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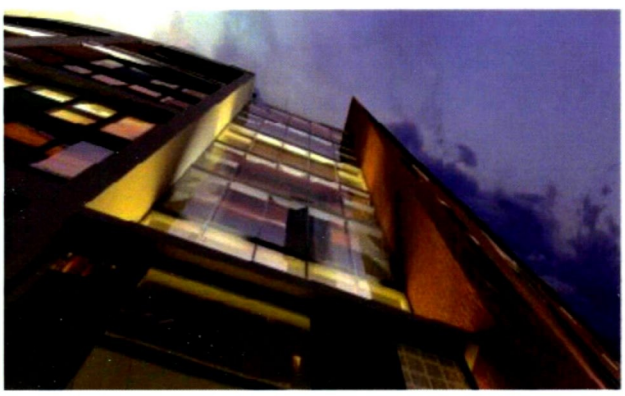
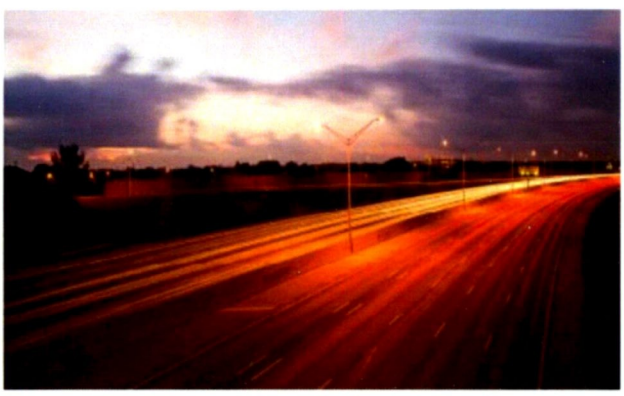

Engineering Assessment Report

Residential Development at Clonburris, Adamstown, Co. Dublin

January 2023

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Issue	Date	Prepared by	Checked by	Approved by
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Comments

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1. Introduction

1.1 Background of Report

This engineering assessment report has been prepared by Waterman Moylan as part of the planning documentation for a proposed residential development on lands at Clonburris, Adamstown, Co. Dublin, part of the Clonburris Strategic Development Zone (SDZ).

This report assesses wastewater and surface water drainage, water supply infrastructure and the road and transportation network in the vicinity of the site, and details the criteria used to design the proposed wastewater and surface water drainage, water supply and road networks.

1.2 Site Location and Description

The subject site is located at Adamstown, Lucan, Co. Dublin, and is bound to the north by the Dublin-Kildare rail line, to the west by the R120, to the south by Lucan pitch & putt club, and to the east by Hayden's Lane, as per *Figure 1* below. It is approximately 2.4km south of Lucan town centre.

The subject site is approximately 13.37Ha in area and is bisected by Haden's Lane. Hayden's Lane, as it exits the site on the eastern boundary, continues to run southwards as a vehicular carriageway, and, it also runs to the north as a pedestrian/cyclist route forming an overpass of the rail line and Adamstown Avenue Road. The site is greenfield in nature, with a single structure; a cattle-shed and yard at the west. The northern part of the site is traversed east-west by overhead cable on HV electrical pylons.

Figure 1 | *Site Location (Source: Google Earth)*

A topographic survey of the subject site indicates it generally slopes southwest to northeast from a high of 64.52m OD on the southwest to a low of 55.81m OD on the northeast. The survey has also shown that the hedgerow running from north to south contains a local ditch system, which is culverted under Hayden's Lane, and outfalls to the Griffeen River which forms the south-eastern boundary of the site.

The Griffeen River generally flows in a northerly direction, it is culverted under the rail lines and Adamstown Avenue which run in parallel at this location as per *Figure 2* below, which has been extracted from the Clonburris SDZ Planning Scheme 2019. It exits the culvert at Griffeen Valley Park, flowing northwards to Vesey park, before ultimately outfalling to the River Liffey at Lucan.

***Figure 2** | Image extracted from the Clonburris SDZ 2017*

1.3 Proposed Development

The proposed development consists of a total of 385 residential units, comprising 139 houses and 154 apartments, and 92 duplex type units as set out in the Schedule of accommodation in *Table 1* below.

Description	1-bed	2-bed	3-bed	4-bed	Total
House	-	-	98	41	139
Duplex	-	21	71	-	92
Apartment	48	106	-	-	154
Total	**48**	**127**	**169**	**41**	**385**

***Table 1** | Schedule of Accommodation*

The proposed development will consist of 385 No. units (139 No. houses, 70 No. 'Build-to-Rent' duplex/apartments, 72 No. duplex/apartments, and 104 No. apartments), ranging between 2 – 6 storeys and all associated and ancillary site development, infrastructural, hard and soft landscaping and boundary treatment works, including: - a single storey tenant amenity building; areas of public open space; car parking

spaces; bicycle parking spaces; bin and bicycle stores; plant provided at undercroft level and additional plant provided at roof level of the proposed apartment blocks; 2 No. ESB Sub-stations and demolition of remaining walls and hardstanding associated with a former agricultural building. Permission is also sought for minor revisions to attenuation pond permitted under SDCC Reg. Ref. SDZ20A/0021 as well as connections to water services (wastewater, surface water, and water supply) and connections to permitted cycle / pedestrian paths. All on a site of c. 9.08 Ha in the townland of Adamstown, within the Clonburris Strategic Development Zone (Adamstown Extension – Development Areas AE-51 and AE-52).

2. Foul Water Network

2.1 Existing Foul Water Network

The site is currently greenfield in nature, and not served by any foul network. An existing network map has been obtained from Irish Water and is extracted to *Figure 3* below. This map shows that the nearest existing foul network is to the southwest of the site on the R120. This network flows by gravity to a syphon system. The syphon system allows foul volumes to cross at the 12th Lock Bridge in a southerly direction before reverting to a gravity system.

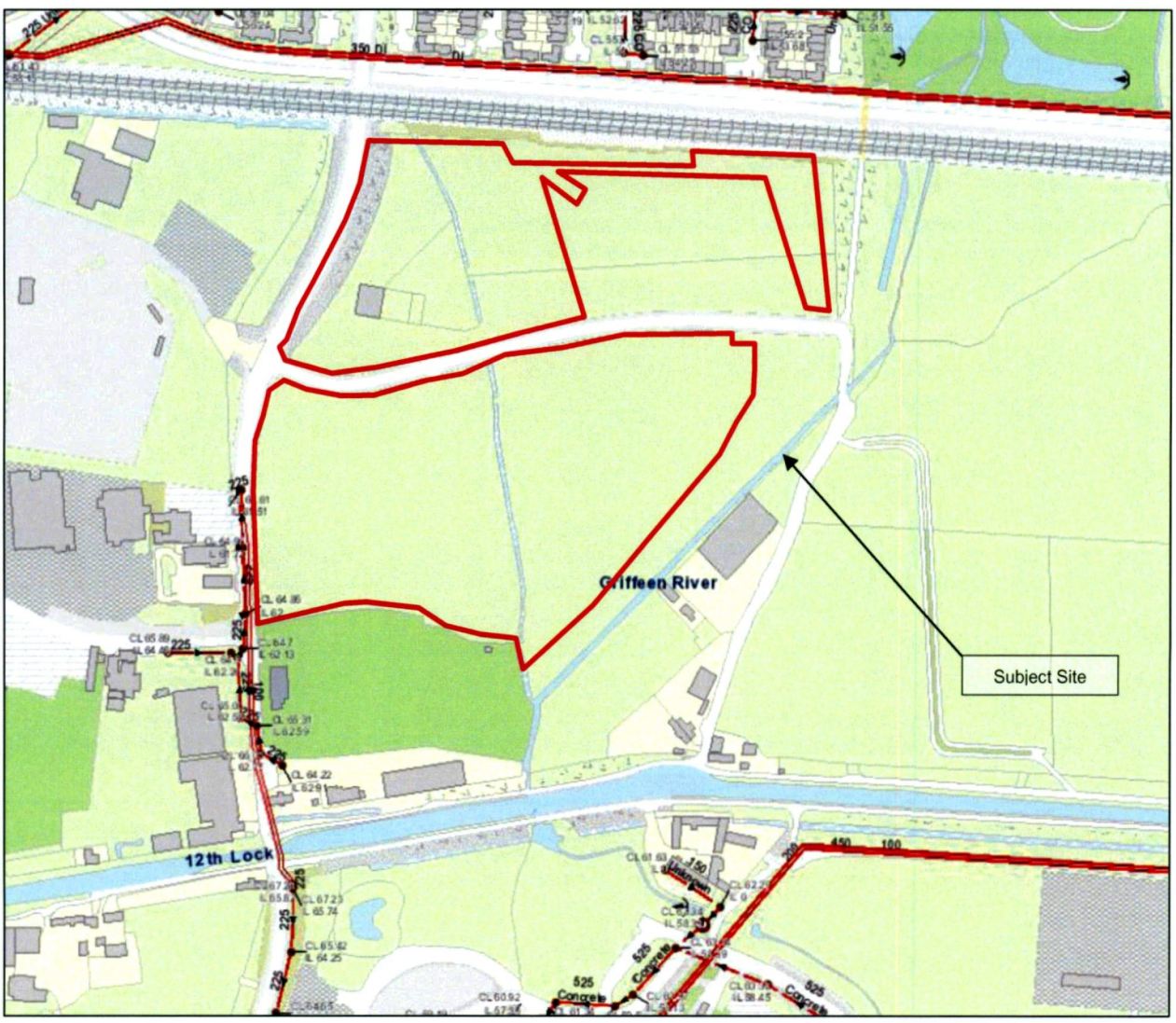


***Figure 3** | Existing Foul Network Map Extract*

2.2 Future Foul Water Network

Planning permission has been granted under Reg Ref: SDZ20A/0021 for infrastructural works in anticipation of the submission of this proposed development. Permission has been granted for a 225mmØ foul network, to be constructed in Hayden's Lane, which will flow eastwards out of the site boundary. This is line with the Clonburris SDZ document, and the strategic Network Development plan for wastewater. *Figure 4* overleaf, is a map showing this strategy as extracted from Figure 2.9.2 of the SDZ document.

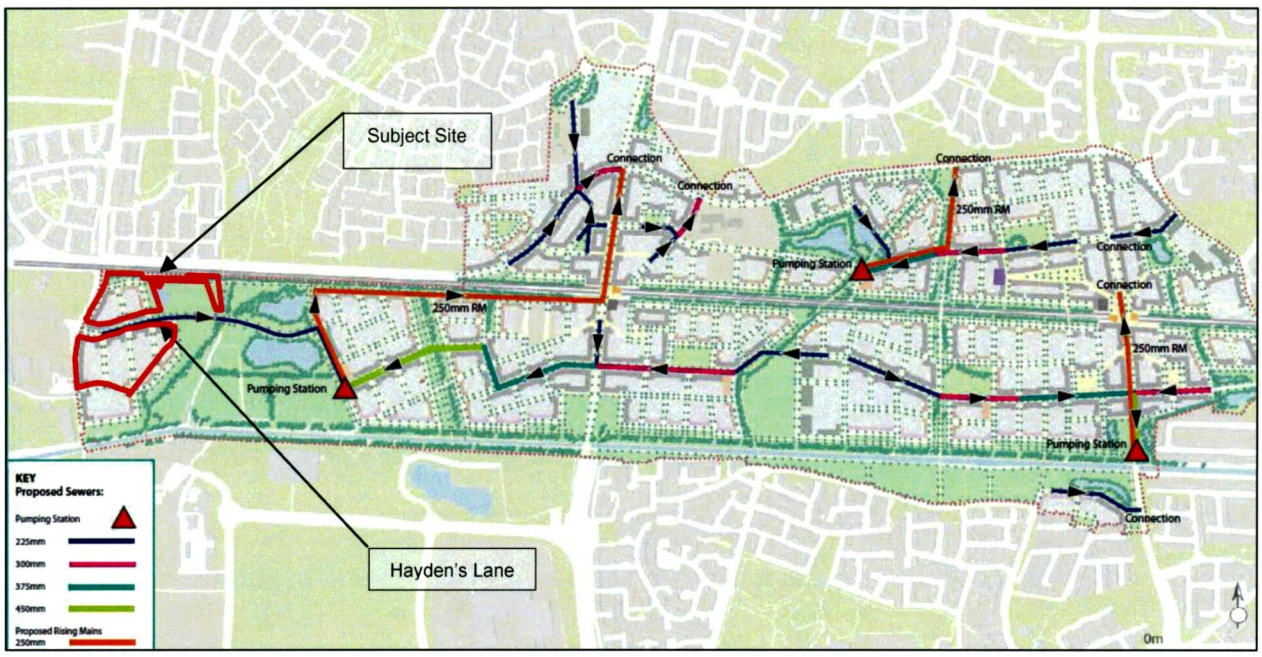


Figure 4 | *Clonburris SDZ Extract of the Foul Drainage Strategy*

2.3 Proposed Foul Water Network

It is proposed to drain wastewater from the proposed development via a network of 225mm Ø foul gravity sewers, which will flow to the 225mm Ø network in Hayden's Lane as permitted under Reg Ref: SDZ20A/0021. There will be a total of 2 No. connections from the proposed development to the permitted infrastructure, 1 No. connection from the north of Hayden's Lane, and 1 No. connection from the south of Hayden's Lane. This permitted foul network has been sized and designed in advance of the required connection of the subject application.

The proposed foul drainage network has been designed and sized in accordance with the Irish Water code of Practice for Wastewater Infrastructure and Standard Details. Please refer to Drawing numbers: 21-055-P1200 to P1202, which show the proposed foul drainage layout, and the connections to, and route, of the permitted foul water network.

Irish Water will ultimately decide on the feasibility of the existing wastewater infrastructure to cater for the proposed development. In this regard, a Pre-Connection Enquiry was submitted to Irish Water. A Confirmation of Feasibility Letter under Reg Ref: CDS22008208 was received, dated 10th January 2023. This letter notes that connection to the existing wastewater network is feasible subject to upgrade– refer to the letter included in Appendix A. These upgrades are the completion of the core foul drainage infrastructure for the SDZ lands which is being progressed by Clonburris Infrastructure Ltd. (CIL).

A Statement of Design Acceptance under Reg Ref: CDS22008208 has also been issued by Irish Water for the proposed development, and is included in Appendix B. The letter states that Irish Water has no objection to the proposals.

2.4 Foul Water Drainage Calculations

The calculated foul water flows at the subject development are set out in *Table 2*, below. Domestic wastewater loads have been calculated based on 2.7 persons per unit with a per capita wastewater flow of 150 litres per head per day along with a 10% unit consumption allowance, in line with Section 3.6 of the Irish Water Code of Practice for Wastewater Infrastructure. A peak flow multiplier of 3 has been used, as per Section 2.2.5 of Appendix B of the Code of Practice.

Description	Total Population	Load per Capita	Daily Load	Total DWF	Peak Flow
	No. People	*l/day*	*l/day*	*l/s*	*l/s*
139 Houses	375.3	150	61,924.5	0.717	2.151
92 Duplexes	248.4	150	40,986	0.474	1.422
154 Apartments	415.8	150	68,607	0.794	2.382
Total	**1,039.5**	**150**	**171,517.5**	**1.985**	**5.955**

Table 2 | *Calculation of Total Foul Water Flow from the Development*

The total dry weather flow from the development has been calculated as: 1.985 l/s, with a peak flow of 5.955 l/s.

2.5 Foul Water Drainage – General

Foul water sewers will be constructed strictly in accordance with Irish Water requirements. No private drainage will be located within public areas.

Drains will be laid to comply with the requirements of the latest Building Regulations, and in accordance with the recommendations contained in the Technical Guidance Document H.

3. Surface Water Network

3.1 Existing Surface Water Network

The site is greenfield in nature. There is a local ditch internal to the site, following the route of a hedgerow running from northwest to south. This local ditch has been culverted under Hayden's Lane. Surface water from this local ditch, and the site in general, discharges to the Griffeen River which forms the southeast boundary of the site. The Griffeen River flows in a generally northerly direction to outfall to the River Liffey at Lucan.

3.2 Sustainable Drainage Systems

Sustainable Drainage Systems (SuDS) are a collection of water management practices that aim to align modern drainage systems with natural water processes.

By using SuDS techniques (Green/Blue Infrastructure), water is either infiltrated or conveyed more slowly to the drainage system and ultimately more slowly to water courses via permeable paving, swales, green roofs, rainwater harvesting, detention basins, ponds, and wetlands.

Green/Blue Infrastructure strategies for developments are designed to prevent pollution of streams and rivers and to slow down runoff from sites, therefore helping to prevent downstream flooding and improve water quality. This closely mimics natural catchment behaviour where rainfall either infiltrates through the soil or runs off slowly over the ground surface to the nearest watercourse. This is known as the "treatment train" approach. SuDS devices should be placed at source, site, and regional levels. SuDS can also provide amenity benefits to local communities and benefits for biodiversity simultaneously.

The design of this infrastructure has also been cognisant of the specific requirements as per the Clonburris SDZ document's, Section 2.3 Green and Blue Infrastructure, & Section 2.9.5 Surface Water Drainage and Sustainable Urban Drainage Systems (SuDS). The strategy used aligns with the National Guidance Document '*Nature Based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas*'. This document reflects the provisions of the EU Water Framework Directive (2000/60/EC) (WFD)

In the following sections of the surface water chapter, it will be outlined in detail how SuDS devices have been utilised and incorporated to the overall plan for the proposed development, and how their inclusion will mitigate the risk of localised and downstream flooding, while also promoting residential amenity and biodiversity.

3.3 Future Surface Water Network

Planning permission has been granted under Reg Ref: SDZ20A/0021 for infrastructural works in anticipation of the submission of this proposed development. Permission has been granted for the following:

- A surface water network with pipe diameters raging from 375mm to 1050mm on Hayden's Lane.
- Attenuation pond with sufficient capacity to accommodate the proposed development.
- A 600mm Ø outfall pipe with petrol interceptor to the Griffeen River.
- The outflow rate is limited to 44.74 l/s by Hydrobrake (or similar approved).

This is line with the Clonburris SDZ document, and the Surface Water Drainage and Sustainable Urban Drainage System strategy. *Figure 5* overleaf, is a map showing this strategy as extracted from figure 2.9.3 of the SDZ document.

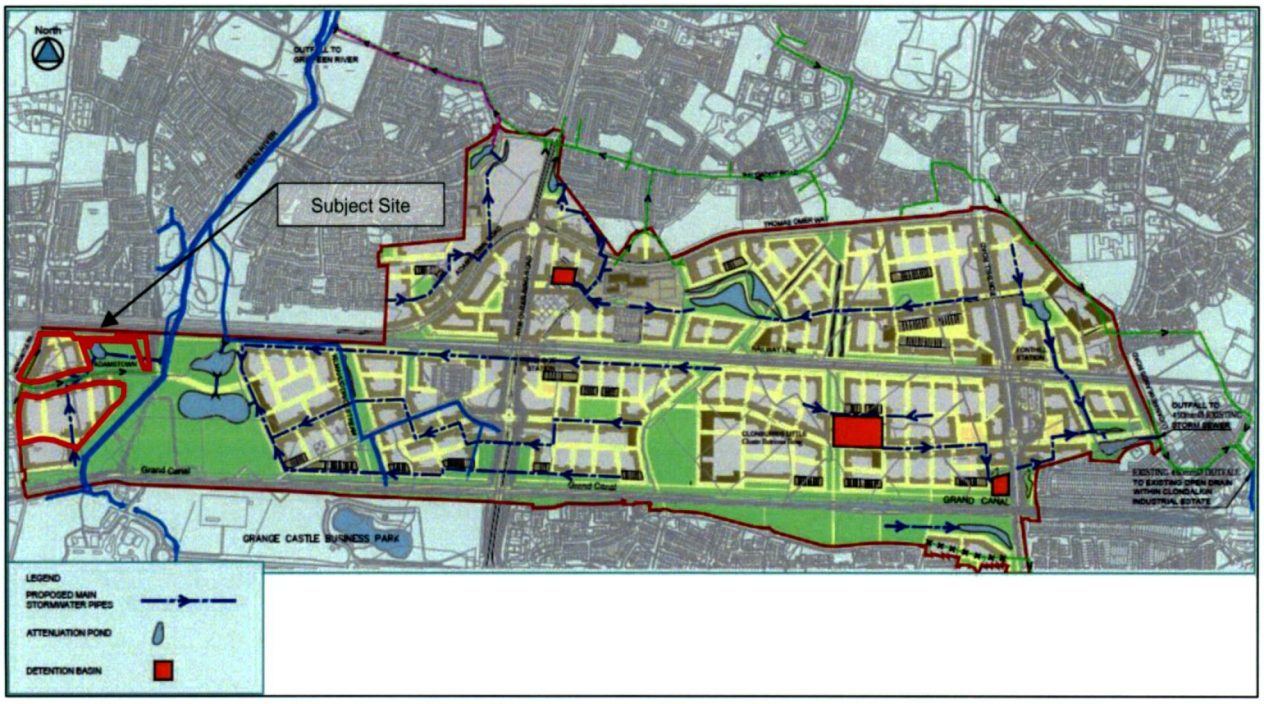


***Figure 5** | Clonburris SDZ Surface Water Drainage and SuDS Strategy Map Extract*

3.4 Proposed Surface Water Network and SuDS Strategy

It is proposed to drain surface water from the part of the development south of Hayden's Lane via 4 No. connections from a network of 225mm and 300mm Ø pipes to the permitted surface water network in Hayden's Lane. From where it will discharge to the permitted attenuation pond.

For the part of the development north of Hayden's Lane it is intended to discharge directly to the permitted attenuation pond via a network of proposed 225mm to 450mm Ø surface water pipes and outfall headwall.

As previously noted, the permitted surface water network, attenuation pond, outfall network, flow control device and petrol interceptor have been sized and designed in anticipation of the subject planning application.

It is proposed to incorporate a Storm Water Management Plan through the use of various SuDS techniques to treat and minimise surface water runoff from the site. The methodology involved in developing a Storm Water Management Plan for the subject site is based on recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual. Based on three key elements – Water Quantity, Water Quality and Amenity – the targets of the SuDS train concept have been implemented in the design, providing SuDS devices for each of the following:

- Source Control
- Site Control
- Regional Control (Permitted as Reg Ref: SDZ20A/0021)

3.4.1 Source Control

Permeable Paving:

It is proposed to introduce permeable paving at all private driveways and parking courts throughout the development. Downpipes from the front of the houses and apartments will drain to filter drains beneath the permeable paving to facilitate maximum infiltration of surface water from driveways and roof areas.

The goal of permeable paving is to control stormwater at the source to reduce runoff. In addition to reducing surface runoff, permeable paving has the dual benefit of improving water quality by trapping suspended solids and filtering pollutants in the substrata layers.

Filter Drains:

It is proposed to install 225mm diameter filter drains, consisting of perforated pipes surrounded in filter stone around the perimeter of each apartment block. The filter drains will provide infiltration, optimise the retention time, and provide quality improvement to the storm water runoff, in particular the first flush from hardstanding areas. The proposed perforated pipes connect to the proposed surface water sewer network.

Green / Sedum Roof:

It is proposed to introduce sedum roofing as a source control device on the Apartment Blocks 1 & 2. The blocks have a combined roof area of 2,650m² and the sedum roofing is proposed to cover 72% of the total apartment roof area, totalling a cumulative green roof area of 1,905m². The sedum roofing typically consists of 75mm substrate with a sedum blanket.

The substrate and the plant layers in a green roof absorb large amounts of rainwater and release it back into the atmosphere by transpiration and evaporation. They also filter water as it passes through the layers, so the run-off, when it is produced, has fewer pollutants. Rainfall not retained by green roofs is detained, effectively increasing the time to peak, and slowing peak flows.

A sedum roof can reduce annual percentage runoff by between 40% and 80% through this retention and evapotranspiration, with the impact dependent on a range of factors including the depth of substrate, the saturation of substrate at the onset of a rain event, the angle of the roof, the range of vegetation growing, intensity of rainfall and the time of year.

3.4.2 Site Control

Roadside Bio-retention Tree Pits:

It is proposed to provide roadside trees throughout the development. Trees can help control storm water runoff because their leaves, stems, and roots slow rain from reaching the ground and capture and store rainfall to be released later. Trees help to attenuate flows, trap silts and pollutants, promote infiltration and prevent erosion. Incorporating tree planting offers multiple benefits, including attractive planting features, improved air quality and increased biodiversity whilst helping to ensure adaptation to climate change.

Swales:

Swales are grassed channels proposed to run parallel and adjacent to selected roads throughout the site. Rainfall from the road surface will be directed to gaps in the road kerbing and will flow to the swales. The swales will be linked back to the drainage network to prevent flooding in extreme weather events, where the volume of rainfall exceeds the percolation capacity of the swales.

Grassed swales enhance surface water runoff quality as they slow down water flow, allowing suspended particles to filter and settle out of suspension.

3.4.3 Regional Control (Permitted under SDZ20A/0021)

Regional control will be provided by the infrastructure permitted under Reg Ref: SDZ20A/0021, which has been sized and designed in anticipation of the subjection application. This permitted infrastructure includes an attenuation pond, a flow control device, and a petrol interceptor.

3.5 Interception or Treatment Storage and Attenuation Storage

The methodology involved in developing the Storm Water Management Plan for the subject site is based on recommendations set out in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual. Appendix E of the Greater Dublin Strategic Drainage Study (GDSDS) sets out criteria for determining the provision of interception or treatment storage, attenuation storage and long-term storage at a development site. For the progression of the following calculations, the area of the site and the areas of green space or hardstanding have been measured as per the blue shaded catchments in *Figure 6* below.

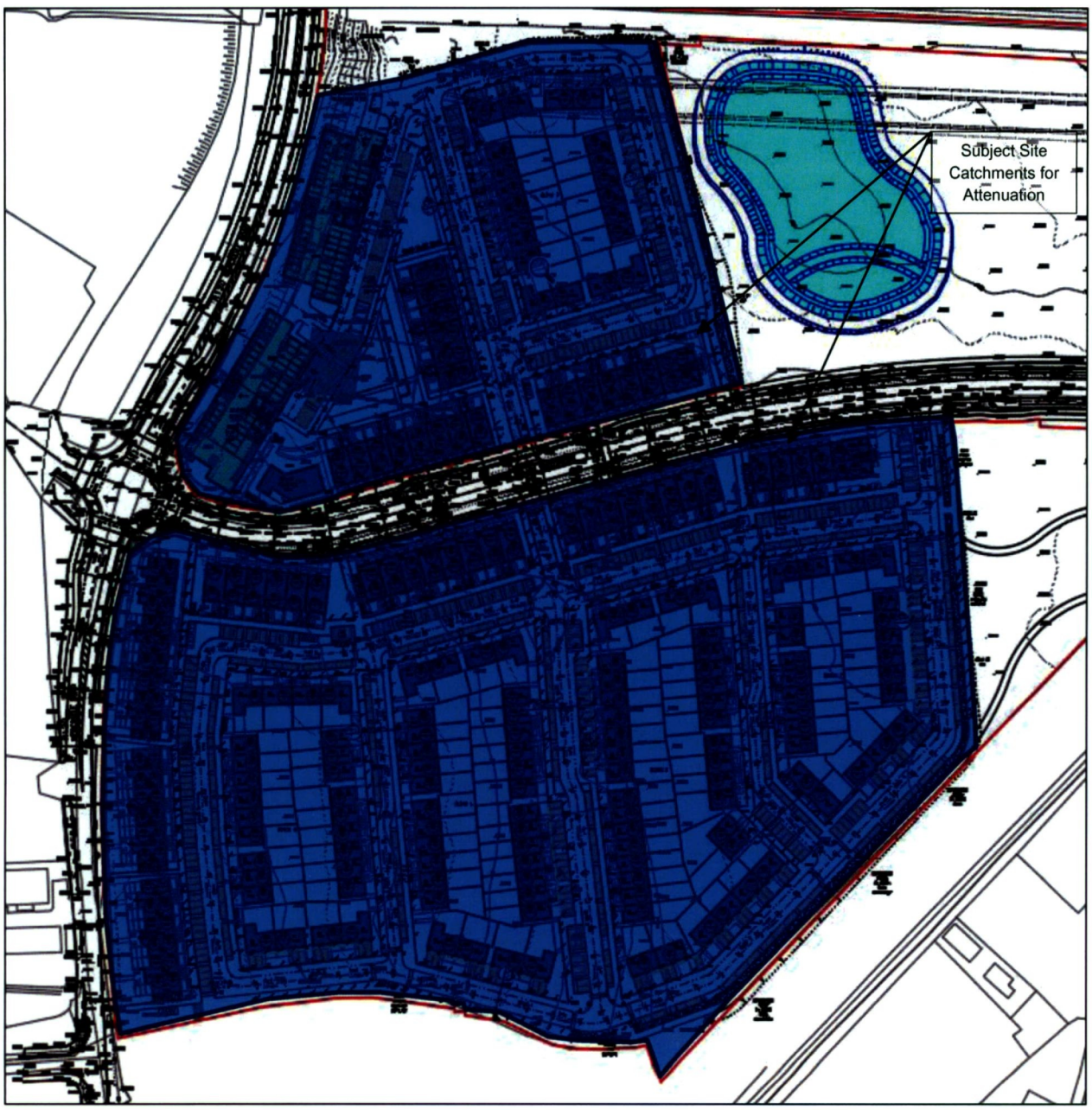


***Figure 6** | Area of Attenuation Calculations*

These calculations are summarised below:

3.5.1 Criterion 1: River Water Quality Protection

Criterion 1.1: Interception

The Greater Dublin Strategic Drainage Study (GDSDS) states that approximately 30% to 40% of rainfall events are sufficiently small that there is no measurable runoff from greenfield areas into the receiving waters. These events are generally considered as the first 5mm of rainfall. Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 5mm of rainfall yields the following:

Paved surfaces connected to drainage system	*75,219m² x 0.76 x 1 =* 56,988m²	*75,219m² site area* *76% of the site is paved* *100% of the paved area*
Volume of Interception Storage	*56,988m² x 5mm x 0.8 =* **227.95m³**	*Paved area directly drained* *5mm rainfall depth* *80% paved runoff factor*

***Table 3** | Interception Calculation*

The required interception volume is 285m³. It is not proposed to provide the entire required interception volume. Criterion 1.2 will therefore be assessed to provide the required River Water Quality Protection in accordance with Criterion 1.

Criterion 1.2: Treatment Volume

For events larger than 5mm, and in situations where interception storage cannot be provided, surface water runoff treatment is provided utilising SuDS in accordance with the CIRIA design manual C521.

Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 15mm of rainfall:

Paved surfaces draining to drainage system	*75,219m² x 0.76 x 0.75 =* 56,988m²	*75,219m² site area* *76% of the site is paved* *100% of the paved area*
Volume of Treatment Storage	*56,988m² x 15mm x 0.8 =* **683.86m³**	*Paved area directly drained* *15mm rainfall depth* *800% runoff from paved surfaces*

***Table 4** | Treatment Volume Calculation*

The required treatment volume for the site is met through the introduction of various SuDS features (which have been described in Section 3.2, above).

Permeable paving is proposed in private driveways and accounts for a total cumulative area of C. 5,880m². Assuming a subbase depth of 0.4m with 33% voids, this yields a treatment volume of 776.16m³.

As noted above, the green sedum roofing amounts to a cumulative area of approximately 1,905m² and shall consist of 75mm substrate with a sedum blanket. Assuming a 30% water volume retention, this amounts to approximately 43m³ of treatment storage volume. 268 liner metres of Swales are proposed as are Filter drains, raingardens, and roadside trees around the site provide further treatment volume.

These SuDS features provide ample treatment volume to meet the Criteria 1 requirements.

3.5.2 Criterion 2: River Regime Protection

Attenuation storage is provided by the permitted Reg Ref: SDZ20A/0021, which advises that Attenuation Area 1, the attenuation area proposed to serve the subject development, will have an attenuation capacity of 4,930m³, and outflow rate limited to 44.74 l/s.

The site development area, as indicated in *Figure 6* above, has been measured in order to determine its attenuation requirement. The site development area has a total area of 75,219m² of which 56,988m² is hardstanding (including permeable paving and green roofs).

As per the GDSDS, the required attenuation volume has been calculated for the 1-year, 30-year and 100-year return periods, identifying the critical storm for each – refer to calculations included in Appendix C.

The calculations included in Appendix C have been based on the usage of soil type 3, as indicated by the Site Investigation report received for the site.

The calculations for the subject site, included as Appendix C can be summarised as; requiring an attenuation volume of 4,179.58m³, with an outflow rate of 22.891 l/s.

This confirms that the permitted attenuation area under Reg Ref: SDZ20A/0021 has sufficient capacity for the subject development.

3.5.3 Criterion 3: Levels of Service

There are four criteria for levels of service. These are:

Criterion 3.1: No external flooding except where specifically planned (30-year high intensity rainfall event).

Criterion 3.2: No internal flooding (100-year high intensity rainfall event).

Criterion 3.3: No internal flooding (100-year river event and critical duration for site storage).

Criterion 3.4: No flood routing off site except where specifically planned (100-year high intensity rainfall event).

Both internal and external flooding have been assessed in the Flood Risk Assessment report which accompanies this Engineering Assessment report. The Flood Risk Assessment has been carried out in accordance with the *DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management* published in November 2009.

The assessment identifies the risk of both internal and external flooding at the site from various sources and sets out mitigation measures against the potential risks of flooding. The sources of possible flooding assessed in the report include coastal, fluvial, pluvial (direct heavy rain), groundwater and human/mechanical errors.

As a result of the flood risk management and mitigation measures proposed, the residual risk of internal or external flooding for the 30-year and 100-year flood events is low, and accordingly all four of the above criteria have been met. Please refer to the accompanying Flood Risk Assessment report for the full analysis of the flood risk at the subject site.

3.5.4 Criterion 4: River Flood Protection

The long-term storage volume is a comparison of pre- and post-development runoff volumes. The objective is to limit the runoff discharged after development to the same as that which occurred prior to development.

Of the three methods described in the GDSDS for establishing River Flood Protection by comparison of the pre- and post-development runoff volumes, (Criteria 4.1, 4.2 and 4.3 respectively), Criteria 4.3 is selected for use as the most practical criteria at this stage in the design.

The Criteria 4.3 approach is for all runoff to be limited to either Q_{BAR} or to 2 l/s/Ha, whichever is the greater. The proposed drainage system includes flow control devices at the outfall for each catchment to ensure that the discharge rate is limited to the greenfield equivalent and ample attenuation is provided for the 1-in-100 year storm, accounting for a 20% increase due to climate change.

The extra runoff volume of the development runoff over greenfield runoff, Vol_{xs}, is calculated in Appendix C for each of the sub-catchments. Note that as stated in the GDSDS, this volume is not additional to the attenuation storage volume but is effectively an element of it.

3.6 Surface Water – General

Surface water sewers will generally consist of PVC (to IS 123) or concrete socket and spigot pipes (to IS 6) and laid strictly in accordance with South Dublin County Council requirements for taking in charge. It is intended that all sewers within the public domain will be handed over to South Dublin County Council for taking in charge.

All private outfall manholes will be built in accordance with the Greater Dublin Regional Code of Practice for Drainage Works. No private drainage will be located within public areas.

Drains will be laid in accordance with the requirements of the Building Regulations, Technical Guidance Document H.

3.7 Flood Risk Assessment

A site-specific Flood Risk Assessment has been carried out for the proposed development and accompanies this submission under a separate cover.

4. Water Supply

4.1 Existing Water Supply

Irish Water records for the site and surrounding area have been obtained and are extracted to *Figure 7* below.

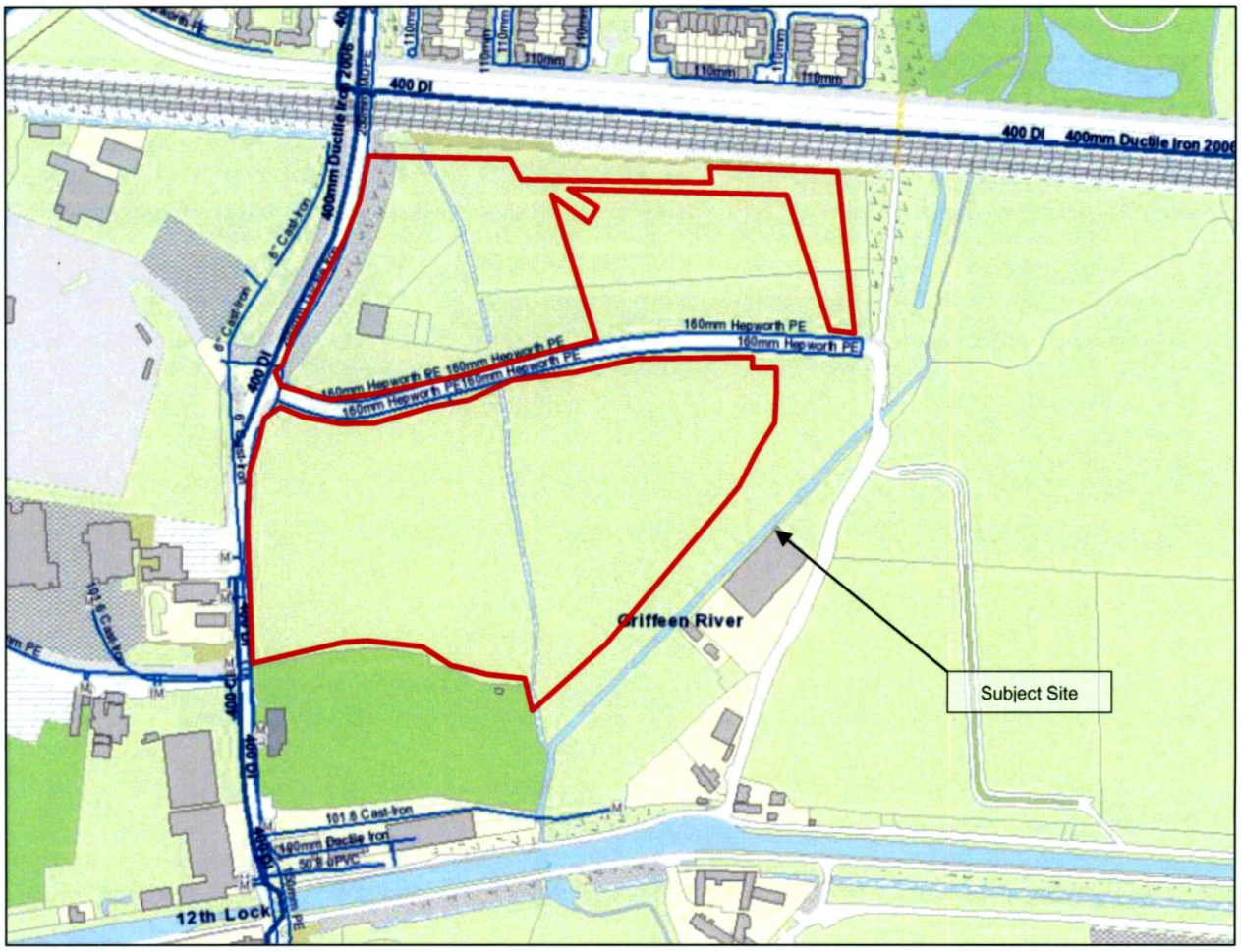


***Figure 7** | Watermain Network Map Extract*

There is a 160mm Ø watermain network located on Hayden's Lane, which is fed from a 200mm Ø Watermain on the R120. There is also a 400mm Ø Watermain network on the R120, which forms the western boundary of the site.

4.2 Future Water Network

Planning permission has been granted under Reg Ref: SDZ20A/0021 for infrastructural works in anticipation of the submission of this proposed development. Permission has been granted for the following:

- Removal of the existing watermain in Hayden's Lane.
- Construction of a 160mm OD watermain along Hayden's Lane.
- Construction of a 225mm OD watermain along Hayden's Lane.

This is line with the Clonburris SDZ document, Section 2.9.2 Water Supply strategy. *Figure 8* overleaf, is a map showing this strategy as extracted from Figure 2.9.1 of the SDZ document.

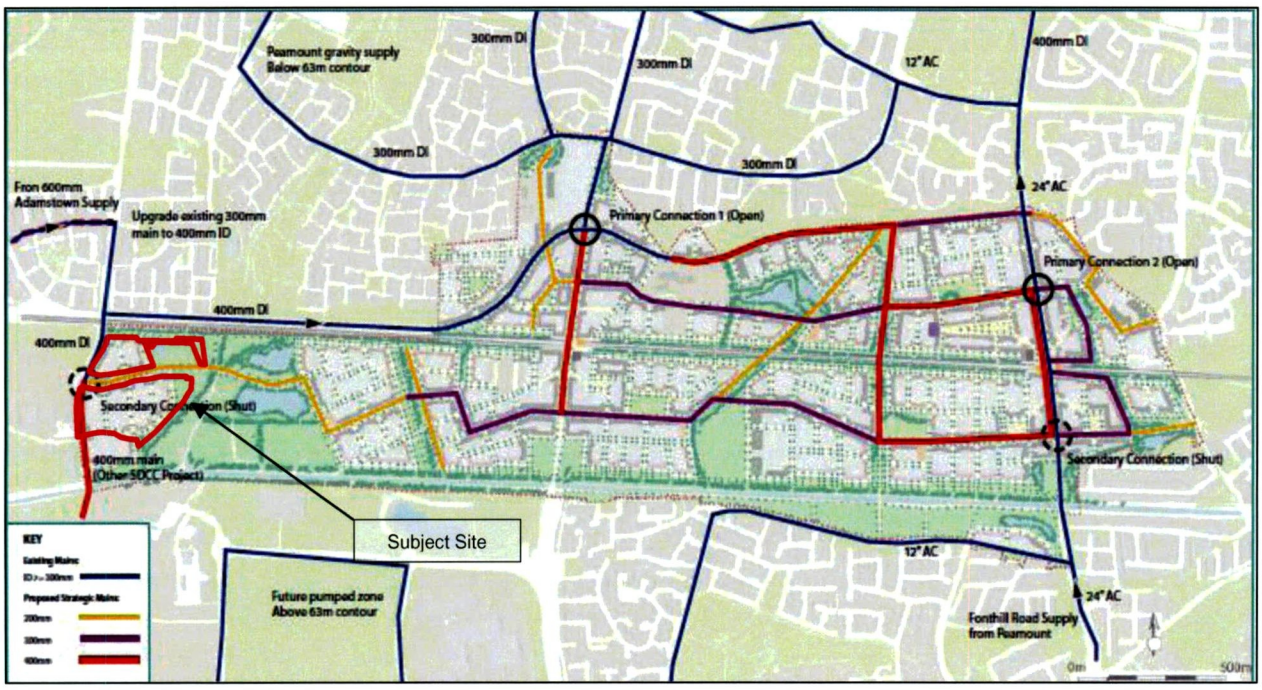


***Figure 8** | Clonburris SDZ Water Supply Strategy*

4.3 Proposed Water Supply

Water will be supplied to the proposed development via 8 no. connections to the permitted watermain networks as per Reg Ref: SDZ20A/0021. 3 No. connections will serve the development to the north of Hayden's Lane, and 5 No. connections serving the lands to the south.

All proposed connections to the permitted watermain will be 150mm Ø networks with a series of smaller 100mm Ø watermain loops and branches as per drawings: 21-055-P1300-P1302.

Irish Water will ultimately decide on the feasibility of the existing water supply infrastructure to cater for the proposed development. In this regard, a Pre-Connection Enquiry was submitted to Irish Water.

A Confirmation of Feasibility Letter under Reg Ref: CDS22008208 was received, dated 10th January 2023, and is included in Appendix A. This letter notes that connection to the existing water supply network is feasible subject to infrastructure upgrades, as follows:

- The Development should be supplied, as a long-term temporary solution, from the existing 400mm DI main to the west. Valves on the main must be adjusted for the connection. The connection main should be 150mm ID pipe with a control valve installed on the line. The control valve will be closed during normal operation after a permanent connection installation.
- Future (permanent) supply will be through the Zone from the East. Water infrastructure within the Development must be designed and installed in accordance with Clonburris SDZ Master Plan including the proposed 200mm main within the site boundaries.

A Statement of Design Acceptance has also been issued by Irish Water for the proposed development under Reg Ref: CDS22008208, and is included as Appendix B. The letter states that Irish Water has no objection to the proposals.

4.4 Water Supply Calculations

The calculated water demand at the subject development is set out in the table below. The average domestic demand has been established based on an average occupancy ratio of 2.7 persons per dwelling

with a daily domestic per capita consumption of 150 litres per head per day and with a 10% allowance factor. The average day/peak week demand has been taken as 1.25 times the average daily domestic demand, while the peak demand has been taken as 5 times the average day/peak week demand, as per Section 3.7.2 of the Irish Water Code of Practice for Water Infrastructure.

Description	Total Population	Water Demand	Average Demand	Average Peak Demand	Peak Demand
	No. People	*l/day*	*l/s*	*l/s*	*l/s*
139 Houses	375.3	61,924.5	0.717	0.896	4.480
92 Duplexes	248.4	40,986	0.474	0.593	2.965
154 Apartments	415.8	68,607	0.794	0.993	4.965
Total	**1,039.5**	**171,517.5**	**1.985**	**2.482**	**12.410**

Table 5 | *Calculation of Water Demand for the Development*

The average demand for the development is 1.985 l/s, with a peak demand of 12.410 l/s.

4.5 Water Supply – General

All watermains will be laid strictly in accordance with Irish Water requirements for taking in charge.

Valves, hydrants, scour and sluice valves, and bulk water meters will be provided in accordance with the requirements of Irish Water.

5. Roads and Transport Network

This section provides an overview of the existing and proposed road and transportation network in the vicinity of the site. A comprehensive Traffic and Transport Assessment and Travel Plan have been prepared by Waterman Moylan in accordance with the requirements of the Traffic and Transport Assessment Guidelines published by National Roads Authority in May 2014 and accompanies this submission under separate covers.

5.1 Existing Road Layout

The site is located adjacent to the east side of the R120 and is bisected by Hayden's Lane. The R120 is a 2-lane carriage way, with left-turning lanes at junctions, and with a posted speed limit of 60kph. Where it forms the western boundary of the site, it has pedestrian footpaths on both sides of the road, an off-road cycle lane north of the junction with Hayden's lane, and a shared pedestrian and cyclist path south of the junction with Hayden's Lane.

The N4 is 1.9km, a 4-minute drive, away northwards from the site via the R120. The N7 is 5.5km, an 8-minute drive, away southeast of the site via the R120, R134, and then the R136.

The M50 is reached at the N4 interchange by an 8-minute drive via the R120 and N4.

Figure 9 | *Significant Road networks in the Locality*

5.2 Future Road Network

Planning permission has been granted under Reg Ref: SDZ20A/0021 for infrastructural works in anticipation of the submission of this proposed development. Permission has been granted for the upgrading of Hayden's Lane and its Junction with the R120 which will include the following works:

- Signalisation of the Hyden's Lane and R120 junction, incorporating pedestrian and cyclist crossings.
- Creation of off-road cycle track at the junction upgrade on the east side, and creation of on-road cycle track on the west side.
- The upgrading of Hayden's Lane to incorporate on and off-road cycle lanes, bus stops, pedestrian crossings, and parking bays, with the location of the existing pedestrian footpaths to be relocated to facilitate construction of the previous items.
- The creation of vehicular access points, one to the north of Hayden's Lane and two to the south (in anticipation of the planning submission of the subject development).

5.3 Proposed Road Layout

The site will be accessed from Hayden's Lane, with one vehicular access to the north, and two to the south, as per section 5.2.

The internal road networks are proposed to be 2-way, 2-lane carriageways with a width of 6m, as per drawings: 21-055-P1100 to P1121.

The internal road network includes local access roads and "home-zones/shared-surfaces", as shown on Waterman Moylan's Road Surfacing Layout Drawing 21-055-P1100.

5.4 Design Manual for Urban Roads & Streets (DMURS)

5.4.1 Background

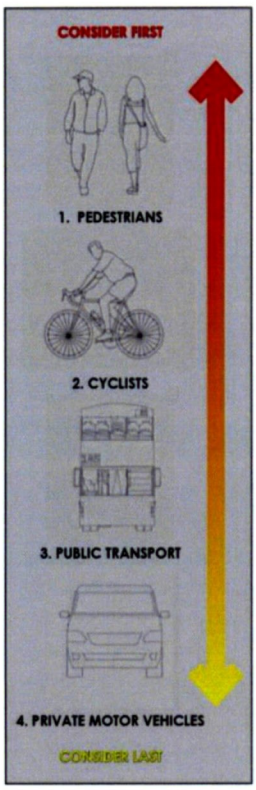
The stated objective of DMURS (Design Manual for Urban Roads and Streets) is to achieve better street design in urban areas. This will encourage more people to choose to walk, cycle or use public transport by making the experience safer and more pleasant. It will lower traffic speeds, reduce unnecessary car use, and create a built environment that promotes healthy lifestyles and responds more sympathetically to the distinctive nature of individual communities and places. The implementation of DMURS is intended to enhance how we go about our business, how we interact with each other, and have a positive impact on our enjoyment of the places to and through which we travel.

5.4.2 DMURS Statement of Design Consistency

Waterman Moylan Consulting Engineers considers that the proposed road and street design is consistent with the principles and guidance outlined in the Design Manual for Urban Roads and Streets (DMURS). Outlined below are some of the specific design features that have been incorporated within the proposed scheme with the objective of delivering a design that is in compliance with DMURS.

5.4.3 Creating a Sense of Place

Four characteristics represent the basic measures that should be established in order to create people friendly streets that facilitate more sustainable neighbourhoods. These characteristics are connectivity, enclosure, active edges, and pedestrian activities/facilities.



Connectivity:

"The creation of vibrant and active places requires pedestrian activity. This in turn requires walkable street networks that can be easily navigated and are well connected."

In order of importance, DMURS prioritises pedestrians, cyclists, public transport, and private cars. This is illustrated in the adjacent image extracted from DMURS.

The proposed development has been designed with pedestrians and cyclists taking precedence over other modes of transport. In this regard, footpaths are provided throughout the development with regular pedestrian crossings along anticipated desire lines. Footpaths within the development will generally be 2m to 3m wide, which is wide enough to allow 2 wheelchairs to pass each other without inconvenience.

Pedestrian crossings have been designed to allow pedestrians to cross the street at grade. 'Home-zones' are proposed, which provide a safe space for residents, pedestrians, and cyclists with the dominance of cars reduced. All crossings will utilise tactile paving and drop kerbing to facilitate safe crossings at grade, and have been located on elevated road surfaces, such as raised tables and the aforementioned home-zones. These elevated road surfaces can only be accessed by car via a ramp, which is one of many safety measures implemented throughout the development, and in line with the recommendations of DMURS, to reduce the speed of vehicles. These elevated road surfaces will be of a different colour, and potentially texture, the exact composition of which is to be agreed with South Dublin County Council, to further make motorists aware of the change of user priority, this being a change from a vehicle priority road to a pedestrian priority surface.

DMURS notes that cul-de-sacs should not dominate residential layouts, and their use should be limited. In particular, the number of walkable/cyclable routes between destinations should be maximised. Section 3.3.2 of DMURS notes that cul-de-sacs may be used to serve a small number of dwellings, to enable more compact/efficient forms of development. The proposed development does include one cul-de-sac which serves the apartment blocks however, the proposed development layout has prioritised and facilitates pedestrian and cyclist movements at all locations internally, and also at projected desire lines for accessing the R120 and Hayden's Lane from "inside" the development and vice-versa. The proposed cul-de-sac is safe, with clear, open sightlines, and passive surveillance.

Enclosure:

"A sense of enclosure spatially defines streets and creates a more intimate and supervised environment. A sense of enclosure is achieved by orientating buildings towards the street and placing them along its edge. The use of street trees can also enhance the feeling of enclosure."

The proposed development has been designed with residential units overlooking streets and pedestrian routes throughout. High quality landscaping and tree planting are proposed throughout the scheme which creates a definitive sense of place. Road widths are 6m throughout the development and ensure that a strong sense of enclosure is achieved on residential roads.

Active Edge:

"An active frontage enlivens the edge of the street creating a more interesting and engaging environment. An active frontage is achieved with frequent entrances and openings that ensure the street is overlooked and generate pedestrian activity as people come and go from buildings."

As stated in Section 2.2.1 of DMURS, an active frontage enlivens the edge of the street, creating a more interesting and engaging environment. An active frontage is achieved with frequent entrances and openings. Section 3.4.1 of DMURS further notes that designers should avoid the creation of Dendritic Networks, which place heavy restrictions on movement.

Vehicular access has been provided from Hayden's Lane. The provision of pedestrian crossings will encourage and facilitate pedestrian and cyclist activity. The proposal includes strategically placed raised tables, which will promote lower vehicular speeds while enabling pedestrians to cross the streets at grade, in accordance with Section 4.4.7 of DMURS.

There are a number of advantages to more permeable networks in regard to the management of traffic and vehicle speeds. Drivers are more likely to maintain lower speeds over shorter distances than over longer ones. Since drivers are able to access individual properties more directly from Access/Link streets (where speeds are more moderate), they are more likely to comply with lower speed limits on Local Streets, as stated in Section 3.4.1 of DMURS.

Section 4.4.7 of DMURS recommends the use of horizontal and vertical deflections on straights where there is more than 70m between junctions. The internal road network of the proposed development has been designed by the Civil Engineers in conjunction with the Architects so as to ensure that this distance of 70m without horizontal or vertical deflection has not been exceeded throughout the development.

On-street parking separates pedestrians from the vehicle carriageway and, as per DMURS Section 4.4.9, can calm traffic by increasing driver caution, contribute to pedestrian comfort by providing a buffer between the vehicular carriageway and footpath and provide good levels of passive security. On-street parking has been designed at selected locations to implement this DMURS recommendation.

Suitable sightlines have been provided throughout the development, ensuring that localised planting does not obscure visibility as cars make turning manoeuvres, improving the pedestrian safety at crossing points. Turning radii throughout the site and at the access junctions are typically 5m.

Pedestrian Activities/Facilities:

"The sense of intimacy, interest and overlooking that is created by a street that is enclosed and lined with active frontages enhances a pedestrian's feeling of security and well-being. Good pedestrian facilities (such as wide footpaths and well-designed crossings) also make walking a more convenient and pleasurable experience that will further encourage pedestrian activity."

As outlined in the items above, the proposed development has been designed to provide excellent pedestrian connectivity, with footpaths providing permeability for pedestrians and cyclists throughout the site and to both the R120 & Hayden's Lane.

Throughout the site, pedestrian routes are generally 2m wide or greater which, as mentioned previously, provides adequate space for two wheelchairs to pass one another. DMURS identifies a 1.8m wide footpath as being suitable for areas of low pedestrian activity and a 2.5m footpath as being suitable for low to moderate pedestrian activity. It is considered that a 2m wide footpath is appropriate for the proposed development, and the footpath width increases in the proposed development for areas which will be trafficked more by pedestrians.

5.4.4 Key Design Principles

DMURS sets out four core design principles which designers must have regard to when designing roads and streets. These four core principles are set out below together with a commentary establishing how these design principles have been incorporated into the design of the proposed development.

Design Principle 1: Pedestrian Activity/Facilities:

"To support the creation of integrated street networks which promote higher levels of permeability and legibility for all users and in particular more sustainable forms of transport."

Streets have been designed in accordance with the alignment and curvature recommendations set out in DMURS Section 4.4.6. The road layout is generally orthogonal. Section 3.3.1 of DMURS notes that street networks that are generally orthogonal in nature are the most effective in terms of permeability (and legibility). Staggered junctions along with raised pedestrian tables/crossings at main pedestrian desire lines will encourage reduced driving speeds.

Design Principle 2: Multi-Functional Streets:

"The promotion of multi-functional, place-based streets that balance the needs of all users within a self-regulating environment."

The road hierarchy comprises Local Access roads and Home-Zones. The local access streets comprise of 6m wide carriageways (i.e. 3m wide vehicle lanes) with footpaths with a width of 2m minimum.

The proposed home-zones are streets designed primarily to meet the needs of pedestrians, cyclists, children, and residents, where the speeds and dominance of cars is reduced.

It is proposed to utilise a buff-coloured chipping / macadam or similar approved surfacing at home-zones, subject to South Dublin County Council Roads and Transportation Department approval. Use of a shared-surface buff coloured chipping/macadam and flush kerb indicates to both drivers and pedestrians/cyclists that the road is a shared space. As stated in Section 4.4.2 of DMURS, paving materials combined with embedded kerbs can encourage a low vehicle speed shared environment.

Entry treatment to home-zones is provided in the form of a ramp up, which helps announce that a driver is entering into a home-zone. The ramp up to this elevated shared surface is to be in accordance with Figure 4.44 in Section 4.3.3 of DMURS.

It is stated in Section 4.3.4 of DMURS that shared surface streets and junctions are highly desirable where movement priorities are low and there is a high place value in promoting more liveable streets (i.e., home-zones), such as on Local streets within Neighbourhood and Suburbs.

Design Principle 3: Pedestrian Focus:

"The quality of the street is measured by the quality of the pedestrian environment."

The design of the scheme has placed a particular focus on the pedestrian. Connectivity throughout the scheme is heavily weighted towards the pedestrian. There are excellent pedestrian links to the R120 & Hayden's Lane and their associated public transport services and amenities, for residents of the development.

Raised tables are provided at the internal junctions, which allow pedestrians to continue at grade. The raised tables also promote lower vehicle speeds. Stop signs and road markings will be provided prior to the raised table, to give pedestrians priority, as per drawing number: 21-055-P1010.

***Figure 10** | Extract from DMURS Figure 4.69*

Design Principle 4: Multi-Disciplinary Approach:

"Greater communication and co-operation between design professionals through promotion plan led multidisciplinary approach to design."

The design of the proposed scheme has been developed through the design team working closely together. The proposed development design is led by BKD Architects working together with multiple disciplines including Waterman Moylan Consulting Engineers, Stephen Little & Associates Planning Consultants and Brady Shipman Martin Planning & Landscape specialists.

Public areas fronting and within the proposed development have been designed by a multidisciplinary design team to accommodate pedestrians and cyclists in accordance with the appropriate principles and guidelines set out in DMURS. In particular the vehicular access and public footways within the remit of the development will incorporate the relevant DMURS requirements and guidelines as set out above.

5.4.5 Quality Audit

Section 5.4.2 of DMURS states that a Quality Audit should be undertaken to demonstrate that appropriate consideration has been given to all of the relevant aspects of the design. An independent Quality Audit has been undertaken by Bruton Consulting Engineers. The Quality Audit comprises; a stage 1 Road Safety Audit, an Access Audit, a Cycle Audit & and a Walking Audit. The Quality Audit is included in full as Appendix D to this report.

Note that the Quality Audit is intended to be a preliminary design tool to assess the early-stage proposals. The auditor's recommendations have been reviewed and, where appropriate, have subsequently been taken on board by the design team, with the development proposals revised to address any of the issues identified.

The audit identified 5 issues relating to junction design, sightlines and visibility, pedestrian and cyclist desire lines and access. A summary of the issues identified by the Quality Audit is set out in the table below, alongside the remedial measures taken to address each of the issues identified. The final Quality Audit report notes that each issue identified has been resolved to the satisfaction of the independent safety consultants.

Section	Issue Identified	Measure Proposed
3.1	It is proposed to provide raised tables at many internal junctions. If there is too small of a kerb upstand drivers may cut the corners given the tight radii and mount the footpaths. This could lead to the breaking of the tactile paving which would become a trip hazard for pedestrians.	Raised ramp to be 75mm high, leaving 50mm kerb upstand. The kerb is only to be flush 0-6mm at crossing point and raised in between to 50mm height to prevent kerb overrun.
3.2	The junction of Roads 1 & 2 is at an acute approach angle. Drivers giving way at the top of Road 2 might not be able to look over their shoulder to drivers approaching from Road 1 especially if they have limited neck mobility. This could lead to collisions. The priority at the junction is also unclear.	It is proposed to alter the road layout at the junction between Roads 1 and 2, to improve the angle of approach and provide adequate visibility for all. It is also proposed to provide a raised table across this junction. Priority at this junction is proposed to be clearly defined via the introduction of a STOP on approach to the raised table from road 2.
3.3	There will be a desire line for pedestrians and cyclists to travel from the R120 Newcastle Road into the development at the most northern point, without adequate facilities being provided there may be gaps made by those users which could lead to slips and falls on the embankment in wet conditions.	Given both the constraints of the existing site conditions and the layout of the infrastructure planning permission, it is deemed unfeasible to provide a usable cycle connection between the R120 and the railway overbridge. In this regard, we refer you to the feasibility report prepared by BSM. Please refer separate attached draft document. It is proposed to provide an alternative off-road cycle connection to cross the railway. This route will pass along the northern edge of the proposed open space (adjacent to the railway boundary) before turning south and connecting to the junction of the overbridge ramp and the link road. The proposed off-road cycle track is shown in orange below. Cyclist connecting to the R120 can follow a combination of Local Streets and segregated cycle lanes along the link road.
3.4	There is a missing link of footpath between Apartment Block 1 and the section of Road 1 to the east of the junction with Road 2. This could lead to pedestrians travelling on the carriageway which has not been designed as a shared uses surface. Visitors parking in from of Apartment Block 1 would also have to travel along the carriageway to the access point to the building.	We are proposing a raised crossing at the northern end of the scheme, providing a safe VRU linkage point between the apartments and the path on the northern boundary. This is proposed to link with a new footpath that passes through the open space fronting the apartments, affording direct and safe access and desire line path linkages for residents and VRUs.
3.5	There is no proposed gap in the verge for pedestrians to access the residential/internal roads at the junction of Road 9 and at the crossing point at house no. 373. This could lead to slips and falls in the grassed verge.	Drawings to be updated to show the addition of gaps in the verges for pedestrian access.

***Table 6** | Quality Audit Issues Identified and Remedial Actions*

5.5 Traffic and Transport Assessment & Travel Plan

A comprehensive Traffic and Transport Assessment and Travel Plan have also been prepared by Waterman Moylan and accompany this pre-planning submission under separate covers.

Appendices

A. Irish Water Confirmation of Feasibility Letter

CONFIRMATION OF FEASIBILITY

Uisce Éireann
Bosca OP448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

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

www.water.ie

Robert Walpole

Waterman Moylan
Block S Eastpoint Business Park
Alfie Byrne Road
East Wall, Dublin 3
Dublin
D03H3F4

10 January 2023

Our Ref: CDS22008208 Pre-Connection Enquiry
Clonburris, Adamstown, Lucan, Dublin

Dear Applicant/Agent,

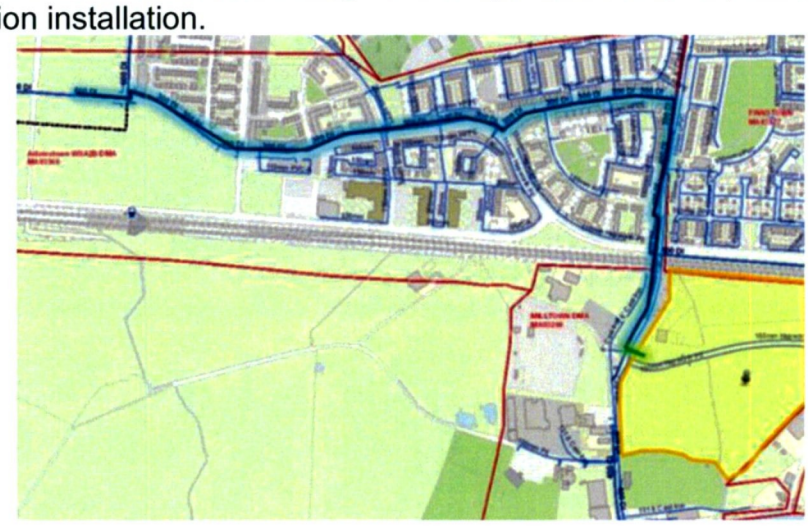
We have completed the review of the Pre-Connection Enquiry.

Irish Water has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 385 unit(s) at Clonburris, Adamstown, Lucan, Dublin, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible without infrastructure upgrade by Irish Water

- The Development should be supplied, as a temporary solution, from the existing 400mm DI main (blue highlighted mains). Valves on the supply line must be adjusted to allow the water supply from Peamount Reservoir. A connection main should be a 150mm ID pipe with a control valve installed on the line. The control valve will be closed during normal operation, after a permanent connection installation.



- The Development is a part of Clonburris Development Zone and future (permanent) supply will be through the Zone from the East. Water infrastructure within the Development must be designed and installed in accordance with Clonburris SDZ Master Plan including the proposed 200mm main within the site boundaries. Developer is required to pay for the section of the future 200mm ID main.

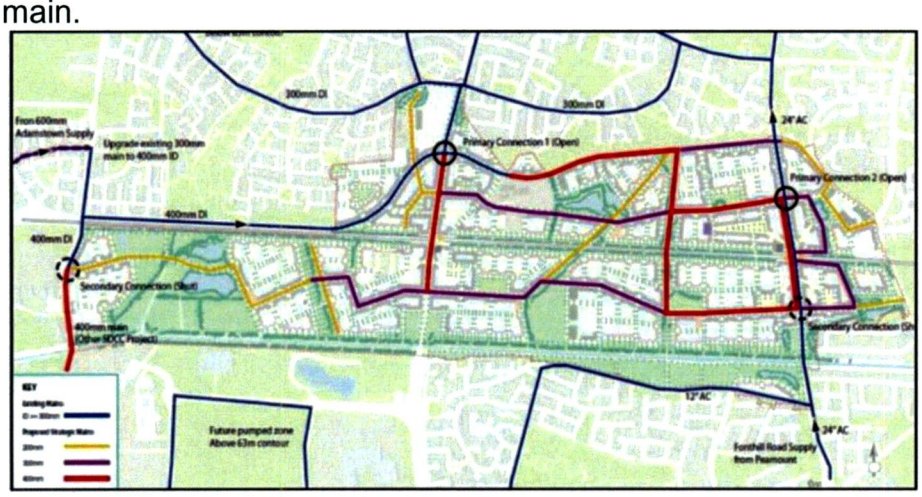
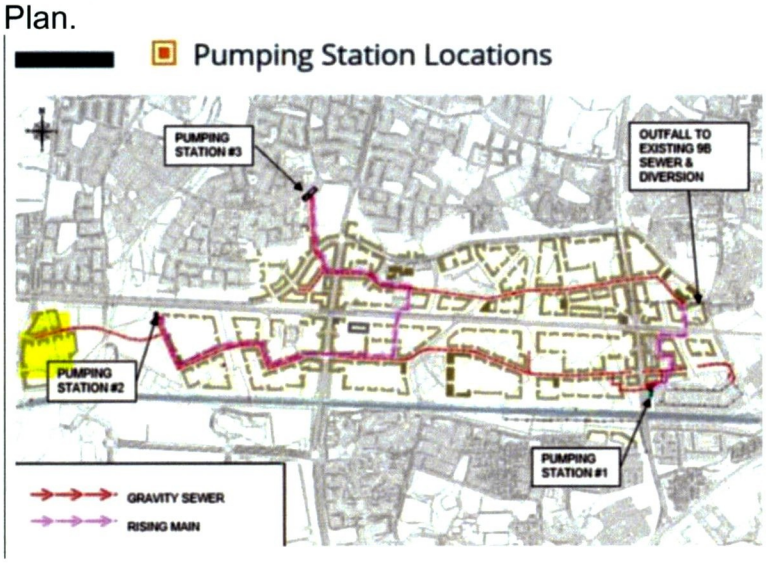


Figure 4.1: SDZ Water Strategy Layout

- **Wastewater Connection** - Feasible Subject to upgrades

- The Development is a part of Clonburris Development Zone. In order to facilitate the proposed Development, all relevant core wastewater infrastructure within the Zone have to be completed, connected to the Irish Water network and in operation. That includes Clonburris Pumping Station 02, associated rising main and foul network (Northern Sewer Route) to be delivered by Clonburris Infrastructure Ltd (CIL).
- On an interim basis, a connection may be permitted in advance of completion of the Northern Sewer Infrastructure (to be delivered by CIL), subject to the delivery of Clonburris Pumping Station 01 (to be delivered by Irish Water), available capacity in PS01 at the moment, progress of works on the Northern Sewer Infrastructure and connection from customer site to PS01 (to be delivered by the Customer and CIL)
- All required works will need to be in accordance with Clonburris SDZ Master Plan.



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

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Irish Water's Network(s)

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

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

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

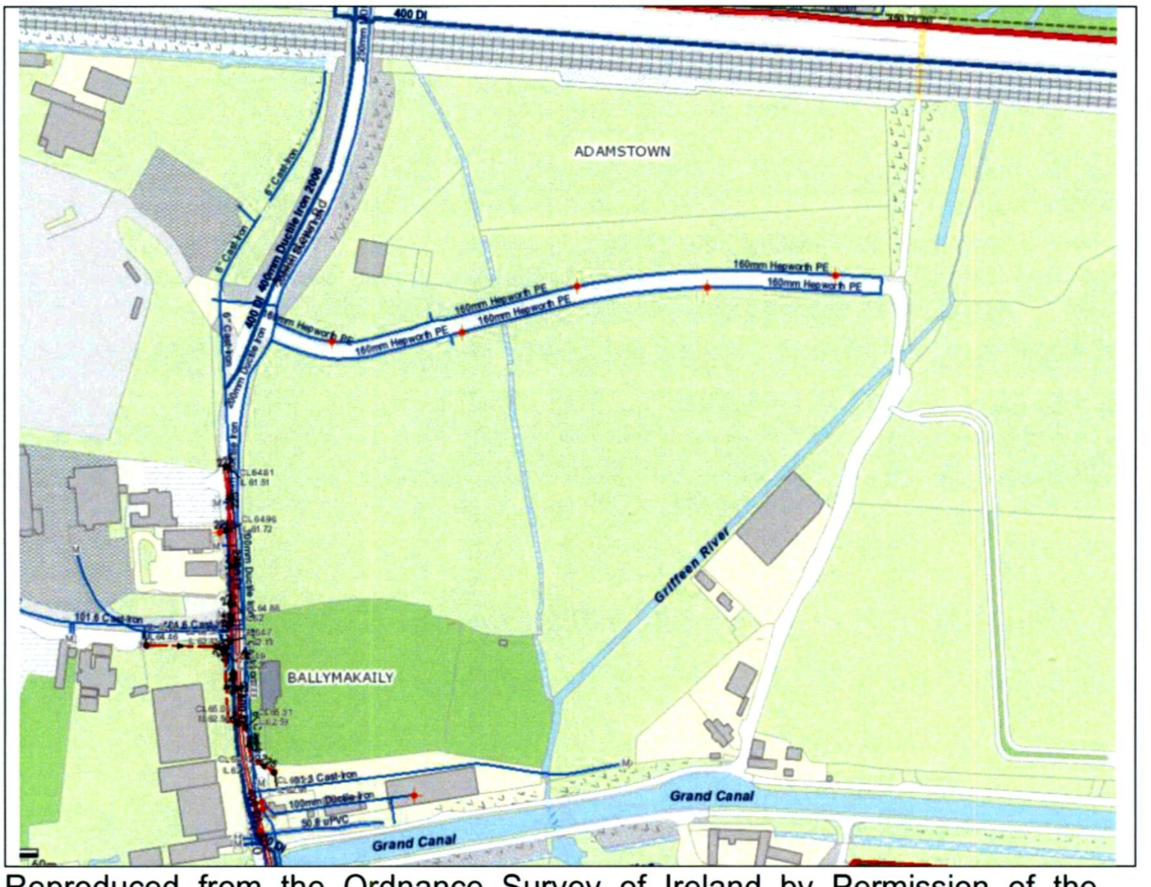
Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Irish Water's network(s). • Before the Development can connect to Irish Water's network(s), you must submit a connection application and be granted and sign a connection agreement with Irish Water.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Irish Water connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Irish Water's network(s), including works in the public space, must be carried out by Irish Water*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Irish Water's network(s)?	• Requests for maps showing Irish Water's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Irish Water Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Irish Water's Network(s)

The map included below outlines the current Irish Water infrastructure adjacent the Development: To access Irish Water Maps email datarequests@water.ie



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

Note: The information provided on the included maps as to the position of Irish Water's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Irish Water.

Whilst every care has been taken in respect of the information on Irish Water's network(s), Irish Water assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Irish Water's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Irish Water's underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

B. Irish Water Statement of Design Acceptance

Robert Walpole
Waterman Moylan
Block S
Eastpoint Business Park
Alfie Byrne Road
East Wall
Dublin 3
D03H3F4

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

18 January 2023

Re: Design Submission for Clonburris, Adamstown, Lucan, Dublin (the "Development") (the "Design Submission") / Connection Reference No: CDS22008208

Dear Robert Walpole,

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: Antonio Garzón
Email: antonio.garzon@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

- 21-055-P1200A Drainage General Arrangement
- 21-055-P1201A Drainage Layout Sheet 1 of 2
- 21-055-P1202A Drainage Layout Sheet 2 of 2
- 21-055-P1210A Foul Sewer Longitudinal Sections Sheet 1
- 21-055-P1301 Watermain Layout Sheet 1 of 2
- 21-055-P1302 Watermain Layout Sheet 2 of 2

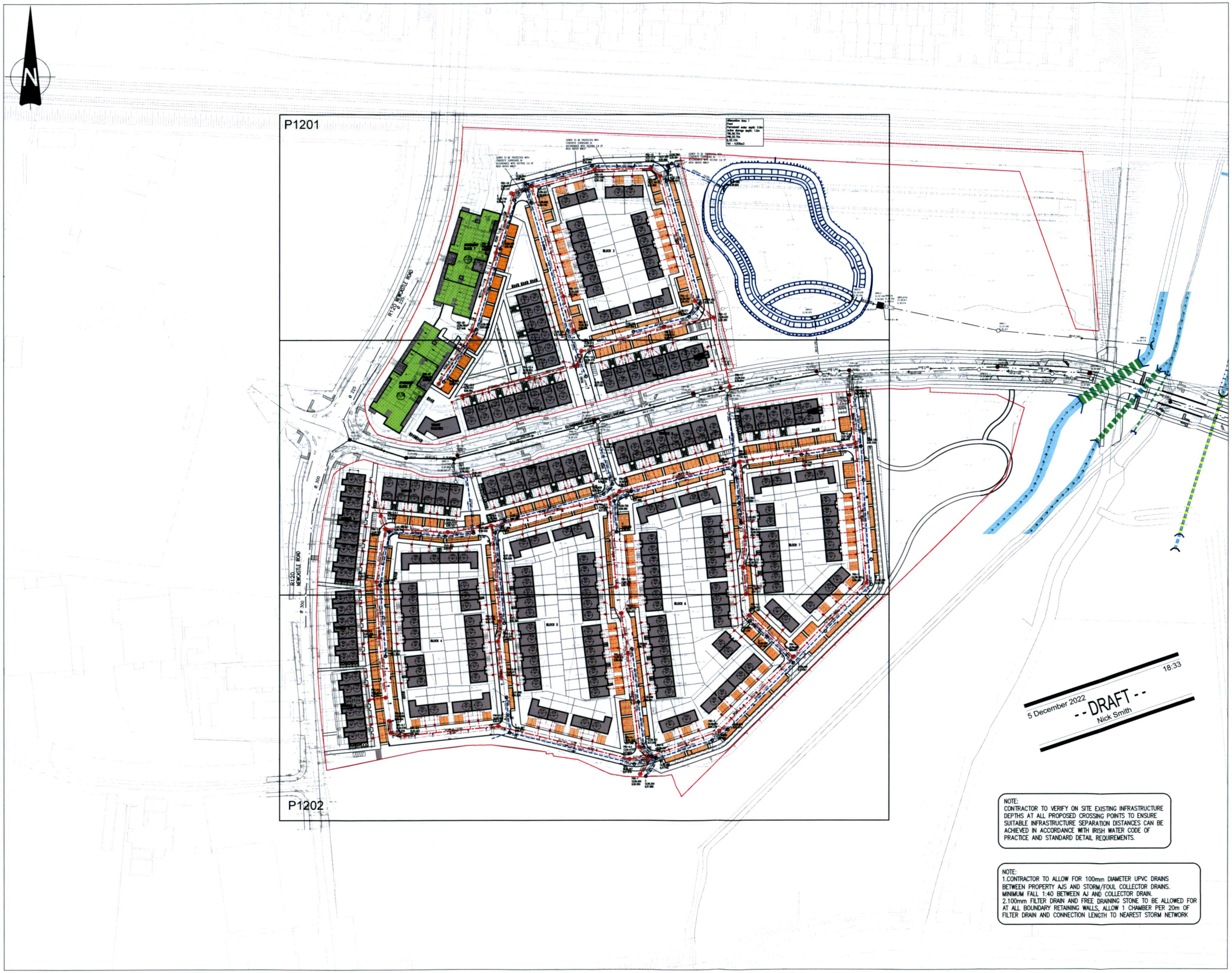
Additional Comments

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

Irish Water cannot guarantee that its Network in any location will have the capacity to deliver a particular flow rate and associated residual pressure to meet the requirements of the relevant Fire Authority, see Section 1.17 of Water Code of Practice.

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

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.



NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE CONSTRUCTED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS. THE CODE OF PRACTICE AND STANDARD DETAILS ARE AVAILABLE TO DOWNLOAD FROM THE IRISH WATER WEBSITE AT WWW.WATER.IE/CONNECTIONS/DEVELOPER-SERVICES/ WHERE THE DETAILS CONTAINED ON THIS DRAWING DIFFER FROM THE IRISH WATER CODE OF PRACTICE OR STANDARD DETAILS THIS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY. IRISH WATER STANDARDS WILL TAKE PRECEDENCE.

NOTES:

ALL PROPOSED PUBLIC STORM WATER DRAINAGE WORKS TO BE IN ACCORDANCE WITH FINGAL COUNTY COUNCIL'S REQUIREMENTS FOR TAKING IN CHARGE AND IN ACCORDANCE WITH THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS.

ALL PROPOSED PUBLIC FOUL WATER DRAINAGE WORKS TO BE IN ACCORDANCE WITH IRISH WATER REQUIREMENTS.

ALL PRIVATE DRAINAGE WORKS SHALL BE IN ACCORDANCE WITH THE BUILDING REGULATIONS PART H.

ALL COVER LEVELS ARE INDICATIVE ONLY AND SHOULD BE SET TO SUIT THE FINISHED ROAD OR PAVED LEVEL. LEVELS IN REAR GARDENS HAVE BEEN ASSUMED AS STRAIGHT GRADE TO ADJACENT BOUNDARY FROM FFL – 150mm. EXTERNAL LEVELS TO BE CONFIRMED BY ARCHITECT

GRAVITY SEWER PIPE MATERIAL TYPES

WASTEWATER PIPE MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 3.13 OF THE IRISH WATER CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE.

THE TYPES AND FITTINGS OUTLINED HEREIN SHALL BE USED IN THE CONSTRUCTION OF THE GRAVITY SEWERS. PIPE MATERIAL SHOULD NOT CHANGE BETWEEN MANHOLES. THE LIST BELOW DOES NOT APPLY TO PIPES INSTALLED BY PIPE JACKING OR MICRO TUNNELLING.

CONCRETE: CONCRETE SEWER PIPES WITH SPIGOT AND SOCKET JOINTS AND RUBBER RING FITTINGS SHALL COMPLY WITH IS EN 1916 (2002), BS 5911, PART 1 (2002 –2010) AND IS 6 (2004) OR EQUIVALENT STANDARD, STRENGTH CLASS 120 WITH MINIMUM CRUSHING LOADS IN ACCORDANCE WITH TABLE 8 OF BS 5911–1 (20022010).

ALL PIPES AND FITTINGS SHALL HAVE GASKET TYPE JOINTS OF SPIGOT AND SOCKET OR REBATED FORM (PIPE DIAMETERS 225MM AND ABOVE).

THERMOPLASTIC STRUCTURED WALL PIPES: THERMOPLASTIC STRUCTURED WALL PIPES SHALL COMPLY WITH THE PROVISIONS OF IS EN 13476 (2007/2009). PIPES TO BE OF STIFFNESS CLASS 8KN/M2 AND TO BE CAPABLE OF DEMONSTRATING A JETTING RESISTANCE OF 2,600 PSI (180 BAR) WITHOUT DAMAGE WHEN TESTED IN ACCORDANCE WITH SECTION 3.3 OF WIS 4–35–01 (2008). (SEWER DIAMETERS 150MM UP TO 450MM, SERVICE CONNECTIONS OF 100MM DIAMETER).

UNPLASTICISED PVC: UNPLASTICISED PVC PIPES AND FITTINGS SHALL COMPLY WITH THE PROVISIONS IS EN 1401 2009/2012. PIPES TO BE APPLICATION AREA CODE 'UD', STIFFNESS CLASS 8KN/M2. PROVISION FOR JETTING SHALL BE BASED ON THE WRC SEWER JETTING CODE OF PRACTICE, JUNE 1997. PIPES TO BE CAPABLE OF RESISTING A MAXIMUM JETTING PUMP PRESSURE OF 2,600PSI (180 BAR) WITHOUT DAMAGE. (SEWER DIAMETERS 150MM UP TO 450MM, SERVICE CONNECTIONS OF 100MM DIAMETER);

OTHER: THE USE OF ALTERNATIVE PIPE TYPES AND MATERIALS WILL REQUIRE THE PRIOR WRITTEN AGREEMENT OF IRISH WATER.

WHERE 1.2m COVER TO FOUL WATER PIPE SOFFIT IS NOT ACHIEVABLE IN ROADWAYS, CONCRETE SURROUND SHALL BE PROVIDED IN ACCORDANCE WITH STD–WW–08 OF WASTEWATER INFRASTRUCTURE STANDARD DETAILS.

SERVICE LAYOUT DISTANCES:

HORIZONTAL AND VERTICAL SERVICE LAYOUT DISTANCES SHALL BE AS PER IRISH WATER STANDARD DETAIL STD–WW–05.

THE EXTERNAL FACE OF MANHOLES SHALL BE AT LEAST 0.5m FROM KERB LINE.

RESTRICTIONS ON PLANTING:

PLANTING ADJACENT TO WASTEWATER INFRASTRUCTURE SHALL BE IN COMPLIANCE WITH IRISH WATER STANDARD DETAILS STD–WW–06 AND STD–WW–06A.

NOTE:
CONTRACTOR TO VERIFY ON SITE EXISTING INFRASTRUCTURE DEPTHS AT ALL PROPOSED CROSSING POINTS TO ENSURE SUITABLE INFRASTRUCTURE SEPARATION DISTANCES CAN BE ACHIEVED IN ACCORDANCE WITH IRISH WATER CODE OF PRACTICE AND STANDARD DETAIL REQUIREMENTS.

NOTE:
1.CONTRACTOR TO ALLOW FOR 100mm DIAMETER UPVC DRAINS BETWEEN PROPERTY AJS AND STORM/FOUL COLLECTOR DRAINS. MINIMUM FALL 1:40 BETWEEN AJ AND COLLECTOR DRAIN.
2.100mm FILTER DRAIN AND FREE DRAINING STONE TO BE ALLOWED FOR AT ALL BOUNDARY RETAINING WALLS, ALLOW 1 CHAMBER PER 20m OF FILTER DRAIN AND CONNECTION LENGTH TO NEAREST STORM NETWORK

1:1000	0		20.0		40.0		60.0		80.0		100.0m
1:1	0	10	20	30	40	50	60	70	80	90	100

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REV.	DATE	AMENDMENT	DRN	APPD
A	05/12/22	REVISED TO SUIT COMMENTS FROM IRISH WATER	NS	RM

STATUS **PLANNING**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 K7W7 IRELAND.
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CLIENT QUINTAIN
ARCHITECT BKD ARCHITECTS
PROJECT CLONBURRIS
TITLE DRAINAGE GENERAL ARRANGEMENT

DRAWN	DESIGNED	APPROVED	DATE
MS	RM	MD	NOV 2022
SCALE 1:1000 @ A1	JOB NO. 21–055	DRG. NO. P1200	REVISION A

NOTE:
ALL INDIVIDUAL PRIVATE FOUL WATER DRAINS TO BE 100ø PIPES, MIN AT 1/60, MAX AT 1/30.
ALL PRIVATE SURFACE WATER DRAINS TO BE 150ø PIPES.
ALL COLLECTOR FOUL WATER DRAINS TO BE 150ø PIPES.

NOTE:
PIPE MATERIAL SPECIFICATION AS PER NOTES ON GENERAL ARRANGEMENT DRAWING NO. P1200.

LEGEND

- EX XXXø @ 1/XXX — EXSX CL X IL X — EXISTING SURFACE WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
- EX XXXø @ 1/XXX — EXFX CL X IL X — EXISTING FOUL WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
- XXXø @ 1/XXX — FX CL X IL X — PROPOSED FOUL WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
- PROPOSED INSPECTION CHAMBER
- XXXø @ 1/XXX — SX CL X IL X — PROPOSED SURFACE WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
- PROPOSED GULLY AND 150ø GULLY PIPE, DOUBLE GULLY AT LOW POINTS
- PERMEABLE PAVING
- PROPOSED GREEN ROOF MIN 60% COVERAGE

5 December 2022 18:25
- - DRAFT - -
Nick Smith

APPARATMENTS BLOCKS TO DRAIN TO ADJACENT FOUL VIA INTERNAL DRAINAGE FROM CAR PARK. INTERNAL DRAINAGE TO BE DESIGNED AT DETAIL DESIGN STAGE

Attenuation Area 1
Pond
Permanent water depth: 0.6m
Active storage depth: 1.0m
TWL:56.704
PWL:55.704
IL:55.104
Vol = 4,930m3

APPROXIMATE LOCATION OF PROPOSED HEADWALL IL 55.805

FOUL WATER CONNECTION TO PROPOSED NEW MANHOLE ON EXISTING LINE

FOUL WATER CONNECTION TO EXISTING SPUR

PROPOSED FOUL & STORM WATER SPUR NOT REQUIRED

PROPOSED FOUL & STORM WATER SPURS NOT REQUIRED

PROPOSED FOUL WATER SPUR NOT REQUIRED

SEWER TO BE PROTECTED WITH CONCRETE SURROUND IN ACCORDANCE WITH SECTION 3.9 OF IRISH WATER WWCP

APARTMENT BLOCK 1
APARTMENT BLOCK 2
TENANT FACILITIES
BLOCK 3
BLOCK 7
TERRACE 1
TERRACE 2
TERRACE 3
TERRACE 4
TERRACE 7
TERRACE 8
TERRACE 9
TERRACE 10
ROAD 1
ROAD 2
ROAD 3
ROAD 4
ROAD 5
ROAD 6
CLONBURRIS NEW LINK STREET / AVENUE
R120 NEWCASTLE ROAD

NOTES:

DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

ALL PROPOSED PUBLIC STORM WATER DRAINAGE WORKS TO BE IN ACCORDANCE WITH FINGAL COUNTY COUNCIL'S REQUIREMENTS FOR TAKING IN CHARGE AND IN ACCORDANCE WITH THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS.

ALL PROPOSED PUBLIC FOUL WATER DRAINAGE WORKS TO BE IN ACCORDANCE WITH IRISH WATER REQUIREMENTS.

ALL PRIVATE DRAINAGE WORKS SHALL BE IN ACCORDANCE WITH THE BUILDING REGULATIONS PART H.

ALL COVER LEVELS ARE INDICATIVE ONLY AND SHOULD BE SET TO SUIT THE FINISHED ROAD OR PAVED LEVEL. LEVELS IN REAR GARDENS HAVE BEEN ASSUMED AS STRAIGHT GRADE TO ADJACENT BOUNDARY FROM FFL – 150mm. EXTERNAL LEVELS TO BE CONFIRMED BY ARCHITECT

GRAVITY SEWER PIPE MATERIAL TYPES

WASTEWATER PIPE MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 3.13 OF THE IRISH WATER CODE OF PRACTICE FOR WASTEWATER INFRASTRUCTURE.

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SERVICE LAYOUT DISTANCES:

HORIZONTAL AND VERTICAL SERVICE LAYOUT DISTANCES SHALL BE AS PER IRISH WATER STANDARD DETAIL STD–WW–05.

THE EXTERNAL FACE OF MANHOLES SHALL BE AT LEAST 0.5m FROM KERB LINE.

RESTRICTIONS ON PLANTING:

PLANTING ADJACENT TO WASTEWATER INFRASTRUCTURE SHALL BE IN COMPLIANCE WITH IRISH WATER STANDARD DETAILS STD–WW–06 AND STD–WW–06A.
1.

1:500 0 10.0 20.0 30.0 40.0 50.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD
A	05/12/22	REVISED TO SUIT COMMENTS FROM IRISH WATER	NS	RM

STATUS **PLANNING**

Waterman Moylan
Engineering Consultants
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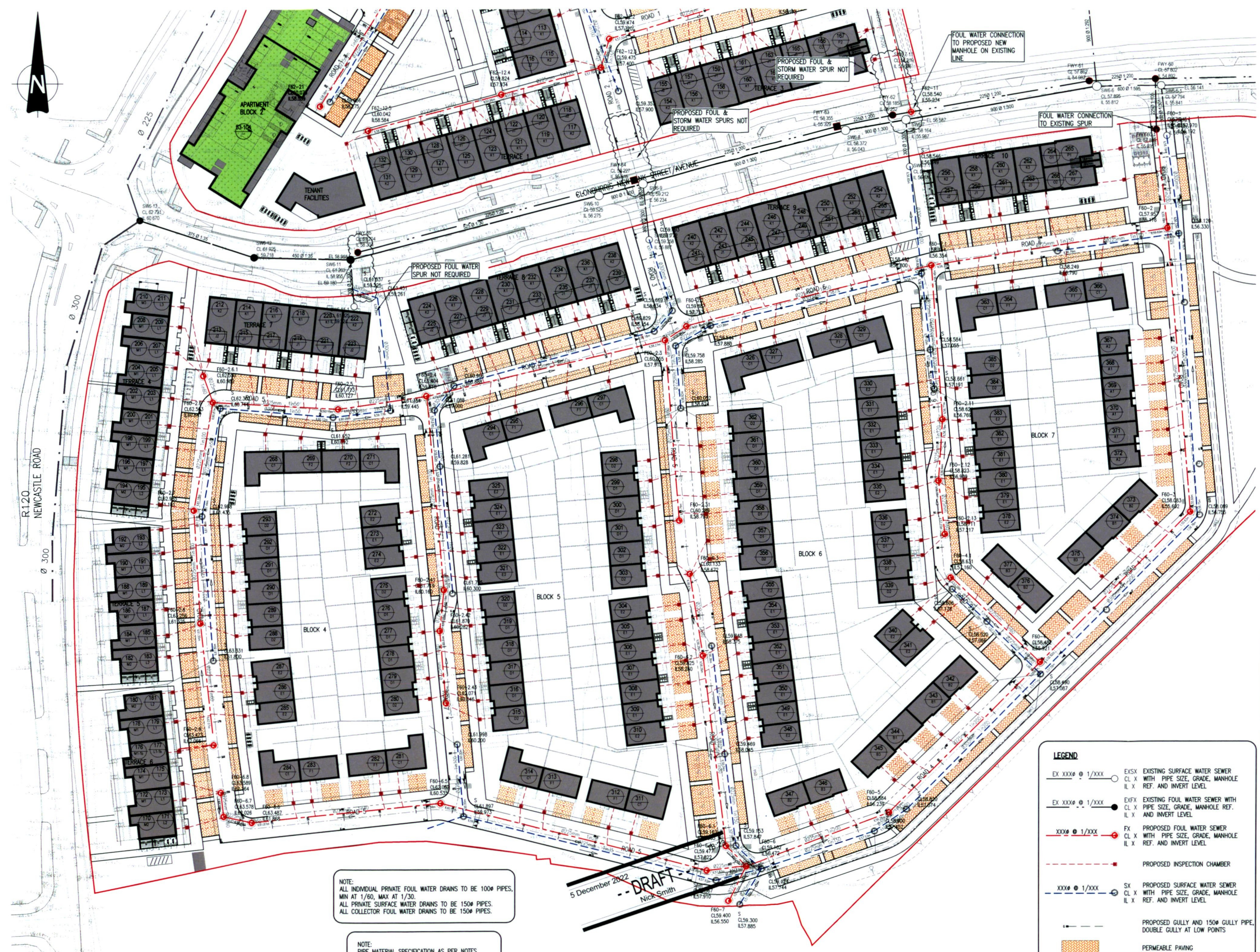
CLIENT	QUINTAIN
ARCHITECT	BKD ARCHITECTS
PROJECT	CLONBURRIS
TITLE	DRAINAGE LAYOUT SHEET 1 OF 2

DRAWN	DESIGNED	APPROVED	DATE
MS	RM	MD	NOV 2022
SCALE 1:500 @ A1	JOB NO. 21–055	DRG. NO. P1201	REVISION A



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NOTE:
PIPE MATERIAL SPECIFICATION AS PER NOTES ON GENERAL ARRANGEMENT DRAWING NO. P1200.

NOTES:

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SERVICE LAYOUT DISTANCES:

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RESTRICTIONS ON PLANTING:

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1.

1:500 0 10.0 20.0 30.0 40.0 50.0m
1:1 0 10 20 30 40 50 60 70 80 90 100

LEGEND

EX XXXø @ 1/XXX	EXSX CL X IL X	EXISTING SURFACE WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
EX XXXø @ 1/XXX	EXFX CL X IL X	EXISTING FOUL WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
XXXø @ 1/XXX	FX CL X IL X	PROPOSED FOUL WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
		PROPOSED INSPECTION CHAMBER
XXXø @ 1/XXX	SX CL X IL X	PROPOSED SURFACE WATER SEWER WITH PIPE SIZE, GRADE, MANHOLE REF. AND INVERT LEVEL
		PROPOSED GULLY AND 150ø GULLY PIPE, DOUBLE GULLY AT LOW POINTS
▨		PERMEABLE PAVING
🟩		PROPOSED GREEN ROOF MIN 60% COVERAGE

Ordnance Survey Ireland

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REV.	DATE	AMENDMENT	DRN	APPD
A	05/12/22	REVISED TO SUIT COMMENTS FROM IRISH WATER	NS	RM

STATUS **PLANNING**

Waterman Moylan
Engineering Consultants
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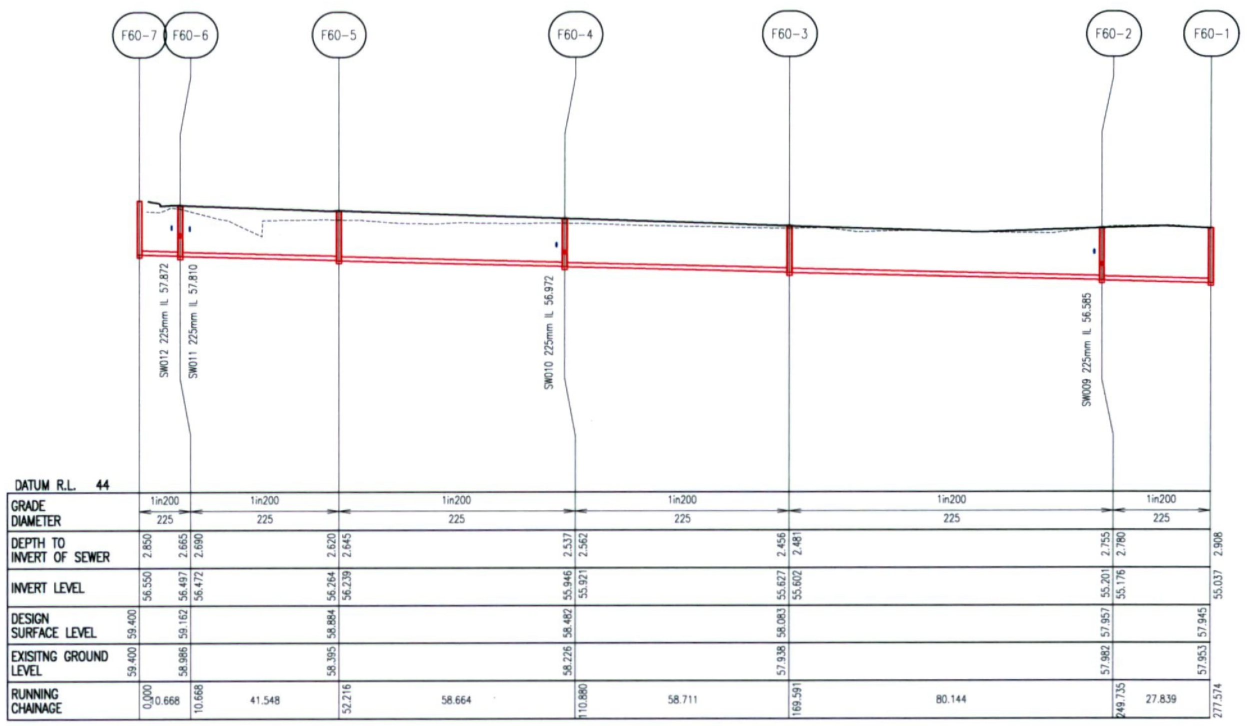
CLIENT QUINTAIN
ARCHITECT BKD ARCHITECTS
PROJECT CLONBURRIS
TITLE DRAINAGE LAYOUT SHEET 2 OF 2

DRAWN	DESIGNED	APPROVED	DATE
MS	RM	MD	NOV 2022
SCALE	JOB NO.	DRG. NO.	REVISION
1:500 @ A1	21–055	P1202	A

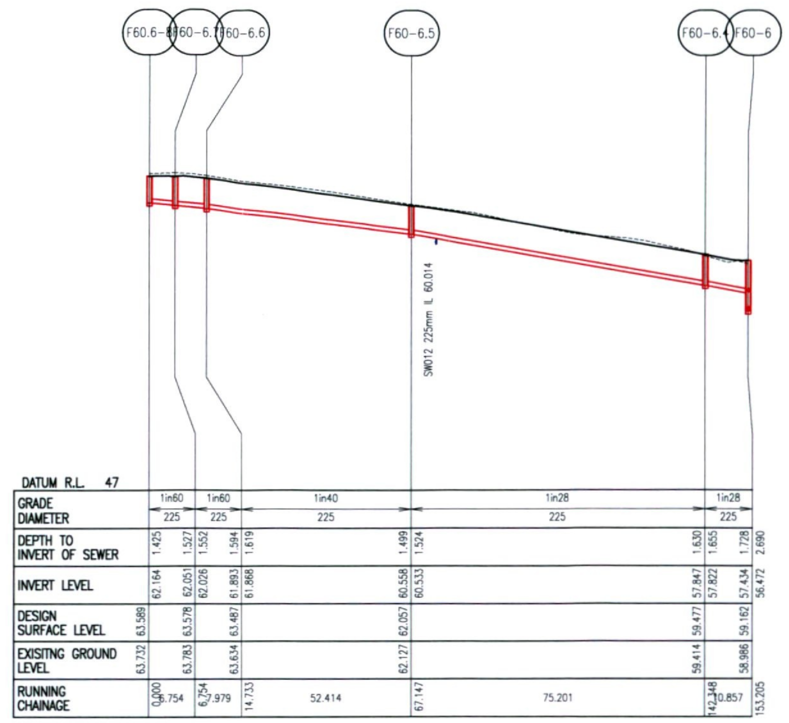
Dec 05, 2022 - 6:23pm Drawing Location: M:\Projects\21\21-055 - Clonburris\Drawings\Waterman Moylan\Civil\Planning\Autocad Drawings\21-055-P1201-P1202 Drainage Layout.dwg

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.



FS-001



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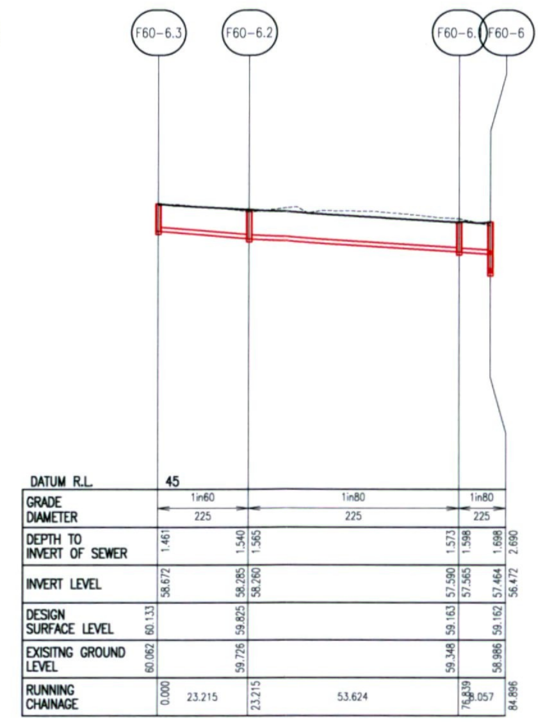
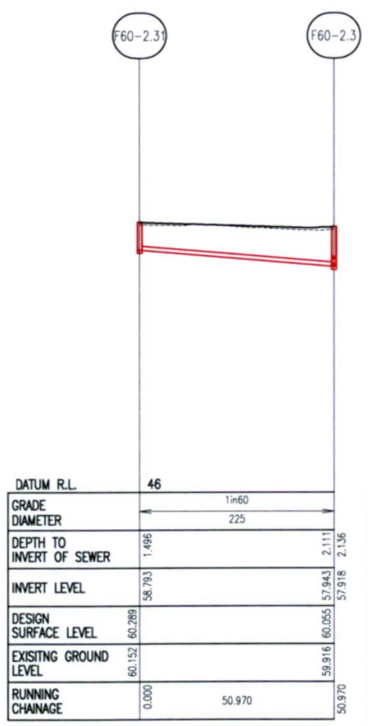


FS003

5 December 2022 18:26
- - DRAFT - -
Nick Smith



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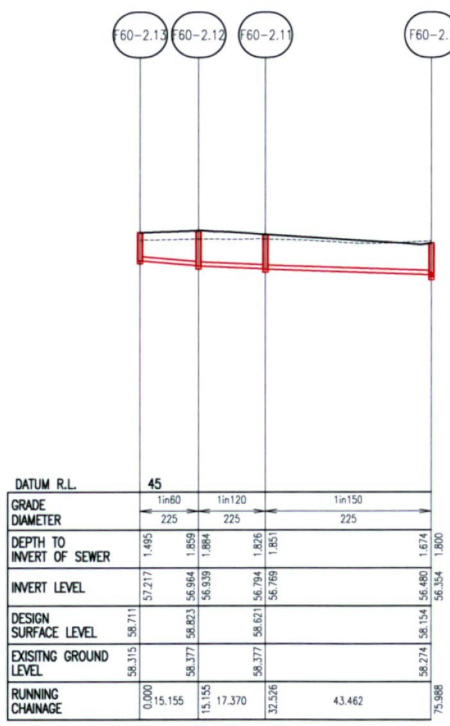

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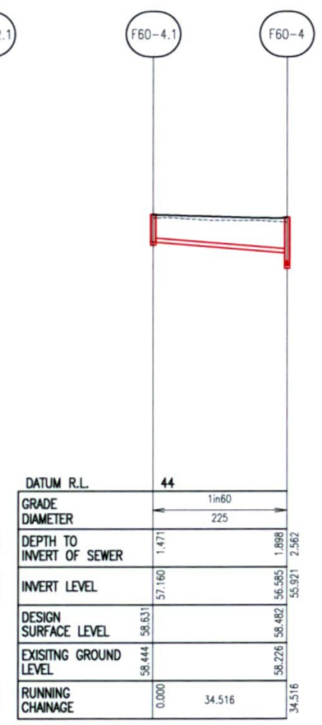
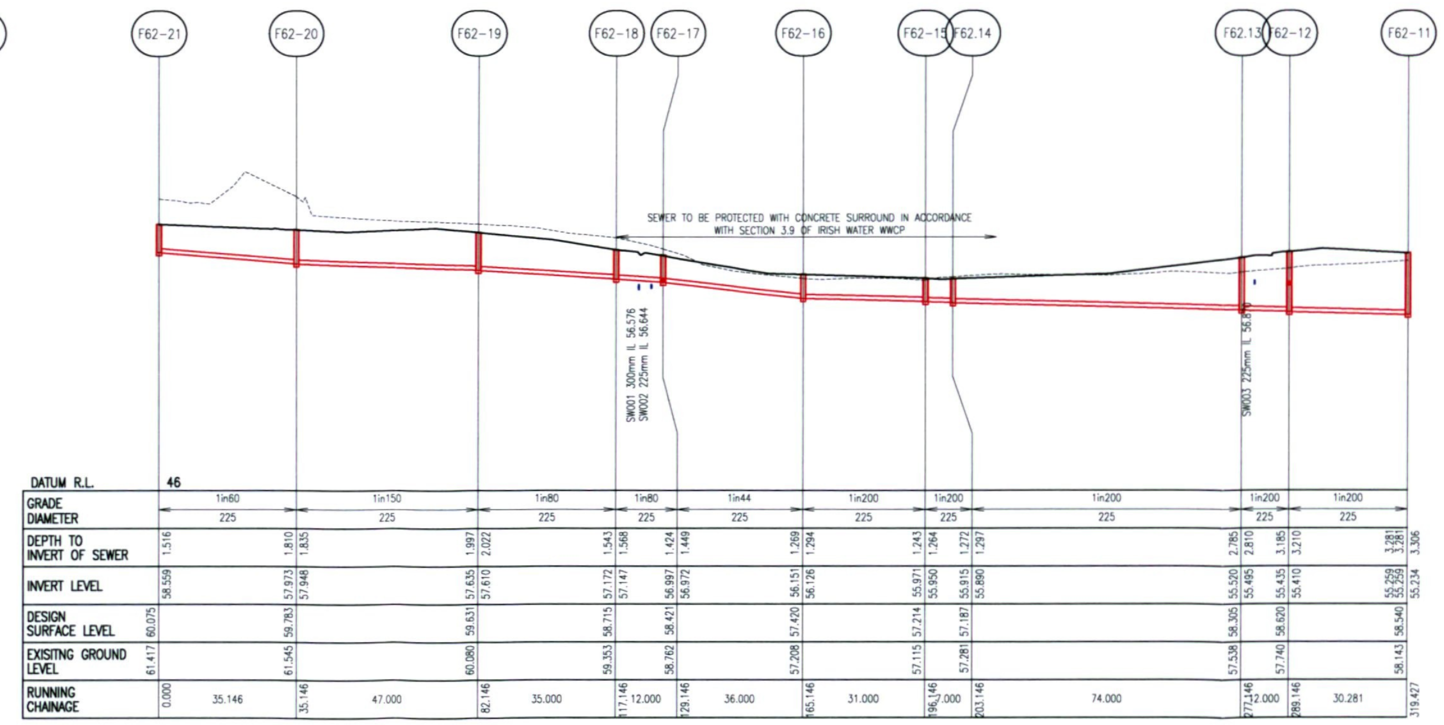


FS008



FW001

REV.	DATE	AMENDMENT	DRN	APPD
A	05/12/22	REVISED TO SUIT COMMENTS FROM IRISH WATER	NS	RM

STATUS **PLANNING**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 K7W7 IRELAND.
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CLIENT **QUINTAIN**

ARCHITECT **BKD ARCHITECTS**

PROJECT **CLONBURRIS**

TITLE **FOUL DRAINAGE LONGITUDINAL SECTIONS SHEET 1 OF 2**

DRAWN	DESIGNED	APPROVED	DATE
MS	RM	MD	NOV 2022
SCALE 1:500 @ A1	JOB NO. 21-055	DRG. NO. P1210	REVISION A

Dec 05, 2022 - 6:26pm Drawing Location: M:\Projects\21\21-055 - Clonburris\Drawings\Waterman Moylan\Civil\Planning\Autocad Drawings\21-055-P1210 & P1211 Foul Sewer Longitudinal Sections.dwg

NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.
3. ALL PIPE MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 3.9 OF THE IRISH WATER CODE OF PRACTICE FOR WATER INFRASTRUCTURE. WATERMAINS SHALL BE EITHER DUCTILE IRON (DI) OR POLYETHYLENE (PE), WITH PE80 OR PE100 RATING (MDPE, HDPEOR HPPE). ALL PLASTIC WATER PIPES SHALL BE BLUE IN COLOUR.
4. ALL SERVICE CONNECTIONS TO BE 25ø HDPE(SDR-17).
5. ALL WATERMAINS UNDER ROADS OR AT ROAD CROSSINGS TO BE HDPE OR DUCTILE IRON.
6. HDPE DISTRIBUTION PIPES TO BE PE-100(SDR-17).
7. DUCTILE IRON PIPES TO IS EN 545 WITH C40 POWER RATING.
8. AIR VALVE AND HYDRANTS COVERS, WHERE LOCATED IN GRASS AREAS, SHALL BE SURROUNDED BY A CONCRETE PLINTH, 200MM ALL ROUND AND 100MM DEEP FORMED WITH C20/25 CONCRETE, 20MM AGGREGATE SIZE, BEDDED IN CLAUSE 804 MATERIAL. THE PLINTH SHALL INCORPORATE MILD STEEL REINFORCED LINKS AND SHALL HAVE BULL-NOSE FINISH AROUND ITS EXTERNAL PERIMETER.
9. THRUST BLOCKS SHALL BE PROVIDED AT EACH BEND ALONG THE COURSE OF THE WATERMAIN.
10. PLANTING ADJACENT TO WATER INFRASTRUCTURE SHALL COMPLY WITH IRISH WATER STANDARD DETAIL STD-W-12A.
11. HORIZONTAL AND VERTICAL SERVICE LAYOUT DISTANCES SHALL BE AS PER IRISH WATER STANDARD DETAIL STD-W-11.
12. FOR ANY BOOSTED WATER SUPPLY SYSTEMS, AN ACCEPTABLE ISOLATION DEVICE SHALL BE PROVIDED USING A CONNECTION VIA AN UNRESTRICTED AIR-GAP DEVICE (AA TYPE DEVICE, IS EN 1717) TO PREVENT BACKFLOW FROM THE INTERNAL WATER DISTRIBUTION SYSTEM TO IRISH WATER'S NETWORK TO PREVENT THE RISK OF BACKFLOW CONTAMINATION
13. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE CONSTRUCTED IN ACCORDANCE WITH THE IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS. THE CODE OF PRACTICE AND STANDARD DETAILS ARE AVAILABLE TO DOWNLOAD FROM THE IRISH WATER WEB SITE AT WWW.WATER.IE/CONNECTIONS/DEVELOPER-SERVICES/ WHERE THE DETAILS CONTAINED ON THIS DRAWING DIFFER FROM THE IRISH WATER CODE OF PRACTICE OR STANDARD DETAILS THIS MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY. IRISH WATER STANDARDS WILL TAKE PRECEDENCE.

14:21
1 December 2022
- - DRAFT - -
Paul Donoghue

1:750	0	15.0	30.0	45.0	60.0	75.0m
1:1	0	10 20	30 40	50 60	70 80	90 100

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REV.	DATE	AMENDMENT	DRN	APPD

STATUS **PLANNING**

Waterman Moylan
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Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT QUINTAIN
ARCHITECT BKD ARCHITECTS
PROJECT CLONBURRIS
TITLE WATERMAIN GENERAL ARRANGEMENT

DRAWN	DESIGNED	APPROVED	DATE
MS	RM	MD	NOV 2022
SCALE 1:750 @ A1	JOB NO. 21-055	DRG. NO. P1300	REVISION

Dec 01, 2022 - 2:21pm Drawing Location: M:\Projects\21\21-055 - Clonburris\Drawings\Waterman Moylan\Civil\Planning\Autocad Drawings\21-055-P1300 Watermain General Arrangement.dwg

NOTES:

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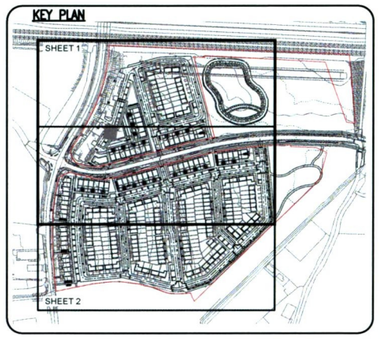
LEGEND

XXXmm ø	PROPOSED HDPE WATERMAIN WITH PIPE SIZE
SV	PROPOSED SLUICE VALVE
H	PROPOSED HYDRANT
AV	PROPOSED AIRVALVE
ScV	PROPOSED SCOURCE VALVE
	PROPOSED BOUNDARY BOX AND CONNECTION
150mm ø	EXISTING WATERMAIN WITH PIPE SIZE
200mm ø	EXISTING WATERMAIN WITH PIPE SIZE

KEY PLAN



OFFLINE SCOUR VALVE WITH NON – RETURN VALVE, TO DISCHARGE INTO SURFACE WATER SYSTEM, IN ACCORDANCE WITH STD–W–30B

BULK FLOW METER IN ACCORDANCE WITH STD–W–26A FOR APARTMENT BLOCK (MORE THAN 40 UNITS)

AIR VALVE AT HIGH POINT AS PER IRISH WATER DETAIL STD–W–22

63mm CONNECTION

CONNECT TO EXISTING 150mm WATERMAIN

CONNECT TO EXISTING 150mm WATERMAIN SPUR

BULK FLOW METER IN ACCORDANCE WITH STD–W–26A

EXISTING WATERMAIN TO BE REMOVED

CLONBURRIS NEW LINK STREET/AVENUE

R120 NEWCASTLE ROAD

APARTMENT BLOCK 1

APARTMENT BLOCK 2

TENANT FACILITIES

BLOCK 3

BLOCK 7

TERRACE 1

TERRACE 2

TERRACE 3

TERRACE 4

TERRACE 5

TERRACE 6

TERRACE 7

TERRACE 9

ROAD 1

ROAD 2

ROAD 4

ROAD 5

ROAD 6

ROAD 7

1 December 2022 13:47

- - DRAFT - -

Paul Donoghue

1:500 0 10.0 20.0 30.0 40.0 50.0m

1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **PLANNING**

Waterman Moylan
Engineering Consultants
BLOCK S, EASTPOINT BUSINESS PARK, ALFIE BYRNE ROAD, DUBLIN D03 KW7 IRELAND.
Tel: (01) 664 8900 Fax: (01) 661 3618
Email: info@waterman-moylan.ie www.waterman-moylan.ie

CLIENT **QUINTAIN**

ARCHITECT **BKD ARCHITECTS**

PROJECT **CLONBURRIS**

TITLE **WATERMAIN LAYOUT SHEET 1 OF 2**

DRAWN	DESIGNED	APPROVED	DATE
MS	RM	MD	NOV 2022
SCALE 1:500 @ A1	JOB NO. 21–055	DRG. NO. P1301	REVISION

BULK FLOW METER IN ACCORDANCE WITH STD-W-26A FOR APARTMENT BLOCK (MORE THAN 40 UNITS)

AIR VALVE AT HIGH POINT AS PER IRISH WATER DETAIL STD-W-22

63mm CONNECTION

APARTMENT BLOCK 2

TENANT FACILITIES

CONNECT TO EXISTING 150mm WATERMAIN

CONNECT TO EXISTING 150mm WATERMAIN SPUR

CLONBURRIS NEW LINK STREET/AVENUE

BULK FLOW METER IN ACCORDANCE WITH STD-W-26A

EXISTING WATERMAIN TO BE REMOVED

CONNECT TO EXISTING 150mm WATERMAIN

CONNECT TO EXISTING 150mm WATERMAIN SPUR

CONNECT TO EXISTING 150mm WATERMAIN

AIR VALVE AT HIGH POINT AS PER IRISH WATER DETAIL STD-W-22

OFFLINE SCOUR VALVE WITH NON – RETURN VALVE, TO DISCHARGE INTO SURFACE WATER SYSTEM, IN ACCORDANCE WITH STD-W-30B

AIR VALVE AT HIGH POINT AS PER IRISH WATER DETAIL STD-W-22

AIR VALVE AT HIGH POINT AS PER IRISH WATER DETAIL STD-W-22

TEMPRORARY 'DEAD END' FOR FUTURE EXTENSION. REFER TO STD-W-05 FOR DETAIL.

TEMPRORARY 'DEAD END' FOR FUTURE EXTENSION. REFER TO STD-W-05 FOR DETAIL.

TEMPRORARY 'DEAD END' FOR FUTURE EXTENSION. REFER TO STD-W-05 FOR DETAIL.

TERRACE 1 TERRACE 2 TERRACE 3 TERRACE 4 TERRACE 5 TERRACE 6 TERRACE 7 TERRACE 8 TERRACE 9

BLOCK 4 BLOCK 5 BLOCK 6 BLOCK 7

ROAD 1 ROAD 2 ROAD 3 ROAD 4 ROAD 5 ROAD 6 ROAD 7

R120 NEWCASTLE ROAD

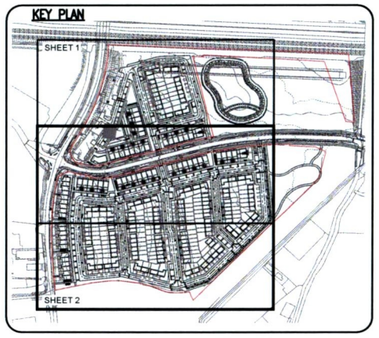
NOTES:

1. DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECTURAL AND ENGINEERING DRAWINGS.

LEGEND

XXXmm ø	PROPOSED HDPE WATERMAIN WITH PIPE SIZE
SV	PROPOSED SLUICE VALVE
H	PROPOSED HYDRANT
AV	PROPOSED AIRVALVE
ScV	PROPOSED SCOURCE VALVE
	PROPOSED BOUNDARY BOX AND CONNECTION
150mm ø	EXISTING WATERMAIN WITH PIPE SIZE
200mm ø	EXISTING WATERMAIN WITH PIPE SIZE

KEY PLAN



1 December 2022 14:05

- - DRAFT - -

Paul Donoghue

1:500 0 10.0 20.0 30.0 40.0 50.0m

1:1 0 10 20 30 40 50 60 70 80 90 100

REV.	DATE	AMENDMENT	DRN	APPD

STATUS **PLANNING**

Waterman Moylan
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CLIENT **QUINTAIN**

ARCHITECT **BKD ARCHITECTS**

PROJECT **CLONBURRIS**

TITLE **WATERMAIN LAYOUT SHEET 2 OF 2**

DRAWN	DESIGNED	APPROVED	DATE
MS	RM	MD	NOV 2022
SCALE 1:500 @ A1	JOB NO. 21-055	DRG. NO. P1302	REVISION

C. GDSDS Attenuation Calculations

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Calculation By:	RW
Approved by:	RM

Project Data

Catchment	Development Area
Project Name	Clonburris
Project Number	21-055
Client	Clear Real Estate Holdings Ltd.
Architect	BKD Architects
Status	Planning 2022
Date	21/11/2022

Description		%	Area
Total Site Area		-	75,219m²
Paved Area	Total	76%	56,988m²
	Drained	100%	56,988m²
Soil Area	Total	24%	18,231m²
	Drained	0%	0m²

Soil Type:	Type 3
SPR Index (from FSR):	0.37
SAAR:	733mm
Rain Data:	Dublin Airport
Climate Change Factor:	20%

Greenfield Runoff:

$Q_{BARrural} = 0.00108 \times Area^{0.89} \times SAAR^{1.17} \times Soil^{2.17}$

Area = 0.07522km² ... *Total site area in km²*
SAAR = 733mm ... *Standard Average Annual Rainfall in mm*
SOIL = 0.37 ... *The "SPR" index from FSR*

Note: Where a site is <0.5km², the $Q_{BARrural}$ formula should be applied for 0.5km² and the result factored based on the ratio of the actual site area and the applied area.

$Q_{BARrural}$ = 0.023m³/s
$Q_{BARrural}$ = 22.805 l/s
$Q_{BARrural}$ = 3.032 l/s/Ha

Return Period	1-year	30-year	100-year
Growth Factor	0.85	2.10	2.60
Q_{BAR} (l/s)	19.38	47.89	59.29
Q_{BAR} (l/s/Ha)	2.58	6.37	7.88
Allowable Discharge	22.81	22.81	22.81

Rainfall Data:

Rain Data From: Dublin Airport
Climate Change Factor: 20%

Duration	Return Period *(Years)*						
(Hours)	1	5	10	20	30	50	100
0.5	9.0	14.4	17.9	22.0	24.2	28.8	33.6
1	12.0	18.6	22.9	27.6	30.4	36.0	42.0
2	15.7	23.8	28.8	34.8	37.6	43.2	50.4
4	21.2	31.2	37.2	43.2	46.4	52.8	61.2
6	25.6	37.2	43.2	50.4	54.4	62.4	70.8
12	32.4	46.8	54.0	63.6	68.0	76.8	86.4

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Calculation By:	RW
Approved by:	RM

Summary

Catchment	Development Area
Project Name	Clonburris
Project Number	21-055
Client	Clear Real Estate Holdings Ltd.
Architect	BKD Architects
Status	Planning 2022
Date	21/11/2022

Summary of GDSDS Calculations:

Criterion 1: River Protection Volume

Interception Volume	**227.95m³**
Treatment Volume	**683.86m³**

Criterion 2: River Regime Protection

1-in-1-Year Storm	1,205.03m³
1-in-30-Year Storm	1,926.21m³
1-in-100-Year Storm	1,048.35m³
Reduction of Long-Term Storage	-1,543.91m³
Volume Required	**2,635.67m³**

... Includes head-loss correction

Criterion 4: River Flood Protection

Long Term Storage *(no interception provided)*	**1,543.91m³**
Long Term Storage *(Interception provided)*	**1,315.96m³**

Total Attenuation Volume Requirement:

1-in-100 Year Storm

1-in-1-Year Storm	1,205.03m³
1-in-30-Year Storm	1,926.21m³
1-in-100-Year Storm	1,048.35m³
Total	**4,179.58m³**

The maximum attenuation volume required is 4,179.58m³

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Calculation By:	RW
Approved by:	RM

Criterion 1
River Protection Volume

Catchment	Development Area
Project Name	Clonburris
Project Number	21-055
Client	Clear Real Estate Holdings Ltd.
Architect	BKD Architects
Status	Planning 2022
Date	21/11/2022

1.1 Interception

Paved surfaces connected to drainage system	*75219m² x 0.757627727 x 1 =* 56,988.00m²	*75,219m² site area* *76% of the site is paved* *100% of the paved area*
Volume of Interception Storage	*56987.999997213m² x 5mm x 0.8 =* **227.95m³**	*Paved area directly drained* *5mm rainfall depth* *80% paved runoff factor*

1.2 Treatment Volume

Paved surfaces draining to river	*75219m² x 0.757627727 x 1 =* 56,988.00m²	*75,219m² site area* *76% of the site is paved* *100% of the paved area*
Volume of Treatment Storage	*56987.999997213m² x 15mm x 0.8 =* **683.86m³**	*Paved area directly drained* *15mm rainfall depth* *80% runoff from paved surfaces*

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Calculation By:	RW
Approved by:	RM

Criterion 2
River Regime Protection

Catchment	Development Area
Project Name	Clonburris
Project Number	21-055
Client	Clear Real Estate Holdings Ltd.
Architect	BKD Architects
Status	Planning 2022
Date	21/11/2022

1-Year Return Period
(Climate Change Factor = 20%)

Duration	Rainfall Rate	Runoff = Rainfall Rate x Area x Soil Type				Discharge		Storage	
		Paved	Green	Total	Volume	Rate	Volume	Rate	Volume
Hours	*(l/s/Ha)*	l/s	l/s	l/s	m³	l/s	m³	l/s	m³
0.5	50.00	284.94	0.00	284.94	512.9	22.81	41.0	262.13	471.8
1	33.33	189.96	0.00	189.96	683.9	22.81	82.1	167.15	601.8
2	21.83	124.42	0.00	124.42	895.9	22.81	164.2	101.62	731.7
4	14.75	84.06	0.00	84.06	1,210.4	22.81	328.4	61.25	882.0
6	11.83	67.44	0.00	67.44	1,456.6	22.81	492.6	44.63	964.0
12	7.50	42.74	0.00	42.74	1,846.4	22.81	985.2	19.94	861.2

30-Year Return Period
(Climate Change Factor = 20%)

Duration	Rainfall Rate	Runoff = Rainfall Rate x Area x Soil Type				Discharge		Storage	
		Paved	Green	Total	Volume	Rate	Volume	Rate	Volume
Hours	*(l/s/Ha)*	l/s	l/s	l/s	m³	l/s	m³	l/s	m³
0.5	134.67	767.44	0.00	767.44	1,381.4	22.81	11.5	744.63	376.3
1	84.43	481.17	0.00	481.17	1,732.2	22.81	34.1	458.36	686.1
2	52.22	297.57	0.00	297.57	2,142.5	22.81	84.2	274.77	1,014.3
4	32.23	183.64	0.00	183.64	2,644.5	22.81	191.7	160.84	1,352.1
6	25.18	143.51	0.00	143.51	3,099.9	22.81	310.5	120.71	1,643.3
12	15.74	89.71	0.00	89.71	3,875.4	22.81	656.6	66.90	1,926.2

100-Year Return Period
(Climate Change Factor = 20%)

Duration	Rainfall Rate	Runoff = Rainfall Rate x Area x Soil Type				Discharge		Storage	
		Paved	Green	Total	Volume	Rate	Volume	Rate	Volume
Hours	*(l/s/Ha)*	l/s	l/s	l/s	m³	l/s	m³	l/s	m³
0.5	186.67	1,063.78	0.00	1,063.78	1,914.8	22.81	-22.3	1,040.97	-1,016.5
1	116.67	664.86	0.00	664.86	2,393.5	22.81	-20.6	642.05	-578.8
2	70.00	398.92	0.00	398.92	2,872.2	22.81	-11.0	376.11	-182.2
4	42.50	242.20	0.00	242.20	3,487.7	22.81	28.0	219.39	269.0
6	32.78	186.79	0.00	186.79	4,034.8	22.81	90.7	163.99	651.9
12	20.00	113.98	0.00	113.98	4,923.8	22.81	262.2	91.17	1,048.4

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Calculation By:	RW
Approved by:	RM

Criterion 4
River Flood Protection

Catchment	Development Area
Project Name	Clonburris
Project Number	21-055
Client	Clear Real Estate Holdings Ltd.
Architect	BKD Architects
Status	Planning 2022
Date	21/11/2022

Vol_{XS} = RD x A x 10 [(PIMP/100 x α0.8) + (1 - (PIMP/100))(β x Soil) - Soil]

Vol_{XS}		*... Extra runoff volume of development over Greenfield runoff*
RD	= 71 mm	*... Rainfall depth of the 100 year, 6 hour event mm*
A	= 7.522 Ha	*... Area of site*
PIMP	= 76%	*... Impermeable area of total site*
α0.8	= 100%	*... Proportion of paved area drained to drainage network or river with 80% runoff*
β	= 60%	*... Proportion of pervious area drained to the network or river*
Soil	= 0.37	*... SPR index*

Vol_{XS} = 1,543.91m³

D. External Quality Audit

Title: **QUALITY AUDIT**

INCLUDING

Road Safety Audit Stage 1-2, Access Audit, Cycle Audit and Walking Audit.

For;

Adamstown Extension – Clonburris SDZ Residential Development

Client: **Waterman Moylan on behalf of Quintain**

Date: **November 2022**

Report reference: **1687R01**

VERSION: **FINAL (13-12-2022)**

Prepared By:

Bruton Consulting Engineers Ltd

Glaspistol
Clogherhead
Drogheda
Co. Louth.

Tel: 041 9881456
Mob: 086 8067075
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BRUTON CONSULTING ENGINEERS

CONTENTS SHEET

Contents

1.0 Introduction

This report was prepared in response to a request from Mr. Richard Miles, Waterman Moylan Consulting Engineers, for a Quality Audit for a proposed residential development as part of the Clonburris Strategic Development Zone (SDZ) on behalf of Quintain.

The Quality Audit has been carried out in accordance with the guidance in the Design Manual for Urban Roads and Streets (DMURS), produced by Department of Transport Tourism and Sport in March 2013 and as updated in June 2019.

This portion of the Quality Audit is a design stage audit and includes a Stage 1&2 Road Safety Audit (in accordance with TII Publication GE-DTY-01024, dated December 2017), an access audit, a walking audit and a cycling audit. (i.e. aspects of a Quality Audit carried out independent of the Design Team and generally included as appendices to the overall Audit)

The Road Safety and Quality Audit Team comprised of;

Team Leader:	**Norman Bruton,** BE CEng FIEI, Cert Comp RSA.
	TII Road safety Auditor approval number: NB 168446
Team Member:	**Owen O'Reilly**, B.SC. Eng Dip Struct. Eng NCEA Civil Dip Civil. Eng CEng MIEI
	TII Auditor Approval no. OO 1291756

This portion of the Quality Audit involved the examination of drawings and other material and a site visit by the Audit Team, on the 28th of April 2022 and a follow up visit by the Audit Team Leader on the 13th of October 2022. The weather at the time of the site visit was dry and the road surface was also dry.

The problems raised in this Quality Audit may belong to more than one of the categories of Audit named above. A table has been provided at the start of Section 3 of this report detailing which category of audit each problem is associated with.

Recommendations have been provided to help improve the quality of the design with regard to the areas described above. A feedback form has also been provided for the designer to complete indicating whether or not he/she will accept those recommendations or provide alternative recommendations for implementation.

The information supplied to the Audit Team is listed in **Appendix A.**

A feedback form for the Designer to complete is contained in **Appendix B.**

A plan drawing showing the problem locations is contained in **Appendix C**.

Bruton Consulting Engineers carried out the Road Safety Audits for the roads infrastructure for the SDZ at planning stage in association with DBFL Consulting Engineers (Report refs 864 R01- Stage 1 RSA and 864 R02 Stage 2 RSA dated January 2022). It is assumed that safety issues raised in the Stage 2 RSA will be mitigated at the construction stage as committed to in the feedback form.

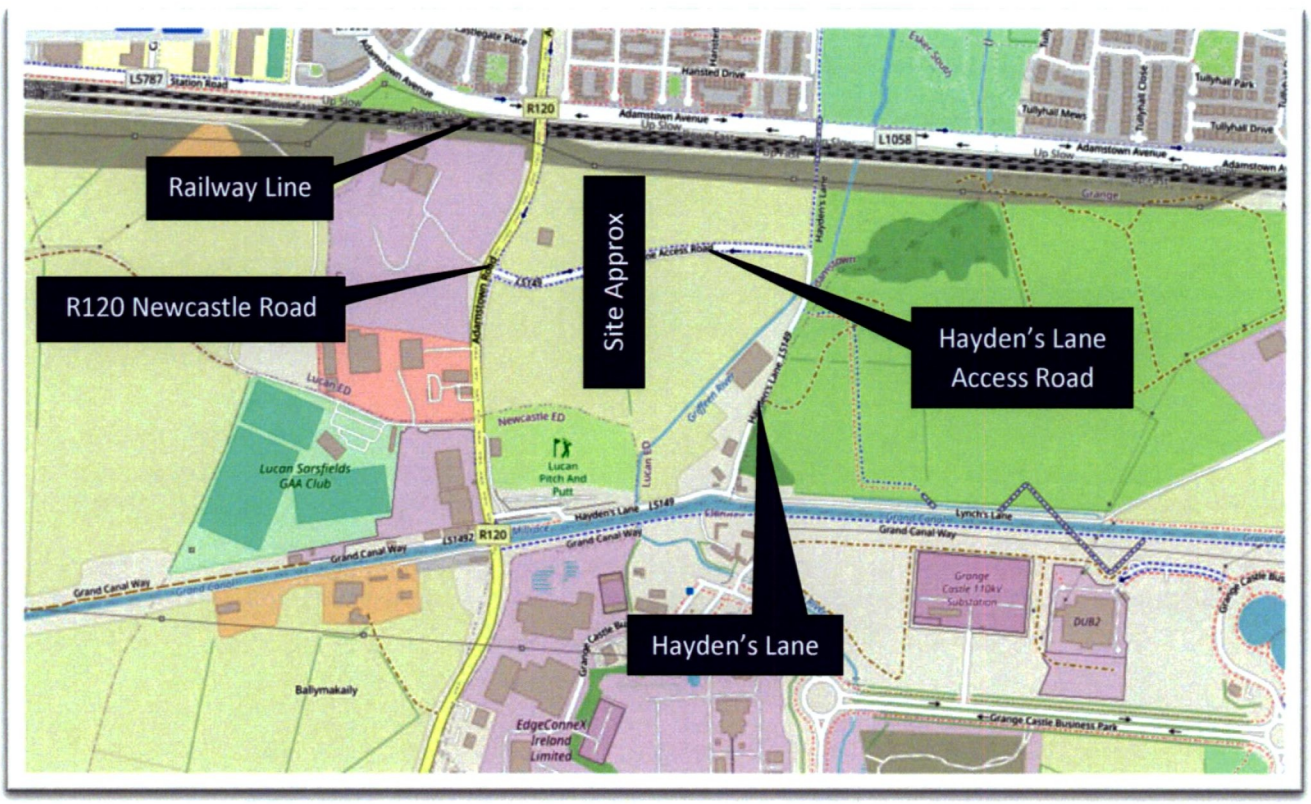
2.0 Background

It is proposed to construct part of the residential scheme associated with Clonburris SDZ. The area involved would connect with the R120 Newcastle Road and would have residential development both north and south of the Clonburris new Link Street/Avenue which follows the alignment of the existing Hayden's Lane Access Road. The site is bounded to the north by the railway line and to the south by Newcastle Pitch and Putt grounds.

The Link road layout, cross section etc. has been determined during the SDZ planning. The focus of this Quality Audit is generally on the development as a stand-alone scheme including the internal layout and connectivity.

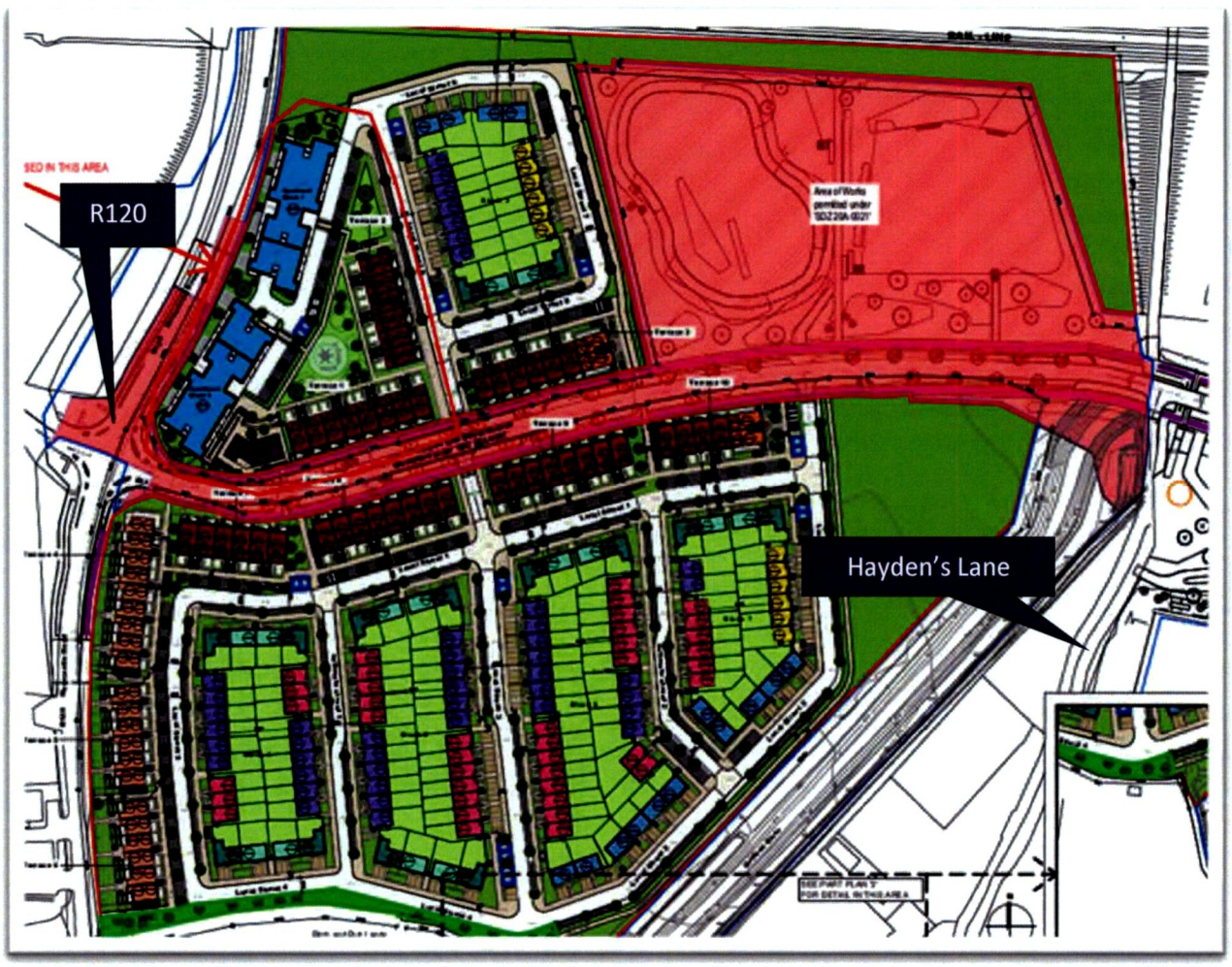
The design speed within the development is 30km/hr.

The site location map is shown below.



Site Location Map (image courtesy of openstreetmap.org

The overall scheme extents is shown in the drawing extract below. (The Link Road including the junction on the R120 is not included in the scope of the Audit)



3.0 Issues Identified in This Quality Audit.

Summary Table of Problem Categories

Problem Reference	Access Audit	Walking Audit	Cycling Audit	Road Safety Audit	Quality Audit
3.1		✓		✓	✓
3.2	✓	✓		✓	✓
3.3	✓		✓	✓	✓
3.4	✓	✓		✓	✓
3.5	✓	✓		✓	✓

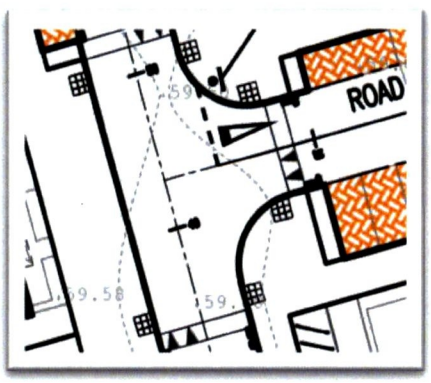
3.1 Problem

LOCATION

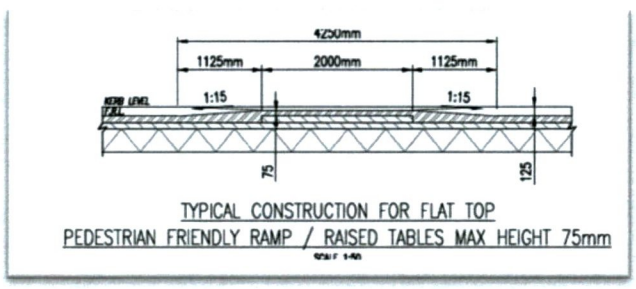
Drawing 21-055 P1010 & P1120 Rev – Nov 2022, Internal junctions.

ISSUE

It is proposed to provide raised tables at many internal junctions. If there is too small of a kerb upstand drivers may cut the corners given the tight radii and mount the footpaths. This could lead to breaking of the tactile paving which would become a trip hazard for pedestrians.



Example only



RECOMMENDATION

It is recommended that suitable kerb upstands be provided at the raised table areas that will make it unattractive for drivers to mount the kerb. The kerbs will need to be flush at the crossing points.

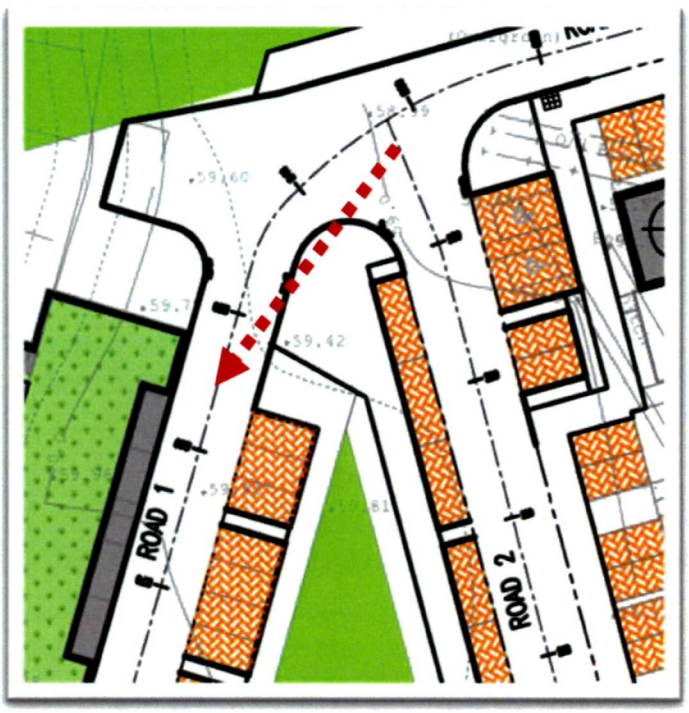
3.2 Problem

LOCATION

Drawing 21-055 P1010 Rev – Nov 2022, Internal junctions, Road 1 and Road 2.

ISSUE

The junction of Road 1 and Road 2 is at an acute approach angle. Drivers giving way at the top of Road 2 might not be able to look over their shoulder to drivers approaching from Road 1 especially if they have limited neck mobility. This could lead to collisions. The priority at the junction is also unclear.



RECOMMENDATION

It is recommended that the junction layout be clearly defined so that adequate visibility is provided and priority is clear.

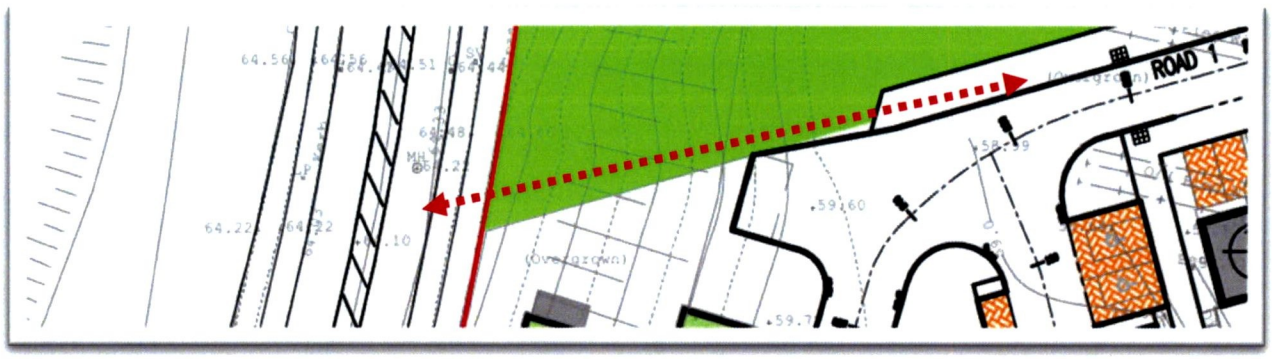
3.3 Problem

LOCATION

Drawing 21-055 P1010 Rev – Nov 2022, R120 Link.

PROBLEM

There will be a desire line for pedestrians and cyclists to travel from the R120 Newcastle road into the development at the most northern point. Without adequate facilities being provided there may be gaps made by those users which could be slips and falls on the embankment in wet conditions.



RECOMMENDATION

It is recommended that the feasibility of providing a pedestrian and cycle link with suitable gradients be assessed.

3.4 Problem

LOCATION

Drawing 21-055 P1010 Rev – Nov 2022, Apartment Block 1.

ISSUE

There is a missing link of footpath between Apartment Block 1 and the section of Road 1 to the east of the junction with Road 2. This could lead to pedestrians travelling on the carriageway which has not been designed as a shared use surface. Visitors parking in front of Apartment Block 1 would also have to travel along the carriageway to the access point to the building.

RECOMMENDATION

It is recommended that the grassed verge to the rear of the perpendicular parking spaces be changed to a footpath and that a suitable crossing of Road 1 be provided.

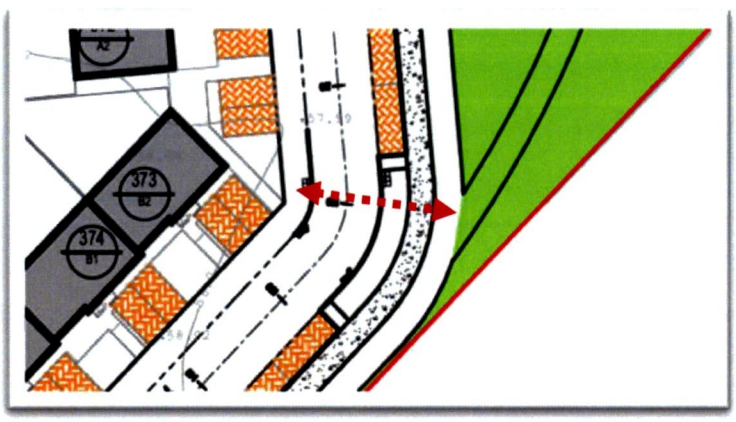
3.5 Problem

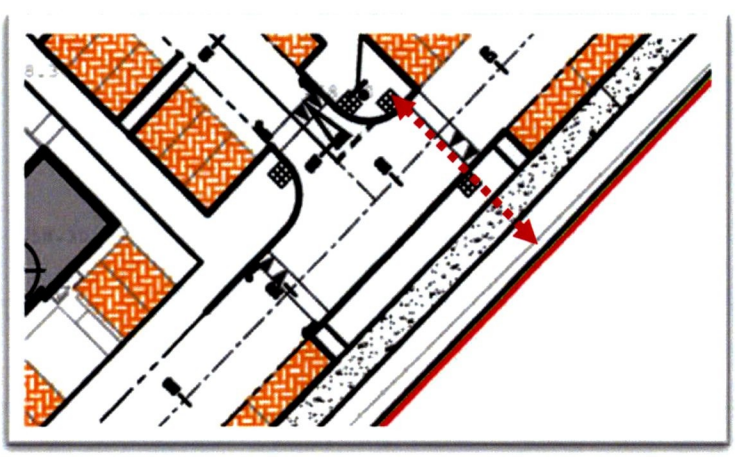
LOCATION

Drawing 21-055 P1010 Rev – Nov 2022, Road 4.

ISSUE

There is no proposed gap in the verge for pedestrians to access the residential units/internal roads at the junction of Road 9 and at the crossing point at house no. 373. This could lead to slips and falls in the grassed verge.





RECOMMENDATION

Provide suitable gaps in the verge at the pedestrian desire lines.

4 Observations

4.1 Observation

It is assumed that the yield signs and markings at the end of Road 1 are graphical errors and will be on the opposite side of the carriageway.

4.2 Observation

Public lighting details have not been provided to the Audit Team.

5 Quality Audit Statement

This portion of the Quality Audit has been carried out in accordance with the guidance given in DMURS and takes into consideration the principles approaches and standards of that Manual.

The quality audit has been carried out by the persons named below who have not been involved in any design work on this scheme as a member of the Design Team.

Norman Bruton	**Signed:**	
(Quality Audit Team Leader)	**Dated:**	**13-12-2022**
Owen O'Reilly	**Signed:**	
(Quality Audit Team Member)	**Dated:**	**13-12-2022**

Appendix A

List of Material Supplied for this Quality Audit;

Drawing 21-055-P1111 Swept Path Layout for a Refuse Vehicle
Drawing 21-055-P1112 Swept Path Layout for a Arial Platform
Drawing 21-055-P1120 Road Details and Sections
Drawing 6268-P-003-004 - Proposed Site & Master Plan-6268-P-004
Drawing 21-055-P1010 Road Markings & Signage
Drawing 21-055-P1100 Road General Arrangement
Drawing 21-055-P1101 Road Layout, Sheet 1 of 2
Drawing 21-055-P1102 Road Layout, Sheet 2 of 2
Drawing 21-055-P1110 Swept Path Layout for a Fire Tender

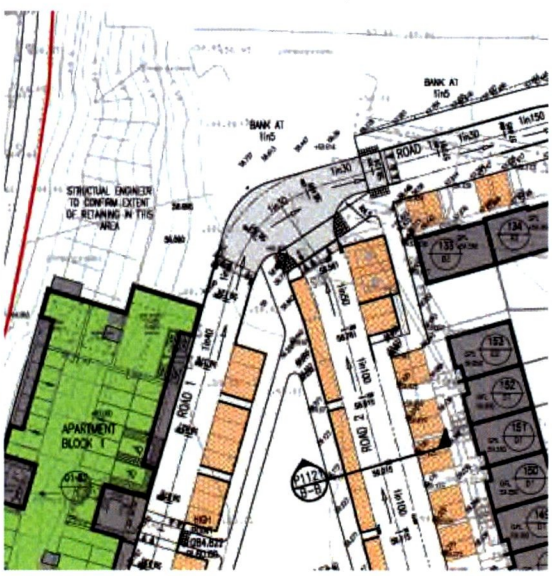
Appendix B

Feedback Form

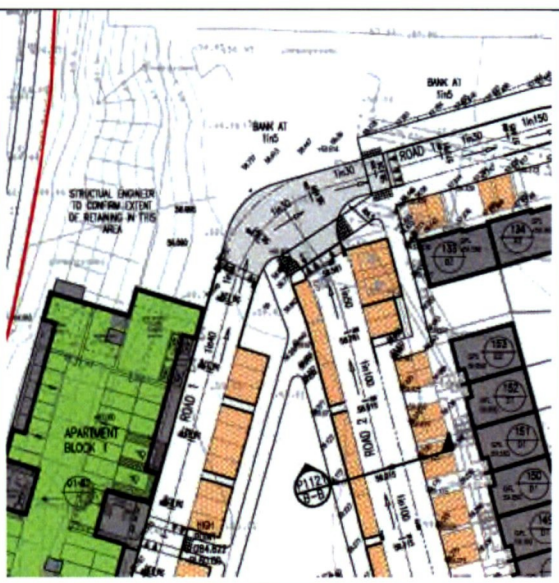
BRUTON CONSULTING ENGINEERS

QUALITY AUDIT FORM – FEEDBACK ON QUALITY AUDIT REPORT

Scheme: Clonburris SDZ, Quintain
Quality Audit- Stage 1 (Planning)
Date Audit (site visit) Completed 13-10-2022

Paragraph No. in Quality Audit Report	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Alternative measures (describe)	Alternative measures accepted by Auditors (Yes/No)
3.1	Yes	Yes	Raised ramp to be 75mm high, leaving 50mm kerb upstand. The kerb is only to be flush 0-6mm at crossing point and raised in between to 50mm height to prevent kerb overrun.	
3.2	Yes	Yes	It is proposed to alter the road layout at the junction between Roads 1 and 2 (shown in image snip below), to improve the angle of approach and provide adequate visibility for all. It is also proposed to provide a raised table across this junction. Priority at this junction is proposed to be clearly defined via the introduction of a STOP on approach to the raised table from road 2. 	
3.3	Yes	Yes, assessment undertaken,	Given both the constraints of the existing site conditions and the layout of the infrastructure planning permission, it is deemed unfeasible	Yes

Paragraph No. in Quality Audit Report	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Alternative measures (describe)	Alternative measures accepted by Auditors (Yes/No)
		alternative measures proposed	to provide a usable cycle connection between the R120 and the railway overbridge. In this regard, we refer you to the feasibility report prepared by BSM. Please refer separate attached draft document. It is propose to provide an alternative off-road cycle connection to cross the railway. This route will pass along the northern edge of the proposed open space (adjacent to the railway boundary) before turning south and connecting to the junction of the overbridge ramp and the link road. The proposed off-road cycle track is shown in orange below. Cyclist connecting to the R120 can follow a combination of Local Streets and segregated cycle lanes along the link road. (Shown in Purple in the image below) 	
3.4	Yes	Yes	We are proposing a raised crossing at the northern end of the scheme, providing a safe VRU linkage point between the apartments and the path on the northern boundary. This is proposed to link with a new footpath that passes through the open space fronting the apartments, affording direct and safe access and desire line path linkages for residents and VRUs.	

Paragraph No. in Quality Audit Report	Problem accepted (yes/no)	Recommended measure accepted (yes/no)	Alternative measures (describe)	Alternative measures accepted by Auditors (Yes/No)
				
3.5	Yes	Yes	Drawings to be updated to show the addition of gaps in the verges for pedestrian access.	

Signed..... Richard Lister **Date** .....**08/12/22**.....

Design Team Leader

Signed.... Norman Bruton **Date**: .....13/12/2022.....

Audit Team Leader

Appendix C

Problem Location Plan.


3.2
3.3
3.4
3.1
Example
3.5 Example
3.5 Example
R120 NEWCASTLE ROAD
CLONBURRIS NEW LINE STREET/AVENUE
APARTMENT BLOCK 1
APARTMENT BLOCK 2
TENNIS FACILITIES
BLOCK 3
BLOCK 4
BLOCK 5
BLOCK 6
BLOCK 7
BLOCK 8
ROAD 1
ROAD 2
ROAD 3
ROAD 4
ROAD 5
ROAD 6
STOP
YIELD
RUS026
YIELD
RUS027
STOP

UK and Ireland Office Locations