Proposed Town Centre and Environs Review at Cherrywood, Dublin 18

Infrastructure Report

Dún Laoghaire-Rathdown County Council

Project number: 60726839
60726839-ACM-XX-00-RP-CE-00-0001

December 2024

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	11/12/2024	Final Issue	MO'D	Marc O'Dowd	Principal Engineer
1	17/12/2024	Updated Report	MO'D	Marc O'Dowd	Principal Engineer

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1. Background

1.1 Development Background

AECOM have been appointed by Dún Laoghaire-Rathdown County Council (DLRCC) to undertake a capacity analysis of the existing infrastructure serving the proposed Cherrywood Town Centre and Environs (TCE) development.

This development currently proposes 4 separate Town Centre Quadrants, and surrounding immediate environs, comprising 5 separate High Intensity Employment (HIE) plots. The arrangement of these quadrants, along with the associated HIE plots, is presented in Figure 1.1.

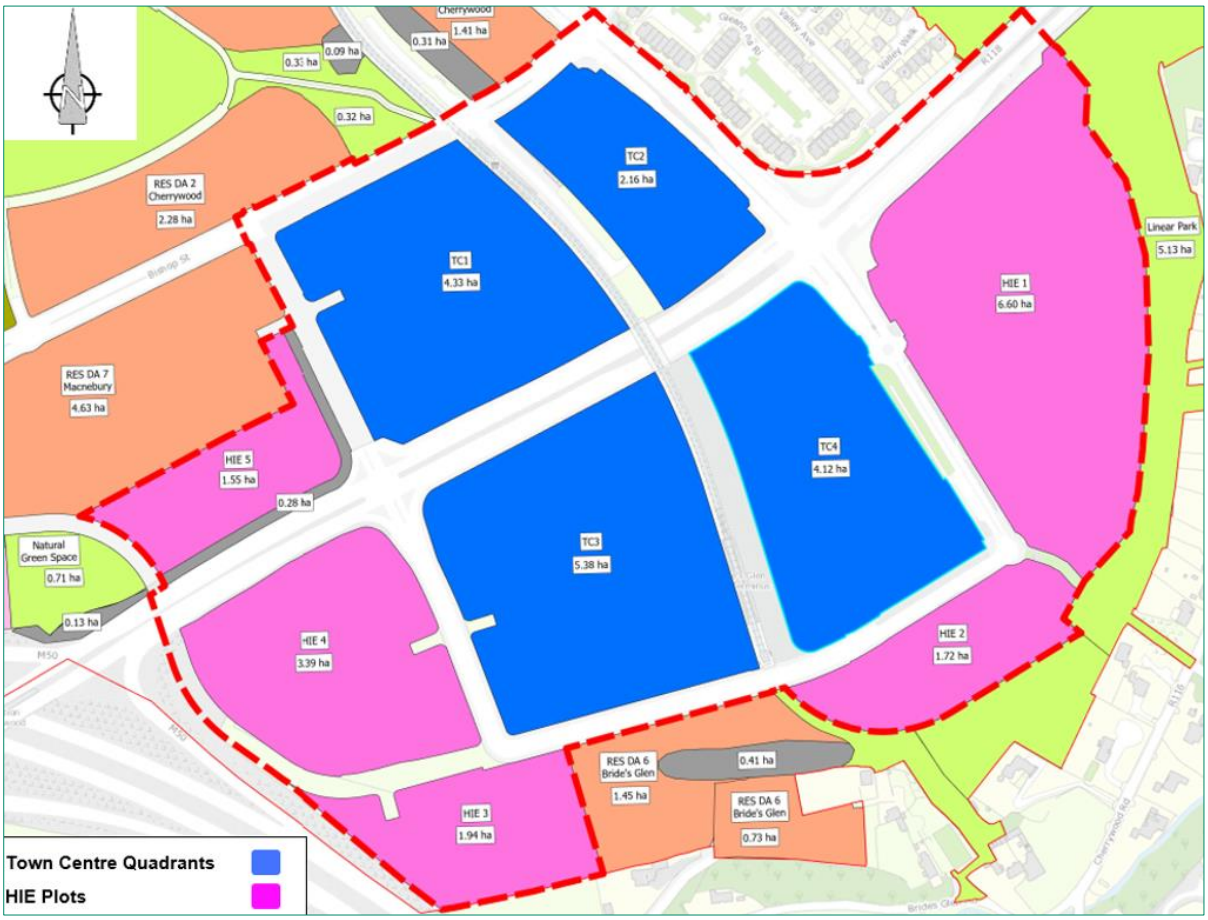

Figure 1.1: Proposed Town Centre Quadrants and HIE Plots

AECOM have been requested to undertake a physical infrastructure capacity analysis of the existing infrastructure serving the proposed development, and make suitable suggestions for any required potential infrastructure upgrades that may be required as a result of this development.

This report contains a review in relation to surface water and attenuation, water supply, foul drainage, telecommunications, and power supply.

Along with such reviews, proposals regarding building height amendments have been assessed, with such amendments now being approved, as discussed in Section 2.2.1 herein. Moreover, additional reviews are presently ongoing in relation to car parking amendments for this development, as well as a review of residential car parking standards, specifically Car Parking Amendment No. 9, which are yet to be concluded. These reviews also include ongoing assessments in relation to the 2,300 units threshold for development in Growth Area 2 and 3, as set out in the Cherrywood Planning Scheme, with these reviews yet to be concluded.

2. Surface Water and Attenuation

2.1 Existing Infrastructure

2.1.1 Existing and Approved Attenuation Provisions

There are a number of existing attenuation ponds located within the Cherrywood TCE area. A full catchment analysis has been undertaken on each of these existing ponds, within Report R2 (refer to Section 8), as part of the approved DZ15A/0758 planning application. Moreover, amendments have been made to the existing surface water infrastructure as part of 'Roads and Infrastructure' Phase 1 of the scheme, to facilitate the proposed development.

As part of this infrastructure design, a new 750mm diameter surface water outfall has been provided from the proposed Town Centre Quadrants TC1, TC2, and TC4, along with the proposed HIE plots HIE 1, and HIE 2, to the existing attenuation pond, noted as Pond 4, as outlined in Figure 2.1. Separately, the remaining catchments of the development area, which include TC3, HIE 3, HIE 4, and HIE 5, drain to an additional temporary attenuation pond. This temporary attenuation pond, which is currently existing and noted as Pond 5A (see Figure 2.1) is to subsequently be replaced by a permanent attenuation pond, also to be noted as Pond 5A. This permanent attenuation pond, which is estimated to be completed by the end of Q1 2025, consists of a sedimentary forebay, termed as Pond 5A-0, and a main body pond, termed as Pond 5A-2. For noting, the pond located in Druid Valley, referred to as Pond 2B and constructed under planning application DZ15A/0758, is now completed and operational.

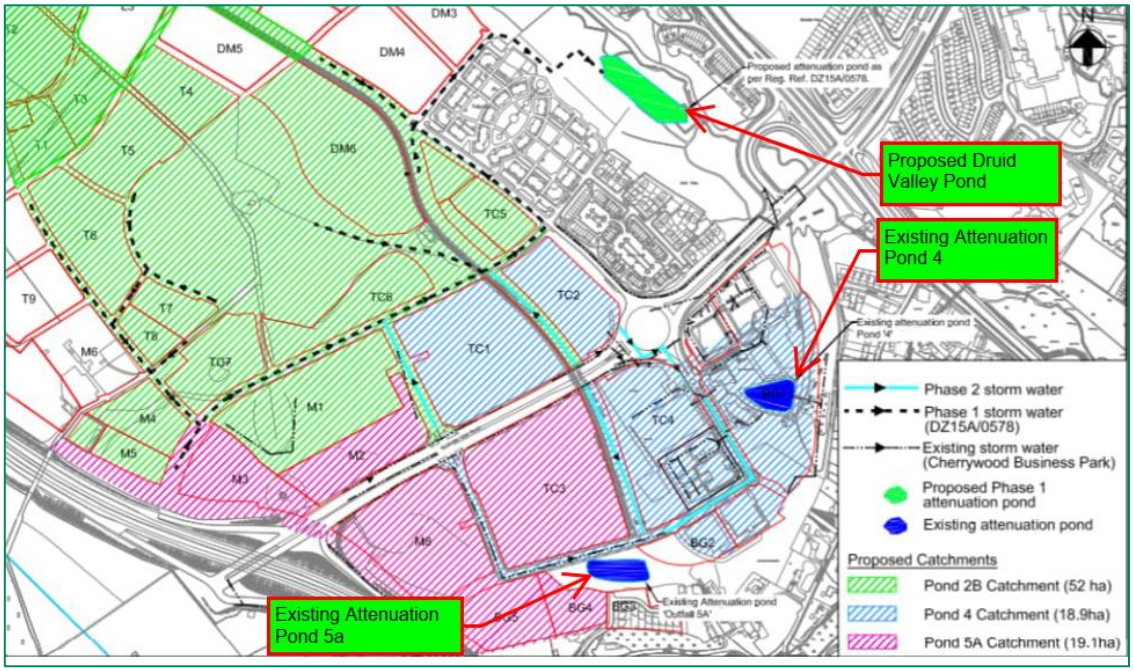

Figure 2.1: Current SDZ Approved Cherrywood TCE Surface Water Catchment Areas (Source: Arup Memorandum MEM_07 dated 4th August 2022)

As part of the approved catchment study, it has been determined that a maximum discharge rate of 1 L/sec/Ha can be facilitated from TC1, TC2, TC4, HIE 1, and HIE 2, to towards Pond 4. This pond, which will cater for an overall refined catchment area of circa 18.9 ha, has been subject to modifications, including raising the level of the outfall, and the inclusion of a low-level defence wall, to allow for a maximum discharge of 1 L/sec/Ha, in accordance with the Planning Scheme, up to a 1:100 return period storm event with an additional 20% allowance for climate change.

It must also be noted that the current infrastructure design within Town Centre Quadrants TC1 and TC2 includes sufficient attenuation storage, by means of a basement attenuation tank, for a 1 in 1000-year storm event with an additional 10% climate change factor. With a restricted outflow of 1 L/sec/Ha, it is noted in report R7 that a storage volume of approximately 5,530m^3 is required to attenuate surface water runoff from TC1 and TC2 combined. Resultantly, the proposed basement attenuation tank, designed to attenuate surface water runoff for TC1 and TC2, has been designed to cater for a capacity of approximately 11,100m^3 for a 1-in-1000 year storm event, with an additional 10% allowance due to climate change. Please refer to Section 8 for further information regarding the

aforementioned report. Additionally, TC4 has been noted in R7 to require a storage volume of circa 3,050m^3, with a cumulative surface water attenuation volume of circa 3,168m^3 being provided on site to cater for this requirement.

Similarly to the above, surface water storage volume requirements for HIE plots HIE 1 and HIE 2 must align with a discharge requirement of 1 L/sec/Ha. Illustrations are provided in Figure 2.2 regarding an indicative location of the proposed 225mm dia. surface water outfall from TC1 and TC2 in Wyattville Link Road. Thereafter, this outfall connects in to the proposed 750mm dia. surface water outfall towards the existing Pond 4, located within Cherrywood Business Park.

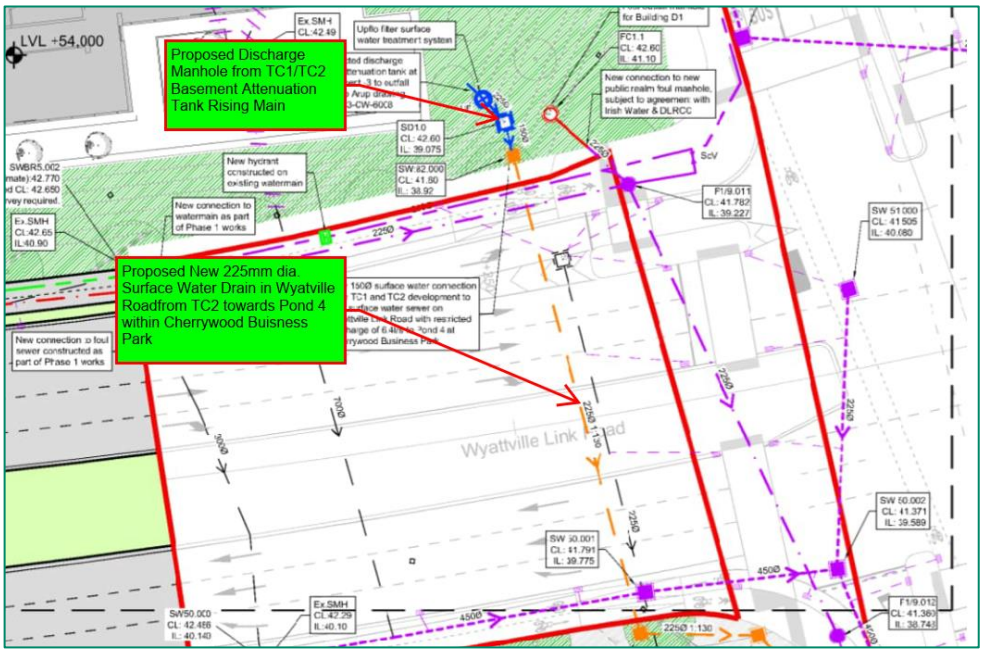

Figure 2.2: Proposed TC1/TC2 Surface Water Outfall Towards Pond 4 (Source: Arup Memorandum MEM_07 dated 4th August 2022)

As previously mentioned, a basement attenuation tank has also been proposed to cater for the surface water runoff generated from Town Centre Quadrants TC1 and TC2, with the layout of this tank being illustrated in Figure 2.3.

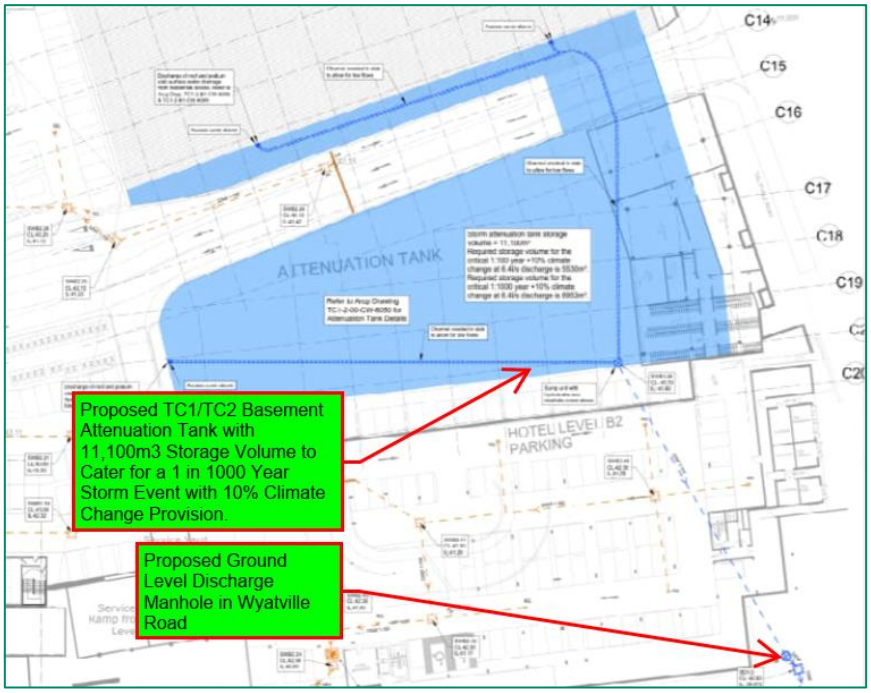

Figure 2.3: Proposed TC1/TC2 Basement Attenuation Tank Layout (Source: Arup R1)

The surface water runoff generated from Town Centre Quadrant TC3, along with HIE plots HIE 3, HIE 4, and HIE 5, is to adhere to a maximum discharge rate of 1L/sec/Ha when discharging to proposed permanent attenuation pond, noted as Pond 5A. These proposed attenuation ponds, similar to existing temporary pond, Pond 5A, are to provide surface water storage for a refined catchment area of circa 19.1 ha (representing the cumulative TC3, HIE 3, HIE 4, and HIE 5 catchment area).

Moreover, it is noted in Report R6 (refer to Section 8) that a storage volume of approximately 3,000m^3 is proposed to attenuate surface water runoff from TC3. Similarly to the above, surface water storage volume requirements for plots HIE 3, HIE 4, and HIE 5 must align with an outfall rate for the 1:100 annual exceedance probability (AEP) with an additional 20% allowance for climate change. Furthermore, any attenuation provided within these plots must be in accordance with the Cherrywood Planning Scheme, along with the 2022-2028 DLRCC County Development Plan, prioritising the use of above-ground SuDS, and only using underground attenuation with prior approval from DLRCC.

2.1.2 Current SDZ Approved SuDS Provisions

The currently proposed SuDS measures included in the design for the Cherrywood Town Centre Quadrants and HIE plots, as outlined for town centres TC1 and TC2 in Report R1 (refer to Section 8), have been noted to include the following measures:

- Intensive and Extensive Green Roofs (minimum 60% roof coverage),
- Rainwater Harvesting,
- Water Butts,
- Attenuation Tank,
- Attenuation Ponds,
- Proprietary Surface Water Treatment Systems (Up-Flo Filter, Fuel and Oil Separator),
- Additional Soft Landscaping Areas.

It must be noted that the previous requirements for the currently approved intensive and extensive green roofs are now out-dated, with the Green Roof Policy within the 2022-2028 DLRCC County Development Plan outlining minimum requirements of 50% or 70%, for intensive or extensive roof coverage, respectively, for all roofs in excess of 100m^2. All future planning applications are to adhere to the relevant associated Green Roof Policy at the time of application.

With the exception of intensive and extensive green roofs, the currently approved SuDS design includes sufficient measures to comply with the requirements of the GDSDS and the relevant DLRCC specific objectives relating to SuDS. Report R1, relevant for Town Centre Quadrants TC1 and TC2, has been approved by DLRCC, and demonstrates that the current proposed design for town centres TC1 and TC2 provides adequate interception storage volume.

Following a review of the DLRCC County Development Plan, 2022-2028, with the exception of the currently approved intensive and extensive green roofs, the above currently proposed SuDS measures have been noted to comply with requirements set out in the Cherrywood Planning Scheme, and the County Development Plan. Any potential future applications, or amendments to current applications, are to adhere to the requirements of the Planning Scheme, the GDSDS and the current 2022-2028 DLRCC County Development Plan SuDS requirements, which may be different to those agreed prior to 2022. Any departures from the current standards will need to be agreed with the Planning Authority on a case-by-case basis.

With regards to underground attenuation structures such as attenuation tanks, all preferential methods of above-ground storage systems and SuDS are to be considered before opting for this method of surface water attenuation.

2.2 Additional Demand Requirements

2.2.1 Car Parking and Building Height Amendments

For estimating if there is any additional increase in runoff linked to the associated residential units that are to be provided within the Cherrywood Town Centre Quadrants and HIE plots, this will be dictated by the proposed internal roof layouts, and the resultant impermeable area associated with these layouts, within each Town Centre Quadrant. Please refer to Figure 2.4 for the approved building height amendment locations.

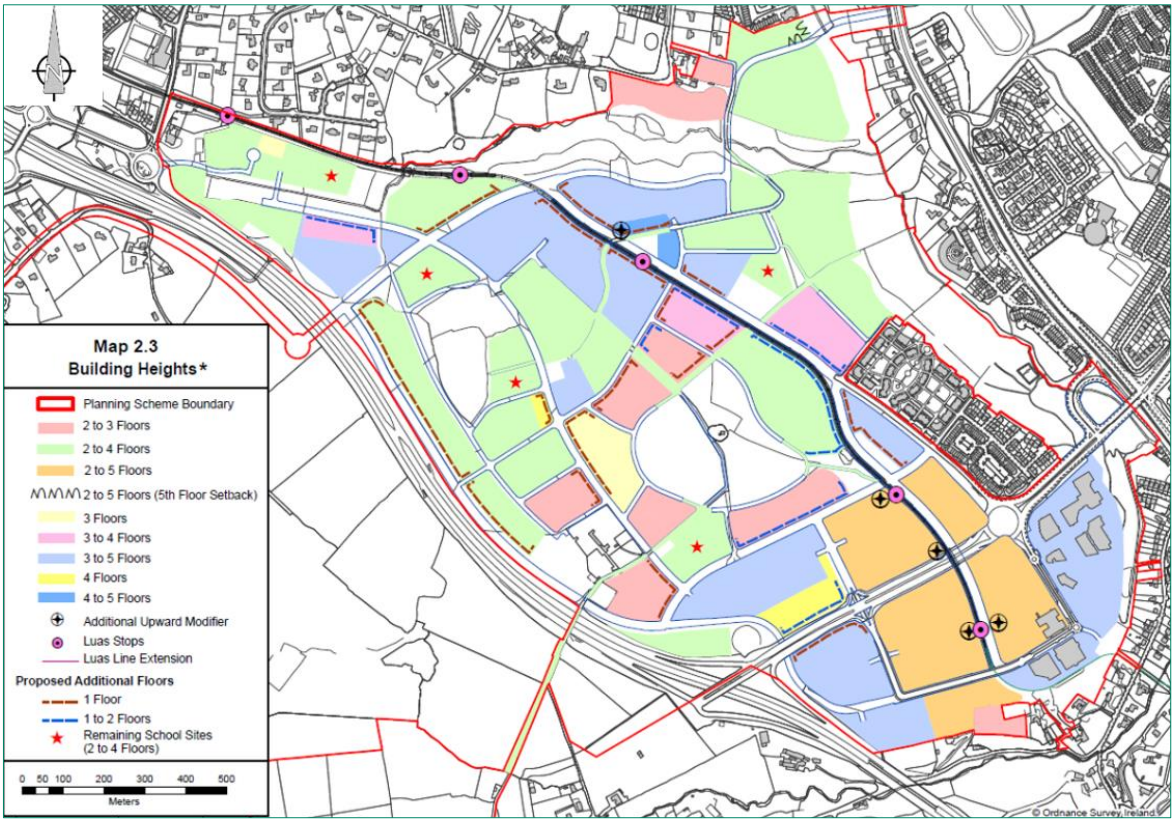

Figure 2.4. Approved Building Height Amendment Locations (Source: R5)

As part of the proposed changes associated with the building height amendment, there may be changes to impermeable areas, which could have an impact on surface water runoff within each of the HIE plots. Any potential increase in impermeable area will need to be offset by an equivalent increase in SuDS or other attenuation provisions within each of the associated Town Centre Quadrants, to ensure that the outfall rate within each quadrant will adhere to the requirement for no more than 1 L/sec/ha surface water outfall from each quadrant, allowing for 1:100 AEP with 20% climate change allowance. Moreover, in the event that such equivalent increases in attenuation provisions are deemed necessary, the available additional capacities within the current approved attenuation provisions, as outlined in Section 2.1.1, are to be taken into consideration.

Additionally, the conclusion of ongoing reviews, in relation to significant reductions in car parking, will also inform a potential change in impermeable area within the development. Once such reviews have been completed, estimations for the predicted surface water runoff can be calculated as part of an independent study for such reviews.

2.2.2 Town Centres and HIE Plots

Any potential proposed change of use from retail, non-retail, and HIE plots to residential units, within the Town Centre Quadrants and HIE plots, is not expected to increase the amount of impermeable area across these quadrants and plots. Thus, it is not expected that any excess surface water is generated outside each plot boundary associated with the proposals. This is subject to each town centre and HIE plot adhering to the flow proposals for this development (i.e. 1 L/sec/ha discharge rate for 1:100 AEP with 20% climate change allowance). Similarly, there should be no decrease in SuDS provisions associated with the proposed amendments which could cause an increase in runoff volumes being generated within the site.

2.3 Feasibility to Increase Capacity

The current approved discharge rate from the Town Centre Quadrants and HIE plots is 1 L/sec/Ha for a 1 in 100-year return period storm with an additional 20% climate change factor, in line with the requirements set out in the Cherrywood Planning Scheme. This should be maintained, and sufficient attenuation storage should be provided within all Town Centre Quadrants and HIE plots to cater for any proposed amendment to the building layouts.

2.4 Upgrades Required & Recommendation

Based on the documents and information available, AECOM have determined that the proposed development for Cherrywood TCE should not result in any adverse impact on existing surface water drainage capacity or require any upgrades to existing surface water infrastructure within the public domain (outside each of the development plots). This is subject to the current approved discharge rate of 1 L/sec/Ha for a 1 in 100-year return period storm allowing for 20% climate change, along with required updates to intensive and extensive green roof coverage provisions as outlined in Section 2.1.2.

As discussed in Section 2.1.2, and as outlined in the Cherrywood Planning Scheme and the DLRCC County Development Plan 2022-2028, it is recommended that all preferential methods of above-ground storage systems and SuDS are to be considered before opting for the implementation of underground attenuation structures, such as attenuation tanks. It should be noted that modifications within the development plots may be required in terms of SuDS attenuation provisions throughout the development for the proposal of any potential additional units. Amendments to the planning design' are to be assessed on a case-by-case basis, by each developer, and agreed with the Planning Authority.

3. Water Supply

3.1 Existing Infrastructure

3.1.1 Existing and Approved Water Supply Provisions

With regards to local water supply, the Cherrywood Planning Scheme notes the presence of an existing reservoir nearby at Rathmichael, which is at a suitable elevation and has the potential to provide sufficient local storage to service the full extents of the Cherrywood TCE. However, as noted in the Planning Scheme, the supply to this reservoir is currently inadequate, namely due to its reliance on Roundwood Water Treatment Works. Therefore, as the solution to such supply difficulties are outside the direct control of DLRCC, resolving this issue will require the involvement of Dublin City Council, Uisce Éireann, and the Department of the Environment, Community and Local Government.

Moreover, the Cherrywood Planning Scheme notes that, in relation to water supply from the Rathmichael reservoir, a circa 150m length of 20" asbestos-cement (AC) main is to be upgraded, with this length of pipe to be renewed with ductile iron (DI) or polyethylene (PE) from Bride's Glen Road.

Uisce Éireann records indicate that there are several existing water supply provisions within the vicinity of the Cherrywood TCE area, one of which being a 450mm HDPE trunk main running along Bishop Street, located along the northern end of Town Centre Quadrants TC1 and TC2. When reviewing Uisce Éireann records, along with R1, it is evident that there is also an existing 500mm ductile iron main running along the western end of TC1. These mains subsequently facilitate a 225mm PE main running along the perimeters of both TC1 and TC2, with the 450mm HDPE main and 500mm ductile iron main feeding the supplies for TC1 and TC2, respectively. HIE plot HIE 5 is also to be served by the existing 500mm ductile iron main. For further illustrations of the aforementioned existing watermains, please refer to Figure 3.1.

Figure 3.1: Existing Water Mains to Serve TC1 and TC2 (Source: Uisce Éireann)

When considering Town Centre Quadrant TC3, an existing 500mm ductile iron main is located along the southern end of this Town Centre Quadrant's boundary. This 500mm main subsequently reduces to a size of 355mm, before spurring off as a connection point for this development. Moreover, for TC4, an existing 300mm ductile iron main is

noted to be running along the eastern end of the Town Centre Quadrant's boundary, before spurring off and reducing to a 150mm connection point for the development.

Regarding the associated HIE plots, HIE 4 is to be served by an existing 560mm HDPE main along the eastern boundary of the plot. Plots HIE 2 and HIE 1 are to be served by an existing 300mm ductile iron main, which runs along the northern and western boundaries of the aforementioned plots, respectively. Based off Uisce Éireann records, it is unclear as to whether an existing connection point to HIE plot HIE 3 has been provided. For further information regarding existing water mains within the vicinities of TC3, TC4, and these HIE plots, please refer to Figure 3.2.

Figure 3.2: Existing Water Mains to Serve TC3 and TC4 (Source: Uisce Éireann)

The existing water mains currently located within the extents of the Cherrywood TCE have been sized based on currently permitted Town Centre Quadrant and HIE plot massing figures, as set out within Appendix D of R8 (refer to Section 8). Any further amendments and alterations made to these massing figures may lead to additional demand requirements for the local water main network, and may subsequently require certain sections of the water main network to be upsized. Further discussions regarding proposed massing figure amendments are presented in Section 3.2.

3.2 Additional Demand Requirements

3.2.1 Town Centre Quadrants

The following section outlines the massing figures, and associated water demand requirements, associated with all Town Centre Quadrants proposed for this development.

3.2.1.1 TC1

Proposed updates for TC1, in relation to land uses for both TC1A and TC1B, include increasing the cumulative land use for residential areas from 32,076m^2 to a maximum of 90,000m^2. In relation to retail & services and HIE areas within TC1, these land uses have been projected to increase from, 17,591m^2 and 9,026m^2, to 31,040m^2 and 10,000m^2, respectively. Land uses for community, and leisure / recreational / tourism areas have been projected to decrease from 1,437m^2 and 12,622m^2, to 500m^2 and 0m^2, respectively. A further breakdown of these areas, along with the associated water demands, is shown in Table 3.1 and Table 3.2, which present water demand calculations for the current approved, and proposed amendment land uses, respectively. It must be noted that these proposed amendment land uses represent the highest potential land use massing scenario projected by DLRCC, whereas the current approved land uses represent the proposals approved as part of planning application DZ17A/0862.

Table 3.1: TC1 Current Approved Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	32,076m^2	N/A	365	986	147,825 L/d	2.14 L/s	10.69 L/s
Retail & Services	17,591m^2	17m^2	N/A	1,035	31,043 L/d	0.45 L/s	2.25 L/s
Leisure / Recreational / Tourism	12,622m^2	36m^2	N/A	351	10,518 L/d	0.15 L/s	0.76 L/s
HIE	9,026m^2	10m^2	N/A	903	81,234 L/d	1.18 L/s	5.88 L/s
Community	1,437m^2	36m^2	N/A	40	1,996 L/d	0.03 L/s	0.14 L/s
					Total:	3.94 L/s	19.72 L/s

Table 3.2: TC1 Proposed Amendment Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	90,000m^2	N/A	1059	2,859	428,895 L/d	6.21 L/s	31.03 L/s
Retail & Services	31,040m^2	17m^2	N/A	1826	54,776 L/d	0.79 L/s	3.96 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
HIE	10,000m^2	10m^2	N/A	1,000	90,000 L/d	1.30 L/s	6.51 L/s
Community	500m^2	36m^2	N/A	14	694 L/d	0.01 L/s	0.05 L/s
					Total:	8.31 L/s	41.55 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism).

*** Average Day/Peak Week Demand is 1.25 times the average daily domestic demand, as per Uisce Éireann requirements.

**** Peak Demand is 5 times the average day/peak week demand, for sizing of the pipe network, as per Uisce Éireann requirements.

***** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

From the figures presented in Table 3.1 and Table 3.2, it is evident that the proposed updates to land use changes will result in an overall increase in the peak demand flow for TC1, with this peak demand increasing from 19.72 L/s to a maximum of 41.55 L/s. This demand was calculated using assumed 'area per employee' figures, taken from R3 (refer to Section 8), and subsequently using values of 17m^2 per employee from the 'food superstores – retail' group, 10m^2 per employee from the 'office – serviced office' group, and 36m^2 per employee from the 'leisure and visitor attractions – cultural attractions' group.

The guidelines set out within Section 3.7 of R4 (refer to Section 8) outline a small number of parameters regarding the sizing of water mains. One such parameter relates to the sizing of water mains relative to the number of residential dwellings proposed for the development. This states that, for a development of 300 to 700 residential dwellings, a typical pipe size of 225mm OD should be used. For TC1, 1,059 residential units have been proposed, as part of the TC1 proposed land-use amendment, to be served by a 225mm PE main, which lies outside the

parameters set out in R4. This is in contrast to the dwelling numbers proposed as part of the current approved scenario, where 365 residential units were proposed, which falls within the aforementioned parameters. As R4 does not set out guidelines for recommended pipe sizes to serve residential developments greater than 700 dwellings, the impact of the additional demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with these 1,059 dwelling units, on the capacity of this 225mm PE main, is to be assessed by Uisce Éireann by means of a pre-connection enquiry (PCE) application.

3.2.1.2 TC2

Proposed updates for TC2 include increasing the land use for residential areas from 35,290m^2 to a maximum of 42,300m^2. In relation to retail & services, HIE, and community areas within TC2, these land uses have also been projected to increase from 300m^2, 0m^2, and 0m^2, to 2,082m^2, 2,015m^2, and 950m^2, respectively. Land uses for leisure / recreational / tourism areas have been projected to decrease from 10,790m^2 to 7,375m^2. A further breakdown of these areas, along with the associated water demand, is shown in Table 3.3 and Table 3.4, which present water demand calculations for the current approved, and proposed amendment land uses, respectively. It must be noted that these proposed amendment land uses represent the highest potential land use massing scenario projected by DLRCC, whereas the current approved land uses represent the proposals approved as part of planning application DZ17A/0862.

Table 3.3: TC2 Current Approved Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	35,290m^2	N/A	384	1,037	155,520 L/d	2.25 L/s	11.25 L/s
Retail & Services	300m^2	17m^2	N/A	18	529 L/d	0.01 L/s	0.04 L/s
Leisure / Recreational / Tourism	10,790m^2	36m^2	N/A	300	8,992 L/d	0.13 L/s	0.65 L/s
HIE	0m^2	10m^2	N/A	0	0 L/d	0.00 L/s	0.00 L/s
Community	0m^2	36m^2	N/A	0	0 L/d	0.00 L/s	0.00 L/s
					Total:	2.39 L/s	11.94 L/s

Table 3.4: TC2 Proposed Amendment Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	42,300m^2	N/A	497	1342	201,285 L/d	2.91 L/s	14.56 L/s
Retail & Services	2,082m^2	17m^2	N/A	122	3,674 L/d	0.05 L/s	0.27 L/s
Leisure / Recreational / Tourism	7,375m^2	36m^2	N/A	205	6,146 L/d	0.09 L/s	0.44 L/s
HIE	2,015m^2	10m^2	N/A	202	18,135 L/d	0.26 L/s	1.31 L/s
Community	950m^2	36m^2	N/A	26	1,319 L/d	0.02 L/s	0.10 L/s
					Total:	3.34 L/s	16.68 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism).

*** Average Day/Peak Week Demand is 1.25 times the average daily domestic demand, as per Uisce Éireann requirements.

**** Peak Demand is 5 times the average day/peak week demand, for sizing of the pipe network, as per Uisce Éireann requirements.

***** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

From the figures presented in Table 3.3 and Table 3.4, it is evident that the proposed updates to land use changes will result in an overall increase in the peak demand flow for TC2, with this peak demand increasing from 11.94 L/s to a maximum of 16.68 L/s. This demand was calculated using assumed 'area per employee' figures, taken from R3, and subsequently using values of 17m^2 per employee from the 'food superstores – retail' group, 10m^2 per employee from the 'office – serviced office' group, and 36m^2 per employee from the 'leisure and visitor attractions – cultural attractions' group.

The guidelines set out within Section 3.7 of R4 outline a small number of parameters regarding the sizing of water mains. One such parameter relates to the sizing of water mains relative to the number of residential dwellings proposed for the development. This states that, for a development of 300 to 700 residential dwellings, a typical pipe size of 225mm OD should be used. For TC2, 497 residential units have been proposed, as part of the TC2 proposed land-use amendment, to be served by a 225mm PE main, which complies with the aforementioned parameters set out in R4. The impact of the additional demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with these 497 dwelling units, on the capacity of this 225mm PE main, is to be assessed by Uisce Éireann by means of a PCE application.

3.2.1.3 TC3

Proposed updates for TC3 include increasing the land use for residential areas from 27,000m^2 to a maximum of 80,000m^2. In relation to retail & services, leisure / recreational / tourism, and community areas within TC3, these land uses have also been projected to increase from, 3,000m^2, 8,000m^2, and 1,100m^2, to 10,000m^2, 20,000m^2, and 12,000m^2, respectively. Land uses for HIE areas have been projected to decrease from 54,800m^2 to 10,000m^2. A further breakdown of these areas, along with the associated water demand, is shown in Table 3.5 and Table 3.6, which present water demand calculations for the current SDZ approved, and maximum projected land uses, respectively. It must be noted that these proposed amendment land uses represent the highest potential land use massing scenario projected by DLRCC, whereas the current SDZ approved land uses represent the proposals approved as noted in the Cherrywood Planning Scheme.

Table 3.5: TC3 Current SDZ Approved Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	27,000m^2	N/A	358	967	144,990 L/d	2.10 L/s	10.49 L/s
Retail & Services	3,000m^2	17m^2	N/A	176	5,294 L/d	0.08 L/s	0.38 L/s
Leisure / Recreational / Tourism	8,000m^2	36m^2	N/A	222	6,667 L/d	0.10 L/s	0.48 L/s
HIE	54,800m^2	10m^2	N/A	5,480	493,200 L/d	7.14 L/s	35.68 L/s
Community	1,100m^2	36m^2	N/A	31	1,528 L/d	0.02 L/s	0.11 L/s
					Total:	9.43 L/s	47.14 L/s

Table 3.6: TC3 Maximum Projected Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	80,000m^2	N/A	941	2541	381,105 L/d	5.51 L/s	27.57 L/s
Retail & Services	10,000m^2	17m^2	N/A	588	17,647 L/d	0.26 L/s	1.28 L/s
Leisure / Recreational / Tourism	20,000m^2	36m^2	N/A	556	16,667 L/d	0.24 L/s	1.21 L/s
HIE	10,000m^2	10m^2	N/A	1000	90,000 L/d	1.30 L/s	6.51 L/s
Community	12,000m^2	36m^2	N/A	333	16,667 L/d	0.24 L/s	1.21 L/s
					Total:	7.55 L/s	37.77 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism).

*** Average Day/Peak Week Demand is 1.25 times the average daily domestic demand, as per Uisce Éireann requirements.

**** Peak Demand is 5 times the average day/peak week demand, for sizing of the pipe network, as per Uisce Éireann requirements.

***** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

From the figures presented in Table 3.5 and Table 3.6, it is apparent that the proposed updates to land use changes will result in an overall decrease in the peak demand flow for TC3, with this peak demand decreasing from 47.14 L/s to a maximum of 37.77 L/s. These demands were calculated using assumed 'area per employee' figures, taken from R3, and subsequently using values of 17m^2 per employee from the 'food superstores – retail' group, 10m^2 per employee from the 'office – serviced office' group, and 36m^2 per employee from the 'leisure and visitor attractions – cultural attractions' group.

The guidelines set out within Section 3.7 of R4 outline a small number of parameters regarding the sizing of water mains. One such parameter relates to the sizing of water mains relative to the number of residential dwellings proposed for the development. This states that, for a development of 300 to 700 residential dwellings, a typical pipe size of 225mm OD should be used. For TC3, 941 residential units have been proposed to be served by a 355mm PE main, based off existing records. As R4 does not set out guidelines for recommended pipe sizes to serve residential developments greater than 700 dwellings, the impact of the additional demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with these 941 dwelling units, on the capacity of this 355mm PE main, is to be assessed by Uisce Éireann by means of a PCE application.

Any potential proposed change of use from retail, non-retail, and HIE plots to residential units, within this Town Centre Quadrant, may result in an increase in associated peak water demand for this Quadrant. Thus, any potential additional changes in this area should be followed up by further analyses of peak water demands, to distinguish the requirement for potential upsizing of the associated water main network.

3.2.1.4 TC4

Proposed updates for TC4 include increasing the land use for residential areas from 47,966m^2 to a maximum of 69,041m^2. In relation to retail & services, HIE, and community areas within TC4, these land uses have also been projected to increase from, 2,393m^2, 13,920m^2, and 0m^2, to 2,501m^2, 30,789m^2, and 425m^2, respectively. Land uses for leisure / recreational / tourism areas have been projected to decrease from 7,703m^2 to 0m^2. A further breakdown of these areas, along with the associated water demand, is shown in Table 3.7 and Table 3.8, which present water demand calculations for the current approved, and proposed amendment land uses, respectively. It must be noted that these proposed amendment land uses represent the highest potential land use massing scenario projected by DLRCC, whereas the current approved land uses represent the proposals approved as part of planning application DZ17A/0862.

Table 3.7: TC4 Current Approved Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	47,966m^2	N/A	520	1,404	210,600 L/d	3.05 L/s	15.23 L/s
Retail & Services	2,393m^2	17m^2	N/A	141	4,223 L/d	0.06 L/s	0.31 L/s
Leisure / Recreational / Tourism	7,703m^2	36m^2	N/A	214	6,419 L/d	0.09 L/s	0.46 L/s
HIE	13,920m^2	10m^2	N/A	1,392	125,280 L/d	1.81 L/s	9.06 L/s
Community	0m^2	0m^2	N/A	0	0 L/d	0.00 L/s	0.00 L/s
					Total:	5.01 L/s	25.07 L/s

Table 3.8: TC4 Proposed Amendment Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	69,041m^2	N/A	813	2195	362,192 L/d	4.76 L/s	23.82 L/s
Retail & Services	2,501m^2	17m^2	N/A	147	4,414 L/d	0.06 L/s	0.32 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
HIE	30,789m^2	10m^2	N/A	3,079	277,101 L/d	4.01 L/s	20.04 L/s
Community	425m^2	36m^2	N/A	12	590 L/d	0.01 L/s	0.04 L/s
					Total:	8.85 L/s	44.23 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism).

*** Average Day/Peak Week Demand is 1.25 times the average daily domestic demand, as per Uisce Éireann requirements.

**** Peak Demand is 5 times the average day/peak week demand, for sizing of the pipe network, as per Uisce Éireann requirements.

***** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

From the figures presented in Table 3.7 and Table 3.8, it is evident that the proposed updates to land use changes will result in an overall increase in the peak demand flow for TC4, with this peak demand increasing from 25.07 L/s to a maximum of 44.23 L/s. This demand was calculated using assumed 'area per employee' figures, taken from R3, and subsequently using values of 17m^2 per employee from the 'food superstores – retail' group, 10m^2 per employee from the 'office – serviced office' group, and 36m^2 per employee from the 'leisure and visitor attractions – cultural attractions' group.

The guidelines set out within Section 3.7 of R4 outline a small number of parameters regarding the sizing of water mains. One such parameter relates to the sizing of water mains relative to the number of residential dwellings proposed for the development. This states that, for a development of 300 to 700 residential dwellings, a typical pipe size of 225mm OD should be used. For TC4, 813 residential units have been proposed, as part of the TC4 proposed land-use amendment, to be served by a 355mm PE main, based off existing records. As R4 does not set out guidelines for recommended pipe sizes to serve residential developments greater than 700 dwellings, the impact of the additional demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with these 813 dwelling units, on the capacity of this 355mm PE main, is to be assessed by Uisce Éireann by means of a PCE application.

3.2.2 HIE Plots

For HIE plot HIE 1, there are proposed changes in land use with regards to retail & services and HIE land use types, from the current SDZ approved land use mixes to the maximum projected land use mixes. Comparisons between these land use mix scenarios are presented in Table 3.9 and Table 3.10, respectively, where it is shown that an overall increase in the peak demand flow has been calculated for the maximum projected land use mix scenario, with this peak demand increasing from 55.22 L/s to a maximum of 82.48 L/s.

These demand calculations were computed using assumed 'area per employee' figures, taken from R3, and subsequently using values of 17m^2 per employee from the 'food superstores – retail' group, 10m^2 per employee from the 'office – serviced office' group, and 36m^2 per employee from the 'leisure and visitor attractions – cultural attractions' group.

Table 3.9: HIE 1 Current SDZ Approved Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	0m^2	N/A	0	0	0 L/d	0 L/s	0 L/s
Retail & Services	0m^2	17m^2	N/A	0	0 L/d	0 L/s	0 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
HIE	84,813m^2	10m^2	N/A	6,481	763,317 L/d	11.04 L/s	55.22 L/s
Community	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
					Total:	11.04 L/s	55.22 L/s

Table 3.10: HIE 1 Maximum Projected Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	0m^2	N/A	0	0	0 L/d	0 L/s	0 L/s
Retail & Services	6,600m^2	17m^2	N/A	388	11,647 L/d	0.17 L/s	0.84 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
HIE	125,000m^2	10m^2	N/A	12,540	1,128,600 L/d	16.33 L/s	81.64 L/s
Community	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
					Total:	16.50 L/s	82.48 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism).

*** Average Day/Peak Week Demand is 1.25 times the average daily domestic demand, as per Uisce Éireann requirements.

**** Peak Demand is 5 times the average day/peak week demand, for sizing of the pipe network, as per Uisce Éireann requirements.

***** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

Similarly to plot HIE 1, there are proposed changes in land use for HIE plot HIE 2 with regards to retail & services and HIE land use types, from the current SDZ approved land use mixes to the maximum projected land use mixes. Comparisons between these land use mix scenarios are presented in Table 3.11 and Table 3.12, respectively, where it is shown that an overall increase in the peak demand flow has been calculated for the maximum projected land use mix scenario, with this peak demand increasing from 15.72 L/s to a maximum of 21.50 L/s.

These demand calculations were computed using assumed 'area per employee' figures, taken from R3, and subsequently using values of 17m^2 per employee from the 'food superstores – retail' group, 10m^2 per employee from the 'office – serviced office' group, and 36m^2 per employee from the 'leisure and visitor attractions – cultural attractions' group.

Table 3.11: HIE 2 Current SDZ Approved Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	0m^2	N/A	0	0	0 L/d	0 L/s	0 L/s
Retail & Services	0m^2	17m^2	N/A	0	0 L/d	0 L/s	0 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
HIE	24,149m^2	10m^2	N/A	2,415	217,341 L/d	3.14 L/s	15.72 L/s
Community	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
					Total:	3.14 L/s	15.72 L/s

Table 3.12: HIE 2 Maximum Projected Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	0m^2	N/A	0	0	0 L/d	0 L/s	0 L/s
Retail & Services	1,720m^2	17m^2	N/A	101	3,035 L/d	0.04 L/s	0.22 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
HIE	32,680m^2	10m^2	N/A	3,268	294,120 L/d	4.26 L/s	21.28 L/s
Community	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
					Total:	4.30 L/s	21.50 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism).

*** Average Day/Peak Week Demand is 1.25 times the average daily domestic demand, as per Uisce Éireann requirements.

**** Peak Demand is 5 times the average day/peak week demand, for sizing of the pipe network, as per Uisce Éireann requirements.

***** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

With regards to HIE plots HIE 3, HIE 4, and HIE 5, the maximum projected land uses for these plots are presented in Table 3.13, Table 3.14, and Table 3.15, where peak demands of 18.55 L/s , 42.37 L/s, and 19.37 L/s are noted, respectively.

Table 3.13: HIE 3 Maximum Projected Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	18,430m^2	N/A	217	586	87,885 L/d	1.27 L/s	6.36 L/s
Retail & Services	0m^2	17m^2	N/A	0	0 L/d	0 L/s	0 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
HIE	18,430m^2	10m^2	N/A	1,843	165,870 L/d	2.40 L/s	12.00 L/s
Community	1,940m^2	36m^2	N/A	54	2,694 L/d	0.04 L/s	0.19 L/s
					Total:	3.71 L/s	18.55 L/s

Table 3.14: HIE 4 Maximum Projected Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	0m^2	N/A	0	0	0 L/d	0 L/s	0 L/s
Retail & Services	3,390m^2	17m^2	N/A	199	5,982 L/d	0.09 L/s	0.43 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
HIE	64,410m^2	10m^2	N/A	6,441	579,690 L/d	8.39 L/s	41.93 L/s
Community	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
					Total:	8.47 L/s	42.37 L/s

Table 3.15: HIE 5 Maximum Projected Water Demand Calculations

Use	Total Area	Area per Employee *****	Proposed No. Residential Units	Associated Population *	Average Water Demand **	Average Day / Peak Week Demand ***	Peak Demand ****
Residential	0m^2	N/A	0	0	0 L/d	0 L/s	0 L/s
Retail & Services	1,550m^2	17m^2	N/A	91	2,735 L/d	0.04 L/s	0.20 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
HIE	29,450m^2	10m^2	N/A	2,945	265,050 L/d	3.83 L/s	19.17 L/s
Community	0m^2	36m^2	N/A	0	0 L/d	0 L/s	0 L/s
					Total:	3.87 L/s	19.37 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism).

*** Average Day/Peak Week Demand is 1.25 times the average daily domestic demand, as per Uisce Éireann requirements.

**** Peak Demand is 5 times the average day/peak week demand, for sizing of the pipe network, as per Uisce Éireann requirements.

***** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

The guidelines set out within Section 3.7 of R4 outline a small number of parameters regarding the sizing of water mains. One such parameter relates to the sizing of water mains relative to the number of residential dwellings proposed for the development. This states that, for a development of 300 to 700 residential dwellings, a typical pipe size of 225mm OD should be used. For HIE 3, 217 residential units have been proposed as part of the HIE 3 proposed land-use amendment. However, as noted in Section 3.1.1, it is unclear as to whether an existing water connection has currently been provided for this plot.

The impact of the additional demand of HIE and community areas, along with these 217 dwelling units, on the capacity of the watermain proposed to serve this plot, is to be assessed by Uisce Éireann by means of a PCE application. Any potential proposed change of use from retail, non-retail, and HIE plots to residential units, within these HIE plots, may result in an increase in associated peak water demand for these plots. Thus, any potential additional changes in this area should be followed up by further analyses of peak water demands, to distinguish the requirement for potential upsizing of the associated water main network.

3.3 Feasibility to Increase Capacity

With regards to the local 225mm PE water main network proposed to serve Town Centre Quadrant TC1, and when considering the proposed TC1 land-use amendment massing figures presented in Table 3.2, this water main would not adhere to guidelines set out in R4, in relation to the sizing of water mains relative to the number of residential dwellings proposed for the development. This is in contrast to the dwelling numbers proposed as part of the current approved scenario, where 365 residential units were proposed, which falls within the aforementioned guidelines. Therefore, the impact of the additional demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with the 1,059 dwelling units projected as part of the proposed land-use amendment for TC1, on the capacity of this 225mm PE main, should be further assessed by Uisce Éireann by means of a PCE application.

In relation to the local 225mm PE water main network proposed to serve Town Centre Quadrant TC2, this water main complies with guidelines set out in R4, for the sizing of water mains based on the number of residential dwellings proposed. However, the additional demand generated from the alternate land use areas, such as retail & services, HIE, leisure / recreational / tourism, and community areas, along with the 497 dwelling units projected as part of the proposed amendment for TC2, on the capacity of this 225mm PE main, is to be further assessed by Uisce Éireann by means of a PCE application.

Regarding Town Centre Quadrant TC3, at present, this quadrant is to be served by a 355mm PE watermain. As R4 does not set out guidelines for the maximum number of dwelling units to be served by a 355mm pipe, it is unclear whether the demand generated from this quadrant complies with Uisce Éireann guidelines. Therefore, the impact of the additional demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with the 941 dwelling units projected as the “maximum” scenario for TC3, on the capacity of this 355mm PE main, should be further assessed by Uisce Éireann by means of a PCE application.

For Town Centre Quadrant TC4, this quadrant is to be served by a 355mm PE watermain. As R4 does not set out guidelines for the maximum number of dwelling units to be served by a 355mm pipe, it is unclear whether the demand generated from this quadrant complies with Uisce Éireann guidelines. Therefore, the impact of the additional demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with the 813 dwelling units projected as part of the proposed amendment for TC4, on the capacity of this 355mm PE main, should be further assessed by Uisce Éireann by means of a PCE application.

For HIE plots HIE 1 and HIE 2, due to increases in land use for retail & services and HIE areas, increases in peak water demand have been projected for these plots. Regarding HIE plots HIE 3, HIE 4, and HIE 5, the impact of the additional demand of HIE and community areas, along with these 217 dwelling units, on the capacity of the watermain proposed to serve this plot, is to be assessed by Uisce Éireann by means of a PCE application.

Additionally, for the 450mm HDPE trunk main serving TC1, and the 500mm ductile iron trunk main serving TC3, a PCE application has been submitted to Uisce Éireann to determine the feasibility of any potential required upsizing of these trunk water main networks serving the developments. Although further correspondence has not yet been received, a PCE application reference number CDS24003833 has been provided by Uisce Éireann. From this PCE application, Uisce Éireann will subsequently provide feedback regarding the feasibility of serving the proposed development, given the stipulated peak water demands outlined in Section 3.2.1.1 and Section 3.2.1.3.

3.4 Upgrades Required & Recommendation

Based on the documents and information currently available, AECOM have determined that, for Town Centre Quadrants TC1, TC2, and TC4, and HIE plots HIE 1 and HIE 2, upgrades may be required to the existing local private-side water main network, due to increases in peak water demands from the current approved land use mixes to the proposed amendment land use mixes. To confirm such potential upgrade requirements, the demand calculations set out in Sections 3.2.1.1, 3.2.1.2, 3.2.1.4, and 3.2.2, are to be further assessed by Uisce Éireann by means of a PCE application.

For Town Centre Quadrant TC3, and HIE plots HIE 3, HIE 4, and HIE 5, any proposed changes within these areas may result in an increase in associated peak water demand, and should be followed up by further analyses of peak water demands, to distinguish the requirement for potential upsizing of the associated water main networks. This should be assessed by Uisce Eireann on a case-by-case basis. Regarding Town Centre Quadrant TC3, due to the projected decrease in peak water demand, no upgrades are envisaged to be required for this quadrant at this time.

It should be noted that upgrades may be required, in terms of the upsizing of water mains, throughout the development for the proposal of any potential additional units. Amendments to the planning design are to be assessed on a case-by-case basis, by each developer, and agreed with the Planning Authority.

Moreover, it is important to note that AECOM have held initial conversations with Uisce Éireann regarding potential upgrade requirements for the TCE. From these conversations, it is anticipated that Uisce Éireann are to carry out analyses of the impacts of the maximum projected water demands, and ultimately revert with commentary in relation to the feasibility of the existing watermain network catering for such demands, along with requirements for any potential network upgrades. AECOM will continue to engage with Uisce Éireann until the results from the aforementioned analyses have been concluded, and the relevant Confirmation of Feasibility has been provided, as well as confirmation regarding the potential need for any upgrades associated with the proposed land-use amendments.

4. Foul Drainage

4.1 Existing Infrastructure

4.1.1 Existing and Approved Foul Drainage Provisions

In relation to existing foul water drainage in the Cherrywood TCE area, the Cherrywood Planning Scheme notes that foul water within the area discharges to the Shanganagh Wastewater Treatment Works (SWTW), which are located circa 2km to the east of the development. It is also noted that the SWTW has been upgraded as part of the Shanganagh Bray Wastewater Project, to cater for existing and all projected future catchment development flows.

Additionally, it is noted in the Planning Scheme that the Cherrywood development area is serviced by the Carrickmines Trunk Sewer, which ranges from 600mm to 900mm in diameter in the area of the Planning Scheme.

Uisce Éireann records specify a number of existing foul sewer networks within the vicinity of the Cherrywood TCE area, one of which being a 300mm uPVC sewer running along Wyattville Link Road, located along the northern end of Town Centre Quadrants TC1 and TC2. When reviewing Uisce Éireann records, along with R1, it is evident that this sewer increases to 375mm along the northern boundary of TC2. This sewer subsequently facilitates 150mm connections for both TC1 and TC2 areas, with these locations being positioned towards the northern end of each area. For further illustrations of the aforementioned existing foul sewer networks, please see Figure 4.1.

Figure 4.1: Existing Foul Sewer Networks to Serve TC1 and TC2 (Source: Uisce Éireann)

When considering Town Centre Quadrant TC3, an existing 300mm foul sewer pipeline is located along the southern end of this Town Centre Quadrant's extents. This 300mm pipeline subsequently reduces to a size of 225mm when running along the southern end of the adjacent Town Centre Quadrant, TC4. These sewers then facilitate a 150mm connection for TC3 located towards the southern end of the Town Centre Quadrant. For TC4, a 300mm foul sewer runs along the eastern end of this Town Centre Quadrant, before increasing again to 300mm, facilitating connections at 2 separate locations along the Town Centre Quadrant's eastern boundary.

Regarding the associated HIE plots, HIE 3 is to be served by an existing 300mm foul sewer pipeline along the northern boundary of the plot. Plots HIE 2 and HIE 1 are to be served by the same line that facilitates TC4, with this foul sewer pipeline running along the northern and western boundaries of the aforementioned plots, respectively. Based off Uisce Éireann records, it is unclear as to whether an existing connection point to HIE plots HIE 4 and HIE 5 have been provided. For further information regarding existing foul sewer networks within the vicinities of TC3, TC4, and these HIE plots, please refer to Figure 4.2.

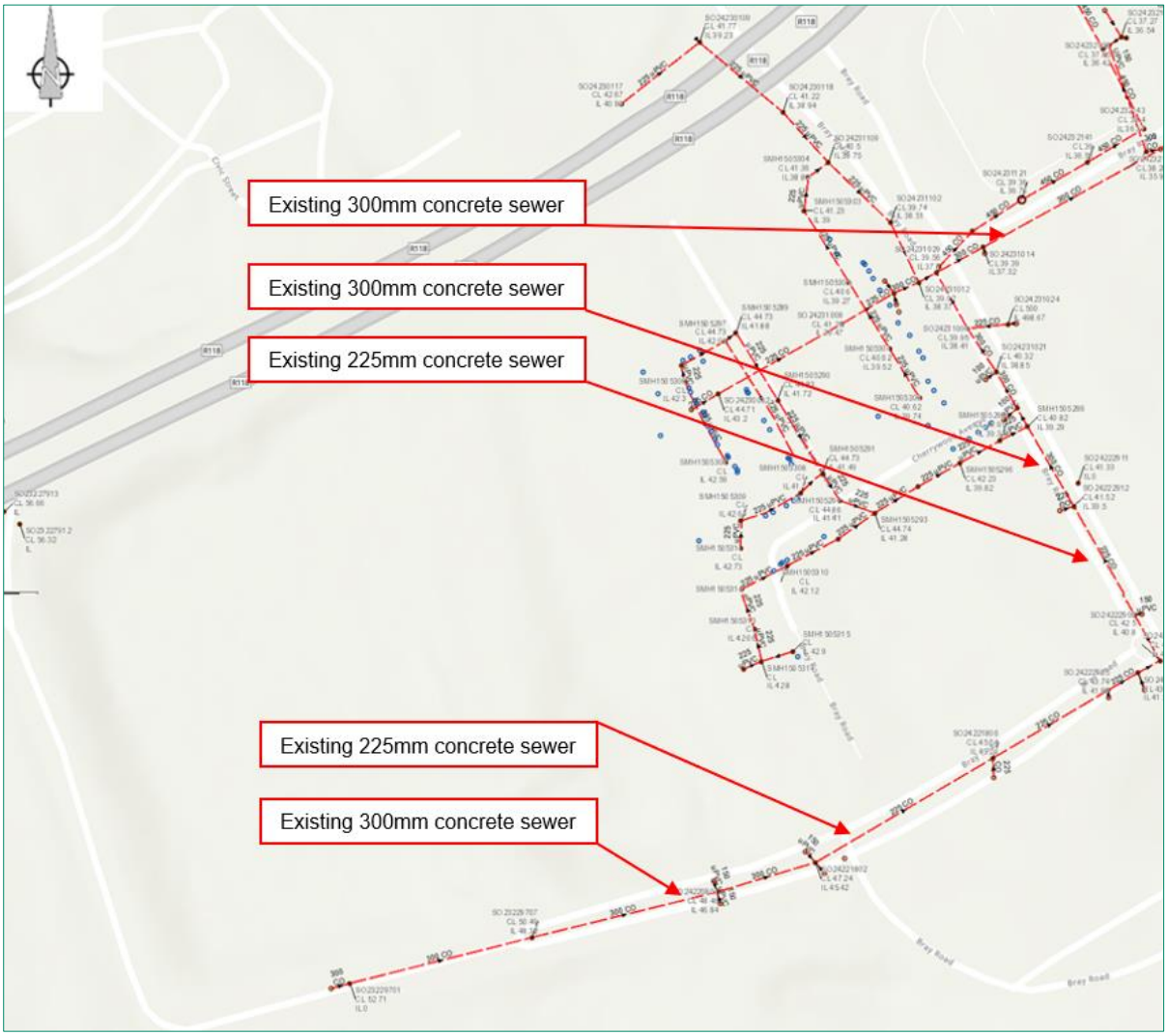

Figure 4.2: Existing Foul Sewer Networks to Serve TC3 and TC4 (Source: Uisce Éireann)

The existing foul sewer networks currently located within the extents of the Cherrywood TCE have been sized based on currently permitted Town Centre Quadrant and HIE plot massing figures, as set out within Appendix D of R8. Any further amendments and alterations made to these massing figures may lead to additional demand requirements for the local foul sewer networks, and may subsequently require certain sections of the network to be upsized. Further discussions regarding proposed massing figure amendments are presented in Section 4.2.

4.2 Additional Demand Requirements

4.2.1 Town Centre Quadrants

The following section outlines the massing figures, and associated foul loading requirements, associated with all Town Centre Quadrants proposed for this development.

4.2.1.1 TC1

Proposed updates for TC1, in relation to land uses for both TC1A and TC1B, include increasing the cumulative land use for residential areas from 32,076m^2 to a maximum of 90,000m^2. In relation to retail & services and HIE areas within TC1, these land uses have been projected to increase from, 17,591m^2 and 9,026m^2, to 31,040m^2 and

10,000m^2, respectively. Land uses for community, and leisure / recreational / tourism areas have been projected to decrease from 1,437m^2 and 12,622m^2, to 500m^2 and 0m^2, respectively. A further breakdown of these areas, along with the associated water demand, is shown in Table 4.1 and Table 4.2, which present water demand calculations for the current approved, and proposed amendment land uses, respectively. It must be noted that these proposed amendment land uses represent the highest potential land use massing scenario projected by DLRCC, whereas the current approved land uses represent the proposals approved as part of planning application DZ17A/0862.

Table 4.1: TC1 Current Approved Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	32,076m^2	N/A	365	986	4.5	162,608 L/d	1.88 L/s	8.47 L/s
Retail & Services	17,591m^2	17m^2	N/A	1,035	4.5	34,147 L/d	0.40 L/s	1.78 L/s
Leisure / Recreational / Tourism	12,622m^2	36m^2	N/A	351	4.5	11,570 L/d	0.13 L/s	0.60 L/s
HIE	9,026m^2	10m^2	N/A	903	4.5	89,357 L/d	1.03 L/s	4.65 L/s
Community	1,437m^2	36m^2	N/A	40	4.5	2,195 L/d	0.03 L/s	0.11 L/s
						Total:	3.47 L/s	15.62 L/s

Table 4.2: TC1 Proposed Amendment Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	90,000m^2	N/A	1,059	2,859	3.0	471,785 L/d	5.46 L/s	16.38 L/s
Retail & Services	31,040m^2	17m^2	N/A	1826	4.5	60,254 L/d	0.70 L/s	3.14 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	4.5	0 L/d	0 L/s	0 L/s
HIE	10,000m^2	10m^2	N/A	1,000	4.5	99,000 L/d	1.15 L/s	5.16 L/s
Community	500m^2	36m^2	N/A	14	4.5	764 L/d	0.01 L/s	0.04 L/s
						Total:	7.31 L/s	24.72 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism), allowing 10% infiltration, as per Uisce Éireann requirements.

*** Based on peaking factor of 6.0 (for residential population between 0 to 750 persons), 3.0 (for residential population between 1,001 to 5,000 persons), and 4.5 (for commercial developments with an area of 0 to 5.5 hectares), as per Uisce Éireann requirements.

**** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

From the figures presented in Table 4.1 and ,Table 4.2, it is evident that the proposed updates to land use changes will result in an overall increase in the peak foul demand flow for TC1, with this peak demand increasing from 15.62 L/s to a maximum of 24.72 L/s. This demand was calculated using assumed ‘area per employee’ figures, taken from R3, and subsequently using values of 17m^2 per employee from the ‘food superstores – retail’ group, 10m^2 per employee from the ‘office – serviced office’ group, and 36m^2 per employee from the ‘leisure and visitor attractions – cultural attractions’ group.

The guidelines set out within Section 3.6 of R9 outline a selection of parameters for the sizing of foul sewers. One parameter relates to the sizing of foul sewers relative to the pipe gradient and residential dwelling numbers proposed for the development. This states that for a development of 331 to 830 residential dwellings, a typical pipe size of 300mm OD should be used. For TC1, 1,059 residential units have been proposed, as part of the TC1 proposed land-use amendment, with these units being served by a 300mm uPVC sewer, which lies outside these parameters set out in R9. This is in contrast to the dwelling numbers proposed as part of the current approved scenario, where 365 residential units were proposed, which falls within the aforementioned parameters. As R9 does not set out guidelines for recommended pipe sizes to serve residential developments greater than 830 dwellings, the impact of the additional demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with these 1,059 dwelling units, on the capacity of this 300mm uPVC sewer, is to be assessed by Uisce Éireann by means of a PCE application.

4.2.1.2 TC2

Proposed updates for TC2 include increasing the land use for residential areas from 35,290m^2 to a maximum of 42,300m^2. In relation to retail & services, HIE, and community areas within TC2, these land uses have also been projected to increase from, 300 m^2, 0m^2, and 0m^2, to 2,082m^2, 2,015m^2, and 950m^2, respectively. Land uses for leisure / recreational / tourism areas have been projected to decrease from 10,790m^2 to 7,375m^2. A further breakdown of these areas, along with the associated water demand, is shown in Table 4.3 and Table 4.4, which present water demand calculations for the current approved, and proposed amendment land uses, respectively. It must be noted that these proposed amendment land uses represent the highest potential land use massing scenario projected by DLRCC, whereas the current approved land uses represent the proposals approved as part of planning application DZ17A/0862.

Table 4.3: TC2 Current Approved Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	35,290m^2	N/A	384	1,037	3.0	171,072 L/d	1.98 L/s	5.94 L/s
Retail & Services	300m^2	17m^2	N/A	18	4.5	582 L/d	0.01 L/s	0.03 L/s
Leisure / Recreational / Tourism	10,790m^2	36m^2	N/A	300	4.5	9,891 L/d	0.11 L/s	0.52 L/s
HIE	0m^2	10m^2	N/A	0	4.5	0 L/d	0.00 L/s	0.00 L/s
Community	0m^2	36m^2	N/A	0	4.5	0 L/d	0.00 L/s	0.00 L/s
Total:							2.10 L/s	6.49 L/s

Table 4.4: TC2 Proposed Amendment Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	42,300m^2	N/A	497	1342	3.0	221,414 L/d	2.56 L/s	7.69 L/s
Retail & Services	2,082m^2	17m^2	N/A	122	4.5	4,042 L/d	0.05 L/s	0.21 L/s
Leisure / Recreational / Tourism	7,375m^2	36m^2	N/A	205	4.5	6,760 L/d	0.08 L/s	0.35 L/s
HIE	2,015m^2	10m^2	N/A	202	4.5	19,949 L/d	0.23 L/s	1.04 L/s
Community	950m^2	36m^2	N/A	26	4.5	1,451 L/d	0.02 L/s	0.08 L/s
Total:							2.94 L/s	9.37 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism), allowing 10% infiltration, as per Uisce Éireann requirements.

*** Based on peaking factor of 6.0 (for residential population between 0 to 750 persons), 3.0 (for residential population between 1,001 to 5,000 persons), and 4.5 (for commercial developments with an area of 0 to 5.5 hectares), as per Uisce Éireann requirements.

**** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

From the figures presented in Table 4.3 and Table 4.4, it is apparent that the proposed updates to land use changes will result in an overall increase in the peak foul demand flow for TC2, with this peak demand increasing from 6.49 L/s to a maximum of 9.37 L/s. This demand was calculated using assumed 'area per employee' figures, taken from R3, and subsequently using values of 17m^2 per employee from the 'food superstores – retail' group, 10m^2 per employee from the 'office – serviced office' group, and 36m^2 per employee from the 'leisure and visitor attractions – cultural attractions' group.

The guidelines set out within Section 3.6 of R9 outline a selection of parameters regarding the sizing of foul sewers. One such parameter relates to the sizing of foul sewers relative to the pipe gradient and number of residential dwellings proposed for the development. This states that, for a development of 331 to 830 residential dwellings, a typical pipe size of 300mm OD should be used. For TC2, 497 residential units have been proposed, as part of the TC2 proposed land-use amendment, to be served by a 300mm uPVC sewer, which complies with the aforementioned parameters set out in R9. The impact of the additional foul loading demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with these 497 dwelling units, on the capacity of this 300mm uPVC sewer, is to be assessed by Uisce Éireann by means of a PCE application.

4.2.1.3 TC3

Proposed updates for TC3 include increasing the land use for residential areas from 27,000m^2 to a maximum of 80,000m^2. In relation to retail & services, leisure / recreational / tourism, and community areas within TC3, these land uses have also been projected to increase from, 3,000m^2, 8,000m^2, and 1,100m^2, to 10,000m^2, 20,000m^2, and 12,000m^2, respectively. Land uses for HIE areas have been projected to decrease from 54,800m^2 to 10,000m^2. A further breakdown of these areas, along with the associated water demand, is shown in Table 4.5 and Table 4.6, which present water demand calculations for the current SDZ approved, and maximum projected land uses, respectively. It must be noted that these proposed amendment land uses represent the highest potential land use massing scenario projected by DLRCC, whereas the current SDZ approved land uses represent the proposals approved as noted in the Cherrywood Planning Scheme.

Table 4.5: TC3 Current SDZ Approved Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	27,000m^2	N/A	358	967	4.5	159,489 L/d	1.85 L/s	8.31 L/s
Retail & Services	3,000m^2	17m^2	N/A	176	4.5	5,824 L/d	0.07 L/s	0.30 L/s
Leisure / Recreational / Tourism	8,000m^2	36m^2	N/A	222	4.5	7,333 L/d	0.08 L/s	0.38 L/s
HIE	54,800m^2	10m^2	N/A	5,480	4.5	542,520 L/d	6.28 L/s	28.26 L/s
Community	1,100m^2	36m^2	N/A	31	4.5	1,681 L/d	0.02 L/s	0.09 L/s
Total:							8.30 L/s	37.34 L/s

Table 4.6: TC3 Maximum Projected Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	80,000m^2	N/A	941	2541	3.0	419,216 L/d	4.85 L/s	14.56 L/s
Retail & Services	10,000m^2	17m^2	N/A	588	4.5	19,412 L/d	0.22 L/s	1.01 L/s
Leisure / Recreational / Tourism	20,000m^2	36m^2	N/A	556	4.5	18,333 L/d	0.21 L/s	0.95 L/s
HIE	10,000m^2	10m^2	N/A	1000	4.5	99,000 L/d	1.15 L/s	5.16 L/s
Community	12,000m^2	36m^2	N/A	333	4.5	18,333 L/d	0.21 L/s	0.95 L/s
Total:							6.65 L/s	22.63 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism), allowing 10% infiltration, as per Uisce Éireann requirements.

*** Based on peaking factor of 6.0 (for residential population between 0 to 750 persons), 3.0 (for residential population between 1,001 to 5,000 persons), and 4.5 (for commercial developments with an area of 0 to 5.5 hectares), as per Uisce Éireann requirements.

**** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

From the figures presented in Table 4.5 and Table 4.6, it is apparent that the proposed updates to land use changes will result in an overall decrease in the peak foul demand flow for TC3, with this peak demand decreasing from 37.34 L/s to a maximum of 22.63 L/s. This demand was calculated using assumed 'area per employee' figures, taken from R3, and subsequently using values of 17m^2 per employee from the 'food superstores – retail' group, 10m^2 per employee from the 'office – serviced office' group, and 36m^2 per employee from the 'leisure and visitor attractions – cultural attractions' group.

The guidelines set out within Section 3.6 of R9 outline a selection of parameters regarding the sizing of foul sewers. One such parameter relates to the sizing of foul sewers relative to the pipe gradient and number of residential dwellings proposed for the development. This states that, for a development of 331 to 830 residential dwellings, a typical pipe size of 300mm OD should be used. For TC3, 941 residential units have been proposed to be served by a 300mm foul sewer, based off existing records. As R9 does not set out guidelines for recommended pipe sizes to serve residential developments greater than 830 dwellings, the impact of the additional foul loading demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with these 941 dwelling units, on the capacity of this 300mm foul sewer, is to be assessed by Uisce Éireann by means of a PCE application.

4.2.1.4 TC4

Proposed updates for TC4 include increasing the land use for residential areas from 47,966m^2 to a maximum of 69,041m^2. In relation to retail & services, HIE, and community areas within TC4, these land uses have also been projected to increase from, 2,393m^2, 13,920m^2, and 0m^2, to 2,501m^2, 30,789m^2, and 425m^2, respectively. Land uses for leisure / recreational / tourism areas have been projected to decrease from 7,703m^2 to 0m^2. A further breakdown of these areas, along with the associated water demand, is shown in Table 4.7 and Table 4.8, which present water demand calculations for the current approved, and proposed amendment land uses, respectively. It must be noted that these proposed amendment land uses represent the highest potential land use massing scenario projected by DLRCC, whereas the current approved land uses represent the proposals approved as part of planning application DZ17A/0862.

Table 4.7: TC4 Current Approved Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	47,966m^2	N/A	754	1,404	3.0	231,660 L/d	2.68 L/s	8.04 L/s
Retail & Services	2,393m^2	17m^2	N/A	141	4.5	4,645 L/d	0.05 L/s	0.24 L/s
Leisure / Recreational / Tourism	7,703m^2	36m^2	N/A	214	4.5	7,061 L/d	0.08 L/s	0.37 L/s
HIE	13,920m^2	10m^2	N/A	1,392	4.5	137,808 L/d	1.60 L/s	7.18 L/s
Community	0m^2	36m^2	N/A	0	4.5	0 L/d	0.00 L/s	0.00 L/s
Total:							4.41 L/s	15.83 L/s

Table 4.8: TC4 Proposed Amendment Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	69,041m^2	N/A	813	2195	3.0	362,192 L/d	4.19 L/s	12.58 L/s
Retail & Services	2,501m^2	17m^2	N/A	147	4.5	4,855 L/d	0.06 L/s	0.25 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	6.0	0 L/d	0 L/s	0 L/s
HIE	30,789m^2	10m^2	N/A	3,079	4.5	304,811 L/d	3.53 L/s	15.88 L/s
Community	425m^2	36m^2	N/A	12	4.5	649 L/d	0.01 L/s	0.03 L/s
Total:							7.78 L/s	28.74 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism), allowing 10% infiltration, as per Uisce Éireann requirements.

*** Based on peaking factor of 6.0 (for residential population between 0 to 750 persons), 3.0 (for residential population between 1,001 to 5,000 persons), and 4.5 (for commercial developments with an area of 0 to 5.5 hectares), as per Uisce Éireann requirements.

**** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

From the figures presented in Table 4.7 and Table 4.8, it is evident that the proposed updates to land use changes will result in an overall increase in the peak foul demand flow for TC4, with this peak demand increasing from 15.83 L/s to a maximum of 28.74 L/s. This demand was calculated using assumed 'area per employee' figures, taken from R3, and subsequently using values of 17m^2 per employee from the 'food superstores – retail' group, 10m^2 per employee from the 'office – serviced office' group, and 36m^2 per employee from the 'leisure and visitor attractions – cultural attractions' group.

The guidelines set out within Section 3.6 of R9 outline a selection of parameters regarding the sizing of foul sewers. One such parameter relates to the sizing of foul sewers relative to the pipe gradient and number of residential dwellings proposed for the development. This states that, for a development of 331 to 830 residential dwellings, a typical pipe size of 300mm OD should be used. For TC4, 813 residential units have been proposed, as part of the TC4 proposed land-use amendment, to be served by a 300mm foul sewer, which complies with the aforementioned parameters set out in R9. This is also the case when considering the dwelling numbers proposed as part of the

current approved scenario, where 754 residential units were proposed. However, the impact of the additional demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with these 813 dwelling units, on the capacity of this 225mm foul sewer, is to be further assessed by Uisce Éireann by means of a PCE application.

4.2.2 HIE Plots

For HIE plot HIE 1, there are proposed changes in land use with regards to retail & services and HIE land use types, from the current SDZ approved land use mixes to the maximum projected land use mixes. Comparisons between these land use mix scenarios are presented in Table 4.9 and Table 4.10, respectively, where it is shown that an overall increase in the peak foul demand flow has been computed for the maximum projected land use mix scenario, with this peak demand increasing from 34.01 L/s to a maximum of 43.77 L/s. These demand calculations were computed using assumed 'area per employee' figures, taken from R3, and subsequently using values of 17m^2 per employee from the 'food superstores – retail' group, 10m^2 per employee from the 'office – serviced office' group, and 36m^2 per employee from the 'leisure and visitor attractions – cultural attractions' group.

Table 4.9: HIE 1 Current SDZ Approved Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	0m^2	N/A	0	0	4.5	0 L/d	0 L/s	0 L/s
Retail & Services	0m^2	17m^2	N/A	0	4.5	0 L/d	0 L/s	0 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	4.5	0 L/d	0 L/s	0 L/s
HIE	84,813m^2	10m^2	N/A	8,481	3.5	839,649 L/d	9.72 L/s	34.01 L/s
Community	0m^2	36m^2	N/A	0	4.5	0L/d	0 L/s	0 L/s
Total:							9.72 L/s	34.01 L/s

Table 4.10: HIE 1 Maximum Projected Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	0m^2	N/A	0	0	6.0	0 L/d	0 L/s	0 L/s
Retail & Services	6,600m^2	17m^2	N/A	388	4.5	12,812 L/d	0.15 L/s	0.67 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	6.0	0 L/d	0 L/s	0 L/s
HIE	125,400m^2	10m^2	N/A	12,540	3.0	1,241,460 L/d	14.37 L/s	43.11 L/s
Community	0m^2	36m^2	N/A	0	4.5	0L/d	0 L/s	0 L/s
Total:							14.52 L/s	43.77 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism), allowing 10% infiltration, as per Uisce Éireann requirements.

*** Based on peaking factor of 6.0 (for residential population between 0 to 750 persons), 3.0 (for residential population between 1,001 to 5,000 persons), and 4.5 (for commercial developments with an area of 0 to 5.5 hectares), as per Uisce Éireann requirements.

**** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

Similarly to plot HIE 1, there are proposed changes in land use for HIE plot HIE 2 with regards to retail & services and HIE land use types, from the current SDZ approved land use mixes to the maximum projected land use mixes. Comparisons between these land use mix scenarios are presented in Table 4.11 and Table 4.12, respectively, where it is shown that an overall increase in the peak foul demand flow has been computed for the maximum projected land use mix scenario, with this peak demand increasing from 12.45 L/s to a maximum of 17.02 L/s.

These demand calculations were computed using assumed 'area per employee' figures, taken from R3, and subsequently using values of 17m^2 per employee from the 'food superstores – retail' group, 10m^2 per employee from the 'office – serviced office' group, and 36m^2 per employee from the 'leisure and visitor attractions – cultural attractions' group.

Table 4.11: HIE 2 Current SDZ Approved Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	0m^2	N/A	0	0	4.5	0 L/d	0 L/s	0 L/s
Retail & Services	0m^2	17m^2	N/A	0	4.5	0 L/d	0 L/s	0 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	4.5	0 L/d	0 L/s	0 L/s
HIE	24,149m^2	10m^2	N/A	2,415	4.5	239,075 L/d	2.77 L/s	12.45 L/s
Community	0m^2	36m^2	N/A	0	4.5	0 L/d	0 L/s	0 L/s
Total:							2.77 L/s	12.45 L/s

Table 4.12: HIE 2 Maximum Projected Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	0m^2	N/A	0	0	4.5	0 L/d	0 L/s	0 L/s
Retail & Services	1,720m^2	17m^2	N/A	101	4.5	3,339 L/d	0.04 L/s	0.17 L/s
Leisure / Recreational / Tourism	0m^2	36m^2	N/A	0	4.5	0 L/d	0 L/s	0 L/s
HIE	32,680m^2	10m^2	N/A	3,268	4.5	323,532 L/d	3.74 L/s	16.85 L/s
Community	0m^2	36m^2	N/A	0	4.5	0 L/d	0 L/s	0 L/s
Total:							3.78 L/s	17.02 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism), allowing 10% infiltration, as per Uisce Éireann requirements.

*** Based on peaking factor of 6.0 (for residential population between 0 to 750 persons), 3.0 (for residential population between 1,001 to 5,000 persons), and 4.5 (for commercial developments with an area of 0 to 5.5 hectares), as per Uisce Éireann requirements.

**** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

With regards to HIE plots HIE 3, HIE 4, and HIE 5, the maximum projected land uses for these plots are presented in Table 4.13, Table 4.14, and Table 4.15, where peak foul loading demands of 16.37 L/s , 26.17 L/s, and 15.34 L/s are noted, respectively.

Table 4.13: HIE 3 Maximum Projected Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	18,430m²	N/A	217	586	6.0	96,674 L/d	1.12 L/s	6.71 L/s
Retail & Services	0m²	17m²	N/A	0	4.5	0 L/d	0 L/s	0 L/s
Leisure / Recreational / Tourism	0m²	36m²	N/A	0	4.5	0 L/d	0 L/s	0 L/s
HIE	18,430m²	10m²	N/A	1,843	4.5	182,457 L/d	2.11 L/s	9.50 L/s
Community	1,940m²	36m²	N/A	54	4.5	2,964 L/d	0.03 L/s	0.15 L/s
Total:							3.26 L/s	16.37 L/s

Table 4.14: HIE 4 Maximum Projected Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	0m²	N/A	0	0	6.0	0 L/d	0 L/s	0 L/s
Retail & Services	3,390m²	17m²	N/A	199	4.5	6,581 L/d	0.08 L/s	0.34 L/s
Leisure / Recreational / Tourism	0m²	36m²	N/A	0	6.0	0 L/d	0 L/s	0 L/s
HIE	64,410m²	10m²	N/A	6,441	3.5	637,659 L/d	7.38 L/s	25.83 L/s
Community	0m²	36m²	N/A	0	4.5	0 L/d	0 L/s	0 L/s
Total:							7.46 L/s	26.17 L/s

Table 4.15: HIE 5 Maximum Projected Foul Demand Calculations

Use	Total Area	Area per Employee ****	Proposed No. Residential Units	Associated Population *	Peaking Factor	Foul Discharge **		Peak Flow ***
Residential	0m²	N/A	0	0	3.0	0 L/d	0 L/s	0 L/s
Retail & Services	1,550m²	17m²	N/A	91	4.5	3,009 L/d	0.03 L/s	0.16 L/s
Leisure / Recreational / Tourism	0m²	36m²	N/A	0	4.5	0 L/d	0 L/s	0 L/s
HIE	29,450m²	10m²	N/A	2,945	4.5	291,555 L/d	3.37 L/s	15.19 L/s
Community	0m²	36m²	N/A	0	4.5	0L/d	0 L/s	0 L/s
Total:							3.41 L/s	15.34 L/s

* Based on a national average of 2.7 persons/house (Uisce Éireann Code of Practice), and on 'Employment Densities Guide' published by Drivers Jonas Deloitte. Applicable for Residential only.

** Based on per-capita consumption, as per Uisce Éireann Code of Practice, of 150 l/p/d for residential units, 30 l/p/d for restaurants (retail & services), 90 l/p/d for industrial full-time day staff (HIE), and 50 l/p/d for health club / sports centre (community & leisure / tourism), allowing 10% infiltration, as per Uisce Éireann requirements.

*** Based on peaking factor of 6.0 (for residential population between 0 to 750 persons), 3.0 (for residential population between 1,001 to 5,000 persons), and 4.5 (for commercial developments with an area of 0 to 5.5 hectares), as per Uisce Éireann requirements.

**** Based on area per employee figures of 17m² (Food superstores - retail), 10m² (office - serviced office), and 36m² (leisure and visitor attractions - cultural attractions), as per 'Employment Densities Guide' published by Drivers Jonas Deloitte.

The guidelines set out within Section 3.6 of R9 outline a selection of parameters regarding the sizing of foul sewers. One such parameter relates to the sizing of foul sewers relative to the pipe gradient and number of residential dwellings proposed for the development. This states that, for a development of 331 to 830 residential dwellings, a

typical pipe size of 300mm OD should be used. For HIE 3, 217 residential units have been proposed, as part of the HIE 3 proposed land-use amendment, to be served by a 300mm foul sewer, which complies with the aforementioned parameters set out in R9. The impact of the additional foul loading demand from HIE and community areas, along with these 217 dwelling units, on the capacity of this 300mm foul sewer, is to be assessed by Uisce Éireann by means of a PCE application.

Any potential proposed change of use from retail, non-retail, and HIE plots to residential units, within these HIE plots, may result in an increase in associated peak foul loading demand for these plots. Thus, any potential additional changes in this area should be followed up by further analyses of peak foul demands, to distinguish the requirement for potential upsizing of the associated foul sewer network.

4.3 Feasibility to Increase Capacity

With regards to the 300mm uPVC foul sewer proposed to serve Town Centre Quadrant TC1, and when considering the proposed TC1 land-use amendment massing figures shown in Table 4.2, this sewer would not adhere to guidelines set out in R9, in relation to the sizing of foul sewers relative to the pipe gradient and number of residential dwellings proposed for the development. This is in contrast to the dwelling numbers proposed as part of the current approved scenario, where 365 residential units were proposed, which falls within the aformentioned guidelines. Therefore, the impact of the additional demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with the 1,059 dwelling units projected as part of the proposed amendment for TC1, on the capacity of this 300mm uPVC sewer, should be further assessed by Uisce Éireann by means of a PCE application.

In relation to the local 300mm uPVC foul sewer proposed to serve Town Centre Quadrant TC2, this foul sewer complies with guidelines set out in R9, for the sizing of foul sewers based on the pipe gradient and number of residential dwellings proposed. However, the additional demand generated from the alternate land use areas, such as retail & services, HIE, leisure / recreational / tourism, and community areas, along with the 497 dwelling units projected as part of the proposed land-use amendment for TC2, on the capacity of this 300mm foul sewer, is to be further assessed by Uisce Éireann by means of a PCE application.

Regarding Town Centre Quadrant TC3, this quadrant is to be served by a 300mm foul sewer. As R4 does not set out guidelines for recommended pipe sizes to serve residential developments greater than 830 dwellings, the impact of the additional foul loading demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with these 941 dwelling units, on the capacity of this 300mm foul sewer, is to be assessed by Uisce Éireann by means of a PCE application.

For Town Centre Quadrant TC4, this quadrant is to be served by a 300mm foul sewer, which, when considering the proposed TC4 amendment massing figures shown in Table 4.8, does adhere to guidelines set out in R9 in relation to the sizing of foul sewers relative to the pipe gradient and number of residential dwellings proposed for the development. However, the impact of the additional demand of retail & services, HIE, leisure / recreational / tourism, and community areas, along with the 813 dwelling units projected as part of the proposed land-use amendment for TC4, on the capacity of this 225mm foul sewer, should be further assessed by Uisce Éireann by means of a PCE application.

For HIE plots HIE 1 and HIE 2, due to increases in land use for retail & services and HIE areas, increases in peak foul demand have been projected for these plots. Regarding HIE plots HIE 3, HIE 4, and HIE 5, for HIE 3, 217 residential units have been proposed as part of the proposed HIE 3 land-use amendment, which are to subsequently be served by a 300mm foul sewer, thus complying with the aforementioned parameters set out in R9. However, the impact of the additional demand of HIE and community areas, along with these 217 dwelling units, on the capacity of this 300mm sewer proposed to serve this plot, is to be assessed by Uisce Éireann by means of a PCE application. Additionally, for TC1, and TC3, a PCE application has been submitted to Uisce Éireann to determine the feasibility of any potential required upsizing of these foul sewer networks to serve the developments. Although further correspondence has not yet been received, a PCE application reference number CDS24003833 has been provided by Uisce Éireann. From this PCE application, Uisce Éireann will subsequently provide feedback regarding the feasibility of serving the proposed development, given the stipulated peak foul loading demands outlined in Section 4.2.1.1 and Section 4.2.1.3.

4.4 Upgrades Required & Recommendation

Based on the documents and information currently available, AECOM have determined that, for Town Centre Quadrants TC1, TC2, and TC4, and HIE plots HIE 1 and HIE 2, upgrades may be required to the existing local private-side foul sewer network, due to increases in peak foul loading demands from the current approved land use mixes to the proposed amendment land use mixes. To confirm such potential upgrade requirements, the demand calculations set out in Sections 4.2.1.1, 4.2.1.2, and 4.2.1.4, are to be further assessed by Uisce Éireann by means of a PCE application.

For Town Centre Quadrant TC3, and HIE plots HIE 3, HIE 4, and HIE 5, at present, any proposed changes within these remaining areas may result in an increase in associated foul loading demand, and should be followed up by further analyses of peak demands, to distinguish the requirement for potential upsizing of the associated foul sewer networks. Regarding Town Centre Quadrant TC3, due to the projected decrease in peak water demand, no upgrades are envisaged to be required for this quadrant at this time.

It should be noted that upgrades may be required, in terms of the upsizing of foul sewers, throughout the development for the proposal of any potential additional units. Amendments to the planning design are to be assessed on a case-by-case basis, by each developer, and agreed with the Planning Authority.

Moreover, it is important to note that AECOM have held initial conversations with Uisce Éireann regarding potential upgrade requirements for the TCE. From these conversations, it is anticipated that Uisce Éireann are to carry out analyses of the impacts of the maximum projected foul demands, and ultimately revert with commentary in relation to the feasibility of the existing foul drainage network catering for such foul demands, along with requirements for any potential network upgrades. AECOM will continue to engage with Uisce Éireann until the results from the aforementioned analyses have been concluded, and the relevant Confirmation of Feasibility has been provided, as well as confirmation regarding the potential need for any upgrades associated with the proposed land-use amendments.

5. Telecommunications

An assessment has been undertaken for the provision telecommunications for this development, evaluating the locations of existing BT, Eir, and Virgin Media telecommunication utilities within the vicinity of the Cherrywood TCE, which will indicate the suitability of these existing utilities in terms of serving the proposed development.

5.1 Existing BT Services

The extents of existing BT services within the proximity of the Cherrywood TCE area are primarily to the east of the development, with the majority of these services being located within HIE 1. Figure 5.1 illustrates an extract from an existing BT services layout for the area, showing in green the approximate BT services extents for this development, which also indicates the presence of existing BT services along the boundaries of HIE 2 and Town Centre Quadrant TC4.

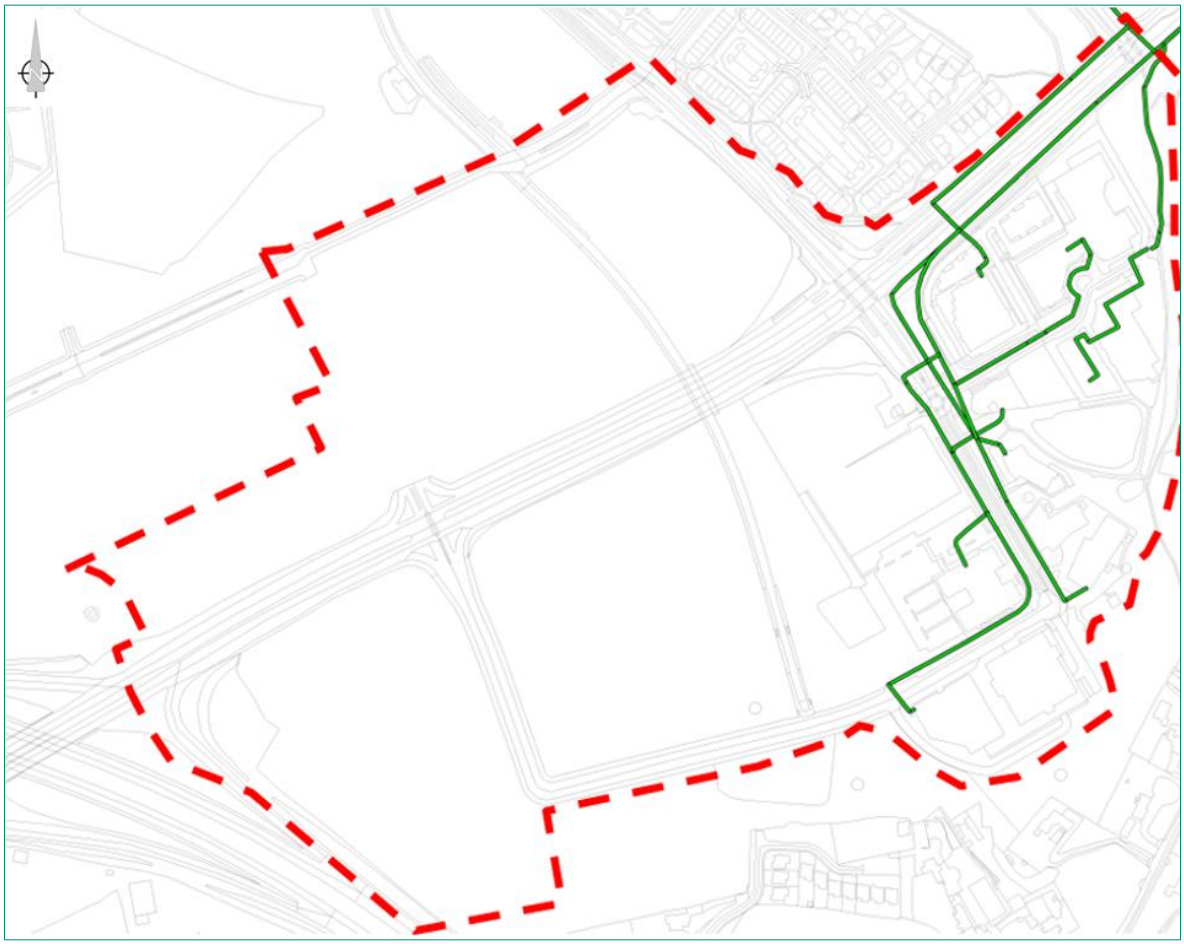

Figure 5.1: Existing BT services extents (Source: BT)

5.2 Existing Eir Services

Eir are noted to be providing existing telecommunication services at various locations across the Cherrywood TCE extents. Existing Eir services layouts indicate the presence of existing communications ducting along the boundaries of HIE 4 and TC2, running in the R118 roadway. For TC4, ducting is noted to be running along the roadway parallel to the eastern boundary of this Town Centre Quadrant, with numerous single 100PP cables being located within the extents of this Quadrant area. The Town Centre Quadrant TC2 area is noted to currently be served by 10 No. 1-way MD (10/8) ducts, along with numerous single 100PP ducts within the current Quadrant extents. Moreover, 5 No. 1-way MD ducts are noted to be installed to currently serve the northern portion of TC2. Figure 5.2 shows an extract from an existing Eir services layout for the area, highlighting in blue the locations of existing Eir services for the development, where the top-left and top-right images in this figure indicate the approximate service locations within the vicinities of HIE 4 and TC4, respectively. The bottom-left image then corresponds to the TC2 area, with the bottom right image relating to the northern boundaries of TC1 and TC2.

Figure 5.2: Existing Eir services extents (Source: Eir)

5.3 Existing Virgin Media Services

Existing Virgin Media services are noted to be located throughout a portion of the development extents. Based off existing Virgin Media records, existing ducting is indicated to be running along the northern boundary of TC3 and TC4, being installed parallel to the regional road R118, and stopping just short of the northern boundary of HIE 4. An existing duct bank is also indicated to be running along the eastern and southern boundary of TC4, whilst also being installed along the HIE 1 and HIE 2 areas.

Moreover, an existing duct bank is noted to be running along the northern boundaries of TC1 and TC2. There are no existing Virgin Media services indicated within the direct proximities of HIE 3 and HIE 5. An extract of these existing Virgin Media records is presented in Figure 5.3.

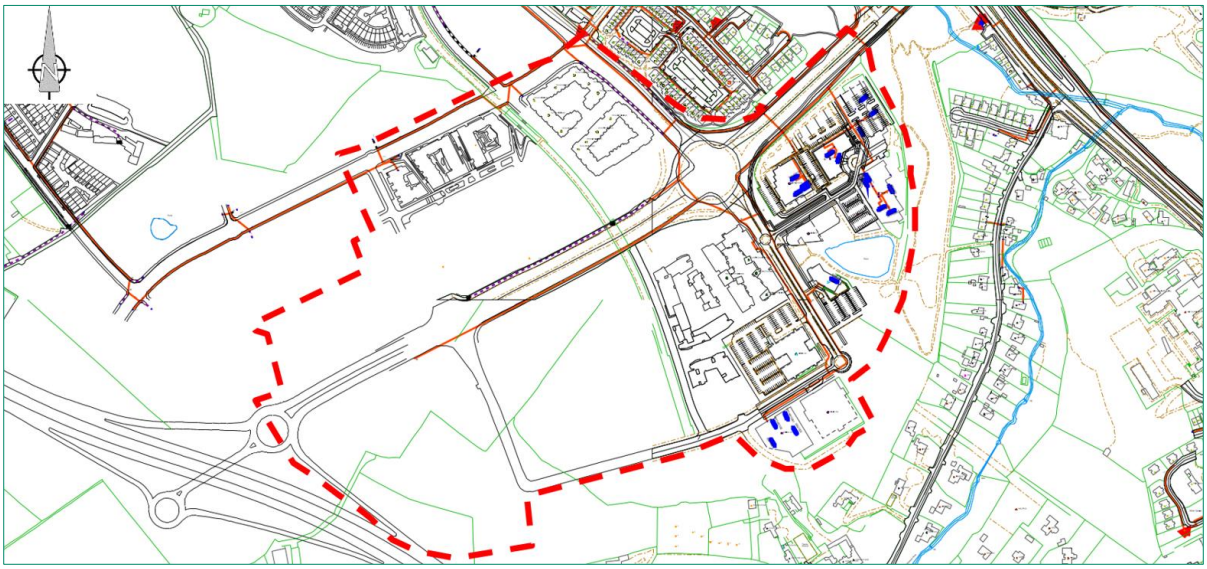

Figure 5.3: Existing Virgin Media services extents (Source: Virgin Media)

5.4 Upgrades Required & Recommendation

Based on the documents and information currently available, AECOM have noted the presence of existing telecommunication services within, and around the immediate extents of, all Town Centre Quadrants, along with HIE 1, HIE 2, HIE 4, and HIE 5. At present, it is unclear as to whether there are existing telecommunication services installed within direct proximity of HIE 3.

Prior to connection, each Town Centre Quadrant and HIE plot is to submit an application to the relevant telecommunication service provider, where the service provider will then confirm if capacity is currently available to serve the requirements of the respective Quadrant or HIE plot.

6. Power Supply

The provision of power supply has been assessed for this development, with the availability of electrical supply being reviewed at or near the proposed site extents. Using existing records, ESB network supplies have been reviewed to give an indication of power line availability within the vicinity of the proposed Cherrywood TCE. This assessment included:

- Outlining the presence of existing ESB HV (underground and overhead), MV (overhead and three-phase), and LV power lines.
    - For an assessment of this type, each plot is scored **Green** where HV and MV lines are available, **Amber** where there is availability of HV or MV lines, and **Red** where only LV, MVLV or MV single-phase lines are present.
    - For all Town Centre Quadrants and HIE areas, HV lines have been noted to be available, thus scoring the development as **Green** for this given parameter. An extract of the existing ESB network layout relative to the Cherrywood TCE area is shown in Figure 6.1.

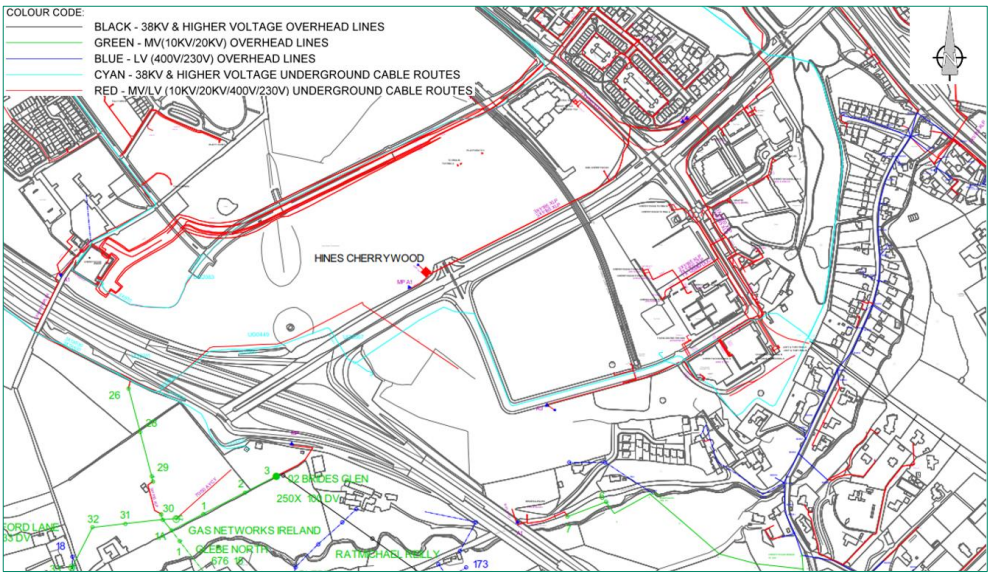

Figure 6.1: Existing ESB network layout for Cherrywood TCE area (Source: ESB)

- Evaluating the proximity of powerlines to the development.
    - The development is scored as **Green**, **Amber**, or **Red**, if powerlines are located within 1000m, between 100m-500m, or over 500m from the development, respectively.
    - All Town Centre Quadrants and HIE areas have been found to be within a 100m proximity to powerlines, giving the development a score of **Green** for this parameter.

- Assessing the right of way to the ESB network.
    - Where direct access to the ESB network is available, the development is scored **Green**. Conversely, if the site does not have direct road access and required crossings over private lands, the site is scored **Red**.
    - Direct access to the ESB network has been noted to be available for each Town Centre Quadrant and HIE plot, giving the development a score of **Green** for access requirements.

- Reviewing the existing electricity demand capacity.
    - The existing electricity demand capacity for the Cherrywood TCE area has been reviewed and assessed using the ESB Networks Demand Capacity Map, which illustrates the demand capacity available across numerous substations around the country. This map has been used to determine the demand capacity of the development, where capacities of greater than 200kVA, 20kVA-200kVA, and 0kVA-20kVA, relate to scores of **Green**, **Amber**, and **Red**, respectively.

- Based on information provided in this map, the majority of substations within the Cherrywood TCE area have been noted to be at capacity, having an available demand ranging from 0kVA-50kVA. Conversely, two substations in the area are noted to have current available demands of 200kVA-1,000kVA, with one of these substations being located inside HIE 1, and the other being located circa 100m to the north of TC1. From these findings, a score of **Red** has been given to this development relating to existing electricity demand capacity. An extract of this ESB Demand Capacity Map is presented in Figure 6.2.

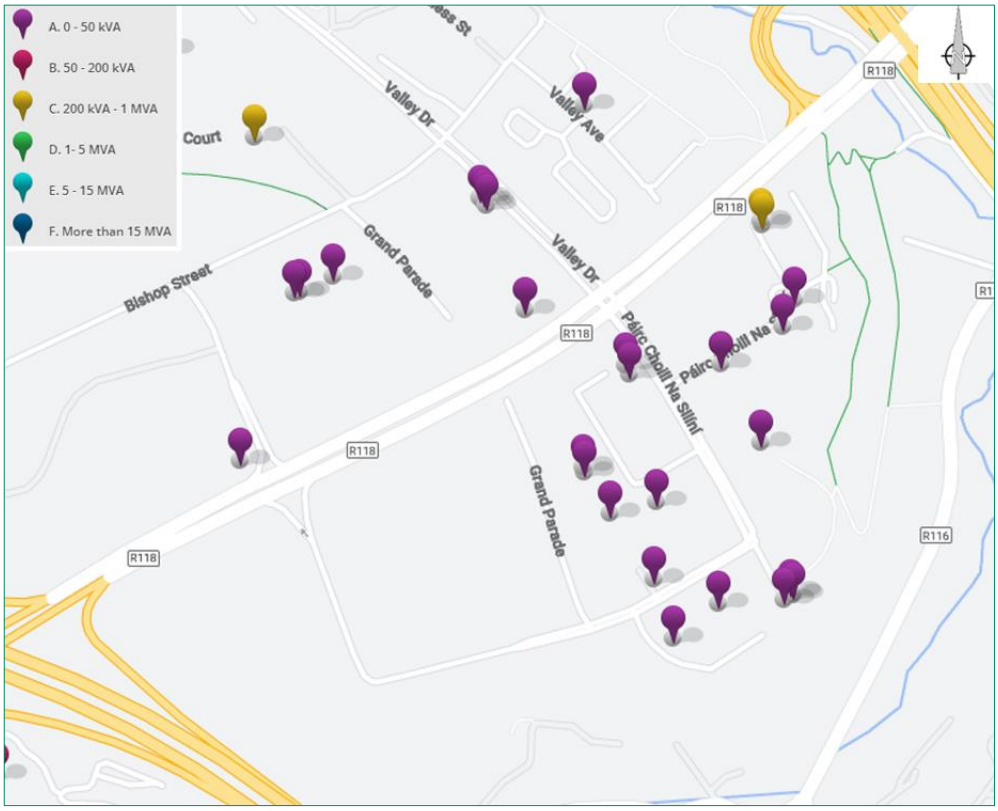

Figure 6.2: ESB Demand Capacity Map (Source: ESB)

From the scoring of the aforementioned supply parameters, a cumulative score of **Green** has been concluded for this development in relation to power supply, denoting the existing infrastructure as sufficient in terms of providing an electrical supply for the proposed development.

Moreover, to offset demand requirements on the local ESB network, it is noted in the Cherrywood Planning Scheme that efforts are to be made to encourage locally generated renewable and low emission energy to supply a portion of Cherrywood's energy demand, which could include implementing energy options such as district biomass, solar thermal collectors, and ground thermal energy storage.

6.1 Upgrades Required & Recommendation

In regard to the documents and information currently available, AECOM have noted the presence of existing power supply services within, and around the immediate extents of, all Town Centre Quadrants and HIE plots, primarily in the form of 38KV (and higher) voltage underground cable routes, and MVLV (10KV / 20KV / 400V / 230V) underground cable routes. These cable routes were found to be located within 100m from all Quadrants and HIE plots, and have all been deemed as having sufficient access and right of way to the existing ESB network.

In relation to existing electricity demand capacity, information currently available via the ESB Networks Demand Capacity Map suggests that majority of substations within the Cherrywood TCE area are operating at capacity, with two separate substations in the area currently being noted to have capacities greater than 200kVA. It is AECOM's recommendation that, prior to connection, each Town Centre Quadrant and HIE plot submits respective applications to ESB, which will then allow for currently available electricity demand capacities to be confirmed, along with verifying the capacity requirements needed to serve each respective Quadrant and HIE plot.

7. Assumptions

The following is a list of assumptions from AECOM in preparation of this Technical Note:

- The proposed SuDS provisions for Town Centre Quadrants and HIE plots, previously agreed upon, will be provided as a minimum, with the exception of intensive and extensive green roof coverage provisions, which are to be updated as outlined in Section 2.1.2.
- The attenuation requirements at the Town Centre Quadrants and HIE plots will be assessed on a case-by-case basis, to adhere to the specified outfall requirements, in the event that the impermeable area of a plot increases due to the addition of units.
- The approved discharge from the Town Centre Quadrants and HIE plots will not change, as per the Cherrywood Planning Scheme Requirements for a maximum discharge rate of 1L/sec/ha..
- All Uisce Éireann records for existing water mains are accurate and up to date.
- Water demand calculations were determined using assumed 'area per employee' figures, taken from R3.
  - A value of 17m^2 per employee, taken from the 'food superstores – retail' group within R3, was used for retail and services areas.
  - A value of 10m^2 per employee, taken from the 'office – serviced office' group within R3, was used for HIE areas.
  - A value of 36m^2 per employee, taken from the 'leisure and visitor attractions – cultural attractions' group within R3, was used for community areas.
- All Uisce Éireann records for existing foul sewer networks are accurate and up to date.
- Foul loading demand calculations were determined using assumed 'area per employee' figures, taken from R3.
  - A value of 17m^2 per employee, taken from the 'food superstores – retail' group within R3, was used for retail and services areas.
  - A value of 10m^2 per employee, taken from the 'office – serviced office' group within R3, was used for HIE areas.
  - A value of 36m^2 per employee, taken from the 'leisure and visitor attractions – cultural attractions' group within R3, was used for community areas.
- All BT records for existing utility services are accurate and up to date.
- All Eir records for existing utility services are accurate and up to date.
- All Virgin Media records for existing utility services are accurate and up to date.
- All ESB records for existing utility services are accurate and up to date.

8. References

The following documents have been reviewed as part of this water supply analysis:

- R1. Cherrywood Town Centre Development, Water Services Engineering Report – TC1/TC2 Issue 2 18th September 2017, Arup
- R2. Cherrywood Town Centre Development, Roads Engineering Report – Issue 1 19th September 2017, Arup
- R3. Employment Densities Guide – 2nd Edition, 2010, Drivers Jonas Deloitte
- R4. Code of Practice for Water Infrastructure – Connections and Developer Services, July 2020, Uisce Éireann
- R5. Proposed Amendment No. 8 Building Height & Density Review, Cherrywood Planning Scheme 2014 (as amended), May 2021.
- R6. Block TC3, Cherrywood, Dublin 18, Engineering Services Statement – Issue 11th August 2022.
- R7. Cherrywood Town Centre, Engineering Response to Request for Further Information Item 7 and Item 12 – (Document Ref. 246359-10) Issue 28th March 2018
- R8. Cherrywood Town Centre and Environs Review – Have Your Say Non-Statutory Public Consultation, December 2023, Cherrywood Planning Scheme
- R9. Code of Practice for Wastewater Infrastructure – Connections and Developer Services, July 2020, Uisce Éireann