Geotechnical, chemical and environmental laboratory testing was scheduled on a range of soil samples. The geotechnical soil testing included moisture contents, Atterberg Limits and particle size distribution [PSD] testing in addition to quick undrained triaxial testing. Suites of both chemical testing and environmental testing were undertaken on soils. This report presents the factual geotechnical data acquired from the 2023 investigation.

2. FIELDWORKS

2.1 General

The geotechnical investigation works were carried out in September and October 2023. The site works comprised the following:

- Cable Percussion Boring (5 No.)
- Trial Pits (12 No.)
- Dynamic Probes (8 No.)
- Plate Bearing Tests (4 No.)
- Soakaway Tests (3 No.)
- Surveying of Exploratory Hole Locations

2.2 Cable Percussion Boreholes

Cable percussive boring (200mm diameter) methods were deployed at five locations [BH_] using a Dando 2000 rig. The boreholes extended to depths of between 8.70m and 3.20m. At all locations, boring commenced through hand-dug service inspection pits. Disturbed bulk samples were recovered at 1m intervals or change of strata during boring and these are denoted 'B' on the engineering logs. An undisturbed thin-walled sample was recovered from BH05 at 1.0m bgl and this is denoted 'U' on the relevant log.

Standard Penetration Tests (SPT's) were performed in the boreholes and given the nature of the soils, a solid cone was used. It is noted that the SPT N-Values reported are the number of blows for 300mm increment penetration (e.g. BH01 at 1.0m where N=11). These exclude the seating blow values, which represent the initial 150mm depth of penetration. Where partial penetration was achieved during testing, the number of blows is shown for the actual penetration depth achieved (e.g. BH03 at 3.0m where N=50/75mm). In accordance with Eurocode 7, the SPT hammer has been calibrated and the energy ratio (Er) value is incorporated on the engineering logs. Calibration certificates for SPT hammers (presented in Appendix 1) can be cross-referenced using the assigned hammer code noted on the individual driller logs. It is highlighted that the SPT N-Values reported on the engineering logs are uncorrected for energy ratio.

A groundwater monitoring standpipe was installed in borehole BH03. The standpipe consisted of 50mm diameter HDPE pipework with proprietary 1mm slots and incorporated a pea gravel filter pack and cement / bentonite grout seal. A headwork cover was fixed in place.

Descriptions of the soils encountered, in-situ tests undertaken and samples recovered are presented on the borehole records in Appendix 1. Details of groundwater strikes and hard strata boring (i.e. chiselling) are also presented on the aforementioned records.

2.3 Trial Pits

Trial pitting was performed at twelve locations across the site. The trial pits were excavated, logged and sampled under the direction of an IGSL geotechnical engineer in accordance with BS 5930 (2015+A1:2020). Bulk samples (B) (typically 20 to 30kg) were taken as the pits progressed.

The bulk samples were placed in heavy-duty polyethylene bags. The trial pits were backfilled with the as-dug arisings and reinstated to the satisfaction of IGSL's site geotechnical engineer. The trial pit logs and photos are presented in Appendix 2 and include descriptions of the soils encountered, groundwater conditions and stability of the pit sidewalls.

2.4 Dynamic Probing

In-situ "Heavy" dynamic probing (DPH) was performed at eight locations using a Dando Terrier crawler rig. The probing unit meets the requirements of BS 1377, Part 9 (1990) and IS EN 1997-2:2007. The probing rig utilized a 50kg drop weight and 500mm drop height with a 60° cone. In accordance with the standards, the number of blows required to drive the cone each 100mm

increment into the sub-soil was recorded. Probing is generally terminated when blow counts, N_{100} values, exceed 25, in order to avoid damage to equipment. The probe records are presented in Appendix 3 and include blow-counts in both numerical and graphical format.

2.5 Plate Load Testing

Plate load tests were caried out at four locations at a consistent depth of 0.40m below ground level [bgl]. The plate tests were positioned in pits TP01 (CBR01), TP03 (CBR02), TP05 (CBR03) and TP10 (CBR04). The plate testing was undertaken to evaluate the modulus of sub-grade reaction (Ks) and equivalent CBR value. A 450mm diameter plate was used for the tests with kentledge provided by a mechanical excavator. Two load cycle tests were performed and the load / settlement plots, Ks and equivalent CBR values are presented in Appendix 4.

2.6 Soakaway Tests (to BRE 365)

Three number infiltration tests were performed to assess the suitability of the sub-soils for dispersion of storm water through a soakaway system. The infiltration tests were each performed in accordance with BRE Digest 365 'Soakaway Design'. The tests were undertaken adjacent to TP02 (SA02), TP07 (SA07) and TP12 (SA12). To obtain a measure of the infiltration rate of the sub-soils, water was poured into each test pit, with records taken of the fall in water level against time. Following the first soak cycle, the procedure was repeated to ensure saturation of the sub-soils. The infiltration rate is the volume of water dispersed per unit of exposed area per unit of time, and is generally expressed as metres / minute or metres / second. Designs are based on the slowest infiltration rate, which is generally calculated from the final soak cycle. The soakaway design logs are presented in Appendix 5.

2.7 Surveying of Exploratory Hole Locations

Following completion of the exploratory works, surveying was carried out using GPS techniques. Co-ordinates (x, y) were measured to Irish Transverse Mercator and ground levels (z) established to Malin Head. The co-ordinates and ground levels are shown on the exploratory hole logs with locations shown on the exploratory hole plans in Appendix 8.

3. LABORATORY TESTING

Geotechnical laboratory testing was performed at IGSL's INAB-accredited laboratory in accordance with the methods set out in BS1377; British Standard Methods of Test for Soils for Civil Engineering Purposes; British Standards Institute:1990. The laboratory applies best practice management systems as per International Standard IS EN ISO/IEC 17025. The geotechnical testing included moisture contents, Atterberg Limits, particle size distribution [PSD] and quick undrained triaxial testing. The results from geotechnical testing on selected cable percussion borehole and trial pit soil samples are presented in Appendix 6.

Chemical analysis to BRE SD1 Greenfield Site (Suite B) was scheduled on two recovered soil samples. The chemical results are presented in Appendix 7. Soil samples were selected from pits for specialist geo-environmental assessment using the *Rilta* Suite of environmental testing. The results are also presented in the Chemtest report in Appendix 7.

BIBLIOGRAPHY

1.0 BS 5930 (2015 + A1:2020) Code of Practice for Site Investigation, British Standards Institution (BSI).

2.0 BS 1377 (1990). Methods of Testing of Soils for Civil Engineering Purposes, BSI.

3.0 CEN (2018A). Geotechnical Investigation and Testing – Identification and classification of soil – Part 1: Identification and description (ISO 14688-1:2017)

4.0 CEN (2018B). Geotechnical Investigation and Testing – Identification and classification of soil – Part 2: Principles for a classification (ISO 14688-2:2017)

5.0 CEN (2018C). Geotechnical Investigation and Testing – Identification, description & classification of rock (EN ISO 14689-1:2017)

6.0 EN 1997-2 (2007). Eurocode 7: Geotechnical design. Part 2: Ground Investigation & Testing

7.0 Site Investigation Practice: Assessing BS 5930 (1986), Geological Society Special Publication, No. 2.

Appendix 1

Cable Percussion Borehole Logs

SPT Calibration Report

GEOTECHNICAL BORING RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**BOREHOLE NO.**	**BH01**
		SHEET	Sheet 1 of 1
CO-ORDINATES	702,802.42 E 751,861.38 N	**RIG TYPE**	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (mOD)	79.75	**BOREHOLE DEPTH (m)**	5.80
		DATE COMMENCED	27/09/2023
		DATE COMPLETED	27/09/2023
CLIENT	Marshall Yards Development Co. Ltd	**SPT HAMMER REF. NO.**	SA7
		BORED BY	DT
ENGINEER	DOBA	**ENERGY RATIO (%)**	74.07
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		79.65	0.10						
	Firm mottled brown sandy slightly gravelly SILT/CLAY									
1			78.45	1.30	AA1677795	B	1.00		N = 11 (0, 1, 2, 2, 2, 5)	
	Firm grey/brown sandy gravelly SILT/CLAY		77.95	1.80						
2	Very stiff grey/black sandy gravelly SILT with some cobbles and occasional boulders				AA1677796	B	2.00		N = 35 (6, 5, 6, 6, 7, 16)	
3					AA1677797	B	3.00		N = 48 (4, 7, 9, 10, 14, 15)	
4					AA1677798	B	4.00		N = 53 (6, 10, 12, 11, 17, 13)	
5					AA1677799	B	5.00		N = 61 (7, 10, 12, 18, 16, 15)	
			73.95	5.80						
6	Obstruction End of Borehole at 5.80 m								N = 50/75 mm (25, 50)	
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
5.00	5.10	0.75	
5.70	5.80	1.5	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS CAT scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 24972.GPJ IGSL.GDT 17/6/24

GEOTECHNICAL BORING RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**BOREHOLE NO.**	**BH02**
		SHEET	Sheet 1 of 1
CO-ORDINATES	702,704.44 E 751,812.26 N	**RIG TYPE**	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (mOD)	81.63	**BOREHOLE DEPTH (m)**	8.70
		DATE COMMENCED	28/09/2023
		DATE COMPLETED	28/09/2023
CLIENT	Marshall Yards Development Co. Ltd	**SPT HAMMER REF. NO.**	SA7
		BORED BY	DT
ENGINEER	DOBA	**ENERGY RATIO (%)**	74.07
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		81.43	0.20						
	Soft mottled brown sandy slightly gravelly SILT/CLAY				AA204451	B	1.00		N = 8 (0, 2, 1, 2, 2, 3)	
1			80.23	1.40						
	Firm grey/brown sandy gravelly CLAY with occasional cobbles				AA204452	B	2.00		N = 25 (2, 2, 4, 5, 7, 9)	
2			79.53	2.10						
	Stiff grey/black sandy silty gravelly CLAY with occasional cobbles				AA204453	B	3.00		N = 26 (4, 5, 4, 4, 8, 10)	
3										
					AA204454	B	4.00		N = 42 (5, 8, 8, 10, 12, 12)	
4			77.53	4.10						
	Very stiff grey/brown sandy silty gravelly CLAY with some cobbles				AA204455	B	5.00		N = 40 (2, 5, 7, 10, 13, 10)	
5			76.13	5.50						
	Very stiff black slightly sandy very gravelly silty CLAY with some cobbles and occasional boulders				AA204456	B	6.00		N = 49 (5, 9, 11, 11, 14, 13)	
6										
					AA204457	B	7.00		N = 50 (6, 10, 12, 13, 13, 12)	
7										
					AA204458	B	8.00		N = 64 (6, 8, 15, 16, 19, 14)	
8			72.93	8.70						
	Obstruction								N = 50/75 mm (25, 50)	
9	End of Borehole at 8.70 m									

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
8.20	8.40	1	
8.60	8.70	1.5	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
8.40	8.40	No	6.80	20	Rapid

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
28-09-23	8.70	Nil	6.70	End of BH

REMARKS Tractor required to move rig due to very wet ground conditions.CAT scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 24972.GPJ IGSL.GDT 17/6/24

GEOTECHNICAL BORING RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**BOREHOLE NO.**	**BH03**
		SHEET	Sheet 1 of 1
CO-ORDINATES	702,778.00 E 751,706.00 N	**RIG TYPE**	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (mOD)		**BOREHOLE DEPTH (m)**	3.40
		DATE COMMENCED	02/10/2023
		DATE COMPLETED	03/10/2023
CLIENT	Marshall Yards Development Co. Ltd	**SPT HAMMER REF. NO.**	SA7
		BORED BY	DT
ENGINEER	DOBA	**ENERGY RATIO (%)**	74.07
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	TOPSOIL			0.20						
	Soft mottled brown sandy slightly gravelly SILT/CLAY									
1				1.40	AA204465	B	1.00		N = 7 (0, 2, 2, 1, 2, 2)	
	Very stiff grey/brown sandy gravelly CLAY and occasional cobbles									
2				2.30	AA204466	B	2.00		N = 48 (5, 4, 5, 4, 8, 31)	
	Dense grey clayey/silty sandy fine to coarse angular GRAVEL with occasional cobbles									
3				3.40	AA204467	B	3.00		N = 50/75 mm (25, 50)	
	Obstruction								N = 50/75 mm (25, 50)	
	End of Borehole at 3.40 m									
4										
5										
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
3.00	3.10	0.5	
3.30	3.40	1.5	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
2.40	2.40	No	2.10	20	Slow

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type
03-10-23	3.40	1.00	3.40	50mm SP

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
03-10-23	3.40	Nil	2.20	End of BH

REMARKS Tractor required to move rig due to very wet ground conditions.CAT scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 24972.GPJ IGSL.GDT 17/6/24

GEOTECHNICAL BORING RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**BOREHOLE NO.**	**BH04**
		SHEET	Sheet 1 of 1
CO-ORDINATES	702,686.00 E 751,692.00 N	**RIG TYPE**	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (mOD)		**BOREHOLE DEPTH (m)**	4.90
		DATE COMMENCED	29/09/2023
		DATE COMPLETED	29/09/2023
CLIENT	Marshall Yards Development Co. Ltd	**SPT HAMMER REF. NO.**	SA7
ENGINEER	DOBA	**ENERGY RATIO (%)**	74.07
		BORED BY	DT
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Samples: Sample Type	Samples: Depth (m)	Samples: Recovery	Field Test Results	Standpipe Details
0	TOPSOIL			0.20						
1	Soft to firm mottled brown sandy slightly gravelly SILT/CLAY			1.60	AA204460	B	1.00		N = 10 (1, 2, 2, 2, 3, 3)	
2	Stiff grey sandy gravelly SILT/CLAY with occasional cobbles			2.50	AA204461	B	2.00		N = 19 (2, 3, 4, 5, 5, 5)	
3	Stiff to very stiff black sandy gravelly CLAY with some cobbles				AA204462	B	3.00		N = 24 (4, 5, 5, 6, 6, 7)	
4					AA204463	B	4.00		N = 50/150 mm (17, 8, 25, 25)	
5	Obstruction End of Borehole at 4.90 m			4.90					N = 50/75 mm (25, 50)	
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
4.10	4.20	1	
4.80	4.90	1.5	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REMARKS Tractor required to move rig due to very wet ground conditions.CAT scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

IGSL BH LOG 24972.GPJ IGSL.GDT 17/6/24

GEOTECHNICAL BORING RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**BOREHOLE NO.**	**BH05**
		SHEET	Sheet 1 of 1
CO-ORDINATES	702,819.33 E 751,646.87 N	**RIG TYPE**	Dando 2000
		BOREHOLE DIAMETER (mm)	200
GROUND LEVEL (mOD)	77.75	**BOREHOLE DEPTH (m)**	3.20
		DATE COMMENCED	04/10/2023
		DATE COMPLETED	04/10/2023
CLIENT	Marshall Yards Development Co. Ltd	**SPT HAMMER REF. NO.**	SA7
ENGINEER	DOBA	**ENERGY RATIO (%)**	74.07
		BORED BY	DT
		PROCESSED BY	F.C

Depth (m)	Description	Legend	Elevation	Depth (m)	Samples: Ref. Number	Sample Type	Depth (m)	Recovery	Field Test Results	Standpipe Details
0	TOPSOIL		77.55	0.20						
	Soft to firm mottled brown sandy gravelly CLAY				AA204468	B	0.50			
1					AA204469	U	1.00	100%rec 20 blows	N = 7 (1, 2, 1, 2, 2, 2)	
			76.45	1.30						
	Stiff grey/brown sandy gravelly SILT/CLAY with occasional cobbles				AA204470	B	1.50			
2					AA204471	B	2.00		N = 25 (2, 3, 5, 7, 8, 5)	
			74.75	3.00						
3	Dense grey fine to coarse angular GRAVEL with occasional cobbles		74.55	3.20	AA204472	B	3.00		N = 50/75 mm (25, 50)	
	Obstruction End of Borehole at 3.20 m									
4										
5										
6										
7										
8										
9										

HARD STRATA BORING/CHISELLING

From (m)	To (m)	Time (h)	Comments
2.00	2.70	2	
3.00	3.20	1.5	

WATER STRIKE DETAILS

Water Strike	Casing Depth	Sealed At	Rise To	Time (min)	Comments
					No water strike

INSTALLATION DETAILS

Date	Tip Depth	RZ Top	RZ Base	Type

GROUNDWATER PROGRESS

Date	Hole Depth	Casing Depth	Depth to Water	Comments
04-10-23	3.20	Nil	2.80	End of BH

REMARKS Tractor required to move rig due to very wet ground conditions.CAT scanned location and hand dug inspection pit carried out.

Sample Legend
D - Small Disturbed (tub)
B - Bulk Disturbed
LB - Large Bulk Disturbed
Env - Environmental Sample (Jar + Vial + Tub)
UT - Undisturbed 100mm Diameter Sample
P - Undisturbed Piston Sample
W - Water Sample

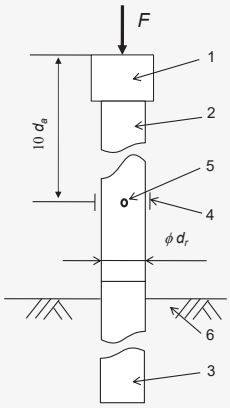
IGSL BH LOG 24972.GPJ IGSL.GDT 17/6/24

SPT Calibration Report

Hammer Energy Measurement Report

Type of Hammer		SPT Hammer
Test No		EQU2023_59
Client		IGSL
Test Depth (m)		9.70
Mass of hammer	m =	63.5kg
Falling height	h =	0.76m
E_{theor} =	$m \times g \times h$ =	473J

Characteristics of the instrumented rod



Key

1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

F Force
d_r Diameter of rod

Fig. B.1 and B.2
BS EN ISO 22476-3 : 2005 + A1 : 2011

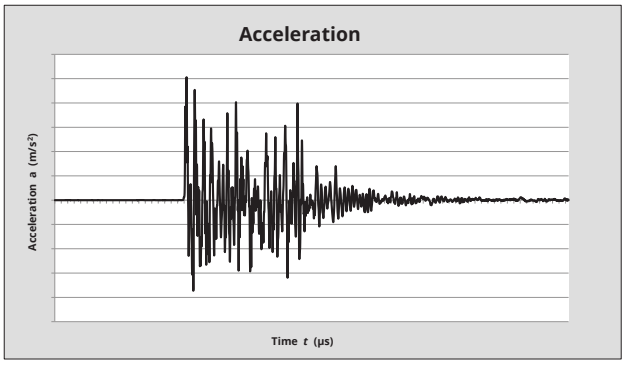
Diameter	d_r =	0.052 m
Length of instrumented rod		0.558 m
Area	A =	11.61 cm²
Modulus	E_a =	206843 MPa

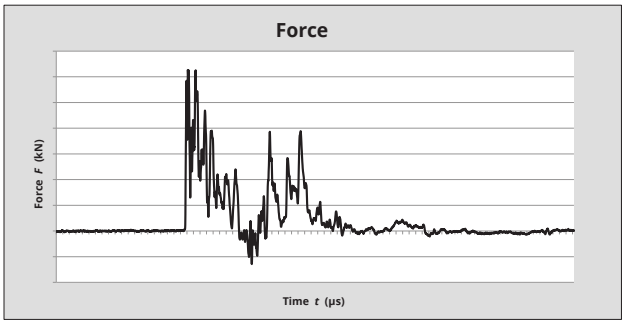
DATE OF TEST	VALID UNTIL	HAMMER ID
06/03/2023	05/03/2024	SA7

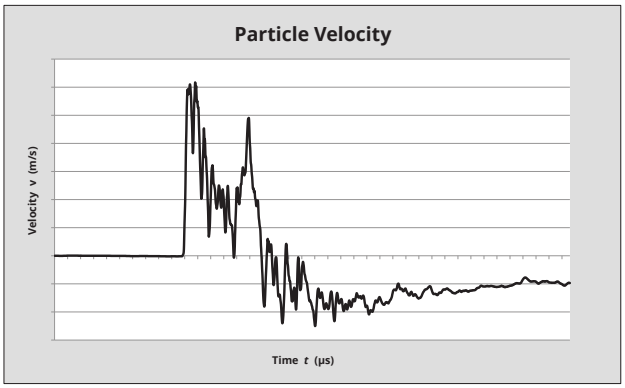
E_{meas} = **0.350** kN-m

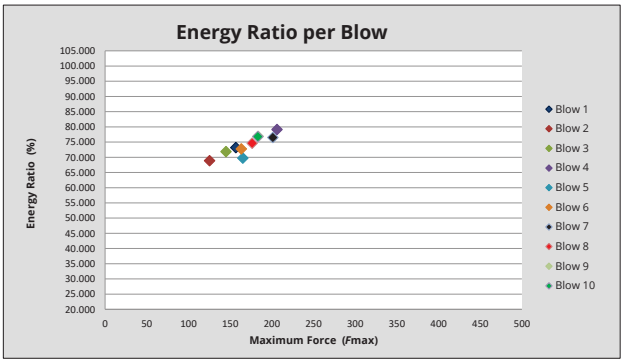
E_{theor} = **0.473** kN-m

Comments









Energy Ratio (Er) = $\frac{E_{meas}}{E_{theor}}$ **74.07%**

Equipe SPT Analyzer Operator	Certificate prepared by	Certificate checked by	Certificate date
JL			10/03/2023

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

Appendix 2

Trial Pit Logs & Photographs

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP01**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,818.64 E 751,897.26 N
		DATE STARTED	12/10/2023
		DATE COMPLETED	12/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	79.92
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		0.20	79.72						
Firm becoming firm to stiff brown sandy gravelly CLAY with a medium cobble content. Sand is fine to medium. Gravel is subrounded to rounded medium to coarse. Cobbles are subangular to subrounded.					AA191072	B	0.50-0.60		
1.0					AA191073	B	1.20-1.30		
2.0 Stiff greyish brown sandy gravelly CLAY with a medium cobble content and a low boulder content. Sand is fine to medium. Gravel is subangular to angular medium to coarse. Cobbles are subrounded to rounded. Cobbles are angular to subrounded.		2.10	77.82						
		2.50	77.42		AA191074	B	2.40-2.50		
Stiff to very stiff dark grey sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine to medium. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded to rounded. Boulders are subangular to subrounded.									
3.0					AA191075	B	3.30-3.40		
End of Trial Pit at 3.50m		3.50	76.42						

Groundwater Conditions
Dry

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP02**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,765.87 E 751,828.06 N
		DATE STARTED	12/10/2023
		DATE COMPLETED	12/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	80.73
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		0.20	80.53						
Soft to firm brown slightly sandy gravelly CLAY with a medium cobble content and a low boulder content. Sand is fine. Gravel is subrounded to rounded medium to coarse. Cobbles are subrounded to rounded. Boulders are angular to subrounded.		0.70	80.03		AA191079	B	0.60-0.70		
1.0 Firm to stiff brown slightly sandy gravelly CLAY with a medium cobble content and a low boulder content. Sand is fine. Gravel is subrounded to rounded medium to coarse. Cobbles are subrounded to rounded. Boulders are angular to subrounded.									
2.0					AA191080	B	1.90-2.20		
Stiff brownish grey slightly sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine. Gravel is subrounded to rounded fine to coarse. Cobbles are angular to subrounded. Boulders are angular to subrounded (up to 400mm).		2.10	78.63						
Stiff dark grey slightly sandy gravelly CLAY with a high cobble content and a medium boulder content. Sand is fine. Gravel is subrounded to rounded medium to coarse. Cobbles are angular to subrounded. Boulders are subrounded to rounded (up to 400mm).		2.90	77.83		AA191081	B	2.90-3.20		
3.0 End of Trial Pit at 3.30m		3.30	77.43						

Groundwater Conditions
Dry

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP03**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,713.22 E 751,824.06 N
		DATE STARTED	12/10/2023
		DATE COMPLETED	12/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	81.78
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

	Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0	TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		0.20	81.58						
	Soft to firm brown sandy gravelly CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.					AA191071	B	0.50-0.60		
1.0	Firm to stiff brown sandy gravelly CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		1.00	80.78						
						AA191069	B	1.50-1.60		
2.0	Stiff greyish brown sandy gravelly CLAY with a medium cobble content. Sand is fine to medium. Gravel is subangular to angular medium to coarse. Cobbles are subrounded to rounded.		2.00	79.78						
						AA191070	B	2.10-2.20		
	Stiff to very stiff dark grey slightly silty sandy gravelly CLAY with a medium cobble content and a low boulder content. Sand is fine to medium. Gravel is subangular to angular medium to coarse. Cobbles are subrounded to rounded. Boulders are angular to subrounded.		2.50	79.28						
	Obstruction		2.90	78.88						
3.0	End of Trial Pit at 2.90m									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit ended on obstruction / possible rockhead

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP04**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,811.78 E 751,840.92 N
		DATE STARTED	12/10/2023
		DATE COMPLETED	12/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	79.32
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		0.25	79.07						
Firm brown sandy gravelly CLAY with a low cobble content. Sand is fine. Gravel is angular to subangular medium to coarse. Cobbles are subrounded to rounded.					AA191076	B	0.60-0.70		
1.0									
Firm to stiff brown sandy gravelly CLAY with a low cobble content. Sand is fine. Gravel is angular to subangular medium to coarse. Cobbles are subrounded to rounded.		1.20	78.12						
2.0 Stiff dark grey sandy gravelly slightly silty CLAY with a high cobble content and a low boulder content. Sand is fine. Gravel is angular to subrounded medium to coarse. Cobbles are angular to subrounded. Boulders are subrounded to rounded (up to 400mm).		2.00	77.32		AA191078	B	2.20-2.30		
3.0									
End of Trial Pit at 3.20m		3.20	76.12						

Groundwater Conditions
Dry

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP05**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,761.83 E 751,752.13 N
		DATE STARTED	13/10/2023
		DATE COMPLETED	13/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		0.25							
Firm to stiff brown slightly sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine to medium. Gravel is angular to subrounded medium to coarse. Cobbles are subangular to subrounded. Boulders are angular to subrounded.					AA191089	B	0.60-0.70		
1.0									
2.0 Stiff brownish grey slightly sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine. Gravel is angular to subangular medium to coarse. Cobbles are angular to subrounded. Boulders are angular to subrounded (up to 350mm).		2.00			AA191090	B	2.20-2.30		
Stiff and very stiff dark grey slightly sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine to medium. Gravel is is subangular to angular medium to coarse. Cobbles are subangular to angular. Boulders are subangular to rounded (up to 450mm).		2.90							
3.0					AA191091	B	3.10-3.20		
End of Trial Pit at 3.40m		3.40							

Groundwater Conditions
Dry

Stability
Good

General Remarks

IGSL TP LOG 24972.GPJ IGSL.GDT 17/6/24

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP06**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,694.00 E 751,745.00 N
		DATE STARTED	16/10/2023
		DATE COMPLETED	16/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		0.25							
Soft to firm brown sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine to medium. Gravel is angular to subrounded medium to coarse. Cobbles are angular to subrounded. Boulders are angular to subrounded.		0.60			AA192353	B	0.70-0.80		
1.0 Firm to stiff brown sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine to medium. Gravel is angular to subrounded medium to coarse. Cobbles are angular to subrounded. Boulders are angular to subrounded.									
2.0 Stiff becoming very stiff dark grey slightly sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine to medium. Gravel is angular to subrounded medium to coarse. Cobbles are angular to subrounded. Boulders are angular to subrounded.		2.00			AA192354	B	2.00-2.10		
3.0					AA192355 AA192356	B B	3.10-3.20 3.10-3.20		
End of Trial Pit at 3.50m		3.50							

Groundwater Conditions
Dry

Stability
Good

General Remarks

IGSL TP LOG 24972.GPJ IGSL.GDT 17/6/24

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP07**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,807.78 E 751,723.02 N
		DATE STARTED	13/10/2023
		DATE COMPLETED	13/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	78.43
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		0.25	78.18						
Firm occasionally soft to firm brown sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine. Gravel is angular to subrounded medium to coarse. Cobbles are angular to subrounded. Boulders are angular to subrounded.					AA191095	B	0.70-0.80		
1.0 Firm to stiff brown sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine. Gravel is angular to subrounded medium to coarse. Cobbles are angular to subrounded. Boulders are angular to subrounded.		1.00	77.43						
					AA191096	B	1.90-2.20		
2.0 Stiff greyish brown sandy gravelly CLAY with a medium cobble content and a low boulder content. Sand is fine. Gravel is subangular to angular medium to coarse. Cobbles are subrounded to rounded. Boulders are angular to subrounded.		2.00	76.43						
				1 (Moderate)	AA191097	B	2.40-2.50		
Obstruction End of Trial Pit at 2.50m		2.50	75.93						
3.0									

Groundwater Conditions
Water strike at 2.50

Stability
Stable up to 2.30

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP08**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,752.00 E 751,713.00 N
		DATE STARTED	12/10/2023
		DATE COMPLETED	12/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		0.20							
Soft to stiff brown slightly sandy gravelly CLAY with a medium cobble content. Sand is fine. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded to rounded.					AA191082	B	0.60-0.70		
1.0 Firm to stiff brown slightly sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded to rounded. Boulders are angular to subrounded.		0.90							
2.0 Stiff dark grey slightly sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine to medium. Gravel is is subrounded to rounded medium to coarse. Cobbles are rounded to subrounded. Boulders are angular to subrounded.		2.00			AA191083	B	2.00-2.10		
					AA191084	B	2.90-2.10		
3.0 Stiff dark grey/orange sandy gravelly SILT (to silty Sand) with a high cobble content and a low boulder content. Sand is fine to medium. Gravel is angular to subangular medium to coarse. Cobbles are subrounded to rounded. Boulders are angular to subrounded.		3.00			AA191085	B	3.20-3.30		
End of Trial Pit at 3.40m		3.40							

Groundwater Conditions
Dry

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP09**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,720.00 E 751,665.00 N
		DATE STARTED	12/10/2023
		DATE COMPLETED	12/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		0.20							
Soft to firm brown slightly sandy gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse.		0.60							
Firm to stiff becoming stiff brown slightly sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded to rounded. Boulders are angular to subrounded. 1.0 2.0					AA191086	B	0.70-0.80		
Very stiff dark grey slightly sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine to medium. Gravel is is subrounded to rounded medium to coarse. Cobbles are rounded to subrounded. Boulders are angular to subrounded (up to 450mm).		2.20			AA191087	B	2.60-2.70		
3.0					AA191088	B	3.10-3.20		
End of Trial Pit at 3.30m		3.30							

Groundwater Conditions
Dry

Stability
Good

General Remarks

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP10**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,753.00 E 751,673.00 N
		DATE STARTED	13/10/2023
		DATE COMPLETED	13/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		0.20							
Soft and soft to firm brown sandy gravelly CLAY. Sand is fine. Gravel is angular to subrounded medium to coarse.		0.65							
Firm to stiff brown sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine. Gravel is angular to subrounded medium to coarse. Cobbles are angular to subrounded. Boulders are angular to subrounded.					AA191092	B	0.70-0.80		
1.0					AA191093	B	1.50-1.60		
Stiff becoming very stiff brown sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine. Gravel is angular to subrounded medium to coarse. Cobbles are angular to subrounded. Boulders are angular to subrounded.		1.75							
2.0					AA191094	B	2.10-2.20		
Obstruction End of Trial Pit at 2.40m		2.40							
3.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit ended on obstruction / possible rockhead

IGSL TP LOG 24972.GPJ IGSL.GDT 17/6/24

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP11**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,835.07 E 751,677.13 N
		DATE STARTED	13/10/2023
		DATE COMPLETED	13/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	77.57
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.									
		0.40	77.17						
Firm to stiff greyish brown sandy gravelly CLAY with a high cobble content and occasional sandy lenses. Sand is medium to coarse. Gravel is subrounded to rounded medium to coarse. Cobbles are subrounded to rounded. 0.40-1.90m Recovered moist					AA191098	B	0.70-0.80		
1.0									
		1.90	75.67						
Stiff dark brownish grey sandy gravelly slightly silty CLAY with a high cobble content and a low boulder content. Sand is medium to coarse. Gravel is subangular to subrounded medium to coarse. Cobbles are subrounded to rounded. Boulders are subangular to subrounded (up to 350mm).					AA191099	B	1.90-2.00		
2.0					AA191100	B	2.30-2.40		
		2.50	75.07	1 (Moderate)					
End of Trial Pit at 2.50m									
3.0									

Groundwater Conditions
Water strike at 2.50

Stability
Good

General Remarks
Pit ended due to slow progress and minor sidewall collapse

TRIAL PIT RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**TRIAL PIT NO.**	**TP12**
		SHEET	Sheet 1 of 1
LOGGED BY	OK	**CO-ORDINATES**	702,772.00 E 751,636.00 N
		DATE STARTED	16/10/2023
		DATE COMPLETED	16/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**GROUND LEVEL (m)**	
ENGINEER	DOBA	**EXCAVATION METHOD**	JCB 8ton

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content. Sand is fine to medium. Gravel is subangular to subrounded medium to coarse. Cobbles are subangular to subrounded.		0.20							
Firm occaisonally firm to stiff brown sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine. Gravel is angular to subangular medium to coarse. Cobbles are angular to subangular. Boulders are angular to subangular (up to 450mm).					AA192351	B	0.70-0.80		
1.0									
Stiff light brown to brown sandy gravelly CLAY with a high cobble content and a low boulder content. Sand is fine to medium. Gravel is angular to subangular medium to coarse. Cobbles are angular to subangular. Boulders are angular to subangular.		1.80			AA192352	B	1.90-2.10		
2.0									
Obstruction End of Trial Pit at 2.20m		2.20							
3.0									

Groundwater Conditions
Dry

Stability
Good

General Remarks
Pit ended on obstruction / possible rockhead

TP01 - 1 of 5

TP01 - 2 of 5

TP01 - 3 of 5

TP01 - 4 of 5

TP01 - 5 of 5

TP02 - 1 of 5

TP02 - 2 of 5

TP02 - 3 of 5

TP02 - 4 of 5

TP02 - 5 of 5

TP03 - 1 of 4

TP03 - 2 of 4

TP03 - 3 of 4

TP03 - 4 of 4

TP04 - 1 of 5

TP04 - 2 of 5

TP04 - 3 of 5

TP04 - 4 of 5

TP04 - 5 of 5

TP05 - 1 of 4

TP05 - 2 of 4

TP05 - 3 of 4

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TP06 - 1 of 4

TP06 - 2 of 4

TP06 - 3 of 4

TP06 - 4 of 4

TP07 - 1 of 4

TP07 - 2 of 4

TP07 - 3 of 4

TP07 - 4 of 4

TP08 - 1 of 4

TP08 - 2 of 4

TP08 - 3 of 4

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TP09 - 1 of 4

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Appendix 3

Dynamic Probe Records

DYNAMIC PROBE RECORD

REPORT NUMBER 24972

CONTRACT Ratoath Housing Development , Co.Meath

PROBE NO. DP01
SHEET Sheet 1 of 1

CO-ORDINATES 702,815.16 E
751,898.99 N
GROUND LEVEL (mOD) 80.01

HAMMER MASS (kg) 50
INCREMENT SIZE (mm) 100
FALL HEIGHT (mm) 500

DATE COMMENCED 02/10/2023
DATE COMPLETED 02/10/2023

CLIENT Marshall Yards Development Co. Ltd.
ENGINEER DOBA

PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	0
						0.20	0
						0.30	0
						0.40	0
						0.50	2
						0.60	3
						0.70	5
						0.80	4
						0.90	4
1.0						1.00	5
						1.10	8
						1.20	6
						1.30	6
						1.40	5
						1.50	6
						1.60	6
						1.70	8
						1.80	9
						1.90	9
2.0						2.00	13
						2.10	19
						2.20	23
						2.30	24
						2.40	25
	End of Probe at 2.50 m			77.51			
3.0							
4.0							

Graphic Probe Record
0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 24972.GPJ IGSL.GDT 17/6/24

DYNAMIC PROBE RECORD

REPORT NUMBER 24972

CONTRACT	Ratoath Housing Development , Co.Meath	**PROBE NO.**	**DP02**
		SHEET	Sheet 1 of 1
CO-ORDINATES	702,808.81 E 751,840.20 N		
GROUND LEVEL (mOD)	79.38	**DATE COMMENCED**	02/10/2023
		DATE COMPLETED	02/10/2023
CLIENT	Marshall Yards Development Co. Ltd.	**HAMMER MASS (kg)**	50
ENGINEER	DOBA	**INCREMENT SIZE (mm)**	100
		FALL HEIGHT (mm)	500
		PROBE TYPE	DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	1
						0.20	1
						0.30	2
						0.40	1
						0.50	2
						0.60	2
						0.70	2
						0.80	1
						0.90	0
1.0						1.00	0
						1.10	2
						1.20	2
						1.30	4
						1.40	5
						1.50	5
						1.60	4
						1.70	7
						1.80	8
						1.90	8
2.0						2.00	22
						2.10	25
	End of Probe at 2.20 m			77.18			
3.0							
4.0							

Graphic Probe Record: 0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 24972.GPJ IGSL.GDT 17/6/24

DYNAMIC PROBE RECORD

REPORT NUMBER 24972

CONTRACT Ratoath Housing Development , Co.Meath

PROBE NO. **DP03**
SHEET Sheet 1 of 1

CO-ORDINATES 702,715.21 E
751,827.78 N
GROUND LEVEL (mOD) 81.81

HAMMER MASS (kg) 50
INCREMENT SIZE (mm) 100
FALL HEIGHT (mm) 500

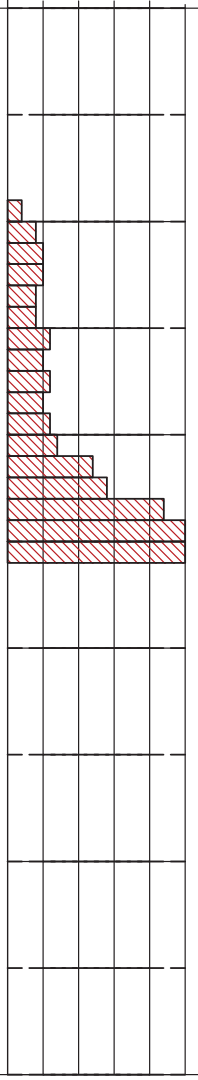
DATE COMMENCED 02/10/2023
DATE COMPLETED 02/10/2023

CLIENT Marshall Yards Development Co. Ltd.
ENGINEER DOBA

PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	0
						0.20	0
						0.30	0
						0.40	0
						0.50	0
						0.60	0
						0.70	0
						0.80	0
						0.90	2
1.0						1.00	4
						1.10	5
						1.20	5
						1.30	4
						1.40	4
						1.50	6
						1.60	5
						1.70	6
						1.80	5
						1.90	6
2.0						2.00	7
						2.10	12
						2.20	14
						2.30	22
						2.40	25
						2.50	25
	End of Probe at 2.60 m			79.21			
3.0							
4.0							

Graphic Probe Record



GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 24972.GPJ IGSL.GDT 17/6/24

DYNAMIC PROBE RECORD

REPORT NUMBER 24972

CONTRACT Ratoath Housing Development , Co.Meath

PROBE NO. **DP04**
SHEET Sheet 1 of 1

CO-ORDINATES 702,761.83 E
751,752.13 N
GROUND LEVEL (mOD)

HAMMER MASS (kg) 50
INCREMENT SIZE (mm) 100
FALL HEIGHT (mm) 500

DATE COMMENCED 02/10/2023
DATE COMPLETED 02/10/2023

CLIENT Marshall Yards Development Co. Ltd.
ENGINEER DOBA

PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	0
						0.20	0
						0.30	1
						0.40	0
						0.50	1
						0.60	2
						0.70	4
						0.80	5
						0.90	5
1.0						1.00	4
						1.10	5
						1.20	4
						1.30	3
						1.40	4
						1.50	3
						1.60	3
						1.70	5
						1.80	6
						1.90	7
2.0						2.00	7
						2.10	9
						2.20	10
						2.30	12
						2.40	19
						2.50	25
	End of Probe at 2.60 m						
3.0							
4.0							

Graphic Probe Record: 0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 24972.GPJ IGSL.GDT 17/6/24

DYNAMIC PROBE RECORD

REPORT NUMBER 24972

CONTRACT Ratoath Housing Development , Co.Meath

PROBE NO. **DP05**
SHEET Sheet 1 of 1

CO-ORDINATES 702,703.35 E
751,731.49 N
GROUND LEVEL (mOD)

HAMMER MASS (kg) 50
INCREMENT SIZE (mm) 100
FALL HEIGHT (mm) 500

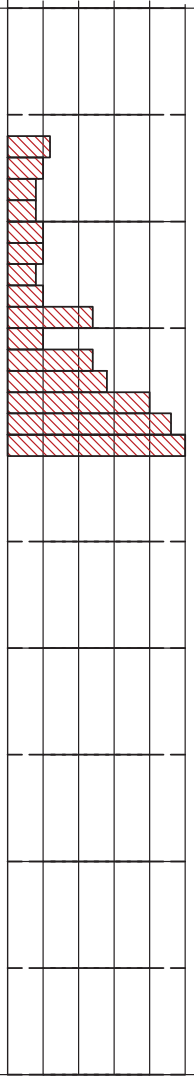
DATE COMMENCED 02/10/2023
DATE COMPLETED 02/10/2023

CLIENT Marshall Yards Development Co. Ltd.
ENGINEER DOBA

PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	0
						0.20	0
						0.30	0
						0.40	0
						0.50	0
						0.60	6
						0.70	5
						0.80	4
						0.90	4
1.0						1.00	5
						1.10	5
						1.20	4
						1.30	5
						1.40	12
						1.50	5
						1.60	12
						1.70	14
						1.80	20
						1.90	23
2.0						2.00	25
	End of Probe at 2.10 m						
3.0							
4.0							

Graphic Probe Record



GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 24972.GPJ IGSL.GDT 17/6/24

DYNAMIC PROBE RECORD

REPORT NUMBER 24972

CONTRACT Ratoath Housing Development , Co.Meath

PROBE NO. **DP06**
SHEET Sheet 1 of 1

CO-ORDINATES 702,720.00 E
751,662.00 N
GROUND LEVEL (mOD)

HAMMER MASS (kg) 50
INCREMENT SIZE (mm) 100
FALL HEIGHT (mm) 500

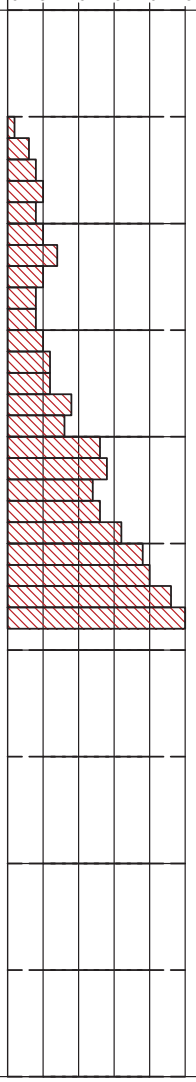
DATE COMMENCED 02/10/2023
DATE COMPLETED 02/10/2023

CLIENT Marshall Yards Development Co. Ltd.
ENGINEER DOBA

PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	0
						0.20	0
						0.30	0
						0.40	0
						0.50	1
						0.60	3
						0.70	4
						0.80	5
						0.90	4
1.0						1.00	5
						1.10	7
						1.20	5
						1.30	4
						1.40	4
						1.50	5
						1.60	6
						1.70	6
						1.80	9
						1.90	8
2.0						2.00	13
						2.10	14
						2.20	12
						2.30	13
						2.40	16
						2.50	19
						2.60	20
						2.70	23
						2.80	25
	End of Probe at 2.90 m						
3.0							
4.0							

Graphic Probe Record



GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 24972.GPJ IGSL.GDT 17/6/24

DYNAMIC PROBE RECORD

REPORT NUMBER 24972

CONTRACT Ratoath Housing Development , Co.Meath

PROBE NO. **DP07**
SHEET Sheet 1 of 1

CO-ORDINATES 702,757.00 E
751,673.00 N
GROUND LEVEL (mOD)

HAMMER MASS (kg) 50
INCREMENT SIZE (mm) 100
FALL HEIGHT (mm) 500

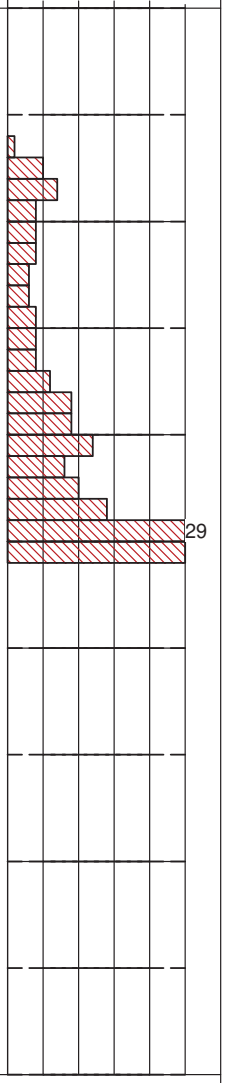
DATE COMMENCED 02/10/2023
DATE COMPLETED 02/10/2023

CLIENT Marshall Yards Development Co. Ltd.
ENGINEER DOBA

PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	0
						0.20	0
						0.30	0
						0.40	0
						0.50	0
						0.60	1
						0.70	5
						0.80	7
						0.90	4
1.0						1.00	4
						1.10	4
						1.20	3
						1.30	3
						1.40	4
						1.50	4
						1.60	4
						1.70	6
						1.80	9
						1.90	9
2.0						2.00	12
						2.10	8
						2.20	10
						2.30	14
						2.40	29
	End of Probe at 2.60 m					2.50	25
3.0							
4.0							

Graphic Probe Record



GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 24972.GPJ IGSL.GDT 17/6/24

DYNAMIC PROBE RECORD

REPORT NUMBER 24972

CONTRACT Ratoath Housing Development , Co.Meath

PROBE NO. **DP08**
SHEET Sheet 1 of 1

CO-ORDINATES 702,832.47 E
751,678.25 N
GROUND LEVEL (mOD) 77.57

HAMMER MASS (kg) 50
INCREMENT SIZE (mm) 100
FALL HEIGHT (mm) 500

DATE COMMENCED 02/10/2023
DATE COMPLETED 02/10/2023

CLIENT Marshall Yards Development Co. Ltd.
ENGINEER DOBA

PROBE TYPE DPH

Depth (m)	Geotechnical Description	Legend	Depth (m)	Elevation (mOD)	Water	Depth (m)	Probe Readings (Blows/Increment)
0.0	.					0.00	0
						0.10	0
						0.20	1
						0.30	0
						0.40	0
						0.50	0
						0.60	5
						0.70	5
						0.80	7
						0.90	7
1.0						1.00	5
						1.10	5
						1.20	6
						1.30	3
						1.40	3
						1.50	12
						1.60	3
						1.70	4
						1.80	5
						1.90	6
2.0						2.00	7
						2.10	6
						2.20	7
						2.30	8
						2.40	11
						2.50	21
						2.60	19
						2.70	25
	End of Probe at 2.80 m			74.77			
3.0							
4.0							

Graphic Probe Record: 0 5 10 15 20 25

GROUNDWATER OBSERVATIONS

REMARKS

IGSL DP LOG 100MM INCREMENTS 24972.GPJ IGSL.GDT 17/6/24

Appendix 4

Plate Bearing Test Records

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

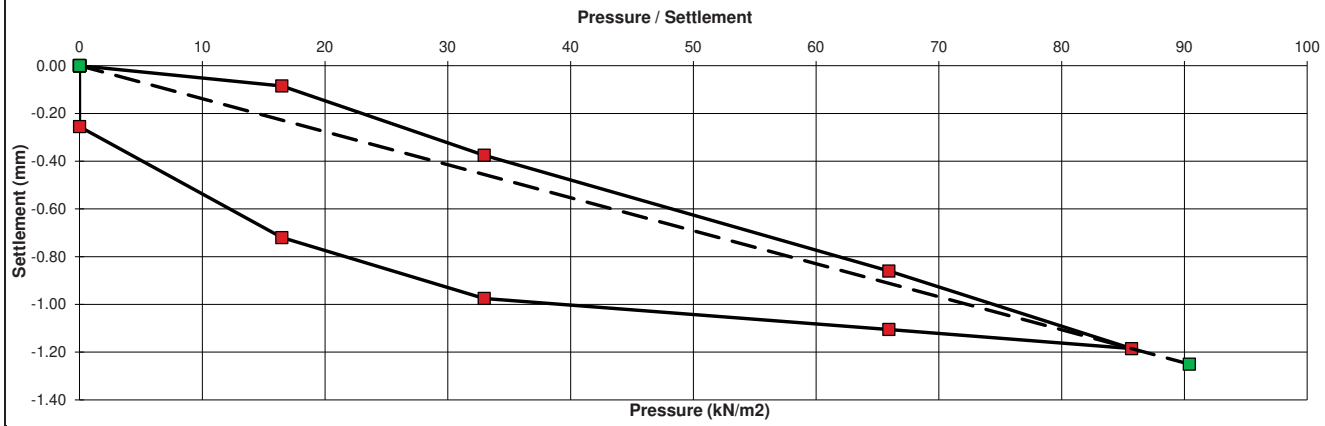
Reference No.	R150058
Contract	Rataoth Meath
Test No.	CBR01- Load
Location	TP01
Depth	0.4m
Client	DOBA
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	OK
Authorised by	
Date	17/10/2023

Description of soil under test
(natural soil, placed fill, sub-base)

brown sandy gravelly CLAY with a low cobble content.

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 72
Modulus of subgrade reaction = 46 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 7.5 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

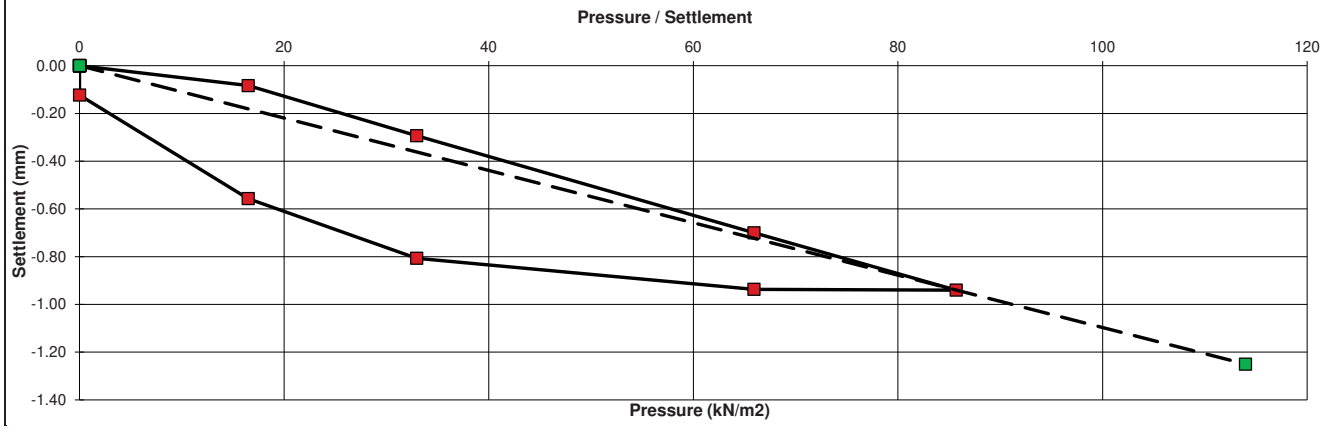
Reference No.	R150058
Contract	Rataoth Meath
Test No.	CBR01- Reload
Location	TP01
Depth	0.4m
Client	DOBA
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	OK
Authorised by	
Date	17/10/2023

Description of soil under test
(natural soil, placed fill, sub-base)

brown sandy gravelly CLAY with a low cobble content.

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 91
Modulus of subgrade reaction = 59 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 11.2 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

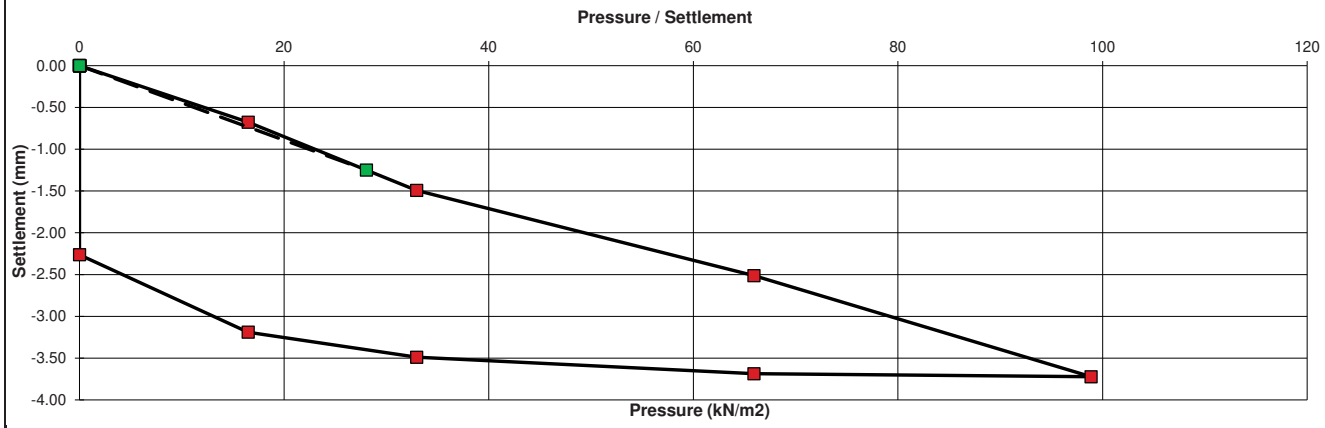
Reference No.	R150059
Contract	Rataoth Meath
Test No.	CBR02- Load
Location	TP03
Depth	0.4m
Client	DOBA
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	OK
Authorised by	
Date	17/10/2023

Description of soil under test
(natural soil, placed fill, sub-base)

brown sandy gravelly CLAY with a low cobble content.

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 22
Modulus of subgrade reaction = 14 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 1.0 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

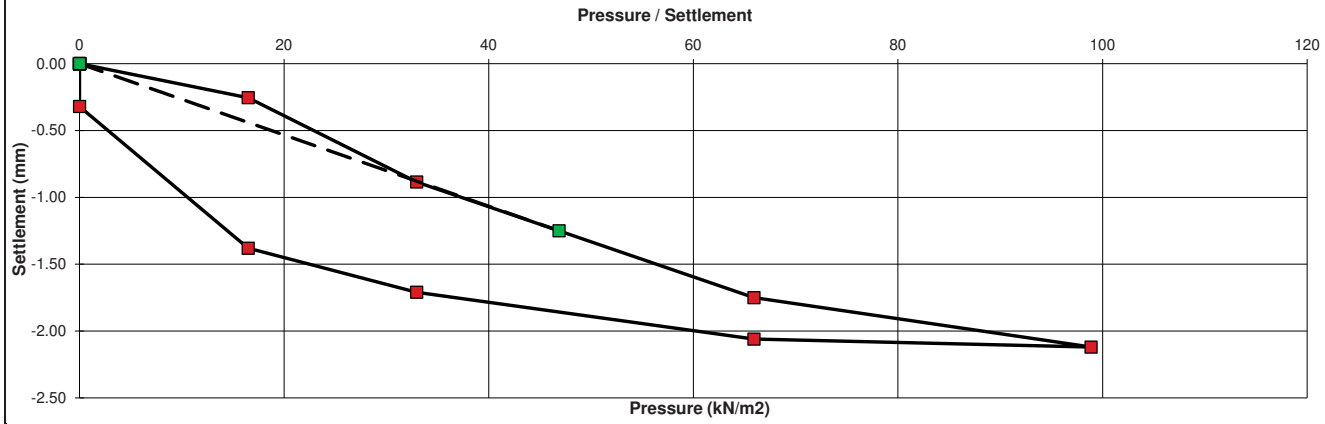
Reference No.	R150059
Contract	Rataoth Meath
Test No.	CBR02- Reload
Location	TP03
Depth	0.4m
Client	DOBA
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	OK
Authorised by	
Date	17/10/2023

Description of soil under test
(natural soil, placed fill, sub-base)

brown sandy gravelly CLAY with a low cobble content.

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 37
Modulus of subgrade reaction = 24 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.4 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

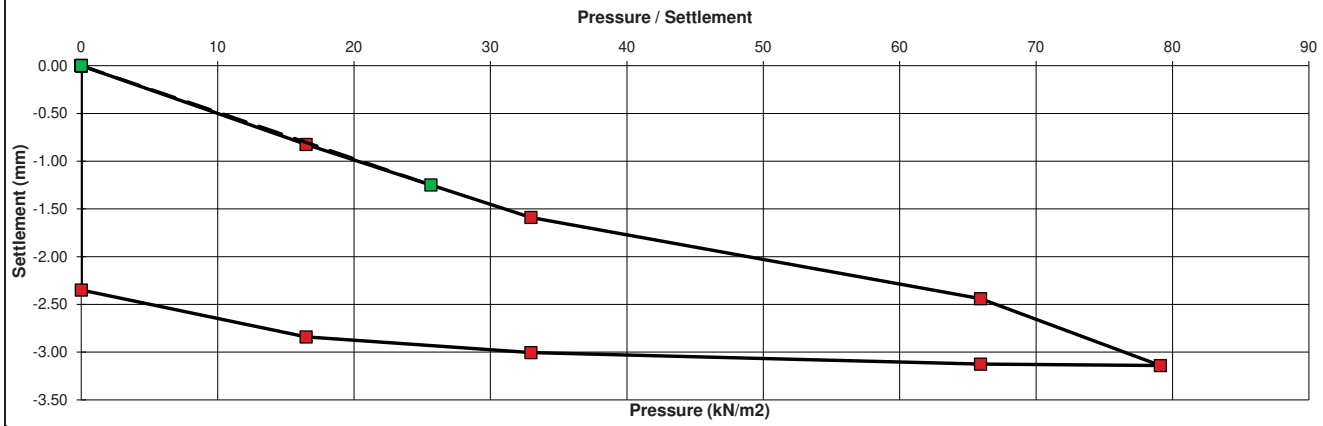
Reference No.	R150060
Contract	Rataoth Meath
Test No.	CBR03- Load
Location	TP05
Depth	0.4m
Client	DOBA
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	OK
Authorised by	
Date	17/10/2023

Description of soil under test
(natural soil, placed fill, sub-base)

brown sandy gravelly CLAY with a low cobble content.

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 21
Modulus of subgrade reaction = 13 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 0.8 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

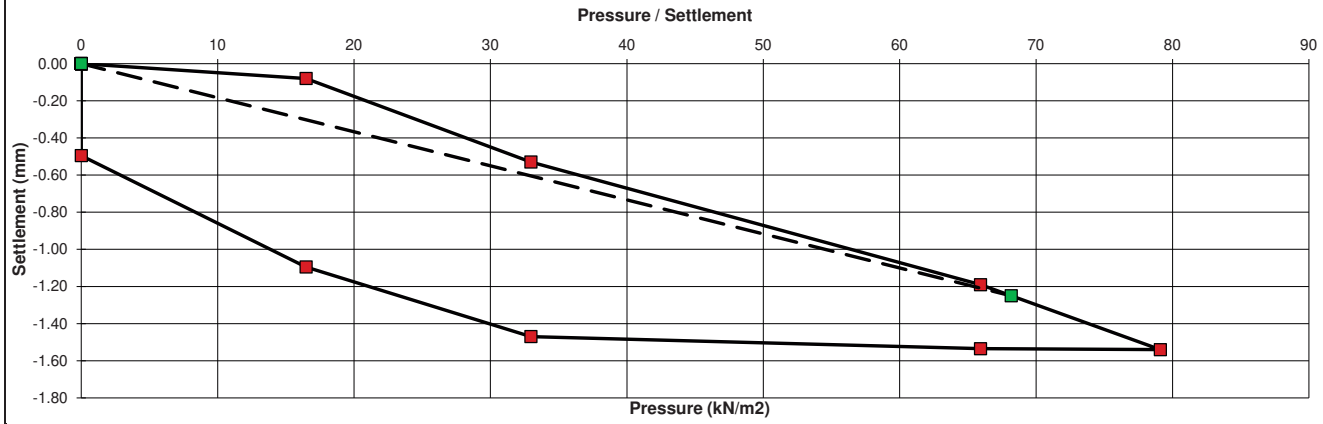
Reference No.	R150060
Contract	Rataoth Meath
Test No.	CBR03- Reload
Location	TP05
Depth	0.4m
Client	DOBA
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	OK
Authorised by	
Date	17/10/2023

Description of soil under test
(natural soil, placed fill, sub-base)

brown sandy gravelly CLAY with a low cobble content.

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 55
Modulus of subgrade reaction = 35 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 4.6 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

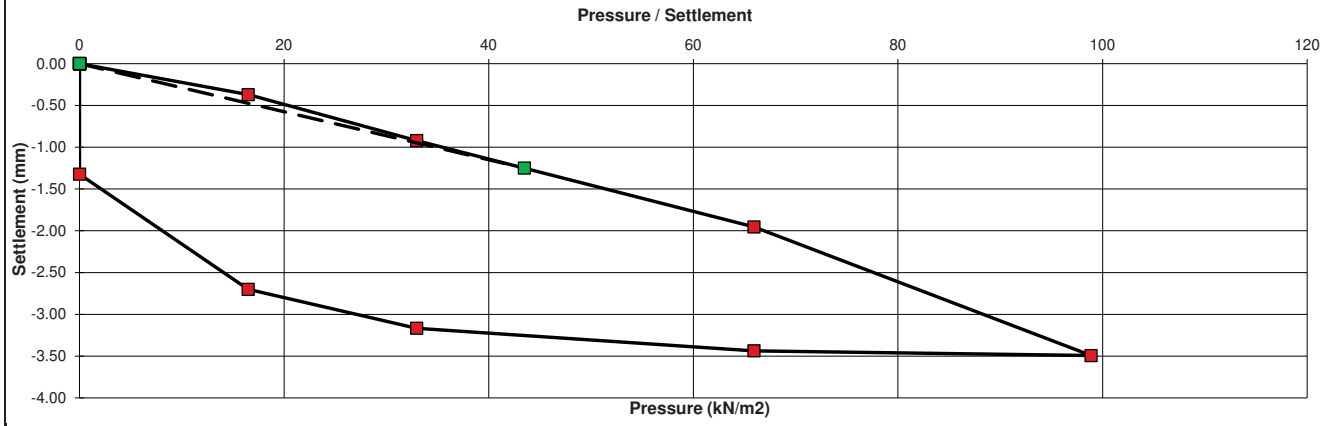
Reference No.	R150061
Contract	Rataoth Meath
Test No.	CBR04- Load
Location	TP10
Depth	0.4m
Client	DOBA
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	OK
Authorised by	
Date	17/10/2023

Description of soil under test
(natural soil, placed fill, sub-base)

brown sandy gravelly CLAY with a low cobble content.

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 35
Modulus of subgrade reaction = 22 MPa/m
Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 2.1 %

PLATE TEST REPORT SHEET (F3.1)

Applied Pressure/Settlement Curve

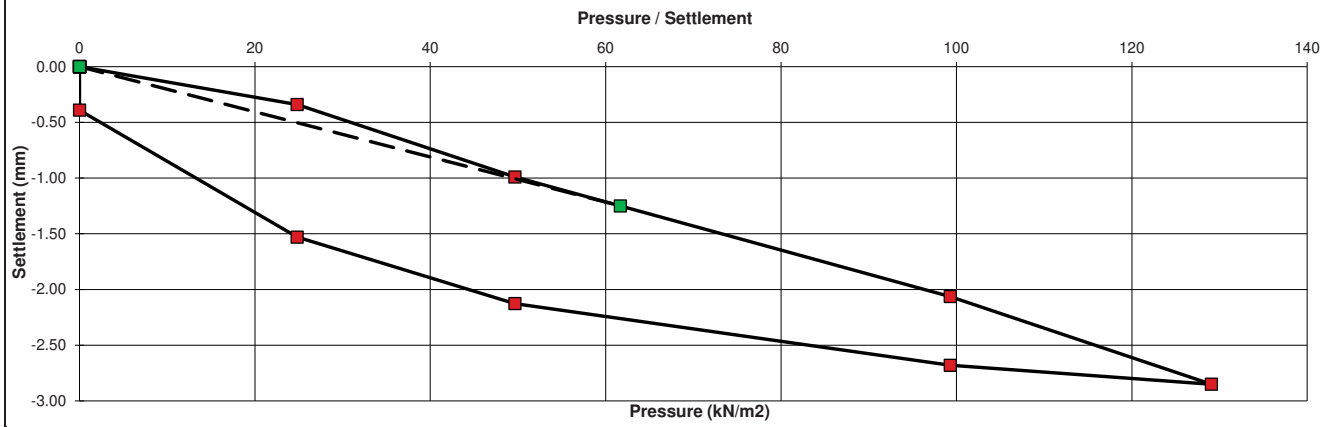
Reference No.	R150061
Contract	Rataoth Meath
Test No.	CBR04- Reload
Location	TP10
Depth	0.4m
Client	DOBA
Plate Diameter:	450 mm
Test Method	BS 1377: Part 9: 1990 Test4 - Incremental Loading Test
Technician	OK
Authorised by	
Date	17/10/2023

Description of soil under test (natural soil, placed fill, sub-base)

brown sandy gravelly CLAY with a low cobble content.

Sample Ref No.

Depth m bgl



Gradient at 1.25 mm settlement intersection = 49

Modulus of subgrade reaction = 32 MPa/m

Correction factor applied = 0.64 as per HD 25-26/10

Equivalent CBR value in accordance with NRA HD25-26/10 3.9 %

Appendix 5

Soakaway Test Records

Soakaway Design f -value from field tests

IGSL

Contract: Ratoath Housing
Contract No. **24972**
Test No. SA02
Engineer DOBA
Date: 13/10/2023

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	TOPSOIL	
0.20	1.50	Firm to stiff, brown to greyish brown, slightly sandy gravelly CLAY with high	
		cobbles content. Sand is fine to coarse. Gravel is fine to coarse subangular to	DRY
		subrounded. Cobbles are subangular to subrounded.	

Notes: SA02 done beside TP02 location

Field Data

Depth to Water (m)	Elapsed Time (min)
0.570	0.00
0.570	1.00
0.575	2.00
0.575	3.00
0.575	4.00
0.575	5.00
0.575	6.00
0.575	7.00
0.575	8.00
0.575	9.00
0.575	10.00
0.575	12.00
0.575	14.00
0.575	16.00
0.575	18.00
0.575	20.00
0.575	25.00
0.575	30.00
0.575	40.00
0.575	50.00
0.575	60.00

Field Test

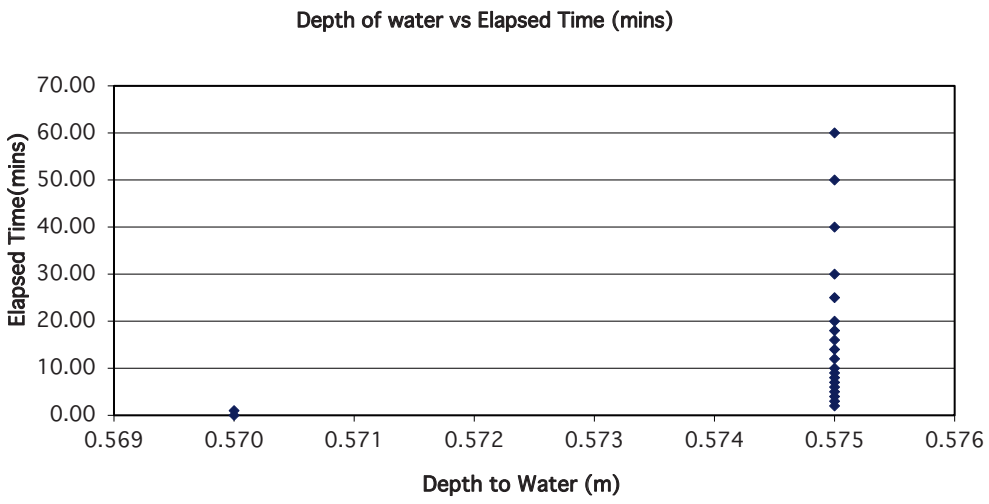
Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	1.50	m
Initial depth to Water =	0.57	m
Final depth to water =	0.575	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m

Water Soakage stop at 0.575m

Base area=	0.75	m2
*Av. side area of permeable stratum over test perio	3.71	m2
Total Exposed area =	4.46	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 1.4E-05 m/min or 2.33558E-07 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Ratoath Housing
Contract No. **24972**
Test No. SA07
Engineer DOBA
Date: 13/10/2023

Summary of ground conditions

from	to	Description	Ground water
0.00	0.25	TOPSOIL: Soft brown sandy gravelly CLAY with rootlets and a low cobble content	
0.25	1.00	Firm occasionally soft to firm brown sandy gravelly CLAY with a high cobble content and a low boulder content	DRY
1.00	2.00	Firm to stiff brown sandy gravelly CLAY with a high cobble content and a low boulder content	

Notes: SA07 done beside TP07 location

Field Data

Depth to Water (m)	Elapsed Time (min)
0.675	0.00
0.675	1.00
0.675	2.00
0.675	3.00
0.675	4.00
0.675	5.00
0.675	6.00
0.675	7.00
0.675	8.00
0.675	9.00
0.675	10.00
0.675	12.00
0.675	14.00
0.675	16.00
0.675	18.00
0.675	20.00
0.675	25.00
0.675	30.00
0.675	40.00
0.675	50.00
0.675	60.00

Field Test

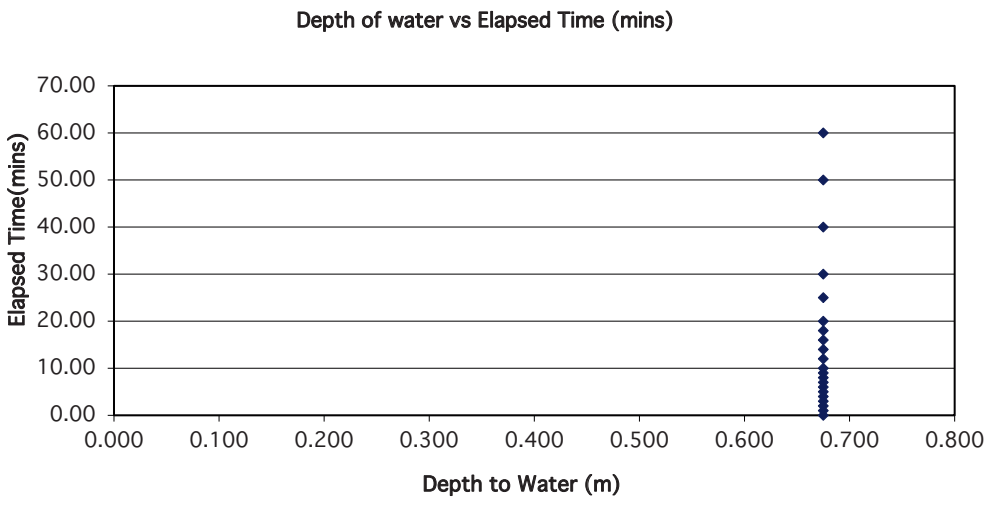
Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	2.00	m
Initial depth to Water =	0.675	m
Final depth to water =	0.675	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m

No Any Water Soakage

Base area=	1	m2
*Av. side area of permeable stratum over test perio	4.125	m2
Total Exposed area =	5.125	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Soakaway Design f -value from field tests

IGSL

Contract: Ratoath Housing
Contract No. **24972**
Test No. SA12
Engineer DOBA
Date: 13/10/2023

Summary of ground conditions

from	to	Description	Ground water
0.00	0.20	TOPSOIL	
0.20	0.60	Soft, brown, slightly sandy slightly gravelly CLAY with some roots (possible fill)	
0.60	1.50	Firm, greyish brown, slightly sandy gravelly CLAY with medium cobbles conternt.	DRY
		Sand is fine to coarse, gravel is fine to coarse subangular to subrounded,	
		cobbles are subangular to subrounded.	

Notes: SA12 done beside TP12 location

Field Data

Depth to Water (m)	Elapsed Time (min)
0.645	0.00
0.645	1.00
0.645	2.00
0.645	3.00
0.645	4.00
0.645	5.00
0.645	6.00
0.645	7.00
0.645	8.00
0.645	9.00
0.645	10.00
0.645	12.00
0.645	14.00
0.645	16.00
0.645	18.00
0.645	20.00
0.645	25.00
0.645	30.00
0.645	40.00
0.645	50.00
0.645	60.00

Field Test

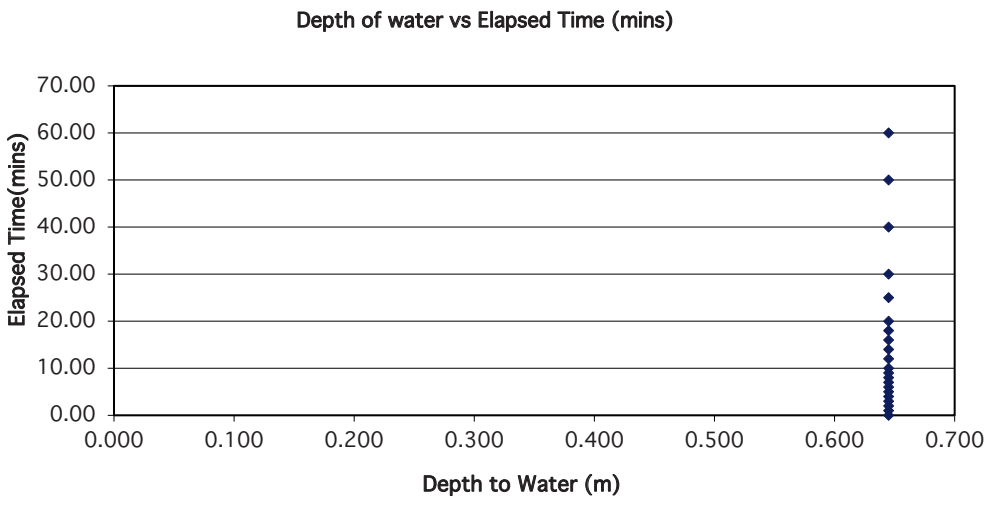
Depth of Pit (D)	1.50	m
Width of Pit (B)	0.50	m
Length of Pit (L)	2.00	m
Initial depth to Water =	0.645	m
Final depth to water =	0.645	m
Elapsed time (mins)=	60.00	
Top of permeable soil		m
Base of permeable soil		m

No Any Water Soakage

Base area=	1	m2
*Av. side area of permeable stratum over test perio	4.275	m2
Total Exposed area =	5.275	m2

Infiltration rate (f) = Volume of water used/unit exposed area / unit time

f= 0 m/min or 0 m/sec



Appendix 6

Geotechnical Laboratory Results (Soil)

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3**

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No. **R151920** Contract No. 24972 Contract Name: Ratoath , Co.Meath

Customer DOBA

Samples Received: 28/10/23 Date Tested: 28/10/23

BH/TP*	Sample No.	Depth* (m)	Lab. Ref	Sample Type*	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
BH01	AA167796	2.0	A23/4362	B	15	39	16	23	58	WS	4.4	C I	Grey/brown sandy gravelly SILT
BH01	AA167799	5.0	A23/4363	B	14	27	NP	NP	53	WS	4.4		Grey/brown slightly sandy, gravelly, SILT
BH02	AA204452	2.0	A23/4364	B	14	33	17	16	56	WS	4.4	C L	Grey/brown sandy gravelly CLAY
BH04	AA204462	3.0	A23/4365	B	11	41	15	26	59	WS	4.4	C I	Grey/brown sandy gravelly CLAY
BH05	AA204469	1.0	A23/4366	U	25	35	21	14	74	WS	4.4	C L	Brown sandy gravelly CLAY
TP01	AA191075	3.3	A23/4370	B	12	32	16	16	57	WS	4.4	C L	Grey/brown sandy gravelly CLAY
TP03	AA191069	1.5	A23/4371	B	19	35	17	18	59	WS	4.4	C L	Brown sandy gravelly CLAY
TP06	AA192356	3.1	A23/4372	B	13	31	15	16	52	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY
TP07	AA191097	2.4	A23/4373	B	10	36	17	19	69	WS	4.4	C I	Brown sandy gravelly CLAY
TP08	AA191085	3.2	A23/4374	B	19	30	NP	NP	60	WS	4.4		Brown sandy gravelly SILT

Preparation: WS - Wet sieved
AR - As received
NP - Non plastic

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method
4.4 Cone Penetrometer one point method

Sample Type: B - Bulk Disturbed
U - Undisturbed

Remarks:
Results relate only to the specimen tested,in as received condition unless otherwise noted.
NOTE: **These clauses have been superceded by EN 17892-1 and EN17892-12.
Opinions and interpretations are outside the scope of accreditation. * denotes Customer supplied information.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports
H Byrne (Laboratory Manager)

Approved by: H Byrne

Date: 08/12/23

Page: 1 of 1

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	99	
20	94	
14	90	
10	85	
6.3	78	
5	75	
3.35	69	
2	64	
1.18	58	SAND
0.6	52	
0.425	50	
0.3	47	
0.15	42	
0.063	36	SILT/CLAY
0.037	31	
0.027	28	
0.017	25	
0.010	22	
0.007	18	
0.005	16	
0.002	8	

Contract No. 24972 Report No. R151951
Contract Name : Ratoath , Co.Meath
BH/TP No. BH01
Sample No.* AA167799 Lab. Sample No. A23/4363
Sample Type: B
Depth* (m) 5.00 Customer: DOBA
Date Received 28/10/2023 Date Testing started 28/10/2023
Description: Grey/brown slightly sandy, gravelly, SILT

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.
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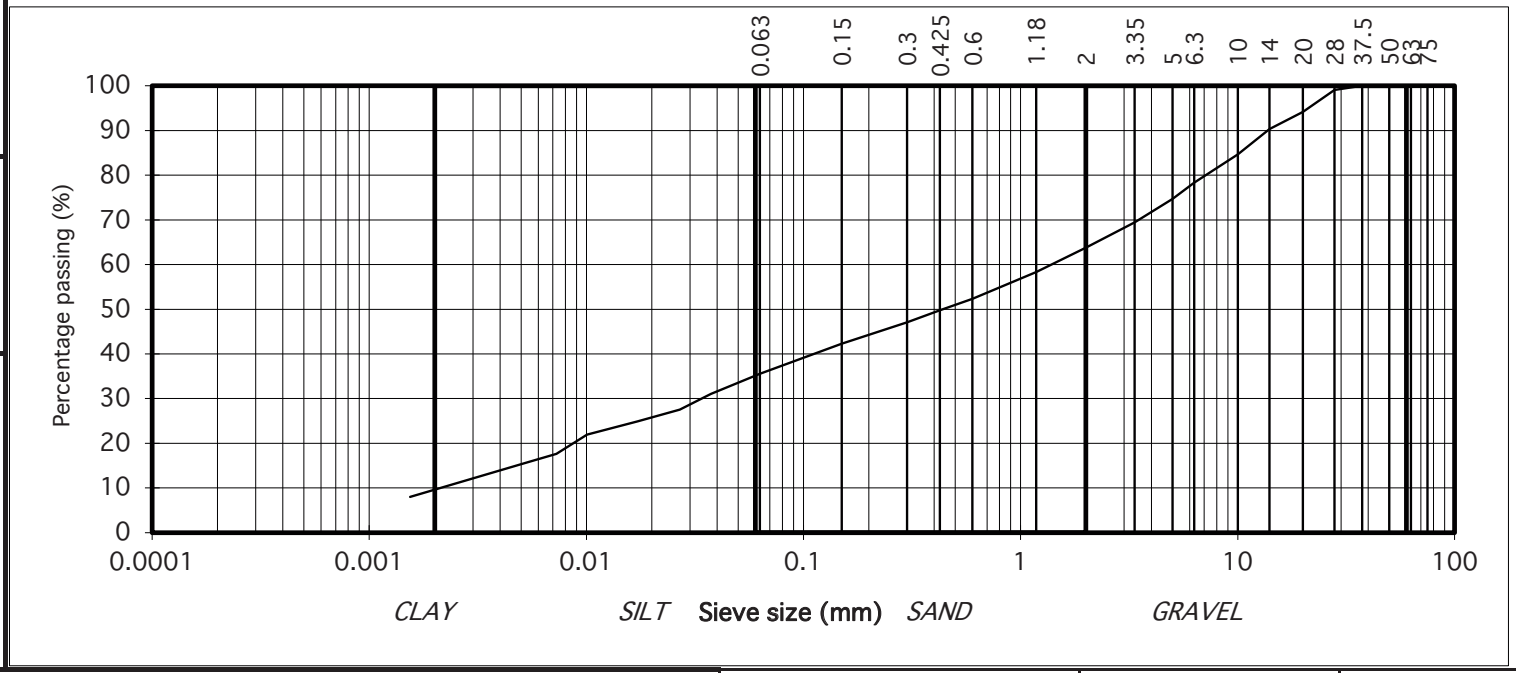

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Approved by:	Date:	Page no:
H Byrne	08/12/23	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

particle size	% passing	
75	100	COBBLES
63	84	
50	84	GRAVEL
37.5	60	
28	52	
20	47	
14	44	
10	42	
6.3	40	
5	39	
3.35	37	
2	34	
1.18	32	SAND
0.6	30	
0.425	29	
0.3	28	
0.15	25	
0.063	21	SILT/CLAY
0.037	19	
0.027	17	
0.017	15	
0.010	13	
0.007	11	
0.005	9	
0.002	6	

Contract No. 24972 Report No. R151952
Contract Name : Ratoath , Co.Meath
BH/TP No. BH02
Sample No.* AA204457 Lab. Sample No. A23/4365
Sample Type: B
Depth* (m) 7.00 Customer: DOBA
Date Received 28/10/2023 Date Testing started 28/10/2023
Description: Grey/brown slightly sandy, very gravelly, SILT/CLAY with some cobbles

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2 Sample size did not meet the requirements of BS1377

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.
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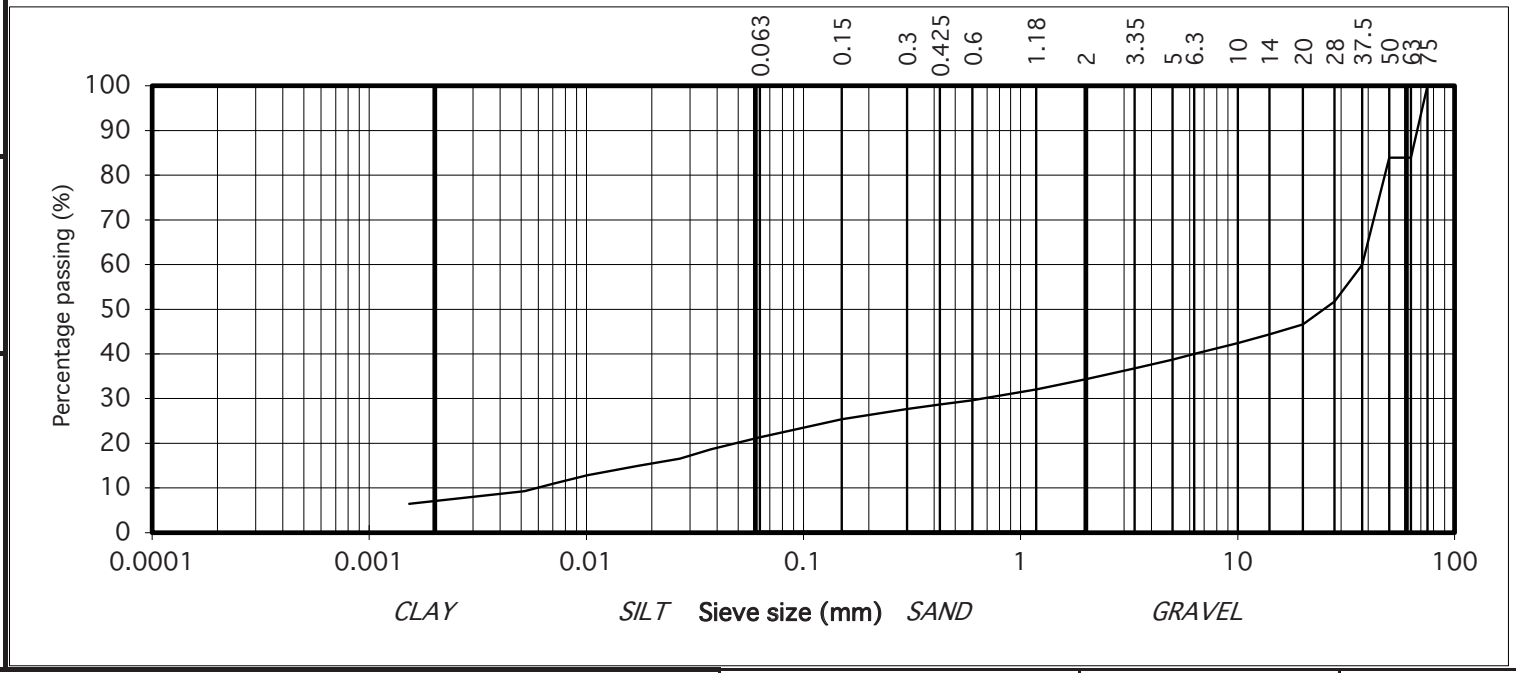

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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	80	
50	71	GRAVEL
37.5	64	
28	58	
20	48	
14	41	
10	37	
6.3	33	
5	31	
3.35	30	
2	28	
1.18	26	SAND
0.6	23	
0.425	22	
0.3	21	
0.15	19	
0.063	16	SILT/CLAY

Contract No. 24972 Report No. R151953
Contract Name : Ratoath , Co.Meath
BH/TP No. BH03
Sample No.* AA204467 Lab. Sample No. A23/4366
Sample Type: B
Depth* (m) 3.00 Customer: DOBA
Date Received 28/10/2023 Date Testing started 28/10/2023
Description: Brown clayey/silty, sandy, GRAVEL with many cobbles

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2 Sample size did not meet the requirements of BS1377

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.
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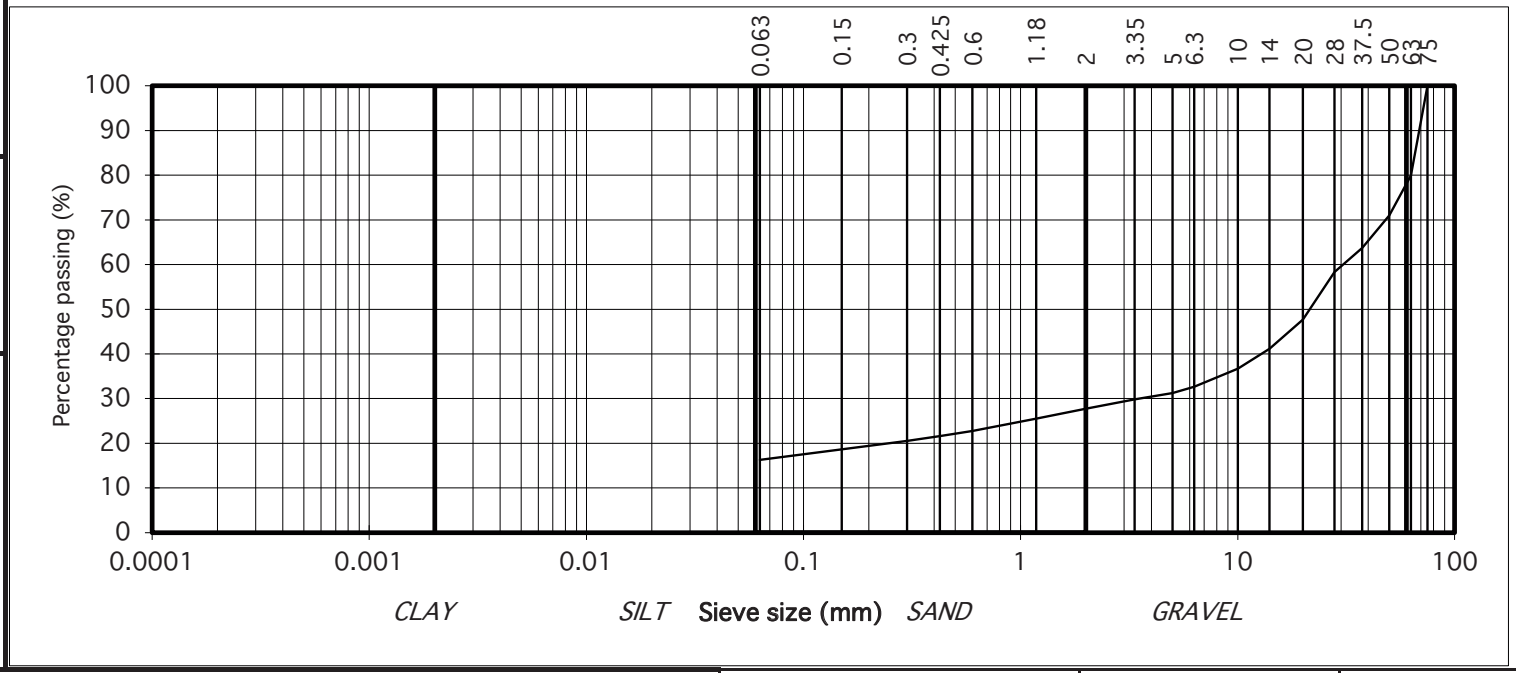

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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

particle size	% passing	
75	100	COBBLES
63	74	
50	71	GRAVEL
37.5	68	
28	64	
20	63	
14	62	
10	60	
6.3	56	
5	53	
3.35	49	
2	44	
1.18	40	SAND
0.6	36	
0.425	34	
0.3	33	
0.15	31	
0.063	29	SILT/CLAY

Contract No. 24972 Report No. R151954
Contract Name : Ratoath , Co.Meath
BH/TP No. BH05
Sample No.* AA204472 Lab. Sample No. A23/4369
Sample Type: B
Depth* (m) 3.00 Customer: DOBA
Date Received 28/10/2023 Date Testing started 28/10/2023
Description: Brown slightly sandy, gravelly, SILT/CLAY with many cobbles

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2 Sample size did not meet the requirements of BS1377

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.
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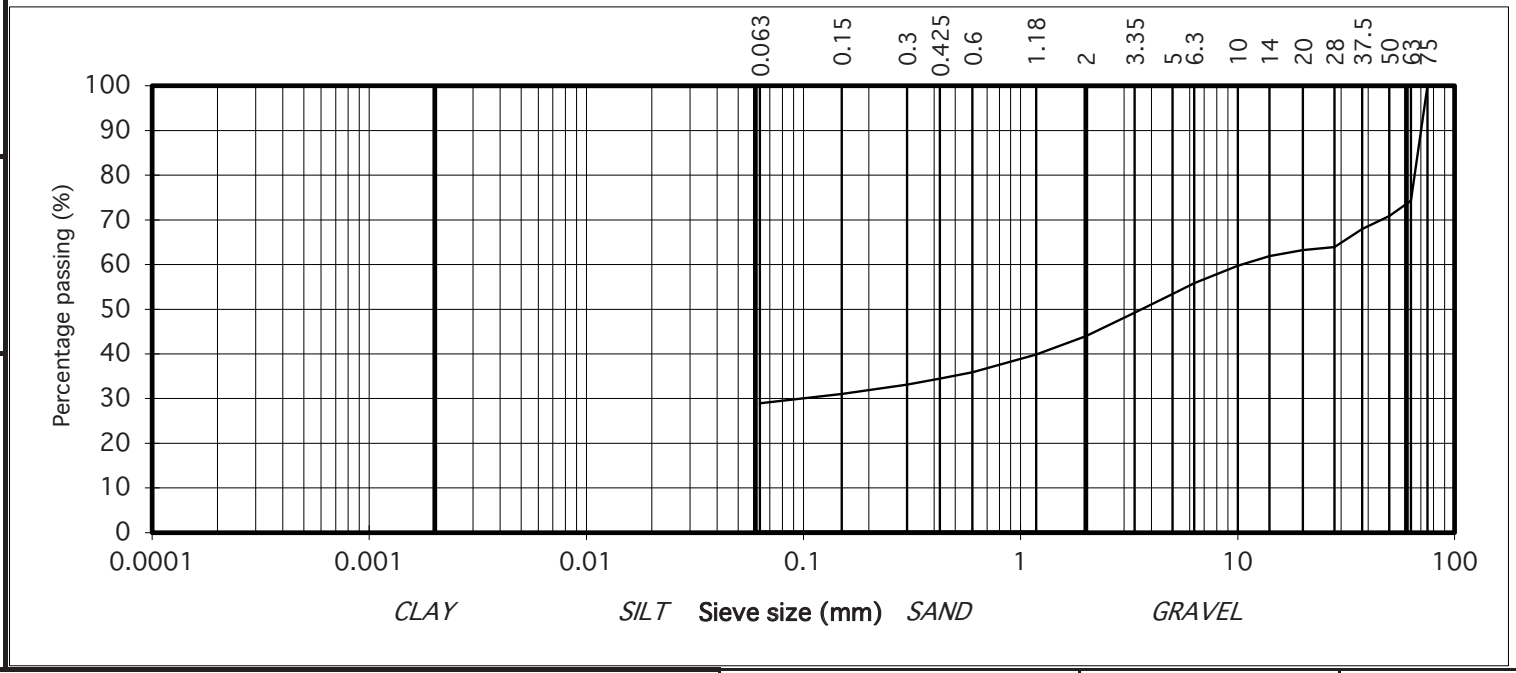

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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.133T

particle size	% passing	
75	100	COBBLES
63	100	
50	94	GRAVEL
37.5	91	
28	84	
20	83	
14	79	
10	76	
6.3	71	
5	70	
3.35	67	
2	63	
1.18	58	SAND
0.6	54	
0.425	52	
0.3	49	
0.15	45	
0.063	39	SILT/CLAY
0.038	33	
0.027	30	
0.017	27	
0.010	23	
0.007	21	
0.005	18	
0.002	12	

Contract No.	24972	Report No.	R151955	
Contract Name :	Ratoath , Co.Meath			
BH/TP No.	TP06			
Sample No.*	AA192356	Lab. Sample No.		A23/4372
Sample Type:	B			
Depth* (m)	3.10	Customer:	DOBA	
Date Received	28/10/2023	Date Testing started		28/10/2023
Description:	Brown slightly sandy, gravelly, CLAY			

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.
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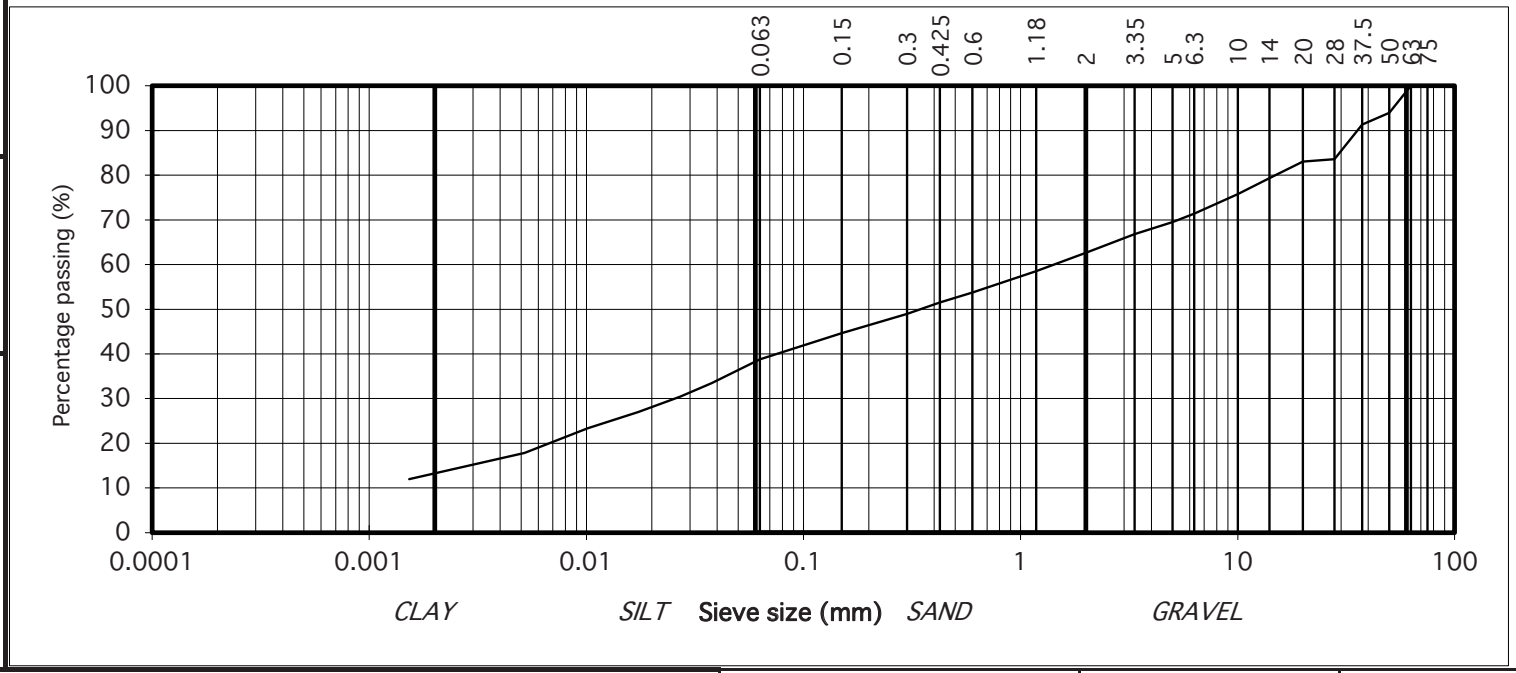

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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	96	
20	93	
14	87	
10	83	
6.3	77	
5	74	
3.35	70	
2	64	
1.18	60	SAND
0.6	54	
0.425	52	
0.3	49	
0.15	41	
0.063	31	SILT/CLAY
0.037	27	
0.027	24	
0.017	22	
0.010	19	
0.007	16	
0.005	13	
0.002	10	

Contract No. 24972 Report No. R151956
Contract Name : Ratoath , Co.Meath
BH/TP No. TP12
Sample No.* AA192352 Lab. Sample No. A23/4375
Sample Type: B
Depth* (m) 1.90 Customer: DOBA
Date Received 28/10/2023 Date Testing started 28/10/2023
Description: Brown slightly sandy, gravelly, SILT/CLAY

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.
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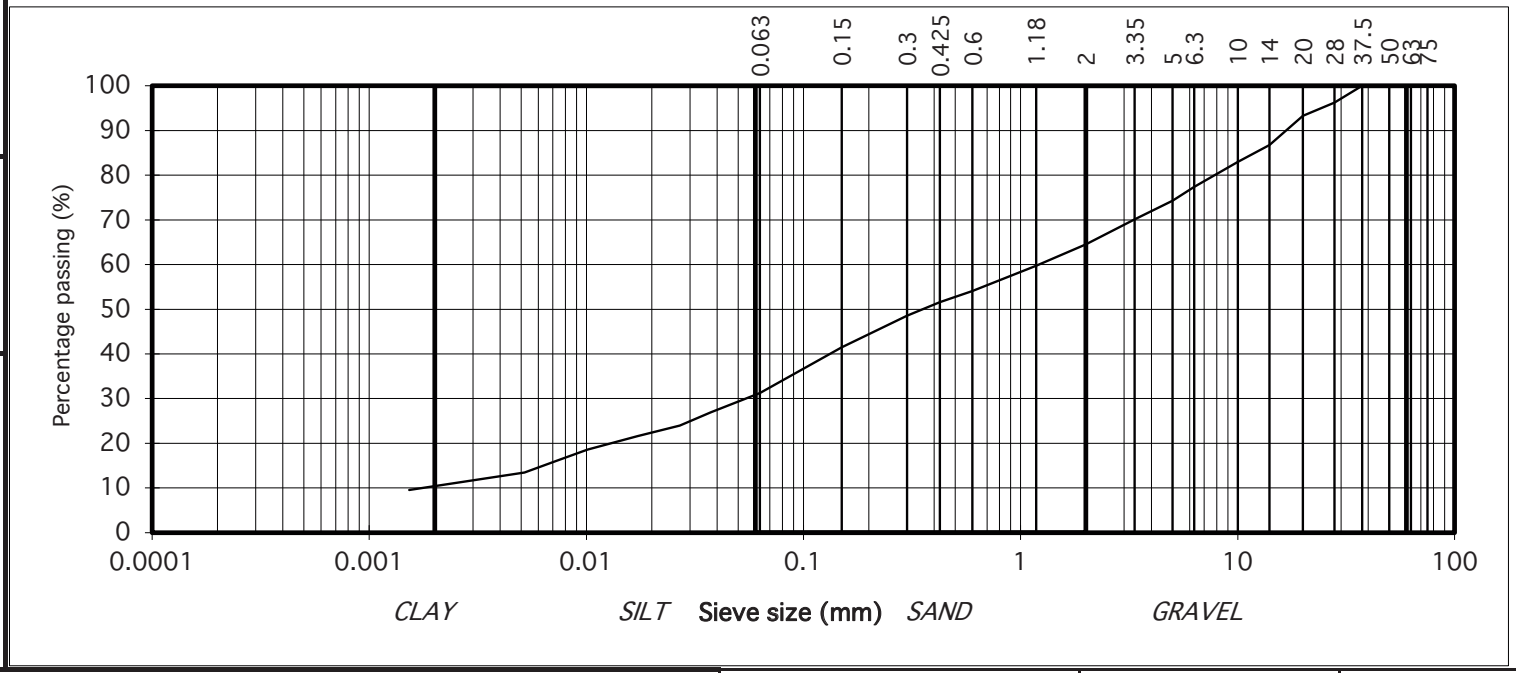

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Approved by:	Date:	Page no:
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Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

IGSL Ltd
Materials Laboratory
Unit F, M7 Business Park
Naas
Co. Kildare

045-899324

Test Report

Undrained shear strength in triaxial compression
(without pore pressure measurement)

Tested in accordance with BS1377:Part 7:1990 clause 8
(definitive method)**

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.1331

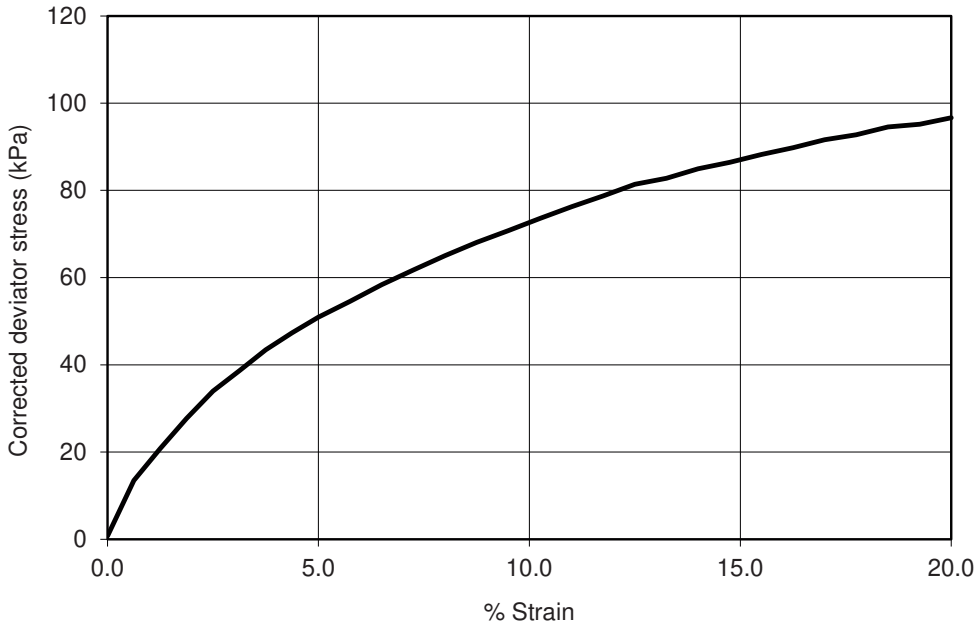
Report no: R149756

Contract Name:	Ratoath, Meath	Contract No:	24972
Location*:	BH05 1.0m	Sample No*.	204469

Description: Brown mottled orange sandy gravelly SILT/CLAY with cobbles

Customer: Marshall Yards Development Company Ltd

Height (mm)	200	Diameter	103	Cell pressure(kPa)	30
Moisture Content %	14	Bulk density (Mg/m^3)	2.20	Dry density (Mg/m^3)	1.93



Strain at failure %	20	Cohesion C_u (kPa) (Undrained shear strength kPa)	48
Rate of strain (%/minute)	2.0		
Thickness of membrane	0.2	Membrane correction (at failure)	0.74
Date received	-	Date tested	16/11/23

Results relate only to the specimen tested, in as received condition unless otherwise noted. Opinions and interpretations are outside the scope of accreditation.

* denotes Customer supplied information

**This Standard has been superceded by ISO17892-8:2018

Person authorised to approve report: J Barrett (Quality Manager)

	Approved by	Date	Page
IGSL Materials Laboratory		20/11/23	1 of 1

Appendix 7

Chemical / Environmental Laboratory Results (Soil)

23-35608

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	23-35608-1
Initial Date of Issue:	31-Oct-2023
Re-Issue Details:	
Client	IGSL
Client Address:	M7 Business Park Naas County Kildare Ireland
Contact(s):	Darren Keogh
Project	24972 Rataoth Meath

Quotation No.:		**Date Received:**	24-Oct-2023
Order No.:		**Date Instructed:**	24-Oct-2023
No. of Samples:	4		
Turnaround (Wkdays):	7	**Results Due:**	01-Nov-2023
Date Approved:	31-Oct-2023		

Approved By:

Details: Stuart Henderson, Technical Manager

Results - Leachate

Project: 24972 Rataoth Meath

Client: IGSL						**Chemtest Job No.:**	23-35608	23-35608
Quotation No.:						**Chemtest Sample ID.:**	1721499	1721501
Order No.:						Client Sample Ref.:	AA191072	AA192353
						Sample Location:	TP1	TP6
						Sample Type:	SOIL	SOIL
						Top Depth (m):	0.50	0.70
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**			
pH at 20C	U	1010	10:1		N/A		9.1	9.1
Ammonium	U	1220	10:1	mg/l	0.050		< 0.050	< 0.050
Ammonium	N	1220	10:1	mg/kg	0.10		0.44	0.63
Boron (Dissolved)	U	1455	10:1	mg/kg	0.01		< 0.01	< 0.01
Benzo[j]fluoranthene	N	1800	10:1	µg/l	0.010		< 0.010	< 0.010

Results - Soil

Project: 24972 Rataoth Meath

Client: IGSL			**Chemtest Job No.:**		23-35608	23-35608	23-35608	23-35608
Quotation No.:			**Chemtest Sample ID.:**		1721499	1721500	1721501	1721502
Order No.:			Client Sample Ref.:		AA191072	AA191069	AA192353	AA191083
			Sample Location:		TP1	TP3	TP6	TP8
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.50	1.50	0.70	2.00
			Asbestos Lab:		COVENTRY		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type	U	2192		N/A	-		-	
Asbestos Identification	U	2192		N/A	No Asbestos Detected		No Asbestos Detected	
Moisture	N	2030	%	0.020	13	12	14	10
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Loam	Loam	Loam	Loam
pH (2.5:1) at 20C	N	2010		4.0		[A] 8.7		[A] 8.2
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40	[A] < 0.40		[A] < 0.40	
Magnesium (Water Soluble)	N	2120	g/l	0.010		[A] < 0.010		[A] < 0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010		[A] 0.010		[A] 0.20
Total Sulphur	U	2175	%	0.010		[A] 0.039		[A] 0.53
Sulphur (Elemental)	M	2180	mg/kg	1.0	[A] 2.4		[A] 2.2	
Chloride (Water Soluble)	M	2220	g/l	0.010		[A] < 0.010		[A] 0.011
Nitrate (Water Soluble)	N	2220	g/l	0.010		< 0.010		< 0.010
Cyanide (Total)	M	2300	mg/kg	0.50	[A] < 0.50		[A] < 0.50	
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	[A] 3.4		[A] 3.6	
Ammonium (Water Soluble)	M	2220	g/l	0.01		< 0.01		< 0.01
Sulphate (Acid Soluble)	U	2430	%	0.010	[A] 0.013	[A] 0.014	[A] 0.012	[A] 0.13
Arsenic	M	2455	mg/kg	0.5	16		15	
Barium	M	2455	mg/kg	0	100		72	
Cadmium	M	2455	mg/kg	0.10	2.2		2.2	
Chromium	M	2455	mg/kg	0.5	23		17	
Molybdenum	M	2455	mg/kg	0.5	6.2		6.1	
Antimony	N	2455	mg/kg	2.0	2.6		2.4	
Copper	M	2455	mg/kg	0.50	41		34	
Mercury	M	2455	mg/kg	0.05	0.06		0.05	
Nickel	M	2455	mg/kg	0.50	63		55	
Lead	M	2455	mg/kg	0.50	38		23	
Selenium	M	2455	mg/kg	0.25	1.4		1.2	
Zinc	M	2455	mg/kg	0.50	78		70	
Chromium (Trivalent)	N	2490	mg/kg	1.0	23		17	
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50		< 0.50	
Mineral Oil (TPH Calculation)	N	2670	mg/kg	10	< 10		< 10	
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C8-C10	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C10-C12	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C12-C16	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	

Results - Soil

Project: 24972 Rataoth Meath

Client: IGSL			**Chemtest Job No.:**		23-35608	23-35608	23-35608	23-35608
Quotation No.:			**Chemtest Sample ID.:**		1721499	1721500	1721501	1721502
Order No.:			Client Sample Ref.:		AA191072	AA191069	AA192353	AA191083
			Sample Location:		TP1	TP3	TP6	TP8
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.50	1.50	0.70	2.00
			Asbestos Lab:		COVENTRY		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Aliphatic TPH >C16-C21	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C21-C35	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0		[A] < 5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aromatic TPH >C8-C10	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aromatic TPH >C10-C12	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aromatic TPH >C12-C16	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aromatic TPH >C16-C21	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0		[A] < 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[A] < 10		[A] < 10	
Benzene	M	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0	
Toluene	M	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0	
Ethylbenzene	M	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0	
m & p-Xylene	M	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0	
o-Xylene	M	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0	
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0	
Naphthalene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Acenaphthylene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Acenaphthene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Fluorene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Phenanthrene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Anthracene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Fluoranthene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Pyrene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Benzo[a]anthracene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Chrysene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Benzo[b]fluoranthene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Benzo[k]fluoranthene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Benzo[a]pyrene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Indeno(1,2,3-c,d)Pyrene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Benzo[g,h,i]perylene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Coronene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010	
Total Of 17 PAH's	N	2800	mg/kg	0.20	[A] < 0.20		[A] < 0.20	
PCB 28	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] 0.012	

Results - Soil

Project: 24972 Rataoth Meath

Client: IGSL			**Chemtest Job No.:**		23-35608	23-35608	23-35608	23-35608
Quotation No.:			**Chemtest Sample ID.:**		1721499	1721500	1721501	1721502
Order No.:			Client Sample Ref.:		AA191072	AA191069	AA192353	AA191083
			Sample Location:		TP1	TP3	TP6	TP8
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.50	1.50	0.70	2.00
			Asbestos Lab:		COVENTRY		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
PCB 52	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] 0.012	
PCB 90+101	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] 0.012	
PCB 118	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] 0.012	
PCB 153	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] 0.012	
PCB 138	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] 0.012	
PCB 180	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] 0.012	
Total PCBs (7 congeners)	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] 0.081	
Total Phenols	M	2920	mg/kg	0.10	< 0.10		< 0.10	

Results - Single Stage WAC

Project: 24972 Rataoth Meath

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-35608						
Chemtest Sample ID:	1721499						
Sample Ref:	AA191072						
Sample ID:							
Sample Location:	TP1						
Top Depth(m):	0.50						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.57	3	5	6
Loss On Ignition	2610	M	%	2.9	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	M	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH at 20C	2010	M		8.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.0070	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	< 0.0002	< 0.0020	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	0.0014	0.014	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0018	0.018	0.5	10	30
Nickel	1455	U	0.0005	0.0051	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455	U	0.004	0.042	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.24	2.4	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	34	340	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	2.8	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	13

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 24972 Rataoth Meath

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	23-35608						
Chemtest Sample ID:	1721501						
Sample Ref:	AA192353						
Sample ID:							
Sample Location:	TP6						
Top Depth(m):	0.70						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	M	%	[A] 0.95	3	5	6
Loss On Ignition	2610	M	%	3.3	--	--	10
Total BTEX	2760	M	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] 0.081	1	--	--
TPH Total WAC	2670	M	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH at 20C	2010	M		8.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.0070	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0003	0.0026	0.5	2	25
Barium	1455	U	< 0.005	< 0.050	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0050	0.5	10	70
Copper	1455	U	0.0033	0.033	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0027	0.027	0.5	10	30
Nickel	1455	U	0.0007	0.0065	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0050	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0050	0.1	0.5	7
Zinc	1455	U	0.004	0.043	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.23	2.3	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	37	370	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.3	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	14

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1721499	AA191072		TP1		A	Amber Glass 250ml
1721499	AA191072		TP1		A	Plastic Tub 500g
1721500	AA191069		TP3		A	Amber Glass 250ml
1721500	AA191069		TP3		A	Plastic Tub 500g
1721501	AA192353		TP6		A	Amber Glass 250ml
1721501	AA192353		TP6		A	Plastic Tub 500g
1721502	AA191083		TP8		A	Amber Glass 250ml
1721502	AA191083		TP8		A	Plastic Tub 500g

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH at 20°C	pH Meter
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity at 25°C and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH at 20°C	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.

Test Methods

SOP	Title	Parameters included	Method summary
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix 8

Exploratory Hole Location Plans

DWG01 – DWG02

24972 - Residential Development at Ratoath

Exploratory Hole Location Plan - DWG01

24972 - Residential Development at Ratoath

Exploratory Hole Location Plan - DWG02

Appendix B Surface Water Calculations

SURFACE WATER NETWORK CALCULATIONS TABLE OF CONTENTS

MANHOLE DETAILS

DOBA 2334: Residential Zone lands at Ratoath Surface Water Calculations	Date: 06/06/2024		
	Designed by: EC	Checked by: AL	Approved By: AL
Report Details: Type: Junctions Storm Phase: Surface Network 1	Company Address:		

Name	Junction Type	Easting (m)	Northing (m)	Cover Elevation (m)	Depth (m)	Invert Elevation (m)	Chamber Shape	Diameter (m)
SMH 1.00	Manhole	702834.124	751879.449	79.978	1.943	78.035	Circular	1.350
SMH 1.01	Manhole	702809.990	751885.118	80.467	2.531	77.936	Circular	1.200
SMH 2.04	Manhole	702763.730	751821.187	80.821	1.799	79.022	Circular	1.200
SMH 5.02	Manhole	702715.110	751764.531	81.288	1.820	79.468	Circular	1.200
SMH 5.04	Manhole	702743.927	751763.298	80.640	2.097	78.543	Circular	1.200
SMH 1.11	Manhole	702768.891	751759.871	79.992	2.848	77.144	Circular	1.200
SMH 1.12	Manhole	702765.401	751734.954	79.654	2.592	77.062	Circular	1.200
SMH 7.07	Manhole	702758.670	751686.864	79.712	1.619	78.093	Circular	1.200
SMH 7.06	Manhole	702753.864	751653.469	80.479	2.214	78.265	Circular	1.200
SMH 1.17	Manhole	702785.252	751638.095	78.604	1.995	76.609	Circular	1.200
HEADWALL	Manhole	702768.528	751548.404	77.530	1.330	76.200	Circular	0.000
SMH 4.00	Manhole	702726.589	751841.616	81.954	1.525	80.429	Circular	1.350
SMH 5.01	Manhole	702712.142	751740.857	81.708	1.632	80.076	Circular	1.200
SMH 5.00	Manhole	702708.621	751714.350	82.186	1.977	80.209	Circular	1.350
SMH 7.05	Manhole	702749.867	751650.905	80.567	1.780	78.787	Circular	1.350
SMH 7.04	Manhole	702729.653	751653.574	80.977	2.084	78.893	Circular	1.200
SMH 7.03	Manhole	702703.867	751657.555	81.505	1.937	79.568	Circular	1.200
SMH 7.02	Manhole	702701.193	751660.821	81.573	1.983	79.590	Circular	1.200
SMH 7.01	Manhole	702704.219	751683.094	81.806	2.104	79.702	Circular	1.200
SMH 7.00	Manhole	702707.324	751705.485	82.102	2.287	79.815	Circular	1.200
SMH 6.02	Manhole	702779.257	751732.598	79.612	2.361	77.251	Circular	1.200
SMH 6.00	Manhole	702812.262	751704.524	79.025	1.557	77.468	Circular	1.350
SMH 1.04	Manhole	702786.461	751822.059	80.240	2.607	77.633	Circular	1.350
SMH 1.06	Manhole	702800.339	751815.661	80.016	2.459	77.557	Circular	1.200
SMH 1.07	Manhole	702798.904	751805.489	79.678	2.162	77.516	Circular	1.350
SMH 1.08	Manhole	702802.279	751800.302	79.500	2.007	77.493	Circular	1.350
SMH 1.10	Manhole	702791.672	751756.618	79.500	2.189	77.311	Circular	1.350
SMH 1.16	Manhole	702771.282	751643.574	79.672	3.016	76.656	Circular	1.200
SMH 8.00	Manhole	702852.115	751715.760	78.473	1.398	77.075	Circular	1.350
SMH 1.13	Manhole	702760.930	751703.203	79.430	2.564	76.866	Circular	1.200
SMH 1.14	Manhole	702765.972	751702.537	79.450	2.610	76.840	Circular	1.200
SMH 1.15	Manhole	702785.396	751685.950	79.335	2.568	76.767	Circular	1.200
SMH 2.02	Manhole	702724.578	751826.677	81.830	2.033	79.797	Circular	1.200
SMH 2.01	Manhole	702720.498	751796.686	81.583	1.634	79.949	Circular	1.200
SMH 8.02	Manhole	702809.732	751675.275	78.896	2.016	76.880	Circular	1.200
SMH 8.03	Manhole	702790.470	751648.453	78.681	1.911	76.770	Circular	1.200
SMH 1.18	Manhole	702776.031	751619.761	78.509	1.954	76.555	Circular	1.200
SMH 1.20	Manhole	702767.445	751595.001	78.585	2.105	76.480	Circular	1.200
SMH 1.21	Manhole	702779.624	751587.254	78.500	2.061	76.439	Circular	1.200
SMH 2.00	Manhole	702718.198	751779.050	81.437	1.400	80.037	Circular	1.200
SMH 1.02	Manhole	702797.909	751834.076	80.073	2.347	77.726	Circular	1.200
SMH 1.03	Manhole	702788.908	751835.893	80.217	2.528	77.689	Circular	1.200
SMH 1.05	Manhole	702785.634	751818.066	80.363	2.746	77.617	Circular	1.200
SMH 1.09	Manhole	702797.528	751768.086	79.500	2.138	77.362	Circular	1.200
SMH 2.03	Manhole	702739.883	751824.519	81.401	1.681	79.720	Circular	1.200
SMH 6.01	Manhole	702799.118	751715.902	79.354	1.985	77.369	Circular	1.350
SMH 1.24	Manhole	702768.210	751550.274	77.530	1.323	76.207	Circular	1.200
SMH 10.00	Manhole	702799.367	751596.687	78.140	1.458	76.682	Circular	1.200
SMH 9.02	Manhole	702729.288	751623.011	80.182	2.600	77.582	Circular	1.200
SMH 9.01	Manhole	702701.243	751630.222	81.013	2.050	78.963	Circular	1.200
SMH 9.00	Manhole	702685.139	751637.796	81.518	1.850	79.668	Circular	1.200
SMH 1.19	Manhole	702770.481	751607.727	78.677	2.160	76.517	Circular	1.200
SMH 3.00	Manhole	702816.155	751813.367	79.558	1.419	78.139	Circular	1.200
SMH 5.03	Manhole	702718.548	751766.878	81.288	1.841	79.447	Circular	1.200
SMH 8.01	Manhole	702828.826	751695.714	78.969	1.996	76.973	Circular	1.200
SMH 1.22	Manhole	702772.839	751574.873	78.700	2.302	76.398	Circular	1.200
SMH 1.23	Manhole	702768.300	751567.881	78.497	2.239	76.258	Circular	1.200

SMH 11.00	Manhole	702770.388	751840.354	80.688	1.800	78.888	Circular	1.200
SMH 12.01	Manhole	702799.909	751633.740	78.510	1.758	76.752	Circular	1.200
SMH 12.00	Manhole	702810.005	751652.657	78.280	1.430	76.850	Circular	1.200
SMH 13.00	Manhole	702815.524	751661.955	78.280	1.330	76.950	Circular	1.200

Name	Lock
SMH 1.00	Elevations
SMH 1.01	Elevations
SMH 2.04	Elevations
SMH 5.02	Elevations
SMH 5.04	Elevations
SMH 1.11	Elevations
SMH 1.12	Elevations
SMH 7.07	Elevations
SMH 7.06	Elevations
SMH 1.17	Elevations
HEADWALL	Elevations
SMH 4.00	Elevations
SMH 5.01	Elevations
SMH 5.00	Elevations
SMH 7.05	Elevations
SMH 7.04	Elevations
SMH 7.03	Elevations
SMH 7.02	Elevations
SMH 7.01	Elevations
SMH 7.00	Elevations
SMH 6.02	Elevations
SMH 6.00	Elevations
SMH 1.04	Elevations
SMH 1.06	Elevations
SMH 1.07	Elevations
SMH 1.08	Elevations
SMH 1.10	Elevations
SMH 1.16	Elevations
SMH 8.00	Elevations
SMH 1.13	Elevations
SMH 1.14	Elevations
SMH 1.15	Elevations
SMH 2.02	Elevations
SMH 2.01	Elevations
SMH 8.02	Elevations
SMH 8.03	Elevations
SMH 1.18	Elevations
SMH 1.20	Elevations
SMH 1.21	Elevations
SMH 2.00	Elevations
SMH 1.02	Elevations
SMH 1.03	Elevations
SMH 1.05	Elevations
SMH 1.09	Elevations
SMH 2.03	Elevations
SMH 6.01	Elevations
SMH 1.24	Elevations
SMH 10.00	Elevations
SMH 9.02	Elevations
SMH 9.01	Elevations
SMH 9.00	Elevations
SMH 1.19	Elevations
SMH 3.00	Elevations
SMH 5.03	Elevations
SMH 8.01	Elevations

INLET & HYDROBRAKE DETAILS

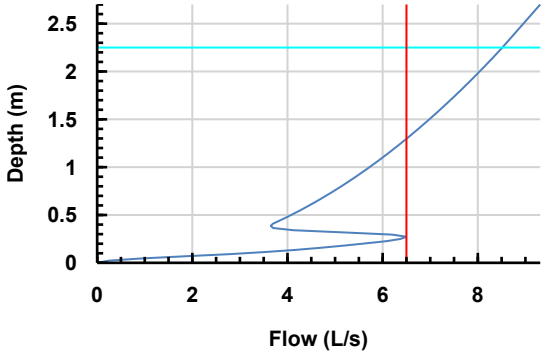
DOBA 2334: Residential Zone lands at Ratoath Surface Water Calculations	Date: 06/06/2024			
	Designed by: EC	Checked by: AL	Approved By: AL	
Report Details: Type: Junctions Storm Phase: Surface Network 1	Company Address:			

SMH 1.22	Elevations
SMH 1.23	Elevations
SMH 11.00	Elevations
SMH 12.01	None
SMH 12.00	None
SMH 13.00	None

Outlets

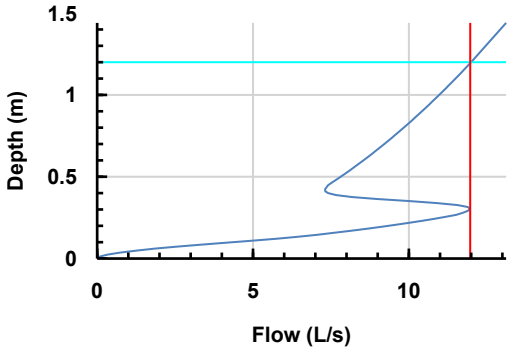
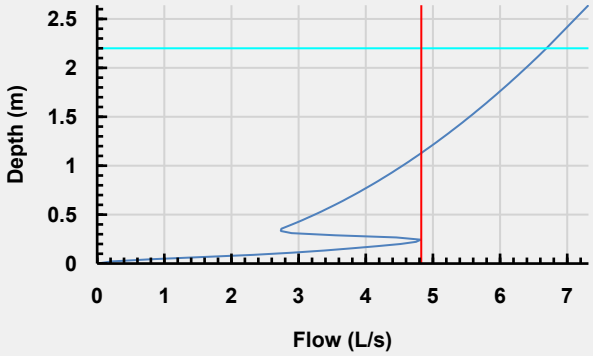
Junction	Outlet Name	Outgoing Connection	Outlet Type
SMH 1.00	Outlet	S1-S2	Free Discharge
SMH 1.01	Outlet	S2-S3	Free Discharge
SMH 2.04	Outlet	Pipe (23)	Free Discharge
SMH 5.02	Outlet	S7-S8	Free Discharge
SMH 5.04	Outlet	S8-S9	Free Discharge
SMH 1.11	Outlet	Pipe (40)	Hydro-Brake®

Invert Elevation (m)	77.144
Design Depth (m)	2.250
Design Flow (L/s)	8.5
Objective	Minimize Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☐
Unit Reference	CHE-0109-8500-2250-8500



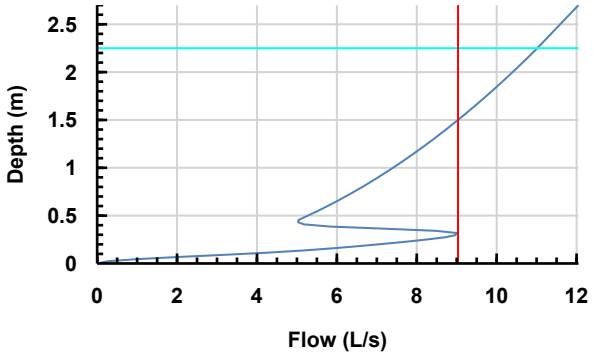
SMH 1.12	Outlet	S10-S11	Free Discharge
SMH 7.07	Outlet (1)	Pipe (20)	Free Discharge
SMH 7.06	Outlet	Pipe (22)	Free Discharge
SMH 1.17	Outlet	S15-S16	Free Discharge
SMH 4.00	Outlet	Pipe (25)	Free Discharge
SMH 5.01	Outlet	S21-S7	Free Discharge
SMH 5.00	Outlet	Pipe (32)	Free Discharge
SMH 7.05	Outlet	Pipe (7)	Free Discharge
SMH 7.04	Outlet	S25-S24	Free Discharge
SMH 7.03	Outlet	S26-S25	Free Discharge
SMH 7.02	Outlet	S27-S26	Free Discharge
SMH 7.01	Outlet	S28-S27	Free Discharge
SMH 7.00	Outlet	Pipe (5)	Free Discharge
	Outlet	Pipe (4)	Hydro-Brake®

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Junctions Storm Phase: Surface Network 1	Company Address:		

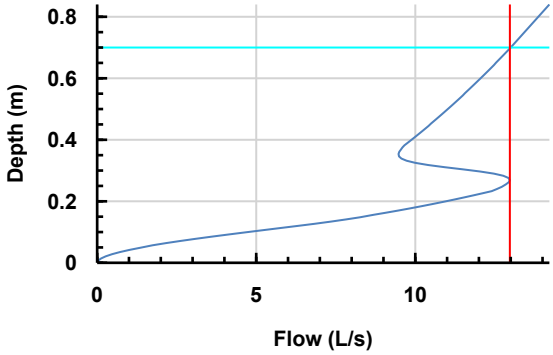
Junction	Outlet Name	Outgoing Connection	Outlet Type
SMH 6.02	Invert Elevation (m)	77.251	
	Design Depth (m)	1.200	
	Design Flow (L/s)	12.0	
	Objective	Minimize Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0147-1200-1200-1200	
			
SMH 6.00	Outlet	Pipe (18)	Free Discharge
SMH 1.04	Outlet	S33-S3	Free Discharge
SMH 1.06	Outlet	S34-S35	Free Discharge
SMH 1.07	Outlet	S35-S36	Free Discharge
SMH 1.08	Outlet	S36-S37	Free Discharge
SMH 1.10	Outlet	S37-S9	Free Discharge
SMH 1.16	Outlet	Pipe (21)	Hydro-Brake®
	Invert Elevation (m)	76.656	
	Design Depth (m)	2.200	
	Design Flow (L/s)	6.69	
	Objective	Minimize Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0097-6690-2200-6690	
			
SMH 8.00	Outlet	Pipe (11)	Free Discharge
SMH 1.13	Outlet	Pipe (8)	Free Discharge
SMH 1.14	Outlet	Pipe (9)	Free Discharge
SMH 1.15	Outlet	Pipe (10)	Free Discharge
SMH 2.02	Outlet	Pipe (3)	Free Discharge
SMH 2.01	Outlet	Pipe (24)	Free Discharge
SMH 8.02	Outlet	Pipe (12)	Free Discharge
SMH 8.03	Outlet	Pipe (13)	Free Discharge
SMH 1.18	Outlet	Pipe (14)	Free Discharge
SMH 1.20	Outlet	Pipe (15)	Free Discharge

DOBA 2334: Residential Zone lands at Ratoath Surface Water Calculations	Date: 06/06/2024		
	Designed by: EC	Checked by: AL	Approved By: AL
Report Details: Type: Junctions Storm Phase: Surface Network 1	Company Address:		

Junction	Outlet Name	Outgoing Connection	Outlet Type
SMH 1.21	Outlet	Pipe (17)	Free Discharge
SMH 2.00	Outlet	Pipe (19)	Free Discharge
SMH 1.02	Outlet	S2-S3 (1)	Free Discharge
SMH 1.03	Outlet	Pipe (26)	Free Discharge
SMH 1.05	Outlet	Pipe (2)	Hydro-Brake®
	Invert Elevation (m)	77.617	
	Design Depth (m)	2.250	
	Design Flow (L/s)	11.0	
	Objective	Minimize Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0125-1100-2250-1100	

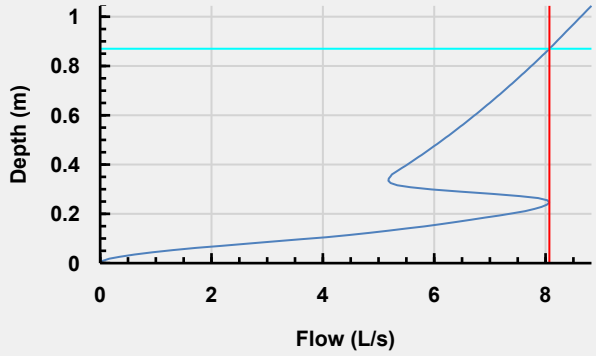
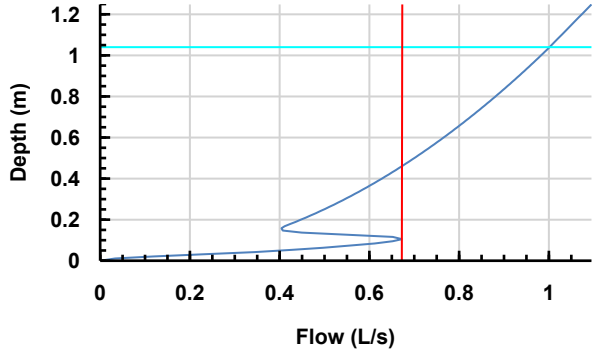


SMH 1.09	Outlet	Pipe (1) (1)	Free Discharge
SMH 2.03	Outlet	Pipe (37)	Hydro-Brake®
	Invert Elevation (m)	79.720	
	Design Depth (m)	0.700	
	Design Flow (L/s)	13.0	
	Objective	Minimize Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0161-1300-0700-1300	



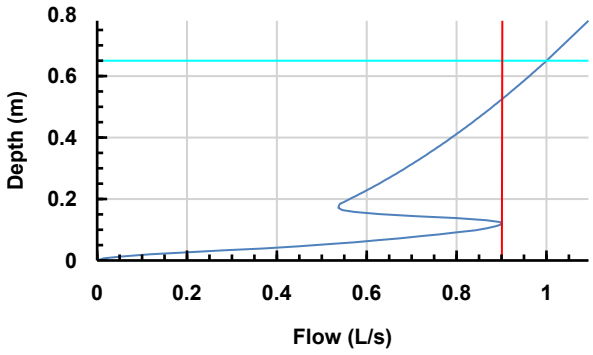
SMH 6.01	Outlet	Pipe (18) (1)	Free Discharge
SMH 1.24	Outlet	S18-S19 (1)	Free Discharge
SMH 10.00	Outlet	Pipe (36)	Free Discharge
SMH 9.02	Outlet	Pipe (35)	Free Discharge
SMH 9.01	Outlet	Pipe (34)	Free Discharge
SMH 9.00	Outlet	Pipe (33)	Free Discharge
SMH 1.19	Outlet	Pipe (14) (1)	Free Discharge
SMH 3.00	Outlet	Pipe (39)	Free Discharge
SMH 5.03	Outlet	S7-S8 (1)	Free Discharge
SMH 8.01	Outlet	Pipe (11) (1)	Free Discharge

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Junctions Storm Phase: Surface Network 1	Company Address:		

Junction	Outlet Name	Outgoing Connection	Outlet Type
SMH 1.22	Outlet	Pipe (16) (1)	Hydro-Brake®
	Invert Elevation (m)	76.398	
	Design Depth (m)	0.870	
	Design Flow (L/s)	8.07	
	Objective	Minimize Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0128-8070-0870-8070	
			
SMH 1.23	Outlet	Pipe (16) (1) (1)	Free Discharge
SMH 11.00	Outlet	Pipe (38)	Free Discharge
SMH 12.01	Outlet	Overflow	Hydro-Brake®
	Invert Elevation (m)	76.752	
	Design Depth (m)	1.040	
	Design Flow (L/s)	1.0	
	Objective	Minimize Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0045-1000-1040-1000	
			
SMH 12.00	Outlet	Pipe (42)	Free Discharge
	Outlet	Pipe (45)	Hydro-Brake®

DOBA 2334: Residential Zone lands at Ratoath Surface Water Calculations	Date: 06/06/2024		
	Designed by: EC	Checked by: AL	Approved By: AL
Report Details: Type: Junctions Storm Phase: Surface Network 1	Company Address:		

Junction	Outlet Name	Outgoing Connection	Outlet Type
SMH 13.00	Invert Elevation (m)	76.950	
	Design Depth (m)	0.650	
	Design Flow (L/s)	1.0	
	Objective	Minimize Upstream Storage Requirements	
	Application	Surface Water Only	
	Sump Available	☐	
	Unit Reference	CHE-0050-1000-0650-1000	



STORMWATER CONTROLS - RAINGARDENS

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 17

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.100
Depth (m)	0.050
Base Elevation (m)	81.050
Top Area (m²)	22.76
Side Slope (1:x)	2.00
Base Area (m²)	16.37
Freeboard (mm)	0
Porosity (%)	100
Length (m)	31.953
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	3.125

Filter Area

Base Elevation (m)	80.750

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	64.931
Top Perimeter (m)	65.331

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 18

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.000
Depth (m)	0.050
Base Elevation (m)	80.950
Top Area (m²)	22.76
Side Slope (1:x)	2.00
Base Area (m²)	16.37
Freeboard (mm)	0
Porosity (%)	100
Length (m)	31.953
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	3.125

Filter Area

Base Elevation (m)	80.650

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	64.931
Top Perimeter (m)	65.331

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 20

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	80.500
Depth (m)	0.050
Base Elevation (m)	80.450
Top Area (m²)	22.76
Side Slope (1:x)	2.00
Base Area (m²)	16.37
Freeboard (mm)	0
Porosity (%)	100
Length (m)	31.953
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	3.125

Filter Area

Base Elevation (m)	80.150

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	64.931
Top Perimeter (m)	65.331

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 19

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	80.200
Depth (m)	0.050
Base Elevation (m)	80.150
Top Area (m²)	22.76
Side Slope (1:x)	2.00
Base Area (m²)	16.37
Freeboard (mm)	0
Porosity (%)	100
Length (m)	31.953
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	3.125

Filter Area

Base Elevation (m)	79.850

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	64.931
Top Perimeter (m)	65.331

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 1

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.600
Depth (m)	0.050
Base Elevation (m)	81.550
Top Area (m²)	21.05
Side Slope (1:x)	2.00
Base Area (m²)	15.15
Freeboard (mm)	0
Porosity (%)	100
Length (m)	29.522
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.891

Filter Area

Base Elevation (m)	81.250

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	60.070
Top Perimeter (m)	60.470

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 2

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.400
Depth (m)	0.050
Base Elevation (m)	81.350
Top Area (m²)	19.94
Side Slope (1:x)	2.00
Base Area (m²)	14.62
Freeboard (mm)	0
Porosity (%)	100
Length (m)	26.591
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.770

Filter Area

Base Elevation (m)	81.050

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	54.282
Top Perimeter (m)	54.682

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 3

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.400
Depth (m)	0.050
Base Elevation (m)	81.350
Top Area (m²)	19.94
Side Slope (1:x)	2.00
Base Area (m²)	14.62
Freeboard (mm)	0
Porosity (%)	100
Length (m)	26.591
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.770

Filter Area

Base Elevation (m)	81.050

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	54.282
Top Perimeter (m)	54.682

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 4

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.400
Depth (m)	0.050
Base Elevation (m)	81.350
Top Area (m²)	19.94
Side Slope (1:x)	2.00
Base Area (m²)	14.62
Freeboard (mm)	0
Porosity (%)	100
Length (m)	26.591
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.770

Filter Area

Base Elevation (m)	81.050

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	54.282
Top Perimeter (m)	54.682

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 5

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.700
Depth (m)	0.050
Base Elevation (m)	81.650
Top Area (m²)	19.94
Side Slope (1:x)	2.00
Base Area (m²)	14.62
Freeboard (mm)	0
Porosity (%)	100
Length (m)	26.591
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.770

Filter Area

Base Elevation (m)	81.350

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	54.282
Top Perimeter (m)	54.682

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 10

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.500
Depth (m)	0.050
Base Elevation (m)	81.450
Top Area (m²)	19.94
Side Slope (1:x)	2.00
Base Area (m²)	14.62
Freeboard (mm)	0
Porosity (%)	100
Length (m)	26.591
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.770

Filter Area

Base Elevation (m)	81.150

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	54.282
Top Perimeter (m)	54.682

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 6

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.600
Depth (m)	0.050
Base Elevation (m)	81.550
Top Area (m²)	19.94
Side Slope (1:x)	2.00
Base Area (m²)	14.62
Freeboard (mm)	0
Porosity (%)	100
Length (m)	26.591
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.770

Filter Area

Base Elevation (m)	81.250

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	54.282
Top Perimeter (m)	54.682

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 7

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.250
Depth (m)	0.050
Base Elevation (m)	81.200
Top Area (m²)	11.26
Side Slope (1:x)	2.00
Base Area (m²)	8.23
Freeboard (mm)	0
Porosity (%)	100
Length (m)	15.182
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	1.561

Filter Area

Base Elevation (m)	80.900

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	31.448
Top Perimeter (m)	31.848

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 12

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.500
Depth (m)	0.050
Base Elevation (m)	81.450
Top Area (m²)	25.35
Side Slope (1:x)	2.00
Base Area (m²)	18.70
Freeboard (mm)	0
Porosity (%)	100
Length (m)	33.266
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	3.535

Filter Area

Base Elevation (m)	81.150

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	67.657
Top Perimeter (m)	68.057

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 14

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.600
Depth (m)	0.050
Base Elevation (m)	81.550
Top Area (m²)	12.10
Side Slope (1:x)	2.00
Base Area (m²)	8.88
Freeboard (mm)	0
Porosity (%)	100
Length (m)	16.125
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	1.682

Filter Area

Base Elevation (m)	81.250

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	33.350
Top Perimeter (m)	33.750

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 15

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	79.800
Depth (m)	0.050
Base Elevation (m)	79.750
Top Area (m²)	12.10
Side Slope (1:x)	2.00
Base Area (m²)	8.87
Freeboard (mm)	0
Porosity (%)	100
Length (m)	16.134
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	1.681

Filter Area

Base Elevation (m)	79.450

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	33.368
Top Perimeter (m)	33.768

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
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Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 11

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	79.500
Depth (m)	0.050
Base Elevation (m)	79.450
Top Area (m²)	19.94
Side Slope (1:x)	2.00
Base Area (m²)	14.62
Freeboard (mm)	0
Porosity (%)	100
Length (m)	26.591
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.770

Filter Area

Base Elevation (m)	79.150

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	54.282
Top Perimeter (m)	54.682

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 8

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	81.400
Depth (m)	0.050
Base Elevation (m)	81.350
Top Area (m²)	16.29
Side Slope (1:x)	2.00
Base Area (m²)	11.68
Freeboard (mm)	0
Porosity (%)	100
Length (m)	23.027
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.232

Filter Area

Base Elevation (m)	81.050

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	47.069
Top Perimeter (m)	47.469

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 9

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	80.400
Depth (m)	0.050
Base Elevation (m)	80.350
Top Area (m²)	16.29
Side Slope (1:x)	2.00
Base Area (m²)	11.68
Freeboard (mm)	0
Porosity (%)	100
Length (m)	23.027
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.232

Filter Area

Base Elevation (m)	80.050

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	47.069
Top Perimeter (m)	47.469

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 13

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	79.500
Depth (m)	0.050
Base Elevation (m)	79.450
Top Area (m²)	25.35
Side Slope (1:x)	2.00
Base Area (m²)	18.70
Freeboard (mm)	0
Porosity (%)	100
Length (m)	33.266
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	3.535

Filter Area

Base Elevation (m)	79.150

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	67.657
Top Perimeter (m)	68.057

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 16

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	79.300
Depth (m)	0.050
Base Elevation (m)	79.250
Top Area (m²)	32.95
Side Slope (1:x)	2.00
Base Area (m²)	24.47
Freeboard (mm)	0
Porosity (%)	100
Length (m)	42.434
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	4.613

Filter Area

Base Elevation (m)	78.950

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	86.022
Top Perimeter (m)	86.422

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
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Raingarden 21

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	80.200
Depth (m)	0.050
Base Elevation (m)	80.150
Top Area (m²)	17.53
Side Slope (1:x)	2.00
Base Area (m²)	12.66
Freeboard (mm)	0
Porosity (%)	100
Length (m)	24.382
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.413

Filter Area

Base Elevation (m)	79.850

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	49.803
Top Perimeter (m)	50.203

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 22

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	80.400
Depth (m)	0.050
Base Elevation (m)	80.350
Top Area (m²)	14.35
Side Slope (1:x)	2.00
Base Area (m²)	10.38
Freeboard (mm)	0
Porosity (%)	100
Length (m)	19.834
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	1.977

Filter Area

Base Elevation (m)	80.050

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	40.714
Top Perimeter (m)	41.114

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
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	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 25

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	80.200
Depth (m)	0.050
Base Elevation (m)	80.150
Top Area (m²)	18.42
Side Slope (1:x)	2.00
Base Area (m²)	13.25
Freeboard (mm)	0
Porosity (%)	100
Length (m)	25.831
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	2.529

Filter Area

Base Elevation (m)	79.850

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	52.688
Top Perimeter (m)	53.088

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
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Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 24

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	80.300
Depth (m)	0.050
Base Elevation (m)	80.250
Top Area (m²)	22.92
Side Slope (1:x)	2.00
Base Area (m²)	16.60
Freeboard (mm)	0
Porosity (%)	100
Length (m)	31.592
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	3.160

Filter Area

Base Elevation (m)	79.950

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	64.235
Top Perimeter (m)	64.635

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Raingarden 23

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	80.200
Depth (m)	0.050
Base Elevation (m)	80.150
Top Area (m²)	30.63
Side Slope (1:x)	2.00
Base Area (m²)	22.20
Freeboard (mm)	0
Porosity (%)	100
Length (m)	42.178
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	4.225

Filter Area

Base Elevation (m)	79.850

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	300	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	85.409
Top Perimeter (m)	85.809

DOBA 2334:	Date:		
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Raingarden 26

Type : Bioretention

Ponding Area

Exceedance Elevation (m)	77.900
Depth (m)	0.100
Base Elevation (m)	77.800
Top Area (m²)	15.50
Side Slope (1:x)	2.00
Base Area (m²)	9.78
Freeboard (mm)	0
Porosity (%)	100
Length (m)	14.282
Long. Slope (1:x)	0.00
Filtration Rate (m/hr)	5.0
Friction Scheme	Manning's n
n	0.015
Total Volume (m³)	4.868

Filter Area

Base Elevation (m)	76.900

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Friction Scheme	Manning's n
n	0.015
Release Height (m)	0.000

Filtration Layers

Use	Name	Filtration Layer Depth (mm)	Porosity (%)	Conductivity (m/hr)	Soil Type
☐	Soil	0	0	0.0	Soil Type
	Storage	900	40	500.0	

Advanced

Ponding Area

Base Perimeter (m)	29.934
Top Perimeter (m)	30.734

STORMWATER CONTROLS - UNDERGROUND TANKS

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tank 4

Type : Tank

Dimensions

Exceedance Elevation (m)	78.900
Depth (m)	2.200
Base Elevation (m)	76.700
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	67
Average Slope (1:x)	-8.808
Total Volume (m³)	489.494

Depth (m)	Area (m²)	Volume (m³)
0.000	506.800	0.000
1.439	506.800	488.621
1.440	0.001	488.734

Advanced

Perimeter	Circular
Length (m)	29.967

Tank 2

Type : Tank

Dimensions

Exceedance Elevation (m)	79.380
Depth (m)	1.960
Base Elevation (m)	77.420
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	67
Average Slope (1:x)	-6.579
Total Volume (m³)	273.432

Depth (m)	Area (m²)	Volume (m³)
0.000	283.000	0.000
1.439	283.000	272.849
1.440	0.001	272.912

Advanced

Perimeter	Circular
Length (m)	29.467

Tank 1

Type : Tank

Dimensions

Exceedance Elevation (m)	79.850
Depth (m)	2.200
Base Elevation (m)	77.650
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	67
Average Slope (1:x)	-5.043
Total Volume (m³)	161.325

Depth (m)	Area (m²)	Volume (m³)
0.000	166.500	0.000
1.439	166.500	160.528
1.440	0.001	160.565

Advanced

Perimeter	Circular
Length (m)	18.776

Tank 5

Type : Tank

Dimensions

Exceedance Elevation (m)	77.980
Depth (m)	1.561
Base Elevation (m)	76.419
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	67
Average Slope (1:x)	-3.426
Total Volume (m³)	74.376

Depth (m)	Area (m²)	Volume (m³)
0.000	77.000	0.000
1.439	77.000	74.238
1.440	0.001	74.255

Advanced

Perimeter	Circular
Length (m)	9.689

Tank 3

Type : Tank

Dimensions

Exceedance Elevation (m)	78.951
Depth (m)	1.700
Base Elevation (m)	77.251
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	67
Average Slope (1:x)	-4.826
Total Volume (m³)	59.408

Depth (m)	Area (m²)	Volume (m³)
0.000	82.800	0.000
1.059	82.800	58.749
1.060	0.001	58.768

Advanced

Perimeter	Circular
Length (m)	10.376

STORMWATER CONTROLS - DETENTION BASINS

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Detention Basin 2

Type : Pond

Dimensions

Exceedance Elevation (m)	79.380
Depth (m)	0.200
Base Elevation (m)	79.180
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:x)	9.023
Total Volume (m³)	46.159

Depth (m)	Area (m²)	Volume (m³)
0.000	184.00	0.000
0.200	281.00	46.159

Advanced

Perimeter	Circular
Length (m)	22.237
Friction Scheme	Manning's n
n	0.015

Detention Basin 4

Type : Pond

Dimensions

Exceedance Elevation (m)	78.900
Depth (m)	0.300
Base Elevation (m)	78.600
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:x)	4.358
Total Volume (m³)	89.395

Depth (m)	Area (m²)	Volume (m³)
0.000	260.00	0.000
0.250	326.00	73.095

Advanced

Perimeter	Circular
Length (m)	33.679
Friction Scheme	Manning's n
n	0.015

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
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Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Detention Basin 3

Type : Pond

Dimensions

Exceedance Elevation (m)	78.900
Depth (m)	0.250
Base Elevation (m)	78.650
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:x)	4.044
Total Volume (m³)	10.221

Depth (m)	Area (m²)	Volume (m³)
0.000	30.00	0.000
0.250	52.84	10.221

Advanced

Perimeter	Circular
Length (m)	10.259
Friction Scheme	Manning's n
n	0.015

Detention Basin 1

Type : Pond

Dimensions

Exceedance Elevation (m)	79.850
Depth (m)	0.300
Base Elevation (m)	79.550
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:x)	4.099
Total Volume (m³)	29.312

Depth (m)	Area (m²)	Volume (m³)
0.000	77.00	0.000
0.300	120.00	29.312

Advanced

Perimeter	Circular
Length (m)	19.429
Friction Scheme	Manning's n
n	0.015

STORMWATER CONTROLS - POROUS PAVING

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Porous Paving 1

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 2

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.500
Depth (m)	0.560
Base Elevation (m)	80.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	10.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	9.057

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 3

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.500
Depth (m)	0.560
Base Elevation (m)	80.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 4

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 5

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 6

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 7

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 8

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 9

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.800
Depth (m)	0.560
Base Elevation (m)	81.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 10

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 11

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 12

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.800
Depth (m)	0.560
Base Elevation (m)	81.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 13

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.900
Depth (m)	0.560
Base Elevation (m)	81.340
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 14

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.900
Depth (m)	0.560
Base Elevation (m)	81.340
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 15

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	82.000
Depth (m)	0.560
Base Elevation (m)	81.440
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 16

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.800
Depth (m)	0.560
Base Elevation (m)	79.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	10.000
Total Volume (m³)	9.029

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 17

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.700
Depth (m)	0.560
Base Elevation (m)	81.140
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 18

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 19

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 20

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.800
Depth (m)	0.560
Base Elevation (m)	79.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 21

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.800
Depth (m)	0.560
Base Elevation (m)	79.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 24

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.000
Depth (m)	0.560
Base Elevation (m)	80.440
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 25

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.000
Depth (m)	0.560
Base Elevation (m)	80.440
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 26

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.500
Depth (m)	0.560
Base Elevation (m)	80.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 27

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.500
Depth (m)	0.560
Base Elevation (m)	80.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 28

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.500
Depth (m)	0.560
Base Elevation (m)	79.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 29

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.500
Depth (m)	0.560
Base Elevation (m)	79.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 30

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.450
Depth (m)	0.560
Base Elevation (m)	80.890
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 33

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.500
Depth (m)	0.560
Base Elevation (m)	79.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	2.500
Long. Slope (1:x)	200.00
Width (m)	45.000
Total Volume (m³)	20.264

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 34

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.900
Depth (m)	0.560
Base Elevation (m)	80.340
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	35.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	15.950

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 35

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.850
Depth (m)	0.560
Base Elevation (m)	80.290
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	30.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	13.671

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 36

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	2.500
Long. Slope (1:x)	200.00
Width (m)	40.000
Total Volume (m³)	18.014

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 37

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.400
Depth (m)	0.560
Base Elevation (m)	80.840
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 38

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.700
Depth (m)	0.560
Base Elevation (m)	80.140
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 39

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.400
Depth (m)	0.560
Base Elevation (m)	80.840
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 40

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 41

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 42

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.700
Depth (m)	0.560
Base Elevation (m)	80.140
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 43

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.400
Depth (m)	0.560
Base Elevation (m)	80.840
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 44

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.200
Depth (m)	0.560
Base Elevation (m)	79.640
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 45

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.200
Depth (m)	0.560
Base Elevation (m)	79.640
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 46

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.800
Depth (m)	0.560
Base Elevation (m)	80.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 47

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.800
Depth (m)	0.560
Base Elevation (m)	80.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 48

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.700
Depth (m)	0.560
Base Elevation (m)	79.140
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	12.500
Total Volume (m³)	11.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 49

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.200
Depth (m)	0.560
Base Elevation (m)	79.640
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 50

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.100
Depth (m)	0.560
Base Elevation (m)	79.540
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 51

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.300
Depth (m)	0.560
Base Elevation (m)	79.740
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 52

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.400
Depth (m)	0.560
Base Elevation (m)	79.840
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 53

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.100
Depth (m)	0.560
Base Elevation (m)	79.540
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 54

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.100
Depth (m)	0.560
Base Elevation (m)	79.540
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 55

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.400
Depth (m)	0.560
Base Elevation (m)	79.840
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 56

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.200
Depth (m)	0.560
Base Elevation (m)	79.640
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 57

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.500
Depth (m)	0.560
Base Elevation (m)	79.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 58

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.300
Depth (m)	0.560
Base Elevation (m)	79.740
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 59

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.300
Depth (m)	0.560
Base Elevation (m)	79.740
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 60

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.100
Depth (m)	0.560
Base Elevation (m)	79.540
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 62

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.400
Depth (m)	0.560
Base Elevation (m)	79.840
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	20.000
Total Volume (m³)	18.029

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 63

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.600
Depth (m)	0.560
Base Elevation (m)	79.040
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	4.800
Total Volume (m³)	4.349

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 64

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	4.800
Total Volume (m³)	4.349

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 65

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.400
Depth (m)	0.560
Base Elevation (m)	78.840
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	4.800
Total Volume (m³)	4.349

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 66

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.400
Depth (m)	0.560
Base Elevation (m)	78.840
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	4.800
Total Volume (m³)	4.349

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 67

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.050
Depth (m)	0.560
Base Elevation (m)	78.490
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	4.800
Total Volume (m³)	4.349

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 69

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.300
Depth (m)	0.560
Base Elevation (m)	78.740
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	4.800
Total Volume (m³)	4.349

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 130

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.400
Depth (m)	0.560
Base Elevation (m)	80.840
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 129

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.150
Depth (m)	0.560
Base Elevation (m)	80.590
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 125

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.200
Depth (m)	0.560
Base Elevation (m)	79.640
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 61

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.200
Depth (m)	0.560
Base Elevation (m)	79.640
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 80

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.300
Depth (m)	0.560
Base Elevation (m)	79.740
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 31

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.000
Depth (m)	0.560
Base Elevation (m)	80.440
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 134

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.350
Depth (m)	0.560
Base Elevation (m)	79.790
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 32

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.200
Depth (m)	0.560
Base Elevation (m)	80.640
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 123

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 122

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 120

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 118

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 117

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 115

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 113

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 133

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.000
Depth (m)	0.560
Base Elevation (m)	79.440
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 132

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.800
Depth (m)	0.560
Base Elevation (m)	79.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 128

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.560
Depth (m)	0.560
Base Elevation (m)	80.000
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 126

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.300
Depth (m)	0.560
Base Elevation (m)	79.740
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 68

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.200
Depth (m)	0.560
Base Elevation (m)	79.640
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 107

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.800
Depth (m)	0.560
Base Elevation (m)	81.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 106

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.800
Depth (m)	0.560
Base Elevation (m)	81.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 104

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.900
Depth (m)	0.560
Base Elevation (m)	81.340
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 124

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.900
Depth (m)	0.560
Base Elevation (m)	81.340
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 84

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.200
Depth (m)	0.560
Base Elevation (m)	79.640
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 82

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.100
Depth (m)	0.560
Base Elevation (m)	79.540
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 103

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.900
Depth (m)	0.560
Base Elevation (m)	81.340
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 105

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.800
Depth (m)	0.560
Base Elevation (m)	81.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 23

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.500
Depth (m)	0.560
Base Elevation (m)	80.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 22

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.000
Depth (m)	0.560
Base Elevation (m)	80.440
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 86

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.500
Depth (m)	0.560
Base Elevation (m)	80.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 78

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 77

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 95

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.500
Depth (m)	0.560
Base Elevation (m)	80.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 108

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.500
Depth (m)	0.560
Base Elevation (m)	80.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 93

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.500
Depth (m)	0.560
Base Elevation (m)	80.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 76

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 70

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 97

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 90

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 91

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 89

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 88

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.800
Depth (m)	0.560
Base Elevation (m)	81.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 87

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.800
Depth (m)	0.560
Base Elevation (m)	81.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 96

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.000
Depth (m)	0.560
Base Elevation (m)	80.440
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 127

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.560
Depth (m)	0.560
Base Elevation (m)	80.000
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 131

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.650
Depth (m)	0.560
Base Elevation (m)	80.090
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 109

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.800
Depth (m)	0.560
Base Elevation (m)	79.240
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 119

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 110

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 116

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 112

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 121

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 114

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	0.560
Base Elevation (m)	78.940
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 111

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.600
Depth (m)	0.560
Base Elevation (m)	79.040
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 85

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	79.600
Depth (m)	0.560
Base Elevation (m)	79.040
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 94

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.900
Depth (m)	0.560
Base Elevation (m)	81.340
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 92

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.900
Depth (m)	0.560
Base Elevation (m)	81.340
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 75

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.900
Depth (m)	0.560
Base Elevation (m)	81.340
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 79

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.900
Depth (m)	0.560
Base Elevation (m)	81.340
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 74

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.900
Depth (m)	0.560
Base Elevation (m)	81.340
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 73

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.850
Depth (m)	0.560
Base Elevation (m)	81.290
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 72

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 71

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.780
Depth (m)	0.560
Base Elevation (m)	81.220
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 102

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.700
Depth (m)	0.560
Base Elevation (m)	81.140
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 101

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.750
Depth (m)	0.560
Base Elevation (m)	81.190
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 98

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.700
Depth (m)	0.560
Base Elevation (m)	81.140
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 100

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.750
Depth (m)	0.560
Base Elevation (m)	81.190
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 99

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	81.750
Depth (m)	0.560
Base Elevation (m)	81.190
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 81

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.300
Depth (m)	0.560
Base Elevation (m)	79.740
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	2.500
Total Volume (m³)	2.279

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 83

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	80.200
Depth (m)	0.560
Base Elevation (m)	79.640
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	5.000
Total Volume (m³)	4.529

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 135

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	77.950
Depth (m)	0.560
Base Elevation (m)	77.390
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	19.978
Total Volume (m³)	18.009

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

Porous Paving 136

Type : Porous Paving

Dimensions

Exceedance Elevation (m)	78.200
Depth (m)	0.560
Base Elevation (m)	77.640
Paving Layer Depth (mm)	110
Membrane Percolation (m/hr)	1000.0
Porosity (%)	40
Length (m)	5.000
Long. Slope (1:x)	200.00
Width (m)	18.751
Total Volume (m³)	16.905

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	110
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

STORMWATER CONTROLS - TREE PITS

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 2

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.300
Depth (m)	1.500
Base Elevation (m)	79.800
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 3

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.600
Depth (m)	1.500
Base Elevation (m)	80.100
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 8

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.600
Depth (m)	1.500
Base Elevation (m)	80.100
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 9

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.600
Depth (m)	1.500
Base Elevation (m)	80.100
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 19

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.600
Depth (m)	1.500
Base Elevation (m)	80.100
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 20

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.300
Depth (m)	1.500
Base Elevation (m)	79.800
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 21

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.300
Depth (m)	1.500
Base Elevation (m)	79.800
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 22

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	80.400
Depth (m)	1.500
Base Elevation (m)	78.900
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 25

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.800
Depth (m)	1.500
Base Elevation (m)	80.300
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 26

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.800
Depth (m)	1.500
Base Elevation (m)	80.300
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 27

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.800
Depth (m)	1.500
Base Elevation (m)	80.300
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 28

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.700
Depth (m)	1.500
Base Elevation (m)	80.200
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 10

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.600
Depth (m)	1.500
Base Elevation (m)	80.100
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 12

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.600
Depth (m)	1.500
Base Elevation (m)	80.100
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 13

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.400
Depth (m)	1.500
Base Elevation (m)	79.900
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 14

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.800
Depth (m)	1.500
Base Elevation (m)	80.300
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 16

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.400
Depth (m)	1.500
Base Elevation (m)	79.900
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 4

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.400
Depth (m)	1.500
Base Elevation (m)	79.900
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 5

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	80.100
Depth (m)	1.500
Base Elevation (m)	78.600
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 6

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	80.000
Depth (m)	1.500
Base Elevation (m)	78.500
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 7

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	80.000
Depth (m)	1.500
Base Elevation (m)	78.500
Freeboard (mm)	200
Porosity (%)	40
Length (m)	1.800
Long. Slope (1:x)	200.00
Width (m)	1.800
Total Volume (m³)	1.728

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 11

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	1.500
Base Elevation (m)	78.000
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 17

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	79.750
Depth (m)	1.500
Base Elevation (m)	78.250
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 18

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	79.400
Depth (m)	1.500
Base Elevation (m)	77.900
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 1

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	80.400
Depth (m)	1.500
Base Elevation (m)	78.900
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 29

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	80.400
Depth (m)	1.500
Base Elevation (m)	78.900
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 23

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	80.400
Depth (m)	1.500
Base Elevation (m)	78.900
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 31

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	1.500
Base Elevation (m)	78.000
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 24

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	80.200
Depth (m)	1.500
Base Elevation (m)	78.700
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 32

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	79.400
Depth (m)	1.500
Base Elevation (m)	77.900
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 30

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	79.300
Depth (m)	1.500
Base Elevation (m)	77.800
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 33

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	79.500
Depth (m)	2.000
Base Elevation (m)	77.500
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.928

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 34

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	79.600
Depth (m)	2.000
Base Elevation (m)	77.600
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.928

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Tree Pit 15

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	81.900
Depth (m)	1.500
Base Elevation (m)	80.400
Freeboard (mm)	200
Porosity (%)	40
Length (m)	2.000
Long. Slope (1:x)	200.00
Width (m)	2.000
Total Volume (m³)	2.128

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

STORMWATER CONTROLS - FILTER DRAIN

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Filter Drain 1

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	80.950
Depth (m)	1.000
Base Elevation (m)	79.950
Freeboard (mm)	0
Porosity (%)	40
Length (m)	19.500
Long. Slope (1:x)	200.00
Width (m)	1.200
Total Volume (m³)	9.825

Under Drain

Height Above Base (m)	0.050
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Company Address:		

Filter Drain 2

Type : Infiltration Trench

Dimensions

Exceedance Elevation (m)	78.400
Depth (m)	1.800
Base Elevation (m)	76.600
Freeboard (mm)	400
Porosity (%)	40
Length (m)	10.000
Long. Slope (1:x)	200.00
Width (m)	1.000
Total Volume (m³)	5.839

Under Drain

Height Above Base (m)	0.150
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Advanced

Conductivity (m/hr)	500.0

INFLOWS SUMMARY

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Inflow Summary Storm Phase: Surface Network 1	Company Address:		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analyzed (ha)
1.000 - 80.65m	Raingarden 23		Time of Concentration	0.008	28.5	0	28.50	0.002
1.000 - 82.38m	Raingarden 23		Time of Concentration	0.008	28.5	0	28.50	0.002
1.000 - 84.62m	Porous Paving 62		Time of Concentration	0.008	28.5	0	28.50	0.002
1.000 - 101.49m	Raingarden 23		Time of Concentration	0.010	28.5	0	28.50	0.003
1.000 - 173.56m	Porous Paving 62		Time of Concentration	0.017	95.0	10	104.50	0.018
1.000 - 173.82m	Porous Paving 62		Time of Concentration	0.017	95.0	10	104.50	0.018
1.000 - 204.23m	Tree Pit 1		Time of Concentration	0.020	80.0	0	80.00	0.016
1.000 - 211.79m	Porous Paving 62		Time of Concentration	0.021	80.0	0	80.00	0.017
1.000 - 358.50m	Raingarden 23		Time of Concentration	0.036	28.5	0	28.50	0.010
1.001 - 11.48m	Porous Paving 55		Time of Concentration	0.001	80.0	0	80.00	0.001
1.001 - 11.51m	Porous Paving 60		Time of Concentration	0.002	80.0	0	80.00	0.002
1.001 - 11.53m	Porous Paving 52		Time of Concentration	0.003	80.0	0	80.00	0.002
1.001 - 11.57m	Porous Paving 83		Time of Concentration	0.004	80.0	0	80.00	0.003
1.001 - 11.59m	Porous Paving 60		Time of Concentration	0.002	80.0	0	80.00	0.001
1.001 - 11.63m	Porous Paving 59		Time of Concentration	0.002	80.0	0	80.00	0.002
1.001 - 11.64m	Porous Paving 51		Time of Concentration	0.001	80.0	0	80.00	0.001
1.001 - 11.68m	Tree Pit 6		Time of Concentration	0.001	80.0	0	80.00	0.001
1.001 - 14.06m	Porous Paving 50		Time of Concentration	0.004	80.0	0	80.00	0.003
1.001 - 19.68m	Porous Paving 58		Time of Concentration	0.003	80.0	0	80.00	0.002
1.001 - 22.04m	Porous Paving 81		Time of Concentration	0.003	80.0	0	80.00	0.002
1.001 - 23.03m	Porous Paving 56		Time of Concentration	0.002	80.0	0	80.00	0.002
1.001 - 23.06m	Porous Paving 49		Time of Concentration	0.002	80.0	0	80.00	0.002
1.001 - 23.16m	Porous Paving 50		Time of Concentration	0.001	80.0	0	80.00	0.001
1.001 - 23.35m	Porous Paving 57		Time of Concentration	0.002	80.0	0	80.00	0.002
1.001 - 25.20m	Porous Paving 56		Time of Concentration	0.003	80.0	0	80.00	0.002
1.001 - 29.46m	Porous Paving 56		Time of Concentration	0.003	80.0	0	80.00	0.002
1.001 - 30.35m	Porous Paving 51		Time of Concentration	0.003	28.5	0	28.50	0.001
1.001 - 32.76m	Raingarden 22		Time of Concentration	0.008	28.5	0	28.50	0.002
1.001 - 34.91m	Porous Paving 60		Time of Concentration	0.006	80.0	0	80.00	0.004
1.001 - 35.77m	Porous Paving 54		Time of Concentration	0.004	80.0	0	80.00	0.003
1.001 - 36.21m	Raingarden 25		Time of Concentration	0.004	28.5	0	28.50	0.001
1.001 - 37.50m	Porous Paving 62		Time of Concentration	0.004	80.0	0	80.00	0.003
1.001 - 37.75m	Porous Paving 59		Time of Concentration	0.004	80.0	0	80.00	0.003

1.001 - 37.78m	Porous Paving 51		Time of Concentration	0.004	80.0	0	80.00	0.003
1.001 - 37.93m	Porous Paving 84		Time of Concentration	0.004	80.0	0	80.00	0.003
1.001 - 40.42m	Porous Paving 50		Time of Concentration	0.003	28.5	0	28.50	0.001
1.001 - 42.98m	Porous Paving 57		Time of Concentration	0.005	95.0	10	104.50	0.005
1.001 - 43.55m	Porous Paving 80		Time of Concentration	0.004	95.0	10	104.50	0.005
1.001 - 43.80m	Porous Paving 51		Time of Concentration	0.004	95.0	10	104.50	0.005
1.001 - 44.00m	Porous Paving 55		Time of Concentration	0.004	95.0	10	104.50	0.005
1.001 - 44.11m	Porous Paving 60		Time of Concentration	0.006	95.0	10	104.50	0.006
1.001 - 44.24m	Porous Paving 83		Time of Concentration	0.006	95.0	10	104.50	0.006
1.001 - 44.28m	Porous Paving 61		Time of Concentration	0.004	95.0	10	104.50	0.005
1.001 - 44.59m	Porous Paving 82		Time of Concentration	0.004	95.0	10	104.50	0.005
1.001 - 44.82m	Porous Paving 125		Time of Concentration	0.004	95.0	10	104.50	0.005
1.001 - 44.84m	Porous Paving 54		Time of Concentration	0.004	95.0	10	104.50	0.005
1.001 - 45.37m	Porous Paving 59		Time of Concentration	0.006	95.0	10	104.50	0.007
1.001 - 49.97m	Porous Paving 62		Time of Concentration	0.005	80.0	0	80.00	0.004
1.001 - 50.09m	Porous Paving 125		Time of Concentration	0.005	80.0	0	80.00	0.004
1.001 - 53.02m	Raingarden 25		Time of Concentration	0.005	28.5	0	28.50	0.002
1.001 - 54.14m	Porous Paving 62		Time of Concentration	0.005	28.5	0	28.50	0.002
1.001 - 55.68m	Porous Paving 81		Time of Concentration	0.004	95.0	10	104.50	0.005
1.001 - 56.65m	Porous Paving 49		Time of Concentration	0.006	95.0	10	104.50	0.006
1.001 - 57.23m	Porous Paving 84		Time of Concentration	0.006	95.0	10	104.50	0.006
1.001 - 57.74m	Porous Paving 52		Time of Concentration	0.005	95.0	10	104.50	0.005
1.001 - 58.83m	Porous Paving 55		Time of Concentration	0.006	95.0	10	104.50	0.006
1.001 - 59.39m	Porous Paving 58		Time of Concentration	0.004	95.0	10	104.50	0.005
1.001 - 60.25m	Porous Paving 50		Time of Concentration	0.006	95.0	10	104.50	0.007
1.001 - 60.25m (1)	Detention Basin 1		Time of Concentration	0.007	28.5	10	31.35	0.002
1.001 - 60.99m	Raingarden 25		Time of Concentration	0.006	28.5	0	28.50	0.002
1.001 - 62.58m	Raingarden 24		Time of Concentration	0.006	28.5	0	28.50	0.002
1.001 - 63.94m	Raingarden 21		Time of Concentration	0.004	80.0	0	80.00	0.003
1.001 - 65.53m	Raingarden 24		Time of Concentration	0.007	28.5	0	28.50	0.002
1.001 - 66.57m	Raingarden 22		Time of Concentration	0.007	28.5	0	28.50	0.002
1.001 - 67.75m	Raingarden 25		Time of Concentration	0.007	28.5	0	28.50	0.002
1.001 - 70.40m	Raingarden 24		Time of Concentration	0.007	28.5	0	28.50	0.002
1.001 - 70.64m	Raingarden 24		Time of Concentration	0.007	28.5	0	28.50	0.002

1.001 - 78.60m	Raingarden 22		Time of Concentration	0.004	28.5	0	28.50	0.001
1.001 - 91.75m	Porous Paving 57		Time of Concentration	0.006	80.0	0	80.00	0.005
1.001 - 125.79m	Raingarden 21		Time of Concentration	0.004	28.5	0	28.50	0.001
1.001 - 125.79m (1)	Raingarden 21		Time of Concentration	0.006	28.5	0	28.50	0.002
1.001 - 125.79m (1) (1)	Raingarden 21		Time of Concentration	0.004	28.5	0	28.50	0.001
1.001 - 125.79m (1) (2)	Raingarden 21		Time of Concentration	0.006	28.5	0	28.50	0.002
1.001 - 125.79m (1) (3)	Raingarden 21		Time of Concentration	0.004	28.5	0	28.50	0.001
1.001 - 147.65m	Tree Pit 29		Time of Concentration	0.015	80.0	0	80.00	0.012
1.001 - 315.41m	Detention Basin 1		Time of Concentration	0.032	80.0	0	80.00	0.025
1.001 - 318.15m	Tree Pit 1		Time of Concentration	0.029	80.0	0	80.00	0.023
1.002 - 11.52m	Porous Paving 53		Time of Concentration	0.001	80.0	0	80.00	0.001
1.002 - 63.79m	Porous Paving 53		Time of Concentration	0.006	95.0	10	104.50	0.007
1.002 - 225.74m	Detention Basin 1		Time of Concentration	0.014	80.0	0	80.00	0.011
1.002 - 225.74m (1)	Porous Paving 48		Time of Concentration	0.008	80.0	0	80.00	0.007
1.003 - 11.56m	Porous Paving 45		Time of Concentration	0.001	80.0	0	80.00	0.001
1.003 - 11.60m	Tree Pit 5		Time of Concentration	0.001	80.0	0	80.00	0.001
1.003 - 23.08m	Porous Paving 47		Time of Concentration	0.002	80.0	0	80.00	0.002
1.003 - 26.06m	Porous Paving 45		Time of Concentration	0.003	80.0	0	80.00	0.002
1.003 - 28.98m	Porous Paving 47		Time of Concentration	0.003	80.0	0	80.00	0.002
1.003 - 30.33m	Porous Paving 47		Time of Concentration	0.003	80.0	0	80.00	0.002
1.003 - 44.10m	Porous Paving 127		Time of Concentration	0.004	95.0	10	104.50	0.005
1.003 - 44.55m	Porous Paving 68		Time of Concentration	0.004	95.0	10	104.50	0.005
1.003 - 44.58m	Porous Paving 128		Time of Concentration	0.004	95.0	10	104.50	0.005
1.003 - 45.15m	Porous Paving 44		Time of Concentration	0.005	95.0	10	104.50	0.005
1.003 - 45.50m	Porous Paving 126		Time of Concentration	0.005	95.0	10	104.50	0.005
1.003 - 49.69m	Porous Paving 68		Time of Concentration	0.005	80.0	0	80.00	0.004
1.003 - 50.34m	Porous Paving 127		Time of Concentration	0.005	80.0	0	80.00	0.004
1.003 - 56.47m	Porous Paving 47		Time of Concentration	0.006	95.0	10	104.50	0.006
1.003 - 61.75m	Raingarden 19		Time of Concentration	0.006	28.5	0	28.50	0.002
1.003 - 62.01m	Raingarden 20		Time of Concentration	0.006	28.5	0	28.50	0.002
1.003 - 63.71m	Porous Paving 45		Time of Concentration	0.006	95.0	10	104.50	0.007
1.003 - 69.82m	Raingarden 20		Time of Concentration	0.007	28.5	0	28.50	0.002

1.003 - 71.24m	Raingarden 19		Time of Concentration	0.007	28.5	0	28.50	0.002
1.003 - 72.28m	Raingarden 20		Time of Concentration	0.007	28.5	0	28.50	0.002
1.003 - 76.22m	Raingarden 19		Time of Concentration	0.008	28.5	0	28.50	0.002
1.003 - 101.99m	Raingarden 19		Time of Concentration	0.010	28.5	0	28.50	0.003
1.003 - 113.34m	Raingarden 20		Time of Concentration	0.011	28.5	0	28.50	0.003
1.003 - 211.74m	Porous Paving 35		Time of Concentration	0.021	80.0	0	80.00	0.017
1.003 - 760.24m	Detention Basin 1		Time of Concentration	0.057	28.5	0	28.50	0.016
1.004 - 8.00m	Porous Paving 46		Time of Concentration	0.001	80.0	0	80.00	0.001
1.004 - 8.10m	Porous Paving 30		Time of Concentration	0.001	80.0	0	80.00	0.001
1.004 - 11.57m	Tree Pit 4		Time of Concentration	0.001	80.0	0	80.00	0.001
1.004 - 11.73m	Tree Pit 16		Time of Concentration	0.001	80.0	0	80.00	0.001
1.004 - 23.15m	Porous Paving 46		Time of Concentration	0.002	80.0	0	80.00	0.002
1.004 - 44.59m	Porous Paving 43		Time of Concentration	0.004	95.0	10	104.50	0.005
1.004 - 45.05m	Porous Paving 129		Time of Concentration	0.005	95.0	10	104.50	0.005
1.004 - 45.28m	Porous Paving 96		Time of Concentration	0.005	95.0	10	104.50	0.005
1.004 - 46.65m	Porous Paving 43		Time of Concentration	0.005	95.0	10	104.50	0.005
1.004 - 49.89m	Tree Pit 4		Time of Concentration	0.005	80.0	0	80.00	0.004
1.004 - 49.93m	Porous Paving 129		Time of Concentration	0.005	80.0	0	80.00	0.004
1.004 - 57.07m	Porous Paving 46		Time of Concentration	0.006	95.0	10	104.50	0.006
1.004 - 60.70m	Raingarden 17		Time of Concentration	0.006	28.5	0	28.50	0.002
1.004 - 61.91m	Raingarden 18		Time of Concentration	0.006	28.5	0	28.50	0.002
1.004 - 63.45m	Porous Paving 30		Time of Concentration	0.006	95.0	10	104.50	0.007
1.004 - 64.70m	Raingarden 17		Time of Concentration	0.006	28.5	0	28.50	0.002
1.004 - 65.76m	Raingarden 18		Time of Concentration	0.007	28.5	0	28.50	0.002
1.004 - 68.93m	Raingarden 18		Time of Concentration	0.007	28.5	0	28.50	0.002
1.004 - 70.37m	Raingarden 18		Time of Concentration	0.007	28.5	0	28.50	0.002
1.004 - 70.56m	Raingarden 17		Time of Concentration	0.007	28.5	0	28.50	0.002
1.004 - 72.77m	Raingarden 17		Time of Concentration	0.007	28.5	0	28.50	0.002
1.004 - 75.00m	Filter Drain 1		Time of Concentration	0.008	80.0	0	80.00	0.006
1.004 - 206.77m	Porous Paving 35		Time of Concentration	0.021	80.0	0	80.00	0.017
1.004 - 353.45m	Filter Drain 1		Time of Concentration	0.036	28.5	0	28.50	0.010
1.005 - 23.14m	Porous Paving 13		Time of Concentration	0.002	80.0	0	80.00	0.002
1.005 - 23.15m	Porous Paving 8		Time of Concentration	0.002	80.0	0	80.00	0.002
1.005 - 23.23m	Porous Paving 14		Time of Concentration	0.002	80.0	0	80.00	0.002
1.005 - 23.33m	Porous Paving 9		Time of Concentration	0.002	80.0	0	80.00	0.002

1.005 - 23.38m	Porous Paving 12		Time of Concentration	0.002	80.0	0	80.00	0.002
1.005 - 29.07m	Porous Paving 88		Time of Concentration	0.003	80.0	0	80.00	0.002
1.005 - 29.37m			Time of Concentration	0.003	80.0	0	80.00	0.002
1.005 - 37.76m			Time of Concentration	0.004	80.0	0	80.00	0.003
1.005 - 37.85m	Porous Paving 8		Time of Concentration	0.004	80.0	0	80.00	0.003
1.005 - 38.33m			Time of Concentration	0.004	80.0	0	80.00	0.003
1.005 - 44.43m	Porous Paving 105		Time of Concentration	0.004	95.0	10	104.50	0.005
1.005 - 44.49m	Porous Paving 107		Time of Concentration	0.004	95.0	10	104.50	0.005
1.005 - 44.59m	Porous Paving 88		Time of Concentration	0.004	95.0	10	104.50	0.005
1.005 - 44.79m	Porous Paving 89		Time of Concentration	0.004	95.0	10	104.50	0.005
1.005 - 44.88m	Porous Paving 87		Time of Concentration	0.004	95.0	10	104.50	0.005
1.005 - 45.63m	Porous Paving 106		Time of Concentration	0.005	95.0	10	104.50	0.005
1.005 - 49.58m	Porous Paving 107		Time of Concentration	0.005	80.0	0	80.00	0.004
1.005 - 50.25m	Porous Paving 87		Time of Concentration	0.005	80.0	0	80.00	0.004
1.005 - 56.37m	Porous Paving 13		Time of Concentration	0.006	95.0	10	104.50	0.006
1.005 - 56.42m	Porous Paving 14		Time of Concentration	0.006	95.0	10	104.50	0.006
1.005 - 56.53m	Porous Paving 9		Time of Concentration	0.006	95.0	10	104.50	0.006
1.005 - 56.60m	Porous Paving 8		Time of Concentration	0.006	95.0	10	104.50	0.006
1.005 - 56.93m	Porous Paving 12		Time of Concentration	0.006	95.0	10	104.50	0.006
1.005 - 99.16m	Raingarden 3		Time of Concentration	0.010	28.5	0	28.50	0.003
1.005 - 101.64m	Raingarden 2		Time of Concentration	0.010	28.5	0	28.50	0.003
1.005 - 102.59m	Raingarden 2		Time of Concentration	0.010	28.5	0	28.50	0.003
1.005 - 109.09m	Tree Pit 14		Time of Concentration	0.011	80.0	0	80.00	0.009
1.005 - 111.42m	Raingarden 1		Time of Concentration	0.011	28.5	0	28.50	0.003
1.005 - 175.47m	Tree Pit 12		Time of Concentration	0.018	80.0	0	80.00	0.014
1.005 - 180.24m	Raingarden 3		Time of Concentration	0.018	28.5	0	28.50	0.005
1.005 - 182.23m	Raingarden 2		Time of Concentration	0.018	28.5	0	28.50	0.005
1.005 - 296.44m	Tree Pit 3		Time of Concentration	0.030	80.0	0	80.00	0.024
1.006 - 9.80m	Porous Paving 37		Time of Concentration	0.001	80.0	0	80.00	0.001
1.006 - 11.54m	Porous Paving 39		Time of Concentration	0.001	80.0	0	80.00	0.001
1.006 - 11.55m	Porous Paving 37		Time of Concentration	0.001	80.0	0	80.00	0.001
1.006 - 44.68m	Porous Paving 31		Time of Concentration	0.004	80.0	0	80.00	0.004
1.006 - 44.73m	Porous Paving 32		Time of Concentration	0.004	95.0	10	104.50	0.005
1.006 - 44.82m	Porous Paving 31		Time of Concentration	0.004	95.0	10	104.50	0.005
1.006 - 44.85m	Porous Paving 39		Time of Concentration	0.004	95.0	10	104.50	0.005

1.006 - 44.90m	Porous Paving 31		Time of Concentration	0.004	95.0	10	104.50	0.005
1.006 - 62.76m	Porous Paving 37		Time of Concentration	0.006	80.0	0	80.00	0.005
1.006 - 63.11m	Porous Paving 31		Time of Concentration	0.006	80.0	0	80.00	0.005
1.006 - 107.37m	Tree Pit 13		Time of Concentration	0.011	80.0	0	80.00	0.009
1.006 - 129.07m	Tree Pit 13		Time of Concentration	0.013	80.0	0	80.00	0.010
1.007 - 23.32m	Porous Paving 42		Time of Concentration	0.002	80.0	0	80.00	0.002
1.007 - 23.40m	Porous Paving 38		Time of Concentration	0.002	80.0	0	80.00	0.002
1.007 - 32.83m	Porous Paving 38		Time of Concentration	0.003	80.0	0	80.00	0.003
1.007 - 44.57m	Porous Paving 134		Time of Concentration	0.004	95.0	10	104.50	0.005
1.007 - 44.67m	Porous Paving 131		Time of Concentration	0.004	95.0	10	104.50	0.005
1.007 - 44.93m	Porous Paving 133		Time of Concentration	0.004	95.0	10	104.50	0.005
1.007 - 56.61m	Porous Paving 38		Time of Concentration	0.006	95.0	10	104.50	0.006
1.007 - 56.62m	Porous Paving 42		Time of Concentration	0.006	95.0	10	104.50	0.006
1.007 - 62.03m	Raingarden 15		Time of Concentration	0.006	28.5	0	28.50	0.002
1.007 - 72.37m	Porous Paving 134		Time of Concentration	0.007	28.5	0	28.50	0.002
1.007 - 276.18m	Porous Paving 16		Time of Concentration	0.028	80.0	0	80.00	0.022
1.008 - 11.50m	Tree Pit 17		Time of Concentration	0.001	80.0	0	80.00	0.001
1.008 - 11.57m	Porous Paving 21		Time of Concentration	0.001	80.0	0	80.00	0.001
1.008 - 23.06m	Porous Paving 20		Time of Concentration	0.002	80.0	0	80.00	0.002
1.008 - 34.73m	Porous Paving 20		Time of Concentration	0.003	80.0	0	80.00	0.003
1.008 - 36.13m	Raingarden 15		Time of Concentration	0.004	28.5	0	28.50	0.001
1.008 - 39.06m	Porous Paving 20		Time of Concentration	0.004	80.0	0	80.00	0.003
1.008 - 40.16m	Detention Basin 3		Time of Concentration	0.004	28.5	0	28.50	0.001
1.008 - 44.54m	Porous Paving 109		Time of Concentration	0.004	95.0	10	104.50	0.005
1.008 - 57.05m	Porous Paving 20		Time of Concentration	0.006	95.0	10	104.50	0.006
1.008 - 60.45m	Raingarden 13		Time of Concentration	0.006	28.5	0	28.50	0.002
1.008 - 60.65m	Raingarden 15		Time of Concentration	0.006	28.5	0	28.50	0.002
1.008 - 63.33m	Porous Paving 21		Time of Concentration	0.006	95.0	10	104.50	0.007
1.008 - 132.58m	SMH 1.12		Time of Concentration	0.013	80.0	0	80.00	0.011
1.008 - 162.34m	Detention Basin 3		Time of Concentration	0.016	28.5	0	28.50	0.005
1.009 - 23.02m	Porous Paving 122		Time of Concentration	0.002	80.0	0	80.00	0.002
1.009 - 23.11m	Porous Paving 120		Time of Concentration	0.002	80.0	0	80.00	0.002
1.009 - 27.87m	Porous Paving 122		Time of Concentration	0.003	80.0	0	80.00	0.002
1.009 - 34.49m	Porous Paving 119		Time of Concentration	0.003	28.5	0	28.50	0.001
1.009 - 37.50m	Porous Paving 110		Time of Concentration	0.004	80.0	0	80.00	0.003

1.009 - 37.50m	Porous Paving 116		Time of Concentration	0.004	80.0	0	80.00	0.003
1.009 - 37.50m	Detention Basin 4		Time of Concentration	0.004	80.0	0	80.00	0.003
1.009 - 44.62m	Porous Paving 119		Time of Concentration	0.004	95.0	10	104.50	0.005
1.009 - 56.82m	Porous Paving 120		Time of Concentration	0.006	95.0	10	104.50	0.006
1.009 - 57.12m	Porous Paving 122		Time of Concentration	0.006	95.0	10	104.50	0.006
1.009 - 58.53m	Porous Paving 120		Time of Concentration	0.006	28.5	0	28.50	0.002
1.009 - 60.46m	Porous Paving 118		Time of Concentration	0.006	95.0	10	104.50	0.006
1.009 - 61.58m	Porous Paving 115		Time of Concentration	0.006	95.0	10	104.50	0.006
1.009 - 61.70m	Porous Paving 117		Time of Concentration	0.006	95.0	10	104.50	0.006
1.009 - 61.89m	Porous Paving 121		Time of Concentration	0.006	95.0	10	104.50	0.006
1.009 - 63.71m	Raingarden 13		Time of Concentration	0.006	28.5	0	28.50	0.002
1.009 - 63.97m	Raingarden 13		Time of Concentration	0.006	28.5	0	28.50	0.002
1.009 - 65.25m	Raingarden 11		Time of Concentration	0.007	28.5	0	28.50	0.002
1.009 - 65.28m	Raingarden 11		Time of Concentration	0.007	28.5	0	28.50	0.002
1.009 - 65.47m	Raingarden 11		Time of Concentration	0.007	28.5	0	28.50	0.002
1.009 - 87.62m	Tree Pit 18		Time of Concentration	0.009	80.0	0	80.00	0.007
1.009 - 91.67m	Tree Pit 30		Time of Concentration	0.004	80.0	0	80.00	0.003
1.009 - 95.35m	Detention Basin 4		Time of Concentration	0.010	28.5	0	28.50	0.003
1.009 - 114.61m	Porous Paving 110		Time of Concentration	0.011	28.5	0	28.50	0.003
1.009 - 120.56m	Porous Paving 36		Time of Concentration	0.011	28.5	0	28.50	0.003
1.009 - 267.87m	Tree Pit 32		Time of Concentration	0.027	80.0	0	80.00	0.021
1.010 - 59.55m	SMH 7.07		Time of Concentration	0.006	80.0	0	80.00	0.005
1.010 - 61.68m	Porous Paving 85		Time of Concentration	0.006	95.0	10	104.50	0.006
1.010 - 61.74m	Porous Paving 113		Time of Concentration	0.006	95.0	10	104.50	0.006
1.010 - 105.64m	Tree Pit 31		Time of Concentration	0.011	80.0	0	80.00	0.008
1.011 - 50.00m	Detention Basin 4		Time of Concentration	0.005	95.0	0	95.00	0.005
1.011 - 50.00m	Detention Basin 4		Time of Concentration	0.005	95.0	0	95.00	0.005
1.011 - 64.39m	Raingarden 11		Time of Concentration	0.006	28.5	0	28.50	0.002
1.011 - 117.06m	Porous Paving 33		Time of Concentration	0.012	28.5	0	28.50	0.003
1.011 - 227.24m	Detention Basin 4		Time of Concentration	0.023	28.5	0	28.50	0.006
1.011 - 809.22m	Detention Basin 4		Time of Concentration	0.081	28.5	0	28.50	0.023
1.012 - 111.52m	Porous Paving 33		Time of Concentration	0.011	80.0	0	80.00	0.009
3.000 - 23.22m	Tree Pit 15		Time of Concentration	0.002	80.0	0	80.00	0.002
3.000 - 41.43m	Tree Pit 15		Time of Concentration	0.004	80.0	0	80.00	0.003
3.000 - 44.39m	Porous Paving 103		Time of Concentration	0.004	95.0	10	104.50	0.005

3.000 - 44.74m	Porous Paving 104		Time of Concentration	0.004	95.0	10	104.50	0.005
3.000 - 44.84m	Porous Paving 124		Time of Concentration	0.004	95.0	10	104.50	0.005
3.000 - 50.51m	Porous Paving 14		Time of Concentration	0.005	80.0	0	80.00	0.004
3.000 - 57.60m	Porous Paving 15		Time of Concentration	0.006	95.0	10	104.50	0.006
3.000 - 168.11m	Raingarden 1		Time of Concentration	0.017	28.5	0	28.50	0.005
3.000 - 213.32m	Raingarden 1		Time of Concentration	0.021	28.5	0	28.50	0.006
3.000 - 291.85m	Filter Drain 1		Time of Concentration	0.029	80.0	0	80.00	0.023
4.000 - 23.45m	Porous Paving 4		Time of Concentration	0.002	80.0	0	80.00	0.002
4.000 - 41.35m	Tree Pit 27		Time of Concentration	0.004	80.0	0	80.00	0.003
4.000 - 43.86m	Porous Paving 95		Time of Concentration	0.004	95.0	10	104.50	0.005
4.000 - 44.63m	Porous Paving 86		Time of Concentration	0.004	95.0	10	104.50	0.005
4.000 - 56.99m	Porous Paving 4		Time of Concentration	0.006	95.0	10	104.50	0.006
4.000 - 61.35m	Porous Paving 99		Time of Concentration	0.006	95.0	10	104.50	0.006
4.000 - 61.47m	Porous Paving 101		Time of Concentration	0.006	95.0	10	104.50	0.006
4.000 - 64.05m	Raingarden 12		Time of Concentration	0.006	28.5	0	28.50	0.002
4.000 - 64.69m	Raingarden 12		Time of Concentration	0.006	28.5	0	28.50	0.002
4.000 - 103.05m	Porous Paving 98		Time of Concentration	0.009	80.0	0	80.00	0.007
4.000 - 113.60m	Porous Paving 4		Time of Concentration	0.011	80.0	0	80.00	0.009
4.000 - 164.28m	Tree Pit 28		Time of Concentration	0.016	80.0	0	80.00	0.013
4.000 - 234.77m	Raingarden 5		Time of Concentration	0.023	28.5	0	28.50	0.007
4.001 - 23.04m	Porous Paving 17		Time of Concentration	0.002	80.0	0	80.00	0.002
4.001 - 35.46m	Porous Paving 5		Time of Concentration	0.004	80.0	0	80.00	0.003
4.001 - 44.79m	Porous Paving 78		Time of Concentration	0.004	95.0	10	104.50	0.005
4.001 - 44.85m	Porous Paving 77		Time of Concentration	0.004	95.0	10	104.50	0.005
4.001 - 57.20m	Porous Paving 17		Time of Concentration	0.006	95.0	10	104.50	0.006
4.001 - 60.36m	Porous Paving 17		Time of Concentration	0.006	28.5	0	28.50	0.002
4.001 - 78.03m	Tree Pit 8		Time of Concentration	0.008	80.0	0	80.00	0.006
4.002 - 9.60m	Tree Pit 10		Time of Concentration	0.001	80.0	0	80.00	0.001
4.002 - 11.54m	Porous Paving 10		Time of Concentration	0.001	80.0	0	80.00	0.001
4.002 - 11.56m	Tree Pit 10		Time of Concentration	0.001	80.0	0	80.00	0.001
4.002 - 23.04m	Porous Paving 19		Time of Concentration	0.002	80.0	0	80.00	0.002
4.002 - 23.11m	Porous Paving 18		Time of Concentration	0.002	80.0	0	80.00	0.002
4.002 - 23.19m	Porous Paving 7		Time of Concentration	0.002	80.0	0	80.00	0.002
4.002 - 23.22m	Porous Paving 6		Time of Concentration	0.002	80.0	0	80.00	0.002
4.002 - 23.42m	Porous Paving 5		Time of Concentration	0.002	80.0	0	80.00	0.002

4.002 - 27.15m	Porous Paving 11		Time of Concentration	0.003	80.0	0	80.00	0.002
4.002 - 27.40m	Porous Paving 19		Time of Concentration	0.003	80.0	0	80.00	0.002
4.002 - 28.27m	Tree Pit 19		Time of Concentration	0.003	80.0	0	80.00	0.002
4.002 - 34.68m	Porous Paving 18		Time of Concentration	0.003	80.0	0	80.00	0.003
4.002 - 34.99m	Raingarden 12		Time of Concentration	0.003	28.5	0	28.50	0.001
4.002 - 38.08m	Porous Paving 6		Time of Concentration	0.004	80.0	0	80.00	0.003
4.002 - 43.98m	Porous Paving 97		Time of Concentration	0.004	95.0	10	104.50	0.005
4.002 - 44.17m	Porous Paving 90		Time of Concentration	0.004	95.0	10	104.50	0.005
4.002 - 44.52m	Porous Paving 11		Time of Concentration	0.004	95.0	10	104.50	0.005
4.002 - 44.66m	Porous Paving 102		Time of Concentration	0.004	95.0	10	104.50	0.005
4.002 - 44.67m	Porous Paving 91		Time of Concentration	0.004	95.0	10	104.50	0.005
4.002 - 50.12m	Porous Paving 91		Time of Concentration	0.005	80.0	0	80.00	0.004
4.002 - 56.68m	Porous Paving 18		Time of Concentration	0.006	95.0	10	104.50	0.006
4.002 - 56.92m	Porous Paving 5		Time of Concentration	0.006	95.0	10	104.50	0.006
4.002 - 57.06m	Porous Paving 19		Time of Concentration	0.006	95.0	10	104.50	0.006
4.002 - 57.18m	Porous Paving 6		Time of Concentration	0.006	95.0	10	104.50	0.006
4.002 - 57.32m	Porous Paving 7		Time of Concentration	0.006	95.0	10	104.50	0.006
4.002 - 60.63m	Raingarden 12		Time of Concentration	0.006	28.5	0	28.50	0.002
4.002 - 62.29m	Raingarden 14		Time of Concentration	0.006	28.5	0	28.50	0.002
4.002 - 63.50m	Porous Paving 10		Time of Concentration	0.006	95.0	10	104.50	0.007
4.002 - 99.95m	Raingarden 14		Time of Concentration	0.010	28.5	0	28.50	0.003
4.002 - 177.33m	Raingarden 4		Time of Concentration	0.018	28.5	0	28.50	0.005
4.002 - 192.87m	Raingarden 4		Time of Concentration	0.019	28.5	0	28.50	0.005
4.002 - 193.23m	Raingarden 5		Time of Concentration	0.019	28.5	0	28.50	0.006
4.002 - 363.41m	Tree Pit 9		Time of Concentration	0.036	80.0	0	80.00	0.029
5.000 - 50.65m	Porous Paving 48		Time of Concentration	0.005	80.0	0	80.00	0.004
5.000 - 157.27m	Porous Paving 48		Time of Concentration	0.016	80.0	0	80.00	0.013
5.002 - 525.05m	Detention Basin 2		Time of Concentration	0.053	28.5	0	28.50	0.015
5.002 - 566.11m	Detention Basin 2		Time of Concentration	0.057	28.5	0	28.50	0.016
5.003 - 11.49m	Tree Pit 11		Time of Concentration	0.001	80.0	0	80.00	0.001
5.003 - 11.49m	Porous Paving 40		Time of Concentration	0.001	80.0	0	80.00	0.001
5.003 - 25.13m	Porous Paving 40		Time of Concentration	0.003	80.0	0	80.00	0.002
5.003 - 44.84m	Porous Paving 132		Time of Concentration	0.004	95.0	10	104.50	0.005
5.003 - 44.97m	Porous Paving 41		Time of Concentration	0.004	95.0	10	104.50	0.005
5.003 - 48.82m	Porous Paving 132		Time of Concentration	0.005	80.0	0	80.00	0.004

5.003 - 64.02m	Porous Paving 40		Time of Concentration	0.006	95.0	10	104.50	0.007
5.003 - 134.20m	Porous Paving 16		Time of Concentration	0.013	28.5	0	28.50	0.004
5.003 - 185.05m	Porous Paving 16		Time of Concentration	0.019	80.0	0	80.00	0.015
6.000 - 8.89m	Porous Paving 64		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 10.21m	Porous Paving 36		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 11.33m	Porous Paving 36		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 11.47m	Porous Paving 63		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 11.51m	Porous Paving 66		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 11.51m	Porous Paving 67		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 11.52m	Porous Paving 64		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 11.52m	Porous Paving 67		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 11.53m	Porous Paving 66		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 11.53m	Porous Paving 69		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 11.56m	Porous Paving 63		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 12.48m	Porous Paving 36		Time of Concentration	0.001	80.0	0	80.00	0.001
6.000 - 15.35m	Detention Basin 4		Time of Concentration	0.002	28.5	0	28.50	0.000
6.000 - 15.80m	Porous Paving 69		Time of Concentration	0.002	80.0	0	80.00	0.001
6.000 - 16.37m	Porous Paving 64		Time of Concentration	0.002	80.0	0	80.00	0.001
6.000 - 16.49m	Porous Paving 69		Time of Concentration	0.002	80.0	0	80.00	0.001
6.000 - 16.97m	Porous Paving 66		Time of Concentration	0.002	80.0	0	80.00	0.001
6.000 - 20.69m	Porous Paving 64		Time of Concentration	0.002	80.0	0	80.00	0.002
6.000 - 22.13m	Porous Paving 36		Time of Concentration	0.002	28.5	0	28.50	0.001
6.000 - 22.65m	Porous Paving 66		Time of Concentration	0.002	80.0	0	80.00	0.002
6.000 - 22.94m	Tree Pit 34		Time of Concentration	0.002	80.0	0	80.00	0.002
6.000 - 23.04m	Porous Paving 66		Time of Concentration	0.002	80.0	0	80.00	0.002
6.000 - 25.17m	Raingarden 16		Time of Concentration	0.003	80.0	0	80.00	0.002
6.000 - 26.56m	Porous Paving 36		Time of Concentration	0.003	28.5	0	28.50	0.001
6.000 - 27.32m	SMH 1.14		Time of Concentration	0.003	28.5	0	28.50	0.001
6.000 - 27.74m	Porous Paving 36		Time of Concentration	0.003	28.5	0	28.50	0.001
6.000 - 28.23m	Porous Paving 36		Time of Concentration	0.003	28.5	0	28.50	0.001
6.000 - 28.99m	Porous Paving 36		Time of Concentration	0.003	28.5	0	28.50	0.001
6.000 - 37.50m	Porous Paving 36		Time of Concentration	0.004	80.0	0	80.00	0.003
6.000 - 37.67m	Detention Basin 4		Time of Concentration	0.004	28.5	0	28.50	0.001
6.000 - 37.90m	Detention Basin 4		Time of Concentration	0.004	28.5	0	28.50	0.001
6.000 - 57.61m	Porous Paving 36		Time of Concentration	0.006	28.5	0	28.50	0.002

6.000 - 59.90m	Raingarden 16		Time of Concentration	0.006	28.5	0	28.50	0.002
6.000 - 61.21m	Porous Paving 66		Time of Concentration	0.006	95.0	10	104.50	0.006
6.000 - 61.41m	Porous Paving 65		Time of Concentration	0.006	95.0	10	104.50	0.006
6.000 - 61.84m	Porous Paving 69		Time of Concentration	0.006	95.0	10	104.50	0.006
6.000 - 61.87m	Porous Paving 63		Time of Concentration	0.006	95.0	10	104.50	0.006
6.000 - 62.08m	Porous Paving 64		Time of Concentration	0.006	95.0	10	104.50	0.006
6.000 - 62.87m	Porous Paving 67		Time of Concentration	0.006	95.0	10	104.50	0.007
6.000 - 62.87m (1)	Porous Paving 135		Time of Concentration	0.013	95.0	10	104.50	0.014
6.000 - 62.87m (1) (1)	Porous Paving 136		Time of Concentration	0.014	95.0	10	104.50	0.014
6.000 - 62.87m (1) (1) (1)	Porous Paving 136		Time of Concentration	0.003	95.0	10	104.50	0.004
6.000 - 62.87m (1) (1) (1) (1)	Porous Paving 135		Time of Concentration	0.003	95.0	10	104.50	0.004
6.000 - 63.59m	Raingarden 16		Time of Concentration	0.006	28.5	0	28.50	0.002
6.000 - 67.55m	Detention Basin 4		Time of Concentration	0.007	28.5	0	28.50	0.002
6.000 - 68.26m	Porous Paving 36		Time of Concentration	0.007	95.0	10	104.50	0.007
6.000 - 70.43m	Porous Paving 36		Time of Concentration	0.007	95.0	10	104.50	0.007
6.000 - 73.72m	Porous Paving 36		Time of Concentration	0.007	95.0	10	104.50	0.008
6.000 - 73.72m	Porous Paving 36		Time of Concentration	0.007	95.0	10	104.50	0.008
6.000 - 74.51m	Porous Paving 36		Time of Concentration	0.007	95.0	10	104.50	0.008
6.000 - 75.60m	Raingarden 16		Time of Concentration	0.008	28.5	0	28.50	0.002
6.000 - 77.45m	Porous Paving 36		Time of Concentration	0.008	95.0	10	104.50	0.008
6.000 - 87.32m	Raingarden 16		Time of Concentration	0.009	28.5	0	28.50	0.002
6.000 - 98.50m	SMH 8.00		Time of Concentration	0.010	80.0	0	80.00	0.008
6.000 - 99.27m	Raingarden 16		Time of Concentration	0.010	28.5	0	28.50	0.003
6.000 - 99.27m (1)	Porous Paving 136		Time of Concentration	0.076	28.5	0	28.50	0.022
6.000 - 99.27m (1) (1)	Raingarden 26		Time of Concentration	0.029	28.5	0	28.50	0.008
6.000 - 100.20m	Raingarden 16		Time of Concentration	0.010	28.5	0	28.50	0.003
6.000 - 100.20m (1)	Porous Paving 34		Time of Concentration	0.051	28.5	0	28.50	0.015
6.000 - 100.20m (1) (1)	Porous Paving 34		Time of Concentration	0.069	28.5	0	28.50	0.020
6.000 - 135.63m	Porous Paving 63		Time of Concentration	0.014	28.5	0	28.50	0.004
6.000 - 192.97m	Tree Pit 33		Time of Concentration	0.019	80.0	0	80.00	0.015
6.000 - 279.41m	Tree Pit 34		Time of Concentration	0.028	80.0	0	80.00	0.022

6.000 - 280.00m	SMH 8.00		Time of Concentration	0.028	28.5	0	28.50	0.008
6.000 - 280.00m (1)	Porous Paving 136		Time of Concentration	0.011	80.0	0	80.00	0.009
6.000 - 280.00m (1) (1)	Porous Paving 135		Time of Concentration	0.011	80.0	0	80.00	0.009
6.001 - 124.02m	SMH 1.12		Time of Concentration	0.012	80.0	0	80.00	0.010
7.000 - 22.99m	Porous Paving 1		Time of Concentration	0.002	80.0	0	80.00	0.002
7.000 - 37.42m	Porous Paving 1		Time of Concentration	0.004	80.0	0	80.00	0.003
7.000 - 40.69m	Tree Pit 26		Time of Concentration	0.004	80.0	0	80.00	0.003
7.000 - 43.90m	Porous Paving 70		Time of Concentration	0.004	95.0	10	104.50	0.005
7.000 - 58.15m	Porous Paving 1		Time of Concentration	0.006	95.0	10	104.50	0.006
7.000 - 61.47m	Porous Paving 72		Time of Concentration	0.006	95.0	10	104.50	0.006
7.000 - 61.52m	Porous Paving 74		Time of Concentration	0.006	95.0	10	104.50	0.006
7.000 - 64.54m	Raingarden 10		Time of Concentration	0.006	28.5	0	28.50	0.002
7.000 - 64.75m	Raingarden 10		Time of Concentration	0.006	28.5	0	28.50	0.002
7.000 - 118.71m	Porous Paving 73		Time of Concentration	0.008	80.0	0	80.00	0.007
7.000 - 133.42m	Tree Pit 26		Time of Concentration	0.013	80.0	0	80.00	0.011
7.000 - 187.37m	Raingarden 6		Time of Concentration	0.019	28.5	0	28.50	0.005
7.001 - 32.90m	Porous Paving 1		Time of Concentration	0.003	80.0	0	80.00	0.003
7.001 - 45.34m	Porous Paving 76		Time of Concentration	0.005	95.0	10	104.50	0.005
7.001 - 61.84m	Porous Paving 79		Time of Concentration	0.006	95.0	10	104.50	0.006
7.001 - 64.79m	Raingarden 10		Time of Concentration	0.006	28.5	0	28.50	0.002
7.001 - 74.47m	Tree Pit 25		Time of Concentration	0.007	80.0	0	80.00	0.006
7.002 - 11.07m	Tree Pit 20		Time of Concentration	0.001	80.0	0	80.00	0.001
7.002 - 23.05m	Porous Paving 3		Time of Concentration	0.002	80.0	0	80.00	0.002
7.002 - 39.27m	Porous Paving 2		Time of Concentration	0.004	80.0	0	80.00	0.003
7.002 - 44.11m	Porous Paving 93		Time of Concentration	0.004	95.0	10	104.50	0.005
7.002 - 45.23m	Porous Paving 108		Time of Concentration	0.005	95.0	10	104.50	0.005
7.002 - 50.00m	Porous Paving 2		Time of Concentration	0.005	95.0	10	104.50	0.005
7.002 - 55.80m	Raingarden 8		Time of Concentration	0.006	28.5	0	28.50	0.002
7.002 - 55.96m	Porous Paving 3		Time of Concentration	0.006	80.0	0	80.00	0.004
7.002 - 56.77m	Porous Paving 3		Time of Concentration	0.006	95.0	10	104.50	0.006
7.002 - 61.55m	Porous Paving 2		Time of Concentration	0.006	80.0	0	80.00	0.005
7.002 - 61.78m	Porous Paving 94		Time of Concentration	0.006	95.0	10	104.50	0.006
7.002 - 63.54m	Porous Paving 26		Time of Concentration	0.006	95.0	10	104.50	0.007
7.002 - 65.07m	Raingarden 10		Time of Concentration	0.007	28.5	0	28.50	0.002

7.002 - 74.58m	Raingarden 7		Time of Concentration	0.007	28.5	0	28.50	0.002
7.002 - 81.75m	Raingarden 7		Time of Concentration	0.008	28.5	0	28.50	0.002
7.002 - 96.73m	Raingarden 6		Time of Concentration	0.010	28.5	0	28.50	0.003
7.002 - 102.62m	Porous Paving 92		Time of Concentration	0.008	80.0	0	80.00	0.006
7.002 - 153.40m	Porous Paving 2		Time of Concentration	0.015	95.0	10	104.50	0.016
7.002 - 227.99m	Raingarden 6		Time of Concentration	0.023	28.5	0	28.50	0.006
7.002 - 262.57m	Tree Pit 25		Time of Concentration	0.026	80.0	0	80.00	0.021
7.003 - 19.98m	Tree Pit 2		Time of Concentration	0.002	80.0	0	80.00	0.002
7.003 - 57.82m	Tree Pit 2		Time of Concentration	0.006	80.0	0	80.00	0.005
7.003 - 135.55m	SMH 7.02		Time of Concentration	0.014	28.5	0	28.50	0.004
7.004 - 11.51m	Tree Pit 21		Time of Concentration	0.001	80.0	0	80.00	0.001
7.004 - 11.54m	Porous Paving 26		Time of Concentration	0.001	80.0	0	80.00	0.001
7.004 - 22.86m	Tree Pit 21		Time of Concentration	0.002	80.0	0	80.00	0.002
7.004 - 23.03m	Porous Paving 25		Time of Concentration	0.002	80.0	0	80.00	0.002
7.004 - 30.37m	Raingarden 8		Time of Concentration	0.003	28.5	0	28.50	0.001
7.004 - 30.56m	Raingarden 8		Time of Concentration	0.003	28.5	0	28.50	0.001
7.004 - 30.67m	Raingarden 8		Time of Concentration	0.003	28.5	0	28.50	0.001
7.004 - 44.35m	Porous Paving 23		Time of Concentration	0.004	95.0	10	104.50	0.005
7.004 - 44.69m	Porous Paving 27		Time of Concentration	0.004	95.0	10	104.50	0.005
7.004 - 45.07m	Porous Paving 22		Time of Concentration	0.005	95.0	10	104.50	0.005
7.004 - 52.33m	Raingarden 9		Time of Concentration	0.005	28.5	0	28.50	0.001
7.004 - 56.83m	Porous Paving 25		Time of Concentration	0.006	95.0	10	104.50	0.006
7.004 - 151.00m	Porous Paving 34		Time of Concentration	0.015	28.5	0	28.50	0.004
7.004 - 193.21m	Tree Pit 21		Time of Concentration	0.019	80.0	0	80.00	0.015
7.005 - 11.50m	Tree Pit 23		Time of Concentration	0.001	80.0	0	80.00	0.001
7.005 - 11.54m	Porous Paving 29		Time of Concentration	0.001	80.0	0	80.00	0.001
7.005 - 20.60m	Tree Pit 24		Time of Concentration	0.002	80.0	0	80.00	0.002
7.005 - 21.45m	Porous Paving 29		Time of Concentration	0.002	80.0	0	80.00	0.002
7.005 - 23.04m	Porous Paving 28		Time of Concentration	0.002	80.0	0	80.00	0.002
7.005 - 30.36m	Raingarden 9		Time of Concentration	0.003	28.5	0	28.50	0.001
7.005 - 30.45m	Raingarden 9		Time of Concentration	0.003	28.5	0	28.50	0.001
7.005 - 44.60m	Porous Paving 29		Time of Concentration	0.004	95.0	10	104.50	0.005
7.005 - 44.82m	Tree Pit 22		Time of Concentration	0.004	95.0	10	104.50	0.005
7.005 - 53.00m	Raingarden 9		Time of Concentration	0.005	28.5	0	28.50	0.002
7.005 - 55.42m	Porous Paving 111		Time of Concentration	0.006	28.5	0	28.50	0.002

7.005 - 56.83m	Porous Paving 24		Time of Concentration	0.006	95.0	10	104.50	0.006
7.005 - 63.29m	Tree Pit 24		Time of Concentration	0.006	95.0	10	104.50	0.007
7.005 - 75.00m	Porous Paving 34		Time of Concentration	0.008	80.0	0	80.00	0.006
7.005 - 92.20m	Porous Paving 34		Time of Concentration	0.009	80.0	0	80.00	0.007
7.005 - 95.91m	Porous Paving 34		Time of Concentration	0.010	80.0	0	80.00	0.008
7.005 - 103.93m	Porous Paving 34		Time of Concentration	0.010	80.0	0	80.00	0.008
7.005 - 244.10m	Detention Basin 4		Time of Concentration	0.024	28.5	0	28.50	0.007
7.006 - 472.15m	Detention Basin 4		Time of Concentration	0.047	28.5	0	28.50	0.013
8.000 - 663.37m	SMH 8.01		Time of Concentration	0.066	80.0	0	80.00	0.053
8.000 - 1204.78m	SMH 8.02		Time of Concentration	0.095	80.0	0	80.00	0.076
8.000 - 1204.78m (1)	SMH 10.00		Time of Concentration	0.067	80.0	0	80.00	0.053
8.000 - 1204.78m (1) (1)	SMH 9.02		Time of Concentration	0.064	80.0	0	80.00	0.051
8.000 - 1204.78m (1) (1) (1)	SMH 9.00		Time of Concentration	0.112	80.0	0	80.00	0.090
8.000 - 1204.78m (1) (2)	SMH 1.20		Time of Concentration	0.087	80.0	0	80.00	0.069
Catchment Area	Porous Paving 123		Time of Concentration	0.003	28.5	0	28.50	0.001
Catchment Area (1)	Porous Paving 100		Time of Concentration	0.002	28.5	0	28.50	0.000
Catchment Area (2)	Porous Paving 75		Time of Concentration	0.002	80.0	0	80.00	0.002
Catchment Area (3)	Porous Paving 71		Time of Concentration	0.003	80.0	0	80.00	0.003
Catchment Area (4)	Porous Paving 112		Time of Concentration	0.001	80.0	0	80.00	0.001
Catchment Area (5)	Porous Paving 114		Time of Concentration	0.001	80.0	0	80.00	0.001
TOTAL		**0.0**		**3.946**				**2.521**

NETWORK DESIGN DETAILS

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Network Design Criteria Storm Phase: Surface Network 1	Company Address:		

Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

Pipe Options

Lock Slope Options	None
Design Level	Level Crowns
Min. Cover Depth (m)	1.200
Min. Slope (1:x)	500.00
Max. Slope (1:x)	40.00
Min. Backdrop (m)	0.200
Max. Backdrop (m)	2.500
Min. Velocity (m/s)	0.75
Max. Velocity (m/s)	2.5
Use Flow Restriction	☐
Reduce Channel Depths	☐

Pipe Size Library

Default

Add. Increment (mm)	75

Diameter (mm)	Min. Slope (1:x)	Max. Slope (1:x)
100	0.00	0.00
150	0.00	0.00

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Network Design Criteria Storm Phase: Surface Network 1	Company Address:		

Manhole Options

Manhole Size Library

Default

Diameter / Width

Connection (mm)	Diameter / Length (m)	Width (m)
0	1.200	0.000
375	1.350	0.000
500	1.500	0.000
0	0.000	0.000

Additional Sizing

Connection (mm)	900
Diameter / Length (m)	0.900
Width (m)	0.000

Depth

Depth (m)	Diameter / Length (m)	Width (m)
0.000	1.050	0.000
1.500	1.200	0.000

Benching Requirements

Landing Width (mm)	500
Benching Width (mm)	225

RAINFALL ANALYSIS CRITERIA

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Title:	Company Address:		
Rainfall Analysis Criteria			

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Use Catchment Values
Junction Flood Risk Margin (mm)	200
Perform First Flush Analysis	☐

Rainfall

FSR 100 yr

Type: FSR

Region	Scotland and Ireland
M5-60 (mm)	15.1
Ratio R	0.275
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	20.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

CRITICAL STORM- MANHOLE MAX. DEPTH

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Junctions Summary Storm Phase: Surface Network 1	Company Address:		

Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Elevation (m)	Invert Elevation (m)	Max. Elevation (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
SMH 1.00	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	79.978	78.035	79.707	1.672	1.6	2.392	0.000	0.6	2.199	Surcharged
SMH 1.01	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	80.467	77.936	79.706	1.770	9.0	2.002	0.000	8.5	98.747	Surcharged
SMH 2.04	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	80.821	79.022	79.705	0.683	14.5	0.772	0.000	14.5	160.646	Surcharged
SMH 5.02	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.288	79.468	79.611	0.142	37.7	0.161	0.000	35.9	29.893	OK
SMH 5.04	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	80.640	78.543	79.220	0.677	6.8	0.765	0.000	6.8	224.378	Surcharged
SMH 1.11	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	79.992	77.144	79.220	2.076	8.4	2.348	0.000	6.5	703.409	Surcharged
SMH 1.12	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	79.654	77.062	78.794	1.732	8.5	1.959	0.000	8.3	1242.034	Surcharged
SMH 7.07	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	79.712	78.093	78.794	0.701	5.7	0.792	0.000	5.3	346.500	Surcharged
SMH 7.06	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	80.479	78.265	78.794	0.529	4.9	0.598	0.000	4.9	319.911	Surcharged
SMH 1.17	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.604	76.609	77.830	1.221	7.4	1.381	0.000	7.0	910.647	Surcharged
HEADWALL	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	77.530	76.200	76.268	0.068	8.8	0.000	0.000	8.8	49.170	OK
SMH 4.00	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	81.954	80.429	80.805	0.376	6.6	0.538	0.000	3.5	7.925	Surcharged
SMH 5.01	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.708	80.076	80.167	0.091	30.8	0.103	0.000	28.1	16.492	OK
SMH 5.00	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	82.186	80.209	80.286	0.077	10.3	0.110	0.000	8.7	4.658	OK
SMH 7.05	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.567	78.787	78.873	0.086	42.9	0.123	0.000	42.1	42.731	OK
SMH 7.04	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.977	78.893	79.089	0.196	46.3	0.222	0.000	42.6	42.497	OK
SMH 7.03	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.505	79.568	79.671	0.103	37.7	0.117	0.000	35.8	32.469	OK
SMH 7.02	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.573	79.590	79.743	0.153	34.1	0.173	0.000	31.8	28.131	OK
SMH 7.01	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.806	79.702	79.855	0.153	30.2	0.173	0.000	25.4	14.730	OK
SMH 7.00	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	82.102	79.815	79.913	0.098	16.0	0.111	0.000	14.6	7.186	OK

SMH 6.02	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	79.612	77.251	78.798	1.569	4.6	1.774	0.000	1.6	219.066	Surcharged
SMH 6.00	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	79.025	77.468	78.798	1.352	0.5	1.935	0.000	0.4	11.619	Surcharged
SMH 1.04	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	80.240	77.633	79.704	2.071	12.1	2.963	0.000	7.7	189.332	Surcharged
SMH 1.06	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	80.016	77.557	79.222	1.665	7.5	1.883	0.000	7.4	456.636	Surcharged
SMH 1.07	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	79.678	77.516	79.222	1.706	7.6	2.441	0.000	7.5	461.405	Surcharged
SMH 1.08	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	79.500	77.493	79.222	1.729	7.5	2.474	0.000	7.4	460.276	Surcharged
SMH 1.10	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	79.500	77.311	79.220	1.909	5.5	2.732	0.000	5.7	484.832	Surcharged
SMH 1.16	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	79.672	76.656	78.793	2.137	7.2	2.417	0.000	5.8	1514.853	Surcharged
SMH 8.00	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.473	77.075	77.830	0.755	0.4	1.080	0.000	0.3	12.785	Surcharged
SMH 1.13	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	79.430	76.866	78.794	1.928	13.8	2.180	0.000	13.6	1627.026	Surcharged
SMH 1.14	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	79.450	76.840	78.793	1.953	13.6	2.209	0.000	13.6	1624.709	Surcharged
SMH 1.15	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	79.335	76.767	78.793	2.026	13.6	2.292	0.000	13.5	1621.248	Surcharged
SMH 2.02	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	81.830	79.797	80.803	1.006	15.6	1.138	0.000	14.0	35.580	Surcharged
SMH 2.01	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	81.583	79.949	80.809	0.860	11.3	0.973	0.000	9.3	20.589	Surcharged
SMH 8.02	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.896	76.880	77.830	0.950	3.7	1.074	0.000	3.6	143.882	Surcharged
SMH 8.03	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.681	76.770	77.830	1.060	3.6	1.199	0.000	3.5	143.298	Surcharged
SMH 1.18	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.509	76.555	77.830	1.275	7.0	1.441	0.000	7.0	909.309	Surcharged
SMH 1.20	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.585	76.480	77.829	1.349	11.4	1.526	0.000	11.3	1116.769	Surcharged
SMH 1.21	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.500	76.439	77.828	1.389	11.3	1.571	0.000	11.3	1115.301	Surcharged
SMH 2.00	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	81.437	80.037	80.812	0.775	11.0	0.877	0.000	6.6	13.741	Surcharged
SMH 1.02	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	80.073	77.726	79.705	1.979	13.1	2.238	0.000	12.9	142.835	Surcharged
SMH 1.03	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	80.217	77.689	79.704	2.015	12.9	2.279	0.000	12.6	142.347	Surcharged
SMH 1.05	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	80.363	77.617	79.703	2.086	15.2	2.360	0.000	9.0	280.748	Surcharged

SMH 1.09	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	79.500	77.362	79.221	1.859	5.2	2.102	0.000	5.2	496.690	Surcharged
SMH 2.03	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	81.401	79.720	80.791	1.071	19.3	1.211	0.000	14.2	58.027	Surcharged
SMH 6.01	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	79.354	77.369	78.798	1.451	3.4	2.077	0.000	1.9	132.982	Surcharged
SMH 1.24	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	77.530	76.207	76.283	0.076	8.8	0.086	0.000	8.8	49.170	OK
SMH 10.00	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.140	76.682	77.829	1.147	1.3	1.298	0.000	1.2	42.681	Surcharged
SMH 9.02	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	80.182	77.582	77.829	0.247	3.3	0.280	0.000	3.3	113.833	OK
SMH 9.01	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.013	78.963	79.035	0.072	31.6	0.081	0.000	31.0	14.777	OK
SMH 9.00	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.518	79.668	79.749	0.081	32.0	0.092	0.000	31.6	14.787	OK
SMH 1.19	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.677	76.517	77.829	1.312	9.8	1.484	0.000	9.7	1062.295	Surcharged
SMH 3.00	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	79.558	78.139	79.222	1.083	0.6	1.225	0.000	0.2	1.486	Surcharged
SMH 5.03	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.288	79.447	79.544	0.097	43.7	0.110	0.000	42.8	35.349	OK
SMH 8.01	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.969	76.973	77.830	0.857	1.6	0.969	0.000	1.5	55.601	Surcharged
SMH 1.22	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.700	76.398	77.828	1.430	8.9	1.617	0.000	8.8	1096.483	Surcharged
SMH 1.23	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	78.497	76.258	76.334	0.076	8.8	0.085	0.000	8.8	49.389	OK
SMH 11.00	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	80.688	78.888	79.704	0.816	1.2	0.923	0.000	0.5	1.382	Surcharged
SMH 12.01	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	78.510	76.752	77.920	1.169	1.0	1.322	0.000	0.7	24.847	Surcharged
SMH 12.00	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	78.280	76.850	77.920	1.070	2.4	1.211	0.000	2.1	26.292	Surcharged
SMH 13.00	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.280	76.950	77.829	0.879	0.8	0.994	0.000	0.8	26.495	Surcharged

CRITICAL STORM - SUDS MAX. DEPTH

DOBA 2334:	Date:		
Residential Zone lands at Ratoath Surface Water Calculations	06/06/2024		
	Designed by:	Checked by:	Approved By:
	EC	AL	AL
Report Details: Type: Stormwater Controls Summary Storm Phase: Surface Network 1	Company Address:		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Elevation (m)	Max. DS Elevation (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Tank 4	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.793	78.793	2.093	2.093	13.5	489.171	0.000	0.000	7.2	1407.040	0.066	OK
Tank 2	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	79.221	79.221	1.801	1.801	11.7	273.154	0.000	0.000	5.0	414.002	0.102	OK
Tank 1	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	79.704	79.704	2.054	2.054	24.4	160.976	0.000	0.000	7.6	104.227	0.216	OK
Porous Paving 1	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.344	81.336	0.099	0.116	3.4	1.076	0.000	0.000	2.7	2.302	76.249	OK
Porous Paving 2	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.112	81.092	0.122	0.152	7.3	2.742	0.000	0.000	5.3	5.138	69.721	OK
Porous Paving 3	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.060	81.051	0.095	0.111	3.0	1.029	0.000	0.000	2.5	2.078	77.272	OK
Porous Paving 4	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.355	81.347	0.110	0.127	4.2	1.185	0.000	0.000	3.5	3.035	73.827	OK
Porous Paving 5	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.335	81.325	0.090	0.105	2.6	0.977	0.000	0.000	2.1	1.775	78.429	OK
Porous Paving 6	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.336	81.326	0.091	0.106	2.7	0.984	0.000	0.000	2.2	1.812	78.281	OK
Porous Paving 7	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.326	81.312	0.081	0.092	1.9	0.866	0.000	0.000	1.4	1.214	80.887	OK
Porous Paving 8	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.335	81.326	0.090	0.106	2.7	0.981	0.000	0.000	2.1	1.796	78.341	OK
Porous Paving 9	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.346	81.332	0.081	0.092	1.9	0.862	0.000	0.000	1.4	1.204	80.959	OK
Porous Paving 10	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.323	81.311	0.078	0.091	1.9	0.842	0.000	0.000	1.3	1.206	81.401	OK
Porous Paving 11	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.327	81.315	0.082	0.095	2.4	0.443	0.000	0.000	1.6	0.817	80.536	OK

Porous Paving 12	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.346	81.332	0.081	0.092	1.9	0.864	0.000	0.000	1.4	1.209	80.923	OK
Porous Paving 13	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.446	81.431	0.081	0.091	1.9	0.860	0.000	0.000	1.4	1.193	81.006	OK
Porous Paving 14	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.458	81.450	0.093	0.110	2.9	1.013	0.000	0.000	2.4	1.989	77.624	OK
Porous Paving 15	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	81.538	81.522	0.073	0.082	1.2	0.772	0.000	0.000	0.9	1.342	82.955	OK
Porous Paving 16	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.438	79.423	0.173	0.183	10.1	3.551	0.000	0.000	7.0	7.439	60.673	OK
Porous Paving 17	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.252	81.241	0.087	0.101	2.4	0.936	0.000	0.000	1.8	1.547	79.328	OK
Porous Paving 18	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.340	81.324	0.095	0.104	2.6	0.993	0.000	0.000	2.0	1.686	78.082	OK
Porous Paving 19	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.333	81.322	0.088	0.102	2.5	0.953	0.000	0.000	2.0	1.635	78.966	OK
Porous Paving 20	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.364	79.357	0.099	0.117	3.4	1.080	0.000	0.000	2.8	2.384	76.151	OK
Porous Paving 21	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.345	79.330	0.080	0.090	1.9	0.850	0.000	0.000	1.3	1.152	81.223	OK
Porous Paving 24	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.545	80.530	0.080	0.090	1.5	0.424	0.000	0.000	1.3	1.025	81.403	OK
Porous Paving 25	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.546	80.532	0.081	0.092	1.9	0.863	0.000	0.000	1.4	1.203	80.934	OK
Porous Paving 26	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.045	81.031	0.080	0.091	1.9	0.853	0.000	0.000	1.3	1.163	81.174	OK
Porous Paving 27	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.041	81.023	0.076	0.083	1.2	0.398	0.000	0.000	1.0	0.765	82.531	OK
Porous Paving 28	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	80.024	80.003	0.059	0.063	0.4	0.305	0.000	0.000	0.2	0.351	86.614	OK
Porous Paving 29	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.044	80.029	0.079	0.089	1.8	0.840	0.000	0.000	1.3	1.112	81.449	OK
Porous Paving 30	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.994	80.980	0.079	0.090	1.8	0.846	0.000	0.000	1.3	1.137	81.310	OK

Porous Paving 33	FSR 100 yr: 100 years: +20 %: 180 mins: Winter	80.019	80.017	0.067	0.077	1.2	3.230	0.000	0.000	0.7	3.232	84.062	OK
Porous Paving 34	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.675	80.524	0.160	0.184	16.9	6.566	0.000	0.000	7.1	9.010	58.834	OK
Porous Paving 35	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	80.642	80.632	0.202	0.342	6.5	8.211	0.000	0.000	5.4	7.467	39.942	OK
Porous Paving 36	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	79.142	79.134	0.189	0.194	11.7	7.652	0.000	0.000	7.5	14.912	57.523	OK
Porous Paving 37	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.941	80.926	0.076	0.086	1.7	0.810	0.000	0.000	1.1	1.005	82.109	OK
Porous Paving 38	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.254	80.244	0.089	0.104	2.6	0.967	0.000	0.000	2.0	1.718	78.646	OK
Porous Paving 39	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.944	80.928	0.079	0.088	1.4	0.417	0.000	0.000	1.2	0.950	81.705	OK
Porous Paving 40	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	79.107	79.107	0.142	0.167	0.2	1.548	0.000	0.000	0.9	7.397	65.808	OK
Porous Paving 41	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	79.109	79.109	0.144	0.169	0.1	0.784	0.000	0.000	0.5	3.633	65.597	OK
Porous Paving 42	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.246	80.232	0.081	0.092	1.9	0.862	0.000	0.000	1.4	1.204	80.959	OK
Porous Paving 43	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.961	80.954	0.096	0.114	3.4	0.524	0.000	0.000	2.6	1.201	77.012	OK
Porous Paving 44	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.739	79.724	0.074	0.084	1.2	0.394	0.000	0.000	1.0	0.819	82.701	OK
Porous Paving 45	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.750	79.741	0.085	0.101	2.4	0.930	0.000	0.000	1.9	1.637	79.457	OK
Porous Paving 46	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.346	80.337	0.081	0.097	2.1	0.888	0.000	0.000	1.6	1.431	80.396	OK
Porous Paving 47	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.359	80.353	0.094	0.113	3.1	1.034	0.000	0.000	2.5	2.200	77.178	OK
Porous Paving 48	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	79.270	79.264	0.105	0.124	4.5	2.859	0.000	0.000	3.3	5.639	74.651	OK
Porous Paving 49	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.743	79.732	0.078	0.092	1.9	0.849	0.000	0.000	1.4	1.261	81.254	OK

Porous Paving 50	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	79.699	79.700	0.134	0.160	0.6	1.470	0.000	0.000	0.6	6.578	67.538	OK
Porous Paving 51	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.859	79.853	0.094	0.113	3.4	0.516	0.000	0.000	2.5	1.204	77.372	OK
Porous Paving 52	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.960	79.953	0.095	0.113	4.2	0.520	0.000	0.000	2.6	1.463	77.161	OK
Porous Paving 53	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	79.675	79.675	0.110	0.135	0.4	1.230	0.000	0.000	0.5	4.078	72.840	OK
Porous Paving 54	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	79.705	79.705	0.140	0.165	0.4	0.762	0.000	0.000	0.4	4.260	66.554	OK
Porous Paving 55	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.959	79.949	0.094	0.109	2.9	1.016	0.000	0.000	2.3	1.913	77.574	OK
Porous Paving 56	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	79.741	79.723	0.076	0.083	1.2	0.792	0.000	0.000	1.0	1.330	82.504	OK
Porous Paving 57	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.068	80.061	0.103	0.121	3.9	0.559	0.000	0.000	3.1	1.394	75.468	OK
Porous Paving 58	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.850	79.836	0.085	0.096	2.5	0.453	0.000	0.000	1.6	0.783	80.102	OK
Porous Paving 59	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.864	79.847	0.099	0.107	2.8	1.029	0.000	0.000	2.2	1.782	77.274	OK
Porous Paving 60	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	79.706	79.706	0.141	0.166	0.7	1.536	0.000	0.000	0.7	7.790	66.084	OK
Porous Paving 62	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	80.063	80.043	0.198	0.203	12.4	8.010	0.000	0.000	7.9	16.071	55.571	OK
Tank 5	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	77.828	77.828	1.409	1.409	11.3	72.698	0.000	0.000	8.9	1097.298	2.257	OK
Porous Paving 63	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.161	79.152	0.096	0.112	3.0	0.994	0.000	0.000	2.5	2.031	77.134	OK
Porous Paving 64	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.058	79.048	0.093	0.108	2.8	0.964	0.000	0.000	2.3	1.831	77.822	OK
Porous Paving 65	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	78.941	78.925	0.076	0.085	1.6	0.769	0.000	0.000	1.0	0.952	82.321	OK
Porous Paving 66	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	78.964	78.955	0.099	0.115	3.3	1.028	0.000	0.000	2.7	2.260	76.366	OK

Porous Paving 67	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.777	78.777	0.262	0.287	0.1	2.639	0.000	0.000	0.4	7.675	39.314	OK
Porous Paving 69	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	78.855	78.843	0.090	0.103	2.5	0.924	0.000	0.000	2.0	1.605	78.757	OK
Tank 3	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.798	78.798	1.547	1.547	4.6	59.108	0.000	0.000	0.8	53.688	0.504	OK
Detention Basin 1	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	79.704	79.704	0.154	0.154	9.4	13.413	0.000	0.000	4.2	40.530	54.242	OK
Detention Basin 2	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	79.221	79.221	0.041	0.041	1.3	7.897	0.000	0.000	2.2	29.334	82.892	OK
Porous Paving 130	FSR 100 yr: 100 years: +20 %: 15 mins: Summer	80.865	80.840	0.000	0.000	0.0	0.000	0.000	0.000	0.0	0.000	100.000	OK
Porous Paving 129	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	80.770	80.769	0.155	0.179	1.7	0.835	0.000	0.000	1.5	2.244	63.337	OK
Porous Paving 125	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.757	79.749	0.092	0.109	3.1	0.504	0.000	0.000	2.4	1.060	77.862	OK
Porous Paving 61	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.742	79.723	0.077	0.083	1.1	0.399	0.000	0.000	1.0	0.733	82.480	OK
Porous Paving 80	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.841	79.823	0.076	0.083	1.1	0.397	0.000	0.000	1.0	0.717	82.555	OK
Porous Paving 31	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.579	80.570	0.114	0.130	4.5	1.219	0.000	0.000	3.7	3.202	73.077	OK
Porous Paving 134	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.899	79.885	0.084	0.095	2.4	0.448	0.000	0.000	1.5	0.768	80.329	OK
Porous Paving 32	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.742	80.723	0.077	0.083	1.2	0.400	0.000	0.000	1.0	0.738	82.443	OK
Porous Paving 123	FSR 100 yr: 100 years: +20 %: 240 mins: Winter	79.012	78.995	0.047	0.055	0.1	0.255	0.000	0.000	0.1	0.274	88.826	OK
Porous Paving 122	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.054	79.043	0.089	0.103	2.5	0.959	0.000	0.000	2.0	1.598	78.819	OK
Porous Paving 120	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.053	79.040	0.088	0.100	2.3	0.937	0.000	0.000	1.8	1.479	79.305	OK
Porous Paving 118	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.047	79.031	0.082	0.091	2.3	0.433	0.000	0.000	1.4	0.705	80.978	OK

Porous Paving 117	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.048	79.032	0.083	0.092	2.3	0.438	0.000	0.000	1.4	0.724	80.769	OK
Porous Paving 115	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.048	79.032	0.083	0.092	2.3	0.437	0.000	0.000	1.4	0.722	80.802	OK
Porous Paving 113	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.048	79.032	0.083	0.092	2.3	0.438	0.000	0.000	1.4	0.724	80.769	OK
Porous Paving 133	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.542	79.523	0.077	0.083	1.2	0.401	0.000	0.000	1.0	0.743	82.407	OK
Porous Paving 132	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.357	79.349	0.092	0.109	3.1	0.503	0.000	0.000	2.3	1.049	77.934	OK
Porous Paving 128	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.102	80.083	0.077	0.083	1.2	0.400	0.000	0.000	1.0	0.738	82.443	OK
Porous Paving 126	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.842	79.824	0.077	0.084	1.2	0.402	0.000	0.000	1.0	0.760	82.367	OK
Porous Paving 68	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.757	79.749	0.092	0.109	3.1	0.503	0.000	0.000	2.3	1.049	77.934	OK
Porous Paving 107	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.357	81.349	0.092	0.109	3.1	0.503	0.000	0.000	2.3	1.049	77.934	OK
Porous Paving 106	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.342	81.324	0.077	0.084	1.2	0.402	0.000	0.000	1.0	0.760	82.367	OK
Porous Paving 104	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.442	81.423	0.077	0.083	1.2	0.400	0.000	0.000	1.0	0.738	82.443	OK
Porous Paving 124	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.442	81.423	0.077	0.083	1.2	0.400	0.000	0.000	1.0	0.738	82.443	OK
Detention Basin 4	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.793	78.793	0.193	0.193	2.9	54.836	0.000	0.000	2.3	108.937	38.659	OK
Porous Paving 84	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.759	79.751	0.094	0.111	3.2	0.513	0.000	0.000	2.5	1.109	77.498	OK
Porous Paving 82	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	79.690	79.690	0.125	0.150	0.2	0.686	0.000	0.000	0.4	2.546	69.890	OK
Porous Paving 103	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.442	81.423	0.077	0.083	1.1	0.399	0.000	0.000	1.0	0.733	82.480	OK
Porous Paving 105	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.342	81.323	0.077	0.083	1.1	0.399	0.000	0.000	1.0	0.733	82.480	OK

Porous Paving 23	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.042	81.023	0.077	0.083	1.1	0.399	0.000	0.000	1.0	0.733	82.480	OK
Porous Paving 22	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	80.534	80.515	0.069	0.075	0.9	0.722	0.000	0.000	0.6	0.935	84.054	OK
Porous Paving 86	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.042	81.023	0.077	0.083	1.2	0.400	0.000	0.000	1.0	0.738	82.443	OK
Porous Paving 78	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.322	81.303	0.077	0.083	1.2	0.400	0.000	0.000	1.0	0.738	82.443	OK
Porous Paving 77	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.322	81.303	0.077	0.083	1.2	0.400	0.000	0.000	1.0	0.738	82.443	OK
Porous Paving 95	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.042	81.023	0.077	0.083	1.1	0.398	0.000	0.000	1.0	0.723	82.519	OK
Porous Paving 108	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.042	81.023	0.077	0.083	1.2	0.401	0.000	0.000	1.0	0.754	82.403	OK
Porous Paving 93	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.042	81.023	0.077	0.083	1.1	0.398	0.000	0.000	1.0	0.728	82.516	OK
Porous Paving 76	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.322	81.304	0.077	0.084	1.2	0.402	0.000	0.000	1.0	0.760	82.367	OK
Porous Paving 70	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.322	81.303	0.077	0.083	1.1	0.398	0.000	0.000	1.0	0.723	82.519	OK
Porous Paving 97	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.322	81.303	0.077	0.083	1.1	0.398	0.000	0.000	1.0	0.728	82.516	OK
Porous Paving 90	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.322	81.303	0.077	0.083	1.1	0.399	0.000	0.000	1.0	0.733	82.480	OK
Porous Paving 91	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.337	81.329	0.092	0.109	3.1	0.504	0.000	0.000	2.4	1.060	77.862	OK
Porous Paving 89	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.322	81.303	0.077	0.083	1.2	0.400	0.000	0.000	1.0	0.738	82.443	OK
Porous Paving 88	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.351	81.337	0.086	0.097	2.5	0.456	0.000	0.000	1.7	0.803	79.978	OK
Porous Paving 87	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.358	81.350	0.093	0.110	3.1	0.506	0.000	0.000	2.4	1.066	77.811	OK
Porous Paving 96	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	80.647	80.647	0.182	0.207	0.9	0.973	0.000	0.000	1.9	1.123	57.301	OK

Porous Paving 127	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.117	80.109	0.092	0.109	3.1	0.503	0.000	0.000	2.3	1.052	77.908	OK
Porous Paving 131	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.192	80.173	0.077	0.083	1.2	0.400	0.000	0.000	1.0	0.738	82.443	OK
Porous Paving 109	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.342	79.323	0.077	0.083	1.2	0.400	0.000	0.000	1.0	0.738	82.443	OK
Porous Paving 119	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.045	79.028	0.080	0.088	1.4	0.419	0.000	0.000	1.2	0.934	81.598	OK
Porous Paving 110	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.047	79.031	0.082	0.091	1.6	0.431	0.000	0.000	1.3	1.068	81.077	OK
Porous Paving 116	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.035	79.013	0.070	0.073	0.8	0.356	0.000	0.000	0.6	0.414	84.394	OK
Porous Paving 112	FSR 100 yr: 100 years: +20 %: 360 mins: Winter	79.006	78.994	0.041	0.054	0.0	0.237	0.000	0.000	0.0	0.250	89.592	OK
Porous Paving 121	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.047	79.031	0.082	0.091	2.3	0.434	0.000	0.000	1.4	0.708	80.945	OK
Porous Paving 114	FSR 100 yr: 100 years: +20 %: 180 mins: Winter	79.012	78.995	0.047	0.055	0.1	0.253	0.000	0.000	0.1	0.231	88.895	OK
Porous Paving 111	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	79.124	79.101	0.059	0.061	0.3	0.300	0.000	0.000	0.2	0.274	86.855	OK
Porous Paving 85	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.148	79.132	0.083	0.092	2.3	0.437	0.000	0.000	1.4	0.722	80.802	OK
Porous Paving 94	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.448	81.432	0.083	0.092	2.3	0.438	0.000	0.000	1.4	0.724	80.769	OK
Porous Paving 92	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.448	81.433	0.083	0.093	2.3	0.439	0.000	0.000	1.4	0.727	80.737	OK
Porous Paving 75	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	81.425	81.402	0.060	0.062	0.3	0.304	0.000	0.000	0.2	0.290	86.661	OK
Porous Paving 79	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.448	81.432	0.083	0.092	2.3	0.438	0.000	0.000	1.4	0.724	80.769	OK
Porous Paving 74	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.448	81.432	0.083	0.092	2.3	0.437	0.000	0.000	1.4	0.722	80.802	OK
Porous Paving 73	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.399	81.384	0.084	0.094	2.4	0.446	0.000	0.000	1.5	0.757	80.430	OK

Porous Paving 72	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.328	81.312	0.083	0.092	2.3	0.437	0.000	0.000	1.4	0.722	80.802	OK
Porous Paving 71	FSR 100 yr: 100 years: +20 %: 60 mins: Summer	81.312	81.289	0.067	0.069	0.6	0.339	0.000	0.000	0.4	0.469	85.103	OK
Porous Paving 102	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.242	81.223	0.077	0.083	1.2	0.400	0.000	0.000	1.0	0.738	82.443	OK
Porous Paving 101	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.298	81.282	0.083	0.092	2.3	0.437	0.000	0.000	1.4	0.722	80.802	OK
Porous Paving 98	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.251	81.237	0.086	0.097	2.5	0.456	0.000	0.000	1.7	0.803	79.978	OK
Porous Paving 100	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	81.246	81.242	0.031	0.052	0.0	0.206	0.000	0.000	0.0	0.124	90.953	OK
Porous Paving 99	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.298	81.282	0.083	0.092	2.3	0.437	0.000	0.000	1.4	0.719	80.835	OK
Tree Pit 2	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.891	79.885	0.081	0.085	2.2	0.132	0.000	0.000	2.1	0.880	93.787	OK
Tree Pit 3	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	80.813	80.812	0.703	0.712	4.6	1.132	0.000	0.000	3.1	6.704	46.804	OK
Tree Pit 8	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.191	80.187	0.081	0.087	2.2	0.135	0.000	0.000	2.0	0.881	93.678	OK
Tree Pit 9	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.251	80.249	0.141	0.149	10.4	0.232	0.000	0.000	10.0	4.650	89.110	OK
Tree Pit 19	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.178	80.167	0.068	0.067	0.8	0.108	0.000	0.000	0.8	0.277	94.920	OK
Tree Pit 20	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.869	79.857	0.059	0.057	0.2	0.093	0.000	0.000	0.2	0.123	95.642	OK
Tree Pit 21	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.923	79.921	0.113	0.121	6.5	0.187	0.000	0.000	6.3	2.783	91.188	OK
Tree Pit 22	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.089	79.090	0.179	0.190	1.2	0.295	0.000	0.000	0.5	0.866	86.129	OK
Tree Pit 25	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.445	80.443	0.135	0.143	9.6	0.222	0.000	0.000	9.4	4.295	89.571	OK
Tree Pit 26	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.412	80.409	0.102	0.109	5.0	0.169	0.000	0.000	4.8	2.057	92.061	OK

Tree Pit 27	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.382	80.373	0.072	0.073	1.2	0.115	0.000	0.000	1.1	0.435	94.580	OK
Tree Pit 28	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.316	80.314	0.106	0.114	4.7	0.176	0.000	0.000	4.3	1.935	91.746	OK
Tree Pit 10	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.175	80.164	0.065	0.064	0.6	0.103	0.000	0.000	0.6	0.196	95.141	OK
Tree Pit 12	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	80.812	80.812	0.702	0.712	2.7	1.132	0.000	0.000	1.8	3.985	46.816	OK
Tree Pit 13	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.025	80.023	0.115	0.123	6.8	0.190	0.000	0.000	6.6	2.896	91.051	OK
Tree Pit 14	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	80.802	80.803	0.492	0.503	1.7	0.797	0.000	0.000	1.4	2.417	62.563	OK
Tree Pit 16	FSR 100 yr: 100 years: +20 %: 180 mins: Winter	80.149	80.149	0.239	0.249	0.1	0.391	0.000	0.000	0.6	0.348	81.642	OK
Tree Pit 4	FSR 100 yr: 100 years: +20 %: 120 mins: Winter	80.683	80.683	0.773	0.783	0.6	1.245	0.000	0.000	1.9	1.779	41.484	OK
Tree Pit 5	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.825	78.825	0.215	0.225	0.0	0.352	0.000	0.000	0.1	0.898	83.480	OK
Tree Pit 6	FSR 100 yr: 100 years: +20 %: 960 mins: Winter	78.825	78.825	0.315	0.325	0.0	0.512	0.000	0.000	0.4	1.013	75.921	OK
Tree Pit 7	FSR 100 yr: 100 years: +20 %: 15 mins: Summer	78.509	78.500	0.000	0.000	0.0	0.000	0.000	0.000	0.0	0.000	100.000	OK
Tree Pit 11	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.452	78.452	0.442	0.452	0.0	0.715	0.000	0.000	0.6	1.362	66.412	OK
Tree Pit 17	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	78.603	78.603	0.343	0.353	0.0	0.556	0.000	0.000	1.4	1.038	73.848	OK
Tree Pit 18	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.794	78.794	0.884	0.894	0.1	1.422	0.000	0.000	0.8	8.684	33.167	OK
Tree Pit 1	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	79.706	79.706	0.796	0.806	2.0	1.282	0.000	0.000	2.0	22.939	39.747	OK
Tree Pit 29	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	79.706	79.706	0.796	0.806	0.6	1.281	0.000	0.000	1.3	7.084	39.775	OK
Tree Pit 23	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	78.969	78.957	0.059	0.057	0.2	0.093	0.000	0.000	0.2	0.128	95.623	OK

Tree Pit 31	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.793	78.793	0.783	0.793	0.1	1.262	0.000	0.000	0.8	10.145	40.709	OK
Tree Pit 24	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	78.796	78.792	0.086	0.092	2.9	0.143	0.000	0.000	2.8	1.194	93.298	OK
Tree Pit 32	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.793	78.793	0.883	0.893	0.3	1.421	0.000	0.000	2.4	23.413	33.208	OK
Tree Pit 30	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.763	78.763	0.953	0.963	0.0	1.533	0.000	0.000	0.6	4.152	27.950	OK
Tree Pit 33	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.820	78.820	1.310	1.320	0.2	2.104	0.000	0.000	1.2	18.197	28.138	OK
Tree Pit 34	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.820	78.820	1.210	1.220	0.4	1.944	0.000	0.000	2.1	27.264	33.615	OK
Tree Pit 15	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	80.769	80.770	0.359	0.370	1.0	0.583	0.000	0.000	0.9	1.416	72.589	OK
Raingard en 17	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.863	80.834	0.113	0.084	1.9	0.686	0.000	0.000	1.0	0.809	78.042	OK
Raingard en 18	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.763	80.734	0.113	0.084	1.9	0.685	0.000	0.000	1.0	0.814	78.066	OK
Raingard en 20	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.269	80.239	0.119	0.089	2.2	0.720	0.000	0.000	1.2	1.005	76.973	OK
Raingard en 19	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.968	79.938	0.118	0.088	2.2	0.716	0.000	0.000	1.2	0.983	77.091	OK
Raingard en 1	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.401	81.372	0.151	0.122	5.0	0.856	0.000	0.000	3.1	1.406	70.401	OK
Raingard en 2	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.182	81.157	0.132	0.107	3.9	0.723	0.000	0.000	2.2	1.045	73.915	OK
Raingard en 3	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.166	81.139	0.116	0.089	2.0	0.626	0.000	0.000	1.2	0.996	77.388	OK
Raingard en 4	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.178	81.154	0.128	0.104	3.8	0.703	0.000	0.000	2.0	0.987	74.621	OK
Raingard en 5	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.490	81.464	0.140	0.114	4.4	0.767	0.000	0.000	2.6	1.187	72.324	OK
Raingard en 10	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.263	81.237	0.113	0.087	1.8	0.613	0.000	0.000	1.1	0.895	77.869	OK

Raingarden 6	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	81.405	81.377	0.155	0.127	5.2	0.852	0.000	0.000	3.4	1.492	69.262	OK
Raingarden 7	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	80.997	80.982	0.097	0.082	1.6	0.301	0.000	0.000	0.9	0.427	80.697	OK
Raingarden 12	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.255	81.227	0.105	0.077	1.6	0.725	0.000	0.000	0.7	0.613	79.483	OK
Raingarden 14	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.349	81.330	0.099	0.080	1.1	0.328	0.000	0.000	0.9	0.661	80.498	OK
Raingarden 15	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.549	79.530	0.099	0.080	1.1	0.326	0.000	0.000	0.8	0.647	80.597	OK
Raingarden 11	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.263	79.237	0.113	0.087	1.8	0.613	0.000	0.000	1.1	0.899	77.866	OK
Raingarden 8	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	81.148	81.125	0.098	0.075	1.1	0.423	0.000	0.000	0.6	0.474	81.046	OK
Raingarden 9	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.150	80.127	0.100	0.077	1.2	0.435	0.000	0.000	0.7	0.549	80.498	OK
Raingarden 13	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	79.248	79.223	0.098	0.073	1.0	0.686	0.000	0.000	0.6	0.837	80.601	OK
Raingarden 16	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.096	79.055	0.146	0.105	3.9	1.304	0.000	0.000	2.1	1.816	71.740	OK
Raingarden 21	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.984	79.972	0.134	0.122	3.5	0.655	0.000	0.000	1.8	0.925	72.840	OK
Raingarden 22	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.155	80.134	0.105	0.084	1.4	0.405	0.000	0.000	1.0	0.787	79.543	OK
Raingarden 25	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.958	79.933	0.108	0.083	1.5	0.531	0.000	0.000	1.0	0.749	78.993	OK
Raingarden 24	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.063	80.034	0.113	0.084	1.9	0.693	0.000	0.000	1.0	0.810	78.058	OK
Raingarden 23	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	80.005	79.961	0.155	0.111	4.4	1.248	0.000	0.000	2.4	2.138	70.450	OK
Detention Basin 3	FSR 100 yr: 100 years: +20 %: 2880 mins: Winter	78.798	78.798	0.148	0.148	0.4	6.310	0.000	0.000	0.3	10.720	38.270	OK
Filter Drain 1	FSR 100 yr: 100 years: +20 %: 60 mins: Winter	80.787	80.791	0.740	0.841	8.5	7.398	0.000	0.000	5.9	12.598	24.705	OK

Porous Paving 81	FSR 100 yr: 100 years: +20 %: 15 mins: Winter	79.849	79.835	0.084	0.095	2.4	0.447	0.000	0.000	1.5	0.765	80.361	OK
Porous Paving 83	FSR 100 yr: 100 years: +20 %: 30 mins: Winter	79.751	79.738	0.086	0.098	2.2	0.919	0.000	0.000	1.7	1.386	79.710	OK
Porous Paving 135	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	77.692	77.692	0.277	0.302	0.6	11.580	0.000	0.000	0.7	19.947	35.699	OK
Porous Paving 136	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	77.921	77.921	0.256	0.281	2.5	10.066	0.000	0.000	2.4	26.639	40.453	OK
Filter Drain 2	FSR 100 yr: 100 years: +20 %: 480 mins: Winter	77.921	77.921	1.271	1.321	2.1	5.183	0.000	0.000	1.0	25.158	11.233	OK
Raingarden 26	FSR 100 yr: 100 years: +20 %: 1440 mins: Winter	77.860	77.860	0.960	0.960	0.2	4.201	0.000	0.000	0.6	6.404	13.698	OK

Project	Residential Zone Lands at Ballybin, Ratoath, Co. Meath
Project No.	DOBA2334
Calculation	Interception Calculations

DONNACHADH O'BRIEN
& ASSOCIATES CONSULTING ENGINEERS

Sub-Catchment		**1**	
Interception Storage required			
Interception Storage required	=	Sub-Catchment area x min. rainfall	
Sub-Catchment Area	=	11386	m^2
Minimum Rainfall	=	10	mm
Total required	=	**114**	**m^3**
Interception Storage Provided			
Area Type		SuDS Feature Interception Volume	
Tree Pit	=	15.6	m^3
Rain garden	=	19.2	m^3
Permeable Paving	=	103.5	m^3
Bioretention Areas	=	5.8	m^3
Attenuation Tank	=	11.3	m^3
Total provided	=	**155**	**m^3**
Interception Storage Provided	**>**	**Interception Storage Required**	

Interception Calculation		
Tree Pit		
Length	2.0	m
Width	2.0	m
Depth of stone below invert	0.75	m
Void ratio	0.4	
Volume	1.2	m^3
No. Tree Pits	13	nr
Interception Volume	15.6	m^3

Rain garden		
Length	240.0	m
Width	1.0	m
Depth of stone below invert	0.2	m
Voids Ratio	0.4	
Interception Volume	19.2	m^3

Permeable Paving		
Area	862.5	m^2
Depth of stone below invert	0.3	m
Voids Ratio	0.4	
Interception Volume	103.5	m^3

Bioretention Areas		
Area	144.0	m^2
Depth of stone below invert	0.1	m
Voids Ratio	0.4	
Interception Volume	5.8	m^3

Attenuation Tank		
Length	22.7	m
Width	8.3	m
Depth of Stone below invert	0.2	m
Void Ratio	0.4	
Interception Volume	11.3	m^3

Total Interception Storage Provided	155.4	m^3

Project	Residential Zone Lands at Ballybin, Ratoath, Co. Meath
Project No.	DOBA2334
Calculation	Interception Calculations

DONNACHADH O'BRIEN & ASSOCIATES CONSULTING ENGINEERS

Sub-Catchment	**2**		
Interception Storage required			
Interception Storage required	=	Sub-Catchment area x min. rainfall	
Sub-Catchment Area	=	7431	m^2
Minimum Rainfall	=	10	mm
Total required	=	**74**	**m^3**
Interception Storage Provided			
Area Type		SuDS Feature Interception Volume	
Tree Pit	=	7.2	m^3
Rain garden	=	11.2	m^3
Permeable Paving	=	88.5	m^3
Bioretention Areas	=	6.8	m^3
Attenuation Tank	=	21.4	m^3
Total provided	**=**	**135**	**m^3**
Interception Storage Provided	**>**	**Interception Storage Required**	

Interception Calculation		
Tree Pit		
Length	2.0	m
Width	2.0	m
Depth of stone below invert	0.75	m
Void ratio	0.4	
Volume	1.2	m^3
No. Tree Pits	6	nr
Interception Volume	7.2	m^3

Rain garden		
Length	140.0	m
Width	1.0	m
Depth of stone below invert	0.2	m
Voids Ratio	0.4	
Interception Volume	11.2	m^3

Permeable Paving		
Area	737.5	m^2
Depth of stone below invert	0.3	m
Voids Ratio	0.4	
Interception Volume	88.5	m^3

Bioretention Areas		
Area	169.0	m^2
Depth of stone below invert	0.1	m
Voids Ratio	0.4	
Interception Volume	6.8	m^3

Attenuation Tank		
Length	31.0	m
Width	11.5	m
Depth of Stone below invert	0.2	m
Void Ratio	0.4	
Interception Volume	21.4	m^3

Total Interception Storage Provided	135.1	m^3

Project	Residential Zone Lands at Ballybin, Ratoath, Co. Meath
Project No.	DOBA2334
Calculation	Interception Calculations

DONNACHADH O'BRIEN & ASSOCIATES CONSULTING ENGINEERS

Sub-Catchment	**3**		
Interception Storage required			
Interception Storage required	=	Sub-Catchment area x min. rainfall	
Sub-Catchment Area	=	3311	m^2
Minimum Rainfall	=	10	mm
Total required	=	**33**	**m^3**
Interception Storage Provided			
Area Type		SuDS Feature Interception Volume	
Tree Pit	=	2.4	m^3
Rain garden	=	4.4	m^3
Permeable Paving	=	27.0	m^3
Bioretention Areas	=	1.7	m^3
Attenuation Tank	=	2.2	m^3
Total provided	=	**38**	**m^3**
Interception Storage Provided	**>**	**Interception Storage Required**	

Interception Calculation		
Tree Pit		
Length	2.0	m
Width	2.0	m
Depth of stone below invert	0.75	m
Void ratio	0.4	
Volume	1.2	m^3
No. Tree Pits	2	nr
Interception Volume	2.4	m^3

Rain garden		
Length	55.0	m
Width	1.0	m
Depth of stone below invert	0.2	m
Voids Ratio	0.4	
Interception Volume	4.4	m^3

Permeable Paving		
Area	225.0	m^2
Depth of stone below invert	0.3	m
Voids Ratio	0.4	
Interception Volume	27.0	m^3

Bioretention Areas		
Area	42.0	m^2
Depth of stone below invert	0.1	m
Voids Ratio	0.4	
Interception Volume	1.7	m^3

Attenuation Tank		
Length	6.5	m
Width	5.6	m
Depth of Stone below invert	0.2	m
Void Ratio	0.4	
Interception Volume	2.2	m^3

Total Interception Storage Provided	37.7	m^3

Project	Residential Zone Lands at Ballybin, Ratoath, Co. Meath
Project No.	DOBA2334
Calculation	Interception Calculations

DONNACHADH O'BRIEN & ASSOCIATES CONSULTING ENGINEERS

Sub-Catchment	**4**		
Interception Storage required			
Interception Storage required	=	Sub-Catchment area x min. rainfall	
Sub-Catchment Area	=	10416	m^2
Minimum Rainfall	=	10	mm
Total required	=	**104**	**m^3**
Interception Storage Provided			
Area Type		SuDS Feature Interception Volume	
Tree Pit	=	16.8	m^3
Rain garden	=	14.4	m^3
Permeable Paving	=	79.5	m^3
Bioretention Areas	=	11.7	m^3
Attenuation Tank	=	27.3	m^3
Total provided	=	**150**	**m^3**
Interception Storage Provided	**>**	**Interception Storage Required**	

Interception Calculation		
Tree Pit		
Length	2.0	m
Width	2.0	m
Depth of stone below invert	0.75	m
Void ratio	0.4	
Volume	1.2	m^3
No. Tree Pits	14	nr
Interception Volume	16.8	m^3

Rain garden		
Length	180.0	m
Width	1.0	m
Depth of stone below invert	0.2	m
Voids Ratio	0.4	
Interception Volume	14.4	m^3

Permeable Paving		
Area	662.5	m^2
Depth of stone below invert	0.3	m
Voids Ratio	0.4	
Interception Volume	79.5	m^3

Bioretention Areas		
Area	293.0	m^2
Depth of stone below invert	0.1	m
Voids Ratio	0.4	
Interception Volume	11.7	m^3

Attenuation Tank		
Length	33.0	m
Width	13.8	m
Depth of Stone below invert	0.2	m
Void Ratio	0.4	
Interception Volume	27.3	m^3

Total Interception Storage Provided	149.7	m^3

Project	Residential Zone Lands at Ballybin, Ratoath, Co. Meath
Project No.	DOBA2334
Calculation	Interception Calculations

DONNACHADH O'BRIEN
& ASSOCIATES CONSULTING ENGINEERS

Sub-Catchment	**5**		
Interception Storage required			
Interception Storage required	=	Sub-Catchment area x min. rainfall	
Sub-Catchment Area	=	5292	m^2
Minimum Rainfall	=	10	mm
Total required	=	**53**	**m^3**
Interception Storage Provided			
Area Type		SuDS Feature Interception Volume	
Tree Pit	=	0.0	m^3
Rain garden	=	0.0	m^3
Permeable Paving	=	0.0	m^3
Bioretention Areas	=	0.0	m^3
Attenuation Tank	=	9.9	m^3
Total provided	=	**10**	**m^3**
Interception Storage Provided	<	**Interception Storage Required**	

Interception Calculation		
Tree Pit		
Length	2.0	m
Width	2.0	m
Depth of stone below invert	0.75	m
Void ratio	0.4	
Volume	1.2	m^3
No. Tree Pits	0	nr
Interception Volume	0.0	m^3

Rain garden		
Length	0.0	m
Width	1.0	m
Depth of stone below invert	0.2	m
Voids Ratio	0.4	
Interception Volume	0.0	m^3

Permeable Paving		
Area	0.0	m^2
Depth of stone below invert	0.3	m
Voids Ratio	0.4	
Interception Volume	0.0	m^3

Bioretention Areas		
Area	0.0	m^2
Depth of stone below invert	0.1	m
Voids Ratio	0.4	
Interception Volume	0.0	m^3

Attenuation Tank		
Length	15.0	m
Width	11.0	m
Depth of Stone below invert	0.2	m
Void Ratio	0.4	
Interception Volume	9.9	m^3

Total Interception Storage Provided	9.9	m^3

Project	Residential Zone Lands at Ballybin, Ratoath, Co. Meath
Project No.	DOBA2334
Calculation	Interception Calculations

DONNACHADH O'BRIEN & ASSOCIATES CONSULTING ENGINEERS

Sub-Catchment	**6**		
Interception Storage required			
Interception Storage required	=	Sub-Catchment area x min. rainfall	
Sub-Catchment Area	=	1788	m^2
Minimum Rainfall	=	10	mm
Total required	=	**18**	**m^3**
Interception Storage Provided			
Area Type		SuDS Feature Interception Volume	
Tree Pit	=	0.0	m^3
Rain garden	=	0.4	m^3
Permeable Paving	=	23.2	m^3
Bioretention Areas	=	0.0	m^3
Attenuation Tank	=	0.0	m^3
Total provided	=	**24**	**m^3**
Interception Storage Provided	**>**	**Interception Storage Required**	

Interception Calculation		
Tree Pit		
Length	2.0	m
Width	2.0	m
Depth of stone below invert	0.75	m
Void ratio	0.4	
Volume	1.2	m^3
No. Tree Pits	0	nr
Interception Volume	0.0	m^3

Rain garden		
Length	5.0	m
Width	1.0	m
Depth of stone below invert	0.2	m
Voids Ratio	0.4	
Interception Volume	0.4	m^3

Permeable Paving		
Area	193.0	m^2
Depth of stone below invert	0.3	m
Voids Ratio	0.4	
Interception Volume	23.2	m^3

Bioretention Areas		
Area	0.0	m^2
Depth of stone below invert	0.1	m
Voids Ratio	0.4	
Interception Volume	0.0	m^3

Attenuation Tank		
Length	0.0	m
Width	0.0	m
Depth of Stone below invert	0.2	m
Void Ratio	0.4	
Interception Volume	0.0	m^3

Total Interception Storage Provided	23.6	m^3

Appendix C Uisce Éireann Confirmation of Feasibility

CONFIRMATION OF FEASIBILITY

Alan Lambe

Donnachadh O'Brien & Associates Consulting Engineers
Unit 5C
Elm House
Millenium Park
Naas
Kildare
W91P9P8

Uisce Éireann
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Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

20 June 2024

Our Ref: CDS24003830 Pre-Connection Enquiry
Residential Zone Lands, Ballybin Road, Ratoath, Co. Meath

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 141 unit(s) at Residential Zone Lands, Ballybin Road, Ratoath, Co. Meath, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible without infrastructure upgrade by Irish Water

- Connection is feasible to the 355mm main to the South of the subject site.

- **Wastewater Connection** - Feasible Subject to upgrades

- Approximately 365m of gravity network extension (225mm sewer) will be required for the connection to the Uisce Éireann wastewater network as per the applicant layouts. These extension works are not currently on the Uisce Éireann investment plan therefore, the applicant will be required to fund these local network upgrades. The fee will be calculated at connection application stage.

- There is sufficient storage capacity at Moulden Bridge WWPS (Wastewater Pumping Station) to accommodate this development. Uisce Eireann are currently carrying out a detailed assessment on the operational functionality (Mechanical and Electrical) of the WWPS. This detailed assessment will be completed by Q4 2024 (this may be subject to change), and any operational upgrade requirements (If any) will be known at this stage.
- The applicant will be required to fund a relevant portion of these mechanical and electrical upgrades (If required). The fee will be calculated at Connection Application Stage.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

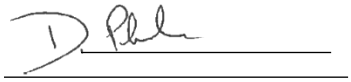
Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Uisce Éireann's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



Dermot Phelan
Connections Delivery Manager

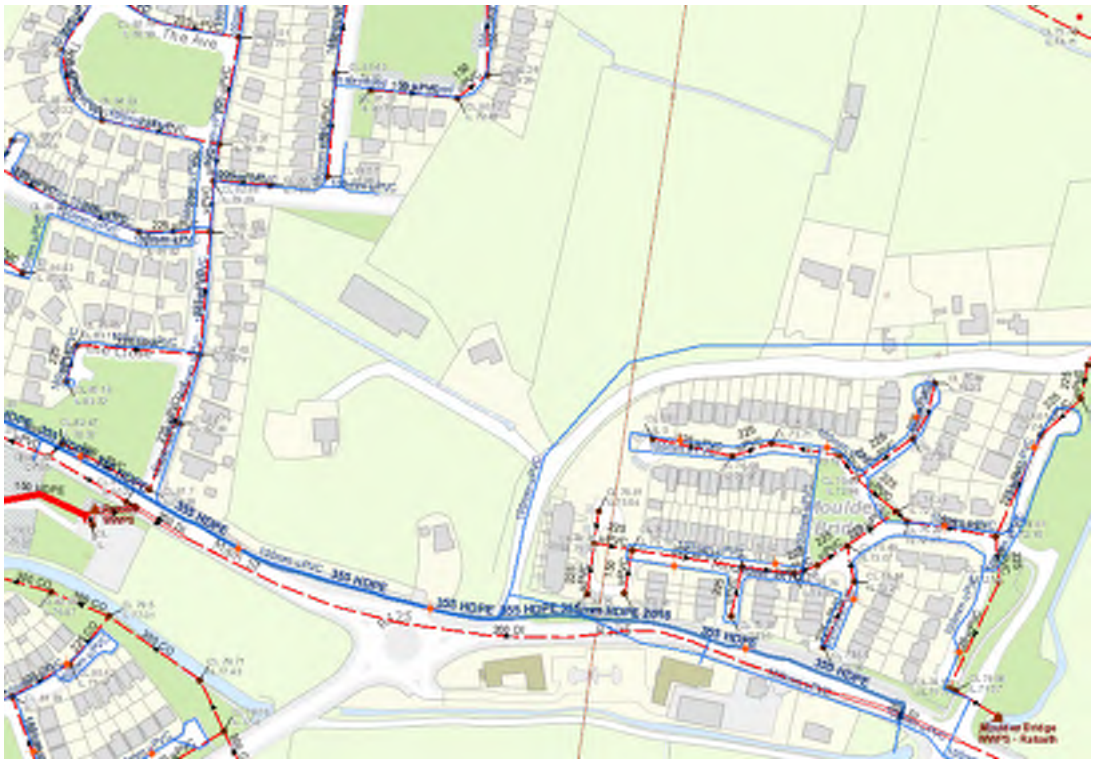
Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Uisce Éireann's Network(s)

The map included below outlines the current Uisce Éireann infrastructure adjacent the Development: To access Uisce Éireann Maps email datarequests@water.ie



Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

Note: The information provided on the included maps as to the position of Uisce Éireann's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Uisce Éireann.

Whilst every care has been taken in respect of the information on Uisce Éireann's network(s), Uisce Éireann assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Uisce Éireann's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann's underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

Appendix D Statement of Design Acceptance

Alan Lambe
Donnachadh O'Brien & Associates
Unit 5C Elm House
Millenium Park
Naas
Kildare
W91P9P8

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

21 June 2024

Re: Design Submission for Residential Zone Lands, Ballybin Road, Ratoath, Meath (the "Development")
(the "Design Submission") / Connection Reference No: CDS24003830

Dear Alan Lambe,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Uisce Éireann has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before you can connect to our network you must sign a connection agreement with Uisce Éireann. This can be applied for by completing the connection application form at www.water.ie/connections. Uisce Éireann's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Uisce Éireann's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Uisce Éireann does not, in any way, render Uisce Éireann liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Uisce Éireann representative:
Name: Antonio Garzón Mielgo
Email: antonio.garzonmielgo@water.ie

Yours sincerely,

Dermot Phelan
Connections Delivery Manager

Appendix A

Document Title & Revision

- 2334-DOB-XX-SI-DR-C-0310 Proposed WW & SW Layout Overall
- 2334-DOB-XX-SI-DR-C-0311 Proposed WW & SW Layout Sheet 1
- 2334-DOB-XX-SI-DR-C-0312 Proposed WW & SW Layout Sheet 2
- 2334-DOB-XX-SI-DR-C-0400 Water Supply Layout
- 2334-DOB-XX-SI-DR-C-1450 Proposed WW Longitudinal Sections

Additional Comments

The design submission will be subject to further technical review at connection application stage.

Uisce Éireann cannot guarantee that its Network in any location will have the capacity to deliver a particular flow rate and associated residual pressure to meet the requirements of the relevant Fire Authority, see Section 1.17 of Water Code of Practice.

*For further information, visit **www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Uisce Éireann will not, in any way, render Uisce Éireann liable for any elements of the design and/or construction of the Self-Lay Works.

N

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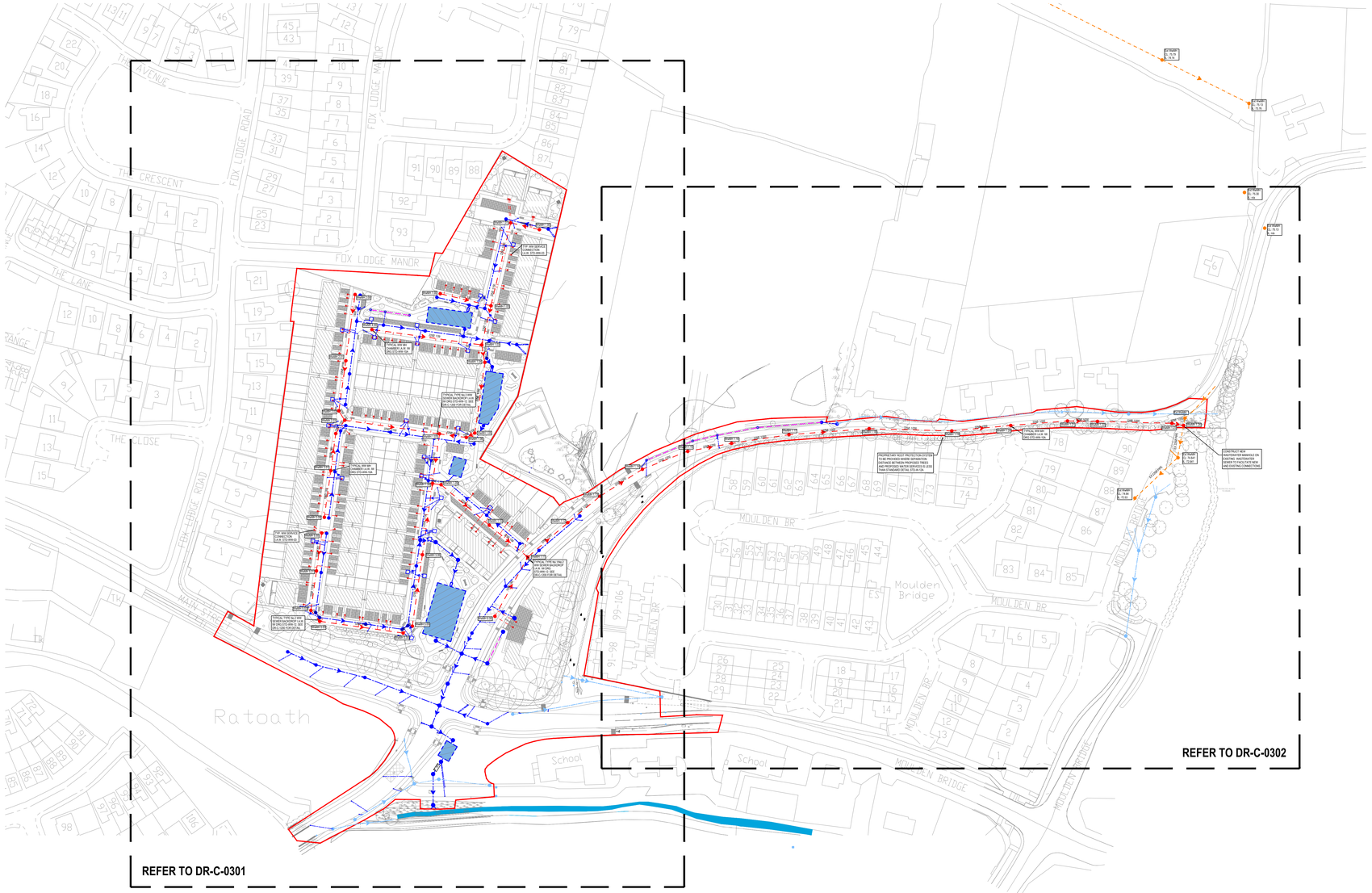


NOTES:

1. FOR STANDARD DOBA NOTES REFER TO DRAWING 2334-DOB-XX-SI-DR-S-0001 & S-0002
2. REFER TO ARCHITECTS DRAWINGS FOR ALL SITE & APPLICATION BOUNDARIES
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT'S & ENGINEER'S DRAWINGS AND SPECIFICATIONS.
4. USE FIGURED DIMENSIONS ONLY. DO NOT SCALE
5. REFER TO SURVEY DRAWINGS FOR EXISTING SERVICES LAYOUTS AND MANHOLE INFORMATION
6. ALL EXISTING SURFACES TO BE REINSTATED FOLLOWING DIVERSION OF SERVICES/CONSTRUCTION OF NEW SERVICES
7. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND LEVELS WITH ARCHITECTURAL DRAWINGS PRIOR TO START OF CONSTRUCTION. ANY DISCREPANCIES TO BE NOTIFIED TO THE ENGINEER & ARCHITECT FOR RESOLUTION
8. CONTRACTOR TO ENSURE ALL WATER & WASTEWATER RELATED WORKS ARE IN ACCORDANCE WITH THE IRISH WATER WATER INFRASTRUCTURE & WASTEWATER INFRASTRUCTURE CODE OF PRACTICE & STANDARD DETAILS DOCUMENTS
9. TESTING OF ALL GRAVITY SEWERS AND MANHOLES TO BE IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE SECTION 4.10 TESTING OF GRAVITY SEWERS & MANHOLES

SURFACE WATER LEGEND:

- EX. SURFACE WATER SEWER
- EX. SURFACE WATER MANHOLE
- EX. SURFACE WATER INSPECTION CHAMBER
- EX. WATER COURSE
- EX. SURFACE WATER SEWER TO BE DECOMMISSIONED
- PR. SURFACE WATER SEWER
- PR. SURFACE WATER MANHOLE
- PR. SURFACE WATER INSPECTION CHAMBER
- PR. SURFACE WATER ACCESS JUNCTION
- PR. ROAD GULLY
- PR. ATTENUATION TANK
- PR. PERMEABLE PAVING
- PR. FILTER DRAIN
- PR. DRAINAGE CHANNEL
- PR. BIORETENTION AREA/SWALE
- PR. PETROL INTERCEPTOR
- PR. TREE PIT DISCHARGING TO MAIN SW DRAINAGE
- PROPOSED SOAKAWAY

WASTEWATER LEGEND:

- EX. WASTEWATER SEWER
- FMH EX. WASTEWATER MANHOLE
- EX. WASTEWATER SEWER TO BE DECOMMISSIONED
- PR. WASTEWATER SEWER
- FMH PR. WASTEWATER MANHOLE
- FIC PR. WASTEWATER INSPECTION CHAMBER
- FAJ PR. WASTEWATER ACCESS JUNCTION
- PR. BACKDROP IN MH
- FIC PR. LOCAL FOUL DRAINAGE

NOTE 1: MANHOLE COVER LEVELS ARE APPROXIMATE. ACTUAL COVER LEVELS SHOULD MATCH SURROUNDING FINISHED GROUND LEVELS U.N.O.

NOTE 2: ALL WASTEWATER SEWERS TO BE PROVIDED WITH COVER (WITHOUT PROTECTION) IN ACCORDANCE WITH IRISH WATER STANDARD DETAIL STD-WW-07 AND CLAUSE 3.9 OF IW-CDS-5030-03.

NOTE 3: FOR WASTEWATER SEWERS REQUIRING PROTECTION, REFER TO IRISH WATER STANDARD DETAIL STD-WW-08 AND CLAUSE 3.9 OF IW-CDS-5030-03.

NOTE 4: ALL MANHOLE COVERS LOCATED IN GRASS AREAS TO BE SURROUNDED (Min. 200mm SURROUND) IN 100mm THK C20/25 CONCRETE APRON

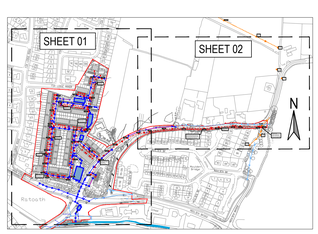
FOUL PIPE MATERIAL TO BE IN ACCORDANCE WITH IW-CDS-5030-03 SECTION 3.13.2

3.13.2 THERMOPLASTIC STRUCTURAL WALL PIPES: THERMOPLASTIC STRUCTURED WALL PIPES SHALL COMPLY WITH THE PROVISIONS OF IS EN 13476 (2007/2009). PIPES TO BE OF STIFFNESS CLASS 8kN/m² & TO BE CAPABLE OF DEMONSTRATING A JETTING RESISTANCE OF 2,600 PSI (180 BAR) WITHOUT DAMAGE WHEN TESTED IN ACCORDANCE WITH SECTION 3.3 OF WIS 4-35-01 (2008). (SEWER DIAMETERS 150mm UP TO 450mm, SERVICE CONNECTIONS OF 100mm DIAMETER).

WASTE WATER DRAINAGE MANHOLE SCHEDULE

REF:	CL:	IL:	NOTES:
WwMH 1.00	80.073	79.225	
WwMH 1.01	80.408	78.944	
WwMH 1.02	80.087	78.619	
WwMH 1.03	80.097	78.466	
WwMH 1.04	80.000	78.366	
WwMH 1.05	79.700	78.126	
WwMH 1.06	79.777	78.097	
WwMH 1.07	79.947	77.967	B.D. FROM WwMH2.03 @ 78.627
WwMH 1.08	79.651	77.796	
WwMH 1.09	79.657	77.762	
WwMH 1.10	79.269	77.523	
WwMH 1.11	78.966	74.886	B.D. FROM WwMH1.10 @ 77.186 B.D. FROM WwMH5.00 @ 76.186
WwMH 1.12	78.580	74.735	
WwMH 1.13	78.057	74.616	
WwMH 1.14	77.352	74.473	
WwMH 1.15	76.704	74.333	
WwMH 1.16	76.048	74.206	
WwMH 1.17	75.474	74.040	
WwMH 1.18	75.191	73.810	
WwMH 1.19	74.913	73.574	
WwMH 1.20	74.685	73.404	
WwMH 1.21	74.402	73.242	
WwMH 1.22	74.430	73.156	
WwMH 1.23	74.400	72.951	
WwMH 1.24	74.378	72.905	
Ex WwMH	74.480	72.770	
Ex WwMH	74.640	72.620	
Ex WwMH2	74.610	72.470	
WwMH 2.00	81.947	80.466	
WwMH 2.01	81.559	79.660	
WwMH 2.02	81.407	79.534	
WwMH 2.03	81.364	79.492	
WwMH 3.00	82.197	80.615	
WwMH 3.01	81.708	80.156	
WwMH 3.02	81.347	79.809	
WwMH 4.00	81.549	80.124	
WwMH 5.00	82.104	80.688	
WwMH 5.01	81.819	80.324	
WwMH 5.02	81.587	80.096	
WwMH 5.03	81.480	78.785	B.D. FROM WwMH5.02 @ 80.016
WwMH 5.04	80.553	78.464	
WwMH 5.05	80.444	78.420	
WwMH 5.06	79.588	78.145	
WwMH 6.00	78.789	76.841	
WwMH 7.00	80.644	79.232	

FOR INFORMATION ONLY



KEY PLAN

Rev.	Note	Date	Drawn	Check
S2.P03	ISSUED FOR INFORMATION	06.06.2024	SP	AL
S2.P02	ISSUED FOR PLANNING	15.05.2024	RR	AL
S2.P01	ISSUED FOR INFORMATION	15.04.2024	SP	AL

DONNACHADH O'BRIEN & ASSOCIATES CONSULTING ENGINEERS
UNIT 5C ELM HOUSE MILLENNIUM PARK NAAS CO. KILDARE
P +353 45 984 042
INFO@DOBA.IE WWW.DOBA.IE

Client:	MARSHALL YARDS DEVELOPMENT COMPANY LTD.
Project:	RESIDENTIAL DEVELOPMENT AT RATOATH, CO. MEATH
Drawing Title:	PROPOSED WW & SW LAYOUT OVERALL

Drawn By:	Checked By:	Approved By:	Date:	Scale:	Sheet Size:
RR	PD	DOB	MARCH 2023	1:1000	A0

Project Number:	Drawing Number:	Status Code:	Rev Number:
DOBA2334	2334-DOB-XX-SI-DR-C-0310	S2	P03

N

0 5 10 15 20 25 m
SCALE 1:500 @ A0

NOTES:

1. FOR STANDARD DOBA NOTES REFER TO DRAWING 2334-DOB-XX-SI-DR-S-0001 & S-0002
2. REFER TO ARCHITECTS DRAWINGS FOR ALL SITE & APPLICATION BOUNDARIES
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT'S & ENGINEER'S DRAWINGS AND SPECIFICATIONS.
4. USE FIGURED DIMENSIONS ONLY. DO NOT SCALE
5. REFER TO SURVEY DRAWINGS FOR EXISTING SERVICES LAYOUTS AND MANHOLE INFORMATION
6. ALL EXISTING SURFACES TO BE REINSTATED FOLLOWING DIVERSION OF SERVICES/CONSTRUCTION OF NEW SERVICES
7. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND LEVELS WITH ARCHITECTURAL DRAWINGS PRIOR TO START OF CONSTRUCTION. ANY DISCREPANCIES TO BE NOTIFIED TO THE ENGINEER & ARCHITECT FOR RESOLUTION
8. CONTRACTOR TO ENSURE ALL WATER & WASTEWATER RELATED WORKS ARE IN ACCORDANCE WITH THE IRISH WATER WATER INFRASTRUCTURE & WASTEWATER INFRASTRUCTURE CODE OF PRACTICE & STANDARD DETAILS DOCUMENTS
9. TESTING OF ALL GRAVITY SEWERS AND MANHOLES TO BE IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE SECTION 4.10 TESTING OF GRAVITY SEWERS & MANHOLES

WASTEWATER LEGEND:

- EX. WASTEWATER SEWER
- FMH — EX. WASTEWATER MANHOLE
- EX. WASTEWATER SEWER TO BE DECOMMISSIONED
- PR. WASTEWATER SEWER
- FMH — PR. WASTEWATER MANHOLE
- FIC — PR. WASTEWATER INSPECTION CHAMBER
- FAJ — PR. WASTEWATER ACCESS JUNCTION
- PR. BACKDROP IN MH
- FIC — PR. LOCAL FOUL DRAINAGE

NOTE 1: MANHOLE COVER LEVELS ARE APPROXIMATE. ACTUAL COVER LEVELS SHOULD MATCH SURROUNDING FINISHED GROUND LEVELS U.N.O.

NOTE 2: ALL WASTEWATER SEWERS TO BE PROVIDED WITH COVER (WITHOUT PROTECTION) IN ACCORDANCE WITH IRISH WATER STANDARD DETAIL STD-WW-07 AND CLAUSE 3.9 OF IW-CDS-5030-03.

NOTE 3: FOR WASTEWATER SEWERS REQUIRING PROTECTION, REFER TO IRISH WATER STANDARD DETAIL STD-WW-08 AND CLAUSE 3.9 OF IW-CDS-5030-03.

NOTE 4: ALL MANHOLE COVERS LOCATED IN GRASS AREAS TO BE SURROUNDED (Min. 200mm SURROUND) IN 100mm THK C20/25 CONCRETE APRON

FOUL PIPE MATERIAL TO BE IN ACCORDANCE WITH IW-CDS-5030-03 SECTION 3.13.2

3.13.2 THERMOPLASTIC STRUCTURAL WALL PIPES; THERMOPLASTIC STRUCTURED WALL PIPES SHALL COMPLY WITH THE PROVISIONS OF IS EN 13476 (2007/2009). PIPES TO BE OF STIFFNESS CLASS 8kN/m^2 & TO BE CAPABLE OF DEMONSTRATING A JETTING RESISTANCE OF 2,600 PSI (180 BAR) WITHOUT DAMAGE WHEN TESTED IN ACCORDANCE WITH SECTION 3.3 OF WIS 4-35-01 (2008). (SEWER DIAMETERS 150mm UP TO 450mm, SERVICE CONNECTIONS OF 100mm DIAMETER).

SURFACE WATER LEGEND:

- EX. SURFACE WATER SEWER
- EX. SURFACE WATER MANHOLE
- EX. SURFACE WATER INSPECTION CHAMBER
- EX. WATER COURSE
- EX. SURFACE WATER SEWER TO BE DECOMMISSIONED
- PR. SURFACE WATER SEWER
- PR. SURFACE WATER MANHOLE
- PR. SURFACE WATER INSPECTION CHAMBER
- PR. SURFACE WATER ACCESS JUNCTION
- PR. ROAD GULLY
- PR. ATTENUATION TANK
- PR. PERMEABLE PAVING
- PR. FILTER DRAIN
- PR. DRAINAGE CHANNEL
- PR. BIORETENTION AREA/SWALE
- P. INT — PR. PETROL INTERCEPTOR
- PR. TREE PIT DISCHARGING TO MAIN SW DRAINAGE
- PROPOSED SOAKAWAY

WASTE WATER DRAINAGE MANHOLE SCHEDULE

REF:	CL:	IL:	NOTES:
WwMH 1.00	80.073	79.225	
WwMH 1.01	80.406	78.944	
WwMH 1.02	80.087	78.619	
WwMH 1.03	80.097	78.466	
WwMH 1.04	80.000	78.398	
WwMH 1.05	79.700	78.126	
WwMH 1.06	79.777	78.090	
WwMH 1.07	79.947	77.987	B.D. FROM WwMH2.03 @ 78.627
WwMH 1.08	79.651	77.796	
WwMH 1.09	79.657	77.762	
WwMH 1.10	79.269	77.523	
WwMH 1.11	78.966	74.886	B.D. FROM WwMH1.10 @ 77.186 B.D. FROM WwMH6.00 @ 76.195
WwMH 1.12	78.580	74.735	
WwMH 1.13	78.057	74.616	
WwMH 1.14	77.352	74.473	
WwMH 1.15	76.704	74.333	
WwMH 1.16	76.048	74.206	
WwMH 1.17	75.474	74.040	
WwMH 1.18	75.191	73.810	
WwMH 1.19	74.913	73.574	
WwMH 1.20	74.685	73.404	
WwMH 1.21	74.402	73.242	
WwMH 1.22	74.430	73.156	
WwMH 1.23	74.400	72.951	
WwMH 1.24	74.378	72.905	
Ex WwMH	74.480	72.770	
Ex WwMH1	74.640	72.620	
Ex WwMH2	74.610	72.470	
WwMH 2.00	81.947	80.466	
WwMH 2.01	81.559	79.660	
WwMH 2.02	81.407	79.534	
WwMH 2.03	81.364	79.492	
WwMH 3.00	82.197	80.615	
WwMH 3.01	81.708	80.166	
WwMH 3.02	81.347	79.809	
WwMH 4.00	81.549	80.124	
WwMH 5.00	82.104	80.688	
WwMH 5.01	81.819	80.324	
WwMH 5.02	81.587	80.096	
WwMH 5.03	81.480	78.785	B.D. FROM WwMH5.02 @ 80.016
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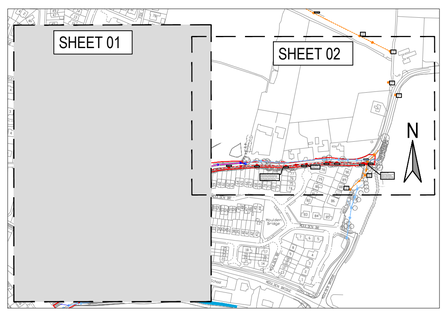
WwMH 5.05	80.444	78.420	
WwMH 5.06	79.588	78.145	
WwMH 6.00	78.789	76.841	
WwMH 7.00	80.644	79.232	

REFER TO SHEET 2

REFER TO SHEET 2

FOR INFORMATION ONLY



KEY PLAN

Rev.	Note	Date	Drawn	Check
S2.P03	ISSUED FOR INFORMATION	06.06.2024	SP	AL
S2.P02	ISSUED FOR INFORMATION	15.05.2024	RR	AL
S2.P01	ISSUED FOR INFORMATION	15.04.2024	SP	AL

DONNACHADH O'BRIEN & ASSOCIATES CONSULTING ENGINEERS
UNIT 5C ELM HOUSE MILLENNIUM PARK NAAS CO. KILDARE
P +353 45 984 042
INFO@DOBA.IE WWW.DOBA.IE

Client: MARSHALL YARDS DEVELOPMENT COMPANY LTD.

Project: RESIDENTIAL DEVELOPMENT AT RATOATH, CO. MEATH

Drawing Title: PROPOSED WW & SW LAYOUT SHEET 1

Drawn By:	Checked By:	Approved By:	Date:	Scale:	Sheet Size:
RR	PD	DOB	MARCH 2023	1:500	A0

Project Number:	Drawing Number:	Status Code:	Rev Number:
DOBA2334	2334-DOB-XX-SI-DR-C-0311	S2	P03

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SCALE 1:500 @ A0

REFER TO SHEET 1

REFER TO SHEET 1

Ext WwMH
CL: 75.30
IL: n/a

Ext WwMH
CL: 75.13
IL: n/a

WwMH 1.14 — 2250 1/200 — WwMH 1.15 — 2250 1/200 — WwMH 1.16 — 2250 1/200 — WwMH 1.17 — 2250 1/200 — WwMH 1.18 — 2250 1/200 — WwMH 1.19 — 2250 1/200 — WwMH 1.20 — 2250 1/200 — WwMH 1.21 — 2250 1/200 — WwMH 1.22 — 2250 1/200 — WwMH 1.23 — 2250 1/200 — WwMH 1.24 — Ext WwMH

PROPRIETARY ROOT PROTECTION SYSTEM TO BE PROVIDED WHERE SEPARATION DISTANCE BETWEEN PROPOSED TREES AND PROPOSED WATER SERVICES IS LESS THAN STANDARD DETAIL STD-W-12A

TYPICAL WW MH CHAMBER I.A.W. IW DRG STD-WW-10A

EX 225Ø PIPE

EX 225Ø PIPE

Ext WwMH
CL: 74.641
IL: 72.641

CONSTRUCT NEW WASTEWATER MANHOLE ON EXISTING WASTEWATER SEWER TO FACILITATE NEW AND EXISTING CONNECTIONS

Ext WwMH
CL: 74.64
IL: 72.53

MOULDEN BR

Moulden Bridge

MOULDEN BRIDGE

MOULDEN BR

MOULDEN BR

MOULDEN BR

MOULDEN BRIDGE

School

R91-98

NOTES:

1. FOR STANDARD DOBA NOTES REFER TO DRAWING 2334-DOB-XX-SI-DR-S-0001 & S-0002
2. REFER TO ARCHITECTS DRAWINGS FOR ALL SITE & APPLICATION BOUNDARIES
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- EX. SURFACE WATER MANHOLE
- EX. SURFACE WATER INSPECTION CHAMBER
- EX. WATER COURSE
- EX. SURFACE WATER SEWER TO BE DECOMMISSIONED
- PR. SURFACE WATER SEWER
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- PR. DRAINAGE CHANNEL
- PR. BIORETENTION AREA/SWALE
- PR. PETROL INTERCEPTOR
- PR. TREE PIT DISCHARGING TO MAIN SW DRAINAGE
- PROPOSED SOAKAWAY

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- FMH — EX. WASTEWATER MANHOLE
- EX. WASTEWATER SEWER TO BE DECOMMISSIONED
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- FIC — PR. LOCAL FOUL DRAINAGE

NOTE 1: MANHOLE COVER LEVELS ARE APPROXIMATE. ACTUAL COVER LEVELS SHOULD MATCH SURROUNDING FINISHED GROUND LEVELS U.N.O.

NOTE 2: ALL WASTEWATER SEWERS TO BE PROVIDED WITH COVER (WITHOUT PROTECTION) IN ACCORDANCE WITH IRISH WATER STANDARD DETAIL STD-WW-07 AND CLAUSE 3.9 OF IW-CDS-5030-03.

NOTE 3: FOR WASTEWATER SEWERS REQUIRING PROTECTION, REFER TO IRISH WATER STANDARD DETAIL STD-WW-08 AND CLAUSE 3.9 OF IW-CDS-5030-03.

NOTE 4: ALL MANHOLE COVERS LOCATED IN GRASS AREAS TO BE SURROUNDED (Min. 200mm SURROUND) IN 100mm THK C20/25 CONCRETE APRON

FOUL PIPE MATERIAL TO BE IN ACCORDANCE WITH IW-CDS-5030-03 SECTION 3.13.2

3.13.2 THERMOPLASTIC STRUCTURAL WALL PIPES: THERMOPLASTIC STRUCTURED WALL PIPES SHALL COMPLY WITH THE PROVISIONS OF IS EN 13476 (2007/2009). PIPES TO BE OF STIFFNESS CLASS 8kN/m² & TO BE CAPABLE OF DEMONSTRATING A JETTING RESISTANCE OF 2,600 PSI (180 BAR) WITHOUT DAMAGE WHEN TESTED IN ACCORDANCE WITH SECTION 3.3 OF WIS 4-35-01 (2008). (SEWER DIAMETERS 150mm UP TO 450mm, SERVICE CONNECTIONS OF 100mm DIAMETER).

WASTE WATER DRAINAGE MANHOLE SCHEDULE

REF:	CL:	IL:	NOTES:
WwMH 1.00	80.073	79.225	
WwMH 1.01	80.406	78.944	
WwMH 1.02	80.087	78.619	
WwMH 1.03	80.097	78.466	
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WwMH 1.06	79.777	78.090	
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WwMH 1.09	79.657	77.762	
WwMH 1.10	79.269	77.523	
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WwMH 1.12	78.580	74.735	
WwMH 1.13	78.057	74.616	
WwMH 1.14	77.352	74.473	
WwMH 1.15	76.704	74.333	
WwMH 1.16	76.048	74.206	
WwMH 1.17	75.474	74.040	
WwMH 1.18	75.191	73.810	
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WwMH 2.01	81.559	79.660	
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WwMH 3.01	81.708	80.166	
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WwMH 4.00	81.549	80.124	
WwMH 5.00	82.104	80.686	
WwMH 5.01	81.819	80.324	
WwMH 5.02	81.587	80.096	
WwMH 5.03	81.480	78.785	B.D. FROM WwMH5.02 @ 80.016
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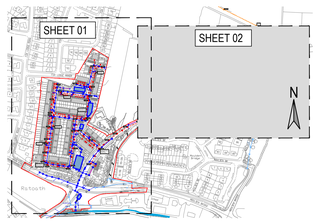
WwMH 5.05	80.444	78.420	
WwMH 5.06	79.588	78.145	
WwMH 6.00	78.789	76.841	
WwMH 7.00	80.644	79.232	

FOR INFORMATION ONLY



KEY PLAN

Rev.	Note	Date	Drawn	Check
S2.P03	ISSUED FOR INFORMATION	06.06.2024	SP	AL
S2.P02	ISSUED FOR INFORMATION	15.05.2024	RR	AL
S2.P01	ISSUED FOR INFORMATION	15.04.2024	SP	AL

DONNACHADH O'BRIEN & ASSOCIATES CONSULTING ENGINEERS
UNIT 5C ELM HOUSE MILLENNIUM PARK NAAS CO. KILDARE
P +353 45 984 042
INFO@DOBA.IE WWW.DOBA.IE

Client: MARSHALL YARDS DEVELOPMENT COMPANY LTD.

Project: RESIDENTIAL DEVELOPMENT AT RATOATH, CO. MEATH

Drawing Title: PROPOSED WW & SW LAYOUT SHEET 2

Drawn By:	Checked By:	Approved By:	Date:	Scale:	Sheet Size:
RR	PD	DOB	MARCH 2023	1:500	A0

Project Number:	Drawing Number:	Status Code:	Rev Number:
DOBA2334	2334-DOB-XX-SI-DR-C-0312	S2	P03

NOTES:

1. FOR STANDARD DOBA NOTES REFER TO DRAWING 2334-DOB-XX-SI-DR-S-0001 & S-0002
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5. REFER TO SURVEY DRAWINGS FOR EXISTING SERVICES LAYOUTS AND MANHOLE INFORMATION
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9. TESTING OF ALL GRAVITY SEWERS AND MANHOLES TO BE IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE SECTION 4.10 TESTING OF GRAVITY SEWERS & MANHOLES

WATER SUPPLY LEGEND:

- EX. WATERMAIN
- EX. WATERMAIN TO BE DECOMMISSIONED
- EX. WATERMAIN FROM UISCE EIREANN MAPS
- PR. 100mm DIA. WATERMAIN
- PR. 150mm DIA. WATERMAIN
- PR. 200mm DIA. WATERMAIN
- H — PR. HYDRANT
- BM — PR. BULK METER
- M — PR. BOUNDARY BOX
- AV — PR. AIR VALVE
- SV — PR. SLUICE VALVE
- ScV — PR. SCOUR VALVE
- PRV — PR. PRESSURE REDUCING VALVE
- TB — THRUST BLOCKS (OMITTED FOR CLARITY)
- VC — VALVE CHAMBER

NOTE 1:	MANHOLE COVER LEVELS ARE APPROXIMATE. ACTUAL COVER LEVELS SHOULD MATCH SURROUNDING FINISHED GROUND LEVELS U.N.O.
NOTE 2:	ALL WATERMAINS TO BE PROVIDED WITH COVER IN ACCORDANCE WITH IRISH WATER STANDARD DETAIL STD-W-13 AND CLAUSE 3.11 OF IW-CDS-5020-03.
NOTE 3:	ALL MANHOLE COVERS LOCATED IN GRASS AREAS TO BE SURROUNDED (Min. 200mm SURROUND) IN 100mm THK C20/25 CONCRETE APRON

WATERMAIN MATERIAL TO BE IN ACCORDANCE WITH IW-CDS-5020-03 SECTION 3.9.2

3.9.2 MDPE & HDPE PIPES SHALL BE OF A TYPE PE-80 & HAVE AN SDR-11 OR SDR-17 RATING. THEY SHALL CONFORM TO IS EN 12201:PART 1 & PART 2 (PLASTIC SYSTEMS FOR WATER SUPPLY, DRAINAGE & SEWERAGE UNDER PRESSURE - PART 1, GENERAL, & PART 2, PIPES) & I.S. EN 12201-3 (PLASTIC SYSTEMS FOR WATER SUPPLY, DRAINAGE & SEWERAGE UNDER PRESSURE - PART 3: FITTINGS).

N

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SCALE 1:500 @ A0

PROPOSED STANDARD CUSTOMER CONNECTION I.A.W. IW DRG STD-W-03 OUTSIDE THE PROPERTY BOUNDARY

PROPOSED WATERMAIN IN FOOTPATH LOCATED MINIMUM 0.75m FROM KERB EDGE SHOWN THUS I.A.W. IW DRG STD-W-11

PROPOSED WATERMAIN IN ROAD LOCATED MINIMUM 1.0m FROM KERB EDGE SHOWN THUS I.A.W. IW DRG STD-W-40

PROPOSED WATERMAIN LOOP ARRANGEMENT I.A.W. STD-W-39

PROPOSED OFFLINE HYDRANTS I.A.W. TGD PART B (MIN 6m AND MAX. 46m FROM PROPOSED DWELLINGS) AND IW DRG STD-W-19

PROPOSED TYPICAL VALVE CHAMBER AS PER WATERMAIN LOOP LOCATION I.A.W STD-W-39

PROPOSED ONLINE HYDRANTS SHOWN THUS I.A.W IW-STD-W-18 TGD PART B (MIN 6m AND MAX. 46m FROM PROPOSED DWELLINGS)

PROPOSED TEMPORARY DEAD END FOR FUTURE CONNECTION SHOWN THUS I.A.W. IW DRG STD-W-05

PROPOSED SLUICE VALVE ARRANGEMENT SHOWN THUS I.A.W. STD-W-15

PROPOSED ONLINE AIR VALVE FOR P.E. PIPE I.A.W. IW DRG STD-W-22

PROPOSED WATERMAIN IN FOOTPATH LOCATED MINIMUM 0.75m FROM KERB EDGE SHOWN THUS I.A.W. IW DRG STD-W-11

PROPOSED STANDARD CUSTOMER CONNECTION I.A.W. IW DRG STD-W-03 OUTSIDE THE PROPERTY BOUNDARY

PROPOSED ONLINE HYDRANTS SHOWN THUS I.A.W IW-STD-W-18 TGD PART B (MIN 6m AND MAX. 46m FROM PROPOSED DWELLINGS)

PROPRIETARY ROOT PROTECTION SYSTEM TO BE PROVIDED WHERE SEPARATION DISTANCE BETWEEN PROPOSED TREES AND PROPOSED WATER SERVICES IS LESS THAN STANDARD DETAIL STD-W-12A

PROPOSED WATERMAIN IN FOOTPATH LOCATED MINIMUM 0.75m FROM KERB EDGE SHOWN THUS I.A.W. IW DRG STD-W-11

PROPOSED ONLINE HYDRANTS SHOWN THUS I.A.W IW-STD-W-18 TGD PART B (MIN 6m AND MAX. 46m FROM PROPOSED DWELLINGS)

PROPOSED BULK METER I.A.W. IW DRG STD-W-26 METER SELECTED, SUPPLIED AND INSTALLED BY UISCE EIREANN

CONNECT PROPOSED WATERMAIN TO EXISTING (150Ø STUB) WATERMAIN I.A.W. STD-W-04

EXISTING 355mm HDPe & 100mm uPVC PUBLIC WATERMAINS (ACCORDING TO UISCE EIREANN MAPS)

EXISTING 200mm DUCTILE IRON WATERMAIN (ACCORDING TO UISCE EIREANN MAPS)

EXISTING 355mm HDPe PUBLIC WATERMAIN

EXISTING 100mm uPVC PUBLIC WATERMAIN

FOX LODGE ROAD

FOX LODGE MANOR

Ratoath

School

FOR INFORMATION ONLY

Rev.	Note	Date	Drawn	Check
S2.P11	ISSUED FOR SoDA	21.06.2024	SP	AL
S2.P10	ISSUED FOR PLANNING	19.06.2024	RR	AL
S2.P09	ISSUED FOR INFORMATION	17.06.2024	RR	AL
S2.P08	DRAFT ISSUE	07.06.2024	RR	AL
S2.P07	ISSUED FOR INFORMATION	06.06.2024	SP	AL
S2.P06	ISSUED FOR INFORMATION	21.05.2024	RR	AL
S2.P05	ISSUED FOR SODA	15.05.2024	RR	AL
S2.P04	ISSUED FOR INFORMATION	15.04.2024	SP	AL
S2.P03	ISSUED FOR LRD OPINION	27.03.2024	NQ	AL
S2.P02	DRAFT ISSUE	21.03.2024	NQ	AL
S2.P01	DRAFT ISSUE	14.03.2024	NQ	AL

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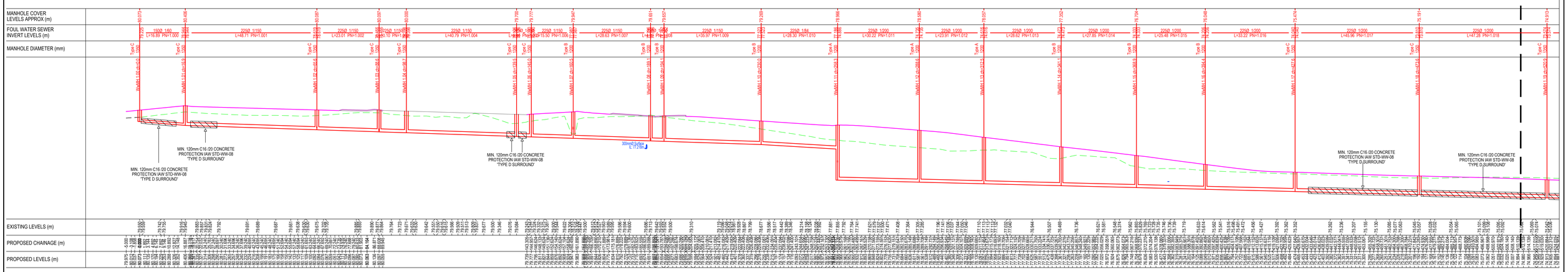
Client:	MARSHALL YARDS DEVELOPMENT COMPANY LTD.
Project:	BALLYBIN ROAD LRD , RATOATH, CO. MEATH
Drawing Title:	PROPOSED WATER SUPPLY LAYOUT

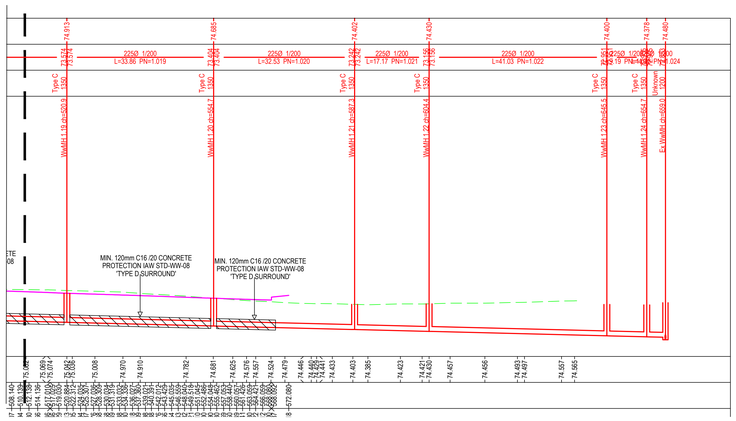
Drawn By:	Checked By:	Approved By:	Date:	Scale:	Sheet Size:
RR	PD	DOB	MARCH 2023	1:500	A0

Project Number:	Drawing Number:	Status Code:	Rev Number:
DOBA2334	2334-DOB-XX-SI-DR-C-0400	S2	P11



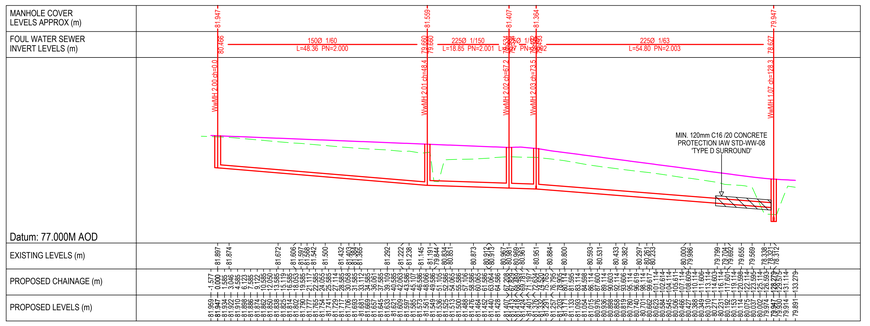
PROPOSED LONGITUDINAL SECTION WwMH 1.00 - WwMH 1.24

SCALE H 1:500, V 1:100



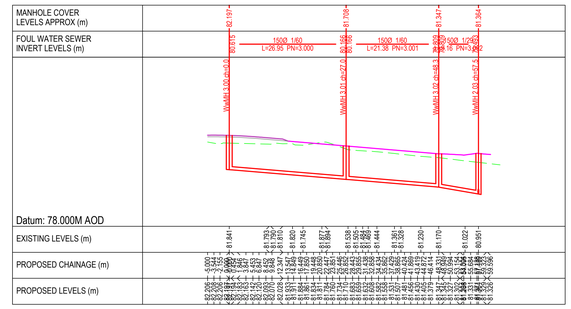
PROPOSED LONGITUDINAL SECTION WwMH 1.00 - WwMH 1.24

SCALE H 1:500, V 1:100



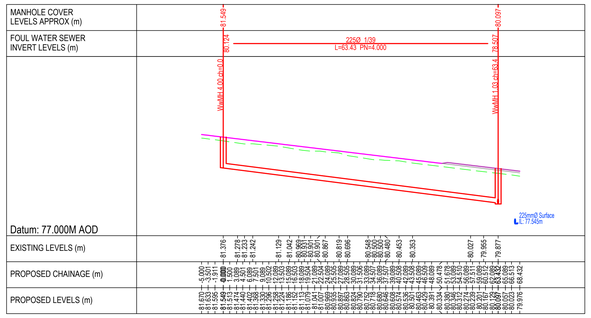
PR. LONG SECTION WwMH 2.00 - WwMH 1.07

SCALE H 1:500, V 1:100



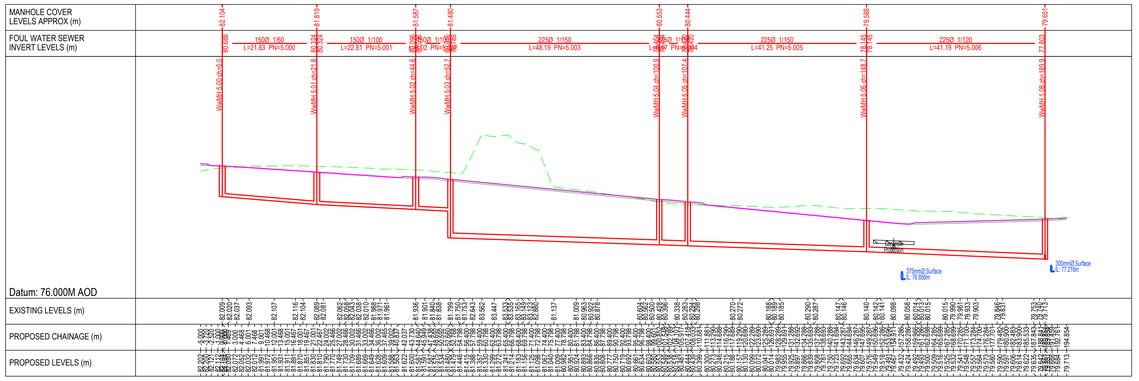
PR. LONG SECTION WwMH 3.00 - WwMH 2.03

SCALE H 1:500, V 1:100



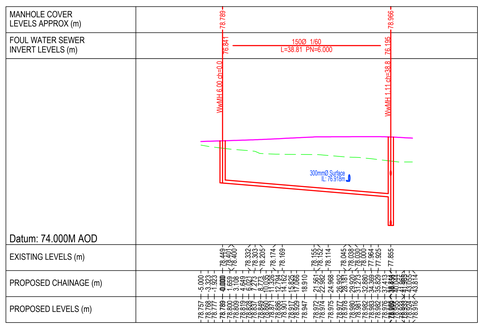
PR. LONG SECTION WwMH 4.00 - WwMH 1.03

SCALE H 1:500, V 1:100



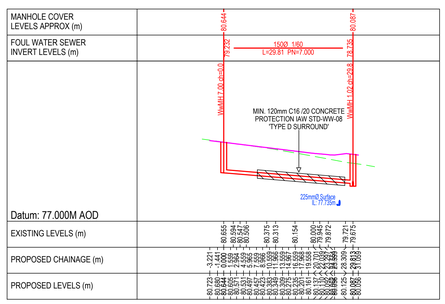
PROPOSED LONGITUDINAL SECTION WwMH 5.00 - WwMH 1.08

SCALE H 1:500, V 1:100



PROPOSED LONGITUDINAL SECTION WwMH 6.00 - WwMH 1.11

SCALE H 1:500, V 1:100



PROPOSED LONGITUDINAL SECTION WwMH 7.00 - WwMH 1.02

SCALE H 1:500, V 1:100

LEGEND:

- PROPOSED SURFACE WATER
- PROPOSED FOUL WATER
- PROPOSED GROUND/ ROAD LEVEL
- EXISTING GROUND PROFILE

GENERAL NOTES:

1. FOR STANDARD DOBA NOTES REFER TO DRAWING 2334-DOB-XX-SI-DR-S-0001 & S-0002
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S DRAWINGS AND SPECIFICATIONS.
3. USE FIGURED DIMENSIONS ONLY. DO NOT SCALE
4. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND LEVELS WITH ENGINEERING DRAWINGS PRIOR TO START OF CONSTRUCTION. ANY DISCREPANCIES TO BE NOTIFIED TO THE ENGINEER FOR RESOLUTION.
5. CONTRACTOR IS RESPONSIBLE FOR ANY NECESSARY CONDITION SURVEY OF THE WORKS AREA, PUBLIC ROADS AND RETURN TO ORIGINAL CONDITION FOLLOWING WORKS
6. CONTRACTOR TO ALLOW FOR SCANNING AND GPR SURVEY OF THE SITE FOR ANY UNDERGROUND SERVICES PRIOR TO WORKS. REFER TO PUBLIC UTILITIES DRAWINGS FOR APPROXIMATE LOCATION OF EXISTING SERVICES

FOR INFORMATION ONLY

Rev.	Note	Date	Drawn	Check
S2.P05	ISSUED FOR INFORMATION	06.06.2024	SP	AL
S2.P04	ISSUED FOR INFORMATION	23.05.2024	EC	AL
S2.P03	ISSUED FOR INFORMATION	15.04.2024	SP	AL
S2.P02	ISSUED FOR LRD OPINION	27.03.2024	NQ	AL
S2.P01	ISSUED FOR INFORMATION	14.03.2024	EC	AL

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Client: MARSHALL YARDS DEVELOPMENT COMPANY LTD.

Project: RESIDENTIAL DEVELOPMENT AT RATOATH Co. MEATH

Drawing Title: PROPOSED WW LONGITUDINAL SECTIONS

Drawn By:	Checked By:	Approved By:	Date:	Scale:	Sheet Size:
EC	AL	DOB	MAR 2024	H 1:500,V 1:100	A0

Project Number:	Drawing Number:	Status Code:	Rev Number:
DOBA2334	2334-DOB-XX-SI-DR-C-1450	S2	P05