



The runoff from catchment 1B is to be attenuated in a detention basin, where the discharge will be restricted to 29.3l/s. The combined discharge from catchment 1B+2 will then be allowed to flow through a petrol interceptor before discharging to the Shambles River.

5.3.3 Northern Catchment (1C)

As part of the stormwater management system, Davnets Row Path (catchment 1C) is designed as a one-way cross-fall, which directs runoff towards an infiltration trench that runs along the length of the shared path. This system is designed to effectively drain an area of 0.07 ha of the shared path at Davnets row. A cellular storage system is located at the low point to provide storage for the Q100+CC event and from where runoff allowed to infiltrate into the soil.

5.4 Impermeable Areas: Strategy

The various impermeability factors used for the subject site were determined and agreed with MCC drainage department, see Table 5-1 below.

	Impermeability Factors
Roads and Footpaths - Type 1 (Draining to gullies) (m ²)	0.95
Roads and Footpaths - Type 2 (Draining to Suds features - Swale) (m ²)	0.7
Roads and Footpaths - Type 2 (Draining to Suds features - Infiltration trench) (m ²)	0.4
Grass Areas (m ²)	0.35
Development Areas (Site assumed as 70% impermeable)	0.7

Table 5-1: Impermeability factors

Table 5-2, Table 5-3 , Table 5-4 and Table 5-5 below provide an overview of the impermeable areas both non-contributing and contributing to the surface water drainage network The non-contributing runoff area . By applying the impermeability factor to the runoff area, impermeable areas were calculated for each catchment area. As a result, catchments 1A, 1B, and 2 have impermeable areas of 0.19ha, 0.39ha, and 2.67ha, respectively.



CATCHMENT 1A	Runoff Area	Runoff Coeff.	Effective Runoff Area
Roads and Footpaths - Type 1 (Draining to gullies) (m ²)	1902	0.95	1807
Grassed Areas (m ²)	143	0.35	50
Catchment area (ha)	0.20		
Impermeable area (ha)	0.19		

Table 5-2: Catchment 1A - Impermeable run-off area

CATCHMENT 1B	Runoff Area	Runoff Coeff.	Effective Runoff Area
Roads and Footpaths - Type 1 (Draining to gullies) (m ²)	373	0.95	354
Roads and Footpaths - Type 2 (Draining to Suds features) (m ²)	4128	0.70	2890
Grassed Areas (m ²)	1892	0.35	662
Catchment area (ha)	0.64		
Impermeable area (ha)	0.39		

Table 5-3: Catchment 1B - Impermeable run-off area

CATCHMENT 1C	Runoff Area	Runoff Coeff.	Effective Runoff Area
Roads and Footpaths - Type 2 (Draining to Suds features - Infiltration trench) (m ²)	490	0.40	196
Grass Areas (m ²)	210	0.35	73.5
Catchment area (ha)	0.07		
Impermeable area (ha)	0.027		

Table 5-4: Catchment 1C - Impermeable runoff area



CATCHMENT 2	Runoff Area	Runoff Coeff.	Effective Runoff Area
Developed Area (Site assumed as 70% impermeable)	38183	0.70	26728
Catchment area (ha)	3.82		
Impermeable area (ha)	2.67		

Table 5-5: Catchment 2A - Impermeable run-off area

5.5 Compliance with Surface Water Policy

Surface water management for the proposed development is designed to comply with the Greater Dublin Strategic Drainage Study (GDSDS) policies and guidelines and the requirements of Monaghan County Council. The GDSDS guidelines require the following main 4 main criteria to be provided by the development's surface water design;

- Criterion 1: River Water Quality Protection – satisfied by providing interception storage and treatment of run-off within the SUDS features e.g. infiltration to ground in Swales and attenuation, filtration and uptake by SuDS vegetation, downstream petrol interceptor
- Criterion 2: River Regime Protection – satisfied by attenuating run-off with flow control device prior to discharge to the existing ditch to the south of the site.
- Criterion 3: Level of Service (flooding) for the site – satisfied by the site being outside the 1000 year coastal and fluvial flood levels. Pluvial flood risk addressed by development designed to accommodate a 100-year storm as per GDSDS. Planned flood routing for storms greater than 100-year level considered in design and development run-off contained within site.
- Criterion 4: River flood protection – attenuation and flow restriction to Q_{bar} provided in SUDS features

5.6 Surface Water Drainage Design Standards

The mean annual catchment runoff from the site (Q_{bar}) was calculated using the Institute of Hydrology equation, refer to Appendix C : for permissible stormwater discharge and Met Eireann Rainfall data.



Storm water drainage for the proposed development is designed using the recommendations of the GDSDS, EN752 and BS8301:1985, with the following parameters applied:

- Return period for pipe network 2 years,
 - check 30-year 15 minute, no flooding;
 - check 100-year flooding in designated areas;
- Time of entry 4 minutes
- Pipe Friction (Ks) (concrete) 0.6 mm
- Minimum Velocity 1.0 m/s
- Standard Average Annual Rainfall 987mm
- M5-60 16.1mm
- Ratio r (M5-60/M5-2D) 0.271
- Storage System Storm Return Event GDSDS Volume 2, p61, Criterion 3
 - 10-year no flooding on site
 - 30-year no flooding on site
 - 100-year check no internal property flooding. Flood routing plan. Lowest level along road is + 500mm freeboard above 100-year flood level. No flooding to adjacent areas.
- Climate Change 20%
- C_v winter 0.84
- C_v summer 0.75

(Note on C_v Factors; value of 0.84 for Winter and 0.75 for Summer is standard practice and is appropriate for this site.)

Surface water sewers have been designed in accordance with IS EN 752 and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS). The minimum pipe diameter for public surface water sewers is 225mm. Standard drainage details are as per drawing 220084-RY-05-Z00-XXX-DR-DBFL-CE-5001, 5002 and 5003 in accordance with the Greater Dublin Regional Code of Practice for Drainage Works.



The Network Module of Microdrainage has been used to assess the performance of the proposed surface water network. This analysis indicated that the pipe sizes and grades are adequate for storm events up to the 1% AEP refer to Appendix A : for the Stormwater Network analysis.

Refer to DBFL drawing reference 220084-RY-05-Z00-XXX-DR-DBFL-CE-1301 & 1302 for the proposed surface water layout and the Surface water longitudinal sections are shown in DBFL drawing 220084-RY-05-Z00-XXX-DR-DBFL-CE-3301 & 3302.

5.7 Discharge Rate

Surface water runoff volumes from the development is attenuated to flow rates equal to the greenfield runoff (Q_{bar}), in accordance with the recommendations of the GDSDS. Q_{bar} is calculated using the Institute of Hydrology equation, as recommended in the Greater Dublin Strategic Drainage Study (GDSDS), as follows:

$$Q_{bar [rural]} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times Soil^{2.17}$$

Where:

- $Q_{bar [rural]}$ is the mean catchment annual flow from a 50 ha rural catchment in m^3/s ;
- SAAR is the standard average annual rainfall = 987mm.
- SOIL is the soil index, with 5 soil types used and SPR values (standard percentage runoff) applied to each soil type.

The SPR values for the 5 soil types are as follows:

Soil 1 = 0.1; Soil 2 = 0.3; Soil 3 = 0.37; Soil 4 = 0.47; Soil 5 = 0.53;

SPR value of 0.3 (Soil Type 2) is applied for the catchment 1A and. SPR value of 0.47 (Soil Type 4) is chosen for both Catchment 1B, 1C & 2. The Soil types are chosen based on site specific conditions, as confirmed using preliminary site investigations.

Greenfield run-off rates were calculated for Catchments 1A, 1B, 1C, and 2 on the subject site, as shown in Table 5-6 with the relevant runoff area. Note, Catchment 1C does not contribute to the Overall Subject Site discharge, the runoff generated from this catchment will be allowed to infiltrate into the ground. The discharge values have been agreed with Monaghan County Council's drainage department. Refer to Appendix C :for the Permissible Stormwater Discharge calculations and the relevant Rainfall data.