SHEAR design
Consulting Civil and Structural Engineers

PURPOSE BUILT STUDENT ACCOMMODATION

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

FORMER GAMECOCK PUBLIC HOUSE SITE
BOOTH STREET WEST
BOUNDARY LANE
MANCHESTER
M15 6GE

FOR CURLEW ALTERNATIVES EIGHTH PROPERTY LP

MAY 2021
20049.02.03.D100A

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Issue	Prepared by	Checked by	NOTES	Date
1	TU	DK	Issue 1	01.04.2021
2	TU	TS.DK	Issue 2	11.05.2021

1.0 Introduction

The applicant: Curlew Alternatives Eight Property LP proposes a development in Manchester on land at Booth Street West at its junction with Boundary Lane. To the south, Camelford Close forms the southern boundary. The development comprises the construction of a thirteen-storey high-rise student accommodation building to the west of Manchester University. There is a small basement area for bicycle storage including lift and stair core for access and maintenance. The ground floor (Level 00) footprint is slightly smaller than the upper storeys as there is a building overhang on the north elevation commencing at first floor (Level 01). Level 00 has two entrances on the northern elevation serving the Community Hub which is separate from the Student Accommodation entrance lobby that accesses the lift core and stair core. Other facilities include a staff area and an amenity space / gym. At the rear (south elevation) are a series of service rooms including a bin store, generator room, sub-station, plant room and a service lift. Individual external doorways access each of these rooms. Although the development has an area of less than 1.0Ha and is not located in Flood Zone 2 or 3, it is within a critical drainage area and therefore this drainage strategy document includes a section on Flood Risk.

This document has been written to support the Planning Application for development of the site.

Shear Design Ltd have prepared this report in accordance with the instructions of its Client – Curlew Alternatives Eight Property LP for its Client's sole and specific use. This report is not assignable without the prior written permission of Shear Design Ltd. This report should not be relied upon exclusively for decision making purposes and should be read in conjunction with other Engineer's reports, specifications and drawings in addition to all other relevant reports, drawings and specifications.

2.0 Topography and Site Description

The Site is located in Hulme to the west of Manchester University at the junction of Booth Street West and Boundary Lane with a site area of 844m^2. The Grid Reference is: SJ 84139 96699 / SJ841966 / Eastings and Northings: 384139, 396699. A site location plan can be found in **Appendix A.**

The Topographical Survey provided by Point Surveyors was produced in January 2020. This survey shows that the site is positioned at an elevation ranging from 36.4ma Above Ordnance Datum (AOD) in the north east to 35.6m AOD in the south west, giving a level range on site of 0.8m. The surrounding carriageways and footways adjoin the northern, western and southern flanks and in the east, separated by boundary railings is a private area of grassed soft landscaping, hedges and maple trees.

The land is currently occupied by the Gamecock Inn which has been closed for a number of years but is still present, and with no obvious changes other than becoming slightly overgrown and slightly dilapidated. Three further maple trees sit within the site on the western boundary. Vehicle access to the Gamecock Inn is via Camelford Close and there is a forecourt of tarmac paving fronting onto Boundary Lane to the west. More site detail can be found on the topographical survey located in Appendix B.

3.0 Existing Drainage

Historical maps show that in 1851 the area was developing as a dense back-to-back residential area. It is noted that the site itself is vacant on the 1851 map but appears on the 1891 map. The houses were last present on the map published 1961-1973 and the Gamecock Inn first appears on the map published 1969-1985 and also on the map published 1974-1976. In these later maps the road network changes noticeably except that the line of Booth Street West is unchanged on all the mapping.

The site currently comprises 535m^2 of roof and hard standing representing 63% of the 844m^2 site area. A channel drain and some gully pots serve the tarmac area in the west and the building has a number of rainwater downpipes for the roof. These surface water items connect to drains running round the building perimeter from the south, then around the west and heading north to a single point of connection into the combined sewer in Booth Street West located in the footway. En-route foul drainage from the building connects into this on-site drainage. Surface water from some perimeter hardstanding may shed off onto soft ground within the site and disperse naturally.

United Utilities records show that there is an existing public combined flow sewer running east to west in Booth Street West within the footway adjacent to the site. Information obtained by Point Surveyors demonstrates that this sewer is approximately 4m deep and this is confirmed by United Utilities. The topographical survey shows that the line of the sewer cuts at an angle close to the back of the footway, more so than is shown on the sewer records. This existing combined sewer is discussed further in Section 5.0. with regard to easement considerations.

There is an existing foul drainage pipe to the east of the proposed building in the adjacent land that connects into the public combined sewer in the footway immediately north east of the proposed building. This drainage is not shown on the sewer records but is discussed further with United Utilities in Section 5.0 of this report.

On the West side of Boundary Lane runs a combined public sewer into which the aforementioned Booth Street West sewer is connected. There are several existing manholes as the pipe runs north and these can be utilised as discussed in the following pages for connection of diverted drainage and as alternative options for connecting the drainage from the development.

A plan of the existing United Utilities sewer network plan can be found in Appendix C. A CCTV drainage survey is due to be completed in the near future and this report will be reviewed accordingly.

4.0 Flood Risk

Low lying areas beside the River Medlock are at most risk of fluvial flooding. The Gamecock Inn is positioned at an elevation of 36m AOD compared with peak flooding levels of about 27m AOD on the River Medlock at Deansgate 1.1km away. The Environment Agency flood map for planning can be found in Appendix D and this demonstrates that the site is located in Flood zone 1 but with the carriageways of Boundary Lane and Booth Street West being located in Flood Zone 2. Parts of Manchester University fall within Flood Zone 3 within 200m of the Gamecock Inn. A larger scale map in Appendix D shows the site in a wider context with regard to flooding. As no part of the site is within Flood Zones 2 or 3, a sequential test is not required.

Section 2.10.2 of the Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA SFRA (March 2011) discusses the Hulme / Ardwick Area:

'In a 1 in 100 year flood event considering climate change, flooding starts at three locations; Kincardine Road, Oxford Road at the University and Charles Halle Road at the Brewery. Flooding from Kincardine Road affects residential streets as it flows north-westwards. Flooding from Oxford Road flows westwards along the Booth Street West towards Princes Road, where it is retained, and to the south affecting residential properties along Epping Street and Eden Close. Flooding from Charles Halle Road flows south and has little impact on residential properties. In a 1 in 1000 year flood event, flooding follows a similar sequence however; there is additional flooding at St Mary's Street to the southwest, along Charles Halle Road, Kincardine Road and Oxford Road.'

The Princes Road reference has been assumed by Shear Design (assuming typo error) as Princess Road which is a dual carriageway that appears to be lowered and partially within a cutting or revetment although flood mapping does not show this road as prone to flooding. Epping Street and Eden Close are both located to the west / south west of The Gamecock Inn suggesting that water from Oxford Road is flowing westwards along Booth Street West passing Gamecock Inn and affecting residential properties along Epping Street and Eden Close.

Proposed finished floor level at ground level is set at +35.850m AOD and the community hub is set at +35.745AOD with the internal connecting corridor set to a gradient for level access between the two. Levels have been set based on creating level access from the existing footway but generally gradients fall away from the building, with the exception of an area on the south façade where the external levels are fairly flat. This area will still fall away from the door thresholds into a channel to drain the area and allow exceedance to follow an over-land route towards Camelford Close and Boundary Lane rather than risk entry into the service rooms at the rear of the building. Camelford Close is part of the area within Flood Zone 1 and has a gentle gradient towards Boundary Lane allowing surface exceedance water to flow away from the proposed building along Camelford Close. Thresholds drains are recommended for all doorways to prevent ingress of wind-blown surface water. Two ground floor plans are available in Appendix D. One shows the Architect's proposed ground floor levels and the other shows the Engineer's external area levels plan using contours.

An updated SFRA is understood to be in circulation shortly and may have some additional relevance to the scheme but at the time of writing the new SFRA was not available.

Clause 4.2.14 of the Tweedie Evans Consulting Preliminary Geo-Environmental Assessment advises that the site is reported as being located within an area at limited risk of groundwater flooding. Further clauses advise that here are no recorded licensed discharge consents to land/soakaway within 250m of the site and that based upon the above information the geological and hydrogeological setting of the site is considered to be of Moderate Sensitivity. Within the Preliminary Geo-Environmental Assessment further sub-clauses under Clause 4.3 'Hydrology' go on to say,

"4.3.1 The closest surface water course to the site is the River Medlock located approximately 690m to the north of the site."

"4.3.2. There are no recorded surface water abstractions, licensed discharge consents, or pollution incidents within 250m of the site."

"4.3.3. The site is reported to be located immediately adjacent to the south and east from the areas within the extent of extreme flooding (adjacent Booth Street West and Boundary Lane)."

"4.3.4. Given the above information, the hydrology of the site is considered to be of Low Sensitivity."

Ground water monitoring was undertaken for contamination testing (Clause 8.5.2 : no exceedances of screening values were recorded). Groundwater strikes were encountered at two locations in the southern site area at approximate depths of between 2.0mbgl and 2.8mbgl within granular superficial ground deposits. Therefore, flooding from groundwater on this site is considered to be a low risk.

The possibility of sewer flooding in the vicinity of the site has not been mentioned by United Utilities. The public combined sewers are approximately 4m deep and would require considerable hydraulic head to occur before sewer flooding occurs at the site. Should sewer flooding happen the proposed building is slightly elevated in its Flood Zone 1 position. If the amount of surcharging backs up into the building it will cause ground floor shower and toilet facilities to overflow, however, at that stage the rest of the neighbourhood will be experiencing similar issues. It is more likely that flooding will discharge from road gullies rather than from relatively elevated ground floor sanitary fittings. The basement has no proposed drainage outlet as it serves only a bicycle storage facility and will not be at risk of flooding from surcharging within the drainage system.

Rainwater also discharges into the same sewer., therefore as a consequence of sewer flooding the permeable paving would be unable to accept any more water due to its lower operating head and water would make its own way off-site overland. To avoid any possibility of foul contamination of any proposed permeable paving sub-base, the outlet should be fitted with a non-return valve. The roofs would continue to be able to discharge due to the downpipes and therefore providing a sufficient head of pressure to keep the water flowing. The consequence for downstream properties has already been discussed in the text mentioned above taken from the SFRA. However, as discussed in Section 6.0 of this report: Proposed Surface Water Drainage, the development is designed to mitigate loading of the sewer network by detaining a considerable volume of rainfall for controlled discharge with capacity for the 1:100 year return period plus 40% added for climate change.

5.0 Easement Considerations

The United Utility records indicate a public combined sewer running within the footway immediately north of the site. The proposed footprint of the ground floor is more than 3m from the centre of this sewer. However from the first floor up the building projects out by 2.6m, still within the site boundary, and for some extent is between 1m to 3m from the sewer. The vertical clearance to the underside of the overhang is 3m.

United Utilities advises that according to its public sewer records there are public sewers located near to the site boundary, as described above regarding the first-floor overhang. The Engineering Team of United Utilities advises that the 300mm diameter public combined sewer is approximately 4m deep, therefore foundation design and construction methods should take this into consideration with no damage or additional loading being applied to the public sewer. Regarding the overhang, United Utilities will need to be reassured that the plant required to safely dig down to maintain these assets at this depth can be achieved with the proposed overhang. Once this reassurance has been provided, United Utilities will be in a position to review the proposals.

There is an existing foul drainage pipe to the east of the proposed building crossing the adjacent soft landscaped area before connecting into the public combined sewer immediately to the north east of the proposed building. This has been surveyed and recorded as drainage run MH39 to MH16. The downstream end passing the corner of the site and connecting to MH16 can be seen on the Existing Drainage Layout in Appendix C . This drainage is not shown on the sewer records and land search indicates that no easements are present. However, the drain appears to serve two separate properties, known as Cooper House and Trinity Court. United Utilities were consulted regarding the adopted status of this sewer and commented that this is a difficult matter to determine. To have been part of the Transfer of Sewers in October 2011, the sewer must have been constructed prior to 2011 and must serve two or more curtilages. Two buildings are mentioned but this might not mean two curtilages however. Further investigation of the ownership of Cooper House and Trinity Court along with any other properties served will determine whether the existing foul drain to the east is a public sewer.

The corner of the proposed building is 2.4m away from this drainage, impinging on what would normally be a minimum 3.0m easement width. In response, United Utilities stated that assuming this is a public sewer asset, they would hold no major problems with reducing the easement to 2.4m so long as the total 6m can be maintained so that they can ensure 24 hour access to the assumed asset, should this be required. Comments surrounding asset protection/foundation design and construction considerations need to be ensured. However, it should be noted that the proposed building will have piled foundations and will not be surcharging the sewer.

Following an initial risk assessment and development of a draft method statement it is anticipated that United Utilities will be reassured that the plant required to safely dig down to maintain these assets can be achieved with the proposed overhang. Once a Contractor is appointed, they will develop and submit a detailed risk assessment and method statement for the retention of the drain in proximity to the north elevation.

6.0 Proposed Surface Water Drainage

A pre-development enquiry has been submitted to United Utilities proposing that the new foul and surface water connection utilises an existing combined connection to the 300mm public sewer located in the footway of Booth Street West, north of the site. A response was received from Wastewater Developer Services at United Utilities. Both items of correspondence can be found in Appendix E. United Utilities has provided a surface water drainage discharge figure for use by the development, should all other means of surface water discharge prove unviable. The discharge figure is based on the site being classified as a brownfield site for drainage purposes with a betterment rate of surface water discharge compared with greenfield developments. The discharge figure has been rounded up to 5.0 L/s by United Utilities.

United Utilities has correctly asserted that all surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, of the National Planning Practice Guidance *(Reference ID: 7-080-20150323).* United Utilities also recommend prioritising the use of multi-functional sustainable drainage systems for the management of surface water in accordance with National Planning Policy. Generally, the aim should be to discharge surface run-off as high up the following hierarchy of drainage options as reasonably practicable. This is outlined as follows, in order of priority:

1. into the ground (infiltration);
2. to a surface waterbody;
3. to a surface water sewer or highway drain;
4. to a combined sewer.

1. Surface water discharge into the ground (infiltration)

United Utilities states that surface water runoff generated from this development should discharge to the ground via infiltration system where feasible. A detailed evidence-based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal. Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. This development occupies a large proportion of the plot using a single building footprint and leaves insufficient space for the installation of soakaway chambers. Part of the proposals for the development includes permeable paving that can include an infiltration geotextile on the formation to allow water to discharge into the ground. The rate of infiltration will need to be determined by undertaking several shallow depth infiltration tests at the proposed formation level.

2. Surface water discharge to a surface water body;

United Utilities and the Lead Local Flood Authority (LLFA) note there is a culverted watercourse located approximately 100m south of the site which they would like considered but recognise however that access to make a connection to this asset will be very challenging for this site. With

reference to the United Utilities Sewer Records shown in Appendix C there is a 1875 x 3075 line shown crossing sports pitches within an education facility. The line deviates south close to a building annotated as the Sixth Form College. Accessing a connection onto the line would entail a new drain approximately 100m along Boundary Lane; and then a 40m lateral drain into the education premises, passing through sports pitches and utilising a gap in a line of mature trees within that site. As this would be a large undertaking given the small size of the upstream catchment it is recommended this option should be discounted.

3. Surface water discharge to a surface water sewer or highway drain;

The next means of connection to explore is the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse therefore contacting the relevant Highway Authority. Shear Design contacted the Highway Authority (HA) and the HA confirm they have no drainage records in the area. To explore this option further a CCTV drainage survey has been commissioned and is due to be undertaken shortly. However, it has been stated by the LLFA that connection to a highway drain will not be permitted.

4. Surface water discharge to a combined sewer.

Once evidence is provided as outlined above, United Utilities and the Lead Local Flood Authority (LLFA) will consider a connection to the 300mm diameter public combined sewer within Booth Street West, located north of the proposed site at a pass forward flow to be agreed by LLFA. A minimum 50% betterment should be achieved over the existing Brownfield runoff rate. Assuming a 50mm rainfall event on an estimated positively drained area of 0.06Ha this provides an existing Brownfield runoff rate of 8.3l/s. As a result, United Utilities requested that any agreed rate does not exceed 5l/s which they have rounded up from the 50% betterment figure of 4.15l/s. The LLFA has been contacted for discussions regarding the scheme proposals and their response is provided within Appendix E. On receipt of this information this report had already been substantially completed ready for submission and the majority of the points raised are covered in this report. Some of the LLFA comments however will require further consideration at detailed design.

The building and its roofs will occupy a significant proportion of the development, some 78% of the site area. To address the roof runoff volumes, blue roof systems are being incorporated into the proposals. These roof attenuation systems start with the Level 14 - Roof at the top of building detaining water for discharge at a controlled rate using a proprietary blue roof system incorporating cellular detention units and finished with a ballast layer. Proposals include the integration of a Solar PV array at Level 14.

The Level 13 roof is shared with an adjoining top storey of student accommodation and the requirement for the roof build-up to be of similar in thickness means the runoff from this level and the perimeter roof area will drain without prior detention or control and will enter a drainage attenuation system at ground level described later in this section.

Level 09 has an extensive wildflower green roof finish that is integrated with a blue roof attenuation system, referred to as a blue/green roof. The access to this roof is intended to be for maintenance purposes only allowing the wildflower system to provide full coverage of the area. The same principles of attenuated controlled discharge of rainwater will apply with the addition of a water treatment stage and the process of water absorption and evapotranspiration from the living green layer.

At ground level, permeable paving will allow rainfall to percolate directly through the surface and be treated and detained in the porous sub-base stone. Runoff from the roof at Level 13 will be added to the overall volume of rainfall to be detained by the permeable paving. To provide for the net total volume of water being handled at ground level, the drainage scheme is augmented with lengths of oversized pipe and manhole chamber volumes. Once specialist blue/green roof drainage calculations are available and the location of incoming mains service connections are established the extent of the oversized pipes and manhole chamber volumes can be reviewed. A plan of the proposed drainage layout can be found in Appendix F.

Table 1 below demonstrates a summary of the sources of runoff:

	Level 14 Blue Roof	Level 09 Blue/Green R	Level 00 Perm Pave
Half Drain Time (min)	90	130	35
Max Depth (mm)	97	99	333
Max Control (L/s)	1.6	0.9	2.5
Storm Event (min)	120 Winter	120 Winter	60 Winter
Control Orifice(s)	18no x 10mm	10no x 10mm	1no x 40mm

Table 1

A plan and a selection of blue/green roof details can be found in Appendix G.

The surface water drainage calculations can be found in Appendix H.

Once the specialist blue/green roof drainage calculations are available this report will be reviewed accordingly.

To summarise, the proposals currently incorporate a blue / green roof system and permeable paving with soft landscaping and this will be further developed during the detailed design proposals with regard to provision of SUDS elements. If there are any further enhancement possibilities these will be considered where practicable.

The foul and surface water flows will combine in a manhole inside the site boundary and utilise the existing connection into the public sewer. Interception of fuel and oil is not considered necessary due to restricted vehicle access within the site.

7.0 Proposed Foul Water Drainage

As explored in Section 6.0 a pre-development enquiry was submitted to United Utilities proposing that the new foul and surface water connection utilises an existing combined connection to the 300mm public sewer located in the footway of Booth Street West, north of the site. A response was received from Wastewater Developer Services at United Utilities. Both items of correspondence can be found in Appendix E. United Utilities states that foul flow from this site will be allowed to drain into the public foul water/combined sewer system and that this will be permitted at an unrestricted rate.

United Utilities states that in accordance with its infrastructure plans it may ask for a change to the point of connection and it suggests making contact again prior to formalising the drainage proposals, which it suggests is before submission for Full Planning. Correspondence to this effect can be found in Appendix E.

The foul water discharge from the building will be collected using internal pipework above ground in accordance with plans to be developed by the Building Services Engineer. Once at ground floor the discharge will connect to the foul sewer via a gravity lateral connection. The foul drainage will connect to the same sewer that provides a surface water point of connection; inclusive of an anti-backflow valve.

The estimated foul flow rate for the development is based on the number of students in residence when the building is at full capacity, which in this case is 261 single occupancy bedrooms. On the ground floor there is a community hub open to non-residents with a single accessible toilet; a gym with single accessible toilet and a staff kitchen with single accessible toilet and shower. The flow rate will typically be 120 L/person/day for the resident students (averaged over 24 hours), with a peaking factor of 6x the average flow rate to account for times during the day when the facilities are at their busiest. To account for the ground floor facilities an additional 10% is added. The calculation is given in Appendix I and results in an average flow rate of 0.40 L/s; and a peak foul flow rate of 2.36 L/s. The overall daily volume of foul discharge is 34.45m^3.

8.0 Summary

The site is located in Hulme, west of Manchester University at the junction of Booth Street West and Boundary Lane and has a site area of 844m^2. The topographical survey shows that the site is positioned at an elevation ranging from 36.4m Above Ordnance Datum (AOD) in the north east to 35.6m AOD giving a level range on site 0.8m. The development comprises the construction of a thirteen-storey, high-rise student accommodation building to the west of Manchester University. The land is currently occupied by the Gamecock Inn that has been closed for a number of years. Although the development has an area of less than 1.0Ha and is not located in Flood Zone 2 or 3, it is within a critical drainage area and therefore requires a review of flood risk.

Historical maps show the area developing during the 19th Century. The Gamecock Inn first appears on the map published 1974-1976 following clearance of the Victorian housing. The site currently comprises 535m^2 of roof and hard standing representing 63% of the 844m^2 site area. Combined drainage from the site discharges to a single point of connection into the combined sewer in Booth Street West located in the footway.

United Utilities records show that there is an existing public combined flow sewer running east to west in Booth Street West within the footway adjacent to the site, at a depth of approximately 4m. The line of the sewer cuts at an angle close to the back of the footway. An existing foul drain runs to the east of the proposed building in the adjacent land and connects to the public combined sewer in the footway north east of the proposed building. This drainage is not shown on the United Utilities public sewer records. A CCTV drainage survey is due to be completed in the near future.

The Environment Agency flood map for planning shows the site located in Flood Zone 1 with adjacent carriageways located in Flood Zone 2. As no part of the site is within Flood Zone 2 or 3, a sequential test is not required.

The Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA (March 2011) discusses the Hulme / Ardwick Area and identifies that flooding from Oxford Road flows westwards along Booth Street West towards Princes Road, where it is retained. This water also flows to the south affecting residential properties along Epping Street and Eden Close. Since Epping Street and Eden Close are located to the west

this suggests that water from Oxford Road is flowing westwards along Booth Street West passing the site.

Proposed finished floor levels at ground level are set at +35.850m AOD and +35.745AOD so that gradients fall away from the building, with the exception of an area on the south façade where the external levels are flat. This area falls away from the door thresholds using a channel line and exceedance flow will pass westwards into Boundary Lane rather than risk entry into the service rooms at the rear of the building.

A review of ground conditions indicates the site is in an area at limited risk of groundwater flooding. The geological and hydrogeological setting of the site is considered to be of Moderate Sensitivity and the hydrology of the site is considered to be of Low Sensitivity. Groundwater strikes were encountered at two locations on site at depths of between 2.0mbgl and 2.8mbgl and therefore flooding from groundwater on this site is considered to be a low risk.

The possibility of sewer flooding in the vicinity of the site has not been mentioned by United Utilities and is considered to be low risk due to the slightly elevated position and the absence of a basement waste outlet. As a precaution, non-return valves for the lateral connections to the public sewer are recommended.

With regard to the first-floor overhang on the north elevation it is anticipated that United Utilities will allow the existing sewer to be retained at its 4m depth, in proximity to the proposed overhang. Once a contractor is appointed, they will develop and submit a detailed risk assessment and method statement for approval by United Utilities to demonstrate the procedure for maintenance of the sewer adjacent to the overhang.

Similar considerations will need to be given where the private foul drain passes close to the north east corner of the building. United Utilities has stated that assuming this is a public sewer asset, they would hold no major problems with reducing the easement to 2.4m so long as the total 6m can be maintained.

For surface water discharge the hierarchy of drainage options in order of priority has been considered:

1. Surface water discharge into the ground (infiltration) is restricted by the shortage of proposed external space on the site. Permeable paving may be an option if shallow infiltration testing gives suitable results and the soil contamination does not pose a risk.
2. Surface water discharge to a surface water body has been discounted due to the work entailed in making a connection to a culverted watercourse located approximately 100m south of the site within an education facility.
3. Surface water discharge to a surface water sewer is unlikely as there are no records of such drains in the area. Connection to a highway drain will not be permitted.
4. Surface water discharge to a combined sewer is the most likely option. United Utilities has requested that any agreed rate does not exceed 5l/s. The Lead Local Flood Authority (LLFA) has been contacted for discussions regarding the scheme proposals and their response is appended within Appendix E.

The building roof areas will provide much of the attenuation on site using blue/green roof systems. Roofs cover 78% of the site area. At ground level, permeable paving will treat and detain rainwater and potentially the runoff from the Level 13 roof plant area. Lengths of oversized pipe and manhole chamber volumes are included within the proposals in case further capacity is required due to limitations on the permeable paving system.

The SUDS systems proposed will be further developed during the detailed design stage. If there are any further enhancement possibilities these will be considered where practicable. Interception of fuel and oil is not considered necessary due to restricted vehicle access within the site.

United Utilities states that foul flow from this site will be allowed to drain into the public foul water/combined sewer system and that this will be permitted at an unrestricted rate. The foul water discharge from the building will be collected using internal pipework above ground in accordance with plans to be developed by the Building Services Engineer. Once at ground floor the discharge will connect to the foul sewer via a gravity lateral connection. The foul drainage will connect to the same sewer that provides a surface water point of connection inclusive of an anti-backflow valve.

The estimated foul flow rate for the development is based on 261 single occupancy bedrooms. The ground floor has additional facilities and an additional 10% is added resulting in an average flow rate of 0.40 L/s and a peak foul flow rate of 2.36 L/s. The overall daily volume of foul discharge is 34.45m^3.

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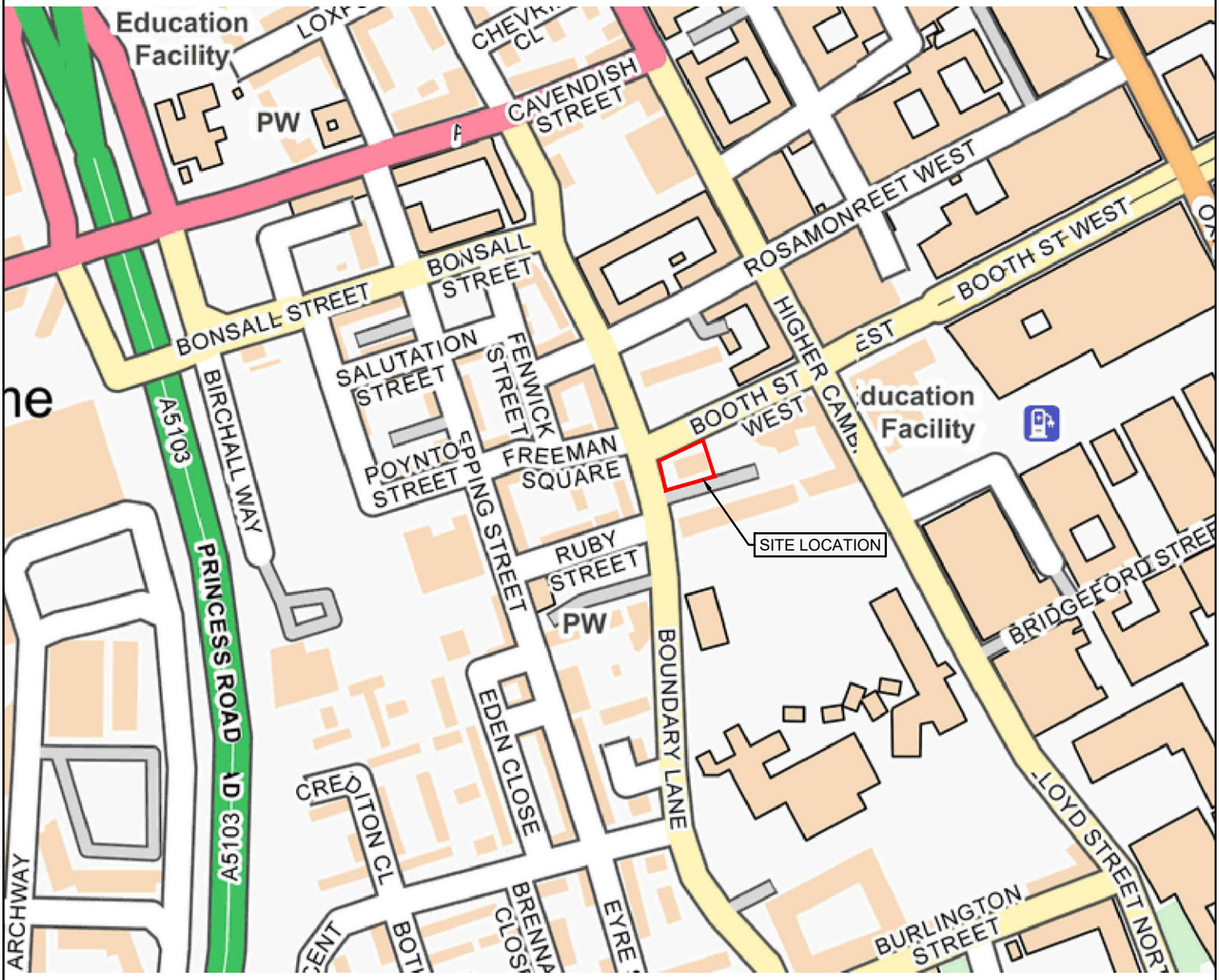
APPENDIX A

THE SITE LOCATION PLAN



CLIENT: CURLEW OPPORTUNITIES

PROJECT: GAMECOCK. BOOTH STREET WEST, MANCHESTER

TITLE: LOCATION PLAN

DRAWN: TU | DATE: MAR 2021

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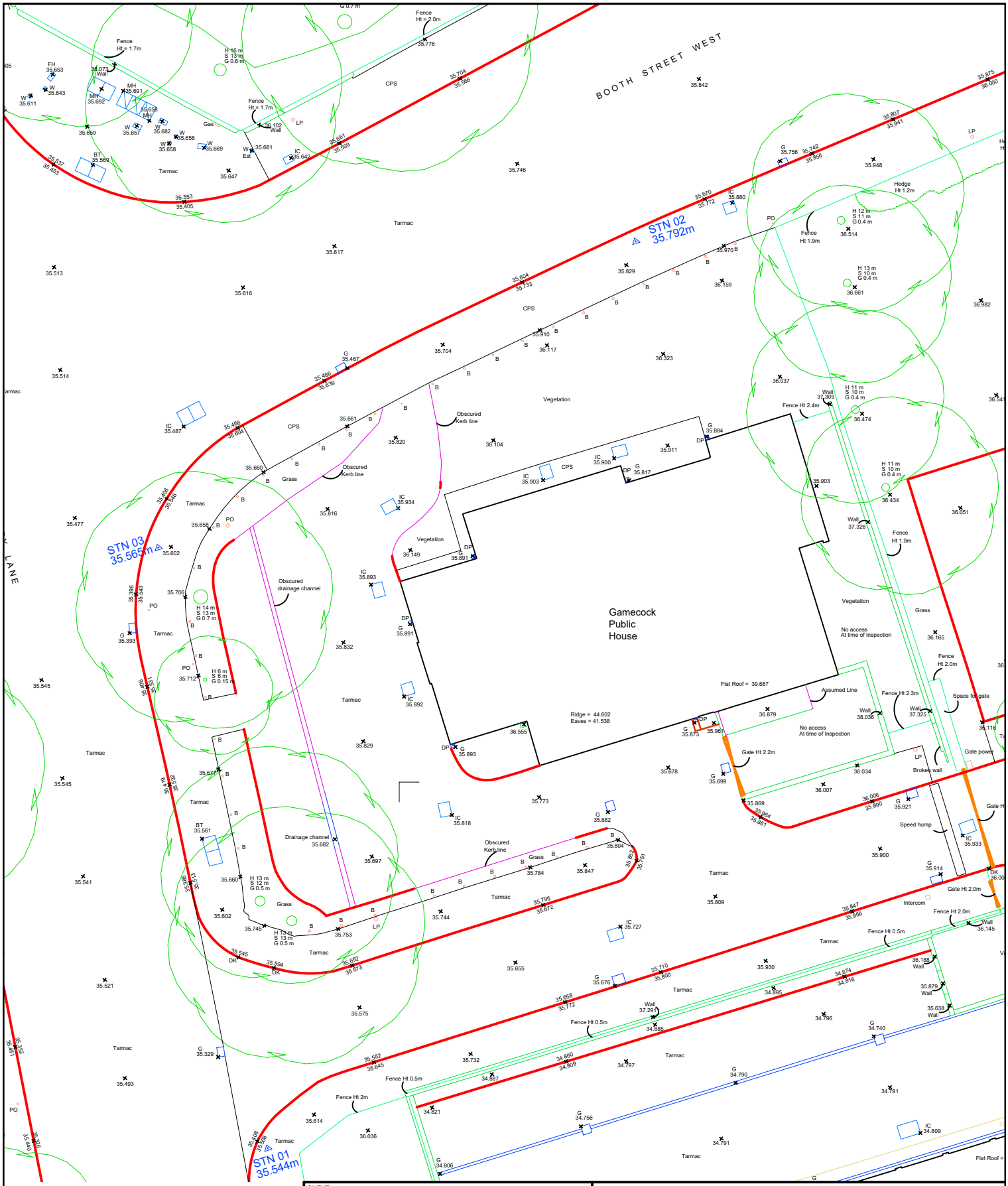
AMENDMENTS		

APPENDIX B

TOPOGRAPHICAL SURVEY WITH GROUND RADAR UTILITY SURVEY



CLIENT:	CURLEW OPPORTUNITIES
PROJECT:	GAMECOCK. BOOTH STREET WEST, MANCHESTER
TITLE:	TOPOGRAPHICAL SURVEY

REV	DATE	DESCRIPTION
AMENDMENTS		

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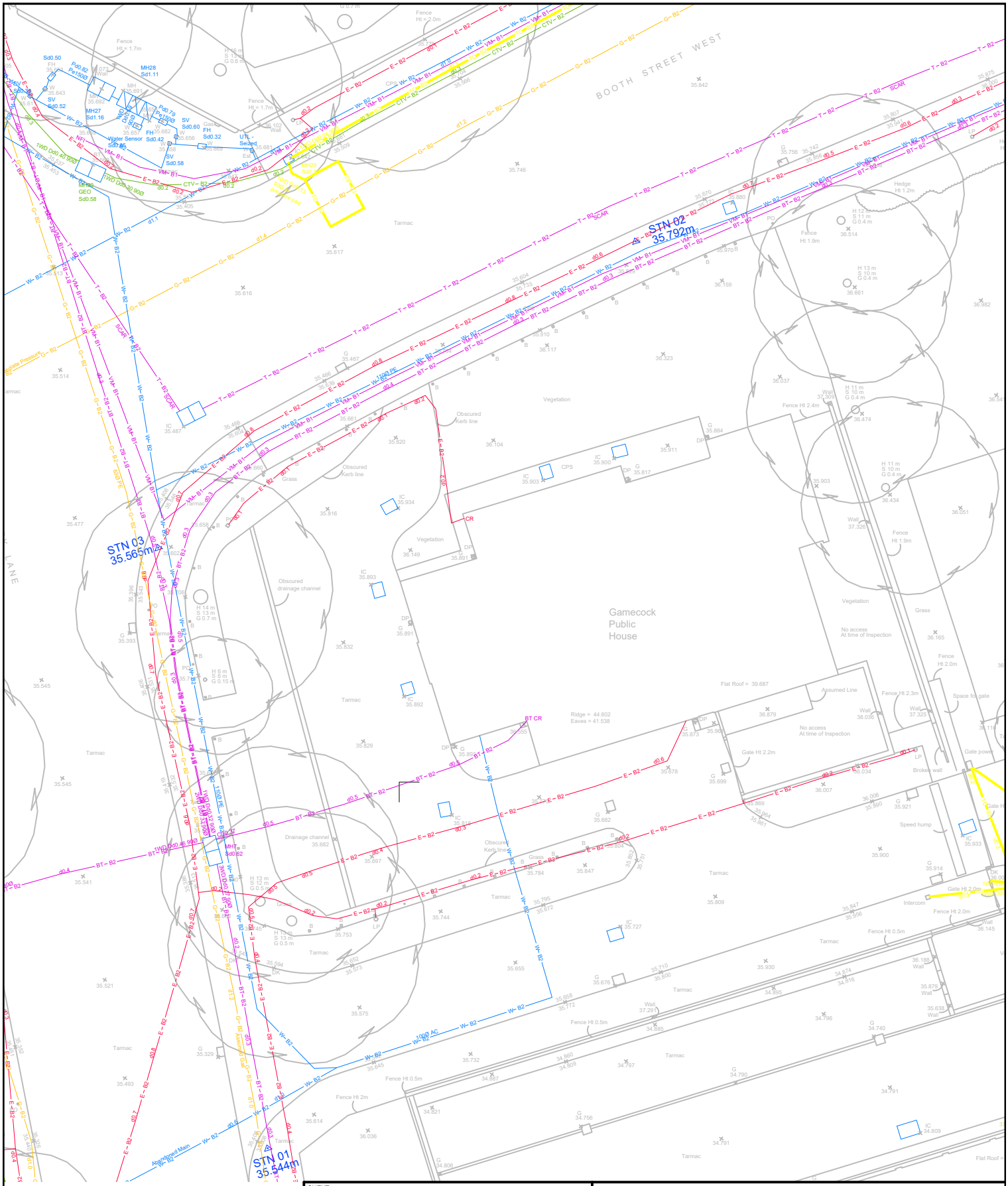
SHEAR design
Consulting Civil and Structural Engineers
7 Ashtree Court - Woodsy Close - Cardiff Gate Business Park - Cardiff - CF23 8RW
Tel: 029 2054 7000 - Fax: 029 2054 7001 - www.shear-design.com - enquiries@shear-design.com

STATUS KEY: I = INFORMATION P = PRELIMINARY A = APPROVAL CO = CONTRACT
T = TENDER C = CONSTRUCTION AB = AS-BUILT

STATUS:	DRAWING NUMBER:	REVISION:
A	20049-101	-

APPENDIX C

EXISTING DRAINAGE LAYOUT AND STATUTORY UTILITY RECORDS



REV	DATE	DESCRIPTION
AMENDMENTS		

CLIENT: CURLEW OPPORTUNITIES

PROJECT: GAMECOCK. BOOTH STREET WEST, MANCHESTER

TITLE: UTILITY SERVICES SUB-SCAN

DRAWN: TU | DATE: MAR 2021

CHECKED: DK | SCALE: 1:250 @ A4

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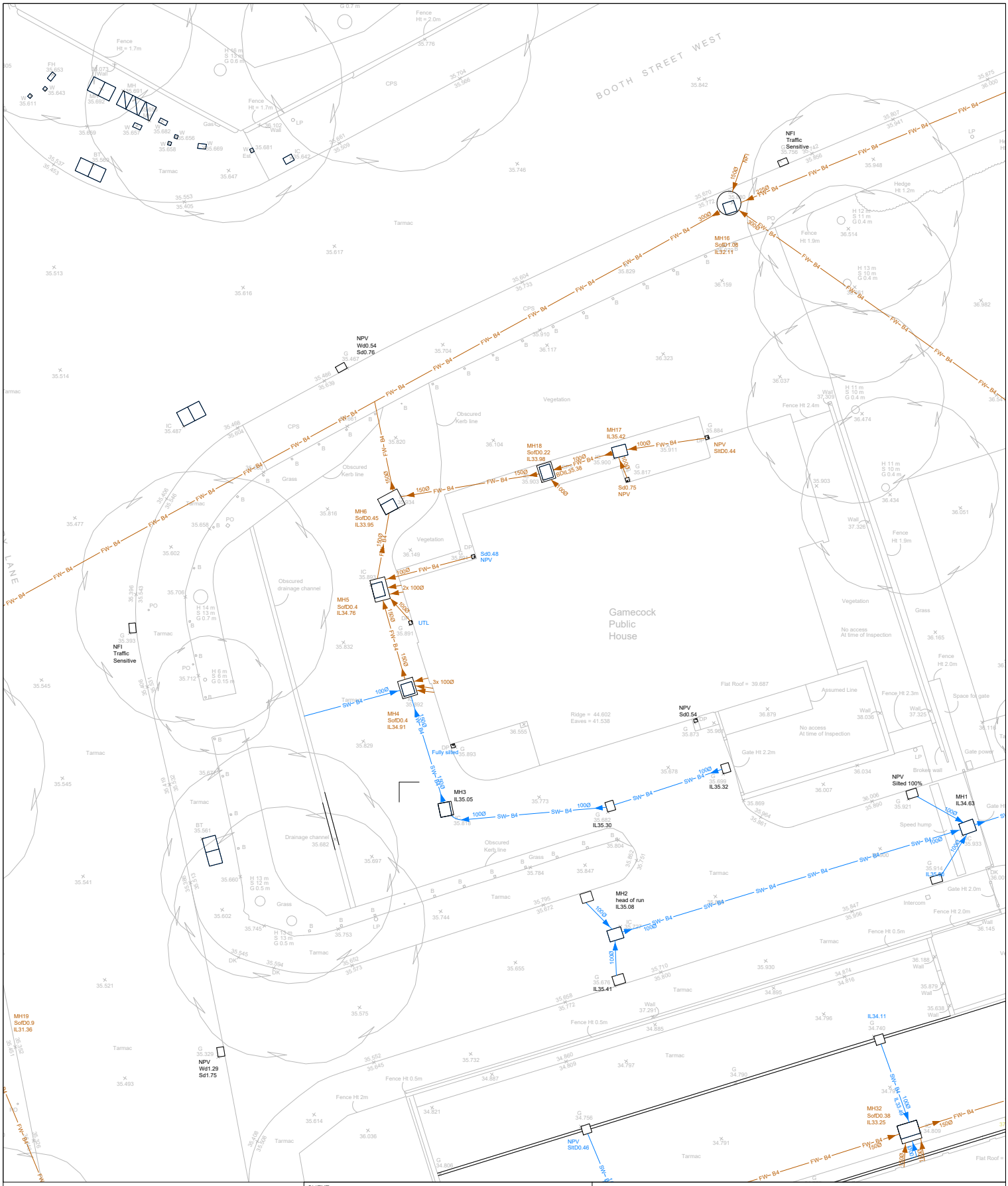
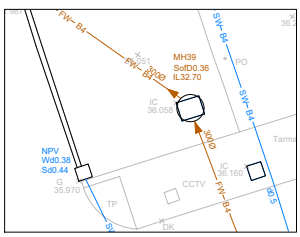
STATUS: A

DRAWING NUMBER: 20049-102

REVISION: -





REV	DATE	DESCRIPTION		
A	14.04.21	Offsite existing MH39 shown using additional window	TU	DK

AMENDMENTS

CLIENT: CURLEW OPPORTUNITIES

PROJECT: GAMECOCK. BOOTH STREET WEST, MANCHESTER

TITLE: EXISTING DRAINAGE LAYOUT

DRAWN: TU | DATE: MAR 2021

CHECKED: DK | SCALE: 1:250 @ A4

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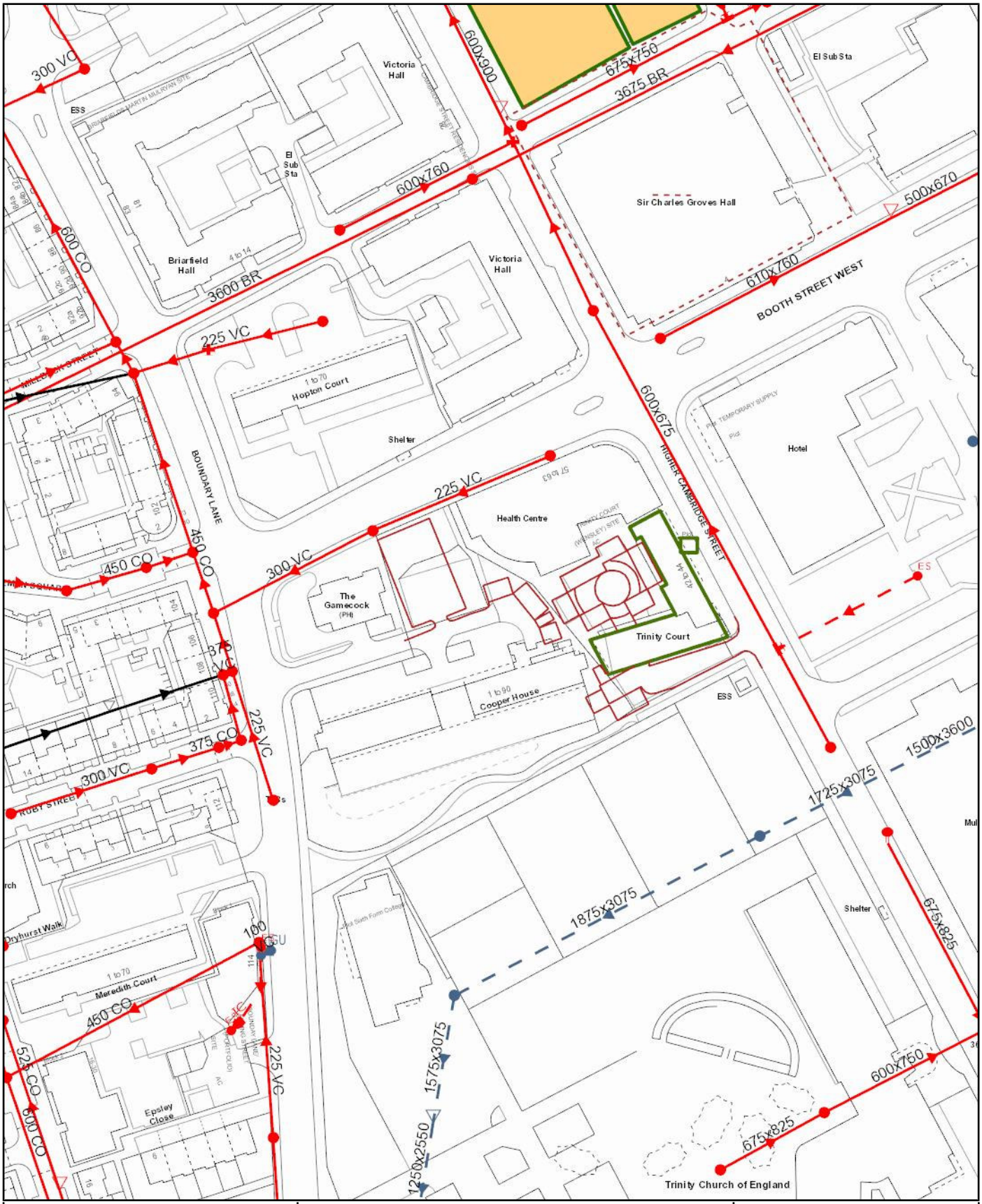
Consulting Civil and Structural Engineers
7 Ashtree Court - Woodsy Close - Cardiff Gate Business Park - Cardiff - CF23 8RW
Tel: 029 2054 7000 - Fax: 029 2054 7001 - www.shear-design.com - enquiries@shear-design.com

STATUS KEY: I = INFORMATION P = PRELIMINARY A = APPROVAL CO = CONTRACT T = TENDER C = CONSTRUCTION AB = AS-BUILT

STATUS:	DRAWING NUMBER:	REVISION:
A	20049-105	A



Scale:	1:1489	**SEWER RECORDS**	United Utilities helping life flow smoothly
Date:	27/01/2020		
Address or Site Reference:	Booth Street		
Printed by:	Property Searches		

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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APPENDIX D

ENVIRONMENT AGENCY
– FLOOD MAPS AND PROPOSED GROUND FLOOR LEVELS

Flood map for planning

Your reference	Location (easting/northing)	Created
Gamecock PH	**384143/396692**	**8 Mar 2021 11:57**

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

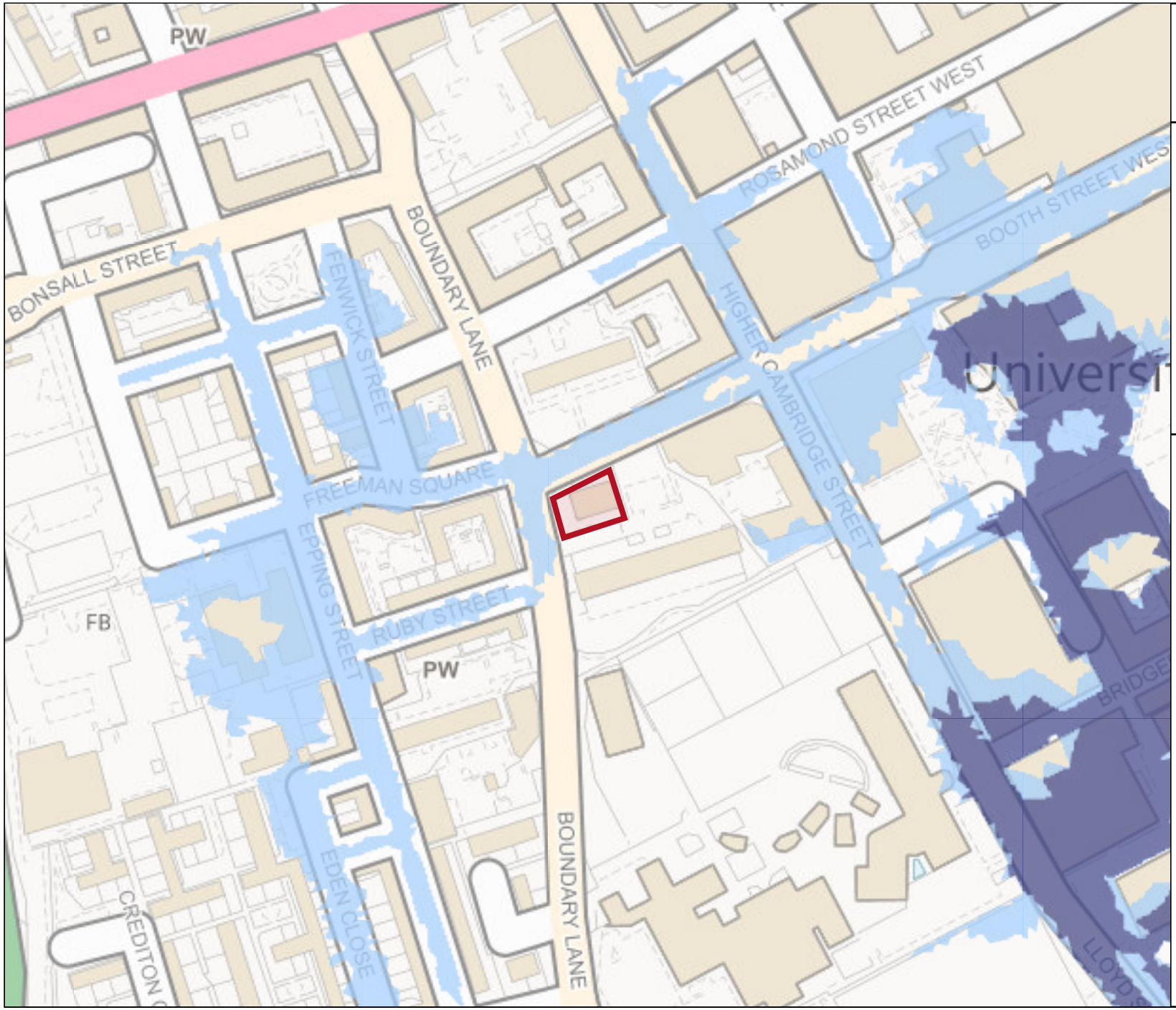
- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

The Open Government Licence sets out the terms and conditions for using government data.
https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/



Environment Agency

Flood map for planning

Your reference
Gamecock PH

Location (easting/northing)
384143/396692

Scale
1:2500

Created
8 Mar 2021 11:57

- Selected area
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

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Flood map for planning

Your reference	Location (easting/northing)	Created
Gamecock Inn	**384144/396698**	**19 Mar 2021 12:35**

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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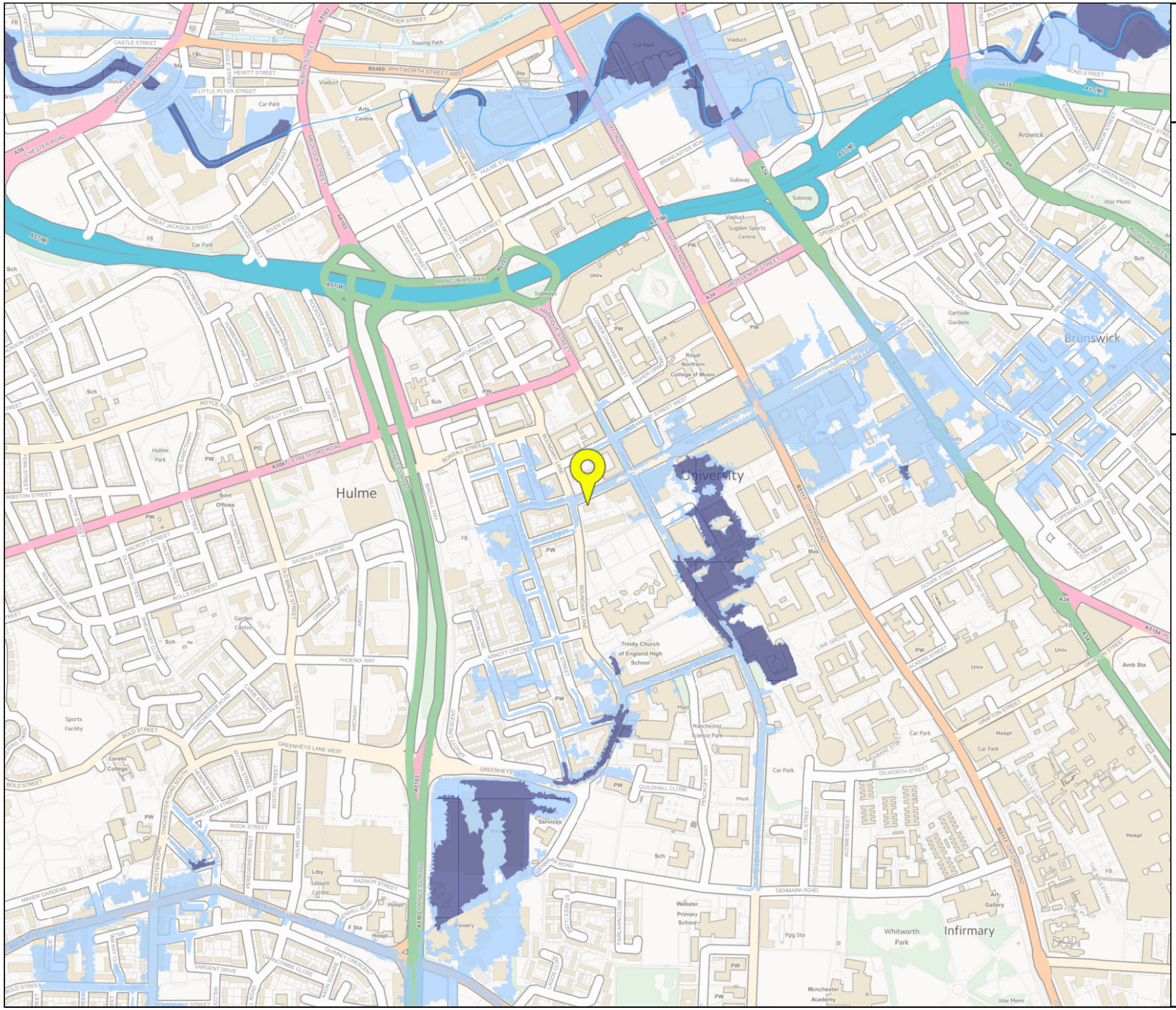

Environment Agency

Flood map for planning

Your reference
Gamecock Inn

Location (easting/northing)
384144/396698

Scale
1:10000

Created
19 Mar 2021 12:35

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 100 200 300m

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< Back

Learn more about this area's flood risk

Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

Enter a place or postcode

Extent of flooding from reservoirs

Maximum extent of flooding

Location you selected

View the flood risk information for the location you originally searched for (/long-term-flood-risk/risk)

View the flood risk information for another location (/long-term-flood-risk/postcode)

This information meets the requirements of the EU Floods Directive 2007/60/EC

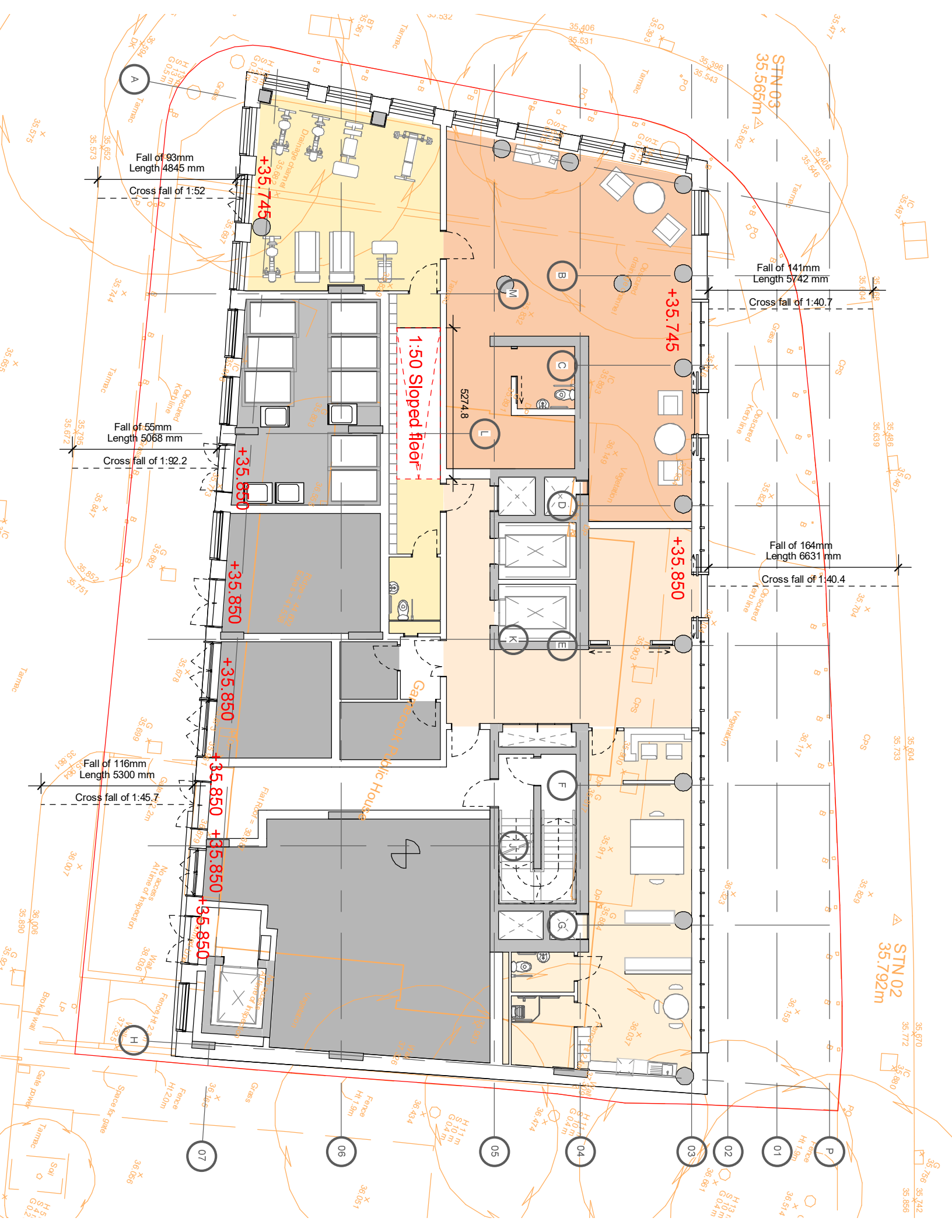
SHEAR DESIGN LIMITED

FLOOD RISK ASSESSMENT

LOCALE: BOOTH STREET WEST | BOUNDARY LANE | CAMELFORD CLOSE, MANCHESTER M15 6GE

Historic reported flood incidents on highway

Recorded flood incidents (yellow triangles)


Fall of 93mm
Length 4845 mm
Cross fall of 1:52
+35.745
Fall of 141mm
Length 5742 mm
Cross fall of 1:40.7
+35.745
1:50 Sloped floor
5274.8
Fall of 55mm
Length 5068 mm
Cross fall of 1:92.2
+35.850
+35.850
+35.850
Fall of 164mm
Length 6631 mm
Cross fall of 1:40.4
+35.850
Fall of 116mm
Length 5300 mm
Cross fall of 1:45.7
+35.850
+35.850
+35.850
+35.850
STN 03
35.565m
STN 02
35.792m
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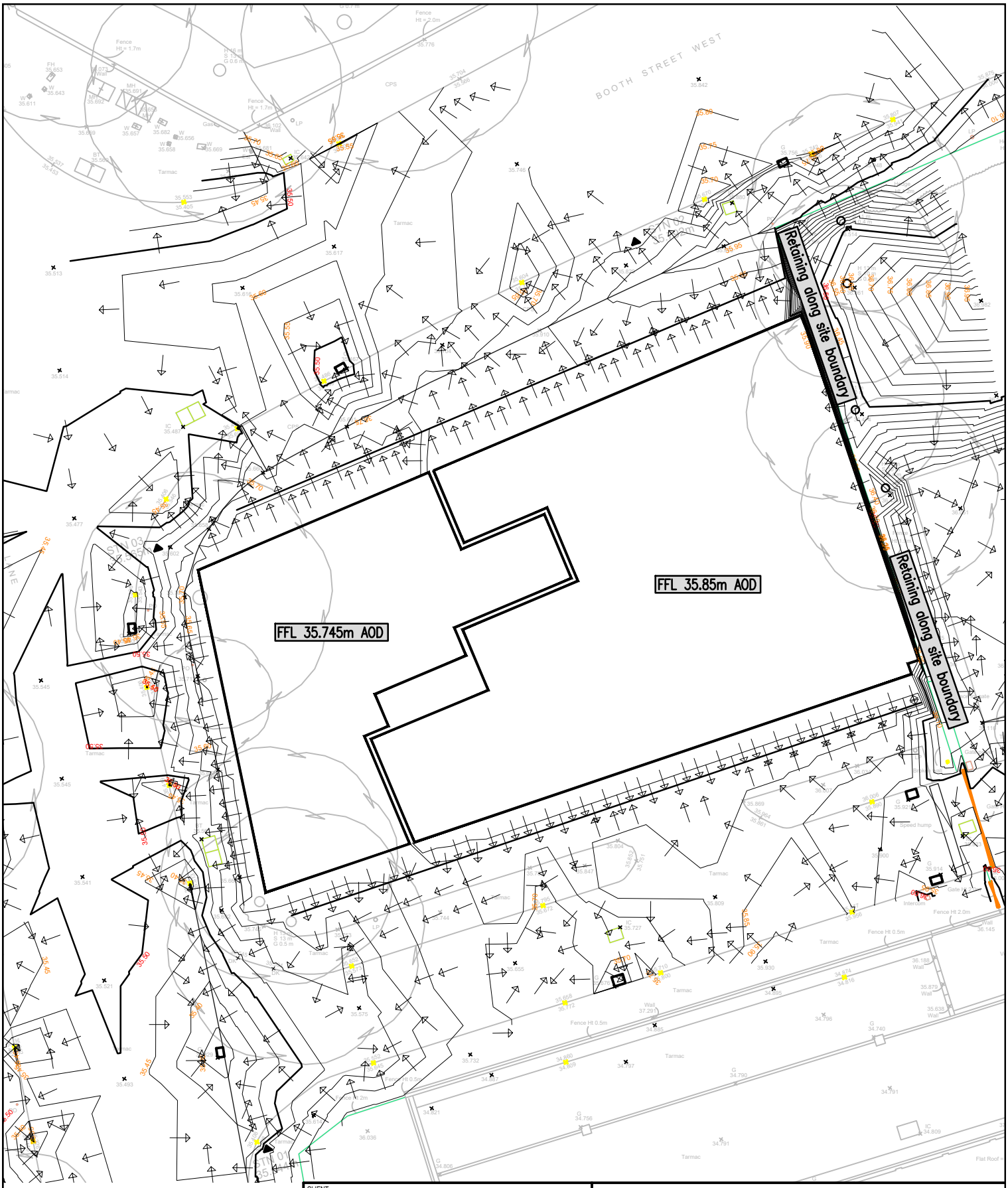


REV	DATE	DESCRIPTION
AMENDMENTS		

CLIENT: CURLEW OPPORTUNITIES

PROJECT: GAMECOCK. BOOTH STREET WEST, MANCHESTER

TITLE: PROPOSED LEVELS LAYOUT EXTERNAL AREA

DRAWN:	TU	DATE:	MAR 2021
CHECKED:	DK	SCALE:	1:250 @ A4

SHEAR design
Consulting Civil and Structural Engineers
7 Ashtree Court - Woodsy Close - Cardiff Gate Business Park - Cardiff - CF23 8RW
Tel: 029 2054 7000 - Fax: 029 2054 7001 - www.shear-design.com - enquiries@shear-design.com

STATUS KEY: I = INFORMATION P = PRELIMINARY A = APPROVAL CO = CONTRACT T = TENDER C = CONSTRUCTION AB = AS-BUILT

STATUS:	DRAWING NUMBER:	REVISION:
A	20049-111	-

APPENDIX E

CORRESPONDENCE

MANCHESTER CITY COUNCIL

To reply please contact:

E-mail:
roadinformationsearches@manchester.gov.uk
Our Ref: 3377070
Your Ref:

Date: 16 September 2019

BY EMAIL:-
searchorders@search-acumen.co.uk

Dear Sirs

Highway Enquiries: – Land and Buildings at Booth Street West and Boundary Lane, Manchester M15 (3377070)

Please find attached a plan showing the extent of the adopted public highways within the vicinity of the site in red, together with other relevant details.

Our records indicate that Booth Street West, Boundary Lane and Higher Chatham Street are adopted highway maintainable at public expense.

Our records indicate that Camelford Close is unadopted as shown blue on the attached plan.

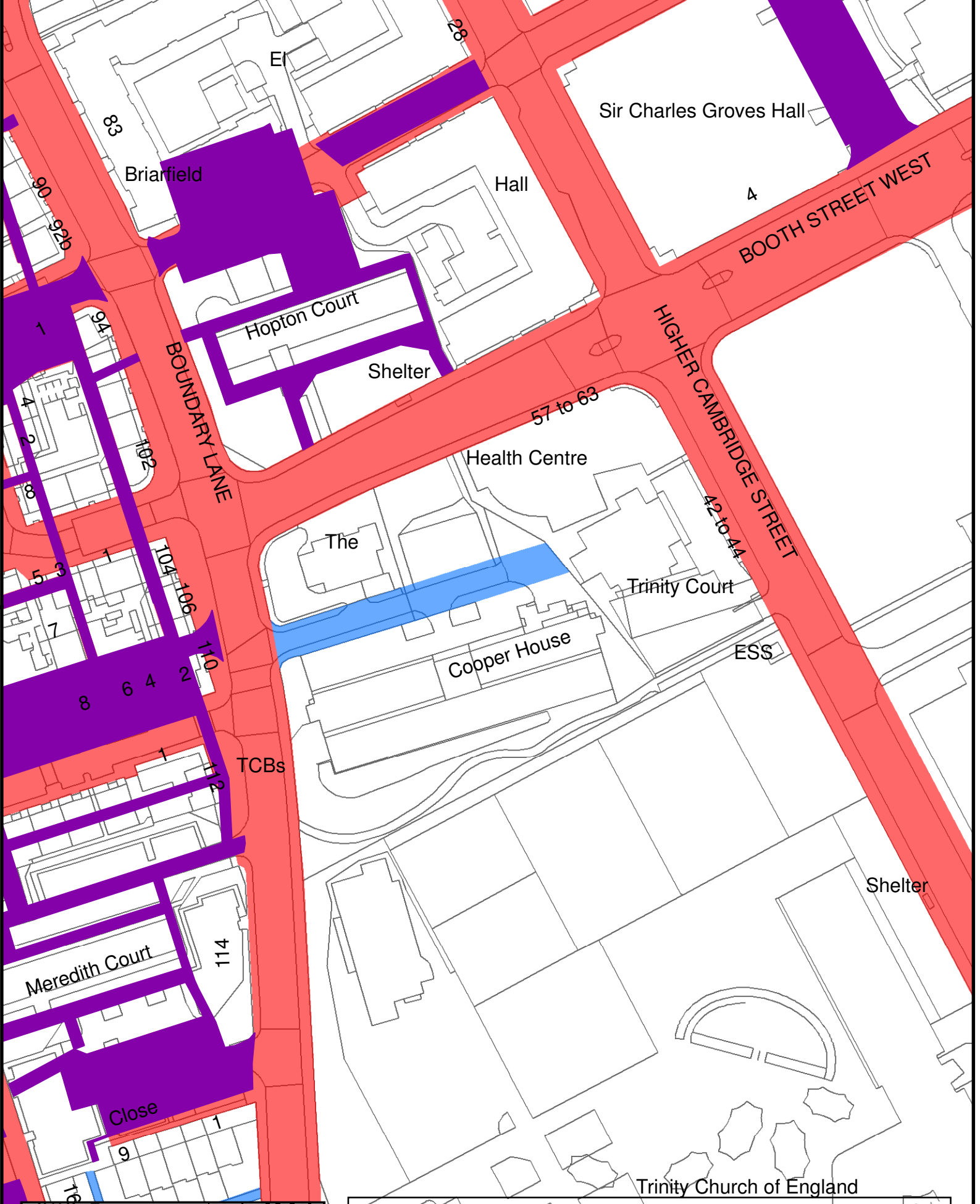
Our records indicate that there is no evidence of any intervening strip of land existing between the boundary of your site and the adopted public highway. We would however recommend that the title deeds of the property/land ownership documents be examined to establish the actual boundary line.

The Definitive Map of registered public rights of way, which is held within our department, has been checked and confirms that the site is not affected. We are not in a position to comment on the existence of any private rights of way or any prescriptive rights of way established by usage under Section 31 (i) of the Highways Act 1980, (other than the adopted highways shown in red on the attached plan). We would, suggest that the possibility of private or public rights affecting the site be taken into consideration, and that you undertake the appropriate investigations into these matters at this present time on any future proposals that could affect the site.

The plan attached shows the indicative view of the highways maintained at public expense.

Yours sincerely

Street Records
Email:- roadinformationsearches@manchester.gov.uk



MANCHESTER CITY COUNCIL

Please note that the highways maintained at public expense revealed in your report are an indicative status that has been captured onto our business system and is not the definitive adoption extent.

Highway Status Adopted Unadopted Maintained

Highway Closures Proposed Legal Diversion

Alley Gating Adopted Unadopted Maintained Proposed

Proposd Schemes Rail Road Traffic Orders

Private Developments **Field Footpaths** **Live Rail Schemes**

Scale: 1:1,200

N

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Wastewater pre-development enquiry

United Utilities
helping life flow smoothly

This form is for all first time enquiries you may have when planning your development.

If your enquiry relates to advice on **connection points and discharge rates**, please complete all sections, providing as much information as you have available. You will notice some fields are marked as optional, all other fields are mandatory.

For **all other enquiries**, please complete Sections 1, 2, 7 and 8.

When answering the yes/no questions please mark an 'x' in the appropriate box.

All enquiries must be accompanied by a site location plan, clearly identifying the site boundary.

Once completed, please return this form by email to **WastewaterDeveloperServices@uuplc.co.uk** or post to United Utilities Developer Services, Grasmere House, Second Floor, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington WA5 3LP.

We aim to respond to enquiries within 15 working days from receipt of your completed enquiry form.

Section 1: About you		
	Applicant	**Agent (if applicable)**
Name		Dameon Kilgour
Company's name	Curlew Alternatives Eighth Property LTD	Shear Design
Home or company address *(including postcode)*		7 Ashtree House, Woodsy Close, Cardiff Gate Business Park, Cardiff CF23 8RW
Contact telephone number *(a mobile number is fine)*		07838214620
Email		dameon@shear-design.com
What is your enquiry		
Who should we send the enquiry response to?	Applicant ☐ Agent ☑ Both ☐	

Section 2: About your site						
Site name	The Gamecock					
Site Address *(or nearest main road)*	Booth Street West, Manchester M15 6GE					
Site grid reference *(mid point)*	X:	384144	Y:	396698		
Approx. number of dwellings	1 Student accommodation comprising 259 rooms					
Total site area *(hectares)*	0.0860					
Site name	Gamecock					
Development area *(hectares)* *(Optional)*	0.0860					
Estimated onsite date *(Optional)*	tbc					
Estimated first occupation *(Optional)*	tbc					
Does the site have planning permission	Full	Yes ☐ No ☑	Application submitted	☐	Planning ref (if applicable)	
	Outline	Yes ☐ No ☑	Application submitted	☐	Planning ref (if applicable)	
Have you approached us about this site previously?	Yes ☐ No ☑		If yes, please provide Ref No. and/or contact details			

Section 3: Your site drainage strategy		
Type of site	GREENFIELD *(Go to Q 3.1)* ☐	BROWNFIELD *(Go to Q 3.2)* ☑
3.1 Greenfield site *(Optional)*		Confirmed attachment:
Please provide full calculations to show existing greenfield run off rates		Yes ☐ No ☐
3.2 Brownfield site *(Optional)*		Confirmed attachment:
Please provide a plan showing existing foul water drainage from this site to the public sewer network (including location of existing drains, pipe sizes and points of connection)		Yes ☑ No ☐
Please provide a plan showing the existing surface water drainage from this site to the public sewer network, including location of existing drains, pipe sizes and points of connection		Yes ☑ No ☐
Will this development produce trade effluent?		Yes ☐ No ☑
Separate approval must be obtained for the discharge to the public sewer of any trade effluent from a factory, manufacturing or commercial process. You can apply for consent through a retailer of wastewater services who will apply to us on your behalf. A list of retailers can be found via the Market Operator here: **www.mosl.co.uk/members/member-list** A copy of the consent will be needed for you to make a sewer connection application.		Yes ☐ No ☑
If yes, to which sewer?		
Section 4: Foul water connection		
Are you proposing to use an existing connection to the public sewer?		Yes ☑ No ☐
If **Yes**, please provide manhole number or grid reference number If **no**, please provide the proposed flow rate and connection points (litres per second)		Existing saddle 384134, 396704
Is the foul water discharge to be pumped?		Yes ☐ No ☑
Section 5: Surface water connection **If you are proposing to connect surface water to a public sewer, please attach evidence that all options for Sustainable Urban Drainage Systems (SUDs) have been explored in accordance with part H of the Building Regulations 2010.** **Details of SUDs can be found at http://www.ciria.com/sudsdesign_guidance.htm**		
How do you propose to drain surface water from the site?	SUDs *(Go to Section 6)* ☐	Discharge to public sewer *(Go to Q5.1)* ☑
5.1 Does the site have existing surface water connections to the public sewer?		Yes *(Go to Q5.2)* ☑ No *(Go to Q5.3)* ☐
5.2 Proposed surface water discharging to public sewer via **existing connection**		
Are you proposing to use an existing connection?		Yes ☑ No *(Go to Q5.3)* ☐
If **yes**, please provide manhole number or grid reference number & proposed flow rates		Existing saddle 384134, 396704
5.3 Proposed surface water discharging to public sewer via a **new connection**		
Have you completed a flood risk assessment in support of your planning application?		Yes ☐ No ☑
Is the surface water to be controlled? *(Optional)*		Yes ☑ No ☐
Is the surface water to be pumped?*(Optional)*		Yes ☐ No ☑
Section 6: Development details (Optional)		
Is the development part of a larger site that will be developed in phases or will be subject to separate planning applications? If **yes**, please provide details below.		Yes ☐ No ☑

Phase number		1	2	3	4	5	6	7
Start date on site								
Anticipated date of first occupation								
Anticipated completion date								
No. of dwellings								
Sustainability code for dwellings								
Public houses and/or restaurants	No. of seats							
	Floor space (m^2)							
Hotels: Total No. of beds								
Schools: Total No. of pupils								
Hospitals: Total No. of beds								
Retail units: Total No. of units								
Office space: Total No. of units								
Industrial / manufacturing: Total No. of units								
Other: Foul water *(litres per second)*								

Section 7: Supporting information Please confirm you have included all supporting information in relation to your enquiry	
Site location plan	☑ Yes ☐ No
Site boundary	☑ Yes ☐ No
Proposed drainage layout plan *(optional)*	☐ Yes ☑ No
Indicative layout plan *(optional)*	☑ Yes ☐ No
Calculations in support of proposed flow rates or run off rates *(optional)*	☐ Yes ☑ No
Flood risk assessment *(if appropriate)*	☐ Yes ☑ No

Section 8: Declaration

I understand that the submission of this form is to be treated as a preliminary enquiry and the information may be subject to change. In particular, I understand that the information United Utilities Water Limited provides in response is valid only in conjunction with the information provided in relation to this enquiry, any changes to regulation or development layout will invalidate our response.

Name	Dameon Kilgour	Signature	
Company	Shear Design	Date	13/01/2021

UU use only

Date received	D D M M Y Y Y Y	UUW Ref No	\

United Utilities
helping life flow smoothly

About us

United Utilities is the North West s water company. We keep the taps flowing and toilets flushing for seven million customers every day. From Crewe to Carlisle, we work hard behind the scenes to help your life flow smoothly.

United Utilities Water Limited, Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Warrington WA5 3LP.
Registered in England and Wales. Registered Number 2366678.

Tara Urding

Subject: FW: Gamecock Inn, Booth St West, Manchester M15 6GE - Drainage Query (20049)
Attachments: 20049 Site Location.pdf; 20049-SK102 Existing Site Layout-A1.pdf; UUPLC Sewer Records - 27-10-2020.pdf

From: Dameon Kilgour
Sent: 14 January 2021 14:23
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: RE: Gamecock Inn, Booth St West, Manchester M15 6GE - Drainage Query (20049)

Dear Sue

Following on from your email below please find attached completed Wastewater pre-development enquiry form for the proposed redevelopment of The Gamecock site in Manchester. As mentioned in our original email we are the consulting engineers for this project and the scheme is to demolish the existing building and construct a multi-storey student accommodation on the site. We have a few queries regarding the existing drainage adjacent to the site as listed below and should be grateful if you could provide us with your comments for each.

- The United Utility records indicate a public combined sewer running within the footway immediately north of the site. The proposed footprint of the ground floor is more than 3m from the centre of this sewer however from the first floor up the building projects out by 2.6m, still within the site boundary, and for some extent is between 1m to 3m from the sewer. We understand that there may be an easement on this sewer that projects in to our client's land, although this is yet to be confirmed, so although the overhang does not extend as far as the sewer it is within 3m of it. The vertical clearance to the underside of the overhang is 3m. Please see attached drawing 20049-SK102 which illustrates this. Please could you confirm if there is an easement on this sewer and also if you have any issues with the first floor overhang.
- The existing surface and foul water drainage discharge from the site via a single connection in to the combined public sewer to the north. The development will have separate surface and foul drainage that will combine in a manhole inside site boundary and utilise the existing connection in to the public sewer. Please confirm that this is acceptable.
- The surface water shall be attenuated on site. Please can you confirm what percentage betterment over the existing brownfield runoff rate from the site you require?
- There is an existing foul drainage pipe to the east of the proposed building in the adjacent site that connects in to the public combined sewer. This is shown as drainage run MH39 to MH16 on drawing 20049-SK102. This drainage is not shown on the sewer records however it appears to server two separate properties, known as Cooper House and Trinity Court. Please can you confirm that by serving two properties this drainage will be considered as a public sewer and if so would there be an easement on it? The corner of the proposed building is 2.4m away from this drainage so assuming an easement is required would you accept an offset easement? Please note that the proposed building will have piled foundations so will not be surcharging the sewer.

Should you require any additional information or have any queries then please do note hesitate to contact me 0n 07838 214620

Regards

Dameon Kilgour
Project Engineer

Shear Design Ltd
7 Ashtree Court | Woodsy Close
Cardiff Gate Business Park
Cardiff | CF23 8RW
T: +44 (0)29 2054 7000 | M: 07838 214620

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 07 October 2020 08:06
To: Dameon Kilgour <dameon@shear-design.com>
Subject: Gamecock Inn, Booth St West, Manchester M15 6GE - Drainage Query (20049)

Hi Dameon

In order for us to carry out our investigation please can you fill in the attached pre-development application form and return with relevant plans. Once we have this information we will be able to advise you further

Thanks sue

United Utilities
Water for the North West

Sue King
Customer Services Advanced
Developer Services & Metering
Customer Services
T: 0345 072 6067
unitedutilities.com

From: Property General Enquiries
Sent: 01 October 2020 15:53
To: Planning Liaison <Planning.Liaison@uuplc.co.uk>
Cc: Dameon@shear-design.com
Subject: FW: Gamecock Inn, Booth St West, Manchester M15 6GE - Drainage Query (20049)

Good afternoon

As the below email. I have checked our mapping system and there appear to be no easements at SJ841 967, however there is a public sewer and water main, wondered did the network need to know about the building and overhang.

Regards
Alison

United Utilities
Water for the North West

Alison Fryer
Administration Assistant
Property Services
T: 01925 (working from home)
unitedutilities.com
Lingley Mere, Clearwater 2

From: Dameon Kilgour [mailto:Dameon@shear-design.com]
Sent: 01 October 2020 10:51
To: Property General Enquiries <PropertyGeneralEnquiries@uuplc.co.uk>
Subject: Gamecock Inn, Booth St West, Manchester - Drainage Query (20049)

To whom it may concern

We are the consulting engineers for a project on the site of the former Gamecock Inn, Booth Street West, Manchester (Post Code M15 6GE). The scheme is to demolish the existing building and construct a multi-storey student accommodation on the site.

The United Utility records indicate a public combined sewer running within the footway immediately north of the site. The proposed footprint of the ground floor is more than 3m from the centre of this sewer however from the first floor up the building projects out by 2.6m, still within the site boundary, and for some extent is between 1m to 3m from the sewer. We understand that there may be an easement on this sewer that projects in to our clients land, although this is yet to be confirmed, so although the overhang does not extend as far as the sewer it is within 3m of it. The vertical clearance to the underside of the overhand is 3m. Please see attached drawing which illustrates this.

We should be grateful if you could confirm if there is an easement on this sewer and also if you have any issues with the first floor overhang.

Regards

Dameon Kilgour
Project Engineer
Shear Design Ltd
7 Ashtree Court | Woodsy Close
Cardiff Gate Business Park
Cardiff | CF23 8RW
T: +44 (0)29 2054 7000 | M: 07838 214620

Tara Urding

Subject: FW: PDE 4200036283 Gamecock Inn, Booth St West, Manchester M15 6GE

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 27 January 2021 10:46
To: Dameon Kilgour <dameon@shear-design.com>; Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: PDE 4200036283 Gamecock Inn, Booth St West, Manchester M15 6GE

Good morning Dameon,

Pre Development Enquiry for: Gamecock Inn, Booth St West, Manchester M15 6GE UU Reference Number : 4200036283

For future reference we now have a new wastewater pre-development enquiry form designed to be easier and more user friendly which is available on our website via the following link:

https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/wastewater-pre-dev/

We have carried out an assessment of your application which is based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your drainage strategy will need to be reviewed by other competent authorities as part of the planning process, and we advise that you carry out the necessary site investigations to confirm the viability of your proposals.

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 3723223 or refer to the link below:

https://www.unitedutilities.com/builders-developers/working-near-our-assets/

Foul Water

Foul flow from this site will be allowed to drain into the public foul water/combined sewer system.

Our preferred point of discharge would be to the 300mm diameter public combined sewer within Booth Street West located to the north of your proposed development at an unrestricted rate.

If you are able to identify an alternative, more suitable point of discharge, we request that you contact us at your earliest convenience so that we can assess suitability.

In accordance with our infrastructure plans we may ask you to change your point of connection. Therefore please contact us when you are ready to formalise your drainage proposals, we would suggest before you submit for Full Planning.

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you

prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.
This is outlined as follows, in order of priority:

1. **into the ground (infiltration);**
2. **to a surface waterbody;**
3. **to a surface water sewer or highway drain;**
4. **to a combined sewer.**

For guidance, The North West SuDS Pro-Forma provides information on the appropriate evidence required at each stage of the hierarchy, to demonstrate how each level has been discounted.

The Lead Local Flood Authority has responsibility for all surface water drainage concerns and their input to your proposal is critical. You should also consider whether it is necessary to discuss your proposal with the Environment Agency, or Internal Drainage Board (if operating in your area).

The Local Planning Authority are the determining authority for any application for planning permission and the appropriate authority for determining cost viability of a proposed drainage scheme, such assessments are outside of the jurisdiction of United Utilities.

Infiltration

Surface water runoff generated from this development should discharge to the ground via infiltration system where feasible.

A detailed evidence based feasibility assessment must be carried out in line with Chapter 25 of the CIRIA SuDS Manual 2015 to determine whether infiltration is a suitable method of surface water disposal.

Particular attention must be paid to Ground Water Source Protection Zones to ensure that the risk of pollution to these valuable resources is not compromised. Details can be obtained from the government website:

https://www.gov.uk/guidance/groundwater-source-protection-zones-spzs#find-groundwater-spzs

If your site is in a Groundwater Source Protection Zone, you should have regard to the Environment Agency's approach to Groundwater Protection. Information on this is available via the link below:

https://www.gov.uk/government/publications/groundwater-protection-position-statements

Please note that such a location could have implications for the principle of your development and the need for additional mitigating measures to protect the groundwater environment and public water supply in the detailed design of your site.

Waterbody

We note there is a culverted watercourse located approximately 100m south of the site which we would like you to consider but we believe access to make a connection to this asset will be very challenging for this site.

Highway Drainage

If an evidence based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you investigate the possibility of draining surface water to the highway drain where this ultimately discharges to a watercourse, by contacting the relevant Highway Authority.

Public Sewer

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.

Once evidence is provided as outlined above, United Utilities will consider a connection to the 300mm diameter public combined sewer within Booth Street West located north of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. I minimum 50% betterment should be achieved over the existing Brownfield runoff rate. Assuming a 50mm rainfall event on an estimated positively drained area of 0.06Ha gives an existing Brownfield runoff rate of 8.3l/s. As a result, United Utilities request that any agreed rate does not exceed 5l/s which we have rounded up from the 50% betterment figure of 4.15l/s.

As a Water Company, we have no obligation to accept highway drainage into our public sewer network. However, should your proposals include runoff from highways, we would request that consideration is given to SuDS components that deliver source control are incorporated within the design of the scheme to reduce the volume and frequency of discharges of these flows to the public sewer.

Levels

For low-lying sites, (where the ground level of the site or the level of a basement is below the ground level at the point where the drainage connects to the public sewer), care should be taken to ensure that the property is not at increased risk of flooding. If these circumstances exist, we recommend that you contact us to discuss further. It could affect the detailed design of your site and result in the need to incorporate appropriate mitigating measures in your drainage scheme.

Land drainage / Overland flows / track drainage

United Utilities have no obligation, and furthermore we do not accept land drainage, overland flows or track drainage into the pubic sewerage network under any circumstances.

Existing Wastewater Assets Crossing the Site

According to our public sewer records there are public sewers located near to your site boundary which you have described in your email below regarding the first floor overhang. There does not appear any legal easement on this public sewer; however, for clarification on this matter you can contact our property searches team. On speaking with our engineering team, the 300mm diameter public combined sewer is approximately 4m deep, foundation design and construction methods should take this into consideration with no damage or additional loading being applied to our public sewer. Regarding the overhang we need to be reassured that the plant required to safely dig down to maintain these assets at this depth can be achieved with the proposed overhang, only then would we be in a position to review the proposals. Alternatively you could consider diverting the public sewer so that the proposed building will not overhang the public sewer asset.

Please refer to the link below to obtain full details of the processes involved with sewer diversions:

https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-diversions/

Regarding the potentially public asset to the east of the development, this is difficult for us to determine. The sewer must have been constructed prior to 2011 and must serve two or more curtilages, whilst you have mentioned it may drain two buildings, this might not mean two curtilages however. Assuming this is a public sewer asset, we hold no major problems with reducing the easement to 2.4m so long as the total 6m can be maintained so that we can ensure 24hour access to our assumed asset, should this be required and comments surrounding asset protection/foundation design and construction considerations need to be ensured.

Existing Water Assets Crossing the Site

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address: DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:

https://www.unitedutilities.com/builders-developers/larger-developments/pre-development/water-pre-dev/

Connection Application

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-connections/

We recommend that the detailed design should confirm the locations of all utilities in the area and ensure that any proposed drainage solution considers routing and clash checks where required.

If we can be of any further assistance please don't hesitate to contact us further.

Kind regards,

United Utilities
Water for the North West

Robert Brenton
Developer Engineer
Developer Services & Metering
Customer Services
M: 07880299827
unitedutilities.com

Tara Urding

Subject: FW: PDE 4200036283 Gamecock Inn, Booth St West, Manchester M15 6GE (20049)

From: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Sent: 05 February 2021 11:41
To: Dameon Kilgour <dameon@shear-design.com>; Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: PDE 4200036283 Gamecock Inn, Booth St West, Manchester M15 6GE (20049)

Good morning Dameon,

Our department will be your point of contact and we will review your proposals with our engineering department.

We currently believe that it will be difficult to physically access and maintain the 300mm public combined sewer asset to the north of the site at a depth of 4m below ground with a 3m property overhang. It is incumbent on the developer to provide information sufficient for our engineering department to assess whether the development will have a detrimental impact on our public sewer in both construction and ongoing maintenance contexts. This could be by assessing the foundation design in comparison to the public sewer, the existing ground conditions and what methodology you propose should this public sewer fail given the overhang constraints the proposed building would impose on this sewer.

If there are no methods which can be found to safely physically access the public sewer at depth in perpetuity given the proposed overhang constraints which are being imposed as a result of the development, you may wish to consider diverting the public sewer further away from the development into the public highway.

Kind regards,

United Utilities
Water for the North West

Robert Brenton
Developer Engineer
Developer Services & Metering
Customer Services
M: 07880299827
unitedutilities.com

From: Dameon Kilgour [mailto:Dameon@shear-design.com]
Sent: 04 February 2021 11:52
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: RE: PDE 4200036283 Gamecock Inn, Booth St West, Manchester M15 6GE (20049)

Hello

Thank you for your response to our application.

With regards the overhang you state "*we need to be reassured that the plant required to safely dig down to maintain these assets at this depth can be achieved with the proposed overhang, only then would we be in a position to review the proposals*." Please can you advise who we need to speak to within United Utilities who can comment on this as we were given your details as the department who dealt with these matters?

Regards

Dameon Kilgour
Project Engineer
Shear Design Ltd
7 Ashtree Court | Woodsy Close
Cardiff Gate Business Park
Cardiff | CF23 8RW
T: +44 (0)29 2054 7000 | M: 07838 214620

LLFA Comments 08/04/2021

The information in the following email has been considered:

From: Tara Urding <Tara@shear-design.com>
Sent: 29 March 2021 10:37
To: Laura Peacock <Laura.Peacock@manchester.gov.uk>
Cc: Tony Spencer <Tony@shear-design.com>; Dameon Kilgour <Dameon@shear-design.com>
Subject: RE: Gamecock Inn, Hulme, Manchester (20049)

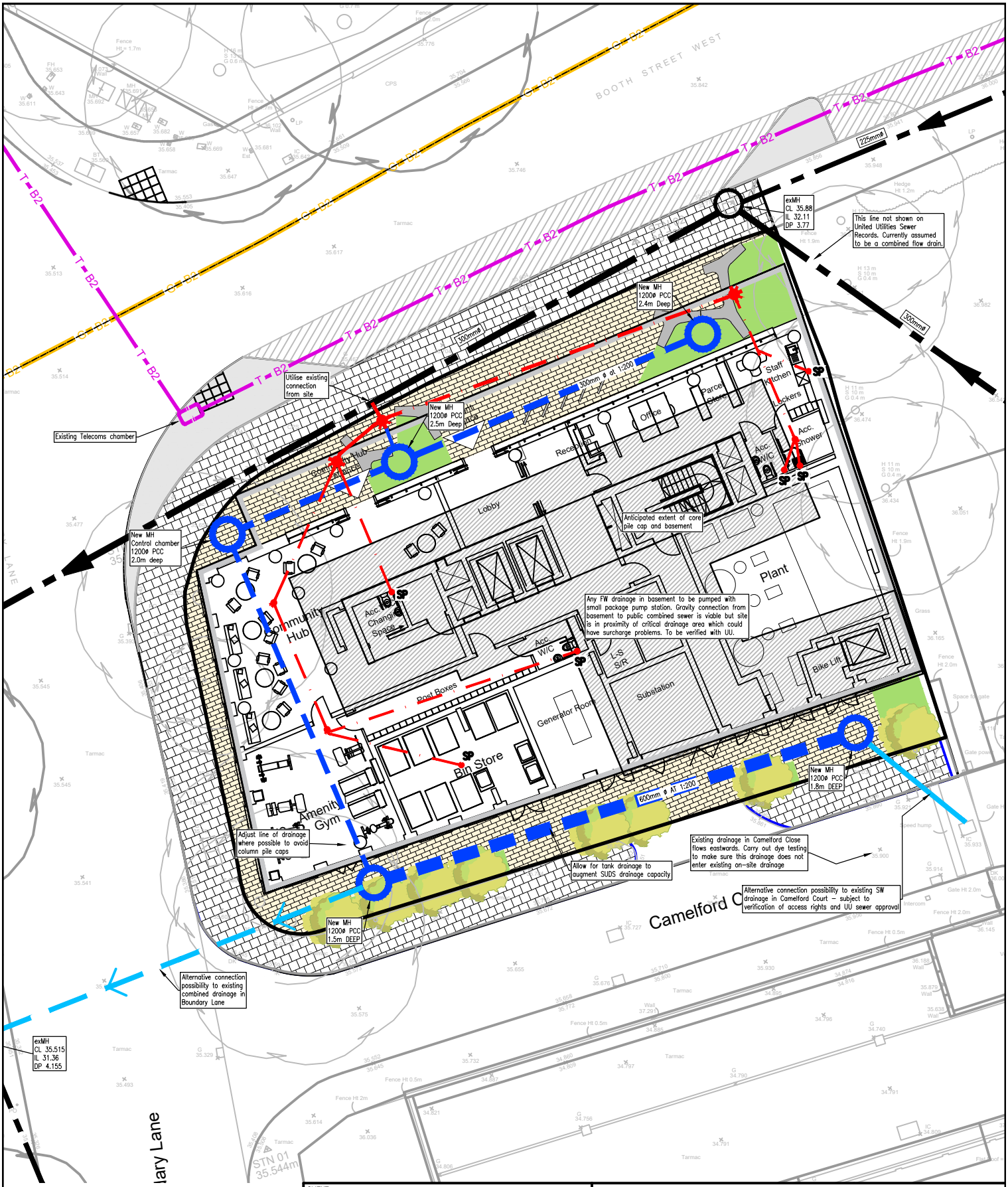
We recommend the following is considered in the application:

- FRA to be submitted. Note site is located within Conurbation Core Critical Drainage Area (CDA).
- Proposed drainage layout showing components, levels, connectivity and FFLs.
- Survey existing drainage to understand condition and connectivity and to inform brownfield betterment calculations.
- Proposal must not exacerbate local flood risk. Proposal should take account of historic reported flood incidents on highway. Recorded flood incidents (yellow triangles) are shown in extract p.2.
- Drainage strategy must show evidence-based progression through drainage hierarchy:
    - Evidence of consultation with EA on permissibility of infiltration as site is in SPZ.
    - If infiltration is permissible – assess whether viable: exhibit all appropriate evidence from ground investigation (soakaway testing, groundwater levels, contamination) & demonstrate whether soakaways can be viably sited with regard to buildings etc. If full discharge by infiltration is not viable, consider whether the site could partially discharge by infiltration.
    - If infiltration is proven not viable, consideration of discharge to watercourse - the culverted Cornbrook exists 100m to the south however 3rd party land access constraints will be considered as evidence by the LLFA.
    - Where surface water is connected to the public sewer, agreement in principle from United Utilities is required. An email of acceptance of proposed flows and/or new connection will suffice (as-provided for this pre-application advice).
    - Consider interception.
    - Surface water connection to highway drain will not be permitted.
- Demonstrate maximised integration of green SuDS components (for infiltration or attenuation) where practicable. Suggested components for high-density urban developments include tree pits, rain gardens, green roofs and green walls. Clear appraisal & maximised integration is required for major development applications.
- Hardscaping to be permeable where viable.
- Details of surface water attenuation that offers at least a 50% reduction in runoff rate compared to the existing rates. This should be calculated from the modelled existing network. It is acceptable to ‘round-up’ to 5 l/s for calculated flows <5 l/s.

- Runoff volume in the 1 in 100 year, 6 hours rainfall shall be constrained to a value as close as is reasonable practicable to the greenfield runoff volume for the same event, but never to exceed the runoff volume from the development site prior to redevelopment.
- Evidence that the drainage system has been designed (unless an area is designated to hold and/or convey water as part of the design) so that flooding does not occur during a 1 in 100 year rainfall event with allowance for 40% climate change in any part of a building.
- Assessment of overland flow routes for extreme events that is diverted away from buildings (including basements). Overland flow routes need to be designed to convey the flood water in a safe manner in the event of a blockage or exceedance of the proposed drainage system capacity including inlet structures. A layout with overland flow routes needs to be presented with appreciation of these overland flow routes with regards to the properties on site and adjacent properties off site.
- Hydraulic calculation of the proposed drainage system.
- Construction details of flow control and SuDS elements.
- Verification report providing photographic evidence of construction as per design drawings.
- As built construction drawings if different from design construction drawings.
- Management and maintenance plan for the lifetime of the development. For the avoidance of doubt this must clearly name the responsible party and provide a schedule of tasks and frequencies for the drainage components, which should be in accordance with manufacturers' recommendations and/or CIRIA C753.
- The applicant is strongly advised to fully review the **Manchester City Council - SuDS Requirement for Developers.pdf** prior to submission.

APPENDIX F

PROPOSED DRAINAGE LAYOUT



REV	DATE	DESCRIPTION
A	10.05.21	Updated with new ground floor layout and site plan. Revised extent of basement. Alternative SW connection options made clearer. TU DK

AMENDMENTS

CLIENT: CURLEW OPPORTUNITIES

PROJECT: GAMECOCK. BOOTH STREET WEST, MANCHESTER

TITLE: PROPOSED DRAINAGE LAYOUT

DRAWN: TU | DATE: MAR 2021

CHECKED: DK | SCALE: 1:250 @ A4

SHEAR design
Consulting Civil and Structural Engineers
7 Ashtree Court - Woodsy Close - Cardiff Gate Business Park - Cardiff - CF23 8RW
Tel: 029 2054 7000 - Fax: 029 2054 7001 - www.shear-design.com - enquiries@shear-design.com

STATUS KEY: I = INFORMATION P = PRELIMINARY A = APPROVAL CO = CONTRACT T = TENDER C = CONSTRUCTION AB = AS-BUILT

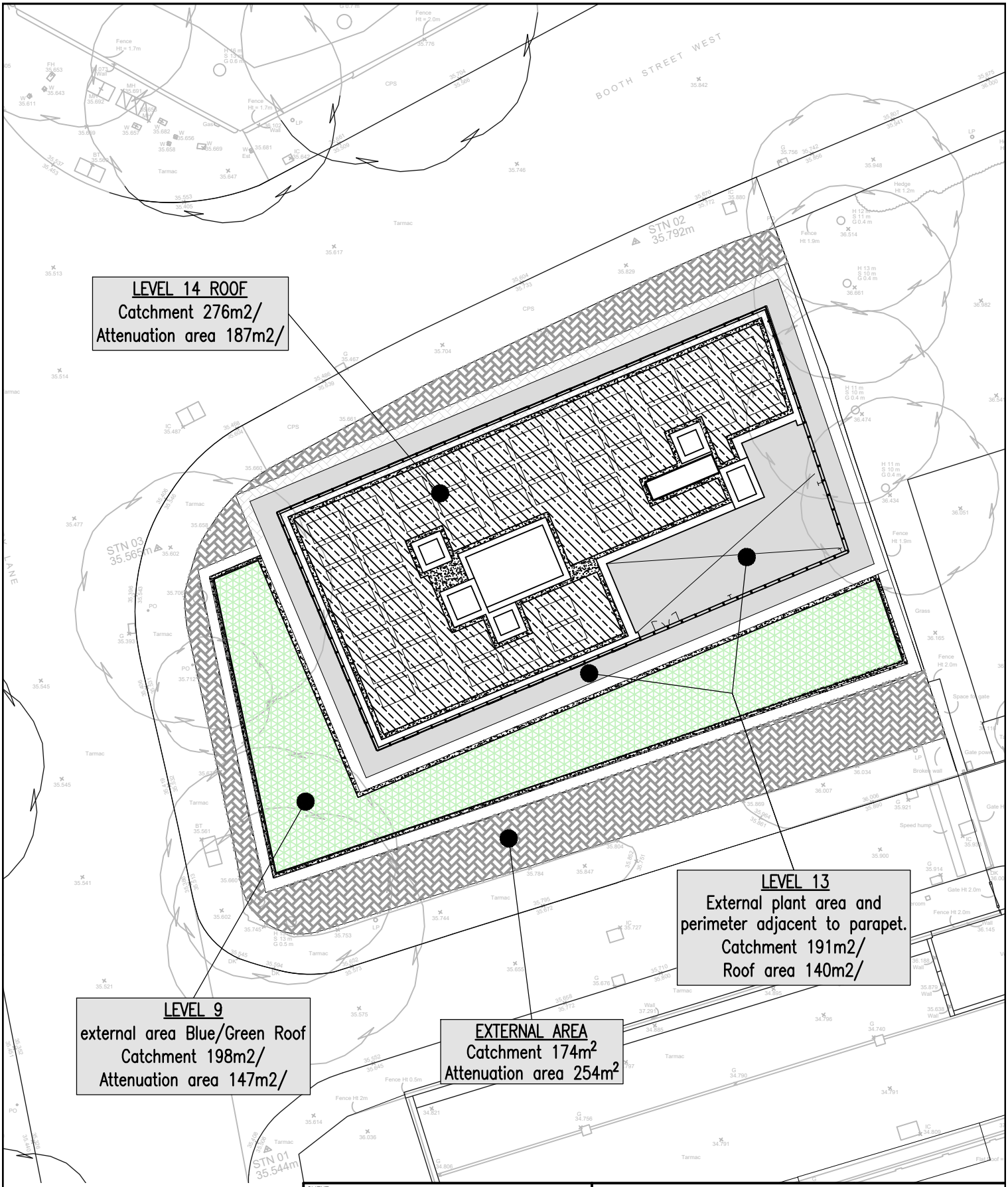
STATUS: A

DRAWING NUMBER: 20049-121

REVISION: A

APPENDIX G

BLUE / GREEN ROOF LAYOUT AND DETAILS



REV	DATE	DESCRIPTION		
A	15.03.21	Floor level references amended Roof area changed to attenuation area. Gravel margin added. Roof penetrations accounted for. Figures adjusted.	TU	DK

AMENDMENTS

CLIENT: CURLEW OPPORTUNITIES

PROJECT: GAMECOCK. BOOTH STREET WEST, MANCHESTER

TITLE: PROPOSED IMPERMEABLE AREA CATCHMENT PLAN

DRAWN: TU | DATE: MAR 2021

CHECKED: DK | SCALE: 1:250 @ A4

SHEAR design
Consulting Civil and Structural Engineers
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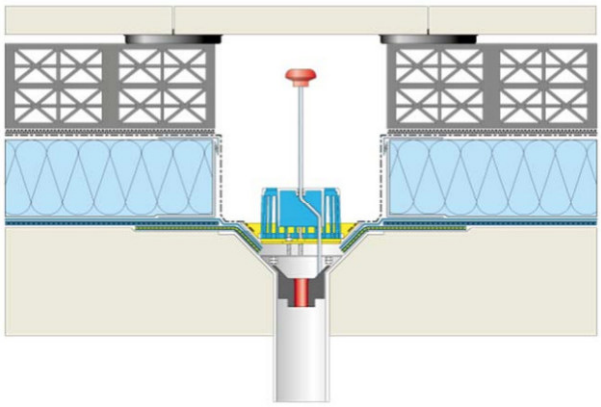
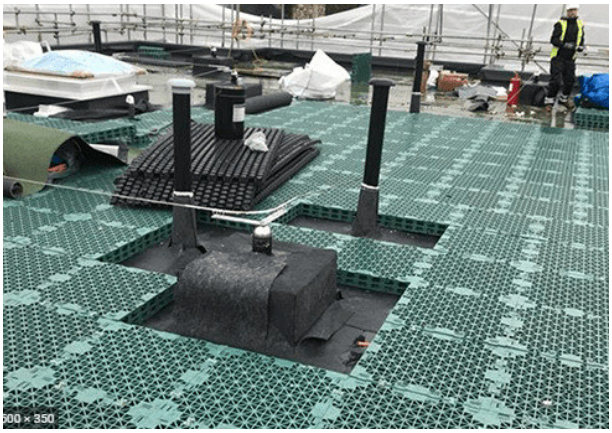
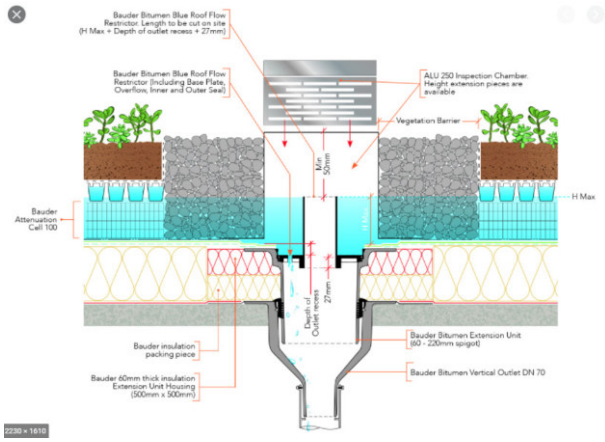
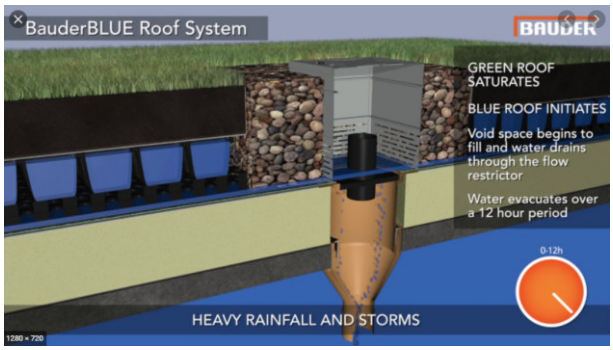
STATUS KEY: I = INFORMATION P = PRELIMINARY A = APPROVAL CO = CONTRACT T = TENDER C = CONSTRUCTION AB = AS-BUILT

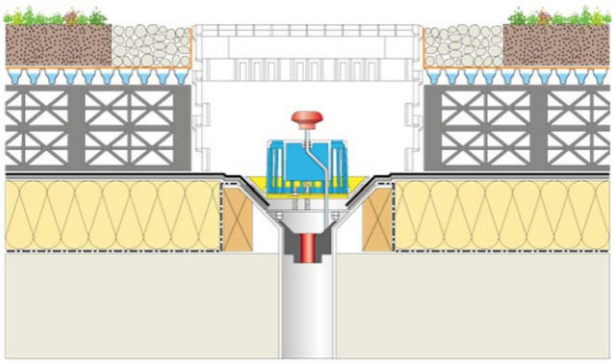
STATUS:	DRAWING NUMBER:	REVISION:
A	20049-120	A











CLIENT: CURLEW OPPORTUNITIES

PROJECT: GAMECOCK, BOOTH STREET WEST, MANCHESTER

TITLE: TYPICAL BLUE ROOF DEATILS

DRAWN: TU | DATE: MARCH 2020

CHECKED: DK | SCALE: NTS @ A4

REV	DATE	DESCRIPTION
AMENDMENTS		

SHEAR design
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STATUS KEY: I = INFORMATION P = PRELIMINARY A = APPROVAL CO = CONTRACT T = TENDER C = CONSTRUCTION AB = AS-BUILT

STATUS: A

DRAWING NUMBER: 20049-174

REVISION: -

APPENDIX H

SURFACE WATER DRAINAGE CALCULATIONS

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

Half Drain Time : 35 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.800	0.280	0.0	2.4	2.4	6.1	O K
30 min Summer	9.822	0.302	0.0	2.5	2.5	7.1	O K
60 min Summer	9.827	0.307	0.0	2.5	2.5	7.4	O K
120 min Summer	9.816	0.296	0.0	2.5	2.5	6.9	O K
180 min Summer	9.798	0.278	0.0	2.4	2.4	6.0	O K
240 min Summer	9.778	0.258	0.0	2.4	2.4	5.2	O K
360 min Summer	9.736	0.216	0.0	2.3	2.3	3.6	O K
480 min Summer	9.697	0.177	0.0	2.2	2.2	2.5	O K
600 min Summer	9.662	0.142	0.0	2.1	2.1	1.6	O K
720 min Summer	9.630	0.110	0.0	2.0	2.0	1.0	O K
960 min Summer	9.575	0.055	0.0	1.8	1.8	0.2	O K
1440 min Summer	9.520	0.000	0.0	1.4	1.4	0.0	O K
2160 min Summer	9.520	0.000	0.0	1.1	1.1	0.0	O K
2880 min Summer	9.520	0.000	0.0	0.8	0.8	0.0	O K
4320 min Summer	9.520	0.000	0.0	0.6	0.6	0.0	O K
5760 min Summer	9.520	0.000	0.0	0.5	0.5	0.0	O K
7200 min Summer	9.520	0.000	0.0	0.4	0.4	0.0	O K
8640 min Summer	9.520	0.000	0.0	0.3	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.498	0.0	8.3	16
30 min Summer	79.373	0.0	11.1	28
60 min Summer	50.812	0.0	14.1	44
120 min Summer	31.483	0.0	17.6	80
180 min Summer	23.483	0.0	19.6	112
240 min Summer	18.956	0.0	21.1	146
360 min Summer	13.897	0.0	23.2	208
480 min Summer	11.157	0.0	24.7	268
600 min Summer	9.402	0.0	26.1	326
720 min Summer	8.170	0.0	27.2	382
960 min Summer	6.541	0.0	29.0	492
1440 min Summer	4.773	0.0	31.8	0
2160 min Summer	3.476	0.0	34.7	0
2880 min Summer	2.772	0.0	36.9	0
4320 min Summer	2.011	0.0	40.2	0
5760 min Summer	1.600	0.0	42.6	0
7200 min Summer	1.339	0.0	44.6	0
8640 min Summer	1.157	0.0	46.2	0

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	9.520	0.000	0.0	0.3	0.3	0.0	O K
15 min Winter	9.821	0.301	0.0	2.5	2.5	7.1	O K
30 min Winter	9.848	0.328	0.0	2.5	2.5	8.4	O K
60 min Winter	9.853	0.333	0.0	2.5	2.5	8.6	O K
120 min Winter	9.834	0.314	0.0	2.5	2.5	7.7	O K
180 min Winter	9.806	0.286	0.0	2.4	2.4	6.4	O K
240 min Winter	9.775	0.255	0.0	2.4	2.4	5.1	O K
360 min Winter	9.711	0.191	0.0	2.2	2.2	2.8	O K
480 min Winter	9.652	0.132	0.0	2.1	2.1	1.4	O K
600 min Winter	9.598	0.078	0.0	1.9	1.9	0.5	O K
720 min Winter	9.548	0.028	0.0	1.8	1.8	0.1	O K
960 min Winter	9.520	0.000	0.0	1.4	1.4	0.0	O K
1440 min Winter	9.520	0.000	0.0	1.0	1.0	0.0	O K
2160 min Winter	9.520	0.000	0.0	0.8	0.8	0.0	O K
2880 min Winter	9.520	0.000	0.0	0.6	0.6	0.0	O K
4320 min Winter	9.520	0.000	0.0	0.4	0.4	0.0	O K
5760 min Winter	9.520	0.000	0.0	0.3	0.3	0.0	O K
7200 min Winter	9.520	0.000	0.0	0.3	0.3	0.0	O K
8640 min Winter	9.520	0.000	0.0	0.3	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.023	0.0	47.7	0
15 min Winter	118.498	0.0	9.2	16
30 min Winter	79.373	0.0	12.3	30
60 min Winter	50.812	0.0	15.8	48
120 min Winter	31.483	0.0	19.5	86
180 min Winter	23.483	0.0	21.8	122
240 min Winter	18.956	0.0	23.6	156
360 min Winter	13.897	0.0	25.9	218
480 min Winter	11.157	0.0	27.7	274
600 min Winter	9.402	0.0	29.2	326
720 min Winter	8.170	0.0	30.5	374
960 min Winter	6.541	0.0	32.5	0
1440 min Winter	4.773	0.0	35.6	0
2160 min Winter	3.476	0.0	38.9	0
2880 min Winter	2.772	0.0	41.3	0
4320 min Winter	2.011	0.0	45.0	0
5760 min Winter	1.600	0.0	47.7	0
7200 min Winter	1.339	0.0	49.9	0
8640 min Winter	1.157	0.0	51.8	0

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	9.520	0.000	0.0	0.2	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.023	0.0	53.4	0

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.359	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.037

Time (mins) From:	To:	Area (ha)
0	4	0.037

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 10.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.0
Membrane Percolation (mm/hr)	1000	Length (m)	31.0
Max Percolation (l/s)	68.9	Slope (1:X)	65.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.30	Evaporation (mm/day)	0
Invert Level (m)	9.520	Membrane Depth (m)	0

Orifice Outflow Control

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 9.250

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Summary of Results for 100 year Return Period (+140%)

Half Drain Time : 130 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.888	0.053	0.0	0.8	0.8	6.8	O K
30 min Summer	9.903	0.068	0.0	0.8	0.8	8.8	O K
60 min Summer	9.915	0.080	0.0	0.9	0.9	10.2	O K
120 min Summer	9.919	0.084	0.0	0.9	0.9	10.7	O K
180 min Summer	9.917	0.082	0.0	0.9	0.9	10.5	O K
240 min Summer	9.915	0.080	0.0	0.9	0.9	10.2	O K
360 min Summer	9.909	0.074	0.0	0.9	0.9	9.5	O K
480 min Summer	9.904	0.069	0.0	0.8	0.8	8.8	O K
600 min Summer	9.898	0.063	0.0	0.8	0.8	8.1	O K
720 min Summer	9.893	0.058	0.0	0.8	0.8	7.4	O K
960 min Summer	9.884	0.049	0.0	0.8	0.8	6.2	O K
1440 min Summer	9.867	0.032	0.0	0.7	0.7	4.1	O K
2160 min Summer	9.850	0.015	0.0	0.7	0.7	2.0	O K
2880 min Summer	9.840	0.005	0.0	0.7	0.7	0.6	O K
4320 min Summer	9.835	0.000	0.0	0.6	0.6	0.0	O K
5760 min Summer	9.835	0.000	0.0	0.4	0.4	0.0	O K
7200 min Summer	9.835	0.000	0.0	0.4	0.4	0.0	O K
8640 min Summer	9.835	0.000	0.0	0.3	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	203.139	0.0	7.6	18
30 min Summer	136.068	0.0	10.1	32
60 min Summer	87.106	0.0	13.0	62
120 min Summer	53.971	0.0	16.1	106
180 min Summer	40.256	0.0	18.0	138
240 min Summer	32.496	0.0	19.4	170
360 min Summer	23.824	0.0	21.3	240
480 min Summer	19.126	0.0	22.9	308
600 min Summer	16.117	0.0	24.1	376
720 min Summer	14.006	0.0	25.2	442
960 min Summer	11.214	0.0	26.9	576
1440 min Summer	8.182	0.0	29.4	822
2160 min Summer	5.958	0.0	32.1	1172
2880 min Summer	4.751	0.0	34.2	1504
4320 min Summer	3.448	0.0	37.2	0
5760 min Summer	2.743	0.0	39.5	0
7200 min Summer	2.296	0.0	41.3	0
8640 min Summer	1.984	0.0	42.9	0

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Summary of Results for 100 year Return Period (+140%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	9.835	0.000	0.0	0.3	0.3	0.0	O K
15 min Winter	9.896	0.061	0.0	0.8	0.8	7.7	O K
30 min Winter	9.913	0.078	0.0	0.9	0.9	10.0	O K
60 min Winter	9.927	0.092	0.0	0.9	0.9	11.8	O K
120 min Winter	9.934	0.099	0.0	0.9	0.9	12.7	O K
180 min Winter	9.932	0.097	0.0	0.9	0.9	12.4	O K
240 min Winter	9.928	0.093	0.0	0.9	0.9	11.9	O K
360 min Winter	9.920	0.085	0.0	0.9	0.9	10.8	O K
480 min Winter	9.911	0.076	0.0	0.9	0.9	9.8	O K
600 min Winter	9.903	0.068	0.0	0.8	0.8	8.7	O K
720 min Winter	9.895	0.060	0.0	0.8	0.8	7.7	O K
960 min Winter	9.881	0.046	0.0	0.8	0.8	5.9	O K
1440 min Winter	9.859	0.024	0.0	0.7	0.7	3.0	O K
2160 min Winter	9.838	0.003	0.0	0.7	0.7	0.4	O K
2880 min Winter	9.835	0.000	0.0	0.6	0.6	0.0	O K
4320 min Winter	9.835	0.000	0.0	0.4	0.4	0.0	O K
5760 min Winter	9.835	0.000	0.0	0.3	0.3	0.0	O K
7200 min Winter	9.835	0.000	0.0	0.3	0.3	0.0	O K
8640 min Winter	9.835	0.000	0.0	0.2	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.753	0.0	44.2	0
15 min Winter	203.139	0.0	8.5	18
30 min Winter	136.068	0.0	11.4	32
60 min Winter	87.106	0.0	14.6	60
120 min Winter	53.971	0.0	18.0	116
180 min Winter	40.256	0.0	20.2	146
240 min Winter	32.496	0.0	21.7	184
360 min Winter	23.824	0.0	24.0	260
480 min Winter	19.126	0.0	25.6	334
600 min Winter	16.117	0.0	27.0	406
720 min Winter	14.006	0.0	28.2	476
960 min Winter	11.214	0.0	30.1	608
1440 min Winter	8.182	0.0	32.9	854
2160 min Winter	5.958	0.0	36.0	1168
2880 min Winter	4.751	0.0	38.3	0
4320 min Winter	3.448	0.0	41.7	0
5760 min Winter	2.743	0.0	44.2	0
7200 min Winter	2.296	0.0	46.3	0
8640 min Winter	1.984	0.0	48.0	0

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Summary of Results for 100 year Return Period (+140%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	9.835	0.000	0.0	0.2	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.753	0.0	49.5	0

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.359	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+140

Time Area Diagram

Total Area (ha) 0.020

Time (mins) From:	To:	Area (ha)
0	4	0.020

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 10.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	1.0
Membrane Percolation (mm/hr)	1000	Length (m)	147.0
Max Percolation (l/s)	40.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.87	Evaporation (mm/day)	0
Invert Level (m)	9.835	Membrane Depth (m)	0

Complex Outflow Control

Orifice

Diameter (m) 0.010 Discharge Coefficient 0.600 Invert Level (m) 9.735

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Summary of Results for 100 year Return Period (+140%)

Half Drain Time : 90 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	9.892	0.057	0.0	1.5	1.5	9.3	O K
30 min Summer	9.907	0.072	0.0	1.5	1.5	11.7	O K
60 min Summer	9.917	0.082	0.0	1.6	1.6	13.3	O K
120 min Summer	9.917	0.082	0.0	1.6	1.6	13.4	O K
180 min Summer	9.915	0.080	0.0	1.6	1.6	13.0	O K
240 min Summer	9.911	0.076	0.0	1.6	1.6	12.4	O K
360 min Summer	9.904	0.069	0.0	1.5	1.5	11.2	O K
480 min Summer	9.897	0.062	0.0	1.5	1.5	10.0	O K
600 min Summer	9.890	0.055	0.0	1.5	1.5	8.9	O K
720 min Summer	9.883	0.048	0.0	1.4	1.4	7.8	O K
960 min Summer	9.872	0.037	0.0	1.4	1.4	6.0	O K
1440 min Summer	9.854	0.019	0.0	1.3	1.3	3.1	O K
2160 min Summer	9.839	0.004	0.0	1.2	1.2	0.7	O K
2880 min Summer	9.835	0.000	0.0	1.1	1.1	0.0	O K
4320 min Summer	9.835	0.000	0.0	0.8	0.8	0.0	O K
5760 min Summer	9.835	0.000	0.0	0.6	0.6	0.0	O K
7200 min Summer	9.835	0.000	0.0	0.5	0.5	0.0	O K
8640 min Summer	9.835	0.000	0.0	0.5	0.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	203.139	0.0	10.6	18
30 min Summer	136.068	0.0	14.2	32
60 min Summer	87.106	0.0	18.2	60
120 min Summer	53.971	0.0	22.5	94
180 min Summer	40.256	0.0	25.3	128
240 min Summer	32.496	0.0	27.2	162
360 min Summer	23.824	0.0	29.9	230
480 min Summer	19.126	0.0	32.1	298
600 min Summer	16.117	0.0	33.8	364
720 min Summer	14.006	0.0	35.2	428
960 min Summer	11.214	0.0	37.6	552
1440 min Summer	8.182	0.0	41.1	794
2160 min Summer	5.958	0.0	44.9	1124
2880 min Summer	4.751	0.0	47.9	0
4320 min Summer	3.448	0.0	52.1	0
5760 min Summer	2.743	0.0	55.3	0
7200 min Summer	2.296	0.0	57.9	0
8640 min Summer	1.984	0.0	60.0	0

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Summary of Results for 100 year Return Period (+140%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	9.835	0.000	0.0	0.4	0.4	0.0	O K
15 min Winter	9.900	0.065	0.0	1.5	1.5	10.5	O K
30 min Winter	9.918	0.083	0.0	1.6	1.6	13.4	O K
60 min Winter	9.930	0.095	0.0	1.6	1.6	15.5	O K
120 min Winter	9.932	0.097	0.0	1.6	1.6	15.8	O K
180 min Winter	9.928	0.093	0.0	1.6	1.6	15.1	O K
240 min Winter	9.923	0.088	0.0	1.6	1.6	14.3	O K
360 min Winter	9.911	0.076	0.0	1.6	1.6	12.4	O K
480 min Winter	9.900	0.065	0.0	1.5	1.5	10.6	O K
600 min Winter	9.890	0.055	0.0	1.5	1.5	8.9	O K
720 min Winter	9.880	0.045	0.0	1.4	1.4	7.3	O K
960 min Winter	9.864	0.029	0.0	1.3	1.3	4.7	O K
1440 min Winter	9.842	0.007	0.0	1.2	1.2	1.1	O K
2160 min Winter	9.835	0.000	0.0	1.0	1.0	0.0	O K
2880 min Winter	9.835	0.000	0.0	0.8	0.8	0.0	O K
4320 min Winter	9.835	0.000	0.0	0.6	0.6	0.0	O K
5760 min Winter	9.835	0.000	0.0	0.5	0.5	0.0	O K
7200 min Winter	9.835	0.000	0.0	0.4	0.4	0.0	O K
8640 min Winter	9.835	0.000	0.0	0.3	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.753	0.0	61.9	0
15 min Winter	203.139	0.0	11.9	18
30 min Winter	136.068	0.0	15.9	31
60 min Winter	87.106	0.0	20.4	60
120 min Winter	53.971	0.0	25.4	100
180 min Winter	40.256	0.0	28.3	138
240 min Winter	32.496	0.0	30.4	176
360 min Winter	23.824	0.0	33.5	250
480 min Winter	19.126	0.0	35.9	322
600 min Winter	16.117	0.0	37.8	390
720 min Winter	14.006	0.0	39.5	456
960 min Winter	11.214	0.0	42.1	580
1440 min Winter	8.182	0.0	46.1	806
2160 min Winter	5.958	0.0	50.4	0
2880 min Winter	4.751	0.0	53.6	0
4320 min Winter	3.448	0.0	58.4	0
5760 min Winter	2.743	0.0	61.9	0
7200 min Winter	2.296	0.0	64.8	0
8640 min Winter	1.984	0.0	67.2	0

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Summary of Results for 100 year Return Period (+140%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	9.835	0.000	0.0	0.3	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	1.753	0.0	69.3	0

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.359	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+140

Time Area Diagram

Total Area (ha) 0.028

Time (mins) From:	To:	Area (ha)
0	4	0.028

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

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Model Details

Storage is Online Cover Level (m) 10.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	1.0
Membrane Percolation (mm/hr)	1000	Length (m)	187.0
Max Percolation (l/s)	51.9	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	0
Porosity	0.87	Evaporation (mm/day)	0
Invert Level (m)	9.835	Membrane Depth (m)	0

Complex Outflow Control

Orifice

Diameter (m) 0.010 Discharge Coefficient 0.600 Invert Level (m) 9.735

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APPENDIX I

FOUL WATER DRAINAGE CALCULATIONS

20049 Gamecock, Manchester

Student Beds	261
Flow per person per day L/d	120
Flow per day L/d	31320
Add 10% for community hub and staff	34452
Flow per second L/s	0.40
Peaking Factor	6
Peak Flow per second L/s	2.39