



Carmoor Road

Flood Risk Assessment

Client: Tiger Developments Limited

Date: 16/11/2022

P451205-WW-XX-XX-RP-C-0001

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REVISION RECORD

Rev	Date	Description	Prepared	Reviewed	Approved
P1	16/11/2022	Issue for planning	TT	RS	RW

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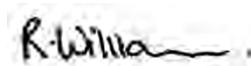
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1 INTRODUCTION

This Flood Risk Assessment (FRA) has been prepared in accordance with National Planning Policy Framework (NPPF) to support the development at Carmoor Road, hereby referred to as 'The Site'. This assessment has been undertaken to ascertain the constraints in order to redevelop the site, and to assess the impact of the proposals, with respect to flood risk.

1.1 Sources of Information

A review of the relevant information from a range of sources has been undertaken and includes the following:

- Manchester City, Salford City and Trafford Councils, Strategic Flood Risk Assessment level 2 (2011);
- Manchester City, Salford City and Trafford Councils, Strategic Flood Risk Assessment level 1 (2010);
- Collinshall, Phase 1 Desk Top Study (2021);
- Manchester Council, Local Plan (2019); and
- United Utilities, Asset location map (2022);

1.2 Environment Agency Data

The following information has been gathered from DEFRA's Spatial Data Catalogue of data.gov.uk [accessed November 2022]. The Environment Agency's Product Data, which is specific to the site, has been requested and received. This data has been reviewed and used to inform this FRA.

- Flood Map for Planning (Rivers and Sea) – Flood Zone 2;
- Flood Map for Planning (Rivers and Sea) – Flood Zone 3;
- Risk of Flooding from Reservoirs – Maximum Flood Extent;
- Risk of Flooding from Surface Water Extent (1%, 3.3% and 0.1% AEP); and
- Statutory Main River Map.

2 THE SITE

2.1 Site location and Description

The site is located within the development plan defined central area of Manchester. It sits just outside of the defined city centre, just beyond the Corridor Manchester sub-area of the city centre. It is also just outside of and within easy walking distance of the defined Oxford Road Corridor regeneration area. The Oxford Road Corridor is a focus for the University of Manchester teaching departments. The site is very close to the Manchester University NHS Foundation Trust hospitals on Upper Brook Street and Oxford Road.

The site is not allocated for any specific use in the development plan.

Existing uses on the site includes a garage workshop and a building used previously as a private day nursery which is now vacant. None of the buildings are of any architectural merit or are subject to statutory protection. The nearest statutorily listed asset (Victoria Baths on Hathersage Road) is some distance away. The application site is not within a conservation area. It is situated some 250 metres north of Victoria Park conservation area.

There are limited trees on-site and adjacent to the site. An arboricultural impact assessment and arboricultural management strategy are submitted with the planning application.

The site is located immediately south of a community centre managed by the West Indian Organisations Coordinating Committee (WIOCC). The immediate area comprises a mix of residential and commercial uses, including offices and other Class E uses. Opposite the site is the Octagon office building, a private car park and an electricity sub-station. The Octagon is a multi-level office building of significant scale and massing. To the north and west of the site is the Liberty Park student accommodation. To the south are the rear of commercial uses fronting Hathersage Road. St Mary's Hospital occupies a significant site to the west side of Upper Brook Street. Layout, scale and massing locally is varied but it is generally to a suburban scale and relatively low-rise.

The site extends approximately 0.21 ha, and its approximate centre is located at a national grid reference of 385510, 395940. The nearest postcode to the site is M13 0FB. Figure 1 below shows the site location.

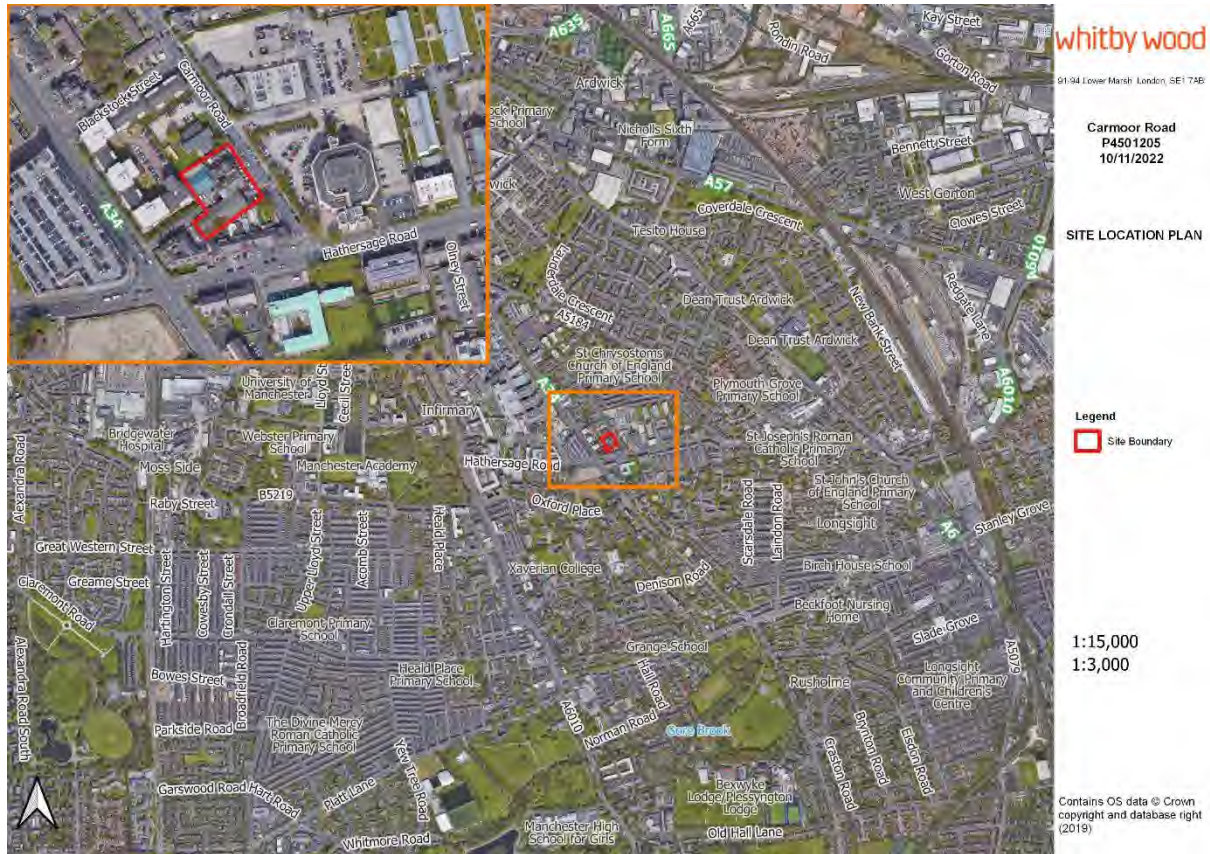


FIGURE 1 - SITE LOCATION PLAN

2.2 Watercourses

The nearest main watercourse is both Corn Brook and Gore Brook which are situated approximately 1 km to the north and south of the site respectfully. The Corn Brook drains the urban area south of the River Medlock. The brook is largely culverted and flows from Openshaw in a westerly direction, discharging into the Manchester Ship Canal at Pomona Docks.

The nearest reservoir is Audenshaw which is to the east of the site with a distance of 5.44 km measured between the two.

2.3 Geology

From British Geological Survey (BGS) 1:50,000 maps, the site is underlain with Collyhurst Sandstone Formation with till superficial deposits recorded. A fault runs NW-SE approximately 250m East of the site. The site is in a lower probability radon area (< 1%) and no radon protective measures are necessary in the construction of new dwellings or extensions.

2.4 Proposed Development

The proposed development includes the demolition of existing buildings and construction of purpose-built student accommodation with 172 beds in a mix of studio and cluster units alongside ancillary facilities and shared amenity space, site access and other associated works in a development of three to six storeys.

3 FLOOD RISK

3.1 Fluvial and Tidal

The Environment Agency's Flood Risk Data shows the site is situated in Flood Zone 1. Figure 2 shows the site overlaid by the flood zone map and suggests that the site is not currently benefitting from any flood defences. The figure also demonstrates that the nearest area that is in Flood Zone 2 is approximately 1 km away. The definition of each flood zone can be found below.

- Land in **Flood Zone 1** has a 0.1% or less annual probability of river or sea flooding.
- Land in **Flood Zone 2** has between 0.1% and 1% annual probability of river flooding and between 0.1% and 0.5% annual probability of sea flooding.
- Land in **Flood Zone 3** has a 1% or greater annual probability of river flooding and a 0.5% annual probability of sea flooding.

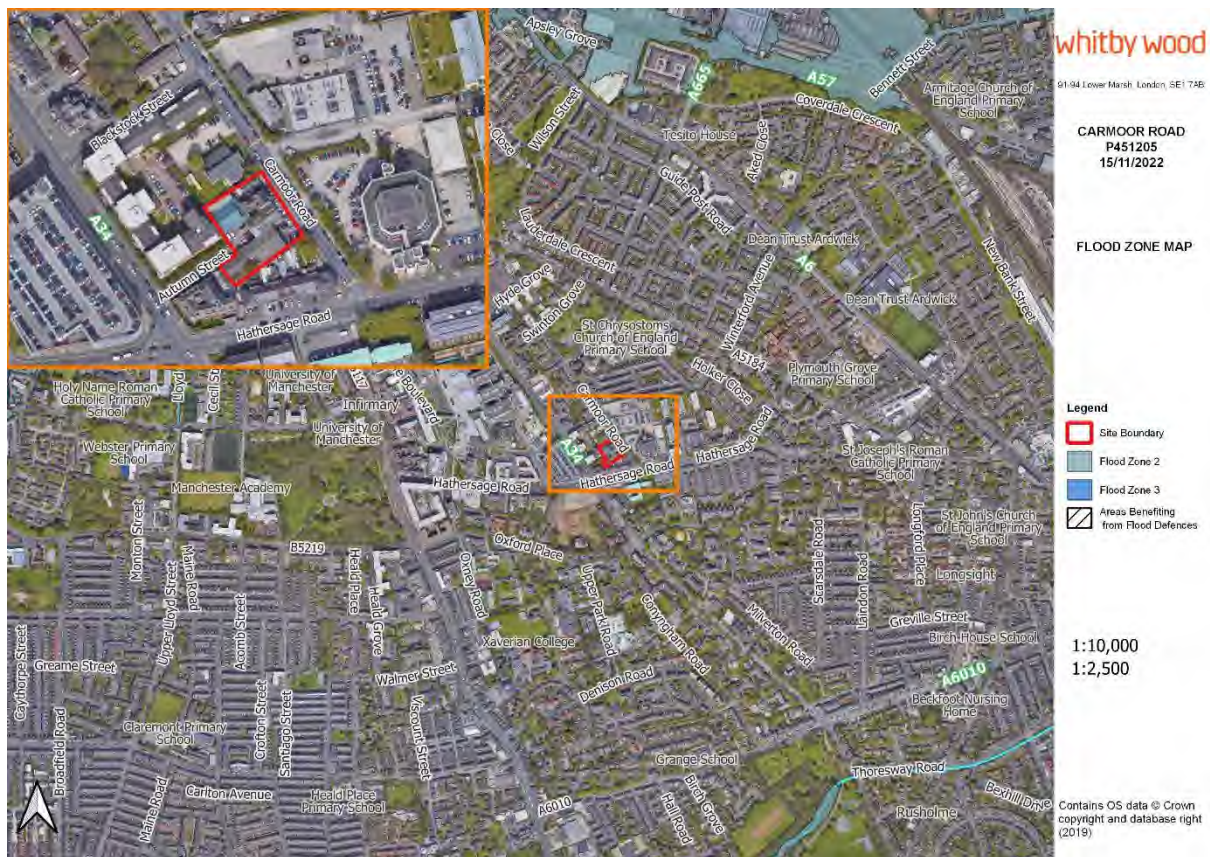


FIGURE 2 – ENVIROMENT AGENCY FLOOD ZONE MAP

3.2 Surface Water

The risk of surface water flooding has been assessed by viewing the Updated Flood Map for Surface Water (uFMfSW), which have been replicated in the figure below. This demonstrates that there is no surface water flood risk within the defined site boundary and that the risk is deemed 'Very low'. The definitions for each surface water flood risk category have been detailed below:

- **Very low** risk means that each year this area has a chance of flooding of less than 0.1%.
 - **Low** risk means that each year this area has a chance of flooding of between 0.1% and 1%.
 - **Medium** risk means that each year this area has a chance of flooding of between 1% and 3.3%.
- Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.
- **High** risk means that each year this area has a chance of flooding of greater than 3.3%.

It should be noted that flooding from surface water is difficult to predict as rainfall location and volume are not easy to forecast. In addition to this, local features can greatly affect the chance and severity of flooding. It is therefore important to consider exceedance routes and overland flow paths of surface water, this will be explored further once the sitewide masterplan is developed further.

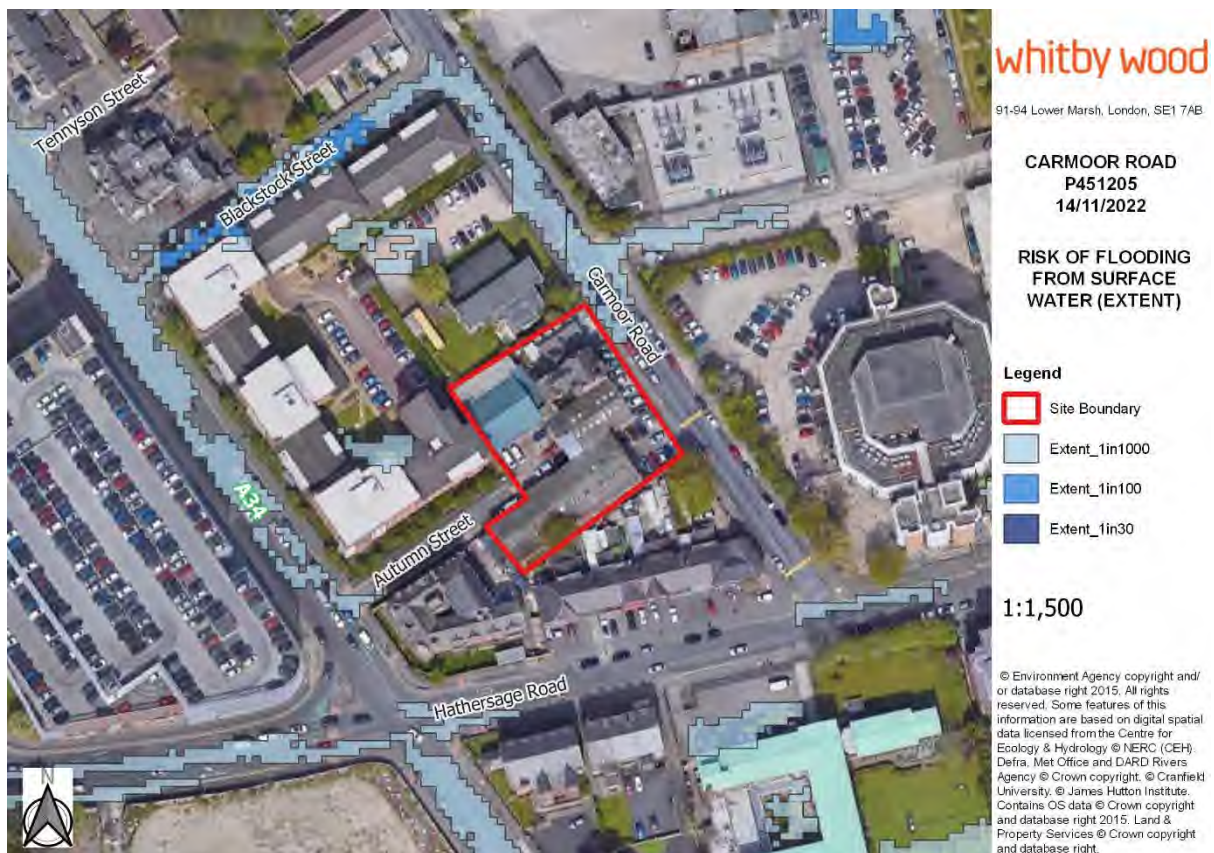


FIGURE 3 - RISK OF SURFACE WATER FLOODING EXTENT MAP



FIGURE 4 - SURFACE WATER FLOOD DEPTHS (1IN1000 YEAR EVENT)



FIGURE 5 - SURFACE WATER FLOOD VELOCITY (1IN1000 YEAR EVENT)



FIGURE 6 - SURFACE WATER FLOOD HAZARD (1IN1000 YEAR EVENT)

3.3 Groundwater

According to the Collins Hall Desk Study report, the site is situated over a Bedrock Principal Aquifer and Superficial Secondary aquifer with low vulnerability for groundwater flooding. In addition, the SFRA Groundwater flooding map demonstrates that the site is in an area not vulnerable to this form of flooding. This map can be found in Appendix D.

3.4 Sewer Flooding

After obtaining an Asset Location map of the local area it was determined that the site is served by surface water and foul sewer in a combined network. The site falls within a post code district where there are no reported flood incidents from sewer flooding according to the SFRA and therefore the risk is considered low. Additionally, any reduction in surface water discharge rates achieved through the proposed drainage strategy and carrying out a capacity check with United Utilities will also help mitigate the risk of sewer flooding.

3.5 Artificial Sources

The Environment Agency mapping shows that there is no risk from flooding because of the reservoir failing. This can be demonstrated by the figure below. Reservoirs across England are regulated by the Reservoirs Act 1975 which set stringent conditions for the operation of reservoirs to ensure high levels of safety. They are designed to operate in a way which ensures the likelihood of failure is incredibly low and therefore the risk of the site flooding from a reservoir is low.



FIGURE 8 – ARTIFICIAL FLOODING

3.6 Summary

The table below provides a summary of the 5 sources of flood risk. Overall, the site has low risks for consideration from low to high depending on the source. For reference, the flood maps used to inform this FRA can be found in Appendix B.

TABLE 4 – FLOOD RISK SUMMARY

Flood Type	Risk		
	Low	Medium	High
Fluvial& Tidal	✓		
Pluvial	✓		
Groundwater	✓		
Sewer	✓		
Artificial	✓		

4 PLANNING POLICY AN GUIDANCE

4.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) provides the planning framework on which this FRA has been based. The NPPF states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Where development is necessary, the development should be made safe and not increase flood risk elsewhere.

4.1.1 Sequential Test

The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. Development should not be permitted if there are reasonably available sites appropriate for development in areas at a lower risk of flooding.

It is necessary to undertake a Sequential Test for a planning application if both of the following apply.

- The proposed development is in Flood Zone 2 or 3; and
- A Sequential Test hasn't already been completed for a development of the type you plan to carry out on your proposed site.

As the development is within the Flood Zone 1, therefore, a Sequential Test will not need to be carried out.

4.1.2 Flood Vulnerability Classification

Any proposed development on the site will be subject to the planning requirements of Manchester City Council, the lead local flood authority (LLFA) and the National Planning Policy Framework (NPPF).

Flood risk vulnerability classification for all flood zones has been reproduced in Table 5. This has been extracted from Table 3 of the NPPF Planning Practice Guidance. Building types are classified depending on their use and are placed in a higher vulnerability class depending on flood risk sensitivity. Examples of typical building uses for each vulnerability classification have also been included below.

The NPPF guidance states that 'buildings used for dwelling houses' falls under the category of 'more vulnerable'. This hasn't change in classification from the existing buildings. As the proposed site for development is mostly within Flood Zone 1, an exception test is not required.

TABLE 5 – FLOOD RISK VULNERABILITY AND FLOOD ZONE COMPATABILITY

Flood Zones	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a	Exception Test required	X	Exception Test required	✓	✓
Zone 3b	Exception test required	X	X	X	✓

TABLE 6 – FLOOD RISK VULNERABILITY CLASSIFICATION

Vulnerability Classification	Building Use Example
Essential infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which must 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 stations, ambulance stations and fire stations and command centres and 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.
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, restaurants and cafes, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable", 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). • Car parks.
Water compatible	• Flood control infrastructure. • Water and sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.

	• Water-based recreation • 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.
--	---

4.1.3 Exception Test

If after undertaking the Sequential Test, it is not feasible for the development to be in a zone at lower risk of flooding, the Exception Test can be applied as appropriate.

There are two steps which must be fulfilled for the Exception Test to be passed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk; and
- A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and where possible, will reduce flood risk overall.

As the proposed development is within the Flood Zone 1, there is no requirement to undertake a Exception test.

4.2 Climate Change

In May 2022, climate change allowances were published by the Environment Agency. These allowances are based upon predicted changes in fluvial flows and rainfall intensities due to climate change.

4.2.1 Peak fluvial Flows

Table 7 has been extracted from the DEFRA's climate changes allowances map showing peak river flow allowances for the Irwell Management Catchment. As the site is in Flood Zone 1 and proposals are for 'more vulnerable' building uses, the central and higher central allowance would be appropriate.

TABLE 1 – PEAK RIVER FLOW ALLOWANCES FOR IRWELL MANAGEMENT CATCHMENT

Allowance category	Central	Higher	Upper
Total potential change anticipated for '2020s'	12%	15%	24%
Total potential change anticipated for '2050s'	19%	26%	43%
Total potential change anticipated for '2080s'	35%	46%	75%

4.2.2 Peak Rainfall Intensity

The peak rainfall intensity is expected to increase as a result of climate change. Table 8 has been extracted from DEFRA's climate change allowances and assesses different scenarios of 1% and 3.3% annual exceedance rainfall events. Both the upper and central allowances of the associated epoch should be reviewed for a proposed development.

TABLE 2 – PEAK RAINFALL INTENSITY ALLOWANCES FOR IRWELL MANAGEMENT CATCHMENT

Allowance category	Total potential change anticipated for the '2050s'		Total potential change anticipated for the '2070s'	
	3.3% rainfall event	1% rainfall event	3.3% rainfall event	1% rainfall event
Central	25%	25%	30%	30%
Upper	35%	40%	40%	45%

4.3 Manchester's Local Development Framework Policies

The Manchester Plan forms a framework for development within Greater Manchester taking account of the principal purposes of the Greater Manchester Authority. Policy EN 14 of the Development plan is specific to Flood risk and sets the guidance for drainage strategies. Each of the policies within EN 14 have been detailed below:

- In line with the risk-based sequential approach contained within PPS25, development should be directed away from sites at the greatest risk of flooding, and towards sites with little or no risk of flooding; this should take account of all sources of flooding identified in the Manchester-Salford-Trafford Strategic Flood Risk Assessment (SFRA).
- In addition to the requirements for site-specific Flood Risk Assessments (FRAs) set out in PPS25, an appropriate FRA will also be required for all development proposals, including changes of use, on sites greater than 0.5ha within Critical Drainage Areas (CDAs) and Canal Hazard Zones identified in the SFRA.
- All new development should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of Green Infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In CDAs, evidence to justify the surface water run-off approach / rates will be required. The City of Manchester contains many sections of rivers which are culverted or 'hidden'; where these are indicated in the SFRA beneath the proposed development site, further investigation will be required and the development proposal should take this into account; where feasible and appropriate development should seek to open up culverted/hidden rivers to reduce the associated flood risk and danger of collapse, taking advantage of opportunities to enhance biodiversity and Green Infrastructure.

5 MANAGING FLOOD RISK

5.1 Master Planning

It is recommended that during the progression of the masterplan, the proposed development is continued to be designed with flood risk and drainage implications in mind. Proposed ground levels will need to consider potential exceedance flow pathways from onsite drainage. Any displaced surface water flooding should be mitigated against to avoid increasing flooding elsewhere.

5.2 Mitigating Measures

There are no immediate requirements for flood mitigation measures that are required for the site due to the low food risk.

5.2.1 Flood Compensation

Where the proposed development changes in scope, the new structures and buildings will displace flood water and could cause increased flood risk elsewhere on site, or to neighbouring properties. To ensure no increase in flood risk elsewhere, flood compensation storage should be taken into account.

As the site isn't currently in a flood zone, there is no requirement for flood compensation.

6 SURFACE WATER MANAGEMENT

6.1 Existing Site Drainage

A United Utilities Asset Search, which can be found in Appendix A of the drainage strategy report, has shown there is existing drainage infrastructure surrounding the site, both foul and surface water gravity sewers. The entire site is hardstanding and therefore drains into the public sewer network. A pre-planning capacity check will be coordinated with United Utilities to ensure there is sufficient capacity for drainage into the combined sewers.

6.2 Greenfield Runoff Rates and Volumes

Greenfield runoff rates have been calculated using IH124 method and a 6-hour rainfall event, these can be found in Appendix C. The table below shows the greenfield runoff rates for the entire site (approximately 1.06 ha) and factored to provide a runoff rate per hectare. The table also illustrates the current discharge rates based on existing site conditions. The existing discharge rates have been calculated using the Modified Rational Method as presented in Equation 1. A percentage of impermeable area (PIMP) of 100% and a time of concentration of 5 minutes were assumed. A runoff coefficient of 1 has been used as only impermeable areas have been included in the calculation.

$$Q = 2.78 C_v C_r i A_i \quad (1)$$

Where;

C_v is the volumetric runoff coefficient;

C_r is the dimensionless routing coefficient, with a value of 1.3 used;

i is the rainfall intensity; and

A_i is the impermeable area.

TABLE 3 – GREENFIELD RUNOFF AND EXISTING DISCHARGE RATES

Return Period	Greenfield runoff rates		Existing Discharge Rates (l/s)
	Whole Site [0.2 ha] (l/s)	Per hectare (l/s/ha)	
QBAR	1.32	6.6	-
1-year	1.15	5.75	33.7
30-year	2.25	11.25	78.7
100-year	2.75	13.75	99.2

It is proposed that surface water to is subject to be discharged at 2l/s and will be coordinated with United Utilities to ensure that the sewers have capacity.

6.3 Delivering a SuDS Scheme

The philosophy of SuDS is about maximising the benefits and minimising the negative impacts of surface water runoff from developed areas. The ‘four pillars’ of SuDS design as described by the SuDS Manual are;

- Water Quantity;
- Water Quality;
- Amenity; and
- Biodiversity.

SuDS deliver high quality drainage while supporting areas to cope better with severe rainfall both now and in the future.

SuDS can improve the quality of life in developments by making them more vibrant, visually attractive, sustainable and more resilient to change, by improving urban air quality, regulating building temperatures, reducing noise and delivering recreation and education opportunities.

SuDS design should maximise the use of the available space by delivering efficient drainage together with other functions to help meet the objectives of the site.

The SuDS design should, as much as possible, be based around the following;

- Using surface water runoff as a resource;
- Managing rainwater close to where it falls;
- Managing runoff on the surface;
- Allowing rainfall to soak into the ground;
- Promoting evapotranspiration;
- Slowing and storing runoff to mimic natural runoff characteristics;
- Reducing contamination of runoff through pollution prevention and controlling the runoff at source; and
- Treating runoff to reduce the risk of urban contaminants causing environmental pollution.

Any proposed development on the site has the potential to maximise SuDS and conform to SuDS best practice. Ultimately a well designed and constructed SuDS scheme will provide a robust and reliable surface water drainage network, whilst providing increased amenity and biodiversity.

6.4 Drainage Hierarchy

As stated in the National Planning Practice Guidance, the aim should be to discharge surface water run-off as high up the drainage hierarchy, as reasonably practicable. Local Authorities and Water Boards often require proof that each option is not feasible before considering the next.

The drainage hierarchy is as follows:

1. Discharge into the ground (infiltration);
2. Discharge to a surface water body;
3. Discharge to a surface water sewer, highway drain, or another drainage system;
4. Discharge to a combined sewer.

For this site, infiltration will not be feasible due the site geology being below the rated seemed acceptable for permeability. Discharging to a surface water body will not be feasible due to nearest watercourse being over 1 km from the site. There is no separate surface water sewer in the local area according to the asset search, therefore, this will be discharged into the nearby public sewer which is to the south of the site.

7 CONCLUSIONS AND RECOMMENDATIONS

The main conclusions from this flood risk assessment are detailed below.

- The site is situated in Flood zone 1.
- The site is located in a 'very low' area of risks of surface water flooding.
- There is generally considered to be a low risk of flooding from all other sources based.
- Due to the location and low risk of flooding, neither will a sequential or exception test will be required to be facilitated.
- A total 96 cubic meters of surface water attenuation will be provided.
- A proposed discharge rate of 2 l/s for surface water has been obtained.
- Further flood resilience measures should be implemented to reduce the likelihood of effects from flood damage during an unlikely inundation event.

Appendix A – Site Map

Carmoor Road
P4501205
10/11/2022

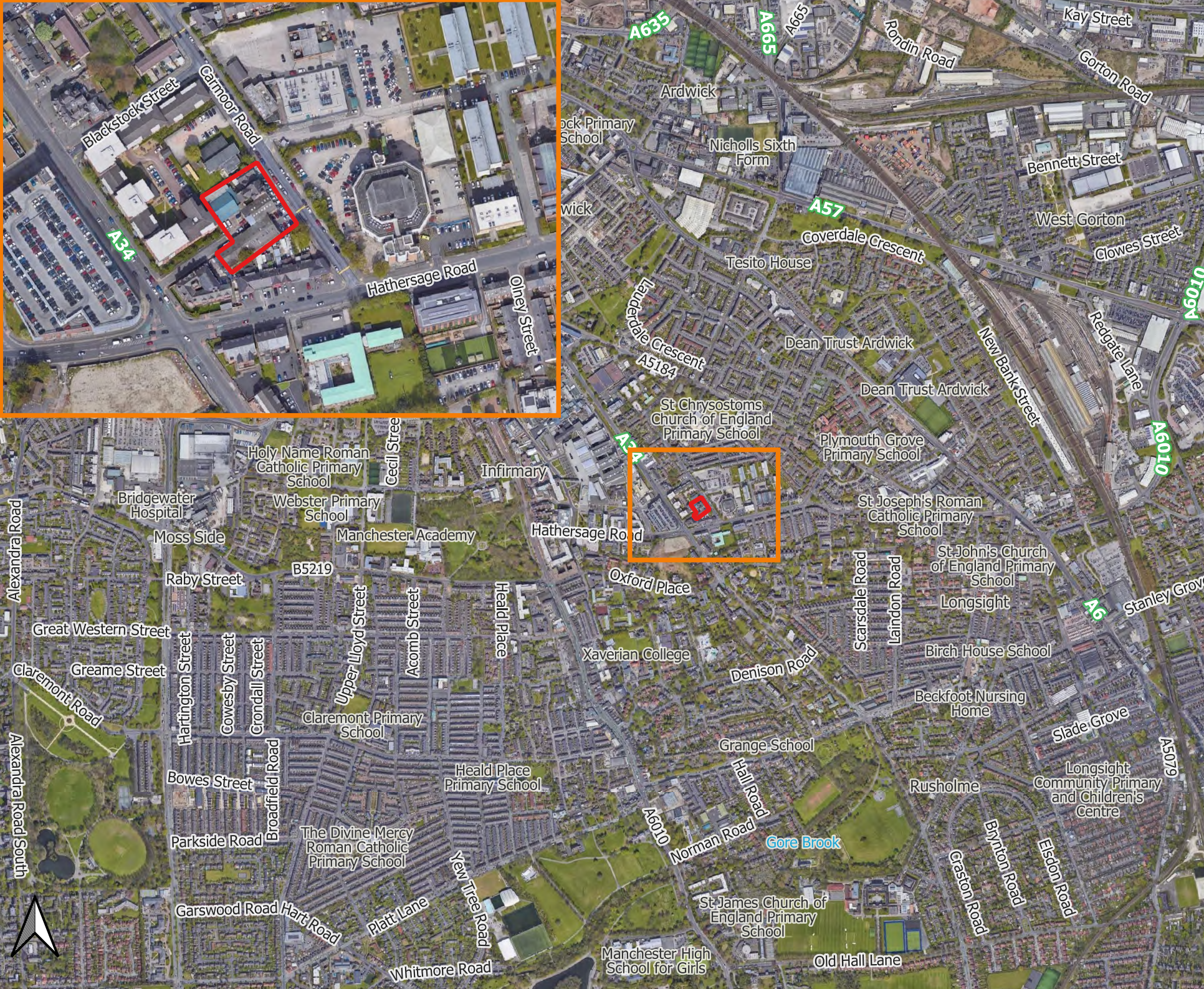
SITE LOCATION PLAN

Legend

 Site Boundary

1:15,000

1:3,000



Appendix B – Flood Maps

CARMOOR ROAD
P451205
15/11/2022

FLOOD ZONE MAP

Legend

-  Site Boundary
-  Flood Zone 2
-  Flood Zone 3
-  Areas Benefiting from Flood Defences

1:10,000
 1:2,500





whitby wood

91-94 Lower Marsh, London, SE1 7AB

CARMOOR ROAD

P451205

14/11/2022

**ARTIFICIAL FLOOD
EXTENTS (RESERVOIR
FLOODING)**

Legend



Site Boundary



Reservoir Flood Extents

1:2,500

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CARMOR ROAD
P451205
14/11/2022

RISK OF FLOODING FROM SURFACE WATER (DEPTH) 1:1000 YEAR EVENT

Legend

 Site Boundary

Depth (m) 1in1000

 0.00 - 0.15

 0.15 - 0.30

 0.30 - 0.60

 0.60 - 0.90

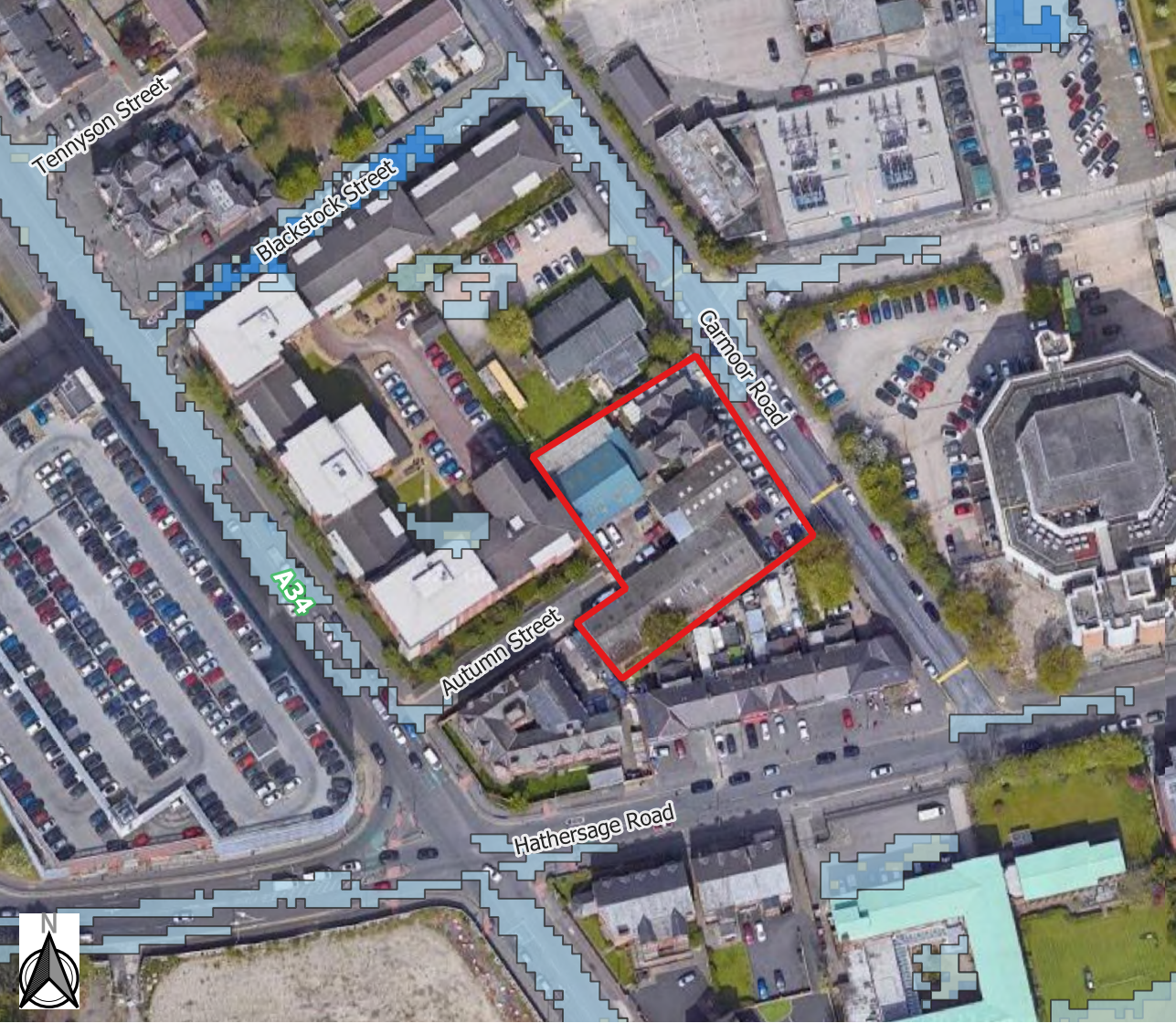
 0.90 - 1.20

 > 1.20

1:1,500

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CARMOOR ROAD

P451205

14/11/2022

**RISK OF FLOODING
FROM SURFACE
WATER (EXTENT)**

Legend

 Site Boundary

 Extent_1in1000

 Extent_1in100

 Extent_1in30

1:1,500

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whitby wood

91-94 Lower Marsh, London, SE1 7AB

PROJECT NAME
PROJECT NUMBER
XX/XX/2022

RISK OF FLOODING
FROM SURFACE
WATER (HAZARD)
1:1000 YEAR EVENT

Legend

 Site Boundary

Hazard Rating

 0.00 - 0.75

 0.75 - 1.25

 1.25 - 2.00

 > 2.00

1:1,500

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CARMOOR ROAD
P451205
14/11/2022

**RISK OF FLOODING
 FROM SURFACE
 WATER (VELOCITY)
 1:1000 YEAR EVENT**

Legend

 Site Boundary

Velocity (m/s) 1in1000

 0.00 - 0.25

 0.25 - 0.50

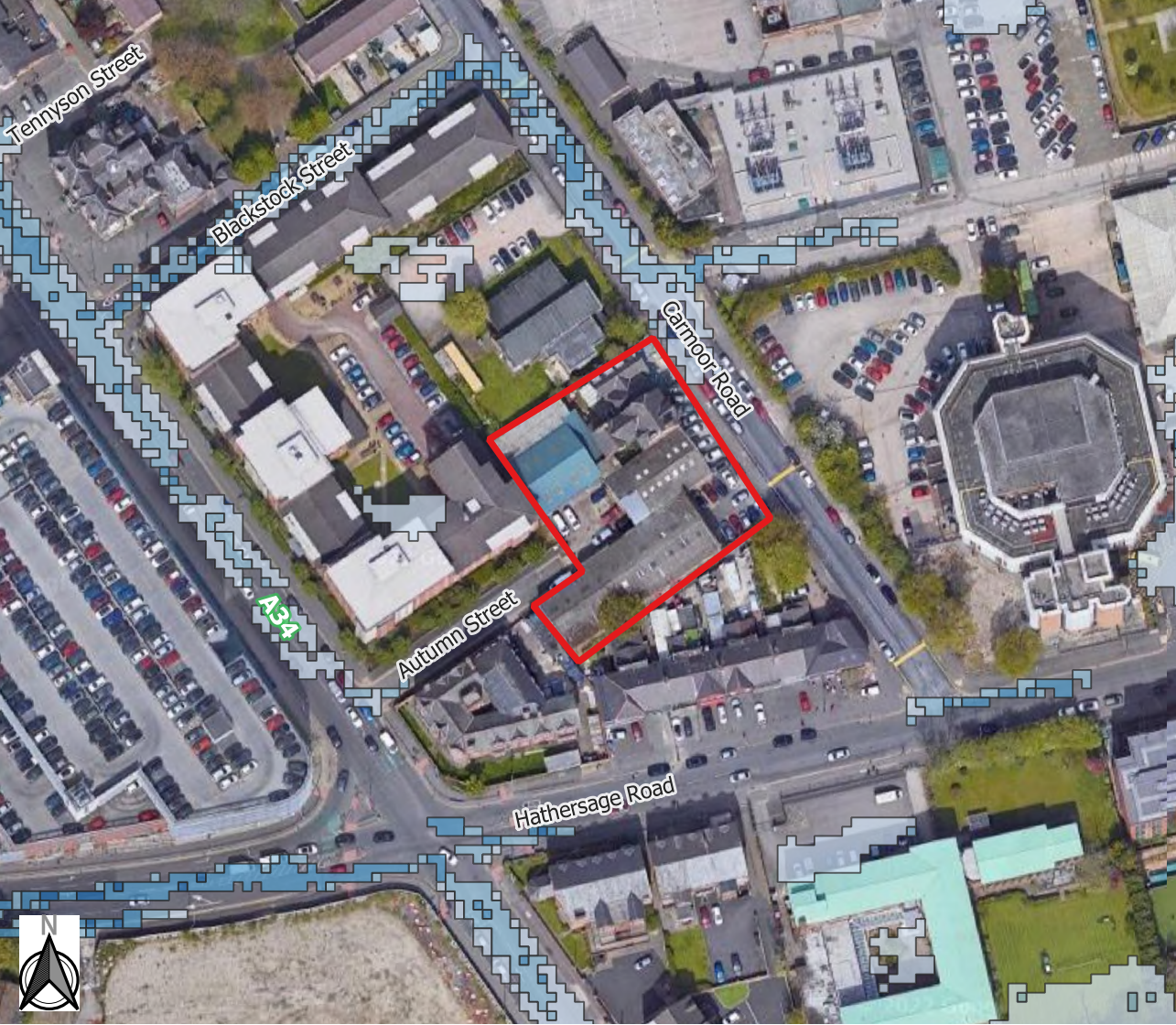
 0.50 - 1.00

 1.00 - 2.00

 > 2.00

1:1,500

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Appendix C – Surface Water Attenuation and Discharge Calculations

[Print](#)[Close Report](#)

Surface water storage requirements for sites

www.uksubs.com | Storage estimation tool

Calculated by:	Tom Tosetti
Site name:	Carmoor Road
Site location:	Manchester

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	53.46090° N
Longitude:	2.22058° W
Reference:	4261310759
Date:	Nov 14 2022 10:58

Site characteristics

Total site area (ha):	0.21
Significant public open space (ha):	0
Area positively drained (ha):	0.21
Impermeable area (ha):	0.188
Percentage of drained area that is impermeable (%):	90
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.21
Net impermeable area for storage volume design (ha):	0.19
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Use long term storage
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Methodology

esti	IH124	
Q_{BAR} estimation method:	Calculate from SPR and SAAR	
SPR estimation method:	Calculate from SOIL type	
Soil characteristics	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47
Hydrological characteristics	Default	Edited
Rainfall 100 yrs 6 hrs:	--	55
Rainfall 100 yrs 12 hrs:	--	72.45
FEH / FSR conversion factor:	1.15	1.15
SAAR (mm):	879	879
M5-60 Rainfall Depth (mm):	17	17
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 10 year:	1.38	1.38
Growth curve factor 30 year:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Q_{BAR} for total site area (l/s):	1.32	1.32
Q_{BAR} for net site area (l/s):	1.32	1.32

Site discharge rates	Default	Edited	Estimated storage volumes	Default	Edited
1 in 1 year (l/s):	2	2	Attenuation storage 1/100 years (m³):	82	82
1 in 30 years (l/s):	2.2	2.2	Long term storage 1/100 years (m³):	14	14
1 in 100 year (l/s):	2.8	2.8	Total storage 1/100 years (m³):	96	96

This report was produced using the storage estimation tool developed by HRWallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at <http://uksuds.com/terms-and-conditions.htm>. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Calculated by: Tom Tosetti

Site name: Carmoor Road

Site location: Manchester

Site Details

Latitude: 53.46087° N

Longitude: 2.22076° W

Reference: 3174260509

Date: Nov 14 2022 11:00

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.21

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics

SOIL type: 4 4

HOST class: N/A N/A

SPR/SPRHOST: 0.47 0.47

Hydrological characteristics

SAAR (mm): 879 879

Hydrological region: 10 10

Growth curve factor 1 year: 0.87 0.87

Growth curve factor 30 years: 1.7 1.7

Growth curve factor 100 years: 2.08 2.08

Growth curve factor 200 years: 2.37 2.37

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

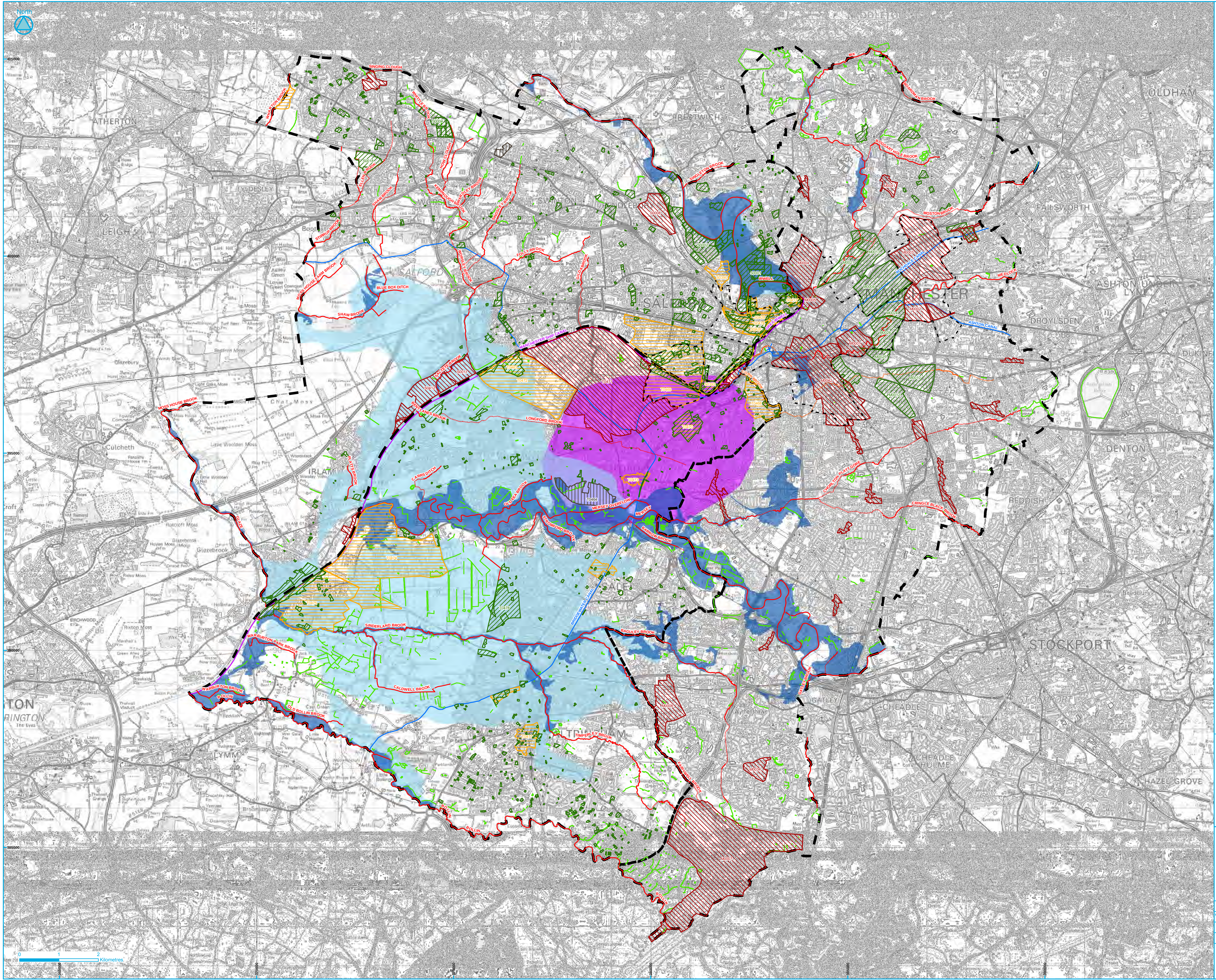
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	1.32	1.32
1 in 1 year (l/s):	1.15	1.15
1 in 30 years (l/s):	2.25	2.25
1 in 100 year (l/s):	2.75	2.75
1 in 200 years (l/s):	3.14	3.14

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix D – Groundwater map



- Council Boundary
- Ashton, Bridgewater and Rochdale Canals
- Manchester Ship Canal / Grey Inwell
- Other Waterbodies
- Main Rivers (V8.0)**
 - Culverted
 - Open
- Digitised River Lines**
 - Culverted
 - Open
- Potential Development Sites / Locations**
 - Employment
 - Housing
 - Mixed Use
 - Other
- Regional Centre Boundary

The map has been produced in accordance with PPS25: Development and Flood Risk and its Practice Guide. This map shows areas that are potentially at risk from groundwater flooding and should be used to scope suitable mitigation measures in a site specific Flood Risk Assessment.

The Main River information shown in the SFRA is provided by the Environment Agency; the centreline data may deviate from that shown on basemapping due to inherent differences in data resolution. Further information on Main Rivers is provided on the Environment Agency's website. The mapping of culverted sections of watercourse is a strategic screening only based upon Ordnance Survey 1:10,000 mapping and should be confirmed for more detailed studies such as site specific Flood Risk Assessment. The canals layer does not necessarily cover all the canal arms, but the modelled overtopping/breaching and hydraulic interactions with rivers and other waterbodies is complete and accurate as appropriate for a Strategic Flood Risk Assessment.

The information on the map is based on Environment Agency potential groundwater rebound areas, data from the Coal Authority, BGS drift geology mapping and Defra Groundwater Emergence Maps.

The River Inwell between Victoria Station and Pomona Island is not shown as a Main River on the Environment Agency's Flood Map although Flood Zones related to the river are. The same approach has been taken in this SFRA.

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Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA

Groundwater Flooding

Drawn by:	J Cheetham	Date:	08/03/2011	This map is based upon Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Licence number: 100015668 2011.	
Checked by:	J Dimelow	Date:	01/02/2011		
Approved by:	J Cooper	Date:	01/02/2011		
File Name: .._ArcViewMapping\Level1\MST_GroundwaterFlooding_V1.3.mxd					
Drawing Number:	GW_2.1	Status:	FINAL	Scale:	1:45,000
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