8 WATER

8.1 Introduction

This section of the Environmental Effect Assessment Report (EIAR) has been prepared by Waterman Moylan and provides an assessment of the effect that the proposed development in Dunshaughlin will have on the water resources within the vicinity of the site. It also sets out mitigation and remedial measures and methods of monitoring after the development is operational.

This chapter was prepared by Penelope Ingle, (BEng (Civil)) Jana Ulicna, (MSc, BE(Hons) Civil, MIEI) and reviewed by Ian Swartz, (C.Eng. Pr.Eng, BSc (Civil) Eng, MIEI, MSAICE, MSAISC).

Penelope is an Assistant Civil Engineer with Waterman Moylan. She holds a bachelor's degree in Civil Engineering from the University of Pretoria. She has over 4 years' experience within the Civil industry, including all design stages and on-site construction supervision.

Jana is a Civil Engineer with Waterman Moylan. She holds a fist class honours degree in Civil Engineering and a master's degree in Environmental Health and Safety from Dublin Institute of Technology now Technological University Dublin. She has over 7 years practical experience in the industry and has demonstrated a high level of competence on all of her projects at all stages from project feasibility studies, design, planning, control of construction, testing, inspecting and commissioning thereof.

Ian is an Associate Engineer with Waterman Moylan. Ian is a highly qualified Chartered Engineer with over 28 years practical experience in the industry, who has demonstrated a high level of competence on all of his projects at all stages from feasibility study, through preliminary design to construction stage.

The development proposed in this instance will comprise of 415no. residential units with supporting childcare facility in Dunshaughlin, Co. Meath. It will include all associated and ancillary site development, infrastructural, landscaping and boundary treatment works.

The infrastructure of the proposed development is directly linked to the infrastructure constructed and approved under the previous Phase 1 development DA/120987, which is currently under construction to the east of R125 and north and south of Drumree Road, and forms part of the Meath County Development Plan (MCCDP) 2013-2019 for Dunshaughlin.

The proposed infrastructure for Phase 2 falls under the "Permissible Uses" of land zoning, as it is categorised as residential units and a childcare facility, outlined within the MCCDP, with a direct extract from the document stating: -

> *"A "permissible use" is one which is generally acceptable in principle in the relevant zone, but which is subject to normal planning consideration, including policies and objectives outlined in the plan."*

The capacities required for this portion of the development has been designed into the overall receiving infrastructure, which was constructed to accommodate the subject site.

Four aspects of water resources in relation to the proposed development are considered in this EIAR: -

- Foul Water Drainage.
- Surface Water Drainage.
- Water Supply.
- Flood Risk

8.2 Assessment Methodology

Research for this section included the review of designed and as-built infrastructure that covers the proposed development within Dunshaughlin for the following aspects: -

- Foul drainage network.
- Surface water drainage network.
- Water supply network servicing.

A Site-Specific Flood Risk Assessment has been prepared as part of this planning application.

A desktop study related to the groundwater vulnerability was undertaken based on information provided by the Geological Survey of Ireland Ltd. (GSI).

8.3 Receiving Environment

8.3.1 Proposed Development

Foul Water Drainage

Phase 1 of the Dunshaughlin development (Reg. Ref. DA/120987, ABP Ref. PL17.241988), that is currently under construction, discharges via a network of 150mm and 225mm wastewater sewers to an existing 525mm diameter trunk sewer. The existing 525mm diameter trunk sewer runs alongside the northern side of the River Skane in a south-westerly direction and ultimately discharges to the Wastewater Treatment Works at Castletown - Tara, which has a design capacity of 12 000 PE and is currently operating at 6000 PE. For the development addressed in this report it is proposed to drain the foul water by gravity to the existing 525mm foul sewer.

North Site

As described above, the Phase 1 foul sewer system discharges into the existing 525mm trunk sewer and has been designed and constructed to accommodate the additional flows from the subject development. Figure 8.1 below, shows the existing foul water infrastructure constructed under the Phase 1 development and to which Phase 2 shall tie-in to. The existing infrastructure is depicted in dark grey.

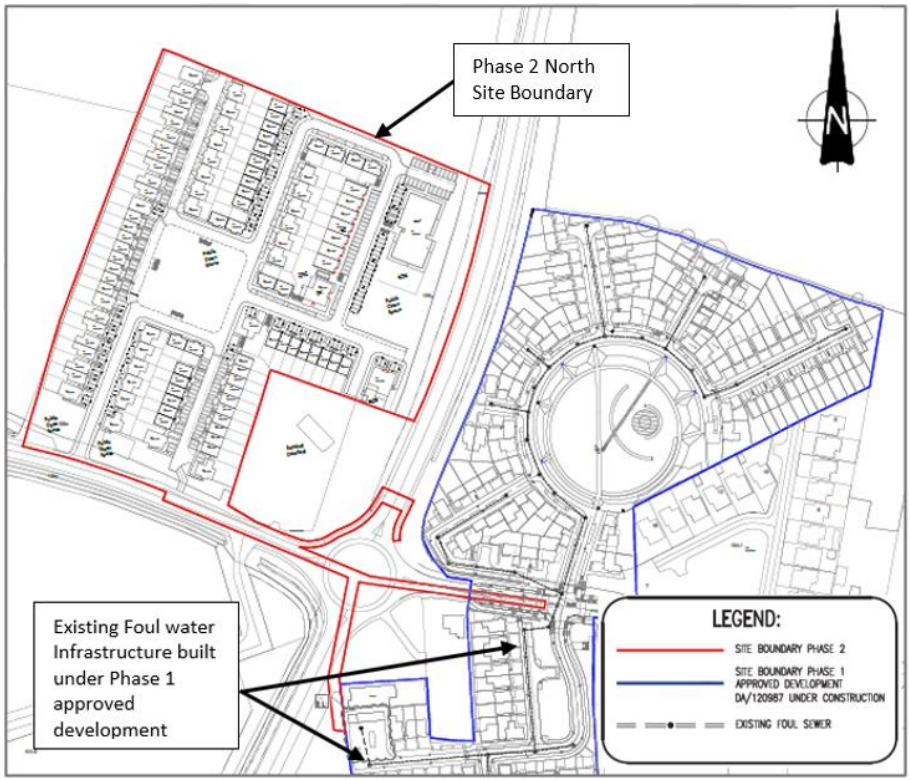

Figure 8.1: Phase 2 North Site Existing Foul Drainage Network.

South Site

The south site of Phase 2 is separated into two parcels, one north of the River Skane and one south.

Under the approved Phase 1 development a 225mm wastewater sewer has been constructed through the proposed development lands. The existing 225mm wastewater sewer discharges to the existing 525mm trunk sewer, which is located parallel the River Skane's north bank.

Figure 8.2 below, shows the existing foul water infrastructure and to which Phase 2 shall tie-in to. The existing infrastructure is depicted in dark grey.

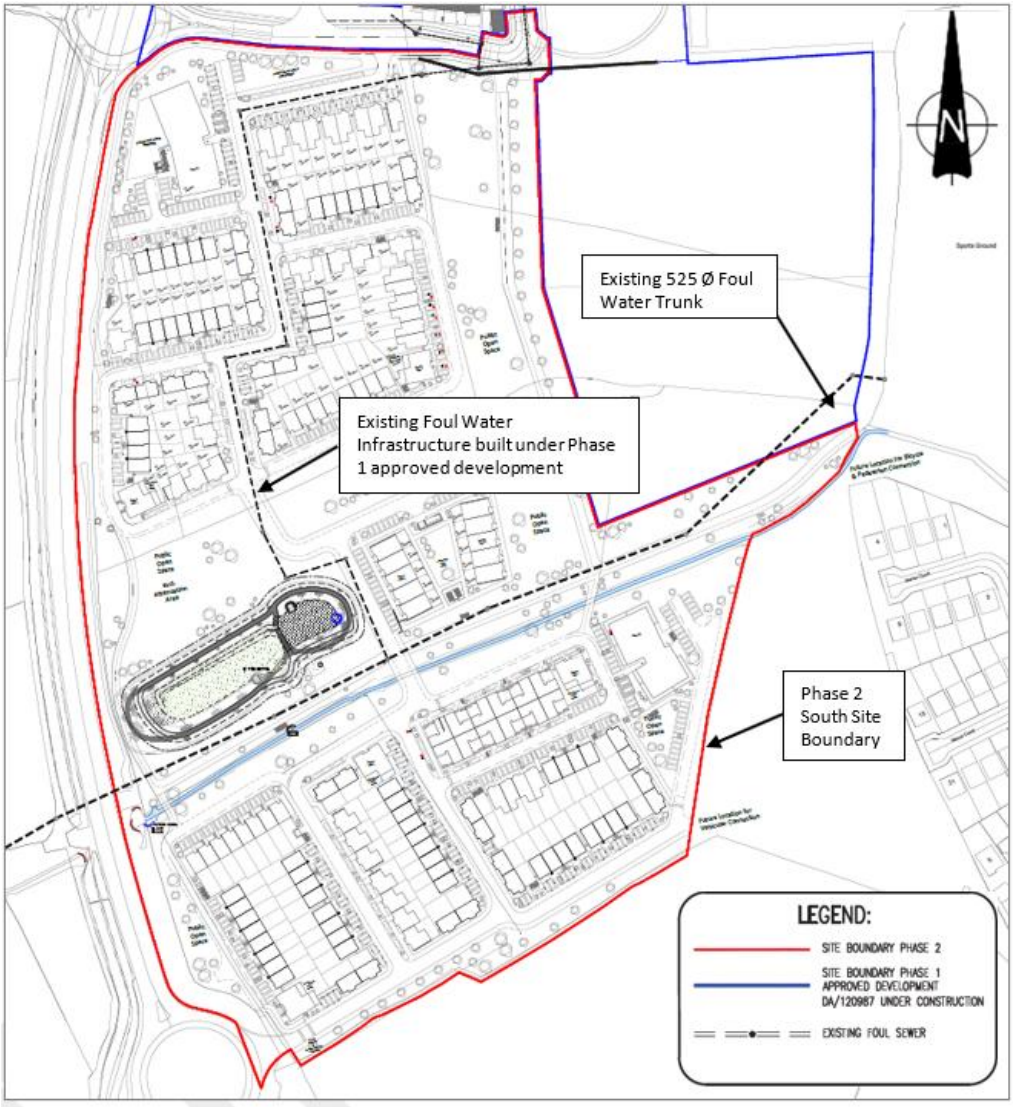

Figure 8.2: Phase 2 South Site Existing Foul Water Network.

The Wastewater Treatment Works at Castletown - Tara, which has a design capacity of 12 000 PE is currently operating at 6000 PE.

Further, a Pre-Connection Enquiry form was submitted to Irish Water and a response has been received. In summary Irish Water have confirmed that the existing wastewater infrastructure can accommodate the proposed development. The letter states that it is subject to the following network upgrade: -

- Approximately 600m of 225mm foul sewer subject to contribution of relevant portion of costs for the upgrade required.

Based on the above, there are not anticipated to be any cumulative effects with regard to foul drainage. We have engaged with Irish Water to determine where the 600m of additional foul sewer is located. In addition, on the 4th September 2020, Irish Water issued a Design Acceptance following review of the Design.

Surrounding existing foul water sewer network and Wastewater Treatment Works within the Dunshaughlin area can be seen in Figure 8.3 below.

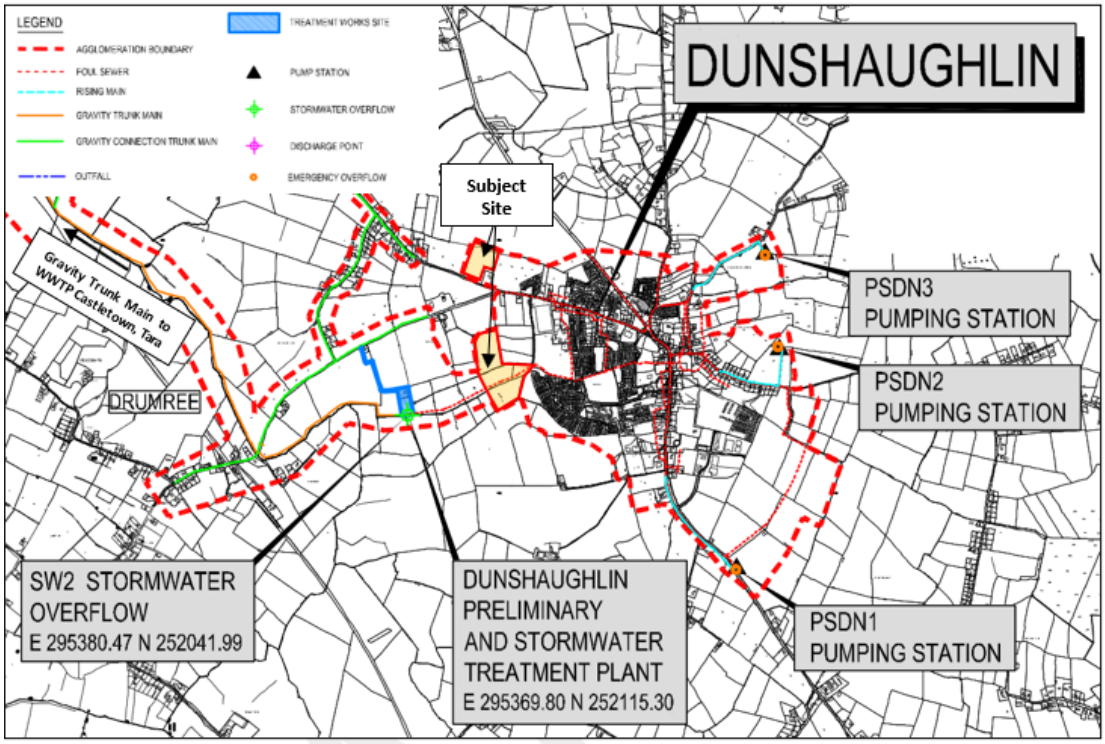

Figure 8.3: Extract from Dunshaughlin Agglomeration Extent and Boundary Drawing for WWTP Castletown – Tara, Waste Water Discharge Licence Application.

Surface Water Drainage

As previously mentioned, the River Skane is located on the South Site of Phase 2, all surface water from both the north and south sites of Phase 2 will ultimately drain to this river.

As part of the SUDS design implemented for the Phase 1 development an attenuation pond was constructed adjacent to the River Skane to attenuate the runoff collected from the Phase 1 development and the majority of the proposed Phase 2 development that is subject to this report. This attenuation pond is thus considered as existing infrastructure.

Surface water drainage networks were constructed under Phase 1 for sites located on the north and south of Drumree Road, and which are positioned adjacent (to the east) the proposed Phase 2 development.

An existing 450mm diameter surface water pipeline is located within the Drumree Road, east & west of the roundabout, and carries surface water along the R125 in a southerly direction, ultimately discharging into the River Skane.

North Site

The proposed Phase 2 north site network flows via gravity pipes into the existing 450mm diameter stormwater pipe within Drumree Road which flows east and then connects into the existing 450mm diameter pipes at the south eastern side of the roundabout. This existing pipe network flows in a southernly direction along the eastern side of the R125 and discharges into the River Skane.

Figure 8.4 below shows the existing storm sewer infrastructure within proximity of the north site, all existing infrastructure is illustrated in grey.

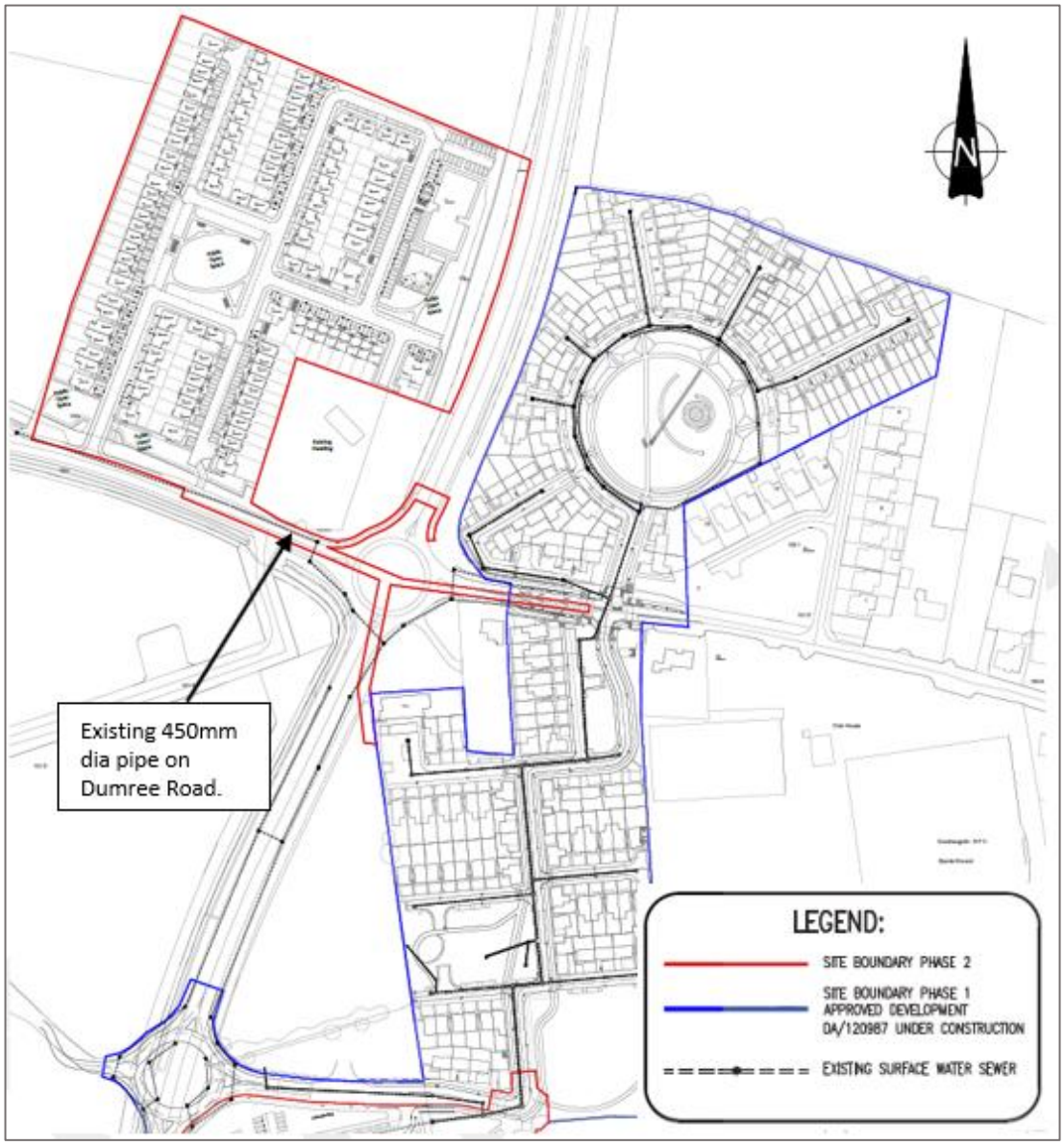

Figure 8.4: Phase 2 North Site Existing Storm Water Infrastructure.

South Site

The south site portion of the development forms part of the River Skane catchment area and is divided by the river which flows in a south westerly direction. An existing surface water network, constructed under Phase 1, traverses the south site of Phase 2 in a southernly direction until discharging into the constructed attenuation pond. The pond has an existing outfall to the River Skane.

Figure 8.5 below shows the existing storm sewer infrastructure within proximity of the Phase 2 south site, and for which was built under Phase 1, all existing infrastructure is illustrated in grey.

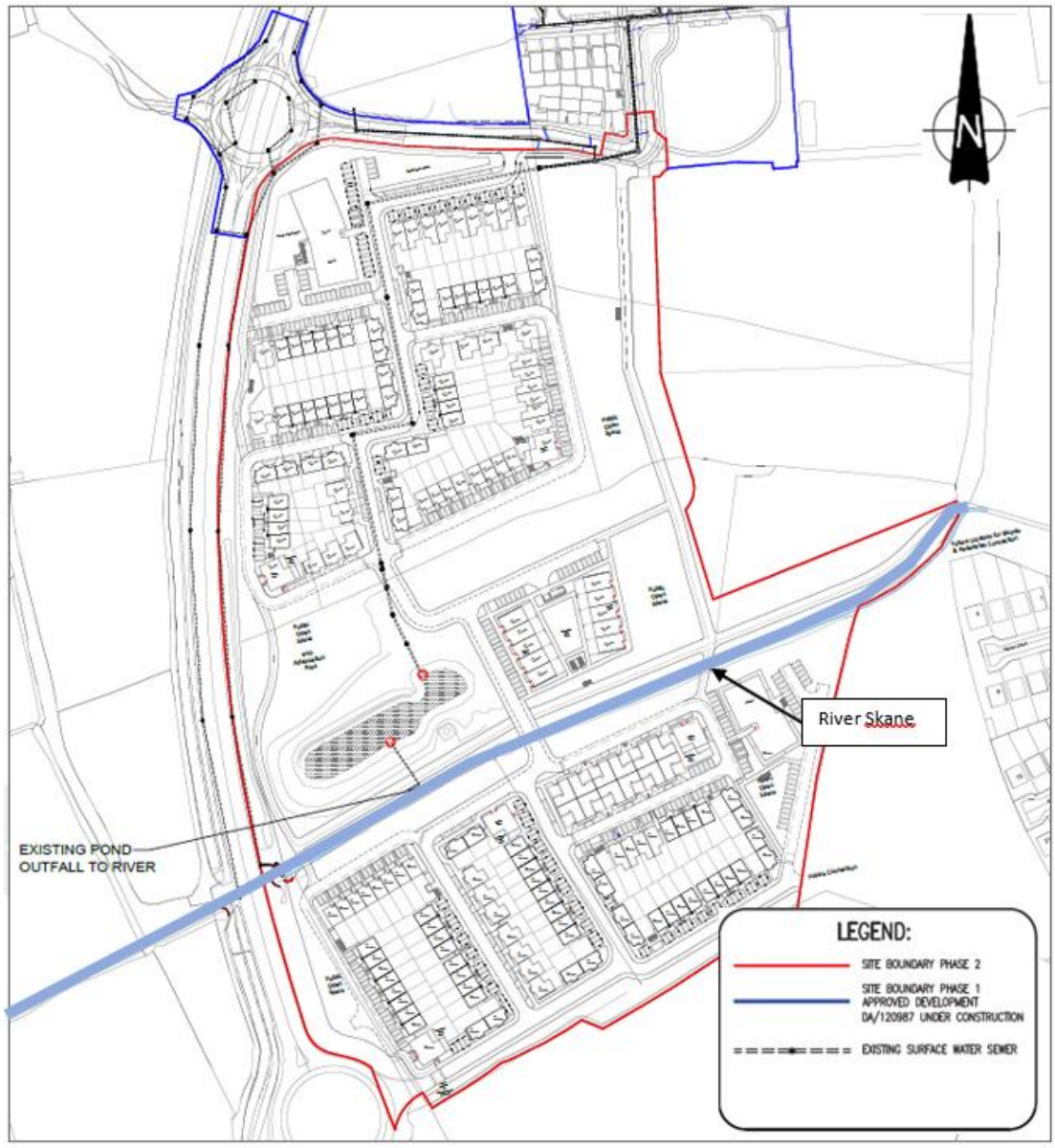

Figure 8.5: Phase 2 South Site Existing Storm Water Infrastructure.

Water

North & South Sites

The proposed development is served by an existing 225mm (OD) diameter water main within Drumree Road and existing watermain spurs constructed under the permitted Phase 1 development, these spurs are 160mm (OD) to the north and 225mm (OD) to the south and west in size as reflected in Figure 8.6 below.

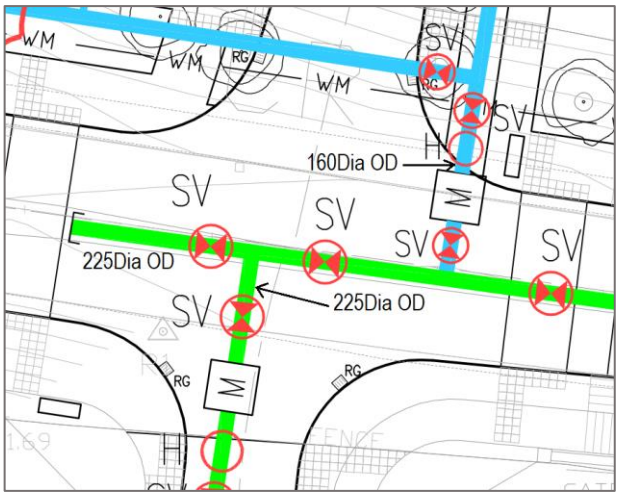

Figure 8.6: Existing Potable Water Infrastructure – Drumree Road Junction with Phase 1.

The existing watermain constructed under Phase 1 is located between the north and south sites of Phase 2. Figure 8.7 below shows the existing constructed watermain, and connection points for the Phase 2 development (depicted by red stars).

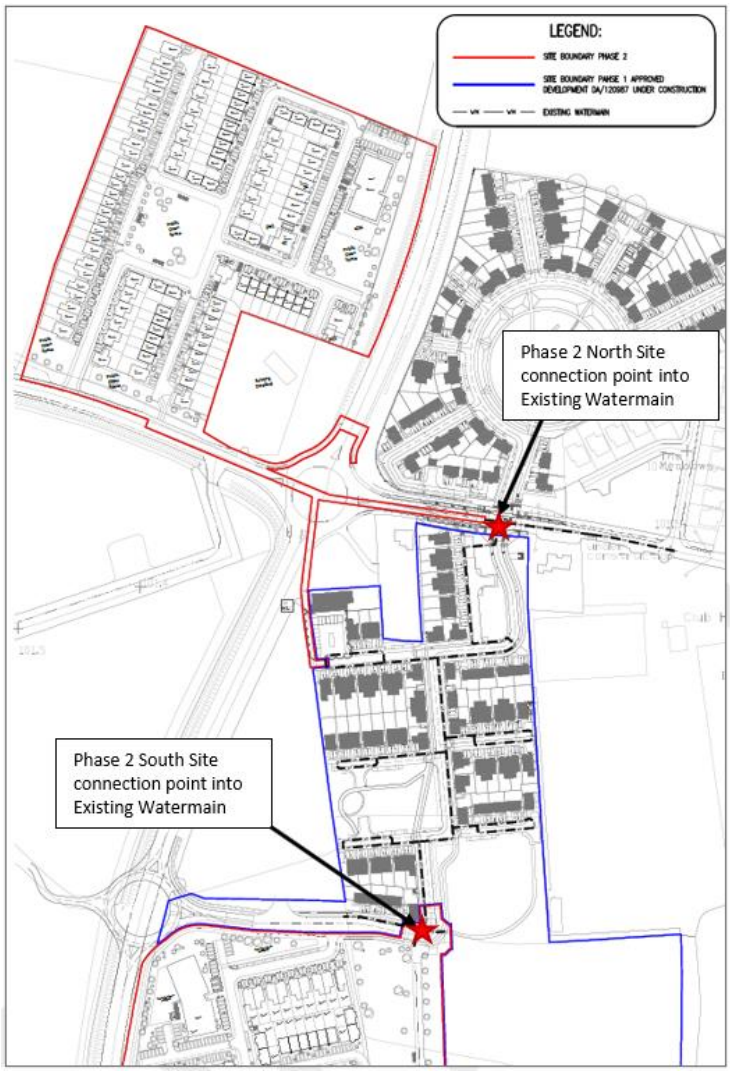

Figure 8.7: Existing Water Supply Network – Connection Points.

8.3.2 Cumulative

Foul Water Drainage

North & South Sites

The cumulative foul water drainage receiving environment is as per the proposed development.

Storm Water Drainage

North & South Sites

As required by the GDSDS and Dunshaughlin LAP 2009-2015, the subject site will be attenuated within its own boundaries and discharge to the existing surface water network and the River Skane at a controlled rate of 2 l/s/ha. This includes both surface water runoff for Phase 1 and the proposed Phase 2 infrastructure. There are therefore not anticipated to be any cumulative impacts relating to surface water drainage.

Water

North & South Sites

The 225mm (OD) diameter mains serving the Phase 1 and proposed Phase 2 developments were constructed and commissioned in 2019. These watermains have been laid along Drumree Road and between the Phase 1 and proposed Phase 2 developments and are designed to serve the adjacent development lands. Three connections will be made onto the existing main, one on Drumree Road and two to the south of Phase 1. The metered points for the development are located as described below:

- 1 no. meter located on Drumree Road, immediately south of the North Site development.
- 1 no. meter located south of Phase 1 at the interface of the proposed Phase 2 development, on north side of the South Site.
- 1 no. meter located on the north side of the River Skane, within the proposed Phase 2 south site development.

As the water supply network has been designed to accommodate the development, there are therefore not anticipated to be any cumulative impacts relating to water supply.

8.4 Characteristics of the Development

8.4.1 Proposed Development

8.4.1.1 Construction Stage

Foul Water Drainage

The private Foul water drains, in areas not to be vested to Irish Water, will be laid to comply with the requirements of the Building Regulations, Technical Guidance Documents, Section H.

Foul water sewers, which will vest with Irish Water, will be laid strictly in accordance with Irish Water requirements for vesting and will be installed in accordance the Irish Water Connection Agreement for the proposed development. Designs Acceptance has been issued by Irish Water for the proposed Development on the 4th September 2020.

North Site

The proposed Phase 2 north site Foul Drainage Network will connect into the existing Foul Drainage Network constructed under Phase 1 in the vicinity of the Phase 1 Creche. The connection is located south of Drumree road and east of the R125.

Figure 8.8 below shows the proposed north site Foul Drainage Network and the connection location into the existing network (depicted by a red star) within the Phase 1 boundary, the proposed sewers are indicated in red with the existing network depicted in grey.

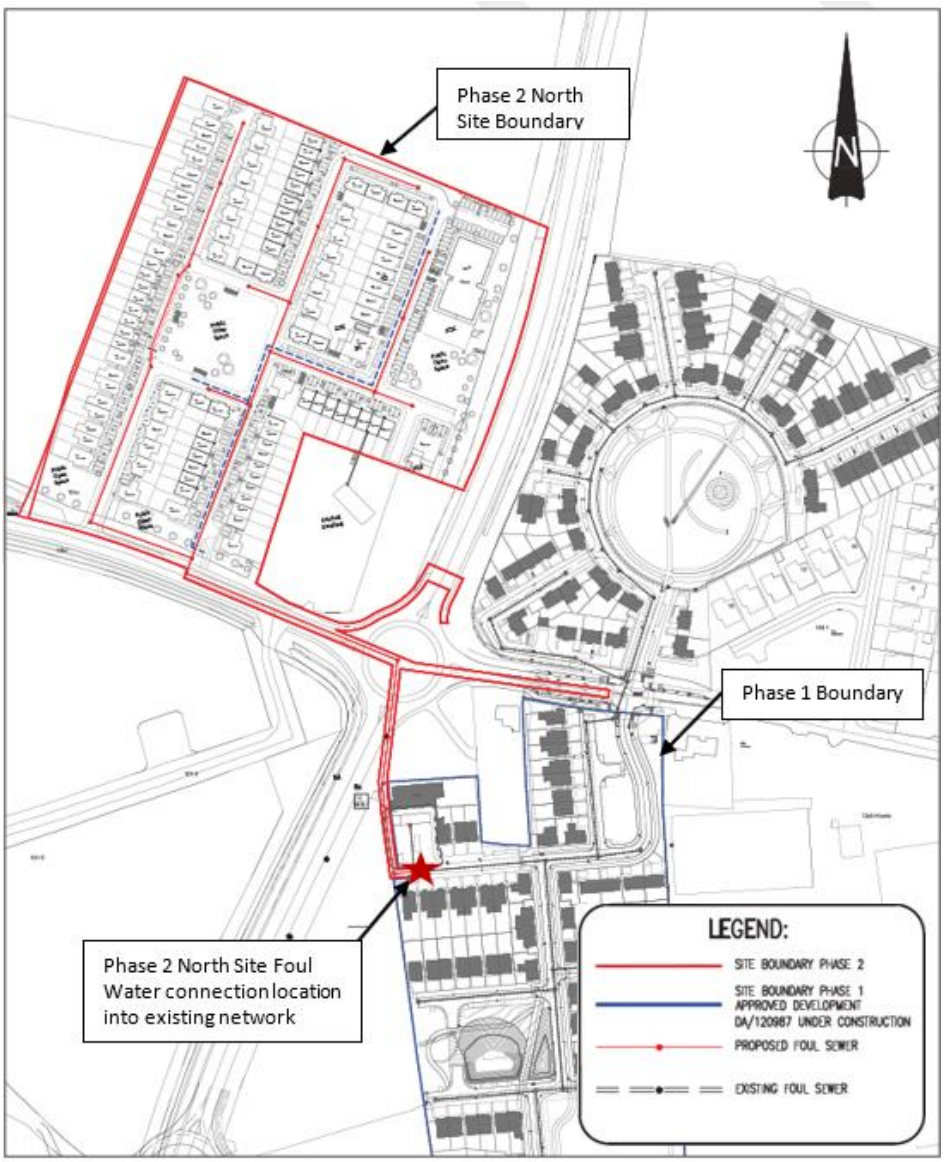

Figure 8.8: North Site Proposed Foul Sewers.

South Site

This part of Phase 2 is separated into two parcels, one north portion and one south, as mentioned previously.

For the site north of the River Skane it is also proposed to discharge the foul water into the Phase 1 foul sewer system at multiple connections along the existing foul network within the internal road, Road A, which traverses the northern portion of the south site.

The southern parcel of the site will drain via gravity in a northernly direction to the existing 525mm trunk sewer which runs parallel to the River Skane and will discharge into an existing outfall manhole constructed under Phase 1 on the 525mm trunk foul sewer.

Figure 8.9 below shows the proposed Foul Drainage Network and the connection locations into the existing network, the proposed sewers are indicated in red with the existing network depicted in grey.

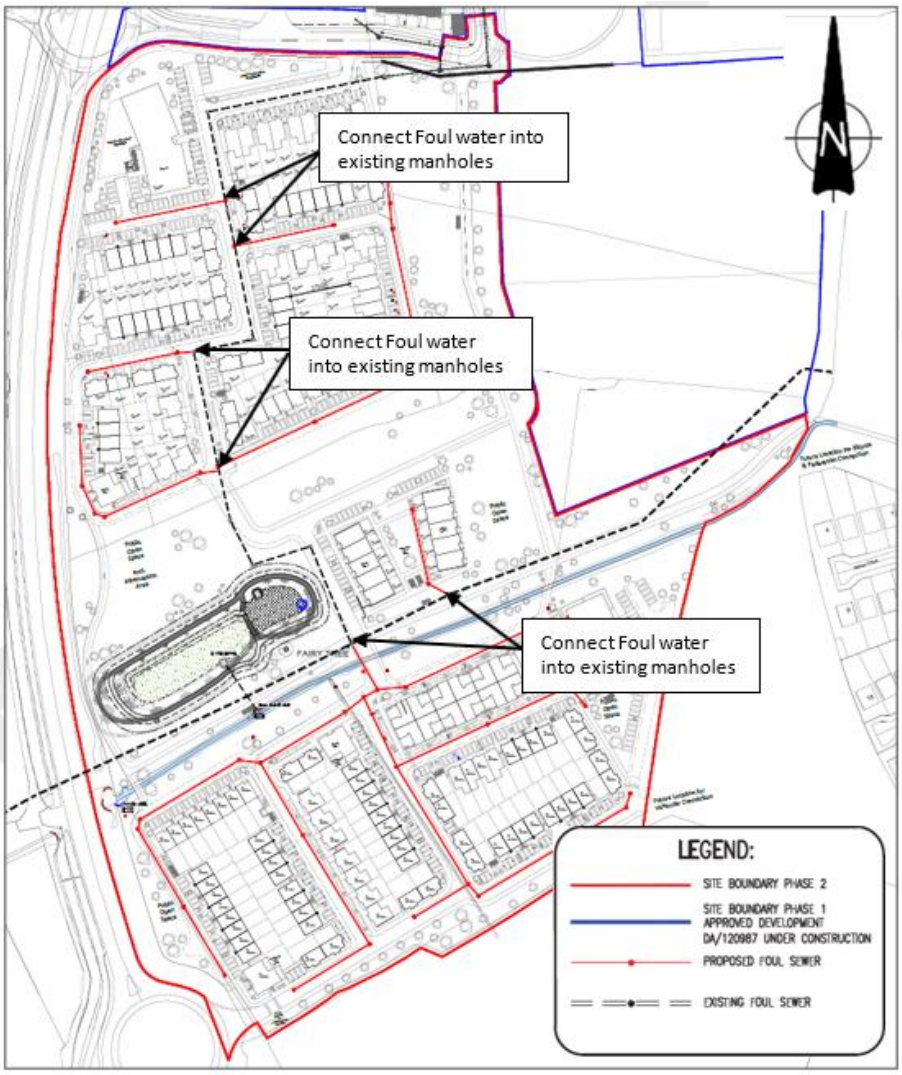

Figure 8.9: South Site Proposed Foul Sewers

Typical construction activities required to construct the foul water drainage will in broad term include the following activities: -

- Transportation and storage of materials.
- Location of other utilities.
- Manholes and chambers construction.
- Trench excavation.
- Inspection/cleaning pipes.
- Pipe bedding, haunch and surround.
- Pipe laying.
- Backfilling.
- Pipe testing.
- Connecting.
- CCTV & manhole surveys.

Surface Water Drainage

Surface water drains, in areas not for taking in charge, will be laid to comply with the requirements of the Building Regulations, Technical Guidance Documents, Section H.

Surface water sewers which will be taken in charge will be laid strictly in accordance with 'Greater Dublin Regional Code of Practice for Drainage Works' (GDSDS) and to Meath County Council's requirements for taking into charge.

It is proposed that the development will discharge surface water runoff at a rate (equivalent of the existing agricultural runoff) for both the north and south Sites. The greenfield run-off rates for the sites are as follows: -

- North Site – 9,78 ℓ/s.
- North portion of South Site – 16,41 ℓ/s.
- South portion of South Site – 8,66 ℓ/s.

Surface water from the development will be drained by gravity pipes connecting into the existing drainage via an approved surface water pipe system. The total surface water run-off rate for the global Phase 2 site is estimated at 34.9 ℓ/s.

As required by Meath County Council policy, GDSDS and Dunshaughlin LAP 2009-2015, the subject site will be attenuated within its own boundaries and discharged to the existing surface water network, and ultimately to the River Skane at a controlled rate of 2 l/s/ha.

The existing attenuation pond constructed on the south site, adjacent to the River Skane, will collect this stormwater runoff from both the Phase 1 development and the upper portion of the proposed Phase 2 south site development. Stormwater runoff from the north site of the proposed Phase 2 development will drain by gravity pipes into the existing 450mm diameter pipeline location on the Drumree Road. This pipeline carries surface water along the R125 and discharges into the River Skane.

<u>North Site</u>

The surface water drainage within the north site has been separated into 3 no. catchment areas. The catchment areas each contain an underground attenuation tank, which has been designed to attenuate the 1 in 100 year critical storm event.

Once surface water runoff has attenuated in the individual tanks it will be drained by gravity pipes from the Phase 2 into the existing 450mm diameter stormwater pipe located on Drumree Road as discussed with MCC.

Figure 8.10 shows the existing storm water infrastructure constructed under the R125 by-pass works and for which the proposed Phase 2 north site shall tie-in to, the connected point is depicted by a red star.

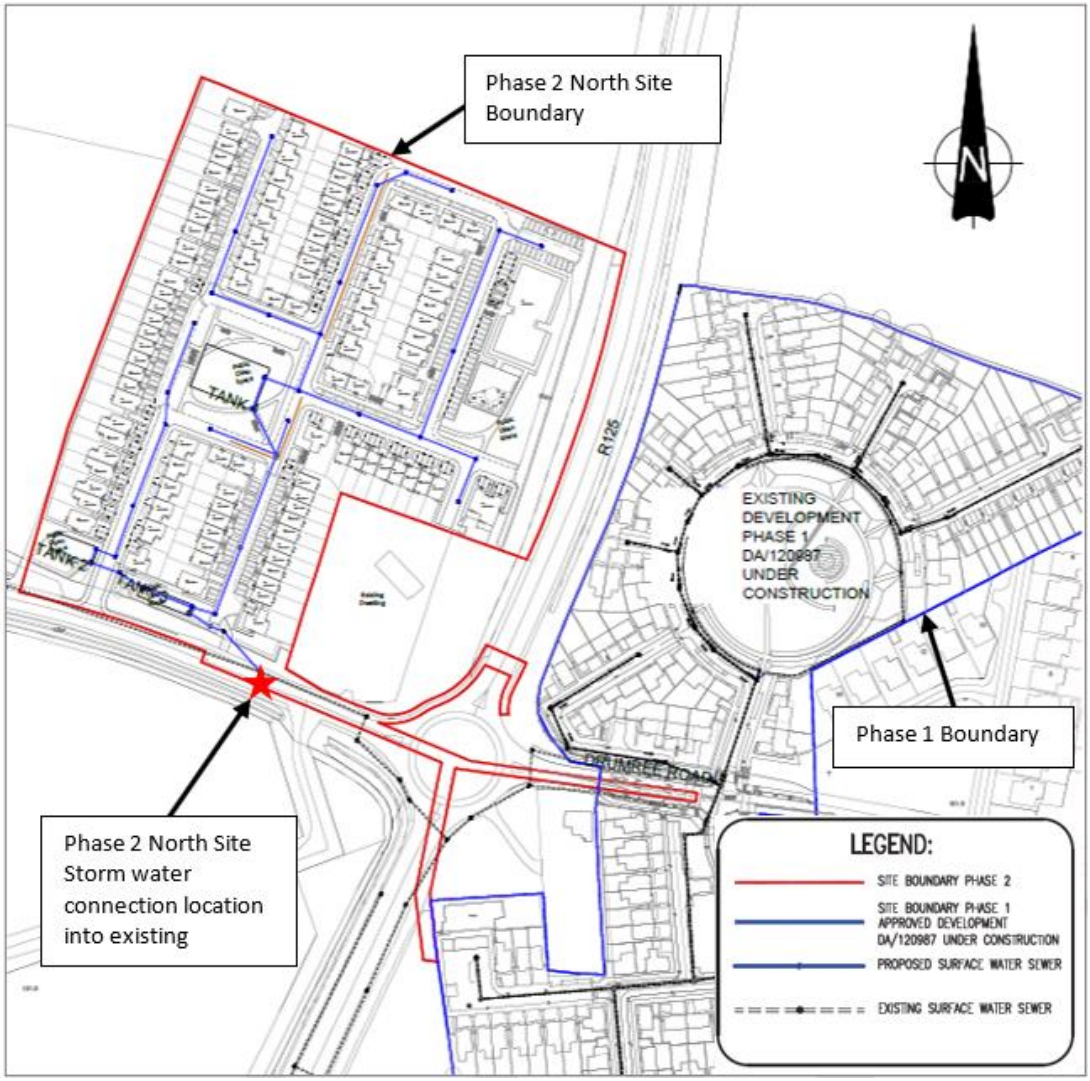

Figure 8.10: North Site Proposed Storm Sewers Network

South Site

The north portion of the south site will connect at various locations into the existing surface water network traversing the site. All surface wate drainage will be drained by gravity pipes into the constructed attenuation pond.

The southern portion of the south site contains 2 no. underground attenuation tanks, located adjacent the River Skane, to collect the storm water runoff before discharging the runoff into the River Skane. Both attenuation tanks have been designed to accommodate the 1 in 100 year critical storm event The stormwater will be discharged from the tanks in the River Skane at a controlled rate of 2 l/s/ha.

Figure 8.11 shows the existing storm water infrastructure constructed under the Phase 1 development and for which the proposed Phase 2 south site shall tie-in to, the underground attenuation tanks on the southern portion of the south site are depicted by blue stars.

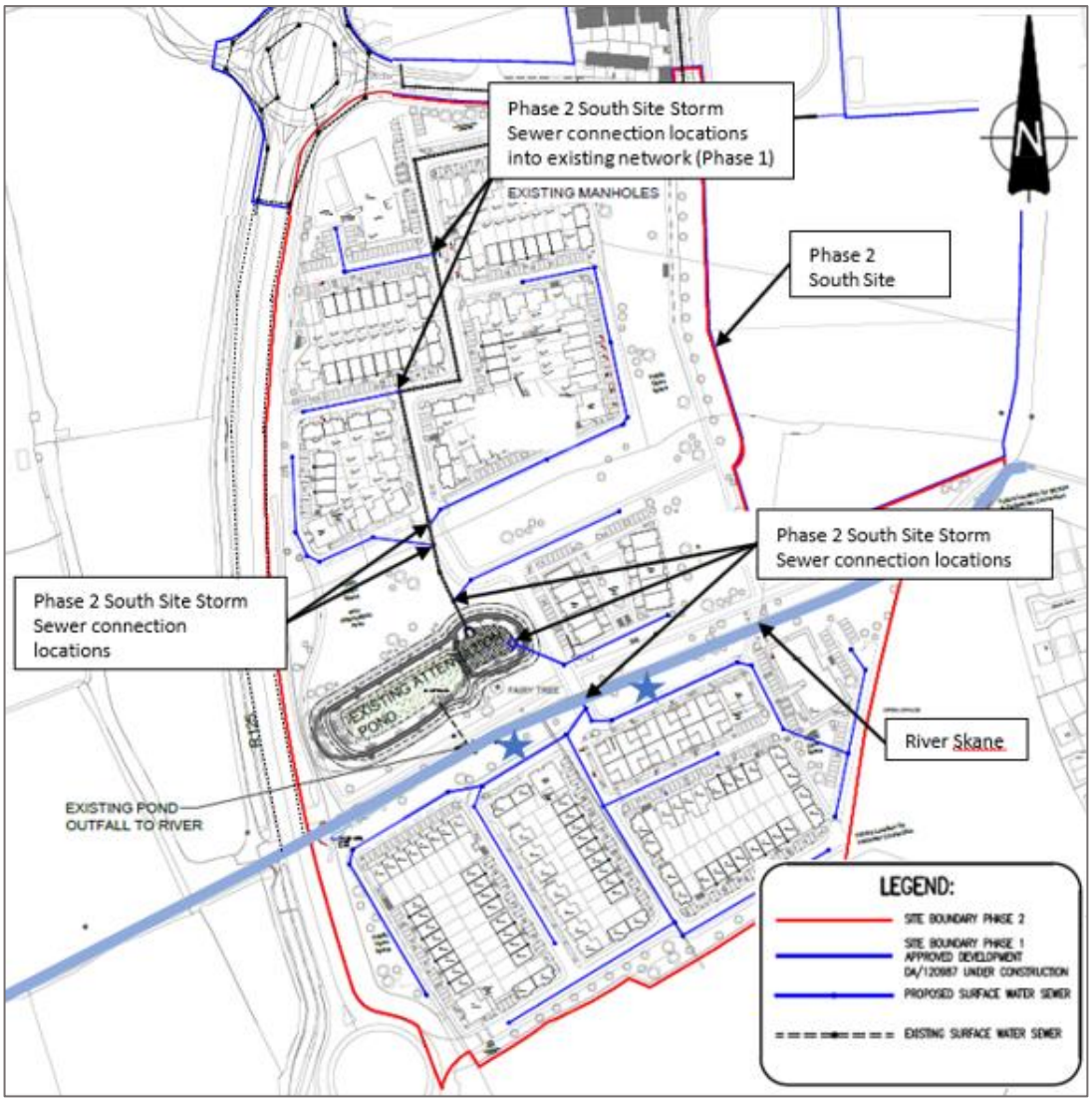

Figure 8.11: South Site Proposed Storm Sewers Network

Typical construction activities required to construct the surface water drainage will in broad term include the following activities: -

- Transportation and storage of materials.
- Location of other utilities.
- Manholes and chambers construction.
- Trench excavation.
- Inspection/cleaning pipes.
- Pipe bedding, haunch and surround.
- Pipe laying.
- Backfilling.
- Pipe testing.
- Connecting.
- CCTV & manhole surveys.

Water

North & South Sites

Watermains which will be vested in Irish Water will be laid strictly in accordance with Irish Water requirements and are to be installed as per the Irish Water Connection Agreement.

Connections to the water supply network will be carried out to the requirements of, and under the direction of, Irish Water and Meath County Council. A pre-connection enquiry (PCE) application was sent to Irish Water and a Conformation of Feasibility (COF) response ref no. CDS19008551 was received on 20 February 2020. The response stated that the reviewed application was assessed by Irish Water and subject to a valid Connection Agreement the proposed connection can be facilitated, subject to certain requirements. On the 4th September 2020, Irish Water issued a Design Acceptance for the proposed SHD following review of the drawings issued to Irish Water.

The proposed North Site will comprise of a 225mm diameter (OD) watermain extended along the Drumree Road in a westerly direction. The Proposed South Site will be serviced by a connection to the Phase 1 installed 225mm diameter (OD) watermain.

In addition to the above, proposed 160mm diameter (OD) mains will link into the proposed 225mm diameter mains in both the North and South sites with 110mm diameter (OD) pipes servicing the bulk of the development in accordance with Irish Water signed off design arrangement.

Figures 8.12 and 8.13 below show the proposed watermain networks for the North and South sites of Phase 2, respectively.

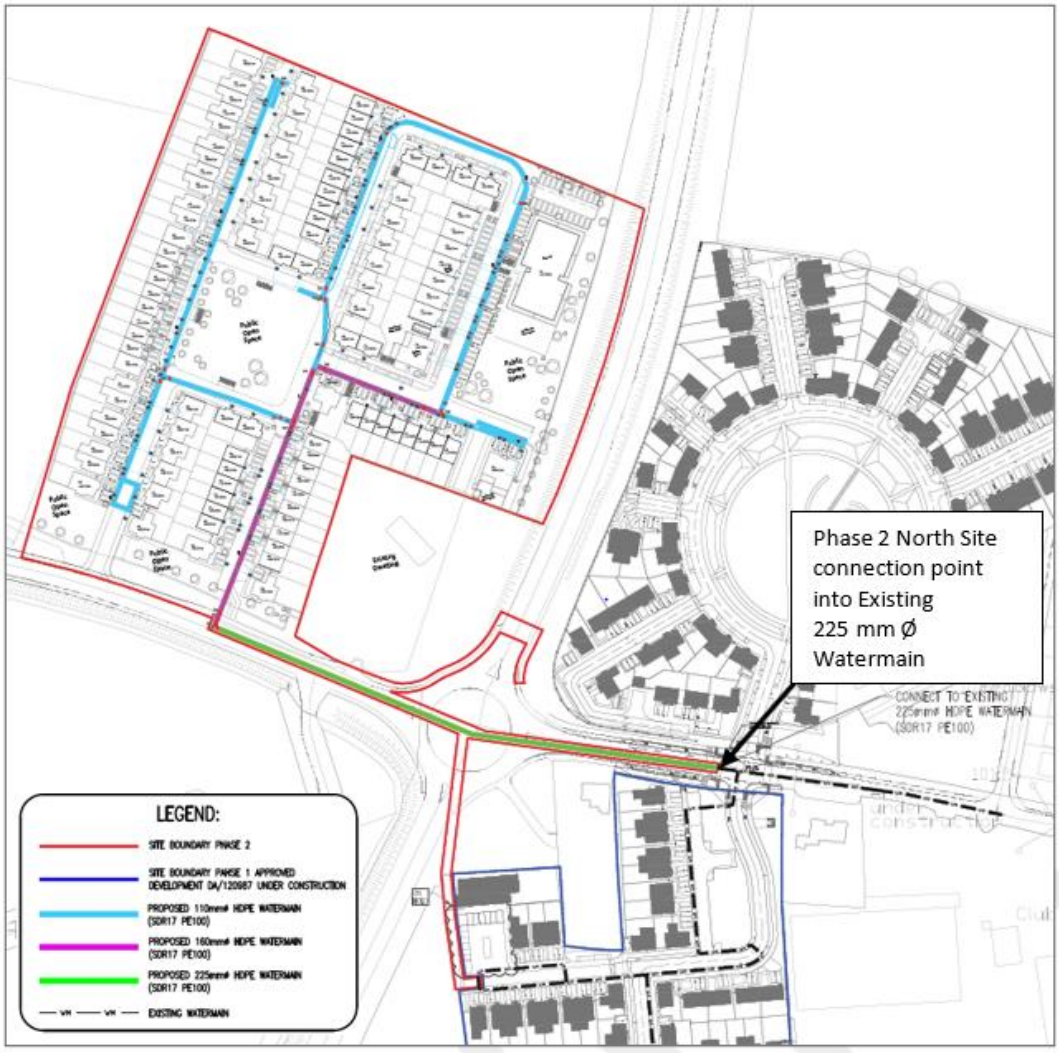

Figure 8.12: North Site Proposed Water Supply Network.

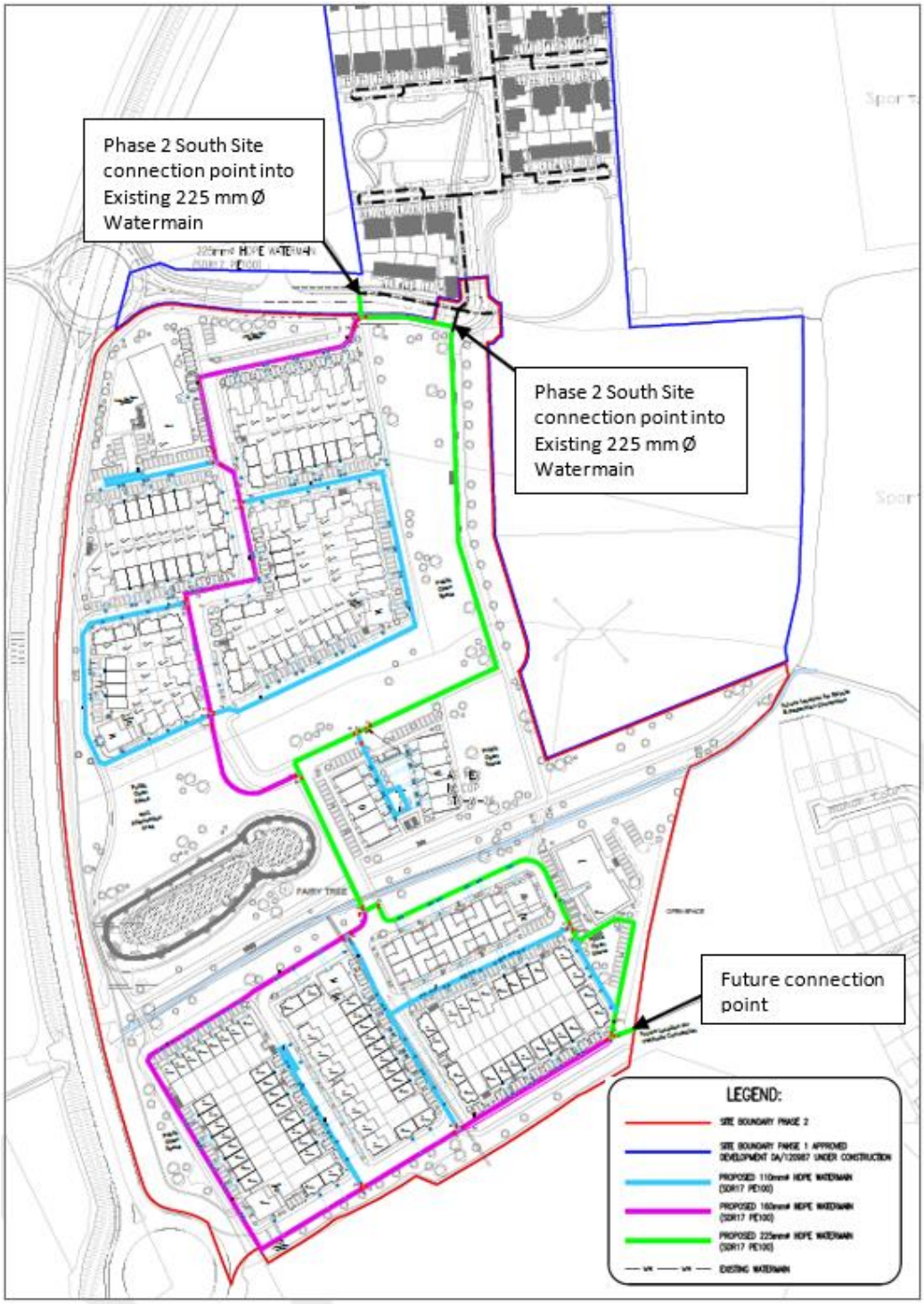

Figure 8.13: South Site Proposed Water Supply Network.

Typical construction activities required to construct the watermain network will in broad term include the following activities: -

- Transportation and storage of materials
- Location of other utilities.
- Trench excavation.
- Anchor/thrust/support blocks construction.

- Inspection/cleaning pipes.
- Pipe bedding, haunch and surround.
- Pipe laying.
- Backfilling.
- Booster pumping station, kiosks and ancillary works.
- Testing and commissioning.
- Water quality testing.
- Connecting to water network.
- Flushing of water mains.
- Service connection to water supply system.

Connections to the supply network will be carried out to the requirements of, and under the direction of, Irish Water and Meath County Council.

An alternative layout has been provided by the design team, which includes the omission of a vehicular link between Character Area 3 and Character Area 4. It is a minor and localised amendment to the proposed development which does not have a bearing on its water impact.

8.4.1.2 Operational Stage

Foul Water Drainage

North & South Sites

An estimate of the foul water discharge rate from the proposed development to the public drainage network is shown in Table 8.1, below.

	№ of Units	Pop. Per Unit	Total Population	Flow per Head (ℓ/h/d)	Total Discharge (ℓ/d)	Infiltration 10%	Dry Weather Flow (DWF) (ℓ/s)	Peak Factors	Peak Foul Flow (ℓ/s)
Residential Units	415	2.7	1121	150	168,150	184,965	2.14	3.0	6.42
Childcare Facility	1	96	96	90	8,640	9,504	0.11	3.0	0.33
Total Peak Foul Discharge									**6.75**

Table 8.1: Foul Water Discharge Rate.

Domestic wastewater loads have been calculated based on 2.7 persons per residential unit with a per capita wastewater flow of 150 liters per head per day along with a 10% infiltration allowance, in line with Section 3.6 of the Irish Water Code of Practice for Wastewater Infrastructure. A peak flow multiplier of 3.0 has been used, as per Section 1.2.5 of Appendix C of the Irish Water Code of Practice (COP), with commercial flow rates taken from Appendix D of the COP.

The total peak flow from the development to the approved Foul Drainage Network is 6.75 ℓ/s.

Surface Water Drainage

The proposed surface water drainage system is designed to collect and convey runoff generated from the proposed residential development in accordance with the Greater Dublin Regional Code of Practice for Drainage Works Version 6.0 and the CIRIA SUDS Manual C753 2015.

The surface water drainage system will have three discharge points to the River Skane, one via the constructed attenuation pond and the second by direct discharge into the river, from the south portion of the south site, as reflected on the drainage drawings for the total site. The third discharge is for the North Site via the existing 450 dia. surface water pipes running parallel to the R125.

North & South Sites

Surface water runoff from the proposed development will be conveyed through an approved surface water drainage network and it will incorporate the following elements: -

- SuDS features in a management train.
- 3x underground attenuation tanks for the North Site, to attenuate the 1 in 100 year critical storm events (including 20% storage facility for climate change).
- 2x underground attenuation tanks for the South Site, to attenuate the lower half located south of the River Skane, the 1 in 100 year critical storm events (including 20% storage facility for climate change) and a detention area to the north of the existing attenuation basin.
- An attenuation basin on the south site which has been designed to attenuate almost all runoff from the upper half of the south site.
- Flow control device to limit runoff to greenfield runoff rates of 2 l/s/ha.

The proposed development incorporates a Storm Water Management Plan through the use of various SuDS techniques. Treatment and storage of surface water at source will intercept and slow down the rate of runoff from the site to the existing surface water sewer system on the north site, and into the River Skane on the south site. All attenuation tanks for the Phase 2 development will have hydrobrake manholes installed downstream of each tank with a peak discharge equal to 2.0 l/s (minimum recommended discharge). As part of the works to remove suspended solids and hydrocarbons, Downstream Defenders will be installed below the hydrobrakes.

Based on three key elements, Water Quantity, Water Quality and Amenity, the targets of the SuDS train concept have been implemented in the design. The SuDS train provides for SuDS devices for each of the following: -

- Source Control – Individual blocks or private areas.
- Site Control – Public areas within the development.

The SuDS devices proposed within and around the proposed housing units are described below.

Source Control

- **Permeable Paving**

  Permeable pavements are alternative paving surfaces to standard finishes that allow stormwater runoff to filter through voids in the pavement surface into an underlying stone reservoir, where it is temporarily stored.

  Permeable Paving is proposed for car parking bays along the access roads within the site boundary.

- **Swales**

  A swale is a grassed depression, usually liner in direction with the road that collects runoff, both treating and providing a level of infiltration. Swales can be planted and be managed as wet or dry swales. The location of a swales on should be along access roads and within proximity of green or landscaped areas.

Site Control

- **On-Site Attenuation Tank**

  It is proposed to provide on-site attenuation using underground storage in addition to the existing attenuation provided in Phase 1. The proposed underground concrete tanks, with a depth of 2.1 m head height for maintenance access, will attenuate surface water to restrict the outflow to the equivalent of the 2l/s/ha. The depth of storage varies in each based on the hydraulic grade line. Given that the site is located within hydrogeological area with low permeability subsoil a concrete attenuation tank is being used instead of an infiltration system. The 5no. attenuation tanks have varying storage capacities and a detention basin, as listed below: -

  North Site

  - Tank N1 – 1176 m^3
  - Tank N2 – 315 m^3
  - Tank N3 – 252 m^3

  South Site

  - Tank S2 – 840 m^3
  - Tank S3 – 441 m^3
  - Detention basin – 431 m^3

- **Downstream Defender (Hydrocarbon and Suspended Solids Vortex Separator)**

  A Downstream Defender unit will be installed on networks discharging into the River Skane, those being the attenuation pond discharge and the direct discharge from the lower portion of the south site.

  A Downstream Defender improves the quality of the water being discharged into the existing sewer network and water course. The Downstream Defender is an advanced hydrodynamic vortex separator designed to remove sediment, floatables, hydrocarbons and associated pollutants from storm water.

  It meets the requirements of a class 1/2 separator and removes material suspended within the water column. The device is installed into a concrete manhole and is made from co-polymer polypropylene, which will not corrode and has no moving parts. A Downstream Defender is positioned to allow for easy access and is maintained using a simple gully sucker to remove the oils and sediments.

- **Attenuation Pond & Detention Basin**

  The existing attenuation pond constructed under Phase 1 has a maximum capacity of 3885 m^3 and with a 500mm freeboard height of 2809 m^3 based on the as-constructed information supplied. The required attenuation volume for Phase 1 is 1477 m^3, and approximately 990 m^3 is required for the proposed Phase 2 development which amounts in total to 2467 m^3.

In addition to Phases 1 and 2, an adjacent development exists, Readsland Neighbourhood Centre, located between the R125 and Phase 1 of Dunshaughlin. This development submitted a planning application (ref DA/901200) which has a status of planning on the Meath Local Authorities website as 'Incompleted Application'. The draft report submitted for this development has been considered within the cumulative impacts for the overall development area. All information cited regarding this adjacent development has been taken from the Report ***Readsland Neighbourhood Centre Dunshaughlin County Meath – Services Report***, WYG, May 2009. It was proposed to discharge the surface water runoff from this development into the shared constructed attenuation pond. The calculated storage requirement for this development according to Table 3.6: Storage Requirements within the report states a volume of 1476m^3. However, this attenuation volume area included areas which have been developed within the Phase 1 site of Dunshaughlin.

The main area of the Readsland Neighbourhood Centre which has not been developed out to date, a 1.25Ha triangular shaped area, has been taken into consideration within the overall site attenuation volume calculations. On the assumption of 100% impermeable area within the 1.25Ha site, taken as a worst-case scenario to ensure conservative results, based on a 1:100 year flood event, an estimated volume of 466m^3 stormwater storage is required.

However, it is assumed that during the final design phase for submission to the relevant planning authority, various SuDS measures will be utilized within the stormwater network and on site within the Neighbourhood Centre which will result in a sizeable reduction of the stormwater runoff.

Considering the volume requirements from Phase 1, Phase 2 and the adjacent developments equate to a total of 2933m^3, the constructed attenuation pond is insufficient to cater for all surrounding surface water runoff as the requirement is higher than the freeboard level capacity of the pond, by an estimated 124m^3.

Further to this, the attenuation pond has an average invert level of 92.25m throughout the ponds base with an outlet pipe invert level of 92.587m, and a pond base area of 910m^2, resulting in a potential permanent water volume within the attenuation pond of approx. 307m^3. Please note that the pond is not lined. This volume of water will remain within the pond and not be discharged due to the outlet invert level being higher than the volume of water top level. During a 1:100 year storm event, this approx. volume of 307m^3 cannot be included within the attenuation storage capability of the stormwater network.

With this is mind, the site requires additional storage capacity for the estimated 124m^3 mentioned above, and the 307m^3, total of 431m^3 additional storage for stormwater runoff from a 1:100 year flood event.

A secondary detention area to the north of the existing attenuation pond has been incorporated into the design to accommodate the additional stormwater runoff generated from the 1:100 year event. The location of the natural depression within the landscape exists approx. 18m north of the existing attenuation pond. This area has sufficient volume to cater for the additional requirement of 413m^3 of water storage.

Further to the design of an additional detention area, two existing ditches/swales exist on the site, located to the north east of the constructed attenuation pond and will be utilized as part of the overall SUDs measures for the surface water runoff.

Figure 8.14 below shows the location of the Neighbourhood Centre development, with the site boundary indicated in red, with the storm water network and proposed discharge point into the constructed attenuation pond.

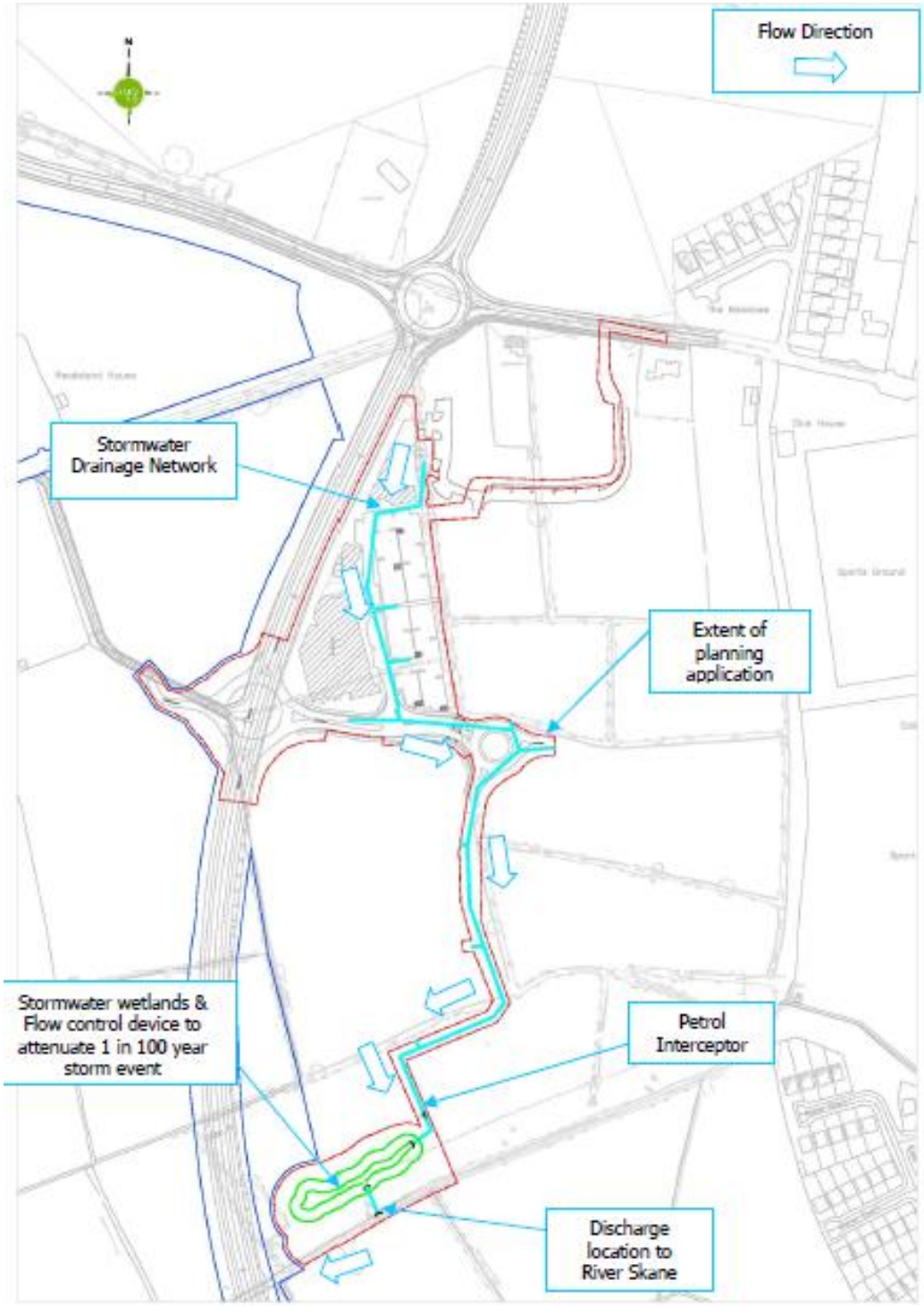

Figure 8.14: Extract from WYG Services 2009 report - Surface water drainage network.

Water

North & South Sites

The proposed development consists of 415no. residential units comprising of 254no. dwelling houses, 55no. duplex apartments and 106no. apartments, and a supporting crèche facility for 80no. children and 16no. staff. It is proposed to supply water to the development via connections to the approved watermain network constructed under Phase 1 of the development.

An estimate of the water demand from the public water supply system for the subject development is shown in in Table 8.2 below.

	№ of Units	Population Per Unit	Total Population	Flow per person (ℓ/h/d)	Average Demand (ℓ/s)	Average day/peak week demand (ℓ/s)	Peak Demand (ℓ/s)
Residential Units	415	2.7	1121	150	1.95	2.44	12.20
Crèche	1	96	96	90	0.10	0.125	0.625
Total Water Demand					2.05	2.57	**12.83**

Table 8.2: Water Demand.

Water demand has been calculated based on 2.7 average occupancy factor per residential unit with a per capita wastewater flow of 150 litres per person per day along with an average day/peak week demand factor 1.25 for average daily domestic demand. A peak week demand multiplier of 5 has been used, as per Section 3.7.2 of the Irish Water Code of Practice for Water Infrastructure. The commercial flow rates taken from Appendix D and Appendix C of the Irish Water Code of Practice for Wastewater Infrastructure.

The total peak water demand of the proposed development was estimated at 12.83 ℓ/s (1,108.50m^3/day).

8.4.2 Cumulative

8.4.2.1 Construction Stage

Foul Water Drainage

North & South Sites

Phase 1 foul water sewers will be constructed before construction begins for Phase 2 foul water sewer, the Neighbourhood Centre currently does not have a permission so as such, no cumulative construction effects are anticipated.

Surface Water Drainage

North & South Sites

Phase 1 surface water drainage will be constructed before construction begins for Phase 2 stormwater drainage, the Neighbourhood Centre currently does not have a permission so as such, no cumulative construction effects are anticipated.

Water

North & South Sites

No other watermains will be under construction during the construction stage of the proposed Phase 2 development. There are therefore not anticipated to be any cumulative effects relating to water supply during the construction stage.

8.4.2.2 Operational Stage

Foul Drainage Network

North & South Sites

Given the capacity of the 525 dia trunk sewer running parallel to the River Skane, to which the site drains, is approximately 180 ℓ/s, there is adequate provision for anticipated 6.75 ℓ/s peak flows from the 415 no. residential units and crèche within the proposed Phase 2 development.

The cumulative development of the Phase 1 and proposed Phase 2 Dunshaughlin Lands will consist of approximately: -

- **Phase 1 Development**
    - 160no. housing units.
    - 1no. childcare facility.
- **Phase 2 Development**
    - 415no. residential units.
    - 1no. childcare facility.

An estimate of the quantity of wastewater that will be discharged from the cumulative Phase 1 and proposed Phase 2 developments is 30.75 ℓ/s.

The foul sewer system within the Dunshaughlin LAP Lands has been designed to accommodate the 30.75 ℓ/s peak flows.

The subject lands are within the catchment of the existing Dunshaughlin WwTW at Castletown, Tara, County Meath. The treatment works have been operational since November 2006. The WwTW has a design capacity of 12,000 PE, is licensed by the EPA to cater for a population equivalent up to 10,000 PE, and currently has an approximate 6,000 PE entering the plant

This treatment works has been designed to accommodate the Dunshauglin Lands, including the Phase 1 development and proposed Phase 2 development.

Based on the above, there are not anticipated to be any cumulative effects.

Surface Water Network

North & South Sites

There is adequate provision for anticipated cumulative 49.8 ℓ/s discharge rate from both the Phase 1 and proposed Phase 2 developments (14.9 ℓ/s + 34.9 ℓ/s).

The cumulative development of Phase 1 and proposed Phase 2 sites will consist of: -

- **Phase 1 Development**
    - 160no. housing units.
    - 1no. childcare facility.
- **Phase 2 Development**
    - 415no. residential units.
    - 1no. childcare facility.

The cumulative discharge from the Phase 1 and 2 within Dunshauglin has been calculated at 49.8 ℓ/s.

With the balance of flows stored in the areas mentioned above that cater for up to the 100- year storm event and adequate provision for anticipated cumulative 49.8 ℓ /s discharge rate from both Phase 1 and the proposed Phase 2 development, there are therefore not anticipated to be any cumulative effects relating to surface water.

Water

The cumulative development of the lands within the Proposed Phase 2 Dunshaughlin site are the following: -

- Phase 1

  The total water demand for Phase 1 was estimated at 1.06 ℓ/s, applying the same demand factors as above, the total peak demand for this development is 6.7 ℓ/s.

- Phase 2

  The total peak water demand for the proposed development is estimated at 12.83 ℓ/s.

Total peak demands for the Phase 1 and proposed Phased 2 sites is estimated at 19.53 ℓ/s.

Irish Water have indicated with the Confirmation of Feasibility (COF) response that the existing water infrastructure can facilitate the proposed Phase 2 development. There are therefore not anticipated to be any cumulative effects relating to water supply during the operational phase.

8.5 Potential Impact of the Proposed Development

8.5.1 Proposed Development

8.5.1.1 Construction Stage

Foul Water Drainage

North & South Sites

During the construction of the new foul sewer there is the potential for surface water to be discharged to the existing public foul sewer system due to pipes and manholes being left open.

There is a risk of pollution of groundwater and water courses by accidental spillage of foul effluent during connections being made to live sewers.

Remedial and reductive measures will be implemented to limit negative effects of the proposed development on the environment during the construction phase.

The negative effects as identified above will be temporary in duration.

Surface Water Drainage

North & South Sites

During the construction of the new surface water drainage the development will require the removal of topsoil and the completion of extensive earthworks to facilitate the construction of drainage, roads, creche and residential units. These activities have the potential to give rise to contamination of the surface water with soil particles when discharging to the existing watercourses and ultimately to the River Skane.

The initial runoff from newly laid bitumen surfaces will contain some soluble extracts from the bitumen binder. These extracts will mostly consist of phenolic and hydrocarbon substances in low concentrations (circa 10 to 50 ug/l). The quantities will not adversely affect the water quality due to dilution effects.

Remedial and reductive measures will be implemented to limit negative effects of the proposed development on the environment during the construction phase.

The negative effects as identified above will be temporary in duration.

Water

North & South Sites

No significant impact to the existing watermains is anticipated during the construction phase of the development, though there will be some minor water demand for site offices. A separate Temporary Contractor's supply will be applied for through Irish Water

There is a risk of contamination to the existing water supply during connection of the watermains to the public water supply.

The negative effects as identified above will be temporary in duration.

8.5.1.2 Operational Stage

Foul Water Drainage

North & South Sites

There is a possibility of surface water ingress into the foul water drainage system due to poor workmanship, which would increase the load on the existing sewers. There is also a possibility of leakage from sewers and drains within the development and along the route to the outfall sewer. Any foul water leakage would result in local contamination of soil and ground waters in the area.

Surface Water Drainage

North & South Sites

The development will result in the increase of hard standing areas, and therefore an increase in the runoff of surface water to the River Skane which may result in downstream flooding.

There is a potential impact for the discharge of contaminants from surfaced areas within the development to the River Skane. The quality of runoff from the site would be dependent on the time of year, weather, particulate deposition from the atmosphere and any gritting or salting carried out. The time of year has a major bearing on the quality of storm water run-off - in particular the first rains after a prolonged dry period where accumulated deposits of rubber, particulates, oils, etc. are washed away.

In an absence of mitigation measures, the proposed development could have a significant effect on water quality degradation in the River Skane. The use of SuDS devices and downstream defender at the discharge points reduces the amount of pollutants present in the water entering the main watercourse.

The rate of discharge of storm water that will be discharged from the site to the River Skane will be unaltered by the proposed development, due the restriction of discharge to the watercourse.

There is a possibility of surface water ingress into the foul water drainage system due to poor workmanship, which would increase the load on the existing foul sewers.

Water

North & South Sites

During the operational stage of the development, there will be an increase in demand for water from the public water supply.

8.5.1.3 Do Nothing Impact

Foul Water Drainage

North & South Sites

In terms of the ''do nothing'' scenario the subject lands would be retained within the Dunshaughlin LAP as vacant site and there will be no additional discharge of foul water to the existing sewer system.

Surface Water Drainage

North & South Sites

In terms of the ''do nothing'' scenario the subject lands would be retained within the Dunshaughlin LAP as a greenfield site that consists of natural planted areas and agricultural land and there would be no additional discharge of surface water to the existing surface water system or River Skane. The existing system would still receive a surface run off of approximately 2 l/s/ha since the site is classed as a green field.

Water

North & South Sites

In terms of the ''do nothing'' scenario the subject lands would be retained within the Dunshaughlin LAP as vacant site and there will be no additional water demand from the existing water supply.

8.5.2 Cumulative

8.5.2.1 Construction Stage

Foul Water Drainage

North & South Sites

The phasing/commencement of any other permitted development within the Dunshaughlin LAP could potentially result in the scenario where a number of other developments are under construction at the same time as the proposed development.

The potential effect of the cumulative development during the construction phase is as per the proposed development.

Surface Water Drainage

North & South Sites

The potential effect of the cumulative development during the construction phase is the same as per the proposed development.

Water

North & South Sites

The potential effect of the cumulative development during the construction phase is as per the proposed development.

8.5.2.2 Operational Stage

Foul Water Drainage

North & South Sites

The development of the proposed site along with other cumulative development will result in an expansion of the foul sewer network.

The potential effect of the cumulative development during the operational phase is as per the proposed development.

Surface Water Drainage

North & South Sites

The potential effect of the cumulative development during the operational phase is as per the proposed development.

Water

North & South Sites

During the operational phase of the cumulative development there will be a significant increase in the demand for water from the public water supply.

8.5.2.3 Do Nothing Impact

Foul Water Drainage

North & South Sites

The overall strategy for the Dunshaughlin area is the completion of development on the remaining vacant sites and their successful and sustainable integration into the urban fabric of both the immediate area and the wider town.

In terms of the "do nothing" scenario the existing lands would remain vacant and the overall strategy for the Dunshaguhlin area within the County Meath Development Plan will not be realized.

Surface Water Drainage

North & South Sites

The overall strategy for the Dunshaughlin LAP is the completion of development on the remaining vacant sites and their successful and sustainable integration into the urban fabric of both the immediate area and the wider city.

In terms of the "do nothing" scenario the existing lands would remain vacant and the overall strategy for the Dunshaguhlin area within the County Meath Development Plan will not be realized.

Water

North & South Sites

The overall strategy for the Dunshaughlin LAP is the completion of development on the remaining vacant sites and their successful and sustainable integration into the urban fabric of both the immediate area and the wider town.

In terms of the "do nothing" scenario the existing lands would remain vacant and the overall strategy for the Dunshaughlin LAP will not be realized.

8.6 Mitigation Measures (Ameliorative, Remedial or Reductive Measures)

8.6.1 Proposed Development

8.6.1.1 Construction Stage

Foul Water Drainage

North & South Sites

In order to reduce the risk of defective or leaking foul sewers, the following remedial measures will be implemented: -

- All new foul sewer connections will be tested by means of an approved air test during the construction phase in accordance with Irish Waters Code of Practice and Standard Details.
- All private drainage will be inspected and signed off by the design Engineer in accordance with the Building Regulations Part H and BCAR requirements.
- All foul sewers will be surveyed by CCTV and assessed to identify possible physical defects. Any defects will be remediated and re-CCTV'd to verify that the works have been completed in accordance with the specifications.
- The connection of the new foul sewers to the public sewer will be carried out under the supervision of Irish Water in the connections are approved under Self Lay Agreement and will be checked prior to commissioning. Alternatively, Irish Water will undertake the connections as part of the Connection Agreement for sewers in the public domain by their Network Contractors.

- Prior to commencement of excavations in public areas, all utilities and public services will be identified and checked, to ensure that adequate protection measures are implemented during the construction phase and in accordance with MCC road opening licence requirements.

Surface Water Drainage

North & South Sites

The contractor will prepare and implement a Construction Management Plan which will outline the requirements for the storage and handling of fuel, including the refuelling of vehicles in designated refuelling zones/bunded areas to minimise the risk of spillages, and the impact of spillages should they occur.

The Construction Management Plan will also utilise sedimentation controls, including silt traps, tailings ponds and silt fences during the construction period.

All private drainage will be inspected and signed off by the design Engineer in accordance with the Building Regulations Part H and BCAR requirements. This will reduce the possibility of any cross connections being constructed going forward in the proposed subject Blocks.

Water

North & South Sites

A method statement setting out in detail the procedures to be used when working in the vicinity of existing watermains will be produced by the contractor for any construction works within the vicinity of watermains and for roads and / or services crossing watermains.

All watermains will be cleaned and tested in accordance with Irish Water guidelines prior to connection to the public watermain.

All connections to the public watermain will be carried out by or under the supervision of Irish Water and MCC.

8.6.1.2 Operational Stage

Foul Drainage

North & South Sites

All foul drains will be tested and surveyed prior to connection to the public sewers to minimise the risk of uncontrolled ground water seepage or leakage of the foul water to ground water on the site.

Otherwise, no remedial or reductive measures are deemed to be necessary after completion of the development other than normal maintenance of the foul sewer system.

Surface Water Drainage

North & South Sites

The increased runoff from the site will be attenuated within the on-site attenuation tanks, with the discharge rates limited to the greenfield runoff rate. In addition, the significant SuDS devices, outlined in Section 8.4.1.2, will significantly reduce and slow down the rate of surface water runoff. This will reduce the peak flows and flooding of storm water to the downstream system during major storm events. Gullies, downstream defenders and the hydrobrake manholes shall be regularly maintained to avoid blockages.

The SuDS treatment train will also pre-treat the surface water discharging to the River Skane, removing pollutants and hydrocarbons from the surface water runoff. Maintenance of these SuDS devices will be required to ensure that they continue to operate as designed.

Water

North & South Sites

Water meters will be installed at key locations in agreement with Irish Water, and these meters will be linked to Irish Water's monitoring system by telemetry. These meters will facilitate the early detection of unusual water usage in the network and identify potential leaks in the system.

All plumbing fixtures and fittings and sanitary wear to be installed within the development should be to the current best practice for water consumption to minimise future water usage.

It is not envisaged that any further remedial or reductive measures will be necessary on completion.

8.6.2 Cumulative

8.6.2.1 Construction Stage

Foul Water Drainage

North & South Sites

In order to minimise the effect of the construction of the outfall sewer on the public road the following reductive measures are suggested: -

- Prior to commencement of excavations in public areas all utilities and public services will be identified and checked, to ensure that adequate protection measures are implemented during the construction phase.
- Traffic management for vehicular, cycle and pedestrian traffic will be implemented to minimise disruption to the public.
- All excavations within the public roads will be backfilled in a controlled manner and the public road will be reinstated to the satisfaction of the Local Authority.
- Method statements for all works will be prepared and assessed prior to commencement of the works. All construction methods used will be tailored to reduce, where possible, dust and noise and interference with residents in neighbouring development.
- All spoil and waste material will be removed to an approved storage or disposal facility.

Surface Water Drainage

North & South Sites

The mitigation measures of the cumulative development during the operational phase is as per the proposed development.

Water

North & South Sites

The mitigation measures of the cumulative development during the construction phase is as per the proposed development.

8.6.2.2 Operation Stage

Foul Drainage

North & South Sites

The mitigation measures of the cumulative development during the operational phase is as per the proposed development.

Surface Water Drainage

North & South Sites

The mitigation measures of the cumulative development during the operational phase is as per the proposed development.

Water

North & South Sites

The mitigation measures of the cumulative development during the operational phase is as per the proposed development.

8.7 Residual Impact of the Proposed Development

8.7.1 Proposed Development

8.7.1.1 Construction Stage

Foul Drainage

North & South Sites

The construction phase of the project has the potential to give rise to some short-term negative impacts as identified above. However, provided that the proposed remediation or reductive measures are implemented, the impact of the proposed development during the construction stage of the foul drainage network will be minimised and no significant effects will result from the construction works.

Surface Water Drainage

North & South Sites

The construction phase of the project has the potential to give rise to some short-term negative impacts as identified above. However, provided that the proposed remediation or reductive measures are implemented, the impact of the proposed development during the construction stage of the stormwater network will be minimised and no significant effect is likely to result from the construction works.

Water

North & South Sites

Due to the proposed remedial measures outlined above no negative impacts are expected to arise during the construction phase of the proposed development on the water supply network.

8.7.1.2 Operational Stage

Foul Drainage

North & South Sites

The proposed development will result in a permanent increase in foul water flows in the existing drainage system. These increased flows will result in an additional peak flow of 6.75l/s discharging to the Castletown -Tara WwTW. Both the Foul Drainage Network and the pumping station have been designed to cater for the increased flow.

Surface Water Drainage

North & South Sites

With the implementation of the SuDS treatment train and attenuation tank outlined in section 8.10.1.2, the surface water quality and quantity discharging to the River Skane will be pre-treated and attenuated to the greenfield runoff rate, in accordance with the requirements set out in the GDSDS, and no significant adverse effect are envisaged.

Water

North & South Sites

The proposed development will result in a permanent increase in water demand from the water supply network. There will be a water demand for the proposed development of approximately 1,108.50m^3 per day. The water supply network of the LAP Lands has been designed and constructed to cater for this increase in water demand. Furthermore, the Irish Water has issued a Confirmation of Feasibility for this development.

8.7.1.3 Worst Case Impact

Foul Drainage

North & South Sites

The ''worse case'' scenario for the site is that foul effluent from the site or sewer discharges into the ground and/or River Skane, contaminating the soil and water. The possibility of this scenario occurring is very low as all pipelines will be tested prior to connection to the main sewer and any work in the vicinity of the main sewer will be monitored for breakages in the pipeline.

Surface Water Drainage

North & South Sites

A worst-case scenario is that for a very intense storm, minimal flooding of landscape areas and roads may occur within the site.

Water

North & South Sites

The "worst-case" scenario for the site is that the watermain along Drumree Road, serving the development is damaged or severed, stopping the water supply to the north site of the proposed Phase 2 development.

8.7.2 Cumulative

8.7.2.1 Construction Stage

Foul Drainage

North & South Sites

If the recommended remedial or reductive measures are implemented, the proposed development will not give rise to any significant residual adverse effect. Negative effects during the construction phase will be temporary only.

Surface Water Drainage

North & South Sites

The construction phase of the project will result in some short-term negative impacts as identified above. However, provided that the proposed remediation or reductive measures are implemented, the impact of the proposed development during the construction stage will be minimised and no significant impacts will result from the construction works.

Water

North & South Sites

The potential residual effect of the cumulative development during the construction phase is as per the proposed development.

8.7.2.2 Operation Stage

Foul Drainage

North & South Sites

The cumulative development will result in a permanent increase in the foul water flows in the existing drainage system. These increased flows will result in an additional peak flow of 17.7 l/s discharging to the Castletown, Tara, WwTW. Both the Foul Drainage Network and the pumping station have been designed to cater for the increased flow.

Surface Water Drainage

North & South Sites

Provided the storm water attenuation system is incorporated into the cumulative development at each stage of the development, no adverse impact resulting in an increase in the storm water runoff rate from the development is envisaged.

Water

North & South Sites

The potential residual effect of the cumulative development during the operational phase is as per the proposed development.

8.7.2.3 Worst Case Impact

Foul Drainage

North & South Sites

The ''worse case'' scenario for the cumulative development is that foul effluent from the Dunshaughlin area discharges into the ground contaminating the soil. The likelihood of this scenario is very low as all pipelines will be tested and CCTV'd prior to connection to the main sewer and any work in the vicinity of the main sewer will be monitored for breakages in the pipeline.

Surface Water Drainage

North & South Sites

A "worse case" scenario is that for a very intense storm, minimal flooding of landscape areas and roads may occur within the Lands.

Water

North & South Sites

The worst-case effect of the cumulative development is as per the proposed development.

8.8 Monitoring

8.8.1 Proposed Development

8.8.1.1 Construction Stage

Foul Drainage

North & South Sites

Following the construction of the development there are no monitoring requirements envisaged for the proposed development and cumulative developments, other than the normal monitoring and maintenance of the wastewater system by the sanitary authority.

Surface Water Drainage

North & South Sites

The surface water network (drains, gullies, manholes, AJs, downstream defenders, hydrobrake manholes, SuDS devices, attenuation tanks and attenuation pond, etc.) will need to be regularly maintained and where required cleaned out. A suitable maintenance regime of inspecting and cleaning shall be incorporated into the safety file/maintenance manual for the development. These means of monitoring are applicable to both the proposed development and future development stages.

Water

North & South Sites

Water usage and potential leakage will be monitored by Irish Water using the water meters which will be installed on the supply pipes so that the development can be monitored in sections. The location of these meters will be agreed with Irish Water and the meters will be linked to Irish Water's monitoring system via telemetry.

8.8.1.2 Operational Stage

Foul Drainage

North & South Sites

Required operational stage monitoring will be int the form of standard monitoring and maintenance of the wastewater system by the sanitary authority.

Surface Water Drainage

North & South Sites

The operational stage monitoring of the stormwater network is as per the construction stage monitoring. For detail refer to section 8.8.1.1 above.

Water

North & South Sites

Water usage and potential leakage will be monitored by Irish Water using the water meters which will be installed on the supply pipes so that the development can be monitored in sections. The location of these meters will be agreed with Irish Water and the meters will be linked to Irish Water's monitoring system via telemetry.

8.8.2 Cumulative Development

8.8.2.1 Construction Stage

Foul Drainage

North & South Sites

Cumulative development monitoring during the construction stage for the foul drainage network is as per proposed development monitoring.

Surface Water Drainage

North & South Sites

Cumulative development monitoring during the construction stage for the surface water drainage network is as per proposed development monitoring.

Water

North & South Sites

Cumulative development monitoring during the construction stage for the water network is as per proposed development monitoring.

8.8.2.2 Operational Stage

Foul Drainage

North & South Sites

Cumulative development monitoring during the operational stage for the foul drainage network is as per proposed development monitoring.

Surface Water Drainage

North & South Sites

Cumulative development monitoring during the operational stage for the surface water drainage network is as per proposed development monitoring.

Water

North & South Sites

Cumulative development monitoring during the operational stage for the water network is as per proposed development monitoring.

8.9 Reinstatement

8.9.1 Proposed Development

8.9.1.1 Construction Stage

Foul Drainage

North Site

Following the construction of the foul drainage network within the north site of the proposed Phase 2 development, reinstatement of the Drumree Road and a small portion of the R125 would require reinstatement.

It is estimated that 175m of 225mm (ID) diameter foul pipeline will be installed within both the Drumree Road and the R125.

South Site

No reinstatement works are expected for the Phase 2 south site of the subject site.

Surface Water Drainage

North & South Sites

Following the construction of the stormwater network for the proposed development there are no reinstatement works required beyond the construction of the MH onto the existing 450 diameter Surface Water pipe at the edge of Drumree Road.

Water

North Site

Following the construction of the water network for the north site of the proposed Phase 2 development, reinstatement works of the Drumree Road between the Phase 1 development and the north site Phase 2 development would be required.

It is estimated that 226m of 225mm (OD) diameter watermain will be installed within the Drumree Road.

South Site

No reinstatement works are expected for the Phase 2 south site of the subject site beyond the actual connection to the existing watermain.

8.9.1.2 Operational Stage

Foul Drainage

No reinstatement works are required during the operational stage of the development.

Surface Water Drainage

No reinstatement works are required during the operational stage of the development.

Water

No reinstatement works are required during the operational stage of the development.

8.9.2 Cumulative

8.9.2.1 Construction Stage

Foul Drainage

Reinstatement during construction of the foul water drainage network is as per the proposed development construction stage.

Surface Water Drainage

Reinstatement during construction of the stormwater water drainage network is as per the proposed development construction stage.

Water

Reinstatement during construction of the water drainage network is as per the proposed development construction stage.

8.9.2.2 Operational Stage

Foul Water Drainage

No reinstatement works are required during the operational stage of the development.

Surface Water Drainage

No reinstatement works are required during the operational stage of the development.

Water

No reinstatement works are required during the operational stage of the development.

8.10 Difficulties Encountered

There were no difficulties encountered.

8.11 Flood Risk

The Site Specific Flood Risk Assessment was prepared in accordance with the guidelines set out in the DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management published in November 2009 and submitted with this planning application.

The components to be considered in the identification and assessment of flood risk are as per Table A1 of the above guidelines: -

- Tidal – flooding from high sea levels.
- Fluvial – flooding from water courses.
- Pluvial – flooding from rainfall / surface water.
- Ground Water – flooding from springs / raised ground water.
- Human/mechanical error – flooding due to human or mechanical error.

Each component was investigated from a Source, Pathway and Receptor perspective, determining the overall risk of flooding to a development, taking into account the likelihood of a flooding event within the development, versus the consequences of such flooding.

Based on the above various components, summarized in Table 8.3 below, the overall risk of flooding to the proposed development was assessed to be low and very low.

Source	Pathway	Receptor	Likelihood	Consequence	Risk	Mitigation Measure	Residual Risk
Tidal	None	Proposed Development	na	na	na	na	**na**
Fluvial	None	Proposed Development	Low - Moderate	High Water Ingress in Buildings	There is a moderate risk of fluvial flooding for housing units but high risk of flooding to landscaped areas and roads	Design levels high enough to account for fluvial flooding and overland flood routing.	**Low**
Pluvial	Private and Public Drainage Network	Proposed Development	High	High Flooding of the proposed buildings and roads	High risk of minor to severe damage to dwellings	Appropriate drainage design, overland flood routing and setting of floor levels	**Low**
Ground Water	Ground	Proposed Development	Low	Moderate Saturation of the surrounding grounds during long rainfall periods	Low risk of minor saturation of area around the development	Appropriate drainage design, overland flood routing and setting of floor levels	**Low**
Human / Mechanical Error	Drainage network	Proposed Development	High	High Surcharging of surface water network resulting in flooding of the properties	High risk of damage to dwellings	Appropriate drainage design, overland flood routing and setting of floor levels	**Low**

Table 8.3: Summary of the Flood Risk from the Various Components.