

**18 PARKSIDE ROAD
READING**

DARCILFFE HOMES

Surface Water Design Statement

AMc/22:0387/6810
16th December 2022

MJA Consulting have been appointed by Darcliffe Homes to undertake the detailed design for the re-development of 18 Parkside Road, Reading, Berks. The following statement updates and outlines the surface water drainage proposals in accordance with the planning condition 19.

Planning Condition:

Condition 19:

No development shall commence on site until a Sustainable Drainage Strategy and associated detailed design, management and maintenance plan of surface water drainage for the site using SuDS methods has been submitted to and approved in writing by the Local Planning Authority. The plan shall include:

- i. a timetable for its implementation, and*
- ii. a management and annual maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme throughout its lifetime.*

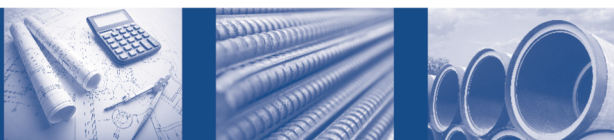
REASON: These details are required due to insufficient information being contained within this submission and in order to reduce the risk of flooding onsite or elsewhere in accordance with Policy EN18 of the Reading Borough Local Plan 2019.

Surface Water Drainage Design:

The surface water drainage design follows the principles of Sustainable Drainage Design while combining the requirements of a constrained site area. The existing plot has no direct surface water discharge and relied on-plot infiltration type soakaways.

Following a review of existing ground conditions, tree root protection zones, existing foul sewer and proposed building location limited locations were available for the outfall soakaway. The proposed storm drainage design incorporates sealed permeable type paving and sub base together with cellular crate soakaway systems.

On site ground investigations indicated a suitable location close to the southern boundary for the soakaway. The sub strata indicated variable soils including sections of made ground, gravely clayey sand overlying clayey sandy gravel. The lowest infiltration rate was in the region of 4.67×10^{-6}



The surface water drainage design for the development is described below:

Roof Runoff:-

Roof runoff will typically be collected by a conventional system of guttering, downpipes and private storm drainage before discharged to either the driveway sub base or directly to the cellular soakaway crate.

Private Drive & Parking Court:-

This area will be constructed with sealed permeable block paving draining to the sub base below. Flows are naturally controlled by the stone sub base linking to the piped outfall and cellular soakaway crate.

Final Soakaway Attenuation:-

Runoff from both the driveway / parking area and plot discharge to the cellular crate soakaway system. Flows are then attenuated and discharge via infiltration. The combination of the permeable paving sub base and cellular crate system has been designed to accommodate the necessary storage volumes to manage the 1:100 year storm event, plus an extra allowance of 40% for the predicted potential increase in peak rainfall up to 2115.

The surface water design ensures that all surface water drainage features are designed to accommodate the extreme storm event and will minimise the occurrence or potential for surface flooding within the development. This also ensures that no property flooding will occur and will not increase flood risk off site.

Flood Exceedance Routing:-

The piped drainage network, permeable paving and attenuation tank has been designed to ensure no flooding within the 1 in 30 year storm events as well as the 1 in 100 year storm event, plus an extra allowance of 40% climate change with no flooding. Should any flooding occur any excess water would typically temporarily lie on the paving surface before draining through.

SUDs Maintenance Plan:-

Permeable Block Paving

Key Maintenance Requirements:

- Sweeping
- Regular brushing and vacuuming (to be carried out by a specialist contractor)

Regular inspection and maintenance is important for the effective operation of permeable pavements and should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Permeable block paving needs to be regularly cleaned of silt and other sediments to preserve infiltration capability and should have a minimum of three surface sweepings per year.

A brush and suction cleaner, which can be a lorry-mounted device or a smaller precinct sweeper, should be used and the sweeping regime should be as follows:

1. End of winter (April) – to collect winter debris.
2. Mid-summer (July/August) – to collect dust, flower and grass-type deposits.
3. After autumn leaf fall (November).

Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material and any lost material should be replaced.

To ensure the continual optimal performance of the permeable paving, it is recommended that the following maintenance should be carried out. The following guidelines are offered as an initial regime, but maybe either increased or decreased depending on the local environment and any external contributing factors:

- A visual inspection of the paving may be carried out on a regular basis.
This will confirm the effectiveness of the agitation maintenance due to variations between sites and allow any refinement of the regular agitation activity if necessary.
- The paving should be agitated (e.g. brushed, vacuumed, etc.) at least twice a year.
This is to ensure no vegetation of any sort is allowed to grow and develop in the joints. Ideally, this activity should be carried out in the spring and autumn seasons.
- The paving should be inspected after any heavy precipitation to ensure no displacement of any organic matter onto the surface of the pavement.
- For winter maintenance, the controlled use of de-icing may be used without causing significant detrimental effects towards the permeable pavements performance.
When used carefully, the use of these chlorides will not result in an increase in the chloride levels in the local ground.
- Weed growth – when sedimentation occurs in areas of permeable paving then there is the potential for weed growth, this will typically occur where there are overhanging trees or soft landscaping slopes down on to the paving or in areas which do not receive over run from vehicles particularly frequently.

Depending on the amount of usage and the environment the permeable pavement has received and been exposed to, the laying course material may require either replacement or cleaning after a 25 to 30 year period. This would be evident if the infiltration rate of the paving became prolonged, allowing ponding to develop. Should this occur, the uplifting and cleaning (or replacing, depending on the costings of the activity) of the laying course may be considered. The laying course material, jointing and blocks may be reused (once cleaned), minimising costs.

If reconstruction is necessary, the following procedure should be followed:

1. Lift surface layer and laying course.
2. Remove any geotextile filter layer.
3. Inspect sub-base and remove, wash and replace if required.
4. Renew any geotextile layer.
5. Renew laying course, jointing material and concrete block paving.

Materials removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and may need to be disposed of as controlled waste. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

Piped network and Inspection Chambers

The network of pipes and inspection chambers that form the surface water drainage system should be periodically inspected to ensure that any accumulation of scale, silt and grease, or foreign objects that may be reducing the bore of the pipe work is cleaned out.

During these inspections the general operation and structural integrity of all components and joints should be recorded and repaired as required.

All surface water inspection chambers should be visually inspected at 4 monthly intervals for the first year after installation and then a minimum of once a year thereafter. It is recommended that a full CCTV survey of the foul and storm water system is carried out after this first year, then once every 5 years.

Cellular Attenuation Tank

The key maintenance requirement for the cellular attenuation and soakaway tank will be the visual inspection of the internal units via built in access chambers and integral maintenance tunnel for the removal of sediment and jetting as required. A visual inspection of the impermeable geomembrane that envelopes the structure should also be carried out to check for structural integrity, where possible.

The built in modular inspection unit and maintenance tunnels within the tank allow almost the entire volume of the structure to be inspected via CCTV camera and flushed through.

A catchpit chamber is to be installed immediately upstream of the attenuation tank to reduce the amount of silt entering the tank and it will generally only be necessary to ensure that the upstream catchpits / silt traps are free from debris such as leaves or sediment.

It is recommended that the attenuation tank system be inspected no less frequently than at monthly intervals for the first 3 months and thereafter at 6 monthly intervals. In addition, it is suggested that the installation is inspected immediately following the first storm event, whenever this should occur post installation.

It should also be noted that more regular inspections may be required should the catchpit(s) fill more frequently and/or if the initial inspections reveal that maintenance / cleaning will be required more regularly than at six month intervals.

Cellular Systems - Operation and Maintenance Requirements

Maintenance schedule	Required action	Recommended Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually, or as required
Remedial actions	Repair/rehabilitation of inlets, outlet , overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms

Construction Surface Water Management:-

The purpose of this section is to set out the basis and principles for the protection of the constructed development drainage system as well as how site runoff will be managed during construction. The following will form part of the detailed development site Construction Environmental Management Plan.

Construction activities have the potential to pollute third party land off site. This could occur through excavations (i.e. during groundworks) resulting in alterations to hydrology, silt and/ or accidental spills of polluting substances (i.e. hydrocarbons). During construction the contractor must ensure that general surface water runoff together with any groundwater from excavations and construction activities is prevented from discharging from the site.

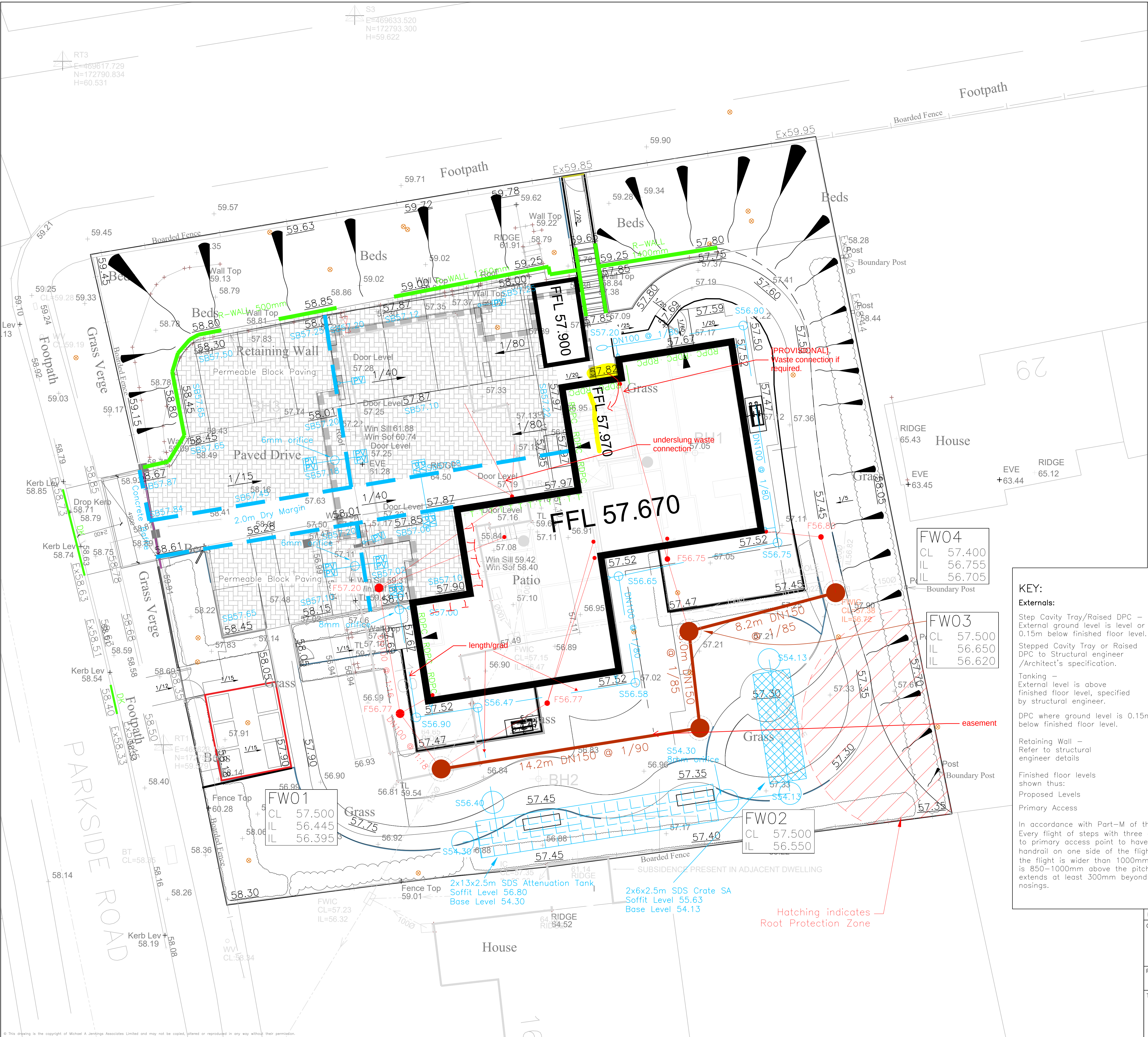
- The following list shows measures that will be put in place to prevent pollution and would conform to the best practice policy proposed by the Environment Agency (EA) via the Pollution Prevention Guidelines.
 - the handling, use and storage of hazardous materials to be undertaken in line with the EA's Pollution Prevention Guidelines
 - adequately bunded and secure areas with impervious walls and floor for the temporary storage of fuel, oil and chemicals on site during construction;
 - drip trays to collect leaks from diesel pumps or from standing plant;
 - oil interceptor(s) fitted to all temporary discharge points and for discharge from any temporary oil storage/ refuelling areas;
 - Provision of spill containment equipment such as absorbent material on site. All fuel, oil and chemical storage will be sited on an impervious base within a bund and secured.
- Point of temporary site discharge to be agreed with the LLFA, an onsite silt settlement system to be installed between dewatering point and discharge point where necessary.
- Regular monitoring of discharge point along with testing as required.
- Temporary stockpiles of excavated material should be kept away from the onsite drainage system where practicable.
- Keep freshly exposed ground to a minimum.
- Use of self-contained vehicle wheel wash system or wheel washing facilities in the form of a pressure washer to be provided at all times at the site entrance. Resulting material to be carefully removed and disposed off-site to avoid any siltation contamination.

- Single designated washout /washdown area to be provided as required. Location to be a minimum of 10m away from any known onsite sewers, gullies and watercourse or ditch.
- Once constructed the storm drainage system and attenuation tank should be protected from the ingress of pollutants, silts and general construction debris. Typically all gullies will be sealed with gully bags or hessian sacks to prevent silt into the system.
- Permeable paved areas will be constructed with a macadam running surface during the construction phase. Prior to the final block paved surface is laid the macadam surface will be fully cleaned down and cored allowing the runoff through.
- Once complete a jet clean of the system will be undertaken to ensure it is operating effectively.

Alistair McShane
FOR MJA CONSULTING



Appendix 1:
Engineering Drawings



Construction Notes:

- Do not scale from this drawing.
- All dimensions in metres.
- All levels relate to ordnance datum.
- This drawing is based on the latest Architectural planning layout and shall be read in conjunction with all other relevant longitudinal sections and construction drawings.
- Any discrepancies with any of the drawings shall be reported to MJA Consulting Engineer.
- The level and location of all existing services shall be verified on site by the Contractor before commencing any construction work.
- Contractor must comply with all current legislation relating to CDM, Health and Safety and COSHH.
- All material in excess of 20kg (i.e. kerbs, manhole units cover etc.) shall be mechanically lifted and laid where possible at all times.
- Manholes, sewers, headwalls and other structures intended to convey surface water or sewerage are to be constructed in accordance with the Water Authorities Association specification "Sewers for Adoption" 6th edition and to Thames Water specification and addendum.
- All foul and storm water drains which are not to be adopted as public sewers under a section 104 agreement shall be constructed using uPVC pipes or similar approved, bedded and backfilled in accordance with the manufacturers instructions and to the Building Regulations Part H, BS EN 752 & B.R.E. SD1.
- All building drainage to be 100mm dia. laid at a minimum gradient of 1 in 60 (FW) and 1 in 80 (SW) unless otherwise shown.
- Sewers and drains of different diameters should be laid soffit to soffit.
- Inspection chambers on private drains shall be non-access preformed polypropylene.

Depth to invert	Minimum size
< 1.2m	DN450
> 1.2m	DN600

In accordance with the Building Regulations Part H & BS EN 752.
- Position of soil pipes, stubstacks, WC outlets rainwater downpipes etc positions shall be checked against architects house type drawings to ensure compatibility.
- Where back inlet gullies are used they should be roddable.
- All stub stacks to be fitted with air admittance valve where branch drain exceeds 12m except at head of run.
- Rainwater downpipes to be connected directly to drains via removable adapter to permit access for rodding.
- All drain runs are to be flushed through and building materials removed where necessary at the time of final test by Building Inspector and prior to occupation.
- All soakaways to be positioned a minimum of 5.0m from buildings
- All finished floor levels are shown on the drawing for guidance only and may need to be adjusted on site. However there is to be no deviation without prior approval.

KEY:

Externals:

Step Cavity Tray/Raised DPC – External ground level is level or 0.15m below finished floor level.

Stepped Cavity Tray or Raised DPC to Structural engineer /Architect's specification.

Tanking – External level is above finished floor level, specified by structural engineer.

DPC where ground level is 0.15m below finished floor level.

Retaining Wall – Refer to structural engineer details

Finished floor levels shown thus:

Proposed Levels

Primary Access

In accordance with Part-M of the Building Regulations – Every flight of steps with three or more risers (approach to primary access point to have a suitable grippable handrail on one side of the flight (or both sides where the flight is wider than 1000mm). This grippable handrail is 850-1000mm above the pitch line of the flight and extends at least 300mm beyond the top and bottom nosings.

KEY:

Proposed Adoptable Sewers:

Foul sewer

Proposed Private Drainage:

Foul drain

Storm drain

Rodding eye

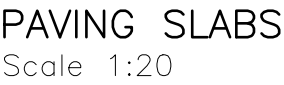
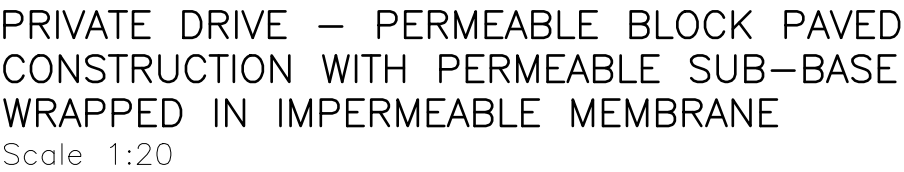
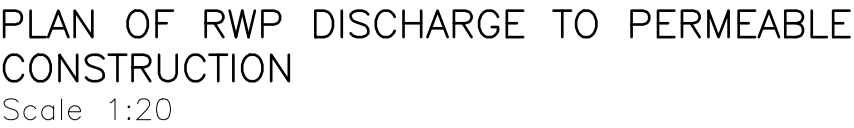
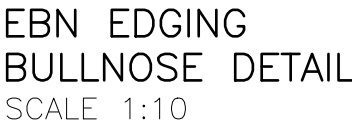
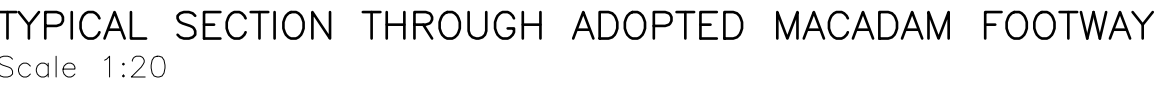
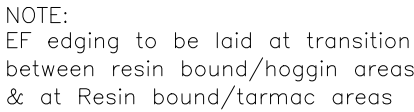
Permavoid – Surface Water Collector & Distribution Cell Size and specification, site specific.

Private inspection chambers shall be non-access structural wall plastic. Chamber sizes to accord with manufacturers specifications, Building Regulations Part H, BS EN 752 and to NHBC Standards.

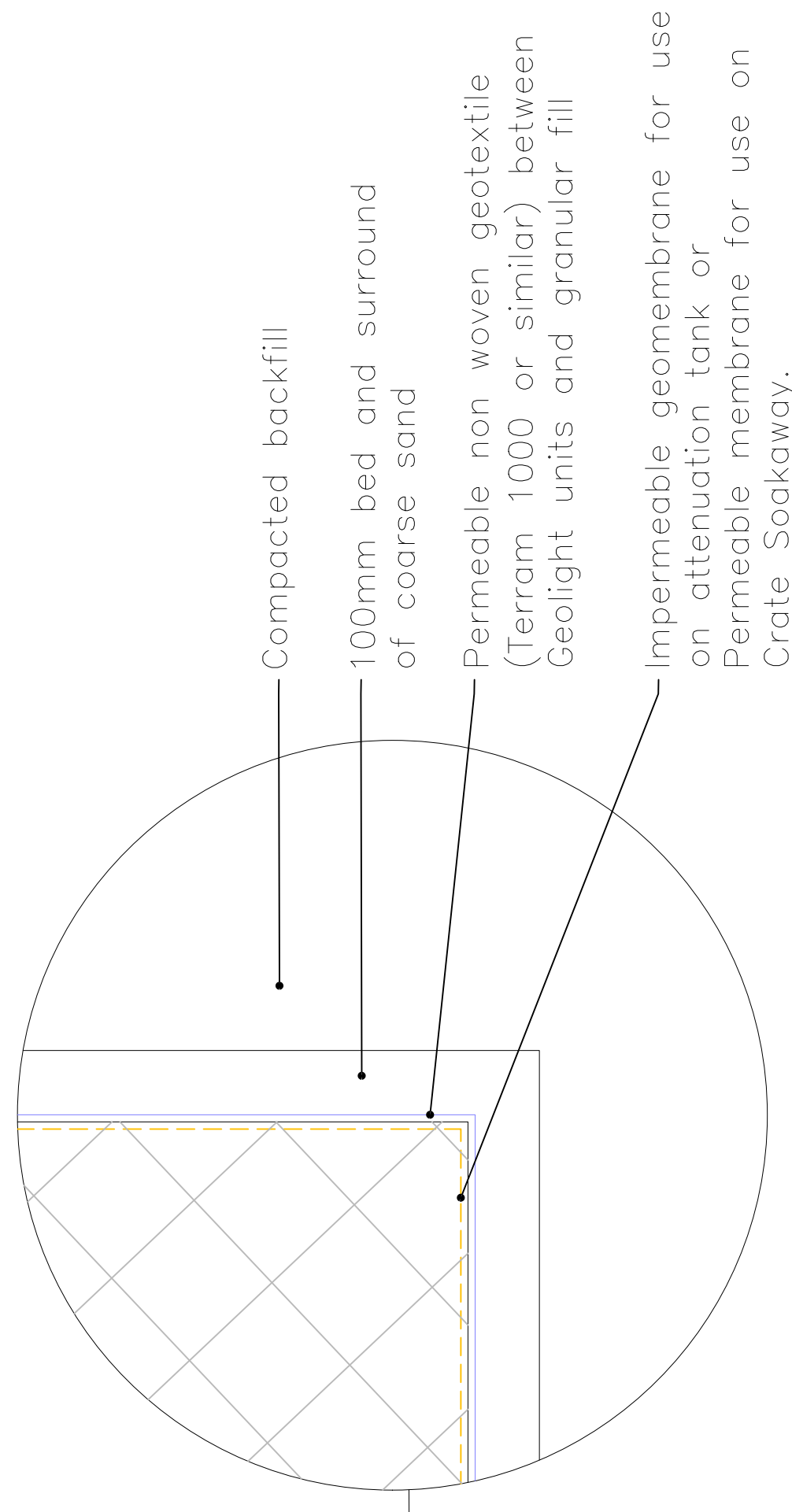
Invert levels shown thus:

Surface water strategy subject to change following detailed drainage calculations

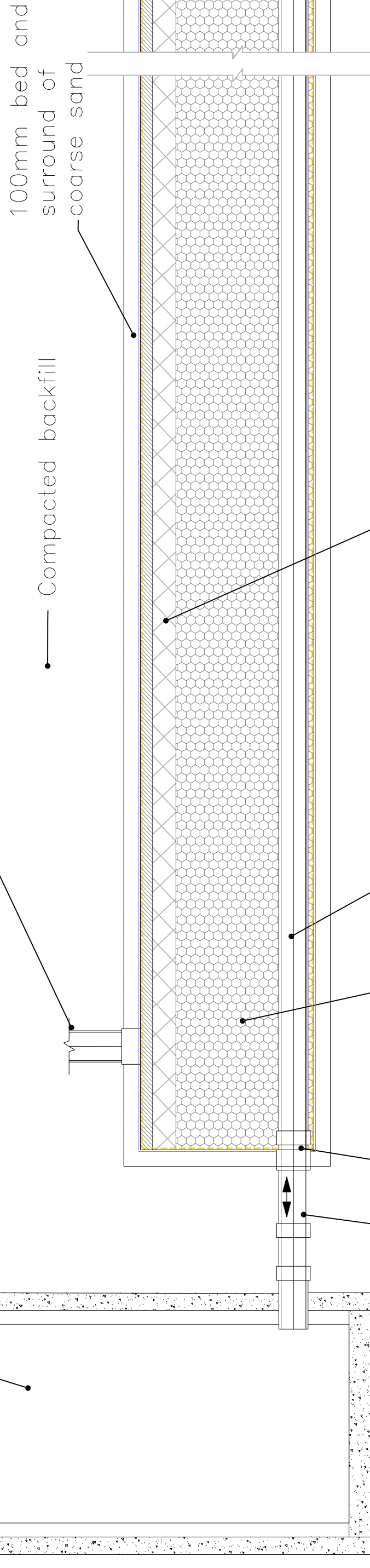
REV. No.	DATE	DESCRIPTION	DRAWN	CHECKED
Client	DARCLIFFE HOMES Superior Homes Built For Life			
Project	18 Parkside Road Reading			
Title	Engineering Layout			
Scale:	1:100 @ A1	Status:	PRELIMINARY	
Drawn:	EP	Project Engineer	MJA Project No:	Date:
		JAK	6810	17/11/2022
Drawing Number:	6810-MJA-SW-XX-DR-C-001			Rev:
				P1



REV. No.	DATE	DESCRIPTION	DRAWN	CHECKED
Client  MJA CONSULTING CIVIL & STRUCTURAL ENGINEERS Ipsom Court, 24 The Quadrant, Abingdon Science Park, Abingdon Oxon, OX14 3YS Tel: 01235 555173 Email: mail@mjaconsulting.co.uk				
Project 18 Parkside Road Reading				
Title Construction Details			Scale: As Shown @ A2 Status: PRELIMINARY	
Drawing: EP		Project Engineer JAK	MJA Project No: 6810	Date: 07/12/2022
Drawing Number: 6810-MJA-SW-XX-DR-C-200				Rev: P1



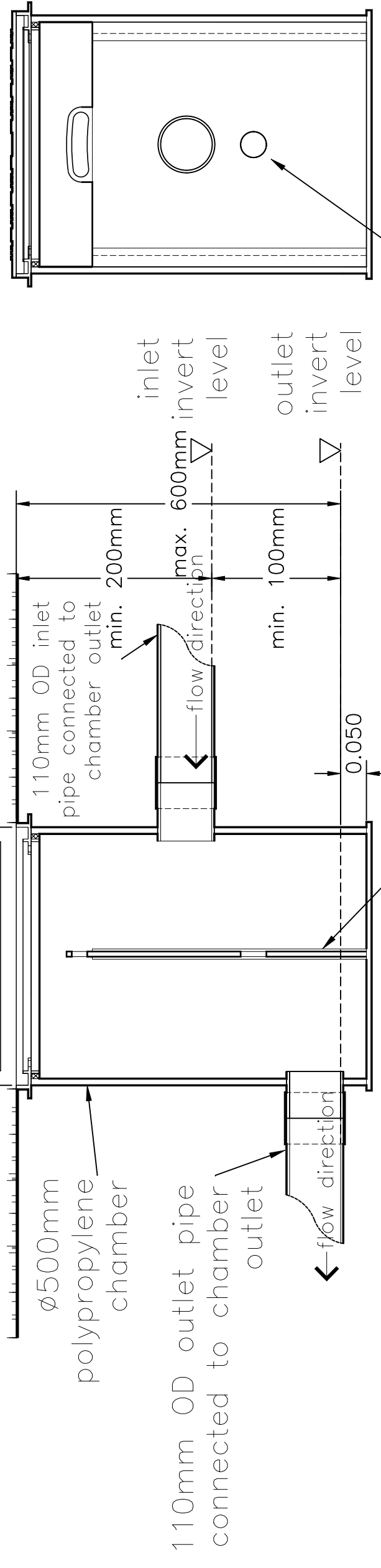
Scale 1:25



Scale 1:25

Cover level to be above maximum storage level of connected permeable paving or open storage area.

Diagram illustrating a circular weir structure. The weir is shown as a semi-circular barrier across a channel. Two flow direction indicators are present: one on the left side pointing left, labeled "flow direction", and one on the right side pointing right, labeled "flow direction". A label "weir plate with orifice control as specified" points to the weir structure.



Scale NTS

Check	Drawn	
		
MJA CONSULTING CIVIL & STRUCTURAL ENGINEERS		
Ipsium Court, 24 The Quadrant, Abingdon Science Park, Abingdon Oxon, OX14 3YS Tel: 01235 555173 Email: mail@mjaconsulting.co.uk		
Scale:	AS SHOWN	A1
Status:	PRELIMINARY	
Project Engineer	MJA	Project No:
Drawn	JAK	6810
Date:	07/11/2022	
Issuing Number:	6810-MJA-SW-XX-DR-C-203	
Rev:	P1	



Appendix 2:
Micro Drainage Calculations

MJA Consulting							Page 2
Monarch House Barton Lane OX14 3NB			Parkside Road Darcliffe Homes Sub-base 1				
Date 30/11/2022 File System.CASX			Designed by S.Smith Checked by EP				
Innovyze			Source Control 2020.1				
Cascade Summary of Results for Sub-base 1.SRCX							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	99.069	0.069	0.0	0.2	0.2	0.2	O K
10080 min Summer	99.056	0.056	0.0	0.1	0.1	0.1	O K
15 min Winter	99.335	0.335	0.0	0.4	0.4	3.8	O K
30 min Winter	99.387	0.387	0.0	0.4	0.4	5.0	O K
60 min Winter	99.425	0.425	0.0	0.4	0.4	6.1	O K
120 min Winter	99.445	0.445	0.0	0.4	0.4	6.7	O K
180 min Winter	99.445	0.445	0.0	0.4	0.4	6.7	O K
240 min Winter	99.441	0.441	0.0	0.4	0.4	6.6	O K
360 min Winter	99.425	0.425	0.0	0.4	0.4	6.1	O K
480 min Winter	99.407	0.407	0.0	0.4	0.4	5.6	O K
600 min Winter	99.389	0.389	0.0	0.4	0.4	5.1	O K
720 min Winter	99.370	0.370	0.0	0.4	0.4	4.6	O K
960 min Winter	99.334	0.334	0.0	0.4	0.4	3.8	O K
1440 min Winter	99.270	0.270	0.0	0.3	0.3	2.5	O K
2160 min Winter	99.197	0.197	0.0	0.3	0.3	1.3	O K
2880 min Winter	99.145	0.145	0.0	0.2	0.2	0.7	O K
4320 min Winter	99.086	0.086	0.0	0.2	0.2	0.2	O K
5760 min Winter	99.058	0.058	0.0	0.1	0.1	0.1	O K
7200 min Winter	99.042	0.042	0.0	0.1	0.1	0.1	O K
8640 min Winter	99.034	0.034	0.0	0.1	0.1	0.0	O K
10080 min Winter	99.028	0.028	0.0	0.1	0.1	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
8640 min Summer	1.107	0.0	19.3	4400			
10080 min Summer	0.976	0.0	19.5	5136			
15 min Winter	134.372	0.0	4.0	18			
30 min Winter	88.266	0.0	5.5	32			
60 min Winter	55.250	0.0	7.1	60			
120 min Winter	33.426	0.0	8.7	116			
180 min Winter	24.587	0.0	9.7	148			
240 min Winter	19.657	0.0	10.4	184			
360 min Winter	14.271	0.0	11.3	262			
480 min Winter	11.374	0.0	12.1	336			
600 min Winter	9.532	0.0	12.6	406			
720 min Winter	8.247	0.0	13.1	476			
960 min Winter	6.558	0.0	13.9	608			
1440 min Winter	4.740	0.0	15.0	864			
2160 min Winter	3.420	0.0	16.1	1212			
2880 min Winter	2.711	0.0	16.9	1556			
4320 min Winter	1.951	0.0	17.9	2240			
5760 min Winter	1.543	0.0	18.6	2936			
7200 min Winter	1.286	0.0	19.0	3672			
8640 min Winter	1.107	0.0	19.3	4296			
10080 min Winter	0.976	0.0	19.5	5008			
©1982-2020 Innovyze							

MJA Consulting		Page 3																														
Monarch House Barton Lane OX14 3NB	Parkside Road Darcliffe Homes Sub-base 1																															
Date 30/11/2022	Designed by S.Smith																															
File System.CASX	Checked by EP																															
Innovyze		Source Control 2020.1																														
<u>Cascade Rainfall Details for Sub-base 1.SRCX</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.950</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.950</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.500</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.400</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.015 <table> <tr> <td>Time (mins)</td> <td>Area</td> </tr> <tr> <td>From:</td> <td>To: (ha)</td> </tr> <tr> <td>0</td> <td>4 0.015</td> </tr> </table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.950	Region	England and Wales	Cv (Winter)	0.950	M5-60 (mm)	19.500	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+40	Time (mins)	Area	From:	To: (ha)	0	4 0.015
Rainfall Model	FSR	Winter Storms	Yes																													
Return Period (years)	100	Cv (Summer)	0.950																													
Region	England and Wales	Cv (Winter)	0.950																													
M5-60 (mm)	19.500	Shortest Storm (mins)	15																													
Ratio R	0.400	Longest Storm (mins)	10080																													
Summer Storms	Yes	Climate Change %	+40																													
Time (mins)	Area																															
From:	To: (ha)																															
0	4 0.015																															
©1982-2020 Innovyze																																

MJA Consulting		Page 4																								
Monarch House	Parkside Road																									
Barton Lane	Darcliffe Homes																									
OX14 3NB	Sub-base 1																									
Date 30/11/2022	Designed by S.Smith																									
File System.CASX	Checked by EP																									
Innovyze		Source Control 2020.1																								
<u>Cascade Model Details for Sub-base 1.SRCX</u> Storage is Online Cover Level (m) 100.000 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Width (m)</td> <td>15.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>10.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>41.7</td> <td>Slope (1:X)</td> <td>15.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>99.000</td> <td>Membrane Depth (m)</td> <td>0</td> </tr> </table> <u>Orifice Outflow Control</u> Diameter (m) 0.018 Discharge Coefficient 0.600 Invert Level (m) 99.000			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	15.0	Membrane Percolation (mm/hr)	1000	Length (m)	10.0	Max Percolation (l/s)	41.7	Slope (1:X)	15.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	99.000	Membrane Depth (m)	0
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	15.0																							
Membrane Percolation (mm/hr)	1000	Length (m)	10.0																							
Max Percolation (l/s)	41.7	Slope (1:X)	15.0																							
Safety Factor	2.0	Depression Storage (mm)	5																							
Porosity	0.30	Evaporation (mm/day)	3																							
Invert Level (m)	99.000	Membrane Depth (m)	0																							
©1982-2020 Innovyze																										

MJA Consulting

Monarch House
Barton Lane
OX14 3NB

Parkside Road
Darcliffe Homes
Sub-base 2

Date 30/11/2022
File System.CASX

Designed by S.Smith
Checked by EP

Page 1



Innovyze

Source Control 2020.1

Cascade Summary of Results for Sub-base 2.SRCX

Upstream Structures

Outflow To

Overflow To

Sub-base 1.SRCX

Soakaway.SRCX

(None)

Half Drain Time : 487 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	99.286	0.286	0.0	0.4	0.4	10.9	O K
30 min Summer	99.377	0.377	0.0	0.4	0.4	14.5	O K
60 min Summer	99.474	0.474	0.0	0.5	0.5	18.2	O K
120 min Summer	99.573	0.573	0.0	0.5	0.5	22.1	O K
180 min Summer	99.628	0.628	0.0	0.5	0.5	24.3	O K
240 min Summer	99.665	0.665	0.0	0.5	0.5	25.7	O K
360 min Summer	99.709	0.709	0.0	0.6	0.6	27.4	Flood Risk
480 min Summer	99.733	0.733	0.0	0.6	0.6	28.3	Flood Risk
600 min Summer	99.744	0.744	0.0	0.6	0.6	28.8	Flood Risk
720 min Summer	99.744	0.744	0.0	0.6	0.6	28.8	Flood Risk
960 min Summer	99.737	0.737	0.0	0.6	0.6	28.5	Flood Risk
1440 min Summer	99.715	0.715	0.0	0.6	0.6	27.6	Flood Risk
2160 min Summer	99.673	0.673	0.0	0.6	0.6	26.0	O K
2880 min Summer	99.624	0.624	0.0	0.5	0.5	24.1	O K
4320 min Summer	99.529	0.529	0.0	0.5	0.5	20.4	O K
5760 min Summer	99.450	0.450	0.0	0.4	0.4	17.3	O K
7200 min Summer	99.387	0.387	0.0	0.4	0.4	14.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	134.372	0.0	14.8	64
30 min Summer	88.266	0.0	19.9	43
60 min Summer	55.250	0.0	25.3	64
120 min Summer	33.426	0.0	30.9	124
180 min Summer	24.587	0.0	34.2	184
240 min Summer	19.657	0.0	36.6	244
360 min Summer	14.271	0.0	39.9	362
480 min Summer	11.374	0.0	42.4	482
600 min Summer	9.532	0.0	44.4	600
720 min Summer	8.247	0.0	46.1	708
960 min Summer	6.558	0.0	48.9	808
1440 min Summer	4.740	0.0	52.7	1040
2160 min Summer	3.420	0.0	57.0	1424
2880 min Summer	2.711	0.0	60.0	1812
4320 min Summer	1.951	0.0	64.1	2552
5760 min Summer	1.543	0.0	67.0	3288
7200 min Summer	1.286	0.0	69.2	4032

©1982-2020 Innovyze

MJA Consulting		Page 2					
Monarch House Barton Lane OX14 3NB		Parkside Road Darcliffe Homes Sub-base 2					
Date 30/11/2022 File System.CASX		Designed by S.Smith Checked by EP					
Innovyze		Source Control 2020.1					
Cascade Summary of Results for Sub-base 2.SRCX							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	99.336	0.336	0.0	0.4	0.4	12.9	O K
10080 min Summer	99.295	0.295	0.0	0.4	0.4	11.2	O K
15 min Winter	99.286	0.286	0.0	0.4	0.4	10.9	O K
30 min Winter	99.377	0.377	0.0	0.4	0.4	14.5	O K
60 min Winter	99.474	0.474	0.0	0.5	0.5	18.2	O K
120 min Winter	99.573	0.573	0.0	0.5	0.5	22.1	O K
180 min Winter	99.629	0.629	0.0	0.5	0.5	24.3	O K
240 min Winter	99.666	0.666	0.0	0.5	0.5	25.7	O K
360 min Winter	99.710	0.710	0.0	0.6	0.6	27.4	Flood Risk
480 min Winter	99.736	0.736	0.0	0.6	0.6	28.4	Flood Risk
600 min Winter	99.748	0.748	0.0	0.6	0.6	28.9	Flood Risk
720 min Winter	99.750	0.750	0.0	0.6	0.6	29.0	Flood Risk
960 min Winter	99.738	0.738	0.0	0.6	0.6	28.5	Flood Risk
1440 min Winter	99.707	0.707	0.0	0.6	0.6	27.3	Flood Risk
2160 min Winter	99.637	0.637	0.0	0.5	0.5	24.6	O K
2880 min Winter	99.562	0.562	0.0	0.5	0.5	21.7	O K
4320 min Winter	99.436	0.436	0.0	0.4	0.4	16.8	O K
5760 min Winter	99.345	0.345	0.0	0.4	0.4	13.2	O K
7200 min Winter	99.278	0.278	0.0	0.4	0.4	10.6	O K
8640 min Winter	99.229	0.229	0.0	0.3	0.3	8.7	O K
10080 min Winter	99.191	0.191	0.0	0.3	0.3	7.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
8640 min Summer	1.107	0.0	70.8	4752			
10080 min Summer	0.976	0.0	72.1	5456			
15 min Winter	134.372	0.0	14.8	64			
30 min Winter	88.266	0.0	19.9	42			
60 min Winter	55.250	0.0	25.3	64			
120 min Winter	33.426	0.0	30.9	122			
180 min Winter	24.587	0.0	34.2	182			
240 min Winter	19.657	0.0	36.6	240			
360 min Winter	14.271	0.0	39.9	358			
480 min Winter	11.374	0.0	42.4	472			
600 min Winter	9.532	0.0	44.4	584			
720 min Winter	8.247	0.0	46.1	690			
960 min Winter	6.558	0.0	48.9	834			
1440 min Winter	4.740	0.0	52.8	1078			
2160 min Winter	3.420	0.0	57.0	1488			
2880 min Winter	2.711	0.0	60.0	1876			
4320 min Winter	1.951	0.0	64.1	2640			
5760 min Winter	1.543	0.0	67.0	3400			
7200 min Winter	1.286	0.0	69.2	4120			
8640 min Winter	1.107	0.0	70.9	4848			
10080 min Winter	0.976	0.0	72.2	5552			
©1982-2020 Innovyze							

MJA Consulting		Page 3																														
Monarch House Barton Lane OX14 3NB	Parkside Road Darcliffe Homes Sub-base 2																															
Date 30/11/2022	Designed by S.Smith																															
File System.CASX	Checked by EP																															
Innovyze		Source Control 2020.1																														
<u>Cascade Rainfall Details for Sub-base 2.SRCX</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.950</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.950</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.500</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.400</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.036 <table> <tr> <td>Time (mins)</td> <td>Area</td> </tr> <tr> <td>From:</td> <td>To: (ha)</td> </tr> <tr> <td>0</td> <td>4 0.036</td> </tr> </table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.950	Region	England and Wales	Cv (Winter)	0.950	M5-60 (mm)	19.500	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+40	Time (mins)	Area	From:	To: (ha)	0	4 0.036
Rainfall Model	FSR	Winter Storms	Yes																													
Return Period (years)	100	Cv (Summer)	0.950																													
Region	England and Wales	Cv (Winter)	0.950																													
M5-60 (mm)	19.500	Shortest Storm (mins)	15																													
Ratio R	0.400	Longest Storm (mins)	10080																													
Summer Storms	Yes	Climate Change %	+40																													
Time (mins)	Area																															
From:	To: (ha)																															
0	4 0.036																															
©1982-2020 Innovyze																																

MJA Consulting		Page 4																								
Monarch House	Parkside Road																									
Barton Lane	Darcliffe Homes																									
OX14 3NB	Sub-base 2																									
Date 30/11/2022	Designed by S.Smith																									
File System.CASX	Checked by EP																									
Innovyze		Source Control 2020.1																								
<u>Cascade Model Details for Sub-base 2.SRCX</u> Storage is Online Cover Level (m) 100.000 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Width (m)</td> <td>10.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>13.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>36.1</td> <td>Slope (1:X)</td> <td>1000.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>99.000</td> <td>Membrane Depth (m)</td> <td>0</td> </tr> </table> <u>Orifice Outflow Control</u> Diameter (m) 0.018 Discharge Coefficient 0.600 Invert Level (m) 99.000			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0	Membrane Percolation (mm/hr)	1000	Length (m)	13.0	Max Percolation (l/s)	36.1	Slope (1:X)	1000.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	99.000	Membrane Depth (m)	0
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0																							
Membrane Percolation (mm/hr)	1000	Length (m)	13.0																							
Max Percolation (l/s)	36.1	Slope (1:X)	1000.0																							
Safety Factor	2.0	Depression Storage (mm)	5																							
Porosity	0.30	Evaporation (mm/day)	3																							
Invert Level (m)	99.000	Membrane Depth (m)	0																							
©1982-2020 Innovyze																										

MJA Consulting			Page 1																																																																																																																																																																																					
Monarch House Barton Lane OX14 3NB		Parkside Road Darcliffe Homes Soakaway																																																																																																																																																																																						
Date 30/11/2022 File System.CASX		Designed by S.Smith Checked by EP																																																																																																																																																																																						
Innovyze		Source Control 2020.1																																																																																																																																																																																						
<u>Cascade Summary of Results for Soakaway.SRCX</u>																																																																																																																																																																																								
Upstream Structures Outflow To Overflow To Sub-base 2.SRCX (None) (None) Sub-base 1.SRCX Half Drain Time : 2119 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>98.209</td><td>0.209</td><td>0.1</td><td>8.3</td><td>O K</td></tr><tr><td>30 min Summer</td><td>98.298</td><td>0.298</td><td>0.1</td><td>11.9</td><td>O K</td></tr><tr><td>60 min Summer</td><td>98.394</td><td>0.394</td><td>0.1</td><td>15.7</td><td>O K</td></tr><tr><td>120 min Summer</td><td>98.494</td><td>0.494</td><td>0.1</td><td>19.7</td><td>O K</td></tr><tr><td>180 min Summer</td><td>98.554</td><td>0.554</td><td>0.1</td><td>22.1</td><td>O K</td></tr><tr><td>240 min Summer</td><td>98.595</td><td>0.595</td><td>0.1</td><td>23.8</td><td>O K</td></tr><tr><td>360 min Summer</td><td>98.654</td><td>0.654</td><td>0.1</td><td>26.1</td><td>O K</td></tr><tr><td>480 min Summer</td><td>98.697</td><td>0.697</td><td>0.1</td><td>27.8</td><td>O K</td></tr><tr><td>600 min Summer</td><td>98.730</td><td>0.730</td><td>0.1</td><td>29.1</td><td>O K</td></tr><tr><td>720 min Summer</td><td>98.758</td><td>0.758</td><td>0.1</td><td>30.2</td><td>O K</td></tr><tr><td>960 min Summer</td><td>98.799</td><td>0.799</td><td>0.2</td><td>31.9</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>98.853</td><td>0.853</td><td>0.2</td><td>34.0</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>98.894</td><td>0.894</td><td>0.2</td><td>35.7</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>98.909</td><td>0.909</td><td>0.2</td><td>36.3</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>98.885</td><td>0.885</td><td>0.2</td><td>35.3</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>98.838</td><td>0.838</td><td>0.2</td><td>33.4</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>98.796</td><td>0.796</td><td>0.2</td><td>31.8</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>134.372</td><td>0.0</td><td>889</td></tr><tr><td>30 min Summer</td><td>88.266</td><td>0.0</td><td>1072</td></tr><tr><td>60 min Summer</td><td>55.250</td><td>0.0</td><td>1244</td></tr><tr><td>120 min Summer</td><td>33.426</td><td>0.0</td><td>1416</td></tr><tr><td>180 min Summer</td><td>24.587</td><td>0.0</td><td>1522</td></tr><tr><td>240 min Summer</td><td>19.657</td><td>0.0</td><td>1600</td></tr><tr><td>360 min Summer</td><td>14.271</td><td>0.0</td><td>1720</td></tr><tr><td>480 min Summer</td><td>11.374</td><td>0.0</td><td>1822</td></tr><tr><td>600 min Summer</td><td>9.532</td><td>0.0</td><td>1914</td></tr><tr><td>720 min Summer</td><td>8.247</td><td>0.0</td><td>2000</td></tr><tr><td>960 min Summer</td><td>6.558</td><td>0.0</td><td>2156</td></tr><tr><td>1440 min Summer</td><td>4.740</td><td>0.0</td><td>2450</td></tr><tr><td>2160 min Summer</td><td>3.420</td><td>0.0</td><td>2876</td></tr><tr><td>2880 min Summer</td><td>2.711</td><td>0.0</td><td>3312</td></tr><tr><td>4320 min Summer</td><td>1.951</td><td>0.0</td><td>4232</td></tr><tr><td>5760 min Summer</td><td>1.543</td><td>0.0</td><td>4912</td></tr><tr><td>7200 min Summer</td><td>1.286</td><td>0.0</td><td>5616</td></tr></tbody></table>					Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	98.209	0.209	0.1	8.3	O K	30 min Summer	98.298	0.298	0.1	11.9	O K	60 min Summer	98.394	0.394	0.1	15.7	O K	120 min Summer	98.494	0.494	0.1	19.7	O K	180 min Summer	98.554	0.554	0.1	22.1	O K	240 min Summer	98.595	0.595	0.1	23.8	O K	360 min Summer	98.654	0.654	0.1	26.1	O K	480 min Summer	98.697	0.697	0.1	27.8	O K	600 min Summer	98.730	0.730	0.1	29.1	O K	720 min Summer	98.758	0.758	0.1	30.2	O K	960 min Summer	98.799	0.799	0.2	31.9	O K	1440 min Summer	98.853	0.853	0.2	34.0	O K	2160 min Summer	98.894	0.894	0.2	35.7	O K	2880 min Summer	98.909	0.909	0.2	36.3	O K	4320 min Summer	98.885	0.885	0.2	35.3	O K	5760 min Summer	98.838	0.838	0.2	33.4	O K	7200 min Summer	98.796	0.796	0.2	31.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	134.372	0.0	889	30 min Summer	88.266	0.0	1072	60 min Summer	55.250	0.0	1244	120 min Summer	33.426	0.0	1416	180 min Summer	24.587	0.0	1522	240 min Summer	19.657	0.0	1600	360 min Summer	14.271	0.0	1720	480 min Summer	11.374	0.0	1822	600 min Summer	9.532	0.0	1914	720 min Summer	8.247	0.0	2000	960 min Summer	6.558	0.0	2156	1440 min Summer	4.740	0.0	2450	2160 min Summer	3.420	0.0	2876	2880 min Summer	2.711	0.0	3312	4320 min Summer	1.951	0.0	4232	5760 min Summer	1.543	0.0	4912	7200 min Summer	1.286	0.0	5616
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																			
15 min Summer	98.209	0.209	0.1	8.3	O K																																																																																																																																																																																			
30 min Summer	98.298	0.298	0.1	11.9	O K																																																																																																																																																																																			
60 min Summer	98.394	0.394	0.1	15.7	O K																																																																																																																																																																																			
120 min Summer	98.494	0.494	0.1	19.7	O K																																																																																																																																																																																			
180 min Summer	98.554	0.554	0.1	22.1	O K																																																																																																																																																																																			
240 min Summer	98.595	0.595	0.1	23.8	O K																																																																																																																																																																																			
360 min Summer	98.654	0.654	0.1	26.1	O K																																																																																																																																																																																			
480 min Summer	98.697	0.697	0.1	27.8	O K																																																																																																																																																																																			
600 min Summer	98.730	0.730	0.1	29.1	O K																																																																																																																																																																																			
720 min Summer	98.758	0.758	0.1	30.2	O K																																																																																																																																																																																			
960 min Summer	98.799	0.799	0.2	31.9	O K																																																																																																																																																																																			
1440 min Summer	98.853	0.853	0.2	34.0	O K																																																																																																																																																																																			
2160 min Summer	98.894	0.894	0.2	35.7	O K																																																																																																																																																																																			
2880 min Summer	98.909	0.909	0.2	36.3	O K																																																																																																																																																																																			
4320 min Summer	98.885	0.885	0.2	35.3	O K																																																																																																																																																																																			
5760 min Summer	98.838	0.838	0.2	33.4	O K																																																																																																																																																																																			
7200 min Summer	98.796	0.796	0.2	31.8	O K																																																																																																																																																																																			
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)																																																																																																																																																																																					
15 min Summer	134.372	0.0	889																																																																																																																																																																																					
30 min Summer	88.266	0.0	1072																																																																																																																																																																																					
60 min Summer	55.250	0.0	1244																																																																																																																																																																																					
120 min Summer	33.426	0.0	1416																																																																																																																																																																																					
180 min Summer	24.587	0.0	1522																																																																																																																																																																																					
240 min Summer	19.657	0.0	1600																																																																																																																																																																																					
360 min Summer	14.271	0.0	1720																																																																																																																																																																																					
480 min Summer	11.374	0.0	1822																																																																																																																																																																																					
600 min Summer	9.532	0.0	1914																																																																																																																																																																																					
720 min Summer	8.247	0.0	2000																																																																																																																																																																																					
960 min Summer	6.558	0.0	2156																																																																																																																																																																																					
1440 min Summer	4.740	0.0	2450																																																																																																																																																																																					
2160 min Summer	3.420	0.0	2876																																																																																																																																																																																					
2880 min Summer	2.711	0.0	3312																																																																																																																																																																																					
4320 min Summer	1.951	0.0	4232																																																																																																																																																																																					
5760 min Summer	1.543	0.0	4912																																																																																																																																																																																					
7200 min Summer	1.286	0.0	5616																																																																																																																																																																																					
©1982-2020 Innovyze																																																																																																																																																																																								

MJA Consulting				Page 2	
Monarch House Barton Lane OX14 3NB		Parkside Road Darcliffe Homes Soakaway			
Date 30/11/2022 File System.CASX		Designed by S.Smith Checked by EP			
Innovyze		Source Control 2020.1			
<u>Cascade Summary of Results for Soakaway.SRCX</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
8640 min Summer	98.757	0.757	0.1	30.2	O K
10080 min Summer	98.720	0.720	0.1	28.7	O K
15 min Winter	98.209	0.209	0.1	8.3	O K
30 min Winter	98.298	0.298	0.1	11.9	O K
60 min Winter	98.394	0.394	0.1	15.7	O K
120 min Winter	98.494	0.494	0.1	19.7	O K
180 min Winter	98.554	0.554	0.1	22.1	O K
240 min Winter	98.595	0.595	0.1	23.8	O K
360 min Winter	98.654	0.654	0.1	26.1	O K
480 min Winter	98.697	0.697	0.1	27.8	O K
600 min Winter	98.731	0.731	0.1	29.2	O K
720 min Winter	98.758	0.758	0.1	30.2	O K
960 min Winter	98.800	0.800	0.2	31.9	O K
1440 min Winter	98.854	0.854	0.2	34.1	O K
2160 min Winter	98.896	0.896	0.2	35.7	O K
2880 min Winter	98.910	0.910	0.2	36.3	O K
4320 min Winter	98.887	0.887	0.2	35.4	O K
5760 min Winter	98.828	0.828	0.2	33.0	O K
7200 min Winter	98.772	0.772	0.1	30.8	O K
8640 min Winter	98.717	0.717	0.1	28.6	O K
10080 min Winter	98.661	0.661	0.1	26.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
8640 min Summer	1.107	0.0	6336		
10080 min Summer	0.976	0.0	7072		
15 min Winter	134.372	0.0	889		
30 min Winter	88.266	0.0	1072		
60 min Winter	55.250	0.0	1244		
120 min Winter	33.426	0.0	1416		
180 min Winter	24.587	0.0	1520		
240 min Winter	19.657	0.0	1598		
360 min Winter	14.271	0.0	1720		
480 min Winter	11.374	0.0	1822		
600 min Winter	9.532	0.0	1912		
720 min Winter	8.247	0.0	1996		
960 min Winter	6.558	0.0	2152		
1440 min Winter	4.740	0.0	2444		
2160 min Winter	3.420	0.0	2868		
2880 min Winter	2.711	0.0	3300		
4320 min Winter	1.951	0.0	4252		
5760 min Winter	1.543	0.0	4976		
7200 min Winter	1.286	0.0	5728		
8640 min Winter	1.107	0.0	6520		
10080 min Winter	0.976	0.0	7312		
©1982-2020 Innovyze					

MJA Consulting		Page 3
Monarch House Barton Lane OX14 3NB	Parkside Road Darcliffe Homes Soakaway	
Date 30/11/2022 File System.CASX	Designed by S.Smith Checked by EP	
Innovyze Source Control 2020.1		

Cascade Rainfall Details for Soakaway.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

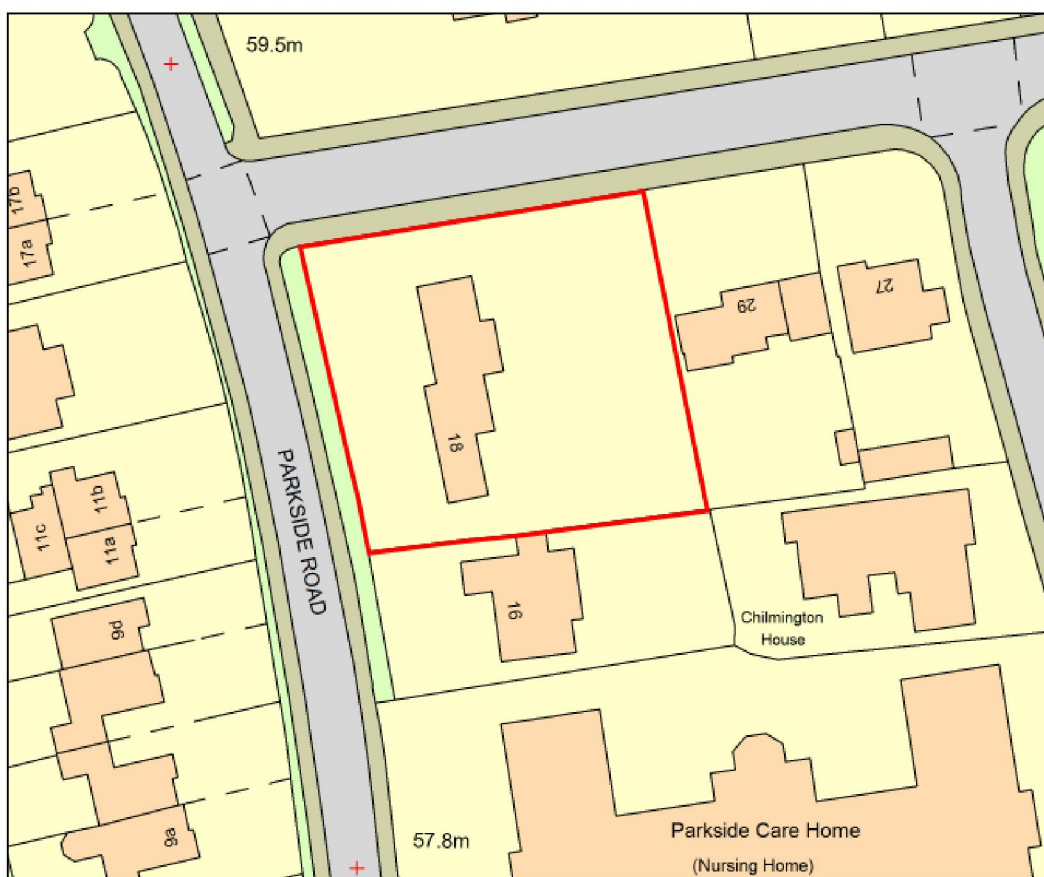
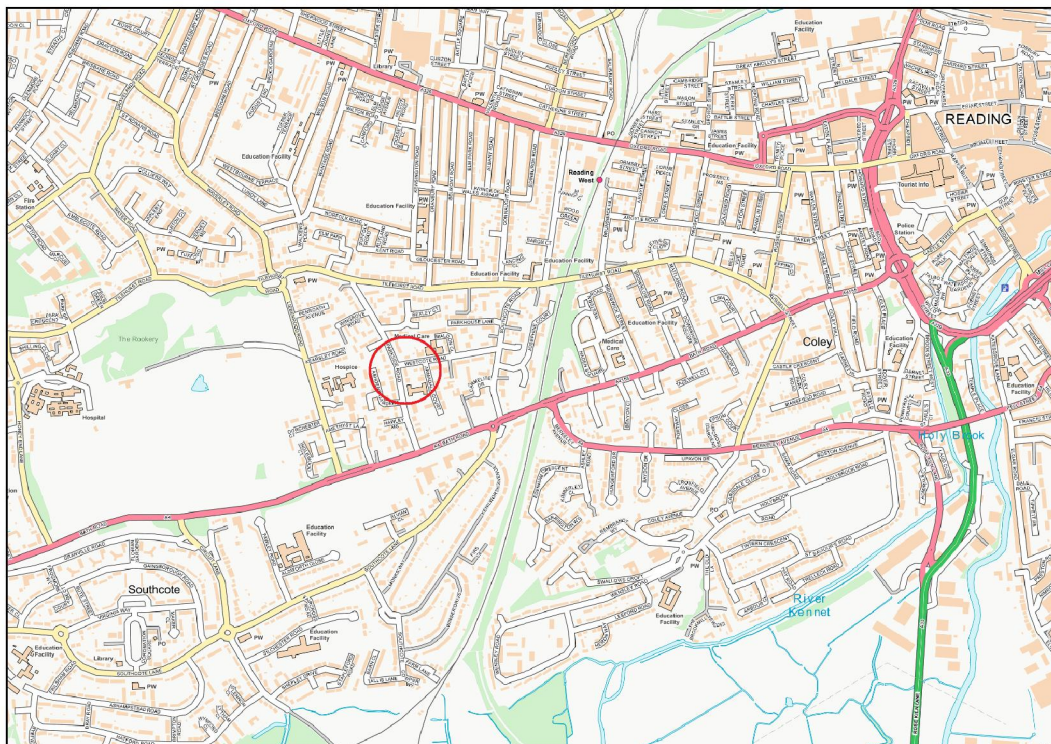
Total Area (ha) 0.000

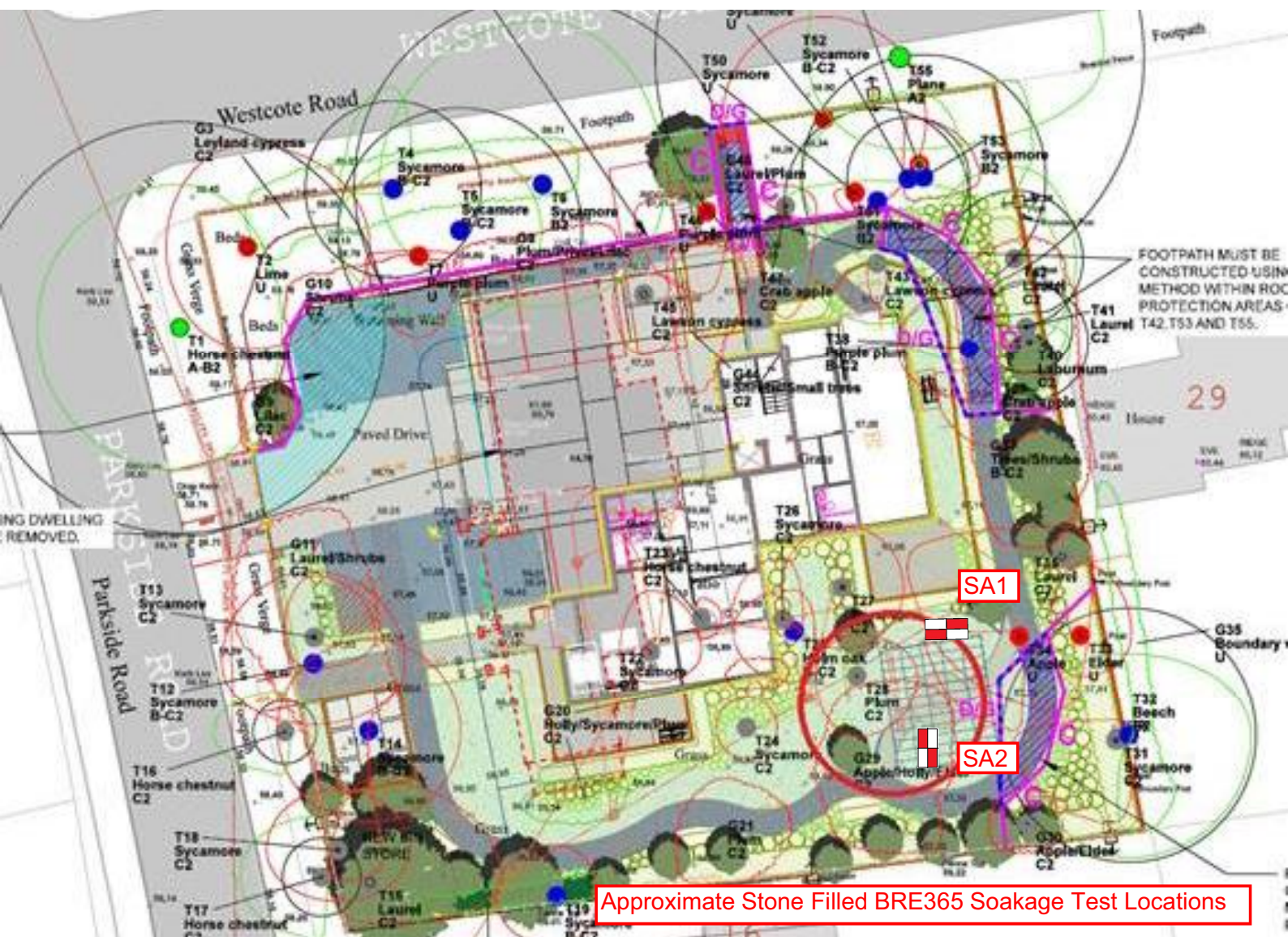
Time (mins)	Area
From: To:	(ha)
0 4	0.000

©1982-2020 Innovyze

MJA Consulting		Page 4																		
Monarch House Barton Lane OX14 3NB	Parkside Road Darcliffe Homes Soakaway																			
Date 30/11/2022 File System.CASX	Designed by S.Smith Checked by EP																			
Innovyze	Source Control 2020.1																			
<u>Cascade Model Details for Soakaway.SRCX</u> Storage is Online Cover Level (m) 100.000 <u>Cellular Storage Structure</u> Invert Level (m) 98.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.01683 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.01683 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>42.0</td><td>42.0</td><td>1.001</td><td>0.0</td><td>70.4</td></tr><tr><td>1.000</td><td>42.0</td><td>70.4</td><td></td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	42.0	42.0	1.001	0.0	70.4	1.000	42.0	70.4			
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)															
0.000	42.0	42.0	1.001	0.0	70.4															
1.000	42.0	70.4																		
©1982-2020 Innovyze																				

Appendix 3:
Ground Investigation & Permeability Tests



**SOAKAGE TEST
LOCATIONS**

PAGE: 3		iGeo-22-165					TRIALPIT SA1		
DATE:13.09.22		18 Parkside Road, Reading, RG30 2DB							
DESCRIPTION	REDUCED	DEPTH	LEGEND	SAMPLE		THICKNESS	SPT	REMARKS	
	LEVEL m			m	TYPE				DEPTH
TOPSOIL		0.00				0.25		Soakage Trial Pit (2.0m x 0.45m x 3.1m average depth)	
MADE GROUND: Soft to firm dark brown, occasionally yellow brown sandy silty CLAY, with fine to coarse sub-rounded flint gravel		0.25				0.50		Pit located half way between WS1 and CP1 (close to foul drain run)	
MADE GROUND: Firm to stiff brown sandy silty CLAY, with occasional fine to coarse sub-rounded & sub-angular flint gravel, also dark brown layers and occasional brick gravel & roots		0.75				0.80		Black coal layer at rear of pit (1.05m to 1.15m)	
Medium dense greenish yellowish orange brown silty SAND [Lynch Hill Gravel Member / Lambeth Group-Reading Formation?]		1.55				0.25			
Stiff reddish brown mottled grey silty CLAY [Lambeth Group-Reading Formation]		1.80				0.30		Water fill depth 2.05m to 2.1m	
Alternating beds of stiff brownish grey silty CLAY and light brown silty SAND [Lambeth Group-Reading Formation]		2.10				0.40		A 50mm perforated standpipe was installed, before the trial pit was backfilled with a single sized 20mm flint gravel (voids ratio 37.6%) to the surface. Water level dataloggers were then installed before the pits had water added (3 fills)	
Medium dense light brown silty SAND [Lambeth Group-Reading Formation]		2.50				0.75			
		3.25							

iGeo Limited

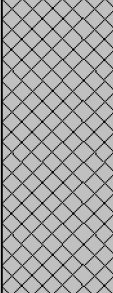
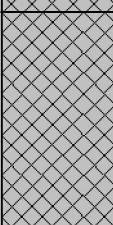
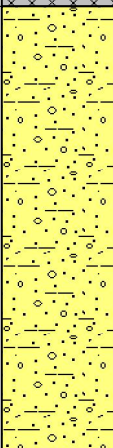
183 Long Lane Tilehurst Reading RG31 6YW

REMARKS: Soakage Trial Pits Excavated on 10th November 2022

U100=100mm dia. UNDISTURBED SAMPLE
B=BULK SAMPLE W=WATER SAMPLE

U38=38mm dia. UNDISTURBED SAMPLE
SPT=STANDARD PENETRATION TEST

D=SMALL DISTURBED SAMPLE
CPT=CONE PENETRATION TEST

PAGE: 4		iGeo-22-165					TRIALPIT SA2		
DATE:13.09.22		18 Parkside Road, Reading, RG30 2DB							
DESCRIPTION	REDUCED	DEPTH	LEGEND	SAMPLE		THICKNESS	SPT	REMARKS	
	LEVEL m			TYPE	DEPTH	m			
		0.00						Soakage Trial Pit (1.9m x 0.45m x 3.1m average depth)	
TOPSOIL						0.25			
MADE GROUND: Soft brown sandy silty CLAY, with fine to coarse sub-rounded flint gravel		0.25				0.20		Over WS1	
MADE GROUND: Firm to stiff brown & occasionally dark brown silty CLAY, with occasional fine to coarse sub-rounded flint gravel, also occasional coal & rare brick fragments		0.45				0.70			
MADE GROUND: Very stiff (desiccated) brown silty CLAY, with occasional fine to coarse sub-rounded & sub-angular flint gravel (brick at side at 1.5m)		1.15				0.50			
Dense darkish brown gravelly clayey SAND / gravelly sandy CLAY. Gravel is fine to coarse sub-rounded & sub-angular flint [Probable Natural or Reworked, Lynch Hill Gravel Member]		1.65				1.05		Variable horizon	
Medium dense orange brown slightly clayey sandy GRAVEL. Gravel is fine to coarse sub-rounded flint. Occasional flint cobbles [Lynch Hill Gravel Member]		2.70				0.65		Water fill depths: 1st Fill ~2.6m 2nd Fill ~2.4m 3rd Fill ~2.23m A 50mm perforated standpipe was installed, before the trial pit was backfilled with a single sized 20mm flint gravel (voids ratio 37.6%) to the surface. Water level dataloggers were then installed before the pits had water added (3 fills)	
		3.35						The trial pit was dry & stable on completion	
 iGeo Limited 183 Long Lane Tilehurst Reading RG31 6YW		REMARKS: Soakage Trial Pits Excavated on 10th November 2022							
U100=100mm dia. UNDISTURBED SAMPLE B=BULK SAMPLE W=WATER SAMPLE		U38=38mm dia. UNDISTURBED SAMPLE SPT=STANDARD PENETRATION TEST			D=SMALL DISTURBED SAMPLE CPT=CONE PENETRATION TEST				

PAGE: 5

DATE:13.09.22

iGeo-22-165

18 Parkside Road, Reading, RG30 2DB

SOAKAGE TESTS

Soakaway Design Calculations to BRE365 (DG 365 Revised 2016)

Soakage Test Number SA1

Trial Pit Soakage Test

Soakage Pit Length [m] 2.00
Soakage Pit Width [m] 0.45
Soakage Pit Depth [m] 3.10
TP Test Base (if different) [m] 3.10
Pit Voids [%] 37.6

(100% if an open pit,
30% or measured if stone)

Borehole Soakage Test

Borehole Diameter [m]
Standpipe Diameter [m]
Borehole Depth [m]
BH Test Base (if different) [m]
Bentonite Seal Depth [m]
Borehole Surround Voids [%]

(100% if an open Borehole
30% if stone)

First Fill

Date (dd/mm/yy)	Hours (24hr)	Mins	Elapsed Time	Depth to Water (m)	Collapsing Observed (°C)
10/11/22	14	26	0	2.131	
10/11/22	14	27	1	2.195	
10/11/22	14	28	2	2.257	
10/11/22	14	29	3	2.325	
10/11/22	14	30	4	2.381	
10/11/22	14	32	6	2.485	
10/11/22	14	34	8	2.575	
10/11/22	14	36	10	2.653	
10/11/22	14	38	12	2.731	
10/11/22	14	40	14	2.801	
10/11/22	14	42	16	2.875	
10/11/22	14	44	18	2.936	
10/11/22	14	46	20	3.000	
10/11/22	14	50	24	3.084	

Remarks:

Test effective depth [m] 0.97

Vp75 [m] = 2.37325

Tp75 [mins] = 3.86

Vp25 [m] = 2.85775

Tp25 [mins] = 15.57

Soil Infiltration Rate [m/s] = 7.125E-05

Onsite Extrapolation Ratio = 0.6 (over 1 extrapolated)

Second Fill

Date (dd/mm/yy)	Hours (24hr)	Mins	Elapsed Time	Depth to Water (m)	Collapsing Observed (°C)
11/11/22	09	41	0	2.041	
11/11/22	09	43	2	2.122	
11/11/22	09	45	4	2.194	
11/11/22	09	47	6	2.266	
11/11/22	09	50	9	2.349	
11/11/22	09	53	12	2.424	
11/11/22	09	56	15	2.492	
11/11/22	09	59	18	2.557	
11/11/22	10	03	22	2.634	
11/11/22	10	07	26	2.710	
11/11/22	10	12	31	2.791	
11/11/22	10	17	36	2.863	
11/11/22	10	24	43	2.937	
11/11/22	10	34	53	3.018	
11/11/22	10	47	66	3.083	

Remarks:

Test effective depth [m] 1.06

Vp75 [m] = 2.31

Tp75 [mins] = 7.46

Vp25 [m] = 2.84

Tp25 [mins] = 34.01

Soil Infiltration Rate [m/s] = 3.219E-05

Onsite Extrapolation Ratio = 0.5 (over 1 extrapolated)

Third Fill

Date (dd/mm/yy)	Hours (24hr)	Mins	Elapsed Time	Depth to Water (m)	Collapsing Observed (°C)
11/11/22	14	39	0	2.066	
11/11/22	14	41	2	2.123	
11/11/22	14	44	5	2.205	
11/11/22	14	47	8	2.270	
11/11/22	14	49	10	2.311	
11/11/22	14	55	16	2.416	
11/11/22	15	00	21	2.485	
11/11/22	15	06	27	2.570	
11/11/22	15	12	33	2.641	
11/11/22	15	18	39	2.712	
11/11/22	15	25	46	2.787	
11/11/22	15	34	55	2.865	
11/11/22	15	46	67	2.940	
11/11/22	16	06	87	3.014	
11/11/22	16	52	133	3.092	

Remarks:

Test effective depth [m] = 1.03

Vp75 [m] = 2.32

Tp75 [mins] = 10.95

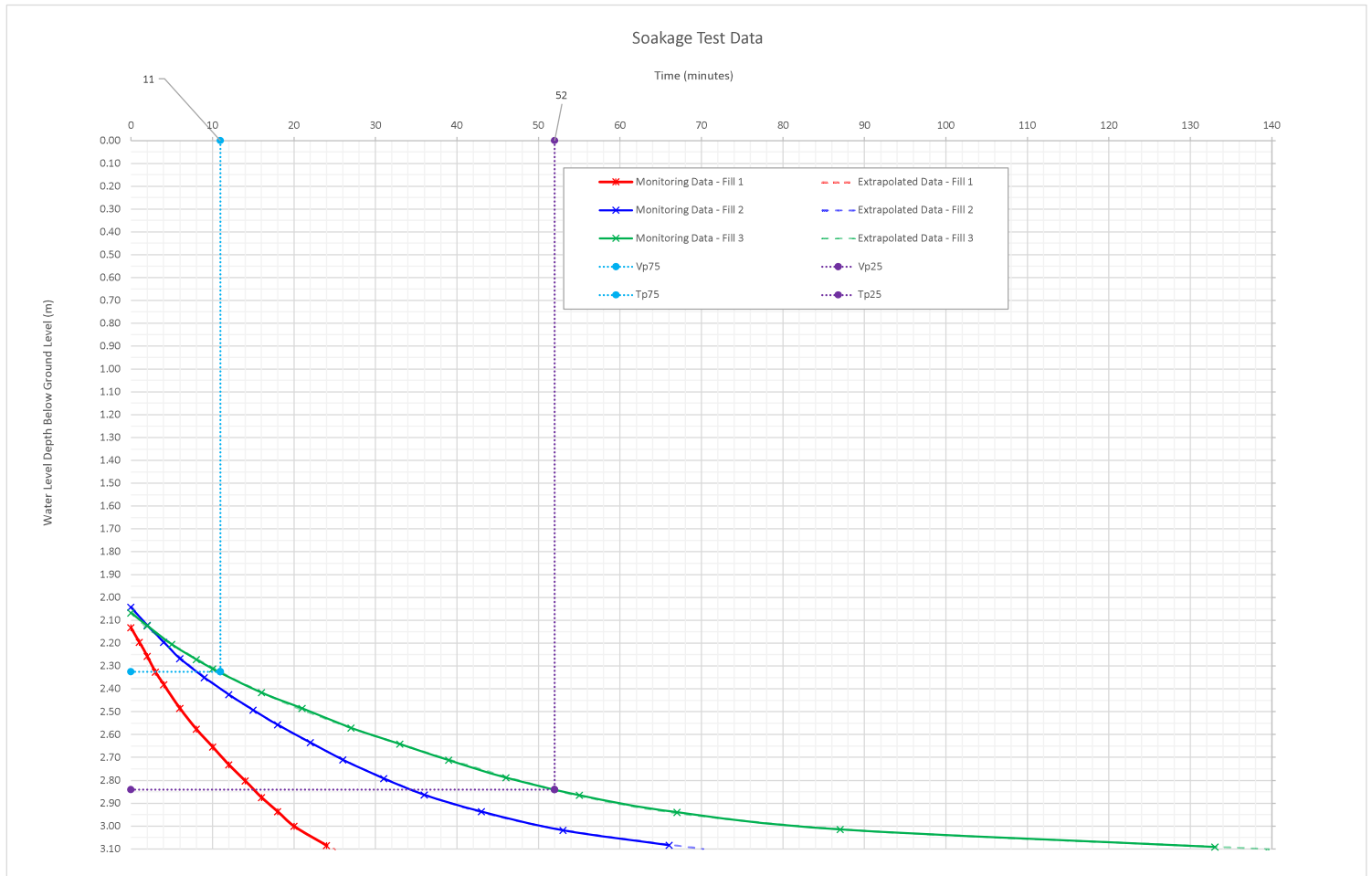
Vp25 [m] = 2.84

Tp25 [mins] = 51.95

Soil Infiltration Rate [m/s] = 2.071E-05

Onsite Extrapolation Ratio = 0.4 (over 1 extrapolated)

Slowest Soil Infiltration Rate [m/s] = 2.071E-05



PAGE: 6

DATE:13.09.22

iGeo-22-165

18 Parkside Road, Reading, RG30 2DB

SOAKAGE TESTS

Soakaway Design Calculations to BRE365 (DG 365 Revised 2016)

Soakage Test Number SA2

Trial Pit Soakage Test

Soakage Pit Length [m] 1.90
Soakage Pit Width [m] 0.45
Soakage Pit Depth [m] 3.10
TP Test Base (if different) [m] 3.10
Pit Voids [%] 37.6

(100% if an open pit,
30% or measured if stone)

Borehole Soakage Test

Borehole Diameter [m]
Standpipe Diameter [m]
Borehole Depth [m]
BH Test Base (if different) [m]
Bentonite Seal Depth [m]
Borehole Surround Voids [%]

(100% if an open Borehole
30% if stone)

First Fill					
Date (dd/mm/yy)	Hours (24hr)	Mins	Elapsed Time	Depth to Water (m)	Collapsing Observed (°C)
10/11/22	13	40	0	2.599	
10/11/22	13	41	1	2.623	
10/11/22	13	43	3	2.675	
10/11/22	13	46	6	2.714	
10/11/22	13	50	10	2.742	
10/11/22	13	56	16	2.777	
10/11/22	14	04	24	2.812	
10/11/22	14	14	34	2.850	
10/11/22	14	27	47	2.887	
10/11/22	14	43	63	2.923	
10/11/22	15	00	80	2.956	
10/11/22	15	29	109	2.992	
10/11/22	16	05	145	3.027	
10/11/22	16	46	186	3.064	
10/11/22	17	48	248	3.100	
Remarks:					

Test effective depth [m] 0.50	
Vp75 [m] = 2.72425	Tp75 [mins] = 7.77
Vp25 [m] = 2.97475	Tp25 [mins] = 94.88
Soil Infiltration Rate [m/s] = 7.582E-06	
Onsite Extrapolation Ratio = 0.4 (over 1 extrapolated)	

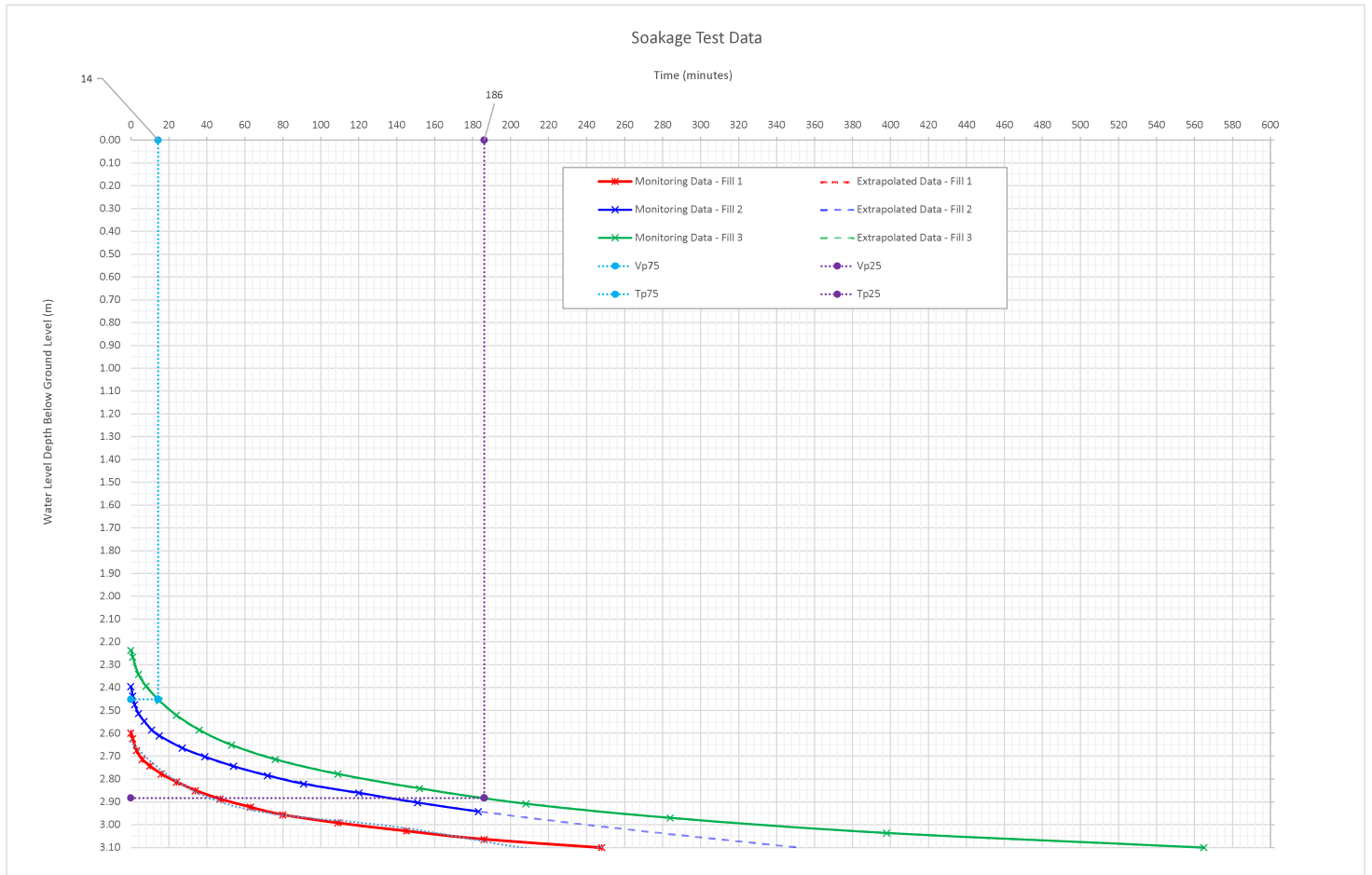
Second Fill					
Date (dd/mm/yy)	Hours (24hr)	Mins	Elapsed Time	Depth to Water (m)	Collapsing Observed (°C)
11/11/22	09	30	0	2.394	
11/11/22	09	31	1	2.435	
11/11/22	09	32	2	2.473	
11/11/22	09	34	4	2.513	
11/11/22	09	37	7	2.547	
11/11/22	09	41	11	2.585	
11/11/22	09	45	15	2.610	
11/11/22	09	57	27	2.663	
11/11/22	10	09	39	2.702	
11/11/22	10	24	54	2.744	
11/11/22	10	42	72	2.785	
11/11/22	11	01	91	2.821	
11/11/22	11	30	120	2.861	
11/11/22	12	01	151	2.903	
11/11/22	12	33	183	2.942	
Remarks:					

Test effective depth [m] 0.71	
Vp75 [m] = 2.57	Tp75 [mins] = 9.46
Vp25 [m] = 2.92	Tp25 [mins] = 167.28
Soil Infiltration Rate [m/s] = 4.767E-06	
Onsite Extrapolation Ratio = 0.9 (over 1 extrapolated)	

Third Fill					
Date (dd/mm/yy)	Hours (24hr)	Mins	Elapsed Time	Depth to Water (m)	Collapsing Observed (°C)
11/11/22	14	30	0	2.235	
11/11/22	14	31	1	2.265	
11/11/22	14	34	4	2.341	
11/11/22	14	38	8	2.393	
11/11/22	14	45	15	2.457	
11/11/22	14	54	24	2.520	
11/11/22	15	06	36	2.585	
11/11/22	15	23	53	2.651	
11/11/22	15	46	76	2.714	
11/11/22	16	19	109	2.777	
11/11/22	17	02	152	2.841	
11/11/22	17	58	208	2.908	
11/11/22	19	14	284	2.970	
11/11/22	21	08	398	3.036	
11/11/22	23	55	565	3.100	
Remarks:					

Test effective depth [m] = 0.87	
Vp75 [m] = 2.45	Tp75 [mins] = 14.35
Vp25 [m] = 2.88	Tp25 [mins] = 185.97
Soil Infiltration Rate [m/s] = 4.676E-06	
Onsite Extrapolation Ratio = 0.3 (over 1 extrapolated)	

Slowest Soil Infiltration Rate [m/s] = 4.676E-06





Project Name

18 Parkside Road, Reading (Soakage)

iGeo Limited

183 Long Lane, Tilehurst, Reading, Berkshire, RG31 6YW
Office: 0118 943 9910 Email: hello@igeo.co.uk Web: www.igeo.co.uk



MJA CONSULTING

Civil & Structural Engineers

www.mjaconsulting.co.uk

Ipsium Court
24 The Quadrant
Abingdon Science Park
Abingdon
Oxfordshire
OX14 3YS