Climate Ready Park, Bishopbriggs – Briefing Note

Project No:	332611684	**Prepared By:**	Rory Selkirk
Doc No:	332611684_Climate Ready Park Bishopbriggs_Flooding Review_Briefing Note_01	**Reviewed By:**	Ricky Mitchell
Date:	20th October 2025	**Approved By:**	Ross Murphy
Status:	Update following EDC comments	**Revision:**	02
Subject:	Model and Design Review Briefing Note		

Contents

0 Glossary

Hydraulic Model: A computer simulation of how water flows through pipes, drains, and over land surfaces during rainfall events.

SuDS: Sustainable Drainage System

Overflow Manhole: A manhole fitted with a high-level pipe to divert excess flow during heavy rainfall to prevent surcharging

DN750 / DN450 / DN1050 / DN1200: Diameter Nominal – Refers to the internal diameter of a pipe in millimetres. For example, a DN750 pipe has 750mm width.

Non-Return Valve: A valve that allows water to flow in one direction only, preventing backflow into pipes or property connections.

Bund: A raised earth barrier used to redirect or contain flow of water on the ground surface.

Swale: A shallow channel designed to slow and direct surface water runoff.

Attenuation Basin: A storage area that temporarily holds surface water and releases it slowly to reduce flood risk.

Filter Drain: A trench filled with gravel or other porous material that filters and drains water.

Soakaway Manhole: A chamber that allows water to soak into the ground, helping to manage excess surface water.

Contributing Area: The portion of the catchment from which rainfall or surface runoff flows into a specific drainage system, pipe, or watercourse being modelled.

Subcatchment: A smaller area within a hydraulic model that contributes runoff to the drainage system.

Surcharge Level: The height water reaches in a pipe or manhole during rainfall. Pipes may be fully or partially surcharged.

Critical Storm Duration: The length of a storm (in minutes) that causes the worst flooding in a given area, used for design and modelling.

Return Period (e.g., 1 in 200yr): A statistical measure indicating how often a storm of a certain rainfall depth is likely to occur. A 1 in 200-year event has a 0.5% chance of occurring in any given year.

NAPI (New Antecedent Precipitation Index): A measure of how wet the ground is before a storm, affecting how much water runs off.

Areal Reduction Factor: A factor used to adjust rainfall data based on the size of the catchment area.

Antecedent Depth: The amount of moisture in the soil before a storm, influencing runoff volume.

Model Verification: The process of checking whether a hydraulic model accurately reflects real-world conditions using observed data, usually from flow monitoring of sewers. This usually involves recording depths and velocities in chamber(s) over a period of time e.g. 12 weeks, in order to gain information on the flow in pipes in dry weather and during rainfall. The model will then be simulated under the same rainfall conditions and the observed vs model predicted results compared.

Combined Sewer Overflow (CSO): A structure that allows excess water from combined sewers (carrying both rainwater and sewage) to overflow during heavy rainfall.

Headloss: The loss of energy or pressure in water flow due to friction or changes in pipe direction or diameter.

Invert Level: The lowest internal point of a pipe or manhole, used to determine system capacity.

Ground Infiltration: This is applied to hydraulic models to mimic the ingress to sewer network from ground water. This ingress generally increases during the winter as the ground water table rises, and the soil becomes wetter.

1 Executive Summary

1.1.1 Stantec were appointed by East Dunbartonshire Council (EDC) in 2023 to undertake hydraulic modelling and provide detailed design of drainage features for construction within the Etive and Woodhill Parks area of Bishopbriggs.

1.1.2 The full Climate Ready Park project was constructed and commissioned in early 2025. Following commissioning, a flooding incident occurred on 15th July 2025, impacting residents on Springfield Road. Reports indicated flooding from a manhole located on the Bishopbriggs Burn culvert, the rainfall event this flooding resulted from was a 1 in 20-year event at its worst.

1.1.3 Following this event Stantec have undertaken a review of the baseline hydraulic model used for the Climate Ready Park design. This model was received from AECOM, who used it to develop Surface Water Management Plans (SWMPs) for the catchment, based on a model built by WSP in 2014 as a baseline for their SWMP modelling.

1.1.4 Further investigation works have been undertaken by EDC to develop confidence in the baseline model, this investigation work has been detailed in this briefing note and where required incorporated into any modelling assessment.

1.1.5 In addition to the review of the baseline model, a review of the Climate Ready Park design model scenario was undertaken to determine any modelling factors which may impact the design. Within the design model, no flooding of any manholes within the surface water sewer network or the piped network are predicted to occur in any event up to the 1 in 200yr plus climate change allowance.

1.1.6 In summary, various modelling inputs and data have been reviewed including reassessing with alternatives where appropriate. Although this assessment has seen minor changes in the design modelling output it doesn't identify any change from the original design modelling prediction or any clear cause of the flooding event.

1.1.7 The note concludes with a recommendation that historical flow monitoring data from Scottish Water should continue to be requested and be investigated (if received) to determine baseline model accuracy. If no further information is available on the level of verification achieved in the catchment, new flow monitoring would be recommended to undertake model verification and increase confidence in model-predicted flows at the Climate Ready Park.

2 Introduction

2.1.1 Stantec were appointed by East Dunbartonshire Council (EDC) in 2023 to undertake hydraulic modelling and provide detailed design of mitigation measures within the Etive and Woodhill Parks area of Bishopbriggs. This was part of a wider project – Climate Ready Parks Bishopbriggs – which focusses on the wider area of parkland within the town. Allotment and landscape designs were completed by Stantec (and sub-consultants) and were informed by the hydraulic modelling undertaken by Stantec.

2.1.2 The hydraulic model build, baseline modelling, and mitigation modelling are detailed in the *Hydraulic Modelling Report* (April 2023) and the *Final Hydraulic Modelling Technical Note* (February 2025). This briefing note details a review of the baseline and design hydraulic models which were used to inform the design for the Climate Ready Park, Bishopbriggs.

2.1.3 The full Climate Ready Park project was constructed and commissioned in early 2025 including allotments and a cycle track. The drainage elements had previously been constructed and commissioned on 31st August 2024 while construction continued of the other park features. Following commissioning, a flooding incident occurred on 15th July 2025, impacting residents on Springfield Road. Reports indicated flooding from a manhole located on the Bishopbriggs Burn culvert, upstream of the newly installed overflow manhole.

2.1.4 Additional information was received from the residents at No. 88 Springfield Road on 9th September 2025 and a complaint in August 2024 stating that they are experiencing surcharging of the culvert leading to water flooding in their property. In response, a review of the baseline and design models has been undertaken. The hydraulic baseline model was provided to Stantec by AECOM, who had used the model for surface water management plans (SWMPs), based on an existing model provided to AECOM by WSP in 2014). The baseline model was further updated by Stantec for use in this project.

2.1.5 The final hydraulic modelling of the scheme within the Etive and Woodhill Parks area suggested that the new overflow into the SuDS basin would first operate in a 1 in 2 yr return period event. The modelling predicted that there would be no residual flood risk and that the basin could accommodate the 1 in 200yr+CC event overflow volume. The modelling Technical Note also noted that:

- No flooding of any manholes within the surface water sewer network or the piped network are predicted to occur in any event up to the 1 in 200yr+CC

The hydraulic model build, baseline modelling, and mitigation modelling are detailed in full in the Hydraulic Modelling Report (April 2023) and the Final Hydraulic Modelling Technical Note (February 2025)

2.1.6 The drainage elements of the Climate Ready Park project were constructed and commissioned in August 2024. A flooding incident occurred on 15th July 2025, impacting residents on Springfield Road. Reports indicated flooding from a manhole located on the Bishopbriggs Burn culvert, upstream of the newly installed overflow manhole.

2.1.7 Final Hydraulic Modelling Technical Note (Feb 2025) noted that flooding occurred within the disconnecting manhole of the property at No 88 Springfield Road while the new overflow manhole was surcharged, and it was discovered that the connection from this property to the surface water sewer within the road was not recorded within existing utilities plans or received hydraulic models. As such this hadn't been identified during the mitigation modelling.

2.1.8 In response to this flooding incident, a review of the baseline and design models has been undertaken. This briefing note details a review of the baseline and design hydraulic models which were used to inform the design for the Climate Ready Park, Bishopbriggs.

3 Climate Ready Park Scheme Design

3.1 Summary

3.1.1 The Climate Ready Park scheme in Bishopbriggs was constructed and commissioned in early 2025 although the Drainage elements of the scheme were commissioned on 31st August 2024. The design and hydraulic modelling are detailed in the 'Final Design Hydraulic Modelling Technical Note' and 'Hydraulic Modelling Report'. The previously existing network, before the construction of the Climate Ready Park is shown in Figure 2-1.

Figure 2-1 Network Layout Showing Culvert (Green), Surface Water (Blue), Foul (Brown) and Combined (Red) Piped Systems Before the Construction of the Climate Ready Park

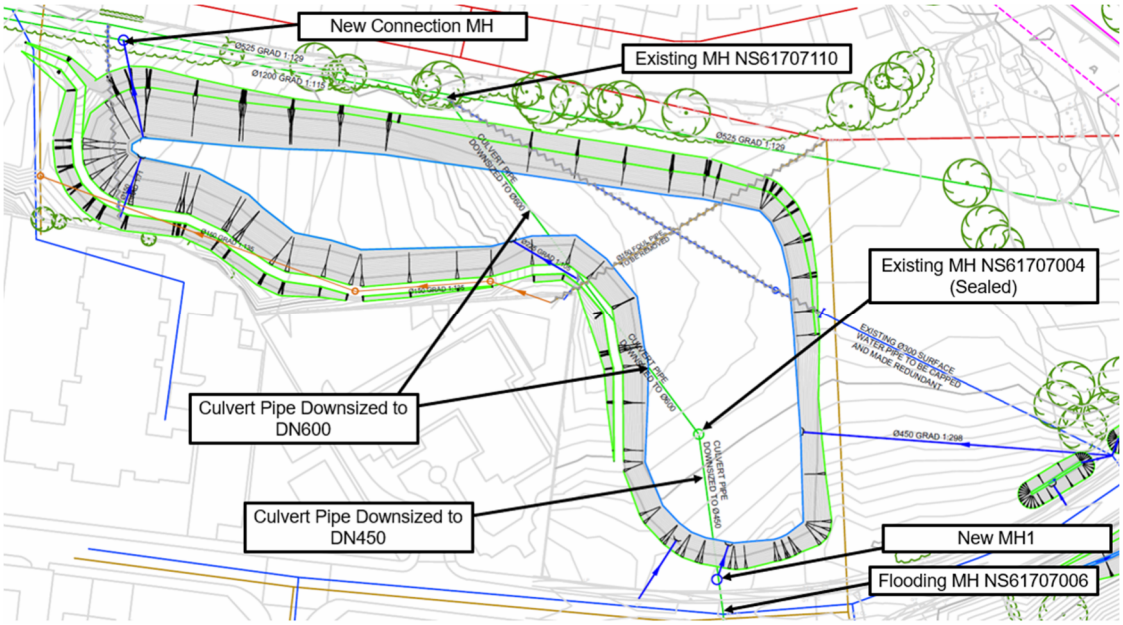
3.1.2 Figure 2-2 shows the location of the constructed features at the Climate Ready Park. Sections 2.1.3 to 2.1.8 describe the constructed features in more detail.

Figure 2-2 Overview location of the constructed Climate Ready Park features

3.1.3 The key features of the Climate Ready Park in the main Etive Park area include:

- A new SuDS basin located between Menteith Avenue and Etive Crescent
- A new overflow manhole ('MH1') on the existing Bishopbriggs Burn culvert constructed in the park, containing a DN750 overflow pipe to route flows to the new SuDS basin
- Downsizing of the existing Bishopbriggs Burn culvert from DN1050 to DN450 between MH1 and NS61707004
- Downsizing of the existing Bishopbriggs Burn culvert from DN1200 to DN600 between manholes NS61707004 and NS61707110
- A new DN450 outlet from the SuDS basin to the existing Bishopbriggs Burn culvert downstream of manhole NS61707110
- Non-return valve fitted within MH1 although these have subsequently been removed
- Sealing of manhole NS61707004 within the basin area
- Additionally, 3no. other outfalls to the basin were added to connect surface water into the basin from the swales on Menteith Avenue, Springfield Road, and within the park area.

3.1.4 Figure 2-3 illustrates the general arrangement and key manholes around the new basin.

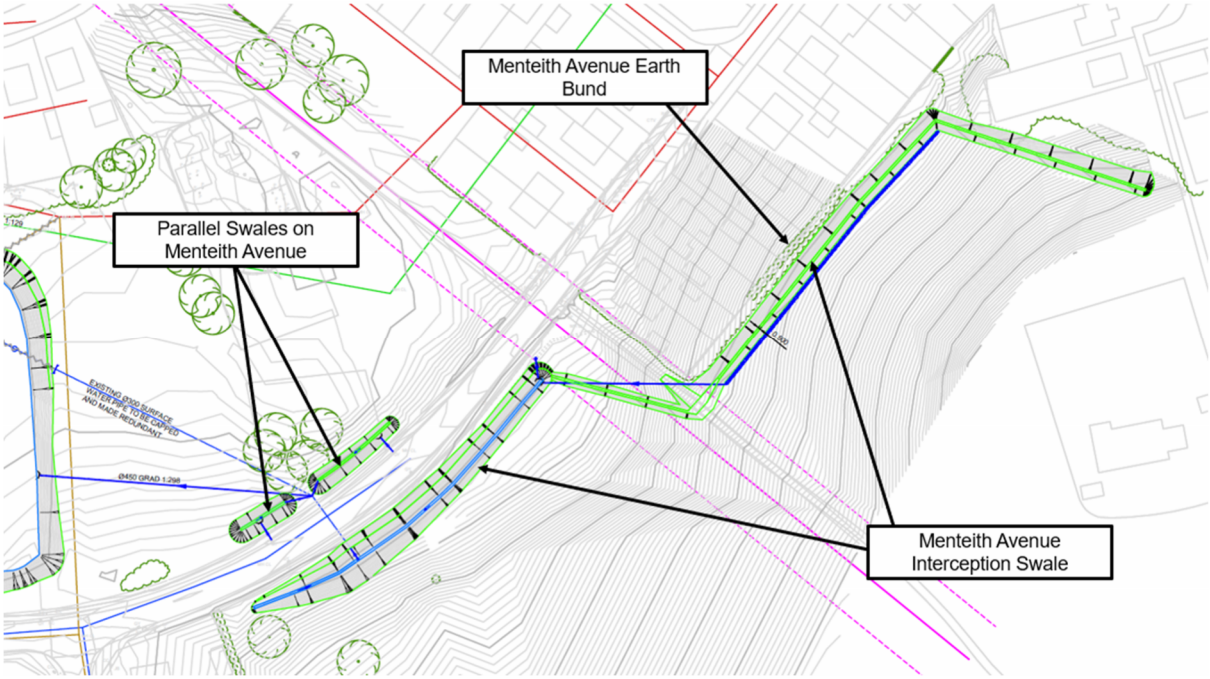


2-3 Climate Ready Park Main SuDS Basin General Arrangement

3.1.5 Additionally, the following features formed part of the design at Menteith Avenue:

- An interception swale along the southern edge of Menteith Avenue along the length of the sloping parkland with bunding on the northern side.
- A small earth bund southeast uphill along the rear of 41-65 Menteith Avenue.
- Two parallel swales on the northern side of the road, connected to new gully pots and routed to the park's drainage system

3.1.6 Figure 2-4 illustrates the general arrangement at Menteith Avenue.



2-4 Menteith Avenue General Arrangement

3.1.7 The following features also form part of the design at the Western Allotments on the previous blaes pitch:

- A linear attenuation basin feature to capture overland flow and attenuate surcharged flows from the Bishopbriggs Burn culvert
- Filter drain along the western edge of the site
- A 150mm high bund in the park to direct flows west toward the linear basin
- A soakaway manhole to allow flood water to drain down

3.1.8 Figure 2-5 illustrates the general arrangement at the Western Allotments.

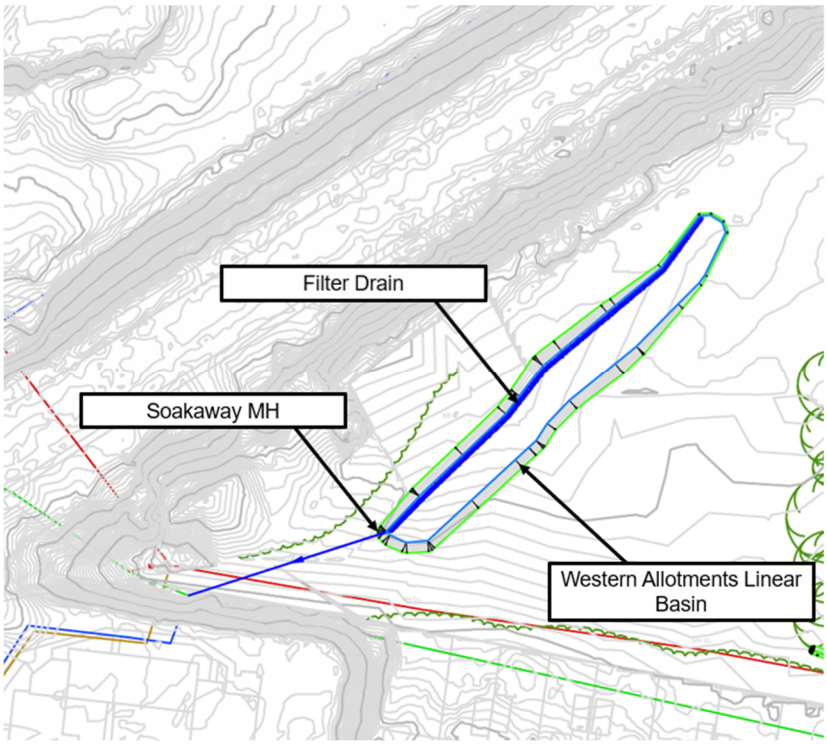


Figure 2-5 Western Allotments General Arrangement

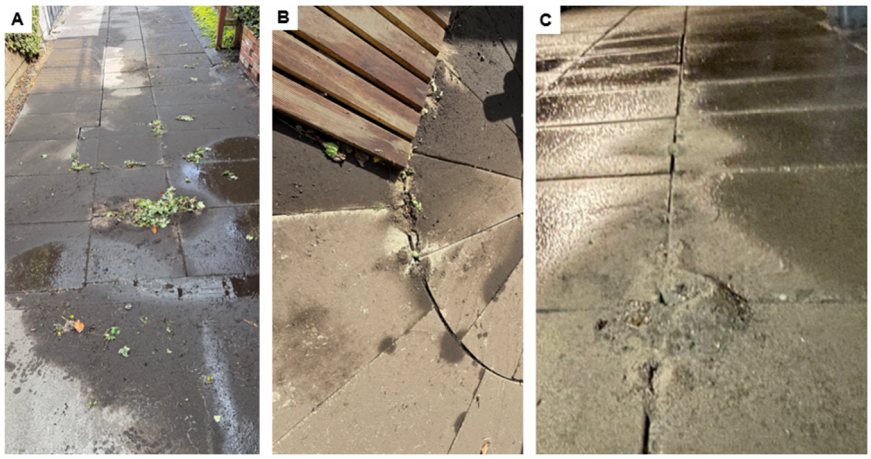
4 July 2025 Flooding Event

4.1 Summary

4.1.1 Following commissioning of the Climate Ready Park, a flooding event was experienced by residents at Springfield Road on 15th July 2025. Reported flooding emanated from manhole NS61707006, located upstream of the new overflow MH1 (refer Figure 2-1). During the flooding event, the DN750 overflow pipe from MH1 was discharging flows into the attenuation pond. The manhole cover at NS61707006 had the cover pushed off by the force of the water. Figure 3-1 shows the flooding experienced by local residents, with the surcharging manhole in the road outside No. 88 Springfield Road.

3-1 July 2025 Flooding Event

4.1.2 The residents at No. 88 Springfield Road reported that the flood level reached 61.59m, 500mm above the finished floor level of the property approximately 61.09m. It is noted that the ground floor level of the property is above the invert level of the overflow pipe, 60.6m. A sketch showing layout the levels of No. 88 and the drainage features has been included at the end of this Briefing note. Residents at No. 88 Springfield Road had also previously experienced flooding in 2024 as noted in Final Hydraulic Modelling Technical Note (Feb 2025).



3-2 Local Resident Photo Showing Sediment Transported Through Slabs (A & B – July 2025; C – August 2024)

4.1.3 Following the flooding event, East Dumbartonshire Council (EDC) CCTV and vactor crews attended to inspect the system. No blockages or other operational issues were found which may have explained the flooding event experienced.

4.1.4 Based on the previous hydraulic modelling undertaken (refer report 'Final Design Hydraulic Modelling Technical Note'), no model predicted flooding occurred in this location in the design model up to and including a 1 in 200-year (with 41% climate change uplift) event. The flooding event experienced in July 2025 was a 1 in 20-year event (at its worst; Figure 3-3), therefore the model does not replicate the flooding experienced in July 2025.

FEH2013 Rainfall data for event at 261500,670500 on 15/07/2025

	Pixel Centre		Area										Maximum Rainfall Return Period			
Pixel	Easting	Northing	km†	Duration(h)	0.25	0.5	1	2	4	5	12	24	48	**RP yrs**	**Depth mm**	**Duration h**	**End time of rainfall**
1	260500	671500	1	Max rainfall(mm)	8.8	14.1	24.5	29.4	32.1	33.6	36.5	36.5	50.9				
				Return period(yrs)	3.2	4.6	9.5	8.9	6.2	5.8	3.1	1.5	1.8	9.5	24.5	1	16:00 GMT 15-July-2025
2	261500	671500	1	Max rainfall(mm)	10.4	16.9	27	31.8	34.5	35.4	38.5	38.5	54				
				Return period(yrs)	4.6	7.1	12.8	11.6	8	7.1	3.8	1.8	2.3	12.8	27	1	15:55 GMT 15-July-2025
3	262500	671500	1	Max rainfall(mm)	9.5	15.1	25.6	30.3	33.1	33.8	37.4	37.4	52.7				
				Return period(yrs)	3.8	5.4	11	9.9	7.1	6.1	3.5	1.7	2.1	11	25.6	1	15:50 GMT 15-July-2025
4	260500	670500	1	Max rainfall(mm)	7	13	23.1	28.8	32.2	33.5	36.6	36.6	51.1				
				Return period(yrs)	2.2	3.9	8.2	8.4	6.4	5.9	3.2	1.6	1.9	8.4	28.8	2	16:00 GMT 15-July-2025
5	261500	670500	1	Max rainfall(mm)	9.3	16.5	30.7	34.9	38.3	40	43.3	43.3	58.4				
				Return period(yrs)	3.6	6.7	19.8	16.6	12.4	11.8	6.2	2.6	3.3	19.8	30.7	1	15:50 GMT 15-July-2025
6	262500	670500	1	Max rainfall(mm)	11.4	16.9	31	34.4	37.6	38.7	42.1	42.1	56.1				
				Return period(yrs)	5.7	7.2	20.3	15.8	11.6	10.4	5.7	2.4	2.8	20.3	31	1	15:45 GMT 15-July-2025
7	260500	669500	1	Max rainfall(mm)	6.5	11.1	16.8	24.3	30.7	32.6	35.7	35.7	49.7				
				Return period(yrs)	2	2.9	3.9	5.2	5.6	5.5	3	1.5	1.8	5.6	30.7	4	16:55 GMT 15-July-2025
8	261500	669500	1	Max rainfall(mm)	7.4	13.6	22.2	28.3	32.6	35.1	38.4	38.4	51.3				
				Return period(yrs)	2.4	4.3	7.4	8.1	6.9	7.2	4	1.8	2	8.1	28.3	2	15:55 GMT 15-July-2025
9	262500	669500	1	Max rainfall(mm)	8.1	14.3	26.9	30.7	35.1	37.1	40.3	40.3	53.7				
				Return period(yrs)	2.8	4.9	12.9	10.7	9.1	9.1	4.9	2.2	2.5	12.9	26.9	1	15:45 GMT 15-July-2025

Catchment

3-3 FEH13 Rainfall Return Period Analysis

4.1.5 In response to the flooding event, a review of the hydraulic model information has been undertaken. Section 4 summarises this review and recommends further investigations work which could be undertaken.

5 Hydraulic Model Review

5.1 Baseline Hydraulic Model

5.1.1 As outlined in the April 2023 'Hydraulic Modelling Report', the baseline hydraulic model used for the Climate Ready Park design was built in Infoworks ICM v9.5 and was constructed as a linked 1D-2D model, where the below ground network of surface water sewers is linked to the 2-dimensional ground surface, this is further described in 2D modelling section. This allows flows to route both in and out of the below ground network. This model was received from AECOM, who used it to develop surface water management plans (SWMPs) for the catchment, based on a model built by WSP in 2014 as a baseline for their SWMP modelling.

5.1.2 As per the 'Hydraulic Modelling Report', once the received model was run, it was established that flows were incorrectly allocated within the model. This was due to overlapping foul and storm subcatchments which both represented. Therefore, for the design of the Climate Ready Park, subcatchments were amended to allocated appropriately for contributing rainfall and ensure that within each subcatchment area, rainfall was only applied to either the surface water *or* combined sewer.

5.1.3 As per industry standard practice, the extents of the model were trimmed (cut down) to only include the area of study, all network pipes, nodes and reaches upstream of it, and a short section of the downstream Bishopbriggs Burn culvert. This removed the main reach of open 1D-2D river in the west of the town as this was not considered to be affected by any works within this study.

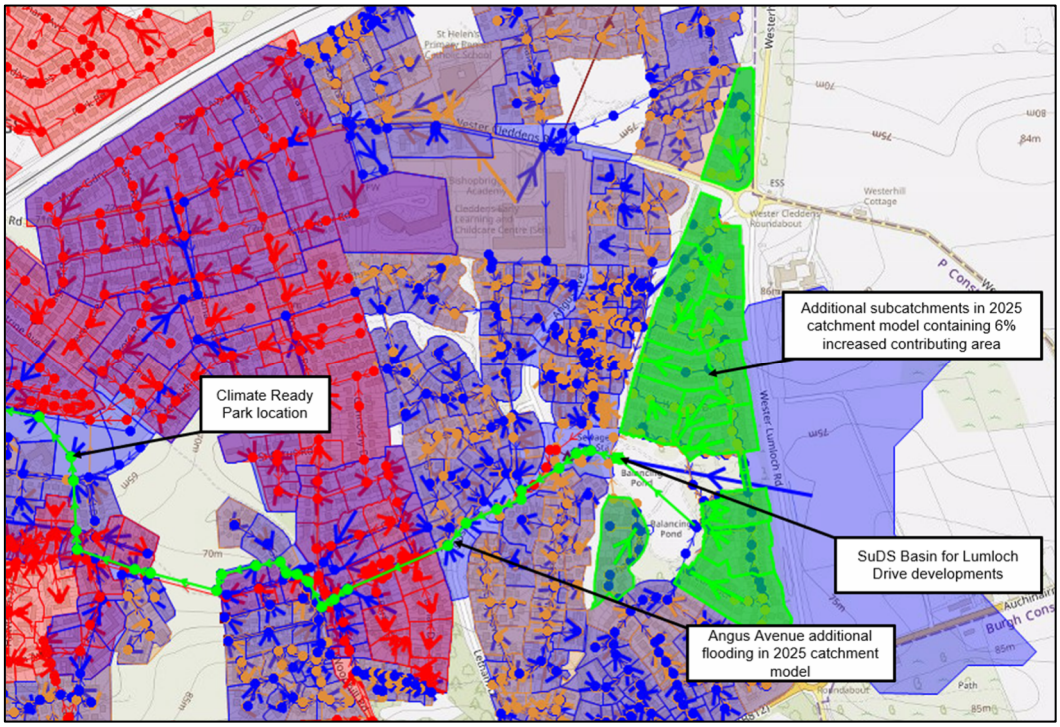
5.1.4 No further updates were made to the baseline model. This baseline model was then used to model the Climate Ready Park scheme. A review of the baseline model is summarised in Sections 4.2-4.9.

5.2 Model Version

5.2.1 As per the 'Hydraulic Modelling Report', the baseline model used for the Climate Ready Park design is thought to have been developed in 2014 by WSP. Regular model maintenance is undertaken by Scottish Water for their models, and therefore the baseline model was compared against the most recent 2025 version of the catchment model for any changes in the area upstream of the Climate Ready Park.

5.2.2 The 2025 model has 6% more contributing area applied upstream of the Climate Ready Park than the baseline model used. This contributing area represents flows from an upstream new development around Lumloch Drive upstream of the SuDS attenuation feature for the development. There is a potential that this development was not fully vested as a public network at the time of the original WSP model build in 2014, and therefore this is why this development is not included in the design model. Figure 4-1 shows the location of subcatchments which are not included in the Climate Ready Park model at Lumloch Drive.

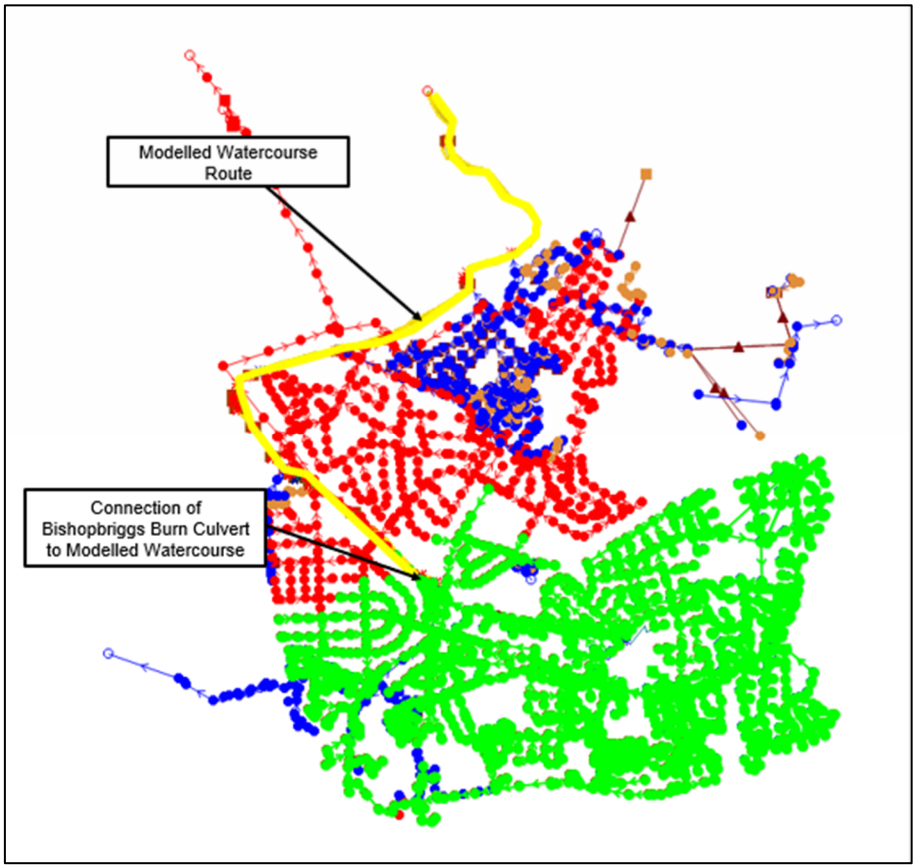
5.2.3 However, the additional contributing flows from Lumloch Drive do not increase model flows in the Climate Ready Park area. This is because these additional flows cause new model-predicted flooding at Angus Avenue in the 2025 model, upstream of the Climate Ready Park. Therefore, the difference in flows between model versions is not likely to contribute to flooding experienced in July 2025, despite the 6% less contributing area applied to the Climate Ready Park model.



4-1 Location of additional contributing areas in the 2025 model compared to the baseline model

5.3 Model Cut

5.3.1 As described in Section 4.1.3, the baseline hydraulic model was a cut-down version of the received model. The cut down model extent is shown in Figure 4-2.



4-2 Plan showing the cut down model extent (green) within the full Bishopbriggs model

5.3.2 When running the design scenario within the full model for the 200yr 120-minute event (with 41% CC), minor surcharge levels are inherited at the SuDS Basin from the watercourse (<100mm). This event represents the design horizon used for the modelling to size the design based on SEPA specification. Figure 4-3 shows a long section comparison of the option design within the cut down model versus the full model (including the watercourse). While there is an increased top water level (TWL), the model still does not predict flooding in the design when run within the full model including the watercourse.

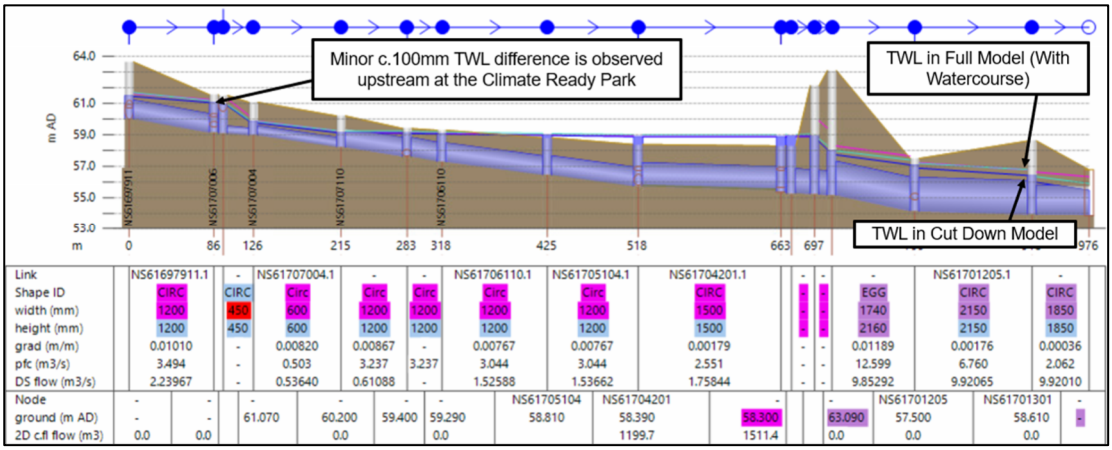


Figure 4-3 Option Cut Model vs. Full Model Long Section Comparison (M200-120-S+41% CC)

5.4 Model Extent

5.4.1 The baseline model extent provided by AECOM was reviewed against the Scottish Water asset GIS to identify any network shown in the GIS but not included in the model. Aside from the network at the Lumloch Drive development (see Section 4.3.2) and some network simplification, the GIS and baseline model extent match well. No other significant network is missing from the model when compared to the Scottish Water GIS showing existing drainage assets.

5.4.2 One 'unknown end' exists in the GIS upstream of the Climate Ready Park on the Bishopbriggs Burn culvert, located to the south of Auchinairn Road. The pipe is shown as a DN375 pipe, of which the upstream extent is unknown. This pipe may have a greater upstream extent than shown on the map, particularly as the GIS does not show any drainage for the nearby Littlehill Golf Course. Therefore, there may be additional flows greater than the baseline model (provided by AECOM) representation, entering the DN375 pipe at the unknown end, potentially from Littlehill Golf Course. If additional flows drain to the Climate Ready Park which are not represented in the model, this may explain why flooding was experienced but is not predicted by the design model. The location of the unknown end is shown in Figure 4-4.

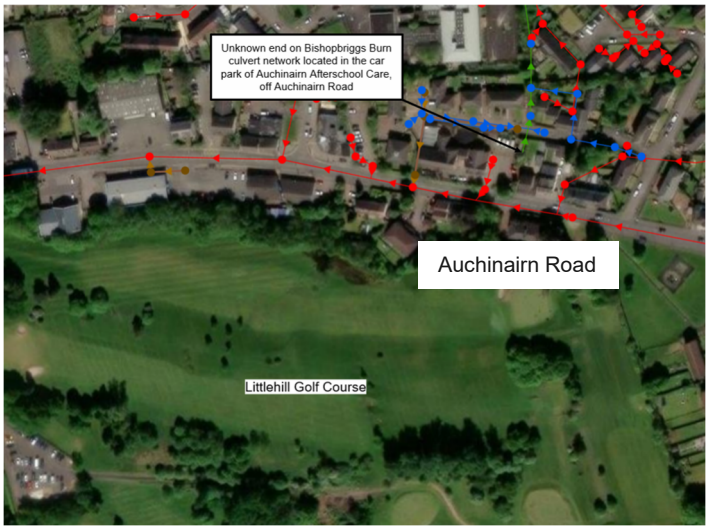


Figure 4-4 Unknown end at Auchinairn Road

5.4.3 Survey work was undertaken on behalf of EDC in September 2025 to investigate the upstream extent of the culvert and determine if any drainage from Littlehill Golf Course enters the system. A summary of the results of the CCTV is shown in Figure 4-5. No chambers connected to the culvert were found on Auchinairn Road, and 1 no. chamber was located in the golf course, however a noise test was not heard at the most upstream culvert manhole.

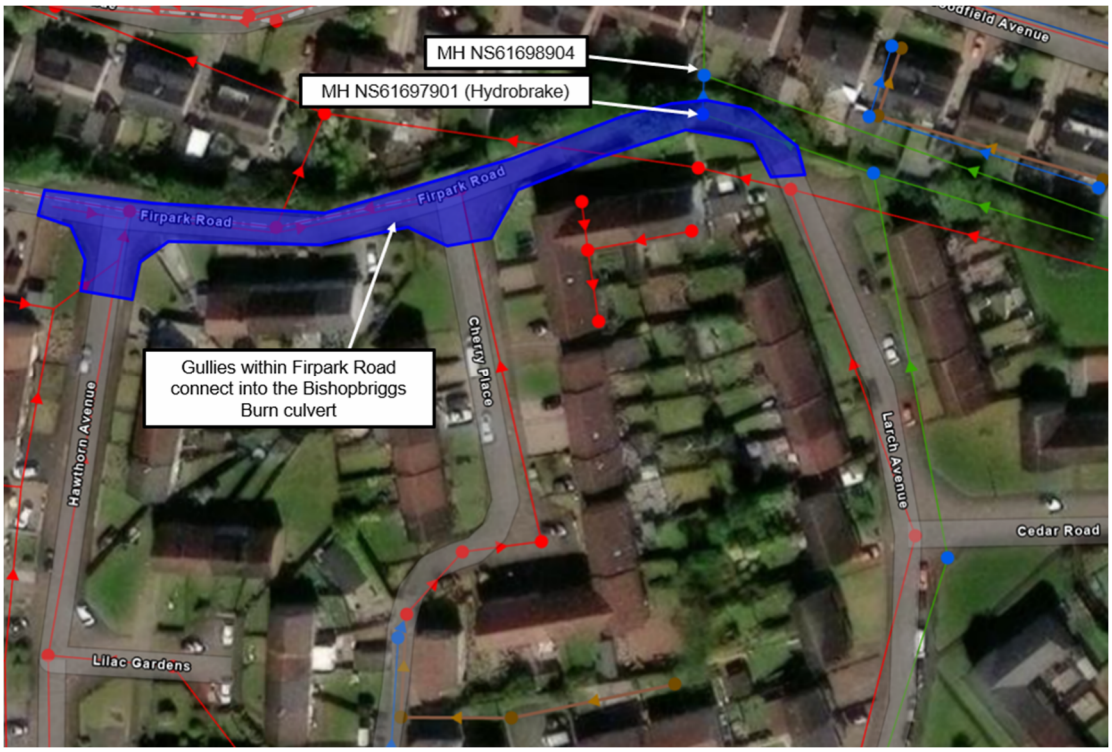
Figure 4-5 Summary of CCTV undertaken at James Dunlop Gardens/Auchinairn Road

5.4.4 A screenshot of the upstream section of the CCTV survey is given in Figure 4-6. There is a minor flow in the pipe (<5% of pipe cross sectional area) during light rain on the 2nd September 2025. This suggests that there is some minor inflow into the pipe upstream. The survey contractor estimated the upstream extent of the pipe was c. 30m upstream of the blockage, this extent is not covered by the existing model subcatchment. Therefore, while the CCTV work completed has not confirmed the exact upstream extent of the pipe, the survey contractor was unable to find evidence of Auchinairn Road/Littlehill Golf Course connecting into the culvert.

Figure 4-6 CCTV Survey at James Dunlop Gardens

5.4.5 Overall, some minor flow may be entering the system at James Dunlop Gardens which is not represented in the model; however, there is no evidence that large areas such as Auchinairn Road or Littlehill Golf Course drain to the culvert. To determine the exact magnitude of missing flows from the model, observed flow survey data or information on previous flow monitoring and verification would be required.

5.4.6 Additional survey work was also conducted at Larch Avenue in September 2025 by EDC to confirm if flows in this area drain to the Bishopbriggs Burn culvert. It was confirmed that surface water drainage from road gullies on Firpark Road connect into MH NS61697901, which has a hydrobrake which controls flow into MH NS61698904. Figure 4-7 shows the layout discovered in the survey. This is circa 130m upstream of the Climate Ready Park on the Bishopbriggs Burn culvert. The baseline model was reviewed against this data, and the baseline model does represent the surface water from road gullies in this location entering the culvert. While the hydrobrake is not modelled, this would result in potentially restricted flows going to the Climate Ready Park. Therefore, the design model represents the worst case as it assumes that there is no hydrobrake controlling pass forward flows at MH NS61697901.



4-7 Plan Showing Larch Avenue Surveyed Layout

5.5 Rainfall

5.5.1 The Climate Ready Park modelling included model runs for the critical duration event (120-minute summer storm as noted in previous reporting) for 1 in 2yr, 1 in 5yr, 1 in 10yr, 1 in 30yr, 1 in 50yr, 1 in 100yr, 1 in 200yr and 1 in 200yr + 41% Climate Change (CC). This assessment meets or exceeds requirements set out in East Dunbartonshire Council's technical guidance for drainage.

5.5.2 The 'Final Design Hydraulic Modelling Technical Note' states that the climate change uplift of 41% applied based on SEPA's latest guidance (Climate Change Allowances for Flood Risk Assessment in Land Use Planning V6).

5.5.3 For this independent assessment, rainfall was generated using the FEH13 design rainfall generator in InfoWorks ICM, and the FEH13 point descriptor for X=261500 Y=672200 was used. The Scottish Water specification states that an antecedent rainfall depth of 99mm and 3mm/day summer evaporation rate should be used to generate the rainfall. The NAPI value is

derived from the SAAR value in the FEH13 point descriptor. When re-assessing the model, flows and flood volumes in the network are now higher using this process to generate rainfall data. This is due to more runoff being generated by the higher NAPI (Net Anti Precedent Index) values assigned to the rainfall (based on soil conditions), aerial reduction factor, and antecedent depth values when following the Scottish Water specification.

5.5.4 Using this alternative approach to generating rainfall data as a independent assessment, while more flows are predicted to arrive at the Climate Ready Park, there is still no model-predicted flooding at the Climate Ready Park when running the M200 + 41% CC event with the newly generated rainfall. Therefore, the difference between the rainfall used for the modelling and newly generated rainfall is not enough to explain the flooding experienced at the Climate Ready Park in July 2025.

5.5.5 Additionally, only the 120-minute summer storm was used for model simulations, which is noted to be the critical storm duration. Rainfall was generated for short and long duration events (60 minute and 1440 minute durations) as a check to determine if the assessed critical duration was correct. No flooding was predicted in the design model at the Climate Ready Park in these storms, and the 120 minute duration event had the worst-case top water level (TWL) at flooding MH NS61707006 and new MH1. As such, the 120-minute summer storm can be considered the “critical” storm duration.

5.5.6 This alternative approach to rainfall used for this study is higher, however, based on the assessment undertaken, the update to the rainfall will not replicate the flooding observed during the July 2025 flooding event.

5.6 Model Verification

5.6.1 Significant flow monitoring was undertaken in Bishopbriggs in 2010 for the Glasgow Strategic Study (GSS), undertaken by Mouchel, including a flow (depth and velocity) monitor in manhole NS61707006 which flooded during the July 2025 flooding event. The monitor was installed in the culvert between 02/03/2010 and 12/05/2010. However, the GSS MBV (Model Build & Verification) report does not outline the results of model verification for any monitors within the Bishopbriggs area. Therefore, the level of verification, or confidence in baseline model predicted flows, cannot be concluded at this time.

5.6.2 If the baseline model (provided by AECOM for the study) does not replicate observed flows well, and flows in the culvert are underpredicted, additional flows may be arriving at the Climate Ready Park. This may contribute to the flooding experienced at the Climate Ready Park in July 2025.

5.6.3 However, it is not known whether the flows represented in the baseline model (provided by AECOM for the study) replicate observed data. Further investigations into model verification against observed data are recommended to determine whether the model represents observed flows accurately. Discussions with Scottish Water are currently ongoing with a view to locating the historical data. If no further information is available on the model verification undertaken by Mouchel for the GSS, further work to undertake flow monitoring in the catchment is recommended in order to increase confidence in the model-predicted flows upstream of the Climate Ready Park.

5.7 Inflows

5.7.1 No inflow files are applied to the baseline or design models upstream of the Climate Ready Park. As noted in Section 4.4.2, flows may enter the system upstream of Auchinairn Road which would lead to higher flows at the Climate Ready Park, which could contribute to the flooding experienced in July 2025, however from survey information provided by EDC this isn’t expected to have significant impact on the network. This is further explained throughout this briefing note.

5.7.2 As per Section 4.4.3, survey work was undertaken to investigate the upstream extent of the culvert piped system and determine if any drainage from Littlehill Golf Course enters the system

upstream of the Climate Ready Park. The CCTV work completed has not confirmed the exact upstream extent of the pipe. The survey contractor was unable to find evidence of Auchinairn Road/Littlehill Golf Course connecting into the culvert.; however, the CCTV images show some flows in the system during light rain. It is recommended that further investigations could be undertaken to confirm where the drainage of Littlehill Golf Course drains to, in order to confirm if the drainage connects to the Bishopbriggs Burn Culvert upstream of the Climate Ready Park.

5.7.3 There is no Ground Infiltration Module used in this part of the baseline model. It is assumed that any previous verification work had concluded that there was no Ground Infiltration impact to the combined / surface water sewers in the area of Bishopbriggs. However, as there is no documentation available for the previous verification, this is an assumption based on the received baseline model.

5.8 Combined Sewer Overflows (CSOs)

5.8.1 One CSO is present upstream of the Climate Ready Park at 41 O'Neill Avenue. This has been modelled using survey data and is represented similarly in both the Climate Ready Park baseline model and the 2025 catchment model from Scottish Water. The model representation of the CSO is therefore high confidence.

5.8.2 Additionally, a survey of 41 O'Neill Avenue was undertaken on 30th August 2025. The survey contractor noted that there was evidence of sewage in the culvert, and that the CSO is not screened. No survey of the weir dimensions or levels was taken in order to compare against the baseline model representation. However, incoming and outgoing pipe sizes and depths and chamber measurements were taken, all of which were within 100mm of the existing model levels. Therefore, from the data available the model representation of the CSO is considered acceptable.

5.9 2D Modelling

5.9.1 A review of the 2D hydraulic modelling approach was undertaken. No obvious issues were identified with the 2D modelling which would lead to underestimated flows in the hydraulic model. Therefore, the 2D modelling approach is considered acceptable.

5.10 Design Model

5.10.1 A review of the design model scenario was undertaken to determine any modelling factors which may impact the design.

5.10.2 Default headlosses were applied correctly in the new/modified pipework at the Climate Ready Park. The design model was updated and run with the site specific headloss values. This update caused a minor change in the surcharge level at the Climate Ready Park in the 1 in 200yr 120-minute event, with a maximum difference of 36mm. The design model was not predicted to flood when running the model with the site specific headlosses. However, it is recommended that if any further modelling is undertaken at the Climate Ready Park, the model is updated to include the site specific headloss values at the newly constructed pipework.

5.10.3 The design model was also compared with the survey data provided by Lanes in July 2025. Comparing the design model with the survey data for Lanes, the outgoing invert level of the overflow pipe from MH1 is shallower in the surveyed information compared to the design model. Therefore, the constructed pipe could have a 10% lower capacity than the design model. With the capacities modelled as above, there is no flooding predicted at the manhole in the road in the 1 in 200yr 120-minute event.

5.10.4 Subsequently, manhole cards were received for the manholes surrounding the Climate Ready Park in September 2025. Figure 4-8 shows the manhole survey locations received.

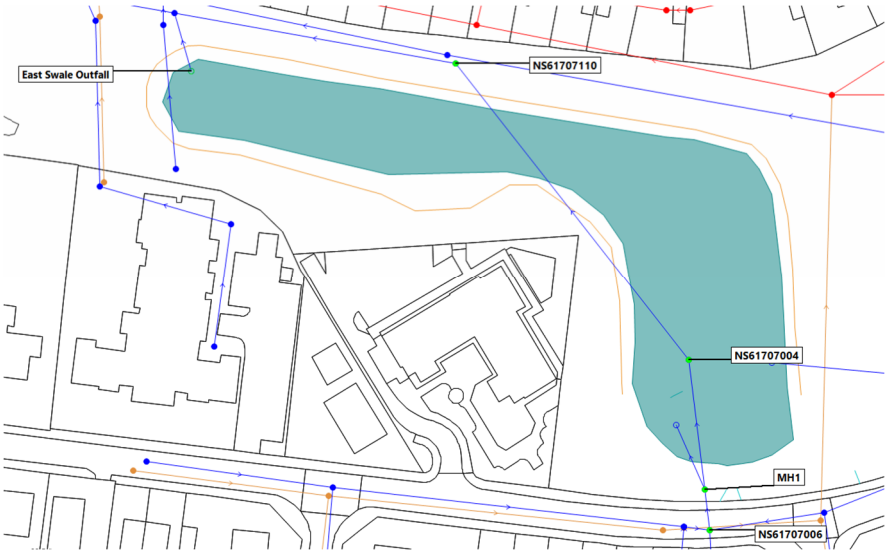


Figure 4-8 Surveyed Manholes Surrounding the Climate Ready Park Received in September 2025

5.11 Design Factors

5.11.1 In the scheme design for the Climate Ready Park, the soffit of the overflow pipe to the SuDS basin is close to the cover level of manhole NS61707006. If the overflow pipe reaches full capacity, additional head is required to drive flow through the outfall pipe. As the cover level of flooding manhole NS61707006 is only 340mm higher than the overflow pipe soffit, there is little head potential before flooding would occur out of manhole NS61707006.

6 Conclusions and Recommendations

6.1 Conclusions

6.1.1 The design model for the Climate Ready Park scheme did not predict flooding at MH NS61707006 up to the 1 in 200-year plus 41% climate change event. A flooding event was experienced on 15th July 2025 following commission of the Climate Ready Park. An independent review has been undertaken view a view to understand the cause of the flooding event.

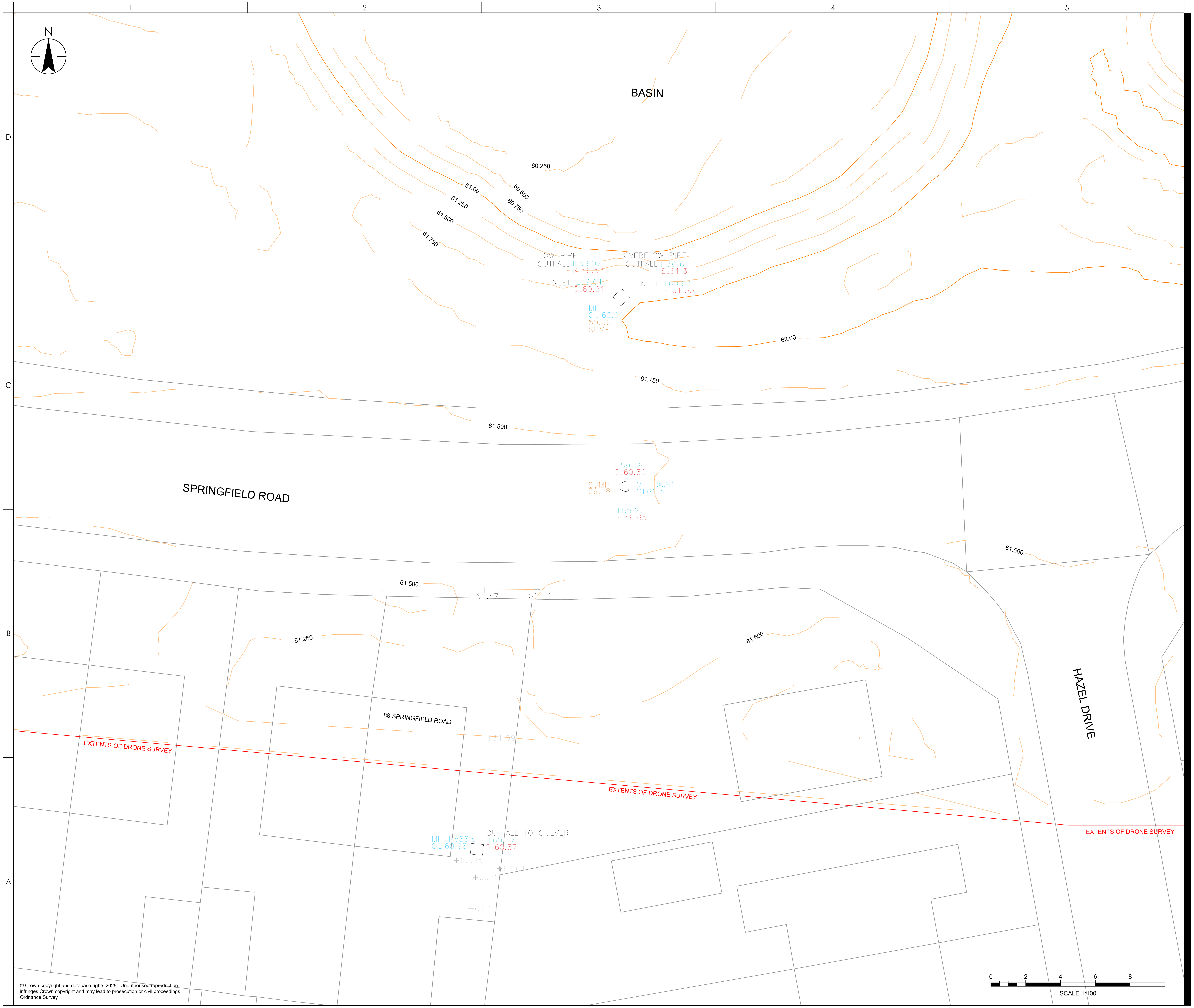
6.1.2 A review of the confidence in the baseline model (received from AECOM) used for the Climate Ready Park design has been undertaken in response to the flooding event. The key potential issues identified with the model which may contribute to flooding experienced in July 2025, which is not predicted by the model, are summarised below:

- The model may not fully represent upstream inflows, for example from the unknown end at Auchinairn Road / Littlehill Golf Course. CCTV work was undertaken, and the survey contractor was unable to find evidence of Auchinairn Road/Littlehill Golf Course connecting into the culvert. However, some minor flow was evident in the CCTV images / videos which may be entering the system from the upstream catchment. In order to determine the exact magnitude of missing flows from the model, observed flow survey data or information on previous flow monitoring and verification would be required. Additionally, further investigations to confirm the drainage at Littlehill Golf Course and where it connects would be beneficial.
- No verification data is available for the model in the Bishopbriggs area. Therefore, it is unclear whether the model accurately replicates observed flows in the catchment.

6.1.3 Additionally, a review of the design model has been undertaken. Various design inputs and data have been tested including alternatives where appropriate. Although this assessment has seen minor changes in the design modelling output it doesn't identify any clear cause of the flooding event.

6.2 Recommendations

6.2.1 The historical flow monitoring data from Scottish Water should continue to be requested and be investigated if received in order to determine baseline model accuracy in terms of model-predicted flows. If no further information is available on the level of verification achieved in the catchment, new flow monitoring would be recommended in order to undertake model verification and increase confidence in model-predicted flows at the Climate Ready Park.



Stantec

Stantec UK Limited

PICK YOUR OFFICE

Tel.
www.stantec.com/uk

Notes

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

Issued/Revision	By	Appd	YYYY.MM.DD
SKETCH			

	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	-	-	-	2025.09.30

Issue Status

S1 - FOR COORDINATION

This document is suitable only for the purpose noted above. Use of this document for any other purpose is not permitted.

Client/Project Logo

Client/Project
East Dunbartonshire Council

Climate Ready Park

Title
CLIMATE READY PARK - DRAINAGE LEVELS SKETCH

Project No.	A1 Scale
332611684	Custom

Revision	Drawing No.
01	