

Flood Risk Assessment
for a
New Science Block
at
Xaverian College, Rusholme, Manchester
undertaken on behalf of
Xaverian College

Report Title:	Flood Risk Assessment – New Science Block, Xaverian College
Report Reference:	10961-WML-00-XX-RP-C-0001 – Rev 03
Client:	Xaverian College
Issue Date:	September 2023
Drafted By:	Kevin Tyldesley
Authorised By:	Loughlin O’Gorman

Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked
01	March 2023	For planning submission.	KPT	LOG
02	May 2023	Stage 3 update.	KPT	LOG
03	Sept. 2023	Updated to reflect amended site layout.	KPT	LOG

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1.0 INTRODUCTION

- 1.1 WML Consulting Ltd have been commissioned by Xaverian College to provide a Flood Risk Assessment (FRA) to support a planning application for a New Science Block within the existing Xaverian College site at Rusholme, Manchester.
- 1.2 The Flood Risk Assessment (FRA) follows the guidance and requirements of the National Planning Policy Framework (NPPF) – and the supporting Technical Guidance to the NPPF.
- 1.3 The NPPF identifies that it is the responsibility of developers to demonstrate:
- whether the development would be affected by current or future flooding from any source;
 - that the development is safe and where possible reduces flood risk overall;
 - whether flood risk would be increased elsewhere;
 - mitigation measures for any identified flooding risks;
 - that the site can be developed and occupied safely.
- 1.4 The FRA identifies whether there are any flooding or surface water management issues related to the development site that may warrant further consideration.

2.0 NATIONAL PLANNING POLICY

- 2.1 The aim of the Sequential Test, as set out in the NPPF, is as follows:-

‘Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.’

- 2.2 It is intended that new development is steered to areas with the lowest probability of flooding.
- 2.3 The flood zones are shown on the Flood Map for Planning, these zones indicate the probability of sea and river flooding. The extents of Flood Zones 2 and 3 are shown on the flood map, with Flood Zone 1 being the land outside Flood Zones 2 and 3. Flood Zone 1 is the area at the lowest probability of sea or river flooding.

These maps can be viewed on the GOV.UK website via the link below.

<https://flood-warning-information.service.gov.uk/long-term-flood-risk>

- 2.4 The NPPF Technical Guidance defines at Table 1 the Flood Risk Zones as below:

Flood Zone 1 Low Probability	Land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
Flood Zone 2 Medium Probability	Land assessed as having between 1 in 100 and 1 in 1,000 annual probability of river flooding (1% to 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% to 0.1%) in any year.
Flood Zone 3a High Probability	Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
Flood Zone 3b Functional Floodplain	Land where water has to flow or be stored at times of flood.

2.5 The NPPF Technical Guidance defines at Table 2 the Flood Risk Vulnerability Classifications, i.e. five categories of flood risk vulnerability with each category having a list of appropriate development uses. The classifications are:

- Essential Infrastructure
- Highly Vulnerable
- More Vulnerable
- Less Vulnerable
- Water – compatible development

2.6 The NPPF Technical Guidance defines at Table 3 the Flood Risk Vulnerability and flood zone ‘compatibility’ as shown below. Thereby providing a matrix that confirms whether a proposed development type is appropriate within a particular flood risk zone.

Table 3 Flood risk vulnerability and flood zone ‘compatibility’

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood Zone (Table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	ExceptionTest required	✓	✓
	Zone 3a	Exception Test required	✓	X	ExceptionTest required	✓
	Zone 3b functional flood plain	Exception Test required	✓	X	X	X

Key: ✓ - Development is appropriate.
 X - Development should not be permitted.

2.7 The proposed development would be classified as a ‘more vulnerable’ form of development. From table 3 it can be seen that this form of development is appropriate in Flood Zones 1 and 2, and also in Flood Zone 3a subject to satisfying the requirements of the Exception Test.

3.0 LOCAL POLICY DOCUMENTS

3.1 Strategic Flood Risk Assessments (SFRAs) are prepared by Lead Local Flood Authorities (LLFAs) in consultation with the Environment Agency, sewerage undertakers and where applicable internal drainage boards. Their aim is to assess the risk to the local area from flooding from all sources currently and in the future, taking account of the impact of future climate change.

3.2 The final version of the joint Manchester City, Salford City and Trafford Council Level 2 Hybrid SFRA was published in March 2011. The SFRA, and the information associated with it, can be found via the link below.

https://www.manchester.gov.uk/downloads/download/3871/strategic_flood_risk_assessment_sfra

4.0 EXISTING SITE AND PROPOSED DEVELOPMENT DESCRIPTION

- 4.1 The existing Xaverian College site is located on Lower Park Road, Manchester, M14 5RB. A plan illustrating the existing site layout can be found at appendix 01.
- 4.2 The site contains several existing college buildings together with student play / social areas and car parking / access areas.
- 4.3 It is understood that the development proposals are as follows:-
- The demolition of the existing Sunbury Building (noted as no. 2 on the plan at appendix 01).
 - The construction of the New Science Block in place of the Sunbury Building
 - Minor alterations and resurfacing to the existing external area around the New Science Block.
- 4.4 A plan illustrating the development proposals that can be found at Appendix 02.

5.0 POTENTIAL SOURCES OF FLOODING

- 5.1 The Environment Agency (EA), Manchester City Council (MCC), and United Utilities (UU) have been asked to confirm if they have any information regarding past, present or future flooding issues that may affect the site.
- 5.2 The EA's response can be found at appendix 03, the information provided in it is discussed further below.
- 5.3 The MCC response is yet to be received. However, if it is received during the planning application determination period, and if it contains information that significantly affects the findings of the FRA, the response will be added at appendix 03, the report amended to suit, and re-submitted to the planning authority.
- 5.4 The UU response, which can be found at appendix 04, confirms that they have no records of sewer flooding incidents in the vicinity of the proposed development site.
- 5.5 Potential sources of flooding that require consideration as part of the FRA are as below:-
- Flooding from rivers – fluvial flooding;
 - Flooding from sea – tidal flooding;
 - Flooding from surface water run-off – pluvial flooding;
 - Flooding from sewers;
 - Flooding from ground waters;
 - Flooding from reservoirs;
 - Flooding from other sources.

Flooding from Rivers – Fluvial Flooding

- 5.6 The online Flood Map for Planning and the information supplied by the EA confirms that the area where the development is proposed is located in Flood Zone 1 (very low risk), which means that this area has a chance of flooding of less than 0.1% (1 in 1,000) each year.
- 5.7 Hence it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Sea – Tidal Flooding

- 5.8 The site is not located in an area that is at risk of tidal flooding.

- 5.9 Hence it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Surface Water Runoff – Pluvial Flooding

- 5.10 The online surface water flood mapping appears to indicate that the site is generally at “very low” risk from this form of flooding. Very low risk means that each year this area has a chance of flooding of less than 0.1% (1 in 1,000) each year.
- 5.11 However, it can be seen that the potential for surface water flood risk appears to increase to “low” (0.1% to 1%) within the public highway to the south and west of where the New Science Block is to be constructed.
- 5.12 Though it should be noted that flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features, such as surface water drainage systems that were not taken into account when the modelling behind the surface water flood maps was carried out, can greatly affect the chance and severity of flooding.
- 5.13 It is considered that the locations where the surface water flood risk increases above “very low” actually represent localised low spots, which would be served by the existing highway drainage system.
- 5.14 Given the above, it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Sewers

- 5.15 United Utilities have confirmed that they do not have any records of sewer flooding in the vicinity of the site.
- 5.16 On this basis it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Groundwater

- 5.17 Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below ground infrastructure and buildings (tunnels, basements, etc.) where these are underlain by permeable strata (aquifers).
- 5.18 From the online British Geological Survey data, it appears that the ground conditions in the vicinity of the site are Devensian Glacial Till, indicated to mainly comprise clay locally interbedded with sands and gravels. In general, clayey ground conditions such as this are likely to limit the potential for ground water flooding.
- 5.19 From the topographic survey of the area, it can be seen that the site levels are slightly above those of the public highways to the south and west of where the New Science Block will be constructed. Hence it is considered that groundwater would be unlikely to gather at significant depths within the site.
- 5.20 In addition, it is understood that whilst the New Science Block will not have any basement areas, the existing Sunbury Building, which does have a basement area, has not been affected by groundwater flooding in the past.
- 5.21 Given the above, it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Reservoirs

- 5.22 The online reservoir flood mapping does indicate that the site is potentially at risk from this form of flooding.

5.23 In England the legal framework for reservoir safety is set out in the Reservoirs Act 1975, with amendments from the Flood and Water Management Act 2010. The implementation of the rules set out by these acts is overseen by the Environment Agency. They have resulted in a strict and comprehensive programme of inspection, renovation and management having been in place for many decades, thereby ensuring that reservoirs that pose risks are regularly inspected and that their owners address any problems identified.

5.24 On this basis it is considered that the risk to the proposed development from this form of flooding is low.

Flooding from Other Sources

5.25 From a review of the Ordnance Survey mapping, there does not appear to be any other significant bodies of water in the vicinity of the site.

5.26 On this basis, it is considered that the risk to the development from this form of flooding is low.

6.0 DRAINAGE STRATEGY

6.1 The proposed development is to be drained by separate foul and surface water drainage systems.

Surface water drainage proposals

6.2 The surface water drainage proposals for the development will incorporate the principles of the NPPF and the SUDS manual.

6.3 The proposed drainage system will be designed in accordance with BS EN 752-4 and the Building Regulations Approved Document H (2010), which indicates the following hierarchy for the disposal of surface water drainage from new development sites:

1. discharge via infiltration
2. discharge to watercourse
3. discharge to sewer

6.4 These options are discussed further below.

6.5 Surface water discharge via infiltration – the near surface ground conditions in the vicinity of the site are described as Devensian Glacial Till, mainly comprising clay locally interbedded with sands and gravels.

6.6 Clayey ground conditions such as this tend to be relatively impermeable, hence it is considered that the use of soakaways or other infiltration techniques are unlikely to be appropriate for discharging all the runoff generated by the development.

6.7 However, it is considered that the proposed hard landscaped areas should utilise porous surfacing, so that infiltration will be achieved from these areas.

6.8 The ground conditions will be confirmed by intrusive site investigations prior to detailed design stage, and if, during these investigations, it appears that the ground conditions may support the use of infiltration, then this should be confirmed by BRE365 compliant infiltration testing to inform the design of infiltration devices.

6.9 Surface water discharge via watercourse – from the Ordnance Survey mapping covering the area around the site, it can be seen that there are no existing watercourses within, or in the vicinity of the proposed development.

6.10 Hence it will not be feasible to discharge the surface water runoff via this route.

6.11 Surface water discharge via the public sewerage system – given the above it is considered that it will be necessary to discharge the surface water runoff from the proposed development to the public drainage system, as the area does currently.

Design of the proposed surface water drainage system

6.12 The existing site is a brown field site. Therefore, in line with current guidance, the surface water runoff rates from the re-developed site should achieve a 50% betterment when compared against the existing situation for all storm events up to and including the critical 1 in 100 year event plus a 40% climate change allowance.

6.13 To this end, it is proposed that the allowable discharge rate from the development be restricted to 3 l / sec for all storm events up to and including the critical 1 in 100 year event plus a 40% climate change allowance.

- 6.14 As the development does not involve a significant reduction in impermeable area, it is clear that attenuation storage and flow control will be required to ensure the reduced allowable runoff rate is not exceeded.
- 6.15 It is assumed that this attenuation will be provided within geo-cellular storage tanks, oversized pipework or similar located beneath the external area that surrounds the proposed building.
- 6.16 A plan illustrating the drainage strategy for the proposed development can be found at appendix 06, and supporting surface water drainage calculations can be found at appendix 07.

Foul water drainage proposals

- 6.17 The foul drainage flows generated by the proposed development will be directed to the existing on-site private foul drainage system, which in turn discharges into the public foul drainage system locally.

7.0 SUMMARY

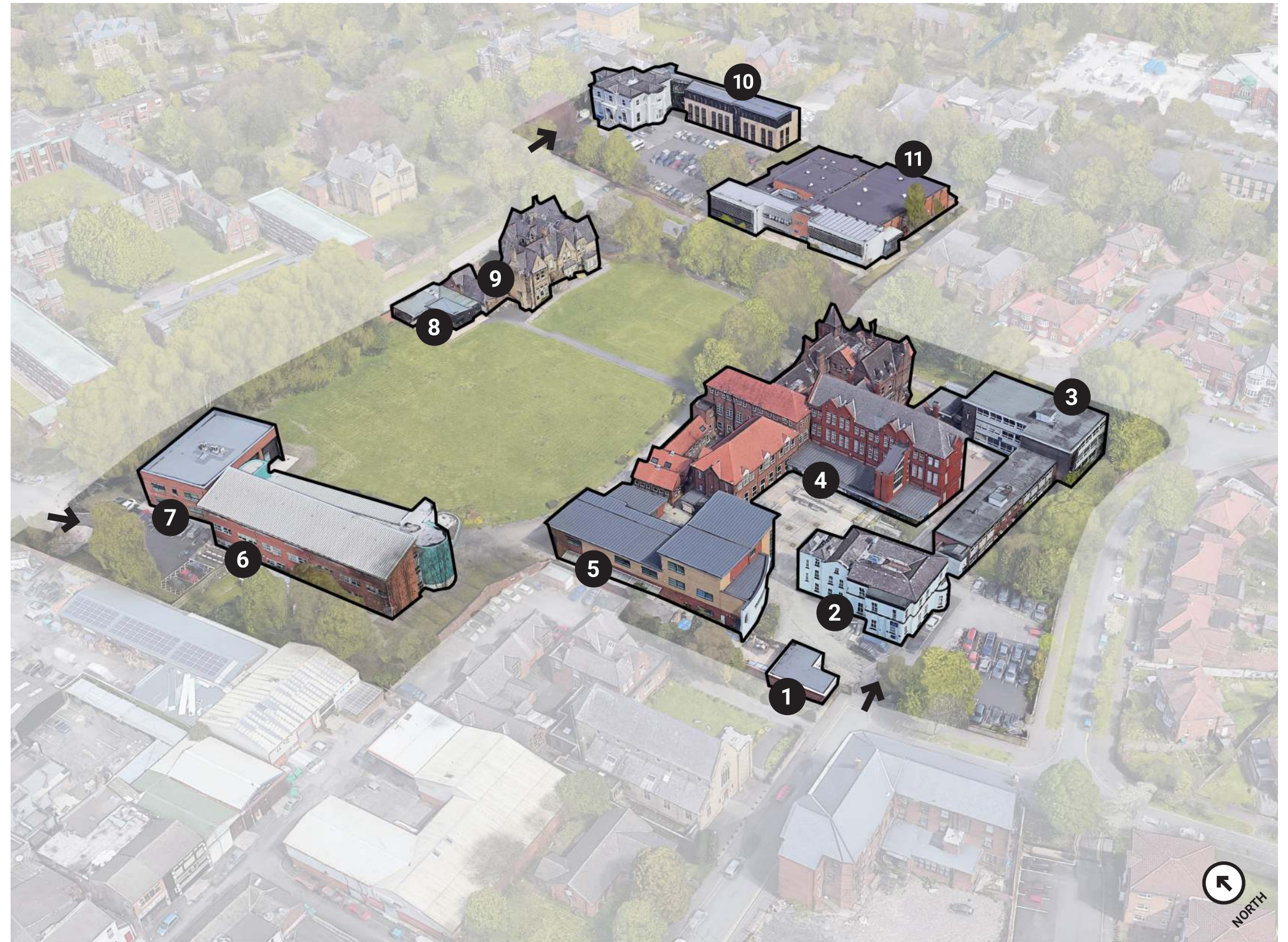
- 7.1 WML Consulting Ltd have been commissioned by Xaverian College to provide a Flood Risk Assessment (FRA) to support a planning application for a New Science Block within the existing Xaverian College site at Rusholme, Manchester.
- 7.2 It is understood that the development proposals are as follows:-
- The demolition of the existing Sunbury Building (noted as no. 2 on the plan at appendix 01).
 - The construction of the New Science Block in place of the Sunbury Building
 - Minor alterations and resurfacing to the existing external area around the New Science Block.
- 7.3 The online Flood Map for Planning confirms that the area where the development is proposed is located in Flood Zone 1 (very low risk), which means that this area has a chance of flooding of less than 0.1% (1 in 1,000) each year.
- 7.4 The proposed development type would be classified as a 'more vulnerable' form of development, and from Table 3 of the NPPF guidance notes it can be seen that this type of development is appropriate in Flood Zone 1.
- 7.5 It is considered that the development is not at significant risk of flooding from tidal waters, surface water, reservoirs, sewers, groundwater or from other sources.
- 7.6 The surface water drainage proposals for the development will incorporate the principles of the NPPF and the SUDS manual. For further details of the surface water drainage proposals refer to chapter 6.
- 7.7 The foul drainage flows generated by the proposed development will be directed to the existing on-site private foul drainage system, which in turn discharges into the public foul drainage system locally.
- 7.8 Given the above it is considered that the proposed development should not be at risk from flooding during its life time, and that it will not increase flood risk to elsewhere.
- 7.9 Given the above it is considered that the development is appropriate in this instance.

Appendix 01
Site Location Plan

Existing Site.

Xaverian Campus Buildings

1. Estate Workshop / Gatehouse
Staff spaces
2. Sunbury
RE (Pastoral)
3. Xavier
Science
Lecture Theatre
4. Firwood (*Grade II Listed*)
General Teaching (main block)
Admin Spaces
Social / Dining & associated kitchens.
Chapel
5. Ryken
General Teaching
Main Reception
LRC (Library)
6. Mayfield
General Teaching
7. Theresa Quinn
General Teaching
8. The Pavilion
Social / Dining
9. Marylands (*Grade II Listed*)
General Teaching
10. Ward Hall (*Grade II Listed*)
Art / DT / Graphics
11. Birtles
Main Hall / Exams
Performing Arts
Sport



Google Earth View of Xaverian Campus

Appendix 02

Proposed Site Plan

Appendix 03

Environment Agency correspondence

Kevin Tyldesley

To: GMMC Info Requests
Subject: RE: GMMC301298JP - Response attached from the Environment Agency - Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

From: GMMC Info Requests <InfoRequests.GMMC@environment-agency.gov.uk>

Sent: 17 March 2023 13:18

To: Kevin Tyldesley <Kevin.Tyldesley@wmlconsulting.com>

Subject: GMMC301298JP - Response attached from the Environment Agency - Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

Importance: High

Dear Kevin Tyldesley,

Thank you for your enquiry which was received on 21/02/2023 and then subsequently clarified on 16/03/2023.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Please find attached:

- Detailed Flood Map
- Table

Please be aware there is an update to this modelling planned.

There are no 2D levels available for this site.

We have no records of flooding affecting the site. However, this does not mean flooding has not occurred in the past or that it will not flood in future. We recommend that you also contact United Utilities and Manchester District Council who may hold additional information (the former especially in relation to sewer flooding).

Please be aware you can check your risk of flooding on our external website <https://flood-warning-information.service.gov.uk/long-term-flood-risk/>

Here are some useful links below:

<https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

For surface water information please use link: <https://check-long-term-flood-risk.service.gov.uk/map?easting=362125.07&northing=388310.97&map=SurfaceWater>

Please refer to the [Open Government Licence](#) which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Kind regards,

Julia Poole
Customer and Engagement Officer

Greater Manchester, Merseyside and Cheshire

Email: Inforequests.gmmc@environment-agency.gov.uk

From: Kevin Tyldesley <Kevin.Tyldesley@wmlconsulting.com>

Sent: 21 February 2023 10:17

To: Enquiries, Unit <enquiries@environment-agency.gov.uk>

Subject: Ref 230303/JC11 Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

Hi.

We have been asked to provide a Flood Risk Assessment for a proposed development at the above site, as indicated on the screenshot below.



Can you confirm if you are aware of any flood risk issues that may affect the site please ?

Kind regards.

Kevin Tyldesley

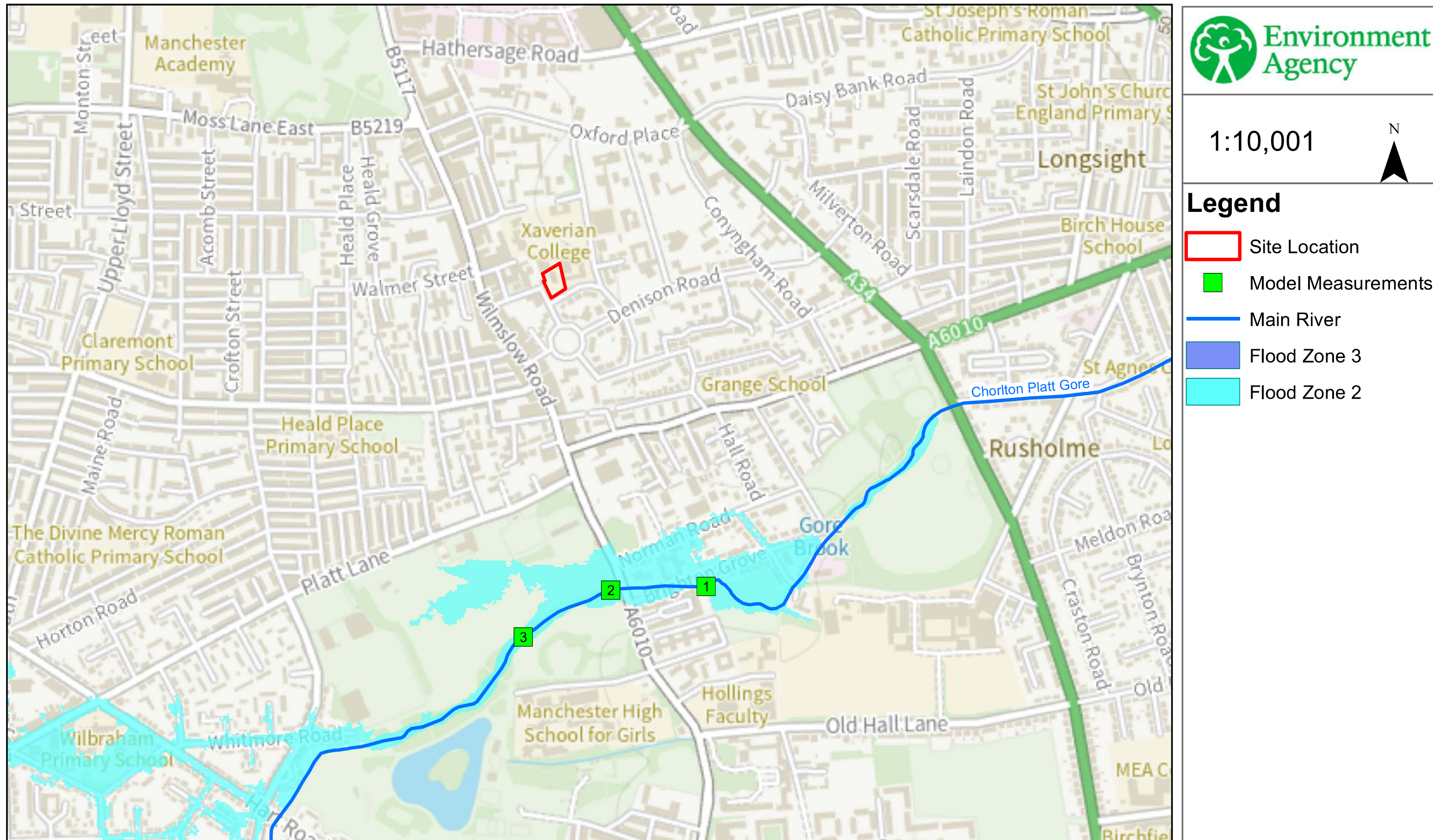
WML Consulting Ltd

Civil, Structural & Geotechnical Engineers

No. 8 Oak Green | Earl Road | Stanley Green Business Park | Cheadle Hulme | Cheshire | SK8 6QL

Tel: 0161 482 0600 | email: kevin.tyldesley@wmlconsulting.com

Detailed Flood Map Centred on Lower Park Road, Manchester, M14 5RB. Created 16/03/2023 [GMMC301298JP]



Map Reference	Model Node Reference	Easting	Northing	Data	Undertended								Defended								
					10 % AEP (1 in 10 year)	4 % AEP (1 in 25 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 30% increase in flow	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow	0.1 % AEP (1 in 1000 year)	50 % AEP (1 in 2 year)	10 % AEP (1 in 10 year)	4 % AEP (1 in 25 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 30% increase in flow	1 % AEP (1 in 100 year) + 35% increase in flow	1 % AEP (1 in 100 year) + 70% increase in flow	0.1 % AEP (1 in 1000 year)
1	ea013_Model_CHOPO2_0823U	385616	394760	Modelled Water Level (m aodN)	36.88	37.23	37.60	37.68	38.38	38.52	38.86	38.89	36.47	36.88	37.23	37.60	37.68	38.38	38.52	38.86	38.89
2	ea013_Model_CHOPO2_0635M	385423	394753	Modelled Flow (cumecs)	5.86	8.13	10.66	11.21	13.91	14.16	14.51	14.46		5.86	8.13	10.66	11.21	13.91	14.16	14.51	14.46
				Modelled Water Level (m aodN)	35.37	35.55	35.74	35.78	35.94	35.96	36.45	36.66	35.11		35.37	35.55	35.74	35.78	35.94	35.96	36.37
				Modelled Flow (cumecs)	5.86	8.13	10.66	11.21	13.91	14.16	14.51	14.46		5.86	8.13	10.66	11.21	13.91	14.16	14.51	14.46
				Modelled Water Level (m aodN)	34.45	34.65	34.87	34.92	35.17	35.23	36.28	36.51	34.18	34.45	34.65	34.87	34.92	35.17	35.24	36.30	36.67
3	ea013_Model_CHOPO2_D423I	385245	394657	Modelled Flow (cumecs)	5.86	8.12	10.66	11.21	13.90	14.13	17.47	18.62		5.86	8.12	10.66	11.21	13.90	14.13	17.31	18.75

Model data taken from Chorlton Pfalli Gore 2012
AEP - Annual Exceedance Probability
m aodN - metres above ordnance datum Newlyn
cumecs - cubic metres per second

Notes: *Climate Change Scenario - 30%, 35% and 70% increases in flow calculated for the 2080's (2070 - 2115). Please see <https://www.gov.uk/guidance/food-risk-assessments-climate-change-allowances> for more information regarding the new climate change guidance. The location of the site and the type (vulnerability) of development determine the climate change allowances to consider in any food risk assessment.

Appendix 04

Manchester City Council correspondence

Appendix 05

United Utilities correspondence

Kevin Tyldesley

To: wastewaterdeveloperservices@uuplc.co.uk
Subject: RE: Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>
Sent: 22 February 2023 14:47
To: Kevin Tyldesley <Kevin.Tyldesley@wmlconsulting.com>
Subject: Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

Good Afternoon Kevin,

Thank you for contacting United Utilities.

I can confirm that we have no current record of sewer flooding within the vicinity of the proposed development.

Please note that United Utilities Water Limited (Uuw) can only record and check flooding events which are reported to us and we have to comply with our Regulators instructions on the qualification of flooding events to place on the register.

Our response does not include:

- any sewer flooding events caused by blockages or collapses which are the result of third party actions, natural events or other actions over which Uuw has no control and not a facet of sewer capacity; or
- any historical sewer flooding events that have been removed from the register as a result of investment in our infrastructure.

As with all development sites, we recommend you liaise with our water and wastewater engineers by contacting our Developer Services team so the details of your development proposal can be considered further. Details can be found at the following link.

<https://www.unitedutilities.com/services/builders-developers/>

Should you require any further information please do not hesitate to contact me.'

Kind regards



Louise Dack
Customer Advisor Advanced
Developer Services & Metering
Customer Services
T: 01925 233063 (33063 internal)
unitedutilities.com

Did you know we now have a live chat facility available to you Mon to Friday 8 -5pm. You just click on the orange live chat box on our webpage and one of our advisors will be ready to chat to you and help you with your enquiry <https://www.unitedutilities.com/builders-developers/> or you can email us at WastewaterDeveloperServices@uuplc.co.uk

----- Original Message -----

From: Kevin Tyldesley [kevin.tyldesley@wmlconsulting.com]

Sent: 21/02/2023 10:17

To: wastewaterdeveloperservices@uuplc.co.uk

Subject: Xaverian College, Lower Park Road, Rusholme, Manchester, M14 5RB - 10961

Hi.

We have been asked to provide a Flood Risk Assessment for a proposed development at the above site, as indicated on the screenshot below.



Can you confirm if you are aware of any flood risk issues that may affect the site please ?

Kind regards.

Kevin Tyldesley

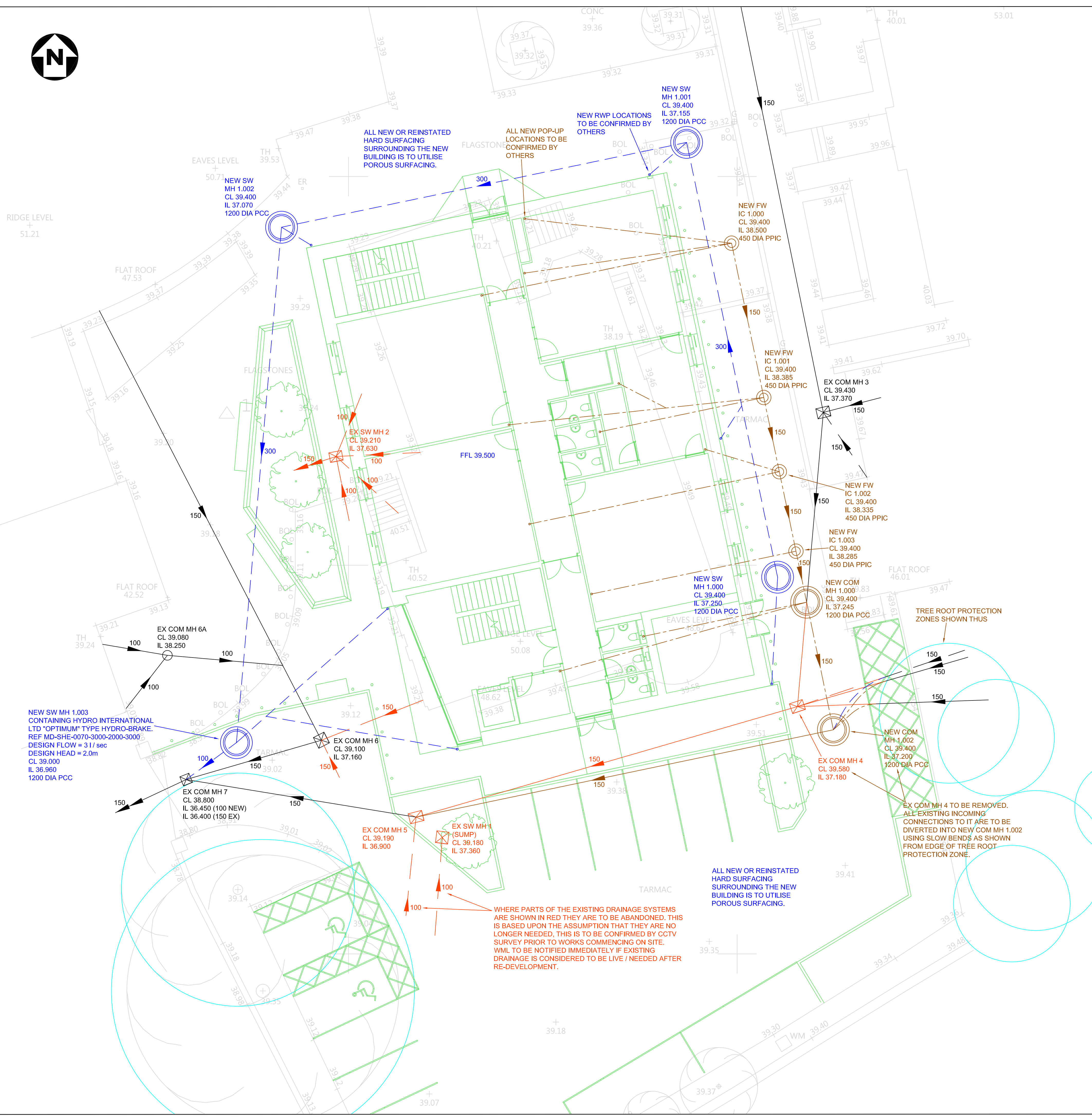
WML Consulting Ltd

Civil, Structural & Geotechnical Engineers

No. 8 Oak Green | Earl Road | Stanley Green Business Park | Cheadle Hulme | Cheshire | SK8 6QL

Tel: 0161 482 0600 | email: kevin.tyldesley@wmlconsulting.com

Appendix 06
Drainage Strategy Plan



DRAINAGE STRATEGY

THE PROPOSED DEVELOPMENT IS TO BE DRAINED VIA SEPARATE FOUL AND SURFACE WATER DRAINAGE SYSTEMS.

SURFACE WATER DRAINAGE PROPOSALS

THE SURFACE WATER DRAINAGE PROPOSALS FOR THE DEVELOPMENT WILL INCORPORATE THE PRINCIPLES OF THE NPPF AND THE SUDS MANUAL.

THE PROPOSED DRAINAGE SYSTEM WILL BE DESIGNED IN ACCORDANCE WITH BS EN 752-4 AND THE BUILDING REGULATIONS APPROVED DOCUMENT H (2010), WHICH INDICATES THE FOLLOWING HIERARCHY FOR THE DISPOSAL OF SURFACE WATER DRAINAGE FROM NEW DEVELOPMENT SITES:

- DISCHARGE VIA INFILTRATION
- DISCHARGE TO WATERCOURSE
- DISCHARGE TO SEWER

THESE OPTIONS ARE DISCUSSED FURTHER BELOW.

SURFACE WATER DISCHARGE VIA INFILTRATION - THE NEAR SURFACE GROUND CONDITIONS IN THE VICINITY OF THE SITE ARE DESCRIBED AS DEVENSIAN GLACIAL TILL, MAINLY COMPRISING CLAY LOCALLY INTERBEDDED WITH SANDS AND GRAVELS.

CLAYEY GROUND CONDITIONS SUCH AS THIS TEND TO BE RELATIVELY IMPERMEABLE. HENCE IT IS CONSIDERED THAT THE USE OF SOAKAWAYS OR OTHER INFILTRATION TECHNIQUES ARE UNLIKELY TO BE APPROPRIATE FOR DISCHARGING ALL THE RUNOFF GENERATED BY THE PROPOSED BUILDING'S ROOF AREA.

HOWEVER, IT IS CONSIDERED THAT THE PROPOSED HARD LANDSCAPED AREAS COULD STILL UTILISE POROUS SURFACING, SO THAT SOME INFILTRATION WILL BE ACHIEVED.

THE GROUND CONDITIONS WILL BE CONFIRMED BY INTRUSIVE SITE INVESTIGATIONS PRIOR TO DETAILED DESIGN STAGE, AND IF, DURING THESE INVESTIGATIONS, IT APPEARS THAT THE GROUND CONDITIONS MAY SUPPORT THE USE OF INFILTRATION, THEN THIS SHOULD BE CONFIRMED BY BRE365 COMPLIANT INFILTRATION TESTING TO INFORM THE DESIGN OF INFILTRATION DEVICES.

SURFACE WATER DISCHARGE VIA WATERCOURSE - FROM THE ORDNANCE SURVEY MAPPING COVERING THE AREA AROUND THE SITE, IT CAN BE SEEN THAT THERE ARE NO EXISTING WATERCOURSES WITHIN, OR IN THE VICINITY OF THE PROPOSED DEVELOPMENT.

HENCE IT WILL NOT BE FEASIBLE TO DISCHARGE THE SURFACE WATER RUNOFF VIA THIS ROUTE.

SURFACE WATER DISCHARGE VIA THE PUBLIC SEWERAGE SYSTEM - GIVEN THE ABOVE IT IS CONSIDERED THAT IT WILL BE NECESSARY TO DISCHARGE THE SURFACE WATER RUNOFF FROM THE PROPOSED BUILDING'S ROOF AREA TO THE PUBLIC DRAINAGE SYSTEM, AS THE AREA DOES CURRENTLY.

DESIGN OF THE PROPOSED SURFACE WATER DRAINAGE SYSTEM

THE EXISTING SITE IS A BROWN FIELD SITE. THEREFORE, IN LINE WITH CURRENT GUIDANCE, THE SURFACE WATER RUNOFF RATES FROM THE RE-DEVELOPED SITE SHOULD ACHIEVE A 50% BETTERMENT WHEN COMPARED AGAINST THE EXISTING SITUATION FOR ALL STORM EVENTS UP TO AND INCLUDING THE CRITICAL 1 IN 100 YEAR EVENT PLUS A 40% CLIMATE CHANGE ALLOWANCE.

TO THIS END, IT IS PROPOSED THAT THE ALLOWABLE DISCHARGE RATE FROM THE DEVELOPMENT BE RESTRICTED TO 3 l/sec FOR ALL STORM EVENTS UP TO AND INCLUDING THE CRITICAL 1 IN 100 YEAR EVENT PLUS A 40% CLIMATE CHANGE ALLOWANCE.

AS THE DEVELOPMENT DOES NOT INVOLVE A SIGNIFICANT REDUCTION IN IMPERMEABLE AREA, ATTENUATION STORAGE AND FLOW CONTROL WILL BE REQUIRED TO ENSURE THE REDUCED ALLOWABLE RUNOFF RATE IS NOT EXCEEDED.

FOUL WATER DRAINAGE PROPOSALS

THE FOUL DRAINAGE FLOWS GENERATED BY THE PROPOSED DEVELOPMENT WILL BE DIRECTED TO THE EXISTING ON-SITE PRIVATE FOUL DRAINAGE SYSTEM, WHICH IN TURN DISCHARGES INTO THE PUBLIC FOUL DRAINAGE SYSTEM LOCALLY.

KEY

- EXISTING COMBINED SEWERS TO BE RETAINED SHOWN THUS
- EXISTING COMBINED SEWERS TO BE ABANDONED SHOWN THUS
- EXISTING SURFACE WATER SEWERS TO BE RETAINED SHOWN THUS
- EXISTING SURFACE WATER SEWERS TO BE ABANDONED SHOWN THUS
- PROPOSED SURFACE WATER SEWERS SHOWN THUS
- PROPOSED FOUL SEWERS SHOWN THUS

GENERAL NOTES

DO NOT SCALE FROM THIS DRAWING WORK TO FIGURED DIMENSIONS ONLY.

NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS ALLOWED WITHOUT PRIOR PERMISSION IN WRITING.

ALL DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND THE SPECIFICATION.

THE CONTRACTOR SHALL INCORPORATE ALL THE REQUIREMENTS OF THE PRE-TENDER STAGE HEALTH AND SAFETY PLAN.

FOR DETAILS OF MATERIALS AND WORKMANSHIP REFER TO THE SPECIFICATION.

MAINTENANCE OF THE BELOW GROUND DRAINAGE SYSTEM

THE BELOW DRAINAGE PROPOSALS INDICATED ARE RELATIVELY TRADITIONAL IN NATURE, AND SHOULD PROVIDE YEARS OF RELATIVELY LOW MAINTENANCE OPERATION IN RELATION TO THE ANTICIPATED LIFESPAN OF THE PROPOSED DEVELOPMENT.

IN LINE WITH CURRENT GOOD PRACTICE:-

GULLIES AND LINEAR DRAINAGE CHANNELS SHOULD BE INSPECTED AND / OR CLEANED OUT AT 6 MONTHLY INTERVALS.

INSPECTION CHAMBERS, MANHOLES, CATCHPITS, ETC. SHOULD BE INSPECTED AT 6 MONTHLY INTERVALS TO ENSURE THAT THE PIPEWORK AND AND INFILTRATION DEVICES ASSOCIATED WITH THEM ARE OPERATING EFFECTIVELY.

ANY PROBLEMS HIGHLIGHTED BY THESE INSPECTIONS WILL NEED TO BE INVESTIGATED, POSSIBLY BY CCTV SURVEY, TO CONFIRM THE NATURE OF THE PROBLEM AND TO ALLOW IT TO BE REMEDIED IN A TIMELY MANNER.

IT IS UNDERSTOOD THAT THE MONITORING AND ROUTINE MAINTENANCE OF THE BELOW GROUND DRAINAGE SYSTEM WILL BE CARRIED OUT BY THE COLLEGE'S MAINTENANCE STAFF WITH ADDITIONAL HELP PROVIDED BY EXTERNAL SPECIALIST DRAINAGE PROFESSIONALS BROUGHT IN AS REQUIRED.

THE AREAS OF POROUS SURFACING SHOULD BE REGULARLY SWEEPED, VACUUMED OR BLOWN TO REMOVE LEAVES AND OTHER DEBRIS THAT MAY LEAD TO THE PORES WITHIN THE SURFACING BECOMING BLOCKED. IT IS ANTICIPATED THAT THIS CLEANING WILL BE REQUIRED TWICE PER YEAR, HOWEVER THE EFFECTIVENESS OF THIS CLEANING FREQUENCY WILL NEED TO BE MONITORED, AND MAY NEED TO BE INCREASED. AREAS OF POROUS SURFACING SHOULD NOT BE USED FOR THE STORAGE OF ANY MATERIALS THAT MAY CLOG THE PORES WITHIN THE SURFACING. SIMILARLY THE USE OF SAND OR OTHER NON-SOLUBLE MATERIALS FOR SNOW AND ICE CONTROL SHOULD BE AVOIDED.

IT IS UNDERSTOOD THAT THE EXTERNAL AREAS OF THE SITE WILL BE ROUTINELY INSPECTED AND MAINTAINED BY BY THE COLLEGE'S MAINTENANCE STAFF, THOUGH IT MAY BE NECESSARY TO CALL IN EXTERNAL SPECIALIST CONTRACTORS IF VACUUMING OF THE SURFACINGS ARE REQUIRED.

PRELIMINARY

P03	AMENDED TO SUIT UPDATED SITE LAYOUT.	05.9.23	KPT	LOG
P02	AMENDED TO SUIT UPDATED SITE LAYOUT.	19.5.23	KPT	LOG
P01	PRELIMINARY ISSUE.	24.3.23	KPT	LOG

Rev.	Amendment	Date	By	Chkd
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Project

NEW SCIENCE BLOCK

Client

XAVERIAN COLLEGE

Title

PROPOSED DRAINAGE STRATEGY

WML Job No.	Drawn	Checked	Date	Scale
10961	KPT	LOG	MARCH 2023	1:100 AT A1

WML CONSULTING
Civil, Structural & Geotechnical Engineers

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Drawing No.

Project Originator Volume Level Type Role Number Rev

10961- WML - 00 - XX - DR - C - 1001 P03

Appendix 07

Surface Water Drainage Calculations

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No. 8 Oak Green Stanley Green Business Park Earl Rd, Cheadle Hulme, SK8 6QL	10961 - XAVERIAN COLLEGE SURFACE WATER DRAINAGE DESIGN REV 02	
Date 01/05/2023 File 10961 - SW - 02.MDX	Designed by KPT Checked by LOG	
Innovyze	Network 2020.1.3	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.359	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	250	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.036	4-8	0.014

Total Area Contributing (ha) = 0.050

Total Pipe Volume (m³) = 5.042

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	23.000	0.095	242.1	0.025	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	21.000	0.085	247.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	27.000	0.110	245.5	0.025	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	3.000	0.510	5.9	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	133.84	5.38	37.250	0.025	0.0	0.0	0.0	1.01	71.1	9.1
S1.001	130.71	5.73	37.155	0.025	0.0	0.0	0.0	1.00	70.4	9.1
S1.002	126.96	6.18	37.070	0.050	0.0	0.0	0.0	1.00	70.6	17.2
S1.003	126.84	6.20	36.960	0.050	0.0	0.0	0.0	3.21	25.2	17.2

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Innovyze		Network 2020.1.3



Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	39.500	2.250	Open Manhole	1200	S1.000	37.250	300				
S2	39.500	2.345	Open Manhole	1200	S1.001	37.155	300	S1.000	37.155	300	
S3	39.500	2.430	Open Manhole	1200	S1.002	37.070	300	S1.001	37.070	300	
S4	39.100	2.140	Open Manhole	1200	S1.003	36.960	100	S1.002	36.960	300	
S	39.000	2.550	Open Manhole	0		OUTFALL		S1.003	36.450	100	

No coordinates have been specified, layout information cannot be produced.

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Innovyze	Network 2020.1.3	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S4, DS/PN: S1.003, Volume (m³): 4.2

Unit Reference	MD-SHE-0070-3000-2000-3000
Design Head (m)	2.000
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	70
Invert Level (m)	36.960
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	3.0
Flush-Flo™	0.310	2.2
Kick-Flo®	0.630	1.8
Mean Flow over Head Range	-	2.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	1.200	2.4	3.000	3.6	7.000	5.4
0.200	2.1	1.400	2.5	3.500	3.9	7.500	5.6
0.300	2.2	1.600	2.7	4.000	4.1	8.000	5.7
0.400	2.2	1.800	2.9	4.500	4.4	8.500	5.9
0.500	2.1	2.000	3.0	5.000	4.6	9.000	6.1
0.600	1.9	2.200	3.1	5.500	4.8	9.500	6.2
0.800	2.0	2.400	3.3	6.000	5.0		
1.000	2.2	2.600	3.4	6.500	5.2		

[illegible]

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Date 01/05/2023				Designed by KPT					
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Innovyze				Network 2020.1.3					
30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm									
Simulation Criteria									
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000									
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000									
Hot Start Level (mm) 0 Inlet Coefficient 0.800									
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000									
Foul Sewage per hectare (l/s) 0.000									
Number of Input Hydrographs 0 Number of Storage Structures 0									
Number of Online Controls 1 Number of Time/Area Diagrams 0									
Number of Offline Controls 0 Number of Real Time Controls 0									
Synthetic Rainfall Details									
Rainfall Model FSR Ratio R 0.359									
Region England and Wales Cv (Summer) 0.750									
M5-60 (mm) 18.000 Cv (Winter) 0.840									
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF									
Analysis Timestep Fine Inertia Status OFF									
DTS Status ON									
Profile(s) Summer and Winter									
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080									
Return Period(s) (years) 1, 30, 100									
Climate Change (%) 0, 0, 40									
Water									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)
S1.000	S1	30 Winter	30	+0%	100/15 Summer				37.440
S1.001	S2	30 Winter	30	+0%	100/15 Summer				37.439
S1.002	S3	30 Winter	30	+0%	30/15 Winter				37.438
S1.003	S4	30 Winter	30	+0%	1/15 Summer				37.436
Surcharged Flooded									
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.110	0.000	0.09			5.7	OK	
S1.001	S2	-0.016	0.000	0.07			4.2	OK	
S1.002	S3	0.068	0.000	0.10			6.6	SURCHARGED	
S1.003	S4	0.376	0.000	0.11			2.2	SURCHARGED	
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Date 01/05/2023				Designed by KPT					
File 10961 - SW - 02.MDX				Checked by LOG					
Innovyze				Network 2020.1.3					
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>									
<u>Simulation Criteria</u>									
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000 Foul Sewage per hectare (l/s) 0.000									
Number of Input Hydrographs 0 Number of Storage Structures 0 Number of Online Controls 1 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0									
<u>Synthetic Rainfall Details</u>									
Rainfall Model FSR Ratio R 0.359 Region England and Wales Cv (Summer) 0.750 M5-60 (mm) 18.000 Cv (Winter) 0.840									
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF Analysis Timestep Fine Inertia Status OFF DTS Status ON									
<u>Profile(s)</u>									
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080 Return Period(s) (years) 1, 30, 100 Climate Change (%) 0, 0, 40									
<u>Water Level Exceeded</u>									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	60 Winter	100	+40%	100/15	Summer			38.904
S1.001	S2	60 Winter	100	+40%	100/15	Summer			38.902
S1.002	S3	60 Winter	100	+40%	30/15	Winter			38.900
S1.003	S4	60 Winter	100	+40%	1/15	Summer			38.897
<u>Surcharged Flooded</u>									
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	1.354	0.000	0.09			5.4	SURCHARGED	
S1.001	S2	1.447	0.000	0.05			3.1	SURCHARGED	
S1.002	S3	1.530	0.000	0.08			5.0	SURCHARGED	
S1.003	S4	1.837	0.000	0.15			3.0	FLOOD RISK	
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