CONSULTING ENGINEERS

Surface Water Drainage and Flood Risk Summary Report

Project Title:	Bloodmill Road Extension Scheme, Limerick
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1. Introduction

MHL Consulting Engineers have been appointed by Limerick City and County Council (LCCC) to design and manage the delivery of the Bloodmill Road Extension Scheme, at Towlerton, Ballysimon, Limerick.

The aim of the project is to realign the existing Bloodmill Road to link with the recently constructed developer provided link road to the Northern Trust Roundabout on Groody Road. The scheme will implement improved Active Travel measures for pedestrians, cyclists and public transport to serve the currently under construction secondary school and private hospital on surrounding zoned lands. The scheme should encourage the uptake of more sustainable transport options by providing safer road infrastructure for vulnerable road users. The scheme will provide high quality facilities for pedestrians, cyclists and the mobility impaired with a view to encouraging modal shift from private car use to more sustainable, active travel options such as walking and cycling.

This is a strategically important link road required for connectivity in the Towlerton/Ballysimon/Castletroy area as well as for opening up zoned lands for development in this rapidly growing suburban district centre. The delivery of the road will provide alternative traffic routing in the area and provide access to the new secondary school, new private hospital and other public and commercial buildings that will be constructed adjacent to the road in the future.
The project will involve:

- Construction of approx. 260m of new road corridor with a 6.2m wide carriageway, 2x2m footpaths, 2x2m landscaped verges and 2x2m off-road cycle tracks.
- The construction of a new surface water drainage system.
- The installation of a new public lighting system.
- The construction of a new culvert across the Towlerton Stream where the existing newly constructed link road terminates.

This report will focus on the new surface water drainage system and the requirements of the proposed culvert across the Towlerton Stream.

2. Site Location

The site is located on the south-eastern side of Limerick City. The existing Bloodmill Road is approximately 1.6km long and connects Childers Road to Ballysimon Road. Figure 1.1 below shows the site location in the south-eastern side of Limerick City centre.

Figure 1: Site Location of Proposed Bloodmill Road Extension

3. Proposed Drainage Design

The proposed storm sewer network has been designed with one catchment only which will flow through a hydrocarbon interceptor and attenuation tank before discharging to the Towlerton Stream which passes to the east of the site. The attenuation tank has been designed to cater for a 1 in 100-year storm event including a 20% allowance for climate change. The catchment area of the drainage system can be seen below in Figure 2. The catchments encapsulates the entire area of the proposed new road as well as the southern side of the existing road to the north west for a distance of 175m. There is currently no formal drainage on this side of the road to the north and thus must form part of the catchment. The other side of the road is drained by the Amharc Muileann Housing Development drainage system. The total catchment area is 0.6ha.

Figure 2: Proposed Drainage System Catchment Area

The proposed storm water network has been modelled using Causeway Flow drainage software. Modelling parameters were calculated as per the Wallingford procedure.

The following design parameters were used to model the network:

Storm duration = 15 to 1440 minutes.
Storm return period = 100 Years
Total catchment area = 0.606 ha.
M5-60 (mm) = 14
Standard Annual Average Rainfall (SAAR) = 1004mm.
Allowance for climate change = 20%.
Discharge rate = 5 l/s/ha for the positively drained area with a minimum discharge rate of 5l/s to reduce the risk of blockages.

The storm network was modelled using the above parameters. This allowed for the storm network pipes and storage tank to be correctly sized to ensure adequate capacity during critical storm events.

The model results show that there are no flooding events for the 100-year return period during critical storm events with 20% allowance for climate change.

Appendix A outlines the results from the Causeway Flow drainage modelling software.

Figure 3 is an extract from BR-DR-P01 & P02 and illustrates the design on plan and shows the location of Storm Attenuation Tank and the proposed outfall to the Towlerton Stream

The minimum gradient in the development storm sewer network is 1/300, The proposed storm sewer main line pipes are to be a combination of 225mm, 300mm and 375mm internal diameter and the proposed storm sewer connection pipes to road gullies are to be 150mm internal diameter.

A proposed 220m^3 attenuation tank is to be located at the southeastern end of the site, next to the stream. The attenuation system is designed to hold the water from a 1 in 100-year storm event. The proposed tank will measure 15m x 10m x 1.5m. The surface water will pass through a hydrocarbon interceptor before entering the attenuation system.

It is proposed to outfall into the Towlerton Stream downstream of the proposed culvert following attenuation which is located on the southeastern side of the site via a hydrobrake manhole which limits the outfall to 5l/s.

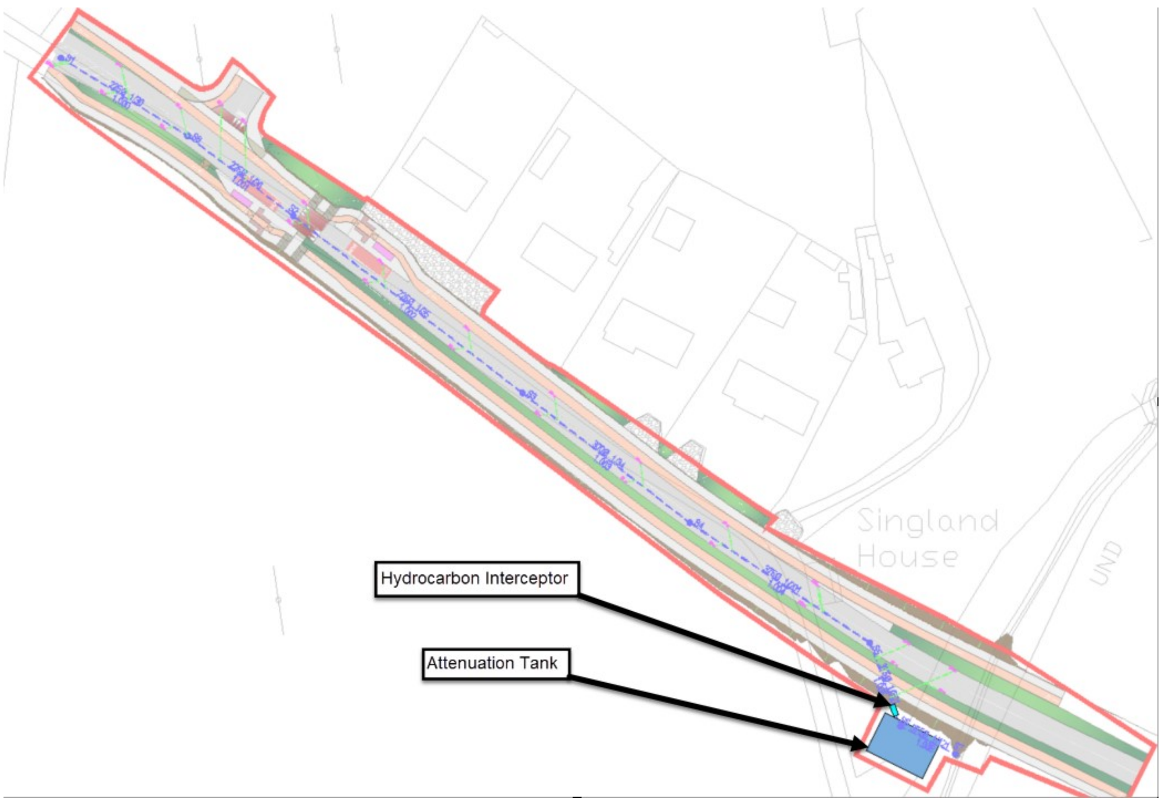


Figure 3: Proposed Stormwater Drainage Network

4. Flood Risk Assessment and Preliminary Culvert Design

A desktop flood risk analysis was carried out as part of this report. An excerpt from the CFRAM mapping for the area can be seen below in Figure 4. There is very little flooding within the site boundary. Critically, there is no probability of flooding in the location of the proposed attenuation tank. The proposed surface water drainage system has been designed for no flooding during the 1 in 100-year storm event. This also includes a 20% allowance for climate change.

The proposed development will increase the impermeable area of the road which could increase stream flows downstream if it was not mitigated on site. The surface water drainage system is designed to mitigate this by storing excess runoff on site and releasing the runoff slowly to the stream. The drainage system has been designed to fully control the 1% AEP event and to ensure that the proposed road does not increase the risk of flooding downstream.

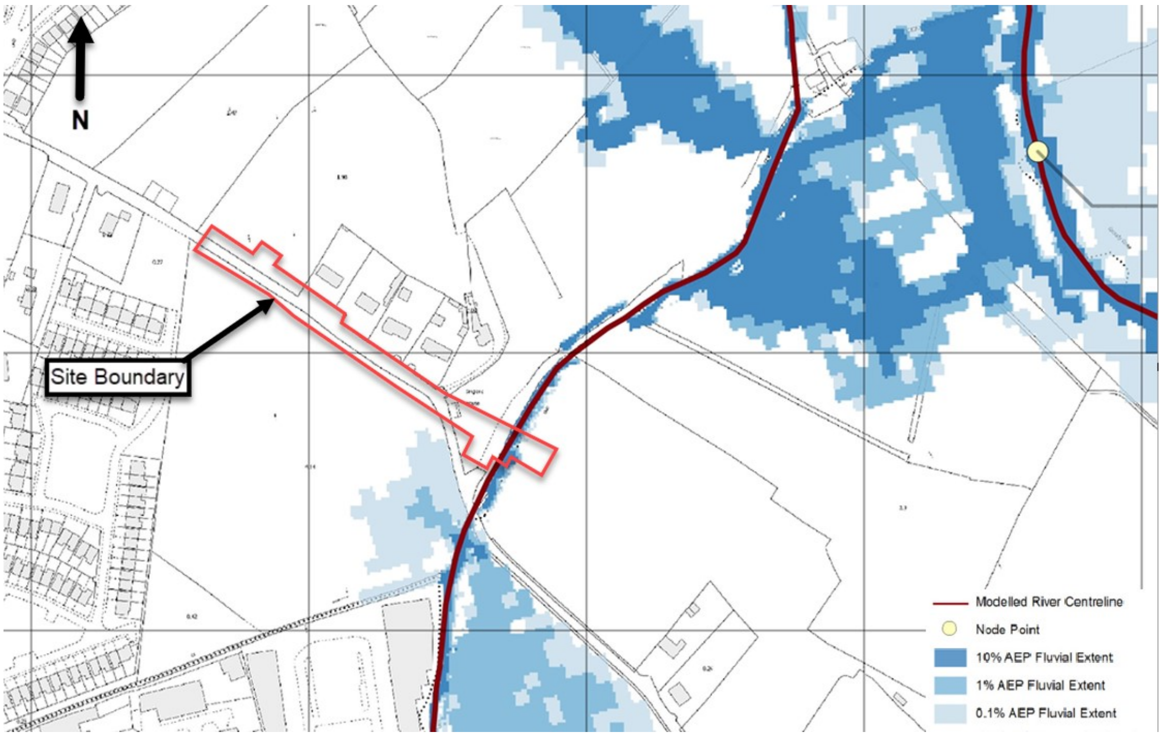


Figure 4: CFRAM River Flood Extents

The proposed culvert has also been designed for a 1 in 100 storm event with a 20% allowance for climate change. The results of the preliminary culvert design can be seen in Figure 5 below and a cross section through the proposed culvert can be seen in Figure 6 below. There is no increase in the water level following the construction of the proposed culvert. The proposed culvert design is subject to approval of a pending Section 50 application to the Office of Public Works.

Proposed culvert summary	
Width (m)	1.80
Height (m)	2.10
Length (m)	18.00
US invert* (mOD)	6.25
DS invert* (mOD)	6.17
Air gap (m)	0.56

*inverts dropped to accommodate IFI requirement for new culverts to be set below bed level. Set to 200mm below unless directed by design team or ecologist

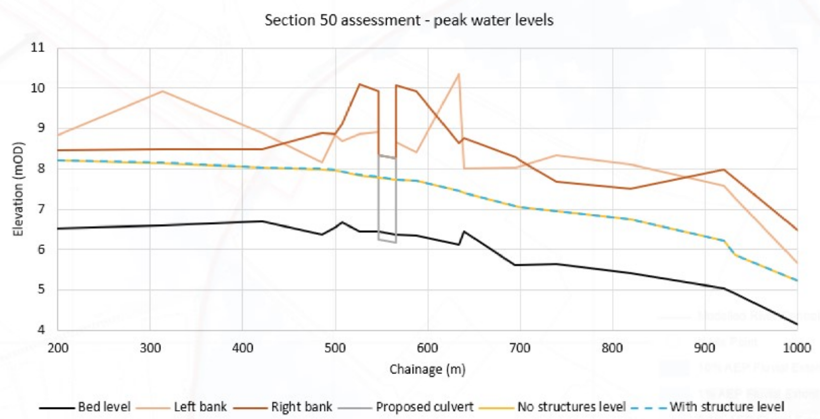


Figure 5: Preliminary Culvert Design

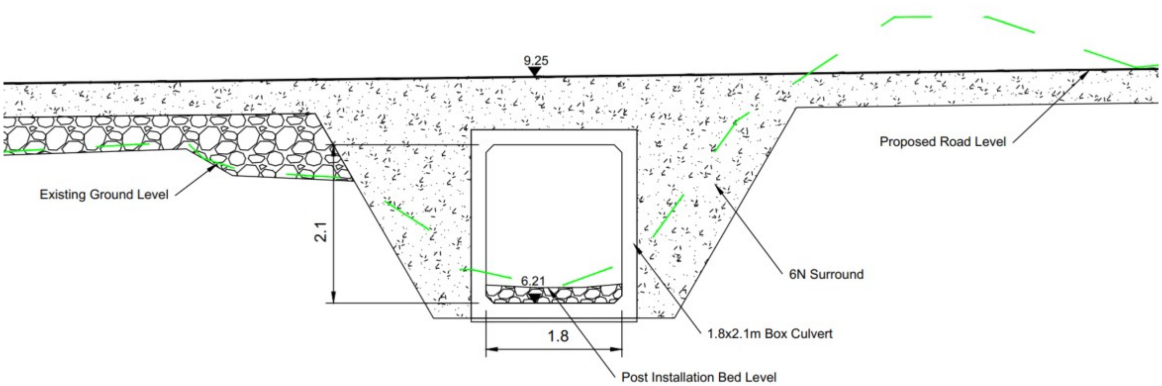


Figure 6: Cross Section Through the Proposed Culvert

Appendix A

Design Settings

Rainfall Methodology	FSR
Return Period (years)	10
Additional Flow (%)	10
FSR Region	Scotland and Ireland
M5-60 (mm)	14.000
Ratio-R	0.300
CV	0.750
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	1.000
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	✓
Enforce best practice design rules	✓

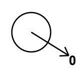
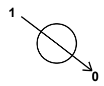
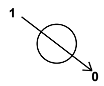
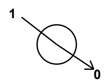
Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.148	5.00	14.524	1350	560283.971	656325.806	1.474
S2	0.112	5.00	12.401	1350	560340.375	656287.344	1.361
S3	0.082	5.00	10.504	1200	560393.068	656246.642	1.674
S4	0.086	5.00	9.194	1350	560432.627	656215.994	1.604
S5	0.113	5.00	8.857	1200	560475.201	656187.586	1.676
S6			8.366	1350	560482.510	656167.844	1.326
S7			7.500	1350	560495.471	656161.213	0.557
S8	0.066	5.00	13.506	1350	560313.915	656307.418	1.456

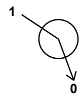
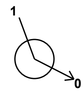
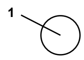
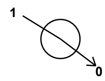
Links (Input)

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
S1-S8	S1	S8	35.139	0.600	13.050	12.050	1.000	35.1	225	5.26	50.0
S8-S2	S8	S2	33.213	0.600	12.050	11.040	1.010	32.9	225	5.51	50.0
S2-S3	S2	S3	66.583	0.600	11.040	8.830	2.210	30.1	225	5.97	50.0
S3-S4	S3	S4	50.042	0.600	8.830	7.590	1.240	40.4	300	6.31	50.0
S4-S5	S4	S5	51.181	0.600	7.590	7.181	0.409	125.1	375	6.83	50.0
S5-S6	S5	S6	21.052	0.600	7.181	7.040	0.141	149.3	375	7.07	50.0
S6-S7	S6	S7	14.558	0.600	7.040	6.943	0.097	150.1	375	7.23	50.0

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1	560283.971	656325.806	14.524	1.474	1350	 0	S1-S8	13.050	225
S2	560340.375	656287.344	12.401	1.361	1350	 1	S8-S2	11.040	225
						0	S2-S3	11.040	225
S3	560393.068	656246.642	10.504	1.674	1200	 1	S2-S3	8.830	225
						0	S3-S4	8.830	300
S4	560432.627	656215.994	9.194	1.604	1350	 1	S3-S4	7.590	300
						0	S4-S5	7.590	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S5	560475.201	656187.586	8.857	1.676	1200		1	S4-S5	7.181	375
							0	S5-S6	7.181	375
S6	560482.510	656167.844	8.366	1.326	1350		1	S5-S6	7.040	375
							0	S6-S7	7.040	375
S7	560495.471	656161.213	7.500	0.557	1350		1	S6-S7	6.943	375
S8	560313.915	656307.418	13.506	1.456	1350		1	S1-S8	12.050	225
							0	S8-S2	12.050	225

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	Scotland and Ireland	Skip Steady State	x
M5-60 (mm)	14.000	Drain Down Time (mins)	600
Ratio-R	0.300	Additional Storage (m³/ha)	0.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	20	0	0

Node S6 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	7.040	Product Number	CTL-SHE-0106-5000-1000-5000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node S6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	7.040
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	384

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	214.4	0.0	1.500	214.4	0.0	1.501	0.0	0.0

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.82%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	13.172	0.122	50.1	0.1741	0.0000	OK
15 minute winter	S2	12	11.581	0.541	107.7	0.7741	0.0000	SURCHARGED
15 minute summer	S3	10	9.013	0.183	120.4	0.2069	0.0000	OK
360 minute winter	S4	344	7.972	0.382	28.0	0.5462	0.0000	SURCHARGED
360 minute winter	S5	344	7.971	0.790	34.4	0.8941	0.0000	SURCHARGED
360 minute winter	S6	344	7.971	0.931	33.2	201.0116	0.0000	SURCHARGED
15 minute summer	S7	1	6.943	0.000	5.0	0.0000	0.0000	OK
15 minute winter	S8	11	12.215	0.165	72.2	0.2356	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	S1-S8	S8	49.8	1.985	0.566	0.9136	
15 minute winter	S2	S2-S3	S3	95.7	2.665	1.006	2.4637	
15 minute summer	S3	S3-S4	S4	123.2	2.166	0.702	2.8194	
360 minute winter	S4	S4-S5	S5	28.0	0.961	0.157	5.6451	
360 minute winter	S5	S5-S6	S6	33.2	1.092	0.203	2.3220	
360 minute winter	S6	Hydro-Brake®	S7	5.0				247.6
15 minute winter	S8	S8-S2	S2	69.8	2.039	0.767	1.1776	