

**LAND OFF UPPER MARSH ROAD
WARMINSTER**

**FLOOD RISK ASSESSMENT
&
DRAINAGE STRATEGY**

BACKHOUSE HOUSING LTD

Date: 30th March 2026
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Rev: -



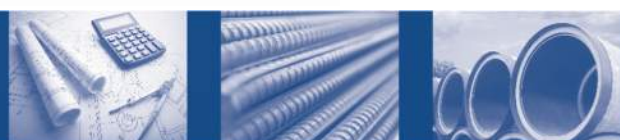
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References

Environment Agency Flood Map Information © and database right www.environment_agency.gov.uk

Contains British Geological Survey materials © NERC (2018)

National Planning Policy Framework (Department for Communities and Local Government, March 2012)

PPG Flood risk and coastal change (Department for Communities and Local Government, March 2014)

Wiltshire Council Strategic Flood Risk Assessments (SFRA).

Wiltshire Council SUDs & Drainage Guidance.



Introduction

1.1 Scope

Backhouse Housing Ltd is seeking outline planning permission for a 49 unit residential development on land off Marsh Road, Warminster. The proposed development site comprises a total site area of approximately 2.2 hectares of existing grass and arable land.

- 1.2 MJA Consulting has been appointed to undertake a Flood Risk Assessment and Development Drainage Strategy to determine the potential flood risks associated with the site and to provide a suitable strategy for the disposal of surface and foul water from the proposed development.

1.4 Report Structure

The National Planning Policy Framework (NPPF) and the Flood Risk and Coastal Planning Practice Guidance (PPG) is the current guidance on development and flood risk in England and Wales. The Flood Risk technical guidance for the National Planning Policy Framework requires a Flood Risk Assessment (FRA) to be carried out on sites over 1ha to consider all potential forms of flooding including that from river, sea, estuarial, land drainage, groundwater, overland flow, surface water run-off, sewer systems, and artificial water bodies (lakes, reservoirs, canals etc.) to both the development site and to offsite parties and land.

- 1.5 This report will take the structure of a 'Flood Risk Assessment' in accordance with the National Planning Policy Framework, the Flood Risk and Coastal Planning Practice Guidance, Environment Agency's Flood Risk Assessment Guidance and CIRIA Report 624 'Development and Flood Risk.

- 1.6 The objectives of this report are:

- To confirm whether the proposed development site is affected by current or anticipated future flooding from all sources for the lifetime of the site.
- To confirm that this development will not increase the risk of flooding to any offsite properties and land or increase the population within a floodplain.
- To undertake calculations to establish the foul and surface water runoff rates from the existing site and to assess the potential foul and surface water runoff from the proposed development.
- To detail a suitable strategy for the management of foul and surface water generated from the proposed development allowing for future climate change.

The Development Site

Figure 1: Site location

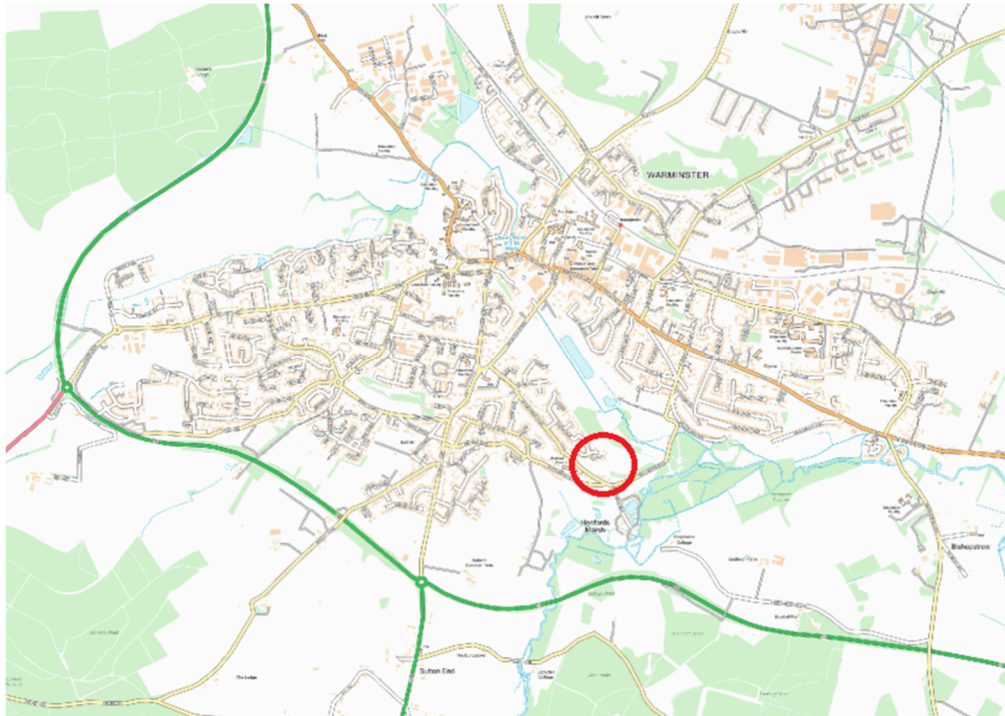


Image courtesy of: Bing Maps, 2022 Microsoft Corporation Image courtesy of Ordnance Survey

Figure 2: Development site



Site Description & Development Proposals

- 2.1 The application site covers an area of approximately 2.2 Ha and is centred on National Grid Reference ST 87712 44144. The site is bounded by existing residential properties to the northwest, Upper Marsh Road and Smallbrook Road to the south and southeast east and existing fields to the north. Access is via Upper Marsh Road on the southern boundary.
- 2.2 The proposed development consists of the provision of 49 new residential dwellings, together with associated access, parking, amenity space and landscaping. See Appendix A for Development proposals

Topography

- 2.3 A topographical survey of the site indicates the main area of the site is has a central plateau area then falls away on all sides to the boundaries. Levels range from 127.15 – 119.00m AOD.
Refer to Appendix B for a Topographical Survey of the existing site.

Geology

- 2.4 The site-specific ground investigations were undertaken these include an Interpretive report by Structural Soils in February 2019, with further investigations by Ruddlesden Geotechnical in July/August 2020 and infiltration testing being undertaken in November 2020.
- 2.5 From the various reports ground conditions encountered were similar as highlighted within the table below. However, the site-specific infiltration testing in November 2020 did highlight a more changeable sub strata below the topsoil with the Upper Green Sand Formation containing a more clayey silty sand which could account for the variable infiltration results.

Summary of Ground Conditions			
Strata Encountered	Depth to top of strata	Range Thickness	Notes
Topsoil / Made Ground	G.L.	0.3 – 0.45 0.85	
Shaftesbury Sandstone Member	0.30 – 0.75m	Up to 4.65m	Upper Greensand Formation
Cann Sand Member	1.40 – 5.30m	.10.35m	Upper Greensand Formation
No groundwater was encountered			

- 2.6 As part of the Structural Soils investigation in February 2019 one Infiltration test was undertaken within the middle of the site. This indicated good infiltration at 2×10^{-4} m/s.
- 2.7 The Infiltration testing by Ruddlesden Geotechnical in November 2020 showed a variable permeability throughout the site ranging from 1.24×10^{-4} m/s to 9.74×10^{-6} m/s. Some areas of testing failed to reach suitable results. Details and summary of test locations within relevant appendix.

- 2.8 From the findings of the infiltration testing a proportion of the site including the access is largely impermeable and unsuitable for permeable type drainage techniques. As part of the planning condition and in consultation with Wiltshire Council LLFA it was agreed that an alternative surface water strategy and design would be required for the site. The initial proposals put forward for discussion were to utilise a mix of the original permeable drainage design in suitable areas with a more traditional attenuation and positive discharge for areas of non-permeability. However, due to the variable nature of the impermeable soils the surface water drainage strategy will be now based on a full gravity piped and attenuated scheme with SUDs elements within driveway areas.

Hydrogeology and Hydrology

- 2.9 The nearest main waterbody is the River Were which lies approximately 250 north east and approximately 20m below the site; this then flows in an easterly direction outfalling into the River Wylde approximately 750m to the east.
- 2.10 The Environment Agency mapping indicates that the site is located within an area in which the bedrock geology is identified as being in an area allocated as a “Principal” category Aquifer.

Flood Risk

- 3.1 The assessment of flood risk to the site requires that all potential forms of flooding are considered. In accordance with the Environment Agency's Flood Risk Assessment Guidance, NPPF, PPG and CIRIA Report 624, sources of flooding to be assessed include tidal, fluvial (rivers, streams and watercourses), pluvial (overland rainfall runoff), groundwater, artificial sources (canals and reservoirs) and existing/proposed sewerage and water mains infrastructure.

History of Flooding

- 3.2 During the data collection process, it is important to consider the information which already exists for the site location with respect to flood risk. The main sources of data for flood risk and recorded incidents of flooding for this site has been the Environment Agency, Wiltshire Council Strategic Flood Risk Assessments (SFRA).
- 3.3 Within the SFRA studies, consultation was carried out with all appropriate authorities and organisations including the Environment Agency, Wessex Water, local councils and local community stakeholders to identify known or perceived problem areas with respect to flooding.
- 3.4 With reference to the above, and in the context of the proposed development, there have been no historic issues found for the site of flooding from the following potential sources including:
- Fluvial (Rivers and Sea).
 - Tidal.
 - Groundwater.
 - Pluvial (Surface water runoff).
 - Existing foul, storm and combined sewers or potable water main infrastructure.
 - Artificial infrastructure.
- 3.5 Nevertheless, the new development must not create or exacerbate any existing flood risk within the local area. During the design of the proposed development, careful consideration will be given to the most appropriate and sustainable method of foul and surface water disposal.

Fluvial

- 3.6 The Environment Agency (EA) carries out a national flood risk assessment (NaFRA) which assesses the probability of flooding to land from all main rivers in England. The results of this modelling are combined and calibrated against data from recorded flood events to produce the Environment Agency's Flood Zone Map.

- 3.7 The latest on-line Environment Agency 'Flood Zone Map' (July 2022) indicates that the site lies within Flood Zones 1 which is the lowest risk category.

Figure 3: Extract from Environment Agency River and Sea Water Flood Map



Contains Environment Agency information © Environment Agency 2022

Key:

 Main Rivers

Dark Blue : (Flood Zone 3)

Shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded: from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year, or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light Blue : (Flood Zone 2)

Shows the additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1% (1 in 1000) chance of occurring each year. These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

Clear : (Flood Zone 1)

Shows the area where flooding from rivers and the sea is very unlikely. There is less than a 0.1% (1 in 1000) chance of flooding occurring each year.

3.8 NPPF Guidance & Planning Policy

The NPPF In accordance with the NPPF the following tables outline the Flood Zoning definitions and Flood Risk Vulnerability.

Table 1: Flood Zones:

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
Zone 2 Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding.
Zone 3a High Probability	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea.
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

Table 2: Flood risk vulnerability and flood zone 'incompatibility'

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	Yes	Yes	Yes	Yes	Yes
Zone 2	Yes	Exception Test required	Yes	Yes	Yes
Zone 3a	Exception Test required	No	Exception Test required	Yes	Yes
Zone 3b	Exception Test required	No	No	No	Yes

Note: The above table does not show the application of the Sequential Test.

Information on flood risk vulnerability classification relating to the proposed development:

More Vulnerable:

- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.

Less Vulnerable:

- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.

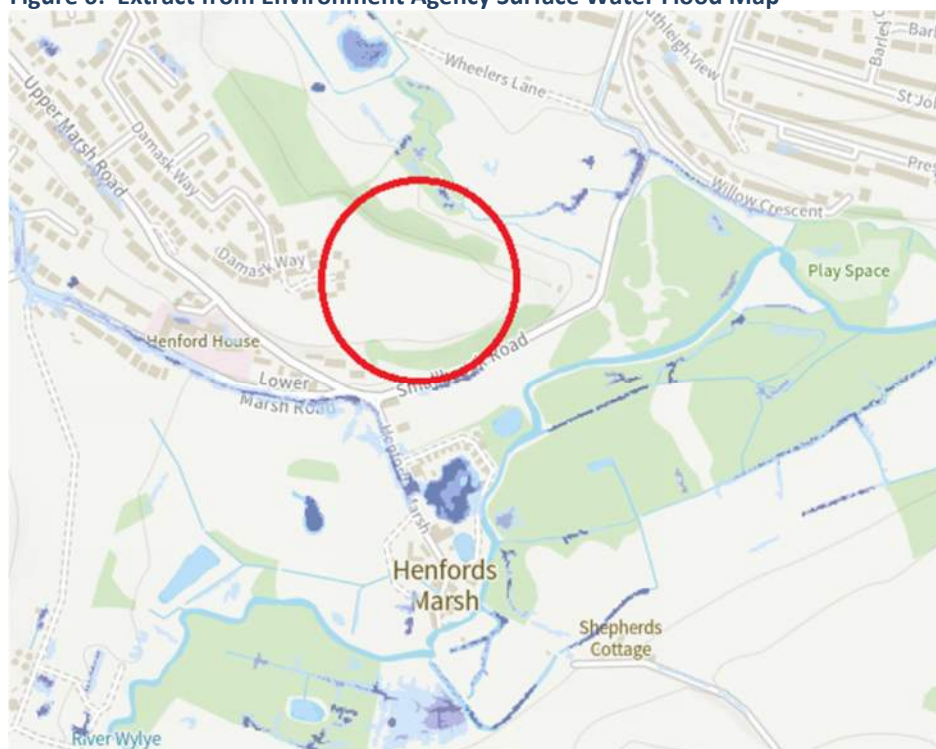
Tidal

- 3.9 Taking into account the proximity of Warminster to the coastline, tidal flooding is not an issue

Surface Water

- 3.10 The SFRA does not highlight any incidents of flooding from surface water runoff that have been recorded at the site. Since the SFRA reports were produced, no further evidence of surface water flooding at the site has been identified.
- 3.11 The Environment Agency's Flood Map for Surface Water is a theoretical assessment of potential overland flow paths, ground levels and drainage systems to indicate areas that may be susceptible to surface water flooding.

Figure 6: Extract from Environment Agency Surface Water Flood Map



Contains Environment Agency information © Environment Agency 2022

Key:

- High (Greater than 1:30(3.3%) chance of flooding)
- Medium (Between 1:100(1%) and 1:30(3.3%) chance of flooding)
- Low (Between 1:1000 (0.1%) and 1:100 (1%) chance of flooding)
- ☐ Very Low (Less than 1:1000 (0.1%) chance of flooding)

-
- 3.12 The latest Environment Agency 'Surface Water Flood Zone Map' indicates that the development site is at low risk.
- 3.13 The implementation of a robust drainage scheme to collect, attenuate and convey the surface water runoff from the proposed development will mitigate any residual risk of surface water flooding to the site in its redeveloped state.

Groundwater

- 3.14 No recorded events of groundwater flooding have been identified at or within the vicinity of the site.

Artificial Sources

- 3.15 There have been no recorded or known incidents of flooding to the site or surrounding areas from artificial sources. This includes sources such as from canals, reservoirs and sewage treatment works, existing foul and surface water sewers or potable water mains.

Proposed Site Drainage

- 3.16 All storm water drainage and SuDS within the development will be sized to manage the runoff from the exceptionally rare 1 in 100 storm event (1% AEP), plus an additional 40% allowance for predicted future climate change effects (in accordance with EA recommendations up to the year 2115).

4 Existing and Proposed Site Runoff

- 4.1 This section aims to calculate the estimated surface water runoff from the existing site. These discharge figures are then used to establish the post-development constraints to inform the preliminary design of the site surface water drainage strategy.

Surface Water Runoff Peak Runoff Rate

- 4.2 An assessment of the estimated Scrub Land greenfield runoff rate has been carried out using the loH 124 methodology.
- 4.3 In accordance with Wiltshire Council's 'Drainage and Betterment Strategy' (June 2024), where full disposal of surface water via infiltration is not viable, Wiltshire Council requires post-development discharges from greenfield sites to provide 30% betterment over pre-development discharges for all storm events between the 1 in 1year and 1 in 100year return period events.

Development Greenfield Runoff:

Storm Return Period	Runoff
1 in 1 year	7.1 l/s
1 in 30 year	18.8 l/s
1 in 100 year	26.5 l/s
QBar	8.3 l/s

Reduced Runoff Assessment:

Storm Return Period	Greenfield Runoff Assessment	Proposed Site Runoff	Reduction %
1 in 1 year	7.1 l/s	4.97 l/sec	30%
1 in 30 year	18.8 l/s	4.97 l/sec	73%
1 in 100 year	26.5 l/s	4.97 l/sec	81%
QBar	8.3 l/sec	4.97 l/sec	40%

- 4.3 Therefore, all runoff from the redevelopment site will be restricted to a maximum discharge rate 5 l/sec (**4.97 l/sec**) for all storm events up to the 1 in 100 year plus an extra allowance of 45% for the predicted potential increase in peak rainfall up to 2115.

5 Surface Water Drainage Strategy

- 5.1 The National Planning Policy Framework (NPPF) requires that developments do not exacerbate flood risks both to the development site and to offsite parties and land, which means there is a need to control surface water drainage and overland runoff to ensure there are no increases in peak rates and volumes of runoff as a result of the development.
- 5.2 Wiltshire Council as the Lead Local Flood Authority (LLFA) has produced 'The Local Flood Risk Management Strategy' (April 2015) and the 'Drainage and Betterment Strategy' (June 2024), which details the key principles of flood risk management to ensure adequate consideration of flooding is given within planning applications.
- 5.3 The Building Regulations Document H (2015) and The SuDS Manual CIRIA 753 (2015) and the National standards for sustainable drainage systems 'Standard 1: Runoff Destinations (2025), detail the appropriate hierarchy of potential methods for disposing of surface water from a development:
1. Collected for non-potable use.
 2. Discharge to ground via infiltration.
 3. Discharge to a surface water body such as a watercourse.
 4. Discharge to a surface water sewer.
 5. Discharge to a combined sewer.
- 5.2 The use of rainwater harvesting (RWH) for non-potable domestic use at this development shall be considered where it is deemed to be appropriate, considering all factors such as lifetime maintenance implications, spatial requirements, public health and on-going running costs to the individual property owner long-term.
- 5.3 Soil permeability is variable across the site within the Greensands was reasonable and potentially suitable for smaller infiltration features.
Therefore, it is proposed that where possible all driveways are permeable and discharge to ground, where standoffs and the sub strata is suitable rear garden soakaways are utilized.
- 5.4 Due to the available space, location of services and drainage pipework permeable roads would be unsuitable. The access road to the development runs up a very steep embankment with limited available space. Therefore, all road runoff drainage is collected via a positive drainage system, attenuated on-site within a series of attenuation tanks. The site outfalls to the ditch network which runs along Upper Marsh Road.
- 5.5 The storm drainage for the development site will be a mix of infiltration and traditional piped and attenuated drainage.
- 5.6 The peak rate of runoff from the development will be restricted to the existing greenfield 1 year runoff rate with a 30% reduction (4.97 l/s) up to the 1:100y+ 45%cc rainfall event.
- 5.7 All SuDS will be sized to manage the runoff from the 1 in 100 rainfall event (1% AEP), plus an additional 45% allowance for predicted future effects of climate change (in accordance with EA recommendations up to the year 2115).

5.8 The surface water drainage strategy for the development is described below:

Roof Runoff:-

Roof runoff will be collected by a conventional system of guttering and downpipes discharging to a rear garden soakaway where possible. Should infiltration not be viable downpipe pipework will discharge directly to the gravity storm drain.

Private Drives & Parking Courts:-

All private drives and parking bays will typically drain via a permeable type block paving or yard gullies/aco drains discharging to permeable sub-base.

Development Roads:-

Runoff from the highway areas will drain via deep trapped road gullies connecting directly to the main piped storm drain network.

Water Quality and Pollution Prevention

- 5.9 It is important that the development of this site does not adversely affect the existing greenfield hydrological conditions and impact the quantity and quality of runoff that both currently infiltrates into the ground and discharges offsite into the receiving watercourses. As such, all surface water runoff from impermeable areas at this development will receive an appropriate level of treatment to remove hydrocarbons and other contaminants prior to discharge to the receiving waterbody.
- 5.10 The pollution hazard of surface water runoff from residential roofs is very low and the hazard of surface water runoff from residential car parks, and low-traffic roads (e.g. cul-de-sacs, home zones, general access roads) is low. Therefore a 'Simple Index' method can be used to make a qualitative assessment of the proposed SuDS management.
- 5.11 The CIRIA SuDS Manual 2015 details an approach for establishing the hazard posed by the intended land use activities and the extent to which the proposed SuDS components can reduce and mitigate the contamination risk. Tables 26.2, 26.3 & 26.4 outline the pollution hazard indices for different land use classifications and the SUDs mitigation for the SUDs elements.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
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 schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater

Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates ¹	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.6 ⁴	0.5	0.6
A soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.4	0.4
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 attenuation potential ² of at least 300 mm in depth ³	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.8 ⁴	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

5.12 On site SUDs

Type of SUDs component (Within development)	Mitigation indices		
	TSS	Metals	Hydrocarbons
Permeable Paving	0.7	0.6	0.7
Vortex Separator (SDS Type)	0.8	0.5	0.7

The table below provides an assessment and comparison of pollution hazards for the storm outfall soakaway. SUDs are provided via sealed permeable paving together with a vortex separator and the available SUDS mitigation.

		Total suspended solids (TSS)	Metals	Hydrocarbons
Land Use	Driveways	0.5	0.4	0.5
SUDs Mitigation	Permeable paving	0.7	0.6	0.7
		Acceptable	Acceptable	Acceptable
Land Use	Access Road	0.5	0.4	0.5
SUDs Mitigation	Vortex Separator	0.8	0.5	0.7
		Acceptable	Acceptable	Acceptable

SuDS Management and Maintenance

- 5.13 A development management company will put in place to manage and maintain non-adopted drainage systems and any outside of the plot curtilage together with any other areas of site outlined within SuDS Management and Maintenance plan.

Foul Water Drainage Strategy

- 6.1 The foul water generated from each property will drain via gravity through the house drainage before discharging to a new sewer network located typically within the development road. This proposed system will connect to the existing Wessex Water public foul network which runs through the site.
- 6.2 The predicted peak foul sewer discharge from the whole site to the existing foul network based on the Sewers for Adoption figure (4000 l/dwelling/day) for 49 units will be 2.27 l/s.
- 6.4 It is the intention that the development foul drainage network will be offered to Wessex Water for adoption under a Section 104 agreement of the Water Industry Act 1991. Under the current Water Authority legislation the water authority will ensure that capacity is made available for the new development flows; any required sewer modelling work and upgrades will be paid for via the development infrastructure charge.
- 6.6 Wessex Water will be consulted on the proposed development, to confirm if there is adequate capacity within the receiving foul sewer and the downstream catchment to accommodate the proposed foul flows from the development. This will ensure that the proposed development has a 'no detriment' impact on the local foul sewer system and does not create an increase in flood risk.

Summary & Conclusion

- 7.1 The proposed development consists of the provision of 49 new residential dwellings with associated access, parking, amenity space and landscaping.
- 7.2 The proposed development including dwellings, access roads and drainage infrastructure will be fully located within the Fluvial Flood Zone 1.
This is land assessed by the Environment Agency as having the lowest risk of flooding from rivers and watercourses with less than 1 in 1000 (<0.1%) annual probability of flooding. This assessment of flooding risk includes the predicted effects of climate change and the increase in rainfall and river flows over the lifetime of the development.
- 7.3 A detailed Flood Risk Assessment for the development has confirmed that the site will not be affected by current or anticipated future risk of flooding from other potential sources including Surface Water, Tidal, Groundwater, Existing, Proposed or Artificial Infrastructure for the lifetime of the development.
- 7.4 The implementation of an mixed surface water drainage system with both infiltration and a positive outfall incorporating the use of SuDS to manage the surface water runoff, will also provide a level of betterment to the level of surface water flood risk by capturing and attenuating all runoff from impermeable areas at source and disposing of this runoff in a controlled manner.
- 7.5 This assessment also proposes a robust drainage and SuDS strategy for the management of surface water generated from the proposed development to ensure that there is no increase in the risk of flooding to both the development and offsite properties and land.
- 7.6 The surface water drainage strategy for the development is described below:
Roof Runoff:-
Roof runoff will be collected by a conventional system of guttering and downpipes discharging to a rear garden soakaway where possible. Should infiltration not be viable downpipe pipework will discharge directly to the gravity storm drain.
- Private Drives & Parking Courts:-**
All private drives and parking bays will typically drain via a permeable type block paving or yard gullies/aco drains discharging to permeable sub-base.
- Development Roads:-**
Runoff from the highway areas will drain via deep trapped road gullies connecting directly to the main piped storm drain network.
- 7.7 In accordance with Wiltshire Council's 'Drainage and Betterment Strategy' (June 2024), where full disposal of surface water via infiltration is not viable, Wiltshire Council requires post-development discharges from greenfield sites to provide 30% betterment over pre-development discharges for all storm events between the 1 in 1year and 1 in 100year return period events.

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- 7.8 It is therefore proposed that all runoff from areas unsuitable for infiltration impermeable areas on the site will be attenuated within the site boundary with a restricted discharge to a 30% reduction from the 1 in 1 year runoff.
- 7.9 All SuDS will be sized to manage the runoff from the 1 in 100 rainfall event (1% AEP), plus an additional 45% allowance for predicted future effects of climate change (in accordance with EA recommendations up to the year 2115).
- 7.10 It is important that the development of this site does not adversely affect the existing greenfield hydrological conditions and impact the quantity and quality of runoff from the site. The proposed surface water drainage system will offer a suitable level of mitigation to ensure surface water runoff from impermeable areas at this development will receive an appropriate level of treatment in accordance with the Environment Agency pollution prevention guidance GP3, CIRIA C753 and DEFRA guidance to remove all pollutants and contaminants prior to discharge to the receiving waterbody.
- 7.11 The foul water flows from each property will drain to a new gravity foul sewer located within the development road network.
This proposed system will connect to the existing Wessex Water public foul network located within the site boundary.
- 7.12 Wessex Water will be consulted on the proposed development, to confirm if there is adequate capacity within the receiving foul sewer and the downstream catchment to accommodate the proposed foul flows from the development. This will ensure that the proposed development has a 'no detriment' impact on the local foul sewer system and does not create an increase in flood risk.

APPENDIX A

SITE LAYOUT



- NOTES:
- Application boundary
 - Affordable units
 - 15m Existing building offset
 - 20m Existing building offset
 - Acidic grassland
 - 20m Badger sett offset

Accommodation schedule

Affordable Mix (30%)

Unit Type	no.
TA1.1	4
FOG	1
TA2.2	6
TA3.2	4

TOTAL AFFORDABLE: 15 units

Open Market Mix (70%)

Unit Type	no.
FOG	1
Bramford	6
Lock	13
Cary	4
Mead	5
Gables	4
Stanton	1

TOTAL OPEN MARKET: 34 units

TOTAL HOUSES: 49 units

REV	NOTES	DATE
	Damask Way, Warminster Proposed Site Layout	B JH/DC
240707 L 02 01	1:500@A1	Feb 26

CliftonEmerydesign

Hems House 84 Longbrook Street Exeter, Devon, EX4 6AP
T: 01392 368866 W: www.cliftonemerydesign.co.uk M: mail@cliftonemerydesign.co.uk

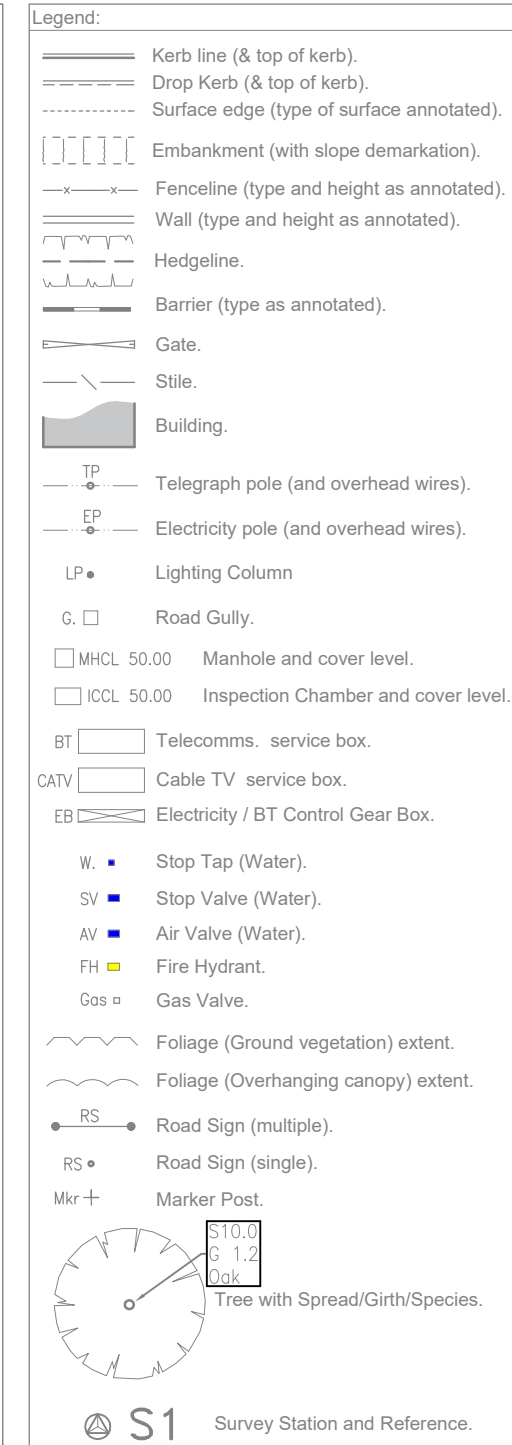
DRAWING-STATUS: DRAFT for comment

CONTRACTORS MUST CHECK ALL DIMENSIONS ON SITE. ONLY FIGURED DIMENSIONS ARE TO BE WORKED FROM. THIS DRAWING IS COPYRIGHT.



APPENDIX B

TOPOGRAPHICAL & UTILITY SURVEYS



Any surveyed features not shown above are annotated appropriately. Tree species is only annotated where known. Service covers are surveyed where accessible. Header Surveys cannot accept liability for missing covers due to them being buried or obscured by parked vehicles at the time of site visit.

Station	Easting	Northing	Lev.
B1	387858.365	144164.690	127.7
B2	387848.642	144165.534	128.0
F1	387853.538	144160.101	128.3
F2	387869.489	144167.017	128.5
F3	387697.241	144122.443	128.6
F4	387686.658	144175.015	118.8
F5	387878.229	144166.524	123.3
F15	387918.939	144126.209	117.2
S1	387594.464	144139.712	127.7
S2	387542.200	144136.332	124.8
S3	387496.567	144136.624	121.4
S4	387580.096	144070.994	113.5
S5	387631.073	144042.246	111.1
S6	387710.093	144007.566	108.8
S7	387693.096	144036.624	109.9
S8A	387466.089	144774.211	125.5
S8B	387711.264	144009.047	108.8

Grid Origin and Level Datum:
 Ordnance Survey GPS OSGB36(15) Grid and Levels used
 GPS Grid to Ground Scale Factor used 1.000
 For TPS measures use Ground to Grid Mean
 Scale Factor 0.99944718586

Client:

BACKHOUSE

This drawing is copyright. Its use or reproduction without prior



Project: Damask Way, Warminster

Drawing:
Topographic Survey

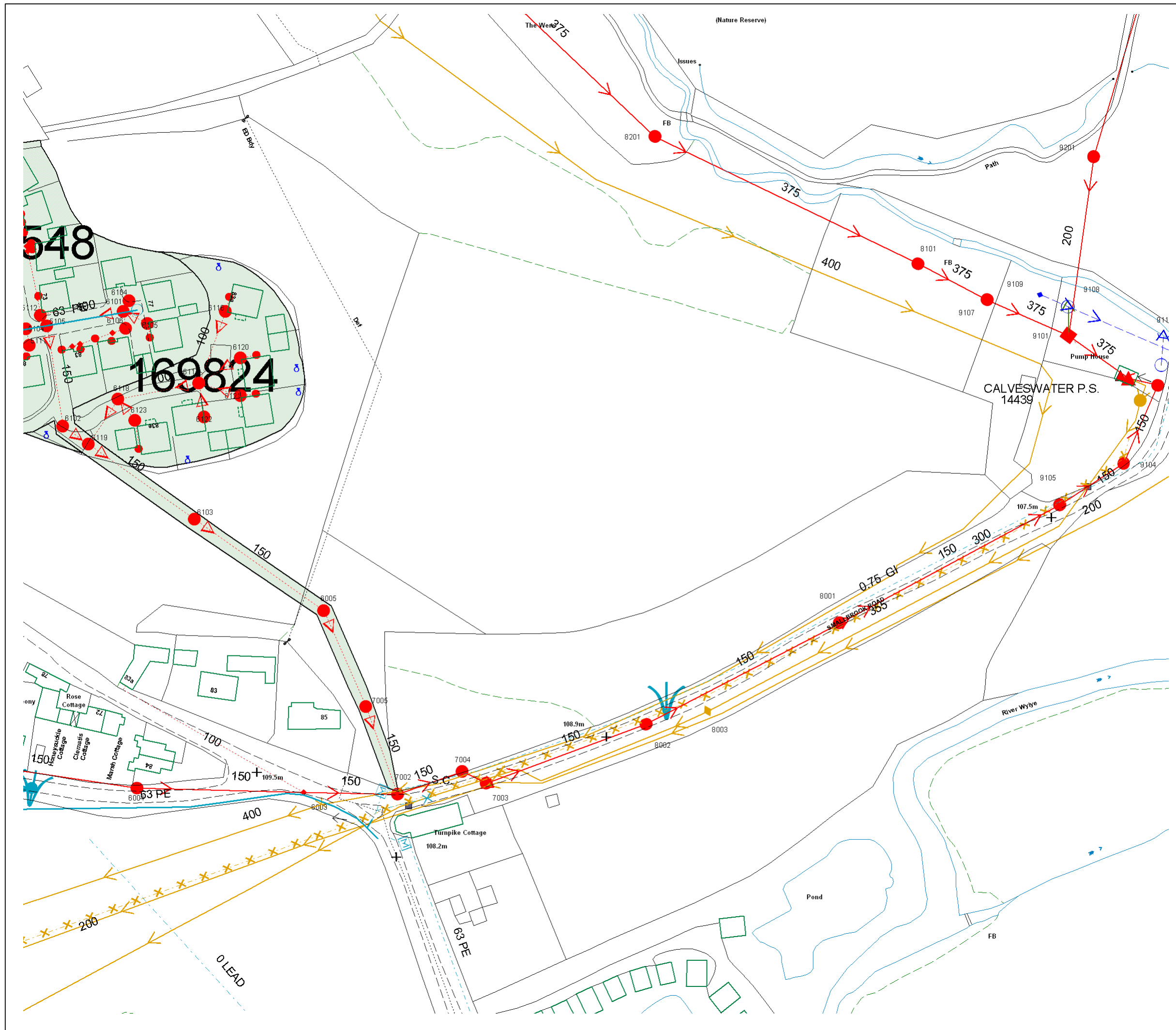
Date:	February 2020
Submitted:	DT

Sub Project:	DT
Drawn:	DT
Checked:	BE

Scale:	Sheet Size:	Sheet No
1:500	A0	1 of

Job No:	
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P3172



Upper Marsh Road

Printed on : 01/12/2017 11:40

WATER MAINS		Public	Private
Public			
Raw Water			
Abandoned			
Valve	X	Hydrant	PRV
			Meter
SEWERS		Public	Section 104 - Private
Foul			
Combined			
Surface			
Abandoned sewers			
OTHER WESSEX PIPES			
Rising Mains			
Effluent Disposal Main			
Overflow			
NON-WESSEX PIPES			
Private Rising Mains			
Culverted Water Course			
Highway Drain			

Information in this plan is provided for identification purposes only. No warranty as to accuracy is given or implied. The precise route of pipe work may not exactly match that shown. Wessex Water does not accept liability for inaccuracies.

Sewers and lateral drains adopted by Wessex Water under the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011 are to be plotted over time and may not yet be shown.

In carrying out any works, you accept liability for the cost of any repairs to Wessex Water apparatus damaged as a result of your works. You are advised to commence excavations using hand tools only. Mechanical digging equipment should not be used until pipe work has been precisely located.

If you are considering any form of building works and pipe work is shown within the boundary of your property or a property to be purchased (or very close by) a surveyor should plot its exact position prior to commencing works or purchase. Building over or near Wessex Water's apparatus is not normally permitted.

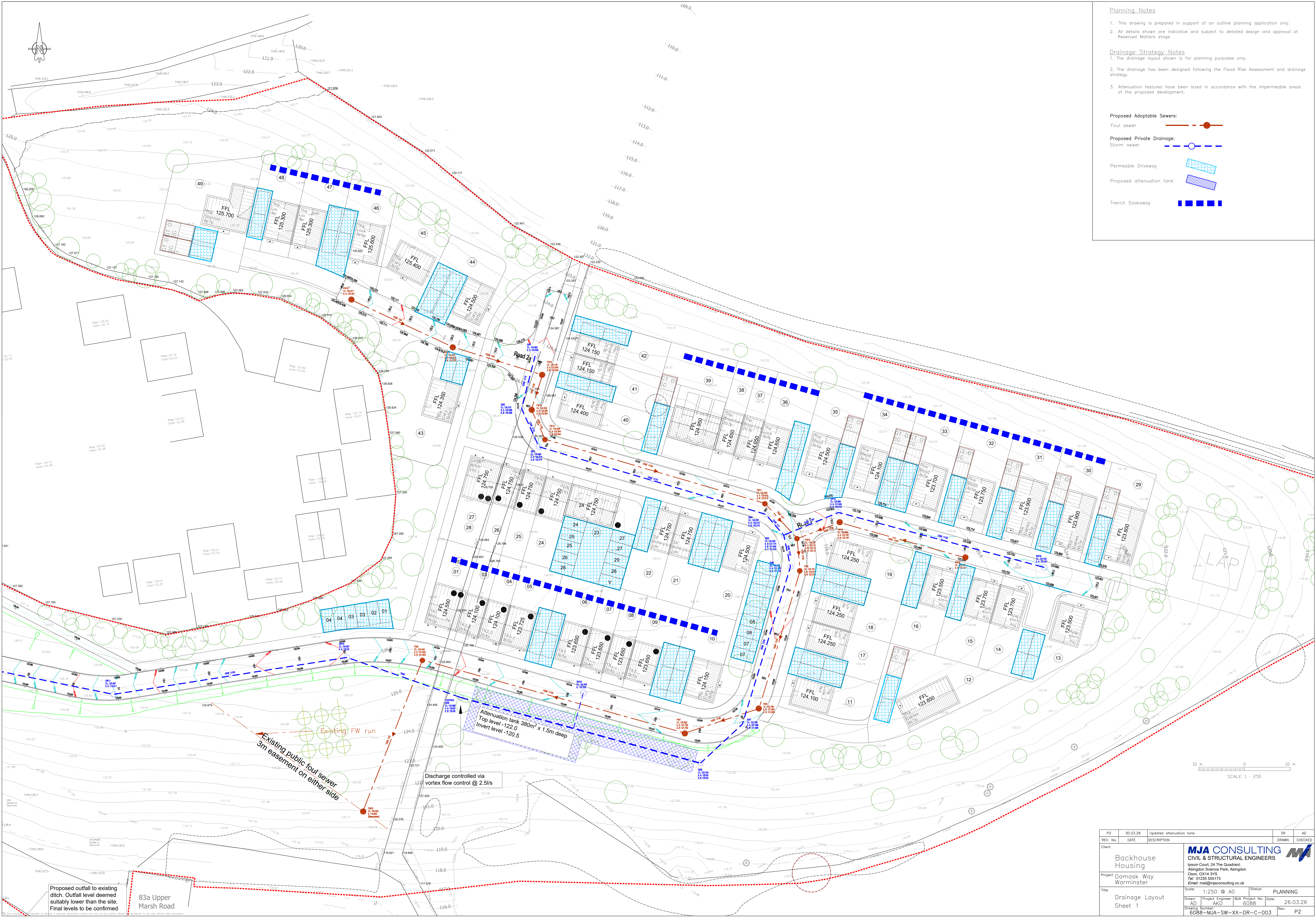
Centre:387786.96 , 144110.76

Scale = 1:1250

Metres 20 40 60

APPENDIX C

FOUL & SURFACE WATER DRAINAGE STRATEGY



Planning Notes

1. This drawing is prepared in support of an outline planning application only.
2. All details shown are indicative and subject to detailed design and approval at Reserved Matters stage.

Drainage Strategy Notes

1. The drainage layout shown is for planning purposes only.
2. The drainage has been designed following the Flood Risk Assessment and drainage strategy.
3. Attenuation features have been sized in accordance with the impermeable areas of the proposed development.

Proposed Adoptable Sewers:

Foul sewer

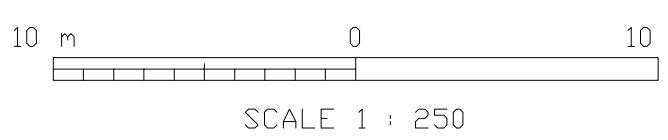
Proposed Private Drainage:

Storm sewer

Permeable Driveway

Proposed attenuation tank

Trench Soakaway



P2	30.03.26	Updated attenuation tank.	SR	AD
REV. No.	DATE	DESCRIPTION	DRAWN	CHECKED
Client				
Backhouse Housing			MJA CONSULTING CIVIL & STRUCTURAL ENGINEERS	
Project Damask Way Warmminster			Ipsium Court, 24 The Quadrant, Abingdon Science Park, Abingdon Oxon, OX14 3YS Tel: 01235 555173 Email: mail@mjaconsulting.co.uk	
Title			Scale: 1:250 @ A0 Status: PLANNING	
Drainage Layout Sheet 1			Drawn: Project Engineer MJA Project No: 6088 Date: 26.03.26	
			AD AKD 6088	
			Drawing Number: 6088-MJA-SW-XX-DR-C-003 Rev: P2	

Planning Notes

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2. All details shown are indicative and subject to detailed design and approval at Reserved Matters stage.

Drainage Strategy Notes

1. The drainage layout shown is for planning purposes only.
2. The drainage has been designed following the Flood Risk Assessment and drainage strategy.
3. Attenuation features have been sized in accordance with the impermeable areas of the proposed development.

Proposed Adoptable Sewers:

Foul sewer

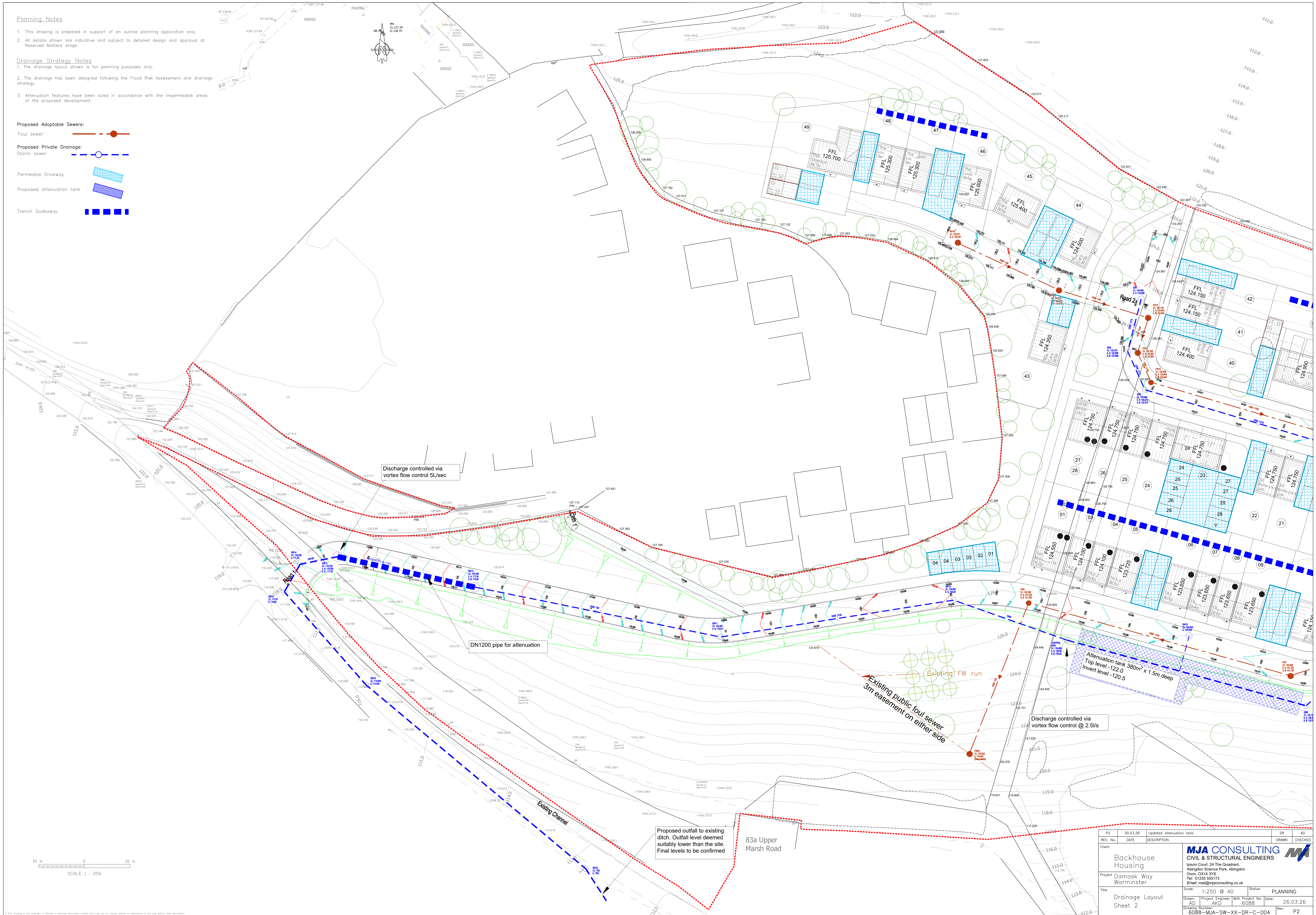
Proposed Private Drainage:

Storm sewer

Permeable Driveway

Proposed attenuation tank

Trench Soakaway



P2	30.03.26	Updated attenuation tank.	SR	AD
REV. No.	DATE	DESCRIPTION	DRAWN	CHECKED
Client				
Backhouse Housing			MJA CONSULTING CIVIL & STRUCTURAL ENGINEERS	
Project Damask Way Warmminster			Ipsium Court, 24 The Quadrant, Abingdon Science Park, Abingdon Oxon, OX14 3YS Tel: 01235 555173 Email: mail@mjaconsulting.co.uk	
Title			Scale: 1:250 @ A0	Status: PLANNING
Drawing Number: 6088-MJA-SW-XX-DR-C-004			Drawn: Project Engineer MJA	Project No: 6088
Sheet 2			Date: 26.03.26	Rev: P2



APPENDIX D

DEVELOPMENT RUNOFF & SURFACE WATE CALCULATIONS

MJA Consulting		Page 1																								
Monarch House Barton Lane OX14 3NB	Damask Way Warminster Backhouse Homes																									
Date 21/07/2021 14:05 File	Designed by mcshane Checked by																									
Innovyze	Source Control 2020.1																									
<u>ICP SUDS Mean Annual Flood</u> Input <table><tr><td>Return Period (years)</td><td>1</td><td>Soil</td><td>0.400</td></tr><tr><td>Area (ha)</td><td>1.900</td><td>Urban</td><td>0.000</td></tr><tr><td>SAAR (mm)</td><td>867</td><td>Region Number</td><td>Region 7</td></tr></table> Results l/s <table><tr><td>QBAR Rural</td><td>8.3</td></tr><tr><td>QBAR Urban</td><td>8.3</td></tr><tr><td>Q1 year</td><td>7.1</td></tr><tr><td>Q1 year</td><td>7.1</td></tr><tr><td>Q30 years</td><td>18.8</td></tr><tr><td>Q100 years</td><td>26.5</td></tr></table>			Return Period (years)	1	Soil	0.400	Area (ha)	1.900	Urban	0.000	SAAR (mm)	867	Region Number	Region 7	QBAR Rural	8.3	QBAR Urban	8.3	Q1 year	7.1	Q1 year	7.1	Q30 years	18.8	Q100 years	26.5
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©1982-2020 Innovyze																										

MJA Consulting				Page 1																																																																																																																																																																																																																		
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<u>Cascade Summary of Results for TNK1.SRCX</u> Upstream Outflow To Overflow To Structures (None) TNK3.SRCX (None) <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>122.975</td><td>0.475</td><td>2.0</td><td>180.7</td><td>O K</td></tr><tr><td>30 min Summer</td><td>123.138</td><td>0.638</td><td>2.0</td><td>242.6</td><td>O K</td></tr><tr><td>60 min Summer</td><td>123.315</td><td>0.815</td><td>2.0</td><td>309.6</td><td>O K</td></tr><tr><td>120 min Summer</td><td>123.498</td><td>0.998</td><td>2.1</td><td>379.1</td><td>O K</td></tr><tr><td>180 min Summer</td><td>123.602</td><td>1.102</td><td>2.2</td><td>418.6</td><td>O K</td></tr><tr><td>240 min Summer</td><td>123.670</td><td>1.170</td><td>2.2</td><td>444.5</td><td>O K</td></tr><tr><td>360 min Summer</td><td>123.760</td><td>1.260</td><td>2.3</td><td>479.0</td><td>O K</td></tr><tr><td>480 min Summer</td><td>123.821</td><td>1.321</td><td>2.4</td><td>502.1</td><td>O K</td></tr><tr><td>600 min Summer</td><td>123.863</td><td>1.363</td><td>2.4</td><td>518.0</td><td>O K</td></tr><tr><td>720 min Summer</td><td>123.893</td><td>1.393</td><td>2.4</td><td>529.3</td><td>O K</td></tr><tr><td>960 min Summer</td><td>123.928</td><td>1.428</td><td>2.4</td><td>542.6</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>123.944</td><td>1.444</td><td>2.5</td><td>548.6</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>123.916</td><td>1.416</td><td>2.4</td><td>538.0</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>123.881</td><td>1.381</td><td>2.4</td><td>524.7</td><td>O K</td></tr><tr><td>15 min Winter</td><td>122.976</td><td>0.476</td><td>2.0</td><td>180.7</td><td>O K</td></tr><tr><td>30 min Winter</td><td>123.138</td><td>0.638</td><td>2.0</td><td>242.6</td><td>O K</td></tr><tr><td>60 min Winter</td><td>123.315</td><td>0.815</td><td>2.0</td><td>309.6</td><td>O K</td></tr><tr><td>120 min 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Summer</td><td>10.276</td><td>0.0</td><td>346.1</td><td>606</td></tr><tr><td>720 min Summer</td><td>8.935</td><td>0.0</td><td>351.1</td><td>726</td></tr><tr><td>960 min Summer</td><td>7.160</td><td>0.0</td><td>357.2</td><td>964</td></tr><tr><td>1440 min Summer</td><td>5.230</td><td>0.0</td><td>359.4</td><td>1442</td></tr><tr><td>2160 min Summer</td><td>3.812</td><td>0.0</td><td>683.9</td><td>1844</td></tr><tr><td>2880 min Summer</td><td>3.042</td><td>0.0</td><td>670.3</td><td>2224</td></tr><tr><td>15 min Winter</td><td>128.339</td><td>0.0</td><td>162.4</td><td>26</td></tr><tr><td>30 min Winter</td><td>86.287</td><td>0.0</td><td>165.7</td><td>41</td></tr><tr><td>60 min Winter</td><td>55.393</td><td>0.0</td><td>303.2</td><td>70</td></tr><tr><td>120 min Winter</td><td>34.352</td><td>0.0</td><td>328.5</td><td>128</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	15 min Summer	122.975	0.475	2.0	180.7	O K	30 min Summer	123.138	0.638	2.0	242.6	O K	60 min Summer	123.315	0.815	2.0	309.6	O K	120 min Summer	123.498	0.998	2.1	379.1	O K	180 min Summer	123.602	1.102	2.2	418.6	O K	240 min Summer	123.670	1.170	2.2	444.5	O K	360 min Summer	123.760	1.260	2.3	479.0	O K	480 min Summer	123.821	1.321	2.4	502.1	O K	600 min Summer	123.863	1.363	2.4	518.0	O K	720 min Summer	123.893	1.393	2.4	529.3	O K	960 min Summer	123.928	1.428	2.4	542.6	O K	1440 min Summer	123.944	1.444	2.5	548.6	O K	2160 min Summer	123.916	1.416	2.4	538.0	O K	2880 min Summer	123.881	1.381	2.4	524.7	O K	15 min Winter	122.976	0.476	2.0	180.7	O K	30 min Winter	123.138	0.638	2.0	242.6	O K	60 min Winter	123.315	0.815	2.0	309.6	O K	120 min Winter	123.498	0.998	2.1	379.4	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	128.339	0.0	162.4	26	30 min Summer	86.287	0.0	165.7	41	60 min Summer	55.393	0.0	303.2	70	120 min Summer	34.352	0.0	328.6	130	180 min Summer	25.597	0.0	330.0	188	240 min Summer	20.630	0.0	331.3	248	360 min Summer	15.163	0.0	334.8	368	480 min Summer	12.185	0.0	339.8	486	600 min Summer	10.276	0.0	346.1	606	720 min Summer	8.935	0.0	351.1	726	960 min Summer	7.160	0.0	357.2	964	1440 min Summer	5.230	0.0	359.4	1442	2160 min Summer	3.812	0.0	683.9	1844	2880 min Summer	3.042	0.0	670.3	2224	15 min Winter	128.339	0.0	162.4	26	30 min Winter	86.287	0.0	165.7	41	60 min Winter	55.393	0.0	303.2	70	120 min Winter	34.352	0.0	328.5	128
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<u>Cascade Model Details for TNK1.SRCX</u> Storage is Online Cover Level (m) 125.500 <u>Tank or Pond Structure</u> Invert Level (m) 122.500 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>380.0</td><td>1.500</td><td>380.0</td><td>1.600</td><td>0.0</td></tr></table> <u>Hydro-Brake® Optimum Outflow Control</u> <table><tr><td>Unit Reference</td><td>MD-SHE-0068-2500-1500-2500</td></tr><tr><td>Design Head (m)</td><td>1.500</td></tr><tr><td>Design Flow (l/s)</td><td>2.5</td></tr><tr><td>Flush-Flo™</td><td>Calculated</td></tr><tr><td>Objective</td><td>Minimise upstream storage</td></tr><tr><td>Application</td><td>Surface</td></tr><tr><td>Sump Available</td><td>Yes</td></tr><tr><td>Diameter (mm)</td><td>68</td></tr><tr><td>Invert Level (m)</td><td>122.500</td></tr><tr><td>Minimum Outlet Pipe Diameter (mm)</td><td>100</td></tr><tr><td>Suggested Manhole Diameter (mm)</td><td>1200</td></tr></table> <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>1.500</td><td>2.5</td></tr><tr><td>Flush-Flo™</td><td>0.300</td><td>2.0</td></tr><tr><td>Kick-Flo®</td><td>0.609</td><td>1.7</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>2.0</td></tr></table> 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 <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>1.7</td><td>1.200</td><td>2.3</td><td>3.000</td><td>3.4</td><td>7.000</td><td>5.1</td></tr><tr><td>0.200</td><td>2.0</td><td>1.400</td><td>2.4</td><td>3.500</td><td>3.7</td><td>7.500</td><td>5.3</td></tr><tr><td>0.300</td><td>2.0</td><td>1.600</td><td>2.6</td><td>4.000</td><td>3.9</td><td>8.000</td><td>5.4</td></tr><tr><td>0.400</td><td>2.0</td><td>1.800</td><td>2.7</td><td>4.500</td><td>4.2</td><td>8.500</td><td>5.6</td></tr><tr><td>0.500</td><td>1.9</td><td>2.000</td><td>2.9</td><td>5.000</td><td>4.4</td><td>9.000</td><td>5.8</td></tr><tr><td>0.600</td><td>1.7</td><td>2.200</td><td>3.0</td><td>5.500</td><td>4.6</td><td>9.500</td><td>5.9</td></tr><tr><td>0.800</td><td>1.9</td><td>2.400</td><td>3.1</td><td>6.000</td><td>4.8</td><td></td><td></td></tr><tr><td>1.000</td><td>2.1</td><td>2.600</td><td>3.2</td><td>6.500</td><td>4.9</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	380.0	1.500	380.0	1.600	0.0	Unit Reference	MD-SHE-0068-2500-1500-2500	Design Head (m)	1.500	Design Flow (l/s)	2.5	Flush-Flo™	Calculated	Objective	Minimise upstream storage	Application	Surface	Sump Available	Yes	Diameter (mm)	68	Invert Level (m)	122.500	Minimum Outlet Pipe Diameter (mm)	100	Suggested Manhole Diameter (mm)	1200	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.500	2.5	Flush-Flo™	0.300	2.0	Kick-Flo®	0.609	1.7	Mean Flow over Head Range	-	2.0	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	1.7	1.200	2.3	3.000	3.4	7.000	5.1	0.200	2.0	1.400	2.4	3.500	3.7	7.500	5.3	0.300	2.0	1.600	2.6	4.000	3.9	8.000	5.4	0.400	2.0	1.800	2.7	4.500	4.2	8.500	5.6	0.500	1.9	2.000	2.9	5.000	4.4	9.000	5.8	0.600	1.7	2.200	3.0	5.500	4.6	9.500	5.9	0.800	1.9	2.400	3.1	6.000	4.8			1.000	2.1	2.600	3.2	6.500	4.9		
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Summer</td><td>118.112</td><td>0.862</td><td>5.0</td><td>25.5</td><td>O K</td></tr><tr><td>600 min Summer</td><td>118.031</td><td>0.781</td><td>5.0</td><td>22.7</td><td>O K</td></tr><tr><td>720 min Summer</td><td>117.923</td><td>0.673</td><td>5.0</td><td>18.7</td><td>O K</td></tr><tr><td>960 min Summer</td><td>117.771</td><td>0.521</td><td>5.0</td><td>13.1</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>117.569</td><td>0.319</td><td>5.0</td><td>6.2</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>117.433</td><td>0.183</td><td>4.6</td><td>2.4</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>117.379</td><td>0.129</td><td>4.2</td><td>1.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>117.948</td><td>0.698</td><td>5.0</td><td>19.6</td><td>O K</td></tr><tr><td>30 min Winter</td><td>118.112</td><td>0.862</td><td>5.0</td><td>25.5</td><td>O K</td></tr><tr><td>60 min Winter</td><td>118.245</td><td>0.995</td><td>5.0</td><td>29.9</td><td>O K</td></tr><tr><td>120 min Winter</td><td>118.300</td><td>1.050</td><td>5.0</td><td>31.4</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>128.339</td><td>0.0</td><td>185.1</td><td>21</td></tr><tr><td>30 min Summer</td><td>86.287</td><td>0.0</td><td>196.1</td><td>35</td></tr><tr><td>60 min Summer</td><td>55.393</td><td>0.0</td><td>342.6</td><td>64</td></tr><tr><td>120 min Summer</td><td>34.352</td><td>0.0</td><td>377.2</td><td>112</td></tr><tr><td>180 min Summer</td><td>25.597</td><td>0.0</td><td>384.4</td><td>144</td></tr><tr><td>240 min Summer</td><td>20.630</td><td>0.0</td><td>389.8</td><td>178</td></tr><tr><td>360 min Summer</td><td>15.163</td><td>0.0</td><td>399.3</td><td>252</td></tr><tr><td>480 min Summer</td><td>12.185</td><td>0.0</td><td>409.0</td><td>326</td></tr><tr><td>600 min Summer</td><td>10.276</td><td>0.0</td><td>419.0</td><td>402</td></tr><tr><td>720 min Summer</td><td>8.935</td><td>0.0</td><td>427.3</td><td>450</td></tr><tr><td>960 min Summer</td><td>7.160</td><td>0.0</td><td>438.5</td><td>564</td></tr><tr><td>1440 min Summer</td><td>5.230</td><td>0.0</td><td>448.5</td><td>784</td></tr><tr><td>2160 min Summer</td><td>3.812</td><td>0.0</td><td>781.4</td><td>1128</td></tr><tr><td>2880 min Summer</td><td>3.042</td><td>0.0</td><td>774.0</td><td>1472</td></tr><tr><td>15 min Winter</td><td>128.339</td><td>0.0</td><td>185.1</td><td>21</td></tr><tr><td>30 min Winter</td><td>86.287</td><td>0.0</td><td>196.2</td><td>35</td></tr><tr><td>60 min Winter</td><td>55.393</td><td>0.0</td><td>342.6</td><td>62</td></tr><tr><td>120 min Winter</td><td>34.352</td><td>0.0</td><td>377.1</td><td>116</td></tr></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	15 min Summer	117.947	0.697	5.0	19.6	O K	30 min Summer	118.108	0.858	5.0	25.4	O K	60 min Summer	118.238	0.988	5.0	29.6	O K	120 min Summer	118.293	1.043	5.0	31.2	O K	180 min Summer	118.280	1.030	5.0	30.9	O K	240 min Summer	118.250	1.000	5.0	30.0	O K	360 min Summer	118.182	0.932	5.0	27.9	O K	480 min Summer	118.112	0.862	5.0	25.5	O K	600 min Summer	118.031	0.781	5.0	22.7	O K	720 min Summer	117.923	0.673	5.0	18.7	O K	960 min Summer	117.771	0.521	5.0	13.1	O K	1440 min Summer	117.569	0.319	5.0	6.2	O K	2160 min Summer	117.433	0.183	4.6	2.4	O K	2880 min Summer	117.379	0.129	4.2	1.2	O K	15 min Winter	117.948	0.698	5.0	19.6	O K	30 min Winter	118.112	0.862	5.0	25.5	O K	60 min Winter	118.245	0.995	5.0	29.9	O K	120 min Winter	118.300	1.050	5.0	31.4	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	128.339	0.0	185.1	21	30 min Summer	86.287	0.0	196.1	35	60 min Summer	55.393	0.0	342.6	64	120 min Summer	34.352	0.0	377.2	112	180 min Summer	25.597	0.0	384.4	144	240 min Summer	20.630	0.0	389.8	178	360 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Date 30/03/2026 12:35 File	Designed by mcshane Checked by	
Innovyze	Source Control 2020.1.3	

Cascade Rainfall Details for TNK3.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	18.900	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	2880
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.075

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.025	4 8	0.050

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Ipsium Court, 24 The Quadrant Abingdon Science Park Abingdon, OX14 3YS	Damask Way Warminster ROAD TNK-OUTFALL	
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Cascade Model Details for TNK3.SRCX

Storage is Online Cover Level (m) 119.250

Pipe Structure

Diameter (m) 1.200 Length (m) 30.000
Slope (1:X) 350.000 Invert Level (m) 117.250

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0102-5000-1250-5000
Design Head (m) 1.250
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 102
Invert Level (m) 117.250
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.250	5.0
Flush-Flo™	0.370	5.0
Kick-Flo®	0.772	4.0
Mean Flow over Head Range	-	4.4

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	3.4	1.200	4.9	3.000	7.5	7.000	11.2
0.200	4.7	1.400	5.3	3.500	8.1	7.500	11.6
0.300	5.0	1.600	5.6	4.000	8.6	8.000	12.0
0.400	5.0	1.800	5.9	4.500	9.1	8.500	12.3
0.500	4.9	2.000	6.2	5.000	9.6	9.000	12.7
0.600	4.7	2.200	6.5	5.500	10.0	9.500	13.0
0.800	4.1	2.400	6.8	6.000	10.4		
1.000	4.5	2.600	7.0	6.500	10.9		

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APPENDIX E

SUDS MANAGEMENT PLAN

SUDs Management Plan

Storm water pipework & Road Gullies

The key maintenance requirement for the surface water drainage system includes the removal of sediments and debris from the system as required.

All storm water pipe work should be visually inspected a minimum of monthly for the first three months after installation and then a minimum of once year.

As road gullies are the first on the treatment train and susceptible to higher silt loadings, these will need to be inspected a minimum of monthly for the first three months after installation and then a minimum of every four months.

During this inspection identify any gully pots or pipes that require remedial maintenance such removal of sediment, debris, leaves and litter as required.

This involves the removal all protective covers and grids and the cleaning out of channels or gully pots by hand or with suitable jetting equipment.

During the first year of operation each gully should be inspected every 3 months, and every 6 months thereafter for structural integrity and cleaned out as required.

Any sections of highway offered to the County Council Highways for adoption together with associated gullies and highway drainage pipework will transfer to Highway Authority ownership and be maintained as part of the standard highway maintenance procedures.

Permeable Block Paving

Key Maintenance Requirements:

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

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

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

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

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

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

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

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

Depending on the amount of usage and the environment the permeable pavement has received and been exposed to, the laying course material may require either replacement or cleaning after a 25 to 30 year period. This would be evident if the infiltration rate of the paving became prolonged, allowing ponding to develop.

Should this occur, the uplifting and cleaning (or replacing, depending on the costings of the activity) of the laying course maybe considered. The laying course material, jointing and blocks may be reused (once cleaned), minimising costs.

Driveways & Private Roads

Driveways & Private Roads will either be constructed as permeable block paving (outlined above) or constructed as an impervious surface drained via traditional deep trapped / yard gullies discharging into a permeable high-void aggregate sub-base layer beneath. This sub-base allows for filtration of pollutants from the runoff which is discharge to the perforated filter pipework below.

General yard gully and linear channel maintenance involves the removal of dead leaves, soil, litter from the gratings and sediments from the sump within the gully pot or channel. This involves the removal all protective covers and grids and the cleaning out of channels or gully pots by hand or with suitable jetting equipment.

During the first year of operation each gully and channel should be inspected every 3 months, and every 6 months thereafter for structural integrity and cleaned out as required.

Hydrodynamic Vortex Separator & Filter

SDS Ltd Aqua Swirl proprietary Hydrodynamic Vortex Separator provided on the outfalls to the attenuation basin and from the access road.

Maintenance:

Long term performance of the Aqua Swirl or any other device depends on inspection and maintenance program.

Recommended schedule in line with CIRIA C753 guidance; upon hand over – 3 months -6 months -12 months and then annually or as deemed necessary from details obtain from previous inspections. Each site sediment loadings will be different and at its highest just after the build phase, hence why a more frequent visit is required at the start of the programme.

The Aqua-Swirl® has been designed to minimize and simplify the inspection and maintenance process. The single chamber system can be inspected and maintained entirely from the surface thereby eliminating the need for confined space entry. Furthermore, the entire structure (specifically, the floor) is accessible for visual inspection from the surface. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any free-floating oil and floatable debris can be directly observed and maintained through the manhole access provided directly over the swirl chamber. Chamber system can be inspected and maintained entirely from the surface.

Inspection:

To inspect the Aqua-Swirl®, remove the manhole cover. The only tools needed to inspect the Aqua-Swirl® system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating oil and debris can be observed directly from the surface. Sediment depths can easily be determined by lowering a measuring device to the top of the sediment pile and to the surface of the water.

When the sediment pile is within 42 to 48 inches of the water surface (or sediment pile thickness is 18 to 24 inches as measured from the base), the system should be maintained. The maximum Sediment storage capacity of the Aqua-Swirl® is reached when the sediment pile is within 30 inches of the water surface (or sediment accumulation is 36 inches thick as measured from the base).

It should be noted that to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile. Keep in mind that the finer sediment at the top of the pile may offer less resistance to the measuring device than the larger particles which typically occur deeper within the sediment pile.

The Aqua-Swirl® design allows for the sediment to accumulate in a semi-conical fashion as illustrated above. That is, the depth to sediment as measured below the water surface may be less in the center of the swirl chamber; and likewise, may be greater at the edges of the swirl chamber.

Removal:

Cleaning the Aqua-Swirl® is simple and quick. Free-floating oil and floatable debris can be observed and removed directly through the 750mm service access riser provided. A vacuum truck is typically used to remove the accumulated sediment and debris. An advantage of the Aqua-Swirl® design is that the entire sediment storage area can be reached with a vacuum hose from the surface (reaching all the sides). Since there are no multiple or limited (hidden or “blind”) chambers in the Aqua-Swirl®, there are no restrictions to impede on-site maintenance tasks.

Disposal:

Sediments excavated from swales that receive runoff from residential or standard road and roof areas are generally not toxic or hazardous material and can be safely disposed of by either land application or landfilling. All removed products should be disposed of in line with local council and environmental requirements

Cellular Attenuation Tank

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

The attenuation tank is to be constructed from cellular units that allow internal CCTV and jetting access for inspection and maintenance (SDS Geolight, Hydro Stormbloc®, Wavin Aquacell or similar approved).

The built in modular inspection unit and maintenance tunnels within the attenuation tank allow almost the entire volume of the structure to be inspected via CCTV camera and flushed through. A catchpit chamber is to be installed immediately upstream of the attenuation tank to reduce the amount of silt entering the tank and it will generally only be necessary to ensure that the upstream catchpits / silt traps are free from debris such as leaves or sediment.

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

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

Any silt & debris should be flushed to the inspection or catchpit manhole and removed in accordance with the Management Company policy for waste management.

Cellular Systems - Operation and Maintenance Requirements

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



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