A CAF GROUP COMPANY

ADVISORY

Richborough
Land East of Rugby Road
Clifton-upon-Dunsmore, Rugby
Sustainable Drainage Statement

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(i) The date on which this assessment was undertaken, and
(ii) The date on which the final report is delivered

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All Environment Agency mapping data used under special license. Data is current as of July 2025 and is subject to change.

The information presented, and conclusions drawn, are based on statistical data and are for guidance purposes only. The study provides no guarantee against flooding of the study site or elsewhere, nor of the absolute accuracy of water levels, flow rates and associated probabilities.

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FIGURES

TABLES

APPENDICES

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. A Flood Risk Assessment has been produced for the site (reference: 244849-BWB-ZZ-XX-T-W-0001_FRA) and this SDS accompanies this overarching document.

1.3 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 proposal. The proposal comprises a residential development of up to 160 dwellings with open space, landscaping and associated infrastructure. Access is proposed from Newall Close, to the west. A Proposed Framework Plan is included as **Appendix 1.**

1.4 A site summary is provided within **Table 1.1**, with the location of the site illustrated within **Figure 1.1**.

Table 1.1: Site Summary

Site Name	Land East of Rugby Road
Location	Clifton-upon-Dunsmore, Rugby
NGR (approx.)	SP 526 759
Application Site Area (ha)	9.4 (approx.)
Development Area (ha)	4.8 (approx.)
Development Type	Residential
Lead Local Flood Authority	Warwickshire County Council
Local Planning Authority	Rugby Borough Council
Sewerage Undertaker	Severn Trent Water

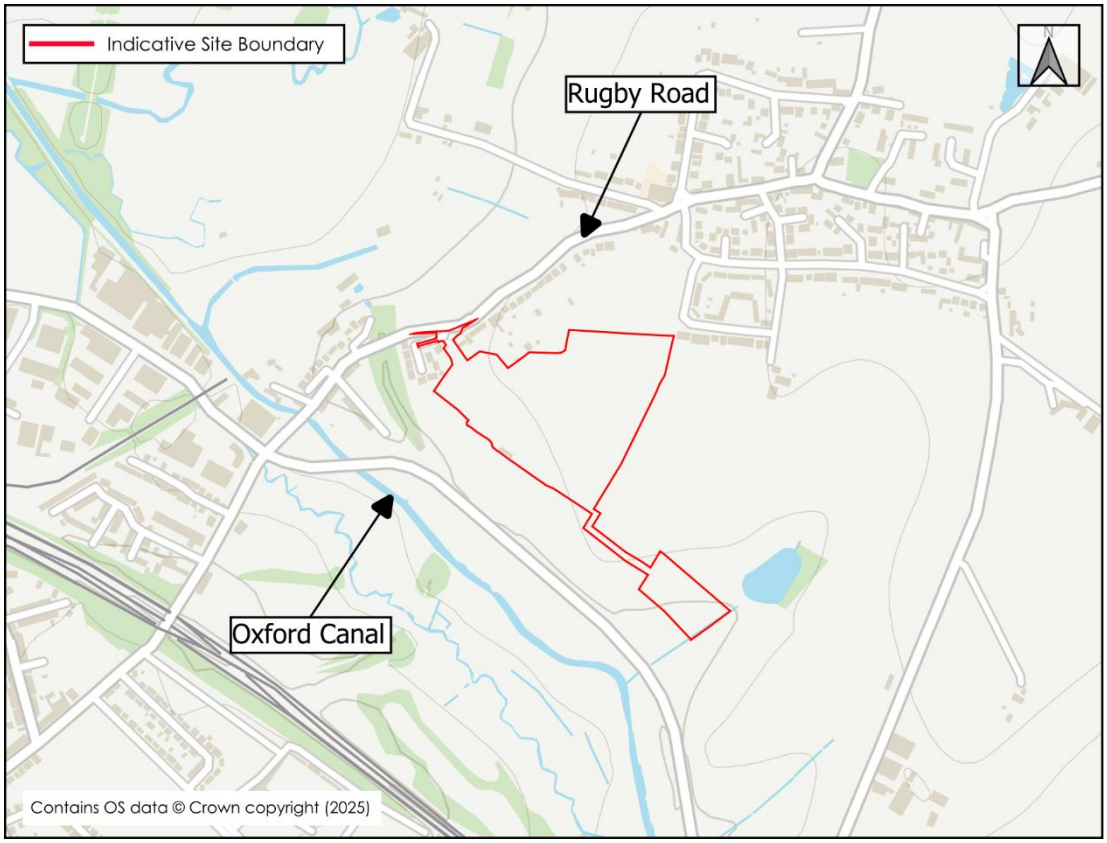

Figure 1.1: Site Location

Sustainable Drainage Guidance

1.5 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.

1.6 Warwickshire County Council in their role as LLFA have published a 'Flood Risk Guidance for Development'[1] guidance document. The guidance notes:

- For greenfield sites, discharge into a watercourse or sewer will be based on the calculated pre-development greenfield runoff rate for the site. Rates should not exceed the QBAR greenfield runoff rate for the development.
- The discharge rate should be calculated upon the impermeable area/contributing area (the same contributing area should be used in the drainage design).
- A minimum freeboard of 300mm should typically be provided between the highest design water level and the top the surface water storage pond. 1 in 4 slopes should ideally be used for surface water storage basins.
- A 10% allowance for urban creep is required as part of the surface water drainage proposals for new residential development.

[1] Flood Risk Guidance for Development (Warwickshire County Council, June 2023)

- A Cv (Volumetric Run-off Coefficient) value of 1 should be used within the drainage design where only the impermeable area is collected within the surface water system.
- SuDS should be considered within a management train approach utilising source control, appropriate above-ground conveyance and strategic, multi-functional attenuation.

1.7 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'[2], included as shows the anticipated changes in peak rainfall intensity.

Table 1.2: Avon Warwickshire Management Catchment Peak Rainfall Allowances

Avon Warwickshire 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%
Central	20%	25%

1.8 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 is expected to fall into the 2070s epoch and a 40% climate change allowance will be applied to the calculations for the 1 in 100-year event. It should be noted that the 1 in 30-year event plus 35% climate change event will need to be considered at the detailed design stage.

1.9 The Non-Statutory Technical Standards (NSTS) for Sustainable Drainage Systems[3], CIRIA SuDS Manual[4] and the Sewerage Sector Guidance 'Design and Construction Guidance (DCG)[5] have also been used to inform the production of this drainage strategy.

[2] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances
[3] 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems
[4] The SuDS Manual (C753). CIRIA 2015
[5] 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)

2. EXISTING CONDITIONS

2.1 The site is located to the south of Clifton-upon-Dunsmore, approximately 2km east of Rugby town centre. The site is bound to the north by playing fields, to the east and south by agricultural land and to the west by residential properties and Rugby Road. The recently constructed Houlton Way bypass road is located approximately 100m south of the site.

2.2 A topographical survey of the site is included in **Appendix 2**. Ground levels generally fall in a south-westerly direction across the site, ranging from approximately 118metres Above Ordnance Datum (m AOD) in the north-east to approximately 104m AOD in the south west.

2.3 Severn Trent Water asset records are included within **Appendix 3.** The records show there are no sewers within the site boundary. The nearest surface water sewer to the site is MH3002, located within Newall Cl, approximately 70m west of the site. The sewer records show that this surface water sewer connects to the foul sewers within the road. The sewer is understood to be a 150mm diameter asset with a depth to invert of approximately 0.91m. The sewer flows away from the site in a north westerly direction.

2.4 The nearest foul water sewer is MH3001, located on Newall Close. According to the sewer records, it has a depth of 1.57 metres and connects to the wider public foul sewer network.

2.5 British Geological Survey (BGS) mapping shows the site to be underlain by the Charmouth Mudstone Formation - Mudstone. Superficial deposits of Dunsmore Gravel – Sand and Gravel are expected to be present across the entirety of the site.

2.6 Therefore, considering the topography and the underlying ground conditions, the existing drainage regime is thought to predominately consist of limited and localised infiltration followed by surface water runoff to the low spot in the south west of the site. Ultimately the site falls within the catchment of the Clifton Brook.

2.7 There is an existing pond 500m to the south east of the site with an Unnamed Ordinary Watercourse (UOW) flowing south west. The pond and watercourse sit within land owned by the applicant.

Existing Runoff Rates

2.8 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**.

2.9 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[6]. This was undertaken within HR Wallingford Greenfield runoff estimation tool[7], which makes the necessary adjustments for small sites automatically.

Table 2.1: Existing Runoff Rate from the Site per Hectare

Return Period (Yrs.)	Runoff Rate (l/s/ha)
1	3.6
Mean Annual Flow Rate (QBAR)	4.3
30	8.7
100	11.2

Existing Runoff Volume

2.10 An assessment of the existing surface water runoff volume from the area proposed for development (4.81ha) has been made for a 1 in 100-year, 6 hour storm.

2.11 As the existing site is permeable, the runoff volume has been calculated using Causeway 'Flow' to be **1,370m³**, results are included within **Appendix 5**.

[6] The National SUDS Working Group (2004), Interim Code of Practice for Sustainable Drainage
[7] https://www.uksuds.com/tools/greenfield-runoff-rate-estimation

3. SURFACE WATER DRAINAGE STRATEGY

3.1 The site has a total area of 9.4ha and an approximate total development area of 4.81ha (including the proposed SuDS basins) has been measured from the proposed Framework Plan included as **Appendix 1**. The total impermeable area has been estimated to be 3.58ha. The following percentages have been taken to assess the impermeable areas across the development:

- Residential: 65% + 10% urban creep
- Proposed Attenuation Basin: 100%

Drainage Hierarchy

3.2 The Planning Policy Guidance[8] and the SuDS Manual[9] 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.

3.3 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.

3.4 The site is underlain by mudstone which is unlikely to support an infiltration only drainage solution for the development. Ground Investigation and infiltration testing in accordance with BRE 365 guidance should be undertaken at the site to confirm this assumption.

3.5 The proposed outfall for the developed site is an existing UOW within the wider ownership boundary, approximately 290m east of the site. The ditch has an upstream connection to an existing pond and flows in a southerly direction, via a culvert beneath Houlton Way.

Peak Flow Control

3.6 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.

3.7 It is therefore proposed to restrict flows for all events up to the 1 in 100- year plus climate change scenario to the existing greenfield QBAR rate, as summarised within **Table 3.1**.

[8] Planning Practice Guidance. http://planningguidance.planningportal.gov.uk/.
[9] The SuDS Manual (C753). CIRIA 2015.
[10] 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems

3.8 The rate per hectare should be prorated in accordance with the impermeable area. In this instance, the peak runoff rate leaving the site should not exceed 14.8l/s, based on a total impermeable area of 3.43ha (impermeable area + SuDS Basins)

Table 3.1: Existing & Proposed Runoff Rates

Return Period (Yr.)	Existing Runoff Rate (l/s/ha)	Existing Runoff Rate for 3.58ha impermeable area (l/s)	Proposed Discharge Rate (l/s)
1	3.6	12.9	15.4
QBAR	4.3	15.4	
30	8.7	31.1	
100	11.2	40.1	
100 + 40%		-	

3.9 This approach fulfils the necessary peak runoff control criteria.

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 a position where it is hydraulically isolated from any fluvial floodplain or external surface water floodplain/ overland flow route that may be present in the site.

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 current proposed development area to allow for urban creep over the life time 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 two attenuation basins located in the south-east and south-west corners of the site.

3.14 For the purpose of this outline assessment, it has been assumed that the basins will accommodate all 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 Causeway 'Flow' to identify the necessary storage provision. Using the discharge rate as detailed in **Table 3.1**, 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 3.2** and calculations are included as **Appendix 6**.

Table 3.2: Outline Attenuated Storage Requirements

Catchment	Rainfall Method	Critical Storm	Maximum Volume (m^3)
Catchment 1	Flood Studies Report (FSR)	1440 min Winter	2,100
	Flood Estimation Handbook (FEH)	960 min Winter	2,105
Catchment 2	FSR	960 min Winter	1,095
	FEH	720 min Winter	1,100

3.16 At this outline design stage, it is expected that a minimum of **3,205m^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 The FEH Rainfall method has been used to design the attenuation basins as it is the more conservative method and is considered to be the most up to date source of data.

3.18 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

3.19 The Non-Statutory Technical Standards for Sustainable Drainage Systems S4-S6[11] states that where reasonable 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.:

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 2 l/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 2 l/s/ha or less.

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

3.20 The 1 in 100-year 6 hour storm runoff volume from the site will 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

3.21 An Illustrative Drainage Strategy Plan for the proposed development is shown on BWB Dwg No. 244849-BWB-ZZ-XX-D-W-0001 which is included as **Appendix 7.** The site has been split into 2 catchment areas.

3.22 Surface Water runoff will be stored within two above ground attenuation basins. The attenuation basins have been designed to be 1.4m deep with a 400mm freeboard and a maximum water depth of 1.0m in the 1 in 100-year + 40% climate change storm.

3.23 Surface water runoff from 'Catchment 2' will be directed to 'Attenuation Basin 2', located in the southwest corner of the site. From there, it will discharge to 'Attenuation Basin 1' at a controlled rate equivalent to the greenfield runoff rate (5.4l/s) for its catchment. Attenuation Basin 1' will also receive surface water runoff from 'Catchment 1' and will discharge the combined flows at a total combined rate of 15.4l/s.

3.24 The attenuation basins will discharge into the existing UOW to the east of the site within the wider ownership boundary. A vortex flow control chamber, in conjunction with a new headwall, will limit the discharge rate from the basin.

3.25 The attenuation basins should be appropriately planted to provide a primary level of treatment through filtration. It is recommended that further levels of treatment are provided in the form of swales, permeable paving, rain gardens, tree pits or similar. It is envisaged that the treatment stages will be determined during the detailed design stage once the development layout and drainage areas are fixed.

3.26 Where possible, the attenuation basins should be unlined to allow for any residual infiltration and should be landscaped into the development plans to provide amenity and biodiversity benefits. Forebays, low flow channels and variable depths should be designed to enhance the treatment and biodiversity benefits of the basins.

Residual Risk and Designing for Exceedance

3.27 It is recommended that the final layout uses the proposed road infrastructure to provide drainage exceedance (overland flood flow) routes through the development and towards the positively drained areas.

3.28 A filter drain is proposed at the south west corner of the site, topographically below 'Attenuation Basin 2', to capture any overflow in an exceedance storm event.

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

3.30 A 400mm freeboard has been provided in the 100-year + 40% scenario.

Water Quality

3.31 The SuDS Manual Mitigation Index will be used to assess the treatment levels proposed in relation to the pollution hazard posed from the proposed land use. This methodology is adopted to ensure that surface water flows receive adequate treatment through all areas of the site prior to being infiltrated into the ground.

3.32 An assessment of water quality has been undertaken in accordance with the SuDS manual (Tables 26.2 and 26.3). The pollution hazards have been identified as:

i. Individual Property Driveways, Residential Car parks and Low Traffic Roads – Low pollution hazard level

   (Total Suspended Solids: **0.5**, Metals: **0.4**, Hydrocarbons: **0.4**)

ii. Residential Roofs

   (Total Suspended Solids: **0.2**, Metals: **0.2**, Hydrocarbons: **0.05**)

3.33 The proposed attenuation basins would provide 0.5, 0.6 and 0.6 mitigation respectively. This provides sufficient mitigation for the highest pollution hazard (Individual property drive ways). Therefore, the use of attenuation basins is considered adequate for the proposed development and any additional SuDS features incorporated would provide additional treatment beyond what is required.

3.34 Additional SuDS features such as permeable paving, tree pits and swales should be considered at detailed design.

4. MAINTENANCE

4.1 The drainage network should be constructed in accordance with the Design and Construction Guidance[12] and be offered up for adoption to Severn Trent Water. If any parts of the drainage network remain unadopted, or until the point that they are, an appropriate maintenance company should be appointed. Any drainage features within the private curtilage will be the responsibility of the homeowner.

4.2 Requirements for the 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 areas 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 basin should be undertaken to remove litter/debris, invasive/colonising vegetation and silt build up as necessary.
vi. Inlet and outlet structures to be regularly inspected, with remedial work as required to maintain water flows and prevent silt/vegetation build up.
vii. Vegetation/grass with the attenuation basin should be maintained appropriately to allow establishment and promote habitat formation, without impeding the operation of the inlet and outlet structure.
viii. Flow controls should be inspected every 6 months, litter/debris and silt build up should be removed as necessary.

[12] Design and Construction Guidance (May 2021)

5. FOUL WATER DRAINAGE

5.1 As the existing site is currently undeveloped, a new foul water outfall will be required. It is proposed to drain foul water separately from surface water.

5.2 Severn Trent Water asset records show there are foul sewers located within Newall Close, which is adjacent to the proposed access road to the site. The sewer records are included within **Appendix 3**.

5.3 It is proposed to make a foul water connection to the existing Severn Trent Water network at Manhole Reference 3001. Due to levels within the site and at the point of connection, a pumping station will be required. The location of the proposed pumping station is shown on the Illustrative Drainage Strategy Plan included within **Appendix 7**.

5.4 The pumping station should be designed in accordance with the Design and Construction Guidance and requires a 15m cordon sanitare from the wet well to any habitable dwellings or third-party land. It must also be accessible from the adopted highway.

5.5 A developer enquiry was submitted to Severn Trent Water to determine whether the existing sewers have capacity for the additional flows. The response has confirmed that the proposed connection is acceptable and is included in **Appendix 8**.

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)		9.4	
Impermeable Area (Ha)		-	3.58
Outfall Location		Clifton Brook Catchment	Existing UOW
Peak Runoff Rate (l/s)	**QBAR**	15.4	15.4
	1 in 30-Year	31.1	
	1 in 100-Year	40.1	
	1 in 100-Year + CC	-	
Runoff Volume (100yr RP 6 hour Storm)		-	1,370m^3
Volume Control		-	Discharge rate limited to QBAR
Proposed Storage Volume		-	3,205m^3
Flow Control Type		-	Vortex Flow Control
SuDS Features		-	Swales Attenuation Basins
Maintenance Responsibility		-	Management Company/Sewerage Company

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 Illustrative Masterplan

The scaling of this drawing cannot be assured

Revision		Date	Drn	Ckd
A	Layout amended following Client's comments	19.06.2025	DE	TM
B	Red line and schedule updated	05.06.2025	SL	RM

- Site Boundary
- Existing Vegetation to be retained
- Indicative Proposed Planting
- Indicative Location for Play Area
- Residential Development
- Streets
- Private Drives
- Proposed Paths
- Proposed SUDs
- Public Open Space
- Potential All Modes Access
- Potential Pedestrian Access
- Potential Sports Pitches
- Drainage Outfall

Status: **DRAFT**

Client: **Richborough Estates**

Project title: **Land East of Rugby Road Clifton-upon-Dunsmore**

Drawing title: **Sketch Layout**

Scale:	1:500 @A3
Date:	08.05.25
Drawn by:	TM
Checked by:	RM
Drawing no.:	SK-01
Revision:	B

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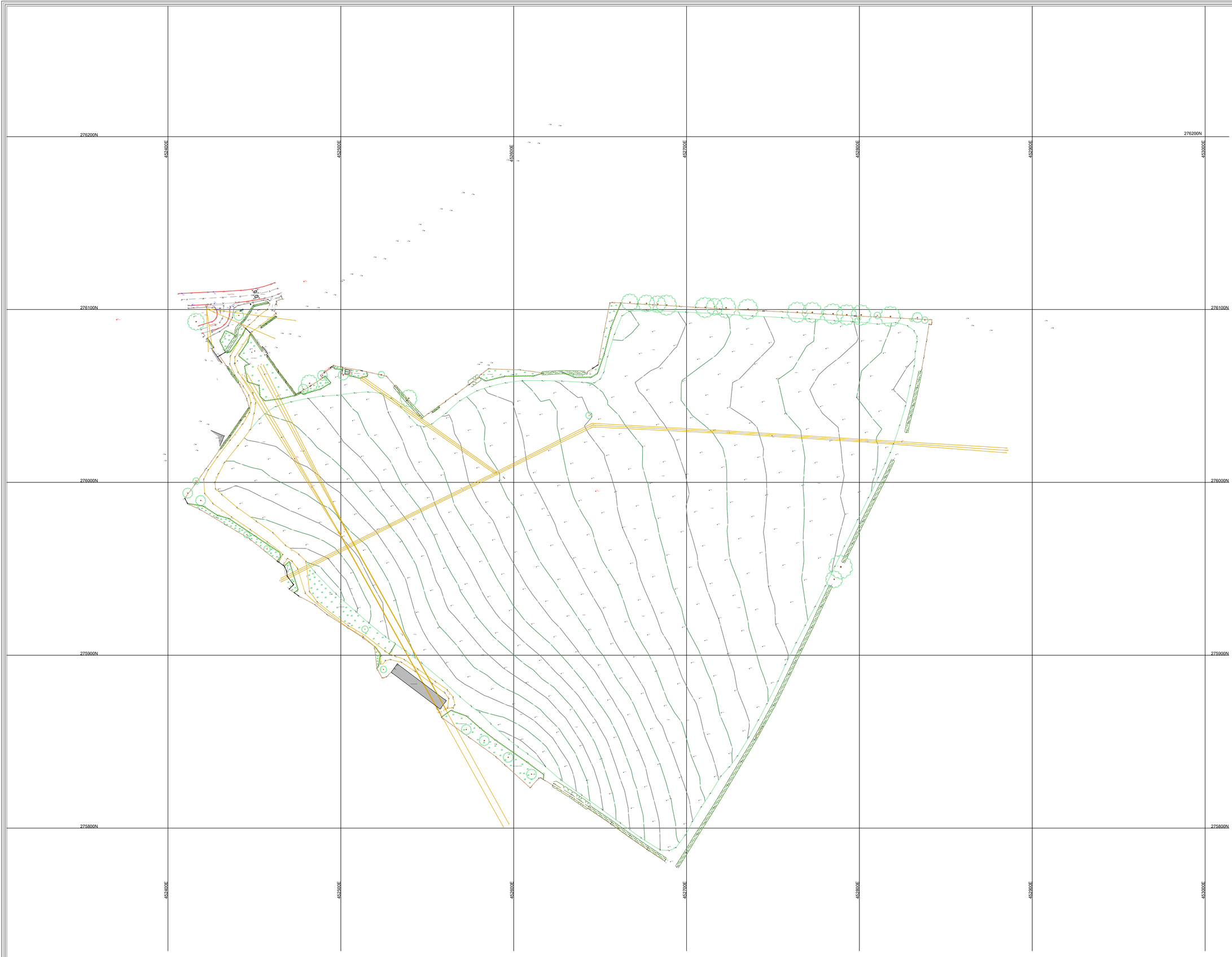
Appendix 2: Topographic Survey



N

SURVEY STATIONS			
Name	Easting	Northing	Height
GH1	452370.370	276094.127	108.199
GH2	452414.935	276100.996	108.165
GH3	452478.671	276116.198	108.754
GH4	452473.211	276013.746	109.056
GH5	452647.443	275994.890	113.750

OS Note:

This survey has been orientated to the Ordnance Survey (O.S) National Grid OSGB36(15) via Global Navigation Satellite Systems (GNSS) and the O.S. Active Network (OS Net).

A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN15GB & OSGM15GB transformation models.

The survey has been correlated to this point and a further one or more OSGB36 (15) points established to create a true O.S. bearing for angle orientation.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.

Please refer to Survey Station Table to enable establishment of the on-site grid and datum.

Legend:

Buildings	Overhead Cable	CVR	Cover (generic)	RBo	Reflective Bollard
Wall	Concrete edge	IC	Inspection chamber	Rem Bo	Removable Bollard
Kerb line	Tarmac edge	Pinv	Pipe invert	Bo	Bollard
Line marking	Grass verge	Gy	Gully	IB	Illuminated bollard
Drop kerb	Canopy/Overhang	Bg	Back gully	BIN	Rubbish bin
Centre line	Verge	DP	Down pipe	VP	Vent pipe
Top of bank	Bottom of bank	Pipe	Pipe above ground	PBOX	Post box
1	Station and Name	MH	Manhole	Stump	Tree Stump
100.000	Station Level	WL	Water level	Stile	Stile
	Tree / Bush / Sapling	WO	Wash out	IFL	Internal floor level
	Area of Undergrowth	SV	Stop valve	THL	Threshold level
	Woodland	ST	Stop tap	SP	Sign post
R:	Ridge Level	EP	Electricity post	PLO	Pile Location
E:	Eaves Level	LP	Lamp post	BH	Borehole
F:	Flat Roof Level	TP	Telegraph post	ELC	Electric
	Gate	TL	Traffic light	BT	British Telecom
Fence types:		Bus	Bus stop	CBX	Control box
SW	Interwoven	ER	Earth rod	TT	Tactile
IR	Iron Railings	WM	Water meter	BP	Brick pavied
WM	Wire Mesh	Gas	Gas valve	CPS	Concrete paving slabs
PR	Post & Rail	Air	Air valve	CVR	Cover
PW	Post & Wire	ICU	Unidentified inspection	RWall	Retaining wall
CL	Chain Link	FL	Flood light	TWL	Top of Wall Level
WD	Wooden Panels	RE	Rodding eye	TCL	Tree canopy level
CB	Close Boarded	BB	Bellsha beacon	TVL	Top of Vegetation Level
SP	Steel Palisade	CTV	Cable tv	G;	Girth
		Mkr	Marker post	MG	Multi girth
		Gmkr	Gas marker post	CL	Cover level
		So	Soffit	IL	Invert level
		FH	Fire hydrant	UTR	Unable to raise
		CE	Cats Eyes		
		GL	Ground light		

Rev.	Date	Description	Drawn	Q. Ref.

greenhatch group

- Topographical Surveys
- Site Engineering
- Utility / CCTV Surveys
- Measured Building Surveys
- 3D Laser Scanning
- Revit & BIM Models

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Newcastle Bus. Park
Newcastle-U-Tyne
NE4 7YL
t. (01912) 736391

London
27, Cornwall Terrace Mews
Regents Park
London
NW1 5LL
t. (02072) 241806

CLIENT

Richborough Estates Limited

PROJECT

Land East of Rugby Road
Clifton-Upon-Dunsmore
CV23 0DF

TITLE

Topographical Survey

SCALE	DATE SURVEYED
A1@ 1:1000	17.01.2025
DRAWN	QUALITY REF
MH	GH23465

Level datum	See note
Grid orientation	See note
Job number	53046

Drawing No.	Rev.
53046_T	0

Comments

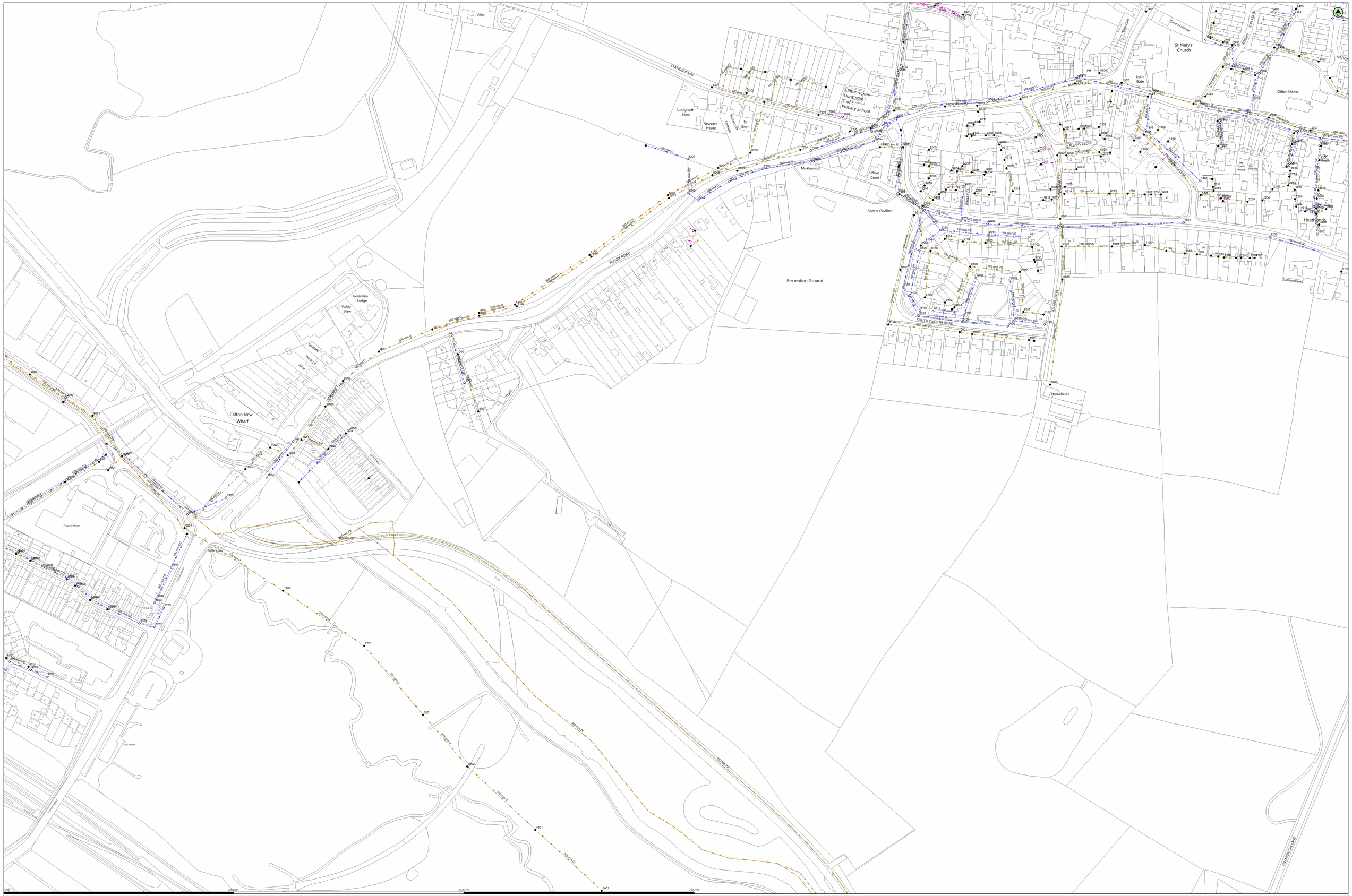
This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

Appendix 3: Severn Trent Sewer Records



Date: 13/12/24

Scale: 1:1250

Map Centre: 452617,275973

Data updated: 14/11/24

Our Ref: 1641632 - 2

Wastewater Plan A0
Powered by digital

- 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
- Filling
- Manhole Foul
- Manhole Surface
- Abandoned Pipe
- Chamber

Section 104 sewers are shown in green
Private sewers are shown in magenta

monika.ivanova@bwbconsulting.com

244849

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 May2014

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
	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
0000	F		0	0
0001	F		0	0
0100	F		0	0
0101	F		0	0
0102	F		0	0
0103	F		0	0
0104	F		0	0
0105	F		0	0
0107	F		0	0
0200	F		0	0
0201	F	120.47	117.3	3.17
0202	F	119.88	116.76	3.12
0204	F		0	0
0205	F		0	0
0206	F		0	0
0207	F		0	0
0208	F		0	0
0209	F		0	0
0210	F		0	0
0212	F		0	0
0213	F		0	0
0214	F		0	0
0215	F		0	0
0300	F		0	0
0301	F		0	0
0302	F		0	0
0303	F	119.01	114.53	4.48
0306	F	119.14	118.16	0.98
0307	F		0	0
0308	F		0	0
0309	F		0	0
0310	F		0	0
0801	F	90.04	85.55	4.49
0902	F	88.48	85.27	3.21
0904	F	88.57	85.61	2.96
1100	F		0	0
1101	F		0	0
1102	F		0	0
1103	F		0	0
1104	F		0	0
1200	F		0	0
1202	F		0	0
1203	F		0	0
1204	F		0	0
1205	F		0	0
1206	F		0	0
1302	F	120	115.43	4.57
1303	F	120.41	115.85	4.56
1304	F		0	0
1305	F		0	0
1306	F		0	0
1307	F	119.62	114.85	4.77
1309	F		0	0
1310	F		0	0
1401	F	119.13	116.96	2.17
1801	F	88.87	85.9	2.97
1901	F	92.55	88.72	3.83
1902	F	96.55	88.89	0
1903	F	97.04	95.11	1.93
2001	F	107	104.46	2.54
2002	F	104.9	102.89	2.01
2003	F	102.54	101.04	1.5
2100	F		0	0
2101	F		0	0
2102	F		0	0
2103	F		0	0
2104	F		0	0
2105	F		0	0
2200	F		0	0
2202	F	119.5	118.18	1.32
2204	F		0	0
2205	F		0	0
2206	F		0	0
2207	F		0	0
2208	F		0	0
2210	F		0	0
2211	F		0	0
2212	F		0	0
2213	F		0	0
2214	F		0	0
2215	F		0	0
2216	F		0	0
2304	F	120.45	116.22	4.23
2305	F	120.71	115.98	4.73
2306	F	119.74	116.69	3.05
2307	F	120.9	116.11	4.79
2308	F	120.74	116.04	4.7
2309	F	119.53	115.9	3.63
2311	F	120.56	118.56	2
2312	F	119.81	118.2	1.61
2314	F	119.14	117.66	1.48
2316	F	118.93	117.45	1.48
2401	F	120.64	116.96	3.68
2402	F	120.41	116.46	3.95
2406	F	120.05	116.81	3.24
2408	F	120.88	117.36	3.52
2701	F	88.07	86.24	1.83
2901	F	98.63	96.87	1.76
2903	F	100.29	99.22	1.07
2904	F	102.49	101.03	1.46
3001	F	107.71	106.14	1.57
3100	F		0	0
3103	F	107.18	104.65	2.53
3200	F		0	0
3201	F		0	0
3205	F		0	0
3207	F		0	0
3208	F		0	0
3209	F		0	0
3210	F		0	0
3211	F		0	0
3300	F		0	0
3301	F	119.29	116.79	2.5
3307	F	118.75	116.29	2.46
3601	F	88.24	86.46	1.78
3602	F	88.49	86.63	1.86
4001	F	108.27	107.26	1.01
4101	F	106.76	105.55	1.21
4102	F	106.89	105.93	0.96
4103	F	106.46	105.09	1.37
4104	F	106.57	105.53	1.04
4501	F	88.54	86.76	1.78
5101	F	108.1	106.43	1.67
5102	F	108	106.41	1.59
5401	F	88.78	86.74	2.04
6201	F	108.93	107.03	1.9
6202	F	108.72	107.09	1.63
6203	F	111.53	108.1	3.43
6204	F	109.89	107.76	2.13
6205	F	110.58	107.56	3.02
6206	F	109.76	107.22	2.54
6300	F		0	0
6301	F	109.5	108.1	1.4
7201	F	112.87	109.89	2.98
7301	F	113.7	110.64	3.06
7302	F	111.96	107.87	4.09
8100	F		0	0
8103	F		0	0
8106	F		0	0
8107	F		0	0
8109	F		0	0
8200	F		0	0
8201	F	117.33	114.76	2.57
8203	F	117.74	115.13	2.61
8205	F		0	0
8206	F		0	0
8207	F		0	0
8208	F		0	0
8209	F		0	0
8210	F		0	0
8211	F		0	0
8301	F	116.01	111.59	4.42
8302	F	116.21	114.19	2.02
8303	F	114.42	111.8	2.62
8304	F	115.22	111.06	4.16
8305	F	114.92	110.96	3.96
8402	F	115.85	113.55	2.3
8410	F	115.88	112.07	3.81
8701	F		17.82	0
8814	F	90.12	87.86	2.26
9000	F		0	0
9001	F	87.93	85	2.94
9001	F		0	0
9004	F	87.83	84.85	2.99
9100	F		0	0
9103	F		0	0
9104	F		0	0
9106	F		0	0
9109	F		0	0
9111	F		0	0
9112	F		0	0
9200	F		0	0
9204	F		0	0
9205	F		0	0
9206	F		0	0
9207	F		0	0
9208	F		0	0
9209	F		0	0
9210	F		0	0
9211	F		0	0
9212	F		0	0
9213	F		0	0
9215	F		0	0
9216	F		0	0
9217	F		0	0
9218	F		0	0
9219	F		0	0
9300	F		0	0
9301	F	118	114.21	3.79
9302	F	116.62	113.71	2.91
9303	F	117.13	113.92	3.21
9305	F		0	0
9306	F		0	0
9307	F		0	0
9308	F		0	0
9309	F		0	0
9310	F		0	0
9311	F		0	0
9312	F		0	0
9401	F	116.49	114.61	1.88
9701	F		17.82	0
9704	F	90.18	89.15	1.03
9801	F	89.84	88.73	1.11
9802	F	89.93	88	1.93
9803	F	89.9	88.81	1.09
9810	F	90.09	88.98	1.11
9901	F	88.21	85.9	2.31
9905	F	88.95	86.64	2.31
0106	S		0	0
0203	S	120.37	119.08	1.29
0211	S		0	0
0304	S	118.99	117.09	1.9
0305	S	119.01	118.41	0.6
0701	S	89.99	87.59	2.4
0702	S	89.9	87.47	2.43
0703	S	89.36	87.41	1.95
0704	S	90.18	87.88	2.3
0800	S	88.92	87.22	1.7
0803	S	89.07	87.27	1.8
0804	S	88.74	87.14	1.6
0901	S	88.42	87.13	1.29
0903	S	88.98	87.37	1.61
1201	S	121.14	120.01	1.13
1207	S		0	0
1300	S		0	0
1301	S	120.01	119.17	0.84
1308	S		0	0
1404	S	120.95	119.34	1.61
1904	S		0	0
1905	S		0	0
2201	S	120.58	118.86	1.72
2203	S	119.49	118.19	1.3
2209	S		0	0
2217	S		0	0
2301	S	119.69	117.91	1.78
2302	S	120.41	118.14	2.27
2303	S	120.49	118.31	2.18
2310	S	120.75	118.68	2.07
2313	S	119.86	118.55	1.31
2315	S	119.13	117.59	1.54
2317	S	118.93	0	0
2403	S	120.42	118.6	1.82
2404	S	120.14	119.07	1.07
2407	S	120.55	119.34	1.21
2409	S	120.86	118.95	1.91
2410	S	120.65	118.82	1.83
2905	S	102.62	100.72	1.9
2907	S	98.16	97.23	0.93
3002	S	107.9	106.99	0.91
3202	S		0	0
3203	S		0	0
3204	S		0	0
3206	S		0	0
3212	S		0	0
3213	S		0	0
3302	S		0	0
3305	S		0	0
3401	S	118.89	117.47	1.42
6207	S	106.35	104.55	1.8
6208	S	111.49	109.43	2.06
6209	S	111.05	108.64	2.41
6210	S	110.94	107.61	3.33
7202	S	111.94	109.78	2.16
7203	S	113.38	110.8	2.58
7204	S	113.41	110.85	2.56
7205	S	112.77	111.26	1.51
7303	S	114.1	0	0
7304	S	114.66	113.51	1.15
8101	S	118.25	116.93	1.32
8102	S	118.73	117.4	1.33
8104	S		0	0
8105	S		0	0
8108	S		0	0
8110	S		0	0
8111	S		0	0
8202	S	117.8	116.23	1.57
8204	S		0	0
8308	S		0	0
8309	S	115.94	0	0
8315	S	114.23	112.67	1.56
8316	S	0	112.72	0
8317	S	0	112.65	0
8318	S	115.81	112.32	3.49
8319	S	114.71	111.83	2.88
8401	S	115.85	114.31	1.54
8411	S	115.34	112.96	2.38
8412	S	0	112.74	0
8704	S		51.93	0
9002	S	88.67	87.28	1.39
9101	S	119.46	117.84	1.62
9102	S	120.16	118.36	1.8
9105	S		0	0
9107	S		0	0
9108	S		0	0
9110	S		0	0
9201	S	119.2	117.77	1.43
9202	S	119.25	117.5	1.75
9203	S	119.92	118.34	1.58
9214	S		0	0
9220	S		0	0
9304	S	117.3	115.39	1.91
9402	S	116.57	114.95	1.62
9702	S		300	0
9703	S		51.93	0
9804	S	90.1	88.6	1.5
9805	S	89.99	88.48	1.51
9806	S	89.82	88.41	1.41
9807	S	89.82	88.26	1.56
9808	S	89.94	88.18	1.76
9809	S	90.12	87.99	2.13
9903	S	88.63	86.56	2.07
9904	S	89.14	87.13	2.01

Appendix 4: Existing Greenfield Run-off Rates

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Ariya Shademani
Site name:	RUGBY ROAD
Site location:	

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.37890° N
Longitude:	1.22682° W
Reference:	2024621101
Date:	Dec 11 2024 16:40

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	639	639
Hydrological region:	4	4
Growth curve factor 1 year:	0.83	0.83
Growth curve factor 30 years:	2	2
Growth curve factor 100 years:	2.57	2.57
Growth curve factor 200 years:	3.04	3.04

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):	4.34	4.34
1 in 1 year (l/s):	3.6	3.6
1 in 30 years (l/s):	8.68	8.68
1 in 100 year (l/s):	11.15	11.15
1 in 200 years (l/s):	13.19	13.19

Appendix 5: Existing Run-off Volume

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	✓
Winter CV	1.000	Additional Storage (m³/ha)	20.0	100 year 360 minute (m³)	1370

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	4.810	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.440
CWI	96.148	Runoff Volume (m³)	1370

Appendix 6: Network Storage Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Depth/Area 1	2.160	5.00	108.800	16.987	77.975	1.400
Depth/Area 2	1.270		109.200	14.501	79.212	1.400

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	✓
Winter CV	1.000	Additional Storage (m³/ha)	20.0	100 year 360 minute (m³)	1258

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	4.600	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.438
CWI	96.148	Runoff Volume (m³)	1258

Node Depth/Area 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	107.400	Product Number	CTL-SHE-0174-1480-1000-1480
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	14.8	Min Node Diameter (mm)	1500

Node Depth/Area 2 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node	Depth/Area 1	Sump Available	✓
Invert Level (m)	107.800	Product Number	CTL-SHE-0110-5500-1000-5500
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.5	Min Node Diameter (mm)	1200

Node Depth/Area 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	107.400
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1800.0	0.0	1.000	2837.0	0.0	1.400	3281.0	0.0

Node Depth/Area 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	107.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1020.0	1020.0	1.000	1531.0	1546.3	1.400	1764.0	1786.3

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Depth/Area 1	945	108.262	0.862	106.9	1964.1740	0.0000	OK
720 minute winter	Depth/Area 2	705	108.684	0.884	75.8	1116.6690	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Depth/Area 1	Hydro-Brake®		14.8	808.4
720 minute winter	Depth/Area 2	Hydro-Brake®	Depth/Area 1	5.5	264.8

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
Depth/Area 1	2.160	5.00	108.800	16.987	77.975	1.400
Depth/Area 2	1.270		109.200	14.501	79.212	1.400

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	20.000	Starting Level (m)	
Ratio-R	0.400	Check Discharge Rate(s)	x
Summer CV	1.000	Check Discharge Volume	✓
Winter CV	1.000	100 year 360 minute (m³)	1258
Analysis Speed	Normal		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	4.600	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.438
CWI	96.148	Runoff Volume (m³)	1258

Node Depth/Area 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	107.400	Product Number	CTL-SHE-0174-1480-1000-1480
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	14.8	Min Node Diameter (mm)	1500

Node Depth/Area 2 Offline Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Loop to Node	Depth/Area 1	Sump Available	✓
Invert Level (m)	107.800	Product Number	CTL-SHE-0110-5500-1000-5500
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.5	Min Node Diameter (mm)	1200

Node Depth/Area 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	107.400
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1800.0	0.0	1.000	2837.0	0.0	1.400	3281.0	0.0

Node Depth/Area 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	107.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1020.0	1020.0	1.000	1531.0	1546.3	1.400	1764.0	1786.3

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Depth/Area 1	1410	108.262	0.862	78.2	1963.5790	0.0000	OK
960 minute winter	Depth/Area 2	945	108.679	0.879	59.4	1109.8240	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Depth/Area 1	Hydro-Brake®		14.8	1118.9
960 minute winter	Depth/Area 2	Hydro-Brake®	Depth/Area 1	5.5	328.8

Appendix 7: Illustrative Surface Water Drainage Strategy

Catchment 2
Total Developable area: 1.50ha
Estimated impermeable area (65% + 10% urban creep): 1.07ha

SuDs Footprint: 0.18ha
Total Impermeable area (SuDs + impermeable area) = 1.25ha

QBAR: 5.4l/s

Foul Water Manhole 3001
IL: 106.14
Proposed foul point of connection.
Subject to pre development enquiry.

Filter Drain proposed
for Exceedance Storm Event.

Attenuation Basin 2
CL: 109.2mAOD
IL: 107.8mAOD
Maximum water depth*: 1m
Minimum freeboard*: 400mm
Maximum water volume*: 1,100m³
Total approximate footprint: 1,765m²
Discharge Rate: 5.4l/s
CV Value: 1
*During the 1 in 100-year + 40% critical storm.

3m maintenance walkway buffer.
1:4 minimum internal side slopes.

Further coordination required to determine levels and drainage solution for access road

Foul Pumping Station
To be accessed via public highway.
15m easement from wetwell to nearest dwelling and third-party land.

Catchment 1
Total Developable area: 2.80ha
Estimated impermeable area (65% + 10% urban creep): 2.0ha

SuDs Footprint: 0.33ha
Total Impermeable area (SuDs + impermeable area) = 2.33ha

QBAR: 10.0l/s

Attenuation Basin 1
CL: 108.8mAOD
IL: 107.4mAOD
Maximum water depth*: 1m
Minimum freeboard*: 400mm
Maximum water volume*: 2,105m³
Total approximate footprint: 3,280m²
Discharge Rate: (Basin 2 + Basin 1) = 15.4l/s
CV Value: 1
*During the 1 in 100-year + 40% critical storm.

3m maintenance walkway buffer.
1:4 minimum internal side slopes.

CL: 112.50m
IL: 106.50m
DEPTH: 6.0m

Existing Watercourse

Indicative Route, subject to further survey

Outfall IL: 97.0mAOD
Site Visit in Jan 2025 found this to be the closest possible outfall.

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
3. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. Enclosed Masterplan based on Marrons Framework Plan dated 08.05.25.
6. A greenfield QBAR runoff rate of 4.3l/s/ha as been calculated for the site. Warwickshire County Council guidance states that the discharge rate should be calculated based upon the impermeable/contributing area and the same area should be used in the drainage design. The runoff rate of 15.4l/s has therefore been calculated using the impermeable area of 3.58ha
7. 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.
8. The impermeable area is assumed to be 65% of the developable area. An additional 10% allowance has been included to account for urban creep.
9. All detention basins to have minimum 1:4 internal side slopes. Basin forebays and erosion protection should be considered at detailed design.
10. Surface water outfall route subject to consultation with the LLFA
11. 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. Do not construct based on this drawing.

Legend

- Wider Site Boundary
- Indicative Site Boundary
- Attenuation Basin with 1 in 3 grading
- 3m Maintenance Area
- Catchment 1
- Catchment 2
- Proposed Headwall
- Proposed Surface Water Flow Control Chamber
- Proposed Surface Water Sewer
- Proposed Swale
- Existing Watercourse
- Proposed Earthworks
- Existing Foul Water Sewers
- Foul Water Rising Main
- Proposed Foul Water Sewers
- Foul Water Pumping Station
- Badger Set with 20m Offset
- Proposed Outfall Surface Water Sewer Easement (10m Total)
- Gradient
- Filter Drain

Rev	Date	Details of issue / revision	Drw	Rev
P05	11.07.25	Masterplan updates	AS	RJ
P04	16.06.25	Masterplan updates	AS	LDR
P03	27.05.25	Masterplan updates	AS	LDR
P02	08.04.25	Preliminary Issue	AS	LDR
P01	14.02.25	Preliminary Issue	AS	LDR

Issues & Revisions

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Client
RICHBOROUGH

Project Title
LAND EAST OF RUGBY ROAD

Drawing Title
ILLUSTRATIVE DRAINAGE STRATEGY

Drawn:	A. Shademani		Reviewed:	L. Ream	
BWB Ref:	244849	Date:	14/02/25	Scale@A1:	1:1000

Drawing Status
PRELIMINARY

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
244849-BWB-ZZ-XX-D-W-0001	S2	P04

Appendix 8: Development Enquiry Response

WONDERFUL ON TAP

Severn Trent Water Ltd
Oxley Moor Road
Wolverhampton
WV9 5HN

www.stwater.co.uk
network.solutions@severntrent.co.uk

Contact: Jasveer Bullock
Contact No: 07970198053

Your ref:
Reference: 1147836

Ariya Shademani
BWB Consulting Ltd
5th Floor Waterfront House
Station Street
Nottingham
NG2 3DQ

1st May 2025

Dear Ariya

Proposed Development: Land at Rugby Road, Clifton upon Dunsmore, Rugby, CV23 0DE (X – 452613, Y – 275940)

I refer to your 'Development Enquiry Request' for the development of 160 new dwellings at the above named site. Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes which refer to surface water disposal from development sites.

Public Sewers in Site – Required Protection

Due to a change in legislation on 1 October 2011, there may be former private sewers on the site which have transferred to the responsibility of Severn Trent Water Ltd, which are not shown on the statutory sewer records but are located within your client's land. These sewers would also have protective strips that we will not allow to be built over. If such sewers are identified to be present on the site, please contact us for further guidance.

Foul Water Drainage

I can confirm we would not have any objections to the anticipated additional foul flows of approximately 2.5 litres/second 2xDWF to the receiving 150mm diameter public foul sewer for a gravity connection to manhole 3001 located in Newall Close, as this will not have an adverse impact on the network.

I see that a pumped connection is proposed to the 150mm diameter public foul sewer to manhole 3001. We would anticipate a pumped connection of approximately 4 litres/second, which would be acceptable.

Therefore, a connection to the public sewer (direct or indirect) is acceptable subject to a formal Section 106 sewer connection approval (see later.)

Surface Water Drainage

If following testing, it is demonstrated that soakaways would not be possible on the site; satisfactory evidence will need to be submitted from the SI consultant **(extract or a supplementary letter**).

If soakaways are not possible, there is canal located to the west of the site you would need to investigate for the disposal of the surface water run-off, at a rate of 5 litres /second /hectare (greenfield rate). This would satisfy SGN1 (enclosed), in accordance with Warwickshire Council SUDS Policy as the Lead Local Flood Authority (LLFA) for the area and statutory consultee in the planning process. Please see the guidance notes attached for further information.

Subject to flows being agreed with the LLFA and Section 106 sewer connection application.

New Connections

For any new connections (including the re-use of existing connections) to the public sewerage system, the developer will need to submit Section 106 application forms. Our New Connections department are responsible for handling all such enquiries and applications. To contact them for an application form and associated guidance notes please call 0800 7076600 or you can download them from our website www.stwater.co.uk.

Please quote ref: 1147836 in any future correspondence (including e-mails) with STW Limited. Please note that 'Development Enquiry' responses are only valid for 6 months from the date of this letter.

Yours sincerely,

J Bullock

Jasveer Bullock (Mrs)
Network Solutions - Developer Services

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