Drainage Design Report

Athlone Link Road Phase 2 - Coosan Point to The Cresence

On behalf of **Westmeath County Council**

Prepared by

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Civil
Structural
Traffic

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DOCUMENT CONTROL

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Report By: .....

Stuart Summerfield

Date 02/07/2025

Approved By: .....

Francis Fidgeon

Chartered Engineer

Date 02/07/2025

1. INTRODUCTION

PUNCH Consulting Engineers / CST Group were appointed by Westmeath County Council to provide detailed designs for the provision of Phase 2 of a new link road from Coosan Point to The Crescent, Athlone. The provision of the new link road will also provide additional parking areas within the CIE bus depot. The works will result in increased hard paved areas and increased surface water run-off to the storm water drainage network. This report outlines the storm and foul water drainage design for the proposals.

2. SURFACE WATER MANAGEEMENT

2.1 Existing Surface Water Drainage Regime

The site comprises of the existing CIE bus depot and undeveloped, greenfield land which gently slopes generally from east to west. There are a number of shallow open channels flowing across the lands towards a culvert on the western side of the lands. This culvert crosses under the Southern Station Road and connects with an open drain to the south of the Corrib Oil depot. This open drain is understood to ultimately discharge to the River Shannon nearby. It is likely the surface water run-off from the existing CIE depot and the housing development to the south of the subject land discharges to this drainage network.

Local knowledge suggests the lands are subject to occasional flooding. Reference to the OPW Floodmaps indicates historic flood events are recorded at the Railway Bridge on Coosan Point Road but no recordings are found for these subject lands.

Figure 1: OPW Floodmaps Extract

PH McCarthy Consulting Engineers produced designs for the Athlone Main Drainage Scheme in 2006. Part of the PH McCarthy proposals is to provide upgraded storm drainage networks for the lands to the north of the subject site. These upgraded sewers are routed through the CIE lands and discharge to the same storm water culvert under the Southern Station Road.

2.2 Surface Water Drainage Discharge Options

The following options have been considered for storm water drainage of these lands.

Option 1 – Infiltrate to Groundwater
Infiltration tests have not been undertaken on the site, however from inspection of trial pits and local knowledge suggests the use of soak-aways on this site are not viable.

Option 2 – Discharge into the Existing Storm Water drain to the west.
The open drain / culvert to the western side of the lands currently receives the storm water for the subject lands, the housing development to the south and the lands to the north. The development lands generally fall from the east to the west in the direction of this open drain. In order to ensure downstream flooding does not result from the increased run-off rate from the increased hard paved surfacing, any discharge to this ditch should be controlled to pre-development run-off rates.

In view of the assessment of these options it was decided in order to best replicate the existing drainage path and the goals of SuDS best management practises to discharge the storm water run-off to the existing open drain to the west. In order to replicate existing run-off rates on-site attenuation should be provided together with a restrictor on the drainage train prior to the outfall to ensure run-off is controlled to pre-development or local authority dictated run-off rates.
The PH McCarthy proposals should remain unaffected by the current link road and CIE bus depot expansion works.
The drainage attenuation system should be sized sufficient to accommodate all storm durations and intensities up to the 1:30 year storm without surface water leaving the site.
The green field predevelopment run-off from the lands should be no greater that outlined in the Flood Studies Report. The areas of additional hard paved impermeable surface are shown in **Appendix A** and the estimated run-off from these lands are shown in **Appendix B.**
The post development run-off should be no greater than this figure.

2.3 Surface Water Drainage Strategy

A surface water drainage strategy has been prepared in accordance with the general design principles set out below and in general compliance with TII standard DN-DNG-03066 'Design of Earthworks, Drainage, Network Drainage, Attenuation & Pollution Control' and also the Irish Water document 'Code of Practice for Wastewater Infrastructure'. The strategy has been prepared based on the catchment areas/boundaries as defined by existing site topography.

The strategy comprises a conventional, gravity piped drainage system that will collect and convey surface water run-off arising from the catchment. The design levels and drainage layout are such that the designed system will discharge via gravity to the outfall location.

The works consist of two distinctly separate areas. One being the link road, that will remain in Local Authority ownership, and the other being the CIE bus depot as shown in **Appendix A**.

Due to the requirement to control the outflow of water from the site to no greater than pre-development levels, the storm network will discharge via underground attenuation tanks in advance of the discharge point. The discharge will be controlled by a Hydro-brake to limit flows equivalent to green field run-off. As the two separate development areas will have two difference owners, the attenuation and flow controls will be separate and located within the ownership boundary of the developments.

The lagoons will be sized to accommodate surface water run-off arising from the new hard paved surface areas of the two separate development sections for up to and including the 1-in-30 year rainfall event, plus an allowance for climate change (20%). Exceptional events in excess of the 1:30 year storm may overtop the discharge control (Hydrobrake) and result in short term uncontrolled flows towards the culvert. This however will not impact the surrounding residential dwellings.

2.4 Design Parameters

This section sets out the design parameters that have been used in the design of the surface water drainage pipe network and surface water balancing measures serving the proposed development.

2.4.1 Limiting/Allowable Discharge Rate

The greenfield run-off rates from the lands to be developed have been calculated utilising the Institute of Hydrology Report 124 (IoH124) 'Flood Estimation for Small Catchments (1994)' methodology and catchment specific rainfall parameters derived from the Flood Estimation Handbook (FEH) – see **Appendix A** for Greenfield Run-off Rate Estimation. In order to determine run-off rates the permeability of the soil should first be determined. The flood studies report (NERC 1975) divides soil types into 5 categories:

- SOIL Type 1 = SPR 0.1 (sandy highly permeable material);
- SOIL Type 2 = SPR 0.3;
- SOIL Type 3 = SPR 0.37;
- SOIL Type 4 = SPR 0.47 (heavy clay);
- SOIL Type 5 = SPR 0.53 (which is rarely applied) is exposed rock.

The default soil type for the site, as used by the HR Wallingford software, which is derived from the Irish SuDS map, is Type 4. The existing lands for locating the link road are known to be boggy and often submerged and therefore have zero capacity for soakage. Therefore, it is considered more appropriate to use and index of 5 for these lands. SOIL type 4 is considered appropriate for the CIE element of the development. Calculations are provided in **Appendix B**.

Return Period	Greenfield Run-off Rate i/sec/Ha	Greenfield Run-off Rate – Link Road Catchment Area 0.534Ha (i/sec)
Q_{bar}	10.00	5.34
Q_{30}	16.50	8.81
Q_{100}	19.51	10.42

Table 1. Greenfield Run-off for Link Road Lands

Return Period	Greenfield Run-off Rate i/sec/Ha	Greenfield Run-off Rate – Link Road Catchment Area 0.534Ha (i/sec)
Q_{bar}	7.71	6.09
Q_{30}	12.72	10.05
Q_{100}	15.02	11.87

Table 2. Greenfield Run-off for Additional CIE Lands

The surface water drainage strategy for developments generally assume that surface water outflows are limited to the mean annual run-off rate (Qbar) for all storm events up to and including the 1:30-year return period and therefore providing betterment to the downstream receiving network.

Discharge from both development parcels to the open drain / culvert will be controlled by way of a Hydrobake located on the two drainage trains, adjacent to the attenuation tanks. Surplus flow will back-up in the tanks for temporary storage.

2.4.2 Volumetric Run-off Coefficient for Design of the Attenuation Provision

An onerous volumetric runoff coefficient (Cv) of 0.9 has been utilized in the sizing of the surface water pipes and simulated for the 1:30 year storm using a Cv of 1.0.

2.4.3 Impermeable Areas

The proposed impermeable areas associated with the development proposals have been taken from the site layout plan for the development as shown in **Appendix A**. It has been assumed that 100% of the new paved area will be impermeable and the run-off from this area will be routed via an underground pipe network to the outfall. The total areas contributing to the storm drainage network comprise impermeable areas such as roads and hard standing.

2.4.4 Piped Surface Water Drainage System

The proposed surface water drainage system will comprise a network of pipes which will be designed and constructed in accordance with the requirements of Irish Water, the Department of the Environment and Local Government's 'Recommendations for Site Development Works for Housing Areas' and/or the TII 'Specification for Road Works' and also subject to the approval of Westmeath County Council.

2.4.5 Modified Rational Method

The Modified Rational Method has been used for the design of the drainage network by use of the 'MicroDrainage' software. Calculations for the surface water drainage catchment are included in **Appendix B**. These set out catchment and impermeable areas. The calculations also outline the maximum and minimum pipe velocities.

2.4.6 Pipe Flows and Discharge Rates

Calculations for the pipe flows and discharge rates are shown in **Appendix C** for the two systems. Analysis found the critical storm for the Link Road occurs during the 120-minute duration storm and the 480-minute duration storm for the CIE lands. These events have been assessed for the 1:30 year return period storm. Details of the general arrangement/configuration of the surface water drainage infrastructure is shown on drawing number 120278-501 in **Appendix D**.

2.5 Contaminates

2.5.1 Hydrocarbons

Removal of hydrocarbons from the surface water drainage network will be achieved by use of trapped road gullies on the road network and a by-pass interceptor for the CIE lands, where there is greater risk of hydrocarbons from parked vehicles. The proposed interceptor is a Kingspan NSFA125 – see **Appendix E** for details. This has been sized to accommodate surface water flows from all additional hard paved areas within the CIE development.

2.6 Maintenance

2.6.1 Detritus and Silts

The storm water drainage network utilises conventional road gullies. Detritus and silts can gather in the gullies and other inlets to the underground drainage network. The proposed Hydrobrake restrictors incorporates a small-bore orifice that may restrict passage of larger elements of detritus. Without regular maintenance this small bore may become blocked. Storm water would then back-up into the attenuation tanks and eventually overtop the underground network.

It will be the responsibility of the local authority and CIE to undertake regular inspections of the Hydrobrake chamber and clear any gathering detritus.

3. FOUL WATER MANAGEMENT

3.1 Existing Foul Water Drainage Regime

There is an existing foul water sewer running through the CIE lands. These lands are proposed to be used for long term parking of CIE vehicles.

3.2 Foul Water Drainage Proposals

The provision of the link road adjacent and to the south of the CIE lands creates opportunity to divert the existing foul water sewer into local authority owned lands.

The proposed works divert the existing sewer to be within the link road. The new diversion connects to the existing foul sewer to the west of the land, near Coosan Point Road.

Calculations are provided in **Appendix E**.

4. CONCLUSION

4.1 Existing Undeveloped Lands

The existing lands incorporate the existing CIE bus depot and undeveloped green field lands. There is an existing storm sewer within the CIE depot that discharges to an open drain that runs through the undeveloped lands towards a culvert under Southern Station Road and ultimately discharges to the River Shannon.
Some of the undeveloped lands are known to be boggy and parts are sometimes underwater.
PH McCarthy Consulting Engineers have developed a Main Drainage design for improvements to the storm drainage network to the north of the subject lands.
There is an existing foul sewer crossing the CIE lands to a manhole adjacent to Coosan Point Road.

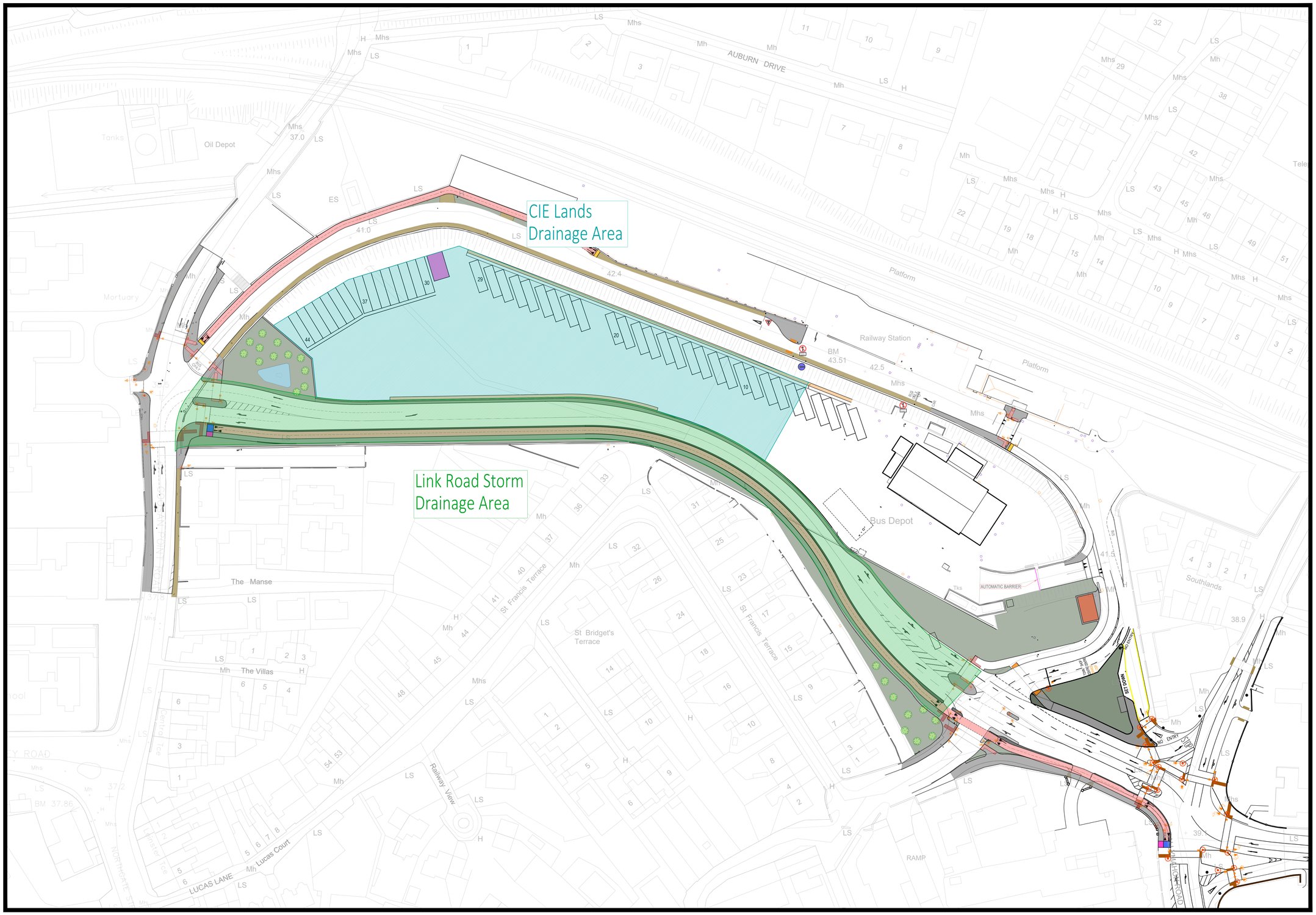
4.2 Post Development

To provide an impact-neutral drainage strategy for the storm water from any additional hard paved surfaces resultant from this development the surface water run-off will be routed to the existing outfall at the culvert under the Southern Station Road. Surface water run-off from the development will be controlled to rates equivalent green-field run-off rates.

All storms up to and including the 1:30 year return period storm will be attenuated and contained within underground attenuation tanks.

The PH McCarthy proposals will remain separate to the drainage network proposed for this development.
In order to locate as much of the foul sewer within local authority as possible, the works will divert the foul sewer to be located within the proposed link road.

APPENDIX A
Storm Drainage Catchment Areas



N

PL1	CHANGE OF TITLEBLOCK TEMPLATE	SMD	30.06.25
REV.	AMENDMENT	BY	DATE

DRAWN:	KL	TECH. CHECK:	KF
SCALE @ A0:	1:500	ENG. CHECK:	SS
DATE:	09.06.21	APPROVED:	FF
STAGE:	PLANNING		

JOB TITLE: ATHLONE LINK ROAD

DRAWING TITLE: STORM DRAINAGE CATCHMENT AREAS

CLIENT: WESTMEATH COUNTY COUNCIL

DRAWING No: 120278-SK-500

REV: PL1

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Appendix B1
Greenfield Run-off Estimation – Link Road

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Stuart summerfield
Site name:	120278 Athlone Link Road
Site location:	Athlone

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.42693° N
Longitude:	7.93882° W
Reference:	1971078906
Date:	Nov 27 2020 15:00

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): .534

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	5
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.53

Hydrological characteristics

	Default	Edited
SAAR (mm):	1044	1044
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	4.12	5.34
1 in 1 year (l/s):	3.5	4.54
1 in 30 years (l/s):	6.79	8.81
1 in 100 year (l/s):	8.02	10.42
1 in 200 years (l/s):	8.85	11.48

Appendix B2
Greenfield Run-off Estimation – CIE Lands

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Stuart summerfield
Site name:	CIE Depot
Site location:	Athlone Town |Centre

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.42693° N
Longitude:	7.93901° W
Reference:	1564424785
Date:	Jul 29 2021 09:18

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.79

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1044	1044
Hydrological region:	13	13
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	1.65	1.65
Growth curve factor 100 years:	1.95	1.95
Growth curve factor 200 years:	2.15	2.15

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	6.09	6.09
1 in 1 year (l/s):	5.18	5.18
1 in 30 years (l/s):	10.05	10.05
1 in 100 year (l/s):	11.87	11.87
1 in 200 years (l/s):	13.09	13.09

APPENDIX C1
Network Analysis – Storm Network – Link Road

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 120278 LINK ROAD STORM 2020 11 27.SWS

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	Add Flow / Climate Change (%)	20
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.300	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.900	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for 120278 LINK ROAD STORM 2020 11 27.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	52.007	0.260	200.0	0.091	5.00	0.0	0.600	o	225
1.001	36.145	0.181	200.0	0.067	0.00	0.0	0.600	o	225
1.002	51.581	0.258	200.0	0.065	0.00	0.0	0.600	o	300
1.003	64.402	0.322	200.0	0.181	0.00	0.0	0.600	o	300
2.000	48.884	0.244	200.3	0.130	5.00	0.0	0.600	o	225
1.004	51.936	0.260	200.0	0.000	0.00	0.0	0.600	o	375

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.94	37.900	0.091	0.0	0.0	3.0	0.92	36.6	17.7
1.001	50.00	6.60	37.640	0.158	0.0	0.0	5.1	0.92	36.6	30.8
1.002	48.21	7.37	37.384	0.223	0.0	0.0	7.0	1.11	78.3	41.9
1.003	45.59	8.34	37.126	0.404	0.0	0.0	12.0	1.11	78.3	71.8
2.000	50.00	5.89	36.700	0.130	0.0	0.0	4.2	0.92	36.6	25.3
1.004	43.95	9.02	36.306	0.534	0.0	0.0	15.3	1.28	141.1	91.5

Free Flowing Outfall Details for 120278 LINK ROAD STORM 2020 11 27.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	6	36.850	36.046	36.065	0	0

Simulation Criteria for 120278 LINK ROAD STORM 2020 11 27.SWS

Volumetric Runoff Coeff	0.900	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	20.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Run Time (mins)	240
Hot Start Level (mm)	0	Output Interval (mins)	4
Manhole Headloss Coeff (Global)	0.500		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.900
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	120
Ratio R	0.300		

Online Controls for 120278 LINK ROAD STORM 2020 11 27.SWS

Hydro-Brake® Manhole: 5, DS/PN: 1.004, Volume (m³): 9.3

Design Head (m)	0.900	Diameter (mm)	99
Design Flow (l/s)	5.3	Invert Level (m)	36.306
Hydro-Brake® Type	Md6 SW Only		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	1.200	6.1	3.000	9.7	7.000	14.8
0.200	4.6	1.400	6.6	3.500	10.5	7.500	15.3
0.300	4.5	1.600	7.1	4.000	11.2	8.000	15.8
0.400	4.3	1.800	7.5	4.500	11.9	8.500	16.3
0.500	4.3	2.000	7.9	5.000	12.5	9.000	16.8
0.600	4.5	2.200	8.3	5.500	13.1	9.500	17.2
0.800	5.0	2.400	8.7	6.000	13.7		
1.000	5.6	2.600	9.0	6.500	14.3		

Storage Structures for 120278 LINK ROAD STORM 2020 11 27.SWS

Tank or Pond Manhole: 5, DS/PN: 1.004

Invert Level (m) 36.306

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	80.0	0.750	80.0

Summary of Results for 120 minute 30 year Summer (120278 LINK ROAD STORM 2020 11 27.SWS)

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	OFF

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	38.008	-0.117	0.000	0.46	0.0	16.1	OK
1.001	2	38.003	0.138	0.000	0.81	0.0	27.9	SURCHARGED
1.002	3	37.996	0.311	0.000	0.52	0.0	38.8	SURCHARGED
1.003	4	37.990	0.564	0.000	0.84	0.0	62.5	SURCHARGED
2.000	7	37.986	1.061	0.000	0.58	0.0	20.4	FLOOD RISK
1.004	5	37.979	1.298	0.000	0.06	0.0	7.2	SURCHARGED

APPENDIX C2
Network Analysis – Storm Network – CIE Lands

1 O'Connell St Sligo F91 W7YV	120278 CIE depot Athlone	
Date 2021 07 29 File 120278 CIE Bus De... Elstree Computing Ltd	Designed By SS Checked By Network W.12.4	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	2	Add Flow / Climate Change (%)	20
M5-60 (mm)	14.500	Minimum Backdrop Height (m)	0.750
Ratio R	0.300	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Volumetric Runoff Coeff.	0.900	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	120.000	0.800	150.0	0.500	5.00	0.0	0.600	o	300
1.001	30.500	0.819	37.2	0.100	0.00	0.0	0.600	o	300
2.000	46.000	0.844	54.5	0.190	5.00	0.0	0.600	o	300
1.002	26.000	0.173	150.0	0.000	0.00	0.0	0.600	o	375
1.003	2.000	0.013	150.0	0.000	0.00	0.0	0.600	o	375

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	40.86	6.56	38.500	0.500	0.0	0.0	13.3	1.28	90.6	79.7
1.001	40.34	6.76	37.700	0.600	0.0	0.0	15.7	2.58	182.7	94.4
2.000	44.38	5.36	37.800	0.190	0.0	0.0	5.5	2.13	150.9	32.9
1.002	39.61	7.05	36.806	0.790	0.0	0.0	20.3	1.48	163.1	122.0
1.003	39.55	7.07	36.633	0.790	0.0	0.0	20.3	1.48	163.1	122.0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.003		38.100	36.619	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.900	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	20.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Run Time (mins)	960
Hot Start Level (mm)	0	Output Interval (mins)	8
Manhole Headloss Coeff (Global)	0.500		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0		

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.900
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	14.500	Storm Duration (mins)	480
Ratio R	0.300		

Online Controls for Storm

Hydro-Brake® Manhole: 5, DS/PN: 1.003, Volume (m³): 4.0

Design Head (m)	0.450	Diameter (mm)	118
Design Flow (l/s)	6.1	Invert Level (m)	36.633
Hydro-Brake® Type	Md5 SW Only		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.7	1.200	9.2	3.000	14.5	7.000	22.2
0.200	5.9	1.400	9.9	3.500	15.7	7.500	22.9
0.300	6.0	1.600	10.6	4.000	16.8	8.000	23.7
0.400	5.9	1.800	11.2	4.500	17.8	8.500	24.4
0.500	6.2	2.000	11.9	5.000	18.7	9.000	25.1
0.600	6.6	2.200	12.4	5.500	19.7	9.500	25.8
0.800	7.5	2.400	13.0	6.000	20.5		
1.000	8.4	2.600	13.5	6.500	21.4		

Storage Structures for Storm

Tank or Pond Manhole: 5, DS/PN: 1.003

Invert Level (m) 36.633

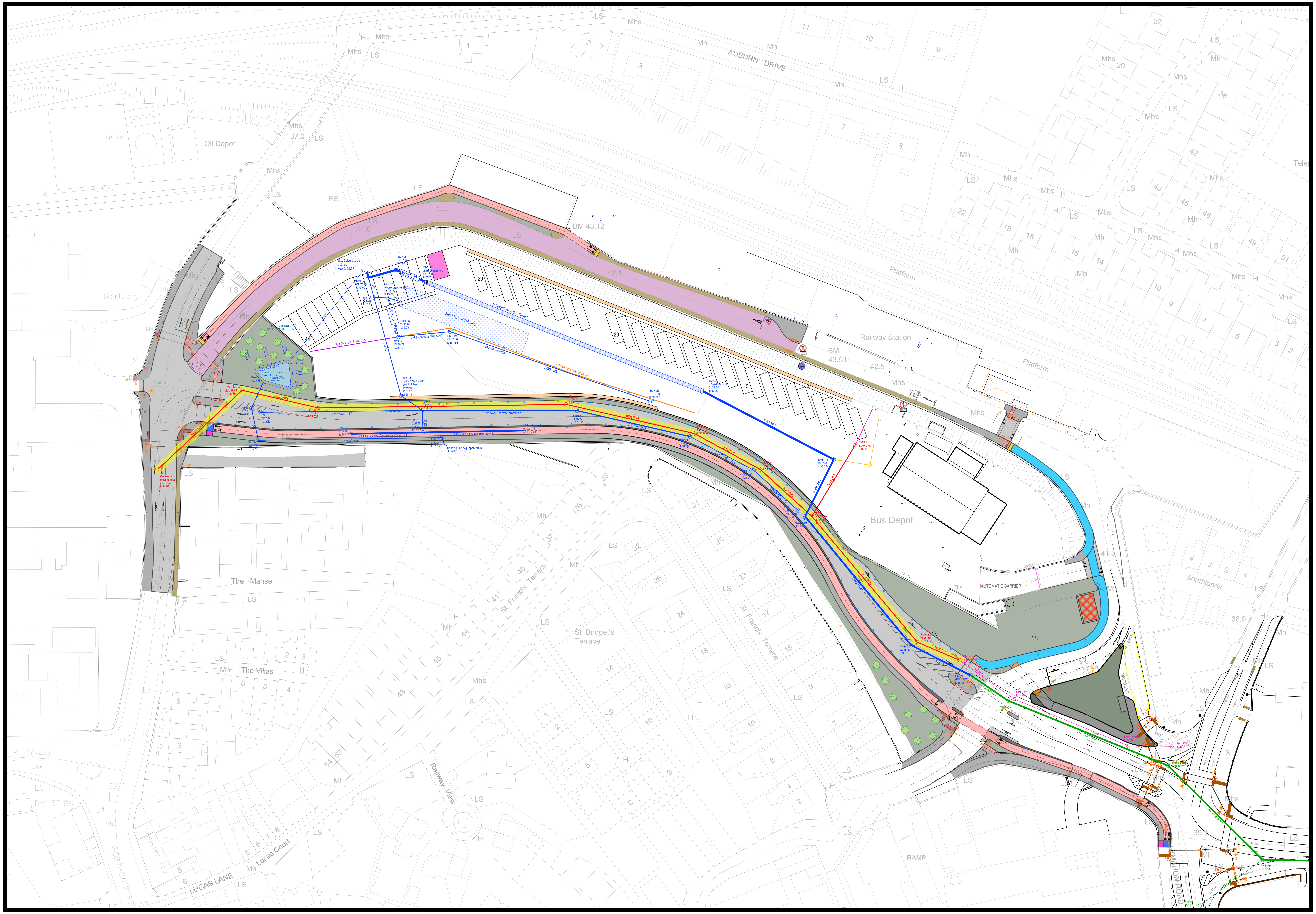
Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	360.0	0.450	360.0

Summary of Results for 480 minute 30 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	38.620	-0.180	0.000	0.34	0.0	30.1	FLOOD RISK
1.001	2	37.794	-0.206	0.000	0.22	0.0	36.1	OK
2.000	3	37.857	-0.243	0.000	0.08	0.0	11.4	FLOOD RISK
1.002	4	37.297	0.116	0.000	0.33	0.0	47.0	FLOOD RISK
1.003	5	37.292	0.285	0.000	0.08	0.0	6.8	FLOOD RISK

APPENDIX D
Storm Drainage Network Drawing



KEY:

- PROPOSED STORM SEWER
- PROPOSED FOUL SEWER
- PROPOSED ROAD GULLY
- PROPOSED SLOT CHANNEL
- PROPOSED DISHED CONCRETE CHANNEL
- PROPOSED STORM & FOUL PCC MANHOLE D400 COVER
- UISCE EIREANN EASEMENT
- EXISTING STORM SEWER
- EXISTING PHASE1 STORM SEWER
- EXISTING FOUL SEWER

REV.	AMENDMENT	BY	DATE
PL1	CHANGE OF TITLEBLOCK TEMPLATE	SMD	30.06.25

DRAWN:	KL	TECH. CHECK:	KF
SCALE @ A0:	1:500	ENG. CHECK:	SS
DATE:	09.06.21	APPROVED:	FF
STAGE:	PLANNING		

JOB TITLE: ATHLONE LINK ROAD

DRAWING TITLE: DRAINAGE LAYOUT

CLIENT: WESTMEATH COUNTY COUNCIL

DRAWING No: 120278-501

PUNCH consulting engineers

REV: PL1

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