Plot H4, Indurent
Heywood Distribution Park,
OL10 2TR

Flood Risk Assessment & Drainage Strategy

for

Ref: 30042-BGL-XX-XX-RP-D-00001

Version 7
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DOCUMENT CONTROL SHEET

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5	27.05.2025	Updated to suit latest masterplan
6	16.06.2025	Amended to suit Planning Prospects comments
7	19.08.2025	Amended to latest masterplan

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1.0 – EXECUTIVE SUMMARY

This updated Flood Risk Assessment and Drainage Strategy has been developed in due cognisance of all relevant available policy information.

This report relates to Plot H4 of Heywood Distribution Park in Heywood, Rochdale. It has been prepared to discharge the requirements of conditions 8 and 9 of the outline planning permission reference 24/00805/OUT and reflects the proposed reserved matters scheme which comprises an employment unit with parking and service yard, open storage area, access, landscaping and associated infrastructure.

For clarity, this report is intended to support the approval of detail applications for the following conditions:

Condition 8 - *Prior to the commencement of development within any phase, details of a sustainable surface water drainage scheme and a foul water drainage scheme for that phase, in accordance with the principles set out in the submitted Flood Risk Assessment & Drainage Strategy reference 30042-BGL-XX-XX-RP-D-00001 Version 4 shall be submitted to and approved in writing by the Local Planning Authority. The drainage schemes must include:*

(i) An investigation of the hierarchy of drainage options in the National Planning Practice Guidance (or any subsequent amendment thereof).
(ii) A restricted rate of discharge of surface water agreed with the Local Planning Authority (if it is agreed that infiltration is discounted by the investigations);
(iii) Levels of the proposed drainage systems including proposed ground and finished floor levels in AOD;
(iv) Mitigation measures to manage the risk of sewer surcharge where applicable; and
(v) Foul and surface water which drain on separate systems. The approved schemes shall also be in accordance with the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) or any subsequent replacement national standards.
Prior to occupation of any phase the proposed development, the drainage schemes shall be completed in accordance with the approved details for that phase and retained thereafter for the lifetime of the development.

Condition 9 - *Prior to occupation of any phase of the development, a sustainable drainage management and maintenance plan for that phase shall be submitted to the Local Planning Authority and approved in writing.*
(i)The sustainable drainage management and maintenance plan shall include as a minimum:
Arrangements for adoption by an appropriate public body or statutory undertaker, or, management and maintenance by a management company; and
(ii) Arrangements for inspection and ongoing maintenance of all elements of the sustainable drainage system to secure the operation of the surface water drainage scheme throughout its lifetime.
The sustainable drainage system provided as part of each phase of the development shall subsequently be maintained and managed in accordance with the approved plan for that phase for the lifetime of the development.

Requirements summary

Planning Conditions **Ref.** 24/00805/OUT	**Summary**
Condition 8	(i) The drainage hierarchy has been considered. Infiltration is not suitable due to the ground conditions therefore the next appropriate means of discharge is into a watercourse via the existing sitewide surface water network which conveys flows towards Brightley Brook . Refer to section 5.1 (Disposal of surface water) for further details (ii) The surface water discharge has been restricted to a rate of 131.2 l/s. Refer to section 5.6 (Discharge rates) for further details. (iii) Level information is presented on drainage layout drawing ref. 30042-BGL-XX-XX-DR-C-00250. Refer to appendix D (Drainage layout) for further details. (iv) Hydraulic calculations, included in appendix E, show that the proposed drainage has been designed with no exceedance for storms up to and including 1:100-year events. For the unlikely event that exceedance emerges, due to blockage, damage etc. exceedance will be held and contained in the low-lying areas of the site such as the loading docks. Refer to section 7.2 (Drainage and exceedance flow routes) for further details. (v) Foul and surface water drainage has been designed on separate systems and in accordance with all relevant standards.
Condition 9	Reference should be made to the Drainage Inspection and Maintenance Schedule in Appendix F, which includes required actions and typical frequencies for all drainage infrastructure serving the development. The drainage will be managed and maintained by an appointed Management Company.

- The United Utilities Public Sewer Records, which have been included in Appendix C of this report, show there to be no public sewers within the site.
- Reference should be made to the following JPG reports.

Geoenvironmental Desk Study Report 5986-JPG-XX-XX-RP-G-060-S2-P03 dated January 2022

Geoenvironmental Ground Investigation 5986-JPG-XX-XX-RP-G-0605-S2-P03 dated January 2022

- The EA flood maps for planning show the site to be located wholly within flood zone 1.
- The EA Map of long-term flood risk from surface water indicates that the site is at a very low risk from surface water flooding.
- Based on the limited information available, it is considered that the risk of groundwater flooding to the development is low.
- As described in section 2.4 of this report, the majority of the site is underlain by Glacial Till, which is generally unfavourable to infiltration. Therefore, it is considered that soakaway drainage will not be a suitable means of disposing surface water runoff from the developed site.
  In line with the latest guidance, a 45% climate change allowance has been made on the 100-year storm event.
- The maximum runoff rate from the developed site will not exceed 131.2 l/s for all storms up to and including the 1 in 100-year storm plus 45% allowance for climate which is combination of greenfield

runoff for the area previously greenfield and a 50% reduction in brownfield runoff for the area currently impermeable.

- It is anticipated that the average foul flow from the development will be 0.9 l/s.
- This Flood Risk Assessment and Drainage Strategy has concluded that the development is appropriate and can be occupied safely subject to implementation of the flood risk mitigation described in this report being carried out.

2.0 - PROJECT BACKGROUND

2.1 - Appointment

Burrows Graham Limited have been commissioned by Client Indurent (referred to the as 'the applicant' hereafter) to undertake an updated flood risk assessment and drainage strategy to discharge the requirements of conditions 8 and 9 of the outline planning permission reference 24/00805/OUT. It reflects the proposed reserved matters scheme for an employment unit with parking and service yard, open storage area, access, landscaping and associated infrastructure on Plot H4 at Heywood Business Park, Moss Hall, Road, Heywood, OL10 2TR.

2.2 - Aim of study

This FRA and Drainage Strategy has been developed in due cognisance of all relevant available policy information. It is anticipated that this report will satisfy the requirements of the National Planning Policy Framework (NPPF) and all relevant flood risk planning policies.

2.3 - Relevant policy and strategy documents

The following documents were reviewed as part of this Flood Risk Assessment:

- Defra Sustainable Drainage Systems Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015)
- Environment Agency Climate Change Guidance (February 2016)
- Flood and Water Management Act (April 2010)
- National Planning Policy Framework (Updated December 2023) and Planning Practice Guidance (March 2014)
- Sustainable Drainage Systems Written Statement HCWS161 (December 2014)
- Bury, Rochdale, and Oldham Strategic Flood Risk Assessment (SFRA) Level 2 (October 2020)
- Rochdale Borough Strategy for Flood Risk Management 2014-2024 (March 2014)
- Rochdale Metropolitan Borough Council Preliminary Flood Risk Assessment (PFRA) (May 2011)

2.4 - Proposed development

- Outline planning was granted for the development of land with Use Classes E(g)(iii) (industrial processes), B2 (general industrial), B8 (storage and distribution, data centre), and removal of existing structures, hard standing, and associated works in May 2025 under reference 24/00805/OUT. Pursuant to that permission, an application has been made for the approval of Reserved Matters for an employment unit with parking and service yard, open storage area, access, landscaping and associated infrastructure. This report provides information required by conditions 8 and 9 of the permission and reflects the proposed reserved maters scheme.
- The development can be classified as 'less vulnerable' in accordance with guidance set out on the 'gov.uk' website, namely 'Table 2: Flood vulnerability classification'.

Reference should be made to the 'Site Plan' included in Appendix A, an extract of which is shown below.



Figure 1 –Site Plan

3.0 - SITE DETAILS

3.1 - Site description



Figure 2 – Site Location Plan

Table 1 - Site characteristics

Site address	Plot H4, Indurent Heywood Distribution Park, Pilsworth Road, Heywood, OL10 2TR
Grid reference	383720, 409367
Area (hectares)	The site boundary has been measured to be 10.69 hectares.
Usage	Up to 47,400 sq m of E(g)(iii), B2 and B8 floor space
Surroundings	Heywood Distribution Park delineates all the boundaries of the site
Topography	Site levels generally fall from the Northwest to the Southeast. They vary between circa 124m at the Northwest to around circa 115m to the Southeast. A copy of the topographical survey has been included in Appendix B of this report.

3.2 - Existing drainage

The United Utilities Public Sewer Records, which have been included in Appendix C of this report, show there to be no public sewers within the site.



Figure 3 –Rochdale Watercourses Plan

The site is a mix of scrubland and existing landscaping (5.244Ha) and hardstanding (5.446Ha), the hardstanding area currently discharges via a network of sewers through the industrial estate which ultimately discharges via an 825dia pipe under Pilsworth Road to Blighty Brook which is shown on the Rochdale Watercourse Plan on figure 3.

3.3 - Existing watercourses

The nearest watercourse and main river is Blighty Brook which runs to the south of Pilsworth Road.

3.4 - Geology and hydrogeology

Reference should be made to the following JPG reports.

- Geoenvironmental Desk Study Report 5986-JPG-XX-XX-RP-G-060-S2-P03 dated January 2022
- Geoenvironmental Ground Investigation 5986-JPG-XX-XX-RP-G-0605-S2-P03 dated January 2022

- The key findings are Made Ground: Variable across the site with thickness between 0.20m and greater than 2.88m

- Glacial Till: Slightly sandy, slightly gravelly clay base between 2.40m bgl and 12.50m bgl. Generally firm, becoming stiff and very stiff with depth, however, some softer material within the upper 3m within central part of the site.
- Bedrock: Extremely weak to very weak mudstone and sandstone.
- In the Southeast of the site, at 0.55m to 0.90m thick coal seam at depths 1.90m bgl and 2.00m bgl

4.0 – FLOOD RISK STATEMENT

4.1 - Fluvial flood risk

The National Planning Policy Framework (NPPF) categorises flood risk as follows:

- Zone 1 (low probability) – Land assessed as having less than a 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Zone 2 (medium probability) – Land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year; and
- Zone 3a (high probability) - Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
- Zone 3b The Functional Floodplain - This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the EA. (Not separately distinguished from Zone 3a on the Flood Map).

The EA flood maps for planning show that most of the site to be located within flood zone 1.



Figure 4 – EA Flood Map for Planning

Based on the above, the site considered to be at low risk of flooding from rivers or sea.

4.2 - Surface water flooding

The EA descriptions for the High, Medium and Low risk scenarios for surface water flooding are as follows:

- High risk means that each year this area has a chance of flooding of greater than 3.3%.
- Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%.
- Low risk means that each year this area has a chance of flooding of between 0.1% and 1%.
- Very Low risk means that each year this area has a chance of flooding of less than 0.1%.

The EA Map of long-term flood risk from surface water indicates that the site is generally at a very low risk from surface water flooding with some areas that show low to medium risk of surface water flooding. These areas are due to the low-lying existing topography and will be mitigated against through the proposed developments levels and drainage designs.



Figure 5 – EA Flood Map for Surface Water

4.3 - Groundwater flood risk

Groundwater flooding occurs when the water table, the level of water below the ground, rises above the ground surface or into cellars and basements. Groundwater flooding is most likely to occur in low lying areas underlain by permeable rocks (aquifers). These may be extensive, regional aquifers, such as chalk or sandstone, or may be localised sands or river gravels in valley bottoms underlain by less permeable rocks.

Based on the ground conditions outlined in Section 3.4, the risk of flooding from groundwater cannot be ruled out.

Based on the limited information available, it is considered that the risk of groundwater flooding to the development is low.

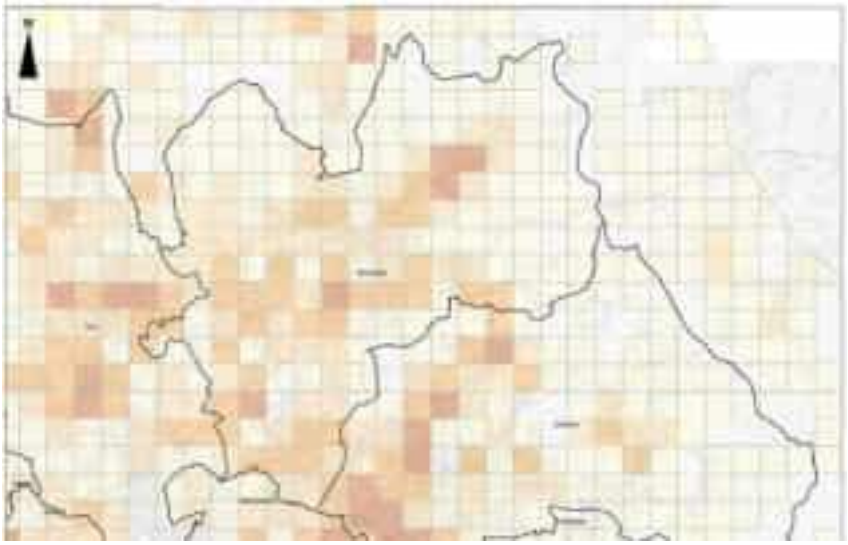


Figure 7 – Rochdale SFRA 5.14 – Risk of Flooding from Groundwater Extract

4.4 - Sewer flooding

There are no existing public sewers within the vicinity of the site. Therefore, the site is at low of risk of flooding from sewers.

4.5 - Tidal flooding

The site is remote from tidal influences and is therefore not at risk of tidal or coastal flooding.

4.6 - Reservoir flooding

Based on the EA Flood Risk from Reservoirs Map, the site is not at risk of flooding from reservoirs.

5.0– SURFACE WATER DRAINAGE STRATEGY

5.1 – Disposal of surface water

The method for removal of surface water from the site has been selected in accordance with the hierarchy outlined in Building Regulations Part H as summarised below:

- Infiltration to the ground
- Discharge to a watercourse
- Connection to a surface water sewer
- Connection to a combined sewer

As described in section 3.4 of this report, the majority of the site is underlain by Glacial Till, which is generally unfavourable to infiltration and given the site conditions provided in the Geo-Environmental Report it has been determined that infiltration is not feasible, primarily due to the deposits of clay and made ground. Therefore, it is considered that soakaway drainage will not be a suitable means of disposing surface water runoff from the developed site.

Following the drainage hierarchy, it is proposed to discharge surface water runoff from the site into a watercourse. Surface water flows from the site will be routed to an existing manhole within the Heywood Park development, reference should be made the drainage survey and drainage layout which has been included in appendix C and D respectively of this report. The existing sitewide surface water network conveys flows towards a watercourse to the south of the site, Brightley Brook, this approach replicates the existing scenario.

5.2 – Sustainable Drainage Systems

Sustainable Drainage Systems (SuDS) will be utilised in line with The SuDS Manual (C753) guidance and aim to minimise the impact a development has on the runoff quantity and quality and maximise amenity and biodiversity opportunities.

The management train approach is a fundamental principle of SuDS, it aims to primarily reduce pollution, flow rates and volume of runoff from the site. The main objective is to treat the runoff as close to the source as possible and it is imperative that at least two of the following should be included within the drainage strategy.

- **Prevention** – The use of good site design and rainwater re-use measures to prevent runoff.
- **Source Control** – Controlling the runoff as close to source as possible by using; green roofs, porous pavements and soakaways.
- **Site Control** – Use of water management techniques within local area, i.e. detention basins and geo-cellular storage.
- **Regional Control** – Management of water from a number of sites in a specific location, i.e. balancing ponds and wetlands.
-

The drainage strategy for this development will incorporate prevention by using rainwater harvesting systems where possible and site control in the form of flow control and associated attenuation ponds, attenuation tanks and permeable paving.

5.3 – General strategy

Refer to Burrows Graham Drainage Layout drawing (ref: 30042-BGL-XX-XX-DR-C-00250), which has been included in Appendix D of this report for general strategy for the surface water drainage system.

5.4 – Total site area and impermeable areas

Based on the parameters plan, the total drained impermeable area of the proposed development has been measured to be 9.1 hectares.

5.5 – Climate Change

In line with the latest guidance, a 45% allowance has been made.

5.6 – Discharge rates

The site is considered to be a brownfield development. A 50% betterment has been applied to existing rates.

The hydrological characteristics for the site have been taken from uksuds.com and summarised in Table 2 below.

Table 2 – Hydrological characteristics for the site

SAAR (mm)	1052
Hydrological region	10
Soil type	4
SPR	0.47

Using the IH124 method (Institute of Hydrology, 1994) and the above hydrological characteristics, the greenfield runoff rate has been applied to the area of the site which was previously greenfield (5.6Ha).

Table 3 – Greenfield runoff rates

QBAR	43.5 l/s
Q(1)	37.9 l/s
Q(30)	74.0 l/s
Q(100)	90.6 l/s

QBAR = 43.5 l/s
50% reduction = 21.75

The remaining area (3.5 Ha) of the plot, which is existing hardstanding, is calculated based on brownfield runoff rates using the Modified Rational Method (MRM) as below.

MRM = 2.78 x 25 x 3.5 x 0.9 = 218.92 l/s
50% reduction = 109.46 l/s

As such, the maximum runoff rate from the developed site will not exceed 131.2 l/s for all storms up to and including the 1 in 100-year storm plus 45% allowance for climate.

5.7 – Attenuation storage

In order to achieve the restriction in peak rate of surface water runoff from the developed site as described above, on site surface water attenuation storage will be required in order to temporarily store the residual volume of surface water for rainfall events resulting in a peak runoff rate greater than the allowable rate stated in section 5.6.

Attenuation will be provided in the form of detention ponds and underground attenuation tanks.

The attenuation storage will be designed to ensure that there is no surface water flooding on site for rainfall events up to and including the 1 in 30-year storm event. The attenuation storage will be designed to ensure that surface water runoff for storm events up to and including the 100-year storm plus a 45% allowance will not cause a risk of flooding to properties or increase the flood risk outside of the site.

A hydraulic modelling exercise of the proposed drainage system has been undertaken to ensure sufficient attenuation capacity is provided. The hydraulic calculations for this exercise can be found in Appendix E of this report.

5.8 – Water quality

Water quality has been considered and the following measures have been included within the surface water drainage proposals:

- Runoff from roofs is considered to be clean and can be discharged directly into the surface water network.
- All runoff from the car parking bays has a low risk and will pass through permeable paving.
- Runoff from service yard areas will pass through a Class 1 full retention separator. Service yard on the eastern proportion of the site will pass through the attenuation pond
- Silt will be prevented from entering the system by the use of channels with silt traps and catch pits where required.
-

5.9 – Maintenance

Reference should be made to the Drainage Inspection and Maintenance Schedule in Appendix F, which includes required actions and typical frequencies for all drainage infrastructure serving the development.

The drainage will be managed and maintained by an appointed Management Company.

6.0 – Foul water drainage strategy

It is currently proposed to discharge the foul flows generated from the development to the existing adopted foul/combined pumping station to the west of the site.

Any new connections (including the re-use of existing connections) to the public sewerage system will require Section 106 agreement for an indirect connection.

Based on an anticipated gross internal floor space of circa 47,400 square metres, it is calculated that the average foul flow from the development will be 0.9 l/s with the peak flow at 5.4 l/s

6DWF = 6PG + I + 3E

Where:
6DWF = foul drainage design flow (l/d)
P = population= 165 persons per hectare
G = water consumption = 90 l/person/day
I = dry weather infiltration = 10%
E = trade effluent = 0 l/s/ha

7.0 - MITIGATION / MANAGEMENT OF FLOOD RISK

7.1 – Access and egress

Details of access to and egress from the site are reserved at this stage, but the proposed development will utilise the existing road infrastructure within Heywood Distribution Park connecting to Pilsworth Road.

Pilsworth Road and the proposed site access road are located within flood zone 1. Therefore, a safe means of access / egress is available to the site at all times.

7.2 - Drainage & exceedance flow routes

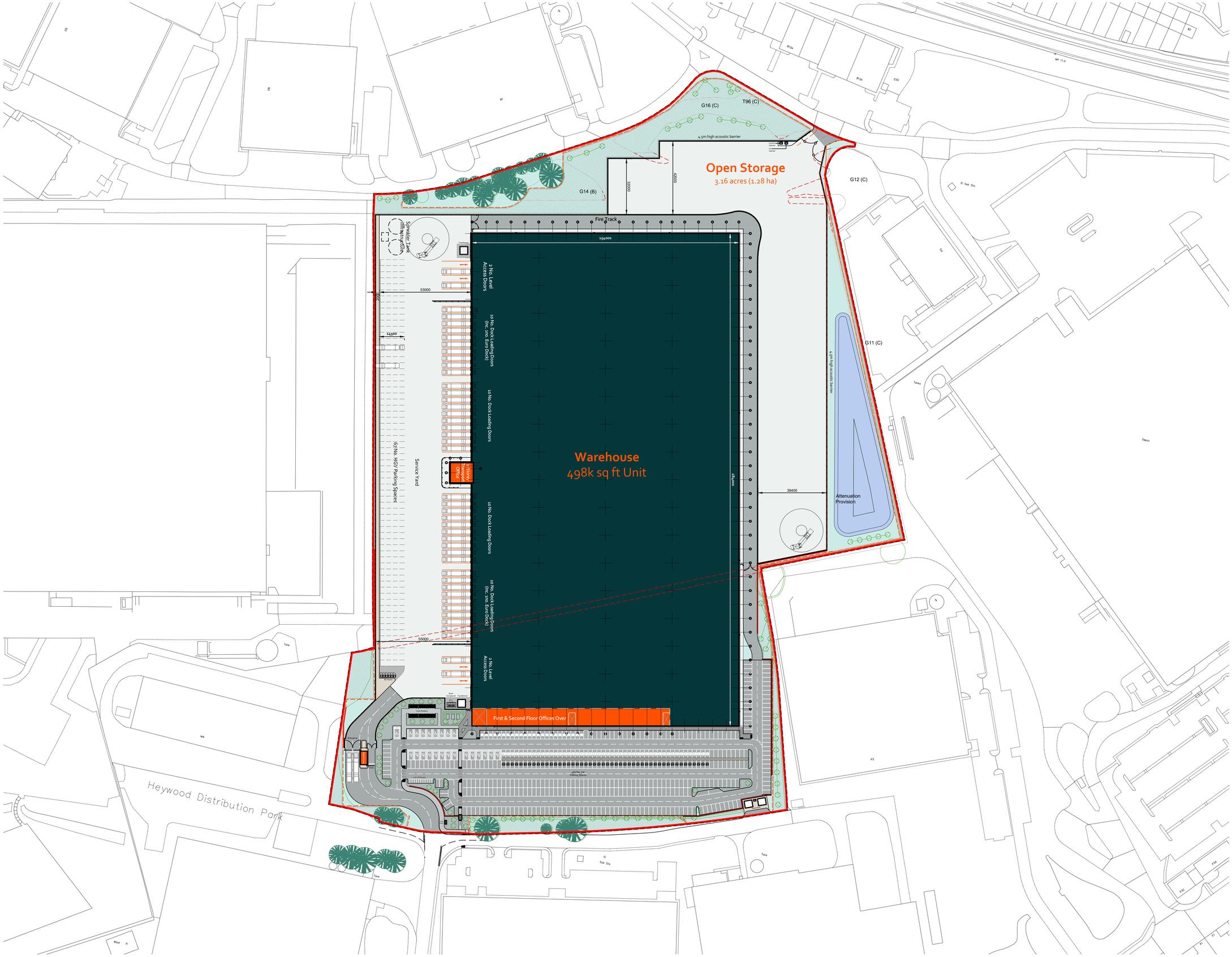
The proposed surface water drainage system will be designed in accordance with the drainage strategy set out in Section 4 of this report. This will ensure that there is no increase in flood risk to the site or elsewhere in the local catchment for all storm events up to and including the 100-year storm plus 45% climate change.

It should be noted that if storm events in excess of the 100-year storm plus 45% climate change or blockages occur, this will result in flood water arising from the site drainage system. If the site drainage system were to flood, it is considered that any surface water arising from the site drainage system would be contained within the area of dock levellers which are below ground level.

8.0 – CONCLUSION

This Flood Risk Assessment and Drainage Strategy has concluded that the development is appropriate and can be occupied safely subject to implementation of the flood risk mitigation described in this report being carried out.

APPENDIX A – SITE PLAN



UMC ARCHITECTS.

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General Notes

- This document is to be used for the stated purpose only and should not be used for any other.
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- It is the recipients responsibility to print this document to the correct size & scale.
- All relevant drawings and specifications should be read in conjunction with this document.
- Scaling of this document is not recommended.

North

Document Scale(s)

10m SCALE 1:1000

SCHEDULE OF ACCOMMODATION

Warehouse Area	-	469,110 ft²	- 43,582 m²
Ground Floor Core	-	909 ft²	- 84m²
Escape Stair Core -1	-	321 ft²	- 30 m²
Escape Stair Core -2	-	321 ft²	- 30 m²
1st & 2nd Floor Offices	-	23,686 ft²	- 2,200 m²
Transport Office	-	3,286 ft²	- 305 m²
Gatehouse	-	255 ft²	- 24 m²
Total Area	-	**497,888 ft²**	**- 46,255 m²**
Amenity Deck	-	12,150 ft²	- 1,129 m²
Total inc. Amenity Deck	-	**510,038 ft²**	**- 47,384 m²**
Loading Docks	-	38	
Euro Docks	-	2	
Level Access	-	4	
HGV Parking	-	67	
Car Parking	-	465 - including: 23 No. Accessible (5% min.) 48 No. Active EV (10% min.) 48 No. Passive EV (10% min.) 24 No. Car Share (5% min.) + 12 PTW + 136 Cycle Spaces	
Lease Area	-	19.32 Acres / 7.82 Hectares	
Site Area	-	26.40 Acres / 10.69 Hectares	

Project Name

Plot H4, Indurent Heywood Business Park

Employer	Project Address
Indurent	**Plot H4 , Heywood Distribution Park, Pilsworth Rd, Heywood**
RIBA Workstage	Suitability
3 - Spatial Coordination	**S3 - Review & Comment**

Drawn	Checked	Created	Size
TJ	**TDA**	**30.07.2025**	**A1**

UMC Project Reference	Scale	LOD	LOI
25007	**1:1000**	**1**	**1**

Document Title

Site Plan

Document Reference

25007 - UMC - 0100 - SI - DR - A - 0604

Revision Note

**Drawing renamed.
Pedestrian access and accessible bays revised.
Landscaping to main entrance revised.**

Issue Date	Status	Current Revision
11.08.2025		**P03**

APPENDIX B – TOPOGRAPHICAL SURVEY



Notes

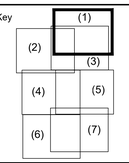
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N

Grid : OS National Grid.
Using the OS GPS Network and applying
OSTN15 transformation and then removi
the scale factor for true distances with a
one-step transformation centred on G2

Datum : OS Level Datum.
Using the OS GPS Network and applying
OSGM15 National Geoid Model to obtain
local area corrections.

Layout Key



KEY

AIR VALVE	AV	KERB OUTLET	
BENCH MARK	BM	LAMP POST	
BIN	BIN	MANHOLE (CIRCULAR)	
BOLLARD	BO	MANHOLE (RECTANGULAR)	
BORE HOLE	BH	MANHOLE (TRIANGULAR)	
BRITISH TELECOM COVER	BT	MARKER POST	
BUS STOP	BUS	GULLY	
CABLE TV COVER	CATV	RODDING EYE	
CABLE TV SUPPLY	CA	SIGN POST	
COLUMN	COL	TELECOM COVER	
DROPPED KERB	DK	TELEGRAPH POLE	
EARTHING POINT	ER	THRESHOLD LEVEL	
ELECTRICITY COVER	ELEC	TRAFFIC LIGHT	
ELECTRICITY POLE	EP	TRIAL PIT	
FIRE HYDRANT	FH	WASH OUT	
GAS VALVE	GAS	WATER METER	
GATE		WATER STOP COCK	
INSPECTION COVER (CIRCULAR)	IC	WATER STOP VALVE	
INSPECTION COVER (RECTANGULAR)	IC		
COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UT
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Station Listing

Station	Easting	Northing	Leve
E1	383932.269	409652.407	117.73
E2	383900.820	409721.459	117.40
G1	383801.035	409553.841	118.36
G2	383820.440	409409.951	116.24
G6	383640.627	409388.836	116.71
G7	383659.276	409326.492	115.03
G10	384029.220	409806.225	117.81
G1A	383862.380	409575.275	117.41
G1C	383880.576	409536.526	118.76
G1Z	383767.185	409481.128	117.70
G2A	383801.740	409467.221	116.28
G2D	383768.964	409417.119	116.21
G2E	383723.879	409407.709	116.12
GX	383730.318	409389.092	116.06
I1	383663.179	409423.997	117.72
I2	383737.569	409315.318	115.13
I3	383823.794	409343.219	115.77
I4	383703.149	409350.782	115.10
I5	383878.646	409360.617	116.03
I7	383889.760	409496.505	116.05
I8	383867.085	409510.560	116.20
J1	383835.531	409763.385	119.31
J2	383766.785	409683.028	119.67
J3	383788.508	409562.954	118.64
J1B	383842.111	409733.436	118.67
J2A	383794.679	409715.168	117.99
J2B	383852.033	409689.753	117.88
T1	383733.376	409728.775	120.65
T2	383794.355	409797.264	119.92
T1A	383714.663	409743.380	122.50
X1	383893.545	409464.755	116.21
X2	383879.480	409418.068	117.88

Rev	Date	Drawn	Description
-	--/--/----	--	--

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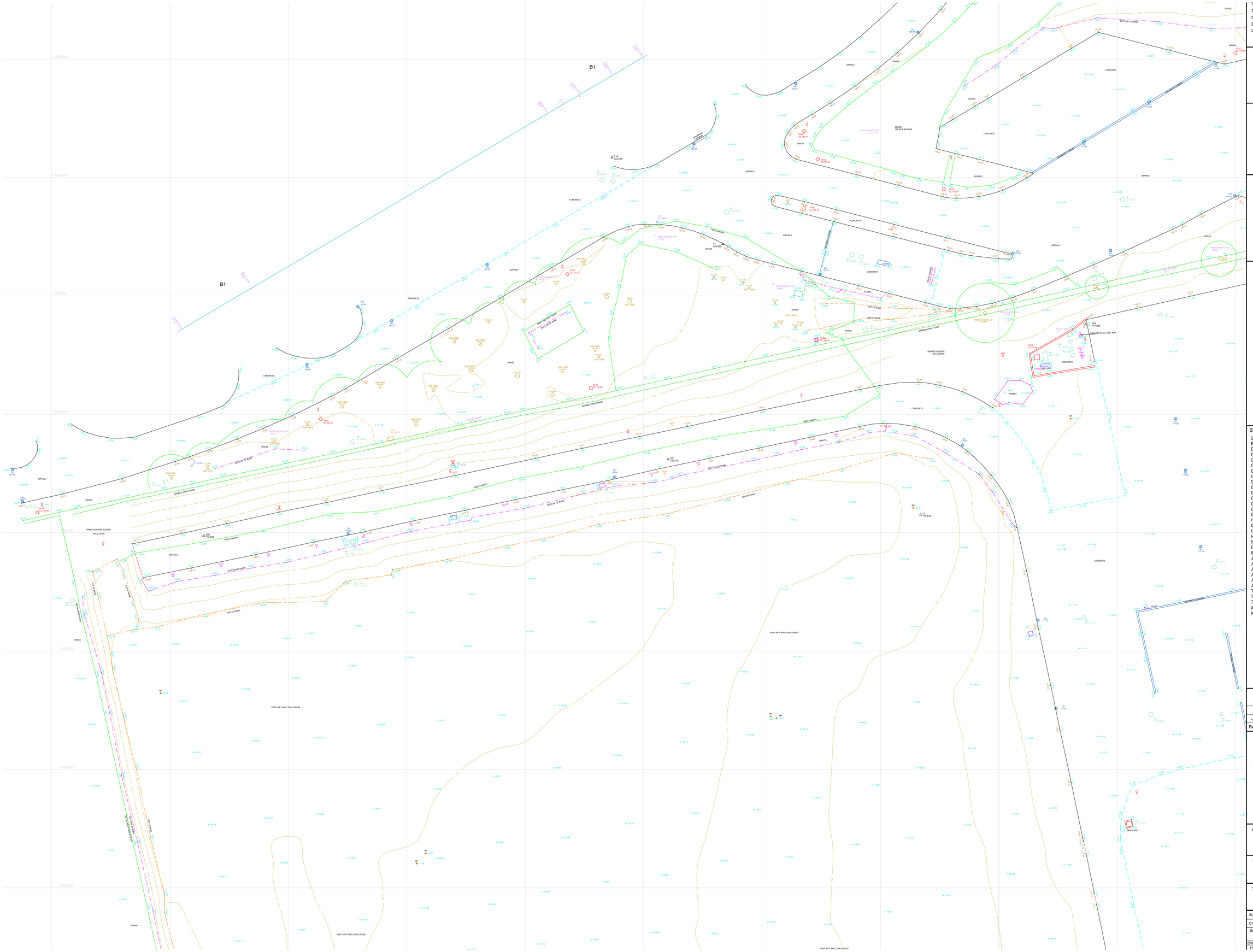
Site
M400,
HEYWOOD DISTRIBUTION PARK

Title
TOPOGRAPHICAL SURVEY

Surveyed	JS / TW	Drawn	JS / TW
Check	DA	Date	13/10/2021
Scale 1:200	Job No P21-01208	Sheet Size A0	Rev 0

DWG Ref.

Project Number	Origin	Zone	Level	Desc	Type	Role



Notes

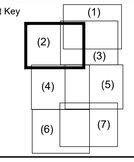
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Layout Key



KEY

AIR VALVE	AV	KERB OUTLET	KO
BENCH MARK	BM	LAMP POST	LP
BIN	BIN	MANHOLE (CIRCULAR)	MH
BOLLARD	BO	MANHOLE (RECTANGULAR)	MH
BORE HOLE	BH	MANHOLE (TRIANGULAR)	MH
BRITISH TELECOM COVER	BT	MARKER POST	MP
BUS STOP	BUS	GULLY	SO
CABLE TV COVER	CATV	RODDING EYE	RE
CABLE TV SUPPLY	CA	SIGN POST	SIG
COLUMN	COL	TELECOM COVER	TC
DROPPED KERB	DK	TELEGRAPH POLE	TP
EARTHING POINT	ER	THRESHOLD LEVEL	TH
ELECTRICITY COVER	ELEC	TRAFFIC LIGHT	TL
ELECTRICITY POLE	EP	TRIAL PIT	TP
FIRE HYDRANT	FH	WASH OUT	WO
GAS VALVE	GAS	WATER METER	WM
GATE		WATER STOP COCK	WSC
INSPECTION COVER (CIRCULAR)	IC	WATER STOP VALVE	WSV
INSPECTION COVER (RECTANGULAR)	IC		
COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UT
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Station Listing

Station	Easting	Northing	Level
E1	383932.269	409652.407	117.730
E2	383900.820	409721.459	117.407
G1	383801.035	409553.841	118.368
G2	383820.440	409409.951	116.242
G6	383640.627	409388.836	116.711
G7	383659.276	409326.492	115.039
G10	384029.220	409806.225	117.812
G1A	383862.380	409575.275	117.419
G1C	383880.576	409536.526	118.768
G1Z	383767.185	409481.128	117.708
G2A	383801.740	409467.221	116.285
G2D	383768.964	409417.119	116.214
G2E	383723.879	409407.709	116.122
GX	383730.318	409389.092	116.062
I1	383663.179	409423.997	117.726
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I3	383823.794	409343.219	115.773
I4	383703.149	409350.782	115.100
I5	383878.646	409360.617	116.038
I7	383889.760	409496.505	116.050
I8	383867.085	409510.560	116.201
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J2	383766.785	409683.028	119.679
J3	383788.508	409562.954	118.642
J1B	383842.111	409733.436	118.670
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T1A	383714.663	409743.380	122.508
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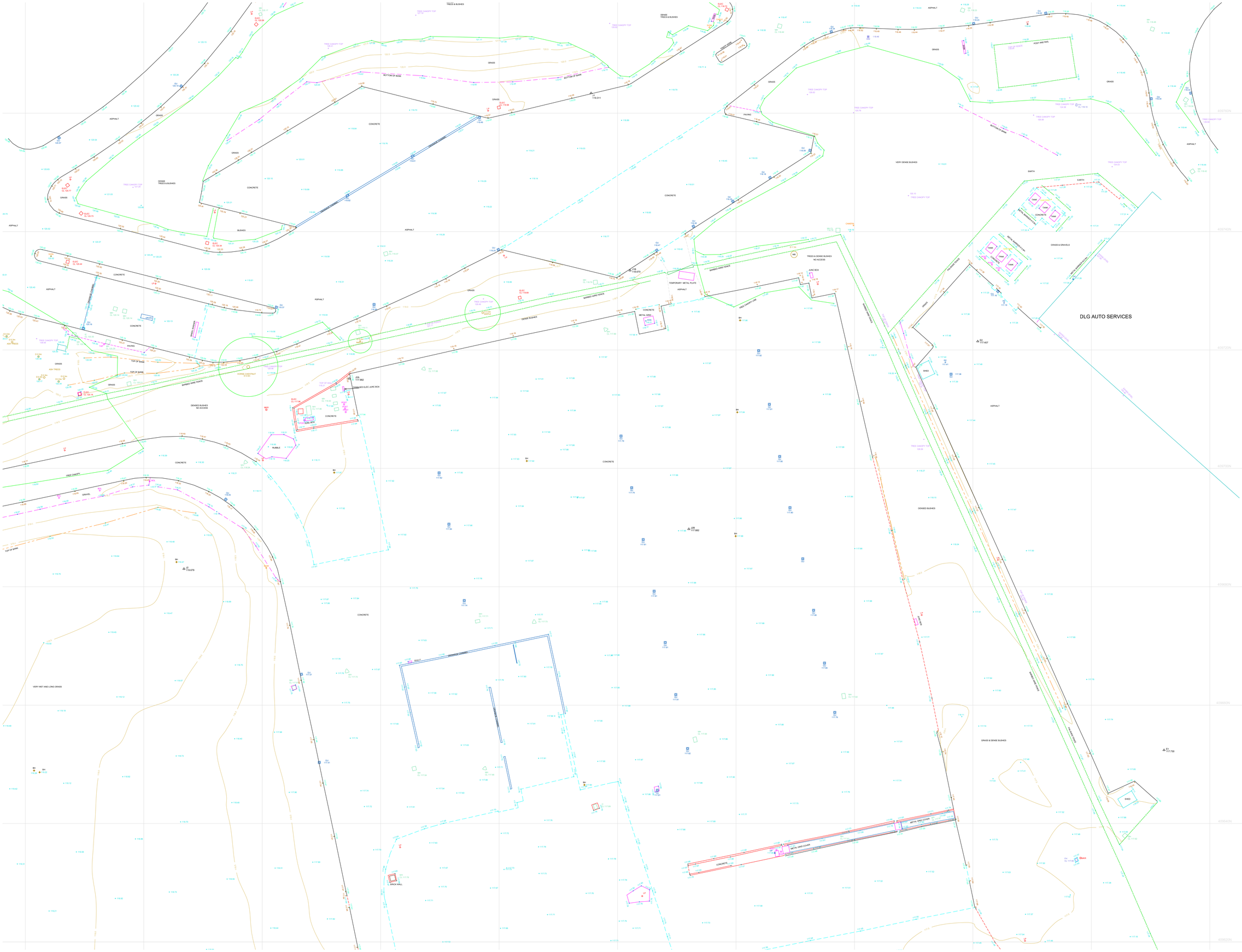
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Site
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Title
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Surveyed	JS / TW	Drawn	JS / TW
Check	DA	Date	13/10/2021
Scale 1:200	Job No P21-01208	Sheet Size A0	Rev 0

DWG Ref.
Project Number | Origin | Zone | Level | Desc | Type | Role



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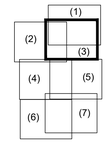
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Layout Key



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BUS STOP	BUS	GULLY	GU
CABLE TV COVER	CATV	RODDING EYE	RE
CABLE TV SUPPLY	CS	SIGN POST	SP
COLUMN	COL	TELECOM COVER	TC
DROPPED KERB	DK	TELEGRAPH POLE	TP
EARTHING POINT	ER	THRESHOLD LEVEL	TH
ELECTRICITY COVER	ELEC	TRAFFIC LIGHT	TL
ELECTRICITY POLE	EP	TRIAL PIT	TP
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GAS VALVE	GAS	WATER METER	WM
GATE		WATER STOP COCK	WSC
INSPECTION COVER (CIRCULAR)	IC	WATER STOP VALVE	WSV
INSPECTION COVER (RECTANGULAR)	IC		

COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UT
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

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G2A	383801.740	409467.221	116.285
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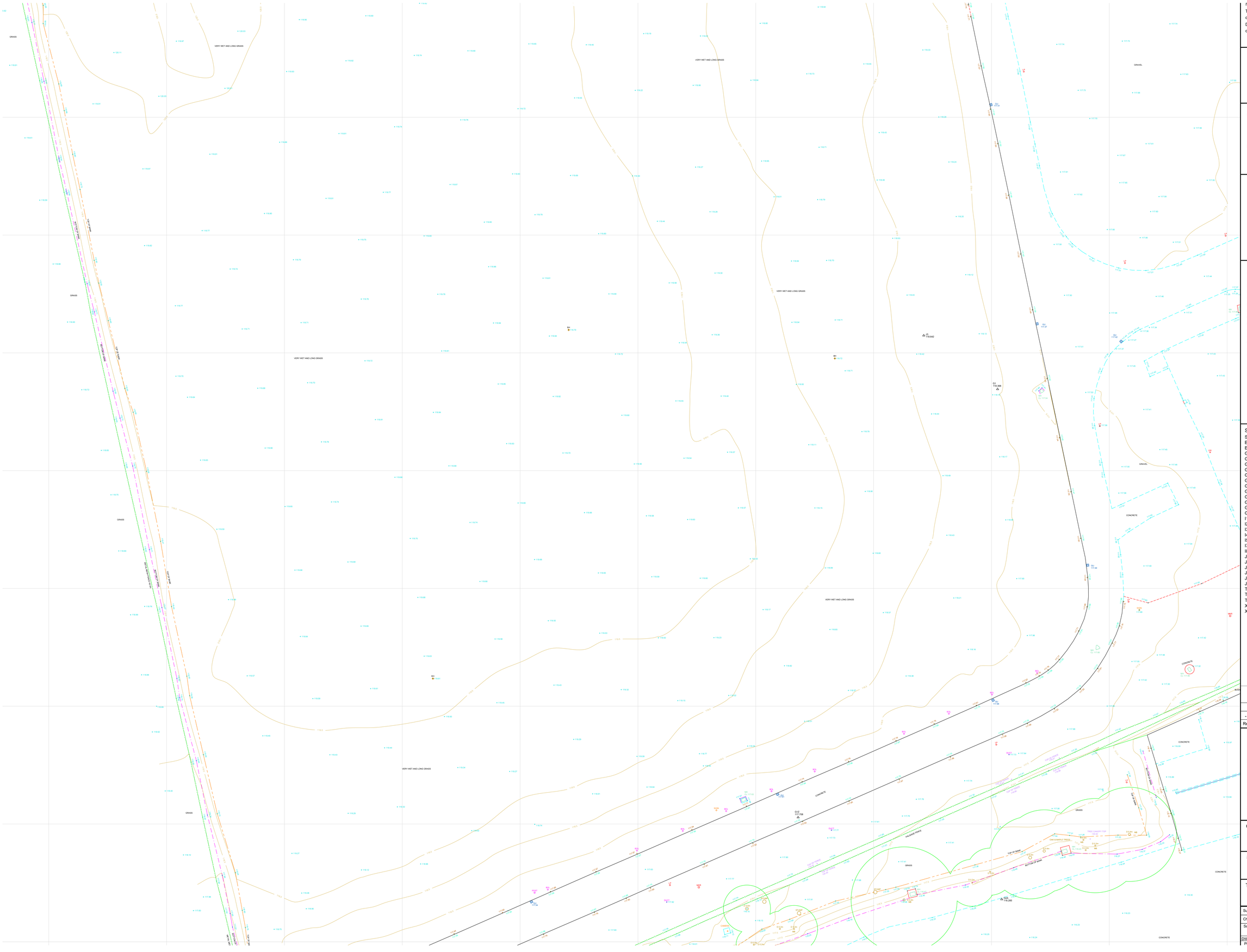
Client
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Site
M400,
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Title
TOPOGRAPHICAL SURVEY

Surveyed	JS / TW	Drawn	JS / TW
Check	DA	Date	13/10/2021
Scale 1:200	Job No P21-01208	Sheet Size A0	Rev 0

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Project Number Origin Zone Level Desc Type Role



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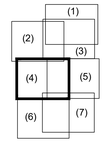
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Layout Key



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BENCH MARK	BM	LAMP POST	LP
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BORE HOLE	BH	MANHOLE (TRIANGULAR)	MH
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BUS STOP	BUS	GULLY	G
CABLE TV COVER	CATV	RODDING EYE	RE
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DROPPED KERB	DK	TELEGRAPH POLE	TP
EARTHING POINT	ER	THRESHOLD LEVEL	TH
ELECTRICITY COVER	ELEC	TRAFFIC LIGHT	TL
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FIRE HYDRANT	FH	WASH OUT	WO
GAS VALVE	GAS	WATER METER	WM
GATE		WATER STOP COCK	WSC
INSPECTION COVER (CIRCULAR)	IC	WATER STOP VALVE	WSV
INSPECTION COVER (RECTANGULAR)	IC		

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INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
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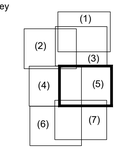
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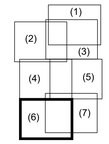
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INSPECTION COVER (RECTANGULAR)	IC		
COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch.L
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UTM
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Station Listing

Station	Easting	Northing	Level
E1	383932.269	409652.407	117.730
E2	383900.820	409721.459	117.407
G1	383801.035	409553.841	118.368
G2	383820.440	409409.951	116.242
G6	383640.627	409388.836	116.711
G7	383659.276	409326.492	115.039
G10	384029.220	409806.225	117.812
G1A	383862.380	409575.275	117.419
G1C	383880.576	409536.526	118.768
G1Z	383767.185	409481.128	117.708
G2A	383801.740	409467.221	116.285
G2D	383768.964	409417.119	116.214
G2E	383723.879	409407.709	116.122
GX	383730.318	409389.092	116.062
I1	383663.179	409423.997	117.726
I2	383737.569	409315.318	115.133
I3	383823.794	409343.219	115.773
I4	383703.149	409350.782	115.100
I5	383878.646	409360.617	116.038
I7	383889.760	409496.505	116.050
I8	383867.085	409510.560	116.201
J1	383835.531	409763.385	119.311
J2	383766.785	409683.028	119.679
J3	383788.508	409562.954	118.642
J1B	383842.111	409733.436	118.670
J2A	383794.679	409715.168	117.992
J2B	383852.033	409689.753	117.882
T1	383733.376	409728.775	120.655
T2	383794.355	409797.264	119.924
T1A	383714.663	409743.380	122.508
X1	383893.545	409464.755	116.213
X2	383879.480	409418.068	117.888

Rev	Date	Drawn	Description	Check
02	25/10/2021	SJR	ADDITIONAL MANHOLES & NUMBERS	DBS

Met GEO ENVIRONMENTAL
Southgate House
Pontefract Road
Stourton
Leeds
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LS10 1SW
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Client
BLACK CAT BUILDING CONSULTANCY LTD

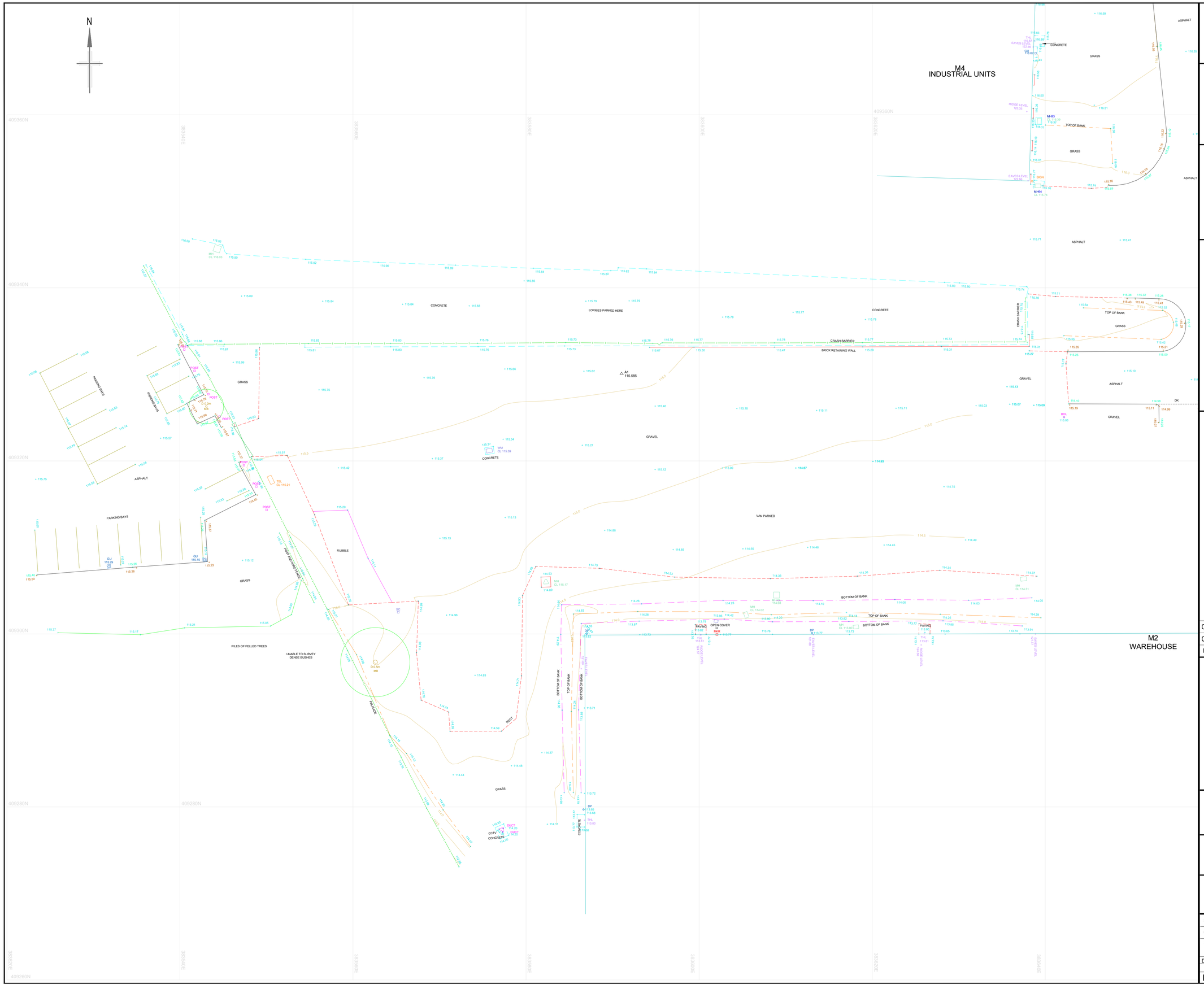
Site
M400,
HEYWOOD DISTRIBUTION PARK

Title
TOPOGRAPHICAL SURVEY

Surveyed	JS / TW	Drawn	JS / TW
Check	DA	Date	13/10/2021
Scale 1:200	Job No P21-01208	Sheet Size A0	Rev 02

DWG Ref.

Project Number	Origin	Zone	Level	Desc	Type	Role	Sheet
P21-01208	MET	EXT	XX	TOP	M2	G	006


N
M4
INDUSTRIAL UNITS
M2
WAREHOUSE
409360N
409340N
409320N
409300N
409280N
409260N
383540E
383560E
383580E
383600E
383620E
383640E
383660E
ASPHALT
CONCRETE
GRASS
GRAVEL
LORRIES PARKED HERE
CRASH BARRIER
BRICK RETAINING WALL
TOP OF BANK
BOTTOM OF BANK
PARKING BAYS
VAN PARKED
RUBBLE
PILES OF FELLED TREES
UNABLE TO SURVEY
DENSE BUSHES
FENCE
A1
115.585
MH1
CL 116.03
MH2
CL 115.74
MH3
CL 115.39
MH4
CL 114.93
MH5
CL 114.02
MH6
CL 113.90
MH7
CL 114.31
MH8
CL 113.73
MH9
CL 114.17
MH10
CL 114.03
MH11
CL 114.31
OPEN COVER
CL 113.77
PAVING
CL 113.82
CL 113.80
CL 113.71
CL 113.91
DP
CL 113.72
CL 113.68
CL 113.77
CL 113.80
CCTV
CL 114.00
DUCT
CL 114.20
CL 114.00
TEL
CL 115.21
WM
CL 115.39
GU
115.29
GU
115.15
SIGN
CL 115.76
CL 115.69
SIGN
CL 115.06
RIDGE LEVEL
123.39
EAVES LEVEL
122.56
EAVES LEVEL
122.60
TYE
116.87
TYE
116.87
TYE
113.80
TYE
113.91
TYE
113.91
TYE
113.91

APPENDIX C – PUBLIC SEWER RECORDS & EXISTING DRAINAGE INFORMATION

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	73.162	300.0	750	Circular	118.331	116.381	1.200	118.331	116.137	1.444
1.001	4.838	300.0	750	Circular	118.331	116.137	1.444	118.331	116.121	1.460
1.002	71.705	300.0	900	Circular	118.331	115.971	1.460	118.331	115.732	1.699
1.003	45.208	300.0	900	Circular	118.331	115.732	1.699	118.163	115.581	1.682
2.000	43.679	35.6	150	Circular	118.758	117.408	1.200	118.163	116.181	1.832
1.004	65.148	300.0	1050	Circular	118.163	115.431	1.682	117.811	115.214	1.547
1.005	60.017	100.0	1050	Circular	117.811	115.214	1.547	117.811	114.614	2.147
3.000	56.596	188.7	450	Circular	117.752	116.200	1.102	117.752	115.900	1.402
3.001	48.308	241.5	450	Circular	117.752	115.900	1.402	117.752	115.700	1.602
3.002	20.318	236.3	600	Circular	117.752	115.550	1.602	117.811	115.464	1.747
1.006	33.150	290.8	1050	Circular	117.811	114.464	2.297	117.350	114.350	1.950
1.007	71.371	400.0	300	Circular	117.350	114.350	2.700	118.300	114.172	3.828
1.008	61.100	400.0	300	Circular	118.300	114.172	3.828	118.184	114.019	3.865
1.009	61.101	400.0	300	Circular	118.184	114.019	3.865	118.000	113.866	3.834
1.010	13.859	400.0	300	Circular	118.000	113.866	3.834	118.000	113.831	3.869
1.011	69.197	400.0	450	Circular	118.000	113.781	3.769	118.000	113.608	3.942
1.012	4.838	400.0	450	Circular	118.000	113.608	3.942	118.000	113.596	3.954
1.013	102.571	434.6	450	Circular	118.000	113.596	3.954	117.800	113.360	3.990
4.000	63.778	75.9	300	Circular	117.781	116.881	0.600	116.941	116.041	0.600

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1800	Manhole	Adoptable	2	1800	Manhole	Adoptable
1.001	2	1800	Manhole	Adoptable	3	1800	Manhole	Adoptable
1.002	3	1800	Manhole	Adoptable	4	1800	Manhole	Adoptable
1.003	4	1800	Manhole	Adoptable	6	1950	Manhole	Adoptable
2.000	5	1200	Manhole	Adoptable	6	1950	Manhole	Adoptable
1.004	6	1950	Manhole	Adoptable	7	1950	Manhole	Adoptable
1.005	7	1950	Manhole	Adoptable	11	2025	Manhole	Adoptable
3.000	8	1350	Manhole	Adoptable	9	1350	Manhole	Adoptable
3.001	9	1350	Manhole	Adoptable	10	1500	Manhole	Adoptable
3.002	10	1500	Manhole	Adoptable	11	2025	Manhole	Adoptable
1.006	11	2025	Manhole	Adoptable	Pond		Junction	
1.007	Pond		Junction		13	1200	Manhole	Adoptable
1.008	13	1200	Manhole	Adoptable	14	1200	Manhole	Adoptable
1.009	14	1200	Manhole	Adoptable	15	1200	Manhole	Adoptable
1.010	15	1200	Manhole	Adoptable	40	1350	Manhole	Adoptable
1.011	40	1350	Manhole	Adoptable	41	1350	Manhole	Adoptable
1.012	41	1350	Manhole	Adoptable	42	1350	Manhole	Adoptable
1.013	42	1350	Manhole	Adoptable	Tank		Junction	
4.000	17		Junction		18	1200	Manhole	Adoptable

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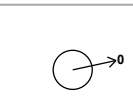
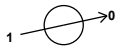
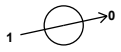
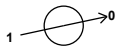
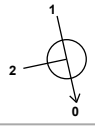
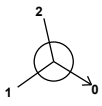
Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
4.001	8.010	50.7	300	Circular	116.941	116.041	0.600	116.783	115.883	0.600
4.002	25.440	275.0	300	Circular	116.783	115.883	0.600	116.716	115.790	0.626
4.003	156.255	275.0	300	Circular	116.716	115.790	0.626	116.566	115.222	1.044
4.004	42.922	23.4	300	Circular	116.566	115.222	1.044	117.800	113.390	4.110
5.000	42.942	550.5	450	Circular	118.072	116.500	1.122	118.072	116.422	1.200
6.000	25.625	200.0	300	Circular	117.220	116.400	0.520	118.072	116.272	1.500
5.001	62.128	400.0	600	Circular	118.072	116.272	1.200	118.072	116.117	1.355
5.002	47.834	193.7	750	Circular	118.072	116.117	1.205	118.072	115.870	1.452
7.000	25.525	67.2	300	Circular	117.220	116.400	0.520	118.072	116.020	1.752
5.003	83.793	400.0	750	Circular	118.072	115.870	1.452	118.072	115.661	1.661
5.004	24.677	0.0	750	Circular	118.072	115.661	1.661	117.800	115.661	1.389
8.000	173.514	275.0	300	Circular	117.000	116.100	0.600	117.000	115.469	1.231
8.001	23.764	11.4	300	Circular	117.000	115.469	1.231	117.800	113.390	4.110
9.000	12.314	25.9	300	Circular	118.400	116.975	1.125	118.000	116.500	1.200
9.001	30.231	100.0	300	Circular	118.000	116.500	1.200	117.800	116.198	1.302
1.014	40.391	400.0	450	Circular	117.800	113.390	3.960	116.800	113.289	3.061
11.000	16.198	40.0	225	Circular	117.100	115.650	1.225	116.800	115.245	1.330
1.015	14.005	200.0	450	Circular	116.800	113.289	3.061	115.150	113.219	1.481
10.000	30.598	100.0	225	Circular	116.500	114.250	2.025	116.800	113.944	2.631

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
4.001	18	1200	Manhole	Adoptable	19	1200	Manhole	Adoptable
4.002	19	1200	Manhole	Adoptable	20		Junction	
4.003	20		Junction		21		Junction	
4.004	21		Junction		Tank		Junction	
5.000	22	1350	Manhole	Adoptable	23	1500	Manhole	Adoptable
6.000	38	1200	Manhole	Adoptable	23	1500	Manhole	Adoptable
5.001	23	1500	Manhole	Adoptable	24	1800	Manhole	Adoptable
5.002	24	1800	Manhole	Adoptable	25	1800	Manhole	Adoptable
7.000	39	1200	Manhole	Adoptable	25	1800	Manhole	Adoptable
5.003	25	1800	Manhole	Adoptable	26	1800	Manhole	Adoptable
5.004	26	1800	Manhole	Adoptable	Tank		Junction	
8.000	27		Junction		28		Junction	
8.001	28		Junction		Tank		Junction	
9.000	43	1200	Manhole	Adoptable	44	1200	Manhole	Adoptable
9.001	44	1200	Manhole	Adoptable	Tank		Junction	
1.014	Tank		Junction		36	2100	Manhole	Adoptable
11.000	31	1200	Manhole	Adoptable	36	2100	Manhole	Adoptable
1.015	36	2100	Manhole	Adoptable	37_out	1350	Manhole	Adoptable
10.000	32	1200	Manhole	Adoptable	36	2100	Manhole	Adoptable

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	383682.639	409683.576	118.331	1.950	1800				
						0	1.000	116.381	750
2	383754.154	409699.014	118.331	2.194	1800		1.000	116.137	750
									
						0	1.001	116.137	750
3	383758.883	409700.035	118.331	2.360	1800	1	1.001	116.121	750
									
						0	1.002	115.971	900
4	383828.974	409715.163	118.331	2.599	1800	1	1.002	115.732	900
									
						0	1.003	115.732	900
5	383863.703	409767.150	118.758	1.350	1200				
						0	2.000	117.408	150
6	383873.204	409724.517	118.163	2.732	1950	1	2.000	116.181	150
						2	1.003	115.581	900
									
						0	1.004	115.431	1050
7	383887.616	409660.983	117.811	2.597	1950	1	1.004	115.214	1050
									
						0	1.005	115.214	1050
8	383862.747	409693.348	117.752	1.552	1350				
						0	3.000	116.200	450
9	383874.432	409637.971	117.752	1.852	1350	1	3.000	115.900	450
									
						0	3.001	115.900	450
10	383884.382	409590.699	117.752	2.202	1500	1	3.001	115.700	450
									
						0	3.002	115.550	600
11	383900.946	409602.465	117.811	3.347	2025		3.002	115.464	600
							1.005	114.614	1050
						0	1.006	114.464	1050
Pond	383929.190	409585.110	117.350	3.000		1	1.006	114.350	1050
									
						0	1.007	114.350	300
13	383872.811	409541.347	118.300	4.128	1200	1	1.007	114.172	300
									
						0	1.008	114.172	300

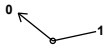
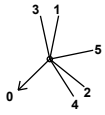
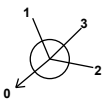
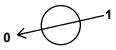
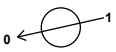
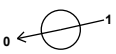
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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
14	383885.792	409481.642	118.184	4.165	1200	1	1.008	114.019	300
						0	1.009	114.019	300
15	383898.774	409421.936	118.000	4.134	1200	1	1.009	113.866	300
						0	1.010	113.866	300
17	383903.153	409456.695	117.781	0.900		0	4.000	116.881	300
18	383916.444	409394.317	116.941	0.900	1200	1	4.000	116.041	300
						0	4.001	116.041	300
19	383912.324	409387.448	116.783	0.900	1200	1	4.001	115.883	300
						0	4.002	115.883	300
20	383888.328	409378.998	116.716	0.926		1	4.002	115.790	300
						0	4.003	115.790	300
21	383735.629	409345.953	116.566	1.344		1	4.003	115.222	300
						0	4.004	115.222	300
22	383657.138	409637.565	118.072	1.572	1350	0	5.000	116.500	450
23	383666.238	409595.598	118.072	1.800	1500	1	6.000	116.272	300
						2	5.000	116.422	450
						0	5.001	116.272	600
24	383679.403	409534.881	118.072	1.955	1800	1	5.001	116.117	600
						0	5.002	116.117	750
25	383689.539	409488.133	118.072	2.202	1800	1	7.000	116.020	300
						2	5.002	115.870	750
						0	5.003	115.870	750
26	383707.295	409406.243	118.072	2.411	1800	1	5.003	115.661	750
						0	5.004	115.661	750
27	383900.689	409403.754	117.000	0.900		0	8.000	116.100	300

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
28	383731.058	409367.252	117.000	1.531		 1	8.000	115.469	300
						0	8.001	115.469	300
Tank	383712.524	409382.126	117.800	4.440		 1	9.001	116.198	300
						2	8.001	113.390	300
						3	5.004	115.661	750
						4	4.004	113.390	300
						5	1.013	113.360	450
						0	1.014	113.390	450
31	383677.418	409368.796	117.100	1.450	1200	 0	11.000	115.650	225
32	383713.708	409348.000	116.500	2.250	1200	 0	10.000	114.250	225
36	383683.676	409353.856	116.800	3.511	2100	 1	11.000	115.245	225
						2	10.000	113.944	225
						3	1.014	113.289	450
						0	1.015	113.289	450
37_out	383672.943	409344.859	115.150	1.931	1350	 1	1.015	113.219	450
38	383691.286	409601.006	117.220	0.820	1200	 0	6.000	116.400	300
39	383714.484	409493.542	117.220	0.820	1200	 0	7.000	116.400	300
40	383885.249	409418.911	118.000	4.219	1350	 1	1.010	113.831	300
						0	1.011	113.781	450
41	383817.724	409403.793	118.000	4.392	1350	 1	1.011	113.608	450
						0	1.012	113.608	450
42	383813.003	409402.736	118.000	4.404	1350	 1	1.012	113.596	450
						0	1.013	113.596	450
43	383730.555	409414.412	118.400	1.425	1200	 0	9.000	116.975	300

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
44	383718.531	409411.754	118.000	1.500	1200	1	9.000	116.500	300
									
						0	9.001	116.500	300

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.300	Starting Level (m)	
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	0	0

Node 36 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.015	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0434-1312-1600-1312
Invert Level (m)	113.289	Min Outlet Diameter (m)	0.450
Design Depth (m)	1.600	Min Node Diameter (mm)	0
Design Flow (l/s)	131.2		

Node Pond Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	114.350
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	256

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	355.0	0.0	3.000	2275.0	0.0

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	113.360
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1000.0	0.0	2.000	1000.0	0.0	2.001	0.0	0.0

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Node 21 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	115.222	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	80	Depth (m)	0.250
Safety Factor	2.0	Width (m)	80.000	Inf Depth (m)	
Porosity	0.30	Length (m)	21.000		

Node 20 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	115.790	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.250
Safety Factor	2.0	Width (m)	75.000	Inf Depth (m)	
Porosity	0.30	Length (m)	21.000		

Node 17 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	116.881	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.250
Safety Factor	2.0	Width (m)	40.000	Inf Depth (m)	
Porosity	0.30	Length (m)	18.000		

Node 27 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	116.100	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	2	Depth (m)	0.250
Safety Factor	2.0	Width (m)	90.000	Inf Depth (m)	
Porosity	0.30	Length (m)	26.000		

Node 28 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	115.469	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.250
Safety Factor	2.0	Width (m)	110.000	Inf Depth (m)	
Porosity	0.30	Length (m)	26.000		

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	116.568	0.187	106.8	2.0790	0.0000	OK
15 minute winter	2	11	116.445	0.308	206.2	3.0578	0.0000	OK
15 minute winter	3	11	116.290	0.319	292.1	2.8187	0.0000	OK
15 minute winter	4	11	116.159	0.427	478.0	6.0829	0.0000	OK
15 minute winter	5	11	117.436	0.028	2.3	0.0390	0.0000	OK
15 minute winter	6	11	115.812	0.381	472.3	1.1376	0.0000	OK
15 minute winter	7	12	115.511	0.297	475.7	0.8862	0.0000	OK
15 minute summer	8	1	116.200	0.000	0.0	0.0000	0.0000	OK
15 minute winter	9	11	116.068	0.168	61.7	1.1143	0.0000	OK
15 minute winter	10	11	115.756	0.206	100.5	1.0108	0.0000	OK
120 minute winter	11	94	114.986	0.522	232.4	1.6800	0.0000	OK
120 minute winter	Pond	94	114.986	0.636	226.8	355.0544	0.0000	SURCHARGED
120 minute winter	13	92	114.685	0.512	69.3	0.5796	0.0000	SURCHARGED
120 minute winter	14	88	114.413	0.394	70.2	0.5861	0.0000	SURCHARGED
120 minute winter	15	84	114.148	0.282	71.6	0.4362	0.0000	OK
15 minute summer	17	1	116.881	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	1	116.041	0.000	0.0	0.0000	0.0000	OK
15 minute winter	19	10	115.948	0.065	7.2	0.1542	0.0000	OK
15 minute winter	20	12	115.909	0.119	27.3	2.1345	0.0000	OK
15 minute winter	21	12	115.307	0.085	43.3	1.1958	0.0000	OK
15 minute winter	22	11	116.654	0.154	34.7	0.7516	0.0000	OK
15 minute winter	23	11	116.480	0.208	85.2	0.8671	0.0000	OK
15 minute winter	24	11	116.295	0.178	112.8	0.8539	0.0000	OK
15 minute winter	25	12	116.129	0.259	163.5	1.1632	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	102.8	0.822	0.145	9.3543	
15 minute winter	2	1.001	3	202.6	1.309	0.285	0.7496	
15 minute winter	3	1.002	4	294.5	1.187	0.257	17.8297	
15 minute winter	4	1.003	6	470.0	1.707	0.410	12.5745	
15 minute winter	5	2.000	6	2.2	0.992	0.075	0.0981	
15 minute winter	6	1.004	7	475.7	1.987	0.277	15.6381	
15 minute winter	7	1.005	11	476.9	2.517	0.160	11.3780	
15 minute summer	8	3.000	9	0.0	0.000	0.000	1.4761	
15 minute winter	9	3.001	10	58.9	1.124	0.284	2.5337	
15 minute winter	10	3.002	11	101.1	1.248	0.226	1.6459	
15 minute winter	11	1.006	Pond	570.5	3.106	0.327	9.2266	
120 minute winter	Pond	1.007	13	69.3	0.984	1.256	5.0259	
120 minute winter	13	1.008	14	69.3	0.984	1.257	4.3026	
120 minute winter	14	1.009	15	70.2	0.996	1.273	4.2507	
120 minute winter	15	1.010	40	71.6	1.161	1.300	0.8391	
15 minute summer	17	4.000	18	0.0	0.000	0.000	0.0001	
15 minute summer	18	4.001	19	0.0	0.000	0.000	0.0434	
15 minute winter	19	4.002	20	6.9	0.437	0.104	0.4621	
15 minute winter	20	4.003	21	21.0	1.006	0.315	3.3249	
15 minute winter	21	4.004	Tank	41.3	2.507	0.179	1.0922	
15 minute winter	22	5.000	23	33.5	0.802	0.245	1.7953	
15 minute winter	23	5.001	24	86.3	1.105	0.252	4.8558	
15 minute winter	24	5.002	25	111.8	1.055	0.126	5.1091	
15 minute winter	25	5.003	26	160.6	1.009	0.261	13.3567	

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	12	115.988	0.327	182.8	1.4339	0.0000	OK
15 minute winter	27	12	116.240	0.140	36.4	3.1843	0.0000	OK
15 minute winter	28	11	115.564	0.094	73.7	1.7703	0.0000	OK
240 minute winter	Tank	168	113.816	0.456	192.7	456.2848	0.0000	OK
15 minute winter	31	10	115.713	0.063	13.3	0.1619	0.0000	OK
15 minute winter	32	10	114.301	0.051	5.8	0.0776	0.0000	OK
240 minute winter	36	168	113.756	0.467	127.9	1.7246	0.0000	SURCHARGED
15 minute summer	37_out	1	113.219	0.000	56.5	0.0000	0.0000	OK
15 minute winter	38	10	116.517	0.117	26.5	0.7218	0.0000	OK
15 minute winter	39	10	116.492	0.092	26.5	0.5679	0.0000	OK
60 minute summer	40	35	114.039	0.258	94.9	0.7788	0.0000	OK
60 minute summer	41	35	113.953	0.345	118.5	0.9882	0.0000	OK
60 minute summer	42	35	113.916	0.320	145.2	0.9588	0.0000	OK
15 minute winter	43	10	117.064	0.089	40.8	0.4998	0.0000	OK
15 minute winter	44	10	116.626	0.126	40.4	0.1428	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	26	5.004	Tank	179.3	1.140	0.406	3.9032	
15 minute winter	27	8.000	28	27.8	1.120	0.417	4.4165	
15 minute winter	28	8.001	Tank	71.8	3.788	0.217	0.5995	
240 minute winter	Tank	1.014	36	126.1	0.855	0.785	6.3368	
15 minute winter	31	11.000	36	13.1	1.484	0.159	0.1430	
15 minute winter	32	10.000	36	5.6	0.856	0.108	0.2009	
240 minute winter	36	Hydro-Brake®	37_out	127.9				1572.5
15 minute winter	38	6.000	23	25.7	0.671	0.329	0.9889	
15 minute winter	39	7.000	25	25.8	1.442	0.190	0.5122	
60 minute summer	40	1.011	41	94.3	0.892	0.587	7.7634	
60 minute summer	41	1.012	42	118.6	0.945	0.738	0.6068	
60 minute summer	42	1.013	Tank	145.3	1.659	0.944	10.4309	
15 minute winter	43	9.000	44	40.4	1.776	0.185	0.2815	
15 minute winter	44	9.001	Tank	39.7	1.446	0.357	0.8341	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	116.711	0.330	261.7	3.6596	0.0000	OK
15 minute winter	2	11	116.685	0.548	502.7	5.4442	0.0000	OK
15 minute winter	3	11	116.599	0.628	703.4	5.5487	0.0000	OK
15 minute winter	4	11	116.501	0.769	1147.2	10.9539	0.0000	OK
15 minute winter	5	10	117.452	0.044	5.7	0.0615	0.0000	OK
15 minute winter	6	11	116.062	0.631	1149.5	1.8849	0.0000	OK
180 minute winter	7	168	115.715	0.501	336.6	1.4955	0.0000	OK
15 minute summer	8	1	116.200	0.000	0.0	0.0000	0.0000	OK
15 minute winter	9	11	116.191	0.291	151.0	1.9304	0.0000	OK
15 minute winter	10	11	115.900	0.350	247.5	1.7116	0.0000	OK
180 minute winter	11	140	115.736	1.272	407.4	4.0985	0.0000	SURCHARGED
180 minute winter	Pond	164	115.714	1.364	390.9	1079.7070	0.0000	SURCHARGED
180 minute winter	13	168	115.384	1.211	73.5	1.3702	0.0000	SURCHARGED
240 minute winter	14	220	115.088	1.069	73.4	1.5890	0.0000	SURCHARGED
15 minute winter	15	11	114.903	1.037	81.0	1.6040	0.0000	SURCHARGED
15 minute summer	17	1	116.881	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	1	116.041	0.000	0.0	0.0000	0.0000	OK
15 minute winter	19	12	115.996	0.113	17.7	0.2691	0.0000	OK
15 minute winter	20	12	115.991	0.201	67.3	5.5926	0.0000	OK
15 minute winter	21	12	115.361	0.139	106.9	2.8979	0.0000	OK
15 minute winter	22	10	116.751	0.251	85.1	1.2230	0.0000	OK
15 minute winter	23	11	116.622	0.350	208.6	1.4623	0.0000	OK
15 minute winter	24	11	116.421	0.304	276.4	1.4584	0.0000	OK
15 minute winter	25	11	116.334	0.464	398.2	2.0838	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	248.2	0.976	0.349	19.4172	
15 minute winter	2	1.001	3	482.3	1.589	0.678	1.5503	
15 minute winter	3	1.002	4	697.9	1.334	0.608	37.6251	
15 minute winter	4	1.003	6	1144.0	2.157	0.997	23.8369	
15 minute winter	5	2.000	6	5.5	1.284	0.182	0.1861	
15 minute winter	6	1.004	7	1147.9	2.450	0.668	30.6618	
15 minute winter	7	1.005	11	1152.1	2.790	0.386	24.7878	
15 minute summer	8	3.000	9	0.0	0.000	0.000	2.9667	
15 minute winter	9	3.001	10	145.8	1.409	0.703	4.9963	
15 minute winter	10	3.002	11	249.3	1.568	0.558	3.2309	
15 minute winter	11	1.006	Pond	1389.3	3.435	0.796	24.7240	
30 minute winter	Pond	1.007	13	81.1	1.151	1.470	5.0259	
30 minute winter	13	1.008	14	81.1	1.151	1.471	4.3026	
30 minute winter	14	1.009	15	81.1	1.152	1.471	4.3027	
15 minute winter	15	1.010	40	83.6	1.206	1.516	0.9759	
15 minute summer	17	4.000	18	0.0	0.000	0.000	0.0001	
15 minute summer	18	4.001	19	0.0	0.000	0.000	0.0861	
15 minute winter	19	4.002	20	17.3	0.549	0.259	0.9468	
15 minute winter	20	4.003	21	51.4	1.272	0.771	6.4157	
15 minute winter	21	4.004	Tank	102.5	3.086	0.445	2.1590	
15 minute winter	22	5.000	23	82.3	1.040	0.602	3.3986	
15 minute winter	23	5.001	24	211.3	1.346	0.617	9.7499	
15 minute winter	24	5.002	25	273.0	1.204	0.308	10.8383	
15 minute winter	25	5.003	26	388.6	1.279	0.632	25.4522	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	12	116.177	0.516	449.4	2.2621	0.0000	OK
15 minute winter	27	12	116.346	0.246	89.2	8.6224	0.0000	OK
15 minute winter	28	11	115.623	0.154	178.4	4.2042	0.0000	OK
240 minute winter	Tank	232	114.574	1.214	351.9	1213.6450	0.0000	SURCHARGED
15 minute winter	31	10	115.755	0.105	32.6	0.2687	0.0000	OK
240 minute winter	32	232	114.516	0.266	3.2	0.4085	0.0000	SURCHARGED
240 minute winter	36	232	114.516	1.227	132.6	4.5287	0.0000	SURCHARGED
15 minute summer	37_out	1	113.219	0.000	127.8	0.0000	0.0000	OK
15 minute winter	38	11	116.725	0.325	64.8	2.0021	0.0000	SURCHARGED
15 minute winter	39	10	116.545	0.145	64.8	0.8949	0.0000	OK
30 minute summer	40	19	114.851	1.070	158.8	3.2277	0.0000	SURCHARGED
30 minute summer	41	19	114.720	1.112	230.1	3.1857	0.0000	SURCHARGED
30 minute summer	42	19	114.653	1.057	310.9	3.1684	0.0000	SURCHARGED
15 minute winter	43	10	117.132	0.157	99.8	0.8775	0.0000	OK
15 minute winter	44	10	116.726	0.226	99.0	0.2554	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	26	5.004	Tank	449.2	1.571	1.017	7.0422	
15 minute winter	27	8.000	28	65.2	1.397	0.979	8.4437	
15 minute winter	28	8.001	Tank	176.0	4.723	0.533	1.2233	
30 minute winter	Tank	1.014	36	131.0	0.861	0.816	6.3997	
15 minute winter	31	11.000	36	32.2	1.869	0.391	0.2792	
15 minute winter	32	10.000	36	13.8	1.096	0.266	0.3869	
960 minute summer	36	Hydro-Brake®	37_out	131.2				4790.8
15 minute winter	38	6.000	23	62.3	0.884	0.795	1.8045	
15 minute winter	39	7.000	25	65.3	1.530	0.481	1.3118	
15 minute winter	40	1.011	41	146.7	0.926	0.913	10.9638	
15 minute winter	41	1.012	42	225.7	1.425	1.405	0.7665	
30 minute summer	42	1.013	Tank	302.3	2.027	1.962	16.2517	
15 minute winter	43	9.000	44	99.0	2.091	0.452	0.5798	
15 minute winter	44	9.001	Tank	97.1	1.767	0.874	1.6719	

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	118.005	1.624	490.4	18.0247	0.0000	SURCHARGED
15 minute winter	2	11	117.892	1.754	902.7	17.4429	0.0000	SURCHARGED
15 minute winter	3	11	117.759	1.788	1312.6	15.7892	0.0000	SURCHARGED
15 minute winter	4	11	117.340	1.608	2162.4	22.9140	0.0000	SURCHARGED
15 minute winter	5	10	117.469	0.061	10.6	0.0856	0.0000	OK
360 minute winter	6	344	116.729	1.298	389.0	3.8758	0.0000	SURCHARGED
360 minute winter	7	344	116.729	1.515	379.0	4.5241	0.0000	SURCHARGED
360 minute winter	8	344	116.729	0.529	2.6	0.7572	0.0000	SURCHARGED
360 minute winter	9	344	116.729	0.829	47.9	5.4953	0.0000	SURCHARGED
360 minute winter	10	344	116.729	1.179	82.7	5.7722	0.0000	SURCHARGED
360 minute winter	11	344	116.729	2.265	436.5	7.2940	0.0000	SURCHARGED
360 minute winter	Pond	344	116.729	2.378	433.5	2654.6720	0.0000	SURCHARGED
360 minute winter	13	280	116.531	2.359	81.8	2.6677	0.0000	SURCHARGED
360 minute winter	14	264	116.413	2.394	81.8	3.5576	0.0000	SURCHARGED
30 minute summer	15	19	116.464	2.598	83.3	4.0190	0.0000	SURCHARGED
15 minute summer	17	1	116.881	0.000	0.0	0.0000	0.0000	OK
360 minute winter	18	272	116.174	0.133	1.2	0.1505	0.0000	OK
360 minute winter	19	272	116.174	0.291	5.6	0.6947	0.0000	OK
360 minute winter	20	272	116.174	0.384	21.4	19.1240	0.0000	SURCHARGED
360 minute winter	21	264	116.170	0.948	92.8	110.4142	0.0000	SURCHARGED
15 minute winter	22	12	117.020	0.520	159.3	2.5363	0.0000	SURCHARGED
15 minute winter	23	12	116.926	0.654	388.2	2.7321	0.0000	SURCHARGED
15 minute winter	24	12	116.741	0.624	500.7	2.9922	0.0000	OK
15 minute winter	25	11	116.672	0.802	680.3	3.6048	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	468.6	1.065	0.659	32.2001	
15 minute winter	2	1.001	3	902.0	2.050	1.268	2.1293	
15 minute winter	3	1.002	4	1312.5	2.071	1.144	45.4448	
15 minute winter	4	1.003	6	2146.2	3.387	1.871	28.6516	
15 minute winter	5	2.000	6	10.5	1.474	0.350	0.5321	
15 minute winter	6	1.004	7	2148.9	2.612	1.251	50.8956	
15 minute winter	7	1.005	11	2141.5	2.993	0.718	46.8280	
15 minute winter	8	3.000	9	-24.2	-0.273	-0.103	7.1198	
15 minute winter	9	3.001	10	257.7	1.635	1.243	7.3246	
15 minute winter	10	3.002	11	448.1	1.826	1.003	4.9471	
15 minute winter	11	1.006	Pond	2569.4	3.626	1.472	28.5964	
15 minute winter	Pond	1.007	13	-92.0	-1.307	-1.669	5.0259	
15 minute winter	13	1.008	14	-95.9	-1.362	-1.740	4.3026	
15 minute winter	14	1.009	15	84.1	1.195	1.526	4.3027	
15 minute winter	15	1.010	40	87.7	1.246	1.591	0.9759	
15 minute summer	17	4.000	18	0.0	0.000	0.000	0.3138	
15 minute winter	18	4.001	19	-4.7	-0.161	-0.030	0.3043	
15 minute summer	19	4.002	20	27.2	0.633	0.408	1.5887	
15 minute winter	20	4.003	21	74.0	1.440	1.110	9.2789	
15 minute winter	21	4.004	Tank	176.8	3.334	0.767	2.5501	
15 minute winter	22	5.000	23	150.5	1.057	1.101	6.8039	
15 minute winter	23	5.001	24	371.1	1.432	1.084	17.5000	
15 minute winter	24	5.002	25	461.8	1.239	0.521	19.8854	
15 minute winter	25	5.003	26	674.7	1.533	1.096	36.6862	

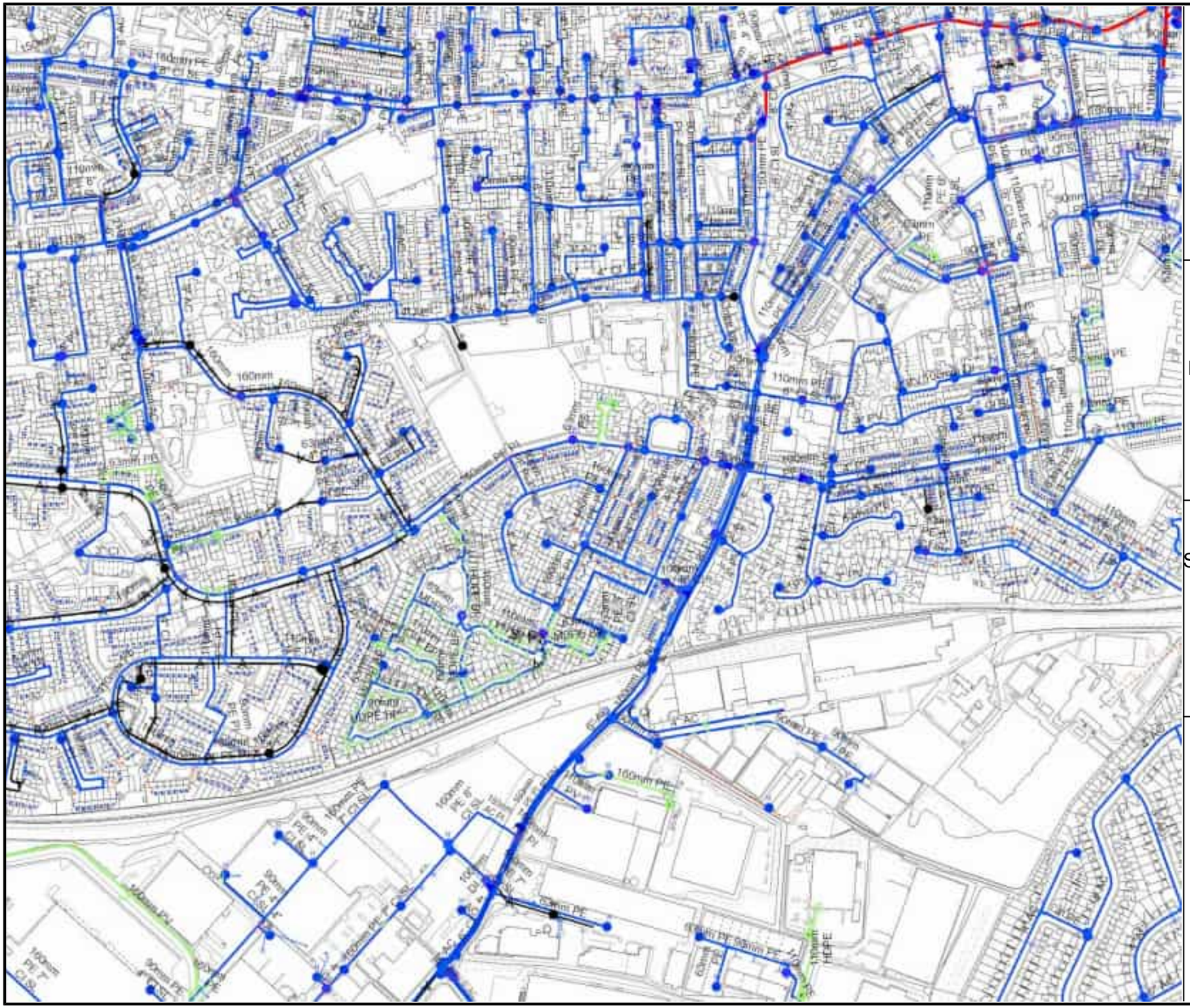
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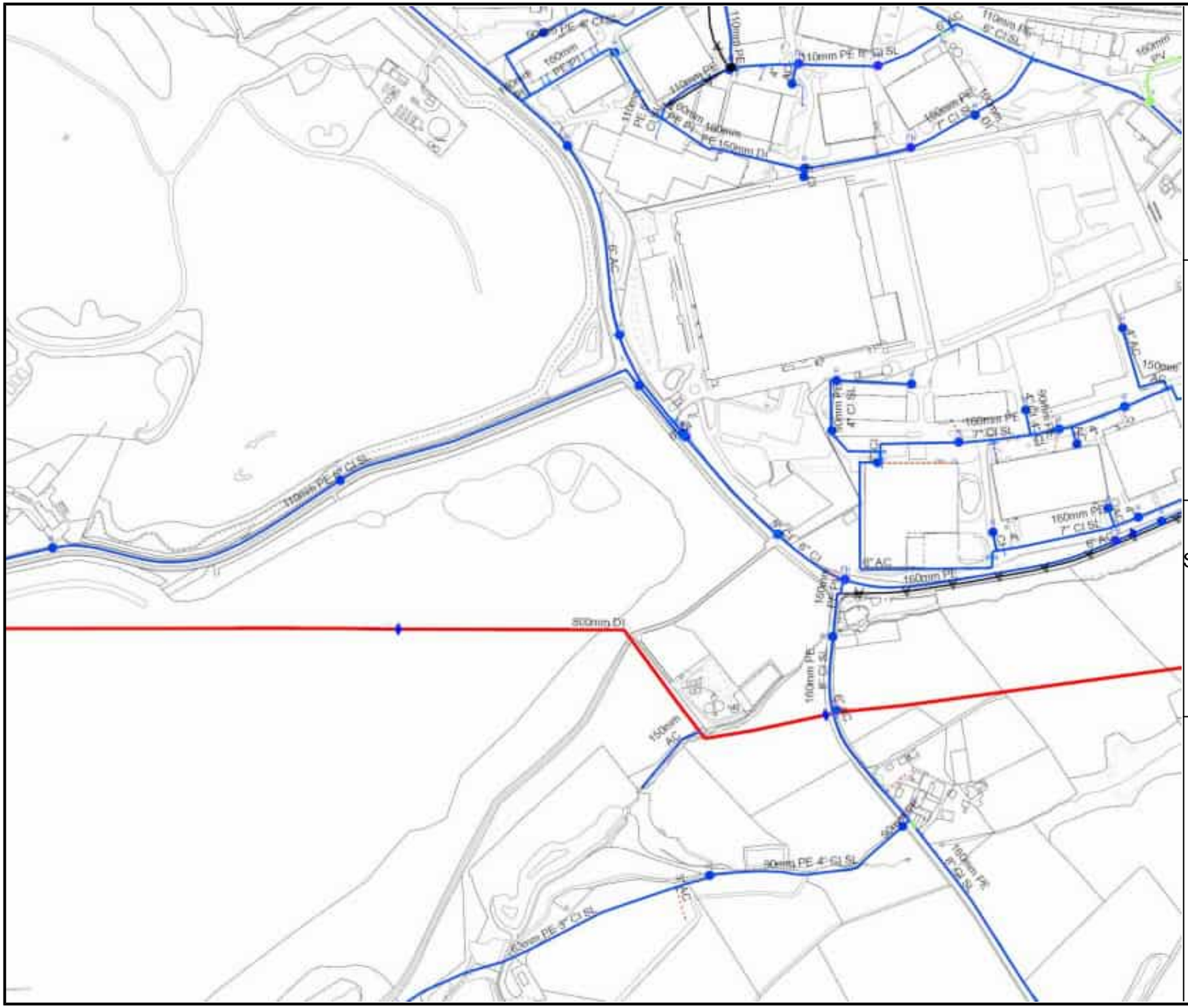
Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	11	116.385	0.724	783.0	3.1769	0.0000	OK
15 minute winter	27	14	116.548	0.448	167.0	26.3440	0.0000	SURCHARGED
360 minute winter	28	264	116.173	0.704	72.4	74.3802	0.0000	SURCHARGED
360 minute winter	Tank	264	116.165	2.805	462.3	2000.5000	0.0000	SURCHARGED
360 minute winter	31	264	116.045	0.395	10.3	1.0136	0.0000	SURCHARGED
360 minute winter	32	264	116.045	1.795	4.5	2.7530	0.0000	SURCHARGED
360 minute winter	36	264	116.044	2.755	171.0	10.1674	0.0000	SURCHARGED
15 minute summer	37_out	1	113.219	0.000	131.2	0.0000	0.0000	OK
15 minute winter	38	11	117.215	0.815	121.5	5.0276	0.0000	FLOOD RISK
15 minute winter	39	11	116.978	0.578	121.5	3.5679	0.0000	FLOOD RISK
30 minute summer	40	19	116.465	2.684	177.8	8.0987	0.0000	SURCHARGED
30 minute summer	41	19	116.299	2.691	308.5	7.7124	0.0000	SURCHARGED
360 minute winter	42	264	116.228	2.632	170.0	7.8919	0.0000	SURCHARGED
15 minute winter	43	11	117.768	0.793	187.0	4.4354	0.0000	SURCHARGED
15 minute winter	44	11	117.297	0.797	173.9	0.9015	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	26	5.004	Tank	783.1	1.968	1.773	9.6335	
15 minute winter	27	8.000	28	80.5	1.572	1.207	10.9112	
15 minute winter	28	8.001	Tank	298.2	5.191	0.902	1.4944	
360 minute winter	Tank	1.014	36	165.6	1.045	1.031	6.3997	
15 minute winter	31	11.000	36	60.5	2.135	0.733	0.4583	
15 minute winter	32	10.000	36	26.1	1.287	0.502	0.6825	
360 minute winter	36	Hydro-Brake®	37_out	171.0				4485.6
15 minute winter	38	6.000	23	110.1	1.564	1.406	1.8045	
15 minute winter	39	7.000	25	107.5	1.561	0.791	1.7975	
15 minute summer	40	1.011	41	169.7	1.071	1.056	10.9638	
15 minute summer	41	1.012	42	318.9	2.013	1.985	0.7665	
15 minute winter	42	1.013	Tank	483.0	3.052	3.136	16.2517	
15 minute winter	43	9.000	44	173.9	2.470	0.794	0.8671	
15 minute winter	44	9.001	Tank	173.6	2.465	1.562	2.1073	

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160mm
110mm
160mm PE
110mm PE
160mm PE
160mm PE
160



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WATER MAIN RECORDS

Address or Site Reference

Heywood Business Park Heywood Business Park,
Heywood,
.

SD8309SW

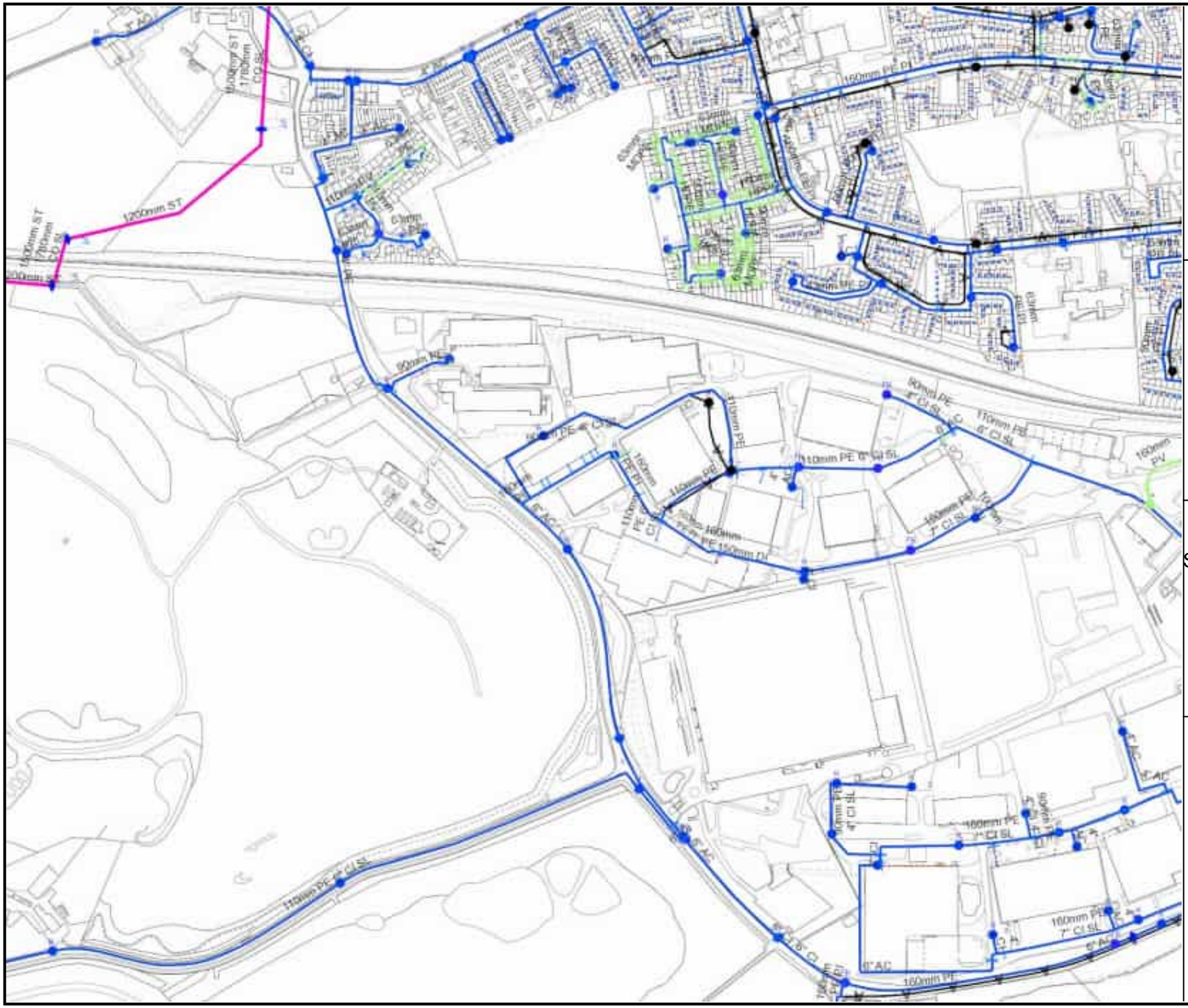
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Date: 09/09/2020

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WATER MAIN RECORDS

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SD8309NW

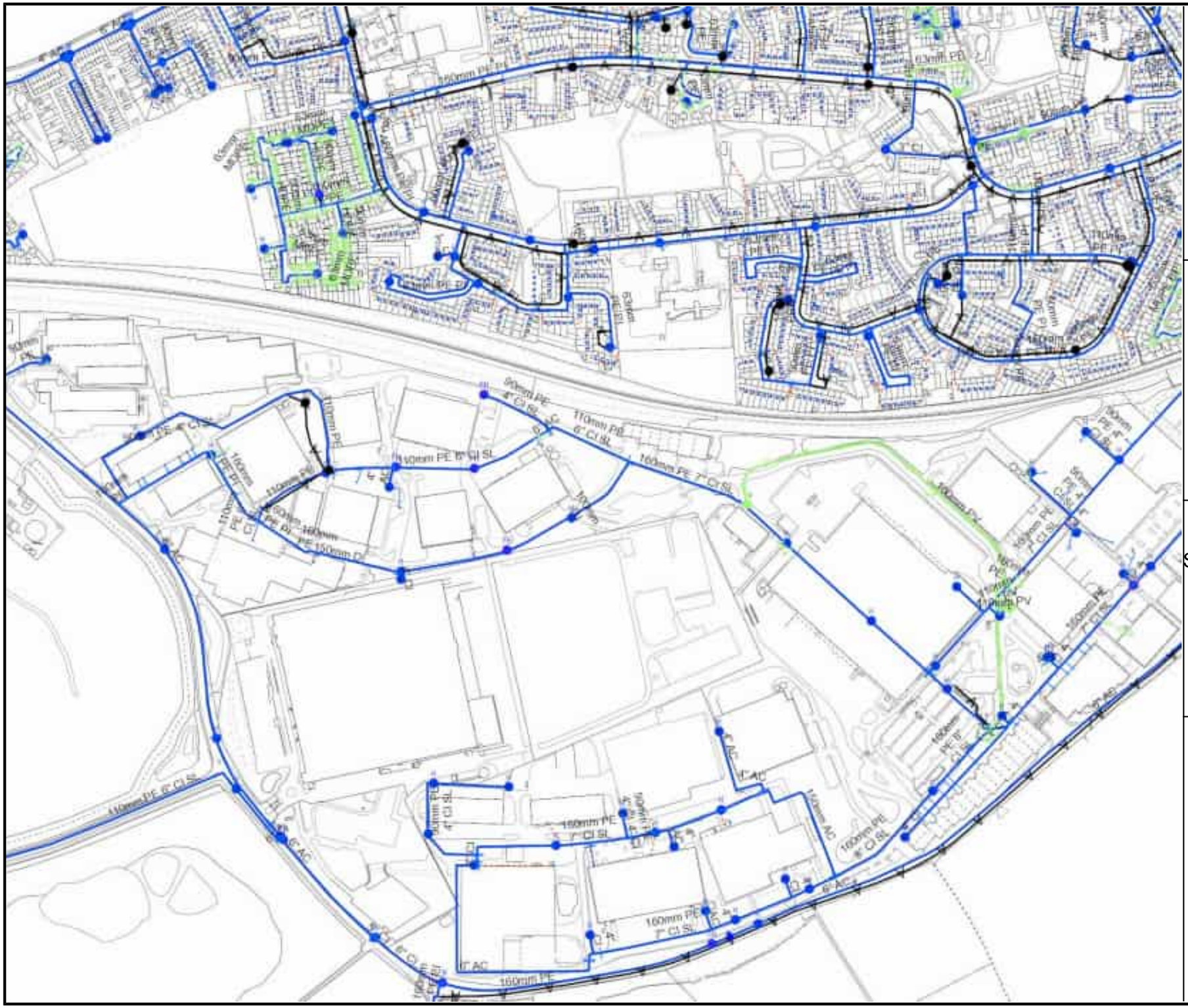
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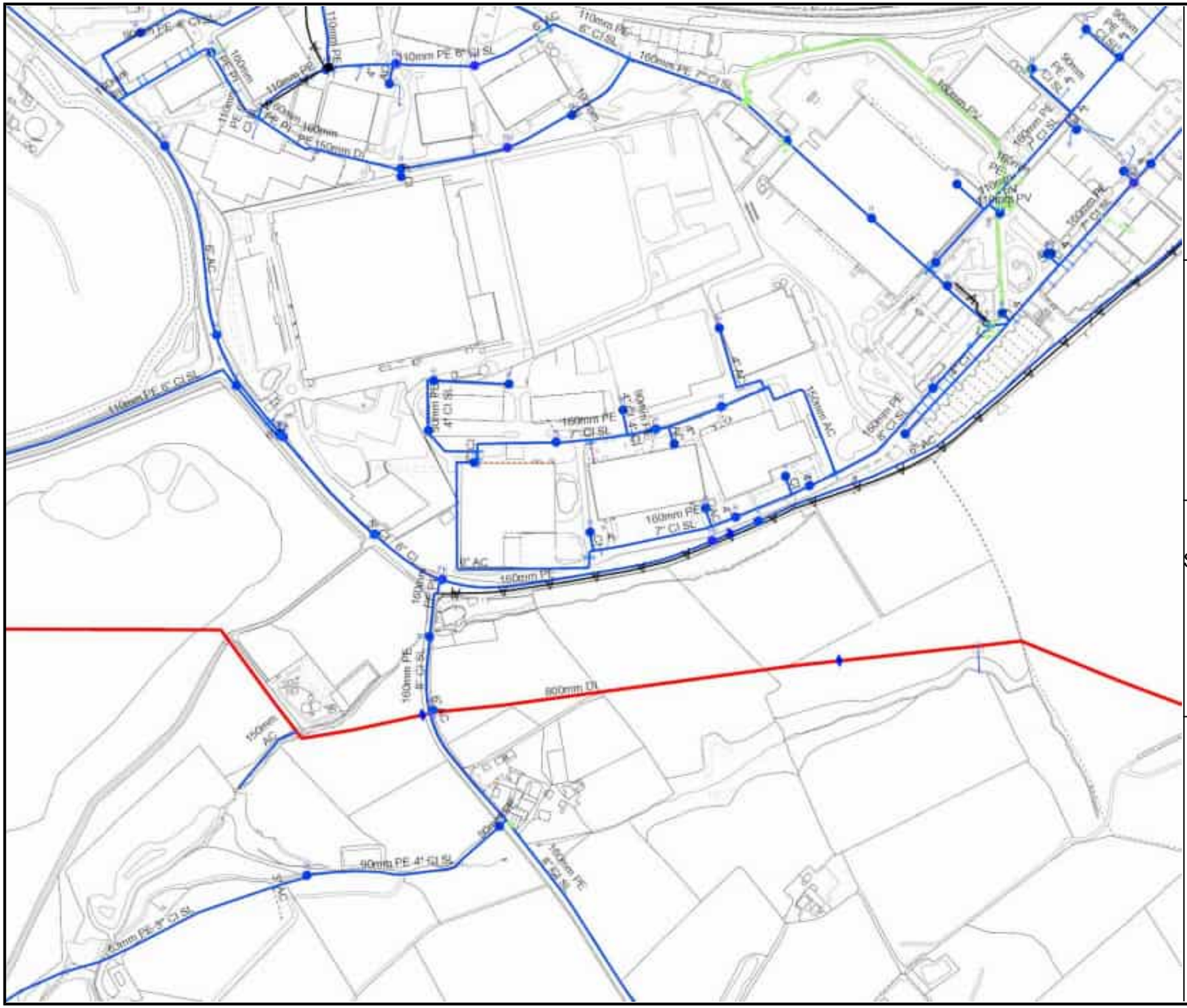
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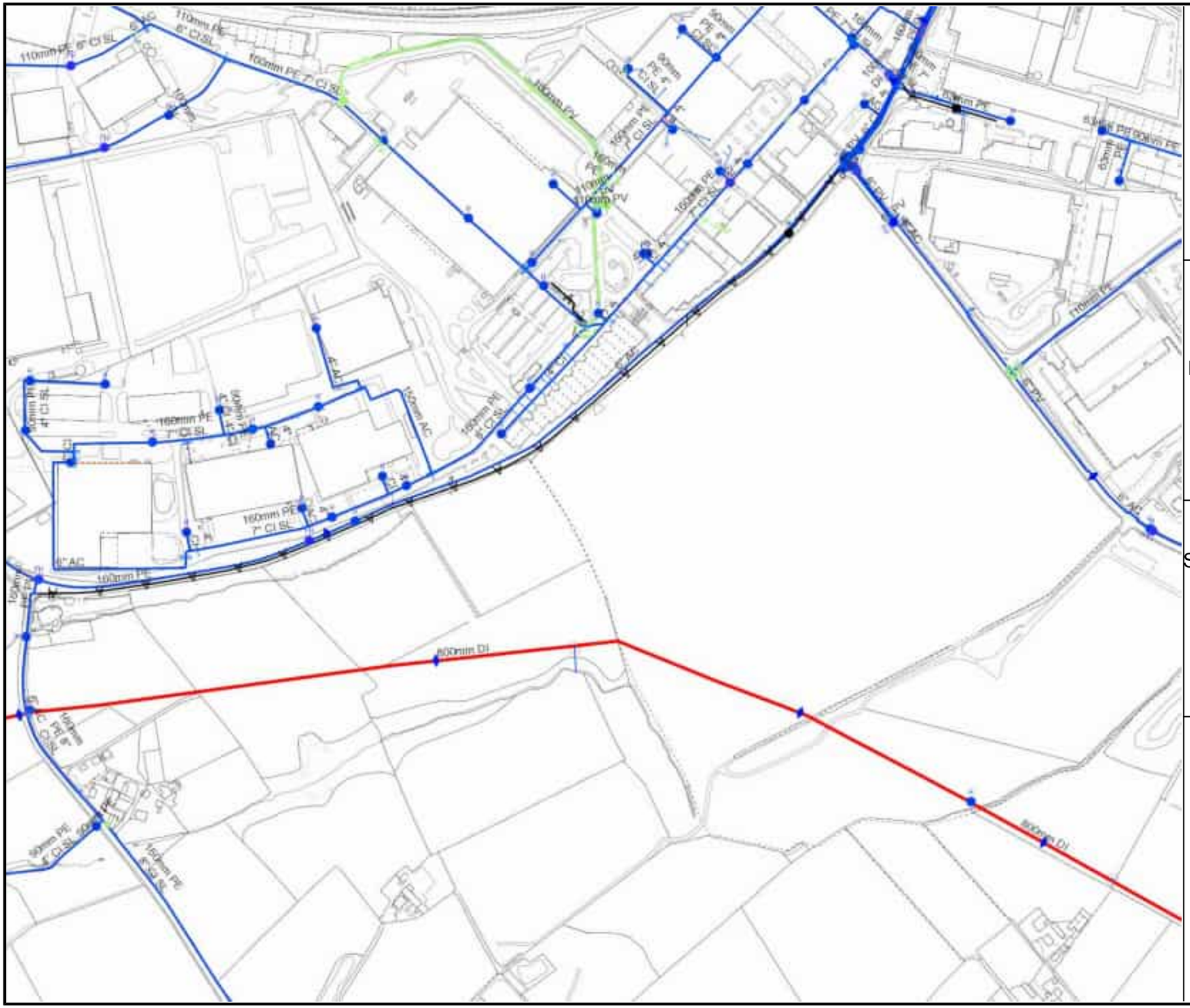
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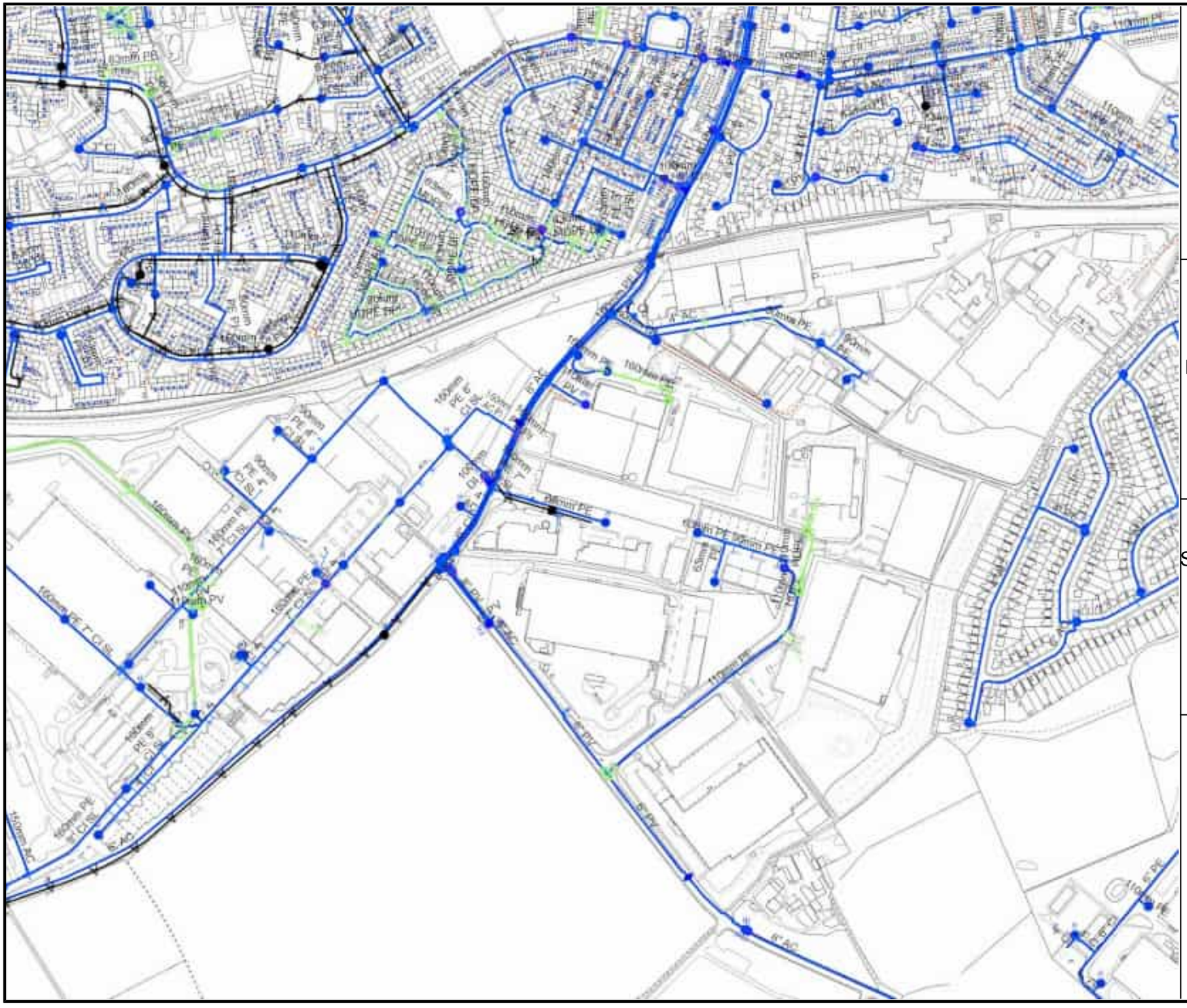
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160mm PE 6" CI SL
110mm PE
160mm PE 7" CI SL
160mm PE
6" AC
160mm PE 8" CI SL
160mm PE 7" CI SL
160mm PE 6" CI SL
160mm PE 7" CI SL
160mm PE
6" AC
160mm PE
7" CI SL
160mm PE
7" CI SL
160mm PE
7" CI SL


110mm PE 6" Cl SL
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140mm PE 6" W SL
110mm PE
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160mm PE 7" Cl SL
160mm PV
110mm PE 6" Cl SL
160mm PE 7" Cl SL
160mm PE 7" Cl SL
160mm PE 7


110mm PE 6" CI SL
110mm PE 6" CI SL
160mm PE 7" CI SL
160mm PV
160mm PE 7" CI SL
160mm PE 7" CI SL
160mm PE 7" CI SL



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SD8409NE

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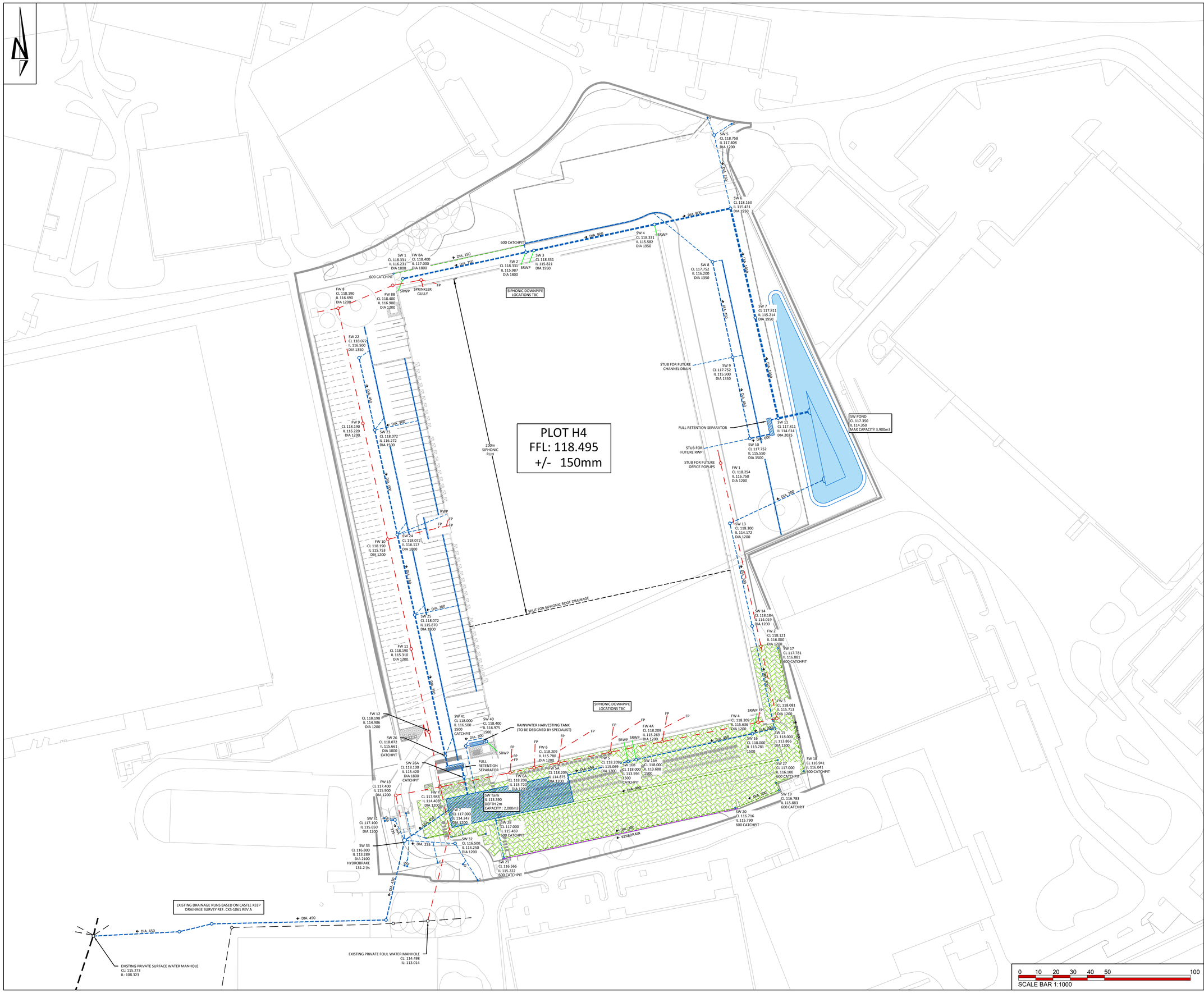
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APPENDIX D – DRAINAGE LAYOUT



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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

CONSTRUCTION

MAINTENANCE

DEMOLITION

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT

GENERAL NOTES:

1. This drawing shall be read in conjunction with all the relevant architects, engineers' and service engineers drawings & specifications.
2. All units in millimeters U.O.N. on the drawing.
3. Do Not Scale off the drawing.

KEY:

- Surface Water Drainage
- Attenuation pond
- Underground Attenuation Tank
- Permeable Paving (Lined)
- Kerb Drain
- Channel Drain
- Perforated Drain / Filter Drain
- Foul Water Drainage (150mm Dia, Min. Gradient 1:150)
- Existing Drainage

REV	DATE	BY	DESCRIPTION	CHKD
P03	19.08.2025	BP	Update to latest layout	JW
P02	27.05.2025	BP	Update to latest layout	JW
P01	01.05.2025	BP	Preliminary Issue	JW

Burrows Graham

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Tel: +44 (0)161 804 8046

South Office:
Buckland House, Dower Mews, High Street, Berkhamsted HP4 2BL
Tel: +44 (0)161 804 8046

CLIENT

INDURENT

PROJECT

HEYWOOD

DRAWING TITLE

PLOT H4
DRAINAGE LAYOUT

BGL PROJECT NUMBER	DRAWING STATUS	OFFICE	
30042	PRELIMINARY	NORTH	
SCALE @ A1	DATE	DRAWN BY	CHECKED BY
1:1000	01.05.2025	BP	JW

DRAWING No: 30042-BGL-XX-XX-DR-C-00250 REV: P03

APPENDIX E – HYDRAULIC CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	1.155	5.00	118.331	1800	383682.639	409683.576	2.100
2	1.157	5.00	118.331	1800	383754.154	409699.014	2.344
3	1.058	5.00	118.331	1950	383758.883	409700.035	2.510
4	1.856	5.00	118.331	1950	383828.974	409715.163	2.749
5	0.018	5.00	118.758	1200	383863.703	409767.150	1.350
6			118.163	1950	383873.204	409724.517	2.732
7			117.811	1950	383887.616	409660.983	2.597
8		5.00	117.752	1350	383862.747	409693.348	1.552
9	0.481	5.00	117.752	1350	383874.432	409637.971	1.852
10	0.345	5.00	117.752	1500	383884.382	409590.699	2.202
11			117.811	2025	383900.946	409602.465	3.197
Pond			117.350		383929.190	409585.110	3.000
13			118.300	1200	383872.811	409541.347	4.128
14	0.074	5.00	118.184	1200	383885.792	409481.642	4.165
15	0.086	5.00	118.000	1200	383898.774	409421.936	4.134
16	0.284	5.00	118.000	1200	383835.611	409407.795	4.296
17		5.00	117.781		383903.153	409456.695	0.900
18			116.941	1200	383916.444	409394.317	0.900
19	0.057	5.00	116.783	1200	383912.324	409387.448	0.900
20	0.159	5.00	116.716		383888.328	409378.998	0.926
21	0.198	5.00	116.566		383735.629	409345.953	1.344
22	0.271	5.00	118.072	1350	383657.138	409637.565	1.572
23	0.217	5.00	118.072	1500	383666.238	409595.598	1.800
24	0.220	5.00	118.072	1800	383679.403	409534.881	1.955
25	0.215	5.00	118.072	1800	383689.539	409488.133	2.202
26	0.222	5.00	118.072	1800	383707.295	409406.243	2.411
27		5.00	117.000		383900.689	409403.754	0.900
28	0.395	5.00	117.000		383731.058	409367.252	1.531
Tank			117.800		383712.524	409382.126	4.410
30	0.043	5.00	117.652	1200	383680.426	409397.549	1.425
31	0.045	5.00	117.253	1200	383670.174	409378.796	1.453
32	0.017	5.00	116.845	1200	383673.353	409363.769	1.498
34	0.045	5.00	116.260	1200	383713.708	409348.000	1.991
35			116.330	1200	383695.153	409344.090	2.156
36	0.040	5.00	116.670	1350	383683.676	409353.856	3.381
37_out			115.150	1350	383672.943	409344.859	1.931
38	0.207	5.00	117.220	1200	383691.286	409601.006	0.820
39	0.207	5.00	117.220	1200	383714.484	409493.542	0.820

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	73.162	0.600	116.231	115.987	0.244	300.0	900	5.68	50.0
1.001	2	3	4.838	0.600	115.987	115.971	0.016	300.0	900	5.72	50.0
1.002	3	4	71.705	0.600	115.821	115.582	0.239	300.0	1050	6.32	50.0
1.003	4	6	45.208	0.600	115.582	115.431	0.151	300.0	1050	6.70	50.0
2.000	5	6	43.679	0.600	117.408	116.181	1.227	35.6	150	5.43	50.0
1.004	6	7	65.148	0.600	115.431	115.214	0.217	300.0	1050	7.25	50.0
1.005	7	11	60.017	0.600	115.214	114.614	0.600	100.0	1050	7.54	50.0
3.000	8	9	56.596	0.600	116.200	115.900	0.300	188.7	450	5.64	50.0
3.001	9	10	48.308	0.600	115.900	115.700	0.200	241.5	450	6.26	50.0
3.002	10	11	20.318	0.600	115.550	115.464	0.086	236.3	600	6.47	50.0
1.006	11	Pond	33.150	0.600	114.614	114.350	0.264	125.6	1050	7.72	50.0
1.007	Pond	13	71.371	0.600	114.350	114.172	0.178	400.0	300	9.25	50.0
1.008	13	14	61.100	0.600	114.172	114.019	0.153	400.0	300	10.55	50.0
1.009	14	15	61.101	0.600	114.019	113.866	0.153	400.0	300	11.86	50.0
1.010	15	16	64.727	0.600	113.866	113.704	0.162	400.0	300	13.24	50.0
1.011	16	Tank	125.735	0.600	113.704	113.390	0.314	400.0	300	15.93	50.0
4.000	17	18	63.778	0.600	116.881	116.041	0.840	75.9	300	5.59	50.0
4.001	18	19	8.010	0.600	116.041	115.883	0.158	50.7	300	5.65	50.0
4.002	19	20	25.440	0.600	115.883	115.790	0.093	275.0	300	6.10	50.0
4.003	20	21	156.255	0.600	115.790	115.222	0.568	275.0	300	8.86	50.0
4.004	21	Tank	42.922	0.600	115.222	113.390	1.832	23.4	300	9.08	50.0
5.000	22	23	42.942	0.600	116.500	116.422	0.078	550.5	450	5.83	50.0
6.000	38	23	25.625	0.600	116.400	116.272	0.128	200.0	300	5.39	50.0
5.001	23	24	62.128	0.600	116.272	116.117	0.155	400.0	600	6.69	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.803	1147.3	156.5	1.200	1.444	1.155	0.0	222	1.282
1.001	1.803	1147.3	313.3	1.444	1.460	2.312	0.0	319	1.548
1.002	1.984	1718.0	456.6	1.460	1.699	3.369	0.0	367	1.692
1.003	1.984	1718.0	708.1	1.699	1.682	5.225	0.0	469	1.894
2.000	1.692	29.9	2.4	1.200	1.832	0.018	0.0	29	1.024
1.004	1.984	1718.0	710.5	1.682	1.547	5.243	0.0	470	1.895
1.005	3.446	2983.8	710.5	1.547	2.147	5.243	0.0	346	2.857
3.000	1.476	234.8	0.0	1.102	1.402	0.000	0.0	0	0.000
3.001	1.303	207.3	65.2	1.402	1.602	0.481	0.0	173	1.159
3.002	1.580	446.6	111.9	1.602	1.747	0.826	0.0	204	1.324
1.006	3.074	2661.5	822.5	2.147	1.950	6.069	0.0	399	2.727
1.007	0.780	55.1	822.5	2.700	3.828	6.069	0.0	300	0.790
1.008	0.780	55.1	822.5	3.828	3.865	6.069	0.0	300	0.790
1.009	0.780	55.1	832.5	3.865	3.834	6.143	0.0	300	0.790
1.010	0.780	55.1	844.1	3.834	3.996	6.229	0.0	300	0.790
1.011	0.780	55.1	882.6	3.996	4.110	6.513	0.0	300	0.790
4.000	1.806	127.7	0.0	0.600	0.600	0.000	0.0	0	0.000
4.001	2.213	156.4	0.0	0.600	0.600	0.000	0.0	0	0.000
4.002	0.943	66.7	7.7	0.600	0.626	0.057	0.0	68	0.633
4.003	0.943	66.7	29.2	0.626	1.044	0.216	0.0	139	0.914
4.004	3.261	230.5	56.0	1.044	4.110	0.413	0.0	100	2.709
5.000	0.859	136.7	36.7	1.122	1.200	0.271	0.0	159	0.732
6.000	1.108	78.3	28.0	0.520	1.500	0.207	0.0	124	1.019
5.001	1.211	342.4	94.1	1.200	1.355	0.695	0.0	214	1.040

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
5.002	24	25	47.834	0.600	116.117	115.870	0.247	193.7	750	7.09	50.0
7.000	39	25	25.525	0.600	116.400	116.020	0.380	67.2	300	5.22	50.0
5.003	25	26	83.793	0.600	115.870	115.661	0.209	400.0	750	8.09	50.0
5.004	26	Tank	24.677	0.600	115.661	115.661	0.000	0.0	750	8.50	50.0
8.000	27	28	173.514	0.600	116.100	115.469	0.631	275.0	300	8.07	50.0
8.001	28	Tank	23.764	0.600	115.469	113.390	2.079	11.4	300	8.15	50.0
1.012	Tank	36	40.391	0.600	113.390	113.289	0.101	400.0	450	16.59	50.0
9.000	30	31	21.372	0.600	116.227	115.800	0.427	50.1	225	5.19	50.0
9.001	31	32	15.360	0.600	115.800	115.347	0.453	33.9	225	5.31	50.0
9.002	32	36	14.312	0.600	115.347	114.962	0.385	37.2	225	5.42	50.0
10.000	34	35	18.962	0.600	114.269	114.174	0.095	200.0	225	5.34	50.0
10.001	35	36	15.070	0.600	114.174	114.099	0.075	200.0	225	5.62	50.0
1.013	36	37_out	14.005	0.600	113.289	113.219	0.070	200.0	450	16.76	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
5.002	2.007	886.7	124.0	1.205	1.452	0.915	0.0	187	1.435
7.000	1.921	135.8	28.0	0.520	1.752	0.207	0.0	92	1.520
5.003	1.393	615.3	181.0	1.452	1.661	1.336	0.0	277	1.218
5.004	1.000	441.8	211.1	1.661	1.389	1.558	0.0	0	∞
8.000	0.943	66.7	0.0	0.600	1.231	0.000	0.0	0	0.000
8.001	4.675	330.4	53.5	1.231	4.110	0.395	0.0	81	3.469
1.012	1.010	160.7	1203.3	3.960	2.931	8.879	0.0	450	1.023
9.000	1.853	73.7	5.8	1.200	1.228	0.043	0.0	43	1.116
9.001	2.254	89.6	11.8	1.228	1.273	0.087	0.0	55	1.574
9.002	2.152	85.6	14.1	1.273	1.483	0.104	0.0	61	1.594
10.000	0.921	36.6	6.1	1.766	1.931	0.045	0.0	62	0.686
10.001	0.921	36.6	6.1	1.931	2.346	0.045	0.0	62	0.686
1.013	1.434	228.0	1228.9	2.931	1.481	9.068	0.0	450	1.452

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	73.162	300.0	900	Circular	118.331	116.231	1.200	118.331	115.987	1.444
1.001	4.838	300.0	900	Circular	118.331	115.987	1.444	118.331	115.971	1.460
1.002	71.705	300.0	1050	Circular	118.331	115.821	1.460	118.331	115.582	1.699
1.003	45.208	300.0	1050	Circular	118.331	115.582	1.699	118.163	115.431	1.682
2.000	43.679	35.6	150	Circular	118.758	117.408	1.200	118.163	116.181	1.832
1.004	65.148	300.0	1050	Circular	118.163	115.431	1.682	117.811	115.214	1.547

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1800	Manhole	Adoptable	2	1800	Manhole	Adoptable
1.001	2	1800	Manhole	Adoptable	3	1950	Manhole	Adoptable
1.002	3	1950	Manhole	Adoptable	4	1950	Manhole	Adoptable
1.003	4	1950	Manhole	Adoptable	6	1950	Manhole	Adoptable
2.000	5	1200	Manhole	Adoptable	6	1950	Manhole	Adoptable
1.004	6	1950	Manhole	Adoptable	7	1950	Manhole	Adoptable

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.005	60.017	100.0	1050	Circular	117.811	115.214	1.547	117.811	114.614	2.147
3.000	56.596	188.7	450	Circular	117.752	116.200	1.102	117.752	115.900	1.402
3.001	48.308	241.5	450	Circular	117.752	115.900	1.402	117.752	115.700	1.602
3.002	20.318	236.3	600	Circular	117.752	115.550	1.602	117.811	115.464	1.747
1.006	33.150	125.6	1050	Circular	117.811	114.614	2.147	117.350	114.350	1.950
1.007	71.371	400.0	300	Circular	117.350	114.350	2.700	118.300	114.172	3.828
1.008	61.100	400.0	300	Circular	118.300	114.172	3.828	118.184	114.019	3.865
1.009	61.101	400.0	300	Circular	118.184	114.019	3.865	118.000	113.866	3.834
1.010	64.727	400.0	300	Circular	118.000	113.866	3.834	118.000	113.704	3.996
1.011	125.735	400.0	300	Circular	118.000	113.704	3.996	117.800	113.390	4.110
4.000	63.778	75.9	300	Circular	117.781	116.881	0.600	116.941	116.041	0.600
4.001	8.010	50.7	300	Circular	116.941	116.041	0.600	116.783	115.883	0.600
4.002	25.440	275.0	300	Circular	116.783	115.883	0.600	116.716	115.790	0.626
4.003	156.255	275.0	300	Circular	116.716	115.790	0.626	116.566	115.222	1.044
4.004	42.922	23.4	300	Circular	116.566	115.222	1.044	117.800	113.390	4.110
5.000	42.942	550.5	450	Circular	118.072	116.500	1.122	118.072	116.422	1.200
6.000	25.625	200.0	300	Circular	117.220	116.400	0.520	118.072	116.272	1.500
5.001	62.128	400.0	600	Circular	118.072	116.272	1.200	118.072	116.117	1.355
5.002	47.834	193.7	750	Circular	118.072	116.117	1.205	118.072	115.870	1.452
7.000	25.525	67.2	300	Circular	117.220	116.400	0.520	118.072	116.020	1.752
5.003	83.793	400.0	750	Circular	118.072	115.870	1.452	118.072	115.661	1.661
5.004	24.677	0.0	750	Circular	118.072	115.661	1.661	117.800	115.661	1.389
8.000	173.514	275.0	300	Circular	117.000	116.100	0.600	117.000	115.469	1.231
8.001	23.764	11.4	300	Circular	117.000	115.469	1.231	117.800	113.390	4.110
1.012	40.391	400.0	450	Circular	117.800	113.390	3.960	116.670	113.289	2.931

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.005	7	1950	Manhole	Adoptable	11	2025	Manhole	Adoptable
3.000	8	1350	Manhole	Adoptable	9	1350	Manhole	Adoptable
3.001	9	1350	Manhole	Adoptable	10	1500	Manhole	Adoptable
3.002	10	1500	Manhole	Adoptable	11	2025	Manhole	Adoptable
1.006	11	2025	Manhole	Adoptable	Pond		Junction	
1.007	Pond		Junction		13	1200	Manhole	Adoptable
1.008	13	1200	Manhole	Adoptable	14	1200	Manhole	Adoptable
1.009	14	1200	Manhole	Adoptable	15	1200	Manhole	Adoptable
1.010	15	1200	Manhole	Adoptable	16	1200	Manhole	Adoptable
1.011	16	1200	Manhole	Adoptable	Tank		Junction	
4.000	17		Junction		18	1200	Manhole	Adoptable
4.001	18	1200	Manhole	Adoptable	19	1200	Manhole	Adoptable
4.002	19	1200	Manhole	Adoptable	20		Junction	
4.003	20		Junction		21		Junction	
4.004	21		Junction		Tank		Junction	
5.000	22	1350	Manhole	Adoptable	23	1500	Manhole	Adoptable
6.000	38	1200	Manhole	Adoptable	23	1500	Manhole	Adoptable
5.001	23	1500	Manhole	Adoptable	24	1800	Manhole	Adoptable
5.002	24	1800	Manhole	Adoptable	25	1800	Manhole	Adoptable
7.000	39	1200	Manhole	Adoptable	25	1800	Manhole	Adoptable
5.003	25	1800	Manhole	Adoptable	26	1800	Manhole	Adoptable
5.004	26	1800	Manhole	Adoptable	Tank		Junction	
8.000	27		Junction		28		Junction	
8.001	28		Junction		Tank		Junction	
1.012	Tank		Junction		36	1350	Manhole	Adoptable

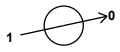
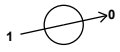
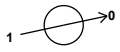
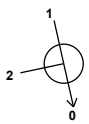
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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
9.000	21.372	50.1	225	Circular	117.652	116.227	1.200	117.253	115.800	1.228
9.001	15.360	33.9	225	Circular	117.253	115.800	1.228	116.845	115.347	1.273
9.002	14.312	37.2	225	Circular	116.845	115.347	1.273	116.670	114.962	1.483
10.000	18.962	200.0	225	Circular	116.260	114.269	1.766	116.330	114.174	1.931
10.001	15.070	200.0	225	Circular	116.330	114.174	1.931	116.670	114.099	2.346
1.013	14.005	200.0	450	Circular	116.670	113.289	2.931	115.150	113.219	1.481

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
9.000	30	1200	Manhole	Adoptable	31	1200	Manhole	Adoptable
9.001	31	1200	Manhole	Adoptable	32	1200	Manhole	Adoptable
9.002	32	1200	Manhole	Adoptable	36	1350	Manhole	Adoptable
10.000	34	1200	Manhole	Adoptable	35	1200	Manhole	Adoptable
10.001	35	1200	Manhole	Adoptable	36	1350	Manhole	Adoptable
1.013	36	1350	Manhole	Adoptable	37_out	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	383682.639	409683.576	118.331	2.100	1800				
						0	1.000	116.231	900
2	383754.154	409699.014	118.331	2.344	1800	1	1.000	115.987	900
									
						0	1.001	115.987	900
3	383758.883	409700.035	118.331	2.510	1950	1	1.001	115.971	900
									
						0	1.002	115.821	1050
4	383828.974	409715.163	118.331	2.749	1950	1	1.002	115.582	1050
									
						0	1.003	115.582	1050
5	383863.703	409767.150	118.758	1.350	1200				
						0	2.000	117.408	150
6	383873.204	409724.517	118.163	2.732	1950		1	2.000	116.181	150
							2	1.003	115.431	1050
							0	1.004	115.431	1050
7	383887.616	409660.983	117.811	2.597	1950		1	1.004	115.214	1050
							0	1.005	115.214	1050

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
8	383862.747	409693.348	117.752	1.552	1350	0	3.000	116.200	450
9	383874.432	409637.971	117.752	1.852	1350	1	3.000	115.900	450
						0	3.001	115.900	450
10	383884.382	409590.699	117.752	2.202	1500	1	3.001	115.700	450
						0	3.002	115.550	600
11	383900.946	409602.465	117.811	3.197	2025	1	3.002	115.464	600
						2	1.005	114.614	1050
						0	1.006	114.614	1050
Pond	383929.190	409585.110	117.350	3.000		1	1.006	114.350	1050
						0	1.007	114.350	300
13	383872.811	409541.347	118.300	4.128	1200	1	1.007	114.172	300
						0	1.008	114.172	300
14	383885.792	409481.642	118.184	4.165	1200	1	1.008	114.019	300
						0	1.009	114.019	300
15	383898.774	409421.936	118.000	4.134	1200	1	1.009	113.866	300
						0	1.010	113.866	300
16	383835.611	409407.795	118.000	4.296	1200	1	1.010	113.704	300
						0	1.011	113.704	300
17	383903.153	409456.695	117.781	0.900		0	4.000	116.881	300
18	383916.444	409394.317	116.941	0.900	1200	1	4.000	116.041	300
						0	4.001	116.041	300
19	383912.324	409387.448	116.783	0.900	1200	1	4.001	115.883	300
						0	4.002	115.883	300
20	383888.328	409378.998	116.716	0.926		1	4.002	115.790	300
						0	4.003	115.790	300

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
21	383735.629	409345.953	116.566	1.344		1	4.003	115.222	300
						0	4.004	115.222	300
22	383657.138	409637.565	118.072	1.572	1350	0	5.000	116.500	450
23	383666.238	409595.598	118.072	1.800	1500	1	6.000	116.272	300
						2	5.000	116.422	450
						0	5.001	116.272	600
24	383679.403	409534.881	118.072	1.955	1800	1	5.001	116.117	600
						0	5.002	116.117	750
25	383689.539	409488.133	118.072	2.202	1800	1	7.000	116.020	300
						2	5.002	115.870	750
						0	5.003	115.870	750
26	383707.295	409406.243	118.072	2.411	1800	1	5.003	115.661	750
						0	5.004	115.661	750
27	383900.689	409403.754	117.000	0.900		0	8.000	116.100	300
28	383731.058	409367.252	117.000	1.531		1	8.000	115.469	300
						0	8.001	115.469	300
Tank	383712.524	409382.126	117.800	4.410		1	8.001	113.390	300
						2	5.004	115.661	750
						3	4.004	113.390	300
						4	1.011	113.390	300
						0	1.012	113.390	450
30	383680.426	409397.549	117.652	1.425	1200	0	9.000	116.227	225
31	383670.174	409378.796	117.253	1.453	1200	1	9.000	115.800	225
						0	9.001	115.800	225
32	383673.353	409363.769	116.845	1.498	1200	1	9.001	115.347	225
						0	9.002	115.347	225
34	383713.708	409348.000	116.260	1.991	1200	0	10.000	114.269	225

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
35	383695.153	409344.090	116.330	2.156	1200	1	10.000	114.174	225
						0	10.001	114.174	225
36	383683.676	409353.856	116.670	3.381	1350	1	10.001	114.099	225
						2	9.002	114.962	225
						3	1.012	113.289	450
						0	1.013	113.289	450
37_out	383672.943	409344.859	115.150	1.931	1350	1	1.013	113.219	450
38	383691.286	409601.006	117.220	0.820	1200	0	6.000	116.400	300
39	383714.484	409493.542	117.220	0.820	1200	0	7.000	116.400	300

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
Rainfall Events	Singular	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	20.000	Additional Storage (m³/ha)	20.0
Ratio-R	0.300	Starting Level (m)	
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	0	0

Node 36 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.013	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0434-1312-1600-1312
Invert Level (m)	113.289	Min Outlet Diameter (m)	0.450
Design Depth (m)	1.600	Min Node Diameter (mm)	0
Design Flow (l/s)	131.2		

Node Pond Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	114.350
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	355.0	0.0	3.000	2275.0	0.0

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	113.390
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	244

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1000.0	0.0	2.000	1000.0	0.0	2.001	0.0	0.0

Node 21 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	115.222	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.250
Safety Factor	2.0	Width (m)	80.000	Inf Depth (m)	
Porosity	0.30	Length (m)	21.000		

Node 20 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	115.790	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.250
Safety Factor	2.0	Width (m)	75.000	Inf Depth (m)	
Porosity	0.30	Length (m)	21.000		

Node 17 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	116.881	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.250
Safety Factor	2.0	Width (m)	40.000	Inf Depth (m)	
Porosity	0.30	Length (m)	18.000		

Node 27 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	116.100	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.250
Safety Factor	2.0	Width (m)	90.000	Inf Depth (m)	
Porosity	0.30	Length (m)	26.000		

Node 28 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	115.469	Slope (1:X)	30.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	0	Depth (m)	0.250
Safety Factor	2.0	Width (m)	110.000	Inf Depth (m)	
Porosity	0.30	Length (m)	26.000		

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	116.438	0.207	148.0	2.8081	0.0000	OK
15 minute winter	2	11	116.330	0.343	290.4	4.2578	0.0000	OK
15 minute winter	3	11	116.192	0.371	412.9	4.2302	0.0000	OK
15 minute winter	4	11	116.063	0.481	640.8	7.9305	0.0000	OK
15 minute winter	5	11	117.436	0.028	2.3	0.0390	0.0000	OK
15 minute winter	6	11	115.880	0.449	640.2	1.3392	0.0000	OK
15 minute winter	7	12	115.562	0.348	639.1	1.0404	0.0000	OK
15 minute summer	8	1	116.200	0.000	0.0	0.0000	0.0000	OK
15 minute winter	9	11	116.068	0.168	61.7	1.1143	0.0000	OK
15 minute winter	10	11	115.756	0.206	100.5	1.0108	0.0000	OK
240 minute winter	11	184	115.210	0.596	194.9	1.9200	0.0000	OK
180 minute winter	Pond	140	115.196	0.846	225.9	529.6241	0.0000	SURCHARGED
180 minute winter	13	136	114.939	0.767	66.0	0.8675	0.0000	SURCHARGED
180 minute winter	14	132	114.713	0.694	66.1	1.0313	0.0000	SURCHARGED
180 minute winter	15	124	114.486	0.620	66.2	0.9586	0.0000	SURCHARGED
60 minute summer	16	36	114.246	0.542	83.6	1.3302	0.0000	SURCHARGED
15 minute summer	17	1	116.881	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	1	116.041	0.000	0.0	0.0000	0.0000	OK
15 minute winter	19	10	115.948	0.065	7.2	0.1542	0.0000	OK
15 minute winter	20	12	115.908	0.118	27.3	2.0860	0.0000	OK
15 minute winter	21	11	115.317	0.095	43.5	1.4506	0.0000	OK
15 minute winter	22	11	116.654	0.154	34.7	0.7515	0.0000	OK
15 minute winter	23	11	116.480	0.208	85.2	0.8671	0.0000	OK
15 minute winter	24	11	116.295	0.178	112.8	0.8539	0.0000	OK
15 minute winter	25	12	116.129	0.259	163.5	1.1632	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	142.4	0.878	0.124	12.1436	
15 minute winter	2	1.001	3	285.3	1.415	0.249	0.9761	
15 minute winter	3	1.002	4	417.0	1.271	0.243	23.5711	
15 minute winter	4	1.003	6	638.0	1.732	0.371	16.6573	
15 minute winter	5	2.000	6	2.2	0.992	0.075	0.0981	
15 minute winter	6	1.004	7	639.1	2.147	0.372	19.4317	
15 minute winter	7	1.005	11	646.6	2.431	0.217	15.9728	
15 minute summer	8	3.000	9	0.0	0.000	0.000	1.4760	
15 minute winter	9	3.001	10	58.9	1.124	0.284	2.5337	
15 minute winter	10	3.002	11	101.0	1.248	0.226	1.6459	
15 minute winter	11	1.006	Pond	737.9	3.837	0.277	10.7737	
15 minute summer	Pond	1.007	13	69.7	1.053	1.265	5.0259	
60 minute winter	13	1.008	14	66.3	0.941	1.202	4.3026	
60 minute winter	14	1.009	15	66.3	0.941	1.203	4.3027	
60 minute winter	15	1.010	16	66.5	0.944	1.206	4.5580	
60 minute winter	16	1.011	Tank	78.0	1.418	1.414	8.5750	
15 minute summer	17	4.000	18	0.0	0.000	0.000	0.0001	
15 minute summer	18	4.001	19	0.0	0.000	0.000	0.0434	
15 minute winter	19	4.002	20	6.9	0.442	0.104	0.4565	
15 minute winter	20	4.003	21	21.0	0.980	0.315	3.4701	
15 minute winter	21	4.004	Tank	44.5	3.471	0.193	0.9969	
15 minute winter	22	5.000	23	33.5	0.802	0.245	1.7953	
15 minute winter	23	5.001	24	86.3	1.105	0.252	4.8555	
15 minute winter	24	5.002	25	111.8	1.055	0.126	5.1088	
15 minute winter	25	5.003	26	160.6	1.009	0.261	13.3562	

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	12	115.988	0.327	182.8	1.4339	0.0000	OK
15 minute summer	27	1	116.100	0.000	0.0	0.0000	0.0000	OK
15 minute winter	28	10	115.558	0.089	50.6	1.5862	0.0000	OK
240 minute winter	Tank	164	113.715	0.325	144.6	325.0455	0.0000	OK
15 minute winter	30	10	116.268	0.041	5.5	0.0714	0.0000	OK
15 minute winter	31	10	115.854	0.054	11.1	0.0938	0.0000	OK
15 minute winter	32	10	115.409	0.062	13.1	0.0835	0.0000	OK
15 minute winter	34	10	114.331	0.062	5.8	0.0978	0.0000	OK
15 minute winter	35	11	114.236	0.062	5.7	0.0698	0.0000	OK
240 minute winter	36	160	113.669	0.380	114.5	0.6327	0.0000	OK
15 minute summer	37_out	1	113.219	0.000	53.9	0.0000	0.0000	OK
15 minute winter	38	10	116.517	0.117	26.5	0.7218	0.0000	OK
15 minute winter	39	10	116.492	0.092	26.5	0.5678	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	26	5.004	Tank	179.3	1.140	0.406	3.9033	
15 minute summer	27	8.000	28	0.0	0.000	0.000	1.4775	
15 minute winter	28	8.001	Tank	51.5	5.096	0.156	0.5511	
240 minute winter	Tank	1.012	36	111.4	0.843	0.693	5.3569	
15 minute winter	30	9.000	31	5.4	0.893	0.074	0.1305	
15 minute winter	31	9.001	32	11.0	1.370	0.123	0.1235	
15 minute winter	32	9.002	36	13.0	1.518	0.151	0.1222	
15 minute winter	34	10.000	35	5.7	0.657	0.156	0.1651	
15 minute winter	35	10.001	36	5.7	0.660	0.155	0.1295	
240 minute winter	36	Hydro-Brake®	37_out	114.5				1580.7
15 minute winter	38	6.000	23	25.7	0.671	0.329	0.9888	
15 minute winter	39	7.000	25	25.8	1.441	0.190	0.5122	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	116.640	0.409	362.3	5.5364	0.0000	OK
15 minute winter	2	11	116.617	0.630	692.9	7.8262	0.0000	OK
15 minute winter	3	11	116.536	0.715	981.2	8.1584	0.0000	OK
15 minute winter	4	11	116.442	0.860	1520.3	14.1808	0.0000	OK
15 minute winter	5	10	117.452	0.044	5.7	0.0615	0.0000	OK
15 minute winter	6	11	116.190	0.759	1523.5	2.2669	0.0000	OK
240 minute winter	7	224	116.036	0.822	368.4	2.4544	0.0000	OK
15 minute summer	8	1	116.200	0.000	0.0	0.0000	0.0000	OK
15 minute winter	9	11	116.191	0.291	151.0	1.9303	0.0000	OK
240 minute winter	10	224	116.036	0.486	58.3	2.3792	0.0000	OK
240 minute winter	11	224	116.036	1.422	426.2	4.5797	0.0000	SURCHARGED
240 minute winter	Pond	224	116.036	1.686	433.8	1507.5930	0.0000	SURCHARGED
240 minute winter	13	188	115.704	1.532	76.2	1.7327	0.0000	SURCHARGED
240 minute winter	14	172	115.421	1.401	76.2	2.0826	0.0000	SURCHARGED
60 minute winter	15	39	115.164	1.298	74.0	2.0084	0.0000	SURCHARGED
60 minute winter	16	37	114.933	1.229	109.8	3.0138	0.0000	SURCHARGED
15 minute summer	17	1	116.881	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	1	116.041	0.000	0.0	0.0000	0.0000	OK
15 minute winter	19	12	115.995	0.112	17.7	0.2665	0.0000	OK
15 minute winter	20	12	115.990	0.200	67.3	5.5471	0.0000	OK
15 minute winter	21	11	115.367	0.145	106.9	3.1330	0.0000	OK
15 minute winter	22	10	116.751	0.251	85.1	1.2230	0.0000	OK
15 minute winter	23	11	116.622	0.350	208.6	1.4623	0.0000	OK
15 minute winter	24	11	116.421	0.304	276.4	1.4585	0.0000	OK
15 minute winter	25	11	116.334	0.464	398.2	2.0838	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	330.0	1.010	0.288	27.5993	
15 minute winter	2	1.001	3	661.6	1.600	0.577	2.1608	
15 minute winter	3	1.002	4	972.2	1.426	0.566	49.5645	
15 minute winter	4	1.003	6	1518.0	2.126	0.884	32.2083	
15 minute winter	5	2.000	6	5.5	1.284	0.182	0.1861	
15 minute winter	6	1.004	7	1517.7	2.576	0.883	38.2577	
15 minute winter	7	1.005	11	1515.7	2.849	0.508	32.9621	
15 minute summer	8	3.000	9	0.0	0.000	0.000	2.9666	
15 minute winter	9	3.001	10	145.8	1.409	0.703	4.9963	
15 minute winter	10	3.002	11	249.3	1.568	0.558	3.2309	
15 minute winter	11	1.006	Pond	1714.7	4.268	0.644	26.4137	
480 minute winter	Pond	1.007	13	77.4	1.099	1.404	5.0259	
480 minute winter	13	1.008	14	77.4	1.100	1.405	4.3026	
480 minute winter	14	1.009	15	77.5	1.101	1.406	4.3027	
480 minute winter	15	1.010	16	77.6	1.102	1.408	4.5580	
30 minute winter	16	1.011	Tank	115.5	1.643	2.095	8.8542	
15 minute summer	17	4.000	18	0.0	0.000	0.000	0.0001	
15 minute summer	18	4.001	19	0.0	0.000	0.000	0.0846	
15 minute winter	19	4.002	20	17.3	0.553	0.259	0.9397	
15 minute winter	20	4.003	21	51.2	1.268	0.768	6.4494	
15 minute winter	21	4.004	Tank	107.8	3.884	0.468	1.9996	
15 minute winter	22	5.000	23	82.3	1.040	0.602	3.3987	
15 minute winter	23	5.001	24	211.3	1.346	0.617	9.7501	
15 minute winter	24	5.002	25	273.0	1.204	0.308	10.8383	
15 minute winter	25	5.003	26	388.6	1.279	0.632	25.4521	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	12	116.177	0.516	449.5	2.2621	0.0000	OK
15 minute summer	27	1	116.100	0.000	0.0	0.0000	0.0000	OK
15 minute winter	28	10	115.602	0.133	123.8	3.2282	0.0000	OK
240 minute winter	Tank	184	114.106	0.716	252.2	715.5691	0.0000	SURCHARGED
15 minute winter	30	10	116.291	0.064	13.4	0.1114	0.0000	OK
15 minute winter	31	10	115.888	0.087	27.3	0.1528	0.0000	OK
15 minute winter	32	10	115.450	0.103	32.2	0.1387	0.0000	OK
15 minute winter	34	10	114.370	0.101	14.2	0.1605	0.0000	OK
15 minute winter	35	11	114.275	0.101	14.0	0.1140	0.0000	OK
240 minute winter	36	180	114.034	0.745	131.4	1.2412	0.0000	SURCHARGED
15 minute summer	37_out	1	113.219	0.000	107.8	0.0000	0.0000	OK
15 minute winter	38	11	116.725	0.325	64.8	2.0022	0.0000	SURCHARGED
15 minute winter	39	10	116.545	0.145	64.8	0.8949	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	26	5.004	Tank	449.2	1.571	1.017	7.0422	
15 minute summer	27	8.000	28	0.0	0.000	0.000	2.5998	
15 minute winter	28	8.001	Tank	126.0	5.715	0.381	0.9831	
120 minute winter	Tank	1.012	36	131.1	0.862	0.816	6.3997	
15 minute winter	30	9.000	31	13.3	1.128	0.180	0.2523	
15 minute winter	31	9.001	32	27.0	1.695	0.301	0.2447	
15 minute winter	32	9.002	36	31.8	1.907	0.372	0.2390	
15 minute winter	34	10.000	35	14.0	0.815	0.382	0.3254	
15 minute winter	35	10.001	36	13.9	0.837	0.380	0.2502	
360 minute winter	36	Hydro-Brake®	37_out	131.2				3379.7
15 minute winter	38	6.000	23	62.3	0.884	0.795	1.8045	
15 minute winter	39	7.000	25	65.3	1.530	0.481	1.3118	

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	118.292	2.061	679.2	27.9055	0.0000	FLOOD RISK
15 minute winter	2	11	118.210	2.223	1247.2	27.5991	0.0000	FLOOD RISK
15 minute winter	3	11	118.102	2.281	1797.2	26.0312	0.0000	FLOOD RISK
15 minute winter	4	11	117.794	2.212	2786.5	36.4691	0.0000	SURCHARGED
15 minute winter	5	10	117.469	0.061	10.6	0.0856	0.0000	OK
15 minute winter	6	12	117.237	1.806	2695.1	5.3925	0.0000	SURCHARGED
360 minute winter	7	344	117.149	1.935	455.5	5.7786	0.0000	SURCHARGED
360 minute winter	8	344	117.149	0.949	4.4	1.3578	0.0000	SURCHARGED
360 minute winter	9	344	117.149	1.249	47.9	8.2790	0.0000	SURCHARGED
360 minute winter	10	344	117.149	1.599	75.2	7.8288	0.0000	SURCHARGED
360 minute winter	11	344	117.148	2.534	604.5	8.1615	0.0000	SURCHARGED
360 minute winter	Pond	344	117.148	2.798	517.7	3498.9880	0.0000	FLOOD RISK
360 minute winter	13	336	116.778	2.606	80.2	2.9478	0.0000	SURCHARGED
360 minute winter	14	328	116.448	2.429	80.3	3.6099	0.0000	SURCHARGED
360 minute winter	15	256	116.112	2.245	80.3	3.4737	0.0000	SURCHARGED
30 minute summer	16	19	116.062	2.358	171.2	5.7831	0.0000	SURCHARGED
15 minute summer	17	1	116.881	0.000	0.0	0.0000	0.0000	OK
15 minute winter	18	13	116.123	0.082	4.7	0.0923	0.0000	OK
15 minute winter	19	13	116.122	0.239	33.3	0.5699	0.0000	OK
15 minute winter	20	13	116.116	0.326	120.8	13.9620	0.0000	SURCHARGED
15 minute winter	21	11	115.420	0.198	184.8	5.6169	0.0000	OK
15 minute winter	22	12	117.020	0.520	159.4	2.5373	0.0000	SURCHARGED
15 minute winter	23	12	116.926	0.654	388.3	2.7324	0.0000	SURCHARGED
15 minute winter	24	12	116.741	0.624	500.8	2.9922	0.0000	OK
15 minute winter	25	11	116.672	0.802	680.4	3.6051	0.0000	SURCHARGED

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	611.6	1.004	0.533	46.3682	
15 minute winter	2	1.001	3	1211.5	1.912	1.056	3.0662	
15 minute winter	3	1.002	4	1758.6	2.039	1.024	61.8554	
15 minute winter	4	1.003	6	2685.0	3.113	1.563	38.9981	
15 minute winter	5	2.000	6	10.5	1.295	0.350	0.5321	
15 minute winter	6	1.004	7	2677.2	3.104	1.558	56.1991	
15 minute winter	7	1.005	11	2663.7	3.088	0.893	51.7729	
15 minute winter	8	3.000	9	-24.3	-0.275	-0.104	7.1230	
15 minute winter	9	3.001	10	257.7	1.635	1.243	7.3247	
15 minute winter	10	3.002	11	448.1	1.826	1.003	5.0407	
15 minute winter	11	1.006	Pond	3083.7	4.593	1.159	28.5964	
1440 minute winter	Pond	1.007	13	83.7	1.189	1.519	5.0259	
1440 minute winter	13	1.008	14	83.8	1.190	1.520	4.3026	
1440 minute winter	14	1.009	15	83.9	1.191	1.522	4.3027	
1440 minute winter	15	1.010	16	84.0	1.194	1.525	4.5580	
15 minute winter	16	1.011	Tank	146.4	2.080	2.655	8.8542	
15 minute summer	17	4.000	18	0.0	0.000	0.000	0.3074	
15 minute winter	18	4.001	19	-4.7	-0.161	-0.030	0.3028	
15 minute summer	19	4.002	20	27.3	0.636	0.409	1.5858	
15 minute winter	20	4.003	21	73.9	1.440	1.108	9.3406	
15 minute winter	21	4.004	Tank	180.6	4.106	0.783	2.5407	
15 minute winter	22	5.000	23	150.5	1.057	1.102	6.8039	
15 minute winter	23	5.001	24	371.2	1.431	1.084	17.5000	
15 minute winter	24	5.002	25	461.8	1.240	0.521	19.8848	
15 minute winter	25	5.003	26	674.7	1.533	1.096	36.6880	

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.39%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	11	116.385	0.724	783.2	3.1775	0.0000	OK
15 minute summer	27	1	116.100	0.000	0.0	0.0000	0.0000	OK
15 minute winter	28	10	115.651	0.182	232.2	5.6954	0.0000	OK
240 minute winter	Tank	232	114.983	1.593	417.2	1593.3960	0.0000	SURCHARGED
15 minute winter	30	10	116.317	0.090	25.2	0.1560	0.0000	OK
15 minute winter	31	10	115.930	0.130	51.3	0.2265	0.0000	OK
15 minute winter	32	10	115.503	0.156	60.4	0.2111	0.0000	OK
240 minute winter	34	232	114.910	0.641	6.0	1.0174	0.0000	SURCHARGED
240 minute winter	35	232	114.910	0.736	6.0	0.8325	0.0000	SURCHARGED
240 minute winter	36	232	114.910	1.621	132.0	2.7023	0.0000	SURCHARGED
15 minute summer	37_out	1	113.219	0.000	130.9	0.0000	0.0000	OK
15 minute winter	38	11	117.215	0.815	121.5	5.0277	0.0000	FLOOD RISK
15 minute winter	39	11	116.979	0.579	121.5	3.5690	0.0000	FLOOD RISK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	26	5.004	Tank	783.1	1.968	1.773	9.6344	
15 minute summer	27	8.000	28	0.0	0.000	0.000	3.8594	
15 minute winter	28	8.001	Tank	229.9	6.082	0.696	1.3189	
960 minute summer	Tank	1.012	36	131.1	0.858	0.816	6.3997	
15 minute winter	30	9.000	31	25.0	1.297	0.339	0.4118	
15 minute winter	31	9.001	32	50.8	1.908	0.566	0.4079	
15 minute winter	32	9.002	36	59.8	2.184	0.699	0.3922	
15 minute winter	34	10.000	35	26.3	0.930	0.718	0.5360	
15 minute winter	35	10.001	36	26.1	0.986	0.712	0.3982	
240 minute winter	36	Hydro-Brake®	37_out	132.0				3168.2
15 minute winter	38	6.000	23	110.1	1.564	1.406	1.8045	
15 minute winter	39	7.000	25	107.4	1.560	0.791	1.7975	

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APPENDIX F – DRAINAGE INSPECTION & MAINTENANCE SCHEDULE

Maintenance Schedule	Required Action	Typical Frequency
Below Ground Drainage Pipes, Manholes, Outfall headwalls, ditches, trash screens etc		
Regular Maintenance	Lift covers and inspect manholes for evidence of debris and silt deposits and evidence of blockages (standing water). Carry out CCTV survey if required. Inspect ditches, trash screens, headwalls etc. and clear debris and silt deposits to avoid restriction to flow.	Quarterly or following significant rainfall events.
Remedial Actions	High pressure jetting and/or remove minor blockages and silt build up	As required – 20% loss of pipe cross-section
	Replace broken access covers, remove major blockages, repair structurally defective pipework	As required
Flow control chamber		
Regular Maintenance	Lift covers and inspect chamber fore evidence of debris and silt deposits and evidence of blockages. Test bypass door operating correctly.	Quarterly or following significant rainfall events.
Remedial Actions	High pressure jetting and or remove minor blockages and silt build up	As required
	Replace broken access covers, remove major blockages, repair/replace defective flow control devices	As required
Linear channel drains and gullies		
Regular Maintenance	Lift access covers and inspect for silt/debris accumulation	Quarterly or following significant rainfall events.
Remedial Actions	Replace broken access covers, gratings	Annually
	High pressure jetting and/or remove minor blockages and silt build up	As required
Rainwater pipes		
Regular Maintenance	Inspect rainwater goods for evidence of leaking pipework	Monthly (or as required)
Occasional Maintenance	Remove rodding eyes and carry out high pressure jetting to remove any debris	Quarterly
Remedial Actions	Replace cracked / leaking pipework	As required
Ponds		
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season)

Maintenance Schedule	Required Action	Typical Frequency
	Cut the meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at the start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Check any mechanical devices, e.g. penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay.	Every 1 to 5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
Occasional Maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, eg every 25–50 years
Remedial actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required

Maintenance Schedule	Required Action	Typical Frequency
	Realign rip-rap or repair other damage	As required
	Repair / rehabilitate inlets, outlets and overflows	As required
Attenuation Tank (Maintenance activities recommended by the manufacturer should be added to this schedule where not included)		
Regular maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation.	Six monthly
	Change the filter media	As recommended by manufacturer
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor performance	Six monthly
	Inspect sediment accumulation rates and filter media and establish appropriate replacement frequencies.	Monthly during first half of the year, then every six months