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SuDS Assessment

Gort Town Centre Public Realm, Co. Galway

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WATER & ENVIRONMENTAL CONSULTANTS

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1 INTRODUCTION

1.1 Terms of Reference

This SuDS Assessment was commissioned by BDP to evaluate the SuDS features proposed as part of the Gort Town Centre Public Realm scheme.

1.2 Statement of Authority

This assessment was prepared and reviewed by qualified professionals with appropriate experience in flood risk, drainage, and hydraulic modelling studies. The key staff members involved in this project are:

- Duncan Hartwick BEng (Hons) BSc (Hons) – Senior Engineer specialising in flood risk assessment, drainage assessment, hydraulic modelling, and flood hydrology.
- Paul Singleton BEng (Hons) MSc CEng MIEI – Associate Director and Chartered Civil and Environmental Engineer specialising in hydrology, flood risk assessment, and SuDS; recognised industry professional actively providing training courses related to these topics to both the public and private sectors in Ireland and the UK.

1.3 Approach to the Assessment

The assessment will consider:

- Hydraulics – estimate the likely reduction in surface water runoff rates as a result of incorporating SuDS into the scheme.
- Water Quality – assess the pollution removal potential of proposed SuDS components

This assessment will consider only the areas that incorporate SuDS and areas that are considered to have the potential to contribute to a proposed SuDS feature. Based on the landscaping proposals, not all areas of the public realm improvements will be drained by SuDS.

1.4 Relevant Documents

The following documents relating to SuDS / surface water management were considered in the preparation of this assessment:

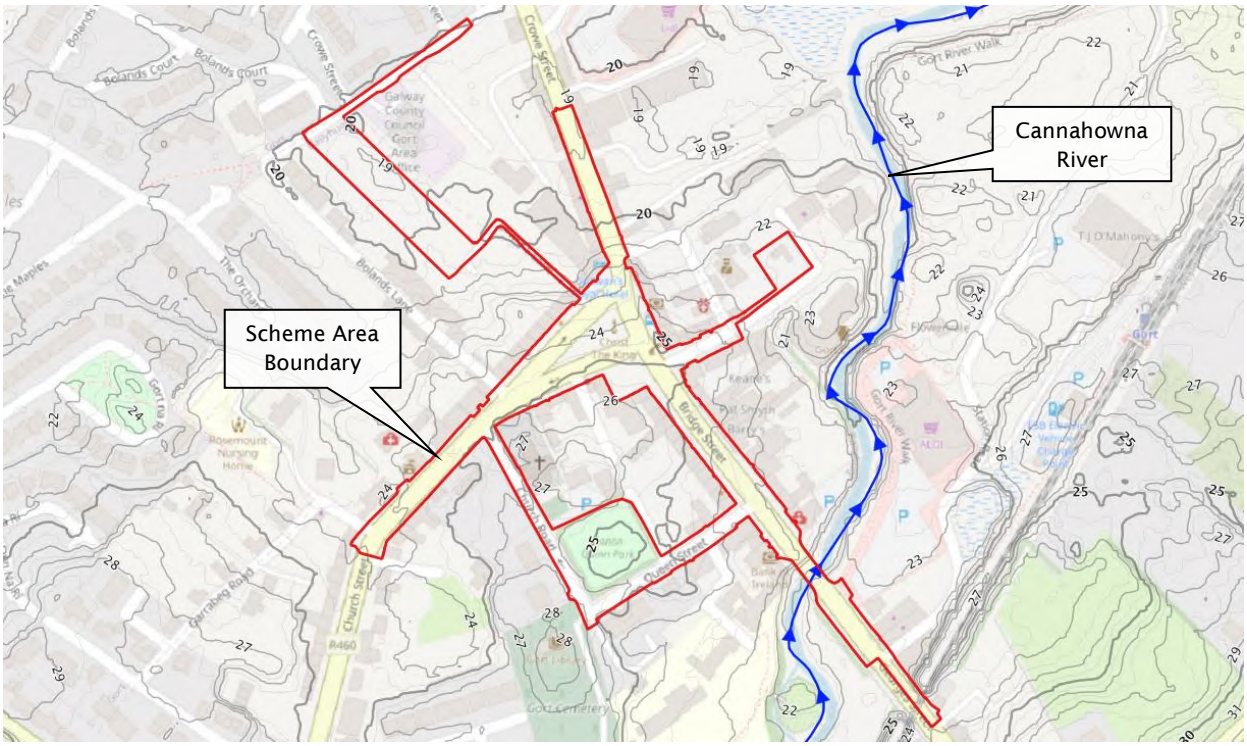
- Department of Housing, Local Government and Heritage (DHLGH) Rainwater Management Plans – Guidance for Local Authorities (2024)
- DHLGH Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas (2022)
- Galway County Development Plan 2022-2028 (Galway CDP)
- Strategic Flood Risk Assessment for the Galway County Development Plan 2022-2028 (Galway SFRA)
- CIRIA C753 The SuDS Manual (2015)
- Greater Dublin Regional Code of Practice for Drainage Works (2012)
- Greater Dublin Strategic Drainage Study (GDSDS) (2005)

2 SCHEME DETAILS

2.1 Location

The scheme area boundary comprises Gort Town Centre, as shown in Figure 2.1.

Figure 2.1: Location Context / Scheme Area Boundary



2.2 Topography

Existing ground levels within the scheme area range from c. 25 to 19 mOD. Contours from best available height data are shown in Figure 2.1.

2.3 Watercourses

A watercourse named 'Cannahowna' on the EPA 'Rivers' dataset flows through the south-eastern extent of the scheme area, as shown in Figure 2.1.

2.4 Existing Land Use

The scheme area currently comprises c. 2.8 ha of primarily developed / urban land across Gort town centre including environs and access roads.

2.5 Proposed Development

Proposed development that this assessment is based upon is summarised as follows:

Gort Town Centre Public Realm Enhancement Project on Market Square, Bridge Street, George Street, Crowe Street, Barrack Street, Queen Street, Church Street, and Canon Quinn Park to include:

1. *Redesigned paved areas along Market Square, Bridge Street, George Street, Crowe Street, Barrack Street, Queen Street and Church Street including new surface materials, installation of a new lighting scheme, hard and soft landscaping and street furniture (The proposed works are located within the Architectural Conservation Area, and in the vicinity of Recorded Protected Structures RPS No 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 436, 437, 438, 439, 440, 441, 442, 3445, 3451, 3452, 3453, 3459, 3464, 3467, 3468, 3469, 3471, 3472.*
2. *Provision of an upgraded and expanded pedestrianised civic/public space in the Market Square.*
3. *Provision of new pedestrian crossings.*
4. *Installation of new road alignments including reduction in carriageway widths and traffic calming measures.*
5. *Installation of new street furniture and cycle parking.*
6. *Rationalised on-street car parking throughout the application area including the provision of new disabled and age friendly parking provision.*
7. *The provision of 2No. new public off-street car parks and Crowe Street and Barrack Street.*
8. *Installation of new landscaping including street trees and planting.*
9. *Upgrade works to the existing Canon Quinn Park including the installation of play equipment, seating, lighting and ancillary infrastructure.*
10. *Installation of a new signage and way-finding scheme.*
11. *Undergrounding of overhead cables and the removal of redundant overhead cabling.*
12. *Installation of upgraded surface water drainage infrastructure including provision of nature-based, sustainable urban drainage solutions.*
13. *The relocating of existing public bus-stop to Bridge Street/George Street and provision 1No. new coach drop off area on Market Square.*
14. *All other associated site and ancillary works at Market Square, Bridge Street, George Street, Crowe Street, Barrack Street, Queen Street, Church Street, and Canon Quinn Park.*

Proposed layout drawings for the current stage of development are included in Appendix A.

3 SUDS ASSESSMENT

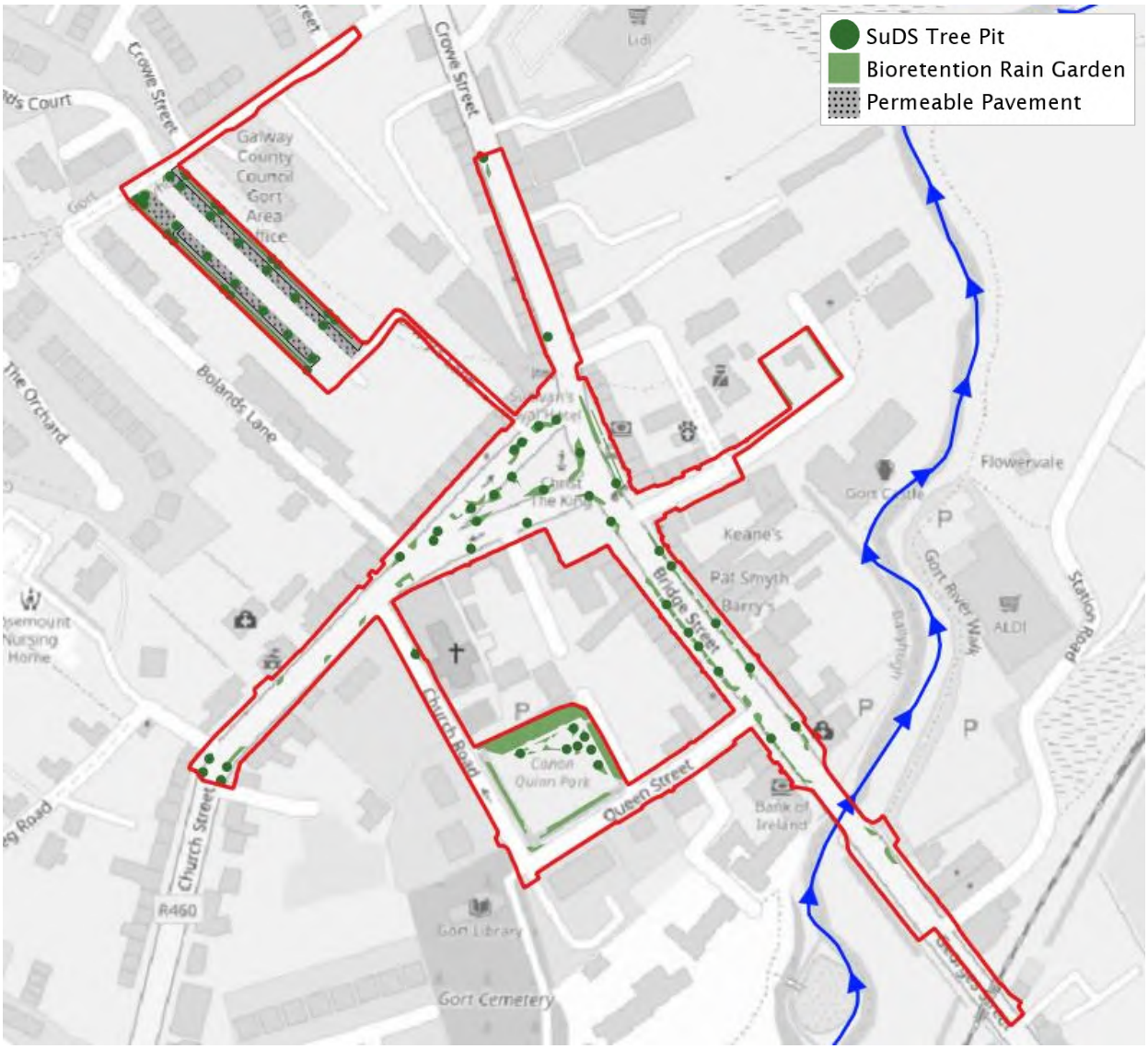
3.1 Hydraulic Assessment

3.1.1 Preamble

A proposed SuDS layout has been undertaken by BDP as part of the landscape plan for the Gort Town Centre Public Realm scheme, as shown in Figure 3.1.

It is noted that the design status is 'concept for planning' and will be subject to detailed design at a later stage. As design is at concept stage a number of assumptions have been made to allow quantity and quality assessment to be undertaken.

Figure 3.1: Proposed SuDS Layout



3.1.2 SuDS Components

The proposed surface water management design presented in Figure 3.1 comprises three types of SuDS components:

- Permeable pavement
- Bioretention rain gardens
- SuDS tree pits

A brief summary of each component and the key design criteria adopted for the purposes of this assessment are summarised as follows.

3.1.2.1 Permeable Pavement

Permeable pavements provide a pavement suitable for pedestrian and / or vehicular traffic allowing rainwater to percolate through the surface into the underlying structural layers. The water is temporarily stored beneath the overlying surface prior to infiltration or controlled discharge downstream.

For this assessment, permeable pavement areas are assumed to be in line with the CIRIA SuDS manual with a 450 mm sub-base of 30% porosity stone. An attenuation system (i.e., no infiltration) has been assumed.

3.1.2.2 Bioretention Rain Gardens

Bioretention systems are shallow landscaped depressions that can reduce runoff rates and volumes as well as treat pollution through the use of filtering runoff through engineered soils and vegetation. The filtered runoff is either collected using an underdrain system or allowed to infiltrate into the surrounding soil. Various planting options can be chosen depending on site conditions.

The depth of bioretention rain garden areas is assumed to be 450 mm engineered soil (15% porosity) with a 150 mm deep underdrain layer (30% porosity). Freeboard of 100 mm (i.e., depth between surrounding hardstanding and top of soil layer) has been included to increase storage, interception, and treatment. An attenuation system (i.e., no infiltration) has been assumed.

3.1.2.3 SuDS Tree Pits

Trees can be planted in a number of SuDS components, or they can be used as a standalone feature within soil-filled tree pits. Tree pits can be designed to collect and attenuate runoff by providing additional storage within the underlying structure of the Tree Pit.

SuDS tree pits proposed as part of this scheme are assumed to be planted in 750 mm depth of soil (15% porosity) with a 150 mm deep underdrain layer (30% porosity). Freeboard of 100 mm (i.e., depth between surrounding hardstanding and top of soil layer) has been included in the assessment. An attenuation system (i.e., not infiltration) has been assumed.

It is noted that the volume of soil required below the surrounding hardstanding area will vary depending on the type of tree chosen, and the tree pit may extend beyond the surface 'plan area' shown on the layout plan to provide the tree with sufficient volume to grow.

3.1.3 Climate Change

The future impacts of climate change on rainfall should be accounted for in the design of a drainage scheme. Requirements for climate change allowances are set out in the OPW's 'Climate Change Sectoral Adaptation Plan' published in 2019, which recommends a 20% uplift in extreme rainfall depths for the Mid-Range Future Scenario (MRFS) and a 30% uplift for the High-End Future Scenario (HEFS).

In line with current best practice, the MRFS allowance is applied for climate change calculations carried out for this assessment.

3.1.4 Controlled Flow Rates

Flow rates are in accordance with the requirements of GDSDS and Galway CC for restriction of post-development runoff to greenfield rates. Greenfield rates were calculated using the Flood Studies

Supplementary Report (FSSR) and Institute of Hydrology Report no. 124 (IoH124) methodologies with catchment-specific characteristics.

Notwithstanding, flows from individual (or hydraulically linked) SuDS features will be controlled to a minimum of 1 lps, which will apply to a number of smaller subcatchments identified within the scheme area. SuDS components will include overflows and consider exceedance routes as part of detailed design.

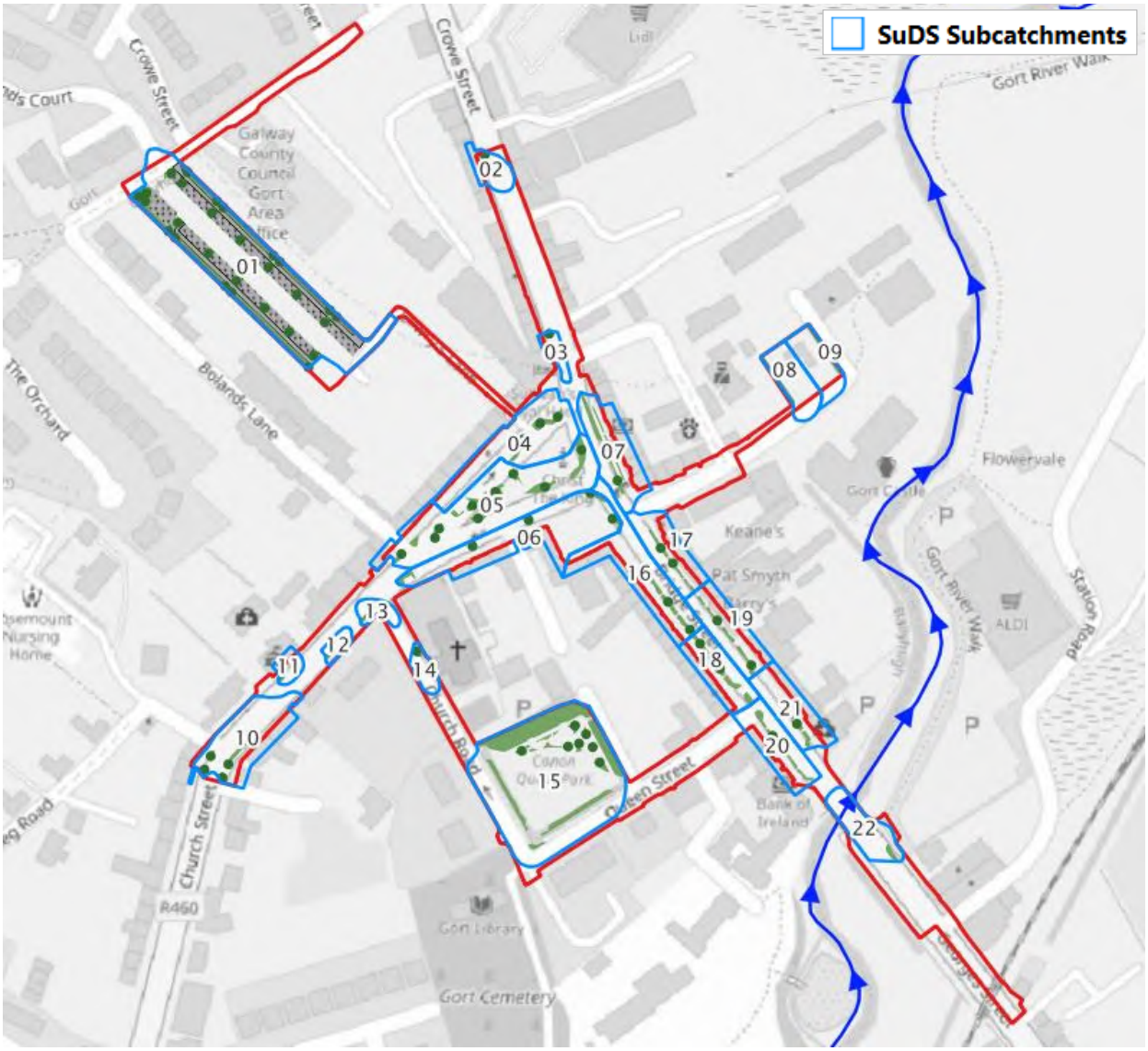
It is noted that based on best available geological / soil data, infiltration is unlikely to be a feasible method of discharge from the site. Site investigation and detailed design should confirm this.

3.1.5 Subcatchments

A subcatchment (i.e., area of contributing hardstanding) has been delineated for each SuDS component or set of hydraulically linked SuDS components (where adjacent SuDS features are located at a similar topographical level) using best available LiDAR height data, the BDP landscape plan for the site and aerial / street view imagery. Figure 3.2 shows the subcatchments for the scheme that have been used as a basis for the hydraulic calculations.

Runoff will be attenuated within each subcatchment, with a limiting controlled flow applied based on the contributing area. It is noted that a number of the subcatchments extend outside the site boundary as the SuDS components are considered likely to receive runoff from those areas.

Figure 3.2: SuDS Subcatchments



3.1.6 Hydraulic Analysis

Hydraulic analysis has been undertaken for each subcatchment shown in Figure 3.2.

Contributing impermeable areas have been calculated by excluding any undrained green space within each subcatchment. Pre-development runoff rates are estimated using the Modified Rational Method equation while post-development runoff for all subcatchments is limited to 1 l/s as all would have a greenfield runoff rate lower than 1 l/s due to the relatively small areas under consideration. Storage provided is based on the characteristics of each component as outlined in Section 3.1.2.

An estimate of the return period stored in each subcatchment has been determined using StormFlow surface water design software. The return period stored is presented as one of the following general design horizons:

- 1 in 1 year
- 1 in 2 year
- 1 in 5 year
- 1 in 10 year
- 1 in 20 year
- 1 in 30 year
- 1 in 50 year
- 1 in 100 year
- 1 in 100 year + 20% (MRFS) allowance for climate change

Table 3.1 summarises the hydraulic performance of each SuDS component or set of hydraulically linked SuDS components with the identified subcatchments.

Table 3.1: Performance Summary for Proposed SuDS Subcatchments

SuDS Subcatchment Reference	Estimated Contributing Impermeable Area (m^2)	Pre-Development Runoff Rate (lps)	Post-Development Runoff Rate (lps)	Storage within component(s)(m^3)	Return Period Stored (prior to overflow)
01	3775	31.33	1	690	3.33% AEP (1 in 30)
02	301	2.49	1	14	3.33% AEP (1 in 30)
03	147	1.22	1	12	1% AEP (1 in 100) + MRFS CC
04	1337	11.09	1	95	10% AEP (1 in 10)
05	2374	19.70	1	266	10% AEP (1 in 10)
06	1721	14.28	1	87	50% AEP (1 in 2)
07	934	7.76	1	87	2% AEP (1 in 50)
08	521	4.33	1	27	5% AEP (1 in 20)
09	493	4.09	1	36	2% AEP (1 in 50)

SuDS Subcatchment Reference	Estimated Contributing Impermeable Area (m^2)	Pre-Development Runoff Rate (lps)	Post-Development Runoff Rate (lps)	Storage within component(s)(m^3)	Return Period Stored (prior to overflow)
10	1126	9.35	1	74	10% AEP (1 in 10)
11	166	1.38	1	6	2% AEP (1 in 50)
12	132	1.10	1	6	1% AEP (1 in 100)
13	174	1.45	1	6	2% AEP (1 in 50)
14	188	1.56	1	12	1% AEP (1 in 100)
15	1062	8.82	1	578	1% AEP (1 in 100) + MRFS CC
16	1251	7.64	1	58	50% AEP (1 in 2)
17	698	5.79	1	38	10% AEP (1 in 10)
18	675	5.60	1	69	1% AEP (1 in 100)
19	763	6.33	1	54	5% AEP (1 in 20)
20	742	6.16	1	45	5% AEP (1 in 20)
21	726	6.03	1	27	20% AEP (1 in 5)
22	565	4.69	1	25	10% AEP (1 in 10)

3.2 Water Quality Assessment

3.2.1 Simple Index Approach

The Simple Index Approach outlined in Section 26.7.1 of the CIRIA SuDS Manual has been used to assess SuDS performance in relation to proposed land use. The purpose of this method is to determine whether the proposed SuDS features are appropriate for the intended land use or mitigation.

Step 1: Define Pollution Hazard Indices

Table 3.2 summarises the pollution hazard indices for the proposed land uses. It is based on Table 26.2 of the CIRIA SuDS Manual.

Table 3.2: Pollution Hazard Indices for Proposed Land Uses

Proposed Land Use	Pollution Hazard Level	Pollution Mitigation Indices *		
		Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential or commercial roofs	Very Low – Low	0.2 – 0.3	0.2 (up to 0.8 where there is potential for leaching of metals from roofs)	0.05
Car Parks, low traffic roads, non-residential car parking with infrequent change (i.e., <300 traffic movements per day)	Low	0.5	0.4	0.4
Commercial yards and delivery areas, car parking with frequent change (e.g., retail), roads except low traffic roads and trunk roads and motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution, trunk roads and motorways	High	0.8	0.8	0.9

** Indices range from 0 (no pollution hazard) to 1 (high pollution hazard).*

Step 2: Determine SuDS Pollution Mitigation Indices

Table 3.3 summarises the indicative pollution mitigation indices for the proposed SuDS components. It is based Table 26.3 of the CIRIA SuDS Manual.

Table 3.3: Pollution Mitigation Indices for Proposed SuDS

SuDS Feature	Treatment Indices		
	TSS	Metals	Hydrocarbons
Permeable Pavement	0.7	0.6	0.7
Bioretention Rain Garden	0.8	0.8	0.8
SuDS Tree Pit	0.8	0.8	0.8

Step 3: Assess Total SuDS Mitigation Index

To deliver adequate treatment, the proposed SuDS components should have a total pollution mitigation index equal to or greater than the pollution hazard index for each contaminant type (i.e., TSS, metals, and hydrocarbons). It is noted that SuDS components only deliver these indices if they follow the hydraulics and treatment design guidance set out in the CIRIA SuDS Manual.

Table 3.4 sets out that the proposed SuDS components would provide sufficient mitigation for both 'low' and 'medium' pollution hazard level developments. While parts of the proposed development may be considered 'low' pollution, a precautionary approach would be to consider all areas as 'medium' which the proposed SuDS components can address.

The hydraulic analysis has indicated that the SuDS structures can be designed to have a capacity for the 1 in 1 year rainfall event without overflowing or bypassing the structure. It is estimated that approximately 81% of the scheme area passes through a SuDS structure and therefore has treatment provided.

Table 3.4: Interception Assessment for Proposed SuDS Components

SuDS Feature	Treatment Indices			Meets Water Quality Treatment Guidance Requirements?	
	TSS	Metals	Hydro-carbons	Low Pollution Hazard Level	Medium Pollut'n Hazard Level
Permeable Pavement	0.7	0.6	0.7	Yes	Yes
Bioretention Rain Garden	0.8	0.8	0.8	Yes	Yes
SuDS Tree Pit	0.8	0.8	0.8	Yes	Yes

4 SUMMARY

4.1 Summary and Conclusion

The purpose of this SuDS Assessment was to quantitatively evaluate the SuDS features proposed as part of the Gort Town Centre Public Realm scheme. The assessment considered both the hydraulic and treatment performance of the proposed SuDS components.

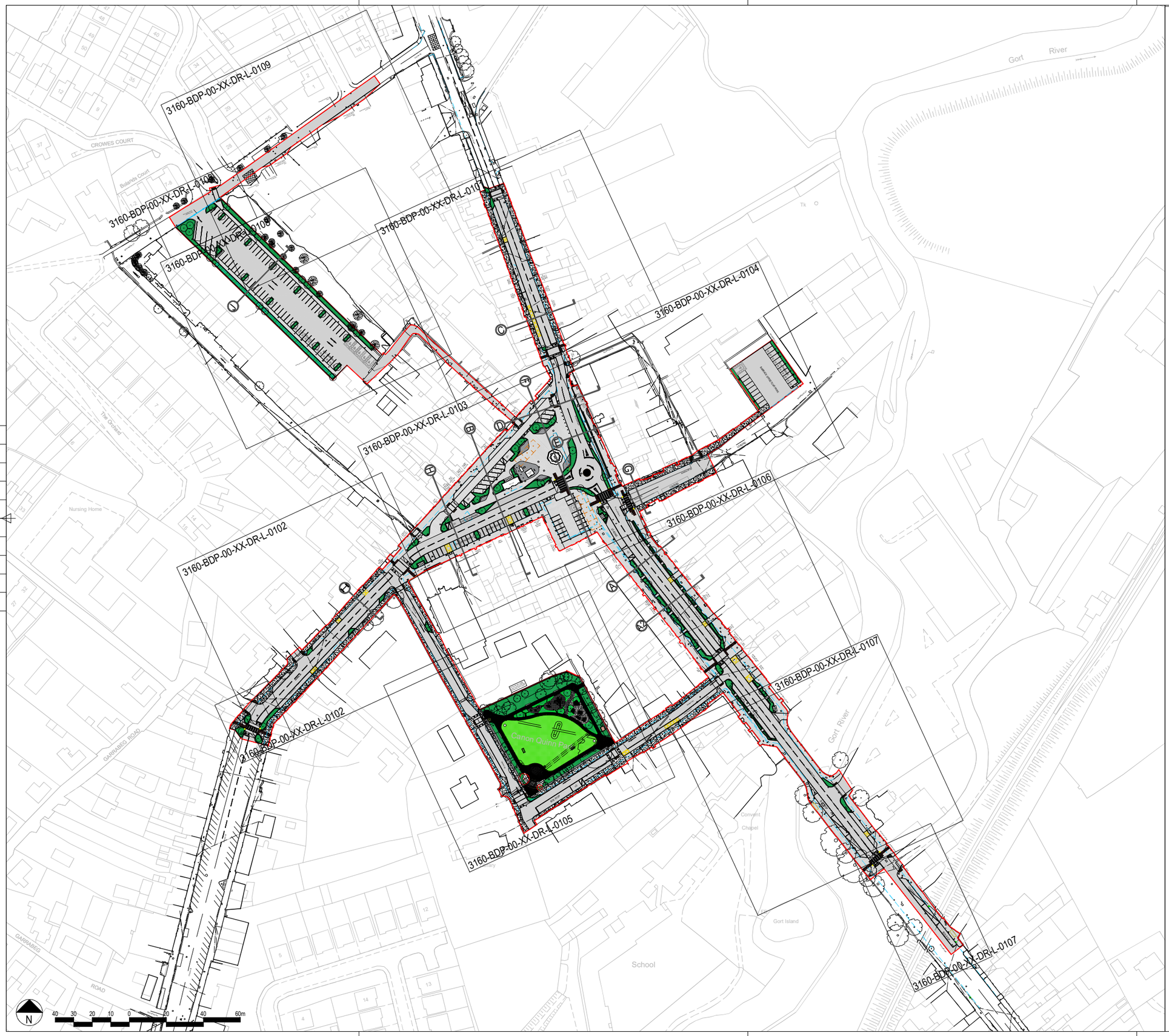
This assessment considered the areas that incorporate SuDS and areas that contribute to a proposed SuDS features (i.e., contributing subcatchments) which is estimated to approximate to c. 80% of the Gort Town Centre Public Realm scheme.

The assessment indicates that the proposed SuDS components provide significant quantity and quality benefits compared to the existing pre-development scenario.

The hydraulic benefit will vary depending on the available storage at each SuDS component (or hydraulically linked SuDS component). It is noted that this assessment provides an early indication and outcomes (particularly around the hydraulic assessment) may be influenced through the development of the design. Storage provision may be reduced due to presence of utilities for example or increased through allocation of additional storage as part of the design process.

Appendix A

Site Drawings



KEY

- EXTENT OF PROJECT BOUNDARY
- NATURAL STONE PAVING - PAVING SIZE VARIES ACCORDING TO USE
- CONCRETE BLOCK PAVING
- INSITU EXPOSED AGGREGATE CONCRETE WITH SETT BAND
- VEHICULAR GRADE ASPHALT
- VEHICULAR GRADE ASPHALT WITH ROLLED BUFF CHIPPINGS
- FEATURE PAVING
- PERMEABLE GRAVEL RETENTION SURFACE
- PERMEABLE CONCRETE BLOCK PAVING
- FEATURE PAVING SETTS
- RED TACTILE BLISTER PAVING TO CONTROLLED AND ZEBRA CROSSINGS
- BUFF TACTILE BLISTER PAVING TO UNCONTROLLED CROSSINGS
- Kx — "K1" 100mm UPSTAND KERB "K0" FLUSH KERB
- K3 K50 — "K3" EDGING KERB "K50" 50mm HIGH CHAMFERED KERB
- KT — "KT" TRANSITION KERB
- RT — "RT" RAISED TABLE TO PEDESTRIAN CROSSING POINTS
- TS — "TS" TRAFFIC SIGN
- PS — "PS" PARKING SIGN
- BB — "BB" BELISHA BEACON
- PBB — "PBB" PUSH BUTTON CONTROLLED CROSSING
- CS — "CS" CYCLE STANDS
- B1 — "B1" EXISTING STONE BOLLARDS RELOCATED
- B2 — "B2" EXISTING STONE BOLLARDS TO BE RETAINED IN PLACE
- BR — "BR" PROPOSED REMOVABLE BOLLARDS
- SW — "SW" SEAT WALL WITH BACKRESTS
- Sx — "S1" PROPOSED BENCH "S2" PROPOSED BENCH WITH BACKREST
- TM — "TM" TOTEM MAP
- WF — "WF" WAYFINDING SIGNAGE
- PB — "PB" EXISTING POST BOX
- ETM / RTM — "ETM" EXISTING TICKET MACHINE "RTM" RELOCATED TICKET MACHINE
- BN — "BN" PROPOSED BINS
- U — "U" PROPOSED POP-UP 5M UMBRELLA
- Lx — "L1" 8M HIGH LIGHTING COLUMN WITH SINGLE LUMINAIRE "L2" 6m HIGH COLUMN WITH SINGLE LUMINAIRE "LW" LOW LEVEL WALL LIGHT
- WLx — "WL1" 4m HIGH COLUMN WITH SINGLE HEAD LUMINAIRE "WL2" 3m HIGH COLUMN WITH SINGLE HEAD LUMINAIRE
- L3 — "L3" 6m HIGH COLUMN WITH MULTI-HEAD LUMINAIRE
- BSP — BUS STOP POLE AND SIGN
- EXISTING TREES
- PROPOSED STREET TREES
- PROPOSED PLANTING MIXES OF SHRUBS AND GROUND COVER (300-500mm HIGH)
- EXISTING KERB LINE
- 25.95EX — "EX" EXISTING SPOT LEVEL RETAINED
- 25.80 — PROPOSED SPOT LEVEL

NOTES

TO BE READ IN CONJUNCTION WITH:
3160-BDP-00-XX-DR-L-0101 - GENERAL ARRANGEMENT 1 OF 9
3160-BDP-00-XX-DR-L-0102 - GENERAL ARRANGEMENT 2 OF 9
3160-BDP-00-XX-DR-L-0103 - GENERAL ARRANGEMENT 3 OF 9
3160-BDP-00-XX-DR-L-0104 - GENERAL ARRANGEMENT 4 OF 9
3160-BDP-00-XX-DR-L-0105 - GENERAL ARRANGEMENT 5 OF 9
3160-BDP-00-XX-DR-L-0106 - GENERAL ARRANGEMENT 6 OF 9
3160-BDP-00-XX-DR-L-0107 - GENERAL ARRANGEMENT 7 OF 9
3160-BDP-00-XX-DR-L-0108 - GENERAL ARRANGEMENT 8 OF 9
3160-BDP-00-XX-DR-L-0109 - GENERAL ARRANGEMENT 9 OF 9

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P00 FIRST ISSUE DRAFT PLANNING	IF	MK	01.09.23

KEY PLAN

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GORT TOWN CENTRE

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P04

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