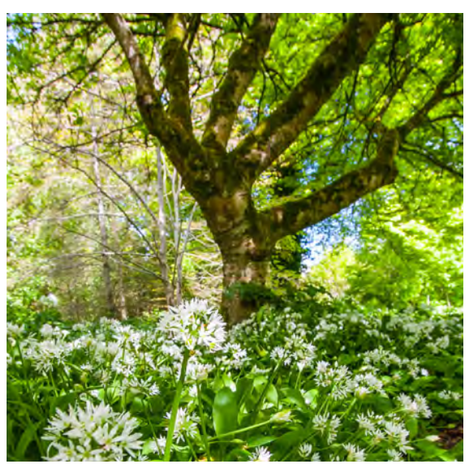
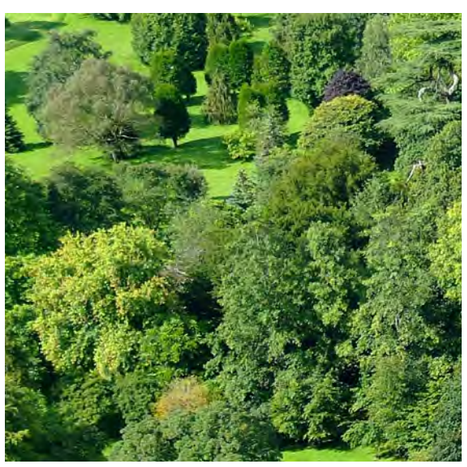




LACKENROE **SHD**

APPENDIX 2

Project Description

VOLUME III | Appendices

LACKENROE **SHD**

APPENDIX 2-1

Infrastructure Report - AECOM

VOLUME III | Appendices

Glounthaune SHD

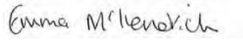
Infrastructure Report

Bluescape Limited

Project number: 60592432

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
			
Aileen Prendergast Principal Engineer	Emma McKendrick Regional Director	Laura Shaughnessy Principal Engineer	Aileen Prendergast Principal Engineer

Revision History

Revision	Revision date	Details	Authorized	Name	Position
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Prepared for:

Bluescape Limited

Prepared by:

AECOM Ireland Limited
1st floor, Montrose House
Carrigaline Road
Douglas, Cork T12 P088
Ireland

T: +353 21 436 5006
F: +353 21 436 5156
aecom.com

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1. Introduction

1.1 Background

AECOM were appointed by Bluescape Limited to undertake the infrastructure design in support of a Strategic Housing Development (SHD) planning application to An Bord Pleanála for a proposed residential development at Glounthaune, Co. Cork. This infrastructure report has been prepared to accompany the planning application for the proposed development. The proposed layout of the development is detailed in the planning drawings prepared by Deady Gahan Architects.

1.2 Site Location

The proposed development is located in Glounthaune Co. Cork, approximately 4km east of Cork City. The site covers an area of approximately 13.87 ha and is bounded to the south, west and north by residential properties and by greenfield to the east. The current site comprises of a greenfield site. The majority of the site is located to the north of L-2970, known locally as 'the Terrace with a small part of the site located to the south of The Terrace Road. There is a considerable variation in ground levels across the site which has been considered in developing the proposed layout. The site slopes from north to south from approximate +110 m OD Malin to +34.5 m OD Malin on The Terrace to approximately +3.30 m OD Malin.

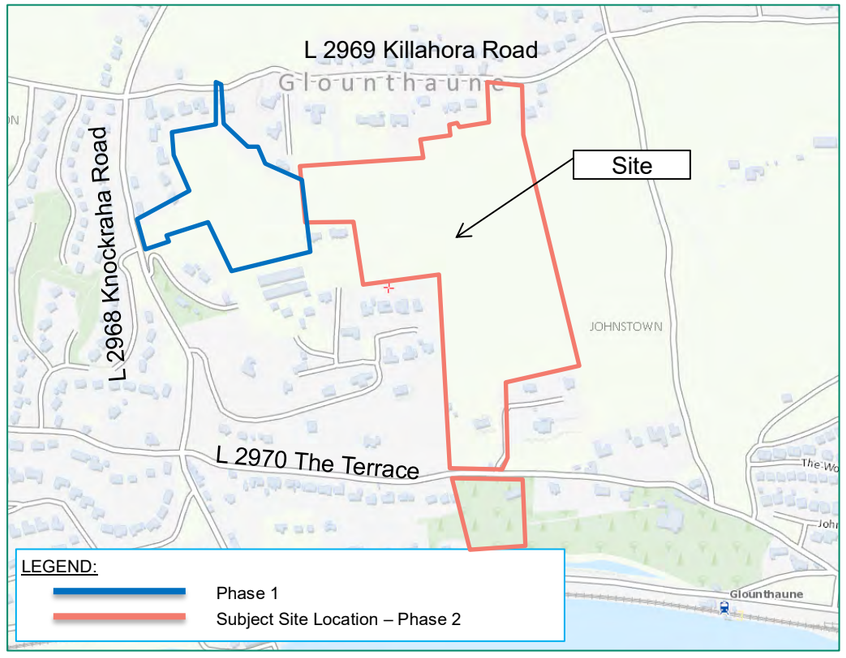


Figure 1-1 - Site Location - Glounthaune, Co. Cork

1.3 Proposed Development

The proposed development consists of the construction of a mixed-use residential development of 289 no. residential units consisting of 201 no. dwelling houses and 88 no. apartment/duplex units, a two storey creche, 4 no. ESB substations and all ancillary site development works at Lackenroe and Johnstown (townlands), Glounthaune, Co. Cork. The proposed development will be constructed on lands to the north and south of the public road, L-2970, known locally as 'the Terrace'. A portion of the site to the south of 'the Terrace' was formerly within Ashbourne Garden and is considered to be within the curtilage and attendant grounds of Ashbourne House, which is a Protected Structure (Ref 00498).

The proposed development to the north of 'the Terrace' provides for 260 no. residential units comprising of 196 no. dwelling houses, 64 no. apartment/duplex units and a two storey creche. The 196 no. dwelling houses includes 5 no. 4 bedroom detached dwellings, 44 no. 4 bedroom semi-detached dwellings, 12 no. 4 bedroom townhouses, 2 no. 3 bedroom detached dwellings, 22 no. 3 bedroom semi-detached dwellings, 47 no. 3 bedroom townhouses and 64 no. 2 bedroom townhouses. The 64 no. apartment/duplex units contains 5 no. 3 bedroom units, 32 no. 2 bedroom units and 27 no. 1 bedroom units contained in 6 no. three storey apartment buildings, with ancillary bicycle parking and bins stores.

The proposed development to the south of 'the Terrace' provides for 29 no. residential units comprising of 5 no. dwelling houses and 24 no. apartments. The 5 no. dwellings include 1 no. 3 bedroom detached dwelling, 2 no. 3 bedroom townhouses and 2 no. 2 bedroom townhouses. The proposed apartments are provided in a four-storey mixed-use building containing a ground floor community unit and a commercial unit with apartments at ground and upper floor levels comprising 3 no. 3 bedroom units, 7 no. 2 bedroom units and 14 no. 1 bedroom units with ancillary rooftop terrace, car parking, bicycle parking and bin stores.

Vehicular access to 2 no. dwellings in the lands to the north of 'the Terrace' will be provided via an upgraded entrance from 'the Terrace' with vehicular access to the remainder of dwellings in the lands to the north of 'the Terrace' via the signalised junction from the L-2968 and internal road network permitted by Cork County Council reference 17/5699 and An Bord Pleanála reference 300128-17. A separate secondary emergency access is also proposed from the L-2969 to the north.

Vehicular access to the 5 no. dwellings to the south of the 'the Terrace' will be via a new entrance from 'the Terrace' and the proposed apartment building will be accessed from Johnstown Close. The proposed development also makes provision for a pedestrian link from the proposed development north of 'the Terrace' to Johnstown Close via 'the Terrace' which will include a signalised pedestrian crossing and associated traffic calming measures on 'the Terrace'.

Ancillary site works include the demolition of 1 no. existing derelict dwelling house and associated outbuildings, landscaping and servicing proposals including the realignment of the existing pedestrian/cycle route on Johnstown Close, the undergrounding of existing overhead lines, upgrade of the storm and foul sewer network to the south and east of the subject lands along 'the Terrace' and Johnstown Close (L-3004).

Please refer to Constraints Study 1 and 2 for additional information outlining the existing site constraints and the development of the proposed development layout.

Figure 1-2 illustrates the extent and layout of the proposed development.

Figure 1-2 – Site Location and Layout

2. Surface Water Drainage

2.1 Existing Surface Water Drainage

Record drawings provided by Cork County Council indicate that there is no surface water sewers present in the immediate proximity of the site. A 400mm diameter surface water sewer is located approximately 420m east of the site and runs in a south easterly direction along the Terrace towards Johnstown Cl. This surface water sewer was constructed circa 2017 as part of the adjoining “The Woods” Development. Figure 2-1 illustrates the route of this sewer. There is also an existing surface water drainage channel running parallel to the Terrace road. This channel discharges to an existing drainage network at the location noted on Figure 2-2.

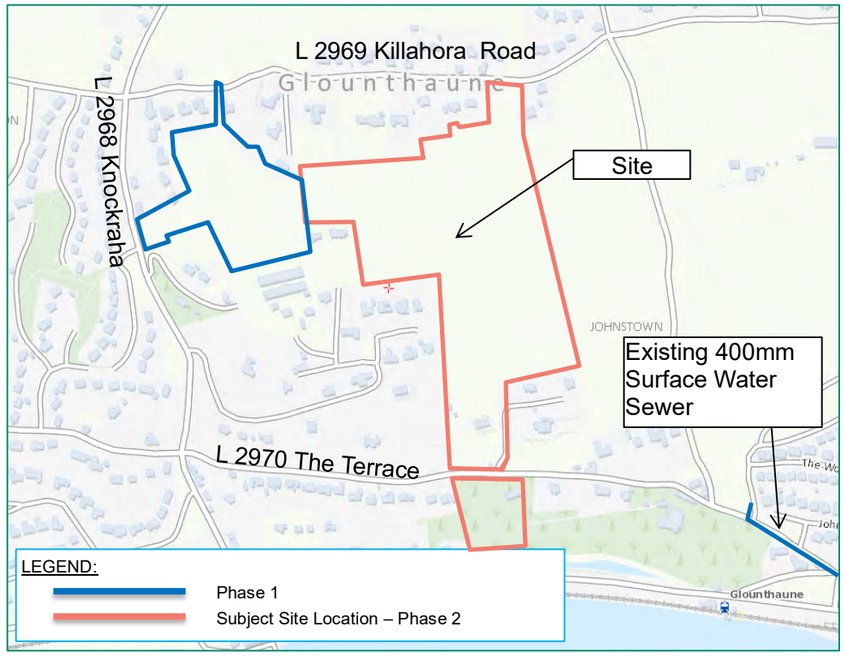


Figure 2-1 – Existing Surface Water Drainage Network

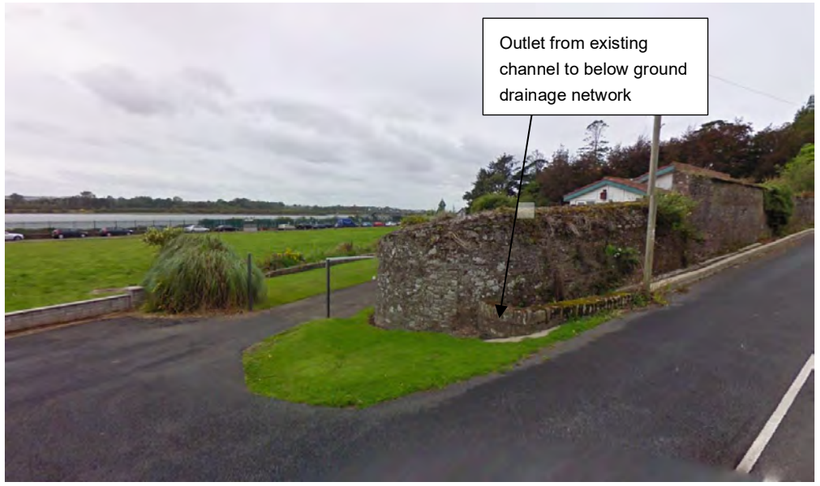


Figure 2-2 – Existing Channel on the Terrace/ Johnstown Close

These existing networks discharge to Lough Mahon through an existing 225 mm diameter pipe running perpendicular to the public roadway and train line. This sewer discharges through a flap valve, as illustrated in Figure 2-3.

Following discussions with Cork County Council (CCC), CCC have noted ongoing issues with this existing outfall (under Glounthaune Train Station) due to the limited capacity of the existing 225 mm diameter pipe. Figure 2-3 is an image of the existing outfall at Glounthaune Train Station (provided by Irish Rail).

Figure 2-3 – Existing Outfall at Glounthaune Train Station

During discussions with CCC, CCC noted that there is an additional surface water outfall to the east of Glounthaune Station, south of Johnstown Park. Cork County Council noted in April 2021 that investigation works were undertaken (2020) and dye testing has been undertaken (2021) to verify the route of the existing network from the public road way to the existing headwall. Figure 2-4 is an image of the existing outfall. This outfall discharges to Lough Mahon between the Cork – Middleton and Cork – Cobh railway lines as shown in Figure 2-5.

Figure 2-4 – Existing Outfall east of Glounthaune Train Station at Johnstown Park

Figure 2-5 – Location of Existing Outfall east of Glounthaune Train Station

2.2 Proposed Surface Water Drainage

It is proposed to provide a separate surface water drainage network within the development. To facilitate maintenance, the proposed surface water drainage network (sewers and attenuation tanks) have been located within roadways and other public areas within the proposed development. It is proposed to discharge surface water from the proposed site to the existing outfall located to the south of Johnstown Park In order to achieve this, it is proposed to lay a new 300mm surface water sewer from the southern boundary of the proposed development along ‘the Terrace’ and Johnstown Close and connect to the existing manhole located adjacent to the public road.

Please refer to the AECOM Drawing 60592432-ACM-00-00-DR-CE-10-0501, 0502 & 0503, 0504, 0505, 0506 and 0507 for more information on the surface water drainage network layouts.

Run-off generated by roof areas, access roads, and car parking areas will be collected by the proposed surface water drainage network. The proposed network has been split in to the following catchments:

Catchment 1: The proposed units at the northern end of the development will form Catchment 1. Run-off from this catchment will discharge at an attenuated rate of 31.7 l/s to the downstream network (MH S1-13).

Catchment 2: The proposed units to the east and west of the proposed creche Catchment 2. Run-off from this catchment will discharge at an attenuated rate of 55.2 l/s to the downstream network (MH 1-30).

Catchment 3: The proposed units to the south of the Central Parkland will form catchment 3. Run-off from this catchment will discharge at an attenuated rate of 75.3 l/s to the downstream network (MH S1-46).

Catchment 4: The proposed units at the southern end of the development will form catchment 4. Run-off from this catchment will discharge at an attenuated rate of 83 l/s to the downstream network (MH S1-62).

Catchment 5: The 5No. Units to the south of 'the Terrace' and the proposed apartment block will form catchment 5. It is proposed to provide a green roof on the proposed apartment block and permeable paving within the parking area to reduce the rate of discharge from this area.

The proposed surface water drainage network has been designed using the hydraulic modelling software MicroDrainage. The network has been designed to convey flows associated with a 1 in 5 year return period rainfall event and have been checked for flooding during a 1 in 100 year return period rainfall event. The hydraulic model indicates that flooding will not occur during a 1 in 100 year return period rainfall event.

2.2.1 Surface Water Attenuation

While it is proposed to discharge run-off from the proposed development to an area that is tidal in nature rather than a stream/ river, in order to reduce the rate of run-off from the proposed development it is proposed to limit discharge from the site to the greenfield rate (Qbar). The greenfield runoff rate was calculated for the site using soil type 4 (Clayey), a soil value of 0.45 and the Standard Annual Average Rainfall (SAAR) of 1077 mm as per the www.uksuds.com website. The Qbar Rate value for the proposed site area (12.7ha) is 101.5 l/s. Please refer to Appendix C for Q_{Bar} calculations.

It is proposed to attenuate run-off from the proposed development through attenuation tanks, permeable pavement and a green roof is proposed as part of the proposed apartment block.

2.2.1.1 Permeable Paving

Permeable pavement is proposed in the parking area and footpaths around the apartment block. Porous surfacing (paving block or open graded material) which can treat rainwater, at source, and allow infiltration through to an underlying porous subbase where water can be stored within the voids of the subbase before being slowly released to the drainage collection system through natural flow via the porous medium. Refer to Figure 2-6 for typical permeable paving at ground floor level.

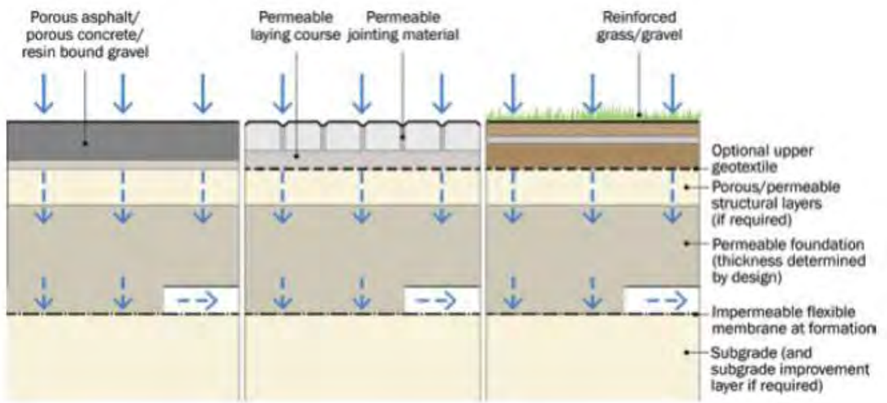


Figure 2-6 – Permeable Paving System (Extract from Ciria C753)

These systems will allow some form of storage for small rainfall events and can result in water evaporation and adsorption in small quantities, therefore there will be less run-off from these areas in small rainfall events thus mimicking the natural response for this catchment. As well as reducing the amount of run-off from the surface, permeable paving will slow down the rate of runoff from the pavement in extreme rainfall events contributing to attenuation of flows.

In addition, permeable paving will increase the quality of water which is intercepted by the system through filtration, biodegradation, pollutant adsorption and settlement and retention of solids, also the reduction in peak flows to the outfall will enhance settlement and biodegradation of pollutants.

2.2.1.2 Green Roof

Green roofs provide ecological, aesthetic and amenity benefits and intercept and retain rainfall, at source, reducing the volume of runoff and attenuating peak flows. Green roofs absorb most of the rainfall that they receive during normal rainfall events, although they will only contribute to attenuation of flows for larger events.

Additionally, green roofs treat surface water through removal of atmospherically deposited urban pollutants. Finally, green roofs may reduce heating (by adding mass and thermal resistance value) and cooling (by evaporative cooling) loads on a building.

The performance of green roofs in the summer is significant in preventing runoff from normal rainfall events due to high levels of evapotranspiration. Green roofs do not provide the same storage in winter as they tend to be saturated for a greater portion of time.

Extensive green roofs allow low growing, low maintenance plants consisting of self-sustaining mosses, sedums, succulents, herbs or grasses over a drainage layer and waterproofing membrane. Extensive roofs are usually only accessed for maintenance. Extensive green roofs typically have a 20-150 mm growing medium.

Intensive green roofs typically have a growing medium greater than 150 mm, allowing for a wider array of planting possibilities, including; grasses, shrubs and trees, as ground cover or within planters. Intensive green roofs are typically accessible as they require a higher level of maintenance. It is proposed that approximately 70% of roof areas are covered with brown or wildflower meadow. Refer to Figure 2-7 for typical detail of green roof.

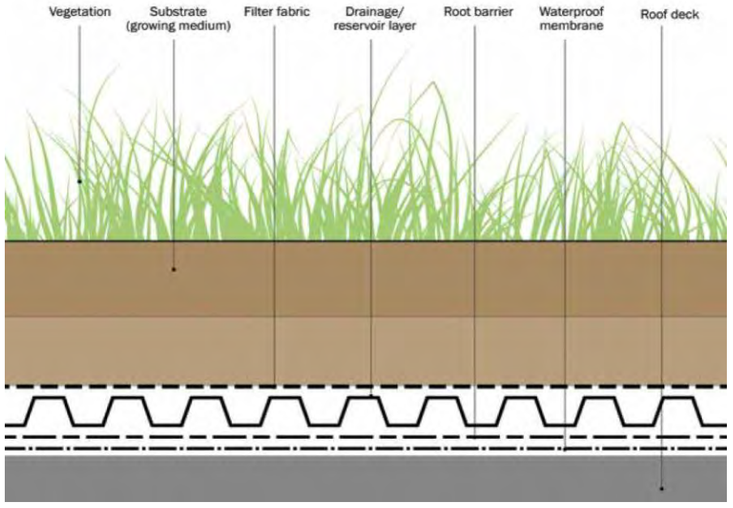


Figure 2-7 – Green Roof Layers (Extract from Ciria C753)

2.2.1.3 Attenuation Tanks

It is proposed to provide a Stormtech attenuation tank with SC-740 cells at the under-croft car park, totalling 18m3 of storage capacity. An impermeable bituminous liner Coletanche or similar surrounding the tank is proposed in order to protect the building's foundations. The Stormtech storage systems include a stone medium (the Stormtech chambers are surrounded by stone to manufacturer specification). Sediments are captured in the stone medium providing treatment by removing silts and some hydrocarbons from the runoff. Figure 2-8 shows a typical section of the tank.

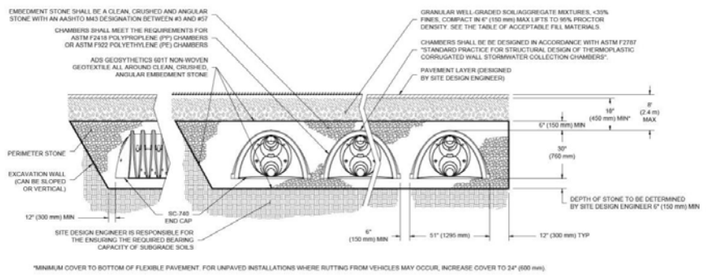


Figure 2-8 – Attenuation Tank Typical Section

2.2.1.4 Petrol & Oil Interceptor

Petrol interceptors are widely used to avoid and prevent hazardous chemical and petroleum by-products from entering watercourses and public sewers. As standard, petrol interceptors shall be positioned close to the potential pollution source (to minimise emulsification of oils and their coating of sediments) and upstream of the connection point to the public network, within the private boundary.

There are two classes of systems:

- Class 1 device means that the resultant effluent should contain 5mg/l hydrocarbon content or less under standard test conditions;
- Class 2 can contain up to 100mg/l in their discharge and are appropriate where drainage is to a foul sewer.

It is proposed to provide a Class I Bypass Petrol & Oil interceptor to treat run-off for possible hydrocarbon contamination within the under-croft car park prior to discharge to the existing foul sewer.

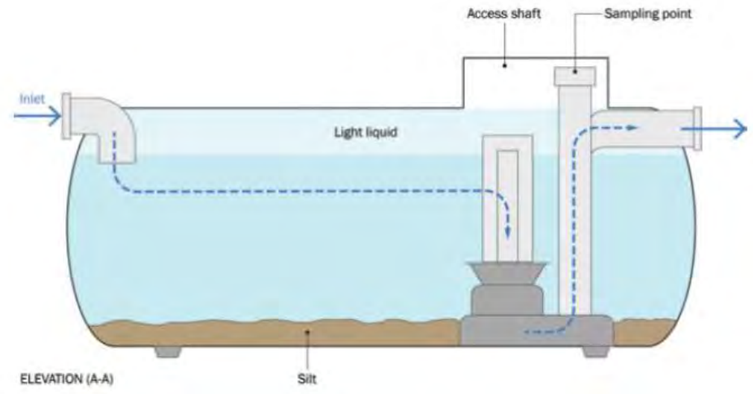


Figure 2-9 – Typical Petrol Interceptor detail (Extract from Ciria C753)

2.2.2 Design Criteria

The design of residential developments is be based on Section 3.5 of the Department of Environment, Heritage and Local Government Recommendations for Site Development Works for Housing Areas and the requirements of Cork County Council.

The following design standards and guidelines have been folloed in the design of the proposed surface water drainage network:

- BS EN 752 – Drains and sewer system outside buildings,
- Greater Dublin Strategic Drainage Study (GDSDS) Volume 2 – New Developments,
- BS EN 858-2- - Separator System for Light Liquids (e.g. oil and petrol),
- Pipe network has been designed to ensure no surcharging during a 1 in 5 year return period rainfall event,
- No pipe flooding during a 1 in 100-year return period rainfall event,
- Surface water storage sized based on a 1 in 100-year return period rainfall event,
- An additional 20% has been allowed for climate change in relation to rainfall intensities,
- The following design criteria have been used in the design of the proposed surface water drainage network:
  - Carrier pipe network – 1.0m/s to 3.0m/s,
  - Colebrook White roughness value of 0.6mm for all pipework,
  - Time of entry: 4 minutes,
  - Return Period: 5 years,
  - Met Eireann rainfall data for site,
  - M5/60 = 18.8 mm,
  - Ratio r = 0.264.

2.3 Drainage Maintenance Inspection Checklist

Maintenance is suggested to be carried out every 6 months to ensure the system is operating correctly. The maintenance for this site consists of inspection and assessment, however if issues arise during inspection remedial measures must be taken. The client is not required to carry out the maintenance themselves but they must ensure that a competent contractor is employed. An example maintenance record and checklist can be seen in Appendix D

Accidental spillages or pollution into the system must be dealt with by a competent contractor. Pollutants will need to be pumped from the system and correctly disposed of.

3. Foul Water Drainage

3.1 Existing Foul Water Drainage

There are no existing wastewater drainage networks within or to the north of the subject site. There are a number of existing combined drainage networks in the area to the west and south of the subject site:

- Existing combined drainage network running in the Knockraha road to the west of the subject site,
- Existing combined network running east along ‘the Terrace’ at the entrance to The Woods residential development and onto Johnstown Park,
- Existing combined network running along the Old Youghal Road at Johnstown Close.

A 225mm diameter surface water sewer is located approximately 420m from the southern boundary of the site and is running in an easterly direction along the Terrace towards Johnstown Close. This foul water sewer was constructed circa 2017 as part of the adjoining “The Woods” Development. Although this sewer is not on current Irish Water record maps AECOM has received confirmation from Irish Water that they deem this sewer network to be in their ownership, due to the fact it is connected to an Irish Water asset downstream.

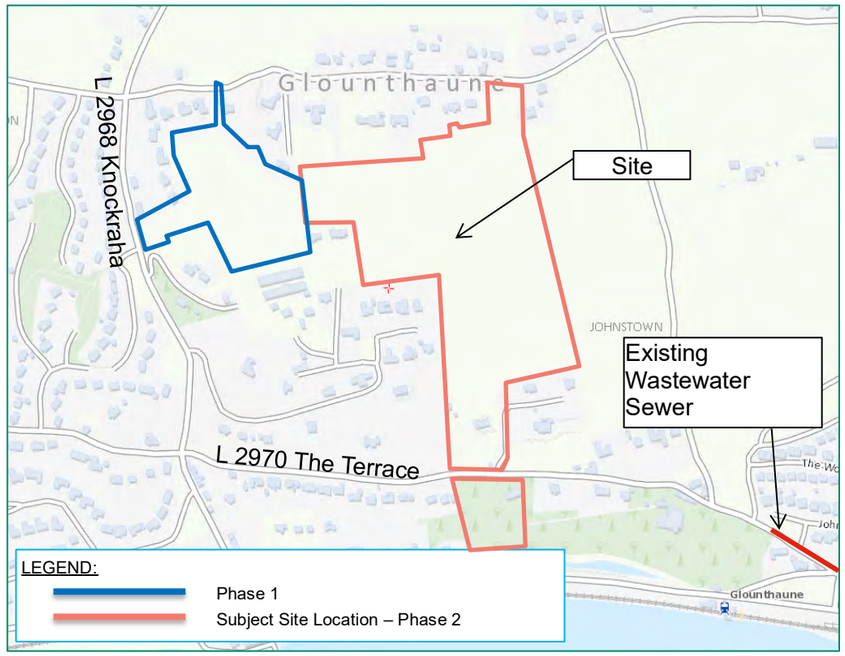


Figure 3-1 – Existing Wastewater Drainage Network Relative to Subject Site

The existing networks running on the Terrace/ Johnstown Park and Johnstown Close discharge to an existing pumping station on Johnstown Close (Johnstown Pumping Station). The existing pumping station is located in the walkway to the east of Fitzpatrick’s Shop/ existing apartments. Figure 3-2 illustrates the extent of the existing wastewater drainage networks in the vicinity of the subject site.

Figure 3-2 – Existing Wastewater Drainage Network

3.2 Proposed Foul Water Drainage

A Pre-Connection Enquiry Form has been issued to Irish Water in relation to the feasibility of servicing the proposed development with a foul water connection. Irish Water confirmed that the proposed wastewater connection to the Irish Water network can be facilitated subject to a valid connection agreement being put in place. Please refer to Appendix A for the Irish Water Confirmation of Feasibility.

It is proposed to discharge the wastewater generated by the proposed development north of 'the Terrace' by gravity into the 225mm diameter public foul sewer running along 'the Terrace'. In order to achieve this, it is proposed to lay a new 225mm foul water sewer from the southern boundary of the proposed development along the terrace and connect to the existing 225mm foul water system. It is proposed to discharge the wastewater generated by the proposed development south of 'the Terrace' by gravity to the existing network to the west of the proposed apartment block. Please refer to the AECOM Drawing No. Drawing 60592432-ACM-00-00-DR-CE-10-0501, 0502, 0503 & 0504 for the foul water drainage layout.

Foul water drainage has been designed in accordance with the Irish Water Wastewater Code of Practice Appendix using Innovyze MicroDrainage software (refer to Appendix E for detailed design calculations). The design guidelines of the Environmental Protection Agency (EPA) Wastewater Treatment Manual, "Treatment Systems for Small Communities, Business, Leisure Centres and Hotels" were used to estimate the proposed hydraulic foul water loading rates. The estimated flows are presented in Table 1.

Table 1. Proposed Foul Water Hydraulic Loadings

Source	Unit	Quantity	Flow	Daily Flow	DWF	DWF	Peak Flow	
			(litres/day/unit or litres/sec/ha)	(litres/ day)	m³/day	litres/ sec	litres/ sec	
Residential Units @ 450 l/day/unit	unit	289	450	130,050.00	130.05	1.51	9.03	6DWF
Creche	Area (ha)	0.0280	0.16	387.07	0.3871	0.004	0.02	4.5DWF

Source	Unit	Quantity	Flow	Daily Flow	DWF	DWF	Peak Flow	
Commercial and Amenity Units (ground floor adjacent to Fitzpatrick's Shop)	Area (ha)	0.0735	0.16	1,016.06	1.0161	0.012	0.05	4.5DWF
Total				131,453.14	131.45	1.52	9.10	

4. Water Supply

4.1 Existing Water Supply

Record drawings provided by Irish Water (refer to Figure 4-1) indicate that there is an existing 150mm watermain running along the north of the site. It also indicates a 100mm watermain running along the terrace at the southern boundary of the proposed development (see Appendix F for full records).

Figure 4-1 – Existing Watermain

4.2 Proposed Water Supply

A Pre-Connection Enquiry Form has been issued to Irish Water in relation to the feasibility of servicing the proposed development with a water supply connection. Irish Water confirmed that the proposed water supply connection to the Irish Water network can be facilitated subject to a valid connection agreement being put in place. Please refer to Appendix A for the Irish Water Confirmation of Feasibility.

It is proposed to service the proposed development via a new 150mm diameter watermain connection off the 150mm diameter watermain running along the northern boundary and to also connect to the 100mm diameter watermain running along the southern boundary indicated on the AECOM Drawing 60592432-ACM-00-00-DR-CE-10-2701, 2702, 2703 & 2704.

The internal water supply network is based on the Department of the Environment 'Recommendation for Site Development Works', the requirements of Irish Water and the Technical Guidance Document – Part B of the Building Regulations 2006:

- The development shall have a bulk water meter (exact location to be agreed with Irish Water) in accordance with Irish Water Code of Practice for Water Infrastructure Section 3.15.4.
- All apartments and similar properties shall have meters installed internally within the premises in accordance with the Building Control Authority's requirements and subject to review by Irish Water as per Irish Water Code of Practice for Water Infrastructure Section 3.15.2.
- Hydrants are positioned within 46m from all the proposed buildings
- Sluice valves are positioned to isolate the watermain
- An air valve is proposed at the high point within the internal water supply network
- A scour valve is proposed the low point within the internal water supply network

Table 2 presents the estimated water demand submitted to Irish Water as part of the Pre-Connection Enquiry Form.

Table 2. Proposed Water Demand

Source	Unit	Quantity	Flow	Daily	Daily	Daily Demand	Average day/ peak week demand (DD*1.25)	Peak week demand (Average day/ peak week demand*5)
			(litres/day/unit or litres/sec/ha)	(litres/ day)	m³/day	litres/ sec	litres/ sec	litres/ sec
Residential Units @ 450 l/day/unit	unit	289	450	130,050.00	130.05	1.51	1.882	9.408
Creche	Area (ha)	0.0280	0.16	387.07	0.3871	0.004	0.006	0.028
Commercial and Amenity Units (ground floor adjacent to Fitzpatrick's Shop)	Area (ha)	0.0735	0.16	1,016.06	1.0161	0.012	0.015	0.074
Total				131,453.14	131.45	1.52	1.90	9.51

To further reduce the water demand on Local Authority water supplies and to reduce the foul discharge from the development, water conservation measures will be incorporated in the sanitary facilities throughout the development, e.g. dual flush toilets.

Appendix A - Irish Water COF

Aileen Prendergast

1st Floor Montrose House
Carrigaline Road
Douglas
Co. Cork

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

28 September 2021

Re: CDS21006136 pre-connection enquiry - Subject to contract | Contract denied

Connection for Multi/Mixed Use Development of 292 unit(s) at Lackenroe, Glouthaune, Cork

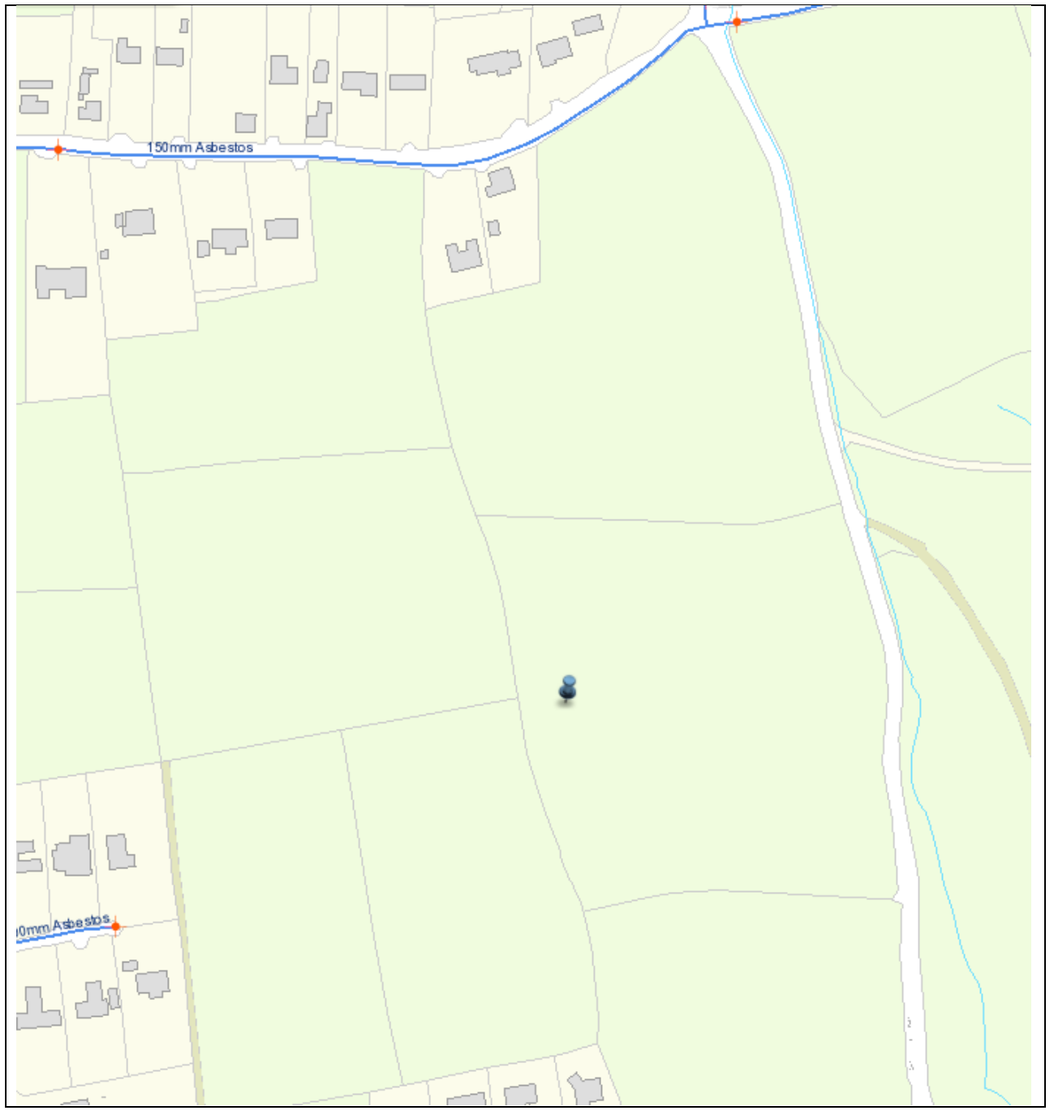
Dear Sir/Madam,

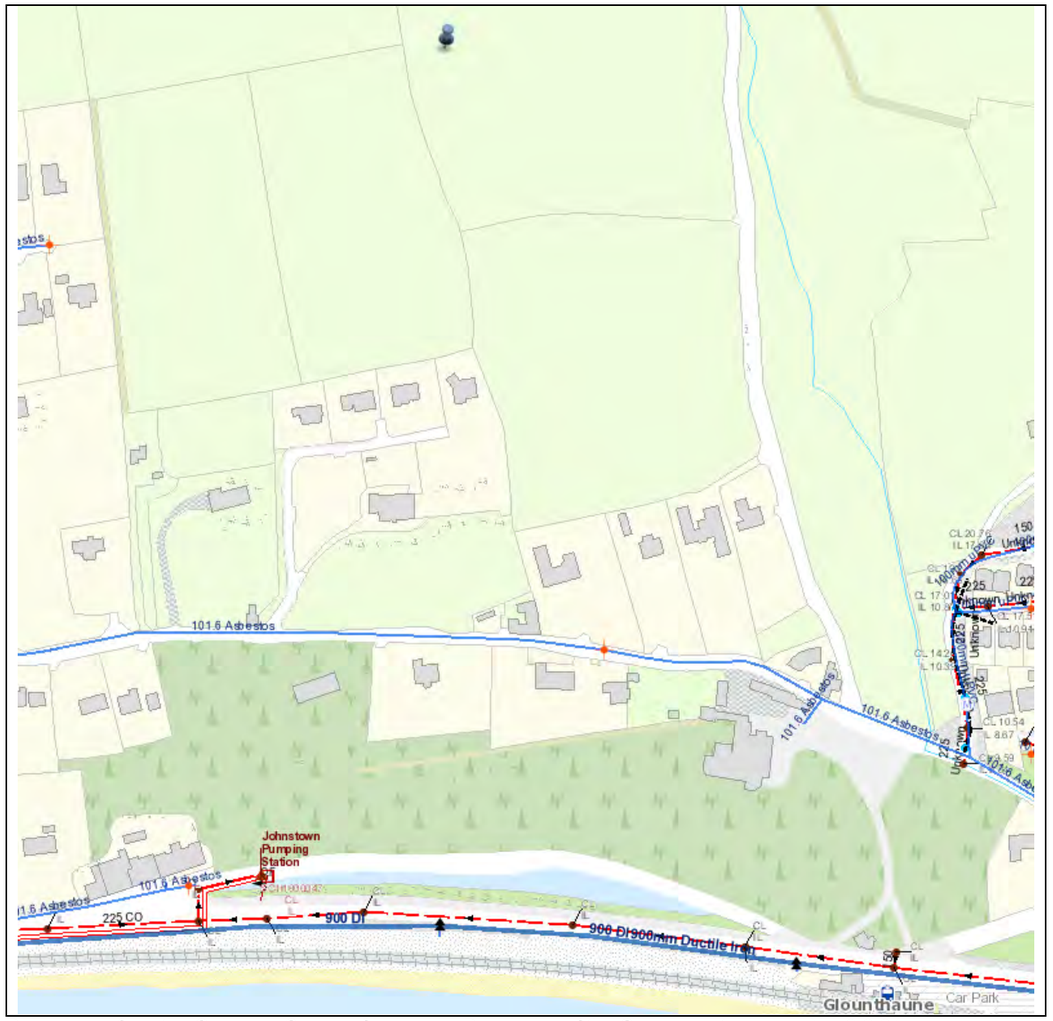
Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Lackenroe, Glouthaune, Cork (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the Irish Water network(s) as assessed by Irish Water, we wish to advise you that your proposed connection to the Irish Water network(s) can be facilitated at this moment in time.

SERVICE	OUTCOME OF PRE-CONNECTION ENQUIRY **THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.**
Water Connection	Feasible without infrastructure upgrade by Irish Water
Wastewater Connection	Feasible Subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	N/A
Wastewater Connection	In order to accommodate the proposed connection to Irish Water wastewater network at the Premises, upgrade works are required to extend the length of the network by approximately 400m on The Terrace from your site to the existing Irish Water network. Irish Water currently does not have any plans to extend its network in this area. Should you wish to progress with the connection you will be required to fund this network extension. Please note that no upgrades to the Johnstown Pumping Station are required to accommodate the proposed 30 units at the South of the development.
Strategic Housing Development	Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore: in

	advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.
The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.	

The map included below outlines the current Irish Water infrastructure adjacent to your site:





Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

General Notes:

1) The initial assessment referred to above is carried out taking into account water demand and wastewater discharge volumes and infrastructure details on the date of the assessment. **The availability of capacity may change at any date after this assessment.**
2) This feedback does not constitute a contract in whole or in part to provide a connection to any Irish Water infrastructure. All feasibility assessments are subject to the constraints of the Irish Water Capital Investment Plan.
3) The feedback provided is subject to a Connection Agreement/contract being signed at a later date.
4) A Connection Agreement will be required to commencing the connection works associated with the enquiry this can be applied for at https://www.water.ie/connections/get-connected/
5) A Connection Agreement cannot be issued until all statutory approvals are successfully in place.
6) Irish Water Connection Policy/ Charges can be found at https://www.water.ie/connections/information/connection-charges/
7) Please note the Confirmation of Feasibility does not extend to your fire flow requirements.
8) Irish Water is not responsible for the management or disposal of storm water or ground waters. You are advised to contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges
9) To access Irish Water Maps email datarequests@water.ie
10) All works to the Irish Water infrastructure, including works in the Public Space, shall have to be carried out by Irish Water.

If you have any further questions, please contact Dario Alvarez from the design team on + 353 2254621 or email dalvarez@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,

Yvonne Harris

Head of Customer Operations

Appendix B – Irish Water Statement of Design Acceptance (SODA)

Aileen Prendergast
1st Floor Montrose House
Carrigaline Road, Douglas
Cork

21 October 2021

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

Re: Design Submission for Glounthaune, Cork, Co.Cork (the "Development") (the "Design Submission") / Connection Reference No: 0850513420

Dear Aileen Prendergast,

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 www.water.ie/connections. 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)(https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to 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: Dario Alvarez
Email: dalvarez@water.ie

Yours sincerely,

Maria O'Dwyer
Connections and Developer Services

Appendix A

Document Title & Revision

- 60592432-ACM-00-00-DR-CE-10-2701
- 60592432-ACM-00-00-DR-CE-10-2702
- 60592432-ACM-00-00-DR-CE-10-2703
- 60592432-ACM-00-00-DR-CE-10-2704 - Rev. B
- 60592432-ACM-00-00-DR-CE-10-0501
- 60592432-ACM-00-00-DR-CE-10-0501
- 60592432-ACM-00-00-DR-CE-10-0502
- 60592432-ACM-00-00-DR-CE-10-0503
- 60592432-ACM-00-00-DR-CE-10-0504
- 60592432-ACM-00-00-DR-CE-10-0505 - Rev. B
- 60592432-ACM-00-00-DR-CE-10-0506
- 60592432-ACM-00-00-DR-CE-10-0507
- 20210820 - Foul Long Sections

*For further information, visit **www.water.ie/connections***

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by 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 C - Glounthaune QBar calcs

Mean Annual Flood Flow Rate Equation for Greenfield Catchments IH124

(Based on Institute of Hydrology report No. 124)

Project title: **Glounthaune SHD - Catchment 1**

Project no.:

Designed: Date:

$Q\ Bar = 0.00108 \times Area^{0.89} \times SAAR^{1.17} \times Soil^{2.17}$

Where			Units
Q Bar	=	Mean Annual Peak Flow	m^3/s
Area	=	Catchment area	km^2
SARR	=	Standard Annual Average Rainfall	mm
Soil	=	Soil Index	-

Table 1

Soil	WRAP	Runoff	Soil value	Soil Characteristics
1	Very high	Very low	0.15	Sandy, well drained
2	High	Low	0.3	Intermediate soils (sandy)
3	Moderate	Moderate	0.4	Intermediate soils (silty)
4	Low	High	0.45	Clayey, poorly drained
5	Very low	Very high	0.5	Steel, rocky areas

Area description: residential

Soil characteristics: Soil type (See Table 1) **4** (Clayey, poorly drained)
=> Soil index = 0.45 **See SI report**

Area = 0.5 km^2 (**43717** m^2)

Where developments are smaller than 50 ha, the analysis for determining the peak greenfield discharge rate should use 50 ha in the formula and linearly interpolate the flow rate value based on the ratio of the development to 50 ha.(Ref: Interim Code of Practice for Sustainable Drainage

SAAR = 1077 mm

Refer to Annual Average Rainfall Diagram on following spreadsheet

Q Bar = 0.3636 m^3/s (Based on 50 ha)

= 363.64 l/s

or

= 7.27 l/s/ha

Linear Interpolation of Q Bar based on ratio of development to 50 ha

Peak greenfield discharge rate, Q_{Bar} = 31.79 l/s

Growth Curve

Return Period Q_{t1}:	1	year
Growth Factor for Q_{t1}:	0.85	
Allowable Discharge for 1 year return period:	**27.03**	**l/s**
Return Period Q_{t2}:	10	year
Growth Factor for Q_{t2}:	1.33	
Allowable Discharge for 10 year return period:	**42.29**	**l/s**
Return Period Q_{t2}:	30	year
Growth Factor for Q_{t2}:	1.58	
Allowable Discharge for 30 year return period:	**50.24**	**l/s**
Return Period Q_{t3}:	100	year
Growth Factor for Q_{t3}:	1.84	
Allowable Discharge for 100 year return period:	**58.50**	**l/s**

Mean Annual Flood Flow Rate Equation for Greenfield Catchments IH124

(Based on Institute of Hydrology report No. 124)

Project title: **Glounthaune SHD - Catchment 2**

Project no.:

Designed: Date:

$Q\ Bar = 0.00108 \times Area^{0.89} \times SAAR^{1.17} \times Soil^{2.17}$

Where			Units
Q Bar	=	Mean Annual Peak Flow	m^3/s
Area	=	Catchment area	km^2
SARR	=	Standard Annual Average Rainfall	mm
Soil	=	Soil Index	-

Table 1

Soil	WRAP	Runoff	Soil value	Soil Characteristics
1	Very high	Very low	0.15	Sandy, well drained
2	High	Low	0.3	Intermediate soils (sandy)
3	Moderate	Moderate	0.4	Intermediate soils (silty)
4	Low	High	0.45	Clayey, poorly drained
5	Very low	Very high	0.5	Steel, rocky areas

Area description: residential

Soil characteristics: Soil type (See Table 1) **4** (Clayey, poorly drained)
=> Soil index = 0.45 **See SI report**

Area = 0.5 km^2 (**75917** m^2)

Where developments are smaller than 50 ha, the analysis for determining the peak greenfield discharge rate should use 50 ha in the formula and linearly interpolate the flow rate value based on the ratio of the development to 50 ha.(Ref: Interim Code of Practice for Sustainable Drainage

SAAR = 1077 mm

Refer to Annual Average Rainfall Diagram on following spreadsheet

Q Bar = 0.3636 m^3/s (Based on 50 ha)

= 363.64 l/s

or

= 7.27 l/s/ha

Linear Interpolation of Q Bar based on ratio of development to 50 ha

Peak greenfield discharge rate, Q_{Bar} = 55.21 l/s

Growth Curve

Return Period Q_{t1}:	1	year
Growth Factor for Q_{t1}:	0.85	
Allowable Discharge for 1 year return period:	**46.93**	**l/s**
Return Period Q_{t2}:	10	year
Growth Factor for Q_{t2}:	1.33	
Allowable Discharge for 10 year return period:	**73.43**	**l/s**
Return Period Q_{t2}:	30	year
Growth Factor for Q_{t2}:	1.58	
Allowable Discharge for 30 year return period:	**87.24**	**l/s**
Return Period Q_{t3}:	100	year
Growth Factor for Q_{t3}:	1.84	
Allowable Discharge for 100 year return period:	**101.59**	**l/s**

Mean Annual Flood Flow Rate Equation for Greenfield Catchments IH124

(Based on Institute of Hydrology report No. 124)

Project title: **Glounthaune SHD - Catchment 3**

Project no.:

Designed: Date:

Q Bar = 0.00108 x Area $^{0.89}$ x SAAR$^{1.17}$ x Soil$^{2.17}$

Where			**Units**
Q Bar	=	Mean Annual Peak Flow	m^3/s
Area	=	Catchment area	km^2
SARR	=	Standard Annual Average Rainfall	mm
Soil	=	Soil Index	-

Table 1

Soil	WRAP	Runoff	Soil value	Soil Characteristics
1	Very high	Very low	0.15	Sandy, well drained
2	High	Low	0.3	Intermediate soils (sandy)
3	Moderate	Moderate	0.4	Intermediate soils (silty)
4	Low	High	0.45	Clayey, poorly drained
5	Very low	Very high	0.5	Steel, rocky areas

Area description: residential

Soil characteristics: Soil type (See Table 1) **4** (Clayey, poorly drained)
=> Soil index = 0.45 **See SI report**

Area = 0.5 km^2 (**103517** m^2)

Where developments are smaller than 50 ha, the analysis for determining the peak greenfield discharge rate should use 50 ha in the formula and linearly interpolate the flow rate value based on the ratio of the development to 50 ha.(Ref: Interim Code of Practice for Sustainable Drainage

SAAR = 1077 mm

Refer to Annual Average Rainfall Diagram on following spreadsheet

Q Bar = 0.3636 m^3/s (Based on 50 ha)

= 363.64 l/s

or

= 7.27 l/s/ha

Linear Interpolation of Q Bar based on ratio of development to 50 ha

Peak greenfield discharge rate, Q_{Bar} = 75.29 l/s

Growth Curve

Return Period Q_{t1}:	1	year
Growth Factor for Q_{t1}:	0.85	
Allowable Discharge for 1 year return period:	**63.99**	**l/s**
Return Period Q_{t2}:	10	year
Growth Factor for Q_{t2}:	1.33	
Allowable Discharge for 10 year return period:	**100.13**	**l/s**
Return Period Q_{t2}:	30	year
Growth Factor for Q_{t2}:	1.58	
Allowable Discharge for 30 year return period:	**118.95**	**l/s**
Return Period Q_{t3}:	100	year
Growth Factor for Q_{t3}:	1.84	
Allowable Discharge for 100 year return period:	**138.53**	**l/s**

Mean Annual Flood Flow Rate Equation for Greenfield Catchments IH124

(Based on Institute of Hydrology report No. 124)

Project title: **Glounthaune SHD - Catchment 4**

Project no.:

Designed: Date:

(Complete figures in **blue** only)

Q Bar = 0.00108 x Area $^{0.89}$ x SAAR$^{1.17}$ x Soil$^{2.17}$

Where			**Units**
Q Bar	=	Mean Annual Peak Flow	m^3/s
Area	=	Catchment area	km^2
SARR	=	Standard Annual Average Rainfall	mm
Soil	=	Soil Index	-

Table 1

Soil	WRAP	Runoff	Soil value	Soil Characteristics
1	Very high	Very low	0.15	Sandy, well drained
2	High	Low	0.3	Intermediate soils (sandy)
3	Moderate	Moderate	0.4	Intermediate soils (silty)
4	Low	High	0.45	Clayey, poorly drained
5	Very low	Very high	0.5	Steel, rocky areas

Area description: commercial

Soil characteristics: Soil type (See Table 1) **4** (Clayey, poorly drained)
=> Soil index = 0.45 **See SI report**

Area = 0.5 km^2 (**114427** m^2)

Where developments are smaller than 50 ha, the analysis for determining the peak greenfield discharge rate should use 50 ha in the formula and linearly interpolate the flow rate value based on the ratio of the development to 50 ha.(Ref: Interim Code of Practice for Sustainable Drainage

SAAR = 1077 mm

Refer to Annual Average Rainfall Diagram on following spreadsheet

Q Bar = 0.3636 m^3/s (Based on 50 ha)

= 363.64 l/s

or

= 7.27 l/s/ha

Linear Interpolation of Q Bar based on ratio of development to 50 ha

Peak greenfield discharge rate, Q_{Bar} = 83.22 l/s

Growth Curve

Return Period Q_{t1}:	1	year
Growth Factor for Q_{t1}:	0.85	
Allowable Discharge for 1 year return period:	**70.74**	**l/s**
Return Period Q_{t2}:	10	year
Growth Factor for Q_{t2}:	1.33	
Allowable Discharge for 10 year return period:	**110.68**	**l/s**
Return Period Q_{t2}:	30	year
Growth Factor for Q_{t2}:	1.58	
Allowable Discharge for 30 year return period:	**131.49**	**l/s**
Return Period Q_{t3}:	100	year
Growth Factor for Q_{t3}:	1.84	
Allowable Discharge for 100 year return period:	**153.13**	**l/s**

Appendix D – Glounthaune Drainage Surface Water Network Details

AECOM		Page 0
Midpoint Alencon Link Basingstoke, RG21 7PP	Glounthaune Co. Cork Proposed Drainage	Micro Drainage
Date 10/08/2021 File GLOUNTHAUNE UPDATED	Designed by JC Checked by AP	
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)	5	PIMP (%)	100
M5-60 (mm)	18.800	Add Flow / Climate Change (%)	20
Ratio R	0.264	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	75	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.000
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.000	4-8	0.000	8-12	0.658	12-16	1.623	16-20	1.885	20-24	0.680	24-28	0.004

Total Area Contributing (ha) = 4.851

Total Pipe Volume (m^3) = 423.477

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	31.308	1.044	30.0	0.052	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	57.547	1.918	30.0	0.036	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	38.663	1.289	30.0	0.103	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	6.184	0.206	30.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	39.985	1.333	30.0	0.149	0.00	0.0	0.600	o	225	Pipe/Conduit	

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 (l/s)	Flow (l/s)
S1.000	67.94	5.22	107.300	0.052	0.0	0.0	1.9	2.40	95.3	11.4
S1.001	66.09	5.62	106.256	0.087	0.0	0.0	3.1	2.40	95.3	18.8
S2.000	67.69	5.27	106.325	0.103	0.0	0.0	3.8	2.40	95.3	22.6
S2.001	67.49	5.31	105.036	0.103	0.0	0.0	3.8	2.40	95.3	22.6
S2.002	66.22	5.59	104.830	0.252	0.0	0.0	9.0	2.40	95.3	54.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.003	6.479	0.216	30.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	65.418	2.181	30.0	0.062	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	51.128	1.704	30.0	0.125	5.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	5.937	0.030	200.0	0.021	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.002	34.165	0.450	75.9	0.051	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.003	18.464	0.440	42.0	0.009	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	39.615	0.943	42.0	0.049	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	39.616	1.200	33.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	6.220	0.188	33.0	0.007	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	50.591	1.533	33.0	0.021	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.008	26.273	0.796	33.0	0.065	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.009	29.699	0.900	33.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.010	8.427	0.255	33.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.000	29.223	1.282	22.8	0.024	5.00	0.0	0.600	o	225	Pipe/Conduit	
S5.000	37.642	1.075	35.0	0.088	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	29.087	1.276	22.8	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	

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 (l/s)	Flow (l/s)
S2.003	66.02	5.63	103.497	0.252	0.0	0.0	9.0	2.40	95.3	54.2
S1.002	64.07	6.09	102.755	0.401	0.0	0.0	13.9	2.40	95.3	83.5
S3.000	67.29	5.36	101.700	0.125	0.0	0.0	4.6	2.40	95.3	27.3
S3.001	66.79	5.46	99.996	0.146	0.0	0.0	5.3	0.92	36.6	31.7
S3.002	65.11	5.84	99.966	0.197	0.0	0.0	6.9	1.50	59.7	41.6
S1.003	63.56	6.22	99.441	0.607	0.0	0.0	20.9	2.43	172.0	125.3
S1.004	62.48	6.49	99.001	0.656	0.0	0.0	22.2	2.43	172.0	133.2
S1.005	61.57	6.73	96.788	0.656	0.0	0.0	22.2	2.75	194.1	133.2
S1.006	61.43	6.77	95.588	0.662	0.0	0.0	22.2	2.75	194.1	133.2
S1.007	60.32	7.07	93.863	0.683	0.0	0.0	22.3	2.75	194.1	133.9
S1.008	59.77	7.23	91.185	0.748	0.0	0.0	24.2	2.75	194.1	145.3
S1.009	59.15	7.41	89.090	0.748	0.0	0.0	24.2	2.75	194.1	145.3
S1.010	58.98	7.46	88.190	0.748	0.0	0.0	24.2	2.74	194.0	145.3
S4.000	68.13	5.18	105.355	0.024	0.0	0.0	0.9	2.75	109.4	5.3
S5.000	67.63	5.28	105.150	0.088	0.0	0.0	3.2	2.22	88.2	19.4
S4.001	66.81	5.46	103.200	0.136	0.0	0.0	4.9	2.75	109.4	29.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	45.698	1.632	28.0	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.003	7.239	0.242	29.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.004	50.509	0.746	67.7	0.103	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.005	10.849	0.136	80.0	0.029	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.006	32.024	0.400	80.0	0.062	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.007	29.244	0.334	87.5	0.067	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.008	6.762	0.097	70.0	0.003	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.009	10.707	0.134	80.0	0.005	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.010	54.448	1.959	27.8	0.125	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.011	7.395	0.266	27.8	0.031	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.012	5.619	0.202	27.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.013	6.197	0.223	27.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.014	15.612	0.473	33.0	0.018	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.015	47.209	0.944	50.0	0.032	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.016	80.567	0.403	200.0	0.146	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.011	24.157	0.121	200.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S6.000	63.011	1.800	35.0	0.083	5.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	17.526	0.531	33.0	0.054	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.002	24.238	0.242	100.0	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	

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 (l/s)	Flow (l/s)
S4.002	65.67	5.71	101.300	0.175	0.0	0.0	6.2	2.98	210.8	37.4
S4.003	65.48	5.76	99.668	0.175	0.0	0.0	6.2	2.89	204.0	37.4
S4.004	63.64	6.20	99.426	0.278	0.0	0.0	9.6	1.91	135.3	57.6
S4.005	63.22	6.30	98.680	0.308	0.0	0.0	10.5	1.76	124.4	63.2
S4.006	62.04	6.60	98.544	0.370	0.0	0.0	12.4	1.76	124.4	74.6
S4.007	60.97	6.89	98.144	0.437	0.0	0.0	14.4	1.68	118.9	86.7
S4.008	60.75	6.95	97.810	0.441	0.0	0.0	14.5	1.88	133.0	87.0
S4.009	60.39	7.05	97.713	0.446	0.0	0.0	14.6	1.76	124.4	87.6
S4.010	59.34	7.36	96.775	0.571	0.0	0.0	18.4	2.99	211.6	110.1
S4.011	59.20	7.40	92.720	0.602	0.0	0.0	19.3	2.99	211.6	115.9
S4.012	59.10	7.43	90.670	0.602	0.0	0.0	19.3	2.99	211.6	115.9
S4.013	58.98	7.46	89.110	0.602	0.0	0.0	19.3	2.99	211.6	115.9
S4.014	58.67	7.56	88.000	0.620	0.0	0.0	19.7	2.75	194.1	118.2
S4.015	57.78	7.83	87.377	0.651	0.0	0.0	20.4	2.88	458.1	122.3
S4.016	55.24	8.68	86.358	0.798	0.0	0.0	23.9	1.58	342.1	143.2
S1.011	54.53	8.94	85.955	1.546	0.0	0.0	45.7	1.58	342.1	273.9
S6.000	66.74	5.47	90.850	0.083	0.0	0.0	3.0	2.22	88.2	18.0
S6.001	66.17	5.60	89.050	0.137	0.0	0.0	4.9	2.29	90.9	29.5
S6.002	64.82	5.91	88.519	0.150	0.0	0.0	5.3	1.31	52.0	31.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.012	20.739	0.104	199.4	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.013	9.132	0.046	198.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.000	48.697	0.243	200.0	0.098	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.014	21.513	0.108	199.2	0.015	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.015	33.486	0.419	79.9	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.016	25.693	0.321	80.0	0.023	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.017	28.625	0.159	180.0	0.060	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.018	22.552	0.113	199.6	0.114	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.019	12.965	0.065	199.5	0.016	0.00	0.0	0.600	o	375	Pipe/Conduit	
S8.000	38.260	0.478	80.0	0.086	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	18.620	0.233	80.0	0.061	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.002	18.523	0.412	45.0	0.016	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.003	9.580	0.274	35.0	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.004	36.029	1.441	25.0	0.041	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.005	52.204	0.653	79.9	0.038	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.006	28.565	0.238	120.0	0.092	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.007	4.016	0.122	33.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.020	28.647	0.143	200.3	0.066	0.00	0.0	0.600	o	450	Pipe/Conduit	

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 (l/s)	Flow (l/s)
S1.012	53.94	9.15	85.834	1.695	0.0	0.0	49.5	1.58	342.6	297.2
S1.013	68.19	5.16	85.730	0.000	31.8	0.0	5.3	0.92	36.8	31.8
S7.000	64.94	5.88	86.700	0.098	0.0	0.0	3.5	0.92	36.6	20.7
S1.014	63.60	6.20	85.250	0.113	31.8	0.0	10.3	1.11	78.5	61.5
S1.015	62.35	6.52	84.750	0.163	31.8	0.0	11.9	1.76	124.4	71.2
S1.016	61.44	6.76	84.331	0.186	31.8	0.0	12.6	1.76	124.3	75.3
S1.017	60.16	7.12	83.935	0.246	31.8	0.0	14.4	1.35	148.8	86.3
S1.018	59.15	7.41	83.776	0.360	31.8	0.0	17.9	1.28	141.3	107.4
S1.019	58.59	7.58	83.663	0.376	31.8	0.0	18.3	1.28	141.3	109.8
S8.000	66.91	5.44	91.295	0.086	0.0	0.0	3.1	1.46	58.2	18.7
S8.001	65.96	5.65	90.817	0.147	0.0	0.0	5.3	1.46	58.2	31.5
S8.002	65.27	5.81	90.000	0.163	0.0	0.0	5.8	1.96	77.7	34.6
S8.003	64.96	5.88	89.000	0.169	0.0	0.0	5.9	2.22	88.2	35.7
S8.004	64.00	6.11	88.000	0.210	0.0	0.0	7.3	2.63	104.5	43.7
S8.005	62.05	6.60	86.484	0.248	0.0	0.0	8.3	1.76	124.4	50.0
S8.006	60.82	6.93	85.831	0.340	0.0	0.0	11.2	1.43	101.4	67.2
S8.007	60.73	6.96	85.593	0.340	0.0	0.0	11.2	2.75	194.1	67.2
S1.020	57.52	7.91	83.523	0.782	31.8	0.0	30.7	1.43	227.9	184.3

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.021	5.980	0.030	199.3	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.022	15.700	0.262	60.0	0.022	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.023	21.135	0.352	60.0	0.034	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.024	22.570	0.376	60.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S9.000	35.012	0.175	200.0	0.098	5.00	0.0	0.600	o	300	Pipe/Conduit	
S10.000	35.450	0.443	80.0	0.078	5.00	0.0	0.600	o	225	Pipe/Conduit	
S10.001	21.177	0.265	80.0	0.070	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.001	28.181	0.141	200.0	0.066	0.00	0.0	0.600	o	300	Pipe/Conduit	
S9.002	47.606	0.238	200.0	0.095	0.00	0.0	0.600	o	375	Pipe/Conduit	
S9.003	12.032	0.060	200.0	0.069	0.00	0.0	0.600	o	375	Pipe/Conduit	
S9.004	8.097	0.040	200.0	0.031	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.025	19.942	0.100	199.4	0.013	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.026	51.540	0.764	67.5	0.052	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.027	21.478	0.318	67.5	0.095	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.028	20.549	0.304	67.5	0.002	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.029	24.871	0.368	67.6	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.030	54.296	0.271	200.4	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
S1.031	12.329	0.062	198.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

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 (l/s)	Flow (l/s)
S1.021	57.32	7.98	83.305	0.782	31.8	0.0	30.7	1.58	342.7	184.3
S1.022	57.04	8.07	83.275	0.804	31.8	0.0	31.2	2.90	626.8	187.1
S1.023	56.67	8.19	81.835	0.838	31.8	0.0	32.1	2.90	626.8	192.4
S1.024	56.29	8.32	80.390	0.838	31.8	0.0	32.1	2.89	626.7	192.4
S9.000	66.50	5.53	78.265	0.098	0.0	0.0	3.5	1.11	78.3	21.2
S10.000	67.06	5.40	80.600	0.078	0.0	0.0	2.8	1.46	58.2	17.0
S10.001	65.97	5.65	80.157	0.148	0.0	0.0	5.3	1.46	58.2	31.7
S9.001	64.16	6.07	78.090	0.312	0.0	0.0	10.8	1.11	78.3	65.1
S9.002	61.71	6.69	77.874	0.407	0.0	0.0	13.6	1.28	141.1	81.6
S9.003	61.13	6.85	77.636	0.476	0.0	0.0	15.8	1.28	141.1	94.6
S9.004	60.75	6.95	77.576	0.507	0.0	0.0	16.7	1.28	141.1	100.1
S1.025	55.67	8.53	77.385	1.358	31.8	0.0	47.3	1.58	342.6	283.8
S1.026	54.78	8.84	77.285	1.410	31.8	0.0	48.2	2.73	591.0	289.1
S1.027	54.42	8.98	75.700	1.505	31.8	0.0	50.7	2.73	590.6	304.3
S1.028	54.11	9.09	75.307	1.507	31.8	0.0	50.7	2.97	838.9	304.3
S1.029	53.74	9.23	74.180	1.507	31.8	0.0	50.7	2.97	838.4	304.3
S1.030	52.49	9.72	73.737	1.507	31.8	0.0	50.7	1.85	661.3	304.3
S1.031	68.09	5.18	73.000	0.000	55.2	0.0	9.2	1.11	78.6	55.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.032	37.487	0.187	200.0	0.125	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.033	37.487	0.750	50.0	0.024	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.034	12.395	0.155	80.0	0.185	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	34.492	1.725	20.0	0.036	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.035	16.820	0.449	37.5	0.054	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.036	16.820	0.449	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.037	5.698	0.152	37.5	0.035	0.00	0.0	0.600	o	375	Pipe/Conduit	
S12.000	27.986	0.700	40.0	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit	
S12.001	27.959	1.398	20.0	0.016	0.00	0.0	0.600	o	225	Pipe/Conduit	
S12.002	44.285	0.805	55.0	0.040	0.00	0.0	0.600	o	225	Pipe/Conduit	
S12.003	40.226	1.609	25.0	0.080	0.00	0.0	0.600	o	225	Pipe/Conduit	
S12.004	14.337	0.717	20.0	0.064	0.00	0.0	0.600	o	225	Pipe/Conduit	
S12.005	22.179	0.111	200.0	0.034	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.006	6.988	0.035	199.6	0.005	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.038	31.274	0.625	50.0	0.019	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.039	33.875	0.847	40.0	0.124	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.040	29.561	0.788	37.5	0.016	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.041	33.090	0.882	37.5	0.024	0.00	0.0	0.600	o	375	Pipe/Conduit	

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 (l/s)	Flow (l/s)
S1.032	65.84	5.67	72.863	0.125	55.2	0.0	15.5	1.28	141.1	93.0
S1.033	64.79	5.92	72.676	0.149	55.2	0.0	16.3	2.57	283.6	97.6
S1.034	64.36	6.02	71.250	0.334	55.2	0.0	22.7	2.03	223.9	136.1
S11.000	68.04	5.20	74.475	0.036	0.0	0.0	1.3	2.94	116.9	8.0
S1.035	63.97	6.11	71.095	0.424	55.2	0.0	25.7	2.97	327.9	154.5
S1.036	63.59	6.21	69.695	0.424	55.2	0.0	25.7	2.97	327.9	154.5
S1.037	63.46	6.24	69.246	0.459	55.2	0.0	26.8	2.97	327.7	161.0
S12.000	67.90	5.22	73.450	0.059	0.0	0.0	2.2	2.08	82.5	13.0
S12.001	67.16	5.38	72.750	0.075	0.0	0.0	2.7	2.94	116.9	16.4
S12.002	65.29	5.80	71.352	0.115	0.0	0.0	4.1	1.77	70.3	24.4
S12.003	64.21	6.06	70.547	0.195	0.0	0.0	6.8	2.63	104.5	40.7
S12.004	63.88	6.14	68.938	0.259	0.0	0.0	9.0	2.94	116.9	53.8
S12.005	62.55	6.47	68.146	0.293	0.0	0.0	9.9	1.11	78.3	59.5
S12.006	62.20	6.56	67.960	0.297	0.0	0.0	10.0	1.28	141.2	60.1
S1.038	61.43	6.77	67.925	0.776	55.2	0.0	36.9	2.57	283.5	221.1
S1.039	60.72	6.96	67.300	0.900	55.2	0.0	40.6	2.87	317.3	243.8
S1.040	60.13	7.13	66.453	0.916	55.2	0.0	40.9	2.97	327.6	245.2
S1.041	59.49	7.31	64.400	0.940	55.2	0.0	41.3	2.97	327.6	247.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.042	10.698	0.285	37.5	0.008	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.000	57.517	0.765	75.2	0.139	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.001	43.659	0.218	200.0	0.100	0.00	0.0	0.600	o	300	Pipe/Conduit	
S13.002	12.661	0.063	200.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S13.003	30.940	0.155	200.0	0.087	0.00	0.0	0.600	o	300	Pipe/Conduit	
S13.004	23.772	0.119	200.0	0.062	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.043	5.101	0.085	60.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.044	3.750	0.063	59.5	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.045	10.149	0.169	60.1	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.046	5.835	0.156	37.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.047	10.127	0.270	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.048	10.126	0.270	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.049	7.863	0.210	37.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.050	9.381	0.250	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.051	6.042	0.161	37.5	0.019	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.052	6.042	0.161	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.053	9.062	0.242	37.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.054	17.313	0.462	37.5	0.039	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.055	10.000	0.267	37.5	0.012	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.056	10.000	0.267	37.5	0.005	0.00	0.0	0.600	o	375	Pipe/Conduit	

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 (l/s)	Flow (l/s)
S1.042	59.28	7.37	63.518	0.948	55.2	0.0	41.5	2.97	327.5	248.8
S13.000	66.02	5.63	63.300	0.139	0.0	0.0	5.0	1.51	60.0	29.8
S13.001	63.25	6.29	62.460	0.238	0.0	0.0	8.2	1.11	78.3	49.0
S13.002	62.51	6.48	62.242	0.238	0.0	0.0	8.2	1.11	78.3	49.0
S13.003	60.77	6.95	62.178	0.325	0.0	0.0	10.7	1.11	78.3	64.2
S13.004	59.51	7.30	62.024	0.387	0.0	0.0	12.5	1.11	78.3	74.9
S1.043	59.18	7.40	61.680	1.335	55.2	0.0	53.8	2.90	626.8	323.0
S1.044	59.11	7.42	59.850	1.335	55.2	0.0	53.8	2.91	629.3	323.0
S1.045	58.91	7.48	57.985	1.335	55.2	0.0	53.8	2.89	626.5	323.0
S1.046	68.84	5.03	56.500	0.000	75.3	0.0	12.6	2.97	328.1	75.3
S1.047	68.56	5.09	54.644	0.000	75.3	0.0	15.1	2.97	327.7	90.4
S1.048	68.28	5.15	52.400	0.000	75.3	0.0	15.1	2.97	327.7	90.4
S1.049	68.07	5.19	50.430	0.000	75.3	0.0	15.1	2.97	327.9	90.4
S1.050	67.82	5.24	49.220	0.000	75.3	0.0	15.1	2.97	327.6	90.4
S1.051	67.65	5.28	47.470	0.019	75.3	0.0	15.8	2.97	327.6	94.5
S1.052	67.49	5.31	45.700	0.019	75.3	0.0	15.8	2.97	327.6	94.5
S1.053	67.26	5.36	44.540	0.019	75.3	0.0	15.8	2.97	327.9	94.5
S1.054	66.81	5.46	43.795	0.058	75.3	0.0	17.2	2.97	327.8	103.0
S1.055	66.55	5.52	41.750	0.070	75.3	0.0	17.6	2.97	327.9	105.5
S1.056	66.30	5.57	39.980	0.075	75.3	0.0	17.7	2.97	327.9	106.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.057	10.000	0.267	37.5	0.004	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.058	9.796	0.261	37.5	0.004	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.059	9.689	0.258	37.6	0.004	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.060	14.747	0.393	37.5	0.004	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.061	14.121	0.121	116.7	0.035	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.062	15.055	0.401	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.063	4.756	0.024	198.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S14.000	17.431	0.218	80.0	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit	
S14.001	11.232	0.140	80.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.064	21.787	0.581	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.065	81.953	2.185	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.066	45.614	1.216	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.067	29.502	0.787	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.068	20.758	0.554	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.069	20.757	0.554	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.070	20.758	0.554	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.071	20.757	0.554	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.072	36.558	0.975	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.073	23.489	0.626	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.074	25.896	0.691	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

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 (l/s)	Flow (l/s)
S1.057	66.05	5.63	37.950	0.079	75.3	0.0	17.9	2.97	327.9	107.3
S1.058	65.80	5.68	36.380	0.083	75.3	0.0	18.0	2.97	327.6	108.2
S1.059	65.56	5.74	35.250	0.087	75.3	0.0	18.2	2.96	327.4	109.0
S1.060	65.21	5.82	33.990	0.091	75.3	0.0	18.3	2.97	327.6	109.7
S1.061	64.61	5.96	33.597	0.126	75.3	0.0	19.5	1.68	185.1	116.9
S1.062	64.25	6.05	33.476	0.126	75.3	0.0	19.5	2.97	327.5	116.9
S1.063	68.69	5.06	31.750	0.000	83.2	0.0	13.9	1.28	141.8	83.2
S14.000	67.37	5.34	33.200	0.000	0.0	0.0	0.0	0.86	6.8	0.0
S14.001	66.37	5.55	32.982	0.000	0.0	0.0	0.0	0.86	6.8	0.0
S1.064	65.83	5.68	31.726	0.000	83.2	0.0	16.6	2.97	327.7	99.8
S1.065	63.87	6.14	31.145	0.000	83.2	0.0	16.6	2.97	327.7	99.8
S1.066	62.85	6.39	28.960	0.000	83.2	0.0	16.6	2.97	327.6	99.8
S1.067	62.21	6.56	27.744	0.000	83.2	0.0	16.6	2.97	327.8	99.8
S1.068	61.77	6.68	26.957	0.000	83.2	0.0	16.6	2.97	327.8	99.8
S1.069	61.33	6.79	26.403	0.000	83.2	0.0	16.6	2.97	327.8	99.8
S1.070	60.91	6.91	25.849	0.000	83.2	0.0	16.6	2.97	327.8	99.8
S1.071	60.49	7.03	25.295	0.000	83.2	0.0	16.6	2.97	327.8	99.8
S1.072	59.77	7.23	24.741	0.000	83.2	0.0	16.6	2.97	327.7	99.8
S1.073	59.32	7.36	23.766	0.000	83.2	0.0	16.6	2.97	327.6	99.8
S1.074	58.83	7.51	23.140	0.000	83.2	0.0	16.6	2.97	327.8	99.8

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.075	86.931	2.318	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.076	69.412	1.851	37.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.077	45.038	0.901	50.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.078	45.039	0.751	60.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.079	51.463	0.172	300.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S15.000	18.804	0.470	40.0	0.037	5.00	0.0	0.600	o	225	Pipe/Conduit	
S15.001	9.098	0.364	25.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.002	6.980	0.279	25.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.003	8.735	0.349	25.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.004	6.537	0.327	20.0	0.098	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.005	11.237	0.562	20.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.006	4.169	0.417	10.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.007	5.981	0.299	20.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.008	5.594	0.280	20.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.009	4.032	0.160	25.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.010	5.992	0.266	22.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.011	18.620	0.466	40.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.012	4.192	0.140	30.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.013	17.772	0.355	50.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.014	7.672	0.128	60.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.015	17.517	1.460	12.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

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 (l/s)	Flow (l/s)
S1.075	57.26	8.00	22.449	0.000	83.2	0.0	16.6	2.97	327.7	99.8
S1.076	56.09	8.39	20.131	0.000	83.2	0.0	16.6	2.97	327.7	99.8
S1.077	55.25	8.68	18.280	0.000	83.2	0.0	16.6	2.57	283.6	99.8
S1.078	54.36	9.00	17.379	0.000	83.2	0.0	16.6	2.34	258.8	99.8
S1.079	52.23	9.82	16.629	0.000	83.2	0.0	16.6	1.04	115.0	99.8
S15.000	68.26	5.15	27.000	0.037	0.0	0.0	1.4	2.07	82.5	8.3
S15.001	67.98	5.21	26.400	0.037	0.0	0.0	1.4	2.63	104.5	8.3
S15.002	67.77	5.25	25.700	0.037	0.0	0.0	1.4	2.63	104.4	8.3
S15.003	67.51	5.31	25.000	0.037	0.0	0.0	1.4	2.63	104.4	8.3
S15.004	67.33	5.35	24.600	0.136	0.0	0.0	4.9	2.94	116.9	29.7
S15.005	67.04	5.41	24.200	0.136	0.0	0.0	4.9	2.94	116.9	29.7
S15.006	66.96	5.43	22.200	0.136	0.0	0.0	4.9	4.16	165.5	29.7
S15.007	66.80	5.46	21.000	0.136	0.0	0.0	4.9	2.94	116.9	29.7
S15.008	66.66	5.49	19.500	0.136	0.0	0.0	4.9	2.94	116.9	29.7
S15.009	66.54	5.52	18.500	0.136	0.0	0.0	4.9	2.62	104.1	29.7
S15.010	66.38	5.55	17.300	0.136	0.0	0.0	4.9	2.77	110.1	29.7
S15.011	65.72	5.70	15.800	0.136	0.0	0.0	4.9	2.07	82.5	29.7
S15.012	65.59	5.73	15.000	0.136	0.0	0.0	4.9	2.40	95.3	29.7
S15.013	64.90	5.89	14.300	0.136	0.0	0.0	4.9	1.85	73.7	29.7
S15.014	64.58	5.97	13.800	0.136	0.0	0.0	4.9	1.69	67.3	29.7
S15.015	64.26	6.04	13.300	0.136	0.0	0.0	4.9	3.80	151.0	29.7

Appendix E - Drainage Maintenance Inspection Checklist

AECOM		Page 9
Midpoint Alencon Link Basingstoke, RG21 7PP	Glounthaune Co. Cork Proposed Drainage	
Date 10/08/2021 File GLOUNTHAUNE UPDATED	Designed by JC Checked by AP	
Innovyze	Network 2020.1	

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S15.016	3.410	0.227	15.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.017	4.800	0.190	25.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.018	33.051	1.653	20.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.019	10.982	0.572	19.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.020	18.001	0.980	18.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.021	8.685	0.347	25.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.022	11.718	0.234	50.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.023	16.645	0.555	30.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.024	14.019	0.234	60.0	0.052	0.00	0.0	0.600	o	225	Pipe/Conduit	
S15.025	53.073	0.152	350.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.026	52.973	0.151	350.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.027	37.373	0.107	350.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.028	49.399	0.123	401.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.029	76.851	0.192	400.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.030	32.833	0.082	400.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.031	71.778	0.179	401.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.032	71.777	0.179	401.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.033	72.143	0.180	400.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.080	86.427	0.144	600.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.081	87.004	0.145	600.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	

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 (l/s)	Flow (l/s)
S15.016	64.19	6.06	11.300	0.136	0.0	0.0	4.9	3.39	134.9	29.7
S15.017	64.06	6.09	10.800	0.136	0.0	0.0	4.9	2.61	103.9	29.7
S15.018	63.30	6.28	10.000	0.136	0.0	0.0	4.9	2.94	116.9	29.7
S15.019	63.06	6.34	8.200	0.136	0.0	0.0	4.9	3.00	119.3	29.7
S15.020	62.68	6.44	7.300	0.136	0.0	0.0	4.9	3.07	122.0	29.7
S15.021	62.46	6.49	5.500	0.136	0.0	0.0	4.9	2.63	104.5	29.7
S15.022	62.06	6.60	5.153	0.136	0.0	0.0	4.9	1.85	73.7	29.7
S15.023	61.62	6.71	4.000	0.136	0.0	0.0	4.9	2.40	95.3	29.7
S15.024	61.11	6.85	3.300	0.188	0.0	0.0	6.2	1.69	67.3	37.3
S15.025	57.53	7.91	2.800	0.188	0.0	0.0	6.2	0.83	59.0	37.3
S15.026	54.44	8.97	2.648	0.188	0.0	0.0	6.2	0.83	59.0	37.3
S15.027	52.50	9.72	2.497	0.188	0.0	0.0	6.2	0.83	59.0	37.3
S15.028	50.02	10.77	2.390	0.188	0.0	0.0	6.2	0.78	55.0	37.3
S15.029	46.71	12.42	2.267	0.188	0.0	0.0	6.2	0.78	55.1	37.3
S15.030	45.46	13.12	2.075	0.188	0.0	0.0	6.2	0.78	55.1	37.3
S15.031	42.99	14.65	1.993	0.188	0.0	0.0	6.2	0.78	55.1	37.3
S15.032	40.84	16.19	1.814	0.188	0.0	0.0	6.2	0.78	55.1	37.3
S15.033	38.93	17.73	1.635	0.188	0.0	0.0	6.2	0.78	55.1	37.3
S1.080	61.49	6.75	1.305	0.000	90.0	0.0	15.0	0.82	130.8	90.0
S1.081	61.44	6.76	1.161	0.000	90.0	0.0	15.0	0.82	130.8	90.0

Table B.25 SuDS maintenance inspection checklist			
General information			
Site ID			
Site location and co-ordinates (GIS if appropriate)			
Elements forming the SuDS scheme		Approved drawing reference(s)	
Inspection frequency		Approved specification reference	
Type of development		Specific purpose of any parts of the scheme (eg biodiversity, wildlife and visual aspects)	

Inspection date								
	Details	**Y/N**	**Action required**	**Date completed**	**Details**	**Y/N**	**Action required**	**Date Completed**
General inspection items								
Is there any evidence of erosion, channelling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours or nuisance insects?								
Have any health and safety risks been identified to either the public or maintenance operatives?								
Is there any deterioration in the surface of permeable or porous surfaces (eg rutting, spreading of blocks or signs of ponding water)?								

Silt/sediment accumulation								
Is there any sediment accumulation at inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes, state depth (mm) and extent. Is removal required? If yes, state waste disposal requirements and confirm that all waste management requirements have been complied with (consult environmental regulator)								
Is surface clogging visible (potentially problematic where water has to soak into the underlying construction or ground (eg underdrained swale or infiltration basin)?								
Does permeable or porous surfacing require sweeping to remove silt?								
System blockages and litter build-up								
Is there evidence of litter accumulation in the system? If yes, is this a blockage risk?								
Is there any evidence of any other clogging or blockage of outlets or drainage paths?								
Vegetation								
Is the vegetation condition satisfactory (density, weed growth, coverage etc)? (Check against approved planting regime.)								
Does any part of the system require weeding, pruning or mowing? (Check against maintenance frequency stated in approved design.)								
Is there any evidence of invasive species becoming established? If yes, state action required								
Infrastructure								
Are any check dams or weirs in good condition?								
Is there evidence of any accidental damage to the system (eg wheel ruts?)								

Is there any evidence of cross connections or other unauthorised inflows?								
Is there any evidence of tampering with the flow controls?								
Are there any other matters that could affect the performance of the system in relation to the design objectives for hydraulic, water quality, biodiversity and visual aspects? (Specify.)								
Other observations								
Information appended (eg photos)								
Suitability of current maintenance regime								
Continue as current Increase maintenance Decrease maintenance								
Next inspection								
Proposed date for next inspection								

FOUL SEWERAGE DESIGN

Design Criteria for Foul

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	150.00	Maximum Backdrop Height (m)	0.000
Persons per House	2.70	Min Design Depth for Optimisation (m)	0.000
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	25.594	0.450	56.9	0.000	2	0.0	1.500	o	150	Pipe/Conduit	
F1.001	49.643	1.867	26.6	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F2.000	38.513	0.642	60.0	0.000	6	0.0	1.500	o	150	Pipe/Conduit	
F2.001	6.339	0.106	60.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F2.002	42.560	0.946	45.0	0.000	9	0.0	1.500	o	150	Pipe/Conduit	
F1.002	70.519	3.983	17.7	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F3.000	41.652	0.694	60.0	0.000	5	0.0	1.500	o	150	Pipe/Conduit	
F3.001	24.370	1.311	18.6	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F3.002	56.933	0.712	80.0	0.000	7	0.0	1.500	o	150	Pipe/Conduit	
F3.003	8.300	0.098	84.7	0.000	0	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

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 (l/s)	Flow (l/s)
F1.000	107.000	0.000	0.0	2	0.0	6	0.23	1.16	20.6	0.1
F1.001	106.550	0.000	0.0	2	0.0	5	0.30	1.70	30.1	0.1
F2.000	106.370	0.000	0.0	6	0.0	10	0.33	1.13	20.0	0.2
F2.001	105.728	0.000	0.0	6	0.0	10	0.33	1.13	20.0	0.2
F2.002	105.622	0.000	0.0	15	0.0	14	0.49	1.31	23.1	0.4
F1.002	104.275	0.000	0.0	17	0.0	12	0.70	2.09	36.9	0.5
F3.000	104.376	0.000	0.0	5	0.0	9	0.31	1.13	20.0	0.1
F3.001	103.682	0.000	0.0	5	0.0	7	0.46	2.04	36.0	0.1
F3.002	102.371	0.000	0.0	12	0.0	15	0.37	0.98	17.3	0.3
F3.003	101.659	0.000	0.0	12	0.0	15	0.37	0.95	16.8	0.3

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F3.004	31.110	0.891	34.9	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
F1.003	17.730	0.610	29.1	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.004	28.460	1.294	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.005	46.536	2.115	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.006	6.640	0.302	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.007	14.483	0.658	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.008	36.766	1.671	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.009	31.436	1.429	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.010	28.508	1.296	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.011	12.176	0.553	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.000	40.658	0.678	60.0	0.000	6	0.0	1.500	o	150	Pipe/Conduit	
F4.001	10.781	0.180	60.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F4.002	58.388	0.973	60.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F4.003	4.897	0.082	60.0	0.000	8	0.0	1.500	o	150	Pipe/Conduit	
F4.004	3.426	0.057	60.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F4.005	10.431	0.174	60.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F4.006	52.919	2.405	22.0	0.000	8	0.0	1.500	o	225	Pipe/Conduit	
F4.007	10.288	0.468	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.008	5.491	0.250	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.009	7.945	0.361	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

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 (l/s)	Flow (l/s)
F3.004	101.561	0.000	0.0	16	0.0	14	0.55	1.49	26.3	0.5
F1.003	100.200	0.000	0.0	33	0.0	17	0.69	2.13	84.8	0.9
F1.004	99.590	0.000	0.0	33	0.0	16	0.76	2.45	97.6	0.9
F1.005	98.000	0.000	0.0	33	0.0	16	0.76	2.45	97.5	0.9
F1.006	95.885	0.000	0.0	33	0.0	16	0.76	2.45	97.5	0.9
F1.007	95.405	0.000	0.0	33	0.0	16	0.76	2.45	97.5	0.9
F1.008	94.193	0.000	0.0	33	0.0	16	0.76	2.45	97.5	0.9
F1.009	91.645	0.000	0.0	33	0.0	16	0.76	2.45	97.5	0.9
F1.010	89.558	0.000	0.0	33	0.0	16	0.76	2.45	97.6	0.9
F1.011	87.400	0.000	0.0	33	0.0	16	0.76	2.45	97.5	0.9
F4.000	98.900	0.000	0.0	6	0.0	10	0.33	1.13	20.0	0.2
F4.001	98.222	0.000	0.0	6	0.0	10	0.33	1.13	20.0	0.2
F4.002	98.042	0.000	0.0	6	0.0	10	0.33	1.13	20.0	0.2
F4.003	97.069	0.000	0.0	14	0.0	15	0.43	1.13	20.0	0.4
F4.004	96.988	0.000	0.0	14	0.0	15	0.43	1.13	20.0	0.4
F4.005	96.930	0.000	0.0	14	0.0	15	0.43	1.13	20.0	0.4
F4.006	96.682	0.000	0.0	22	0.0	13	0.66	2.45	97.5	0.6
F4.007	93.038	0.000	0.0	22	0.0	13	0.66	2.45	97.5	0.6
F4.008	90.825	0.000	0.0	22	0.0	13	0.67	2.46	97.6	0.6
F4.009	88.800	0.000	0.0	22	0.0	13	0.66	2.45	97.5	0.6

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F4.010	11.088	0.055	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.011	8.859	0.044	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.012	36.224	1.228	29.5	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.013	13.802	0.230	60.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F4.014	68.504	0.343	200.0	0.000	11	0.0	1.500	o	225	Pipe/Conduit	
F1.012	13.867	0.069	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.013	48.770	0.244	200.0	0.000	6	0.0	1.500	o	225	Pipe/Conduit	
F5.000	75.458	1.258	60.0	0.000	9	0.0	1.500	o	150	Pipe/Conduit	
F5.001	12.890	0.215	60.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.014	14.953	0.075	200.0	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
F1.015	36.096	1.141	31.6	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
F1.016	44.321	0.222	200.0	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
F6.000	36.716	0.612	60.0	0.000	8	0.0	1.500	o	150	Pipe/Conduit	
F6.001	16.755	0.279	60.1	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F6.002	18.342	0.864	21.2	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F6.003	9.033	0.695	13.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F6.004	24.025	1.848	13.0	0.000	2	0.0	1.500	o	150	Pipe/Conduit	
F6.005	8.731	0.275	31.7	0.000	0	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

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 (l/s)	Flow (l/s)
F4.010	88.439	0.000	0.0	22	0.0	22	0.31	0.81	32.2	0.6
F4.011	88.383	0.000	0.0	22	0.0	22	0.31	0.81	32.2	0.6
F4.012	88.339	0.000	0.0	22	0.0	14	0.60	2.12	84.2	0.6
F4.013	87.111	0.000	0.0	22	0.0	17	0.47	1.48	59.0	0.6
F4.014	86.881	0.000	0.0	33	0.0	27	0.35	0.81	32.2	0.9
F1.012	86.539	0.000	0.0	66	0.0	37	0.44	0.81	32.2	1.9
F1.013	86.469	0.000	0.0	72	0.0	38	0.45	0.81	32.2	2.0
F5.000	89.647	0.000	0.0	9	0.0	12	0.38	1.13	20.0	0.3
F5.001	88.389	0.000	0.0	9	0.0	12	0.38	1.13	20.0	0.3
F1.014	86.225	0.000	0.0	83	0.0	41	0.47	0.81	32.2	2.3
F1.015	86.151	0.000	0.0	85	0.0	27	0.90	2.04	81.3	2.4
F1.016	85.010	0.000	0.0	87	0.0	42	0.48	0.81	32.2	2.4
F6.000	91.332	0.000	0.0	8	0.0	12	0.36	1.13	20.0	0.2
F6.001	90.720	0.000	0.0	8	0.0	12	0.36	1.13	20.0	0.2
F6.002	90.441	0.000	0.0	8	0.0	9	0.51	1.91	33.7	0.2
F6.003	89.500	0.000	0.0	8	0.0	8	0.61	2.44	43.1	0.2
F6.004	88.805	0.000	0.0	10	0.0	9	0.65	2.44	43.1	0.3
F6.005	86.957	0.000	0.0	10	0.0	11	0.48	1.56	27.5	0.3

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F6.006	76.268	0.953	80.0	0.000	7	0.0	1.500	o	150	Pipe/Conduit	
F6.007	16.621	0.208	79.9	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F6.008	36.726	0.288	127.5	0.000	7	0.0	1.500	o	225	Pipe/Conduit	
F1.017	31.207	1.419	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.018	19.868	0.903	22.0	0.000	0	0.5	1.500	o	225	Pipe/Conduit	
F1.019	19.868	0.903	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F7.000	41.539	0.692	60.0	0.000	7	0.0	1.500	o	150	Pipe/Conduit	
F8.000	35.918	0.599	60.0	0.000	7	0.0	1.500	o	150	Pipe/Conduit	
F9.000	18.080	0.301	60.0	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
F8.001	10.775	0.180	60.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F8.002	10.775	0.180	60.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F7.001	22.991	0.115	200.0	0.000	3	0.0	1.500	o	225	Pipe/Conduit	
F7.002	50.143	0.251	200.0	0.000	12	0.0	1.500	o	225	Pipe/Conduit	
F7.003	5.668	0.028	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F7.004	15.552	0.078	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

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 (l/s)	Flow (l/s)
F6.006	86.682	0.000	0.0	17	0.0	17	0.42	0.98	17.3	0.5
F6.007	85.729	0.000	0.0	17	0.0	17	0.42	0.98	17.3	0.5
F6.008	85.446	0.000	0.0	24	0.0	21	0.37	1.02	40.4	0.7
F1.017	84.621	0.000	0.0	111	0.0	28	1.11	2.45	97.6	3.1
F1.018	82.194	0.000	0.5	111	0.0	30	1.16	2.45	97.5	3.6
F1.019	79.791	0.000	0.5	111	0.0	30	1.16	2.45	97.5	3.6
F7.000	78.050	0.000	0.0	7	0.0	11	0.35	1.13	20.0	0.2
F8.000	81.075	0.000	0.0	7	0.0	11	0.35	1.13	20.0	0.2
F9.000	81.345	0.000	0.0	4	0.0	8	0.29	1.13	20.0	0.1
F8.001	80.476	0.000	0.0	11	0.0	13	0.40	1.13	20.0	0.3
F8.002	78.900	0.000	0.0	11	0.0	13	0.40	1.13	20.0	0.3
F7.001	77.283	0.000	0.0	21	0.0	21	0.31	0.81	32.2	0.6
F7.002	77.168	0.000	0.0	33	0.0	27	0.35	0.81	32.2	0.9
F7.003	76.917	0.000	0.0	33	0.0	27	0.35	0.81	32.2	0.9
F7.004	76.889	0.000	0.0	33	0.0	27	0.35	0.81	32.2	0.9

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.020	20.177	0.101	199.8	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.021	52.965	0.265	199.9	0.000	9	0.0	1.500	o	225	Pipe/Conduit	
F1.022	19.986	0.908	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.023	37.453	1.702	22.0	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
F10.000	87.705	1.462	60.0	0.000	8	0.0	1.500	o	150	Pipe/Conduit	
F1.024	21.461	0.976	22.0	0.000	1	0.0	1.500	o	225	Pipe/Conduit	
F1.025	17.602	0.800	22.0	0.000	1	0.0	1.500	o	225	Pipe/Conduit	
F11.000	52.194	3.017	17.3	0.000	2	0.0	1.500	o	150	Pipe/Conduit	
F11.001	45.689	1.015	45.0	0.000	12	0.0	1.500	o	150	Pipe/Conduit	
F11.002	49.617	2.255	22.0	0.000	12	0.0	1.500	o	225	Pipe/Conduit	
F11.003	22.348	0.112	200.0	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
F11.004	5.967	0.030	200.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.026	18.385	0.836	22.0	0.000	4	0.0	1.500	o	225	Pipe/Conduit	
F1.027	47.699	0.318	150.0	0.000	23	0.0	1.500	o	225	Pipe/Conduit	
F1.028	15.503	0.705	22.0	0.020	0	0.0	1.500	o	225	Pipe/Conduit	
F1.029	15.309	0.696	22.0	0.000	2	0.0	1.500	o	225	Pipe/Conduit	
F1.030	27.542	1.252	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.031	9.927	0.451	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

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 (l/s)	Flow (l/s)
F1.020	76.811	0.000	0.5	144	0.0	57	0.57	0.81	32.2	4.6
F1.021	76.710	0.000	0.5	153	0.0	59	0.58	0.81	32.2	4.8
F1.022	76.445	0.000	0.5	153	0.0	34	1.27	2.45	97.5	4.8
F1.023	74.455	0.000	0.5	155	0.0	34	1.27	2.45	97.5	4.9
F10.000	74.290	0.000	0.0	8	0.0	12	0.36	1.13	20.0	0.2
F1.024	71.964	0.000	0.5	164	0.0	35	1.29	2.45	97.6	5.1
F1.025	70.345	0.000	0.5	165	0.0	35	1.29	2.45	97.5	5.1
F11.000	74.500	0.000	0.0	2	0.0	5	0.34	2.11	37.3	0.1
F11.001	71.483	0.000	0.0	14	0.0	14	0.48	1.31	23.1	0.4
F11.002	70.393	0.000	0.0	26	0.0	14	0.70	2.45	97.5	0.7
F11.003	68.137	0.000	0.0	28	0.0	25	0.34	0.81	32.2	0.8
F11.004	68.026	0.000	0.0	28	0.0	25	0.34	0.81	32.2	0.8
F1.026	67.545	0.000	0.5	197	0.0	38	1.36	2.45	97.6	6.0
F1.027	66.709	0.000	0.5	220	0.0	65	0.71	0.94	37.2	6.7
F1.028	66.391	0.020	0.5	220	0.0	40	1.40	2.45	97.6	6.7
F1.029	65.686	0.020	0.5	222	0.0	40	1.40	2.45	97.6	6.7
F1.030	64.990	0.020	0.5	222	0.0	40	1.40	2.45	97.5	6.7
F1.031	62.950	0.020	0.5	222	0.0	40	1.40	2.45	97.5	6.7

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.032	39.727	0.265	149.9	0.000	12	0.0	1.500	o	225	Pipe/Conduit	
F1.033	20.571	0.137	150.2	0.000	6	0.0	1.500	o	225	Pipe/Conduit	
F12.000	29.901	0.498	60.0	0.000	6	0.0	1.500	o	150	Pipe/Conduit	
F12.001	54.696	0.405	135.0	0.000	9	0.0	1.500	o	150	Pipe/Conduit	
F12.002	15.499	0.115	135.0	0.000	3	0.0	1.500	o	150	Pipe/Conduit	
F12.003	10.732	0.079	135.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.034	7.826	0.356	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.035	12.580	0.572	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.036	17.000	0.773	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.037	40.979	1.863	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.038	14.180	0.645	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.039	10.617	0.483	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.040	7.980	0.363	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.041	7.980	0.363	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.042	10.884	0.495	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.043	11.637	0.529	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.044	19.448	0.884	22.0	0.000	1	0.0	1.500	o	225	Pipe/Conduit	
F1.045	9.925	0.451	22.0	0.000	1	0.0	1.500	o	225	Pipe/Conduit	
F1.046	9.925	0.451	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.047	17.626	0.801	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

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 (l/s)	Flow (l/s)
F1.032	62.499	0.020	0.5	234	0.0	66	0.72	0.94	37.2	7.1
F1.033	62.234	0.020	0.5	240	0.0	67	0.72	0.94	37.2	7.3
F12.000	63.381	0.000	0.0	6	0.0	10	0.33	1.13	20.0	0.2
F12.001	62.883	0.000	0.0	15	0.0	19	0.33	0.75	13.3	0.4
F12.002	62.478	0.000	0.0	18	0.0	20	0.35	0.75	13.3	0.5
F12.003	62.363	0.000	0.0	18	0.0	20	0.35	0.75	13.3	0.5
F1.034	62.097	0.020	0.5	258	0.0	43	1.46	2.45	97.6	7.8
F1.035	59.891	0.020	0.5	258	0.0	43	1.46	2.45	97.6	7.8
F1.036	59.319	0.020	0.5	258	0.0	43	1.46	2.45	97.6	7.8
F1.037	58.546	0.020	0.5	258	0.0	43	1.46	2.45	97.6	7.8
F1.038	54.970	0.020	0.5	258	0.0	43	1.46	2.45	97.6	7.8
F1.039	52.058	0.020	0.5	258	0.0	43	1.46	2.45	97.6	7.8
F1.040	49.800	0.020	0.5	258	0.0	43	1.46	2.45	97.5	7.8
F1.041	48.133	0.020	0.5	258	0.0	43	1.46	2.45	97.6	7.8
F1.042	46.270	0.020	0.5	258	0.0	43	1.46	2.45	97.6	7.8
F1.043	44.000	0.020	0.5	258	0.0	43	1.46	2.45	97.5	7.8
F1.044	42.750	0.020	0.5	259	0.0	43	1.47	2.45	97.5	7.8
F1.045	41.127	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.046	39.676	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.047	37.776	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.048	12.056	0.548	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.049	5.111	0.232	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.050	16.414	0.746	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.051	5.587	0.254	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.052	48.992	2.227	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.053	81.507	3.705	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.054	45.850	2.084	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.055	29.537	1.343	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.056	42.404	1.927	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.057	40.655	1.848	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.058	36.305	1.650	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.059	22.839	1.038	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.060	25.324	1.151	22.0	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F1.061	88.717	2.779	31.9	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
F13.000	12.201	0.203	60.1	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
F13.001	12.063	0.201	60.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.002	8.847	0.147	60.0	0.000	1	0.0	1.500	o	150	Pipe/Conduit	
F13.003	6.553	0.164	40.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.004	7.779	0.389	20.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.005	20.776	1.039	20.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.006	12.564	0.628	20.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

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 (l/s)	Flow (l/s)
F1.048	35.575	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.049	35.027	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.050	34.495	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.051	33.520	0.020	0.5	260	0.0	43	1.47	2.45	97.6	7.8
F1.052	33.266	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.053	31.039	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.054	27.334	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.055	25.250	0.020	0.5	260	0.0	43	1.47	2.45	97.6	7.8
F1.056	23.000	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.057	19.678	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.058	16.254	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.059	13.674	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.060	12.350	0.020	0.5	260	0.0	43	1.47	2.45	97.5	7.8
F1.061	11.199	0.020	0.5	260	0.0	47	1.29	2.04	80.9	7.8
F13.000	27.300	0.000	0.0	4	0.0	8	0.29	1.13	20.0	0.1
F13.001	26.400	0.000	0.0	4	0.0	8	0.29	1.13	20.0	0.1
F13.002	26.199	0.000	0.0	5	0.0	9	0.31	1.13	20.0	0.1
F13.003	25.600	0.000	0.0	5	0.0	9	0.36	1.39	24.5	0.1
F13.004	25.200	0.000	0.0	5	0.0	7	0.45	1.97	34.7	0.1
F13.005	24.500	0.000	0.0	5	0.0	7	0.45	1.97	34.7	0.1
F13.006	23.200	0.000	0.0	5	0.0	7	0.45	1.96	34.7	0.1

Network Design Table for Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F13.007	3.502	0.175	20.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.008	7.465	0.149	50.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.009	8.549	0.570	15.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.010	9.972	0.399	25.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.011	5.377	0.414	13.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.012	22.976	1.149	20.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.013	5.168	0.258	20.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.014	17.706	0.354	50.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.015	5.965	0.398	15.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.016	18.054	0.602	30.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.017	4.311	0.216	20.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.018	15.739	1.211	13.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.019	30.184	1.442	20.9	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.020	10.751	0.215	50.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.021	8.966	0.448	20.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.022	10.539	0.527	20.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.023	37.749	1.887	20.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F13.024	59.935	0.266	225.3	0.000	24	0.0	1.500	o	225	Pipe/Conduit	
F13.025	3.181	0.014	227.2	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

Network Results Table

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 (l/s)	Flow (l/s)
F13.007	22.500	0.000	0.0	5	0.0	7	0.45	1.96	34.7	0.1
F13.008	22.000	0.000	0.0	5	0.0	9	0.33	1.24	21.9	0.1
F13.009	20.800	0.000	0.0	5	0.0	7	0.49	2.27	40.1	0.1
F13.010	19.000	0.000	0.0	5	0.0	8	0.42	1.76	31.0	0.1
F13.011	17.100	0.000	0.0	5	0.0	7	0.52	2.44	43.1	0.1
F13.012	15.500	0.000	0.0	5	0.0	7	0.45	1.97	34.7	0.1
F13.013	14.200	0.000	0.0	5	0.0	7	0.45	1.96	34.7	0.1
F13.014	13.900	0.000	0.0	5	0.0	9	0.33	1.24	21.9	0.1
F13.015	13.000	0.000	0.0	5	0.0	7	0.49	2.27	40.1	0.1
F13.016	12.000	0.000	0.0	5	0.0	8	0.39	1.60	28.3	0.1
F13.017	11.000	0.000	0.0	5	0.0	7	0.45	1.97	34.8	0.1
F13.018	10.100	0.000	0.0	5	0.0	7	0.52	2.44	43.1	0.1
F13.019	8.800	0.000	0.0	5	0.0	7	0.44	1.92	33.9	0.1
F13.020	7.300	0.000	0.0	5	0.0	9	0.33	1.24	21.9	0.1
F13.021	7.000	0.000	0.0	5	0.0	7	0.45	1.96	34.7	0.1
F13.022	5.300	0.000	0.0	5	0.0	7	0.45	1.97	34.7	0.1
F13.023	4.000	0.000	0.0	5	0.0	7	0.45	1.96	34.7	0.1
F13.024	2.038	0.000	0.0	29	0.0	26	0.33	0.76	30.3	0.8
F13.025	1.772	0.000	0.0	29	0.0	26	0.32	0.76	30.2	0.8

Appendix G - StormTech MC3500 & MC4500

STORMTECH MC-3500 CHAMBER

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

STORMTECH MC-3500 CHAMBER
(not to scale)

Nominal Chamber Specifications

Size (L x W x H)
90” x 77” x 45”
2,286 mm x 1,956 mm x 1,143 mm

Chamber Storage
109.9 ft³ (3.11 m³)

Min. Installed Storage*
178.9 ft³ (5.06 m³)

Weight
134 lbs (60.8 kg)

Shipping
15 chambers/pallet
7 end caps/pallet
7 pallets/truck

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below chambers, 9” (230 mm) of stone between chambers/end caps and 40% stone porosity.

STORMTECH MC-3500 END CAP
(not to scale)

Nominal End Cap Specifications

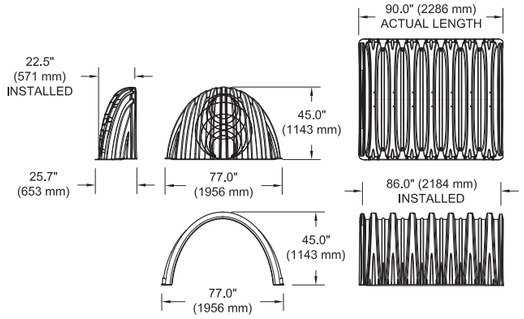
Size (L x W x H)
26.5” x 71” x 45.1”
673 mm x 1,803 mm x 1,145 mm

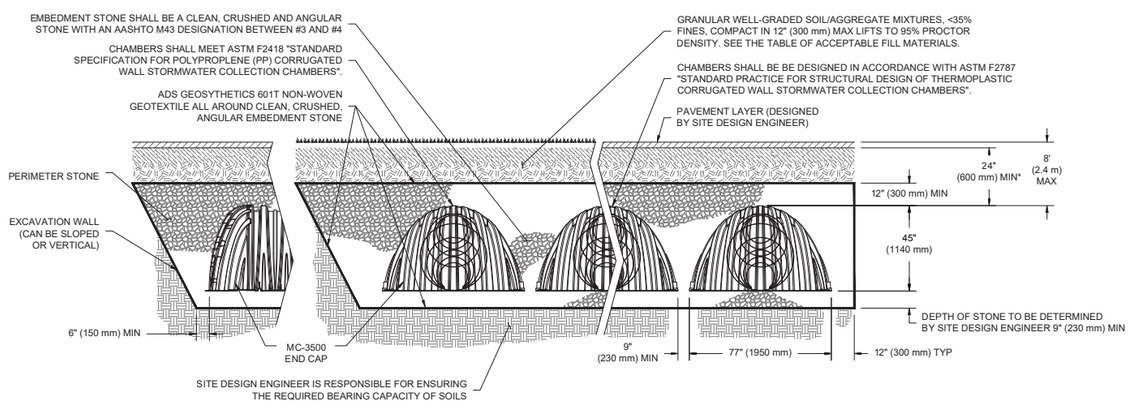
End Cap Storage
14.9 ft³ (1.30 m³)

Min. Installed Storage*
46.0 ft³ (1.30 m³)

Weight
49 lbs (22.2 kg)

*Assumes a minimum of 12” (300 mm) of stone above, 9” (230 mm) of stone below, 6” (150 mm) of stone perimeter, 9” (230 mm) of stone between chambers/end caps and 40% stone porosity.





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

MC-3500 CHAMBER SPECIFICATION

STORAGE VOLUME PER CHAMBER FT³ (M³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)			
		9" (230 mm)	12" (300 mm)	15" (375 mm)	18" (450 mm)
MC-3500 Chamber	109.9 (3.11)	178.9 (5.06)	184.0 (5.21)	189.2 (5.36)	194.3 (5.5)
MC-3500 End Cap	14.9 (.42)	46.0 (1.33)	47.7 (1.35)	49.4 (1.40)	51.1 (1.45)

Note: Assumes 9" (230 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume.

AMOUNT OF STONE PER CHAMBER

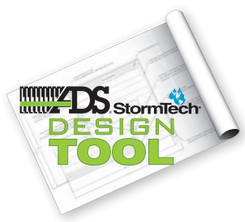
ENGLISH TONS (yds³)	Stone Foundation Depth			
	9"	12"	15"	18"
MC-3500 Chamber	9.1 (6.4)	9.7 (6.9)	10.4 (7.3)	11.1 (7.8)
MC-3500 End Cap	4.1 (2.9)	4.3 (3.0)	4.5 (3.2)	4.5 (3.2)
METRIC KILOGRAMS (m³)	**230 mm**	**300 mm**	**375 mm**	**450 mm**
MC-3500 Chamber	8,220 (4.9)	8,831 (5.3)	9,443 (5.6)	10,054 (6.0)
MC-3500 End Cap	3,699 (2.2)	3,900 (2.3)	4,100 (2.5)	4,301 (2.6)

Note: Assumes 12" (300 mm) of stone above and 9" (230 mm) row spacing and 6" (150 mm) of perimeter stone in front of end caps.

VOLUME EXCAVATION PER CHAMBER YD³ (M³)

	Stone Foundation Depth			
	9" (230 mm)	12" (300 mm)	15" (375mm)	18" (450 mm)
MC-3500 Chamber	12.4 (9.5)	12.8 (9.8)	13.3 (10.2)	13.8 (10.5)
MC-3500 End Cap	4.1 (3.1)	4.2 (3.2)	4.4. (3.3)	4.5 (3.5)

Note: Assumes 9" (230 mm) of separation between chamber rows and 24" (600 mm) of cover. The volume of excavation will vary as depth of cover increases.



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MC-4500 CHAMBER

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

STORMTECH MC-4500 CHAMBER
(not to scale)

Nominal Chamber Specifications

Size (L x W x H)
52" x 100" x 60"
1,321 mm x 2,540 mm x 1,524 mm

Chamber Storage
106.5 ft³ (3.01 m³)

Min. Installed Storage*
162.6 ft³ (4.60 m³)

Weight
120 lbs (54.4 kg)

Shipping
7 chambers/pallet
11 pallets/truck

*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below chambers, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.

STORMTECH MC-4500 END CAP
(not to scale)

Nominal End Cap Specifications

Size (L x W x H)
35.1" x 90.2" x 59.4"
891 mm x 2,291 mm x 1,509 mm

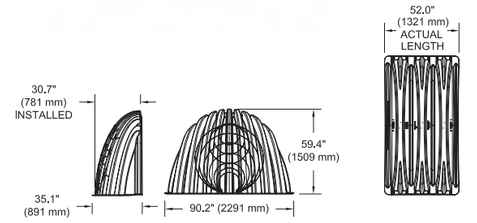
End Cap Storage
35.7 ft³ (1.01 m³)

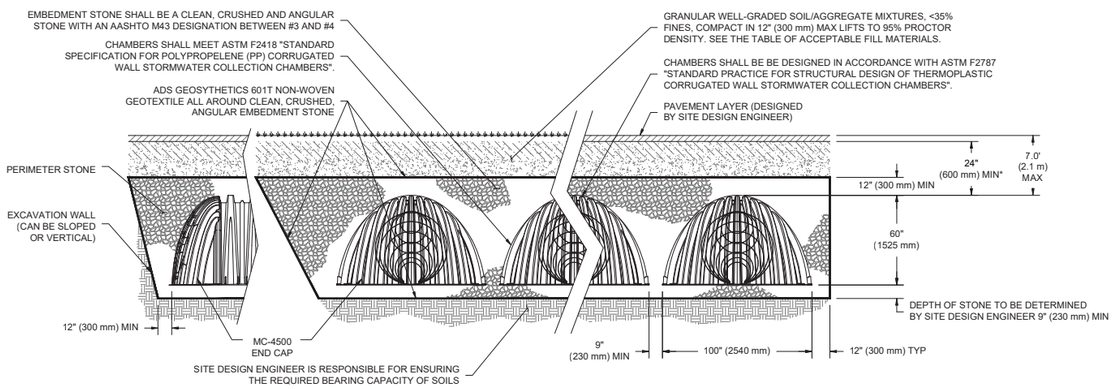
Min. Installed Storage*
108.7 ft³ (3.08 m³)

Weight
120 lbs (54.4 kg)

Shipping
7 end caps/pallet
11 pallets/truck

*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below, 6" (150 mm) of stone perimeter, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

MC-4500 CHAMBER SPECIFICATIONS

STORAGE VOLUME PER CHAMBER FT³ (M³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)			
		9" (230 mm)	12" (300 mm)	15" (375 mm)	18" (450 mm)
MC-4500 Chamber	106.5 (3.02)	162.6 (4.60)	166.3 (4.71)	169.6 (4.81)	173.6 (4.91)
MC-4500 End Cap	35.7 (1.0)	108.7 (3.08)	111.9 (3.17)	115.2 (3.26)	118.4 (3.35)

Note: Assumes 9" (230 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume. End cap volume assumes 12" (300 mm) stone perimeter.

AMOUNT OF STONE PER CHAMBER

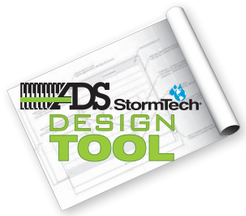
ENGLISH TONS (yds³)	Stone Foundation Depth			
	9"	12"	15"	18"
MC-4500 Chamber	7.4 (5.2)	7.8 (5.5)	8.3 (5.9)	8.8 (6.2)
MC-4500 End Cap	9.6 (6.8)	10.0 (7.1)	10.4 (7.4)	10.9 (7.7)
METRIC KILOGRAMS (m³)	230 mm	300 mm	375 mm	450 mm
MC-4500 Chamber	6,681 (4.0)	7,117 (4.2)	7,552 (4.5)	7,987 (4.7)
MC-4500 End Cap	8,691 (5.2)	9,075 (5.4)	9,460 (5.6)	9,845 (5.9)

Note: Assumes 12" (300 mm) of stone above and 9" (230 mm) row spacing and 12" (300 mm) of perimeter stone in front of end caps.

VOLUME EXCAVATION PER CHAMBER YD³ (M³)

	Stone Foundation Depth			
	9" (230 mm)	12" (300 mm)	15" (375mm)	18" (450 mm)
MC-4500 Chamber	10.5 (8.0)	10.8 (8.3)	11.2 (8.5)	11.5 (8.8)
MC-4500 End Cap	9.3 (7.1)	9.6 (7.3)	9.9 (7.6)	10.2 (7.8)

Note: Assumes 9" (230 mm) of separation between chamber rows, 12" (300 mm) of perimeter in front of the end caps, and 24" (600 mm) of cover. The volume of excavation will varyas depth of cover increases.



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APPENDIX 2-2

Construction and Demolition Waste Management Plan - AECOM

VOLUME III | Appendices

Outline Construction and Demolition Waste Management Plan

Proposed Residential Development at Glounthaune, Co. Cork.

Bluescape Limited

Project number: 60592432
60592432-ACM-00-XX-RP-CE-00-0004

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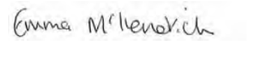
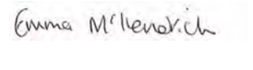
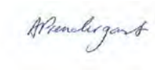
Quality information

Prepared by	Checked by	Verified by	Approved by
			
Aileen Prendergast Principal Engineer	Emma McKendrick Regional Director	Emma McKendrick Regional Director	Aileen Prendergast Principal Engineer

Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	3rd December 2021	Issued for Planning	AP	Aileen Prendergast	Principal Engineer

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Prepared for:

Bluescape Limited

Prepared by:

AECOM Ireland Limited
1st floor, Montrose House
Carrigaline Road
Douglas, Cork T12 P088
Ireland

T: +353 21 436 5006
F: +353 21 436 5156
aecom.com

Construction and Demolition Waste
Management Plan

Bluescape Limited
Project number: 60592432

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Construction and Demolition Waste
Management Plan
Bluescape Limited
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1. Introduction

1.1 Background

AECOM were appointed by Bluescape Limited to prepare an outline Construction Demolition Waste Management Plan (CDWMP) / Resource and Waste Management Plan (RWMP), herein known as 'the plan', in support of a Strategic Housing Development (SHD) planning application to An Bord Pleanála for a proposed residential development at Glounthaune, Co. Cork.

This plan has been prepared to accompany the planning application for the proposed development. The proposed layout of the development is detailed in the planning drawings prepared by Deady Gahan Architects.

The purpose of this plan is to detail how the Contractor is required to manage waste during the construction phase of the proposed development. The objective of this plan is to ensure that the development's resources and construction & demolition (C&D) waste is managed in accordance with applicable legislation, local authority plans and policies and regional waste management targets. C&D wastes are defined as waste which arises from construction, renovation and demolition activities. As per the EPA '*Best Practice Guidelines for the Preparation of Resource Management Plans for Construction & Demolition Projects*', April 2021, this plan will be built upon by the design team and contractor following approval of the submission. A Construction and Environmental Management Plan (CEMP) has also been prepared to accompany this application.

The project lifecycle of the plan during the project is illustrated in Figure 1, taken from Section 3.1 of the EPA '*Best Practice Guidelines for the Preparation of Resource Management Plans for Construction & Demolition Projects*'.

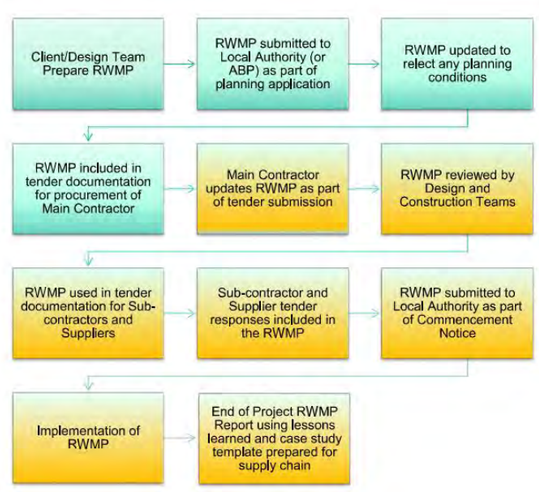

Figure 1 – Project Life Cycle of the CDWMP/ RWMP

1.2 Legislative Basis

Construction and demolition (C&D) waste is defined as waste which arises from construction, renovation and demolition activities, together with all waste categories mentioned in Chapter 17 of the List of Waste (LoW)[1]. Also included within the definition are surplus and damaged products and materials arising during construction work or used temporarily during the course of onsite activities.

This plan has been prepared in accordance with EPA's guidance document *Best Practice Guidelines for the Preparation of Resource Management Plans for Construction & Demolition Projects*. The proposed residential development is classed as a Tier 2 development as set out in Section 3.1 of this guidance document.

Section 3.1 defines Tier 1 projects as '*Smaller scale projects, below the thresholds presented in Text Box 1*', and Tier 2 Developments as '*Larger scale projects, above the thresholds presented in Text Box 1*'. Figure 2 illustrates the thresholds presented in Text Box 1, taken from *Best Practice Guidelines for the Preparation of Resource Management Plans for Construction & Demolition Projects.*

Text Box 1: RWMP Thresholds

Developments below the following thresholds may be classed as Tier 1 development:

- New residential development of less than 10 dwellings;
- Retrofit of 20 dwellings or less;
- New commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 1,250m^2;
- Retrofit of commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 2,000m^2; and
- Demolition projects generating less than 100m^3 in volume of C&D waste.

Developments above these thresholds are classed as Tier-2 projects.

Figure 2 – Text Box 1

This CDWMP has therefore been prepared with reference to and taking account of the following legislation, plans and waste management guidance documents:

- The Waste Management Act 1996 – 2008, Amendments & Associated Regulations;
- CIRIA document 133 Waste Minimisation in Construction;
- The Litter Pollution Act 1997, as amended;
- The Southern Region Waste Management Plan 2015-2021;
- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (DEFRA), September 2009;
- Designing out Waste: A Design Team Guide for Civil Engineering (WRAP); and
- Best Practice Guidelines for the Preparation of Resource Management Plans for Construction & Demolition Projects, Draft for Public Consultation, April 2021.

1.3 Objectives

The objectives of the CDWMP are as follows:

- Promote an integrated approach to waste management throughout the project construction stage and to set out appropriate responsibilities;

[1] Environmental Protection Agency, *Waste Classification, List of Waste & Determining if Waste is Hazardous or Non-Hazardous*, Valid from 5th July 2018

- Promote sustainable waste management in line with the waste management hierarchy;
- Provide an outline plan for the management of wastes arising from construction works for the project in accordance with the relevant Irish and EU waste management legislation; and
- Provide a framework for the designers and the Principal Contractor to appropriately manage waste generated during the course of the project.

This plan outlines methods to achieve waste prevention, maximum recycling and recovery of waste and provides recommendations for the management of the various anticipated waste streams. This plan also provides guidance on collection and transport of waste to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil or water resources).

2. Project Description

2.1 Site Location

The current site comprises primarily of a greenfield site. The site measures approximately 13.87 ha in total. The public road network surrounding the site is defined by Killahora Road (L-2969) to the north, Knockraha Road (L-2968) to the west, and The Terrace (L-2970) / Johnstown Close to the south.

The majority of the site is located to the north of the Terrace (L-2970). This site is primarily greenfield, currently used as agricultural lands with woodland areas at the southern end. These lands have not been developed previously. There is one derelict unit (total area of 148.2 sqm) located at the southern end, accessed from the Terrace (L-2970). The part of the site to the north of the Terrace is bounded by existing residential developments to the north, west and south.

The remainder of the site is located to the south of the Terrace (L-2970). This site is primarily greenfield with wooded areas throughout. These lands have not been developed previously. This part of the site is bounded by the L-2970 to the north, existing dwellings to the east and west, and Johnstown Close to the south.

There is a considerable variation in ground levels across the site which has been considered in developing the proposed layout. The site slopes from north to south from approximate +110 m OD Malin to +34.5 m OD Malin on The Terrace to approximately +3.30 m OD Malin.

2.2 Proposed Development

The proposed development consists of the construction of a mixed-use residential development of 289 no. residential units consisting of 201 no. dwelling houses and 88 no. apartment/duplex units, a two storey creche, 4 no. ESB substations and all ancillary site development works at Lackenroe and Johnstown (townlands), Glounthaune, Co. Cork. The proposed development will be constructed on lands to the north and south of the public road, L-2970, known locally as ‘the Terrace’. A portion of the site to the south of ‘the Terrace’ was formerly within Ashbourne Garden and is considered to be within the curtilage and attendant grounds of Ashbourne House, which is a Protected Structure (Ref 00498).

The proposed development to the north of ‘the Terrace’ provides for 260 no. residential units comprising of 196 no. dwelling houses, 64 no. apartment/duplex units and a two storey creche. The 196 no. dwelling houses includes 5 no. 4 bedroom detached dwellings, 44 no. 4 bedroom semi-detached dwellings, 12 no. 4 bedroom townhouses, 2 no. 3 bedroom detached dwellings, 22 no. 3 bedroom semi-detached dwellings, 47 no. 3 bedroom townhouses and 64 no. 2 bedroom townhouses. The 64 no. apartment/duplex units contains 5 no. 3 bedroom units, 32 no. 2 bedroom units and 27 no. 1 bedroom units contained in 6 no. three storey apartment buildings, with ancillary bicycle parking and bins stores.

The proposed development to the south of ‘the Terrace’ provides for 29 no. residential units comprising of 5 no. dwelling houses and 24 no. apartments. The 5 no. dwellings include 1 no. 3 bedroom detached dwelling, 2 no. 3 bedroom townhouses and 2 no. 2 bedroom townhouses. The proposed apartments are provided in a four-storey mixed-use building containing a ground floor community unit and a commercial unit with apartments at ground and upper floor levels comprising 3 no. 3 bedroom units, 7 no. 2 bedroom units and 14 no. 1 bedroom units with ancillary rooftop terrace, car parking, bicycle parking and bin stores.

Vehicular access to 2 no. dwellings in the lands to the north of ‘the Terrace’ will be provided via an upgraded entrance from ‘the Terrace’ with vehicular access to the remainder of dwellings in the lands to the north of ‘the Terrace’ via the signalised junction from the L-2968 and internal road network permitted by Cork County Council reference 17/5699 and An Bord Pleanála reference 300128-17. A separate secondary emergency access is also proposed from the L-2969 to the north.

Vehicular access to the 5 no. dwellings to the south of the ‘the Terrace’ will be via a new entrance from ‘the Terrace’ and the proposed apartment building will be accessed from Johnstown Close. The proposed development also makes provision for a pedestrian link from the proposed development north of ‘the Terrace’ to Johnstown Close via ‘the Terrace’ which will include a signalised pedestrian crossing and associated traffic calming measures on ‘the Terrace’.

Ancillary site works include the demolition of 1 no. existing derelict dwelling house and associated outbuildings, landscaping and servicing proposals including the realignment of the existing pedestrian/cycle route on Johnstown Close, the undergrounding of existing overhead lines, upgrade of the storm and foul sewer network to the south and east of the subject lands along ‘the Terrace’ and Johnstown Close (L-3004).

Figure 3 illustrates the extent and layout of the proposed development.

Figure 3 – Site Location and Layout

2.3 Engineering Challenges

The site presents a number of engineering challenges. These include topography, geology, physical form and lack of pedestrian connectivity between the upper and lower lands.

The site layout has been developed by the design team to work with the natural form, geology and constraints of the site while at the same time complying with technical design standards:

- The natural topography of the site was considered. Vehicular access to the lands to the north of ‘the Terrace’ will be via the signalised junction from the L-2968 and internal road network permitted by Cork County Council reference 17/5699 and An Bord Pleanála reference 300128-17. The new is road is an extension of the road serving the phase 1 development. The road traverses west to east across with internal roads serving the development.
- A separate secondary emergency access is proposed to the L-2969 to the north.

- A 3m wide shared pedestrian / cycle path has been incorporated to provide access from Johnstown Close to Terrace Road and also from Terrace Road to the dwellings to the north, connecting at access Road 11. Given the topography of the site the minimum gradient achievable is 1 in 12. The maximum length between landings is 10m and a continuous handrail is proposed on down slope of the path. This ensures an accessible, integrated and permeable design.
- To shorten the distance between the points of pedestrian connectivity between Johnstown Close and the Terrace Road for non-disabled persons, 2m wide concrete steps have been incorporated into the slope. A more direct route from the Terrace Road to the dwellings to the north, connecting at access Road 11 within the development for use by non-disabled persons is also provided. Signage will be provided at the both ends of the path and where it intersects with the accessible path warning the route incorporates stairs. A cycle ramp is proposed on the stairs to allow cyclists to push their bicycle up/down the stairs.

Additional detail on the constraints considered as part of the design development of the proposals is provided in the Constraints Reports prepared to accompany this application.

2.4 Proposed Phasing

It is proposed to deliver the proposed development in 3 phases:

- Phase 1: 97 Units including the creche, community facility and commercial unit (shown in blue in Figure 4) This phase also includes the construction of the development access road through the site along with the pedestrian paths traversing from north to south through the site,
- Phase 2: 93 Units along the western boundary of the site (noted in green in Figure 4),
- Phase 3: 99 Units along the eastern boundary of the site (noted in yellow in Figure 4).

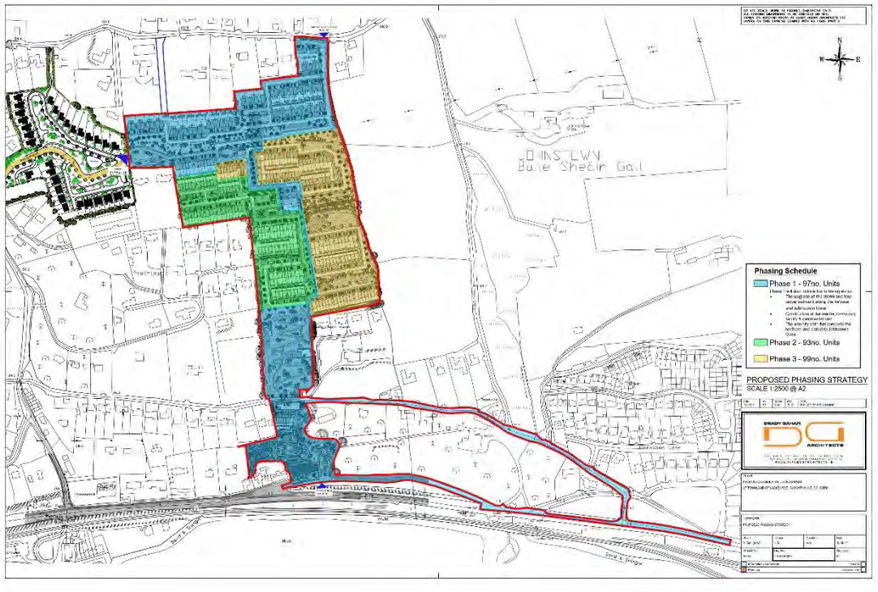

Figure 4 – Proposed Phasing Plan

2.5 Sequence of Works

It is estimated that the overall duration of the Construction Phase will be approximately 48 months. The main stages of construction will be progressed based on the following:

- Complete any necessary pre-construction surveys. Please refer to the EIAR accompanying this application for specified surveys.
- Implement all mitigation measures outlined in the application document,
- Confirm utility locations and divert utilities,
- Establish contractor's site compound and erection of site hoarding,
- Site clearance and top soil stripping,
- Cut and fill to level and re-grading works within site to formation level,
- Installation of services (drainage networks, water supply, electricity, etc.),
- Construction of roads, footpaths & hard/ soft landscaping,
- Installation of foundations/ footings for buildings and retaining walls,
- Construction of new buildings (houses, duplex units and creche),
- Connection to public services,
- Installation of substations,
- Provision of proposed road finishes,
- Provision of landscaping finishes,
- Complete all site finishes,
- Completion of any required testing and commission services within the development.

The above will be undertaken for each of the phases set out in Section 2.4. Table 1 presents the estimated cut and fill volumes associated with the proposed development.

Table 1. Excavation Volumes

Material	Cut Volume (m^3)	Fill Volume (m^3)	Net Volume (m^3)
Top Soil (400 mm depth)	41,772	13,925	27,798
Overburden	53,964	53,964	0
Rock	18,565	12,602 (crushed rock as fill)	5,963

2.5.1 Proposed Demolition Works

There is an existing derelict dwelling to the north of the Terrace that are to be demolished and replaced with two new residential units. Figure 5 illustrates the location of the existing derelict dwelling to be demolished. The total area of the derelict buildings is approximately 148 m^2.

Figure 5 – Location of existing dwellings to be demolished

2.6 Construction Phase Content

As per Appendix C of the EPA '*Best Practice Guidelines for the Preparation of Resource Management Plans for Construction & Demolition Projects*', this plan is to be updated to reflect the following at Construction Phase:

- A summary of any significant design changes imposed since the Design Stage RWMP through mechanisms such as value engineering or other;
- Details of planning permission (if relevant) and in particular any conditions imposed in relation to resource management;
- Any issues related to ground contamination which were identified during the construction phase.

3. Roles & Responsibilities

All parties involved in the Project will have responsibility for waste management. Responsibility will vary at different stages of the project lifecycle, as set out below.

3.1 Pre-Construction Phase

Table 2 sets out the roles and responsibilities during the pre-construction phase of the proposed development.

Table 2. Pre-Construction Phase Waste Management – Key Responsibilities

Responsible Party		Responsibility	Project Stage
Client	Bluescape Limited	Appointment of competent Design Team, Resource Manager and Principal Contractor	Project initiation and subsequent tendering phases
		Responsibility of waste management from 'cradle to grave', including documentation of same.	All project stages
Design Team	Architect: Deady Gahan Architects Ltd	Design of Soil Excavation Plan	Pre-Construction
		Identification of Key Waste Streams	
	Engineer: AECOM	Design to minimize waste generation in lifecycle of completed construction.	
	Landscape Architect: CSR Land Planning & Design	Adequately provide for waste management in tender documents and declare all relevant information & data.	

3.2 Construction Phase

Following appointment of a Contractor to undertake the works, the following information must be included in this section of the plan. Table 3 provides a description of the future role of the Contractor.

- Overview of the Construction Phase roles included Client, Client's Representative, Contractor, Sub-Contractors, etc.;
- Description of the role of the named Client and key personnel;
- Description of the role of the Contractor's Project Manager;
- Description of the role of the Contractor's Site Manager;
- Description of the role of the Contractor's nominated Resource Manager (RM);
- Description of the role of the Quantity Surveyor on procurement and purchasing;
- Description of the role of the named Sub-Consultants and Suppliers.

The appointed Contractor will be responsible for updating the plan.

Table 3. Construction Stage Waste Management – Key Responsibilities

Responsibility		Project Stage
Principal Contractor	Construction & Demolition Waste Management Plan implementation	Project Implementation
	Refinement and implementation of the outline CDWMP within their own over-arching Site Waste Management Plan (SWMP)	Project Implementation
	Appoint competent and authorized waste management contractor(s)	Project tendering phase
	Appoint trained, competent Waste Manager	Construction phase

Responsibility		Project Stage
Waste Manager	SWMP implementation	Project implementation
	Ensure that's the objectives of both the CDWMP and the contractors SWMP are achieved.	Construction stage
	Waste characterisation. Selection of techniques and design to minimize waste and to maximize recovery and recycling of waste during the project.	Project Design Phase and during project implementation
	Maintenance of Waste Documentation for 3 years.	Post-construction stage
	Completion of Final Waste Management Report	Construction stage
	Educate colleagues, site staff, external contractors and suppliers about alternatives to conventional construction waste disposal	Project Design Phase and during project implementation

4. General Waste Management Regulatory and Policy Requirements

Some specific points on waste management policy and regulatory requirements are set out as follows:

- Construction and Demolition (C&D) waste can be defined as all waste that arises from construction, renovation and demolition activities and includes all waste listed in Chapter 17 of the LoW, including hazardous and non-hazardous waste types.
- The EU Waste Framework Directive (2008/98/EC), enacted in Ireland under the Waste Directive Regulations, 2011 of the same title, requires Member States to take the necessary measures to achieve the minimum recycling/recovery target of 70% by weight for non-hazardous C&D waste, excluding naturally occurring materials, by 2020. The Directive specifies that such a target should be achieved by preparing for reuse, recycling and other material recovery, including backfilling operations using waste to substitute other material.
- The Southern Region Waste Management Plan 2015 – 2021 (SR-WMP) was published in May 2015. Notable and relevant points are:
  a. There has been a sharp drop in the number of available operational landfills nationally. Historically these were a significant outlet for C&D waste. Therefore, there is a need to maximize diversion of infill of C&D waste and consider alternative uses, for example, crushing and screening of masonry, stone and concrete wastes for re-use in a variety of engineering applications;
  b. The need to progress towards a 'circular economy' whereby raw materials, traditionally almost entirely becoming waste in a linear life cycle, instead become a much smaller input into a circular approach to materials use from design through to production, through to consumption but then maximizing re-use and recycling to close the circle back to design. For example, C&D wastes can become raw materials in the design phase of a project;
  c. The SR-WMP plan sets out a target of 70% of C&D waste re-use and recycling (excluding soil and stones) by year 2020; and
  d. The SR-WMP brings in the concept of 'upcycling' which is the re-purposing of items that otherwise are seen as waste or useless products.

The Regional Waste Management Planning Offices (RWMPOs) have undertaken a study to quantify and analyse national capacity within the market for the management of soil and stone waste arisings , including hazardous, based on 2018 data. This report updates the Soil and Stone Recovery / Disposal Capacity report published in 2016. The report also documents data with respect to waste concrete and other CDW (construction and demolition waste).

The report delivers a 10-year forecasting exercise predicting the volumes of soil and stone, concrete, and other CDW generation.

The available capacity of the seven facilities in the SR is located in the eastern part of the region, in counties Wexford and Kilkenny, with one facility in each county. There are currently three licenced facilities in County Cork, one is inactive and two are licenced facilities that are yet to commence operation. When operational these facilities will have a combined annual capacity of 580,000 tonnes.

This study found that Cork is (or will be) well served by licenced capacity - "*The available intake data indicates that current volumes would support the development of long-term licensed capacity in these areas to support planned infrastructure and housing developments*".

The primary legislative instruments that govern waste management in Ireland and are applicable to the project are:

- Waste Management Act 1996 (S.I. No. 10 of 1996) as amended by the Waste Management (Amendment) Act 2001. Sub-ordinate legislation to this Act include:
  - European Communities (Waste Directive) Regulations 2011 (SI 126 of 2011) as amended 2011 (S.I. No. 323 of 2011);
  - Waste Management (Collection Permit) Regulations S.I No. 820 of 2007 as amended 2008 (S.I No 87 of 2008);
  - Waste Management (Facility Permit and Registration) Regulations, S.I No. 821 of 2007 as amended 2008 (S.I No. 86 of 2008);
  - Waste Management (Licensing) Regulations 2000 (S.I No. 185 of 2000) as amended 2004 (S.I. No. 395 of 2004), 2010 and (S.I. No. 350 of 2010);
  - Waste Management (Packaging) Regulations 2003 (S.I. No. 61 of 2003) as amended 2004 (S.I. No. 871 of 2004), 2006 (S.I. No. 308 of 2006) and 2007 (S.I. No. 798 of 2007);
  - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997);
  - Waste Management (Landfill Levy) (Amendment) Regulations 2012 (S.I. No. 221 of 2012), as amended 2015 (S.I. No. 189 of 2015);
  - European Communities (Waste Electrical and Electronic Equipment) Regulations 2011;
  - Waste Management (Registration of Brokers and Dealers) Regulations 2008 (S.I. 113 of 2008); and
  - Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009), as amended 2015 (S.I. 190 of 2015).
- Protection of the Environment Act 2003 (S.I. No. 413 of 2003).
- Litter Pollution Act 1997 (S.I. No. 12 of 1997).

These Acts and subordinate Regulations enable the transposition of relevant European Union Policy and Directives into Irish law.

4.1 Guidance Reference Documents

HSE ENV EP006	Company Waste Management Procedure
HSE EB 04	Waste Management on site
HSE ENV GN01	Site Waste Management Plan Guidance

5. Waste Hierarchy

Besides the requirements that the off-site handling of waste generated by this project are subject to the required statutory authorisations under the Waste Management Act, there is also a necessity that it conforms to the Waste Hierarchy[2]. This hierarchy outlines that waste prevention and minimisation are the first priority in managing wastes, followed by waste reuse and recycling with disposal being considered as a last resort.

The EU Waste Directive (2008/98/EC) also mandates that hazardous waste generation should be avoided or at least minimised.

Figure 6 - EU Waste Hierarchy

Definitions defined in the Waste Framework Directive of key terms indicated in Figure 2 are (in order of priority):

- **Prevention** includes measures taken before a substance, material or product has become waste, that reduce (a) the quantity of waste, including through the reuse of products or the extension of the lifespan of products, (b) the adverse impacts of the generated waste on the environment and human health or (c) the content of harmful substances in materials and products.
- **Re-Use** is defined as any operation by which products or components that are not waste are used again for the same purpose for which they were conceived.
- **Recycling** is any recovery operation by which waste materials are processed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.
- **Recovery** is defined as any operation, the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.

The Waste Hierarchy only applies to material that is defined as “waste”, so does not apply to the proportion of the spoil that is handled on-site in conformity with the statutory exclusions.

The Waste Management Hierarchy will be activated for any material which does not satisfy the exclusions; in this regard the contract documents for the detailed design/construction project will clearly set out the staged approach which the contractor will be required to adhere to through the use of the Waste Hierarchy.

[2] Waste Hierarchy as set out in Article 4 of the Waste Framework Directive (2008/98/EC) and transposed into Irish law via Section 21A of the Waste Management Act

5.1 Waste Minimisation

The following waste minimisation measures will be implemented during the course of the construction works:

- Facilitate recycling and appropriate disposal by on site segregation of all waste materials generated during construction into appropriate categories, including:
  - Topsoil, subsoil, gravel hard-core,
  - Concrete, bricks, tile, ceramics, plasterboard,
  - Asphalt, tar and tar products,
  - Metals,
  - Dry Recyclables e.g. cardboard, plastic, timber.
- All waste assessed by the Waste Manager as 'not suitable for reuse' will be stored in skips or other suitable receptacles in a designated area of the site, to prevent cross contamination between waste streams, dispersion and leaching;
- Wherever possible, leftover materials (e.g. timber off cuts) and any suitable demolition materials will be reused on-site;
- Uncontaminated excavated material (top-soil, sub soil, etc.) will be segregated, stockpiled and re-used on site in preference to importation of clean fill, where possible; and
- Where possible, the Waste Manager will ensure that all waste leaving site will be recycled or recovered.

6. Waste Identification, Classification, Quantification and Handling

6.1 Waste Identification, Classification and Quantification

The majority of waste generated will be soil and rock excavated during the course of the construction works. Should appropriate reuse be required, and practical, clean soil will be retained on site and reused in areas of soft landscaping, backfilling, etc. Crushed rock could be used in Crib or Gabion retaining walls. A record of the volumes and reuse requirements will be maintained by the Principal Contractor as part of their plan, as per Appendix C of the EPA '*Best Practice Guidelines for the Preparation of Resource Management Plans for Construction & Demolition Projects*'.

During the construction phase, there will be some building material and packaging waste generated. This will mainly include excess ready-mix concrete and mortar, timber off cuts, plastics, metal off cuts, cladding and tile offcuts, asphalt, tar, tar products as well as plastic and cardboard waste from packaging and potential over-supply of materials.

All individual waste arisings shall be identified, recorded, classified and quantified (volume, weight) as early in the project lifecycle as possible but, inevitably, unanticipated waste arisings may occur as site work progresses, necessitating the need for a procedure to provide for waste classification as the site work proceeds.

It is anticipated that the majority of non-hazardous and inert waste generated will be suitable for reuse, recovery or recycling and will be segregated to facilitate the reuse, recovery and/or recycling, where possible.

A non-exhaustive list of anticipated wastes from the construction phase and preliminary classification as either hazardous or non-hazardous is presented in Table 2.

Table 4. Potential Non Hazardous and Hazardous Waste Classification

Hazardous Waste	Non-Hazardous Waste
Excess Electrical & Electronic Components	Asphalt
Liquid Fuels	Metals (stainless steel, mild steel, copper, aluminium)
Batteries	Wood (Clean), glass, plastic, paper and cardboard
Concrete (contaminated with dangerous substances)	Concrete (not contaminated with dangerous substances)
Excavated Soil (contaminated with dangerous substances)	Excavated soil/fill (not contaminated with dangerous substances)
Asphalt, tar and tar products	Municipal waste
Other construction and demolition wastes containing dangerous substances	

Wastes arising for the project will be segregated, identified and classified by the Principal Contractor in accordance with the EPA '*Best Practice Guidelines for the Preparation of Resource Management Plans for Construction & Demolition Projects*', EPA, 2021.

Wastes shall not be removed from the site until properly classified, assigned a correct LoW code and all appropriate tracking and disposal documentation is in place.

For each waste stream identified and classified, and for each waste stream that may arise during the course of the works, the following shall be identified and documented by the Principal Contractor in their SWMP:

- An appropriate waste classification and correct LoW code; Where a waste type is considered a mirror entry, the classification of materials as non-hazardous and/or hazardous waste will be determined based on the www.hazwasteonline.com web-based waste assessment system (as recognized by the Environmental Protection Agency) and using Waste Acceptance Criteria in accordance with the European Communities (EC) Council Decision 2003/33/EC, which establishes criteria for the acceptance of waste at landfills;
- A suitable Waste Collection Contractor in possession of a valid Waste Collection Permit for the collection of waste within the Cork County Council area;
- Appropriate waste recovery, recycling or disposal facilities, including any required transfer stations whereupon the said facilities shall be in possession of a valid Waste Facility Certificate of Registration, permit or Waste License, as appropriate;
- A recovery, recycling or disposal plan for the waste, where applicable. Where any material is being recovered onsite or offsite for reuse; the Principal Contractor will provide confirmation of any application to the EPA under Article 27[3] or Article 28[4] to classify material as a by-product or as end of life waste respectively; and
- Final reconciled waste quantities generated, including details of waste disposal, reuse and recovery quantities.

6.2 Waste Handling

The site manager will maintain a record of all waste removed from the site. The record shall include information on the type of waste removed, the quantity removed, the date removed, details of whether the waste in question was being removed for either disposal or recovery/ recycling, details of the transporter of waste, details of the facility to which waste is removed (including license or permit number). A location shall be identified where all records in regard to waste transport, recycling, disposal will be held for inspection.

Table 5. Waste Minimisation

Type	Waste Minimisation Decision Taken	By Whom	Intended Results
Demolition Methods	Segregate waste into separate skips for recycling	Contractor	Increased recycling of materials, reduce material to landfill
Materials	Provide segregated skips for material recycling: timber, metals, plastic, etc.	Contractor	Increased recycling of materials, reduce material to landfill
Materials	Request unpackaged materials from suppliers where applicable, e.g. palletised, skips, etc.	Contractor	Reduced packaging waste
Hazardous Materials	Any hazardous materials to be segregated in hazardous waste bin	Contractor	Hazardous waste items removed from site are to be disposed of by licenced contractor/ company.

[3] Notification of by-product decisions by economic operators under Article 27 of the European Communities (Waste Directive) Regulations 2011, S.I. No. 126 of 2011
[4] End-of-Waste Status under article 28 of the European Communities (Waste Directive) Regulations, 2011, S.I. No. 126 of 2011.

6.2.1 Segregation and Storage

Wastes generated during works will be segregated and temporarily stored on site (pending collection or for re-use on site) in accordance with the Contractor's pre-determined segregation and storage strategy.

The following minimum segregation and storage strategy requirements will be required:

- Waste streams will be individually segregated; and all segregation, storage & stockpiling locations will be clearly delineated on site drawings;
- Waste storage, fuel storage and stockpiling and movement are to be undertaken with a view to protecting any essential services (electricity, gas, water) and with a view to protecting existing localised groundwater quality boreholes (if applicable);
- Roles and responsibilities of those managing the segregation and storage areas are to be identified;
- The waste storage area will contain suitably sized containers for each waste stream and will be agreed with the waste contractors in advance of the commencement of the project;
- All segregation and waste storage areas will be inspected regularly by the appointed Waste Manager;
- Waste will be stored on site, including metals, asphalt and soil stockpiles, in such a manner as to:
  - Prevent environmental pollution (bunded and/or covered storage, minimise noise generation and implement dust/odour/pest control measures, as may be required);
  - Maximise waste segregation to minimise potential cross contamination of waste streams and facilitate subsequent re-use, recycling and recovery; and
  - Prevent hazards to site workers and the general public during construction phase (largely noise, vibration, dust and pests).

6.2.2 Waste Permitting, Licences & Documentation

Under the Waste Management (Collection Permit) Regulations 2007, as amended, a collection permit to transport waste, which is issued by the National Waste Collection Permit Office (NWCPO), must be held by each waste collection contractor.

Waste may only be treated or disposed of at facilities that are licensed or permitted to carry out that specific activity (e.g. chemical treatment, landfill, incineration, etc.) for a specific waste type.

Operators of such facilities cannot receive any waste, unless they are in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments or a waste license granted by the EPA. The COR/permit/license held will specify the type and quantity of waste permitted to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

Records of all waste movements and associated documentation will be held at the site. Records management and maintenance will be the responsibility of the Principal Contractor.

Further detail on waste documentation is provided in Section 10.

6.2.3 Predicted Waste Streams

The majority of the waste material generated by the proposed development will consist of excavated soil, gravel, rock associated with the proposed site layout. This material will be segregated from all other waste components in accordance with general waste segregation policy. Material that cannot be reused on site will be transferred to a Materials Recovery

Facility (MRF) by a fully licensed waste contractor where the waste will be further sorted into individual waste streams for recycling, recovery or disposal.

A temporary segregation bay will be set aside at the site for the duration of the construction and demolition phase of the development. The bay will include segregated areas for recyclable waste streams, such as gypsum (plasterboard), cardboard, timber, concrete/blocks/tiles, etc.

Cardboard

Cardboard will be segregated on site. The cardboard will be flattened and placed in a covered skip or tied and covered, to prevent the card getting wet. A recycling contractor will collect it as required.

Plasterboard

There will be a separate skip for plasterboard at the site. There are a number of specialist contractors that recycle plasterboard and they will be contracted to address this matter. Reprocessed gypsum powder, which makes up to 94% of the plasterboard, can be reprocessed into new plasterboard or converted for use in soil conditioners for the agricultural industry. The paper, which makes up to 6% of the plasterboard can be reused in various industries.

Soil/Subsoil

Excess excavated soil will be disposed of off-site. Soil will be removed and disposed of by contractors licensed under the Waste Management Act of 1996, the Waste Management (Permit) Regulations of 1998 and the Waste Management (Collection Permit) Regulations of 2001. This material will be used for fill material on other sites, or capping purposes on site, e.g. at a landfill.

Plastic

As plastic is now considered a highly recyclable material, much of the plastic generated during construction will be diverted from landfill and recycled. Clean plastic will be segregated at source and kept as clean as possible and stored in a dedicated covered skip.

Timber

There will be timber waste generated from the construction work as off-cuts or damaged pieces of timber. Timber that is uncontaminated, i.e. free from paints, preservatives, glues etc, will all be recycled. It will be stored on site in a designated skip, and collected by a recycling contractor. Such companies shred the timber and use it for manufacture of wood products or for landscaping (wood chips etc).

Scrap Metal

Steel is a highly recyclable material and there are numerous companies that will accept waste steel and other scrap metals. A segregated skip will be available for steel storage on site pending recycling.

Asbestos

A specialised contractor will be employed to remove asbestos from site and to ensure that all traces of contaminated material from the site. Asbestos containing materials will be disposed of at a licensed asbestos disposal facility.

6.2.4 Control Measures

The site control measures to manage and minimise waste include:

- Signage on the site office/ welfare bins to separate them as environmental /domestic waste bins,

- Briefings for all sub-contractors via induction handouts,
- Specific checks in all waste carriers licences.

6.2.5 Monitoring and Measurement

All waste transfer notes will be checked and filed in the environmental plan for regular review and monitoring to ensure duty of Care Compliance.

The site control measured to manage and minimise waste include:

- Signage on the site office/ welfare bins to separate them as environmental /domestic waste bins,
- Briefings for all sub-contractors via induction handouts,
- Specific checks in all waste carriers licences.

6.3 Construction Phase Updates

Prior to commencing construction, the Contractor must update the resource inventory to list the following:

- Any changes to the generation volumes presented in the Design Phase Inventory;
- Any changes to the management routes presented in the Design Phase Inventory;
- The nominated permitted haulier who will be employed for each stream must be named along with the relevant permissions;
- The nominated destination site for all streams must be provided along with the relevant permissions.

7. Excavated Material Management

Project works will result in the excavation of soils and rock as part of the site development. An intrusive site investigation was undertaken in early July and August 2018.

Laboratory testing was carried out on representative samples. The following tests were carried out:

- Natural moisture content,
- Atterberg limits,
- PSD (Particle Size Distribution),
- Organic content,
- Sulphate, Chloride and pH tests,
- WAC (Waste Acceptability Criteria) contaminant tests by Chemtest.

The results of the laboratory testing are included in Appendix A. No exceedance levels were identified in any of the samples tested.

The Principal Contractor will, as part of their SWMP, prepare a project-specific Excavated Material Management Plan, which will detail the following as a minimum:

- Detail in-situ (prior to excavation) and ex-situ (post excavation) methodologies to classify waste soil for appropriate disposal, in accordance with relevant Irish and EU legislation and guidance, see Section 8.1 for more detail;
- Identify reuse requirements and soils suitable for reuse on site in consultation with the design team, including assessment methodology to determine which soils are suitable for re-use onsite, see Section 8.1.1 for more detail;
- Site management procedures, including waste minimisation, stockpile management, temporary storage procedures, waste license requirements, see Section 8.1.2; and Waste Management documentation, including waste generation record keeping, waste transfer notes, confirmation of appropriate disposal and details of any rejected consignments.

7.1 Excavated Soil & Materials

The SWMP to be developed by the Principal Contractor will detail relevant procedures including further environmental sampling, testing and assessment requirements, sampling protocols and sample density targets to supplement the existing soil data.

Where any hotspots of potential contamination are encountered, and prior to disposal, further assessment will be undertaken by a suitably qualified environmental scientist to determine the nature and extent of remediation required.

7.1.1 Soil and Crushed Rock for Reuse on Site

Where the Principal Contractor proposes to reuse excavated soil or crushed rock within the works e.g. as backfill, or crushed rock within crib retaining walls and where reuse is permitted in accordance with the relevant legislation and provided that the reuse meets the engineering requirements for material used within the works, the Principal Contractor shall set out their proposal for its management, documentation and reuse. This shall include:

- Define the criteria by which the suitability of the soils for reuse will be assessed (e.g. analytical parameters and limits);
- Delineation of areas where excavated soil is intended for disposal off-site as waste, and where it is intended for re-use on site;

- Identification and recording of the location from where the soil | rock will be excavated and its proposed re-use location and function;
- Engineering assessment to confirm its suitability for re-use; and
- Any proposed treatment or processing required enabling its reuse, as well as any associated treatment permits or licenses required.

7.1.2 Excavated Material for Removal Off-site

Where appropriate, excavated soil and material intended for recovery or disposal offsite shall require appropriate waste classification in order to select an appropriate receiving facility for the waste.

Assessment of the excavated material shall be carried out with due regard to the following guidance and legislation:

- EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002);
- Regulation (EC) No. 1272/2008: the classification, labelling and packaging of substances and mixtures (CLP);
- Environmental Protection Agency document entitled Waste Classification; List of waste and determining if waste is Hazardous or Non Hazardous; and
- UK Environment Agency Technical Guidance WM3: Waste Classification - Guidance on the classification and assessment of waste.

Waste soil and material intended for offsite disposal, recycling or recovery shall not be removed from site prior to appropriate waste classification and receiving written confirmation of acceptance from the selected waste receiving facility.

7.1.3 Stockpile Management

Soil stockpiles might be generated as part of the operations, for example while classification and acceptance at a waste facility is pending or awaiting reuse.

The contractor will consider the following measures to ensure that stockpiles are managed in an appropriate manner:

- A suitable temporary storage area shall be identified and designated;
- All stockpiles are to be assigned a stockpile number;
- Stockpiles shall not be positioned adjacent to ditches, watercourses or existing or future excavations;
- Soils will be stockpiled in the driest condition possible and tracked equipment will be used to reduce compaction;
- Contaminated or potentially contaminated soil shall be stockpiled only on hard-standing or high-grade polythene sheeting to prevent cross-contamination of the soil below;
- Soil stockpiles are to be covered with high-grade polythene sheeting to prevent run-off of rainwater and leaching of potential contaminants from the stockpiled material generation and/or the generation of dust; and
- Mixing of unclassified stockpiles of different origin, or of stockpiles having different classification, will not be carried out. When a stockpile has been sampled for classification purposes, it shall be considered to be complete and no more soil shall be added to that stockpile prior to disposal.

An excavation/stockpile register shall be maintained on site showing at least the following information:

- Stockpile number;
- Origin (i.e. location and depth of excavation);
- Approximate volume of stockpile;
- Date of creation;
- Description and Classification of material;
- Date sampled;
- Date removed from site;
- Disposal/recovery destination; and
- Photograph.

8. Hazardous Materials Waste Management

As the subject site is primarily greenfield and has not been developed previously it is not anticipated that hazardous material will be encountered during construction works. No contaminated materials were identified as part of the ground investigation work undertaken in 2018.

Where hazardous waste is generated/ encountered, the Principal Contractor must undertake the following:

- Immediate notification of the nature of the hazardous waste to the design team in writing;
- Submission of a revised plan detailing the nature and management of the hazardous waste prior to off-site waste disposal; and
- The Principal Contractor must establish a specific procedure for the management of the asbestos cement watermain which traverses the site. The management of such wastes shall be co-ordinated with the client representative, Irish Water and in accordance with the Safety and Health Plan for the overall works, in order to ensure that personnel within the construction site and the local residents are protected against exposure to asbestos. Prior to commencement of any asbestos removal works, the Principal Contractor shall identify a suitable Waste Collection Contractor with a Waste Collection Permit for the transfer of the asbestos cement pipework.

9. Waste Management Documentation

This plan will be updated by the Contractor to include a Waste Documentation System. The Principal Contractor will be responsible for implementation and auditing the Waste Documentation System on a regular basis.

The documentation to be maintained, as a minimum, shall be the following:

- The names of the agent(s) and transporter(s) of the wastes;
- The name(s) of the person(s) responsible for the ultimate recycling, recovery or disposal of the wastes;
- The ultimate destination(s) of the wastes;
- Written confirmation of the acceptance and recovery, recycling or disposal of any waste consignments;
- The tonnages and LoW code for all waste materials;

- Details of any rejected waste consignments;
- Waste Transfer Forms (WTF) for hazardous wastes transferred from site and associated appendices;
- Completed Transfrontier Shipment Forms (TFS) for hazardous wastes transferred abroad;
- Written documentation of waste classifications, including any related analyses; and
- Certificates of Recycling, Recovery, Re-Use or Disposal for all wastes transferred from the site.

All waste records will be maintained for at least a period of 3 years and must be subject to verification and validation. All waste documentation will be maintained and made available for inspection by the Principal Contractor. This will be stored in a safe place, preferably on site, during the project implementation phase. Electronic records will be placed on a secure server that is backed up regularly.

Allowance of time and resources will be made to collate outstanding waste records once the project implementation phase has been completed.

10. Financial Issues of Waste

An outline of the cost issues that should be considered associated with different aspects of waste management is provided below.

10.1 Reuse/ Recovery

By reusing materials on site, there will be a reduction in the transport and disposal costs associated with the requirement for a waste contractor to take the material away to landfill. Clean and inert soils, gravel, stones etc. which cannot be reused on site may be classified as a by-product (under Article 27 of the 2011 Waste Directive Regulations), used as capping material for landfill sites, or for the reinstatement of quarries etc. subject to approvals by EPA. This material is often taken free of charge for such purposes, or when used as capping in landfills will not attract the landfill tax levy, thereby reducing final waste disposal costs.

Rock excavated on the site could be used as granular fill within crib retaining walls if crushed and graded to form a well graded granular material with low fines content.

10.2 Recycling

Salvageable metals will earn a rebate which can be offset against the cost of collection and transportation of the skips. Clean, uncontaminated cardboard and certain hard plastics can be recycled. Waste contractors will charge considerably less to take segregated wastes such as recyclable waste from a site than mixed waste. Timber can be recycled as chipboard. Again, waste contractors will charge considerably less to take segregated wastes, such as timber from a site than mixed waste.

10.3 Disposal

Typically, the current cost of disposal of waste of landfill exceeds €170 per tonne. From 1st July 2013, in accordance with the Waste Management (Landfill Levy) (Amendment) regulations 2013, the landfill level increased to €75 per tonne for waste disposed to landfill.

In addition to disposal costs, waste contractors will also charge a collection fee for skips. Collection of segregated C&D waste usually costs less than municipal waste. Specific C&D waste contractors take the waste off-site to a licensed or permitted facility and, where possible, remove salvageable items from the waste stream before disposing of the remainder to landfill. Clean soil, rubble, etc. is also used as fill/capping material wherever possible.

11. Waste Audits

Details of the inputs of materials to the project site and the outputs of wastage arising from the Project will be investigated and recorded in a Waste Audit undertaken by the Principal Contractor.

This audit will identify the amount, nature and composition of the waste generated on the site. The Waste Audit will examine the manner in which the waste is produced and will provide a commentary highlighting how management policies and practices may inherently contribute to the production of demolition waste.

The Principal Contractor will be responsible for undertaking regular waste auditing and consulting with the local authority. The Design team may review the findings of the waste audits during the course of the construction stage. It is noted that this plan will be treated as a “live” document and regular review and update will be informed by the audit findings.

12. Waste Management Plan Awareness & Training

Copies of this plan must be made available to all personnel on site.

All site personnel and sub-contractors will be instructed about the objectives of these plans and informed of the responsibilities which fall upon them as a consequence of its provisions. Where source segregation and selective material reuse techniques apply, each member of staff will be given instructions on how to comply with the plan.

Posters will be designed to reinforce the key messages within the plan and will be displayed prominently for the benefit of site staff. Specialist training as may be required (e.g. asbestos containing materials handling) will be assessed or provided as required.

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APPENDIX 2-3

Construction & Environmental Management Plan – AECOM

VOLUME III | Appendices

Outline Construction & Environmental Management Plan

Glounthaune SHD

Bluescape Limited

Project number: 60592432
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	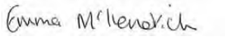	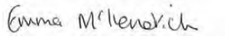	
Aileen Prendergast Principal Engineer	Emma McKendrick Regional Director	Emma McKendrick Regional Director	Aileen Prendergast Principal Engineer

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Prepared for:

Bluescape Limited

Prepared by:

AECOM Ireland Limited
1st floor, Montrose House
Carrigaline Road
Douglas, Cork T12 P088
Ireland

T: +353 21 436 5006
F: +353 21 436 5156
aecom.com

Outline Construction & Environmental Management Plan
Bluescape Limited
Project number: 60592432

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Prepared for: Bluescape Limited
AECOM

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1. Introduction

1.1 Background

AECOM were appointed by Bluescape Limited to prepare an outline Construction and Environmental Management Plan (CEMP) in support of a Strategic Housing Development (SHD) planning application to An Bord Pleanála for a proposed residential development at Glounthaune, Co. Cork.

This CEMP has been prepared to accompany the planning application for the proposed development. The proposed layout of the development is detailed in the planning drawings prepared by Deady Gahan Architects.

The purpose of this report is to ensure that best construction management practices are applied to the site by the main contractor and that measures are in place during construction to reduce as much as possible the impact of the works on people, property, and the environment. The contractor will be required to develop this outline report further in line with his/her detailed requirements.

The proposed activities include site preparation, excavation, building and construction, services installation, materials delivery, materials and waste removal and any other associated engineering works. A Construction and Demolition Waste Management Plan has also been prepared to accompany this application.

1.2 Site Location

The current site comprises of a greenfield site. The site measures approximately 13.87 ha in total. The majority of the site is located to the north of The Terrace Road (‘the Terrace’) with a small part of the site located to the south of ‘the Terrace’. There is a considerable variation in ground levels across the site which has been considered in developing the proposed layout. The site slopes from north to south from approximate +110 m OD Malin to +34.5 m OD Malin on The Terrace to approximately +3.30 m OD Malin.

The northern part of the site is bounded by existing residential developments to the north, west and south. Agricultural land bounds the site to the east. The southern part of the site is bounded by the L-2970, known locally as ‘the Terrace’ to the north, existing dwellings to the east and west and Johnstown Close to the south. The public road network surrounding the site is defined by the L-2969 to the north, the L-2968 to the west, and the L-2970, known locally as ‘the Terrace to the south.

1.3 Proposed Development

The proposed development consists of the construction of a mixed-use residential development of 289 no. residential units consisting of 201 no. dwelling houses and 88 no. apartment/duplex units, a two storey creche, 4 no. ESB substations and all ancillary site development works at Lackenroe and Johnstown (townlands), Glounthaune, Co. Cork. The proposed development will be constructed on lands to the north and south of the public road, L-2970, known locally as ‘the Terrace’. A portion of the site to the south of ‘the Terrace’ was formerly within Ashbourne Garden and is considered to be within the curtilage and attendant grounds of Ashbourne House, which is a Protected Structure (Ref 00498).

The proposed development to the north of ‘the Terrace’ provides for 260 no. residential units comprising of 196 no. dwelling houses, 64 no. apartment/duplex units and a two storey creche. The 196 no. dwelling houses includes 5 no. 4 bedroom detached dwellings, 44 no. 4 bedroom semi-detached dwellings, 12 no. 4 bedroom townhouses, 2 no. 3 bedroom detached dwellings, 22 no. 3 bedroom semi-detached dwellings, 47 no. 3 bedroom townhouses and 64 no. 2 bedroom townhouses.

The 64 no. apartment/duplex units contains 5 no. 3 bedroom units, 32 no. 2 bedroom units and 27 no. 1 bedroom units contained in 6 no. three storey apartment buildings, with ancillary bicycle parking and bins stores.

The proposed development to the south of 'the Terrace' provides for 29 no. residential units comprising of 5 no. dwelling houses and 24 no. apartments. The 5 no. dwellings include 1 no. 3 bedroom detached dwelling, 2 no. 3 bedroom townhouses and 2 no. 2 bedroom townhouses. The proposed apartments are provided in a four-storey mixed-use building containing a ground floor community unit and a commercial unit with apartments at ground and upper floor levels comprising 3 no. 3 bedroom units, 7 no. 2 bedroom units and 14 no. 1 bedroom units with ancillary rooftop terrace, car parking, bicycle parking and bin stores.

Vehicular access to 2 no. dwellings in the lands to the north of 'the Terrace' will be provided via an upgraded entrance from 'the Terrace' with vehicular access to the remainder of dwellings in the lands to the north of 'the Terrace' via the signalised junction from the L-2968 and internal road network permitted by Cork County Council reference 17/5699 and An Bord Pleanála reference 300128-17. A separate secondary emergency access is also proposed from the L-2969 to the north.

Vehicular access to the 5 no. dwellings to the south of the 'the Terrace' will be via a new entrance from 'the Terrace' and the proposed apartment building will be accessed from Johnstown Close. The proposed development also makes provision for a pedestrian link from the proposed development north of 'the Terrace' to Johnstown Close via 'the Terrace' which will include a signalised pedestrian crossing and associated traffic calming measures on 'the Terrace'.

Ancillary site works include the demolition of 1 no. existing derelict dwelling house and associated outbuildings, landscaping and servicing proposals including the realignment of the existing pedestrian/cycle route on Johnstown Close, the undergrounding of existing overhead lines, upgrade of the storm and foul sewer network to the south and east of the subject lands along 'the Terrace' and Johnstown Close (L-3004).

Figure 1 illustrates the extent and layout of the proposed development.

Figure 1 – Site Location and Layout

1.4 Legislative Basis for the CEMP

This Construction and Environmental Management Plan is to be read in conjunction with the EIAR prepared for the project. This Construction and Environmental Management Plan is a 'live' document and must be managed and updated throughout the construction phase as required by the main contractor and it is intended that any such revisions to this Construction and Environmental Management Plan will be agreed with the local authority. In particular, the CEMP will be updated to ensure the requirements of all relevant planning conditions are incorporated.

1.5 Construction Programme and Phasing

Access to the proposed development site will be from the existing public road adjacent to the northern end of the site. The estimated duration of the construction phase of this project is 48 months. Vehicular access to the lands to the north of 'the Terrace' will be via the signalised junction from the L-2968 and internal road network permitted by Cork County Council reference 17/5699 and An Bord Pleanála reference 300128-17 with a separate secondary emergency access proposed to the L-2969 to the north. Vehicular access to the 5 No. Units located to the south of the Terrace will be provided from the Terrace.

As per the Phasing strategy included in Figure 2, it is proposed to construct 97 Units, including the creche, community facility & commercial unit (shown in blue) in Phase 1. This phase also includes the construction of the development access road through the site along with the pedestrian paths traversing from north to south through the site and proposed drainage networks.

As part of Phase 2 it is proposed to construct 93 Units along the western boundary of the site (shown in green in Figure 2). As part of Phase 3 it is proposed to construct 99 Units along the eastern boundary (shown in yellow in Figure 2).

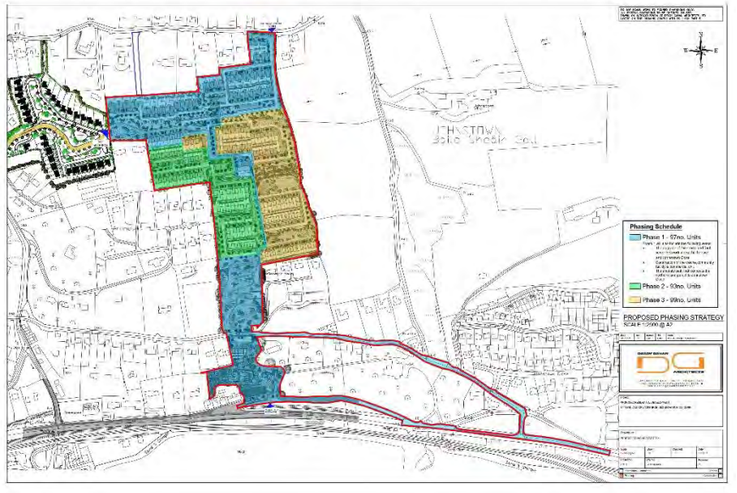


Figure 2 – Proposed Phasing Plan

2. Ground Conditions

Ground investigation has been carried out by Priority Geotechnical Limited (PGL). The typical sequence of stratigraphy is given below.

1. Stratigraphy: 300 mm to 400 mm thick topsoil. Superficial glacial deposits were described as firm to stiff, slightly sandy (slightly) gravelly CLAY/ SILT with varying Cobble content 0.7m to 2.1m thick and granular deposits of (very) silty (very) sandy GRAVEL and (very) sandy (very) clayey GRAVEL with varying cobble content 0.3m to 3.0m thick persisted to depths 1.0m bgl to 4.0m bgl. Typically, the CLAY / SILT deposit transitioned to the GRAVEL overlying the bedrock. No groundwater was encountered. The weathered rock mass was 1.0m to 4.0m below existing ground level (bgl).

2. Bearing capacities: The following was noted by PGL in relation to bearing capacities:

   "A presumed bearing pressure of 75kN/m^2 to 150 kN/m^2 (kPa) is expected of the 'firm to stiff' Clay/ Silt deposits (BS8004, Code of practice for foundations, 1986). A characteristic undrained shear strength of 90kPa is recommended at a depth below 1.0m bgl, describing the stiff deposits. Taking a partial factor of safety, 1.4 a bearing capacity factor Nc = 5.14 yielded an ultimate bearing pressure of 330kPa in the glacial deposits (Skempton, 1951). A characteristic Nspt= 15 was indicative of an allowable bearing pressure 150kPa, (Terzaghi and Peck, 1967) for settlements up to 25mm within the Clay/ Silt deposits. Foundations shall be within the 'firm to stiff' glacial deposits below a depth of 1.0m bgl. Shallow strip and pad foundations are an acceptable foundation form. Services and utilities will be adequately supported within the glacial deposits.

   Some over excavation can be expected where undrained shear strength of 40kPa to 61kPa were identified (BH02 and BH08), noting further similar locations may be present. An allowable bearing pressure of 75kPa to 100kPa is expected in such locations.

   Foundations within SILTSTONE bedrock BS8004 (1986) identified a presumed bearing value of 2,000 kN/m^2 (kPa) for non-weathered strong sedimentary rock mass. In accordance with Figure 1 — Allowable bearing pressures for square pad foundations bearing on rock (for settlement not exceeding 0.5 % of foundation width) this should be reduced to a value of 250MPa for an assumed Group 4, weak, un-cemented and fractured rock mass."

3. Groundwater: No groundwater was encountered in the trial pits or boreholes.

4. Contamination: contamination testing indicates that the material on site is suitable for disposal at an inert waste facility.

5. Sulphates & Ph values for concrete: Based on the pH (7.2 and 7.9) and sulphate (<0.010g/l – 1.2g/l/ <0.010% to 0.3%) data indicate design sulphate class DS-1 in accordance with BRE Digest for concrete in aggressive ground for static groundwater conditions. In general, there are no special requirements with regard to concrete mix design. Note BH01 at 1.0m indicated a DS-2 classification and with an acid soluble sulphate >0.2% (I.S.398 Pt. 1).

3. Earthworks

The draft bulk earthworks are associated with the site strip and levelling & re-grading of the site to accommodate the proposed residential units, road/footpath gradients as necessary. Additional information is provided in the Constraints Reports accompanying this application.

Pedestrian footpaths provide connectivity between all parts of the development. Universally accessible footpaths link from Killahora Road to Johnstone Close and also to Knockraha Road ensuring full pedestrian permeability. Non-disabled routes are also provided.

The levels of the path to the north of the Terrace typically results in cut and fill not exceeding 1.5m, the exception being the path between chainages 180m and 290m where the overall depth of excavation is 2.3m and at chainage 410m to 470m where approximately 2.0m of fill material is required to tie in with the road level of 64.950 m OD Malin.

Side slopes at a gradient no steeper than 1 in 2 are proposed. Generally, the distance required to tie back into the natural ground level is circa 2m, with one exception occurring at chainage 200m where the distance is circa 7.5m.

Short lengths of retaining walls will be required, particularly where the path turns back on itself as it meanders up the slope. It is proposed that these retaining structures be generally formed with timber permicrib gravity retaining wall system with small sections formed with Gabion baskets filled with rock excavated and crushed on site. The retained height throughout is typically 2m.

The levels of the path to the south of the Terrace typically results in cut not exceeding 3.0 m. The extent of this 3m excavation is limited to chainage 390m. The level of the path typically results in fill not exceeding fill 3.5 m. The extent of this fill is limited to the area around chainage 250 m.

Short lengths of retaining walls will be required, particularly where the path turns back on itself as it meanders up the slope. It is proposed that these retaining structures be generally formed with timber permicrib gravity retaining wall system with small sections formed with Gabion baskets filled with rock excavated and crushed on site. The retained height throughout is typically 2m.

The 3m wide footpath will have 1m wide verges with pedestrian guard rail protection at embankment edges. The guardrail protection will also prevent people taking shortcuts between the meandering path.

The choice of introducing embankments or retaining structures was influenced by minimising excavation of rock and also to retain existing trees where possible.

The development as proposed has been designed to work with the natural constraints of the site and successfully overcome them to achieve an accessible, integrated, permeable site layout and design.

The site has been modelled in the Civil 3D software package. Excavated overburden and rock will be used as fill on the site. The estimated earthworks quantities are set out in Table 3-1 below.

Existing topsoil will be retained on site to be used for the proposed development. Topsoil will be stored in an appropriate manner on site for the duration of the construction works and protected for re-use on completion of the main site works.

During the demolition and construction phase, all excavations and exposed sub-soils in open cuts will be blinded and protected with clean broken stone as soon as possible after exposing the subsoil in order to prevent erosion.

Table 3-1. Estimated Excavation Quantities

Material	Cut Volume (m^3)	Fill Volume (m^3)	Net Volume (m^3)
Top Soil (400 mm depth)	41,772	13,925	27,798
Overburden	53,964	53,964	0
Rock	18,565	12,602 (crushed rock as fill)	5,963

Soil stripping, earthworks and stockpiling of soil and rock on site will be carried out during the works. Rock will be crushed and re-used on site. Stockpiles have the potential to cause negative impacts on air and water quality. The effects of soil stripping and stockpiling will be mitigated through the implementation of an appropriate earthworks handling protocol during construction. It is anticipated that any stockpiles will be formed within the boundary of the excavation and there will be no direct link or pathway from this area to any surface water body. It is anticipated that only local/low level of stockpiling will occur as the bulk of the material will be excavated either straight into trucks for transport off site or will be reused in other areas of the site as fill. Any excavated material to be disposed off-site will go to a licensed facility. The maximum number of HGV movements during the construction phase will be 15 HGV's per day.

4. Site Logistics

4.1 Sequence of Works

It is estimated that the overall duration of the Construction Phase will be approximately 48 months. The main stages of construction will be progressed based on the following:

- Complete any necessary pre-construction surveys. Please refer to the EIAR accompanying this application for specified surveys.
- Implement all recommended environmental mitigation measures arising from the preconstruction surveys,
- Confirm utility locations and divert utilities,
- Establish contractor's site compound and erection of site hoarding,
- Site clearance and top soil stripping,
- Cut and fill to level and re-grading works within site to formation level,
- Installation of services (drainage networks, water supply, electricity, etc.),
- Construction of roads, footpaths & hard/ soft landscaping,
- Installation of foundations/ footings for buildings and retaining walls,
- Construction of new buildings (houses, duplex units and creche),
- Connection to public services,
- Installation of substations,
- Provision of proposed road finishes,
- Provision of landscaping finishes,
- Complete all site finishes,
- Completion of any required testing and commission services within the development.

The above will be undertaken for each of the phases set out in Section 1.5.

4.2 Excavation

The proposed development will involve excavation, stripping of topsoil and removal of material from site for platform installations and regrading of the site profile.

4.3 Removal of Mature Trees

Removal of vegetation will include removal of several hedgerows and there are approximately 133 no. trees to be felled.

- A category: 4 No. trees,
- B category: 56 No. trees,
- C category: 57 No. trees,
- U category: 16 No. trees. These are trees which are not considered to be of value and some which are dead.

For details of each category please refer to the Arborist Report prepared for the subject development. For further information relating to the landscape proposals, please refer to Chapter 4 of the EIAR and the Landscape Report prepared by CSR.

4.4 Protection of Existing Trees

Protective barriers must be installed by the Contractor around trees to be retained prior to the commencement of works on site. The locations of all tree protection barriers will be as shown on the Tree Protection Plan (TPP) prepared by CSR and as per BS5837. These barriers will remain in place for the duration of the works. Section 4 of the Arboricultural Survey Report

provides additional detail on the protective barriers to be provided. Figure 3 illustrates a typical detail of the protective barriers required.

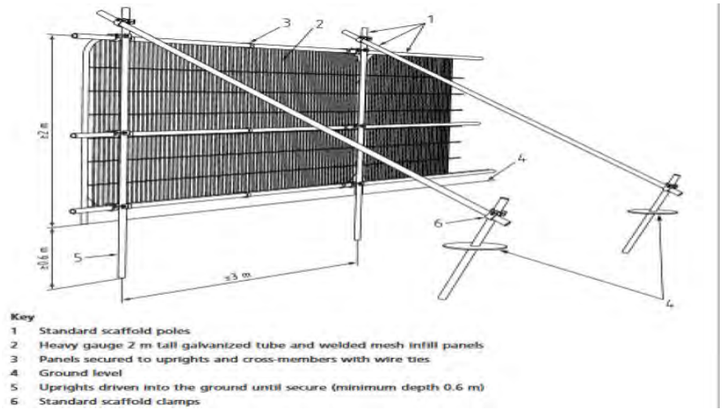


Figure 3 – Typical Detail of Protective Barrier

4.5 Protection of Existing Grotto

There is an existing Grotto Structure within the portion of the site to the south of 'the Terrace' (E:577287, N:573397), to the east of the existing apartment block. For further details of the existing grotto structure please refer to Chapter 11 of the EIAR (Cultural Heritage).

An inspection of the existing grotto structure was undertaken by John Cronin & Associates and the following was noted:

> "*An inspection of the accessible interior of the random rubble structure did demonstrate that it is constructed with poorly sorted, unhewn limestone blocks, perhaps sourced from quarry rubble. The inspection also revealed that sections of the stonework are roughly bonded with a concrete-rich aggregate mortar, but it was unclear if this material represented later repair works or was an original element of the structure. Overall, the walls of the structure have a "dry stone" appearance*."

A method statement describing the steps to be taken in advance of commencing construction has been prepared by John Cronin & Associates. The following measures are to be undertaken in advance of commencing construction.

- The principal requirement will be the demarcation and protection of the structure prior to commencement of any site development works. Given the overgrown nature of the structure, it is easily overlooked and consequently vulnerable to inadvertent damage through tree-felling and machine/plant movements. Prior to site clearance works commencing, the existing grotto must be clearly identified on site with a barrier provided to prevent machinery/ vehicles impacting the structure. The existing grotto structure must remain clearly identified for the duration of the contract.
- Tree felling activities in the area must be carefully undertaken to avoid impact on the existing structure. The methodology for tree felling must ensure measures are incorporated to prevent trees being dropped from height and hitting the existing grotto structure and the ground adjacent to it.
- Prior to commencing works, the Contractor must hold 'toolbox talks' with all staff and sub-contractors to ensure all are aware of the location and sensitivity of the existing grotto structure. This must include any relevant conditions of the planning permission.
- A masonry conservation specialist shall be appointed to oversee the demarcation and vegetation clearance for the creation of a buffer/protection zone. The conservation specialist may require the assistance of a tree surgeon to undertake targeted tree-felling. At later stages of the works, the protection/buffer zone will provide protection from

construction activity/traffic associated with the wider site. The fencing will also control access mortar mixing area and storage of materials.

- The structure will be demarcated by buffer zone consisting of a temporary demountable fence (i.e., "Heras" fence or similar) that provides a minimum of 2.7 metres clearance around the structure. To achieve the clearance to erect the fence line, trees and shrubbery within the buffer zone should cut back, taking due care to prevent damage to the structure. No removal of embedded roots (or grubbing up of the ground surface) should be undertaken without the express consent/approval from the masonry conservation specialist. The contractor must regularly inspect the fencing and buffer zone throughout the duration of the contract.
- On the careful removal of the vegetation to expose the structure and prior to works commencing, a full appraisal of the structure, including the compilation of detailed drawn and photographic records, will be undertaken by the masonry conservation specialist. If necessary, scaffolding can be erected to provide safe access to the upper portions of the structure. At this juncture, the masonry specialist may specify additional conservation measures.
- The Contractor must adhere to the vibration limits set out in Section 6.8 of this document. In order to ensure that the site activities are conducted to minimise the vibration impacts on the existing grotto, vibration monitoring shall be conducted during the course of the works associated with the proposed apartment block and path through the site to the south of 'the Terrace'. It is proposed that vibration monitoring will be conducted using calibrated vibration monitors and geophones and that audible and visual alarm units are installed to ensure if vibration levels approach or exceed the specified limits, site personnel will be alerted to cease at the earliest instance and appropriate mitigation measure may then be implemented to minimise the vibrational impact on the existing grotto structure.
- To provide protection and support during construction, the contractor is to place sandbags within the grotto structure, up to a height of 1m below the existing roof level. This will provide a dampening effect on vibrations while also providing internal support to the grotto for the duration of the works on site. The sand bags are only to be removed as part of the conservation works to be undertaken following substantial completion of the works in this area.
- In the event of damage occurring during construction repairs can be made as part of the conservation works based on the recording of the structure undertaken prior to construction.

Following substantial completion of the proposed development works in this part of the overall site, the conservation works set out in Chapter 11 of the EIAR (prepared by John Cronin & Associates) are to be undertaken on the grotto structure.

4.6 Invasive Plants

An Invasive Alien Plant Species (IAPS) Survey has been undertaken of the subject site (May 2021). A number of non-native invasive plant species listed on the Third Schedule of the 2011 European Communities (Birds and Natural Habitats) Regulations (*i.e.* species of which it is an offense to disperse, spread or otherwise cause to grow in any place) are present at the study site as follows (see IPS 2021);

- Bohemian Knotweed (*Fallopia Bohemica)*,
- Himalayan Knotweed (*Persicaria wallichii)*,
- Three-cornered Garlic (*Allium triquetrum)*,
- Spanish Bluebell (*Hyacinthoides hispanica)*,
- Rhododendron (*Rhododendron ponticum),* and

- American Skunk Cabbage (*Lysichiton americanus)*.

A dedicated Invasive Plants Survey and Management Plan has been developed in relation to these Third Schedule species (IPS 2021).

The locations of each of these IAPS are presented in the IAPS Site Assessment Report and Management Plan. This report also details the treatment programme recommended for each IAPS and is to be implemented on the subject site.

As requested by Cork County Council, the provisions of the Invasive Alien Species Management Plan are included in this CEMP.

Prior to and following commencement of the proposed development the recommended treatment plan must be implemented on site. The appropriate treatment plans recommended by Invasive Plant Solutions for each of the IAPS are included in Appendix A. The recommended treatment plans are to be implemented by the Contractor as part of the works.

Other non-native plant species are also present at the study site (that are not listed on the Third Schedule) that will also need to be managed in accordance with best practice guidelines;

- Buddleia (*Buddleia davidii*),
- Winter Heliotrope (*Petasites fragrans*),
- Snowberry (*Symphoricarpos albus)*,
- Cotoneaster (*Cotoneaster sp.)*,
- Fuchsia (*Fuchsia magellanica*),
- Lawson Cypress (*Chamaecyparis lawsoniana)*, and
- Cypress Leyland (*Cupressus x leylandii species*).

A site assessment by a suitably qualified/experienced Ecologist or Invasive Plant Specialist prior to enabling/construction activities will be required to assess the most up-to-date status of all non-native invasive plants at the site relative to the works area.

4.7 Site Security Fencing and Hoarding

Site hoarding and barriers will prevent unauthorised access to each works area. A minimum 2.4 m high plywood painted timber hoarding is to be provided around working areas. Heras type fencing will be used on short term site boundaries where appropriate to suit the works. The site compounds will each be fenced to deter unauthorised access. The contractor must regularly inspect and maintain the condition of the hoarding throughout the duration of the contract.

Controlled access points to the site, in the form of gates or doors/turnstiles, will be kept locked for any time that these areas are not monitored (e.g., outside working hours). During working hours, a gateman will control traffic movements and deliveries at any active site access to ensure safe access and egress to & from site onto the public roads. All personnel working on site must have a valid Safe Pass card and be inducted by the Main Contractor with regard to site specific information.

The external hoarding and walkways must be maintained in good condition during the construction period. The external hoardings and walkways must not obstruct any drainage, surface water channels or traffic signals, signs, or lights.

The external hoarding and walkways are to be painted with two coats of an approved synthetic paint. Any logo and lettering as shown on drawings/details are to be provided by competent graphics painters and calligraphers.

No fences or hoarding is to be used for advertising purposes and the Contractor must keep the fences or hoarding clear from advertisements.

4.8 Site Facilities during Construction

4.8.1 Site Facilities

It is estimated that 50 staff will be required on site. Site facilities will be provided at three locations within the extent of the proposed development. The on-site accommodation will consist of:

- Contractor's office space,
- Meeting room/ H&S Room, first aid room,
- Separate male and female toilet facilities with a minimum ratio of 1 to 20,
- Drying room,
- Site canteen with drinking water, hot water, seating, plus facilities to heat and refrigerate food,
- Storage containers and bicycle storage,
- Materials storage areas and drop off.

All facilities shall have adequate heat and lighting and shall be cleaned regularly.

Temporary water supply, electricity supply and foul drainage will be required for the new facilities. Connections to electricity & water are available close to the site boundary. A temporary potable water supply will be provided from the adjoining development to the west. Foul drainage will need to be taken to a vented holding tank for regular removal by suction tanker.

It is intended to limit construction staff parking and to encourage the use of public transport (e.g., Cork Middleton rail line) for the journey to and from the subject site. A number of car parking spaces will be provided on a temporary basis for use by the contractor adjacent to the site compound. Construction parking will be managed/ controlled by the contractor subject to the requirements of any planning conditions.

Adequate fire protection and means of escape will be in place. It will be the responsibility of the contractor to provide and maintain the required standard throughout the project and the contractor will inform all operatives of the welfare arrangements for the contract during site inductions.

4.8.2 Facility Locations

It is proposed to provide the facilities described in Section 4.8.1 at a number of locations within the overall proposed development. A temporary hardstanding area, located as shown in Figure 4 will be provided for the portions of Phase 1 located to the north of 'the Terrace' and Phase 2.

As part of the development of the lands to the south of 'the Terrace' during Phase 1, (includes a section of the proposed path, the 5 no. dwelling houses and 24 no. apartments) it is proposed to provide a temporary hardstanding area within the proposed car park adjacent to 'the Terrace' and within the proposed parking spaces adjacent to the apartment block. This will provide limited material storage, site facilities and car parking for the works associated with the path, the 5 no. dwelling houses and 24 no. apartments to the south of 'the Terrace'.

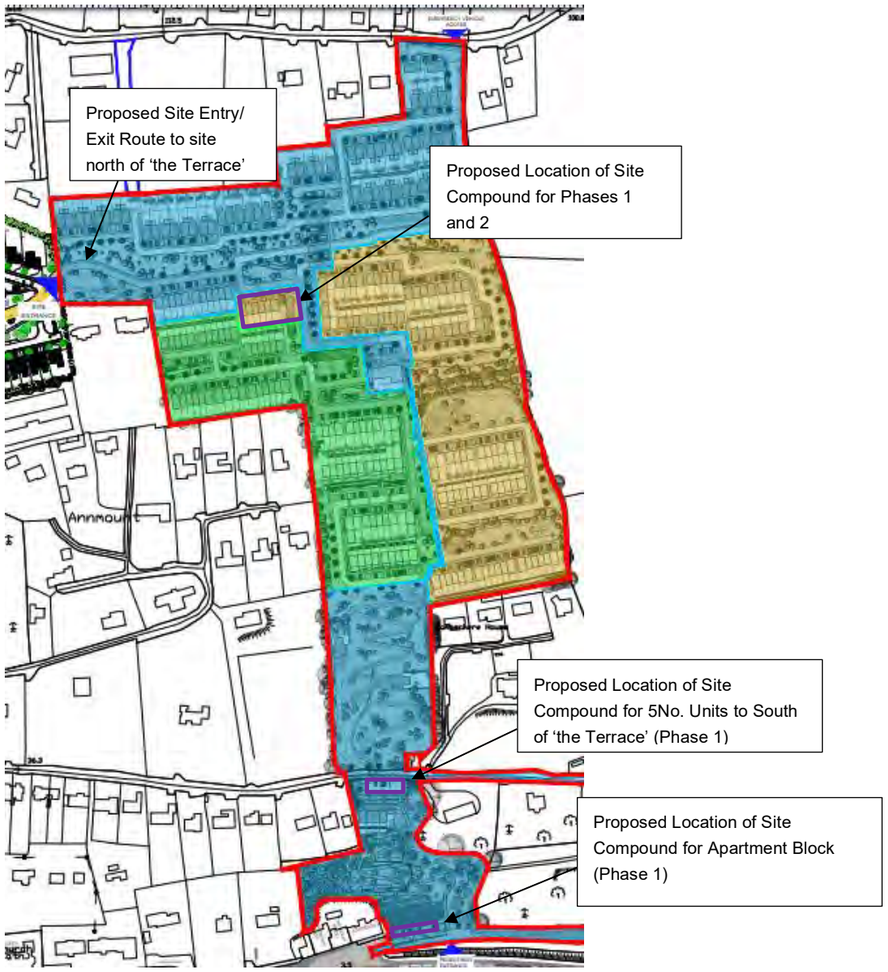


Figure 4 – Proposed Site Facilities – Phases 1 & 2

Following completion of Phases 1 and 2, it is proposed to relocate the site facilities for the duration of Phase 3. A temporary hardstanding area, located as shown in Figure 5 will be provided for Phase 3 of the proposed development.

Figure 5 - Proposed Site Facilities – Phase 3

4.9 Site Working Hours

Unless otherwise required by the requirements of the planning permission, it is proposed that standard construction working hours will apply, i.e.:

- 7am to 6pm Monday to Friday,
- 8am to 2pm on Saturdays.

Any works proposed outside of these periods shall be strictly by agreement with the Local Authority in advance.

In order to mitigate any impact of construction activities, the following measures are proposed:

- Coordination of deliveries to site within working hours,
- Scheduling of noisier activities early in the working day,
- Noise and vibration mitigation measures as per Section 6.8 of this plan.
- The delivery of materials to the site during the construction phase shall be organised so that deliveries are minimised and do not cause traffic hazard, deliveries not permitted at peak times of traffic 8.00am to 9.00am and 5.00pm to 6.00pm and that all construction vehicles are parked within the site.

4.10 Site Security

The Contractor will be responsible for the security of the site. The Contractor will be required to:

- Operate a site induction process for all site staff.
- Ensure all site staff shall have current ‘safe pass’ cards.
- Install adequate site hoarding to the site boundary.
- Maintain site security staff at all times.
- Ensure restricted access is maintained to the works.

4.11 Health and Safety

All construction works will be carried out under appropriate supervision. Works will be carried out by experienced contractors using appropriate and established safe methods of construction. All requirements arising from statutory obligations including the Safety, Health and Welfare at Work Act and associated regulations will be met in full. The Contractor must also comply with all guidelines and procedures in accordance with IÉ specification documents.

All site works to be completed as per the Safety, Health and Welfare at Work (Construction) Regulations 2013. All personnel working on site must have a valid Safe Pass card and have completed PTS training.

4.12 COVID-19

The Contractor is to follow the latest CIF safety protocols for COVID-19 in relation to all activities on site, in relation to travel to & from home to site for all staff, in relation to site visitors and in relation to any other relevant activities connected with the construction of the development.

5. Traffic Management

The Contractor is to inform and educate all regular suppliers and all sub-contractors and delivery drivers of the basic protocols. All deliveries will be controlled at the identified compound location. The designated storage area will be identified prior to taking delivery of the materials and the driver will be directed to the compound. Site access, and the delivery of construction materials, will be carefully planned and managed throughout the construction works. Site access to the Contractor compound area will be via the existing public road to the north of the site (refer to Figure 2).

No works associated with the proposed development are to commence until the signalised junction permitted by Cork County Council reference 17/5699 and An Bord Pleanála reference 300128-17 is operational.

The Contractor will ensure that deliveries are coordinated on site so that trucks do not block the road outside the site. Delivery drivers will wear full PPE as per the site rules and sign the delivery rules at the controlled entrance gate. The site will be fenced and sealed with access gates secured at all times to prevent unauthorised access.

The Contractor must provide wheel washing and road sweeping facilities to ensure that the roads are kept mud and debris free.

5.1 Construction Route

5.1.1 Vehicle Movements

All construction access to the lands to the north of ‘the Terrace’ will be via the signalised junction from the L-2968 and internal road network permitted by Cork County Council reference 17/5699 and An Bord Pleanála reference 300128-17. This will provide access to the area of the proposed development known as ‘The Green’. As noted above, no works associated with the proposed development are to commence until this signalised junction is operational. This is illustrated in Figure 4 for Phases 1 and 2 and Figure 5 for Phase 3.

Construction access to the portion of the site where the 5 no. dwellings to the south of ‘the Terrace’ are proposed will be via a new entrance from ‘the Terrace’ while the works area for the proposed apartments will be accessed from Johnstown Close. In order to ensure that vehicles entering/ exiting the site associated with the proposed Apartment Block a banks man/ flag man will be stationed at the entrance to the site to safely direct traffic.

Materials will be delivered to the proposed site storage areas, offloaded within the site compound using a teleporter and there will be a temporary lay down area used for the duration of the offload. When delivery trucks leave the compound, the material can be delivered to the correct location within the site compound.

Following unloading at the site compounds to the north of ‘the Terrace’, the vehicle can then leave the site via the signalised junction from the L-2968 and internal road network permitted by Cork County Council reference 17/5699 and An Bord Pleanála reference 300128-17 at a safe speed ensuring there is no risk of incidents involving pedestrians or other road users. Vehicles leaving the site compound associated with the 5 no. dwelling houses to the south of ‘the Terrace’ using ‘the Terrace’ road (L-2970-38). Vehicular access to and from the proposed apartments will be provided from Johnstown Close (L-3004-31).

Similar practices shall be put in place for trucks removing excavated material / demolition waste from site. Provision for parking cars / vans etc. will be within a designated area within the site compounds.

5.2 Contractor's Traffic Management Plan

A Traffic Management Plan will be prepared by the contractor and agreed with Cork County Council's Transportation Department & An Garda Siochana, to mitigate any impact of construction on the surrounding road network. The Contractor must propose a Construction Stage Traffic Management Plan in accordance with the following guidance documents for the temporary control of traffic at road works:

- Traffic Signs Manual Chapter 8 Temporary Traffic Measures and Sign Roadworks (2019);
- Traffic Management Guidelines, Department of Transport (2003);
- Requirements of Cork County Council.

The Traffic Management Plan will provide for the following:

1. The contractor will be responsible for and make good any damage to existing roads or footpaths caused by his own contractor's or suppliers transport to and from the site.
2. The contractor must at all times keep all public and private roads, footpaths entirely free of excavated materials, debris, rubbish, provide vehicle wheel wash and thoroughly clean all wheels and arches of all vehicles as they leave the site.
3. The contractor must confine his activities to the area of the site occupied by the works and the builders' compound during any particular phase of the development.
4. Haul routes to and from the site will be defined and agreed with the Local Authority.
5. Properly designed and designated entrance and egress points to the construction site for construction traffic will be used to minimize impact on external traffic.
6. Where traffic signals are not in place, flagmen must be used to control the exit of construction vehicles from the site onto the public road.
7. Existing fire hydrants are to remain accessible for the duration of the works.

Due regard will be paid to minimising any impacts by construction vehicles on the surrounding area. Particular emphasis will be on the following:

- Construction and delivery vehicles must be instructed to use only the approved and agreed means of access; and movement of construction vehicles must be restricted to these designated routes;
- Warning signs / Advanced warning signs are to be installed at appropriate locations in advance of the construction access locations;
- Speed limits of construction vehicles are to be managed by appropriate signage, to promote low vehicular speeds within the site;
- Appropriate vehicles are to be used to minimise environmental impacts from transporting construction material, for example the use of dust covers on trucks carrying dust producing material;
- Parking of site vehicles must be managed by the Contractor and must not be permitted on public road;
- A road sweeper is to be employed to clean the public roads adjacent to the site of any residual debris that may be deposited on the public roads leading away from the construction works;
- On site wheel washing will be undertaken for construction trucks and vehicles to prevent any debris prior to leaving the site, to remove any potential debris on the local roads;

- All vehicles are to be suitably serviced and maintained to avoid any leaks or spillage of oil, petrol, or diesel. Spill kits must be available on site. All scheduled maintenance carried out off-site must not be carried out on the public highway; and
- Safe and secure pedestrian facilities are to be provided where construction works obscure any existing pedestrian footways. Alternative pedestrian facilities must be provided in these instances, supported by physical barriers to segregate traffic and pedestrian movements, and to be identified by appropriate signage. Pedestrian facilities must cater for vulnerable users including mobility impaired persons.

5.3 Measures to Minimise Construction Vehicle Movements

Construction vehicle movements are to be minimised through:

- Consolidation of delivery loads to/from the site and scheduling of large deliveries to site to occur outside of peak periods;
- Use of precast/prefabricated materials where possible;
- 'Cut' material generated by the construction works is to be re-used on site where possible, through various accommodation works;
- Adequate storage space on site will be provided;
- Construction staff vehicle movements will also be minimised by promoting the use of public transport.
- Car sharing among the construction staff following Covid-19 safety guidelines may be used to reduce traffic numbers.
- Public Transport: An information leaflet to all staff as part of their induction on site highlighting the location of the public transport services in the vicinity of the construction site.

6. Environmental Management

The Contractor will be required to be accredited with ISO14001 Environmental Management Systems. The Contractor will be required to mitigate the impact of the construction works on the environment.

6.1 Environmental Impact Assessment Report

An Environmental Impact Assessment Report (EIAR) has been prepared as part of the planning application package. In addition to the various measures noted in this report, a series of impact mitigation measures have been set out in the EIAR. The Contractor must implement these measures. These measures are summarised in Chapter 15 of the EIAR.

A Natura Impact Statement (NIS) has been prepared as part of the planning application package. Potential Impact-receptor pathways are set out in Section 3 of the NIS. The mitigation measures set out in this document have been developed based on the potential Impact-receptor pathways identified.

6.2 Site Control Measures

The designated and operational on-site control measures, which will be established and maintained at this site, will include:

- Designated hard routes through the site,
- Each departing vehicles to be checked by banksman,
- Wheel wash facility at egress point,
- Provision and facilities to cover lorry contents as necessary,
- Controlled loading of excavated material to minimise risk of spillage of contents,
- Spraying/ damping down of excavated material on site,
- Facility to clean roads if mud or spillage occurs.

6.3 Material Handling and Storage

Within the site compounds, a section within the area will be identified for material storage only. It is proposed that unloading bays are provided for deliveries to the site within the hoarding perimeter. They are to be accessible by forklifts. Appropriately demarcated storage zones will be used to separate and segregate materials.

Means to ensure that surface water run-off is controlled such that no silt or other pollutants enter local surface water sewers or drains are to be provided.

6.4 Spill Control Measures

It is not proposed to store any oils/fuels for the purpose of refuelling on the site.

Onsite plant will be refuelled by an external contractor who will call to site as required. Road vehicles are not be refuelled at the site. Minor spills and leaks may occur from road vehicles and the onsite excavator. Any oils or fuels onsite will be removed by an experienced and authorised contractor.

The following steps provide the procedure to be followed in the event of any significant spill or leak.

- Stop the source of the spill and raise the alarm to alert people working in the vicinity of any potential dangers.
- Eliminate any sources of ignition in the immediate vicinity of the incident

- Contain the spill using the spill control materials, track mats or other suitable material. Do not spread or flush away the spill.
- Cover or bund off any vulnerable areas where appropriate such as drains or watercourses.
- Clean up as much as possible using the spill control materials.
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.
- Notify the Contractor immediately giving information on the location, type, and extent of the spill so that they can take appropriate action and further investigate the incident to ensure it has been contained adequately.
- The Employers Representative will inspect the site and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring.

6.5 Foul Drainage

Contractor welfare facilities will be provided within the Contractor's compound. As noted in Section 6.5 foul drainage will need to be taken to a vented holding tank for regular removal by suction tanker. A temporary potable water supply will be provided from Phase 1 of the wider development.

6.6 Surface Water Drainage

All watercourses must be protected from sedimentation and erosion throughout the duration of the Works.

Surface water management on site will comply with the following guidelines from CIRIA:

- C532 Control of Water Pollution from construction Sites, Guidance for Consultants and Contractors,
- C741 Environmental Good Practice on Site - 4th Edition.

Refer to Chapter 8 of the EIAR for additional measures which must be implemented for the duration of the works.

Run-off control measures to include the following:

- Dewatering measures will only be employed where there are no other alternatives.
- For groundwater encountered during construction phase, mitigation measures will include;
  - Dewatering by pumping to a soakaway.
  - Excluding contaminating materials such as fuels and hydrocarbons from sensitive parts of the site i.e., highly vulnerable groundwater areas.
- If concrete mixing is carried out on site, the mixing plant will be sited in a designated area with an impervious surface.
- Existing surface drainage channels within the site that serve adjacent lands will be retained where possible to prevent causing increased flooding impacts.
- Any surface water sewer connections will be made under the supervision of the Local Authority/Irish Water and checked prior to commissioning.
- New onsite surface water drains will be tested and surveyed prior to commissioning to prevent any possibility of ingress of ground water.
- All surface water manholes and drains will be inspected and sealed to ensure that uncontrolled ground water inflow does not occur.

- Filters and silt traps will be used to prevent rain washing silts and other materials into the surface water network and creating blockages.
- Areas surrounding the site are to be protected as necessary from sedimentation and erosion due to direct surface water runoff generated onsite during construction phase. To prevent this from occurring surface water discharge from the site will be managed and controlled for the duration of the construction works, as noted in the points above, until the permanent surface water drainage system of the proposed site is complete.
- Regular inspections of de-watering settlement tanks, if used, are to be carried out and additional treatment used if settlement is not adequate.
- Bunded areas will be created for the storage or use of any fuels, oils, greases, cement, etc.
- Emergency spill kits will be kept close to the works.

6.7 Water Supply

A water supply will be required for various activities on site. The Contractor will require a water source for the duration of the works. Water will be required for:

- Main contractor's welfare facilities.
- Wheel wash and vehicle wash-down (use recycled water where feasible).
- Dust suppression (as applicable).
- Curing of concrete in warm weather.
- General construction cleaning materials/equipment etc.

A temporary potable water supply will be provided from Phase 1 of the wider development. There are existing public water mains to the north and south of the site, which could be used during the construction subject to Irish Water approval.

6.8 Noise & Vibration

The Contractor will comply with the Local Authority requirements with regard to the control of noise. Refer to Chapter 10 of the EIAR for additional measures which must be implemented for the duration of the works.

The Contractor will select and utilise methods of working and items of plant so that the maximum measured ground vibrations do not exceed the limits set out in Chapter 10 of the EIAR.

The Contractor will monitor ground vibrations at selected locations to the approval of the Employer's Representative during the progress of the works. The selected locations are to include the existing grotto structure at the southern end of the site.

Each vibrograph shall be certified as being in proper working order and shall unless otherwise approved, record vibrations in three directions simultaneously with print-out showing the amplitude and frequency of the vibrations.

The noise will comply with the following:

- BS 5228-1: 2009+A1:2014 Code of Practice for Noise Vibration Control on Construction and Open Sites: Noise;
- BS 5228-2: 2009 Code of Practice for Noise and Vibration control on Construction and Open Sites: Vibration;

- Environmental Protection Agency Act 1992 Sections 106-108, Local Authority's specific requirements depending on the location of the site, and
- Safety, Health and Welfare at Work (Control of Noise at Work) Regulations 2006 SI 371 (2006).

As per Chapter 10 of the EIAR, Table 6-1 sets out the maximum permissible noise levels at the facade of dwellings during construction.

Table 6-1. Maximum permissible noise levels at the facade of dwellings during construction

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A	Category B	Category C
Night-time (11.00pm to 7.00am)	45	50	55
Evenings (7.00pm to 11.00pm weekdays). Weekends (1.00pm to 11.00pm Saturdays and 7.00am to 11.00pm Sundays)	55	60	65
Daytime (7.00am to 7.00pm) and Saturdays (7.00am to 1.00pm)	65	70	75

Any contradiction between this table and the planning application documents, the contractor is to work to the most onerous time/noise limits.

The limits outlined in above table may only be modified with the express written agreement of the Employer's Representative and the Local Authority.

Noise will be minimised, as far as practicable, by the selection of appropriate methods and equipment, and by the use of silencing devices wherever necessary. All compressors, percussion tools and vehicles will be fitted with effective silencers of a type recommended by their manufacturers. Measures shall be taken to minimise noise such turning off any machinery not in use.

Employees will not be permitted to use radios or other audio equipment in ways or at times which may cause nuisance and cause a Health and Safety risk.

The Contractor will carry out their works such that the effect of vibration on the surroundings is minimised and does not cause any damage. The Contractor is to refer to Section 10.3.2 (Assessment Criteria), 10.6.1 (Potential Impacts) and 10.7.1 (Mitigtion Measures) of Chapter 10 of the EIAR, this CEMP or tender / Contract documentation for further details of limits on vibration.

In the case of this development, vibration levels used for the purposes of evaluating building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s.

BS 5228 and BS 7385 define the following thresholds for cosmetic damage to residential or light commercial buildings: PPV should be below 15 mm/s at 4 Hz to avoid cosmetic damage. This increases to 20 mm/s at 15 Hz and to 50 mm/s at 40 Hz and above. At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded. This is summarised in Table 6-2.

Table 6-2 Vibration Limits (PPV)

Type of building	Transient Vibration	Continuous Vibration
Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s	25 mm/s
Unreinforced or light framed structures. Residential or light commercial-type buildings	15 mm/s	7.5 mm/s
Protected and Historic Buildings Note 1	6 mm/s – 15 mm/s	3 mm/s – 7 mm/s
Identified Potentially Vulnerable Structures and Buildings with Low Vibration Threshold	3 mm/s	

Note 1: The relevant threshold value to be determined on a case by case basis. Where sufficient structural information is unavailable at the time of assessment, the lower values within the range will be used, depending on the specific vibration frequency.

Furthermore, BS 5228-2 and BS 7385 state that minor structural damage can occur at vibration magnitudes greater than twice those in Table 6-2 and major structural damage can occur at vibration magnitudes greater than four times those in Table 6-2.

BS 5228-2 also provides guidance relating to the human response to vibration. Guidance is again provided in terms of PPV in mm/s since this parameter is routinely measured when monitoring the structural effects of vibration. The potential human response at different vibration levels, as set out in BS 5228-2, is summarised in Table 10.3.

Table 6-3 Guidance on human response to vibration levels

Vibration Level Note A) B) C) (mm/s)	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

A) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.
B) A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.
C) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.

In the absence of more onerous values, the limits set out in Table 6-2 will apply. These values will only be modified with the express written agreement of the Employer's Representative.

6.9 Dust & Air Quality

The Contractor's proposals must include dust control measures in accordance with best practice and with reference to the following:

- The EIAR, in particular Chapter 12 of the EIAR, accompanying this application,

- Air Pollution Act 1987,
- BS 6187: Code of Practice for Demolition.

In order to ensure that adverse air quality impacts are minimised during the construction phase and that the potential for soiling of property and amenity and local public roads is minimised, the following mitigation measures shall be implemented during the course of all construction activities:

- Avoid unnecessary vehicle movements and manoeuvring, and limit speeds on site so as to minimise the generation of airborne dust.
- Use of rubble chutes and receptor skips during construction activities.
- During dry periods, dust emissions from heavily trafficked locations (on and off site) will be controlled by spraying surfaces with water and wetting agents.
- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic only.
- Re-suspension in the air of spillages material from trucks entering or leaving the site will be prevented by limiting the speed of vehicles within the site to 10kmh and by use of a mechanical road sweeper.
- The overloading of tipper trucks exiting the site shall not be permitted.
- Aggregates will be transported to and from the site in covered trucks.
- Where the likelihood of windblown fugitive dust emissions is high and during dry weather conditions, dusty site surfaces will be sprayed by a mobile tanker bowser.
- Wetting agents shall be utilised to provide a more effective surface wetting procedure.
- Exhaust emissions from vehicles operating within the construction site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised by routine servicing of vehicles and plant, rather than just following breakdowns; the positioning of exhausts at a height to ensure adequate local dispersal of emissions, the avoidance of engines running unnecessarily and the use of low emission fuels.
- All plant not in operation shall be turned off and idling engines shall not be permitted for excessive periods.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- Material stockpiles containing fine or dusty elements including top soils shall be covered with tarpaulins.
- Where drilling or pavement cutting, grinding or similar types of stone finishing operations are taking place, measures to control dust emissions will be used to prevent unnecessary dust emissions by the erection of wind breaks or barriers. All concrete cutting equipment shall be fitted with a water dampening system.
- A programme of air quality monitoring shall be implemented at the site boundaries for the duration of construction phase activities to ensure that the air quality standards relating to dust deposition and PM10 are not exceeded. Where levels exceed specified air quality limit values, dust generating activities shall immediately cease and alternative working methods shall be implemented.
- A complaints log shall be maintained by the construction site manager and in the event of a complaint relating to dust nuisance, an investigation shall be initiated.
- Dust netting and site hoarding shall be installed along the north, south, east, and western site boundaries to minimise fugitive windblown dust emissions falling on third party lands and existing residential areas.

The Contactor will put in place a Dust Management Plan as set out in Chapter 12 (Appendix 12.2) of the EIAR.

The key aspects of controlling dust are listed below.

- Drop heights from conveyors, loading shovels, hoppers and other loading equipment will be minimised, if necessary fine water sprays will be employed.
- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- When conditions are such that there is a risk of trackout of dust (i.e., very dry, or muddy), vehicles exiting the site shall make use of a wheel wash facility prior to entering onto public roads.
- Vehicles using site roads will have their speed restricted through speed limit implementation, and this speed restriction will be enforced rigidly. On any site roads, this will be 20 kmph.
- Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust and other dust generating activities will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Full details of the dust management plan can be found in Appendix 12.3 (Volume III) of Chapter 12 of the EIAR.

The dust management plan will include a regime for monitoring dust levels in the vicinity of the site during the works using the Bergerhoff Method. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. Then minimum criteria to be maintained shall be the limit specified by the Environmental Protection Agency (EPA) for licensed facilities in Ireland which is 350mg/m2/day as a 30- day average.

6.10 Fire and Explosion

The Contractor will take precautions to prevent the risk of fire or explosion caused by gas or vapour. Suitable portable fire extinguishers shall be kept at all times in working areas and areas not protected by other fire services.

Containers of flammable liquids or gases shall be handled in accordance with the recommendations of the Fire Services Department, Local Authority and Statutory Regulations.

6.11 Disposal of Materials

Where material is to be stockpiled on site prior to disposal, the contractor will control all run-off to prevent contamination of surrounding watercourses. Any surplus material will be removed off site to a licenced facility. Contaminated soil will be assessed to determine its constituents and disposed of offsite in accordance with Irish Waste Management Legislation.

Where site won topsoil is to be reused on site for planting / landscaping it will be appropriately stored and approved for use by the Employer's Representative prior to spreading in the required locations. Stockpiles must be no higher than 2m and the exposed surface must be seeded out.

6.12 Communication

The types of relevant communication and training required to ensure that the Contractor will take responsible steps to ensure waste and environmental duty of care is complied with and that materials are handled efficiently, and waste is managed appropriately:

- Construction Management Plan,
- Site Waste and Environmental Management Plan,
- Roles and responsibilities,
- Toolbox talks,
- Waste procedures on site,
- Duty of care / responsibilities,
- Material storage.

Waste and environmental management will be included on the Agenda for all site meetings and monitoring statistics will be provided for review.

6.13 Sustainability

The Contractor shall undertake an embodied carbon footprint assessment of the Works in accordance with international best practice / standards. The scope of the assessment shall as a minimum include cradle / source to site and construction activity related emissions. Product type-specific Environmental Product Declarations (in accordance with I.S. EN15804), where these are available, can be consulted to assist in developing embodied carbon footprints of construction products.

7. Monitoring & Protection of Neighbouring Properties

A monitoring regime will be put in place to protect neighbours & neighbouring properties with a full and detailed vibration, noise, dust, and groundwater monitoring regime put in place for the duration of the works.

Flowchart for the Instrumentation and Monitoring Subcontractor (MSC)

7.1 Monitoring Works Specialist

The Contractor will appoint a competent person to be referred to as the Surveying, Instrumentation and Monitoring Subcontractor (MSC) and together with them will prepare and maintain the vibration, noise, dust, and groundwater monitoring plan, for the agreement/approval of the Client, Employers Representative, and the Technical Advisors.

7.2 Condition Schedules

The MSC will be responsible for preparing or organising the preparation of condition surveys of surrounding buildings, walls, hardstanding area etc. prior to the carrying out of any works on site. Extent of surveys to be agreed. The condition surveys shall be carried out to a level of detail, suitable to the nature and extent of conditions encountered in order to obtain an understanding of the general structural condition of the property/structure and/or external environments.

7.3 Movement & Vibration

Monitoring Movement & vibration monitoring of adjoining areas are not deemed to be required given the nature of the works and the site location.

7.4 Noise & Dust Monitoring / Control

Refer to Sections 6.8 and 6.9 of this report, and Chapters 10 and 12 of the EIAR for details.

7.5 Recording

The MSC will monitor, collate, and report on noise & dust in report format, on a monthly basis, increased to weekly during critical activities.

Appendix A IAPS Management Plans

INVASIVE ALIEN PLANT SPECIES :
SITE ASSESSMENT REPORT & MANAGEMENT PLAN

RESIDENTIAL DEVELOPMENT LANDS AT LACKENROE, GLOUNTHAUNE, CO. CORK

FOR

BLUESCAPE LIMITED

16 SEPTEMBER 2021 | ISSUE 2 FINAL

CONTENTS

DOCUMENT NAME	STATUS	REV	DATE	COMMENT	AUTHOR	CKD.
CO-03-21/SARMP/00	DRAFT	00	04/06/2021	ISSUED FOR COMMENTS	KYRAN COLGAN	K.C.
CO-03-21/SARMP/01	ISSUE 1	01	03/09/2021	GENERAL REVISIONS	KYRAN COLGAN	K.C.
CO-03-21/SARMP/02	ISSUE 2	02	16/09/2021	FINAL REVISIONS	KYRAN COLGAN	K.C.

I.A.P.S. SITE ASSESSMENT REPORT & MANAGEMENT PLAN

RESIDENTIAL DEVELOPMENT LANDS, GLOUNTHAUNE, CO. CORK								
PROJECT NO.	CO-03-21	**GPS POSITION : ITM**	**X**	577195	**Y**	573892	**AUTHOR**	MR. KYRAN COLGAN

EXECUTIVE SUMMARY

Invasive Plant Solutions have been retained by Bluescape Limited, to provide IAPS (invasive alien plant species) consultancy services in relation to a land holding in the townland of Lackenroe, Glounthaune, Co. Cork. The majority of the land holding is currently in agricultural use, but with the most southerly part of the holding comprising of a mix of woodland habitat and unoccupied residential use.

Proposals are being considered in relation to the future development of the lands, which currently envisage an integrated mixed residential scheme occupying the main body of the lands, with secondary development and pedestrian connections to Glounthaune village provided via routes through the woodland zone occupying the southern sector of the land holding. These proposals have been developed to a stage whereby Statutory Consents can be sought in the near future, but the outcome of such a process, and specific timelines for any future development, are currently unknown.

This IAPS Site Assessment Report and Management Plan represents the first stage of an ongoing programme of IAPS consultancy services, the scope of which is designed and intended to deliver the safe, bio-secure and comprehensive management of all identified invasive alien plant species. The evolving Management Plan will include any necessary remediation measures that may be required to satisfy this purpose, in circumstances where the land is approved for development.

An initial I.A.P.S. survey was carried out on the 24th. May 2021, which falls within the optimum window in 2021 for surveying for the presence of IAPS. The data and information contained in this document is therefore as up to date as is reasonably possible, and therefore forms a reliable basis for the implementation of a realistic and deliverable IAPS management programme.

The management plan has been developed with reference to *The Management of Noxious Weeds and non-native Invasive Species on National Roads"* by NRA (2010), *Best Practice Management Guidelines* by Invasive Species Ireland (2008) and the UK Environment Agency's *The Knotweed Code of Practice : Managing Japanese Knotweed on Development Sites.* In applying the latter's planning matrix, as well as the "precautionary principle", we can conclude that the IAPS management will initially consist of a combination of three specific measures, as follows :

- Deployment of initial bio-security measures, including fencing of certain infested zones and the fitting of warning / advisory signage
- Multi Annual in-situ herbicide control of certain IAPS infestations, particularly Knotweeds, Three Cornered Garlic and Spanish Bluebell
- On-site physical remediation of certain other IAPS infestations, particularly Rhododendron and American Skunk Cabbage

Based on the outcome of the project development process, including the planning approval and detailed design stages, assessed in conjunction with the overall phasing and timing of any construction works, and with ongoing site monitoring and treatment in the interim, this IAPS Management Plan will be developed and expanded upon. A "construction stage" document will further refine the IAPS management process and will set out the detailed bio-security requirements and individual remediation measures to be deployed at each IAPS location, during the delivery phase of any proposed development.

KYRAN COLGAN
Director

16 SEPTEMBER 2021

invasiveplantsolutions

INVASIVE PLANT SOLUTIONS LIMITED
The Stationhouse
Station Road
Dundrum
Co. Tipperary
E34 EK83

T : 086–2621443 / 062–71589 W : www.knotweed.ie E : info@knotweed.ie

I.A.P.S. SITE ASSESSMENT REPORT

SECTION 1 : GENERAL INTRODUCTION

The Site Assessment Report has been prepared for the client / agency referenced in Section 2 below, and is for their sole and exclusive use. The report reflects the particular site circumstances and conditions, as they presented on the days of inspection. Depending on the time of year of the site assessment, particularly if carried out in advance of the annual IAPS growing season, the evidence of invasive plant species on site may be limited. In these circumstances follow up site inspections, later in the growing season, may be recommended. This will be included in Conclusions and Recommendations at Section 13 of the report.

By their nature, IAPS are aggressive interlopers in our native habitat, are capable of aggressive and rapid dominance, and if left untreated generally result in extensive habitat impairment. It is therefore reasonable to conclude that, where IAPS are identified, but control measures are not applied, these plant species will spread beyond their observed extents.

In addressing invasive alien plant species the precautionary principle should always be applied to their assessment, management and control. All recommended management and control measures should be carried out strictly in accordance with a Site Specific Management Plan, and follow "best practice" principles, as set out in technical reference documents such as the UK Environment Agency's *The Knotweed Code of Practice, The Management of Noxious Weeds and non-native Invasive Species on National Roads"* by NRA (2010), and *Best Practice Management Guidelines* by Invasive Species Ireland (2008)

Control measures should be implemented using a recognised professional service with expertise in this field of work, and take into account any and all sensitivities highlighted in the site assessment report. Particular care should be taken in circumstances where the invasive plant species are located within a designated site of ecological importance, such as an SAC, SPA or NHA, or are set within the context of known ecological sensitivities. Where the use of herbicides are proposed, these should be applied strictly in accordance with the manufacturers recommendations, by a registered Professional Pesticides User, and fully in compliance with the European Communities (Sustainable Use of Pesticides) Regulations, 2012, (S.I. 155 of 2012).

Under no circumstances should any IAPS be cut or dug out without the advice, direction and supervision of an invasive species specialist. Many plant species have extensive root / rhizome systems which spread beyond the footprint of the above ground plant, and some can regenerate themselves from very small fragments of root or stem. Some plants produce very substantial quantities of seeds, which remain viable for many years, while others produce a sap which causes severe skin damage & burns.

The off-site removal of Japanese knotweed, its variants, soil infested with knotweed material, and other IAPS, are all strictly controlled by legislation and require a licence from the National Parks and Wildlife Service in advance of their removal, in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011 (SI 477).

SECTION 2 : LEGISLATIVE CONTEXT

Japanese Knotweed, *Fallopia japonica*, and other invasive plant species, are listed as Invasive Alien Plant Species in Part 1 of the Third Schedule of the *European Communities (Birds and Natural Habitats) Regulations* 2011 (SI 477 of 2011, as amended). In addition, soils and other material containing Knotweeds are classified in Part 3 of the Third Schedule as vector materials and are subject to the same strict legal controls. Failure to comply with the legal requirements set down can result in either civil or criminal prosecution, with very severe penalties accruing. A person who commits an offence under Regulations 49 & 50 is liable (a) on summary conviction, to a Class A fine or imprisonment for a term not exceeding six months, or both, or (b) on conviction on indictment, to a fine not exceeding €500,000, or imprisonment for a term not exceeding three years, or both. A person who knowingly incites, directs, procures, permits or assists another person to carry out an action that is an offence under these Regulations shall also be guilty of an offence. The relevant sections of the regulations are reproduced below.

49(2) *Save in accordance with a licence granted* [by the Department of Arts, Heritage and the Gaeltacht]*, any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in any place* [a restricted non-native plant]*, shall be guilty of an offence.*

49(3) *… it shall be a defence to a charge of committing an offence under paragraph (1) or (2) to prove that the accused took all reasonable steps and exercised all due diligence to avoid committing the offence.*

50(1) *Save in accordance with a licence, a person shall be guilty of an offence if he or she* […] *offers or exposes for sale, transportation, distribution, introduction or release—*

(a) [any restricted non-native animal or plant species]*,*

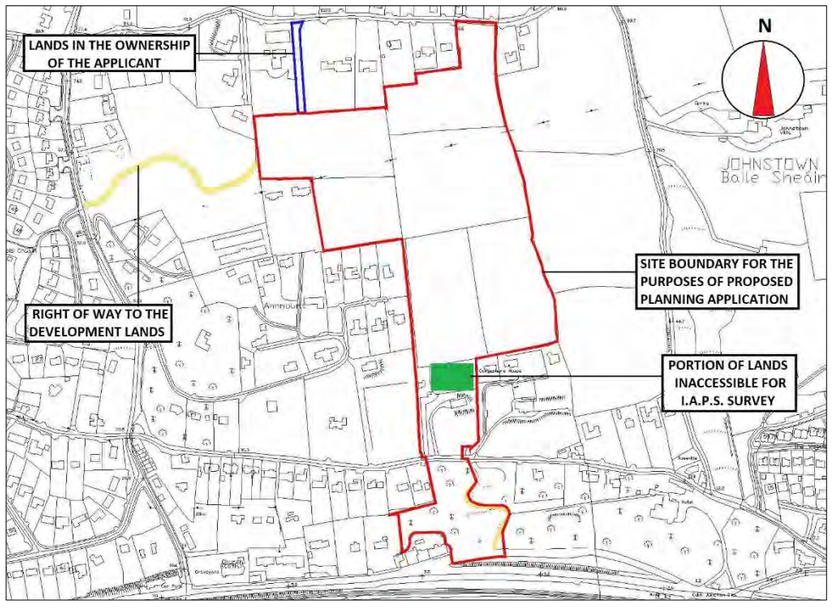
(b) *anything from which an animal or plant referred to in subparagraph (a) can be reproduced or propagated, or*

(c) *a vector material listed in the Third Schedule,* [which includes] *soil or spoil taken from places infested with Japanese Knotweed….and its hybrids…*

It is an offence under regulations 49(2) and 50(1) to spread, or cause to spread, Japanese Knotweed and other IAPS. An offence may only be avoided if the relevant party can prove that they took all reasonable steps to avoid causing an offence under the legislation. To comply with these regulations, therefore, this management plan relies solely on methodologies necessary to ensure strict compliance with the legislation.

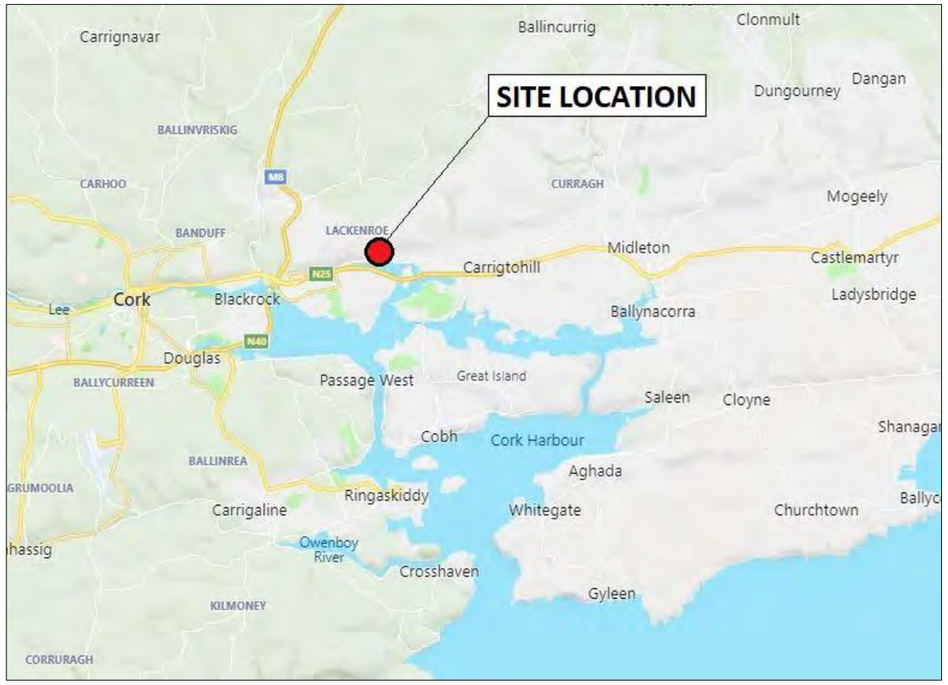
SECTION 3 : CLIENT & SITE DETAILS

GENERAL DETAILS													
SITE ADDRESS	LACKENROE, GLOUNTHAUNE, CO. CORK												
CLIENT DETAILS	**BLUESCAPE LIMITED** 12 MERRION SQUARE DUBLIN 2 IRELAND						**OWNERSHIP**	PUBLIC		PRIVATE	X		
							CLIENT REP.	MR. PAUL Mc. CARTHY					
							TEL / EMAIL	087 233 8991 / paul@westhilluk.com					
STATE AGENCIES INVOLVED	CO. COUNCIL		NPWS		IFI		IRISH WATER		BORD NA MONA				
	ESB		IRISH RAIL		GNI		OTHER						
CONSULTANTS / AGENTS	**ARCHITECTS – DEADY GAHAN ARCHITECTS** EASTGATE VILLAGE RETAIL PARK LITTLE ISLAND CO. CORK **ECOLOGICAL CONSULTANTS – KELLEHER ECOLOGY SERVICES** CASTLELYONS CO. CORK												
SITE USAGE	AGRICULTURAL	X	FORESTRY		RESIDENTIAL	X	COMMERCIAL		INDUSTRIAL				
	PUBLIC SPACE		GREENFIELD	X	BROWNFIELD		OTHER						
SITE AREA	Lands outlined in Red : 12.69 Ha. + Lands outlined in Blue : 0.13 Ha. = Total Site Area : 12.82 Ha.												
SITE DESCRIPTION	THE SUBJECT SITE COMPRISES A LARGE, PRIMARILY GREENFIELD, SOUTH FACING AGRICULTURAL LAND HOLDING, EXTENDING FROM THE L3004 OLD YOUGHAL ROAD, ON THE EAST SIDE OF GLOUNTHAUNE VILLAGE, IN THE SOUTH, AND RUNNING UPHILL TO THE NORTH AND WEST. THE BULK OF THE LANDS ARE LAID OUT IN WELL ESTABLISHED FIELD DIVISIONS, ACCESSED VIA EXISTING AND PROPOSED ROADWAYS TO THE NORTH AND WEST. THE WESTERN ACCESS PIONT IS A FUTURE ROADWAY, TO BE BUILT AND ROUTED ACROSS EXISTING AGRICULTURAL LANDS, AND DELINIATED IN YELLOW ON THE MAP REPRODUCED BELOW. THE SOUTHERN PORTION OF THE LAND HOLDING CONSISTS OF TWO DISUSED RESIDENTIAL PROPERTIES ON INDIVIDUAL SITES, LOCATED ON THE NORTH SIDE OF "THE TERRACE" PUBLIC ROADWAY, AND A TRANCH OF MIXED NATIVE WOODLAND, EXTENDING FROM THE SOUTHERN SIDE OF "THE TERRACE" PUBLIC ROAD DOWNHILL TO THE SOUTHERN LIMITS OF THE OVERALL LAND HOLDING, ON THE PEDESTRIAN WALKWAY JUST NORTH OF THE L3004. A SMALL SECTION OF FORMER GARDENS PROVED TO BE INACCESSIBLE FOR THE PURPOSE OF THIS ASSESSMENT, AND IS ILLUSTRATED ON THE MAP BELOW. THE LAND HOLDING IS BOUNDED BY PRIVATE RESIDENTIAL AND COMMERCIAL PROPERTIES TO THE SOUTH, WEST, AND NORTH, AND BY A MIX OF AGRICULTURAL FIELDS AND PRIVATE RESIDENTIAL PROPERTIES TO THE EAST SITE BOUNDARIES ARE GENERALLY WELL DEFINED AND DEMARCATED, IN A COMBINATION OF STONE AND MASONRY WALLS, NATIVE HEDGES AND FENCING. THE LANDS ARE CURRENTLY BEING ASSESSED AND CONSIDERED FOR A POTENTIAL RESIDENTIAL DEVELOPMENT												



LAND HOLDING MAP REPRODUCED COURTESY OF DEADY GAHAN ARCHITECTS

SECTION 4 : SITE LOCATION MAP & AERIAL SITE LAYOUT



SITE LOCATION MAP

SITE LOCATION MAP REPRODUCED COURTESY OF BING MAPS

AERIAL SITE LAYOUT

AERIAL SITE LAYOUT REPRODUCED COURTESY OF BING MAPS

SECTION 5 : SCOPE OF I.A.P.S. SURVEY

The scope and purpose of the I.A.P.S. Survey was to:

- Confirm presence, or otherwise, and extent of Japanese Knotweed and its hybrids within, or in close proximity to, the site forming the study area
- Confirm the presence, or otherwise, of any other I.A.P.S. within or in close proximity to, the site forming the study area
- Use the survey results to inform the preparation of an I.A.P.S. Site Assessment Report
- Use the survey results to inform the preparation of an I.A.P.S. Management Plan, particularly in relation to any necessary bio-security and control measures that may be required

SECTION 6 : BACKGROUND RESEARCH

A desktop study was carried out in May 2021, to identify any formal records that may exist for the presence of land based I.A.P.S., as set out in Part 1, Schedule 3, of S.I. 477 of 2011, within for the study area.

The National Biodiversity Data Centre (NBDC) invasive species database and mapping system were reviewed, covering the study area, the immediately surrounding lands, and the broader hinterland.

The search of the NBDC invasive alien plant species database yielded no records of the presence of land based I.A.P.S. within the survey area itself. However there are a number of IAPS records located in the broader hinterland, generally relating to the railway line which runs parallel, and to the south, of the L3004 Old Youghal Road, itself just south of the subject site. These records relate primarily for the presence of Japanese Knotweed, but also include a small number of records for Bohemian and Giant Knotweed plants. For reference, we have reproduced below the NBDC map record for the nearest Japanese Knotweed sites, as recorded between 2000 and 2021.

In addition we also referred to various open source mapping, satellite imaging, and data sets, including Land Direct, Geohive, NPWS Map Viewer, Google Maps and Bing Maps

MAPPING RECORDS OF JAPANESE KNOTWEED IN THE VICINITY OF THE SURVEY AREA, 2001- 2021

MAP REPRODUCED COURTESY OF NATIONAL BIODIVERSITY DATA CENTRE

SECTION 7 : I.A.P.S. OVERALL INFESTATION DETAILS

INVASIVE ALIEN SPECIES							
JAPANESE KNOTWEED		GIANT KNOTWEED		BOHEMIAN KNOTWEED	X	HIMALAYAN KNOTWEED	X
GUNNERA		HIMALAYAN BALSAM		GIANT HOGWEED		RHODODENDRON	X
AMERICAN SKUNK CABBAGE	X	THREE CORNERED GARLIC	X	SPANISH BLUEBELL	X	HOTTENTOT FIG	

DESCRIPTION & EXTENT OF KNOTWEED COLONISATIONS

BOHEMIAN KNOTWEED – **BK 1**

BK 1 IS A STAND OF HEALTHY, EMERGING, BOHEMIAN KNOTWEED WITHIN THE WOODLAND ZONE FORMING THE SOUTHERN SECTOR OF THE LANDS. THE STAND IS LOCATED JUST NORTH AND WEST OF SUNKEN STONE STRUCTURE, CLOSE TO A RECENTLY FORMED ACCESS ROUTE THROUGH THE WOODLAND TO THE LOWEST SECTION OF THE SITE. THE BOHEMIAN KNOTWEED IS ALMOST FULLY EMERGED FOR THIS GROWING SEASON, WITH STEMS UP TO 1.5M – 2M IN HEIGHT, AND WITH SMALLER STEMS PRESENTING AROUND THE PERIPHERY OF THE STAND. THERE IS NO EVIDENCE OF DEAD CANES FROM PREVIOUS SEASONS GROWTH, SUGGESTING THAT THE STAND COULD BE PART OF A PREVIOUSLY DORMANT INFESTATION, OR POSSIBLY GROWTH FROM RHIZOME THAT WAS PREVIOUSLY INTRODUCED ONTO THE SITE IN SPOIL MATERIAL, AND WHICH WAS ACTIVATED BY THE RECENT SITE CLEARANCE ACTIVITIES

BOHEMIAN KNOTWEED – **BK 2**

JK 2 IS A STAND OF BOHEMIAN KNOTWEED LOCATED APPROX. 12M TO THE EAST OF **BK 1,** AND IS EXHIBITING SIMILAR CONDITIONS AND CHARACTERISTICS. IT IS POSSIBLE THAT THE TWO STANDS ARE CONNECTED GROWTH ORIGINATING FROM THE SAME REPOSITORY OF RHIZOME MATERIAL CONTAINED WITHIN THE GROUND IN THIS GENERAL AREA. FURTHER INVESTIGATION IS REQUIRED TO DETERMINE THE PRECISE CIRCUMSTANCES OF THE TWO STANDS

HIMALAYAN KNOTWEED – **HK 1**

HK 1 IS A LARGE MONOLITHIC STAND OF RECENTLY EMERGENT HIMILAYAN KNOTWEED LOCATED IN THE SAME SOUTHERN SECTOR, NORTH OF **BK 1**. THE STAND IS PARTIALLY ON THE RECENTLY FORMED ACCESS TRACK, BUT WITH THE MAIN BODY OF THE STAND EXTENDING TO THE WEST, UP THE SLOPING BANK IN OPEN GROUND. AS WITH THE OTHER STANDS, THERE IS NO EVIDENCE OF DEAD STEMS FROM PREVIOUS SEASONS GROWTH.

HIMALAYAN KNOTWEED – **HK 2**

HK 2 COMPRISES A SERIES OF JUVENILE AND IMMATURE HIMALAYAN KNOTWEED SHOOTS, IMMEDIATELY NORTH, AND TO THE WEST, OF **BK 2**, SCATTERED ACROSS THE RECENTLY DISTURBED OPEN GROUND. IT IS EARLY IN THE GROWING SEASON, SO ITS FULL EXTENT MAY NOT YET BE FULLY REPRESENTED.

DESCRIPTION & EXTENT OF OTHER I.A.P.S. COLONISATIONS

THREE CORNERED GARLIC – **TCG 1 & TCG 3**

TCG 1 & TCG 3 ARE LINEAR STANDS OF WELL ESTABLISHED THREE CORNERED GARLIC, SPREADING WITHIN AND ALONG ROADSIDE VERGES

THREE CORNERED GARLIC – **TCG 2**

TCG 2 IS A SMALL STAND OF THREE CORNERED GARLIC, LOCATED WITHIN THE NATIVE HEDGEROW SEPARATING FIELDS IN THE NORTHERN SITE SECTOR

THREE CORNERED GARLIC – **TCG 4, TCG 5, TCG 6 & TCG 7**

TCG 4 - TCG 7 ARE A SERIES OF STANDS OF WELL ESTABLISHED THREE CORNERED GARLIC, SPREADING WITHIN THE NORTHERN PART OF THE WOODLAND THAT FORMS THE SOUTHERN SITE SECTOR, AND ALONG BOTH SIDES OF THE PEDESTRIAN RIGHT OF WAY ON THE WOODLAND'S EASTERN FRINGE

SPANISH BLUEBELL – **SB 1**

SB 1 IS A SMALL GROUP OF SPANISH BLUEBELL PLANTS SCATTERED THROUGH NATIVE VEGETATION. LOCATED IN THE RECENTLY FORMED CLEARANCE IN THE NORTHERN SECTOR OF THE WOODLAND, WHICH FORMS THE SOUTHERN SECTOR OF THE LAND HOLDING

THREE CORNERED GARLIC & SPANISH BLUEBELL – **TCG/SB 1, TCG/SB 2 & TCG/SB 3**

TCG/SB 1, TCG/SB 2 & TCG/SB 3 ARE EXTENSIVE ZONES OF MIXED INFESTATIONS OF BOTH THREE CORNERED GARLIC AND SPANISH BLUEBELL, LOCATED ON THE GROUNDS OF THE TWO RESIDENTIAL PROPERTIES ON THE NORTH SIDE OF "THE TERRACE" PUBLIC ROAD. THE STANDS ARE TYPICALLY WELL ESTABLISHED AND ARE MIXED AND SPREADING AMONGST NATIVE VEGETATION. THERE IS EVIDENCE OF SOME SPERAD INTO THE FIELDS TO THE NORTH

THREE CORNERED GARLIC & SPANISH BLUEBELL – **TCG/SB 4, TCG/SB 5 & TCG/SB 6**

TCG/SB 4, TCG/SB 5 & TCG/SB 6 ARE A SERIES OF MIXED STANDS OF WELL ESTABLISHED THREE CORNERED GARLIC AND SPANISH BLUEBELL, SPREADING WITHIN THE WOODLAND THAT FORMS THE SOUTHERN SITE SECTOR, PARTICULARLY ALONG THE ROADSIDE MARGIN ON ITS NORTHERN FRINGE AND ALONG BOTH SIDES OF THE PEDESTRIAN RIGHT OF WAY ON THE WOODLAND'S SOUTH EASTERN MARGINS

RHODODENDRON – **RHO 1 & RHO 2**

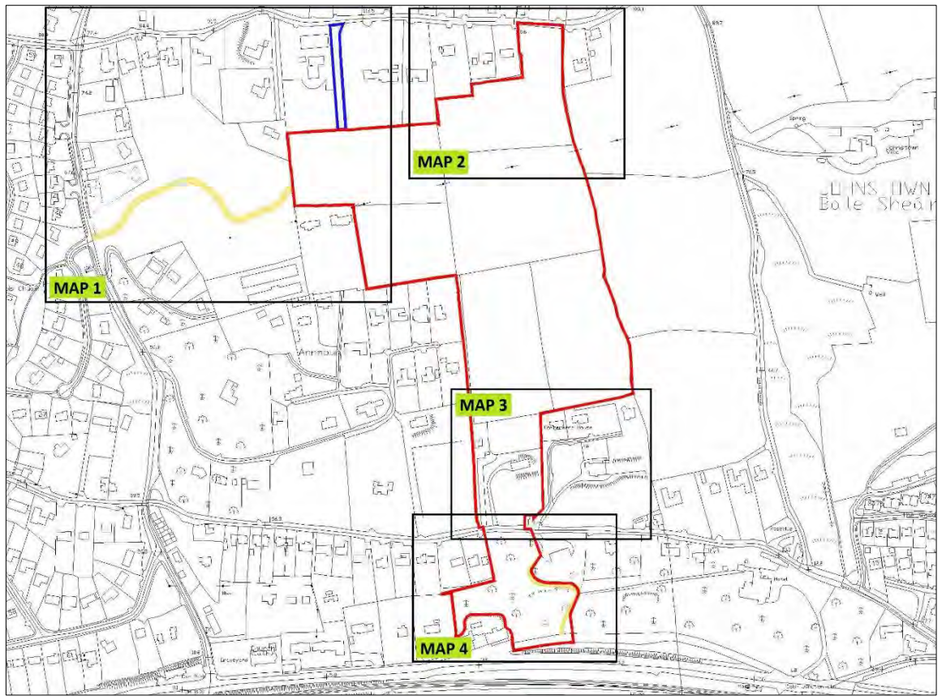
RHO 1 & RHO 2 ARE TWO HEALTH AND MATURE RHODODENDRON TREES, LOCATED IN THE GROUNDS OF THE LARGE DISUSED RESIDENTIAL PROPERTY, ON THE NORTH SIDE OF "THE TERRACE" PUBLIC ROAD. **RHO 1** IS LOCATED CLOSE TO SOUTHERN END OF THE PROPERTY'S EASTERN BOUNDARY, WHILE **RHO 2** IS IN THE WESTERN SECTOR OF THE PROPERTY, IN LINE WITH THE ENTRANCE POINT TO THE SITE. THE TWO TREES ARE CURRENTLY IN FLOWER.

AMERICAN SKUNK CABBAGE – **ASC 1**

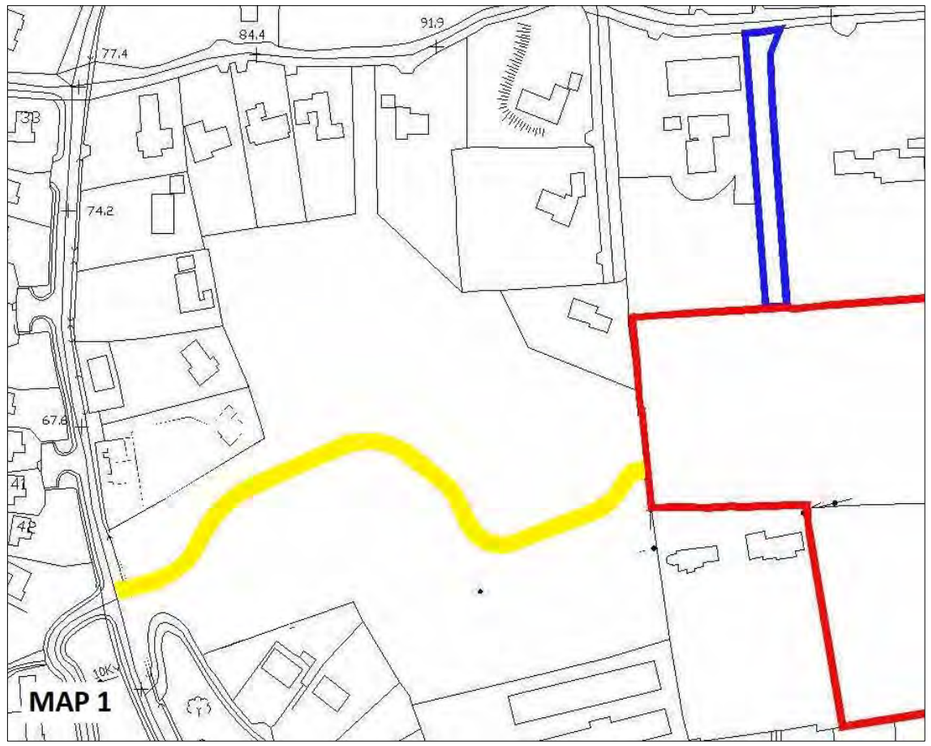
ASC 1 REPRESENTS AN AREA OF AMERICAN SKUNK CABBAGE, COMPRISING APPROX 10 PLANTS, AT VARYING STAGES OF PLANT GROWTH. THEY ARE LOCATED IN A LOW LYING WET GROUND, WITHIN THE SOUTHERN SITE SECTOR, APPROX 20M NORTH OF THE BOEMENIAN KNOTWEED STANDS

CONDITION OF INFESTATIONS									
GROWTH STAGE	EMERGENT	X	REGROWTH		JUVENILE / SEMI MATURE	X	MATURE	X	
CONDITION	HEALTHY	X	DISTRESSED		STUNTED		BONSAI		
RISKS FROM PLANTS									
BOUNDARIES	X	SOFT LANDSCAPE	X	HARD SURFACES		SITE DISPERSAL	X	SENSITIVE HABITATS	X

SECTION 8 : I.A.P.S. DISTRIBUTION MAPS



OVERALL SITE LAYOUT WITH KEY TO I.A.P.S. DISTRIBUTION MAPS

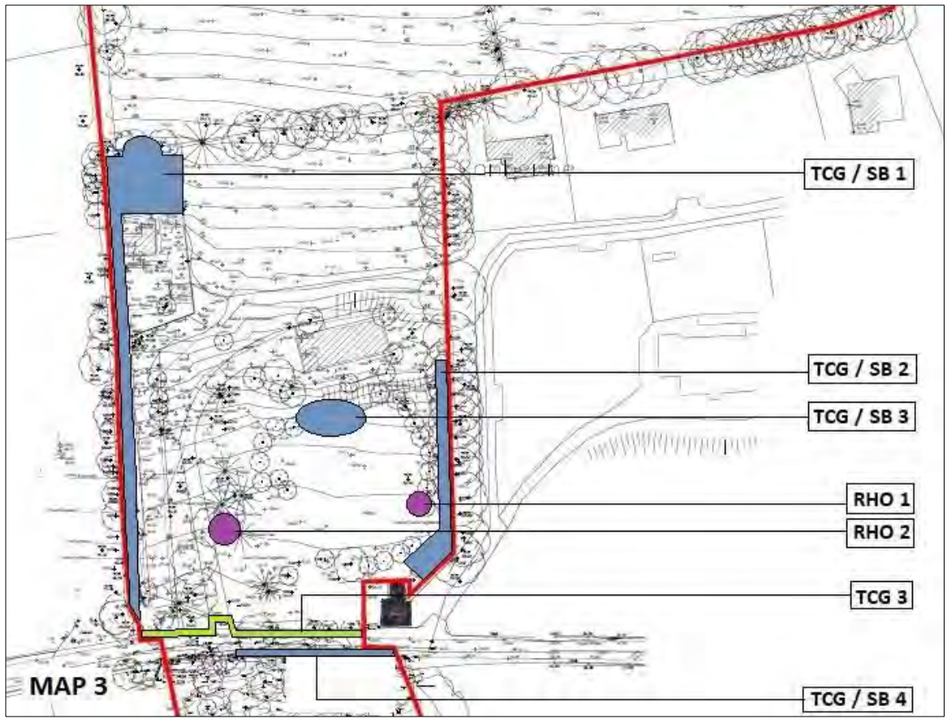


I.A.P.S. DISTRIBUTION MAP 1

MAPS REPRODUCED COURTESY OF DEADY GAHAN ARCHITECTS

SECTION 8 : I.A.P.S. DISTRIBUTION MAPS – CONTD.

I.A.P.S. DISTRIBUTION MAP 2



I.A.P.S. DISTRIBUTION MAP 3

MAPS REPRODUCED COURTESY OF DEADY GAHAN ARCHITECTS

SECTION 8 : I.A.P.S. DISTRIBUTION MAPS – CONTD.

I.A.P.S. DISTRIBUTION MAP 4

MAPS REPRODUCED COURTESY OF DEADY GAHAN ARCHITECTS

SECTION 9 : I.A.P.S. INDIVIDUAL INFESTATION DETAILS

DETAILS	NO.	ITM – X *	ITM – Y *	SIZE (M X M)	COMMENTS
INFESTATION 1	BK 1	577279	573379	+/- 5m dia.	Emergent, distressed stems on periphery
INFESTATION 2	BK 2	577290	573375	+/- 4m x 3m	Emergent, distressed stems on periphery
INFESTATION 3	HK 1	577279	573397	+/- 10m x 6m	Emergent, section on trackway disturbed
INFESTATION 4	HK 2	577286	573380	+/- 4m x 3m	Just emerging, in disturbed ground
INFESTATION 5	TCG 1	577253 to 577302	574098 to 574102	+/- 50m x 1m	On roadside margin, on south side of public Road
INFESTATION 6	TCG 2	577155	573962	+/- 2m dia.	Within hedgerow at crossing point between fields
INFESTATION 7	TCG 3	577209 to 577263	573500 to 573503	+/- 55m x 5m	On roadside margin and spreading into the main property entrance, on north side of public road
INFESTATION 8	TCG 4	577259	573475	+/- 5m x 12m	In woodland clearing, spreading south
INFESTATION 9	TCG 5	577277	573467	+/- 7m x 5m	Under large tree in woodland, spreading south
INFESTATION 10	TCG 6	577276 to 577283	573412 to 573431	+/- 18m x 1m x 2	Both side of pathway, around right hand bend
INFESTATION 11	TCG 7	577236	573439	+/- 2m x 1m	In woodland clearing
INFESTATION 12	SB 1	577256	573456	+/- 3m dia.	In woodland clearing
INFESTATION 13	TCG/SB 1	577205 to 577209	573503 to 573625	+/- 100m x 1m x 2 + +/- 16m x 20m	Both sides of driveway and in open ground behind house, spreading into the field to the north
INFESTATION 14	TCG/SB 2	577274 to 577281	573512 to 573569	+/- 60m x 5 - 10m	
INFESTATION 15	TCG/SB 3	577254	573556	+/- 6m x 3m	Spreading through vegetation at woodland fringe
INFESTATION 16	TCG/SB 4	577232 to 577270	573490 to 573491		On roadside margin, on south side of public Road
INFESTATION 17	TCG/SB 5	577324	573426	+/- 15m x 2m	Both side of pathway, around left hand bend
INFESTATION 18	TCG/SB 6	577313 to 577315	573369 to 583396	+/- 8m x 20m	
INFESTATION 19	RHO 1	577275	573533	+/- 4m dia.	Currently in full flower
INFESTATION 20	RHO 2	577222	573531	+/- 6m dia.	Currently in full flower
INFESTATION 21	ASC 1	577301	573402	+/- 3m x 2m	

* Many of the invasive alien plant species recorded are located within woodland or close to dense canopy cover. Therefore some of the GIS co-ordinates could have a significant margin of error, which should be taken consideration when implementing IAPS management measures. Their exact location and extent should be validated on the ground, and clearly demarcated, using an invasive alien plant species specialist.

SECTION 10 : I.A.P.S. - ENVIRONMENTAL IMPACT AND LOCAL SENSITIVITIES

ENVIRONMENTAL CONTEXT								
VISUAL IMPACT	MINIMAL		MODERATE	**X**	SIGNIFICANT		SEVERE	
ENVIRONMENTAL IMPACT	LIMITED		MODERATE		SIGNIFICANT	**X**	SEVERE	
TRANSLOCATION RISK	LOW		MEDIUM		HIGH	**X**	ACUTE	
PROXIMITY TO WATER BODY	DISTANT		VICINITY	**X**	ADJOINING		WITHIN	
NATURE OF WATER BODY	RIVER		SEA	**X**	LAKE		CHANNEL	**X**
DESIGNATED STATUS								
IS SITE IN A DESIGNATED AREA	SAC	**NO**	SPA	**NO**	NHA / pNHA	**NO**	NO.	**N/A**
DESIGNATED AREA NEARBY	SAC	**YES**	SPA	**YES**	NHA / pNHA	**YES**	NO.	**001058 / 004030**
OTHER SENSITIVITIES								

COMMENTS / NOTES

DESIGNATED SITES

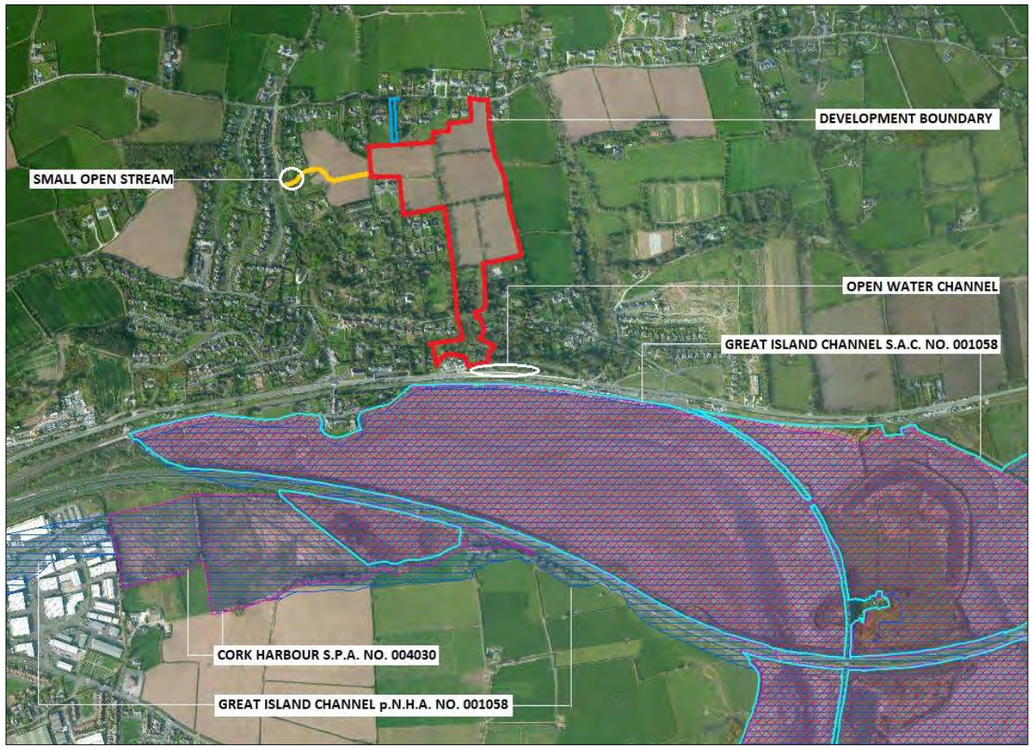
THE NEAREST DESIGNATED SITES ARE **THE GREAT ISLAND CHANNEL S.A.C. NO.001058** AND **THE CORK HARBOUR S.P.A. NO.004030,** BOTH OF WHICH ARE A SHORT DISTANCE TO THE SOUTH OF THE SOUTHERN SITE BOUNDARY, WITH THEIR NORTHERN LIMITS LOCATED JUST SOUTH OF THE CORK TO MIDDLETON RAILWAY LINE, ITSELF SOUTH OF THE L3004 OLD YOUGHAL ROAD.

OTHER SENSITIVITIES

AS WELL AS THE PRESENCE OF THE ABOVE DESIGNATED SITES THERE IS AN ASSOCIATED STREAM / DRAINAGE DYKE LOCATED BETWEEN THE SOUTHERN SITE BOUNDARY AND THE NORTH SIDE OF THE OLD YOUGHAL ROAD. IN ADDITION, THERE IS THE FORMATION OF A SMALL STREAM WHICH PRESENTS ABOVE GROUND AND FOLLOWS THE GENERAL LINE OF THE WESTERNMOST SECTION OF THE PROPOSED WESTERN ACCESS ROAD.

GIVEN THE PROXIMITY OF THE OPEN WATER BODIES CLOSE TO, OR ON, THE LAND HOLDING, AS WELL AS THE DESIGNATED SITES IMMEDIATELY TO THE SOUTH OF THE PROPERTY, THERE MAY BE POTENTIAL PATHWAYS FOR HERBICIDES, WHICH COULD HAVE AN IMPACT ON KNOWN ECOLOGICAL SENSITIVITIES OR RECEPRORS WITHIN THE DESIGNATED SITES

MAPS / ILLUSTRATIONS



RELATIONSHIP BETWEEN THE SITE & THE CLOSEST DESIGNATED SITES

MAPS REPRODUCED COURTESY OF THE N.P.W.S. MAPVIEWER FACILITY

SECTION 11 : SITE PHOTOGRAPHS

BOHEMIAN KNOTWEED – BK 1

VIEW OF STAND – LOOKING WEST

VIEW OF STAND – LOOKING NORTH

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

BOHEMIAN KNOTWEED – BK 2

VIEW OF STAND – LOOKING SOUTH

VIEW OF STAND – LOOKING NORTH

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

BOHEMIAN KNOTWEED – BK 1 & BK 2

DETAIL OF HEALTHY PLANT STEMS AND LEAVES

DETAIL OF DELAYED OR DISTRESSED GROWTH

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

HIMILAYAN KNOTWEED – HK 1

VIEW OF STAND – LOOKING NORTH EAST

VIEW OF STAND – LOOKING NORTH WEST

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

HIMILAYAN KNOTWEED – HK 1

VIEW OF EASTERN END OF THE STAND ON, AND CROSSED BY, A VEHICLE TRACK – LOOKING NORTH

VIEW OF EASTERN END OF THE STAND ON, AND CROSSED BY, A VEHICLE TRACK – LOOKING NORTH

CLOSE UP OF EMERGING NEW SEASON GROWTH

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

HIMILAYAN KNOTWEED – HK 2

HEALTHY ENERGENT NEW SEASON GROWTH IN DISTURBED GROUND – LOOKING NORTH

DELAYED OR DISTRESSED NEW SEASON GROWTH IN DISTURBED GROUND – LOOKING WEST

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

THREE CORNERED GARLIC – TCG 1

ROADSIDE MARGIN – LOOKING WEST

THREE CORNERED GARLIC MIXED AMONGST NATIVE VEGETATION IN ROADSIDE MARGIN

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

THREE CORNERED GARLIC – TCG 2 & TCG 3

THREE CORNERED GARLIC MIXED AMONGST NATIVE VEGETATION IN HEDGEROW AT TCG 2

ROADSIDE MARGIN AT TCG 3 CONTAINING THREE CORNERED GARLIC – LOOKING WEST

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

THREE CORNERED GARLIC – TCG 4 & TCG 5

THREE CORNERED GARLIC MIXED AMONGST NATIVE VEGETATION IN WOODLAND CLEARING AT TCG 4

THREE CORNERED GARLIC AROUND THE BASE OF A TREE IN THE SOUTHERN WOODLAND AT TCG 5

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

THREE CORNERED GARLIC – TCG 6 & TCG 7

THREE CORNERED GARLIC ON THE SIDE OF THE PATH ALONG THE EASTERN WOODLAND FRINGE AT TCG 6

THREE CORNERED GARLIC ON THE SIDE OF THE VEHICLE TRACK THROUGH THE SOUTHERN WOODLANDS AT TCG 7

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

SPANISH BLUEBELL – SB 1

TYPICAL SPANISH BLUEBELL PLANTS IN THE WODLAND CLEARING AT SB 2

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

THREE CORNERED GARLIC & SPANISH BLUEBELL – TCG/SB 1

THREE CORNERED GARLIC AND SPANISH BLUEBELL INTERMITTENTLY ON BOTH SIDES OF DRIVEWAY AT TCG/SB 1

GROUND TO THE REAR (NORTH) OF THE HOUSE HEAVILY COLONISED BY THREE CORNERED GARLIC AT TCG/SB 1

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

THREE CORNERED GARLIC & SPANISH BLUEBELL – TCG/SB 2 & TCG/SB 3

THREE CORNERED GARLIC AND SPANISH BLUEBELL SPREADING THROUGH NATIVE VEGETATION AT TCG/SB 2

SPANISH BLUEBELL SPREADING THROUGH NATIVE VEGETATION AT TCG/SB 3

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

THREE CORNERED GARLIC & SPANISH BLUEBELL – TCG/SB 4 & TCG/SB 5

ROADSIDE MARGIN AT TCG/SB 4 CONTAINING THREE CORNERED GARLIC & SPANISH BLUEBELL – LOOKING WEST

THREE CORNERED GARLIC & SPANISH BLUEBELL BESIDE THE PATH ALONG THE EASTERN WOODLAND FRINGE AT TCG/SB 5

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

THREE CORNERED GARLIC & SPANISH BLUEBELL – TCG/SB 6

THREE CORNERED GARLIC & SPANISH BLUEBELL IN OPEN GROUND AT TCG/SB 6 LOOKING NORTH WEST

THREE CORNERED GARLIC & SPANISH BLUEBELL BOTH SIDES OF THE PATH ON THE EASTERN WOODLAND FRINGE AT TCG/SB 6

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

RHODODENDRON – RHO 1

RHODODENDRON TREE IN THE EASTERN SECTOR OF THE PROPERTY NORTH OF "THE TERRACE" PUBLIC ROAD

SPREAD OF THE RHODODENDRON TREE IN THE EASTERN SECTOR OF THE PROPERTY NORTH OF "THE TERRACE" PUBLIC ROAD

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

RHODODENDRON – RHO 2

RHODODENDRON TREE IN THE WESTERN SECTOR OF THE PROPERTY NORTH OF "THE TERRACE" PUBLIC ROAD

DETAIL OF THE RHODODENDRON TREE IN FLOWER

SECTION 11 : SITE PHOTOGRAPHS – CONTD.

AMERICAN SKUNK CABBAGE – ASC 1

SMALL AMERICAN SKUNK CABBAGE PLANT IN WET GROUND – LOOKING NORTH

LARGER AMERICAN SKUNK CABBAGE PLANT BEYOND – LOOKING NORTH

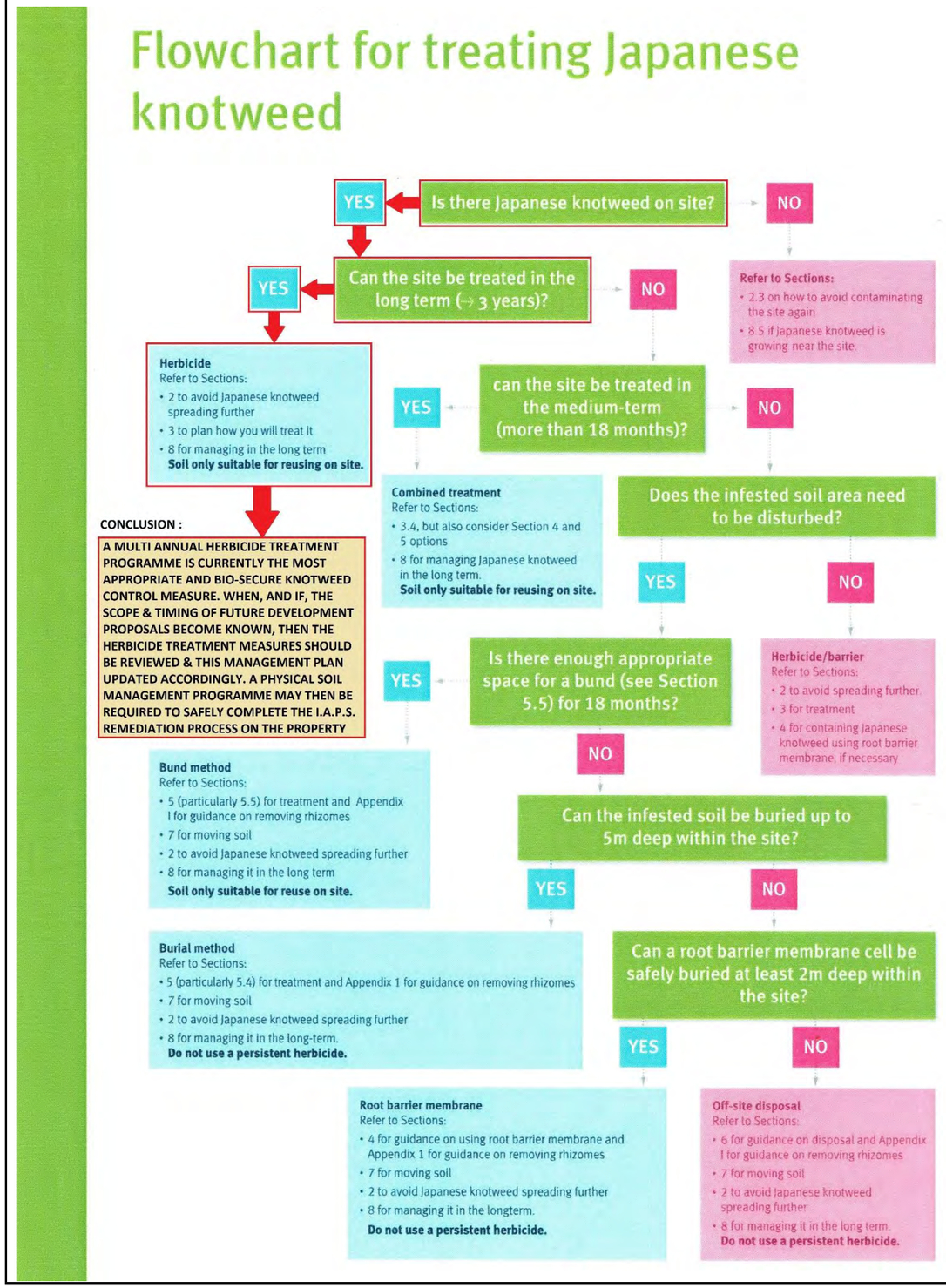
SECTION 12 : CONCLUSIONS & RECOMMENDATIONS

1. BASED ON THE TIME OF YEAR THAT THE 2021 SITE INSPECTION WAS CARRIED OUT, AND CONSIDERING THE GROUND DISTURBANCE WITHIN THE SOUTHERN WOODLAND SECTION OF THE LAND HOLDING, IT IS POSSIBLE THAT I.A.P.S. PLANTS ARE PRESENT BEYOND THE LIMITS RECORDED. IN APPLYING THE “PRECAUTIONARY PRINCIPLE”, ON-GOING SITE MONITORING SHOULD BE MAINTAINED DURING THE 2021 GROWING SEASON
2. FURTHER FORMAL SITE SURVEYS SHOULD BE SCHEDULED ACROSS THE SUMMER GROWING PERIOD, TO INSPECT FOR NEWLY EMERGENT I.A.P.S., INCLUDING KNOTWEEDS, AMERICAN SKUNK CABBAGE AND RHODODENDRON, AS WELL FOR FURTHER NEW SEASON GROWTH OF KNOTWEEDS RELATED TO THE IDENTIFIED STANDS. THE SURVEYS SHOULD INSPECT FOR VIABLE KNOTWEED PLANT/RHIZOME MATERIAL THAT MAY HAVE BEEN DISPERSED INTO OTHER AREAS OF THE PROPERTY. THIS REPORT AND MANAGEMENT PLAN SHOULD BE UPDATED ACCORDINGLY, TO TAKE ACCOUNT OF THE RESULTS OF THE SURVEYS
3. AREAS OF INFESTATION SHOULD BE SECURELY FENCED OFF WITHOUT DELAY, INCLUDING A 5 – 7m BUFFER ZONE AROUND KNOTWEED STANDS. FENCING SHOULD BE STURDY AND SHOULD INCORPORATE APPROPRIATE WARNING / ADVISORY SIGNAGE. WHERE STANDS ARE SMALL, OR JUST INDIVIDUAL STEMS, OR HAVE BEEN PREVIOUSLY TREATED AND COMPRISE OF PRIMARILY OF DEAD STEMS, THEN ADVISORY SIGNAGE ON STURDY TIMBER POSTS MAY SUFFICE
4. THIS REPORT SHOULD BE CIRCULATED TO ALL MEMBERS OF THE DESIGN TEAM FOR THE PROPOSED RESIDENTIAL DEVELOPMENT, AS WELL AS PRESCRIBED AUTHORITIES AND ANY ADJOINING LAND OWNERS AFFECTED BY THE I.A.P.S. PRESENCE, WHERE EITHER RELEVANT OR NECESSARY TO DO SO. IN PARTICULAR THE LOCAL AUTHORITY SHOULD BE FORMALLY NOTIFIED OF THE SIGNIFICANT EXTENT OF THREE CORNERED GARLIC AND SPANISH BLUEBELL POPULATING THE MARGINS OF THE PUBLIC ROADWAYS IN THE VICINITY OF THE SUBJECT LANDS
5. THIS MANAGEMENT PLAN AND TREATMENT METHODOLOGY SHOULD BE SCREENED FOR POTENTIAL INPACTS ON ECOLOGICAL RECEPTORS AND SENSITIVITIES, WHERE THEY EXIST, TO FULLY CONSIDER THE REQUIREMENTS OF S.I. 477 OF 2011 – THE EUROPEAN COMMUNITIES (BIRDS AND NATURAL HABITATS) REGULATIONS 2011 AND S.I. 155 OF 2012 – THE EUROPEAN COMMUNITIES (SUSTAINABLE USE OF PESTICIDES) REGULATIONS 2012
6. IN GENERAL THE I.A.P.S. INFESTATIONS ARE HEALTHY AND SUITABLE FOR THE COMMENCEMENT OF A HERBICIDE CONTROL PROGRAMME DURING THE EARLY SUMMER OF 2021, ALTHOUGH THE THREE CORENERD GARLIC AND SPANISH BLUEBELL PLANTS MAY HAVE ALREADY SET SEED AND BE ENTERING SENESCENCE. A MULTI-ANNUAL TREATMENT PROGRAMME SHOULD BE AGREED AND IMPLEMENTED AT THE EARLIEST APPROPRIATE OPPORTUNITY, TO ARREST THE RISK OF FURTHER SPREAD OF KNOTWEEDS AND OTHER I.A.P.S., AND TO COMMENCE THE PROCESS OF CONTROL AND ERADICATION. SEE SECTIONS 13 TO 19 FOR FURTHER DETAILS
7. NO GROUND MAINTENANCE, OPENING UP OR ANY FURTHER GROUND DISTURBANCE SHOULD TAKE PLACE WITHIN THE FENCED AND SIGNED AREAS, WITHOUT PRIOR CONSULTATION WITH, AND THE DIRECTION OF, AN INVASIVE PLANT SPECIES SPECIALIST, AND THEN ONLY UNDER STRICT SUPERVISION
8. ALL RELEVANT STAFF AND SITE VISITORS SHOULD BE BRIEFED ON THE IDENTIFICATION, RISKS AND DANGERS OF KNOTWEEDS AND OTHER I.A.P.S., AND ON THE SPECIFIC MEASURES, RESTRICTIONS AND PROTOCOLS TO BE DEPLOYED ON THE ESTATE IN GENERAL, AND THE HOTEL DEVELOPMENT SITE IN PARTICULAR
9. IF ACCESS TO THE INFESTED AREAS IS NECESSARY, AND PARTICULARLY IF ANY ESSENTIAL WORK HAS TO BE CARRIED OUT WITHIN THE FENCED LOCATIONS, THEN THIS MUST ONLY BE DONE FOLLOWING FORMAL APPROVAL IN ADVANCE, AND AFTER THE PREPARATION AND AGREEMENT OF A “TASK SPECIFIC” METHOD STATEMENT. NO VIABLE PLANT MATERIAL OR RHIZOME SHOULD BE DISTURBED IN, OR REMOVED FROM, THE ZONES OF INFESTATION
10. WHEN AND IF DEVELOPMENT PROPOSALS ARE APPROVED, AND DETAILED DESIGNS FINALISED, AND WHERE THESE WILL RESULT IN ENCROACHMENT INTO I.A.P.S. INFESTED AREAS, THEN A SITE SPECIFIC SOIL REMEDIATION PROGRAMME SHOULD BE DEVELOPED AND DEPLOYED, TO PROVIDE FOR MANAGEMENT OF I.A.P.S. INFESTED SOILS, AND ENSURE THEIR BIO-SECURE DISPOSAL. THE PLAN SHOULD INCLUDE FOR THE PROVISION OF VERTICAL AND HORIZONTAL ROOT BARRIER MEMBRANES WHERE REQUIRED, AND ALL OTHER MEASURES NECESSARY TO ENSURE STRICT BIO-SECURITY COMPLIANCE ACROSS THE CONSTRUCTION STAGE OF THE PROPOSED DEVELOPMENT. SECTION 19 OF THIS DOCUMENT ALSO PROVIDES SOME GUIDANCE ON MEASURES THAT SHOULD BE DEPLOYED, TO PREVENT THE EXTERNAL INTRODUCTION OF I.A.P.S., DURING CONSTRUCTION WORKS
11. DETAILED GROUND REMEDIATION PROPOSALS SHOULD BE DEVELOPED IN THE POST PLANNING STAGE OF THE DEVELOPMENT PROCESS, IN CLOSE CO-ORDINATION WITH THE RELEVANT DESIGN TEAM CONSULTANTS AND, TO THE GREATEST EXTENT POSSIBLE, SHOULD BE CARRIED OUT AS A SEPERATE ENABLING WORKS CONTRACT IN ADVANCE OF THE COMMENCEMENT OF A PRIMARY CONSTRUCTION CONTRACT

SECTION 13 : KNOTWEEDS - PROCESS OF TREATMENT SELECTION

INVASIVE ALIEN SPECIES							
JAPANESE KNOTWEED		GIANT KNOTWEED		BOHEMIAN KNOTWEED	X	HIMALAYAN KNOTWEED	X
SELECTION OF TREATMENT							

THE MATRIX BELOW HAS BEEN DEVELOPED BY THE U.K. ENVIRONMENT AGENCY, BASED ON BEST PRACTICE AND THE APPLICATION OF "THE PRECAUTIONARY PRINCIPLE". THIS PROCESS IS INTENDED TO ARRIVE AT THE OPTIMUM JAPANESE KNOTWEED MANAGEMENT SOLUTION, WHICH POSES THE LEAST BIO-SECURITY RISK, AND WHICH MANAGES THE PLANT REMEDIATION PROCESS AS CLOSE AS PRECTICABLE TO IT'S EXISTING LOCATION



SECTION 14 : KNOTWEEDS - MANAGEMENT & REMEDIATION PLAN

TREATMENT PLAN				
TREATMENT METHODOLOGY	BASED ON THE OUTCOME OF THE ANALYSIS CARRIED OUT USING THE FLOWCHART AT SECTION 13 ABOVE, IN CONJUNCTION WITH THE CURRENT PREVAILING SITE CONDIITIONS, AND THE INTENTIONS FOR THE FURTHER COMPREHENSIVE RE-DEVELOPMENT OF PARTS OF THE LANDS IN THE SHORT TO MEDIUM TERM, THE PRINCIPLES OF THE PREFERRED MANAGEMENT SOLUTION ARE AS FOLLOWS : 1. FENCE OFF IDENTIFIED BOHEMIAN AND HIMALAYAN KNOTWEED LOCATIONS, USING SECURE FENCING, INCORPORATING APPROPRIATE ADVISORY/WARNING SIGNAGE, AND INCLUDING RECOMMENDED SAFE BUFFER ZONE – SEE APPENDIX 7 AND 8 FOR TYPICAL EXAMPLES 2. CARRY OUT ON-GOING INSPECTIONS OF THE PROPERTY ACROSS THE 2021 SUMMER GROWING PERIOD, TO VALIDATE THE RESULTS OF THE CURRENT SITE SURVEY, AND TO SCREEN THE SITE FOR ADDITIONAL INVASIVE ALIEN PLANT SPECIES WHICH MAY NOT HAVE FULLY EMERGED AT THE TIME OF THE MAY 2021 SITE INSPECTION, OR WHICH MAY HAVE BEEN DISTURBED DURING LAND MANAGEMENT ACTIVITIES, AND MAY HAVE BEEN INADVERTENTLY MOVED IN SOIL SPOIL MATERIAL TO PREVIOUSLY UNINFESTED LOCATIONS 3. UPDATE THIS I.A.P.S. ASSESSMENT REPORT & MANAGEMENT PLAN, AS NECESSARY, FOLLOWING EACH FOLLOW UP SITE SURVEY 4. INSTITUTE A MULTI-ANNUAL HERBICIDE TREATMENT PROGRAMME IN EARLY SUMMER 2021, TO COMMENCE THE MANAGEMENT OF KNOTWEED STANDS BK 1, BK 2, HK 1 AND HK2 5. FOR THE KNOTWEED LOCATIONS, WHEN THE DEVELOPMENT PROGRAMME BECOMES CLEAR, AN UPDATED MANAGEMENT PLAN SHOULD BE PREPARED TO PHASE OUT THE HERBICIDE TREATMENT PROCESS, AND TO REPLACE IT WITH THE PHYSICAL REMEDIATION OF INFESTED SOILS. THE PRECISE DETAILS AND TIMING OF THIS PLAN IS TO BE BASED ON UP TO DATE SURVEY INFORMATION AND DEVELOPED IN PARALLEL TO THE FINALISATION OF DETAILED PROJECT DESIGN. 6. THE CURRENT PREFERRED LONG TERM REMEDIATION SOLUTION WOULD BE FOR THE CONTROLLED REMOVAL OF INFESTED SOILS, FOR OFF-SITE DISPOSAL TO A SUITABLE LICENCED WASTE FACILITY, IN CONJUNCTION WITH THE USE OF VERTICAL ROOT BARRIER MEMBRANES INSTALLED TO PROTECT ANY RETAINED UNDERGROUND WALLS AND STRUCTURES THAT COULD CONTAIN VIABLE KNOTWEED RHIZOME MATERIAL.			
MANAGEMENT ELEMENTS	INITIAL / MULTI-ANNUAL HERBICIDE CONTROL	X	ON-SITE BELOW GROUND SOIL CONTAINMENT CELL	
	DEEP BURIAL – GREATER THAN 5m		EXCAVATE AND DISPOSE OFF-SITE	X
	EXCAVATE AND TREAT IN ON-SITE TEMPORARY BUND		CERTIFIED ROOT BARRIER MEMBRANE SYSTEMS	X
HERBICIDE TREATMENT TECHNIQUE	FOLLIAR SPRAY		STEM INJECTION	X
	CUT AND STEM FILL		SPOT SPRAY / LEAF WIPE / SWAB	X
	STEM INJECTION TO CONSIST OF A 2ml DOSE OF UNDILUTED ROUNDUP BIACTIVE XL, OR ALTERNATIVE LICENCED GLYPHOSATE BASED AND AQUATIC APPROVED HERBICIDE, APPLIED FULLY IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS. INJECTION TO BE APPLIED TO ALL SUITABLE HEALTHY KNOTWEED STEMS, AS CLOSE AS POSSIBLE TO THE BASE OF EACH HOLLOW STEM, USING A PROPRIETARY CALLIBRATED INJECTION UNIT AND NARROW GUAGE NEEDLE, WITH HERBICIDE SUPPLIED VIA A PRE-FILLED DISPENSING UNIT. ON-SITE HANDLING OF HERBICIDE TO BE AVOIDED **SPOT SPRAY** TO CONSIST OF A TARGETED DOSE OF ROUNDUP BIACTIVE XL IN SOLUTION, AT A DILUTION RATE OF 1:40, OR ALTERNATIVE GLYPHOSATE BASED AND AQUATIC APPROVED HERBICIDE, APPLIED FULLY IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS. SPRAY TO BE APPLIED ONLY TO SUITABLE HEALTHY KNOTWEED LEAVES, AND APPLIED USING A PROPRIETRY SPRAY UNIT FITTED WITH AN ANTI DRIFT SHIELD. SPRAY ONLY TO BE APPLIED UNDER SUITABLE PREVAILING WEATHER CONDITIONS AND APPLIED AT A RATE AND PRESSURE WHICH MINIMISES RUN OFF FROM THE KNOTWEED LEAVES. SITE HANDLING AND MIXING OF HERBICIDE TO BE AVOIDED TO THE GREATEST EXTENT POSSIBLE			
ADDITIONAL WORKS	CUT AND BAG PLANT MATERIAL		SHRED & DISPOSE OF VIABLE PLANT MATERIAL	
HERBICIDE TYPE	APPROVED FOR USE WITH KNOTWEEDS	X	APPROVED FOR USE IN AQUATIC ENVIRONMENTS	X
BIO-SECURITY MEASURES	FENCE OFF INFESTATIONS AND FIT WARNING SIGNS	X	SET 5 – 7m SAFETY ZONE AROUND INFESTATIONS	X
	ADVISE AFFECTED PARTIES / NOTIFY NEIGHBOURS		BRIEF WORKERS AND VISITORS TO PROPERTY	X
	IF MORE THAN 1 PARTY, AGREE WORKS IN ADVANCE		ONGOING MONITORING AND RECORDING	X

SECTION 15 : THREE CORNERED GARLIC & SPANISH BLUEBELL – MANAGEMENT PLAN

TREATMENT PLAN				
TREATMENT METHODOLOGY	THE PREFERRED SOLUTION FOR MANAGING THREE CORNERED GARLIC & SPANISH BLUEBELL IS : 1. FIT FENCING AND/OR APPROPRIATE SIGNAGE AT THE IDENTIFIED THREE CORNERED GARLIC AND SPANISH BLUEBELL LOCATIONS – SEE APPENDIX 7 AND 8 FOR TYPICAL EXAMPLES 7. CARRY OUT ON-GOING INSPECTIONS ACROSS THE 2021 SUMMER GROWING PERIOD, TO VALIDATE THE RESULTS OF THE CURRENT SITE SURVEY, AND TO SCREEN THE SITE FOR ADDITIONAL INVASIVE ALIEN PLANT SPECIES WHICH MAY NOT HAVE FULLY PRESENTED AT THE TIME OF THE MAY 2021 SITE INSPECTION, OR WHICH MAY HAVE BEEN DISTURBED DURING LAND MANAGEMENT ACTIVITIES, AND MAY HAVE BEEN INADVERTENTLY MOVED IN SOIL SPOIL MATERIAL TO PREVIOUSLY UNINFESTED LOCATIONS 2. UPDATE THIS I.A.P.S. ASSESSMENT REPORT & MANAGEMENT PLAN, AS NECESSARY, FOLLOWING EACH SITE SURVEY 3. INSTITUTE A MULTI-ANNUAL HERBICIDE TREATMENT PROGRAMME, COMMENCING IN SUMMER 2021, CONSISTING OF TWO TREATMENT VISITS PER YEAR, ALL TO BE CARRIED OUT IN ADVANCE OF THE FLOWERING OF PLANTS 4. FOR PART OR ALL OF ANY OF THE THREE CORNERED GARLIC AND SPANISH BLUEBELL SITES THAT COULD BE DISTURBED BY ELEMENTS OF ANY PROPOSED DEVELOPMENT, WHEN THE DEVELOPMENT PROGRAMME BECOMES CLEAR, AND WHERE ERADICATION HAS NOT BEEN VALIDATED, A DETAILED MANAGEMENT PLAN SHOULD BE PREPARED TO PHASE OUT THE HERBICIDE TREATMENT PROCESS, AND TO REPLACE IT WITH THE PHYSICAL REMEDIATION OF INFESTED SOILS			
MANAGEMENT ELEMENTS	MULTI ANNUAL HERBICIDE CONTROL PROGRAMME	X	ON-SITE BELOW GROUND SOIL CONTAINMENT CELL	
	DEEP BURIAL – GREATER THAN 5m		EXCAVATE AND DISPOSE OFF-SITE	X
	EXCAVATE AND TREAT IN ON-SITE TEMPORARY BUND		CERTIFIED ROOT BARRIER MEMBRANE SYSTEMS	
HERBICIDE TREATMENT TECHNIQUE	FOLLIAR SPRAY		STEM INJECTION	
	CUT AND STEM FILL		SPOT SPRAY / LEAF WIPE / SWAB	X
	SPOT SPRAY TO CONSIST OF A TARGETED DOSE OF ROUNDUP BIACTIVE XL IN SOLUTION, AT A DILUTION RATE OF 1:40, OR EQUIVALENT GLYPHOSATE BASED AND AQUATIC APPROVED HERBICIDE, APPLIED FULLY IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS. HERBICIDE TO BE APPLIED USING A PROPRIETRY UNIT FITTED WITH AN ANTI DRIFT SHIELD, AND THEN ONLY UNDER SUITABLE WEATHER CONDITIONS. THE RATE AND PRESSURE OF THE SPRAY MUST MINIMISE THE RUN-OFF FROM TARGET PLANT LEAVES.			
ADDITIONAL WORKS	CUT AND BAG PLANT MATERIAL		SHRED & DISPOSE OF VIABLE PLANT MATERIAL	
HERBICIDE	APPROVED FOR 3 CORNERED GARLIC/SPANISH BLUEBELL	X	APPROVED FOR USE IN AQUATIC ENVIRONMENTS	X
BIO-SECURITY MEASURES	FENCE OFF INFESTATIONS AND FIT WARNING SIGNS	X	SET SAFETY ZONE AROUND INFESTATIONS	X
	MONITOR AND RECORD	X	BRIEF WORKERS AND VISITORS TO PROPERTY	X

SECTION 16 : RHODODENDRON – MANAGEMENT PLAN

TREATMENT PLAN				
TREATMENT METHODOLOGY	THE PREFERRED SOLUTION FOR MANAGING RHODODENDRON IS : 1. FENCE OFF THE IDENTIFIED RHODODENDRON LOCATIONS USING SECURE FENCING AND APPROPRIATE SIGNAGE 2. CARRY OUT ON-GOING INSPECTIONS ACROSS THE 2021 SUMMER GROWING PERIODS, TO SCREEN THE SITE FOR ADDITIONAL RHODODENDRON SEEDLINGS, AND UPDATE THIS I.A.P.S. ASSESSMENT REPORT & MANAGEMENT PLAN ACCORDINGLY 3. INSTITUTE A MULTI-ANNUAL PHYSICAL & HERBICIDE TREATMENT PROGRAMME, COMMENCING IN SUMMER 2021, CONSISTING OF THE CUTTING AND IN-SITU CHIPPING OF THE ABOVE GROUND RHODODENDRON PLANT MATERIAL, AND THE DIGGING OUT OF THE PLANTS' ROOT SYSTEM TO THE GREATEST EXTENT POSSIBLE. IF THE ROOT, OR PART OF IT, HAS TO REMAIN IN THE GROUND THEN THE RESIDUAL PLANT STUMP SHOULD BE SWAB TREATED WITH APPROVED HERBICIDE. WORKS TO BE CARRIED OUT IN ADVANCE OF THE PLANT FLOWERING PERIOD WHEREVER POSSIBLE 4. CONTINUE THE TREATMENT METHODOLOGY IN THE FOLLOWING YEARS AS REQUIRED, INCLUDING THE PULLING OF ALL NEW SEEDLINGS THAT PRESENT THEMSELVES, UNTIL THE REPOSITORY OF VIABLE SEEDS HAS BEEN EXHAUSTED			
MANAGEMENT ELEMENTS	PHYSICAL & HERBICIDE CONTROL PROGRAMME	X	ON-SITE BELOW GROUND SOIL CONTAINMENT CELL	
	DEEP BURIAL – GREATER THAN 5m		EXCAVATE AND DISPOSE OFF-SITE	
HERBICIDE TECHNIQUE	FOLLIAR SPRAY		STEM INJECTION	
	CUT AND STEM FILL		SPOT SPRAY / LEAF WIPE / SWAB	X
HERBICIDE	APPROVED FOR RHODODENDRON	X	APPROVED FOR USE IN AQUATIC ENVIRONMENTS	X
BIO-SECURITY MEASURES	FENCE OFF INFESTATIONS AND FIT WARNING SIGNS	X	SET SAFETY ZONE AROUND INFESTATIONS	X
	MONITOR AND RECORD	X	BRIEF WORKERS AND VISITORS TO PROPERTY	X

SECTION 17 : AMERICAN SKUNK CABBAGE – MANAGEMENT PLAN

TREATMENT PLAN				
TREATMENT METHODOLOGY	THE PREFERRED SOLUTION FOR MANAGING AMERICAN SKUNK CABBAGE IS : 1. FENCE OFF THE IDENTIFIED AMERICAN SKUNK CABBAGE LOCATIONS USING SECURE FENCING AND APPROPRIATE SIGNAGE 2. CARRY OUT ON-GOING INSPECTIONS ACROSS THE 2021 SUMMER GROWING PERIODS, TO SCREEN THE SITE FOR ADDITIONAL EMERGING AMERICAN SKUNK CABBAGE PLANTS, AND UPDATE THIS I.A.P.S. ASSESSMENT REPORT & MANAGEMENT PLAN ACCORDINGLY 3. INSTITUTE A MULTI-ANNUAL PHYSICAL CONTROL PROGRAMME, COMMENCING IN SUMMER 2021, CONSISTING OF DIGGING OUT OF THE PLANT AND ASSOCIATED ROOT SYSTEM, AND DOUBLE BAGGING ALL EVIDENT PLANT GROWTH. PLANT MATERIAL TO BE LEFT ON SITE IN A SEALED HOLDING UNIT, LOCATED IN A SAFE AND CLEARLY DESIGNATED LOCATION, TO ROT DOWN NATURALLY. REMOVAL TO BE IN ADVANCE OF THE FLOWERING AND SEEDING OF PLANTS 4. CONTINUE THE TREATMENT METHODOLOGY IN THE FOLLOWING YEARS, UNTIL THE SEED REPOSITORY IS EXHAUSTED			
MANAGEMENT ELEMENTS	PHYSICAL CONTROL PROGRAMME	X	ON-SITE BELOW GROUND SOIL CONTAINMENT CELL	
	DEEP BURIAL – GREATER THAN 5m		EXCAVATE AND DISPOSE OFF-SITE	
HERBICIDE TECHNIQUE	FOLLIAR SPRAY		STEM INJECTION	
	CUT AND STEM FILL		SPOT SPRAY / LEAF WIPE / SWAB	
HERBICIDE	APPROVED FOR AMERICAN SKUNK CABBAGE		APPROVED FOR USE IN AQUATIC ENVIRONMENTS	
BIO-SECURITY MEASURES	FENCE OFF INFESTATIONS AND FIT WARNING SIGNS	X	SET SAFETY ZONE AROUND INFESTATIONS	X
	MONITOR AND RECORD	X	BRIEF WORKERS AND VISITORS TO PROPERTY	X

SECTION 18 : TREATMENT PROGRAMME

PROGRAMME	
STAGE 1 SPRING/SUMMER 2021	• DEPLOY BIOSECURITY MEASURES, COMPRISING SECURE FENCING AND ADVISORY / WARNING SIGNAGE • CARRY OUT FOLLOW UP SITE SURVEYS, TO INSPECT FOR NEW, EMERGING AND SPREADING I.A.P.S. • UPDATE ASSESSMENT REPORT AND MANAGEMENT PLAN, BASED ON OUTCOME OF SURVEYS
STAGE 2 SUMMER 2021	• CARRY OUT THE FIRST HERBICIDE TREATMENT AT KNOTWEED STANDS , CONSISTING OF STEM INJECTION AND SPOT SPRAYING, AS REQUIRED • CARRY OUT TWO HERBICIDE TREATMENTS AT THREE CORNERED GARLIC AND SPANISH BLUEBELL STANDS , CONSISTING OF SPOT SPRAYING,AS REQUIRED • CARRY OUT PHYSICAL AND HERBICIDE CONTROL TREATMENTS AT RHODODENDRON STANDS, CONSISTING OF THE CUTTING AND IN-SITU CHIPPING OF THE ABOVE GROUND RHODODENDRON PLANT MATERIAL, AND THE DIGGING OUT OF THE PLANTS ROOT SYSTEM. SWAB THE FRESH CUT STUMP OF ANY RESIDUAL PLANT MATERIAL WITH APPROVED HERBICIDE, APPLIED STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS DIRECTIONS. INSPECT FOR, AND PULL, ANY EMERGING RHODODENDRON SEEDLINGS • CARRY OUT PHYSICAL CONTROL TREATMENTS AT THE AMERICAN SKUNK CABBAGE STAND, CONSISTING OF DIGGING OUT AND DOUBLE BAGGING OF PLANT MATERIAL, AND ITS PLACEMENT IN A SECURE BULK CONTAINER, LOCATED IN A SAFE AND CLEARLY DESIGNATED LOCATION, AND LEFT TO ROT DOWN ON SITE • INSPECT FENCING AND SIGNAGE. CARRY OUR ANY NECESSARY REPAIRS / REPLACEMENT / RE-CONFIGURATION • CARRY OUT FOLLOW UP SITE SURVEYS, TO INSPECT FOR NEW, EMERGING AND SPREADING I.A.P.S. • UPDATE ASSESSMENT REPORT AND MANAGEMENT PLAN, BASED ON OUTCOME OF SURVEYS • IF PLANNING PERMISSION IS GRANTED AND DEVELOPMENT OF THE LANDS IS SCHEDULED, IN ADVANCE OF FULL ERADICATION HAVING BEEN ACHIEVED, PREPARE AND IMPLEMENT A CONSTRUCTION STAGE INVASIVE ALIEN PLANT SPECIES REMEDIATION PLAN, TO FULLY REMEDIATE THE INFESTED SOILS AT THE AFFECTED I.A.P.S. LOCATIONS, IN ADVANCE OF THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES
STAGE 3 SUMMER/AUTUMN 2021	• RECORD RESULTS OF SUMMER HERBICIDE TREATMENTS AND PHYSICAL CONTROL MEASURES • CARRY OUT THE SECOND HERBICIDE TREATMENT AT KNOTWEED STANDS , CONSISTING OF STEM INJECTION AND SPOT SPRAYING, AS REQUIRED • INSPECT FENCING AND SIGNAGE. CARRY OUR ANY NECESSARY REPAIRS / REPLACEMENT / RE-CONFIGURATION • CARRY OUT FOLLOW UP SITE SURVEYS, TO INSPECT FOR NEW, EMERGING AND SPREADING I.A.P.S. • UPDATE ASSESSMENT REPORT AND MANAGEMENT PLAN, BASED ON OUTCOME OF SURVEYS
STAGE 4 SPRING 2022 ONWARDS	• CONTINUE IMPLEMENTATION OF THE MULTI-ANNUAL HERBICIDE TREATMENT PROGRAMME AND PHYSICAL CONTROL MEASURES, WITH SUFFICIENT TREATMENT, CONTROL AND INSPECTION VISITS, SCHEDULED TO SUIT THE EVOLVING SITE CONDITIONS AND PARTICULAR I.A.P.S. GROWTH CYCLES, AND AS NECESSARY TO ACHIEVE AND VALIDATE FULL ERADICATION OF ALL I.A.P.S. STANDS

SECTION 19 : I.A.P.S. – ADDITIONAL CONSTRUCTION STAGE I.A.P.S. MANAGEMENT MEASURES

REMEDIATION PLAN	
OVERVIEW	NOTWITHSTANDING THE FACT THAT THE I.A.P.S. PRESENT ON THE PROPERTY MAY BE EITHER ERADICATED OR REMEDIATED BY THE TIME CONSTRUCTION ACTIVITIES ARE SCHEDULED TO COMMENCE, THERE IS ALWAYS A RISK TO PROPERTIES FROM THE INTRODUCTION OF I.A.P.S. FROM THE OUTSIDE. THE PRIMARY PATHS OF INTRODUCTION ARE VIA : 1. PHYSICAL SPREAD OF I.A.P.S. PLANTS FROM ADJACENT / ADJOINING LANDS 2. AIRBORNE DISPERSAL OF SEEDS OR OTHER VIABLE I.A.P.S. MATERIAL 3. IMPORTED SOILS AND OTHER FILL/LANDSCAPING MATERIALS CONTAINING VIABLE SEED OR OTHER I.A.P.S. MATERIAL 4. SOIL ON MACHINERY AND VEHICLES CONTAMINATED WITH VIABLE SEEDS OR OTHER I.A.P.S. MATERIAL 5. TOOLS AND FOOTWEAR CONTAINING VIABLE SEED OR OTHER I.A.P.S. MATERIAL CONSTRUCTION WORKS, BY THEIR NATURE, POSE A HEIGHTENED RISK OF THE INTRODUCTION OF I.A.P.S. ONTO DEVELOPMENT SITES, PARTICULARLY VIA ITEMS 3. – 5. ABOVE. THEREFORE IT IS ADVISED THAT ALL CONTRACTORS, AND SUB-CUNTRACTORS, SHOULD EMPLOY I.A.P.S. MANAGEMENT PROCEDURES AS AN INTEGRAL PART OF THEIR CONSTRUCTION ACTIVITIES, INCLUDING DEVELOPMENT ON THIS PROPERTY FOR INFORMATION PURPOSES, THE SCHEMATIC OF THE DEVELOPMENT PROPOSAL IS INCLUDED BELOW
PRIMARY MANAGEMENT MEASURES	THE CONTRACTOR SHOULD CONSIDER PREPARING A PROJECT SPECIFIC I.A.P.S. STANDARD OPERATING PROCEDURE DOCUMENT, IN ADVANCE OF WORK COMMENCEMENT. THE DOCUMENT SHOULD BE PREPARED BY AN I.A.P.S. SPECIALIST, AND SHOULD COVER THE BIO-SECURITY MEASURES TO BE TAKEN, INCLUDING THE MAINTENANCE OF RECORDS, TO SCREEN FOR THE INTRODUCTION OF I.A.P.S. AND TO ENABLE THEIR TRACING, IF SUCH AN INTRODUCTION OCCURS, INCLUDING : • VALIDATION THAT ALL MACHINERY / VEHICLES ARE FREE OF I.A.P.S., PRIOR TO THEIR FIRST INTRODUCTION TO SITE • CERTIFICATION FROM THE SUPPLIERS THAT ALL IMPORTED SOILS AND OTHER FILL/LANDSCAPING MATERIALS ARE FREE OF I.A.P.S. • A REGULAR SCHEDULE OF SITE INSPECTIONS ACROSS THE I.A.P.S. GROWING SEASONS, FOR THE DURATION OF THE CONSTRUCTION WORKS PROGRAMME

RESIDENTIAL DEVELOPMENT LANDS
LACKENROE
GLOUNTHAUNE
CO. CORK

APPENDIX 1
Bohemian Knotweed I.D. Sheet

KYRAN COLGAN
Director

16 SEPTEMBER 2021

invasiveplantsolutions
INVASIVE PLANT SOLUTIONS LIMITED
The Stationhouse
Station Road
Dundrum
Co. Tipperary
E34 EK83

T : 086–2621443 / 062–71589
W : www.knotweed.ie
E : info@knotweed.ie

Inland Fisheries Ireland : Bohemian Knotweed I.D. Sheet

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APPENDIX 2
Himalayan Knotweed I.D. Sheet

Inland Fisheries Ireland : Himalayan Knotweed I.D. Sheet

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APPENDIX 3
Three Cornered Garlic I.D. Sheet

NNSS
GB non-native species secretariat

www.nonnativespecies.org

Produced by Alison Jukes, Max Wade, Vicky Ames and Kelly McKee of RPS

Non-Native Garlics

Species Description

Scientific names: *Allium* species
AKA: Gerllyg (Welsh)
Native to: Mediterranean, Caucasus and Iran
Habitat: Roadsides, hedge banks, riverbanks, field margins, rough and waste ground and in woodland

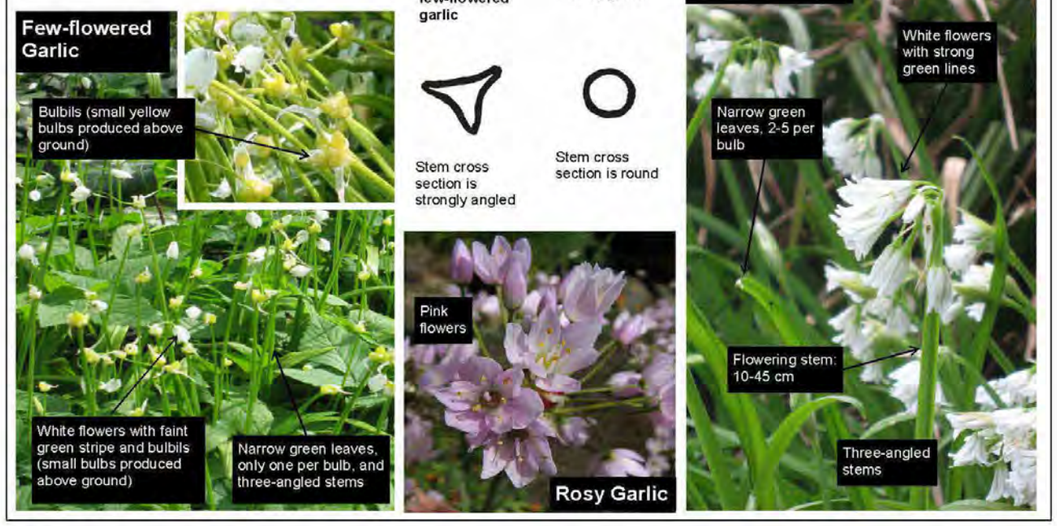
Garlics are perennial herbs with bulbs and grass-like leaves, usually smelling of garlic when fresh and crushed. The most widespread invasive garlics in the UK are Three-cornered Garlic *Allium triquetrum* and Few-flowered Garlic *Allium paradoxum*. Other invasive species include Rosy Garlic *Allium roseum* and Keeled Garlic *Allium carinatum*.

The seeds of Three-cornered Garlic are spread naturally by ants. It was established initially in Guernsey in 1849 and is now naturalised and increasingly abundant and widespread in milder areas of the UK, especially in the south and west, with scattered, sometimes short-lived, populations elsewhere.

Few-flowered Garlic spreads by means of bulbils (small bulbs produced above ground). It was first recorded in the wild near Edinburgh in 1863 and can be very invasive in disturbed habitats. It is increasingly abundant throughout its range, especially in southern Scotland and is most common in the east of Britain.

Rosy Garlic was first recorded in the wild in 1837 and is spreading, especially in south-west England. Keeled Garlic has been naturalised since at least 1806, but there is little evidence of a significant increase in range over the last 50 years.

Key ID Features



Identification throughout the year

Three-cornered garlic flowers April to June.

Few-flowered garlic flowers April to May.

Rosy garlic flowers May to June.

Keeled garlic flowers in August.

Leaves are not present over winter as these species die back in cold winters and come up from bulbs in the spring.

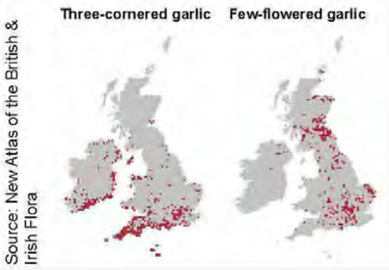
Distribution

Three-cornered garlic is widespread in milder areas, especially the south-west, and has increased in numbers and range.

Few-flowered garlic has a mainly eastern distribution and is increasing throughout its range.

Rosy garlic is scattered in the south and west and is spreading.

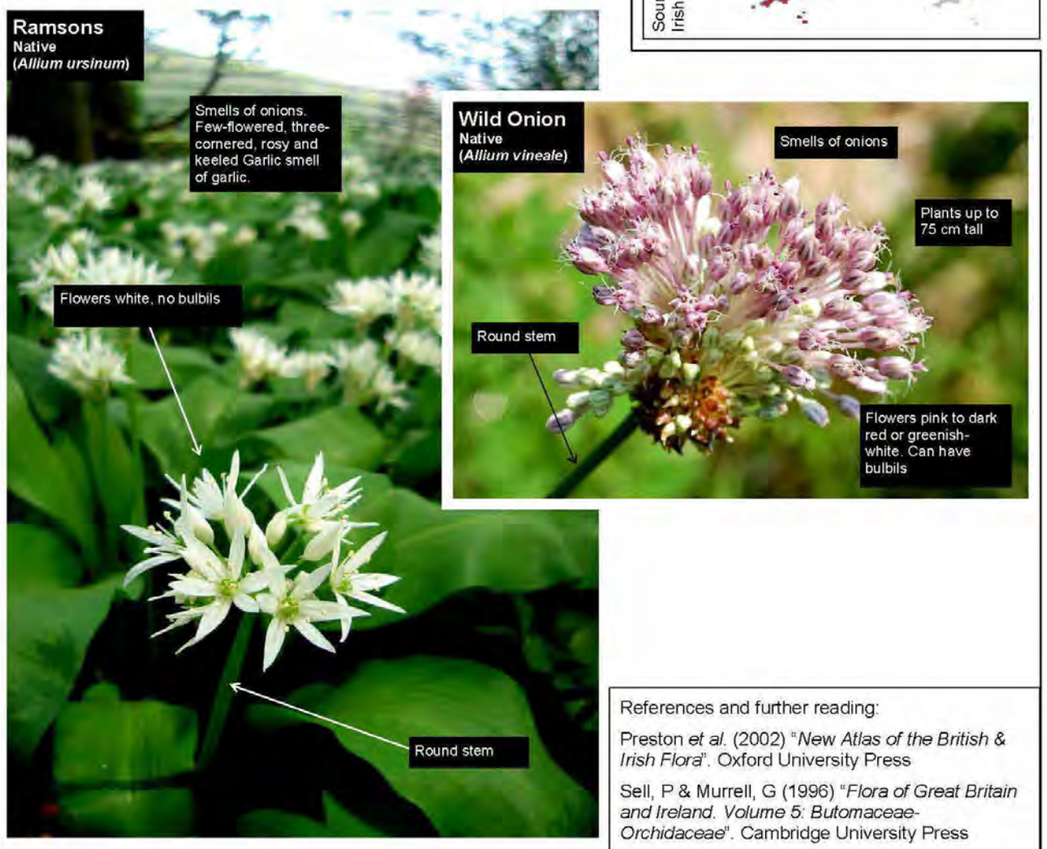
Keeled garlic is scattered throughout the lowlands but does not seem to be increasing.



Source: New Atlas of the British & Irish Flora

Similar Species

There are a number of native onion and garlic species in the UK with ramsons and wild onion being the most common. There are many species with leaves which are similar to the non-native garlics but the onion/garlic smell is distinctive.



References and further reading:

Preston *et al.* (2002) "*New Atlas of the British & Irish Flora*". Oxford University Press

Sell, P & Murrell, G (1996) "*Flora of Great Britain and Ireland. Volume 5: Butomaceae-Orchidaceae*". Cambridge University Press

Stace, C (1997) "*New Flora of the British Isles*". Cambridge University Press

Photos from: Becky Dewdney-York, Nhu Nguyen, William Vann, Max Wade

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APPENDIX 4
Spanish Bluebell I.D. Sheet

WIKIPEDIA

Hyacinthoides hispanica

Hyacinthoides hispanica (syn. *Endymion hispanicus* or *Scilla hispanica*), the **Spanish bluebell**, is a spring-flowering bulbous perennial native to the Iberian Peninsula. It is one of around 11 species in the genus *Hyacinthoides*, others including the common bluebell (*Hyacinthoides non-scripta*) in northwestern Europe, and the Italian bluebell (*Hyacinthoides italica*) further east in the Mediterranean region.[1]

It is distinguished from the common bluebell by its paler and larger blue flowers, which are less pendulous and not all drooping to one side like the common bluebell; plus a more erect flower stem (raceme), broader leaves, blue anthers (where the common bluebell has creamy-white ones) and little or no scent compared to the strong fragrant scent of the northern species. Like *Hyacinthoides non-scripta*, both pink- and white-flowered forms occur.

The Spanish bluebell was introduced in the United Kingdom. Since then, it has hybridised frequently with the native common bluebell and the resulting hybrids are regarded as invasive. The resulting hybrid *Hyacinthoides* × *massartiana* and the Spanish bluebell both produce highly fertile seed but it is generally the hybrid that invades areas of the native common bluebell. This has caused the common bluebell to be viewed as a threatened species.

The Spanish bluebell is also cultivated as a garden plant, and several named cultivars exist with flowers in various shades of white, pink and blue.

Hyacinthoides hispanica

Scientific classification	
Kingdom:	Plantae
Clade:	Angiosperms
Clade:	Monocots
Order:	Asparagales
Family:	Asparagaceae
Subfamily:	Scilloideae
Genus:	*Hyacinthoides*
Species:	***H. hispanica***

Binomial name
Hyacinthoides hispanica
(Mill.) Chouard *ex* Rothm.

References

1. *World Checklist of Selected Plant Families* (http://apps.kew.org/wcsp/home.do). The Board of Trustees of the Royal Botanic Gardens, Kew. retrieved 2011-07-05, search for "Hyacinthoides"

General

- The-Tree.org: Bluebell (https://web.archive.org/web/20060427035443/http://www.the-tree.org.uk/EnchantedForest/WoodlandFlowers/bluebell.htm) (includes key to identification of hybrids)
- Huxley, A. (1992). *New RHS Dictionary of Gardening* vol. 2: 604. Macmillan.

External links

- Media related to *Hyacinthoides hispanica* at Wikimedia Commons

Wikipedia – Spanish Bluebell information page

Native bluebells *(Hyacinthoides non-scripta)*

- Distinctive 'droop' like the top of a shepherd's crook
- Sweet, cool perfume
- Narrow bell-shaped flowers with rolled back tips
- Creamy white pollen

If your bluebells have all of these characteristics then they're native bluebells.

Spanish bluebells (*Hyacinthoides hispanica)* and hybrids

- Upright stems
- No scent
- Conical bell-shaped flowers with open tips
- Blue pollen

If the bluebells you see have some or all of these characteristics then they're not a pure native bluebell.

Berkshire Buckinghamshire & Oxfordshire Wildlife Trusts – Spanish Bluebell identification

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APPENDIX 5
Rhododendron I.D. Sheet

NNSS
GB non-native species secretariat

www.nonnativespecies.org

Produced by Olaf Booy, Max Wade and Vicky White of RPS

Rhododendron

Species Description

Scientific name: *Rhododendron ponticum*
AKA: Rhododendron
Native to: South-west Europe and south-west Asia. UK's stock is believed to come from Spain.
Habitat: Common on acid, peaty or sandy soils in woodland, heathland, rocky hill-sides, river banks, gardens and parks

A large evergreen shrub with leathery leaves, attractive purple to pink flowers and solid stems forming into a trunk when mature. Relatively easy to identify, but can be confused with cherry laurel or horticultural varieties of rhododendron. However, horticultural varieties of rhododendron are relatively rarely found in the wild. Spreads by suckers and seed, which are small and carried long distances by wind.

Introduced by gardeners in the late 18th century into parks and woodlands, where it was also used for game cover. Still widely planted, particularly by gardeners. Often grows in ecologically sensitive habitats, such as heath, broad-leaved woodland and dunes, where dense growth can considerably alter the structure of the habitat.

For details of legislation go to www.nonnativespecies.org/legislation.

Key ID Features

Identification throughout the year

Varies little throughout the year as leaves are evergreen and woody stems remain the same. Flowers appear May to June followed by seed pods.

Distribution

Widespread across the whole of the UK, most common in the south and west.

Source: NBN Gateway. Check website for current distribution

Similar Species

Cherry laurel
Non-native
(*Prunus laurocerasus*)

***Rhododendron* leaf (for comparison)**

Cherry laurel leaf

Varieties of Rhododendron

There are a large number of highly sought after species and varieties of rhododendron, of which the invasive *Rhododendron ponticum* is just one. It is unusual to encounter other varieties or species outside of planted habitats.

References in the further reading list can be used to distinguish between the different varieties if necessary.

Examples of rhododendron varieties:

References and further reading:

Cullen, J (2005) *"Hardy rhododendron species: a guide to identification"*. Collins

Preston, C D and Croft, J M (1997) *"Aquatic plants in Britain and Ireland"*. Harley Books

Preston, C D, Pearman, D A and Dines, T A (editors) (2002) *"New Atlas of the British and Irish Flora"*. Oxford University Press

Stace, C (1999) *"Field Flora of the British Isles"*. Cambridge University Press

Photos from: Olaf Booy, David Fenwick, Mike McCabe, Helen Parish

RESIDENTIAL DEVELOPMENT LANDS
LACKENROE
GLOUNTHAUNE
CO. CORK

APPENDIX 6
American Skunk Cabbage I.D. Sheet

NNSS
GB non-native species secretariat

www.nonnativespecies.org

Produced by Peter Brown, Olaf Booy and Mark Hill

American Skunk-cabbage

Species Description

Scientific name: *Lysichiton americanus*
AKA: Western Skunk-cabbage
Native to: Western North America
Habitat: Wet woodland, streamsides, muddy pond margins

Yellow flowers are produced in spring (late March to May) that resemble those of wild arum (lords-and-ladies). They emit a strong odour like that of a skunk. The plant has a basal rosette of stemmed leathery leaves, usually up to about 70cm long. It is a tall herb growing up to 1.5m in height. Green berries are produced in the summer.

American skunk-cabbage needs a wet site but has no specific soil requirements - it can occur in soils from light sand to heavy clay that are acid, neutral or alkaline. It is a hardy perennial lowland plant, but can grow at altitudes of up to 1400m.

Seeds may be dispersed via waterways but also probably by birds and mammals, as occurs in the native range.

American skunk-cabbage is able to form dense stands and may negatively impact on some native plants, out-competing them by shadowing.

Key ID Features

1 or 2 (sometimes up to 4) bright yellow spathes (look like large petals)

Leaves 40-70cm long (sometimes up to 1.5m)

Identification throughout the year

Most easily identified when in flower (late March to May). When not in flower large cabbage-like leaves, often on swamp mud, may be used for identification.

Distribution

Widespread but not generally common. Its normal habitat is wet woodland.

Source: NBN Gateway. Check website for current distribution

Similar Species

Asian Skunk-cabbage
Non-native
(*Lysichiton camtschatcensis*)

White spathe

Very similar plant but slightly smaller. Occurs in similar habitats. Hybrids between American and Asian skunk-cabbages can occur.

Flowers more or less scentless

Lords-and-ladies
Native
(*Arum maculatum*)

References and further reading:

Blamey, M, Fitter, R and Fitter, A (2003) *"The Wild Flowers of Britain and Ireland. The Complete Guide to the British and Irish Flora"* A & C Black, London

Preston, C D, Pearman, D A and Dines, T A (editors) (2002) *"New Atlas of the British and Irish Flora"*. Oxford University Press

Stace, C (1999) *"Field Flora of the British Isles"*. Cambridge University Press

Photos from: Sannse, RPS and GBNNSS

U.K. Non Native Species Secretariat : American Skunk Cabbage I.D. Sheet - Page 2

RESIDENTIAL DEVELOPMENT LANDS
LACKENROE
GLOUNTHAUNE
CO. CORK

APPENDIX 7
Sample Site Signage

SAMPLE SIGN 1

SAMPLE SIGN 2

SAMPLE SIGN 3

SAMPLE SIGN 4

SAMPLE SIGN 5

RESIDENTIAL DEVELOPMENT LANDS
LACKENROE
GLOUNTHAUNE
CO. CORK

APPENDIX 8
Sample Site Fencing

SAMPLE FENCING 1 – POST AND WOVEN MESH FENCING

SAMPLE FENCING 2 – HEAVY DUTY HERRAS FENCING

aecom.com

aecom.com

LACKENROE **SHD**

APPENDIX 2-4

Proposed Site Layout – Deady Gahan Architects

VOLUME III | Appendices

DO NOT SCALE. WORK TO FIGURED DIMENSIONS ONLY.
ALL EXISTING DIMENSIONS TO BE CHECKED ON SITE.
DRAWN ON AUTOCAD R2004 AT DEADY GAHAN ARCHITECTS LTD
LAYERS ON THIS DRAWING COMPLY WITH BS 1192: PART 5

LOCATION OF SITE NOTICE

LOCATION OF SITE NOTICE

EMERGENCY VEHICLE ACCESS

Refer to accompanying plans prepared by AECOM for details of proposed emergency vehicle access

EMERGENCY ACCESS TO BE PROVIDED - FLEXIBLE BOLLARDS AND GRASSCRETE TO BE PROVIDED TO FACILITATE TURNING MOVEMENT

AREA REQUIRED TO ALLOW REFUSE VEHICLE TO TURN - GRASSCRETE TO BE PROVIDED TO FACILITATE TURNING MOVEMENT

Lands outlined in blue excluded from the application/red line boundary as a pedestrian connection in this location would lack passive surveillance and would be unsupervised

Developable area shown in orange (8.7Ha)

Refer to accompanying plans prepared by Cunnane Stratton Reynolds for details of all external boundary treatments

The sloped undevelopable area to the rear of units 09-22 has been omitted from the density calculation and the private amenity space allocation for these units

Upper floor windows on western elevation fitted with frosted/opaque glass to prevent overlooking of adjacent property

Refer to accompanying plans prepared by Cunnane Stratton Reynolds for details of all external boundary treatments

Dashed magenta line denotes the existing overhead power lines that are to be diverted underground

Refer to accompanying plans prepared by Cunnane Stratton Reynolds for details of all amenity areas/public open spaces

SITE ENTRANCE

No first floor windows on western elevation to prevent overlooking of adjacent property

Developable area shown in orange (8.7Ha)

Refer to accompanying plans prepared by Cunnane Stratton Reynolds for details of all amenity areas/public open spaces

Upper floor windows on western elevation fitted with frosted/opaque glass to prevent overlooking of adjacent property

Play area (230m²)

MUGA (Multi-Use Games Area)

LOCAL PLAY AREA

Developable area shown in orange (8.7Ha)

Refer to accompanying plans prepared by Cunnane Stratton Reynolds for details of all external boundary treatments

No first floor windows on western elevation to prevent overlooking of adjacent property

Upper floor windows on western elevation fitted with frosted/opaque glass to prevent overlooking of adjacent property

Refer to accompanying plans prepared by Cunnane Stratton Reynolds for details of all amenity areas/public open spaces

Note
- Please refer to landscape proposal for public realm,open space & external boundaries information
- Please refer to boundary treatment drawing (Dwg - 20151/P/007) for all internal boundary treatments

- Character Area 1 (natural stone + off-white render)
- Character Area 2 (beige brick + beige render)
- Character Area 3 (red brick + off-white render)
- Character Area 4 (natural stone, beige brick + off-white/ beige render)

KEY:
- SITE BOUNDARY
- DEVELOPABLE AREA
- ADJACENT LANDS IN APPLICANT'S OWNERSHIP

PROPOSED SITE PLAN - PART A
SCALE 1:500 @ A0

date	rev	name	chk	note
01.12.21	P1	LM	EJG	ISSUE FOR PLANNING

DEADY GAHAN ARCHITECTS
EASTGATE VILLAGE, LITTLE ISLAND, CORK
T: 021 4355016 W:WWW.DGARCHITECTS.IE
EMAIL:INFO@DGARCHITECTS.IE

Project
PROPOSED RESIDENTIAL DEVELOPMENT
AT TOWNLAND OF LACKENROE, GLOUNTHAUNE, CO CORK

Drawing title
PROPOSED SITE PLAN - PART A

Scale	Drawn	Checked	Date
1:500 @ A0	LM	EJG	26.07.21

Project No.	Drg. No.	Revision
20151	20151/P/003A	P1

☐ Information \ Comments — Tender ☐
☐ Planning — Construction ☐

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date	rev	name	chk	note
01.12.21	P1	LM	EJG	ISSUE FOR PLANNING

DEADY GAHAN ARCHITECTS
EASTGATE VILLAGE, LITTLE ISLAND, CORK
T: 021 4355016 W:WWW.DGARCHITECTS.IE
EMAIL:INFO@DGARCHITECTS.IE

Project
PROPOSED RESIDENTIAL DEVELOPMENT
AT TOWNLAND OF LACKENROE, GLOUNTHAUNE, CO. CORK

Drawing title
PROPOSED SITE PLAN - PART B

Scale	Drawn	Checked	Date
1:500 @ A0	LM	EJG	01.12.21

Project No.	Drg. No.	Revision
20151	20151/P/003B	P1

☐ Information \ Comments — Tender ☐
☐ Planning — Construction ☐

Developable area shown in orange (8.7Ha)

Refer to accompanying plans prepared by Cunnane Stratton Reynolds for details of all external boundary treatments

No first floor windows on western elevation to prevent overlooking of adjacent property

Upper floor windows on western elevation fitted with frosted/opaque glass to prevent overlooking of adjacent property

Refer to accompanying plans prepared by Cunnane Stratton Reynolds for details of all amenity areas/public open spaces

LOCAL PLAY AREA

Play area (230m²)

Upper Level +87.70 — Lower Level +83.00 — 67 Child Créche

Refer to accompanying plans prepared by AECOM & Cunnane Stratton Reynolds for details of proposed pedestrian link

Refer to accompanying plans prepared by AECOM for details of proposed pedestrian crossing & traffic calming measures on 'the Terrace'

LOCATION OF SITE NOTICE

Refer to accompanying plans prepared by Cunnane Stratton Reynolds for details of proposed realignment of the pedestrian/cycle way to accommodate car parking to the front of the mixed-use building

Refer to accompanying plans prepared by Cunnane Stratton Reynolds for details of all external boundary treatments

Proposed foul sewer and surface water upgrades - Refer to Engineering details prepared by AECOM for details

'The Terrace'

'Johnstown Close'

Mixed-use building with community/ commercial units at ground floor and 24no apartments in total

Refer to accompanying plans prepared by Cunnane Stratton Reynolds for information in relation to the apartment building communal roof terrace

THE GREAT O'NEILL

WATERSIDE APTS

PEDESTRIAN ENTRANCE

GREENWAY

Right of Way

PROPOSED INNER GATEWAY LANDSCAPING

KEY:
- SITE BOUNDARY
- DEVELOPABLE AREA
- ADJACENT LANDS IN APPLICANT'S OWNERSHIP

Note
- Please refer to landscape proposal for public realm,open space & external boundaries information
- Please refer to boundary treatment drawing (Dwg - 20151/P/007) for all internal boundary treatments

- Character Area 1 (natural stone + off-white render)
- Character Area 2 (beige brick + beige render)
- Character Area 3 (red brick + off-white render)
- Character Area 4 (natural stone, beige brick + off-white/ beige render)

PROPOSED SITE PLAN - PART B
SCALE 1:500 @ A0

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N
W E
S

KEY:

SITE BOUNDARY

Upgrade of the storm and foul sewer network along the Terrace and Johnstown Close - Please refer to accompanying engineering and servicing plans prepared by AECOM for full details

Roseville

'The Terrace'

Hotel

Ashbourne House

Ashbourne Garden

The Woods

Johnstown Close

'Johnstown Close'

LOCATION OF SITE NOTICE

Car Park

Footbridge

Cobh Junction 5th

Mast

LB

Sand & Shi

date	rev	name	chk	note
01.12.21	P1	LM	EJG	ISSUE FOR PLANNING

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Project
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AT TOWNLAND OF LACKENROE, GLOUNTHAUNE, CO CORK

Drawing title
PROPOSED SITE PLAN - PART C

Scale	Drawn	Checked	Date
1:500@A0	LM	EJG	01.12.21

Project No.	Drg. No.	Revision
20151	20151/P/003C	P1

☐ Information \ Comments — Tender ☐
☐ Planning — Construction ☐

PROPOSED SITE PLAN - PART C
SCALE 1:500 @ A0