Leydens Wholesalers & Distributors Dublin, No. 158A

Infrastructure Design Report

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1 INTRODUCTION

1.1 Background

DBFL Consulting Engineers were commissioned to provide engineering services to accompany a planning submission for a proposed mixed-use development at Leydens Wholesalers & Distributors Dublin, No. 158A, Dublin 3, with Dublin City Council.

1.2 Objectives

This report addresses the main infrastructure elements including;

- Site access;
- Proposed roads;
- Management of surface water runoff (Surface Water Management Plan);
- Foul drainage strategy;
- Water supply;

1.3 Development Proposals

Malkey Limited intend to apply for permission for development (Large-scale Residential Development (LRD)) at this c. 0.55 hectare site at the former Leydens Wholesalers & Distributors, No. 158A Richmond Road, Dublin 3, D03 YK12. The site is bounded to the north-east by Richmond Road, to the west/south-west by No. 146A and Nos. 148-148A Richmond Road (pending application ABP Reg. Ref. TA29N.312352), to the south/south-west by a residential and commercial development (Distillery Lofts) and to the east/south-east by the Former Distillery Warehouse (derelict brick and stone building). Improvement works to Richmond Road are also proposed including carriageway widening up to c. 6 metres in width, the addition of a c. 1.5 metre wide one-way cycle track/lane in both directions, the widening of the northern footpath on Richmond Road to a minimum of c. 1.8 metres and the widening of the southern footpath along the site frontage which varies from c. 2.2 metres to c. 7.87 metres, in addition to a new signal controlled pedestrian crossing facility, all on an area of c. 0.28 hectares. The development site area and road works area will provide a total application site area of c. 0.83 hectares.

The proposed development will principally consist of: a Large-scale Residential Development (LRD) comprising the demolition of existing industrial structures on site (c. 3,359 sq m) and the construction of a mixed-use development including artist studios (c. 749 sq m), a creche (c. 156 sq



m), a retail unit (c. 335 sq m), and a gym (c. 262 sq m), and 133 No. residential units (65 No. one bed apartments and 68 No. two bed apartments). The development will be provided in 3 No. blocks ranging in height from part 1 No. to part 10 No. storeys as follows: Block A will be part 1 No. storey to part 4 No. storeys in height, Block B will be part 1 No. storeys to part 10 No. storeys in height (including podium) and Block C will be part 1 No. storeys to part 9 No. storeys in height (including podium). The proposed development has a gross floor area of c. 14,590 sq m and a gross floor space of c. 13,715 sq m.

The development also proposes the construction of: a new c. 204 No. metre long flood wall along the western, southern and south-eastern boundaries of the proposed development with a top of wall level of c. 6.4 metres AOD to c. 7.15 metres AOD (typically c. 1.25 metres to c. 2.3 metres in height) if required; and new telecommunications infrastructure at roof level of Block B including shrouds, antennas and microwave link dishes (18 No. antennas enclosed in 9 No. shrouds and 6 No. transmission dishes, together with all associated equipment) if required. A flood wall and telecommunications infrastructure are also proposed in the adjoining Strategic Housing Development (SHD) application (pending decision ABP Reg. Ref. TA29N.312352) under the control of the Applicant. If that SHD application is granted and first implemented, no flood wall or telecommunications infrastructure will be required under this application for LRD permission (with soft landscaping provided instead of the flood wall). If the SHD application is refused permission or not first implemented, the proposed flood wall and telecommunications infrastructure in the LRD application will be constructed.

The proposed development also provides ancillary residential amenities and facilities; 25 No. car parking spaces including 13 No. electric vehicle parking spaces, 2 No. mobility impaired spaces and 3 No. car share spaces; 2 No. loading bays; bicycle parking spaces; motorcycle parking spaces; electric scooter storage; balconies and terraces facing all directions; public and communal open space; hard and soft landscaping; roof gardens; green roofs; boundary treatments; lighting; ESB substation; switchroom; meter room; comms rooms; generator; stores; plant; lift overruns; and all associated works above and below ground.

1.4 Site Location and Topography and Characteristics

The site has an area of circa 0.55ha, excluding the Richmond Road upgrade works and is accessed from Richmond Road. The subject brownfield site, previously occupied by Leydens Wholesalers & Distributors Dublin, is bound to the west and southwest by a site upon which a recently submitted SHD application has been made to An Bord Pleanála (ABP). To the north lies the Richmond Road



corridor. The subject site is bound to the south-east by Distillery Lofts commercial premises whilst to the east lies the remains of a previous commercial building which is in a state of disrepair. The site location is shown in *Figure 1-1* below.

A section of Richmond Road, which provides access to the subject site, is proposed to be upgraded as part of the development and includes cycle tracks/lanes and footpaths on both sides of the road.

The site is generally flat, with a fall from Richmond Road at the north-west to the south-east, at an average gradient of 1/130. The industrial site is fully paved with concrete and asphalt surfacing.



Figure 1-1 Site Location Map [Google Maps]

The site is within the jurisdiction of the Dublin City Development Plan, 2022-2028. Based on the information provided on the Map E, "Use Zonings Objectives" map, the subject site is zoned Z10 in the 2022 – 2028 Dublin City Development Plan *"to consolidate and facilitate the development of inner city and inner suburban sites for mixed-uses".*



2 ROADS AND ACCESS

2.1 Vehicular Access

The subject development will benefit from direct vehicular access onto Richmond Road as presented in Figure 2-1. The proposed site access will be located to the west of the Lofts and the Stables Apartment complex access. The access will take the form of a priority-controlled junction and access is proposed to be secured by a proposed gate to restrict access to permitted residents / visitors only. The design of the new access junction, in addition to the internal road, has been actively influenced by and subsequently complies with DMURS.



Figure 2-1 Site access arrangement

Further details of the site access arrangements has been illustrated in DBFL Drawing No. 210178-DBFL-TR-SP-DR-C-1102. Access arrangements are shown for the proposed development after the road upgrade works have been completed, tying into the existing Richmond Road alignment as well as the proposed road upgrade tying into the post DCC Richmond Road enhancement corridor objective works have been complete. This approach would ensure the proposed Richmond Road upgrade works aligns with the future DCC plans to upgrade the Richmond Road corridor on either side of the proposed works.

2.2 Richmond Road Works

The scheme also includes for enhancements of approx. 204m of the Richmond Road corridor comprising improved footways and the introduction of dedicated cycle infrastructure. The provision of dedicated high-quality pedestrian footways (1.8m to 2.0m wide) and cycle tracks/lanes



(1.5m wide) which will be provided as part of the Richmond Road upgrades proposed as part of the subject application. A signalised pedestrian crossing is proposed approx. 40m north-west of Block A. It is noted that these upgrades were initially incorporated within the adjoining SHD development (ABP Pl. Ref. 312352) but has now been included within the subject application in order that these road upgrades are independent of the SHD development (i.e., will be delivered regardless of the SHD development' planning application outcome). The proposed Richmond Road works ties into the existing road with gradual tapers. The north-west tie-in is proposed as a temporary tie-in until the roadworks are extended north at a later stage. Refer to Figure 2-2 for the extent of the proposed Richmond Road works.



Figure 2-2 Richmond Road Upgrade Proposed Works

Refer to Figure 2-3 for the Richmond Road works when the road upgrade is extended north at a later stage.



Figure 2-3 Development Frontage Arrangements Post DCC Richmond Road Corridor Enhancement Objective

The proposed cross-section for Richmond Road is shown on the enclosed drawing 210178-DBFL-RD-SP-DR-C-5202 and the road long sections on drawings 210178-DBFL-RD-SP-DR-C-3201 to 3203. The proposed Richmond Road works tie in at existing levels north of Richmond Road (across the road from the proposed development) to ensure minimal change to the exiting levels at property accesses.

On the northern side of Richmond Road, a 60mm kerb is proposed between the road and the offroad cycle track and a 60mm kerb between the cycle track and the footpaths.

On the southern side (Development side) of Richmond Road, a 100mm kerb is proposed between the road and the off-road cycle track and a 50mm kerb between the cycle track and the footpaths.

The existing alignment is to be kept as far as possible with minimal changes to existing vertical alignment proposed at centreline.

A Traffic & Transportation Assessment (TTA), prepared by DBFL Consulting Engineers, is included as a standalone document and addresses car parking, cycle parking facilities and access to public transport.

The development is designed in accordance with DMURS (*Design Manual Urban Roads and Streets*) and a DMURS Compliance Statement is included in the separate TTA report included in this submission.

2.3 Vehicle Tracking

DBFL Drawing No. 210178-DBFL-TR-SP-DR-C-1103 indicates all vehicle tracking for a refuse vehicle, delivery goods vehicle and fire tender. Appropriate vehicle sizes are used for the tracking as indicated on drawing number 210178-DBFL-TR-SP-DR-C-1103. Designated on-site areas have been



provided for the refuse vehicle and delivery vehicle at the south-east corner of the site as indicated in Figure 2-4 below.



Figure 2-4 Refuse/delivery vehicle set down area

A fire tender route has been provided between Blocks A & B as indicated in Figure 2-5 below.



Figure 2-5 Fire tender access route



Further details on the site access is included in the separate TTA document and the enclosed drawing 210178-DBFL-TR-SP-DR-C-1103.

2.4 Available Sightlines

Sightlines at the entrance to the proposed development in accordance with the recommendations of DMURS are included on DBFL drawing no. 210178-DBFL-RD-SP-DR-C-1200.

2.5 Vehicle and Cycle Parking

An appropriate amount of vehicle and cycle parking has been provided as set out in the separate TTA document.



3 EXISTING UTILITIES

Existing utilities within the site and in the immediate vicinity of the site was determined by as-built records from utility companies and a GPR Utility Survey completed by Murphy Geospatial.

Existing utilities as identified by the GPR Survey include:

- ESB (Electrical) ESB records show electrical connections to Ebox offsite. None found on site;
- Public lighting Connections to the lamp poles were identified on site. Two lamp posts were reported as being disused – please refer to the attached Murphy Geospatial Survey attached as **Appendix I**;
- EIR None identified on site;
- UPC – None identified on site;
- ENET – None identified on site;
- GNI (Gas) Partially located on site. Refer to drawings in report;

Refer to Murphy Geospatial Utility Survey included in **Appendix I** for further details.



4 SITE INVESTIGATION

A preliminary site investigation was conducted as attached in **Appendix J** and includes the following tests:

- 3 x Trial pits up to 1.5m depth
- 2 x infiltration tests

The ground investigation revealed that the site is surfaced with 10mm layer of asphalt. Below the surfacing, two distinctive soil layers have been identified:

<u>Made Ground</u>: Greyish brown sandy clayey angular fine to coarse GRAVEL BACKFILL. Sand is fine to coarse.

<u>In-situ Material</u>: Light brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium.



5 SURFACE WATER MANAGEMENT PLAN

5.1 Existing Surface Water Drainage

Local Authority record drawings indicate a large diameter surface water sewer in the vicinity of the site. There is a 1350mm diameter surface water sewer at the proposed entrance to the subject development under Richmond Road. Refer to *Figure 5-1* below.



Figure 5-1 Extract of Local Authority Record Drawings

Within the site, the existing surface water network comprises of a combination of gullies, concrete channels, 100mm - 225mm diameter uPVC surface water pipes, which collects surface water runoff from the existing site, and discharges unattenuated runoff to the public surface water sewer in Richmond Road near the current entrance of the site.

5.2 General Surface Water Management Policy

Dublin City Council is within the Greater Dublin Area (GDA) as identified in the Greater Dublin Strategic Drainage Study (GDSDS). The GDSDS outlines regional drainage policies to address the drainage needs of the GDA. These policies address surface water management from development sites, from the point of view of water quality, quantity, risk of flooding and compliance with relevant environmental legislation. As outlined in the GDSDS, proposed developments must be drained on separate foul and surface water drainage systems and must incorporate Sustainable Urban Drainage Systems (SuDS) for the management of surface water runoff. The SuDS strategy follows CIRIA SuDS Guidelines.



The guidelines require the following 4 main criteria to be provided by the design;

• Criterion 1: River Water Quality Protection – River Water Quality Protection – Satisfied by providing interception storage and treatment of surface water run-off by SUDS features such as permeable paving, tree pits, green/blue roof/podium & filter layers under attenuation.

• Criterion 2: River Regime Protection – Satisfied by attenuating surface water run-off in association with flow control devices prior to discharge off site at greenfield runoff rate within the green/blue roof and cellular below ground storage.

• Criterion 3: Level of Service (flooding) for the site – satisfied by the development's surface water drainage design, planned flood routing and on-site storage. Also refer to DBFL Site Specific Flood Risk Assessment.

• Criterion 4: River flood protection – Satisfied by attenuating surface water discharge to greenfield runoff rates, addressing pluvial flood risk associated with the 1 in 100 year storm and avoiding development the addition of a flood wall in the proposals to protect the development from river flooding.

5.3 Management of Surface Water Runoff

To manage surface water runoff from the development, it is proposed to discharge attenuated runoff from the development to the existing public surface water sewer at the south east corner of the site in Richmond Road. Surface water storage will be provided within the site to accommodate runoff from a 1% AEP event plus 20% climate change. A combination of SuDS (sustainable urban drainage) features and traditional drainage, such as gullies and pipes will be utilised to manage runoff from the site.

Two separate surface water management systems have been identified as part of the proposed works to include:

- 1. The proposed development
- 2. The area of proposed Richmond Road works which would provide access to the proposed development.



5.4 Surface Water management - Proposed development (Excluding the Richmond Road works)

To control the quality and quantity of runoff from the site it is proposed to incorporate significant SuDS measures within the scheme, including a green/blue roof system for the terrace and building roofs and permeable paving for hard surfaces where possible.

Surface water runoff not absorbed by SuDS features will be attenuated to Q_{bar} (Greenfield Runoff) with runoff exceeding this stored on site for up to a 1% AEP (Annual Exceedance Probability), in accordance with the requirements of the GDSDS (Greater Dublin Strategic Drainage Study). Surface water runoff from the building roofs is contained within the green/blue roof system within an underground cellular storage located in the south-east corner of the site, under the proposed road. Further ground level storage is also provided in the form of permeable paving, designed with enough storage to contain the 1% AEP storm event for the area between blocks A and B. Any incidental surface water build-up in this area would drain north to Richmond Road or into the proposed surface water sewer via the linear drains at the entrances to the buildings.

For severe (>1%AEP) storm events, an overland surface water strategy has been developed to ensure buildings are not flooded in the case of these storm events and appropriate freeboard has been allowed for. It is intended that all surface water collected will pass through an appropriate petrol interceptor and grease trap.

5.4.1 Surface Water Attenuation

Surface water runoff from the development is designed to be attenuated to greenfield runoff (Q_{bar}) , in accordance with the recommendations of the GDSDS. Surface water run-off from the surface water catchment will be controlled using a vortex flow control device (Hydrobrake or equivalent) on the surface water outlet from the catchment area. Q_{bar} has been calculated based on the effective drainage area for the scheme, which is calculated as circa 0.471ha (effective catchment area). Refer to dr. 210178-DBFL-CS-SP-DR-C-1310 and Figure 5-2 for the extent of the effective drainage area.

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Figure 5-2 Proposed development catchment area

Q_{bar} is calculated using the *Institute of Hydrology* equation, as recommended in the Greater Dublin Strategic Drainage Study (GDSDS), as follows:

$$Q_{bar \ [rural]} = 0.00108 \ x \ AREA^{0.89} x \ SAAR^{1.17} x \ Soil^{2.17}$$

Where:

- Q_{bar[rural]} is the mean catchment annual flow from a rural catchment in m³/s;
- AREA is the area of the catchment in km^2 . For a catchment area less than 50ha, calculate Q_{bar} for 50 ha and pro rata it. Area = 50ha or $0.5 km^2$
- SAAR is the standard average annual rainfall = 729mm.
- SOIL is the soil index, with 5 soil types used and SPR values (standard percentage runoff) applied to each soil type.

The SPR values for the 5 soil types are as follows:

Soil 1 = 0.1; Soil 2 = 0.3; Soil 3 = 0.37; Soil 4 = 0.47; Soil 5 = 0.53;

A soil value of 0.37 (**Soil Type 3**) is applied for the subject site as derived from the preliminary site investigation infiltration results. The infiltration coefficient derived from the infiltration tests and used the calculate the appropriate storage volumes for SuDS elements such as permeable paving is 0.169m/h.



 $Q_{bar[rural]} = 0.00108 x (0.050 x 0.01)^{0.89} x 729^{1.17} x 0.37^{2.17} * 1000/50$

= 3.0l/s/ha

= 1.6 l/s for the gross catchment Area of 0.536 ha

Refer to **Appendix A** for the applicable Met Eireann Rainfall data.

AS RECOMMENDED IN THE GDSDS, TO REDUCE THE RISK OF BLOCKAGES IN THE ORIFICE, THE ALLOWABLE OUTFLOW FROM THE SITE WILL BE LIMITED TO <u>2.01/s.</u>

5.4.2 Surface Water Storage

The overall required storage volumes for the catchment area has been calculated by modelling how the surface water cascades from the roof level storage to the cellular underground storage tank at a controlled rate (0.2l/s), and is then discharged into the public surface water sewer at another controlled flow rate (Qbar = 2l/s). Permeable paving at ground level also acts as off line storage for surface water at ground level to reduce surface water entering the proposed surface water sewer system by encouraging infiltrating into the ground. The *Micro Drainage Source Control Cascade* module was used to model this process and calculations are attached in **Appendix B.** Figure 5-3 below depicts the cascading of surface water from one storage structure to the next before being discharged into the public surface water sewer in Richmond Road at a controlled rate.



Figure 5-3 Surface Water Storage Cascade



Roof Level Storage

The ABG Green/Blueroof System D108mm or similar approved is proposed for the roofs and terraces. A storage layer in the build-up will accommodate runoff from roofs and terraces. The storage provided in each green/blue roof and terrace is indicated Table 5-1. The green/blue roofs and terraces have been modelled to release attenuated surface water at a rate of 0.2l/s. Surface water would then cascade to the downstream cellular attenuation tank. An overflow structure would be installed in the outlet of the green/blue roofs and terraces in case of a roof outlet control blockage. Refer to **Appendix H** for ABG blue roof brochure.

Ground Level Storage

At ground level, surface water is attenuated in the proposed 100m² permeable paving build-up and in an underground cellular attenuation system. Storage is provided for runoff volumes for rainfall events up to a 1% AEP (Annual Exceedance Probability) plus 20% climate change. Surface water runoff at ground level between blocks A and B is stored off line within the permeable paving build-up and is sized to store the 1% AEP storm event of the catchment area between blocks A and B (0.048ha). Refer to Appendix B for the Micro Drainage Source Control calculations used to confirm the storage capacity of the permeable paving. 120m² Of permeable paving provides 18m³ of storage, assuming 30% porosity as per the CIRIA, document No. C521.

Additional storage of 114m³ is provided in an underground cellular attenuation system to attenuate surface water runoff from the entire site and would be the last storage structure within the attenuation train before surface water is released to the public surface water sewer at a controlled rate. The underground cellular storage tank is proposed at the south-east corner of the site under the proposed road, with attenuated flows discharging to existing public 1350mm surface water pipe in Richmond Road at the proposed entrance to the development. Refer to **Appendix G** for the proposed Stormbloc Brochure and Maintenance Procedures.



Total Surface Water Storage Provision				
Surface Type	Volume Required (m ³)	Storage Surface Area Provided (m²)	Storage Volume Provided (m ³)	
(P3) Green/Blue Podium	11.3	248.0	24	
(P4) Green/Blue Podium	2.8	147.0	14	
(P5) Green/Blue Podium	75.5	972.0	94	
(P6) Green/Blue Podium	3.7	111.0	11	
(P7) Green/Blue Podium	8.8	208.0	20	
(P8) Green/Blue Podium	17.9	350.0	34	
(G1) Green/Blue Roof	17.9	357.0	35	
(G2) Green/Blue Roof	27.8	479.0	47	
(G3) Green/Blue Roof	28.7	493.0	48	
(G4) Green/Blue Roof	0.9	41.0	4	
(G5) Green/Blue Roof	1.2	44.0	4	
Roof Storage Sub-Total			327	
Cellular Below Ground Attenuation Tank	68.7	179.0	114	
Permeable Paving/Surfacing	4.3	120.0	18	
Underground Storage Sub-Total			132	
Total	270		459	

Table 5-1 Required and Provided Surface Water Storage

5.4.3 SuDS

The document 'Sustainable Urban Drainage Systems' (SuDS) published by CIRIA, document No. C521, was utilised for the surface water design strategy for the proposed development. The document encourages the use of a variety of alternative measures in the design of sustainable drainage systems, which take account of quality, quantity and amenity. These measures protect or enhance water quality, are sympathetic to the environment, provide a habitat for wildlife and encourage natural ground water recharge. They provide storage that not only attenuates the flow but also permits settlement of coarse silts. Runoff would also be treated by absorption of particles by aquatic vegetation or by soil, and by biological activity.

The SuDS features incorporated into the drainage design for the scheme include the following:

- Green/Blue Terrace;
- Green/Blue Roof;
- Permeable paving;
- o Soft Landscaping
- o SuDS Tree Pits

5.4.3.1 Green/Blue Roofs & Terraces

A typical extensive green roof build-up is included in Figure 5-4 below.



Figure 5-4 Typical Extensive Green Roof Detail

The proposed ABG D108 green/blue roof system build-up for the roofs and terraces is illustrated in Figure 5-5 below. The finishing no top of the blue roof storage layer would vary, depending on the final landscape layout and would be a mixture of soft and permeable hard surfaces, both contributing to surface water interception.



Figure 5-5 Blue Roof Detail – D108mm

The surface water drainage layout for the scheme is detailed in DBFL drawings no. 210178-DBFL-CS-SP-DR-C-1300 (Site Services) and 210178-DBFL-CS-SP-DR-C-1310 (Surface Water Catchment Plan).

5.4.3.2 Permeable Paving

The proposed design includes permeable paving finishes as indicated on drawings 210178-DBFL-CS-SP-DR-C-1310. Surface water runoff from the paved areas is intercepted by the permeable build-up of the paved areas where it is intended to naturally infiltrate into the ground. If the porous build-up of the paving and the in-situ material beneath becomes saturated, surface water would



drain to the surface water pipe network through gullies and linear drains as indicated on drawing 210178-DBFL-CS-SP-DR-C-1300.

Permeable paving reduces pollutants such as petrol and diesel as it contributes to its biodegrading process. It also assists in filtering solid particles out of surface water runoff, providing filtration before discharging into the surface water pipe network and ultimately the receiving watercourse.

5.4.3.3 SuDS Tree Pits

Tree Pits are proposed to intercept excess surface water runoff from soft landscaping areas between buildings within the development. SuDS tree pit details as proposed are shown on drawing 210178-DBFL-CS-SP-DR-C-5303. Tree pits are slightly lowered below surrounding surface area to allow surface water to be directly intercepted at the base of the tree pit and infiltrate down to the tree root system. Once the tree pit is saturated, water would be routed to the surface water pipe network through an overflow as detailed on drawing 210178-DBFL-CS-SP-DR-C-5303.

5.4.4 Surface Water Drainage Design Standards

Surface water drainage for the proposed development is designed using the recommendations of the GDSDS, EN752 and BS8301:1985, with the following parameters applied:

- Return period for pipe network 2 years,
 - o check 30-year 15 minute, no flooding;
 - check 100-year flooding in designated areas;
- Time of entry 4 minutes
 Pipe Friction (Ks) (concrete) 0.6 mm
 Minimum Velocity 1.0 m/s
 Standard Average Annual Rainfall 729mm
 M5-60 16.1mm
 Ratio r (M5-60/M5-2D) 0.278
- Storage System Storm Return Event GDSDS Volume 2, p61, Criterion 3
 - \circ 10-year no flooding on site;
 - 30-year no flooding on site;



 100-year check no internal property flooding. Flood routing plan. FFL + 500mm freeboard above 100-year flood level. No flooding to adjacent areas.

•	Climate Change	20% for rainfall intensities.
•	C _v winter	0.84
•	C _v summer	0.75

(Note on C_v Factors; The DOE "Recommendations for Site Development Works" & BS8301:1985 note that the volumetric runoff coefficient Cv should be set at 0.6 for rapidly draining soils and 0.9 for heavy soils. Applying a Cv rate of 0.84 for Winter and 0.75 for Summer is standard practice and is appropriate for this site.

The *Network Module* of *Microdrainage* has been used to assess the performance of the proposed surface water network, attenuation structures and controlled discharge into the existing public surface water network in Richmond Road. This analysis indicated that the pipe sizes and grades are adequate for storm events up to the 1% AEP and that the underground cellular storage volume of 114m³ cellular storage at ground level satisfies attenuation requirements along with the storage provided in the green/blue roofs and terraces.

Refer to **Appendix C** for *Microdrainage Network Module* calculations.

A breakdown of the impermeable areas contributing to the surface water drainage network is included in *Table 5-2* below;

Catchment 1 - 158A Richmond Road Development				
Surface Type	Gross Area (ha)	Runoff Coefficient	Total Impermeable	
Green/Blue Roof	0.141	0.9	0.127	
Green/Blue Podium	0.141	0.9	0.126	
Footpaths on Green/Blue Podium	0.063	0.9	0.057	
Roof Area (Traditional)	0.056	1.0	0.056	
Permeable Paving	0.012	0.8	0.010	
Soft Landscaped Areas	0.040	0.3	0.012	
Hard Landscaping Areas	0.083	1.0	0.083	
Total	0.536		0.471	

Table 5-2 Impermeable Areas

The green/blue roof area and the green/blue terrace areas make up a total of **70%** of the total roof/terrace area as calculated in Table 5-3 below (0.141+0.141)/(0.40)*100 = 70%, satisfying the minimum 70% required by DCC for extensive green/blue roofs stipulated in the Green & Blue Roof Guide, 2021 and section 15.6.3 of the DCC Development Plan 2022 – 2028..



Table 5-3 Roof/Terrace Areas

Roof Area Breakdown			
Surface Type	Gross Area (ha)		
Green/Blue Roof	0.141		
Green/Blue Terrace	0.141		
Footpaths on Green/Blue Terrace	0.063		
Roof Area (Traditional)	0.056		
Total	0.40		

5.4.5 Interception and Treatment Storage

To prevent pollutants or sediments discharging into water courses the GDSDS requires "interception storage" to be incorporated into the development.

The volume of interception required is based on 5mm of rainfall depth from 80% of the runoff from impermeable areas as defined in GDSDS. The interception volume attributable to each SuDS feature consists of the volume of water that can infiltrate to the ground, evaporate into the atmosphere or can transpire through plants and vegetation. Additionally, there will be some losses of water due to absorption, wetting of stone and soil media.

Interception is provided as follows:

- Green/blue roof runoff is intercepted in the green roof build-up.
- Green/Blue terrace runoff is intercepted in the build-up of the green areas on the terrace and stone build-up of the hard terrace areas.
- Footpath runoff in landscaped areas at ground level are intercepted by the specified permeable paving or adjacent soft landscaping where impermeable paving is used.

All surfaced water collected from roads will pass through an appropriate petrol interceptor and grease trap, complying with the provision of 2 treatment stages mentioned within requirements of the CIRIA document C697.

5.5 Surface Water Management – Richmond Road Works

Surface water run-off from Richmond Road currently drains along the road in a south easterly direction as shown in Figure 5-6, where it drains into existing gullies connected to the existing 1350mm surface water sewer at the south eastern corner of the proposed development.



Figure 5-6 Richmond Road Works Surface Water Management

A new surface water sewer is proposed for the section of Richmond Road to be upgraded as indicated on drawing 210178-DBFL-CS-SP-DR-C-1300. The proposed 300mm surface water sewer would drain runoff from the road, footpaths and cycle tracks/lanes through road gullies and tie in at the same proposed manhole where the proposed development's surface water is proposed to discharge. All rainfall parameters for the Richmond Road works match the parameters for the internal surface water sewer network as listed in section 4.4.4.

Surface water network calculations for the Richmond Road surface water sewer network generated with the Micro-Drainage Network module are included in **Appendix C**.

5.6 Flood Risk

A separate '*Site Specific flood Risk Assessment*' (SSFRA) by DBFL Consulting Engineers, is included under separate cover, and addresses the flood protection measures for the proposed development.



5.7 DCC Surface Water Management Policies

The Surface Water Management Plan as detailed in this chapter satisfied the relevant surface water management policies as stipulated in *Chapter 9: Sustainable Environmental Infrastructure and Flood Risk* of the DCC Development Plan 2022 – 2028.

The relevant DCC surface water management policies are listed below:

SI7 Water Quality Status - Water quality enhanced by nature based drainage features

SI8 Physical Condition of Waterbodies - N/A

SI9 Groundwater Pollution – Groundwater pollution reduced through SuDS features

SI10 Managing Development Within and Adjacent to River Corridors - N/A

SI11 Managing Development Within and Adjacent to Camac River Corridor - N/A

SI12 River Restoration in Strategic Development and Regeneration Areas - N/A

SI13 Minimising Flood Risk - Addressed in the SSFRA

SI14 Strategic Flood Risk Assessment - Addressed in the SSFRA

SI15 Site-Specific Flood Risk Assessment - SSFRA as per the DCC 2022-2028 SFRA enclosed

SI16 Site-Specific Flood Risk Assessment- N/A

SI17 Catchment-Based Flood Risk Management Plans – Catchment plan drawing enclosed dr 210178-DBFL-SW-SP-DR-C-1310

SI18 Protection of Flood Alleviation Infrastructure

SI19 Provision and Upgrading of Flood Alleviation Assets – Flood wall provided as per dr 210178-DBFL-RD-SP-DR-C-5211

SI20 Basement Flood Risk Management - No Basement/ N/A

SI21 Managing Surface Water Flood Risk - SUDS and nature based solutions included as per section 5.4.3 of the Infrastructure Design Report

SI22 Sustainable Drainage Systems – included in design as per section 5.4.3 of the Infrastructure Design Report

SI23 Green Blue Roofs – Included in design as per section 5.4.3 of the Infrastructure Design Report

SI24 Control of Paving of Private Driveways / Vehicular Entrances / Grassed Areas



SI25 Surface Water Management – Included as part of this report

SI26 Taking in Charge of Private Drainage Infrastructure – Public Road drainage and connections will be to DCC standard. The Development will be private building drainage – it is assumed that building drainage does not need to be constructed to DCC standard (e.g. Ajs, Inspection chambers, attenuation storage etc)



6 FOUL DRAINAGE

There is an existing 900mm concrete foul sewer in Richmond Road. It is proposed to discharge foul flows from the development to the existing 900mm located on Richmond Road at the proposed site entrance at the existing manhole indicated in *Figure 6-1* below.

A pre-connection enquiry form for the subject site was issued to Irish Water and a copy of the Confirmation of Feasibility (COF) from Irish Water is included in **Appendix E.**



Figure 6-1 Extract of Irish Water Records (Foul connection)

In accordance with the conditions set by Irish Water within the confirmation of feasibility, foul and surface water flows from the development will be conveyed in separate networks.

The design of the foul water network was issued to Irish Water and the letter with the Statement of Design Acceptance from Irish Water is included in **Appendix F.**

Foul sewers have been designed in accordance with the Building Regulations and specifically in accordance with the principles and methods set out in the DOE "Recommendations for Site



Development Works for Housing Areas", IS EN752 (2008), BS8301: 1985, IS EN12056: Part 2 (2000) and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS).

The following criteria have been applied:

Demand	446l/house/day (Irish Water Code of Practice)
Discharge units	14 units per house (BS8301:1985)
Pipe Friction (Ks)	1.5 mm (concrete)
Pipe Friction (Ks)	0.15 mm (uPVC)
Minimum Velocity	0.75 m/s (self-cleansing velocity)
Maximum Velocity	3.0 m/s (1:20 maximum pipe gradient)
Frequency Factor	0.5 for domestic use

Estimated foul loading generated by the development are included in Table 6-1 below:

Table 6-1 Foul Loading Demand

TITLE				Job Reference							
158A Richmond Road				210178		H					
SUBJECT				Calc. Sheet No.							
Wastewater Demand for Irish Water				1							
DRAWING NUMBER		Calculations by		Checked by	Date						
-		DB		KS	24/01/2023						
RESIDENTIAL - PREDICTED DEVELOPMENT FOUL FLOWS											
Unit Type	No.	Loading	Occupancy	Occupancy	ccupancy Daily Loading						
		l/person/day	person/unit		l/day	l/s					
2 Bed	68	150	2.7	184	27,540	0.32					
1 Bed	65	150	2.7	176	26,325	0.30					
				Reside	ential Daily Loading	0.62					
Growth Factor											
				Infiltration @ 10% (as CoP App C 1.2.4)	0.06					
				Dr	y Weather Flow I/s	0.69					
			Resid	ential Peak Factor (as CoP App C 1.2.5)	6.0					
				0	Design Foul Flow I/s	4.11					
	*Flow rates calcula	ted using IW CoP for	Wastewater Infrastruct	ture Appendix C							
	NON-RESI	DENTIAL - PREDICTED	DEVELOPMENT FOUL	FLOWS							
Unit Type	e Floor Area Occupancy Load Occupancy				Daily Loading	Daily Loading					
m²		m ² /person		I/Person/day	l/day	l/s					
Commercial (Retail)	1,111	50	22	12	267	0.00					
Community Area (Artist Studio)	749	30	25	50	1,248	0.01					
				Non - Reside	ential Daily Loading	0.02					
Growth Factor											
Infiltration @ 10% (as CoP App C 1.2.4)											
Dry Weather Flow I/s											
Commercial Peak Factor (as CoP App C 1.2.7)											
Design Foul Flow I/s											
		1	TOTAL PREDICTED DEVI	LOPMENT AVERA	GE FOUL FLOWS I/s	0.64					
TOTAL PREDICTED DEVELOPMENT PEAK FOUL FLOWS I/s											

Refer to **Appendix D** for the Micro Drainage Foul Drainage Network calculations.



7 WATER SUPPLY AND DISTRIBUTION

The water main distribution system for the development will connect to the existing 150mm diameter water main located in Richmond Road as shown in Figure 7-1. A pre-connection enquiry form for the subject site was issued to Irish Water and a copy of the Confirmation of Feasibility (COF) from Irish Water is included in **Appendix E**.



Figure 7-1 Extract of Irish Water Records (Water connection)

Water for firefighting purposes will be routed from the tank room to a separate sprinkler lank room on the ground floor of the site, from where water will be distributed internally to the sprinkler system. 2 Hydrants are located in Richmond Road within 46m of the proposed buildings for firefighting purposes.

The estimated water daily water demand generated by the development is included in Table 7-1 below.



Table 7-1 Water Demand

TITLE				Job Reference							
158A Richmond Road		210178									
SUBJECT			Calc. Sheet No.								
Water Demand for Irish Water				2							
DRAWING NUMBER		Calculations by		Checked by	Date						
-		DB		KS	24/01/2023						
RESIDENTIAL - WATER DEMAND											
Unit Type	No. Dwellings	Occupancy Rate	Occupancy	Per Capita	Average Daily	Average Daily					
		/dwelling	,	Consumption	Domestic Demand	Domestic Demand					
		,		I/Person/day	l/day	l/s					
2 Bed	68	2.7	184	150	27,540	0.32					
1 Bed	65	2.7	176	150	26,325	0.30					
				Total Av	erage Daily Loading I/s	0.62					
				Average Day/W	eek Domestic Demand	1.25					
				Average Day/F	Peak Week Demand I/s	0.78					
					Peak Demand Factor	5					
				Peak H	our Water Demand I/s	3.90					
	*Flow ra	tes calculated using	IW CoP for Wa	ter Infrastructure							
		NON-RESIDENT	IAL WATER DEN	IAND							
Unit Type	Floor Area	Occupancy Rate Occupancy		Per Capita	Average Daily	Average Daily					
				Consumption	Demand	Demand					
	m	m ² /person		I/Person/day	l/day	l/s					
Commercial (Retail)	1,111	50	22	150	3,333	0.04					
Community Area (Artist Studio)	749	30	25	150	3,745	0.04					
				Total Av	erage Daily Loading I/s	0.08					
					- Deviltiget Devi	1.25					
Average Day/Week Demand											
Average Day/Peak Week Demand I/s											
Park Downed Faster											
Peak bernand Factor											
*Flow rates calculated using IW CoP for Water Infratructure											
		tes calculated dollig	The COP TOT WA	ter innastructure							
						0.71					
				TOTAL AVERA	GE DAILY LOADING I/s	0.71					
				TOTAL AVERA AVERAGE DAY/PE PEAK H	GE DAILY LOADING I/s AK WEEK DEMAND I/s OUR WATER DEMAND	0.71 0.88 4.41					

The design of the watermain was issued to Irish Water and the letter with the Statement of Design Acceptance from Irish Water is included in **Appendix F.**



Appendix A : Met Eireann Rainfall Data

Met Eireann Return Period Rainfall Depths for sliding Durations Irish Grid: Easting: 316654, Northing: 236444,

	Inte	rval					Years									
DURATION	Szonths,	lyear,	2,	3,	- 4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.5,	3.6,	4.1,	5.0,	5.6,	6.0,	7.5,	9.2,	10.3,	11.8,	13.2,	14.3,	16.0,	17.3,	18.4,	N/A ,
10 mins	3.5,	5.0,	5.7,	6.9,	7.7,	8.4,	10.4,	12.8,	14.3,	16.5,	18.4,	20.0,	22.3,	24.1,	25.6,	N/A ,
15 mins	4.1,	5.8,	6.8,	8.2,	9.1,	9.8,	12.3,	15.0,	16.8,	19.4,	21.7,	23.5,	26.2,	28.4,	30.2,	N/A ,
30 mins	5.4,	7 6,	8.8,	10.5,	11.7,	12.6.	15.5,	18.9,	21.1,	24.2,	26.9,	29.0,	32.3,	34.8,	36.9.	N/A ,
1 hours	7.2,	9.9,	11.4,	13.5,	15.0,	16.1,	19.7,	23.8,	26.4,	30.1,	33.4,	35.9,	39.8,	42.7,	45.2,	N/A ,
2 hours	9.5,	12.9,	14.7,	17.4,	19.2,	20.6,	25.0,	29.9,	33.1,	37.5,	41.4,	44.4,	49.0,	52.5,	55.4,	N/A ,
3 hours	11.2,	15.1,	17.2,	20.2,	22.2,	23.7,	28.7,	34.2,	37.7,	42.6,	46.9,	50.2,	55.3,	59.2,	62.3,	N/A ,
4 hours	12.6,	16.9,	19.1,	22.4,	24.6,	26.3,	31.7,	37.6,	41.4,	46.7,	51.3,	54.9,	60.3,	64.4,	67.8,	N/A ,
6 hours	14.8,	19.7,	22.3,	26.0,	28.5,	30.3,	36.4,	43.0,	47.2,	53.1,	58.2,	62.1,	68.1,	72.6,	76.3,	N/A ,
9 hours	17.4,	23.0,	25.9,	30.1,	32.9,	35.0,	41.8,	49.1,	53.9,	60.4,	66.0,	70.3,	76.9,	81.8,	85.9,	N/A ,
12 hours	19.5,	25.7,	28.9,	33.5,	36.5,	38.8,	46.1,	54.0,	59.1,	66.1,	72.2,	76.8,	83.8,	89.1,	93.5,	N/A ,
18 hours	23.0,	30.0,	33.6,	38.8,	42.2,	44.8,	53.0,	61.8,	67.5,	75.2,	81.9,	87.0,	94.6,	100.5,	105.2,	N/A ,
24 hours	25.8,	33.5,	37.4,	43.1,	46.8,	49.6,	58.4,	68.0,	74.1,	82.3,	89.5,	95.0,	103.2,	109.4,	114.5,	131.8,
2 days	31.6,	40.2,	44.6,	50.8,	54.9,	57 <mark>.9</mark> ,	67.5,	77.7,	84.1,	92.9,	100.4,	106.0,	114.5,	120.9,	126.2,	143.8,
3 days	36.2,	45.7,	50.4,	57.1,	61.4,	64.7,	74.8,	85.6,	92.4,	101.6,	109.4,	115.3,	124.1,	130.8,	136.2,	154.4,
4 days	40.2,	50.4,	55.4,	62.5,	67.1,	70.5,	81.3,	92.6,	99.7,	109.2,	117.4,	123.5,	132.6,	139.5,	145.0,	163.7,
é days	47.3,	58.6,	64.1,	72.0,	77.0,	80.7,	92.4,	104.6,	112.2,	122.5,	131.2,	137.7,	147.3,	154.6,	160.5,	180.1,
8 days	53.5,	65.8,	71.8,	80.2,	85.6,	89.6,	102.1,	115.1,	123.2,	134.0,	143.2,	150.0,	160.2,	167.8,	173.9,	194.5,
10 days	59.1,	72.3,	78.7,	87.7,	93.4,	97.7,	110.9,	124.6,	133.1,	144.4,	154.0,	161.1,	171.8,	179.7,	186.1,	207.4,
12 days	64.4,	78.4,	85.2,	94.6,	100.7,	105.2,	119.0,	133.3,	142.2,	154.0,	164.0,	171.4,	182.4,	190.6,	197.3,	219.3,
1 days	74.2,	89.5,	97.0,	107.3,	113.9,	118.8,	133.8,	149.3,	158.8,	171.5,	182.2,	190.1,	201.8,	210.5,	217.6,	240.9,
20 days	83.1,	99.8,	107.8,	119.0,	126.0,	131.3,	147.3,	163.8,	173.9,	187.3,	198.6,	207.0,	219.4,	228.5,	235.9,	260.4,
25 days	93.6,	111.7,	120.4,	132.4,	140.0,	145.7,	162.8,	180.4,	191.2,	205.5,	217.5,	226.4,	239.5,	249.2,	257.0,	282.7,

NOTES:

N/A Data not available

Thuse 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


Appendix B : Surface Water Storage Calculations [Micro Drainage Cascade Source Control]

210178-DBFL-Z0-XX-RP-C-0001 P02 February 2023

DBFL Consulting Engineers				Page 1					
Ormond House									
Upper Ormond Quay									
Dublin 7				Micco					
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Innovyze	Source C	~	1						
	bource c	0110101 2020.	±						
Cascade Summary of Res	ults for	220830 Cellu	lar Tank SRC	v					
Cascade Summary of Results for 220030 Certuial Idik.SKCA									
Upstream Outflow To Overflow To									
Structures									
220830 GreenBlue Podi	um (P3).SR	CX (None)	(None)						
220830 GreenBlue Podi 220830 GreenBlue Podi	.um (P4).SR	CX							
220830 GreenBlue Podi 220830 GreenBlue Podi	um (P6).SR	CX							
220830 GreenBlue Podi	.um (P7).SR	CX							
220830 GreenBlue Rc	of (G1).SR	CX							
220830 GreenBlue Ro	of (G2).SR	CX							
220830 GreenBlue Ro	of (G3).SR	CX							
220830 GreenBlue Podi	um (P8) SR	CX							
220830 GreenBlue Ro	of (G4).SR	CX							
220830 GreenBlue Ro	of (G5).SR	CX							
Storm M	lax Max	Max Max	Status						
Event Le	wel Depth	(1/e) (m ³)							
	(11)	(1/3) (11)							
15 min Summer 3.	272 0.100	1.9 18.1	O K						
30 min Summer 3.	309 0.137	1.9 24.6	O K						
60 min Summer 3.	346 0.174	2.0 31.3	OK						
120 min Summer 3.	408 0.215	2.0 38.3	OK						
240 min Summer 3.	425 0.253	2.0 45.5	0 K						
360 min Summer 3.	448 0.276	2.0 49.6	0 K						
480 min Summer 3.	463 0.291	2.0 52.4	0 K						
600 min Summer 3.	474 0.302	2.0 54.4	O K						
960 min Summer 3.	482 0.310	2.0 55.7	OK						
Joo min Junner J.	105 0.517	2.0 37.0	0 10						
Storm R	ain Flood	ed Discharge T	ime-Peak						
Event (mm	n/hr) Volum	ne Volume	(mins)						
	(m³)	(m³)							
15 min Summer 84	.523 0	.0 39.2	18						
30 min Summer 58	3.468 0	.0 57.6	33						
60 min Summer 38	3.020 0	.0 94.2	62						
120 min Summer 23	3.997 O	.0 121.7	122						
180 min Summer 18	3.178 0	.0 139.4	182						
240 min Summer 14 360 min Summer 11	.219 O	.0 172.8	242 362						
480 min Summer 9	0.163 0	.0 187.8	482						
600 min Summer 7	.826 0	.0 199.6	602						
720 min Summer 6	5.878 0	.0 209.2	722						
960 min Summer 5	6.608 0	.0 224.1	960						
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DBFL Consulting Engineers						Page 2		
Ormond House								
Upper Ormond Ouav								
Dublin 7						Micco		
$D_{2} = 23/02/2023 - 20.55$	Dogi	anod h	vy hogi	tord				
Date 23/02/2023 20:33	Char		y bes	ceru		Drainage		
File 20220829 Cascade.CASX	Chec	скеа ру	·					
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		c 0/		~	- 1			
Cascade Summary of Re	sults	for 22	20830	Cellu.	lar Tank.SRC	<u>×</u>		
0 to am	Man	Mass	Man	Man	Chatwa			
Storm	Max	Max Depth C	Max	Max	Status			
Evenc	(m)	(m)	(1/s)	(m ³)				
	(,	()	(=, =,	()				
1440 min Summer	3.490	0.318	2.0	57.2	0 K			
2160 min Summer	3.484	0.312	2.0	56.1	ОК			
2880 min Summer	3.473	0.301	2.0	54.1	O K			
4320 min Summer	3.44⊥ 3.404	U.209 0 232	2.0	48.3 /1 0	OK			
7200 min Summer	3.404	0.232	2.0	41.8 41.8	0 K			
8640 min Summer	3.339	0.167	2.0	30.1	O K			
10080 min Summer	3.314	0.142	2.0	25.5	0 K			
15 min Winter	3.285	0.113	1.9	20.3	0 K			
30 min Winter	3.327	0.155	2.0	27.8	0 K			
60 min Winter	3.370	0.198	2.0	35.6	ΟK			
120 min Winter	3.415	0.243	2.0	43.8	ОК			
180 min Winter	3.443	0.271	2.0	48.9	ОК			
240 min Winter	3.464	0.292	2.0	52.6	ОК			
360 min Winter	3.494	0.322	2.0	57.9	O K			
480 min Winter	3.514	0.342	2.0	61.6	ОК			
600 min Winter	3.528	0.356	2.0	64.1	O K			
720 min Winter	3.538	0.366	2.0	65.9	O K			
960 min Winter	3.550	0.378	2.0	68.1	ОК			
Storm	Rain	Floode	d Disch	arge T	ime-Peak			
Event	(mm/hr)	Volume		ume	(mins)			
	(,,	(m ³)		³)	(
1440 min Summer	4.204	0.	0 2	242.5	1224			
2160 min Summer	3.150	0.	03	323.6	1600			
2880 min Summer	2.565	0.	U 3	344.9	1988			
4320 min Summer	1.917	0.	U 3	368.5	2764			
5/60 min Summer	1 226	υ.	0 4	193 0	332U 1256			
8640 min Summer	1 160	0.		103.2 501 3	4200			
10080 min Summer	1 030	0.	0 5	512 7	5648			
15 min Winter	84.523	0.	0	44.8	18			
30 min Winter	58.468	0.	0	65.8	33			
60 min Winter	38.020	0.	0 1	06.9	62			
120 min Winter	23.997	0.	0 1	37.6	122			
180 min Winter	18.178	0.	0 1	57.3	182			
240 min Winter	14.896	0.	0 1	72.2	240			
360 min Winter	11.219	0.	0 1	94.3	360			
480 min Winter	9.163	0.	0 2	210.4	478			
600 min Winter	7.826	0.	0 2	223.0	596			
720 min Winter	6.878	0.	0 2	233.2	712			
960 min Winter	5.608	0.	υ 2	248.6	942			
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DBFL Consulting Engineers		Page 3
Ormond House		
Upper Ormond Quay		
Dublin 7		Mirro
Date 23/02/2023 20:55	Designed by besterd	Dcainago
File 20220829 Cascade.CASX	Checked by	Diamage
Innovyze	Source Control 2020.1	•

Cascade Summary of Results for 220830 Cellular Tank.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
1440 min Winte	r 3.554	0.382	2.0	68.7	ОК
2160 min Winte	r 3.535	0.363	2.0	65.4	ΟK
2880 min Winte	r 3.513	0.341	2.0	61.5	ОК
4320 min Winte	r 3.455	0.283	2.0	50.9	ОК
5760 min Winte	r 3.393	0.221	2.0	39.7	ОК
7200 min Winte	r 3.341	0.169	2.0	30.5	ОК
8640 min Winte	r 3.302	0.130	1.9	23.4	ОК
10080 min Winte	r 3.274	0.102	1.9	18.4	ОК

	Stor: Even	m t	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
1440	min	Winter	4.204	0.0	266.9	1380
2160	min	Winter	3.150	0.0	359.6	1752
2880	min	Winter	2.565	0.0	382.0	2164
4320	min	Winter	1.917	0.0	408.0	2984
5760	min	Winter	1.558	0.0	512.0	3744
7200	min	Winter	1.326	0.0	538.6	4400
8640	min	Winter	1.162	0.0	557.6	5104
10080	min	Winter	1.039	0.0	569.6	5752

DBFL Consulting Engineers		Page 4
Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/02/2023 20:55	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Digitigh
Innovyze	Source Control 2020.1	
Cascade Rainfall Det	ails for 220830 Cellular Tank.SRCX	
Rainfall Model Return Period (years) Region Scotl M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms M 100 Cv (Summer) 0.7 and and Ireland Cv (Winter) 0.8 16.100 Shortest Storm (mins) 0.278 Longest Storm (mins) 100 Yes Climate Change %	Yes 150 140 15 180 -20
<u> </u>	me Area Diagram	
То	tal Area (ha) 0.120	
	Time (mins) Area	
F	rom: To: (ha)	
	0 4 0.120	

Ormand House Opper Ormand Quay Designed by besterd Date 23/02/2023 Cascade.CASX Designed by besterd Checked by Innovyze Source Control 2020.1 Designed by besterd Innovyze Source Control 2020.1 Cascade Model Details for 220830 Cellular Tank.SRCX Storage is Online Cover Level (m) 4.100 Tank or Pond Structure Invert Level (m) 3.172 Depth (n) Area (m²) Depth (n) Area (m²) 0.000 180.0 0.660 190.0 0.661 0.0 Hydro-Brake@ Optimum Outflow Control Doit Reference MD-BER-0070-2000-00-75-2000 Design Read (m) 2.0 Design Read (m) 0.000 0.661 10.0 0.776 Design Read (m) Calculated 0.776 Design Flow (1/s) 2.0 Diameter (ma) 70 Tanker Level (m) 3.156 Surgested Manhole Diameter (ma) 100 Surgested Manhole Diameter (ma) 100 Surgested Manhole Diameter (ma) 1200 Control Points Read (m) Flow (1/s) Kick-Flo® 0.493 1.6 Prish-Flo® 0.222 2.0 Mean Flow oren Head Range	DBFL Consulting Engineers		Page 5							
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4320 min Summer 9.688 0.038 0.2 9.4 Flood Risk 5760 min Summer 9.685 0.035 0.2 8.7 Flood Risk Korm Korm Korm Korm Korn Volume Volume Volume Volume Volume (m³) (m³) 15 min Summer Storm 30 min Summer Store 15 min Summer 38.020 0.0 5.1 64 100 min Summer 18.178 0.0 7.7 182 240 min Summer 14.896 0.0 8.5 242 360 min Summer 11.219 0.0 9.7 354 480 min Summer 9.163 0.0 10.6 406 6.878 0.0 11.3 464 720 min Summer 5.608 0.0 13.0 <td< td=""><td>2880</td><td>min Summer</td><td>9.691</td><td>0.041</td><td>(</td><td>0.2</td><td>10.1</td><td>Flood Risk</td><td></td></td<>	2880	min Summer	9.691	0.041	(0.2	10.1	Flood Risk					
Storm Rain Flooded Discharge Time-Peak Event Wolume Volume Volume (mins) 15 min Summer 84.523 0.0 2.0 19 30 min Summer 58.468 0.0 3.0 34 60 min Summer 38.020 0.0 5.1 64 120 min Summer 18.178 0.0 7.7 182 240 min Summer 14.896 0.0 8.5 242 360 min Summer 11.219 0.0 9.7 354 480 min Summer 7.826 0.0 11.3 464 720 min Summer 5.608 0.0 13.0 662 1440 min Summer 3.150 0.0 17.8 1340 280 min Summer 1.917 0.0 24.2 3280 2160 min Summer 1.558 0.0 24.2 3280	4320	min Summer	9.688	0.038		J.2	9.4	Flood Risk					
Storn EventRain (mm/hr)Flooded Volume (m³)Discharge Volume (mins)Time-Peak (mins)15ninSummer84.5230.02.01930ninSummer58.4680.03.03460ninSummer38.0200.05.164120ninSummer18.1780.07.7122180ninSummer11.2190.09.7354480ninSummer11.2190.011.3464720ninSummer7.8260.011.3464720ninSummer6.8780.011.3464720ninSummer5.6080.013.0622140ninSummer4.2040.014.49362160ninSummer2.5650.019.317324320ninSummer1.5180.024.23280	5780	min summer	9.005	0.03.) (J•Z	0./	FIODU RISK					
Storn EventRain (mm/m)Flooded volume (mg/m)Discharg Volume (mg/m)Time-Path (mins)15minSumer min84.5230.02.0193minSummer58.4680.03.03460minSummer38.0200.05.164120minSummer23.9970.06.7122180minSummer18.1780.07.7182200minSummer11.2190.09.7354480minSummer17.8260.011.3464700minSummer6.8780.011.952660minSummer3.1500.017.81340280minSummer2.5650.019.31732432minSummer1.5580.021.22508576minSummer1.5580.024.23280													
Stork Rain Plooded Discharg Time-Pack Number Number Number Number Number Number 15 min Summer 84.523 0.0 2.0 19 30 min Summer 58.468 0.0 3.0 34 60 min Summer 38.020 0.0 5.1 64 120 min Summer 18.178 0.00 7.7 182 240 min Summer 14.896 0.0 10.3 406 100 min Summer 14.896 0.0 11.3 406 100 min Summer 14.896 0.0 11.3 406 100 min Summer 7.826 0.0 11.3 406 100 min Summer 4.204 0.0 11.3 406 140 min Summer 3.508 0.0 11.3 406 120 min Summer 3.208 0.0 11.3 406													
Event (mm/hr) Volume (m³) Volume (m³) (mins) 15 min Summer 84.523 0.0 2.0 19 30 min Summer 58.468 0.0 3.0 34 60 min Summer 38.020 0.0 5.1 64 120 min Summer 23.997 0.0 6.7 122 180 min Summer 18.178 0.0 7.7 182 240 min Summer 14.896 0.0 8.5 242 360 min Summer 11.219 0.0 9.7 354 480 min Summer 7.826 0.0 11.3 464 720 min Summer 5.608 0.0 11.3 526 960 min Summer 3.150 0.0 14.4 936 2160 min Summer 3.50 0.0 19.3 1732 4320 min Summer 1.558 0.0 24.2 3280		Storm	Rai	n Fl	Looded	Dis	charge	Time-Peak					
(m³) (m³) 15 min Summer 84.523 0.0 2.0 19 30 min Summer 58.468 0.0 3.0 3.0 460 min Summer 38.020 0.0 5.1 64 120 min Summer 23.997 0.0 6.7 122 180 min Summer 18.178 0.0 7.7 182 240 min Summer 14.896 0.0 8.5 242 360 min Summer 11.219 0.0 9.7 354 480 min Summer 9.163 0.0 10.6 406 600 min Summer 7.826 0.0 11.3 464 720 min Summer 6.878 0.0 11.9 526 960 min Summer 6.878 0.0 13.0 662 1440 min Summer 4.204 0.0 14.4 936 2160 min Summer 3.150 0.0 17.8 1340 2800 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280		Event	(mm/]	hr) V	olume	v	olume	(mins)					
15 min Summer 84.523 0.0 2.0 19 30 min Summer 58.468 0.0 3.0 34 60 min Summer 38.020 0.0 5.1 64 120 min Summer 18.178 0.0 7.7 182 240 min Summer 18.178 0.0 7.7 182 240 min Summer 14.896 0.0 8.5 242 360 min Summer 11.219 0.0 9.7 354 480 min Summer 9.163 0.0 10.6 406 600 min Summer 5.608 0.0 11.3 464 720 min Summer 5.608 0.0 13.0 662 1440 min Summer 5.608 0.0 13.0 662 1440 min Summer 3.150 0.0 17.8 1340 2880 min Summer 2.565 0.0 19.3 1732 4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280					(m³)		(m³)						
15 min Summer 84.523 0.0 2.0 19 30 min Summer 58.468 0.0 3.0 34 60 min Summer 38.020 0.0 5.1 64 120 min Summer 23.997 0.0 6.7 122 180 min Summer 18.178 0.0 7.7 182 240 min Summer 14.896 0.0 8.5 242 360 min Summer 11.219 0.0 9.7 354 480 min Summer 9.163 0.0 11.3 464 720 min Summer 7.826 0.0 11.3 464 720 min Summer 5.608 0.0 13.0 662 960 min Summer 3.150 0.0 17.8 1340 280 min Summer 3.150 0.0 17.8 1340 280 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280		E min Gu	0.4	E 0 0	0 0		0 0	1.0					
60 min Summer 38.020 0.0 5.1 64 120 min Summer 23.997 0.0 6.7 122 180 min Summer 18.178 0.0 7.7 182 240 min Summer 14.896 0.0 8.5 242 360 min Summer 11.219 0.0 9.7 354 480 min Summer 9.163 0.0 10.6 406 600 min Summer 7.826 0.0 11.3 464 720 min Summer 6.878 0.0 13.0 662 960 min Summer 4.204 0.0 14.4 936 2160 min Summer 3.150 0.0 17.8 1340 2880 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280		o min Summer	84. 50	2∠3 ∕69	0.0		2.0	79 19					
120 min Summer 23.997 0.0 6.7 122 180 min Summer 18.178 0.0 7.7 182 240 min Summer 14.896 0.0 8.5 242 360 min Summer 11.219 0.0 9.7 354 480 min Summer 9.163 0.0 10.6 406 600 min Summer 7.826 0.0 11.3 464 720 min Summer 6.878 0.0 11.9 526 960 min Summer 5.608 0.0 13.0 662 1440 min Summer 3.150 0.0 17.8 1340 2880 min Summer 2.565 0.0 19.3 1732 4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280) min Summer	30. 38	-00 020	0.0		5.U 5.1	54					
180 min Summer 18.178 0.0 7.7 182 240 min Summer 14.896 0.0 8.5 242 360 min Summer 11.219 0.0 9.7 354 480 min Summer 9.163 0.0 10.6 406 600 min Summer 7.826 0.0 11.3 464 720 min Summer 6.878 0.0 13.0 662 960 min Summer 5.608 0.0 13.0 662 1440 min Summer 3.150 0.0 17.8 1340 2880 min Summer 2.565 0.0 19.3 1732 4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280	12) min Summer	23.	997	0.0		6.7	122					
240 min Summer 14.896 0.0 8.5 242 360 min Summer 11.219 0.0 9.7 354 480 min Summer 9.163 0.0 10.6 406 600 min Summer 7.826 0.0 11.3 464 720 min Summer 6.878 0.0 11.9 526 960 min Summer 5.608 0.0 13.0 662 1440 min Summer 4.204 0.0 14.4 936 2160 min Summer 3.150 0.0 17.8 1340 2880 min Summer 2.565 0.0 19.3 1732 4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280	18) min Summer	18.	178	0.0		7.7	182					
360 min Summer 11.219 0.0 9.7 354 480 min Summer 9.163 0.0 10.6 406 600 min Summer 7.826 0.0 11.3 464 720 min Summer 6.878 0.0 11.9 526 960 min Summer 5.608 0.0 13.0 662 1440 min Summer 4.204 0.0 14.4 936 2160 min Summer 3.150 0.0 17.8 1340 2880 min Summer 2.565 0.0 19.3 1732 4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280	24) min Summer	14.	896	0.0		8.5	242					
480 min Summer 9.163 0.0 10.6 406 600 min Summer 7.826 0.0 11.3 464 720 min Summer 6.878 0.0 11.9 526 960 min Summer 5.608 0.0 13.0 662 1440 min Summer 4.204 0.0 14.4 936 2160 min Summer 3.150 0.0 17.8 1340 2880 min Summer 2.565 0.0 19.3 1732 4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280	36) min Summer	11.	219	0.0		9.7	354					
600 min Summer 7.826 0.0 11.3 464 720 min Summer 6.878 0.0 11.9 526 960 min Summer 5.608 0.0 13.0 662 1440 min Summer 4.204 0.0 14.4 936 2160 min Summer 3.150 0.0 17.8 1340 2880 min Summer 2.565 0.0 19.3 1732 4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280	48) min Summer	9.	163	0.0		10.6	406					
720 min Summer 6.878 0.0 11.9 526 960 min Summer 5.608 0.0 13.0 662 1440 min Summer 4.204 0.0 14.4 936 2160 min Summer 3.150 0.0 17.8 1340 2880 min Summer 2.565 0.0 19.3 1732 4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280	60) min Summer	7.	826	0.0		11.3	464					
900 min Summer 5.008 0.0 13.0 662 1440 min Summer 4.204 0.0 14.4 936 2160 min Summer 3.150 0.0 17.8 1340 2880 min Summer 2.565 0.0 19.3 1732 4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280	72	J min Summer	6.	8/8 609	0.0		11.9	526					
2160 min Summer 3.150 0.0 17.8 1340 2880 min Summer 2.565 0.0 19.3 1732 4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280	96) min Summer	5. л	000 201	0.0		13.U	002 036					
2880 min Summer 2.565 0.0 19.3 1732 4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280	216) min Summer	4. 2	150	0.0		17 8	1340					
4320 min Summer 1.917 0.0 21.2 2508 5760 min Summer 1.558 0.0 24.2 3280 ©1982-2020 Innovyze	288) min Summer	2.	565	0.0		19.3	1732					
5760 min Summer 1.558 0.0 24.2 3280 ©1982-2020 Innovyze	432) min Summer	1.	917	0.0		21.2	2508					
©1982-2020 Innovyze	576) min Summer	1.	558	0.0		24.2	3280					
©1982-2020 Innovyze													
		(01982	-2020) Inno	ovy2	ze						

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Ormond House								
Upper Ormond Quay								
Dublin 7					Micco			
Date 23/02/2023 20:56	Desig	ned by be	esterd					
File 20220829 Cascade CASY	Check	ad by			Drainage			
	Course	control	2020	1				
тшоууге	SOULCE		2020	• ⊥				
Casaada Cummanu of Decult	a fam 0	20020 Cm	o o n D l u	a Dadium (D2				
Cascade Summary of Result	<u>s 101 z</u>	20030 GI	eenbru	<u>e Podium (Ps</u>).SRCA			
Storm M	on Mon	More	Man	Status				
Event Le	vel Dept	h Control	Volume	Status				
(m) (m)	(1/s)	(m ³)					
7200 min Summer 9.	683 0.03	3 0.2	8.1	Flood Risk				
8640 min Summer 9.	681 0.03	1 0.1	7.6	Flood Risk				
15 min Winter 9	666 0 01	9 0.1 6 0.1	7.2	Flood Risk				
30 min Winter 9.	671 0.02	1 0.1	5.3	Flood Risk				
60 min Winter 9.	677 0.02	7 0.1	6.8	Flood Risk				
120 min Winter 9.	684 0.03	4 0.2	8.3	Flood Risk				
180 min Winter 9.	687 0.03	7 0.2	9.2	Flood Risk				
240 min Winter 9.	689 0.03	9 0.2	9.8	Flood Risk				
360 min Winter 9.	692 0.04	2 0.2	10.4	Flood Risk				
480 min Winter 9.	693 0.04	3 0.2	10.7	Flood Risk				
720 min Winter 9.	694 0.04	4 U.2 5 0.2	11.0	Flood Risk				
960 min Winter 9.	696 0.04	6 0.2	11.3	Flood Risk				
1440 min Winter 9.	696 0.04	6 0.2	11.3	Flood Risk				
2160 min Winter 9.	694 0.04	4 0.2	10.9	Flood Risk				
2880 min Winter 9.	692 0.04	2 0.2	10.3	Flood Risk				
4320 min Winter 9.	687 0.03	7 0.2	9.2	Flood Risk				
5760 min Winter 9.	683 0.03	3 0.2	8.2	Flood Risk				
Storm	Dain E	looded Die	- ch	Mime - De els				
Event (mm/hr) N	Volume V	olume	(mins)				
Evenc ((m ³)	(m ³)	(milis)				
		. ,	. ,					
7200 min Summer	1.326	0.0	25.6	3968				
8640 min Summer	1.162	0.0	26.8	4752				
10080 min Summer	1.039	0.0	27.7	5448				
15 min Winter	04.JZJ 58 169	0.0	∠.3 २ ⊑	сс ТА				
60 min Winter	38.020	0.0	5.9	62				
120 min Winter	23.997	0.0	7.6	120				
180 min Winter	18.178	0.0	8.7	178				
240 min Winter	14.896	0.0	9.6	234				
360 min Winter	11.219	0.0	11.0	346				
480 min Winter	9.163	0.0	12.0	448				
600 min Winter	/.826	0.0	12.8	480				
/20 min winter 960 min Winter	0.0/0 5 608	0.0	13.5 14 6	336 710				
1440 min Winter	4.204	0.0	16.2	1010				
2160 min Winter	3.150	0.0	20.0	1444				
2880 min Winter	2.565	0.0	21.7	1848				
4320 min Winter	1.917	0.0	23.9	2636				
5760 min Winter	1.558	0.0	27.1	3400				
©1982-2020 Innovyze								

DBFL Consulting Engineers						Page 3
Ormond House						
Upper Ormond Quay						
Dublin 7						Micco
Date 23/02/2023 20:56		Desi	gned by	besterd		
File 20220829 Cascade.CASX		Chec	ked by			Digitigh
Innovyze		Sour	ce Cont	rol 2020	.1	
Cascade Summary of I	Results	for	220830	GreenBlu	e Podium	(P3).SRCX
Storm	Ma	x Ma	ax Max	k Max	Status	
Event	Lev	el Dej	pth Conti m) (1/a	rol Volume		
	(111) (1) (1/2	5) (111)		
7200 min Wi	nter 9.6	80 0.0	030 (0.1 7.5	Flood Risk	
8640 min Wi 10080 min Wi	nter 9.6 nter 9.6	78 0.0 76 0.0	028 (026 (D.1 6.8	Flood Risk	
10000 1011 W1	iiter 9.0	/0 0.0	020 (J.1 0.4	FICOU KISK	
Storm	F	Rain	Flooded	Discharge	Time-Peak	
Event	(m	m/hr)	Volume	Volume	(mins)	
			(m³)	(m³)		
7200 min W	inter	1.326	0.0	28.8	4112	
8640 min W	inter	1.162	0.0	30.1	4848	
10080 min W	inter	1.039	0.0	31.1	5552	
	©198	32-20	20 Inno	vyze		

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Ormond House								
Upper Ormond Quay								
Dublin 7		Micco						
Date 23/02/2023 20:56	Designed by besterd							
File 20220829 Cascade.CASX	Checked by	Drainage						
Innovyze	Source Control 2020.1							
Cascade Rainfall Details	for 220830 GreenBlue Podium (P3).	SRCX						
Rainfall Model	FSR Winter Storms	Yes						
Return Period (years)	100 Cv (Summer) 0.	750						
M5-60 (mm)	16 100 Shortest Storm (mins)	15						
Ratio R	0.278 Longest Storm (mins) 10	080						
Summer Storms	Yes Climate Change %	+20						
<u>Ti</u>	<u>me Area Diagram</u>							
Tot	al Area (ha) 0.022							
т	ime (mins) Area							
Fi	com: To: (ha)							
	0 4 0.022							
Ti	me Area Diagram							
Tot	Total Area (ha) 0.000							
	ima (mina) Buas							
T F1	com: To: (ha)							
	0 4 0.000							
<u></u> ∩10	82-2020 Innovyze							
019	OF FORD THHONÀTE							

DBFL Consulting Engineers				Page 5
Ormond House				
Upper Ormond Quay				
Dublin 7				Micro
Date 23/02/2023 20:56	De	esigned by be	sterd	
File 20220829 Cascade.CAS	X Ch	hecked by		Dialitatje
Innovyze	Sc	ource Control	2020.1	
<u>Cascade Model De</u>	etails for	220830 Green	Blue Podium (P3)	.SRCX
		and Grand Transl	() 0.050	
Sto	rage is Unit.	THE COVEL TEAST	(m) 9.850	
	<u>Tank or</u>	Pond Structu	ire	
	Invert	Level (m) 9.65	0	
Depth (m) Area	a (m²) Depth	n (m) Area (m²)	Depth (m) Area (m ²	²)
0.000	248.0 0	248.0	0.109 0.	0
<u>Hydr</u>	o-Brake® 0	ptimum Outflo	<u>ow Control</u>	
	Unit De	afamanaa MD CUE	0020 2000 0100 200	
	Design H	Head (m)	0.10)9
	Design Flo	ow (1/s)	0 .	.2
	Flu	ush-Flo™	Calculate	ed
	Ob Annl	bjective Minim lication	ise upstream storag	je
	Sump Av	vailable	Ye	es
	Diamet	ter (mm)	2	28
Minimum Outland	Invert Le	evel (m)	9.65	50
Minimum Outlet Suggested Ma	t Pipe Diamet anhole Diamet	ter (mm) ter (mm)	12(0
Control Points Head	d (m) Flow ((1/s) Cont	rol Points He	ad (m) Flow (l/s)
Design Point (Calculated)	0.109	0.2	Kick-Flo®	0.079 0.2
Flush-Flo™	0.046	0.2 Mean Flow	over Head Range	- 0.2
The hydrological calculation	s have been l	based on the He	ad/Discharge relat	ionship for the
Hydro-Brake® Optimum as spec	ified. Shoul	ild another type	of control device	other than a
Hydro-Brake Optimum® be util	ised then the	nese storage rou	ting calculations	will be invalidated
Depth (m) Flow (1/s) Dept	h (m) Flow ((l/s) Depth (m)	Flow (1/s) Depth	(m) Flow (l/s)
0.100 0.2	1.200	0.6 3.000	0.9 7.0	000 1.3
0.200 0.3	1.400	0.6 3.500	1.0 7.5	500 1.4
0.300 0.3	1.600	0.6 4.000	1.0 8.0	1.4
0.500 0.4	2.000	0.7 5.000	1.1 9.0	00 1.5
0.600 0.4	2.200	0.8 5.500	1.2 9.5	500 1.6
0.800 0.5	2.400	0.8 6.000	1.2	
1.000 0.5	∠.600	0.8 6.500	1.3	
	<u></u>			
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DBFL Consulting Engi	neers					Page 1
Ormond House						
Upper Ormond Ouav						
Dublin 7						
Dabiin /	7	Dog	igned h	v bootord		- MICro
Date 23/02/2023 20:3	/	Des	igned b	y pesteru		Drainage
File 20220829 Cascad	e.CASX	Che	cked by			Brainege
Innovyze		Sou	rce Con	trol 2020	.1	
<u>Cascade</u> Summa	ry of Resul	ts for	220830	GreenBlu	<u>ie Podium (P4)</u>	.SRCX
Upstream	n Out	flow To	D	Ove	rflow To	
Structure	es					
(None	e) 220830 Cell	lular T	ank.SRCX	220830 Cel	lular Tank.SRCX	
	-,					
	Storm 1	Max 1	Max Ma	ax Max	Status	
	Event L	evel D	epth Cont	rol Volume		
		(m)	(m) (l,	's) (m³)		
15	min Summer 23	8.764 0	.014	0.0 2 0	Flood Risk	
30	min Summer 23	3.769 0	.019	0.1 2.8	Flood Risk	
60	min Summer 23	8.774 0	.024	0.1 3.5	Flood Risk	
120	min Summer 23	8.779 0	.029	0.1 4.2	Flood Risk	
180	min Summer 23	8.781 0	.031	0.1 4.5	Flood Risk	
240	min Summer 23	3.782 0	.032	0.2 4.7	Flood Risk	
360	min Summer 23	2.784 U	.034	0.2 5.0	Flood Risk	
480	min Summer 23	3.785 0	.035	0.2 5.2	Flood Risk	
720	min Summer 23	.786 0	.036	0.2 5.3	Flood Risk	
960	min Summer 23	8.786 0	.036	0.2 5.3	Flood Risk	
1440	min Summer 23	8.786 0	.036	0.2 5.2	Flood Risk	
2160	min Summer 23	8.784 0	.034	0.2 5.0	Flood Risk	
2880	min Summer 23	8./82 U	.032	0.1 4.7	Flood Risk	
4320	min Summer 23	3.776 0	026	0.1 3.8	Flood Risk	
	MIN BUMMET 20	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	.020	0.1 0.0	riood hioh	
	Storm	Rain	Flooded	Discharge	Time-Peak	
	Event	(mm/hr)	Volume	Volume	(mins)	
			(m³)	(m³)		
1	5 min Summer	84 523	3 0 0	1 /	1 Q	
	0 min Summer	58.468	3 0.0	2.1	33	
6	0 min Summer	38.020	0.0	3.3	62	
12	0 min Summer	23.997	0.0	4.2	122	
18	0 min Summer	18.178	3 0.0	4.9	180	
24	0 min Summer	14.896	5 0.0	5.3	216	
36	0 min Summer	11.219 0 160		6.1	276	
40	0 min Summer	7.826	5 0.0	0.0 7.1	408	
72	0 min Summer	6.878	3 0.0	7.5	476	
96	0 min Summer	5.608	3 0.0	8.1	614	
144	0 min Summer	4.204	1 0.0	9.1	880	
216	0 min Summer	3.150	0.0	10.7	1276	
288	0 min Summer	2.565	5 0.0	11.6	1644	
432	0 min Summer	1.917		12.9	2380	
576	U MILLI GUIMMEL	1.000	, 0.0	14.4	JIIZ	
	©1	982-2	020 Tnn	ovvze		
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DBFL Consulting Engineers					Page 2				
Ormond House									
Upper Ormond Quay									
Dublin 7					Micco				
Date 23/02/2023 20:57	Desi	Designed by besterd							
File 20220829 Cascade CASX	Chec	ked by		Drainage					
	Sour	co Cont	1						
тшоууге	SOUL	ce conc	.101 2020.	• ⊥					
Cascado Summary of Posult	c for	220830	CroopPlu	o Podium (PA)	SDCV				
<u>cascade summary of result</u>	5 101	220030	Greenbru	e rourum (r4)	. SRCA				
Storm	lav M	lav Ma	v Mav	Statue					
Event Le	vel De	oth Cont	rol Volume	blacus					
	(m) (m) (1/	's) (m ³)						
7200 min Summer 23	.774 0.	024	0.1 3.5	Flood Risk					
8640 min Summer 23	.//2 0.	022	U.L 3.3	Flood Risk					
15 min Winter 23	.//1 U.	015	0.1 3.L	FLOOD RISK					
15 Min Winter 23	./05 U.	021	U.⊥ ∠.3 0.1 3.1	Flood Risk					
60 min Winter 23	.,,⊥ U. .777 ∩	021	0.1 3 9	Flood Rick					
120 min Winter 23	.782 0.	032	0.2 4.7	Flood Risk					
180 min Winter 23	.785 0.	035	0.2 5.1	Flood Risk					
240 min Winter 23	.786 0.	036	0.2 5.3	Flood Risk					
360 min Winter 23	.788 0.	038	0.2 5.6	Flood Risk					
480 min Winter 23	.789 0.	039	0.2 5.7	Flood Risk					
600 min Winter 23	.789 0.	039	0.2 5.8	Flood Risk					
720 min Winter 23	.789 0.	039	0.2 5.8	Flood Risk					
960 min Winter 23	.789 0.	039	0.2 5.7	Flood Risk					
1440 min Winter 23	.787 0.	037	0.2 5.4	Flood Risk					
2160 min Winter 23	.784 0.	034	0.2 5.0	Flood Risk					
2880 min Winter 23	./81 0.	031	0.1 4.5	Flood Risk					
4320 min Winter 23	.770 0.	020	0.1 3.9	Flood Risk					
5760 min Winter 23	. / / 3 0.	023	0.1 3.4	Flood Risk					
Storm	Rain	Flooded	Discharge	Time-Peak					
Event	(mm/hr)	Volume	Volume	(mins)					
		(m³)	(m³)						
7200 min Summer	1.326	0.0	15.3	3824					
8640 min Summer	1.162	0.0	16.0	4576					
10080 min Summer	1.039	0.0	16.6	5248					
15 min Winter	04.323 58 160	0.0	1.6	55 FA					
60 min Winter	38 020	0.0	2.4	55					
120 min Winter	23.997	0.0	4.8	118					
180 min Winter	18.178	0.0	5.5	174					
240 min Winter	14.896	0.0	6.0	228					
360 min Winter	11.219	0.0	6.8	286					
480 min Winter	9.163	0.0	7.5	362					
600 min Winter	7.826	0.0	8.0	438					
720 min Winter	6.878	0.0	8.4	512					
960 min Winter	5.608	0.0	9.2	658					
1440 min Winter	4.204	0.0	10.3	938					
2160 min Winter	3.150	0.0	12.1	1340					
2880 min Winter	∠.565 1 017	0.0	13.1 17 5	1/28 2/6/					
5760 min Winter	1.558	0.0	16.1	3176					
	982-20	20 Inno	± • • ±	5110					
01	ノロムームリ		v y Z C						

DBFL Consulting E	Engineers							Page 3
Ormond House								
Upper Ormond Quay	7							
Dublin 7								Micro
Date 23/02/2023 2	20:57	E	esi	gned k	y be			
File 20220829 Cas	scade.CASX	С	hec	ked by	Diamaye			
Innovyze		S	our	ce Cor	trol	1 2020.	1	
Cascade St	ummary of Resu	lts :	for	22083) Gr	eenBlue	e Podium	(P4).SRCX
	Storm	Max	м	lax l	lax	Max	Status	
	Event	(m)	. De	m) (ltrol /e)	(m ³)		
		(111)		, (.	, 3,	(111)		
	7200 min Winter	23.77	1 0.	021	0.1	3.1	Flood Risk	2
1	8640 min Winter 0080 min Winter	23.76	00. 80.	020	0.1	2.9	Flood Risk	<u>.</u>
-	oooo min wincer	20.70	0 0.	010	0.1	2.,	11000 11101	
	Storm	Ra	in	Floode	d Dis	scharge	Time-Peak	
	Event	(mm/	'hr)	Volume (m ³)	e V	(m ³)	(mins)	
				()		(111)		
	7200 min Winter	r 1.	.326	0.	0	17.1	3888	
	8640 min Winter 10080 min Winter	r 1. r 1	.162	0.	0	18.0 18.6	4584 5440	
	10000 min wince	L 1.	.055	0.	0	10.0	5440	
	(01982	-20	20 Inr	ovyz	ze		

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Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/02/2023 20:57	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Digingda
Innovyze	Source Control 2020.1	
Cascade Rainfall Details	for 220830 GreenBlue Podium (P4).	SRCX
Rainfall Model	FSR Winter Storms	Yes
Return Period (years)	100 Cv (Summer) 0.	940
M5-60 (mm)	16.100 Shortest Storm (mins)	15
Ratio R	0.278 Longest Storm (mins) 10	080
Summer Storms	Yes Climate Change %	+20
<u></u>	<u>me Area Diagram</u>	
Tot	al Area (ha) 0.013	
	ime (mins) Area	
Fi	com: To: (ha)	
	0 4 0.013	
<u>Ti</u>	me Area Diagram	
Tot	al Area (ha) 0.000	
T	ime (mins) Area	
Fi	com: To: (ha)	
	0 4 0.000	
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DBFL Consulting Engine	eers								Pa	ge 5	
Ormond House											
Upper Ormond Quay											
Dublin 7									N	licco	
Date 23/02/2023 20:57		Ι	Desig	ned by	best	tero	ł				
File 20220829 Cascade	CASX	C	Check	ed by						dii la	JUC
Innovyze		5	Sourc	e Cont:	rol 2	2020	0.1				
<u>Cascade Mode</u>	el Detail	s for	220	830 Gre	eenBl	Lue	Podiu	um (P4).	SRCX		
	Storage i	s Onl	ine Co	over Lev	rel (m	ı) 23	3.950				
	<u>Ta</u>	ank o	r Por	<u>ıd Stru</u>	lctur	e					
		Invert	Leve	l (m) 23	3.750						
Depth (m)	Area (m²)	Dept	:h (m)	Area (1	m²) D	epth	n (m) 1	Area (m²)			
0.000	147.3	3	0.108	14'	/.3	0	.109	0.0			
	<u>Hydro-Bra</u>	ake®	<u>Optim</u>	<u>ium Out</u>	<u>tlow</u>	Co	ntrol	<u>.</u>			
	г	Unit :	Refere	nce MD-	SHE-0	028-	-2000-	0109-2000			
	Des	sign F	пеац low (l	(m) ./s)				0.109			
		F	lush-F	lo™			Ca	alculated			
		(Object	ive Mi	nimis	e up	pstream	m storage			
		Ap	plicat Availa	ion ble				Surface			
		Diam	eter ((mm)				28			
	Ir	vert	Level	(m)				23.750			
Minimum C	utlet Pipe	Diam	eter (mm)				75			
Suggest	ed Manhole	e Diam	eter (mm)				1200			
Control Points	Head (m)	Flow	(l/s)	c	ontro	ol Po	oints	Head	(m)	Flow (1/s)
Design Point (Calculated)	0.109		0.2				Kick-	Flo® 0	.079		0.2
Flush-Flo ^m	0.046		0.2	Mean F	low or	ver	Head R	lange	-		0.2
The hydrological calcula Hydro-Brake® Optimum as Hydro-Brake Optimum® be	ations have specified utilised	e been . Shc then t	n based buld an chese a	d on the nother t storage	e Head type d routi	l/Di of co	scharg ontrol calcul	e relation device of ations wil	nship ther t ll be	for th han a invali	ne Idated
Depth (m) Flow (l/s)	Depth (m)	Flow	(1/s)	Depth	(m) F	low	(1/s)	Depth (m)	Flow	(1/s)	
0.100 0.2	1.200		0.6	3.0	000		0.9	7.000)	1.3	3
0.200 0.3	1.400		0.6	3.5	500		1.0	7.500)	1.4	ł –
0.300 0.3	1.600		0.6	4.0	000		1.0	8.000)	1.4	<u>.</u>
0.500 0.4	2.000		0.7	4.5	000		1.1	9.000)	1.5	5
0.600 0.4	2.200		0.8	5.5	500		1.2	9.500)	1.6	5
0.800 0.5	2.400		0.8	6.0	000		1.2				
1.000 0.5	2.600		0.8	6.5	500		1.3				
		©1982	2-202	0 Inno	vyze						

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Ormond House					
Upper Ormond Quay					
Dublin 7					Micco
Date 24/02/2023 15:35	Des	igned by h	hesterd		
Eilo 20220220 Concodo CAS	Z Cho	aked by			Drainage
The 20220029 Cascade.CAS		CKEU Dy	1 0000	1	
Innovyze	Sou	rce contro	51 2020	• 1	
<u>Cascade Summary of F</u>	<u>Results for</u>	<u>220830 G</u>	reenBlu	<u>le Podium (P</u>	<u>5).SRCX</u>
			-	-	
Upstream	Outflow To		Ove	rflow To	
Structures					
(None) 22083	0 Cellular Ta	ank.SRCX 220	0830 Cel	lular Tank.SRC	Х
Storm	Max M	ax Max	Max	Status	
Event	(m) (m (1/e)	(m ³)		
	(11) (m) (1/3)	(111)		
15 min Sum	mer 9.214 0.	014 0.0	14.2	Flood Risk	
30 min Sum	mer 9.220 0.	020 0.1	19.7	Flood Risk	
60 min Sum	mer 9.225 0.	025 0.1	25.5	Flood Risk	
120 min Sum	mer 9.232 0.	0.1	31.9	Flood Risk	
180 min Sum 240 min Sum	mer 9.236 U.	0.30 U.2	35.9 Ra n	rioud Kisk Flood Rieb	
360 min Sum	mer 9.243 0.	043 0.2	43.4	Flood Risk	
480 min Sum	mer 9.246 0.	046 0.2	46.6	Flood Risk	
600 min Sum	mer 9.249 0.	049 0.2	49.1	Flood Risk	
720 min Sum	mer 9.251 0.	051 0.2	51.1	Flood Risk	
960 min Sum	mer 9.254 0.	054 0.2	54.3	Flood Risk	
1440 min Sum	mer 9.258 O.	058 0.2	58.6	Flood Risk	
2160 min Sum 2880 min Sum	mer 9.262 0.	062 0.2	62.1	Flood Risk	
2880 min Sum 4320 min Sum	mer 9.264 U.	066 0.2	64.U	Flood Risk	
5760 min Sum	mer 9.267 0.	067 0.2	67.1	Flood Risk	
7200 min Sum	mer 9.267 0.	067 0.2	67.3	Flood Risk	
8640 min Sum	mer 9.267 0.	067 0.2	66.9	Flood Risk	
			_		
Storm	Rain	Flooded Di	scharge	Time-Peak	
Event	(1111/112)	(m ³)	(m ³)	(mins)	
		(()		
15 min Su	mmer 84.523	0.0	3.4	19	
30 min Su	mmer 58.468	0.0	5.5	34	
60 min Su	mmer 38.020	0.0	12.7	64	
120 min Su	mmer 10 170	0.0	10.9 10 5	124 194	
240 min Su	mmer 14.896	0.0	19.J 21.3	2.44	
360 min Su	mmer 11.219	0.0	23.8	362	
480 min Su	mmer 9.163	0.0	25.4	482	
600 min Su	mmer 7.826	0.0	26.4	602	
720 min Su	mmer 6.878	0.0	27.0	722	
960 min Su	mmer 5.608	0.0	27.4	962	
1440 min Su	mmer 4.204	0.0	26.2 51 F	1442 2160	
2100 IIIII Su 2880 min Su	mmer 2 565	0.0	51 2	2100	
4320 min Su	mmer 1.917	0.0	46.2	3288	
5760 min Su	mmer 1.558	0.0	86.6	4088	
7200 min Su	mmer 1.326	0.0	89.1	4904	
8640 min Su	mmer 1.162	0.0	89.1	5712	
	@1007_7	120 Throw	70		
	ST 202-21	JEO TINOVÀ	20		

DBFL Consultir	ng Engineers						Page 2
Ormond House							
Upper Ormond (Quay						
Dubiin /	23 15.35		Design	ed by	hesterd		Micro
File 20220829	Cascade.CASX		Checke	d by	Desteru		Drainage
Innovyze		S	Source	Conti	rol 2020	.1	
<u>Cascade</u>	Summary of Resu	lts i	<u>for 22</u>	0830	GreenBlu	e Podium (F	25).SRCX
	Storm	Max	Max	Мах	Max	Status	
	Event	Level	Depth	Contr	ol Volume		
		(m)	(m)	(1/s) (m³)		
	10080 min Summer	9.266	5 0.066	0	.2 66.2	Flood Risk	
	15 min Winter	9.216	5 0.016	0	.1 15.9	Flood Risk	
	30 min Winter 60 min Winter	9.222	8 0 022	0	1 22.0	Flood Risk	
	120 min Winter	9.236	5 0.020	0	.2 35.7	Flood Risk	
	180 min Winter	9.240	0.040	0	.2 40.3	Flood Risk	
	240 min Winter	9.244	0.044	0	.2 43.7	Flood Risk	
	360 min Winter	9.249	0.049	0	.2 48.7	Flood Risk	
	480 min Winter	9.252	0.052	0	.2 52.4	Flood Risk	
	720 min Winter	9.258	0.055 0.058	0	.2 57.7	Flood Risk	
	960 min Winter	9.261	0.061	0	.2 61.5	Flood Risk	
	1440 min Winter	9.266	5 0.066	0	.2 66.6	Flood Risk	
	2160 min Winter	9.271	0.071	0	.2 71.1	Flood Risk	
	2880 min Winter	9.273	3 0.073	0	.2 73.4	Flood Risk	
	5760 min Winter	9.275	5 0.075	0	2 75.0	Flood Risk	
	7200 min Winter	9.275	5 0.075	0	.2 75.1	Flood Risk	
	8640 min Winter	9.274	0.074	0	.2 73.9	Flood Risk	
	10080 min Winter	9.272	2 0.072	0	.2 72.3	Flood Risk	
	Other and	De	- F1		Dischause	Time Deels	
	Event	(mm/	in fi /hr) Vc	olume	Volume	(mins)	
		(,	,	(m ³)	(m ³)	(
	10080 min Summer	· 1.	.039	0.0	86.9	6560	
	15 min Winter	2 84.	.523	0.0	4.0	19	
	30 min Winter	58.	468	0.0	6.5	34	
	60 min Winter	38.	.020	0.0	14.7	64	
	120 min Winter	= 23. - 19	.99/ 178	0.0	19.3	122	
	240 min Winter	14.	. 896	0.0	22.0	240	
	360 min Winter	- 11 .	.219	0.0	26.5	358	
	480 min Winter	<u> </u>	.163	0.0	27.8	476	
	600 min Winter	<u> </u>	.826	0.0	28.5	594	
	720 min Winter 960 min Winter	- 6. - 5	. ୪ / ୪ 608	0.0	28.8	710	
	1440 min Winter	. J. 2 4.	.204	0.0	26.2	1402	
	2160 min Winter	<u> </u>	.150	0.0	54.6	2080	
	2880 min Winter	2.	.565	0.0	53.0	2740	
	4320 min Winter	· 1.	.917	0.0	46.8	3628	
	7200 min Winter	⊆ ⊥. ∽ 1	. 326	0.0	95.3	<u>444</u> 0 5400	
	8640 min Winter	 - 1.	.162	0.0	95.2	6304	
	10080 min Winter	: 1 .	.039	0.0	91.4	7168	
	(01982	-2020	Innov	vyze		
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Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 24/02/2023 15:35	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Diamage
Innovyze	Source Control 2020.1	
<u>Cascade Rainfall Deta</u>	ils for 220830 GreenBlue Podium (P5).SRCX
Rainfall Model Return Period (years) Region So M5-60 (mm) Ratio R Summer Storms	FSR Winter Storms 100 Cv (Summer) cotland and Ireland Cv (Winter) 16.100 Shortest Storm (mins) 0.278 Longest Storm (mins) Yes Climate Change %	Yes 0.750 0.840 15 10080 +20
	<u>Time Area Diagram</u>	
	Total Area (ha) 0.090	
	Time (mins) Area From: To: (ha)	
	0 4 0.090	

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Ormond House								
Upper Ormond Quay								
Dublin 7				Micro				
Date 24/02/2023 15:35	Designed by b	esterd		Drainage				
File 20220829 Cascade.CASX	Checked by							
Innovyze Source Control 2020.1								
<u>Cascade Model Details fo</u>	or 220830 Gree	nBlue Podiur	m (P5).SR0	<u>CX</u>				
Storage is Or	nline Cover Leve	L (m) 9.400						
Tank	or Pond Struct	<u>ure</u>						
Inve	rt Level (m) 9.2	00						
Depth (m) Area (m ²) Dep	oth (m) Area (m²)	Depth (m) A	rea (m²)					
0.000 1002.0	0.108 1002.	0.109	0.0					
<u>Hydro-Brake®</u>	Optimum Outf	<u>ow Control</u>						
Unit	Reference MD-SH	E-0028-2000-01	109-2000					
Design	n Head (m) Flow (l/s)		0.109					
	Flush-Flo™	Cal	lculated					
2	Objective Mini	mise upstream	storage Surface					
Sump	Available		Yes					
Dia	meter (mm)		28					
Minimum Outlet Pipe Dia	meter (mm)		9.200 75					
Suggested Manhole Dia	meter (mm)		1200					
Control Po:	ints Head	(m) Flow (l/s)						
Design Point (Ca	alculated) 0.2	0.2						
E	flush-Flo™ 0.0	0.2)					
Mean Flow over H	Head Range	- 0.2)					
The hydrological calculations have b Hydro-Brake® Optimum as specified. Hydro-Brake Optimum® be utilised the invalidated	een based on the Should another t n these storage	ype of control routing calcul	ge relation: l device ot lations will	snip for the her than a l be				
Depth (m) Flow (1/s) Depth (m) Flow	r (l/s) Depth (m)	Flow (l/s)	Depth (m) F	low (l/s)				
0.100 0.2 1.200	0.6 3.00	0.9	7.000	1.3				
0.200 0.3 1.400	0.6 3.50		7.500	1.4				
0.400 0.3 1.800	0.7 4.50	1.1	8.500	1.4				
0.500 0.4 2.000	0.7 5.00	0 1.1	9.000	1.5				
0.600 0.4 2.200	0.8 5.50	1.2	9.500	1.6				
1.000 0.5 2.600	0.8 6.50	0 1.3						
	I							
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Ormond House									
Upper Ormond Quay									
Dublin 7					Micco				
Date 23/02/2023 20:57	Desi	Designed by besterd							
File 20220829 Cascade CASX	Chec	rked by	, 2000010		Drainage				
	Court	ched by	+rol 2020	1					
IIIIOVyze	5001	.ce con	101 2020	• ⊥					
Casaada Summary of Dogu	lta for	220020	CroopPlu	Dodium (DG)	CDCV				
Cascade Summary of Resul	115 101	220030	Greenbru	le rourum (ro)	. SRCA				
linstream Ou	tflow To		0170	rflow To					
Structures	0110# 10		076	1110# 10					
(None) 220830 Cel	llular Ta	nk.SRCX	220830 Cel	lular Tank.SRCX					
Storm	Mow M	lov Mo	w Maw	Status					
Event	Max M Level De	ax Mo	rol Volume	Status					
	(m) (m) (1/	(m ³)						
	()	, (=,	c, (,						
15 min Summer 2	2.563 0.	013	0.0 1.4	Flood Risk					
30 min Summer 2	2.567 0.	017	0.1 1.9	Flood Risk					
60 min Summer 2	2.572 0.	022	0.1 2.4	Flood Risk					
120 min Summer 2	2.575 0.	025	0.1 2.8	Flood Risk					
240 min Summer 2	2.578 0	027	0.1 3.0	Flood Risk					
360 min Summer 2	2.580 0.	030	0.1 3.3	Flood Risk					
480 min Summer 2	2.580 0.	030	0.1 3.4	Flood Risk					
600 min Summer 2	2.581 0.	031	0.1 3.4	Flood Risk					
720 min Summer 2	2.581 0.	031	0.1 3.4	Flood Risk					
960 min Summer 2	2.581 0.	031	0.1 3.4	Flood Risk					
1440 min Summer 2 2160 min Summer 2	2.579 0.	029	0.1 3.3	Flood Risk					
2880 min Summer 2	2.576 0.	027	0.1 2.8	Flood Risk					
4320 min Summer 2	2.573 0.	023	0.1 2.5	Flood Risk					
5760 min Summer 2	2.571 0.	021	0.1 2.3	Flood Risk					
Storm	Rain	Flooded	Discharge	Time-Peak					
Event	(mm/nr)	volume (m ³)	volume (m ³)	(mins)					
		()	(111)						
15 min Summer	84.523	0.0	1.0	19					
30 min Summer	58.468	0.0	1.6	33					
60 min Summer	38.020	0.0	2.3	62					
120 min Summer	23.997	0.0	3.0	120					
180 min Summer 240 min Summer	14 896	0.0	3.4 ເຊ	190					
360 min Summer	11.219	0.0	4.3	254					
480 min Summer	9.163	0.0	4.7	322					
600 min Summer	7.826	0.0	5.0	390					
720 min Summer	6.878	0.0	5.3	458					
960 min Summer	5.608	0.0	5.7	590					
1440 min Summer	4.204	0.0	6.4	852					
2160 min Summer 2880 min Summer	3.150 2 565	0.0	/.5 0 1	1588					
4320 min Summer	2.505	0.0	0.1 9.0	2336					
5760 min Summer	1.558	0.0	10.0	3056					
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Ormond House					
Upper Ormond Quay					
Dublin 7					Micco
Date 23/02/2023 20:57	Desi	aned by	besterd		
File 20220829 Cascade CASX	Chec	ked by		Drainage	
The 20220029 Cascade.CASA				1	
Innovyze	Sour	ce cont	roi 2020.	. 1	
		000000	G		an au
Cascade Summary of Result	<u>s ior</u>	220830	GreenBlu	<u>e Poalum (P6)</u>	<u>.SRCX</u>
0 to				C h = h = e	
Storm P	ax Max	ax Ma	x Max	Status	
	(m)	(m) (1/	(m ³)		
	(,	(, (-)	C) (
7200 min Summer 22	.569 0.	.019	0.1 2.1	Flood Risk	
8640 min Summer 22	.568 0.	.018	0.1 2.0	Flood Risk	
10080 min Summer 22	.567 0.	.017	0.1 1.9	Flood Risk	
15 min Winter 22	.564 0.	.014	0.0 1.6	Flood Risk	
30 Min Winter 22 60 min Winter 22	.309 U. 574 N	024	0.1 2.1	rioua Kisk Flood Risk	
120 min Winter 22	.579 0.	.029	0.1 3.2	Flood Risk	
180 min Winter 22	.580 0.	.030	0.1 3.4	Flood Risk	
240 min Winter 22	.581 0.	.031	0.1 3.5	Flood Risk	
360 min Winter 22	.583 0.	.033	0.2 3.6	Flood Risk	
480 min Winter 22	.583 0.	.033	0.2 3.7	Flood Risk	
600 min Winter 22	.583 0.	.033	0.2 3.7	Flood Risk	
/20 min Winter 22	.583 0.	.033	0.2 3.6	Flood Risk	
1440 min Winter 22	580 0	030	0.1 3.3	Flood Risk	
2160 min Winter 22	.577 0.	.027	0.1 2.9	Flood Risk	
2880 min Winter 22	.574 0.	.024	0.1 2.7	Flood Risk	
4320 min Winter 22	.571 0.	.021	0.1 2.3	Flood Risk	
5760 min Winter 22	.569 0.	.019	0.1 2.1	Flood Risk	
Storm	Rain	Flooded	Discharge	Time-Peak	
Event	(mm/hr)	Volume	Volume	(mins)	
		(m°)	(m ³)		
7200 min Summer	1.326	0.0	10.6	3752	
8640 min Summer	1.162	0.0	11.1	4496	
10080 min Summer	1.039	0.0	11.5	5240	
15 min Winter	84.523	0.0	1.2	19	
30 min Winter	58.468	0.0	1.8	33	
60 min Winter	38.020	0.0	2.6	62 110	
120 Min Winter 180 min Winter	23.99/	0.0	3.4 २ व	172	
240 min Winter	14.896	0.0	4.2	196	
360 min Winter	11.219	0.0	4.8	270	
480 min Winter	9.163	0.0	5.3	346	
600 min Winter	7.826	0.0	5.6	420	
720 min Winter	6.878	0.0	5.9	492	
960 min Winter	5.608	0.0	6.4	634	
1440 min Winter	4.204	0.0	7.2	898	
2100 min Winter 2880 min Winter	2.565	0.0	0.4 9.1	1644	
4320 min Winter	1.917	0.0	10 1	2380	
		0.0	TO.T	2000	
5760 min Winter	1.558	0.0	11.2	3112	

DBFL Consulting	Engineers							Page 3					
Ormond House													
Upper Ormond Qu	ay												
Dublin 7								Micco					
Date 23/02/2023	20:57	De	esig	ned by	, be	sterd	erd Desipage						
File 20220829 C	Checked by								Idye				
Innovyze		Sc	ourc	e Cont	rol	2020.	1						
Cascade	Summary of Resu	lts f	or 2	220830	Gre	enBlue	e Podium (1	P6).SRCX					
							·	<u> </u>					
	Storm	Max	Ma	.x Ma	x	Max	Status						
	Event	Level	Dep	th Cont	rol	Volume							
		(m)	(m	l) (1/	s)	(m³)							
	7200 min Winter	22.567	0.0	17	0.1	1.9	Flood Risk						
	8640 min Winter	22.566	0.0	16	0.1	1.7	Flood Risk						
	10080 min Winter	22.565	0.0	15	0.1	1.6	Flood Risk						
	Storm	Rai	n 1	Flooded	Dise	charge	Time-Peak						
	Event	(mm/)	nr)	Volume	Vo	lume	(mins)						
			•	(m³)	(m³)							
	7200		225	0 0		11 0	2000						
	7200 min Winter 8640 min Winter	r 1.	326 162	0.0		11.9 12 5	3896 4584						
	10080 min Winter	c 1.0	039	0.0		12.9	5344						
			_										
	(01982-	-202	0 Innc	vyze	e							

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Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/02/2023 20:57	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Digingda
Innovyze	Source Control 2020.1	
Cascade Rainfall Details	for 220830 GreenBlue Podium (P6).	SRCX
Rainfall Model	FSR Winter Storms	Yes
Return Period (years)	100 Cv (Summer) 0.	750
M5-60 (mm)	16.100 Shortest Storm (mins)	15
Ratio R	0.278 Longest Storm (mins) 10	080
Summer Storms	Yes Climate Change %	+20
<u></u>	<u>me Area Diagram</u>	
Tot	al Area (ha) 0.009	
T	ime (mins) Area	
Fi	rom: To: (ha)	
	0 4 0.009	
<u>Ti</u>	me Area Diagram	
Tot	al Area (ha) 0.000	
T Fi	ime (mins) Area rom: To: (ha)	
	0 4 0.000	
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Ormond House								
Upper Ormond Quay								
Dublin 7		Micco						
Date 23/02/2023 20:57	Designed by bester							
File 20220829 Cascade.CASX	Checked by	Drainage						
Innovyze	Source Control 202	20.1						
Cascade Model Details	for 220830 GreenBlue	Podium (P6) SRCX						
Storage 15	Online Cover Level (m)	22.750						
<u>Tan</u> }	or Pond Structure							
Inv	ert Level (m) 22.550							
Depth (m) Area (m²) [epth (m) Area (m²) Dept	ch (m) Area (m²)						
0.000 111.0	0.108 111.0	0.109 0.0						
<u>Hydro-Brake</u>	® Optimum Outflow C	ontrol						
Un	it Reference MD-SHE-002	3-2000-0109-2000						
Des	Ign Head (m)	0.109						
Desig	n Flow (l/s) Fluch-Flo™	0.2 Calculated						
	Objective Minimise	ipstream storage						
	Application	Surface						
Su	np Available	Yes						
D Inve	Lameter (mm)	28						
Minimum Outlet Pipe D	Lameter (mm)	75						
Suggested Manhole D	lameter (mm)	1200						
Control Points Head (m) Fl	ow (l/s) Control	Points Head (m) Flow (l/s)						
Design Point (Calculated) 0.109	0.2	Kick-Flo® 0.079 0.2						
Flush-Flo™ 0.046	0.2 Mean Flow over	Head Range - 0.2						
The hydrological calculations have h	een based on the Head/D	ischarge relationship for the						
Hydro-Brake Optimum as specified. Hydro-Brake Optimum® be utilised the	n these storage routing	control device other than a calculations will be invalidated						
Depth (m) Flow (l/s) Depth (m) Fl	ow (l/s) Depth (m) Flow	v (l/s) Depth (m) Flow (l/s)						
0.100 0.2 1.200	0.6 3.000	0.9 7.000 1.3						
0.200 0.3 1.400	0.6 3.500	1.0 7.500 1.4						
		1.0 8.000 1.4						
0.500 0.4 2.000	0.7 5.000	1.1 9.000 1.5						
0.600 0.4 2.200	0.8 5.500	1.2 9.500 1.6						
0.800 0.5 2.400	0.8 6.000	1.2						
1.000 0.5 2.600	0.8 6.500	1.3						
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Ormond House					
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Dublin 7					Micco
Date 23/02/2023 20:58	Desi	aned hy	, hesterd		
File 20220820 Casada CASY	Choo	kod by	Debtera		Drainage
File 20220629 Cascade.CASA	Chec	keu by		1	J
Innovyze	Sour	ce Cont	rol 2020	•1	
			I		
Cascade Summary of Resul	ts ior	220830	GreenBlu	le Podium (P/)	<u>.SRCX</u>
The state of the s	61 m .		0	- 61	
Structures	LTOM TO		Ove	FILOW TO	
btractares					
(None) 220830 Cell	ular Ta	nk.SRCX	220830 Celi	lular Tank.SRCX	
				-	
Storm M	Max M	ax Ma	x Max	Status	
Event Le	evel De	ptn Cont m) (1/	roi voiume		
	(111) (1	III) (1)	5) (111)		
15 min Summer 22	.564 0.	014	0.0 2.8	Flood Risk	
30 min Summer 22	.569 0.	019	0.1 3.9	Flood Risk	
60 min Summer 22	.574 0.	024	0.1 4.9	Flood Risk	
120 min Summer 22	.579 0.	029	0.1 6.0	Flood Risk	
240 min Summer 22	.582 U.	032	0.1 6.6	Flood Risk	
360 min Summer 22	.585 0.	035	0.2 7.3	Flood Risk	
480 min Summer 22	.586 0.	036	0.2 7.6	Flood Risk	
600 min Summer 22	.587 0.	037	0.2 7.8	Flood Risk	
720 min Summer 22	.588 0.	038	0.2 7.9	Flood Risk	
960 min Summer 22	.589 0.	039	0.2 8.1	Flood Risk	
1440 min Summer 22 2160 min Summer 22	.589 0.	039	0.2 8.1	Flood Risk	
2880 min Summer 22	.587 0.	030	0.2 7.7	Flood Risk	
4320 min Summer 22	.584 0.	034	0.2 7.0	Flood Risk	
5760 min Summer 22	.581 0.	031	0.1 6.4	Flood Risk	
Storm	Rain	Flooded	Discharge	Time-Peak	
Event	(mm/nr)	(m ³)	(m ³)	(mins)	
		(m)	(m)		
15 min Summer	84.523	0.0	1.7	19	
30 min Summer	58.468	0.0	2.6	34	
60 min Summer	38.020	0.0	4.3	64	
120 min Summer	23.99/ 18 170	0.0	5.6	122	
180 min Summer 240 min Summer	14.896	0.0	6.5 7 1	⊥o∠ 240	
360 min Summer	11.219	0.0	8.1	314	
480 min Summer	9.163	0.0	8.9	376	
600 min Summer	7.826	0.0	9.5	436	
720 min Summer	6.878	0.0	10.0	506	
960 min Summer	5.608	0.0	10.9	642	
1440 min Summer 2160 min Summer	4.204 3 150	0.0	12.1 1/ 7	910 1316	
2880 min Summer	2.565	0.0	15.9	1704	
4320 min Summer	1.917	0.0	17.6	2464	
5760 min Summer	1.558	0.0	19.8	3224	
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DBFL Consulting Engineers						Page 2
Ormond House						
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Dublin 7						Micco
Date 23/02/2023 20:58	De	signed	by bes	sterd		
File 20220829 Cascade CAS	x Ch	ecked k				Drainage
			ontrol	2020	1	
Coccodo Cummonu of	Deculta fo	2200	20 0 200	0 m l 1 1	Dodium (D7)	CDCV
<u>Cascade Summary Of</u>	Results it	<u> 2208</u>	<u>SU Gre</u>	enstue	e Poarum (P7)	. SRCA
	Mass	Man	Mass	Man	Chatura	
Event	Max Level	Depth C	ontrol	Volume	Status	
	(m)	(m)	(1/s)	(m ³)		
		. ,		. ,		
7200 min S	Summer 22.579	0.029	0.1	6.0	Flood Risk	
8640 min S	Summer 22.577	0.027	0.1	5.6	Flood Risk	
LUU80 min S	Summer 22.5/5	0.025	U.1	5.3	Flood Risk	
LS MIN V 30 min 1	linter 22.565	0.015	0.1	3.2 1 3	Flood Rick	
50 MILIN / 60 min M	linter 22.571	0.021	0.1	4.3	Flood Risk	
120 min 4	linter 22.582	0.032	0.2	6.7	Flood Risk	
180 min 0	linter 22.586	0.036	0.2	7.4	Flood Risk	
240 min 🕅	linter 22.587	0.037	0.2	7.8	Flood Risk	
360 min M	linter 22.590	0.040	0.2	8.2	Flood Risk	
480 min 0	linter 22.591	0.041	0.2	8.5	Flood Risk	
600 min 0	linter 22.592	0.042	0.2	8.7	Flood Risk	
/20 min V	linter 22.592	0.042	0.2	8.8	Flood Risk	
960 MII / 1440 min M	linter 22.592	0.042	0.2	0.0 8 7	Flood Risk	
2160 min M	linter 22.589	0.039	0.2	8.2	Flood Risk	
2880 min M	linter 22.587	0.037	0.2	7.7	Flood Risk	
4320 min M	linter 22.582	0.032	0.2	6.7	Flood Risk	
5760 min M	linter 22.579	0.029	0.1	6.0	Flood Risk	
Stor	m Rain	n Flood	ded Disc	charge	Time-Peak	
Ever	nt (mm/h	nr) Volu	me Vo	lume	(mins)	
		(m 3) (1	m³)		
7200 min	Summer 1.3	326 (0.0	21.0	3960	
8640 min	Summer 1.1	_62 C	0.0	22.0	4672	
10080 min	Summer 1.0)39 C	0.0	22.7	5352	
15 min	Winter 84.5	523 C	0.0	2.0	19	
30 min	Winter 58.4	168 C	0.0	3.1	33	
60 min	Winter 38.0)20 C	0.0	4.9	62	
120 min	Winter 23.9	78 (.0	6.4 7 2	170	
100 Min 240 min	Winter 14 8	10 U 196 U).0	7.3 8.0	234	
360 min	Winter 11.2	219 ().0	9.2	340	
480 min	Winter 9.1	163 0	0.0	10.0	388	
600 min	Winter 7.8	326 C	0.0	10.7	462	
720 min	Winter 6.8	878 C	0.0	11.3	538	
960 min	Winter 5.6	508 C	0.0	12.3	692	
1440 min	Winter 4.2	204 0	0.0	13.7	982	
2160 min	Winter 3.1	10U (.0	17 0	1 4 U 4	
4320 min	Winter 1 9))))))))))))) ().0	19.8	2592	
5760 min	Winter 1.5	558 C	0.0	22.2	3296	
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			-			

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Ormond House					
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Dublin 7					Micco
Date 23/02/2023 20:58	Desi	gned by	v besterd		
File 20220829 Cascade.CASX	Chec	ked by			Dialitatje
Innovyze	Sour	ce Cont	rol 2020.	1	
Cascade Summary of Resu	lts for	220830	GreenBlu	e Podium	(P7).SRCX
Storm	Max N	Max Ma	ax Max	Status	
Event	(m)	im) (1/	(m ³)		
7200 min Winter	22.576 0.	.026	0.1 5.4	Flood Risk	5 -
10080 min Winter	22.572 0.	.024	0.1 5.0	Flood Risk	Σ
	_ ·	-1	<u>.</u>		
Storm	Rain	Flooded	Discharge	Time-Peak	
Event	(1111)	(m ³)	(m ³)	(mins)	
7200 min Winte	r 1.326	0.0	23.6	4032	
10080 min Winte	r 1.162	0.0	24.7	4760 5544	
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Ormond House		
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Dublin 7		Micco
Date 23/02/2023 20:58	Designed by besterd	
File 20220829 Cascade CASX	Checked by	Urainage
	Source Control 2020 1	
Cascade Rainfall Details	for 220830 GreenBlue Podium (P7).	<u>SRCX</u>
Dainfall Madal	ECD Winter Storma	Yoo a
Return Period (vears)	100 Cv (Summer) 0.	750
Region Scotla	and and Ireland Cv (Winter) 0.3	840
M5-60 (mm)	16.100 Shortest Storm (mins)	15
Ratio R	0.278 Longest Storm (mins) 10	080
Summer Storms	Yes Climate Change %	+20
<u>Ti</u>	<u>me Area Diagram</u>	
Tot	al Area (ha) 0.018	
	ime (mins) Area	
Fr	com: To: (ha)	
	0 4 0.018	
<u></u>	me Area Diagram	
Tot	al Area (ha) 0.000	
T Fr	ime (mins) Area :om: To: (ha)	
	0 4 0.000	
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DBFL Consulting Enginee	ers									Pa	ge 5	
Ormond House												
Upper Ormond Quay												
Dublin 7										N	lica	
Date 23/02/2023 20:58		Ι	Desig	ned by	bes	ster	d				coin	
File 20220829 Cascade.	CASX	(Check	ed by							Idli	laye
Innovyze			Sourc	e Cont	rol	202	0.1					
<u>Cascade Model</u>	. Detail	s foi	r 220	830 Gr	eenI	Blue	Podiu	um (P	7).S	RCX		
		0.1		-	-							
	Storage 1	s Oni	ine Co	over Lev	vel ((m) 2	22.750					
	Τa	ank o	r Por	ıd Strı	ıctu	re						
	-	Invert	Leve	l (m) 2	2.55	0						
Depth (m)	Area (m²)	Dept	:h (m)	Area (m²)	Dept	.h (m) 2	Area ((m²)			
0.000	208.2	2	0.108	20	8.2		0.109		0.0			
<u><u>H</u></u>	ydro-Bra	ake®	Optim	um Out	flo	w Co	ontrol	<u>.</u>				
		IIn i t	Pofore	nce MD-	-QUF-	.0029	8-2000-1	0109-2	2000			
	D	esign	Head	(m)	JIL	0020	2000	01052	109			
	Des	ign F	low (l	/s)					0.2			
		F	lush-F	'lo™			Ca	alcula	ated			
		An	object	ion Mi	LNIMI	se ı	ipstrea	m stor Surf	age face			
		Sump	Availa	ble				0411	Yes			
		Diam	eter (mm)					28			
Minimum Qu	In tlat Dina	vert	Level	(m)				22.	550			
Suggeste	d Manhole	e Diam e Diam	eter (eter (mm)				1	.200			
		_		,		_			_		_	
Control Points	Head (m)	Flow	(l/s)	0	Contr	ol I	oints		Head	(m) 1	Flow	(l/s)
Design Point (Calculated)	0.109		0.2				Kick-	Flo®	0.	.079		0.2
Flush-Flo™	0.046		0.2	Mean F	low	over	Head R	lange		-		0.2
The hydrological calculat	cions have	e beer	n based	d on the	e Hea	ad/D:	ischarg	e rela	ation	ship	for t	he
Hydro-Brake® Optimum as s	specified	. Sho	ould an	nother ·	type	of	control	devid	ce ot	her t	han a	1
Hydro-Brake Optimum® be u	utilised t	then t	hese :	storage	rout	cing	calcul	ations	s wil	l be	inval	idated
Depth (m) Flow (l/s)	epth (m)	Flow	(l/s)	Depth	(m)	Flow	(1/s)	Depth	ı (m)	Flow	(1/s	;)
0.100 0.2	1.200		0.6	3.	000		0.9	7	.000		1.	3
0.200 0.3	1.400		0.6	3.	500		1.0	7	.500		1.	4
0.300 0.3	1.600		0.6	4.	500		1.0	8	5000		1.	4
0.500 0.4	2.000		0.7	5.	000		1.1	9	.000		1.	5
0.600 0.4	2.200		0.8	5.	500		1.2	9	.500		1.	6
0.800 0.5	2.400		0.8	6.	000		1.2					
1.000 0.5	2.600		0.8	6.	500		1.3					
	(©1982	2-202	0 Inno	vyze	5						

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Ormond House					
Upper Ormond Quay					
Dublin 7					Micco
Date 23/02/2023 20:58	Desi	aned by	, hesterd		
Filo 20220829 Casado CASY	Choc	zkod by	y Debterd		Drainage
The 20220029 Cascade.CASA				1	
ΙΠΠΟνγχε	Sour	ce com	2020	• 1	
Cacaada Summary of Popult	a for	220020	CroopPlu	10 Dodium (DO) CDCV
<u>Cascade Summary of Result</u>	5 101	220030	GIGGUDIU	de Podium (Po	J. SRCA
Unstream Outf	1 ow To		0170	rflow To	
Structures	10# 10		016	1110# 10	
(None) 220830 Cellu	ılar Ta	ank.SRCX	220830 Cel	lular Tank.SRCX	
Storm M	av M	av Mar	v Mav	Statue	
Event Le	vel De	oth Conti	rol Volume	blacus	
(1	n) (1	m) (1/s	s) (m ³)		
15 min Summer 9.	214 0.	014 (0.0 4.9	Flood Risk	
30 min Summer 9.	219 U. 225 n	UIY (025 (J.⊥ 6.7 D.1 9.4	Flood Risk	
120 min Summer 9	223 0.1	025 (D.1 107	Flood Risk	
180 min Summer 9.	234 0.	034 (0.2 11.9	Flood Risk	
240 min Summer 9.	236 0.	036 (0.2 12.7	Flood Risk	
360 min Summer 9.	239 0.	039 (0.2 13.7	Flood Risk	
480 min Summer 9.	241 0.	041 (0.2 14.3	Flood Risk	
600 min Summer 9.	242 0.	042 (0.2 14.7	Flood Risk	
720 min Summer 9.	243 0.	043 (0.2 15.0	Flood Risk	
960 min Summer 9.	244 0.1	044 (J.2 15.5	Flood Risk	
2160 min Summer 9.	240 0.	040 ($1.2 10.0 \\ 1.2 16.3 \\ 16$	Flood Risk	
2880 min Summer 9.1	246 0.	046 (0.2 16.2	Flood Risk	
4320 min Summer 9.1	244 0.	044 (0.2 15.5	Flood Risk	
5760 min Summer 9.	242 0.	042 (0.2 14.7	Flood Risk	
2 t	De in	1 1	Discharge	minus Daah	
Storm Event ()	Rain	Volumo	Volumo	(ming)	
Event ()	(m ³)	(m ³)	(mins)	
		、 <i>/</i>	· /		
15 min Summer	84.523	0.0	2.3	19	
30 min Summer	58.468	0.0	3.7	34	
60 min Summer	38.020	0.0	6.7	64	
120 min Summer	23.99/ 18 179	0.0	8.8 1∩ ?	182	
240 min Summer	14.896	0.0	11.2	2.42	
360 min Summer	11.219	0.0	12.8	360	
480 min Summer	9.163	0.0	14.0	480	
600 min Summer	7.826	0.0	14.9	546	
720 min Summer	6.878	0.0	15.7	598	
960 min Summer	5.608	0.0	17.0	720	
1440 min Summer 2160 min Summer	4.204	0.0	18.6 24 4	982 1 A O A	
2100 min Summer	2.565	0.0	24.4	1816	
4320 min Summer	1.917	0.0	28.9	2596	
5760 min Summer	1.558	0.0	33.7	3392	
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Ormond House					
Upper Ormond Quay					
Dublin 7					Micco
Date 23/02/2023 20:58	Design	ed by be	esterd		
File 20220829 Cascade CASY	Checke	d hy	000010		Drainage
	Cource	Contro.	1 2020	1	
ΙΠΙΟνγΖΕ	Source	CONCLO.	1 2020	• ⊥	
Coccede Cummercu of Deculto	for 20	0020 0		a Dadium (DQ	
Cascade Summary of Results	101 22	.0630 GI	eenstu	<u>e Podium (Po</u>).SRCA
Storm No.		Man	Maria	Otatua	
Event Lev	al Denth	Control	Volume	Status	
(m	(m)	(1/s)	(m ³)		
,	-,,	(_/ -/	()		
7200 min Summer 9.2	40 0.040	0.2	13.9	Flood Risk	
8640 min Summer 9.2	38 0.038	0.2	13.2	Flood Risk	
10080 min Summer 9.2	36 0.036	0.2	12.5	Flood Risk	
15 min Winter 9.2	16 0.016	0.1	5.5	Flood Risk	
30 min Winter 9.2	22 0.022	0.1	1.5	Flood Risk	
120 min Winter 9.2	34 0 034	0.1	9.7	Flood Risk	
180 min Winter 9.2	38 0.038	0.2	13.3	Flood Risk	
240 min Winter 9.2	41 0.041	0.2	14.2	Flood Risk	
360 min Winter 9.2	44 0.044	0.2	15.4	Flood Risk	
480 min Winter 9.2	46 0.046	0.2	16.2	Flood Risk	
600 min Winter 9.2	48 0.048	0.2	16.6	Flood Risk	
720 min Winter 9.2	48 0.048	0.2	17.0	Flood Risk	
960 min Winter 9.2	50 0.050	0.2	17.4	Flood Risk	
1440 min Winter 9.2	51 0.051	0.2	17.9	Flood Risk	
2160 min Winter 9.2	51 0.051	0.2	17.8	Flood Risk	
2880 min Winter 9.2	49 0.049	0.2	17.3	Flood Risk	
4320 min Winter 9.2	45 0.045	0.2	10.8	Flood Risk	
5760 min Winter 9.2	42 0.042	0.2	14.3	Flood Risk	
Storm	Rain Fl	ooded Dia	scharge	Time-Peak	
Event (m	m/hr) Vo	olume V	olume	(mins)	
		(m³)	(m³)		
7200 min Summer	1.326	0.0	35.7	4112	
8640 min Summer	1.162	0.0	37.3	4848	
10080 min Summer	1.039	0.0	38.4	5648	
LO MIN WINTER 8	4.023	0.0	2.1 1 0	23 TA	
60 min Winter 3	8.020	0.0	4.3	53 62	
120 min Winter 2	3.997	0.0	10.0	120	
180 min Winter 1	8.178	0.0	11.6	180	
240 min Winter 1	4.896	0.0	12.7	238	
360 min Winter 1	1.219	0.0	14.5	352	
480 min Winter	9.163	0.0	15.8	462	
600 min Winter	7.826	0.0	16.9	572	
720 min Winter	6.878	0.0	17.8	674	
960 min Winter	5.608	0.0	19.1	770	
1440 min Winter	4.204	0.0	20.8	1080	
2160 min Winter	3.13U 2.565	0.0	21.5	1060	
4320 min Winter	1.917	0.0	29.1 32 5	2768	
5760 min Winter	1.558	0.0	37.9	3568	
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		1-			

DBFL Consulting Engineers					Page 3
Ormond House					
Upper Ormond Quay					
Dublin 7					Micco
Date 23/02/2023 20:58	Desi	gned by k	pesterd		
File 20220829 Cascade.CASX	Chec	ked by			Digiliga
Innovyze	Sour	ce Contro	ol 2020.	.1	
Cascade Summary of Result	ts for	220830 G	reenBlu	e Podium	(P8).SRCX
Storm 1	Max Ma	ax Max	Max	Status	
Event Lo	evel Der (m) (m	oth Contro	1 Volume		
	(11) (11	u) (1/S)	(111-)		
7200 min Winter 9	.238 0.0	0.2	2 13.4	Flood Risk	
8640 min Winter 9	.235 0.0	0.2	2 12.4	Flood Risk	
10080 min Winter 9	.233 0.0	0.1	2 11.5	Flood Risk	
Storm	Rain	Flooded D:	ischarge	Time-Peak	
Event	(mm/hr)	Volume	Volume	(mins)	
		(m³)	(m³)		
7200 min Winter	1 326	0 0	10.2	1328	
8640 min Winter	1.162	0.0	40.2	5096	
10080 min Winter	1.039	0.0	43.3	5848	
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DBFL Consulting Engineers		Page 4
Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/02/2023 20:58	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Digingda
Innovyze	Source Control 2020.1	
Cascade Rainfall Details	for 220830 GreenBlue Podium (P8).	SRCX
Rainfall Model	FSR Winter Storms	Yes
Return Period (years)	100 Cv (Summer) 0.	940
M5-60 (mm)	16.100 Shortest Storm (mins)	15
Ratio R	0.278 Longest Storm (mins) 10	080
Summer Storms	Yes Climate Change %	+20
<u></u>	me Area Diagram	
Tot	al Area (ha) 0.031	
T	ime (mins) Area	
Fi	com: To: (ha)	
	0 4 0 001	
	0 4 0.031	
Ti	me Area Diagram	
Tot	al Area (ha) 0.000	
т	ime (mins) Area	
Fi	com: To: (ha)	
	0 4 0.000	
	00 2020 Tag	
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DBFL Consulting Engineers		Page 5						
Ormond House								
Upper Ormond Quay								
Dublin 7		Micro						
Date 23/02/2023 20:58	Designed by besterd							
File 20220829 Cascade.CASX	Checked by	Digitige						
Innovyze	Source Control 2020.1							
<u>Cascade Model Details :</u>	for 220830 GreenBlue Podium (<u>(P8).SRCX</u>						
Storage is	Online Cover Level (m) 9.400							
Tank	or Pond Structure							
In	vert Level (m) 9.200							
Depth (m) Area (m²) D	epth (m) Area (m²) Depth (m) Area	(m²)						
0.000 350.0	0.108 350.0 0.109	0.0						
<u>Hydro-Brake</u>	® Optimum Outflow Control							
Un:	t Reference MD-SHE-0028-2000-0108	-2000						
Dest	gn Head (m)	0.108						
Design	n Flow (l/s)	0.2						
	Flush-Flo™ Calcu Objective Minimise upstream st	lated						
	Application Su	rface						
Sur	np Available	Yes						
D:	Lameter (mm)	28						
Inver Minimum Outlet Pipe D	ameter (m)	75						
Suggested Manhole D	ameter (mm)	1200						
Control Points Head (m) Fl	ow (1/s) Control Points	Head (m) Flow (l/s)						
Design Point (Calculated) 0 108	0 2 Kick-Flow							
Flush-Flo™ 0.046	0.2 Mean Flow over Head Range	e - 0.2						
'The hydrological calculations have b Hydro-Brake® Optimum as specified.	een based on the Head/Discharge re Should another type of control dev	lationship for the vice other than a						
Hydro-Brake Optimum® be utilised the	n these storage routing calculatio	ons will be invalidated						
Depth (m) Flow (l/s) Depth (m) Fl	ow (l/s) Depth (m) Flow (l/s) Dep	th (m) Flow (l/s)						
0.100 0.2 1.200	0.6 3.000 0.9	7.000 1.4						
0.200 0.3 1.400	0.6 3.500 1.0	7.500 1.4						
0.300 0.3 1.600	0.6 4.000 1.0	8.000 1.4						
	0.7 5.000 1.1	8.500 1.5 9.000 1.5						
0.600 0.4 2.200	0.8 5.500 1.2	9.500 1.6						
0.800 0.5 2.400	0.8 6.000 1.3							
1.000 0.5 2.600	0.8 6.500 1.3							
©1	982-2020 Innovyze							

DBFL Consulti	ng Engineers					Page 1
Ormond House						
Upper Ormond	Quay					
Dublin 7	~1					
	0.0 0.1 0.0			1		MICIO
Date 23/02/20	23 21:00	Desi	Designed by besterd			Drainago
File 20220829	Cascade.CASX	Chec	Checked by			Diamage
Innovyze		Sour	cce Cont	crol 2020	.1	
Casca	ade Summary of Rea	sults fo	r 22083	0 GreenBl	ue Roof (G1)	.SRCX
	Ilpstream 0	utflow To		Ove	rflow To	
	Structures	40110# 10		010		
	(None) 220830 Ce	ellular Ta	ank.SRCX	220830 Cel	lular Tank.SRCX	
	Storm	Max M	lax Ma	x Max	Status	
	Event	Level De	pth Cont	rol Volume		
		(m) ((m) (1/	s) (m³)		
	15 min Summer	23 389 0	014	0 0 1 9	Flood Rick	
	30 min Summer	23.394 0	019	0.1 67	Flood Risk	
	60 min Summer	23.399 0.	024	0.1 8.6	Flood Risk	
	120 min Summer	23.405 0.	030	0.1 10.7	Flood Risk	
	180 min Summer	23.408 0.	033	0.2 11.9	Flood Risk	
	240 min Summer	23.411 0.	036	0.2 12.7	Flood Risk	
	360 min Summer	23.413 0.	038	0.2 13.7	Flood Risk	
	480 min Summer	23.415 0.	040	0.2 14.3	Flood Risk	
	600 min Summer	23.416 0.	041	0.2 14.7	Flood Risk	
	720 min Summer	23.417 0.	042	0.2 15.0	Flood Risk	
	960 min Summer	23.418 0.	043	0.2 15.5	Flood Risk	
	1440 min Summer	23.420 0.	045	0.2 16.1	Flood Risk	
	2160 min Summer	23.421 0.	046	0.2 16.4	Flood Risk	
	2880 min Summer	23.421 0.	046	0.2 16.3	Flood Risk	
	4320 min Summer	23.419 0.	044	0.2 15.6	Flood Risk	
	5760 min Summer	23.417 0.	042	0.2 14.8	Flood Risk	
	Storm	Rain	Flooded	Discharge	Time-Peak	
	Event	(mm/hr)	Volume	Volume	(mins)	
			(m ³)	(m ³)		
	15 min Summe	r 84.523	0.0	2.3	19	
	30 min Summe	r 58.468	0.0	3.6	34	
	60 min Summe	r 38.020	0.0	6.6	64	
	120 min Summe	r 23.997	0.0	8.7	122	
	180 min Summe	r 18.178	0.0	10.1	182	
	240 min Summe	r 14.896	0.0	11.1	242	
	360 min Summe	r 11.219	0.0	12.7	362	
	480 min Summe	r 9.163	0.0	13.9	480	
	600 min Summe	r 7.826	0.0	14.8	548	
	720 min Summe	r 6.878	0.0	15.6	600	
	960 min Summe	r 5.608	0.0	16.9	722	
	1440 min Summe	r 4.204	0.0	18.5	982	
	2160 min Summe	r 3.150	0.0	24.3	1404	
	2880 min Summe	r 2.565	0.0	26.3	1812	
	4320 min Summe	r 1.917	0.0	28.7	2596	
	5760 min Summe	r 1.558	0.0	33.7	3400	
DBFL Consulting Engineers					Page 2	
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Ormond House						
Upper Ormond Quay						
Dublin 7					Micco	
Date 23/02/2023 21:00	Desi	aned by	besterd			
File 20220829 Cascade CASX		Drainage				
	1					
тшоууге	SOUL		101 2020.	• ⊥		
Casaada Cummany of Decult	a fam		CreenDl	Doof(C1)	CDCV	
<u>cascade summary of Result</u>	<u>.5 101</u>	220030	<u> Greensi</u>	ue ROOI (GI).	SRUA	
Storm Ma	M	No		Status		
Event Lev	nal Dev	ax Ma nth Cont	rol Volume	Status		
(n	n) (1	m) (1/	s) (m ³)			
	, ,	, , ,	-, , ,			
7200 min Summer 23.	414 0.	039	0.2 14.1	Flood Risk		
8640 min Summer 23.	412 0.	037	0.2 13.3	Flood Risk		
10080 min Summer 23.	410 U. 300 0	UJJ 015	0.2 12.7	Flood Risk		
15 MIN WINCER 23. 30 min Winter 23	396 N	021	0.1 7 5	Flood Risk		
60 min Winter 23.	402 0.	027	0.1 9.7	Flood Risk		
120 min Winter 23.	408 0.	033	0.2 12.0	Flood Risk		
180 min Winter 23.	412 0.	037	0.2 13.3	Flood Risk		
240 min Winter 23.	415 0.	040	0.2 14.3	Flood Risk		
360 min Winter 23.	418 0.	043	0.2 15.5	Flood Risk		
480 min Winter 23.	420 0.	045	0.2 16.2	Flood Risk		
720 min Winter 23.	422 U. 423 O	047 048	0.2 10.7	Flood Risk		
960 min Winter 23.	423 0.	040	0.2 17.0	Flood Risk		
1440 min Winter 23.	425 0.	050	0.2 17.9	Flood Risk		
2160 min Winter 23.	425 0.	050	0.2 17.9	Flood Risk		
2880 min Winter 23.	424 0.	049	0.2 17.4	Flood Risk		
4320 min Winter 23.	420 0.	045	0.2 16.0	Flood Risk		
5760 min Winter 23.	416 0.	041	0.2 14.7	Flood Risk		
Storm	Dain	Floodod	Dischange	mime-Deelt		
Event (n	m/hr)	Volume	Volume	(mins)		
Evenc (ii	, ,	(m ³)	(m ³)	(11113)		
		()	()			
7200 min Summer	1.326	0.0	35.7	4176		
8640 min Summer	1.162	0.0	37.3	4920		
10080 min Summer	1.039	0.0	38.4	5648		
15 min Winter 8 30 min Winter 5	58 169	0.0	2.1	23 TA		
60 min Winter 3	38.020	0.0	4.2 7 6	55 62		
120 min Winter 2	23.997	0.0	9.9	120		
180 min Winter 1	L8.178	0.0	11.5	180		
240 min Winter 1	L4.896	0.0	12.6	238		
360 min Winter 1	L1.219	0.0	14.4	352		
480 min Winter	9.163	0.0	15.7	462		
600 min Winter	1.826	0.0	16.8	5/2		
960 min Winter	5.608	0.0	19 N	768		
1440 min Winter	4.204	0.0	20.7	1080		
2160 min Winter	3.150	0.0	27.4	1536		
2880 min Winter	2.565	0.0	29.6	1960		
4320 min Winter	1.917	0.0	32.4	2768		
5760 min Winter	1.558	0.0	37.8	3576		
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Ormond House							
Upper Ormond Qua	ау						
Dublin 7							Micco
Date 23/02/2023	21:00	Des	signed	d by b	esterd		
File 20220829 Cascade.CASX Checked by						Diamage	
Innovyze		Soi	urce (Contro	ol 2020.	1	I
<u>Cascade</u>	Summary of Res	ults f	or 22	0830 (GreenBl	ue Roof (Gl).SRCX
	Storm	Max	Max	Max	Max 1 Volume	Status	
	lvenc	(m)	(m)	(1/s)	(m ³)		
	7200 min Winter	23.413	0.038	0.1	2 13.6 2 12.6	Flood Risk	
	10080 min Winter	23.410	0.033	0.1	2 12.0	Flood Risk	
	Storm	Rain	Floo	oded Di	Lscharge Volume	Time-Peak	
	Event	(1111/111	(m	1 ³)	(m ³)	(mills)	
			•	•			
	7200 min Winte	r 1.32 r 1.16	26	0.0	40.1	4328	
	10080 min Winte	r 1.18 r 1.03	⊃∠ 39	0.0	41.9	5848	
	(©1982-2	2020 1	Ennovy	ze		

DBFL Consulting Engineers		Page 4
Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/02/2023 21:00	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Digitigh
Innovyze	Source Control 2020.1	
Cascade Rainfall Details	for 220830 GreenBlue Roof (G1).SH	<u>RCX</u>
Rainfall Model	FSR Winter Storms M	Yes 750
Return Period (years) Region Scotla	and and Ireland CV (Summer) 0.	750 840
M5-60 (mm)	16.100 Shortest Storm (mins)	15
Ratio R	0.278 Longest Storm (mins) 100	080
Summer Storms	Yes Climate Change %	+20
	ne Area Diagram	
<u>1</u>	<u>me Area Diagram</u>	
Tot	al Area (ha) 0.031	
т	ime (mins) Area	
FI	com: To: (ha)	
	0 4 0.031	
<u></u>	me Area Diagram	
Tot	al Area (ha) 0.000	
T	ime (mins) Area	
	com: TO: (na)	
	0 4 0.000	
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DBFL Consulting Engineer	ſS						Pa	ge 5	
Ormond House									
Upper Ormond Quay									
Dublin 7							N	licco	
Date 23/02/2023 21:00		Desig	ned by be	sterd	[
File 20220829 Cascade.CA	ASX	Check	ed bv					I allo	age
Innovyze		Sourc	e Control	2020	1				
Cascade Model	Detail	s for 22	0830 Gree	nBlue	Root	E (G1).SF	RCX		
St	torage is	Online C	over Level	(m) 23	8.675				
	<u>Tar</u>	<u>nk or Po</u>	nd Structu	<u>ire</u>					
	т,	auart Taur	1 (m) 22 25	75					
	11 200 (2)	Donth ()	Amon (2)	Dert	()	man (2)			
Deptn (m) A	rea (m-)	рерти (ш)	Area (m-)	Depth	(m) 2	Area (m-)			
0.000	357.3	0.108	357.3	0	.109	0.0			
Hyd	dro-Brał	ke® Optin	num Outflo	ow Cor	ntrol				
	U	nit Refer	ence MD-SHE	-0028-	2000-0	0 108-2000			
	Desi	gn Flow (.	(m) 1/s)			0.100			
		Flush-	Flo™		Ca	alculated			
		Objec	tive Minim	ise up	stream	m storage			
	0	Applica	tion			Surface			
	5	Diameter	ante (mm)			res 28			
	Inv	ert Level	(m)			23.375			
Minimum Out	let Pipe	Diameter	(mm)			75			
Suggested	Manhole	Diameter	(mm)			1200			
Control Points H	ead (m) 1	Flow (l/s)	Cont	rol Po	ints	Head	(m) I	Flow (1/s)
Design Point (Calculated)	0 108	0 2			Kick-	Flor 0	078		0.2
Flush-Flo™	0.046	0.2	Mean Flow	over H	Head R	ange	-		0.2
			I			-			
The hydrological calculati	ons have	been base	d on the He	ead/Dis	charg	e relation	ship	for th	ne
Hydro-Brake® Optimum as sp Hydro-Brake Optimum® be ut	ecified. ilised th	Should a nen these	nother type storage rou	e of co uting c	ontrol calcul	device ot ations wil	her t l be	han a invali	idated
				··					
Depth (m) Flow (l/s) De	pth (m) I	Flow (l/s)	Depth (m)	Flow	(1/s)	Depth (m)	Flow	(l/s)	
0.100 0.2	1.200	0.6	3.000		0.9	7.000		1.4	1
0.200 0.3	1.400	0.6	3.500		1.0	7.500		1.4	1
0.300 0.3	1.600 1.800	0.6	4.000		1.0 1.1	8.000		1.4	±
0.500 0.4	2.000	0.7	5.000		1.1	9.000		1.5	5
0.600 0.4	2.200	0.8	5.500		1.2	9.500		1.6	5
0.800 0.5	2.400	0.8	6.000		1.3				
1.000 0.5	2.600	0.8	6.500		1.3				
	©	1982-202	0 Innovyz	е					

)BFL Consulti	ng Engineers					Page 1
rmond House						
per Ormond	Ouav					
1 = 1 = 1	~ <u>-</u> 1					
NTTU /						— Micro
Date 23/02/2023 21:00 Designed by beste						Dcaina
File 20220829 Cascade.CASX Checked by						
Innovyze Source Control 2020.1						
-						
Casca	de Summary of Re	sults fo	r 22083	0 GreenBl	ue Roof $(G2)$	SRCX
		DUICD IO	1 22000	<u>o dreenbr</u>	<u>ue noor (02)</u>	· bitten
	Illnetreem (wtflow To		010	rflow To	
	Structures	Juciio# 10		076	1110# 10	
	00-4004-00					
	(None) 220830 C	ellular Ta	ink.SRCX	220830 Cel	lular Tank.SRCX	
	C 1				<u>.</u>	
	Storm	Max M	lax Ma	x Max	Status	
	Event	reat ne	pth Cont	roi volume		
		(m) (m) (1/	s) (m°)		
	15 min Summer	38.689 0	014	0.0 6.8	Flood Risk	
	30 min Summer	38.695 0.	020	0.1 9.4	Flood Risk	
	60 min Summer	38.700 0.	025	0.1 12.1	Flood Risk	
	120 min Summer	38.706 0.	031	0.1 15.0	Flood Risk	
	180 min Summer	38.710 0.	035	0.2 16.7	Flood Risk	
	240 min Summer	38.713 0.	038	0.2 18.0	Flood Risk	
	360 min Summer	38.716 0.	041	0.2 19.7	Flood Risk	
	480 min Summer	38.718 0.	043	0.2 20.8	Flood Risk	
	600 min Summer	38.720 0.	045	0.2 21.5	Flood Risk	
	720 min Summer	38.721 0.	046	0.2 22.0	Flood Risk	
	960 min Summer	38.723 0.	048	0.2 22.8	Flood Risk	
	1440 min Summer	38.725 0.	050	0.2 23.9	Flood Risk	
	2160 min Summer	38.727 0.	052	0.2 24.8	Flood Risk	
	2880 min Summer	38.727 0.	052	0.2 25.0	Flood Risk	
	4320 min Summer	38.727 0.	052	0.2 24.7	Flood Risk	
	5760 min Summer	38.725 0.	050	0.2 23.8	Flood Risk	
	Storm	Rain	Flooded	Discharge	Time-Peak	
	Event	(mm/hr)	Volume	Volume	(mins)	
			(m³)	(m³)		
	15 min Summa	r 81 523	0 0	о т	1 Q	
	30 min Summe	r 58.468	0.0	4 3	34	
	60 min Summe	r 38.020	0.0	8.5	64	
	120 min Summe	r 23.997	0.0	11.2	124	
	180 min Summe	r 18.178	0.0	13.0	182	
	240 min Summe	r 14.896	0.0	14.3	242	
	360 min Summe	r 11.219	0.0	16.3	362	
	480 min Summe	r 9.163	0.0	17.8	482	
	600 min Summe	r 7.826	0.0	18.9	600	
	720 min Summe	r 6.878	0.0	19.8	716	
	960 min Summe	r 5.608	0.0	21.2	828	
	1440 min Summe	r 4.204	0.0	22.5	1094	
	2160 min Summe	r 3.150	0.0	32.5	1496	
	2880 min Summe	r 2.565	0.0	34.9	1908	
	4320 min Summe	r 1.917	0.0	37.4	2724	
	5760 min Summe	r 1.558	0.0	46.2	3520	

DBFL Consulting Engineers	_				Page 2
Ormond House					
Upper Ormond Quay					
Dublin 7					Micro
$D_{2} = 23/02/2023 21 \cdot 00$	Design	ed by be	etord		
	Charles		.steru		Drainage
File 20220829 Cascade.CASX	Спеске	α ρά ρ			
Innovyze	Source	Control	2020.	1	
<u>Cascade Summary of Result</u>	s for 2	20830 G:	reenBl	ue Roof (G2).	SRCX
Storm Ma	ax Max	Max	Max	Status	
Event Lev	vel Depti	n Control	Volume		
(п	n) (m)	(1/s)	(m³)		
7200 min Summer 38	723 0 04	3 0 2	22 8	Flood Risk	
8640 min Summer 38.	720 0.04	5 0.2	21.8	Flood Risk	
10080 min Summer 38.	719 0.04	4 0.2	20.9	Flood Risk	
15 min Winter 38.	691 0.01	6 0.1	7.6	Flood Risk	
30 min Winter 38.	697 0.02	2 0.1	10.5	Flood Risk	
60 min Winter 38.	703 0.02	3 0.1	13.5	Flood Risk	
120 min Winter 38.	710 0.03	5 0.2	16.8	Flood Risk	
180 min Winter 38.	714 0.03	9 0.2	18.8	Flood Risk	
240 min Winter 38. 360 min Winter 38	721 0 04	2 0.2	20.2	Flood Risk	
480 min Winter 38.	724 0.04	9 0.2	23.5	Flood Risk	
600 min Winter 38.	726 0.05	1 0.2	24.5	Flood Risk	
720 min Winter 38.	728 0.05	3 0.2	25.2	Flood Risk	
960 min Winter 38.	730 0.05	5 0.2	26.2	Flood Risk	
1440 min Winter 38.	732 0.05	7 0.2	27.1	Flood Risk	
2160 min Winter 38.	733 0.05	3 0.2	27.8	Flood Risk	
2880 min Winter 38.	733 0.05	3 0.2	27.7	Flood Risk	
4320 min Winter 38.	730 0.05		26.5	Flood Risk	
5760 min winter 58.	121 0.05	2 0.2	24.0	FIOOD RISK	
Storm	Rain Fl	ooded Dis	charge	Time-Peak	
Event (n	nm/hr) V	olume V		(mins)	
	,,	(m ³)	(m ³)	(1112110)	
		()	()		
7200 min Summer	1.326	0.0	48.9	4320	
8640 min Summer	1.162	0.0	50.9	5024	
10080 min Summer	1.039	0.0	52.3	5840	
15 min Winter 8	34.523	0.0	3.2	19	
30 min Winter 5	28.468 28.020	0.0	5.1	34 62	
120 min Winter	23 997	0.0	9.7 12.8	122	
180 min Winter 1	18.178	0.0	14.8	180	
240 min Winter 1	14.896	0.0	16.3	238	
360 min Winter 1	11.219	0.0	18.5	354	
480 min Winter	9.163	0.0	20.0	470	
600 min Winter	7.826	0.0	21.3	584	
720 min Winter	6.878	0.0	22.2	694	
960 min Winter	5.6U8	0.0	23.5	914	
1440 min Winter 2160 min Winter	4.204 3 150		24.4	1640	
2880 min Winter	2.565	0.0	39.0	2104	
4320 min Winter	1.917	0.0	41.7	2984	
5760 min Winter	1.558	0.0	51.9	3808	
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DBFL Consulting Engineers							Page 3
Ormond House							
Upper Ormond Quay							
Dublin 7							Micco
Date 23/02/2023 21:00	De	signe	ed by	v be	sterd		
File 20220829 Cascade.CASX	Ch	ecked	l by				Digingda
Innovyze	Sc	urce	Cont	rol	2020.	1	
Cascade Summary of Res	ults :	for 2	2083	0 Gr	eenBl	ue Roof (C	G2).SRCX
Storm	Max	Max	Ma	IX -	Max	Status	
Event	Level	Depth (m)	Cont	rol	Volume		
	(m)	(m)	(1)	5)	(m-)		
7200 min Winter	38.723	0.048		0.2	23.0	Flood Risk	
8640 min Winter	38.720	0.045		0.2	21.4	Flood Risk	
10080 min Winter	38./1/	0.042		0.2	20.2	Flood Risk	
Storm	Rai	n Fl	ooded	Dis	charge	Time-Peak	
Event	(mm/h	r) Vo	lume	Vo	lume	(mins)	
		(m³)	((m³)		
7200 min Winte	r 1.3	2.6	0.0		54.9	4544	
8640 min Winte	r 1.1	.62	0.0		57.3	5280	
10080 min Winte	r 1.0	139	0.0		58.9	6056	
	-1.0.0.0		_				
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Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/02/2023 21:00	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Diginarie
Innovyze	Source Control 2020.1	
Cascade Rainfall Details	for 220830 GreenBlue Roof (G2).SI	RCX
Rainfall Model	FSR Winter Storms	Yes
Return Period (years)	100 Cv (Summer) 0.	750
M5-60 (mm)	16 100 Shortest Storm (mins)	15
Ratio R	0.278 Longest Storm (mins) 10	080
Summer Storms	Yes Climate Change %	+20
<u></u>	<u>me Area Diagram</u>	
Tot	al Area (ha) 0.043	
Т	ime (mins) Area	
FI	com: To: (ha)	
	0 4 0.043	
Ti	me Area Diagram	
Tot	al Area (ha) 0.000	
	ing (ming) Area	
I Fr	com: To: (ha)	
	0 4 0.000	
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Ormond House							
Upper Ormond Quay							
Dublin 7						Mic	
Date 23/02/2023 21:00		Design	ned by bes	sterd			
File 20220829 Cascade.CAS	X	Checke	ed bv			DIG	inage
Innovyze		Source	e Control	2020.1			
				2020.2			
Cascade Model I	Details f	or 220)830 Greer	Blue Roo	f (G2).SR	RCX	
Sto	rage is Onl	ine Co	ver Level (m) 38.875			
	<u>Tank c</u>	or Pon	<u>d Structu</u>	re			
	Toucor	t Torrol	(m) 29 67	5			
	Inver	с Level	L (III) 20.0/3	J 			
Depth (m) Are	a (m²) Dep	th (m)	Area (m²)	Depth (m) 1	Area (m²)		
0.000	479.0	0.108	479.0	0.109	0.0		
<u>Hydr</u>	o-Brake®	Optim	um Outflo	w Control	<u>.</u>		
	Unit	Refere	nce MD-SHE-	0028-2000-	0108-2000		
	Design	Head	(m)	0020 2000	0.108		
	Design F	'low (l	/s)		0.2		
	E	lush-F	10 TM	С	alculated		
	7.5	Object	ive Minimi	.se upstrea	m storage		
	Sump	Availa	ble		Yes		
	Diam	neter (mm)		28		
	Invert	Level	(m)		38.675		
Minimum Outle	t Pipe Diam	eter (mm)		75		
Suggested M	annoie Dian	leter (11111)		1200		
Control Points Hea	d (m) Flow	(1/s)	Contr	ol Points	Head	(m) Flo	w (l/s)
Design Point (Calculated)	0 108	0 2		Kick-	-Flor O	078	0.2
Flush-Flo™	0.046	0.2	Mean Flow	over Head H	lige 0. Range	-	0.2
			I		2		
The hydrological calculation	is have been	n basec	d on the Hea	ad/Discharg	e relation	ship for	the
HVdro-Brake(R) ()ntimium as she	cified. She	ould ar		- · ·	davice of	her thar	ia
Hydro-Brake Optimum® be util	ised then t	these s	storage rout	of control	ations wil	l be int	validated
Hydro-Brake Optimum® be util	ised then	these s	storage rout	of control ting calcul	ations wil	l be inv	validated
Hydro-Brake Optimum® be util Depth (m) Flow (1/s) Dept	ised then the	these s	Depth (m)	of control ting calcul Flow (l/s)	ations wil	l be inv	validated ./s)
Hydro-Brake Optimum® be util Depth (m) Flow (1/s) 0.100 0.2	.ised then the final control of the second s	these s (1/s) 0.6	Depth (m) 3.000	of control ting calcul Flow (l/s) 0.9	ations wil	l be inv	validated . /s) 1.4
Hydro-Brake Optimum® be util Depth (m) Flow (1/s) Dept 0.100 0.2 0.200 0.3	ised then the	(1/s) (1/s) 0.6 0.6	Depth (m) 3.000 3.500	of control ting calcul Flow (1/s) 0.9 1.0	Depth (m) 7.000 7.500	l be inv	validated ./s) 1.4 1.4
Depth (m) Flow (l/s) Dept 0.100 0.2 0.300 0.3 0.300 0.3	ised then the	(1/s) (1/s) 0.6 0.6 0.6 0.7	Depth (m) 3.000 3.500 4.000	of control ing calcul Flow (1/s) 0.9 1.0 1.1	Depth (m) 7.000 7.500 8.000	l be inv	<pre>validated ./s) 1.4 1.4 1.4 1.5</pre>
Depth (m) Flow (l/s) Dept 0.100 0.2 0.200 0.3 0.300 0.3 0.400 0.3 0.400 0.4	ised then h (m) Flow 1.200 1.400 1.600 1.800 2.000	(1/s) (1/s) 0.6 0.6 0.6 0.7 0.7	Depth (m) 3.000 3.500 4.000 4.500 5.000	of control ing calcul Flow (1/s) 0.9 1.0 1.0 1.1 1.1	Depth (m) 7.000 7.500 8.000 8.500 9.000	l be int	<pre>validated ./s) 1.4 1.4 1.4 1.5 1.5</pre>
Depth (m) Flow (1/s) Dept 0.100 0.2 0.200 0.3 0.300 0.3 0.300 0.3 0.500 0.4 0.400 0.4	ised then h (m) Flow 1.200 1.400 1.600 1.800 2.000 2.200	(1/s) (1/s) 0.6 0.6 0.6 0.7 0.7 0.8	Depth (m) 3.000 3.500 4.000 4.500 5.000 5.500	of control cing calcul Flow (1/s) 0.9 1.0 1.0 1.1 1.1 1.2	ations wil Depth (m) 7.000 7.500 8.000 8.500 9.000 9.500	l be inv	<pre>validated //s) 1.4 1.4 1.4 1.5 1.5 1.6</pre>
Depth (m) Flow (1/s) Dept 0.100 0.2 0.200 0.3 0.300 0.3 0.300 0.3 0.500 0.4 0.600 0.4 0.800 0.5 0.4 0.5	ised then (m) Flow 1.200 1.400 1.600 1.800 2.000 2.200 2.400	(1/s) (1/s) 0.6 0.6 0.6 0.7 0.7 0.7 0.8 0.8	Depth (m) 3.000 3.500 4.000 4.500 5.000 5.500 6.000	of control ting calcul Flow (1/s) 0.9 1.0 1.0 1.1 1.1 1.2 1.3	ations wil Depth (m) 7.000 7.500 8.000 8.500 9.000 9.500	l be inv	<pre>validated //s) 1.4 1.4 1.4 1.5 1.5 1.6</pre>
Hydro-Brake Optimum® be util Depth (m) Flow (l/s) Dept 0.100 0.2 0.200 0.3 0.300 0.3 0.400 0.3 0.500 0.4 0.600 0.4 0.800 0.5 1.000 0.5	ised then h (m) Flow 1.200 1.400 1.600 1.800 2.000 2.200 2.400 2.600	(1/s) 0.6 0.6 0.6 0.7 0.7 0.7 0.8 0.8 0.8	Depth (m) 3.000 3.500 4.000 4.500 5.000 5.500 6.000 6.500	of control cing calcul Flow (1/s) 0.9 1.0 1.0 1.1 1.1 1.2 1.3 1.3	ations wil Depth (m) 7.000 7.500 8.000 8.500 9.000 9.500	l be inv	<pre>validated //s) 1.4 1.4 1.4 1.5 1.5 1.6</pre>
Injuito Brance Optimum® be util Hydro-Brake Optimum® be util Depth (m) Flow (1/s) Dept 0.100 0.2 0.200 0.3 0.300 0.3 0.400 0.3 0.500 0.4 0.600 0.4 0.800 0.5 1.000 0.5	ised then h (m) Flow 1.200 1.400 1.600 1.800 2.000 2.200 2.400 2.600	(1/s) 0.6 0.6 0.6 0.7 0.7 0.7 0.8 0.8 0.8	Depth (m) 3.000 3.500 4.000 4.500 5.000 5.500 6.000 6.500	of control cing calcul Flow (1/s) 0.9 1.0 1.0 1.1 1.1 1.2 1.3 1.3	ations wil Depth (m) 7.000 7.500 8.000 8.500 9.000 9.500	l be inv	<pre>validated //s) 1.4 1.4 1.4 1.5 1.5 1.6</pre>
Hydro-Brake Optimum® be util Depth (m) Flow (1/s) Dept 0.100 0.2 0.200 0.3 0.300 0.3 0.400 0.3 0.500 0.4 0.600 0.4 0.800 0.5 1.000 0.5	ised then (m) Flow 1.200 1.400 1.600 1.800 2.000 2.200 2.400 2.600	(1/s) 0.6 0.6 0.6 0.7 0.7 0.7 0.8 0.8 0.8	Depth (m) 3.000 3.500 4.000 4.500 5.000 5.500 6.000 6.500	of control ting calcul Flow (1/s) 0.9 1.0 1.0 1.1 1.1 1.2 1.3 1.3	ations wil Depth (m) 7.000 7.500 8.000 8.500 9.000 9.500	l be inv	<pre>validated //s) 1.4 1.4 1.4 1.5 1.5 1.6</pre>
Hydro-Brake Optimum® be util Depth (m) Flow (l/s) Dept 0.100 0.2 0.200 0.3 0.300 0.3 0.400 0.3 0.500 0.4 0.600 0.4 0.800 0.5 1.000 0.5	ised then th (m) Flow 1.200 1.400 1.600 1.800 2.000 2.200 2.400 2.600	(1/s) 0.6 0.6 0.6 0.7 0.7 0.7 0.8 0.8 0.8	Depth (m) 3.000 3.500 4.000 4.500 5.000 5.500 6.000 6.500	of control ting calcul Flow (1/s) 0.9 1.0 1.0 1.1 1.1 1.2 1.3 1.3	ations wil Depth (m) 7.000 7.500 8.000 8.500 9.000 9.500	l be inv	<pre>validated //s) 1.4 1.4 1.4 1.5 1.5 1.6</pre>
Hydro-Brake Optimum® be util Depth (m) Flow (1/s) Dept 0.100 0.2 0.200 0.3 0.300 0.3 0.400 0.3 0.500 0.4 0.600 0.4 0.800 0.5 1.000 0.5	ised then h (m) Flow 1.200 1.400 1.600 1.800 2.000 2.200 2.400 2.600	(1/s) 0.6 0.6 0.6 0.7 0.7 0.7 0.8 0.8 0.8	Depth (m) 3.000 3.500 4.000 4.500 5.000 5.500 6.000 6.500	of control cing calcul Flow (1/s) 0.9 1.0 1.0 1.1 1.1 1.2 1.3 1.3	ations wil Depth (m) 7.000 7.500 8.000 8.500 9.000 9.500	l be inv	<pre>validated ./s) 1.4 1.4 1.4 1.5 1.5 1.6</pre>
Hydro-Brake Optimum® be util Depth (m) Flow (1/s) Dept 0.100 0.2 0.200 0.3 0.300 0.3 0.400 0.3 0.500 0.4 0.600 0.4 0.800 0.5 1.000 0.5	<pre>ised then * th (m) Flow 1.200 1.400 1.600 1.800 2.000 2.200 2.400 2.600</pre>	(1/s) 0.6 0.6 0.6 0.7 0.7 0.7 0.8 0.8 0.8	Depth (m) 3.000 3.500 4.000 4.500 5.000 5.500 6.000 6.500	of control cing calcul Flow (1/s) 0.9 1.0 1.0 1.1 1.1 1.2 1.3 1.3	ations wil Depth (m) 7.000 7.500 8.000 8.500 9.000 9.500	l be inv	<pre>validated //s) 1.4 1.4 1.4 1.5 1.5 1.6</pre>

DBFL Consulting Engi	neers						Page 1
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ate 23/02/2023 21:0	ĨŪ	De	esigned	a by b	esterd		Drainag
ile 20220829 Cascad	le.CASX	Ch	necked	by			Diamac
Innovyze Source Control 2020.1							
Cascade Sum	mary of Re	sults	for 22	0830 (GreenBl	ue Roof (G3)	.SRCX
Upstrea	ım C	Outflow	То		Ove	rflow To	
Structur	es						
(Nor	e) 220830 Ce	ellular	Tank.SF	RCX 220)830 Cel.	lular Tank.SRCX	
	Storm	Mav	Max	Max	Max	Status	
	Event	Level	Depth (Control	Volume	beacab	
	20010	(m)	(m)	(1/s)	(m ³)		
		()	()	(=/ =/	()		
15	min Summer	32.014	0.014	0.0	6.9	Flood Risk	
30	min Summer	32.019	0.019	0.1	9.6	Flood Risk	
60	min Summer	32.025	0.025	0.1	. 12.3	Flood Risk	
120	min Summer	32.031	0.031	0.1	15.3	Flood Risk	
180	min Summer	32.035	0.035	0.2	2 17.1	Flood Risk	
240	min Summer	32.03/	0.037	0.2	18.5 20.2	Flood Risk	
300	min Summer	32.041	0.041	0.2	20.2	Flood Risk	
400	min Summer	32.045	0.045	0.2	22.1	Flood Risk	
720	min Summer	32.046	0.046	0.2	22.7	Flood Risk	
960	min Summer	32.048	0.048	0.2	23.5	Flood Risk	
1440	min Summer	32.050	0.050	0.2	24.6	Flood Risk	
2160	min Summer	32.052	0.052	0.2	25.5	Flood Risk	
2880	min Summer	32.052	0.052	0.2	25.8	Flood Risk	
4320	min Summer	32.052	0.052	0.2	25.6	Flood Risk	
5760	min Summer	32.050	0.050	0.2	24.7	Flood Risk	
	Storm	Rair		ded Di	scharge	Time-Peak	
	Event	(mm/h	r) Volu	ume V	7olume	(mins)	
			, (m ³	3)	(m ³)	,	
	15 min Summe	r 84.5	23	0.0	2.7	19	
	30 min Summe	r 58.4	68	0.0	4.4	34	
1.	oo min Summe	1 38.0 2 3 0	∠U 07	0.0	8.6 11 2	64 104	
1.	20 min Summo	r 19 1	ン / 7 8	0.0	12 1	1.82	
2	40 min Summe	r 14 8	96	0.0	14 5	242	
31	60 min Summe	r 11.2	19	0.0	16.5	362	
41	30 min Summe	r 9.1	63	0.0	18.0	482	
6)0 min Summe	r 7.8	26	0.0	19.1	600	
7:	20 min Summe	r 6.8	78	0.0	20.1	720	
9	60 min Summe	r 5.6	08	0.0	21.4	838	
14	10 min Summe	er 4.2	04	0.0	22.6	1108	
21	60 min Summe	r 3.1	50	0.0	33.1	1512	
28	30 min Summe	r 2.5	65	0.0	35.5	1928	
433	20 min Summe	r 1.9	17	0.0	37.9	2728	
57	oU min Summe	r 1.5	58	υ.Ο	47.1	3528	

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Ormond House					
Upper Ormond Quay					
Dublin 7					Misso
$D_{2} = 23/02/2023 21.00$	Desig	ned by	hesterd		
	Charl		DESCEIU		Drainage
File 20220829 Cascade.CASX	Cneck	ea by			
Innovyze	Sourc	e Conti	col 2020.	1	
<u>Cascade Summary of Result</u>	ts for	220830	GreenBl	ue Roof (G3).	SRCX
Storm Ma	ax Ma	x Max	K Max	Status	
Event Lev	vel Dep	oth Contr	col Volume		
(1	n) (n	1) (1/s	s) (m³)		
7200 min Summer 32	048 0 0	148 (1 2 23 7	Flood Bisk	
8640 min Summer 32.	046 0.0)46 ().2 23.7	Flood Risk	
10080 min Summer 32.	044 0.0)44 ().2 21.8	Flood Risk	
15 min Winter 32.	016 0.0	16 0	0.1 7.8	Flood Risk	
30 min Winter 32.	022 0.0	22 0	0.1 10.7	Flood Risk	
60 min Winter 32.	028 0.0	28 0).1 13.8	Flood Risk	
120 min Winter 32.	035 0.0)35 C).2 17.2	Flood Risk	
180 min Winter 32.	039 0.0)39 (19.2	Flood Risk	
240 min Winter 32.	042 0.0)42 ()46 ().2 20.7	Flood Risk	
480 min Winter 32	040 0.0	140 (149 () 2 22.7	Flood Risk	
600 min Winter 32.	051 0.0)51 (2.2 25.1	Flood Risk	
720 min Winter 32.	052 0.0	052 0).2 25.9	Flood Risk	
960 min Winter 32.	055 0.0)55 C	.2 26.9	Flood Risk	
1440 min Winter 32.	057 0.0)57 C	0.2 27.9	Flood Risk	
2160 min Winter 32.	058 0.0)58 C	28.7	Flood Risk	
2880 min Winter 32.	058 0.0)58 (28.7	Flood Risk	
4320 min Winter 32.	056 0.0	156 ().2 27.5	Flood Risk	
5760 min Winter 32.	052 0.0	152 (.2 25.8	Flood Risk	
Storm	Dain	Flooded	Diachanga		
Storm Event (r	Rain . mm/hm)	Volumo	Volumo	(minc)	
Evenc (i)	(m ³)	(m ³)	(mills)	
		(111)	(111)		
7200 min Summer	1.326	0.0	49.9	4320	
8640 min Summer	1.162	0.0	52.0	5096	
10080 min Summer	1.039	0.0	53.3	5848	
15 min Winter	84.523	0.0	3.2	19	
30 min Winter	58.468	0.0	5.1	34	
60 min Winter	58.UZU 23.997	0.0	9.8 12 0	64 122	
120 MIN WINTER . 180 min Winter :	23.397 18.178	0.0	12.9 14 Q	180	
240 min Winter	14.896	0.0	16.5	238	
360 min Winter	11.219	0.0	18.7	354	
480 min Winter	9.163	0.0	20.3	470	
600 min Winter	7.826	0.0	21.5	584	
720 min Winter	6.878	0.0	22.4	696	
960 min Winter	5.608	0.0	23.7	916	
1440 min Winter	4.204	0.0	24.6	1298	
2160 min Winter 2880 min Winter	3.13U 2.565		31.1 30 7	1044 2104	
4320 min Winter	1.917	0.0	42.2	2984	
5760 min Winter	1.558	0.0	53.0	3808	
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Ormond House					
Upper Ormond Quay					
Dublin 7					Micco
Date 23/02/2023 21:00	Desi	.gned by	y besterd		
File 20220829 Cascade.CASX	Chec	ked by			Diamaye
Innovyze	Sour	ce Cont	rol 2020.	1	
Cascade Summary of Res	ults fo	r 22083	0 GreenBl	ue Roof (G3).SRCX
Storm	Max N	lax Ma	ax Max	Status	
Hvent	(m)	∮pen conc (m) (1/	(m ³)		
7200 min Winter	32.049 0.	.049	0.2 24.0	Flood Risk	
10080 min Winter	32.043 0.	.043	0.2 22.4	Flood Risk	
Storm	Rain	Flooded	Discharge	Time-Peak	
Event	(mm/nr)	(m ³)	(m ³)	(mins)	
		()	()		
7200 min Winter	r 1.326	0.0	56.1	4608	
8640 min Winter 10080 min Winter	r 1.162 r 1.039	0.0	58.5 60 1	5360 6144	
	1.000	0.0	00.1	0111	
	-1000 00				
(01982-20	20 Innc	ovyze		

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Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/02/2023 21:00	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Diginaria
Innovyze	Source Control 2020.1	
Cascade Rainfall Details	for 220830 GreenBlue Roof (G3).SH	RCX
Rainfall Model	FSR Winter Storms	les
Return Period (years)	100 Cv (Summer) 0.	/50
M5-60 (mm)	16 100 Shortest Storm (mins)	15
Ratio R	0.278 Longest Storm (mins) 10	080
Summer Storms	Yes Climate Change %	+20
<u>Ti</u>	<u>me Area Diagram</u>	
Tot	al Area (ha) 0.044	
Т	ime (mins) Area	
Fr	com: To: (ha)	
	0 4 0.044	
<u></u>	me Area Diagram	
Tot	al Area (ha) 0.000	
_		
T	ime (mins) Area	
	0 4 0.000	
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Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/02/2023 21:00	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Drainage
Innovyze	Source Control 2020.1	
Cascade Model Details	for 220830 GreenBlue Roof (G3).	SRCX
Storage is	Online Cover Level (m) 32.200	
<u>Tan</u>	<u>c or Pond Structure</u>	
To	rort Lourol (m) 22 000	
	Net Level (m) 32.000	
Depth (m) Area (m ²)	Septh (m) Area (m ²) Depth (m) Area (m ²)
0.000 493.8	0.108 493.8 0.109 0.	0
<u>Hydro-Brak</u>	e® Optimum Outflow Control	
l IIr	it Reference MD-SHE-0028-2000-0108-200	0
Des	ign Head (m) 0.10	8
Desig	n Flow (1/s) 0.	2
	Flush-Flo™ Calculate	:d
	Objective Minimise upstream storag	re 10
Su	mp Available Ye	e s
Ľ	iameter (mm) 2	8
Inve	rt Level (m) 32.00	0
Minimum Outlet Pipe I	iameter (mm) 7	5
Suggested Mannole L		
Control Points Head (m) F	.ow (l/s) Control Points He	ad (m) Flow (l/s)
Design Point (Calculated) 0 108	0.2 Kick-Flo®	0 078 0 2
Flush-Flo™ 0.046	0.2 Mean Flow over Head Range	- 0.2
The hydrological calculations have I	een based on the Head/Discharge relation	lonship for the
Hydro-Brake® Optimum as specified. Hydro-Brake Optimum® be utilised the	Should another type of control device on these storage routing calculations w	other than a vill be invalidated
Depth (m) Flow (1/s) Depth (m) F	ow (1/s) Depth (m) Flow (1/s) Depth (m) Flow (l/s)
0.100 0.2 1.200	0.6 3.000 0.9 7.0	00 1.4
0.200 0.3 1.400	0.6 3.500 1.0 7.5	00 1.4
		00 1.4
0.400 0.3 1.800		00 1.5
0.600 0.4 2.200	0.8 5.500 1.2 9.5	00 1.6
0.800 0.5 2.400	0.8 6.000 1.3	
1.000 0.5 2.600	0.8 6.500 1.3	
	002 2020 Innouna	
(A)	967 = 70700 100000000	

DBFL Consulting Engi	neers					Page 1
Ormond House						
Upper Ormond Ouay						
Dublin 7						Vicco
$Date 23/02/2023 21 \cdot 0$	11	Des	igned h	v hesterd		— MICrO
		Des.		y pesteru		Drainage
	le.CASX	Chee	скеа ру			
Innovyze		Sou	rce Con	trol 2020	.1	
	C D	1. 6				AD A .
Cascade Sumr	<u>nary of Res</u>	sults io	r 22083	0 GreenBl	ue Rooi (G4)	<u>. SRCX</u>
Unstres	-			0	mflow Mo	
Structur	ini Ot	uciiow io		ove.	1110w 10	
(Nor	e) 220830 Ce	ellular Ta	ank.SRCX	220830 Cel	lular Tank.SRCX	2
	Storm	Max N	Max Ma	ax Max	Status	
	Event	Level De	epth Cont	crol Volume		
		(m)	(m) (l/	's) (m³)		
15	min Summer	16.711 0	011	0.0 0.5	Flood Risk	
30	min Summer	16.715 0	.015	0.1 0.6	Flood Risk	
60	min Summer	16.718 0	.018	0.1 0.7	Flood Risk	
120	min Summer	16.720 0	.020	0.1 0.8	Flood Risk	
180	min Summer	16.721 0	.021	0.1 0.9	Flood Risk	
240	min Summer	16.721 0	.021	0.1 0.9	Flood Risk	
360	min Summer	16.721 0	.021	0.1 0.9	Flood Risk	
480	min Summer	16.721 0	.021	0.1 0.9	Flood Risk	
600	min Summer	16.721 U	.021	0.1 0.9	Flood Risk	
960	min Summer	16 719 0	019	0.1 0.8	Flood Risk	
1440	min Summer	16.718 0	.018	0.1 0.7	Flood Risk	
2160	min Summer	16.716 0	.016	0.1 0.7	Flood Risk	
2880	min Summer	16.715 0	.015	0.1 0.6	Flood Risk	
4320	min Summer	16.713 0	.013	0.0 0.5	Flood Risk	
5760	min Summer	16.712 0	.012	0.0 0.5	Flood Risk	
	0 to	Daia	F laadad	Dischause	Time Deels	
	Storm	Rain (mm/hr)	Volumo	Volumo	(ming)	
	Evenc	(1111)	(m ³)	(m ³)	(milis)	
			()	、 <i>/</i>		
	15 min Summer	84.523	0.0	0.4	18	
	30 min Summer	58.468	0.0	0.6	32	
	50 min Summer	38.020	0.0	0.8	60	
12	20 min Summer	23.997	0.0	1.0	90	
	40 min Summer	- 10.1/8 - 14 RGG	0.0	1.2 1.3	156	
24	50 min Summer	11.219	0.0	1.5	2.2.4	
48	30 min Summer	9.163	0.0	1.6	290	
60	00 min Summer	7.826	0.0	1.7	354	
72	20 min Summer	6.878	0.0	1.8	418	
90	60 min Summer	5.608	0.0	2.0	540	
144	40 min Summer	4.204	0.0	2.2	792	
210	50 min Summer	3.150	0.0	2.5	1152	
288	30 min Summer	2.565	0.0	2.7	1504	
43.	20 MIIN SUMMER	- 1.91/ - 1.558	0.0	3.1 3.3	2248 2944	
		1.000	0.0	5.5	2711	

DBFL Consulting Engineers					Page 2				
Ormond House									
Upper Ormond Quay									
Dublin 7					Micco				
Date 23/02/2023 21:01	Design	ned by	besterd						
File 20220829 Cascade.CASX		Drainage							
Innovyze	Source	- Conti	col 2020	1					
Cascade Summary of Results for 220830 GreenBlue Roof (G4) SRCX									
	.0 101	220000	OICONDI	<u>ue noor (01).</u>	01(011				
Storm Ma	ax Max	k Max	K Max	Status					
Event Lev	rel Dept	th Conti	ol Volume						
(п	n) (m)) (1/s	s) (m³)						
7000 min Ourman 10	711 0 07	11 (
7200 min Summer 16. 8640 min Summer 16	711 0.0. 710 0 0'		0.0 0.4	Flood Risk					
10080 min Summer 16.	710 0.01	LO (0.0 0.4	Flood Risk					
15 min Winter 16.	712 0.03	L2 (0.0	Flood Risk					
30 min Winter 16.	716 0.03	L6 (0.1 0.7	Flood Risk					
60 min Winter 16.	720 0.02	20 (0.1 0.8	Flood Risk					
120 min Winter 16.	722 0.02	22 (0.1 0.9	Flood Risk					
180 min Winter 16.	722 0.02	22 (0.1 0.9	Flood Risk					
240 min Winter 16.	723 0.02	23 (0.1 0.9	Flood Risk					
480 min Winter 16	722 0.02 722 0.02	22 () 1 0.9	Flood Risk					
600 min Winter 16.	721 0.02	21 (0.1 0.9	Flood Risk					
720 min Winter 16.	720 0.02	20 0	0.1 0.8	Flood Risk					
960 min Winter 16.	719 0.03	L9 (0.1 0.8	Flood Risk					
1440 min Winter 16.	717 0.03	L7 (0.1 0.7	Flood Risk					
2160 min Winter 16.	714 0.01	L4 (0.0 0.6	Flood Risk					
2880 min Winter 16.	713 0.0	L3 (0.0	Flood Risk					
4320 min Winter 16.	710 0.0		0.0 0.3	Flood Risk					
5760 mill winder 16.	/10 0.0.	LU (0.4	FICOU KISK					
Storm	Rain F	looded	Discharge	Time-Peak					
Event (n	nm/hr) v	Volume	Volume	(mins)					
		(m³)	(m³)						
	1 226	0 0	2 6	2600					
7200 min Summer	1.326 1.160	0.0	3.6	3680					
10080 min Summer	1 039	0.0	3.7 3.9	5136					
15 min Winter 8	34.523	0.0	0.5	18					
30 min Winter 5	58.468	0.0	0.7	32					
60 min Winter 3	38.020	0.0	0.9	58					
120 min Winter 2	23.997	0.0	1.2	94					
180 min Winter 1	L8.178	0.0	1.3	132					
240 min Winter 1	L4.896	0.0	1.5	168					
200 Min Winter 1 480 min Winter	9 163	0.0	1 A	∠ 3 0 3 0 4					
600 min Winter	7.826	0.0	1.9	372					
720 min Winter	6.878	0.0	2.0	440					
960 min Winter	5.608	0.0	2.2	560					
1440 min Winter	4.204	0.0	2.5	808					
2160 min Winter	3.150	0.0	2.8	1192					
2880 min Winter	2.565	0.0	3.1	1524					
4520 MIN WINTER 5760 min Winter	1.558	0.0	3.4 3.7	∠∠00 2960					
	82-2020) Tnnoī		2,00					
			.170						

DBFL Consulting	Engineers					Page 3
Ormond House						
Upper Ormond Qua	У					
Dublin 7						Mirro
Date 23/02/2023	Dcainago					
File 20220829 Ca	scade.CASX	Chec	ked by			Digitige
Innovyze		Sour	ce Cont	rol 2020.	.1	
Cascade	<u>4).SRCX</u>					
	Storm Event	Max M Level De	ax Ma	ax Max rol Volume	Status	
		(m) (m) (1/	'S) (m ³)		
	7200 min Winter	16.709 0.	009	0.0 0.4	Flood Risk	
	8640 min Winter	16.709 0. 16.708 0	009	0.0 0.4	Flood Risk	
	10000 min wincer	10.700 0.	000	0.0 0.5	FIODU KISK	
			_			
	Storm	Rain	Flooded	Discharge	Time-Peak	
	Event	(mm/nr)	(m ³)	(m ³)	(mins)	
			()	()		
	7200 min Winter	1.326	0.0	4.0	3752	
	8640 min Winter	r 1.162 - 1.039	0.0	4.2 4.2	4208	
	10000 min wince	1.000	0.0	1.1	4920	
		1000 00	20 T			
	(0	91982-20	∠∪ innc	ovyze		

DBFL Consulting Engineers		Page 4
Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/02/2023 21:01	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Drainage
Innovyze	Source Control 2020.1	
Cascade Rainfall Details	s for 220830 GreenBlue Roof (G4).S	RCX
Rainfall Model	FSR Winter Storms	Yes
Return Period (years)	100 Cv (Summer) 0.	750
Region Scotla	and and Ireland Cv (Winter) 0.3	840
MO-60 (mm) Ratio P	0 278 Longest Storm (mins)	15
Summer Storms	Yes Climate Change %	+20
Ti	me Area Diagram	
Tot	al Area (ha) 0.003	
T	ime (mins) Area	
- F1	rom: To: (ha)	
	0 4 0.003	
<u>++</u>	me Area Diagram	
Tot	al Area (ha) 0.000	
T	ime (mins) Area	
F	rom: To: (ha)	
	0 4 0.000	
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Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/02/2023 21:01	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Dialitatje
Innovyze	Source Control 2020.1	
<u>Cascade Model Details</u>	for 220830 GreenBlue Roof (G4).	<u>. SRCX</u>
Storage is	Online Cover Level (m) 16.900	
Tanl	<u>k or Pond Structure</u>	
Inv	vert Level (m) 16.700	
Depth (m) Area (m²) I	Depth (m) Area (m²) Depth (m) Area (m²	²)
0.000 41.9	0.108 41.9 0.109 0.	. 0
<u>Hydro-Brake</u>	e® Optimum Outflow Control	
Un	it Reference MD-SHE-0028-2000-0109-200	00
Des	ign Head (m) 0.10)9
Desig	n Flow (1/s) 0.	.2
	Objective Minimise upstream storad	a a
	Application Surfac	ce
Su	mp Available Ye	es
D	iameter (mm) 2 rt Level (m) 16.70	28
Minimum Outlet Pipe D	iameter (mm)	75
Suggested Manhole D	iameter (mm) 120	00
Control Points Head (m) Fl	.ow (l/s) Control Points He	ad (m) Flow (l/s)
Design Point (Calculated) 0.109	0.2 Kick-Flo®	0.079 0.2
Flush-Flo TM 0.046	0.2 Mean Flow over Head Range	- 0.2
The hydrological calculations have k Hydro-Brake® Optimum as specified.	een based on the Head/Discharge relat: Should another type of control device	ionship for the other than a
Hydro-Brake Optimum® be utilised the	en these storage routing calculations w	will be invalidated
Depth (m) Flow (l/s) Depth (m) Fl	ow (1/s) Depth (m) Flow (1/s) Depth ((m) Flow (l/s)
0.100 0.2 1.200	0.6 3.000 0.9 7.0	00 1.3
		500 1.4 200 1.4
0.400 0.3 1.800	0.7 4.500 1.1 8.5	500 1.5
0.500 0.4 2.000	0.7 5.000 1.1 9.0	000 1.5
0.600 0.4 2.200	0.8 5.500 1.2 9.5	500 1.6
1.000 0.3 2.000	0.01 0.000 1.01	
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Ormond House						
Upper Ormond Quay						
Dublin 7						Misco
Date $23/02/2023$ 21.02						
Eile 20220820 Casede CASY	Chag	lad br	y DCS	JUCIU		Drainage
-	Chec	Ked by		0.000	1	J
Innovyze	Sour	ce Con	trol	2020.	• 1	
	c	00000		51		0.0.011
Cascade Summary of Result	LS IOI	22083	su Gre	eenbl	ue rooi (G5).	<u>SRCX</u>
Machine and Out 61	T			0	-flam Ta	
Structures	.0W 10			Over	TIOW TO	
(None) 220830 Cellu	lar Ta	nk.SRCX	22083	0 Cell	lular Tank.SRCX	
					a	
Storm Ma	x Ma	ax Ma	ax Frol V	Max	Status	
		m) (1.	(s)	(m ³)		
(., (.	, (±,	37	(
15 min Summer 16.	714 0.	014	0.0	0.6	Flood Risk	
30 min Summer 16.	718 0.	018	0.1	0.8	Flood Risk	
60 min Summer 16.	722 0.	022	0.1	1.0	Flood Risk	
120 min Summer 16.	726 0	025	0.1	1 1	Flood Risk	
240 min Summer 16.	726 0.1	020	0.1	1.2	Flood Risk	
360 min Summer 16.	726 0.	026	0.1	1.2	Flood Risk	
480 min Summer 16.	726 0.	026	0.1	1.2	Flood Risk	
600 min Summer 16.	726 0.	026	0.1	1.1	Flood Risk	
720 min Summer 16.	725 0.	025	0.1	1.1	Flood Risk	
960 min Summer 16.	724 0.	024	0.1	1.0	Flood Risk	
1440 min Summer 16.	721 U.	021 019	0.1	0.9	Flood Risk	
2100 min Summer 16. 2880 min Summer 16.	717 0.	019	0.1	0.8	Flood Risk	
4320 min Summer 16.	715 0.	015	0.1	0.7	Flood Risk	
5760 min Summer 16.	714 0.	014	0.0	0.6	Flood Risk	
Storm 1	Rain	Flooded	Disch	harge	Time-Peak	
Event (m	m/hr)	Volume	Vol	ume	(mins)	
		(m³)	(m	13)		
15 min Summer 8	4.523	0.0		0.6	18	
30 min Summer 5	8.468	0.0		0.8	32	
60 min Summer 3	8.020	0.0		1.1	60	
120 min Summer 2	3.997	0.0		1.4	90	
180 min Summer 1	8.178	0.0		1.6	124	
240 min Summer 1	4.896	0.0		1.7	156 224	
480 min Summer	9.163	0.0		∠.∪ 2.2	224	
600 min Summer	7.826	0.0		2.3	354	
720 min Summer	6.878	0.0		2.4	418	
960 min Summer	5.608	0.0		2.6	540	
1440 min Summer	4.204	0.0		3.0	792	
2160 min Summer	3.150	0.0		3.4	1148	
2880 min Summer	∠.565 1 017	0.0		3./ / 1	1528	
5760 min Summer	1.558	0.0		4.5	2952	
		0.0			2202	
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DBFL Consulting Engineers					Page 2
Ormond House					
Upper Ormond Quay					
Dublin 7					Micco
$D_{a+a} 23/02/2023 21.02$	Des	igned by	, hestard		MILIO
		Drainage			
File 20220829 Cascade.CASX	Cne	скеа ру			
Innovyze	Sou	rce Con	trol 2020	.1	
Cascade Summary of Resu	ilts fo	or 22083	0 GreenBl	ue Roof (G5).	SRCX
Storm	Max	Max M	ax Max	Status	
Event	Level I	epth Con	trol Volume	2	
	(m)	(m) (l	/s) (m³)		
7200 min Summer 1	6 713 0	013	0 0 0 6	Flood Risk	
8640 min Summer 1	6.712 0	012	0.0 0.5	Flood Risk	
10080 min Summer 1	16.711 0	.011	0.0 0.5	Flood Risk	
15 min Winter 1	6.716 0	.016	0.1 0.7	/ Flood Risk	
30 min Winter 1	6.721 0	.021	0.1 0.9) Flood Risk	
60 min Winter 1	6.725 0	.025	0.1 1.1	Flood Risk	
120 min Winter 1	16.727 0	0.027	0.1 1.2	2 Flood Risk	
180 min Winter 1	16.728 (0.028	0.1 1.2	? Flood Risk	
240 min Winter 1 360 min Winter 1	16.728 (16.728 (0.028	0.1 1.3	Flood Risk	
480 min Winter 1	6.727 (020	0.1 1.2	P Flood Risk	
600 min Winter 1	16.726 C	.026	0.1 1.1	. Flood Risk	
720 min Winter 1	L6.725 C	.025	0.1 1.1	Flood Risk	
960 min Winter 1	6.723 0	.023	0.1 1.0) Flood Risk	
1440 min Winter 1	6.720 0	.020	0.1 0.9) Flood Risk	
2160 min Winter 1	16.717 0	0.017	0.1 0.8	B Flood Risk	
2880 min Winter 1	16.715 0	0.015	0.1 0.7	/ Flood Risk	
4320 min Winter 1 5760 min Winter 1	16./13 (16.712 (0.013	0.0 0.6	Flood Risk	
5760 min Winter 1	16./12 (0.012	0.0 0.5) Flood Risk	
Storm	Pain	Flooded	Discharge	Time-Deak	
Event	(mm/hr	Volume	Volume	(mins)	
Evenc	((m ³)	(m ³)	(11113)	
		((
7200 min Summer	1.32	6 0.0	4.8	3680	
8640 min Summer	1.16	2 0.0	5.0	4416	
10080 min Summer	1.03	9 0.0	5.2	5144	
15 min Winter	84.52	3 0.0	0.6	18	
30 min Winter	58.46	8 U.C	0.9	32	
00 MIN WINTER 120 min Winter	23 90	0 0.0 7 0 0	1.2	58 94	
180 min Winter	18.17	/ 0.0 8 0.0	1.8	132	
240 min Winter	14.89	6 0.0	2.0	168	
360 min Winter	11.21	9 0.0	2.2	240	
480 min Winter	9.16	3 0.0	2.4	308	
600 min Winter	7.82	6 0.0	2.6	374	
720 min Winter	6.87	8 0.0	2.7	436	
960 min Winter	5.60	8 0.0	3.0	560	
1440 min Winter	4.20 2 1 E	4 U.C	3.3	810 1172	
2100 MILL WINTER 2880 min Winter	2 56	5 0.0	2.8 4 1	1560	
4320 min Winter	1.91	7 0.0	4.6	2252	
5760 min Winter	1.55	8 0.0	5.0	3056	
C	1982-2	020 Inn	ovyze		

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Ormond House										
Upper Ormond Qua	ау									
Dublin 7	-					Micco				
Date 23/02/2023	21:02	Desi	laned by	v besterd						
File 20220829 Ca	ascade.CASX	Chec	cked by	2000020		Drainage				
Innovyze		Sour	ce Cont	rol 2020	1					
11110 1 2 2 0		5001		2101 2020	• -					
Cascade	Cascade Summary of Results for 220830 GreenBlue Roof (G5) SBCX									
	ouboulde building of Rebuild for 220000 Steenbilde Roof (00) .									
	Storm Max Max Max Max Status									
	Event	Level D	epth Cont	crol Volume						
		(m)	(m) (l/	/s) (m³)						
	7200 min Wintor	16 711 0	011	0 0 0 5	Flood Rick					
	8640 min Winter	16.710 0	.011	0.0 0.4	Flood Risk					
	10080 min Winter	16.710 0	.010	0.0 0.4	Flood Risk					
	Storm	Rain	Flooded	Discharge	Time-Peak					
	Event	(mm/hr)	Volume	Volume	(mins)					
			(m³)	(m³)						
	7200 min Winte	r 1.326	0.0	5.3	3816					
	8640 min Winte	r 1.162	0.0	5.6	4256					
	10080 min Winte	r 1.039	0.0	5.8	5000					
		A1000 00)20 T							
	(シェックスーズし	JZU INUC	ovyze						

DBFL Consulting Engineers		Page 4
Ormond House		
Upper Ormond Quay		
Dublin 7		Micco
Date 23/02/2023 21:02	Designed by besterd	
File 20220829 Cascade.CASX	Checked by	Drainage
Innovyze	Source Control 2020.1	
Cascade Rainfall Details	s for 220830 GreenBlue Roof (G5).S	RCX
Rainfall Model	FSR Winter Storms	Yes
Return Period (years)	100 Cv (Summer) 0.	750
Region Scotla	and and Ireland CV (Winter) U.3	15
MS-60 (MM) Ratio R	0 278 Longest Storm (mins) 10	15
Summer Storms	Yes Climate Change %	+20
<u>Ti</u>	<u>me Area Diagram</u>	
Tot	al Area (ha) 0.004	
Т	ime (mins) Area	
Fi	com: To: (ha)	
	0 4 0.004	
Ti	me Area Diagram	
Tot	al Area (ha) 0.000	
	ime (mins) Area	
Fi	com: To: (ha)	
	0 4 0.000	
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Ormond House										
Upper Ormond Quay										
Dublin 7								N	licco	
Date 23/02/2023 21:02		1	Desig	ned by b	este	rd				
File 20220829 Cascade	.CASX	(Check	ed by					l dii idi	IJΡ
Innovyze			Sourc	e Contro	1 20	20.1				
<u>Cascade Mod</u>	del Detai	ls fo	or 22	0830 Gre	enBl	ue Roo	f (G5).SF	RCX		
	Storage :	is Onl	ine Co	over Level	(m)	16.900				
	<u>T</u>	ank c	r Por	d Struct	ure					
		Inver	t Leve	l (m) 16.7	00					
Depth (m) Area (m²) Dept	th (m)	Area (m ²)	Dep	oth (m)	Area (m²)			
0.00	44.	⊥ ⊃ k ~ @	0.108	44.]	-	0.109	0.0			
	<u>Hydro-Br</u>	akew		ium Outri	<u>ow</u>	Control	<u>.</u>			
		Unit Design	Ketere Head	nce MD-SH (m)	E-002	28-2000-	0109-2000 0.109			
	De	sign F	'low (l	(m) /s)			0.105			
		F	lush-F	'lo™		С	alculated			
		7	Object	ive Mini	mise	upstrea	m storage			
		Ap	Availa	lon ble			Suriace Yes			
		Diam	eter (mm)			28			
	I	nvert	Level	(m)			16.700			
Minimum (Dutlet Pip	e Diam	eter (mm)			75 1200			
Sugges	Lea Mannoi	e Dian	leter (11111)			1200			
Control Points	Head (m)	Flow	(l/s)	Con	trol	Points	Head	(m)	Flow (l	/s)
Design Point (Calculated	0.109		0.2			Kick-	-Flo® 0	.079		0.2
Flush-Flo ^r	™ 0.046		0.2	Mean Flow	ove	r Head H	Range	-		0.2
The hydrological calcul Hydro-Brake® Optimum as Hydro-Brake Optimum® be	ations hav specified utilised	re beer 1. Sho then t	n base ould an chese a	d on the H nother typ storage ro	ead/ e of utin	Discharg control g calcul	e relation device ot ations wil	ship her t l be	for the han a invalid	lated
Depth (m) Flow (l/s)	Depth (m)	Flow	(l/s)	Depth (m)	Flc	w (l/s)	Depth (m)	Flow	(1/s)	
0.100 0.2	1.200		0.6	3.000)	0.9	7.000		1.3	
0.200 0.3	1.400		0.6	3.500)	1.0	7.500		1.4	
0.300 0.3	1.600		0.6	4.000)	1.0	8.000		1.4	
0.500 0.4	2.000		0.7	5.000	,)	1.1	9.000		1.5	
0.600 0.4	2.200		0.8	5.500)	1.2	9.500		1.6	
0.800 0.5	2.400		0.8	6.000)	1.2				
1.000 0.5	2.600		0.8	6.500	1	1.3				
		©1982	2-202) Innovv	ze					



Appendix C : Water Network Calculations [Micro Drainage

Network Module]

Internal Site Surface Water Drainage Network Calculations

DBFL Consulting Engineers	Page 1									
Ormond House	158A Richmond Road									
Upper Ormond Quay	Internal SW Drainage									
Dublin 7	Micro									
Date 24/01/2023 10:40	Designed by DCB									
File 230120 SW Network Calcul	Checked by									
Innovyze	Network 2020.1									
STORM SEWER DESIGN by the Modified Rational Method Design Criteria for Storm Pipe Sizes STANDARD Manhole Sizes STANDARD FSR Rainfall Model - Scotland and Ireland Return Period (years) 100 M5-60 (mm) 16.100 Add Flow / Climate Change (%) 0 Ratio R 0.278 Maximum Rainfall (mm/hr) 50 Maximum Time of Concentration (mins) 30 Min Design Depth for Optimisation (m) Yolumetric Runoff Coeff. 0.750 Min Slope for Optimisation (1:X) 500										
Designed with Level Soffits <u>Time Area Diagram for Storm</u>										
Time Area Time Area Time Area										
(mins) (na)	(mins) (na) $(mins)$ $(na)4-8 0 107 8-12 0 013$									
Total Area	Contributing (ba) = 0.120									
Total Pi	pe Volume (m ³) = 21.561									
<u>Network D</u>	esign Table for Storm									
PN Length Fall Slope I.Area T. (m) (m) (1:X) (ha) (mi	E. Base k HYD DIA Section Type Auto ns) Flow (l/s) (mm) SECT (mm) Design									
S1.000 47.794 0.318 150.3 0.024 4 S1.001 11.973 0.110 108.8 0.024 0	.00 0.0 0.600 o 225 Pipe/Conduit 🔒 0.00 0.0 0.600 o 225 Pipe/Conduit 🍦									
S2.000 20.085 0.134 149.9 0.024 4	.00 0.0 0.600 o 225 Pipe/Conduit 🕚									
Netwo	ork Results Table									
PN Rain T.C. US/ILΣI.A (mm/hr) (mins) (m) (ha	rea ΣBase Foul Add Flow Vel Cap Flow) Flow (l/s) (l/s) (l/s) (m/s) (l/s) (l/s)									
s1.000 50.00 4.75 <mark>3.600</mark> 0.	024 0.0 0.0 0.0 1.06 42.3 3.2									
S1.001 50.00 4.91 3.282 0.	048 0.0 0.0 0.0 1.25 49.8 6.5									
s2.000 50.00 4.31 3.379 0.	024 0.0 0.0 0.0 1.07 42.4 3.2									
©198	32-2020 Innovyze									

DBFL Consulting Engineers						
Ormond House	158A Richmond Road					
Upper Ormond Quay	Internal SW Drainage					
Dublin 7		Mirro				
Date 24/01/2023 10:40	Designed by DCB					
File 230120 SW Network Calcul	Checked by	Diamage				
Innovyze	Network 2020.1					

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Ba Flow	se (1/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.001	12.015	0.060	200.3	0.024	0.00		0.0	0.600	0	225	Pipe/Conduit	•
S1.002	44.801	0.000	0.0	0.024	0.00		0.0	0.600	0	660	Pipe/Conduit	a
S1.003	3.248	0.016	203.0	0.000	0.00		0.0	0.600	0	225	Pipe/Conduit	ā
S1.004	21.604	0.210	103.0	0.000	0.00		0.0	0.600	0	225	Pipe/Conduit	ā
S1.005	5.441	0.027	200.0	0.000	0.00		0.0	0.600	0	225	Pipe/Conduit	Ā
S1.006	25.434	0.127	200.0	0.000	0.00		0.0	0.600	0	225	Pipe/Conduit	Ă
S1.007	9.174	0.043	213.6	0.000	0.00		0.0	0.600	0	225	Pipe/Conduit	ă

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (1/s)	Flow (l/s)
S2.001	50.00	4.53	3.245	0.048	0.0	0.0	0.0	0.92	36.6	6.5
S1.002	50.00	7.90	3.172	0.120	0.0	0.0	0.0	0.25	85.5	16.2
S1.003	50.00	7.95	3.172	0.120	0.0	0.0	0.0	0.91	36.3	16.2
S1.004	50.00	8.23	3.156	0.120	0.0	0.0	0.0	1.29	51.2	16.2
S1.005	50.00	8.33	2.948	0.120	0.0	0.0	0.0	0.92	36.6	16.2
S1.006	50.00	8.79	2.921	0.120	0.0	0.0	0.0	0.92	36.6	16.2
S1.007	50.00	8.96	2.792	0.120	0.0	0.0	0.0	0.89	35.4	16.2

DBFL Consulting Engineers						
Ormond House	158A Richmond Road					
Upper Ormond Quay	Internal SW Drainage					
Dublin 7		Mirco				
Date 24/01/2023 10:40	Designed by DCB					
File 230120 SW Network Calcul	Checked by	Diamaye				
Innovyze	Network 2020.1					

PIPELINE SCHEDULES for Storm

<u>Upstream Manhole</u>

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	0	225	S1	5.150	3.600	1.325	Open Manhole	1200
S1.001	0	225	s2	4.700	3.282	1.193	Open Manhole	1200
s2.000	0	225	s2	5.000	3.379	1.396	Open Manhole	1200
S2.001	0	225	s3	5.000	3.245	1.530	Open Manhole	1200
S1.002	0	660	S3	4.700	3.172	0.868	Open Manhole	1500
s1.003	0	225	S6	4.179	3.172	0.782	Open Manhole	1500
S1.004	0	225	S6	4.100	3.156	0.719	Open Manhole	1200
S1.005	0	225	S4	4.100	2.948	0.927	Open Manhole	1200
S1.006	0	225	s5	4.300	2.921	1.154	Open Manhole	1200
S1.007	0	225	S6	4.700	2.792	1.683	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	47.794	150.3	S2	4.700	3.282	1.193	Open Manhole	1200
S1.001	11.973	108.8	S3	4.700	3.172	1.303	Open Manhole	1500
s2.000	20.085	149.9	S3	5.000	3.245	1.530	Open Manhole	1200
S2.001	12.015	200.3	S3	4.700	3.185	1.290	Open Manhole	1500
S1.002	44.801	0.0	S6	4.179	3.172	0.347	Open Manhole	1500
S1.003	3.248	203.0	S6	4.100	3.156	0.719	Open Manhole	1200
S1.004	21.604	103.0	S4	4.100	2.946	0.929	Open Manhole	1200
S1.005	5.441	200.0	S5	4.300	2.921	1.154	Open Manhole	1200
S1.006	25.434	200.0	S6	4.700	2.794	1.681	Open Manhole	1200
S1.007	9.174	213.6	S	4.800	2.749	1.826	Open Manhole	0

DBFL Consulting Engineers		Page 4							
Ormond House	158A Richmond Road								
Upper Ormond Quay	Internal SW Drainage								
Dublin 7		Micco							
Date 24/01/2023 10:40	Designed by DCB								
File 230120 SW Network Calcul	Checked by	Digitiga							
Innovyze	Network 2020.1								
Area Summary for Storm									
Pipe PIMP PIMP P	IMP Gross Imp. Pipe Total								
Number Type Name (%) Area (ha) Area (ha) (ha)								
1 000	100 0.024 0.024								
1.000 1	100 0.024 0.024 0.024 0.024								
2.000	100 0.024 0.024 0.024								
2.001 :	100 0.024 0.024 0.024								
1.002 :	100 0.024 0.024 0.024								
1.003 :	100 0.000 0.000 0.000								
1.004 3	100 0.000 0.000 0.000								
1.005 3	100 0.000 0.000 0.000								
1.006 3	100 0.000 0.000 0.000								
1.007 :	100 0.000 0.000 0.000								
	Total Total Total								
	0.120 0.120 0.120								
Free Flowing Outfall Details for Storm									
Outfall Outfall C. Level I. Level Min D,L W									
Pipe Number Name (m) (m) I. Level (mm) (mm)									
(m)									
S1.007 S	4.800 2.749 0.000 0 0								
Simulati	<u>on Criteria for Storm</u>								
		0 000							
Volumetric Runoff Coeff	1.000 MADD Eactor * 10m ³ /ba Storage	w 0.000							
Areal Reduction Factor	1.000 MADD Factor ^ 10m²/na Storage	E 2.000							
Hot Start Level (mm)	0 Flow per Person per Day (1/per/day)								
Manhole Headloss Coeff (Global)	0 500 Bun Time (mins)	60							
Foul Sewage per hectare (1/s)	0.000 Output Interval (mins)) 1							
Number of Input Hydrographs 0 Number of Online Controls 1 Number of	of Offline Controls 0 Number of Time/Ar	ea Diagrams 2 me Controls 0							
	ayo obtactures 2 Manufor of Acut 11.								
<u>Synthet</u>	<u>cic Rainfall Details</u>								
Rainfall Model	FSR Profile Type Win	ter							
Return Period (years)	100 Cv (Summer) 0.	750							
Region Scotla	nd and Ireland Cv (Winter) 0.	840							
M5-60 (mm)	16.100 Storm Duration (mins)	30							
Ratio R	0.278								
	92 2020 Taxores								
©19	02-2020 innovyze								

DBFL Consulting Engineers	Page 5									
Ormond House	158A Richmond Road									
Upper Ormond Quay	Internal SW Drainage									
Dublin 7	Micro									
Date 24/01/2023 10:40	Designed by DCB									
File 230120 SW Network Calcul	. Checked by									
Innovyze	Network 2020.1									
Online	Online Controle for Storm									
Hydro-Brake® Optimum Manhole: S6, DS/PN: S1.004, Volume (m³): 1.1										
	1010. 50/ 50/ IN. 51.001/ Volume (m / . 1.1									
Uni	hit Reference MD-SHE-0070-2000-0776-2000									
Design	$\begin{array}{c} \text{gn Flow (1/s)} \\ \text{2.0} \end{array}$									
	Flush-Flo™ Calculated									
	Objective Minimise upstream storage									
Cum	Application Surface									
Di	Diameter (mm) 70									
Inver	ert Level (m) 3.156									
Minimum Outlet Pipe Di	Diameter (mm) 100									
Suggested Manhole Di	Diameter (mm) 1200									
Control Points Head (m) Flo	low (l/s) Control Points Head (m) Flow (l/s									
Design Point (Calculated) 0.776 Flush-Flo™ 0.232	2.0 Kick-Flo® 0.493 1. 2.0 Mean Flow over Head Range - 1.									
The hydrological calculations have be	heen based on the Head/Discharge relationship for the									
Hydro-Brake® Optimum as specified.	Should another type of control device other than a									
Hydro-Brake Optimum® be utilised then	en these storage routing calculations will be invalidat									
Depth (m) Flow (l/s) Depth (m) Flo	low (l/s) Depth (m) Flow (l/s) Depth (m) Flow (l/s)									
0.100 1.8 1.200	2.4 3.000 3.7 7.000 5.5									
0.200 2.0 1.400	2.6 3.500 4.0 7.500 5.7									
0.300 2.0 1.600	2.8 4.000 4.3 8.000 5.9 2.8 4.500 4.5 9.500 6.1									
0.400 1.9 1.800	2.9 4.500 4.5 8.500 6.1 3.1 5.000 4.7 9.000 6.3									
0.600 1.8 2.200	3.2 5.500 4.9 9.500 6.4									
0.800 2.0 2.400	3.4 6.000 5.1									
1.000 2.2 2.600	3.5 6.500 5.3									

DBFL Consulting Engineers									Pa	age 6	
Ormond	House				158A 1	Richmo	ond Roa	ıd			
Upper C	rmond	Quay			Inter	nal SV	V Drair	nage			
Dublin	7									Ν	Aicco
Date 24	/01/20	023 10:40)		Desig	ned by	7 DCB				
File 23	0120 s	SW Netwo:	rk Cal	cul	Check	ed by					Janaye
Innovyz	e				Netwo	rk 202	20.1				
Storage Structures for Storm Storage Structures for Storm Porous Car Park Manhole: S2, DS/PN: S2.000 Infiltration Coefficient Base (m/hr) 0.16900 Width (m) 10.0 Membrane Percolation (mm/hr) 1000 Length (m) 12.0 Max Percolation (1/s) 33.3 Slope (1:X) 1000.0 Safety Factor 1.0 Depression Storage (mm) 0 Porosity 0.30 Evaporation (mm/day) 3 Invert Level (m) 4.500 Manhole: S6, DS/PN: S1.003 Invert Level (m) 3.172 Depth (m) Area (m²) Depth (m) Area (m²)											
		Depre	ssion S	Area Storage	(m ³) 155 (mm) 10	5 Evapo 0 De	oration ecay Coe	(mm/day) efficient	3		
Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.028257	32	36	0.005705	64	68	0.001152	96	100	0.000233
4	8	0.023135	36	40	0.004671	68	72	0.000943	100	104	0.000190
8	12	0.018942	40	44	0.003824	72	76	0.000772	104	108	0.000156
12	16 20	0.012697	44	48	0.003131	80	80 84	0.000632	112	112	0.000128
20	20	0.010395	52	56	0.002009	84	88	0.000424	116	120	0.000086
24	28	0.008511	56	60	0.001718	88	92	0.000347		100	0.000000
28	32	0.006968	60	64	0.001407	92	96	0.000284			
	<u>Time</u>	Area Di	agram	for G	reen Roc	<u>f at</u>	<u>Pipe N</u>	umber S2	.000	<u>(Storm</u>	<u>)</u>
		Depre	ssion S	Area Storage	(m ³) 155 (mm) 10	5 Evapo 0 De	oration ecay Coe	(mm/day) efficient	3 0.050		
Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.028257	12	16	0.015508	24	28	0.008511	36	40	0.004671
4	8	0.023135	16	20	0.012697	28	32	0.006968	40	44	0.003824
8	12	0.018942	20	24	0.010395	32	36	0.005705	44	48	0.003131
				©1	982-202) Innc	ovyze				

DBFL Consulting Engineers	Page 7	
Ormond House	158A Richmond Road	
Upper Ormond Quay	Internal SW Drainage	
Dublin 7		Micro
Date 24/01/2023 10:40	Designed by DCB	
File 230120 SW Network Calcul	Checked by	Diamage
Innovyze	Network 2020.1	

Time Area Diagram for Green Roof at Pipe Number S2.000 (Storm)

Time From:	(mins) To:	Area (ha)									
48	52	0.002563	68	72	0.000943	88	92	0.000347	108	112	0.000128
52	56	0.002099	72	76	0.000772	92	96	0.000284	112	116	0.000104
56	60	0.001718	76	80	0.000632	96	100	0.000233	116	120	0.000086
60	64	0.001407	80	84	0.000518	100	104	0.000190			
64	68	0.001152	84	88	0.000424	104	108	0.000156			

DBFL Consulting Engineers						ge 8		
Ormond House 158A Richmond Road								
Upper Ormond Quay	Internal SW Drainage							
Dublin 7					Ν	Aicco		
Date 24/01/2023 10:40	Designed by DCB							
File 230120 SW Network Calcul	Checked by					Idilidye		
Innovyze	Network 2	020.1						
4								
Summary of Critical Results by Maximum Level (Rank 1) for Storm								
Si	mulation Cri	iteria						
Areal Reduction Factor	1.000 Add:	itional F	low -	% of To	tal Flow O	.000		
Hot Start (mins) 0 MADD Factor * 10m ³ /ha Storage 2.000								
Hot Start Level (mm) 0 Inlet Coefficient 0.800								
Manhole Headloss Coeff (Global) Foul Sewage per hectare (1/s)	0.500 Flow F	per Perso	n per	Day (1/	per/day) 0	.000		
Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 2								
Number of Online Controls 1 Number o	f Storage St	ructures	2 Num	ber of	Real Time	Controls 0		
Synthe	etic Rainfal	l Details	3					
Rainfall Model		FSR	Ratio	R 0.27	8			
Region Scot	land and Ire	eland Cv	(Summe	r) 0.75 r) 0.84	0			
	Ξť	0.100 CV	(WINCE	1) 0.04	0			
Margin for Flood Risk	Warning (mm)	300.0	DVD	Status	OFF			
Analy.	sis Timestep) Fine I	nertia	Status	OFF			
	DIS Status	5 ON						
				~	1			
Duration(s) (mins) 15,	30, 60, 12	0, 180, 2	40, 36	Summer 0, 480,	and Winter 600, 720,			
	,	-, -,	-,	960, 1	440, 10080			
Return Period(s) (years) 1, 30, 100								
Climate Change (%) 20, 20, 20								
		Duration	us/ci.	Water	Surcharged	f Flooded		
US/MH PN Name Event	:	Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	l Flooded Volume (m³)		
US/MH PN Name Event		Duration (mins)	US/CL (m)	Water Level (m)	Surcharged Depth (m)	I Flooded Volume (m ³)		
US/MH PN Name Event S1.000 S1 10080 minute 100 year Wi S1.001 S2 15 minute 100 year Wi	nter I+20%	Duration (mins) 10080 15	US/CL (m) 5.150 4.700	Water Level (m) 3.615 3.361	Surcharged Depth (m) -0.21(-0.14)	<pre>i Flooded Volume (m³) 0 0.000 5 0.000</pre>		
US/MH PN Name Event S1.000 S1 10080 minute 100 year Wi S1.001 S2 15 minute 100 year Wi S2.000 S2 10080 minute 100 year Wi	nter I+20% nter I+20% nter I+20%	Duration (mins) 10080 15 10080	US/CL (m) 5.150 4.700 5.000	Water Level (m) 3.615 3.361 3.395	Surcharged Depth (m) -0.210 -0.146 -0.205	<pre>d Flooded Volume (m³) 0 0.000 5 0.000 0 0.000</pre>		
US/MH PN Name Event S1.000 S1 10080 minute 100 year Wi S1.001 S2 15 minute 100 year Wi S2.000 S2 10080 minute 100 year Wi S2.001 S3 15 minute 100 year Wi	nter I+20% nter I+20% nter I+20% nter I+20%	Duration (mins) 10080 15 10080 15	US/CL (m) 5.150 4.700 5.000 5.000	Water Level (m) 3.615 3.361 3.395 3.351	Surcharged Depth (m) -0.210 -0.140 -0.209 -0.119	<pre>4 Flooded Volume (m³) 0 0.000 5 0.000 9 0.000 9 0.000</pre>		
US/MH PN Name Event S1.000 S1 10080 minute 100 year Wi S1.001 S2 15 minute 100 year Wi S2.000 S2 10080 minute 100 year Wi S2.001 S3 15 minute 100 year Wi S1.002 S3 15 minute 100 year Wi	nter I+20% nter I+20% nter I+20% nter I+20% nter I+20%	Duration (mins) 10080 15 10080 15 15	US/CL (m) 5.150 4.700 5.000 5.000 4.700 4.700	Water Level (m) 3.615 3.361 3.395 3.351 3.322	Surcharged Depth (m) -0.210 -0.144 -0.209 -0.119 -0.500	<pre>I Flooded Volume (m³) 0 0.000 5 0.000 0 0.000 0 0.000 0 0.000</pre>		
US/MH PN Name Event S1.000 S1 10080 minute 100 year Wi S1.001 S2 15 minute 100 year Wi S2.000 S2 10080 minute 100 year Wi S2.001 S3 15 minute 100 year Wi S1.002 S3 15 minute 100 year Wi S1.003 S6 180 minute 100 year Wi	nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20%	Duration (mins) 10080 15 10080 15 15 180	US/CL (m) 5.150 4.700 5.000 4.700 4.179	Water Level (m) 3.615 3.361 3.395 3.351 3.332 3.288	Surcharged Depth (m) -0.210 -0.140 -0.209 -0.119 -0.500 -0.109	<pre>H Flooded Volume (m³) 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000</pre>		
US/MH PN Name Event \$1.000 \$1 10080 minute 100 year Wi \$1.001 \$2 15 minute 100 year Wi \$2.000 \$2 1080 minute 100 year Wi \$2.001 \$3 15 minute 100 year Wi \$1.002 \$3 15 minute 100 year Wi \$1.003 \$6 180 minute 100 year Wi \$1.004 \$6 480 minute 100 year Wi	nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20%	Duration (mins) 10080 15 10080 15 15 180 480 180	US/CL (m) 5.150 4.700 5.000 5.000 4.700 4.179 4.100 4.100	Water Level (m) 3.615 3.361 3.395 3.351 3.332 3.288 3.355 2.987	Surcharged Depth (m) -0.210 -0.140 -0.209 -0.119 -0.500 -0.109 -0.020 -0.180	<pre>I Flooded Volume (m³) 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000</pre>		
US/MH PN Name Event \$1.000 \$1 10080 minute 100 year Wi \$1.001 \$2 15 minute 100 year Wi \$2.000 \$2 10080 minute 100 year Wi \$2.001 \$3 15 minute 100 year Wi \$1.002 \$3 15 minute 100 year Wi \$1.003 \$6 180 minute 100 year Wi \$1.004 \$6 480 minute 100 year Wi \$1.005 \$4 180 minute 100 year Wi \$1.006 \$5 180 minute 100 year Wi	nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20%	Duration (mins) 10080 15 10080 15 15 180 480 180 180	US/CL (m) 5.150 4.700 5.000 5.000 4.700 4.179 4.100 4.100 4.300	Water Level (m) 3.615 3.361 3.395 3.351 3.332 3.288 3.355 2.987 2.956	Surcharged Depth (m) -0.210 -0.144 -0.209 -0.119 -0.500 -0.109 -0.026 -0.186 -0.190	<pre>d Flooded Volume (m³) 0 0.000 5 0.000 0 0.000 0 0.000 0 0.000 0 0.000 5 0.000 5 0.000 5 0.000</pre>		
US/MH PN Name Event \$1.000 \$1 10080 minute 100 year Wi \$1.001 \$2 15 minute 100 year Wi \$2.000 \$2 10080 minute 100 year Wi \$2.001 \$3 15 minute 100 year Wi \$1.002 \$3 15 minute 100 year Wi \$1.003 \$6 180 minute 100 year Wi \$1.004 \$6 480 minute 100 year Wi \$1.005 \$4 180 minute 100 year Wi \$1.006 \$5 180 minute 100 year Wi	nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20%	Duration (mins) 10080 15 10080 15 15 180 480 180 180 180 180	US/CL (m) 5.150 4.700 5.000 4.700 4.179 4.100 4.100 4.300 4.300 4.700	Water Level (m) 3.615 3.361 3.395 3.351 3.332 3.288 3.355 2.987 2.956 2.830	Surcharged Depth (m) -0.210 -0.140 -0.209 -0.119 -0.500 -0.109 -0.020 -0.180 -0.190 -0.181	I Flooded Volume (m³) 0 0.000 5 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000		
US/MH PN Name Event \$1.000 \$1 10080 minute 100 year Wi \$1.001 \$2 15 minute 100 year Wi \$2.000 \$2 10080 minute 100 year Wi \$2.001 \$3 15 minute 100 year Wi \$1.002 \$3 15 minute 100 year Wi \$1.003 \$6 180 minute 100 year Wi \$1.004 \$6 480 minute 100 year Wi \$1.005 \$4 180 minute 100 year Wi \$1.006 \$5 180 minute 100 year Wi	nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20%	Duration (mins) 10080 15 10080 15 15 180 480 180 180 180	US/CL (m) 5.150 4.700 5.000 5.000 4.700 4.100 4.100 4.100 4.300 4.700	Water Level (m) 3.615 3.361 3.395 3.351 3.332 3.288 3.355 2.987 2.956 2.830	Surcharged Depth (m) -0.210 -0.146 -0.209 -0.119 -0.500 -0.109 -0.186 -0.190 -0.187	H Flooded Volume (m³) 0 0.000 5 0.000 6 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000 0 0.000		
US/MH FN Name Event \$1.000 \$1 10080 minute 100 year Wi \$1.001 \$2 15 minute 100 year Wi \$2.000 \$2 10080 minute 100 year Wi \$2.001 \$3 15 minute 100 year Wi \$1.002 \$3 15 minute 100 year Wi \$1.003 \$6 180 minute 100 year Wi \$1.003 \$6 180 minute 100 year Wi \$1.004 \$6 480 minute 100 year Wi \$1.005 \$4 180 minute 100 year Wi \$1.006 \$5 180 minute 100 year Wi	nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20%	Duration (mins) 10080 15 10080 15 15 180 480 180 180 180	US/CL (m) 5.150 4.700 5.000 4.700 4.179 4.100 4.100 4.300 4.700 Pipe	Water Level (m) 3.615 3.361 3.395 3.351 3.332 3.288 3.355 2.987 2.956 2.830	Surcharged Depth (m) -0.210 -0.140 -0.209 -0.119 -0.500 -0.109 -0.180 -0.190 -0.187	<pre>4 Flooded Volume (m³) 0 0.000 5 0.000 9 0.000 9 0.000 9 0.000 9 0.000 5 0.000 5 0.000 5 0.000 7 0.000</pre>		
US/MH PN Name Event S1.000 S1 10080 minute 100 year Wi S1.001 S2 15 minute 100 year Wi S2.000 S2 10080 minute 100 year Wi S2.001 S3 15 minute 100 year Wi S1.002 S3 15 minute 100 year Wi S1.003 S6 180 minute 100 year Wi S1.004 S6 480 minute 100 year Wi S1.005 S4 180 minute 100 year Wi S1.006 S5 180 minute 100 year Wi S1.007 S6 180 minute 100 year Wi S1.007 S6 180 minute 100 year Wi	nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20%	Duration (mins) 10080 15 10080 15 15 180 480 180 180 180 180	US/CL (m) 5.150 4.700 5.000 4.700 4.179 4.100 4.100 4.300 4.300 4.700 Pipe Flow	Water Level (m) 3.615 3.361 3.395 3.351 3.332 3.288 3.355 2.987 2.956 2.830	Surcharged Depth (m) -0.210 -0.140 -0.209 -0.119 -0.500 -0.109 -0.020 -0.180 -0.190 -0.187	<pre>4 Flooded Volume (m³) 0 0.000 5 0.000 0 0.000 0 0.000 0 0.000 0 0.000 5 0.000 5 0.000 0 0.000 7 0.000</pre>		
US/MH PN Name Event S1.000 S1 10080 minute 100 year Wi S1.001 S2 15 minute 100 year Wi S2.000 S2 10080 minute 100 year Wi S2.001 S3 15 minute 100 year Wi S1.002 S3 15 minute 100 year Wi S1.003 S6 180 minute 100 year Wi S1.004 S6 480 minute 100 year Wi S1.005 S4 180 minute 100 year Wi S1.006 S5 180 minute 100 year Wi S1.007 S6 180 minute 100 year Wi S1.007 S6 180 minute 100 year Wi	<pre>.nter I+20% .nter I+20%</pre>	Duration (mins) 10080 15 10080 15 15 180 480 180 180 180 180 180	US/CL (m) 5.150 4.700 5.000 4.700 4.100 4.100 4.100 4.300 4.300 4.700 Pipe Flow (l/s)	Water Level (m) 3.615 3.361 3.395 3.351 3.332 3.288 3.355 2.987 2.956 2.830 Status	Surcharged Depth (m) -0.210 -0.146 -0.209 -0.119 -0.500 -0.109 -0.186 -0.190 -0.187	<pre>H Flooded Volume (m³) 0 0.000 0 0.000</pre>		
US/MH PN Name Event S1.000 S1 10080 minute 100 year Wi S1.001 S2 15 minute 100 year Wi S2.000 S2 10080 minute 100 year Wi S2.001 S3 15 minute 100 year Wi S1.002 S3 15 minute 100 year Wi S1.003 S6 180 minute 100 year Wi S1.004 S6 480 minute 100 year Wi S1.005 S4 180 minute 100 year Wi S1.006 S5 180 minute 100 year Wi S1.007 S6 180 minute 100 year Wi	nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20% nter I+20%	Duration (mins) 10080 15 10080 15 15 180 480 180 180 180 180 180 0.012	US/CL (m) 5.150 4.700 5.000 4.700 4.179 4.100 4.100 4.300 4.300 4.700 Pipe Flow (l/s) 0.5	Water Level (m) 3.615 3.361 3.395 3.351 3.332 3.288 3.355 2.987 2.956 2.830 Status OK	Surcharged Depth (m) -0.210 -0.140 -0.209 -0.119 -0.500 -0.109 -0.180 -0.190 -0.187	<pre>4 Flooded Volume (m³) 0 0.000 5 0.000 9 0.000 9 0.000 9 0.000 9 0.000 5 0.000 5 0.000 9 0.000 7 0.000</pre>		

DBFL Consulting Engineers	Page 9		
Ormond House	158A Richmond Road		
Upper Ormond Quay	Internal SW Drainage		
Dublin 7		Micro	
Date 24/01/2023 10:40	Designed by DCB		
File 230120 SW Network Calcul	Checked by	Diamage	
Innovyze	Network 2020.1	·	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S1.001	S2	0.23		0.161	9.7	OK
S2.000	S2	0.01		0.012	0.5	OK
S2.001	s3	0.31		0.217	9.7	OK
S1.002	s3	0.13		0.672	28.8	OK
S1.003	S6	0.10		21.619	2.6	OK
S1.004	S6	0.04		0.281	1.8	OK
S1.005	S4	0.07		0.066	1.9	OK
S1.006	S5	0.06		0.049	1.9	OK
S1.007	S6	0.07		0.079	1.9	OK

Richmond Road Works Surface Water Drainage Network Calculations
DBFL Consulting Engineers	Page 1											
Ormond House	158A Richmond Road											
Upper Ormond Quay	Richmond Road Works Drainage											
Dublin 7	Micco											
Date 24/01/2023 10:45	Designed by DCB											
File 20230109 Richmond Road B	Checked by											
Innovyze	Network 2020.1											
Innovyze <u>STORM SEWER DESIGN</u> <u>Design</u> Pipe Sizes STA FSR Rainfall Return Period (years) M5-60 (mm) Ratio R Maximum Rainfall (mm/hr) Maximum Time of Concentration (mins) Foul Sewage (l/s/ha) Volumetric Runoff Coeff.	Network 2020.1 by the Modified Rational Method Criteria for Storm ANDARD Manhole Sizes STANDARD Model - Scotland and Ireland 100 PIMP (%) 100 16.100 Add Flow / Climate Change (%) 0 0.278 Minimum Backdrop Height (m) 0.200 50 Maximum Backdrop Height (m) 1.500 30 Min Design Depth for Optimisation (m) 1.200 0.000 Min Vel for Auto Design only (m/s) 1.00 0.750 Min Slope for Optimisation (1:X) 500											
Designed with Level Soffits <u>Time Area Diagram for Storm</u>												
Time Area Time Area												
(
0	4 0.169 4-8 0.101											
Total Area	Contributing (ha) = 0.270											
Total Pi	pe Volume $(m^3) = 10.277$											
Network I	Design Table for Storm											
« - Indica	ates pipe capacity < flow											
PN Length Fall Slope I.Area T. (m) (m) (1:X) (ha) (mi	E. Base k HYD DIA Section Type Auto ns) Flow (l/s) (mm) SECT (mm) Design											
1.000 46.231 0.191 242.0 0.067 4	.00 0.0 0.600 o 300 Pipe/Conduit 🔒											
1.001 70.228 0.234 300.1 0.067 0	.00 0.0 0.600 o 300 Pipe/Conduit											
1.002 20.2/3 0.088 298.6 0.06/ 0	.00 0.0 0.000 0 300 Pipe/Conduit											
Network Results Table												
PN Rain T.C. US/ILΣI.A (mm/hr) (mins) (m) (ba	rea E Base Foul Add Flow Vel Cap Flow) Flow (1/s) (1/s) (1/s) (1/s) (1/s)											
1.000 50.00 4.77 3.300 0.	067 0.0 0.0 0.0 1.01 71.1 9.1											
1.002 50.00 6.55 2.875 0.	201 0.0 0.0 0.0 0.90 63.9 27.2											
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DBFL Consul	lting Er	nginee	rs]	Page 2
Ormond Hous	se			15	58A R.	ichmo	nd Roa	ad			
Upper Ormor	nd Quay			Ri	Richmond Road Works Drainage						
Dublin 7											Micco
Date 24/01/	/2023 10):45		De	esigne	ed by	DCB				
File 202301	LO9 Rich	nmond	Road B.	Cr	necke	d by					Drainage
Innovyze Network 2020.1											
			Networ	k Des	ign T	able	for S	torm			
PN Len	gth Fall	L Slope	e I.Area	T.E.	Ва	ase	k	HYD DIA	Sect	ion Ty	pe Auto
()	m) (m)	(1:X)) (ha)	(mins)	Flow	(l/s)	(mm)	SECT (mm))		Design
1.003 10.	610 0.03	8 279.2	2 0.069	0.00		0.0	0.600	o 150) Pipe	/Condu	it 🔺
									1 -		•
			N	etwork	Resi	ults '	<u> Table</u>				
PN	Rain	T.C.	US/IL Σ	I.Area	Σ Ι	Base	Foul	Add Flow	Vel	Cap	Flow
	(mm/hr)	(mins)	(m)	(ha)	Flow	(1/s)	(1/s)	(1/s)	(m/s)	(1/s)	(1/s)
1.003	50.00	6.84	2.787	0.270		0.0	0.0	0.0	0.60	10.5«	36.6
				a1000	2020	Tore					
			(⊜T 882-	-2020	⊥nno	vyze				

DBFL Consulting Engineers	Page 3	
Ormond House	158A Richmond Road	
Upper Ormond Quay	Richmond Road Works Drainage	
Dublin 7		Mirro
Date 24/01/2023 10:45	Designed by DCB	
File 20230109 Richmond Road B	Checked by	Diamage
Innovyze	Network 2020.1	

PIPELINE SCHEDULES for Storm

<u>Upstream Manhole</u>

PN	Hyd	Diam	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	Sect	(mm)	Name	(m)	(m)	(m)	Connection	(mm)
1.000	0	300	1	4.986	3.300	1.386	Open Manhole	1200
1.001	0	300	2	4.564	3.109	1.155	Open Manhole	1200
1.002	0	300	3	4.341	2.875	1.166	Open Manhole	1200
1.003	0	150	4	4.706	2.787	1.769	Open Manhole	1200

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
1.000	46.231	242.0	2	4.564	3.109	1.155	Open Manhole	1200
1.001	70.228	300.1	3	4.341	2.875	1.166	Open Manhole	1200
1.002	26.275	298.6	4	4.706	2.787	1.619	Open Manhole	1200
1.003	10.610	279.2		4.529	2.749	1.630	Open Manhole	0

DBFL Consulting Engineers		Page 4
Ormond House	158A Richmond Road	
Upper Ormond Quay	Richmond Road Works Drainage	
Dublin 7		Micco
Date 24/01/2023 10:45	Designed by DCB	
File 20230109 Richmond Road B	Checked by	Drainage
Innovyze	Network 2020.1	
Area	Summary for Storm	
Pipe PIMP PIMP PI	MP Gross Imp. Pipe Total	
Number Type Name (%) Area (ha) Area (ha) (ha)	
1 000 1	00 0.067 0.067 0.067	
1.001 1	00 0.067 0.067 0.067	
1.002 1	.00 0.067 0.067 0.067	
1.003 1	0.069 0.069 0.069	
	Total Total Total	
	0.270 0.270 0.270	
Free Flowing	Outfall Details for Storm	
Outfall Outfall C	L. Level I. Level Min D,L W	
Pipe Number Name	(m) (m) I. Level (mm) (mm)	
	(11)	
1.003	4.529 2.749 0.000 0 0	
Simulatio	on Criteria for Storm	
Volumetric Runoff Coeff	0.750 Additional Flow - % of Total Flow	w 0.000
Areal Reduction Factor	1.000 MADD Factor * 10m³/ha Storage	e 2.000
Hot Start Level (mm)	0 Flow per Person per Day (1/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500 Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000 Output Interval (mins)) 1
Number of Input Hydrographs 0 Number Number of Online Controls 0 Number o	of Offline Controls 0 Number of Time/Ard f Storage Structures 0 Number of Real Ti	ea Diagrams O me Controls O
<u>Synthet</u>	<u>ic kaintall Details</u>	
Rainfall Model	FSR Profile Type Sum	mer
Return Period (years)	100 Cv (Summer) 0.	750
Region Scotla	nd and Ireland Cv (Winter) 0.	840
M5-60 (mm)	17.200 Storm Duration (mins)	30
Ratio R	0.302	
	22.0000 -	
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DBFL Consulting Enginee.	rs					Page	5					
Ormond House		158A Richmo	nd Ro	ad								
Upper Ormond Quay		Richmond Ro	ad Wo	rks Draina	age							
Dublin 7						Mic						
Date 24/01/2023 10:45		Designed by	DCB									
File 20230109 Richmond 3	Road B	Checked by				DICI	nage					
Innovyze		Network 202	0.1									
Summary of Crit	ical Resul	ts by Maximu	m Lev	el (Rank 1	l) for	Storm						
	C -	mulation Crita	~i~									
Areal Reduct	ion Factor	1.000 Additi	<u>ria</u> onal F	low - % of	Total Fl	ow 0.000)					
Hot St	art (mins)	0 MA	DD Fac	tor * 10m³/	ha Stora	ge 2.000)					
Hot Start	Level (mm)	0	_	Inlet Co	effiecie	nt 0.800)					
Manhole Headloss Coel	t (Global)	0.500 Flow per	Perso	n per Day (l/per/da	y) 0.000)					
	Cuic (1/5)	0.000										
Number of Input Hydrographs	0 Number	of Offline Co	ntrols	0 Number o	f Time/A	rea Diag	grams O					
Number of Online Controls	0 Number o	of Storage Stru	ctures	0 Number o	f Real T	'ime Cont	rols 0					
	<u>S</u> ynthe	<u>etic Rain</u> fall I	<u>Deta</u> ils	5								
Rainfall	Model	F	SR	Ratio R 0.	278							
	Region Scot	land and Irela	nd Cv	(Summer) 0.	750							
M5-6	50 (mm)	16.1	00 Cv	(Winter) 0.	840							
Margin for	Flood Risk	Warning (mm) 3	00.0	DVD Stat	us OFF							
Margin for Flood Risk warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF												
DTS Status ON												
Pro	ofile(s)			Summe	r and Wi	nter						
Duration(s)	(mins) 15,	, 30, 60, 120,	180, 2	40, 360, 48	0, 600,	720,						
	500	0, 1440, 2100,	2000,	4320, 3700,	1 1	.0080						
Return Period(s)	(years)				1, 30,	100						
Climate Cha	ange (%)				20, 20	, 20						
				Water Sur	charged	Flooded						
US/MH		Duration	US/CL	Level I	Depth	Volume	Flow /					
PN Name Ex	vent	(mins)	(m)	(m)	(m)	(m³)	Cap.					
1.000 1 15 minute 100 y	year Winter	I+20% 15	4.986	4.302	0.702	0.000	0.33					
1.001 2 15 minute 100 5	vear Winter	I+20% 15	4.564	4.282	0.873	0.000	0.45					
1.002 3 30 minute 100 y	vear Winter	I+20% 30	4.341	4.232	1.057	0.000	0.71					
1.005 4 50 minute 100 3	year winter	1+20% 30	4.706	4.105	1.240	0.000	5.62					
			Pipe									
	US/MH Over	rflow Maximum	Flow	0+-+								
PN	Name (1	./s) vol (m³)	(1/S)	Status								
1.00	0 1	1.128	22.3	SURCHARGED								
1.00	1 2	4.504	27.6	FLOOD RISK								
1.00	2 3 3 4	6.408 3 348	41.0 55 0	FLOOD RISK								
1.00		5.540	55.0	JonomingeD								
	©19	82-2020 Inno	vvze									



Appendix D : Foul Water Network Calculations [Micro

Drainage]

DBFL Con	sultin	g Eng	ineer	S								Pa	ge 1
Ormond H	ouse				15	58A R	ichmo	nd Ro	ad				
Upper Or	mond Q	uay			Fc	oul W	ater	Netwo	rk Ca	alcs			
Dublin 7												M	licro
Date 24/	01/202	3 11:	06		De	esign	ed by	DCB					
File 230	124 Fo	ul Wa	ter Ne	etwor	Ch	necke	d by					D	lainaye
Innovyze	1				Ne	etwor	k 202	0.1				1	
					FOUL SI	EWERA	AGE DI	ESIGN					
				Des	sign Cr	iter	ia fo	<u>r Sto</u>	rm				
			Pipe	e Size:	S STANDA	ARD Ma	anhole	Sizes	STAND	ARD			
Ir F]	Indust ndustria ow Per Domesti	rial F l Peak Person Perso Domes c Peak	low (1) Flow 1 (1/pe: ns per tic (1) Flow 1	/s/ha) Factor r/day) House /s/ha) Factor	0.00 6.00 165.00 2.70 0.00 6.00	Min D Mi	Add M Design .n Vel Min Si	d Flow Minimun Maximun Depth for Au lope fo	/ Cli n Back n Back for O nto De or Opt	mate drop drop ptimi sign imisa	Change (%) Height (m) Height (m) sation (m) only (m/s) tion (1:X)	0.2 1.5 1.2 1	0 200 500 200 .00 500
				De	esigned	with i	Level	Soffit	s				
				Netwo	rk Des	ign 1	able	for S	Storm				
PN	Length	Fall	Slope	Area	Houses	Ba	se	k	HYD	DIA	Section Ty	/pe	Auto
	(m)	(m)	(1:X)	(ha)		Flow	(l/s)	(mm)	SECT	(mm)			Design
1.000	45.940	0.306	150.1	0.000	16		0.0	1.500	0	225	Pipe/Condu	iit	A
1.001	7.278	0.049	148.5	0.000	0		0.0	1.500	0	225	Pipe/Condu	uit	ě
2.000	25.335	0.220	115.2	0.000	51		0.0	1.500	0	225	Pipe/Condu	iit	•
1.002	79.788	0.532	150.0	0.000	36		0.0	1.500	0	225	Pipe/Condu	iit	A
1.003	28.308	0.298	95.0	0.000	30		0.0	1.500	0	225	Pipe/Condu	iit	ă
1.004	12.021	0.060	200.0	0.000	0		0.0	1.500	0	225	Pipe/Condu	iit	e

<u>Network Results Table</u>

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (1/s)	Flow (l/s)
1.000 1.001	3.500 3.190	0.000 0.000	0.0	16 16	0.0	18 18	0.32 0.32	0.94 0.94	37.2 37.4	0.5 0.5
2.000	3.358	0.000	0.0	51	0.0	30	0.50	1.07	42.5	1.6
1.002 1.003 1.004	3.141 2.609 2.311	0.000 0.000 0.000	0.0 0.0 0.0	103 133 133	0.0 0.0 0.0	45 45 54	0.57 0.72 0.56	0.94 1.18 0.81	37.2 46.8 32.2	3.2 4.1 4.1

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DBFL Consulting Engineers						
Ormond House	158A Richmond Road					
Upper Ormond Quay	Foul Water Network Calcs					
Dublin 7		Micro				
Date 24/01/2023 11:06	Designed by DCB					
File 230124 Foul Water Networ	Checked by	Diamage				
Innovyze	Network 2020.1					

PIPELINE SCHEDULES for Storm

<u>Upstream Manhole</u>

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	0	225	1	5.000	3.500	1.275	Open Manhole	1200
1.001	0	225	2	5.000	3.190	1.585	Open Manhole	1200
2.000	0	225	3	5.000	3.358	1.417	Open Manhole	1200
1.002	0	225	3	4.700	3.141	1.334	Open Manhole	1200
1.003	0	225	4	4.100	2.609	1.266	Open Manhole	1200
1.004	0	225	5	4.800	2.311	2.264	Open Manhole	1200

Downstream Manhole

PN	Length	Slope	MH	C.Level	I.Level	D.Depth	MH	MH DIAM., L*W
	(m)	(1:X)	Name	(m)	(m)	(m)	Connection	(mm)
1.000	45.940	150.1	2	5.000	3.194	1.581	Open Manhole	1200
1.001	7.278	148.5	3	4.700	3.141	1.334	Open Manhole	1200
2.000	25.335	115.2	3	4.700	3.138	1.337	Open Manhole	1200
1.002 1.003 1.004	79.788 28.308 12.021	150.0 95.0 200.0	4 5	4.100 4.800 4.498	2.609 2.311 2.251	1.266 2.264 2.022	Open Manhole Open Manhole Open Manhole	1200 1200 0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	c.	Level (m)	Ι.	Level (m)	Ι.	Min Level (m)	D,L (mm)	W (mm)	
1.004			4.498		2.251		0.000	0	0	



Appendix E : Irish Water Confirmation of Feasibility



CONFIRMATION OF FEASIBILITY

Dieter Bester

DBFL Ormond House Ormond Quay Upper Dublin Dublin D07 W704 **Uisce Éireann** Bosca OP 448 Oifig Sheachadta na Cathrach Theas Cathair Chorcaí

Irish Water PO Box 448, South City Delivery Office Cork City.

www.water.ie

16 August 2022

Our Ref: CDS22005766 Pre-Connection Enquiry 158A Richmond Road, Drummcondra, Co. Dublin

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Irish Water has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Multi/Mixed Use Development of 150 unit(s) at 158A Richmond Road, Drummcondra, Co. Dublin, (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
- Wastewater Connection Feasible without infrastructure upgrade by Irish Water

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before the Development can be connected to our network(s) you must submit a connection application <u>and be granted and sign</u> a connection agreement with Irish Water.

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 <u>www.water.ie/connections/get-connected/</u>

Where can you find more information?

• Section A - What is important to know?

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Irish Water's network(s). This is not a connection offer and capacity in Irish Water's network(s) may only be secured by entering into a connection agreement with Irish Water.

For any further information, visit <u>www.water.ie/connections</u>, email <u>newconnections@water.ie</u> or contact 1800 278 278.

Yours sincerely,

vonne Maesis

Yvonne Harris Head of Customer Operations

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 Irish Water's network(s).
	 Before the Development can connect to Irish Water's network(s), you must submit a connection application <u>and</u> <u>be granted and sign</u> a connection agreement with Irish Water.
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?	Irish Water connection charges can be found at: <u>https://www.water.ie/connections/information/charges/</u>
Who will carry out the connection work?	 All works to Irish Water's network(s), including works in the public space, must be carried out by Irish Water*.
	*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 Irish Water's network(s)?	 Requests for maps showing Irish Water's network(s) can be submitted to: <u>datarequests@water.ie</u>

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 <i>the Irish Water</i> <i>Connections and Developer Services Standard Details</i> <i>and Codes of Practice,</i> available at <u>www.water.ie/connections</u>
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: <u>https://www.water.ie/business/trade-effluent/about/</u> **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)



Appendix F : Irish Water Statement of Design Acceptance



Dieter Bester Ormond House Ormond Quay Upper Dublin, Dublin D07 W704

5 September 2022

Ulsce Éireann Bosca OP 448 Oifig Sheachadta na Cathrach Theas Cathair Chorcaí

Irish Water PO Box 448, South City Delivery Office, Cork City.

www.water.ie

Re: Design Submission for 158A Richmond Road, Drummcondra, Co. Dublin (the "Development") (the "Design Submission") / Connection Reference No: CDS22005766

Dear Dieter Bester,

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, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at <u>www.water.ie/connections</u>. Irish Water'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)(<u>https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/</u>).

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 Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative: Name: Marina Byrne Phone: 01 89 25991/ 087619321 Email: mzbyrne@water.ie

Yours sincerely,

yvonne Maeeis

Yvonne Harris Head of Customer Operations

Appendix A

Document Title & Revision

- 210178-DBFL-CS-SP-DR-C-1300-C-1300
- 210178-DBFL-CS-SP-DR-C-3311 Longitudinal Sections Through Foul Water Sewers -Sheet 1

Additional Comments

The design submission will be subject to further technical review at connection application stage.

While Irish Water notes that the wastewater services infrastructure will remain private and not be vested, we have the following comments: It is recommended that the foul sewer should have 3 m clearance from the proposed building.

Irish Water 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

<u>Notwithstanding any matters listed above, the Customer (including any appointed</u> <u>designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay</u> <u>Works.</u> Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.



Appendix G : Stormbloc Brochure and Maintenance

Procedures

Stormbloc[®] Optimum

Hydro International

Attenuate surface water and stormwater effectively even in challenging high-traffic urban environments.

Stormbloc[®] Optimum is a resilient geocellular storage system that provides underground storage and infiltration of urban runoff.

Lightweight materials combined with robust design make it easy to transport, quick to install and extremely durable, even beneath high-traffic areas such as roads, car parks and warehouse yards.

Stormbloc[®] Optimum is modular and easily customisable, giving you the freedom to configure storage for even the most challenging SuDS project.

Applications

- New and retrofit Sustainable Drainage (SuDS) schemes.
- Infiltration / soakaway schemes.
- Attenuation schemes.
- Highways and infrastructure projects.
- To increase swale / pond capacity.
- Car parks and Park & Ride schemes.
- Housing Developments.
- Schools and Public / Civil schemes.
- Aquifer re-charge.
- Storage for rainwater harvesting and re-use.

Inspection and Maintenance Access

Access shafts can be easily constructed during installation of the Stormbloc[®] Optimum system to enable inspection and maintenance.

The channels between the vertical struts allow access for CCTV inspection, maintenance and cleaning and ensures that the storage volume of the system isn't compromised by the build up of silts.





Benefits

Customise Your Storage

Length, width and depth of storage can be customised in order to meet even the most demanding of drainage environments. Two inspection channels enable easy inspection and maintenance.

Save Space On Site

Stormbloc[®] Optimum stacks into compact nests for transportation and storage, saving valuable space during transport and on site. The nested units can also enable more storage volume to be lifted into excavations at any one time, saving time and cost of lifting machinery. The units unstack simply for installation. With up to 75% space reduction, a double pallet of stacked, nested boxes delivers more than 14 m³ of stormwater storage, and a single lorry delivery can provide 345 m³.

Lightweight and Strong

Combining strength with a storage coefficient of 96%, Stormbloc[®] Optimum allows you to plan and design effective SuDS systems even in challenging urban environments with high traffic levels. The Stormbloc[®] Optimum can withstand heavy goods vehicle traffic with an overall load of up to 60 tons, and can be installed at base depths of up to 4 metres.

Technical information

	Stormbloc [®] Optimum Full Block	Stormbloc [®] Optimum Half Block
Material	Polypropylene	Polypropylene
Length / Width / Height	800 / 800 / 660 mm	800 / 800 / 360 mm
Nominal Block Volume	0.422 m ³	0.230 m ³
Nominal Storage Capacity per Unit	0.405 m ³	0.221 m³
Constructed Block Weight	18.6 kg	13.7 kg
Porosity	96%	96%
Vertical Ultimate Compressive Strength	≥ 420 kN/m²	≥ 420 kN/m²
Horizontal Ultimate Compressive Strength	≥ 165 kN/m²	≥ 225 kN/m²



Stormbloc[®] Optimum inspection and maintenance channel.



Stormbloc® Optimum installation.

Learn more

To learn more about how Stormbloc[®] Optimum can help you to make better water management decisions, visit **hydro-int. com**, search **Stormbloc Optimum** online or contact us:

Americas

+1 (207) 756 6200 inquiries@hydro-int.com

Asia Pacific

+61 436 433 686 enquiries@hydro-int.com

Europe & RoW

+44 (0)1275 878371 enquiries@hydro-int.com

Middle East

+971 506 026 400 enquiries@hydro-int.com

hydro-int.com/contact

Appendix H : ABG Blue/Green Roof Brochure

blueroof System Range D



Inverted Roof Construction

Warm Roof Construction

ABG **blueroof** systems provide a constant drainage path, SuDS attenuation, filtration and controlled release of stormwater, combining all the key elements of a good SuDS design. The storage element of the system must be used in conjunction with the 'blue roof' restrictor chamber. These chambers are bespoke to each project in order to help achieve the project engineer's maximum discharge rates, and to suit the required build-up and final use of the podium/roof area. ABG's 'blue roofs' are generally used for zero falls, inverted/warm roof and podium applications, under a mix of hard and soft landscaped finishes. Other combinations of ABG **blueroof** systems and most surface finishes are available. Please refer to ABG's Technical team for project/system specific advice & 'blue roof' SuDS calculations.

			A	BG bluer	oof VF HI)			
System Properties		58mm	80mm	108mm	130mm	158mm	180mm		
Thickness at 2kPa	(mm)	58	80	108	130	158	180	±10%	EN ISO 9863-1
Maximum saturated weight	(kg/m²)	58	80	108	130	158	180	approx.	EN ISO 9864
Stormwater attenuation volume	(l/m²)	50	65	97	113	145	160		
Growing medium recharge value	(l/m²)	25	25	25	25	25	25		Per 100mm depth
Drainable void space	%	86	81	90	87	92	89		
Resistance to weathering		Gre	ater thar	n 60% reta	ained ten	sile streng	gth		EN 12224
Resistance to chemicals				Exce	llent				EN 14030
Upper Filter/Separator Properties									
Pore size 0 ₉₀	(µm)			12	20			±30%	EN ISO 12956
Breakthrough head	(mm)			C)			nominal	BS 6906 Part 3
CBR puncture resistance (N)		1 600 -20%							EN ISO 12236
Dynamic perforation cone drop	(mm)			3	2			+20%	EN ISO 13433
Type and material	Non-woven needle-punched and heat-treated long staple fibre polyprop Protector: Non-woven felt of polypropylene. Min wt. of 120g/m ²				olypropyl 2	ene			

'Blue roof' system use & compatible surface finishes

Suitable for ABG Load Class 2 (Pedestrians, cycles and light vehicles, MUGAs, medium sized plant installations). Landscaped, paved or permeable resin-bound gravel finishes.

Notes

1. The values given are indicative and correspond to nominal results obtained in our laboratories and testing institutes. In line with our policy of continuous improvement the right is reserved to make changes without notice at any time.

2. Any additional installations such as plant/services, PV panels, paved areas or additional vehicular/traffic access, must be discussed with ABG prior to their installation/use.

3. Final determination of the suitability of any information is the sole responsibility of the user. ABG will be pleased to discuss the use of this or any other product but responsibility for selection of a material and its application in any specific project remains with the user.

4. Can be used in conjunction with rainwater harvesting & grey water recycling systems. Any petrochemical pollution waste discharged from the system to be treated by others.

ABG blueroof System Range D - Rev 1.01 DATASHEET

abg ltd. E7 Meltham Mills Rd, Meltham, West Yorkshire, HD9 4DS UK t 01484 852096 e geo@abgltd.com Export t+44(0)1484 852250 e export@abgltd.com www.abgltd.com

creative geosynthetic engineering

blueroof Restrictor Chamber

ABG **blueroof** Restrictor Chambers are purpose designed and patented as an integral part of ABG's **blueroof** system. Each chamber contains a restrictor valve and filter and when used in conjunction with our blue roof attenuation layers, controls the blue roof discharge rate in line with the planning consent of the site. Restrictor Chambers are available in 2 main types; a dense polypropylene chamber with galvanised lid for foot traffic only areas and a stainless steel chamber and lid for vehicular trafficked areas such as podiums or walkways (recessed lid also available). All chambers are accessible to allow for on-going maintenance. They are manufactured to order to specific heights as dictated by the chosen ABG **blueroof** system ("x"), surface finish ("y") and insulation depths ("z"). An alternative chamber profile is available when used with a parapet outlet.





ABG Restrictor Chamber in place to insulation depth ready to receive the ABG blueroof system

Bespoke design specific heights

Materials	Upper chamber width (mm) ("A")	Upper chamber length (mm) ("B")	Application notes				
Polypropylene chamber galvanised steel lid	361	361	Placed in open area of roof. Maintenance foot traft only. No vehicular traffic. e.g. paved surface finish				
Parapet Restrictor Chamber – Polypropylene (maintenance foot traffic only)(no ribs on one side to fit to parapet)							
Materials	Upper chamber width (mm) ("A")	Upper chamber length (mm) ("B")	Application notes				
Polypropylene chamber galvanised steel lid	361	341	Placed tight to parapet wall. Maintenance foot traf only. No vehicular traffic. e.g. paved surface finish				
Internal Restrictor Chamber – Steel (trafficked) (similar profile to illustration above)							
Materials	Upper chamber width (mm) ("A")	Upper chamber length (mm) ("B")	Application notes				
Stainless Steel chamber and lid	375	375	Placed in open area of roof. Pedestrian or vehicular traffic. e.g. podium deck				
Parapet Restrictor Chamber	– Steel (trafficked)	(no ribs on one sid	le to fit to parapet)				
Materials	Upper chamber width (mm) ("A")	Upper chamber length (mm) ("B")	Application notes				
Stainless Steel chamber and lid	375	350	Placed tight to parapet wall. Pedestrian or vehicu traffic. e.g. podium deck				
blueroof Filter Geotextile Ch	aracteristics						
Characteristic	Units	Value	Allowable variance	Standard			
Pore size O ₉₀	(µm)	115	±30%	EN ISO 12956			
Water flow at 50mm head	l/m ² .s	105	-15% EN ISO 11058				
Type of material	Non woven needle	-punched polypropyl	lene geotextile				
Resistance to chemicals	Excellent			EN ISO 14030			

blueroof Restrictor Chamber Rev 1.01

abg ltd. E7 Meltham Mills Rd, Meltham, West Yorkshire, HD9 4DS UK t 01484 852096 e geo@abgltd.com Export t+44(0)1484 852250 e export@abgltd.com www.abgltd.com

creative geosynthetic engineering Appendix I : Murphy Geospatial Utility Survey and Utility Survey Report



Geospatial certainty you can trust murphygs.ie

Utility Survey Report

Project Name – Leydons Richmond Road Project Number – 43568 Client – Malkey Limited





Document Register

Rev	Date	Prepared by	Role	Checked by	Role	Revision Reason
00	28/10/2021	IP	CAD Technician	DS	Quality Manager	First issue

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1 Introduction

1.1 Terms of Reference

Location:	158A Richmond Rd, Ballybough, Dublin 3
Client:	Malkey Limited
Utility Survey Date start:	27/10/2021

This report should be viewed with the following drawings: MGS43568-U.dwg

This document is the technical report for this investigation; it therefore supersedes any previous reports whether written or oral.

1.2 Background/Purpose of Investigation

Murphy Geospatial were requested to carry out a full GPR & utility survey on behalf of Malkey Limited. The intention of this survey is to detect, locate and record all existing Utilities and highlight any anomalies in the required area for upcoming works.

1.3 Objective of project

The objective of the survey was to locate the position and depth of all existing underground utilities using a combination of non-intrusive survey techniques. As the main investigative techniques used are largely non-destructive, the findings given in this report are based on indirect measurements and the interpretation of acoustic, electrical and electromagnetic signals. The findings represent the best professional opinions of the authors, based on our experience and the results of non-intrusive pipe location carried out elsewhere on similar materials and projects.

1.4 Site aerial view





1.5 Key Personnel

Project Manager:	Aidan Doherty				
	Responsible for the management of the overall project				
Senior Surveyor:	Luke Maguire				
	Lead surveyor responsible for the site work				
Safety Advisor:	Dermot Guiney				
	Responsible for safety inductions (internal requirements only) and advising on safe working practices				
Quality Manager:	Daniel Stempien				
	Responsible for processing and quality assessment of data				

1.6 Specifications and International Standards

All survey works were carried out in accordance with the following guidelines and standards:

- European GPR Association Policy on the Use of GPR in Utility Detection
- American Society of Civil Engineers- Standard Guideline for the collection and depiction of existing subsurface utility data.
- Radio detection- abc & xyz of locating buried pipes and cables.
- PAS128: 2014 Publicly Available Specification 128 2014



2 Survey Report

2.1 Survey Restrictions

There was limited or no access to some areas due to parked cars or containers/pallets located on the site – please refer to the drawing.



2.2 Field Data Survey

Survey was carried out in ITM OSGM15 coordinate system. All levels are related to Malin Head Datum. Survey results were overlaid on the topographical background.

2.3 Traffic Management

No Traffic Management was required for this project.

2.4 Methodology

2.4.1 Underground Utility & GPR Survey

Murphy Geospatial detect conductive services with the use of the Radio detection RD8100 receivers and transmitters which use very low electromagnetic frequencies to detect the services utilising the following methods:-

Direct Connection – This technique incorporates the use of a signal generator which is capable of generating sine waves at very low frequencies, typically 8 kHz or 33 kHz which can be applied to a metallic service. The service acts like an aerial and conducts the transmitted signal, which can then be detected on the surface using the receiver.



This is the most accurate method of locating a buried service and is applied in the first instance where access to pipes and cables is possible.

Signal Clamp – The signal clamp will be used to trace buried LV and HV cables. The signal will be applied via a clamp which is placed around the cable at a point the service enters or exits the ground.

Induction – Where a direct signal cannot be applied, the transmitter is used to radiate an indirect signal actively. The transmitter has a built-in aerial, which is capable of transmitting an electromagnetic field into the ground which conducts along the pipe or cable and can be detected on the surface using a receiver.

Passive – In Passive mode, the receiver is used without the transmitter to detect signals, which are generated by power cables or from distant radio transmitters, which constantly induce a signal into metallic services.

This method should only be used once both Direct Connection and Induction methods have been exhausted.

2.4.2 GPR Methodology:

A number of different GPR grids were set out over the site. Data field files were collected with a multi frequency array antenna system to give maximum depth penetration whilst maintaining a high resolution at both shallow and deep depths. Full calibration was carried out at the start scan with constant quality monitoring during acquisition and frequent recalibration checks were carried out where necessary.

Depth readings from GPR rely on multiplying the measured two-way travel time by the velocity of the radio signals passing through the materials under investigation. As the surface and subsurface of the site changes, frequent recalibration of the subsurface velocities results in an accurate calculation of depths and thicknesses of located features relative to the surface.

Post site processing then took place in the office, using specialised software, GPR Slice. A number of processing stages were involved, including start time correction, amplitude gain adjustments, Gaussian filtering, dynamic correction and noise removal. Once the raw data was processed individual targets were identified on each survey line and linear features mapped out over the survey areas. These GPR results are then incorporated into AutoCAD for final processing.



2.5 Equipment Used

RD4000/8000, Dual-Frequency GPR Radar System, Sonde, Copper Flex, Trimble S3 Total Station/R6 GPS Trimble

2.6 Surveyors Involved

Luke Maguire, Adam Maguire

2.7 Works Programme

Site Works Commenced in October 2021

Delivery of drawings - 28/10/2021

2.8 Software Used for Processing

AutoCAD Civil 3D 2019

AutoCAD 2019

GPR Slice V7.0

GRED HD 3D 01.02.00

GeoPal.

2.9 Quality Assurance Site Procedures

Equipment used was calibrated and tested in line with manufacturer guidelines.

Calibration certificates can be provided on request. Distance & angle checks were carried out on site regularly.



2.10 Findings

2.10.1 Drainage

Comments	Quality Level QL- A,B,C,D	Methodology M1 - M4
No evidence of foul/combined sewer network was identified within survey area. Storm water network was identified in manholes 3, 4, 6, 5, 2 and 1 running from manholes around the buildings towards manhole 1 where storm water is discharged to manhole offsite – please refer to the drawing. Please note that due to the siltage or blockage in the pipes, it was not possible to verify all drainage connections on site – please refer to the drawing. Drainage service records drawing doesn't show any connections within survey area.	B2P	M2P

2.10.2 Water Mains/Fire Mains

Comments	Quality Level QL- A,B,C,D	Methodology M1 - M4
Due to possible non-metallic nature, no signal was detected from water valve located offsite which is possible the access valve for the main building connection. Water main pipe were identified in manhole 1 and then these pipes are exposed on the nearby wall. Service records drawing shows only a main water pipe entering the site in the North-East section of the site. Water pipes which are shown on records drawings but which couldn't be located and verified on site were marked with 'records' note and it is recommended to treat their location as indicative only.	B2P (located) B4 (records)	M2P



2.10.3 Electricity, HV, LV, Street lighting, Traffic

Comments	Quality Level QL- A,B,C,D	Methodology M1 - M4
No evidence of Electrical cable was found within survey area. ESB records shows only electrical connections from offsite to EBOX located offsite. ESB connections which were shown on records but couldn't be located and verified don site were marked with 'records' note and it is recommended to treat their location as indicative only. Public lighting connections to the lamp poles were identified on site. Two lamp posts were reported as being disused – pleas refer to the drawing.	B4	M2P

2.10.4 Eir, Enet, UPC (Virgin), BT and other Comms

Comments	Quality Level QL- A,B,C,D	Methodology M1 - M4
No evidence of Enet, BT, Eir, UPC was identified on site. There is no Enet, BT, Eir, UPC in this area according to records data.	N/A	M2P

2.10.5 Gas, Oil & Fuel mains

Comments	Quality Level QL- A,B,C,D	Methodology M1 - M4
Due to non-metallic nature no signal was detected of gas pipe which is present within survey area according to the GNI records drawings. GPR results were also not fully conclusive for this gas pipe and only some sections of the gas network were identified on site – please refer to the drawing. Sections which are shown on records drawings but which couldn't be located and verified on site were marked with 'records' note and it is recommended to treat their location as indicative only.	B2P (located) B4 (records)	M2P



2.10.6 GPR data conclusion

Comments

Generally, the depth of investigation from GPR does not exceed 1.5 metres in this area.

As well as all the confirmed utility services which have been identified, there are unidentified features shown as GPR Anomalies. These features may be the result of services which are running through the sites, abandoned services, natural geological features or land drains amongst other things.



2.11 Manhole and pit schedules

Each manhole/inspection cover within the survey area was opened and the contents documented. These measurements are recorded on a digital manhole description sheet using Geopal applications. The manholes were individually numbered. All depths recorded inside the chamber were by disto, measuring tape or levelling staff. Details included:

- Cover Levels
- Invert levels
- Service Type
- Service Material
- Pipe sizes
- Chamber dimensions
- Direction of flow
- Photographs

After completing manhole investigation each manhole sheets was exported to Excel format and submitted together with final drawing and GPR report as a part of final deliverables.

2.12 Recommendations

Services which are shown on service records drawings, but which couldn't be located and verified on site and services which couldn't be traced due to no signal being obtained or signal being lost during the trace will require further investigation.

It is recommended to carry out slit trenching investigation in this area which would allow identifying location and depths of these untraceable services.

Drainage lines which couldn't be traced will require further investigation. It is recommended to clean (jet wash) the pipes and carry out CCTV investigation works which would allow identifying connection points for these pipes.

It is recommended to clear the area from any obstacles and re-check those cleared areas for any potential evidence of the manholes or services in those currently obstructed sections of the site.



3	Pas Detection	Methods and	Quality Level	Tables
---	---------------	-------------	----------------------	--------

	Survey type	Quality level	Post-	Location	Accuracy		
(Establish	with client prior to survey)	to determine post survey)	Processing	Horizontal 1)	Vertical ₂₎	supporting Data	
٥	Desktop utility records search	d-10	ı	Undefined	Undefined	I	
υ	Site reconnaissance	0-1C	ı	Undefined	Undefined	A segment of utility whose location is demonstrated by visual reference to street furniture, topographical features or evidence of previous street works (reinstatement scar).	
		QL-B4	ı	Undefined	Undefined	A utility segment which is suspected to exist but has not been detected and is therefore shown as an assumed route.	
		QL-B3	No		Undefined (No reliable depth	Horizontal location only of the utility detected by one of the geophysical techniques used	
	3)	QL-B3P	Yes	±500 mm	measurement possible)		
20	Detection	QL-B2	No	±250 mm or ±40% of detected denth	±40% of	Horizontal and vertical location of the utility detected by one of the geophysical techniques used. 4)	-
		QL-B2P	Yes	whichever is greater	detected depth		
		QL-B1	No	±150 mm or ±15% of detected denth	±15% of	Horizontal and vertical location of the utility detected by multiple geophysical techniques used.	~
		QL-B1P	Yes	whichever is greater	detected depth		
Α	Verification	QL-A	ı	±50 mm	±25 mm	Horizontal and vertical location of the top and/or bottom of the utility.	
 I) Horizontal I. I) Vertical loca I) For detectic I) Electronic d I) Some utilitie 	ocation is to the centreline of the ation is to the top of the utility. In, it is a requirement that a mil epth readings using EML equip as can only be detected by one	he utility. nimum of GPR and EM ment are not normally of the existing detecti	L techniques ar sufficient to acl on techniques. <i>i</i>	e used (see 8.2.1.1.2). hieve a QL-B2 or higher. As a consequence, such ut	ilities cannot be classified	sa QL-B1.	


Method 1)	Survey	Grid/Search Resoluti	on 2)		Ouality	
(to be determined in consultation	Ĩ	GPR		Other	Levels	Typical Application (informative)
with the client)	EML 3)	General	Post- Processing	Techniques 4)	achievable	
M1	Orthogonal search transect at ≤10 m intervals and when following a utility	Use as applicable	No		B1, B2, B3, B4	الممالية محمل فمالية ملماسية محملينا لمحمل
M1P	trace, search transects at ≤5 m intervals		Yes	≤5 m survey grid	B1P, B2P, B3P	used where the density of services is typical of an undeveloped area
M2	Orthogonal search transect at ≤5 m intervals and when following a utility	Either: a) ≤2 m orthogonal; or	No		B1, B2, B3, B4	Used where the density of services is
M2P	trace, search transects at ≤2 m intervals	b) high density array 5)	Yes	≤2 m survey grid	B1P, B2P, B3P	typical of a suburball area of where the utility services cross a boundary of a survey area
M3	Orthogonal search transect at ≤2 m intervals and when following a utility	Either: a) ≤1 m orthogonal; or	No		B1, B2, B3, B4	Used where the density of services is typical of a busy urban area or for
M3P	trace, search transects at ≤1 m intervals	b) high density array 5)	Yes	≤1 m survey grid	B1P, B2P, B3P	clearance surveys prior to operations such as borehole/drilling/fencing/ tree planting
M4	Orthogonal search transect at ≤2 m intervals and when following a utility	Either: a) ≤0.5 m orthogonal; or	No		B1, B2, B3, B4	الممالية محمد فمالية ملمحمد فيمار
M4P	trace, search transects at ≤0.5 m intervals	b) high density array 5)	Yes	≤0.5 m survey grid	B1P, B2P, B3P	used where the density of services is typical of a congested city area
NOTE 1 In general the detection method that NOTE 2 "P" indicates c	effort increases from M1 to M4 and the has a higher level of effort should be se off-site post-processing has been include	e addition of post-processin slected. ed.	ıg. For areas w	th a greater density o	of utilities or area	is considered high risk by the client, a
 It is a requirement the construction or the coll the coll the coll the construction of the transect centre of the transect centre of the high density array 	hat a minimum of GPR and EML techniq thogonal transect centres and survey gr hat passive EML is deployed over the wh depends on technique used. comprises 100 mm or closer antenna se	ues are used. ids shall be ±0.1 m. nole survey area and that w sparation.	here an active	EML method can be	used, it is used.	



4 Disclaimers

The survey aims to map all existing utilities and sub-surface structures and provide information with respect to pipe size, material type and drainage connectivity. However, GPR surveying is limited by the following guidelines and it may not be possible to accurately survey, define and locate all services and sub-surface features. Survey Results are representative of the date and time of survey only.

- Locational accuracy is determined by referring to the manufacturers guidelines for the detectors used.
- Existing record information showing underground services is often incomplete and unknown accuracy; therefore, it should be regarded only as an indication.
- In ideal conditions these spatial accuracies for the underground utilities are +/- 5% for the RD4000 and +/- 10% of depth for the GPR to 2.5m deep. However, variations within the subsurface may alter this estimated accuracy.
- Although all reasonable steps have been taken to locate all features, there is no guarantee that all will be shown on the drawing as some above ground features may have obstructed the survey.
- GPR surveying operates best within high resistivity material. Clay overburden can impair GPR surveying.
- Due to the attenuation of the radar signal with depth, resolution is restricted, hence making identification of anomalies difficult with increasing depth.
- The depth penetration and quality of the data depends on the ground conditions on the site. Poor data may be a result of areas with high conductivity. Also, high reflective materials close to the surface i.e., rebar may hide deeper anomalies.
- It is not always possible to trace the entire length of each underground service.
- It is always our intention to use the Utility providers' details, if supplied prior to survey commencement as a guide for location purposes. However, should we not be able to locate those guided services we shall not be held responsible for the accuracy, or otherwise, of the location of that service, as issued by the utility provider and therefore shown "Taken from Records" on the drawing and we are not liable for any loss that may arise due to the lack of accuracy in the guided information.
- Unless otherwise stated, all services and sub-surface structures shown on Murphy Geospatial plan drawings have been surveyed using approved detectors and the connections between manholes, if not traced, are assumed to run straight.
- Plan accuracies of the order of + or 150mm may be achieved but this figure will depend on the depth of the service below ground level. Where similar services run on close proximity, separation may be impossible. Successful tracing of non-metallic pipes may be limited.
- Please note that not all buried pipes, cables and ducts can be detected and mapped in consideration of their depth, location, material type, geology and proximity to other



utilities. Even an appropriate and professionally executed survey may not be able to achieve a 100% detection rate.

- Services which have been untraceable are shown from Records where possible.
- DP represents distance from the surface level to the top of the service/ radar.

No allowance has been made within our quotation, unless otherwise stated, for the location and mapping of undeclared services. Failure to detect or fully map any declared service will be recorded within the notes accompanying our final drawings.

Where technically possible, depth indications will be given. These should be used for guidance only and wherever critical accuracy is required these should be confirmed by the Client by undertaking trial excavations or similar. Bends, lateral service connections, or the close proximity of other services and local magnetic, atmospheric or ground conditions, could in certain situations influence the accuracy of the plan and depth indication facility. Depths will not be provided unless we are reasonably confident of their validity.

Where Murphy Geospatial issues a CAD drawn utility service plan, this should be read in conjunction with all available public utility records etc. As part of our exhaustive Quality Control procedures, Murphy Geospatial endeavour to add relevant Public Utility record information onto the final issue drawing. An allowance should be made for the width of services, particularly where these are laid in bands or are of significant size etc. For clarification or appropriate easement bands, we would recommend that direct contact is made with the Asset Owner or Statutory Undertaker.

We exclude the following, except where otherwise specified and possible to do so:

- All private service connections, (including water or gas fittings where no through flow of applied signal is possible.
- Pot ended or disconnected cables or terminated short lengths of pipe.
- Internal building services
- Fibre optic cables (except where laid with a standard communications cable or builtin tracer wire or similar conductor system) or can be clearly located using ground penetrating radar.
- Small diameter cables less than 17mm diameter, or pipes less than 38mm diameter.
- Above ground services unless specifically requested.
- Lifting manhole covers which require longer than 10-minute effort using standard heavy duty lifting apparatus.
- Services positioned directly below other pipes or cables etc (i.e., masking signal) intrusive verification options available on request.
- Deep non-metallic pipes, ducts or culverts (unless probing or Pipe Track 3d is specified as part of the fully invasive survey option).



 Passing through defective pipework (displaced joints etc) or acute bends between access points.

Please note that our Quotation does not allow for location of individual service feeds to properties unless reasonable to do so, as access would be required into each property to apply direct connections to inlet points and this would significantly increase the scope of work, survey cost and also cause possible disruption to occupants.

Service provider utility drawings may not be up to date or give sufficient coverage of all areas surveyed, as such extra precaution should be taken when excavation works are carried out on site and it is recommended to contact service providers before commencing any excavation works within surveyed areas.

All work carried out by Murphy Geospatial conforms to the guidelines set out by The Survey Association (TSA).



5 GNI Gas Pipeline Disclaimer

Gas Networks Ireland (GNI), their affiliates and assigns, accept no responsibility for any information contained in this document concerning location and technical designation of the gas distribution and transmission network ("the Information"). Any representations and warranties express or implied, are excluded to the fullest extent permitted by law. No liability shall be accepted for any loss or damage including, without limitation, direct, indirect, special, incidental, punitive or consequential loss including loss of profits, arising out of or in connection with the use of the Information (including maps or mapping data). NOTE: DIAL BEFORE YOU DIG Phone 1850 427 747 or e-mail dig@gasnetworks.ie – The actual position of the gas/electricity distribution and transmission network must be verified on site before any mechanical excavating takes place. If any mechanical excavation is proposed, hard copy maps must be requested from GNI re gas. All work in the vicinity of the gas distribution and transmission network must be completed in accordance with the current edition of the Health & Safety Authority publication, 'Code of Practice for Avoiding Danger from Underground Services' which is available from the Health and Safety Authority (1890 28 93 89) or can be downloaded free of charge at www.hsa.ie.



6 General GPR Limitations

GPR surveying is lin	nited by the following guidelines	Minimizing GPR Limitations
Depth and size of Utility	In good ground conditions and within the depth range of two metres the ability to detect a utility will reduce in diameter by 1mm for each 10mm of depth. i.e., a 200mm pipe can be detected at 2m and a 50mm pipe at 0.5m but a 25mm plastic water service pipe to a house cannot be detected at 1.2m with radar	Murphy Geospatial incorporated Radio Detection surveys in areas where GPR was found to be ineffective.
Shadowing	This can happen where shallow buried utilities hide or mask deeper buried utilities below.	Murphy Geospatial use mutli frequency radar systems to reduce the effect of shadowing.
Soil Condition	GPR surveying operates best within high resistivity material. Clay overburden can impair GPR surveying. The depth penetration and quality of the data depends on the ground conditions on site. Poor data maybe a result of areas with high conductivity	Murphy Geospatial calibrate our GPR Systems for varying soil types on each project.
Plan Accuracies	Plan accuracies of the order of + or – 150mm maybe achieved but this figure will depend on the depth of the service below ground level.	Murphy Geospatial incorporated Radio Detection surveys in areas where GPR was found to be ineffective.
Utility location	Although all reasonable steps have been taken to locate all features, there is no guarantee that all will be shown on the drawing as some above ground features may have obstructed the survey.	Murphy Geospatial utility surveyors are all qualified and certified to locate underground services.
Existing Utility Records	Existing record information showing underground services is often incomplete and unknown accuracy; therefore, it should be regarded only as an indication.	It is always our intention to use the Utility provider's details, if supplied prior to survey commencement, as a guide for location purposes. However, should we not be able to locate those guided services we shall not be held responsible for the accuracy, or otherwise, of the location of that service, as issued by the utility



		shown "Taken from Records" on the drawing and we are not liable for any loss that may arise due to the lack of accuracy in the guided information.
Loss of Signal	It is not always possible to trace the entire length of each underground service.	Murphy Geospatial will indicate on the drawing if a service trace is lost.
Utility Congestion	Where similar services run on close proximity, separation maybe impossible.	Murphy Geospatial incorporated Radio Detection surveys in areas where GPR was found to be ineffective.
Pipe Material	Successful tracing of non-metallic pipes maybe limited due to material construction of the pipe.	Murphy Geospatial incorporate Radio Detection/ Manhole& PWG surveys in areas where GPR was found to be ineffective.

The American Society of Civil Engineers in their 'Standard Guidance for the collection and depiction of existing subsurface utility data' has a useful rule of thumb for GPR which in, metric values, can be summarised as: 'In good ground conditions and within the depth range of two metres the ability to detect a utility will reduce in diameter by 1mm for each 10mm of depth. i.e., a 200mm pipe can be detected at 2m and a 50mm pipe at 0.5m but a 25mm plastic water service pipe to a house cannot be detected at 1.2m with radar'.

Appendix J : Site Investigation



Richmond Road Phase 2 – Ground Investigation

Client:

Malkey Limited

Client's Representative: DBFL Consulting Engineers

Report No.:

22-1762

Date:

January 2023

Status:

Interim Report

This report is an interim report to be used for indicative purposes only and should not be used for detailed design or tendering purposes.

Causeway Geotech Ltd

8 Drumahiskey Road, Ballymoney Co. Antrim, N. Ireland, BT53 7QL +44 (0)28 2766 6640 info@causewaygeotech.com www.causewaygeotech.com

istered in Northern Ireland. Company Number: NI610766 Approved: ISO 9001 • ISO 14001 • OHSAS 18001





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APPENDICES

Appendix A	Site and exploratory hole location plans
Appendix D	Trial pit logs
Appendix C	Trial pit photographs
Appendix D	Infiltration test results
Appendix E	Plate load test results
Appendix F	Environmental laboratory test results
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Document Control Sheet

Report No.:		22-1762					
Project Title:		Richmond Road	Phase 2				
Client:		Malkey Limited					
Client's Repres	entative:	DBFL Consulting Engineers					
Revision:	A00	Status:	Interim Report	Issue Date:20th January2023			
Prepared by:		Reviewed by:		Approved by:			
hia	Ross.	Colm Hur Con		Jam O'll Mo. 7.			
Sean Ross BSc MSc MIEI P(Geo	Colm Hurley BSc PGeo		Darren O'Mahony BSc MSc MIEI EurGeol PGeo			

The works were conducted in accordance with:

British Standards Institute (2015) BS 5930:2015+A1:2020, Code of practice for ground investigations.

BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

Laboratory testing was conducted in accordance with:

British Standards Institute BS 1377:1990 parts 2, 4, 5, 7 and 9



METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015+A1:2020, The Code of Practice for Ground Investigation.

Abbreviations use	ed on exploratory hole logs
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler).
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler).
Р	Nominal 100mm diameter undisturbed piston sample.
В	Bulk disturbed sample.
LB	Large bulk disturbed sample.
D	Small disturbed sample.
С	Core sub-sample (displayed in the Field Records column on the logs).
L	Liner sample from dynamic sampled borehole.
W	Water sample.
ES / EW	Soil sample for environmental testing / Water sample for environmental testing.
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained).
SPT (c)	Standard penetration test using 60 degree solid cone.
(x,x/x,x,x,x)	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length.
(Y for Z/ Y for Z)	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given seating or test length 'Z' (mm).
N=X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm).
HVP / HVR	In situ hand vane test result (HVP) and vane test residual result (HVR). Results presented in kPa.
V VR	Shear vane test (borehole). Shear strength stated in kPa.V: undisturbed vane shear strengthVR: remoulded vane shear strength
Soil consistency description	In cohesive soils, where samples are disturbed and there are no suitable laboratory tests, N values may be used to indicate consistency on borehole logs – a median relationship of Nx5=Cu is used (as set out in Stroud & Butler 1975).
dd-mm-yyyy	Date at the end and start of shifts, shown at the relevant borehole depth. Corresponding casing and water depths shown in the adjacent columns.
\bigtriangledown	Water strike: initial depth of strike.
•	Water strike: depth water rose to.
Abbreviations relatin	g to rock core – reference Clause 36.4.4 of BS 5930: 2015+A1:2020
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock coring.
(xxx/xxx/xxx)	Spacing between discontinuities (minimum/average/maximum) measured in millimetres.





1 AUTHORITY

On the instructions of DBFL Consulting Engineers, ("the Client's Representative"), acting on the behalf of Malkey Limited ("the Client"), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of a proposed residential development.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and the laboratory test results. A discussion on the recommendations for construction is also provided.

All information given in this report is based upon the ground conditions encountered during the ground investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client and the Client's Representative in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

2 SCOPE

The extent of the investigation, as instructed by the Client's Representative, included trial pits, soil sampling, environmental sampling, in-situ and laboratory testing, and the preparation of a report on the findings including recommendations for construction.

NOTE: The full scope of works has not been completed for the site.

3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted in the car park of Leydens Wholesalers & Distributors on Richmond Road in Drumcondra in Dublin. The site is bordered by Richmond Road to the north, and industrial units on all other sides. The Tolka River is located 40m to the south of the site.





4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted on the 20th December 2022, comprised:

- four machine dug trial pits
- an infiltration test performed in two trial pits
- plate load testing at two locations.

The exploratory holes and in-situ tests were located as instructed by the Client's Representative, and as shown on the exploratory hole location plan in Appendix A.

4.2 Trial Pits

Four trial pits (TP01–TP02 and IT01-IT02) were excavated using a JCB 3CX fitted with a 600mm wide bucket, to a maximum depth of 1.70m. IT01 and IT02 were excavated to allow completion of infiltration test.

Environmental samples were taken at standard depths in each trial pit.

Disturbed (bulk bag) samples were taken at standard depth intervals and at change of strata.

Any water strikes encountered during excavation were recorded along with any changes in their levels as the excavation proceeded. The stability of the trial pit walls was noted on completion.

Appendix B presents the trial pit logs with photographs of the pits and arising provided in Appendix C.

4.3 Infiltration tests

An infiltration/soakaway test was carried out at two locations (IT01- IT02) in accordance with BRE Digest 365 - Soakaways (BRE, 2016). The tests were conducted in similarly numbered trial pits.

Appendix D presents the results and analysis of the infiltration test.

4.4 Plate load tests

Plate load tests were carried out at two locations (CBR01 and CBR02). Hardstanding at both locations was completed using a JCB3X excavator and the tests undertaken on the sub-base/made ground beneath the hardstanding.

The plate load tests were conducted as incremental loading tests in accordance with Clause 4.1 of BS1377:





Part 9: 1990 (British Standards Institute, 1990). A 450mmdiameter bearing plate was used with five equal loadings to a maximum pressure of approximately 300kPa, followed by unloading. The testing was conducted using a wireless plate load testing system, PLATEMAN, which utilises Bluetooth technology with a remotely-operated rugged PDA system.

Plate movements were measured using three strain gauges fitted to a remotely fixed tripod frame. Each loading increment was maintained until the plate movement had essentially stopped.

The test results provided in Appendix E are as follows:

- plots of the plate settlements, average of the three gauges, against pressure.
- plots of average settlement against time during the loading increments/decrement.

The Modulus of Subgrade Reaction, k, is estimated by applying a "best fit" to the settlement-pressure plots, and is reported in MPa/m. The numerical value represents the pressure, in kPa, on the bearing plate that induces 1.25mm of settlement.

An approximate CBR value was estimated using the guidance provided in the Interim Advice Note 73/06 (Revision 1, 2009) of the Design Guidance for Road Pavement Foundations (Draft HD25). The document provides methods to convert the measured k value to the equivalent for a 762mm diameter plate and the consequent relationship with CBR. This method of estimating an equivalent CBR value is relatively conservative.

5 LABORATORY WORK

5.1 Environmental laboratory testing of soils

Environmental testing, was conducted on selected environmental soil samples by Chemtest at its laboratory in Newmarket, Suffolk.

Rilta suite of analysis was carried out on seven samples for landfill disposal criteria. This included testing for a range of determinants, including:

Testing was carried out for a range of determinants, including:

- Metals
- Speciated total petroleum hydrocarbons (TPH)
- Speciated polycyclic aromatic hydrocarbons (PAH)
- BTEX compounds
- Volatile Organic Compounds (VOCs)
- Semi-Volatile Organic Compounds (SVOCs)





- Polychlorinated biphenyls (PCBs)
- Phenols
- Organic matter
- Total Organic Carbon (TOC)
- Cyanides
- Asbestos screen
- Sulphate and sulphide
- Sulphur
- Phosphate
- Calcium
- pH
- Waste acceptance criteria (WAC)

Results of environmental laboratory testing are presented in Appendix F.

A waste classification report was compiled analysing the results of the above testing. The report is presented in Appendix G.

6 GROUND CONDITIONS

6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise made ground and alluvium. These deposits are underlain by limestones and shales of the Lucan Formation.

6.2 Ground types encountered during investigation of the site

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- Paved surface: All location encountered 100mm of bitmac surfacing.
- **Made Ground (fill):** greyish brown sandy clayey gravel encountered immediately below bitmac containing anthropogenic material such as concrete and brick fragments, underlain by reworked sandy gravelly clay which also contained fragments of brick, concrete, scrap metal and Styrofoam.

6.3 Groundwater

Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.





Groundwater was encountered during excavation of TP01 and IT01 as groundwater strikes at depths of 1.50m and 1.30m respectively. Groundwater was not noted during excavation of either of the other pits.

Seasonal variation in groundwater levels should also be factored into design considerations.

7 DISCUSSION

7.1 Proposed construction

It is proposed to construct a new residential development on the site with associated infrastructure.

No further details were available to Causeway Geotech at the time of preparing this report and any designs based on the recommendations or conclusions within this report should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory holes. Causeway Geotech were commissioned to provide a geotechnical report, and it is outwith our remit to advise on structure design.

7.2 Recommendations for construction

7.2.1 Access roads, car parks and hard standing

Based on a summary of the CBR tests undertaken at the site, it is envisaged that the upper strata on site may be suitable for the placement of road make up layers however it should be noted that the two results (0.7% and 30%) are likely representative of the variation in made ground encountered across the site within which the two tests were conducted. Ideally this made ground should be excavated and replaced with engineered backfill for pavement build up.

Table 2.1 of volume 7 section 2 of the Design Manual for Roads and Bridges (below), gives guidance on the average thickness of the pavement layers in relation to the CBR results. As can be seen, a CBR in excess of 15% does not require any capping layers, however a sub-base thickness of 200mm is suggested.







Table 2.1 (DMRB Vol.7 Sec2) 2009

It is recommended that further testing be undertaken during the course of construction works at intervals as set out in the Earthworks Specification, and should any areas indicate lower than expected value, the above plot should be used to determine the thicknesses of any capping or sub-base layers that may need to be placed in these areas.

The use of geosynthetics in the construction of paved areas, will be beneficial, particularly in areas of Made Ground. These could include a geosynthetic (e.g., a geogrid) at subgrade level with further benefit gained by incorporating further layer(s) within the capping/sub-base layer. Road design should be undertaken by a specialist earthworks contractor/designer.

7.3 Infiltration drainage

In infiltration test carried out in trial pit IT01 and IT02, the rates of infiltration were calculated as shown in Table 1 below.

GI Ref	Infiltration rate (q)	Strata
IT01	n/a	Made Ground: Reworked sandy gravelly CLAY.
IT02	0.169	Made Ground: Reworked sandy gravelly CLAY.

Table 1 Summary of BRE soakaway test results

The low-permeability fine-grained soils encountered in IT01 along with the soil descriptions, are therefore considered to be poor infiltration media, and would be deemed unsuitable for the implementation of infiltration drainage systems.





The rate of infiltration calculated in IT02 along with the material descriptions imply that the subsoil may be considered suitable media for an infiltration drainage system.

Reference should be made the Sustainable Drainage Systems (SuDS) design guidance, taking into account meteorological conditions and a hydrogeological assessment.

7.4 Waste classification

For consideration of material to be removed from site, a waste classification of the solid soil laboratory results was completed using HazWasteOnline[™] software. A copy of the Waste Classification report is included at Appendix G. The Waste Classification report shows that the material tested can be classified as non-hazardous material considering the List of Wastes (LoW) code 17 for Construction and Demolition Wastes (including soils excavated from contaminated sites), specifically 17 05 03* and 17 05 04.

Following completion of the waste classification, and to determine a suitable disposal route for the soil, assessment of the WAC analysis of the samples was completed. The laboratory results of the WAC testing indicate that the soils from the site are suitable for disposal as Inert waste to an appropriate licenced facility with the exception of those samples listed in Table 2 which exceeded Inert WAC limits.

GI Ref	Determinant Failure	Comment
IT01 0.5m	-TOC (3.5%) exceeds Inert WAC (3.5%) -Antimony (0.074mg/kg) exceed Inert WAC (0.06%)	Exceeds Inert WAC, suitable for disposal as non-hazardous waste.
IT01 1.5m	-TOC (3.4%) exceeds Inert WAC (3.5%) -Antimony (0.064mg/kg) exceed Inert WAC (0.06%)	Exceeds Non-Haz WAC, suitable for disposal as hazardous waste.
TP01 1.5m	-TOC (3.3%) exceeds Inert WAC (3%)	Exceeds Non-Haz WAC, suitable for disposal as hazardous waste. (see Note 1)

Tabla	2 Samn	loc whore	Non-Hoz	WAC are	avcoodod
I able	2 samp	ies where	NUII-IIaz	WALATE	exceeded

Note 1: Per Section 2 paragraph 2.1.2.2 of EU Council Decision 2003-33-EC higher value TOC may be admitted by the competent authority for Inert WAC provided the DOC value of <500 mg/kg is achieved. It is recommended that the receiving destination review WAC test data to ensure suitability for disposal in line with licensing arrangements.

It is noted that this waste classification assessment has been based solely on the available samples results and corresponding investigation findings. In making this assessment all due care and attention to available and relevant legislative and guidance frameworks has been taken in arriving at the conclusions.

Also, potential areas of localised contamination outside the areas of the investigation cannot be discounted. Any potential contamination identified during site development work by visual or olfactory means should be investigated, including further laboratory testing, and appropriate health & safety, waste disposal and remediation measures adopted. Additional testing of the soils to be disposed from site may also be requested by the individual landfill before acceptance at their facility.





8 **REFERENCES**

Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland.

IS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. National Standards Authority of Ireland.

BS 5930: 2015+A1:2020: Code of practice for ground investigations. British Standards Institution.

BS EN ISO 14688-1:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 1 Identification and description.

BS EN ISO 14688-2:2018: Geotechnical investigation and testing. Identification and classification of soil. Part 2 Principles for a classification.

BS 1377: 1990: Methods of test for soils for civil engineering purposes. British Standards Institution.

Building Research Establishment (2007), BRE Digest 365: Soakaways.

Land contamination risk management (LCRM), (2020) Environment Agency.



APPENDIX A SITE AND EXPLORATORY HOLE LOCATION PLANS









APPENDIX B TRIAL PIT LOGS

		Proj	Project No. Project Name:			Trial Pit ID			
		SEWAY	22-	-1762	Richmo	ond Road Phase 2			
		GEOTECH	Coor	dinates	Client:				TP01
			7166	07.86 E	Malkey	Limited			
Method:			7364	68.04 N	Client's	Representative:		Sh	eet 1 of 1
Irial Pitting			Гю	untin an	DBFL C	onsulting Engineers		So	cale: 1:25
			Elev	mon			ger:		FINAL
JCB 3CX	formula /		Loval	MOD Denth	20/12/			5	
(m)	Tests	Field Records	(mOD)	(m)	Legend	Description		Wate	
				0.10				-	_
				-		GRAVEL with fragments of brick and concrete. Sand is fine	to coarse		_
				-					_
				-					_
0.50 0.50	B1 ES2			-					0.5
				-					_
				- 0.75		MADE GROUND: Soft dark brown sandy gravelly CLAY with	fragments of		_
				-		concrete, cinder blocks, scrap metal and wire. Sand is fine Gravel is angular to subangular fine to coarse.	to coarse.		_
				-					1.0
				-					_
				-					_
				-					_
1.50	В3			-				≖	1.5 —
1.50	ES4	Heavy strike at 1 50m		-					_
		neuvy strike ut 1.50m.		1.70		End of trial pit at 1.70m		-	_
				-					_
				-					2.0
				-					_
				-					_
				-					_
				-					_
				-					2.5
				-					_
				-					_
				-					-
				-					3.0
				-					_
				-					_
				-					_
				-					3.5 —
				-					_
				-					-
				-					
				-					4.0
				-					-
				-					-
				-					-
				-					4.5
				-					_
				-					-
				-					-
				-					_
Water	Strikes	Depth: 1.70	Ren	iarks:					
1.50	Heavy strike	width: 0.70							
	1.50m.	Length: 2.10							
		Stability:	Terr	nination R	eason		Last Up	date	
		Unstable	Term	ninated due	to water i	ngress causing the pit to collapse.	20/01	/2023	AGS
				Terminated due to water ingress causing the pit to collapse. 20/01/2					AUD

		Proj	Project No.		Project Name:			Trial Pit ID		
	CALIS	EWAY	22	-1762	Richmo	ond Road Phase 2				
	CAUS		Coor	dinates	Client:				TP02	
		JLOTLCT	74.66		Malkey	Limited				
Method:			- /166	38.20 E	Client'	ient's Representative:		, c	Sheet 1 of 1	
Trial Pitting			7364	60.23 N	DBFL C	DBFL Consulting Engineers			Scale: 1:25	
Plant:			Ele	vation	Date:		Logger:			
ІСВ ЗСХ				mOD	20/12/	2022	DM		FINAL	
Depth	Sample /		Level	Depth				e		
(m)	Tests	Field Records	(mOD)	(m)	Legend	Description		Wat		
				0.10		BITMAC			_	
				-		coarse GRAVEL with fragments of red brick, concr	ete and pieces of		_	
				-		styrafoam. Sand is fine to coarse.			-	
				-					-	
0.50 0.50	B1 FS2			-					0.5	
0.50	232			- 0.60		End of trial pit at 0.60m			_	
				-						
				-					_	
				-					1.0	
				-					_	
				-					-	
				-					-	
				-					-	
				-					1.5 —	
				-						
				-						
				-					_	
				-					2.0	
				-					_	
				-					-	
				-					-	
				-					-	
				-					2.5	
				-						
				-					_	
				-					_	
				-					3.0	
				-					-	
				-					-	
				-					-	
				-					25	
				-						
				-					_	
				-					_	
				-					-	
				-					4.0	
				-					-	
				-					-	
				-						
				-					4.5	
				-					_	
				-					-	
				-					-	
				-					-	
			<u> </u>	<u> </u>						
Wate	er Strikes	Depth: 0.60	Ren	narks:	amber -	accuptored at 0.60m				
Struck at (m)	Remarks	Width: 0.65	No i	≠i piate/ ch groundwat	er encou	ntered.				
		Length: 1.70			-					
		Stability	Torr	mination P	laasan		I .	act I Indet	ed 💻 – P	
		Stability:	ierr	milation K	เซสรบที		"	.asi opuat		
		Stable	Term	ninated on E	ngineer's	instruction.		20/01/202	3 AGS	



APPENDIX C TRIAL PIT PHOTOGRAPHS

Report No.: 22-1762





Report No.: 22-1762





Report No.: 22-1762





Report No.: 22-1762





Report No.: 22-1762





Report No.: 22-1762





Report No.: 22-1762





Report No.: 22-1762





Report No.: 22-1762




Report No.: 22-1762





Report No.: 22-1762





Report No.: 22-1762





Report No.: 22-1762







APPENDIX D SOAKAWAY TEST RESULTS

			Proj	ect No.	Project	Name:		Tri	al Pit ID
	CAUS	FWAY	22-	-1762	Richmond Road Phase 2				
		EOTECH	Coor	dinates	Client:			IT01	
			7166	12.97 F	Malkey	Limited			
Method:			7364	75 15 N	Client's	Representative:		She	et 1 of 1
Trial Pitting			/ 304	/5.15 1	DBFL C	onsulting Engineers		Scale: 1:25	
Plant:			Elev	vation	Date:	Logg	er:	F	ΙΝΑΙ
JCB 3CX				mOD	20/12/	2022 DM			
(m)	Tests	Field Records	(mOD)	(m)	Legend	Description		Wate	
				0.10		TARMAC	-		_
				-		MADE GROUND: Greyish brown sandy angular to subangular coarse GRAVEL with fragments of brick, concrete and pieces	fine to of cloth.		_
				-					-
				-					_
0.50 0.50	B1 ES2			- 0.50		MADE GROUND: Soft to firm brownish black sandy gravelly (LAY with		0.5
				-		fragments of brick and concrete. Sand is fine to coarse.			_
				-					-
				-					_
				-					1.0
				-					_
		Strike at 1.30m.		-			2	•	_
				-					_
1.50	B3			- 1.50		End of trial pit at 1.50m			1.5 —
1.50	L34			-					_
				-					_
				-					_
				-					2.0
				-					_
				-					_
				-					_
				-					2.5
				-					_
				-					_
				-					_
				-					3.0
				-					_
				-					_
				-					_
				-					3.5
				[-
				-					_
									_
				-					4.0
				-					_
				-					-
				-					_
				-					4.5
									-
				-					-
				-					_
				[
Water	Strikes		Ren	narks:					
Struck at (m)	Remarks	Depth: 1.50							
1.30	Strike at 1.30	0m. Width: 0.65							
		Length: 1.80							
		Stability:	Terr	nination R	eason		Last Upda	ated	
		Stable	Term	ninated at sc	heduled o	lepth.	20/01/20	023	AGS

Soakaway Infiltration Test

Project No.: 22-1762

2

Test Location: IT01

ſ

Test Date: 20-Dec-22

Т



and CIRIA Report C697-The SUDS Manual

Analysis using method as described in BRE Digest 365

	width (m)	length (m)
test pit top dimensions	0.65	2.10
test pit base dimensions	0.50	1.70

Т

test pit depth (m)

٦

1.60

depth to groundwater before adding water (m) = Dry

	depth to	
	water surface	depth of water
time (mins)	(m)	in pit (m)
0	0.75	0.85
1	0.75	0.85
2	0.75	0.85
4	0.76	0.84
6	0.77	0.83
8	0.78	0.82
10	0.78	0.82
15	0.79	0.81
20	0.79	0.81
25	0.80	0.80
30	0.80	0.80
45	0.80	0.80
60	0.82	0.78
75	0.83	0.77
90	0.84	0.76
120	0.85	0.75
	depth to	depth of water
time	water	in pit
(mins)	(m)	(m)
	. ,	-

From graph below: test start - 75% depth at 0.6375 m water depth time is not determined

> test end - 25% depth at 0.2125 m water depth time is not determined

infiltration rate (q) is very low

	depth to	depth of water	time	volume of	Area of walls and		
time	water	in pit	elapsed	water lost	base at 50% drop	q	q
(mins)	(m)	(m)	(mins)	(m ³)	(m ²)	(m/min)	(m/h)
	0.96	0.6375					
	1.39	0.2125					



			Proje	ect No.	Project	Name:				Tr	ial Pit ID
		EWAY	22-	-1762	Richmo	ond Road Phase	2				
		EOTECH	Coor	dinates	Client:				IT02		
	0		7166	12 27 F	Malkey	Limited					
Method:			71004	+3.27 E	Client's	s Representative	e:			Sh	eet 1 of 1
Trial Pitting			/ 5041	56.91 N	DBFL C	onsulting Engine	eers			Sc	ale: 1:25
Plant:			Elev	vation	Date:			Logger	:		
JCB 3CX				mOD	20/12/	2022		DM			FINAL
Depth (m)	Sample /	Field Records	Level	Depth (m)	Legend		Description			Vater	
(m)	lests		(mod)	(m) -		TARMAC				>	
				F							-
				- 0.20 [MADE GROUND: B	Brownish grey sandy angular to su	bangular fir	ie to		_
				ŀ		COARSE GRAVEL. Sa	and is the to coarse.				_
0.50	B1			F							0.5 —
0.50	ES2			F							-
				f							_
				0.80		MADE GROUND: S	Soft to firm light brown sandy sligh	tly gravelly	CLAY with		-
				Ē		fragments of yello	w brick, scrap metal and concrete	. Sand is fin	e to		_
				F		coarse. Gravel is su	ubangular to subrounded fine to i	nedium.			1.0
				Ē							_
				+ F							_
				F							_
1.50	В3			- 1.50			End of trial pit at 1 50m				1.5 —
1.50	ES4			Ē							_
				- -							-
				F							_
				F							-
				Ē							2.0
				Ĺ							_
				F							_
				F							-
				Ē							2.5
				ŀ							_
				F							_
				F							-
											3.0
				F							_
				F							-
				Ē							-
				ŀ							-
				ŀ							3.5 —
				f							_
				Ē							_
				ŀ							_
				F							4.0
				F							_
				Ē							_
				F							-
				F							-
				Ē							4.5
				F							_
				F							_
				F							-
				<u> </u>						_	
Water	Strikes	Depth: 1.50	Rem	arks:	_						
Struck at (m)	Remarks	Width 0.70	Nog	groundwate	er encou	ntered.					
		length: 1.90									
			<u> </u>	<u> </u>						<u> </u>	
		Stability:	Tern	nination R	eason				Last Upo	Jated	
		Moderately stable	Term	inated at sc	cheduled o	lepth.			20/01/2	2023	AGS

Soakaway Infiltration Test

Project No.: 22-1762

Test Location: IT02



Test Date:	20-Dec-2	22					
test pit toj test pit base	o dimensions e dimensions	width (m) 0.65 0.40	length (m) 1.90 1.50	And	llysis using method as de and CIRIA Repo	escribed in Bi rt C697-The	RE Digest 365 SUDS Manual
test	pit depth (m)	1.60	C	lepth to groundw	ater before adding w	ater (m) =	Dry
time (mins) 0 1 2 4 6 8 10 15 20 25 30 45 60 75 90 120	depth to water surface (m) 1.00 1.07 1.10 1.18 1.22 1.27 1.30 1.33 1.39 1.41 1.43 1.45 1.48 1.50 1.55 1.60	depth of water in pit (m) 0.60 0.53 0.50 0.42 0.38 0.33 0.30 0.27 0.21 0.19 0.17 0.15 0.12 0.10 0.05 0.00	From g	raph below: test start - 75% d 0.45 time is test end - 25% d 0.15 time is test infi	depth at m water depth 3.0 minutes epth at m water depth 45.0 minutes Itration rate (q) =	0.169	m/h
	depth to	depth of water	time	volume of	Area of walls and		
time	water	in pit	elapsed	water lost	base at 50% drop	q	q
(mins)	(m)	(m)	(mins)	(m^{3})	(m ²)	(m/min)	(m/h)
3	1.15	0.45	40	0.21	1 70	2.05.02	0.1.0
45	1.45	0.15	42	0.21	1.79	2.8E-03	0.169
0.70 +							





APPENDIX E PLATE LOAD TEST RESULTS



TEST REPORT PLATE LOADING TEST

Project Client	Richmond Rd	Test No: Lab Ref No: Date Reported Weather Conditions	22-1762 CBR01 21.12.22 Drv
Technician	DM	Air Temperature °C	7
Date Tested	20.12.22	Plate Dia (mm)	450
GPS Coord's		Depth (m)	0.3
Material Type	MG: CLAY	Reaction Type	15T
No Cycles	1	App Weight (kg)	43



Plate Settlement (mm)	Applied Pressure (kN/m2)
0.00	0.0
4.12	77.1
9.36	124.4
13.02	189.6
14.38	213.7
14.51	212.4
14.01	0.0



	Cycle 1
Maximum Applied Pressure (kPa):	216
Maximum deformation (mm):	14.51
Modulus of subgrade reaction K (MN/m3):	18.7
K762 (MN/m3):	11.7
Estimated CBR (%):	0.7

Comments:

Final loading stage not applied due to high settlement.

Jam O llag.

Approved Signature Causeway Geotech Darren O'Mahony Director

Plate Load - Tested in accordance with BS 1377 : Part 9 Cl. 4.1 : 1990





TEST REPORT PLATE LOADING TEST

Project Client	Richmond Rd	Test No: Lab Ref No: Date Reported Weather Conditions	22-1762 CBR02 21.12.22 Dry
Technician	DM	Air Temperature °C	7
Date Tested Location	20.12.22	Plate Dia (mm)	450
GPS Coord's		Depth (m)	0.3
Material Type	MG: CLAY	Reaction Type	15T
No Cycles	1	App Weight (kg)	43



Plate Settlement (mm)	Applied Pressure (kN/m2)
0.00	0.0
0.24	78.9
0.45	121.7
0.93	180.6
1.65	239.7
2.75	299.3
2.55	0.0



	Cycle 1
Maximum Applied Pressure (kPa):	302
Maximum deformation (mm):	2.75
Modulus of subgrade reaction K (MN/m3):	165.4
K762 (MN/m3):	103.1
Estimated CBR (%):	30

Comments:

Jam O llag.

Approved Signature Causeway Geotech Darren O'Mahony Director

Plate Load - Tested in accordance with BS 1377 : Part 9 Cl. 4.1 : 1990





APPENDIX F ENVIRONMENTAL LABORATORY TEST RESULTS



😵 eurofins

Chemtest

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

Final Report

Report No.:	22-49100-1		
Initial Date of Issue:	18-Jan-2023		
Client	Causeway Geotech Ltd		
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL		
Contact(s):	Alistair McQuat Carin Cornwall Celine Rooney Colm Hurley Darren O'Mahony Dean McCloskey Gabriella Horan Joe Gervin John Cameron Lucy Newland Martin Gardiner Matthew Gilbert Matthew Gilbert Matthew Graham Neil Haggan Paul Dunlop Sean Ross Stephen Franey S		
Project	22-1762 Richmond Road Phase 2		
Quotation No.:		Date Received:	23-Dec-2022
Order No.:		Date Instructed:	23-Dec-2022
No. of Samples:	7		
Turnaround (Wkdays):	8	Results Due:	10-Jan-2023
Date Approved:	18-Jan-2023		
Approved By:			

X

Details:

Stuart Henderson, Technical Manager

eurofins 👬

Chemtest

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

<u> Results - Soil</u>

Project: 22-1762 Richmond Road Phase 2

Client: Causeway Geotech Ltd	Chemtest Job No.:		22-49100	22-49100	22-49100	22-49100	22-49100	22-49100	22-49100		
Quotation No.:	(Chemte	est Sam	ple ID.:	1569217	1569218	1569219	1569220	1569221	1569222	1569223
Order No.:	Client Sample Ref.:		1	2	1	2	1	2	1		
		Sa	ample Lo	ocation:	IT01	IT01	IT02	IT02	TP01	TP01	TP02
			Sampl	e Type:	SOIL						
			Top De	oth (m):	0.5	1.5	0.5	1.5	0.5	1.5	0.5
			Date Sa	ampled:	22-Dec-2022						
Determinand	Accred.	SOP	Units	LOD							
Moisture	Ν	2030	%	0.020	12	29	17	27	9.5	19	17
Arsenic	U	2455	mg/kg	0.5	8.9	7.2	8.1	7.6	12	11	8.7
Barium	U	2455	mg/kg	0	77	55	220	59	48	68	150
Cadmium	U	2455	mg/kg	0.10	0.54	0.78	0.69	0.66	0.79	1.3	0.45
Chromium	U	2455	mg/kg	0.5	5.3	8.9	8.7	8.2	4.1	12	8.5
Molybdenum	U	2455	mg/kg	0.5	2.3	1.9	1.3	1.2	2.1	2.8	0.7
Antimony	N	2455	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	2.1	< 2.0	< 2.0
Copper	U	2455	mg/kg	0.50	41	21	19	17	30	28	33
Mercury	U	2455	mg/kg	0.05	0.31	0.22	1.1	0.40	0.11	0.36	1.6
Nickel	U	2455	mg/kg	0.50	11	22	18	17	11	27	11
Lead	U	2455	mg/kg	0.50	150	55	120	60	50	66	260
Selenium	U	2455	mg/kg	0.25	0.66	0.69	0.53	0.49	0.46	1.1	0.25
Zinc	U	2455	mg/kg	0.50	130	68	130	66	140	95	77
Chromium (Trivalent)	N	2490	mg/kg	1.0	5.3	8.9	8.7	8.2	4.1	12	8.3
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20	3.5	3.4	1.3	1.8	1.2	3.3	0.91
Aliphatic TPH >C5-C6	Ν	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	Ν	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	Ν	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	Ν	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	Ν	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	Ν	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	Ν	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

<u> Results - Soil</u>

Project: 22-1762 Richmond Road Phase 2

Client: Causeway Geotech Ltd	Chemtest Job No.:		22-49100	22-49100	22-49100	22-49100	22-49100	22-49100	22-49100		
Quotation No.:	Chemtest Sample ID.:		1569217	1569218	1569219	1569220	1569221	1569222	1569223		
Order No.:	Client Sample Ref.:		1	2	1	2	1	2	1		
		Sa	ample Lo	ocation:	IT01	IT01	IT02	IT02	TP01	TP01	TP02
			Sampl	e Type:	SOIL						
			Top Dep	oth (m):	0.5	1.5	0.5	1.5	0.5	1.5	0.5
			Date Sa	ampled:	22-Dec-2022						
Determinand	Accred.	SOP	Units	LOD							
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene	U	2800	mg/kg	0.10	0.25	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	Ν	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2800	mg/kg	0.10	0.15	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2800	mg/kg	0.10	1.0	0.42	0.23	0.17	0.19	0.23	0.16
Anthracene	U	2800	mg/kg	0.10	0.22	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2800	mg/kg	0.10	1.3	0.66	0.29	< 0.10	0.34	0.24	0.18
Pyrene	U	2800	mg/kg	0.10	1.1	0.64	0.24	< 0.10	0.37	0.26	0.17
Benzo[a]anthracene	U	2800	mg/kg	0.10	0.65	0.39	< 0.10	< 0.10	< 0.10	0.14	< 0.10
Chrysene	U	2800	mg/kg	0.10	0.60	0.32	< 0.10	< 0.10	< 0.10	0.12	< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	0.91	0.59	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	0.25	0.24	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2800	mg/kg	0.10	0.65	0.41	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	0.46	0.35	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	Ν	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	0.55	0.30	< 0.10	< 0.10	0.18	< 0.10	< 0.10
Coronene	Ν	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 17 PAH's	Ν	2800	mg/kg	2.0	8.1	4.5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 90+101	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 118	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 138	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
PCB 180	U	2815	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total PCBs (7 Congeners)	U	2815	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

Chemtest Job No:	22-49100				Landfill \	Naste Acceptanc	e Criteria
Chemtest Sample ID:	1569217					Limits	
Sample Ref:	1					Stable, Non-	
Sample ID:						reactive	
Sample Location:	IT01					hazardous	Hazardous
Top Depth(m):	0.5				Inert Waste	waste in non-	Waste
Bottom Depth(m):					Landfill	hazardous	Landfill
Sampling Date:	22-Dec-2022					Landfill	
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	3.5	3	5	6
Loss On Ignition	2610	U	%	4.9			10
Total BTEX	2760	U	mg/kg	< 0.010	6		
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1		
TPH Total WAC	2670	U	mg/kg	< 10	500		
Total (Of 17) PAH's	2800	N	mg/kg	8.1	100		
рН	2010	U		8.0		>6	
Acid Neutralisation Capacity	2015	N	mol/kg	0.065		To evaluate	To evaluate
Eluate Analysis			10:1 Eluate	10:1 Eluate	Limit values	eaching test	
			mg/l	mg/kg	using BS EN 12457 at L/S 10 l/kg		
Arsenic	1455	U	0.0041	0.041	0.5	2	25
Barium	1455	U	0.018	0.18	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	0.0031	0.031	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0084	0.084	0.5	10	30
Nickel	1455	U	0.0011	0.011	0.4	10	40
Lead	1455	U	0.0008	0.0083	0.5	10	50
Antimony	1455	U	0.0074	0.074	0.06	0.7	5
Selenium	1455	U	0.0025	0.025	0.1	0.5	7
Zinc	1455	U	0.004	0.042	4	50	200
Chloride	1220	U	1.9	19	800	15000	25000
Fluoride	1220	U	0.22	2.2	10	150	500
Sulphate	1220	U	33	330	1000	20000	50000
Total Dissolved Solids	1020	N	130	1300	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.6	< 50	500	800	1000

Solid Information								
Dry mass of test portion/kg	0.090							
Moisture (%)	12							

Chemtest Job No:	22-49100				LandfIII Waste Acceptance Criteria		
Chemtest Sample ID:	1569218					Limits	
Sample Ref:	2					Stable, Non-	
Sample ID:						reactive	
Sample Location:	IT01					hazardous	Hazardous
Top Depth(m):	1.5				Inert Waste	waste in non-	Waste
Bottom Depth(m):					Landfill	hazardous	Landfill
Sampling Date:	22-Dec-2022					Landfill	
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	3.4	3	5	6
Loss On Ignition	2610	U	%	15			10
Total BTEX	2760	U	mg/kg	< 0.010	6		
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1		
TPH Total WAC	2670	U	mg/kg	< 10	500		
Total (Of 17) PAH's	2800	N	mg/kg	4.5	100		
рН	2010	U		7.6		>6	
Acid Neutralisation Capacity	2015	Ν	mol/kg	0.092		To evaluate	To evaluate
Eluate Analysis			10:1 Eluate	10:1 Eluate	Limit values	for compliance	eaching test
			mg/l	mg/kg	using BS EN 12457 at L/S 10 l/kg		
Arsenic	1455	U	0.0053	0.052	0.5	2	25
Barium	1455	U	0.039	0.39	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	0.0016	0.016	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.025	0.25	0.5	10	30
Nickel	1455	U	0.0016	0.016	0.4	10	40
Lead	1455	U	0.0022	0.022	0.5	10	50
Antimony	1455	U	0.0065	0.064	0.06	0.7	5
Selenium	1455	U	0.0021	0.020	0.1	0.5	7
Zinc	1455	U	0.003	0.029	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.20	2.0	10	150	500
Sulphate	1220	U	50	500	1000	20000	50000
Total Dissolved Solids	1020	N	240	2300	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.7	57	500	800	1000

Solid Information								
Dry mass of test portion/kg	0.090							
Moisture (%)	29							

Chemtest Job No:	22-49100				LandfIII Waste Acceptance Criteria		
Chemtest Sample ID:	1569219					Limits	
Sample Ref:	1					Stable, Non-	
Sample ID:						reactive	
Sample Location:	IT02					hazardous	Hazardous
Top Depth(m):	0.5				Inert Waste	waste in non-	Waste
Bottom Depth(m):					Landfill	hazardous	Landfill
Sampling Date:	22-Dec-2022					Landfill	
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	1.3	3	5	6
Loss On Ignition	2610	U	%	0.91			10
Total BTEX	2760	U	mg/kg	< 0.010	6		
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1		
TPH Total WAC	2670	U	mg/kg	< 10	500		
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100		
рН	2010	U		9.5		>6	
Acid Neutralisation Capacity	2015	Ν	mol/kg	0.0050		To evaluate	To evaluate
Eluate Analysis			10:1 Eluate	10:1 Eluate	Limit values for compliance leaching test		eaching test
			mg/l	mg/kg	using BS EN 12457 at L/S		S 10 I/kg
Arsenic	1455	U	0.0022	0.022	0.5	2	25
Barium	1455	U	0.011	0.11	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	0.0036	0.036	0.5	10	70
Copper	1455	U	0.0009	0.0094	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0017	0.017	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	0.0024	0.024	0.06	0.7	5
Selenium	1455	U	0.0012	0.012	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	4	50	200
Chloride	1220	U	3.8	38	800	15000	25000
Fluoride	1220	U	0.26	2.6	10	150	500
Sulphate	1220	U	11	110	1000	20000	50000
Total Dissolved Solids	1020	N	66	660	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.1	< 50	500	800	1000

Solid Information							
Dry mass of test portion/kg	0.090						
Moisture (%)	17						

Project:	22-1762	Richmond	Road Phase	e 2
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Chemtest Job No:	22-49100				LandfIII Waste Acceptance Criteria			
Chemtest Sample ID:	1569220					Limits		
Sample Ref:	2					Stable, Non-		
Sample ID:						reactive		
Sample Location:	IT02					hazardous	Hazardous	
Top Depth(m):	1.5				Inert Waste	waste in non-	Waste	
Bottom Depth(m):					Landfill	hazardous	Landfill	
Sampling Date:	22-Dec-2022					Landfill		
Determinand	SOP	Accred.	Units					
Total Organic Carbon	2625	U	%	1.8	3	5	6	
Loss On Ignition	2610	U	%	19			10	
Total BTEX	2760	U	mg/kg	< 0.010	6			
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1			
TPH Total WAC	2670	U	mg/kg	< 10	500			
Total (Of 17) PAH's	2800	Ν	mg/kg	< 2.0	100			
рН	2010	U		9.0		>6		
Acid Neutralisation Capacity	2015	Ν	mol/kg	0.18		To evaluate	To evaluate	
Eluate Analysis			10:1 Eluate	10:1 Eluate	Limit values for compliance leaching test		eaching test	
			mg/l	mg/kg	using B	S EN 12457 at L/	at L/S 10 l/kg	
Arsenic	1455	U	0.0044	0.043	0.5	2	25	
Barium	1455	U	0.007	0.073	20	100	300	
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5	
Chromium	1455	U	0.0015	0.015	0.5	10	70	
Copper	1455	U	0.0057	0.057	2	50	100	
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2	
Molybdenum	1455	U	0.0079	0.080	0.5	10	30	
Nickel	1455	U	0.0018	0.018	0.4	10	40	
Lead	1455	U	0.0007	0.0066	0.5	10	50	
Antimony	1455	U	0.0033	0.033	0.06	0.7	5	
Selenium	1455	U	0.0022	0.022	0.1	0.5	7	
Zinc	1455	U	0.006	0.058	4	50	200	
Chloride	1220	U	6.3	63	800	15000	25000	
Fluoride	1220	U	0.26	2.6	10	150	500	
Sulphate	1220	U	11	110	1000	20000	50000	
Total Dissolved Solids	1020	N	110	1100	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-	
Dissolved Organic Carbon	1610	U	4.8	< 50	500	800	1000	

Solid Information							
Dry mass of test portion/kg	0.090						
Moisture (%)	27						

Chemtest Job No:	22-49100				LandfIII Waste Acceptance Criteria		
Chemtest Sample ID:	1569221					Limits	
Sample Ref:	1					Stable, Non-	
Sample ID:						reactive	
Sample Location:	TP01					hazardous	Hazardous
Top Depth(m):	0.5				Inert Waste	waste in non-	Waste
Bottom Depth(m):					Landfill	hazardous	Landfill
Sampling Date:	22-Dec-2022					Landfill	
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	1.2	3	5	6
Loss On Ignition	2610	U	%	9.7			10
Total BTEX	2760	U	mg/kg	< 0.010	6		
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1		
TPH Total WAC	2670	U	mg/kg	< 10	500		
Total (Of 17) PAH's	2800	Ν	mg/kg	< 2.0	100		
рН	2010	U		8.6		>6	
Acid Neutralisation Capacity	2015	Ν	mol/kg	0.026		To evaluate	To evaluate
Eluate Analysis			10:1 Eluate	10:1 Eluate	Limit values for compliance leaching test		eaching test
		mg		mg/kg	using BS EN 12457 at L/S 10 l/kg		
Arsenic	1455	U	0.0038	0.038	0.5	2	25
Barium	1455	U	0.005	0.052	20	100	300
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5
Chromium	1455	U	0.0066	0.066	0.5	10	70
Copper	1455	U	0.0012	0.012	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.0036	0.036	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0050	0.5	10	50
Antimony	1455	U	0.0017	0.018	0.06	0.7	5
Selenium	1455	U	0.0015	0.015	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.12	1.2	10	150	500
Sulphate	1220	U	4.5	45	1000	20000	50000
Total Dissolved Solids	1020	N	52	520	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.2	< 50	500	800	1000

Solid Information							
Dry mass of test portion/kg	0.090						
Moisture (%)	9.5						

Project:	22-1762	Richmond	Road Phase	e 2
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Chemtest Job No:	22-49100				LandfIII Waste Acceptance Criteria		
Chemtest Sample ID:	1569222					Limits	
Sample Ref:	2					Stable, Non-	
Sample ID:						reactive	
Sample Location:	TP01					hazardous	Hazardous
Top Depth(m):	1.5				Inert Waste	waste in non-	Waste
Bottom Depth(m):					Landfill	hazardous	Landfill
Sampling Date:	22-Dec-2022					Landfill	
Determinand	SOP	Accred.	Units				
Total Organic Carbon	2625	U	%	3.3	3	5	6
Loss On Ignition	2610	U	%	3.8			10
Total BTEX	2760	U	mg/kg	< 0.010	6		
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1		
TPH Total WAC	2670	U	mg/kg	< 10	500		
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100		
рН	2010	U		8.2		>6	
Acid Neutralisation Capacity	2015	N	mol/kg	0.025		To evaluate	To evaluate
Eluate Analysis			10:1 Eluate	10:1 Eluate	Limit values for compliance leaching test		eaching test
			mg/l	mg/kg	using B	S EN 12457 at L/S 10 l/kg	
Arsenic	1455	U	0.0012	0.012	0.5	2	25
Barium	1455	U	0.008	0.079	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	0.0011	0.011	2	50	100
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2
Molybdenum	1455	U	0.013	0.13	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	0.0012	0.012	0.06	0.7	5
Selenium	1455	U	0.0010	0.0098	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.025	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	1.6	16	1000	20000	50000
Total Dissolved Solids	1020	N	110	1100	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 (%)	19						

Chemtest Job No:	22-49100				LandfIII Waste Acceptance Criteria					
Chemtest Sample ID:	1569223					Limits				
Sample Ref:	1					Stable, Non-				
Sample ID:						reactive				
Sample Location:	TP02					hazardous	Hazardous			
Top Depth(m):	0.5				Inert Waste	waste in non-	Waste			
Bottom Depth(m):					Landfill	hazardous	Landfill			
Sampling Date:	22-Dec-2022					Landfill				
Determinand	SOP	Accred.	Units							
Total Organic Carbon	2625	U	%	0.91	3	5	6			
Loss On Ignition	2610	U	%	4.3			10			
Total BTEX	2760	U	mg/kg	< 0.010	6					
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1					
TPH Total WAC	2670	U	mg/kg	< 10	500					
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100					
рН	2010	U		8.3		>6				
Acid Neutralisation Capacity	2015	N	mol/kg	0.029		To evaluate	To evaluate			
Eluate Analysis	luate Analysis 10:1 Eluate			10:1 Eluate	Limit values	for compliance leaching test				
			mg/l	mg/kg	using B	S EN 12457 at L/	S 10 I/kg			
Arsenic	1455	U	0.031	0.30	0.5	2	25			
Barium	1455	U	0.032	0.32	20	100	300			
Cadmium	1455	U	< 0.00011	< 0.0011	0.04	1	5			
Chromium	1455	U	0.047	0.47	0.5	10	70			
Copper	1455	U	0.0011	0.011	2	50	100			
Mercury	1455	U	< 0.00005	< 0.00050	0.01	0.2	2			
Molybdenum	1455	U	0.0012	0.012	0.5	10	30			
Nickel	1455	U	< 0.0005	< 0.0050	0.4	10	40			
Lead	1455	U	0.0037	0.037	0.5	10	50			
Antimony	1455	U	0.0015	0.015	0.06	0.7	5			
Selenium	1455	U	0.0010	0.0098	0.1	0.5	7			
Zinc	1455	U	0.007	0.073	4	50	200			
Chloride	1220	U	< 1.0	< 10	800	15000	25000			
Fluoride	1220	U	0.42	4.2	10	150	500			
Sulphate	1220	U	6.4	64	1000	20000	50000			
Total Dissolved Solids	1020	N	65	650	4000	60000	100000			
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-			
Dissolved Organic Carbon	1610	U	2.9	< 50	500	800	1000			

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	17

Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity 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
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	рН	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
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.
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

Test Methods

SOP	Title	Parameters included	Method summary
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
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

Кеу	
U	UKAS accredited
Μ	MCERTS and UKAS accredited
Ν	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
Т	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: <u>customerservices@chemtest.com</u>



APPENDIX G WASTE CLASSIFICATION REPORT



HazWasteOnline[™]

Waste Classification Report

HazWasteOnline[™] classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is

Job name 22-1762 Richmond Road Phase 2 Description/Comments Waste classification on samples recovered from site in December 2022. Project Site 22-1762 Site 22-1762 Richmond Road Phase 2 Classified by Name: Company: Sean Ross Causeway Geotech Ltd Unit 1 Fingal House, Stephenstown Date: Balbriggan K32 VR66 House Classification Course that covers the use of the source water dessification to course that covers the use of the source water dessification to course that covers the use of the source water dessification to course that covers the use of the source water dessification to course that covers the use of the source water dessification to course that covers the use of the source water dessification to course the to water dessification to be nemed every source. HazWasteOnline™ Certification:	 Not assessed). It is the resporting a) understand the origin of b) select the correct List of d d) select and justify the che correctly apply moisture f) add the meta data for thg) check that the classifica 	ACPCC-JVDA5-16WD8		
22-1762 Richmond Road Phase 2 Description/Comments Waste classification on samples recovered from site in December 2022. Project 22-1762 Classified by Name: Company: Causeway Geotech Ltd Causeway Geotech Ltd Causeway Geotech Ltd Date: Unit 1 Fingal House, Stephenstown Industrial Estate, Balbriggan K32 VR66 HazNate Classification Course HazNaste Classification Course HazNaste Classification Date S0% complete Purpose of classification Causeway Geotech Causeway Geotech Course HazNaste Classification Date S1C for the process giving rise to the waste Redevelopment of industrial site into a residential development.	Job name			
Description/Comments Waste classification on samples recovered from site in December 2022. Project Site 22-1762 Richmond Road Phase 2 Classified by Name: Classified by Name: Sean Ross Causeway Geotech Ltd Unit 1 Fingal House, Stephenstown Industrial Estate, Balbriggan K32 VR66 Purpose of classification Purpose of classification 2- Material Characterisation Address of the waste Richmond Road, Dublin. Sto for the process giving rise to the waste Purpose of industry/producer giving rise to the waste Richmond Road, Dublin.	22-1762 Richmond Road	Phase 2		
Waste classification on samples recovered from site in December 2022. Project Site P22-1762 Richmond Road Phase 2 Classified by Company: Vame: Company: Sean Ross Causeway Geotech Ltd Date: Unit 1 Fingal House, Stephenstown Industrial Estate, Balbriggan K32 VR66 Course Purpose of classification Date 2- Material Characterisation 50% complete Address of the waste Richmond Road, Dublin. SIC for the process giving rise to the waste Post Code N/A SIC for the process giving rise to the waste Redevelopment of industry/producer giving rise to the waste	Description/Commen	ts		
Project Site 22-1762 Richmond Road Phase 2 Classified by Name: Company: Sean Ross Causeway Geotech Ltd Unit 1 Fingal House, Stephenstown Industrial Estate, Balbriggan HazWasteOnline™ provides a two day, hazardous waste classification techniques. Certification 20 Jan 2023 10:40 GMT Industrial Estate, Date Balbriggan Course Date X32 VR66 Course Date Purpose of classification 50% complete Address of the waste Site Richmond Road, Dublin. Post Code N/A SIC for the process giving rise to the waste Site into a residential development.	Waste classification on sa	mples recovered from site in December 20)22.	
222-1762 Richmond Road Phase 2 Classified by Name: Company: Sean Ross Causeway Geotech Ltd use of the software and both basic and advanced waste classification course that covers the use of the software and both basic and advanced waste classification course that covers the use of the software and both basic and advanced waste classification course that covers the use of the software and both basic and advanced waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years. 20 Jan 2023 10:40 GMT Unit 1 Fingal House, Stephenstown industrial Estate, Balbriggan K32 VR66 HazWasteOnline™ Certification: - Purpose of classification 20 Waste Classification 50% complete Purpose of the waste - - - Richmond Road, Dublin. Post Code N/A - SlC for the process giving rise to the waste - - Description of industry/producer giving rise to the waste - - Redevelopment of industrial site into a residential development. - -	Project		Site	
Classified by Name: Company:: Sean Ross Causeway Geotech Ltd Date: Unit 1 Fingal House, Stephenstown Industrial Estate, Balbriggan K32 VR66 Course Purpose of classification Date 2- Material Characterisation 50% complete Address of the waste Post Code N/A SIC for the process giving rise to the waste Post Code N/A Description of industry/producer giving rise to the waste Revelopment of industrial site into a residential development.	22-1762		Richmond Road Phase 2	
Name: Company: HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basis and advanced waste classification techniques. Certification has to be renewed every 3 years. Date: Unit 1 Fingal House, Stephenstown industrial Estate, HazWasteOnline™ Certification: - Balbriggan K32 VR66 Date - - Purpose of classification Software - - - Address of the waste -	Classified by			
Purpose of classification 2 - Material Characterisation Address of the waste Richmond Road, Dublin. Post Code N/A SIC for the process giving rise to the waste Description of industry/producer giving rise to the waste Redevelopment of industrial site into a residential development.	Name: Sean Ross Date: 20 Jan 2023 10:40 GMT Telephone:	Company: Causeway Geotech Ltd Unit 1 Fingal House, Stephenstown Industrial Estate, Balbriggan K32 VR66	HazWasteOnline [™] provides a two day, hazardous waste clas use of the software and both basic and advanced waste clas has to be renewed every 3 years. HazWasteOnline [™] Certification: Course Hazardous Waste Classification	stification course that covers the sification techniques. Certification - Date 50% complete
2 - Material Characterisation Address of the waste Richmond Road, Dublin. Post Code N/A SIC for the process giving rise to the waste Description of industry/producer giving rise to the waste Redevelopment of industrial site into a residential development.	Purpose of classificat	ion		
Address of the waste Richmond Road, Dublin. Post Code N/A SIC for the process giving rise to the waste Description of industry/producer giving rise to the waste Redevelopment of industrial site into a residential development.	2 - Material Characterisati	on		
Richmond Road, Dublin. Post Code N/A SIC for the process giving rise to the waste Description of industry/producer giving rise to the waste Redevelopment of industrial site into a residential development.	Address of the waste			
SIC for the process giving rise to the waste Description of industry/producer giving rise to the waste Redevelopment of industrial site into a residential development.	Richmond Road, Dublin.		Post	t Code N/A
Description of industry/producer giving rise to the waste Redevelopment of industrial site into a residential development.	SIC for the process gi	iving rise to the waste		
Description of industry/producer giving rise to the waste Redevelopment of industrial site into a residential development.				
Redevelopment of industrial site into a residential development.	Description of indust	ry/producer giving rise to the waste	Ś	
	Redevelopment of industr	al site into a residential development.		
Description of the specific process, sub-process, and/or activity that created the waste	Description of the sp	cific process sub-process and/or	activity that created the waste	
Vaste created during redevelopment of the site.	Vaste created during rede	evelopment of the site	astraty that oreated the waste	

Description of the waste

Generally reworked soft to firm brown sandy gravelly clay with construction waste (e.g. concrete, brick and scrap metal fragments).



Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	WAC F	Page		
#	Sample hame	Deptilling	Classification Result	riazaru properties	Inert	Non Haz	- i aye	
1	IT01-1-22/12/2022-0.5	0.5	Non Hazardous		Fail	Pass	3	
2	IT01-2-22/12/2022-1.5	1.5	Non Hazardous		Fail	Pass	6	
3	IT02-1-22/12/2022-0.5	0.5	Non Hazardous		Pass	Pass	9	
4	IT02-2-22/12/2022-1.5	1.5	Non Hazardous		Pass	Pass	12	
5	TP01-1-22/12/2022-0.5	0.5	Non Hazardous		Pass	Pass	15	
6	TP01-2-22/12/2022-1.5	1.5	Non Hazardous		Fail	Pass	18	
7	TP02-1-22/12/2022-0.5	0.5	Non Hazardous		Pass	Pass	21	

Related documents

# Name	Description
1 HWOL_22-49100-20230118 143343.hwol	Eurofins Chemtest .hwol file used to populate the Job
2 Example waste stream template for contaminated soils	waste stream template used to create this Job

WAC results

WAC Settings: samples in this Job do not constitute a single population.

WAC limits used to evaluate the samples in this Job: "Ireland" The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

Report	
Created by: Sean Ross	Created date: 20 Jan 2023 10:40 GMT

Appendices	Page
Appendix A: Classifier defined and non EU CLP determinands	24
Appendix B: Rationale for selection of metal species	25
Appendix C: Version	26



HazWasteOnline[™] Report created by Sean Ross on 20 Jan 2023

Classification of sample: IT01-1-22/12/2022-0.5



Sample details

Sample name:	LoW Code:	
IT01-1-22/12/2022-0.5	Chapter:	17: Construction and Demolition Wastes (including excavated soil
Sample Depth:		from contaminated sites)
0.5 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05
Moisture content:		03)
12%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 12% Wet Weight Moisture Correction applied (MC)

#		EU CLP index	Determinand EC Number	CAS Number	CLP Note	User entere	d data	Conv. Factor	Compound	conc.	Classification value	MC Applied	Conc. Not Used
1	4	antimony { antimor	y trioxide }			<2	mg/kg	1.197	<2.394	mg/kg	<0.000239 %		<lod< td=""></lod<>
2	*	051-005-00-X arsenic { arsenic tr 033-003-00-0	215-175-0 ioxide } 215-481-4	1309-64-4		8.9	mg/kg	1.32	10.341	mg/kg	0.00103 %	~	
3	~	cadmium {	<mark>m oxide</mark> } 215-146-2	1306-19-0		0.54	mg/kg	1.142	0.543	mg/kg	0.0000543 %	~	
4	4	chromium in chrom chromium(III) oxide	hium(III) compound e (worst case) 215-160-9	ls {	_	5.3	mg/kg	1.462	6.817	mg/kg	0.000682 %	~	
5	\$	chromium in chrom compounds, with th of compounds spe	hium(VI) compound he exception of bar cified elsewhere in	this Annex }		<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<lod< td=""></lod<>
6		copper { dicopper {	oxide; copper (I) ox	(ide }		41	mg/kg	1.126	40.622	mg/kg	0.00406 %	~	
7	*	lead { <mark>lead chroma</mark> 082-004-00-2	231-846-0	7758-97-6	1	150	mg/kg	1.56	205.896	mg/kg	0.0132 %	~	
8	*	mercury { mercury 080-010-00-X	dichloride } 231-299-8	7487-94-7		0.31	mg/kg	1.353	0.369	mg/kg	0.0000369 %	\checkmark	
9	*	molybdenum {	ybdenum(VI) oxide 215-204-7	} 1313-27-5		2.3	mg/kg	1.5	3.036	mg/kg	0.000304 %	~	
10	4	nickel { nickel chro 028-035-00-7	<mark>mate</mark> } 238-766-5	14721-18-7		11	mg/kg	2.976	28.81	mg/kg	0.00288 %	\checkmark	
11	4	selenium { nickel s 028-031-00-5	elenate } 239-125-2	15060-62-5		0.66	mg/kg	2.554	1.483	mg/kg	0.000148 %	\checkmark	
12	*	zinc { zinc chromat	te } 236-878-9	13530-65-9		130	mg/kg	2.774	317.362	mg/kg	0.0317 %	~	
13		tert-butyl methyl et 2-methoxy-2-methy 603-181-00-X	her; MTBE; ylpropane	1634-04-4		<0.001	mg/kg		<0.001	mg/kg	<0.000001 %		<lod< td=""></lod<>
14		benzene 601-020-00-8	200-753-7	71-43-2		<0.001	mg/kg		<0.001	mg/kg	<0.000001 %		<lod< td=""></lod<>
15		toluene 601-021-00-3	203-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< td=""></lod<>





#		Determinand		Note	User entere	d data	Conv.	Compound conc.		Classification	Applied	Conc. Not	
		EU CLP index number	EC Number	CAS Number	CLP			Factor			value	MC /	Used
16	8	ethylbenzene				<0.001	ma/ka		<0.001	ma/ka	<0.000001 %		<1 OD
		601-023-00-4	202-849-4	100-41-4									
		xylene											
17		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.002	mg/kg		<0.002	mg/kg	<0.0000002 %		<lod< td=""></lod<>
18		naphthalene				0.25	mg/kg		0.22	mg/kg	0.000022 %	\checkmark	
		601-052-00-2	202-049-5	91-20-3			0.0					Ľ	
19	۲	acenaphthylene				<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
			205-917-1	208-96-8			5.5						-
20	۲	acenaphthene				<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
			201-469-6	83-32-9	1								
21	0	fluorene				0.15	ma/ka		0.132	ma/ka	0.0000132 %	1	
			201-695-5	86-73-7						0.0000102 //	Ň		
22	۲	phenanthrene				1	ma/ka		0.88	ma/ka	0.000088 %	1	
			201-581-5	85-01-8							*		
23	۲	anthracene				0.22	ma/ka		0.194	ma/ka	0.0000194 %	1	
			204-371-1	120-12-7								*	
24	۲	fluoranthene				1.3	ma/ka		1,144	ma/ka	0.000114 %	1	
			205-912-4	206-44-0								*	
25	۲	pyrene				1.1	ma/ka		0.968	ma/ka	0.0000968 %	1	
			204-927-3	129-00-0						5.5		ľ	
26		benzo[a]anthracen	ie			0.65	ma/ka		0.572	ma/ka	0.0000572 %	1	
		601-033-00-9	200-280-6	56-55-3			5.5			5.5			
27		chrysene				0.6	ma/ka		0.528	ma/ka	0.0000528 %		
		601-048-00-0 205-923-4 218-01-9							5.5				
28		benzo[b]fluoranthene			0.91	0.91	ma/ka		0.801 m	ma/ka	0.0000801 %		
		601-034-00-4 205-911-9 205-99-2			olo i iiigii						Ľ		
29		benzo[k]fluoranthene			0.25 mg/kg	ma/ka		0.22	ma/ka	0 000022 %			
		601-036-00-5 205-916-6 207-08-9							5.5				
30		benzo[a]pyrene; benzo[def]chrysene			0.65	mg/ka		0.572	mg/ka	0.0000572 %	1		
		601-032-00-3	200-028-5	50-32-8		cico ing/ig	5.3					Ľ	
31	۲	indeno[123-cd]pyre	ene			0.46	ma/ka		0.405	ma/ka	0.0000405 %	1	
			205-893-2	193-39-5								Ľ	
32		dibenz[a,h]anthrac	ene			<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
Ľ		601-041-00-2	200-181-8	53-70-3			39			39			
33	۲	benzo[ghi]perylene	Э			0.55	ma/ka		0.484	ma/ka	0.0000484 %		
			205-883-8	191-24-2			3.9			5.5		Ľ	
34	۲	polychlorobipheny	ls; PCB			<0.1	mg/ka		<0.1	mg/ka	<0.00001 %		<lod< td=""></lod<>
		602-039-00-4	215-648-1	1336-36-3						0.0			
35	4	barium { 📍 barium	sulphide }			77	ma/ka	1 233	83 582	ma/ka	0.00836 %		
		016-002-00-X	244-214-4	21109-95-5	1	.,	ing/kg	1.200	00.002	nig/kg	0.00836 %		
20		coronene		·		-0.1	meller		-0.1	meller	-0.00001.0/		
30			205-881-7	191-07-1	1	<0.1	тід/кд		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
										Total:	0.0636 %	Γ	

Kev

ney	
	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
0	Determinand defined or amended by HazWasteOnline (see Appendix A)
4	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<lod< th=""><th>Below limit of detection</th></lod<>	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification



WAC results for sample: IT01-1-22/12/2022-0.5

WAC Settings: samples in this Job do not constitute a single population.

WAC limits used to evaluate this sample: "Ireland" The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample FAILS the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

	Solid Waste Analysis	Landfill Waste Acceptance Criteria Limits			
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	3.5	3	5
2	LOI (loss on ignition)	%	4.9	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.01	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.1	1	-
5	Mineral oil (C10 to C40)	mg/kg	<10	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	8.1	100	-
7	рН	pН	8	-	>6
8	ANC (acid neutralisation capacity)	mol/kg	0.065	-	-
	Eluate Analysis 10:1				
9	arsenic	mg/kg	0.041	0.5	2
10	barium	mg/kg	0.18	20	100
11	cadmium	mg/kg	<0.0011	0.04	1
12	chromium	mg/kg	<0.005	0.5	10
13	copper	mg/kg	0.031	2	50
14	mercury	mg/kg	<0.0005	0.01	0.2
15	molybdenum	mg/kg	0.084	0.5	10
16	nickel	mg/kg	0.011	0.4	10
17	lead	mg/kg	0.0083	0.5	10
18	antimony	mg/kg	0.074	0.06	0.7
19	selenium	mg/kg	0.025	0.1	0.5
20	zinc	mg/kg	0.042	4	50
21	chloride	mg/kg	19	800	15,000
22	fluoride	mg/kg	2.2	10	150
23	sulphate	mg/kg	330	1,000	20,000
24	phenol index	mg/kg	<0.3	1	-
25	DOC (dissolved organic carbon)	mg/kg	<50	500	800
26	TDS (total dissolved solids)	mg/kg	1300	4,000	60,000

Key

User supplied data

Inert WAC criteria fail



HazWasteOnline[™] Report created by Sean Ross on 20 Jan 2023

Classification of sample: IT01-2-22/12/2022-1.5

Non Hazardous Waste Classified as 17 05 04 in the List of Waste

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Sample details

Sample name:	LoW Code:	
T01-2-22/12/2022-1.5	Chapter:	17: Construction and Demolition Wastes (including excavated soil
Sample Depth:		from contaminated sites)
1.5 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05
Moisture content:		03)
29%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 29% Wet Weight Moisture Correction applied (MC)

#		EU CLP index number	Determinand EC Number	CAS Number	CLP Note	User entere	d data	Conv. Factor	Compound	conc.	Classification value	MC Applied	Conc. Not Used
1	*	antimony { antimon 051-005-00-X	by trioxide }	1309-64-4		<2	mg/kg	1.197	<2.394	mg/kg	<0.000239 %		<lod< td=""></lod<>
2	4	arsenic { arsenic tri 033-003-00-0	<mark>ioxide</mark> } 215-481-4	1327-53-3		7.2	mg/kg	1.32	6.75	mg/kg	0.000675 %	\checkmark	
3	4	cadmium { <mark>cadmiur</mark> 048-002-00-0	<mark>m oxide</mark> } 215-146-2	1306-19-0		0.78	mg/kg	1.142	0.633	mg/kg	0.0000633 %	\checkmark	
4	4	chromium in chrom <mark>chromium(III) oxide</mark>	nium(III) compound (worst case) } 215-160-9	s {		8.9	mg/kg	1.462	9.236	mg/kg	0.000924 %	~	
5	*	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }			<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<lod< td=""></lod<>	
6	4	024-017-00-8 copper { dicopper (029-002-00-X	Dxide; copper (I) ox	ide }		21	mg/kg	1.126	16.787	mg/kg	0.00168 %	~	
7	4	lead { lead chroma 082-004-00-2	te } 231-846-0	7758-97-6	1	55	mg/kg	1.56	60.911	mg/kg	0.0039 %	\checkmark	
8	4	mercury { mercury 080-010-00-X	dichloride } 231-299-8	7487-94-7		0.22	mg/kg	1.353	0.211	mg/kg	0.0000211 %	\checkmark	
9	4	molybdenum { moly 042-001-00-9	ybdenum(VI) oxide 215-204-7	} 1313-27-5		1.9	mg/kg	1.5	2.024	mg/kg	0.000202 %	\checkmark	
10	4	nickel { nickel chror 028-035-00-7	<mark>mate</mark> } 238-766-5	14721-18-7		22	mg/kg	2.976	46.489	mg/kg	0.00465 %	\checkmark	
11	4	selenium { nickel se 028-031-00-5	<mark>elenate</mark> } 239-125-2	15060-62-5		0.69	mg/kg	2.554	1.251	mg/kg	0.000125 %	\checkmark	
12	4	zinc { <mark>zinc chromat</mark> 024-007-00-3	<mark>e</mark> } 236-878-9	13530-65-9		68	mg/kg	2.774	133.936	mg/kg	0.0134 %	~	
13		tert-butyl methyl et 2-methoxy-2-methy 603-181-00-X	her; MTBE; /lpropane	1634-04-4		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< td=""></lod<>
14		benzene 601-020-00-8	200-753-7	71-43-2		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< td=""></lod<>
15		toluene 601-021-00-3	203-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.000001 %		<lod< td=""></lod<>

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#			Determinand		Note	User entere	d data	Conv.	Compound	conc.	Classification	Applied	Conc. Not
		EU CLP index number	EC Number	CAS Number	CLP			i dotor			Value	MC	0000
16	8	ethylbenzene		•		<0.001	ma/ka		<0.001	ma/ka	<0.000001 %		
10		601-023-00-4	202-849-4	100-41-4		<0.001	iiig/kg		<0.001	iiig/kg	<0.0000001 /8		LOD
17		xylene 601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.002	mg/kg		<0.002	mg/kg	<0.0000002 %		<lod< td=""></lod<>
18		naphthalene				0.11	ma/ka		0 0781	ma/ka	0 00000781 %	./	
10		601-052-00-2	202-049-5	91-20-3	1	0.11	ing/itg		0.0701	iiig/itg	0.00000101 /0	Ň	
19	0	acenaphthylene	205-917-1	208-96-8		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
20	0	acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
			201-469-6	83-32-9									
21	0	fluorene	bo4 co5 5	00.70.7		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
	_	2U1-695-5 ¢6-73-7											
22	۲	phenantinene	201-581-5	85-01-8	-	0.42	mg/kg		0.298	mg/kg	0.0000298 %	\checkmark	
23	0	anthracene				0.11	mg/kg		0.0781	mg/kg	0.00000781 %	\checkmark	
			204-371-1	120-12-7									
24	۲	fluoranthene				0.66	mg/kg		0.469	mg/kg	0.0000469 %	\checkmark	
			205-912-4	206-44-0	-							\vdash	
25	۲	pyrene	004 027 2	120.00.0		0.64	mg/kg		0.454	mg/kg	0.0000454 %	\checkmark	
		benzolalanthracen	204-927-3	129-00-0								+	
26		601-033-00-9	200-280-6	56-55-3	-	0.39	mg/kg		0.277	mg/kg	0.0000277 %	\checkmark	
		chrysene	200 200 0	00 00 0									
27		601-048-00-0 205-923-4 218-01-9			-	0.32	mg/kg		0.227	mg/kg	0.0000227 %	\checkmark	
		benzo[b]fluoranthene			0.59	mg/kg		0.419		0.0000419 %	\checkmark		
28		601-034-00-4 205-911-9 205-99-2							-			mg/kg	
20		benzoľkifluoranthene					0.47	malle	0.000047.0/	,			
29		601-036-00-5	6-00-5 205-916-6 207-08-9			0.24	тід/кд		0.17	mg/kg	0.000017 %	\checkmark	
30		benzo[a]pyrene; be	enzo[def]chrysene			0.41	ma/ka		0 201	ma/ka	0 0000291 %	,	
30		601-032-00-3	200-028-5	50-32-8		0.41	iiig/kg		0.231	iiig/kg	0.0000231 /0	~	
31		indeno[123-cd]pyre	ene			0.35	ma/ka		0 248	ma/ka	0.0000248 %	1	
<u> </u>			205-893-2	193-39-5	1	0.00			0.2.10	під/кд	0.00002.10 //	\checkmark	
32		dibenz[a,h]anthrac	ene			<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
		601-041-00-2	200-181-8	53-70-3									
33	۲	benzo[ghi]perylene	9	T		0.3	mg/kg		0.213	mg/kg	0.0000213 %	\checkmark	
			205-883-8	191-24-2	_							\square	
34	Θ	polychlorobipheny	IS; PCB	4000.00.0		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		602-039-00-4	¥15-648-1	1336-36-3	-							\vdash	
35	44	barium { [®] barium	sulphide }			55	mg/kg	1.233	233 48.168	mg/kg	0.00482 %	\checkmark	
		016-002-00-X	244-214-4	21109-95-5	_								
36	0	coronene	205-881-7	191-07-1		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		I		1010/1				Total:		0.0312 %			

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
4	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<lod< td=""><td>Below limit of detection</td></lod<>	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification



WAC results for sample: IT01-2-22/12/2022-1.5

WAC Settings: samples in this Job do not constitute a single population.

WAC limits used to evaluate this sample: "Ireland" The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample FAILS the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

	Solid Waste Analysis	Landfill Waste Acceptance Criteria Limits			
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	3.4	3	5
2	LOI (loss on ignition)	%	15	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.01	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.1	1	-
5	Mineral oil (C10 to C40)	mg/kg	<10	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	4.5	100	-
7	рН	pН	7.6	-	>6
8	ANC (acid neutralisation capacity)	mol/kg	0.092	-	-
	Eluate Analysis 10:1				
9	arsenic	mg/kg	0.052	0.5	2
10	barium	mg/kg	0.39	20	100
11	cadmium	mg/kg	<0.0011	0.04	1
12	chromium	mg/kg	<0.005	0.5	10
13	copper	mg/kg	0.016	2	50
14	mercury	mg/kg	<0.0005	0.01	0.2
15	molybdenum	mg/kg	0.25	0.5	10
16	nickel	mg/kg	0.016	0.4	10
17	lead	mg/kg	0.022	0.5	10
18	antimony	mg/kg	0.064	0.06	0.7
19	selenium	mg/kg	0.02	0.1	0.5
20	zinc	mg/kg	0.029	4	50
21	chloride	mg/kg	<10	800	15,000
22	fluoride	mg/kg	2	10	150
23	sulphate	mg/kg	500	1,000	20,000
24	phenol index	mg/kg	<0.3	1	
25	DOC (dissolved organic carbon)	mg/kg	57	500	800
26	TDS (total dissolved solids)	mg/kg	2300	4,000	60,000

Key

User supplied data

Inert WAC criteria fail


Classification of sample: IT02-1-22/12/2022-0.5



Sample details

Sample name:	LoW Code:	
IT02-1-22/12/2022-0.5	Chapter:	17: Construction and Demolition Wastes (including excavated soil
Sample Depth:		from contaminated sites)
0.5 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05
Moisture content:		03)
17%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 17% Wet Weight Moisture Correction applied (MC)

#		EU CLP index number	Determinand EC Number	CAS Number	CLP Note	User entere	User entered data		Compound conc.		Classification value	MC Applied	Conc. Not Used
1	4	antimony { antimor 051-005-00-X	by trioxide }	1309-64-4		<2	mg/kg	1.197	<2.394	mg/kg	<0.000239 %		<lod< th=""></lod<>
2	4	arsenic { arsenic tr 033-003-00-0	<mark>ioxide</mark> } 215-481-4	1327-53-3		8.1	mg/kg	1.32	8.877	mg/kg	0.000888 %	~	
3	\$	cadmium {	<mark>m oxide</mark> } 215-146-2	1306-19-0		0.69	mg/kg	1.142	0.654	mg/kg	0.0000654 %	\checkmark	
4	4	<pre>chromium in chromium(III) compounds { chromium(III) oxide (worst case) }</pre>		_	8.7	mg/kg	1.462	10.554	mg/kg	0.00106 %	~		
5	*	chromium in chrom compounds, with th of compounds spec	hium(VI) compound the exception of bar cified elsewhere in	Is { chromium (VI) ium chromate and this Annex }		<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<lod< td=""></lod<>
6	*	copper { dicopper c	D <mark>oxide; copper (I) ox</mark>	ide }		19	mg/kg	1.126	17.755	mg/kg	0.00178 %	√	
7	4	029-002-00-X lead { <mark>lead chroma</mark> 082-004-00-2	215-270-7 te } 231-846-0	7758-97-6	1	120	mg/kg	1.56	155.358	mg/kg	0.00996 %	~	
8	\$	mercury { mercury 080-010-00-X	dichloride } 231-299-8	7487-94-7	-	1.1	mg/kg	1.353	1.236	mg/kg	0.000124 %	~	
9	*	molybdenum { moly 042-001-00-9	ybdenum(VI) oxide 215-204-7	} 1313-27-5		1.3	mg/kg	1.5	1.619	mg/kg	0.000162 %	\checkmark	
10	&	nickel { <mark>nickel chro</mark> i 028-035-00-7	<mark>mate</mark> } 238-766-5	14721-18-7		18	mg/kg	2.976	44.465	mg/kg	0.00445 %	\checkmark	
11	*	selenium { nickel so 028-031-00-5	<mark>elenate</mark> } 239-125-2	15060-62-5		0.53	mg/kg	2.554	1.123	mg/kg	0.000112 %	\checkmark	
12	*	zinc { zinc chromat 024-007-00-3	<mark>e</mark> } 236-878-9	13530-65-9		130	mg/kg	2.774	299.33	mg/kg	0.0299 %	\checkmark	
13		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane 603-181-00-X 216-653-1 1634-04-4		_	<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< td=""></lod<>	
14		benzene 601-020-00-8	200-753-7	71-43-2		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< td=""></lod<>
15		toluene 601-021-00-3	203-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< th=""></lod<>





#			Determinand		Note	User entere	d data	Conv.	Compound	conc.	Classification	Applied	Conc. Not
		EU CLP index number	EC Number	CAS Number	CLP			Factor	•		value	MC /	Used
16	8	ethylbenzene				<0.001	ma/ka		< 0.001	ma/ka	<0.0000001 %		<lod< td=""></lod<>
		601-023-00-4	202-849-4	100-41-4									
		xylene											
17		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.002	mg/kg		<0.002	mg/kg	<0.000002 %		<lod< td=""></lod<>
18		naphthalene	202-049-5	91-20-3		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
	_	acenaphthylene	202 043 0	51200									
19	۲		205-917-1	208-96-8	{	<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
-	_	acenaphthene	200 011 1	200 00 0									
20			201-469-6	83-32-9		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
-		fluorene											
21	-		201-695-5	86-73-7		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
22		phenanthrene		1		0.00			0 101		0.0000101.0/		
22			201-581-5	85-01-8		0.23	тід/кд		0.191	тід/кд	0.0000191 %		
23		anthracene				-0.1	ma/ka		<0.1	ma/ka	<0.00001 %		
25			204-371-1	120-12-7		<0.1	iiig/kg		<0.1	iiig/kg	<0.00001 /8		
24		fluoranthene				0.29	ma/ka		0 241	ma/ka	0 0000241 %	./	
Ľ.			205-912-4	206-44-0		0.20	iiig/itg		0.211	ing/itg	0.000021170	Ň	
25	۲	pyrene				0.24	ma/ka		0.199	ma/ka	0.0000199 %		
			204-927-3	129-00-0	<u> </u>		5.5					Ľ	
26		benzo[a]anthracene			<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>	
		601-033-00-9	200-280-6	56-55-3									
27		chrysene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		601-048-00-0	205-923-4	218-01-9	-								
28		benzo[b]fluoranthe	ne	bar an a		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		601-034-00-4	205-911-9	205-99-2								\square	
29		benzo[k]fluorantne	ne	007.00.0		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
-		601-036-00-5	205-916-6	207-08-9	-								
30		601-032-00-3	200-028-5	50-32-8		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
-	_	indeno[123-cd]pyre	200-020-3	50-52-0									
31	۲		205-893-2	193-39-5		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		dibenz[a h]anthrac	ene	100 00 0									
32		601-041-00-2	200-181-8	53-70-3	{	<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		benzolahilpervlene	•										
33	-	10 110 11 1 10	205-883-8	191-24-2	{	<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
24		polychlorobiphenyl	ls; PCB	1	1	-0.1			.0.1		-0.00001.9/	Π	
34		602-039-00-4	215-648-1	1336-36-3	1	<0.1	тіg/кg		<0.1	тıg/кg	<0.00001 %		<lud< td=""></lud<>
0.5	æ	barium {	sulphide }			000		1 000	005 000		0.0005.01		
35		016-002-00-X	244-214-4	21109-95-5	-	220	mg/kg	1.233	225.236	mg/kg	0.0225 %	\checkmark	
0.0		coronene		1	1				<u> </u>		0.00001.0/		1.65
36	-		205-881-7	191-07-1	1	<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
										Total:	0.0716 %	Γ	

Kev

ney	
	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
0	Determinand defined or amended by HazWasteOnline (see Appendix A)
4	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<lod< th=""><th>Below limit of detection</th></lod<>	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification



WAC results for sample: IT02-1-22/12/2022-0.5

WAC Settings: samples in this Job do not constitute a single population.

WAC limits used to evaluate this sample: "Ireland" The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample PASSES the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

	Solid Waste Analysis			Landfill Waste Acceptance Crite				
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill			
1	TOC (total organic carbon)	%	1.3	3	5			
2	LOI (loss on ignition)	%	0.91	-	-			
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.01	6	-			
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.1	1	-			
5	Mineral oil (C10 to C40)	mg/kg	<10	500	-			
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<2	100	-			
7	рН	pН	9.5	-	>6			
8	ANC (acid neutralisation capacity)	mol/kg	0.005	-	-			
	Eluate Analysis 10:1							
9	arsenic	mg/kg	0.022	0.5	2			
10	barium	mg/kg	0.11	20	100			
11	cadmium	mg/kg	<0.0011	0.04	1			
12	chromium	mg/kg	0.036	0.5	10			
13	copper	mg/kg	0.0094	2	50			
14	mercury	mg/kg	<0.0005	0.01	0.2			
15	molybdenum	mg/kg	0.017	0.5	10			
16	nickel	mg/kg	<0.005	0.4	10			
17	lead	mg/kg	<0.005	0.5	10			
18	antimony	mg/kg	0.024	0.06	0.7			
19	selenium	mg/kg	0.012	0.1	0.5			
20	zinc	mg/kg	<0.025	4	50			
21	chloride	mg/kg	38	800	15,000			
22	fluoride	mg/kg	2.6	10	150			
23	sulphate	mg/kg	110	1,000	20,000			
24	phenol index	mg/kg	<0.3	1	-			
25	DOC (dissolved organic carbon)	mg/kg	<50	500	800			
26	TDS (total dissolved solids)	mg/kg	660	4,000	60,000			

Key



Classification of sample: IT02-2-22/12/2022-1.5

Non Hazardous Waste Classified as 17 05 04 in the List of Waste

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Sample details

Sample name:	LoW Code:	
T02-2-22/12/2022-1.5	Chapter:	17: Construction and Demolition Wastes (including excavated soil
Sample Depth:		from contaminated sites)
1.5 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05
Moisture content:		03)
27%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 27% Wet Weight Moisture Correction applied (MC)

#		EU CLP index number	Determinand EC Number	CAS Number	CLP Note	User entere	d data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	4	antimony { antimon 051-005-00-X	y trioxide }	1309-64-4		<2	mg/kg	1.197	<2.394	mg/kg	<0.000239 %		<lod< td=""></lod<>
2	4	arsenic { arsenic tri 033-003-00-0	ioxide } 215-481-4	1327-53-3		7.6	mg/kg	1.32	7.325	mg/kg	0.000733 %	~	
3	4	Cadmium { cadmium oxide } 048-002-00-0 215-146-2 1306-19-0			0.66	mg/kg	1.142	0.55	mg/kg	0.000055 %	\checkmark		
4	4	<pre>chromium in chromium(III) compounds { chromium(III) oxide (worst case) 215-160-9 1308-38-9</pre>				8.2	mg/kg	1.462	8.749	mg/kg	0.000875 %	~	
5	4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<lod< td=""></lod<>
6	4	024-017-00-8 copper { dicopper (029-002-00-X	xide; copper (I) ox	: <mark>ide</mark> }	-	17	mg/kg	1.126	13.972	mg/kg	0.0014 %	~	
7	4	lead { <mark>lead chroma</mark> 082-004-00-2	te } 231-846-0	7758-97-6	1	60	mg/kg	1.56	68.32	mg/kg	0.00438 %	\checkmark	
8	4	mercury { mercury 080-010-00-X	<mark>dichloride</mark> } 231-299-8	7487-94-7		0.4	mg/kg	1.353	0.395	mg/kg	0.0000395 %	\checkmark	
9	4	molybdenum { moly 042-001-00-9	ybdenum(VI) oxide 215-204-7	} 1313-27-5		1.2	mg/kg	1.5	1.314	mg/kg	0.000131 %	\checkmark	
10	4	nickel { nickel chror 028-035-00-7	<mark>mate</mark> } 238-766-5	14721-18-7		17	mg/kg	2.976	36.935	mg/kg	0.00369 %	\checkmark	
11	4	selenium { nickel se 028-031-00-5	elenate } 239-125-2	15060-62-5		0.49	mg/kg	2.554	0.914	mg/kg	0.0000914 %	\checkmark	
12	4	zinc { <mark>zinc chromat</mark> 024-007-00-3	<mark>e</mark> } 236-878-9	13530-65-9		66	mg/kg	2.774	133.658	mg/kg	0.0134 %	\checkmark	
13		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane			<0.001	mg/kg		<0.001	mg/kg	<0.000001 %		<lod< td=""></lod<>	
14		benzene 601-020-00-8	200-753-7	71-43-2		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< td=""></lod<>
15		toluene 601-021-00-3	203-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< td=""></lod<>

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#			Determinand		Note	User entered data	Conv.	Compound conc.	Classification	Applied	Conc. Not
		EU CLP index number	EC Number	CAS Number	CLP		1 40101		Value	MC	0300
16		ethylbenzene				<0.001 ma/ka		<0.001 mg/kg	<0.000001 %		<lod< td=""></lod<>
		601-023-00-4	202-849-4	100-41-4							
17		xylene 601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]	_	<0.002 mg/kg		<0.002 mg/kg	<0.0000002 %		<lod< td=""></lod<>
18		naphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
		601-052-00-2	202-049-5	91-20-3							
19	•	acenaphthylene	205-917-1	208-96-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
20		acenaphthene	1	1		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		
20			201-469-6	83-32-9		<0.1 Ing/kg		<0.1 IIIg/kų	<0.00001 //		
21	8	fluorene	201-695-5	86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
		phenanthrene	201 000 0	00101	\vdash	0.47		0.404	0.0000404.04		
22			201-581-5	85-01-8		0.17 mg/kg		0.124 mg/kg	0.0000124 %	\checkmark	
23		anthracene				<0.1 ma/ka		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
			204-371-1	120-12-7							
24	۰	fluoranthene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
			205-912-4	206-44-0							
25	۰	pyrene		100 00 0	<0.1		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>	
			204-927-3	129-00-0	-						
26		benzo[a]anthracen			_	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
		601-033-00-9	200-280-6	56-55-3	-					H	
27			005 022 4	010 01 0		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
		bonzo[b]fluorontho	203-923-4	210-01-9	+						
28				205 00 2		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
		benzo[k]fluoranthe	203-311-3	203-33-2	┢						
29		601-036-00-5	205-916-6	207-08-9	-	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
		benzo[a]pyrene: be	enzoldeflchrvsene	201 00 0	\vdash						
30		601-032-00-3	200-028-5	50-32-8	-	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
		indeno[123-cd]pyre	ene								
31			205-893-2	193-39-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
00		dibenz[a,h]anthrac	ene	1		0.4		0.4	0.00004.0/		1.05
32		601-041-00-2	200-181-8	53-70-3	-	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
22		benzo[ghi]perylene	9			<0.1 mg/kg		<0.1 mg/kg	<0.00001.%		
33			205-883-8	191-24-2		<0.1 IIIg/kg		<0.1 IIIg/Kų	<0.00001 /8		LOD
34		polychlorobipheny	ls; PCB			<0.1 ma/ka		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>
Ľ		602-039-00-4	215-648-1	1336-36-3	1						
35	4	barium { 🎴 <mark>barium</mark>	<mark>n sulphide</mark> }			59 mg/kg	1.233	53.127 mg/kg	0.00531 %	\checkmark	
		016-002-00-X	244-214-4	21109-95-5							
36	8	o coronene			<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<lod< td=""></lod<>	
			205-881-1	191-07-1				Tota	L 0.0306 %	\vdash	

Key

Rey	
	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
4	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<lod< td=""><td>Below limit of detection</td></lod<>	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification



WAC results for sample: IT02-2-22/12/2022-1.5

WAC Settings: samples in this Job do not constitute a single population.

WAC limits used to evaluate this sample: "Ireland" The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample PASSES the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

	Solid Waste Analysis			Landfill Waste Acceptance Criteria Limits				
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill			
1	TOC (total organic carbon)	%	1.8	3	5			
2	LOI (loss on ignition)	%	19	-	-			
3	BTEX (benzene, toluene, ethylbenzene and xylenes)		<0.01	6	-			
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.1	1	-			
5	Mineral oil (C10 to C40)	mg/kg	<10	500	-			
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<2	100	-			
7	рН	pН	9	-	>6			
8	ANC (acid neutralisation capacity)	mol/kg	0.18	-	-			
	Eluate Analysis 10:1							
9	arsenic	mg/kg	0.043	0.5	2			
10	barium	mg/kg	0.073	20	100			
11	cadmium	mg/kg	<0.0011	0.04	1			
12	chromium	mg/kg	0.015	0.5	10			
13	copper	mg/kg	0.057	2	50			
14	mercury	mg/kg	<0.0005	0.01	0.2			
15	molybdenum	mg/kg	0.08	0.5	10			
16	nickel	mg/kg	0.018	0.4	10			
17	lead	mg/kg	0.0066	0.5	10			
18	antimony	mg/kg	0.033	0.06	0.7			
19	selenium	mg/kg	0.022	0.1	0.5			
20	zinc	mg/kg	0.058	4	50			
21	chloride	mg/kg	63	800	15,000			
22	fluoride	mg/kg	2.6	10	150			
23	sulphate	mg/kg	110	1,000	20,000			
24	phenol index	mg/kg	<0.3	1				
25	DOC (dissolved organic carbon)	mg/kg	<50	500	800			
26	TDS (total dissolved solids)	mg/kg	1100	4,000	60,000			

Key



Classification of sample: TP01-1-22/12/2022-0.5



Sample details

Sample name:	LoW Code:	
TP01-1-22/12/2022-0.5	Chapter:	17: Construction and Demolition Wastes (including excavated soil
Sample Depth:		from contaminated sites)
0.5 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05
Moisture content:		03)
9.5%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 9.5% Wet Weight Moisture Correction applied (MC)

#		EU CLP index	Determinand EC Number	CAS Number	CLP Note	User entere	User entered data		Compound conc.		Classification value	MC Applied	Conc. Not Used
1	4	antimony { antimony	trioxide }	1309-64-4		2.1	mg/kg	1.197	2.275	mg/kg	0.000228 %	√	
2	*	arsenic { arsenic triox 033-003-00-0 21	<mark>xide</mark> } 15-481-4	1327-53-3		12	mg/kg	1.32	14.339	mg/kg	0.00143 %	\checkmark	
3	\$	cadmium { cadmium 048-002-00-0 21	<mark>oxide</mark> } 15-146-2	1306-19-0		0.79	mg/kg	1.142	0.817	mg/kg	0.0000817 %	\checkmark	
4	4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				4.1	mg/kg	1.462	5.423	mg/kg	0.000542 %	\checkmark	
5	\$	chromium in chromiu compounds, with the of compounds specifi	um(VI) compounds exception of bari fied elsewhere in t	s { chromium (VI) um chromate and this Annex }		<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<lod< th=""></lod<>
6	4	copper { dicopper oxi 029-002-00-X 21	<mark>ide; copper (I) oxi</mark> 15-270-7	<mark>de</mark> } 1317-39-1		30	mg/kg	1.126	30.568	mg/kg	0.00306 %	~	
7	4	lead { lead chromate 082-004-00-2 23	} 31-846-0	7758-97-6	1	50	mg/kg	1.56	70.582	mg/kg	0.00453 %	~	
8	4	mercury { mercury di 080-010-00-X 23	<mark>ichloride</mark> } 31-299-8	7487-94-7		0.11	mg/kg	1.353	0.135	mg/kg	0.0000135 %	\checkmark	
9	Å	molybdenum {	<mark>odenum(VI) oxide</mark> 15-204-7	} 1313-27-5		2.1	mg/kg	1.5	2.851	mg/kg	0.000285 %	~	
10	4	nickel {	<mark>ate</mark> } 38-766-5	14721-18-7		11	mg/kg	2.976	29.629	mg/kg	0.00296 %	\checkmark	
11	4	selenium {	<mark>enate</mark> } 39-125-2	15060-62-5		0.46	mg/kg	2.554	1.063	mg/kg	0.000106 %	\checkmark	
12	4	zinc { <mark>zinc chromate</mark> 024-007-00-3 23	} 36-878-9	13530-65-9		140	mg/kg	2.774	351.484	mg/kg	0.0351 %	~	
13	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane 603-181-00-X 216-653-1 1634-04-4			<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< td=""></lod<>		
14		benzene 601-020-00-8 20	00-753-7	71-43-2		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< td=""></lod<>
15		toluene 601-021-00-3 20	03-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< th=""></lod<>





#			Determinand			User entere	d data	Conv.	Compound	conc.	Classification	Applied	Conc. Not
		EU CLP index number	EC Number	CAS Number	CLP			Factor			value	MC /	USed
16	8	ethylbenzene				<0.001	ma/ka		<0.001	ma/ka	<0.0000001 %		<1 OD
		601-023-00-4	202-849-4	100-41-4									
		xylene											
17		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.002	mg/kg		<0.002	mg/kg	<0.0000002 %		<lod< td=""></lod<>
18		naphthalene				<0.1	ma/ka		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		601-052-00-2	202-049-5	91-20-3			0.0						
19	۲	acenaphthylene				<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
			205-917-1	208-96-8			5.5			5.5			-
20	۲	acenaphthene				<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
			201-469-6	83-32-9									_
21		fluorene				<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
			201-695-5	86-73-7									
22	0	phenanthrene				0.19	mg/kg		0.172	mg/kg	0.0000172 %	\checkmark	
			201-581-5	85-01-8									
23	۲	anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
			204-371-1	120-12-7									
24	۲	fluoranthene				0.34	mg/kg		0.308	mg/kg	0.0000308 %		
			205-912-4	206-44-0									
25	۲	pyrene				0.37	mg/kg		0.335	mg/kg	0.0000335 %		
			204-927-3	129-00-0			0.0					Ľ	
26		benzo[a]anthracen	ie			<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
		601-033-00-9	200-280-6	56-55-3			0.0						
27		chrysene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		601-048-00-0 205-923-4 218-01-9											
28		benzo[b]fluoranthe	ene			<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
		601-034-00-4	205-911-9	205-99-2									_
29		benzo[k]fluoranthe	ene			<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
		601-036-00-5	205-916-6	207-08-9									-
30		benzo[a]pyrene; be	enzo[def]chrysene			<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
		601-032-00-3	200-028-5	50-32-8									
31	۲	indeno[123-cd]pyre	ene			<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
			205-893-2	193-39-5									
32		dibenz[a,h]anthrac	ene			<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
_		601-041-00-2	200-181-8	53-70-3									
33	۲	benzo[ghi]perylene	e			0.18	ma/ka		0.163	ma/ka	0.0000163 %		
			205-883-8	191-24-2			3. 9			5.5		Ľ	
34	۲	polychlorobipheny	ls; PCB			<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
Ľ		602-039-00-4	215-648-1	1336-36-3	1		39			39			
35	4	barium { 📍 barium	sulphide }			48	ma/ka	1,233	53 583	ma/ka	0.00536 %		
		016-002-00-X	244-214-4	21109-95-5								ľ	
36		coronene				.0.1			-0.1	ma/ka	<0.00001.94		
36 205-881-7 191-07-1			1	<0.1	ing/kg		<0.1	ing/kg	<0.00001 %		<lod< td=""></lod<>		
										Total:	0.0541 %		

Kev

ney	
	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
0	Determinand defined or amended by HazWasteOnline (see Appendix A)
4	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<lod< th=""><th>Below limit of detection</th></lod<>	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification



WAC results for sample: TP01-1-22/12/2022-0.5

WAC Settings: samples in this Job do not constitute a single population.

WAC limits used to evaluate this sample: "Ireland" The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample PASSES the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

	Solid Waste Analysis			Landfill Waste Acce	otance Criteria Limits
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	1.2	3	5
2	LOI (loss on ignition)	%	9.7	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.01	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.1	1	-
5	Mineral oil (C10 to C40)	mg/kg	<10	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<2	100	-
7	рН	рН	8.6	-	>6
8	ANC (acid neutralisation capacity)	mol/kg	0.026	-	-
	Eluate Analysis 10:1				
9	arsenic	mg/kg	0.038	0.5	2
10	barium	mg/kg	0.052	20	100
11	cadmium	mg/kg	<0.0011	0.04	1
12	chromium	mg/kg	0.066	0.5	10
13	copper	mg/kg	0.012	2	50
14	mercury	mg/kg	<0.0005	0.01	0.2
15	molybdenum	mg/kg	0.036	0.5	10
16	nickel	mg/kg	<0.005	0.4	10
17	lead	mg/kg	<0.005	0.5	10
18	antimony	mg/kg	0.018	0.06	0.7
19	selenium	mg/kg	0.015	0.1	0.5
20	zinc	mg/kg	<0.025	4	50
21	chloride	mg/kg	<10	800	15,000
22	fluoride	mg/kg	1.2	10	150
23	sulphate	mg/kg	45	1,000	20,000
24	phenol index	mg/kg	<0.3	1	-
25	25 DOC (dissolved organic carbon)		<50	500	800
26	TDS (total dissolved solids)	mg/kg	520	4,000	60,000

Key



Classification of sample: TP01-2-22/12/2022-1.5

Non Hazardous Waste Classified as 17 05 04 in the List of Waste

Sample details

Sample name:	LoW Code:	
TP01-2-22/12/2022-1.5	Chapter:	17: Construction and Demolition Wastes (including excavated soil
Sample Depth:		from contaminated sites)
1.5 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05
Moisture content:		03)
19%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 19% Wet Weight Moisture Correction applied (MC)

#		EU CLP index	Determinand EC Number	CAS Number	CLP Note	User entere	d data	Conv. Factor	Compound	conc.	Classification value	MC Applied	Conc. Not Used
1	4	antimony { antimor	y trioxide }	1309-64-4		<2	mg/kg	1.197	<2.394	mg/kg	<0.000239 %		<lod< th=""></lod<>
2	4	arsenic { arsenic tr 033-003-00-0	<mark>ioxide</mark> } 215-481-4	1327-53-3		11	mg/kg	1.32	11.764	mg/kg	0.00118 %	\checkmark	
3	4	cadmium { <mark>cadmiu</mark> 048-002-00-0	<mark>m oxide</mark> } 215-146-2	1306-19-0		1.3	mg/kg	1.142	1.203	mg/kg	0.00012 %	\checkmark	
4	4	chromium in chrom chromium(III) oxide	nium(III) compound • (worst case) } 215-160-9	ls { • 1308-38-9	_	12	mg/kg	1.462	14.206	mg/kg	0.00142 %	~	
5	4	chromium in chrom compounds, with th of compounds spe	nium(VI) compound ne exception of bar cified elsewhere in	ds { chromium (VI) ium chromate and this Annex }		<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<lod< th=""></lod<>
6	4	copper { dicopper (029-002-00-X	<mark>bxide; copper (I) o</mark> x 215-270-7	<mark>(ide</mark> } 1317-39-1	-	28	mg/kg	1.126	25.535	mg/kg	0.00255 %	~	
7	4	lead { lead chroma 082-004-00-2	te } 231-846-0	7758-97-6	1	66	mg/kg	1.56	83.388	mg/kg	0.00535 %	~	
8	4	mercury {	dichloride } 231-299-8	7487-94-7		0.36	mg/kg	1.353	0.395	mg/kg	0.0000395 %	\checkmark	
9	4	molybdenum {	<mark>ybdenum(VI) oxide</mark> 215-204-7	} 1313-27-5		2.8	mg/kg	1.5	3.402	mg/kg	0.00034 %	\checkmark	
10	4	nickel { nickel chro 028-035-00-7	<mark>mate</mark> } 238-766-5	14721-18-7		27	mg/kg	2.976	65.091	mg/kg	0.00651 %	\checkmark	
11	~	selenium {	<mark>elenate</mark> } 239-125-2	15060-62-5		1.1	mg/kg	2.554	2.275	mg/kg	0.000228 %	\checkmark	
12	~	zinc { zinc chromat 024-007-00-3	<mark>e</mark> } 236-878-9	13530-65-9		95	mg/kg	2.774	213.471	mg/kg	0.0213 %	<	
13		tert-butyl methyl et 2-methoxy-2-methy 603-181-00-X	her; MTBE; /lpropane	1634-04-4		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< th=""></lod<>
14		benzene 601-020-00-8	200-753-7	71-43-2		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< th=""></lod<>
15		toluene 601-021-00-3	203-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< th=""></lod<>





LU CLU index soft 2000 EC Number with with with with with with with with	#		Determinand			Note	User entered	d data	Conv.	Compound	conc.	Classification	Applied	Conc. Not
			EU CLP index number	EC Number	CAS Number	CLP			1 00101			Value	MC	0000
No. No. <td>16</td> <td>8</td> <td>ethylbenzene</td> <td></td> <td>•</td> <td></td> <td><0.001</td> <td>ma/ka</td> <td></td> <td><0.001</td> <td>ma/ka</td> <td><0.000001.%</td> <td></td> <td></td>	16	8	ethylbenzene		•		<0.001	ma/ka		<0.001	ma/ka	<0.000001.%		
sylenc sylenc<	10		601-023-00-4	202-849-4	100-41-4	1	<0.001	iiig/kg		<0.001	iiig/kg	<0.0000001 //		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	17		xylene 601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]	_	<0.002	mg/kg		<0.002	mg/kg	<0.0000002 %		<lod< td=""></lod<>
No. Distribution	18		naphthalene				<0.1	ma/ka		<01	ma/ka	<0.00001 %		
$ \begin{array}{ c c c c c c } \hline 1 \\ 1 \\$	10		601-052-00-2	202-049-5	91-20-3		\$0.1	iiig/itg		<0.1	iiig/itg	<0.00001 /0		LOD
20 a conspiration col.1 mg/kg col.1 mg/kg col.0 mg/kg col.0001 % cl.00 21 a plot-sets \$6.73.7 2 col.1 mg/kg col.1 mg/kg col.0001 % 2 cl.00 21 a plot-sets \$6.73.7 2 col.1 mg/kg col.1 mg/kg col.0001 % 2 cl.00 22 a plot-sets \$6.73.7 2 col.1 mg/kg col.1 mg/kg col.0001 % 2 cl.00 23 a anthracene 204-371.1 120-12.7 col.1 mg/kg col.11 mg/kg col.001 % 2 cl.00 24 a flooranthene 205-912.4 206-40.0 0.26 mg/kg col.11 mg/kg col.0011.3 % cl.00 25 plorea 200-280-6 66-55-3 col.14 mg/kg col.11 mg/kg col.00013.4 cl.00 cl.00 26 benzo(k]huoranthene	19	0	acenaphthylene	205-917-1	208-96-8		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
Image: Control of the contro	20	۲	acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
21 Inflorence 201-695-5 Be-73-7 c0.1 mg/kg c0.01 mg/kg c0.0001% cLOD 22 phenanthrene 201-695-5 Be-73-7 0.23 mg/kg 0.186 mg/kg 0.000186% ✓ 23 a inthracene 201-581-5 Be-01-8 0.23 mg/kg 0.186 mg/kg 0.000186% ✓ 24 a inthracene 204-371-1 12012-7 20.6-44-0 0.24 mg/kg 0.194 mg/kg 0.000194% ✓ 25 P prene 204-927.3 129-00-0 0.26 mg/kg 0.211 mg/kg 0.000113% ✓ 26 benzo[a]anthracene 204-927.3 129-00-0 0.26 mg/kg 0.113 mg/kg 0.0000113% ✓ 27 chrysene 204-927-3 129-00-9 0.12 mg/kg 0.0972 mg/kg 0.00001% <tlod< td=""> 28 benzo[a]anthracene 205-911-9 205-99-2 <0.1</tlod<>				201-469-6	83-32-9									
1 pbroduct pb	21	8	fluorene	201-695-5	86-73-7	-	<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
21 201-581-5 85-01-8 20.00 Ng/rg Control ing/rg Control ing/rg <thcotrol ing="" rg<="" th=""> Control ing/rg</thcotrol>	22	8	phenanthrene	201 000 0	00 10 1		0.23	ma/ka		0 186	ma/ka	0 0000186 %	./	
23 anthracene <0.1 mg/kg <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.0001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 % < <0.00001 %				201-581-5	85-01-8	1	0.20					0.0000100 //	Ŷ	
Image: constraint of the	23	0	anthracene	bo 4 074 4	400.40.7		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			a	204-371-1	120-12-7	-							-	
interpretation prome prom prome prome	24	۲	fluorantnene	005 012 4	006 44 0		0.24	mg/kg		0.194	mg/kg	0.0000194 %	\checkmark	
25 product 0.26 mg/kg 0.211 mg/kg 0.000211 % ✓ 26 benzo[a]anthracene 0.14 mg/kg 0.113 mg/kg 0.0000113 % ✓ 27 drysene 0.129 205-92.4 218-01-9 0.12 mg/kg 0.0172 mg/kg 0.0000113 % ✓ 28 benzo[b]fluoranthene 501-032-00- 205-92.4 218-01-9 0.12 mg/kg 0.0172 mg/kg 0.0000172 % ✓ 28 benzo[b]fluoranthene 205-91-9 205-99-2 <0.1 mg/kg <0.1 mg/kg <0.00001 % < <lod< th=""> 29 benzo[k]fluoranthene 205-91-6 207-08-9 <0.1 mg/kg <0.1 mg/kg <0.0001 % <<lod< th=""> 30 benzo[a]pyrene; benzo[def]chrysene <0.1 mg/kg <0.1 mg/kg <0.0001 % <<lod< th=""> 31 indenci[12-3-d]pyrene 205-893-2 [93-39-5 <0.1 mg/kg <0.1 mg/kg <0.0001 % <<lod< th=""> 32 dibenz[a,h]anthracene 50-70-3 <0.1 mg/kg <t< td=""><td></td><td>_</td><td>pyrene</td><td>203-312-4</td><td>200-44-0</td><td>+</td><td></td><td></td><td></td><td></td><td></td><td></td><td>\vdash</td><td></td></t<></lod<></lod<></lod<></lod<>		_	pyrene	203-312-4	200-44-0	+							\vdash	
26 benzo[a]anthracene 0.14 mg/kg 0.113 mg/kg 0.0000113 % ✓ 27 chrysene 0.028-05 §6-55-3 0.12 mg/kg 0.0972 mg/kg 0.0000972 % ✓ 28 benzo[b]fluoranthene 0.12 mg/kg 0.0972 mg/kg 0.0000972 % ✓ 28 benzo[b]fluoranthene 0.14 mg/kg <0.1	25	۲	pyrelie	204-927-3	129-00-0		0.26	mg/kg		0.211	mg/kg	0.0000211 %	\checkmark	
26 601-033-00-9 200-280-6 56-55-3 0.14 mg/kg 0.113 mg/kg 0.00000113% V 27 chrysene 0.102 mg/kg 0.0972 mg/kg 0.0000972% V 28 benzol[b]fluoranthene 205-911-9 205-99-2 <0.1			benzo[a]anthracer	ie	1		0.11			0.440		0.0000140.0/	,	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	26		601-033-00-9	200-280-6	56-55-3		0.14	mg/kg		0.113	mg/kg	0.0000113 %	\checkmark	
21 601-048-00-0 205-923-4 218-01-9 1000000000000000000000000000000000000	27		chrysene				0.12	ma/ka		0.0972	ma/ka	0 0000972 %	1	
28 benzo[b]fluoranthene 601-034-00-4 205-91-9 205-99-2 -0.1 mg/kg <0.1 mg/kg <0.0001 % < <lod< th=""> 29 benzo[k]fluoranthene 601-036-00-5 205-916-6 207-08-9 <0.1</lod<>	21		601-048-00-0	205-923-4	218-01-9	1	0.12	iiig/itg		0.0372	iiig/kg	0.00000072 /0	~	
a 601-034-00-4 205-911-9 205-99-2 a a mg/kg a mg/kg a a mg/kg a <td>28</td> <td></td> <td>benzo[b]fluoranthe</td> <td>ene</td> <td></td> <td></td> <td><0.1</td> <td>ma/ka</td> <td></td> <td><0.1</td> <td>ma/ka</td> <td><0.00001 %</td> <td></td> <td><lod< td=""></lod<></td>	28		benzo[b]fluoranthe	ene			<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
29 benzo[k]fluoranthene 601-036-00-5 205-916-6 207-08-9 <0.1			601-034-00-4	205-911-9	205-99-2	1								
601-036-00-5 205-916-6 207-08-9 -	29		benzo[k]fluoranthe	ene			<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
30 benzo[a]pyrene; benzo[def]chrysene <0.1			601-036-00-5	205-916-6	207-08-9	-								
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	30		benzo[a]pyrene; be	enzo[def]chrysene			<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
31 • indeno[123-cd]pyrene <0.1			601-032-00-3	200-028-5	50-32-8	-								
32 dibenz[a,h]anthracene <0.1	31	۲	indeno[123-cd]pyro	ene	400.00 5		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
32 didenz[a,n]antifiacene <0.1			dihan zla hlanthra	205-893-2	193-39-5	+							-	
33 benzo[ghi]perylene	32		dibenzla,njantnrad	boo 191 9	52 70 2		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
33 • behazelgingpervisite <0.1 mg/kg <0.1 mg/kg <0.00001 % <100 34 • polychlorobiphenyls; PCB <0.1			bonzo[ghi]porylon	200-101-0	p3-70-3	-								
34 polychlorobiphenyls; PCB 602-039-00-4 215-648-1 1336-36-3 35	33	۲	benzolânijber yierk	205-883-8	191-24-2		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
34			polychlorobipheny	Is: PCB		+							\square	
35 ⁴ barium { ⁰ barium sulphide } 016-002-00-X 244-214-4 21109-95-5 36 68 mg/kg 1.233 67.941 mg/kg 0.00679 % √	34		602-039-00-4	215-648-1	1336-36-3		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
36 coronene <0.1 mg/kg 1.23 of .341 mg/kg c.0001 % 36 205-881-7 191-07-1 <0.1	35	4	barium {	sulphide }		\square	68	ma/ka	1 222	67 9/1	ma/ka	0.00679.%		
36 coronene <0.1 mg/kg <0.1 mg/kg <0.00001 % <lod< th=""></lod<>			016-002-00-X	244-214-4	21109-95-5		00	ing/kg	1.200	07.341	iiig/kg	.g 0.00679 %		
205-881-7 (191-07-1 Table 0.0404.9/	36	0	coronene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
				205-881-7	191-07-1						Tatal	0.0464.9/	\square	

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
0	Determinand defined or amended by HazWasteOnline (see Appendix A)
4	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<lod< th=""><td>Below limit of detection</td></lod<>	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification



WAC results for sample: TP01-2-22/12/2022-1.5

WAC Settings: samples in this Job do not constitute a single population.

WAC limits used to evaluate this sample: "Ireland" The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample FAILS the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

	Solid Waste Analysis			Landfill Waste Acceptance Criteria Limits			
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill		
1	TOC (total organic carbon)	%	3.3	3	5		
2	LOI (loss on ignition)	%	3.8	-	-		
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.01	6	-		
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.1	1	-		
5	Mineral oil (C10 to C40)	mg/kg	<10	500	-		
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<2	100	-		
7	рН	pН	8.2	-	>6		
8	ANC (acid neutralisation capacity)	mol/kg	0.025	-	-		
	Eluate Analysis 10:1						
9	arsenic	mg/kg	0.012	0.5	2		
10	barium	mg/kg	0.079	20	100		
11	cadmium	mg/kg	<0.0011	0.04	1		
12	chromium	mg/kg	<0.005	0.5	10		
13	copper	mg/kg	0.011	2	50		
14	mercury	mg/kg	<0.0005	0.01	0.2		
15	molybdenum	mg/kg	0.13	0.5	10		
16	nickel	mg/kg	0.0065	0.4	10		
17	lead	mg/kg	<0.005	0.5	10		
18	antimony	mg/kg	0.012	0.06	0.7		
19	selenium	mg/kg	0.0098	0.1	0.5		
20	zinc	mg/kg	<0.025	4	50		
21	chloride	mg/kg	<10	800	15,000		
22	fluoride	mg/kg	2.3	10	150		
23	sulphate	mg/kg	16	1,000	20,000		
24	24 phenol index		<0.3	1	-		
25	DOC (dissolved organic carbon)	mg/kg	<50	500	800		
26	TDS (total dissolved solids)	mg/kg	1100	4,000	60,000		

Key

User supplied data Inert WAC criteria fail



Classification of sample: TP02-1-22/12/2022-0.5



Sample details

Sample name:	LoW Code:	
TP02-1-22/12/2022-0.5	Chapter:	17: Construction and Demolition Wastes (including excavated soil
Sample Depth:		from contaminated sites)
0.5 m	Entry:	17 05 04 (Soil and stones other than those mentioned in 17 05
Moisture content:		03)
17%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 17% Wet Weight Moisture Correction applied (MC)

#		EU CLP index number	Determinand EC Number	CAS Number	CLP Note	User entere	d data	Conv. Factor	Compound	conc.	Classification value	MC Applied	Conc. Not Used
1	*	antimony {	<mark>y trioxide</mark> } 215-175-0	1309-64-4		<2	mg/kg	1.197	<2.394	mg/kg	<0.000239 %		<lod< th=""></lod<>
2	*	arsenic { arsenic tr 033-003-00-0	<mark>ioxide</mark> } 215-481-4	1327-53-3		8.7	mg/kg	1.32	9.534	mg/kg	0.000953 %	\checkmark	
3	\$	cadmium {	<mark>m oxide</mark> } 215-146-2	1306-19-0		0.45	mg/kg	1.142	0.427	mg/kg	0.0000427 %	\checkmark	
4	4	chromium in chrom <mark>chromium(III) oxide</mark>	nium(III) compound <mark>e (worst case)</mark> } 215-160-9	Is {	_	8.3	mg/kg	1.462	10.069	mg/kg	0.00101 %	\checkmark	
5	4	chromium in chrom compounds, with th of compounds spe	hium(VI) compound he exception of bar cified elsewhere in	Is { chromium (VI) ium chromate and this Annex }		<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<lod< th=""></lod<>
6	4	copper { dicopper {	oxide; copper (I) ox	ide }		33	mg/kg	1.126	30.838	mg/kg	0.00308 %	√	
7	4	lead { lead chroma 082-004-00-2	te } 231-846-0	7758-97-6	1	260	mg/kg	1.56	336.608	mg/kg	0.0216 %	~	
8	*	mercury { mercury 080-010-00-X	dichloride } 231-299-8	7487-94-7		1.6	mg/kg	1.353	1.797	mg/kg	0.00018 %	\checkmark	
9	4	molybdenum {	<mark>ybdenum(VI) oxide</mark> 215-204-7	} 1313-27-5		0.7	mg/kg	1.5	0.872	mg/kg	0.0000872 %	\checkmark	
10	*	nickel { nickel chro 028-035-00-7	<mark>mate</mark> } 238-766-5	14721-18-7	-	11	mg/kg	2.976	27.173	mg/kg	0.00272 %	\checkmark	
11	*	selenium {	<mark>elenate</mark> } 239-125-2	15060-62-5		0.25	mg/kg	2.554	0.53	mg/kg	0.000053 %	\checkmark	
12	*	zinc { zinc chromat 024-007-00-3	<mark>te</mark> } 236-878-9	13530-65-9		77	mg/kg	2.774	177.296	mg/kg	0.0177 %	\checkmark	
13		tert-butyl methyl et 2-methoxy-2-methy 603-181-00-X	her; MTBE; ylpropane 216-653-1	1634-04-4		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< th=""></lod<>
14		benzene 601-020-00-8	200-753-7	71-43-2		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< th=""></lod<>
15		toluene 601-021-00-3	203-625-9	108-88-3		<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<lod< th=""></lod<>





#		De	Determinand			User entered	d data	Conv.	Compound	conc.	Classification	Applied	Conc. Not
		EU CLP index E0 number	C Number	CAS Number	CLP			Factor			value	MC /	Useu
16		ethylbenzene				<0.001	ma/ka		<0.001	ma/ka	<0.000001 %		<1 OD
		601-023-00-4 202-8	349-4	100-41-4			ing/kg						
		xylene											
17		601-022-00-9 202-4 203-3 203-5 215-5	422-2 [1] 396-5 [2] 576-3 [3] 535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<0.002	mg/kg		<0.002	mg/kg	<0.000002 %		<lod< td=""></lod<>
18		naphthalene 601-052-00-2 202-0)49-5	91-20-3		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		acenaphthylene											
19	Ŭ	205-9	917-1	208-96-8		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		acenaphthene											
20	Ŭ	201-4	169-6	83-32-9		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		fluorene											
21	-	201-6	695-5	86-73-7		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
00		phenanthrene		I		0.40			0.400		0.0000400.0/		
22		201-5	581-5	85-01-8		0.16	mg/kg		0.133	mg/ĸg	0.0000133 %	\checkmark	
22		anthracene				.0.1			.0.1	~~~// <i>c</i> ~	-0.00001.0/		
23		204-3	371-1	120-12-7		<0.1	тід/кд		<0.1	тід/кд	<0.00001 %		<lod< td=""></lod<>
24		fluoranthene				0.19	ma/ka		0 1 4 0	ma/ka	0.0000140.%	,	
24		205-9	912-4	206-44-0		0.10	шу/ку		0.149	iiig/kg	0.0000149 %	~	
25		pyrene				0.17	ma/ka		0 141	ma/ka	0.0000141 %	/	
25		204-9	927-3	129-00-0		0.17	iiig/kg		0.141	iiig/kg	0.0000141 /8	~	
26		benzo[a]anthracene				<01	ma/ka		<0.1	ma/ka	<0.00001 %		<1 OD
		601-033-00-9 200-2	280-6	56-55-3			ing/kg						.200
27		chrysene				<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
		601-048-00-0 205-923-4 218-01-9			1								
28		benzo[b]fluoranthene				<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
_		601-034-00-4 205-9	911-9	205-99-2	1								
29		benzo[k]fluoranthene				<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
		601-036-00-5 205-9	916-6	207-08-9									-
30		benzo[a]pyrene; benzo[d	def]chrysene			<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		601-032-00-3 200-0)28-5	50-32-8									
31	۲	indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		205-8	393-2	193-39-5									
32		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		601-041-00-2 200-1	181-8	53-70-3									
33	۲	benzo[ghi]perylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
		205-8	383-8	191-24-2	_								
34	۲	polychlorobiphenyls; PC	В	4000 00 0		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<lod< td=""></lod<>
-		602-039-00-4 215-6	548-1	1336-36-3	-							\square	
35	4	barium { [®] barium sulph	nide }			150	mg/kg	1.233	153.57	mg/kg	0.0154 %	\checkmark	
		016-002-00-X 244-2	214-4	21109-95-5				1.200 100.07					
36	۲	coronene				<0.1	ma/ka		<0.1	ma/ka	<0.00001 %		<lod< td=""></lod<>
Ľ		205-8	381-7	191-07-1			39			39			
										Total:	0.0633 %		

Ko

ney	
	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
0	Determinand defined or amended by HazWasteOnline (see Appendix A)
4	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<lod< td=""><td>Below limit of detection</td></lod<>	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification



WAC results for sample: TP02-1-22/12/2022-0.5

WAC Settings: samples in this Job do not constitute a single population.

WAC limits used to evaluate this sample: "Ireland" The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample PASSES the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

Solid Waste Analysis				Landfill Waste Acceptance Criteria Limits	
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	0.91	3	5
2	LOI (loss on ignition)	%	4.3	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.01	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.1	1	-
5	Mineral oil (C10 to C40)	mg/kg	<10	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<2	100	-
7	рН	pН	8.3	-	>6
8	ANC (acid neutralisation capacity)	mol/kg	0.029	-	-
Eluate Analysis 10:1					
9	arsenic	mg/kg	0.3	0.5	2
10	barium	mg/kg	0.32	20	100
11	cadmium	mg/kg	<0.0011	0.04	1
12	chromium	mg/kg	0.47	0.5	10
13	copper	mg/kg	0.011	2	50
14	mercury	mg/kg	<0.0005	0.01	0.2
15	molybdenum	mg/kg	0.012	0.5	10
16	nickel	mg/kg	<0.005	0.4	10
17	lead	mg/kg	0.037	0.5	10
18	antimony	mg/kg	0.015	0.06	0.7
19	selenium	mg/kg	0.0098	0.1	0.5
20	zinc	mg/kg	0.073	4	50
21	chloride	mg/kg	<10	800	15,000
22	fluoride	mg/kg	4.2	10	150
23	sulphate	mg/kg	64	1,000	20,000
24	phenol index	mg/kg	<0.3	1	-
25	DOC (dissolved organic carbon)	mg/kg	<50	500	800
26	TDS (total dissolved solids)	mg/kg	650	4,000	60,000

Key



Report created by Sean Ross on 20 Jan 2023

Appendix A: Classifier defined and non EU CLP determinands

• chromium(III) oxide (worst case) (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806 Data source date: 17 Jul 2015 Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

• ethylbenzene (EC Number: 202-849-4, CAS Number: 100-41-4)

EU CLP index number: 601-023-00-4 Description/Comments: Additional Hazard Statement(s): Carc. 2; H351 Reason for additional Hazards Statement(s): 03 Jun 2015 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database Data source date: 17 Jul 2015 Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database Data source date: 17 Jul 2015 Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

Description/Comments: Data from C&L Inventory Database Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database Data source date: 06 Aug 2015 Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

• phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database Data source date: 06 Aug 2015 Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

• anthracene (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database Data source date: 17 Jul 2015 Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

fluoranthene (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database Data source date: 21 Aug 2015 Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

[®] pyrene (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014 Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database Data source date: 21 Aug 2015 Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

[•] indeno[123-cd]pyrene (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database Data source date: 06 Aug 2015 Hazard Statements: Carc. 2; H351



• benzo[ghi]perylene (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015 Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database Data source date: 23 Jul 2015 Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

• polychlorobiphenyls; PCB (EC Number: 215-648-1, CAS Number: 1336-36-3)

EU CLP index number: 602-039-00-4 Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans; POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied. Additional Hazard Statement(s): Carc. 1A; H350 Reason for additional Hazards Statement(s): 29 Sep 2015 - Carc. 1A; H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

[•] barium sulphide (EC Number: 244-214-4, CAS Number: 21109-95-5)

EU CLP index number: 016-002-00-X Description/Comments: Additional Hazard Statement(s): EUH031 >= 0.8 % Reason for additional Hazards Statement(s): 14 Dec 2015 - EUH031 >= 0.8 % hazard statement sourced from: WM3, Table C12.2

^o coronene (EC Number: 205-881-7, CAS Number: 191-07-1)

Description/Comments: Data from C&L Inventory Database; no entries in Registered Substances or Pesticides Properties databases; SDS: Sigma Aldrich, 1907/2006 compliant, dated 2012 - no entries; IARC – Group 3, not carcinogenic. Data source: http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=17010&HarmOnly=no?fc=true&lang=en Data source date: 16 Jun 2014 Hazard Statements: STOT SE 2; H371

Appendix B: Rationale for selection of metal species

antimony {antimony trioxide}

Worst case CLP species based on hazard statements/molecular weight and low solubility. Industrial sources include: flame retardants in electrical apparatus, textiles and coatings

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides.

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide.

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

molybdenum {molybdenum(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight

selenium {nickel selenate}

Worst case CLP species based on hazard statements/molecular weight



Report created by Sean Ross on 20 Jan 2023

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight

barium {barium sulphide}

No Cr VI in samples therefore worst case scenario not applicable.

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1.NI - Jan 2021 HazWasteOnline Classification Engine Version: 2023.11.5483.10161 (11 Jan 2023) HazWasteOnline Database: 2023.11.5483.10161 (11 Jan 2023) This classification utilises the following guidance and legislation: WM3 v1.1.NI - Waste Classification - 1st Edition v1.1.NI - Jan 2021 CLP Regulation - Regulation 1272/2008/EC of 16 December 2008 1st ATP - Regulation 790/2009/EC of 10 August 2009 2nd ATP - Regulation 286/2011/EC of 10 March 2011 3rd ATP - Regulation 618/2012/EU of 10 July 2012 4th ATP - Regulation 487/2013/EU of 8 May 2013 Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013 5th ATP - Regulation 944/2013/EU of 2 October 2013 6th ATP - Regulation 605/2014/EU of 5 June 2014 WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014 Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014 7th ATP - Regulation 2015/1221/EU of 24 July 2015 8th ATP - Regulation (EU) 2016/918 of 19 May 2016 9th ATP - Regulation (EU) 2016/1179 of 19 July 2016 10th ATP - Regulation (EU) 2017/776 of 4 May 2017 HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017 13th ATP - Regulation (EU) 2018/1480 of 4 October 2018 14th ATP - Regulation (EU) 2020/217 of 4 October 2019 15th ATP - Regulation (EU) 2020/1182 of 19 May 2020 The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020 The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020 17th ATP - Regulation (EU) 2021/849 of 11 March 2021 18th ATP - Regulation (EU) 2022/692 of 16 February 2022



Registered Office Ormond House Upper Ormond Quay Dublin 7 Ireland D07 W704

+ 353 1 400 4000 info@dbfl.ie www.dbfl.ie Cork Office 14 South Mall Cork T12 CT91

+ 353 21 202 4538 info@dbfl.ie www.dbfl.ie Waterford Office Suite 8b The Atrium Maritana Gate, Canada St Waterford X91 W028

+ 353 51 309 500 info@dbfl.ie www.dbfl.ie