

Project Name	Kingsway Business Park		
Document Number	KBP-BWB-ZZ-XX-RP-CD-0003	Job Number	NTW2889
Author	M. Bailey	Status	S2
Checked	R. Jobling	Revision	P1
Approved	D. Gray	Date	28-01-2022

Introduction

BWB Consulting Ltd (BWB) has been appointed by Wilson Bowden Developments Ltd (the Client) to undertake a drainage network modelling exercise of the existing surface water drainage networks serving Kingsway Business Park, Rochdale.

The drainage strategy across the site is split into three distinct catchments (as shown on **Figure 1.1**), all served by separate piped systems discharging to separate attenuation features. The existing drainage was constructed in 1999 and is understood to have been designed to accommodate the 1 in 100-year storm event for all future plots across the business park.

This Technical Note is dedicated solely to the drainage network that discharges into "Pond 2" prior to flows being discharged at a restricted rate to Stanney Brook, hereafter referred to as "Catchment 2", which is located within the northern extent of the Kingsway Business Park.

This study aims to model the existing Catchment 2 drainage network (using MicroDrainage 2019.1 software) based on the as-built information. The performance of the network and attenuation pond will be assessed in order to verify the drainage strategies that have been / will be used across the business park and to facilitate the drainage of each individual plot.

This technical note will outline the following:

- The sources of data used to create the network model;
- The design parameters used to create the network model;
- The assumptions used to create the model where information is incomplete/missing;
- The results of key storm simulations; and
- Conclusions and recommendations.

This study has been based upon the most up-to date and readily available information at the time of writing.

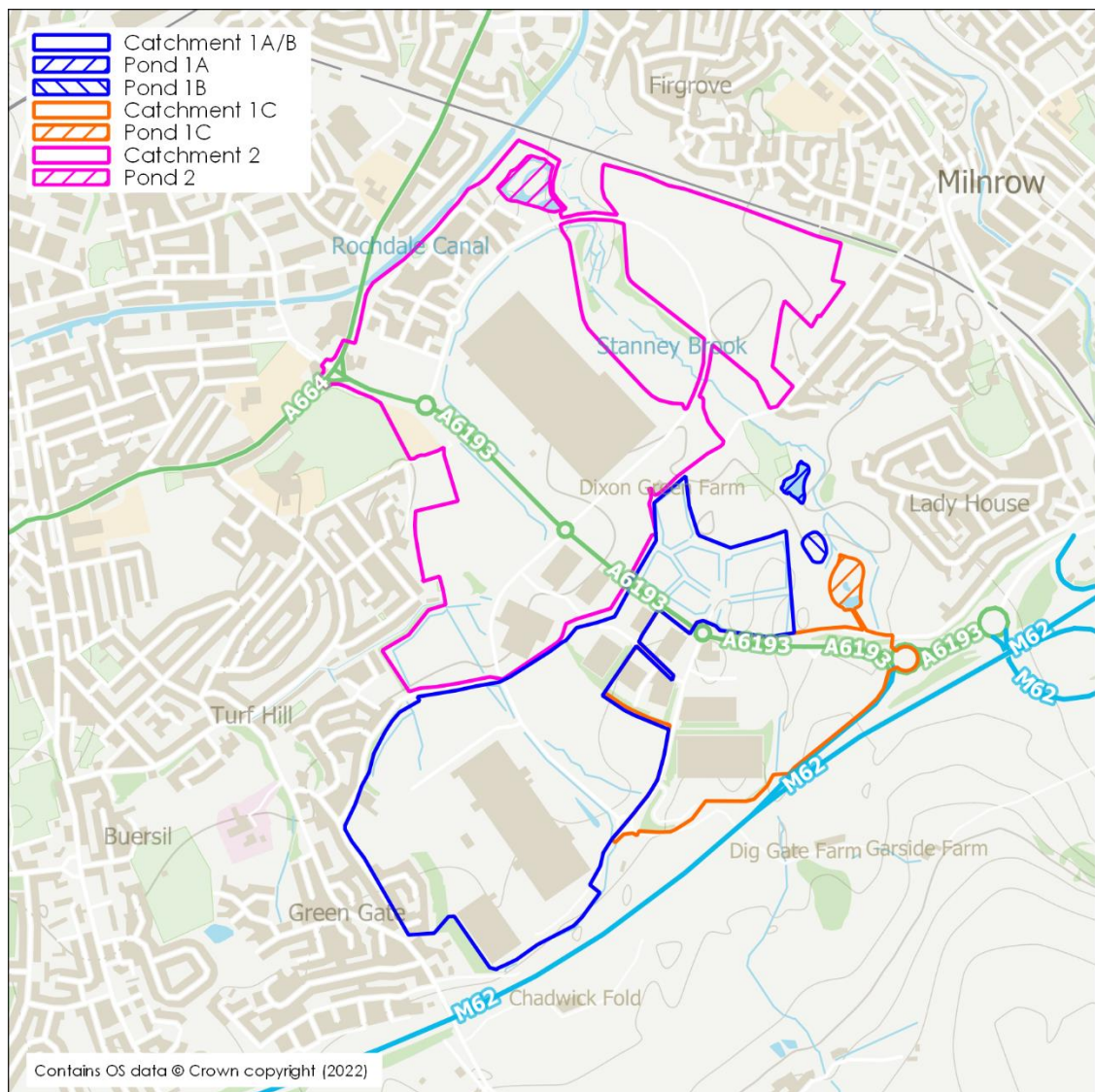


Figure 1.1: Business Park overall indicative catchments and attenuation ponds.

Sources of Information

The following sources on information have been used to recreate/remodel the Catchment 2 drainage network:

- BWB Drainage Adoptions Plan (Sheet 1 of 3; ref: LDH/037/510).
- BWB Drainage Adoptions Plan (Sheet 2 of 3; ref: LDH/037/511).
- White Young Green (WYG) Composite S104 Colourised Drawing Phases 1 and 2 – Flows to Pond 1A (ref: A030095_01-010).
- WYG Pond Area 2 – Flow Control and Outlet from Attenuation Area 2 Cross Section (D-8-003_AB1).
- WYG Attenuation Pond 2 Layout Plan (D-07-001_AB1).
- Kingsway Business Park, Rochdale, United Utilities Adoptable Drainage, Quality File, (dated 29.10.07).
- Kingsway Business Park, Rochdale, Spine / Loop Road (Section 38), Quality File, (dated 29.10.07).
- Kingsway Business Park, Rochdale, United Utilities Adoptable Drainage, Health & Safety File, (dated 29.10.07).
- DLA Architecture Illustrative Masterplan dated 26/04/18 (ref: 2010-095/1826).
- BWB Plot M Sustainable Drainage Statement 'KPM-BWB-ZZ-XX-RP-CD-0001_SDS'.
- BWB Plot N Proposed Surface and Foul Water Drainage Layout Construction Record 'KBP-BWB-HDG-ZN-DR-D-0500'.
- BWB Plot T, JD Sports Extension Drainage Layout Construction Issue 'KBT-BWB-HDG-XX-DR-D-500/505'.

The impermeable areas used within the network model have been taken from the latest Masterplan for the wider Rochdale Business Park provided to BWB (dated 26/04/2018). The source of each contributing impermeable area used within the network model is illustrated on the Assumed Contributing Areas Catchment Plan presented as **Appendix A**.

All highways contributing areas have been assumed to be 100% of the measured area as shown in **Appendix A**.

The contributing areas for plots L, N, O, P1, P2, P3, Q, R, T1, T2, U2, V AND X have been assumed to be 90% of the measured area as shown in **Appendix A**.

The contributing areas for Plots S and U2 have been assumed to be 65% of the measured area as shown in **Appendix A**.

The contributing areas for Plot M have been taken from BWB Sustainable Drainage Statement 'KPM-BWB-ZZ-XX-RP-CD-0001_SDS'. The areas used for Plot M are provided on the contributing areas catchments drawing within **Appendix A**.

Design Parameters & Assumptions

The drainage network model created within this study uses the following parameters:

- All manhole coordinates taken from BWB & WYG S104 Agreement Drawings.
- All manhole cover and invert levels taken from WYG S104 Agreement Drawings, 'UU Adoptions Drainage Quality File' and 'Spine / Loop Road (Section 38) Quality File'. Where 'As-built' cover level information was not available assumed cover levels have been selected using 2020 1m spatial resolution Digital Terrain Model (DTM) Light Detection and Ranging (LiDAR) data.
- Pond 2 has been recreated using information from WYG Attenuation Pond 2 Layout Plan (D-07-001_AB1)*.
- The online flow control structure recreated for the network model has been specified using information from 'Flow Control and Outlet from Attenuation Area 2 Cross Section (D-8-003_AB1)'. See **Figure 1.2**, overleaf for an extract of this control structure.
- The contributing areas for each plot have been directly inputted into the relevant network model node 'stub connection' for each plot as shown on the BWB, WYG S104 Agreement Plans and the Assumed Contributing Areas Plan within **Appendix A**.
- The contributing areas for all highways drainage have either been spread out evenly across the nearest relevant network model nodes that are located within the highways, or where a specific connection into the drainage network is shown on the BWB & WYG S104 Agreement Drawings, as shown within **Appendix A**.
- Network model simulation criteria set to default settings in MicroDrainage 2019.1.
- Simulations have been run for the network model using the 'Seasonal Return Period Wizard' for all storm durations for the 1 in 100-year event on 2.5 second increments with Dynamic Time Step turned off, Dynamic viscous Dampening and Inertia turned on.
- Simulations have been run using both Flood Studies Report (FSR) and Flood Estimation Handbook (FEH) rainfall methodologies.**
 - * The detention basin volumes have been checked by recreating them in AutoCAD Civils 3D Software before being input into the MicroDrainage Network Model. The Pond 2 3D model has included the incorporation of the vole embankments within the centre of the pond.
 - ** Note that the original drainage system was designed using FSR rainfall (as stated within 'Attenuation Ponds Health & Safety File'), however FEH simulations have been ran as a sensitivity test for the recreated network model. The 15-, 30- and 60-minute storms have not been run using FEH rainfall data as it is best practice to exclude these storm events when using FEH data.

The following assumptions have been made during this study:

- Where as-built information was unavailable, the BWB and WYG S104 agreement drawings were used to input information into the MicroDrainage network model.
- The Pond 2 parameters within the network model are based on an area to depth relationship using the basin extents and design levels shown on the WYG Attenuation Pond 2 Layout Plan (D-07-001_AB1). The volumes of each basin have been sense checked using AutoCAD Civil 3D Software before being added to the MicroDrainage Network Model.
- The contributing impermeable areas plan from the original design of the drainage system is unavailable to BWB. Therefore, for this study, the contributing areas have been assumed. The assumed contributing areas used within this study are provided within **Appendix A** and are typically 90% of the plot areas for the commercial / industrial areas, 65% for the residential areas and 100% for the road areas.

The contributing areas for each plot have been directly input into the existing stub connection constructed in anticipation of future development within the business park, as shown in **Appendix A**. This provides a conservative assessment during short-term rainfall events as surface water is directly input into the spine drainage network during each simulation. In reality, once each plot has been developed with their own drainage systems, a 'lag time' would be present where surface water is captured across various parts of individual plot drainage network and reduce the rate of surface water entering the spine drainage network during short-term events.

Additionally, the individual plots within 'Catchment 2' will include on plot attenuation which has not been considered within this study. This provides additional redundancy to the conservative nature of this model during short term storm events.

Any individual modelled plot drainage networks have not been added to the as-built model spine network due to instabilities caused by adding the large networks in the wider spine as-built network model.

Simulation Results

Two simulations have been run for the as-built network model. The simulation parameters are provided within the 'Design Parameters & Assumptions' section of this Technical Note. All simulation calculation outputs are provided within **Appendix B** and are arranged in the following order:

- i. Existing Drainage Network (FSR)
- ii. Existing Drainage Network (FEH)

An extract of the flow control structure for Pond 2 is shown in the WYG "Pond Area 2 – Flow Control and Outlet from Attenuation Area 2 Cross Section" as-built drawing is provided below as **Figure 1.2**. Additionally, the relevant as-built pond and flow control drawings have been enclosed within **Appendix C**.

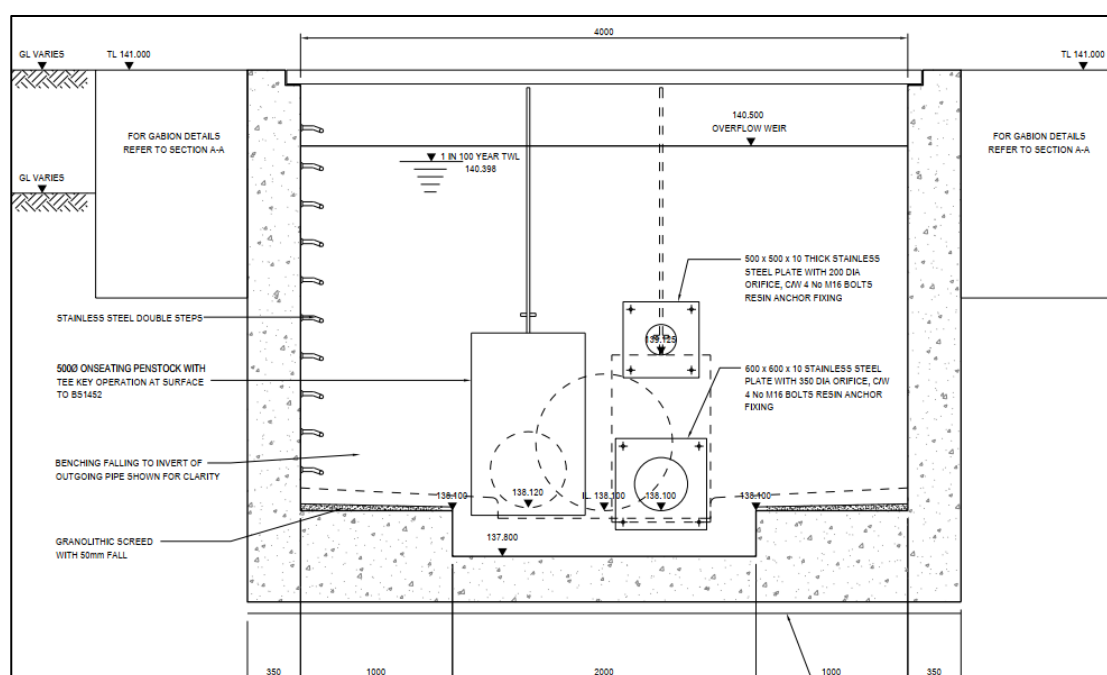


Figure 1.2: Extract of Pond 2 Flow Control structure design (WYG drawing D-8-003_AB1)

An extract of the 1 in 100-year results provided within the 'Attenuation Ponds Health & Safety File' is shown below as **Figure 1.3**. **Figure 1.3** shows the original design maximum outflows, water depths and volumes for 'Ponds 1A/1B, 1C and 2'.

Summary of 1 in 100 year results.

Pond	Critical Duration (min)	Maximum Outflow (l/s)	Maximum Depth (m)	Maximum Volume (m ³)	Permitted Outflow (l/s)
1A/1B	720	304	2.344	10276	292
1C	720	144	0.919	7143	205
2	600	555	2.039	21277	562
Σ		1003			1059

Figure 1.3: Extract of original design results for each attenuation pond in the 1 in 100-year event.

As shown on **Figure 1.3**, the original design criteria for Pond 2 include for a maximum outflow of 555l/s, with an assumed maximum water depth of 2.039m and an assumed maximum storage requirement of 21,277m³.

From a sense check of the ponds using Civils 3D, the maximum Storage volume of Pond 1C is approximately 29,533m³, based on a potential maximum water level of 140.5m Above Ordnance Datum (AOD) (i.e., the top of weir located on the flow control of the pond) to the base level of the pond.

A breakdown of the results for each simulation are provided below. In brief, the overall results of this study show that the pipe network is adequately designed to operate during the 1 in 100-year storm.

Minor flooding of 13.5m³ is shown to occur within Sir Isaac Newton Way (A6193) at manhole S317 during the 1 in 100-year critical storm event. As the critical storm for S317 is the 30-minute winter storm, it is expected that any flooding at S317 will remain within the road corridor for a short period of time before being picked up again by the drainage system as water levels within the network drop.

The results show that the attenuation pond has a maximum discharge rate of 445.5l/s, maximum water depth of 2.17m and maximum water storage volume of 26,565m³. Although there are discrepancies between the original design intent and this modelling exercise, the pond and outflow are operating within the permitted flow rate to Stanney Brook. The larger volume of storage is due to a lower modelled flow rate and accurate modelling of the pond in Civils 3D, however, the maximum water level is lower than the original design intent of 140.398m AOD.

It is understood that the original design modelling for the drainage network was undertaken in an alternative software to MicroDrainage. Additionally, the network was constructed in 1999. It is anticipated that the rainfall intensity data/methodologies used within drainage modelling software have been updated since the original design model was created. Therefore, it is expected that there would be discrepancies between the results provided within this study and the results from the original design model from which the network was constructed.

Existing Drainage Network (FSR) – Simulation Results

The results from this simulation show that the pipe network is adequately designed to receive flows from Catchment 2 after it is entirely developed. The system will be surcharged during the high intensity short duration storms (i.e., the 15-, 30- and 60-minute storms).

Minor flooding (13.5m³) is shown to occur within Sir Isaac Newton Way at S317, to the east of Plot M. This flooding is expected to remain within the road corridor for a short period of time before being picked up again by the drainage system as water levels within the network drop.

Minor flooding (31m³) is also shown to occur on Plot T at manhole S3T3 during the critical (15-minute) storm. This flood is likely due to the size of the outgoing pipe from this plot and the extent of impermeable area being input into the modelled node of S3T3. The extent of flooding at this node is not unusual for private drainage systems during the 1 in 100-year storm and it is likely that a provision is made within the car parking / service yard on Plot T to temporarily store this storm water during such an event.

It should be noted that in reality the modelled flooded volumes at S317 and S3T3 are likely to be lower than shown within the MicroDrainage network model. This is due to the design of the model directly inputting the total contributing areas of each plot directly into the connection stub nodes. In reality, the contributing areas across the catchment will be split across a vast array of private drainage networks within each plot, which will buffer against the flows within the adopted drainage network during the high intensity short duration storms.

The maximum water level within Pond 2 is shown to be 140.268m AOD, this is 130mm below the original design water level of 140.398. This shows that the pond is functioning well and should be adequate to receive the flows from the entire of Catchment 2 once it has entirely been built out.

Existing Drainage Network (FEH) – Simulation Results

A simulation has been run for the recreated network model with FEH rainfall methodologies, as a sensitivity test for the network. As stated above the original design was modelled using FSR rainfall. Therefore, the FEH results are not representative of the original design standards and should only be used as to ensure that no significant flooding occurs when using this dataset. As FEH rainfall data is considered to be less robust for short storm durations, the 15-, 30- and 60-minute return periods have been excluded from this sensitivity check.

The results from this simulation show that the pipe network is adequately designed to receive flows from Catchment 2 after it is entirely developed. The system will be surcharged during the 1 in 100-year return periods.

The maximum water level within Pond 2 is shown to be 140.272m AOD, this is 126mm below the original design water level of 140.398. This shows that the pond is functioning well and should be adequate to receive the flows from the entire Catchment once it has entirely been built out.

Conclusions and Recommendations

BWB Consulting Ltd (BWB) have been appointed by Wilson Bowden Developments Ltd to undertake a drainage network modelling exercise study of the existing surface water drainage networks serving Kingsway Business Park, Rochdale. This Technical Note focuses on the section of the drainage network that drains into Pond 2 (Catchment 2).

An as-built network model for the existing drainage infrastructure, that was installed within the business park in 1999 and adopted by United Utilities (UU) in November 2012, has been created using the best available information at the time of writing.

A list of the sources of information, design parameters and assumptions used to recreate the existing drainage network are provided within this Technical Note. The network model was created using MicroDrainage 2019.1 using a wide range of sources available to BWB, including: historical drawings, Health and Safety and Quality files.

The network has been modelled to provide a conservative approach to the assessment of the drainage network during short-term rainfall events with flows being input directly into the adopted network and no allowances being made for the on-plot drainage and attenuation.

The results from the modelling study show that the overall pipe network adopted by UU is adequate to convey flows during the 1 in 100-year critical storm event through the catchment with only minor flooding (13m³) within Sir Isaac Newton Way once the development has been entirely built out. The minor flooding occurs during the short term high intensity storm events, which is considered to have been conservatively modelled as part of this study. Additionally, the flooding shown to occur is expected to be contained within the highway carriageway for a short period of time before drainage back into the network as the water levels within the system fall.

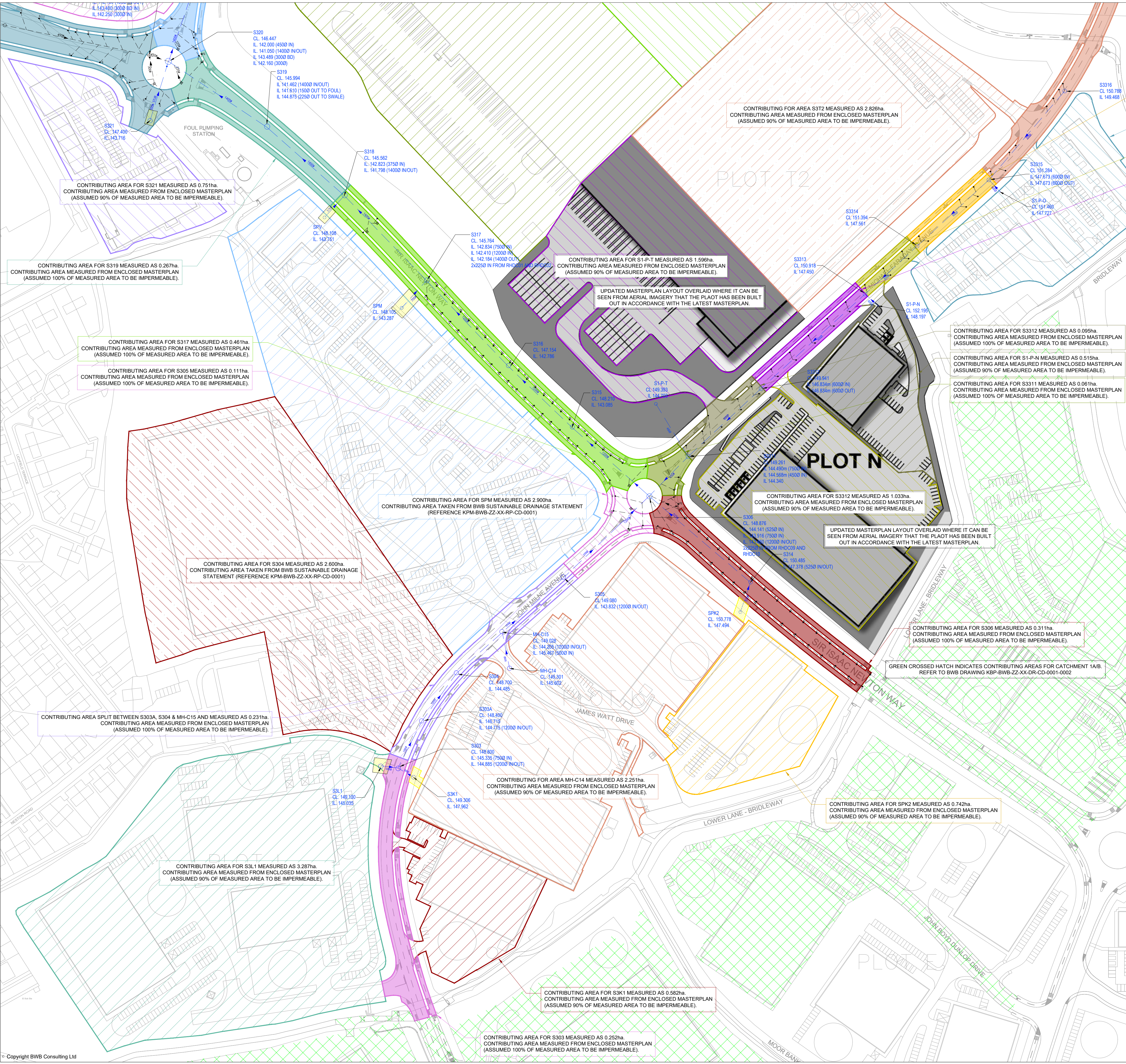
Approximately 31m³ of on plot flooding has been identified during the 1 in 100-year critical storm (15-minute) event. The extent of flooding at this node is not unusual for private drainage systems during the 1 in 100-year storm and is likely the result of the conservative nature of the recreated MicroDrainage network model with respect to short term storms.

The findings show that Pond 2 is able to safely attenuate and discharge flows from 'Catchment 2' with the maximum water level within the pond simulated to be approximately 232mm below the pond's overflow weir crest level.

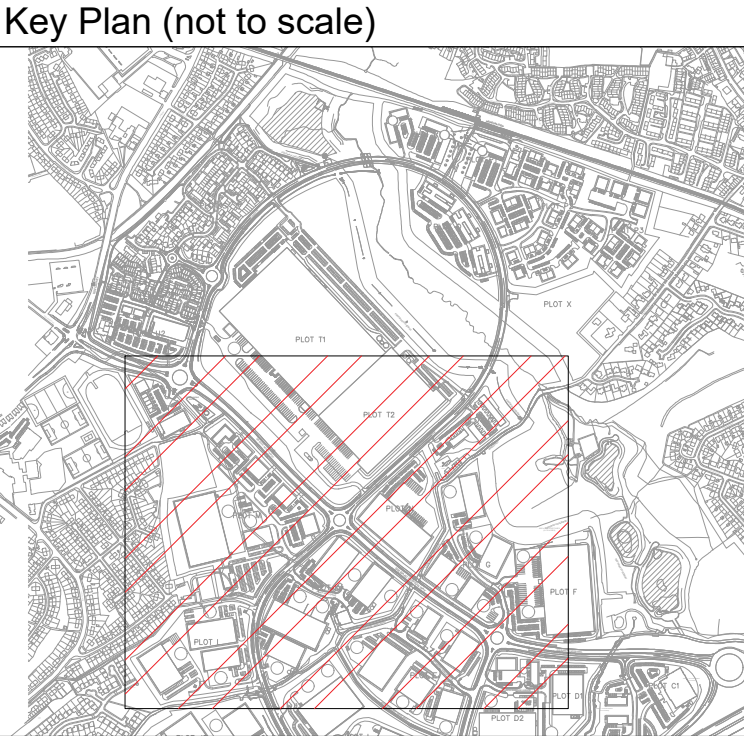
The findings show that the 'Pond 2' discharges surface water at a lower rate (444.5l/s) that of the original design intent (555l/s).

Overall, based on the information available to BWB, the existing drainage network serving 'Catchment 2' of Kingsway Business Park is considered to be currently operating efficiently and safely and has been sufficiently designed to continue to do so once the entire development has been built out.

Appendix A – Assumed Contributing Areas Catchments Plan



- Notes**
1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
 2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
 3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
 4. Any discrepancies noted on site are to be reported to the engineer immediately.
 5. This drawing is to be read in conjunction with BWB Technical Note Reference KBP-BWB-ZZ-XX-RP-CD-0002.



Legend

Contributing Area for Catchment 1A/B - REFER TO BWB DRAWING KBP-BWB-ZZ-XX-RP-CD-0001-0002

IMP. AREA (ha)	PIPE
0.582	S3K1
2.251	MH-C14
0.742	SPK2
1.033	S3312
0.515	S1-P-N
1.596	S1-P-T
3.959	S324
4.559	S313
3.287	S3L1
0.988	S1-P-O
2.900	SPM
0.751	S321
1.614	S3U1
1.287	S3U1
2.826	S3T2
1.067	S3S1
1.560	S3S2
1.229	S1-P-R
1.297	S1-P-R2
2.177	S1-P-P2A
4.178	S1-P-P2B
0.581	S1-P-Q5
1.543	S1-P-Q52
1.942	S1-P-X
0.231	S303A, S304 & MH-C15
0.111	S305
2.600	S304
0.311	S306
0.233	S3316
0.084	S3315
0.054	S3314
0.095	S3312
0.113	S3313
0.061	S3311
0.461	S317
0.267	S319
0.771	S323(H)
0.871	S320, S324, S325, S326, S327, S328, S329, S329A, S330, S331
0.802	S3310, S3309, S3308, S3307, S3306, S3305, S3304, S3303, S3302, S3301, S409
0.252	S303
0.301	S3U2
TOTAL	52.082

P1	28.01.22	Preliminary Issue	MB	DG
Rev	Date	Details of issue / revision	Drw	Rev

Issues & Revisions

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☐ Birmingham | 0121 233 3322
☐ Leeds | 0113 233 8000
☐ London | 020 7407 3879
☒ Manchester | 0161 233 4260
☐ Nottingham | 0115 924 1100
www.bwbconsulting.com

Client

WILSON BOWDEN DEVELOPMENTS LTD

Project Title

KINGSWAY BUSINESS PARK

Drawing Title

CATCHMENT 2 ASSUMED CONTRIBUTING AREAS CATCHMENT PLAN (SHEET 1 OF 3)

Drawn: M. Bailey Reviewed: D. Gray

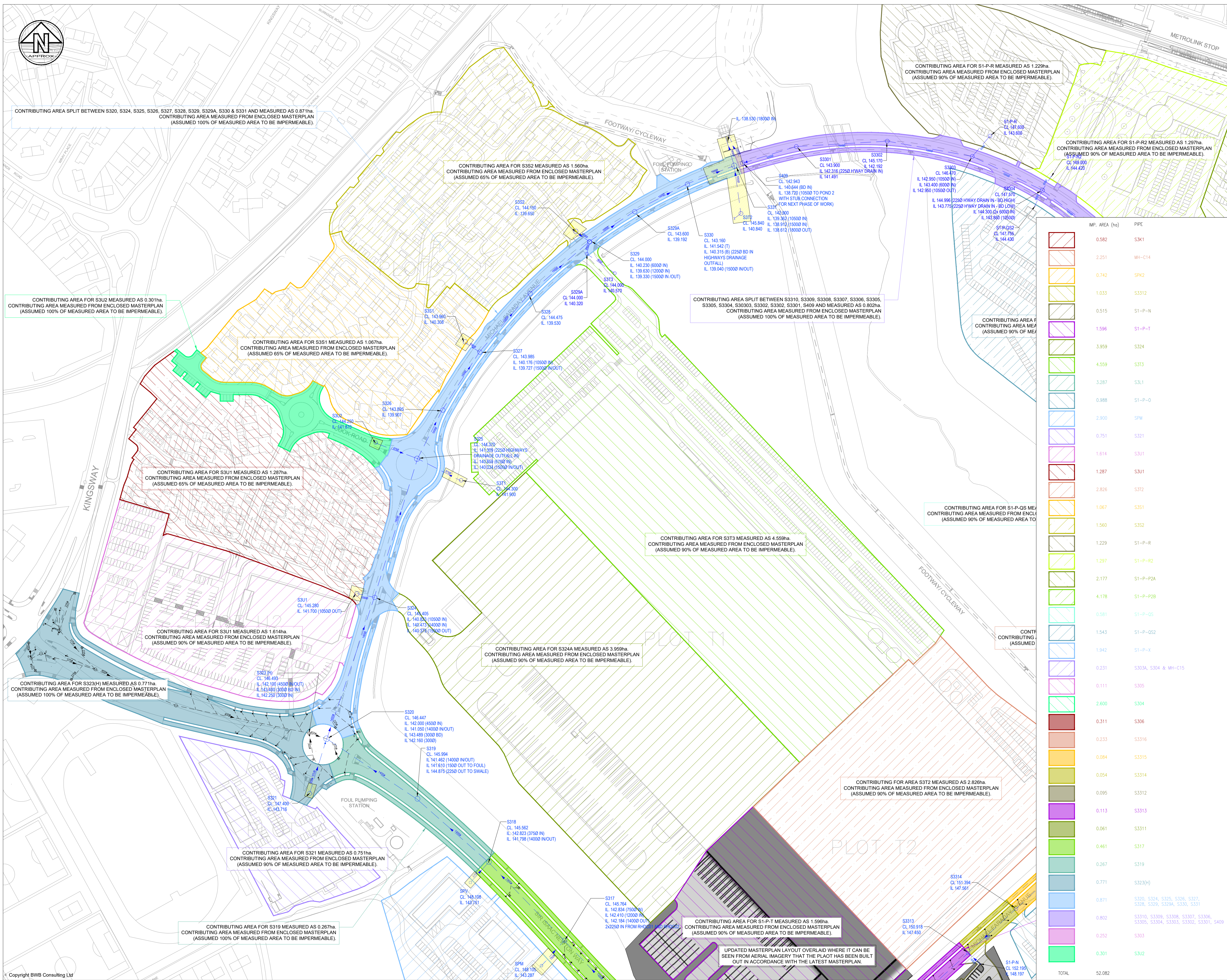
BWB Ref: NTW2889 Date: 28.01.22 Scale@A1: 1:1250

Drawing Status

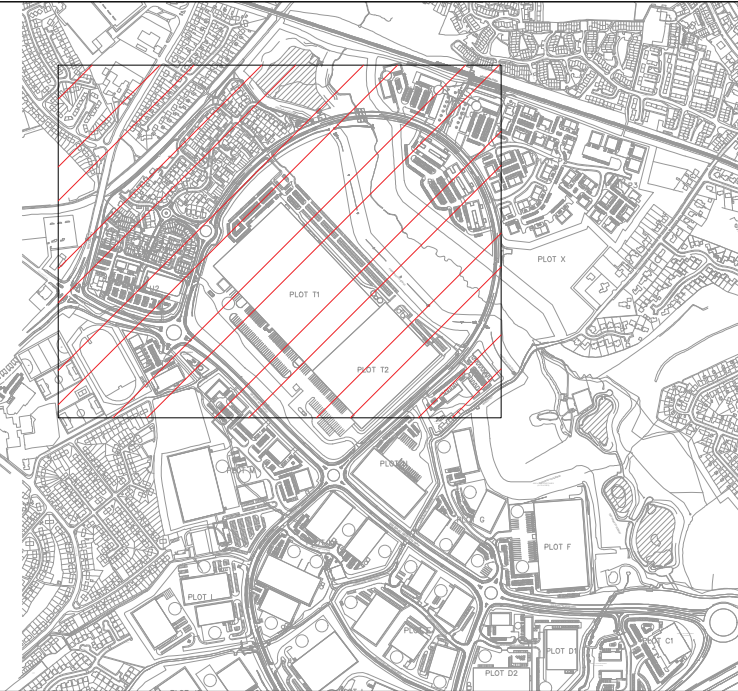
PRELIMINARY

Project - Originator - Zone - Level - Type - Role - Number Status Rev

KBP-BWB-ZZ-XX-DR-CD-0004 S2 P1



- Notes**
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- Key Plan (not to scale)**



Legend

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1.287	S3U1
2.826	S3T2
1.067	S3S1
1.560	S3S2
1.229	S1-P-R
1.297	S1-P-R2
2.177	S1-P-P2A
4.178	S1-P-P2B
0.581	S1-P-Q5
1.543	S1-P-Q52
1.942	S1-P-X
0.231	S303A, S304 & MH-C15
0.111	S305
2.600	S304
0.311	S306
0.233	S3316
0.084	S3315
0.054	S3314
0.095	S3312
0.113	S3313
0.061	S3311
0.461	S317
0.267	S319
0.771	S323(H)
0.871	S320, S324, S325, S326, S327, S328, S329, S329A, S330, S331
0.802	S3310, S3309, S3308, S3307, S3306, S3305, S3304, S3303, S3302, S3301, S409
0.252	S303
0.301	S3U2
TOTAL	52.082

P1	28.01.22	Preliminary Issue	MB	DG
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Issues & Revisions

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Client
WILSON BOWDEN DEVELOPMENTS LTD

Project Title
KINGSWAY BUSINESS PARK

Drawing Title
CATCHMENT 2 ASSUMED CONTRIBUTING AREAS CATCHMENT PLAN (SHEET 1 OF 3)

Drawn:	M. Bailey	Reviewed:	D. Gray
BWB Ref:	NTW2889	Date:	28.01.22
Scale@A1:	1:1250		

Drawing Status
PRELIMINARY

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
KBP-BWB-ZZ-XX-DR-CD-0004	S2	P1

Appendix B – MicroDrainage Network Model

Time Area Diagram for Existing

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	11.794	4-8	24.082	8-12	14.047	12-16	2.159

Total Area Contributing (ha) = 52.083

Total Pipe Volume (m³) = 2652.438

Existing Network Details for Existing

- Indicates pipe length does not match coordinates

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
E1.000	11.913	0.150	79.4	3.287	5.00	0.0	0.600	o	1200	Pipe/Conduit
E2.000	11.955	2.627	4.6	0.582	5.00	0.0	0.600	o	750	Pipe/Conduit
E1.001	35.859	0.170	210.9	0.252	0.00	0.0	0.600	o	1200	Pipe/Conduit
E1.002	40.155	0.230	174.6	0.077	0.00	0.0	0.600	o	1200	Pipe/Conduit
E1.003	41.606	0.280	148.6	2.677	0.00	0.0	0.600	o	1200	Pipe/Conduit
E3.000	25.330	0.135	187.6	2.251	5.00	0.0	0.600	o	500	Pipe/Conduit
E1.004	55.563	0.373	149.0	0.077	0.00	0.0	0.600	o	1200	Pipe/Conduit
E1.005	80.019	0.372	215.1	0.111	0.00	0.0	0.600	o	1200	Pipe/Conduit
E4.000	21.422	0.116	184.7	0.742	5.00	0.0	0.600	o	525	Pipe/Conduit
E4.001	89.800	3.237	27.7	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit
E5.000	79.103	1.795	44.1	0.233	5.00	0.0	0.600	o	225	Pipe/Conduit
E6.000	11.029	0.054	204.2	0.988	5.00	0.0	0.600	o	600	Pipe/Conduit
E5.001	66.134	0.112	590.5	0.084	0.00	0.0	0.600	o	600	Pipe/Conduit
E5.002	47.917	0.111	431.7	0.054	0.00	0.0	0.600	o	600	Pipe/Conduit
E7.000	12.175	0.697	17.5	0.515	5.00	0.0	0.600	o	600	Pipe/Conduit
E5.003	95.200	0.666	142.9	0.113	0.00	0.0	0.600	o	600	Pipe/Conduit
E5.004	67.417	2.344	28.8	1.128	0.00	0.0	0.600	o	600	Pipe/Conduit
E8.000	41.835	0.135	309.9	1.596	5.00	0.0	0.600	o	450	Pipe/Conduit
E5.005	37.597	0.424	88.7	0.061	0.00	0.0	0.600	o	750	Pipe/Conduit
E1.006	70.186	0.375	187.2	0.311	0.00	0.0	0.600	o	1200	Pipe/Conduit
E1.007	59.982	0.299	200.6	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit
E1.008	80.002	0.376	212.8	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit
E9.000	25.299	0.453	55.8	2.900	5.00	0.0	0.600	o	750	Pipe/Conduit
E1.009	80.058	0.386	207.4	0.461	0.00	0.0	0.600	o	1400	Pipe/Conduit
E10.000	20.302	0.928	21.9	0.000	5.00	0.0	0.600	o	375	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
E1.000	145.035	3.287	0.0	4.20	4750.2
E2.000	147.962	0.582	0.0	13.17	5817.3
E1.001	144.885	4.121	0.0	2.57	2909.1
E1.002	144.715	4.198	0.0	2.83	3199.1
E1.003	144.485	6.875	0.0	3.07	3468.8
E3.000	145.602	2.251	0.0	1.58	310.7
E1.004	144.205	9.203	0.0	3.06	3464.5
E1.005	143.832	9.314	0.0	2.55	2880.6
E4.000	147.494	0.742	0.0	1.65	356.1
E4.001	147.378	0.742	0.0	4.26	923.2
E5.000	149.468	0.233	0.0	1.98	78.6
E6.000	147.727	0.988	0.0	1.70	480.7
E5.001	147.673	1.305	0.0	0.99	281.3
E5.002	147.561	1.359	0.0	1.17	329.6
E7.000	148.197	0.515	0.0	5.85	1652.7
E5.003	147.500	1.987	0.0	2.03	575.3
E5.004	146.834	3.115	0.0	4.55	1287.1
E8.000	144.703	1.596	0.0	1.15	182.8
E5.005	144.340	4.772	0.0	2.97	1313.4
E1.006	143.460	15.139	0.0	2.73	3089.2
E1.007	143.085	15.139	0.0	2.64	2983.4
E1.008	142.786	15.139	0.0	2.56	2896.5
E9.000	143.287	2.900	0.0	3.75	1656.4
E1.009	142.184	18.500	0.0	2.85	4389.9
E10.000	143.751	0.000	0.0	3.89	429.5

Existing Network Details for Existing

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
E1.010	70.068	0.336	208.5	0.000	0.00	0.0	0.600	o	1400	Pipe/Conduit
E1.011	80.140	0.412	194.5	0.267	0.00	0.0	0.600	o	1400	Pipe/Conduit
E11.000	42.000	0.227	185.0	0.751	5.00	0.0	0.600	o	300	Pipe/Conduit
E12.000	13.524	0.100	135.2	0.771	5.00	0.0	0.600	o	450	Pipe/Conduit
E1.012	109.739	0.577	190.2	0.087	0.00	0.0	0.600	o	1400	Pipe/Conduit
E13.000	13.351	0.877	15.2	2.901	5.00	0.0	0.600	o	1050	Pipe/Conduit
E1.013	106.625	0.339	314.5	4.046	0.00	0.0	0.600	o	1500	Pipe/Conduit
E14.000	36.067	1.041	34.6	0.000	5.00	0.0	0.600	o	675	Pipe/Conduit
E15.000	32.713	1.011	32.4	0.301	5.00	0.0	0.600	o	675	Pipe/Conduit
E1.014	40.493	0.127	318.8	0.087	0.00	0.0	0.600	o	1500	Pipe/Conduit
E1.015	50.583	0.180	281.0	0.087	0.00	0.0	0.600	o	1500	Pipe/Conduit
E16.000	13.160	0.132	99.7	1.067	5.00	0.0	0.600	o	1050	Pipe/Conduit
E1.016	56.696	0.197	287.8	0.087	0.00	0.0	0.600	o	1500	Pipe/Conduit
E1.017	57.990	0.200	290.0	0.087	0.00	0.0	0.600	o	1500	Pipe/Conduit
E17.000	25.000	0.250	100.0	4.559	5.00	0.0	0.600	o	600	Pipe/Conduit
E17.001	9.000	0.090	100.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit
E18.000	12.736	0.020	636.8	1.560	5.00	0.0	0.600	o	1200	Pipe/Conduit
E1.018	39.976	0.138	289.7	0.087	0.00	0.0	0.600	o	1500	Pipe/Conduit
E1.019	43.686	0.152	287.4	0.087	0.00	0.0	0.600	o	1500	Pipe/Conduit
E1.020	36.994	0.128	289.0	0.087	0.00	0.0	0.600	o	1500	Pipe/Conduit
E19.000	35.519	1.478	24.0	2.826	5.00	0.0	0.600	o	1050	Pipe/Conduit
E1.021	22.240#	0.082	271.2	0.088	0.00	0.0	0.600	o	1800	Pipe/Conduit
E20.000	16.500	0.082	201.2	1.942	5.00	0.0	0.600	o	750	Pipe/Conduit
E20.001	44.135	0.414	106.6	0.073	0.00	0.0	0.600	o	900	Pipe/Conduit
E20.002	40.455	0.382	105.9	0.073	0.00	0.0	0.600	o	900	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
E1.010	141.798	18.500	0.0	2.84	4377.9
E1.011	141.462	18.767	0.0	2.95	4533.7
E11.000	143.716	0.751	0.0	1.15	81.5
E12.000	142.100	0.771	0.0	1.75	277.8
E1.012	141.050	20.376	0.0	2.98	4585.2
E13.000	141.700	2.901	0.0	8.85	7666.5
E1.013	140.373	27.323	0.0	2.41	4264.6
E14.000	141.900	0.000	0.0	4.46	1596.8
E15.000	141.870	0.301	0.0	4.62	1652.4
E1.014	140.034	27.711	0.0	2.40	4235.5
E1.015	139.907	27.798	0.0	2.55	4513.1
E16.000	140.308	1.067	0.0	3.45	2988.9
E1.016	139.727	28.952	0.0	2.52	4459.3
E1.017	139.530	29.039	0.0	2.51	4442.6
E17.000	140.570	4.559	0.0	2.44	688.6
E17.001	140.320	4.559	0.0	2.44	688.6
E18.000	139.650	1.560	0.0	1.48	1668.2
E1.018	139.330	35.245	0.0	2.52	4444.7
E1.019	139.192	35.332	0.0	2.53	4462.4
E1.020	139.040	35.419	0.0	2.52	4449.9
E19.000	140.840	2.826	0.0	7.04	6099.5
E1.021	138.612	38.333	0.0	2.91	7395.7
E20.000	146.382	1.942	0.0	1.97	870.0
E20.001	146.150	2.015	0.0	3.03	1930.5
E20.002	145.736	2.088	0.0	3.04	1936.9

Existing Network Details for Existing

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
E21.000	14.500	0.145	100.0	0.581	5.00	0.0	0.600	o	600	Pipe/Conduit
E22.000	22.000	0.220	100.0	4.178	5.00	0.0	0.600	o	600	Pipe/Conduit
E20.003	52.630	0.454	115.9	0.073	0.00	0.0	0.600	o	900	Pipe/Conduit
E23.000	21.000	0.210	100.0	2.177	5.00	0.0	0.600	o	750	Pipe/Conduit
E20.004	52.603	0.190	276.9	0.073	0.00	0.0	0.600	o	1050	Pipe/Conduit
E20.005	46.317	0.165	280.7	0.073	0.00	0.0	0.600	o	1050	Pipe/Conduit
E20.006	52.286	0.545	95.9	0.073	0.00	0.0	0.600	o	1050	Pipe/Conduit
E24.000	12.000	0.120	100.0	1.297	5.00	0.0	0.600	o	600	Pipe/Conduit
E25.000	13.000	0.130	100.0	1.543	5.00	0.0	0.600	o	600	Pipe/Conduit
E20.007	57.210	0.900	63.6	0.073	0.00	0.0	0.600	o	1050	Pipe/Conduit
E26.000	20.000	0.200	100.0	1.229	5.00	0.0	0.600	o	600	Pipe/Conduit
E20.008	63.532	0.758	83.8	0.073	0.00	0.0	0.600	o	1050	Pipe/Conduit
E20.009	67.003	0.701	95.6	0.073	0.00	0.0	0.600	o	1050	Pipe/Conduit
E20.010	41.345	0.847	48.8	0.073	0.00	0.0	0.600	o	1050	Pipe/Conduit
E20.011	22.710#	0.190	119.5	0.073	0.00	0.0	0.600	o	1050	Pipe/Conduit
E1.022	31.625#	0.100	316.3	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
E21.000	145.799	0.581	0.0	2.44	688.6
E22.000	145.874	4.178	0.0	2.44	688.6
E20.003	145.354	6.920	0.0	2.91	1850.9
E23.000	145.260	2.177	0.0	2.80	1236.4
E20.004	144.750	9.170	0.0	2.07	1789.1
E20.005	144.560	9.243	0.0	2.05	1776.7
E20.006	144.395	9.316	0.0	3.52	3047.1
E24.000	144.420	1.297	0.0	2.44	688.6
E25.000	144.430	1.543	0.0	2.44	688.6
E20.007	143.850	12.229	0.0	4.33	3746.0
E26.000	143.600	1.229	0.0	2.44	688.6
E20.008	142.950	13.531	0.0	3.77	3260.8
E20.009	142.192	13.604	0.0	3.53	3052.8
E20.010	141.491	13.677	0.0	4.94	4276.3
E20.011	138.720	13.750	0.0	3.15	2728.7
E1.022	138.100	52.083	0.0	1.93	1673.3

Manhole Schedules for Existing

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
ES3311	391662.739	411950.779	391662.739	411950.779	Required	
ES306	391636.504	411923.849	391636.504	411923.849	Required	
ES315	391584.329	411970.794	391584.329	411970.794	Required	
ES316	391541.037	412012.311	391541.037	412012.311	Required	
ESPM	391468.761	412051.453	391468.761	412051.453	Required	
ES317	391485.784	412070.168	391485.784	412070.168	Required	
ESPV	391416.478	412112.633	391416.478	412112.633	Required	
ES318	391430.099	412127.688	391430.099	412127.688	Required	
ES319	391377.624	412174.120	391377.624	412174.120	Required	
ES321	391298.351	412178.215	391298.351	412178.215	Required	
ES323 (H)	391297.882	412222.386	391297.882	412222.386	Required	
ES320	391310.784	412218.333	391310.784	412218.333	Required	
ES3U1	391332.996	412324.796	391332.996	412324.796	Required	
ES324	391346.098	412322.234	391346.098	412322.234	Required	
ES3T1	391409.682	412408.348	391409.682	412408.348	Required	
ES3U2	391346.818	412436.112	391346.818	412436.112	Required	
ES325	391377.284	412424.197	391377.284	412424.197	Required	
ES326	391396.227	412459.985	391396.227	412459.985	Required	
ES3S1	391412.715	412510.143	391412.715	412510.143	Required	
ES327	391423.493	412502.591	391423.493	412502.591	Required	
ES328	391460.391	412545.638	391460.391	412545.638	Required	
ES3T3	391522.634	412560.632	391522.634	412560.632	Required	
ES329A	391502.127	412574.931	391502.127	412574.931	Required	
ES3S2	391494.037	412591.462	391494.037	412591.462	Required	
ES329	391504.138	412583.704	391504.138	412583.704	Required	
ES329A	391537.364	412605.931	391537.364	412605.931	Required	
ES330	391576.107	412626.117	391576.107	412626.117	Required	
ES3T2	391615.433	412604.533	391615.433	412604.533	Required	
ES331	391610.513	412639.709	391610.513	412639.709	Required	

Manhole Schedules for Existing

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
ES1-P-X	391983.875	412377.329	391983.875	412377.329	Required	
ES3310	391967.421	412378.562	391967.421	412378.562	Required	
ES3309	391965.020	412422.632	391965.020	412422.632	Required	
ES1-P-QS	391942.916	412456.942	391942.916	412456.942	Required	
ES1-P-P2B	391978.414	412463.282	391978.414	412463.282	Required	
ES3308	391956.442	412462.168	391956.442	412462.168	Required	
ES1-P-P2A	391956.624	412520.000	391956.624	412520.000	Required	
ES3307	391937.521	412511.279	391937.521	412511.279	Required	
ES3306	391910.518	412556.422	391910.518	412556.422	Required	
ES3305	391878.956	412590.320	391878.956	412590.320	Required	
ES1-P-R2	391843.635	412631.794	391843.635	412631.794	Required	
ES1-P-QS2	391831.493	412609.994	391831.493	412609.994	Required	
ES3304	391837.137	412621.705	391837.137	412621.705	Required	
ES1-P-R	391798.718	412661.640	391798.718	412661.640	Required	
ES3303	391785.600	412646.543	391785.600	412646.543	Required	
ES3302	391723.067	412657.763	391723.067	412657.763	Required	
ES3301	391656.181	412653.806	391656.181	412653.806	Required	
ES409	391616.692	412641.560	391616.692	412641.560	Required	
EPOND 2	391551.156	412735.562	391551.156	412735.562	Required	
E	391631.492	412760.413			No Entry	

PIPELINE SCHEDULES for Existing

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
E1.000	o	1200	ES3L1	149.100	145.035	2.865	Open Manhole	2700
E2.000	o	750	ES3K1	149.306	147.962	0.594	Open Manhole	2400
E1.001	o	1200	ES303	148.800	144.885	2.715	Open Manhole	2700
E1.002	o	1200	ES303A	148.400	144.715	2.485	Open Manhole	2700
E1.003	o	1200	ES304	148.700	144.485	3.015	Open Manhole	2700
E3.000	o	500	EMH-C14	149.301	145.602	3.199	Open Manhole	1800
E1.004	o	1200	EMH-C15	149.028	144.205	3.623	Open Manhole	2700
E1.005	o	1200	ES305	149.080	143.832	4.048	Open Manhole	2700
E4.000	o	525	ESPK2	150.778	147.494	2.759	Open Manhole	1800
E4.001	o	525	ES314	150.485	147.378	2.582	Open Manhole	2100
E5.000	o	225	ES3316	150.778	149.468	1.085	Open Manhole	1200
E6.000	o	600	ES1-P-O	151.460	147.727	3.133	Open Manhole	2100
E5.001	o	600	ES3315	151.284	147.673	3.011	Open Manhole	2100
E5.002	o	600	ES3314	151.394	147.561	3.233	Open Manhole	2100
E7.000	o	600	ES1-P-N	152.195	148.197	3.398	Open Manhole	2100
E5.003	o	600	ES3313	150.918	147.500	2.818	Open Manhole	2100
E5.004	o	600	ES3312	149.941	146.834	2.507	Open Manhole	2100
E8.000	o	450	ES1-P-T	149.393	144.703	4.240	Open Manhole	1800
E5.005	o	750	ES3311	149.261	144.340	4.171	Open Manhole	2400
E1.006	o	1200	ES306	148.876	143.460	4.216	Open Manhole	3000
E1.007	o	1200	ES315	148.210	143.085	3.925	Open Manhole	2700
E1.008	o	1200	ES316	147.154	142.786	3.168	Open Manhole	2700
E9.000	o	750	ESPM	148.105	143.287	4.068	Open Manhole	2400
E1.009	o	1400	ES317	145.764	142.184	2.180	Open Manhole	3000
E10.000	o	375	ESPV	148.108	143.751	3.982	Open Manhole	1500

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)
E1.000	11.913	79.4	ES303	148.800	144.885	2.715	Open Manhole	2700
E2.000	11.955	4.6	ES303	148.800	145.335	2.715	Open Manhole	2700
E1.001	35.859	210.9	ES303A	148.400	144.715	2.485	Open Manhole	2700
E1.002	40.155	174.6	ES304	148.700	144.485	3.015	Open Manhole	2700
E1.003	41.606	148.6	EMH-C15	149.028	144.205	3.623	Open Manhole	2700
E3.000	25.330	187.6	EMH-C15	149.028	145.467	3.061	Open Manhole	2700
E1.004	55.563	149.0	ES305	149.080	143.832	4.048	Open Manhole	2700
E1.005	80.019	215.1	ES306	148.876	143.460	4.216	Open Manhole	3000
E4.000	21.422	184.7	ES314	150.485	147.378	2.582	Open Manhole	2100
E4.001	89.800	27.7	ES306	148.876	144.141	4.210	Open Manhole	3000
E5.000	79.103	44.1	ES3315	151.284	147.673	3.386	Open Manhole	2100
E6.000	11.029	204.2	ES3315	151.284	147.673	3.011	Open Manhole	2100
E5.001	66.134	590.5	ES3314	151.394	147.561	3.233	Open Manhole	2100
E5.002	47.917	431.7	ES3313	150.918	147.450	2.868	Open Manhole	2100
E7.000	12.175	17.5	ES3313	150.918	147.500	2.818	Open Manhole	2100
E5.003	95.200	142.9	ES3312	149.941	146.834	2.507	Open Manhole	2100
E5.004	67.417	28.8	ES3311	149.261	144.490	4.171	Open Manhole	2400
E8.000	41.835	309.9	ES3311	149.261	144.568	4.243	Open Manhole	2400
E5.005	37.597	88.7	ES306	148.876	143.916	4.210	Open Manhole	3000
E1.006	70.186	187.2	ES315	148.210	143.085	3.925	Open Manhole	2700
E1.007	59.982	200.6	ES316	147.154	142.786	3.168	Open Manhole	2700
E1.008	80.002	212.8	ES317	145.764	142.410	2.154	Open Manhole	3000
E9.000	25.299	55.8	ES317	145.764	142.834	2.180	Open Manhole	3000
E1.009	80.058	207.4	ES318	145.562	141.798	2.364	Open Manhole	3000
E10.000	20.302	21.9	ES318	145.562	142.823	2.364	Open Manhole	3000

PIPELINE SCHEDULES for Existing

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)
E1.010	o	1400	ES318	145.562	141.798	2.364	Open Manhole	3000
E1.011	o	1400	ES319	145.994	141.462	3.132	Open Manhole	3000
E11.000	o	300	ES321	147.400	143.716	3.384	Open Manhole	1500
E12.000	o	450	ES323 (H)	146.493	142.100	3.943	Open Manhole	1800
E1.012	o	1400	ES320	146.447	141.050	3.997	Open Manhole	3660
E13.000	o	1050	ES3U1	145.280	141.700	2.530	Open Manhole	2700
E1.013	o	1500	ES324	145.405	140.373	3.532	Open Manhole	3000
E14.000	o	675	ES3T1	144.300	141.900	1.725	Open Manhole	2100
E15.000	o	675	ES3U2	144.250	141.870	1.705	Open Manhole	2100
E1.014	o	1500	ES325	144.370	140.034	2.836	Open Manhole	3000
E1.015	o	1500	ES326	143.895	139.907	2.488	Open Manhole	3000
E16.000	o	1050	ES3S1	143.960	140.308	2.602	Open Manhole	2700
E1.016	o	1500	ES327	143.985	139.727	2.758	Open Manhole	3000
E1.017	o	1500	ES328	144.475	139.530	3.445	Open Manhole	3000
E17.000	o	600	ES3T3	144.000	140.570	2.830	Open Manhole	2100
E17.001	o	600	ES329A	144.000	140.320	3.080	Open Manhole	2100
E18.000	o	1200	ES3S2	144.150	139.650	3.300	Open Manhole	2700
E1.018	o	1500	ES329	144.000	139.330	3.170	Open Manhole	3000
E1.019	o	1500	ES329A	143.600	139.192	2.908	Open Manhole	3000
E1.020	o	1500	ES330	143.160	139.040	2.620	Open Manhole	3000
E19.000	o	1050	ES3T2	145.840	140.840	3.950	Open Manhole	2700
E1.021	o	1800	ES331	142.900	138.612	2.488	Open Manhole	3660
E20.000	o	750	ES1-P-X	150.250	146.382	3.118	Open Manhole	2400
E20.001	o	900	ES3310	149.930	146.150	2.880	Open Manhole	2400
E20.002	o	900	ES3309	150.720	145.736	4.084	Open Manhole	2400

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)
E1.010	70.068	208.5	ES319	145.994	141.462	3.132	Open Manhole	3000
E1.011	80.140	194.5	ES320	146.447	141.050	3.997	Open Manhole	3660
E11.000	42.000	185.0	ES320	146.447	143.489	2.658	Open Manhole	3660
E12.000	13.524	135.2	ES320	146.447	142.000	3.997	Open Manhole	3660
E1.012	109.739	190.2	ES324	145.405	140.473	3.532	Open Manhole	3000
E13.000	13.351	15.2	ES324	145.405	140.823	3.532	Open Manhole	3000
E1.013	106.625	314.5	ES325	144.370	140.034	2.836	Open Manhole	3000
E14.000	36.067	34.6	ES325	144.370	140.859	2.836	Open Manhole	3000
E15.000	32.713	32.4	ES325	144.370	140.859	2.836	Open Manhole	3000
E1.014	40.493	318.8	ES326	143.895	139.907	2.488	Open Manhole	3000
E1.015	50.583	281.0	ES327	143.985	139.727	2.758	Open Manhole	3000
E16.000	13.160	99.7	ES327	143.985	140.176	2.759	Open Manhole	3000
E1.016	56.696	287.8	ES328	144.475	139.530	3.445	Open Manhole	3000
E1.017	57.990	290.0	ES329	144.000	139.330	3.170	Open Manhole	3000
E17.000	25.000	100.0	ES329A	144.000	140.320	3.080	Open Manhole	2100
E17.001	9.000	100.0	ES329	144.000	140.230	3.170	Open Manhole	3000
E18.000	12.736	636.8	ES329	144.000	139.630	3.170	Open Manhole	3000
E1.018	39.976	289.7	ES329A	143.600	139.192	2.908	Open Manhole	3000
E1.019	43.686	287.4	ES330	143.160	139.040	2.620	Open Manhole	3000
E1.020	36.994	289.0	ES331	142.900	138.912	2.488	Open Manhole	3660
E19.000	35.519	24.0	ES331	142.900	139.362	2.488	Open Manhole	3660
E1.021	22.240#	271.2	EPOND 2	140.550	138.530	0.220	Open Manhole	5600 x 4000
E20.000	16.500	201.2	ES3310	149.930	146.300	2.880	Open Manhole	2400
E20.001	44.135	106.6	ES3309	150.720	145.736	4.084	Open Manhole	2400
E20.002	40.455	105.9	ES3308	150.520	145.354	4.266	Open Manhole	2400

PIPELINE SCHEDULES for Existing

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)
E21.000	o	600	ES1-P-QS	150.200	145.799	3.801	Open Manhole	2100
E22.000	o	600	ES1-P-P2B	150.000	145.874	3.526	Open Manhole	2100
E20.003	o	900	ES3308	150.520	145.354	4.266	Open Manhole	2400
E23.000	o	750	ES1-P-P2A	150.000	145.260	3.990	Open Manhole	2400
E20.004	o	1050	ES3307	150.570	144.750	4.770	Open Manhole	2700
E20.005	o	1050	ES3306	149.560	144.560	3.950	Open Manhole	2700
E20.006	o	1050	ES3305	148.620	144.395	3.175	Open Manhole	2700
E24.000	o	600	ES1-P-R2	149.000	144.420	3.980	Open Manhole	2100
E25.000	o	600	ES1-P-QS2	147.755	144.430	2.725	Open Manhole	2100
E20.007	o	1050	ES3304	147.570	143.850	2.670	Open Manhole	2700
E26.000	o	600	ES1-P-R	147.600	143.600	3.400	Open Manhole	2100
E20.008	o	1050	ES3303	146.470	142.950	2.470	Open Manhole	2700
E20.009	o	1050	ES3302	145.170	142.192	1.928	Open Manhole	2700
E20.010	o	1050	ES3301	143.900	141.491	1.359	Open Manhole	2700
E20.011	o	1050	ES409	142.943	138.720	3.173	Open Manhole	2700
E1.022	o	1050	EPOND 2	140.550	138.100	1.400	Open Manhole	5600 x 4000

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)
E21.000	14.500	100.0	ES3308	150.520	145.654	4.266	Open Manhole	2400
E22.000	22.000	100.0	ES3308	150.520	145.654	4.266	Open Manhole	2400
E20.003	52.630	115.9	ES3307	150.570	144.900	4.770	Open Manhole	2700
E23.000	21.000	100.0	ES3307	150.570	145.050	4.770	Open Manhole	2700
E20.004	52.603	276.9	ES3306	149.560	144.560	3.950	Open Manhole	2700
E20.005	46.317	280.7	ES3305	148.620	144.395	3.175	Open Manhole	2700
E20.006	52.286	95.9	ES3304	147.570	143.850	2.670	Open Manhole	2700
E24.000	12.000	100.0	ES3304	147.570	144.300	2.670	Open Manhole	2700
E25.000	13.000	100.0	ES3304	147.570	144.300	2.670	Open Manhole	2700
E20.007	57.210	63.6	ES3303	146.470	142.950	2.470	Open Manhole	2700
E26.000	20.000	100.0	ES3303	146.470	143.400	2.470	Open Manhole	2700
E20.008	63.532	83.8	ES3302	145.170	142.192	1.928	Open Manhole	2700
E20.009	67.003	95.6	ES3301	143.900	141.491	1.359	Open Manhole	2700
E20.010	41.345	48.8	ES409	142.943	140.644	1.249	Open Manhole	2700
E20.011	22.710#	119.5	EPOND 2	140.550	138.530	0.970	Open Manhole	5600 x 4000
E1.022	31.625#	316.3	E	140.450	138.000	1.400	Open Manhole	0

BWB Consulting Ltd		Page 13
5th Floor, Waterfront House 35 Station Street Nottingham, NG2 3DQ	Kingsway Business Park Existing SW Network Catchment 2 - FSR	
Date 28/01/2022 File Existing SW Network Model - P1.MDX	Designed by M. Bailey Checked by D. Gray	
Innovyze	Network 2019.1	

Synthetic Rainfall Details

Cv (Summer) 0.750 Cv (Winter) 0.840 Storm Duration (mins) 30

BWB Consulting Ltd		Page 14
5th Floor, Waterfront House 35 Station Street Nottingham, NG2 3DQ	Kingsway Business Park Existing SW Network Catchment 2 - FSR	
Date 28/01/2022 File Existing SW Network Model - P1.MDX	Designed by M. Bailey Checked by D. Gray	
Innovyze	Network 2019.1	

Online Controls for Existing

Complex Manhole: EPOND 2, DS/PN: E1.022, Volume (m³): 115.8

Orifice

Diameter (m) 0.350 Discharge Coefficient 0.600 Invert Level (m) 138.100

Orifice

Diameter (m) 0.200 Discharge Coefficient 0.600 Invert Level (m) 139.125

Weir

Discharge Coef 0.544 Width (m) 4.000 Invert Level (m) 140.500

Storage Structures for Existing

Tank or Pond Manhole: EPOND 2, DS/PN: E1.022

Invert Level (m) 138.100

Depth (m) Area (m²)		Depth (m) Area (m²)	
0.000	10550.0	2.450	14420.0

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m ³ /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

Synthetic Rainfall Details

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

										Water	Surcharged	Flooded			Pipe	
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Flow		
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)	Status	
E1.000	ES3L1	15 Winter	2	+0%	100/15 Summer				145.444	-0.791	0.000	0.25		489.1	OK	
E2.000	ES3K1	15 Winter	2	+0%					148.052	-0.660	0.000	0.03		86.9	OK	
E1.001	ES303	15 Winter	2	+0%	100/15 Summer				145.346	-0.739	0.000	0.31		607.0	OK	
E1.002	ES303A	15 Winter	2	+0%	100/15 Summer				145.172	-0.743	0.000	0.31		608.0	OK	
E1.003	ES304	15 Winter	2	+0%	100/15 Summer				145.038	-0.647	0.000	0.43		919.9	OK	
E3.000	EMH-C14	15 Winter	2	+0%	2/15 Summer				146.182	0.080	0.000	1.31		334.0	SURCHARGED	
E1.004	EMH-C15	15 Winter	2	+0%	30/15 Winter				144.807	-0.598	0.000	0.50		1223.7	OK	
E1.005	ES305	15 Winter	2	+0%	30/15 Summer				144.445	-0.587	0.000	0.51		1211.7	OK	
E4.000	ESPK2	15 Winter	2	+0%					147.734	-0.285	0.000	0.42		109.4	OK	
E4.001	ES314	15 Winter	2	+0%					147.503	-0.400	0.000	0.13		110.8	OK	
E5.000	ES3316	15 Winter	2	+0%	100/15 Summer				149.575	-0.118	0.000	0.45		34.1	OK	
E6.000	ES1-P-O	15 Winter	2	+0%	30/15 Summer				148.084	-0.243	0.000	0.46		144.2	OK	
E5.001	ES3315	15 Winter	2	+0%	30/15 Summer				148.062	-0.211	0.000	0.70		177.3	OK	
E5.002	ES3314	15 Winter	2	+0%	30/15 Winter				147.909	-0.252	0.000	0.61		174.2	OK	
E7.000	ES1-P-N	15 Winter	2	+0%					148.320	-0.477	0.000	0.09		77.1	OK	
E5.003	ES3313	15 Winter	2	+0%	100/15 Winter				147.781	-0.319	0.000	0.44		232.8	OK	
E5.004	ES3312	15 Winter	2	+0%	100/15 Winter				147.063	-0.371	0.000	0.31		359.6	OK	
E8.000	ES1-P-T	15 Winter	2	+0%	2/15 Summer				145.289	0.136	0.000	1.43		233.0	SURCHARGED	
E5.005	ES3311	15 Winter	2	+0%	30/15 Summer				144.741	-0.349	0.000	0.55		565.2	OK	
E1.006	ES306	15 Winter	2	+0%	30/15 Summer				144.249	-0.411	0.000	0.76		1854.2	OK	
E1.007	ES315	15 Winter	2	+0%	30/15 Summer				143.931	-0.354	0.000	0.83		1826.0	OK	
E1.008	ES316	15 Winter	2	+0%	30/15 Summer				143.569	-0.417	0.000	0.75		1798.6	OK	
E9.000	ESPM	15 Winter	2	+0%	100/15 Winter				143.624	-0.413	0.000	0.41		432.4	OK	
E1.009	ES317	15 Winter	2	+0%	30/30 Winter	100/30 Winter			142.940	-0.644	0.000	0.56		1906.7	OK	
E10.000	ESPV	360 Winter	2	+0%	100/15 Winter				143.751	-0.375	0.000	0.00		0.0	OK	
E1.010	ES318	15 Winter	2	+0%	30/30 Winter				142.581	-0.617	0.000	0.60		1884.7	OK	
E1.011	ES319	15 Winter	2	+0%	30/30 Winter				142.196	-0.666	0.000	0.54		1877.6	OK	
E11.000	ES321	15 Winter	2	+0%	2/15 Summer				144.244	0.228	0.000	1.42		107.7	SURCHARGED	
E12.000	ES323 (H)	15 Winter	2	+0%	30/15 Summer				142.366	-0.184	0.000	0.64		114.8	OK	
E1.012	ES320	30 Winter	2	+0%	30/30 Summer				141.745	-0.705	0.000	0.49		1904.7	OK	
E13.000	ES3U1	15 Winter	2	+0%	30/30 Winter				141.973	-0.777	0.000	0.15		432.5	OK	
E1.013	ES324	30 Winter	2	+0%	30/30 Summer				141.233	-0.640	0.000	0.62		2210.2	OK	
E14.000	ES3T1	360 Winter	2	+0%	100/15 Winter				141.900	-0.675	0.000	0.00		0.0	OK	
E15.000	ES3U2	15 Winter	2	+0%	100/15 Winter				141.952	-0.593	0.000	0.04		45.0	OK	
E1.014	ES325	30 Winter	2	+0%	30/15 Winter				141.026	-0.508	0.000	0.77		2216.6	OK	
E1.015	ES326	30 Winter	2	+0%	30/15 Winter				140.834	-0.573	0.000	0.68		2214.4	OK	
E16.000	ES3S1	30 Winter	2	+0%	30/30 Summer				140.678	-0.680	0.000	0.09		131.7	OK	
E1.016	ES327	30 Winter	2	+0%	30/15 Winter				140.673	-0.554	0.000	0.68		2242.0	OK	
E1.017	ES328	30 Winter	2	+0%	30/15 Winter				140.505	-0.525	0.000	0.68		2242.3	OK	
E17.000	ES3T3	15 Winter	2	+0%	2/15 Summer	100/15 Summer			141.626	0.456	0.000	1.26		632.8	SURCHARGED	
E17.001	ES329A	15 Winter	2	+0%	2/15 Summer				141.211	0.291	0.000	1.82		632.3	SURCHARGED	
E18.000	ES3S2	30 Winter	2	+0%	30/15 Winter				140.350	-0.500	0.000	0.32		186.7	OK	
E1.018	ES329	30 Winter	2	+0%	30/15 Winter				140.348	-0.482	0.000	0.80		2403.2	OK	
E1.019	ES329A	30 Winter	2	+0%	30/15 Winter				140.211	-0.481	0.000	0.78		2404.9	OK	
E1.020	ES330	30 Winter	2	+0%	30/15 Winter				140.073	-0.467	0.000	0.82		2406.7	OK	
E19.000	ES3T2	15 Winter	2	+0%					141.075	-0.815	0.000	0.11		422.6	OK	
E1.021	ES331	60 Winter	2	+0%	100/30 Summer				139.669	-0.743	0.000	0.65		2509.6	OK	
E20.000	ES1-P-X	15 Winter	2	+0%	30/15 Summer				146.759	-0.373	0.000	0.49		288.4	OK	
E20.001	ES3310	15 Winter	2	+0%	30/15 Summer				146.428	-0.622	0.000	0.21		297.7	OK	
E20.002	ES3309	15 Winter	2	+0%	30/15 Summer				146.022	-0.614	0.000	0.22		305.9	OK	
E21.000	ES1-P-QS	15 Winter	2	+0%	30/15 Summer				145.993	-0.406	0.000	0.23		86.7	OK	
E22.000	ES1-P-P2B	15 Winter	2	+0%	2/15 Summer				146.635	0.161	0.000	1.33		624.7	SURCHARGED	
E20.003	ES3308	15 Winter	2	+0%	30/15 Summer				145.894	-0.360	0.000	0.66		1001.9	OK	
E23.000	ES1-P-P2A	15 Winter	2	+0%	30/15 Summer				145.617	-0.393	0.000	0.45		324.2	OK	
E20.004	ES3307	15 Winter	2	+0%	30/15 Summer				145.551	-0.249	0.000	0.92		1295.5	OK	
E20.005	ES3306	15 Winter	2	+0%	30/15 Summer				145.363	-0.247	0.000	0.93		1277.7	OK	
E20.006	ES3305	15 Winter	2	+0%	100/15 Summer				144.960	-0.485	0.000	0.56		1261.8	OK	
E24.000	ES1-P-R2	15 Winter	2	+0%	30/15 Winter				144.744	-0.276	0.000	0.56		193.1	OK	
E25.000	ES1-P-QS2	15 Winter	2	+0%	30/15 Summer				144.782	-0.248	0.000	0.63		228.9	OK	
E20.007	ES3304	15 Winter	2	+0%	100/15 Summer				144.393	-0.507	0.000	0.53		1543.4	OK	
E26.000	ES1-P-R	15 Winter	2	+0%	100/15 Summer				143.869	-0.331	0.000	0.41		183.2	OK	
E20.008	ES3303	15 Winter	2	+0%	30/15 Winter				143.550	-0.450	0.000	0.62		1657.9	OK	
E20.009	ES3302	15 Winter	2	+0%	30/15 Winter				142.817	-0.425	0.000	0.66		1665.2	OK	
E20.010	ES3301	15 Winter	2	+0%	100/15 Winter				142.071	-0.470	0.000	0.59		1669.0	OK	
E20.011	ES409	15 Winter	2	+0%	2/15 Summer				139.828	0.058	0.000	1.19		1670.1	SURCHARGED	
E1.022	EPOND 2	1440 Winter	2	+0%	2/720 Winter				139.199	0.049	0.000	0.21		248.4	SURCHARGED	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

PN	US/MH Name	Level Exceeded
E1.000	ES3L1	
E2.000	ES3K1	
E1.001	ES303	
E1.002	ES303A	
E1.003	ES304	
E3.000	EMH-C14	
E1.004	EMH-C15	
E1.005	ES305	
E4.000	ESPK2	
E4.001	ES314	
E5.000	ES3316	
E6.000	ES1-P-O	
E5.001	ES3315	
E5.002	ES3314	
E7.000	ES1-P-N	
E5.003	ES3313	
E5.004	ES3312	
E8.000	ES1-P-T	
E5.005	ES3311	
E1.006	ES306	
E1.007	ES315	
E1.008	ES316	
E9.000	ESPM	
E1.009	ES317	1
E10.000	ESPV	
E1.010	ES318	
E1.011	ES319	
E11.000	ES321	
E12.000	ES323 (H)	
E1.012	ES320	
E13.000	ES3U1	
E1.013	ES324	
E14.000	ES3T1	
E15.000	ES3U2	
E1.014	ES325	
E1.015	ES326	
E16.000	ES3S1	
E1.016	ES327	
E1.017	ES328	
E17.000	ES3T3	4
E17.001	ES329A	
E18.000	ES3S2	
E1.018	ES329	
E1.019	ES329A	
E1.020	ES330	
E19.000	ES3T2	
E1.021	ES331	
E20.000	ES1-P-X	
E20.001	ES3310	
E20.002	ES3309	
E21.000	ES1-P-QS	
E22.000	ES1-P-P2B	
E20.003	ES3308	
E23.000	ES1-P-P2A	
E20.004	ES3307	
E20.005	ES3306	
E20.006	ES3305	
E24.000	ES1-P-R2	
E25.000	ES1-P-QS2	
E20.007	ES3304	
E26.000	ES1-P-R	
E20.008	ES3303	
E20.009	ES3302	
E20.010	ES3301	
E20.011	ES409	
E1.022	EPOND 2	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

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) 19.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.268 Cv (Winter) 0.840

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

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) 2, 30, 100
Climate Change (%) 0, 0, 0

Water Surcharged Flooded Pipe															
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status
E1.000	ES3L1	15 Winter	30	+0%	100/15 Summer				145.719	-0.516	0.000	0.47		924.3	OK
E2.000	ES3K1	15 Winter	30	+0%					148.087	-0.625	0.000	0.06		164.1	OK
E1.001	ES303	15 Winter	30	+0%	100/15 Summer				145.697	-0.388	0.000	0.59		1150.3	OK
E1.002	ES303A	15 Winter	30	+0%	100/15 Summer				145.649	-0.266	0.000	0.58		1148.5	OK
E1.003	ES304	15 Winter	30	+0%	100/15 Summer				145.608	-0.077	0.000	0.80		1697.6	OK
E3.000	EMH-C14	15 Winter	30	+0%	2/15 Summer				146.761	0.659	0.000	2.44		623.3	SURCHARGED
E1.004	EMH-C15	15 Winter	30	+0%	30/15 Winter				145.521	0.116	0.000	0.88		2166.1	SURCHARGED
E1.005	ES305	15 Winter	30	+0%	30/15 Summer				145.361	0.329	0.000	0.80		1906.5	SURCHARGED
E4.000	ESPK2	15 Winter	30	+0%					147.855	-0.164	0.000	0.79		206.6	OK
E4.001	ES314	15 Winter	30	+0%					147.553	-0.350	0.000	0.24		207.8	OK
E5.000	ES3316	15 Winter	30	+0%	100/15 Summer				149.648	-0.045	0.000	0.84		64.0	OK
E6.000	ES1-P-O	15 Winter	30	+0%	30/15 Summer				148.415	0.088	0.000	0.89		276.0	SURCHARGED
E5.001	ES3315	15 Winter	30	+0%	30/15 Summer				148.369	0.096	0.000	1.31		333.7	SURCHARGED
E5.002	ES3314	15 Winter	30	+0%	30/15 Winter				148.174	0.013	0.000	1.11		320.1	SURCHARGED
E7.000	ES1-P-N	15 Winter	30	+0%					148.365	-0.432	0.000	0.17		145.5	OK
E5.003	ES3313	15 Winter	30	+0%	100/15 Winter				147.914	-0.186	0.000	0.80		427.1	OK
E5.004	ES3312	15 Winter	30	+0%	100/15 Winter				147.157	-0.277	0.000	0.56		648.0	OK
E8.000	ES1-P-T	15 Winter	30	+0%	2/15 Summer				146.002	0.849	0.000	2.63		429.0	SURCHARGED
E5.005	ES3311	15 Winter	30	+0%	30/15 Summer				145.502	0.412	0.000	0.98		994.3	SURCHARGED
E1.006	ES306	15 Winter	30	+0%	30/15 Summer				145.184	0.524	0.000	1.24		3032.4	SURCHARGED
E1.007	ES315	15 Winter	30	+0%	30/15 Summer				144.678	0.393	0.000	1.34		2945.1	SURCHARGED
E1.008	ES316	15 Winter	30	+0%	30/15 Summer				144.121	0.135	0.000	1.20		2887.3	SURCHARGED
E9.000	ESPM	15 Winter	30	+0%	100/15 Winter				143.791	-0.246	0.000	0.77		816.3	OK
E1.009	ES317	30 Winter	30	+0%	30/30 Winter	100/30 Winter			143.608	0.024	0.000	0.91		3075.9	SURCHARGED
E10.000	ESPV	360 Winter	30	+0%	100/15 Winter				143.751	-0.375	0.000	0.00		0.0	OK
E1.010	ES318	30 Winter	30	+0%	30/30 Winter				143.368	0.170	0.000	0.91		2873.1	SURCHARGED
E1.011	ES319	30 Winter	30	+0%	30/30 Winter				143.148	0.286	0.000	0.80		2795.2	SURCHARGED
E11.000	ES321	15 Winter	30	+0%	2/15 Summer				145.299	1.283	0.000	2.57		195.2	SURCHARGED
E12.000	ES323 (H)	30 Winter	30	+0%	30/15 Summer				142.993	0.443	0.000	1.00		178.2	SURCHARGED
E1.012	ES320	30 Winter	30	+0%	30/30 Summer				142.910	0.460	0.000	0.74		2878.9	SURCHARGED
E13.000	ES3U1	30 Winter	30	+0%	30/30 Winter				142.875	0.125	0.000	0.24		681.5	SURCHARGED
E1.013	ES324	30 Winter	30	+0%	30/30 Summer				142.596	0.723	0.000	0.93		3304.7	SURCHARGED
E14.000	ES3T1	30 Winter	30	+0%	100/15 Winter				142.296	-0.279	0.000	0.00		5.0	OK
E15.000	ES3U2	30 Winter	30	+0%	100/15 Winter				142.303	-0.242	0.000	0.06		70.7	OK
E1.014	ES325	30 Winter	30	+0%	30/15 Winter				142.296	0.762	0.000	1.16		3327.6	SURCHARGED
E1.015	ES326	60 Winter	30	+0%	30/15 Winter				142.127	0.720	0.000	0.98		3193.2	SURCHARGED
E16.000	ES3S1	60 Winter	30	+0%	30/30 Summer				141.959	0.601	0.000	0.11		161.1	SURCHARGED
E1.016	ES327	60 Winter	30	+0%	30/15 Winter				141.954	0.727	0.000	1.00		3284.8	SURCHARGED
E1.017	ES328	60 Winter	30	+0%	30/15 Winter				141.757	0.727	0.000	1.00		3292.5	SURCHARGED
E17.000	ES3T3	15 Winter	30	+0%	2/15 Summer	100/15 Summer			143.321	2.151	0.000	2.22		1111.0	SURCHARGED
E17.001	ES329A	15 Winter	30	+0%	2/15 Summer				142.045	1.125	0.000	3.21		1114.0	SURCHARGED
E18.000	ES3S2	60 Winter	30	+0%	30/15 Winter				141.564	0.714	0.000	0.41		239.0	SURCHARGED
E1.018	ES329	60 Winter	30	+0%	30/15 Winter				141.559	0.729	0.000	1.28		3866.7	SURCHARGED
E1.019	ES329A	60 Winter	30	+0%	30/15 Winter				141.177	0.485	0.000	1.25		3870.7	SURCHARGED
E1.020	ES330	60 Winter	30	+0%	30/15 Winter				140.796	0.256	0.000	1.31		3875.4	SURCHARGED
E19.000	ES3T2	15 Winter	30	+0%					141.170	-0.720	0.000	0.21		798.7	OK
E1.021	ES331	30 Winter	30	+0%	100/30 Summer				140.412	0.000	0.000	1.05		4051.1	OK
E20.000	ES1-P-X	15 Winter	30	+0%	30/15 Summer				147.281	0.149	0.000	0.93		544.5	SURCHARGED
E20.001	ES3310	15 Winter	30	+0%	30/15 Summer				147.209	0.159	0.000	0.37		533.2	SURCHARGED
E20.002	ES3309	15 Winter	30	+0%	30/15 Summer				146.974	0.338	0.000	0.33		465.9	SURCHARGED
E21.000	ES1-P-QS	15 Winter	30	+0%	30/15 Summer				146.861	0.462	0.000	0.34		131.2	SURCHARGED
E22.000	ES1-P-P2B	15 Winter	30	+0%	2/15 Summer				147.852	1.378	0.000	2.23		1049.2	SURCHARGED
E20.003	ES3308	15 Winter	30	+0%	30/15 Summer				146.801	0.547	0.000	1.02		1555.0	SURCHARGED
E23.000	ES1-P-P2A	15 Winter	30	+0%	30/15 Summer				146.409	0.399	0.000	0.78		559.3	SURCHARGED
E20.004	ES3307	15 Winter	30	+0%	30/15 Summer				146.310	0.510	0.000	1.47		2060.3	SURCHARGED
E20.005	ES3306	15 Winter	30	+0%	30/15 Summer				145.849	0.239	0.000	1.49		2054.2	SURCHARGED
E20.006	ES3305	15 Winter	30	+0%	100/15 Summer				145.177	-0.268	0.000	0.91		2051.2	OK
E24.000	ES1-P-R2	15 Winter	30	+0%	30/15 Winter				145.023	0.003	0.000	1.02		354.2	SURCHARGED
E25.000	ES1-P-QS2	15 Winter	30	+0%	30/15 Summer				145.067	0.037	0.000	1.20		434.3	SURCHARGED
E20.007	ES3304	15 Winter	30	+0%	100/15 Summer				144.682	-0.218	0.000	0.88		2575.6	OK
E26.000	ES1-P-R	15 Winter	30	+0%	100/15 Summer				144.073	-0.127	0.000	0.77		345.8	OK
E20.008	ES3303	15 Winter	30	+0%	30/15 Winter				144.020	0.020	0.000	1.00		2670.7	SURCHARGED
E20.009	ES3302	15 Winter	30	+0%	30/15 Winter				143.269	0.027	0.000	1.05		2663.1	SURCHARGED
E20.010	ES3301	15 Winter	30	+0%	100/15 Winter				142.297	-0.244	0.000	0.95		2670.5	OK
E20.011	ES409	15 Winter	30	+0%	2/15 Summer				140.295	0.525	0.000	1.90		2671.9	SURCHARGED
E1.022	EPOND 2	960 Winter	30	+0%	2/720 Winter				139.864	0.714	0.000	0.33		388.3	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

PN	US/MH Name	Level Exceeded
E1.000	ES3L1	
E2.000	ES3K1	
E1.001	ES303	
E1.002	ES303A	
E1.003	ES304	
E3.000	EMH-C14	
E1.004	EMH-C15	
E1.005	ES305	
E4.000	ESPK2	
E4.001	ES314	
E5.000	ES3316	
E6.000	ES1-P-O	
E5.001	ES3315	
E5.002	ES3314	
E7.000	ES1-P-N	
E5.003	ES3313	
E5.004	ES3312	
E8.000	ES1-P-T	
E5.005	ES3311	
E1.006	ES306	
E1.007	ES315	
E1.008	ES316	
E9.000	ESPM	
E1.009	ES317	1
E10.000	ESPV	
E1.010	ES318	
E1.011	ES319	
E11.000	ES321	
E12.000	ES323 (H)	
E1.012	ES320	
E13.000	ES3U1	
E1.013	ES324	
E14.000	ES3T1	
E15.000	ES3U2	
E1.014	ES325	
E1.015	ES326	
E16.000	ES3S1	
E1.016	ES327	
E1.017	ES328	
E17.000	ES3T3	4
E17.001	ES329A	
E18.000	ES3S2	
E1.018	ES329	
E1.019	ES329A	
E1.020	ES330	
E19.000	ES3T2	
E1.021	ES331	
E20.000	ES1-P-X	
E20.001	ES3310	
E20.002	ES3309	
E21.000	ES1-P-QS	
E22.000	ES1-P-P2B	
E20.003	ES3308	
E23.000	ES1-P-P2A	
E20.004	ES3307	
E20.005	ES3306	
E20.006	ES3305	
E24.000	ES1-P-R2	
E25.000	ES1-P-QS2	
E20.007	ES3304	
E26.000	ES1-P-R	
E20.008	ES3303	
E20.009	ES3302	
E20.010	ES3301	
E20.011	ES409	
E1.022	EPOND 2	

SWB Consulting Ltd										Page 20									
5th Floor, Waterfront House 35 Station Street Nottingham, NG2 3DQ										Kingsway Business Park Existing SW Network Catchment 2 - FSR									
Date 28/01/2022										Designed by M. Bailey									
File Existing SW Network Model - Pl.MDX										Checked by D. Gray									
Innovyze										Network 2019.1									
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing																			
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) 19.000 Cv (Summer) 0.750									
Region England and Wales										Ratio R 0.268 Cv (Winter) 0.840									
Margin for Flood Risk Warning (mm)										300.0					DVD Status ON				
Analysis Timestep 2.5 Second Increment (Extended)										Inertia Status ON									
DTS Status										OFF									
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)										2, 30, 100									
Climate Change (%)										0, 0, 0									
Water Surcharged Flooded Pipe																			
PN	US/MH	Storm	Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Pipe	Flow	Status			
	Name		Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)					
E1.000	ES3L1	30 Winter	100	+0%	100/15 Summer				148.251	2.016	0.000	0.50		983.4	SURCHARGED				
E2.000	ES3K1	15 Winter	100	+0%					148.108	-0.604	0.000	0.08		211.5	OK				
E1.001	ES303	30 Winter	100	+0%	100/15 Summer				147.671	1.586	0.000	0.61		1206.6	SURCHARGED				
E1.002	ES303A	30 Winter	100	+0%	100/15 Summer				147.528	1.613	0.000	0.57		1126.5	SURCHARGED				
E1.003	ES304	30 Winter	100	+0%	100/15 Summer				147.463	1.778	0.000	0.79		1677.6	SURCHARGED				
E3.000	EMH-C14	30 Winter	100	+0%	2/15 Summer				147.665	1.563	0.000	2.65		676.3	SURCHARGED				
E1.004	EMH-C15	30 Winter	100	+0%	30/15 Winter				147.418	2.013	0.000	0.86		2112.0	SURCHARGED				
E1.005	ES305	30 Winter	100	+0%	30/15 Summer				147.314	2.282	0.000	0.83		1997.3	SURCHARGED				
E4.000	ESPK2	15 Winter	100	+0%					147.999	-0.020	0.000	1.00		261.3	OK				
E4.001	ES314	15 Winter	100	+0%					147.575	-0.328	0.000	0.30		260.8	OK				
E5.000	ES3316	15 Winter	100	+0%	100/15 Summer				150.121	0.428	0.000	0.91		69.8	SURCHARGED				
E6.000	ES1-P-O	15 Winter	100	+0%	30/15 Summer				148.662	0.335	0.000	1.11		345.7	SURCHARGED				
E5.001	ES3315	15 Winter	100	+0%	30/15 Summer				148.600	0.327	0.000	1.62		410.9	SURCHARGED				
E5.002	ES3314	30 Winter	100	+0%	30/15 Winter				148.393	0.232	0.000	1.32		378.8	SURCHARGED				
E7.000	ES1-P-N	15 Winter	100	+0%					148.390	-0.407	0.000	0.22		187.7	OK				
E5.003	ES3313	30 Winter	100	+0%	100/15 Winter				148.310	0.210	0.000	0.98		521.8	SURCHARGED				
E5.004	ES3312	30 Winter	100	+0%	100/15 Winter				148.000	0.566	0.000	0.68		791.6	SURCHARGED				
E8.000	ES1-P-T	30 Winter	100	+0%	2/15 Summer				147.812	2.659	0.000	2.62		427.4	SURCHARGED				
E5.005	ES3311	30 Winter	100	+0%	30/15 Summer				147.420	2.330	0.000	1.11		1132.0	SURCHARGED				
E1.006	ES306	30 Winter	100	+0%	30/15 Summer				147.154	2.494	0.000	1.34		3283.7	SURCHARGED				
E1.007	ES315	30 Winter	100	+0%	30/15 Summer				146.712	2.427	0.000	1.44		3158.4	SURCHARGED				
E1.008	ES316	30 Winter	100	+0%	30/15 Summer				146.248	2.262	0.000	1.26		3029.5	SURCHARGED				
E9.000	ESPM	30 Winter	100	+0%	100/15 Winter				145.997	1.960	0.000	0.84		888.5	SURCHARGED				
E1.009	ES317	30 Winter	100	+0%	30/30 Winter	100/30 Winter			145.776	2.192	13.308	1.01		3410.8	FLOOD				
E10.000	ESPV	30 Winter	100	+0%	100/15 Winter				145.509	1.383	0.000	0.03		9.6	SURCHARGED				
E1.010	ES318	30 Winter	100	+0%	30/30 Winter				145.508	2.310	0.000	1.03		3271.5	FLOOD RISK				
E1.011	ES319	30 Winter	100	+0%	30/30 Winter				145.220	2.358	0.000	0.92		3216.9	SURCHARGED				
E11.000	ES321	15 Winter	100	+0%	2/15 Summer				146.168	2.152	0.000	3.22		244.4	SURCHARGED				
E12.000	ES323 (H)	30 Winter	100	+0%	30/15 Summer				144.975	2.425	0.000	1.33		236.6	SURCHARGED				
E1.012	ES320	30 Winter	100	+0%	30/30 Summer				144.913	2.463	0.000	0.86		3348.8	SURCHARGED				
E13.000	ES3U1	30 Winter	100	+0%	30/30 Winter				144.719	1.969	0.000	0.31		888.7	SURCHARGED				
E1.013	ES324	30 Winter	100	+0%	30/30 Summer				144.507	2.634	0.000	1.17		4147.8	SURCHARGED				
E14.000	ES3T1	30 Winter	100	+0%	100/15 Winter				144.066	1.491	0.000	0.01		19.3	FLOOD RISK				
E15.000	ES3U2	30 Winter	100	+0%	100/15 Winter				144.071	1.526	0.000	0.07		92.2	FLOOD RISK				
E1.014	ES325	30 Winter	100	+0%	30/15 Winter				144.064	2.530	0.000	1.44		4147.6	SURCHARGED				
E1.015	ES326	30 Winter	100	+0%	30/15 Winter				143.638	2.231	0.000	1.27		4133.8	FLOOD RISK				
E16.000	ES3S1	30 Winter	100	+0%	30/30 Summer				143.209	1.851	0.000	0.20		278.3	SURCHARGED				
E1.016	ES327	30 Winter	100	+0%	30/15 Winter				143.204	1.977	0.000	1.28		4226.7	SURCHARGED				
E1.017	ES328	30 Winter	100	+0%	30/15 Winter				142.744	1.714	0.000	1.28		4221.9	SURCHARGED				
E17.000	ES3T3	15 Winter	100	+0%	2/15 Summer	100/15 Summer			144.031	2.861	31.204	2.53		1267.7	FLOOD				
E17.001	ES329A	30 Winter	100	+0%	2/15 Summer				143.087	2.167	0.000	3.36		1166.1	SURCHARGED				
E18.000	ES3S2	60 Winter	100	+0%	30/15 Winter				142.313	1.463	0.000	0.54		314.2	SURCHARGED				
E1.018	ES329	60 Winter	100	+0%	30/15 Winter				142.306	1.476	0.000	1.65		4962.1	SURCHARGED				
E1.019	ES329A	60 Winter	100	+0%	30/15 Winter				141.676	0.984	0.000	1.61		4972.9	SURCHARGED				
E1.020	ES330	60 Winter	100	+0%	30/15 Winter				141.044	0.504	0.000	1.69		4976.8	SURCHARGED				
E19.000	ES3T2	15 Winter	100	+0%					141.216	-0.674	0.000	0.28		1029.5	OK				
E1.021	ES331	30 Winter	100	+0%	100/30 Summer				140.499	0.087	0.000	1.35		5217.8	SURCHARGED				
E20.000	ES1-P-X	15 Winter	100	+0%	30/15 Summer				148.392	1.260	0.000	1.01		589.5	SURCHARGED				
E20.001	ES3310	15 Winter	100	+0%	30/15 Summer				148.336	1.286	0.000	0.39		562.4	SURCHARGED				
E20.002	ES3309	15 Winter	100	+0%	30/15 Summer				148.131	1.495	0.000	0.39		537.2	SURCHARGED				
E21.000	ES1-P-QS	15 Winter	100	+0%	30/15 Summer				148.006	1.607	0.000	0.43		163.0	SURCHARGED				
E22.000	ES1-P-P2B	15 Winter	100	+0%	2/15 Summer				149.242	2.768	0.000	2.64		1240.5	SURCHARGED				
E20.003	ES3308	15 Winter	100	+0%	30/15 Summer				147.933	1.679	0.000	1.26		1908.8	SURCHARGED				
E23.000	ES1-P-P2A	15 Winter	100	+0%	30/15 Summer				147.386	1.376	0.000	0.97		697.0	SURCHARGED				
E20.004	ES3307	15 Winter	100	+0%	30/15 Summer				147.293	1.493	0.000	1.78		2501.3	SURCHARGED				
E20.005	ES3306	15 Winter	100	+0%	30/15 Summer				146.727	1.117	0.000	1.78		2451.1	SURCHARGED				
E20.006	ES3305	15 Winter	100	+0%	100/15 Summer				146.173	0.728	0.000	1.07		2427.2	SURCHARGED				
E24.000	ES1-P-R2	15 Winter	100	+0%	30/15 Winter				145.632	0.612	0.000	1.36		470.9	SURCHARGED				
E25.000	ES1-P-QS2	15 Winter	100	+0%	30/15 Summer				145.641	0.611	0.000	1.55		558.4	SURCHARGED				
E20.007	ES3304	15 Winter	100	+0%	100/15 Summer				145.582	0.682	0.000	1.02		2975.8	SURCHARGED				
E26.000	ES1-P-R	15 Winter	100	+0%	100/15 Summer				144.791	0.591	0.000	0.99		441.8	SURCHARGED				
E20.008	ES3303	15 Winter	100	+0%	30/15 Winter				144.646	0.646	0.000	1.17		3138.7	SURCHARGED				
E20.009	ES3302	15 Winter	100	+0%	30/15 Winter				143.693	0.451	0.000	1.22		3095.5	SURCHARGED				
E20.010	ES3301	15 Winter	100	+0%	100/15 Winter				142.664	0.123	0.000	1.09		3070.9	SURCHARGED				
E20.011	ES409	15 Winter	100	+0%	2/15 Summer				140.548	0.778	0.000	2.19		3072.8	SURCHARGED				
E1.022	EPOND 2	960 Winter	100	+0%	2/720 Winter				140.268	1.118	0.000	0.37		445.5	FLOOD RISK				
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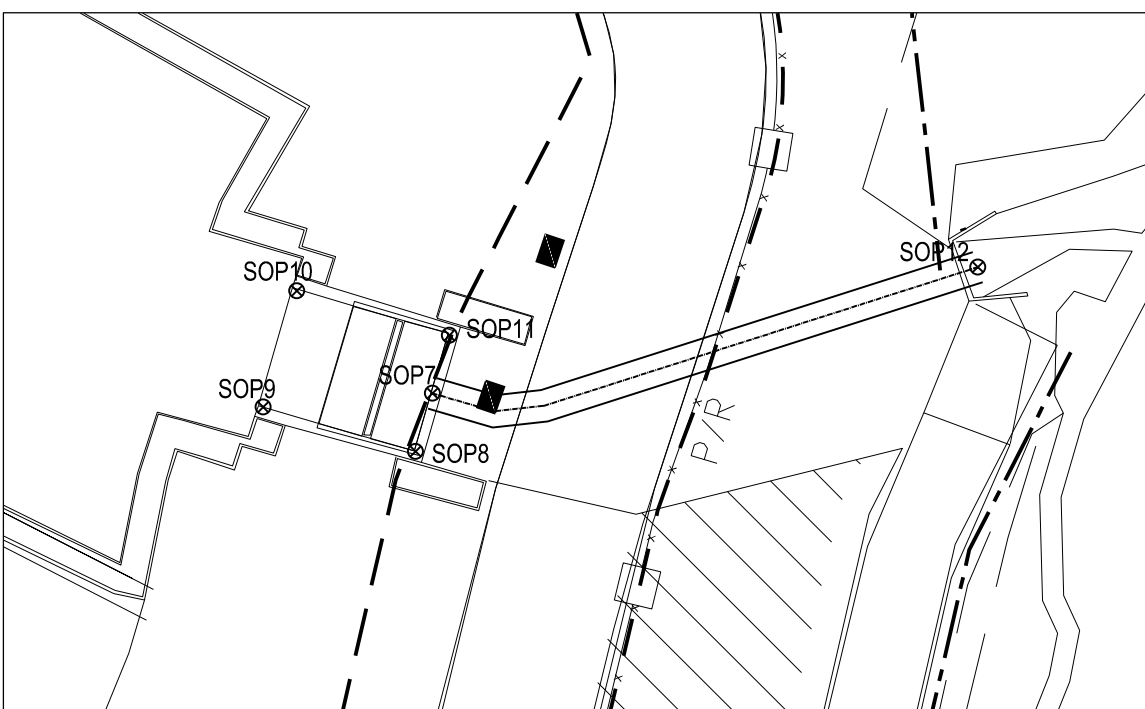
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

PN	US/MH Name	Level Exceeded
E1.000	ES3L1	
E2.000	ES3K1	
E1.001	ES303	
E1.002	ES303A	
E1.003	ES304	
E3.000	EMH-C14	
E1.004	EMH-C15	
E1.005	ES305	
E4.000	ESPK2	
E4.001	ES314	
E5.000	ES3316	
E6.000	ES1-P-O	
E5.001	ES3315	
E5.002	ES3314	
E7.000	ES1-P-N	
E5.003	ES3313	
E5.004	ES3312	
E8.000	ES1-P-T	
E5.005	ES3311	
E1.006	ES306	
E1.007	ES315	
E1.008	ES316	
E9.000	ESPM	
E1.009	ES317	1
E10.000	ESPV	
E1.010	ES318	
E1.011	ES319	
E11.000	ES321	
E12.000	ES323 (H)	
E1.012	ES320	
E13.000	ES3U1	
E1.013	ES324	
E14.000	ES3T1	
E15.000	ES3U2	
E1.014	ES325	
E1.015	ES326	
E16.000	ES3S1	
E1.016	ES327	
E1.017	ES328	
E17.000	ES3T3	4
E17.001	ES329A	
E18.000	ES3S2	
E1.018	ES329	
E1.019	ES329A	
E1.020	ES330	
E19.000	ES3T2	
E1.021	ES331	
E20.000	ES1-P-X	
E20.001	ES3310	
E20.002	ES3309	
E21.000	ES1-P-QS	
E22.000	ES1-P-P2B	
E20.003	ES3308	
E23.000	ES1-P-P2A	
E20.004	ES3307	
E20.005	ES3306	
E20.006	ES3305	
E24.000	ES1-P-R2	
E25.000	ES1-P-QS2	
E20.007	ES3304	
E26.000	ES1-P-R	
E20.008	ES3303	
E20.009	ES3302	
E20.010	ES3301	
E20.011	ES409	
E1.022	EPOND 2	

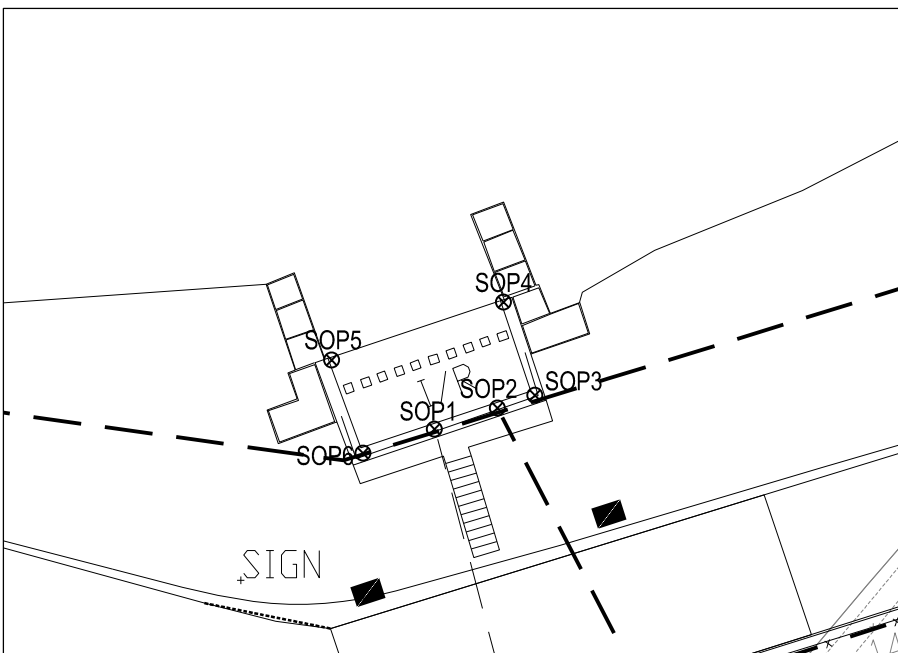
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Existing

PN	US/MH Name	Level Exceeded
E1.000	ES3L1	
E2.000	ES3K1	
E1.001	ES303	
E1.002	ES303A	
E1.003	ES304	
E3.000	EMH-C14	
E1.004	EMH-C15	
E1.005	ES305	
E4.000	ESPK2	
E4.001	ES314	
E5.000	ES3316	
E6.000	ES1-P-O	
E5.001	ES3315	
E5.002	ES3314	
E7.000	ES1-P-N	
E5.003	ES3313	
E5.004	ES3312	
E8.000	ES1-P-T	
E5.005	ES3311	
E1.006	ES306	
E1.007	ES315	
E1.008	ES316	
E9.000	ESPM	
E1.009	ES317	
E10.000	ESPV	
E1.010	ES318	
E1.011	ES319	
E11.000	ES321	
E12.000	ES323 (H)	
E1.012	ES320	
E13.000	ES3U1	
E1.013	ES324	
E14.000	ES3T1	
E15.000	ES3U2	
E1.014	ES325	
E1.015	ES326	
E16.000	ES3S1	
E1.016	ES327	
E1.017	ES328	
E17.000	ES3T3	
E17.001	ES329A	
E18.000	ES3S2	
E1.018	ES329	
E1.019	ES329A	
E1.020	ES330	
E19.000	ES3T2	
E1.021	ES331	
E20.000	ES1-P-X	
E20.001	ES3310	
E20.002	ES3309	
E21.000	ES1-P-QS	
E22.000	ES1-P-P2B	
E20.003	ES3308	
E23.000	ES1-P-P2A	
E20.004	ES3307	
E20.005	ES3306	
E20.006	ES3305	
E24.000	ES1-P-R2	
E25.000	ES1-P-QS2	
E20.007	ES3304	
E26.000	ES1-P-R	
E20.008	ES3303	
E20.009	ES3302	
E20.010	ES3301	
E20.011	ES409	
E1.022	EPOND 2	

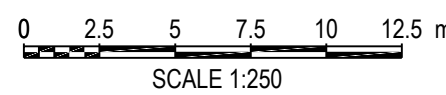
Appendix C – As-built drawings of Ponds and Flow Control



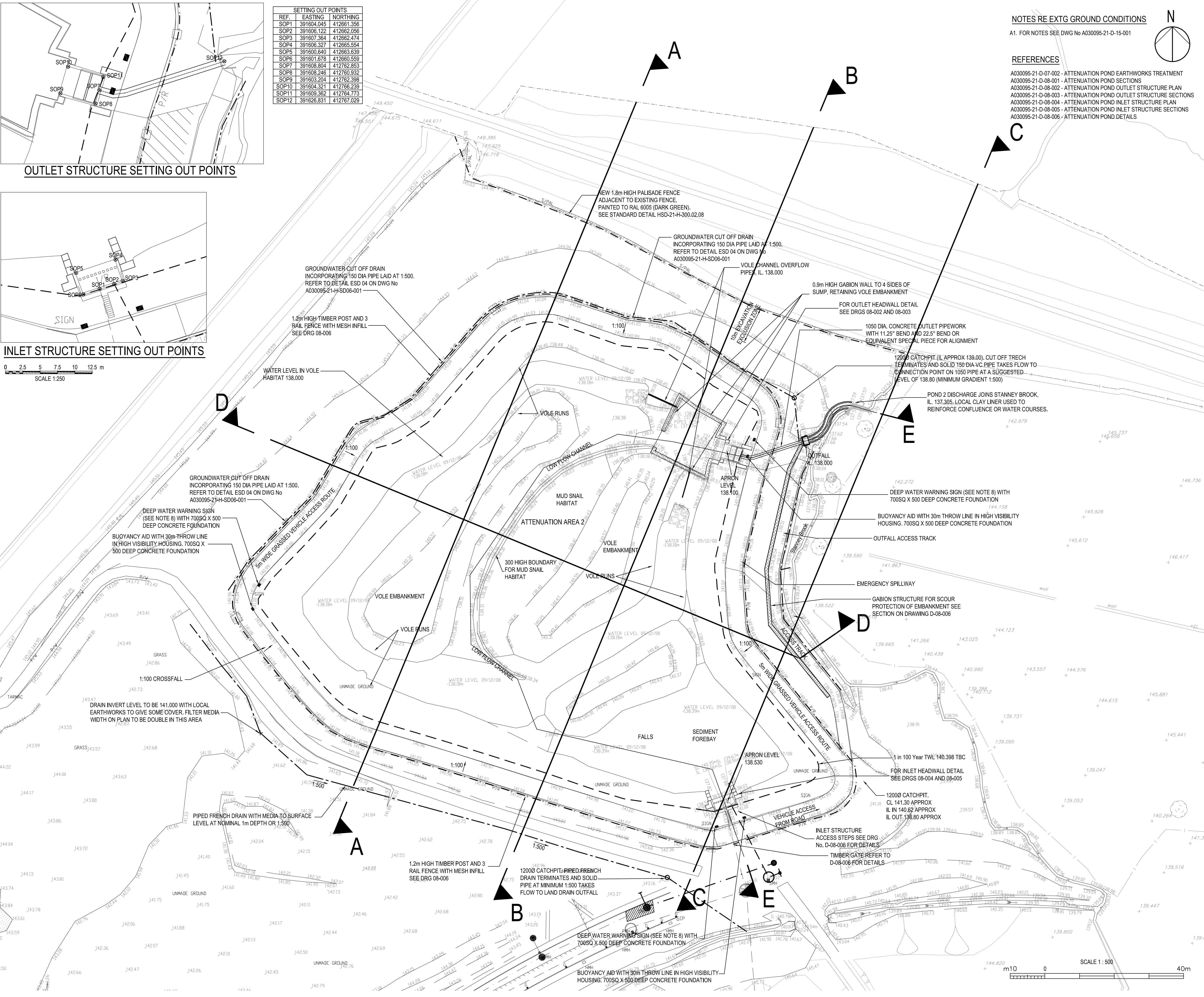
OUTLET STRUCTURE SETTING OUT POINTS



INLET STRUCTURE SETTING OUT POINTS



SETTING OUT POINTS		
REF.	EASTING	NORTHING
SOP1	391604.045	412661.356
SOP2	391606.122	412662.056
SOP3	391607.364	412662.474
SOP4	391606.327	412665.554
SOP5	391600.640	412663.639
SOP6	391601.678	412660.559
SOP7	391608.804	412762.853
SOP8	391608.246	412760.932
SOP9	391603.204	412762.398
SOP10	391604.321	412766.239
SOP11	391609.362	412764.773
SOP12	391626.831	412767.029



NOTES RE EXTG GROUND CONDITIONS

A1. FOR NOTES SEE DWG No A030095-21-D-15-001

REFERENCES

A030095-21-D-07-002 - ATTENUATION POND EARTHWORKS TREATMENT
A030095-21-D-08-001 - ATTENUATION POND SECTIONS
A030095-21-D-08-002 - ATTENUATION POND OUTLET STRUCTURE PLAN
A030095-21-D-08-003 - ATTENUATION POND OUTLET STRUCTURE SECTIONS
A030095-21-D-08-004 - ATTENUATION POND INLET STRUCTURE PLAN
A030095-21-D-08-005 - ATTENUATION POND INLET STRUCTURE SECTIONS
A030095-21-D-08-006 - ATTENUATION POND DETAILS

NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER PROJECT DRAWINGS AND THE SPECIFICATION.
- THE SURVEY INFORMATION AND FINISHED AS BUILT INFORMATION OF THE PHASE ONE WORKS USED IN PREPARATION OF THIS AND ALL OTHER WYG DRAWINGS IS NOT WARRANTED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THAT ALL EXISTING INFORMATION PROVIDED IS ACCURATE AND CORRECT. ANY ERRORS SHALL BE REPORTED TO THE PROJECT MANAGER PRIOR TO COMMENCEMENT OF WORKS.
- ALL PROPOSED MANHOLE COVER LEVELS ARE APPROXIMATE ONLY. FINAL COVER LEVELS SHALL TIE IN WITH FINISHED SURFACE LEVELS.
- CONTRACTOR IS TO CONFIRM LOCATIONS AND LEVELS OF EXISTING CULVERTS AND PIPES PRIOR TO START OF WORKS.
- CONTRACTOR SHALL REFER TO RISK ASSESSMENTS IN HEALTH AND SAFETY PLAN PRIOR TO BEGINNING WORKS.
- FOR ACCESS TRACKS AND RAMPS SEE DETAIL AND NOTE ON DRAWING No. D-08-006.
- ALL WORKS TO ADHERE TO ALL RELEVANT CDM REGULATIONS, PROJECT RELATED CDM DOCUMENTATION AND HEALTH AND SAFETY RISK ASSESSMENTS.
- 'DEEP WATER' WARNING SIGN TO BE COMPLIANT WITH BS-5499
- POND PERIMETER FENCE TO BE SET AT 0.5m OFFSET FROM TOP OF EMBANKMENT UNLESS INDICATED OTHERWISE.
- ATTENUATION POND 2 TO PROVIDE STORAGE VOLUME OF 21,277m³.
- 10m EXCLUSION ZONE REQUIRED BY NETWORK RAIL TO ENSURE THAT EMBANKMENT REMAINS UNDISTURBED. NEW PALISADE FENCE TO BE ERECTED POND SIDE OF THE EXISTING NETWORK RAIL FENCE WHICH IS TO BE LEFT UNDISTURBED.
- BUOYANCY AID TO BE RING TYPE LIFEBOUY, 450mm INTERNAL DIA, 750mm EXTERNAL DIA, POLYETHYLENE OUTER STRUCTURE FILLED WITH POLYURETHANE FOAM. THROW LINE TO BE FLOATING POLYPROPYLENE 8mm DIA. TO MEET E.C. DIRECTIVE 96/98 FOR MARINE EQUIPMENT.

IMPORTANT CDM / H&S NOTE

THE DESIGNERS WOULD DRAW THE READERS ATTENTION TO THE KEY OPERATION, MAINTENANCE AND DEMOLITION HEALTH AND SAFETY RISKS DETAILED IN THE RELEVANT HEALTH AND SAFETY FILES FOR THIS ELEMENT OF THE PROJECT

THE "AS BUILT" INFORMATION CONTAINED WITHIN THIS DRAWING HAS BEEN PROVIDED BY: PRINCIPAL CONTRACTOR

Carillon Regional Civil Engineering
Gateway House
1 Old Hall Road
Wirral International Business Park
Bromborough
Wirral
CH62 3NX Tel: 0151 3468000



AND REPRESENTS AN AS BUILT RECORD OF THE WORKS CARRIED OUT FOR:

KINGSWAY PHASE 2
ROCHDALE

VERIFIED AS A TRUE RECORD BY THE ABOVE CONTRACTORS REPRESENTATIVES

NAME	DATE	CONTRACT ROLE	SIGNED
J. TREE	OCT 09	PROJECT MANAGER	J.T.
T. AISYMONTT	OCT 09	AGENT	T.A.

THE AS BUILT INFORMATION PROVIDED BY THE ABOVE COMPANY IS NOT WARRANTED BY WYG.

AB1	AS BUILT ISSUE	BY	CHK	APP	DATE
REV	DESCRIPTION				

Wilson Bowden Developments
Forest Business Park
Cartwright Way
Bardon Hill
Leicestershire
LE67 1UB
Tel: 01530 276 276



ARNDAL COURT
HEADINGLEY
LEEDS
LS6 2UJ



TEL: +44 (0)113 278 7111
FAX: +44 (0)113 278 3487
e-mail: leeds@wyg.com

Project:

KINGSWAY PHASE 2
ROCHDALE

Drawing Title:
ATTENUATION POND 2
LAYOUT PLAN

Scale @	A1	Drawn	Date	Checked	Date	Approved	Date
1:500	NGP	07.07.06	GSG	24.07.06	KAO	24.07.06	
Project No.	Office	Type	Drawing No.	Revision			
A030095	21	D	07-001	AB1			

- NOTES RE EXTG GROUND CONDITIONS

LEGEND

- ### IMPORTANT CDM / H&S NOTE

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FOR CLAY LINING SECTIONS
REFER TO WYG DRG. No.
08.010 LATEST REVISION

