The Crescent, Cudworth

31st October 2025

BC2509-APS-92-XX-RP-C-1001-P01 Drainage Statement

Drainage Statement

The Crescent, Cudworth

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Document history and status

Revision	Date	Description	Originator	Checked	Approved
P01	31/10/2025	Initial Issue	LF	ZS	ZS

Contents

Appendicies

1 Introduction

1.1 Terms of Reference

1.1.1 Align Property Services have been commissioned by Barnsley Metropolitan Borough Council (BMBC) to undertake a drainage design for the proposed development at The Crescent, Cudworth off Barnsley Road.

1.1.2 This report intends to outline the proposed drainage design philosophy for the development.

1.1.3 Maintenance requirements for SuDS components are covered in a separate document; “BC2509-APS-92-XX-RP-C-1002-SuDS-Maintenance-Report”.

1.2 Site Location and Topographical Survey

1.2.1 The site development is located off Barnsley Road, Cudworth comprising existing buildings with associated hardstanding / parking areas to the rear.

1.2.2 The site is generally flat throughout with ground levels varying 76.300-76.600m AOD in the hardstanding / rear car park areas. There is a retaining wall to the north due to the higher levels north of the boundary. The levels on the existing footpath and immediate surroundings to the building frontage, generally fall towards the carriageway. Following demolition works (as part of the proposals) an as-built topographical survey is recommended to confirm levels.

Table 1.2 Site location

OS X	OS Y	National Grid Reference	Nearest Postcode
438902	409294	SE389092	S728SY

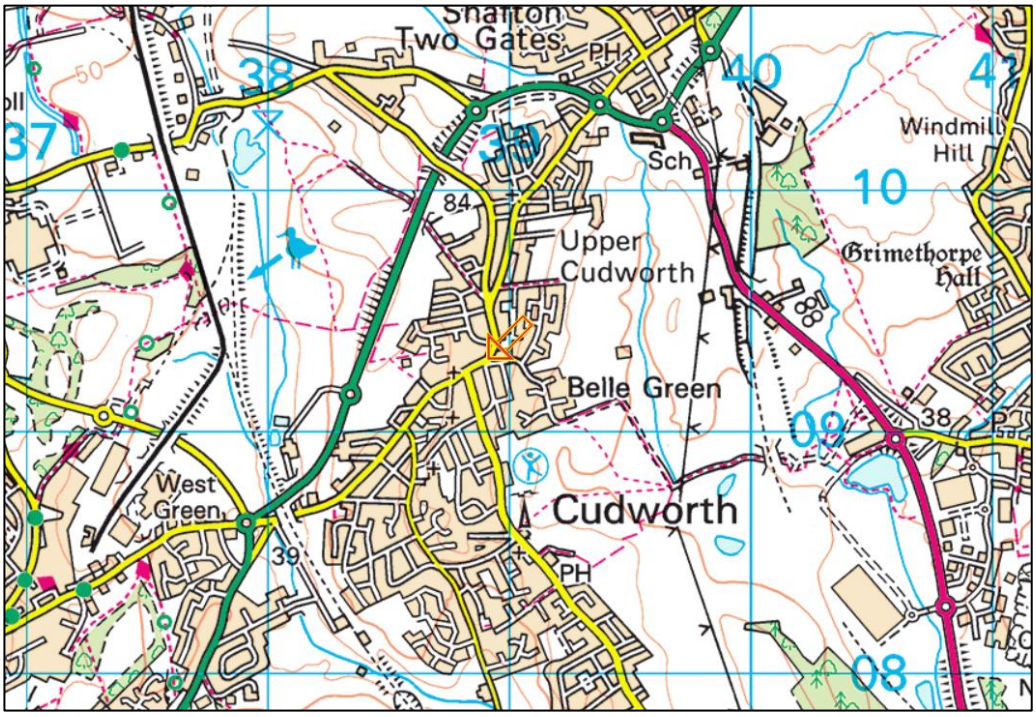


Figure 1.2 Site location plan

2 Drainage Strategy

2.1 Flood Risk Overview

2.1.1 The *National Planning Policy Framework* (NPPF) (December 2024) sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed.

2.1.2 In areas at risk of flooding or for sites of 1 hectare or more, developers must undertake a site-specific flood risk assessment to accompany applications for planning permission (or prior approval for certain types of permitted development).

2.1.3 In accordance with the Environment Agency's flood risk mapping data, the site is located within a Flood Zone 1 area and < 1.0ha and it is therefore not subject to a flood risk assessment, unless the LLFA have specific Flood Risk concerns. A review of the EA flood risk mapping data does not indicate any immediate flood risk issues with the site.

2.2 Existing Drainage

2.2.1 The site currently comprises buildings and a hardstanding area to the rear. These areas are all considered impermeable.

2.2.2 The site is currently connected to a private combined system within the site which connects into the on-site Yorkshire Water sewer and outfalls southeast into the wider 300dia. YW combined system in Barnsley Road.

2.2.3 As this is an existing development with a drainage system and positive outfall, Brownfield rates shall be used to establish existing discharge rates.

2.2.4 The existing arrangement shows approximately 772m² (0.0772ha) impermeable area discharging into the existing combined system as denoted on drawing "BC2509-APS-90-XX-DR-C-7400 P01 Existing Drainage & Impermeable Areas Plan". Using the rational method (typical for the 1 in 1 year rate) to calculate existing brownfield rates:

50 x 2.78 x 0.0772 = <u>10.722 l/s existing discharge rate</u>

2.3 Proposed Surface Water Drainage

2.3.1 Generally, the aim should be discharge surface runoff as high up the following hierarchy of drainage options as reasonably practicable*:*

(a) Collected for non-potable use

(b) Into the ground (infiltration)

(c) To a surface water body

(d) To a surface water sewer, highway drain or another drainage system

(e) To a combined Sewer

2.3.2 While no formal rainwater harvesting system is proposed, rainwater harvesting or similar solutions are encouraged to install. However, since these systems can be assumed to be full during storm events, alternative discharge methods for surface water must also be planned.

2.3.3 The ground conditions and consequent infiltration rates are not known at the site and subject to confirmation of any intrusive Phase II ground investigation.

2.3.4 As there are no nearby feasible watercourses to discharge into, it is therefore proposed to seek a connection into the existing Yorkshire Water sewer as per the existing arrangement.

2.3.5 The existing drainage is currently connected to the Yorkshire Water combined sewer at an unrestricted rate. Any restriction to flows would be a betterment in alleviating peak flows into Yorkshire Water's system.

2.3.6 As the proposals are reducing the hardstanding areas significantly, and will restrict flows, it is therefore proposed to connect any proposed drainage into the existing manhole within the site (Ref MH04).

2.3.7 Greenfield runoff rates for the site as follows:

(0.037ha): 0.1l/s (100.0% AEP), 0.2l/s (Q_{BAR}), 0.3l/s (3.3% AEP) and 0.4l/s (1.0% AEP).

2.3.8 Runoff rates have been established for the development site using the ICP SUDS Greenfield Method:

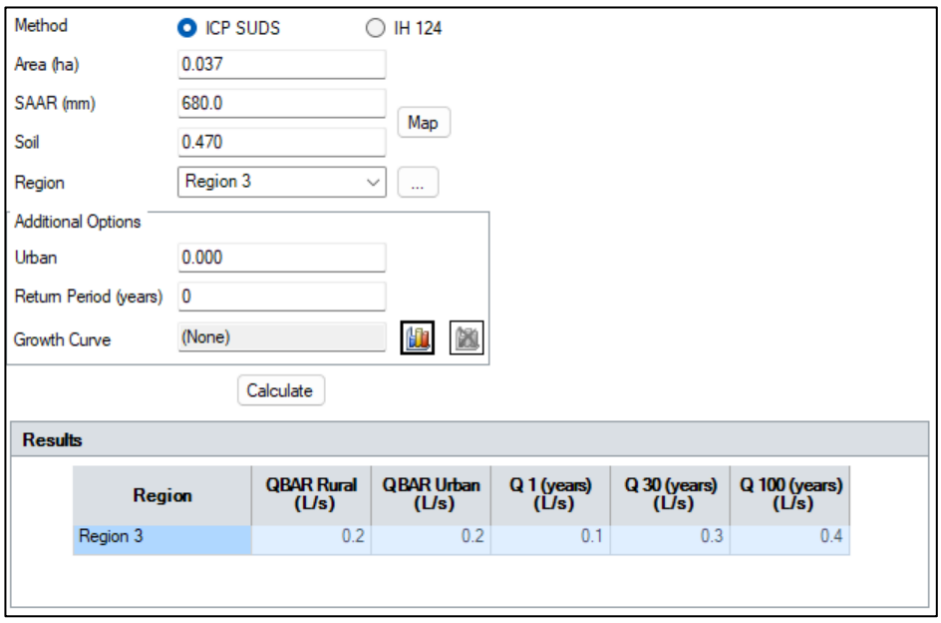


Figure 2.3: Greenfield Runoff Calculations (InfoDrainage Software)

2.3.9 The Greenfield runoff rates of Qbar = 0.2l/s result in an orifice size of <100mm diameter within the proposed flow control devices. In accordance with the South Yorkshire Interim Local Guidance for SuDS, the minimum recommended orifice size is 100mm dia. (Clause 10.12).

2.3.10 Therefore, in accordance with Clause 6.10. Peak Flow Control (South Yorkshire SuDS Guidance), it is proposed to restrict the existing Brownfield rate with a minimum betterment of 30%:

10.722 l/s x 0.7 = 7.50 l/s

2.3.11 A rate of 7.5 l/s provides an estimated betterment of 30% between the proposed and existing brownfield rate of 10.722 l/s and provides a Flow Control orifice of 128mm.

2.3.12 Permeable paving could be provided to provide the necessary attenuation estimated at min. 10m³, to cater for up to 100 year + 40% CC Storm Event. The proposed permeable paving area surpasses this storage at an estimated 35m³.

2.3.13 The drainage system has been designed to cater for an impermeable area of 0.037ha which includes the proposed works to the rear of the hotel and the existing building surface water drainage.

2.3.14 The proposed drainage strategy has been designed so that:

a) flooding does not occur on any part of the site for all events up to 3.3% AEP (1 in 30 years);

b) flooding does not occur in any part of a building or utility plant susceptible to water runoff for all events up to 1.0% AEP (1 in 100 years) + 40% climate change allowance.

2.4 Water Quality Management

2.4.1 The suitability of the proposed drainage strategy to manage the development's pollution risk has been assessed using the simple index approach in *The SuDS Manual* (2015), as summarized in Table 2.4.

Runoff Route / Treatment Train 1				
Land Use / SuDS	**Hazard Level**	**TSS**	**Metals**	**Hydro-Carbons**
Pollution Hazard Indices				
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change eg schools, offices ie <300 traffic movementsday	Low	0.5	0.4	0.4
SuDS Mitigation Indices				
Permeable Paving	-	0.7	0.6	0.7
Total SuDS Mitigation Index ≥ Pollution Hazard Index (for each contaminant type)				

Table 2.4: Surface Water Quality Management (Simple Index Approach)

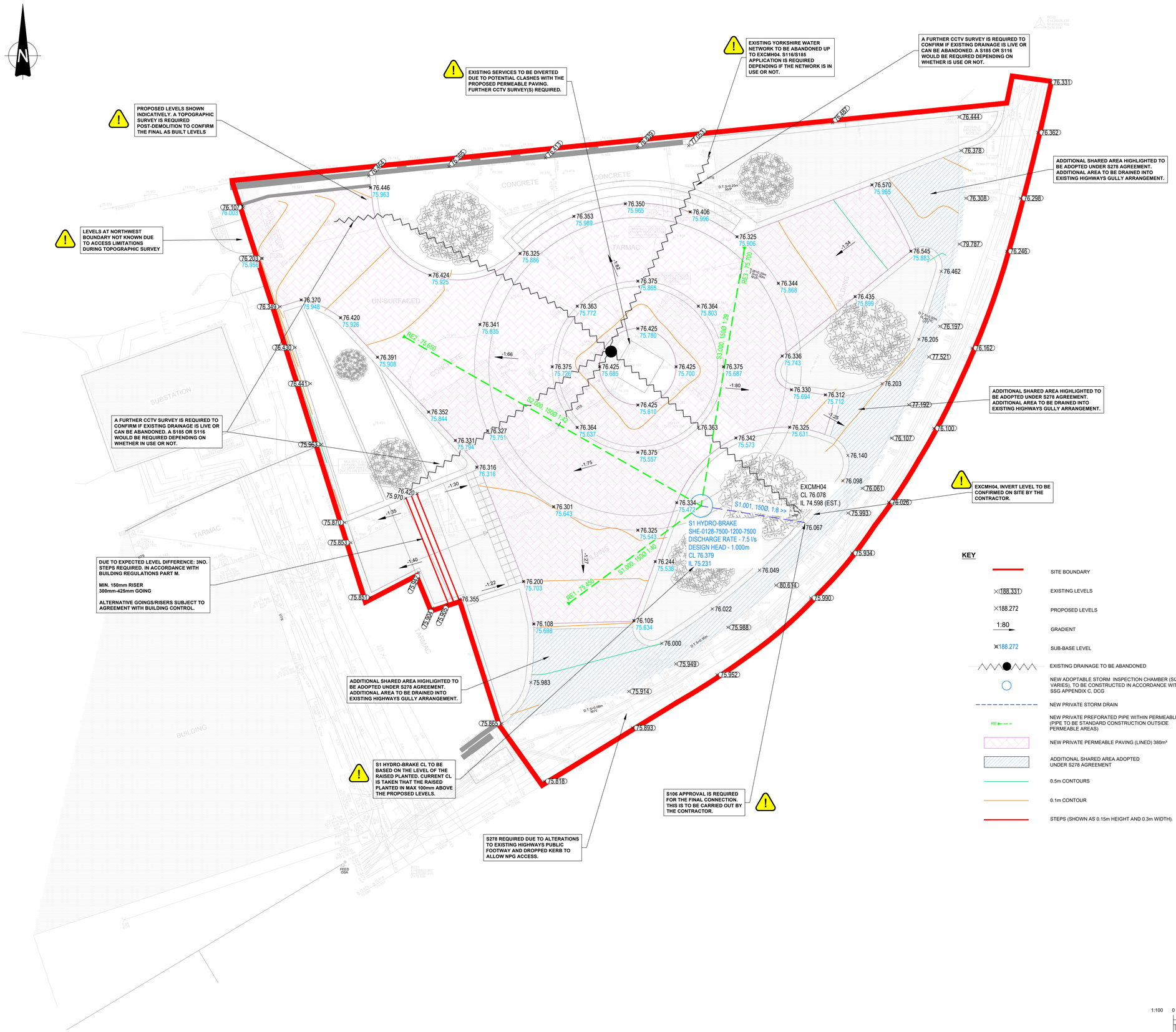
2.4.2 Alternative methods of SuDS mitigation can be explored providing the pollution hazard indices can be mitigated by the SuDS Mitigation Indices as outlined in *The SuDS Manual (2015).*

2.4.3 Maintenance requirements for SuDS components are covered in a separate document; "BC2509-APS-92-XX-RP-C-1002-SuDS-Maintenance-Report".

Appendices

Appendix A

Drainage Layout



DRAINAGE

1. ALL DRAINAGE WORKS TO BE CONSTRUCTED FROM THE OUTFALL TOWARDS THE HEAD OF RUN TO ENSURE THE OUTFALL CAN BE ACHIEVED.
2. ALL EXISTING DRAINS & SERVICES (LINE & LEVELS) TO BE CHECKED & CONFIRMED BY THE CONTRACTOR PRIOR COMMENCEMENT OF ANY ON SITE DRAINAGE WORKS. ANY DISCREPANCY IN LEVELS IS TO BE REPORTED IMMEDIATELY TO APP.
3. CCTV SURVEY TO BE CARRIED OUT TO VERIFY CONDITION OF ANY EXISTING DRAINAGE TO BE RE-USED.
4. ALL DRAINAGE WORK TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS, BS EN 752 & TO THE SATISFACTION OF THE BUILDING INSPECTOR.
5. IN ADDITION, ALL SEWERS INDICATED FOR ADOPTION TO BE BUILT IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE PUBLISHED BY THE WATER SERVICES ASSOCIATION. SEE SEPARATE NOTES.
6. ALL PROPRIETARY ITEMS TO BE INSTALLED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S DETAILS, INSTRUCTIONS & SPECIFICATIONS.
7. ALL COVER LEVELS ARE APPROXIMATE. EXACT LEVELS TO BE DETERMINED FROM THE EXTERNAL WORKS LAYOUT.
8. INVERT LEVELS QUOTED AT MANHOLES & INSPECTION CHAMBERS ARE THOSE OF THE LARGEST CONNECTED PIPE DIAMETER. PIPES AT CHAMBERS TO BE LAID WITH SOFFITS LEVEL UNLESS NOTED OTHERWISE.
9. PIPE GRADIENTS WHERE STATED ARE APPROXIMATE - LEVELS AT THE CHAMBERS TAKE PRECEDENT.
8. REFER TO ARCHITECTS DRAWINGS FOR PRECISE LOCATION OF ALL GULLIES, RAINWATER PIPES, SOIL PIPES ETC.
9. ALL SURFACE WATER GULLIES & RAINWATER PIPES ARE TO BE TRAPPED WHERE CONNECTING TO COMBINED DRAINS/SEWERS.
10. ALL CONNECTIONS ARE TO HAVE AN ABOVE-GROUND OR FLOOR ACCESS POINT TO ENABLE FUTURE ACCESS FOR MAINTENANCE.
11. PIPES & FITTINGS TO BE:
    - CONCRETE PIPES & ANCILLARY PRODUCTS TO BS 5911:2022 & BS EN 1916:2002.
    - VITRIFIED CLAY PIPES & FITTINGS TO BS EN 295:2013
    - DUCTILE IRON TO BS EN 598:2007 & BS ISO 4179:2005.
    - PERFORATED VITRIFIED CLAY PIPES FOR LAND DRAINAGE TO BS 1196.
    - PLASTIC PIPES FOR LAND DRAINAGE TO BS 4962:1982.
    - PLASTIC PIPING SYSTEMS FOR NON-PRESSURE UNDERGROUND DRAINAGE & SEWAGE TO BS EN 1401 & BS 4660 – SOLID WALL ONLY, STRUCTURED WALL PIPES ARE NOT ACCEPTABLE FOR USE IN DRAINAGE SYSTEMS UNLESS AGREED.
    - PRECAST CONCRETE MANHOLE UNITS TO BS EN 1917:2002.
    - PLASTIC INSPECTION CHAMBERS FOR DRAINS & SEWERS TO BS EN 13598-1:2010.
    - GULLY & MANHOLE TOPS FOR VEHICULAR & PEDESTRIAN AREAS TO BS EN 124:1994.
    - DRAINAGE CHANNELS FOR VEHICULAR & PEDESTRIAN AREAS TO BS EN 1433:2002.
12. ALL MANHOLE COVERS, ROAD GULLY COVERS & FRAMES TO COMPLY WITH BS EN124 NON ROCKING TYPE.

    UNLESS NOTED OTHERWISE USE CLASS:

    A15 FOR USE IN PEDESTRIAN AREAS WHERE VEHICLES HAVE NO ACCESS.

    B125 FOR USE IN CAR PARKS & PEDESTRIAN AREAS WHERE INFREQUENT LIGHT VEHICLE ACCESS IS LIKELY (INCLUDING DRIVEWAYS).

    C250 FOR ACCESS COVERS & GULLY GRATINGS IN AREAS OF SLOW MOVING, HEAVY TRAFFIC; ALSO FOR GULLY GRATINGS IN CARRIAGEWAY WITHIN 500mm OF KERB & UP TO 200mm INTO THE FOOTWAY.

    D400 FOR USE IN CARRIAGEWAYS OF ROADS & PARKING AREAS ACCESSED BY ALL TYPES OF VEHICLES.

    E600 FOR USE IN AREAS WHERE HIGH WHEEL LOADS ARE PRESENT.

    F900 FOR USE IN AREAS WHERE EXTREMELY HIGH WHEEL LOADS ARE PRESENT SUCH AS AIRCRAFT PAVEMENTS, DOCKS, HEAVY INDUSTRIAL SITES.

    THE INTEGRITY OF ANY REMAINING EXISTING MANHOLE COVERS, ROAD GULLY COVERS & FRAMES WITHIN THE SITE ARE TO BE CHECKED BY THE CONTRACTOR IN TERMS OF CONDITION AND COMPLIANCE WITH THESE REQUIREMENTS. REPAIR OR REPLACE AS NECESSARY, ADJUSTING FRAME LEVELS TO ACCOMMODATE ANY CHANGES REQUIRED TO SITE LEVELS.
13. MANHOLES IN INTERNAL AREAS REQUIRE DOUBLE SEALED COVERS WITH LOCKING SCREWS, RECESSED WHERE REQUIRED TO ACCOMMODATE FLOOR FINISHES TO ARCHITECTS SPECIFICATION.
14. PIPE BEDDING

    USE CLASS S BEDDING UNLESS NOTED OTHERWISE. NB PROTECT AGAINST CONSTRUCTION TRAFFIC AS NECESSARY

    USE CLASS Z CONCRETE BED & SURROUND OR CONCRETE SLAB PROTECTION AS FOLLOWS:
    - CLASS 120 CLAYWARE OR CLASS M CONCRETE (100 - 600Ø PIPES)

      LANDSCAPING - LESS THAN 600mm COVER TO CROWN.

      HARDSTANDING - LESS THAN 1200mm COVER TO CROWN
    - PLASTIC (100 - 300Ø PIPES)

      LANDSCAPING - LESS THAN 600mm COVER TO CROWN.

      HARDSTANDING - LESS THAN 900mm COVER TO CROWN
15. PIPES BELOW CONCRETE GROUND FLOOR SLABS:

    WHERE THE CROWN OF THE PIPE IS WITHIN 300mm OF THE UNDERSIDE OF SLAB, SPECIAL PROTECTION TO BE PROVIDED IN ACCORDANCE WITH BUILDING REGULATIONS H1 2.44 OR 150mm GEN3 CONCRETE BED & SURROUND CAST INTEGRALLY WITH SLAB.

    OTHERWISE USE CLASS S BEDDING.
16. MAIN BACKFILL TO BE WELL COMPACTED IN 150mm LAYERS OF:

    SELECTED BACKFILL MATERIAL IN ALL SOFT LANDSCAPED AREAS

    TYPE 1 GRANULAR MATERIAL IN ALL HARDSTANDING AREAS OR PUBLIC HIGHWAYS
17. BACKFILL TO DRAINS NEAR FOUNDATIONS TO BE IN ACCORDANCE WITH BUILDING REGULATIONS H1 DIAGRAMS 8 & 12.

KEY

- SITE BOUNDARY
- (188.331) EXISTING LEVELS
- 188.272 PROPOSED LEVELS
- 1:80 GRADIENT
- 188.272 SUB-BASE LEVEL
- EXISTING DRAINAGE TO BE ABANDONED
- NEW ADOPTABLE STORM INSPECTION CHAMBER (SIZE VARIES), TO BE CONSTRUCTED IN ACCORDANCE WITH SSG APPENDIX C, DCG
- NEW PRIVATE STORM DRAIN
- RE NEW PRIVATE PREFORATED PIPE WITHIN PERMEABLE AREAS (PIPE TO BE STANDARD CONSTRUCTION OUTSIDE PERMEABLE AREAS)
- NEW PRIVATE PERMEABLE PAVING (LINED) 380m²
- ADDITIONAL SHARED AREA ADOPTED UNDER S278 AGREEMENT
- 0.5m CONTOURS
- 0.1m CONTOUR
- STEPS (SHOWN AS 0.15m HEIGHT AND 0.3m WIDTH).

Notes

GENERAL

1. THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT PROJECT DOCUMENTATION.
2. OVERALL SETTING OUT DIMENSIONS AND LEVEL DATUMS TO BE CONFIRMED BY THE ARCHITECT.
3. ANY DISCREPANCIES BETWEEN THIS DRAWING AND THE ARCHITECTURAL DRAWINGS SHOULD IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE CONTRACT ADMINISTRATOR, ARCHITECT & ENGINEER.
4. UNLESS NOTED OTHERWISE, ALL DIMENSIONS ON DRAWINGS ARE IN MILLIMETRES, LEVELS ARE IN METRES.
5. DO NOT SCALE OFF DRAWING. ONLY WRITTEN OR CALCULATED DIMENSIONS MUST USED FOR THE PURPOSE OF CONSTRUCTION.
6. ALL DETAILS AND DIMENSIONS, PARTICULARLY THOSE RELATING TO EXISTING STRUCTURES, ARE TO BE CHECKED OR VERIFIED ON SITE BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF CONSTRUCTION OR FABRICATION AND ANY DISCREPANCIES REPORTED TO THE CONTRACT ADMINISTRATOR, ARCHITECT & ENGINEER.
7. MATERIALS AND WORKMANSHIP MUST COMPLY WITH ALL RELEVANT NBS SPECIFICATIONS, NATIONAL/EU CODES OF PRACTICE AND LOCAL AUTHORITY & STATUTORY APPROVALS.
8. ANY NAMED PROPRIETARY PRODUCT OR MATERIAL IS PROVIDED AS A REFERENCE ONLY. CONTRACTORS MAY PROPOSE AN ALTERNATIVE PROVIDED THAT THE PRODUCT OR MATERIAL IS OF EQUIVALENT STANDARD SUBJECT TO THE AGREEMENT OF THE ENGINEER..
9. ALL PROPRIETARY PRODUCTS ARE TO BE USED STRICTLY IN ACCORDANCE WITH THE MANUFACTURER'S DETAILS AND REQUIREMENTS.
10. CONTRACTORS MUST IDENTIFY IN THEIR TENDER SUBMISSION, ANY PRODUCTS THAT HAVE LONG LEAD-IN PERIODS FOR WHICH THE MATERIALS WOULD NEED TO BE PRE-ORDERED PRIOR TO THE AWARD OF THIS CONTRACT.

ABANDONED/REDUNDANT DRAINAGE

1. CONTRACTORS MUST UNDERTAKE A CCTV SURVEY OF THE DRAINS TO BE ABANDONED TO CONFIRM THAT THEIR ARE NO LIVE CONNECTIONS REMAINING.
2. ALL ABANDONED DRAINAGE PIPES MUST BE EITHER GRUBBED OUT OR FILLED WITH A GROUT CONSISTING OF ONE OF THE FOLLOWING:
    - CLASS G3 GROUT TO CONSIST OF 1:10 CEMENT:SAND - MIXED WITH THE MINIMUM AMOUNT OF WATER TO ENSURE FLUIDITY.
    - CLASS G4 GROUT TO CONSIST OF 1:10 CEMENT:PFA - MIXED WITH THE MINIMUM AMOUNT OF WATER TO ENSURE FLUIDITY.
2. GROUT TO BE PUMPED UNDER PRESSURE FROM THE HIGHER END OF THE PIPE BEING FILLED ENSURING THAT NO LENGTH OF PIPE IS FILLED UNTIL ALL UPSTREAM CONNECTING LENGTHS HAVE BEEN COMPLETED.
3. SEALS AT THE LOWER END OF EACH PIPE LENGTH TO BE FITTED WITH A FLEXIBLE BREATHER PIPE, FIXED AT THE PIPE SOFFIT AND TURNED VERTICALLY UPWARDS TO A HEIGHT OF 600mm ABOVE THE SOFFIT OF THE HIGHER END OF THE PIPE.
4. THE HEAD OF EXISTING PIPE LENGTHS "CUT-OFF" AND EXPOSED DURING EXCAVATIONS FOR NEW WORKS SHALL BE SUITABLY SEALED AND A 150mm FLEXIBLE INJECTION PIPE CONSTRUCTED THROUGH THE SEAL AT THE PIPE SOFFIT. THIS SHALL BE TURNED VERTICALLY AND EXTENDED UPWARDS FOR AT LEAST 1m.
5. ON COMPLETION OF GROUTING OPERATIONS, THE INJECTION PIPE SHALL BE SEALED WITH A PLUG OF CONCRETE AT LEAST 150mm DEEP AND HAVING 150mm BEARING OUTSIDE THE INJECTION PIPE.
6. SURPLUS WATER SHALL BE DISPOSED OF WITHOUT CAUSING A NUISANCE.
7. SHAFTS OF ABANDONED/REDUNDANT MANHOLES ARE TO BE BROKEN DOWN TO A LEVEL OF 1m BELOW FINISHED GROUND LEVEL AND THE REMAINING VOID FILLED WITH GEN0 CONCRETE.

1:100 0 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

1:1 0 10 20 30 40 50 60 70 80 90 100

(SCALEBAR IS INDICATIVE ONLY - DO NOT SCALE OFF THIS DRAWING)

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Project Name: THE CRESCENT, CUDWORTH

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BC2509-APS-90-XX-DR-C-2000 P01 Engineering Layout.dwg

Appendix B

Drainage Calculations

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	0.350	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)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
RE1	0.005	5.00	76.440	450	438895.252	409309.699	0.790
RE2	0.019	5.00	76.325	450	438912.948	409311.294	0.625
RE3	0.013	5.00	76.153	450	438903.860	409292.874	0.703
S1			76.379	1200	438911.003	409297.396	1.148
EXCMH04			76.078	600	438916.404	409297.151	1.480

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	RE1	S1	19.986	0.600	75.650	75.231	0.419	47.7	150	5.23	50.0
2.000	RE2	S1	14.033	0.600	75.700	75.231	0.469	29.9	150	5.13	50.0
3.000	RE3	S1	8.454	0.600	75.450	75.231	0.219	38.6	150	5.09	50.0
1.001	S1	EXCMH04	5.407	0.600	75.231	74.598	0.633	8.5	150	5.25	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.460	25.8	0.9	0.640	0.998	0.005	0.0	19	0.679
2.000	1.847	32.6	3.4	0.475	0.998	0.019	0.0	33	1.197
3.000	1.625	28.7	2.3	0.553	0.998	0.013	0.0	29	0.983
1.001	3.468	61.3	6.7	0.998	1.330	0.037	0.0	33	2.275

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	19.986	47.7	150	Circular	76.440	75.650	0.640	76.379	75.231	0.998
2.000	14.033	29.9	150	Circular	76.325	75.700	0.475	76.379	75.231	0.998
3.000	8.454	38.6	150	Circular	76.153	75.450	0.553	76.379	75.231	0.998
1.001	5.407	8.5	150	Circular	76.379	75.231	0.998	76.078	74.598	1.330

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE1	450	Manhole	Adoptable	S1	1200	Manhole	Adoptable
2.000	RE2	450	Manhole	Adoptable	S1	1200	Manhole	Adoptable
3.000	RE3	450	Manhole	Adoptable	S1	1200	Manhole	Adoptable
1.001	S1	1200	Manhole	Adoptable	EXCMH04	600	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE1	438895.252	409309.699	76.440	0.790	450	0	1.000	75.650	150
RE2	438912.948	409311.294	76.325	0.625	450	0	2.000	75.700	150
RE3	438903.860	409292.874	76.153	0.703	450	0	3.000	75.450	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S1	438911.003	409297.396	76.379	1.148	1200		1	3.000	75.231	150
							2	2.000	75.231	150
							3	1.000	75.231	150
							0	1.001	75.231	150
EXCMH04	438916.404	409297.151	76.078	1.480	600		1	1.001	74.598	150

Simulation Settings

Rainfall Methodology	FSR	Summer CV	1.000	Additional Storage (m³/ha)	0.0
Rainfall Events	Singular	Winter CV	1.000	Starting Level (m)	
FSR Region	England and Wales	Analysis Speed	Detailed	Check Discharge Rate(s)	x
M5-60 (mm)	20.000	Skip Steady State	x	Check Discharge Volume	x
Ratio-R	0.350	Drain Down Time (mins)	240		

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

Node S1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	75.231	Product Number	CTL-SHE-0128-7500-1000-7500
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	7.5	Min Node Diameter (mm)	1200

Node S1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	19.000	Depth (m)	0.300
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	75.231	Length (m)	20.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	0	Slope (1:X)	100.0		

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	10	75.689	0.039	3.8	0.0062	0.0000	OK
15 minute summer	RE2	10	75.770	0.070	14.5	0.0111	0.0000	OK
15 minute summer	RE3	10	75.511	0.061	9.9	0.0096	0.0000	OK
60 minute summer	S1	41	75.417	0.186	19.9	10.0795	0.0000	SURCHARGED
60 minute summer	EXCMH04	41	74.632	0.034	6.9	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S1	3.8	0.423	0.146	0.2090	
15 minute summer	RE2	2.000	S1	14.5	1.278	0.443	0.1768	
15 minute summer	RE3	3.000	S1	9.9	0.932	0.344	0.1009	
60 minute summer	S1	1.001	EXCMH04	6.9	2.204	0.113	0.0170	21.0