

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

Revision History:		RO	R1	R2			
Purpose of Issue:	P=Preliminary C=Comment I=Information FC=Fire Cert PL=Planning T=Tender CT=Contract CN=Construction	Ι	I	PL			
Date:		11	20	02			
		07	01	07			
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Originator:		SS	РВ	РВ			
Checked By:		FF	FF	FF			
Approved By:		FF	FF	FF			

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Stuart Summerfield

Date

Report By:

02/07/2025

Approved By:

tranis tie 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 Lan

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



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REV.	AMENDME	NT		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 DRAINA	GE CATCH	MENT	AREAS
CLIENT:	WESTMEATH CO	DUNTY COL	JNCIL	
DRAWING No:	120278-Sk	K-500		
P			REV:	PL1
Char	STGreet Consulting	DUP Engineers	SLIGO F91 W IRELA +353 info@d	7YV







Appendix B1 Greenfield Run-off Estimation – Link Road



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.

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Site Details

Reference:

Date:

Latitude:	53.42693° N
Longitude:	7.93882° W

1971078906

Nov 27 2020 15:00

Runoff estimation app	roach	IH124		
Site characteristics				Notes
Total site area (ha):		.534		(1) Is Q _{BAR} < 2.0 I/s/ha?
Methodology				
Q _{BAR} estimation method: SPR estimation method:	Calculate fro			When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.
Soil characteristics		Default	Edited	
SOIL type:		4	5	(2) Are flow rates < 5.0 l/s?
HOST class:		N/A	N/A	Where flow rates are less than 5.0 l/s consent for discharge is
SPR/SPRHOST:		0.47	0.53	usually set at 5.0 l/s if blockage from vegetation and other
Hydrological characte	ristics	Default	Edited	materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.
SAAR (mm):		1044	1044	(3) Is SPR/SPRHOST ≤ 0.3?
Hydrological region:		13	13	
Growth curve factor 1 year:		0.85	0.85	Where groundwater levels are low enough the use of soakaways
Growth curve factor 30 year	'S:	1.65	1.65	to avoid discharge offsite would normally be preferred for disposal of surface water runoff.
Growth curve factor 100 yea	ars:	1.95	1.95	
Growth curve factor 200 yea	ars:	2.15	2.15	

Greenfield runoff rates		
	Default	Edited
Q _{BAR} (I/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

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



Appendix B2 Greenfield Run-off Estimation – CIE Lands



Stuart summerfield

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 basis for setting consents for the drainage of surface water runoff from sites.

the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may

CIE Depot

Calculated by:

Site name:

be

Site location:

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Site Details

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

Runoff estimation app	roach IH124		
Site characteristics			Notes
Total site area (ha):	0.79		(1) Is Q _{BAR} < 2.0 I/s/ha?
Methodology			
Q _{BAR} estimation method:	Calculate from SPR ar	nd SAAR	When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.
SPR estimation method:	Calculate from SOIL ty	/pe	
Soil characteristics	Default	Edited	
SOIL type:	4	Ediled 4	(2) Are flow rates < 5.0 l/s?
HOST class:	N/A	N/A	Where flow rates are less than 5.0 l/s consent for discharge is
SPR/SPRHOST:	0.47	0.47	usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where
Hydrological character	ristics Default	Edited	the blockage risk is addressed by using appropriate drainage elements.
SAAR (mm):	1044	1044	(3) Is SPR/SPRHOST ≤ 0.3?
Hydrological region:	13	13	
Growth curve factor 1 year:	0.85	0.85	Where groundwater levels are low enough the use of soakaways
Growth curve factor 30 years	s: 1.65	1.65	to avoid discharge offsite would normally be preferred for disposal of surface water runoff.
Growth curve factor 100 yea	rs: 1.95	1.95	
Growth curve factor 200 yea	rs: 2.15	2.15	Ĵ [

Greenfield runoff rates

	Default	Edited
Q _{BAR} (I/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

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



APPENDIX C1 Network Analysis – Storm Network – Link Road

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PN 1.000 1.001	1.001 1.002 1.003 2.000 1.004 Rain	52.007 36.145 51.581 64.402 48.884 51.936 T.C. (mins) 5.94	0.260 0.181 0.258 0.322 0.244 0.260 <u>N</u> US/IL (m) 37.900	200.0 200.0 200.0 200.0 200.3 200.0 <u>etworl</u> E Arc (ha)	0.091 0.067 0.065 0.181 0.130 0.000 <u>k Resu</u> ea <u>E I</u>) (1/ 91 (5.00 0.00 0.00 5.00 0.00 <u>ults Tak</u>	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.600 0.600 0.600 0.600 0.600 Flow	0 0 0 0 0 0 0 0	225 225 300 300 225 375 Cap (1/s) 36.6	(1/s) 17.7
1.000	1.001 1.002 1.003 2.000 1.004 Rain (mm/hr) 50.00	52.007 36.145 51.581 64.402 48.884 51.936 T.C. (mins) 5.94 6.60	0.260 0.181 0.258 0.322 0.244 0.260 <u>N</u> US/IL (m) 37.900 37.640	200.0 200.0 200.0 200.3 200.0 200.0 <u>etworl</u> E Arc (ha) 0.09	0.091 0.067 0.065 0.181 0.130 0.000 <u>k Resu</u> ea <u>E I</u>) (1/ 91 (1/ 58 (5.00 0.00 0.00 5.00 0.00 <u>alts Tak</u> wwF Foul (s) (1/s	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.600 0.600 0.600 0.600 0.600 0.600 Flow L/s) 3.0	• • • • • • • • • • • • • • • • • • •	225 225 300 300 225 375 Cap (1/s) 36.6 36.6	(1/s) 17.7 30.8
1.000	1.001 1.002 1.003 2.000 1.004 Rain (mm/hr) 50.000 50.000	52.007 36.145 51.581 64.402 48.884 51.936 T.C. (mins) 5.94 6.60 7.37	0.260 0.181 0.258 0.322 0.244 0.260 <u>N</u> US/IL (m) 37.900 37.640 37.384	200.0 200.0 200.0 200.3 200.00	0.091 0.067 0.065 0.181 0.130 0.000 <u>k Resu</u> ea <u>E E</u>) (1/ 91 (1/ 58 (2)	5.00 0.00 0.00 5.00 0.00 <u>alts Tak</u> WF Foul (s) (1/s 0.0 0.	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 0 0	0.600 0.600 0.600 0.600 0.600 0.600 Flow 1/s) 3.0 5.1	vel (m/s) 0.92 0.92	225 225 300 300 225 375 Cap (1/s) 36.6 36.6	(1/s) 17.7 30.8 41.9
1.000 1.001 1.002	1.001 1.002 1.003 2.000 1.004 Rain (mm/hr) 50.000 50.000 48.21	52.007 36.145 51.581 64.402 48.884 51.936 T.C. (mins) 5.94 6.60 7.37 8.34	0.260 0.181 0.258 0.322 0.244 0.260 <u>N</u> US/IL (m) 37.900 37.640 37.384 37.126	200.0 200.0 200.0 200.0 200.3 200.0 E Arc (ha) 0.09 0.19 0.25 0.40	0.091 0.067 0.065 0.181 0.130 0.000 <u>k Resu</u> ea <u>E E</u>) (1/ 91 (1/ 58 (23) (23) (1/	5.00 0.00 0.00 5.00 0.00 21ts Tak 200 F Foul 2(s) (1/s 0.0 0. 0.0 0.	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 0 0 0 0 0	0.600 0.600 0.600 0.600 0.600 0.600 Flow 1/s) 3.0 5.1 7.0	vel (m/s) 0.92 1.11	225 225 300 300 225 375 Cap (1/s) 36.6 36.6 78.3	(1/s) 17.7 30.8 41.9 71.8
1.000 1.001 1.002 1.003	1.001 1.002 1.003 2.000 1.004 Rain (mm/hr) 50.000 50.000 48.21 45.59	52.007 36.145 51.581 64.402 48.884 51.936 T.C. (mins) 5.94 6.60 7.37 8.34 5.89	0.260 0.181 0.258 0.322 0.244 0.260 <u>N</u> US/IL (m) 37.900 37.640 37.384 37.126	200.0 200.0 200.0 200.3 200.0 E Arc (ha) 0.09 0.11 0.22 0.40	0.091 0.067 0.065 0.181 0.130 0.000 <u>k Resu</u> ea <u>E E</u>) (1/ 91 (1/ 58 (23) (23) (1/ 58 (23)) 04 (1/)	5.00 0.00 0.00 5.00 0.00 21ts Tak 200 0. 2.0 0. 2.0 0. 2.0 0. 2.0 0.	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 0 0	0.600 0.600 0.600 0.600 0.600 0.600 Flow 1/s) 3.0 5.1 7.0 12.0	<pre></pre>	225 225 300 300 225 375 Cap (1/s) 36.6 78.3 78.3 36.6	(1/s) 17.7 30.8 41.9 71.8
1.000 1.001 1.002 1.003 2.000 1.004	1.001 1.002 1.003 2.000 1.004 Rain (mm/hr) 50.000 48.21 45.59 50.000 43.95	52.007 36.145 51.581 64.402 48.884 51.936 T.C. (mins) 5.94 6.60 7.37 8.34 5.89 9.02	0.260 0.181 0.258 0.224 0.260 <u>IN</u> US/IL (m) 37.900 37.640 37.384 37.126 36.700 36.306	200.0 200.0 200.0 200.3 200.0 E Arc (ha) 0 0.0 0 0.1 0 0.2 0 0.4 0 0.5	0.091 0.067 0.065 0.181 0.130 0.000 <u>k Rest</u> ea Σ Γ) (1/ 91 (1/ 91 (23) 04 (1/ 30) (1/ 34 (1/)	5.00 0.00 0.00 5.00 0.00 21ts Tak 200 0. 200 0. 200 0. 200 0. 200 0. 200 0. 200 0.	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0 0 0 0 0 0	0.600 0.600 0.600 0.600 0.600 0.600 0.600 Flow 2/5) 3.0 5.1 7.0 12.0 4.2 15.3	vel (m/s) 0.92 1.11 1.11 0.92 1.28	225 225 300 300 225 375 Cap (1/s) 36.6 36.6 78.3 78.3 36.6 141.1	(1/s) 17.7 30.8 41.9 71.8 25.3 91.5
1.000 1.001 1.002 1.003 2.000 1.004	1.001 1.002 1.003 2.000 1.004 Rain (mm/hr) 50.00 50.00 48.21 45.59 50.00 43.95 <u>Clowing</u>	52.007 36.145 51.581 64.402 48.884 51.936 T.C. (mins) 5.94 6.60 7.37 8.34 5.89 9.02 <u>Outfal</u>	0.260 0.181 0.258 0.224 0.260 <u>VS/IL</u> (m) 37.900 37.640 37.384 37.126 36.700 36.306 <u>1 Deta</u>	200.0 200.0 200.0 200.3 200.0 E Arc (ha) 0.09 0.11 0.09 0.11 0.09 0.11 0.09 0.11 0.09 0.11 0.09 0.11 0.09 0.11 0.09 0.01 0.05 0.05	0.091 0.067 0.065 0.181 0.130 0.000 k Rest k Rest 0.000 k Rest 0.0000 k Rest 0.00000 k Rest 0.0000 k Rest 00000 k Rest 00000 k Rest 00000000 k Rest 000000 k Rest 000000 k Rest	5.00 0.00 0.00 5.00 0.00 11ts Tak 0.0 0. 1/s (1/s 0.0 0. 0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0 0 0 0 0 0 0 0	0.600 0.600 0.600 0.600 0.600 0.600 0.600 Flow L/s) 3.0 5.1 7.0 12.0 4.2 15.3 <u>D STO</u>	<pre></pre>	225 225 300 300 225 375 Cap (1/s) 36.6 36.6 78.3 78.3 36.6 141.1	(1/s) 17.7 30.8 41.9 71.8 25.3 91.5
1.000 1.001 1.002 1.003 2.000 1.004	1.001 1.002 1.003 2.000 1.004 Rain (mm/hr) 50.00 50.00 48.21 45.59 50.00 43.95 <u>'lowing</u>	52.007 36.145 51.581 64.402 48.884 51.936 T.C. (mins) 5.94 6.60 7.37 8.34 5.89 9.02	0.260 0.181 0.258 0.224 0.260 <u>IN</u> US/IL (m) 37.900 37.640 37.384 37.126 36.700 36.306	200.0 200.0 200.0 200.3 200.0 E Arc (ha) 0.09 0.11 0.09 0.11 0.09 0.11 0.09 0.11 0.09 0.11 0.09 0.11 0.09 0.11 0.09 0.01 0.05 0.05	0.091 0.067 0.065 0.181 0.130 0.000 k Rest k Rest (1/ 91 () 58 () 23 () 04 () 30 () 34 () pr 120 evel 1	5.00 0.00 0.00 5.00 0.00 21ts Tak 200 0. 200 0. 200 0. 200 0. 200 0. 200 0. 200 0.	0.0 0.0 0.0 0.0 0.0 0 0 0 0 0 0 0 0 0 0	0.600 0.600 0.600 0.600 0.600 0.600 0.600 Flow L/s) 3.0 5.1 7.0 12.0 4.2 15.3 .D STO n evel	<pre></pre>	225 225 300 300 225 375 Cap (1/s) 36.6 36.6 78.3 78.3 36.6 141.1	(1/s) 17.7 30.8 41.9 71.8 25.3 91.5
1.000 1.001 1.002 1.003 2.000 1.004	1.001 1.002 1.003 2.000 1.004 Rain (mm/hr) 50.00 50.00 48.21 45.59 50.00 43.95 <u>'lowing</u>	52.007 36.145 51.581 64.402 48.884 51.936 T.C. (mins) 5.94 6.60 7.37 8.34 5.89 9.02 <u>Outfal</u>	0.260 0.181 0.258 0.224 0.260 <u>VS/IL</u> (m) 37.900 37.640 37.384 37.126 36.700 36.306 <u>1 Deta</u>	200.0 200.0 200.0 200.3 200.0 E Arc (ha) 0.01 0.01 0.02 0.01 0.01 0.11 0.22 0.04 0.01 0.11 0.25 0.0	0.091 0.067 0.065 0.181 0.130 0.000 k Rest k Rest (1/ 91 () 58 () 23 () 04 () 30 () 34 () pr 120 evel 1	5.00 0.00 0.00 5.00 0.00 11ts Tak 0.00 0.00 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.0 0.0 0.0 0.0 0.0 0 0 0 0 0 0 0 0	0.600 0.600 0.600 0.600 0.600 0.600 0.600 Flow L/s) 3.0 5.1 7.0 12.0 4.2 15.3 .D STO n evel	<pre></pre>	225 225 300 300 225 375 Cap (1/s) 36.6 36.6 78.3 78.3 36.6 141.1 20 11	(1/s) 17.7 30.8 41.9 71.8 25.3 91.5

CST Group		Page 1
1 O'Connell St	120278	
Sligo	Link Road Drainage	
F91 W7YV	Athlone	Therefore a
Date 05 10 2021	Designed By SS	Drannaca
File 120278 LInk Road	Checked By	
Elstree Computing Ltd	Network W.12.4	
	ia for 120278 LINK ROAD STO	DRM 2020 11 27.SWS
	rvious) 100 Additional Flow Factor 1.000 MADD Factor (mins) 0 el (mm) 0 Outpu	per hectare (1/s) 0.000 - % of Total Flow 20.000 * 10m³/ha Storage 2.000 Run Time (mins) 240 t Interval (mins) 4
	Hydrographs 0 Number of Stora ne Controls 1 Number of Time/. ne Controls 0	
	Synthetic Rainfall Details	
Rainfall Model Return Period (years) Region M5-60 (mm) Ratio R	30 Scotland and Ireland 18.000 Storm Du	Profile Type Summer Cv (Summer) 0.900 Cv (Winter) 0.840 aration (mins) 120
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CST Group					Page	2			
1 O'Conne		12	0278		rage	2			
Sligo	II SC		nk Road Dr	ainage		2			
-									
F91 W7YV			විදාර්ග						
Date 05 1		Ch	signed By ecked By				<u>196730</u>		
	78 Link Ro	ad!	twork W.12	.4					
Elstree C	omputing L	td							
	<u>Online Cor</u>	ntrols for	r 120278 L	INK ROAD S	STORM 2020	11 27.SWS	5		
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									
			oe Md6 SW Or						
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	1.200	6.6			7.500			
0.300	4.5	1.600	7.1			8.000			
0.400	4.3	1.800	7.5		11.9	8.500			
0.500	4.3 4.5	2.000 2.200	7.9 8.3			9.000 9.500	16.8 17.2		
0.800	4.J 5.0	2.200	8.7			9.500	11.2		
1.000	5.6	2.600	9.0		14.3				
				1		I			

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			Page 3
CST Group	120278		Page 3
1 O'Connell St	Link Road Dra	ainago	
Sligo	Athlone	armaye	NY MARO
F91 W7YV	Designed By S	39	Dranage
Date 05 10 2021	Checked By		<u>Dratnage</u>
File 120278 LInk Road	Network W.12.	4	
Elstree Computing Ltd	INCOMOLIN W.IZ.		
Storage Structure	es for 120278 I	LINK ROAD STO	RM 2020 11 27.SWS
<u>Tank</u>	or Pond Manhol	e: 5, DS/PN:	1.004
	Invert Level	(m) 36.306	
Depth	(m) Area (m²)	Depth (m) Area	(m ²)
C	.000 80.0	0.750	80.0
	I		
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CST Group						Page	4			
1 O'Connel	l St									
Sligo				79~						
F91 W7YV					HO O					
Date 05 10 2021 Designed By SS										
			Checked	Вy						
File 120278			 Network	W.12.4						
Elstree Cor	nputing	g Ltd								
Summary	of Res	ults fo	r 120 minu	te 30 ye	ar Sumn	ner (1202	78 LII	<u>NK ROAD STORM</u>		
				20 11 27						
	Margin	for Flood	l Risk Warni:	ng (mm)				300.0		
			Analysis T		.5 Secon	d Incremen	t (Exte	ended)		
				Status				ON		
				Status				ON		
			Inertia	Status				OFF		
		Water	Surcharged	Flooded			Pipe			
	US/MH	Level	Depth	Volume	Flow /	Overflow	Flow			
PN	Name	(m)	(m)	(m³)	Cap.	(1/s)	(l/s)	Status		
1 000	1	38.008	-0.117	0.000	0.46	0.0	16.1	OK		
1.000								SURCHARGED		
1.000	2	38.003	0.138	0.000	0.81	0.0	27.9	SUKCHARGED		
	2	38.003 37.996	0.138 0.311	0.000 0.000	0.81 0.52	0.0	27.9 38.8	SURCHARGED		
1.001	2 3							SURCHARGED		
1.001 1.002	2 3 4	37.996	0.311	0.000	0.52	0.0	38.8 62.5	SURCHARGED SURCHARGED		
1.001 1.002 1.003	2 3 4 7	37.996 37.990	0.311 0.564	0.000 0.000	0.52 0.84	0.0	38.8 62.5	SURCHARGED SURCHARGED FLOOD RISK		
1.001 1.002 1.003 2.000	2 3 4 7	37.996 37.990 37.986	0.311 0.564 1.061	0.000 0.000 0.000	0.52 0.84 0.58	0.0 0.0 0.0	38.8 62.5 20.4	SURCHARGED SURCHARGED FLOOD RISK		
1.001 1.002 1.003 2.000	2 3 4 7	37.996 37.990 37.986	0.311 0.564 1.061	0.000 0.000 0.000	0.52 0.84 0.58	0.0 0.0 0.0	38.8 62.5 20.4	SURCHARGED SURCHARGED FLOOD RISK		
1.001 1.002 1.003 2.000	2 3 4 7	37.996 37.990 37.986	0.311 0.564 1.061	0.000 0.000 0.000	0.52 0.84 0.58	0.0 0.0 0.0	38.8 62.5 20.4	SURCHARGED SURCHARGED FLOOD RISK		
1.001 1.002 1.003 2.000	2 3 4 7	37.996 37.990 37.986	0.311 0.564 1.061	0.000 0.000 0.000	0.52 0.84 0.58	0.0 0.0 0.0	38.8 62.5 20.4	SURCHARGED SURCHARGED FLOOD RISK		
1.001 1.002 1.003 2.000	2 3 4 7	37.996 37.990 37.986	0.311 0.564 1.061	0.000 0.000 0.000	0.52 0.84 0.58	0.0 0.0 0.0	38.8 62.5 20.4	SURCHARGED SURCHARGED FLOOD RISK		
1.001 1.002 1.003 2.000	2 3 4 7	37.996 37.990 37.986	0.311 0.564 1.061	0.000 0.000 0.000	0.52 0.84 0.58	0.0 0.0 0.0	38.8 62.5 20.4	SURCHARGED SURCHARGED FLOOD RISK		

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APPENDIX C2 Network Analysis – Storm Network – CIE Lands

CST Group								Page	1		
1 O'Conne	ll St		120	278							
Sligo			CIE	depot				Γ	78~		
F91 W7YV			Ath	lone						>لير	
Date 2021				igned	-				RE	LLLL	202
File 1202		Bus De	Che	cked E	У						
Elstree C			Net	work W	.12.4						
	-	2		CNL 1			1	1		1	
	<u>ST</u>	ORM SEWI	<u>er desi</u>	<u>GN DY</u>	the M	oalilec	ι κατ	lonal	Meth	<u>100</u>	
			<u>Des</u> :	lgn Cr.	iteria	a for S	<u>torm</u>				
		Pipe	e Sizes	STANDAI	RD Mar	hole Siz	es S'	TANDAR	D		
	atum D				el - Sc	otland a			Change	~ (%)	20
F F	eturn Pe	eriod (ye M5-60	(mm) 14			Add Flow Minimu			Height		.750
			io R 0					-	Heigh		.500
		nfall (mm wage (l/s				ign Depth Vel for A		-			200 0.75
		Runoff Co		.900		n Slope i		2	-	,	500
			Des	igned v	ith Le	vel Soff	its				
			Networ	k Desi	an Ta	ble for	sto	rm			
	PN	Length		Slope		T.E.	DWF	<u>1111</u> k	НУГ	DIA	
	14	(m)		(1:X)			(1/s)				
		120.000						0.60		o 300	
	1.001	30.500	0.819	37.2 (0.100	0.00	0.0	0.60	0	o 300	
	2.000	46.000	0.844	54.5 (0.190	5.00	0.0	0.60	0	o 300	
		26.000 2.000				0.00		0.60 0.60		o 375 o 375	
			Ne	<u>etwork</u>	Resu	lts Tab	le				
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ Area (ha)	a ΣDW (l/s			Flow /s)	Vel (m/s)	Cap (1/s)	Flow (1/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		37.700	0.600				15.7	2.58	182.7	
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	5 7.07	36.633	0.790	0.	0 0.0		20.3	1.48	163.1	122.0
		Free	e Flowi	<u>ng Out</u>	fall	Details	s for	Stor	<u>m</u>		
	Ou	tfall	Outfall	C. Lev	vel I.	Level	Mi	n	D,L	W	
		Number	Name	(m)		(m)	I. Le (m)	vel	(mm)	(mm)	
		1.003		38.3	L00	36.619	0	.000	0	0	
			©1982-	-2010 1	Micro	Draina	qe Lt	.d			

CST Group		Page 2
1 O'Connell St	120278	
Sligo	CIE depot	
F91 W7YV	Athlone	
Date 2021 07 29	Designed By SS	1) Patracia
File 120278 CIE Bus De	Checked By	
Elstree Computing Ltd	Network W.12.4	
	imulation Criteria for Stor	rm
<u>.</u>	Indiation criteria for Stor	
Volumetric Runof:	5	per hectare (1/s) 0.000
	rvious) 100 Additional Flow Factor 1.000 MADD Factor	
Hot Start		* 10m ³ /ha Storage 2.000 Run Time (mins) 960
Hot Start Leve		t Interval (mins) 8
Manhole Headloss Coeff (0	Global) 0.500	
Number of Input	Hydrographs 0 Number of Stora	ge Structures 1
Number of Onl:	ine Controls 1 Number of Time/	
Number of Offl:	ine Controls 0	
	Synthetic Rainfall Details	<u>.</u>
Rainfall Model		Profile Type Summer
Return Period (years) Region	30 Scotland and Ireland	Cv (Summer) 0.900 Cv (Winter) 0.840
M5-60 (mm)		uration (mins) 480
Ratio R	0.300	
C)	1982-2010 Micro Drainage Lt	td

CST Group						Pa	ge 3			
1 O'Connell St		120)278							
Sligo		CIE	E depot		v2			<u> </u>		
			nlone					کترہ	\mathcal{I}	Cm
F91 W7YV		Des	signed By	SS		Г		ᠧᡗᡄ		R
Date 2021 07 29		Che	ecked By				200		<u>Ler</u>	
File 120278 CIE			work W.12	. 4						
Elstree Computi	ng Ltd	1101		• •						
		Onl	ine Contro	ols for	St	orm				
Hydro	o-Brake®	Manho	le: 5, DS,	/PN: 1.	003	, Volum	ne (m³)	: 4.0		
	2	Head (m)				eter (mm				
1	Design Fl) e Md5 SW Or		ert :	Level (m) 36.63	3		
	пуцго-вга	ikes iype	e Maj sw oi	тту						
Depth (m) Flow (l/s) Dep	th (m)	Flow (l/s)	Depth ((m)	Flow (1,	s) Dep	th (m)	Flow	(l/s)
0.100	3.7	1.200	9.2	3 (000	1,	1.5	7.000		22.2
0.200	5.9	1.200	9.2		500		5.7	7.500		22.2
0.300	6.0	1.600	10.6		000		5.8	8.000		23.7
0.400	5.9	1.800	11.2	4.5	500	1	7.8	8.500		24.4
0.500	6.2	2.000	11.9		000		3.7	9.000		25.1
0.600	6.6	2.200	12.4		500		9.7	9.500		25.8
0.800	7.5 8.4	2.400 2.600	13.0 13.5		000 500).5 L.4			
1.000	0.4	2.000	13.5	0.0	000	2.				

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CST Group			Page 4
1 O'Connell St	120278		
Sligo	CIE depot		
F91 W7YV	Athlone		THERE ON
Date 2021 07 29	Designed By	SS	D) REMERCICE
File 120278 CIE Bus De	Checked By		
Elstree Computing Ltd	Network W.12	.4	-
<u>S</u>	torage Struct	ures for Stor	<u>m</u>
Tank	or Pond Manho	le: 5, DS/PN:	1 003
		IC: 0, D0/IN.	1.005
	Invert Level	(m) 36.633	
Depth	(m) Area (m²)	Depth (m) Area	a (m ²)
0	.000 360.0	0.450	360.0
		I	
©	1982-2010 Mic:	ro Drainage Lt	td
		2	

CST Group					Page 5			
1 O'Connell St		120278	120278					
Sligo		CIE dep	CIE depot					
F91 W7YV		Athlone	Athlone				LO .	
Date 2021 07 29 File 120278 CIE Bus De Elstree Computing Ltd		_	Designed By SS					
		Checked	Checked By					
		Network	Network W.12.4					
		-	rning (mm)	300.0 Fine		tatus	OFF	
	Water S	Surcharged		OIV		Pipe		
US/ME		Depth	Volume	Flow /	Overflow	Flow		
US/ME PN Name	Level	-		Flow / Cap.	Overflow (l/s)	-	Status	
PN Name	Level	Depth	Volume			Flow	Status FLOOD RISK	
PN Name	I Level (m)	Depth (m)	Volume (m³)	Cap.	(1/s)	Flow (1/s)		
PN Name 1.000 1 1.001 2	(m)	Depth (m) -0.180	Volume (m³) 0.000	Cap. 0.34 0.22	(1/s) 0.0 0.0	Flow (1/s) 30.1 36.1	FLOOD RISK	
PN Name 1.000 1 1.001 2 2.000 3 1.002 4	Level (m) 38.620 37.794 37.857 37.297	Depth (m) -0.180 -0.206 -0.243 0.116	Volume (m³) 0.000 0.000 0.000 0.000	Cap. 0.34 0.22 0.08 0.33	(1/s) 0.0 0.0	Flow (1/s) 30.1 36.1 11.4 47.0	FLOOD RISK OK FLOOD RISK FLOOD RISK	
PN Name 1.000 1 1.001 2 2.000 3	Level (m) 38.620 37.794 37.857 37.297	Depth (m) -0.180 -0.206 -0.243	Volume (m ³) 0.000 0.000 0.000	Cap. 0.34 0.22 0.08	(1/s) 0.0 0.0 0.0	Flow (1/s) 30.1 36.1 11.4 47.0	FLOOD RISK OK FLOOD RISK	
PN Name 1.000 1 1.001 2 2.000 3 1.002 4	Level (m) 38.620 37.794 37.857 37.297	Depth (m) -0.180 -0.206 -0.243 0.116	Volume (m³) 0.000 0.000 0.000 0.000	Cap. 0.34 0.22 0.08 0.33	(1/s) 0.0 0.0 0.0 0.0	Flow (1/s) 30.1 36.1 11.4 47.0	FLOOD RISK OK FLOOD RISK FLOOD RISK	
PN Name 1.000 1 1.001 2 2.000 3 1.002 4	Level (m) 38.620 37.794 37.857 37.297	Depth (m) -0.180 -0.206 -0.243 0.116	Volume (m³) 0.000 0.000 0.000 0.000	Cap. 0.34 0.22 0.08 0.33	(1/s) 0.0 0.0 0.0 0.0	Flow (1/s) 30.1 36.1 11.4 47.0	FLOOD RISK OK FLOOD RISK FLOOD RISK	
PN Name 1.000 1 1.001 2 2.000 3 1.002 4	Level (m) 38.620 37.794 37.857 37.297	Depth (m) -0.180 -0.206 -0.243 0.116	Volume (m³) 0.000 0.000 0.000 0.000	Cap. 0.34 0.22 0.08 0.33	(1/s) 0.0 0.0 0.0 0.0	Flow (1/s) 30.1 36.1 11.4 47.0	FLOOD RISK OK FLOOD RISK FLOOD RISK	
PN Name 1.000 1 1.001 2 2.000 3 1.002 4	Level (m) 38.620 37.794 37.857 37.297	Depth (m) -0.180 -0.206 -0.243 0.116	Volume (m³) 0.000 0.000 0.000 0.000	Cap. 0.34 0.22 0.08 0.33	(1/s) 0.0 0.0 0.0 0.0	Flow (1/s) 30.1 36.1 11.4 47.0	FLOOD RISK OK FLOOD RISK FLOOD RISK	



APPENDIX D Storm Drainage Network Drawing



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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

KEY:

 SMD
 30.06.25

 BY
 DATE
 PL1 CHANGE OF TITLEBLOCK TEMPLATE AMENDMENT тесн. снеск: КГ DRAWN: KL SCALE @ A0: 1:500 ENG. CHECK: SS DATE: 09.06.21 APPROVED: **FF** STAGE: PLANNING JOB TITLE: ATHLONE LINK ROAD





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> Civil Structural Traffic