

Proposed Site at Gorton Lane, Manchester

Flood Risk Assessment and Drainage Strategy

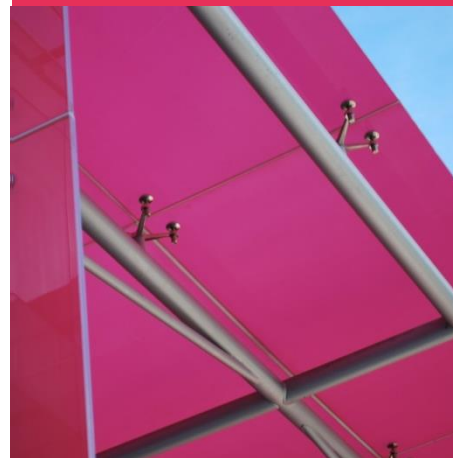
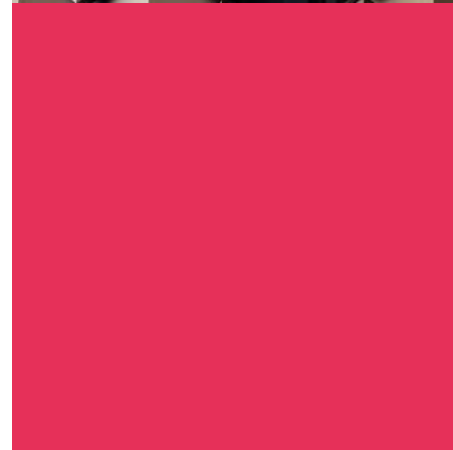
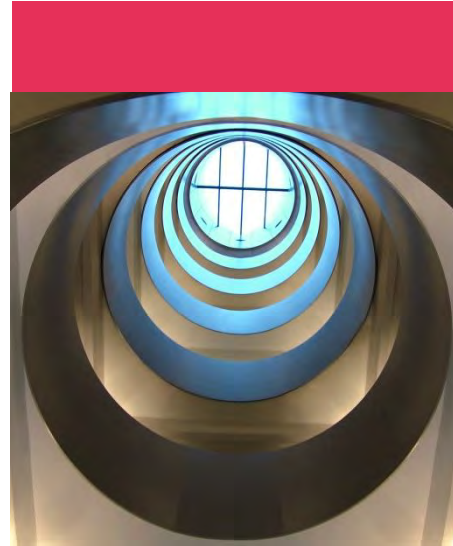
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Table of contents

1.0 Introduction 5

1.1 Project Background 5

1.2 Scope of Assessment 5

1.3 Proposed Development..... 6

2.0 Existing Site Details..... 7

2.1 History and Current Use..... 7

2.2 Existing Watercourses and Other Waterbodies 8

2.3 Existing Drainage 8

2.4 Topography 9

2.5 Geology 9

3.0 Development and Flood Risk 10

3.1 National Planning Policy Framework (NPPF) and Planning Practice Guidance 10

3.2 Site Specific NPPF Flood Risk Categorisation 14

3.3 Site Specific Flood Zone Compatibility 14

3.4 Sequential Test 14

4.0 Hydrological Assessment 15

4.1 Sources of Flood Risk 15

4.2 Fluvial Flooding (Rivers and Streams) 15

4.3 Reservoir Flooding 18

4.4 Canal Flooding 18

4.5 Groundwater Flooding..... 19

4.6 Public Sewers or Highway Drainage Flooding (Infrastructure Failure) 19

4.7 Surface Water Flooding to the Site 20

4.8 Surface Water Flooding from the Site 21

4.9 Historical Flooding..... 22

4.10 Summary of Flood Risk..... 22

5.0 Mitigation 23

5.1	Fluvial Flood Mitigation	23
5.2	Reservoir Flood Mitigation	24
5.3	Surface Water Flooding to the site Mitigation	24
5.4	Surface Water Flooding from the site Mitigation	24
6.0	Drainage Strategy.....	27
6.1	Existing Drainage	27
6.2	Proposed Foul Water Drainage.....	28
6.3	Proposed Surface Water Drainage	28
7.0	Maintenance	35
7.2	Components	35
7.3	Inspection, Manhole and Catchpit Chambers	36
7.4	Pipes	36
7.5	Gullies	38
7.6	Attenuation Tanks	39
7.7	Flow Control Units	40

Appendices

Appendix A

Site Layout

Appendix B

United Utilities Public Sewer Records

Appendix C

CCTV Drainage Survey

Topographical Survey

Borehole Records

Appendix D

Environment Agency Flood Map for Planning

Appendix E

Environment Agency Flood Levels

Environment Agency Flood Map (nodes)

Environment Agency Area Guidance (climate change)

Appendix F

Lead Local Flood Authority Correspondence

United Utilities Correspondence

Appendix G

Existing Flood Extents Overlay

Proposed Flood Extents Overlay

Appendix H

Proposed Drainage Strategy

Overland Flow Routes Plan

Microdrainage Calculations

1.0 Introduction

1.1 Project Background

- 1.1.1 Curtins was appointed by One Manchester to provide a Flood Risk Assessment (FRA) and Drainage Strategy for a proposed residential site adjacent to Gorton Lane, Manchester.
- 1.1.2 The report provides information on the nature of flood risk at the site and follows Government guidance regarding development and flood risk.
- 1.1.3 The report is based on currently available information and preliminary discussions.
- 1.1.4 Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.
- 1.1.5 Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Curtins shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Curtins.

1.2 Scope of Assessment

- 1.2.1 The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Policy Guidance to the National Planning Policy Framework (NPPF).
- 1.2.2 The assessment will:
 - Investigate all potential risks of flooding to the site,
 - Consider the impact the development may have elsewhere with regards to flooding,
 - Consider design proposals to mitigate any potential risk of flooding determined to be present; and
 - Consider foul & surface water drainage proposals for the proposed development.
- 1.2.3 The total site area is approximately 0.317 hectares and following scrutiny of the Environment Agency flood maps it has been identified that The site partially lies within Flood Zone 2 and partially within Flood Zone 1. A Flood Risk Assessment is therefore required to support a planning application taking into consideration the impact of the Flood Zone 2 classification and to consider the management of surface water run-off.

- 1.2.4 In April 2015, the Government made changes to the National Planning Policy Framework which made Sustainable Urban Drainage Systems (SuDS) a material consideration in the determination of planning applications for 'major' developments.
- 1.2.5 A Drainage Strategy will therefore be required as part of the Planning Application for the development, as the site is considered to be 'major' development by the Town and Country Planning Order 2015.
- 1.2.6 This Flood Risk Assessment and Drainage Strategy reviews the following information:
- Environment Agency flood maps for rivers and sea flooding.
 - UK Government Flood Warning Information Service maps for surface water flooding and reservoir flooding.
 - Manchester City, Salford City and Trafford Councils Level 1 Hybrid Strategic Flood Risk Assessment (SFRA) published in March 2010.
 - Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA, User Guide, Final, dated May 2010.
 - Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment (SFRA) published in March 2011.
 - Preliminary Flood Risk Assessment (PFRA) for Manchester County Council dated May 2011.
 - Manchester City Council SuDS Requirements for New Developments.
 - United Utilities Public Sewer Records Extract dated October 2016.
 - Topographical Survey by ND Oliver dated December 2017.
 - Curtins Desk Study Report referenced 067694-CUR-XX-RP-GE-001-V02 dated July 2018.
 - Curtins Phase 2 Site Investigation referenced 068244-CUR-00-XX-RP-GE-001-V02 dated April 2019

1.3 Proposed Development

- 1.3.1 The development is expected to comprise the following:
- 12 No. houses and car parking. The Site Layout is enclosed in *Appendix A*.

2.0 Existing Site Details

2.1 History and Current Use

- 2.1.1 The site is located approximately 3km south-east of Manchester City Centre, in the Belle Vue area of Manchester. The nearest postcode is M12 5DF and the OS Reference of the site is 387230, 397025. The wider area consists of residential and industrial uses to the north of the site (see Figure 1).
- 2.1.2 The site is currently unoccupied landscaped open space bounded by industrial properties to the north, Gorton Lane to the east and south and Pottery Lane to the west.

Figure 1: Aerial Photograph (© Google 2018)



2.2 Existing Watercourses and Other Waterbodies

- 2.2.1 No above ground watercourses have been identified within the proposed sites or immediately adjacent to the sites.
- 2.2.2 The Corn Brook ordinary watercourse is partially culverted approximately 10m north of the site prior to flowing below Pottery Lane. The brook is open channel approximately 25m upstream of the site and reopens for a short section approximately 230m downstream of the site. The upstream open section is likely to be the first flood spill point potentially affecting the site.
- 2.2.3 The Ashton Canal is located approximately 1.4 km north-north-east of the site.

2.3 Existing Drainage

- 2.3.1 The public sewer records have been obtained for the development site, and are enclosed in *Appendix B*.
- 2.3.2 The public sewer records indicate that the following public sewers are located within the development site:
 - A 300mm public combined sewer is located within the northern half of the site. The sewer flows from the west side of Pottery Lane towards Gorton lane in an easterly direction where it connects to an 825mm public sewer.
 - A 900mm public combined sewer is located within the southern half of the site. The sewer flows from Gorton Lane in a south-westerly direction towards Wenlock Way. There is an existing Lamphole 'LH' along the 900mm sewer within the site boundary. There is an abandoned sewer which previously connected to the Lamphole from a southerly direction.
- 2.3.3 The following sewers are recorded within the vicinity of the site:
 - There an 825m combined sewer within Gorton Lane, which flows in a northerly direction, where it turns northwest, and runs across the northern boundary of the site.
 - There is a 225mm Highway Drain recorded on the sewer map within Gorton Lane and flows in a north-westerly direction. This is only recorded for one section adjacent to the sites within Gorton Lane.
- 2.3.4 There are further public sewers identified on the public sewer records within the wider vicinity of the site, but these are not considered relevant to the scheme.
- 2.3.5 A CCTV Drainage Survey has been completed for the site, and the survey drawing is enclosed in *Appendix C*.

2.3.6 The CCTV Drainage Survey indicates that the existing drainage generally follows the public sewer records.

- The site 300mm combined sewer within the northern half of the site has been surveyed. The sewer is approximate 5.94m deep. There are three junction connections onto the public sewer within the site however it is not clear if they are redundant connections from historical development.
- The 900mm combined sewer within the southern half of the site has been surveyed from UU manhole UUMH2004, to the western site boundary. A trial pit was excavated in order to confirm the location and depth of the sewer. The sewer is approximately 5.7m to the crown of the sewer.

2.3.7 The 225mm Highway Drain recorded on the sewer map was not surveyed due to limited access to chambers within Gorton Lane.

2.4 Topography

2.4.1 A topographical survey has been carried out on the proposed site, and is enclosed in *Appendix C*.

2.4.2 The site. The existing ground levels generally fall in a south to north direction. The level along the northern boundary is approximately 51m and the level along the southern boundary is approximately 54.35m.

2.5 Geology

2.5.1 A Phase 1 Desk Top Study, and a Phase 2 Site Investigation have been undertaken to assess the existing ground conditions for the site.

2.5.2 Made Ground generally comprised varying thicknesses of variable deposits comprising dark greyish-brown, sandy, silty Clay and reddish-brown to black, fine to coarse Sand and angular to sub-rounded, fine to coarse Gravel with cobbles of brick and concrete.

2.5.3 The reports confirm that made ground is present across the site, ranging from 0.40 – 5.0m deep.

2.5.4 The Made Ground was underlain by Glacial Till superficial deposits comprising cohesive soils of firm to stiff, brown with grey mottling to dark reddish-brown, gravelly, sandy Clay with rare cobbles. Bedrock was encountered at 11.70-13.00m bgl, recorded as weathered greyish-green, fine to medium Sandstone interbedded with greenish-grey siltstone (Halesowen Formation) and weathered, red with green mottling Mudstone (Etruria Formation).

2.5.5 The site is not located within a Groundwater Source Protection Zone.

3.0 Development and Flood Risk

3.1 National Planning Policy Framework (NPPF) and Planning Practice Guidance

- 3.1.1 In July 2018 the Department of Communities and Local Government published the National Planning Policy Framework document (NPPF) and the Planning Practice Guidance was published in March 2014 which provides guidance on how flood risk should be assessed during the planning and development process.

Table 1: (Extract from Planning Practice Guidance) Flood Zone Classifications

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's [Flood Map for Planning \(Rivers and Sea\)](#), available on the Environment Agency's web site, as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 2: (Extract from Planning Practice Guidance) Flood Risk Vulnerability Classification

Essential Infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable • Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as ‘Essential Infrastructure’).
More Vulnerable • Hospitals • Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less Vulnerable

- Police, ambulance and fire stations which are **not** required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water-Compatible Development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Table 3: (Extract from Planning Practice Guidance) Flood Risk Vulnerability and Flood Zone Compatibility

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

3.2 Site Specific NPPF Flood Risk Categorisation

- 3.2.1 To assess the NPPF flood risk classification for the site, the first step was to inspect the UK Government web based 'Flood Map for Planning' which is used to inform planning of a site's Flood Zone(s) and the probability of flooding from rivers or sea (not taking into account the presence of flood defences or climate change). However, the web based 'Long Term Flood Risk Assessment for Locations in England' should also be used to identify the long-term flood risks from rivers and seas, surface water and reservoirs.
- 3.2.2 The Flood Map for Planning report is enclosed in *Appendix D*, and it can be seen that The site is considered within Flood Zone 1 in the southern areas, however the northern boundary is classified as within Flood Zone 2. Site 2 is classified as entirely within Flood Zone 1.
- 3.2.3 Further site-specific review of the flood risk to the site is provided in section 4.

3.3 Site Specific Flood Zone Compatibility

- 3.3.1 The proposals for the development site are likely to fall within the following category:
- Buildings used for dwellings
- 3.3.2 Buildings used for dwellings are classed as 'More Vulnerable' development in the Flood Risk Vulnerability Classification (Table 2).
- 3.3.3 The site is located within Flood Zone 1 and 2 for which 'More Vulnerable' development is deemed to be appropriate. The sequential test is required for The site (refer to the Flood Zone compatibility table in the NPPF technical guidance).

3.4 Sequential Test

- 3.4.1 The site is located partly in Flood Zones 1 and 2 and therefore the proposed development is required to pass the flood risk sequential test. The aim of the sequential test is to steer development towards areas at low risk of flooding. Therefore, the sequential test of this scheme would need to establish if there are equivalent alternative sites for residential development.
- 3.4.2 Manchester City Council Core Strategy objective for new housing identifies that there is a need for approximately 18,280 new dwellings in East Manchester meeting the needs for the diverse and growing Manchester population. Housing should provide sustainable lifetime neighbourhoods with high quality environments and easy access to employment opportunities.
- 3.4.3 Although the site is partially located within Flood Zone 2, the benefits for locating housing within this location provide far wider benefits for the occupants and the areas regeneration proposals.

4.0 Hydrological Assessment

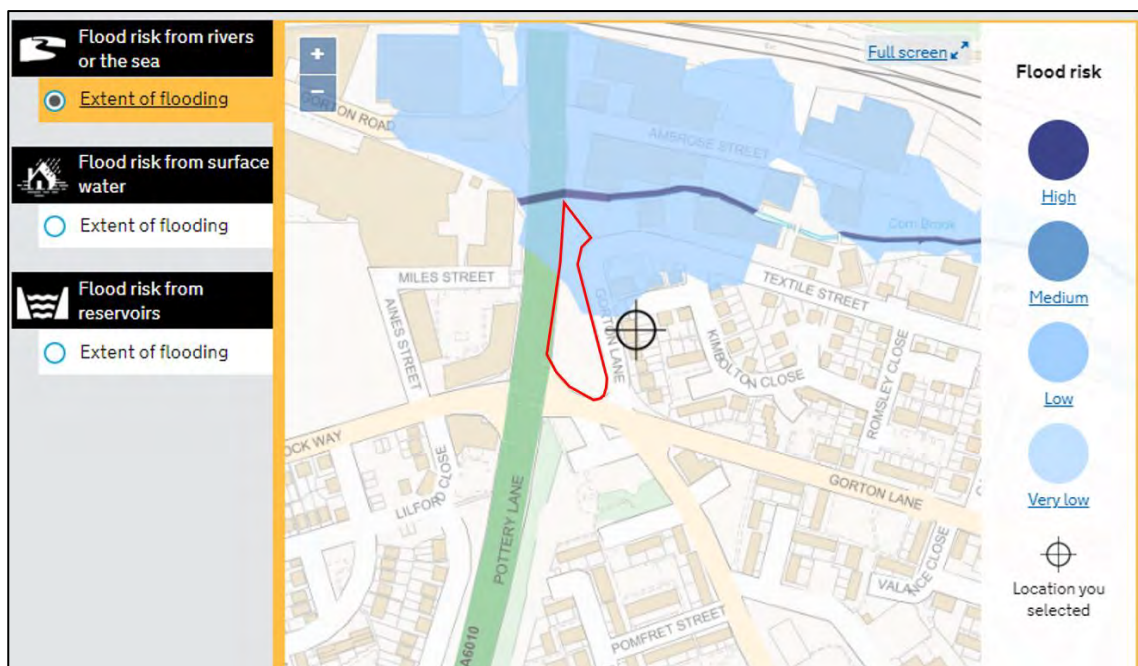
4.1 Sources of Flood Risk

- 4.1.1 This study assesses the risk from different types of flooding to the development and the risk of flooding from the development, taking into consideration climate change, as well as how flood risks should be managed. The approach to assessing flood risk at the development site was informed by the requirements of NPPF in conjunction with the client and Environment Agency requirements.

4.2 Fluvial Flooding (Rivers and Streams)

- 4.2.1 Flooding to the site from rivers and sea is indicated below in Figure 2, taken from the UK Government's Long-Term Flood Risk Information.

Figure 2: Long Term Flood Risk Assessment Map – Flood Risk from Rivers or Sea (© Crown Copyright)



- 4.2.2 It can be seen that the area within the existing sites are in the whole at 'Very Low' risk of fluvial flooding. However, the site encroaches an area considered to be at 'Low' residual risk from fluvial flooding. The sites are not shown to be in an area which benefits from flood defences. Site 2 and the southern area of the site has less than a 0.1% chance of fluvial flooding each year. The north of the site has between a 0.1% and 1% chance of fluvial flooding each year (see Figure 3). Therefore, the proposed site is considered to be at low residual risk from fluvial flooding.

Figure 3: Long Term Flood Risk Assessment (Detailed Information) – Flood Risk from Rivers or Sea (© Crown Copyright)

Flood risk from rivers or the sea

Low risk means that each year this area has a chance of flooding of between 0.1% and 1%. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

- 4.2.1 Due to the Flood Zone 2 designations identified on the Environment Agency maps on site, the recorded flood levels were obtained from the Environment Agency to determine the exact extents of the Flood Zone 2 areas and whether there was any potential impact from the 1% flood levels with climate change allowances applied.
- 4.2.2 The flood levels have been taken from the Corn Brook Study (2017) and the levels and map obtained from the Environment Agency are enclosed in *Appendix E*.

Map Ref	Node Reference	1 in 1000 Year	1 in 100 Year	1 in 100 Year + cc
		Flood Zone 2	Flood Zone 3a	Flood Zone 3a +cc
1	Ea013_0249_mill0218	53.030	52.340	52.490
2	Ea013_0249_mill0218	52.160	51.610	51.750
3	Ea013_0249_mill0218	52.100	50.020	50.600
4	Ea013_0249_mill0218	53.180*	50.570	50.700

***1 in 1000 Year Level data was not provided in the 2017 study results. Therefore, the level from the 2009 study, which was previously provided, has been used.**

- 4.2.3 The node relevant to the development is node 4.
- 4.2.4 The flood mapping is based on the current flood risk without considering defences. Therefore, the extent of flooding and the flood zone category would be:
- 0.1% = 53.180m (Flood Zone 2)
 - 1% = 50.570m (Flood Zone 3a)
 - 1% +cc = 50.700 m (Future risk Flood Zone 3a)

4.2.5 The Environment Agency released updated climate change allowances for peak river flows for catchments across the UK in February 2016 which should be applied to new developments. Table 4 demonstrates the climate change allowances with central and upper end allowances being considered.

Table 4 (Extract Environment Agency Guidance) Peak River Flow climate change allowances and North West catchment

River basin district	Allowance category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
North West	Upper end	20%	35%	70%
	Higher central	20%	30%	35%
	Central	15%	25%	30%

- 4.2.6 The Environment Agency confirmed that the river model has not been updated to reflect the new climate change allowances, however the Environment Agency have provided climate change area guidance, which is enclosed in *Appendix E*. This guidance that confirms that Minor, More Vulnerable developments can utilise the basic assessment to apply the climate change allowances (Table A).
- 4.2.7 The guidance document indicates that the 'Central' climate change allowance is the minimum benchmark for floor risk mitigation. However, a review of the EA online guidance has also been reviewed. This guidance indicates that the 'Higher Central' allowance should be used. The LLFA have confirmed that the 'Higher Central' value should be used for this site.
- 4.2.8 Therefore, the 'Higher Central' climate change allowance has been used, which indicates that 0.24m should be included in addition to the 1% flood event to make allowance for additional climate change factors.
- 4.2.9 The flood level with climate change would therefore be derived as 50.810m. This appears to be higher than the modelled flood level with 35% climate change (50.700m). We have therefore proposed that the benchmark flood level for protection is 50.810.
- 4.2.10 The Lead Local Flood Authority have confirmed this is acceptable, refer to the correspondence enclosed in *Appendix G*.
- 4.2.11 The site would therefore be classified as within Flood Zones 2 in the long term, based on the updated flood model outputs, refer to the current flood mapping extents drawing enclosed within *Appendix F*.

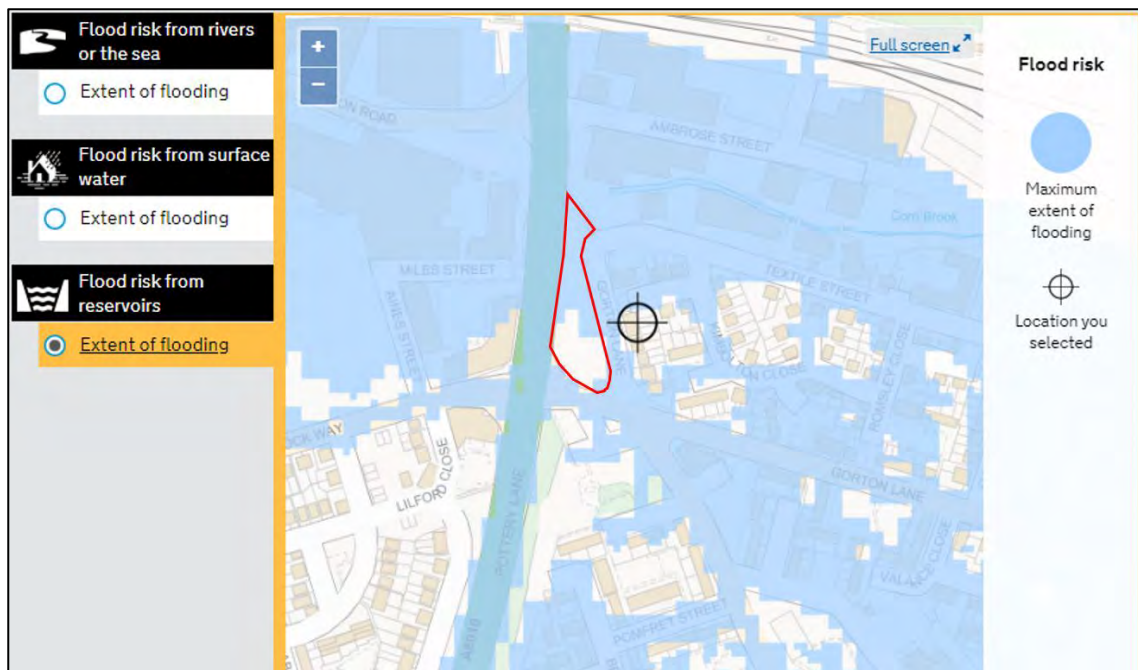
4.2.12 Mitigation Measures are therefore detailed in Section 5.

4.3 Reservoir Flooding

4.3.1 Reservoir flooding is extremely unlikely to happen and there has been no loss of life in the UK from reservoir flooding since 1925. The Environment Agency is the enforcement authority and ensures that reservoirs are inspected regularly, and essential safety work is carried out.

4.3.2 The Long-Term Flood Risk Assessment (Flood Risk from Reservoirs) map shows the largest area that might be flooded if a reservoir were to fail and release the water it holds (see Figure 4).

Figure 4: Long Term Flood Risk Assessment Map – Flood Risk from Reservoirs (© Crown Copyright)



4.3.3 The sites are located within an area that could be affected by reservoir flooding; however, since this is a prediction of a worst-case scenario, it is very low risk that a reservoir flood would be this large. Mitigation measures are proposed in section 5.

4.4 Canal Flooding

4.4.1 The nearest canal to the site is the Ashton Canal which is located approximately 1.4 km north-north-east of the site.

4.4.2 The canals are identified in the SFRA as not generally posing a direct flood risk as they are a controlled water body. Therefore, the residual risk of canal flooding is usually associated with lower probability events such as overtopping and/or the breaching of embankments.

4.4.3 Given the above information, it is considered that there is very low risk of canal flooding to the site.

4.5 Groundwater Flooding

4.5.1 The Phase 1 Desk Study provides BGS Groundwater potential flood mapping which confirms that generally the sites have a potential for groundwater flooding for properties set below the ground level. Towards the north of the site, there is a potential for groundwater flooding to occur at the surface.

4.5.2 The Phase 2 Site Investigation monitored water levels within the boreholes and window samples. The water depths are indicated within Table 5 below:

Table 5 – Groundwater Noted During Site Investigation

Borehole Ref.	Monitored Water Levels		
	Installation Strata	Depth (m bgl)	Depth (m AOD)
CP1	CLAY	7.58 – 9.30	45.30 – 47.02
WS1	MADE GROUND and Clay	DRY (>1.50)	<50.40
WS2	CLAY	**	**
WS3	CLAY	2.72 – DRY (>4.00)	<49.50 – 50.78
WS4	CLAY	3.55 – DRY (>3.70)	<51.50 – 51.65
WS5	CLAY	DRY (>2.80)	<53.60

**** Unable to remove bung to monitor groundwater levels.**

4.5.3 As the highest monitored ground water level is 2.72m deep (WS3), it is considered that there is very low risk of groundwater flooding to the site.

4.6 Public Sewers or Highway Drainage Flooding (Infrastructure Failure)

4.6.1 There are no highway drains recorded within the site.

4.6.2 There are public sewers recorded within the development site.

4.6.3 United Utilities and Manchester City Council have not provided any records of flooding to the site or the vicinity.

- 4.6.4 Providing United Utilities and Manchester City Council maintain their drainage assets within and in the vicinity of the site, the risk of flooding to the proposed development site from public sewers or highway drainage is considered as low.

4.7 Surface Water Flooding to the Site

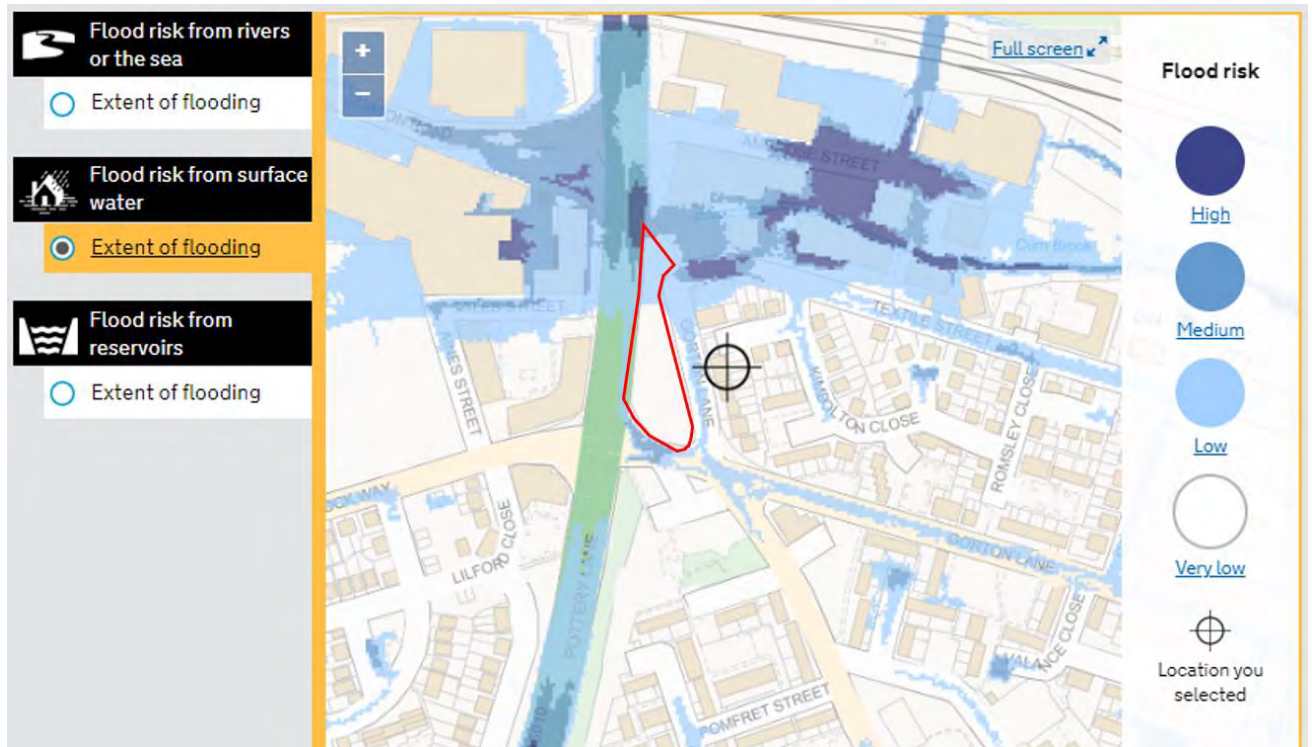
- 4.7.1 Surface water flooding can be caused when rainwater during extreme rainfall events does not drain away through the normal drainage system or soak into the ground with flooding occurring, principally from manholes and gullies. Surcharging sewers can result in overland flows which if originating at a higher elevation than a development site can potentially pose a flood risk.

- 4.7.2 From the UK Government's Flood Risk from Surface Water (extent of flooding) map;

- Where a site is located in a dark blue shaded zone, this indicates that the site is at high risk of flooding, where flooding occurs as a result of rainfall with a greater than 1 in 30 (3.3%) chance in any given year.
- Where a site is located in a mid-blue shaded zone, this indicates that the site is at medium risk of flooding, where flooding occurs as a result of rainfall of between 1 in 100 (1%) and 1 in 30 (3.3%) chance in any given year.
- Where a site is located in a light blue shaded zone, this indicates that the site is at low risk of flooding, where flooding occurs as a result of rainfall of between 1 in 1000 (0.1%) and 1 in 100 (1%) chance in any given year.
- Where a site is located in a clear (unshaded) area; this indicates that the site is at very low risk of flooding, where flooding occurs as a result of rainfall with less than 1 in 1000 (0.1%) chance in any given year.

- 4.7.3 The extent of flooding to the site from surface water is indicated in Figure 5 and it can be seen that the majority of the site is identified as being at 'very low' risk of flooding from surface water. However, there are regions of 'low risk' within Gorton Lane highway and within the northern area of The site.

Figure 5: Risk of Flooding from Surface Water - Extent of Flooding



4.7.4 Considering the above information, the risk of surface water flooding to the site is generally considered very low, with localised regions considered to be at low risk. As such, mitigation measures are proposed in Section 5 in order to account for the low risk of surface water flooding to the site.

4.8 Surface Water Flooding from the Site

- 4.8.1 Developers are responsible for ensuring that new development does not increase the flood risk elsewhere. Where new development is proposed, the proposed surface water drainage network shall be designed to not flood for the critical 1 in 30-year storm event and flood water generated up to the critical 1 in 100-year plus climate change storm event shall be constrained within areas on site so as not to cause damage to buildings, essential services or adjoining developments and services.
- 4.8.2 The development has the potential to increase flood risk where additional run-off from proposed roads, paved areas and building roofs are discharged freely into the downstream drainage network. It is therefore encouraged to propose permeable areas, landscaping areas and incorporate sustainable drainage features utilising infiltration or attenuation where possible.
- 4.8.3 An assessment of the proposed surface flows is carried out within the drainage strategy within section 6 of this report.

4.9 Historical Flooding

4.9.1 United Utilities and Manchester City Council have not provided any records of flooding to the site or the vicinity.

4.10 Summary of Flood Risk

4.10.1 From the evidence collated and subsequent negotiations the main types of flooding that may apply to the proposed development site are as follows:

- Fluvial flooding to the site
- Reservoir Flooding
- Surface water flooding to the site
- Surface water flooding from the site

5.0 Mitigation

5.1 Fluvial Flood Mitigation

- 5.1.1 The development site lies within Flood Zone 2, and therefore there is a medium risk of flooding as a result of a Fluvial flooding.

Flood Levels

- 5.1.2 The flood levels have been taken from the Corn Brook Study (2017) and the levels and map obtained from the Environment Agency are enclosed in *Appendix E*.

Map Ref	Node Reference	1 in 1000 Year	1 in 100 Year	1 in 100 Year + cc
		Flood Zone 2	Flood Zone 3a	Flood Zone 3a +cc
4	Ea013_Model_CORN02_00065	53.180*	50.570	50.700

**1 in 1000 Year Level data was not provided in the 2017 study results. Therefore, the level from the 2009 study, which was previously provided, has been used.*

Property Floor Levels

- 5.1.3 Floor levels should be raised above the predicted maximum flood level and where possible a minimum of 600mm above the predicted 1% flood level (including the Higher Central climate change allowance noted in 4.2). Floor levels are therefore proposed to be set a minimum of 51.410m with the majority of the plots far in excess of this level.
- 5.1.4 The six dwelling houses in the northern area of the site are not sufficiently raised above the 0.1% flood level and would therefore be considered at medium risk of fluvial flooding. The remaining six properties are set in excess of this level (53.180).
- 5.1.5 Refer to the future flood mapping extents drawing enclosed within *Appendix F*.

Flood Compensation

- 5.1.6 As the site is located within Flood Zone 2, flood compensation works are not necessary.

Flood Resilience

- 5.1.7 Although floor levels are set at the predicted 1% plus climate change flood level, flood resilient construction should be considered to mitigate any future flood risk and provide extra protection for the proposed development for the seven properties which are below the predicted 0.1% flood level.

Measures are not compulsory; however, materials should be considered according to its resilience properties which may limit any future permanent damage should flood levels exceed predicted levels (for example a 0.1% event).

5.2 Reservoir Flood Mitigation

- 5.2.1 Manchester City Council is responsible for coordinating emergency plans for reservoir flooding and ensuring communities are well prepared. The building occupiers should have an emergency procedure in the unlikely event that the reservoir fails. This would include considering where you would go to safety and be ready to follow the advice of emergency services.
- 5.2.2 Providing maintenance is carried out by United Utilities, the risk from reservoir flooding would therefore be considered low risk.

5.3 Surface Water Flooding to the site Mitigation

- 5.3.1 The UK Government Long Term Flood Risk Assessment surface water flood maps indicate that the site is at very low risk to low of surface water flooding. However, the site topography is likely to be partially reprofiled as part of the development proposals. Therefore, measures outlined in this section are recommended in order to ensure that the risk of surface water flooding to the post-development site shall not be increased and shall be reduced where possible.
- 5.3.2 The surface water flood maps do not identify any surface water entering the site from outside of the site boundary. It is recommended that these levels should be maintained, in order that the surface water flood risk to the site shall not be increased. It is assumed that the surface water drainage outside of the site boundary will be subject to the relevant landowner's regular drainage maintenance schedule.
- 5.3.3 It is recommended that proposed external ground levels across the site should fall away from the proposed buildings in a manner which does not create low points where water might collect unintentionally. This will ensure that any surface water will not flow towards the proposed buildings. The proposed surface water drainage network shall be designed to accommodate flows generated from within the site.
- 5.3.4 Providing the above measures are implemented the flooding risk to the development site from surface water is therefore considered low post development.
- 5.3.5 A detailed assessment of the proposed surface flows is carried out within the drainage strategy within section 6 of this report.

5.4 Surface Water Flooding from the site Mitigation

- 5.4.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event and flood water generated

from up to the critical 1 in 100-year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments & services.

- 5.4.2 In February 2016, the Environment Agency released updated climate change allowances for peak rainfall intensities which should be applied to new developments. Table 6 demonstrates the climate change allowances with central and upper end allowances being considered.
- 5.4.3 Based on the nature of the development, a lifespan in excess of 60 years is anticipated. Therefore, the potential climate change allowance for 2070-2115 ranges between 20% for the central allowance and 40% for the upper end allowance. As such, an allowance of 40% for climate change on peak rainfall intensity will be included in calculations.

Table 6: (Extract Environment Agency Guidance) Peak Rainfall Intensity Allowance in small and urban catchments

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

- 5.4.4 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration.
- 5.4.5 Section 6 reviews the surface water discharge options, and it is proposed (in accordance with United Utilities Pre-Development Enquiry response) that the surface water will outfall into the public combined sewers within and adjacent to the site (subject to a Section 106 Agreement with United Utilities) via new connections at a maximum pass forward rate at greenfield run-off rates.
- 5.4.6 To minimise localised flooding within the site, the drainage design should ensure that gullies, drainage channels and drains are all suitably sized to accommodate peak storm flows. Also, all inlet features should have suitably sized sumps to catch silts and should be subject to a documented routine maintenance and cleansing regime.
- 5.4.7 Flood water exceedance routes should be identified, both on and off site. A copy of the flood exceedance plan is enclosed within Appendix H
- 5.4.8 For any sustainable drainage systems employed in the development, an appropriate management and maintenance plan for the sustainable drainage system for the lifetime of the development should be submitted which should include:

- Any arrangements for adoption by an appropriate public body or statutory undertaker, management and maintenance by a Residents' Management Company
- Arrangements concerning appropriate funding mechanisms for its on-going maintenance of all elements of the sustainable drainage system (i.e. inspections, regular maintenance)
- Means of access for maintenance and easements where applicable

5.4.9 Assuming that the proposed drainage system is designed to provide adequate capacity, and that the private and adopted sewers will be maintained by their adopted authority, it can be assumed risk of flood from blockage or overloading is minimal.

5.4.10 The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Manchester City Council and United Utilities.

6.0 Drainage Strategy

6.1 Existing Drainage

- 6.1.1 The public sewer records have been obtained for the development site. The public sewer records indicate that the following public sewers are located within the development sites:

Public Sewers	Requirements
A 300mm public combined sewer is located within the northern half of the site. The sewer flows from the west side of Pottery Lane towards Gorton lane in an easterly direction where it connects to an 825mm public sewer.	Existing sewers within the development to maintain a 3m easement to allow United Utilities access.
A 900mm public combined sewer is located within the southern half of the site. The sewer flows from Gorton Lane in a south-westerly direction towards Wenlock Way. There is an existing Lamphole 'LH' along the 900mm sewer within the site boundary.	Existing sewers within the development to maintain a 3m easement either side of the centreline of the sewer.

- 6.1.2 A CCTV Drainage Survey has been completed for the site and indicates that the existing drainage generally follows the public sewer records.
- The 300mm combined sewer within the northern half of the site has been surveyed. The sewer is approximate 5.94m deep. There are three junction connections onto the public sewer within the site however it is not clear if they are redundant connections from historical development.
 - The 900mm combined sewer within the southern half of the site has been surveyed from UU manhole UUMH2004, to the western site boundary. A trial pit was excavated in order to confirm the location and depth of the sewer. The sewer is approximately 5.7m to the crown of the sewer.
- 6.1.3 The 225mm Highway Drain recorded on the sewer map was not surveyed due to limited access to chambers within Gorton Lane.
- 6.1.4 It is considered that no further CCTV works are required.

6.2 Proposed Foul Water Drainage

- 6.2.1 A separate foul and surface water system is proposed.
- 6.2.2 The proposed foul drainage is to be collected by gravity and outfall into the existing combined public sewer within the development site via two outfalls:
- Outfall 1 connects to the 300mm diameter combined sewer in the north of the site.
 - Outfall 2 connects to the 900mm diameter combined sewer in the south of the site.
- 6.2.3 The peak flow rate for the development has been calculated based on Sewers for Adoption 7th Edition, assuming 4000 l/d/d (litres per dwelling per day). The peak foul discharges are therefore estimated as:
- Outfall 1: 2.2 l/s based on 8 dwellings.
 - Outfall 2: 1.1 l/s based on 4 dwellings.
- 6.2.4 United Utilities have confirmed in a previous pre-development enquiry response that foul water flows from the development can be accommodated within the public combined sewer within the vicinity of the site and can be connect at convenient locations. This advice is now out of date, and further correspondence has been sent to UU to confirm this is still valid. No response has been received at the time of writing of this report.
- 6.2.5 Refer to the United Utilities correspondence enclosed in *Appendix G*.
- 6.2.6 The proposed drainage is to remain private, and connection to the public sewer network will be subject to a Section 106 Agreement with United Utilities.
- 6.2.7 The proposed drainage strategy is enclosed in *Appendix H*.

6.3 Proposed Surface Water Drainage

- 6.3.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event and flood water generated for up to the critical 1 in 100-year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services.
- 6.3.2 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration.

Infiltration

- 6.3.3 The Phase 2 Site Investigation shows that the ground within the site is made up of clays to a depth greater than 5m deep. Therefore, it is not considered that discharge via infiltration is not viable.

Watercourse

- 6.3.4 The Corn Brook is located approximately 10m north of the site. No further watercourses are recorded in the vicinity of the site.
- 6.3.5 Options for connecting the proposed site drainage to the watercourse. All of the options involved the laying of drainage both within public highway and third-party land.
- 6.3.6 The public highway in which the drainage would need to be constructed, is Pottery Lane (A6010), which is a dual carriageway. Any works within this highway would create major traffic management implications, and it is considered unlikely that this would be approved.
- 6.3.7 Further complications include clashes with existing services within the highway, and also the loss of some trees within the park area.
- 6.3.8 Therefore, it is considered that discharge to watercourse is not viable.

Surface Water Sewer

- 6.3.9 There are no surface water sewers within the vicinity of the sites.

Combined Water sewer

- 6.3.10 There are various combined sewers within and in the vicinity of the sites. Connection to these sewers would be subject to confirmation of acceptable flows from United Utilities and will be on the basis that a discharge option higher up the standard hierarchy of drainage solutions is not viable.

6.3.11 Table 7 summarises the options for surface water disposal.

Table 7: Surface Water Disposal

Surface Water Disposal	Potential	Description
Infiltration	X	Based on the site investigation, the ground conditions are unsuitable for infiltration SuDS.
Watercourse	X	The Corn Brook is located approximately 10m north of the site. However, a new connection to the river is not considered a viable option as it would have to pass under public highway and numerous third-party lands.
Surface Water Public Sewer	X	There are no surface water sewers within the vicinity of the sites.
Combined Public Sewer	✓	There are various combined water sewers within and in the vicinity of the sites. Connection to the sewers is therefore considered the most viable option at this stage.

6.3.12 It is therefore considered at this stage that connections to the combined public sewer system will be proposed.

Surface Water

6.3.13 The proposed surface water drainage is to be collected by gravity and outfall into the existing 900mm diameter combined public sewer within the site, adjacent to the western boundary.

6.3.14 It is currently proposed that a single outfall is proposed, however this will be subject to co-ordination during detailed design.

6.3.15 The site appears to not have been previously developed. The existing site is therefore assumed to be greenfield.

6.3.16 There are two methods for calculating the Greenfield run-off rate; the IH124 method and the ICP method. The IH124 method calculates the peak Greenfield run-off flow rates by correlation of the Soil Index Value, the Average Annual Rainfall and the Site Area (SOIL, SAAR and AREA). The IH124 Method should be used for sites in excess of 50 hectares and the resulting discharge is linearly interpolated for the required area. The ICP method uses the IH124 method and automatically

interpolates the discharge for sites less than 50 hectares and therefore this is the method that has been used.

6.3.17 The Greenfield flow rate has been calculated as follows:

Figure 6: Greenfield Run-off Rate

Curtins Consulting Ltd		Page 1																								
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Date 27/01/2021 22:06	Designed by losty_a																									
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<u>ICP SUDS Mean Annual Flood</u> Input <table><tr><td>Return Period (years)</td><td>1</td><td>Soil</td><td>0.450</td></tr><tr><td>Area (ha)</td><td>0.317</td><td>Urban</td><td>0.000</td></tr><tr><td>SAAR (mm)</td><td>852</td><td>Region Number</td><td>Region 10</td></tr></table> Results 1/s <table><tr><td>QBAR Rural</td><td>1.8</td></tr><tr><td>QBAR Urban</td><td>1.8</td></tr><tr><td>Q1 year</td><td>1.5</td></tr><tr><td>Q1 year</td><td>1.5</td></tr><tr><td>Q30 years</td><td>3.0</td></tr><tr><td>Q100 years</td><td>3.6</td></tr></table>			Return Period (years)	1	Soil	0.450	Area (ha)	0.317	Urban	0.000	SAAR (mm)	852	Region Number	Region 10	QBAR Rural	1.8	QBAR Urban	1.8	Q1 year	1.5	Q1 year	1.5	Q30 years	3.0	Q100 years	3.6
Return Period (years)	1	Soil	0.450																							
Area (ha)	0.317	Urban	0.000																							
SAAR (mm)	852	Region Number	Region 10																							
QBAR Rural	1.8																									
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Q1 year	1.5																									
Q1 year	1.5																									
Q30 years	3.0																									
Q100 years	3.6																									

- 6.3.18 1.8 l/s for the 1 in 1-year event, 3.0 l/s for the 1 in 30-year event and 3.6 l/s for the 1 in 100-year event.
- 6.3.19 Attenuation is provided by a incorporated cellular storage tanks and utilised landscaping for additional storage which will be utilised for any rainfall events up to the 100 year +40% cc event.
- 6.3.20 The proposed drainage strategy, and the Microdrainage calculations are enclosed in *Appendix H*.
- 6.3.21 Surface water run-off from hard paved areas at risk of contamination should receive water quality treatment. Commercial delivery/service access is considered medium hazard in terms of contamination. Figure 7 illustrates the pollution hazard indices for different land use classifications from The CIRIA SuDS Manual C753 (2015).

Figure 7: Pollution Hazard indices for land use classification (Table 26.2 the CIRIA SuDS manual 2015)

TABLE 26.2	Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons	
Residential roofs	Very low	0.2	0.2	0.05	
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05	
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4	
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7	
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²	

6.3.22 Figure 8 illustrates the SuDS Component mitigation indices from The CIRIA SuDS Manual C753 (2015).

Figure 8: Indicative SuDS mitigation indices (Table 26.3 the CIRIA SuDS manual 2015)

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters				
Type of SuDS component	Mitigation indices¹			
	TSS	Metals	Hydrocarbons	
Filter strip	0.4	0.4	0.5	
Filter drain	0.4 ²	0.4	0.4	
Swale	0.5	0.6	0.6	
Bioretention system	0.8	0.8	0.8	
Permeable pavement	0.7	0.6	0.7	
Detention basin	0.5	0.5	0.6	
Pond ⁴	0.7 ³	0.7	0.5	
Wetland	0.8 ³	0.8	0.8	
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.			

Notes

- 1 SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.
- 2 Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be taken into account in the design and Maintenance Plan.
- 3 Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.
- 4 Where a wetland is not specifically designed to provide significantly enhanced treatment, it should be considered as having the same mitigation indices as a pond.
- 5 See **Chapter 14** for approaches to demonstrate product performance. A British Water/Environment Agency assessment code of practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: <http://tinyurl.com/qf7yuj7>
- 6 SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. SEPA (2014) also provides a flowchart with a summary of checks on suitability of a proprietary system.

6.3.23 The selection of treatment should ensure that the SuDS mitigation component index (Figure 9) exceeds the pollution hazard index (Figure 8).

6.3.24 There is no viable option to provide permeable paving within the car park area, due to the presence of high voltage cables and the UU sewer, with easements, passing through the site, where the car park is proposed. The car parking area is small, it is considered that catchpits provide sufficient treatment for this area.

6.3.25 As the private driveways are small and spread out, there is no permeable paving proposed for these areas. The driveways are drained via linear drainage channels, which include silt boxes and trapped outfalls.

6.3.26 The proposals for pollution protection should be agreed with Manchester City Council.

- 6.3.27 The proposed drainage is to remain private, and the connection to the public sewer network will be subject to a Section 106 Agreement with United Utilities.
- 6.3.28 The proposed drainage strategy is enclosed in *Appendix H*.
- 6.3.29 The final design of the drainage networks shall be in accordance with the legislation set by the Manchester City Council and United Utilities.

7.0 Maintenance

- 7.1.1 This section is intended to give an overview of the operation and maintenance for the drainage features included with the drainage strategy and in relation to typical details. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.
- 7.1.2 The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operation and then adjusted to suit the site requirements.

7.2 Components

- 7.2.1 The following components have been included within the drainage design for the proposed development:
- Inspection, Manhole and Catchpit Chambers
 - Pipes
 - Gullies
 - Attenuation Tank
 - Flow Control Unit
- 7.2.2 The maintenance strategy should be implemented to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.
- 7.2.3 The maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.
- 7.2.4 Maintenance of the drainage network will be the responsibility of an on-site facilities management team.
- 7.2.5 It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.
- 7.2.6 Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.
- 7.2.7 Long-term management practices include monthly sweeping of external paved areas. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilised during storm events and transported to the drainage system.
- 7.2.8 During the winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris or litter

- 7.2.9 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the filter drains and the upstream/downstream chambers.

7.3 Inspection, Manhole and Catchpit Chambers

- 7.3.1 Access points have been located at the head of each run, at a change in direction and at a change of pipe size in accordance with Building Regulations Part H.
- 7.3.2 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access.

7.4 Pipes

- 7.4.1 Pipes are proprietary products and the materials can vary across the site and as such where used the manufacture's recommendations should be followed. Regardless of the product used the pipes will be fully compliant with the Curtins drainage specification.
- 7.4.2 Pipes are intended to be the main conveyance across the development and where oversized they form the attenuation volume required by the limitation of the discharge rate. They are intended to be dry except for during rainfall events. These have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.
- 7.4.3 Access for maintenance is provided through access chambers and manholes.

- 7.4.4 Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be drainage correctly thus exposing the development to a greater level of flood risk.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Initial Inspection should be provided as post construction CCTV survey.	N/A
Regular maintenance\ inspection	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
	Check and remove large vegetation growth near pipe runs.	Monthly or as required
Remedial Action	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

7.5 Gullies

- 7.5.1 Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.
- 7.5.2 Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating.
- 7.5.3 Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the car park channels.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Initial Inspection.	Half yearly and after large storms.
Regular maintenance\ inspection	Litter and debris removal	Monthly or as required.
	Check and remove large vegetation growth near gully gratings.	Monthly or as required
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action. Inspect silt accumulation rates and establish appropriate brushing frequencies. Silt can also be caused by adjacent landscaping areas which should be reprofiled to provide a flat	3-monthly, 48 hours after large storms.

	area or berm adjacent to the paving.	
Remedial Action	Inspect sumps and outlet pipes and rod through poorly performing channels and outlets as initial remediation.	As required.

7.6 Attenuation Tanks

- 7.6.1 The attenuation tanks are currently specified as geocellular units, which are wrapped in a geotextile blanket and are intended for storage of surface water run-off from the site up to and including the 1 in 100 year plus 40% climate change event to reduce the rate of run-off into the downstream network and to minimise flood risk.
- 7.6.2 The geocellular units and geotextile are proprietary products and therefore manufacturer's recommendations should also be taken into consideration.
- 7.6.3 Access for maintenance should be provided by an access shaft located on the tank and from the manhole chambers downstream of the tank.
- 7.6.4 Regular inspection and maintenance is important for the effective operation of attenuation tanks as designed. As the feature is buried, a regular inspection regime is very important to ensure the correction functionality of the surface water drainage network.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets, outlets and overflows for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance\ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.

	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	Remove sediment from pre-treatment structures.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets, outlets and overflows.	As required.

7.7 Flow Control Units

7.7.1 The flow control units are intended for flood control and flow restriction.

7.7.2 The flow control is specified as Hydro-brake and is a proprietary product; therefore, manufacturer's recommendations should also be taken into consideration.

7.7.3 Access for maintenance has been provided by locating within manhole chambers.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance\ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly

Proposed Site at Gorton Lane, Manchester

Flood Risk Assessment and Drainage Strategy



	Remove sediment from pre-treatment structures and flow control chambers.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets.	As required.

Appendix A

Site Layout



KEY

- 3 BED 4 PERSON HOUSE
- 4 BED 6 PERSON HOUSE
- PAVING TO PRIVATE EXTERNAL AREAS
- RESIDENTS' PARKING COURT
- DENSE PLANTING
- PRIVATE GARDEN
- SITE BOUNDARY
- NEW TREE
- EXISTING TREE

PROPOSED SITE LEVELS INDICATED IN RED

EXISTING SITE LEVELS INDICATED IN BLUE

PRELIMINARY ISSUE

One Manchester
Gorton Lane, Manchester

SITE 1 - LAYOUT GROUND

Scale 1:250 @ A1
1405 DWG: L0107
Sep2020
REV P04



OMIArchitects

Appendix B

United Utilities Public Sewer Records

Extract from Map of Public Sewers

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.

The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded.

United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown.

United Utilities Water Limited 2014
The plan is based upon the Ordnance Survey Map with the sanction of the Controller of H.M. Stationery Office. Crown and United Utilities copyrights are reserved. Unauthorised reproduction will infringe these copyrights.

LEGEND

	Water Course
	Overflow Pipe
	Sludge Main
	Highway Drain
	Combined
	Surface Water
	Foul
	Abandoned
	Public Sewer
	Private Sewer
	Section 104
	Rising Main

Pottery Lane and Gorton Lane
Gorton
Manchester
M12 5DF

Printed By : Property Searches Date: 10/10/2016

DO NOT SCALE
Approximate Scale: 1:2500

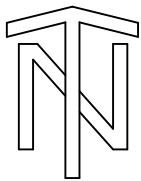
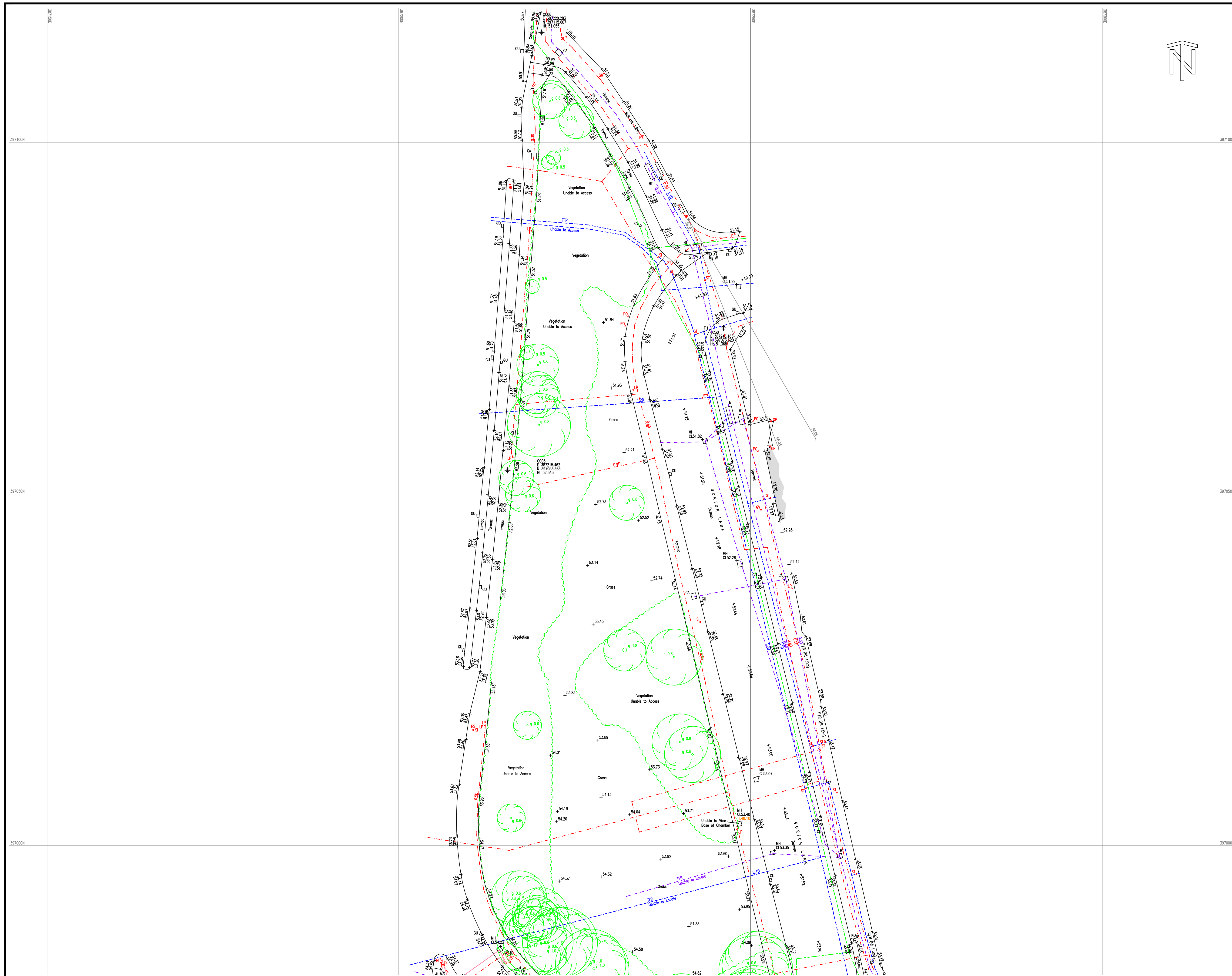
United Utilities
helping life flow smoothly

Appendix C

CCTV Drainage Survey

Topographical Survey

Borehole Records



NOTES

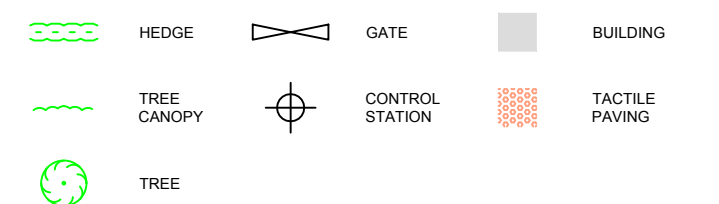
KEY

Grid & Datum - Local Plane Grid related to OS National Grid & Datum
By GNSS RTK Observations

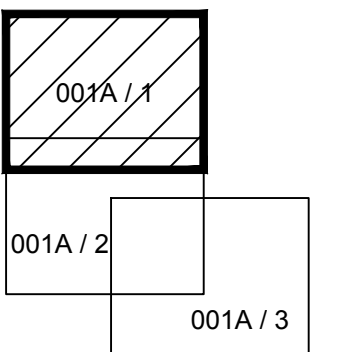
STANDARD ABBREVIATIONS

[illegible]

SYMBOLS



SHEET LAYOUT



UNDERGROUND SERVICE KEY

	SURFACE WATER		FOUL WATER
	ELECTRIC		GAS
	UNKNOWN		TELECOM CABLE
	WATER		TRAFFIC CONTROL
(AR) = ASSUMED ROUTE		(SW) = SURFACE WATER	
D = DEPTH (M)		TFR = TAKEN FROM RECORDS	
EOT = END OF TRACE		UTL = UNABLE TO LIFT	
(FW) = FOUL WATER		UTS = UNABLE TO SURVEY	

NOTE

N D Oliver & Co Ltd does not accept liability for the accuracy or completeness of the information provided

A	10.01.18	TB/BW	Services & Extra Trees Added	AM	NDO
Rev	Date	Drawn	Description	Ch'kd	App'd



Jupiter House, 21 Roebuck Lane, Sale, Manchester, M33 7SY
T: 0161 973 3495 F: 0161 962 6819
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Client

OMI ARCHITECTS
31 BLACKFRIARS ROAD
MANCHESTER
M3 7AQ

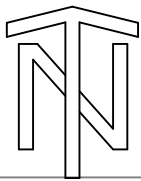
Title

GORTON LANE
GORTON
MANCHESTER
TOPOGRAPHICAL SURVEY
SHEET 1 OF 3

Surveyed	JW	Drawn	BW	Drawn Date:
Checked	AM	Approved	NDO	19/12/2017
Scale 1:250 @ A1		Project 9612 CAD File UNDO-569 Project6612CRAWING29612_001A.DWG		Status REV
Drawing No 9612 / 001A / 1		Rev A		

9612 / 001A / 2

new



NOTES

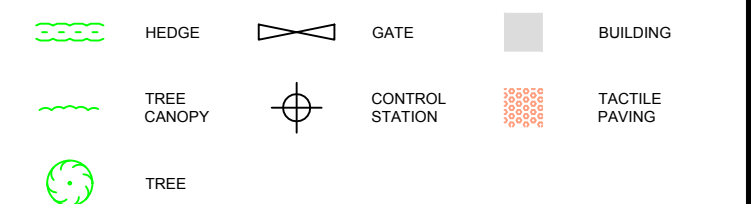
KEY

Grid & Datum - Local Plane Grid related to OS National Grid & Datum
By GNSS RTK Observations

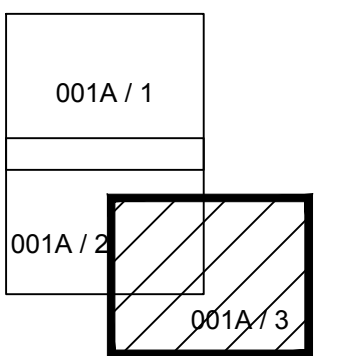
STANDARD ABBREVIATIONS

[illegible]

SYMBOLS



SHEET LAYOUT



UNDERGROUND SERVICE KEY

	SURFACE WATER		FOUL WATER
	ELECTRIC		GAS
	UNKNOWN		TELECOM CABLE
	WATER		TRAFFIC CONTROL
(AR) – ASSUMED ROUTE		(SW) – SURFACE WATER	
D – DEPTH (M)		TFR – TAKEN FROM RECORDS	
EOT – END OF TRACE		UTL – UNABLE TO LIFT	
(FW) – FOUL WATER		UTS – UNABLE TO SURVEY	

NOTE

N D Oliver & Co Ltd does not accept liability for the accuracy or completeness of the information provided

N D Oliver & Co Ltd does not accept liability for the accuracy or completeness of the information provided

A	10.01.18	TB/BW	Services & Extra Trees Added	AM	NDO
Rev	Date	Drawn	Description	Ch'kd	App'd



Jupiter House, 21 Roebuck Lane, Sale, Manchester, M33 7SY
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Client

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M3 7AQ

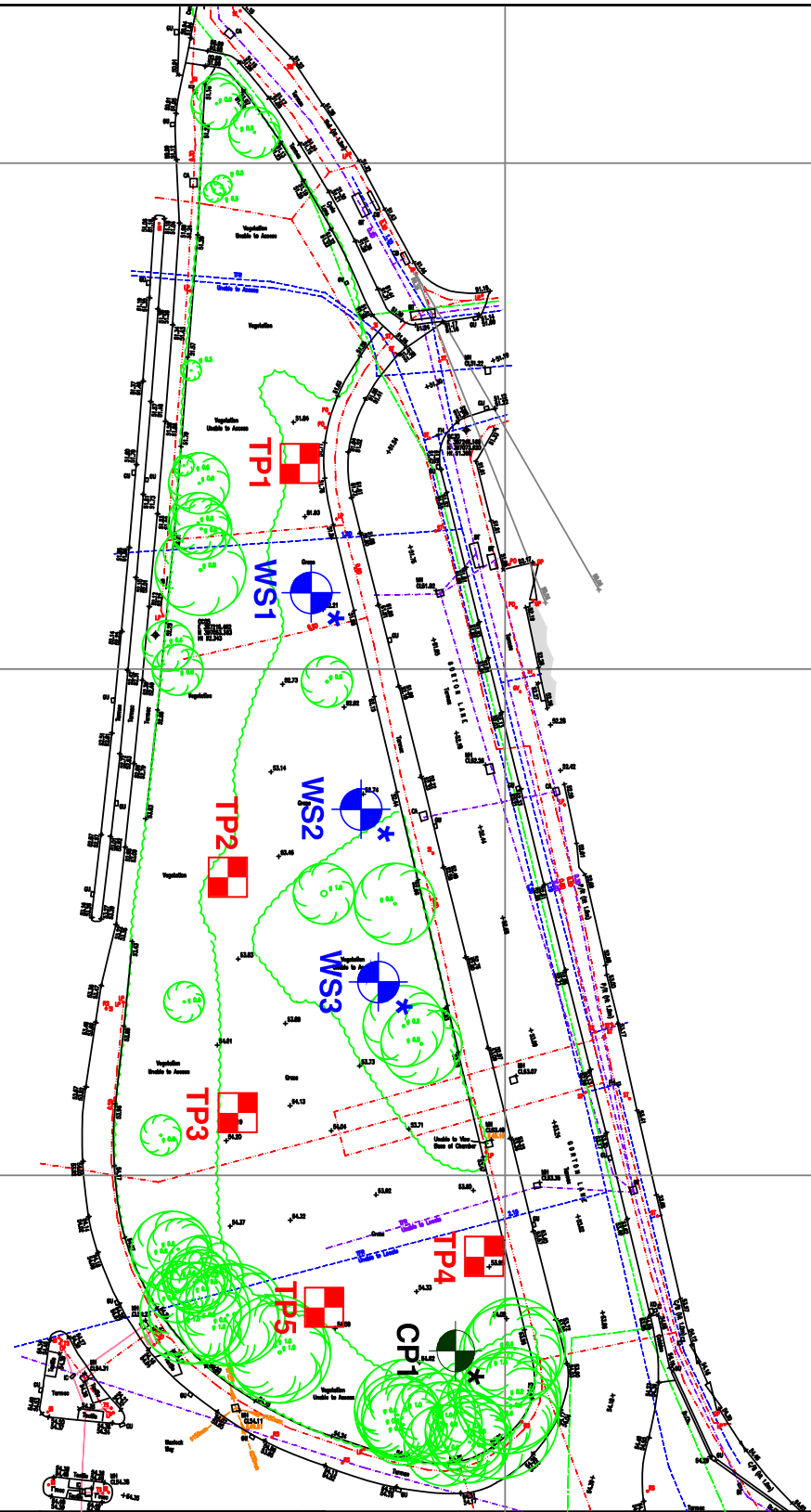
Title

GORTON LANE
GORTON
MANCHESTER

TOPOGRAPHICAL SURVEY
SHEET 3 OF 3

Surveyed	JW	Drawn	BW	Drawn Date:
Checked	AM	Approved	NDO	19/12/2017
Scale 1:250 @ A1		Project 9612		Status
		CAD File \\NDO-S&B\Project\6612\DRAWINGS\9612_001A.DWG		REV
Drawing No		9612 / 001A / 3		Rev A

- **Machine Excavated Trial Pit**
- **Window Sample Borehole Location**
- **Cable Percussive Borehole Location**
- **Denotes borehole is installed**



Curtins Consulting Ltd
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
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www.curtins.com
Structures - Civils - Environmental - Infrastructure - Transportation Planning - Sustainability - Expert Advisory Services
Birmingham - Bristol - Cardiff - Douglas - Edinburgh - Kenton - Leeds - Liverpool - London - Manchester - Nottingham

Status:
Project:
Gorton Lane

Dwg Title:
Site 1 Exploratory Hole Location Plan

Scale:	Size:	First Issue:	Drawn:	Checked:
NTS	A3	20/06/18	JB	JJ
Dwg No:	068244-CUR-00-XX-DR-GE-001-V01			
	Rev: /			



Curtins
Merchant Exchange
17-19 Whitworth Street West
Manchester
M1 5WG

Borehole Log

Borehole No.

CP1

Sheet 1 of 2

Project Name: Gorton Lane

Project No.
B068244.000

Co-ords: -

Hole Type
CP

Location: Manchester

Level: 54.60

Scale
1:40

Client: One Manchester

Dates: 04/06/2018 - 04/06/2018

Logged By
JB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30 - 0.40	ES		0.20 0.25 0.40	54.40 54.35 54.20		Grass over MADE GROUND of dark brown, very gravelly, sandy CLAY. Gravel is angular to sub-rounded, fine to medium of coal, brick, concrete, asphalt and various lithologies.	
								ASPHALT.	
		1.20		N=19 (3,3/4,5,5,5)	1.00	53.60		MADE GROUND of dark brown, very gravelly, fine to coarse SAND. Gravel is angular to sub-angular, fine to coarse of brick, asphalt, concrete, coal, glass and various lithologies.	1
		2.00		N=23 (7,6/4,6,6,7)				MADE GROUND of brown with grey mottling, gravelly, sandy CLAY. Gravel is sub-angular to sub-rounded of various lithologies, brick, concrete and coal.	
		3.00		N=20 (2,2/4,5,5,6)				Stiff, brown with grey, gravelly, slightly sandy CLAY. Gravel is sub-angular to sub-rounded, fine to medium of various lithologies including coal, sandstone and mudstone.	2
		3.40 - 3.60	D						
		4.00		N=38 (4,4/7,8,11,12)	4.00	50.60		Very stiff, brown, very sandy, very gravelly CLAY with rare cobbles. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies including coal, mudstone, sandstone, quartzite.	4
		5.00		N=29 (3,5/6,7,8,8)					5
		6.00 - 6.45	U						6
		7.20		N=50 (5,6/50 for 245mm)					7
								Continued on next sheet	8

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater not encountered. Elevations are estimated from topographic survey.





Curtins
Merchant Exchange
17-19 Whitworth Street West
Manchester
M1 5WG

Borehole Log

Borehole No.

CP1

Sheet 2 of 2

Project Name: Gorton Lane

Project No.
B068244.000

Co-ords: -

Hole Type
CP

Location: Manchester

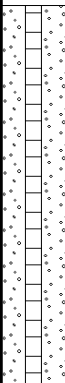
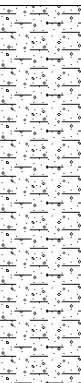
Level: 54.60

Scale
1:40

Client: One Manchester

Dates: 04/06/2018 - 04/06/2018

Logged By
JB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		8.50		N=50 (5,11/50 for 270mm)					9
		10.00		50 (25 for 70mm/50 for 35mm)	10.00	44.60		End of borehole at 10.00 m	10
									11
									12
									13
									14
									15
									16

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater not encountered. Elevations are estimated from topographic survey.





Curtins
Merchant Exchange
17-19 Whitworth Street West
Manchester
M1 5WG

Borehole Log

Borehole No.

WS1

Sheet 1 of 1

Project Name: Gorton Lane

Project No.
B068244.000

Co-ords: -

Hole Type
WS

Location: Manchester

Level: 51.90

Scale
1:40

Client: One Manchester

Dates: 05/06/2018 - 05/06/2018

Logged By
JB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.20	51.70		Grass over MADE GROUND of dark brown, sandy, silty CLAY with frequent rootlets and rare gravel of sandstone, brick and coal.	
		0.40			0.40	51.50		MADE GROUND of dark brown, slightly clayey, fine to coarse SAND and angular to sub-angular, fine to coarse GRAVEL of brick, concrete, clay pipe, coal, slate and clinker.	
		1.20	N=12 (2,2/3,3,3,3)		1.30	50.60		MADE GROUND of black, fine to coarse SAND and angular to sub-angular, fine to coarse GRAVEL of ash, clinker, coal, brick, glass, slate, sandstone and concrete (ASH FILL).	
		2.00						Stiff, greyish-brown with grey mottling, sandy, slightly gravelly CLAY. Gravel is sub-angular to sub-rounded, fine to medium of various lithologies including coal, sandstone and mudstone.	
		3.00							
		3.50 - 4.00	D	N=31 (6,6/6,8,8,9)				Becomes very stiff.	
		4.00			4.20	47.70			
		5.00			5.00	46.90		Very stiff, brown, very sandy, slightly gravelly CLAY with rare cobbles. Gravel is sub-angular to rounded, fine to medium of various lithologies including sandstone, quartzite, mudstone and coal.	
				N=47 (10,10/10,10,10,10)				End of borehole at 5.00 m	
				N=40 (10,10/10,10,10,10)					
				N=47 (10,10/11,11,12,13)					

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater not encountered. Elevations are estimated from topographic survey.





Curtins
Merchant Exchange
17-19 Whitworth Street West
Manchester
M1 5WG

Borehole Log

Borehole No.

WS2

Sheet 1 of 1

Project Name: Gorton Lane

Project No.
B068244.000

Co-ords: -

Hole Type
WS

Location: Manchester

Level: 52.70

Scale
1:40

Client: One Manchester

Dates: 05/06/2018 - 05/06/2018

Logged By
JB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40			0.40	52.30		Grass over MADE GROUND of dark brown, sandy, silty CLAY with frequent rootlets. Gravel is angular to sub-rounded, fine to coarse of brick, slate, glass and ceramic.	
		1.00			1.00	51.70		Firm, brownish-grey with orange mottling, very sandy, silty CLAY with rare gravel of various lithologies including sandstone, quartzite, mudstone and coal.	1
		1.20		N=10 (2,2/3,3,2,2)				Firm, brown with grey, slightly gravelly, sandy CLAY. Gravel is sub-angular to sub-rounded, fine to medium of various lithologies including coal, sandstone, quartzite and mudstone.	
		2.00		N=19 (4,4/4,5,5,5)				<i>Becomes stiff.</i>	2
		3.00		N=21 (5,5/5,5,5,6)				<i>Becomes very stiff.</i>	3
		4.00		N=50 (7,9/50 for 275mm)				<i>Sandstone cobbles.</i>	4
		4.50 - 5.00	D		4.30	48.40		Very stiff, brown, very sandy, slightly gravelly CLAY with rare cobbles of sandstone. Gravel is sub-angular to sub-rounded, fine to medium of various lithologies including sandstone, mudstone, coal and quartzite.	
		5.00		50 (17,17/50 for 225mm)	5.00	47.70		End of borehole at 5.00 m	5
									6
									7
									8

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater not encountered. Elevations are estimated from topographic survey.





Curtins
Merchant Exchange
17-19 Whitworth Street West
Manchester
M1 5WG

Borehole Log

Borehole No.

WS3

Sheet 1 of 1

Project Name: Gorton Lane

Project No.
B068244.000

Co-ords: -

Hole Type
WS

Location: Manchester

Level: 53.50

Scale
1:40

Client: One Manchester

Dates: 05/06/2018 - 05/06/2018

Logged By
JB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40	53.10		Grass over MADE GROUND of dark brown, sandy, silty CLAY with frequent rootlets and fragments of slate, glass, brick, concrete and ceramic.	
					0.60	52.90		MADE GROUND of reddish-brown, sandy, angular to sub-angular, fine to coarse GRAVEL and COBBLES of brick.	
		1.20		N=15 (3,3/3,4,4,4)				Firm, brownish-grey with orange mottling, very sandy, silty CLAY with rare gravel of various lithologies including sandstone, quartzite, mudstone and coal.	1
		1.80 - 2.00	D					Becomes stiff and vertical blueish-grey silt lenses (desiccation cracks).	
		2.00		N=16 (4,4/4,4,4,4)				Rare cobbles.	2
		3.00		N=24 (5,5/6,6,6,6)				Very stiff, dark brown, very sandy, gravelly CLAY. Gravel is sub-angular to sub-rounded, fine to medium of various lithologies including sandstone, mudstone, coal and quartzite.	3
		4.00		N=28 (6,7/7,7,7,7)	4.20	49.30		Very stiff, dark brown, very sandy, gravelly CLAY. Gravel is sub-angular to sub-rounded, fine to medium of various lithologies including sandstone, mudstone, coal and quartzite.	4
		5.00		N=50 (10,15/15,15,15,5)	5.00	48.50		End of borehole at 5.00 m	5
									6
									7
									8

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater not encountered. Elevations are estimated from topographic survey.





Trialpit No

TP1

Sheet 1 of 1

Project Name:	Gorton Lane
---------------	-------------

Project No.	B068244.000
-------------	-------------

Co-ords:	-
Level:	51.90

Date
07/06/2018

Location: Manchester

Dimensions
(m):

Scale
1:25

Client: One Manchester

Depth
2.00

Logged
JB

[illegible]

Remarks:	Groundwater not encountered. Trial pit terminated at 2.00m bgl due to side walls collapsing. Elevations are estimated from topographic survey.
----------	--

Stability: Unstable - side wall collapse.



Appendix D

Environment Agency Flood Map for Planning

Flood map for planning

Your reference
Gorton Lane

Location (easting/northing)
387227/397063

Created
17 Aug 2018 8:32

Your selected location is in flood zone 2, an area with a medium probability of flooding.

This means:

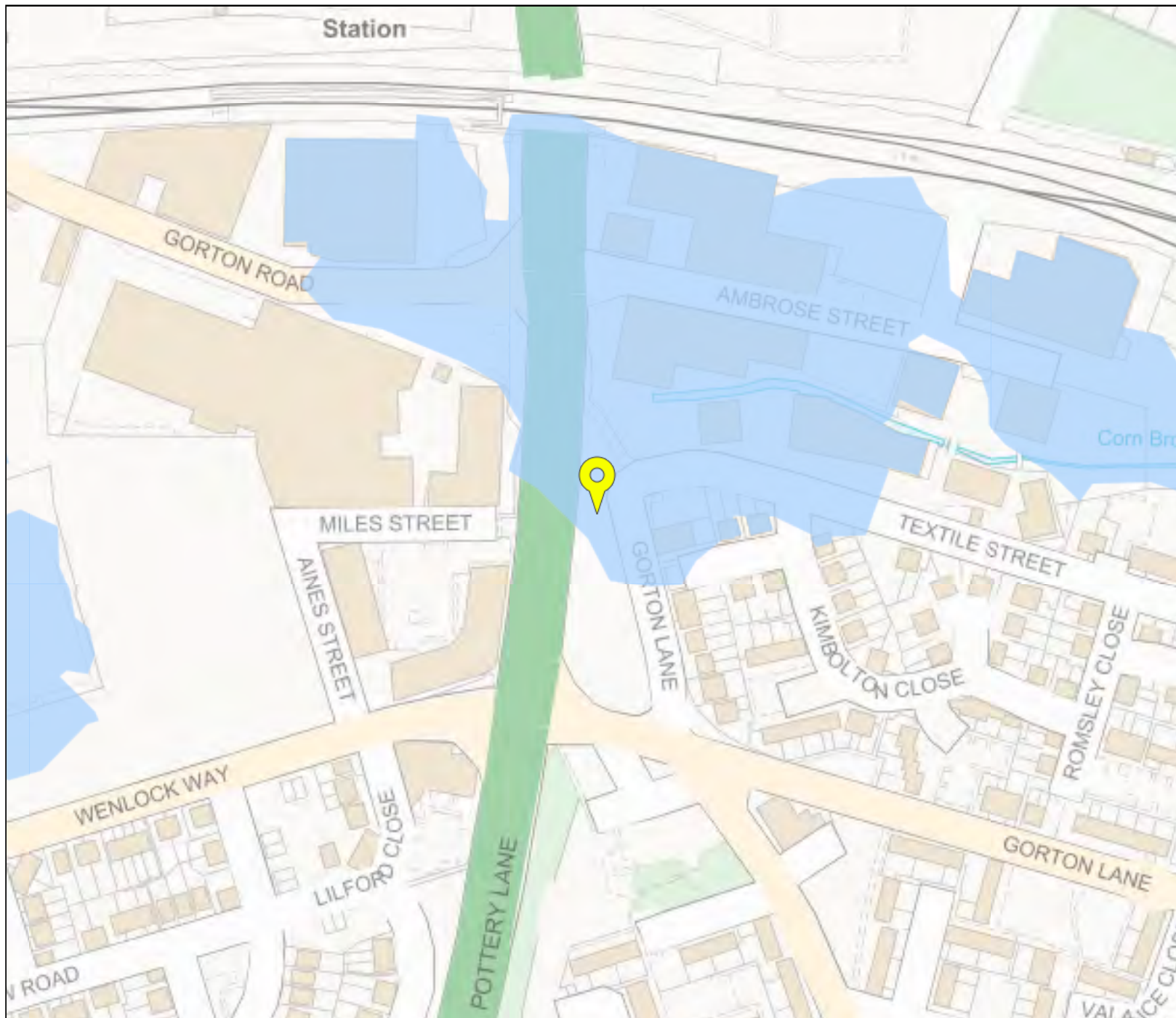
- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

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/>



Flood map for planning

Your reference

Gorton Lane

Location (easting/northing)

387227/397063

Scale

1:2500

Created

17 Aug 2018 8:32

-  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 20 40 60m

Appendix E

Environment Agency Flood Levels

Environment Agency Flood Map (nodes)

Environment Agency Area Guidance (climate change)

Detailed Flood Map centred on Gorton Lane, Manchester, M12 5DF. Created 03/01/2018 [GMMC71035AB]



1:10,001



Legend

-  Site Locations
-  Model_Measurements
-  Main River
-  Flood Zone 3
-  Flood Zone 2

Map Reference	Model Node Reference	Easting	Northing	Data	Undefended													
					20 % AEP (1 in 5 year)	10 % AEP (1 in 10 year)	5 % AEP (1 in 20 year)	4 % AEP (1 in 25 year)	3.33 % AEP (1 in 30 year)	2 % AEP (1 in 50 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 30% Increase Flow	1 % AEP (1 in 100 year) + 35% Increase Flow	1 % AEP (1 in 100 year) + 70% Increase Flow	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year) + 30% Increase Flow
1	ea013_0249_mill0218	387527	397084	Modelled Water Level (m aodN)	51.95	52.01	52.04	52.07	52.11	52.21	52.28	52.34	52.47	52.49	52.68	52.51	52.95	53.03
				Modelled Flow (cumecs)	1.01	1.26	1.43	1.59	1.80	2.38	2.93	3.38	4.50	4.68	6.51	4.90	10.12	12.37
2	ea013_0249_mill0106	387416	397088	Modelled Water Level (m aodN)	51.24	51.29	51.35	51.37	51.41	51.49	51.55	51.61	51.74	51.75	51.79	51.76	52.00	52.16
				Modelled Flow (cumecs)	1.01	1.26	1.49	1.61	1.86	2.36	2.60	3.29	4.76	4.93	5.14	5.12	7.21	8.49
3	ea013_0249_mill0066	387386	397096	Modelled Water Level (m aodN)	49.81	49.83	49.85	49.87	49.88	49.93	49.98	50.02	50.60	50.73	51.46	50.84	52.00	52.10
				Modelled Flow (cumecs)	1.01	1.26	1.47	1.59	1.76	2.26	2.59	2.83	3.92	4.11	7.15	4.15	10.80	13.13
4	ea013_0249_corn7640	387252	397116	Modelled Water Level (m aodN)	49.14	49.23	49.31	49.37	49.45	49.66	49.84	49.93	50.57	50.70		50.82		
				Modelled Flow (cumecs)	1.87	2.31	2.68	2.98	3.38	4.52	5.58	6.10	7.77	8.03		8.26		

Model data taken from Corn Brook 2017

AEP - Annual Exceedence 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/flood-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 flood risk assessment.

Map Reference	Model Node Reference	Easting	Northing	Data	Undefended									
					50 % AEP (1 in 2 year)	20 % AEP (1 in 5 year)	10 % AEP (1 in 10 year)	4 % AEP (1 in 25 year)	2 % AEP (1 in 50 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + Climate Change*	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)
1	ea013_Model_CORN02_00068	387527	397084	Modelled Water Level (m aodN)	52.32	52.37	52.40	52.44	52.50	52.72	52.90	53.43	53.35	55.65
				Modelled Flow (cumecs)	1.22	1.52	1.79	2.17	2.51	2.68	2.81	3.23	3.17	3.76
2	ea013_Model_CORN02_00070	387416	397088	Modelled Water Level (m aodN)	51.12	51.20	51.26	51.34	51.40	51.43	51.46	51.93	51.90	53.96
				Modelled Flow (cumecs)	1.22	1.52	1.79	2.17	2.48	2.65	2.78	3.17	3.12	3.15
3	ea013_Model_CORN02_00067	387386	397096	Modelled Water Level (m aodN)	50.10	50.16	50.21	50.29	50.37	50.53	50.78	51.56	51.56	53.21
				Modelled Flow (cumecs)	1.82	2.29	2.69	3.32	3.94	4.33	4.61	5.30	5.19	7.80
4	ea013_Model_CORN02_00065	387252	397116	Modelled Water Level (m aodN)	49.04	49.14	49.22	49.34	49.57	50.21	50.62	51.50	51.50	53.18
				Modelled Flow (cumecs)	2.72	3.38	3.96	4.87	5.73	6.45	6.92	8.13	7.89	11.39

Model data taken from Corn Brook 2009

AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

cumecs - cubic metres per second

Notes: *Climate Change Scenario - 20% increase in flow. We only hold climate change measurements based on the previous climate change guidance. The new climate change guidance is available at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>. The location of the site and the type (vulnerability) of development determine the climate change allowances to consider in any flood risk assessment. 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. For information on surface water flood risk we recommend that you contact the Lead Local Flood Authority, Manchester Metropolitan District, and for information on sewer flooding please contact United Utilities. There are no flood defences in the vicinity of the site.

Flood risk assessments: Climate change allowances

Application of the allowances and local considerations

Greater Manchester, Merseyside & Cheshire

1) The climate change allowances

The [National Planning Practice Guidance](#) refers planners, developers and advisors to the Environment Agency guidance on considering climate change in Flood Risk Assessments (FRAs). This guidance was updated in February 2016 and is available on [Gov.uk](#) and should be read in conjunction with this document. The guidance can be used for planning applications, local plans, neighbourhood plans and other projects. It provides climate change allowances for peak river flow, peak rainfall, sea level rise, wind speed and wave height. The guidance provides a range of allowances to assess fluvial flooding, rather than a single national allowance. It advises on what allowances to use for assessment based on vulnerability classification, flood zone and development lifetime.

2) Assessment of climate change impacts on fluvial flooding

Table A below indicates the level of technical assessment of climate change impacts on fluvial flooding appropriate for new developments depending on their scale and location. This should be used as **a guide only**. Ultimately, the agreed approach should be based on expert local knowledge of flood risk conditions, local sensitivities and other influences. **For these reasons we recommend that applicants and / or their consultants should contact the Environment Agency at the pre-planning application stage to confirm the assessment approach, on a case by case basis.** **Table A** defines three possible approaches to account for flood risk impacts due to climate change, in new development proposals:

- **Basic:** Developer can add an allowance to the 'design flood' (i.e. 1% annual probability) peak levels to account for potential climate change impacts. The allowance should be derived and agreed locally by Environment Agency teams.
- **Intermediate:** Developer can use existing modelled flood and flow data to construct a stage-discharge rating curve, which can be used to interpolate a flood level based on the required peak flow allowance to apply to the 'design flood' flow.
- **Detailed:** Perform detailed hydraulic modelling, through either re-running Environment Agency hydraulic models (if available) or construction of a new model by the developer.

Table A – Indicative guide to assessment approach

VULNERABILITY CLASSIFICATION	FLOOD ZONE	DEVELOPMENT TYPE		
		MINOR	SMALL-MAJOR	LARGE-MAJOR
ESSENTIAL INFRASTRUCTURE	Zone 2	Detailed		
	Zone 3a	Detailed		
	Zone 3b	Detailed		
HIGHLY VULNERABLE	Zone 2	Intermediate/ Basic	Intermediate/ Basic	Detailed
	Zone 3a	Not appropriate development		
	Zone 3b	Not appropriate development		
MORE VULNERABLE	Zone 2	Basic	Basic	Intermediate/ Basic
	Zone 3a	Basic	Detailed	Detailed
	Zone 3b	Not appropriate development		
LESS VULNERABLE	Zone 2	Basic	Basic	Intermediate/ Basic
	Zone 3a	Basic	Basic	Detailed
	Zone 3b	Not appropriate development		
WATER COMPATIBLE	Zone 2	None		
	Zone 3a	Intermediate/ Basic		
	Zone 3b	Detailed		

NOTES:

- Minor: 1-9 dwellings/ less than 0.5 ha | Office / light industrial under 1ha | General industrial under 1 ha | Retail under 1 ha | Gypsy/traveller site between 0 and 9 pitches
- Small-Major: 10 to 30 dwellings | Office / light industrial 1ha to 5ha | General industrial 1ha to 5ha | Retail over 1ha to 5ha | Gypsy/traveller site over 10 to 30 pitches
- Large-Major: 30+ dwellings | Office / light industrial 5ha+ | General industrial 5ha+ | Retail 5ha+ | Gypsy/traveller site over 30+ pitches | any other development that creates a non residential building or development over 1000 sq m.

The assessment approach should be agreed with the Environment Agency as part of pre-planning application discussions to avoid abortive work.

3) Specific local considerations

Where the Environment Agency and the applicant and / or their consultant has agreed that a 'basic' level of assessment is appropriate the figures in Table B below can be used as a precautionary allowance for potential climate change impacts on peak 'design' (i.e. 1% annual probability) fluvial flood level rather than undertaking detailed modelling.

Table B – Local precautionary allowances for potential climate change impacts

Watercourse	Central	Higher Central	Upper
All	0.15m	0.24m	0.48m

Use of these allowances will only be accepted after discussion with the Environment Agency.

4) Fluvial food risk mitigation

Read the guidance on [Gov.uk](https://www.gov.uk) to find out which allowances to use to **assess** the impact of climate change on flood risk.

For planning consultations where we are a statutory consultee and our [Flood risk standing advice](#) **does not** apply we use the following benchmarks to inform flood risk **mitigation** for different vulnerability classifications. **These are a guide only. We strongly recommend you contact us at the pre-planning application stage to confirm this on a case by case basis. Please note you may be charged for this advice.** For planning consultations where we are not a statutory consultee or our [Flood risk Standing advice](#) applies we recommend local planning authorities and developers use these benchmarks but we do not expect to be consulted.

- For development classed as '[Essential Infrastructure](#)' our benchmark for flood risk mitigation is for it to be designed to the '**upper end**' climate change allowance for the epoch that most closely represents the lifetime of the development, including decommissioning.
- For [highly vulnerable](#) in flood zone 2, the '**higher central**' climate change allowance is our minimum benchmark for flood risk mitigation. In sensitive locations it may be necessary to use the **upper end** allowance.
- For [more vulnerable developments](#) in flood zone 2, the '**central**' climate change allowance is our minimum benchmark for flood risk mitigation, and in flood zone 3 the '**higher central**' climate change allowance is our minimum benchmark for flood risk

mitigation. In sensitive locations it may be necessary to use the **higher central** (in flood zone 2) and the **upper end** allowance (in flood zone 3).

- For [water compatible](#) or [less vulnerable](#) development (e.g. commercial), the 'central' climate change allowance for the epoch that most closely represents the lifetime of the development is our minimum benchmark for flood risk mitigation. In sensitive locations it may be necessary to use the **higher central** (particularly in flood zone 3) to inform built in resilience.

There may be circumstances where local evidence supports the use of other data or allowances. Where you think this is the case we may want to check this data and how you propose to use it.

END.

Appendix F

Lead Local Flood Authority Correspondence

United Utilities Correspondence

Chloé Grimsley

From: z.todorovic@manchester.gov.uk on behalf of floodriskmanagement@manchester.gov.uk
Sent: 05 July 2018 15:33
To: Chloé Grimsley
Cc: floodriskmanagement@manchester.gov.uk
Subject: RE: Flood & Drainage Information Request - Gorton Lane / Bell Vue Street, Manchester
Attachments: Corn Brook - Rivers_Sea Map_Site Boundaries.jpg; GMMC71035AB_DFM.PDF; GMMC71035AB_P4.pdf; CCA - Area External Guidance v5.pdf; 67694-CUR-00-XX-DR-92001-P01_EXISTING SITE FLOOD EXTENTS.pdf; 67694-CUR-00-XX-DR-92002-P01_PROPOSED SITE FLOOD EXTENTS.pdf

Chloe

We agree with your proposal for FFLs.

Regards

Zorica

Flood Risk Management
Highways Service, Growth and Neighbourhoods Directorate
Manchester City Council
Tel: 0161 219 6295
Email: floodriskmanagement@manchester.gov.uk
Web: <http://www.manchester.gov.uk/>

POSTAL ADDRESS: Manchester City Council, Public Realm, The Neighbourhood Service, PO Box 532, Town Hall, Manchester M60 2LA

Chloé Grimsley <Chloe.Grimley@curtins.com> 28/06/2018 08:58	To	"floodriskmanagement@manchester.gov.uk" <floodriskmanagement@manchester.gov.uk>,
	cc	
	Subject	RE: Flood & Drainage Information Request - Gorton Lane / Bell Vue Street, Manchester

Good Morning Esther/Zorica,

Further to your previous correspondence with my colleague Terry (below) in relation to the sites at Gorton Lane (attached) we are now developing the proposals to prepare the Flood Risk Assessment to support the planning application.

With regards to site 1 (most northern) it appears to lie within Flood Zone 2, as a result of flooding from the Corn Brook. The Environment Agency will therefore not be consulted within this Zone therefore following receipt of the flood level data and the climate change allowances that should be applied to provide flood protection we have concluded the following:

The flood levels from the Corn Brook Study confirm the following flood levels adjacent to the site:

100 year = 50.620

100 year +20% = 51.500

1000 year = 53.180

The Environment Agency guidance within the attached email confirms that Small-Major More Vulnerable development can

utilise the basic assessment to apply the climate change allowances (Table A). The Central climate change allowance is the minimum benchmark from protection, which indicates that 0.15m should be included in addition to the 1% flood event.

We therefore assume that a minimum flood protection of floor levels at 50.770m is required. However, in accordance with Environment Agency guidance 600mm freeboard is normally required to the 1% +climate change level, therefore we have proposed that a minimum floor level of 52.100 is applied.

Please could you confirm if this is acceptable?

I have attached the proposed flood extents layout, at present one plot is shown at a level of 52.050, however we propose to raise this flood level to comply with the above.

If you require any further information, please let me know.

Kind Regards,
Chloé

Chloé Grimsley Principal Engineer

Curtins

T. 0161 236 2394 | chloe.grimsley@curtins.com

From: e.ainsworth@manchester.gov.uk [<mailto:e.ainsworth@manchester.gov.uk>] **On Behalf Of**
floodriskmanagement@manchester.gov.uk

Sent: 09 January 2018 14:09

To: Terry McCormick <Terry.McCormick@curtins.com>

Subject: Re: Flood & Drainage Information Request - Gorton Lane / Bell Vue Street, Manchester

Hi Terry,

Please see response in blue below:

- Any historic flooding information / data that you have for the sites

None

- Policies or recommendations for the use of SuDS for the developments

See attached guidance for developers

- Requirements for taking into account climate change

40% increase in rainfall

- Any requirements with regard to discharge of surface water into the watercourse (where this can be achieved)

Greenfield runoff rates if new connection or at least 50% in any existing brownfield runoff into the watercourse

- Any easements associated with Corn Brook within Site 1

8m easement

- Level of detail required to be included in the FRA / Outline Drainage Strategy with regards to infiltration potential / drainage design

See attached guidance for developers

- Any other relevant information relating to Flood Risk / Drainage for the site which would be useful in preparing a Detailed Drainage Design

None

- Identification of the 225mm surface water culvert shown on the public sewer map between Site 1 and Site 2 within Gorton Lane / Wenlock Way (i.e. is this a watercourse or highway drain?)

Highway Drain but connectivity unknown

Flood Risk Management
Highways Service, Corporate Core
Manchester City Council
Tel: 0161 219 6295
Email: floodriskmanagement@manchester.gov.uk
Web: <http://www.manchester.gov.uk/>

POSTAL ADDRESS: Manchester City Council, Public Realm, The Neighbourhood Service, PO Box 532, Town Hall, Manchester M60 2LA

Terry McCormick < Terry.McCormick@curtins.com > 22/12/2017 10:35		
	To:	" floodriskmanagement@manchester.gov.uk " < floodriskmanagement@manchester.gov.uk >
	cc:	Chloe Grimsley < Chloe.Grimsey@curtins.com >
	Subject:	Flood & Drainage Information Request - Gorton Lane / Bell Vue Street, Manchester

Dear Sir / Madam,

We are conducting a Drainage and Flood Risk Assessment for three sites, the results of which will inform a drainage strategy for the sites.

The nearest postcode to the site is M12 5DF, Grid Reference 387300, 396934

Site 1 is considered as Greenfield and lies partially in Flood Zone 2.

Site 2 appears to contain hardstanding and made ground, however it is likely to be treated as Greenfield.

A site location plan and preliminary site layout plan is attached.

A Drainage Constraints drawing is also attached, along with the public sewer map.

Online mapping suggests that there is risk of surface water flooding to Site 1, and in the vicinity of Site 2

Online mapping also shows that Site 2 is partially in Flood Zone 2, associated with Corn Brook. Corn Brook appears to flow directly adjacent to the northern tip of Site 1.

All three sites appear to be within the extents of reservoir flood risk.

The development is expected to comprise of:

- Construction of up to approximately 120 residential dwellings (TBC)
- Associated landscaping and parking

Information Requested from LLFA

Given the proximity to the nearby Corn Brook, and the associated Flood Zone 2 extents, please can you advise on the following:

- Any historic flooding information / data that you have for the sites
- Policies or recommendations for the use of SuDS for the developments

- Requirements for taking into account climate change
- Any requirements with regard to discharge of surface water into the watercourse (where this can be achieved)
- Any easements associated with Corn Brook within Site 1
- Level of detail required to be included in the FRA / Outline Drainage Strategy with regards to infiltration potential / drainage design
- Any other relevant information relating to Flood Risk / Drainage for the site which would be useful in preparing a Detailed Drainage Design
- Identification of the 225mm surface water culvert shown on the public sewer map between Site 1 and Site 2 within Gorton Lane / Wenlock Way (i.e. is this a watercourse or highway drain?)

Yours Faithfully,

Terry McCormick
Graduate Engineer
 T. 0161 236 2394
terry.mccormick@curtins.com



Merchant Exchange
 17-19 Whitworth Street West
 Manchester M1 5WG



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----- Message from GMMC Info Requests <Inforequests.gmmc@environment-agency.gov.uk> on Thu, 4 Jan 2018 09:41:20 +0000 -----

To:	Terry McCormick <Terry.McCormick@curtins.com>
Subject:	GMMC71035AB Response attached from the Environment Agency

Dear Terry,

Thank you for your enquiry which was received on 22/12/17.

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

I enclose the Product 4 data. We have no record of flooding affecting this 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 Metropolitan District 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/>

Please also note that all current EA flood risk strategy documents can be found on our external website <https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>.

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,

Anne Ball
Customer and Engagement Officer
Greater Manchester, Merseyside and Cheshire
Internal: 721 2937
External: 020 302 51232
Mobile: 07769285094
Email: Inforequests.gmmc@environment-agency.gov.uk

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Chloé Grimsley

From: Terry McCormick
Sent: 24 January 2018 11:37
To: Chloé Grimsley
Subject: FW: REPEAT 1: Wastewater Pre-Development Enquiry - Gorton Lane, Manchester - 4200019405

Hi Chloe,

FYI

I have saved the UU response here:

<\\mafs01\Projects\Unassigned Projects\Gorton Lane\United Utilities Pre-Dev Enquiry>

Regards,

Terry McCormick Graduate Engineer

Curtins

T. 0161 236 2394 | terry.mccormick@curtins.com

From: O'Brien, Neil [<mailto:Neil.O'Brien@uuplc.co.uk>]
Sent: 24 January 2018 11:12
To: Terry McCormick <Terry.McCormick@curtins.com>; Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: REPEAT 1: Wastewater Pre-Development Enquiry - Gorton Lane, Manchester - 4200019405

Dear Customer

Thank you for your email of 10/1/17 in relation to my initial Pre Development Enquiry response.

United Utilities would like to see the development drained accordance with the hierarchy of drainage options in the National Planning Practice Guidance and will request that a planning condition is impose to ensure compliance with the National Planning Practice Guidance. The condition is likely to state that no surface water shall discharge to the public combined sewerage system either directly or indirectly

United Utilities would not object to you exercising your right under the Water Industry Act to drain the surface water from the proposed buildings to the public combined sewer once they are constructed in accordance with the development's planning consent but will not allow highway run-off from this development to drain to the public sewer network

If you require any further guidance please follow <http://www.unitedutilities.com/builders-developers.aspx>

If you need a make further enquiry relating to this matter please send your enquiry to WastewaterDeveloperServices@uuplc.co.uk Please quote your reference number

Please Note:- enquiries sent to any other United Utilities e-mail address will be deleted

Please note, should you intend to enter into an adoption agreement with UU and although your proposal may comply with the principal strategy set out in the advice above, we do reserve the right to request changes to any future design proposals put forward for adoption, as we need to be sure that the proposals meet the requirements of Sewers for Adoption and UU Asset Standards. Any design proposals should take in to consideration long term operability whilst also offering cost effectiveness for the life of the assets. Where a developer would like to progress a Section 104 Agreement, it must be emphasised that any works

commenced on site on the basis of the Pre-Development Enquiry Advice without an approved S104 technical assessment will be at the Designers/ Developers own risk and may be subject to change. Please be aware that on site drainage must be designed in accordance with Building Regulations, National Planning Policy, Planning Conditions and local flood authority guidelines, we would recommend that you liaise and make suitable agreements with the relevant statutory bodies.

Regards,

Developer Services

From: Terry McCormick [<mailto:Terry.McCormick@curtins.com>]
Sent: 10 January 2018 14:49
To: O'Brien, Neil <Neil.O'Brien@uuplc.co.uk>; Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: RE: Wastewater Pre-Development Enquiry - Gorton Lane, Manchester - 4200019405

Dear Neil,

Thank you for your response.

With regards to the Surface Water, would United Utilities be able to accept Surface Water Discharge into the Public Combined Sewers adjacent to / running through the various sites?

Although there may be potential to discharge surface water from Site 1 to watercourse (pending further investigations), Site 2 do not appear to be within the vicinity of a watercourse.

Regards,

Terry McCormick Graduate Engineer
Curtins
T. 0161 236 2394 | terry.mccormick@curtins.com

From: O'Brien, Neil [<mailto:Neil.O'Brien@uuplc.co.uk>]
Sent: 10 January 2018 14:34
To: Terry McCormick <Terry.McCormick@curtins.com>; Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: RE: Wastewater Pre-Development Enquiry - Gorton Lane, Manchester - 4200019405

Please see UU's comments below in red

From: Terry McCormick [<mailto:Terry.McCormick@curtins.com>]
Sent: 22 December 2017 10:01
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: Wastewater Pre-Development Enquiry - Gorton Lane, Manchester

Dear Sir / Madam,

We are conducting an initial assessment of the drainage constraints for sites, the results of which will inform a drainage strategy for the sites.

Site 1 is considered as Greenfield and lies partially in Flood Zone 2.

Site 2 appears to contain hardstanding and made ground, however it is likely to be treated as Greenfield.

Please could you provide your initial advice on the sites, with particular detail on the following:

- Easements required on the 300mm and 900mm public combined sewers running through Site 1 - **No formal easement shown – 6.0m protection strip (3.0m either side of centre line of sewer) under H4 of Building Regulations needs to be provided**
- Easements, and clarification of the nature of the 225mm public 'foul' sewer adjacent to the south of Site 2 **No formal easement shown on the foul sewer – 6.0m protection strip (3.0m either side of centre line of sewer) under H4 of Building Regulations needs to be provided**
- Clarification of the nature of the 225mm culvert between Site 1 and Site 2 within Gorton Lane / Wenlock Way – **Shown to be Highway drain**
- Any 'no-build' zones or potential Sewer Diversion associated with the above sewers either on or adjacent to the site **6.0m protection strip (3.0m either side of centre line of sewer) under H4 of Building Regulations needs to be provided or diversion as necessary**

Initial advice on wastewater discharge locations and allowable rates from the sites. **Foul will be allowed to drain to the public combined/ foul sewer network at an unrestricted rate. The connection(s) to the public sewer can be at a point(s) convenient to yourself. Surface water from this site should drain to watercourse. Discharge rates and consents must be discussed and agreed with all interested parties**

Further details have been noted on the attached Wastewater Pre-Development Enquiry form.

Please also find attached a site location plan and preliminary site layout and development proposals.

Regards,

Terry McCormick
Graduate Engineer
T. 0161 236 2394
terry.mccormick@curtins.com

Merchant Exchange
17-19 Whitworth Street West
Manchester M1 5WG

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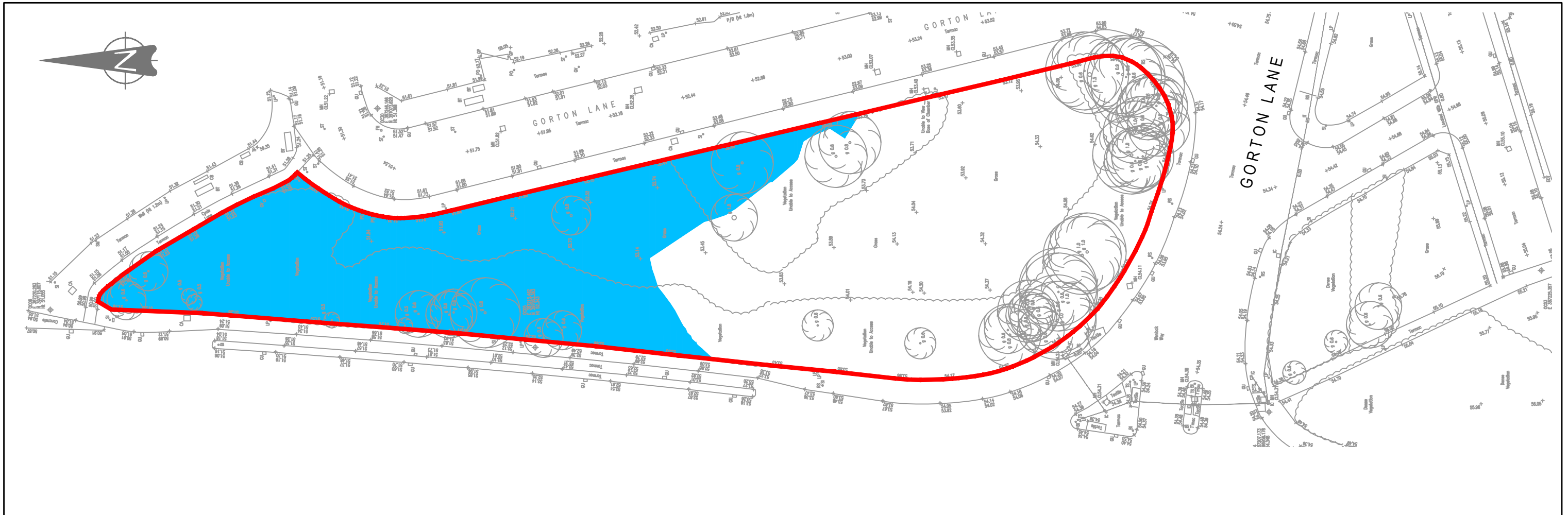
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Appendix G

Existing Flood Extents Overlay

Proposed Flood Extents Overlay



Map Reference	Model Node Reference	Easting	Northing	Data	Undeveloped													
					20 % AEP (1 in 5 year)	10 % AEP (1 in 10 year)	5 % AEP (1 in 20 year)	4 % AEP (1 in 25 year)	3.33 % AEP (1 in 30 year)	2 % AEP (1 in 50 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 30% Increase Flow	1 % AEP (1 in 100 year) + 35% Increase Flow	1 % AEP (1 in 100 year) + 70% Increase Flow	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 100 year) + 30% Increase Flow
	ea013_0249_mill0216	387527	397084	Modelled Water Level (m aodN)	51.95	52.01	52.04	52.07	52.11	52.21	52.28	52.34	52.47	52.49	52.68	52.51	52.95	53.03
				Modelled Flow (cumecs)	1.01	1.26	1.43	1.59	1.80	2.38	2.93	3.38	4.50	4.68	6.51	4.90	10.12	12.37
	ea013_0249_mill0108	387416	397088	Modelled Water Level (m aodN)	51.24	51.29	51.35	51.37	51.41	51.49	51.55	51.61	51.74	51.75	51.79	51.76	52.00	52.16
				Modelled Flow (cumecs)	1.01	1.26	1.49	1.61	1.86	2.38	2.60	3.29	4.76	4.93	5.14	5.12	7.21	9.48
	ea013_0249_mill0066	387386	397096	Modelled Water Level (m aodN)	49.81	49.83	49.85	49.87	49.88	49.93	49.98	50.02	50.60	50.73	51.46	50.84	52.00	52.10
				Modelled Flow (cumecs)	1.01	1.26	1.47	1.59	1.76	2.26	2.59	2.83	3.92	4.11	7.15	4.15	10.80	13.13
	ea013_0249_corn7640	387252	397116	Modelled Water Level (m aodN)	49.14	49.23	49.31	49.37	49.45	49.66	49.84	49.93	50.57	50.70		50.82		
				Modelled Flow (cumecs)	1.87	2.31	2.65	2.98	3.38	4.52	5.58	6.10	7.77	8.03		8.26		



FLOOD ZONES FOR PLANNING (RIVERS AND SEA)

- FLOOD ZONE 2
- FLOOD ZONE 1

1 IN 100 YEAR + CLIMATE CHANGE FLOOD LEVEL IS 50.700 AND INDICATES THE EXTENT OF FLOOD ZONE 3A.

1 IN 1000 YEAR FLOOD LEVEL IS 53.180 AND INDICATES THE EXTENT OF FLOOD ZONE 2 (1 IN 1000 YEAR LEVEL DATA WAS NOT PROVIDED IN

THE 2017 STUDY RESULTS. THEREFORE, THE LEVEL FROM THE 2009 STUDY, WHICH WAS PREVIOUSLY PROVIDED, HAS BEEN USED.



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Project: GORTON LANE		Status: PRELIMINARY	
Drg Title: FLOOD ZONE OVERLAY EXISTING SITE 1		Drawn By: ATL	Checked By: ATL
		Designed By: MW	Date: 28.01.21
		Scale: 1:500	
Project No:	Originator:	Zone:	Level:
		Type:	Discipline:
		Category / Number:	
		Rev:	
8790 - CUR - 00 - XX - DR - D - 92001 -P01			



Map Reference	Model Node Reference	Easting	Northing	Data	Undeveloped													
					20 % AEP (1 in 5 year)	10 % AEP (1 in 10 year)	5 % AEP (1 in 20 year)	4 % AEP (1 in 25 year)	3.33 % AEP (1 in 30 year)	2 % AEP (1 in 50 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year)	1 % AEP (1 in 100 year) + 30% Increase Flow	1 % AEP (1 in 100 year) + 35% Increase Flow	1 % AEP (1 in 100 year) + 70% Increase Flow	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)	0.1 % AEP (1 in 1000 year) + 30% Increase Flow
1	ea013_0249_mill0218	387527	397084	Modelled Water Level (m aodN)	51.95	52.01	52.04	52.07	52.11	52.21	52.28	52.34	52.47	52.49	52.68	52.51	52.95	53.03
				Modelled Flow (cumecs)	1.01	1.26	1.43	1.59	1.80	2.38	2.93	3.38	4.50	4.68	6.51	4.90	10.12	12.37
2	ea013_0249_mill0106	387416	397088	Modelled Water Level (m aodN)	51.24	51.29	51.33	51.37	51.41	51.49	51.55	51.61	51.74	51.75	51.79	51.76	52.00	52.16
				Modelled Flow (cumecs)	1.01	1.26	1.49	1.61	1.86	2.36	2.60	3.29	4.76	4.93	5.14	5.12	7.21	8.49
3	ea013_0249_mill0066	387386	397096	Modelled Water Level (m aodN)	49.81	49.83	49.85	49.87	49.88	49.93	49.98	50.02	50.60	50.73	51.46	50.64	52.00	52.10
				Modelled Flow (cumecs)	1.01	1.26	1.47	1.59	1.76	2.26	2.59	2.83	3.92	4.11	7.15	4.15	10.80	13.13
4	ea013_0249_corn7640	387252	397116	Modelled Water Level (m aodN)	49.14	49.23	49.31	49.37	49.45	49.66	49.64	49.93	50.57	50.70		50.82		
				Modelled Flow (cumecs)	1.67	2.31	2.68	2.98	3.38	4.52	5.88	6.10	7.77	8.08		8.26		



FLOOD ZONES FOR PLANNING (RIVERS AND SEA)

- FLOOD ZONE 2
- FLOOD ZONE 1

1 IN 100 YEAR + CLIMATE CHANGE FLOOD LEVEL IS 50.700 AND INDICATES THE EXTENT OF FLOOD ZONE 3A.

1 IN 1000 YEAR FLOOD LEVEL IS 53.180 AND INDICATES THE EXTENT OF FLOOD ZONE 2 (1 IN 1000 YEAR LEVEL DATA WAS NOT PROVIDED IN

THE 2017 STUDY RESULTS. THEREFORE, THE LEVEL FROM THE 2009 STUDY, WHICH WAS PREVIOUSLY PROVIDED, HAS BEEN USED.



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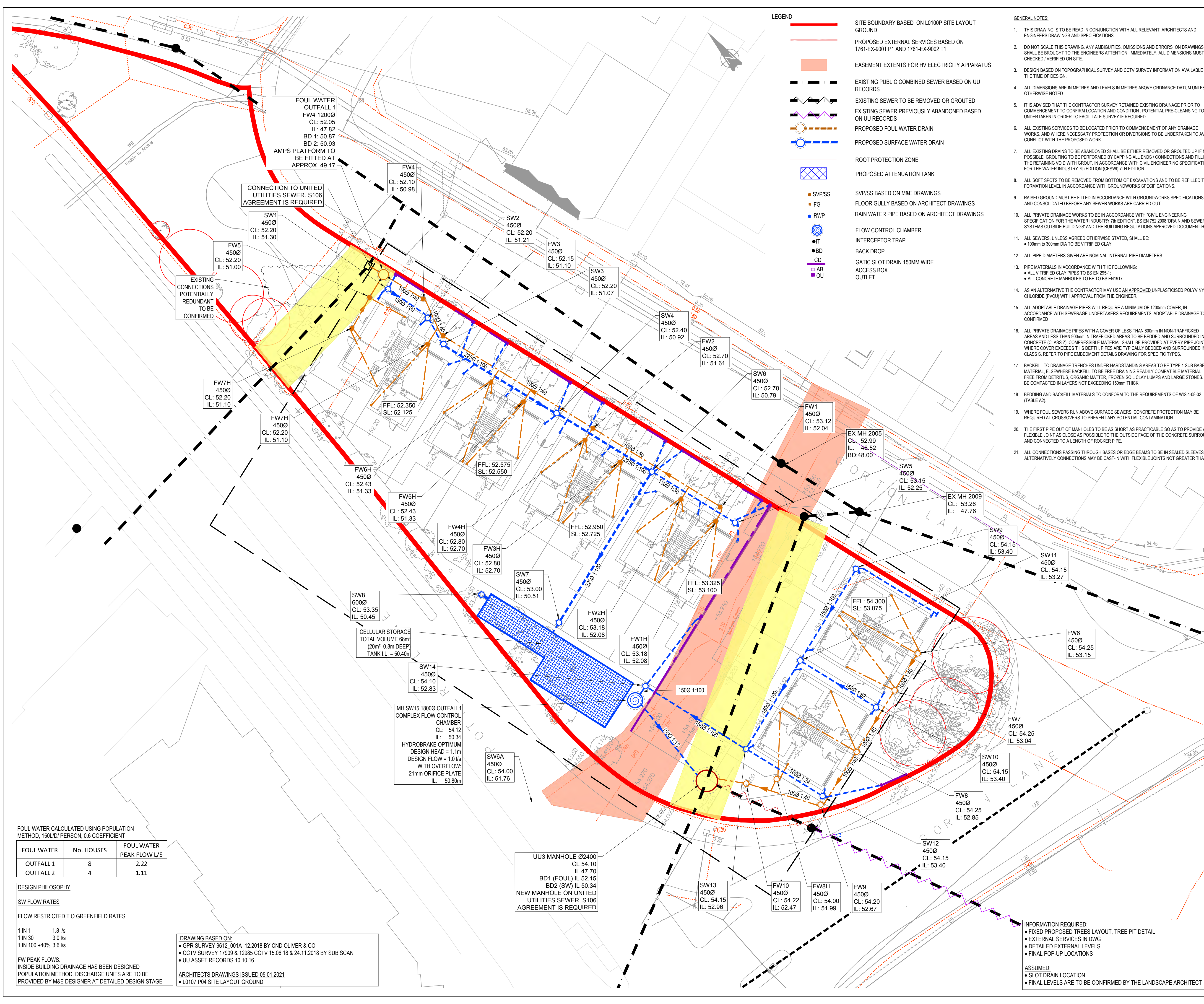
Project: GORTON LANE		Status: PRELIMINARY	
Drg Title: FLOOD ZONE OVERLAY PROPOSED SITE 1		Drawn By: ATL	Checked By: ATL
		Designed By: MW	Date: 28.01.21
		Scale: 1:500	
Project No:	Originator:	Zone:	Level:
	Type:	Discipline:	Category / Number:
8790	- CUR	- 00	- XX - DR - D - 92002 -P01

Appendix H

Proposed Drainage Strategy

Overland Flow Routes Plan

Microdrainage Calculations



LEGEND

- SITE BOUNDARY BASED ON L0100P SITE LAYOUT GROUND
- PROPOSED EXTERNAL SERVICES BASED ON 1761-EX-9001 P1 AND 1761-EX-9002 T1
- EASEMENT EXTENTS FOR HV ELECTRICITY APPARATUS
- EXISTING PUBLIC COMBINED SEWER BASED ON UU RECORDS
- EXISTING SEWER TO BE REMOVED OR GROUTED
- EXISTING SEWER PREVIOUSLY ABANDONED BASED ON UU RECORDS
- PROPOSED FOUL WATER DRAIN
- PROPOSED SURFACE WATER DRAIN
- ROOT PROTECTION ZONE
- PROPOSED ATTENUATION TANK

- SVP/SS BASED ON M&E DRAWINGS
- FLOOR GULLY BASED ON ARCHITECT DRAWINGS
- RAIN WATER PIPE BASED ON ARCHITECT DRAWINGS
- FLOW CONTROL CHAMBER
- INTERCEPTOR TRAP
- BACK DROP
- GATIC SLOT DRAIN 150MM WIDE
- ACCESS BOX
- OUTLET

- SVP/SS
- FG
- RWP
- IT
- BD
- CD
- AB
- OU

GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
- DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
- ALL DIMENSIONS ARE IN METRES AND LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE NOTED.
- IT IS ADVISED THAT THE CONTRACTOR SURVEY RETAINED EXISTING DRAINAGE PRIOR TO COMMENCEMENT TO CONFIRM LOCATION AND CONDITION. POTENTIAL PRE-CLEANING TO BE UNDERTAKEN IN ORDER TO FACILITATE SURVEY IF REQUIRED.
- ALL EXISTING SERVICES TO BE LOCATED PRIOR TO COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORK.
- ALL EXISTING DRAINS TO BE ABANDONED SHALL BE EITHER REMOVED OR GROUTED UP IF NOT POSSIBLE. GROUTING TO BE PERFORMED BY CAPPING ALL ENDS / CONNECTIONS AND FILLING THE RETAINING VOID WITH GROUT, IN ACCORDANCE WITH CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY 7th EDITION (CESW) 7TH EDITION.
- ALL SOFT SPOTS TO BE REMOVED FROM BOTTOM OF EXCAVATIONS AND TO BE REFILLED TO FORMATION LEVEL IN ACCORDANCE WITH GROUNDWORKS SPECIFICATIONS.
- RAISED GROUND MUST BE FILLED IN ACCORDANCE WITH GROUNDWORKS SPECIFICATIONS AND CONSOLIDATED BEFORE ANY SEWER WORKS ARE CARRIED OUT.
- ALL PRIVATE DRAINAGE WORKS TO BE IN ACCORDANCE WITH "CIVIL ENGINEERING SPECIFICATION FOR THE WATER INDUSTRY 7th EDITION", BS EN 752 2008 'DRAIN AND SEWER SYSTEMS OUTSIDE BUILDINGS' AND THE BUILDING REGULATIONS APPROVED DOCUMENT H.
- ALL SEWERS, UNLESS AGREED OTHERWISE STATED, SHALL BE:
 - 100mm to 300mm DIA TO BE VITRIFIED CLAY.
- ALL PIPE DIAMETERS GIVEN ARE NOMINAL INTERNAL PIPE DIAMETERS.
- PIPE MATERIALS IN ACCORDANCE WITH THE FOLLOWING:
 - ALL VITRIFIED CLAY PIPES TO BS EN 295-1.
 - ALL CONCRETE MANHOLES TO BE TO BS EN1917.
- AS AN ALTERNATIVE THE CONTRACTOR MAY USE AN APPROVED UNPLASTICISED POLYVINYL CHLORIDE (PVCU) WITH APPROVAL FROM THE ENGINEER.
- ALL ADAPTABLE DRAINAGE PIPES WILL REQUIRE A MINIMUM OF 1200mm COVER, IN ACCORDANCE WITH SEWERAGE UNDERTAKERS REQUIREMENTS. ADAPTABLE DRAINAGE TO BE CONFIRMED
- ALL PRIVATE DRAINAGE PIPES WITH A COVER OF LESS THAN 600mm IN NON-TRAFFICKED AREAS AND LESS THAN 900mm IN TRAFFICKED AREAS TO BE BEDDED AND SURROUNDED IN CONCRETE (CLASS Z), COMPRESSIBLE MATERIAL SHALL BE PROVIDED AT EVERY PIPE JOINT. WHERE COVER EXCEEDS THIS DEPTH, PIPES ARE TYPICALLY BEDDED AND SURROUNDED IN CLASS S. REFER TO PIPE EMBEDMENT DETAILS DRAWING FOR SPECIFIC TYPES.
- BACKFILL TO DRAINAGE TRENCHES UNDER HARSTANDING AREAS TO BE TYPE 1 SUB BASE MATERIAL, ELSEWHERE BACKFILL TO BE FREE DRAINING READILY COMPATIBLE MATERIAL. FREE FROM DETRITUS, ORGANIC MATTER, FROZEN SOIL, CLAY LUMPS AND LARGE STONES. TO BE COMPACTED IN LAYERS NOT EXCEEDING 150mm THICK.
- BEDDING AND BACKFILL MATERIALS TO CONFORM TO THE REQUIREMENTS OF WIS 4-08-02 (TABLE A2).
- WHERE FOUL SEWERS RUN ABOVE SURFACE SEWERS, CONCRETE PROTECTION MAY BE REQUIRED AT CROSSOVERS TO PREVENT ANY POTENTIAL CONTAMINATION.
- THE FIRST PIPE OUT OF MANHOLES TO BE AS SHORT AS PRACTICABLE SO AS TO PROVIDE A FLEXIBLE JOINT AS CLOSE AS POSSIBLE TO THE OUTSIDE FACE OF THE CONCRETE SURROUND AND CONNECTED TO A LENGTH OF ROCKER PIPE.
- ALL CONNECTIONS PASSING THROUGH BASES OR EDGE BEAMS TO BE IN SEALED SLEEVES. ALTERNATIVELY CONNECTIONS MAY BE CAST-IN WITH FLEXIBLE JOINTS NOT GREATER THAN

- 150MM FROM FACE OF CONCRETE.
- WHERE DRAINAGE PIPES ARE LESS THAN 300mm BELOW THE UNDERSIDE OF THE GROUND FLOOR SLAB, CONCRETE ENCASEMENT IS REQUIRED (CLASS Z), COMPRESSIBLE JOINTS ARE TO BE PROVIDED AT EVERY PIPE JOINT WITHIN THE CONCRETE.
- WHERE PIPES ARE MORE THAN 300mm BELOW THE UNDERSIDE OF THE SLAB, CLASS S BEDDING IS ACCEPTABLE.
- SEWER PIPES TO BE LAID IN MAXIMUM 3 METRE LENGTHS UNLESS THERE IS A SPECIFIC OPERATIONAL NEED TO LAY LONGER LENGTHS.
- PLASTIC CHANNEL SECTIONS WILL NOT BE PERMITTED WITHIN MANHOLE CHAMBERS. CLAYWARE CHANNELS SHALL BE USED WITHIN MANHOLES FOR PIPE SIZES UP TO AND INCLUDING 300mm DIAMETER.
- ALL NEW CONNECTIONS INTO EXISTING MANHOLES (OR INTO EXISTING SEWERS) TO BE 'SOFFITS' LEVEL UNLESS OTHERWISE NOTED.
- SULPHATE RESISTANT CEMENT (C20-DC2) AND PRECAST CONCRETE PRODUCTS MUST BE USED OR A LABORATORY REPORT PROVIDED TO PROVE THAT SUCH PRECAUTIONS ARE NOT REQUIRED.
- SEWERS MUST HAVE 5m CLEARANCE FROM TREES AND HEDGES OR TO HAVE SUITABLE ROOT PROTECTION IN ACCORDANCE WITH SFA REQUIREMENTS.
- THE CHAMBER SIZE OF MANHOLES WITH MORE THAN ONE CONNECTION IN THEM MAY NEED TO BE INCREASED TO ACCOMMODATE THE CONNECTIONS AND BENDS.
- ALL INTERNAL DRAINAGE CONNECTIONS ARE PROVIDED TO THE PENETRATION POSITIONS SHOWN ON ARCHITECT AND M&E DRAWINGS. REFER TO DIMENSIONED LOCATIONS ON ARCHITECT'S GROUND FLOOR SETTING-OUT PLANS.
- RAINWATER AND FOUL WATER POP UP LOCATIONS AND SIZES TO BE CONFIRMED BY ARCHITECT AND M&E ENGINEER.
- ALL UNDERGROUND FOUL DRAINAGE SHOULD BE SUITABLY VENTED AT OR NEAR TO THE HEAD OF RUNS.
- ALL ACCESS FITTINGS, STACKS, RWPS AND GULLIES TO BE RODDABLE. ALL TO HAVE LOW LEVEL RODDING ACCESS PLATES UNLESS AN ALTERNATIVE MEANS OF ACCESS IS AGREED. ACCESS POINT TO BE ABOVE ANY GROUND FLOOR CONNECTED APPLIANCE SPILL LEVEL.
- LARGE ACCESS FITTING REQUIRED ABOVE GROUND WHERE GREATER THAN 12M UP TO 22M TO A JUNCTION. SMALL ACCESS FITTING REQUIRED UP TO 12M TO A JUNCTION.
- ALL GULLY AND CHANNEL DRAIN OUTLETS AND TERMINATION POINTS TO BE TRAPPED AND RODDABLE. INTERNAL GULLIES AND CHANNEL DRAINS TO BE SPECIFIED BY OTHERS.
- ALL BRANCH CONNECTIONS TO BE MADE WITH SWEPT BENDS IN THE DIRECTION OF FLOW IN THE MAIN SEWER.
- ALL FOUL CONNECTIONS TO BE 1000 UNLESS NOTED OTHERWISE. WHERE NO WCS ARE CONNECTED UPSTREAM, UNDERSLAB FW DRAINAGE TO BE LAID AT 140 MIN. AFTER THE CONNECTION OF AT LEAST 1 No. WC, A MIN. FALL OF 1:80 APPLIES.
- ALL INTERNAL COVERS TO HAVE MECHANICALLY JOINTED CORNERS AND DOUBLE SEALED WITH RECESSED TRAY TO ALLOW FOR FINISHES.
- ALL MANHOLE COVERS IN BLOCKSLAB AND EXTERNAL PAVING AREAS TO HAVE RECESSED COVERS OF THE APPROPRIATE GRADE TO ACCEPT ARCHITECT'S PAVING PROPOSAL.
- UNLESS NOTED OTHERWISE IN THE MANHOLE SCHEDULE, ALL MANHOLE, GULLY AND CHANNEL COVERS (IRONWORK) SHOULD BE THE FOLLOWING SPECIFICATION:
 - B125 LOAD CLASS IN PEDESTRIAN AREAS
 - D400 LOAD CLASS IN VEHICULAR AREAS
- COVER LEVELS, GULLY POSITIONS, AND BUILDING LOCATION ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/LANDSCAPE ARCHITECT. CONTRACTOR TO ALLOW FOR ADJUSTMENT TO SUIT AGREED POSITIONS AND FINISHED LEVELS, AND CONFIRM ALL COVER LEVELS ON SITE.
- SLOPES SHOWN INDICATIVELY. CONTRACTOR SHOULD BUILD INVERT LEVELS SHOWN ON DRAWING
- OUTFALL CONNECTION(S) SUBJECT TO AGREEMENT WITH THE APPROVING AUTHORITY.
- THE CONTRACTOR SHALL COMPLY WITH THE FOLLOWING:
 - (I) ALL OPERATIONS SHOULD BE CARRIED OUT IN ACCORDANCE WITH THE GENERAL HEALTH AND SAFETY POLICY OF THE DEVELOPER AS REQUIRED BY SECTIONS 2 OF THE HEALTH AND SAFETY AT WORK ACT 1974 AND IN PARTICULAR THE CONSTRUCTION (GENERAL PROVISIONS) REGULATIONS.
 - (II) THE LOCAL AUTHORITY AND UTILITIES COMPANIES ARE TO BE NOTIFIED PRIOR TO COMMENCEMENT OF WORK ON SITE.
 - (III) PRIOR TO CONSTRUCTION THE ACTUAL POSITIONS AND DEPTHS OF SERVICES LIKELY TO BE AFFECTED BY THE WORKS SHOULD BE ESTABLISHED BY MEANS OF HAND DIG IN CLOSE LIAISON WITH THE UTILITY COMPANIES. THE CONTRACTOR SHALL IMMEDIATELY ADVISE THE ENGINEER OF ANY SERVICES EXPOSED WHICH MAY AFFECT THE DESIGN.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT PIPES ARE ADEQUATELY PROTECTED FROM CONCENTRATED LOADING BY CONSTRUCTION TRAFFIC DURING THE CONSTRUCTION PERIOD.
- THE CONTRACTOR SHALL ALLOW FOR THE PROTECTION, TEMPORARY AND PERMANENT SUPPORT, AND TEMPORARY AND PERMANENT DIVERSION WORKS, AS NECESSARY TO ALL EXISTING SERVICES.
- THE CONTRACTOR SHALL ALLOW FOR KEEPING TRENCHES AND EXCAVATIONS AS DRY AS PRACTICABLE BY PUMPING FROM TEMPORARY SUMPS AND DE-WATERING AS APPROPRIATE. THE POINT AND METHOD OF DISCHARGE TO BE AGREED WITH THE DRAINAGE AUTHORITY & LFA AND ENVIRONMENT AGENCY.
- IT IS ADVISED THAT DRAINAGE WORKS ARE TO BE CONSTRUCTED FROM THE OUTFALL TOWARDS THE HEAD OF RUN TO ENSURE THE OUTFALL CAN BE ACHIEVED.
- ALL DRAINS TO BE CCTV SURVEYED ON COMPLETION OF THE WORKS.

FOUL WATER CALCULATED USING POPULATION METHOD, 150L/D/ PERSON, 0.6 COEFFICIENT

FOUL WATER	No. HOUSES	FOUL WATER PEAK FLOW L/S
OUTFALL 1	8	2.22
OUTFALL 2	4	1.11

DESIGN PHILOSOPHY

SW FLOW RATES

FLOW RESTRICTED TO GREENFIELD RATES

1 IN 1 1.8 l/s
1 IN 30 3.0 l/s
1 IN 100 +40% 3.6 l/s

FW PEAK FLOWS:
INSIDE BUILDING DRAINAGE HAS BEEN DESIGNED
POPULATION METHOD. DISCHARGE UNITS ARE TO BE PROVIDED BY M&E DESIGNER AT DETAILED DESIGN STAGE

DRAWING BASED ON:
• GPR SURVEY 9612_001A 12.2018 BY CND OLIVER & CO
• CCTV SURVEY 17909 & 12985 CCTV 15.06.18 & 24.11.2018 BY SUB SCAN
• UU ASSET RECORDS 10.10.16

ARCHITECTS DRAWINGS ISSUED 05.01.2021
• L0107 P04 SITE LAYOUT GROUND

UU3 MANHOLE Ø2400
CL: 54.10
IL: 47.70
BD1 (FOUL) IL: 52.15
BD2 (SW) IL: 50.34
NEW MANHOLE ON UNITED UTILITIES SEWER, S106 AGREEMENT IS REQUIRED

P01 ISSUED FOR PLANNING 28.01.21 ATL MW

Rev:	Description:	Date:	By:	Chkd:

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Status: PRELIMINARY

Project: GORTON LANE, MANCHESTER

Orig Title: PROPOSED DRAINAGE STRATEGY

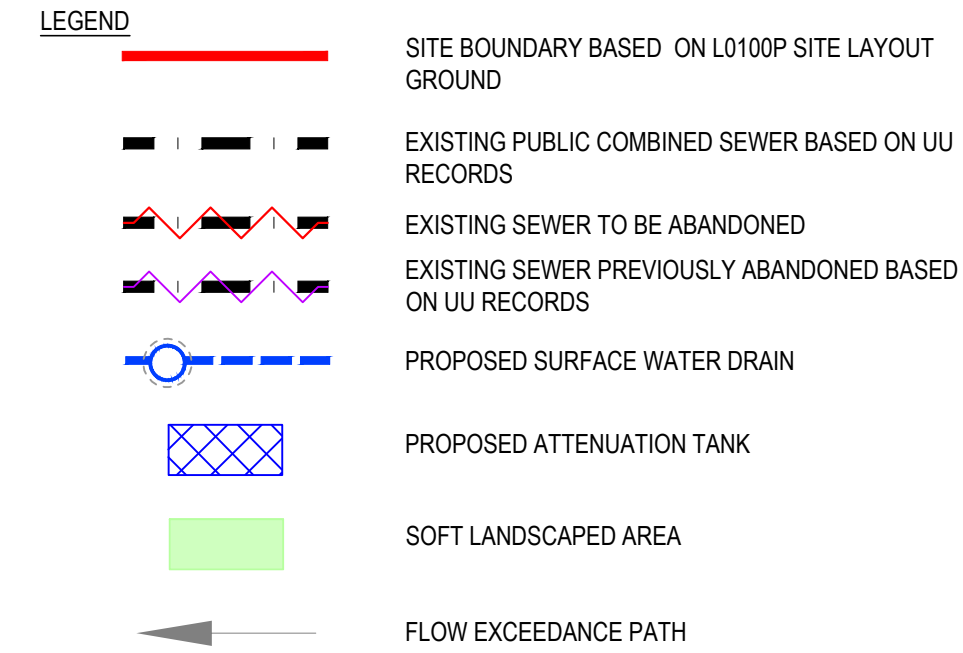
Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	28.01.21	ATL	ATL	MW

Scale: 1:200

Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category/Number:	Rev:
8790	CUR	01	XX	DR	D	92500	-P01

INFORMATION REQUIRED:
• FIXED PROPOSED TREES LAYOUT, TREE PIT DETAIL
• EXTERNAL SERVICES IN DWG
• DETAILED EXTERNAL LEVELS
• FINAL POP-UP LOCATIONS

ASSUMED:
• SLOT DRAIN LOCATION
• FINAL LEVELS ARE TO BE CONFIRMED BY THE LANDSCAPE ARCHITECT



- GENERAL NOTES:**
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
 2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
 3. PERMEABLE PAVEMENT IS NOT ADOPTABLE BY UU SURFACE WATER REQUIRES REDESIGNING IF OFFERED FOR ADOPTION.
 4. OVERSIZED PIPES/ATTENUATION TANK TO PROVIDE STORAGE FOR STORM EVENT FOR 1 IN 30. ADDITIONAL STORAGE TO BE PROVIDED FOR 1 IN 100 YEAR + 40% CC WHICH WILL REMAIN AS PRIVATE.
 5. ALL DRAINAGE WHICH IS OFFERED FOR ADOPTION SHOULD BE DESIGNED IN ACCORDANCE WITH UU STANDARDS AND SEWERS FOR ADOPTION 7th EDITION.
 6. WHERE THE PROPOSED DRAINS HAVE AN EASEMENT LESS THAN 3M A BUILD OVER AGREEMENT IS REQUIRED.
 7. ALL DRAINAGE OFFERED FOR ADOPTION SUBJECT TO UU APPROVAL.
 8. FLOW EXCEEDANCE OCCURRING WITHIN AREAS OF PERMEABLE PAVING IS EXPECTED TO BE RETAINED WITHIN THE PERMEABLE PAVING.
 9. FLOW EXCEEDANCE OCCURRING WITHIN AREAS OF SOFTSCAPE IS EXPECTED TO BE RETAINED WITHIN THE SOFTSCAPED AREAS.

DRAWING BASED ON:

- GPR SURVEY 9612_001A 12.2018 BY CND OLIVER & CO
- CCTV SURVEY 17909 & 12985 CCTV 15.06.18 & 24.11.2018 BY SUB SCAN
- UU ASSET RECORDS 10.10.16

ARCHITECTS DRAWINGS ISSUED 05.01.2021

- L0107 P04 SITE LAYOUT GROUND

P01	ISSUED FOR PLANNING	28.01.21	ATL	MW			
Rev:	Description:	Date:	By:	Chkd:			
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Status:							
INFORMATION							
Project:							
GORTON LANE, MANCHESTER							
Drg Title:							
FLOW EXCEEDANCE PLAN							
Size:	Date:	Drawn By:	Designed By:	Checked By:			
A1	28.01.21	ATL	ATL	MW			
Scale: 1:200							
Project No:	Originator:	Zone:	Level:	Type:	Discipline:	Category / Number:	Rev:
8790 - CUR - ZZ - 00 - DR - C - 92512 -P01							

Imafs(21)Projects(167001 - 168000)(167694 - Gorton Lane)QMS 4 ProductionMB Models & Drawings(Civil-CICAD)

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Innovyze

Network 2017.1.2

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm 1

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
S4.002	13.785	0.138	99.9	0.004	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.003	2.226	0.223	10.0	0.033	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	12.583	1.258	10.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.002	44.47	5.56	52.964	0.034	0.0	0.0	0.0	1.01	17.8	4.1
S4.003	44.43	5.57	52.826	0.067	0.0	0.0	0.0	3.20	56.6	8.1
S1.007	42.96	6.01	50.339	0.145	0.0	0.0	0.0	3.20	56.6	16.9

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Network 2017.1.2

Manhole Schedules for Storm 1

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	52.200	0.900	Open Manhole	450	S1.000	51.300	150				
S2	52.200	0.994	Open Manhole	450	S1.001	51.206	150	S1.000	51.206	150	
S3	52.200	1.128	Open Manhole	600	S1.002	51.072	225	S1.001	51.072	150	
S4	52.400	1.482	Open Manhole	600	S1.003	50.918	225	S1.002	50.918	225	
S5	53.150	0.900	Open Manhole	450	S2.000	52.250	150				
S6	52.780	1.992	Open Manhole	600	S1.004	50.788	225	S1.003	50.788	225	
								S2.000	51.880	150	103
S7	53.000	2.490	Open Manhole	600	S1.005	50.510	300	S1.004	50.585	225	
S8	53.350	2.902	Open Manhole	600	S3.000	50.448	300				
STANK	53.350	2.950	Open Manhole	1800	S1.006	50.400	300	S1.005	50.475	300	7
								S3.000	50.400	300	
S9	54.150	0.750	Open Manhole	450	S4.000	53.400	150				
S10	54.150	0.750	Open Manhole	450	S5.000	53.400	150				
S11	54.150	0.876	Open Manhole	450	S4.001	53.274	150	S4.000	53.274	150	
								S5.000	53.274	150	
S12	54.150	0.750	Open Manhole	450	S6.000	53.400	150				
S13	54.150	1.186	Open Manhole	450	S4.002	52.964	150	S4.001	52.964	150	
								S6.000	52.964	150	
S14	54.100	1.274	Open Manhole	450	S4.003	52.826	150	S4.002	52.826	150	
S15	54.120	3.781	Open Manhole	1800	S1.007	50.339	150	S1.006	50.339	300	
								S4.003	52.603	150	220
SUU 2005	54.100	5.019	Open Manhole	2400		OUTFALL		S1.007	49.081	150	

Curtins Consulting Ltd		Page 4
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Date 27/01/2021 23:27 File Site 1 20.01.21.mdx		
Designed by losty_a Checked by		
Innovyze		Network 2017.1.2

Area Summary for Storm 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.007	0.007	0.007
1.001	-	-	100	0.004	0.004	0.004
1.002	-	-	100	0.010	0.010	0.010
1.003	-	-	100	0.038	0.038	0.038
2.000	-	-	100	0.006	0.006	0.006
1.004	-	-	100	0.013	0.013	0.013
1.005	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.014	0.014	0.014
5.000	-	-	100	0.008	0.008	0.008
4.001	-	-	100	0.004	0.004	0.004
6.000	-	-	100	0.004	0.004	0.004
4.002	-	-	100	0.004	0.004	0.004
4.003	-	-	100	0.033	0.033	0.033
1.007	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.145	0.145	0.145

Free Flowing Outfall Details for Storm 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.007	SUU 2005	54.100	49.081	47.700	2400	0

Simulation Criteria for Storm 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs		0	Number of Storage Structures
Number of Online Controls		1	Number of Time/Area Diagrams
Number of Offline Controls		0	Number of Real Time Controls

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.356		

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. . .		
Date 27/01/2021 23:27 File Site 1 20.01.21.mdx	Designed by losty_a Checked by	
Innovyze	Network 2017.1.2	

Online Controls for Storm 1

Complex Manhole: S15, DS/PN: S1.007, Volume (m³): 10.4

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0054-1400-1100-1400
Design Head (m)	1.100
Design Flow (l/s)	1.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	54
Invert Level (m)	50.339
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.100	1.4
Flush-Flo™	0.239	1.2
Kick-Flo®	0.484	1.0
Mean Flow over Head Range	-	1.1

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	1.0	1.200	1.5	3.000	2.2	7.000	3.3
0.200	1.2	1.400	1.6	3.500	2.4	7.500	3.4
0.300	1.2	1.600	1.7	4.000	2.5	8.000	3.5
0.400	1.1	1.800	1.7	4.500	2.7	8.500	3.6
0.500	1.0	2.000	1.8	5.000	2.8	9.000	3.7
0.600	1.1	2.200	1.9	5.500	2.9	9.500	3.8
0.800	1.2	2.400	2.0	6.000	3.0		
1.000	1.3	2.600	2.1	6.500	3.2		

Orifice

Diameter (m) 0.027 Discharge Coefficient 0.600 Invert Level (m) 51.139

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Date 27/01/2021 23:27
File Site 1 20.01.21.mdx
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Network 2017.1.2

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

PN	US/MH	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level
	Name	Depth (m)	Volume (m³)			Flow (l/s)		Exceeded
S1.000	S1	-0.127	0.000	0.06		1.1		OK
S1.001	S2	-0.124	0.000	0.07		1.6		OK
S1.002	S3	-0.188	0.000	0.06		2.9		OK
S1.003	S4	-0.162	0.000	0.17		7.7		OK
S2.000	S5	-0.133	0.000	0.03		0.9		OK
S1.004	S6	-0.153	0.000	0.22		10.3		OK
S1.005	S7	-0.183	0.000	0.06		3.9		OK
S3.000	S8	-0.121	0.000	0.00		0.0		OK
S1.006	STANK	-0.073	0.000	0.02		1.1		OK
S4.000	S9	-0.114	0.000	0.13		2.1		OK
S5.000	S10	-0.124	0.000	0.07		1.2		OK
S4.001	S11	-0.111	0.000	0.15		3.8		OK
S6.000	S12	-0.137	0.000	0.02		0.6		OK
S4.002	S13	-0.093	0.000	0.30		5.0		OK
S4.003	S14	-0.092	0.000	0.31		9.1		OK
S1.007	S15	0.143	0.000	0.02		1.2	SURCHARGED	

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Date 27/01/2021 23:27
File Site 1 20.01.21.mdx
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm 1

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /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	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.357
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	18.000	Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

										Water	
	US/MH			Return	Climate	First (X)		First (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change		Surcharge		Flood	Overflow	Act.	(m)
S1.000	S1	15	Summer	30	+0%	100/120	Summer				51.337
S1.001	S2	15	Summer	30	+0%	100/120	Summer				51.250
S1.002	S3	15	Summer	30	+0%	100/120	Summer				51.137
S1.003	S4	15	Summer	30	+0%	100/15	Summer				51.037
S2.000	S5	15	Summer	30	+0%						52.278
S1.004	S6	240	Winter	30	+0%	100/15	Summer				50.960
S1.005	S7	240	Winter	30	+0%	30/60	Summer				50.959
S3.000	S8	240	Winter	30	+0%	30/30	Summer				50.958
S1.006	STANK	240	Winter	30	+0%	30/15	Summer				50.958
S4.000	S9	15	Summer	30	+0%	100/15	Summer				53.459
S5.000	S10	15	Summer	30	+0%	100/15	Summer				53.442
S4.001	S11	15	Summer	30	+0%	100/15	Summer				53.338
S6.000	S12	15	Summer	30	+0%						53.421
S4.002	S13	15	Summer	30	+0%	100/15	Summer				53.067
S4.003	S14	15	Summer	30	+0%	100/15	Summer				52.938
S1.007	S15	240	Winter	30	+0%	1/15	Summer				50.955

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Date 27/01/2021 23:27
File Site 1 20.01.21.mdx
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm 1

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Flow (l/s)		
S1.000	S1	-0.113	0.000	0.14		2.6		OK
S1.001	S2	-0.106	0.000	0.19		4.3		OK
S1.002	S3	-0.160	0.000	0.18		8.5		OK
S1.003	S4	-0.106	0.000	0.54		24.4		OK
S2.000	S5	-0.122	0.000	0.08		2.2		OK
S1.004	S6	-0.053	0.000	0.12		5.7		OK
S1.005	S7	0.149	0.000	0.09		5.5	SURCHARGED	
S3.000	S8	0.210	0.000	0.00		0.0	SURCHARGED	
S1.006	STANK	0.258	0.000	0.02		1.0	SURCHARGED	
S4.000	S9	-0.091	0.000	0.32		5.2		OK
S5.000	S10	-0.108	0.000	0.17		3.0		OK
S4.001	S11	-0.086	0.000	0.38		9.8		OK
S6.000	S12	-0.129	0.000	0.05		1.5		OK
S4.002	S13	-0.047	0.000	0.79		12.9		OK
S4.003	S14	-0.038	0.000	0.90		26.6		OK
S1.007	S15	0.469	0.000	0.02		1.2	SURCHARGED	

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

		Surcharged		Flooded	Pipe		
	US/MH	Depth	Volume	Flow /	Overflow	Flow	Level
PN	Name	(m)	(m³)	Cap.	(1/s)	(1/s)	Status Exceeded
S1.000	S1	0.739	0.000	0.04		0.7	FLOOD RISK
S1.001	S2	0.833	0.000	0.05		1.1	FLOOD RISK
S1.002	S3	0.892	0.000	0.04		2.1	FLOOD RISK
S1.003	S4	1.045	0.000	0.12		5.6	FLOOD RISK
S2.000	S5	-0.113	0.000	0.14		4.1	OK
S1.004	S6	1.172	0.000	0.15		7.1	SURCHARGED
S1.005	S7	1.372	0.000	0.11		6.9	SURCHARGED
S3.000	S8	1.433	0.000	0.00		0.1	SURCHARGED
S1.006	STANK	1.481	0.000	0.03		1.8	SURCHARGED
S4.000	S9	0.049	0.000	0.54		8.8	SURCHARGED
S5.000	S10	0.027	0.000	0.29		5.1	SURCHARGED
S4.001	S11	0.135	0.000	0.66		17.2	SURCHARGED
S6.000	S12	-0.111	0.000	0.08		2.7	OK
S4.002	S13	0.318	0.000	1.39		22.6	SURCHARGED
S4.003	S14	0.253	0.000	1.43		42.3	SURCHARGED
S1.007	S15	1.691	0.000	0.06		3.3	SURCHARGED

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