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Project: Proposed Residential Development at Coolmucky, Cloughduv, Co. Cork.

Project No: 24004

Document Title: Civil Engineering Report

Document No: 24004-XX-XX-XX-XX-RP-WDG-CE-001

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Walsh Design Group is a registered trading name of Browne Asset Solutions Ltd.
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Registered Office: The Mall, Maryborough Woods, Douglas, Cork. T12 K8YT
Directors: Michael Walsh, Jamie Wallace, Patrick Beckett

Contents

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1.0 Introduction

Walsh design group (WDG) were appointed by Cork County Council to produce a Civil Engineering Report as part of a planning application for the proposed residential development of 8 dwellings at Coolmucky, Cloughduv, Co. Cork.

This report is particularly concerned with the following engineering services:

- Flood Risk Assessment,
- Road design,
- Wastewater Drainage,
- Surface Water Drainage & Drainage Impact Assessment,
- Water Supply.

This report should be read in conjunction with the following accompanying drawings submitted with the planning application:

- 24004-XX-XX-XX-XX-DR-WDG-CE-001 Site Layout – Roads & Levels,
- 24004-XX-XX-XX-XX-DR-WDG-CE-002 Site Layout - Drainage,
- 24004-XX-XX-XX-XX-DR-WDG-CE-003 Site Layout – Water Supply,
- 24004-XX-XX-XX-XX-DR-WDG-CE-005 Site Layout – Proposed SuDS Features,
- 24004-XX-XX-XX-XX-DR-WDG-CE-500 Surface Water Drainage Typical Details,
- 24004-XX-XX-XX-XX-DR-WDG-CE-501 Irish Water Standard Details – Wastewater,
- 24004-XX-XX-XX-XX-DR-WDG-CE-502 Irish Water Standard Details – Water Supply (Sheet 1 of 2),
- 24004-XX-XX-XX-XX-DR-WDG-CE-503 Irish Water Standard Details – Water Supply (Sheet 2 of 2),
- 24004-XX-XX-XX-XX-DR-WDG-CE-504 Construction Details.

1.1. Site Description

This site proposed for development is a greenfield site and is located just south of the centre of Cloughduv village, County Cork, see Figure 1 for the site location. The site area within the application redline boundary is 0.38ha. The ITM grid coordinates at the approximate centre of the site are E545692, N566255.

Figure 1: Google Earth Satellite Photo of Cloughduv.

Figure 2: Google Earth Satellite Photo of the proposed development site.

The land is mostly grass and scrub covered at this time as is evident from the satellite photo of the site shown in Figure 2. The site is relatively flat but has a gentle fall generally from the southwest to the northeast. The highest point surveyed on site was 58.60m on the southern boundary and the lowest parts of the site are along the base of an open roadside ditch which drops to a level of 56.61m just before it leaves the site in the northeast corner.

The field in which the site is located was originally rectangular, but the plot of a dwelling house was taken out of its westernmost corner. The southwestern and southeastern boundaries of the site are shared with agricultural land. The northeastern boundary is shared with a private dwelling and the northwestern boundary is mostly along the edge of the L-2216 public road.

1.2. Proposed Development

The proposed development would consist of 8 dwelling units including 4No. 1 Bed single storey houses, 2No. 2 Bed 2 Storey houses and 2No. 3 Bed 2 Storey houses. A new vehicular access to the site is proposed off the L-2216 local road. The proposed development will also include new roads, drainage, water supply, landscaping, boundary treatments, public lighting, electrical and telecommunications infrastructure and all other site development works entailed in a residential development.

Architectural, Engineering and Landscaping drawings are included in the planning documentation; an outline of the development is shown in the Architect's site layout in Figure 3.

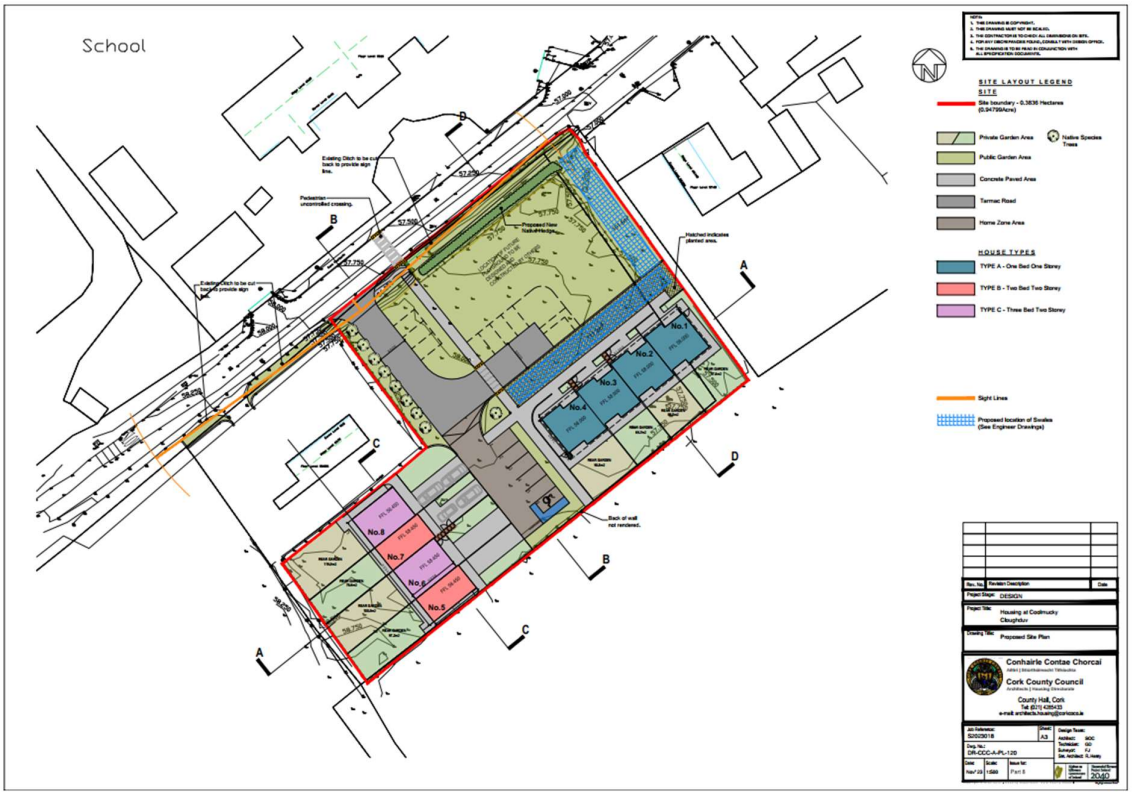

Figure 3: Architect's Site Layout

2.0 Flood Risk

A desktop study of the history of flooding and the probability of flooding at the site was carried out with the intention of assessing the flood risk in accordance with *The Planning System and Flood Risk Management Guideline*s as published by the Department of the Environment, Heritage and Local Government give guidelines on flood risk and development planning.

The guidelines recommend a precautionary, sequential approach to assessing and managing flood risk and, where possible, to avoid development of sites that are at risk.

The sequential approach to flood risk assessment relies on the identification of Flood Zones. These are geographical areas within which the likelihood of flooding is in a particular range. There are three types of flood zones, defined in the guidelines as follows:

Flood Zone A – Where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding),

Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1:100 for river flooding and between 0.1% or 1 in 1000 and 0.5% or 1:200 for coastal flooding),

Flood Zone C - where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood zone C covers all areas of the plan which are not in Zones A or B.

When the flood zone applicable to the site has been identified the guidelines describe the developments that would be appropriate within that zone, considering the level of flood risk involved.

2.1. Flood Maps

The OPW's online resource, Floodmaps.ie, was reviewed to assess the history and probability of all types of flooding at the proposed development site. Figure 4 shows an extract from the online flood map of the area around Cloughduv Village with the proposed site outlined in red.

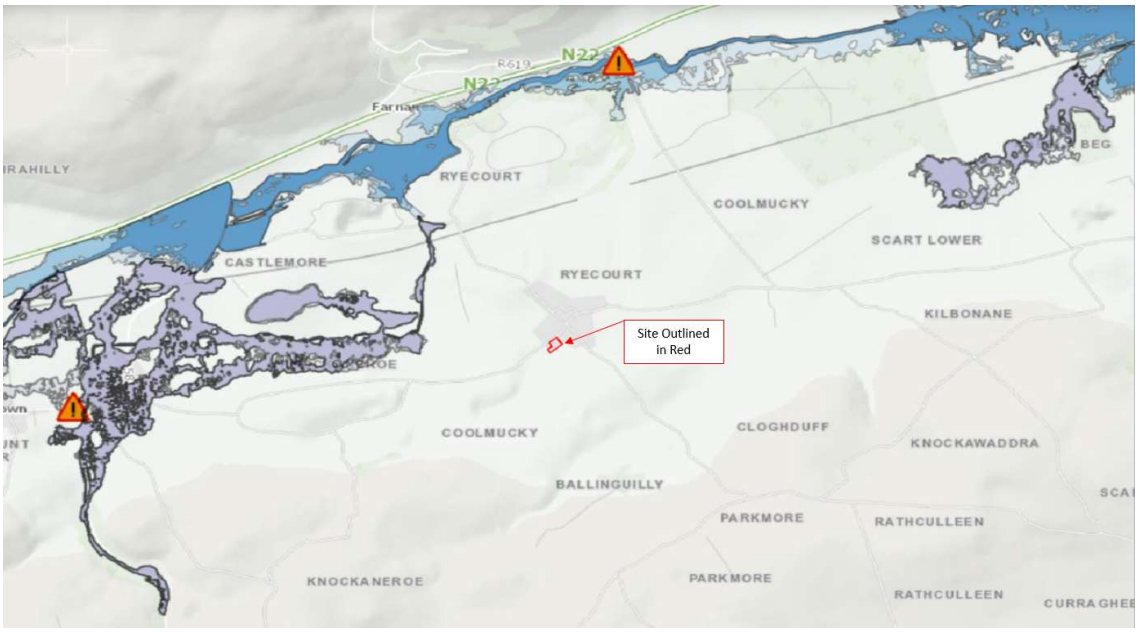

Figure 4: Floodmaps.ie extract map of development site and surrounding area.

The interactive flood map allows the following layers to be switched on to illustrate whether any type of flooding impacts an area:

- CFRAM River Flood Extents with AEP of 10%, 1% and 0.1%,
- CFRAM Coastal Flood Extents with AEP of 10%, 1% and 0.1%,
- NIFM National Indicative Fluvial Mapping – Present day with low and medium probability,
- GSI Groundwater flooding probability Maps with low, medium and high probability,
- Past flood events – indicated with hazard signs on the map and the extent of the recorded flood events shown with a blue outline and dotted hatch pattern.

All of these layers are switched on in the extract shown in Figure 4.

The flood hazard symbol shown directly north of Cloughduv in Figure 4 was recorded on the 19th of November 2009 and the flooding occurred alongside the river Bride and impacted on one dwelling, some pastureland and the L-2206 local road. The hazard symbol shown to the west of Cloughduv is in Crookstown and on the R585 approaching Crookstown. There are multiple reports available on the floodmaps.ie website which recording the flood events and impacts due to the river Bride flooding its banks in the area. Past flood event information is included in Appendix E.

It is clear however that the site lies outside any areas that have flooded in the past or have a probability of flooding in any event, whether fluvial, coastal or groundwater, up to and including a 1 in 1000-year storm. This places the site in flood zone C where residential development is appropriate without requiring a justification test.

3.0 Road Design

The layout of the proposed new roads and how they connect with the L-2216 local road is shown on WDG drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-001.

3.1. Design Guidelines

The proposed roads within the estate have been designed in substantial compliance with the following:

- Design Manual for Urban Roads and Streets (DMURS) - Dept. of Environment and Dept. of Transport Tourism and Sport-2019,
- Recommendations for Site Development Works for housing areas – DOE 1998,

3.2. Road Hierarchy

There are no *Link* roads or 'through roads' proposed in the development. The proposed roads would be considered local roads in the DMURS hierarchy shown in Table 1. Local roads are described as roads that provide access within communities and to *Arterial* and *Link* roads. The local roads in the development will connect with the L-2216 which is considered a link road that will connect the development with Cloughduv Village. The L-2205 connects the village to the arterial N22 national road to the north at Farnanes.

DMURS Description	Roads Act/NRA DMRB	Traffic Management Guidelines	National Cycle Manual
Arterial	National	Primary Distributor Roads	Distributor
Link	Regional (see note 1)	District Distributor Local Collector (see Notes 1 and 2)	Local Collector
Local	Local	Access	Access

Notes

Note 1: Larger Regional/District Distributors may fall into the category of *Arterial* where they are the main links between major centres (i.e. towns) or have an orbital function.

Note 2: Local Distributors may fall into the category of *Local* street where they are relatively short in length and simply link a neighbourhood to the broader street network.

Table 1: DMURS Table 3.1 - Terminology used in DMURS compared with other publications.

It is proposed to use a road width of 5.5m throughout the development. All roads shall be served by at least one footpath with a minimum width of 1.8m and all estate roads shall have a sign posted speed limit of 30km/h.

3.3. Entrance Sightlines

WDG drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-001 includes sightlines drawn at the proposed development's entrance from the L-2216. The sightlines illustrate that a driver leaving the development has a clear view to the near side road edge to the northeast and southwest of at least 49m.

The L-2216 has a sign posted speed limit of 50km/h in this area. The safe stopping distance (SSD) on a bus route with a 50km/h speed limit is 49m according to Table 4.2 of DMURS (2019), see Figure 5.

SSD STANDARDS

Design Speed (km/h)	SSD Standard (metres)
10	7
20	14
30	23
40	33
50	45
60	59

Forward Visibility

Design Speed (km/h)	SSD Standard (metres)
10	8
20	15
30	24
40	36
50	49
60	65

Forward Visibility on Bus Routes

Figure 5: DMURS (2019); Table 4.2, Reduced SSD standards for application within cities towns and villages.

Section 4.4.2 of DMURS (2019) states that a maximum setback or 'X' distance of 2.4m should be used for priority junctions in urban areas as longer setback distances allow higher vehicle speeds through junctions and may encourage more than one vehicle on the minor arm to go for the same gap in traffic on the major arm when it is not ideal that they do so. The shorter setback distances protect pedestrians and other vulnerable road users.

The visibility splay shall be kept clear of any vegetation or obstacle that could block a driver's view of oncoming vehicles or cyclists. Any boundary walls constructed within visibility splays shall be restricted to less than 800mm in height. Similarly, any planting within a visibility splay shall be of a species that will not grow to more than 800mm in height.

Nothing shall be planted or sown within a visibility splay without prior written permission from the Local Authority.

3.4. Shared surfaces and Surface Materials

DMURS encourages the use of raised and shared surfaces which promote integration between pedestrians, cyclists, and drivers. This has been shown to be effective where pedestrian activities are high and vehicle movements are mainly due to lower-level access requirements and circulatory purposes.

DMURS recommends that, where design speeds of 30km/h are desired, periodic changes in the colour and/or texture of the street surfaces should be employed. In this development, a

shared surface is introduced through the raised road section and carparking area and the use of a visual material change in the street surface treatment. The raised surface will be finished in bituminous surfacing with beige coloured chippings to differentiate this area from the normal street surface, finished in standard black bituminous surfacing, see WDG drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-504 for construction details.

The proposed extent of these raised area is shown on WDG drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-001.

3.5. Traffic Calming

It is proposed to limit the vehicle speeds within the development to 30km/h using standard signage and traffic calming measures as recommended by DMURS and the Traffic Management Guidelines (DoELG 2003) to help improve driver behaviour and reduce vehicle speeds.

The more visible traffic calming measure proposed is a low ramp up to the raised road area as shown in WDG drawing No. 24004-XX-XX-XX-XX-DR-WDG-CE-001. This ramp is positioned to reduce the length of straight and level road that would allow a build-up of vehicle speed while also providing a visual indicator that the driver is entering an area where they need to reduce speed.

The ramp to the raised section of roadway shall be constructed in accordance with Diagram 6.34 of The Traffic Management Guidelines. The street level is raised 75mm and finished using bituminous surfacing with beige coloured chippings with 1:15 ramps at each side painted with white triangles (M112) to warn drivers of the elevation change (see Figure 6).

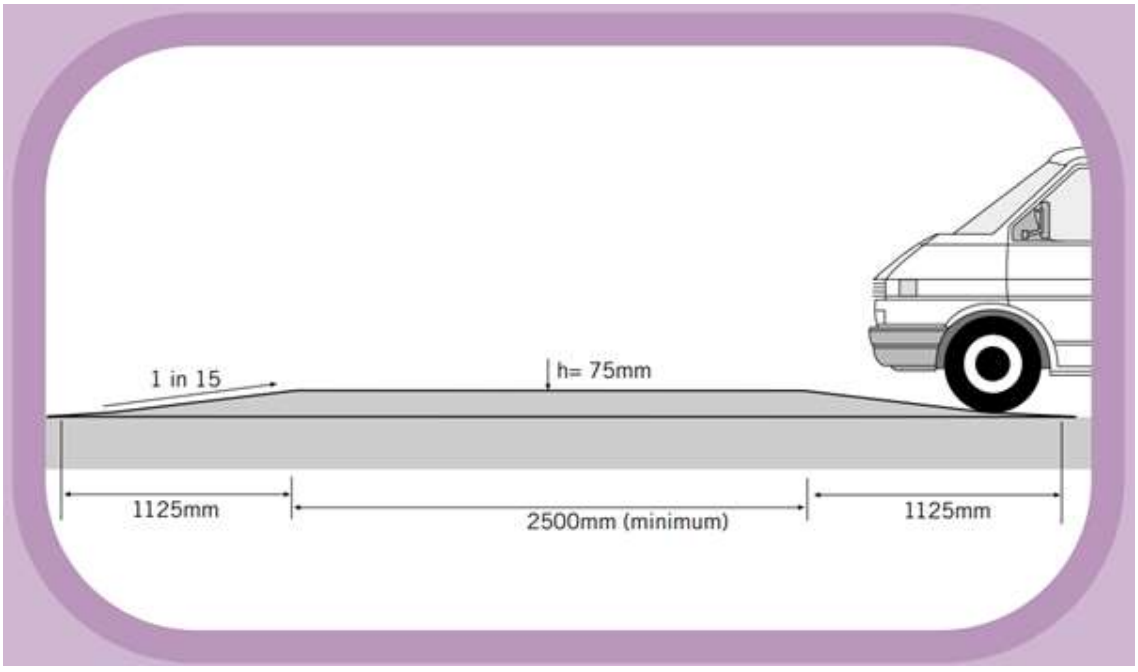

Figure 6: Traffic Management Guidelines, Diagram 6.34 - Raised Tables

3.6. Street Gradients

In accordance with DMURS guidelines, roads have been limited as far as possible, to gradients of 5% or less. As the access road to the development meets the L-2216 it will have a maximum gradient of 2% for 7.0m in accordance with section 2.7 of the *Recommendations for Site Development Works for housing areas – DOE 1998.*

All proposed roads shall have a cross fall of 2.5%. Vertical alignment has been carefully considered to minimise the amount of cut and fill on site.

3.7. Pedestrian Crossings

Pedestrian crossings will be placed at 1 point within the development where there is a natural crossing point with footpaths on both sides of the road, see WDG drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-001. The proposed crossing is an uncontrolled crossing point. The crossing point shall be constructed using dished kerbs to bring the tactile paving to road level in accordance with Diagram 13.1 of the Traffic Management Guidelines 2013, see Figure 7.

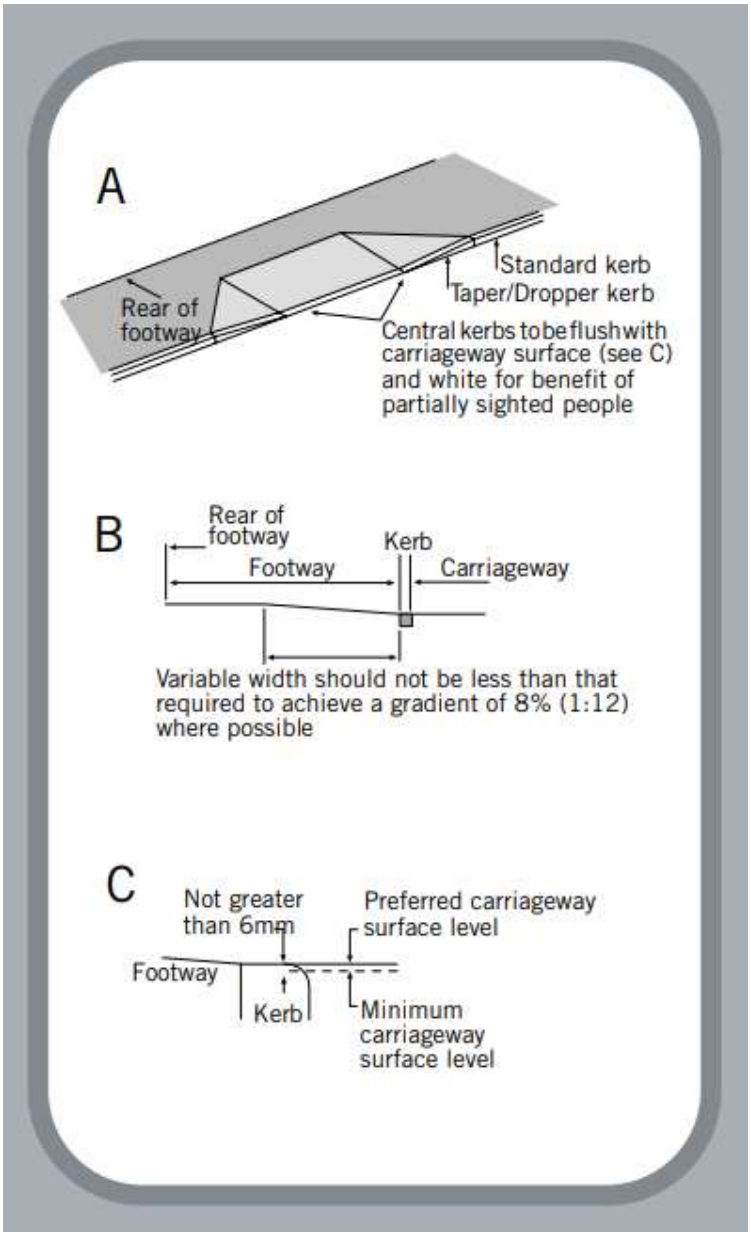

Figure 7: Diagram 13.1 Dished Crossing - Traffic Management Guidelines; DOT, 2013

Buff coloured tactile paving in accordance with Table 13.1 of the Traffic Management Guidelines shall be set in the footpath at the crossing point. Paving slabs measure 400mm x 400mm and shall be laid in a pattern of 3 wide by 2 deep (1200mm wide x 800mm deep) at each crossing point, as illustrated on drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-001.

3.8. Pavement Construction

Road pavement and footpath construction shall be carried out in accordance with the recognised standard; 'Recommendations for Site Development Works for Housing Areas; DoELG 1998'. Roads will be finished in bituminous surfacing and footpaths will be constructed in concrete. See WDG construction details drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-504 for road, footpath, and kerb details.

Road construction assumes a minimum design CBR for the existing ground. The appointed main contractor will be obliged to carry out testing to establish the actual CBR prior to final road design and commencement of road construction.

3.9. Private Driveways & Paving

Each private dwelling plot with car parking included shall have driveway slopes in compliance with Technical Guidance Document M of the Building Regulations. All private parking bays shall be constructed with permeable paving. The permeable paving will allow for some of the surface water to soak into the subsoil and ground water rather than leaving the site via the sewer network which is preferable in terms of SuDS.

3.10. Site Cut and Fill

Prior to any construction works on site the topsoil (approx. 200mm deep) will be stripped from the surface in all areas apart from the large green areas. This topsoil will be stockpiled, according to best practice, on site to be reused in private gardens and landscaped areas.

Stockpiles are to be located, formed and maintained according to best practice. Vegetation and any waste materials are to be removed from storage areas prior to stockpiling. Soils shall be stockpiled in the driest condition possible. Soil will be banked with a maximum side slope of 1 in 2 and grass seeded with a grass/clover mix to minimise soil erosion and help reduce infestation by nuisance weeds. Stockpiles are to be fenced off and have their contents identified using clear signage. No vehicles shall be allowed to pass over stockpiles.

Fill imported onto the site to be placed under buildings shall comply with Technical Guidance Document D of the Building Regulations and NSAI Standard Recommendation 21 (S.R.21). Fill imported for use under roadways shall comply with the Tii Specification for Roadworks Series 600 documents.

4.0 Surface Water Drainage

The proposed storm sewer collection system consists of a 100mm diameter pipe collection network around each house in accordance with TGD part H discharging to 225mm diameter uPVC sewer or larger in the public areas of the development. The surface water network layout is shown in drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-002 and the typical details for the surface water infrastructure are shown on drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-500.

The surface water sewers have been designed using the Causeway Flow design software and the Wallingford procedure for the design and analysis of urban drainage. The surface water system for the development is a single network falling generally from the southwest towards its outfall into the open ditch in the northeast of the site. The flow in the ditch is in the same southwest to northeast direction, towards Cloughduv village.

4.1. Surface Water Design and Simulation Criteria

The storm network's design criteria included:

- maximum rainfall of 50 mm/hr,
- maximum time of concentration of 30 minutes,
- time of entry of 5 minutes,
- minimum cover of 1.2m to pipes under roads,
- M5-60 of 16.9mm (Met Eireann),
- SPR of 0.3.

IGSL Ltd. were contracted by Cork County Council to carry out a site investigation on the site. The soil was noted as being clayey gravelly sand in the trial pit logs and the soil infiltration rates recorded after BRE Digest 365 testing were mixed but relatively good. To classify this soil, Table 5/1 of the NRA, DMRB, Volume 4, Section 2, Part 1 – NRA HD 106/15, was used. The soil would be considered Class S2 with a corresponding SPR of 0.3.

The storm networks were tested by simulating both summer and winter storms with durations of between 15 minutes and 24 hours and return periods of 1, 30 and 100 years with the following criteria:

- Summer volumetric runoff coefficient of 0.75,
- Winter volumetric runoff coefficient of 0.84,
- Areal runoff factor of 1.0,
- Additional flow for climate change of 20%.

The surface water sewer networks have been modelled and each individual pipe run has been designed such that no flooding will occur to individual elements during any storm up to and including 24-hour 100-year return period, summer, and winter storms. In all storm simulations an additional flow of 20% was added to account for future climate change.

(See detailed design in Appendix A to this document).

4.1.1. Allowable Discharge

In accordance with the recommendations of sustainable urban drainage systems (SuDS) the allowable stormwater discharge from the surface water network was calculated by means of the QBAR equation for small rural catchments (< 25 km^2) as indicated in the institute of Hydrology, UK Report No. 124. QBAR is calculated using the following formula:
$QBAR = (0.00108\ [AREA]^{0.89}\ [SAAR]^{1.17}\ [SOIL]^{2.17})$

Where,

QBAR (m^3/sec)	=	Annual peak flow
AREA (km^2)	=	Catchment area
SAAR (mm)	=	Standard annual average rainfall
SOIL	=	Index with values between 0.15 and 0.50

The variables for the sewer network are as follows:

AREA The catchment area of the estate that will have its runoff attenuated is 0.38ha = 0.003836 km^2,

SAAR The standard average rainfall for the site for the period from 1941 to 1970 was obtained from the UKSUDS website and is approximately 1212 mm/year,

SOIL This index was obtained using the Table 5/1 of the DMRB, see Section 4.1 above. Soil Type S2 with a Standard Percentage Runoff (SPR) of 0.3.

For developments smaller than 50ha, the allowable discharge is linearly interpolated from the QBAR value obtained for a 50ha site. Inputting the above data into the QBAR equation, QBAR Actual is calculated as follows:

QBAR	=	$(0.00108\ [0.5]^{0.89}\ [1212]^{1.17}\ [0.3]^{2.17})$
	=	0.173 m^3/sec
	=	173 l/sec

By linear interpolation => Adjusted QBAR = 1.33 l/sec.

4.1.2. Network Design

This single network is designed to fall generally from the southwest to the northeast and exit the development at an outfall headwall into the open roadside ditch in the northeast corner of the site. To reduce the forward flow from the developed site to a maximum of the QBAR greenfield runoff rate of 1.33 l/s a hydrobrake shall be constructed in a manhole prior to the sewer exiting the site. Choking the flow to this rate will result in the requirement for temporary attenuation storage. A certain amount of attenuation storage shall be provided in the roadside swales, but the primary storage element shall be 2 shallow detention basins in the green area of the site. These features are described in more detail in the drainage impact assessment below.

Cloughduv Infiltration Rates			
	(m/sec)	(m/min)	(m/hr)
SW01	5.95E-05	0.0035712	0.214
SW02	1.48E-05	0.0008886	0.053
SW03	1.38E-04	0.008304	0.498
SW04	1.13E-04	0.00675	0.405

Table 2: Summary of IGSL Ltd. Soil Infiltration Rates

The soil infiltration rates shown in Table 2 were recorded by IGSL Ltd. after carrying out 4 no. BRE Digest 365 tests across the site. The IGSL report is included with this application. The infiltration rates range from 0.053m/hr to 0.498m/hr so an amount of infiltration will occur in all SuDS measures constructed to intercept, filter and attenuate the surface water runoff.

To incorporate underdrained roadside swales into the design, the new estate's roads are designed to have a single crossfall towards the verge containing the swale.

In accordance with the Wallingford Procedure, using only impermeable areas in the modified rational method, a Cv (Volumetric Runoff Coefficient) of 0.75 was used for summer events and 0.84 for winter. For the purpose of calculating the volume and rate of flow in the network, the maximum hardstanding area contributing to each pipe run was measured. The hardstanding consists of all roofs, driveways, parking spaces, roads, footpaths and other paved sections within the contributing area. Permeable paving is proposed in areas of the development, and it will serve in an interception and attenuation capacity, however, the attenuation volume provided and the infiltration to the subsoil that will occur under the paving has not been included whilst designing the sewer or calculating the volume of attenuation storage required. For design purposes, full runoff to the sewer is assumed from permeable paving.

The proposed surface water network has been tested with the Causeway Flow software, simulating rainfall events up to and including the 24-hour, 100 year storm with a 20% addition allowed for climate change. Modelling shows that no flooding occurs in any rainfall event tested.

4.2. Drainage Impact Assessment

SuDS measures are proposed for the development in both public and private areas in accordance with the guidance from the County Development Plan 2022 Advice Note 1 on Surface Water management and the CIRIA SuDS Manual C753.

The Measures proposed will decrease the impact of the development on the receiving environment and also provide amenity and biodiversity in many cases. Regular maintenance of the SuDS measures will be required to ensure that they are effective throughout their design life. The following paragraphs describe the following SuDS features proposed: a detention basin, permeable paving, underdrained roadside swales, bio-retention tree pits, bio-retention raingardens and water butts.

4.2.1. Detention Basins

The primary means of attenuating surface water runoff shall be the proposed detention basins. 2 basins are proposed, and both are designed to have a depth of 0.35m and side slopes with a gradient of 4 horizontal to one vertical:

- Basin 1 will be long and roughly rectangular and parallel to the houses backing onto the southwest boundary. It will have a base area of 40m^2 and a surface area of 77m^2 providing attenuation storage of approximately 20.5m^3.
- Basin 2 will also be roughly rectangular and parallel to the northeast boundary. It will have a base area of 55m^2 and a surface area of 98m^2 providing attenuation storage of approximately 26.8m^3.

The infiltration rate of 0.214m/hr was recorded by IGSL at the adjacent test location SW01 during soakaway testing in accordance with BRE Digest 365. An infiltration rate of 0.21m/hr was considered in calculating the size of the basins such that no flooding would occur in the drainage network in any event up to and including the 24-hour 100-year storm.

It is worth noting that the basins are designed to be dry most of the time and will only hold water temporarily, during heavy rainfall events. With their shallow depth and relatively gentle side slopes they are basically shallow depressions in the green area that fill with water quite rarely and for a short period. At all other times they will be dry and can function as green open space containing planting and/or furniture that is compatible with getting wet occasionally. See examples in Figure 8.

Figure 8: Examples of detention basins by Peterborough City Council in the UK (CIRIA SuDS Manual C753)

Grassed slopes of 1:3 or less can be mowed with ride-on lawn mowers for ease of maintenance. The 1:4 side slopes are also important in terms of safety as the change of water depth is gradual rather than sudden should someone enter the basin. See WDG drawings no. 24004-XX-XX-XX-XX-DR-WDG-CE-002 and 504 for the proposed layout and details.

4.2.2. Underdrained Roadside Swales

Traditionally storm sewers were constructed under roadways for the most part. It is proposed here to move the storm sewer into road verges as far as possible. It is proposed to construct linear swales parallel with the roads and to have dropped kerbs at the adjacent road edges to allow runoff to fall evenly into the swale. Where swales are in place the road will be constructed with a single 1:40 crossfall to allow the full surface width to drain towards that side of the road. Under the swale the sewer pipe will be perforated and the trench that the pipe is laid in will be filled with suitable filter material. Runoff from the road surface will be gathered in the shallow swale, drain down through the filter material and enter the sewer pipe having been slowed down and filtered in the process, see Figure 9.

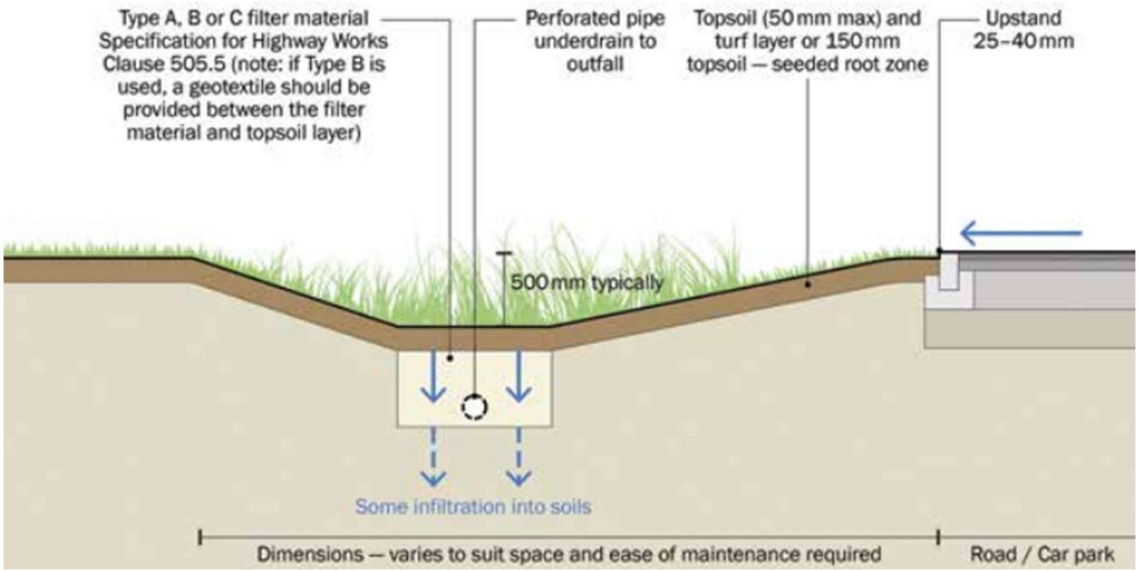

Figure 9: Underdrained Roadside Swale (CIRIA C753 SuDS Manual)

Swales shall be constructed in accordance with the guidance in the CIRIA SuDS Manual Chapter 16 and the detail on the accompanying drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-504. The dimensions of the swale can be variable to suit the available space but the depth will be a maximum of 500mm and the side slopes will be at a maximum gradient of 1:3. The swales shall be set with grass and/or wildflowers which can be mown normally due to the shallow side slopes, see example in Figure 10. The longitudinal gradient of the swale should be maintained at 1:100 or less in order to slow flows and allow full interception.

Figure 10: Example of roadside swale from the CIRIA SuDS Manual (C753)

CIRIA C753 (The SuDS Manual) Table 24.6 notes that filter swales can be considered to provide Interception when draining the runoff from impermeable surfaces, i.e. it can be assumed that there will be zero runoff from the first 5 mm rainfall for 80% of events during the summer and 50% in winter. The stone filled trenches also provide temporary attenuation storage as there is up to 30% voids in the filter material.

4.2.3. Permeable Paving

Permeable paving is proposed for all private car parking spaces and paved areas in the development. The permeable paving will allow surface water to soak into the subsoil and ground water rather than leaving the site via the sewer network which is preferable in terms of SuDS. See the accompanying WDG drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-504 for the construction details of the permeable paving, see example in Figure 11.

CIRIA C753 (The SuDS Manual) notes that studies have shown that runoff typically does not occur from permeable pavements for rainfall events of up to 5 minutes in length. The paving's substrate intercepts and stores the runoff before some of it percolates into the surrounding soil and any overflow is piped to the sewer network. The substrate shall be a minimum of 300mm deep and formed with washed, coarse, graded aggregate with 30% voids for water storage.

Figure 11: Example of permeable paving.

4.2.4. Roadside Bioretention Tree Pits

Bioretention tree pits, constructed in accordance with CIRIA SuDS Manual Chapter 19 and the detail provided in drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-504, are proposed in roadside green areas of the site where a proportion of the surface water from the hard road and footpath surfaces can be channelled towards the tree base for temporary storage and percolation to ground water. The tree pits can be placed in isolated green planters where gaps in the kerbing or kerb drains allow surface water to fall to the base of the trees as per the examples in Figure 12 or tree pits can be arranged to fill an available green space. In all cases, an overflow pipe will carry any overflow back to the sewer in heavier rainfall events. This prevents the tree's roots from being inundated for long periods, causing damage or disease.

Figure 12: Examples of tree pits in isolated green planters from the CIRIA SuDS Manual

Whilst the grass along the top of the roadside verges will most likely be mowed the local area around the base of each tree pit is to be set with a variety of planting to promote urban biodiversity - providing habitat and food for native insects, invertebrates, and birds. This planting scheme will not be mowed regularly but occasionally cleaned and weeded. The

bioretention tree pits offer runoff interception, filtration and water storage as well as offering further benefits such as evapotranspiration, cooling of runoff in the shade and the promotion of biodiversity.

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

See the accompanying WDG drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-002 for the proposed locations of the tree pits.

4.2.5. Bio-retention Rain Garden Planters

It is proposed that dwelling roofs can discharge to rain garden soakaway in back yards. The soakaway will be 2000mm wide consisting of 350mm depth of 40% compost and 60% coarse sand mix to allow drainage whistle promoting plant growth, 100mm depth of 50mm clean crushed limestone filling wrapped in Terram underneath, see diagram in Figure 13.

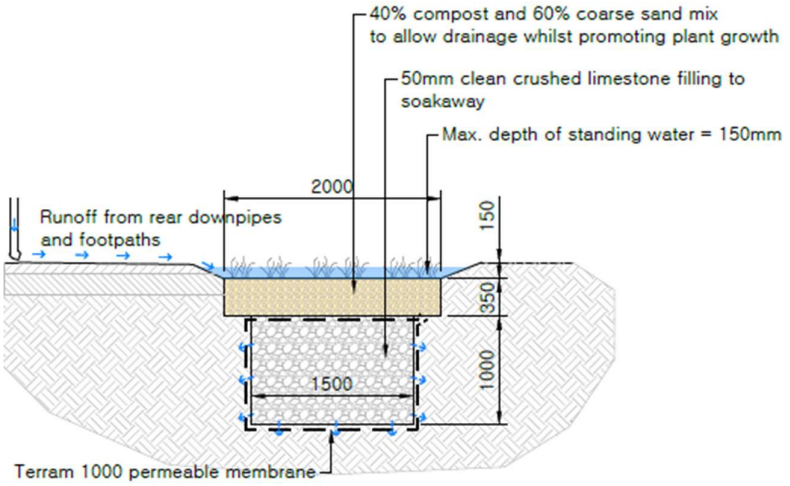

Figure 13: Section through a simple rain garden with outlet pipe (CIRIA C753)

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

4.2.6. Water Butts

It is proposed to install a 300-litre water butt to the rear of each dwelling that has a rear garden. The water butt shall be designed to collect water from the downpipes with a bypass system so that they do not overtop and flood the yard/garden. The overflows shall be connected back to the raingarden soakaways in this development. A tap on the water butt

will allow the water to be used for gardening or car washing etc. and reduce demand on the local authority water supply whilst also slightly reducing the roof runoff entering the surface water sewer. See the accompanying WDG drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-002 for an example of a water butt.

5.0 Wastewater Drainage

The layout of the proposed wastewater drainage network for the development is shown on WDG drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-002 and the typical details for the wastewater infrastructure are shown on drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-501. 1 conventional piped, gravity sewer network is proposed. The network will generally fall from the south of the site to the north where it will connect to existing Irish Water infrastructure at the proposed junction of the new estate road and the L-2216 local road.

To reach the connection point with the existing sewer in the L-2216 the wastewater pipe leaving the development will need to cross underneath the culverted ditch that will cross the development entrance. The crossing shall be constructed in accordance with Irish Water standard detail no. STD-WW-21 and that section of pipe shall be ductile iron.

All sewers within the curtilage of individual houses are to be installed in accordance with TGD Part H (2010) and will consist of 100 mm diameter uPVC Sewers from individual houses laid to falls of min 1:60 to connect to a 150mm uPVC sewer to be laid under the estate roads. Inspection chambers will be constructed within 1m of the boundary of each private property in accordance with Irish Water Standard Details.

All wastewater sewers in the public realm have been designed in compliance with Irish Water's Code of Practice for Wastewater Infrastructure – A Design and Construction Guide for Developers (Revision 2) July 2020. All construction details within the public realm will be in accordance with Irish Water, Wastewater Infrastructure Standard Details (Revision 4), July 2020.

A pre-connection enquiry was submitted to Irish Water to assess the feasibility of providing a connection to the site and on the 3rd of July 2023 Irish Water issued a confirmation of feasibility for the development (see Appendix C). A wastewater connection for the site is feasible without infrastructure upgrade by Irish Water.

5.1. Wastewater Design Criteria

For the purposes of clarity, the wastewater sewer system has been designed using the following parameters, as required in Irish Water document IW-CDS-5030-03 Section 3.6:

- Flow per person: 150 L/day
- Average persons per household: 2.7 persons
- Unit consumption allowance (infiltration) 10%
- Minimum velocity for pipe running full: 0.75 m/sec
- Peak flow: 6 DWF

The population equivalent (PE) for the development is: 8 dwellings x 2.7 = 22.

The detailed hydraulic design parameters and calculations for the wastewater network are included in Appendix B to this document.

6.0 Water Supply

It is proposed that a connection to the existing Irish Water infrastructure will be made in the L-2216 just outside the development entrance. The water main layout is shown on WDG drawing no. 24004-XX-XX-XX-XX-DR-WDG-CE-003 and the water main typical details are shown on drawings 24004-XX-XX-XX-XX-DR-WDG-CE-502 and 24004-XX-XX-XX-XX-DR-WDG-CE-503.

A pre-connection enquiry was submitted to Irish Water to assess the feasibility of providing a connection to the site. Irish Water issued a confirmation of feasibility for the development confirming that a connection is feasible without infrastructure upgrades by Irish Water (see Appendix C).

Private properties will each have a separate service connection, fitted with an Irish Water approved boundary box immediately outside the boundary. Fire hydrants are placed so that no domestic property within the development is more than 46m from a hydrant. All potable water infrastructure will be constructed in accordance with the following Irish Water documents:

- IW-CDS-5020-03 Code of Practice for Water Infrastructure – Connections and Developer Services, July 2020 (Revision 2),
- IW-CDS-5020-01 Water Infrastructure Standard Details - Connections and Developer Services, July 2020 (Revision 4).

To reach the connection point with the existing watermain in the L-2216 the new water pipe from the development will need to cross underneath the culverted ditch that will cross the development entrance. The crossing shall be constructed in accordance with Irish Water standard detail no. STD-WW-31A and that section of pipe shall be surrounded in concrete.

6.1. Water Demand

The mains water demand for the development is calculated, according to Irish Water criteria, using the following parameters:

- 150 litres/person/day,
- 2.7 persons per housing unit,
- Domestic ADPW = 1.25,
- 8 Housing Units.

7.0 Utilities

A Utilities Survey and the accompanying Utilities Survey Report by Murphy Geospatial are included in the suite of documents submitted for planning.

7.1. Electricity

The ESB were contacted for details of their infrastructure in the vicinity of the site. The map supplied in response is included in Appendix D to this report. The map shows that there is one single electricity pole in the north of the site and medium voltage overhead lines cross the site. A proposal for how to proceed has been discussed with the ESB and a formal agreement has been issued. See the M&E drawings that accompany this application for the details of the proposed ESB works.

Any works on site shall be carried out in accordance with the following ESB document:

- Safe Construction with Electricity.

7.2. Gas

Gas Networks Ireland was contacted regarding the gas supply services in the vicinity of the proposed development site. GNI responded with a map to show that there are no gas mains in the vicinity, *s*ee Appendix D.

Appendix A

Surface Water Design

- Surface Water Sewer Network Design

Appendix B

Wastewater Design

- Wastewater Sewer Network Design.

Appendix C

Irish Water Documents

Irish Water Documents:

- Confirmation of feasibility Letter.

Appendix D

Utilities

- Gas Networks Ireland Map
- ESB Map

Appendix E

Flood Documents

- Past Flood Event Local Area Summary Report