PUNCH consulting engineers

Proposed Development of New Mechanical Services Depot & Additional Salt-Barn, Old Lucan Road, Fonthill, Dublin 20

Engineering Planning Report

222153-PUNCH-XX-XX-RP-C-0002

Document Control

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1 Introduction

This report was prepared to accompany South Dublin County Council's (SDCC) Part 8 Planning Application for the proposed development of an additional Salt Barn, New Mechanical Services Depot, and two new diesel pumps with associated underground fuel storage tanks adjoining the Deadman's Inn at existing South Dublin County Council (SDCC) Palmerstown Depot, Old Lucan Road, Dublin 20. The site location is shown in Figure 1-1 below.

1.1 Site Location

The subject site is located on existing SDCC depot lands adjacent to Deadman's Inn at the Old Lucan Road, Fonthill, Dublin 20. The site is approximately 0.75 hectares and is located within SDCC's remit. The lands are bounded by the Old Lucan Road to the north and east, by a slip-road to the N4 to the south and by Deadman's Inn car park to the southeast. The site is a brownfield site with green areas located to the north and south. The site is gently sloping from southeast to northwest. The site is accessed from an existing vehicle access on the Old Lucan Road. Figure 1-1 indicates the location of the subject lands.

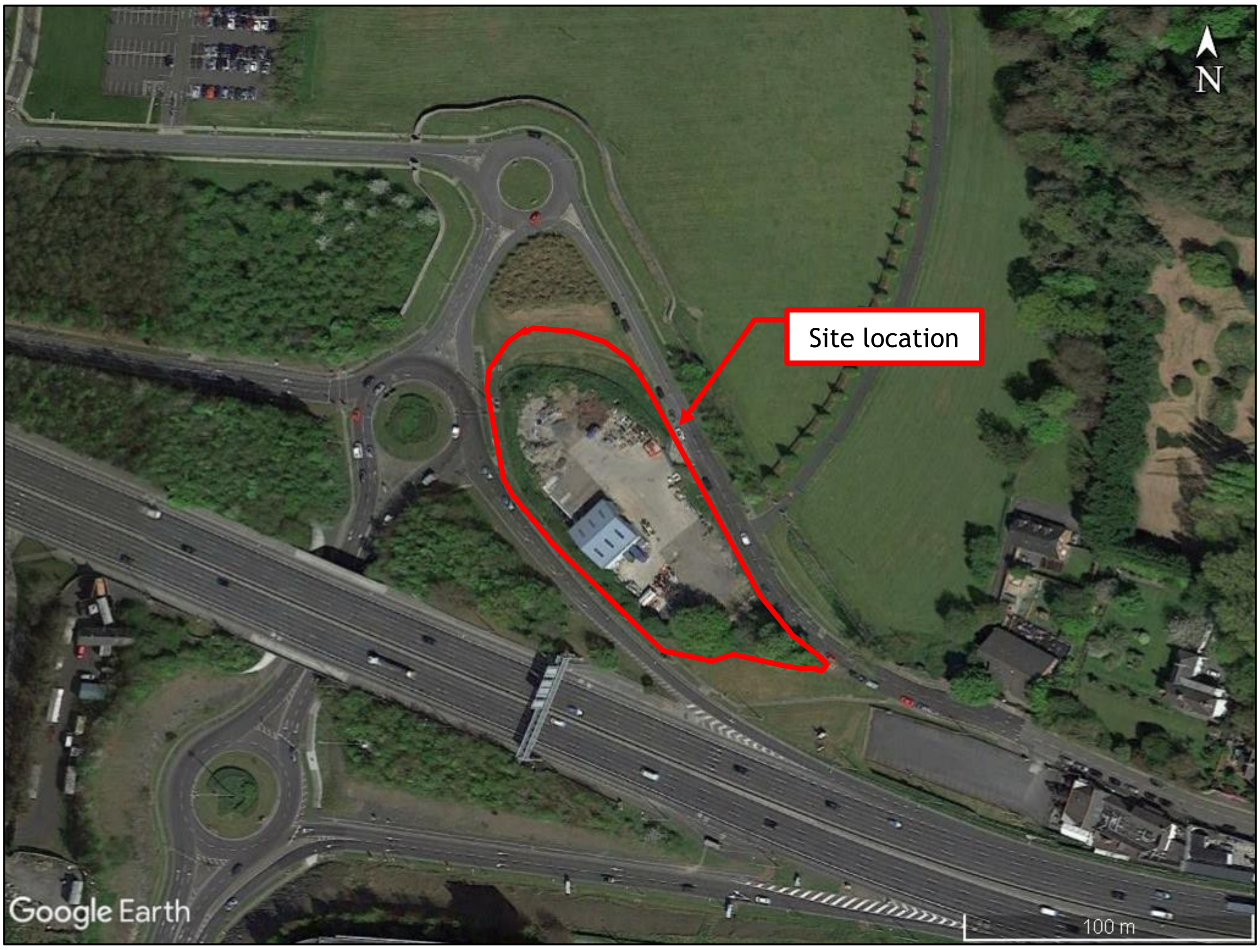


Figure 1-1: Site Location of the Proposed Development (Ref. Google Earth)

1.2 Nature of the Proposed Development

The works to include the construction of Additional Salt Barn, New Mechanical Services Depot and 2no. New Diesel Pumps with Associated Underground Fuel Storage Tanks. The Mechanical Services Depot (two-storey building with single-storey annex) is for servicing of SDCC vehicles and plant, to consist of new 5-bay vehicle maintenance workshop and ancillary support services including offices, canteen, storage and sanitary facilities. The site currently houses a salt barn, wash station and concrete hardstanding area used by SDCC for materials storage.

The works to include the construction of Additional Salt Barn, New Mechanical Services Depot and 2no. New Diesel Pumps with Associated Underground Fuel Storage Tanks. The Mechanical Services Depot (two-storey building with single-storey annex) is for servicing of SDCC vehicles and plant, to consist of new 5-bay vehicle maintenance workshop and ancillary support services including offices, canteen, storage and sanitary facilities. The site currently houses a salt barn, wash station and concrete hardstanding area used by SDCC for materials storage

The proposed works are outlined in a series of architectural drawings prepared by the Architectural Services Department in SDCC, and engineering drawings prepared by PUNCH Consulting Engineers, supplied as part of the planning documentation.

The proposed site layout is shown in Figure 1-2 below.

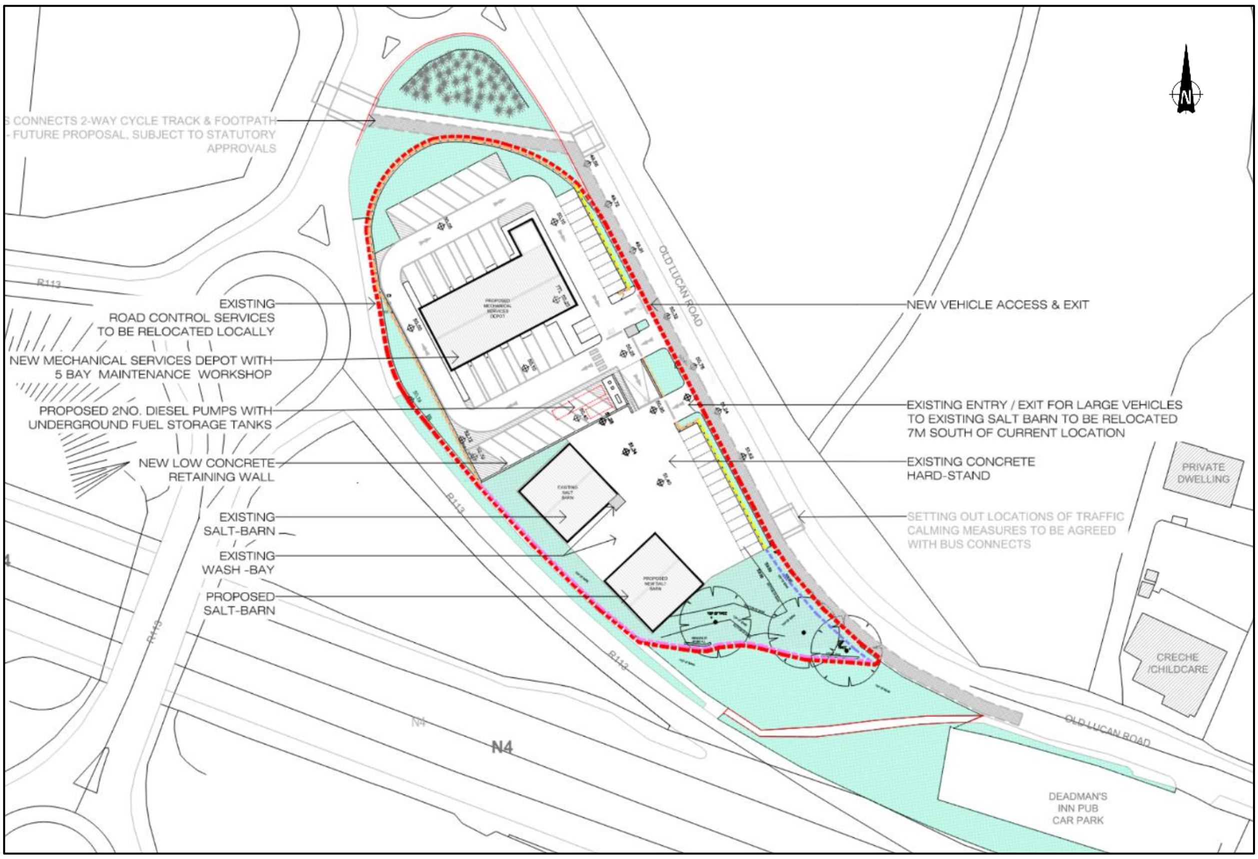


Figure 1-2: Proposed Site Layout Prepared by SDCC

2 Stormwater Drainage Design

2.1 Existing Stormwater Drainage

Record drawings provided by SDCC indicate the presence of an existing 375mm surface water sewer on the N4 slip road to the west of the site. A 225mm surface water sewer is also recorded to the south of the site.

Please refer to Appendix A for Record Drawings illustrating the existing stormwater drainage arrangement. An extract is shown in Figure 2-1 below.

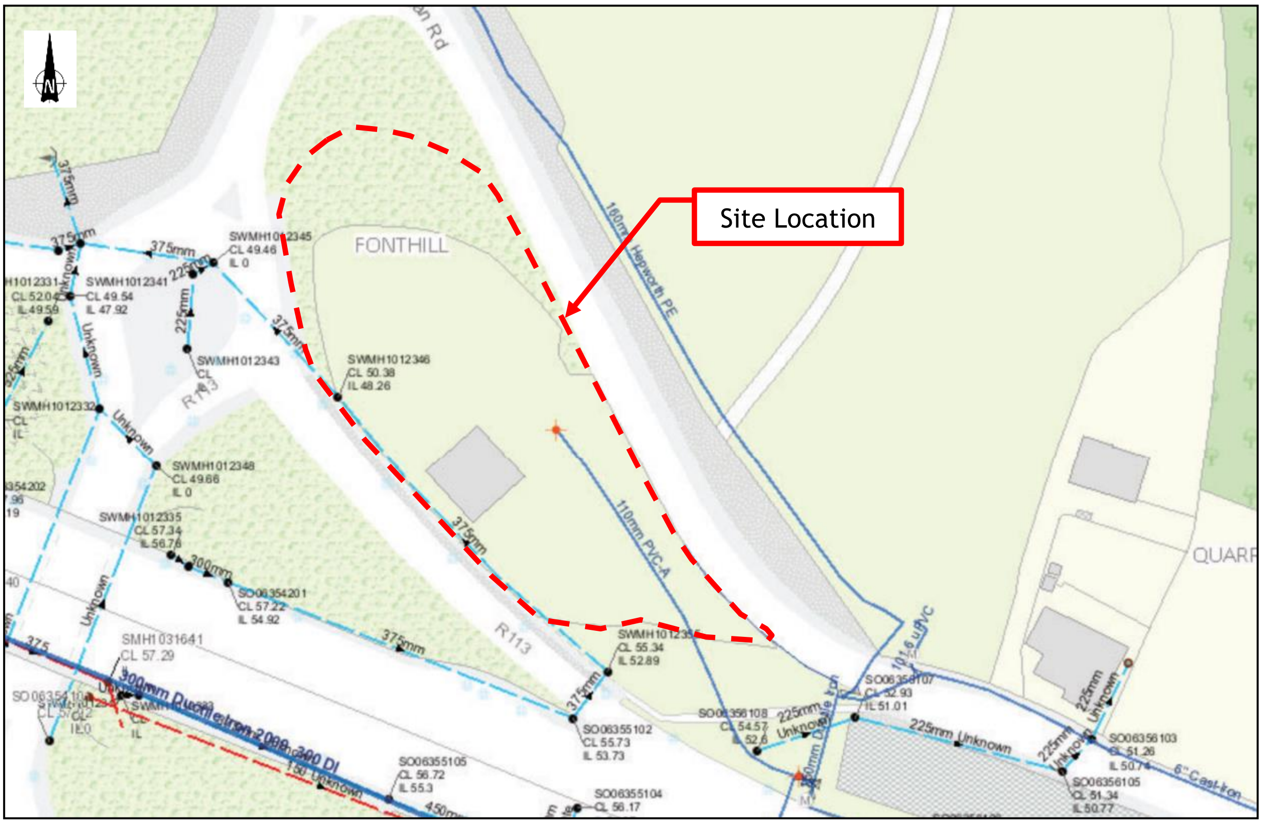


Figure 2-1: Existing Stormwater Drainage Surrounding the Site (Extract from Record Drawings)

A topographical survey of the site and its environs was completed by Precision Surveys in January 2018. The survey recorded the presence of some existing drainage within the existing site. The survey recorded a number of surface water manholes and 225m pipes running parallel to the north façade of the existing salt barn. The survey does not indicate the outfall for the onsite drainage. Survey of existing services onsite is ongoing to inform detailed design. There is potential to retain the existing drainage subject to survey results and detailed design.

Please refer to Appendix B for full topographical survey drawing.

2.2 Proposed Stormwater Drainage

2.2.1 General

The proposed surface water drainage system has been designed using Causeway Flow software in accordance with the "Greater Dublin Strategic Drainage Study" (GDSDS) the SDCC Development Plan (2016-2022), and the SDCC Sustainable Drainage Explanatory Design & Evaluation Guide (2022), with guidance taken from the Department of Environment and Local Government's guidance document "Recommendations for Site Development Works for Housing Areas".

A new surface water sewer network shall be provided for the proposed development which will be entirely separated from the foul water sewer network. All surface water run-off from roof areas and hardstanding areas are designed to be collected by a gravity pipe network. The Sustainable Drainage Explanatory Design & Evaluation Guide requires that the site discharge is limited to either 2l/s/Ha or Qbar, whichever is greater. Please refer to Section 2.2.5 below for details on Qbar.

The surface water network is proposed to discharge to the existing stormwater manhole to the west of the site.

2.2.2 Causeway Flow Modelling - General

The proposed stormwater sewers have been designed using Causeway Flow software. Table 2-1 describes the stormwater drainage design parameters used and detailed calculations are enclosed in Appendix C.

Table 2-1: Stormwater Drainage Design Parameters

Description	Value
Total Impervious Site area	0.53 ha
Return period target	Pipe Design 1 in 5 year. Network Design 1 in 30 year + CC. Check 1 in 100 year + CC for flooding.
Climate Change	20%
M5-60	16.5
Ratio R	0.277
SOIL type	4 (clayey)
Soil value	0.45
SAAR	782 mm
Flow reduction parameter	Qbar
Controlled Outflow	2.63 l/s
Flow restriction method	Hydrobrake
Attenuation Storage Volume	$340m^3$

The model has analysed a range of storms at the 1% AEP (1 in 100-year return period storm), with a 20% additional rainfall to allow for climate change.

The network has been modelled with the proposed attenuation tank volumes and associated hydrobrake flow control outlets included.

Depths of water in the network model (including pipework, manholes, the attenuation tanks and hydrobrakes) have been assessed for surcharging and flood risk. The model is established such that a flood risk is identified in the model results if the water rises to within 300mm of the cover level. If the water level rises to a level below this, it is identified as a surcharge within the model results. It is important to note that this warning is given related to proposed ground level at the node and not related to Finished Floor level. All proposed drainage is within pavements, and the adjacent Floor levels will be at or above the pavement level at that location.

Causeway includes a design setting called "additional storage". This is included in the software to account for storage volume in the network provided by secondary drainage including access junctions, inspection chambers, service connections etc. This provides additional storage in the network above the storage provided within the attenuation tank and primary drainage network. 20m^3/ha is the standard allowance provided for in Causeway Flow and was utilised for this design.

The outputs of the Causeway Flow analysis determine the required attenuation tank

Please refer to detailed Causeway surface water calculations (inputs and outputs) enclosed in Appendix C for details.

2.2.3 Geotechnical & Soils

The GSI quaternary map was reviewed and an extract from this map is shown in Figure 2-2. This indicates the area to be 'Till derived from limestones.'

Based on the above, a soil value of 4 was used for the design which characterises the soil as 'Clayey, poorly drained'.

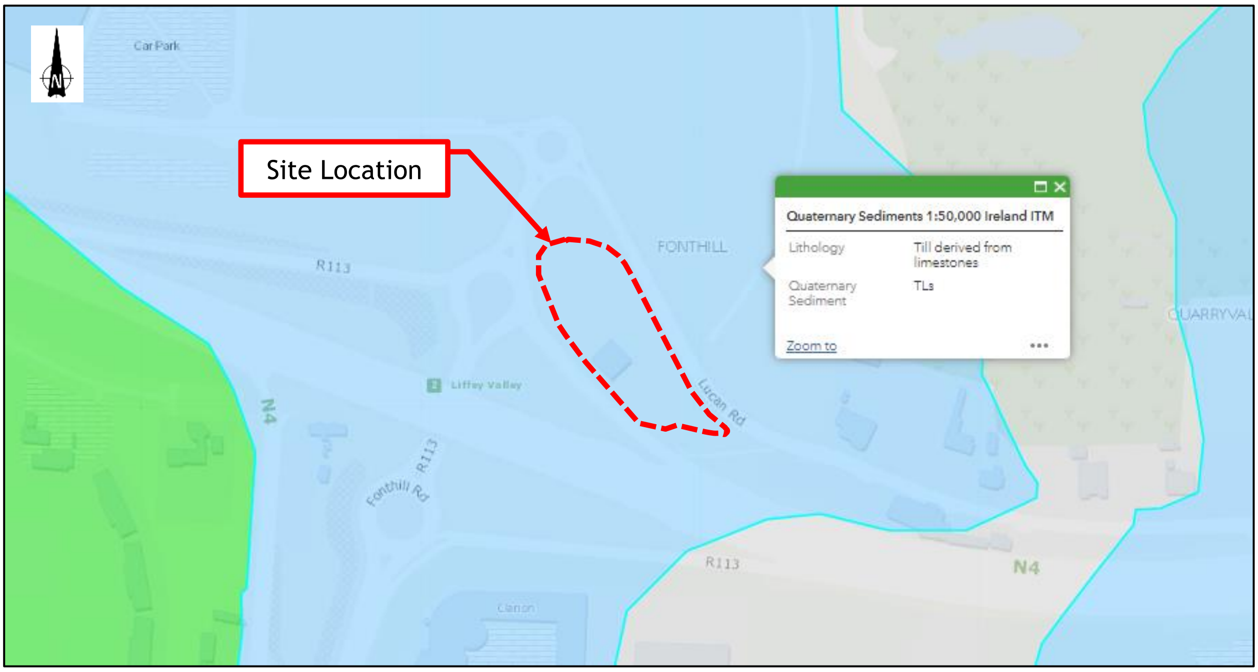


Figure 2-2: Extract from GSI Quaternary Map

2.2.4 Rainfall Data

Use was also made of Met Eireann Rainfall Data which can be found in Appendix D.

A M5-60 Value of 16.5 and an R Value of 0.277 have been used for modelling purposes

2.2.5 Qbar

The following values have been used to calculate Qbar:

1. SAAR = 782 mm – (refer section 2.2.2)
2. SOIL = 0.45 – (refer section 2.2.3)

To establish Qbar for a site less than 50ha, Qbar for 50Ha is calculated, and then proportionately reduced to the actual site area.

Refer below for Qbar calculation:

Qbar for 50Ha:

$$Qbar\ (50Ha) = 0.00108xAREA^{0.89}SAAR^{1.17}SOIL^{2.17}$$

$$Qbar\ (50Ha) = 0.00108x0.50^{0.89}782^{1.17}0.45^{2.17} = 250.05l/s$$

Qbar per Hectare:

Proportionate Qbar for 10,000m^2:

$$Qbar\ (site) = \frac{Qbar(50Ha)xSite\ area}{50,000}$$

$$Qbar\ (site) = \frac{250.05x10,000}{500,000} = 5.00\ l/s$$

This results in a Qbar value of 5.00 l/s/Ha

Qbar for Impervious Catchment

Proportionate Qbar for 5258m^2:

$$Qbar\ (site) = \frac{Qbar(50Ha)xSite\ area}{500,000}$$

$$Qbar\ (site) = \frac{250.05x5258}{500,000} = 2.63\ l/s$$

This results in a Qbar value of 2.63 l/s.

As per a result a discharge rate of 2.63l/s for the entire site has been adopted. Please refer to section 2.3.2 for discussion attenuation storage and discharge rates.

2.3 SUDs Proposals

The proposed development has been assessed in relation to Sustainable Urban Drainage Systems (SuDS). A variety of SuDS measures may be adopted to comply with Council recommendations. All SuDS measures are to be implemented with reference to the UK Suds Manual and SDCC drainage requirements.

Relatively small volumes of rainwater collected on the respective SuDS devices will enter the public sewer network during typical low intensity storms. This is because the proposed SuDS measures will retain rainwater until it is either used via evapotranspiration in the green areas or reused within the development via the rainwater harvesting system.

The SuDS processes decrease the impact of the development on the receiving environment by providing amenity and biodiversity in many cases. Regular maintenance of the SuDS proposals is required to ensure they are operating to their optimal level throughout their design life.

It is noted that green roof systems were considered for the proposed development and found not to be feasible due to the nature of the buildings. The proposed buildings are to be steel framed and steel roofs with limited area that would be suitable for green roofs. The minimal benefit and potential health safety issues associated with maintenance resulted in green roof systems not being proposed.

The specific measures adopted for the proposed development have been agreed in principle with SDCC and comprise the following:

2.3.1 Permeable Pavements

The car parking bays on site are proposed as permeable pavements.

The treatment processes that occurs within permeable pavements include:

I. Filtration of silt and the attached pollutants – the majority of silt is trapped within the top 30mm of the jointing material between the blocks
II. Biodegradation of organic pollutants, such as petrol and diesel within the pavement construction
III. Adsorption of pollutants (pollutants attach or bind to surfaces within the construction) which depends on factors such as texture, aggregate structure and moisture content
IV. Settlement and retention of solids.

The use of permeable pavers for this purpose is supported by the treatment processes outlined above. CIRIA C753 (The SuDS Manual) notes that regarding interception design of pervious pavements, studies have shown that runoff typically does not occur from pervious pavements for rainfall events up to 5 mm.

2.3.2 Attenuation Tank

It is proposed to attenuate all surface water on the site within 1 no. attenuation tank. The proposed attenuation tank is sized to reduce the peak runoff from the site to 2.63 l/s, in a 1:100 year return period storm event, plus 20% climate change. The tank is to be located in the centre of the site under the proposed parking and roadway. Please refer to PUNCH drawings accompanying this report for proposed location, and to section 2.2.2 above.

Following discussion with SDCC Drainage department and PUNCH modelling analysis, the proposed attenuation tank is 340m^3.

A hydro-brake system is to be used to restrict the flow 2.63 l/s. A penstock is to be provided after the hydro brake to allow for increased safety during maintenance and as a safety mechanism in the unlikely event of a salt spillage onsite (refer to section 2.3.8 for further information).

2.3.3 Petrol Interceptor

It is proposed that all surface water run-off from hardstanding areas including HGV and car park areas will outfall via a petrol interceptor. It is proposed that this is to be a forecourt separator due to proposed fuel storage tanks on site. It is to be located upstream of the proposed attenuation tank and downstream of the of the proposed 2 no. diesel pumps and fuel delivery area. This device will store and retain hydrocarbons and fine sediment particles from the site runoff and lower the risk of downstream contamination following an oil spillage on site.

The volume of the forecourt separator is to be sized to suit the proposed fuel deliveries and in consultation with relevant fuel supply and storage specialist designers.

2.3.4 Raingardens

A proportion of pavement surfaces are to runoff overland to rain gardens. The proposed rain gardens will serve to provide treatment to pavement runoff for low intensity storms. Rainwater will be treated through evapotranspiration within the filter media of the rain garden structure.

These rain gardens are to comprise a landscape area with high permeability soil in the top 900mm depth. A perforated surface water drain is to be provided at a low level to drain any excess surface water.

The extent and detail of rain gardens is to be as shown on drawing 222153-PUNCH-XX-XX-DR-C-0100.

Any water that drains through the above-mentioned perforated drainage pipe will subsequently discharge to the main surface water drainage system.

2.3.5 Swales

A swale is to be provided along the southern green area of the proposed development. The swale will provide treatment via evapotranspiration within the topsoil layers with water compatible vegetation. Infiltration into the ground below is feasible due to the permeable sand and gravel layers below. Low level earth dams will be provided along the swales to enable build-up of water for treatment. Please refer to drawing 222153-PUNCH-XX-XX-DR-C-0502 for typical swale detail.

The swale will incorporate a high-flow overflow with a screened outlet to the drainage network to accommodate removal of water in high flow circumstance. The swale will be located as shown on drawing 222153-PUNCH-XX-XX-DR-C-0100.

2.3.6 Filter drain

A filter drain is also proposed below the swale noted above. The water will be filtered through the stone layers before entering the main surface water drainage network.

The filter drains will provide a level of attenuation storage within the voids in the stone within the trench. The base and sides of the drains will be lined and a high-level overflow to the drainage network within the build-up will accommodate removal of water.

CIRIA C753 (The SuDS Manual) Table 24.6 notes that regarding interception design of filter drains, pavements drained by filter drains can be considered to provide interception, i.e. it can be assumed that there will be zero runoff from the first 5 mm rainfall for 80% of events during the summer and 50% in winter.

2.3.7 Rainwater Harvesting

Rainwater harvesting (RWH) is the collection of rainwater runoff for use. Runoff can be collected from roofs and stored and then used as a supply of water for other purposes. RWH systems have a number of key benefits:

I. They can meet some of the building's water demand, delivering sustainability and climate resilience benefits.
II. They can help reduce the volume of runoff from a site.
III. They can help reduce the volume of attenuation storage required on the site.

The proposed development will incorporate rainwater harvesting. Rainwater harvesting will be utilised on site to capture roof runoff from the vehicle maintenance building, with the water to be used for washing of vehicles. The design of the RWH is to be developed by the M&E consultant at detailed design stage. Overflows from the rainwater harvesting tank will connect to the main surface water drainage on site and thus to the attenuation tank. Location of proposed rainwater harvesting unit is shown on drawing 222153-PUNCH-XX-XX-DR-C-0100.

2.3.8 Salt Interception System for Salt Barns

The existing depot site includes an existing Salt Barn with reinforced watertight concrete floor and walls, specially designed for the storage of salt for road maintenance during the winter season. This Part 8 planning application includes for an additional salt barn (also with reinformed watertight concrete floors and walls), to be located just south of the existing barn.

Regarding the potential for the release of salt into the surrounding waterway, please note the following:

1. The salt is stored within a specially designed salt barn, which is fully tanked to protect against ground seepage.
2. The site is surrounded by asphalt roads on three sides and is 550 metres from the River Liffey.
3. There are no waterways/ditches/streams on the site.
4. The area to the south of the Salt Barns (within the area of the site containing trees) is almost a metre in height above the marshalling areas in front of the Salt Barns and will not be affected by potential spillages etc.
5. Permeable paving is restricted to car-parking and will not be affected by the general salt barn area.
6. The removal and delivery of salt to the salt barn(s) is a seasonal operation only and it is inactive for most of the year.
7. In relation to the delivery of salt to the existing salt barn. The HGV partially reverses into the doors of the salt barn and deposits the salt at the entrance. Once the salt is deposited, it is immediately pushed to the back of the barn using heavy duty machinery.

Having reviewed the site area, and the proposed usage (for the storage of salt) the only potential risk concerning the release of salt into the waterways concerns the following:

A. Spillage of salt on delivery.
B. Flooding of the Salt Barns, with saltwater escaping into the site and surrounding area.

In consideration of the above, the following should be noted:

I. The Flood Risk Assessment has confirmed that the possibility of a flooding event within the site is low.

II. SDCC Salt Depot staff will continue to implement a strict salt delivery management QC protocol, where deliveries of salt are carefully monitored and spillages immediately contained and removed.

III. The concrete marshalling areas to the front of the existing salt barn falls way from the vehicular entrance, therefore reducing the potential risk of floodwater entering the barns. The proposed additional salt barn is to be designed to the same principle i.e. hardstanding outside of the vehicular entrance to be laid to fall away.

IV. In the event that rainwater /floodwater should enter the salt barns via the vehicular entrance the following additional measures are proposed to catch the saltwater and prevent it from escaping into the proposed on site surface water network:

   a. A channel drain will be included across the entrance to each of the salt-barns, linked to an underground cess-pool storage tank fitted with a high level alarm system.
   b. This cess pool system is designed to retain water contaminated with salt and will emit an alarm to notify site staff when full.
   c. The channel drains and cess-pool will not be connected to the main surface water network.
   d. A protocol to empty the cess-pool storage tank every quarter will be included in the depot's operation and maintenance regime.
   e. As noted in section 2.3.2 a penstock is to be provided after the hydro brake to allow for as an additional safety mechanism in the unlikely event of a salt spillage onsite, to prevent saltwater escaping from the site should it enter the proposed onsite surface water network.

Figure 2-3: Photo Showing Salt Delivery Method

2.3.9 Summary and Overview of SuDS Effectiveness

The combination of the above noted elements shall allow the proposed development to adhere to the principles of sustainable drainage practices while enhancing overall storm water quality.

There are several benefits from the promotion of these SuDS elements within the development, below is a list of such benefits:

1. **Biodiversity and Ecology**: Habitats are maintained, created & linked to support existing & new wildlife. This increases biodiversity & improves the quality of ecosystems in urban environments.

2. **Water Quality**: SuDS filter sediment & contaminants from runoff which improves quality. They intercept rainfall & slightly reduce the volume entering sewers & drains in short duration events.

3. **Flood Risk Management**: SuDS mimic natural drainage patterns & reduce the volume of runoff reaching drains & watercourses. They provide areas to store water & slow the flow of water to reduce flood risk in urban areas. The attenuation tank provides the primary drainage flood mitigation for the site.

4. **Climate Resilience**: Vegetation and plants used, e.g. landscaped open spaces, can capture & store carbon and greenhouse gases to improve air quality. They can also regulate building temperatures and reduce air & water pollution.

5. **Rainwater Demand**: Water is collected all year round in rainwater butts and the rainwater harvesting tank and can be used for landscape maintenance and vehicle washing. This reduces demand on mains supplies & is useful in drought conditions.

3 Foul Water Drainage Design

3.1 Existing Foul Water Drainage

Irish Water record drawings indicate that there is no existing foul network adjacent to the site. The nearest foul sewer is a 150mm pipe located on the southern side of the N4 and would involve crossing at least 6 lanes on the carriageway to connect to.

Approximately 500m to the east of the site is a 350mm Foul Pipe which connects into the Quarryvale Waste Water Pumping Station.

Please refer to Appendix A for Irish Water Record Drawings illustrating the drainage arrangement. Extracts are shown in Figure 3-1 and Figure 3-2 below.

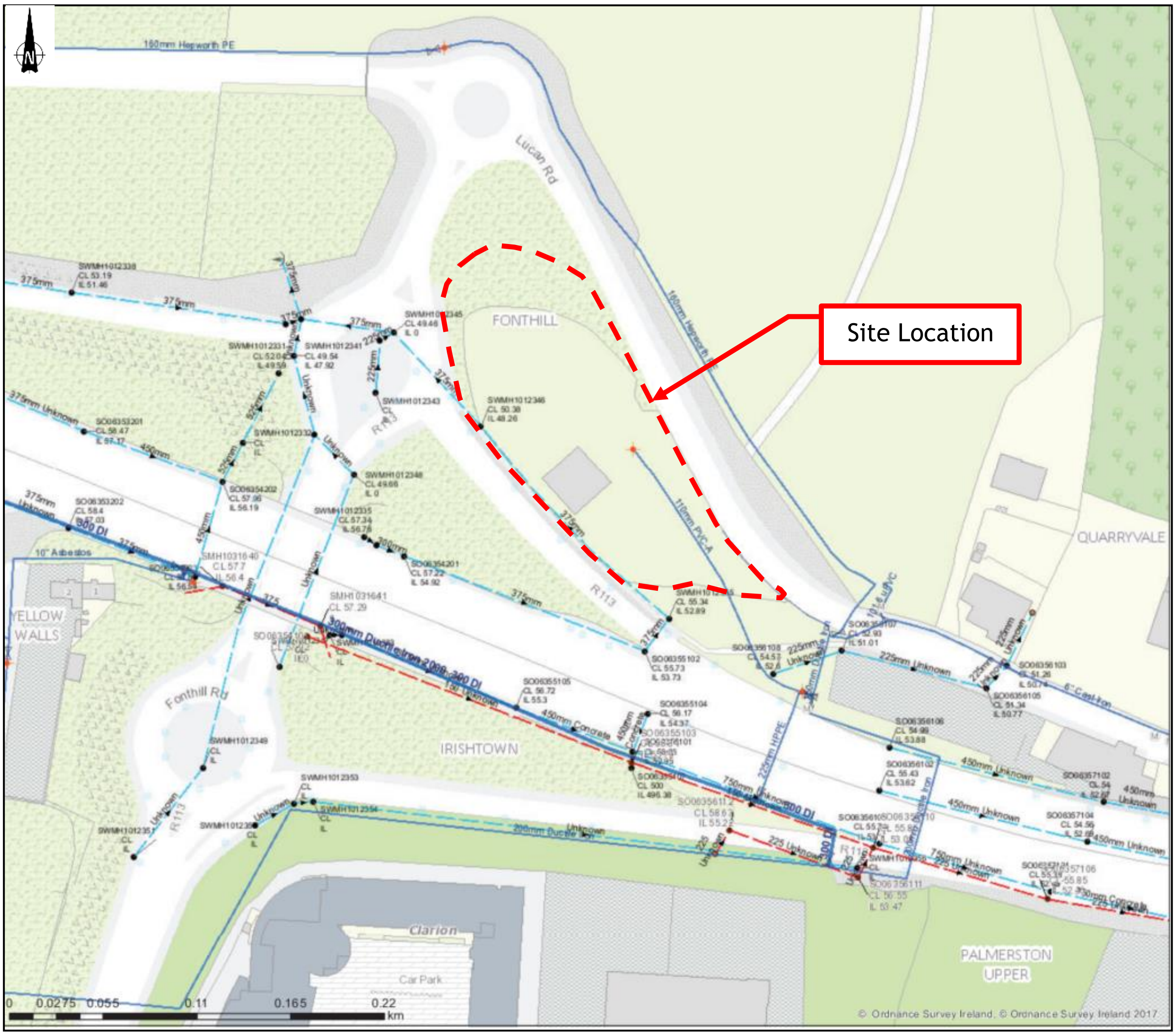


Figure 3-1: Existing Foul Drainage Surrounding the Site (Extract from Irish Water records)

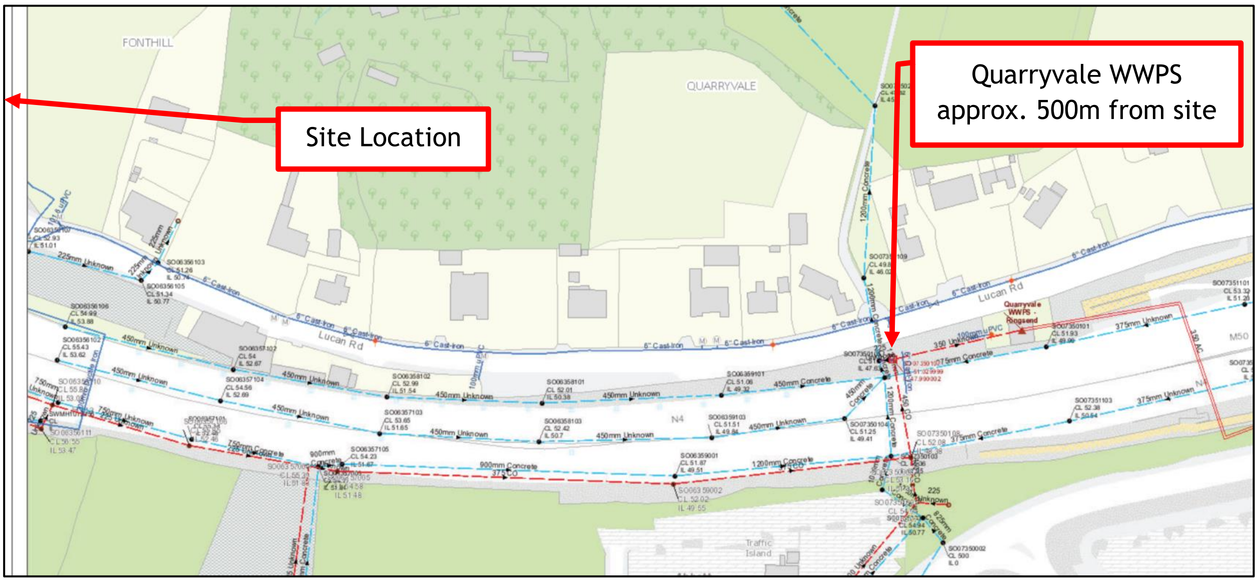


Figure 3-2: Exist Foul Drainage to the East of Site (Extract from Irish Water Records)

3.2 Proposed Foul Water Drainage

The proposed foul water sewers have been designed using Causeway Flow software in accordance with the EPA Wastewater Treatment Manual *(Treatment Systems for Small Communities, Business, leisure Centres and Hotels)*. The foul loading is in line with the sources of waste calculated in the Site Suitability Assessment undertaken by Trinity Green Environmental Consultants. Please refer to section 3.3 and Appendix F for further information.

It is proposed that the foul sewer will discharge by gravity to a proposed onsite waste water treatment system at the northern end of the site.

Table 3-1 below describes the foul water drainage design parameters used and detailed calculations are enclosed in Appendix E.

Table 3-1: Foul Water Drainage Design Parameters

Description	Value
No. Full Time Depot Staff	14
Full Time Staff Flow Rate	50 l/per person/per day
No. Visitors*	40
Industrial Part Time* Staff Flow Rate	5 l/per person/per day
Minimum Self Cleansing Velocity	0.75m/s
Minimum Pipe Diameter	150mm

**Visitors relate to no. visiting staff expected to arrive daily at depot for vehicle servicing*

Table 3-2: Foul Water Drainage Design Calculations

Category	Quantity	Flow Rate	Daily Flow (l/day)
Industrial Full Time Staff	14 persons	50 l/per person/per day	700
Industrial Part Time Staff	40 persons	5 l/per person/per day	200
Total			900

3.3 Proposed Domestic Waste Water Treatment System

Wastewater from the site is proposed to be discharged to an onsite waste water treatment system (WWTS) located in the north of the site. A percolation test and Site Suitability Assessment has been undertaken by Trinity Green Environmental Consultants to confirm the system type and design. The design of the onsite WWTS is to be in accordance with the EPA Code of Practice 2021.

3.3.1 Wastewater Treatment System Description

Trinity Green Environmental Consultants proposed a tertiary treatment system and infiltration /treatment area.

The assessor proposed to install a BAF P16 system provided by O'Reilly Oakstown Environmental or equivalent. As described in their reports, the system is designed to provide proven, cost effective primary and secondary wastewater treatment in robust steel reinforced concrete tanks. The primary sedimentation chambers have substantial capacity (5.5m^3) to allow anaerobic digestion to occur naturally while letting sludge settle on the tank floor. Once primary treatment has taken place the effluent is further degraded in the aeration chamber where oxygen enriched wastewater provides ideal conditions for aerobic bacteria to thrive. Before pumping to the percolation area the clear water is left to further settle in the clarifier chamber to eliminate any remaining settle able solids.

Please refer to drawing 222153-PUNCH-XX-XX-DR-C-0100 for indicative proposed location of wastewater treatment system and percolation system, designed by Trinity Green Environmental Consultants.

Please refer to Appendix F for the Site Suitability Assessment Report and Percolation test results and details of the proposed waste water treatment system.

4 Watermain Design

4.1 Existing Watermain

Irish Water record drawings indicate the presence of an existing 110mm PVC-A connection to the site.

Please refer to Appendix A for Irish Water Record Drawings illustrating the existing watermain arrangement in the area. An extract is shown in Figure 3-1 below.

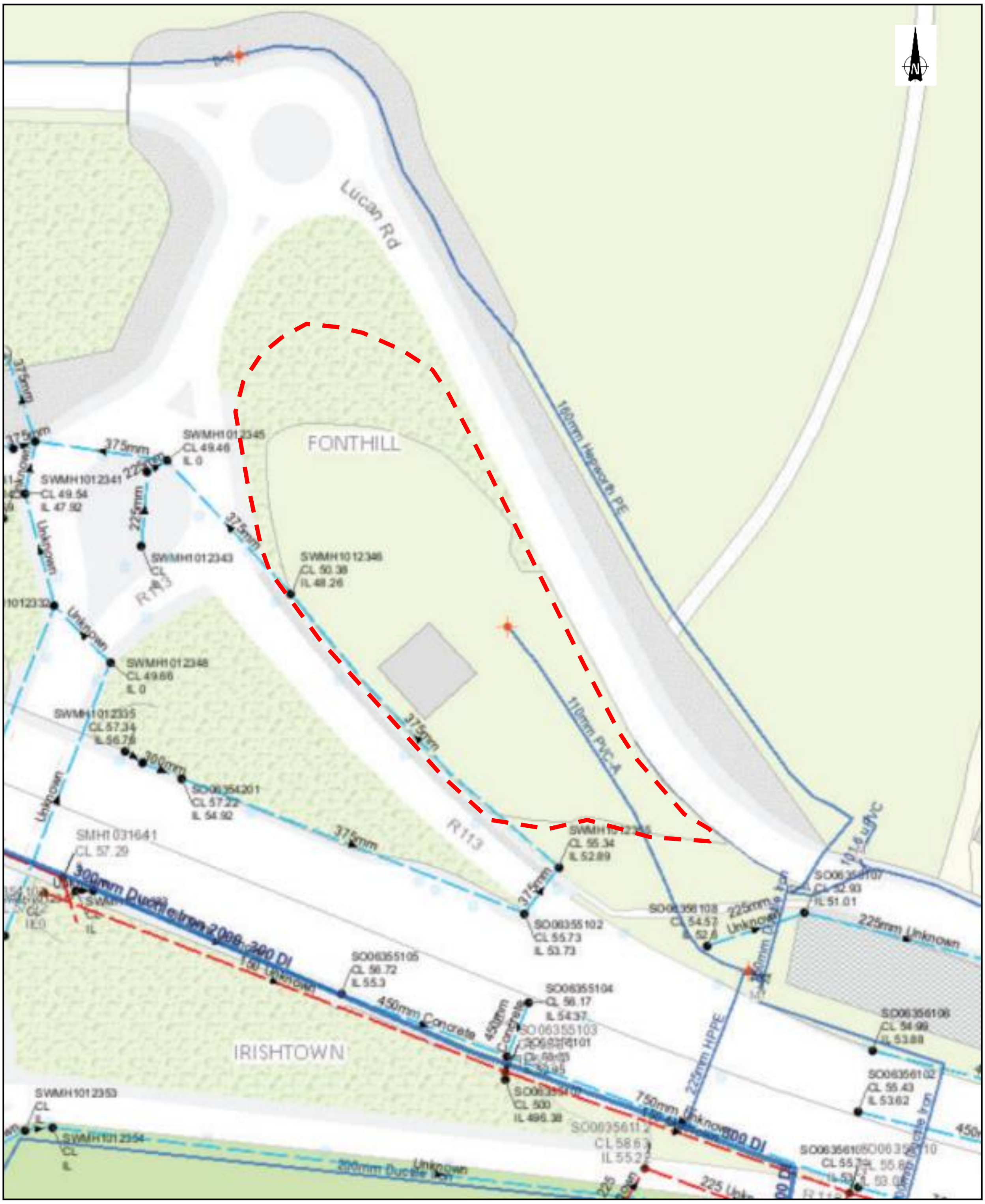


Figure 4-1: Existing watermain surrounding the site (Extract from Irish Water records)

4.2 Proposed Watermain

It is generally accepted that the design loading for foul drainage can be used to evaluate an approximation of the water demand on the site. With reference to Irish Water's Code of Practice for Water Infrastructure, the average daily flow is calculated as the number of persons multiplied by the flow rate per person. The average day peak week flow is taken to be 1.25 times the average flow, and the peak demand is taken to be the average day peak week flow multiplied by a peaking factor of 5.

Table 4-1 describes the watermain design parameters used.

Table 4-2: Watermain Design Parameters

Description	Value
No. Full Time Depot Staff	14
Industrial Full Time Staff Flow Rate	90 l/per person/per day
No. Part Time Staff*	40
Industrial Part Time* Staff Flow Rate	45 l/per person/per day
Average Demand	1.25 DWF
Peak Demand	5 DWF

Table 4-2: Watermain Design Calculation

Category	Quantity	Flow Rate	Daily Flow (l/day)	DWF (l/s)	Average Demand (1.25DWF) (l/s)	Peak Demand (5DWF) (l/s)
Industrial Full Time Staff	14 persons	90 l/per person/per day	1260	0.015	0.018	0.091
Industrial Part Time Staff	40 persons	45 l/per person/per day	1800	0.021	0.026	0.130
Total			3060	0.036	0.044	0.221

On the basis of the above tables, the development will have an increase in average water demand of 0.044 l/s and a peak water demand of 0.221 l/s.

It is proposed to retain the existing 110mm diameter watermain to serve the proposed development based on the above calculated demand.

This feed will provide potable and firefighting water to the proposed development. A bulk water meter shall be provided at the site boundary at the location of the proposed connection to the existing watermain. The watermain layout has been designed in accordance with "Irish Water Code of Practice for Water Infrastructure”. All watermains are to be constructed in accordance with Irish Water Code of Practice and the Local Authority’s requirements. Fire coverage is to be reviewed and certified by the fire consultant.

To reduce the water demand on Local Authority water supplies and to reduce the foul discharge from the development, water conservation measures will be incorporated in the sanitary facilities throughout the development, e.g. dual flush toilets, monobloc low volume push taps and waterless urinals.

A Pre-Connection Enquiry Form has been issued to Irish Water for the proposed development.

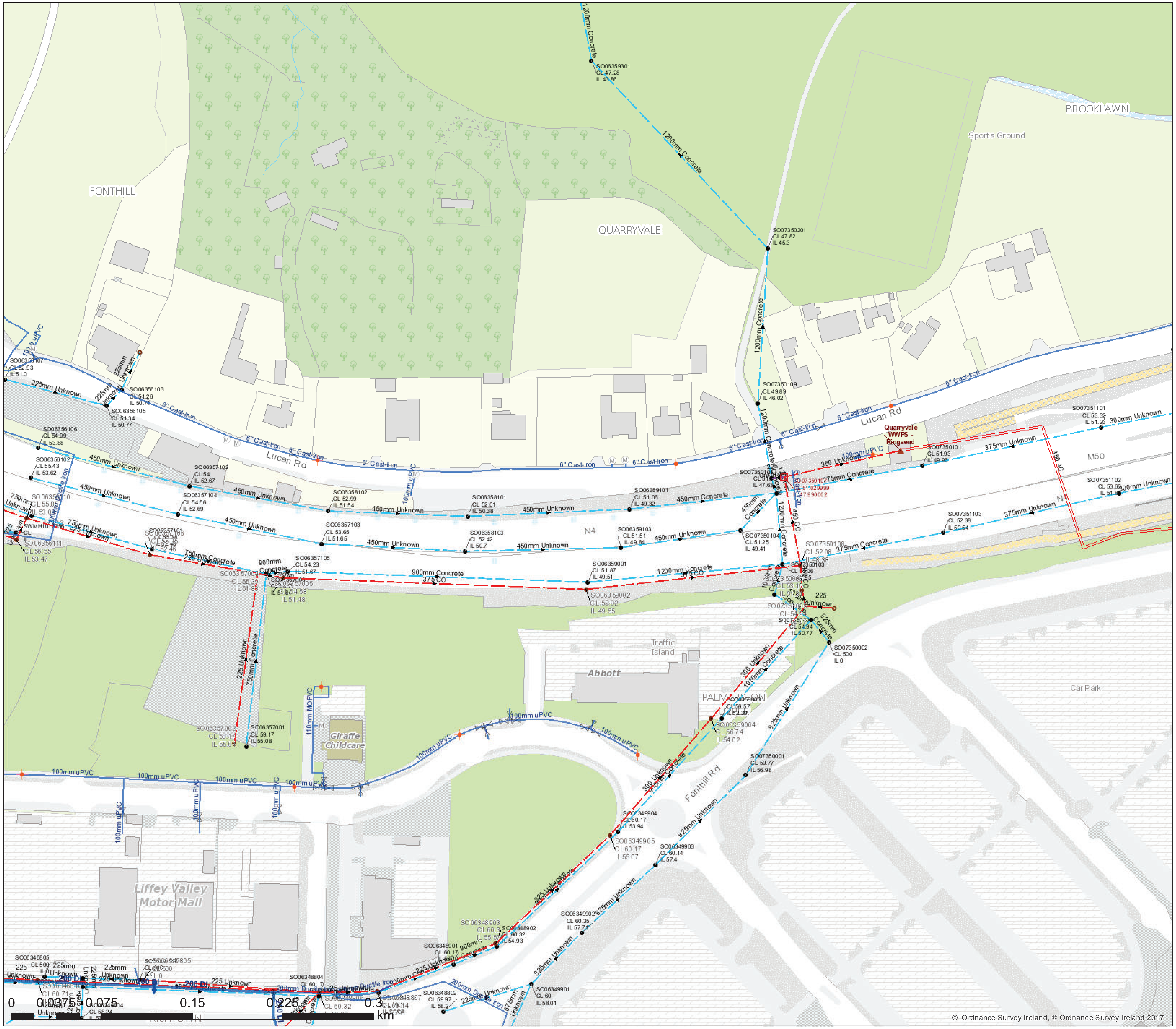
5 Flooding

A Site Specific Flood Risk Assessment Report has been undertaken by PUNCH Consulting Engineers for the development which accompanies this planning submission.

Document reference *222153-PUNCH-XX-XX-RP-C-0001*.

Appendix A Existing Record Drawings

Irish Water Web Map



UISCE ÉIREANN : IRISH WATER

Print Date: 13/07/2022

Printed by:Irish Water

Water Distribution Network
- Water Treatment Plant
- Water Pump Station
- Storage Cell/Tower
- Dosing Point
- Meter Station
- Abstraction Point
- Telemetry Kiosk

Reservoir
- Potable
- Raw Water

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Casings
- Water Abandoned Lines
- Boundary Meter
- Bulk/Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter
- Non-Return
- PRV
- PSV
- Sluice Line Valve Open/Closed
- Butterfly Line Valve Open/Closed
- Sluice Boundary Valve Open/Closed
- Butterfly Boundary Valve Open/Closed
- Scour Valves
- Single Air Control Valve
- Double Air Control Valve
- Water Stop Valves
- Water Service Connections
- Water Distribution Chambers
- Water Network Junctions
- Pressure Monitoring Point
- Fire Hydrant
- Fire Hydrant/Washout

Water Fittings
- Cap
- Reducer
- Tap
- Other Fittings

Sewer Foul Combined Network
- Waste Water Treatment Plant
- Waste Water Pump station

Sewer Mains Irish Water
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow

Sewer Mains Private
- Gravity - Combined
- Gravity - Foul
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul
- Overflow
- Sewer Lateral Lines
- Sewer Casings

Sewer Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown

Discharge Type
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Cleanout Type
- Rodding Eye
- Flushing Structure
- Other; Unknown

Sewer Inlets
- Catchpit
- Gully
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Storm Water Network

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Inlet Type
- Gully
- Standard
- Other; Unknown

Storm Manholes
- Standard
- Backdrop
- Cascade
- Catchpit
- Bifurcation
- Hatchbox
- Lamphole
- Hydrobrake
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Stormwater Chambers

Discharge Type
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Gas Networks Ireland
- Transmission High Pressure Gasline
- Distribution Medium Pressure Gasline
- Distribution Low Pressure Gasline

ESB Networks

ESB HV Lines
- HV Underground
- HV Overhead
- HV Abandoned

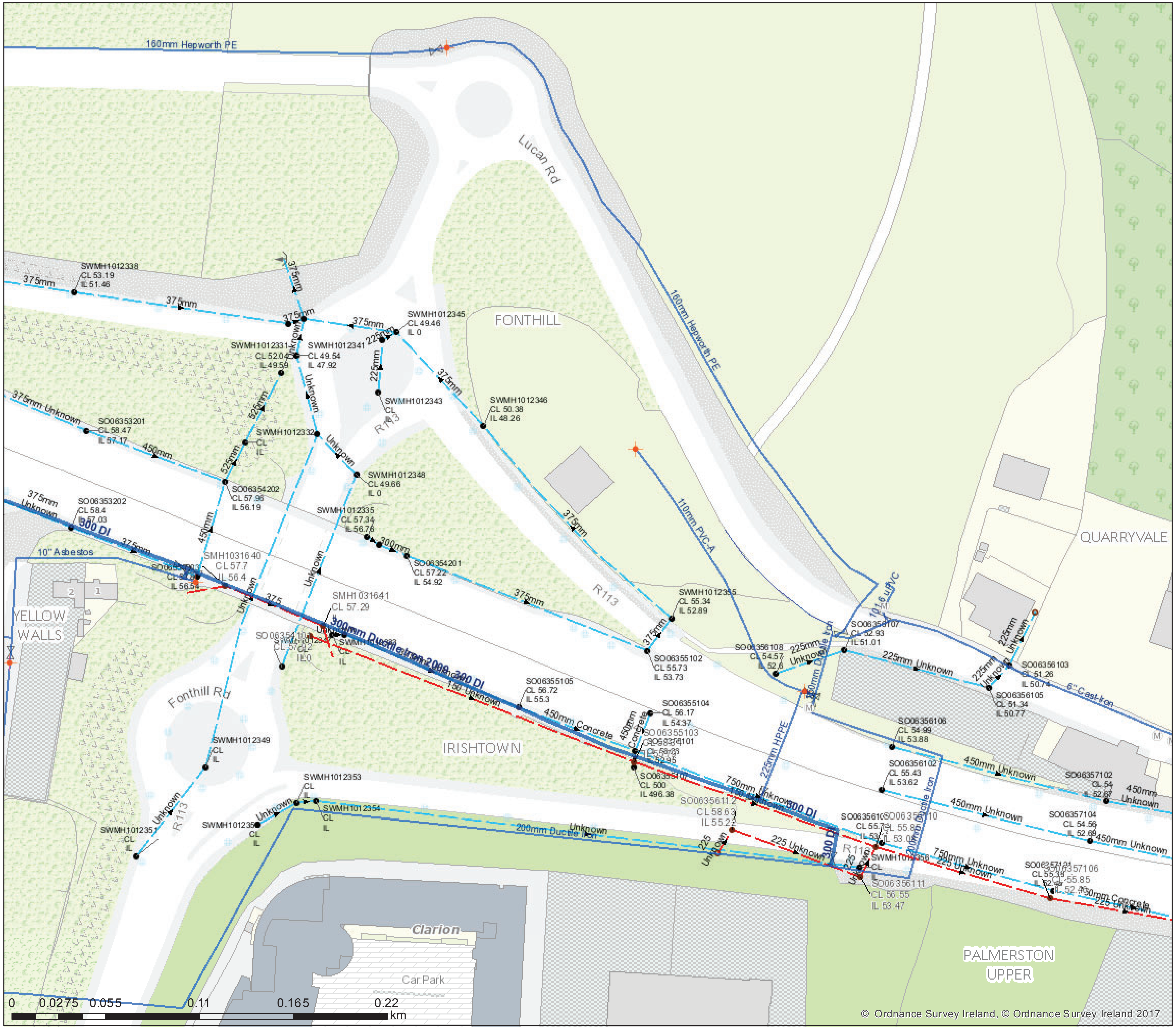
ESB MVLV Lines
- MV Overhead Three Phase
- MV Overhead Single Phase
- LV Overhead Three Phase
- LV Overhead Single Phase
- MVLV Underground
- Abandoned

Non Service Categories
- Proposed
- Under Construction
- Out of Service
- Decommissioned

Water Non Service Assets
- Water Point Feature
- Water Pipe
- Water Structure

Waste Non Service Assets
- Waste Point Feature
- Sewer
- Waste Structure

Irish Water Web Map



UISCE ÉIREANN : IRISH WATER

Print Date: 23/06/2022

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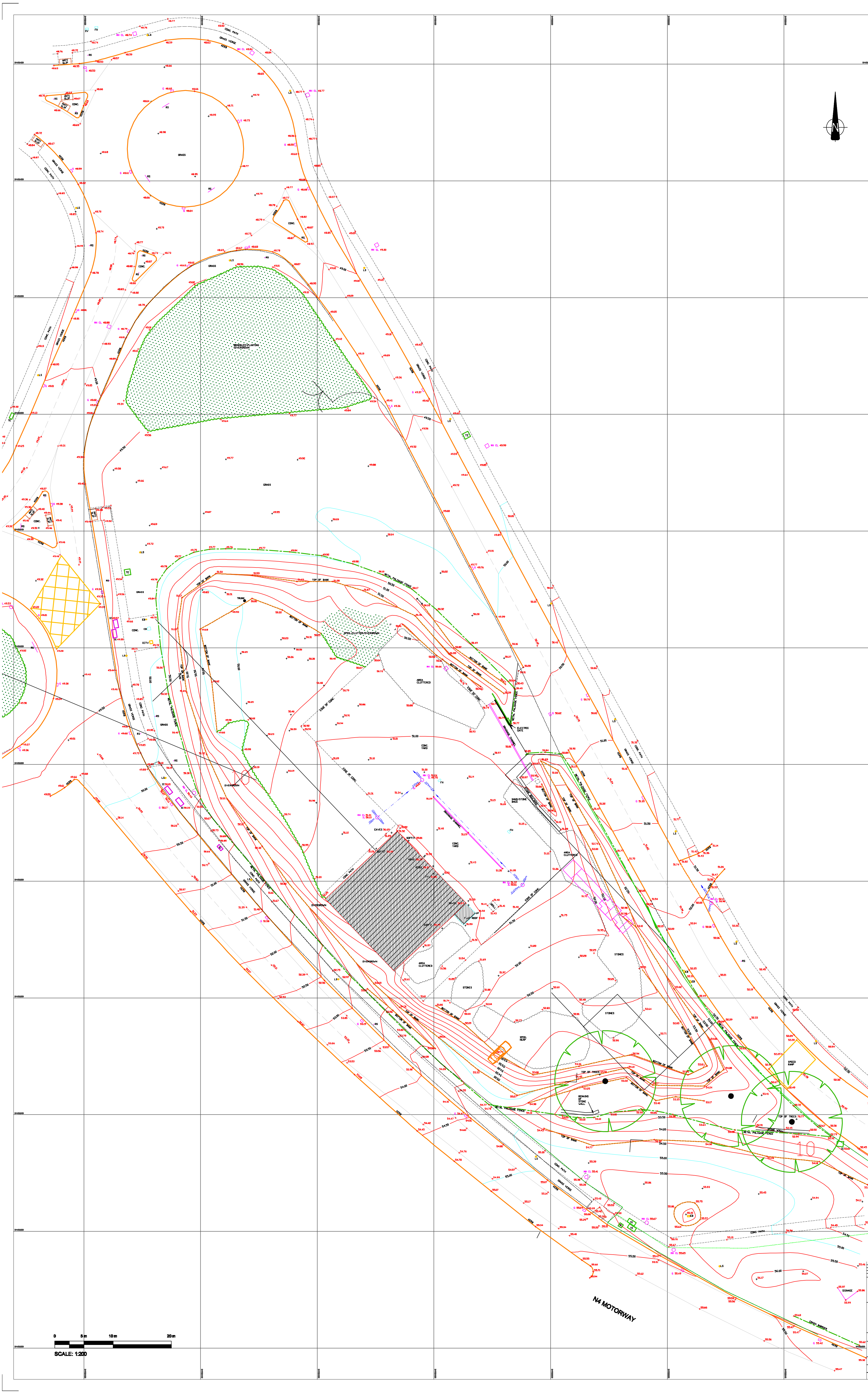
Appendix B Topographical Survey



Rev.	Date	By	Description

NOTE:
HORIZONTAL(ITM) AND VERTICAL(MALIN HEAD) CONTROL OBTAINED BY G.P.S.
PLEASE NOTE CONTOURS (IF ANY) ARE COMPUTER GENERATED.
PHYSICAL BOUNDARIES SHOWN MAY NOT BE THE LEGAL BOUNDARIES.
SEWER PIPE SIZES SHOWN IF ANY ARE ESTIMATED BY EYE.
UNDERGROUND SERVICES ARE ASSUMED TO RUN IN A STRAIGHT LINE BETWEEN POINTS SURVEYED.

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TITLE	TOPOGRAPHIC SURVEY		
PROJECT	DEADMAN'S PUB SITE DEPOT, LIFFEY VALLEY, CO. DUBLIN.	GRID	ITM
		DATUM	MALIN HEAD
CLIENT		SCALE	1: 200
DRAWN D.B.	DATE 24.01.2018 SHEET A0	DRG.NO.	11419B

Appendix C Causeway Stormwater Drainage Design Calculations

Design Settings

Rainfall Methodology	FSR
Return Period (years)	2
Additional Flow (%)	0
FSR Region	Scotland and Ireland
M5-60 (mm)	16.500
Ratio-R	0.277
CV	0.750
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Inverts
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	x
Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
3-0	0.049	5.00	50.100	1200	706433.458	735336.066	0.975
3-1	0.086	5.00	50.150	1200	706466.756	735353.126	1.246
1-0	0.053	5.00	51.500	1200	706483.204	735265.765	2.300
2-0	0.092	5.00	52.200	1200	706513.687	735262.700	2.500
1-1	0.069	5.00	51.300	1200	706502.779	735285.001	2.213
3-2	0.014	5.00	50.150	1200	706482.229	735325.529	1.376
1-2	0.014	5.00	50.600	1200	706493.427	735303.043	1.596
1-3	0.014	5.00	50.250	1200	706488.759	735312.099	1.538
4-0	0.035	5.00	50.000	1200	706435.908	735320.043	1.221
4-1	0.044	5.00	50.150	1200	706443.923	735303.717	1.445
4-2	0.035	5.00	50.150	1200	706476.519	735320.635	1.593
1-4	0.074	5.00	50.100	1350	706482.570	735308.856	1.609
PI			50.100	1350	706476.185	735305.590	1.638
HYDROBRAKE			50.200		706453.764	735294.176	1.841
1-5			50.200	1350	706444.491	735298.948	1.884
Outfall Existing SMH			50.380	1350	706438.868	735295.139	2.092

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
S 1.5000	1-5	Outfall Existing SMH	6.792	0.600	48.316	48.288	0.028	242.6	375	7.15	43.2
S 1.401	HYDROBRAKE	1-5	10.429	0.600	48.359	48.316	0.043	242.5	375	7.05	43.4
S 1.402	PI	HYDROBRAKE	25.159	0.600	48.462	48.359	0.103	244.3	375	6.90	43.8
S 1.400	1-4	PI	7.172	0.600	48.491	48.462	0.029	247.3	375	6.54	44.8
S 1.300	1-3	1-4	6.987	0.600	48.712	48.491	0.221	31.6	300	6.44	45.1
S 4.200	4-2	1-4	13.242	0.600	48.557	48.491	0.066	200.6	300	6.12	46.1
S 4.100	4-1	4-2	36.725	0.600	48.705	48.557	0.148	248.1	300	5.92	46.7
S 4.000	4-0	4-1	18.187	0.600	48.779	48.705	0.074	245.8	300	5.30	48.7
S 3.200	3-2	1-3	14.933	0.600	48.774	48.712	0.062	240.9	300	6.39	45.2
S 1.200	1-2	1-3	10.188	0.600	49.004	48.962	0.042	242.6	300	5.96	46.5
S 1.100	1-1	1-2	20.322	0.600	49.087	49.004	0.083	244.8	300	5.79	47.1
S 1.000	1-0	1-1	27.445	0.600	49.200	49.087	0.113	242.9	300	5.46	48.2
S 2.000	2-0	1-1	24.826	0.600	49.700	49.598	0.102	243.4	300	5.41	48.3
S 3.100	3-1	3-2	31.639	0.600	48.904	48.774	0.130	243.4	300	6.15	46.0
S 3.000	3-0	3-1	37.414	0.600	49.125	48.904	0.221	169.3	225	5.62	47.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)
S 1.5000	1.159	128.0	67.9	1.509	1.717	0.580	0.0	194
S 1.401	1.159	128.0	68.3	1.466	1.509	0.580	0.0	195
S 1.402	1.155	127.5	68.9	1.263	1.466	0.580	0.0	197
S 1.400	1.147	126.7	70.5	1.234	1.263	0.580	0.0	200
S 1.300	2.806	198.3	47.9	1.238	1.309	0.392	0.0	100
S 4.200	1.106	78.2	14.2	1.293	1.309	0.114	0.0	86
S 4.100	0.993	70.2	10.0	1.145	1.293	0.079	0.0	76
S 4.000	0.998	70.6	4.6	0.921	1.145	0.035	0.0	52
S 3.200	1.008	71.3	18.3	1.076	1.238	0.149	0.0	103
S 1.200	1.005	71.0	28.8	1.296	0.988	0.229	0.0	133
S 1.100	1.000	70.7	27.4	1.913	1.296	0.215	0.0	129
S 1.000	1.004	71.0	7.0	2.000	1.913	0.053	0.0	63
S 2.000	1.003	70.9	12.1	2.200	1.402	0.092	0.0	83
S 3.100	1.003	70.9	16.9	0.946	1.076	0.135	0.0	99
S 3.000	1.002	39.8	6.4	0.750	1.021	0.049	0.0	60

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
S 1.5000	6.792	242.6	375	Circular	50.200	48.316	1.509	50.380	48.288	1.717
S 1.401	10.429	242.5	375	Circular	50.200	48.359	1.466	50.200	48.316	1.509
S 1.402	25.159	244.3	375	Circular	50.100	48.462	1.263	50.200	48.359	1.466
S 1.400	7.172	247.3	375	Circular	50.100	48.491	1.234	50.100	48.462	1.263
S 1.300	6.987	31.6	300	Circular	50.250	48.712	1.238	50.100	48.491	1.309
S 4.200	13.242	200.6	300	Circular	50.150	48.557	1.293	50.100	48.491	1.309
S 4.100	36.725	248.1	300	Circular	50.150	48.705	1.145	50.150	48.557	1.293
S 4.000	18.187	245.8	300	Circular	50.000	48.779	0.921	50.150	48.705	1.145
S 3.200	14.933	240.9	300	Circular	50.150	48.774	1.076	50.250	48.712	1.238
S 1.200	10.188	242.6	300	Circular	50.600	49.004	1.296	50.250	48.962	0.988
S 1.100	20.322	244.8	300	Circular	51.300	49.087	1.913	50.600	49.004	1.296
S 1.000	27.445	242.9	300	Circular	51.500	49.200	2.000	51.300	49.087	1.913
S 2.000	24.826	243.4	300	Circular	52.200	49.700	2.200	51.300	49.598	1.402
S 3.100	31.639	243.4	300	Circular	50.150	48.904	0.946	50.150	48.774	1.076
S 3.000	37.414	169.3	225	Circular	50.100	49.125	0.750	50.150	48.904	1.021

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
S 1.5000	1-5	1350	Manhole	Adoptable	Outfall Existing SMH	1350	Manhole	Adoptable
S 1.401	HYDROBRAKE		Junction		1-5	1350	Manhole	Adoptable
S 1.402	PI	1350	Manhole	Adoptable	HYDROBRAKE		Junction	
S 1.400	1-4	1350	Manhole	Adoptable	PI	1350	Manhole	Adoptable
S 1.300	1-3	1200	Manhole	Adoptable	1-4	1350	Manhole	Adoptable
S 4.200	4-2	1200	Manhole	Adoptable	1-4	1350	Manhole	Adoptable
S 4.100	4-1	1200	Manhole	Adoptable	4-2	1200	Manhole	Adoptable
S 4.000	4-0	1200	Manhole	Adoptable	4-1	1200	Manhole	Adoptable
S 3.200	3-2	1200	Manhole	Adoptable	1-3	1200	Manhole	Adoptable
S 1.200	1-2	1200	Manhole	Adoptable	1-3	1200	Manhole	Adoptable
S 1.100	1-1	1200	Manhole	Adoptable	1-2	1200	Manhole	Adoptable
S 1.000	1-0	1200	Manhole	Adoptable	1-1	1200	Manhole	Adoptable
S 2.000	2-0	1200	Manhole	Adoptable	1-1	1200	Manhole	Adoptable
S 3.100	3-1	1200	Manhole	Adoptable	3-2	1200	Manhole	Adoptable
S 3.000	3-0	1200	Manhole	Adoptable	3-1	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
3-0	706433.458	735336.066	50.100	0.975	1200	0	S 3.000	49.125	225
3-1	706466.756	735353.126	50.150	1.246	1200	1	S 3.000	48.904	225
						0	S 3.100	48.904	300
1-0	706483.204	735265.765	51.500	2.300	1200	0	S 1.000	49.200	300
2-0	706513.687	735262.700	52.200	2.500	1200	0	S 2.000	49.700	300
1-1	706502.779	735285.001	51.300	2.213	1200	1	S 2.000	49.598	300
						2	S 1.000	49.087	300
						0	S 1.100	49.087	300
3-2	706482.229	735325.529	50.150	1.376	1200	1	S 3.100	48.774	300
						0	S 3.200	48.774	300
1-2	706493.427	735303.043	50.600	1.596	1200	1	S 1.100	49.004	300
						0	S 1.200	49.004	300
1-3	706488.759	735312.099	50.250	1.538	1200	1	S 1.200	48.962	300
						2	S 3.200	48.712	300
						0	S 1.300	48.712	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
4-0	706435.908	735320.043	50.000	1.221	1200	0	S 4.000	48.779	300
4-1	706443.923	735303.717	50.150	1.445	1200	1	S 4.000	48.705	300
						0	S 4.100	48.705	300
4-2	706476.519	735320.635	50.150	1.593	1200	1	S 4.100	48.557	300
						0	S 4.200	48.557	300
1-4	706482.570	735308.856	50.100	1.609	1350	1	S 4.200	48.491	300
						2	S 1.300	48.491	300
						0	S 1.400	48.491	375
PI	706476.185	735305.590	50.100	1.638	1350	1	S 1.400	48.462	375
						0	S 1.402	48.462	375
HYDROBRAKE	706453.764	735294.176	50.200	1.841		1	S 1.402	48.359	375
						0	S 1.401	48.359	375
1-5	706444.491	735298.948	50.200	1.884	1350	1	S 1.401	48.316	375
						0	S 1.5000	48.316	375
Outfall Existing SMH	706438.868	735295.139	50.380	2.092	1350	1	S 1.5000	48.288	375

Simulation Settings

Rainfall Methodology	FSR	Summer CV	0.750	Additional Storage (m³/ha)	20.0
FSR Region	Scotland and Ireland	Analysis Speed	Normal	Check Discharge Rate(s)	x
M5-60 (mm)	16.500	Skip Steady State	x	Check Discharge Volume	x
Ratio-R	0.277	Drain Down Time (mins)	240		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	20	10	0

Node HYDROBRAKE Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	48.359	Product Number	CTL-SHE-0074-2600-1200-2600
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.6	Min Node Diameter (mm)	1200

Node HYDROBRAKE Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	48.359
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.87	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	350.0	0.0	1.140	350.0	0.0	1.141	0.0	0.0

Results for 100 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	3-0	12	49.385	0.260	20.4	0.5845	0.0000	SURCHARGED
1440 minute summer	3-1	1230	49.357	0.453	5.0	1.2026	0.0000	SURCHARGED
15 minute summer	1-0	11	49.497	0.297	22.0	0.4869	0.0000	OK
15 minute summer	2-0	10	49.863	0.163	38.1	0.3171	0.0000	OK
15 minute summer	1-1	11	49.483	0.396	85.1	0.7198	0.0000	SURCHARGED
1440 minute summer	3-2	1230	49.357	0.583	5.5	0.7901	0.0000	SURCHARGED
1440 minute summer	1-2	1230	49.357	0.353	8.4	0.4675	0.0000	SURCHARGED
1440 minute summer	1-3	1230	49.357	0.645	14.2	0.8580	0.0000	SURCHARGED
1440 minute summer	4-0	1260	49.358	0.579	1.3	1.0205	0.0000	SURCHARGED
1440 minute summer	4-1	1260	49.357	0.652	2.7	1.1775	0.0000	SURCHARGED
1440 minute summer	4-2	1230	49.357	0.800	3.7	1.2865	0.0000	SURCHARGED
1440 minute summer	1-4	1230	49.357	0.866	19.5	2.1152	0.0000	SURCHARGED
1440 minute summer	PI	1230	49.356	0.894	19.3	1.2792	0.0000	SURCHARGED
1440 minute summer	HYDROBRAKE	1290	49.355	0.996	20.7	303.1830	0.0000	SURCHARGED
480 minute summer	1-5	224	48.353	0.037	2.4	0.0531	0.0000	OK
480 minute summer	Outfall Existing SMH	224	48.323	0.035	2.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	3-0	S 3.000	3-1	20.0	0.652	0.503	1.4880	
1440 minute summer	3-1	S 3.100	3-2	5.0	0.525	0.070	2.2280	
15 minute summer	1-0	S 1.000	1-1	21.0	0.402	0.295	1.9310	
15 minute summer	2-0	S 2.000	1-1	37.4	1.014	0.527	0.9192	
15 minute summer	1-1	S 1.100	1-2	84.6	1.201	1.196	1.4311	
1440 minute summer	3-2	S 3.200	1-3	5.4	0.570	0.076	1.0516	
1440 minute summer	1-2	S 1.200	1-3	8.4	0.663	0.118	0.7174	
1440 minute summer	1-3	S 1.300	1-4	13.2	0.652	0.067	0.4920	
1440 minute summer	4-0	S 4.000	4-1	1.1	0.258	0.016	1.2807	
1440 minute summer	4-1	S 4.100	4-2	2.4	0.365	0.034	2.5861	
1440 minute summer	4-2	S 4.200	1-4	3.6	0.206	0.045	0.9325	
1440 minute summer	1-4	S 1.400	PI	19.3	0.569	0.153	0.7911	
1440 minute summer	PI	S 1.402	HYDROBRAKE	20.7	0.727	0.162	2.7750	
1440 minute summer	HYDROBRAKE	Hydro-Brake®	1-5	2.4				
480 minute summer	1-5	S 1.5000	Outfall Existing SMH	2.4	0.460	0.019	0.0362	85.2

Appendix D Met Eireann Rainfall Data

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 306536, Northing: 235276,

DURATION	Interval 6months	1year	Years 2	3	4	5	10	20	30	50	75	100	150	200	250	500
5 mins	2.3	3.4	4.1	5.0	5.6	6.1	7.8	9.8	11.1	13.0	14.7	16.0	18.1	19.8	21.1	N/A
10 mins	3.3	4.8	5.7	7.0	7.9	8.6	10.9	13.6	15.5	18.1	20.5	22.4	25.3	27.6	29.5	N/A
15 mins	3.8	5.7	6.7	8.2	9.2	10.1	12.8	16.1	18.2	21.3	24.1	26.3	29.7	32.4	34.7	N/A
30 mins	5.1	7.4	8.6	10.5	11.8	12.9	16.3	20.2	22.8	26.5	29.9	32.5	36.6	39.8	42.4	N/A
1 hours	6.7	9.6	11.2	13.6	15.2	16.5	20.6	25.4	28.6	33.1	37.1	40.2	45.1	48.8	52.0	N/A
2 hours	8.9	12.5	14.5	17.5	19.5	21.0	26.1	31.9	35.8	41.2	46.0	49.7	55.5	59.9	63.7	N/A
3 hours	10.5	14.6	16.9	20.3	22.5	24.3	30.0	36.5	40.8	46.8	52.1	56.3	62.6	67.6	71.7	N/A
4 hours	11.7	16.3	18.8	22.5	25.0	26.9	33.1	40.2	44.8	51.3	57.0	61.5	68.3	73.6	77.9	N/A
6 hours	13.8	19.1	21.9	26.1	28.9	31.0	38.1	45.9	51.1	58.3	64.7	69.6	77.1	82.9	87.7	N/A
9 hours	16.3	22.3	25.5	30.2	33.4	35.8	43.7	52.5	58.3	66.3	73.3	78.8	87.1	93.5	98.8	N/A
12 hours	18.3	24.9	28.4	33.6	37.0	39.7	48.2	57.8	64.0	72.6	80.2	86.0	94.9	101.8	107.5	N/A
18 hours	21.5	29.1	33.1	38.9	42.8	45.8	55.4	66.1	73.0	82.6	91.0	97.4	107.2	114.8	121.0	N/A
24 hours	24.1	32.5	36.8	43.2	47.5	50.7	61.2	72.7	80.1	90.4	99.4	106.4	116.9	124.9	131.6	154.5
2 days	30.1	39.5	44.3	51.4	56.0	59.5	70.7	82.8	90.6	101.3	110.5	117.5	128.2	136.3	143.0	165.7
3 days	34.8	45.2	50.4	57.9	62.9	66.6	78.4	91.2	99.3	110.3	119.9	127.1	138.0	146.3	153.0	176.0
4 days	39.0	50.1	55.7	63.7	68.9	72.8	85.2	98.5	106.9	118.3	128.1	135.5	146.7	155.1	162.0	185.4
6 days	46.4	58.7	64.9	73.6	79.3	83.6	96.9	111.1	120.0	132.1	142.4	150.2	161.9	170.7	177.8	201.9
8 days	52.9	66.3	72.9	82.3	88.4	93.0	107.1	122.1	131.5	144.1	154.9	163.0	175.1	184.2	191.6	216.4
10 days	58.9	73.2	80.3	90.3	96.7	101.5	116.4	132.0	141.8	155.0	166.2	174.6	187.0	196.4	204.0	229.4
12 days	64.5	79.6	87.1	97.6	104.3	109.4	124.9	141.2	151.4	165.0	176.6	185.2	198.0	207.7	215.5	241.5
16 days	74.8	91.5	99.7	111.1	118.3	123.8	140.5	158.0	168.8	183.2	195.4	204.5	218.0	228.1	236.3	263.4
20 days	84.4	102.4	111.2	123.4	131.2	137.0	154.8	173.2	184.6	199.7	212.5	222.0	236.1	246.6	255.1	283.2
25 days	95.6	115.2	124.6	137.7	146.0	152.2	171.2	190.7	202.7	218.7	232.1	242.1	256.8	267.8	276.6	305.8

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

Ratio R = M5-60 / M5-2 = 16.5/59.5 = 0.277

Appendix E Causeway Foul Water Drainage Design Calculations

Design Settings

Frequency of use (kDU)	0.00
Flow per dwelling per day (l/day)	4000
Domestic Flow (l/s/ha)	0.0
Industrial Flow (l/s/ha)	0.0
Additional Flow (%)	10
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	✓

Nodes

Name	Add Inflow (l/s)	Cover Level (m)	Manhole Type	Easting (m)	Northing (m)	Depth (m)
1-0	0.2	50.150	Adoptable	706473.334	735334.164	1.550
1-1		49.800	Adoptable	706460.199	735359.797	1.681

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
F 1.000	1-0	1-1	28.802	0.150	48.600	48.119	0.481	59.9	150

Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)
F 1.000	0.315	1.534	27.1	0.2	1.400	1.531	0.000	0	0.0	0.2	10

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
F 1.000	28.802	59.9	150	Circular	50.150	48.600	1.400	49.800	48.119	1.531

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
F 1.000	1-0	1200	Manhole	Adoptable	1-1	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
1-0	706473.334	735334.164	50.150	1.550	1200	0	0	F 1.000	48.600	150
1-1	706460.199	735359.797	49.800	1.681	1200	1	1	F 1.000	48.119	150

Appendix F Site Suitability Assessment Report

Trinity Green
Environmental Consultants

Clonfert
Maynooth
Co. Kildare
t: 01-6290616
m: 086-2434828
Vat No. 3251411B

Site Characterisation Report

By

Dr. Eugene Bolton

Applicant: South Dublin County Council.

Clonfert,
Maynooth
Co. Kildare
Email: info@trinitygreen.ie
Mobile 086-2434828

Background

Currently South Dublin have a facility at Palmerstown. This is to be extended and expanded to a Mechanical Services Depot. This will increase the number pf people on the site with the result that the facilities will need to be upgraded. This particular site is not served by mains sewerage and the feasibility of treating and disposing of the wastewater on site needed to be assessed. Trinity Green was commissioned to assess the suitability of the site for safe disposal of treated wastewater and to design a suitable treatment and disposal system for the foul waste generated on the site.

Sources of waste

The sources of waste are shown in the table below.
There are 14 full time workers on site which is an industrial setting. The standard loading for this group would be 30 litres and 20 grams of BOD. However there are shower facilities and it is assumed that due to the nature of the work at least some workers will use this facility. According to the EPA Wastewater Treatment Manual *(Treatment Systems for Small Communities, Business, leisure Centres and Hotels)* 20 Litres and 10 grams is allowed per golf player – which would include shower. Then by allowing a further 20 Litres and 10 Grams of BOD/worker the possible use of showers at the facility will be more than covered.

In addition to the full-time workers there will be visitors to the site. These will largely be drivers who visit the site to have their vehicle serviced or repaired. It is estimated that there could be up to 40 visitors each day. As most visits will be of short duration it is assumed that there will be one use of the facilities. It is therefore assumed that the use of the facilities will mimic that of a public Toilet. The EPA allow 5 litres and 10 grams of BOD per use of a public toilet.

Table 1 – Sources of waste

Source	Number	Litres/Day		Grams BOD/Day	
		Litres/Person	Total	Grams/Person	Total Grams
Full Time Workers	14	(30 +20) 50	700	(20+ 10) 30	420
Visitors	40	5	200	10	400
Total			900		820
PE			6		13.7

The data in table 1 shows the PE based on the hydraulic loading is 6 PE while the organic load equates to a PE of 14
In subsequent design the treatment of the waste must be based on the organic loading or a PE of at least 14.
However in the design of the discharge account is taken of the fact that the organic loading has been removed and therefore design of disposal can be based on the hydraulic load or a minimum of 6 PE (900 litres).

Treatment and Disposal of the wastewater

Prior to determining the type and level of treatment that will be required it is necessary to examine the characteristics of the soil as this determines the level of treatment required and also the rate at which the wastewater can be discharged.

Site Characterisation

A Site Characterisation report was prepared in accordance with the EPA Code of practice. (Appendix 1) The findings show the area has been disturbed in the past – reflecting the fact that there have been road realignments in the area. The soil down to about 1m is made ground largely consisting of clayey soil with a high content of cobbles. It is highly compacted which will reduce the rate of soakage. There is slow soakage with the subsurface percolation rate recorded as T= 45. The watertable was not encountered – no water ingress and no evidence of mottling down to a depth of 2.3m bgl.

Treatment

The PE based on the organic load is a PE of 14.
The soil characteristics are within the acceptable range for a septic tank. There is however very limited space and in addition due to very high organic loading it is preferable to treat the wastewater to a high level in a secondary treatment unit. In fact on this site there is limited space and by polishing the treated wastewater in a polishing filter the footprint can be reduced further.

It is therefore recommended to treat the wastewater in an Oakstown BAF unit. This treatment unit is an Oakstown BAF Unit designed for a PE of 16. It is certified to EN12566-3, is compliant with SR66 and has sufficient treatment capacity to treat wastewater from a PE of up to 16 people. The discharge from this unit will meet the SR66 standard of 20mg/L BOD 30mg/l SS and 20mg/l Ammonia.

Effluent from the BAF P16 unit is polished further in the sand filter. The effluent from the sand filter is very highly treated and is discharged to ground via a gravel infiltration pad. Note the pad is sized based on the hydraulic load as the pollutants have been removed.

Summary

The volume of wastewater equates to a PE of 6
The strength of the waste equates to a PE of 14
Treat the effluent in a BAF unit (P16) and this produces a waste stream with quality characteristics equal to that specified in SR66.
This is polished in a Sand filter sized allowing 2.5m2/PE thus requiring 35m2 filter.
The final effluent from the sand filter is discharged to ground via the gravel base that is 300mm deep and allowing 15m2/PE
The soil has poor soakage with a T-value between 41 and 50. It is very compacted particularly down to about 750mm

As no watertable was encountered at 2.3m bgl the point of infiltration can be in the less compacted soil at about 800mm bgl
Soil is removed down to 800mm bgl and the area levelled.
A layer of washed gravel (20mm diameter pebble) is placed over the area. The size of this area is based on the Hydraulic load of 6PE and allowing 15m2/PE required 90m2.
The Sand Filter is constructed directly on the gravel.
Effluent is pumped from the BAF to the sand filter. It filters through the sand and percolates into the gravel base by gravity

The treatment plant should be a minimum of 7m from the building, 3m from all boundaries and 4m from roads. The infiltration pad (and Sand Filter) should be a minimum of 10m from the building, 3m from all boundaries and 4m from roads.

Signed ....

Dr. Eugene Bolton
Senior Consultant
Trinity Green

13/08/2022

APPENDIX A: SITE CHARACTERISATION FORM

File Reference:

1.0 GENERAL DETAILS (From planning application)

Prefix: First Name: South Dublin County Council Surname:

Address:

Site Location and Townland: SDCC Mechanical Services Depot, Palmerstown

Number of Bedrooms: 1 Maximum Number of Residents: 4

Comments on population equivalent

14 workers and 40 visitors = PE of 14 based on organic load and 6 based on Hydraulic
See cover note for calculation of PE

Proposed Water Supply:

Mains ✔ Private Well/Borehole ☐ Group Well/Borehole ☐

2.0 GENERAL DETAILS (From planning application)

Soil Type, (Specify Type): Limestone Till

Subsoil, (Specify Type): Till derived from Limestones

Bedrock Type: Dinantian Upper Impure Limestone

Aquifer Category: Regionally Important Locally Important LI Poor

Vulnerability: Extreme ☐ High ✔ Moderate ☐ Low ☐

Groundwater Body: Dublin Status Good

Name of Public/Group Scheme Water Supply within 1 km:

Source Protection Area: ZOC ☐ SI ☐ SO ☐ Groundwater Protection Response: R1

Presence of Significant Sites (Archaeological, Natural & Historical):

Past experience in the area: Good soakage but high watertable

Comments:
(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, and/or any potential site restrictions).

Bedrock Aquifer is a LI & Vulnerability is High - Groundwater will be a target at risk.

Note: Only information available at the desk study stage should be used in this section.

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment

Landscape Position: Relatively Flat Landscape with slope to north

Slope: Steep (>1:5) ☐ Shallow (1:5-1:20) ☐ Relatively Flat (<1:20) ☑

Slope Comment

Surface Features within a minimum of 250m (Distance To Features Should Be Noted In Metres)

Houses:

nearest houses = 2 houses 200m Southeast

Existing Land Use:

CC Depot

Vegetation Indicators:

Nothing to suggest poor soakage - Surrounding area is mature managed surface - no veg to reflect soakage

Groundwater Flow Direction: North

Ground Condition:

Dry

Site Boundaries:

Roads

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment (contd.)

Roads:

Slip Road to/from M4 to west
Old Lucan Road to east

Outcrops (Bedrock And/Or Subsoil):

None

Surface Water Ponding:

None

Lakes:

Pond 350m Northeast

Beaches/Shellfish Areas:

None

Wetlands:

None

Karst Features:

None

Watercourses/Streams:*

Liffey 400m North
Tributary of liffey 350m East

***Note and record** water level

3.0 ON-SITE ASSESSMENT

3.1 Visual Assessment (contd.)

Drainage Ditches:*

No ditches bordering site

Springs:*

None

Wells:*

area on mains

Comments:

(Integrate the information above in order to comment on: the potential suitability of the site, potential targets at risk, the suitability of the site to treat the wastewater and the location of the proposed system within the site).

Site is dry
much of the area has been disturbed and reworked in the past during the construction and realignment of roads therefore difficult to predict permeability properties of the soil.

***Note and record** water level

3.2 Trial Hole (should be a minimum of 2.1m deep (3m for regionally important aquifers))

To avoid any accidental damage, a trial hole assessment or percolation tests should not be undertaken in areas which are at or adjacent to significant sites, (e.g. NHAs, SACs, SPAs, and/or Archaeological etc.), without prior advice from National Parks and Wildlife Service or the Heritage Service.

Depth of trial hole (m): 2.3

Depth from ground surface to bedrock (m) (if present):

Depth from ground surface to water table (m) (if present):

Depth of water ingress:

Rock type (if present):

Date and time of excavation: 11-Aug-2022

Date and time of examination: 12-Aug-2022

Depth of Surface and Subsurface Percolation Tests	Soil/Subsoil Texture & Classification**	Plasticity and dilatancy***	Soil Structure	Density/ Compactness	Colour****	Preferential flowpaths
0.1 m	Clayey Fill with high content of round and angular cobbles	Not Dilatant Trds = 10,11,10 Ribs = 110,100,110	Blocky	Very Hard	Brown	Rootlets
0.2 m						
0.3 m						------------------------------
0.4 m						None
0.5 m						
0.6 m						
0.7 m	--------------------------	-------------------------	-------------------	---------------------------------	-------------------	
0.8 m	CLAY with cobbles	Not Dilatent Trds = 11,11,10 Ribs = 110,110,110	Blocky	Hard	Brown	
0.9 m						
1.0 m						
1.1 m						
1.2 m	------------------------------	-------------------------	-------------------	---------------------------------	-------------------	
1.3 m	Clay with few cobbles	Not Dilatent Trds = 12,10,10 Ribs = 110,110,100	Blocky	Stiff to Hard	Dark Brown	
1.4 m						
1.5 m						
1.6 m						
1.7 m						
1.8 m			-			
1.9 m						
2.0 m						
2.1 m						
2.2 m						
2.3 m	------------------------------	-------------------------	--------------------	---------------------------------	-------------------	----------------------------------
2.4 m	Base of Pit					
2.5 m						
2.6 m						
2.7 m						
2.8 m						
2.9 m						
3.0 m						
3.1 m						
3.2 m						
3.3 m						
3.4 m						
3.5 m						

Likely Subsurface Percolation Value: 50

Likely Surface Percolation Value: 40

Note: *Depth of percolation test holes should be indicated on log above. ('Enter Surface or Subsurface at depths as appropriate).

** See Appendix E for BS 5930 classification.

*** 3 samples to be tested for each horizon and results should be entered above for each horizon.

**** All signs of mottling should be recorded.

3.2 Trial Hole (contd.) Evaluation:

Soil is high in clay and is very compacted especially close to surface - expect poor soakage.

3.3(a) Subsurface Percolation Test for Subsoil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm) (A)	600	600	700
Depth from ground surface to base of hole (mm) (B)	1,000	1,000	1,100
Depth of hole (mm) [B - A]	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date	11-Aug-2022	11-Aug-2022	11-Aug-2022
	Time	08:30	08:46	08:50
2nd pre-soak start	Date	11-Aug-2022	11-Aug-2022	11-Aug-2022
	Time	15:09	15:11	15:12

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring T_{100}

Percolation Test Hole No.	1	2	3
Date of test	12-08-2022	12-08-2022	12-08-2022
Time filled to 400 mm	08:11	08:12	08:13
Time water level at 300 mm	09:44	09:39	09:35
Time (min.) to drop 100 mm (T_{100})	93.00	87.00	82.00
Average T_{100}			87.33

If T_{100} > 480 minutes then Subsurface Percolation value >120 – site unsuitable for discharge to ground
If $T_{100} \leq$ 210 minutes then go to Step 4;
If T_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $T_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	Δt (min)
1	09:44	11:50	126.00	09:39	11:38	119.00	09:39	11:37	118.00
2	11:50	14:44	174.00	11:38	14:21	163.00	11:37	14:36	179.00
3	14:44	18:46	242.00	14:21	18:22	241.00	14:36	18:38	242.00
Average Δt Value			180.67			174.33			179.67
	Average Δt/4 = [Hole No.1]		45.17 (t_1)	Average Δt/4 = [Hole No.2]		43.58 (t_2)	Average Δt/4 = [Hole No.3]		44.92 (t_3)

Result of Test: Subsurface Percolation Value = 44.56 (min/25 mm)

Comments:

Slow soakage due to high compaction level

Step 5: Modified Method (where $T_{100} > 210$ minutes)

Percolation Test Hole No.	1					
Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T- Value		T- Value Hole 1 = (T_1)			0.00

Percolation Test Hole No.	2					
Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T- Value		T- Value Hole 2 = (T_2)			0.00

Percolation Test Hole No.	3					
Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Tim§e hh:mm	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T- Value		T- Value Hole 3 = (T_2)			0.00

Result of Test: Subsurface Percolation Value = 0.00 (min/25 mm)

Comments:

3.3(b) Surface Percolation Test for Soil

Step 1: Test Hole Preparation

Percolation Test Hole	1	2	3
Depth from ground surface to top of hole (mm)	0	0	0
Depth from ground surface to base of hole (mm)	400	400	400
Depth of hole (mm)	400	400	400
Dimensions of hole [length x breadth (mm)]	300 x 300	300 x 300	300 x 300

Step 2: Pre-Soaking Test Holes

		1	2	3
Pre-soak start	Date	11-Aug-2022	11-Aug-2022	11-Aug-2022
	Time	08:56	09:05	09:09
2nd pre-soak start	Date	11-Aug-2022	11-Aug-2022	11-Aug-2022
	Time	15:15	15:16	15:17

Each hole should be pre-soaked twice before the test is carried out.

Step 3: Measuring T_{100}

Percolation Test Hole No.	1	2	3
Date of test	19-Jan-22	19-Jan-22	19-Jan-2022
Time filled to 400 mm	08:18	08:19	08:20
Time water level at 300 mm	09:31	09:33	09:36
Time to drop 100 mm (T_{100})	73.00	74.00	76.00
Average T_{100}			74.33

If T_{100} > 480 minutes then Surface Percolation value >90 – site unsuitable for discharge to ground
If $T_{100} \leq$ 210 minutes then go to Step 4;
If T_{100} > 210 minutes then go to Step 5;

Step 4: Standard Method (where $T_{100} \leq 210$ minutes)

Percolation Test Hole	1			2			3		
Fill no.	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)	Start Time (at 300 mm)	Finish Time (at 200 mm)	ΔT (min)
1	09:31	11:25	114.00	09:33	11:34	121.00	09:36	11:35	119.00
2	11:25	14:10	165.00	11:34	14:22	168.00	11:35	14:28	173.00
3	14:10	17:37	207.00	14:22	17:49	207.00	14:28	17:56	208.00
Average ΔT Value			162.00			165.33			166.67
	Average ΔT/4 = [Hole No.1]	40.50	(T_1)	Average ΔT/4 = [Hole No.2]	41.33	(T_2)	Average ΔT/4 = [Hole No.3]	41.67	(T_3)

Result of Test: Surface Percolation Value = 41.17 (min/25 mm)

Comments:

Soakage in topsoil is slow reflecting clay content of topsoil

Step 5: Modified Method (where $T_{100} > 210$ minutes)

Percolation Test Hole No.	1					
Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T- Value		T- Value Hole 1 = (T_1)			0.00

Percolation Test Hole No.	2					
Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T- Value		T- Value Hole 2 = (T_2)			0.00

Percolation Test Hole No.	3					
Fall of water in hole (mm)	Time Factor = T_f	Start Time hh:mm	Finish Time hh:mm	Time of fall (mins) = T_m	$K_{fs} = T_f / T_m$	T – Value = 4.45 / K_{fs}
300 - 250	8.1			0.00		
250 - 200	9.7			0.00		
200 - 150	11.9			0.00		
150 - 100	14.1			0.00		
Average	T- Value		T- Value Hole 3 = (T_2)			0.00

Result of Test: Surface Percolation Value = 0.00 (min/25 mm)

Comments:

4.0 CONCLUSION of SITE CHARACTERISATION

Integrate the information from the desk study and on-site assessment (i.e. visual assessment, trial hole and percolation tests) above and conclude the type of system(s) that is (are) appropriate. This information is also used to choose the optimum final disposal route of the treated wastewater.

Slope of proposed infiltration / treatment area: Flat

Are all minimum separation distances met? ✔

Depth of unsaturated soil and/or subsoil beneath invert of gravel (or drip tubing in the case of drip dispersal system)

Percolation test result: Surface: 41.00 Sub-surface: 45.00

Not Suitable for Development ☐ **Suitable for Development** ✔

Identify all suitable options

1. Septic tank system (septic tank and percolation area) **(Chapter 7)** — No
2. Secondary Treatment System **(Chapters 8 and 9)** and soil polishing filter **(Section 10.1)** — Yes
3. Tertiary Treatment System and Infiltration / treatment area **(Section 10.2)** — Yes

Discharge Route [1]

Groundwater

5.0 SELECTED DWWTS

Propose to install: Tertiary Treatment System and Infiltration /treatment area

and discharge to: Ground Water

Invert level of the trench/bed gravel or drip tubing (m) 900.00

Site Specific Conditions (e.g. special works, site improvement works testing etc.

Install BAF P16 followed by Sand Polishing filter with discharge via a infiltration bed with base of gravel at 800mm below existing ground level.
The area should be excavated with the most compact soil removed down to 800mm below ground level.
A layer of washed pebble (20mm diameter) is placed 300mm deep across the prepared area
The Sand filter is constructed on the surface of this gravel using sand 900mm deep The sand filter is sized allowing 2.5m2/PE. Given the sand filter is part of the treatment then the organic load (PE of 16) is used to size the filter and a filter of 35m2 is required and as the treatment in the BAF and the Sand filter will have removed the pollutants the function of the infiltration pad is to facilitate the hydraulic discharge. The hydraulic load equates to a PE of 6 and as the T-value is between 41 and 50 the pad can be loaded allowing 15m2/PE. The area of the gravel pad is therefore 90m2

[1] A discharge of sewage effluent to “waters” (definition includes any or any part of any river, stream, lake, canal, reservoir, aquifer, pond, watercourse or other inland waters, whether natural or artificial) will require a licence under the Water Pollution Acts 1977-90. Refer to Section 2.4.

6.0 TREATMENT SYSTEM DETAILS

SYSTEM TYPE: Septic Tank Systems (Chapter 7)

Tank Capacity (m^3):

	Percolation Area	Mounded Percolation Area
No. of Trenches		
Length of Trenches (m)		
Invert Level (m)		

SYSTEM TYPE: Secondary Treatment System (Chapters 8 and 9) and polishing filter (Section 10.1)

Secondary Treatment Systems receiving septic tank effluent (Chapter 8)

Media Type	Area (m^2)*	Depth of Filter	Invert Level
Sand/Soil			
Soil			
Constructed Wetland			
Other			

Packaged Secondary Treatment Systems receiving raw wastewater (Chapter 9)

Type: Oakstown BAF

Capacity PE: 16

Sizing of Primary Compartment: 4.00 m^3

Polishing Filter*: (Section 10.1)

Surface Area (m^2)*:

Option 1 - Direct Discharge Surface area (m^2):

Option 2 - Pumped Discharge Surface area (m^2):

Option 3 - Gravity Discharge Trench length (m):

Option 4 - Low Pressure Pipe Distribution Trench length (m):

Option 5 - Drip Dispersal Surface area (m^2):

SYSTEM TYPE: Tertiary Treatment System and infiltration / treatment area (Section 10.2)

Identify purpose of tertiary treatment	Provide performance information demonstrating system will provide required treatment levels	Provide design information
Reduce footprint due to limited space and low soakage	EPA Code of Practice 2021	16 PE based on organic load treat in BAF16 and polish in sand filter 900 Litres discharge from sand filter . discharge to infiltration allowing 15m2/PE

DISCHARGE ROUTE:

Groundwater	✔	Hydraulic Loading Rate * ($l/m^2.d$)	10.00	Surface area (m^2)	90.00
Surface Water **		Discharge Rate (m^3/hr)			

* Hydraulic loading rate is determined by the percolation rate of subsoil

** Water Pollution Act discharge licence required

6.0 TREATMENT SYSTEM DETAILS

QUALITY ASSURANCE:

Installation & Commissioning

Install as specified & supervised by appropriately qualified person

On-going Maintenance

Regular desludging & Maintenance contract with supplier or installer

7.0 SITE ASSESSOR DETAILS

Company: Trinity Green

Prefix: Dr First Name: Eugene Surname: Bolton

Address: Clonfert, Maynooth, Co. Kildare

Qualifications/Experience: FETAC Site assessor, PhD Microbiology

Date of Report: 13-Aug-2022

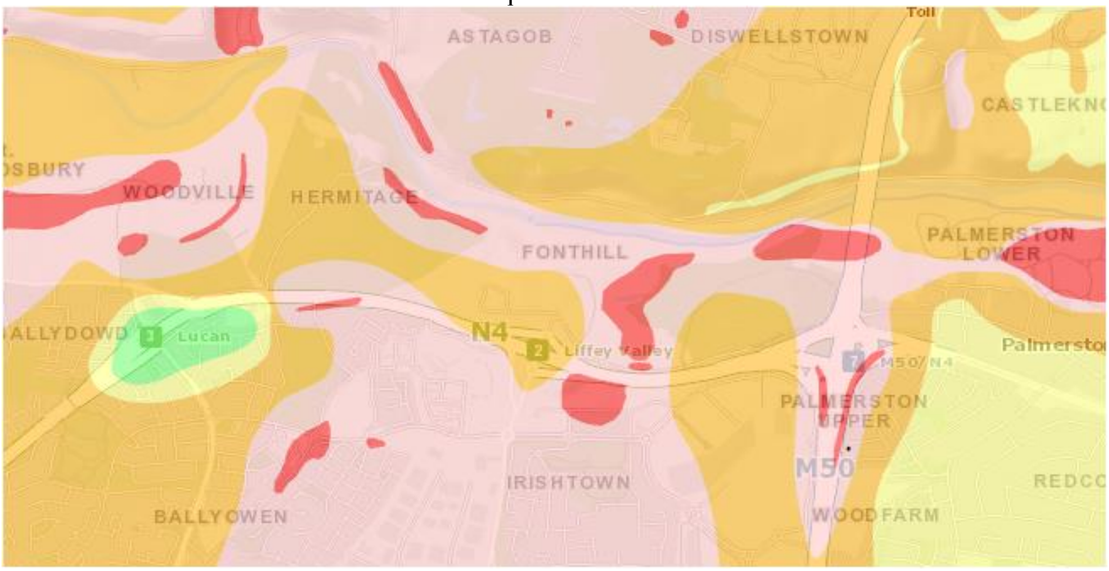
Phone: 0862434828 E-mail info@trinitygreen.ie

Indemnity Insurance Number: PI/C/12453/21/1

Signature: _______________________________________

Maps – Aquifer, Vulnerability, bedrock

Aquifer is LI



Vulnerability is High

Bedrock is Dinantian Upper Impure Limestones

Soil

Parent Material	TLs
Parent Material Name	Till derived chiefly from limestone
Parent Material Desciption	Limestone till (Carboniferous)
Soil Group	Grey Brown Podzolics, Brown Earths(medium-high base status)
IFS Soil Code	BminDW
IFS Soil Description	Derived from mainly calcareous parent materials
County	DUBLIN
Category	Deep well drained mineral (Mainly basic)
Legend	BminDW - Deep well drained mineral (Mainly basic)

Subsoil

Lithology	Till derived from limestones
Quaternary Sediment	TLs

Photos

Row 1 – P1, P2

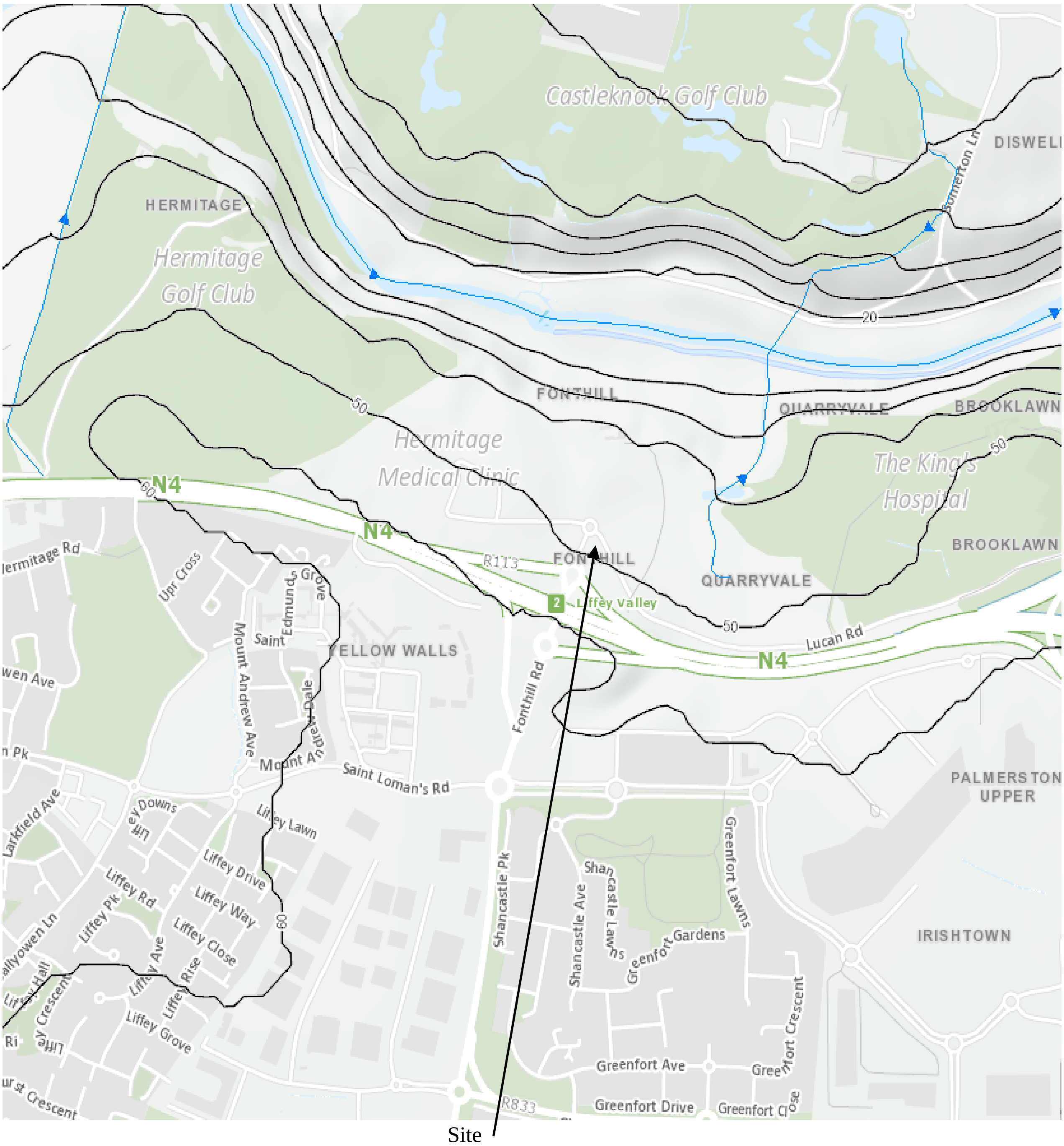
Row 2 – P3, T1

Row 3 – T2, T3

Trial Pit

Site Overview

Site Location



Site

South Dublin County Council,
Mechanical Services Department,
Palmerstown,
Co. Dublin

O'Reilly Oakstown Environmental

O'Reilly Oakstown Environmental

Oakstown, Trim
Co. Meath
Tel: 046 - 943 - 1389
Fax: 046 - 943 - 7054

E: info@oreillyoakstown.com
W: www.oreillyoakstown.com
V.A.T Reg. No.: IE 6401624D
Company Reg. No.: 381624

OAKSTOWN
BAF System

Date: 15th August 2022

Applicant Name: South Dublin County Council

Site Address: Mechanical Services Department, Palmerstown, Co. Dublin.

A representative of *O'Reilly Oakstown Ltd* has assessed the Soil Test Report and confirms the suitability of their Oakstown BAF 16 PE Wastewater Treatment System to treat effluent being discharged from the above proposed dwelling based on the residential / commercial demands submitted to us below.

1. Waste Water Treatment System Design Details:

- Maximum Daily Design Loadings as per client & EPA - Commercial Loading Rates:

	Max No. of users	Flow Litres/day/ person	Total Hydraulic Load	B0D5 (grams/day/ person)	Total Organic Loading (grams/day)
Workers	14	50	700 litres	30	420
Visitors	40	5	200 litres	10	400
Total			**900 Litres (6PE)**		**820 grams (13.7 PE)**

Average treated effluent standard

BOD	20mg/litre
TSS	30mg/litre

- Proposed system details: ► Oakstown BAF 16 P.E.

Volume of Total Plant	11m³
Volume of Primary Sedimentation Chambers	5.5m³
Volume of Secondary Aeration Chamber	2.6m³
Volume of Biomedia	1.6m³

O'REILLY
OAKSTOWN
ENVIRONMENTAL

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OAKSTOWN
BAF System

2. Wastewater Treatment system description:

The Oakstown BAF 16 PE is designed to provide proven, cost effective primary and secondary wastewater treatment in robust steel reinforced concrete tanks.
The primary sedimentation chambers have substantial capacity (5.5m³) to allow anaerobic digestion to occur naturally while letting sludge settle on the tank floor.
Once primary treatment has taken place the effluent is further degraded in the aeration chamber where oxygen enriched wastewater provides ideal conditions for aerobic bacteria to thrive.
Before pumping to the percolation area the clear water is left to further settle in the clarifier chamber to eliminate any remaining settle able solids.

3. Guarantee and warrantees:

Please note that the final treatment results of the effluent leaving the wastewater treatment plant are based on continuous maintenance and servicing of the plant every year or more frequently if deemed necessary by our qualified technicians.

4. Percolation:

The percolation area designed must conform to the requirements of Chapters 8 & 10, Table 8.2 and / or Table 10.4 of the EPA Code of Practice 2021 Wastewater Treatment and Disposal System serving single houses.

The percolation area requirements are as follows:
Groundwater Protection Response: R1
T-value: 44.56 as per Site Characterisation Form.
P-value: 41.17 as per Site Characterisation Form.
Depth from ground surface to water table: None Encountered BGL.
Depth from ground surface to bed rock: None Encountered BGL.
Depth from ground surface to mottling: None Encountered BGL.
Tertiary Treatment is achieved through a sand polishing filter sized: 35m².
Area required for disposal of treated wastewater from sand polishing filter: 90m².
►See Site Characterisation report for percolation area details.

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OAKSTOWN
BAF System

5. Client Responsibilities unless included in our quotation:

- Excavation and backfill.
- Construction of the percolation / polishing filter as recommended by the site engineer on the Site Characterisation report and/or drawing.
- Provision of access for delivery by hi-ab truck to within 3 metres of the excavation.
- Provision of a power ducting from the tanks to the house/garage.
- Mounting and connection of control panel to mains power in the house/garage.
- An adequately sized and working grease trap.

6. Operation and Maintenance:

The client is responsible for the operation and maintenance of the wastewater treatment system in accordance with the owner's manual supplied by O'Reilly Oakstown.

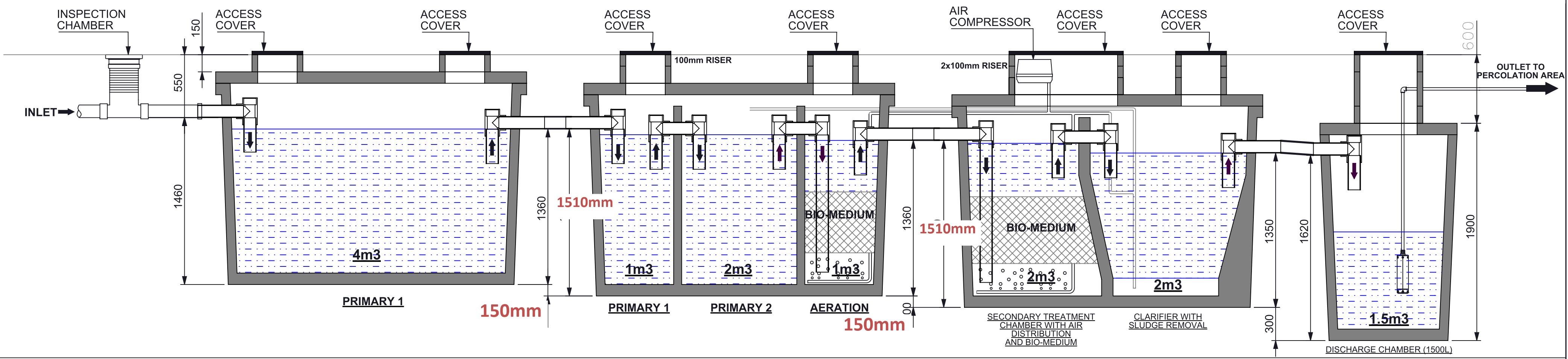
Please do not hesitate to contact us if there are any further queries.

Yours sincerely

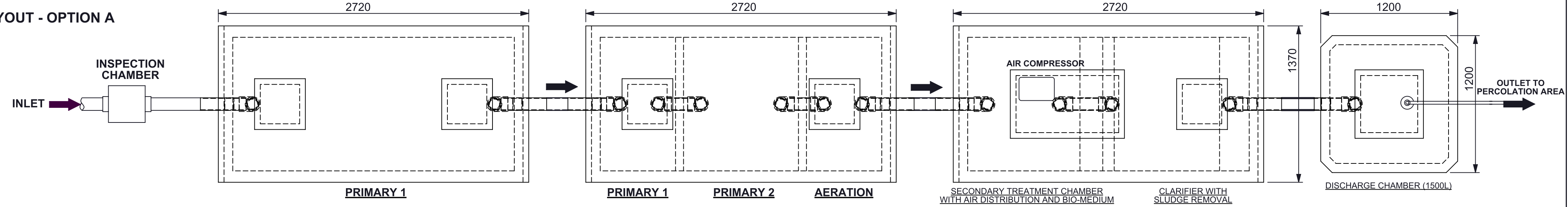
Sarah O'Connor

O'REILLY
OAKSTOWN
ENVIRONMENTAL

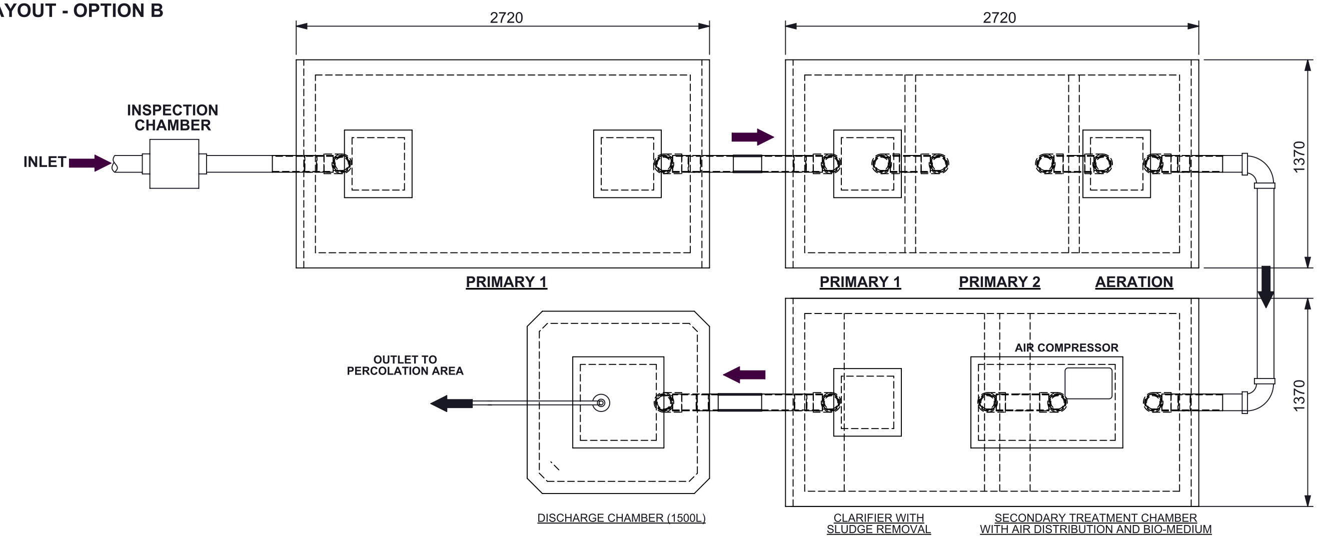
Oakstown 16PE SUPER BAF SYSTEM Sectional Elevation



WWTS LAYOUT - OPTION A



WWTS LAYOUT - OPTION B



VOLUME:

LITRES: 13500

WEIGHT:
TANK 1: 5000kg
TANK 2: 5500kg
TANK 3: 6000kg
TANK 4: 1750kg

PROJECT: SR-66 O'Reilly Oakstown

TITLE: 16PE SUPER BAF SYSTEM

DRAWN: T.Nicinski

CHECKED: D.O'Reilly

O'REILLY concrete

O' REILLY OAKSTOWN LTD.
BAF - WASTEWATER TREATMENT SYSTEMS

O'REILLY OAKSTOWN
TRIM, Co.MEATH
Email: info@oreillyoakstown.com
Tel:(046)9431389 Fax:(046)9437054

SCALE:	DWG NO:	REV:	DATE:
N.T.S.	OAKS 201704	SR66	12/2016