Corrigan Hodnett Consulting
Civil & Structural Engineers
Balheary Demesne, Balheary Road,
Swords, County Dublin

Tel. 01 893 3782
E-mail: info@corriganhodnett.ie
Web: www.corriganhodnett.ie

Mr Sean Maguire

McGill Planning Ltd.

9 Pembroke Street Upper, Dublin 2

D02 KR83

By email: sean@mcgplanning.ie

19th November 2026

Our Ref. CHC-XX-XX-CO-C-00002

RE: FURTHER INFORMATION – KILDARE COUNTY COUNCIL PA REG. REF. 26/60878

PERMISSION FOR A LARGE-SCALE RESIDENTIAL DEVELOPMENT (LRD) ON A SITE OF APPROXIMATELY 4.26 HECTARES (GROSS) AT LANDS LOCATED IN THE TOWNLAND OF "CONFEY", LEIXLIP, CO. KILDARE.

Dear Sean,

The above referenced planning application registered on 30th July 2026 is subject to a request for further information in notice dated 23rd September 2026.

We have been appointed to specifically address item numbers **4.(b), 6., 7., 8. and 11.** of the further information and the respective responses are detailed in the following paragraphs.

Further Information Item 4.(b) Traffic and Transportation

> *The Applicant is requested to submit a detailed design and drawings scale 1:500 for the proposed widening works of R149 consisting of a 6.5m wide carriageway with a 1.5m grass verge, 2m wide cycle track and 2m wide footpath at the site frontage. The Applicant will be required to construct these road improvements prior to occupation of housing. Proposed design to R149 to include drainage, signing and lining and public lighting.'*

R149 Link Road Upgrade

Design Basis

The proposed upgrade of the R149 is detailed on accompanying drawing CHC-00-GR-DR-C-00106 titled 'R149 Link Road Upgrade'. The drawing details the proposed horizontal alignment, longitudinal profile, typical road cross-section, pavement construction and associated pedestrian and cycle infrastructure. The proposed horizontal and vertical geometric parameters are also scheduled on the longitudinal section of the drawing.

The R149 is a Regional Road and the section subject to the proposed works is located within a 50 km/h speed limit zone. The geometric design has therefore been developed principally having regard to the Design Manual for Urban Roads and

Corrigan Hodnett Consulting Limited
Directors: Paul Corrigan, Michael Hodnett
Balheary Demesne - Balheary Road - Swords - County Dublin - K67E5A0
Registered in Dublin, Ireland Company No. 576756

Streets (DMURS), which applies to the design and upgrading of roads and streets within urban areas. Relevant principles contained within TII DN-GEO-03031, Rural Road Link Design, have also been considered where appropriate to the operation of the Regional Road, including sight distance, horizontal and vertical alignment, carriageway crossfall, drainage and the interfaces with the existing road.

The proposed road markings and signage will be provided in accordance with the Department of Transport Traffic Signs Manual, while the proposed cycle infrastructure will be designed in accordance with the NTA Cycle Design Manual.

Geometric Design Schedule

The principal geometric parameters adopted for the proposed R149 upgrade are summarised below. The adopted values are based on the horizontal and vertical alignment detailed on accompanying drawing CHC-00-GR-DR-C-00106 titled 'R149 Link Road Upgrade'.

Design Element	Design Criterion / Guidance	Adopted Design	Compliance / Design Comment
Road classification	Regional Road within 50 km/h urban environment	R149 Regional Road	DMURS adopted as the primary geometric design basis, with TII DN-GEO-03031 considered where relevant.
Posted speed limit	DMURS provides for Arterial and Link Streets operating at moderate speeds up to 50 km/h	50 km/h	Complies. Consistent with existing speed environment and DMURS design principles.
Stopping Sight Distance	DMURS minimum SSD at 50 km/h: 49 m	49m SSD, Eye Height 1.050m, Object Height 0.600m, Along lane centreline	Complies. Minimum 49 m SSD achieved in both directions, including through the tie-ins and vertical curves.
Carriageway width	Appropriate to function, traffic composition and proposed corridor	6.50 m	Complies. Prescribed by KCCC Roads Department. Appropriate in principle, subject to final Roads Department agreement.
Minimum horizontal radius	DMURS Table 4.3: 104 m with 2.5% adverse camber; 82 m with 2.5% superelevation at 50 km/h	65 m, localised at existing-carriageway tie-in	Localised departure required to achieve the transition to the existing R149 while providing the full prescribed road corridor over the maximum practicable extent of the development frontage. Interim condition pending continuation of future road improvements.
Remaining horizontal radii	DMURS reference criterion of 104 m with 2.5% adverse camber	206.75 m, 360 m and 413.25 m	Complies. Radii exceed the relevant DMURS reference criterion and establish

			the standard intended to be continued into subsequent road improvements.
Carriageway crossfall	Approximately 2.5% normal crossfall/camber	Standard crowned carriageway	Complies in principle. Provides consistent transverse drainage. Final crossfalls to be confirmed at detailed design.
Superelevation	DMURS recognises that superelevation may be inappropriate within moderate/low-speed urban environments	Not applied	Appropriate having regard to the 50 km/h environment, shallow longitudinal gradients, surface-water drainage requirements and interim nature of the constrained tie-in.
Vertical curve parameters	DMURS at 50 km/h: minimum crest K = 4.7 and sag K = 6.4	K = 9 and K = 10	Complies, subject to confirmation of the respective crest/sag curves and verification of SSD.
Longitudinal gradients	To provide adequate visibility, drainage, accessibility and driver comfort	Approx. +0.50% to -2.20%	Acceptable in principle. Shallow-gradient locations require careful control of carriageway crossfall and drainage.
Cycle track	NTA Cycle Design Manual	2.00 m	Complies with NTA details. Detailed configuration and interfaces to be confirmed through detailed design.
Tie-ins to existing R149	Safe transition without unacceptable changes in visibility, width or driver expectation	Localised transitions at both extents	Interim arrangement. Future road improvement works will continue the upgraded corridor beyond the current site frontage.
Pavement construction	Applicable TII pavement design requirements and project-specific ground conditions	Planning-stage indicative construction	Detailed foundation design to be undertaken post-planning based on project-specific site investigation.
Final design approval	Agreement with relevant Roads Authority	Kildare County Council Roads Department	Horizontal alignment, vertical alignment, tie-ins and final pavement construction to be agreed prior to commencement of works.

Horizontal Alignment

The proposed horizontal alignment has been developed having regard to the existing R149, the 50 km/h speed environment and the requirement to provide the prescribed upgraded road corridor over the maximum practicable extent of the development frontage.

The proposed upgraded cross-section ties into the existing R149 carriageway at both the eastern and western extents of the current works. Consequently, localised transitions are required between the proposed road cross-section and the

existing carriageway. These transitions result in a narrowing of the road corridor towards the existing carriageway at the limits of the current scheme.

A localised horizontal radius of 65 m occurs in association with the tie-in to the existing carriageway. This radius is below the geometric parameters identified in DMURS Table 4.3 for a 50 km/h design speed. The localised radius arises specifically from the requirement to transition between the proposed upgraded corridor and the existing R149 while allowing the full prescribed road corridor width to be provided over the maximum practicable extent of the development frontage. The 65 m radius is therefore considered an interim tie-in condition and is not representative of the geometric standard proposed for the wider upgraded R149 corridor. The remaining horizontal alignment incorporates radii of 206.75 m, 360 m and 413.25 m, which exceed the applicable DMURS reference criterion for the 50 km/h design environment.

It is intended that subsequent road widening and improvement works extending to the east and west of the current scheme will continue the upgraded road corridor. As these improvements are implemented, the existing-carriageway tie-in constraints will be removed, allowing continuity of the horizontal alignment and the geometric design standards established through the main section of the current proposals.

Notwithstanding the interim nature of the tie-in arrangement, the required 49 m minimum stopping sight distance associated with a 50 km/h DMURS design environment is achieved through the alignment and particularly through the localised tie-in sections.

The existing priority junction at approximately Chainage 355 currently provides sightlines of 18.701 m and 20.588 m to the east and west respectively. The proposed road alignment will significantly improve visibility at the junction, increasing the available sightlines to approximately 49.0 m to the east and 44.024 m to the west. While the proposed western sightline remains marginally below the applicable requirement, it represents a substantial improvement over the existing 20.588 m visibility provision. Full compliance will be achieved upon the future extension of the road improvement works to the west.

Vertical Alignment

The proposed vertical alignment has been developed having regard to the levels of the existing R149, the proposed development levels, the required surface-water drainage regime and the need to achieve appropriate tie-ins to the existing carriageway at both ends of the works.

The proposed longitudinal profile and associated vertical geometry are detailed on accompanying drawing CHC-00-GR-DR-C-00106 titled ‘R149 Link Road Upgrade’. The alignment incorporates relatively modest longitudinal gradients, ranging approximately from +0.50% to -2.20%, together with vertical curves incorporating K-values of 9 and 10.

The adopted vertical curve parameters exceed the DMURS minimum values of K = 4.7 for crest curves and K = 6.4 for sag curves applicable to a 50 km/h design environment, subject to confirmation of the classification of the individual curves and verification of the required stopping sight distance during detailed design.

The proposed profile generally follows the existing road levels while establishing a consistent engineered vertical alignment through the section being upgraded.

Carriageway Crossfall and Superelevation

A standard crowned carriageway/camber is proposed throughout the upgrade, with superelevation intentionally not applied.

The relatively shallow longitudinal gradients along sections of the proposed alignment are an important consideration in this regard. Introducing superelevation would require transitions between the normal crowned carriageway and the superelevated cross-section. Within areas of limited longitudinal gradient, these transitions would introduce extended sections of minimal or effectively flat transverse crossfall and could adversely affect positive surface-water drainage.

Maintaining a standard carriageway camber provides a more consistent transverse fall, thereby facilitating positive runoff from the carriageway and reducing the potential for localised surface-water ponding.

This consideration is particularly relevant to the localised 65 m tie-in radius. Given the interim nature of this tie-in, it is considered preferable to maintain a consistent crowned carriageway and positive transverse drainage rather than introduce a localised superelevation transition that would subsequently become redundant when the road improvement scheme is extended.

The acceptability of this arrangement will be agreed with Kildare County Council Roads Department as part of the detailed design prior to construction.

Pavement Construction

The proposed pavement construction/build-up indicated on accompanying drawing CHC-00-GR-DR-C-00106 titled 'R149 Link Road Upgrade' represents the planning-stage pavement design basis.

The final pavement design will be developed having regard to the relevant TII pavement design requirements, including TII DN-PAV-03021, Analytic Pavement & Foundation Design, where applicable.

The detailed design and specification of the pavement foundation layers will be undertaken post-planning following completion of project-specific site investigation works. The site investigation will establish the existing ground and subgrade conditions along the road improvement corridor and provide the information required to develop the detailed pavement foundation design.

The final pavement construction will therefore be determined having regard to:

- confirmed ground and subgrade conditions;
- project-specific site investigation results;

- anticipated traffic loading;
- existing pavement conditions where relevant; and
- applicable TII pavement design requirements.

The final pavement build-up will be agreed with Kildare County Council Roads Department prior to commencement of the road improvement works.

Pedestrian and Cycle Infrastructure

The proposed road corridor incorporates pedestrian and cycle infrastructure as detailed on accompanying drawing CHC-00-GR-DR-C-00106 titled 'R149 Link Road Upgrade' including a 2.0 m cycle track, 2.0 m footpath and 1.5m verge within the proposed typical cross-section.

The cycle infrastructure, including the detailed treatment of cycle facilities at accesses and side-road crossings, is designed in accordance with the NTA Cycle Design Manual. The proposed facilities form part of the wider road corridor arrangement and are intended to facilitate continuation of the pedestrian and cycle infrastructure as subsequent sections of the R149 are upgraded.

Road Signage and Markings

All regulatory signage, warning signage and road markings associated with the proposed R149 upgrade will be provided in accordance with the Department of Transport Traffic Signs Manual.

Appropriate road narrowing and transition signage and markings will be provided at the interfaces between the upgraded road corridor and the existing carriageway, where required, having regard to the interim nature of these arrangements and the prevailing 50 km/h speed environment.

Detailed Design and Roads Authority Agreement

The proposals presented at planning stage establish the overall design intent and geometric basis for the upgrade of this section of the R149.

The detailed design will be progressed post-planning, taking account of the planning-stage geometry, project-specific site investigation information, confirmed existing levels and conditions, surface-water drainage requirements and any detailed design matters arising through consultation with Kildare County Council Roads Department.

In particular, the detailed design will confirm:

- horizontal alignment and stopping sight distances (design requirements achieved);
- vertical alignment and vertical curve parameters (design requirements achieved);

- detailed crossfalls and carriageway drainage (design requirements achieved);
- eastern and western tie-in arrangements (design requirements achieved but subject to approval from KCC Roads);
- road signage and marking requirements (design requirements achieved);
- cycle and pedestrian infrastructure details (design requirements achieved); and
- final pavement and pavement foundation construction (subject to detailed site-specific site investigation works and agreement with KCC Roads).

The detailed horizontal alignment, vertical alignment, tie-in arrangements and final pavement construction/build-up will be agreed with Kildare County Council Roads Department in advance of commencement of any works to the R149.

The design approach allows the current scheme to deliver the full prescribed road corridor over the maximum practicable extent of the development frontage, while accommodating the existing R149 at the current limits of the works. Subsequent widening and improvement of the R149 to the east and west will allow these interim tie-ins to be removed and will provide for the continuation of the road corridor and continuity of the geometric design standards established by the current proposals.

R149 Widening – Surface Water Drainage

The surface water drainage layout proposals for the upgraded section of the R149 are detailed on accompanying drawing CHC-00-GR-DR-C-00107 titled 'R149 Link Road Upgrade Drainage Layout'. The drainage long sections are show on drawing ref. CHC-00-GR-DR-C-00108 titled 'R149 Link Road Upgrade Drainage Longitudinal Sections' and the details of the retention and detention basin are shown on drawing ref. CHC-00-GR-DR-C-00109 titled 'R149 Link Road Upgrade Drainage Attenuation and Interception Storage Details'.

The drainage catchment for design purposes includes a full allowance for the future provision of footpath, cyclepath and grassed verge on the side of the road opposite to the site as when these elements are constructed they will drain into the same network.

Due to space constraints on the west side of the site, it is not possible to provide a single catchment with retention pond on the west side. The constraints relate to existing Uisce Éireann and Gas Networks Ireland wayleaves which are shown on drawing CHC-00-GR-DR-C-00107 titled 'Link Road Upgrade Drainage Layout'. As such the R149 upgrade, which is all positively drained is split into two separate catchments, one for the eastern portion and one for the western portion both of which are treated independently and have separate discharges into the existing ditches to the west and south of the site. The calculations for the discharge rates for each catchment are shown in *Table 1* and *Table 2* following.

The calculated greenfield runoff rate for the western catchment is 0.478L/s. Owing to the impracticability and increased blockage risk associated with providing a conventional flow-control orifice at such a low discharge rate, a minimum restricted discharge of 1.0L/s is proposed, subject to agreement with the KCC Drainage Department. A proprietary vortex

flow-control device shall be provided and sized by the manufacturer to achieve the specified discharge at the available design head while maximising the minimum clear opening.

Table 1 Site Specific Characteristics

Constants		Data Source
SOIL =	0.30	Based on actual onsite conditions and geotechnical data
SAAR (mm) =	761	Met Eireann Point Rainfall Data
$M_{5\text{-}60}$ (mm) =	16.2	Met Eireann Rainfall Return Period Depths Data[1]
$M_{5\text{-}2day}$ (mm) =	58.9	
Jenkinson's 'R' =	0.275	eq.[$M_{5\text{-}60}/M_{5\text{-}2day}$]
GDSDS E2.2.2 Greenfield Runoff Analysis		
AREA	0.5	sq.km (using 50Ha as site area < 50Ha)
SAAR	761	mm
SOIL	0.30	(SOIL Type 2)
$QBAR_{RURAL} = 0.00108 \times (50Ha)^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$		
$QBAR_{RURAL}$ for 50Ha site =	100	litres per second

Table 2 Catchment Greenfield Runoff Calculations

Catchment Ref.	Eastern Catchment	Western Catchment
Positively Drained Area (sq.m)	4,450	2,380
IH 124 method linear scaling factor (Site Area/50Ha)	0.0089	0.0048
$QBAR_{RURAL}$ (litres/second)	**0.894**	**0.478**
Q_1[2] (litres/second)	0.760	0.407
Q_{30} (litres/second)	1.878	1.004
Q_{100} (litres/second)	2.325	1.244
Adopted Discharge Rate (litres/second)	**1.0**	**1.0**

The 10mm interception storage required for each catchment is detailed in *Table 3* following. The calculated 10 mm interception storage requirements for the respective catchments are 44.5 m³ and 23.8 m³, with 43.2 m³ and 23.25 m³ provided, representing approximately 97% of the calculated requirement in each case. The minor shortfalls are considered negligible in the context of the conservative calculation methodology, which assumes that the full 10 mm rainfall depth across the entire catchment contributes directly to runoff. In practice, initial surface wetting and depression storage,

[1] Refer Appendix 1 – Met Éireann Return Period Rainfall Depths.
[2] Throttle rates calculated using GDSDS Growth Curve Factors.

interception by vegetation, infiltration through landscaped verges and other permeable surfaces, and the reduced runoff response of areas not directly connected to the positive drainage system will reduce the volume reaching the interception storage. Accordingly, the storage volumes provided are considered adequate to achieve the intended interception function for both catchments.

Table 3 Interception storage required and provided on a catchment basis

Catchment	Eastern Catchment	Western Catchment
Positively Drained Area (sq.m)	4,450	2,380
10mm Interception Volume Storage required (cu.m)	44.50	23.80
10mm Interception Volume Storage provided (cu.m)	**43.2**	**23.25**

The interception storage is provided in the bottom of the detention and retention basins for the eastern and western catchments respectively. Details of the basins are shown on drawing CHC-00-GR-DR-C-00109 titled 'Link Road Upgrade Drainage Attenuation and Interception Storage Details'.

The attenuation storage for both catchments is facilitated in the detention and retention basins, details of which, including the critical event top water levels are shown on drawing CHC-00-GR-DR-C-00109 titled 'Link Road Upgrade Drainage Attenuation and Interception Storage Details'.

Full details of the models including analysis of storm events carried out using MicroDrainage design software are included in *Appendix 2.* The analysis includes a 30% Climate Change analysis. Due to the nature of the road catchment, considered to be 100% impermeable there is therefore no allowance for Urban Creep.

Further Information Item 6.

> *'The Applicant is requested to resubmit CHC-00-GR-DR-C-00102 dated 15.07.2026 drawing showing all footpath and car parking dimensions.'*

Revised drawing CHC-00-GR-DR-C-00102 (Revision P04) is included as part of the Further Information response documentation. The revised drawing has annotated dimensions of all footpaths and car parking spaces.

Further Information Item 7.

> *'The Applicant is requested to clarify the tabletop arrangement of R4 and R2 where indent is located within the proposed tabletop.'*

The indents were originally proposed as a horizontal deflection traffic speed management measure. Given that the junctions incorporate a vertical deflection measure in the form of a tabletop arrangement the indents have been removed and are no longer included as part of the development proposals.

Further Information Item 8.

'The Applicant is requested to submit a drawing showing that the RSA recommendations including:

RSA 4.1: No footpath provided on R149

4.2: Limited visibility splays onto R149

4.3: Limited internal visibility splays on internal roads

QA 5.1: Accessibility: lack of continuous footpaths

5.2: Lack of dimension for car parking spaces

6.1: Walking: Footpaths

6.2: Lack of permeability links to canal towpath/future greenway

6.3: Lack of footpaths to R149

7.0: Cycling: No provision of cycling to train station'

Refer accompanying drawing ref. CHC-00-GR-DR-C-00105 titled 'Measures to address Quality Audit Problems'. The drawing identifies the location of each item raised as part of the Road Safety Audit and Quality Audit and includes the accepted proposals to address each item in accordance with the Feedback Form prepared as part of the Audit.

The Road Safety Audit Team (Bruton Consulting Engineers) have reviewed the proposals and have confirmed that they are acceptable. Details are included in NRB Consulting Engineers FI documentation.

Further Information Item 11. Taking in Charge

'It is noted that a portion of the surface water network (SA5 to SA7) traverses' areas of the proposed development which are not intended to be Taken in Charge. The Applicant is asked to review and revise the proposed surface water network design to ensure that the surface water network is positioned within areas intended to be Taken in Charge.'

Refer accompanying updated drawing ref. CHC-00-GR-DR-C-00200 (Revision S4-P04) titled 'Drainage Layout'. The surface water network proposed for the development has been amended such that the network is wholly within areas proposed to be Taken in Charge.

Note that as a result of the Flood Assessment carried out the FFLs of 13no. units and associated road levels have been increased to maintain a freeboard of 300mm above the anticipated flood level as a result of a 2/3 blockage of the culvert beneath the canal and railway line. The revised levels are included on accompanying updated drawing ref. CHC-00-GR-DR-C-100 titled 'Road Layout'.

We trust that the foregoing sufficiently addresses these aspects of the planning application. If there is anything further required or if you have any queries please do not hesitate to contact the undersigned.

Yours Sincerely,



PAUL CORRIGAN NCEA Civil Eng, BSc (Hons) Civil Eng, Pg Cert Civil Eng, AEng, MIEI

Director

For Corrigan Hodnett Consulting

cc Michael Hodnett, CHC, michael@corriganhodnett.ie

Encl. Appendix 1 – Rainfall Return Period Data

Appendix 2 – Microdrainage Model and Analysis Results

Drawing Issue Sheet and referenced Drawings

Confey - R5 Lands - R149 Road Widening

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 301321, Northing: 237074,

	Interval		Years											
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.4,	3.4,	4.0,	4.9,	5.6,	6.1,	7.7,	9.6,	10.8,	12.6,	14.3,	15.5,	17.5,	19.1,	20.4,	N/A ,
10 mins	3.3,	4.8,	5.6,	6.9,	7.8,	8.4,	10.7,	13.3,	15.1,	17.6,	19.9,	21.7,	24.4,	26.6,	28.4,	N/A ,
15 mins	3.9,	5.6,	6.6,	8.1,	9.1,	9.9,	12.6,	15.7,	17.8,	20.7,	23.4,	25.5,	28.7,	31.3,	33.4,	N/A ,
30 mins	5.1,	7.4,	8.6,	10.4,	11.7,	12.7,	16.0,	19.7,	22.3,	25.8,	29.0,	31.5,	35.4,	38.4,	40.9,	N/A ,
1 hours	6.8,	9.6,	11.1,	13.4,	15.0,	16.2,	20.3,	24.8,	27.9,	32.1,	36.0,	38.9,	43.5,	47.1,	50.1,	N/A ,
2 hours	8.9,	12.5,	14.4,	17.3,	19.3,	20.8,	25.7,	31.2,	34.9,	40.0,	44.6,	48.1,	53.6,	57.8,	61.3,	N/A ,
3 hours	10.5,	14.6,	16.8,	20.1,	22.3,	24.0,	29.5,	35.7,	39.8,	45.5,	50.6,	54.5,	60.5,	65.2,	69.0,	N/A ,
4 hours	11.8,	16.3,	18.7,	22.3,	24.7,	26.5,	32.5,	39.3,	43.7,	49.9,	55.3,	59.5,	66.0,	71.0,	75.1,	N/A ,
6 hours	13.9,	19.1,	21.8,	25.8,	28.5,	30.6,	37.4,	44.9,	49.8,	56.7,	62.7,	67.4,	74.5,	80.0,	84.5,	N/A ,
9 hours	16.4,	22.3,	25.4,	30.0,	33.0,	35.4,	42.9,	51.4,	56.8,	64.5,	71.1,	76.3,	84.1,	90.2,	95.1,	N/A ,
12 hours	18.4,	24.9,	28.3,	33.3,	36.6,	39.2,	47.4,	56.5,	62.4,	70.6,	77.8,	83.3,	91.7,	98.2,	103.5,	N/A ,
18 hours	21.6,	29.0,	32.9,	38.6,	42.3,	45.2,	54.4,	64.6,	71.2,	80.3,	88.2,	94.3,	103.6,	110.7,	116.5,	N/A ,
24 hours	24.3,	32.4,	36.6,	42.8,	46.9,	50.1,	60.1,	71.1,	78.1,	87.9,	96.5,	103.0,	112.9,	120.5,	126.7,	148.2,
2 days	30.4,	39.6,	44.3,	51.1,	55.5,	58.9,	69.5,	81.1,	88.4,	98.4,	107.1,	113.7,	123.6,	131.2,	137.3,	158.4,
3 days	35.5,	45.5,	50.5,	57.8,	62.5,	66.1,	77.3,	89.3,	96.9,	107.2,	116.1,	122.9,	133.0,	140.6,	146.8,	168.0,
4 days	39.9,	50.6,	56.0,	63.6,	68.6,	72.3,	84.0,	96.5,	104.4,	115.0,	124.1,	131.0,	141.3,	149.0,	155.4,	176.7,
6 days	47.6,	59.5,	65.4,	73.8,	79.2,	83.2,	95.8,	109.0,	117.3,	128.5,	138.0,	145.2,	155.8,	163.8,	170.3,	192.2,
8 days	54.5,	67.4,	73.8,	82.7,	88.4,	92.7,	106.0,	120.0,	128.6,	140.3,	150.2,	157.5,	168.5,	176.8,	183.5,	205.8,
10 days	60.8,	74.6,	81.4,	90.8,	96.9,	101.4,	115.3,	129.8,	138.9,	150.9,	161.1,	168.7,	180.0,	188.5,	195.3,	218.1,
12 days	66.8,	81.3,	88.4,	98.4,	104.7,	109.4,	123.9,	139.0,	148.3,	160.7,	171.2,	179.0,	190.6,	199.3,	206.3,	229.5,
16 days	77.8,	93.8,	101.5,	112.2,	119.0,	124.1,	139.6,	155.6,	165.5,	178.6,	189.6,	197.8,	209.9,	218.9,	226.2,	250.2,
20 days	88.0,	105.2,	113.5,	125.0,	132.2,	137.6,	154.0,	170.8,	181.1,	194.8,	206.3,	214.8,	227.4,	236.7,	244.2,	268.9,
25 days	100.0,	118.6,	127.5,	139.8,	147.5,	153.2,	170.6,	188.3,	199.1,	213.5,	225.5,	234.3,	247.3,	257.0,	264.7,	290.3,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

$M^{5\text{-}60}$ = 16.2mm
$M^{5\text{-}2day}$ = 58.9mm
Jenkinson's 'R' = [16.2/58.9] = 0.275
$M^{100\text{-}6hr}$ = 67.4mm
SAAR = 766mm (from Met Éireann Point Rainfall Data)
SOIL Type 2; SPR Value (% Runoff) = 0.300 (from FSR + GDSDS)

Corrigan Hodnett Consulting		Page 1
Civil & Structural Engineers Unit 84 Omni Park SC Santry, Dublin 9	Confey R5 Lands Phase 1a R149 Road Upgrade Drainage Catchment 1 (Eastern)	
Date 10/11/2026 14:02 File R149 Drainage.MDX	Designed by P.C. Checked by P.C.	
XP Solutions	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - R149 Opt 2a

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	16.200	Volumetric Runoff Coeff.	0.850	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.275	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	150	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Network Design Table for Storm - R149 Opt 2a

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1-1.000	28.064	0.086	325.0	0.085	5.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1-1.000	58.70	5.47	54.192	0.085	0.0	0.0	0.0	1.00	110.4	15.4

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Network Design Table for Storm - R149 Opt 2a

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1-1.001	33.462	0.103	325.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1-1.002	34.196	0.105	325.0	0.060	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1-1.003	58.094	0.179	325.0	0.059	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1-1.004	72.994	0.225	325.0	0.208	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1-1.005	8.108	0.025	325.0	0.033	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1-1.006	9.959	0.031	321.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1-1.007	8.545	0.026	325.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1-1.008	13.657	0.042	325.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1-1.009	36.447	0.214	170.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1-1.001	56.53	6.03	54.106	0.085	0.0	0.0	0.0	1.00	110.4	15.4
S1-1.002	54.50	6.60	54.003	0.145	0.0	0.0	0.0	1.00	110.4	24.2
S1-1.003	51.45	7.56	53.897	0.204	0.0	0.0	0.0	1.00	110.4	32.2
S1-1.004	48.16	8.78	53.719	0.412	0.0	0.0	0.0	1.00	110.4	60.9
S1-1.005	47.83	8.92	53.494	0.445	0.0	0.0	0.0	1.00	110.4	65.3
S1-1.006	47.43	9.08	53.394	0.445	0.0	0.0	0.0	1.01	111.0	65.3
S1-1.007	47.09	9.22	53.363	0.445	0.0	0.0	0.0	1.00	110.4	65.3
S1-1.008	46.56	9.45	53.337	0.445	0.0	0.0	0.0	1.00	110.4	65.3
S1-1.009	58.14	5.61	52.820	0.000	1.0	0.0	0.0	1.00	39.7	1.0

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Manhole Schedules for Storm - R149 Opt 2a

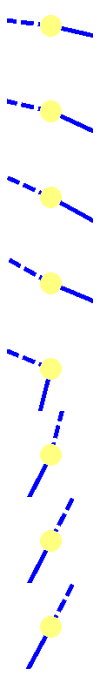
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1-1	55.467	1.275	Open Manhole	1200	S1-1.000	54.192	375				
S1-2	55.609	1.503	Open Manhole	1200	S1-1.001	54.106	375	S1-1.000	54.106	375	
S1-3	55.789	1.786	Open Manhole	1200	S1-1.002	54.003	375	S1-1.001	54.003	375	
S1-4	55.638	1.740	Open Manhole	1200	S1-1.003	53.897	375	S1-1.002	53.897	375	
S1-5	55.913	2.194	Open Manhole	1200	S1-1.004	53.719	375	S1-1.003	53.719	375	
S1-6	55.755	2.260	Open Manhole	1200	S1-1.005	53.494	375	S1-1.004	53.494	375	
S1-7	56.000	2.606	Open Manhole	1200	S1-1.006	53.394	375	S1-1.005	53.469	375	
S1-8	56.202	2.839	Open Manhole	1200	S1-1.007	53.363	375	S1-1.006	53.363	375	
S1-9	56.160	2.823	Open Manhole	1200	S1-1.008	53.337	375	S1-1.007	53.337	375	
S1-10	56.229	3.409	Open Manhole	1200	S1-1.009	52.820	225	S1-1.008	53.295	375	625
S1-11	55.000	2.394	Open Manhole	0		OUTFALL		S1-1.009	52.606	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1-1	701232.130	737176.023	701232.130	737176.023	Required	

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Manhole Schedules for Storm - R149 Opt 2a

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1-2	701259.971	737172.487	701259.971	737172.487	Required	
S1-3	701292.579	737164.976	701292.579	737164.976	Required	
S1-4	701323.644	737150.684	701323.644	737150.684	Required	
S1-5	701374.345	737122.324	701374.345	737122.324	Required	
S1-6	701441.847	737094.546	701441.847	737094.546	Required	
S1-7	701439.847	737086.688	701439.847	737086.688	Required	
S1-8	701435.334	737077.810	701435.334	737077.810	Required	
S1-9	701431.462	737070.193	701431.462	737070.193	Required	



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Manhole Schedules for Storm - R149 Opt 2a

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1-10	701424.966	737058.180	701424.966	737058.180	Required	
S1-11	701407.067	737026.431			No Entry	



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PIPELINE SCHEDULES for Storm - R149 Opt 2a

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1-1.000	o	375	S1-1	55.467	54.192	0.900	Open Manhole	1200
S1-1.001	o	375	S1-2	55.609	54.106	1.128	Open Manhole	1200
S1-1.002	o	375	S1-3	55.789	54.003	1.411	Open Manhole	1200
S1-1.003	o	375	S1-4	55.638	53.897	1.365	Open Manhole	1200
S1-1.004	o	375	S1-5	55.913	53.719	1.819	Open Manhole	1200
S1-1.005	o	375	S1-6	55.755	53.494	1.885	Open Manhole	1200
S1-1.006	o	375	S1-7	56.000	53.394	2.156	Open Manhole	1200
S1-1.007	o	375	S1-8	56.202	53.363	2.464	Open Manhole	1200
S1-1.008	o	375	S1-9	56.160	53.337	2.448	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1-1.000	28.064	325.0	S1-2	55.609	54.106	1.128	Open Manhole	1200
S1-1.001	33.462	325.0	S1-3	55.789	54.003	1.411	Open Manhole	1200
S1-1.002	34.196	325.0	S1-4	55.638	53.897	1.365	Open Manhole	1200
S1-1.003	58.094	325.0	S1-5	55.913	53.719	1.819	Open Manhole	1200
S1-1.004	72.994	325.0	S1-6	55.755	53.494	1.885	Open Manhole	1200
S1-1.005	8.108	325.0	S1-7	56.000	53.469	2.156	Open Manhole	1200
S1-1.006	9.959	321.3	S1-8	56.202	53.363	2.389	Open Manhole	1200
S1-1.007	8.545	325.0	S1-9	56.160	53.337	2.448	Open Manhole	1200
S1-1.008	13.657	325.2	S1-10	56.229	53.295	2.559	Open Manhole	1200

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PIPELINE SCHEDULES for Storm - R149 Opt 2a

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1-1.009	o	225	S1-10	56.229	52.820	3.184	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1-1.009	36.447	170.3	S1-11	55.000	52.606	2.169	Open Manhole	0

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Area Summary for Storm - R149 Opt 2a

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Default	100	0.085	0.085	0.085
1.001	-	-	100	0.000	0.000	0.000
1.002	Classification	Default	100	0.060	0.060	0.060
1.003	Classification	Default	100	0.059	0.059	0.059
1.004	Classification	Default	100	0.086	0.086	0.086
	Classification	Default	100	0.122	0.122	0.208
1.005	Classification	Default	100	0.033	0.033	0.033
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.445	0.445	0.445

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Network Classifications for Storm - R149 Opt 2a

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S1-1.000	S1-1	375	0.900	1.128	Unclassified	1200	0	0.900	Unclassified
S1-1.001	S1-2	375	1.128	1.411	Unclassified	1200	0	1.128	Unclassified
S1-1.002	S1-3	375	1.365	1.411	Unclassified	1200	0	1.411	Unclassified
S1-1.003	S1-4	375	1.365	1.819	Unclassified	1200	0	1.365	Unclassified
S1-1.004	S1-5	375	1.780	1.885	Unclassified	1200	0	1.819	Unclassified
S1-1.005	S1-6	375	1.885	2.156	Unclassified	1200	0	1.885	Unclassified
S1-1.006	S1-7	375	2.156	2.389	Unclassified	1200	0	2.156	Unclassified
S1-1.007	S1-8	375	2.448	2.464	Unclassified	1200	0	2.464	Unclassified
S1-1.008	S1-9	375	2.448	2.559	Unclassified	1200	0	2.448	Unclassified
S1-1.009	S1-10	225	2.169	3.184	Unclassified	1200	0	3.184	Unclassified

Free Flowing Outfall Details for Storm - R149 Opt 2a

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1-1.009	S1-11	55.000	52.606	52.177	0	0

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Simulation Criteria for Storm - R149 Opt 2a

Volumetric Runoff Coeff	0.850	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	16.200	Cv (Summer)	0.850
Return Period (years)	5	Ratio R	0.275	Cv (Winter)	0.840
Region	Scotland and Ireland	Profile Type	Summer	Storm Duration (mins)	30

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Online Controls for Storm - R149 Opt 2a

Hydro-Brake® Optimum Manhole: S1-10, DS/PN: S1-1.009, Volume (m³): 5.2

Unit Reference	MD-SHE-0045-1000-1200-1000	Sump Available	Yes
Design Head (m)	1.200	Diameter (mm)	45
Design Flow (l/s)	1.0	Invert Level (m)	52.820
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	1.0	Kick-Flo®	0.398	0.6
Flush-Flo™	0.196	0.7	Mean Flow over Head Range	-	0.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.7	0.600	0.7	1.600	1.1	2.600	1.4	5.000	1.9	7.500	2.3
0.200	0.7	0.800	0.8	1.800	1.2	3.000	1.5	5.500	2.0	8.000	2.4
0.300	0.7	1.000	0.9	2.000	1.3	3.500	1.6	6.000	2.1	8.500	2.4
0.400	0.6	1.200	1.0	2.200	1.3	4.000	1.7	6.500	2.2	9.000	2.5
0.500	0.7	1.400	1.1	2.400	1.4	4.500	1.8	7.000	2.2	9.500	2.6

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Storage Structures for Storm - R149 Opt 2a

Complex Manhole: S1-10, DS/PN: S1-1.009

Tank or Pond

Invert Level (m) 52.620

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	64.0	0.675	87.0

Tank or Pond

Invert Level (m) 53.295

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	87.0	2.934	220.4

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Summary of Critical Results by Maximum Level (Rank 1) for Storm - R149 Opt 2a

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 16.200 Cv (Summer) 0.750
Region Scotland and Ireland Ratio R 0.275 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 30, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
S1-1.000	S1-1	2880 Winter	100	+30%	100/2160 Winter				54.630	0.063	0.000	0.01	

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Summary of Critical Results by Maximum Level (Rank 1) for Storm - R149 Opt 2a

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1-1.000	S1-1		1.4	SURCHARGED	

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Summary of Critical Results by Maximum Level (Rank 1) for Storm - R149 Opt 2a

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)
S1-1.001	S1-2	2880 Winter	100	+30%	100/1440 Winter				54.630	0.149	0.000	0.01	
S1-1.002	S1-3	2880 Winter	100	+30%	100/720 Winter				54.630	0.252	0.000	0.02	
S1-1.003	S1-4	2880 Winter	100	+30%	30/2160 Winter				54.630	0.358	0.000	0.03	
S1-1.004	S1-5	2880 Winter	100	+30%	30/600 Winter				54.630	0.536	0.000	0.06	
S1-1.005	S1-6	2880 Winter	100	+30%	30/15 Winter				54.630	0.761	0.000	0.10	
S1-1.006	S1-7	2880 Winter	100	+30%	30/15 Summer				54.630	0.861	0.000	0.09	
S1-1.007	S1-8	2880 Winter	100	+30%	30/15 Summer				54.629	0.891	0.000	0.09	
S1-1.008	S1-9	2880 Winter	100	+30%	1/2160 Winter				54.629	0.917	0.000	0.08	
S1-1.009	S1-10	2880 Winter	100	+30%	1/30 Summer				54.628	1.583	0.000	0.03	

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1-1.001	S1-2		1.4	SURCHARGED	
S1-1.002	S1-3		2.4	SURCHARGED	
S1-1.003	S1-4		3.3	SURCHARGED	
S1-1.004	S1-5		6.7	SURCHARGED	
S1-1.005	S1-6		7.1	SURCHARGED	
S1-1.006	S1-7		7.2	SURCHARGED	
S1-1.007	S1-8		7.1	SURCHARGED	
S1-1.008	S1-9		7.0	SURCHARGED	
S1-1.009	S1-10	3034	1.2	SURCHARGED	

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Corrigan Hodnett Consulting		Page 1
Civil & Structural Engineers Unit 84 Omni Park SC Santry, Dublin 9	Confey R5 Lands Phase 1a R149 Road Upgrade Drainage Catchment 2 (Western)	
Date 10/11/2026 14:07 File R149 Drainage.MDX	Designed by P.C. Checked by P.C.	
XP Solutions	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm - R149 Opt 2b

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	5	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	16.200	Volumetric Runoff Coeff.	0.850	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.275	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Network Design Table for Storm - R149 Opt 2b

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2-1.000	41.176	0.242	170.0	0.097	5.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2-1.000	50.00	5.69	54.010	0.097	0.0	0.0	0.0	1.00	39.8	15.0

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Network Design Table for Storm - R149 Opt 2b

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2-1.001	61.543	0.318	193.5	0.099	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2-1.002	15.752	0.079	200.0	0.042	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2-1.003	11.838	0.134	88.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2-1.004	4.712	0.019	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2-1.005	15.653	0.092	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2-1.001	50.00	6.60	53.693	0.196	0.0	0.0	0.0	1.13	79.6	30.1
S2-1.002	50.00	6.83	53.375	0.238	0.0	0.0	0.0	1.11	78.3	36.6
S2-1.003	50.00	6.95	53.296	0.238	0.0	0.0	0.0	1.67	118.3	36.6
S2-1.004	50.00	7.03	53.162	0.238	0.0	0.0	0.0	1.00	70.7	36.6
S2-1.005	50.00	5.26	53.143	0.000	1.0	0.0	0.0	1.00	39.8	1.0

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Manhole Schedules for Storm - R149 Opt 2b

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S2-1	55.435	1.425	Open Manhole	1200	S2-1.000	54.010	225				
S2-2	55.251	1.558	Open Manhole	1200	S2-1.001	53.693	300	S2-1.000	53.768	225	
S2-3	54.475	1.100	Open Manhole	1200	S2-1.002	53.375	300	S2-1.001	53.375	300	
S2-4	54.557	1.261	Open Manhole	1200	S2-1.003	53.296	300	S2-1.002	53.296	300	
S2-5	54.391	1.229	Open Manhole	1200	S2-1.004	53.162	300	S2-1.003	53.162	300	
S2-6	54.346	1.203	Open Manhole	1200	S2-1.005	53.143	225	S2-1.004	53.143	300	
S2-7	55.000	1.949	Open Manhole	0		OUTFALL		S2-1.005	53.051	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2-1	701197.285	737180.161	701197.285	737180.161	Required	
S2-2	701156.398	737185.029	701156.398	737185.029	Required	
S2-3	701095.668	737194.997	701095.668	737194.997	Required	

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Manhole Schedules for Storm - R149 Opt 2b

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2-4	701093.228	737179.435	701093.228	737179.435	Required	
S2-5	701104.923	737177.601	701104.923	737177.601	Required	
S2-6	701103.517	737173.104	701103.517	737173.104	Required	
S2-7	701088.189	737169.929			No Entry	



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PIPELINE SCHEDULES for Storm - R149 Opt 2b

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S2-1.000	o	225	S2-1	55.435	54.010	1.200	Open Manhole	1200
S2-1.001	o	300	S2-2	55.251	53.693	1.258	Open Manhole	1200
S2-1.002	o	300	S2-3	54.475	53.375	0.800	Open Manhole	1200
S2-1.003	o	300	S2-4	54.557	53.296	0.961	Open Manhole	1200
S2-1.004	o	300	S2-5	54.391	53.162	0.929	Open Manhole	1200
S2-1.005	o	225	S2-6	54.346	53.143	0.978	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S2-1.000	41.176	170.0	S2-2	55.251	53.768	1.258	Open Manhole	1200
S2-1.001	61.543	193.5	S2-3	54.475	53.375	0.800	Open Manhole	1200
S2-1.002	15.752	200.0	S2-4	54.557	53.296	0.961	Open Manhole	1200
S2-1.003	11.838	88.3	S2-5	54.391	53.162	0.929	Open Manhole	1200
S2-1.004	4.712	245.0	S2-6	54.346	53.143	0.903	Open Manhole	1200
S2-1.005	15.653	170.0	S2-7	55.000	53.051	1.724	Open Manhole	0

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Area Summary for Storm - R149 Opt 2b

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Default	100	0.097	0.097	0.097
1.001	Classification	Default	100	0.099	0.099	0.099
1.002	Classification	Default	100	0.042	0.042	0.042
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.238	0.238	0.238

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Network Classifications for Storm - R149 Opt 2b

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S2-1.000	S2-1	225	1.200	1.348	Unclassified	1200	0	1.200	Unclassified
S2-1.001	S2-2	300	0.745	1.258	Unclassified	1200	0	1.258	Unclassified
S2-1.002	S2-3	300	0.800	1.009	Unclassified	1200	0	0.800	Unclassified
S2-1.003	S2-4	300	0.929	0.961	Unclassified	1200	0	0.961	Unclassified
S2-1.004	S2-5	300	0.903	0.929	Unclassified	1200	0	0.929	Unclassified
S2-1.005	S2-6	225	0.978	1.724	Unclassified	1200	0	0.978	Unclassified

Free Flowing Outfall Details for Storm - R149 Opt 2b

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S2-1.005	S2-7	55.000	53.051	52.960	0	0

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Simulation Criteria for Storm - R149 Opt 2b

Volumetric Runoff Coeff	0.850	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	16.200	Cv (Summer)	0.850
Return Period (years)	5	Ratio R	0.275	Cv (Winter)	0.840
Region	Scotland and Ireland	Profile Type	Summer	Storm Duration (mins)	30

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Online Controls for Storm - R149 Opt 2b

Hydro-Brake® Optimum Manhole: S2-6, DS/PN: S2-1.005, Volume (m³): 1.6

Unit Reference	MD-SHE-0052-1000-0600-1000	Sump Available	Yes
Design Head (m)	0.600	Diameter (mm)	52
Design Flow (l/s)	1.0	Invert Level (m)	53.143
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	1.0	Kick-Flo®	0.389	0.8
Flush-Flo™	0.186	1.0	Mean Flow over Head Range	-	0.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.9	0.600	1.0	1.600	1.5	2.600	1.9	5.000	2.6	7.500	3.2
0.200	1.0	0.800	1.1	1.800	1.6	3.000	2.1	5.500	2.7	8.000	3.3
0.300	1.0	1.000	1.3	2.000	1.7	3.500	2.2	6.000	2.8	8.500	3.4
0.400	0.8	1.200	1.4	2.200	1.8	4.000	2.4	6.500	3.0	9.000	3.5
0.500	0.9	1.400	1.5	2.400	1.9	4.500	2.5	7.000	3.1	9.500	3.6

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Storage Structures for Storm - R149 Opt 2b

Complex Manhole: S2-6, DS/PN: S2-1.005

Tank or Pond

Invert Level (m) 52.893

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	93.0	0.250	124.0

Tank or Pond

Invert Level (m) 53.143

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	124.0	1.203	380.0

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Summary of Critical Results by Maximum Level (Rank 1) for Storm - R149 Opt 2b

Simulation Criteria

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	0.000

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

Synthetic Rainfall Details

Rainfall Model		FSR M5-60 (mm)	16.200	Cv (Summer)	0.750
Region	Scotland and Ireland	Ratio R	0.275	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	30, 30, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
S2-1.000	S2-1	15 Winter	100	+30%	100/15 Winter				54.265	0.030	0.000	1.00		

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Summary of Critical Results by Maximum Level (Rank 1) for Storm - R149 Opt 2b

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S2-1.000	S2-1	37.8	SURCHARGED	

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Summary of Critical Results by Maximum Level (Rank 1) for Storm - R149 Opt 2b

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
S2-1.001	S2-2	15 Winter	100	+30%	100/15 Summer				54.031	0.038	0.000	0.93		
S2-1.002	S2-3	15 Winter	100	+30%	30/15 Winter				53.768	0.093	0.000	1.19		
S2-1.003	S2-4	15 Winter	100	+30%	100/15 Summer				53.653	0.057	0.000	0.86		
S2-1.004	S2-5	2160 Winter	100	+30%	30/15 Summer				53.629	0.167	0.000	0.10		
S2-1.005	S2-6	2160 Winter	100	+30%	30/240 Winter				53.629	0.261	0.000	0.03		1975

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S2-1.001	S2-2	70.4	SURCHARGED	
S2-1.002	S2-3	78.7	SURCHARGED	
S2-1.003	S2-4	78.8	SURCHARGED	
S2-1.004	S2-5	4.8	SURCHARGED	
S2-1.005	S2-6	1.0	SURCHARGED	

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