

Buckley Road Industrial Estate, Buckley Rd, OL12 9EF

Reference: 609 -Rev - V1

Jan-24

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Rev 1	Produced by: ARD	079 721 44579	arge@rida-reports.co.uk
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Purpose of this report

- 1.1 The purpose of this statement is to accompany the technical drawings and details showing the proposed Surface Water drainage system as part of the planning application for this development.

Site Characteristics

- 2.1 The site background is clearly identified through answers to the questions in table 1 below.

Table 1: Site Characteristics . See appendix B for support documentation

TOPIC	QUESTION	ANSWER
Protected species or habitat	Is the site near to designated sites and priority habitats?	Yes
Flood Plain	Is the site located in the flood plain?	No
Soils and Geology	Soil permeability? - See appendix B for results	No
Space constraints	Space for SuDS components?	Yes
Topography	Sited on a flat site?	Yes
	Sited on a steep slope (5-15%)	No
	Sited on a very steep slope (>15%)	No
Groundwater	Is the site at groundwater flood risk?	Yes
Contaminated land	Are there contaminated soils on site?	Unknown
Source Protection Zone	Is the site within a SPZ 3?	No
Runoff characteristics	Is the development in a high risk flooding area?	No

Existing and Proposed Site

- 2.2 The distribution of catchment areas for existing and proposed site is as per table 2 below. See appendix A for details

Table 2 : Existing and Proposed catchment areas in hectares

Description	Existing Site	Proposed Site
Impermeable Areas	0.000	0.071
Permeable Areas		
Connected to Drainage	0.000	0.208
Self Draining Areas	0.000	0.000
Areas Draining Away from drainage System	0.279	0.000
Total Development Area	0.279	0.279

- 2.3 It has been assumed that the positively drained areas will have different runoff coefficients depending on the type of surface as follow:

Impermeable Surface	1.0
Permeable Surfaces	0.5
Grass Areas	0.3

Evaluation of Discharge Point

3.1 The SuDS design takes into account Building Regulations Section H3 and the National Planning Practice Guidance. The aim is to discharge surface water run-off as high up the drainage hierarchy, as reasonably practicable:

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer, highway drain, or another drainage system;
4. to a combined sewer.

3.2 The discharge point has been evaluated following the NPPG and Building regulations. The findings are in table 3 below.

Table 3: Drainage Hierarchy evaluation

Superficial geology classification	The British Geological Society records show that the superficial deposits are Alluvium - Clay, Silt, Sand and Gravel.
Bedrock geology classification	The British Geological Society records of the site show that it is located within the Milnrow Sandstone - Sandstone.
Landis Top Soil Infiltration	The SOILSCAPE's records of the site show that it is located within an area of impeded drainage soils.
Groundwater	The British Geological Survey's flood risk susceptibility maps show that the development has potential for groundwater flooding above ground level. Groundwater levels would tend to vary seasonally and are influenced by ground and meteorological conditions and proximity to water features.
Is infiltration feasible?	Infiltration is not possible on this site due to the findings on groundwater and soils within the site. The groundwater level is likely to be very high on site.
Is a discharge to a watercourse possible?	There is an existing watercourse near the site. It is possible to connect to the watercourse.
Is a discharge to a surface water sewer possible?	There is no surface water sewer in the proximity to the site.
Is a discharge to a combined sewer possible?	There is no combined water sewers in the proximity to the site.

Existing and Proposed Peak Run-off Calculations

- 4.1 The current site is a Greenfield. The peak runoff rate for the existing site was calculated as per table 4 and discharge rates as per table 5.

Table 4: Peak run-off rate calculation method for existing site

Method Used	Calculation Method
☒	Report 124 Flood Estimation for Small Catchments method has been used to estimate the site peak flow rates
☐	This is a brownfield site, runoff rates are calculated in accordance with best practice simulation modelling and using the modified rational method
☐	This is a brownfield site where the pre-development drainage isn't known. The runoff rates are calculated using the Greenfield model with soil type 5

- 4.2 The runoff flow produced by the development will be controlled as per table 5.

Table 5: Runoff discharge rate control

Control Used	Description of runoff discharge
☐	Water will be discharged into the ground via a SuDS as described in table 6 below
☒	The peak discharge rate has been reduced to Greenfield Qbar flow
☐	The peak discharge rate has been taken as 0.7 l/s as it is not possible to reduce it to the Greenfield Qbar rate
☐	The peak discharge rate has been reduced to Brownfield pre-development 1 in 1 flow
☐	The peak discharge rate has been reduced by 60% from the existing Brownfield pre-development 1 in 2 flow rate

Run-off flows

- 4.3 The size of the SuDS has been calculated for all events up to the 1 in 100 including an allowance for climate change of 40%. As per tables above, it is proposed to discharge at a rate of 2.5 l/s. See table 6 for values and appendix C for calculations.

Table 6: Peak discharge rates for SuDS

Return Period Event	Discharge Rate (l/s)			Infiltration Rate (m/hr)
	Existing Greenfield	Existing Brownfield	Proposed	
Qbar	2.50	N/A	N/A	0.0000
1 in 1	2.20	N/A	2.5	0.0000
1 in 2	2.30	N/A	2.5	0.0000
1 in 30	4.20	N/A	2.5	0.0000
1 in 30 + CC	N/A	N/A	2.5	0.0000
1 in 100	5.20	N/A	2.5	0.0000
1 in 100 + CC	N/A	N/A	2.5	0.0000

Proposed Sustainable Drainage System

- 5.1 The following sustainable drainage systems have been used for this site. The drainage design uses these drainage system through out the site. See table 7 for details.

Table 7: Proposed Drainage System

SuDS Proposed	Feasible	Proposed
Use of green roofs	No	No
Store rainwater for later use	No	No
Use infiltration techniques, for instance soakaways, permeable surfaces	No	No
Attenuate rainwater in ponds or open water features for gradual release	No	No
Attenuate rainwater by storing in tanks or sealed water features for gradual release	Yes	Yes
Discharge Point Proposed		
Discharge rainwater direct to a watercourse	Yes	Yes
Discharge rainwater to a surface water sewer/drain	No	No
Discharge rainwater to the combined sewer	No	No

- 5.2 The location and details of the SuDS can be seen drainage layouts in appendix D. Calculations are in appendix C.
- 5.3 The drainage calculations demonstrate:
- No flooding occurs for the 1 in 30 storm events.
 - Any flooding for the 1 in 100 year + 40% climate change event can be safely contained on site
- 5.4 The proposed drainage strategy presents one possible solution to demonstrate that the development can be sustainably drained, to comply with the requirements of the NPPF. Other solutions may be feasible and may prove to be better suited to the site. These will become apparent during the detailed design stage. The strategy above should not therefore be interpreted as the definitive scheme solution.

Management of Exceedance Flows

- 5.5 The drainage network has been designed to attenuate surface runoff for all events up to and including the 1% AEP + CC(1 in 100 years). However consideration has been given to what may happen when the design capacity of the surface water drainage network is exceeded. Surface water will flow to the lowest points within the site. The flood risk to the buildings would therefore remain low. See appendix D.

Water Quality Assessment

- 5.6 The pollution hazard indices for this development has been taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2. The tables below shows the mitigation measure for the highest pollution hazard indices presented in the development.

Table 8: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Commercial/industrial roofs	Low	0.3	0.2	0.05
TOTAL		0.3	0.2	0.05

Table 9: SuDS Mitigation Indices for worst case**

Type of SuDS	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable paving	0.7	0.6	0.7
TOTAL		0.6	0.7

** Values already reduced as per CIRIA C753

- 5.7 It is demonstrated that the proposed sustainable systems exceeds the required pollution indices and provides sufficient treatment as part of the surface water management train in accordance with the 2015 SuDS Manual (CIRIA C753)

Maintenance and Management plan responsibility

- 6.1 The SuDS will be maintained by The Owner the property

Maintenance and Management plan for proposed SuDS

- 6.2 The maintenance and Management Plan Guidance from the SuDS Manual, CIRIA C753 (CIRIA, 2015) is to be followed for the effective maintenance of the proposed SuDS techniques outlined above. The maintenance for SuDS structures are as follow:

INLETS, OUTLETS, CONTROLS AND INSPECTION CHAMBERS	
Regular Maintenance	Frequency
Inlets, outlets and surface control structures Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage. Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris	Monthly Monthly
Inspection chambers and below ground control chambers	
Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn	Annually
Occasional Maintenance	
Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage	As necessary
Remedial work	Frequency
Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary.	As required
Repair physical damage if necessary.	As required

Operation and maintenance requirements for pervious pavements		
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

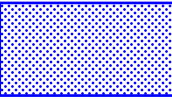
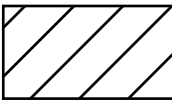
Appendix A

Drawing Scale Bar	
Drawing scale	Line length
1:5	= 0.25 metres
1:10	= 0.5 metres
1:20	= 1.0 metres
1:25	= 1.25 metres
1:50	= 2.5 metres
1:100	= 5.0 metres
Measure length of line above for checking of scale	
←-----→	

Drawing scale	Line length
1:200	= 10.0 metres
1:250	= 12.5 metres
1:500	= 25.0 metres
1:1000	= 50.0 metres
1:1250	= 62.5 metres
1:2500	= 125 metres

GENERAL NOTES

KEY

-  PERMEABLE AREAS
-  IMPERMEABLE AREAS
-  STUDY AREA

Rev	Details	Date	By	Chd

Drawing Status: **PRELIMINARY**



4 Bean Acre Road, Hook Norton, Banbury, Oxfordshire
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www.rida-reports.co.uk

Client: _____

Project:
XXXXXXXXXXXXXXXXXXXXXXXXXXXX

Drawing:
**Existing and Proposed Areas
Permeable and Impermeable**



EXISTING SITE
1:500

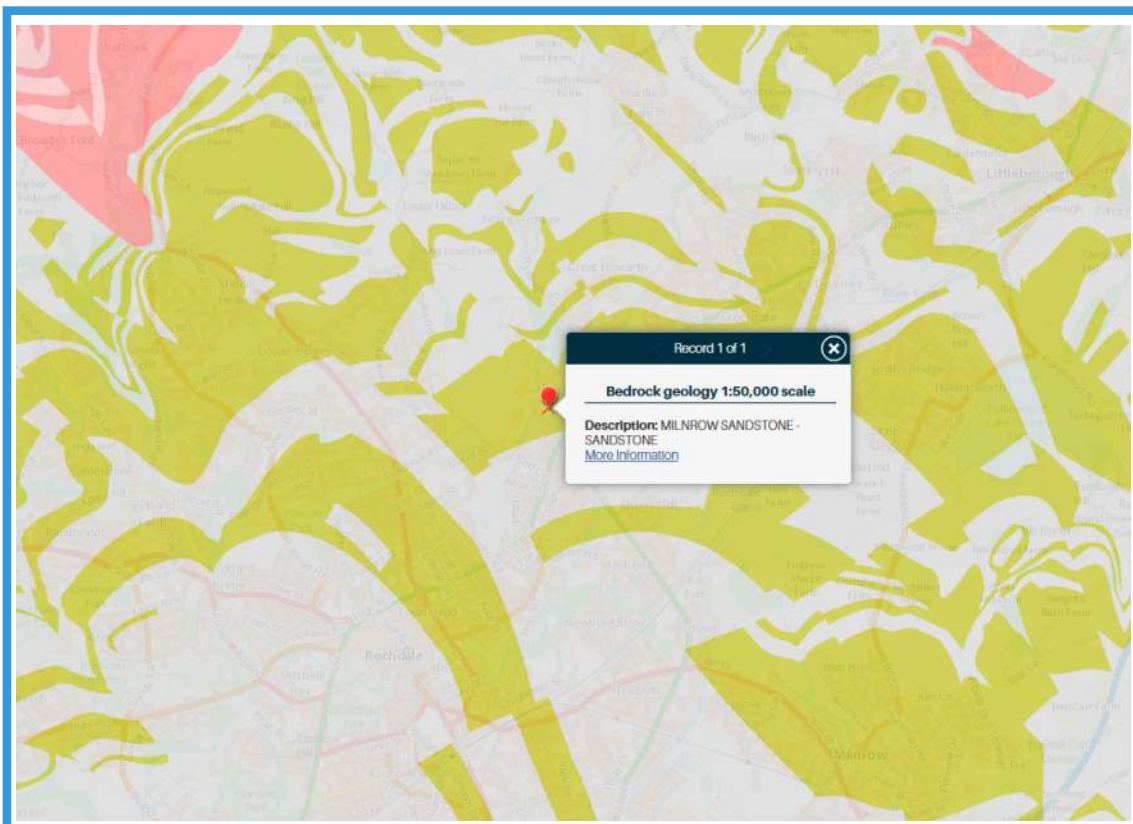


PROPOSED SITE
1:500

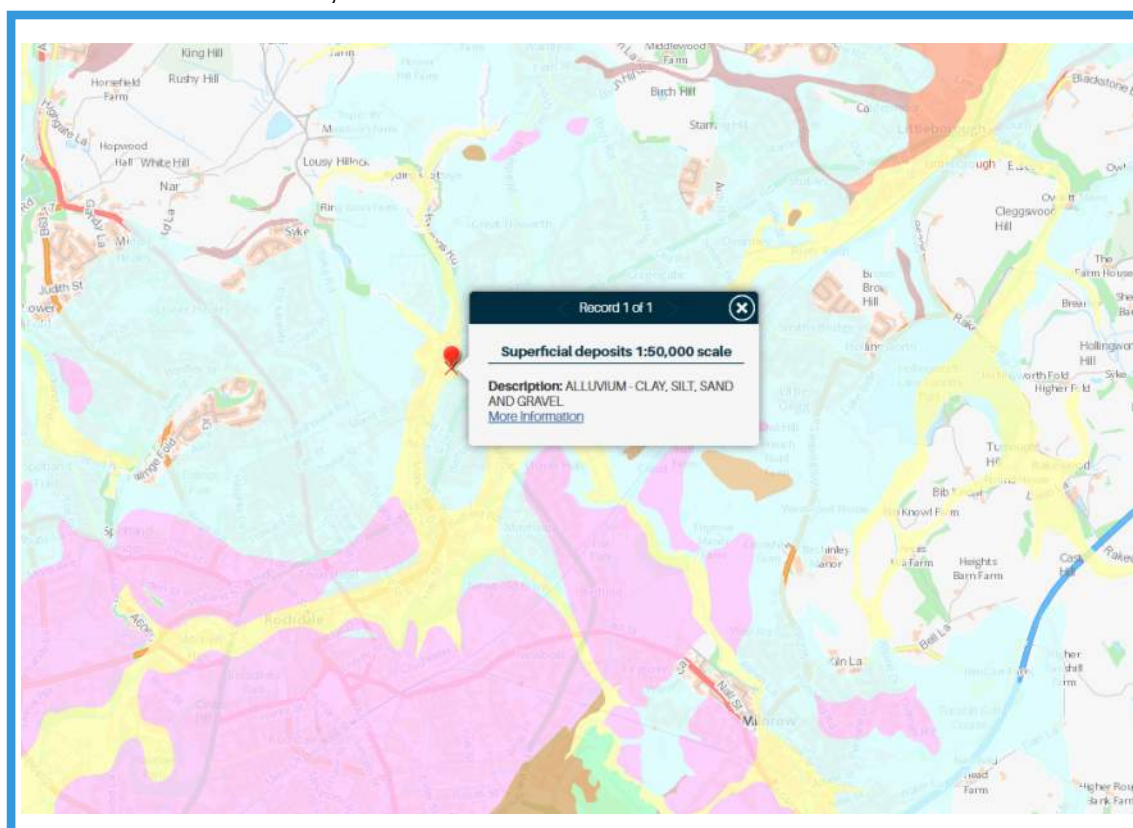
Appendix B



GEOLOGY - BEDROCK - MILNROW SANDSTONE - SANDSTONE

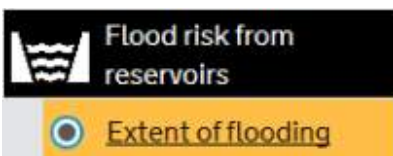
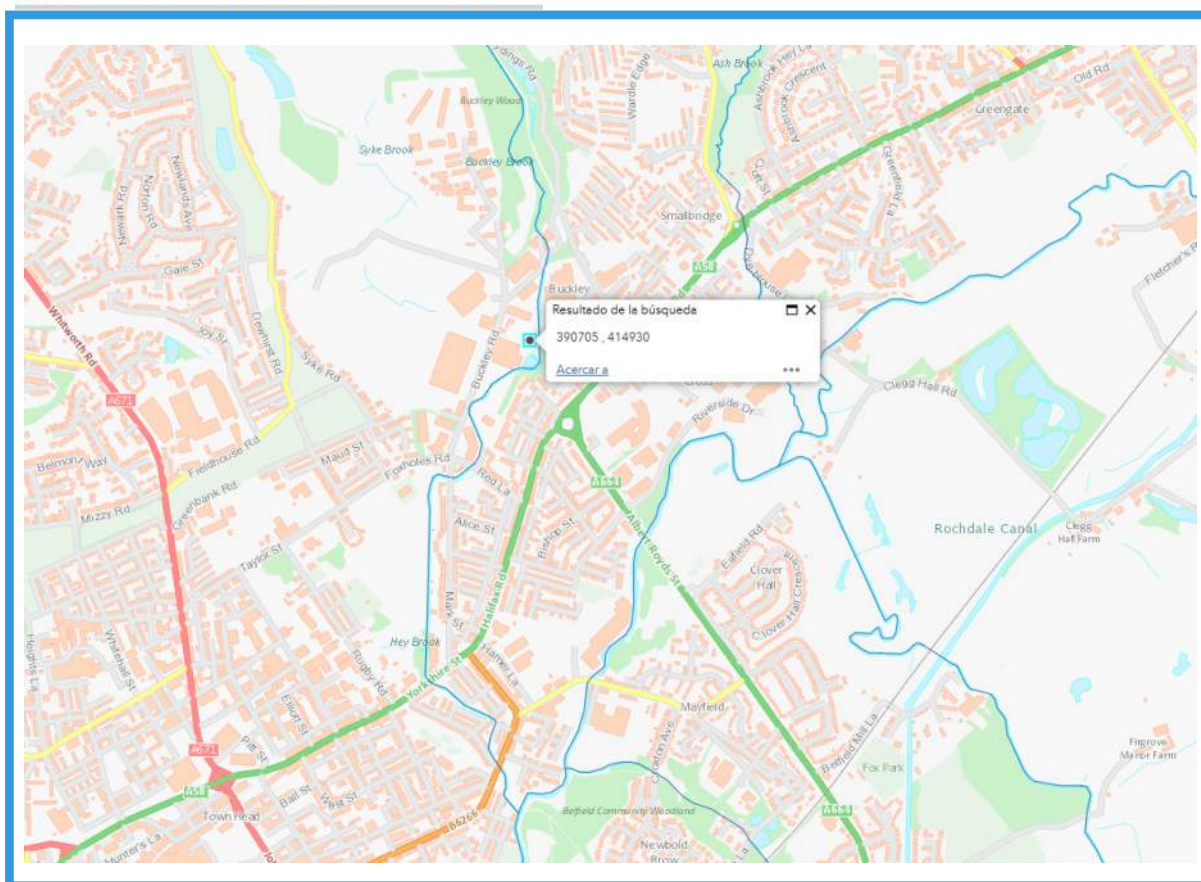


GEOLOGY - SUPERFICIAL DEPOSITS - ALLUVIUM - CLAY, SILT, SAND AND GRAVEL





Main River Map

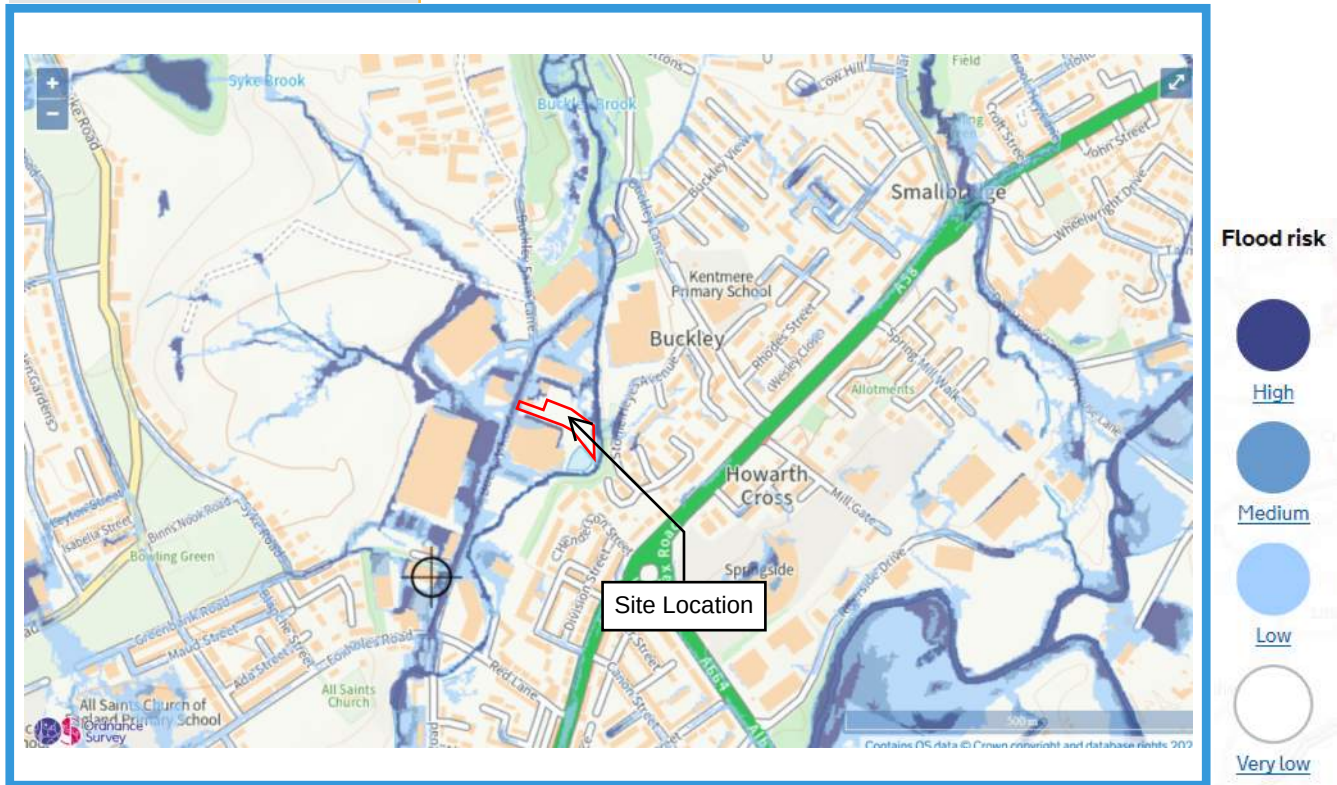


SITE FLOOD RISK

 **Flood risk from surface water**

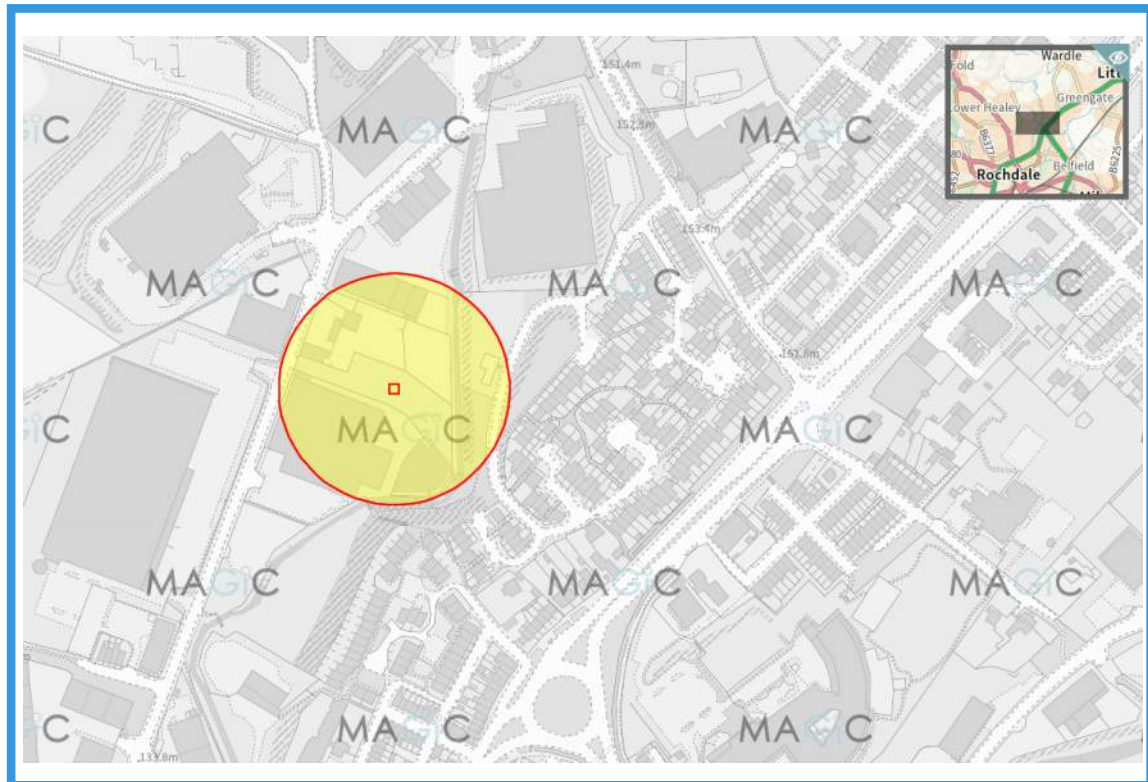
 **Extent of flooding**

High risk means a chance of flooding greater than 3.3% (1:30)
 Medium risk means a chance of flooding of btw 1% (1:100) and 3.3%
 Low risk means a chance of flooding of btw 0.1% (1:1000) and 1%
 Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding



Over 900mm 300 to 900mm Below 300mm

MAGIC RESULTS



Site Check Results

Site Check Report generated on Thu Jan 11 2024

You selected the location: Centroid Grid Ref: SD90681493

The following features have been found in your search area:

Aquifer Designation Map (Bedrock) (England)

Typology

Secondary A

Aquifer Designation Map (Superficial Drift) (England)

Typology

Secondary (undifferentiated)

Typology

Secondary A

Source Protection Zones merged (England)

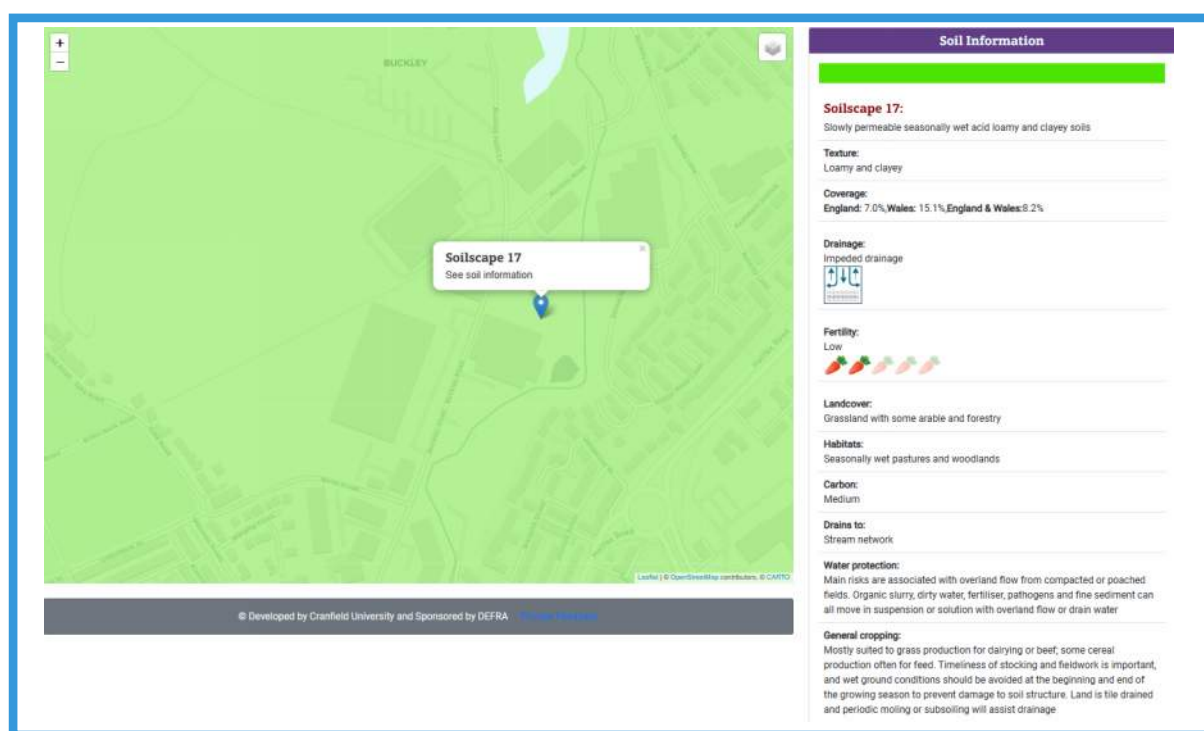
No Features found

OK

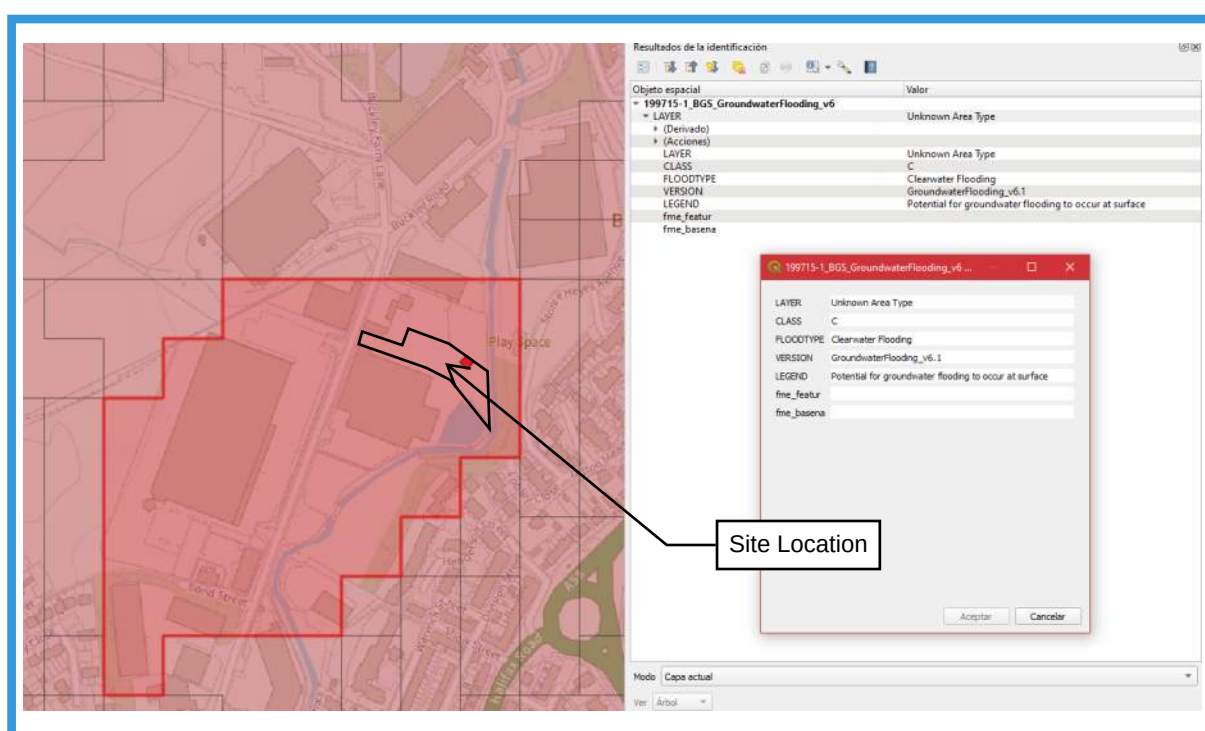
Cancel

Export to CSV

Print



GROUND WATER FLOOD RISK



Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
390668/414916

Created
11 Jan 2024 17:01

Your selected location is in flood zone 2, an area with a medium probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
390668/414916

Scale
1:2500

Created
11 Jan 2024 17:01

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

0 20 40 60m

SSSI Impact Risk Zones - to assess planning applications for likely impacts on SSSIs/SACs/SPAs & Ramsar sites (England)

1. DOES PLANNING PROPOSAL FALL INTO ONE OR MORE OF 2. IF YES, CHECK THE CORRESPONDING DESCRIPTION(S) BELOW. LPA SHOULD CONSULT THE CATEGORIES BELOW? NATURAL ENGLAND ON LIKELY RISKS FROM THE FOLLOWING:

All Planning Applications Infrastructure	Pipelines and underground cables, pylons and overhead cables. Any transport proposal including road, rail and by water (excluding routine maintenance). Airports, helipads and other aviation proposals.
Wind & Solar Energy Minerals, Oil & Gas	Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions etc. Oil & gas exploration/extraction.
Rural Non Residential Residential Rural Residential Air Pollution	Any industrial/agricultural development that could cause AIR POLLUTION (incl: industrial processes, livestock & poultry units with floorspace > 500m², slurry lagoons & digestate stores > 200m², manure stores > 250t).
Combustion	General combustion processes >20MW energy input. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion.
Waste Composting	Landfill. Incl: inert landfill, non-hazardous landfill, hazardous landfill. Any composting proposal with more than 75000 tonnes maximum annual operational throughput. Incl: open windrow composting, in-vessel composting, anaerobic digestion, other waste management.
Discharges Water Supply	Large infrastructure such as warehousing / industry where total net additional gross internal floorspace following development is 1,000m² or more.
Notes 1 Notes 2 GUIDANCE - How to use the Impact Risk Zones	/Metadata_for_magic/SSSI IRZ User Guidance MAGIC.pdf

Aquifer Designation Map (Bedrock) (England)

Typology	Secondary A
----------	-------------

Aquifer Designation Map (Superficial Drift) (England)

Typology	Secondary A
----------	-------------

Soilscape (England)

Reference	17
Name	SLOWLY PERMEABLE SEASONALLY WET ACID LOAMY AND CLAYEY SOILS
Main Surface Texture Class	LOAMY
Natural Drainage Type	IMPEDED DRAINAGE
Natural Fertility	LOW
Characteristic Semi-natural Habitats	SEASONALLY WET PASTURES AND WOODLANDS MAINLY, BUT NOT EXCLUSIVELY, ON THE UPLAND FRINGE
Main Land Cover	GRASSLAND WITH SOME ARABLE AND FORESTRY
Hyperlink	/Metadata_for_magic/soilscape_summary.pdf

Areas of Outstanding Natural Beauty (England)
No Features found

Limestone Pavement Orders (England)
No Features found

Local Nature Reserves (England) - points
No Features found

Local Nature Reserves (England)
No Features found

Moorland Line (England)
No Features found

National Nature Reserves (England) - points
No Features found

National Nature Reserves (England)
No Features found

National Parks (England)
No Features found

Ramsar Sites (England) - points
No Features found

Ramsar Sites (England)
No Features found

Proposed Ramsar Sites (England) - points
No Features found

Proposed Ramsar Sites (England)
No Features found

Sites of Special Scientific Interest Units (England) - points
No Features found

Sites of Special Scientific Interest Units (England)
No Features found

Sites of Special Scientific Interest (England) - points
No Features found

Sites of Special Scientific Interest (England)
No Features found

Special Areas of Conservation (England) - points
No Features found

Special Areas of Conservation (England)
No Features found

Possible Special Areas of Conservation (England) - points
No Features found

Possible Special Areas of Conservation (England)
No Features found

Special Protection Areas (England) - points
No Features found

Special Protection Areas (England)
No Features found

Potential Special Protection Areas (England) - points
No Features found

Potential Special Protection Areas (England)
No Features found

Biosphere Reserves (England) - points
No Features found

Biosphere Reserves (England)
No Features found

Less Favoured Areas (England)
No Features found

Nitrate Vulnerable Zones 2017 Designations (England)
No Features found

Wild Bird General Licence Protected Sites Condition Zone (England)
No Features found

Source Protection Zones merged (England)
No Features found

Appendix C



Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.0
Summer CV	1.000	2 year (l/s)	0.0
Winter CV	1.000	30 year (l/s)	0.0
Analysis Speed	Normal	100 year (l/s)	0.0
Skip Steady State	x	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
2	0	0	0
30	0	0	0
30	40	0	0
100	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.70
Greenfield Method	IH124	Growth Factor 100 year	2.08
Positively Drained Area (ha)	0.279	Betterment (%)	0
SAAR (mm)	1178	QBar	2.5
Soil Index	4	Q 1 year (l/s)	2.2
SPR	0.47	Q 2 year (l/s)	2.3
Region	10	Q 30 year (l/s)	4.2
Growth Factor 1 year	0.87	Q 100 year (l/s)	5.2
Growth Factor 2 year	0.93		



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Inverts
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	6.00	Enforce best practice design rules	✓

Circular Link Type

Shape	Circular	Auto Increment (mm)	75
Barrels	1	Follow Ground	x

Available Diameters (mm)

100 | 150

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Development	0.078	6.00	138.750	450	0.130	0.190	0.350
Permeable Surface	0.140	6.00	138.750		10.094	0.159	0.500
Outfall			138.750	450	20.159	0.025	0.600

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	Development	Permeable Surface	10.000	0.600	138.400	138.250	0.150	66.7	225	6.10	50.0
1.001	Permeable Surface	Outfall	10.000	0.600	138.250	138.150	0.100	100.0	225	6.23	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	1.604	63.8	14.1	0.125	0.275	0.078	0.0	72	1.294
1.001	1.307	52.0	39.3	0.275	0.375	0.218	0.0	146	1.432

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	10.000	66.7	225	Circular	138.750	138.400	0.125	138.750	138.250	0.275
1.001	10.000	100.0	225	Circular	138.750	138.250	0.275	138.750	138.150	0.375

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Development	450	Manhole	Adoptable	Permeable Surface		Junction	
1.001	Permeable Surface		Junction		Outfall	450	Manhole	Adoptable

Node Permeable Surface Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.001	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0083-2500-0500-2500
Invert Level (m)	138.250	Min Outlet Diameter (m)	0.100
Design Depth (m)	0.500	Min Node Diameter (mm)	1200
Design Flow (l/s)	2.5		

Node Permeable Surface Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	138.250	Slope (1:X)	400.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.350
Safety Factor	2.0	Width (m)	45.607	Inf Depth (m)	
Porosity	0.30	Length (m)	45.607		

Approval Settings

Node Size	x	Coordinates	x	Full Bore Velocity	x	Time to Half Empty	✓
Node Losses	x	Crossings	x	Proportional Velocity	x	Return Period (years)	10
Link Size	x	Cover Depth	x	Surcharged Depth	x	Discharge Rates	x
Link Length	x	Backdrops	x	Flooding	x	Discharge Volume	x

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	2 year 60 minute winter	40.727	16.200
1 year 15 minute winter	76.857	30.991	2 year 120 minute summer	37.449	9.897
1 year 30 minute summer	71.439	20.215	2 year 120 minute winter	24.880	9.897
1 year 30 minute winter	50.133	20.215	2 year 180 minute summer	28.672	7.378
1 year 60 minute summer	48.435	12.800	2 year 180 minute winter	18.637	7.378
1 year 60 minute winter	32.179	12.800	2 year 240 minute summer	22.636	5.982
1 year 120 minute summer	30.053	7.942	2 year 240 minute winter	15.039	5.982
1 year 120 minute winter	19.966	7.942	2 year 360 minute summer	17.235	4.435
1 year 180 minute summer	23.233	5.979	2 year 360 minute winter	11.203	4.435
1 year 180 minute winter	15.102	5.979	2 year 480 minute summer	13.550	3.581
1 year 240 minute summer	18.475	4.882	2 year 480 minute winter	9.003	3.581
1 year 240 minute winter	12.274	4.882	2 year 600 minute summer	11.088	3.033
1 year 360 minute summer	14.169	3.646	2 year 600 minute winter	7.576	3.033
1 year 360 minute winter	9.210	3.646	2 year 720 minute summer	9.878	2.647
1 year 480 minute summer	11.185	2.956	2 year 720 minute winter	6.639	2.647
1 year 480 minute winter	7.431	2.956	2 year 960 minute summer	8.113	2.136
1 year 600 minute summer	9.182	2.511	2 year 960 minute winter	5.374	2.136
1 year 600 minute winter	6.274	2.511	2 year 1440 minute summer	5.891	1.579
1 year 720 minute summer	8.203	2.199	2 year 1440 minute winter	3.959	1.579
1 year 720 minute winter	5.513	2.199	30 year 15 minute summer	268.706	76.035
1 year 960 minute summer	6.768	1.782	30 year 15 minute winter	188.566	76.035
1 year 960 minute winter	4.483	1.782	30 year 30 minute summer	174.929	49.499
1 year 1440 minute summer	4.949	1.326	30 year 30 minute winter	122.757	49.499
1 year 1440 minute winter	3.326	1.326	30 year 60 minute summer	116.589	30.811
2 year 15 minute summer	141.566	40.058	30 year 60 minute winter	77.459	30.811
2 year 15 minute winter	99.345	40.058	30 year 120 minute summer	70.438	18.615
2 year 30 minute summer	91.753	25.963	30 year 120 minute winter	46.797	18.615
2 year 30 minute winter	64.388	25.963	30 year 180 minute summer	53.298	13.715
2 year 60 minute summer	61.301	16.200	30 year 180 minute winter	34.645	13.715

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year 240 minute summer	41.604	10.995	100 year 60 minute winter	101.841	40.510
30 year 240 minute winter	27.641	10.995	100 year 120 minute summer	92.562	24.461
30 year 360 minute summer	31.221	8.034	100 year 120 minute winter	61.496	24.461
30 year 360 minute winter	20.295	8.034	100 year 180 minute summer	69.806	17.964
30 year 480 minute summer	24.324	6.428	100 year 180 minute winter	45.376	17.964
30 year 480 minute winter	16.160	6.428	100 year 240 minute summer	54.269	14.342
30 year 600 minute summer	19.756	5.404	100 year 240 minute winter	36.055	14.342
30 year 600 minute winter	13.498	5.404	100 year 360 minute summer	40.484	10.418
30 year 720 minute summer	17.490	4.687	100 year 360 minute winter	26.315	10.418
30 year 720 minute winter	11.754	4.687	100 year 480 minute summer	31.414	8.302
30 year 960 minute summer	14.215	3.743	100 year 480 minute winter	20.871	8.302
30 year 960 minute winter	9.416	3.743	100 year 600 minute summer	25.431	6.956
30 year 1440 minute summer	10.161	2.723	100 year 600 minute winter	17.376	6.956
30 year 1440 minute winter	6.829	2.723	100 year 720 minute summer	22.452	6.017
30 year +40% CC 15 minute summer	376.189	106.449	100 year 720 minute winter	15.089	6.017
30 year +40% CC 15 minute winter	263.992	106.449	100 year 960 minute summer	18.166	4.784
30 year +40% CC 30 minute summer	244.900	69.298	100 year 960 minute winter	12.033	4.784
30 year +40% CC 30 minute winter	171.860	69.298	100 year 1440 minute summer	12.896	3.456
30 year +40% CC 60 minute summer	163.225	43.136	100 year 1440 minute winter	8.667	3.456
30 year +40% CC 60 minute winter	108.443	43.136	100 year +40% CC 15 minute summer	488.233	138.153
30 year +40% CC 120 minute summer	98.613	26.061	100 year +40% CC 15 minute winter	342.620	138.153
30 year +40% CC 120 minute winter	65.516	26.061	100 year +40% CC 30 minute summer	320.551	90.705
30 year +40% CC 180 minute summer	74.617	19.202	100 year +40% CC 30 minute winter	224.948	90.705
30 year +40% CC 180 minute winter	48.503	19.202	100 year +40% CC 60 minute summer	214.603	56.713
30 year +40% CC 240 minute summer	58.245	15.393	100 year +40% CC 60 minute winter	142.577	56.713
30 year +40% CC 240 minute winter	38.697	15.393	100 year +40% CC 120 minute summer	129.587	34.246
30 year +40% CC 360 minute summer	43.710	11.248	100 year +40% CC 120 minute winter	86.094	34.246
30 year +40% CC 360 minute winter	28.413	11.248	100 year +40% CC 180 minute summer	97.729	25.149
30 year +40% CC 480 minute summer	34.053	8.999	100 year +40% CC 180 minute winter	63.526	25.149
30 year +40% CC 480 minute winter	22.624	8.999	100 year +40% CC 240 minute summer	75.977	20.078
30 year +40% CC 600 minute summer	27.658	7.565	100 year +40% CC 240 minute winter	50.477	20.078
30 year +40% CC 600 minute winter	18.898	7.565	100 year +40% CC 360 minute summer	56.677	14.585
30 year +40% CC 720 minute summer	24.485	6.562	100 year +40% CC 360 minute winter	36.841	14.585
30 year +40% CC 720 minute winter	16.456	6.562	100 year +40% CC 480 minute summer	43.979	11.622
30 year +40% CC 960 minute summer	19.901	5.240	100 year +40% CC 480 minute winter	29.219	11.622
30 year +40% CC 960 minute winter	13.183	5.240	100 year +40% CC 600 minute summer	35.604	9.738
30 year +40% CC 1440 minute summer	14.225	3.812	100 year +40% CC 600 minute winter	24.327	9.738
30 year +40% CC 1440 minute winter	9.560	3.812	100 year +40% CC 720 minute summer	31.433	8.424
100 year 15 minute summer	348.738	98.681	100 year +40% CC 720 minute winter	21.125	8.424
100 year 15 minute winter	244.728	98.681	100 year +40% CC 960 minute summer	25.432	6.697
100 year 30 minute summer	228.965	64.789	100 year +40% CC 960 minute winter	16.847	6.697
100 year 30 minute winter	160.677	64.789	100 year +40% CC 1440 minute summer	18.055	4.839
100 year 60 minute summer	153.288	40.510	100 year +40% CC 1440 minute winter	12.134	4.839



Results for 1 year Critical Storm Duration. Lowest mass balance: 99.94%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	10	138.470	0.070	12.4	0.0112	0.0000	OK
240 minute summer	Permeable Surface	164	138.347	0.097	11.2	25.6458	0.0000	OK
15 minute summer	Outfall	1	138.150	0.000	1.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Permeable Surface	12.4	1.499	0.195	0.0955	
240 minute summer	Permeable Surface	Hydro-Brake®	Outfall	2.4				39.5



Results for 2 year Critical Storm Duration. Lowest mass balance: 99.94%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	10	138.480	0.080	16.0	0.0128	0.0000	OK
240 minute summer	Permeable Surface	172	138.359	0.109	13.7	32.6592	0.0000	OK
15 minute summer	Outfall	1	138.150	0.000	2.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Permeable Surface	16.0	1.612	0.251	0.1148	
240 minute summer	Permeable Surface	Hydro-Brake®	Outfall	2.5				46.9



Results for 30 year Critical Storm Duration. Lowest mass balance: 99.94%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	10	138.514	0.114	30.4	0.0182	0.0000	OK
180 minute winter	Permeable Surface	176	138.419	0.169	20.6	69.5922	0.0000	OK
15 minute summer	Outfall	1	138.150	0.000	2.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Permeable Surface	30.4	1.927	0.477	0.1816	
180 minute winter	Permeable Surface	Hydro-Brake®	Outfall	2.5				55.4



Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.94%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	11	138.540	0.140	42.5	0.0223	0.0000	OK
240 minute winter	Permeable Surface	236	138.477	0.227	23.4	105.8913	0.0000	FLOOD RISK
15 minute summer	Outfall	1	138.150	0.000	2.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Permeable Surface	42.5	2.111	0.666	0.2307	
240 minute winter	Permeable Surface	Hydro-Brake®	Outfall	2.5				63.2



Results for 100 year Critical Storm Duration. Lowest mass balance: 99.94%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	11	138.534	0.134	39.4	0.0212	0.0000	OK
240 minute winter	Permeable Surface	236	138.463	0.213	21.8	97.2530	0.0000	OK
15 minute summer	Outfall	1	138.150	0.000	2.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Permeable Surface	39.4	2.069	0.618	0.2186	
240 minute winter	Permeable Surface	Hydro-Brake®	Outfall	2.5				63.2

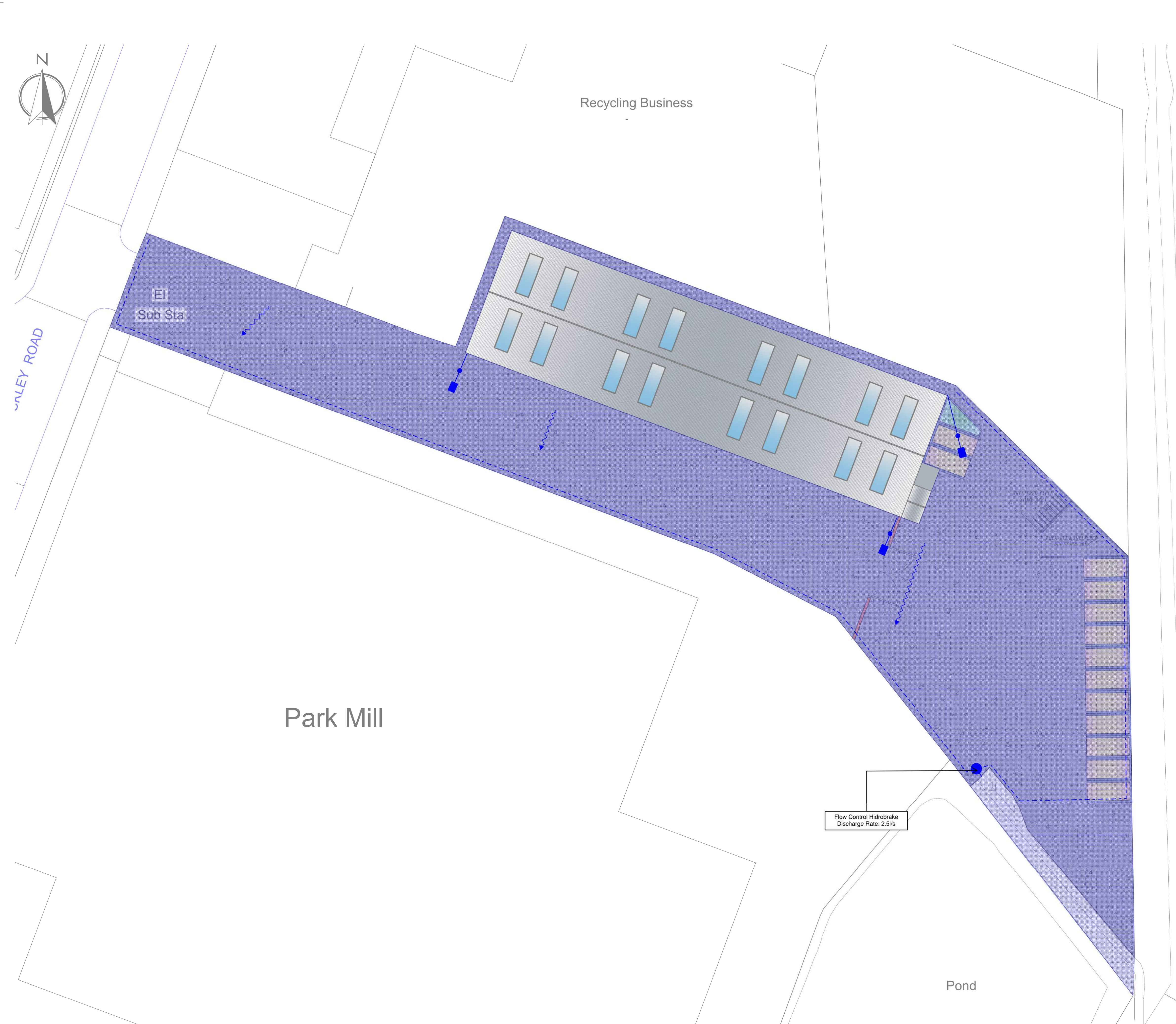


Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.94%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Development	11	138.568	0.167	55.2	0.0266	0.0000	OK
360 minute winter	Permeable Surface	352	138.543	0.293	22.3	147.2052	0.0000	FLOOD RISK
15 minute summer	Outfall	1	138.150	0.000	2.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Development	1.000	Permeable Surface	55.1	2.259	0.865	0.2796	
360 minute winter	Permeable Surface	Hydro-Brake®	Outfall	2.5				77.2

Appendix D



Do not scale from this drawing. Refer to figured dimensions only. RIDA Reports Ltd registered in England and Wales No. 10590566. This drawing is copyright of RIDA Reports Ltd.

Drawing Scale Bar			
Drawing scale	Line length	Drawing scale	Line length
1:5	= 0.25 metres	1:200	= 10.0 metres
1:10	= 0.5 metres	1:250	= 12.5 metres
1:20	= 1.0 metres	1:500	= 25.0 metres
1:25	= 1.25 metres	1:1000	= 50.0 metres
1:50	= 2.5 metres	1:1250	= 62.5 metres
1:100	= 5.0 metres	1:2500	= 125 metres
Measure length of line above for checking of scale			

- GENERAL NOTES**
- All dimensions are in millimetres and levels in m AOD unless stated otherwise.
 - Do not scale. If in any doubt, consult Engineer.
 - Read in conjunction with the architects and engineers schedule drawings.
 - Check inverts and sizes of existing pipes prior to the commencement of any work. Report any discrepancies to the engineer and await instructions.
 - The location of services is shown as indicative. This drawing should be read in conjunction with the utilities drawings. No warranty to their accuracy can be given. The contractor shall take all necessary measures to satisfy himself as to the location of the existing services and connection points. Excavation should be undertaken in compliance with HSG47.
 - Concrete structures design sulphate class and ACEC concrete class unknown.
 - Pipework to be 110mm Thermoplastics U-PVC (Polypipe or similar) installed at levels marked on this drawing UNO. Pipe bedding should be class Z in pipes within 1.5m of the building or shallower than 700mm below ground level. For all other areas the pipe bedding should be class S.
 - Joints and fittings for gravity sewers shall comply with the relevant provisions of BS EN 1401-1, BS EN 1852 and BS EN 12666-1. Pipes shall have a limit of 6% deformation. Pipes shall be SN8 ring stiffness and stamped accordingly. Pipe sections shall not be longer than 3m.
 - Plastic chambers and rings, including demarcation chambers, shall comply with BS EN 3598-1 or BS EN 13598-2 as appropriate.
 - Inspection chamber covers and frames shall comply with the relevant provisions of BS EN 124 and should be double sealed.
 - All inspection chamber covers shall be the non-ventilating type and shall have closed keyways.
 - Testing of pipelines should be as follow:
Gravity Pipework: Air pipe testing. Pipework should withstand a pressure of 100mm water gauge and this should not fall by more than 25mm in a 5minute period. However where traps or gullies are connected they should withstand a pressure of 50mm water gauge and this should not fall by more than 12mm in a 5minute period. It is recommended that pipework installations are tested in sections rather than waiting to complete in one operation.
 - Manhole covers to be set square to the building. Covers of existing manholes to be adjusted to match final ground levels.
 - Granular Bedding for pipes shall be constructed by spreading and compacting granular bedding material over the full width of the pipe trench. After the pipes have been laid, additional granular material shall, if required, be placed and compacted equally on each side of the pipes and, where practicable, this shall be done in sequence with the removal of the trench supports.

Rev	Details		Date	By	Chd

Drawing Status: **PRELIMINARY**



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Client: _____
Project: _____
Buckley Road Industrial Estate, Buckley Rd, OL12 9EF
Drawing: _____
Proposed Drainage Strategy

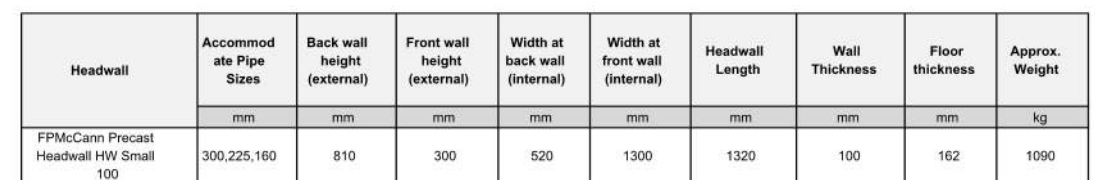
KEY

- Proposed Surface Water Sewer Pipe
- Exceedance Flows
- Permeable Surface as per architect's details Sub-base 350mm Type 3
- Silt Trap
- Perforated Pipe
- Sump and Dispersion Unit

Print Size:	Scale:	Project No:	Drawing No:	Revision:
A1	1:200	0609	003	P1



1. Refer to drawing 8193 for base layouts.



Headwall	Accommodate Pipe Sizes	Back wall height (external)	Front wall height (external)	Width at back wall (internal)	Width at front wall (internal)	Headwall Length	Wall Thickness	Floor thickness	Approx. Weight
	mm	mm	mm	mm	mm	mm	mm	mm	kg
F3M/Corr. Precast Headwall HW Small 100	300,225,160	810	300	520	1300	1320	100	162	1090



1. The vertical angle between the connecting pipe and the horizontal should be greater than 0° and not more than 60°.
2. Where the connection is being made to a sewer with a nominal internal diameter of 300 mm or less, connections should be made using 45° angle, or 90° angle, curved square junctions.
3. Connections made with junction fittings should be made by cutting the existing pipe, inserting the junction fitting and joining with flexible repair couplings or slip couplers.



GENERAL NOTES

Standard Details

A1 NTS 0609 006 P1