Engineering Services Report

Project:

Castle Street, Bray, County Wicklow

Client:

Silverbow Limited

Doc Ref. CHC-00-XX-RP-C-00001

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The information contained herein is current at date of issue in the Details, Control and Issue Log and may be subject to third part approvals for items such as connections, access arrangements and planning approvals.

The report addresses those items outlined only. In the event that there are items not covered within the report, the reader shall not infer that such extraneous items have been considered irrelevant or immaterial. Any items not covered within the report have not been investigated by the Authors and the reader should satisfy themselves that such items have been suitably investigated elsewhere.

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EXECUTIVE SUMMARY

This report has been prepared as part of a design development process to identify potential constraints to the development of the subject site and propose ameliorative measures to address these issues where practicable. The report outlines the design strategy adopted for the civil/structural elements of the planning application for the scheme. The design proposals have been developed over a number of months in consultation with the design team members, Wicklow County Council, An Bord Pleanála, Irish Water, the National Transport Authority and other bodies who have given input into the elements which have been prepared by the different design team members.

The proposed development is an apartment type development based on a density of c.162 units per hectare realising a total number of 139 apartments. The scheme will also include a creche and a limited amount of commercial area. The accommodation is proposed in two blocks with undercroft parking, secure cycle parking and bin storage. There are also a limited number of drop-off car parking spaces and visitor cycle parking at surface level. The scheme includes a high level of landscape proposals for the development.

The vehicular access to the site will be a new access to be constructed off Castle Street proximate to the location of the existing access. Pedestrian and cyclist access will be at four locations, two off Dwyer Park, to the side and to the rear of the site, and two off Castle Street, one of which will be included as part of the primary vehicular access. Fire tender access is off Dwyer Park to the rear with an emergency fire tender access off Castle Street. Refuse collection and deliveries provision will be made at a new loading bay proposed on Dwyer Park immediately adjacent to the development. Wicklow County Council and Jacobs Consulting Engineers (as representatives of the National Transport Authority) have been consulted in relation to the impact of the proposed access on the future Bus Connects scheme for the town and they have confirmed that the proposals suitably accommodate the future infrastructure development. The proposals also include for future connectivity for pedestrians and cyclists from Dwyer Park to the Southern Access Road to be constructed to the northwest of the site as an objective under the CDP.

Car parking provision is sufficient to meet the needs of the development and could be considered excessive given the apartment guidelines classification of the scheme. Visitor car parking and car parking for mobility impaired users is located conveniently within the undercroft area. The quantum of cycle parking to be provided is in accordance with the requirements of the apartments guidelines and the Wicklow County Development Plan. Secure cycle parking allocated to the apartments will be located within the building with visitor cycle parking located at surface level convenient to the entrances and useable green spaces. A Transport Assessment, Mobility Management Plan, Parking Management/Strategy Report and Bus/Dart Capacity & Demand Report have been undertaken to ensure that the development can be accommodated within the exiting transport infrastructure of the immediate and wider area. There has also been several road safety assessments carried out on the proposal at the behest of Wicklow County Council and the National Transport Authority representatives, Jacobs Consulting Engineers.

There are records of previous flood events extending to the site which occurred as a result of tidal flooding of the River Dargle. The construction of the flood defence measures to the Dargle in 2017 has removed the flood risk and the site is no longer at risk of flooding. Based on the desktop study carried out, the site is outside of the 0.1% AEP flood event (1in1000 year flood event) for Fluvial, Coastal and Pluvial flooding. A Site-Specific Flood Risk Assessment is included as part of this application under separate cover.

Irish Water have confirmed that the connections to the existing network can be accommodated, subject to final design and agreement. The Statement of Design Acceptance response from Irish Water is included as part of this application.

The surface water management and disposal proposals for the scheme have been completed and conform to the requirements of the Greater Dublin Strategic Drainage Study. A Climate Change Statement is also included as part of the SHD application.

Having regard to the civil and structural engineering aspects of the scheme, it is considered that the scheme design proposals are appropriate and there are no engineering issues which would pose an impediment to development of the site as is currently being proposed.

1.0 INTRODUCTION

Corrigan Hodnett Consulting Engineers have been appointed in the role of consultant civil and structural engineers for a strategic housing development scheme at the former Heiton-Buckley site at Castle Street, Bray, County Wicklow and the site also includes a dwelling to the rear (north) which is accessed off Dwyer Park. The project is titled 'Castle Street, Bray, County Wicklow'.

This report has been prepared as part of a diligence process to identify potential constraints to the development of the subject site and propose ameliorative measures to address these issues where practicable. The report outlines the design strategy adopted for the civil/structural elements of the planning application for the scheme.

The following matters have been reviewed as part of the assessment:

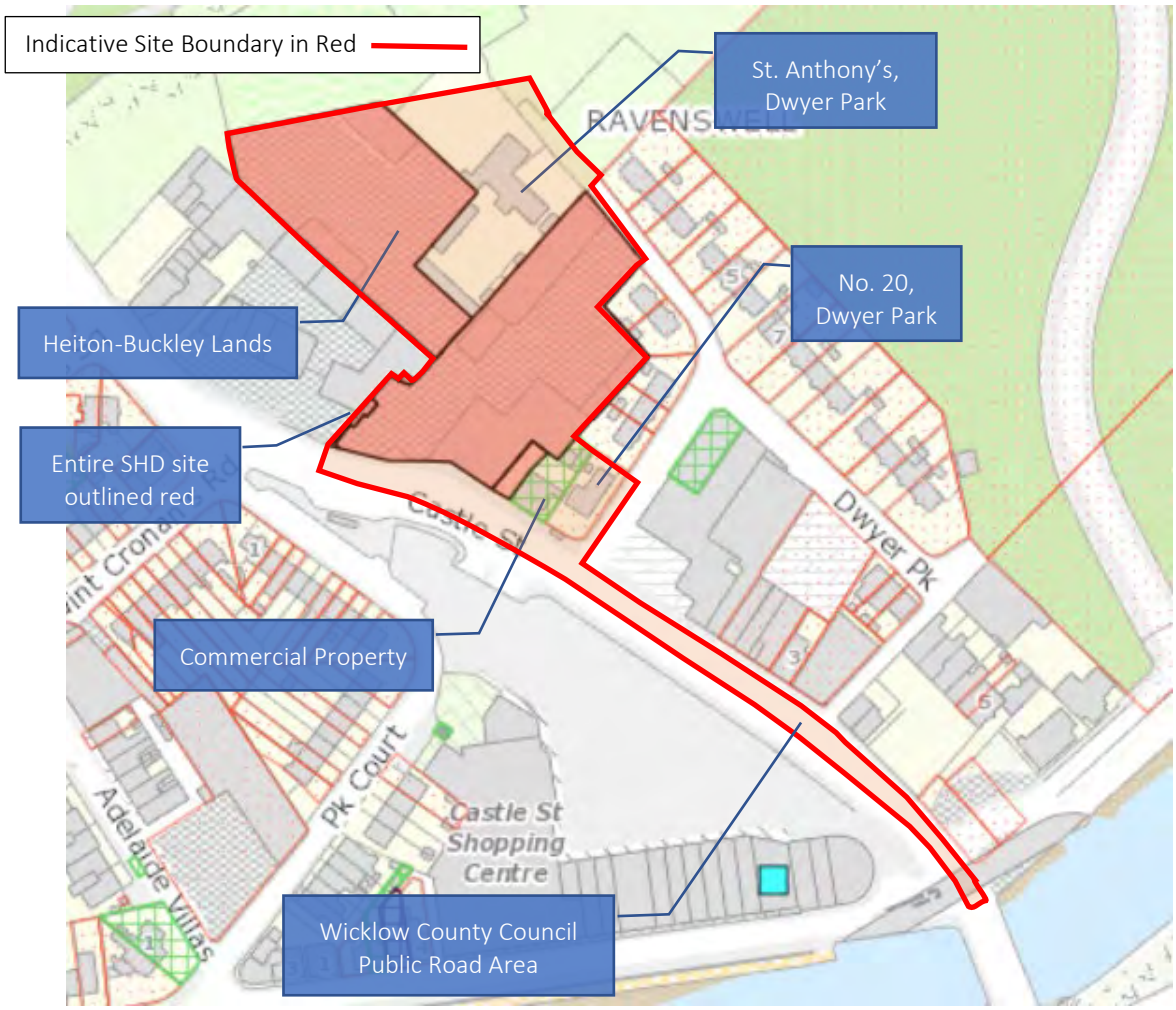
- Planning History and Zoning;
- Traffic and Transportation;
- Flooding;
- Potable Water;
- Foul Water;
- Storm Water;
- Ground Conditions and Soils:

1.1 Site Location

The subject development site under consideration is within the townlands of Ravenswell and Little Bray, off, and to the immediate northeast of, Castle Street (Regional Road R761) in Bray, County Wicklow; to the west of the existing Dwyer Park housing estate; to the east and north of existing Dargle Centre retail park. There are third party development zoned lands to the northwest and west of the site which are designated for the access route into the Former Bray Golf Course lands to the north of the development lands (identified as SLO 3 under the current Bray Local Area Plan).

The overall site is accessed off Castle Street via the existing access which previously served the Heiton-Buckley builder's providers on the site with two access points off Dwyer Park which serves the two existing dwellings on the site. The site is comprised of four properties, the actual Heiton-Buckley site, an adjacent commercial building to the south and two dwellings, namely St. Anthony's, Dwyer Park and No. 20 Dwyer Park as detailed in the following figure;

Figure 1-1 Site Extents



The applicant redline boundary also includes areas of public footpath and roadway along Castle Street to accommodate the necessary footpath upgrade works adjacent to the site, water services connections/outfalls and the proposed new roadmarkings to accommodate a right turn across the existing ghost island into the applicant site.

The lands to the north of the site proper are currently undeveloped greenfield lands which are zoned and there is a development plan objective for the SAR (southern access road) which runs immediately adjacent to the site northern boundary and is necessary to open up these lands to the north and northwest of the site for development (known colloquially as 'the golf course lands').

The Dwyer Park housing development to the east of the site is comprised of a mix of terraced, semi-detached, and detached single and two storey houses.

The existing buildings on the site were most recently used as a builder's providers, Heiton-Buckley, but have been unoccupied for some time and are in a state of dilapidation. The existing dwelling on the site has been occupied until very recently and appears structurally sound. The external walls of a number of

the existing commercial buildings also form the rear garden boundaries of the immediately adjacent houses in Dwyer Park. Similarly, the rear wall of one of the shed structures within the development forms a common boundary with several of the commercial units in the Dargle Centre retail park. It is noted that an initial inspection of the boundaries has identified that a number of the boundaries have structural issues, some of which will result in eventual failure. A detailed structural inspection of all boundaries will be required prior to any works commencing onsite which will inform a remediation plan for those affected boundaries which are to remain in place.

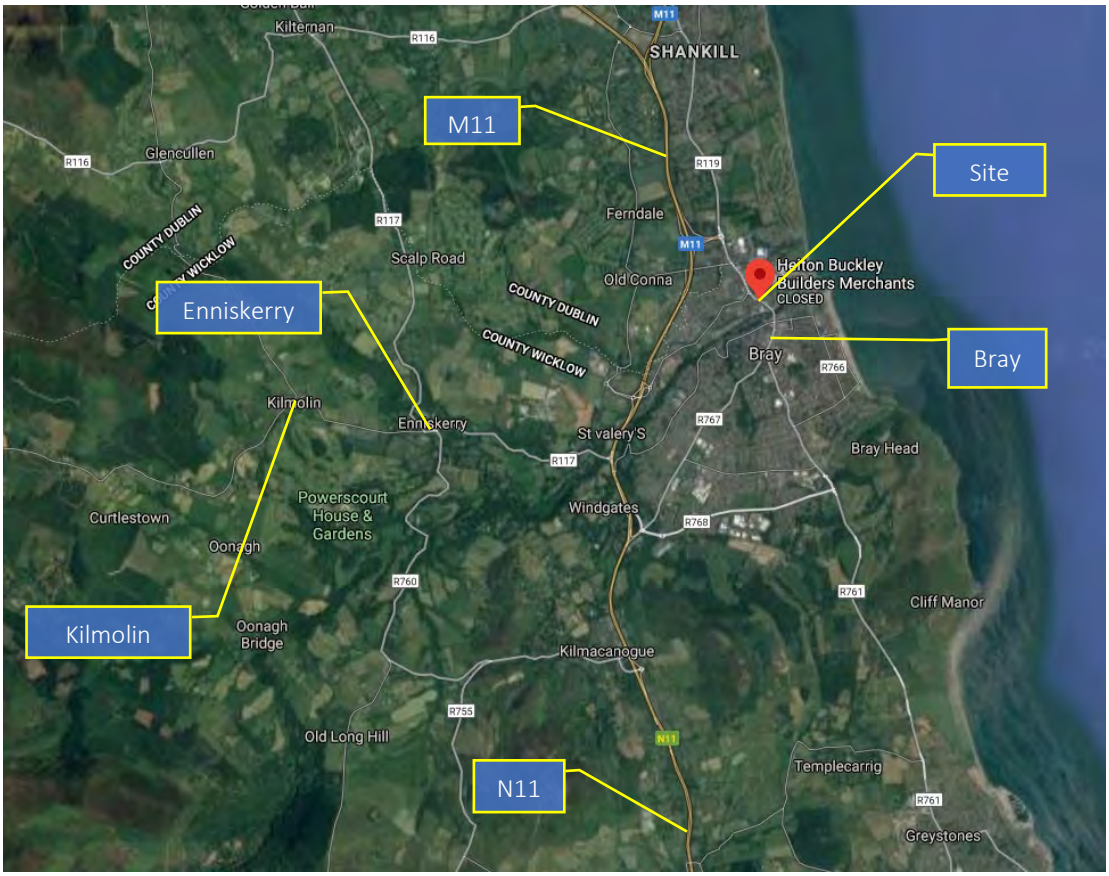
For future reference the terminology 'site' will apply to the subject development lands, i.e. the site under consideration which is identified graphically in the following pages.

The site falls under the authority of Wicklow County Council for planning, road/access and stormwater services purposes. Irish Water are the authority for potable water and wastewater in the area. The NTA are currently preparing a Bus Connects proposal for Castle Street and their representatives, Jacobs Consulting Engineers, are the authority in respect of the interface of the development and Castle Street from a roads and traffic perspective and ensuring that future provision is made for the Bus Connects proposal.

The wider surrounding lands is a mix of low/medium density residential and commercial/retail uses.

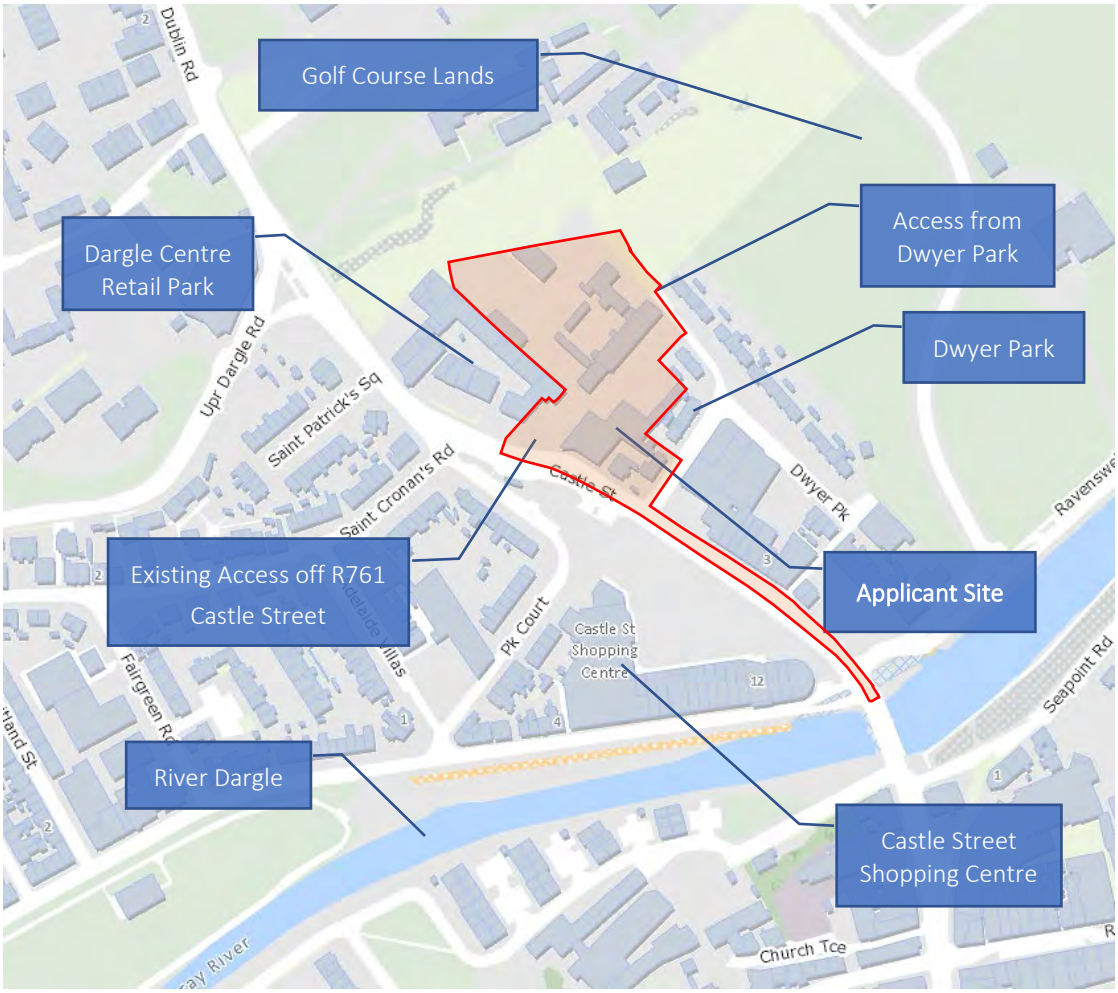
Figure 1-2 and Figure 1-3 following detail the location of the site in a regional and local context respectively.

Figure 1-2 Site Location; Regional Context[1]



[1] Source – Google Maps

Figure 1-3 Site Location; Local Context[2]



From the OS mapping provided and using the topographical survey procured for the site, the overall gross site area (redline area) amounts to approximately 1.0557 Hectares (10,557 square metres/ 2.609 Acres) which is inclusive of the area of public roads and footpaths. The nett area for development (core area) calculation purposes amounts to approximately 0.8594 Hectares (8,594 square metres/ 2.12 Acres). The co-ordinates listed in Table 1-1 following fall within the site boundary.

Table 1-1 Site Co-ordinates

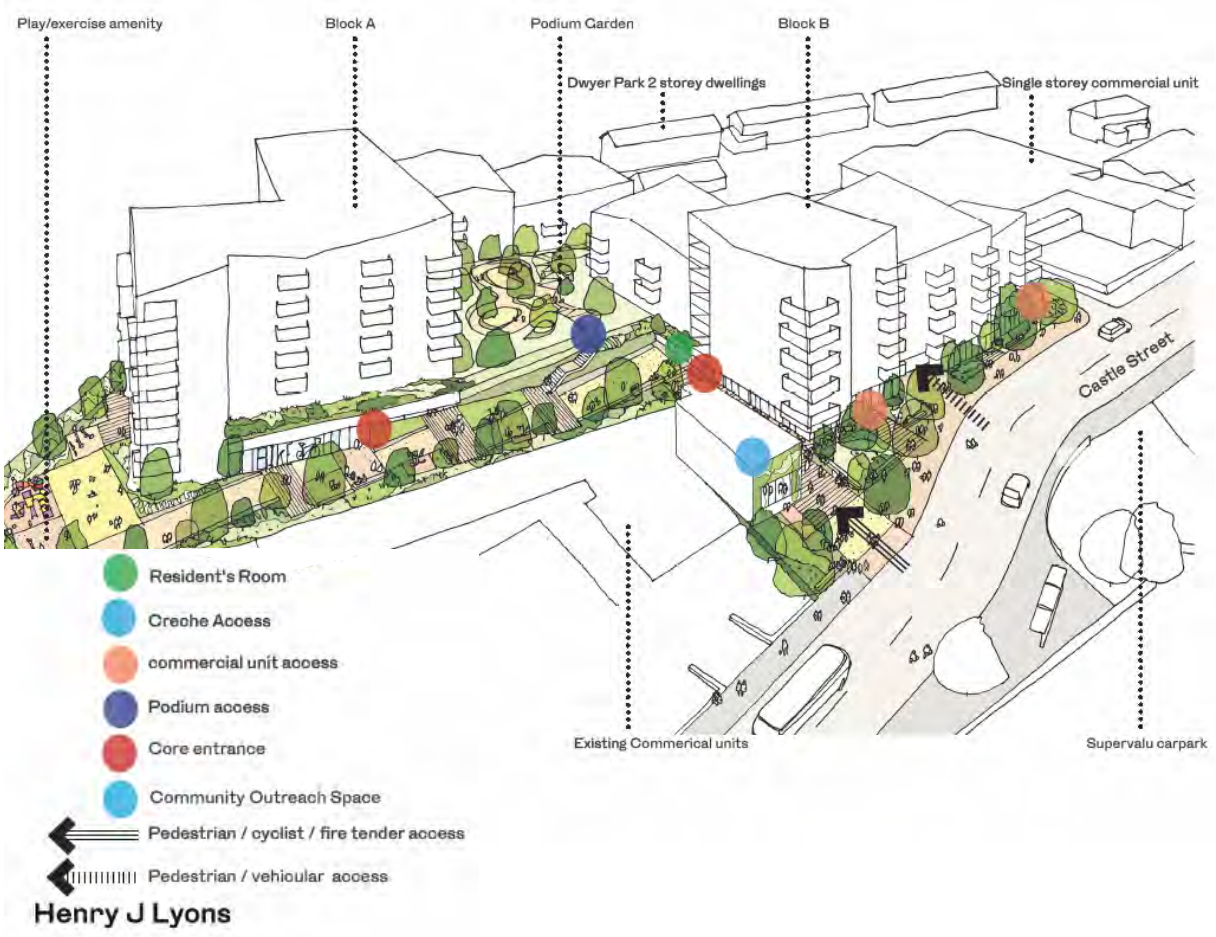
	X/Easting	Y/Northing
ITM co-ordinates	726150	719050
ING co-ordinates	326227	219020

[2] Source – Ordnance Survey Ireland, Geohive Mapping

1.2 Proposed Development

The proposed development is an apartment development based on a density of 162 units per hectare realising a total number of 139 apartments. The scheme will also include a creche (220 square metres) at ground floor of Block A. Block B will include two commercial units at ground floor (combined area of 688 square metres), a residents community meeting room at ground floor (74 square metres) and a separate smaller building housing a community facility (86 square metres). The accommodation is proposed in two blocks, up to seven storeys in height, with undercroft car and motorcycle parking, secure cycle parking and bin storage. There are also a number of visitor cycle parking spaces at surface level. The scheme includes a high level of landscape proposals for the development. For full details of the architectural and landscape proposals please refer to the relevant professional's reports in this regard. Refer Figure 1-4, Figure 1-5 and Figure 1-6 for details of the current proposal, extracted from Henry J. Lyons Architects submission documentation. A copy of the architects *Ground Floor Plan* and *Roof Plan* are included in *Appendix A.1* and *Appendix A.2* respectively.

Figure 1-4 SHD Application, Context Sketch[3]



[3] Source – Henry J. Lyons Architects

Figure 1-5 SHD Application, Proposed Ground Floor Plan[4]

[4] Source – Henry J. Lyons Architects

Figure 1-6 Aerial View of proposal with podium between Block A and Block B visible[5]

Figure 1-7 following details the Schedule of Accommodation for the proposed residential elements of the development.

Figure 1-7 Schedule of Accommodation[6]

RESIDENTIAL GIA	1 BED	2 BED	3 BED	TOTAL	
TOTAL Block A	**28**	**53**	**12**	**93**	**10026**
TOTAL Block B	**5**	**38**	**3**	**46**	**4941**
TOTAL Block A&B	**33**	**91**	**15**	**139**	**14967**
Area of podium Carpark					**1734**
UNIT MIX	24%	65%	11%	100%	

Commerical/Community area (sqm):		Creche:	
Community outreach:	86sqm	**Creche Area:**	**220sqm**
Unit 01:	284sqm	**No. of children:**	**28**
Unit 02:	404sqm	**External Play area:**	**85sqm**
Community meeting:	74sqm	**Creche Drop off spaces:**	3

Based on the land use zoning (see following chapter) and the building types in the immediate and surrounding area, it is considered that the proposed scheme is in keeping with the Bray Municipal District Local Area Plan 2018 (LAP), the Wicklow County Development Plan 2016-2022 (CDP), the National Development Plan 2018-2027 (NDP) and the Project Ireland 2040 National Planning Framework.

[5] Source – Henry J. Lyons Architects

[6] Source – Henry J. Lyons Architects

The planning consultant, Simon Clear & Associates, and the scheme architects, Henry J. Lyons Architects, have prepared detailed studies relating to the architectural and planning aspects of the development site and their expertise should be consulted in this regard for a fully detailed assessment of these aspects of development.

2.0 LAND USE ZONING & PLANNING HISTORY

2.1 Land Use Zoning

The Bray Municipal District Local Area Plan 2018 (2018-2024) sets out the development objectives for the town. The land use zoning objective for the site is ***TC Town Centre***. The following is an extract from the CDP detailing the zoning objective and description for the land use;

Table 2-1 Land Use Zoning Objectives for Applicant Site[7]

Zoning	Objective	Description
TC: Town Centre	To provide for the development and improvement of appropriate town centre uses including retail, commercial, office and civic use, and to provide for 'Living Over the Shop' residential accommodation, or other ancillary residential accommodation.	To develop and consolidate the existing town centres to improve vibrancy and vitality with the densification of appropriate commercial and residential developments ensuring a mix of commercial, recreational, civic, cultural, leisure, residential uses, and urban streets, while delivering a quality urban environment which will enhance the quality of life of resident, visitor and workers alike. The zone will strengthen retail provision in accordance with the County Retail Strategy, emphasise town centre conservation, ensure priority for public transport where applicable, pedestrians and cyclists while minimising the impact of private car based traffic and enhance and develop the existing centres' fabric.

The plan further states;

> *'Uses generally appropriate for **town centres** include retail, retail services, health, restaurants, public house, public buildings, hotels, guest houses, nursing / care homes, parking, residential development, commercial, office, tourism and recreational uses, community, including provision for religious use, utility installations and ancillary developments for town centre uses in accordance with the CDP.'*

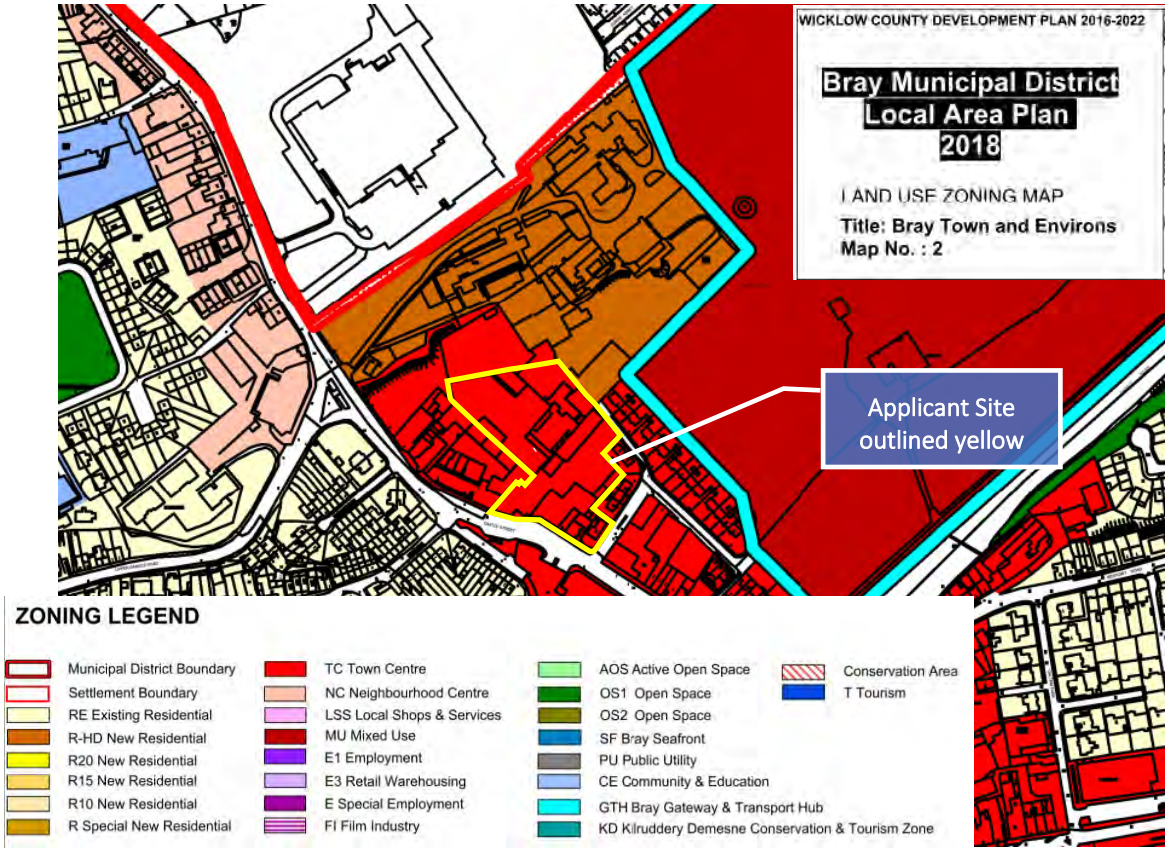
An extract from the LAP Land Use Zoning Map with the site outlined red is shown in Figure 2-1 following.

[7] Source – Bray Municipal District Local Area Plan 2018, Chapter 11, Zoning and Land Use

For a detailed assessment of the land use zoning objectives of the site please refer to the architectural and planning assessments included under separate cover.

Simon Clear & Associates, Planning and Development Consultants, have carried out an extensive planning assessment for the development which is included under separate cover. Their expertise should be referred to in this regard for a detailed review and assessment of the compatibility and suitability of the development proposals relative to the land use zoning and development objectives for the site.

Figure 2-1 Extract from LAP Land Use Zoning Map[8]



The zoning map from the LAP is included in *Appendix B.1* to the rear of this report.

2.2 Protected Structures

A review of the Wicklow County Development Plan 2016-2022 Record of Protected Structures confirms that there are no protected structures within or abutting the site. It is however noted that archaeological assessments have been carried out on the site and are included under separate cover.

[8] Extract from Bray Municipal District Local Area Plan 2018, Land Use Zoning Map, Title: Bray Town and Environs, Map No.:2

3.0 TRAFFIC & TRANSPORTATION

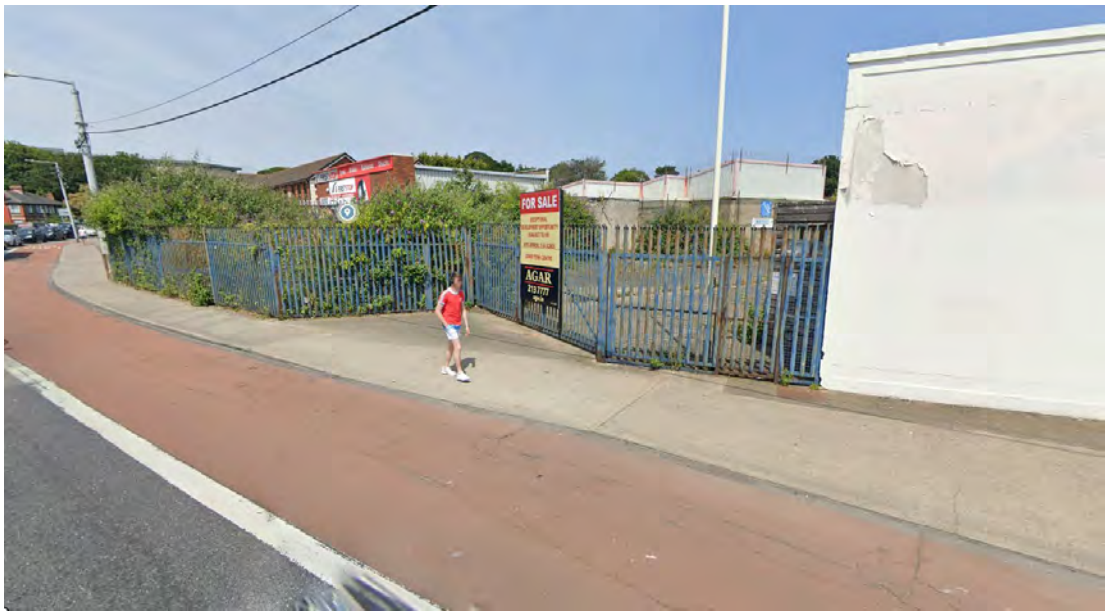
3.1 Current Access Scenario

The site is currently accessed directly off the Regional Road R761, Castle Street and also off Dwyer Park. The access off Castle Street served the majority of the site which was formerly the Heiton-Buckley builder's providers commercial premises. The accesses off Dwyer Park serve the existing dwellings, No. 20 Dwyer Park and the dwelling which is St. Anthony's, Dwyer Park.

The existing access off Castle Street takes the form of a crossover access. The access points off Dwyer Park are a gated access to the existing dwelling, St. Anthony's and a vehicular access to No. 20 Dwyer Park. There are issues with the existing primary entrance off Castle Street in terms of sightlines. The sightlines required to the north under the Design Manual for Urban Roads and Streets (DMURS) is not achieved for egressing traffic. There are no priority roadmarkings and it is considered that roadmarkings should have been required while the builder's providers was operational to further prioritise pedestrians over the extent of the vehicular crossover and also to clearly define the extents of the crossover as the entire kerb along this section of Castle Street is of nominal height making the extents of the crossover unclear.

Based on the entrance width and the fact that the nature of the business would have resulted in commercial traffic accessing the site, the existing access width would have created a bottleneck at the access for all road users. Pedestrians entering the premises would be particularly vulnerable as there is no dedicated pedestrian access. The existing arrangement is shown in Figure 3-1 following.

Figure 3-1 Existing Site Entrance; Access off Castle Street[9]



The accesses off Dwyer Park each serve a single dwelling. The road width along Dwyer Park to the accesses is below minimum current design standards and is not suitable to serve as a primary access for the proposed development – see Figure 3-2 following.

[9] Source – GoogleMaps, Streetview

Figure 3-2 Existing Site Entrance; access off Dwyer Park

The existing access arrangements are detailed in Figure 3-3 following.

Figure 3-3 Existing Site Access – Plan View

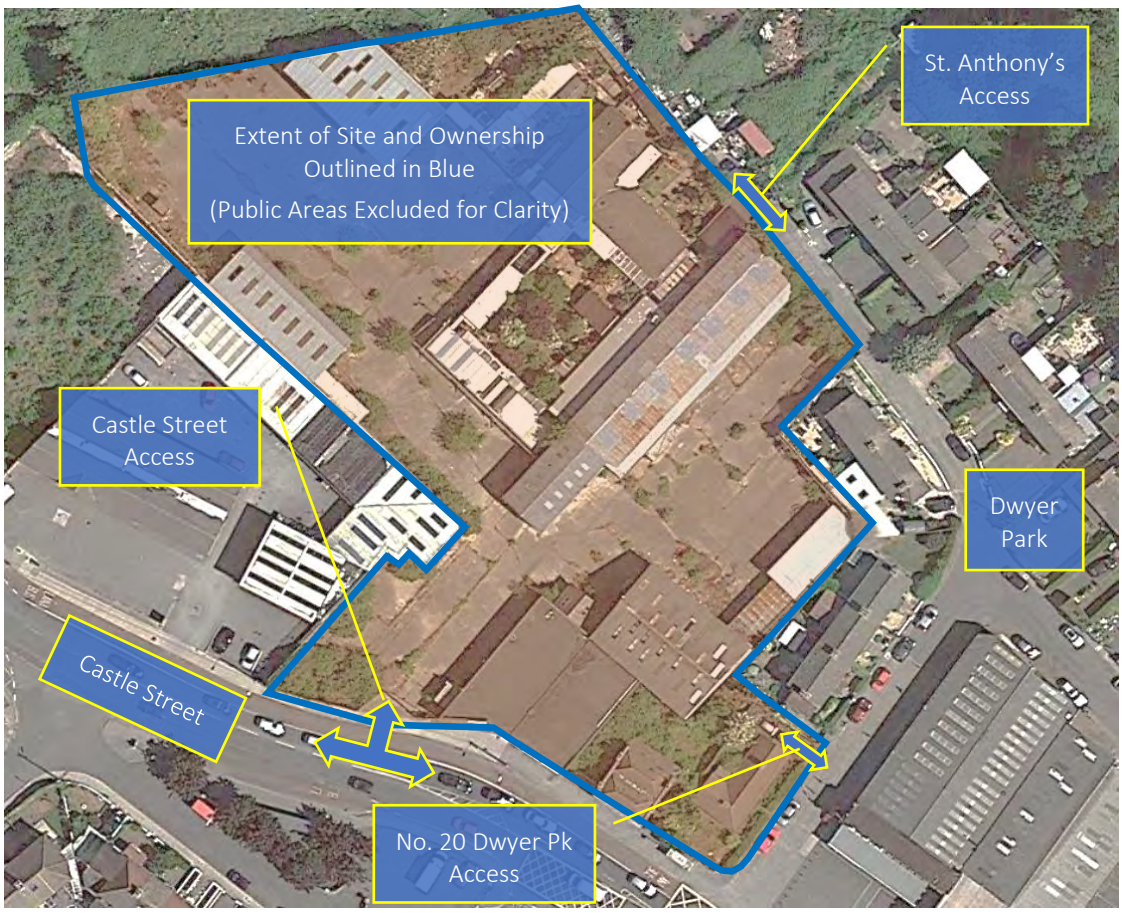


Figure 3-4 and Figure 3-5 following show the street view of Castle Street from the Heiton-Buckley entrance. The property boundary to the northwest of the entrance which impacts on egress sightlines can be clearly seen in Figure 3-5.

Figure 3-4 Street View on Castle Street looking southeast[10]

[10] Source – GoogleMaps, Streetview

Figure 3-5 Street View on Castle Street looking northwest[11]

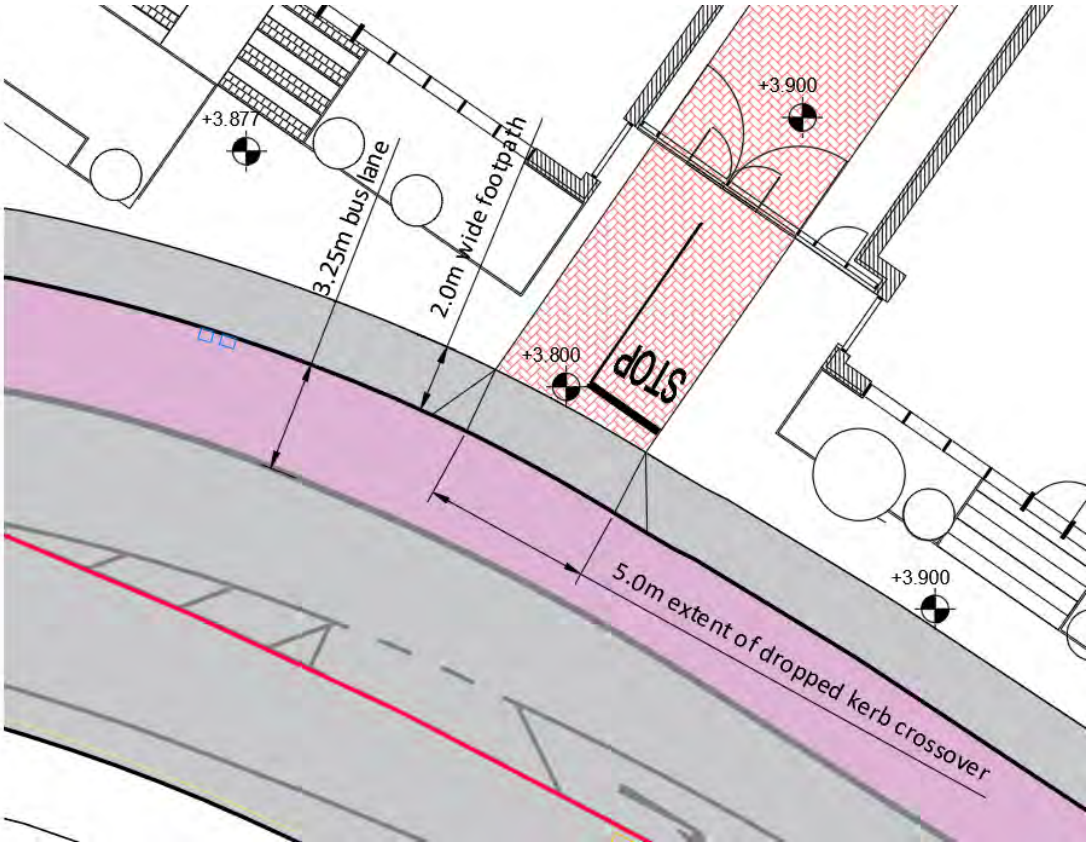
3.2 Proposed Access Scenario

The proposed development will be served by a single vehicular entrance point and a separate pedestrian/cyclist access from Castle Street. The vehicular access is to be located south of the existing entrance to facilitate access sightlines. There will be no vehicular access to the scheme from Dwyer Park with the exception of fire tender access to the buildings on the north-eastern site boundary. While pedestrian/cyclist access to the scheme will be provided off Dwyer Park, it will be a controlled access which can only be used by means of an electronic fob.

It is proposed that the new access will take the form of a vehicular crossover to prioritise pedestrians on Castle Street and that the access road will be finished with an alternative material to bituminous surfacing, e.g., brick paving, etc. The crossover will prioritise pedestrians as the footpath will continue straight across the mouth of the entrance and the STOP line and roadmarkings will be set back behind the line of the footpath – see Figure 3-6 following.

[11] Source – GoogleMaps, Streetview

Figure 3-6 Access crossover arrangement



The vehicular access point for the proposed development is off Castle Street to the southeast of the existing access. There are a number of constraints in relation to sightlines which dictate the optimum location of the access. On egress of the existing access, sightlines to the northwest are not achievable due to the horizontal alignment of Castle Street and the adjacent property boundary to the northwest.

The Wicklow County Council feedback document included comments from the Bray Municipal District Engineer's Planning Report dated 27/10/2021, proposing relocating the access to the development in a northwest direction, closer to the Dargle Centre, or alternatively to provide a vehicular access through third party lands to the north of the site.

Sightlines requirements is addressed as part of development proposals in accordance with the requirements of the Design Manual for Urban Roads and Streets (DOECLG, DOTTS, 2011). The sightline requirements are set out in Table 4.2 of DMURS, reproduced in Table 3-1 following for convenience.

Details of the proposed changes to the existing roadmarkings required to facilitate the access, as well as proposed signage are shown on accompanying CHC drawing number CHC-00-GR-DR-C-00017.

Table 3-1 Stopping Site Distance Standards; Extract from DMURS, Table 4.2

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

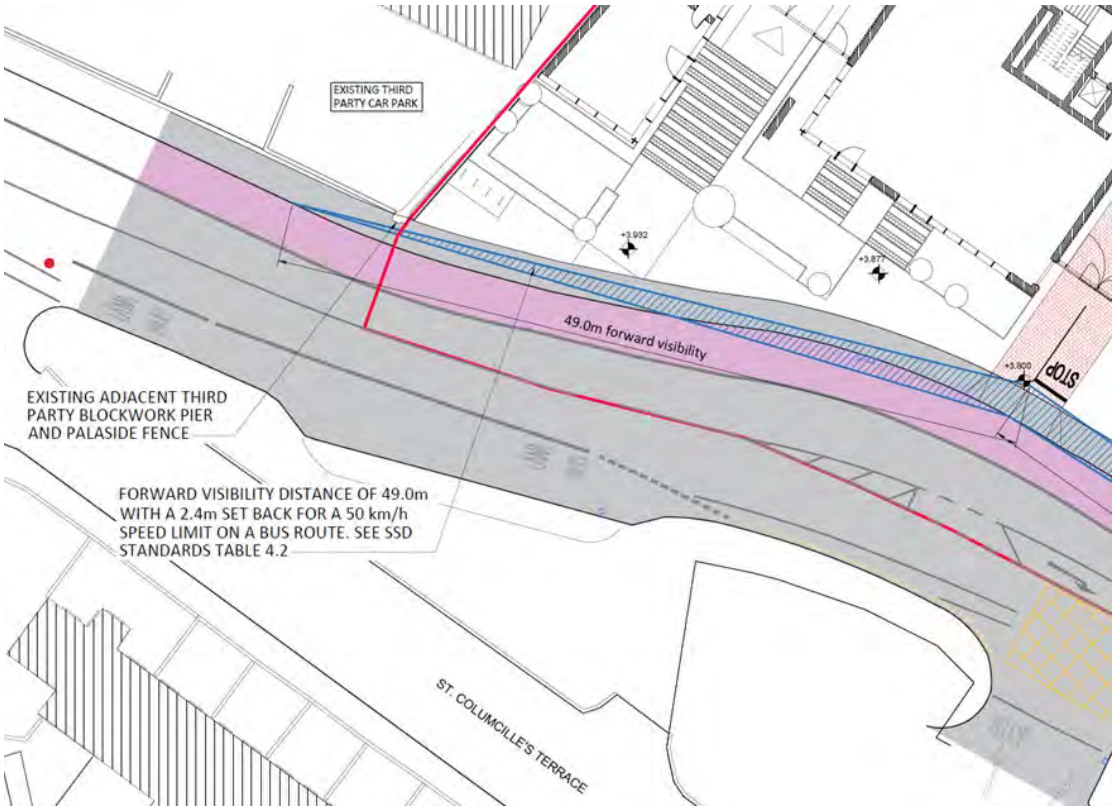
Forward Visibility on Bus Routes

Table 4.2: Reduced SSD standards for application within cities towns and villages. Reduced forward visibility increases driver caution and reduces vehicle speeds.

The current speed limit on Castle Street is 50km/hr. Based on the Design Manual for Urban Roads and Streets (DMURS), the required sightline setback distance ('X' distance) is 2.4metres and the minimum stopping sight distance ('Y' distance) is 49.0m is required to the nearside road edge as Castle Street is a bus route. The following table is an extract from the DMURS document detailing the sightline requirement for different speed limits in urban environments. The SSD Standard stipulated is a minimum standard. As such, SSD distances below that stipulated are not compliant with national road design standards.

The access as currently proposed is positioned as close to the northwest of the site as possible while maintaining the required SSD. The Dargle Centre to the northwest along Castle Street, is private, third-party lands, and their existing property boundary abuts the proposed development site boundary at the rear of the existing footpath. Relocation of the access to a point closer to the Dargle Centre would result in a substandard sightline which would not be compliant with the DMURS requirements and would introduce a safety hazard for road users and an access on a bus route which is not compliant with national standards. As such, the existing arrangements preclude locating an entrance at a more north-westerly position than that currently proposed. Figure 3-7 following, extracted from CHC drawing CHC-00-GR-DR-C-00015, shows the sight triangle at egress shaded blue with a 49m horizontal sightline in accordance with DMURS. The redline boundary is the site boundary and the existing pillar (there is also a high fence on the pillar) at the western site boundary can be seen. Relocation of the access to a more north-westerly location, closer to the Dargle Centre, would cut-off the sightline.

Figure 3-7 DMURS Stopping Sight Distance for proposed vehicular access[12]



It is understood from previous correspondence that the existing speed limit of 50km/hr at this location on Castle Street is under review and it is intended by Wicklow County council that it will be reduced to 30km/hr in the future. This would have the effect of reducing the required SSD from 49metres to 24metres which would facilitate relocation of the entrance in a north-westerly direction. However, the access and sightline design for the proposed development must be designed based on the current scenario. Proposing a sightline based on a speed limit which is not in effect would result in the development being non-compliant in this regard. The changing of speed limits is a reserved function of the local authority in consultation with other stakeholders. As such the applicant cannot implement these changes. From an engineering design perspective it would not be possible to justify a substandard access.

It is considered therefore that the relocation of the access in a north-westerly direction cannot be carried out based on the required design and safety standards and the current scenario. As part of the application process a Transport Assessment has been carried out in accordance with Transport Infrastructure Ireland's Traffic & Transportation Assessment Guidelines by NRB Consulting Engineers and

[12] Extract from CHC drawing number CHC-00-GR-DR-C-00015

included under separate cover. The assessment includes analysis of the proposed access junction and states;

> *'The analysis includes the effects of the existing traffic on the local roads and assesses the impact during the traditional peak commuter peaks periods in accordance with Traffic & Transportation Assessment Guidelines. The Transportation Assessment confirms that the road network and the proposed vehicular access junction arrangement is more than adequate to accommodate the worst case traffic associated with the facility. The assessment also confirms that the construction and full occupation of the scheme will have a negligible and unnoticeable impact upon the operation of the adjacent road network. Detailed analysis also confirms that there is adequate capacity in the proposed access junction to accommodate the low levels of traffic associated with the development of the site.'*

Section 5 of the assessment goes on to state;

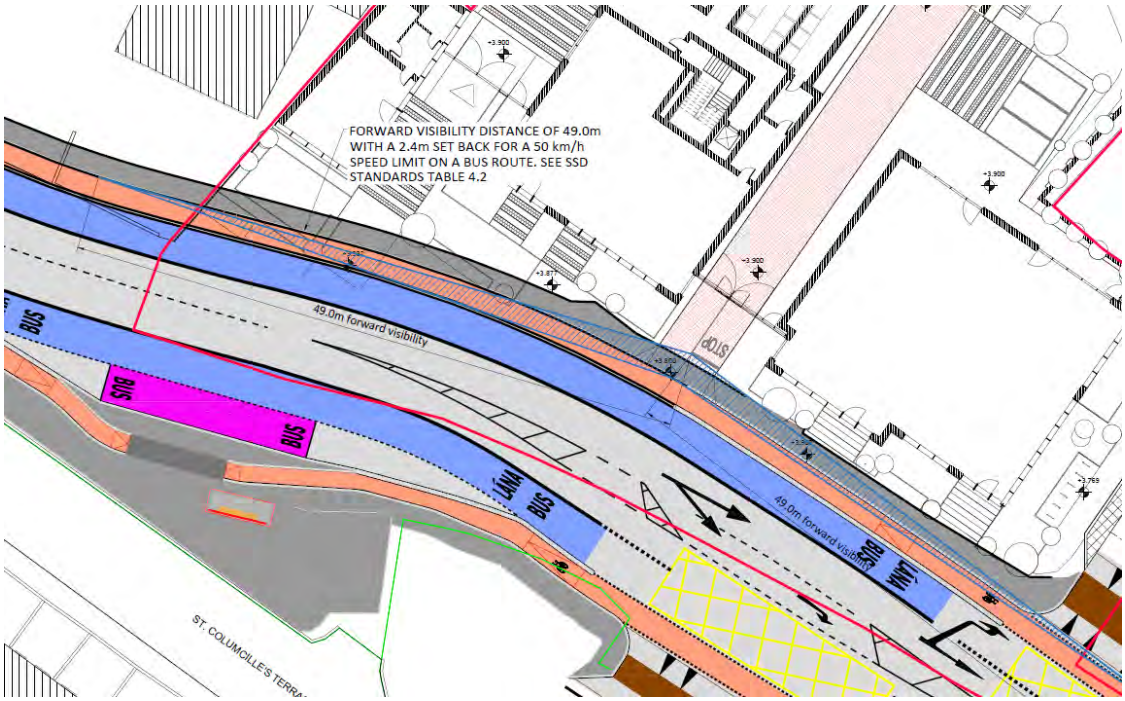
> *'The proposed development is appropriately located within the town of Bray and is well served by public transport as identified in the enclosed MMP. The site is also well served by pedestrian and cycle linkages. The site is therefore ideally well placed to take advantage of non-car modes of travel. Reduced car parking numbers are proposed for the scheme in compliance with the requirements of "Sustainable Urban Housing Design Standards for New Apartments". This report demonstrates that the proposed Development will have an absolutely negligible impact upon the established local traffic conditions and can easily be accommodated on the road network without any capacity concerns arising. The assessment also confirms that the proposed access junction is of more than adequate capacity to accommodate the worst case traffic associated with the proposed development.'*

In addition to the Transport Assessment, an independent Quality Audit has been carried out in accordance with TII Publication GE-STY-01024, Road Safety Audit, dated December 2017. The Quality Audit includes a road safety audit, an access audit, a walking audit and a cycling audit, i.e. those elements carried out by persons independent of the Design Team. The Audit has been carried out by Bruton Consulting Engineers and the Audit Team Leader and Team Member who carried out the audit are qualified in accordance with the TII requirements. The audit does not identify any hazards to pedestrians, cyclists or vehicular traffic as a result of the location of the proposed access. The document is included under separate cover.

The access is located to the westernmost position possible while maintaining DMURS sightlines to the west. This minimises the impact on the right turning lane into the Super Value carpark opposite. The location of the access truncates the right turning lane by 2.73metres which is considered such a minimal impact that it will not noticeably effect the operation of the right turn lane into the Super Value carpark.

As part of the design proposals it is necessary to ensure that the junction location and the development can accommodate the proposed future Bus Connects design along Castle Street. Jacobs Consulting Engineers are appointed on behalf of the NTA to design these works. The Bus Connects scheme will include road widening to facilitate bus lanes, new cycle lanes/paths and new footpaths. As part of the design process we have liaised with Jacobs Consulting Engineers and they have provided details of the proposed Bus Connects designs, into which we have incorporated the proposed development access. The building line of the proposed development has been set back sufficiently to allow for the future Bus Connects road widening. The proposals have been submitted to Jacobs for their review and they are satisfied that the proposals meet with their requirements. The necessary sightlines are readily achievable to the west and east. The extract from our drawing CHC-00-GR-DR-C-00016 below shows the Bus Connects proposals at the proposed entrance and to the west. Note again that the sightline is based on a 50mph design speed as that is the current speed limit on Castle Street notwithstanding the fact that the speed limit may be reduced prior to the construction of the Bus Connects Scheme.

Figure 3-8 DMURS Stopping Sight Distance for proposed future vehicular access with Bus Connects[13]



As part of the design assessment Jacobs requested that an Operational Safety Review of the junction be carried out and the document was issued to Caitriona Molloy of Jacobs on 27/08/2021. David Clements of the NTA subsequently confirmed that the design proposals for the scheme does not detrimentally effect the Bus Connects proposals.

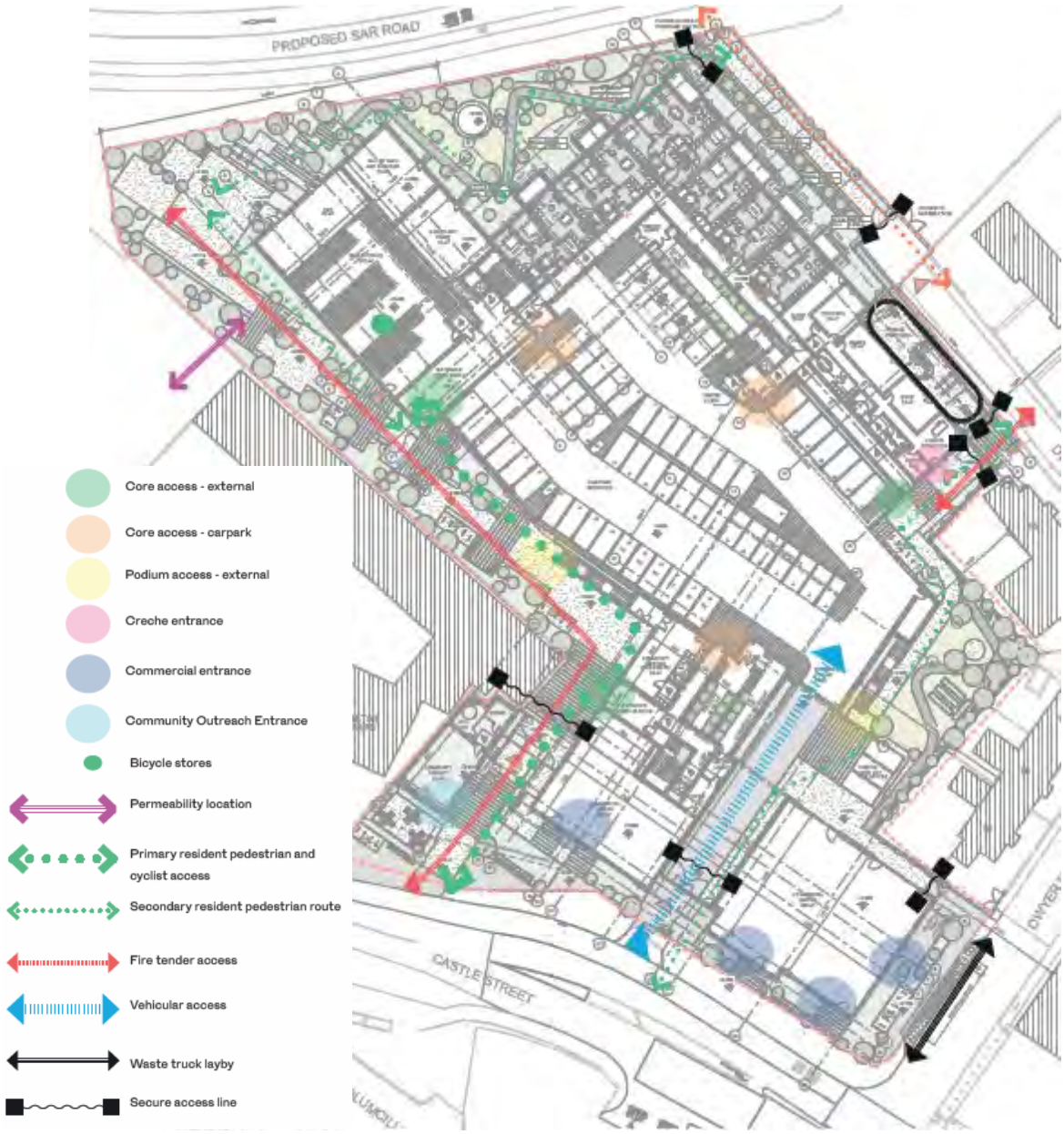
[13] Extract from CHC drawing number CHC-00-GR-DR-C-00016

An alternate access posited by the Bray Municipal District Engineer was to access the development through third party lands. The existing Dwyer Park access road is considered inadequate due to its constrained width and other private lands to the northwest of the site are not under the applicant's control. The applicant does not have rights to include any third party lands as part of the development and as such this proposal has had to be discounted.

It is considered that the current development proposal, primarily residential, with limited parking provision would have nominal effect on traffic in the area and would therefore be considered appropriate. The access for the proposed development is located in the most appropriate position and is fully compliant with national design standards. A copy of the DMURS Design Statement for the proposed development is included in *Appendix C.1*. The Transport Assessment and road safety assessments carried out for the proposed development do not identify hazards as described, the access is in accordance with DMURS design requirements based on the current speed limit on Castle Street and the Jacobs Consulting Engineers and the NTA are satisfied with the current proposals.

There is also a proposed emergency fire tender access off Castle Street located adjacent to the western site boundary. This access also serves as the primary pedestrian access to the development including to the resident's bicycle storage areas. In relation to vehicular access at this location, the only vehicle which will use this access is a fire tender and the fire tender access road terminates as a cul-de-sac with a turning head for the tender. There is no access to parking from the fire tender access road. Fire tender access is also provided off Dwyer Park at and provision for turning is also made at the end of Dwyer Park. It is intended that refuse collection would be off Dwyer Park with the introduction of a loading bay on the existing road immediate to the development with a refuse bin staging area to be located beside the loading bay within the site. *Figure 3-7* following shows the locations of the access points to/from the development.

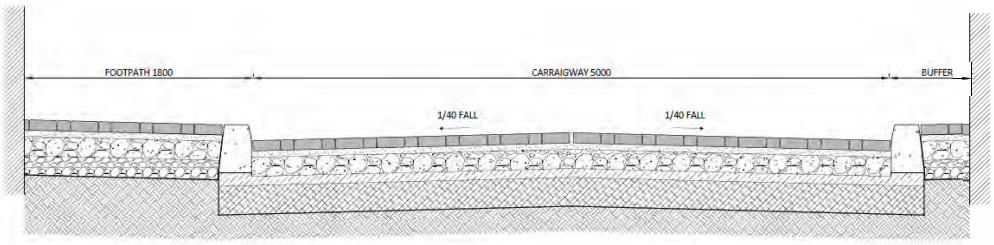
Figure 3-9 Ground Level Circulation and Access[14]



The proposed vehicular access road design cross section is a 1.8wide footpath accessed through a pedestrian access gate, a 5.0m wide carriageway and a buffer on the northwest side when viewing the cross-section towards Castle Street, an example of which is shown in Figure 3-10 following. Full details are shown on accompanying drawing ref. CHC-00-GR-DR-C-0120.

[14] Source – Henry J. Lyons Architects

Figure 3-10 Proposed Entrance Road Cross-Section



SECTION 1 - 5.0m ROAD CROSS SECTION AND PERMEABLE PAVING

Internal construction details will be in accordance with the Recommendations for Site Development Works for Housing Areas, (DOELG, 1998) or other such specification as required by Wicklow County Council.

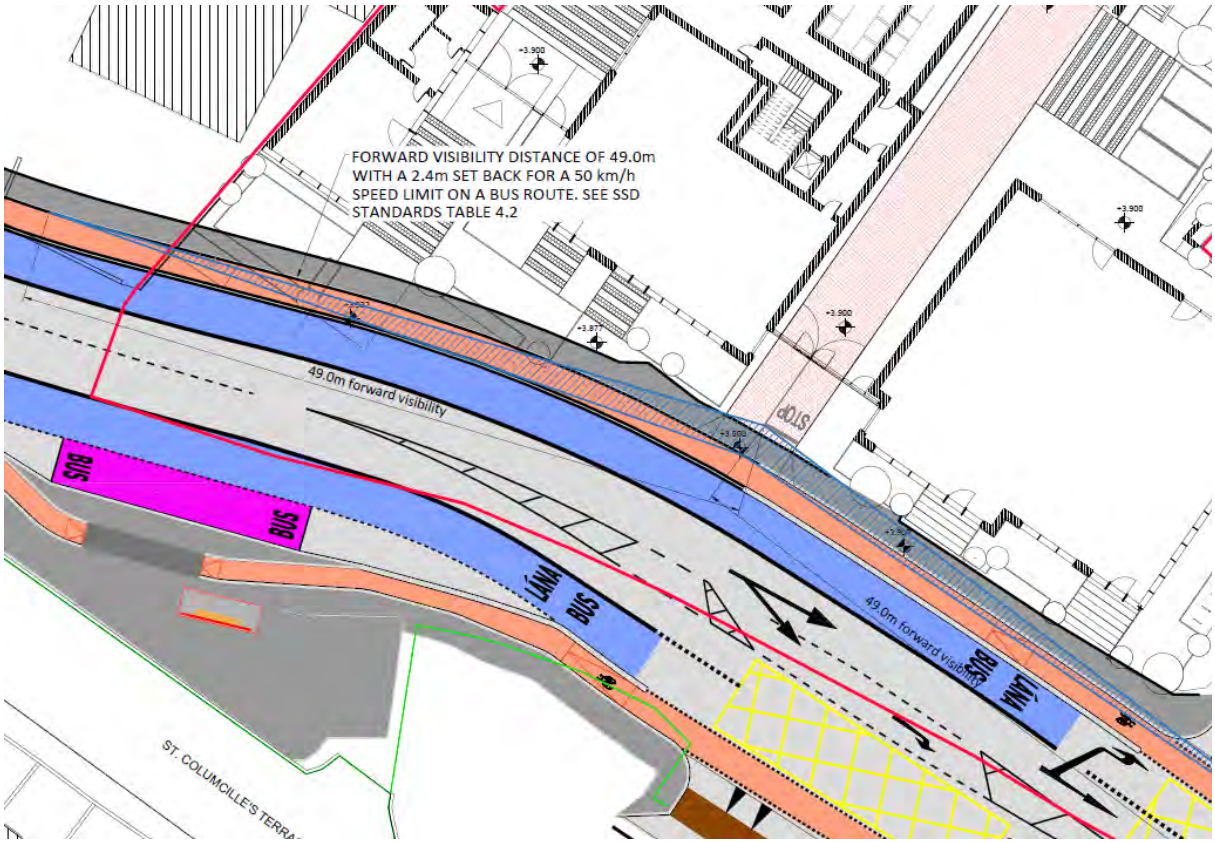
3.3 Bus Connects

The National Transport Authority (NTA) are developing a Bus Connects design proposal for Bray which includes new bus lanes and cycle lanes on Castle Street and will necessitate some land-take to properties to facilitate the road corridor widening. Initial designs have been produced by Jacobs Consulting Engineers on behalf of the NTA. Due to the changes to the roadmarkings required to facilitate the right turn from Castle Street into the site, there will be a minor impact on the existing right turn lane into the SuperValu carpark – it will be reduced in length by c.2.73metres. In addition, the proposed building line for the development is set back to accommodate any necessary road widening for the Bus Connects proposals. Jacobs Consulting Engineers have been consulted in this regard and have confirmed that the proposals show due consideration to the future scenario when the Bus Connects scheme will be in place. Figure 3-11 following shows the future proposal where the Bus Connects design has been modified to incorporate the development access. Full details are shown on accompanying drawing ref. CHC-00-GR-DR-C-016. As part of the design process Jacobs Consulting Engineers have been consulted on an ongoing basis. Their most recent e-mail correspondence states;

> *'We have reviewed the latest VISSIM modelling for this section of our route, and can confirm that the mainline queuing from the Upper Dargle junction does not impede the operation of the development junction. Nor does the right turn queue into the shopping centre exceed the storage area or present any operational difficulties*
>
> *On the last call we discussed the potential challenges for vehicles exiting the development, and giving way to various streams of bus, cycle and car traffic – but we note that the opinion letter confirms there are no safety concerns from the auditor and this will be included in the full RSA, so we have no further comments at this stage.'*

A copy of the e-mail received is included in *Appendix C.2*. A copy of the RSA opinion is included in *Appendix C.3*. A complete Stage 1/2 RSA is included under separate cover and the document will be made available to Jacobs Consulting Engineers for their benefit.

Figure 3-11 Development Access – Future scenario with Bus Connects



3.4 Parking

The car parking requirements for apartment developments are set out in the Department of Housing, Planning and Local Government document titled *'Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities', March 2018*. Section 4.18 of the document states;

> *'The quantum of car parking or the requirement for any such provision for apartment developments will vary, having regard to the types of location in cities and towns that may be suitable for apartment development, broadly based on proximity and accessibility criteria.'*[15]

Due to location and accessibility, the proposed development is considered a **Central and/or Accessible Urban Location** under the Guidelines – Central and/or Accessible Urban locations are classified as *'most likely to be in cities, especially in or adjacent to (i.e. within 15 minutes walking distance of) city centres or*

[15] 'Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities', March 2018, Section 4.18

centrally located employment locations. This includes 10 minutes walking distance of DART, commuter rail or Luas stops or within 5 minutes walking distance of high frequency (min 10 minute peak hour frequency) bus services'.

The requirement for parking provision for Central and/or Accessible Urban Locations is detailed as follows;

> *'In larger scale and higher density developments, comprising wholly of apartments in more central locations that are well served by public transport, the default policy is for car parking provision to be minimised, substantially reduced or wholly eliminated in certain circumstances. The policies above would be particularly applicable in highly accessible areas such as in or adjoining city cores or at a confluence of public transport systems such rail and bus stations located in close proximity.'*[16]

The scheme proposed is in an area zoned TC: Town Centre. The current proposed density, in accordance with the design standards for new apartments requirements, is 162units per Hectare.

Bray Daly DART station is located a twelve-minute walk from the site and provides; a commuter service to Dublin Connolly, Dundalk and Newry; Dublin to Rosslare Europort; and a DART commuter service (Dundalk – Gorey).

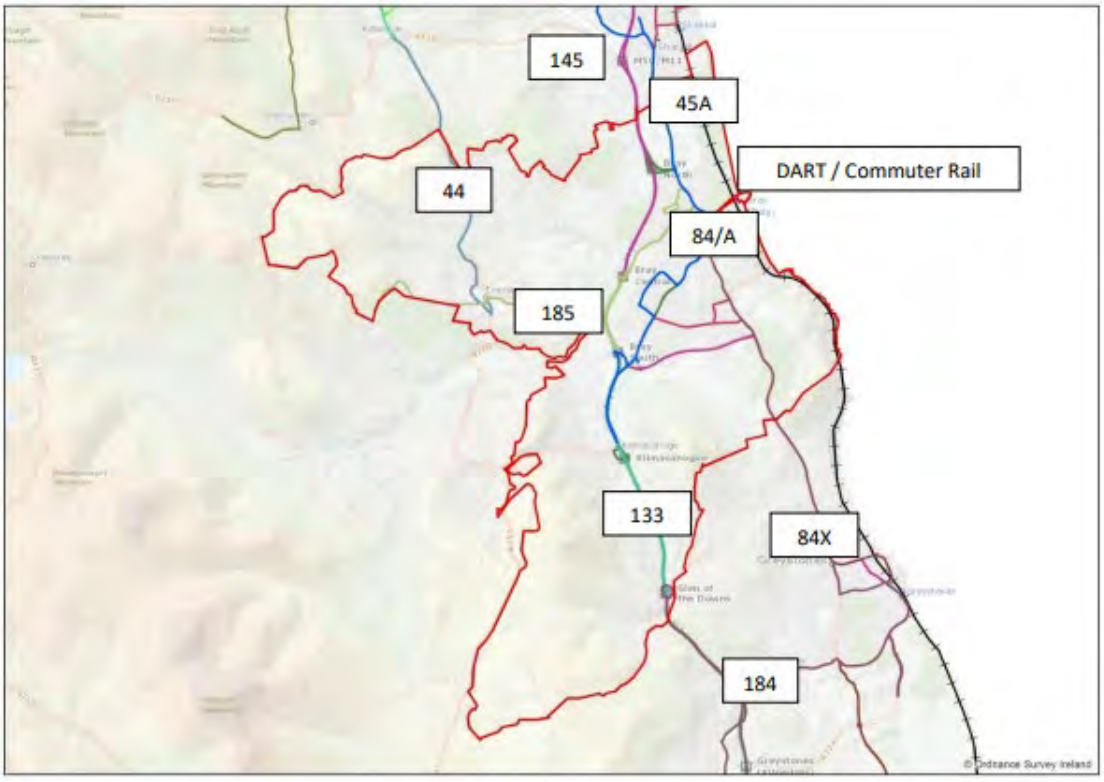
There are a number of bus routes on Castle Street, the closest stop being at the site. The routes served are 45a, 45b, 84, 143, 145 and 185. Bray Bus Depot is located beside the DART Station, a twelve-minute walk from the site.

The Dublin Road / N11 corridor is a key bus route. It is served by the 145, 84/A and 45A services. The 84X uses the M11 to reach Greystones without serving Bray. The 185 links Enniskerry to Bray Station and the 184 links Newtownmountkennedy. Enniskerry is linked to the City Centre by the 44. Of these, only the 145 is a high frequency service linking the study area to Dublin City Centre. Bus Éireann route 133 links Wicklow to Dublin Airport via the M/N11, with off-peak services running via Bray Main Street.

For full details of the public transport facilities in the area refer to NRB Consulting Engineer's accompanying Bus/Dart Capacity & Demand Report included under separate cover.

[16] 'Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities', March 2018, Section 4.19

Figure 3-12 Existing Public Transport Network and Services[17]



Castle Street Shopping Centre is located directly opposite the development and includes a SuperValu supermarket and numerous convenience stores.

The Bray Promenade along with associated playgrounds, eateries and bars is a 15minute walk from the site.

St. Peters Catholic Primary School and Ravenswell Primary School are a seven minute and nine minute walk respectively from the development. Woodbrook College is a 16minute walk from the site and Loreto Catholic Girls Secondary School is an 21minute walk from the site. There are also numerous Montessori and preschools within a 10-15minute walk of the site.

In addition, there are numerous sports facilities and training gyms all within a 15minute walk of the site including tennis, badminton, hockey, basketball, cricket and Wolfe Tone & District Youth Club.

It is clear that there are sufficient facilities in the close surrounding area which negates the requirements for cars to ensure that the residents of the completed development can access services.

[17] Extract from 2019 Bray and Environs Transport Study, Figure A2: Existing Public Transport Network and Services

Note that the foregoing walking travel times are derived from the Google Maps Directions function.

There are a total of 59no. car parking spaces proposed for the scheme, including visitor and accessible spaces, with an additional 3no. drop-off spaces for the creche and two motorcycle spaces. The parking provision is located in the undercroft car parking area with the exception of the three spaces reserved for creche drop off which are located at surface immediate to the creche facility. An allowance will be made for dedicated visitor spaces and three of the spaces provided (equating to 5% of the total spaces provided) are allocated for mobility impaired and appropriately signed as such. Details of the parking provision and allocation are shown in Figure 3-13 following.

Figure 3-13 Car and Bicycle Parking Provision

Car & Bicycle Parking:		
Bicycle Spaces: residents	**260**	*
Bicycle Spaces: visitor	**70**	**
Motorcycle Spaces	**2**	
Accessible Parking Spaces:	*3*	
Residential Spaces:	*56*	***
Total Car Parking Spaces:	**59**	
*** 1 space per UNIT bedroom min req**		
**** 1 visitor space per 2 units min req**		

Based on the foregoing, car parking spaces are provided at a rate of [59/139=] 0.42 spaces per residential unit plus the additional three Creche spaces. Based on the Wicklow development plan, the standards require a car parking provision of two off-street car parking spaces for all dwelling units over 2 bedrooms in size plus an additional visitor space for every 5 residential units provided with only 1 space. This equates to a total of;

[(124units x 1space) + (124units / 5 units x 1space) + (15units x 2spaces)] = 179no. spaces

However, it has been established that the zoning, location of development and proximity of alternative means of transport will realise a substantial reduction in the quantum of car parking permitted to be provided for the development in accordance with the apartment design guidelines requirements.

> *'In larger scale and higher density developments, comprising wholly of apartments in more central locations that are well served by public transport, the default policy is for car parking provision to be minimised, substantially reduced or wholly eliminated in certain circumstances. The policies above would be particularly applicable in highly accessible areas such as in or*

adjoining city cores or at a confluence of public transport systems such rail and bus stations located in close proximity.'[18]

It is clear in this instance that the applicant site meets the most stringent of the criterion set out in the standards and, as such the current level of residential parking is ample for a development of this nature. It may be the case that the car parking provision would be considered excessive given current general trends.

10% of all spaces will benefit from the provision of Electric Vehicle charging points and measures for future electrification of all other car parking spaces will be incorporated into the scheme design by providing the necessary ducting for electrical cables.

A mobility management plan, prepared by NRB Consulting Engineers is included under separate cover and outlines the measures which are to be adopted to best promote and facilitate car sharing, dissemination of information about public transport timetables, etc. A Mobility Manager will be appointed for the scheme to ensure that the recommendations set out in the mobility management plan are implemented and maintained. A Parking Management/Strategy Report and a Bus/Dart Capacity & Demand Report also prepared by NRB Consulting Engineers are included under separate cover.

The cycle parking requirements for apartment developments are set out in the Department of Housing, Planning and Local Government document titled *'Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities', March 2018*. Section 4.17 of the document states;

'The accessibility to, and secure storage of, bicycles is a key concern for apartment residents and apartment proposals must respond accordingly to the requirements below in their design and provision of cycle storage facilities. Requirements of these guidelines include:

- *Location – cycle storage facilities should be directly accessible from the public road or from a shared private area that gives direct access to the public road avoiding unnecessarily long access routes with poor passive security or, slopes that can become hazardous in winter weather.*
- *Quantity – a general minimum standard of 1 cycle storage space per bedroom shall be applied. For studio units, at least 1 cycle storage space shall be provided. Visitor cycle parking shall also be provided at a standard of 1 space per 2 residential units. Any deviation from these standards shall be at the discretion of the planning authority and*

[18] 'Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities', March 2018, Section 4.19

shall be justified with respect to factors such as location, quality of facilities proposed, flexibility for future enhancement/enlargement, etc.

- *Design – cycle storage facilities shall be provided in a dedicated facility of permanent construction, preferably within the building footprint or, where not feasible, within an adjacent or adjoining purpose built structure of permanent construction. Cycle parking areas shall also be designed so that cyclists feel personally safe - secure cage/compound facilities, with electronic access for cyclists and CCTV, afford an increased level of security for residents. Effective security for cycle storage is also maximised by the provision of individual cycle lockers and it is best practice that planning authorities ensure that either secure cycle cage/compound or preferably locker facilities are provided.*

- *Management - an acceptable quality of cycle storage requires a management plan that ensures the effective operation and maintenance of cycle parking, in particular, avoiding arrangements that lead to a significant number of lockers being left locked whilst empty for instance. Cycle parking shall be the subject of a funded maintenance regime that ensures that facilities are kept clean, free of graffiti, well-lit and the parking equipment will be properly maintained. It is essential, therefore, that as far as possible cycle parking is low maintenance, easy to use and easy and attractive to use by residents.'*

Based on the second bullet point (highlighted) in the foregoing quoted text and the current proposed schedule of accommodation, the cycle parking breakdown for the proposed 139no. unit development is as follows;

Table 3-2 Cycle spaces required based on Apartment Guidelines

Unit type	No. Of Units	Cycle Parking Spaces Reqd.
1-bed	33 (@ 1 per bed space)	33
2-bed	91 (@ 1 per bed space)	182
3-bed	15 (@ 1 per bed space)	45
Visitor	139 units (@ 1 per 2 units)	69
Total		**330**

The Wicklow County Council cycle parking standards are set out in Table 7.2 of Appendix 1 of the CDP, an extract of which is shown in *Figure 3-6* following. The CDP standards are the same as those set out in the apartment guidelines.

Figure 3-14 Wicklow County Council CDP Bicycle Parking Standards[19]

Bicycle parking standards ***Table 7.2***

Type of Development	Cycle Parking Standard
Residential units	1 space per bedroom + 1 visitor space per 2 units

Based on the Apartment Guidelines and the CDP standards, there are a total of 260no. spaces required for residents and 70no. spaces required for visitors. The current proposal complies with the requirements and provides a total of 260no. secure parking spaces for and 70no. spaces for visitors which will be managed by the appointed management company for the development in accordance with the rates set out in the relevant standards.

The 270no. secure parking spaces are to be provided at basement level in a number of two-tier racking systems strategically located at the lowest level. The 70no. visitor spaces are to be located at surface level proximate to the green amenity areas and the ground floor entrances to the buildings. This will allow employees of the creche and the commercial areas to utilise the secure bicycle parking whereas visitors can use the surface bicycle parking.

In all instances, for design, maintenance and management purposes, the National Cycle Manual, (National Transport Authority, 2011), National Cycle Policy Framework (Department of Transport, 2009),and the Bike Parking Infrastructure (Dublin Cycling Campaign, 2017) recommendations apply.

3.5 Vehicle Manoeuvring

A vehicle swept path analysis has been undertaken to demonstrate that the proposal will accommodate public and emergency service vehicles. The refuse vehicle used in the assessment is a Phoenix 2 Duo Recycler (P2-12W with Elite 6x4 chassis) with an overall length of 10.2metres. The refuse collection is intended to be kerbside from a new recessed loading bay to be located on Dwyer Park adjacent to the development. This will involve removal of a section of street parking which is c.11.8metres long and reverting this section to a semi-recessed loading bay (1.4metre recess). Fire tenders require a smaller turning radius and can access building facades/elevations from the emergency fire tender access road off Castle Street and, separately, off Dwyer Park. Note that the Fire Safety Certificate and Disability Access Certificate applications will be made at post-planning stage but the layouts, routes, etc. enabling compliance with The Building Regulations Technical Guidance Documents B and M respectively are designed accordingly at pre-planning stage to ensure that the necessary access is achievable. Vehicle swept paths are shown on accompanying CHC drawing number CHC-00-GR-DR-C-00101.

[19] Wicklow County Development Plan 2016-2022, Appendix 1, Table 7.2 Bicycle Parking Standards

Bin stores for the development are located in dedicated areas convenient to the units served and will have a washdown facility. A Preliminary Operational Waste Management Plan is included under separate cover.

3.6 Future Transport Infrastructure

The Bray and Environs Transport Study was completed and published in April 2019. It sets out a number of transport objectives for Bray and the surrounding areas which is broken down into two phases. The purpose of the Study was to identify key infrastructural objectives from a transport planning perspective which would be consistent with, and allow the implementation of, the current and future development objectives of Bray and its environs. The initial delivery phase spans from 2019 to 2027 and the second phase spans from 2028 to 2035. The following is an extract from the Study identifying broadly the infrastructure and/or intensification of infrastructure that the National Transport Authority, Transport Infrastructure Ireland, Wicklow County Council and Dún Laoghaire-Rathdown County Council seek to deliver within the respective timeframe of each of the two phases.

'Bray and Environs Development Phase A – 2019-2027 In Phase A, the agencies (NTA, TII, WCC, DLRCC), subject to the considerations set out in Chapter 2, would seek to deliver the following:

- *Woodbrook DART Station and Park & Ride;*
- *Increased DART frequencies;*
- *Metrolink;*
- *Introduction of bus services linking Fassaroe to Woodbrook;*
- *Framework for interim Traffic Management System for the N11;*
- *N11 capacity and safety upgrades;*
- *Progression of N11/M11 Junction 4 to 14 Improvement Scheme;*
- *Bray (Dublin Road) Core Bus Corridor incl. Castle Street Bridge and junction improvements;*
- *Bus Connects Network Review;*
- *Bus Service from Bride's Glen to Bray via Rathmichael and Old Connaught;*
- *Golf Club Development Roads including Dargle bridge for use by buses, pedestrians and cyclists;*
- *Busway from Fassaroe to Old Connaught over County Brook at Ballyman Glen;*

- *Development of new road link from Ferndale Road to Dublin Road;*
- *New road link from the M50 Cherrywood Interchange to Rathmichael;*
- *Upgrades to local roads serving Old Connaught to facilitate bus, pedestrian and cycle movements, as required by development;*
- *A Feasibility Assessment of the Bridge from Upper Dargle Road to Herbert Road; and*
- *Bus Priority on Killarney Road.'*

Bray and Environs Development Phase B – 2028-2035 In Phase B, the agencies, subject to the considerations set out in Chapter 2, would seek to deliver the following:

- *Increased service frequency on bus services in line with demand;*
- *Luas to Bray;*
- *N11/M11 Junction 4 to 14 Improvement Scheme*
- *Demand Management on the M50 and M/N11;*
- *Bridge from Upper Dargle Road to Herbert Road; and*
- *Upgrades to local roads serving Rathmichael to facilitate bus, pedestrian and cycle movements, as required by development.'*[20]

The Study also identifies the current public transport programme and the intended delivery mechanisms for the relevant objectives as follows;

'As of 2018, the investment programme of the NTA includes the following elements of the preferred approach, as identified by this study:

- *Increased DART Frequencies (implemented);*
- *Planning and Design for Metro;*
- *Bray Core Bus Network; and*
- *Bus Connects Network Review.*

[20] Extract from Bray and Environs Transport Study, April 2019, Section 3.4 and 3.5

All of the other schemes and measures are recommended to be subject to the direct provision by developers; further investment programmes over the period of the Transport Strategy; further collection of development contributions; planning and design work; cost benefit analysis; environmental assessment; and the planning consent process where applicable. Potential for fast tracking certain elements of the programme exists, as does the potential for some elements to be delivered at a later date.'[21]

It is clear that the NTA, TII, Wicklow County Council and Dún Laoghaire-Rathdown County Council have identified a transport strategy for the area which has a focus on delivery of public transport infrastructure which will serve to benefit Bray and the wider area as well as any developments which are constructed and occupied in the area during the lifetime of the Study, until 2035. It is considered that the Phase B objectives are fluid and will be updated in the future as further information becomes available and as necessary.

It is also noted that the Golf Club Development Roads or southern access road (SAR) identified as an objective listed within the Phase A development (2019-2027) is located to the immediate northwest of the applicant site. The northwest site boundary will likely be formed with the proposed new access road when the road is constructed. Provision has been made for the future pedestrian and cyclist connectivity through the proposed development from the end of Dwyer Park to the southern access road. The connection will become useable when the construction of the SAR is completed.

3.7 TTA, MMP & Quality Audit

A Transport Assessment (TA) for the proposed development is included under separate cover and has been prepared in accordance with the TII publication '*Traffic and Transport Assessment Guidelines', PE-PDV-02045, May 2014*.

A Mobility Management Plan (MMP) is a tool employed to increase uses of other forms of transport than the car or to reduce vehicle miles by sharing journeys. While it is more applicable to other land uses such as employment, hotels, etc. it is considered that, due to the scale of the proposed development and the fact that the parking provision is to be managed and maintained by the appointed management company for the scheme, a MMP is appropriate in this instance. As such a MMP, a Parking Management/Strategy Report and a Bus/Dart Capacity & Demand Report is included in NRB Consulting Engineers submission under separate cover.

A Quality Audit consists of a Road Safety Audit (RSA), a Cycling Audit and a Walking Audit. Its purpose is to identify deficits in the design which may result in hazards to the users of a development. A road safety audit is defined as *'the formal safety performance examination of an existing or future road or*

[21] Extract from Bray and Environs Transport Study, April 2019, Section 3.6

intersection by an independent, multidisciplinary team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users'. It is a check for safety issues within a scheme rather than an identification of non-compliance with design standards and is independent of the road design team. In this instance a Stage 1 road safety audit has been carried out. A Stage 1 RSA is carried out at completion of preliminary design. The RSA team members examine the plans and additional information provided including undertaking a site visit. Stage 1 RSA notes safety related features within the design and provides opportunity to introduce ameliorative measures to reduce and/or eliminate identified hazards. The Quality Audit has been completed and is included as part of the application under the NRB Consulting Engineers documentation. The audit has been carried out in accordance with the Transport Infrastructure Ireland publication *'Road Safety Audit, GE-STY-01024', December 2017*. The recommendations identified within the audit have been incorporated into the final scheme design.

Details of the extents of the areas proposed to be taken in charge by Wicklow County Council are shown on accompanying drawing CHC-00-GR-DR-C-00500 titled 'Taking in charge' and are sufficient to accommodate the road widening required for the future Bus Connects scheme based on the current design proposals received.

4.0 FLOODING & FLOOD RISK

4.1 Flood Types

There are a number of flood types which need to be considered as part of the due diligence process for feasibility assessment for any prospective development site. These are outlined in Table 4-1 following;

Table 4-1 Flood Types and Description

Flood Type	Description
Fluvial Flooding	Flooding from a river or other watercourse.
Pluvial Flooding	Usually associated with convective summer thunderstorms or high intensity rainfall cells within longer duration events, pluvial flooding is a result of rainfall-generated overland flows which arise before run-off enters any watercourse or sewer. The intensity of rainfall can be such that the run-off totally overwhelms surface water and underground drainage systems.
Coastal Flooding	Flooding from the sea which is caused by higher than normal sea levels and/or high waves resulting in the sea overflowing onto the land.
Groundwater Flooding	Flooding caused by groundwater escaping from the ground when the water table rises to or above ground level.

Fluvial Flooding

Inspection of the Bray Fluvial Flood Extents project mapping prepared by the OPW shows that the flood extent mapping is currently under review. However, the extents shown clearly show that the site is not close to any of the fluvial flood extents previously identified (on the withdrawn flood extent mapping). Refer Figure 4-1 following which is an extract from the Floodinfo.ie flood extents mapping. The extents of flooding are shown, as is the extents of the flooding area. Based on the mapping, the site is not subject to fluvial flooding for the 0.1% AEP Fluvial event (1in1000year fluvial event).

As such, fluvial flooding is not considered to pose a constraint to development.

Figure 4-1 Extract from Floodinfo.ie Fluvial Flood Maps

Pluvial Flooding

The topography of the immediate surrounding area would suggest that there is little risk of pluvial flooding to the site. In the event that the public network surcharges, the natural topography will direct any flood water away from the site along Castle Street to the south. It will also be necessary to ensure that finished floor levels are above the road levels to prevent any pluvial flooding from neighbouring properties or the public road from impacting on the units.

The internal drainage for the scheme has been designed such that there is no risk of internal flooding to the properties in the event of a system failure.

As such, pluvial flooding is not considered to pose a constraint to development.

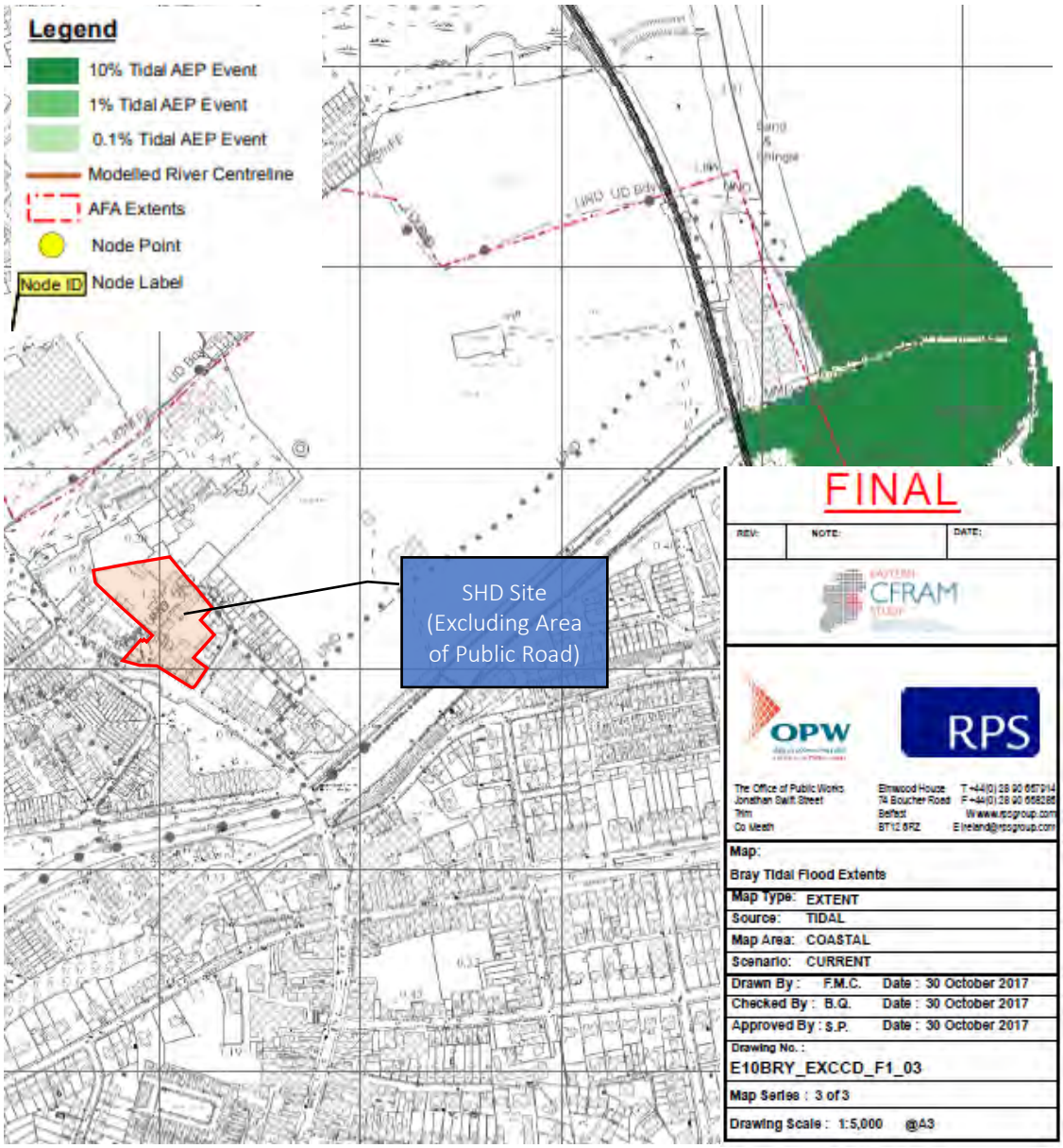
Coastal Flooding

Inspection of the Eastern Catchment Flood Risk Assessment and Management Study, 2016 (CFRAMS) prepared by RPS for the OPW confirms that the site is not subject to Coastal Flooding. Refer Figure 4-2 following which is an extract from the ECFRAMS Bray Tidal Flood Extents map (Map No.

E10BRY_EXCCD_F1_02, dated October 2017). Based on the mapping, the site is not subject to tidal flooding for the 0.1% AEP Tidal event (1in1000year tidal event). The full map is included in *Appendix D.1* to the rear of this report.

As such, coastal flooding is not considered to pose a constraint to development.

Figure 4-2 Extract from ECFRAMS Mapping, Map No. E10BRY_EXCCD_F1_03, Dated Oct 2017



Groundwater Flooding

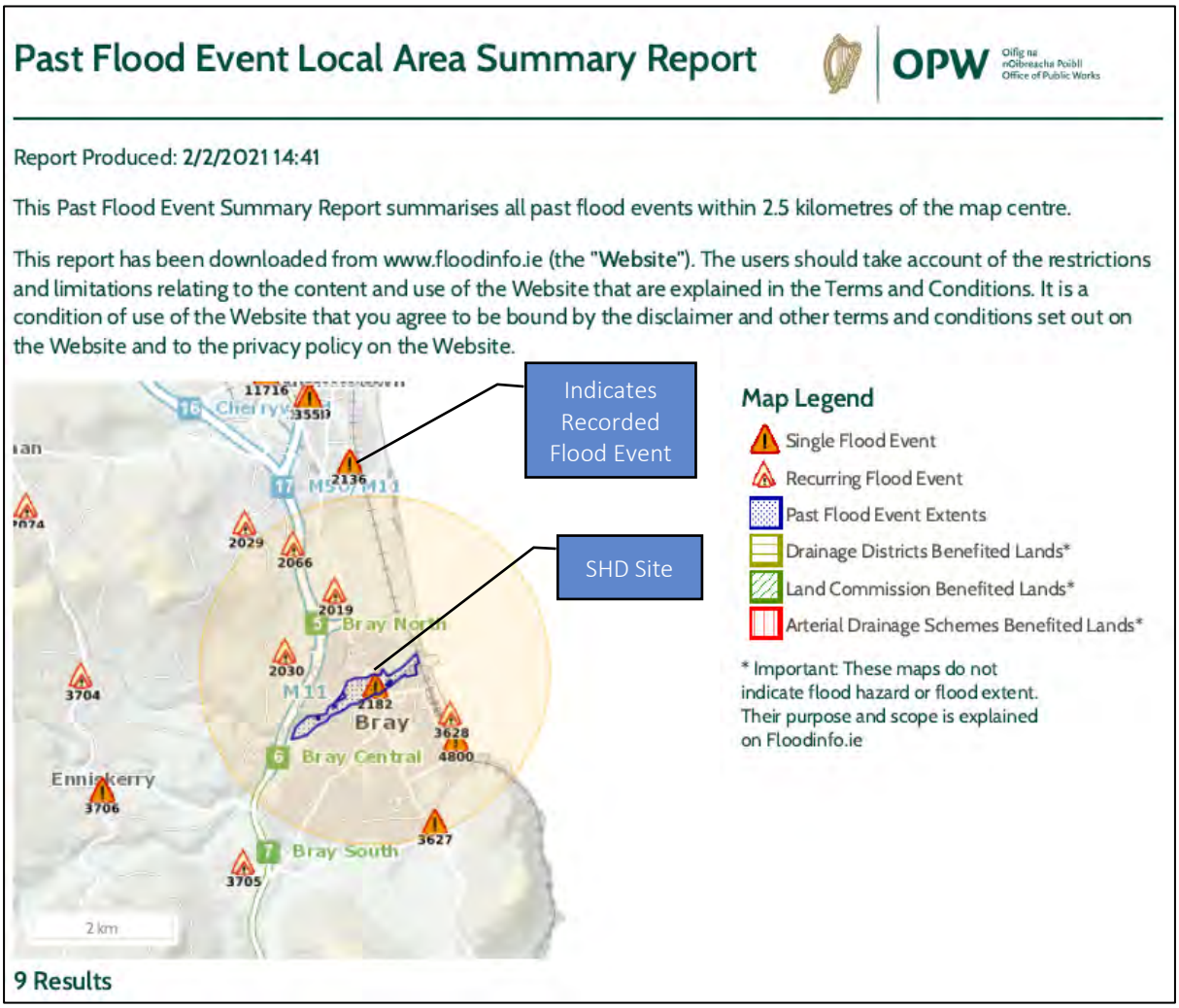
There are no reports of groundwater flooding in the area and, based on the topography in the vicinity of the site and the finished floor levels of the adjacent developments, it is considered that groundwater flooding does not pose a constraint to development.

4.2 OPW Flood Records

As part of this assessment the OPW flood event database was interrogated. There are nine records of floods within 2.5kilometres of the site but the search confirmed that there are no recorded flood events within, or immediate to, the site – see Figure 4-3 following extracted from the Summary Local Area Report. The closest event to the site is referenced Flood ID 2182, the extents of which are shown on the mapping. However, substantial flood defences were constructed along the banks of the Dargle which was one of the key capital investment projects by Wicklow County Council and the Office of Public Works (OPW) with an investment of €46 million and was completed in October 2017. The scheme comprised a variety of flood defences, including construction of new sections of earth embankments, demolition and rebuilding of river walls with extensive stone facing, channel excavation, regrading and riverbank strengthening. The flood defences aim to provide protection against a 1-in-100-year fluvial flood and 1-in-200-year tidal flood. As such, the area identified is no longer at risk of fluvial or tidal flooding.

A copy of the relevant generated Summary Local Area Report is included in *Appendix D.2*.

Figure 4-3 Extract from OPW floodinfo.ie generated Summary Local Area Report

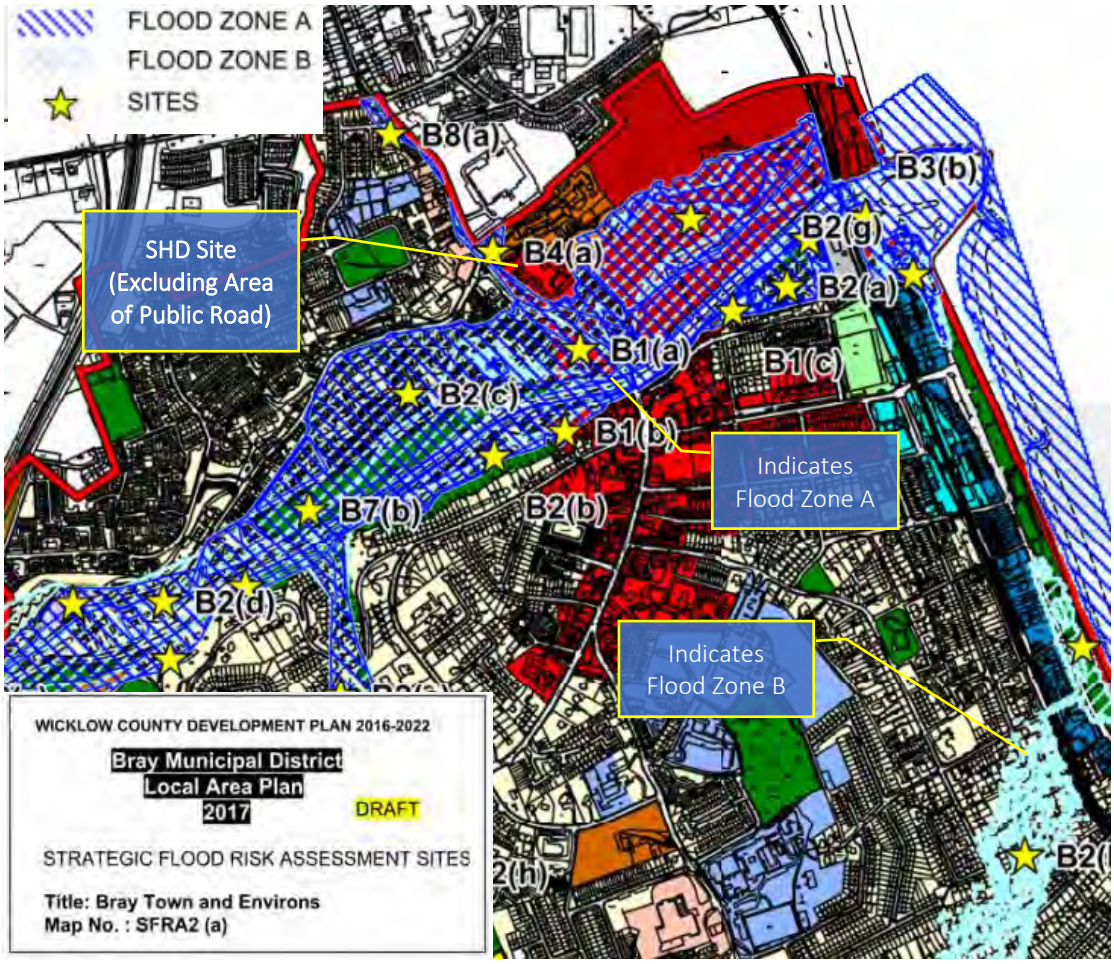


4.3 Bray Municipal District LAP SFRA

The Bray Municipal District Local Area Plan 2018 includes a Strategic Flood Risk Assessment (SSFRA) under Appendix C, titled *'Appendix C Strategic Flood Risk Assessment'*. The assessment was prepared in accordance with the requirements of The Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and Circular PL02/2014 (OPW, 2014). The SFRA provides an assessment of all types of flood risk within the County and assisted Wicklow County Council to make informed strategic land-use planning decisions and formulate flood risk policies. A review of available flood risk information was undertaken to identify any flooding or surface water management issues related to the County that may warrant further investigation.

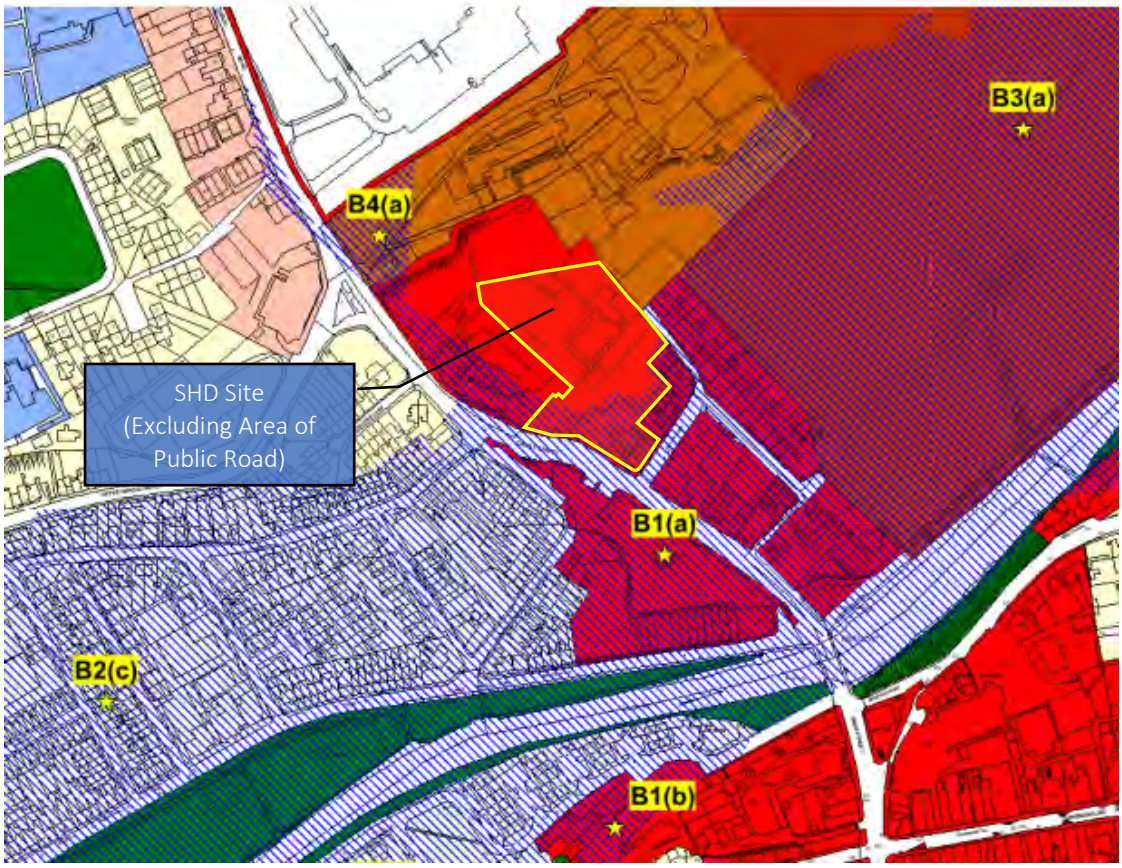
The flood risk mapping for the Bray town and environs area is included in the assessment, an extract of which is shown in Figure 4-4 following and the full map is included in *Appendix D.3* to the rear of this report.

Figure 4-4 Extract from Bray Town and Environs SFRA Sites, Map No.: SFRA2(a)



The flood mapping shows that the site falls partially within Flood Zone A but also includes a strategic flood risk assessment of the specific area (Ref. Site B4(a)) for the Town Centre land use objective which is included in the LAP SFRA.

Figure 4-5 Extract from Bray LAP Strategic Flood Risk Assessment



However, the flood extents shown do not include the flood defence measures which were completed in 2017 and this area is now benefitting land. As such, the site falls within Flood Zone C for all flood mechanisms. Based on the foregoing there is no current evidence of flood risk to the site therefore flooding is not considered a constraint to development.

A Site-Specific Flood Risk Assessment (SSFRA), prepared in accordance with the requirements of The Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and Circular PL02/2014 (OPW, 2014) is included under separate cover. As part of the assessment, potential flooding impacts on adjacent properties resulting from system failure, overland flows, etc. has been evaluated. The assessment has not identified any potential flooding issues.

5.0 POTABLE WATER

5.1 Existing Potable Water Infrastructure

The Bray and environs area is served by a number of public water supplies, including the Bray Direct Public Supply, which serves a population of approximately 5,000; the Bray Reservoir Public Supply, which serves a population of approximately 25,000; the Enniskerry Public Supply which serves a population of approximately 3,000 and the Kilmacanogue Public Supply which serves a population of approximately 1,000. The source of all of these water supplies is the Vartry Reservoir.

Based on IW water services records received, it can be seen that the site is currently served by two supplies of the existing cast iron watermain in the nearside of Castle Street with the two dwellings being served off the existing cast iron watermain in Dwyer Park. A copy of the IW Water Services Records detailing the location of the watermains in the vicinity of the site is included in *Appendix E.1* and an extract from the water services mapping is shown in Figure 5-1 following.

Figure 5-1 Extract from IW Water Services Records Mapping - Water

5.2 Development Potable Water Supply

Given the scale and type development proposed a new water supply will be required. A Pre-connection enquiry was initially submitted to Irish Water in 2019 and a favourable response under Irish Water reference CDS19007364 dated 29th October 2019 was received. A copy of the response letter is included under *Appendix E.2*. However, due to the length of time which has since passed, a new Pre-connection application was submitted to Irish Water in relation to the proposed development to determine if there were any issues in relation to potable water supply and demand for the proposed scheme. A copy of the response letter received under Irish Water reference CDS22000719, dated 23rd March 2022, is included in *Appendix E.3* to the rear of this report. In relation to the feedback for water, the response states;

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

The site specific comments in relation to water states;

> *'The connection point will be determined at connection application stage. A bulk meter will be required on the connection main.'*

The internal layouts within the site will be carried out under a self-lay agreement between the developer and Irish Water should the scheme be granted planning permission.

The connection will be a 150mm diameter connection and will also feed fire hydrants throughout the site. The layout for the proposed watermain connection to serve the development is shown on accompanying drawing ref. CHC-00-GR-DR-C-00300. Watermain details are shown on drawing ref. CHC-00-GR-DR-C-00330, 331 and 332. The proposed connection point is off the existing 6"ID watermain on the opposite side of Castle Street. The supply will be fed to a plant room where the individual supplies will be metered and distributed to each of the individual units including the commercial units and creche. The units will be served from an internal pumped supply due to the height of the proposed development. Irish Water have carried out a full review of the design proposals and have issued a Statement of Design Acceptance for the scheme which is included in *Appendix E.4*.

Based the current Schedule of Accommodation and IW demand figures, the daily residential demand is;

[139units @ 500 l/d/unit] = 69.50m^3/day

As the development demand is between 20m^3 and 200m^3 per day, a bulk meter with a SMS/GPRS telemetry datalogger, with capability to record flow and pressure at regular intervals to IW specification will be required. This is located in the publicly accessible area to the south of the primary pedestrian and cyclist entrance.

All water connection proposals and watermains and associated valves, fittings, etc. will be subject to approval by Irish Water and will have to be constructed and installed to the Irish Water publication *'Code of Practice for Water Infrastructure* (Irish Water, 2017)*,* Document IW-CDS-5020-03. The distribution network within the buildings will be to the Building Regulations, TGD G – Hygiene (DOEHLG, 2011). Low water usage devices will be required throughout any scheme proposed.

Based on the foregoing, and given the type and scale of development, a new water connection is not considered to be a constraint to development and Irish Water have further confirmed this fact in their Statement of Design Acceptance for the scheme which is included in *Appendix E.4*.

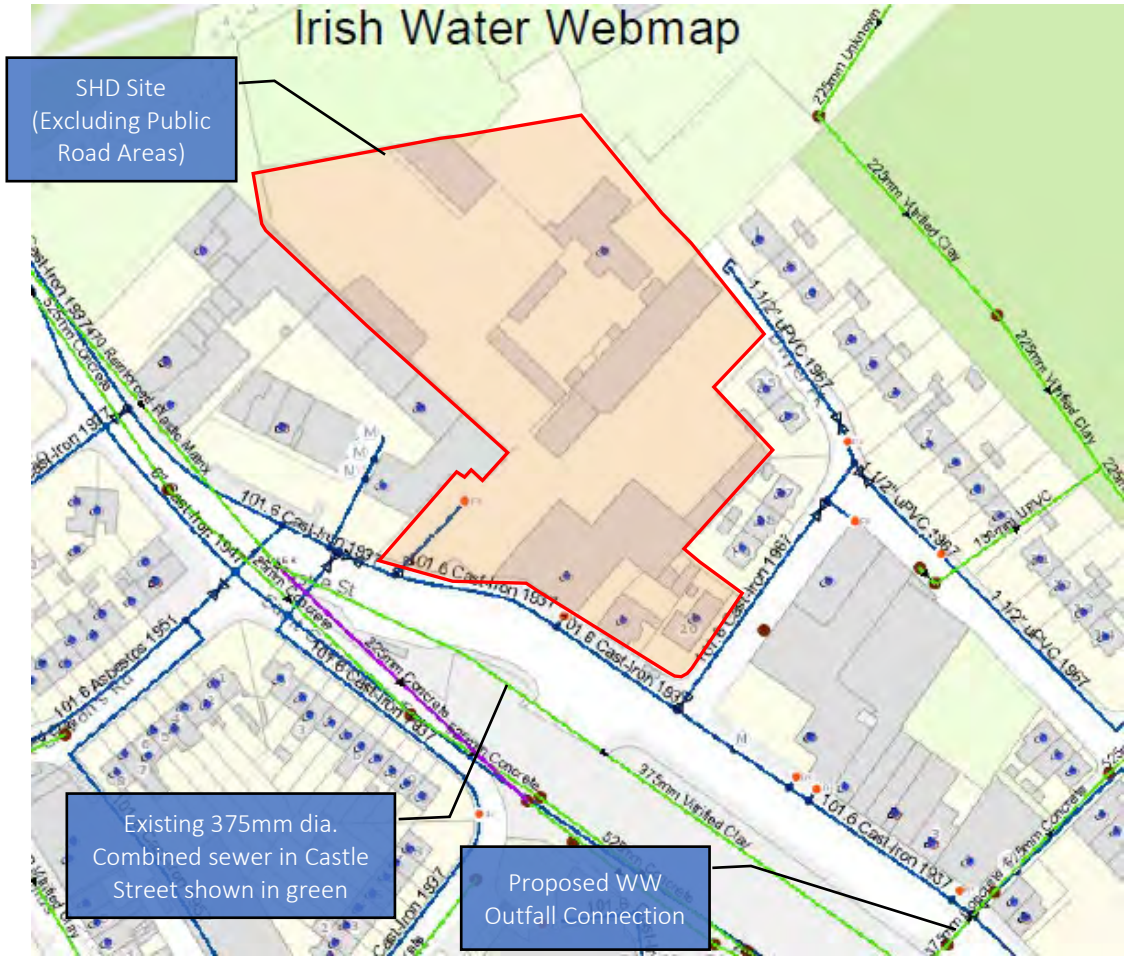
6.0 WASTEWATER

6.1 Existing Wastewater Infrastructure

The majority of the Bray and environs plan area is served by the Shanganagh-Bray wastewater treatment plant, which opened in January 2013. This treatment plant has a design capacity of 186,000 population equivalent and is thus far operating with no capacity issues. Enniskerry is served by a separate wastewater treatment plant located at Cookstown on the R117.

From inspection of the IW Water Services Mapping and the topographic survey of the site, it is apparent that the site currently discharges to the existing 375mm diameter Vitrified Clay combined sewer on the opposite side of Castle Street. There are no wastewater sewers shown on the records serving Dwyer Park so it is considered likely that they are served by runs in the rear gardens of the Dwyer Park properties – See Figure 6-1 below.

Figure 6-1 Extract from IW Water Services Records Mapping - Wastewater



6.2 Development Wastewater Disposal

Given the scale and type development proposed a new wastewater connection will be required. A Pre-connection enquiry was initially submitted to Irish Water in 2019 and a favourable response under Irish Water reference CDS19007364 dated 29th October 2019 was received. A copy of the response letter is included under *Appendix E.2*. However, due to the length of time which has since passed, a new Pre-connection application was submitted to Irish Water in relation to the proposed development to determine if there were any issues in relation to wastewater capacity required to service the proposed scheme. A copy of the response letter received under Irish Water reference CDS22000719, dated 23rd March 2022, is included in *Appendix E.3* to the rear of this report. In relation to the feedback for wastewater, the response states;

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

The site specific comments in relation to water states;

> *'Approximately 120m of network extension will be required for the connection as per applicant layouts. These extension works are not currently on Irish Water investment plan therefore, the applicant will be required to fund these local network upgrades. The fee will be calculated at a connection application stage. It is the responsibility of the applicant to determine if a gravity connection is feasible. Separate storm and foul water connection services have to be provided for the Development. The surface and storm water from the site must be discharged only into an existing storm water network that does not discharge to an IW combined/foul sewer. The connection arrangement should be agreed with the Local Authority Drainage Division.'*

The necessary network extension has been incorporated into the scheme design and the entire scheme design has been subject to the Irish Water audit and the Statement of Design Acceptance from Irish Water is included under *Appendix E.4*.

Based the current Schedule of Accommodation and IW demand figures, the daily residential demand is;

[139units x 2.7persons/unit x 150litres/hd/day x 10% Infiltration] = 61,924.5litres

There will be an additional, relatively nominal, demand for the commercial and creche uses.

A gravity drainage connection from the site is achievable with the Irish Water preferred connection point being to the existing 375mm diameter combined sewer in Castle Street to the southeast of the site at the junction of Castle Street and Dwyer Park. There is a pump located in the undercroft car parking areas to facilitate the removal of collected runoff from parked cars. The effluent passes through an oil and silt separator prior to discharge to a manhole immediately outside the undercroft plan in accordance with the Greater Dublin Regional Code of Practice for Drainage Works recommendations. There are also trapped gullies within the bin store and cycle parking areas for maintenance purposes which drain to the foul network.

Figure 6-2 Preferred Wastewater Discharge Point

All wastewater works for the development will be designed to the Irish Water document *'Code of Practice for Wastewater Infrastructure'*, (Irish Water, 2017), Document IW-CDS-5030-03.

Details of the wastewater proposals for the scheme are shown on accompanying drawing ref. CHC-00-GR-DR-C-00200 titled *'Drainage Layout'* and CHC-00-GR-DR-C-00201 titled *'Drainage Outfall Layout'*. The longitudinal sections are shown on drawing ref. CHC-00-GR-DR-C-00210 titled *'Surface and Wastewater Longitudinal Sections.* Details of the network model from Microdrainage are included in *Appendix F.1*.

The wastewater drainage network within the site will be constructed in accordance with The Building Regulations, Technical Guidance Documents, Part H – Drainage, as the areas within the site are all to remain in private ownership and will not be taken-in charge by Irish Water.

Based on the foregoing, and given the type and scale of development, a new wastewater connection is not considered to be a constraint to development and Irish Water have further confirmed this fact on issue of their Statement of Design Acceptance (Irish Water reference CDS19007364) for the scheme which is included in *Appendix E.4*.

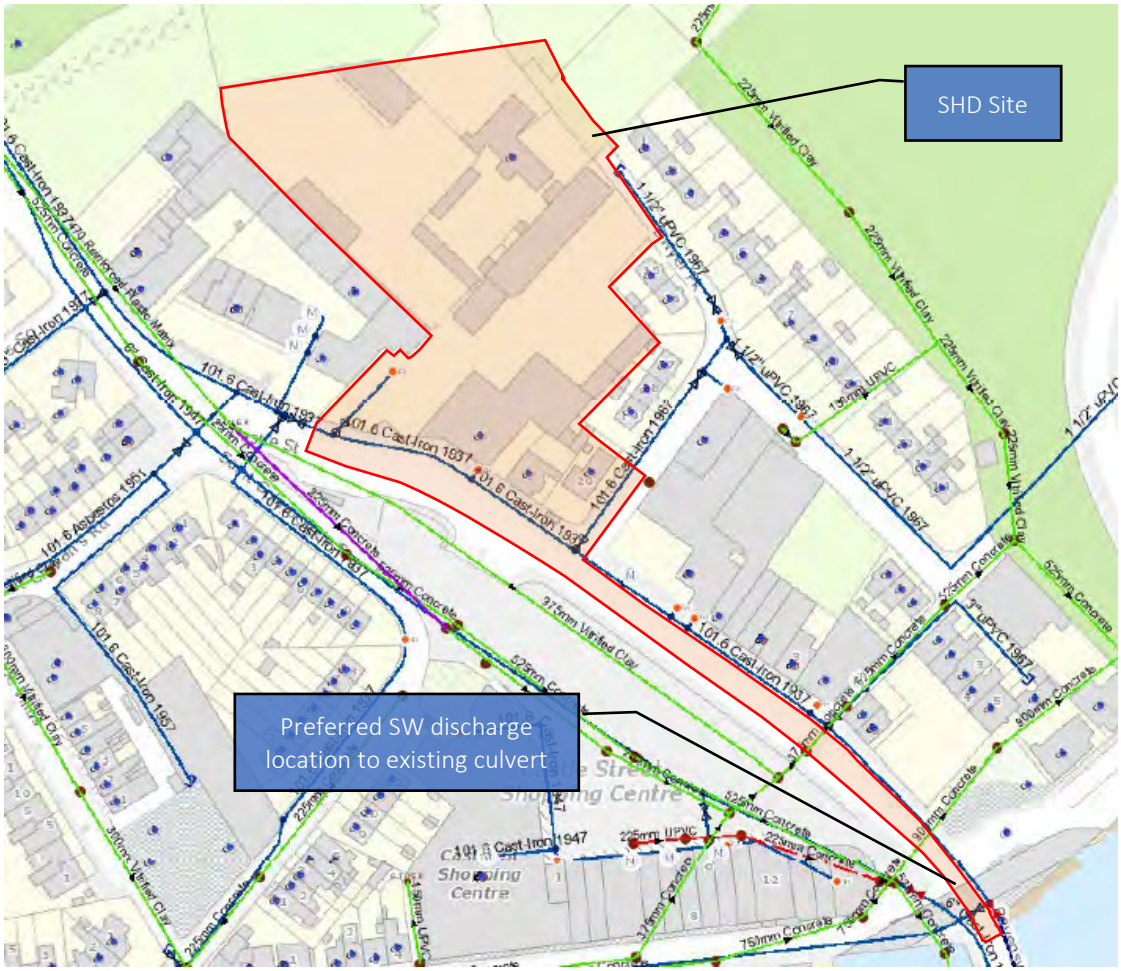
The planning application form sets out several questions to be addressed in relation to water and wastewater within the development and the impact that the proposed development will have on the existing Irish Water infrastructure. These are addressed in Technical Note CHC-XX-XX-TN-C-00003 titled Water & Wastewater Application Form Questions included in *Appendix E.5*.

7.0 SURFACE WATER

7.1 Existing Surface Water Infrastructure

Based on the age of the existing development on the site, the most likely scenario is that the surface water collected from roofs and other areas within the development currently discharges to the existing combined sewer network. It is noted that the site is almost completely impermeable with the exception of the garden areas of the two houses. The result is that all rainwater is discharged to the combined sewer network in Castle Street. Furthermore, there is currently no form of treatment or attenuation prior to discharge. An extract from the Irish Water Surface Water network for the area is shown in Figure 7-1 following.

Figure 7-1 Existing Water Services Network and Preferred SW Discharge Location



7.2 Development Surface Water Management and Disposal

Further to consultation with Wicklow County Council, the preferred connection location for surface water discharge is to the existing Dargle River via a new surface water pipe which will have to be constructed as part of the works as there are no surface water sewers in the area.

Surface water attenuation and treatment is included as part of the surface water management and disposal proposals in accordance with the requirements of the Greater Dublin Strategic Drainage Study (Dublin City Council, 2005). The attenuation storage is provided within the confines of the site and discharges, via a flow control device (Hydrobrake Vortex flow control, or similar) to an outlet manhole within the public realm which is the head of the run for the new connecting pipework from the site to the proposed outfall at the River Dargle.

Based on the site area the Greenfield Runoff Rate ($QBAR_{RURAL}$) for the site can be calculated as follows;

$$[QBAR_{RURAL} = 0.00108 \times (50Ha)^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}] = 110 \text{ litres/sec for a 50Ha site}$$

Using IH 124 method, apply linear scaling factor = [(Site Area/50Ha) x 110 litres/sec] = 1.9 litres/sec for the subject site

Apply GDSDS Growth Curve factors as per Figure 7-1 following;

Table 7-1 Design Return Period Event Throttle Rates based on GDSDS Growth Curve Factors

Return Period (years)	Growth Curve Factor (GDSDS)	Throttle Rates (litres per second)
1	0.85	1.6
QBAR	1.0	1.8
10	1.7	3.1
30	2.1	3.9
100	2.6	4.8
200	2.9	5.4

The throttle rate calculation variables are based on the data shown in Table 7-2 following;

Table 7-2 Throttle Rate Calculation Variables

Variable	Value	Source
Site Area for Drainage Calculations	0.8594Hectares	Site Survey
Soil Type 2	SOIL = 0.3	Flood Studies Report
SAAR	825mm	Met Éireann Point Rainfall Data
$M_{5\text{-}60min}$	17.0mm	Met Éireann Return Period Rainfall Depths for Sliding Duration Data
$M_{5\text{-}2day}$	63.2mm	
Jenkinson's 'R' Value	0.269	[17.0/63.2]

A copy of the return period rainfall depths data received from Met Éireann is included in *Appendix G.1* to the rear of this report.

The development site falls within the administrative jurisdiction of Wicklow County Council. As such, the Greater Dublin Strategic Drainage Study (GDSDS) recommendations are required to be implemented and incorporated into the surface water drainage design solution for the development site.

In order to comply with the GDSDS requirements, any proposed development must ensure that a comprehensive sustainable urban drainage system, SuDS, is incorporated into the development. SuDS requires that post development run-off rates be maintained at equivalent, or lower, levels than pre-development levels. Thus, the development must be able to retain, within its boundaries, storm water volumes from extreme storm events up to a 1 in 100 year storm event, more commonly expressed as a 1.0% AEP (Annual Exceedance Probability). Any new development must have the physical capacity to retain storm water volumes as directed under the Greater Dublin Strategic Drainage Strategy and, if necessary, release these attenuated surface water volumes to an outfall at a controlled flow rate. A further component of the SuDS protocols is to increase the overall water quality of surface water runoff before it enters a natural watercourse or into a public sewer, which ultimately discharges to a water body. This is to ensure the highest possible standard of storm water quality.

A number of systems are available to comply with this protocol. These have been assessed using the Site Evaluation tool on the www.Irishsuds.com website. For the proposed development, it is proposed that the following systems will be used:

10mm Interception Volume Storage

10mm interception volume storage is proposed to be provided for the entirety of the hardstanding areas within the development including the podium area and the green roofs which both have 15mm storage. 10mm Interception storage is provided in an open graded crushed rock (OGCR) storage media beneath the attenuation tank and below the outlet level. The volume required is calculated in accordance with Appendix E2.1.1 of the GDSDS. The volume required equates to 39.992cubic metres. For the purposes of drainage calculations, the entirety of the permeable paved access roads, as well as the area of green roof on the apartment buildings and the podium area, are included as IMPermeable area. Details of the breakdown for the 10mm interception storage is given in the following table. Details of the 10mm interception volume storage arrangements beneath the tank are shown on CHC drawing number CHC-00-GR-DR-C-00242 titled '*Surface Drainage Details. Sheet 3*'. It is noted that the 10mm interception storage provided beneath the attenuation tank is calculated based on the respective upstream catchment IMPermeable area – Refer *Table 7-3* following for calculations detailing that the provided storage of 40.875cubic metres is in excess of the required storage volume of 40.504cubic metres.

Table 7-3 10mm Interception Volume Storage Calculations

Site Catchment IMP Area incl. Green Roof (sq.m)	5,000
Apply 80% and 59% runoff factors	0.464
10mm Interception Volume storage reqd. (cu.m)	40.504
Infiltration Blanket beneath Attenuation tanks Plan Area (sq.m)	545
Depth of 10mm Interception Volume Storage (m)	0.250
Porosity of 10mm Interception Volume Storage (OGCR)	0.3
Vol Provided (cu.m)	40.875

Attenuation Storage

The attenuation storage is proposed to be provided in a tank system beneath the undercroft parking area, in-line, at the lower end of the site, prior to the outfall discharge to the new surface water sewer which is to be laid to the outfall at Bray Bridge. The foundations for the buildings are to be piled to refusal (rock) which ensures that the infiltration of the interception storage volumes does not cause any issue with the foundations. Details of the proposed system are shown on the accompanying CHC drawings CHC-00-GR-DR-C-00200 titled '*Drainage Layout*' and CHC-00-GR-DR-C-00242 titled *'Surface Water Drainage Details Sheet 3*'. The catchment layout is shown on CHC drawing CHC-00-GR-DR-C-00400 titled *'Drainage Catchment Areas Layout'*. Drainage longitudinal sections are shown on drawing CHC-00-GR-DR-C-00210 titled *'Surface and Wastewater Longitudinal Sections'*.

The 10mm interception volume storage is located beneath the attenuation storage facilities beneath the attenuation tank outlet level. The attenuation tanks are concrete tanks with the interception storage volume being located beneath the tanks in an open graded crushed rock (OGCR storage media) which is lined with a permeable membrane and will therefore allow discharge to ground as part of the SuDs measures facilitating groundwater recharge. It is however noted that the ground conditions demonstrate that the subsoil in the site and downstream of the site has limited infiltration characteristics despite adopting a Soil Type 3 for design purposes (which will further limit discharge rates). While the interface will not be impermeably tanked, it is considered that there will only be negligible infiltration achievable, and this is the reason that a large plan area has been used in the design for the infiltration blanket.

The designed attenuation storage caters for events up to, and including, the 1.0% AEP rainfall event with a 20% allowance for Climate Change. The attenuation volumes have been calculated by modelling the catchment in Microdrainage in an iterative process which ensures that the system does not flood. The analysis of the modelled system confirms that the network does not flood. Full details are included in *Appendix G.2* to the rear of this report. The Met Eireann rainfall data is included in *Appendix G.1* to the rear of this report. *Table 7-4* following details the drainage characteristics and calculations for the

drainage catchment. The Factor of Safety, F, applied for calculating the storage volume is 5 in accordance with CIRIA C753, Table 25.2.

Table 7-4 Drainage Characteristics and Calculations

Catchment #01 - Entire Development Site	
Drainage Site Area (Ha) =	0.8594
IMP Paved Area =	0.4999 (incl. Green Roof Area)
SOIL =	0.3
SAAR (mm) =	825
M5-60 (mm) =	17.0
M5-2day (mm) =	63.2
Jenkinson's 'R' =	0.269

GDSDS E2.1.1 Interception - Criterion 1.1

Table E1 Calculation of Interception Volume

Item	Measurement/ Calculation	Comment/clarification
Paved surfaces connecting to the drainage system	80% x 58% x 8,594sq.m = 3,992.2q.m	80% of the paved area (Runoff Factor) 58% of the site is paved 0.85694Ha development area in sq.m
Volume of interception storage	3,992.2sq.m x 10mm = 39.992cu.m	Paved area directly drained 10mm rainfall depth

GDSDS E2.2.2 Greenfield Runoff Analysis

AREA	0.5	sq.km (using 50Ha as site area < 50Ha)
SAAR	825	mm
SOIL	0.3	(SOIL Type 2)
$QBAR_{RURAL} = 0.00108 \times (50Ha)^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$		
$QBAR_{RURAL}$ for 50Ha site =	115	litres per second
Using IH 124 method apply linear scaling factor (Site Area/50Ha)		0.0174
$QBAR_{RURAL}$ =	**1.9**	**litres per second**
Q_1	**1.6**	**litres per second**
Q_{30}	**4.0**	**litres per second**
Q_{100}	**5.0**	**litres per second**

Limiting Discharge

Collected surface water will be discharged from the initial attenuation facility by means of a flow control utilising a Hydrobrake flow control mechanism, the details of which are included in *Appendix G.2*.

Details of the network including online controls and attenuation storage details and simulation summaries are shown in *Appendix G.2*. The MicroDrainage modelled analysis output and calculations confirm that no flooding occurs within the network for any of the analysed storm events modelled as required under Volume 2 of the GDSDS.

The accompanying CHC drawings CHC-00-GR-DR-C-00200 titled '*Drainage Layout',* CHC-00-GR-DR-C-00201 titled '*Drainage Outfall Layout, '*CHC-00-GR-DR-C-00210 titled '*Surface and Wastewater Drainage Longitudinal Sections'*, CHC-00-GR-DR-C-00240, 00241 and 00242 titled '*Surface Drainage Details. Sheet 1, Sheet 2 and Sheet 3* respectively and CHC-00-GR-DR-C-00400 titled '*Drainage Catchment Areas Layout*' details the surface water drainage layouts, longitudinal sections, catchments and private and public SW drainage details for the proposed development. For pipe design purposes, the impermeable sub-catchments are considered 100% impermeable in accordance with the GDSDS. It is noted that the PERmeable Areas are allocated a 70% runoff factor for drainage design purposes but that these areas are excluded from the 10mm interception volume storage as it is considered that the runoff from these areas during minor events will be negligible. As part of the design assumptions, the 10mm interception storage has not been included within the attenuation storage, i.e. it is assumed when a storm is modelled that the 10mm interception volume storage is completely full. This means that the design caters for the worst-case scenario which is appropriate in this instance given the nature of the ground conditions.

Green Roofs are proposed for the apartment buildings. An extensive green roof is proposed with depression storage and daily evaporation values of 15mm and 3mm respectively. Refer to accompanying CHC drawing number CHC-00-GR-DR-C-00241 titled '*Surface water drainage details sheet 2*' which details the proposed green roof makeup and also CHC-00-GR-DR-C-00400 titled '*Drainage Catchment Areas Layout*' detailing the extents of green roof areas. The total area of green roof within the development is 3,663square metres, which is the complete roof area of the proposed buildings on the site.

Permeable paving is proposed for surfacing of the surface car parking areas, footpaths, etc. which also provides a primary level of treatment from runoff from parked cars. The podium is also to be a permeable paved surface with an OGCR sub-base beneath. It is noted that the permeable paved areas will result in an increased time of entry thereby further improving capacity availability within the system. Details of the permeable paved access roads and surface parking areas are shown on accompanying CHC drawing umber CHC-00-GR-DR-C-00120 titled '*Road Details'*.

Oil Interceptor. An interceptor is proposed to be installed on the network prior to discharge from the site to the new surface water sewer which is to be constructed from the development to the proposed surface water final outfall to the River Dargle at Bray Bridge. It is also considered that the permeable pavements used throughout the development will add treatment value where suspended solids, heavy metals and hydrocarbons become trapped in the sub-base material and are broken down by adsorption

and biodegradation. Simple Index Approach as detailed in Section 26.7.1 of The SuDS Manual confirms that the level of treatment inherent in permeable paving systems has a Total SuDS Mitigation Index in excess of the pollution hazard index for the development type and catchment and runoffs proposed.

It is proposed to provide a Sustainable Drainage System (SuDS) in accordance with the Greater Dublin Strategic Drainage Study Regional Drainage Policy Volume 2 - New Development (GDSDS-RDP Volume 2). Specific design requirements for SuDS components are established by the Construction Industry Research and Information Association's publication CIRIA C753 - The SuDS Manual (C753).

Storm flows will be attenuated as previously detailed and comply with the criteria detailed in the following table.

7.3 Greater Dublin Strategic Drainage Study

There are several specific requirements in relation to surface water drainage which must be adhered to as part of any development in areas where the GDSDS is required. Volume 2 of the GDSDS, titled Regional Drainage Policies – Volume 2 New Developments sets out the criteria for new developments. *Table 7-5* following is extract from Volume 2 of the GDSDS which sets out the specific criteria for new developments.

Table 7-5 Extract from GDSDS – Criteria for New Developments

Criteria	Sub-criterion	Return Period (Years)	Design Objective
Criterion 1 **River water quality protection**	1.1	<1	Interception storage of at least 5mm, and preferably 10mm, of rainfall where runoff to the receiving water can be prevented.
	1.2	<1	Where initial runoff from at least 5mm of rainfall cannot be intercepted, treatment of runoff (treatment volume) is required. Retention pond (if used) to have minimum pool volume equivalent to 15mm rainfall.
Criterion 2 **River regime protection**	2.1	1	Discharge rate equal to 1 year greenfield site peak runoff rate or 2l/s/ha, whichever is the greater. Site critical duration storm to be used to assess attenuation storage volume.

Criteria	Sub-criterion	Return Period (Years)	Design Objective
	2.2	100	Discharge rate equal to 1 in 100 year greenfield site peak runoff rate. Site critical duration storm to be used to assess attenuation storage volume.
Criterion 3 Level of service (flooding) for the site	3.1	30	No flooding on site except where specifically planned flooding is approved. Summer design storm of 15 or 30 minutes are normally critical.
	3.2	100	No internal property flooding. Planned flood routing and temporary flood storage accommodated on site for short high intensity storms. Site critical duration events.
	3.3	100	No internal property flooding. Floor levels at least 500mm above maximum river level and adjacent onsite storage retention.
	3.4	100	No flooding of adjacent urban areas. Overland flooding managed within the development.
Criterion 4 River flood protection (criterion 4.1, or 4.2 or 4.3 to be applied)	4.1	100	"Long-term" floodwater accommodated on site for development runoff volume which is in excess of the greenfield runoff volume. Temporary flood storage drained by infiltration on a designated flooding area brought into operation by extreme events only. 100 year, 6 hour duration storm to be used for assessment of the additional volume of runoff.
	4.2	100	Infiltration storage provided equal in volume to "long term" storage. Usually designed to operate for all events. 100year, 6 hour duration storm to be used for assessment of the additional volume of runoff
	4.3	100	Maximum discharge rate of QBAR or 2 l/s/ha, whichever is the greater, for all attenuation storage

Criteria	Sub-criterion	Return Period (Years)	Design Objective
			where separate "long term" storage cannot be provided.

7.3.1 Criterion 1 – River Water Quality Protection

The drainage solution proposed for the development contains a range of treatment methods for surface water prior to discharge to ensure river water quality protection. The design complies with Sub-criterion 1.1 as the drainage solution proposed includes interception of 10mm of surface water from the first flush of storm events. The 10mm interception proposed is based on the hardstanding catchment area and the calculations exclude the benefits of delayed time of entry and storage which will be inherent in the permeable surfacing to be utilised throughout the site. Therefore, the volume provided is in excess of the preferred 10mm requirement set down in the GDSDS. The proposals therefore meet the requirements of Criterion 1.1. An oil interceptor is proposed to be installed on the network prior to discharge from the site. The system proposed is a Klargester® NSFP006 full retention separator with a silt capacity of 600litres and an oil capacity of 60litres. The maximum flow that the separator can accommodate is six litres per second which is in excess of the controlled outflow from the site of 1.9 litres per second. The interceptor is fitted with a GSM alarm system which notifies a predetermined contact (Management Company) when maintenance or emptying is required. It is also considered that the permeable pavements used throughout the development will add treatment value where suspended solids, heavy metals and hydrocarbons become trapped in the sub-base material and are broken down by adsorption and biodegradation over time.

As interception storage is to be provided in accordance with Sub-Criterion 1.1 of the GDSDS, treatment volume is not required. The proposals therefore meet the requirements of Criterion 1.2.

7.3.2 Criterion 2 – River Regime Protection

The proposed method of disposal of surface water from the site is to discharge to River Dargle via a new surface water sewer which is to be constructed to the proposed outfall at Bray Bridge. The discharge from the site to the new drain in Castle Street will be via a limited discharge in the form of a Hydrobrake® flow control devices. The discharge rate stipulated in Sub-criterion 2.1 requires a limited discharge equivalent to the greenfield site peak runoff rate or 2 l/s/ha, whichever is greater. The 2 l/s/ha runoff rate results in a discharge rate from the site of [0.8720Ha*2.0 l/s/ha] = 1.71 l/s. The calculated greenfield runoff rate, $QBAR_{RURAL}$ is 1.9 l/s. The

greater value has been adopted for design purposes as stipulated in Sub-criterion 2.1. Therefore, the proposals satisfy Criteria 2.1.

The attenuation storage for the development has been modelled and the simulation confirms that there is no flooding in any of the simulated scenarios, therefore the proposals satisfy Criteria 2.2.

7.3.3 Criterion 3 – Level of Service (Flooding) for the Site

It is proposed that all storm water runoff from the development will discharge to the River Dargle via an attenuated outfall and through the new surface water sewer to be constructed from the site to the proposed outfall. The proposed drainage layout and attenuation arrangements are shown on the accompanying CHC drawings. Calculations for the design of storm drains have been compiled with the MicroDrainage WinDes Program using the Modified Rational Method in accordance with EN752. Calculations are included for the Storm networks in *Appendix G.2*.

7.3.3.1 Sub-criterion 3.1

The performance of the proposed drainage system in 30-year return period storm events (+20% Climate Change Allowance) has been analysed. The analyses show that no flooding will occur in 30-year return period storm events. The storm events listed in

Table 7-6 following have been simulated and analysed. Details of the analysed critical events sorted by maximum flood volume are included in *Appendix G.2*. The results shown are the Critical Summary of Results by Maximum Flood Volume (Rank 1) which is the worst-case scenario for each individual pipe. The results confirm that no flooding occurs for any of the modelled storm events and therefore the proposals satisfy the requirements of Criterion 3.1.

Table 7-6 Modelled flood events

Seasonal Return Period	Storm Duration (min)
1 yr Winter + 20% Climate Change 1 yr Summer + 20% Climate Change	15, 30, 60, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
30 yr Winter + 20% Climate Change 30 yr Summer + 20% Climate Change	
100 yr Winter + 20% Climate Change 100 yr Summer + 20% Climate Change	

7.3.3.2 Sub-criterion 3.2

The performance of the proposed drainage system in 100-year return period storm events (+20% Climate Change Allowance) has similarly been analysed. The analyses show that no flooding, property or otherwise, is expected in the 100-year return period storm event – refer *Appendix G.2*. Therefore, the proposals satisfy the requirements of Criterion 3.2.

7.3.3.3 Sub-criterion 3.3

The maximum water level in the proposed attenuation will not have an effect on the proposed buildings. All proposed buildings are at least 500mm above the design critical storm water level in their respective attenuation facilities, in accordance with the requirements of Sub-Criterion 3.3. Therefore, the proposals satisfy the requirements of Criterion 3.3.

7.3.4 Sub-criterion 3.4

The performance of the proposed drainage system in the 100-year return period storm events (+20% Climate Change Allowance) has been analysed. The analyses show that no flooding is expected in the 100-year return period storm event. As such, no off-site overland flow is expected in the 100-year return period storm event. The scheme is designed such that a network system failure would result in surcharged and overspill being directed along the proposed roads and green areas due to the design topography of the scheme. Therefore, the proposals satisfy the requirements of Criterion 3.4.

7.4 Criterion 4 – River Flood Protection

7.4.1 Sub-criterion 4.1

Refer Sub-Criterion 4.3 which is complied with as Long Term storage cannot be provided.

7.4.2 Sub-criterion 4.2

Refer Sub-Criterion 4.3 which is complied with as Long Term storage cannot be provided.

7.4.3 Sub-criterion 4.3

Due to the high-density development required under the planning zoning for the site, it is not possible to provide long term storage within the site. There are no areas which can accommodate long term storage volumes without resulting in a reduction in building densities within the site. As such, in accordance with sub-criterion 4.3, runoff from the site will be limited to the adopted QBAR discharge rate of 1.9 litres per second without applying any growth curve factors. By limiting the runoff to this flow rate, the GDSDS-RDP Volume 2, Appendix E Section E2.4 states that this ensures *'that sufficient stormwater runoff retention is achieved to protect the river during extreme events'*. Attenuation storage is provided for the 100-year return period storm event in the proposed underground storage attenuation facility. Control of runoff rates will be achieved through the use of a vortex control devices (e.g. Hydrobrake), which reduce the risk of blockage present with other flow control devices. Modelled simulation results for the entire surface water drainage network are included in *Appendix G.2*.

A copy of the Water Services Records obtained from Wicklow County Council are included in *Appendix E.1*.

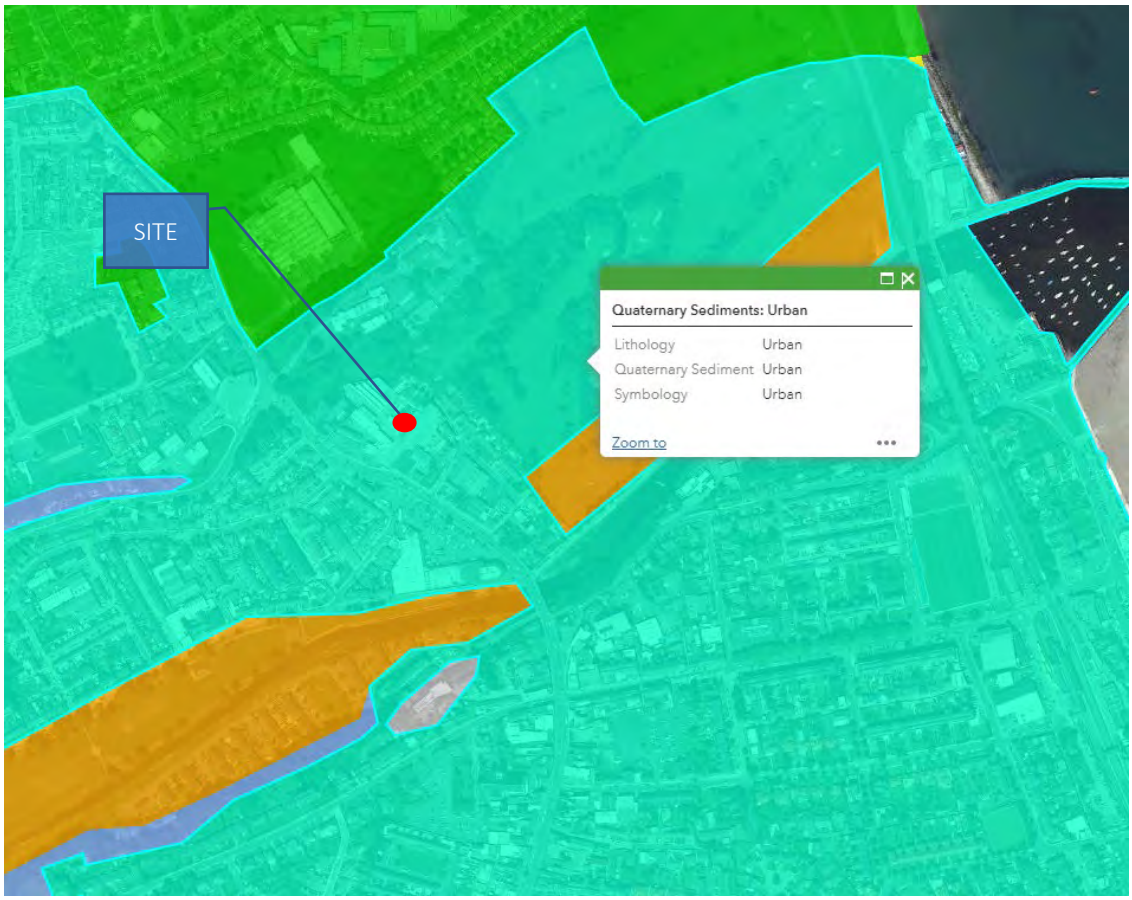
There is also a Climate Change Statement included as part of the application which details the design assumptions made in relation to the surface water drainage design for the proposed development. A copy of the document is included in *Appendix G.3*.

8.0 GROUND CONDITIONS & SUBSOIL STRATA

8.1 GSI & Historical Mapping

Inspection of the Geological Survey of Ireland database and in particular the quaternary soils shows that the surface soil layer is categorised as Urban which is generally fill material. Alluvium deposits would have indicated a prehistoric watercourse where silts would be likely which concludes that the area is also not a prehistoric floodplain. An extract from the GSI mapping is shown in Figure 8-1 Extract from Geological Survey of Ireland Quaternary mapping following.

Figure 8-1 Extract from Geological Survey of Ireland Quaternary mapping



The soil categorisation for the site would be indicative of poor soakage characteristics at depth which is consistent with actual conditions encountered.

The Bedrock Aquifer is classified as a locally important aquifer - bedrock which is moderately productive only in local zones with a maximum groundwater recharge capacity of 200mm/year (Av. Recharge = 134mm/year). The groundwater vulnerability is Medium to Low.

8.2 Ground Investigation Works

Ground investigation works will be carried out to inform the structural designs at the appropriate time prior to construction. They will take the form of soakage tests, trial pits and Dynamic Cone Penetromer (DCP) testing. Any additional testing identified by the local authority can also be carried out at this stage.

It is not anticipated that there would be any special measures necessary for buried concrete (foundations) mix designs as it relates to sulphates but this matter will be addressed as part of the construction design at the appropriate stage.

9.0 CONCLUSIONS & RECOMMENDATIONS

This report has been prepared as part of a diligence process to identify potential constraints to the development of the subject site and propose ameliorative measures to address these issues where practicable. The report outlines the design strategy which has been adopted for the civil/structural elements of the Strategic Housing Development planning application for the scheme.

The proposed development is an apartment type development based on a density of 162 units per hectare realising a total number of 139 apartments. The scheme will also include a creche and a limited amount of commercial development. The accommodation is proposed in two blocks up to seven storeys in height, with undercroft car parking and motorcycle parking, secure cycle parking and bin storage. There are also a number of creche drop-off spaces and cycle parking spaces for visitors proposed at surface level. The scheme includes a high level of landscape proposals for the development. As part of the design requirements, it is necessary to relocate the entrance to the development off Castle Street. The siting of the proposed access is a balance of achieving sightlines for egressing traffic to the northwest while minimising the impact on existing right turn filter into the SuperValu carpark opposite. Transport Infrastructure Ireland are currently developing a Bus Connects design proposal for Bray which involves upgrading Castle Street to include dedicated bus and cycle lanes. The access proposal must be suitable in both the current and future scenario (i.e. with the construction of the Bus Connects works). The design proposals confirm that this is the case, and an appropriate building setback has been made to accommodate any road widening works. Initial consultation with Wicklow County Council and then with Jacobs Consulting Engineers, who are representing Transport Infrastructure Ireland in this regard have confirmed that the access design proposals meet their current and future requirements and can be incorporated into the future Bus Connects scheme.

A Quality Audit has been carried out on the entire scheme including a Road Safety Audit which ensures that the proposed new entrance arrangement is appropriate and safe. Internal roads within the site comply with the requirements of DMURS and the local authority.

There are numerous public transport facilities within a short walk of the site and the Bray and Environs Transport Study has identified a number of further public transport objectives to be delivered in the short and medium term. There are also numerous amenity, commercial and social facilities within easy walking distance of the site. As such, it is considered that the provision of 59no. car parking spaces plus 3no. creche drop off spaces is sufficient for this development at this location. As part of the design process full details of access arrangements and swept path analysis have been completed including a DMURS Design Statement. A TA has been carried out for the scheme which uses development generated traffic figures based on the number of parking spaces provided within the development to assess the impact of the development on the existing roads infrastructure. The submission also includes a Mobility Management Plan detailing how transport needs of residents will be addressed during the lifetime of

the development. These documents are included under separate cover. A Parking Management/Strategy Report and a Bus/Dart Capacity & Demand Report are also included under separate cover.

The level of cycle parking detailed in the apartment guidelines is the same as that in the Bray Development Plan 2018. The proposed development, as a minimum, will meet the targets set out in both documents. There are a total number of 260 secure spaces proposed with additional visitor parking at surface level in the amount of 70no. spaces located strategically throughout the development. It is considered that this number of spaces will be sufficient to service the development.

The site is located within Flood Zone C for Fluvial, Pluvial and Coastal flooding. Notwithstanding the desktop study and details provided in Section 4.0 of this engineering report, a Site-Specific Flood Risk Assessment has been carried out and is included under separate cover as part of this submission.

Irish Water have been consulted by means of a pre-connection enquiry as part of the design process and have confirmed that is sufficient capacity in the existing water and wastewater networks to facilitate connections. The design for these works has been carried out as part of the SHD scheme design and a Statement of Design Acceptance has been issued from Irish Water confirming that the water and wastewater proposals meet their requirements. The potable water connection for the site will be from the existing watermain in Castle Street and the internal arrangement including storage and pumping requirements will be addressed as part of the Irish Water connection application process. The wastewater connection is to the existing combined sewer in Castle Street located approximately 85m southeast of the development site.

There are no surface water sewers recorded within the vicinity of the site. In consultation with Wicklow County Council the preferred outfall location for surface water discharge is to the River Dargle at Bray Bridge approximately 150metres southeast of the site via a new sewer to be constructed as part of the development in accordance with the Greater Dublin Regional Code of Practice. Surface water attenuation and treatment is included as part of the surface water management and disposal proposals in accordance with the requirements of the GDSDS. The attenuation storage is provided within the confines of the site and will discharge, via a flow control device (Hydrobrake Vortex flow control, or similar) to a new manhole constructed in the public area in Castle Street at the head of the new pipeline which will flow to the discharge location at Bray Bridge. The outfall connection will be to the existing culvert on the west side of the bridge. There is also a Climate Change Statement included as part of the application which details the design assumptions made in relation to the surface water drainage design for the proposed development.

The soil categorisation in the site identified as Urban, relating to urban fill which would be indicative of poor soakage characteristics at depth which is consistent with results of testing carried out to date. Additional testing for structural designs will also be carried out as part of the works at the appropriate time prior to construction.

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Appendix A

A.1 – HJL Architectural Layout – Ground Floor Plan

A.2 – HJL Architectural Layout – Roof Plan

ALL DIMENSIONS TO BE CHECKED ON SITE
NO DIMENSIONS TO BE SCALED FROM THIS DRAWING
DRAWING IS TO BE READ IN CONJUNCTION WITH RELEVANT CONSULTANTS DRAWINGS

N

PROPOSED SAR ROAD
FUTURE ACCESS TO PROPOSED SAR ROAD
ACCESS TO NURSERY SITE
WATER TANK AND SPINKLER 72 m²
ESB 82 m²
BOILER AND PLANT 74 m²
BIKE STORAGE 272 m²
260 BIKES
ENTRANCE LOBBY BLOCK A 105 m²
CAR PARK 59 SPACES
VENTED LOBBY
INTRUDER ALARM PANEL
SPRINKLER ROOM
SLEEP 26 m²
TODDLERS 25 m²
BABIES 33 m²
CRECHE PLAY AREA
STAFF 26 m²
ECCE 24 m²
CRECHE RECEPTION
OFFICE 9 m²
DWYER PARK
COMMUNITY MEETING (RESIDENTS) 65 m²
ENTRANCE LOBBY BLOCK B
BIN STORE BLOCK B
COMMERCIAL BIN STORE
ENTRANCE TO CAR PARK
CRECHE DROP OFF 2 No SPACES
STORE 11 m²
COMMUNITY FACILITY 88 m²
ACC. WC
STORE
COMMERCIAL UNIT 01 222 m²
COMMERCIAL UNIT 02 404 m²
RETAIL UNITS
CAR DEALERSHIP
ST. CRONAN'S ROAD
CASTLE STREET
ST. COLUMCILLE'S TERRACE
STOP
STOP

1 PROPOSED-GROUND FLOOR PLAN
1010 SCALE 1 : 200

Appendix A.1 - HJL Architectural Layout - Ground Floor Plan

REV	DATE	DESCRIPTION	CKH	DRN

STATUS CODE DESCRIPTION
ISSUED FOR PLANNING APPROVAL

CLIENT
SILVERBOW LTD.

PROJECT
SHD CASTLE STREET BRAY

DRAWING
PROPOSED GROUND FLOOR PLAN LEVEL 00

PROJECT NUMBER	DATE
950824	01/03/2022
SCALE@ A0: 1 : 200	DRAWN/CHECKED: ROG/ CM

STATUS CODE:	DRAWING NUMBER	REVISION
A1	CSB-HJL-AB-00-DR-A-1010	

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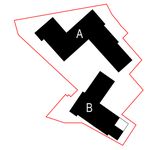
ALL DIMENSIONS TO BE CHECKED ON SITE
NO DIMENSIONS TO BE SCALED FROM THIS DRAWING
DRAWING IS TO BE READ IN CONJUNCTION WITH RELEVANT CONSULTANTS DRAWINGS



N

PROPOSED SAR ROAD

RETAIL UNITS

ST. CRONAN'S ROAD

CASTLE STREET

ST. COLUMCILLE'S TERRACE

DWYER PARK

CAR DEALERSHIP

RETAIL UNITS

AOV

LIFT OVERRUN

STOP

1 **PROPOSED-ROOF LEVEL PLAN**
1 : 200

Appendix A.2 - HJL Architectural Layout - Roof Plan

REV	DATE	DESCRIPTION	CKH	DRN

STATUS CODE DESCRIPTION
ISSUED FOR PLANNING APPROVAL

CLIENT
SILVERBOW LTD.

PROJECT
SHD CASTLE STREET BRAY

DRAWING
PROPOSED ROOF LEVEL PLAN LEVEL 07

PROJECT NUMBER	DATE
950824	01/03/2022
SCALE@ A0: 1 : 200	DRAWN/CHECKED: ROG/ CM

STATUS CODE:	DRAWING NUMBER:	REVISION
A1	CSB-HJL-AB-07-DR-A-1017	

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Appendix B

B.1 – Bray Municipal District LAP 2018, Land Use Zoning Map

WICKLOW COUNTY DEVELOPMENT PLAN 2016-2022

Bray Municipal District Local Area Plan 2018

LAND USE ZONING MAP

Title: Bray Town and Environs
Map No. : 2

ZONING LEGEND

- Municipal District Boundary
- Settlement Boundary
- RE Existing Residential
- R-HD New Residential
- R20 New Residential
- R15 New Residential
- R10 New Residential
- R Special New Residential
- TC Town Centre
- NC Neighbourhood Centre
- LSS Local Shops & Services
- MU Mixed Use
- E1 Employment
- E3 Retail Warehousing
- E Special Employment
- FI Film Industry
- AOS Active Open Space
- OS1 Open Space
- OS2 Open Space
- SF Bray Seafront
- PU Public Utility
- CE Community & Education
- GTH Bray Gateway & Transport Hub
- KD Kilruddery Demesne Conservation & Tourism Zone
- Conservation Area
- T Tourism

Wicklow County Council
Planning Department

Scale: 1:7,600 @ A3

SLO3
SLO5
SLO7
SLO2
AAP1
FASSAROE
SLO8
SLO7
SLO4
SLO9
SLO6
SLO1
KILRUDDERY DEMESNE EAST
SLO8
AAP3

Appendix B.1 - Bray MD LAP 2018, Land Use Zoning Map

Appendix C

C.1 – DMURS Design Statement

C.2 – Jacobs Consulting Engineers E-mail regarding Bus Connects

C.3 – RSA Opinion prepared by Bruton Consulting Engineers

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Civil & Structural Engineers
Unit 84, Omni Park SC, Santry, Dublin 9

Tel. 01 893 3782
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Web: www.corriganhodnett.ie

TECHNICAL NOTE (Doc Ref. CHC-XX-XX-TN-C-00002)

Project: Castle Street, Bray, County Wicklow	Prepared by: P.C.
Subject: DMURS Design Statement	Date: 13.04.2022

Introduction

A DMURS Design Statement Technical Note is a necessary component of any SHD development application. The Design Manual for Urban Roads and Streets was first introduced in 2013 and is a policy document replacing the Design Manual for Roads and Bridges (DMRB) which was more applicable to rural roads infrastructure.

The purpose of DMURS is to address street design within urban areas and, in particular to set out an integrated design approach which will result in the design being influenced by the type of place in which the street is located, and which would balance the needs of all road users with a particular emphasis on more vulnerable road users in the form of pedestrians and cyclists.

> *'In many communities throughout Ireland it is perceived that some or all vehicular traffic is travelling too fast and should be directed elsewhere. The impacts are seen as a threat to the safety of the community and a negative element that detracts from the attractiveness of the road or street and the comfort of those using it.'*[1]

As such, it becomes necessary for a holistic approach to achieve this goal. Collaboration of the different design professionals including the architect, engineer, lighting designer, landscape architect and client is necessary for all of the design elements necessary to ensure that the final proposals are compliant with the manual.

Design Proposals

The proposed scheme has been designed such that it is compliant with the recommendations of DMURS. One of the prime objectives of the document is to emphasise pedestrians and cyclists over vehicular traffic. This principle has been incorporated into the design process by utilising methods which result in reducing vehicle speeds and making drivers more aware of their surroundings thereby ensuring a more pedestrian and cycle friendly environment.

[1] DMURS, Section 1.1

The scheme includes a single road designated as local access roads in accordance with the standards set down in DMURS.

The following measures have been implemented into the scheme to ensure that the scheme adheres to the design concepts of DMURS and will result in a safer and more attractive urban environment for all road users;

- Separation of vehicle and pedestrian/cyclist traffic where the majority of pedestrians and cyclists will use a separate access inti the development site.
- A speed limit of 5kph will apply throughout the scheme which will be reinforced by a number of measures as set out below;
- Shared surface areas which are constructed of paving bricks/blocks;
- Contrasting road surface material;
- Minimised corner radii at junctions and particularly at pedestrian crossings on junctions which will serve to reduce traffic speeds and also reduce the lengths of crossing points. Junction radii have been reduced to the greatest degree possible while still allowing access for refuse vehicles:
- Road cross sections in compliance with the minimum requirements of DMURS.

Summation

The proposed scheme has been designed in accordance with the recommendations set down in DMURS and results in a pedestrian and cyclist friendly environment which serves to reduce vehicle speeds within the scheme and promote a positive and safe environment for all road users.

Paul Corrigan | Corrigan Hodnett Consulting

From: Kelly, Andrew/GLA <Andrew.Kelly1@jacobs.com>
Sent: Wednesday 1 September 2021 11:43
To: Paul Corrigan | Corrigan Hodnett Consulting; Molloy, Caitriona
Cc: De Feu, Paddy; Oliver Wynne; Liam Bourke; Lee, Ivan; norman@brutonceng.ie; Robert McNamara; Noel Nugent | Corrigan Hodnett Consulting; Robert McNamara; Eoin Reynolds
Subject: RE: Bus Connects - Development off Castle Street, Bray

Hi Paul

Caitriona is now on leave so I'm just following up on below in her absence. Thanks for the letter of opinion you attached last week. We have reviewed the latest VISSIM modelling for this section of our route, and can confirm that the mainline queuing from the Upper Dargle junction does not impede the operation of the development junction. Nor does the right turn queue into the shopping centre exceed the storage area or present any operational difficulties

On the last call we discussed the potential challenges for vehicles exiting the development, and giving way to various streams of bus, cycle and car traffic – but we note that the opinion letter confirms there are no safety concerns from the auditor and this will be included in the full RSA, so we have no further comments at this stage

Cheers
Andy

Andrew Kelly | Jacobs | Senior Associate Director, Transport Planning
O:+44.141.243.5776 | M:+44.7949.714.028 | andrew.kelly1@jacobs.com
95 Bothwell Street | Glasgow G2 7HX | UK

From: Paul Corrigan | Corrigan Hodnett Consulting <paul@corriganhodnett.ie>
Sent: 27 August 2021 09:20
To: Molloy, Caitriona <Caitriona.Molloy@jacobs.com>
Cc: De Feu, Paddy <Paddy.DeFeu@jacobs.com>; Oliver Wynne <oliver.wynne@nationaltransport.ie>; Liam Bourke <lbourke@wicklowcoco.ie>; Lee, Ivan <Ivan.Lee1@jacobs.com>; norman@brutonceng.ie; Robert McNamara <robert@mcnamaraproperty.ie>; Noel Nugent | Corrigan Hodnett Consulting <noel@corriganhodnett.ie>; Kelly, Andrew/GLA <Andrew.Kelly1@jacobs.com>; Robert McNamara <robert@mcnamaraproperty.ie>; Eoin Reynolds <eoin.reynolds@nrb.ie>
Subject: [EXTERNAL] RE: Bus Connects - Development off Castle Street, Bray

Good Morning Caitriona

See attached letter of opinion from independent RSA consultant in relation to the proposed development access off Castle Street. Can you please review and revert with any comments.

Also, could you give me an update on what stage you are at with the remodelled VISSIM results. We would appreciate if you could issue them so that we can compare them to our TA figures prepared by NRB Consulting Engineers.

Feel free to give me a call if you would like to discuss any aspects of this matter.

Regards

BRUTON CONSULTING ENGINEERS

Eoin Reynolds
NRB Consulting Engineers
1st Floor
Apollo Building
Dundrum Road
Dundrum
Dublin 14

Contact: Norman Bruton
Tel: 086 8067075
Email: norman@brutonceng.ie
Our Ref: 1140-L01
Date: 26th August 2021

RE: Operational Safety Review/Commentary

Dear Eoin,

As requested, I have reviewed the proposed layout of the access to the proposed development at Castle Street, Bray from a Road Safety Auditor's/ end user's viewpoint in advance of carrying out the formal road safety audit when the design is developed sufficiently.

I understand that the development would consist of 139 residential units including creche along with street fronting commercial units. 60 car parking spaces are to be provided. Recent traffic counts show that the am and pm traffic flow are approximately 1,700 pcus.

It is proposed to provide a right turning area within the ghost island for the right turning lane into the Super Valu supermarket on the opposite side of Castle Street.

From the predicted turning movement provided to me and shown below it is clear that excessive queuing will not occur and will not lead to safety issues arising out of driver frustration.

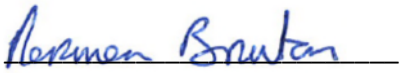
TRICS Data Summary, 139 No. Residential Apartments

139 Apartments	Car Arrivals		Car Departures		Total 2-Way Car Traffic Generated
Network Hour	Per Unit	Trips	Per Unit	Trips	
Weekday AM Peak Hr 8-9	0.062	9	0.203	28	37
Weekday PM Peak Hr 5-6	0.178	25	0.088	12	37

The proposed layout of the right turning area will hold one car at a time and it is proposed to provide a broken line in the boundary of the hatched area. Operationally this type of arrangement works well in similar situations and is covered in legal terms under 7.4.11 of the Traffic Signs Manual.

I do not envisage any safety issues with this arrangement and will be looking at this in particular as part of the RSA.

Yours sincerely,



Norman Bruton BE CEng MIEI

Road Safety Audit Team Leader (TII Approval Number: NB 168446)

Chartered Engineer

Managing Director
Bruton Consulting Engineers

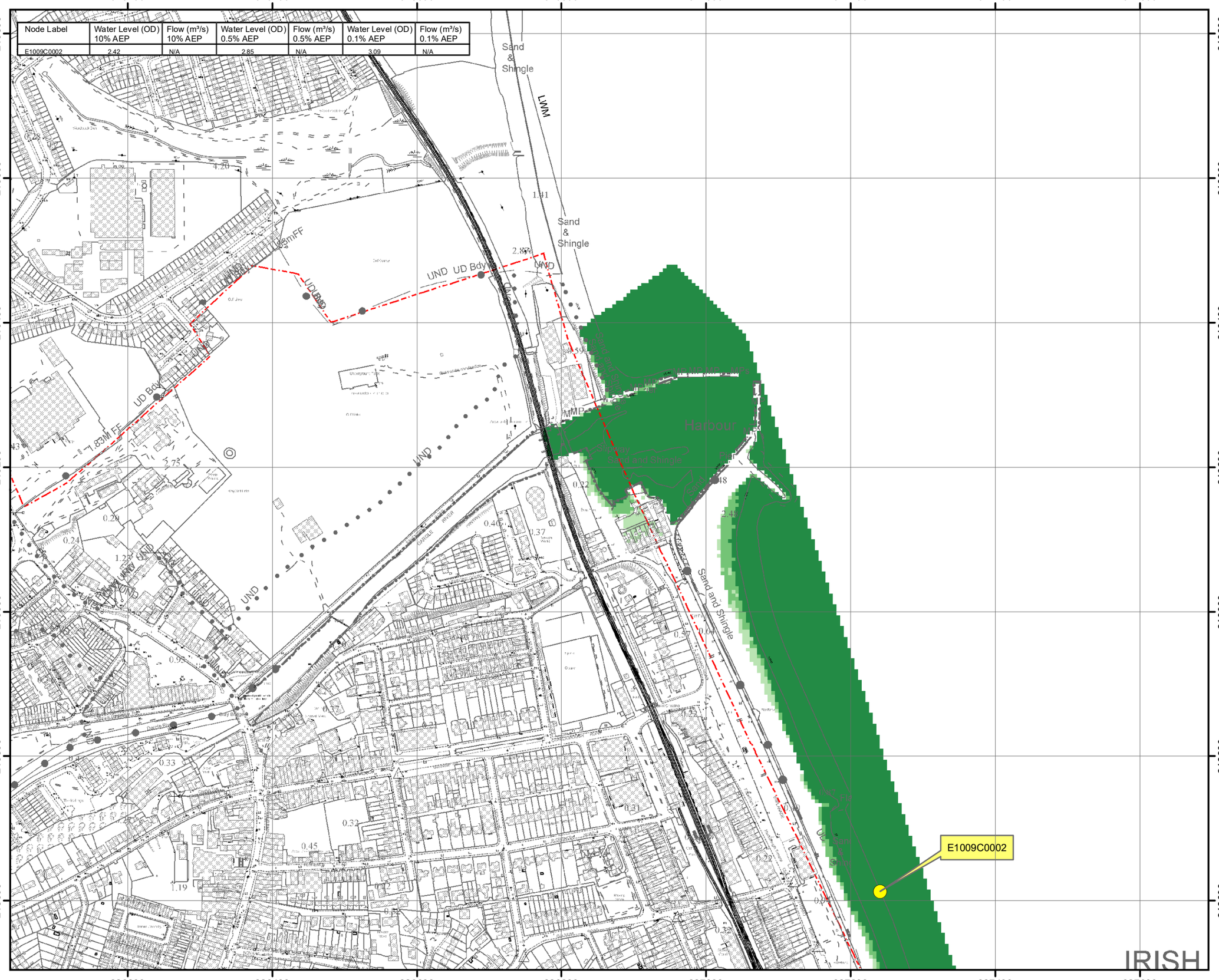
Appendix D

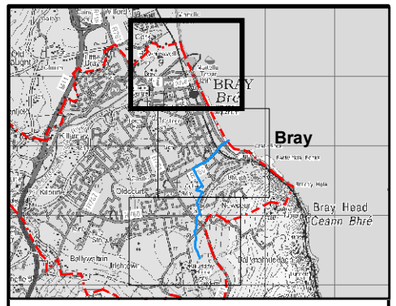
D.1 – ECFRAMS Bray Tidal Flood Extents Map No. E10BRY_EXCCD_F1_02

D.2 – OPW Summary Local Area Report

D.3 – Bray MDLAP 2017 SFRA Flood Risk Mapping – Map No SFRA2 (a)

Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 0.5% AEP	Flow (m³/s) 0.5% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
E1009C0002	2.42	N/A	2.85	N/A	3.09	N/A





IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

- 10% Tidal AEP Event
- 1% Tidal AEP Event
- 0.1% Tidal AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node ID Node Label

FINAL

REV:	NOTE:	DATE:

EASTERN CFRAM STUDY

OPW Oifig na nOibreacha Poiblí The Office of Public Works

RPS

The Office of Public Works, Jonathan Swift Street, Trim, Co Meath
Elmwood House, 74 Boucher Road, Belfast, BT12 6RZ
T +44(0) 28 90 667914
F +44(0) 28 90 668286
W www.rpsgroup.com
E ireland@rpsgroup.com

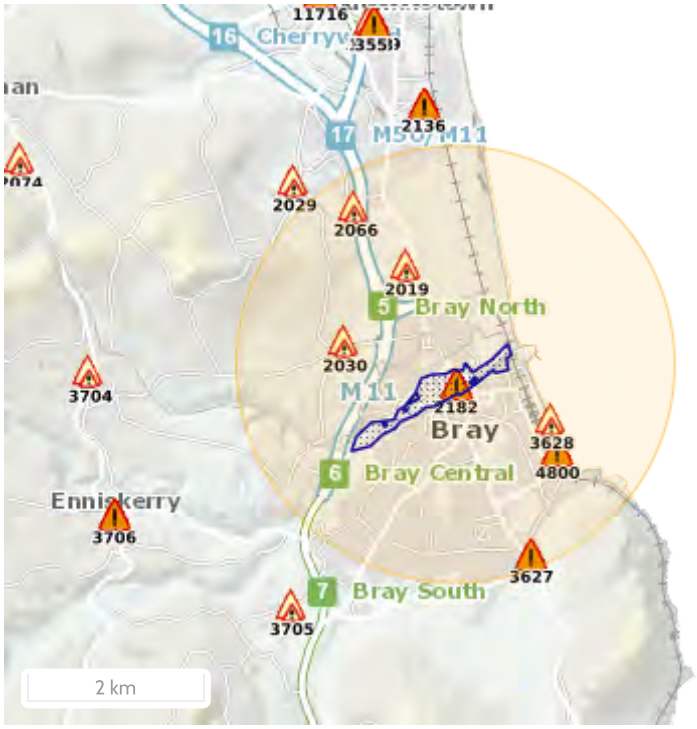
Map:	Bray Tidal Flood Extents
Map Type:	EXTENT
Source:	TIDAL
Map Area:	COASTAL
Scenario:	CURRENT
Drawn By :	F.M.C. Date : 30 October 2017
Checked By :	B.Q. Date : 30 October 2017
Approved By :	S.P. Date : 30 October 2017
Drawing No. :	E10BRY_EXCCD_F1_03
Map Series :	3 of 3
Drawing Scale :	1:5,000 @A3

Appendix D.1 - ECFRAMS Bray Tidal Flood Extents Map No. E10BRY_EXCCD_F1_02

Past Flood Event Local Area Summary Report

Report Produced: **2/2/2021 14:41**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.



Map Legend

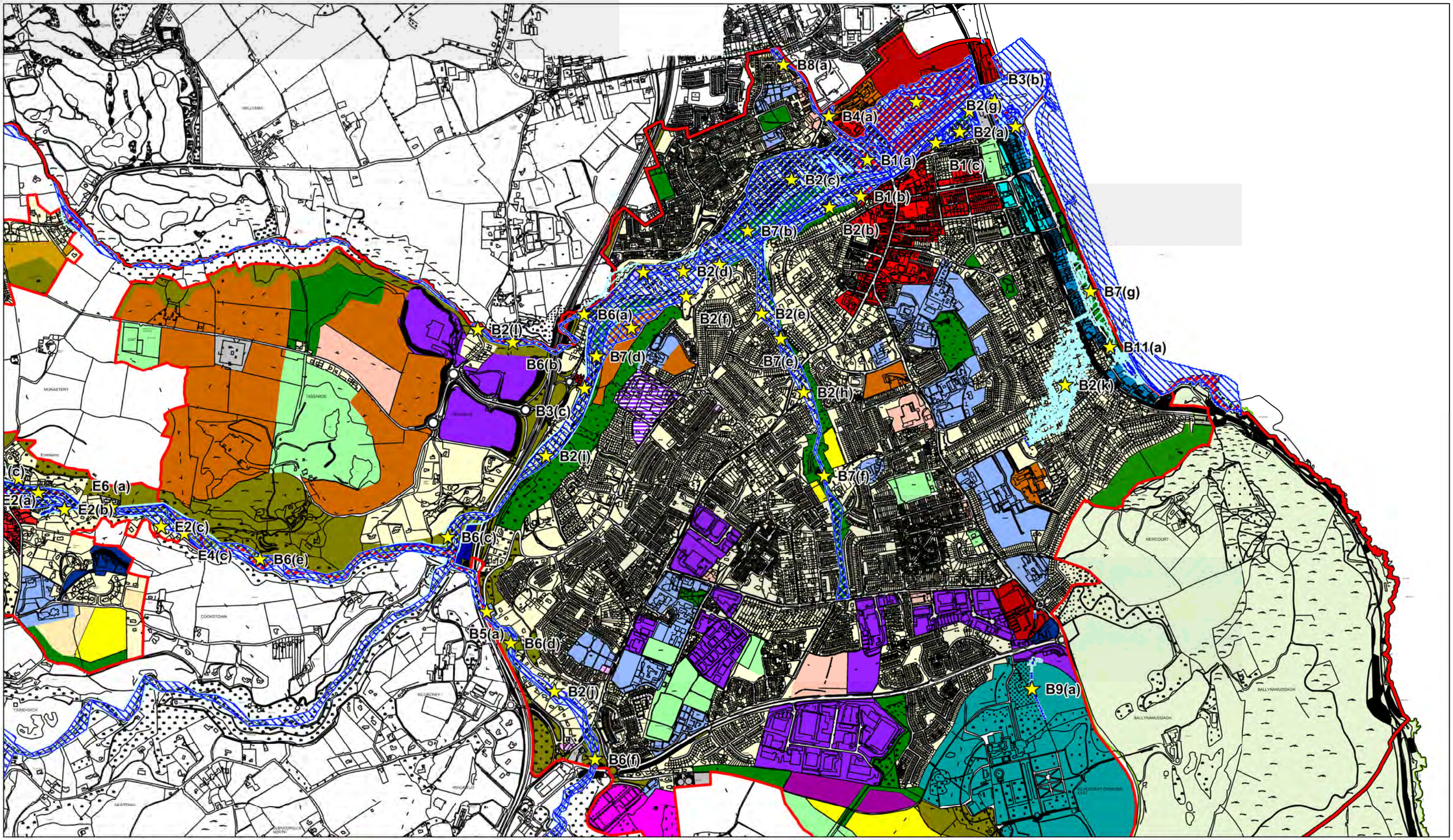
- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

9 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Dargle Bray August 1986 (ID-235)	25/08/1986	Area
	Additional Information: Reports (9) Press Archive (38)		
2.	Crinken Woodbrook Stream Recurring (ID-2019)	n/a	Exact Point
	Additional Information: Reports (5) Press Archive (0)		
3.	Old Connaught Ave Recurring (ID-2030)	n/a	Exact Point
	Additional Information: Reports (2) Press Archive (0)		
4.	Springmount Shankill Recurring (ID-2066)	n/a	Exact Point
	Additional Information: Reports (2) Press Archive (0)		
5.	Dargle Bray Nov 1965 (ID-2182)	17/11/1965	Approximate Point
	Additional Information: Reports (4) Press Archive (3)		
6.	Dargle Bray 1905 (ID-3344)	24/08/1905	Approximate Point
	Additional Information: Reports (4) Press Archive (54)		

	Name (Flood_ID)	Start Date	Event Location
7.	Briarswood Estate Co. Wicklow November 2003 (ID-3627)	01/11/2003	Approximate Point
	Additional Information: Reports (2) Press Archive (0)		
8.	Bray Seafront Co Wicklow Recurring (ID-3628)	n/a	Approximate Point
	Additional Information: Reports (5) Press Archive (29)		
9.	Bray, Co. Wicklow February 2002 (ID-4800)	01/02/2002	Approximate Point
	Additional Information: Reports (2) Press Archive (7)		



WICKLOW COUNTY DEVELOPMENT PLAN 2016-2022

Bray Municipal District Local Area Plan 2017 DRAFT

STRATEGIC FLOOD RISK ASSESSMENT SITES

Title: Bray Town and Environs
Map No. : SFRA2 (a)

- Municipal District Boundary
- Settlement Boundary
- RE Existing Residential
- R-HD New Residential
- R20 New Residential
- R15 New Residential
- R10 New Residential
- R Special New Residential
- TC Town Centre
- VC Village Centre
- LSS Local Shops & Services
- E Employment
- E Special Employment
- FI Film Industry
- T Tourism
- MU Mixed Use
- AOS Active Open Space
- OS1 Open Space
- OS2 Open Space
- SF Bray Seafront
- GTH Bray Gateway & Transport Hub
- KD Kilruddery Demesne Conservation & Tourism Zone
- PU Public Utility
- CE Community & Education
- FLOOD ZONE A
- FLOOD ZONE B
- SITES
- Conservation Area
- Bray Head SAAO

Wicklow County Council
Planning Department

Maps are not to scale

Appendix D.3 - Bray MD LAP 2017 SFRA Flood Risk Mapping - Map No. SFRA2(a)

Appendix E

E.1 – IW Water Services Mapping

E.2 – IW Pre-connection Enquiry Response Letter – CDS19007364

E.3 – IW Pre-connection Enquiry Response Letter – CDS22000719

E.4 – IW Statement of Design Acceptance – CDS19007364

E.5 – Technical Note CHC-XX-XX-TN-C-00003

8/22/2019 9:46:47 AM

Legend

Stormwater Gravity Mains (Irish Water Owned)
- Surface

Stormwater Gravity Mains (Non-Irish Water Owned)
- Surface

Storm Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

Storm Discharge Points
- Outfall
- Overflow
- Soakaway
- Other; Unknown

- Storm Culverts
- Storm Clean Outs

Sewer Gravity Mains (Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Gravity Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

[redacted]

Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland. It should not be relied upon in the event of excavations or other works being carried out in the vicinity of the network. The onus is on the parties carrying out the works to ensure the exact location of the network is identified prior to mechanical works being carried out. Service pipes are not generally shown but their presence should be anticipated. © Irish Water

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

[redacted]

8/22/2019 9:50:16 AM

Legend

Stormwater Gravity Mains (Irish Water Owned)
- Surface

Stormwater Gravity Mains (Non-Irish Water Owned)
- Surface

Storm Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

Storm Discharge Points
- Outfall
- Overflow
- Soakaway
- Other; Unknown

- Storm Culverts
- Storm Clean Outs

Sewer Gravity Mains (Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Gravity Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland. It should not be relied upon in the event of excavations or other works being carried out in the vicinity of the network. The onus is on the parties carrying out the works to ensure the exact location of the network is identified prior to mechanical works being carried out. Service pipes are not generally shown but their presence should be anticipated. © Irish Water

[redacted]

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Appendix E.1 - IW Water Services Mapping

Irish Water Webmap

8/21/2019 9:09:03 AM

Legend

Stormwater Gravity Mains (Irish Water Owned)
- Surface

Stormwater Gravity Mains (Non-Irish Water Owned)
- Surface

Storm Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

Storm Discharge Points
- Outfall
- Overflow
- Soakaway
- Other; Unknown

- Storm Culverts
- Storm Clean Outs

Sewer Gravity Mains (Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Gravity Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland. It should not be relied upon in the event of excavations or other works being carried out in the vicinity of the network. The onus is on the parties carrying out the works to ensure the exact location of the network is identified prior to mechanical works being carried out. Service pipes are not generally shown but their presence should be anticipated. © Irish Water

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

Appendix E.1 - IW Water Services Mapping

Noel Nugent
Unit 84,
Omni Park SC,
Santry,
Dublin 9

29 October 2019

Dear Noel Nugent,

Re: Connection Reference No CDS19007364 pre-connection enquiry -
Subject to contract | Contract denied

Connection for Mixed Use Development of 134 unit(s) at Castle Street, Bray, Wicklow.

Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Castle Street, Bray, Wicklow.

Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water network(s) can be facilitated.

Strategic Housing Development

Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore:

A. In advance of submitting your full application to An Bord Pleanala for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.
B. You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed and appropriate connection fee paid at a later date.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details. A design proposal for the water and/or wastewater infrastructure should be submitted to Irish Water for assessment. Prior to submitting your planning application, you are required to submit these detailed design proposals to Irish Water for review.

You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed at a later date.

A connection agreement can be applied for by completing the connection application form available 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.

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathair Chorcaí

Irish Water
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

If you have any further questions, please contact Patrick O'Neill from the design team on 01 89 25250 or email patoneil@water.ie. For further information, visit **www.water.ie/connections.**

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services

Noel Nugent

Unit 84
Omni Park Sc,
Santry
Dublin 9
Dublin

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Thiar
Cathair Chorcaí

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

www.water

23 March 2022

Re: CDS22000719 pre-connection enquiry - Subject to contract | Contract denied

Connection for Housing Development of 139 domestic units, 4 retail units and a creche at Castle Street, Bray, Co. Wicklow

Dear Sir/Madam,

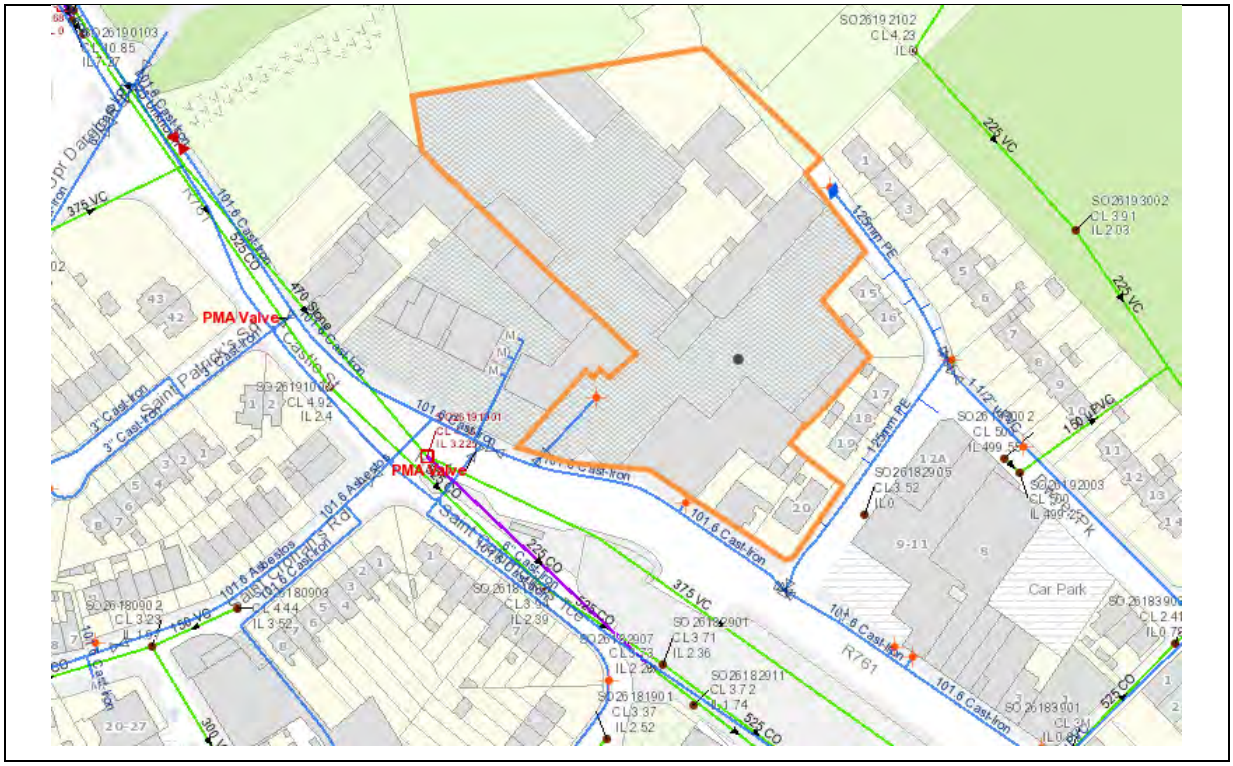
Irish Water has reviewed your pre-connection enquiry in relation to a Water & Wastewater connection at Castle Street, Bray, Co. Wicklow (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on our desk top analysis of the capacity currently available in the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

SERVICE	OUTCOME OF PRE-CONNECTION ENQUIRY THIS IS NOT A CONNECTION OFFER. YOU MUST APPLY FOR A CONNECTION(S) TO THE IRISH WATER NETWORK(S) IF YOU WISH TO PROCEED.
Water Connection	Feasible subject to upgrades
Wastewater Connection	Feasible subject to upgrades
SITE SPECIFIC COMMENTS	
Water Connection	The connection point will be determined at connection application stage. A bulk meter will be required on the connection main.
Wastewater Connection	Approximately 120m of network extension will be required for the connection as per applicant layouts. These extension works are not currently on Irish Water investment plan therefore, the applicant will be required to fund these local network upgrades. The fee will be calculated at a connection application stage. It is the responsibility of the applicant to determine if a gravity connection is feasible.

	Separate storm and foul water connection services have to be provided for the Development. The surface and storm water from the site must be discharged only into an existing storm water network that does not discharge to an IW combined/foul sewer. The connection arrangement should be agreed with the Local Authority Drainage Division.

The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this development shall comply with the Irish Water Connections and Developer Services Standard Details and Codes of Practice that are available on the Irish Water website. Irish Water reserves the right to supplement these requirements with Codes of Practice and these will be issued with the connection agreement.

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



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

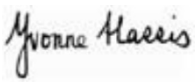
Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish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

General Notes:

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

If you have any further questions, please contact Kevin McManmon from the design team at kmcmanmon@water.ie For further information, visit **www.water.ie/connections.**

Yours sincerely,



Yvonne Harris

Head of Customer Operations

Noel Nugent
Unit 84
Omni Park Sc,
Santry
Dublin 9, Dublin

19 April 2022

Uisce Éireann
Bosca OP 448
Oifig Sheachadta
Cathrach Theas
Cathair Chorcaí

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

www.water.ie

Re: Design Submission for Castle Street, Bray, Wicklow (the "Development") (the "Design Submission") / Connection Reference No: CDS19007364

Dear Noel Nugent,

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: Patrick O'Neill
Phone: 01 89 25250
Email: patoneil@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

Appendix A

Document Title & Revision

CHC-00-GR-DR-C-00300
CHC-00-GR-DR-C-00201
CHC-00-GR-DR-C-00200

Please note that these drawings may need a further review at application stage.

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.

Corrigan Hodnett Consulting
Civil & Structural Engineers
Unit 84, Omni Park SC, Santry, Dublin 9

Tel. 01 893 3782
E-mail: info@corriganhodnett.ie
Web: www.corriganhodnett.ie

TECHNICAL NOTE (Doc Ref. CHC-XX-XX-TN-C-00003)

Project: Castle Street, Bray, County Wicklow	Prepared by: P.C.
Subject: Water & Wastewater Application Form Questions	Date: 13.04.2022

There are several questions to be addressed in relation to water and wastewater within the development and the impact that the proposed development will have on the Irish Water infrastructure.

The planning application form sets out these questions, which are reproduced in italics following with the appropriate responses;

Please submit the following information:

(a) *Where the proposed development has the potential to impact on a public water supply source, irrespective of whether or not a connection to a water/wastewater network is required, this application must be accompanied by evidence of engagement with Irish Water and its outcome.*

Response: The proposed development does not have the potential to impact a public water supply source. There are no sources in the area which have potential for contamination and the surface water discharge is to the existing River Dargle which is tidal at the discharge point. There is no extraction in the vicinity of the discharge and the surface water discharge is compliant with the Greater Dublin Strategic Drainage Strategy requirements in relation to river water quality protection which is achieved by a range of treatment measures prior to discharge.

(b) *A current/valid Confirmation of Feasibility Statement from Irish Water in relation to the proposed development confirming that there is or will be sufficient water network treatment capacity to service the development.*

Response: Irish Water have been consulted as part of the design process which includes an application for a Pre-Connection Enquiry for the development. The Pre-Connection feedback response has been received, under Irish Water reference CDS22000719 dated 23rd March 2022. There are network upgrades required to facilitate the water and wastewater solutions for the development and they have been included as part of the design and submitted to Irish Water as part of the Statement of Design Acceptance application for the scheme. The Pre-Connection Enquiry response is including as part of the planning application.

(c) *A Statement of Compliance with Irish Water's Standard Details and Codes of Practice for water and/or wastewater infrastructure proposals (designs, layouts, etc.).*

Response: The Statement of Design Acceptance for the detailed water and wastewater design proposals has been issued under Irish Water reference CDS22000719. The document confirms that the proposals are compliant with Irish Waters specifications and meet with their requirements. The Statement of Design Acceptance is including as part of the planning application.

(d) *An indication of timelines and phasing for water demand or wastewater collection requirements, or both, as appropriate.*

Response: The development is proposed to be constructed in a single phase due to the nature of the scheme. The anticipated connection date is November 2023.

(e) *Where the proposed development will impact on assets of Irish Water, details of proposals for protection or diversion of such assets.*

Response: The development will not impact on any existing Irish Water assets. The entirety of the works with the exception of the water services (water, wastewater and surface water) connections are contained within the site. On inspections of the water services records, the proposals do not impact on any existing Irish Water assets.

Appendix F

F.1 – Foul Drainage Network Model Details

Corrigan Hodnett Consulting		Page 1
Civil & Structural Engineers Unit 84 Omni Park SC Santry, Dublin 9	Castle Street Bray Co. Wicklow	
Date 23/09/2021 18:04 File Castle_St_MD_20210923.MDX	Designed by P.C. Checked by P.C.	
XP Solutions	Network 2018.1.1	

FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.200
Flow Per Person (l/per/day)	165.00	Maximum Backdrop Height (m)	1.500
Persons per House	2.70	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	16.679	0.167	99.9	0.000	66	0.0	0.600	o	225	Pipe/Conduit	
F1.001	23.680	0.239	99.1	0.000	30	0.0	0.600	o	225	Pipe/Conduit	
F2.000	28.103	0.281	100.0	0.000	20	0.0	0.600	o	225	Pipe/Conduit	
F1.002	25.445	0.254	100.0	0.000	0	0.0	0.600	o	225	Pipe/Conduit	
F1.003	15.767	0.158	100.0	0.000	0	0.0	0.600	o	225	Pipe/Conduit	
F1.004	38.299	0.334	114.7	0.000	27	0.0	0.600	o	225	Pipe/Conduit	
F1.005	29.775	0.149	200.0	0.000	0	0.0	0.600	o	225	Pipe/Conduit	
F1.006	83.748	0.419	200.0	0.000	0	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	2.900	0.000	0.0	66	0.0	30	0.64	1.31	52.0	2.0
F1.001	2.733	0.000	0.0	96	0.0	36	0.72	1.31	52.2	3.0
F2.000	2.775	0.000	0.0	20	0.0	17	0.44	1.31	52.0	0.6
F1.002	2.494	0.000	0.0	116	0.0	40	0.76	1.31	52.0	3.6
F1.003	2.240	0.000	0.0	116	0.0	40	0.76	1.31	52.0	3.6
F1.004	2.082	0.000	0.0	143	0.0	46	0.76	1.22	48.5	4.4
F1.005	1.748	0.000	0.0	143	0.0	53	0.63	0.92	36.6	4.4
F1.006	1.599	0.000	0.0	143	0.0	53	0.63	0.92	36.6	4.4

PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	225	F1	3.900	2.900	0.775	Open Manhole	1200
F1.001	o	225	F2	3.900	2.733	0.942	Open Manhole	1200
F2.000	o	225	F3	3.900	2.775	0.900	Open Manhole	1200
F1.002	o	225	F3	3.900	2.494	1.181	Open Manhole	1200
F1.003	o	225	F4	3.900	2.240	1.435	Open Manhole	1200
F1.004	o	225	F5	3.900	2.082	1.593	Open Manhole	1200
F1.005	o	225	F6	3.443	1.748	1.470	Open Manhole	1200
F1.006	o	225	F7	3.697	1.599	1.873	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	16.679	99.9	F2	3.900	2.733	0.942	Open Manhole	1200
F1.001	23.680	99.1	F3	3.900	2.494	1.181	Open Manhole	1200
F2.000	28.103	100.0	F3	3.900	2.494	1.181	Open Manhole	1200
F1.002	25.445	100.0	F4	3.900	2.240	1.435	Open Manhole	1200
F1.003	15.767	100.0	F5	3.900	2.082	1.593	Open Manhole	1200
F1.004	38.299	114.7	F6	3.443	1.748	1.470	Open Manhole	1200
F1.005	29.775	200.0	F7	3.697	1.599	1.873	Open Manhole	1200
F1.006	83.748	200.0	F	3.581	1.180	2.176	Open Manhole	0

Free Flowing Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.006	F	3.581	1.180	1.180	0	0

Appendix G

G.1 – Met Éireann Return Period Rainfall Depths

G.2 – Microdrainage Network and Model Simulation Results

G.3 – Climate Change Statement

Castle Street, Bray, County Wicklow

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 326217, Northing: 219045,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.8,	3.9,	4.5,	5.3,	5.9,	6.3,	7.8,	9.3,	10.4,	11.8,	13.1,	14.1,	15.6,	16.8,	17.8,	N/A ,
10 mins	3.9,	5.4,	6.2,	7.4,	8.2,	8.8,	10.8,	13.0,	14.5,	16.5,	18.3,	19.7,	21.8,	23.4,	24.8,	N/A ,
15 mins	4.6,	6.4,	7.3,	8.7,	9.7,	10.4,	12.7,	15.3,	17.0,	19.4,	21.5,	23.2,	25.6,	27.6,	29.2,	N/A ,
30 mins	6.1,	8.4,	9.5,	11.2,	12.4,	13.3,	16.1,	19.3,	21.3,	24.2,	26.7,	28.6,	31.6,	33.8,	35.7,	N/A ,
1 hours	8.1,	10.9,	12.3,	14.5,	15.9,	17.0,	20.4,	24.2,	26.7,	30.1,	33.1,	35.4,	38.9,	41.5,	43.7,	N/A ,
2 hours	10.7,	14.2,	16.0,	18.6,	20.4,	21.7,	25.9,	30.5,	33.4,	37.5,	41.1,	43.8,	47.8,	51.0,	53.5,	N/A ,
3 hours	12.6,	16.6,	18.6,	21.6,	23.5,	25.0,	29.7,	34.9,	38.1,	42.7,	46.6,	49.5,	54.0,	57.5,	60.3,	N/A ,
4 hours	14.2,	18.5,	20.8,	24.0,	26.1,	27.7,	32.8,	38.4,	41.9,	46.7,	50.9,	54.1,	58.9,	62.6,	65.6,	N/A ,
6 hours	16.7,	21.7,	24.2,	27.8,	30.2,	32.0,	37.7,	43.9,	47.8,	53.1,	57.7,	61.2,	66.5,	70.5,	73.8,	N/A ,
9 hours	19.6,	25.3,	28.1,	32.2,	34.9,	36.9,	43.3,	50.2,	54.5,	60.4,	65.5,	69.3,	75.1,	79.5,	83.1,	N/A ,
12 hours	22.1,	28.2,	31.4,	35.8,	38.7,	40.9,	47.8,	55.2,	59.8,	66.2,	71.6,	75.7,	81.9,	86.6,	90.4,	N/A ,
18 hours	26.0,	33.0,	36.5,	41.5,	44.8,	47.2,	54.9,	63.1,	68.2,	75.2,	81.2,	85.7,	92.5,	97.6,	101.7,	N/A ,
24 hours	29.2,	36.8,	40.7,	46.1,	49.6,	52.3,	60.6,	69.4,	74.9,	82.4,	88.8,	93.6,	100.8,	106.3,	110.7,	125.5,
2 days	36.8,	45.7,	50.1,	56.2,	60.2,	63.2,	72.4,	82.0,	88.1,	96.2,	103.0,	108.2,	115.9,	121.6,	126.3,	141.9,
3 days	43.1,	52.9,	57.7,	64.4,	68.7,	72.0,	81.9,	92.3,	98.7,	107.3,	114.6,	120.1,	128.2,	134.3,	139.1,	155.5,
4 days	48.5,	59.2,	64.4,	71.6,	76.2,	79.6,	90.2,	101.2,	108.0,	117.1,	124.8,	130.5,	139.0,	145.3,	150.4,	167.4,
6 days	58.2,	70.2,	76.0,	84.1,	89.2,	93.0,	104.7,	116.8,	124.2,	134.0,	142.3,	148.5,	157.6,	164.4,	169.9,	188.0,
8 days	66.8,	80.0,	86.3,	95.1,	100.7,	104.8,	117.4,	130.3,	138.3,	148.8,	157.7,	164.2,	173.9,	181.1,	186.9,	206.0,
10 days	74.7,	88.9,	95.7,	105.2,	111.1,	115.5,	128.9,	142.7,	151.1,	162.2,	171.6,	178.5,	188.7,	196.2,	202.3,	222.2,
12 days	82.1,	97.3,	104.5,	114.5,	120.8,	125.5,	139.7,	154.1,	163.0,	174.7,	184.4,	191.7,	202.3,	210.1,	216.5,	237.2,
16 days	95.9,	112.8,	120.8,	131.8,	138.8,	143.9,	159.4,	175.2,	184.8,	197.4,	208.0,	215.7,	227.2,	235.6,	242.4,	264.6,
20 days	108.7,	127.1,	135.8,	147.8,	155.3,	160.8,	177.5,	194.4,	204.7,	218.2,	229.4,	237.7,	249.8,	258.8,	265.9,	289.4,
25 days	123.7,	143.9,	153.4,	166.4,	174.5,	180.5,	198.5,	216.7,	227.7,	242.2,	254.2,	263.0,	275.9,	285.5,	293.1,	318.0,

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

$M_{5\text{-}60}$ = 17.0mm
$M_{5\text{-}2day}$ = 63.2mm
Jenkinson's 'R' = [17.0/63.2] = 0.269
$M_{100\text{-}6hr}$ = 61.2mm

SAAR = 825mm (from Met Éireann Point Rainfall Data
Soil Type 2; SOIL Index = 0.300 (from FSR)

Corrigan Hodnett Consulting		Page 1
Civil & Structural Engineers Unit 84 Omni Park SC Santry, Dublin 9	Castle Street Bray Co. Wicklow	
Date 23/09/2021 18:04 File Castle_St_MD_20210923.MDX	Designed by P.C. Checked by P.C.	
XP Solutions	Network 2018.1.1	

FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.200
Flow Per Person (l/per/day)	165.00	Maximum Backdrop Height (m)	1.500
Persons per House	2.70	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	16.679	0.167	99.9	0.000	66	0.0	0.600	o	225	Pipe/Conduit	
F1.001	23.680	0.239	99.1	0.000	30	0.0	0.600	o	225	Pipe/Conduit	
F2.000	28.103	0.281	100.0	0.000	20	0.0	0.600	o	225	Pipe/Conduit	
F1.002	25.445	0.254	100.0	0.000	0	0.0	0.600	o	225	Pipe/Conduit	
F1.003	15.767	0.158	100.0	0.000	0	0.0	0.600	o	225	Pipe/Conduit	
F1.004	38.299	0.334	114.7	0.000	27	0.0	0.600	o	225	Pipe/Conduit	
F1.005	29.775	0.149	200.0	0.000	0	0.0	0.600	o	225	Pipe/Conduit	
F1.006	83.748	0.419	200.0	0.000	0	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	2.900	0.000	0.0	66	0.0	30	0.64	1.31	52.0	2.0
F1.001	2.733	0.000	0.0	96	0.0	36	0.72	1.31	52.2	3.0
F2.000	2.775	0.000	0.0	20	0.0	17	0.44	1.31	52.0	0.6
F1.002	2.494	0.000	0.0	116	0.0	40	0.76	1.31	52.0	3.6
F1.003	2.240	0.000	0.0	116	0.0	40	0.76	1.31	52.0	3.6
F1.004	2.082	0.000	0.0	143	0.0	46	0.76	1.22	48.5	4.4
F1.005	1.748	0.000	0.0	143	0.0	53	0.63	0.92	36.6	4.4
F1.006	1.599	0.000	0.0	143	0.0	53	0.63	0.92	36.6	4.4

PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	225	F1	3.900	2.900	0.775	Open Manhole	1200
F1.001	o	225	F2	3.900	2.733	0.942	Open Manhole	1200
F2.000	o	225	F3	3.900	2.775	0.900	Open Manhole	1200
F1.002	o	225	F3	3.900	2.494	1.181	Open Manhole	1200
F1.003	o	225	F4	3.900	2.240	1.435	Open Manhole	1200
F1.004	o	225	F5	3.900	2.082	1.593	Open Manhole	1200
F1.005	o	225	F6	3.443	1.748	1.470	Open Manhole	1200
F1.006	o	225	F7	3.697	1.599	1.873	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	16.679	99.9	F2	3.900	2.733	0.942	Open Manhole	1200
F1.001	23.680	99.1	F3	3.900	2.494	1.181	Open Manhole	1200
F2.000	28.103	100.0	F3	3.900	2.494	1.181	Open Manhole	1200
F1.002	25.445	100.0	F4	3.900	2.240	1.435	Open Manhole	1200
F1.003	15.767	100.0	F5	3.900	2.082	1.593	Open Manhole	1200
F1.004	38.299	114.7	F6	3.443	1.748	1.470	Open Manhole	1200
F1.005	29.775	200.0	F7	3.697	1.599	1.873	Open Manhole	1200
F1.006	83.748	200.0	F	3.581	1.180	2.176	Open Manhole	0

Free Flowing Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.006	F	3.581	1.180	1.180	0	0

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TECHNICAL NOTE (Doc Ref. CHC-XX-XX-TN-C-00001)

Project: Castle Street, Bray, County Wicklow	Prepared by: P.C.
Subject: Climate Change Impact Assessment	Date: 13.04.2022

Introduction

A Climate Change Impact Assessment is a necessary component of any SHD development application. Climate change is occurring as a result of global warming and encompasses not only rising average temperatures but also extreme weather events, shifting wildlife populations and habitats, rising seas, and a range of other impacts.

It becomes necessary to ensure the sustainability of development by incorporating climate change factors to be applied to surface water management and disposal proposals to ensure that networks do not become inundated and fail as a result of increased rainfall (pluvial) or river levels (fluvial) in the future.

The Greater Dublin Strategic Drainage Study, Volume 2, New Development, March 2005 (GDSDS) sets out the initiatives to be adopted to address this issue. Section 6.3.2.4 titled *'Climate Change'* states;

> *'Climate change is acknowledged as taking place the world over. The GDSDS Climate Change policy document advises that rainfall event depths should be factored by 10% and that sea levels will rise by 400mm or more over the coming century. There is no specific advice for river flow rates, but the Defra advice in UK suggests a 20% increase in flood flows. The climate change policy also provides advice on the use of Time Series Rainfall.*
>
> *If these criteria were not applied, and these predictions were found to be correct, then the level of service provided by the drainage system would be less than it was designed to achieve. It is therefore advised that climate change criteria are applied for the design of drainage systems for new developments.'*

Table 6.2 of the document, reproduced following, details the factors to be applied to the different categories within any new development;

Climate Change Category	Characteristics
River flows	20% increase in flows for all return periods up to 100 years
Sea level	400+mm rise (see Climate Change policy document for sea levels as a function of return period)
Rainfall	10% increase in depth (factor all intensities by 1.1)
	Modify time series rainfall in accordance with the GDSDS climate change policy document

Table 6.2 Climate Change Factors to be Applied to Drainage Design[1]

Design Proposals

The proposed scheme has been designed such that it is compliant with the requirements of the GDSDS. The development is not within an area of anticipated fluvial or coastal flooding therefore River Flows and Sea Level increases are not relevant.

The rainfall levels within the site used for the stormwater design for the scheme are empirical data obtained from Met Éireann records. As part of the simulation analysis of the network for the prescribed 1in1, 1in30 and 1in100 year storm events, a 20% increase in rainfall intensities has been applied. No scaling factor has been applied to the adopted Greenfield runoff rate (Q_{bar}) which remains at the original value.

The attenuation storage volume has been designed by means of an iterative modelling process which ensures that the volume provided, and the overall drainage network is sufficient to accommodate the critical storm event without flooding.

Full details of all design, model and simulation information is included in the Engineering Services Report for the scheme which is included under separate cover.

Summation

The proposed scheme has been designed in accordance with the recommendations set out in the GDSDS and an independent Stormwater Audit will be carried out at final submission stage which includes a review of the drainage design in its entirety and any necessary amendments to address any issues raised.

[1] Table 6.2 – Extract from The Greater Dublin Strategic Drainage Study, Volume 2, New Development, March 2005.

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