- Infrastructure Design
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- Geotechnical & Environmental
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jpp

Proposed Care Home
Land at Longford Park Road and Canal Lane
Bodicote
Banbury
Oxfordshire

Drainage Strategy

Revision A: November 2022
R-FRA-24918-01-A

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Drainage Strategy

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Report Reference	R-FRA-24918-01-A
Date	Revision A: November 2022

Report Originators

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Revision	Date	Description	Prepared	Reviewed
0	4th November 2022	Draft Issue	Katherine Rose	Katherine Rose
0	9th November 2022	Finalised following client comments	Katherine Rose	Katherine Rose
A	11th Nov. 2022	Latest site layout included	Katherine Rose	Katherine Rose

Contents

Appendices

Figures

Tables

1.0 Introduction

1.1 Background

1.1.1 This report is a Drainage Strategy which has been prepared by JPP Consulting Limited on behalf of Mercian Group for a proposed Care Home. The benefit of this report is to our instructing Client.

1.1.2 The proposed development is located at Land at Longford Park Road and Canal Lane, Bodicote, Banbury, as shown in Figure 1.1 below. Bodicote is located south of Banbury and west of the M40. The National Grid Reference for the site is E 446680 N 238200. The total site area comprises 0.97ha.

Figure 1.1 Site Location Plan
Source: OpenStreetMap, obtained 21st October 2022

1.2 Objectives

1.2.1 The objective of this report is to advise interested parties the management of surface water run-off arising from the proposals.

1.2.2 The scope of assessment and proposed drainage requirements reflect the quantum of development, comprising a 128 bed care home.

1.2.3 This report has been prepared to support a detailed planning application.

1.3 Reference documents

1.3.1 This report has been prepared with reference to the following publications:-

- Ministry of Housing, Communities and Local Government (March 2012, updated July 2021), National Planning Policy Framework
- Ministry of Housing, Communities and Local Government (March 2014, updated August 2021), Planning Practice Guidance 'Flood Risk and Coastal Change'
- Department for Environment, Food and Rural Affairs (March 2015), Non-statutory technical standards for sustainable drainage systems
- Environment Agency (September 2013), Climate Change Allowances for Planners: Guidance to support the National Planning Policy Framework
- Environment Agency (October 2013), Delivering benefits through evidence: Rainfall runoff management for developments
- HM Government (2010), The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H, The NBS, Newcastle Upon Tyne
- Wilson, Bray, Cooper (2004), Sustainable drainage systems: Hydraulic, structural and water quality advise, C609, CIRIA, London
- Woods-Ballard et al (2015), The SUDS Manual, C753, CIRIA, London
- CIRIA Report C624 Development and flood risk
- National SUDS Working Group (2004), Interim Code of Practice for Sustainable Drainage Systems,
- Institute of Hydrology (1999), Flood Estimation Handbook, Institute of Hydrology, Wallingford
- BS EN 752:2008 Drain and sewer systems outside buildings. Hydraulic design and environmental considerations
- BS 8533:2011 Assessing and managing flood risk in development – Code of Practice
- CIRIA Report C635 Designing for exceedance in urban drainage – good practice
- Cherwell Level 1 Strategic Flood Risk Assessment (May 2017)

2.0 Description and history of the site and development proposals

2.1 Location and description of the site

2.1.1 The proposed development is located at Land at Longford Park Road and Canal Lane, Bodicote, as shown in Figure 1.1 above. The site is bound by residential development to the north, south and west. To the east is Longford Park Road and Longford Primary School.

2.2 History of the site

2.2.1 The site is currently agricultural grassland, as shown on the topographical survey enclosed in **Appendix A**. We are not aware of any previous development on the site.

2.2.2 Aerial imagery dating back to December 2004, shows that the site itself was comparable to present during this time, see Figure 2.1 below. Construction of the surrounding residential development and adjacent primary school had not started at this time.

Figure 2.1 Aerial imagery dated December 2004
Source: Google Earth Pro, obtained: 2st October 2022

2.2.3 Aerial imagery dating back to April 2017, shows the extent of the construction of recent development in the wider area at this time, see Figure 2.2 below.

Figure 2.2 Aerial imagery dated April 2017
Source: Google Earth Pro, obtained: 2st October 2022

2.2.4 Aerial imagery dating back to September 2019, shows the extent of the construction of recent development in the wider area at this time, see Figure 2.3 below.

Figure 2.3 Aerial imagery dated September 2019
Source: Google Earth Pro, obtained 21st October 2022

2.2.5 We are aware that a planning application exists for the site to the south (Cherwell District Council reference 14/01888/F) for future development located 'East of Oxford Road and Adjoining and South of Canal Lane, Bodicote', comprising:

> Erection of two local centre buildings – one to contain four apartment (3 x 2 bed and 1 x 1 bed) over one retail unit and a surgery, and the other to contain four apartments (2 x 1 bed, 1 x 2 bed and 1 x 3 bed) over three retail units and a nursery.

2.3 Proposed development

2.3.1 The proposed development will comprise a 128 bedroom care home. The proposed development layout is shown on the plan enclosed in **Appendix B.**

2.4 Site topography

2.4.1 The topographical survey indicates that topography falls very slightly from north-west (at approximately 120.5m) to south-east (lowest point of approximately 119.75m). The topographical survey is shown on the plan enclosed in **Appendix A**.

2.5 Existing drainage infrastructure

2.5.1 Thames Water's asset plan is enclosed in **Appendix C.** The asset plan identifies no adopted surface water sewers or foul water sewers within the site boundary. The nearest sewers are identified to be under Agreement.

2.5.2 Details of the drainage networks for the surrounding development are provided for surface water and foul water in **Appendix D and E** respectively.

2.6 Geology of the site and ground investigation data

2.6.1 Inspection of the geological maps show that there are no superficial deposits at the site. The bedrock geology which underlies the site is Whitby Mudstone Formation – Mudstone.

2.6.2 JPP Geotechnical & Environmental have completed a Desk Study and infiltration testing on the site. Extracts of the infiltration report are enclosed in **Appendix F.** Details of encountered ground conditions are summarised in Table 2.1 below.

Summary of Ground Investigation Information				
Ground Conditions	Depth (m)			
	TP01	TP02	TP03	TP04
Topsoil	0.25	0.30	0.30	0.30
Marlstone Rock Formation	1.10	1.30	1.45	1.50
Source: JPP Geotechnical & Environmental report ref. L-24934-01-00				

Table 2.1 Ground Investigation Information

2.6.3 No groundwater was encountered in the trial pits during the investigations.

2.6.4 Infiltration testing was carried out in the four trial pit positions across the site up to a maximum depth of 1.50m depth bgl. Due to the cohesive soils encountered, there was insufficient infiltration to derive an infiltration rate with no reduction in water levels recorded during the testing. Therefore, the soils can be considered as impermeable.

Summary of Infiltration Testing			
Trial Pit Position	Cycle	Base Depth of Trial Pit	Infiltration Rate
TP01	1	1.10 m bgl	Insufficient infiltration to derive a permeability rate.
TP02	1	1.30 m bgl	Insufficient infiltration to derive a permeability rate.
TP03	1	1.45 m bgl	Insufficient infiltration to derive a permeability rate.
TP04	1	1.50 m bgl	Insufficient infiltration to derive a permeability rate.
Source: JPP Geotechnical & Environmental report ref. L-24934-01-00			

Table 2.2 Infiltration Testing Information

2.6.5 Therefore, infiltration is not considered a viable method to manage surface water drainage for the proposed development.

3.0 Management of surface water

3.1 Current conditions

3.1.1 The site is currently open with no existing development, and is therefore considered a greenfield site with no existing drainage. Therefore, greenfield run-off calculations shall be used to derive the allowable run off rate from the site.

3.2 Surface water drainage outfalls

3.2.1 It is a requirement of The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H, to dispose of surface water collected by a development in accordance with the following, listed in order of priority:-

1. Infiltration systems where ground condition permit
2. To watercourses
3. To sewers

3.2.2 Each of these is considered separately below:

3.2.3 Infiltration systems

3.2.3.1 The geology of the site is described in Section 2.6 above. The underlying ground conditions and infiltration test results show that soakaways are not a viable method for managing surface water at the site.

3.2.4 Watercourses / Main River

3.2.4.1 There are no watercourses located within or adjacent to the boundary of the proposed development.

3.2.5 Sewers

3.2.5.1 Surface water will outfall to the adjacent surface water network associated with the surrounding network. A connection will be made off Longford Park Road, via the existing spur provided for the site, as identified in **Appendix D**.

3.3 SUDS assessment

3.3.1 We have considered the suitability of SUDS for use on the development site. The review is set out in below Table 3.1.

SUDS Assessment		
SUDS Technique	**Suitability**	**Justification**
Rain Water Harvesting	Maybe	Use will only mitigate a small proportion of the increase in volume of run-off created by the proposed development. To be considered at detailed design to reduce potable water use.
Green Roofs	No	Green roofs are generally only viable on flat roofs. We understand that the proposed is to have a pitched roof.
Infiltration	No	Underlying geology unviable.
Filter Strips / Filter Drains	No	Underlying geology unviable.
Swales	Yes	Swales will be used to convey surface water through the site.
Bioretention Systems	No	No open spaces
Trees	Yes	A number of existing trees will be retained, plus new landscaped areas are proposed.
Pervious Pavements	Yes	Tanked permeable paving to be provided to parking bays, for the interception of surface water and for water quality purposes.
Attenuation Tanks	Yes	Utilised for attenuation.
Detention Basin	No	No open spaces
Ponds and Wetlands	No	No open spaces
Trapped Drainage	No	A sufficient level of water treatment will be provided through the use of swales and permeable paving.

Table 3.1 SUDS Assessment

3.4 Water quality

3.4.1 Chapter 26 of The SuDS Manual 2015 (CIRIA 753) provides guidance on the methods that should be used to design SuDS to meet the water quality design criteria and good practice design standards. Based on the simple index approach, the pollution hazard indices for different land use classifications are listed in Table 26.2, Chapter 26 of the SuDS Manual. Table 3.2 below summarises the pollution hazard indices that are applicable for this development.

Pollution Hazard Indices for Different Land Use Classifications				
Land Use	**Pollution Hazard Level**	**Total Suspended Solids (TSS)**	**Metals**	**Hydro-carbons**
Other roofs (typically commercial / industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg school, offices) ie <300 traffic movements/day	Low	0.5	0.4	0.4
Source: Table 26.2 of The SuDS Manual				

Table 3.2 Pollution Hazard Indices for Different Land Use Classifications

3.4.2 Surface water run-off from the development will pass through swales and tanked permeable paving for the car park.

3.4.3 Table 26.3 of The SuDS Manual shows the mitigation indices for a range of SuDS components for discharges to surface waters. An extract of this is provided in Table 3.3 below for the components relevant to the proposed development.

Indicative SuDS Mitigation Indices for Discharges to Surface Waters			
Type of SuDS Component	**Mitigation Indices**		
	TSS	**Metals**	**Hydro-carbons**
Swale	0.5	0.6	0.6
Permeable pavement	0.7	0.6	0.7
Source: Table 26.3 of The SuDS Manual			

Table 3.3 Indicative SuDS Mitigation Indices for Discharges to Surface Waters

3.4.4 As set out in The SuDS Manual, where two or more components are utilised, *"a factor of 0.5 is used to account for the reduced performance of the secondary or tertiary components"*. This will therefore need to be considered where multiple SUDS components are proposed.

3.4.5 Based on the information and assessment set out above, the range of proposed SuDS features are considered to provide sufficient water treatment for the development proposals.

3.5 Surface water drainage strategy

3.5.1 Surface water discharge rates will be restricted to minimum viable discharge rates. The proposed drainage strategy will comprise a piped network with attenuation provided in an underground attenuation tank. Tanked permeable paving will be provided to the car park for interception and provide a level of surface water treatment. Further, two swales will be provided for the conveyance of surface water and to provide a level of surface water treatment.

3.5.2 An indicative surface water layout plan is enclosed in **Appendix G.** The drawing shows that surface water attenuation can be accommodated on the site and the method of discharge on the basis that infiltration techniques are not viable. The detailed design parameters of the drainage are described below.

3.6 Surface water drainage design and management

3.6.1 Proposals are to design the surface water drainage system to accommodate storms up to the 1 in 100 year event plus an allowance of 40% for climate change. Table 3.4 below is a copy of Table 2 from the Environment Agency's guidance 'Flood risk assessments: climate change allowances' to support the National Planning Policy Framework, which defines the climate change allowances.

Peak Rainfall Intensity Allowance in Small and Urban Catchments			
Allowance	**'2020s' (2015 to 2039)**	**'2050s' (2040 to 2069)**	**'2080s' (2070 to 2115)**
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%
Source: Environment Agency - 2016			

Table 3.4 Peak Rainfall Intensity Allowance in Small and Urban Catchments

3.7 Existing run-off rates

3.7.1 To reflect the changes in the near surface geology across the site the greenfield run-off rates have been calculated. The method used to calculate the greenfield run off rates is the ICP SUDS and the calculations are presented in **Appendix H.**

3.7.2 The greenfield run off rate, for the application site, is:

Soil type	= 0.172 – obtained from the FEH parameters
SAAR	= 644mm – obtained from the FEH parameters
Urban	= 0.000
Region number	= 5
Proposed drained area	= 0.485 ha
Q_1	= 0.2 l/s
Q_{bar}	= 0.2 l/s
Q_{30}	= 0.6 l/s
Q_{100}	= 0.9 l/s

3.7.3 The Q_{bar} equivalent rate for the proposed development is 0.2 l/s. A restriction of 0.2 l/s could potentially result in a small aperture at the outfall which could increase the risk of blockage. To reduce the risk of blockage, a minimum aperture size of 75mm will be used. As such, surface water will be restricted to a run-off rate of 2.5 l/s.

3.8 Attenuation requirements

3.8.1 Surface water will discharge into the adjacent surface water sewer, via the spur provided, and will be attenuated to the minimum viable run-off rate of 2.5 l/s. To achieve this, surface water will be attenuated via underground geocellular storage in the car parking area of the site to accommodate a 1 in 100 year event plus an allowance of 40% for climate change.

3.8.2 The proposed drained area of the development is 0.485 ha as shown on the plan enclosed in **Appendix I**. Based on the proposed drained area and allowable discharge rate of 2.5 l/s, the storage requirement for the 1 in 100 year plus climate change event has been calculated utilising the following parameters. Full calculations are enclosed in **Appendix J.**

Rainfall profile	= Flood Estimation Handbook
Return period	= 100 year
Durations	= 60 to 10080 minutes
Climate change	= 40%
Drained area	= 0.485 ha
Limiting flow to surface water sewer	= 2.5 l/s
Control	= Vortex flow control
Total storage required	= 400m^3
Void ratio included	= 95%
Depth of attenuation	= 0.5m
Minimum depth of cover	= 1.0m

3.8.3 The indicative surface water drainage layout incorporating the attenuation is shown on the plan enclosed in **Appendix G.**

3.9 Overland flows

3.9.1 Proposals are to design the surface water drainage to accommodate the 1 in 100 year storm event taking into account the predicted future effects of climate. Clearly there is a risk of this storm event being exceeded, albeit this risk is considered very low. In such an event the proposed drainage systems will become overwhelmed and overland flows could occur. Overland flows will be directed to follow the path that overland flows currently follow.

3.9.2 Predicted overland flow routes are shown on the plan enclosed in **Appendix K.**

3.10 Foul water drainage strategy

3.10.1 Foul water will outfall to the adjacent foul water network associated with the surrounding network. A connection will be made off Longford Park Road, via the existing spur provided for the site, as identified in **Appendix E.**

3.10.2 Details of this drainage connection are shown on the plan enclosed in **Appendix G.**

4.0 Maintenance

4.1 Surface water drainage maintenance

4.1.1 The drainage system will be designed to minimise maintenance requirements, however, a full maintenance scheme will be established for those elements not being offered for adoption. The various areas will be maintained as set out in Table 4.1 below.

Maintenance Areas – Surface Water	
Aspect	**Maintainer**
Private Drains	Care home operator / Management Company
SUDS	SUDS Adoption Authority / Management Company
Adopted Sewers	Thames Water

Table 4.1 Maintenance Areas – Surface Water

4.1.2 Additional operation and maintenance details of the various surface water drainage elements are set out below.

4.1.3 Hydrobrake

4.1.3.1 Surface water flows will be restricted via a hydrobrake flow control device.

4.1.3.2 Responsibility for the maintenance of the hydrobrake is with the management company, in line with the manufacturer's specifications.

4.1.4 Swales

4.1.4.1 Swales will be provided for the conveyance of surface water. Operation and maintenance requirements for swales are outlined in Table 4.2 below.

Operation and Maintenance: Swales		
Maintenance schedule	**Required action**	**Typical Frequency**
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surface for ponding, compaction, silt accumulations, record areas where water is ponding for >48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional Maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required
Source: Table 17.1 from Source: The SuDs Manual - 2015		

Table 4.2 Operation and Maintenance: Swales

4.1.5 Pervious pavements

4.1.5.1 Tanked permeable paving will be provided to the car park for interception and to provide a level of surface water treatment. Operation and maintenance requirements for pervious pavements are outlined in Table 4.3 below.

Operation and Maintenance: Pervious Pavements		
Maintenance schedule	**Required action**	**Typical Frequency**
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable area as this areas is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied direct into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which through vegetation maintenance or soil slip, has been raised to within 50mm of the level of 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	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first 6 months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually
Source: Table 20.15 from The SuDs Manual - 2015		

Table 4.3 Operation and Maintenance: Pervious Pavements

4.1.6 Attenuation storage tanks

4.1.6.1 Surface water attenuation will be provided in buried geocellular storage beneath the proposed car park. Operation and maintenance requirements for attenuation storage tanks are outlined in Table 4.4 below.

Operation and Maintenance: Attenuation storage tanks		
Maintenance schedule	**Required action**	**Typical Frequency**
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where is may cause risks to perform)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
Source: Table 21.3 from Source: The SuDs Manual – 2015		

Table 4.4 Operation and Maintenance: Attenuation storage tanks

4.1.7 Sewers

4.1.7.1 Operation and maintenance requirements for sewers are outlined in Table 4.5 below.

Operation and Maintenance: Sewers		
Maintenance schedule	**Required action**	**Typical Frequency**
Regular maintenance	Inspect and identify areas that are not operating correctly. If required take remedial action	Monthly for the first 3 months then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Remove sediment from Hydrobrake	Annually or as required
	Cleaning/jetting of annually, or as required, pipes, rodding eyes and manholes	As required

Table 4.5 Operation and Maintenance: Sewers

4.2 Foul water drainage maintenance

4.2.1 The drainage system will be designed to minimise maintenance requirements, however, a full maintenance scheme will be established for those elements not being offered for adoption. The various areas will be maintained as set out in Table 4.6 below.

Maintenance Areas – Foul Water	
Aspect	**Maintainer**
Private Drains	Care home operator
Adopted Sewers	Thames Water

Table 4.6 Maintenance Areas – Foul Water

5.0 Summary and conclusions

5.1 The proposed development is located at Land at Longford Park Road and Canal Lane, Bodicote. The total site area comprises 0.97ha. The site is bound by residential development to the north, south and west. To the east is Longford Park Road and Longford Primary School. The site is currently agricultural grassland and we are not aware of any previous development on the site. Aerial imagery identifies that construction had not started on the surrounding residential development in 2004, and is partially complete by 2017.

5.2 We are aware that a planning application exists for further mixed-use development planned to take place to the south of the site (Cherwell District Council reference 14/01888/F).

5.3 The proposed development will comprise a 128 bedroom care home.

5.4 JPP Geotechnical & Environmental have completed a Desk Study and infiltration testing on the site. Due to the cohesive soils encountered, there was insufficient infiltration to derive an infiltration rate with no reduction in water levels recorded during the testing. Therefore, infiltration is not considered a viable method to manage surface water drainage for the proposed development.

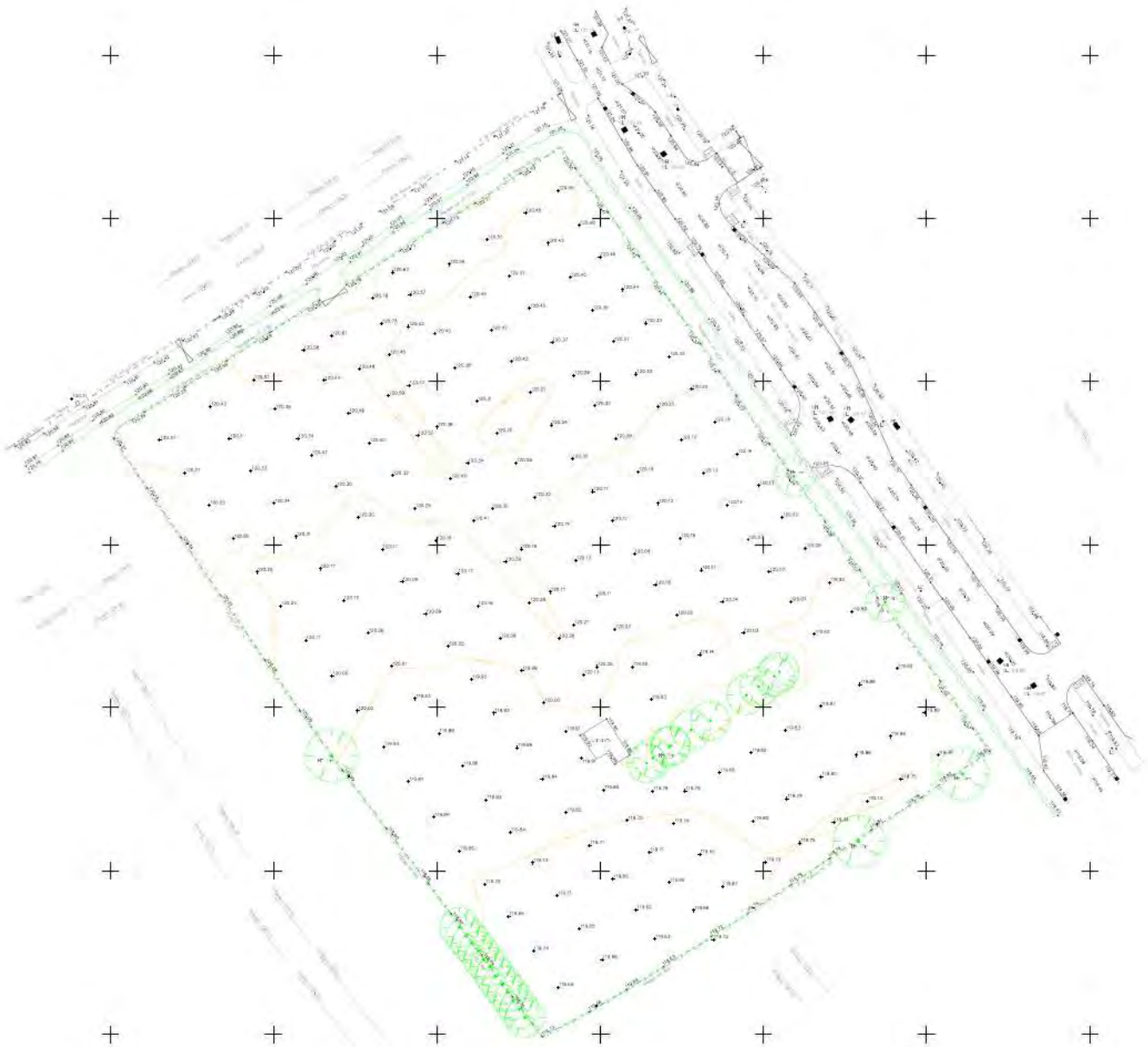
5.5 The proposed surface water drainage strategy will comprise a piped network with attenuation provided in buried geocellular storage, with an outfall to the adjacent sewer network via the existing spur provided, and restricted to the minimum viable discharge rate of 2.5 l/s. Tanked permeable paving will be used for the car for interception purposes and to provide a level of surface water treatment. Further, two swales will be provided for the conveyance of surface water and to provide a level of surface water treatment. A total volume of 400m^3 of attenuation will be provided, sufficient to accommodate storms up to and including the 1 in 100 + 40% climate change event.

5.6 Foul water will outfall to the adjacent foul water network associated with the surrounding network. A connection will be made off Longford Park Road, via the existing spur provided for the site.

Appendix A

Topographical Survey

JPP Surveying drawing no. 25354Y-01



General notes

OSGB and levels have been adopted with OS National GNSS CORS RTK.
All dimensions and levels are in mm unless otherwise stated.
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Survey station information

STATION	EASTING	NORTHING	LEVEL
21	444777.428	289175.609	113.859
22	444752.748	289196.497	121.304

Key

AV	Air Valve	FL	Flood Light	PWR	Post & Rail Fence
Bol	Bollard	FW	Foul Water	PWW	Post & Wire Fence
BH	Borehole	G	Gate	RE	Reading Elec
BL	Bird Level	GV	Gas Valve	RG	Reading Gas
BT	BT Cover	Ht	Height	RP	Rainwater Pipe
CATV	Cable TV Cover	IC	Inspection Chamber	SV	Stop Valve
CBF	Close Boarded Fence	IL	Invert Level	SVP	Soil & Vent Pipe
CLL	Chain Link Fence	MH	Iron Posting	SW	Surface Water
CL	Cover Level	ko	Kerb Outlet	TL	Traffic Light
Col	Column	LC	Lighting column	TP	Telegraph Pole
ED	Elec	MH	Manhole	TW	Top of wall
ER	Earth Rod	MW	Marker Post	UB	Under To Lft
EP	Electricity Pole	OH	Overhead	VP	Vent Pipe
FH	Fire Hydrant	PB	Post Box	WL	Water Level
FL	Floor Level	Po	Post	WM	Water Meter
				wo	Wash Out

Building
Control Water
Tree
Bore Hole
Gate

Bottom of Bank
Top of Bank
Vegetation
Change of surface
Fence
Contours
OH Telecom
OH Electric

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- Infrastructure Design
- Structural Engineering
- Planning Services
- Geotechnical & Environmental
- Surveying
- Professional Advice

Drawn By:	JV	Client:	Meridian Developments
Chkd By:	TB	Project:	Bodiorte
Scale @ A3:	1:100		
Date:	4.2022	Title:	Topographical Survey
Status:	FOR INFORMATION		
Project No.:	2323SY	Drawing No:	01
		Rev:	

jpp

Appendix B

Proposed Site Plan

KWL Architects drawing no. 5196-PL02-A

Revision	Date	Description	Drawn
Rev A	08.11.22	Minor alterations to entrance and delivery bay	ZK

Client: MERCIAN GROUP

Project: CARE HOME DEVELOPMENT AT LONGFORD PARK ROAD, BODICOTE, OX15 4AD

Drawing: PROPOSED SITE PLAN

Scale	Date	Drawn	Checked
1:250 @ A1	01.11.2022	ZK	MP

Job No.	Dwg No.	Revision	Status
5196	PL02	A	PLANNING

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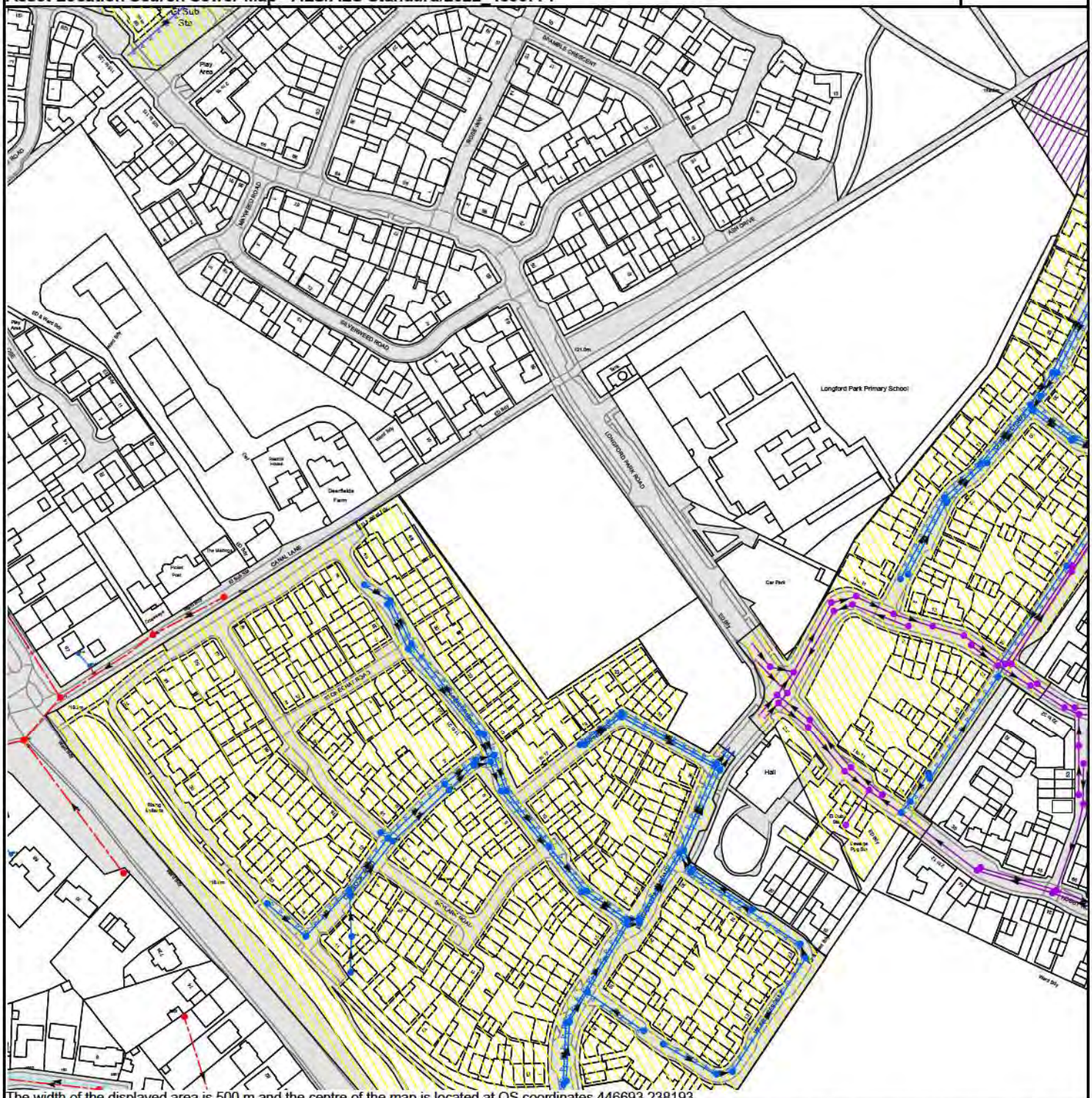
Appendix C
Thames Water Asset Plans

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4696774



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 446693,238193

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
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401A	n/a	n/a
5903	n/a	n/a
691A	n/a	n/a
n/a	n/a	n/a
601D	n/a	n/a
n/a	n/a	n/a
601C	n/a	n/a
n/a	n/a	n/a
4001	n/a	n/a
n/a	n/a	n/a
4102	119.282	116.182
4101	119.454	116.624
411B	n/a	n/a
411A	n/a	n/a
5101	120.324	118.924
5102	120.56	119.68
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
601B	n/a	n/a
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n/a	n/a	n/a
601A	n/a	n/a
n/a	n/a	n/a
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n/a	n/a	n/a
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n/a	n/a	n/a
n/a	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
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n/a	n/a	n/a
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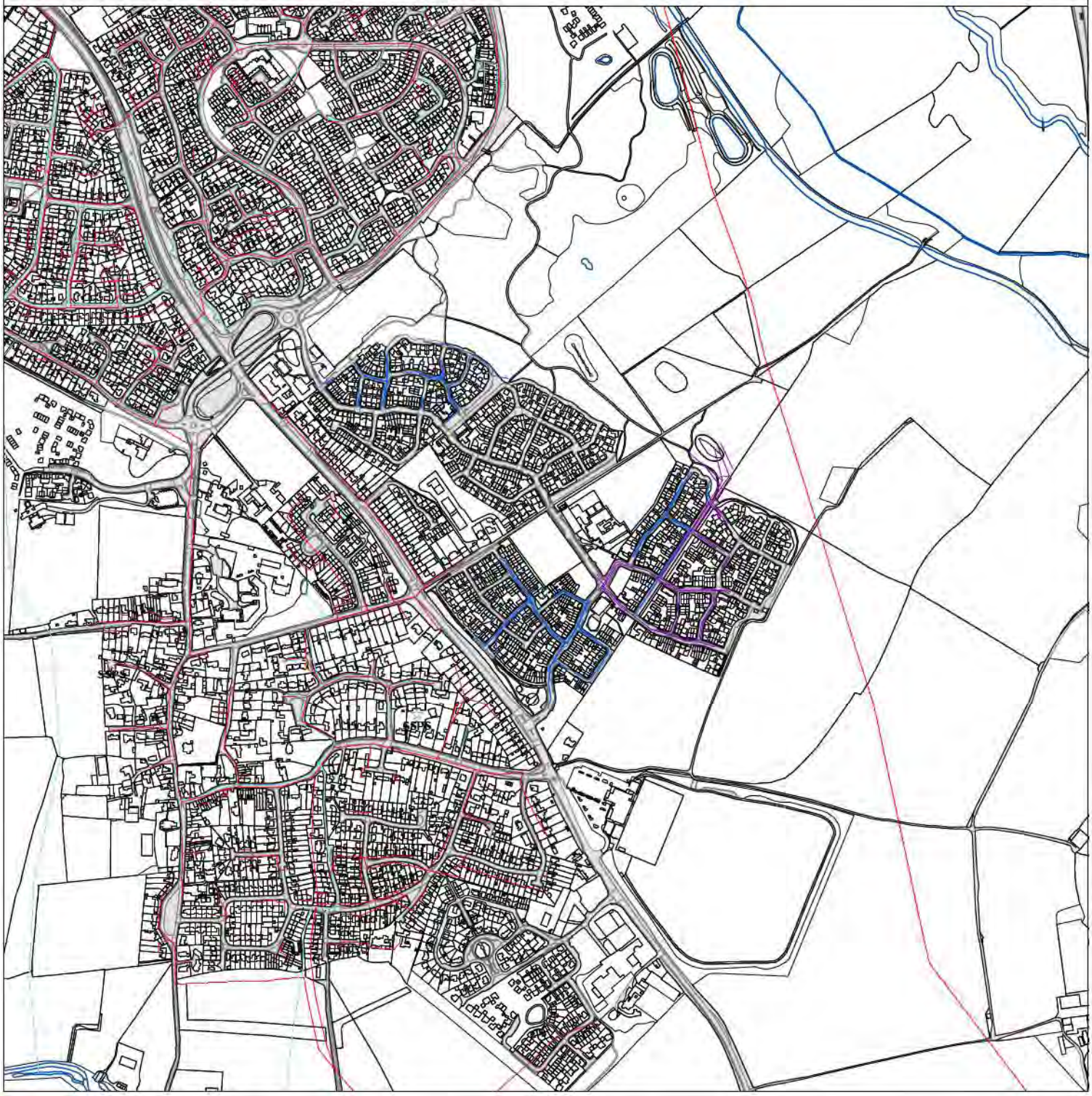
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
4952	116.52	114.65
4901	117.69	115.44
4951	117.69	115.78
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2022_4696774



0 45 90 180 270 360
Meters

Scale:	1:7161
Width:	2000m
Printed By:	Skrishna1
Print Date:	04/08/2022
Map Centre:	446693,238193
Grid Reference:	SP4638SE

Comments:

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

- Inlet
- Outfall
- Undefined End

Other Symbols

Symbols used on maps which do not fall under other general categories.

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement — Ducts may contain high voltage cables. Please check with Thames Water.
- Conduit Bridge
- Subway
- Tunnel

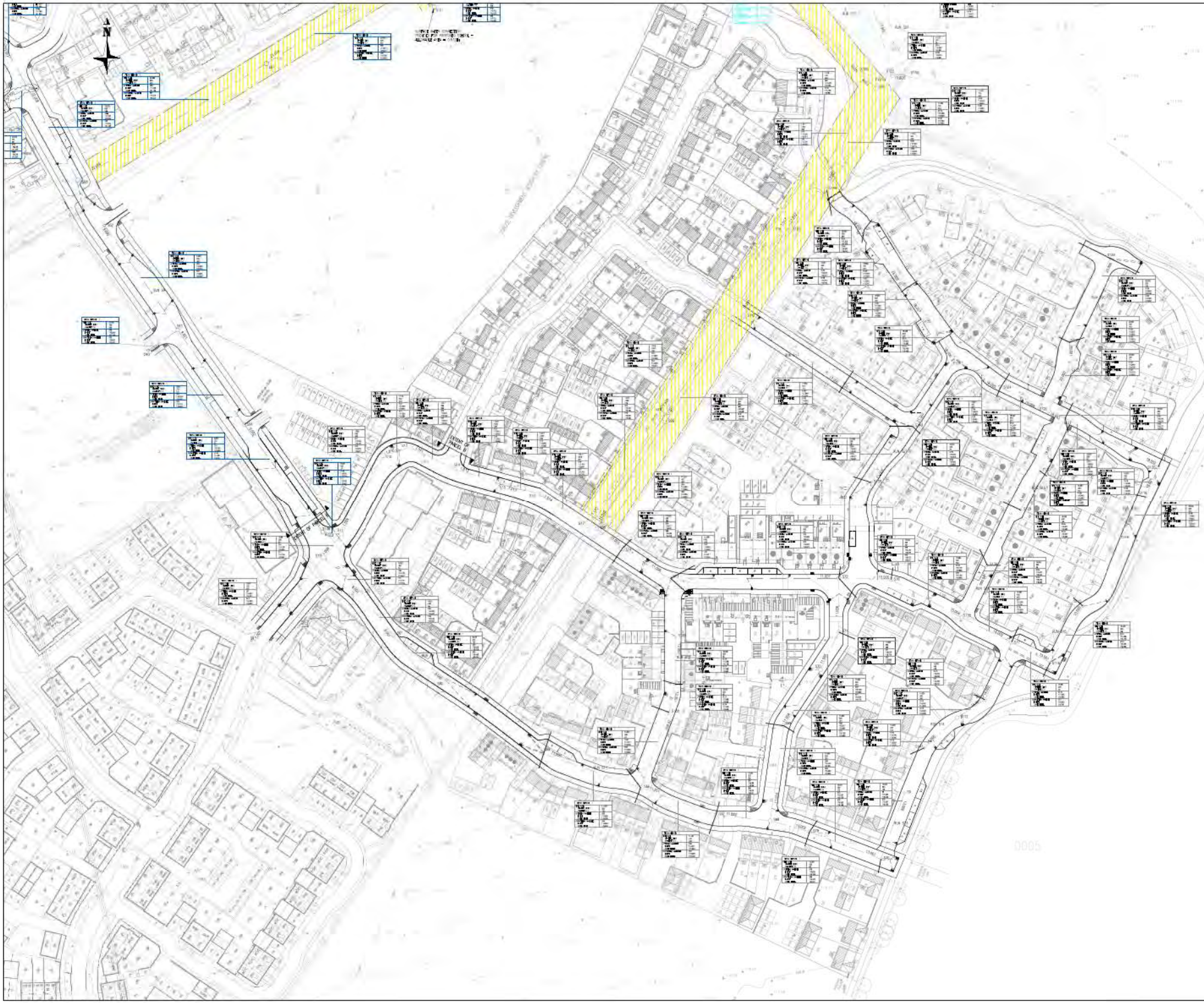
Notes:

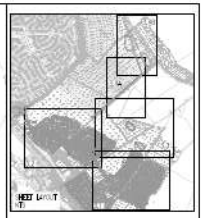
1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement.

If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Appendix D

Adjacent Development: Adoptable Storm Drainage
MEC drawing no. 20488_02_070_3.1





GENERAL NOTES

1. DO NOT SCALE THIS DRAWING
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL THE RELEVANT ENGINEERS, ARCHITECTS AND THE LATEST DESIGN DRAWINGS AND DETAILS.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
4. ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
5. ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH SEWERS FOR ADOPTION 6TH EDITION.
6. THE CONTRACTOR SHALL CHECK ALL LEVELS FOR LIFT AND LEVEL WITH EXISTING BEFORE COMMENCING ANY WORKS. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY IN WRITING SHOULD ANY ERRORS BE FOUND.
7. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE ANY SERVICES AFFECTED BY THE WORKS. THE CONTRACTOR WILL BE HELD LIABLE FOR ANY DAMAGE CAUSED BY ANY FAILURE OF SUCH APPARATUS, HOWEVER CAUSED.
8. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO EXECUTE THE WORKS AT ALL TIMES IN STRICT ACCORDANCE WITH THE HEALTH AND SAFETY AT WORK ACT 1974, AND THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015. THE CONTRACTOR WILL BE DEEMED TO HAVE MADE HIMSELF FULLY AWARE OF AND COMPLIANCE INCLUDING FULL LIAISON WITH THE PLANNING SUPERVISOR, WITHIN THE TENDER.
9. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL WORKS ARE TO THE SATISFACTION OF THE ENGINEER AND SHALL BE DEEMED TO HAVE INCLUDED WITHIN HIS RATES FOR ANY REMEDIAL WORKS.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING ALL EXISTING DRAINAGE SYSTEMS WITHIN THE CONTRACT AREA ARE PROTECTED AND MAINTAINED THROUGHOUT THE DURATION OF THE CONTRACT. ANY DAMAGE CAUSED TO EXISTING DRAINAGE SYSTEMS SHALL BE REPAIRED BY THE CONTRACTOR AT HIS OWN EXPENSE TO THE SATISFACTION OF THE ENGINEER.
11. ALL PRECAST CONCRETE PRODUCTS AND MORTAR SHALL BE MADE USING SULPHATE RESISTING CEMENT.
12. ALL MATERIALS FOR USE IN THE CONTRACT MUST BE AS SPECIFIED.
13. ALL LIFTING EYES IN PRECAST PRODUCTS SHALL BE PAINTED SMOOTH AFTER FITTING.
14. WHERE A CHANGE IN CONTRACT TO AMEND THE DRAWING HAS BEEN AGREED, REFER TO PREVIOUS DRAWING NUMBER 20486_02_070_30

KEY

REV	DESCRIPTION	BY	CHK	DATE
R	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV P ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF P AND R. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
P	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV N ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF P AND R. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
N	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV M ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF N AND O. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
M	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV L ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF M AND N. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
L	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV K ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF L AND M. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
K	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV J ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF K AND L. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
J	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV H ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF J AND K. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
H	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV G ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF H AND J. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
G	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV F ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF G AND H. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
F	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV E ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF F AND G. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
E	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV D ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF E AND F. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
D	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV C ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF D AND E. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
C	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV B ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF C AND D. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
B	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV A ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF B AND C. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
A	LAYOUT REVISED FOLLOWING TP DRAWING. LAYOUT FROM DRAWING NO 20486_02_070_30 REV A ADDED TO DRAWING. SEE SCHEDULE OF CHANGES FOR AMENDMENTS OF A AND B. SOILS AS AGREED AT MEETING 29/07/14. TREES REMOVED AS AGREED AT MEETING 29/07/14.	KA	KM	29.08.14
REV	AMENDMENTS	CHK	CHK	DATE

PROJECT:
LONGFORD PARK
BODICOTE
BANBURY

DRAWING TITLE:
PHASE 2 ADOPTABLE STORM DRAINAGE
GENERAL ARRANGEMENT
SHEET 1 OF 4

CLIENT:
BARRATT HOMES, BOVIS HOMES
TAYLOR WIMPEY

DRAWING NUMBER:
20486_02_070_31

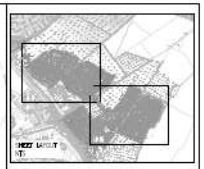
REVISION	SHEET SIZE	SCALE
N	A0	1:500
DRAWN BY	CHECKED BY	DATE
KA	KM	29.08.14

STATUS:
FOR INFORMATION / APPROVAL

M·E·C
Wellington House, Lakeview Park
Clanfield, Oxfordshire OX18 2HP
T 01367 241 700
F 01367 241 701
E info@mec.co.uk
www.mec.co.uk

Appendix E

Adjacent Development: Adoptable Foul Drainage
MEC drawing no. 20488_02_070_13.1



GENERAL NOTES:

1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT CONSULTANTS, ARCHITECTS AND SPECIALIST DESIGN DRAWINGS AND DETAILS.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
4. ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
5. ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION.
6. THE CONTRACTOR SHALL CHECK ALL TIE-INS FOR LEVEL AND LOCATION BOTH BEFORE COMMENCING AND DURING THE EARTHWORKS. SHALL BE NOTIFIED IMMEDIATELY IN WRITING SHOULD ANY DISCREPANCIES BE FOUND.
7. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE ANY SERVICE APPARATUS IN THE VICINITY OF THE WORKS. THE CLIENT WILL NOT BE LIABLE (WHETHER IN RESPECT OF ANY LOSS OR DAMAGE CAUSED) IN RESPECT OF SUCH APPARATUS HOWEVER CAUSED.
8. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THE WORKS AT ALL TIMES IS STRICTLY ACCORDANCE WITH THE REQUIREMENTS OF THE HEALTH AND SAFETY AT WORK ACT 1974 AND THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015. THE CONTRACTOR SHALL BE DEEMED TO HAVE ALLOWED FOR FULL COMPLIANCE IN FULL WITH THE PLANNING SUPERVISOR, WITHOUT NOTICE.
9. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL WORKS MEET THE REQUIREMENTS OF THE ENGINEER AND SHALL BE DEEMED TO HAVE FULLY ALLOWED WITHIN HIS RATES FOR ANY NEEDED RE-TESTING.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL NECESSARY EQUIPMENT AND TRAINED OPERATIVES FOR THE WORKS IN A SATISFACTORY MANNER AND SHALL BE DEEMED TO HAVE ALLOWED FOR THE SAME WITHIN HIS RATES.
11. ALL CLOSED CONCRETE PRODUCTS AND MORTAR SHALL BE MADE USING SULPHATE RESISTING CEMENT.
12. ALL MATERIALS FOR USE IN THE CONTRACT MUST BE APPROVED.
13. ALL UPVC PIPES IN ROAD CONSTRUCTION SHALL BE TESTED TO 30 KPA (4 PSI).
14. WHERE A REVISION COMMENTS THAT THE DRAWING HAS BEEN RENUMBERED REFER TO PREVIOUS DRAWING NUMBER 20488_02_070_13.1.

KEY:

- PROPOSED ADOPTABLE FOUL WATER SEWER
- PRIVATE LATERAL CONNECTION TO ADOPTABLE FOUL DRAINAGE SYSTEM TO BE SUBJECT TO SEPARATE AGREEMENT
- CONSTRUCTED ADOPTABLE FOUL WATER

REV	AMENDMENTS	DRWN	CHKD	DATE
H	LATEST PROPOSALS ADDED TO DRAWING & ADDITIONAL DRAINAGE DESIGN ADDED TO DRAWING. SEE DRAWING CLOUDS FOR AMENDMENTS. PRE PLANNING COMMENTS ADDED. ROAD WIDENING, SPLAY AND CURVES HAVE BEEN REMOVED.	JF	KA	28.08.15
G	LATEST PROPOSALS ADDED TO DRAWING & ADDITIONAL DRAINAGE DESIGN ADDED TO DRAWING. SEE DRAWING CLOUDS FOR AMENDMENTS. PRE PLANNING COMMENTS ADDED.	JF	KA	18.08.15
F	REVISED DRAINAGE LAYOUT	JF	KA	13.08.15
E	POND EMBANKMENT TO BE REMOVED & SECTION DRAWING ADDED TO DRAWING	KA	CF	10.08.15
D	REVISED DRAINAGE LAYOUT & DRAINAGE DESIGN ADDED TO DRAWING	KA	CF	30.07.15
C	POND EMBANKMENT WIDENED	KA	CF	30.07.15
B	POND EMBANKMENT REMOVED & ADDITIONAL AREA TO CLOSED AREA	KA	CF	30.07.15
A	POND EMBANKMENT WIDENED & ADDITIONAL AREA TO CLOSED AREA	KA	CF	30.07.15

LONGFORD PARK
BODICOTE
BANBURY

PHASE 2 ADOPTABLE FOUL DRAINAGE GENERAL ARRANGEMENT SHEET 1 OF 2

BARRATT HOMES, BOVIS HOMES AND TAYLOR WIMPEY

20488_02_070_13.1

DRAWN BY	PAPER SIZE	SCALE
H	A0	1:500
CG	KA	15.01.15

STATUS: TENDER

M·E·C

Appendix F

Extract of Infiltration Results
JPP G& Letter ref. L-24934-01-00

Our Ref: 24934/MC/AP/L01

Your Ref:

Date: 31st August 2022

JPP Geotechnical & Environmental Ltd
4 Ironstone Way | Brixworth
Northampton | NN6 9UD

T: 01604 781811
E: northampton@jppuk.net
W:jppuk.net

Mercian Group
Unit 4
The Triangle
Wildwood Drive
Worcester
WR5 2QX

Dear Mr Brittain,

Re: Infiltration Testing for proposed drainage solution on the land off Longford Park Road, Bodicote Banbury

Introduction

The following provides a summary of infiltration testing carried out on the 18th August 2022. Our investigation was limited to infiltration testing to inform stormwater drainage solutions for the proposed development at land off Longford Park Road, Bodicote, Banbury.

This letter report has been produced for the sole benefit of our client, Mercian Group. JPP do not accept any liability for the third-party use of the information herein without prior reliance agreed. This report is valid for 6 years from the date of issue.

Investigations have been carried out using reasonable care and judgement based on the scope. There is a potential for ground conditions to vary from those encountered during our investigations and differ where not exposed by our investigations.

The scope of this letter covers infiltration testing only to inform drainage options for the proposed development.

Site description

The site is located to the west of Longford Park Road, Bodicote, Banbury and is centred at an approximate grid reference of 446695, 238194. The site is a rectangular grassed paddock with a row of mature trees in the south of the site with boundary hedgerows and vegetation. It is proposed to construct a care home development with associated infrastructure and access.

The site is relatively flat and slopes gently from approximately 120.5m Above Ordnance Datum (m AOD) in the northeast of the down to approximately 119.75mAOD in the south.

Fieldwork

Four trial pits were excavated across the site using a 3 tonne excavator with subsequent infiltration testing carried out within each trial pit. The bedrock deposits prevent significant depth being excavated with the excavator, a maximum penetration of between 1.10m and 1.50m below ground level (m bgl) was achieved.

The infiltration testing was carried out on the 18th August 2022 in general accordance with BRE 365 'Soakaway Design' guidance.

Statutory undertaker's service records were obtained prior to works commencing and were referred to during the site investigation in order to avoid any buried services that may cross the site. Each position was scanned using a cable avoidance tool with the use of a signal generator prior to positioning and proceeding.

The approximate trial pit positions are shown on the topographical survey and proposed site plan (Drawings 01 and 02). Trial pit logs and infiltration test records are also enclosed.

Geology and ground conditions encountered

According to the British Geological Survey (BGS) mapping, there are no superficial deposits on the site. The bedrock geology is of the Whitby Mudstone Formation overlying the Marlstone Rock Formation.

Topsoil was encountered in all trial pits up to a maximum depth of 0.30m below ground level (m bgl) generally comprising a brown, slightly gravelly, slightly sandy clayey topsoil with rootlets and gravels of fine to medium subangular to subrounded ironstone and sandstone with brick fragments found in TP01 and TP02.

The Marlstone Rock Formation was present underlying the topsoil up to a maximum excavated depth of 1.50m bgl and was generally firm to stiff, orange/brown, gravelly, slightly sandy clay with occasional cobbles and gravels consisting of fine to coarse subangular to subrounded ironstone and sandstone.

No groundwater was encountered during the investigation.

Infiltration testing

Infiltration testing was carried out in general accordance with BRE 365 'Soakaway Design', with the results summarised in Table 1. The test records are also enclosed with this letter.

Trial pit position	Cycle	Base depth of trial pit	Testing result
TP01	1	1.10m bgl	Insufficient infiltration to derive a permeability rate.
TP02	1	1.30m bgl	Insufficient infiltration to derive a permeability rate.
TP03	1	1.45m bgl	Insufficient infiltration to derive a permeability rate.
TP04	1	1.50m bgl	Insufficient infiltration to derive a permeability rate.

Table 1

Infiltration testing was carried out in the four trial pit positions across the site up to a maximum depth of 1.50m depth bgl. Due to the cohesive soils encountered there was insufficient infiltration to derive an infiltration rate with no reduction in water levels recorded during the testing. Therefore, the soils can be considered as impermeable.

Assessment and Summary

The infiltration testing we have carried out has indicated that the soils underlying the entire site are not suitable for soakaways proposed on site.

We therefore consider soakaways as unviable for the site surface drainage and an alternative method of drainage should be considered.

Yours sincerely,

[redacted]

Mitch Coldwell BSc (Hons)
Graduate Geo-Environmental Engineer

[redacted]

Anthony Paton BSc (Hons) MSc FGS
Associate

Enclosed
Investigation position plans
Trial pit records
Photographic records of trial pits
Soakaway test records

Base drawing:

Topographical Survey produced by JPP Surveying, drawing number: 25354Y, dated 04/08/22

KEY

TP — Machine excavated trial pit with infiltration testing

Site Boundary

Northampton
T: 01604 781811

Warwick
T: 02476 100530

Milton Keynes
T: 01908 889433

E: mail@jppuk.net
W: jppuk.net

- Infrastructure Design
- Structural Engineering
- Planning Services
- Geotechnical & Environmental
- Surveying
- Professional Advice

Drawn By:	DM
Chkd By:	LC
Scale @A3:	500:1
Date:	August 2022
Status:	FOR INFORMATION
Project No.:	24934

Client Mrecian Developments

Project Bodicote, Banbury

Title Investigation Positions over Topographical Survey

Drawing No: 01 Rev: 0

Base drawing:

Proposed Site Layout produced by KWL Architects, drawing number: SK01 REV H, dated 23.08.2021

KEY

TP — Machine excavated trial pit with infiltration testing

Site Boundary

Northampton
T: 01604 781811

Warwick
T: 02476 100530

Milton Keynes
T: 01908 889433

E: mail@jppuk.net
W: jppuk.net

- Infrastructure Design
- Structural Engineering
- Planning Services
- Geotechnical & Environmental
- Surveying
- Professional Advice

Drawn By:	DM
Chkd By:	LC
Scale @A3:	500:1
Date:	August 2022
Status:	FOR INFORMATION
Project No.:	24934

Client Mrecian Developments

Project Bodicote, Banbury

Title Investigation Positions over Proposed Layout

Drawing No: 02 Rev: 0

jpp

Trial Pit Log

Project Name: Proposed Care Home Development		Client: The Mercian Group	Date: 18/08/2022
Location: Bodicote, Banbury		Contractor: Maddock Geotechnical Support	
Project No. : 24934		Crew Name:	Equipment: 3T Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP01	TP		MC	1:10	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Brown slightly sandy slightly gravelly clayey TOPSOIL with rootlets. Gravel consists of fine to medium subangular to subrounded rare brick gravels, glass, sandstone and flint.
					0.25			Firm to stiff dark brown orange slightly sandy slightly gravelly CLAY. Gravel consists of fine to medium subangular to subrounded sandstone and ironstone. (MARLSTONE ROCK FORMATION)
					1.10			End of Trial Pit at 1.100m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
2.30	0.50						

Remarks

No groundwater enountered. Trial pit refused due to rock present.

Trial Pit Log

Project Name: Proposed Care Home Development	Client: The Mercian Group	Date: 18/08/2022
Location: Bodicote, Banbury	Contractor: Maddock Geotechnical Support	
Project No. : 24934	Crew Name:	Equipment: 3T Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP02	TP		MC	1:10	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Dark brown black slightly sandy slightly gravelly clayey TOPSOIL with rootlets. Gravel consists of fine to coarse subangular to subrounded sandstone and ironstone.
					0.30			Stiff dark orange brown slightly sandy slightly gravelly CLAY. Gravel consists of fine to coarse subangular to subrounded sandstone and ironstone. (MARLSTONE ROCK FORMATION)
					1.30			End of Trial Pit at 1.300m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
2.30	0.50						

Remarks

No groundwater enountered. Trial pit refused due to rock present.

Trial Pit Log

Project Name: Proposed Care Home Development	Client: The Mercian Group	Date: 18/08/2022
Location: Bodicote, Banbury	Contractor: Maddock Geotechnical Support	
Project No. : 24934	Crew Name:	Equipment: 3T Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP03	TP		MC	1:10	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Dark orangey brown slightly sandy slightly gravelly clayey TOPSOIL with rootlets. Gravel consists of fine to coarse subangular to subrounded brick, sandstone and ironstone.
					0.30			Firm to stiff dark brown orange slightly sandy very gravelly CLAY with occasional cobbles up to 5%. Gravel and cobbles consists of fine to medium subangular to subrounded sandstone and ironstone. (MARLSTONE ROCK FORMATION)
					1.45			End of Trial Pit at 1.450m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
2.40	0.50						

Remarks

No groundwater enountered. Trial pit refused due to rock present.

Trial Pit Log

Project Name: Proposed Care Home Development		Client: The Mercian Group	Date: 18/08/2022
Location: Bodicote, Banbury		Contractor: Maddock Geotechnical Support	
Project No. : 24934		Crew Name:	Equipment: 3T Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP04	TP			1:10	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								Dark orange brown sandy slightly gravelly clayey TOPSOIL with rootlets. Gravel consists of fine to medium subangular to subrounded ironstone and sandstone.
					0.30			Firm to stiff dark orange brown slightly sandy very gravelly CLAY with some cobbles up to 20%. Gravel and cobbles consists of fine to medium subangular to subrounded ironstone. (MARLSTONE ROCK FORMATION)
					1.50			End of Trial Pit at 1.500m

1

2

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
2.30	0.50						

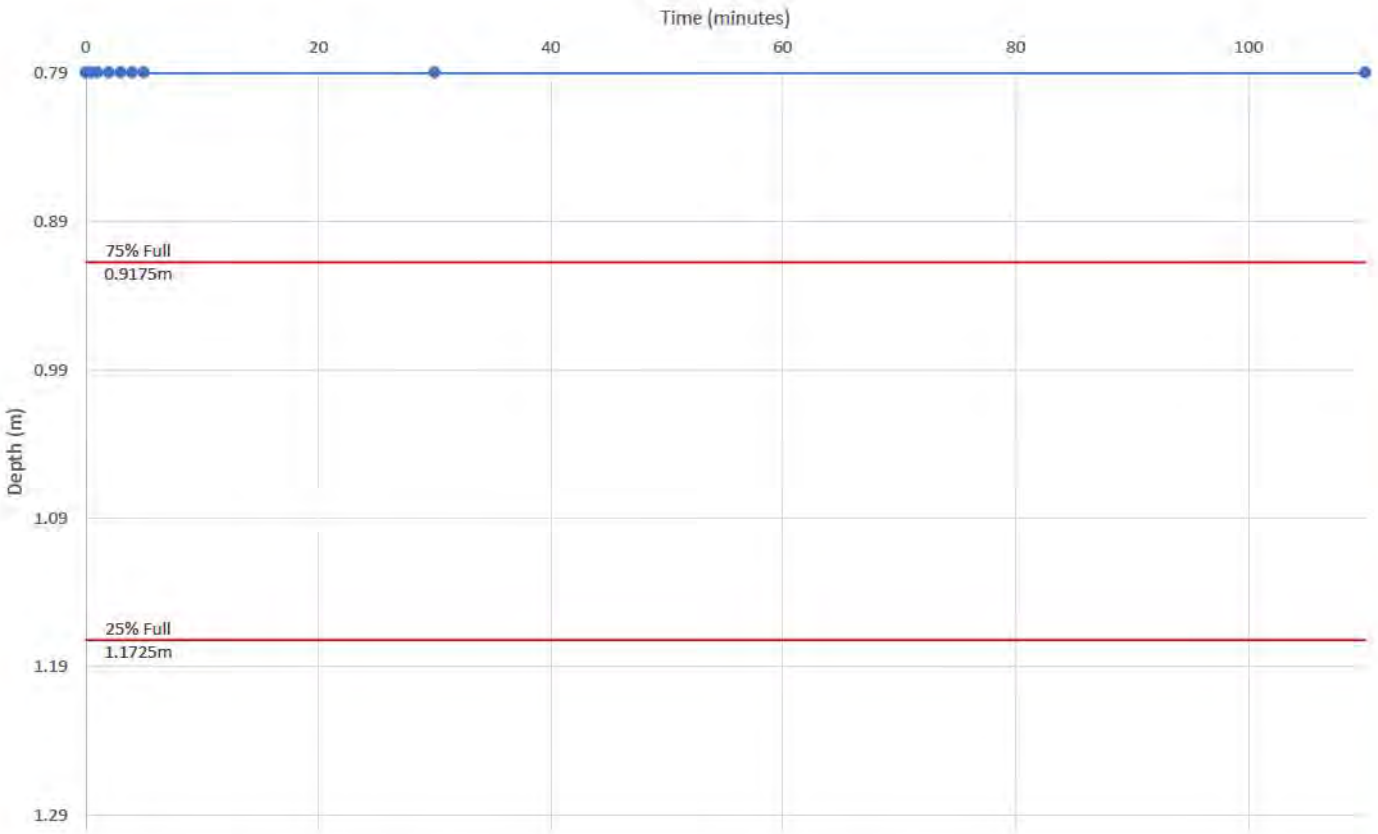
Remarks

No groundwater enountered. Trial pit refused due to rock present.

Soakaway Test TP02 Cycle 1

Project: Bodicote, Banbury
Project Ref: 24934
Date: 19 August 2022
Revision:

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net



Trial pit width = 0.5m
Trial pit length = 2.3m
Trial pit depth = 1.3m

$$\text{Soil infiltration rate } f = \frac{V_{p75\text{-}25}}{a_{s50} \times t_{p75\text{-}25}}$$

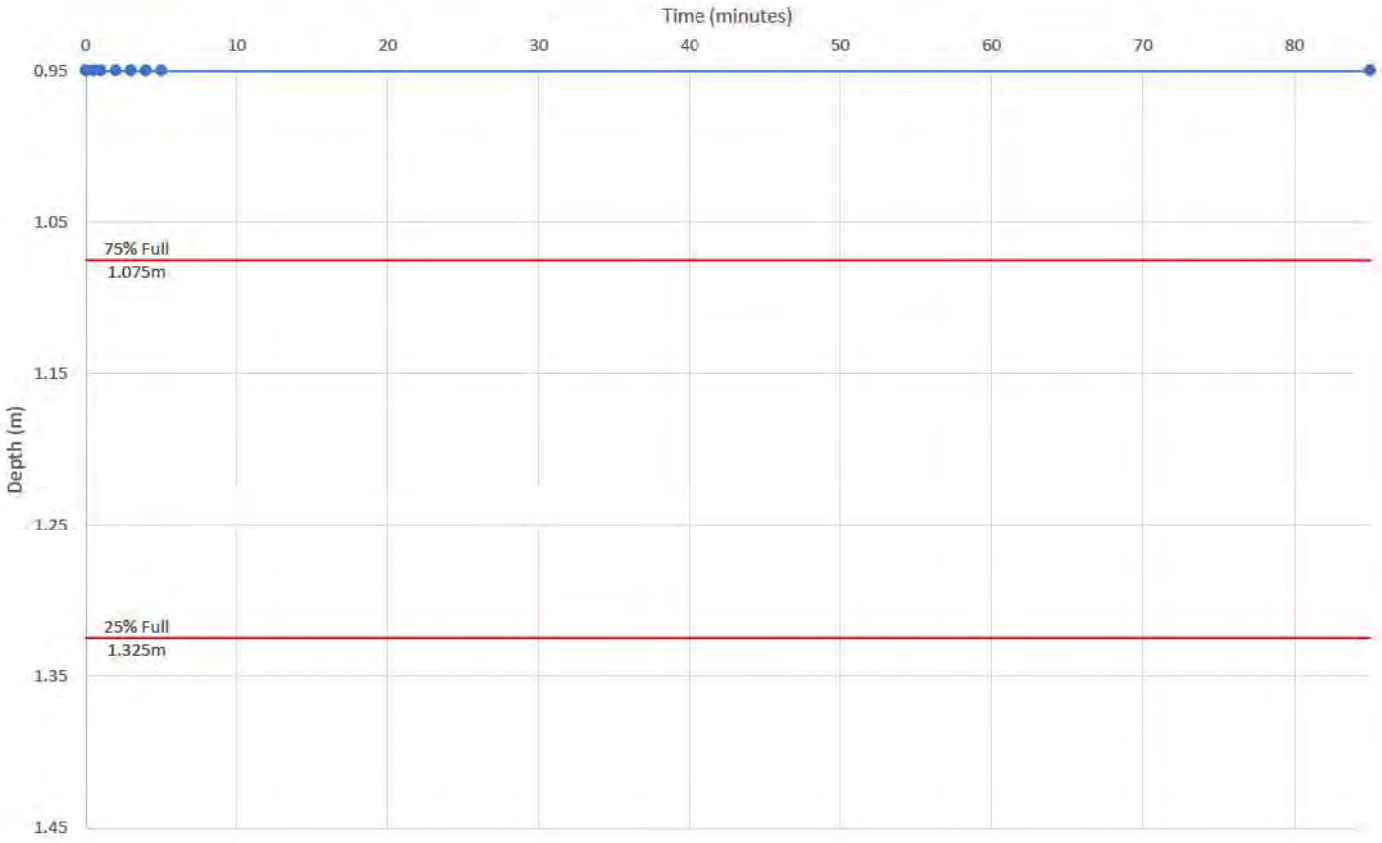
Insufficient infiltration to derive a rate

$V_{p75\text{-}25}$: the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth
a_{s50}: the internal surface area of the soakage trial pit up to 50% effective storage depth and including base area
$t_{p75\text{-}25}$: the time for the water level to fall from 75% to 25% effective storage depth

Soakaway Test TP03 Cycle 1

Project: Bodicote, Banbury
Project Ref: 24934
Date: 19 August 2022
Revision:

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net



Trial pit width = 0.5m
Trial pit length = 2.4m
Trial pit depth = 1.45m

Soil infiltration rate f = $\dfrac{V_{p75\text{-}25}}{a_{s50} \times t_{p75\text{-}25}}$

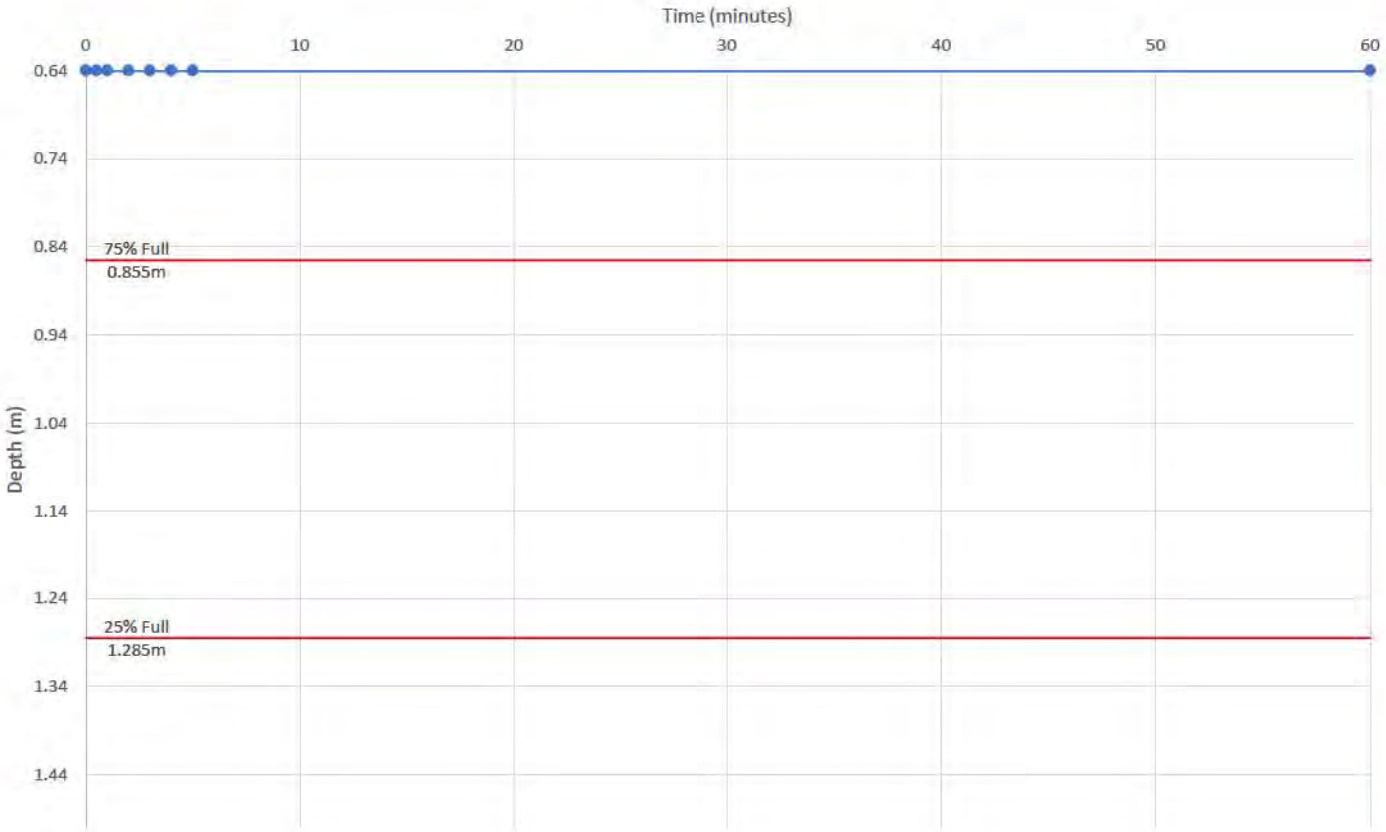
Insufficient infiltration to derive a rate

$V_{p75\text{-}25}$: the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth
a_{s50}: the internal surface area of the soakage trial pit up to 50% effective storage depth and including base area
$t_{p75\text{-}25}$: the time for the water level to fall from 75% to 25% effective storage depth

Soakaway Test TP04 Cycle 1

Project: Bodicote, Banbury
Project Ref: 24934
Date: 19 August 2022
Revision:

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net



Trial pit width = 0.5m
Trial pit length = 2.3m
Trial pit depth = 1.5m

$$\text{Soil infiltration rate } f = \frac{V_{p75\text{-}25}}{a_{s50} \times t_{p75\text{-}25}}$$

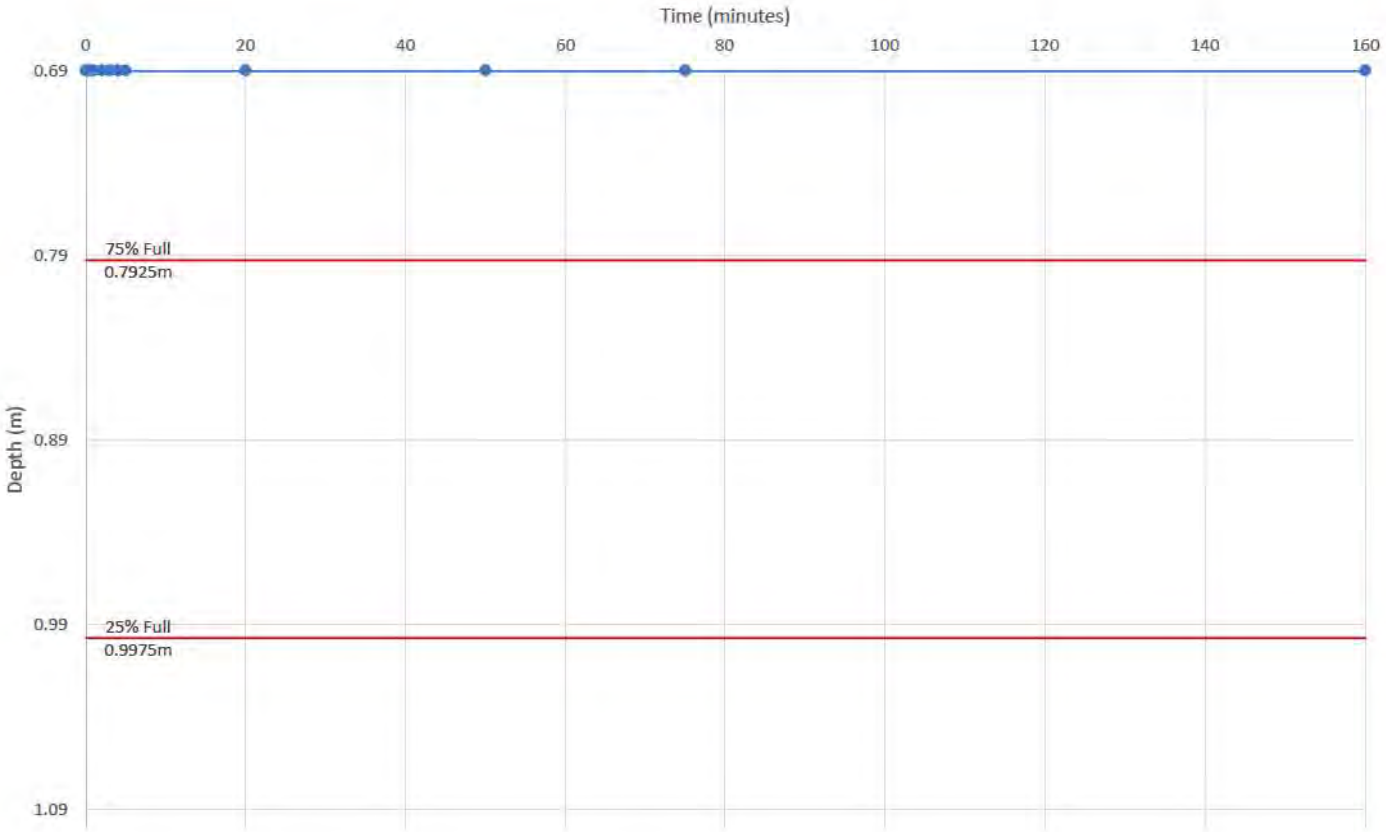
Insufficient infiltration to derive a rate

$V_{p75\text{-}25}$: the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth
a_{s50}: the internal surface area of the soakage trial pit up to 50% effective storage depth and including base area
$t_{p75\text{-}25}$: the time for the water level to fall from 75% to 25% effective storage depth

Soakaway Test TP01 Cycle 1

Project: Bodicote, Banbury
Project Ref: 24934
Date: 19 August 2022
Revision:

T: 01604 781811
E: mail@jppuk.net
W: www.jppuk.net



Trial pit width = 0.5m
Trial pit length = 2.3m
Trial pit depth = 1.1m

$$\text{Soil infiltration rate } f = \frac{V_{p75\text{-}25}}{a_{s50} \times t_{p75\text{-}25}}$$

Insufficient infiltration to derive a rate

$V_{p75\text{-}25}$: the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth
a_{s50}: the internal surface area of the soakage trial pit up to 50% effective storage depth and including base area
$t_{p75\text{-}25}$: the time for the water level to fall from 75% to 25% effective storage depth

Appendix G

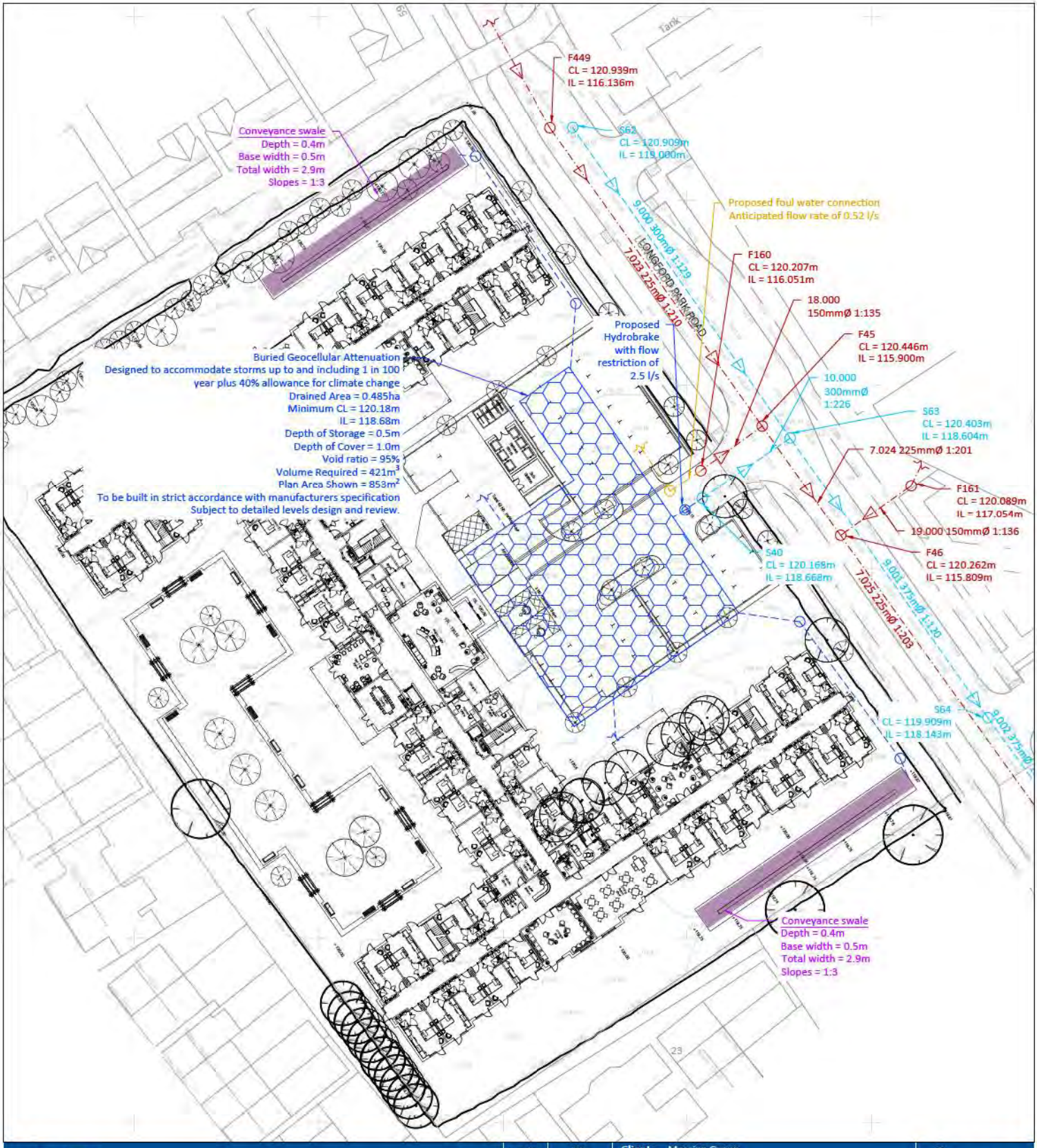
Proposed Drainage Strategy
JPP Consulting drawing no. 24918-FRA03

NOTES

1. Based on Topographical Survey by JPP Surveying, drawing number 25354Y_01 dated August 2022.
2. Based on DWG File by KWL Architects drawing number 'Issued 21.10.22 - 5196 - SK01R - Proposed Site Plan' including Site Layout and OS Mapping.

KEY

- Existing Surface Water Drainage
- Existing Foul Water Drainage
- Proposed Surface Water Drainage
- Proposed Foul Water Drainage
- Proposed Surface Water Attenuation
- Proposed Swale



Northampton T: 01604 781811
Warwick T: 02476 100530
Milton Keynes T: 01908 889433
Poole T: 01202 540888
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W: jppuk.net

Infrastructure Design • Geotechnical & Environmental
Structural Engineering • Surveying
Development Planning • Professional Advice

Drawn By:	ECD
Chkd By:	KER
Scale @A3:	1:500
Date:	26/10/2022
Status:	FOR PLANNING
Project No.:	24918

Client: Mercian Group

Project: Proposed Care Home, Land South of Canal Lane, Bodicote, Banbury

Title: Proposed Drainage Strategy

Drawing No: FRA03 Revision: -

jpp

Appendix H
Greenfield Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.172
Area (ha)	0.485	Urban	0.000
SAAR (mm)	644	Region Number	Region 5

Results l/s

QBAR Rural	0.2
QBAR Urban	0.2
Q100 years	0.9
Q1 year	0.2
Q30 years	0.6
Q100 years	0.9

Appendix I

Proposed Drained Area

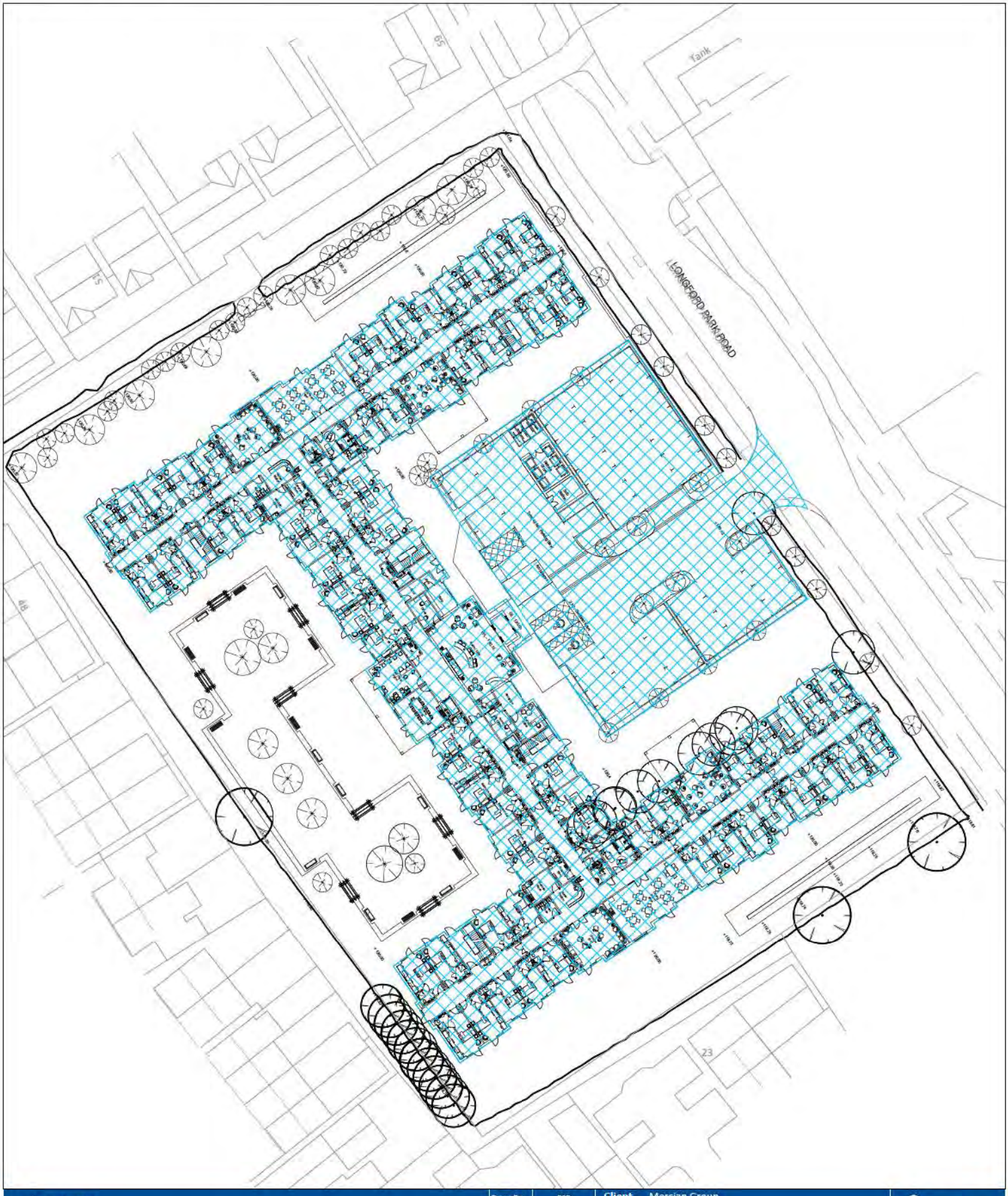
JPP Consulting drawing no. 24918-FRA02

NOTES

1. Based on Topographical Survey by JPP Surveying, drawing number 25354Y_01 dated August 2022.
2. Based on DWG File by KWL Architects drawing number 'Issued 21.10.22 - 5196 - SK01R - Proposed Site Plan' including Site Layout and OS Mapping.

KEY

Proposed Drained Area = 4,850m²



Northampton T: 01604 781811
Warwick T: 02476 100530
Milton Keynes T: 01908 889433
Poole T: 01202 540888
E: mail@jppuk.net
W: jppuk.net

- Infrastructure Design
- Geotechnical & Environmental
- Structural Engineering
- Surveying
- Development Planning
- Professional Advice

Drawn By:	ECD
Chkd By:	KER
Scale @A3:	1:500
Date:	26/10/2022
Status:	FOR PLANNING
Project No.:	24918

Client: Mercian Group

Project: Proposed Care Home, Land South of Canal Lane, Bodicote, Banbury

Title: Proposed Drained Area

Drawing No: FRA02 Revision: -

jpp

Appendix J
Attenuation Calculations

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1338 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	98.231	0.231	0.0	2.5	2.5	184.5	O K
30 min Summer	98.267	0.267	0.0	2.5	2.5	212.7	O K
60 min Summer	98.306	0.306	0.0	2.5	2.5	244.0	O K
120 min Summer	98.348	0.348	0.0	2.5	2.5	277.6	O K
180 min Summer	98.373	0.373	0.0	2.5	2.5	297.5	O K
240 min Summer	98.390	0.390	0.0	2.5	2.5	311.1	O K
360 min Summer	98.412	0.412	0.0	2.5	2.5	328.7	O K
480 min Summer	98.425	0.425	0.0	2.5	2.5	339.0	O K
600 min Summer	98.432	0.432	0.0	2.5	2.5	345.0	O K
720 min Summer	98.436	0.436	0.0	2.5	2.5	348.2	O K
960 min Summer	98.433	0.433	0.0	2.5	2.5	345.4	O K
1440 min Summer	98.419	0.419	0.0	2.5	2.5	334.4	O K
2160 min Summer	98.398	0.398	0.0	2.5	2.5	317.9	O K
2880 min Summer	98.377	0.377	0.0	2.5	2.5	300.9	O K
4320 min Summer	98.330	0.330	0.0	2.5	2.5	263.1	O K
5760 min Summer	98.288	0.288	0.0	2.5	2.5	229.9	O K
7200 min Summer	98.252	0.252	0.0	2.5	2.5	201.1	O K
8640 min Summer	98.222	0.222	0.0	2.4	2.4	176.8	O K
10080 min Summer	98.196	0.196	0.0	2.4	2.4	156.0	O K
15 min Winter	98.259	0.259	0.0	2.5	2.5	206.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	204.756	0.0	156.3	19
30 min Summer	118.649	0.0	176.9	34
60 min Summer	68.753	0.0	236.9	64
120 min Summer	39.840	0.0	274.0	124
180 min Summer	28.953	0.0	297.7	182
240 min Summer	23.086	0.0	315.2	242
360 min Summer	16.777	0.0	340.2	362
480 min Summer	13.377	0.0	357.0	482
600 min Summer	11.222	0.0	368.3	602
720 min Summer	9.722	0.0	374.9	720
960 min Summer	7.683	0.0	376.9	960
1440 min Summer	5.514	0.0	364.7	1180
2160 min Summer	3.957	0.0	507.9	1536
2880 min Summer	3.127	0.0	533.4	1936
4320 min Summer	2.219	0.0	560.1	2728
5760 min Summer	1.739	0.0	603.8	3520
7200 min Summer	1.440	0.0	624.2	4256
8640 min Summer	1.234	0.0	640.5	5016
10080 min Summer	1.083	0.0	652.5	5744
15 min Winter	204.756	0.0	172.4	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	98.299	0.299	0.0	2.5	2.5	238.5	O K
60 min Winter	98.343	0.343	0.0	2.5	2.5	273.7	O K
120 min Winter	98.391	0.391	0.0	2.5	2.5	312.1	O K
180 min Winter	98.420	0.420	0.0	2.5	2.5	335.0	O K
240 min Winter	98.440	0.440	0.0	2.5	2.5	350.9	O K
360 min Winter	98.466	0.466	0.0	2.5	2.5	371.9	O K
480 min Winter	98.482	0.482	0.0	2.5	2.5	384.9	O K
600 min Winter	98.493	0.493	0.0	2.5	2.5	393.2	O K
720 min Winter	98.499	0.499	0.0	2.5	2.5	398.4	O K
960 min Winter	98.499	0.499	0.0	2.5	2.5	398.5	O K
1440 min Winter	98.485	0.485	0.0	2.5	2.5	386.7	O K
2160 min Winter	98.455	0.455	0.0	2.5	2.5	362.8	O K
2880 min Winter	98.425	0.425	0.0	2.5	2.5	339.0	O K
4320 min Winter	98.356	0.356	0.0	2.5	2.5	284.3	O K
5760 min Winter	98.295	0.295	0.0	2.5	2.5	235.5	O K
7200 min Winter	98.243	0.243	0.0	2.5	2.5	194.3	O K
8640 min Winter	98.201	0.201	0.0	2.4	2.4	160.7	O K
10080 min Winter	98.168	0.168	0.0	2.3	2.3	133.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	118.649	0.0	191.3	33
60 min Winter	68.753	0.0	265.1	64
120 min Winter	39.840	0.0	305.8	122
180 min Winter	28.953	0.0	331.2	180
240 min Winter	23.086	0.0	349.4	240
360 min Winter	16.777	0.0	373.3	356
480 min Winter	13.377	0.0	386.0	472
600 min Winter	11.222	0.0	390.9	590
720 min Winter	9.722	0.0	390.8	702
960 min Winter	7.683	0.0	385.6	926
1440 min Winter	5.514	0.0	370.5	1354
2160 min Winter	3.957	0.0	568.0	1668
2880 min Winter	3.127	0.0	595.8	2132
4320 min Winter	2.219	0.0	622.2	2984
5760 min Winter	1.739	0.0	676.5	3800
7200 min Winter	1.440	0.0	699.6	4544
8640 min Winter	1.234	0.0	718.2	5272
10080 min Winter	1.083	0.0	732.3	5952

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	398650 294100 SO 98650 94100
C (1km)	-0.032
D1 (1km)	0.360
D2 (1km)	0.329
D3 (1km)	0.301
E (1km)	0.320
F (1km)	2.422
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.485

Time (mins) From:	To:	Area (ha)
0	4	0.485

Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	840.0	0.0	0.501	0.0	0.0
0.500	840.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0075-2500-1000-2500
Design Head (m)	1.000
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	98.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.5
Flush-Flo™	0.307	2.5
Kick-Flo®	0.627	2.0
Mean Flow over Head Range	-	2.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.1	1.200	2.7	3.000	4.1	7.000	6.2
0.200	2.4	1.400	2.9	3.500	4.5	7.500	6.4
0.300	2.5	1.600	3.1	4.000	4.7	8.000	6.6
0.400	2.5	1.800	3.3	4.500	5.0	8.500	6.8
0.500	2.4	2.000	3.4	5.000	5.3	9.000	7.0
0.600	2.1	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.3	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	6.0		

Appendix K

Overland Flows

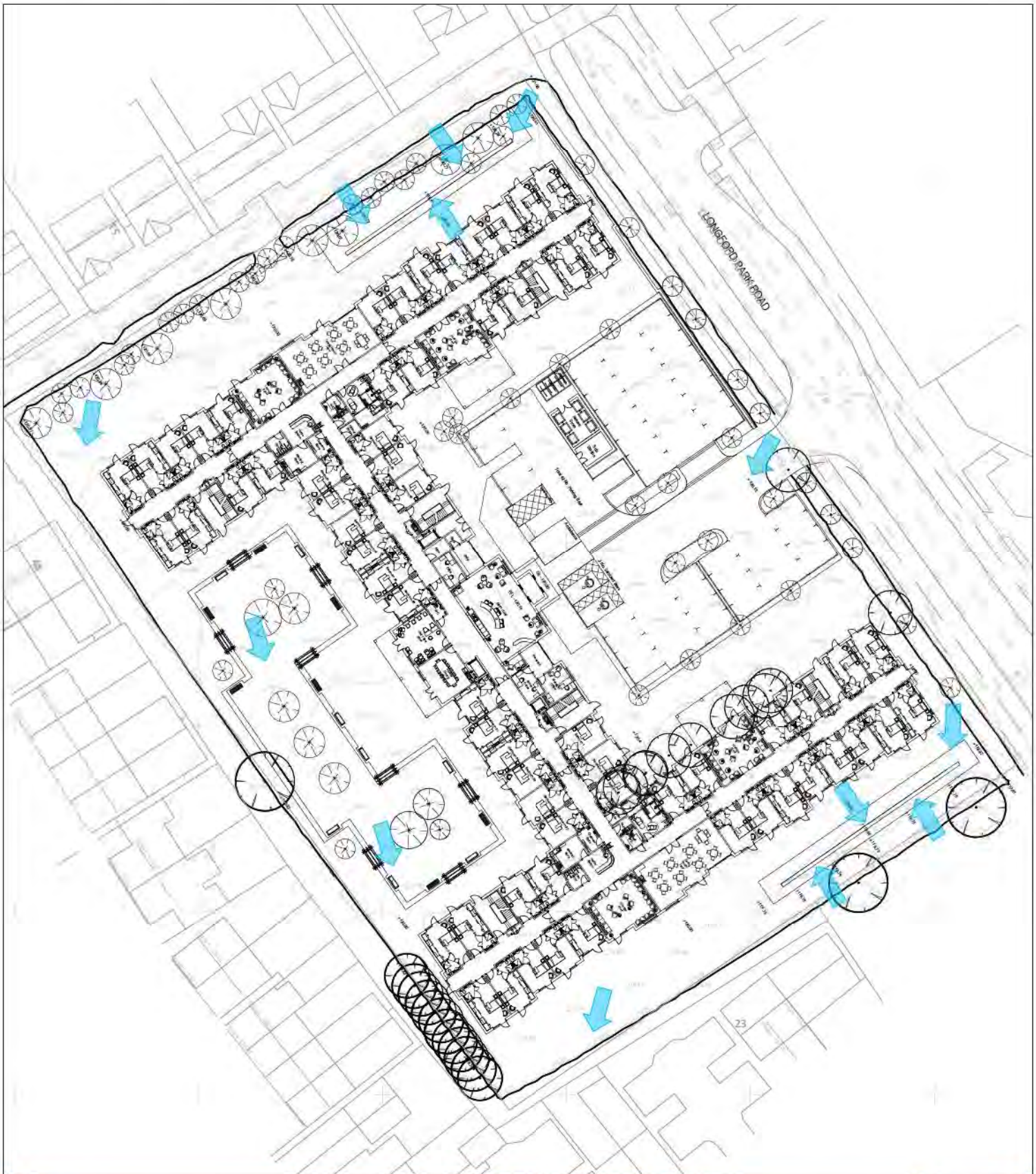
JPP Consulting drawing no. 24918-FRA04

NOTES

1. Based on Topographical Survey by JPP Surveying, drawing number 25354Y_01 dated August 2022.
2. Based on DWG File by KWL Architects drawing number 'Issued 21.10.22 - 5196 - SK01R - Proposed Site Plan' including Site Layout and OS Mapping.

KEY

Predicted Overland Flows



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- Infrastructure Design
- Geotechnical & Environmental
- Structural Engineering
- Surveying
- Development Planning
- Professional Advice

Drawn By:	ECD
Chkd By:	KER
Scale @A3:	1:500
Date:	26/10/2022
Status:	FOR PLANNING
Project No.:	24918

Client Mercian Group

Project Proposed Care Home, Land South of Canal Lane, Bodicote, Banbury

Title Predicted Overland Flows

Drawing No: FRA04 Revision: -

jpp