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ENVIRONMENT

Richborough
Land Situated to the East of Brascote Lane and South of Arnold's Crescent
Newbold Verdon
Sustainable Drainage Statement

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1. INTRODUCTION

1.1 A Sustainable Drainage Statement (SDS) sets out the principles of drainage design for a development and summarises the reasoning behind the chosen design. This includes consideration of national and local guidance, justification of specific flow rates, volumes of attenuated storage, as well as the appropriate level of treatment to be provided to surface water runoff.

1.2 This SDS has been produced by BWB Consulting on behalf of Richborough in respect of a planning application for a proposed residential development at land situated to the east of Brascote Lane and south of Arnold's Crescent, Newbold Verdon.

1.3 The planning application boundary as shown edged red in **Figure 1.1** extends to 13.77ha (hereinafter referred to as the 'Combined Site'), which comprises the following:

- 6.91ha of land to the east of Brascote Lane and south of the Thurlaston Brook, as shown shaded grey on the plan below, which benefits from an extant planning permission under reference 22/00277/OUT, for the purpose only of providing access/egress to the public highway known as Brascote Lane (hereinafter referred to as 'Phase 1'); and
- 6.86ha of land to the south of Arnold's Crescent and north of the Thurlaston Brook, as shown shaded pink on the plan below, for up to 135 dwellings with associated landscaping, open space, drainage infrastructure and associated works (hereinafter referred to as 'Phase 2').

1.4 On the basis Phase 1 has the benefit of planning permission, the scope of this SDS focusses upon Phase 2 (hereinafter referred to as "the site").

1.5 This report is intended to support an outline planning application for a residential development of up to 135 dwellings with associated landscaping, open space, drainage infrastructure and associated works (all matters reserved except access from Brascote Lane). Access is proposed via Phase 1 of the proposed development (planning reference: 22/00277/OUT), located immediately south of the site The level of detail included is commensurate and subject to the nature of the proposals. A proposed site development plan is included as **Appendix 1**.

1.6 A Flood Risk Assessment (FRA, ref: 243693-BWB-ZZ-XX-T-0002_FRA) has been produced for the site and this SDS accompanies this overarching document.

1.7 The site is located south of Newbold Verdon, approximately 3.9km east of Market Bosworth. The site is bound by residential dwellings to the north and west, by recreational grounds and agricultural land to the east, and by the Thurlaston Brook to the south, beyond which lies agricultural land. The existing site is greenfield, comprising agricultural land. The location of the site is illustrated within **Figure 1.1**, with contextual information provided within **Table 1.1**.

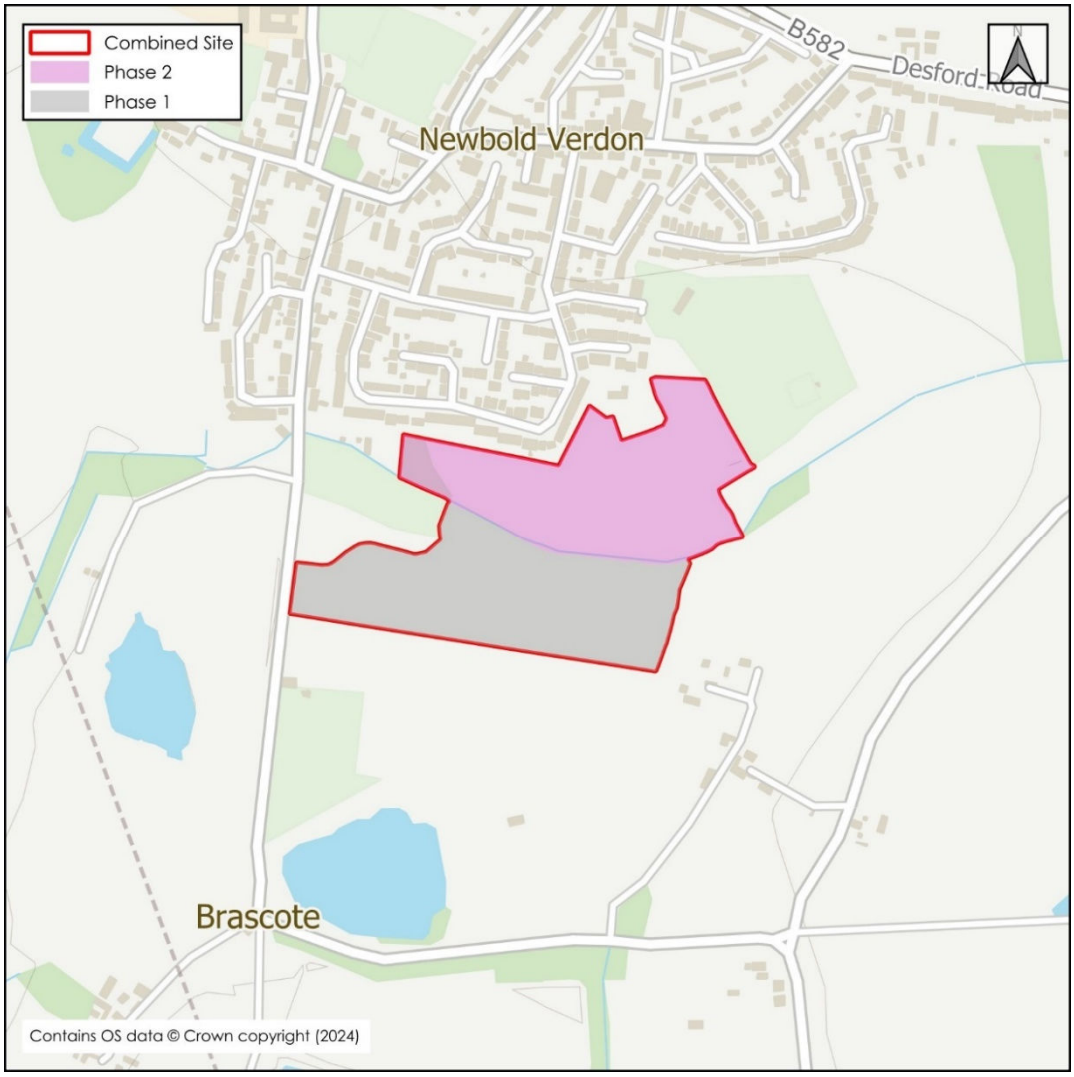


Figure 1.1: Site Location

Table 1.1: Site Details

Site Name	Land Situated to the East of Brascote Lane and South of Arnold's Crescent
Location	Newbold Verdon
NGR (approx.)	SK 4484 0329
Application Site Area (ha)	Combined Site - 13.77 (approx.) Phase 2 Site – 6.86 (approx.)
Developable Area (ha)	4.02(approx.)
Development Type	Residential
Lead Local Flood Authority	Leicestershire County Council
Local Planning Authority	Hinckley and Bosworth Borough Council
Sewerage Undertaker	Severn Trent Water

Sustainable Drainage Guidance

1.8 Sustainable Drainage Systems (SuDS) aim to reduce the impact of development by replicating the natural runoff regime in a sustainable, cost-effective manner, whilst protecting water quality and reducing pollution. The four key objectives of SuDS design are to achieve improvements in water quantity, water quality, amenity provision and biodiversity.

1.9 Leicestershire County Council, in their role as the Lead Local Flood Authority (LLFA), have produced an 'Interim LLFA Guidance Note: Planning and Development in Leicestershire'[1]. This document serves as interim LLFA surface water and flood risk guidance prior to completion of more comprehensive guidance and is to be read in conjunction with 'Planning Applications: Lead Local Flood Authority Statutory Consultation Checklist'[2].

1.10 The LLFA guidance requires a 10% urban creep allowance be applied to the proposed impermeable area and calculations for attenuation requirements should allow for up to the 1 in 100-year return period plus the appropriate allowance for climate change.

1.11 During the planning application for Phase 1 (planning reference: 22/00277/OUT), a comment from the LLFA was received which noted that basins are in close proximity to the watercourse and as such, the peak 1 in 100-year plus climate change level should be considered when setting the base level of these structures. As such, this comment will be considered during the design of the Phase 2 drainage strategy.

1.12 Predicted future changes in peak rainfall intensity caused by climate change are provided by the Environment Agency (EA). Table 2 from the EA's 'Flood risk assessments: climate change allowances'[3], included as **Table 1.2,** shows the anticipated changes in peak rainfall intensity for the site.

Table 1.2: Peak Rainfall Climate Change Allowances for the Soar Management Catchment

Soar Management Catchment Allowance	Total Potential Change Anticipated for the '2050s' (Lifetime up to 2060)	Total Potential Change Anticipated for the '2070s' (2061 to 2125)
1 in 30-Year Rainfall Event		
Upper End	35%	35%
Central	20%	25%
1 in 100-Year Rainfall Event		
Upper End	40%	40%

[1] Interim LLFA Guidance Note: Planning and Development in Leicestershire (Leicestershire County Council, October 2018) available at: https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2018/10/11/LLFA-checklist-interim-guidance.pdf
[2] Planning Applications: Lead Local Flood Authority Statutory Consultation Checklist (Leicestershire County Council, October 2018) available at: https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2018/10/11/LLFA-checklist.pdf
[3] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Soar Management Catchment Allowance	Total Potential Change Anticipated for the '2050s' (Lifetime up to 2060)	Total Potential Change Anticipated for the '2070s' (2061 to 2125)
Central	20%	25%

1.13 The EA's guidance on peak rainfall intensity climate change allowances states that residential development should be considered to have a minimum lifetime of 100 years. Therefore, the proposed development falls into the 2070s epoch.

1.14 Based on the guidance detailed above, a climate change allowance of 40% has been applied to the calculations. It should be noted that the 1 in 30-year plus 35% climate change event will need to be considered at the detailed design stage.

1.15 The Non-Statutory Technical Standards (NSTS) for Sustainable Drainage Systems[4], CIRIA SuDS Manual[5] and the Sewerage Sector Guidance 'Design and Construction Guidance[6] (DCG) have also been used to inform the production of this SDS.

[4] 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems
[5] The SuDS Manual (C753). CIRIA 2015.
[6] Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code") (November 2023) available at: https://www.water.org.uk/sites/default/files/2023-11/SSG%20Appendix%20C%20-%20Design%20and%20Construction%20Guidance%20v2-3_0.pdf

2. EXISTING CONDITIONS

2.1 A topographical survey of the site is included as **Appendix 2**. The site is shown to generally fall in a south-easterly direction, with levels ranging from approximately 129.6metres Above Ordnance Datum (m AOD) in the north-east to approximately 122.9m AOD along the south-western boundary.

2.2 British Geological Survey (BGS) mapping shows the site to be underlain by Gunthorpe Member (Mudstone), which is designated by the EA as a Secondary B Aquifer. Secondary B Aquifers are defined as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

2.3 BGS mapping shows Glaciofluvial Deposits (Sand and Gravel) to be present across the majority of the site. It also depicts Alluvium (Clay, Silt, Sand and Gravel) deposits in the south of the site, adjacent to the watercourse channel. Both these superficial deposits are designated as Secondary A Aquifers, which are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

2.4 Severn Trent Water (STW) sewer records (**Appendix 3**) show several sewers to be located within the site. A 100mm diameter combined sewer is shown to be located to the north of the site and flows in a southerly direction from the residential development. The outfall for this sewer is not known. A 225mm diameter foul sewer is shown to flow through the centre of the site in a westerly direction towards the residential development, where the depth to inverts of the two 9301 and 8301 are 3.133 and 2.78m respectively. To the west of the site, there is a 225mm diameter surface water sewer which marginally crosses the western boundary and flows in a southerly direction from Arnold's Crescent and outfalls to the Thurlaston Brook.

2.5 Based upon the DCG, it is assumed that these sewers will have easements of 5m from the centreline of the sewer.

2.6 An existing inspection chamber is identified within the topographical survey. This is considered to be a private asset independent of the public sewer network. It is recommended that any existing private drainage infrastructure is surveyed to inform the detailed design stage.

2.7 The Thurlaston Brook is located towards the south of the site and therefore a 8m easement from the top of bank of the watercourse will be required. The accompanying FRA notes the site is located entirely within Flood Zone 1, however the Thurlaston Brook has not been represented within the EA's Flood Map for Planning and therefore a hydraulic modelling study has been completed by BWB Consulting to provide a detailed undertaking of fluvial flooding at the site. This is further discussed within the associated FRA (ref: 243693-BWB-ZZ-XX-T-0002_FRA).

2.8 The Hinckley and Bosworth Borough Council Level 1 SFRA[7] highlights the site to be in an area at a moderate (50% up to 75%) susceptibility to groundwater flooding.

2.9 Given the greenfield nature of the site, topographical features and underlying geology, it is likely that the existing drainage regime comprises limited infiltration followed by surface water runoff which will follow the topography and flow towards the Thurlaston Brook.

Existing Runoff Rates

2.10 An assessment of the existing surface water runoff rates per hectare has been undertaken and is summarised within **Table 2.1**. Calculations are included within **Appendix 4**.

2.11 The runoff rates have been estimated using the IH124 method, with appropriate prorated adjustments for a site of less than 50ha, as recommended in Interim Code of Practice for Sustainable Drainage[8]. This was undertaken within Micro Drainage, which makes the necessary adjustments for small sites automatically.

Table 2.1: Existing Runoff Rate per hectare

Return Period (Yrs.)	Runoff Rate (l/s/ha)
1	3.6
Mean Annual Flow Rate (QBAR)	4.4
30	8.6
100	11.3

Existing Runoff Volume

2.12 An assessment of the existing surface water runoff rates from the area proposed for development (4.02ha) has been made for a 1 in 100-year, 6-hour storm.

2.13 As the existing site is permeable, the runoff volume has been calculated using the Source Control module within Micro Drainage to be 1,184m^3, results are included within **Appendix 5**.

[7] Level 1 Strategic Flood Risk Assessment (JBA Consulting, July 2019)
[8] The National SUDS Working Group (2004), Interim Code of Practice for Sustainable Drainage

3. SURFACE WATER DRAINAGE STRATEGY

3.1 The site has an approximate total area of 6.86ha and an approximate development area of 4.02ha has been measured from the proposed development framework plan (**Appendix 1**). It is assumed that 65% of the development area will be impermeable and an additional 10% allowance for urban creep will be applied as outlined within the local guidance. 100% of the proposed basin footprints are included within the development area and proposed impermeable area.

3.2 The site has been divided into three catchments based upon topography and development aspirations. Details of the catchments are presented in **Table 3.1**.

Table 3.1: Catchment Details

Catchment	Developable Area (ha) (including basin footprint)	Impermeable Area (ha) (including 10% urban creep and basin footprint)
1	1.96	1.47
2	0.56	0.43
3	1.50	1.11
Total	**4.02**	**3.01**

Drainage Hierarchy

3.3 The Planning Policy Guidance[9] and the SuDS Manual identify that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable:

i. into the ground (infiltration);
ii. to a surface water body;
iii. to a surface water sewer, highway drain, or another drainage system;
iv. to a combined sewer.

3.4 The aim of this is approach is to manage surface water runoff close to where it falls and mimic natural drainage as closely as possible.

Infiltration

3.5 The site is underlain by mudstone bedrock geology and due to the proximity of the watercourse and the sites' location within an area considered to be at a moderate (50% up to 75%) susceptibility to groundwater flooding, it is assumed that there may be shallow groundwater in proximity to the watercourse. It is therefore assumed that infiltration is not viable within the site. As the scheme progresses, it is recommended that infiltration testing is undertaken in accordance with BRE365. If infiltration is found to be a

[9] Planning Practice Guidance. http://planningguidance.planningportal.gov.uk/.

suitable method of discharging surface water from the development, this strategy should be revised in accordance with the above hierarchy.

Discharge to Surface Water Body

3.6 Due to the close proximity of the Thurlaston Brook, it is proposed to discharge surface water from the site to this watercourse. Given the topography naturally falls to the watercourse, a gravity connection to the watercourse is considered to be viable, mimicking the pre-development conditions.

Peak Flow Control

3.7 In order to comply with the Non-Statutory Technical Standards for Sustainable Drainage Systems S2-S3[10], runoff from greenfield developments should not exceed the equivalent greenfield rates.

3.8 To comply with the peak flow control criterion, it is proposed to restrict flows from the development to the receiving watercourse to the equivalent greenfield QBAR for all events up to the 1 in 100-year plus climate change event. This is summarised within **Table 3.2**.

Table 3.2: Existing and Proposed Runoff Rates

Return Period (Yr.)	Existing Runoff Rate (l/s/ha)	Existing Runoff Rate (4.02ha) (l/s)	Proposed Discharge Rate (l/s)
1	3.6	14.5	17.7
QBAR	4.4	17.7	
30	8.6	34.6	
100	11.3	45.4	
100 + 40%	-	-	

3.9 The proposed discharge rate will be proportionally distributed across the three catchments. This is summarised within **Table 3.3**.

[10] 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems

Table 3.3: Proposed Runoff Rates per Catchment

Catchment	Proposed Runoff Rate (l/s)
1	8.6
2	2.5
3	6.6
Total	**17.7**

Attenuated Storage

3.10 As the development proposals require a restricted runoff rate, it will be necessary to provide attenuated storage to balance the excess volume in a safe manner within the site.

3.11 The surface water storage should be located within the site in a position where it can receive runoff from the development and discharge from the site by gravity, and also is in a position where it is hydraulically isolated from any fluvial floodplain that may be present within the site. The surface water attenuation will be located to the south of the site whilst remaining outside the post-development modelled flood extents associated with the Thurlaston Brook.

3.12 Sufficient storage for events up to the 1 in 100-year storm with an allowance for climate change should be provided, and a 10% allowance should be applied to the proposed impermeable area to allow for urban creep over the lifetime of the development.

3.13 After considering the site constraints and development aspirations it is suggested that the necessary surface water storage volume is found within a series of detention basins located at the lowest elevation of the site, between the proposed development and the outfall location.

3.14 For the purpose of this outline assessment, it has been assumed that the basin will accommodate all of the necessary storage, but it may be possible to redistribute a portion of the storage within other drainage components during the detailed design of the development (e.g.: in the pipe network, swales, filter drains, etc).

3.15 A simulation has been run using Micro Drainage 'Source Control' to identify the necessary storage provision. Using the flow rates shown in **Table 3.3**, and applying a 10% allowance to the proposed impermeable area, the volume of attenuated storage required for the development has been calculated for storm events up to the 100 year + 40% storm. The results are summarised in **Table 3.4** and calculations are included as **Appendix 6**.

Table 3.4: Outline Attenuated Storage Requirements

Rainfall Method	Critical Storm	Maximum Volume (m^3)
Catchment 1		
Flood Studies Report (FSR)	720 min Winter	1011
Flood Estimation Handbook (FEH)	720 min Winter	1077
Catchment 2		
FSR	720 min Winter	289
FEH	600 min Winter	309
Catchment 3		
FSR	600 min Winter	745
FEH	600 min Winter	796
Total		
FSR	-	2,045
FEH	-	2,182

3.16 At this outline design stage it is expected that a minimum of 2,182m^3 of attenuated storage will be provided to cater for the maximum anticipated runoff volume for all storm durations up to the 1 in 100-year return period storm, including a 40% climate change allowance and future urban creep.

3.17 It is envisaged that the final required attenuated storage volume will be determined during the detailed design stage, once the development layout and drainage areas are fixed.

Runoff Volume Control

3.18 The Non-Statutory Technical Standards for Sustainable Drainage Systems S4-S6[11] states that where reasonably practical the runoff volume from a development for the 1 in 100-year 6-hour rainfall event should not exceed the runoff volume prior to development or redevelopment. Additionally, if practicable on previously developed sites, the runoff volume should not exceed the equivalent greenfield runoff volume. Where it is not reasonably practicable to constrain the volume of runoff from a development at or below the existing volume, then the runoff must be discharged in a manner that does not adversely affect flood risk, i.e.:

[11] 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems

i. The additional runoff volume resulting from the development (the 'long term storage volume') should be discharged separately from the site at a rate of 2l/s/ha or less. Or,

ii. All the runoff volume from the development should be discharged at a rate equivalent to the mean annual flow rate (QBAR) rate under greenfield conditions or less. Or,

iii. All the runoff volume from the development should be discharged at a rate of 2l/s/ha or less.

3.19 The existing and post-development runoff volumes during the 1 in 100-year 6-hour storm are compared within **Table 3.5**.

3.20 The post-development runoff volume from the impermeable portion of the proposed development (3.01ha) has been calculated using the formula outlined within **Figure 3.1**. The average rainfall intensity was calculated using FEH rainfall data within Micro Drainage. The 1 in 100-year 6-hour rainfall profile is provided in **Appendix 7**.

Av. Rainfall (m/hr) x 6 (hours) x Impermeable Area (m^2) = Runoff Volume (m^3)

0.011333 x 6 x 30,100 = 2,047

Figure 3.1: 1 in 100-Year, 6 Hour Runoff Volume

3.21 The post-development run off volume for the remaining permeable area (1.01ha) was calculated using MicroDrainage. The calculations for this are included in **Appendix 7**.

Table 3.5: Runoff Volume Comparison

Existing Volume (m^3)	Proposed Volume (m^3)		Difference (m^3)
	Permeable	Impermeable	
1,184	298	2,047	+1,160

3.22 The 1 in 100-year 6-hour storm runoff volume from the site has been shown to increase as a result of the proposed development. However, as the runoff volume from the development will be discharged at a rate equivalent to the mean annual flow rate (QBAR) rate under greenfield conditions, the volume control criteria will be met.

Sustainable Drainage Systems

3.23 A Conceptual Drainage Strategy is included as **Appendix 8** (ref: NVP2-BWB-ZZ-XX-D-W-0001) and demonstrates how the required storage volume can be achieved within the site.

3.24 Surface water runoff will be stored in a series of above ground detention basins located within the south of the site. The detention basins have been modelled with a total depth ranging between 1.0m and 1.3m and include a 400mm freeboard in the 1 in 100-year + 40% climate change event.

3.25 The detention basins should be appropriately planted to provide a primary level of treatment through filtration. It is recommended that the detention basins have a variable depth, permanent water level and low flow channel, the details of which should be agreed and advised during the detailed design stage. Due to the possibility of shallow groundwater within the site, it is recommended that the basins be lined with an impermeable layer and sufficiently tied down to prevent the emergence of groundwater within the basin.

3.26 Further levels of treatment will be provided via rain gardens located within the proposed development. These features will provide water quality, amenity and biodiversity benefits.

3.27 During the planning application for Phase 1 (planning reference: 22/00277/OUT), a comment from the LLFA was received which noted that basins are in close proximity to the watercourse and as such, the peak 1 in 100-year plus climate change level should be considered when setting the base level of these structures. This has been considered and the basin inverts have been raised above the peak flood levels for the modelled 1 in 100-year + CC fluvial event, as shown in the conceptual drainage strategy included as **Appendix 8**.

Water Quality

3.28 In accordance with the SuDS Manual a simple index approach to water quality risk management should be undertaken for the proposed development. This will be compiled to provide a comprehensive account of the water quality treatment provided by the proposed surface water drainage system.

3.29 The SuDS Manual Mitigation Index has been used to assess the treatment levels proposed in relation to the pollution hazard posed from the proposed land uses. This methodology is adopted to ensure that surface water flows receive adequate treatment through all areas of the site prior to final outfall.

3.30 **Table 3.6** shows the pollution hazard indices for the land use classifications that are relevant to the proposed development.

Table 3.6: Pollution Hazard Indices for Different Land Use Classifications

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Low traffic roads, individual property driveways and residential car parks	Low	0.5	0.4	0.4

3.31 The SuDS Mitigation Indices that are relevant to the proposed development, as described within Table 26.3 of the SuDS Manual, are outlined in **Table 3.7.**

Table 3.7: SuDS Mitigation Indices

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Detention Basin	0.5	0.5	0.6

3.32 The pollution hazard rating and proposed SuDS Mitigation Index for the site is compared within **Table 3.8**. Where more than one SuDS component is proposed, a factor of 0.5 should be applied to the downstream (i.e., secondary and/or tertiary) treatment stages to account for the reduced performance due to reduced inflow concentrations.

Table 3.8: Comparison of Pollution Hazard Rating against Proposed Mitigation Index

Pollution Type	Pollution Hazard Rating*	Proposed Mitigation Index*	Sufficient Treatment Provided?
TSS	0.5	0.5	✓
Metals	0.4	0.5	✓
Hydrocarbons	0.4	0.6	✓

* Worst case scenario for pollution hazard rating

3.33 Based on the above assessment, the proposed drainage strategy is considered to provide an appropriate level of treatment to surface water prior to discharge from the site. Rain gardens are included within the proposed drainage strategy and will provide an additional level of treatment to some areas of the site .

Residual Risk and Designing for Exceedance

3.34 It is proposed that the development will utilise the road network to guide drainage exceedance routes through the development to the nearest drainage point for events in excess of the capacity of the drainage system.

3.35 In the event that the capacity of the proposed attenuation features is exceeded, it is proposed that exceedance flows will follow the natural topography and flow towards Thurlaston Brook located to the south of the site.

3.36 In addition to the volume of storage provided within the main attenuation, there will be capacity within upstream pipes, manholes and additional SuDS features which has not been accounted for at this stage and a further level of redundancy to the network will therefore be provided.

3.37 A 400mm freeboard has been provided in the 1 in 100-year + 40% climate change scenario.

4. MAINTENANCE

4.1 The proposed drainage system should be designed in accordance with the DCG and posed for adoption by STW. Any features which remain unadopted, or until the point that they are, should be maintained by a private management company. The private drainage within the curtilage will be the responsibility of the private homeowners.

4.2 Requirements for ongoing maintenance of the drainage network should form part of the Operation and Maintenance manual for the site. Any specialist or proprietary products that are specified at detailed design should have a manufacturer specific maintenance regime which should be included within the document.

4.3 It is envisaged that the Operation and Maintenance manual will be developed at the detailed design stage, but some examples are included below.

i. All drainage features should be located in open areas which are readily accessible.

ii. Gullies should be inspected and de-silted at least once a year, where necessary.

iii. Pipes, manholes and silt traps should be inspected and de-silted at least once a year, where necessary.

iv. The surface water attenuation basins will be predominantly dry, and the base will be seeded with a wildflower grass seed mix that can tolerate wet ground conditions.

v. Regular inspections of the attenuation basins should be undertaken to remove litter/debris, invasive/colonising vegetation and silt build up as necessary. Inlet and outlet structures to be regularly inspected, with remedial work as required to maintain water flows and prevent silt/vegetation build up.

vi. Vegetation/grass with the attenuation basins should be maintained appropriately to allow establishment and promote habitat formation, without impeding the operation of the inlet and outlet structure.

vii. Vortex flow controls should be inspected every 6 months, litter/debris and silt build up should be removed as necessary.

5. FOUL WATER DRAINAGE

5.1 It is proposed to drain foul water from the development separately to surface water. As the site is currently undeveloped, a new connection will be required. It is therefore proposed that foul water from the proposed development will outfall to the existing STW public sewer network at the closest connection point available.

5.2 STW sewer records show an existing 225mm foul sewer to flow through the north of the site. It is proposed to discharge foul flows from the development into this existing sewer network.

5.3 A Developer's Enquiry (which is included in **Appendix 3**) was submitted to STW to determine the capacity of the network to receive foul flows from the development. The Developer's Enquiry response highlights that the nearest manhole suitable for a gravity connection is the 300mm diameter foul sewer located within the grass verge off Brascote Lane. The response states that modelling will be required to understand the impact on the receiving sewerage treatment works. However, it is noted in the pre-development enquiry that there are no public sewers located within the site, contrary to the sewer records provided. Due to the distance between the site and the point of connection proposed by STW, it is proposed to outfall into the foul sewer located within the site. However, further communication is required with STW to confirm that this is a suitable point of connection.

5.4 Due to the levels within the site, a gravity connection to the public foul water network is not considered to be possible. Therefore, a pumping station will be required. The pumping station, proposed to be located in the west of the site, will require a 15m easement from the pumping station wet well and any dwellings or third-party land. The pumping station will require vehicular access, appropriate for a tanker and be designed in accordance with the Water UK Sewerage Sector Guidance Appendix C – Design and Construction Guidance12 (DCG).

5.5 The proposed foul water outfall and indicative pumping station location is shown on the Conceptual Drainage Strategy presented as **Appendix 8**.

5.6 A S106 (Water Industry Act 1991) application should be made to STW for approval prior to a connection being made.

[12] Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code") (November 2023) available at: https://www.water.org.uk/sites/default/files/2023-11/SSG%20Appendix%20C%20-%20Design%20and%20Construction%20Guidance%20v2-3_0.pdf

6. SUMMARY

6.1 This statement and supporting appendices demonstrate that the drainage design for the development will comply with the relevant local and national standards, specifically the hierarchy of discharge, runoff rate and volume criterion.

6.2 This SDS is intended to support an outline planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

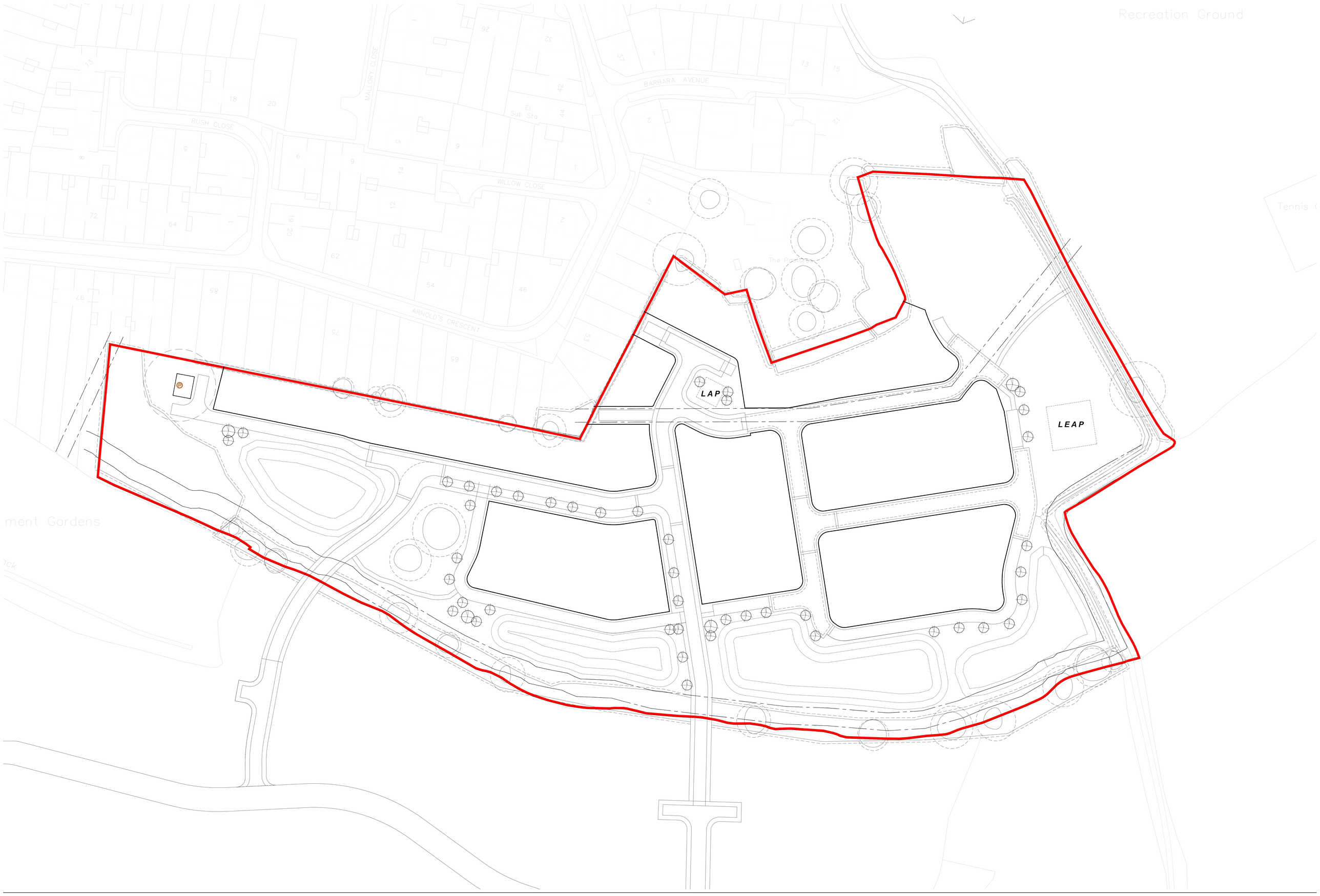
Table 6.1: Sustainable Drainage Statement Summary

		Existing Site	Proposed Development
Site Area (Ha)		13.77 (approx.)	
Developable Area (Ha)		-	4.02
Impermeable Area (Ha)		-	3.01
Outfall Location		Watercourse	Watercourse
Peak Runoff Rate (l/s)	**QBAR**	17.7	17.7
	1 in 30-Year	34.6	
	1 in 100-Year	45.4	
	1 in 100-Year + CC	-	
Runoff Volume (100yr RP 6 hour Storm)		1,185m^3	2,345m^3
Volume Control		-	Discharge rate limited to QBAR
Proposed Storage Volume		-	2,182m^3
Flow Control Type		-	Vortex
SuDS Features		-	Rain Garden Detention Basin
Maintenance Responsibility		-	Sewerage Undertaker, management company, home owners

6.3 It is envisaged that the final drainage strategy will be determined during the detailed design stage, as the development layout is finalised.

APPENDICES

Appendix 1: Proposed Development Framework Plan



0 5m 10m 15m 20m 25m 30m

Status PLANNING

Client: Richborough

Project title: Land South of Arnold's Crescent Newbold Verdon

Drawing title: Development Framework Plan

Scale: 1:500@A0
Date: June 2024
Drawn by: JMP
Checked by: LH
Drawing no.: 902832.36.03
Revision: E

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Bristol, BS2 0ZX
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Appendix 2: Topographical Survey

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in metres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. No scale factor has been applied to this survey, therefore the os coordinates are to be treated as arbitrary. Please refer to survey station information below for on site control establishment.
6. All coordinates and height data relate to OSGB36(15). Control stations are coordinated by means of GPS receiving real time corrections via OS smart net.
7. All manhole data is collected from ground level therefore discrepancies may occur. More accurate data is only achievable via confined space entry.
8. OS license number: 100022432

Key Plan

Legend

	OS Buildings		Contour Lines		
	Surveyed Buildings		Inspection Chamber		
	Building	0.25 / 1	Flow direction and pipe diameter		
	Wall		Station and Name		
	Kerb Channel Line	BH 1	Monitoring Borehole		
	Top of Kerb		Tree / Bush / Sapling		
	Edge of Surface		Area of Vegetation/ Extent of Tree Canopy		
	Top of Bank		Hedge		
	Bottom of Bank		Body of Water		
	Canopy / Overhang		Body of Water from OS		
	Line Marking	50.00	Spot Level		
	Centre Line		Assumed Surface Water Drainage Line		
	Watercourse Centre Line		Surface Water Drainage Line		
	Barrier				
	Fence				
	Gate				
	Overhead Powerline				
	Overhead Utilities				

AP	Anchor Point	FBW	Fence Barbed Wire	LB	Litter Bin
BG	Back Gully	FCB	Fence Closed Board	LP	Lamp Post
BO	Bollard	FCL	Fence Chain Link	MH	Manhole
BS	Bus Stop	FEL	Fence Electric	Mkr	Service Marker
BT	British Telecom	FMP	Fence Metal Panel	PB	Post Box
C	Crest	FMR	Fence Metal Railing	PT	Post
CL	Cover Level	FOB	Fence Open Board	RE	Rodding Eye
CMP	Cable Marker Post	FPW	Fence Post & Wire	SP	Sign Post
		FSP	Fence Steel Palisade	ST	Stop Tap
CCTV	Security Camera	FWM	Fence Wire Mesh	SV	Stop Valve
CTV	Cable TV	FFL	Finished Floor Level	TCB	Telephone Call Box
DC	Drainage Channel	FP	Flagpole	THL	Threshold Level
		Gas	Gas	TL	Traffic Light
DK	Drop Kerb	GV	Gas Valve	TP	Telegraph Post
DP	Down Pipe	GY	Gully	TS	Traffic Signal
Elec	Electric	Ht	Height	UTS	Unable to Survey
EP	Electricity Post	IC	Inspection Chamber	WL	Water Level
ER	Earth Rod	IFL	Internal Floor Level	WM	Water Meter
FH	Fire Hydrant	IL	Invert Level (as a reduced level)	WO	Wash Out
FL	Floodlight				

Rev	Date	Details of issue / revision	Drw	Rev
P1	22.02.24	First Issue	IR	DS

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Client

Richborough Estates Ltd

Project Title

Newbold Verdon Phase 2

Drawing Title

Existing Site 2D Plan Sheet 1 of 2

Drawn:	I.Riley		Reviewed:	D.Smith	
BWB Ref:	243693	Date:	22.02.24	Scale@A1:	1:500

Drawing Status

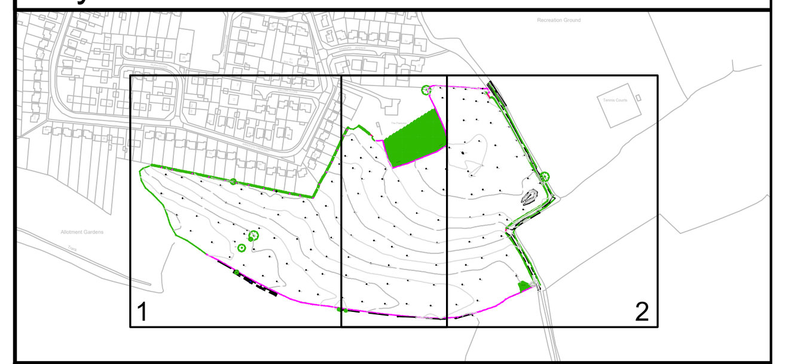
INFORMATION

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
NVP2-BWB-00-01-DR-G-001	S2	P1

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in metres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. No scale factor has been applied to this survey, therefore the os coordinates are to be treated as arbitrary. Please refer to survey station information below for on site control establishment.
6. All coordinates and height data relate to OSGB36(15). Control stations are coordinated by means of GPS receiving real time corrections via OS smart net.
7. All manhole data is collected from ground level therefore discrepancies may occur. More accurate data is only achievable via confined space entry.
8. OS license number: 100022432

Key Plan



Legend

OS Buildings
Surveyed Buildings
Building
Wall
Kerb Channel Line
Top of Kerb
Edge of Surface
Top of Bank
Bottom of Bank
Canopy / Overhang
Line Marking
Centre Line
Watercourse Centre Line
Barrier
Fence
Gate
Overhead Powerline
Overhead Utilities
Contour Lines
Inspection Chamber
Flow direction and pipe diameter (0.25)
Station and Name (1)
Monitoring Borehole (BH 1)
Tree / Bush / Sapling
Area of Vegetation/ Extent of Tree Canopy
Hedge
Body of Water
Body of Water from OS
Spot Level (+50.00)
Assumed Surface Water Drainage Line
Surface Water Drainage Line

AP	Anchor Point	FBW	Fence Barbed Wire	LB	Litter Bin
BG	Back Gully	FCB	Fence Closed Board	LP	Lamp Post
BO	Bollard	FCL	Fence Chain Link	MH	Manhole
BS	Bus Stop	FEL	Fence Electric	Mkr	Service Marker
BT	British Telecom	FMP	Fence Metal Panel	PB	Post Box
C	Crest	FMR	Fence Metal Railing	PT	Post
CL	Cover Level	FOB	Fence Open Board	RE	Rodding Eye
CMP	Cable Marker Post	FPW	Fence Post & Wire	SP	Sign Post
		FSP	Fence Steel Palisade	ST	Stop Tap
CCTV	Security Camera	FWM	Fence Wire Mesh	SV	Stop Valve
CTV	Cable TV	FFL	Finished Floor Level	TCB	Telephone Call Box
DC	Drainage Channel	FP	Flagpole		
		Gas	Gas	THL	Threshold Level
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FL	Floodlight			WO	Wash Out

Rev	Date	Details of issue / revision	Drw	Rev
P1	22.02.24	First Issue	IR	DS

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Client
Richborough Estates Ltd

Project Title
Newbold Verdon Phase 2

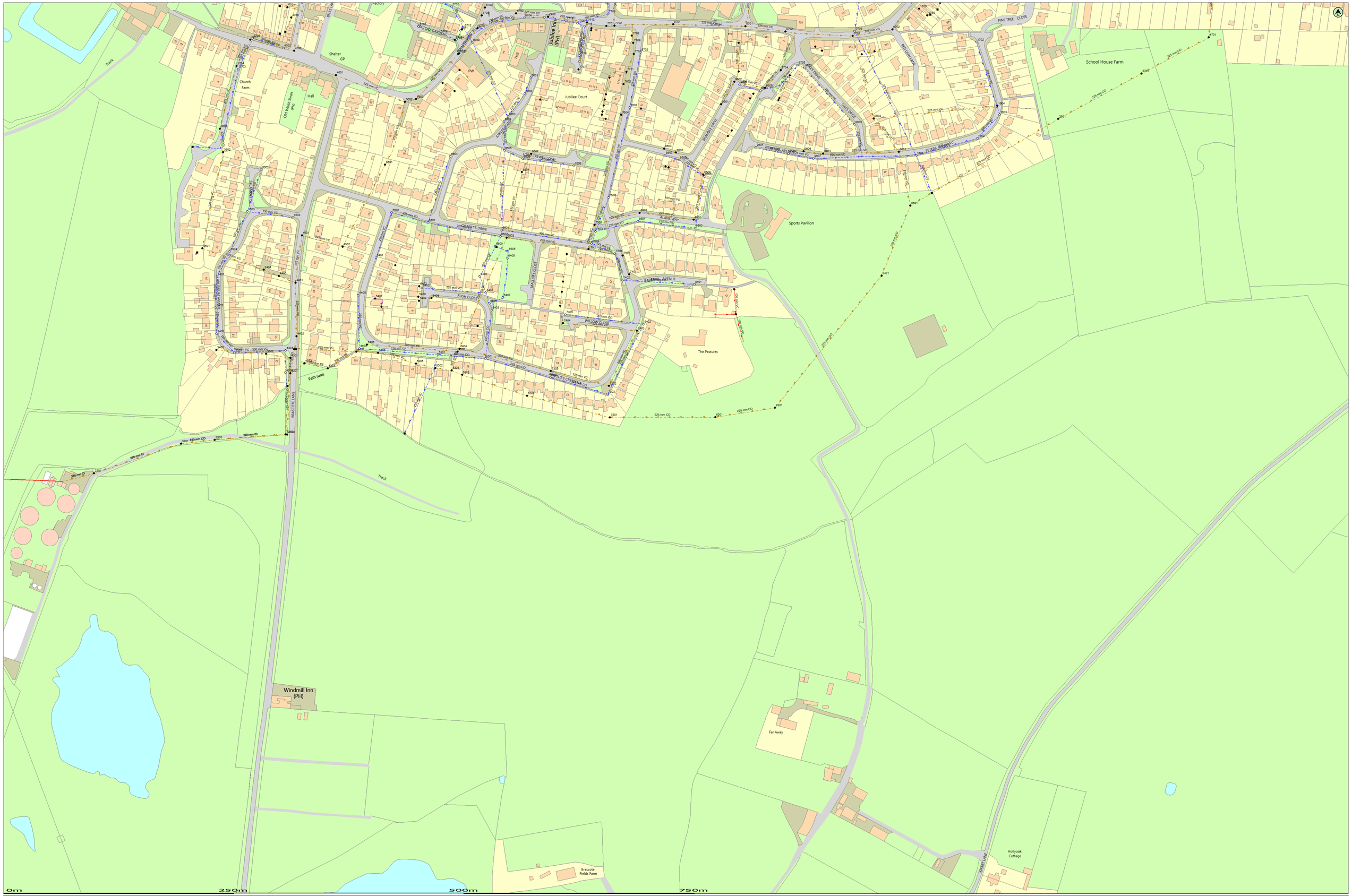
Drawing Title
Existing Site 2D Plan Sheet 2 of 2

Drawn:	I.Riley	Reviewed:	D.Smith
BWB Ref: 243693	Date: 22.02.24	Scale@A1:	1:500

Drawing Status
INFORMATION

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
NVP2-BWB-00-02-DR-G-001	S2	P1

Appendix 3: Severn Trent Water Sewer Records and Pre-Development Enquiry Response



Date: 13/02/24 | Scale: 1:1250 | Map Centre: 444840,303293 | Data updated: 14/01/24 | Our Ref: 1394154 - 1 | Wastewater Plan A0

Public Foul Gravity/Lateral Drain
Public Combined Gravity/Lateral Drain
Public Surface Water Gravity/Lateral Drain
Pressure Foul
Pressure Combined
Pressure Surface Water
Highway Drain
Overflow Pipe
Disposal Pipe
Culverted Water Course
Pumping Station
Fitting
Manhole Foul
Manhole Surface
Abandoned Pipe
Chamber
Section 104 sewers are shown in green
Private sewers are shown in magenta

monika.ivanova@bwbconsulting.com
243693

SEVERN TRENT

GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:
0800 783 4444 (24 hours)

a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991(a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as "STW Apparatus" in these general conditions and precautions.

b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.

c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.

d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.

e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).

f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.

2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).

3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.

4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.

5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.

6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.

7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.

8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.

9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.

10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.

11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.

12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.

13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,

14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

TREE PLANTING RESTRICTIONS

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.

16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.

17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May 2014

18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.

19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main of other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
	C		0	0
	C		0	0
	C		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
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	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
	F		0	0
0401	F	129.12	127.1	2.02
0501	F	129.61	127.51	2.1
0601	F	130.09	127.92	2.17
0603	F	130.58	128.26	2.32
0604	F	130.5	0	0
0701	F	130.15	128.43	1.72
0702	F	130.36	128.57	1.79
1604	F	130.6	129.67	0.93
1700	F		0	0
1703	F		0	0
1750	F		0	0
2201	F	121.94	120.94	1
2601	F	130.27	128.29	1.98
3201	F	122.23	121.37	0.86
3302	F	123.33	0	0
3303	F	122.52	121.51	1.01
3404	F		0	0
3405	F	123.45	122.66	0.79
3501	F	125.97	124.88	1.09
3601	F	129.92	126.91	3.01
3602	F	129.15	126.44	2.71
3701	F	130.79	128.53	2.26
3701	F	130.63	127.69	2.94
3704	F	0	0	0
4300	F	124.36	122.65	1.71
4301	F	123.28	121.92	1.36
4302	F	122.83	122.09	0.74
4303	F	123.05	121.96	1.09
4307	F	122.95	121.93	1.02
4309	F	122.87	121.76	1.11
4310	F	122.85	121.76	1.09
4400	F		0	0
4401	F	126.01	124.19	1.82
4402	F	123.88	122.23	1.65
4501	F	127.97	125.94	2.03
4502	F	128.1	126.01	2.09
4601	F	130.75	128.9	1.85
4700	F		0	0
4701	F		0	0
4701	F		0	0
4702	F	130.81	128.21	2.6
5302	F		0	0
5303	F	124.36	123.26	1.1
5305	F	123.96	123.12	0.84
5306	F	124.28	122.92	1.36
5400	F		0	0
5403	F		0	0
5404	F		0	0
5405	F		0	0
5406	F	125.1	122.76	2.34
5407	F		0	0
5601	F		0	0
5602	F	130.3	128	2.3
5603	F	130.19	128.15	2.04
5705	F	130.03	128.52	1.51
6300	F	124.53	123.06	1.47
6302	F		0	0
6303	F		0	0
6404	F	124.77	123.56	1.21
6503	F	127.74	125.52	2.22
6504	F	128.23	126.6	1.63
6607	F	129.08	127.13	1.95
6700	F		37.36	0
6702	F	130.06	128.5	1.56
6703	F	130.52	128.83	1.69
6705	F	130.22	128.64	1.58
6708	F	129.63	128.3	1.33
6714	F	129.75	0	0
7301	F		0	0
7302	F	127.19	125.6	1.59
7305	F	126.8	124.84	1.96
7401	F	129.57	128.31	1.26
7403	F	128.78	126.39	2.39
7404	F	128.51	127.26	1.25
7501	F	129.55	127.8	1.75
7505	F	129.97	128.16	1.81
7507	F	129.74	128.27	1.47
7602	F		0	0
7604	F	131.45	129.73	1.72
7701	F	131.04	129.72	1.32
7702	F	131.06	129.67	1.39
7706	F	130.74	129.2	1.54
7708	F	131.28	130.15	1.13
7709	F	131.5	130.3	1.2
7710	F	131.73	130.43	1.3
7711	F	131.89	130.72	1.17
7713	F	99.28	97.79	1.49
7717	F	99.88	98.37	1.51
8301	F	128.72	125.94	2.78
8501	F	130.51	129.27	1.24
8503	F	130.4	128.7	1.7
8506	F		0	0
8601	F	131.73	129.9	1.83
8604	F	131.26	129.96	1.3
8605	F	131.17	129.87	1.3
8701	F	131.16	129.37	1.79
9301	F	129.77	126.64	3.13
9602	F	131.42	129.62	1.8
9606	F	130.61	128.97	1.64
9609	F	131.45	129.42	2.03
9701	F	130.63	129.12	1.51
9702	F	130.58	128.95	1.63
9704	F	131	129.23	1.77
0602	S	130.67	129.15	1.52
0703	S	130.2	129.12	1.08
1601	S	129.98	128.59	1.39
1602	S	130.27	129.17	1.1
1603	S	130.53	129.41	1.12
1702	S	131.06	129.87	1.19
3301	S	123.13	121.93	1.2
3401	S	125.78	123.98	1.8
3402	S	124.76	122.86	1.9

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
3403	S	123.85	122.26	1.59
3502	S	129.24	127.87	1.37
3503	S	128.21	126.35	1.86
3504	S	126.64	124.87	1.77
3702	S	130.63	128.88	1.75
3703	S	130.57	0	0
4304	S	123.49	121.59	1.9
4305	S		0	0
4403	S	124.48	123.89	0.59
4405	S	127.29	126.01	1.28
4503	S	129.01	127.57	1.44
4703	S	130.48	129.42	1.06
5301	S	124.46	122.58	1.88
5401	S	128.83	127.87	0.96
5402	S	126.81	125.08	1.73
5501	S	128.91	127.33	1.58
5502	S	129.43	127.54	1.89
5604	S	129.73	128.15	1.58
5702	S	130.65	129	1.65
5703	S	130.98	129.34	1.64
5704	S	130.49	128.85	1.64
6301	S	125.32	123.31	2.01
6401	S	126.28	123.65	2.63
6402	S		0	0
6403	S	126.03	123.54	2.49
6405	S	127.38	0	0
6406	S	127.58	0	0
6407	S	127.54	124.28	3.26
6500	S	127.29	0	0
6501	S	127.64	0	0
6502	S	127.76	125.33	2.43
6505	S	127.54	125.85	1.69
6601	S	130.32	129.07	1.25
6602	S	129.78	128.47	1.31
6603	S	129.24	127.83	1.41
6604	S	129.16	127.57	1.59
6605	S	128.59	127.19	1.4
6606	S	128.94	127.57	1.37
6704	S	130.53	129.09	1.44
6706	S	130.08	128.75	1.33
6709	S	129.77	128.15	1.62
6710	S	129.97	128.7	1.28
6711	S	130.15	128.61	1.54
6712	S	130.15	0	0
7303	S	127.09	125.58	1.51
7304	S	126.83	124.59	2.24
7402	S	129.6	127.91	1.69
7405	S	128.49	127.06	1.43
7502	S	129.63	127.47	2.16
7503	S	129.86	127.68	2.18
7504	S	129.85	127.81	2.04
7506	S	130.4	128.31	2.09
7508	S	130.2	128.84	1.36
7603	S	131.53	129.48	2.05
7703	S	131.36	130.04	1.32
7705	S	130.87	129.62	1.25
7707	S	130.69	129.4	1.29
7712	S	130.82	129.83	0.99
7716	S	99.27	98.02	1.25
7718	S	99.79	98.41	1.38
8401	S	130.03	128.44	1.59
8402	S	128.93	126.34	2.59
8502	S	130.49	128.89	1.6
8504	S	130.36	128.43	1.93
8505	S	130.79	129.19	1.6
8602	S	131.11	129.57	1.54
8603	S	131.23	129.66	1.57
8702	S	131.71	130.31	1.4
9601	S	131.47	130.51	0.96
9603	S	131.43	130.36	1.07
9604	S	130.92	129.68	1.24
9605	S	130.69	129.42	1.27
9607	S	130.57	129.29	1.28
9610	S	131.2	130.26	0.94
9703	S	130.76	129.79	0.97
9705	S	130.77	129.88	0.89

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

WONDERFUL ON TAP

Severn Trent Water Ltd
Leicester Water Centre
Gorse Hill
Anstey
Leicester
LE7 7GU

www.stwater.co.uk
Network.Solutions@severntrent.co.uk

Contact: Emma Nowak
Mob: 07970361864

Our ref: 1113316

BWB Consulting
Whitehall Waterfront,
2 Riverside Way,
Leeds,
LS1 4EH.

FAO Lewis Kemp

11th April 2024

Dear Mr Kemp

Proposed Residential Development (145 Houses) at: Brascote Lane, Arnolds Crescent, Newbold Verdon, Hinckley & Bosworth, Leicestershire, LE9 9LA.

X: 444718 / Y: 303117

I refer to your Development Enquiry Request submitted in respect of the above site. Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) referred to below.

Public Sewers in Site – Required Protection

There are no public sewers crossing the proposed development area.

Please Note: On 1st October 2011 many private sewers were transferred into the ownership of Severn Trent Water as public sewers, where two or more properties in separate ownership are served by those sewers. Most of these former private sewers will not be shown on the public sewer records, therefore a full site survey should be carried out prior to any layout design or construction works to identify where these sewers may be and to avoid later delays and possible added costs.

Foul Water Drainage

The closest point of connection for gravity foul flows is at manhole SK44034309 on the existing 300mm foul water sewer northwest of the site, within the grass verge off Brascote Lane.

Given the overall development site, it will be necessary to undertake a hydraulic assessment of the site to understand the impact on the receiving sewerage treatment works.

We would need to undertake further investigations such as sewer modelling to provide more detail, however it is not clear whether the site has been submitted for planning, and as such, we do not have the certainty to invest in these assessments at this time. Additionally, we have fully committed our resource and are in the process of prioritising any remaining work. This includes a full review of all modelling requests we have raised to make sure that modelling is required, and the risk cannot be better understood using other data sources.

In the meantime, as you progress matters for your site, we would appreciate any updates you have regarding the development progression, as we will be reviewing the modelling requirements on a weekly basis. I would therefore be grateful if you would forward as soon as possible the following details:

- Proposed submission of your Planning Application
- Proposed planned start and completion date.
- Planned occupation dates

Surface Water Drainage

Under the terms of Section H of the Building Regulations 2000, the disposal of surface water by means of soakaways should be considered as the primary method. If this is not practical and no watercourse is available as an alternative, the use of sewerage should be considered. In addition, other sustainable drainage methods should also be explored before a discharge to the public sewerage system is considered.

In the event that following testing, it is demonstrated that soakaways would not be possible on the site; satisfactory evidence will need to be submitted. The evidence should be either percolation test results or a statement from the SI consultant (extract or a supplementary letter).

STW will need to be satisfied that all SUDs options have been exhausted before discharge to public sewer. Severn Trent Water expects all surface water from the development to be drained in a

sustainable way to the nearest watercourse or land drainage channel, subject to the developer discussing all aspects of the developments surface water drainage with the Local Lead Flood Authority (LLFA). Any discharge rate to a watercourse or drainage ditch will be determined by the LLFA.

Sewer records show a watercourse that runs adjacent to the site's western boundary. All surface water from the site should seek to discharge to the watercourse, with attenuation and flows in accordance with SGN (Greenfield) or as stipulated by the Lead Local Flood Authority (Local Council Authority), as statutory consultee in the planning process.

The submitted application form states that surface water will not be connecting into the public sewerage system. The enclosed sewer records show a local watercourse/ditch-course running adjacent to the site's northern boundary. A connection into this watercourse should be investigated further, with flow rates to be determined by the LLFA as statutory consultee in the planning process.

New Connections

For any new connections including the use, reuse and indirect to the public sewerage system, the developer will need to submit Section 106 application. Our Developer Services department are responsible for handling all such enquiries and applications. To contact them for an application form and associated guidance notes, please call 0800 707 6600, email new.connections@severntrent.co.uk or download from www.stwater.co.uk

Please quote the above reference number in any future correspondence (including e-mails) with STW Limited. Please send **all correspondence** to the network.solutions@severntrent.co.uk email inbox address, a response will be made within 15 days.

If you require a VAT receipt for the application fee please email MISCINCOME.NC@SEVERNTRENT.CO.UK quoting the above Reference Number.

Please note that Developer Enquiry responses are only valid for 6 months from the date of this letter.

Yours sincerely,

WONDERFUL ON TAP

SEVERN TRENT

Emma Nowak.
Senior Evaluation Technician
Network Solutions
Developer Services

Appendix 4: Greenfield Runoff Rate

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	1.000	Urban	0.000
SAAR (mm)	700	Region Number	Region 4

Results l/s

QBAR Rural	4.4
QBAR Urban	4.4
Q100 years	11.3
Q1 year	3.6
Q30 years	8.6
Q100 years	11.3

Appendix 5: Greenfield Runoff Volume

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.500
Ratio R	0.400
Areal Reduction Factor	1.00
Area (ha)	4.020
SAAR (mm)	700
CWI	105.000
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	46.14
Greenfield Runoff Volume (m^3)	1184.296

Appendix 6: MicroDraiange Attenuation Calculcations

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	124.924	0.234	8.6	381.4	O K
30 min Summer	124.990	0.300	8.6	498.2	O K
60 min Summer	125.055	0.365	8.6	616.0	O K
120 min Summer	125.115	0.425	8.6	727.8	O K
180 min Summer	125.145	0.455	8.6	785.6	O K
240 min Summer	125.162	0.472	8.6	819.3	O K
360 min Summer	125.183	0.493	8.6	859.8	O K
480 min Summer	125.193	0.503	8.6	879.2	O K
600 min Summer	125.196	0.506	8.6	886.5	O K
720 min Summer	125.196	0.506	8.6	886.0	O K
960 min Summer	125.190	0.500	8.6	874.4	O K
1440 min Summer	125.176	0.486	8.6	845.7	O K
2160 min Summer	125.149	0.459	8.6	794.2	O K
2880 min Summer	125.118	0.428	8.6	733.9	O K
4320 min Summer	125.057	0.367	8.6	618.9	O K
5760 min Summer	125.002	0.312	8.6	518.5	O K
7200 min Summer	124.954	0.264	8.6	433.9	O K
8640 min Summer	124.915	0.225	8.6	366.1	O K
10080 min Summer	124.884	0.194	8.5	313.1	O K
15 min Winter	124.951	0.261	8.6	427.9	O K
30 min Winter	125.024	0.334	8.6	559.2	O K
60 min Winter	125.096	0.406	8.6	692.1	O K
120 min Winter	125.162	0.472	8.6	819.8	O K
180 min Winter	125.196	0.506	8.6	885.3	O K
240 min Winter	125.215	0.525	8.6	924.0	O K
360 min Winter	125.239	0.549	8.6	971.9	O K
480 min Winter	125.251	0.561	8.6	996.6	O K
600 min Winter	125.257	0.567	8.6	1008.0	O K
720 min Winter	125.258	0.568	8.6	1011.0	O K
960 min Winter	125.254	0.564	8.6	1001.7	O K
1440 min Winter	125.233	0.543	8.6	959.7	O K
2160 min Winter	125.199	0.509	8.6	891.5	O K
2880 min Winter	125.159	0.469	8.6	812.1	O K
4320 min Winter	125.065	0.375	8.6	633.7	O K
5760 min Winter	124.981	0.291	8.6	482.0	O K
7200 min Winter	124.914	0.224	8.6	363.6	O K
8640 min Winter	124.865	0.175	8.5	281.3	O K
10080 min Winter	124.838	0.148	8.2	235.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	141.183	0.0	340.2	26
30 min Summer	92.653	0.0	450.1	41
60 min Summer	57.877	0.0	610.4	70
120 min Summer	34.893	0.0	737.2	130
180 min Summer	25.590	0.0	810.6	188
240 min Summer	20.406	0.0	861.1	248
360 min Summer	14.835	0.0	936.6	366
480 min Summer	11.820	0.0	991.7	484
600 min Summer	9.902	0.0	1034.6	602
720 min Summer	8.565	0.0	1069.2	720
960 min Summer	6.807	0.0	1120.2	856
1440 min Summer	4.917	0.0	1165.9	1098
2160 min Summer	3.546	0.0	1386.3	1496
2880 min Summer	2.809	0.0	1462.4	1900
4320 min Summer	2.020	0.0	1569.2	2680
5760 min Summer	1.597	0.0	1681.2	3416
7200 min Summer	1.330	0.0	1748.4	4120
8640 min Summer	1.145	0.0	1802.4	4840
10080 min Summer	1.009	0.0	1843.4	5456
15 min Winter	141.183	0.0	383.1	26
30 min Winter	92.653	0.0	503.4	40
60 min Winter	57.877	0.0	684.7	70
120 min Winter	34.893	0.0	825.7	128
180 min Winter	25.590	0.0	907.0	186
240 min Winter	20.406	0.0	962.7	242
360 min Winter	14.835	0.0	1045.4	358
480 min Winter	11.820	0.0	1104.8	474
600 min Winter	9.902	0.0	1149.9	588
720 min Winter	8.565	0.0	1184.8	698
960 min Winter	6.807	0.0	1230.7	914
1440 min Winter	4.917	0.0	1233.4	1154
2160 min Winter	3.546	0.0	1553.0	1608
2880 min Winter	2.809	0.0	1637.4	2076
4320 min Winter	2.020	0.0	1757.4	2896
5760 min Winter	1.597	0.0	1884.1	3632
7200 min Winter	1.330	0.0	1959.7	4320
8640 min Winter	1.145	0.0	2020.9	4856
10080 min Winter	1.009	0.0	2068.6	5440

Rainfall Details

Rainfall Model	FSR	Ratio R	0.400	Cv (Winter)	0.840
Return Period (years)	100	Summer Storms	Yes	Shortest Storm (mins)	15
Region	England and Wales	Winter Storms	Yes	Longest Storm (mins)	10080
M5-60 (mm)	20.400	Cv (Summer)	0.750	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.470

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.490	4	8	0.490	8	12	0.490

Model Details

Storage is Online Cover Level (m) 125.690

Tank or Pond Structure

Invert Level (m) 124.690

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1530.0	0.600	2070.0	1.000	2450.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0141-8600-0600-8600	Sump Available	Yes
Design Head (m)	0.600	Diameter (mm)	141
Design Flow (l/s)	8.6	Invert Level (m)	124.690
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	8.6	Kick-Flo®	0.448	7.5
Flush-Flo™	0.224	8.6	Mean Flow over Head Range	-	7.1

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.1	0.600	8.6	1.600	13.6	2.600	17.2	5.000	23.5	7.500	28.6
0.200	8.5	0.800	9.8	1.800	14.4	3.000	18.4	5.500	24.6	8.000	29.6
0.300	8.4	1.000	10.9	2.000	15.2	3.500	19.8	6.000	25.7	8.500	30.5
0.400	8.0	1.200	11.9	2.200	15.9	4.000	21.1	6.500	26.6	9.000	31.4
0.500	7.9	1.400	12.8	2.400	16.6	4.500	22.4	7.000	27.6	9.500	32.2

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	124.918	0.228	8.6	370.5	O K
30 min Summer	124.983	0.293	8.6	484.5	O K
60 min Summer	125.046	0.356	8.6	600.0	O K
120 min Summer	125.120	0.430	8.6	737.9	O K
180 min Summer	125.163	0.473	8.6	820.2	O K
240 min Summer	125.189	0.499	8.6	871.9	O K
360 min Summer	125.216	0.526	8.6	924.7	O K
480 min Summer	125.225	0.535	8.6	944.4	O K
600 min Summer	125.227	0.537	8.6	946.6	O K
720 min Summer	125.223	0.533	8.6	938.8	O K
960 min Summer	125.208	0.518	8.6	908.5	O K
1440 min Summer	125.176	0.486	8.6	847.0	O K
2160 min Summer	125.132	0.442	8.6	761.7	O K
2880 min Summer	125.092	0.402	8.6	684.5	O K
4320 min Summer	125.028	0.338	8.6	565.9	O K
5760 min Summer	124.978	0.288	8.6	476.7	O K
7200 min Summer	124.942	0.252	8.6	411.8	O K
8640 min Summer	124.914	0.224	8.6	363.5	O K
10080 min Summer	124.893	0.203	8.6	327.3	O K
15 min Winter	124.944	0.254	8.6	415.6	O K
30 min Winter	125.016	0.326	8.6	543.9	O K
60 min Winter	125.086	0.396	8.6	674.2	O K
120 min Winter	125.168	0.478	8.6	830.9	O K
180 min Winter	125.215	0.525	8.6	923.5	O K
240 min Winter	125.244	0.554	8.6	982.6	O K
360 min Winter	125.275	0.585	8.6	1044.9	O K
480 min Winter	125.287	0.597	8.6	1070.2	O K
600 min Winter	125.290	0.600	8.6	1076.1	Flood Risk
720 min Winter	125.288	0.598	8.6	1070.9	O K
960 min Winter	125.273	0.583	8.6	1041.4	O K
1440 min Winter	125.234	0.544	8.6	961.2	O K
2160 min Winter	125.181	0.491	8.6	855.7	O K
2880 min Winter	125.127	0.437	8.6	750.6	O K
4320 min Winter	125.029	0.339	8.6	568.4	O K
5760 min Winter	124.954	0.264	8.6	433.9	O K
7200 min Winter	124.901	0.211	8.6	341.0	O K
8640 min Winter	124.864	0.174	8.5	279.1	O K
10080 min Winter	124.842	0.152	8.3	242.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	137.200	0.0	330.0	26
30 min Summer	90.160	0.0	437.9	41
60 min Summer	56.420	0.0	594.7	70
120 min Summer	35.350	0.0	746.9	130
180 min Summer	26.645	0.0	843.9	188
240 min Summer	21.630	0.0	912.0	248
360 min Summer	15.867	0.0	999.8	366
480 min Summer	12.611	0.0	1055.2	484
600 min Summer	10.497	0.0	1092.8	602
720 min Summer	9.007	0.0	1119.7	722
960 min Summer	7.033	0.0	1152.2	864
1440 min Summer	4.923	0.0	1166.8	1098
2160 min Summer	3.442	0.0	1345.7	1484
2880 min Summer	2.680	0.0	1395.6	1876
4320 min Summer	1.910	0.0	1483.9	2644
5760 min Summer	1.521	0.0	1600.8	3400
7200 min Summer	1.292	0.0	1697.6	4112
8640 min Summer	1.141	0.0	1795.3	4840
10080 min Summer	1.035	0.0	1891.0	5544
15 min Winter	137.200	0.0	371.8	26
30 min Winter	90.160	0.0	490.2	40
60 min Winter	56.420	0.0	667.3	70
120 min Winter	35.350	0.0	836.4	128
180 min Winter	26.645	0.0	943.8	186
240 min Winter	21.630	0.0	1018.8	244
360 min Winter	15.867	0.0	1114.1	360
480 min Winter	12.611	0.0	1172.5	474
600 min Winter	10.497	0.0	1210.5	588
720 min Winter	9.007	0.0	1235.6	700
960 min Winter	7.033	0.0	1259.1	916
1440 min Winter	4.923	0.0	1233.7	1154
2160 min Winter	3.442	0.0	1507.4	1608
2880 min Winter	2.680	0.0	1563.2	2052
4320 min Winter	1.910	0.0	1663.5	2856
5760 min Winter	1.521	0.0	1794.0	3576
7200 min Winter	1.292	0.0	1902.8	4256
8640 min Winter	1.141	0.0	2012.9	4856
10080 min Winter	1.035	0.0	2122.0	5448

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 444400 303300 SK 44400 03300	Shortest Storm (mins)	15
Data Type	Catchment	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.470

Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)
0	4	0.490	4	8	0.490	8	12	0.490

Model Details

Storage is Online Cover Level (m) 125.690

Tank or Pond Structure

Invert Level (m) 124.690

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1530.0	0.600	2070.0	1.000	2450.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0141-8600-0600-8600	Sump Available	Yes
Design Head (m)	0.600	Diameter (mm)	141
Design Flow (l/s)	8.6	Invert Level (m)	124.690
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	8.6	Kick-Flo®	0.448	7.5
Flush-Flo™	0.224	8.6	Mean Flow over Head Range	-	7.1

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.1	0.600	8.6	1.600	13.6	2.600	17.2	5.000	23.5	7.500	28.6
0.200	8.5	0.800	9.8	1.800	14.4	3.000	18.4	5.500	24.6	8.000	29.6
0.300	8.4	1.000	10.9	2.000	15.2	3.500	19.8	6.000	25.7	8.500	30.5
0.400	8.0	1.200	11.9	2.200	15.9	4.000	21.1	6.500	26.6	9.000	31.4
0.500	7.9	1.400	12.8	2.400	16.6	4.500	22.4	7.000	27.6	9.500	32.2

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	123.786	0.286	2.5	111.2	O K
30 min Summer	123.856	0.356	2.5	145.3	O K
60 min Summer	123.919	0.419	2.5	179.4	O K
120 min Summer	123.975	0.475	2.5	211.6	O K
180 min Summer	124.002	0.502	2.5	227.5	O K
240 min Summer	124.016	0.516	2.5	236.5	O K
360 min Summer	124.033	0.533	2.5	246.7	O K
480 min Summer	124.039	0.539	2.5	251.1	O K
600 min Summer	124.041	0.541	2.5	252.0	O K
720 min Summer	124.039	0.539	2.5	250.8	O K
960 min Summer	124.030	0.530	2.5	244.9	O K
1440 min Summer	124.010	0.510	2.5	232.5	O K
2160 min Summer	123.979	0.479	2.5	214.0	O K
2880 min Summer	123.946	0.446	2.5	194.6	O K
4320 min Summer	123.881	0.381	2.5	158.3	O K
5760 min Summer	123.820	0.320	2.5	127.5	O K
7200 min Summer	123.766	0.266	2.5	101.8	O K
8640 min Summer	123.720	0.220	2.5	81.0	O K
10080 min Summer	123.681	0.181	2.5	64.9	O K
15 min Winter	123.815	0.315	2.5	124.8	O K
30 min Winter	123.890	0.390	2.5	163.2	O K
60 min Winter	123.959	0.459	2.5	201.9	O K
120 min Winter	124.019	0.519	2.5	238.4	O K
180 min Winter	124.048	0.548	2.5	256.9	O K
240 min Winter	124.065	0.565	2.5	267.6	O K
360 min Winter	124.084	0.584	2.5	280.4	O K
480 min Winter	124.093	0.593	2.5	286.6	O K
600 min Winter	124.097	0.597	2.5	289.0	O K
720 min Winter	124.097	0.597	2.5	289.0	O K
960 min Winter	124.090	0.590	2.5	284.6	O K
1440 min Winter	124.066	0.566	2.5	268.2	O K
2160 min Winter	124.029	0.529	2.5	244.5	O K
2880 min Winter	123.988	0.488	2.5	219.1	O K
4320 min Winter	123.889	0.389	2.5	162.7	O K
5760 min Winter	123.796	0.296	2.5	116.0	O K
7200 min Winter	123.717	0.217	2.5	79.9	O K
8640 min Winter	123.657	0.157	2.5	55.2	O K
10080 min Winter	123.617	0.117	2.4	40.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	141.183	0.0	110.0	26
30 min Summer	92.653	0.0	144.0	41
60 min Summer	57.877	0.0	184.8	70
120 min Summer	34.893	0.0	222.8	130
180 min Summer	25.590	0.0	245.0	188
240 min Summer	20.406	0.0	260.4	248
360 min Summer	14.835	0.0	283.6	366
480 min Summer	11.820	0.0	300.8	484
600 min Summer	9.902	0.0	314.5	602
720 min Summer	8.565	0.0	325.7	722
960 min Summer	6.807	0.0	342.9	884
1440 min Summer	4.917	0.0	356.7	1120
2160 min Summer	3.546	0.0	410.4	1516
2880 min Summer	2.809	0.0	433.3	1916
4320 min Summer	2.020	0.0	466.9	2684
5760 min Summer	1.597	0.0	493.9	3456
7200 min Summer	1.330	0.0	514.1	4176
8640 min Summer	1.145	0.0	530.9	4840
10080 min Summer	1.009	0.0	544.8	5464
15 min Winter	141.183	0.0	123.2	26
30 min Winter	92.653	0.0	160.7	41
60 min Winter	57.877	0.0	207.0	70
120 min Winter	34.893	0.0	249.4	128
180 min Winter	25.590	0.0	274.2	186
240 min Winter	20.406	0.0	291.2	244
360 min Winter	14.835	0.0	316.9	360
480 min Winter	11.820	0.0	335.6	474
600 min Winter	9.902	0.0	350.0	588
720 min Winter	8.565	0.0	361.1	700
960 min Winter	6.807	0.0	373.6	920
1440 min Winter	4.917	0.0	363.4	1180
2160 min Winter	3.546	0.0	459.6	1628
2880 min Winter	2.809	0.0	485.3	2100
4320 min Winter	2.020	0.0	522.8	2904
5760 min Winter	1.597	0.0	553.2	3640
7200 min Winter	1.330	0.0	575.9	4320
8640 min Winter	1.145	0.0	594.7	4928
10080 min Winter	1.009	0.0	610.5	5456

Rainfall Details

Rainfall Model	FSR	Ratio R	0.400	Cv (Winter)	0.840
Return Period (years)	100	Summer Storms	Yes	Shortest Storm (mins)	15
Region	England and Wales	Winter Storms	Yes	Longest Storm (mins)	10080
M5-60 (mm)	20.400	Cv (Summer)	0.750	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.430

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.144	4	8	0.143	8	12	0.143

Model Details

Storage is Online Cover Level (m) 124.600

Tank or Pond Structure

Invert Level (m) 123.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	311.0	0.700	760.0	1.100	1039.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0080-2500-0700-2500	Sump Available	Yes
Design Head (m)	0.700	Diameter (mm)	80
Design Flow (l/s)	2.5	Invert Level (m)	123.500
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	2.5	Kick-Flo®	0.456	2.1
Flush-Flo™	0.207	2.5	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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.3	0.600	2.3	1.600	3.7	2.600	4.6	5.000	6.2	7.500	7.5
0.200	2.5	0.800	2.7	1.800	3.9	3.000	4.9	5.500	6.5	8.000	7.8
0.300	2.4	1.000	2.9	2.000	4.1	3.500	5.3	6.000	6.8	8.500	8.0
0.400	2.3	1.200	3.2	2.200	4.2	4.000	5.6	6.500	7.0	9.000	8.3
0.500	2.1	1.400	3.4	2.400	4.4	4.500	5.9	7.000	7.3	9.500	8.5

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	123.780	0.280	2.5	108.0	O K
30 min Summer	123.848	0.348	2.5	141.3	O K
60 min Summer	123.911	0.411	2.5	174.7	O K
120 min Summer	123.980	0.480	2.5	214.5	O K
180 min Summer	124.018	0.518	2.5	237.5	O K
240 min Summer	124.040	0.540	2.5	251.8	O K
360 min Summer	124.062	0.562	2.5	265.8	O K
480 min Summer	124.069	0.569	2.5	270.3	O K
600 min Summer	124.068	0.568	2.5	269.8	O K
720 min Summer	124.063	0.563	2.5	266.4	O K
960 min Summer	124.046	0.546	2.5	255.1	O K
1440 min Summer	124.010	0.510	2.5	232.9	O K
2160 min Summer	123.964	0.464	2.5	204.8	O K
2880 min Summer	123.920	0.420	2.5	179.5	O K
4320 min Summer	123.850	0.350	2.5	142.5	O K
5760 min Summer	123.795	0.295	2.5	115.2	O K
7200 min Summer	123.752	0.252	2.5	95.2	O K
8640 min Summer	123.718	0.218	2.5	80.3	O K
10080 min Summer	123.691	0.191	2.5	69.2	O K
15 min Winter	123.807	0.307	2.5	121.2	O K
30 min Winter	123.881	0.381	2.5	158.7	O K
60 min Winter	123.950	0.450	2.5	196.6	O K
120 min Winter	124.025	0.525	2.5	241.7	O K
180 min Winter	124.066	0.566	2.5	268.1	O K
240 min Winter	124.091	0.591	2.5	284.8	O K
360 min Winter	124.116	0.616	2.5	302.0	O K
480 min Winter	124.125	0.625	2.5	308.4	O K
600 min Winter	124.126	0.626	2.5	309.2	O K
720 min Winter	124.123	0.623	2.5	306.8	O K
960 min Winter	124.108	0.608	2.5	296.4	O K
1440 min Winter	124.066	0.566	2.5	268.6	O K
2160 min Winter	124.012	0.512	2.5	233.8	O K
2880 min Winter	123.958	0.458	2.5	201.1	O K
4320 min Winter	123.851	0.351	2.5	142.9	O K
5760 min Winter	123.766	0.266	2.5	101.5	O K
7200 min Winter	123.701	0.201	2.5	73.1	O K
8640 min Winter	123.655	0.155	2.5	54.5	O K
10080 min Winter	123.625	0.125	2.4	42.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	137.200	0.0	106.9	26
30 min Summer	90.160	0.0	140.2	41
60 min Summer	56.420	0.0	180.1	70
120 min Summer	35.350	0.0	225.7	130
180 min Summer	26.645	0.0	255.1	188
240 min Summer	21.630	0.0	275.8	248
360 min Summer	15.867	0.0	303.0	366
480 min Summer	12.611	0.0	320.4	484
600 min Summer	10.497	0.0	332.5	604
720 min Summer	9.007	0.0	341.4	722
960 min Summer	7.033	0.0	352.7	900
1440 min Summer	4.923	0.0	356.8	1120
2160 min Summer	3.442	0.0	398.4	1516
2880 min Summer	2.680	0.0	413.5	1880
4320 min Summer	1.910	0.0	441.5	2644
5760 min Summer	1.521	0.0	470.4	3408
7200 min Summer	1.292	0.0	499.2	4112
8640 min Summer	1.141	0.0	528.8	4840
10080 min Summer	1.035	0.0	558.8	5544
15 min Winter	137.200	0.0	119.7	26
30 min Winter	90.160	0.0	156.5	40
60 min Winter	56.420	0.0	201.8	70
120 min Winter	35.350	0.0	252.7	128
180 min Winter	26.645	0.0	285.3	186
240 min Winter	21.630	0.0	308.4	244
360 min Winter	15.867	0.0	338.0	360
480 min Winter	12.611	0.0	356.4	476
600 min Winter	10.497	0.0	368.2	590
720 min Winter	9.007	0.0	375.4	702
960 min Winter	7.033	0.0	378.1	920
1440 min Winter	4.923	0.0	363.5	1180
2160 min Winter	3.442	0.0	446.1	1624
2880 min Winter	2.680	0.0	463.1	2084
4320 min Winter	1.910	0.0	494.6	2856
5760 min Winter	1.521	0.0	526.9	3576
7200 min Winter	1.292	0.0	559.2	4256
8640 min Winter	1.141	0.0	592.4	4920
10080 min Winter	1.035	0.0	626.2	5544

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 444400 303300 SK 44400 03300	Shortest Storm (mins)	15
Data Type	Catchment	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.430

Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)
0	4	0.144	4	8	0.143	8	12	0.143

Model Details

Storage is Online Cover Level (m) 124.600

Tank or Pond Structure

Invert Level (m) 123.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	311.0	0.700	760.0	1.100	1039.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0080-2500-0700-2500	Sump Available	Yes
Design Head (m)	0.700	Diameter (mm)	80
Design Flow (l/s)	2.5	Invert Level (m)	123.500
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	2.5	Kick-Flo®	0.456	2.1
Flush-Flo™	0.207	2.5	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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.3	0.600	2.3	1.600	3.7	2.600	4.6	5.000	6.2	7.500	7.5
0.200	2.5	0.800	2.7	1.800	3.9	3.000	4.9	5.500	6.5	8.000	7.8
0.300	2.4	1.000	2.9	2.000	4.1	3.500	5.3	6.000	6.8	8.500	8.0
0.400	2.3	1.200	3.2	2.200	4.2	4.000	5.6	6.500	7.0	9.000	8.3
0.500	2.1	1.400	3.4	2.400	4.4	4.500	5.9	7.000	7.3	9.500	8.5

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	123.563	0.363	6.6	287.1	O K
30 min Summer	123.661	0.461	6.6	375.1	O K
60 min Summer	123.754	0.554	6.6	463.3	O K
120 min Summer	123.837	0.637	6.6	546.6	O K
180 min Summer	123.877	0.677	6.6	587.8	O K
240 min Summer	123.899	0.699	6.6	610.9	O K
360 min Summer	123.924	0.724	6.6	637.3	O K
480 min Summer	123.934	0.734	6.6	648.3	O K
600 min Summer	123.936	0.736	6.6	650.4	O K
720 min Summer	123.933	0.733	6.6	647.0	O K
960 min Summer	123.920	0.720	6.6	632.8	O K
1440 min Summer	123.891	0.691	6.6	602.6	O K
2160 min Summer	123.846	0.646	6.6	556.1	O K
2880 min Summer	123.798	0.598	6.6	507.2	O K
4320 min Summer	123.699	0.499	6.6	411.3	O K
5760 min Summer	123.613	0.413	6.6	331.7	O K
7200 min Summer	123.538	0.338	6.6	265.4	O K
8640 min Summer	123.476	0.276	6.6	212.7	O K
10080 min Summer	123.428	0.228	6.6	172.9	O K
15 min Winter	123.603	0.403	6.6	322.2	O K
30 min Winter	123.710	0.510	6.6	421.3	O K
60 min Winter	123.812	0.612	6.6	521.3	O K
120 min Winter	123.903	0.703	6.6	615.5	O K
180 min Winter	123.948	0.748	6.6	663.1	O K
240 min Winter	123.973	0.773	6.6	690.5	O K
360 min Winter	124.003	0.803	6.6	723.3	O K
480 min Winter	124.017	0.817	6.6	738.9	O K
600 min Winter	124.022	0.822	6.6	744.6	O K
720 min Winter	124.022	0.822	6.6	744.1	O K
960 min Winter	124.011	0.811	6.6	732.0	O K
1440 min Winter	123.974	0.774	6.6	691.7	O K
2160 min Winter	123.918	0.718	6.6	631.1	O K
2880 min Winter	123.855	0.655	6.6	565.5	O K
4320 min Winter	123.707	0.507	6.6	418.5	O K
5760 min Winter	123.576	0.376	6.6	298.0	O K
7200 min Winter	123.470	0.270	6.6	207.0	O K
8640 min Winter	123.395	0.195	6.5	146.3	O K
10080 min Winter	123.349	0.149	6.2	110.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	141.183	0.0	279.7	26
30 min Summer	92.653	0.0	366.8	41
60 min Summer	57.877	0.0	474.7	70
120 min Summer	34.893	0.0	572.4	130
180 min Summer	25.590	0.0	629.4	188
240 min Summer	20.406	0.0	668.9	248
360 min Summer	14.835	0.0	728.4	366
480 min Summer	11.820	0.0	772.6	484
600 min Summer	9.902	0.0	807.6	602
720 min Summer	8.565	0.0	836.3	720
960 min Summer	6.807	0.0	880.6	856
1440 min Summer	4.917	0.0	925.3	1102
2160 min Summer	3.546	0.0	1057.7	1500
2880 min Summer	2.809	0.0	1116.7	1912
4320 min Summer	2.020	0.0	1202.5	2680
5760 min Summer	1.597	0.0	1274.2	3408
7200 min Summer	1.330	0.0	1326.1	4112
8640 min Summer	1.145	0.0	1369.0	4832
10080 min Summer	1.009	0.0	1404.1	5456
15 min Winter	141.183	0.0	313.5	26
30 min Winter	92.653	0.0	409.3	40
60 min Winter	57.877	0.0	531.8	70
120 min Winter	34.893	0.0	640.9	128
180 min Winter	25.590	0.0	704.4	186
240 min Winter	20.406	0.0	748.2	242
360 min Winter	14.835	0.0	814.0	358
480 min Winter	11.820	0.0	862.2	474
600 min Winter	9.902	0.0	899.6	588
720 min Winter	8.565	0.0	929.2	698
960 min Winter	6.807	0.0	968.9	914
1440 min Winter	4.917	0.0	961.2	1156
2160 min Winter	3.546	0.0	1184.6	1620
2880 min Winter	2.809	0.0	1250.5	2080
4320 min Winter	2.020	0.0	1346.8	2896
5760 min Winter	1.597	0.0	1427.4	3624
7200 min Winter	1.330	0.0	1485.6	4256
8640 min Winter	1.145	0.0	1533.9	4848
10080 min Winter	1.009	0.0	1573.8	5440

Rainfall Details

Rainfall Model	FSR	Ratio R	0.400	Cv (Winter)	0.840
Return Period (years)	100	Summer Storms	Yes	Shortest Storm (mins)	15
Region	England and Wales	Winter Storms	Yes	Longest Storm (mins)	10080
M5-60 (mm)	20.400	Cv (Summer)	0.750	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.110

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.370	4	8	0.370	8	12	0.370

Model Details

Storage is Online Cover Level (m) 124.500

Tank or Pond Structure

Invert Level (m) 123.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	706.0	0.900	1166.0	1.300	1397.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0122-6600-0900-6600	Sump Available	Yes
Design Head (m)	0.900	Diameter (mm)	122
Design Flow (l/s)	6.6	Invert Level (m)	123.200
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	6.6	Kick-Flo®	0.602	5.5
Flush-Flo™	0.272	6.6	Mean Flow over Head Range	-	5.7

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.3	0.600	5.5	1.600	8.6	2.600	10.9	5.000	14.8	7.500	18.0
0.200	6.5	0.800	6.2	1.800	9.1	3.000	11.6	5.500	15.5	8.000	18.6
0.300	6.6	1.000	6.9	2.000	9.6	3.500	12.5	6.000	16.2	8.500	19.1
0.400	6.5	1.200	7.5	2.200	10.0	4.000	13.3	6.500	16.8	9.000	19.7
0.500	6.2	1.400	8.1	2.400	10.5	4.500	14.1	7.000	17.4	9.500	20.1

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	123.554	0.354	6.6	278.8	O K
30 min Summer	123.650	0.450	6.6	364.7	O K
60 min Summer	123.741	0.541	6.6	451.2	O K
120 min Summer	123.844	0.644	6.6	554.1	O K
180 min Summer	123.902	0.702	6.6	613.5	O K
240 min Summer	123.936	0.736	6.6	650.2	O K
360 min Summer	123.969	0.769	6.6	686.1	O K
480 min Summer	123.979	0.779	6.6	697.4	O K
600 min Summer	123.978	0.778	6.6	695.7	O K
720 min Summer	123.970	0.770	6.6	686.7	O K
960 min Summer	123.944	0.744	6.6	658.4	O K
1440 min Summer	123.892	0.692	6.6	603.6	O K
2160 min Summer	123.824	0.624	6.6	533.0	O K
2880 min Summer	123.758	0.558	6.6	467.8	O K
4320 min Summer	123.656	0.456	6.6	371.1	O K
5760 min Summer	123.578	0.378	6.6	300.2	O K
7200 min Summer	123.519	0.319	6.6	248.8	O K
8640 min Summer	123.474	0.274	6.6	210.8	O K
10080 min Summer	123.440	0.240	6.6	182.9	O K
15 min Winter	123.592	0.392	6.6	313.0	O K
30 min Winter	123.698	0.498	6.6	409.7	O K
60 min Winter	123.798	0.598	6.6	507.7	O K
120 min Winter	123.911	0.711	6.6	623.9	O K
180 min Winter	123.974	0.774	6.6	691.9	O K
240 min Winter	124.013	0.813	6.6	734.8	O K
360 min Winter	124.052	0.852	6.6	778.5	O K
480 min Winter	124.066	0.866	6.6	794.6	O K
600 min Winter	124.067	0.867	6.6	796.1	O K
720 min Winter	124.062	0.862	6.6	789.4	O K
960 min Winter	124.038	0.838	6.6	762.1	O K
1440 min Winter	123.975	0.775	6.6	692.8	O K
2160 min Winter	123.893	0.693	6.6	604.1	O K
2880 min Winter	123.811	0.611	6.6	520.6	O K
4320 min Winter	123.653	0.453	6.6	368.3	O K
5760 min Winter	123.534	0.334	6.6	261.9	O K
7200 min Winter	123.449	0.249	6.6	190.4	O K
8640 min Winter	123.393	0.193	6.5	144.8	O K
10080 min Winter	123.357	0.157	6.3	116.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	137.200	0.0	271.7	26
30 min Summer	90.160	0.0	357.1	41
60 min Summer	56.420	0.0	462.7	70
120 min Summer	35.350	0.0	579.9	130
180 min Summer	26.645	0.0	655.3	188
240 min Summer	21.630	0.0	708.6	248
360 min Summer	15.867	0.0	778.2	366
480 min Summer	12.611	0.0	822.9	484
600 min Summer	10.497	0.0	854.1	602
720 min Summer	9.007	0.0	877.0	722
960 min Summer	7.033	0.0	906.8	864
1440 min Summer	4.923	0.0	926.0	1102
2160 min Summer	3.442	0.0	1026.6	1496
2880 min Summer	2.680	0.0	1065.6	1876
4320 min Summer	1.910	0.0	1137.0	2640
5760 min Summer	1.521	0.0	1213.5	3400
7200 min Summer	1.292	0.0	1287.7	4112
8640 min Summer	1.141	0.0	1363.5	4768
10080 min Summer	1.035	0.0	1440.1	5464
15 min Winter	137.200	0.0	304.6	26
30 min Winter	90.160	0.0	398.8	40
60 min Winter	56.420	0.0	518.4	70
120 min Winter	35.350	0.0	649.2	128
180 min Winter	26.645	0.0	733.1	186
240 min Winter	21.630	0.0	792.3	244
360 min Winter	15.867	0.0	868.6	360
480 min Winter	12.611	0.0	916.4	474
600 min Winter	10.497	0.0	948.4	588
720 min Winter	9.007	0.0	970.0	700
960 min Winter	7.033	0.0	989.8	916
1440 min Winter	4.923	0.0	961.3	1156
2160 min Winter	3.442	0.0	1149.8	1608
2880 min Winter	2.680	0.0	1193.4	2076
4320 min Winter	1.910	0.0	1274.0	2852
5760 min Winter	1.521	0.0	1359.4	3568
7200 min Winter	1.292	0.0	1442.6	4248
8640 min Winter	1.141	0.0	1527.8	4848
10080 min Winter	1.035	0.0	1614.2	5456

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 444400 303300 SK 44400 03300	Shortest Storm (mins)	15
Data Type	Catchment	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.110

Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)
0	4	0.370	4	8	0.370	8	12	0.370

Model Details

Storage is Online Cover Level (m) 124.500

Tank or Pond Structure

Invert Level (m) 123.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	706.0	0.900	1166.0	1.300	1397.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0122-6600-0900-6600	Sump Available	Yes
Design Head (m)	0.900	Diameter (mm)	122
Design Flow (l/s)	6.6	Invert Level (m)	123.200
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	6.6	Kick-Flo®	0.602	5.5
Flush-Flo™	0.272	6.6	Mean Flow over Head Range	-	5.7

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

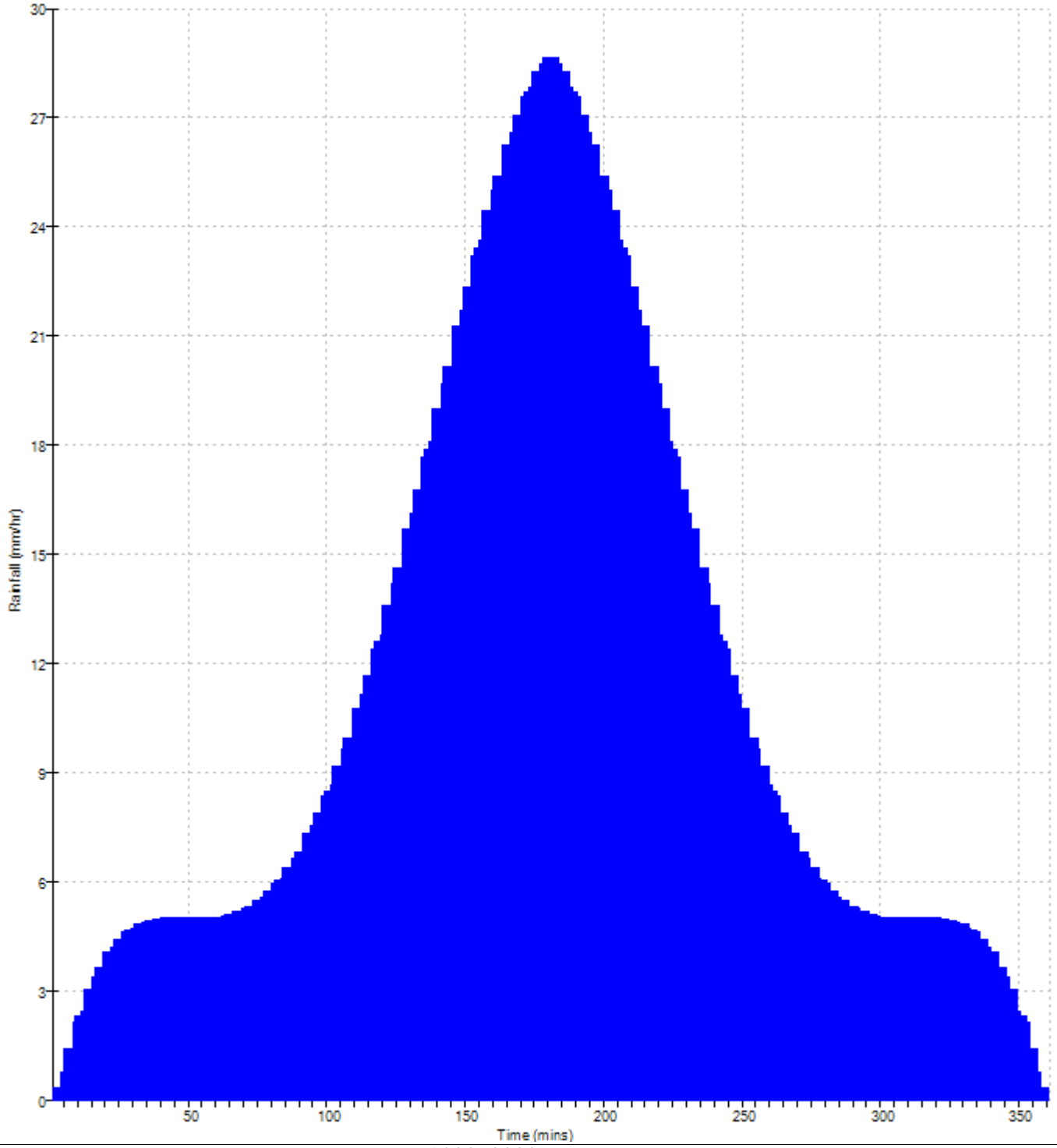
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.3	0.600	5.5	1.600	8.6	2.600	10.9	5.000	14.8	7.500	18.0
0.200	6.5	0.800	6.2	1.800	9.1	3.000	11.6	5.500	15.5	8.000	18.6
0.300	6.6	1.000	6.9	2.000	9.6	3.500	12.5	6.000	16.2	8.500	19.1
0.400	6.5	1.200	7.5	2.200	10.0	4.000	13.3	6.500	16.8	9.000	19.7
0.500	6.2	1.400	8.1	2.400	10.5	4.500	14.1	7.000	17.4	9.500	20.1

Appendix 7: Post Development Runoff Volume Calculations and Rainfall Graph

Rainfall profile

Storm duration (mins) 360

FEH Data	
FEH Rainfall Version	2013
Site Location	GB 444400 303300 SK 44400 03300
Data Type	Catchment
Peak Intensity (mm/hr)	28.664
Ave. Intensity (mm/hr)	11.333
Return Period (years)	100.0



Greenfield Runoff Volume

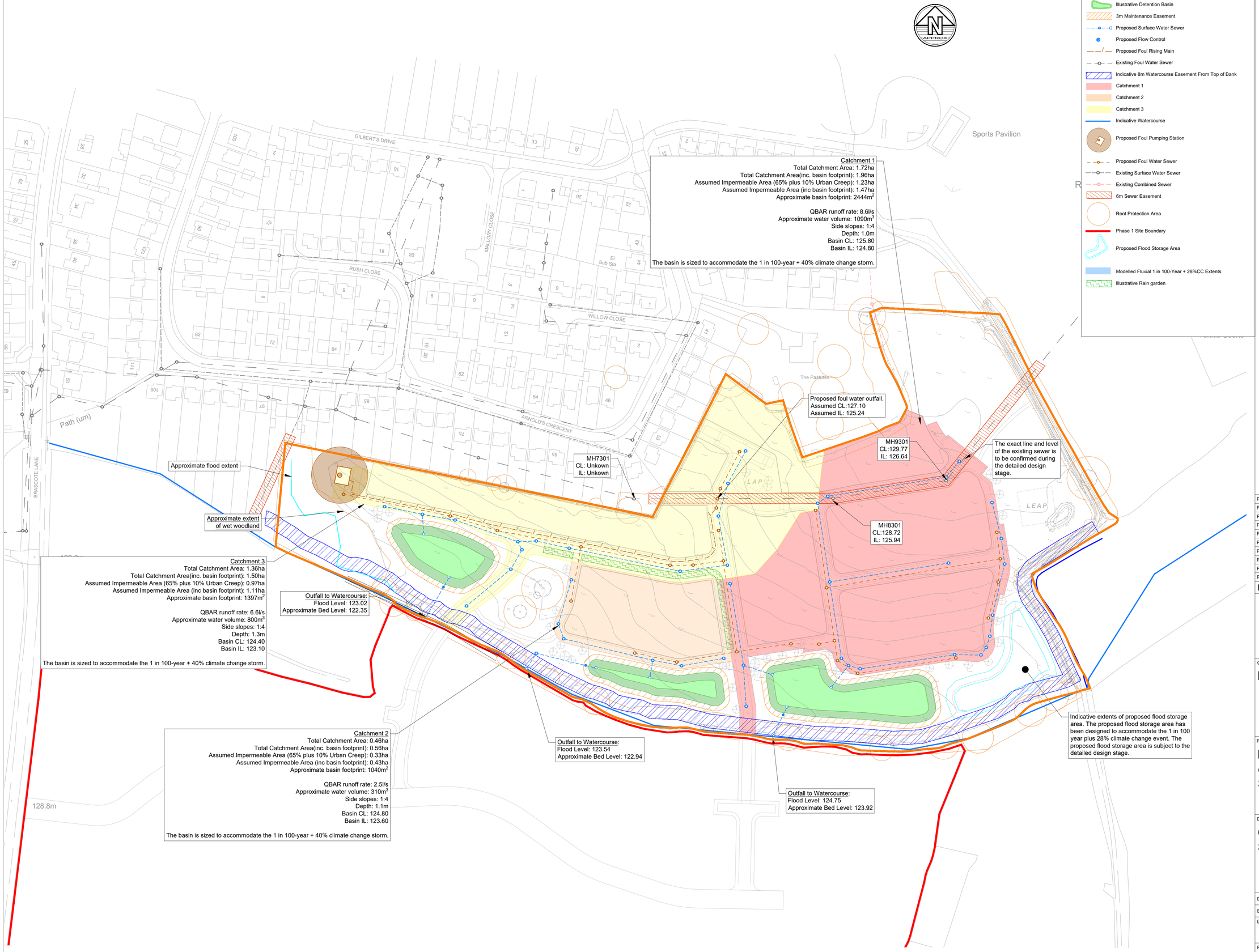
FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.500
Ratio R	0.400
Areal Reduction Factor	1.00
Area (ha)	1.010
SAAR (mm)	700
CWI	105.000
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	46.14
Greenfield Runoff Volume (m^3)	297.547

Appendix 8: Conceptual Drainage Strategy



Legend

- Illustrative Site Location
- Illustrative Detention Basin
- 3m Maintenance Easement
- Proposed Surface Water Sewer
- Proposed Flow Control
- Proposed Foul Rising Main
- Existing Foul Water Sewer
- Indicative 8m Watercourse Easement From Top of Bank
- Catchment 1
- Catchment 2
- Catchment 3
- Indicative Watercourse
- Proposed Foul Pumping Station
- Proposed Foul Water Sewer
- Existing Surface Water Sewer
- Existing Combined Sewer
- 6m Sewer Easement
- Root Protection Area
- Phase 1 Site Boundary
- Proposed Flood Storage Area
- Modelled Fluvial 1 in 100-Year + 28%CC Extents
- Illustrative Rain garden

Notes

1. Do not scale this drawing. All dimensions must be checked / verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. Enclosed Topographical Survey based on BWB Consulting drawing 'NVP2-BWB-00-ZZ-DR-G-001' dated 22.02.24.
6. Enclosed Masterplan based on Marrons drawing '902832.36.03E' dated June 2024.
7. Enclosed sewerage infrastructure details are based on .PDF Severn Trent Water asset plans, dated 14.01.24. The exact location and level information of the existing public sewerage infrastructure is to be confirmed and has been given without liability or warranty.
8. Indicative sewer easements based on Sewers for Adoption 6th Edition Guidance and should be confirmed via a pre-development enquiry with Severn Trent Water
9. This drawing is to be read in conjunction with BWB Sustainable Drainage Statement: 243693-BWB-ZZ-XX-T-W-0003.
10. Do not construct or cost from this drawing.
11. The maximum catchment discharge rates are based on calculated greenfield Qbar rate of 4.4l/s/ha, multiplied by the measured developable area plus proposed basin footprints.
12. All basins have been designed to accommodate the 1 in 100-year + 40% critical storm event with a 400mm freeboard. The attenuation calculations has been undertaken using Flood Estimation Handbook (FEH) rainfall data.
13. All detention basins to have minimum 1:4 internal side slopes. Basin forebays and erosion protection should be considered at detailed design.
14. The proposed Type 3 foul water pumping station location to be confirmed. The pumping station will require highway access and a minimum 15m easement between the wetwell and nearest dwelling.
15. This strategy is a proof of concept only and all details are to be confirmed at the detailed design stage in agreement with all relevant statutory consultees.
16. Following comments from the LLFA during planning for the proposed Phase 1 development, the basin invert levels have been set above the modelled flood levels at the point of outfall.
17. The hydraulic modeling flood extents are yet to peer reviewed.

P09	11.07.24	Updated to latest masterplan	WJ	LR
P08	02.07.24	Updated to reflect change to access road	WJ	RJ
P07	19.06.24	Updated to reflect chnages to project name	WJ	RJ
P06	18.06.24	Updated to reflect lastest masterplan	WJ	RJ
P05	23.05.24	WIP	RJ	RJ
P04	22.05.24	Basin locations adjusted, earthworks extent added	RJ	RJ
P03	20.05.24	Update to developable area	WJ	RJ
P02	16.05.24	Inclusion of FSA and alternative Road Alignment	WJ	RJ
P01	11.04.24	Preliminary Issue	WJ	RJ
Rev	Date	Details of issue / revision	Drw	Rev

Issues & Revisions

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Client
Richborough

Project Title
Land Situated to the East of Brascote Lane and South of Arnold's Crescent

Drawing Title
Conceptual Drainage Strategy

Drawn:	W. James		Reviewed:	R. Jobling	
BWB Ref:	243693	Date:	11.04.24	Scale@A1:	1:1000

Drawing Status
PRELIMINARY

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
NVP2-BWB-ZZ-XX-D-W-0001	S2	P09

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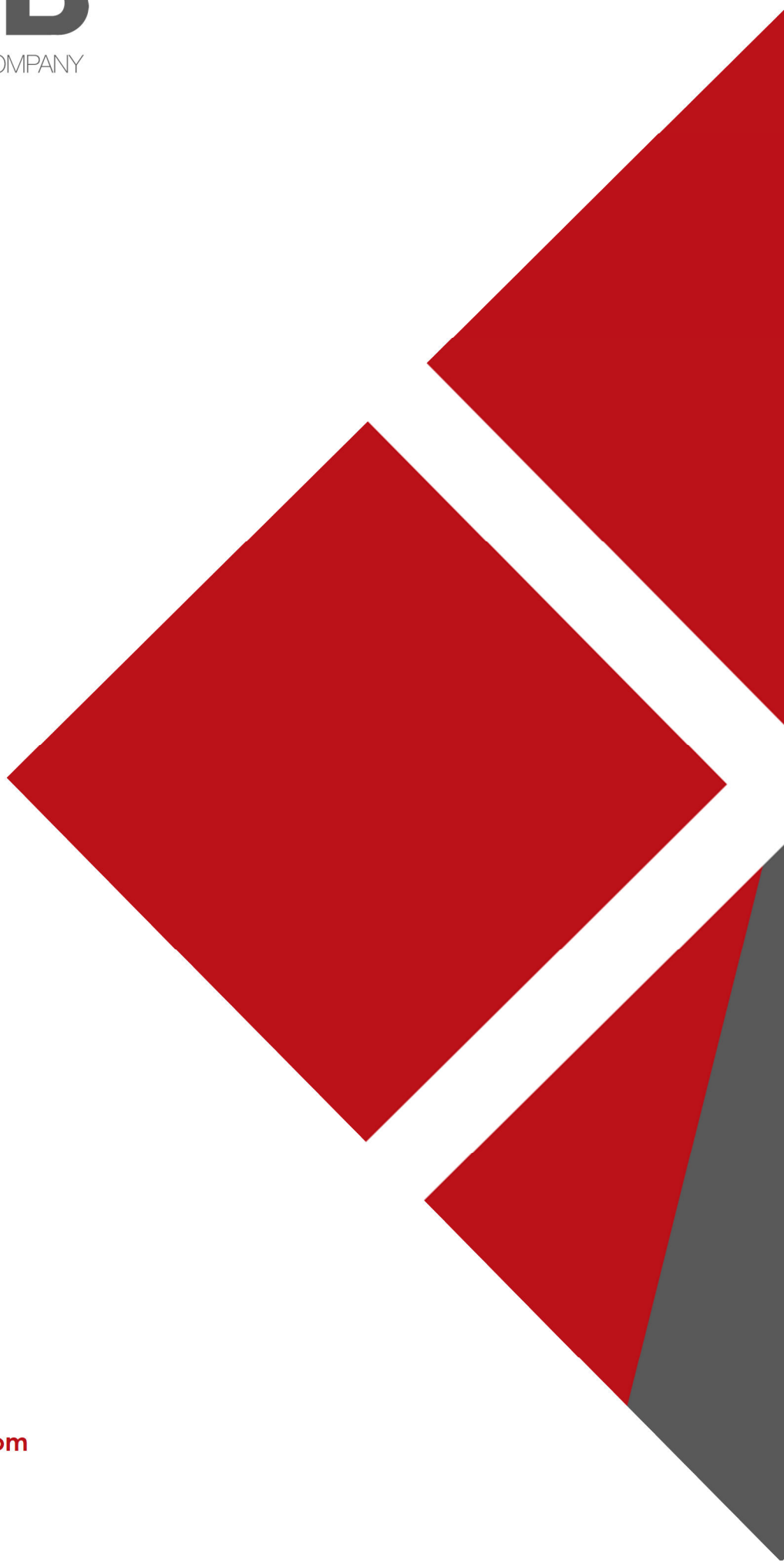

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