

Technical Note

Project	Gwersyllt	Project No	14009
Subject	Discharge of Planning Conditions 14 & 15	Date	14 September 2023
File Ref	14009-CRH-ZZ-XX-TN-C-0001_Condition 14 & 15 Technical Note (new).docx	Page	16

1.0 INTRODUCTION

1.1 J10 Planning is proposing to develop the land off Mold Road, Gwersyllt for use as a 54 bed low secure unit with associated parking and soft landscaping.

1.2 CampbellReith was appointed by J10 planning to discharge planning condition 14 and 15 in support of the full planning permission granted by the Welsh Ministers in November 2018 (ref: APP/H6955/A/18/3207621).

1.3 Condition 14 refers to the requirement for a comprehensive SuDS strategy for the scheme:

"No development shall take place on a part of the site until a comprehensive sustainable drainage scheme indicating how foul water, surface water and land drainage shall be dealt with for that part of the site has been submitted to and approved in writing by the local planning authority. The scheme shall be implemented and thereafter be managed and maintained in accordance with the approved details.

These details shall include:

i) a timetable for its implementation; and

ii) a management and maintenance plan for the lifetime of the development which shall include arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage system throughout its lifetime."

1.4 Condition 15 states that:

"No surface water run-off shall be permitted to flow from the development onto the adjoining highway. An ACO drain or similar shall be provided across the approved access to intercept any such run-off prior to first occupation of the development."

1.5 Both Conditions 14 and 15 have been accounted for within the detailed drainage strategy outlined below.

2.0 SITE CONTEXT

2.1 The site is located at the land off Mold Road, Gwersyllt, Wrexham, LL11 4AF. National Grid Reference 331510E, 353800N. The site is approximately 1.5 ha in area and is approximately 3.5 km North-West of Wrexham town centre. Refer to Appendix A for site location plan.

3.0 SURFACE WATER DRAINAGE STRATEGY

3.1 Overview

3.1.1 The surface water drainage system has been designed in accordance with the NPPF and the accompanying Guidance and Technical Standards for SuDS. It also complies with the requirements under Building Regulations Part H.

3.2 Surface Water Hierarchy

3.2.1 In line with the SuDS hierarchy under paragraph 80 of the PPG, surface water should be managed by:

- 1.) Infiltration to the maximum extent that is practical – where it is safe and acceptable to do so
- 2.) Discharge to watercourses
- 3.) Discharge to surface water sewer, highway drain or another drainage system
- 4.) Discharge to combined sewers (last resort)

3.2.2 Infiltration testing has been conducted as part of the ground investigations undertaken by Bigfoot Geo-Environmental Consultants in June 2023. Bigfoot Geo-environmental Consultants Limited undertook a series of BRE 365 soakaway testing at five soakaway locations requested as part of the initial drainage strategy development by CampbellReith. The exact locations of the proposed infiltration testing are detailed within the full report contained within Appendix D.

3.2.3 The table below summarises the results achieved from the soakaway testing conducted on the 4th/5th May 2023.

Location	Test 1 (m ³ /m ² /s)	Test 2 (m ³ /m ² /s)	Test 3 (m ³ /m ² /s)
SA1	N/A*	-	-
SA2	1.13E-05	N/A*	-
SA3	N/A*	-	-
SA4	N/A*	-	-
SA5	4.61E-05	2.36E-05	2.00E-05

Table 6.1: Soakaway Test Results (Bigfoot Geo-Environmental Report ref: BFG1042 BRE 365 Soakaway tests)

*N/A – Insufficient infiltration to calculate rate

3.2.4 Location SA5 in the south of the development was the only location to yield successful infiltration results on all three tests and would therefore be the only viable location on site to locate any infiltration infrastructure. Refer to section 3.4 for the full SuDS design.

3.3 Discharge Rates

3.3.1 As the design solely utilises infiltration to dispose of surface water, greenfield runoff from the site has not been calculated.

3.4 SuDS Strategy

3.4.1 The surface water network has been modelled using Infodrainage version 2024.2 to demonstrate that no surcharging occurs in the 1 in 1 year event and no flooding occurs in the 1 in 30 or 1 in 100 year + climate change events. Climate change must be considered as an integral part of any surface water drainage design in order to minimise the impact of future flooding and allow adequate consideration for resilience to alleviate the burden on potential future users of the proposed development. The climate change allowance for this particular site is 40%.

- 3.4.2 The surface water drainage system will convey water from all external hard paving and building roof areas to the proposed infiltration blanket located beneath the car park in the south of the development and infiltrate to the ground at a rate of approximately 0.072 m/hr. The infiltration blanket has been sized to accommodate any additional attenuation required on site up to the 1 in 100 year plus 40% climate change event whilst maintaining an appropriate half drain time.
- 3.4.3 The infiltration blanket has an invert level of 101.30m which correlates to the depth at which infiltration values were recorded to ensure these values can be achieved during operation of the system following construction. The surface area and depth of the infiltration blanket have been sized in order to achieve a half drain time below 24 hours. The resultant volume of the tank is 633 m³ with a half drain time of 1416 minutes (23.60 hours). Infiltration has been assumed from both the base and sides of the tank with an applied safety factor of 5 which is in accordance with Table 4.6 of Ciria publication 156 "Infiltration Drainage Manual of Good Practice".
- 3.4.4 The scheme also incorporates a green roof across a portion of the proposed building's roof (approximately 300m²). The green roof will provide both nominal at-source water storage as well as significant water quality benefits to the scheme. The provision of a green roof proves to be beneficial for the management of shorter more intense storms and results in a slower flow rate of runoff from the roof as the organic matter on the roof provides at-source interception storage which is often sufficient to retain runoff from most short duration rainfall events. This storage has conservatively not been accounted for within calculations at this stage and therefore will provide additional storage over and above what is currently shown on the drawing. Additionally, any additional storage volume provided by the permeable paving within the southern car park has also not been accounted for and will therefore provide additional betterment on the storage values currently allowed for in the design.
- 3.4.5 The system has been designed to ensure no flooding occurs within the development up to and including the 1 in 100 year plus 40% climate change event. However, should any part of the system fail or become blocked, any resultant flooding will follow the topography of the site towards the southern car park of the development which is proposed to be permeable paving. Additionally, an ACO channel has been located at the edge of the proposed development where it meets the adjoining existing highway. The purpose of the ACO Channel is to intercept any run-off during normal and flooded scenarios to ensure it does not cause flooding off site. During detailed design the above exceedance flooding should be considered during the development of the external site levels design to ensure that exceedance flows are routed safely around buildings towards the southern car park.
- 3.4.6 It is therefore considered that surface water run-off from the proposed development can be managed in such a way to ensure that it does not pose a risk to the site or its occupants and does not increase flood risk to the wider catchment.
- 3.4.7 Refer to Appendix E for the proposed drainage strategy drawing and supporting hydraulic calculations.
- 3.5 **Surface Water Quality**
- 3.5.1 The SuDS components within the surface water drainage strategy have been designed in accordance with the guidance set-out in the Ciria publication C753 The SuDS Manual.
- 3.5.2 Treatment within SuDS components is essential for frequent low intensity and duration rainfall events, where urban contaminants are mobilised and washed off urban surfaces and the aggregated contribution to the total pollutant load to the receiving surface water body is potentially high. For rainfall events greater than the 1 in 1year return period, the pollutants become diluted and the environmental risks will be reduced which means that the SuDS

treatment process becomes less crucial. Treatment effectiveness is strongly linked to the hydraulic control of runoff, in particular velocity control and retention time.

- 3.5.3 Table 26.2 of the CIRIA SuDS Manual provides the pollution hazard indices for different land use classifications as shown in the table below.

Table 6.2: CIRIA Pollution hazard indices for different land use classifications

Land Use	Pollution Level	Hazard	Total Solids (TSS)	Suspended	Metals	Hydro-carbons
Residential Roofs	Very Low		0.2	0.2	0.05	
Individual property driveways, residential car parks, low traffic roads, car parks with infrequent change	Low		0.5	0.4	0.4	

- 3.5.4 As the development is categorised as residential end use the proposed pollution level is deemed to be low.

- 3.5.5 Table 3.3 below summarises the treatment efficiency of different SuDS components discharging to surface waters as detailed in Chapter 26 of the SuDS Manual. Where discharging to ground, the mitigation indices in table 3.3 should be used for any upstream SuDS components.

Table 6.3: CIRIA Indicative SuDS Mitigation Indices for Discharges to surface water

Mitigation Indices			
Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Permeable Pavement	0.7	0.6	0.7

- 3.5.6 As per guidance given in the CIRIA SuDS Manual, when infiltration to groundwater is the primary source of discharge from the site then the risk of pollutants must be assessed.

- 3.5.7 Table 4.3 within the CIRIA SuDS Manual determines the minimum water quality requirements for discharge to groundwater. For areas with a low pollution hazard classification, a simple index approach can be used. For areas with a pollution hazard classification of medium, Groundwater Risk Screening must be undertaken to determine if a simple index approach can be applied. For areas with a pollution hazard classification of high, a detailed site-specific risk assessment must be undertaken.

- 3.5.8 As summarised in Table 3.2 above, the pollution hazard rating for the site is low. Therefore, a simple index approach can be used.

- 3.5.9 Table 3.4 below summarises the treatment efficiency of different SuDS components discharging to groundwater as detailed in Chapter 26 of the SuDS Manual.

Table 6.4: CIRIA Indicative SuDS Mitigation Indices for Discharges to groundwater

Mitigation Indices			
Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant potential of at least 300 mm in depth.	0.7	0.6	0.7
Proprietary treatment systems.	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentration relevant to the contributing drainage area.		

4.0 FOUL WATER DRAINAGE STRATEGY

4.1 The information obtained from the Welsh Water asset plans confirm that foul water from site is routed through a combined sewer network along the site access road which subsequently connects into the Welsh Water public sewer on Mold road.

4.2 The foul water flows from the site are proposed to discharge into an existing combined water manhole within the highway in the southeastern corner of the site (exact location shown on CRH drawing no 5050). It is assumed this existing asset is owned by Welsh Water therefore approval from the statutory body will be required to make a connection into their network.

4.3 Refer to Appendix E for Proposed Drainage layout and supporting calculations.

5.0 MANAGEMENT AND MAINTENANCE SCHEDULE

5.1 Overview

5.1.1 In respect of condition 14, a management and maintenance schedule of the sustainable drainage system for the lifetime of the development is required.

5.1.2 The main drainage infrastructure, both foul and surface water, including all SuDS features will remain under private ownership. The drainage assets will be maintained by a Management/Maintenance Company set up specifically for the development. Maintenance will require regular inspection of ACO Channels, gullies, manholes and all associated pipe work to remove any build-up of sediment and debris. SuDS features such as permeable paving; the infiltration blanket and green roof have more specific maintenance requirements as outlined in their respective sections below.

5.2 Permeable Paving

Construction

5.2.1 Construction vehicles and equipment not directly involved in the construction of the pervious pavements will be kept away from these areas. Silt fences, staged excavation works and

temporary drainage swales/bunds to divert runoff away from exposed areas will be utilised, as appropriate, to manage the risks associated with, and to intercept the discharge of sediment laden runoff. Landscaping activities will be carefully designed and carried out to prevent deposition of topsoil, turf and other materials on the surface of the pavement. Infiltration surfaces will not be compacted and will be protected at all times. Excavations for the pervious pavement installation should aim to be undertaken in times of dry weather, when possible, to prevent mobilisation of sediments from exposed surfaces during rainfall events. Surfaces exposed as part of the pervious paving installation works should be stabilised as soon as possible. Perimeter controls should be installed prior to construction to protect watercourses.

Maintenance Schedule

- 5.2.2 The table below shows the operation and maintenance requirements for the pervious pavements which are in accordance with the CIRIA C753 SuDS Manual.

Table 6.5: Operation and maintenance requirements for pervious pavements (CIRIA C753, 2015)

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 surfaces from adjacent impervious areas as these areas are 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 onto 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, 48hrs after large storms in first six months

	Assess silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

5.3 Infiltration Blanket

Construction

- 5.3.1 Construction vehicles and equipment not directly involved in the construction of the soakaways will be kept away from these areas. The construction activities should not clog the infiltration system or compact the underlying soils. Silt fences, staged excavation works and temporary drainage swales/bunds to divert runoff away from exposed areas will be utilised, as appropriate, to manage the risks associated with, and to intercept the discharge of sediment laden runoff from discharging into the soakaway.

- 5.3.2 Excavations for the pervious pavement installation should aim to be undertaken in times of dry weather, when possible, to prevent mobilisation of sediments from exposed surfaces during rainfall events.

Maintenance Schedule

- 5.3.3 The table below shows the operation and maintenance requirements for the detention basins, taken from the CIRIA C753 SuDS Manual.

Table 6.6: Operation and maintenance requirements for soakaways

Maintenance Schedule	Required Action	Typical frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional Maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial Action	Reconstruct soakaway and/ or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

5.4 Green Roof

- 5.4.1** Maintenance frequency varies pertaining to the complexity of the green roof; intensive green roofs require regular inspection and action, this may include weekly mowing of grassed areas and weeding of plant beds. On the other hand, extensive green roofs will be managed with a more subtle approach, biannual visits to remove litter, invasive plants species as well as checking fire breaks and drains.
- 5.4.2** Maintenance responsibility for green roof systems should be placed with a responsible organisation with specialist training in green roof care, all maintenance actions must comply with appropriate health and safety regulations, especially as this encompasses regulations for working at height (e.g. operators require safety fastenings to work at roof level). Training and guidance information for operating and maintaining the roof is to be distributed to all property owners and tenants.
- 5.4.3** Roof access points should be designed with safety and mobile convenience at foremost, providing secure points for harness attachments where approach of the roof edges is required. CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.
- 5.4.4** The table below provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required.
- 5.4.5** Maintenance plans and schedules should be developed during the design phase and will be specific to the type of roof that is adopted. Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements.

Table 6.7: Maintenance and Operation of Green Roofs (CIRIA C753, 2015)

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth.	Biannually
	During establishment (i.e. year one), replace dead plants as required	Monthly (usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where >5% loss of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Biannually or as required
	Remove nuisance and invasive vegetation, including weeds	Biannually or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Biannually or as required
	If erosion channels are evident, these should be stabilised with extra soil substrate similar to	As required

Remedial actions	the original material and sources of erosion damage should be identified and controlled	
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required
Monitoring	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance of roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms

5.5 Proprietary Treatment Systems

5.5.1 The proprietary treatment systems include conventional pipework, gullies, catchpits, manholes, channels and headwalls.

Construction

5.5.2 During construction the principal contractor must ensure that preventative measures have been put in place as to not allow the construction runoff drain into the system. Measures must be taken to ensure debris from the construction site does not block the components. Routine inspections should be undertaken ensuring that the drainage is functioning properly. Outfalls must be constructed to the correct level and all joints must be correctly sealed. During construction backfill should be correctly installed as specified as per the manufactures' recommendations.

Maintenance Schedule

5.5.3 The maintenance schedule for the aforementioned SuDS has been adopted from the SuDS Manual C753 and are summarised in the table below.

Table 6.8: Maintenance and Operation of Proprietary Treatment Systems (CIRIA C753, 2015)

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Monitoring	Inspect monthly
Occasional maintenance	Sediment management	Annually or as required
Remedial maintenance	Structure rehabilitation/repair	As required

6.0 CONCLUSION

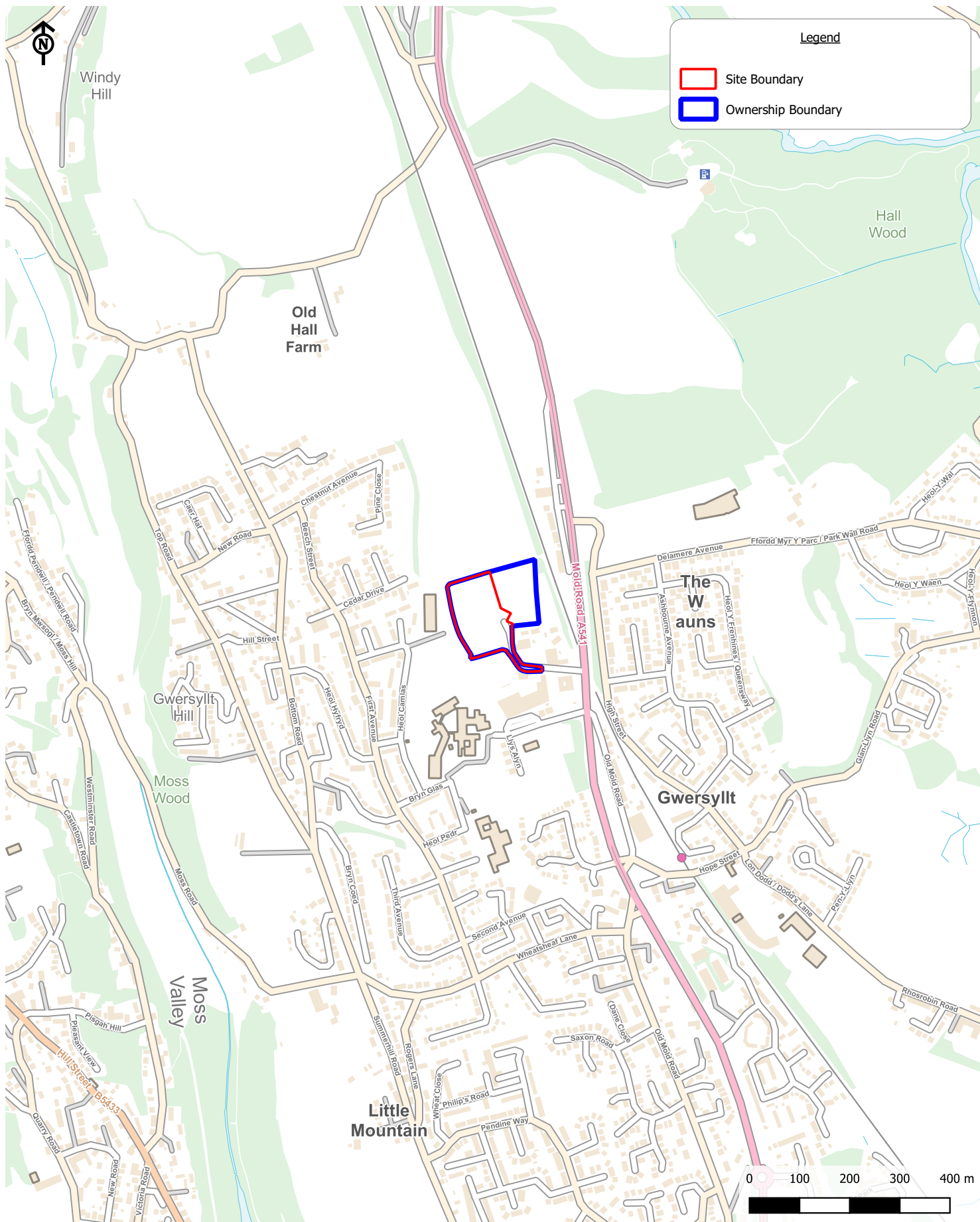
- 6.1 The proposed surface water drainage strategy for the site has been designed to incorporate a SuDS-based solution to manage surface water runoff from the impermeable areas within the proposed development. The drainage strategy demonstrates a feasible surface water drainage solution for the site, which includes attenuation of surface water runoff up to and including the 1 in 100 year, plus 40% climate change event. As such, surface water runoff from the proposed development can be managed to ensure that it does not pose an increased risk to the site, its occupants, or to the wider catchment through effective design utilising SuDS features and an ACO Channel across the access to the existing highway.
- 6.2 The proposed foul water drainage strategy formulated for the site, incorporates an infrastructure-based solution to manage wastewater from the proposed development. The foul water drainage strategy demonstrates a feasible gravity drainage solution for the site flowing into the nearby combined sewer.
- 6.3 Both foul and surface water systems will be maintained and managed by a dedicated drainage management company as per the maintenance schedule above.



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Appendix A

Site Location Plan



Gwersyllt, Wrexham

Site Location

Client: J10 Planning

Scale: 1:10000@A4
 CampbellReith OS Copyright: © Crown copyright. All rights reserved. Licence number 100020027
 Contains Ordnance Survey data © Crown copyright and database right 2023.
 Job Number: 14009
 Drawn by - Checked by: RLF - IC
 Drg No - Status/Revision: 14009-CRH-XX-XX-FG-G-7000 - P2
 File location: N:\14000 - 14249\14009 M - Gwersyllt, Wrexham\Project_Workspaces (pdf in Outputs)
 Date (Revision History): 07/09/2023 (P1, First Issue, 17/08/23, RLF; P2, 07/09/23, RLF)

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Appendix B

Proposed Site Plan

KEY - GENERAL

 RS Refuse Store
 Soft Landscaping, Trees and Grassed Areas
 Parking - Standard
 Parking - Disabled

	ACCOMMODATION	PARKING		
REF	TYPE	No. Houses/ Apartments	Provisions per Unit	No. provided (disseminated included)
1 - 6	Detached & semi detached 3 - 4 bed houses	6	2	12
A	3 Storey apartment block 1 & 2 bed flats	12	1.5	18
B	3 Storey apartment block 1 & 2 bed flats	12	1.5	18
Total		30 Units		48 Spaces (incl. 5No disab)

1. This Hybrid Application includes a Full Application for Low Secure Unit and an Outline Application for housing.
2. Site Plan based on Topographical Survey Ref. 9963 T received on 22.06.2017.
3. All entry points off access road to existing sites and businesses to be retained.
4. See DTPC drawing & report for highways improvements and alteration.
5. See Clancy Flood Consequence Assessment & Drainage Strategy Report including incorporated surface & foul water strategy drawing.

— Site Boundary (Site Area 2.58 Hectares)
MH Existing Combined Outfall Manhole & Combined Sewer Route

KEY - GENERAL

KEY - UNITS WITHIN BUILDING

KEY - EXTERNAL AMENITY AREAS

ACCOMMODATION - GIA 4955 m²

- | PARKING | | | |
|---------|--------------------|-----------|---|
| | TYPE | PROVISION | NOTES |
| 1. | Standard spaces | 61 | To provide for staff in 3no shifts as part of 24 hours operation and visitors |
| 2. | Disabled spaces | 5 | Close to main entrance |
| 3. | Cycle spaces | 10 | Refer to Broxap Coventry Cantilever cycle shelter spec sheet |
| 4. | Motor cycle spaces | 4 | Close to main entrance |

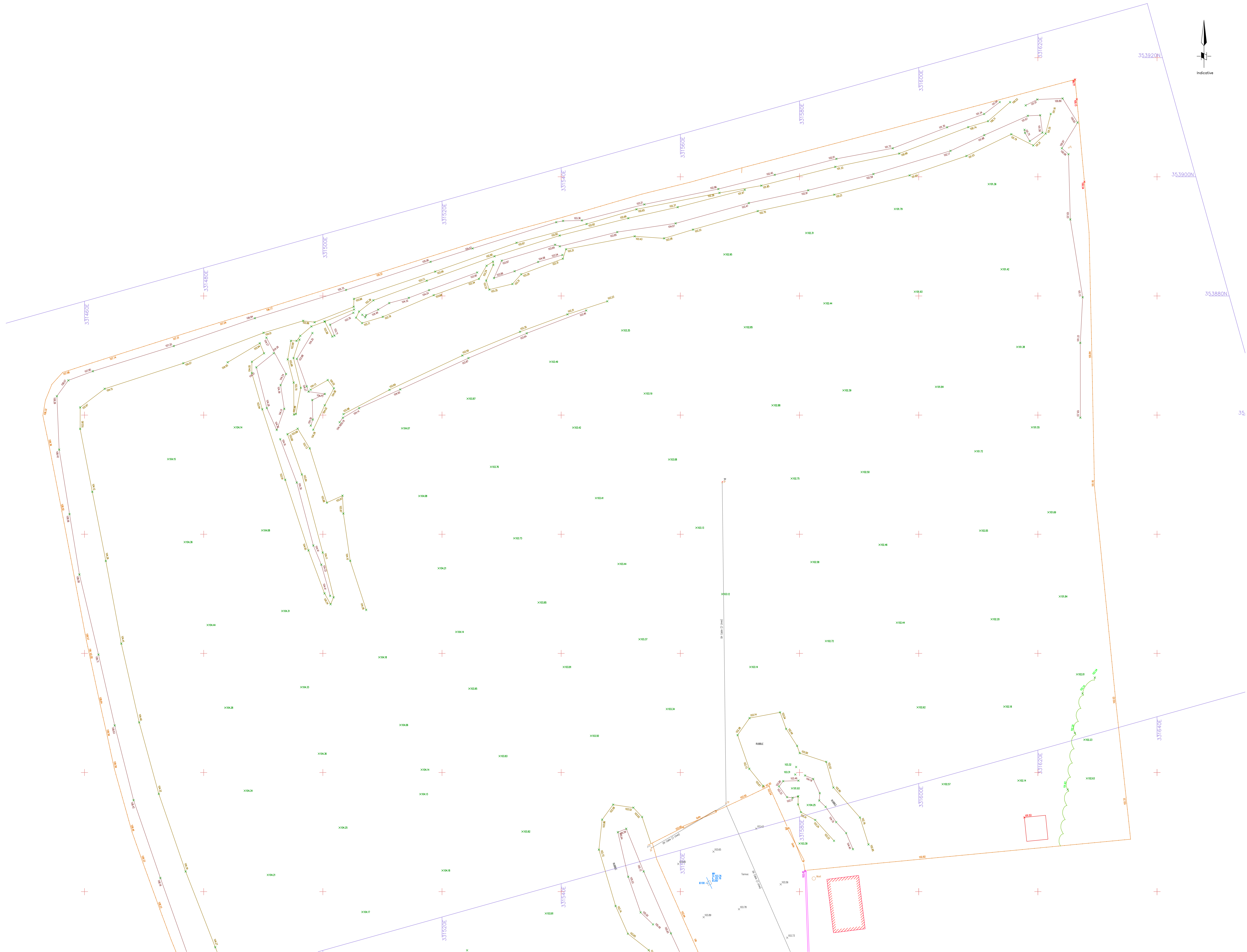
SITE PLAN - AS PROPOSED



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Appendix C

Existing Site information



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Legend	
AV	Air valve
BH	Borehole
BOL	Bolted
BT	British Telecom cover
CLTV	Cable television cover
CL	Cover level
DPC	Damp proof coating level
EarthVER	Earthling rod
ELIC	Electric cover
EP	Electricity pole
Fence IR	Iron railing fence
Fence CR	Closeboard fence
Fence CP	Concrete post & rail fence
Fence P	Palisade fence
Fence PW	Post and wire fence
Fence PIR	Post and rail fence
Fence PIP	Post and panel fence
Fence PIP	Finished floor level
FB	Flower bed
GY	Gully
IC	Inspection chamber
IC	Invert level
INV	Invert level
LT	Lamp post
LT	Light
MT	Manhole
Nymex	Telecommunications cover
OSBM	Ordnance Survey Bench Mark
PTM	Parking ticket machine
RE	Road sign
RS	Road sign
RSW	Rotating wall
SSX	Switch box
SP	Sign post
SPS	Safety playing surface
ST	Steel top
SV	Service valve
TBM	Temporary Bench Mark
TP	Telegraph pole
THL	Through Level
TRL	Traffic light
WH	Wash out
WL	Water level
WQ	Wash out

Building	Building
Building overtop / Foundations / Ruins	Building overtop / Foundations / Ruins
Road edge / Change of surface / Drain	Road edge / Change of surface / Drain
Change of slope	Change of slope
Fence	Fence

Safety barrier	Site
Overhead cable	Tree
Gate	52.47 Spot level
Hedge	
Link of foliage/tree	
completes	

The survey grid & level datum relate to the Ordnance Survey datum. GPS network coordinates are given in Easting and Northing. The data is correct to the nearest millimetre. The current survey has been merged with existing survey data, from other sources, and may have been produced at a different scale to the most recent information.

This survey is produced using a combination of Ordnance Survey (OS) digital data and topographical digital surveying. Care should be taken when measuring from one system to another as the two datasets have been produced using different techniques. The OS information is provided by Ordnance Survey.

Please note this survey is a refresh, at the clients request, of a previous survey produced by Formby Surveys Ltd in 2017.

Co-ordinates and Levels related to Ordnance Survey National Grid and Datum using Leica's 5200+ dual frequency GNSS receiver and SmartNet RTK corrections.

Station	Easting	Northing	Level
FS01	331504.309	353810.775	103.51
FS02	331500.900	353838.838	103.40
FS03	331542.777	353851.818	103.45
FS04	331539.297	353872.765	103.39
FS05	331532.348	353868.177	104.35
FS06	331516.675	353884.323	105.29
FS07	331509.121	353893.521	105.58
FS08	331454.928	353881.469	108.40
FS09	331463.851	353814.195	108.87
FS10	331481.478	353798.111	104.80
FS11	331536.380	353778.706	104.12
FS12	331538.126	353755.887	104.01
FS13	331574.269	353737.408	104.37
FS14	331583.448	353737.846	104.42
FS15	331601.396	353699.374	104.32

REV	DESCRIPTION	DWN	CHKD	DATE
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CLIENT	C/o J10 Planning
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PROJECT	Mold Road, Gwersyllt, Wrexham, LL11 4AF
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TITLE	Topographical Survey
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DWN	DATE	CHKD	DATE	APPD	DATE	SCALE
MB	10/08/2017					1:200 @ A0

MB SURVEYING 4D Unit 5, The Grange, Gwersyllt, Wrexham, LL11 4AF		Phone: 01929 756000 Fax: 01929 756001 www.mbsurveying.co.uk
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Drawing Number	MBS1032	AG
REV		



NOTES

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[illegible]

	Building
	Building overhead / Foundations / Ruins
	Road edge / Change of surface / Drain
	Change of slope
	Fence

	Safety barrier		
	Overhead cable		Stile
	Gate		Tree
	Hedge		
	Limit of foliage/tree canopies	52.47	Spot level

The survey grid & level datum relate to the Ordnance Survey active GPS network established via Leica SmartNET, plotted with no scale factor applied.

The current survey has been merged with existing survey data, from either a previous project or from a third party. This data may not truly represent current features due to site changes and may have been produced at a different scale to the most recent information.

This survey is produced using a combination of Ordnance Survey (OS) digital data and topographical digital surveying. Care should be taken when measuring from one system to another as the two datasets have been produced using different techniques. The OS information is provided for guidance only.

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Co-ordinates and Levels related to Ordnance Survey National Grid and Datum using Leica's GS08+ dual frequency GNSS receiver and SmartNet RTK corrections.

Station	Easting	Northing	Level
FS01	331564.309	353610.775	103.51
FS02	331550.900	353636.838	103.40
FS03	331542.177	353651.818	103.45
FS04	331530.297	353672.765	103.39
FS05	331520.448	353688.712	103.43
FS06	331516.675	353698.323	105.29
FS07	331509.121	353682.021	105.56
FS08	331454.926	353681.469	108.40
FS09	331463.831	353614.195	106.67
FS10	331481.476	353576.111	104.60
FS11	331420.396	353577.708	104.32
FS12	331530.126	353755.867	104.01
FS13	331574.369	353737.408	104.37
FS14	331583.448	353737.946	104.42
FS15	331601.396	353699.374	104.32

REV	DESCRIPTION	DWN	CHK'D	DATE
-----	-------------	-----	-------	------

CLIENT C/o J10 Planning

PROJECT Mold Road, Gwersyllt,
Wrexham LL11 4AF

TITLE	Topographical Survey
-------	----------------------

DWN	DATE	CHK'D	DATE	APP'D	DATE	SCALE
MR	08/13/2003					1-2000



Drawing Number	MBS1032	A0 REV
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NOTES

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[illegible]

_____ Building
 _____ Building overhead / Foundations / Ruins
 _____ Road edge / Change of surface / Drain
 _____ Change of slope
 _____ C/L _____ Fence

	Safety barrier		
	Overhead cable		Stile
	Gate		
	Hedge		Tree
	Limit of foliage/tree canopies	52.47	Spot level

The survey grid & level datum relate to the Ordnance Survey active GPS network established via Leica SmartNET, plotted with no scale factor applied.

The current survey has been merged with existing survey data, from either a previous project or from a third party. This data may not truly represent current features due to site changes and may have been produced at a different scale to the most recent information.

This survey is produced using a combination of Ordnance Survey (OS) digital data and topographical digital surveying. Care should be taken when measuring from one system to another as the two datasets have been produced using different techniques. The OS information is provided for guidance only.

Please note this is a refresh, at the clients request, of a previous survey produced by Formby Surveys Ltd in 2017

Co-ordinates and Levels related to Ordnance Survey National Grid and Datum using Leica's GS08+ dual frequency GNSS receiver and SmartNet RTK corrections

Station	Easting	Northing	Level
FS01	331564.309	353610.775	103.51
FS02	331550.900	353636.838	103.40
FS03	331542.177	353651.818	103.45
FS04	331539.297	353672.765	103.39
FS05	331532.448	353688.712	103.43
FS06	331516.675	353684.323	105.29
FS07	331509.121	353682.021	105.56
FS08	331454.926	353681.469	108.40
FS09	331463.831	353614.195	106.67
FS10	331481.476	353576.111	104.60
FS11	331428.396	353577.708	104.32
FS12	331539.126	353755.867	104.01
FS13	331574.369	353737.408	104.37
FS14	331583.448	353737.946	104.42
FS15	331601.396	353699.374	104.32

REV	DESCRIPTION	DWN	CHK'D	DATE
-----	-------------	-----	-------	------

CLIENT C/o J10 Planning

PROJECT Mold Road, Gwersyllt,
Wrexham, Clwyd, Wales

TITLE	Topographical Survey
-------	----------------------

DWN	DATE	CHK'D	DATE	APP'D	DATE	SCALE
MB	08/13/2003					1-200@



Drawing Number	MBS1032	A0 REV
----------------	---------	-----------





Waste network:

	Foul chamber		Outfall
	Surface water chamber		Lamphole
	Combined chamber		Storm Overflow
	Combined sewer overflow		Rising main
	Special purpose chamber		Gravity sewer
	Treatment works		Private sewer
	Pumping station		Private sewer subject to Sect. 104 adoption agreement

NB: Sewer symbol colour indicates the type.

RED	- Combined		Private Sewer Transfer
GREEN	- Surface Water		
BROWN	- Foul		

Lateral Drain

Inspection Chamber

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Dwr Cymru Cyf gives this information as to the position of its underground apparatus by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the Company's apparatus and anyonus of locating the apparatus before carrying out any excavations rests entirely on you. It must be understood that the furnishing of the information is entirely without prejudice to the provision of the New Roads and Streetworks Act 1991 and of the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated

**EXACT LOCATIONS OF ALL APPARATUS
TO BE DETERMINED ON SITE.**

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Map Ref: 331695,353669
Map scale: 1:2,500
Printed by: DT
Printed on: 09/08/2017



CampbellReith
consulting engineers

Appendix D

Infiltration Tests Results



Saturday 17 June 2023

**Adeel Abbas – ASC Real Estate Investments Ltd, Regent House, Regent Street,
Blackburn, BB1 6BH**

Ref: BFG1042 – Gwersylit, Wrexham

Dear Adeel,

Soakaway Test Results – Gwersylit, Wrexham

Introduction

As part of the proposed development at the above site, Bigfoot Geo-environmental Consultants Limited undertook a series of BRE 365 soakaway testing as detailed within our Fee Quote Ref: BFG1042.

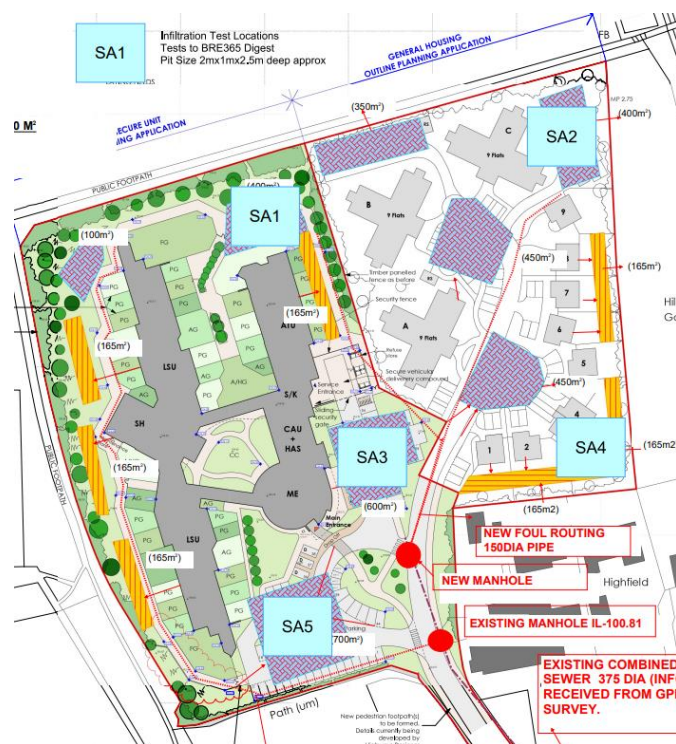
This factual letter report provides the following:

- Soakaway Locations;
- Soakaway results; and
- Calculation Sheets.

Soakaway Locations

Five soakaway locations were requested as part of the development by the drainage consultant Garry Taylor at Campbell Reith.

The locations proposed are shown below as SA1 to SA5:



Field Work

Five soakaways test locations were progressed in general accordance with BRE365 during the site work, undertaken over two days between 4th and 5th of May 2023. The following table, confirms the dimensions of the Trial pits and the base depth of the soakaway test.

Location	Length (m)	Width (m)	Depth (m)
SA1	1.9	0.7	2.0
SA2	2.1	0.7	2.05
SA3	2.0	0.7	2.0
SA4	1.9	0.7	2.1
SA5	2	0.7	2.15

The general ground conditions encountered in each location are confirmed below:

Location	General Ground Conditions
SA1	MADE GROUND to 0.4m bgl, overlying glaciofluvial sands and gravels to 0.8m bgl, overlying sandy gravelly clay.
SA2	MADE GROUND to 0.2m bgl, overlying sandy gravelly CLAY.
SA3	MADE GROUND to 0.8m bgl, overlying sandy gravelly CLAY.
SA4	MADE GROUND to 1.0m bgl, overlying sandy gravelly CLAY.
SA5	MADE GROUND to 1.2m bgl, overlying gravelly SAND.

Where ground conditions permitted, multiple soakaway tests were undertaken in each location, over the course of the two days.

Soakaway Results

Location	Test 1 (m3/m2/s)	Test 2 (m3/m2/s)	Test 3 (m3/m2/s)
SA1	N/A*	-	-
SA2	1.13E-05	N/A*	-
SA3	N/A*	-	-
SA4	N/A*	-	-
SA5	4.61E-05	2.36E-05	2.00E-05

* N/A – Insufficient infiltration to calculate rate

Conclusion

BRE 365 Soakaway testing was undertaken across 4th and 5th May 2023. Ground conditions encountered enabled testing and calculation of infiltration rates to be completed across 2No. Soakaway test locations.

3No. locations did not provide sufficient data to allow for infiltration rates to be calculated (limited drainage due to encountered ground conditions).

Infiltration rates range from 4.62E-05 to 1.13E-05.

Yours sincerely

for and on behalf of Bigfoot Geo-Environmental Consultants Ltd

B Hall

Brad Hall
Director

Enc. Soakaway Location Plan
Trial Pit Logs
Soakaway Photos
Soakaway Calculations

SOAKAWAY TRENCH
AREA- 495 M²

Infiltration Test Locations
Tests to BRE365 Digest
Pit Size 2mx1mx2.5m deep approx

**GENERAL HOUSING
OUTLINE PLANNING APPLICATION**

INFILTRATION
BLANKET
AREA- 1800M²

TOTAL AREA OF THE SITE - 12000 M2

COMMUNITY CENTRE
CAR PARK

3.0m high security fencing to all external resident amenity area

2.4 high existing security fence on top of banking to be retained together with dense shrub and tree planting

- Site boundary (Site Area 6.18 Acres)
- 2 Storey Low Secure Unit (with single storey elements)
- Soft landscaping, trees and grassed areas
- Banking
- Footpaths & maintenance access tracks
- Parking - standard
- Parking - disabled
- Main entrance
- **Service entrance**
- Existing level
- **Proposed level**

ME	Main Entrance
HAS	Hospital Admin Suite (first floor)
CAU	Clinical Assessment Unit (Ground Floor)
S/K	Services Block/Kitchen
ATU	Assessment Treatment Unit (2 storey - 2No. 7 bed units)
LSU	Low Secure Unit (2 storey - 4No. 10 bed units)
SH	Sports Hall
KEY - EXTERNAL AMENITY AREAS	
CC	Central Landscaped Courtyard
AG	Amenity Garden (to resident unit day space)
FG	First Floor Amenity Garden
A/HG	Amenity/Horticultural Garden
PG	Private Resident Garden

1. 14 Bed Assessment Treatment Unit arranged as 2No. 7 bed units.
2. 40 Bed Low Secure Accommodation arranged as 4No. 10 bed units.
3. Main reception.
4. Clinical and management administration units.
5. Resident facilities including cafe, activity rooms, gym, and sports hall. Includes external amenity spaces

	TYPE	PROVISIONS	NOTES
1.	Standard parking spaces	66	To provide for staff in 3rd shifts as part of 24 hours operation and visitors
2.	Disabled parking spaces	5	Close to main entrance
3.	Cycle parking spaces	10	Refer to Broxap Coventry Camillever cycle shelter spec sheet
4.	Motor cycle parking spaces	4	Close to main entrance

[illegible]

KEY - GENERAL

- Proposed Building
1 -9 = Houses
A-C = Apartment Blocks
- RS Refuse Store
- Parking Standard
- Disabled Parking
- Soft landscaped perimeter

ACCOMMODATION		PARKING		
REF	TYPE	No. Houses/ Apartments	No. provided (disabled included)	
1 - 9	Detached & semi detached 3 - 4 bed houses	9	2	18
A	3 Storey apartment block 1 & 2 bed flats	9	1.5	13
B	3 Storey apartment block 1 & 2 bed flats	9	1.5	14
C	3 Storey apartment block 1 & 2 bed flats	9	1.5	14
Total Residential Units		36		
Total Parking		59 (includes 7No disabled)		

SOAKAWAY TRENCH
AREA- 495 M²

INFILTRATION
BLANKET
AREA- 1650M²

TOTAL AREA OF THE SITE- 10000 M2

~~TRAINING APPLICATION~~

- | | |
|--|------------|
| 1. Site levels revised to suit new layout | |
| 2. Retaining wall introduced | |
| 3. Maintenance access path amended | |
| 4. First floor Unit garden & private garden sizes | 20.10.2017 |
| 1. 3 No. First floor Unit gardens maximised in size | |
| 2. Highlighted staircases amended to suit larger gardens | |
| 3. Car parking revised | 12.10.2017 |
| 1. Number of car parking spaces reduced | |
| 2. Building repositioned to suit revised car park | |
| 3. Highlighted staircases amended | 04.10.2017 |
| 4. First floor Unit amenity gardens extended | |
| 1. Revision notes added | 21.09.2017 |
| 1. General notes added | |
| 2. Number of car parking spaces reduced | |
| 3. Highlighted staircases to USUs amended | |
| 4. First floor Unit amenity gardens extended | |
| 5. Secure delivery compound introduced | |
| 6. Boundary between sites amended | |
| 7. Highlighted areas of service path omitted | |
| 8. Security fencing amended | |

20.09.2017

REVISION DRAWS **DATE / BY**

☐ Preliminary

☐ For Approval

☐ Tender

☐ Construction

CLIENT

ASC Realstate Investments Ltd

PROJECT	Proposed Low Secure Units & Housing Mold Road, Gweryllt Wrexham LL11 4AF
DRAWING TITLE	Proposed Site Plan

SCALE drawn by date
1:500@A1 MP 29-08-2017
DRAWING NO. revision
17-032-110 (P7)

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CLA
Cindy Lofthouse Architects

F: 0151 207 4371 • F: 0151 207 7087

SITE PLAN - AS PROPOSED

SURFACE & FOUL WATER STRATEGY FOR LOW SECURE UNIT & GENERAL HOUSING AT MOLD ROAD, WREXHAM-SK001.

**EXISTING
WELSH WATER
FOUL SEWER
(INFO RECEIVED
FROM WELSH
WATER ASSET
PLAN.**

PROJECT	Gwersyllt	 TRIAL PIT LOG SA1
PROJECT NO.	BFG1042	
EXPLORATORY HOLE ID	SA1	
DATE	04/05/2023	
DESCRIBED BY	JL	
LOGGER SIGNATURE	JL	

Strata			Samples and Tests		
From (m)	To (m)	Description	Depth,m	Type	Result
0.00	0.40	MADE GROUND: Grass over brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is fine to medium angular to rounded of sandstone, concrete, brick.	0.20	ES	
0.40	0.80	Light yellowish brown mottled grey clayey slightly gravelly fine to coarse SAND. Gravel is fine to medium subangular to subrounded of sandstone and siltstone.	0.50	ES	
0.80	2.00	Firm reddish brown slightly sandy gravelly CLAY. Gravel is fine to medium subrounded to rounded of mudstone and sandstone. Occasional 100mm pockets of brown clayey gravelly fine to medium sand. Perched water in sand pockets.			

Remarks	
Stable ground conditions, Poor infiltration	
Method/ Plant	Mechanical Excavator
Stability	Stable
Shoring	None
Weather	
U=Undisturbed, P=Piston, D=Disturbed, B= Bulk, W=Water, ES=Environmental Soil Sample, EW=Environmental Water Sample	

PROJECT	Gwersyllt	BIGFOOT GEO-ENVIRONMENTAL CONSULTANTS  TRIAL PIT LOG SA2
PROJECT NO.	BFG1042	
EXPLORATORY HOLE ID	SA2	
DATE	05/05/2023	
DESCRIBED BY	JL	
LOGGER SIGNATURE	JL	

Strata			Samples and Tests		
From (m)	To (m)	Description	Depth,m	Type	Result
0.00	0.20	MADE GROUND: Grey very gravelly fine to coarse SAND. Gravel is fine to coarse angular to subrounded of limestone, concrete, brick. Occasional cobbles of brick.	0.20	ES	
0.20	2.10	Firm reddish brown very sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded to rounded of sandstone and siltstone. Occasional cobbles of sandstone and siltstone.	0.50	ES	

Remarks

Stable ground conditions, Limited infiltration

Method/ Plant	Mechanical Excavator
Stability	Stable
Shoring	None
Weather	

U=Undisturbed, P=Piston, D=Disturbed, B= Bulk, W=Water, ES=Environmental Soil Sample, EW=Environmental Water Sample

PROJECT	Gwersyllt	 TRIAL PIT LOG SA3
PROJECT NO.	BFG1042	
EXPLORATORY HOLE ID	SA3	
DATE	04/05/2023	
DESCRIBED BY	JL	
LOGGER SIGNATURE	JL	

Strata			Samples and Tests		
From (m)	To (m)	Description	Depth,m	Type	Result
0.00	0.80	MADE GROUND: Light grey gravelly fine to coarse SAND. Gravel is fine to coarse of sandstone, brick, mudstone, concrete. Occasional cobbles of concrete.	0.30	ES	
0.80	2.00	Firm reddish brown mottled grey slightly sandy CLAY. Sand is fine to medium.	1.00	ES	

Remarks	
Stable ground conditions, Poor infiltration	
Old derelict pipe and telecom cables @ 0.2m bgl	
Method/ Plant	Mechanical Excavator
Stability	Stable
Shoring	None
Weather	
U=Undisturbed, P=Piston, D=Disturbed, B= Bulk, W=Water, ES=Environmental Soil Sample, EW=Environmental Water Sample	

PROJECT	Gwersyllt	 TRIAL PIT LOG SA4
PROJECT NO.	BFG1042	
EXPLORATORY HOLE ID	SA4	
DATE	05/05/2023	
DESCRIBED BY	JL	
LOGGER SIGNATURE	JL	

Strata			Samples and Tests		
From (m)	To (m)	Description	Depth,m	Type	Result
0.00	1.00	MADE GROUND: Grass over dark brown and grey clayey gravelly fine to coarse SAND. Gravel is fine to coarse angular to subangular of concrete, brick, sandstone, siltstone, charcoal. Occasional cobbles of brick and concrete. Rare buried derelict cables.	0.40	ES	
1.00	2.10	Firm reddish brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to coarse subrounded to rounded of sandstone and siltstone.	1.10	ES	

Remarks	
Stable ground conditions, Poor infiltration	
Method/ Plant	Mechanical Excavator
Stability	Stable
Shoring	None
Weather	
U=Undisturbed, P=Piston, D=Disturbed, B= Bulk, W=Water, ES=Environmental Soil Sample, EW=Environmental Water Sample	

PROJECT	Gwersyllt	 TRIAL PIT LOG SA5
PROJECT NO.	BFG1042	
EXPLORATORY HOLE ID	SA5	
DATE	04/05/2023	
DESCRIBED BY	JL	
LOGGER SIGNATURE	JL	

Strata			Samples and Tests		
From (m)	To (m)	Description	Depth,m	Type	Result
0.00	0.40	MADE GROUND: Brownish grey slightly clayey gravelly fine to coarse SAND. Gravel is fine to coarse angular to subrounded of brick, sandstone, concrete, quartzite. Rare pieces of metal.	0.60	ES	
0.40	1.20	Dark brownish grey clayey slightly gravelly ashy SAND. Gravel is fine to coarse angular to subangular of slate, brick, mudstone.			
1.20	2.20	Brown mottled light yellowish brown clayey slightly gravelly SAND. Gravel is fine to medium subangular to subrounded of sandstone.	1.50	ES	
Remarks Stable ground conditions, Good infiltration					
Method/ Plant		Mechanical Excavator			
Stability		Stable			
Shoring		None			
Weather					
U=Undisturbed, P=Piston, D=Disturbed, B= Bulk, W=Water, ES=Environmental Soil Sample, EW=Environmental Water Sample					



Soakaway Test Location 1



Soakaway Test Location 2



Soakaway Test Location 3



Soakaway Test Location 4



Soakaway Test Location 5



Infiltration Test Report

Carried out by:	Date:	Method:				Trial pit dimensions:	Before:	After:	Location:	Grid: OSGB
JL	04/05/23	BRE Digest DG 365: 2016				Length (m):	1.90	1.90	mE:	-
Chkd by:	Test no:	Granular infill:	Datum height (m agl):	Depth to water: Start: End:		Width (m):	0.70	0.70	mN:	-
BH	1	No	0.00	0.96	0.97	Depth (m):	2.00	2.00	m OD:	-

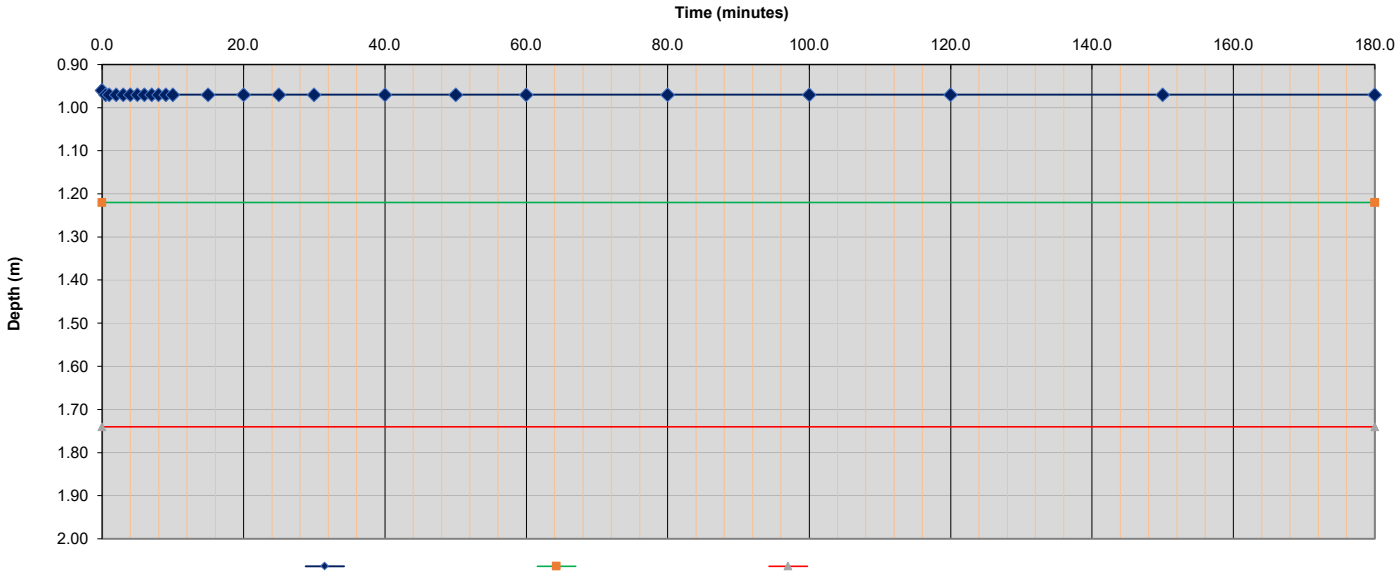
Elapsed time (mins):	Water depth (m):	Elapsed time (mins):	Water depth (m below datum):
0.0	0.96		
0.5	0.97		
1.0	0.97		
2.0	0.97		
3.0	0.97		
4.0	0.97		
5.0	0.97		
6.0	0.97		
7.0	0.97		
8.0	0.97		
9.0	0.97		
10.0	0.97		
15.0	0.97		
20.0	0.97		
25.0	0.97		
30.0	0.97		
40.0	0.97		
50.0	0.97		
60.0	0.97		
80.0	0.97		
100.0	0.97		
120.0	0.97		
150.0	0.97		
180.0	0.97		

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:
75%	1.22	75%		0.00
50%	1.48	50%		Known
25%	1.74	25%		

Base area of pit		1.330	m ²
Mean surface area through which outflow occurs		4.034	m ²
Volume outflow between 75 and 25% effective depth (Assume 30% void within gravel infill)		-0.207	m ³
Soil infiltration rate, f	N/A	m ³ /m ² /s	
Soil infiltration rate, f	N/A	m/hr	
Percolation Value, vp	N/A	s/mm	

INSUFFICEINT INFILTRATION TO CALCULATE RATE

Notes: 1. See accompanying trial pit log;



	Notes: For explanation of symbols and abbreviations see Key Sheet. All depths in meters.		Project: Gwersyllt		Test reference: SA1 – Test 1
	Issue: Draft		Proj No: 1042		
			Client: Peter		

Infiltration Test Report

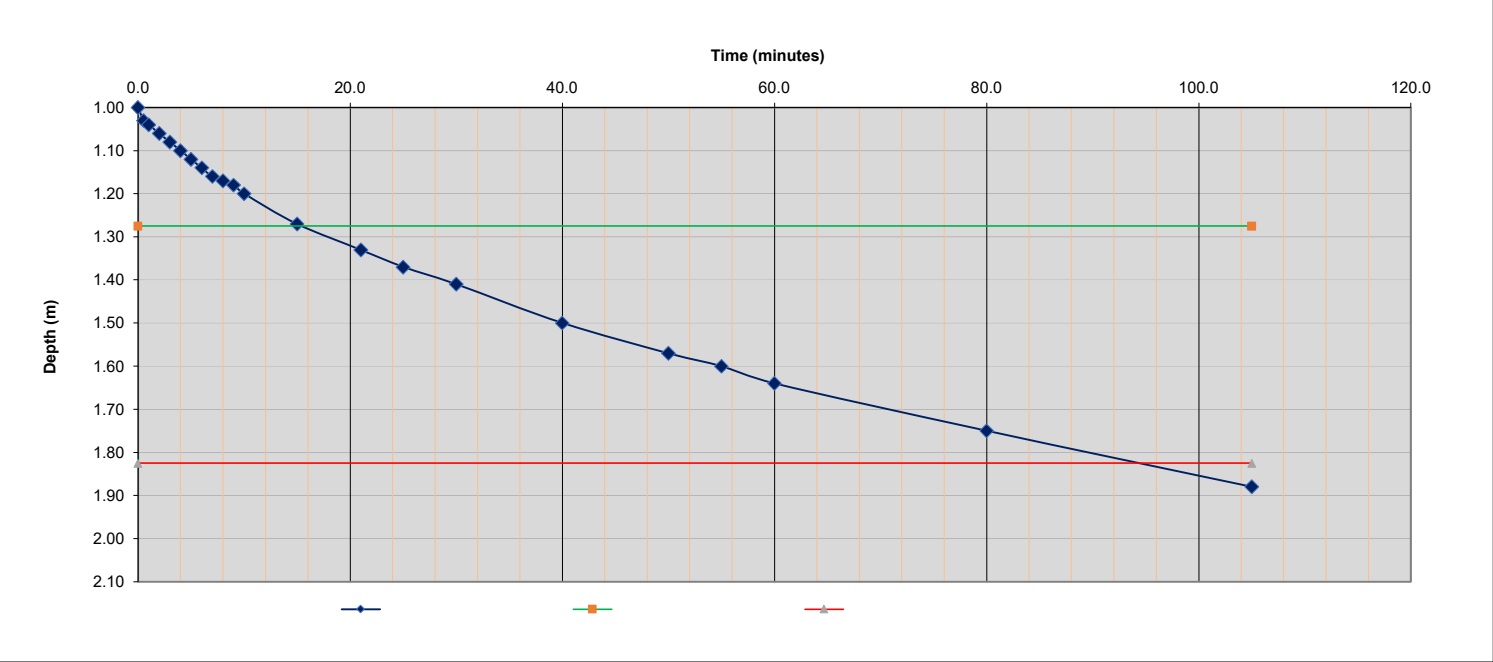
Carried out by:	Date:	Method:				Trial pit dimensions:	Before:	After:	Location:	Grid: OSGB
JL	05/05/23	BRE Digest DG 365: 2016				Length (m):	2.10	2.10	mE:	-
Chkd by:	Test no:	Granular infill:	Datum height (m agl):	Depth to water: Start: End:		Width (m):	0.70	0.70	mN:	-
BH	1	No	0.00	1.00	1.88	Depth (m):	2.10	2.05	m OD:	-

Elapsed time (mins):	Water depth (m):	Elapsed time (mins):	Water depth (m below datum):
0.0	1		
0.5	1.03		
1.0	1.04		
2.0	1.06		
3.0	1.08		
4.0	1.1		
5.0	1.12		
6.0	1.14		
7.0	1.16		
8.0	1.17		
9.0	1.18		
10.0	1.2		
15.0	1.27		
21.0	1.33		
25.0	1.37		
30.0	1.41		
40.0	1.5		
50.0	1.57		
55.0	1.6		
60.0	1.64		
80.0	1.75		
105.0	1.88		

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:
75%	1.28	75%	15.50	0.00
50%	1.55	50%		Known
25%	1.83	25%	94.00	

Base area of pit		1.470	m ²
Mean surface area through which outflow occurs		4.550	m ²
Volume outflow between 75 and 25% effective depth (Assume 30% void within gravel infill)		-0.243	m ³
Soil infiltration rate, f	1.13E-05	m ³ /m ² /s	
Soil infiltration rate, f	0.04	m/hr	
Percolation Value, vp	8.56E+00	s/mm	

Notes: 1. See accompanying trial pit log;



Infiltration Test Report

Carried out by:	Date:	Method:				Trial pit dimensions:	Before:	After:	Location:	Grid: OSGB
JL	05/05/23	BRE Digest DG 365: 2016				Length (m):	2.10	2.10	mE:	-
Chkd by:	Test no:	Granular infill:	Datum height (m agl):	Depth to water: Start: End:		Width (m):	0.70	0.70	mN:	-
BH	1	No	0.00	1.00	1.38	Depth (m):	2.05	2.05	m OD:	-

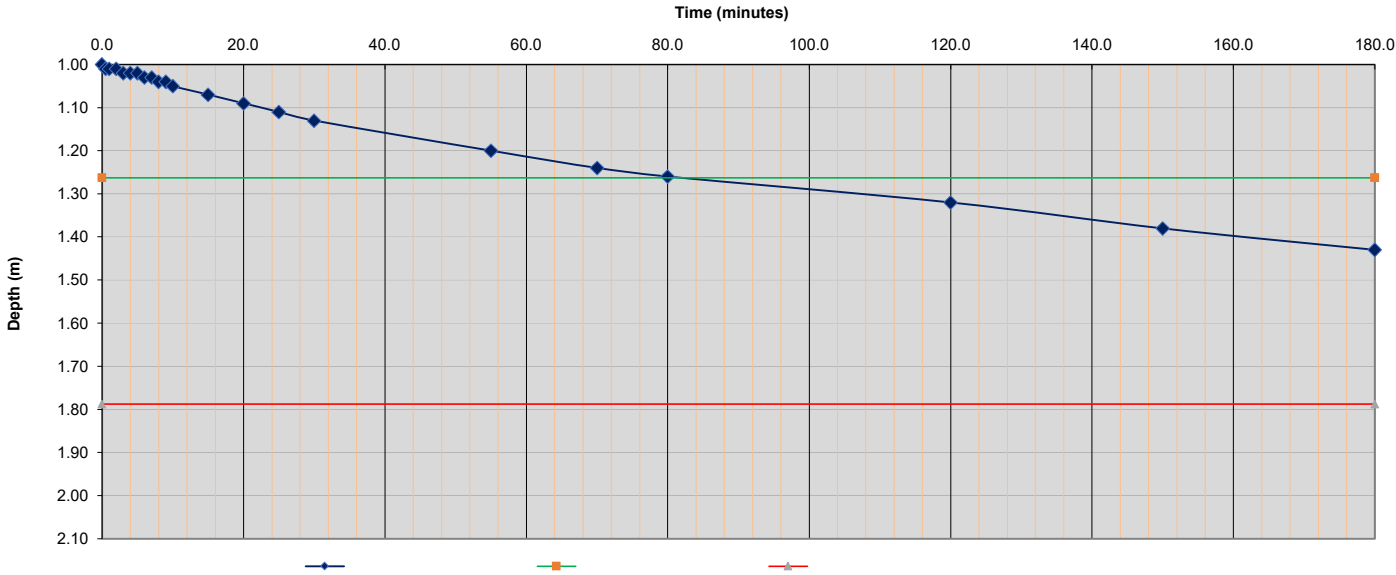
Elapsed time (mins):	Water depth (m):	Elapsed time (mins):	Water depth (m below datum):
0.0	1		
0.5	1.01		
1.0	1.01		
2.0	1.01		
3.0	1.02		
4.0	1.02		
5.0	1.02		
6.0	1.03		
7.0	1.03		
8.0	1.04		
9.0	1.04		
10.0	1.05		
15.0	1.07		
20.0	1.09		
25.0	1.11		
30.0	1.13		
55.0	1.2		
70.0	1.24		
80.0	1.26		
120.0	1.32		
150.0	1.38		
180.0	1.43		

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:
75%	1.26	75%	82.00	0.00
50%	1.53	50%		Known
25%	1.79	25%		

Base area of pit		1.470	m ²
Mean surface area through which outflow occurs		4.410	m ²
Volume outflow between 75 and 25% effective depth (Assume 30% void within gravel infill)		-0.232	m ³
Soil infiltration rate, f	N/A	m ³ /m ² /s	
Soil infiltration rate, f	N/A	m/hr	
Percolation Value, vp	N/A	s/mm	

INSUFFICEINT INFILTRATION TO CALCULATE RATE

Notes: 1. See accompanying trial pit log;



Infiltration Test Report

Carried out by:	Date:	Method:				Trial pit dimensions:	Before:	After:	Location:	Grid: OSGB
JL	04/05/23	BRE Digest DG 365: 2016				Length (m):	2.00	2.00	mE:	-
Chkd by:	Test no:	Granular infill:	Datum height (m agl):	Depth to water: Start: End:		Width (m):	0.70	0.70	mN:	-
BH	1	No	0.00	1.00	1.21	Depth (m):	2.00	2.00	m OD:	-

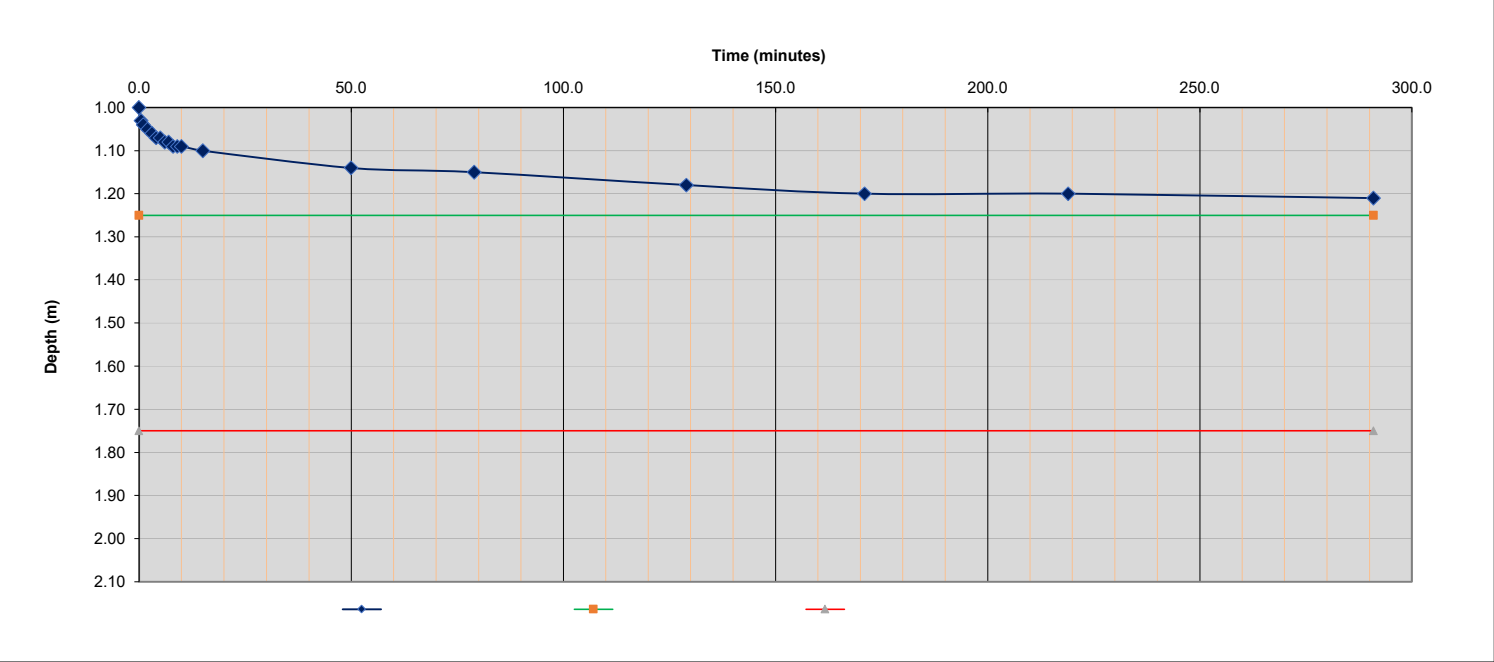
Elapsed time (mins):	Water depth (m):	Elapsed time (mins):	Water depth (m below datum):
0.0	1		
0.5	1.03		
1.0	1.04		
2.0	1.05		
3.0	1.06		
4.0	1.07		
5.0	1.07		
6.0	1.08		
7.0	1.08		
8.0	1.09		
9.0	1.09		
10.0	1.09		
15.0	1.1		
50.0	1.14		
79.0	1.15		
129.0	1.18		
171.0	1.2		
219.0	1.2		
291.0	1.21		

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:
75%	1.25	75%		0.00
50%	1.50	50%		Known
25%	1.75	25%		

Base area of pit		1.400	m ²
Mean surface area through which outflow occurs		4.100	m ²
Volume outflow between 75 and 25% effective depth (Assume 30% void within gravel infill)		-0.210	m ³
Soil infiltration rate, f	N/A	m ³ /m ² /s	
Soil infiltration rate, f	N/A	m/hr	
Percolation Value, vp	N/A	s/mm	

INSUFFICEINT INFILTRATION TO CALCULATE RATE

Notes: 1. See accompanying trial pit log;



	Notes: For explanation of symbols and abbreviations see Key Sheet. All depths in meters.		Project: Gwersyllt	Test reference: SA3 – Test 1
	Issue: Draft		Proj No: 1042	
			Client: Peter	

Infiltration Test Report

Carried out by:	Date:	Method:				Trial pit dimensions:	Before:	After:	Location:	Grid: OSGB
JL	05/05/23	BRE Digest DG 365: 2016				Length (m):	1.90	1.90	mE:	-
Chkd by:	Test no:	Granular infill:	Datum height (m agl):	Depth to water: Start: End:		Width (m):	0.70	0.70	mN:	-
BH	1	No	0.00	1.10	1.52	Depth (m):	2.10	2.10	m OD:	-

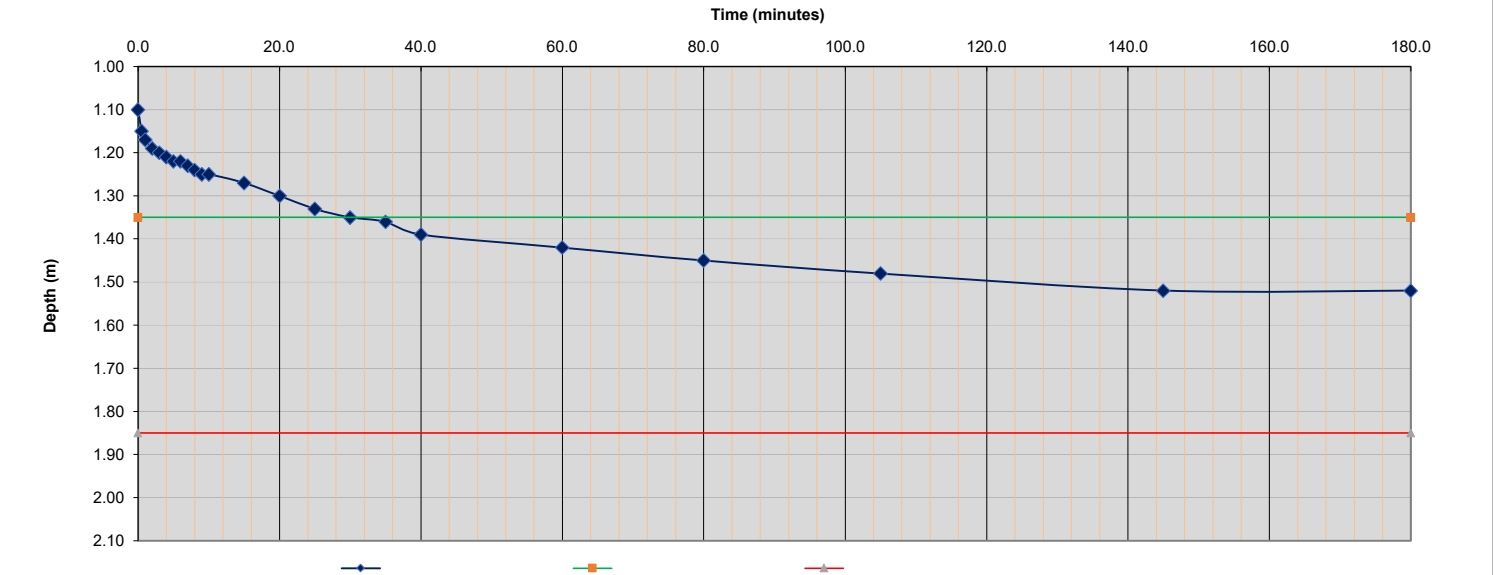
Elapsed time (mins):	Water depth (m):	Elapsed time (mins):	Water depth (m below datum):
0.0	1.1		
0.5	1.15		
1.0	1.17		
2.0	1.19		
3.0	1.2		
4.0	1.21		
5.0	1.22		
6.0	1.22		
7.0	1.23		
8.0	1.24		
9.0	1.25		
10.0	1.25		
15.0	1.27		
20.0	1.3		
25.0	1.33		
30.0	1.35		
35.0	1.36		
40.0	1.39		
60.0	1.42		
80.0	1.45		
105.0	1.48		
145.0	1.52		
180.0	1.52		

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:
75%	1.35	75%	32.00	0.00
50%	1.60	50%		Known
25%	1.85	25%		

Base area of pit		1.330	m ²
Mean surface area through which outflow occurs		3.930	m ²
Volume outflow between 75 and 25% effective depth (Assume 30% void within gravel infill)		-0.200	m ³
Soil infiltration rate, f	N/A	m ³ /m ² /s	
Soil infiltration rate, f	N/A	m/hr	
Percolation Value, vp	N/A	s/mm	

INSUFFICEINT INFILTRATION TO CALCULATE RATE

Notes: 1. See accompanying trial pit log;



Carried out by:	Date:	Method:				Trial pit dimensions:	Before:	After:	Location:	Grid: OSGB
JL	04/05/23	BRE Digest DG 365: 2016				Length (m):	2.00	2.00	mE:	-
Chkd by:	Test no:	Granular infill:	Datum height (m agl):	Depth to water: Start: End:		Width (m):	0.70	0.70	mN:	-
BH	1	No	0.00	1.20	1.98	Depth (m):	2.20	2.15	m OD:	-

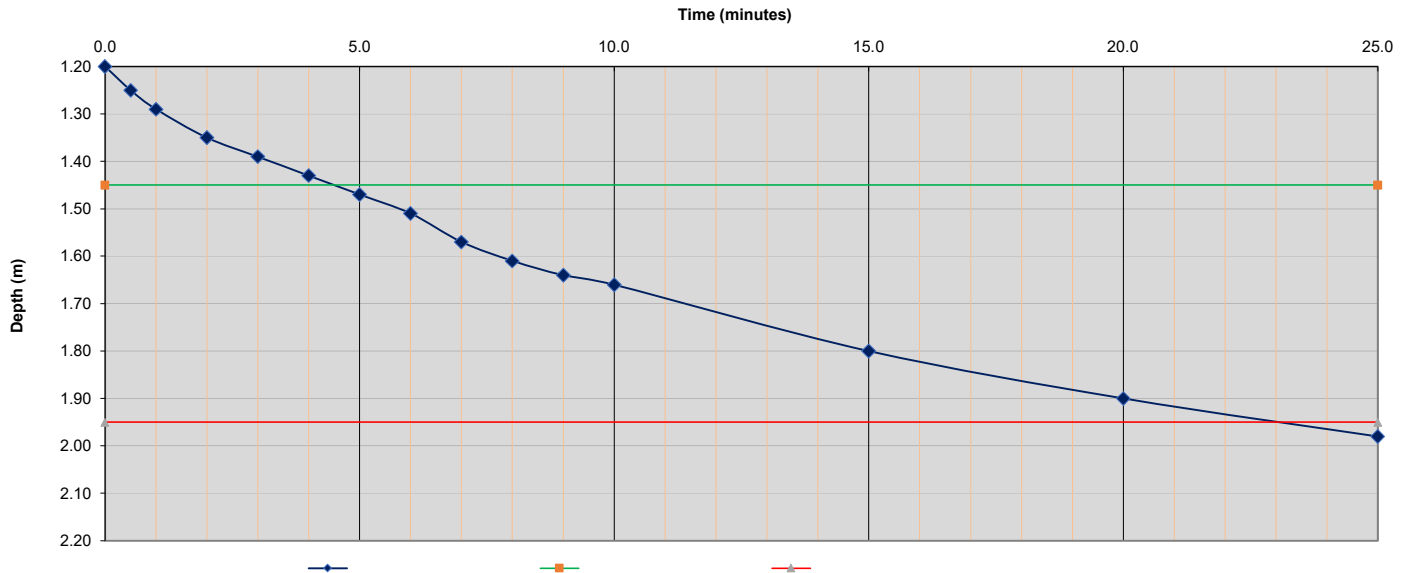
[illegible]

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:	Known
75%	1.45	75%	4.50	0.00	
50%	1.70	50%			
25%	1.95	25%	23.00		

Base area of pit	1.400	m ²
Mean surface area through which outflow occurs	4.100	m ²
Volume outflow between 75 and 25% effective depth (Assume 30% void within gravel infill)	-0.210	m ³

Soil infiltration rate, f	4.61E-05	m ³ /m ² /s
Soil infiltration rate, f	0.17	m/hr
Percolation Value, vp	2.22E+00	s/mm

Notes: 1. See accompanying trial pit log;



Project:	Gwersyllt
Proj No:	1042
Client:	Peter

SA5 – Test 1

Issue: Draft

Infiltration Test Report

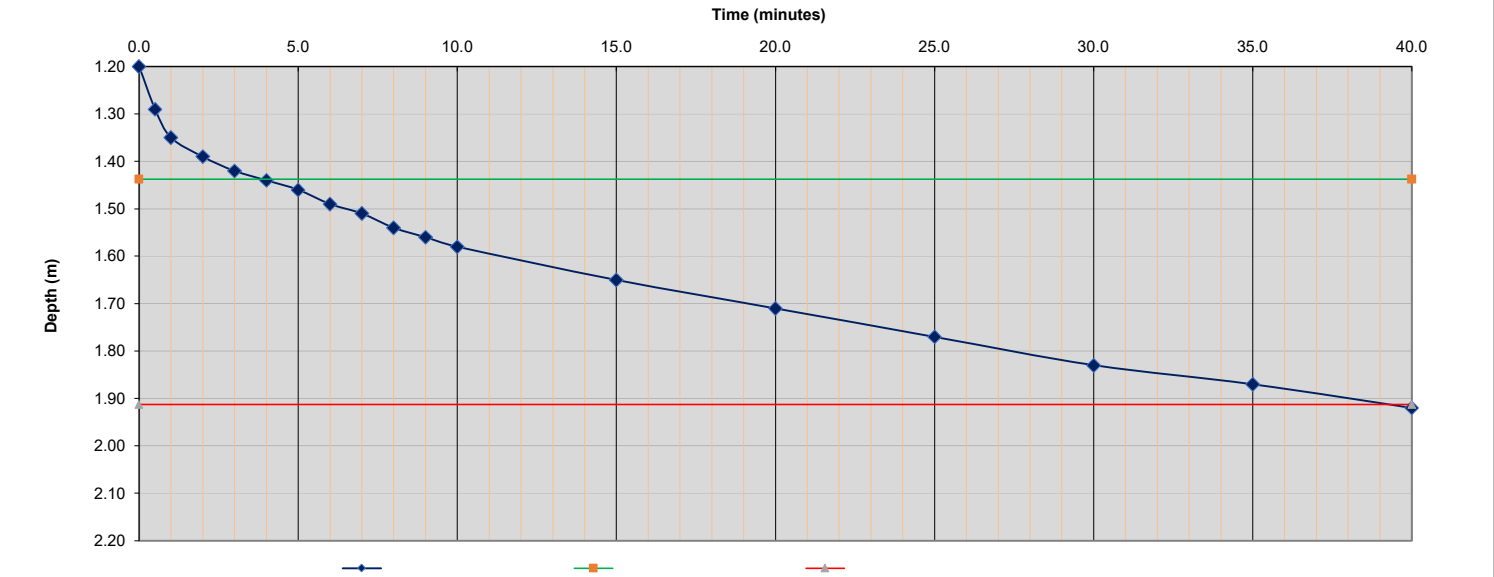
Carried out by:	Date:	Method:				Trial pit dimensions:	Before:	After:	Location:	Grid: OSGB
JL	04/05/23	BRE Digest DG 365: 2016				Length (m):	2.00	2.00	mE:	-
Chkd by:	Test no:	Granular infill:	Datum height (m agl):	Depth to water: Start: End:		Width (m):	0.70	0.70	mN:	-
BH	2	No	0.00	1.20	1.92	Depth (m):	2.15	2.15	m OD:	-

Elapsed time (mins):	Water depth (m):	Elapsed time (mins):	Water depth (m below datum):
0.0	1.20		
0.5	1.29		
1.0	1.35		
2.0	1.39		
3.0	1.42		
4.0	1.44		
5.0	1.46		
6.0	1.49		
7.0	1.51		
8.0	1.54		
9.0	1.56		
10.0	1.58		
15.0	1.65		
20.0	1.71		
25.0	1.77		
30.0	1.83		
35.0	1.87		
40.0	1.92		

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:
75%	1.44	75%	4.00	0.00
50%	1.68	50%		Known
25%	1.91	25%	39.50	

		Base area of pit	1.400	m ²
		Mean surface area through which outflow occurs	3.965	m ²
		Volume outflow between 75 and 25% effective depth (Assume 30% void within gravel infill)	-0.200	m ³
Soil infiltration rate, f	2.36E-05	m ³ /m ² /s		
Soil infiltration rate, f	0.09	m/hr		
Percolation Value, vp	4.48E+00	s/mm		

Notes: 1. See accompanying trial pit log;



Infiltration Test Report

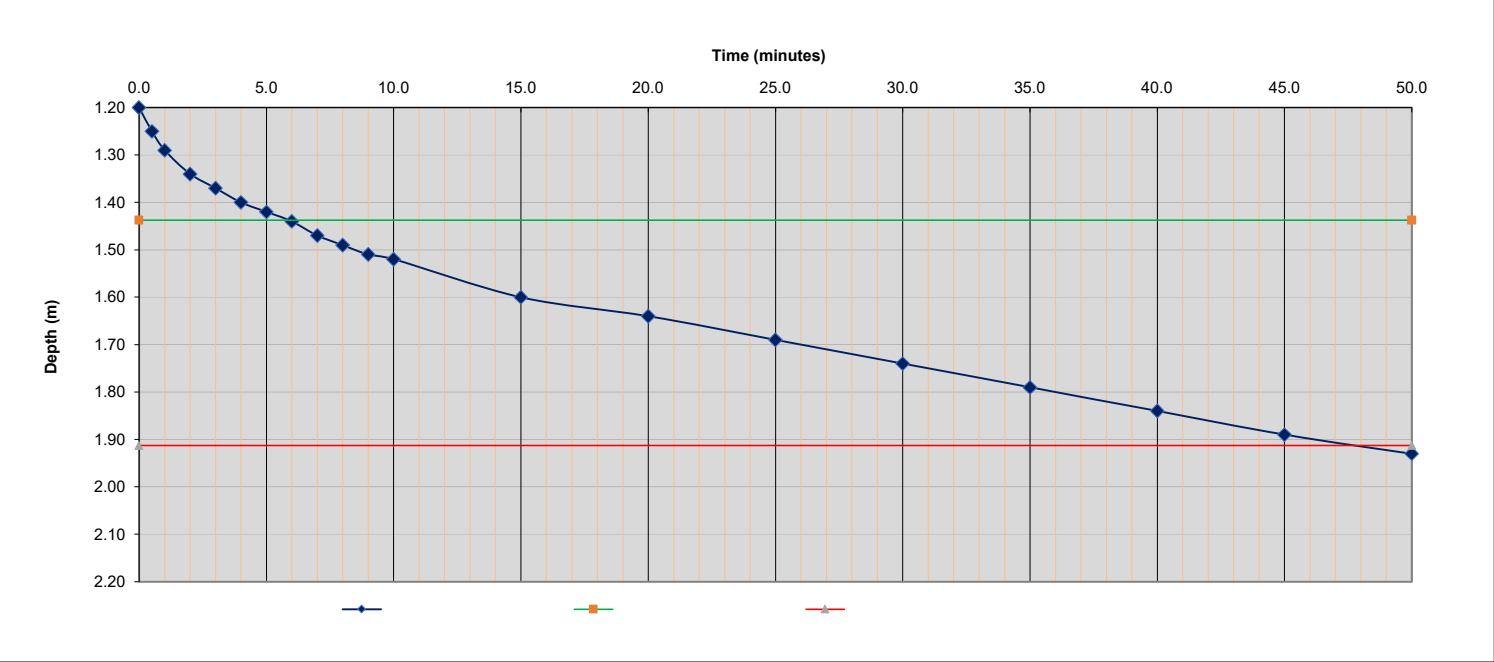
Carried out by:	Date:	Method:				Trial pit dimensions:	Before:	After:	Location:	Grid: OSGB
JL	04/05/23	BRE Digest DG 365: 2016				Length (m):	2.00	2.00	mE:	-
Chkd by:	Test no:	Granular infill:	Datum height (m agl):	Depth to water: Start: End:		Width (m):	0.70	0.70	mN:	-
BH	3	No	0.00	1.20	1.93	Depth (m):	2.15	2.15	m OD:	-

Elapsed time (mins):	Water depth (m):	Elapsed time (mins):	Water depth (m below datum):
0.0	1.20		
0.5	1.25		
1.0	1.29		
2.0	1.34		
3.0	1.37		
4.0	1.40		
5.0	1.42		
6.0	1.44		
7.0	1.47		
8.0	1.49		
9.0	1.51		
10.0	1.52		
15.0	1.60		
20.0	1.64		
25.0	1.69		
30.0	1.74		
35.0	1.79		
40.0	1.84		
45.0	1.89		
50.0	1.93		

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:
75%	1.44	75%	6.00	0.00
50%	1.68	50%		Known
25%	1.91	25%	48.00	

		Base area of pit	1.400	m ²
		Mean surface area through which outflow occurs	3.965	m ²
		Volume outflow between 75 and 25% effective depth (Assume 30% void within gravel infill)	-0.200	m ³
Soil infiltration rate, f	2.00E-05	m ³ /m ² /s		
Soil infiltration rate, f	0.07	m/hr		
Percolation Value, vp	5.31E+00	s/mm		

Notes: 1. See accompanying trial pit log;



	Notes: For explanation of symbols and abbreviations see Key Sheet. All depths in meters.		Project: Gwersyllt	Test reference:
			Proj No: 1042	SA5 – Test 3
	Issue: Draft		Client: Peter	



CampbellReith
consulting engineers

Appendix E

Proposed Drainage Strategy

14009: Gwersyllt Foul Water Calculations P1		Date: 29/08/2023			
Report Details: Type: Manhole Schedule Foul Phase: FW		Designed by: IC	Checked by: LM		Approved By:
		CampbellReith: 1 Marsden Street Manchester M2 1HW			

Name	Cover Level (m) Invert Level (m)		Connection Details				Type
Coordinates (m)	Depth (m)	Manhole Size (m)	Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
MH17	104.300 102.950	Diameter / Length: 1.200					Manhole
E:331536.266 N:353855.701	1.350		{a} 3.000	Pipe	102.950	Diam/Width:150	Not Applicable
MH1	104.600 103.850	Diameter / Length: 1.200					Manhole
E:331479.165 N:353847.310	0.750		{a} 1.000	Pipe	103.850	Diam/Width:150	Not Applicable
MH5	104.300 103.134	Diameter / Length: 1.200	{1} 1.003	Pipe	103.134	Diam/Width:150	Manhole
E:331485.231 N:353799.632	1.166		{a} 1.004	Pipe	103.134	Diam/Width:150	Not Applicable
MH14	104.300 102.586	Diameter / Length: 1.200	{1} 2.002	Pipe	102.586	Diam/Width:150	Manhole
E:331509.480 N:353783.925	1.714		{a} 2.003	Pipe	102.586	Diam/Width:150	Not Applicable
MH11	103.970 103.220	Diameter / Length: 1.200					Manhole
E:331506.996 N:353845.243	0.750		{a} 2.000	Pipe	103.220	Diam/Width:150	Not Applicable

14009: Gwersylt Foul Water Calculations P1		Date: 29/08/2023			
Report Details: Type: Manhole Schedule Foul Phase: FW		Designed by: IC	Checked by: LM		Approved By:
		CampbellReith: 1 Marsden Street Manchester M2 1HW			

Name	Cover Level (m) Invert Level (m)		Connection Details				Type
Coordinates (m)	Depth (m)	Manhole Size (m)	Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
MH15	104.300 102.375	Diameter / Length: 1.200	{1} 2.003	Pipe	102.375	Diam/Width:150	Manhole
E:331514.854 N:353763.501	1.925		{a} 2.004	Pipe	102.375	Diam/Width:150	Not Applicable
MH6	104.600 102.878	Diameter / Length: 1.200	{1} 1.004	Pipe	102.878	Diam/Width:150	Manhole
E:331491.952 N:353774.891	1.722		{a} 1.005	Pipe	102.878	Diam/Width:150	Not Applicable
MH18	103.800 102.173	Diameter / Length: 1.200	{1} 3.000	Pipe	102.173	Diam/Width:150	Manhole
E:331545.147 N:353825.898	1.627		{a} 3.001	Pipe	102.173	Diam/Width:150	Not Applicable
MH12	104.180 102.919	Diameter / Length: 1.200	{1} 2.000	Pipe	102.919	Diam/Width:150	Manhole
E:331515.857 N:353816.520	1.261		{a} 2.001	Pipe	102.919	Diam/Width:150	Not Applicable
MH2	104.450 103.499	Diameter / Length: 1.200	{1} 1.000	Pipe	103.499	Diam/Width:150	Manhole
E:331487.014 N:353820.365	0.951		{a} 1.001	Pipe	103.499	Diam/Width:150	Not Applicable

14009: Gwersyllt Foul Water Calculations P1		Date: 29/08/2023			
Report Details: Type: Manhole Schedule Foul Phase: FW		Designed by: IC	Checked by: LM		Approved By:
		CampbellReith: 1 Marsden Street Manchester M2 1HW			

Name	Cover Level (m) Invert Level (m)		Connection Details				Type
Coordinates (m)	Depth (m)	Manhole Size (m)	Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
MH13	104.150 102.740	Diameter / Length: 1.200	{1} 2.001	Pipe	102.740	Diam/Width:150	Manhole
E:331512.420 N:353799.003	1.410		{a} 2.002	Pipe	102.740	Diam/Width:150	Not Applicable
MH16	104.300 102.185	Diameter / Length: 1.200	{1} 2.004	Pipe	102.185	Diam/Width:150	Manhole
E:331520.229 N:353745.239	2.115		{a} 2.005	Pipe	102.185	Diam/Width:150	Not Applicable
MH19	103.500 101.599	Diameter / Length: 1.200	{1} 3.001	Pipe	101.599	Diam/Width:150	Manhole
E:331552.243 N:353801.861	1.901		{a} 3.002	Pipe	101.599	Diam/Width:150	Not Applicable
MH3	104.450 103.399	Diameter / Length: 1.200	{1} 1.001	Pipe	103.399	Diam/Width:150	Manhole
E:331477.438 N:353817.447	1.051		{a} 1.002	Pipe	103.399	Diam/Width:150	Not Applicable
MH7	104.450 102.585	Diameter / Length: 1.200	{1} 1.005	Pipe	102.585	Diam/Width:150	Manhole
E:331500.888 N:353746.871	1.865		{a} 1.006	Pipe	102.585	Diam/Width:150	Not Applicable

14009: Gwersyllt Foul Water Calculations P1		Date: 29/08/2023			
Report Details: Type: Manhole Schedule Foul Phase: FW		Designed by: IC	Checked by: LM		Approved By:
		CampbellReith: 1 Marsden Street Manchester M2 1HW			

Name	Cover Level (m) Invert Level (m)		Connection Details				Type
Coordinates (m)	Depth (m)	Manhole Size (m)	Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
MH20	103.940 101.294	Diameter / Length: 1.200	{1} 3.002	Pipe	101.294	Diam/Width:150	Manhole
E:331560.371 N:353772.439	2.646		{a} 3.003	Pipe	101.294	Diam/Width:150	Not Applicable
MH8	104.550 102.089	Diameter / Length: 1.200	{1} 1.006	Pipe	102.089	Diam/Width:150	Manhole
E:331517.076 N:353736.206	2.461		{2} 2.005	Pipe	102.089	Diam/Width:150	
			{a} 1.007	Pipe	102.089	Diam/Width:150	Not Applicable
MH4	104.500 103.284	Diameter / Length: 1.200	{1} 1.002	Pipe	103.284	Diam/Width:150	Manhole
E:331472.239 N:353807.205	1.216		{a} 1.003	Pipe	103.284	Diam/Width:150	Not Applicable
MH9	103.800 101.984	Diameter / Length: 1.200	{1} 1.007	Pipe	101.984	Diam/Width:150	Manhole
E:331520.174 N:353726.224	1.816		{a} 1.008	Pipe	101.984	Diam/Width:150	Not Applicable
MH21	103.890 101.167	Diameter / Length: 1.200	{1} 3.003	Pipe	101.167	Diam/Width:150	Manhole
E:331571.463 N:353766.337	2.723		{a} 3.004	Pipe	101.167	Diam/Width:150	Not Applicable

14009: Gwersyllt Foul Water Calculations P1		Date: 29/08/2023			
Report Details: Type: Manhole Schedule Foul Phase: FW		Designed by: IC	Checked by: LM		Approved By:
		CampbellReith: 1 Marsden Street Manchester M2 1HW			

Name	Cover Level (m) Invert Level (m)		Connection Details				Type
Coordinates (m)	Depth (m)	Manhole Size (m)	Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
MH22	104.330 100.947	Diameter / Length: 1.200	{1} 3.004	Pipe	100.947	Diam/Width:150	Manhole
E:331574.926 N:353744.564	3.383		{a} 3.005	Pipe	100.947	Diam/Width:150	Not Applicable
MH10	104.100 101.531	Diameter / Length: 1.200	{1} 1.008	Pipe	101.531	Diam/Width:150	Manhole
E:331563.583 N:353739.148	2.569		{a} 1.009	Pipe	101.531	Diam/Width:150	Not Applicable
Existing MH	102.160 100.810	Diameter / Length: 1.200	{1} 1.009	Pipe	100.810	Diam/Width:150	Manhole
E:331582.856 N:353733.438	1.350		{2} 3.005	Pipe	100.810	Diam/Width:150	
							Not Applicable

14009: Gwersyllt Foul Water Calculations P1	Date: 29/08/2023			
Report Details: Type: Network Design Criteria Foul Phase: FW	Designed by:	Checked by:	Approved By:	
	IC	LM		
CampbellReith: 1 Marsden Street Manchester M2 1HW				

Pipe Options

Lock Slope Options	None
Design Options	Minimise Excavation
Design Level	Level Inverts
Min. Slope (1:X)	500.00
Max. Slope (1:X)	40.00
Velocity Criteria	(UK) 1/3 Proportional Velocity
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Pipe Size Library

Default

Add. Increment (mm)	75
Max. Diameter (mm)	0

Diameter (mm)	Min. Slope (1:X)	Max. Slope (1:X)
100	0.00	0.00
150	0.00	0.00

Manhole Options

Apply Offset	☐
--------------	--------------------------

Manhole Size Library

Default

Diameter / Width

Connection (mm)	Diameter / Length (m)	Width (m)
0	1.200	0.000
375	1.350	0.000
500	1.500	0.000
750	1.800	0.000

Additional Sizing

Connection (mm)	900
Diameter / Length (m)	0.900
Width (m)	0.000

Depth

Depth (m)	Diameter / Length (m)	Width (m)
0.000	1.050	0.000
1.500	1.200	0.000

Access

Depth (m)	Ladder Protrusion (mm)
0.000	130
3.000	230

Benching Requirements

Landing Width (mm)	500
Benching Width (mm)	225

14009: Gwersyllt Foul Water Calculations P1	Date: 29/08/2023			
	Designed by: IC	Checked by: LM	Approved By:	
Report Details: Type: Outfall Details Foul Phase: FW	CampbellReith: 1 Marsden Street Manchester M2 1HW			

Outfalls

Outfall	Outfall Type	Fixed Surcharged Level (m)	Level Curve
Existing MH	Free Discharge		

14009: Gwersyllt Foul Water Calculations P1	Date: 29/08/2023		
	Designed by: IC	Checked by: LM	Approved By:
Report Details: Audit Report Foul Phase: FW	CampbellReith: 1 Marsden Street Manchester M2 1HW		



Pipe Full Bore Velocity

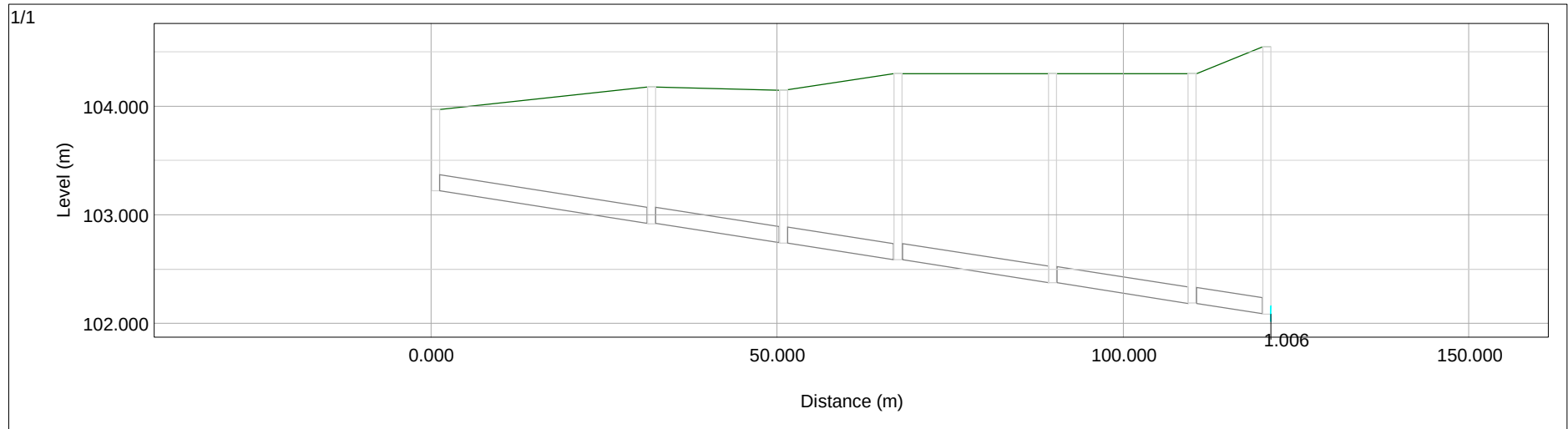
Audit Details

Range	Min. (m/s)	Max. (m/s)
Min. ≤ x ≤ Max.	1.0	4.0

Results

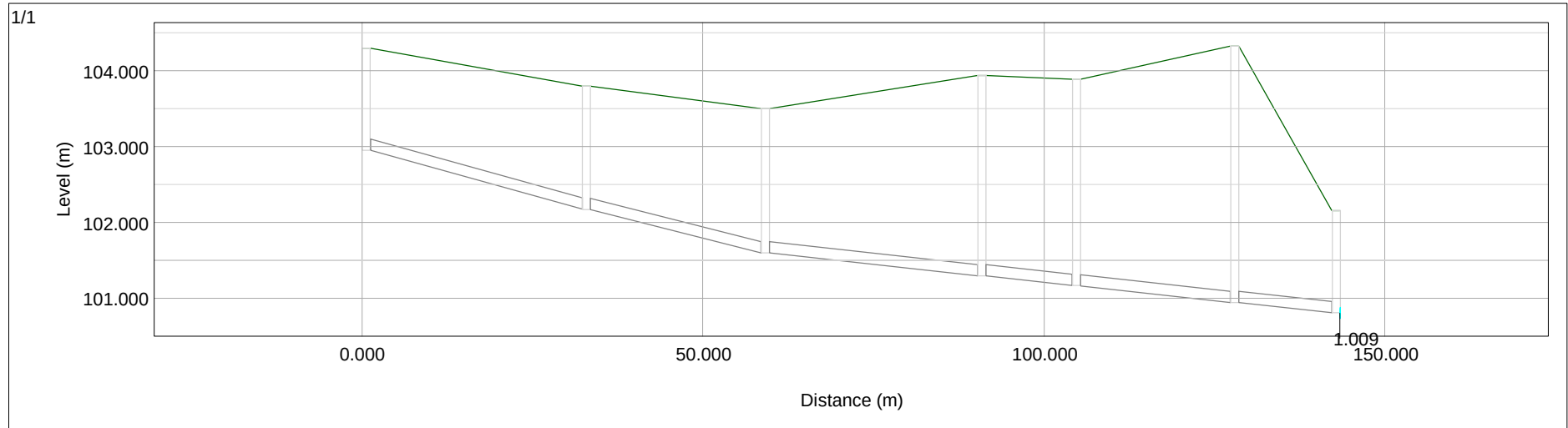
All items pass

		Page 2
14009: Gwersylt Foul Water Calculations P1	CampbellReith: 1 Marsden Street Manchester M2 1HW	CampbellReith consulting engineers
Modified date 29/08/2023 File 14009 - Foul Water Calculations P1.iddx	Designed by IC Checked by LM	
InfoDrainage 2024.2		
Profile - 2.000		Horizontal Scale 1:880, Vertical Scale 1:58



Junction	MH11	MH12	MH13	MH14	MH15	MH16	MH8
Type	Manhole	Manhole	Manhole	Manhole	Manhole	Manhole	Manhole
CL (m)	103.970	104.180	104.150	104.300	104.300	104.300	104.550
IL (m)	103.220	102.919	102.740	102.586	102.375	102.185	102.089
Connection	2.000	2.001	2.002	2.003	2.004	2.005	
Type	Pipe	Pipe	Pipe	Pipe	Pipe	Pipe	
Curved	No	No	No	No	No	No	
Length (m)	30.059	17.851	15.361	21.120	19.036	9.568	
Diam (mm)	150	150	150	150	150	150	
Height (mm)							
U/S IL (m)	103.220	102.919	102.740	102.586	102.375	102.185	
D/S IL (m)	102.919	102.740	102.586	102.375	102.185	102.089	
C. Splay (mm)							
SWC							
Type							
EL (m)							
BL (m)							

		Page 3
14009: Gwersylt Foul Water Calculations P1	CampbellReith: 1 Marsden Street Manchester M2 1HW	CampbellReith consulting engineers
Modified date 29/08/2023 File 14009 - Foul Water Calculations P1.iddx	Designed by IC Checked by LM	
InfoDrainage 2024.2		
Profile - 3.000		Horizontal Scale 1:893, Vertical Scale 1:83



Junction	MH17	MH18	MH19	MH20	MH21	MH22	Existing MH
Type	Manhole	Manhole	Manhole	Manhole	Manhole	Manhole	Manhole
CL (m)	104.300	103.800	103.500	103.940	103.890	104.330	102.160
IL (m)	102.950	102.173	101.599	101.294	101.167	100.947	100.810
Connection	3.000	3.001	3.002	3.003	3.004	3.005	
Type	Pipe	Pipe	Pipe	Pipe	Pipe	Pipe	
Curved	No	No	No	No	No	No	
Length (m)	31.097	25.063	30.524	12.660	22.047	13.663	
Diam (mm)	150	150	150	150	150	150	
Height (mm)							
U/S IL (m)	102.950	102.173	101.599	101.294	101.167	100.947	
D/S IL (m)	102.173	101.599	101.294	101.167	100.947	100.810	
C. Splay (mm)							
SWC							
Type							
EL (m)							
BL (m)							

14009 - Gwersyllt: Storm Water Drainage Calculations P1		Date: 07/09/2023			
		Designed by: IC	Checked by: LM		Approved By:
Report Details: Type: Manhole Schedule Storm Phase: Phase		CampbellReith: No. 1 Marsden Street Manchester M2 1HW			

Name	Cover Level (m) Invert Level (m)	Manhole Size (m)	Connection Details				Type
Coordinates (m)	Depth (m)		Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
MH1	104.600 103.250	Diameter / Length: 1.200					Manhole
E:331474.635 N:353849.246	1.350						
			{a} 1.000	Pipe	103.250	Diam/Width:150	Not Applicable
MH2	104.750 102.931	Diameter / Length: 1.200	{1} 1.000	Pipe	102.931	Diam/Width:150	Manhole
E:331478.075 N:353836.969	1.819						
			{a} 1.001	Pipe	102.931	Diam/Width:150	Not Applicable
MH3	104.600 102.870	Diameter / Length: 1.200	{1} 1.001	Pipe	102.870	Diam/Width:150	Manhole
E:331476.080 N:353832.463	1.730						
			{a} 1.002	Pipe	102.870	Diam/Width:150	Not Applicable
MH4	104.450 102.575	Diameter / Length: 1.200	{1} 1.002	Pipe	102.575	Diam/Width:150	Manhole
E:331481.316 N:353815.676	1.875						
			{a} 1.003	Pipe	102.575	Diam/Width:225	Not Applicable
MH5	104.300 102.507	Diameter / Length: 1.200	{1} 1.003	Pipe	102.507	Diam/Width:225	Manhole
E:331476.520 N:353806.685	1.793						
			{a} 1.004	Pipe	102.507	Diam/Width:225	Not Applicable

14009 - Gwersyllt: Storm Water Drainage Calculations P1		Date: 07/09/2023			
		Designed by: IC	Checked by: LM		Approved By:
Report Details: Type: Manhole Schedule Storm Phase: Phase		CampbellReith: No. 1 Marsden Street Manchester M2 1HW			

Name	Cover Level (m) Invert Level (m)	Manhole Size (m)	Connection Details				Type
Coordinates (m)	Depth (m)		Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
MH6	104.700 102.381	Diameter / Length: 1.200	{1} 1.004	Pipe	102.381	Diam/Width:225	Manhole
E:331482.607 N:353788.777	2.319		{a} 1.005	Pipe	102.381	Diam/Width:225	Not Applicable
MH7	104.700 102.344	Diameter / Length: 1.200	{1} 1.005	Pipe	102.344	Diam/Width:225	Manhole
E:331481.830 N:353783.281	2.356		{a} 1.006	Pipe	102.344	Diam/Width:225	Not Applicable
MH8	104.600 102.020	Diameter / Length: 1.200	{1} 1.006	Pipe	102.020	Diam/Width:225	Manhole
E:331493.658 N:353747.872	2.580		{a} 1.007	Pipe	102.020	Diam/Width:300	Not Applicable
MH9	105.000 101.930	Diameter / Length: 1.200	{1} 1.007	Pipe	101.930	Diam/Width:300	Manhole
E:331503.772 N:353733.081	3.070		{a} 1.008	Pipe	101.930	Diam/Width:300	Not Applicable
MH10	104.400 101.431	Diameter / Length: 1.200	{1} 1.008	Pipe	101.431	Diam/Width:300	Manhole
E:331513.341 N:353730.187	2.969		{a} 1.009	Pipe	101.431	Diam/Width:300	Not Applicable

14009 - Gwersyllt: Storm Water Drainage Calculations P1		Date: 07/09/2023			
		Designed by: IC	Checked by: LM		Approved By:
Report Details: Type: Manhole Schedule Storm Phase: Phase		CampbellReith: No. 1 Marsden Street Manchester M2 1HW			

Name	Cover Level (m) Invert Level (m)	Manhole Size (m)	Connection Details				Type
Coordinates (m)	Depth (m)		Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
MH12	104.300 102.950	Diameter / Length: 1.200					Manhole
E:331509.344 N:353850.979	1.350						
			{a} 2.000	Pipe	102.950	Diam/Width:150	Not Applicable
MH13	104.300 101.994	Diameter / Length: 1.200	{1} 2.000	Pipe	101.994	Diam/Width:150	Manhole
E:331519.856 N:353817.349	2.306						
			{a} 2.001	Pipe	101.994	Diam/Width:225	Not Applicable
MH14	104.300 101.847	Diameter / Length: 1.200	{1} 2.001	Pipe	101.847	Diam/Width:225	Manhole
E:331516.043 N:353795.639	2.453						
			{a} 2.002	Pipe	101.847	Diam/Width:225	Not Applicable
MH15	104.300 101.660	Diameter / Length: 1.200	{1} 2.002	Pipe	101.660	Diam/Width:225	Manhole
E:331513.110 N:353779.056	2.640						
			{a} 2.003	Pipe	101.660	Diam/Width:300	Not Applicable
MH16	104.000 101.300	Diameter / Length: 1.200	{1} 2.003	Pipe	101.300	Diam/Width:300	Manhole
E:331520.935 N:353751.239	2.700						
			{a} 2.004	Pipe	101.300	Diam/Width:300	Not Applicable

14009 - Gwersyllt: Storm Water Drainage Calculations P1		Date: 07/09/2023			
		Designed by: IC	Checked by: LM		Approved By:
Report Details: Type: Manhole Schedule Storm Phase: Phase		CampbellReith: No. 1 Marsden Street Manchester M2 1HW			

Name	Cover Level (m) Invert Level (m)	Manhole Size (m)	Connection Details				Type
Coordinates (m)	Depth (m)		Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
MH21	103.800 101.407	Diameter / Length: 1.200	{1} 3.003	Pipe	101.407	Diam/Width:300	Manhole
E:331543.741 N:353766.831	2.393		{a} 3.004	Pipe	101.407	Diam/Width:300	Not Applicable
MH20	103.800 101.941	Diameter / Length: 1.200	{1} 3.002	Pipe	101.941	Diam/Width:225	Manhole
E:331560.622 N:353780.043	1.859		{a} 3.003	Pipe	101.941	Diam/Width:300	Not Applicable
MH19	103.650 102.182	Diameter / Length: 1.200	{1} 3.001	Pipe	102.182	Diam/Width:225	Manhole
E:331555.233 N:353799.853	1.468		{a} 3.002	Pipe	102.182	Diam/Width:225	Not Applicable
MH18	104.300 102.402	Diameter / Length: 1.200	{1} 3.000	Pipe	102.402	Diam/Width:150	Manhole
E:331545.659 N:353831.402	1.898		{a} 3.001	Pipe	102.402	Diam/Width:225	Not Applicable
MH17	104.000 102.886	Diameter / Length: 1.200					Manhole
E:331537.725 N:353859.065	1.114		{a} 3.000	Pipe	102.886	Diam/Width:150	Not Applicable

14009 - Gwersyllt: Storm Water Drainage Calculations P1	Date: 07/09/2023			
	Designed by: IC	Checked by: LM	Approved By:	
	Report Details: Type: Manhole Schedule Storm Phase: Phase			
CampbellReith: No. 1 Marsden Street Manchester M2 1HW				

Name	Cover Level (m) Invert Level (m)	Manhole Size (m)	Connection Details				Type
Coordinates (m)	Depth (m)		Incoming Connections	Connection Type	Connection Invert (m)	Connection Size (mm)	Junction Type
			Outgoing Connections				Cover
MH11	104.000 101.300	Diameter / Length: 1.200	{1} 1.009	Pipe	101.300	Diam/Width:300	Manhole
E:331523.877 N:353741.112	2.700		{a} 1.010	Pipe	101.300	Diam/Width:300	Not Applicable

14009 - Gwersyllt: Storm Water Drainage Calculations P1		Date: 07/09/2023			
		Designed by: IC	Checked by: LM		Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase		CampbellReith: No. 1 Marsden Street Manchester M2 1HW			

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
1	MH1		Time of Concentration	0.005	100	0	100	0.005
1.1	MH1		Time of Concentration	0.007	100	0	100	0.007
1.2	MH1		Time of Concentration	0.004	100	0	100	0.004
2	MH2		Time of Concentration	0.004	100	0	100	0.004
2.1	MH2		Time of Concentration	0.022	100	0	100	0.022
3	MH3		Time of Concentration	0.001	100	0	100	0.001
4	MH4		Time of Concentration	0.006	100	0	100	0.006
4.1	MH4		Time of Concentration	0.036	100	0	100	0.036
5	MH5		Time of Concentration	0.004	100	0	100	0.004
5.1	MH5		Time of Concentration	0.020	100	0	100	0.020
6	MH6		Time of Concentration	0.006	100	0	100	0.006
6.1	MH6		Time of Concentration	0.022	100	0	100	0.022
7	MH7		Time of Concentration	0.007	100	0	100	0.007
7.1	MH7		Time of Concentration	0.024	100	0	100	0.024
8	MH8		Time of Concentration	0.008	100	0	100	0.008
8.1	MH8		Time of Concentration	0.020	100	0	100	0.020
9	MH9		Time of Concentration	0.005	100	0	100	0.005
9.1	MH9		Time of Concentration	0.007	100	0	100	0.007
10	MH10		Time of Concentration	0.004	100	0	100	0.004
10.1	MH10		Time of Concentration	0.004	100	0	100	0.004
11	MH12		Time of Concentration	0.012	100	0	100	0.012
11.1	MH12		Time of Concentration	0.029	100	0	100	0.029
12	MH13		Time of Concentration	0.016	100	0	100	0.016
12.1	MH13		Time of Concentration	0.050	100	0	100	0.050
13 (Green Roof)	MH14		Green Roof	0.011		0		0.011
13.1	MH14		Time of Concentration	0.017	100	0	100	0.017
14 (Green Roof)	MH15		Green Roof	0.020		0		0.020
15	MH16		Time of Concentration	0.016	100	0	100	0.016
16	MH17		Time of Concentration	0.007	100	0	100	0.007
17	MH18		Time of Concentration	0.015	100	0	100	0.015
18	MH18		Time of Concentration	0.033	100	0	100	0.033
18.1	MH18		Time of Concentration	0.028	100	0	100	0.028
19	MH19		Time of Concentration	0.066	100	0	100	0.066
20	MH20		Time of Concentration	0.047	100	0	100	0.047
21	MH20		Time of Concentration	0.031	100	0	100	0.031
22	MH21		Time of Concentration	0.024	100	0	100	0.024

14009 - Gwersyllt: Storm Water Drainage Calculations P1	Date: 07/09/2023		
	Designed by: IC	Checked by: LM	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	CampbellReith: No. 1 Marsden Street Manchester M2 1HW		

CampbellReith
consulting engineers

CS 1	Cellular Storage		Time of Concentration	0.096	100	0	100	0.096
CS 2	Cellular Storage		Time of Concentration	0.048	100	0	100	0.048
TOTAL		0.0		0.783				0.783

14009 - Gwersyllt: Storm Water Drainage Calculations P1	Date: 07/09/2023		
	Designed by: IC	Checked by: LM	Approved By:
Report Details: Type: Network Design Criteria Storm Phase: Phase	CampbellReith: No. 1 Marsden Street Manchester M2 1HW		



Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

FEH99/13

Type: FEH

Site Location	GB 332300 353850 SJ 32300 53850
Return Period (years)	1.0
Rainfall Version	1999
C (1km)	-0.026
D1 (1km)	0.355
D2 (1km)	0.393
D3 (1km)	0.317
E (1km)	0.289
F (1km)	2.411

Pipe Options

Lock Slope Options	None
Design Options	Minimise Excavation
Design Level	Level Soffits
Min. Slope (1:X)	500.00
Max. Slope (1:X)	40.00
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Pipe Size Library

Default

Add. Increment (mm)	75
Max. Diameter (mm)	0

Diameter (mm)	Min. Slope (1:X)	Max. Slope (1:X)
100	0.00	0.00
150	0.00	0.00

14009 - Gwersyllt: Storm Water Drainage Calculations P1	Date: 07/09/2023			
	Designed by: IC	Checked by: LM	Approved By:	
Report Details: Type: Network Design Criteria Storm Phase: Phase	CampbellReith: No. 1 Marsden Street Manchester M2 1HW			

Manhole Options

Apply Offset ☐

Manhole Size Library

Default

Diameter / Width

Connection (mm)	Diameter / Length (m)	Width (m)
0	1.200	0.000
375	1.350	0.000
500	1.500	0.000
750	1.800	0.000

Additional Sizing

Connection (mm)	900
Diameter / Length (m)	0.900
Width (m)	0.000

Depth

Depth (m)	Diameter / Length (m)	Width (m)
0.000	1.050	0.000
1.500	1.200	0.000

Access

Depth (m)	Ladder Protrusion (mm)
0.000	130
3.000	230

Benching Requirements

Landing Width (mm)	500
Benching Width (mm)	225

14009 - Gwersyllt: Storm Water Drainage Calculations P1	Date: 07/09/2023		
	Designed by: IC	Checked by: LM	Approved By:
Report Title: Rainfall Analysis Criteria	CampbellReith: No. 1 Marsden Street Manchester M2 1HW		



Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH22

Type: FEH

Site Location	GB 332300 353850 SJ 32300 53850
Rainfall Version	2022
Summer	☒
Winter	☒

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	0.000
100.0	40.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

14009 - Gwersyllt: Storm Water Drainage Calculations P1	Date: 07/09/2023		
	Designed by: IC	Checked by: LM	Approved By:
Report Title: Rainfall Analysis Criteria	CampbellReith: No. 1 Marsden Street Manchester M2 1HW		



FSR-default

Type: FSR

Region	England And Wales
M5-60 (mm)	18.0
Ratio R	0.316
Summer	☒
Winter	☒

Return Period

Return Period (years)	Increase Rainfall (%)
1.0	0.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

FEH99/13

Type: FEH

Site Location	GB 332300 353850 SJ 32300 53850
Rainfall Version	1999
C (1km)	-0.026
D1 (1km)	0.355
D2 (1km)	0.393
D3 (1km)	0.317
E (1km)	0.289
F (1km)	2.411
Summer	☒
Winter	☒

Return Period

Return Period (years)	Increase Rainfall (%)
1.0	0.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

14009 - Gwersyllt: Storm Water Drainage Calculations P1	Date: 07/09/2023			
	Designed by: IC	Checked by: LM	Approved By:	
Report Title: Rainfall Analysis Criteria	CampbellReith: No. 1 Marsden Street Manchester M2 1HW			

FSR aLL 15min storm

Type: FSR

Region	England And Wales
M5-60 (mm)	18.0
Ratio R	0.316
Summer	☒
Winter	☒

Return Period

Return Period (years)	Increase Rainfall (%)
1.0	0.000
30.0	0.000
100.0	40.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30

14009 - Gwersyllt: Storm Water Drainage Calculations P1	Date: 07/09/2023		
	Designed by: IC	Checked by: LM	Approved By:
Report Details: Type: Junctions Summary Storm Phase: Phase	CampbellReith: No. 1 Marsden Street Manchester M2 1HW		





Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
MH1	FEH22: 100 years: +40 %: 15 mins: Winter	104.60 0	103.25 0	103.306	0.056	8.5	0.063	0.000	7.9	3.927	OK
MH2	FEH22: 100 years: +40 %: 15 mins: Winter	104.75 0	102.93 1	103.292	0.360	21.9	0.408	0.000	16.8	10.387	Surcharged
MH3	FEH22: 100 years: +40 %: 15 mins: Winter	104.60 0	102.87 0	103.225	0.356	17.3	0.402	0.000	18.6	10.657	Surcharged
MH4	FEH22: 100 years: +40 %: 15 mins: Winter	104.45 0	102.57 5	103.131	0.556	34.9	0.628	0.000	30.2	21.170	Surcharged
MH5	FEH22: 100 years: +40 %: 15 mins: Winter	104.30 0	102.50 7	103.081	0.574	43.1	0.649	0.000	38.7	27.098	Surcharged
MH6	FEH22: 100 years: +40 %: 15 mins: Winter	104.70 0	102.38 1	102.952	0.571	54.1	0.645	0.000	50.3	34.206	Surcharged
MH7	FEH22: 100 years: +40 %: 15 mins: Winter	104.70 0	102.34 4	102.860	0.516	66.8	0.584	0.000	63.3	41.818	Surcharged
MH8	FEH22: 100 years: +40 %: 15 mins: Winter	104.60 0	102.02 0	102.248	0.228	78.4	0.258	0.000	76.9	48.744	OK
MH9	FEH22: 100 years: +40 %: 15 mins: Winter	105.00 0	101.93 0	102.067	0.136	83.6	0.154	0.000	82.4	51.810	OK
MH10	FEH22: 100 years: +40 %: 960 mins: Winter	104.40 0	101.43 1	102.064	0.633	9.9	0.716	0.000	9.7	223.623	Surcharged
MH12	FEH22: 100 years: +40 %: 15 mins: Winter	104.30 0	102.95 0	103.048	0.098	22.0	0.110	0.000	21.6	10.159	OK
MH13	FEH22: 100 years: +40 %: 15 mins: Winter	104.30 0	101.99 4	102.383	0.389	56.9	0.439	0.000	52.7	26.486	Surcharged
MH14	FEH22: 100 years: +40 %: 15 mins: Winter	104.30 0	101.84 7	102.116	0.269	63.5	0.304	0.000	60.5	32.500	Surcharged
MH15	FEH22: 100 years: +40 %: 960 mins: Winter	104.30 0	101.66 0	102.064	0.404	7.0	0.457	0.000	7.0	160.343	Surcharged
MH16	FEH22: 100 years: +40 %: 960 mins: Winter	104.00 0	101.30 0	102.064	0.764	7.8	0.864	0.000	7.6	174.870	Surcharged
MH21	FEH22: 100 years: +40 %: 960 mins: Winter	103.80 0	101.40 7	102.066	0.659	11.4	0.745	0.000	11.3	259.558	Surcharged
MH20	FEH22: 100 years: +40 %: 15 mins: Winter	103.80 0	101.94 1	102.130	0.189	109.8	0.214	0.000	106.9	56.244	OK
MH19	FEH22: 100 years: +40 %: 15 mins: Winter	103.65 0	102.18 2	102.577	0.395	72.9	0.447	0.000	67.8	36.863	Surcharged
MH18	FEH22: 100 years: +40 %: 15 mins: Winter	104.30 0	102.40 2	102.783	0.381	44.2	0.431	0.000	37.4	20.482	Surcharged
MH17	FEH22: 100 years: +40 %: 15 mins: Winter	104.00 0	102.88 6	102.925	0.039	3.7	0.044	0.000	3.5	1.688	OK
MH11	FEH22: 100 years: +40 %: 960 mins: Winter	104.00 0	101.30 0	102.064	0.764	9.7	0.864	0.000	9.7	222.345	Surcharged

14009 - Gwersyllt: Storm Water Drainage Calculations P1	Date: 07/09/2023		
	Designed by: IC	Checked by: LM	Approved By:
	Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		
CampbellReith: No. 1 Marsden Street Manchester M2 1HW			



Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Half Drain Down Time (mins)	Percentage Available (%)
Cellular Storage	FEH22: 100 years: +40 %: 960 mins: Winter	102.064	102.064	0.764	0.764	35.1	603.957	0.000	407.259	0.0	1.072	1416	4.799

14009 - Gwersyllt: Storm Water Drainage Calculations P1	Date: 07/09/2023			
	Designed by:	Checked by:	Approved By:	
	IC	LM		
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	CampbellReith: No. 1 Marsden Street Manchester M2 1HW			

Status

OK

14009 - Gwersyllt: Storm Water Drainage Calculations P1	Date: 07/09/2023		
	Designed by: IC	Checked by: LM	Approved By:
Report Details: Type: Connections Summary Storm Phase: Phase	CampbellReith: No. 1 Marsden Street Manchester M2 1HW		



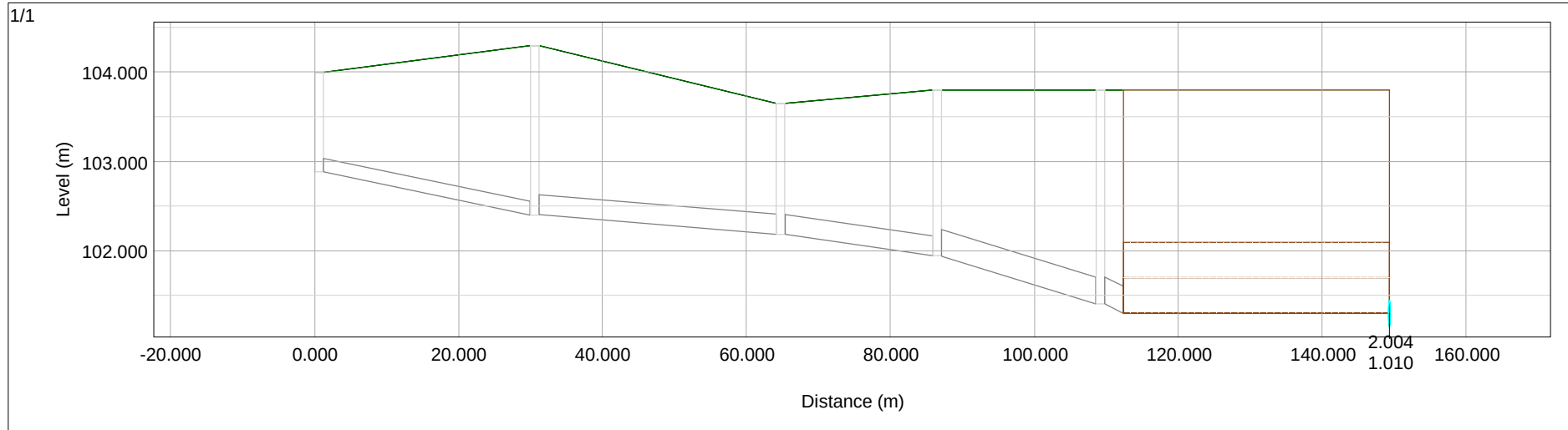


Critical Storm Per Item: Rank By: Max. Flow

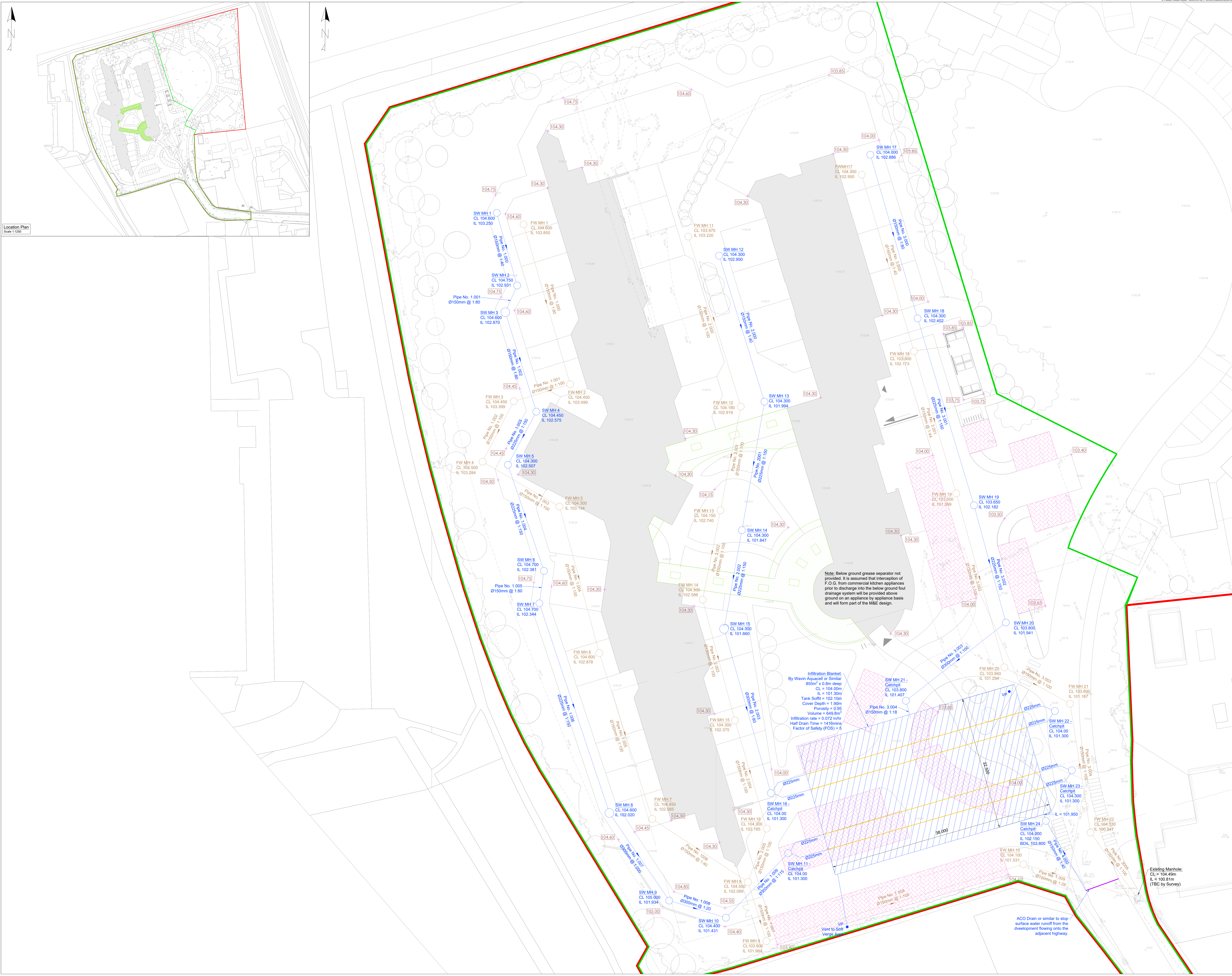
Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
1.000	FSR aLL 15min storm: 100 years: +40 %: 15 mins: Winter	Pipe	MH1	MH2	104.600	103.304	0.150	3.762	0.5	0.28	8.0	OK
1.001	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH2	MH3	104.750	103.292	0.150	10.387	1.0	0.84	16.8	Surcharged
1.002	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH3	MH4	104.600	103.225	0.150	10.657	1.1	0.81	18.6	Surcharged
1.003	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH4	MH5	104.450	103.131	0.225	21.170	0.8	0.71	30.2	Surcharged
1.004	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH5	MH6	104.300	103.081	0.225	27.098	1.0	0.91	38.7	Surcharged
1.005	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH6	MH7	104.700	102.952	0.225	34.206	1.3	1.19	50.3	Surcharged
1.006	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH7	MH8	104.700	102.860	0.225	41.818	1.6	1.31	63.3	Surcharged
1.007	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH8	MH9	104.600	102.248	0.182	48.744	1.7	0.98	76.9	OK
1.008	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH9	MH10	105.000	102.067	0.199	51.810	1.7	0.33	82.4	OK
2.000	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH12	MH13	104.300	103.048	0.150	10.159	1.2	0.73	21.6	OK
2.001	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH13	MH14	104.300	102.383	0.225	26.486	1.3	1.24	52.7	Surcharged
2.002	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH14	MH15	104.300	102.116	0.212	32.500	1.6	1.1	60.5	Surcharged
2.003	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH15	MH16	104.300	101.816	0.195	35.823	1.2	0.48	60.1	OK
3.001	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH18	MH19	104.300	102.783	0.225	20.482	0.9	0.88	37.4	Surcharged
3.002	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH19	MH20	103.650	102.577	0.225	36.863	1.7	1.2	67.8	Surcharged
3.004	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH21	Cellular Storage	103.800	101.606	0.177	61.769	3.9	0.52	117.6	OK
2.004	FSR aLL 15min storm: 100 years: +40 %: 15 mins: Summer	Pipe	MH16	Cellular Storage	104.000	101.543	0.197	32.936	2.5	1.76	93.5	OK
1.009	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH10	MH11	104.400	101.692	0.270	53.237	1.2	0.8	82.6	OK
1.010	FSR aLL 15min storm: 100 years: +40 %: 15 mins: Winter	Pipe	MH11	Cellular Storage	104.000	101.558	0.223	50.109	2.5	1.97	104.3	OK
3.000	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH17	MH18	104.000	102.925	0.150	1.688	0.2	0.15	3.5	OK

14009 - Gwersyllt: Storm Water Drainage Calculations P1				Date: 07/09/2023												
				Designed by:		Checked by:							Approved By:			
				IC		LM										
Report Details: Type: Connections Summary Storm Phase: Phase				CampbellReith: No. 1 Marsden Street Manchester M2 1HW												
3.003	FEH22: 100 years: +40 %: 15 mins: Winter	Pipe	MH20	MH21	103.800	102.130	0.194	56.244	2.2	0.61	106.9	OK				

14009 - Gwersyllt: Storm Water Drainage Calculations P1		CampbellReith: No. 1 Marsden Street Manchester M2 1HW	Page 3
Modified date 07/09/2023 File 14009-Storm Water Calculations P1.iddx		Designed by IC Checked by LM	CampbellReith consulting engineers
Profile - 3.000		InfoDrainage 2024.2 Horizontal Scale 1:847, Vertical Scale 1:71	



Junction	MH17	MH18	MH19	MH20	MH21	
Type	Manhole	Manhole	Manhole	Manhole	Manhole	
CL (m)	104.000	104.300	103.650	103.800	103.800	
IL (m)	102.886	102.402	102.182	101.941	101.407	
Connection	3.000	3.001	3.002	3.003	3.004	
Type	Pipe	Pipe	Pipe	Pipe	Pipe	
Curved	No	No	No	No	No	
Length (m)	28.778	32.970	20.530	21.437	2.619	
Diam (mm)	150	225	225	300	300	
Height (mm)						
U/S IL (m)	102.886	102.402	102.182	101.941	101.407	
D/S IL (m)	102.402	102.182	101.941	101.407	101.300	
C. Splay (mm)						
SWC						Cellular Storage
Type						Cellular Storage
EL (m)						103.800
BL (m)						101.300



Notes

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S1 - Suitable for coordination, **S2** - Suitable for information, **S3** - Suitable for review and comment, **S4** - Suitable for stage approval.
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- Work Stages:
2 - Concept, **3** - Definition, **4** - Design, **5** - Build & commission, **6** - Handover
- Only drawings with revision **Cn** and status **A5** to be used for Construction
- Utilities:
The positions of Statutory Undertakers mains & services shown on this drawing have been based on information extracted from records obtained from various Utilities Companies. These must be regarded as approximate only. The accuracy or completeness of the information or the location of such apparatus as shown on this drawing is not guaranteed and no warranty is given or implied regarding the position, depth, size, gradient thereof. The Contractor must make his own enquiries of the Utilities Companies and Public Authorities and satisfy himself as to the exact position of services and depth, sizes, gradient thereof. In the interests of safety, the approximate position of underground cables should be obtained by use of electronic cable locators and this position confirmed by careful trial-holing using hand-dug methods.
- Proposed Masterplan based on drawing no 17-032-110 (Received from Condy Lofthouse Architects on 07/07/23). No guarantee as to the accuracy of the layout is given or implied. Masterplan shown for information only
- All existing survey information shown or referred to is based upon a topographical survey prepared by MS Surveying 4D, dated March 2023 as supplied to Campbell Reith - no warranty to the accuracy of the information is given or implied.

Legend:

- Site Boundary
- Ownership Boundary
- Proposed Surface Water Network
- Infiltration Blanket
- Proposed Foul Water Network
- Existing Combined Sewer
- External Levels (as per Architects Design)
- Green Roof
- ACO Channel
- Aquacel Plus R Maintenance Channel
- Permeable Paving

P2	Drainage Layout Updated	07/09/23	IC
P1	Issued for Information	20/07/23	IC
Rev	Description	Date	By

CampbellReith

consulting engineers

London

020 7340 1700

☐

Manchester

0161 819 3060

Surrey

01737 784 500

☐

Birmingham

01675 467 484

Bristol

0117 916 1066

☐

Dubai

00 971 4345 7088

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Job Title

Gwersylt, Wrexham

Client

J10 Planning

Proposed Drainage Strategy

Drawn by	Date made	Scale @ A0	Checked by	Suitability	CR Project
IC	11/07/23	1:200	LM	S2	14009

Project No	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
14009	CRH	ZZ	XX	DR	C	5050	P2

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Drainage Notes:

1.0 Standards

- 1.1. All works shall be Read in conjunction with the CampbellReith specification and these notes are intended to support the specification.
- 1.2. All private drainage works shall be in accordance with 'The Building Regulations Approved Document H' and British Standard EN 752.
- 1.3. All works in or adjacent to the Public Highway shall be in accordance with the requirements of the Highway Authority. The Contractor shall obtain all necessary licences to carry out works within the Public Highway.
- 1.4. All works to new or existing Public Sewers shall be to the approval of the Water Authority and in accordance with 'Sewers for Adoption'-latest edition.

2.0 Generally

- 2.1. Prior to commencement of the works the Contractor shall liaise with all relevant authorities to obtain their requirements and to obtain approval for his method of working and where appropriate his intended choice of materials.
- 2.2. Refer to site survey for details of existing site conditions and benchmarks.
- 2.3. Prior to commencement of the works the Contractor shall liaise with all relevant authorities to locate, protect and where necessary divert all existing services affected by the works.
- 2.4. All excavations shall be kept free of standing water.
- 2.5. The Contractor shall ensure the stability of all excavations is maintained at all times.
- 2.6. Prior to commencement of the works all drainage outfall points, whether existing sewer, drain or watercourse, shall be verified on site by the Contractor. If the outfall point is found to be higher or significantly lower than shown on the drawings then the Contract Administrator shall be notified immediately. (Significant redesign of drainage and levels may be necessary). Prior to commencement of construction on-site the Contractor shall install all off-site drainage connections, or satisfy himself that there are no obstructions or other reasons why, the drain connections can not be made.
- 2.7. All cover levels shown on this drawing are approximate. Exact levels of new covers and frames to be determined on site to match level and profile of finished surface.
- 2.8. Exact location of gullies to be determined on site to suit low points. The Contractor shall ensure that all finished surface are laid to falls that are sufficient for all surface water to drain without surface ponding.
- 2.9. For the exact location of soil pipes, stubstacks, W.C.'s and other drainage connections refer to the large scale

architectural building plans.

- 2.10. Rainwater downpipes that do not connect directly to an access point, shall be fitted with a rodding access.
- 2.11. Prior to commencement of any works the existing drainage must be traced to ensure that no 'live' connections remain. Any such connections must be reported to the Contract Administrator, prior to diversion into the new drains.
- 2.12. All new service installations shall be strictly in accordance with NJUG recommendations
- 3.0 Pipework

3.1. Unless noted otherwise all pipework shall be 150mm diameter laid to a fall of 1 in 150 or steeper for surface water and 100mm diameter at 1 in 40 or steeper for foul water. Foul drains with one or more W.C. connected may be laid at 1 in 80 or steeper.

3.2. Unless noted otherwise all pipework shall be constructed from 'super strength' vitrified clay to BS 65,BS EN 295 or UPVC to BS EN 1201 bedded and backfilled as per the manufacturers recommendations and the above listed publications.
- 4.0 Concrete works

4.1. Refer to Site Investigation Report for existing ground conditions and any special requirements for buried concrete (special requirements for buried concrete shall include all pre-cast and in-situ concrete and mortars). Where appropriate refer to contamination reports for details of chemicals affecting choice of materials and other additional requirements. Unless otherwise stated all buried concrete shall be designed to BRE Special Digest 1 - Concrete in Aggressive Ground.

4.2. All mortar's specified for drainage works shall be Class (i) in accordance with BS EN 998-2, unless otherwise specified on the detail.

4.3. All pre-cast and in-situ concrete and mortars used in the construction of foul drains and sewers shall be made from sulphate resisting cement.
- 5.0 Manholes / Inspection chambers

5.1. Access fittings, inspection chambers and manholes shall be constructed to the dimensions shown in Tables 11 and 12 of 'The Building Regulations Approved Document H' and from the materials listed in Table 14. Access points, inspection chambers and manholes shall be constructed from products designed/rated for the location in which they are to be used. They shall be installed in accordance with the manufacturers/suppliers recommendations.

5.2. All covers, gratings and frames to chambers, gullies, channels etc. shall be of the correct load class to suit

their location.

- Load Class B125 Pedestrian areas (not accessible by vehicles)
- Load Class C250 Lightly trafficked areas.
- Load Class D400 Main Roads.

Gratings in pedestrian areas to be designed for pedestrian use (i.e. heel safe).

- 5.1. All existing chambers, gullies channels, pipes and other drainage apparatus shall be protected from damage during the works. The Contractor shall take all necessary measures to ensure that no material enters the drains (other than that which they are designed to carry).
- 5.2. Unless noted otherwise all drains and sewers to connect with soffit's level. Chamber invert levels shown on this drawing are to outgoing pipe.
- 5.3. Invert levels at catchpits relate to invert of outgoing pipe.
- 6.0 Infiltration drainage

6.1 Upon commencement of site works, the Contractor is to undertake location specific infiltration tests in strict accordance with BRE365 at the proposed formation level and location of each infiltration device to verify the design percolation rates. The results of these tests are to be provided to CampbellReith for review at least 5 working days prior to the infiltration device installation.

6.2 Where the results of location specific infiltration tests confirm that the infiltration rates are less favourable than the design rates, the size or nature of the proposed infiltration device will need to be reviewed and potentially amended. The contractor should be aware of this when placing orders for drainage materials/products and programme any additional testing accordingly.

6.3 Please note, unless otherwise noted or instructed, location specific infiltration tests may not be required for infiltration devices receiving catchment areas of 500 sq.m. or less (e.g. house soakaway's).
- 7.0 Proprietary products

7.1 Installation of proprietary products, such as petrol interceptors, grease traps or flow restricting devices, shall be strictly in accordance with the manufacturers' specification and installation instructions. Any variance or conflict between specifications shall be brought to the attention of the Contract Administrator immediately.

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5. Drawing revision:

P: Preliminary

Evolving drawings for approvals, tenders, billings etc.

C: Contractural

Drawings authorized and approved for stage completion i.e. Stage-Tender or Stage 5-Construction .

6. Drawing status:

Work in progress

S0 - Initial status

Shared (Non-contractual)

S1 - Suitable for coordination, S2 - Suitable for information, S3 - Suitable for review and comment, S4 - Suitable for stage approval.

Published (For contractors purposes)

A1, An etc - Authorised and accepted ('n' relates to work stages)

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CR - As constructed record document (Final Construction ONLY. Any deviations to that which is on site is not the liability of CampbellReith)

7. Work Stages:

2 - Concept, 3 - Definition, 4 - Design, 5 - Build & commission, 6 - Handover

8. Only drawings with revision Cn and status A5 to be used for Construction

P1	Issued for Information	07/08/09	IC
Rev	Description	Date	By

CampbellReith consulting engineers

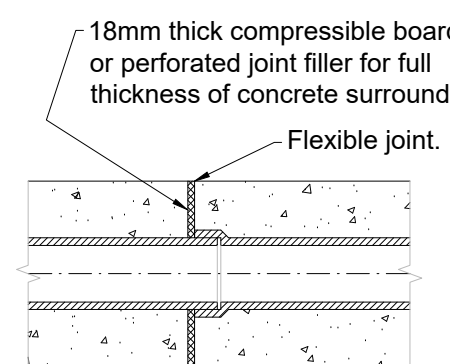
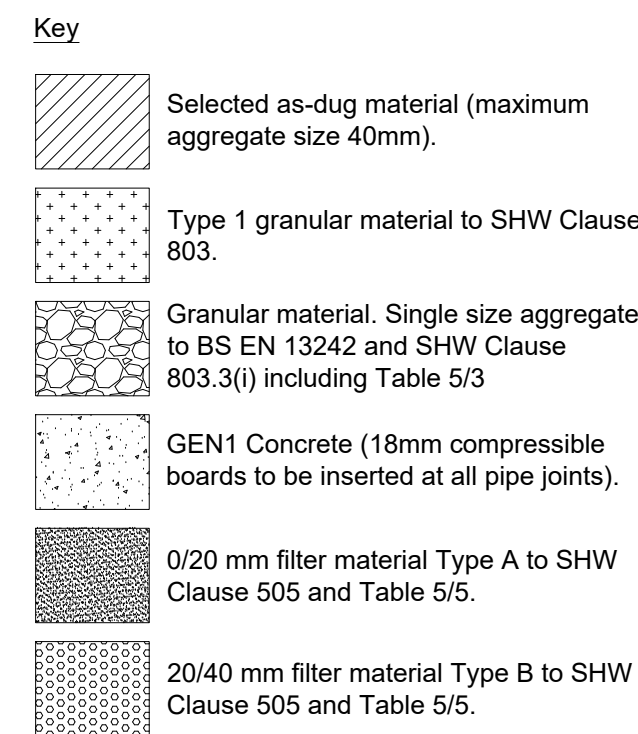
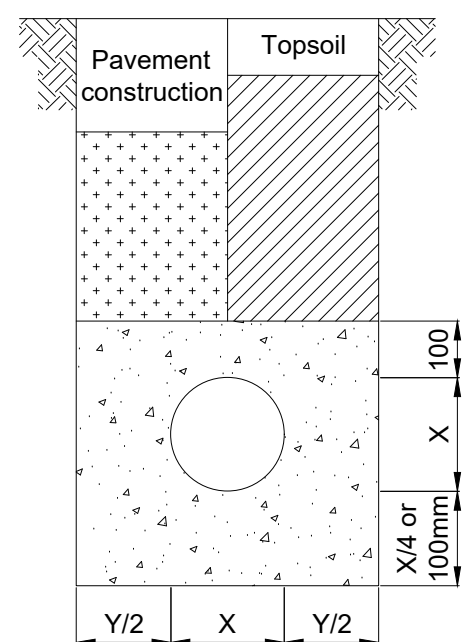
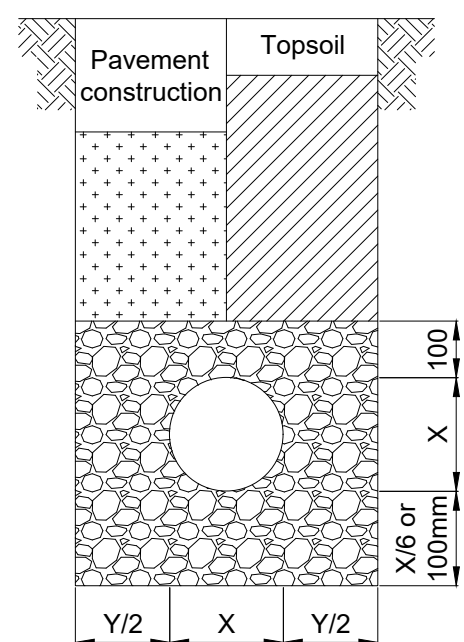
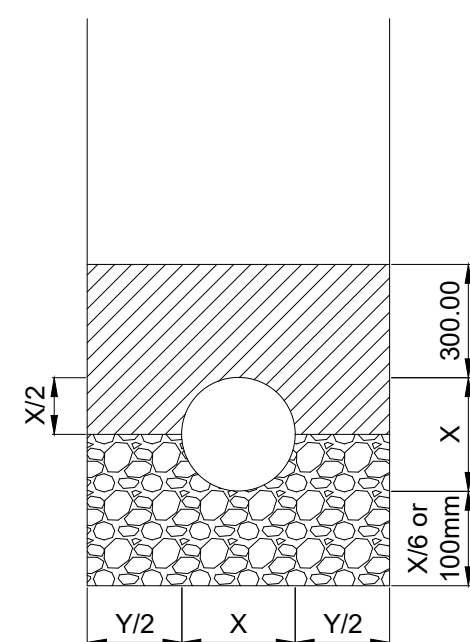
London	020 7340 1700	☐	☒ Manchester	0161 819 3060
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Job Title	Gwersyllt, Wrexham
Client	J10 Planning

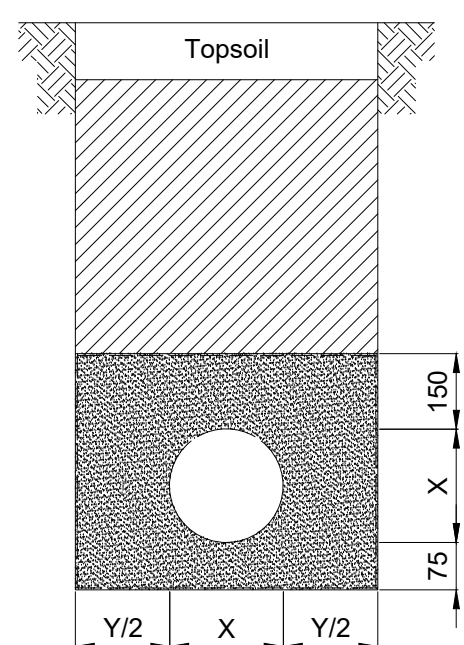
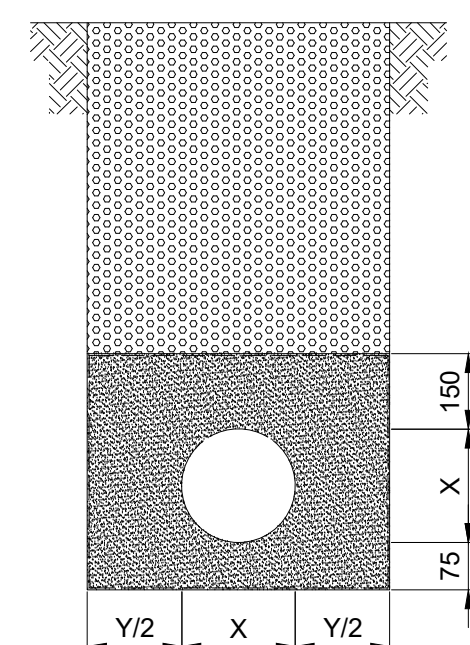
Proposed Drainage Standard Notes

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
IC	17/08/23	NTS	LM	S2	14009

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
14009	CRH	ZZ	XX	DR	C	5300	P1



Movement joint for pipes with concrete bed and surround



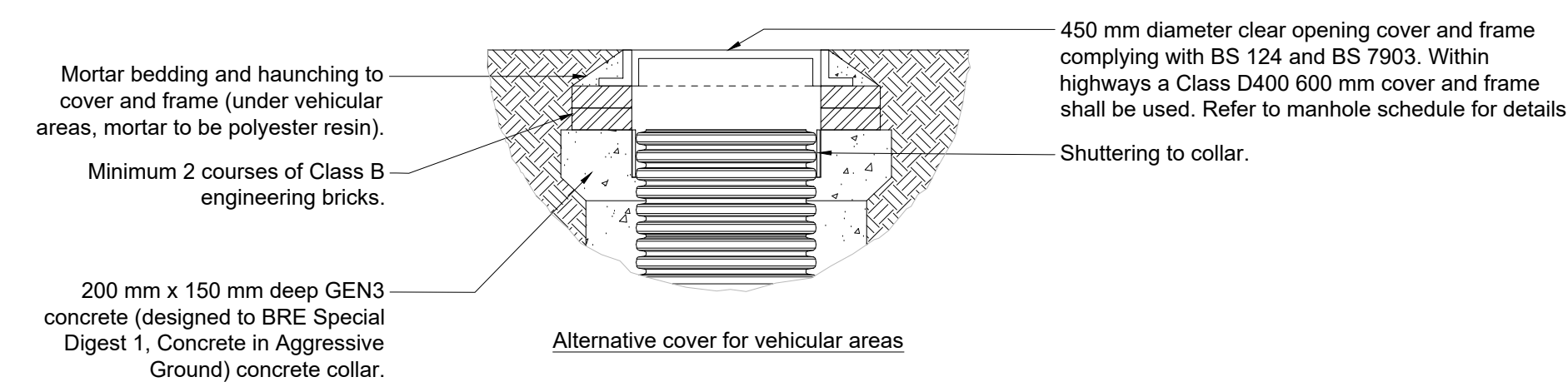
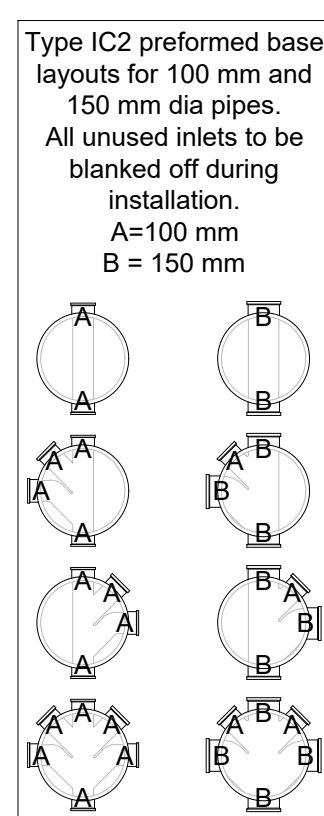
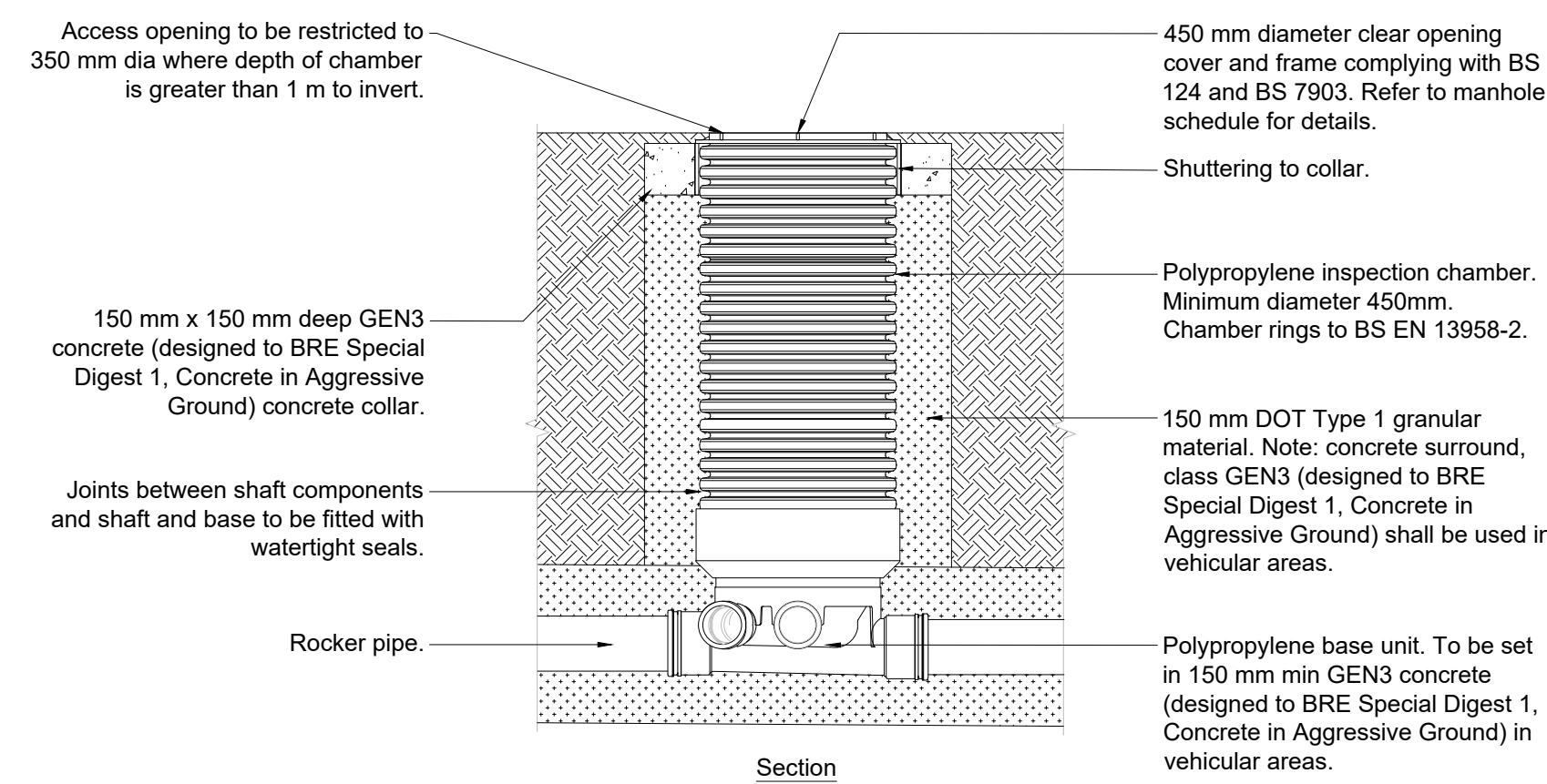
NOTES:

1. X = Outside diameter (OD) of pipe.
2. The first 300mm of fill above the crown of the pipe shall not be mechanically compacted.
3. Geotextiles may be used, where directed by the Engineer, to contain bedding material in certain soils, such as running sand.
4. In very wet conditions, or where directed by the Engineer, a temporary land drain may be laid within the granular bed.

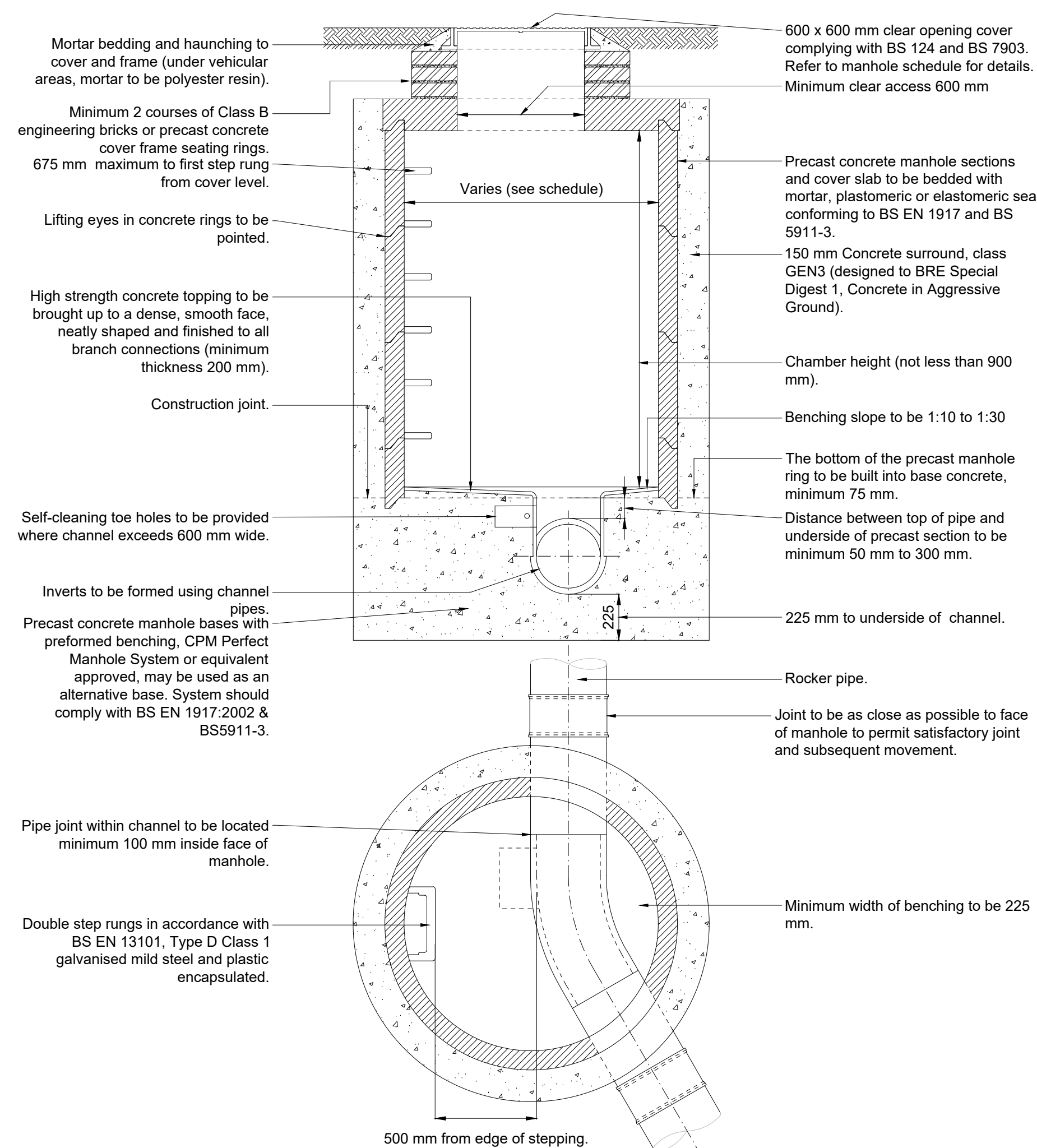
Pipe (DN) size	Y (mm)	Granular fill
100	400	10mm nominal size single stone
150	400	10, 14mm nominal size single stone
225 - 300	500	
375 - 450	700	
525 - 675	700	10, 14, 20mm nominal size single stone
750 - 1200	850	
1350 - 1800	1000	

Pipe bedding details

Scale 1:20



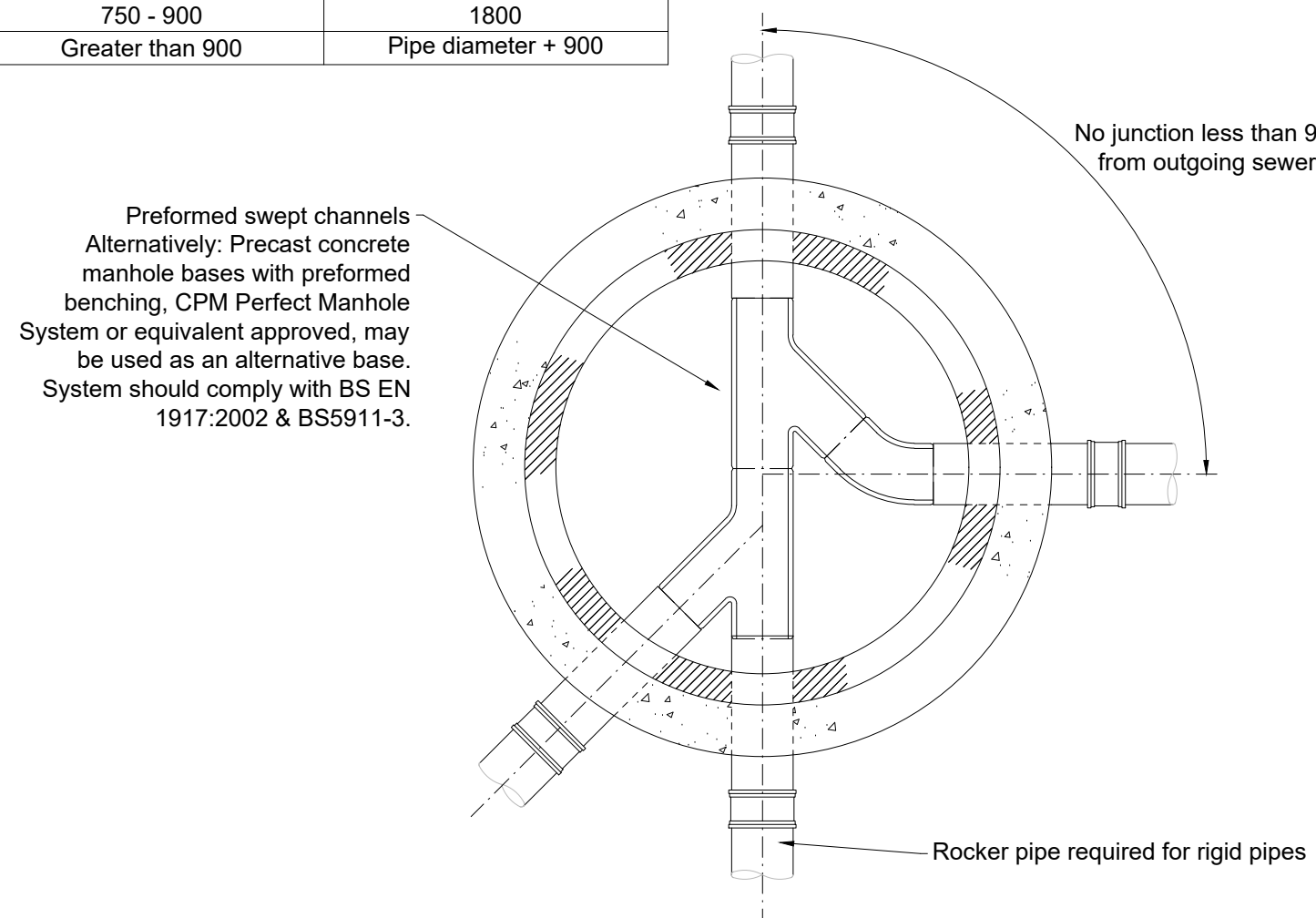
Inspection chamber (Type IC2)
Non-entry
Maximum depth to soffit 3.0m
Scale 1:20



Type 2 manhole
(maximum depth from cover level to soffit of pipe 3.0m)
Scale 1:20

Nominal internal diameter of largest pipe in manhole (mm)	Minimum nominal internal dimension of manhole (mm)
Less than 375	1200
375 - 450	1300
500 - 700	1500
750 - 900	1800
Greater than 900	Pipe diameter + 900

Nominal diameter (mm)	Maximum effective length (m)
150 - 600	0.60
601 - 750	1.00
Over 750	1.25



Rigid pipes built into manhole should have flexible joint as close as feasible to the external face of the structure and the length of the next rocker pipe should be as shown.

Typical arrangement of pipe junctions within manholes

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- | | |
|------------------------|--|
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i.e. Stage-Tender or Stage 5-Construction . |

6. Drawing status:
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8. Only drawings with **revision Cn** and **status A5** to be used for Construction

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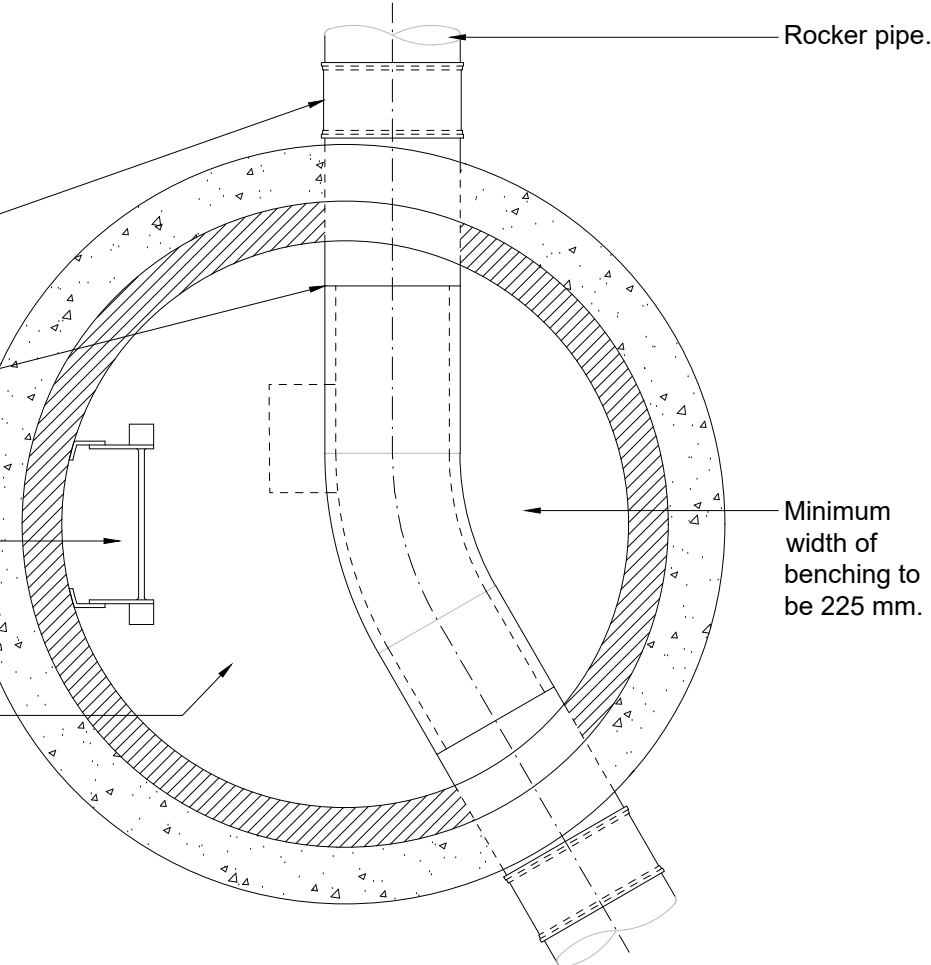
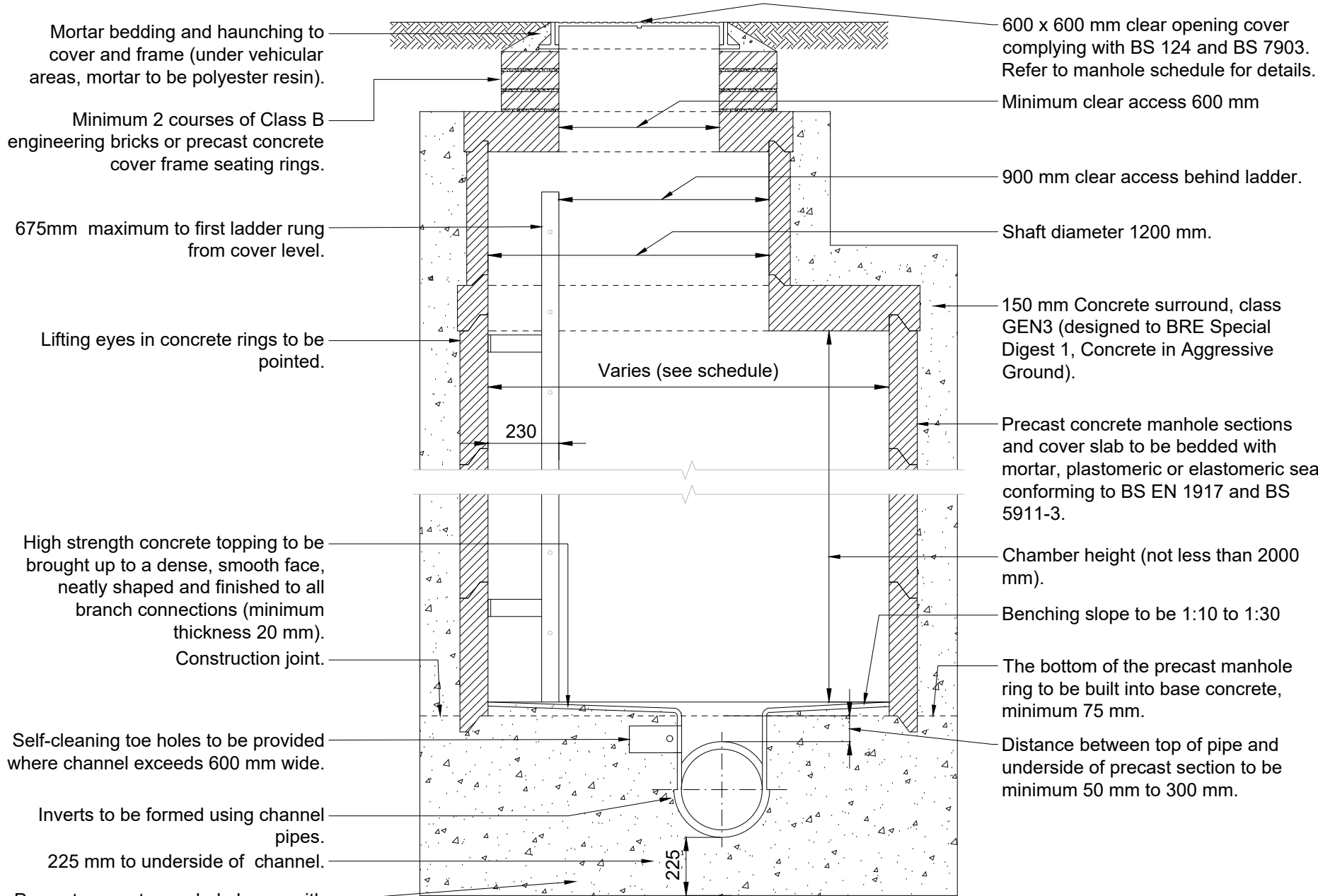
Job Title **Gwersyllt, Wrexham**

Client	J10 Planning
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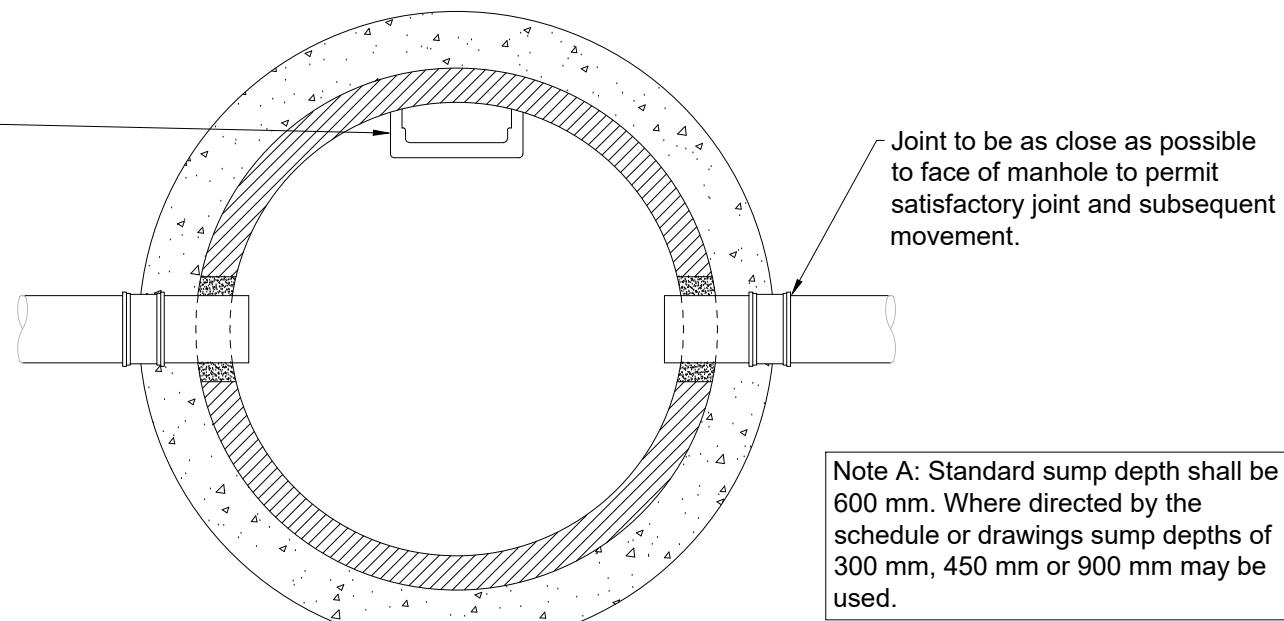
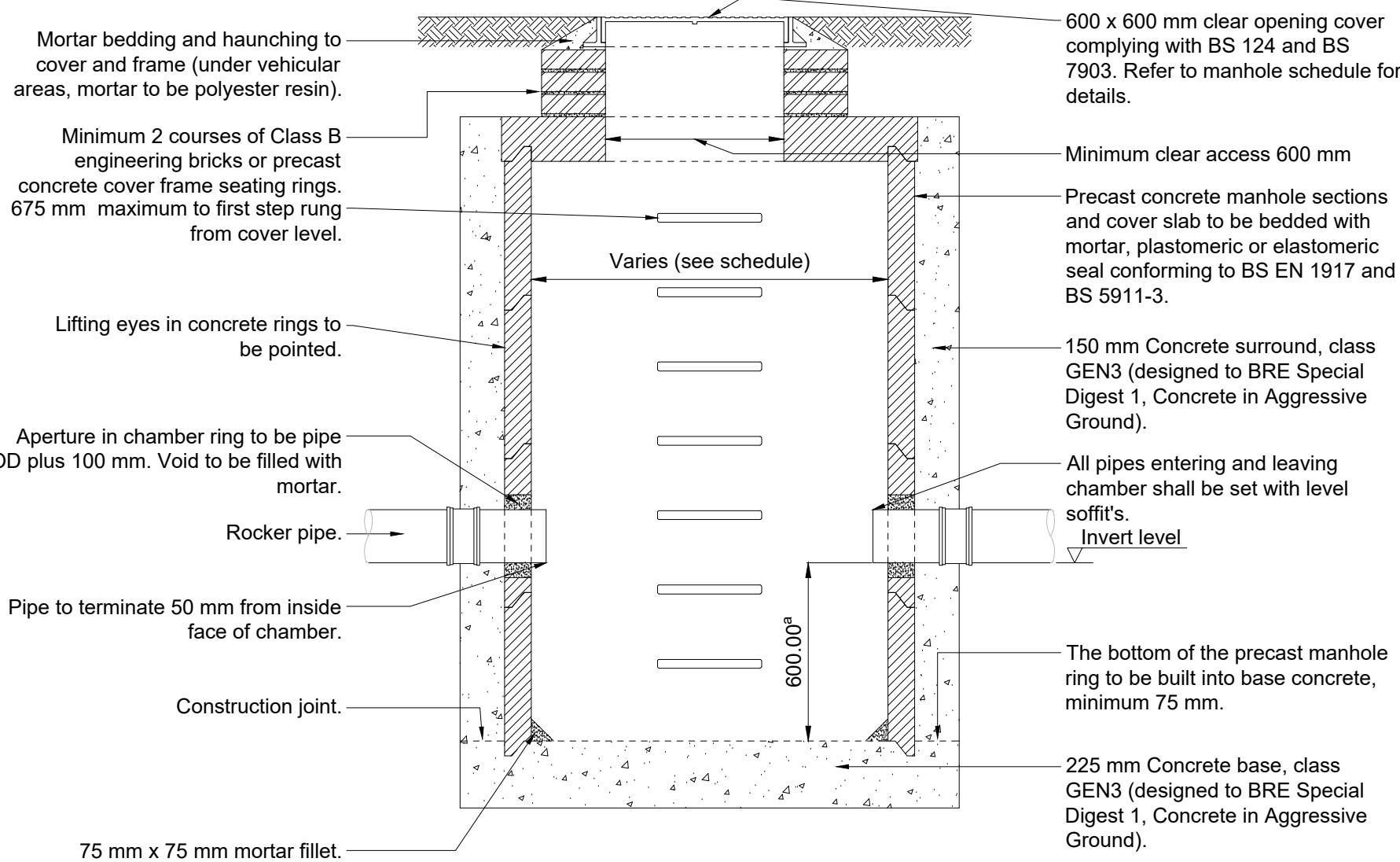
Proposed Drainage Standard Details (Sheet 1 of 3)

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
IC	17/08/23	1:20	LM	S2	14009

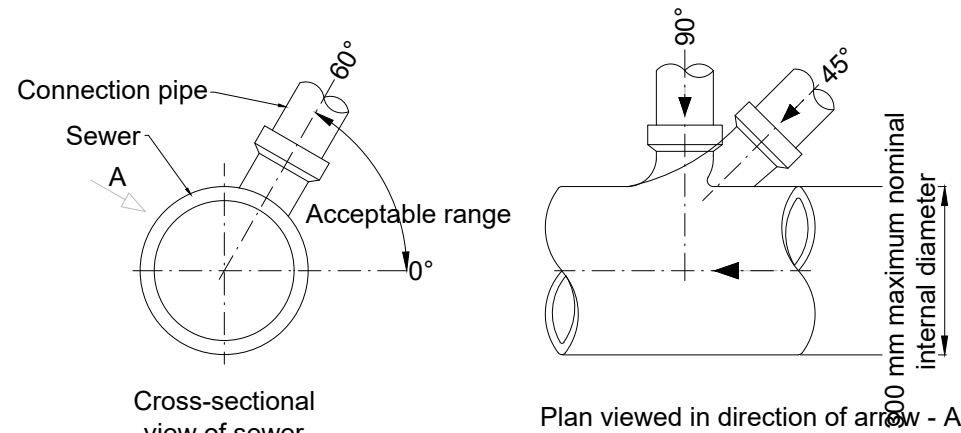
Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
14009	CRH	ZZ	XX	DR	C	5301	P1



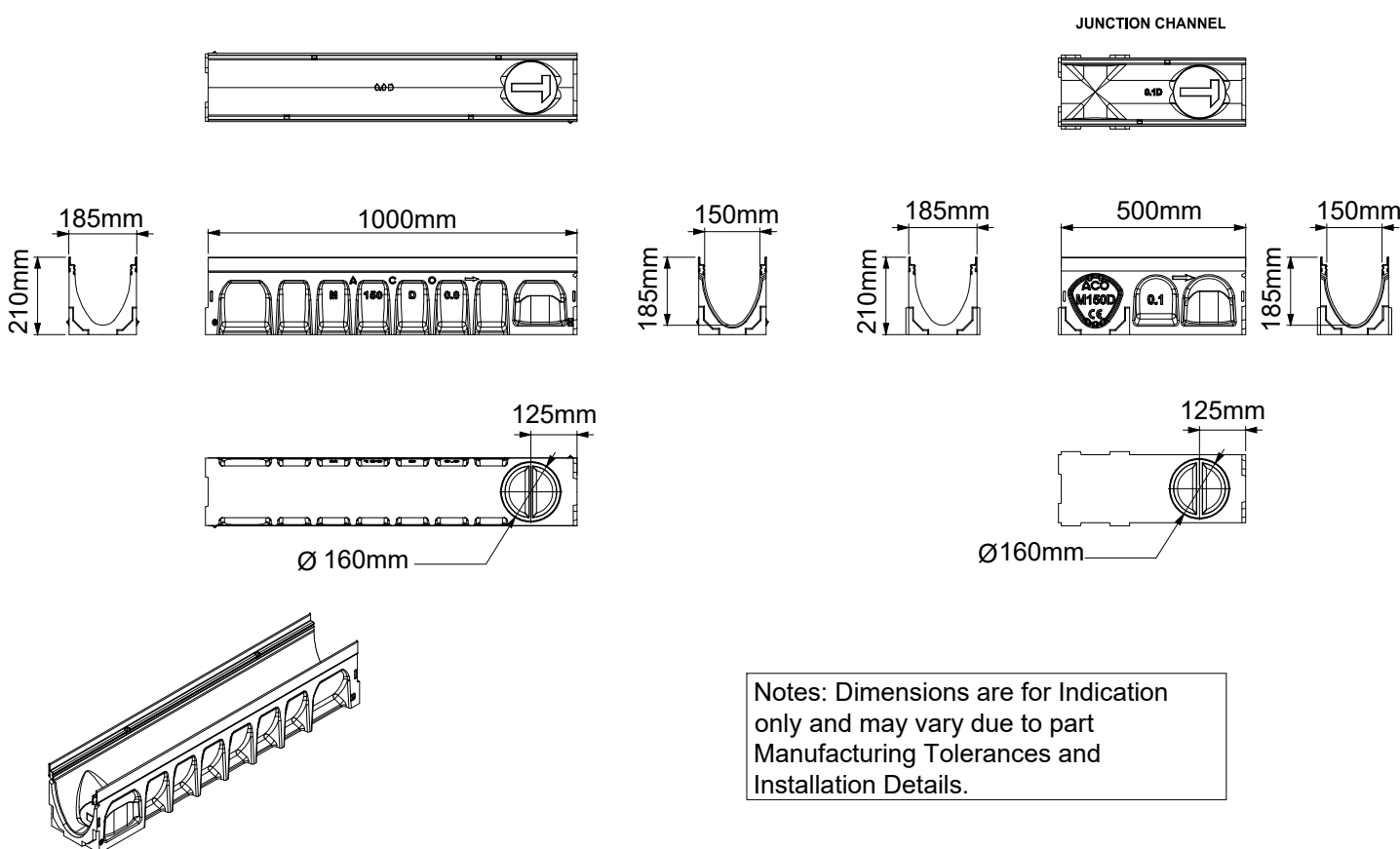
Type 1A manhole
(depth from cover level to soffit of pipe 3.0 m to 6.0 m)
Scale 1:20



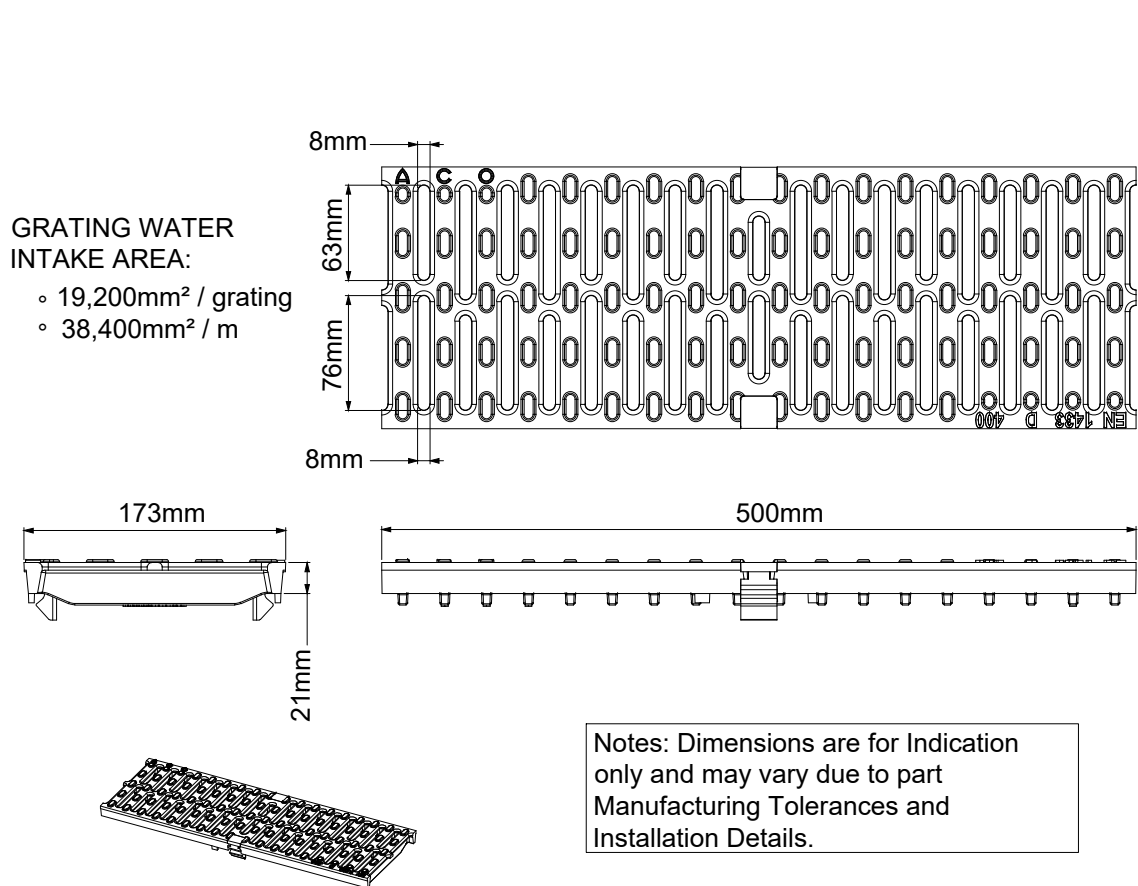
Catchpit Type CP1
(maximum depth from cover level to base 3.0m)
Scale 1:20



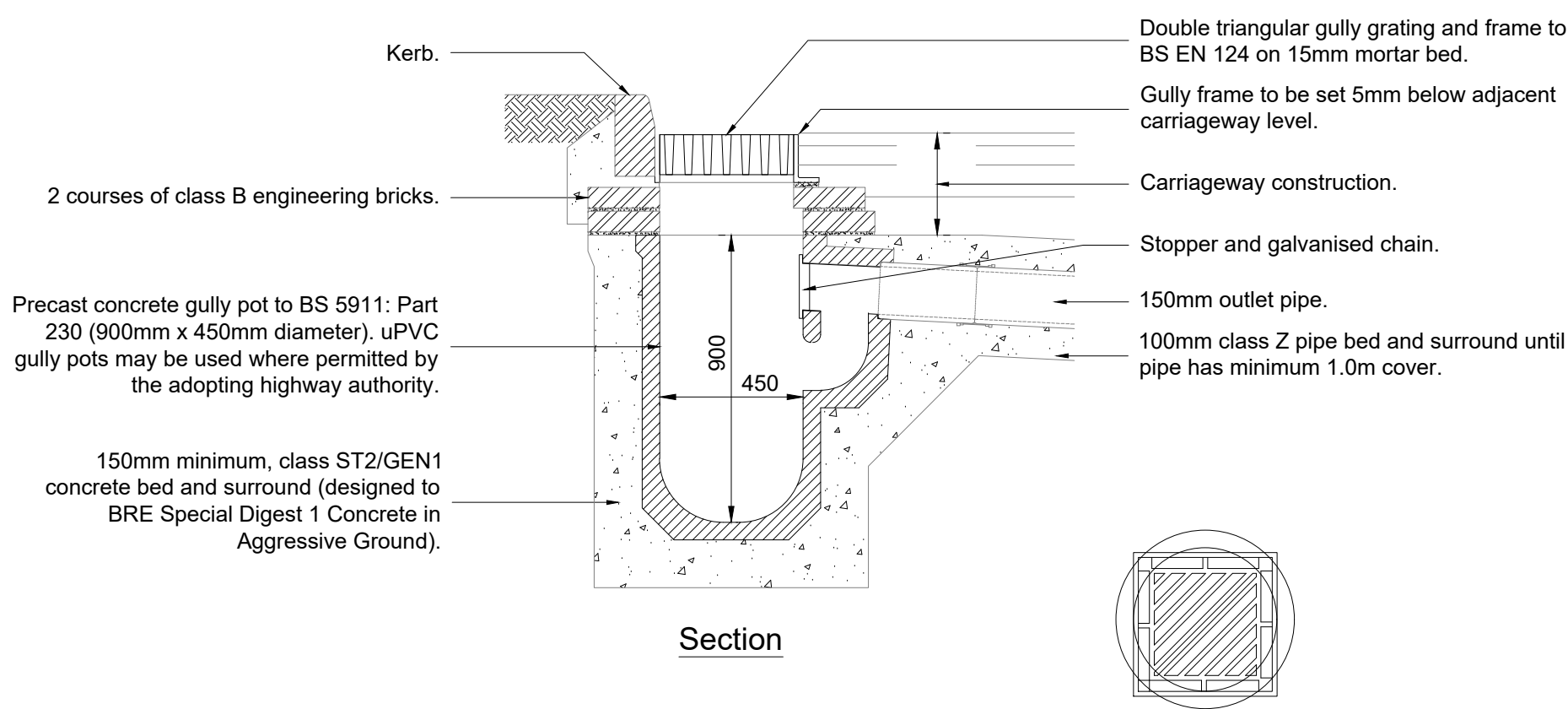
Connection to sewers
Scale 1:20



Multidrain M150D Channels
(ACO Technologies Detail Ref:E1-M01-127-1)
(0.0, 0.1 J, DS 0.0, DS 0.1 J)



M150D Heelguard Grating Slotted Ductile Iron
(ACO Technologies Detail Ref: E1-M01-229-1)
(Load Class - D400)



Road gully (type 1)
Scale 1:20

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P1	Issued for Information	07/09/23	IC
Rev	Description	Date	By

CampbellReith
consulting engineers

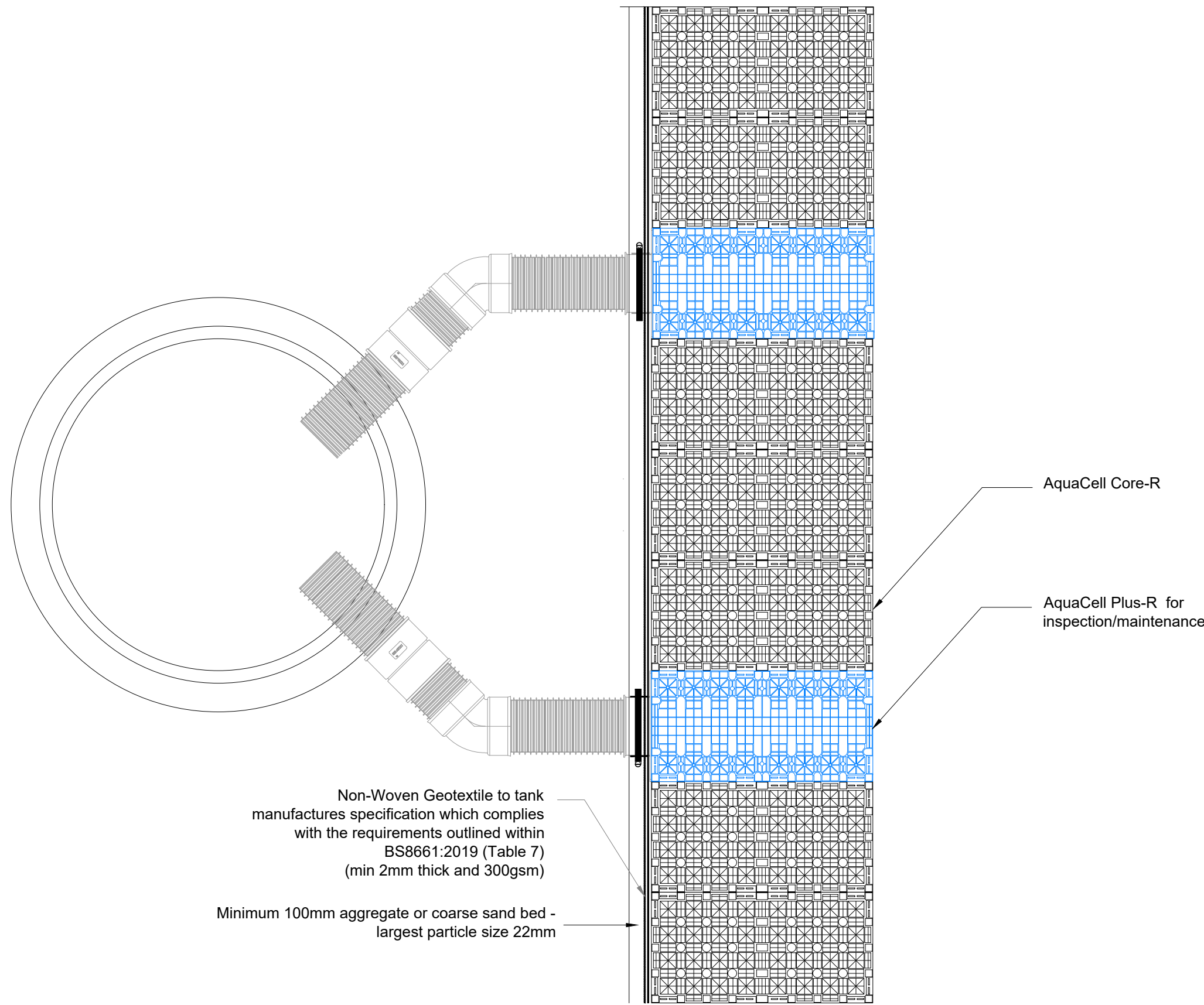
London	020 7340 1700	Manchester	0161 819 3060
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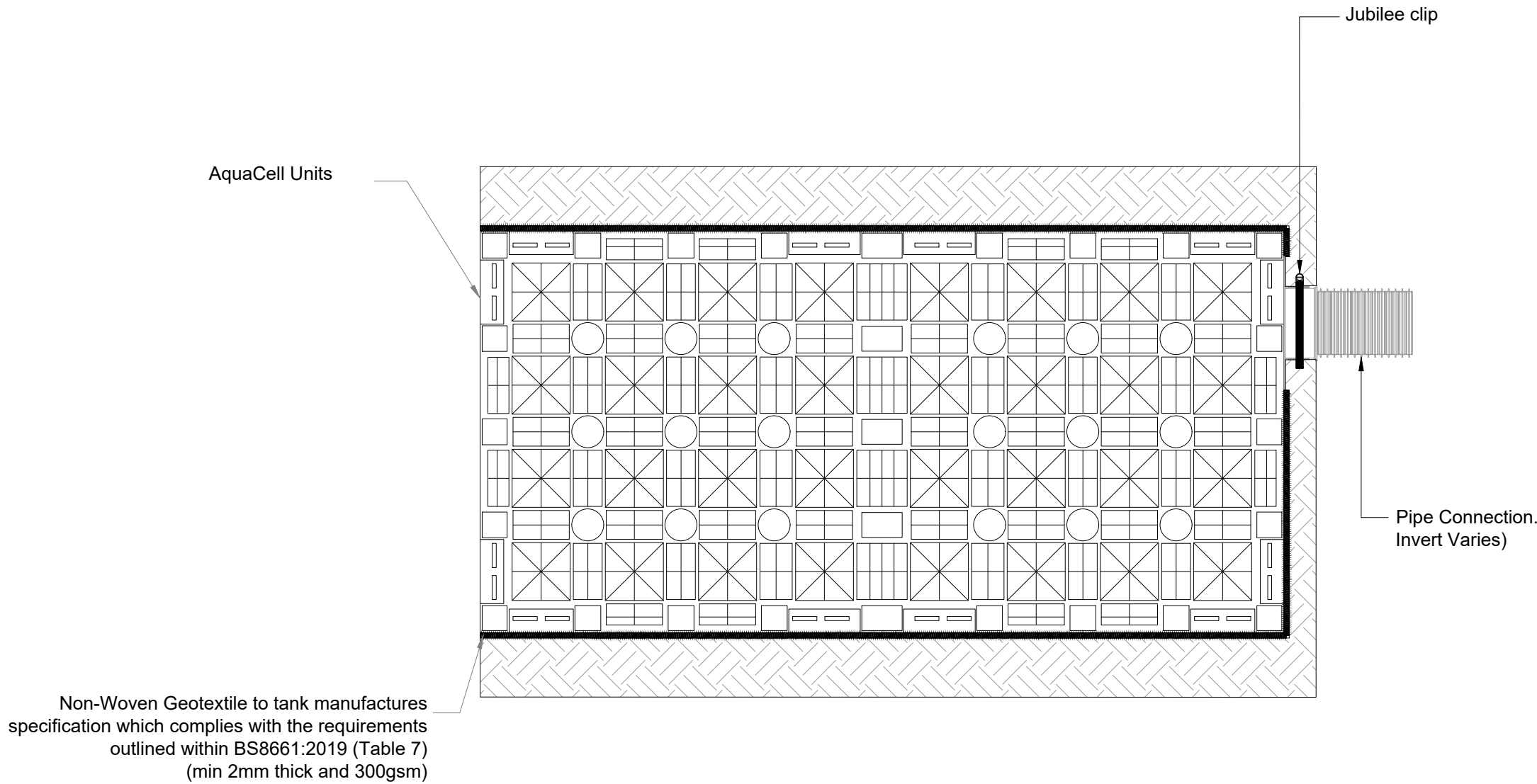
Proposed Drainage Standard Details (Sheet 2 of 3)

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
IC	17/08/23	1:20	LM	S2	14009

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
14009	CRH	ZZ	XX	DR	C	5302	P1



AquaCell Core-R attenuation tank link pipe detail



Typical connection to AquaCell units

INSTALLATION METHOD
(As supplied by Tank Manufacturer)

- Excavate the trench to the required depths ensuring that the plan area is slightly greater than that of the AquaCell units.
- Lay 100mm bed of coarse sand or non angular granular material, level and compact.
- Lay the geotextile over the base and up the site of the trench.
- Lay the AquaCell units parallel with each other. In multiple layer applications, wherever possible, continuous vertical joints should be avoided. AquaCell units can be laid in a 'brick bond' formation (i.e. to overlap the joints below) - see page 16. For single layer applications use the AquaCell clips and for multi layer applications use the AquaCell clips and the AquaCell Shear Connectors (vertical rods).
- Fix the Adaptor to the AquaCell unit as required and connect piecework.
- In order to prevent silt from entering the tank clogging inlet pipework and reducing storage capacity, it is recommended that the Domestic Silt Trap (6LB300) or one of the Standard Silt Traps (6LB600, 6LB625, 6LB630) is installed prior to the inlet pipework - see page 24 for installation guidelines.
- Wrap and overlap the geotextile covering the entire AquaCell structure.
- Lay 100mm of coarse sand or non angular granular material between the trench walls and the AquaCell structure and compact.
- Lay 100mm of coarse sand or non angular granular material over the geotextile and compact.
- Backfill with suitable material.
- Rainwater from roof areas may discharge directly into the soakaway but rainwater from car parks must discharge through a catchpit manhole and/or a petrol interceptor.

GEOTEXTILE SPECIFICATION

Geotextile:

- 300gsm and 2mm thick non-woven with sewn or glued joints.

It is crucial that the specified material will:

- Withstand the rigours of installation
- Resist puncture
- Resist multi-axial elongation stress and strains associated with settlement
- Resist environmental stress cracking
- Resist damage from in ground contaminants
- Remain intact for the full design life of the AquaCell installation
- Maintain its permeability with respect to passage of water for the full design life of the AquaCell installation

BACKFILL SPECIFICATION

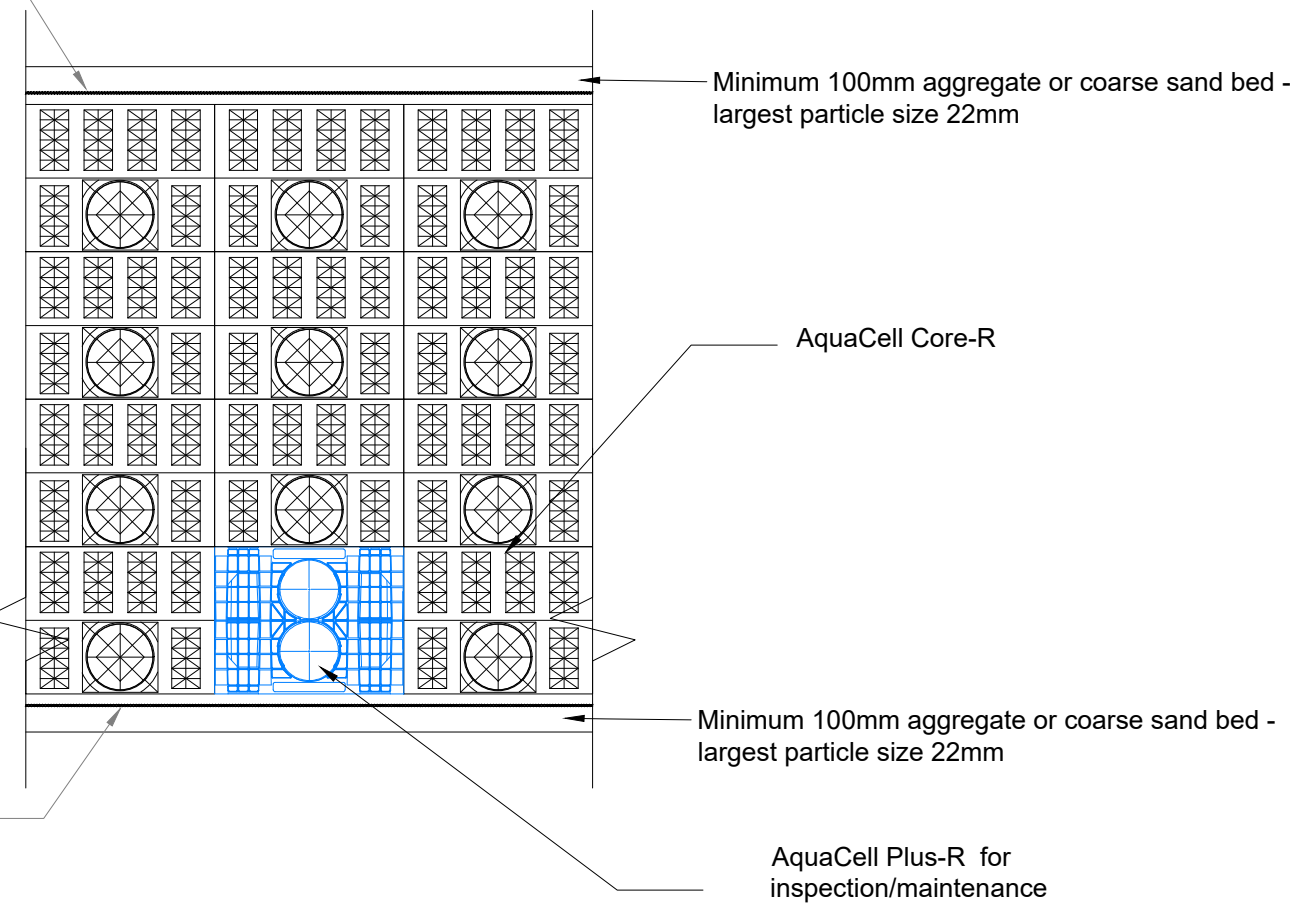
Backfill to be compacted granular material Type 1 (or Type 2). Tracked excavators (not exceeding 21 tonnes weight) should be used to placed fill over the AquaCell units

NOTE: This applies to AquaCell Plus R and Core R ONLY. AquaCell ECO are NOT suitable for construction traffic loading

At least 300mm of fill should be placed before Construction Traffic delivering the backfill are allowed to traffic over the units.

Compact in 150mm layers after the initial 300mm layer. Compaction Plant should should not exceed 2300kg/m width.

Non-Woven Geotextile to tank manufactures specification which complies with the requirements outlined within BS8661:2019 (Table 7) (min 2mm thick and 300gsm)



AquaCell Core-R Attenuation tank section

Notes

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- All work is to be done in accordance with the relevant specifications issued by CampbellReith, British Standard Codes of Practice, Statutory Requirements and the Contract Documents.

Drawing revision:

- | | |
|-----------------------|---|
| P: Preliminary | Evolving drawings for approvals, tenders, billings etc. |
| C: Contractual | Drawings authorized and approved for stage completion i.e. Stage-Tender or Stage 5-Construction . |

Drawing status:

- Work in progress
S0 - Initial status
Shared (Non-contractual)
S1 - Suitable for coordination, **S2** - Suitable for information, **S3** - Suitable for review and comment, **S4** - Suitable for stage approval.
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Work Stages:

- 2** - Concept, **3** - Definition, **4** - Design, **5** - Build & commission, **6** - Handover

Only drawings with revision Cn and status A5 to be used for Construction

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Client
J10 Planning

Proposed Drainage
Standard Details
(Sheet 3 of 3)

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
IC	17/08/23	1:20	LM	S2	14009

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
14009	CRH	ZZ	XX	DR	C	5303	P1

MANHOLE SCHEDULE NETWORK: SW								
MANHOLE NO.	PIPE NO.	COVER LEVEL (mAOD)	DOWNSTREAM PIPE DIA.(mm)	DOWNSTREAM PIPE INVERT LEVEL (mAOD)	MANHOLE DEPTH (m)	MANHOLE DIAMETER (m)	MANHOLE COORDINATES (EASTING, NORTHING)	MANHOLE TYPE
SW MH 1	1.000	104.600	0.150	103.250	1.350	1.200	331474.636, 353849.246	TYPE 2
SW MH 2	1.001	104.750	0.150	102.931	1.819	1.200	331478.075, 353836.969	TYPE 2
SW MH 3	1.002	104.600	0.150	102.870	1.730	1.200	331476.080, 353832.463	TYPE 2
SW MH 4	1.003	104.450	0.225	102.575	1.875	1.200	331481.316, 353815.676	TYPE 2
SW MH 5	1.004	104.300	0.225	102.507	1.793	1.200	331476.520, 353806.685	TYPE 2
SW MH 6	1.005	104.700	0.225	102.381	2.319	1.200	331482.607, 353788.777	TYPE 2
SW MH 7	1.006	104.700	0.225	102.344	2.356	1.200	331481.830, 353783.281	TYPE 2
SW MH 8	1.007	104.600	0.300	102.020	2.580	1.200	331483.658, 353747.872	TYPE 2
SW MH 9	1.008	105.000	0.300	101.934	3.070	1.200	331503.772, 353733.081	TYPE 2
SW MH 10	1.009	104.400	0.300	101.431	2.969	1.200	331513.341, 353730.187	TYPE 2
SW MH 11	TANK	104.000	0.300	101.300	2.700	1.200	331523.877, 353741.112	CATCHPIT
SW MH 12	2.000	104.300	0.150	102.950	1.350	1.200	331512.181, 353842.011	TYPE 2
SW MH 13	2.001	104.300	0.225	101.994	2.306	1.200	331519.856, 353817.349	TYPE 2
SW MH 14	2.002	104.300	0.225	101.847	2.453	1.200	331516.043, 353795.639	TYPE 2
SW MH 15	2.003	104.300	0.300	101.660	2.640	1.200	331513.110, 353779.056	TYPE 2
SW MH 16	2.004	104.000	0.300	101.300	2.700	1.200	331520.935, 353751.239	CATCHPIT
SW MH 17	3.000	104.000	0.150	102.886	1.114	1.200	331537.725, 353859.065	TYPE 2
SW MH 18	3.001	104.300	0.225	102.402	1.898	1.200	331545.659, 353831.402	TYPE 2
SW MH 19	3.002	103.650	0.225	102.182	1.468	1.200	331555.233, 353799.853	TYPE 2
SW MH 20	3.003	103.800	0.300	101.941	1.859	1.200	331560.622, 353780.043	TYPE 2
SW MH 21	3.004	103.800	0.300	101.407	2.393	1.200	331543.741, 353766.831	CATCHPIT
SW MH 22	TANK	104.000	0.225	101.300	2.700	1.200	331568.912, 353765.113	CATCHPIT
SW MH 23	TANK	104.300	0.225	101.300	3.000	1.200	331571.782, 353755.085	CATCHPIT
SW MH 24	4.001	104.000	0.150	102.150	2.850	1.200	331567.387, 353746.534	CATCHPIT

MANHOLE SCHEDULE NETWORK: FW								
MANHOLE NO.	PIPE NO.	COVER LEVEL (mAOD)	DOWNSTREAM PIPE DIA.(mm)	DOWNSTREAM PIPE INVERT LEVEL (mAOD)	MANHOLE DEPTH (m)	MANHOLE DIAMETER (m)	MANHOLE COORDINATES (EASTING, NORTHING)	MANHOLE TYPE
FW MH 1	1.000	104.600	0.150	103.850	0.750	1.200	331479.165, 353847.310	TYPE 2
FW MH 2	1.001	104.450	0.150	103.499	0.951	1.200	331487.036, 353820.293	TYPE 2
FW MH 3	1.002	104.450	0.150	103.399	1.051	1.200	331477.504, 353817.413	TYPE 2
FW MH 4	1.003	104.500	0.150	103.284	1.216	1.200	331472.239, 353807.205	TYPE 2
FW MH 5	1.004	104.300	0.150	103.134	1.166	1.200	331485.231, 353799.632	TYPE 2
FW MH 6	1.005	104.600	0.150	102.878	1.722	1.200	331491.952, 353774.891	TYPE 2
FW MH 7	1.006	104.450	0.150	102.585	1.865	1.200	331500.888, 353746.871	TYPE 2
FW MH 8	1.007	104.550	0.150	102.089	2.461	1.200	331517.076, 353736.206	TYPE 2
FW MH 9	1.008	103.800	0.150	101.984	1.816	1.200	331520.174, 353726.224	TYPE 2
FW MH 10	1.009	104.100	0.150	101.531	2.569	1.200	331563.604, 353739.220	TYPE 2
FW MH 11	2.000	103.970	0.150	103.220	0.750	1.200	331506.996, 353845.243	TYPE 2
FW MH 12	2.001	104.180	0.150	102.919	1.261	1.200	331515.857, 353816.520	TYPE 2
FW MH 13	2.002	104.150	0.150	102.740	1.410	1.200	331512.420, 353799.003	TYPE 2
FW MH 14	2.003	104.300	0.150	102.586	1.714	1.200	331509.407, 353783.906	TYPE 2
FW MH 15	2.004	104.300	0.150	102.375	1.925	1.200	331514.854, 353763.501	TYPE 2
FW MH 16	2.005	104.300	0.150	102.185	2.115	1.200	331520.229, 353745.239	TYPE 2
FW MH 17	3.000	104.300	0.150	102.950	1.350	1.200	331536.266, 353855.701	TYPE 2
FW MH 18	3.001	103.800	0.150	102.173	1.627	1.200	331545.097, 353825.845	TYPE 2
FW MH 19	3.002	103.500	0.150	101.599	1.901	1.200	331552.243, 353801.661	TYPE 2
FW MH 20	3.003	103.940	0.150	101.294	2.646	1.200	331560.384, 353772.471	TYPE 2
FW MH 21	3.004	103.890	0.150	101.167	2.723	1.200	331571.463, 353766.337	TYPE 2
FW MH 22	3.005	104.330	0.150	100.947	3.383	1.200	331574.926, 353744.564	TYPE 1A

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Job Title	Gwersyllt, Wrexham
Client	J10 Planning

Manhole Schedule

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
IC	17/08/23	1:200	LM	S2	14009

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
14009	CRH	ZZ	XX	DR	C	5850	P1