NORTON COMMUNITY HALL & CRICKET PAVILLION

SuDS Drainage Strategy

Brockhill Lane, Worcester WR5 2PP

NCH-BML-ERD-ZZ-RP-C-0500

Thursday, 10th December 2020

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1. Introduction

1.1 Project Background

Barnsley Marshall was appointed by Worcester Norton CIC to provide a SuDS Drainage Strategy to support a proposed new sports hall with changing facilities and community meeting space. Work will also be needed to improve access and on-site parking. The development is on 0.23Ha off Brickhill Lane, Worcester, with postcode WR5 2PP.

The report provides plan layouts for foul and surface water drainage for the proposed development based on government and local authority guidance with regard to flood risk and drainage.

The report is based on currently available and preliminary discussions.

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Barnsley Marshall shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Barnsley Marshall.

1.2 Scope of Assessment

The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Policy Guidance to the National Planning Policy Framework (NPPF) and Worcestershire City Council's 'Sustainable Drainage: Design & Evaluation Guide.'

The development area is next to the Brockhill lane, and approximately 0.23Ha. Following scrutiny of the Environment Agency flood maps it has been identified that the existing site lies within an area classified as Flood Zone 1 indicating that the risk of flooding from rivers and sea is low, with an Annual Exceedance Probability of flooding of less than 0.1%. Due to the site being less than 1.0Ha, a Flood Risk Assessment is not required in accordance with Planning Policy Guidance.

In April 2015, the Government made changes to the National Planning Policy Framework which made Sustainable Urban Drainage Systems (SUDS) a material consideration in the determination of planning applications for new developments. This report has therefore been produced to support the Planning Application in accordance with the Town and Country Planning Order 2015.

The Strategy reviews the following information:

- Environment Agency flood maps for rivers and sea flooding.
- Sustainable Drainage: Design & Evaluation Guide, Worcestershire City Council.
- Severn Trent Water Public Sewer Records.
- Design & Construction Guidance, April 2020.
- Part H of the Building Regulations: Drainage and waste disposal.
- BE EN12056 Part 2 Gravity Drainage Systems Inside Buildings.
- Technical Guidance to the National Planning Polity Framework.
- CIRIA Report C753 SUDS Manual 2016.
- BS EN 752:2008 Drain and sewer systems outside buildings.
- BS 8582:2013, Code of Practice for surface water management for development sites.
- BS 8533:2011, Assessing and managing flood risk in development – Code of practice.
- CIRIA C635 Designing for exceedance in urban drainage - good practice
- Flood Estimation Handbook (FEH) /Flood Studies Report (FSR) methods.
- Institute of Hydrology (IH) Reports No. 124.
- Environmental Agency (EA) / Department for Environment, Food and Rural Affairs (DEFRA) recommendations.
- DMRB Design Manual for Roads and Bridges Volume 4 Section 2 'Drainage'.
- Floods and Water Management Act 2010.
- Flood plan guidance for communities and groups – EA.
- Adapting to Climate Change: Advice for Flood and. Coastal Erosion Risk Management Authorities – EA.
- Code for Sustainable Homes.

1.3 Proposed Development

The proposed development comprises of proposed new sports hall with changing facilities and community meeting space. Work will also be needed to improve access and on-site parking. The development is on 0.23Ha off Brickhill Lane, Worcester, with postcode WR5 2PP. The proposed development layout is shown in ***Appendix A***.

2. Existing Site Details

2.1 History and Current Use

The site is approximately 3km south-east of Worcester City Centre, and approximately 0.8km west of the M5 junction 7. The site is currently occupied by an existing building, customer car park, and two cricket pitches.

The site is surrounded by a residential housing estate on the south-west and south-east, and bounded by the Brockhill Lane to the north-east, as shown on ***Figure 1.***

Figure 1: Cricket Club site shown with blue border & proposed development site shown in red border

(Source: Google Maps, 2020-12-03, 1300hrs)

2.2 Topography

The site is generally flat from north-east to south-west but falls approximately 2.0m from south-east to north-west (39.000mAOD to 37.800mAOD), which converts to an approximate gradient of 1 in 20. Refer to the topographical survey in ***Appendix B*** for existing site levels.

2.3 Geology

No Ground Investigation Survey had been carried out at the time this report was compiled, although it was in the process of being commissioned. A search on British Geological Survey online showed that the nearest borehole logs are dated September 1986 and November 1987. Borehole reference number SO85SE215 (Grid Reference: X:3886596 Y:252300) is located approximately 170m to the north-west of the site and borehole reference number SO85SE153 (Grid Reference: X:387263 Y:251500) is located approximately 200m to the south-east of the site, and gave the information on ***Table 1.***

Table 1: Geological Information from BGS

From	To	Description
Borehole SO85SE215		
Ground Level	0.40m below ground	Topsoil
0.40m below ground	0.80m below ground	Firm brown silty sandy CLAY with occasional fine root material
0.80m below ground	3.80m below ground	Firm to stiff friable in places silty CLAY with some sand and gravel size siltstone lithorelicts (Mercia Mudstone Zone IVa/III) Becoming less weathered gradually with depth
3.80m below ground	5.00m below ground (bottom of pit)	Red brown with occasional small green pockets highly weathered SILTSTONE weak (Mercia Mudstone Zone III/II)
Borehole SO85SE153		
Ground Level	0.10m below ground	Topsoil
0.10m below ground	0.40m below ground	Made Ground: firm brown silty CLAY with some sand and rootlets
0.40m below ground	0.80m below ground	Made Ground: Firm mettled brown reddish and greyish green slightly sandy silty CLAY with some fine mudstone gravel
0.80m below ground	1.30m below ground	Firm to stiff reddish brown and greyish green slightly gravelly sandy silty CLAY. Gravel is fine to medium mudstone and siltstone.
1.30m below ground	2.00m below ground	Reddish brown thickly laminated very closely jointed moderately weathered silty MUDSTONE, very week, with some silty clay matrix.
2.00m below ground	8.21m below ground (bottom of pit)	Reddish brown thickly laminated very closely jointed moderately weathered silty MUDSTONE, weak to very weak.

(Source: British Geological Survey - https://mapapps.bgs.ac.uk/geologyofbritain/home.html Accessed on 2020-11-16, 1530hrs)

Figure 2: Location of the Borehole Log from British Geological Survey
(Source: British Geological Survey, Accessed on 2020-12-03, 1333hrs)

A copy of the borehole results is contained in ***Appendix C.***

The soil profile from the two boreholes indicate that the soil is predominantly CLAY for depths of more than 3m from the surface and would not support drainage via infiltration. Attenuation of runoff shall therefore be provided by geo-cellular Storage Tank located within the verge area between the buildings and the existing access road off Brockhill Lane. A hydro-brake shall control flow past the tank into the existing combined sewer to the existing STW public foul sewer.

2.4 Existing Watercourses

There is an existing ditch approximately 170m to the north-west of the side. Discharge to that watercourses is however not practically possible due to the need to avoid various existing infrastructure before reaching the watercourse.

2.5 Existing Public Drainage

A public sewer record has been acquired from Severn Trent Water and is contained in ***Appendix C.***

There are no existing public sewers on site. The closest Severn Trent Water public sewers are located along Vimiera Close. The sewers comprise of a 150mm diameter public Foul Sewer and a 225mm diameter public Surface Water Sewer.

There is also an existing Severn Trent Water foul sewer that cross the northern cricket ground diagonally (flowing south-east to north-west) and connects with the rest of the STW sewers to the north-west of the site, refer to ***Appendix D*** for a plan layout of the proposed drainage – the layout also shows the approximate alignment of this existing STW foul public sewer.

2.6 Existing Private Drainage

A detailed Drainage and CCTV Survey was commissioned to determine the exact layout of any sewers on site, and the survey demonstrated that the existing buildings are served by a combined DN100 sewer that collect both foul and surface water drainage from the buildings and yard and discharge into a buried manhole at the north-western corner of the site. Flow from the buried manhole is conveyed by a DN150 foul sewer that discharges into an existing STW public foul sewer to the north-west of the site. Refer to ***Appendix B*** for a plan layout of the existing private drainage on site.

The existing catchment area (paved & roofed) discharging to the buried manhole is 0.106Ha. The existing drainage was modelled in micro-drainage it was found that the peak flows to the buried manhole at the north-western corner of the site for 1-year + 40%CC Storm event, 30-year + 40%CC Storm event, and 100-year + 40%CC Storm event are 18.2 l/s, 45.3 l/s, and 55.5 l/s respectively.

3. Drainage Strategy

3.1 Key Principles of SuDS

Figure 3 gives the four key design principles critical for the implementation of SuDS:

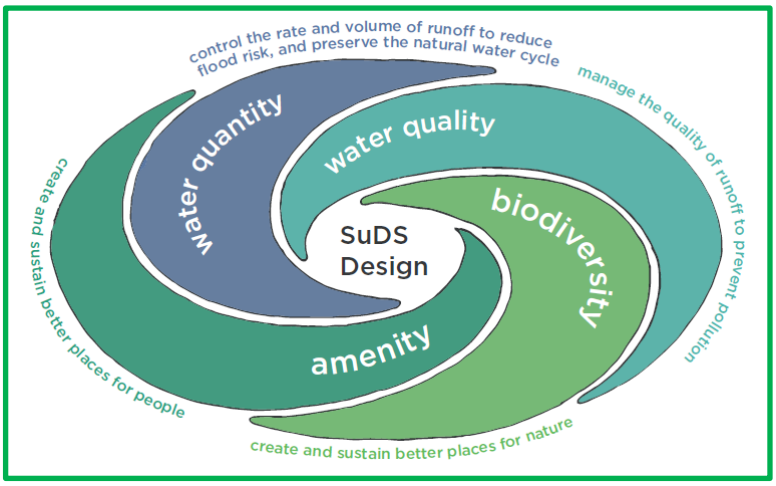

Figure 3: Four Key Principles of SuDS

(Source: Sustainable Drainage: Design & Evaluation Guide, 2018, Worcestershire County Council)

Quantity Control : Achieved by controlling the quantity of surface water runoff reaching a watercourse, drainage system or sewer. Controlling runoff can aid in mitigating the risk of flooding. The benefits to quantity control include:

- Less surface water entering watercourses, thereby offsetting peak flows and reducing fluvial flood risk.
- Less surface water entering sewers, thereby freeing capacity and reducing flood risk
- Allows for adaption to climate change
- Allows for recharge of underground aquifer

Quality Control : Achieved by improving the quality of surface water reaching a watercourse, drainage system or sewer. The benefits to quality control include:

- Reduces of pollution levels in surface water bodies
- Protects groundwater resources from contamination
- Enables compliance with the Water Framework Directive

Biodiversity and Amenity Value : Achieved by introducing SuDS that enhance the existing biodiversity of the area and/or add amenity value to the community. The benefits include:

- Contributes to community health & wellbeing by providing green spaces with value in terms of landscape, recreation and walking routes

- Provides opportunities for multifunctional areas
- Provides wildlife habitat and ecological benefits
- Increases property values

These key design principles should be considered in all aspects of SuDS selection and design. All SuDS should aim to achieve ***each of these principles.***

3.2 Discharge Hierarchy

Under the terms of Section H of the Building Regulations 2000, the SUDS Manual 2015 report C753, and the Technical Guidance to the National Planning Policy Framework, the disposal of surface water by means of soakaways should be considered as the primary method, refer to ***Figure 4.***

No Ground Investigation Survey had been carried out at the time this report was compiled, although it was in the process of being commissioned. However, based on British Geological Survey historical boreholes (refer ***section 2.3***), the soil profile is predominantly CLAY for depths of more than 3m from the surface and would not support drainage via infiltration. Attenuation of runoff shall therefore be provided by geo-cellular Storage Tank located within the verge area between the buildings and the existing access road off Brockhill Lane. A hydro-brake shall control flow past the tank not exceed 15.0 l/s for all storm events up to and including the 100-year + 40%CC storm event into the existing combined sewer to the existing STW public foul sewer.

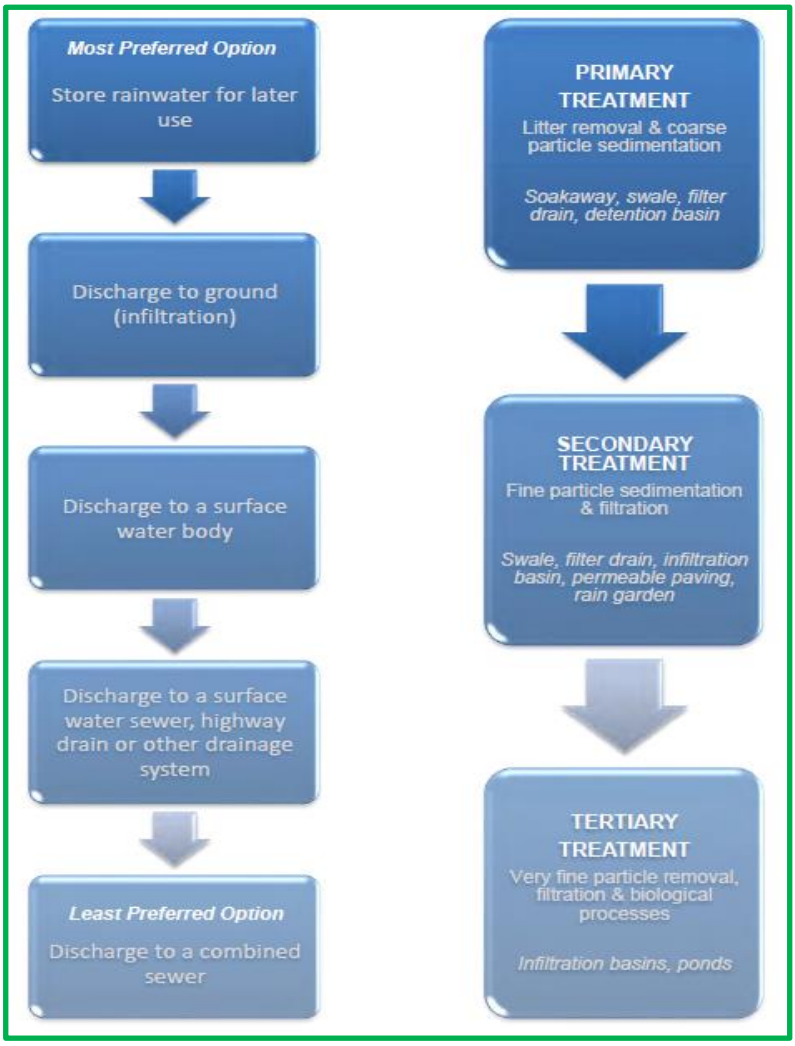

Figure 4: Recommended SuDS Discharge Hierarchy

(Source: Sustainable Drainage: Guide to Design, Adoption and Maintenance, June 2015, Birmingham City Council)

3.3 Sustainable Drainage Systems.

A SuDS appraisal was conducted based on the SuDS hierarchy given in ***Figure 4***. ***Table 2*** gives the results of the appraisal.

Table 2: Scheme Appraisal of SuDS Drainage Features

SuDS Feature	Is feature suitable for the proposed site?	Comment
Soakaway	NO	Clay soils, infiltration not possible.
Green/Brown Roofs	NO	Most of the roof will be covered by M& E plant.
Filter Trench/Drain	YES	Could be provided at the interface between the front yard and the green / cricket pitch, however dished concrete channels and sumped gullies have been
Swale	NO	Insufficient area to incorporate swales.
Permeable Paving	YES	Retained as part of the front yard is paved with Block Paving.
Infiltration Basin	NO	Clay soils, infiltration not possible.
Detention Basin	NO	Insufficient area to incorporate basin.
Bioretention System (Rain Garden / Stormwater Planters)	NO	Insufficient area to incorporate basin.
Pond	NO	Insufficient area to incorporate basin.
Storage System: Geo-cellular or Tank	YES	Provided along the back of the buildings, between the buildings and the existing access road off Brockhill Lane.

Based on the selected SuDS features as per ***Table 2***, the main SuDS features associated with the proposed drainage strategy are summarised below:

Rigistorm Separate Catchpits: A catchpit has been proposed upstream of the geo-cellular tank to capture silt and debris and prevent it from entering the geo-cellular tank.

Permeable Pavement: The existing front yard to the buildings is partly concrete-paved and partly block-paved. It is proposed that any pavement amendments of re-surfacing of the front yard should be mage of permeable pavement (Block Paving). Permeable pavement underlaid by a drainage blanket (5-20mm sub-base) wrapped in impermeable geomembrane will allow runoff to undergo filtration through the sand layer and sub-base. Refer to ***Appendix D*** for areas to receive permeable pavement and construction make-up.

Geo-cellular Attenuation Tank: Provide storage of runoff to enable a controlled outflow of 15.0 l/s maximum for all storm events up to and including the 100-year + 40% CC storm event.

Flow Control Device: Runoff from the development shall be controlled to maximum 15.0 l/s for all storm events up to and including the 100-year + 40% CC storm event by a Hydro-brake Outflow Control, details of which are shown in ***Appendix D.***

The controlled flow shall be discharged to the existing buried manhole at the north-western corner of the site. Flow from the buried manhole is conveyed by a DN150 foul sewer that discharges into an existing STW public foul sewer to the north-west of the site. The invert level of the buried manhole and flow connectivity to the existing STW foul sewer will need to be established by way of a targeted CCTV & Drainage Survey before construction commences.

3.4 Surface Water Drainage

The plan layout of the proposed surface water drainage is shown in ***Appendix D,*** which also contains the Catchment Areas and Pavement Design (External Surfaces) proposals. The drainage system has been designed so that no part of the system floods for all storm events up to and including the 100-year + 40% CC event.

Figure 5 gives a summary of the proposed SuDS Drainage Strategy.

The existing catchment area (paved & roofed) discharging to the buried manhole is 0.106Ha. The existing drainage was modelled in micro-drainage and it was found that the peak flows to the buried manhole at the north-western corner of the site for 1-year + 40%CC storm event, 30-year + 40%CC storm event, and 100-year + 40%CC storm event are 18.2 l/s, 45.3 l/s, and 55.5 l/s respectively.

Because the site is a brownfield site, it is proposed to provide at least 30% betterment to the existing flows to ensure that proposed flows past the buried manhole and to the existing STW public foul sewer are less than existing flows.

The proposed catchment area (paved & roofed) discharging to the buried manhole is 0.118Ha. It is not known what pipe size or pipe slope leaves the buried manhole to the existing STW foul sewer. A reasonable assumption would be an existing DN150 pipe laid at a slope of 1 in 100. With a k-value of 0.600mm, the pipe would have full bore capacity of 17.7 l/s. With this in mind, a decision was made to limit the peak flow past the buried manhole to 15.0 l/s maximum for all storm events up to and including the 100-year + 40%CC storm event. The proposed drainage was modelled in micro-drainage and it was found that the peak flows to the buried manhole at the north-western corner of the site for 1-year + 40%CC storm event, 30-year + 40%CC storm event, and 100-year + 40%CC storm event shall be 7.7 l/s, 14.9 l/s, and 14.9 l/s respectively. This provides flow betterment to the existing of 57.7%, 67.1%, and 73.1% for the 1-year + 40%CC storm event, 30-year + 40%CC storm event, and 100-year + 40%CC storm event respectively.

A Hydro-brake flow control chamber immediately downstream of the geo-cellular storage tank shall restrict discharge from the development to 15.0 l/s maximum for all storm events up to and including the 100-year + 40%CC storm event, refer to ***Appendix D*** for location and layout.

The invert level of the buried manhole and flow connectivity to the existing STW foul sewer will need to be established by way of a targeted CCTV & Drainage Survey before construction commences

Appendix E gives the hydraulic calculations of the existing and proposed drainage.

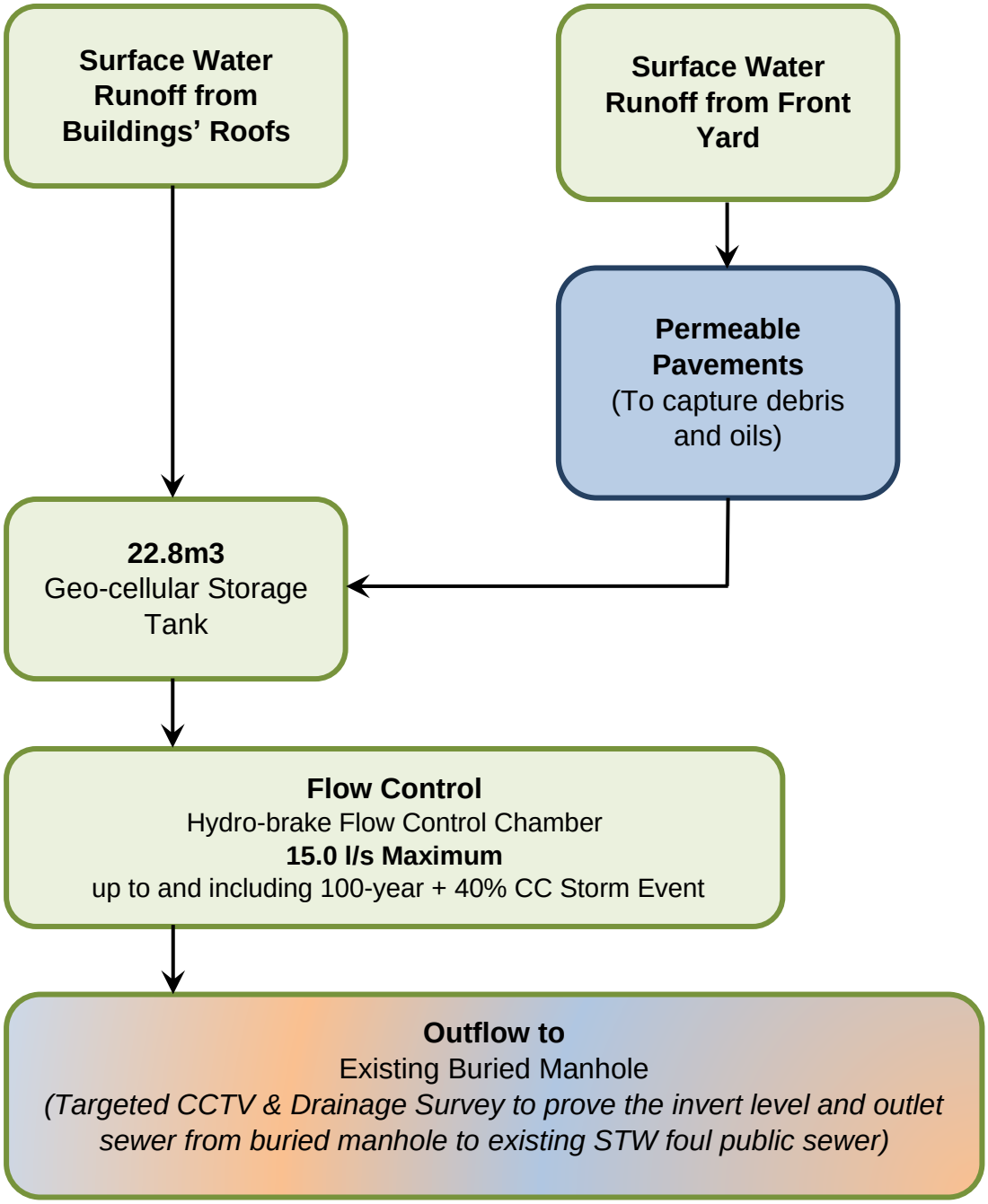

Figure 5: SuDS Drainage Strategy Summary

3.5 Pollution Control and Water Quality

The following pollution control devices have been proposed:

- ***Rigistorm Separate Catchpits:***
  A catchpit has been proposed upstream of the geo-cellular tank to capture silt and debris and prevent it from entering the geo-cellular tank.

- ***Permeable Pavement:***
  The existing front yard to the buildings is partly concrete-paved and partly block-paved. It is proposed that any pavement amendments of re-surfacing of the front yard should be mage of permeable pavement (Block Paving). Permeable pavement underlaid by a drainage blanket (5-20mm sub-base) wrapped in impermeable geomembrane will allow runoff to undergo filtration through the sand layer and sub-base. Refer to ***Appendix D*** for areas to receive permeable pavement and construction make-up.

CIRIA report C753, The SuDS Manual, says on page 567 'To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).'

Table 3 shows Table 26.2 of the SuDS Manual, which gives the pollution hazard indices for various land uses.

Table 3: Pollution hazard indices for different land use classifications

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Notes

1 Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).

2 These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.

Table 4 shows Table 26.3 of the SuDS Manual, which gives indicative SuDS mitigation indices for discharges to surface waters.

Table 4: Indicative SuDS mitigation indices for discharges to surface waters

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

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

Notes

1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.

2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.

3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.

4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.

5 See Chapter 14 for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: **http://tinyurl.com/qf7yujl7**

6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

Table 5 gives a summary analysis of the adequacy of the proposed SuDS drainage in addressing pollution control and water quality. It has been assumed, based on the cleansing properties of the pond as described in Note 3 of ***Table 4*** (SuDS Manual Table 26.3), that a catchpit will have the same effect as a pond for small networks by removing / capturing sediments and sediment-bound pollutants.

Table 5: Mitigation versus hazard indices for proposed layouts

SuDS Drainage Layout	SuDS device/Land Use	TSS	Metals	Hydro-carbons	Remark
Permeable Pavement	Permeable Pavements	**0.7**	**0.6**	**0.7**	**OK**, SuDS element provides sufficient treatment.
	Front Yard	0.5	0.4	0.4	
Permeable Pavement + Catchpits	Permeable Pavement + Catchpits	**1.1**	**1.0**	**1.1**	**OK**, SuDS element provides sufficient treatment.
	Front Yard + Roofs	0.7	0.6	0.45	

3.6 Exceedance Flows

Exceedance flows are those flows generated by flooding of part or all of the drainage scheme due to storm events in excess of the design storm event [100-year + 40% CC storm event]. Proposed Drainage hydraulic calculations (***Appendix E***) show that there shall be ***no flooding on site*** for all storm events up to and including the 100-year + 40% CC storm.

To check the effect of an extreme event and how flooding will be managed on site, a 1000-year + 0% CC storm event was run in Micro-drainage and Flood Flow Analysis carried out using Alternate Direction Implicit and Fine Dynamic Time stepping.

The results of the analysis indicated that localised flooding will take place at chambers S13, S14, and S15 (refer to the drainage plan layout in ***Appendix D***). A total of 5.1m3 will flow from these flooded manholes onto the existing access road, and over to the grassy verge on the north, refer to the FloodFlow Analysis plan layout in ***Appendix F***. The surface water system has been designed to be resilient to flooding up to the 500-year +0%CC storm event.

3.7 Foul Drainage

A detailed Drainage and CCTV Survey was commissioned to determine the exact layout of any sewers on site, and the survey demonstrated that the existing buildings are served by a combined DN100 sewer that collect both foul and surface water drainage from the buildings and yard and discharge into a buried manhole at the north-western corner of the site. Flow from the buried manhole is conveyed by a DN150 foul sewer that discharges into an existing STW public foul sewer to the north-west of the site. The invert level of the buried manhole and flow connectivity

to the existing STW foul sewer will need to be established by way of a targeted CCTV & Drainage Survey before construction commences.

The proposed drainage strategy separates the foul drainage from the surface water for both the existing and proposed buildings. The separate sewers however combine in the buried manhole at the north-western corner of the site. It will be essential to identify all existing and proposed SVPs and connect them to the proposed foul sewer, and all existing and proposed RWPs and connect them to the proposed surface water sewer.

The peak foul flow was calculated by assuming a dry weather flow of 300litres/100m2/day for the buildings, and based on a total commercial space of 1110m2, the peak foul flow was found to be 0.08 l/s.

Proposed foul drainage is shown on drainage plan layouts in ***Appendix D,*** and the peak flow calculation is in ***Appendix E.***

3.8 Maintenance and Operation

A SuDS Operation and Maintenance Manual has been produced and issued as a separate document from this report. The Manual shall be revised post-construction to suit as-built drainage (which should be in accordance with details approved at planning stage) and added to the Health and Safety File.

Please refer to report ***NCH-BML-ERD-ZZ-RP-C-0501*** SuDS Operation and Maintenance Manual for details of Owner and Maintainer of the assets, and recommended maintenance regime for the drainage assets.

APPENDICES

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Appendix A

Proposed Site Development

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SCALE BAR - 1:200

0m 5 10 15

GENERAL
DO NOT SCALE FROM THIS DRAWING. CHECK ACCURACY OF DIMENSIONS ON SITE. DISCREPANCIES BETWEEN SCALE. DIMENSIONS, DRAWINGS OR SPECIFICATION ARE SUBJECT TO VARIFICATION BEFORE PURCHASING, MANUFACTURE OR WORK PROCEEDS. CONTRACTOR TO BE RESPONSIBLE FOR ANY DISCREPANCIES AFTER DRAWING APPROVED.

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Site Boundary

Worcester Norton Sports Club

BOUGHTON BUTLER
ARCHITECTURE - PLANNING - DEVELOPMENT

1 CRUCIBLE TERRACE, NORTON,
WORCESTER WR5 2DQ

Tel: (01905) 350008
Email: architects@boughtonbutler.co.uk
planning@boughtonbutler.co.uk
Web: www.boughtonbutler.co.uk

Client
Worcester Norton CIC

Project
Worcester Norton Community Hall

Title
Proposed Site Plan

Date	Drawn
Nov 2020	SC
Scale	**Checked**
1:200@A3	DS

Job No.	Dwg No.	Rev
2034	019	-

Appendix B

Topographical Survey Showing Existing Drainage

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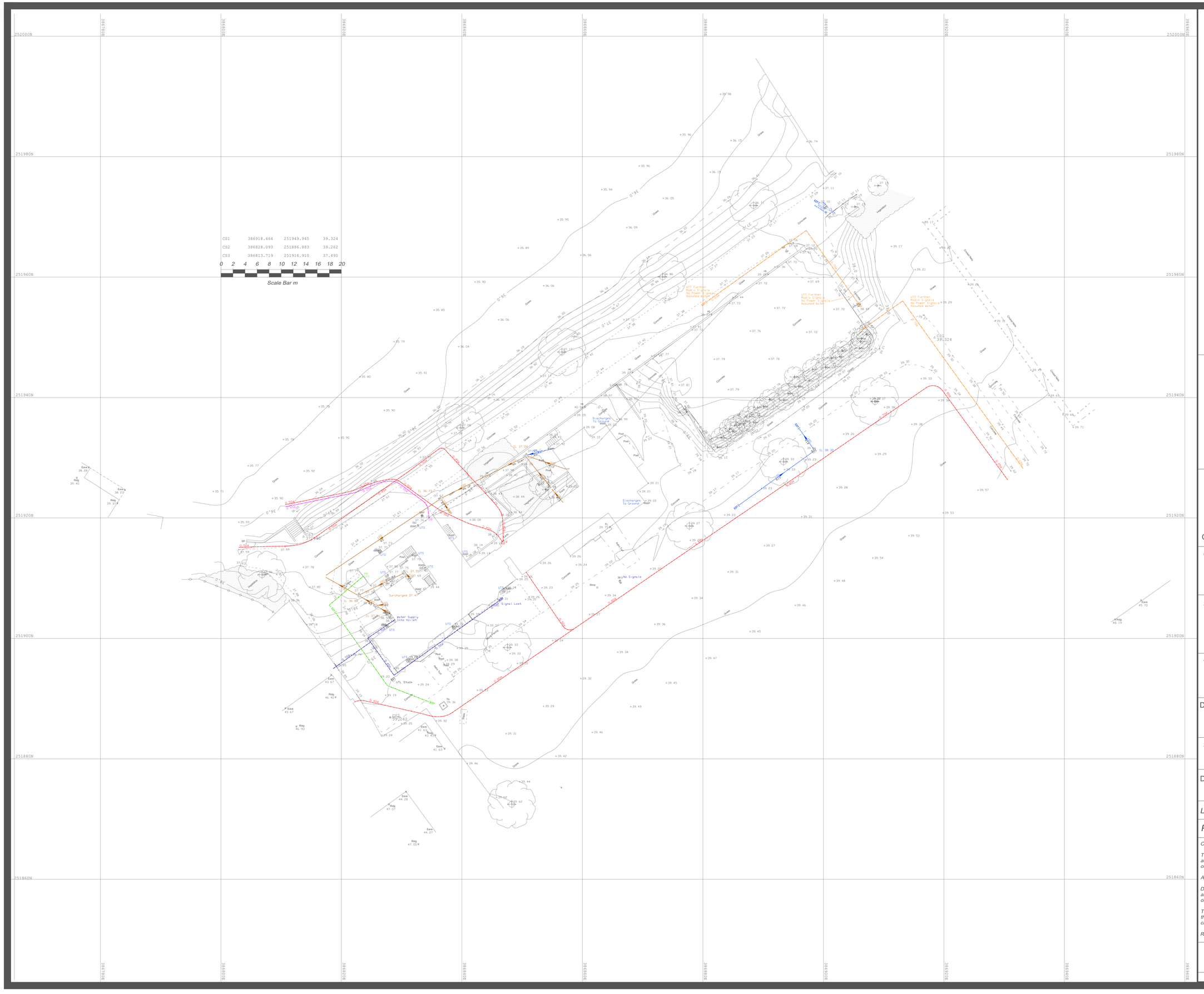

KEY FOR UNDERGROUND SERVICES

- Foul/Combined water drain
- Foul/Combined drain 300ø and above
- Surface water drain
- Surface water drain 300ø and above
- End of trace (EOT)
- Electric cables
- HV cables
- Gas
- Water
- Telephone
- Catv
- CCTV
- Comms
- Fibre Optics
- Pipe
- Vents
- Fuel
- Offsets
- Vapour Recovery
- Gauge Lines
- Unidentified GPR
- Unidentified EML
- Taken From Records
- Assumed Routes
- Empty Ducts
- Earth Rod
- Rising Main
- Overhead
- Heating Pipes
- Traffic Signals

ABBREVIATION KEY

AR	assumed route
BD	base bend
BD	backdrop
CP	cable pit
CL	cover level
CR	cable riser
DP	down pipe
EOT	end of trace
EP	electricity pole
FH	fire hydrant
G	gully
GV	gas valve
HDR	head of run
HL	high level
IC	inspection chamber
IL	invert level
MH	manhole
PR	pipe riser
RE	rodding eye
RWP	rainwater pipe
SP	soil pipe
SVP	soil vent pipe
TE	trapped exit
TFR	taken from records
TP	telegraph pole
UTF	unable to find
UTL	unable to lift
UTS	unable to survey
UTT	unable to trace
VP	vent pipe
WL	water level
WM	water meter
WO	wash out valve

Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus;

UTILITY SURVEY NOTES

ELECTROMAGNETIC AND/OR GROUND PENETRATING RADAR TECHNIQUES HAVE BEEN USED TO LOCATE AND MAP UNDERGROUND UTILITIES AND FEATURES ON THIS DRAWING. DO HAVE MADE EVERY ENDEAVOR TO MAKE SURE THE INFORMATION CONTAINED WITHIN THIS DRAWING IS ACCURATE AND OF THE HIGHEST QUALITY. HOWEVER, THE RESULTS FROM THESE TYPES OF SURVEYS ARE NOT INFALLIBLE AND SHOULD THE LOCATION OR DEPTH OF SERVICES/FEATURES BE OF PARTICULAR IMPORTANCE TO A PROJECT, THEN IT IS STRONGLY ADVISED THAT TRIAL EXCAVATIONS SHOULD BE UNDERTAKEN TO CONFIRM SURVEY RESULTS.

CS HAVE USED ALL RECORD DRAWINGS THAT WERE AVAILABLE TO US BY THE CLIENT OR BY THE STATUTORY UTILITY PROVIDERS AT THE TIME OF THE SURVEY. ANY INFORMATION TAKEN FROM THESE DRAWINGS (IE PIPE SIZES, MATERIALS) IS NOT GUARANTEED. SERVICES LOCATED FROM RECORD DRAWINGS WILL BE SHOWN AND ANNOTATED AS TAKEN FROM RECORDS (TFR). HISTORIC RECORD INFORMATION IS OFTEN INCOMPLETE/INACCURATE AND CANNOT BE RELIED UPON.

A SINGLE LINE INDICATING A UTILITY MAY INDICATE THE PRESENCE OF MULTIPLE SERVICES WITHIN CLOSE PROXIMITY TO EACH OTHER. WHERE A SINGLE LINE TYPE IS SHOWN WE RECOMMEND HAND DIGGING WITHIN 0.5m, TO EXPOSE HIDDEN SERVICES.

WHERE QUOTED, DEPTH INFORMATION OF UNDERGROUND SERVICES/FEATURES IS STATED, DEPTHS ARE GENERALLY WITHIN +/– 10% ACCURATE, BUT CANNOT BE GUARANTEED. ANY DEPTHS SHOWN ARE USUALLY TO THE TOP OF THE SERVICE/FEATURE, GRAVITY SEWERS AND DRAINS ARE USUALLY TO INVERT (BASE OF DRAINAGE CHANNEL) UNLESS OTHERWISE STATED.

AT CS WE USE SKILLED STAFF AND MODERN CALIBRATED EQUIPMENT TO PERFORM OUR SURVEYS. HOWEVER, THE COMPLETENESS OF ANY UNDERGROUND SURVEY CANNOT BE 100% GUARANTEED AND WE CANNOT BE HELD RESPONSIBLE FOR ANY INACCURACIES BEYOND THOSE THAT COULD BE REASONABLY EXPECTED BY A COMPETENT COMPANY.

CONTRACTORS UTILISING OUR DRAWINGS FOR INTRUSIVE WORK SHOULD TAKE ALL REASONABLE MEASURES TO WORK SAFELY IN ACCORDANCE WITH HSG47 GUIDELINES "AVOIDING DANGER FROM UNDERGROUND SERVICES".

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UTILITY
DRAINAGE CCTV SURVEYS & REPORTS
QUALITY ASSURANCE SURVEYS & REPORTS

CLIENT:

SITE DETAILS:

Cricket Club

TITLE:

Utility

DRAWING NO.:	REV:
20379-20-01	*A*

SCALE:	DATE:
1: 200	**19/10/2020**

DRAWN:	CHECKED:
TL	**PJ**

Level datum	*OSGB36(15)*
Paper Size - A0	

Comments:

This plan should only be used for its original purpose. Castle Surveys Ltd dos not accept any responsibility for this plan if supplied to any other party, other than the original client.

All dimensions and levels should be check 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. Some services may have been omitted due to parked vehicles or due to the site being overgrown with vegetation.

Tree information (where applicable) has been surveyed from ground level and therefore should be treated as approximate only. Advise that a tree survey should be carried out.

Roof linework (where applicable) is indicative only.

DO NOT SCALE

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Appendix C

Public Sewer Records & Geology Boreholes

Public Sewer Records

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Date: 09/11/20

Scale: 1:1250

Map Centre: 386830,251953

Data updated: 14/10/20

Our Ref: 457441 - 1

Wastewater Plan A1

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

alex@barnsleymarshall.co.uk

Club OS Maps

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
	F		0	0
	F		0	0
	F		0	0
0600	F		0	0
0607	F	39.87	37.36	2.51
0608	F	36.44	34.41	2.03
0609	F	36.99	34.66	2.33
0610	F	38.44	36.29	2.15
0611	F	37.6	35.4	2.2
0612	F	36.32	34.19	2.13
0614	F	39.6	37.5	2.1
0703	F	41.18	39.38	1.8
0704	F	0	0	0
0801	F	41.94	0	0
1702	F	39.87	37.76	2.12
1703	F	39.67	37.33	2.34
4805	F	29.77	0	0
5702	F	31.72	28.99	2.73
5802	F	30.68	28.3	2.38
5803	F	32.26	29.54	2.72
5806	F	30.44	27.99	2.45
6616	F	33.17	30.81	2.36
6617	F	33.76	30.64	3.12
6618	F	33.82	30.4	3.42
6619	F	35.04	32.89	2.15
6706	F	33.15	30.08	3.07
6707	F	34.62	32.48	2.14
6708	F	34.18	32.03	2.15
6709	F	33.5	29.8	3.7
6710	F	32.95	29.63	3.32
6711	F	32.49	29.38	3.11
6714	F	32.62	30.44	2.18
6715	F	32.21	29.23	2.98
6803	F	33.22	30.94	2.28
6804	F	95.18	92.36	2.82
6805	F	94.52	91.92	2.6
7603	F	35.83	33.71	2.12
7604	F	35.4	33.34	2.06
7609	F	97.16	94.91	2.25
7701	F	98.11	96.53	1.58
7704	F	97.96	96.08	1.88
7707	F	96.42	94.84	1.58
7708	F	95.95	94.58	1.37
7802	F	96.59	94.36	2.23
7803	F	97.29	94.08	3.21
7804	F	96.58	93.56	3.02
7805	F	96.25	93.23	3.02
7806	F	95.58	92.75	2.83
8601	F	100	97.02	2.98
8602	F	37.24	35.14	2.11
8701	F	40.3	98.12	0
8703	F	100	97.02	2.98
8802	F	39.52	97.37	0
8803	F	39.59	37.38	2.21
9604	F	0	0	0
9605	F	37.76	33.58	4.17
9606	F	37.82	33.87	3.95
9607	F	38.19	33.78	4.41
9701	F	40.57	38.44	2.13
9708	F	39.69	37.29	2.4
9709	F	39.83	37.77	2.06
9801	F	41.07	39.55	1.52
9803	F	40.93	39.22	1.71
	S		0	0
0601	S	39.69	37.87	1.81
0602	S	0	0	0
0603	S	38.47	36.7	1.77
0604	S	37.07	34.99	2.08
0605	S	36.46	34.59	1.87
0606	S	36.4	33.36	3.04
0615	S	39.51	38.02	1.49
0616	S		0	0
0617	S		0	0
0618	S		0	0
0701	S	41.1	39.65	1.46
0702	S	0	0	0
0705	S	39.88	37.79	2.09
0802	S	41.92	0	0
1701	S	39.78	37.85	1.93
1704	S	39.85	38.17	1.67
3201	S	29.35	28.38	0.97
4803	S	29.73	0	0
4804	S	29.96	27.91	2.05
4806	S	29.01	27.78	1.23
4807	S	28.71	27.73	0.98
5703	S	31.73	29.52	2.21
5801	S	30.52	28.38	2.14
5804	S	30.74	28.68	2.06
5805	S	32.26	29.92	2.34
6611	S	33.18	31.13	2.05
6612	S	33.69	30.93	2.76
6613	S	33.85	30.78	3.07
6614	S	35.06	33.3	1.76
6712	S	32.51	29.97	2.54
6713	S	32.26	29.78	2.48
6716	S	33.25	30.68	2.57
6717	S	33.44	30.43	3.01
6718	S	32.92	30.28	2.64
6719	S	34.6	32.84	1.76
6720	S	34.13	32.43	1.7
6801	S	32.57	31.15	1.42
6802	S	33.24	31.36	1.88
6806	S	95.19	92.77	2.42
6807	S	94.44	92.32	2.12

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
7606	S	35.48	33.66	1.82
7608	S	97.23	95.27	1.96
7702	S	98.16	95.94	2.22
7703	S	97.96	96.54	1.42
7705	S	96.41	95.14	1.27
7706	S	95.96	94.93	1.03
7801	S	97.3	94.59	2.71
7807	S	96.63	93.89	2.74
7808	S	96.26	93.64	2.62
7809	S	95.68	93.25	2.43
7810	S	96.63	94.78	1.85
8605	S	38.58	36.88	1.69
8607	S	38.17	36.56	1.61
8608	S	37.58	35.92	1.66
8609	S	37.19	35.47	1.72
8702	S	40.28	97.58	0
8704	S	39.38	0	0
8801	S	39.53	96.72	0
8804	S	39.6	36.86	2.74
8805	S	39.38	37.75	1.63
9601	S	37.92	33.2	4.72
9602	S	36.86	33.34	3.52
9608	S	37.53	33.01	4.52
9609	S	38.21	33.1	5.11
9702	S	40.54	37.95	2.59
9703	S	40.65	39	1.65
9704	S	40.26	38.53	1.73
9705	S	0	0	0
9706	S	40.12	38.58	1.54
9707	S	39.76	37.76	2
9802	S	41.12	39.29	1.83
9804	S	40.91	38.91	2

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

7605	S	35.87	34.1	1.77

Appendix C

Public Sewer Records & Geology Boreholes

Geology Boreholes

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Norwest Holst Soil Engineering Ltd.

Borehole No. D64

BOREHOLE LOG

SO 85SE153

Contract No. F7630
Location M5 Contract 1
Client D.T.P.
Method of Boring Cable Percussion
Diameter of Borehole 150mm

Sheet 1 **of** 1
Co-ord: E87 263 N51 500
Ground Level 36.548 m.A.O.D.
Date 21/11/1987

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL		0.10	36.44				SPT Blows
MADE GROUND: firm brown silty CLAY with some sand and rootlets.		0.40	36.14		0.30 0.45 0.50-0.95 (56) 1.00 x 2		
MADE GROUND: Firm mottled brown reddish brown and greyish green slightly sandy silty CLAY with some fine mudstone gravel.		1.30	35.24		1.05-1.50 S	"50"	(3, 4) 6,14 17,13
Firm to stiff reddish brown and greyish green slightly gravelly sandy silty CLAY. Gravel is fine to medium mudstone and siltstone. (Reworked Mercia Mudstone)		2.00	34.54		1.80 2.00 x 2 2.00-2.45 S	"57"	(5,13) 12,14 15,16
Reddish brown thickly laminated very closely jointed moderately weathered silty MUDSTONE, very weak, with some silty clay matrix, and black iron staining. ... 1.70-1.80m becoming very thinly bedded slightly weathered SILTSTONE weak to moderately weak. (Mercia Mudstone Zone IIIa)					2.80 3.00-3.45 S 3.80 4.00-4.45 S	"52" "78"	(9,12) 13,11 16,13 (12,9) 11,17 24,24
Reddish brown thickly laminated, very closely jointed slightly weathered silty MUDSTONE, weak to very weak. (Mercia Mudstone Zone II) ... 2.50-3.80m becoming brown and occasionally moderately weak with a little to some silty clay matrix. ... 3.80m becoming thinly to thickly laminated weak, with some moderately weak beds. ... 4.40-4.50m greyish green and reddish brown. ... 6.80m becoming thinly laminated.				150 mm to 7.50m	4.80 5.00-5.45 S 5.80 6.00-6.23 S 6.80 7.00-7.23 S 7.80 8.00-8.21 S	"130" 84 for 140 mm 51 for 75 mm 50 for 80 mm	(9,16) 24,28 30,48 (12,24) 44,50 (18,36) 51 (21,40) 50
Borehole complete at 8.21m.		8.21	28.33				

Type of Sample

- S.P.T.
- Undisturbed
- C.P.T.
- Vane
- Jar
- Water
- Bulk
- Piezometer

Remarks (Observations of Ground Water etc.) (-) U100 blows.

Ground water encountered at 2.00m, casing 1.20m rising to 1.30m in 20 mins.

Standing water level 21/11 pm 4.90m, casing 7.90m

... or tidal variations and should not be taken as constant

British Geological Survey

Sampling		Properties			Strata 86596 52300 SO 85 SE 215			
Depth	Type	Cu kPa	W%	SPT N	Description	Depth	Level	Legend
					TOPSOIL	G.L.	34.70	
0.30	D							
0.50-1.00	U(42)		20		Firm brown silty sandy CLAY with occasional fine root material	0.40	34.30	
					Firm to stiff friable in places silty CLAY with some sand and gravel size siltstone lithorelicts (Mercia Mudstoned Zone IVa/III) Becoming less weathered gradually with depth	0.80	33.90	
1.30	D							
1.50-2.00	U(67)	87	11					
2.30	D							
2.50-3.00	U(73)							
3.30	D							
3.50-4.00	U(100)		19					
					Red brown with occasional small green pockets highly weathered SILTSTONE weak (Mercia Mudstone Zone III/II)	3.80	30.90	
4.30	D							
4.50-5.00	SD			119				
					End of Borehole	5.00	29.70	

Drilling

Type	From	To	Size	Fluid
Cable Tool Percussion	G.L.	5.00	0.15	

Ground Water

Struck	Behaviour	Sealed	Date	Hole	Cased	Water
			30.9.86	-	-	-
			30.9.86	5.00	4.50	DRY

Remarks

Borehole Record

exploration associates

Project
Worcester Southern Relief Road
Hereford & Worcester County Council

Contract E6185

Borehole 10
Sheet 1 of 1

British Geological Survey

Appendix D

SuDS Drainage Proposals

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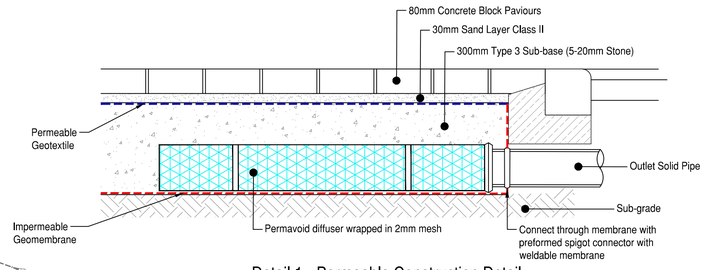
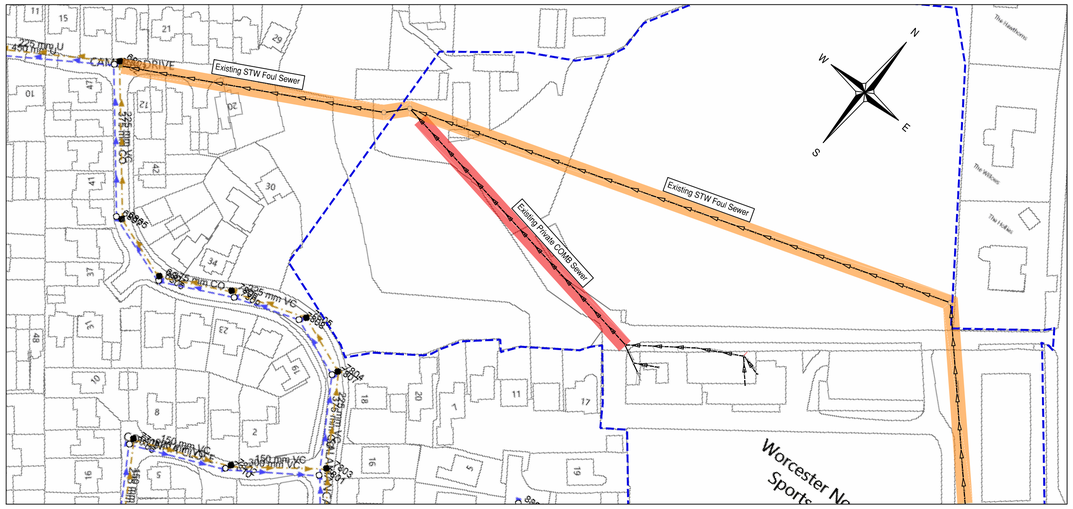


Detail 1 - Permeable Construction Detail

Scale 1:10



KEY:

- Existing Site Boundary
- Scope of Development
- New building
- Existing Building
- Existing Green Areas
- Existing Access Road
- Existing Hardstanding around the buildings: concrete, astro turf and block paving

Existing STW Foul Sewer

Assumed DN150 buried 1:100 Combined Sewer leading to existing STW Foul Sewer (Maximum Capacity is 17.7l/s)

Expose the buried manhole, build up to existing yard levels and provide D400 cover

Proposed Flow Control Chamber
Hydro-brake Optimum
Unit Reference MD-SHE-0175-1500-1000-1500
Design Head :1.0 m
Design Flow :15.0 l/s
Minimum Outlet Pipe Diameter :225 mm
Suggested Manhole Diameter :1200 mm
Cover Level :37.723m
Invert Level :36.527m

Geocellular Attenuation Tank
Gross Volume: 22.8 m3
Eff. VOL : 24.0 m3
Plan : 60.0 m2
Depth : 0.40 m
Void Ratio : 0.95

Base of Tank: 36.673m
Top of Tank: 37.073
Cover above Tank: 0.55m

Base of Tank: 36.605m
Top of Tank: 37.005m
Cover above Tank: 0.73m

Assumed Buried Manhole
CL:37.800m (Assumed)
IL: 36.505m (Assumed)

Max. Discharge Flow Rate
1yr + 40% CC -7.7 l/s
30yr + 40% CC -14.9 l/s
100-yr + 40% CC -14.9 l/s

FWIC 05
DN600
CL: 37.800m
IL: 36.609m

SWIC 05
DN600
CL: 37.877m
IL: 36.827m

SWIC 04
DN600
CL: 38.744m
IL: 37.324m

SWIC 03
DN600
CL: 39.160m
IL: 37.396m

Existing Access Road

EXCWIC 03
CL:37.670m
IL: 36.730m

EXCWIC 04
CL:37.970m
IL: 37.090m

SWCP 04
DN1200
CL: 37.625m
IL: 36.675m

EXCWIC 02
CL:37.770m
IL: 36.880m

EXCWIC 01
CL:38.120m
IL: 37.060m

EXCWIC 06
CL:37.750m
IL: 36.950m

SWIC 06
DN600
CL: 37.750m
IL: 36.906m

FWIC 04
DN600
CL: 37.600m
IL: 36.881m

FWIC 06
DN600
CL: 38.000m
IL: 36.986m

FWIC 03
DN600
CL: 37.640m
IL: 37.191m

SWIC 08
DN450
CL: 37.637m
IL: 37.062m

FWIC 02
DN600
CL: 37.695m
IL: 37.257m

FWIC 01
DN600
CL: 37.750m
IL: 37.300m

SWIC 07
DN450
CL: 37.750m
IL: 37.170m

SWIC 01
DN600
CL: 39.205m
IL: 37.936m

SWIC 02
DN600
CL: 39.325m
IL: 37.584m

FFL:37.750m

Bar room
Toilets
Hallway
Kitchen
Function Room
Function Room
BALCONY
HALL STORE
FLOOR LEVEL: 37.75
FEMALE CHANGE
STORE / PLANT
DWC CHANGE
MALE CHANGE
LOBBY
OFFICE
MAIN ENTRANCE
FLOOR LEVEL: 39.46
RETAINING WALL

DN150 SWS 1:100.9

GY 03
GY 02
GY 01
Dished Channel
Dished Channel
Dished Channel

In the event of the front yard being re-paved, contractor to provide permeable paving to Detail 1.

Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

Refer to Drawing:

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Drainage Key

DN150 SWS 1 in 100	Proposed Surface Water Sewer
SWIC XX DN XXXX CL: XX.XX IL: XX.XX	Proposed Surface Water Inspection Chamber
SWCP XX DN XXXX CL: XX.XX IL: XX.XX	Proposed Ridgistorm Separate Catchpit
	Proposed DN150 RWP and Gully Connection
	Proposed Hydro-brake Chamber. Refer to drawing NCH-BML-ERD-ZZ-DR-C-0501 for details.
	Proposed Dished Channel. Refer to drawing NCH-BML-ERD-ZZ-DR-C-0501 for details.
GY 01	Proposed Gully. Refer to drawing NCH-BML-ERD-ZZ-DR-C-0501 for details.
DN150 FWS 1 in 80	Proposed Foul Water Sewer
FWMH XX DN XXXX CL: XX.XX IL: XX.XX	Proposed Foul Water Manhole
	Proposed DN150 SVP
Existing COMB	Existing Combined Sewer
Existing FWS	Existing Sewer to be removed
FFL:29.300	Assumed Finished Floor Level

Rev	By	Chk'd	Date	Description
P01	VI	AM	07/12/20	First Issue for Approval

PRELIMINARY DRAWING
This drawing is not to be used for construction

Client

Worcester Norton CIC

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Project

Norton Community Hall & Cricket Pavillion

Drawing

Combined Drainage Layout

Drawn by VI Date 07/12/20

Drawing No. NCH-BML-ERD-ZZ-DR-C-0500

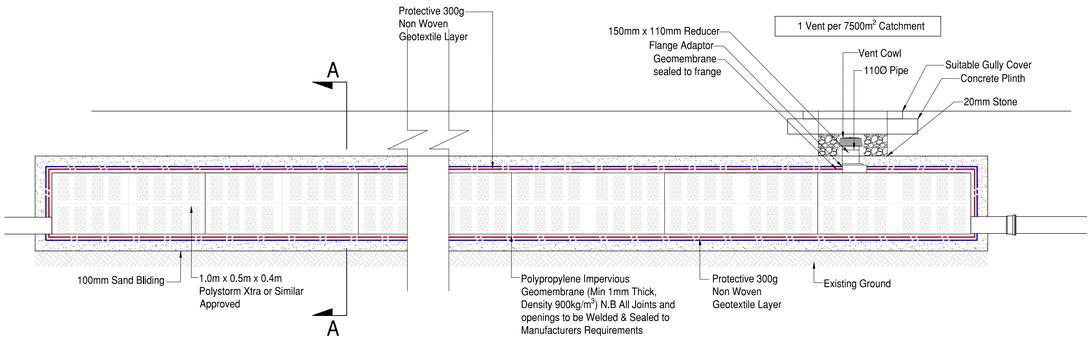
Revision P01

BML Job No. 1018-01

Status

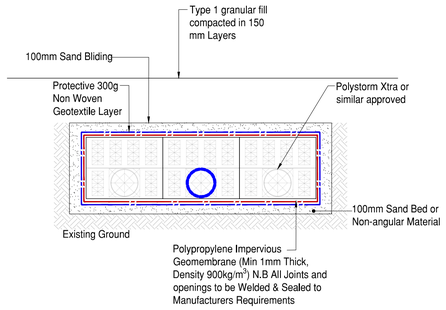
Drawing Scale at A1: 1:200

CAD filename

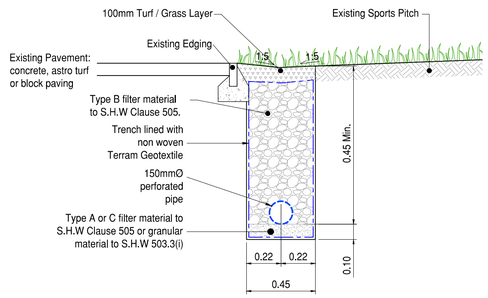


Typical Cellular Storage Tank

Scale 1:20

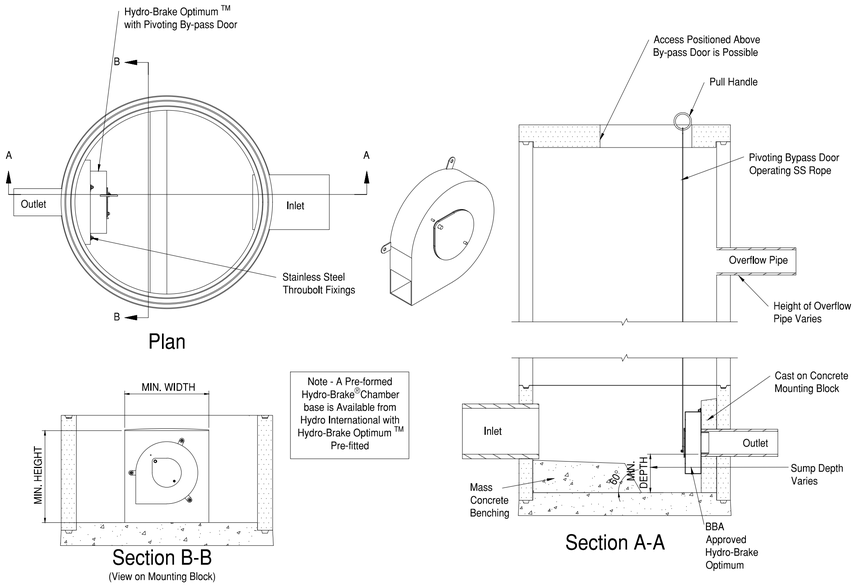


Section A-A



Typical Filter Drain Detail

Scale 1:20



Typical Hydrobrake Chamber Detail With Overflow Pipe

Scale 1:20

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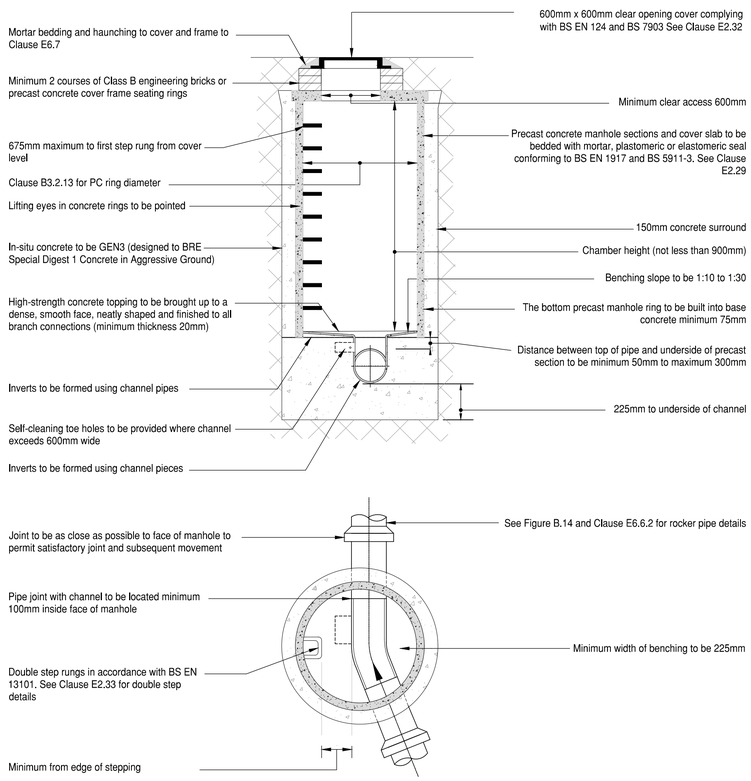
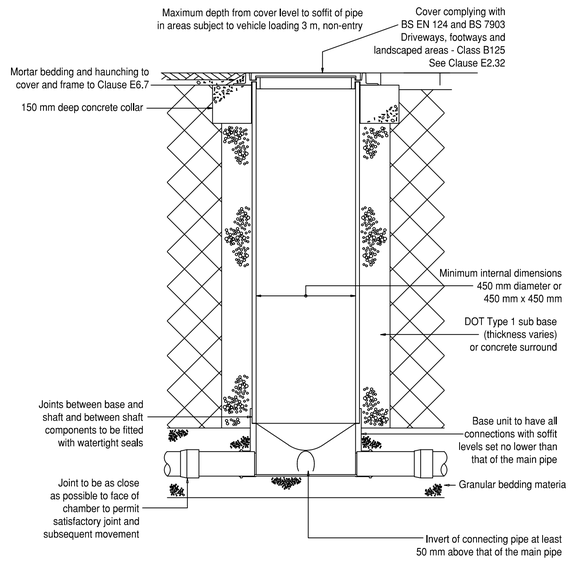
8. Details and locations of existing services are based on the Topographical Survey and Utility Records received from Third Parties and Service Providers respectively, and should be considered indicative and approximate only. The existing services shown on drawings may not be exhaustive. The Contractor shall use Trial Pits and other approved methods to accurately locate and verify the positions and depths of all existing services before commencement of works on site.



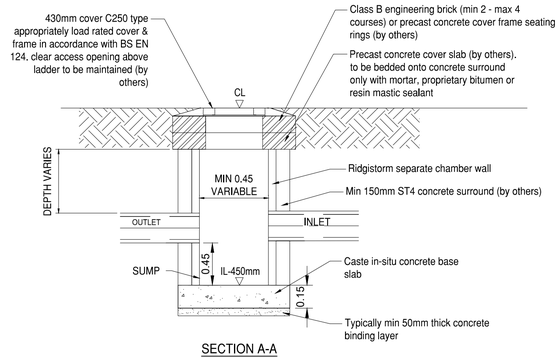
Typical Manhole Detail (Max depth from cover to soffit of pipe 3.0m)

Scale 1:20

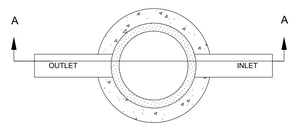


Typical Inspection Chamber Detail (Flexible Material Detail)

NTS



SECTION A-A



PLAN

Rigistorm Separate Catchpit

NTS

Rev	By	Chk'd	Date	Description
P01	VI	AM	07/12/20	First Issue for Approval

PRELIMINARY DRAWING
This drawing is not to be used for construction

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Project
Norton Community Hall & Cricket Pavillion

Drawing
Drainage Details

Drawn by VI
Date 07/12/20

Drawing No.
NCH-BML-ERD-ZZ-DR-C-0501

Revision
P01

BML Job No.
1018-01

Status

Drawing Scale at A1: As Shown

CAD filename

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Web: www.barnsleymarshall.co.uk

Project
Norton Community Hall & Cricket Pavillion

Drawing
Proposed Catchment Areas

Drawn by VI
Date 07/12/20

Drawing No.
NCH-BML-ERD-ZZ-DR-C-0502

Revision
P01

BML Job No.
1018-01

Status

Drawing Scale at A1: 1:200

CAD filename

Appendix E

Drainage Hydraulic Calculations

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	3	PIMP (%)	100
M5-60 (mm)	18.900	Add Flow / Climate Change (%)	40
Ratio R	0.398	Minimum Backdrop Height (m)	4.000
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	4.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.900
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.088	4-8	0.029

Total Area Contributing (ha) = 0.118

Total Pipe Volume (m³) = 3.785

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	12.847	0.127	100.9	0.011	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	8.382	0.083	100.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	35.544	0.352	100.9	0.011	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	20.999	0.208	100.9	0.013	4.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	80.20	4.21	38.146	0.011	0.0	0.0	0.9	1.00	17.7	3.2
S1.001	79.20	4.35	38.019	0.011	0.0	0.0	0.9	1.00	17.7	3.2
S1.002	75.27	4.95	37.936	0.022	0.0	0.0	1.8	1.00	17.7	6.3
S2.000	79.23	4.35	38.165	0.013	0.0	0.0	1.1	1.00	17.7	3.8

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.001	6.923	0.373	18.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	18.886	0.187	100.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	16.818	0.167	100.9	0.013	4.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	6.633	0.714	9.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	7.277	0.072	100.9	0.009	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.005	7.352	0.497	14.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.006	6.938	0.225	30.8	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.000	10.859	0.108	100.9	0.030	4.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	3.951	0.387	10.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.002	42.554	0.073	582.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	3.646	0.022	167.9	0.016	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.001	78.89	4.40	37.957	0.013	0.0	0.0	1.1	2.35	41.5	3.8
S1.003	73.36	5.26	37.584	0.035	0.0	0.0	2.7	1.00	17.7	9.6
S3.000	79.72	4.28	38.277	0.013	0.0	0.0	1.2	1.00	17.7	4.0
S3.001	79.49	4.31	38.110	0.013	0.0	0.0	1.2	3.33	58.8	4.0
S1.004	72.66	5.38	37.396	0.056	0.0	0.0	4.4	1.00	17.7	15.6
S1.005	72.39	5.43	37.324	0.056	0.0	0.0	4.4	2.63	46.5	15.6
S1.006	72.03	5.49	36.827	0.071	0.0	0.0	5.6	1.82	32.2	19.5
S4.000	80.44	4.18	37.170	0.030	0.0	0.0	2.6	1.00	17.7	9.2
S4.001	80.15	4.22	37.062	0.030	0.0	0.0	2.6	2.56	45.2	9.2
S4.002	69.54	5.95	36.675	0.030	0.0	0.0	2.6	0.41	7.2«	9.2
S1.007	69.22	6.01	36.527	0.118	0.0	0.0	8.8	1.01	40.0	30.9

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Back (m
S1	39.196	1.050	Open Manhole	450	S1.000	38.146	150				
S2	39.187	1.168	Open Manhole	450	S1.001	38.019	150	S1.000	38.019	150	
S3	39.205	1.269	Open Manhole	600	S1.002	37.936	150	S1.001	37.936	150	
S4	39.215	1.050	Open Manhole	450	S2.000	38.165	150				
S5	39.319	1.362	Open Manhole	450	S2.001	37.957	150	S2.000	37.957	150	
S6	39.325	1.741	Open Manhole	600	S1.003	37.584	150	S1.002	37.584	150	
								S2.001	37.584	150	
S7	39.327	1.050	Open Manhole	450	S3.000	38.277	150				
S8	39.252	1.141	Open Manhole	450	S3.001	38.110	150	S3.000	38.110	150	
S9	39.160	1.764	Open Manhole	600	S1.004	37.396	150	S1.003	37.396	150	
								S3.001	37.396	150	
S10	38.744	1.420	Open Manhole	600	S1.005	37.324	150	S1.004	37.324	150	
S11	37.877	1.050	Open Manhole	600	S1.006	36.827	150	S1.005	36.827	150	
S12	37.750	0.580	Open Manhole	450	S4.000	37.170	150				
S13	37.637	0.575	Open Manhole	450	S4.001	37.062	150	S4.000	37.062	150	
S14	37.625	0.950	Open Manhole	1200	S4.002	36.675	150	S4.001	36.675	150	
S15	37.723	1.196	Open Manhole	1200	S1.007	36.527	225	S1.006	36.602	150	
								S4.002	36.602	150	
SexBuriedMH	37.800	1.295	Open Manhole	1200		OUTFALL		S1.007	36.505	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	386869.432	251914.460	386869.432	251914.460	Required	
S2	386879.930	251921.866	386879.930	251921.866	Required	
S3	386872.498	251925.743	386872.498	251925.743	Required	
S4	386866.058	251912.216	386866.058	251912.216	Required	
S5	386848.920	251900.082	386848.920	251900.082	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S6	386843.812	251904.754	386843.812	251904.754	Required	
S7	386846.007	251898.094	386846.007	251898.094	Required	
S8	386832.408	251888.200	386832.408	251888.200	Required	
S9	386828.566	251893.607	386828.566	251893.607	Required	
S10	386824.313	251899.512	386824.313	251899.512	Required	
S11	386824.484	251906.862	386824.484	251906.862	Required	
S12	386864.985	251930.159	386864.985	251930.159	Required	
S13	386858.563	251938.915	386858.563	251938.915	Required	
S14	386855.110	251936.996	386855.110	251936.996	Required	
S15	386820.357	251912.439	386820.357	251912.439	Required	
SexBuriedMH	386817.366	251910.355			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	39.196	38.146	0.900	Open Manhole	450
S1.001	o	150	S2	39.187	38.019	1.018	Open Manhole	450
S1.002	o	150	S3	39.205	37.936	1.119	Open Manhole	600
S2.000	o	150	S4	39.215	38.165	0.900	Open Manhole	450
S2.001	o	150	S5	39.319	37.957	1.212	Open Manhole	450
S1.003	o	150	S6	39.325	37.584	1.591	Open Manhole	600
S3.000	o	150	S7	39.327	38.277	0.900	Open Manhole	450
S3.001	o	150	S8	39.252	38.110	0.991	Open Manhole	450
S1.004	o	150	S9	39.160	37.396	1.614	Open Manhole	600
S1.005	o	150	S10	38.744	37.324	1.270	Open Manhole	600
S1.006	o	150	S11	37.877	36.827	0.900	Open Manhole	600
S4.000	o	150	S12	37.750	37.170	0.430	Open Manhole	450
S4.001	o	150	S13	37.637	37.062	0.425	Open Manhole	450
S4.002	o	150	S14	37.625	36.675	0.800	Open Manhole	1200
S1.007	o	225	S15	37.723	36.527	0.971	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	12.847	100.9	S2	39.187	38.019	1.018	Open Manhole	450
S1.001	8.382	100.9	S3	39.205	37.936	1.119	Open Manhole	600
S1.002	35.544	100.9	S6	39.325	37.584	1.591	Open Manhole	600
S2.000	20.999	100.9	S5	39.319	37.957	1.212	Open Manhole	450
S2.001	6.923	18.5	S6	39.325	37.584	1.591	Open Manhole	600
S1.003	18.886	100.9	S9	39.160	37.396	1.614	Open Manhole	600
S3.000	16.818	100.9	S8	39.252	38.110	0.991	Open Manhole	450
S3.001	6.633	9.3	S9	39.160	37.396	1.614	Open Manhole	600
S1.004	7.277	100.9	S10	38.744	37.324	1.270	Open Manhole	600
S1.005	7.352	14.8	S11	37.877	36.827	0.900	Open Manhole	600
S1.006	6.938	30.8	S15	37.723	36.602	0.971	Open Manhole	1200
S4.000	10.859	100.9	S13	37.637	37.062	0.425	Open Manhole	450
S4.001	3.951	10.2	S14	37.625	36.675	0.800	Open Manhole	1200
S4.002	42.554	582.9	S15	37.723	36.602	0.971	Open Manhole	1200
S1.007	3.646	167.9	SexBuriedMH	37.800	36.505	1.070	Open Manhole	1200

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Setting Out Information - True Coordinates (Storm)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S1.000	S1	450		386869.432	251914.460	386869.432	251914.460	
S1.001	S2	450		386879.930	251921.866	386879.930	251921.866	
S1.002	S3	600		386872.498	251925.743	386872.498	251925.743	
S2.000	S4	450		386866.058	251912.216	386866.058	251912.216	
S2.001	S5	450		386848.920	251900.082	386848.920	251900.082	
S1.003	S6	600		386843.812	251904.754	386843.812	251904.754	
S3.000	S7	450		386846.007	251898.094	386846.007	251898.094	
S3.001	S8	450		386832.408	251888.200	386832.408	251888.200	
S1.004	S9	600		386828.566	251893.607	386828.566	251893.607	
S1.005	S10	600		386824.313	251899.512	386824.313	251899.512	
S1.006	S11	600		386824.484	251906.862	386824.484	251906.862	
S4.000	S12	450		386864.985	251930.159	386864.985	251930.159	
S4.001	S13	450		386858.563	251938.915	386858.563	251938.915	
S4.002	S14	1200		386855.110	251936.996	386855.110	251936.996	
S1.007	S15	1200		386820.357	251912.439	386820.357	251912.439	

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Setting Out Information - True Coordinates (Storm)

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S1.007	SexBuriedMH	1200		386817.366	251910.355	

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.011	0.011	0.011
1.001	-	-	100	0.000	0.000	0.000
1.002	User	-	100	0.011	0.011	0.011
2.000	User	-	70	0.018	0.013	0.013
2.001	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.013	0.013	0.013
3.001	-	-	100	0.000	0.000	0.000
1.004	User	-	100	0.009	0.009	0.009
1.005	-	-	100	0.000	0.000	0.000
1.006	User	-	100	0.015	0.015	0.015
4.000	User	-	100	0.030	0.030	0.030
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.000	0.000	0.000
1.007	User	-	100	0.016	0.016	0.016
				Total	Total	Total
				0.123	0.118	0.118

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.007	SexBuriedMH	37.800	36.505	36.505	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	3	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.900	Storm Duration (mins)	30
Ratio R	0.398		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S15, DS/PN: S1.007, Volume (m³): 2.2

Unit Reference	MD-SHE-0175-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	15.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	175
Invert Level (m)	36.527
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.000	15.0
Flush-Flo™	0.323	15.0
Kick-Flo®	0.704	12.7
Mean Flow over Head Range	-	12.7

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)**
0.100	6.2	1.200	16.3	3.000	25.3	7.000	38.0
0.200	14.4	1.400	17.6	3.500	27.2	7.500	39.3
0.300	15.0	1.600	18.7	4.000	29.0	8.000	40.6
0.400	14.9	1.800	19.8	4.500	30.7	8.500	41.8
0.500	14.6	2.000	20.8	5.000	32.3	9.000	43.0
0.600	14.1	2.200	21.8	5.500	33.9	9.500	44.1
0.800	13.5	2.400	22.7	6.000	35.3		
1.000	15.0	2.600	23.6	6.500	36.7		

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Storage Structures for Storm

Cellular Storage Manhole: S15, DS/PN: S1.007

Invert Level (m) 36.527 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	60.0	0.0	0.401	0.0	0.0
0.400	60.0	0.0	1.196	0.0	0.0

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.397
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.900 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 3.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+40%					38.182
S1.001	S2	15 Summer	1	+40%					38.055
S1.002	S3	15 Winter	1	+40%	100/15 Summer				37.984
S2.000	S4	15 Winter	1	+40%					38.203
S2.001	S5	15 Winter	1	+40%					37.983
S1.003	S6	15 Winter	1	+40%	30/15 Summer				37.647
S3.000	S7	15 Winter	1	+40%					38.317
S3.001	S8	15 Winter	1	+40%					38.132
S1.004	S9	15 Winter	1	+40%	30/15 Summer				37.486
S1.005	S10	15 Winter	1	+40%					37.375
S1.006	S11	15 Winter	1	+40%	30/15 Summer				36.898
S4.000	S12	15 Winter	1	+40%	100/15 Summer				37.233
S4.001	S13	15 Winter	1	+40%	100/15 Summer				37.101
S4.002	S14	15 Winter	1	+40%	30/15 Summer				36.781
S1.007	S15	30 Winter	1	+40%	30/15 Summer				36.647

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.114	0.000	0.13			2.1	OK	
S1.001	S2	-0.113	0.000	0.14			2.1	OK	
S1.002	S3	-0.102	0.000	0.22			3.8	OK	
S2.000	S4	-0.112	0.000	0.15			2.5	OK	
S2.001	S5	-0.124	0.000	0.07			2.5	OK	
S1.003	S6	-0.086	0.000	0.37			6.2	OK	
S3.000	S7	-0.110	0.000	0.16			2.6	OK	
S3.001	S8	-0.128	0.000	0.05			2.6	OK	
S1.004	S9	-0.060	0.000	0.66			10.0	OK	
S1.005	S10	-0.099	0.000	0.25			10.1	OK	
S1.006	S11	-0.079	0.000	0.45			12.4	OK	
S4.000	S12	-0.087	0.000	0.38			6.0	OK	
S4.001	S13	-0.111	0.000	0.15			6.0	OK	
S4.002	S14	-0.044	0.000	0.85			5.9	OK	
S1.007	S15	-0.105	0.000	0.29		18	7.7	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.397
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.900 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 3.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+40%					38.204
S1.001	S2	15 Winter	30	+40%					38.078
S1.002	S3	15 Summer	30	+40%	100/15 Summer				38.021
S2.000	S4	15 Winter	30	+40%					38.227
S2.001	S5	15 Winter	30	+40%					37.998
S1.003	S6	15 Winter	30	+40%	30/15 Summer				37.817
S3.000	S7	15 Winter	30	+40%					38.342
S3.001	S8	15 Winter	30	+40%					38.146
S1.004	S9	15 Winter	30	+40%	30/15 Summer				37.656
S1.005	S10	15 Winter	30	+40%					37.409
S1.006	S11	15 Winter	30	+40%	30/15 Summer				37.030
S4.000	S12	15 Winter	30	+40%	100/15 Summer				37.283
S4.001	S13	15 Winter	30	+40%	100/15 Summer				37.125
S4.002	S14	15 Winter	30	+40%	30/15 Summer				37.042
S1.007	S15	30 Winter	30	+40%	30/15 Summer				36.825

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.092	0.000	0.32			5.1	OK	
S1.001	S2	-0.091	0.000	0.33			5.1	OK	
S1.002	S3	-0.064	0.000	0.60			10.3	OK	
S2.000	S4	-0.088	0.000	0.36			6.1	OK	
S2.001	S5	-0.109	0.000	0.17			6.0	OK	
S1.003	S6	0.083	0.000	0.93			15.4	SURCHARGED	
S3.000	S7	-0.085	0.000	0.39			6.4	OK	
S3.001	S8	-0.114	0.000	0.13			6.4	OK	
S1.004	S9	0.110	0.000	1.62			24.5	SURCHARGED	
S1.005	S10	-0.065	0.000	0.61			24.4	OK	
S1.006	S11	0.053	0.000	1.11			30.6	SURCHARGED	
S4.000	S12	-0.037	0.000	0.92			14.6	OK	
S4.001	S13	-0.087	0.000	0.37			14.6	OK	
S4.002	S14	0.217	0.000	1.92			13.5	SURCHARGED	
S1.007	S15	0.074	0.000	0.55		18	14.9	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.397
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.900 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 3.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 40, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%					38.213
S1.001	S2	15 Winter	100	+40%					38.154
S1.002	S3	15 Winter	100	+40%	100/15 Summer				38.137
S2.000	S4	15 Winter	100	+40%					38.237
S2.001	S5	15 Winter	100	+40%					38.005
S1.003	S6	15 Winter	100	+40%	30/15 Summer				37.981
S3.000	S7	15 Winter	100	+40%					38.352
S3.001	S8	15 Winter	100	+40%					38.151
S1.004	S9	15 Winter	100	+40%	30/15 Summer				37.758
S1.005	S10	15 Winter	100	+40%					37.465
S1.006	S11	30 Winter	100	+40%	30/15 Summer				37.408
S4.000	S12	30 Winter	100	+40%	100/15 Summer				37.415
S4.001	S13	30 Winter	100	+40%	100/15 Summer				37.402
S4.002	S14	30 Winter	100	+40%	30/15 Summer				37.396
S1.007	S15	30 Winter	100	+40%	30/15 Summer				37.368

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.083	0.000	0.41			6.6	OK	
S1.001	S2	-0.015	0.000	0.41			6.3	OK	
S1.002	S3	0.051	0.000	0.71			12.2	SURCHARGED	
S2.000	S4	-0.078	0.000	0.47			7.8	OK	
S2.001	S5	-0.102	0.000	0.22			7.8	OK	
S1.003	S6	0.247	0.000	1.13			18.7	SURCHARGED	
S3.000	S7	-0.074	0.000	0.51			8.3	OK	
S3.001	S8	-0.109	0.000	0.17			8.3	OK	
S1.004	S9	0.211	0.000	1.99			30.1	SURCHARGED	
S1.005	S10	-0.009	0.000	0.74			29.7	OK	
S1.006	S11	0.430	0.000	1.13			31.1	SURCHARGED	
S4.000	S12	0.095	0.000	0.90			14.3	SURCHARGED	
S4.001	S13	0.190	0.000	0.36			14.2	SURCHARGED	
S4.002	S14	0.571	0.000	1.89			13.3	SURCHARGED	
S1.007	S15	0.617	0.000	0.56		22	14.9	SURCHARGED	

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PEAK FOUL FLOW CALCULATION PROCEDURE

(used by UK water companies)

Norton Community Hall & Cricket Pavillion

NOTE: PLEASE ENTER DATA IN YELLOW CELLS ONLY

DOMESTIC PREMISES
(houses, apartments, flats, etc)

1) Assume a Dry Weather Flow (DWF) of 225 litres/person/day	0.0026042
2) Assume 3 people/dwelling (houses, apartments, flats, etc)	3
3) Enter number of dwellings (houses, apartments, flats, etc)	0
DOMESTIC PEAK FLOW, **l/s**	**0**

NOTE: PLEASE ENTER DATA IN YELLOW CELLS ONLY

COMMERCIAL PREMISES
(restaurants, shops, offices, gym, etc)

1) Assume a Dry Weather Flow (DWF) of 300 litres/100m2/day	0.0000347
3) Enter the total area of commerical space (restaurants, shops, gym, , etc)	1110
COMMMERCIAL PEAK FLOW, **l/s**	**0.07708333**

TOTAL PEAK FOUL FLOW, l/s	**0.08**

Appendix F

FloodFlow Analysis

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	3	PIMP (%)	100
M5-60 (mm)	18.900	Add Flow / Climate Change (%)	40
Ratio R	0.398	Minimum Backdrop Height (m)	4.000
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	4.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.900
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.088	4-8	0.029

Total Area Contributing (ha) = 0.118

Total Pipe Volume (m³) = 3.785

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Back (m
S1	39.196	1.050	Open Manhole	450	S1.000	38.146	150				
S2	39.187	1.168	Open Manhole	450	S1.001	38.019	150	S1.000	38.019	150	
S3	39.205	1.269	Open Manhole	600	S1.002	37.936	150	S1.001	37.936	150	
S4	39.215	1.050	Open Manhole	450	S2.000	38.165	150				
S5	39.319	1.362	Open Manhole	450	S2.001	37.957	150	S2.000	37.957	150	
S6	39.325	1.741	Open Manhole	600	S1.003	37.584	150	S1.002	37.584	150	
								S2.001	37.584	150	
S7	39.327	1.050	Open Manhole	450	S3.000	38.277	150				
S8	39.252	1.141	Open Manhole	450	S3.001	38.110	150	S3.000	38.110	150	
S9	39.160	1.764	Open Manhole	600	S1.004	37.396	150	S1.003	37.396	150	
								S3.001	37.396	150	
S10	38.744	1.420	Open Manhole	600	S1.005	37.324	150	S1.004	37.324	150	
S11	37.877	1.050	Open Manhole	600	S1.006	36.827	150	S1.005	36.827	150	
S12	37.750	0.580	Open Manhole	450	S4.000	37.170	150				
S13	37.637	0.575	Open Manhole	450	S4.001	37.062	150	S4.000	37.062	150	
S14	37.625	0.950	Open Manhole	1200	S4.002	36.675	150	S4.001	36.675	150	
S15	37.723	1.196	Open Manhole	1200	S1.007	36.527	225	S1.006	36.602	150	
								S4.002	36.602	150	
SexBuriedMH	37.800	1.295	Open Manhole	1200		OUTFALL		S1.007	36.505	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	386869.432	251914.460	386869.432	251914.460	Required	
S2	386879.930	251921.866	386879.930	251921.866	Required	
S3	386872.498	251925.743	386872.498	251925.743	Required	
S4	386866.058	251912.216	386866.058	251912.216	Required	
S5	386848.920	251900.082	386848.920	251900.082	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S6	386843.812	251904.754	386843.812	251904.754	Required	
S7	386846.007	251898.094	386846.007	251898.094	Required	
S8	386832.408	251888.200	386832.408	251888.200	Required	
S9	386828.566	251893.607	386828.566	251893.607	Required	
S10	386824.313	251899.512	386824.313	251899.512	Required	
S11	386824.484	251906.862	386824.484	251906.862	Required	
S12	386864.985	251930.159	386864.985	251930.159	Required	
S13	386858.563	251938.915	386858.563	251938.915	Required	
S14	386855.110	251936.996	386855.110	251936.996	Required	
S15	386820.357	251912.439	386820.357	251912.439	Required	
SexBuriedMH	386817.366	251910.355			No Entry	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	39.196	38.146	0.900	Open Manhole	450
S1.001	o	150	S2	39.187	38.019	1.018	Open Manhole	450
S1.002	o	150	S3	39.205	37.936	1.119	Open Manhole	600
S2.000	o	150	S4	39.215	38.165	0.900	Open Manhole	450
S2.001	o	150	S5	39.319	37.957	1.212	Open Manhole	450
S1.003	o	150	S6	39.325	37.584	1.591	Open Manhole	600
S3.000	o	150	S7	39.327	38.277	0.900	Open Manhole	450
S3.001	o	150	S8	39.252	38.110	0.991	Open Manhole	450
S1.004	o	150	S9	39.160	37.396	1.614	Open Manhole	600
S1.005	o	150	S10	38.744	37.324	1.270	Open Manhole	600
S1.006	o	150	S11	37.877	36.827	0.900	Open Manhole	600
S4.000	o	150	S12	37.750	37.170	0.430	Open Manhole	450
S4.001	o	150	S13	37.637	37.062	0.425	Open Manhole	450
S4.002	o	150	S14	37.625	36.675	0.800	Open Manhole	1200
S1.007	o	225	S15	37.723	36.527	0.971	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	12.847	100.9	S2	39.187	38.019	1.018	Open Manhole	450
S1.001	8.382	100.9	S3	39.205	37.936	1.119	Open Manhole	600
S1.002	35.544	100.9	S6	39.325	37.584	1.591	Open Manhole	600
S2.000	20.999	100.9	S5	39.319	37.957	1.212	Open Manhole	450
S2.001	6.923	18.5	S6	39.325	37.584	1.591	Open Manhole	600
S1.003	18.886	100.9	S9	39.160	37.396	1.614	Open Manhole	600
S3.000	16.818	100.9	S8	39.252	38.110	0.991	Open Manhole	450
S3.001	6.633	9.3	S9	39.160	37.396	1.614	Open Manhole	600
S1.004	7.277	100.9	S10	38.744	37.324	1.270	Open Manhole	600
S1.005	7.352	14.8	S11	37.877	36.827	0.900	Open Manhole	600
S1.006	6.938	30.8	S15	37.723	36.602	0.971	Open Manhole	1200
S4.000	10.859	100.9	S13	37.637	37.062	0.425	Open Manhole	450
S4.001	3.951	10.2	S14	37.625	36.675	0.800	Open Manhole	1200
S4.002	42.554	582.9	S15	37.723	36.602	0.971	Open Manhole	1200
S1.007	3.646	167.9	SexBuriedMH	37.800	36.505	1.070	Open Manhole	1200

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.011	0.011	0.011
1.001	-	-	100	0.000	0.000	0.000
1.002	User	-	100	0.011	0.011	0.011
2.000	User	-	70	0.018	0.013	0.013
2.001	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.013	0.013	0.013
3.001	-	-	100	0.000	0.000	0.000
1.004	User	-	100	0.009	0.009	0.009
1.005	-	-	100	0.000	0.000	0.000
1.006	User	-	100	0.015	0.015	0.015
4.000	User	-	100	0.030	0.030	0.030
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.000	0.000	0.000
1.007	User	-	100	0.016	0.016	0.016
				Total	Total	Total
				0.123	0.118	0.118

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.007	SexBuriedMH	37.800	36.505	36.505	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	1000	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.900	Storm Duration (mins)	30
Ratio R	0.398		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S15, DS/PN: S1.007, Volume (m³): 2.2

Unit Reference	MD-SHE-0175-1500-1000-1500
Design Head (m)	1.000
Design Flow (l/s)	15.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	175
Invert Level (m)	36.527
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.000	15.0
Flush-Flo™	0.323	15.0
Kick-Flo®	0.704	12.7
Mean Flow over Head Range	-	12.7

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)**
0.100	6.2	1.200	16.3	3.000	25.3	7.000	38.0
0.200	14.4	1.400	17.6	3.500	27.2	7.500	39.3
0.300	15.0	1.600	18.7	4.000	29.0	8.000	40.6
0.400	14.9	1.800	19.8	4.500	30.7	8.500	41.8
0.500	14.6	2.000	20.8	5.000	32.3	9.000	43.0
0.600	14.1	2.200	21.8	5.500	33.9	9.500	44.1
0.800	13.5	2.400	22.7	6.000	35.3		
1.000	15.0	2.600	23.6	6.500	36.7		

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Storage Structures for Storm

Cellular Storage Manhole: S15, DS/PN: S1.007

Invert Level (m) 36.527 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	60.0	0.0	0.401	0.0	0.0
0.400	60.0	0.0	1.196	0.0	0.0

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Summary of Results for 30 minute 1000 year Winter (Storm)

Margin for Flood Risk Warning (mm) 150.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	38.209	-0.087	0.000	0.37			6.0	OK
S1.001	S2	38.133	-0.036	0.000	0.38			5.9	OK
S1.002	S3	38.123	0.038	0.000	0.68			11.7	SURCHARGED
S2.000	S4	38.233	-0.082	0.000	0.42			7.0	OK
S2.001	S5	38.087	-0.020	0.000	0.20			7.0	OK
S1.003	S6	38.077	0.344	0.000	1.06			17.5	SURCHARGED
S3.000	S7	38.348	-0.079	0.000	0.45			7.5	OK
S3.001	S8	38.149	-0.111	0.000	0.15			7.4	OK
S1.004	S9	38.026	0.479	0.000	1.90			28.8	SURCHARGED
S1.005	S10	37.943	0.469	0.000	0.71			28.2	SURCHARGED
S1.006	S11	37.866	0.889	0.000	1.29			35.5	FLOOD RISK
S4.000	S12	37.697	0.377	0.000	1.07			17.0	FLOOD RISK
S4.001	S13	37.637	0.425	0.406	0.41			16.0	FLOOD
S4.002	S14	37.625	0.800	3.540	2.12			14.9	FLOOD
S1.007	S15	37.723	0.971	1.163	0.59		28	16.0	FLOOD

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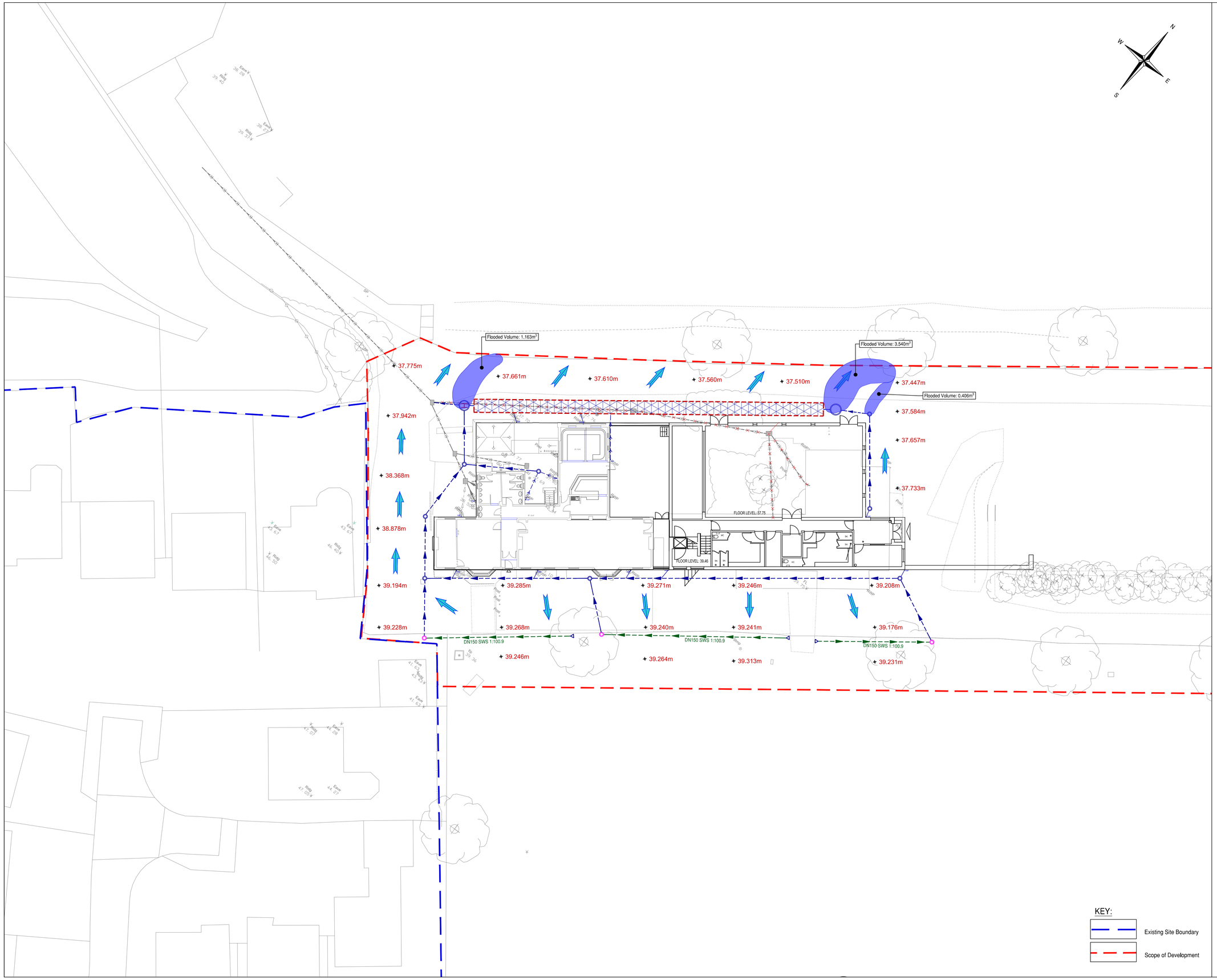

Safety, Health & Environmental Information:

In addition to the hazards and risks normally associated with the types of work detailed on this drawing, please note the significant hazards identified by symbols below,

INDICATES A RESIDUAL RISK AS A WARNING

INDICATES A RESIDUAL RISK FOR INFORMATION

and described below:

Construction/Maintenance/Cleaning/Demolition

Refer to Drawing:

General Notes:

1. Do not scale from this drawing.

2. All dimensions are in metres (m), all levels in metres (m) unless noted otherwise.

3. Discrepancies or omissions are to be reported to the Engineer prior to work commencing.

4. Materials and workmanship are to comply in all respects with current British Standard Specifications, Codes of Practice, and Building Regulations Approved Documents.

5. The copyright of this drawing is vested in the Engineer and must not be copied or reproduced without written consent.

6. The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work commences.

7. This drawing is to be read in conjunction with all relevant specifications and drawings issued by the Engineer, Architect and other Specialists.

Drainage Key

DN150 SWS 1 in 100	Proposed Surface Water Sewer
SWIC XX DN XXXX CL: XX.XX IL: XX.XX	Proposed Surface Water Inspection Chamber
SWCP XX DN XXXX CL: XX.XX IL: XX.XX	Proposed Ridgistorm Separate Catchpit
	Proposed DN150 RWP and Gully Connection
	Proposed Hydro-brake Chamber. Refer to drawing NCH-BML-ERD-ZZ-DR-C-0501 for details.

Flood Depth Bands

Depth (mm)	Hazard Rating <	Lower Colour	Upper Colour
0 - 10	0.00	Not Drawn	
10 - 50	0.75		
50 - 125	1.50		
125 - 300	2.50		

Rev	By	Chk'd	Date	Description
P01	VI	AM	07/12/20	First Issue for Approval

PRELIMINARY DRAWING
This drawing is not to be used for construction

Client
Worcester Norton CIC

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Project
Norton Community Hall & Cricket Pavillion

Drawing
FloodFlow Analysis
1000-Year
30min Winter Storm Event

Drawn by VI
Date 07/12/20

Drawing No.
NCH-BML-ERD-ZZ-DR-C-0503
Revision
P01

BML Job No.
1018-01
Status

Drawing Scale at A1: 1:200

CAD filename