

VICTORIA PARK, PROBATION CENTRE, MANCHESTER

FLOOD RISK ASSESSMENT & OUTLINE DRAINAGE STRATEGY

Job Number: FRA 22 1121
Date: January 2023
Client: Britannia Victoria Ltd



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LK Consult Document Verification			
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EXECUTIVE SUMMARY

Scope and Background

This Flood Risk Assessment and Outline Drainage Strategy (FRA) has been undertaken by LK Consult Ltd (LKC) to support a planning application for the redevelopment of the former Probation Centre, Laidon Road, Manchester. The development comprises low-rise residential houses and apartments.

LKC has prepared this FRA in line with the NPPF and Technical Guidance where appropriate.

In considering the proposals the following key principles have therefore been applied:

- Identification of flood risks.
- Protection of users of the new development.
- No increased flood risk to third parties.

Consultations

The Environment Agency (EA) has been consulted to inform the preparation of this report. They have provided a more detailed flood map, but no modelled data was available.

Manchester City Council (LLFA) and United Utilities (UU) were also consulted concerning flood risk.

All relevant consultees have confirmed that there is a Negligible to Low risk of flooding to this site from all sources.

Flood Risk

The site is shown on the Environment Agency's (EA) website Flood Zone Mapping as being in Flood Zone 1 (PPG Table 1).

The site is in Flood Zone 1 – Very Low Risk – annual probability of flooding less than 0.1% (1 in 1000).

Mitigation

Design

Site falls will be arranged to allow reasonably level access for occupants and visitors and to allow the site to be free-draining in case of local ponding at times of heavy rainfall. Floor levels of the residential properties will be set as high as possible above the flood level giving regard to necessary access for the less-able.

The development will not result in a reduction in flood plain storage compared to the existing situation.

In considering the potential drainage options for the site at present it is assumed that surface water runoff arising from the development will discharge into the existing combined sewer to the west of the site.

The proposed development will increase the proportion of the site covered by impermeable surfaces and will therefore generate more runoff. Attenuation will therefore be required as an allowance for climate change.

Foul sewage arising from the development will be discharged into the public combined sewer in Laindon Road to the west of the site.

The outline drainage strategy considers the use of attenuation-based SuDS to be feasible with a discharge to the combined sewer on the western boundary of the site.

Therefore, the most effective strategy, in line with the SuDS management train, would be to have a detention facility at the western boundary. The required detention facility has been estimated to be **65.2 m³** for the 1 in 30-year event restricted flow.

Similarly, the estimated volume to be retained on site for the 1 in 100-year storm event including an allowance for climate change is between **128.6 m³** and **160.8 m³**.

The site is considered to be at Low risk of flooding. It is recommended that the minimum finished floor levels for the development should be set at a nominal height above the proposed ground levels. This is to allow for overland flow during exceedance flows from an extreme event or a drainage failure.

Access

Access close to the site is elevated above potential flood levels and will always provide safe access to and from the site from Laindon Road to the west of the site.

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1 Introduction

1.1 Background

LK Consult Ltd (LKC) were commissioned by Britannia Victoria Ltd to carry out a Flood Risk Assessment (FRA) and Outline Drainage Strategy for the former Victoria Park Probation Centre, Manchester. The report was undertaken in support of a future planning application to redevelop the site for residential use.

The report will address the vulnerability to flooding from all possible sources and will also consider the impact of the development on surface water runoff accounting for climate change and the potential to increase flood risk elsewhere. The Outline Drainage Strategy in Section 5 will provide an overview of the SuDS techniques which could be considered on the site. The issues of actual flood risk are discussed in Section 4.

Government policy with respect to development in flood risk areas is contained within the Department of Communities and Local Government National Planning Policy Framework¹ and accompanying Technical Guidance of March 2012 (revised to the Planning Practice Guidance (PPG)², which supersedes Planning Policy Statement 25 (PPS25) 'Development and Flood Risk'. The guidance on Climate Change allowance issued by the Environment Agency in February 2016 has also been considered.

LKC has prepared this Flood Risk Assessment (FRA) in line with the NPPF and the PPG where appropriate. The level of detail entered into any flood risk assessment is dependent upon the scale and potential impact of the proposed development, and the vulnerability classification of the proposed land-use.

1.2 Site Details

A summary of the general site details is presented in Table 1-1. Plans, Drawings and Figures are provided in Appendix A. Figure 1 indicates the site location and boundary. Figure 2 indicates the proposed development.

Site Details	
Location	South of Daisy Bank Road, east of Laindon Road, Manchester, M14 5YJ. Centred at approximate National Grid Reference 386180E, 395730N.
Area	Approximately 0.62 Ha.
Topography	48.69 metres above ordnance datum (AOD) in the north of the site and 47.44m AOD in the southwest. The site is sloping down gently towards the southwest.
Current Land Use	<u>Site</u> Vacated probation centre and associated grounds, including surfaced car park, grassed area and another small derelict building. Site bounded by a brick retaining wall and metal palisade fencing. <u>Surrounding Area/ Boundary Treatment</u> North: Daisy Bank Road and residential properties. East: Ayton Grove, Merwood Grove and residential properties. South: Residential properties. West: Laindon Road and Residential properties.
Proposed Development	Residential houses with rear gardens and apartments with a residential garden area and car parking. Access will be from Laindon Road.

Table 1-1: Summary of site details.

¹ DCLG (2021). "National Planning Policy Framework." Department of Communities and Local Government. July 2021.

² DCLG (2022). "Planning Practice Guidance" <http://planningguidance.communities.gov.uk>, Update August 2022.

2 Site Setting

2.1 Vulnerability

As an initial phase in identifying whether a site is potentially at risk of flooding, LKC has consulted the Environment Agency's (EA) website Flood Zone Mapping. This mapping is (often) based on coarse scale modelling and provides only an initial indication of the flood risk to a site. The Environment Agency Flood Zone maps were developed using a very coarse Digital Elevation Map (DEM) and are superseded by a more detailed analysis of modelled flood levels and topographic survey levels.

The Flood Zones divide the floodplain into three categories of flood risk, and do not take flood defences into account. The NPPF defines the Flood Zones as:

- » Flood Zone 1 – little or no risk, with annual probability of flooding from rivers and the sea of less than 0.1% (1 in 1000).
- » Flood Zone 2 – low risk, with annual probability of flooding of 0.1 to 1.0% from rivers and 0.1 to 0.5% from the sea.
- » Flood Zone 3 – medium to high risk of flooding with an annual probability of flooding of 1.0% or greater from rivers, and 0.5% or greater from the sea.

The Flood Zone Mapping indicates the site as being within Flood Zone 1 in the PPG (paragraph 065, Table 1).

Although the development site is in Flood Zone 1, it is over 0.5 hectare in size and in a critical drainage area, so under current regulations a Flood Risk Assessment will be necessary to accompany the Planning Application.

The proposed development is for a residential end use, and this is classified within the 'More Vulnerable' category in the PPG (paragraph 066, Table 2).

2.2 The Sequential and Exception Tests

The NPPF does not require that the Sequential Test be applied to development proposals in Flood Zone 1. Since the site has been shown to be located in Zone 1 for flood risk (see section 4.1), a sequential approach should not be required for planning.

However, the principles should still be applied for developments within the site such that, for example, dwellings are situated on a high part of the site when there is a risk of local surface water flooding. The issues of actual flood risk are discussed below. The issues of safety and reduction in flood risk to others required by an Exception Test are also addressed in this document.

The Local Planning Authority (LPA) will make the final decision with regard to any planning application.

2.3 Environmental Setting

LKC has undertaken a review of public domain information including British Geological Survey data, Environment Agency data, historical mapping and aerial photography to provide a summary of the environmental setting of the site. This is summarised in Table 2-1 below.

Summary of the Environmental Setting			
Geology	Superficial		Till (Diamicton).
	Bedrock		Chester Formation (Sandstone).
	BGS Boreholes		BH Ref: SJ89NE1857, 87m E: Topsoil with roots to 0.10m, bricks, brick pieces, ashes, cinders, stones, sand and soil (Made Ground) to 0.55m and stiff to very stiff light brown / brown silty and sandy Clay with grey / fissures stone and coal inclusions to 1.78m. BH Ref: SJ89NE659, 90m W: Made Ground to 0.40m and very stiff brown silty and sandy Clay with grey fissures stone and coal inclusions to 4.50m. BH Ref: SJ89NE658, 125m SW: Made Ground (ash cinders in a clay matrix-Disturbed Ground) to 1.20m and very stiff brown silty and sandy Clay with grey fissures and coal inclusions, rounded medium gravel and occasional rounded cobbles and lenses of sand to 4.80m.
	Defra Soilscape Mapping		Type 17 – Slowly permeable seasonally wet acid loamy and clayey soils.
Hydrogeology	Aquifer Designation	Superficial	Secondary Undifferentiated Aquifer.
		Bedrock	Principal Aquifer.
	Source Protection Zone (SPZ)		Site not within an SPZ.
Hydrology	All adjacent and internal surface water		The Platt Brook is located approximately 700m south of the site.
	Flooding		Flood Zone 1.
Site History			Historical mapping indicates that the site consisted of a field from at least 1848 until 1956. From 1891 a large garden including glass houses, trees and paths associated with Stafford House to the east are present. It was likely demolished with Stafford House after 1956 mapping as not present by 1968 mapping. From 1968 mapping a school is present towards the south of the site. This is labelled as St Joesph’s RC Infants School from 1968 to 1995 mapping, associated with Chapel, Convent and High School to the south. This is unlabelled from 1999 to 2021 mapping and labelled as Victoria Park Probation and Community Centre on 2022 aerial photography. A pond was present towards the northwest from 1848 until 1891 and is no longer present on the 1910 map as it was likely infilled. Two ponds were present 58m and 158m south of the site respectively from 1891 and 1848 until 1894 mapping and 1908 mapping. The surrounding area has become increasingly urbanised.

Table 2-1: Summary of the Environmental Setting.

2.4 Geo-Environmental Investigation.

The investigation was undertaken on site by LK Consult Ltd in August 2022³.

The investigation involved the drilling of five window sample boreholes (referenced WS101 to WS105) to depths of 5.45 metres below ground level (mbgl) and the excavation of six trial pits (referenced TP101 to TP106) to depths of between 1.42mbgl to 3.00mbgl.

All sampling locations are shown in Appendix B.

Made Ground

Made ground was recorded in all boreholes from ground level to a maximum depth of 0.30-2.20mbgl. The made ground comprised horizons of gravel, sand, silt, clay with anthropogenic material including ash, brick, coal, clinker, ceramic, plastic, rebar, timber, metal, and glass.

Exceptions to this were found at the following locations:

- » WS103: paving stone with sub-base.
- » WS105: tarmacadam underlain by probable sub-base.
- » TP104 and TP104B: had a large volume of brick fragments in the made ground.
- » TP105: also contained concrete fragments and copper pipe in the made ground.

Natural Strata

Natural Strata was encountered from 0.30-2.20mbgl to a maximum depth of 2.20-10.13mbgl, comprising gravelly clay with fragments of coal. The clay was generally high strength and very firm consistency across the site. The clay at WS101 increased in strength and consistency with depth.

Profile Logs are shown in Appendix B.

One groundwater strike was recorded during the site investigation at a depth of 5.00mbgl in WS105.

³ Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy report by LK Consult (Ref: CL-602-LKC 21 1679-02, dated September 2022).

2.5 Site Reconnaissance

A site reconnaissance was undertaken in July 2022 and further photographs are provided below.

Relevant features identified on site are summarised below:

- Vehicular access to the site is to the west of the site via a barrier off Laindon Road.
- The site comprises two buildings, a hardstood tarmacadam area / car park in the centre of the site, and a grassed and shrubbed area with several established trees in the north.
- The two-storey Probation Centre is present towards the south of the site, and the centre's yard is fenced off with metal palisade fencing.
- The other building on site is small, one storey and fire damaged.
- The vegetated area in the north of the site was noted to be slightly undulating.
- The site is relatively flat with a slight slope from the north towards the southwest.
- The site is bounded by a brick retaining wall towards the north, east and west. Palisade fencing present towards the south.
- Several manhole covers are present within the central car parking area.
- A drainage gully and channel are also present within the car parking area.
- Highway gullies and manhole covers were also observed within Laindon Road to the west of the site and Daisy Bank Road to the north.

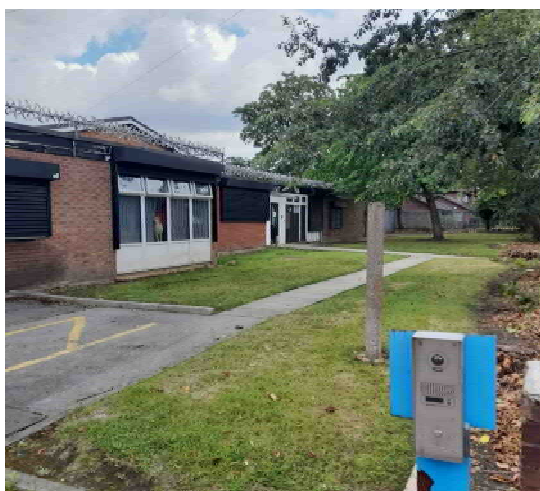
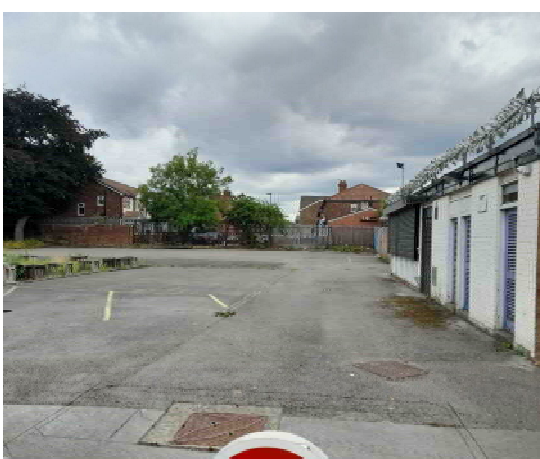
The surrounding area comprises residential land use, with Laindon Road and Daisy Bank Road bordering the site to the west and north, respectively.

- Hand dug pits were carried out in 3no. locations and are summarised in Plate 2-1.

HD101	HD102	HD103
GL-0.15m: TOPSOIL (dark brown slightly gravelly sandy SILT with occasional rootlets and rare coal fragments). Hand tool refusal at 0.15mbgl on made ground (concrete).	GL-0.55m: MADE GROUND (dark brown slightly gravelly sandy SILT with occasional rootlets, coal fragments and rare brick). 0.55-0.70m: Firm consistency brown and grey slightly gravelly CLAY with occasional coal fragments.	GL-0.30m: MADE GROUND (dark brown slightly gravelly sandy SILT with occasional rootlets, coal fragments and rare brick). 0.30-0.60m: Firm consistency brown and grey slightly gravelly CLAY with occasional coal fragments.

Plate 2-1: Hand Dug Pit Logs.

Relevant photographs are provided in Plate 2-2.

	
Photograph 1: View of site access towards the west of the site off Laindon Road.	Photograph 2: View of the Probation Centre towards the west of site. Site is relatively level.
	
Photograph 3: Car park area towards the centre of site.	Photograph 4: Car park area towards the centre of site and manhole covers on site.



Photograph 5: Derelict smaller building towards the centre of site.



Photograph 6: Grassed area towards the southern boundary.



Photograph 7: View of south of Probation Centre from the southwest.



Photograph 8: View of grassed area to the northwest of site. Site slopes gently towards the south.

	
Photograph 9: Grassed area facing northwest. Site to the west is bounded by a retaining wall.	Photograph 10: Drainage gully and manhole cover located in car park area.

Plate 2-2 (continued): Site photographs.

2.6 Site and Access Levels

A topographic survey of the site was provided, the information is included on the drawings in Appendix B. The site is sloping down gently from the north towards the southwest. The elevation ranges from 48.69m AOD in the north to 47.44m AOD in the southwest. The final site levels and ground floor levels of the residential properties have not yet been determined. The proposed access would join Laindon Road at around 46.87m AOD.

3 Consultation

Information from all relevant consultees is summarised in Table 3-1 below.

Relevant correspondence is provided in Appendices C (EA) and D (others).

Source	Details	
Environment Agency (EA)	Flood Zone 1: Very Low risk, with annual probability of flooding from rivers and the sea of less than 0.1% (1 in 1000).	
	Modelled River Levels	No information available as the site does not fall within 150m of an area at risk of flooding from rivers or the sea.
	Records of Flooding	No information available.
	Records of Flood Warning Service	Not within a flood warning service area.
	Surface Water Flooding	Very low risk of surface water flooding across the majority of the site. A small section of the site towards the south has a low risk of surface water flooding up to a depth of 300mm.
	Flooding from reservoirs	The site is at risk of flooding from reservoirs.
	Groundwater Source Protection Zone	Not within Source Protection Zone.
Manchester City Council (LLFA)	MCC Data screening report stated that the site is located within the Conurbation Core Critical Drainage Area (CDA). The nearest flood incident occurred on 10/02/2020 approximately 55m to the southeast of the site on Holbeck Grove, described as a blocked highway gully or drain. There are no culverted ordinary watercourse conduits on record in the LLFA asset register within the vicinity of the site.	
	Possible or known incidents of highway flooding	Unaware of any current flooding problems associated with Laindon Road.

Table 3-1: Summary consultee information

Source	Details	
United Utilities (UU)	Likely conditions for connecting into their sewerage system	UU would request conditions for a separate system with only foul draining to foul / combined sewers and surface water draining to soakaway/SuDS, watercourse, or surface water sewer. Surface water runoff generated from this development should discharge to the ground via infiltration system where feasible. UU would also request for a condition to prevent development within 3m either side of the sewer running through site towards the centre. All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80 of the National Planning Practice Guidance. If not feasible, UU will consider a connection to the 225mm diameter public combined sewer located in Laindon Road to the west of the site at a pass forward flow to be agreed by the Lead Local Flood Authority. UU request that any agreed rate does not exceed 13.9l/s. Foul flow from this site will be allowed to drain into the public combined sewer system. UU does not have a preference to the specific connection point in this instance. UU request that all proposed manhole chambers cover levels and finished floor levels are higher than the receiving public sewer. UU Wastewater Developer department was contacted regarding sewer flooding history for the site. UU confirmed that they did not have records of internal or external sewer flooding of properties in the vicinity of the site as a result of overloaded sewers.
	Sewer map	There is a 225mm diameter public combined sewer parallel to the site's western boundary along Laindon Road running in a southerly direction. There are 225mm and 300mm diameter public combined sewers parallel to the site's northern boundary along Daisy Bank Road to the north of the site running in a westerly direction. There is a combined sewer inspection chamber located on site towards the centre of the boundary.
Strategic Flood Risk Assessment (SFRA)	Level 1 SFRA ⁴	The site has no history of flooding from any source.
	Level 2 SFRA ⁵	The site has no history of flooding from any source.
Preliminary Flood Risk Assessment (PFRA) ⁶	The Preliminary Flood Risk Assessment (PFRA) ³ for the area indicates that there are no records of flooding for the area which conforms with information supplied by the EA.	

Table 3-1: Summary consultee information (continued).

⁴ Strategic Flood Risk Assessment Level 1: Manchester City, Salford City and Trafford Councils; Level 1 SFRA (2010), JBA Consulting.

⁵ Strategic Flood Risk Assessment Level 2: Manchester City, Salford City and Trafford Councils; Level 2 SFRA (2011), JBA Consulting.

⁶ Preliminary Flood Risk Assessment: Manchester City Council; Preliminary Flood Risk Assessment (2011), JBA Consulting.

4 Assessment of Flood Risk

4.1 Flood Zones

The detailed flood map provided by the EA indicates that the site is in Flood Zone 1. (see Appendix C).

A direct comparison was made between the provided EA flood levels at this location and the LiDAR levels.

The extents of the 0.1% (1000-year) flood level remain outside of the development area.

4.2 Sources of Flooding

The risk of flooding from the following flood sources has been considered:

Fluvial – The EA has confirmed the study area is within Flood Zone 1. Therefore, the flood risk associated with this source is considered Very Low.

Tidal – The study area is remote from the sea and tidally influenced water bodies. Therefore, the flood risk associated with this source is considered Negligible.

Pluvial (Rainfall) – The surface water flood risk maps show a small area towards the centre of the site which has the potential to flood during prolonged heavy rainfall. This area is associated with natural depressions that are likely to be positively drained following the development process. These areas need consideration within the detailed design phase or there is the potential to have areas of standing water in gardens and landscaped areas not positively drained if overland flow routes are not considered. Therefore, the risk of flooding from surface water flooding is Low but should be considered further during the detailed design.

Surface Water (Overland flow) – This relates to surface water entering the site. Surface water arising from the north of the study area is likely to be intercepted by the highway drains and therefore pose no threat to the development. If there was a drainage failure causing overland flow, it would flow towards the southwestern boundary. Therefore, the flood risk associated with this source is considered Low.

Groundwater – The BGS has no groundwater records for the study area. The superficial 'Till' deposits are more than 4.80m thick which would make it unlikely for groundwater flooding to occur. No evidence of shallow groundwater was observed during the walkover. One groundwater strike was encountered during the on-site Geo-Environmental Investigation at 5.00mbgl. Falling Head tests have been undertaken in some of the boreholes and these have recorded a standing water level of between 0.4m and 1.5m BGL. This is likely to be water rising up the borehole from below the clay based soils were pierced due to the ground investigation. Therefore, the flood risk associated with this source is considered Low.

Sewers – UU sewer records show combined and surface water sewers within the vicinity of the study area and within the surrounding housing developments. The Drainage and Water Enquiry states that no property on land surrounding the site is at risk of internal flooding due to overloaded public sewers. There are no records of sewer flooding at the site location. The highways to the north and west would intercept any overland flow before it enters the site. Therefore, the flood risk associated with this source is considered Very Low.

Artificial sources – According to the EA online maps, the study area is at risk from reservoir flooding. The likely risk of an incident occurring if the reservoir is adequately maintained and monitored is Low. Therefore, the flood risk associated with this source is considered Low; however, improvements are recommended during redevelopment.

4.3 Summary of Flood Risk

Source of Flooding	Risk Assessment Level
Fluvial	Very Low
Pluvial (Rainfall)	Low
Surface Water	Low
Tidal	Negligible
Groundwater	Low
Sewers	Very Low
Artificial Sources	Low

Table 4-1: Summary of Existing Risk Level.

The site is located within Flood Zone 1 and a Negligible to Very Low risk of flooding from all sources except for groundwater, pluvial, surface water and artificial sources which pose a Low risk of flooding has been identified for the site. LKC consider that a strategy for surface water management will be required at the site to mitigate the risk to others. The assessments of a range of measures that are feasible for the site are outlined in Section 5.

5 Surface Water Management

The NPPF recognises that flood risk and other environmental damage can be managed by minimising changes in the volume and rate of surface run-off from development sites through the use of Sustainable Drainage Systems (SuDS), this being complementary to the control of development within the floodplain.

SuDS will not alleviate flooding in an area prone to flooding; however, properly designed SuDS have the potential to prevent the surface water runoff from new development worsening the flood risk. The effective disposal of surface water from any new development is a material planning consideration in determining if the proposals for the development and use of land are acceptable.

The accepted principles are that surface water arising from a developed area should, as far as practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account.

The Building Regulations Requirement H3⁷ stipulates that rainwater from roofs and paved areas is carried away from the surface to discharge to one of the following, listed in order of priority:

- an adequate soakaway or other adequate infiltration system,
- a watercourse or, where that is not practicable,
- a sewer.

The concept of a sustainable drainage system has been incorporated into the outline drainage strategy for the study area in order to comply with the Flood and Water Management Act 2010⁸.

Suitability of different SuDS will be governed by prevailing site conditions, such as the type and scale of development, topography, ground conditions (soil permeability, ground stability, depth to water table), local hydrogeology and risk of groundwater contamination (presence of sensitive aquifers and source protection zones) etc.

5.1 Infiltration

The Groundwater Source Protection Zone mapping from the EA website shows that the site is not within any identified protection zones. A summary of the British Geological Survey superficial and bedrock aquifer descriptions and classifications supplemented by local records is shown in Table 5-1 below:

Classification	Description	Aquifer Classification	Recorded Water Table Depth	Soakaway Potential
Till Deposits	Stiff light brown / brown silty and sandy Clay	Secondary Undifferentiated	N/A	Poor
Chester Formation	Sandstone	Principal	N/A	Good

Table 5-1: Geological and Hydrogeological Setting.

⁷ Building Regulations part H3 2010: Approved Document, Drainage and Waste Disposal.

⁸ Flood and Water Management Act 2010: UK Government.

Infiltration methods such as soakaways are unlikely to be feasible. The presence of made ground and underlying CLAY soils is likely to be of low permeability and therefore it is not recommended that soakaways are used for the disposal of surface water runoff. However, this may be investigated further at the detailed design stage.

During further ground investigation it was noted that the water level had risen within the boreholes to between 0.4m and 1.5m BGL suggesting that deep excavations may be at risk from artesian groundwater entry.

5.2 Surface Water Drainage Strategy

There is a slope over the site and surrounding area which indicates that groundwater in the vicinity of the site would drain towards the southwestern boundary.

There are no observable watercourses within or near the boundary of the site.

There is a combined water sewer running adjacent to the site in Laindon Road.

Further combined water sewers run to the north of the site in Daisy Bank Road.

The drainage options relating to the final discharge of surface water for this section of the site are listed in Table 5-2 in order of priority within the NPPF:

Option No:	Drainage Solution	Most feasible solution	Comments
a	Soakaway/Infiltration	2	Not likely to be feasible as the site is underlain by made ground and clay based soils. The impermeable ground conditions also make the use of infiltration unlikely.
b	Connection to Watercourse	N/A	Not feasible as there are no known watercourses within or adjacent to the site and would require third party access, a road crossing and EA and LLFA consent.
c	Discharge into a sewer	1	A connection into the 225mm diameter public combined sewer in Laindon Road would be possible – subject to approval from LLFA and connection consent from United Utilities.

Table 5-2: Drainage options.

Table 5-3 provides a summary of the SuDS options appraisal with consideration of CIRIA C753 (The SUDS Manual)⁹ for the development:

SuDS Option	Appropriate to Development	Comments
Soakaways	X	Due to the nature of the ground conditions, the use of infiltration systems may not be feasible.
Infiltration basin	X	Depressions that store and dispose of water via infiltration. May not be appropriate given the ground conditions.
Filter drains	X	Linear trenches filled with a permeable granular material, often with a perforated pipe in the base of the trench.
Detention basin	X	Dry depressions designed to hold water for a specific retention time.
Swales	✓	Swales are shallow grass-lined channels that provide capacity for conveying flows at a controlled rate into ponds and watercourses.
Rainwater harvesting	*	Rainwater harvesting collects the rain which falls onto roofs, then stores it in a tank until required for a non-potable use. When required, the water is pumped to the point of use, thus displacing what would otherwise be a demand for mains-water. In the process, a volume of water is kept out of the storm-water management system, thereby helping to reduce flooding risks. Rainwater harvesting systems are currently not included in the development proposals.
Green/blue roofs	*	Green roof installations can help to reduce surface water runoff from roof areas depending on the system specified. Green roofs are not currently included in the development proposals.
Geo-cellular storage systems	✓	Modular block systems can be used to provide an underground storage facility. Any geo-cellular storage systems should be lined with a geo-membrane to provide attenuation storage.
Permeable Pavements – with granular and geo-cellular storage systems	✓	Permeable pavements allow inflow of rainwater into underlying construction. Any geo-cellular storage systems would have to be lined with an impermeable membrane to provide storage rather than infiltration for runoff from highways.
Ponds	X	Attenuation ponds can be used to offset the increase in surface water flows attributable to increased area of hard standing, in order to minimise the risk of flooding to and from the proposed development. Ponds will attenuate the surface water flow prior to discharging to the public surface water sewers. The storage volume afforded by these features should not include any permanent water in the pond.
Oversized Pipes	✓	Oversizing the pipes that make up the on-site drainage network is a cost-effective method for providing attenuation storage within the network. Such systems could be considered on the parts of the development where gradients are relatively flat.
Tanks	✓	Prefabricated underground tanks could be considered at the detailed design stage in order to provide storage to attenuate surface water runoff.
Flow control devices	✓	The peak flow rates will be controlled by flow control devices e.g. hydrobrake style flow control systems, and restricted orifices. Flow control devices enable the discharge to be restricted to a constant rate from the development.

Table 5-3: Summary of the SuDS options appraisal.

Notes

- ✓ Suitable for use given the nature and scale of the development
- * Possibly suitable for use – not included in the client and architect design proposal at present
- X Not suitable

⁹ CIRIA C753 - The SUDS Manual. London 2015.

5.3 Surface Water Attenuation Requirements

In line with the correspondence provided by Manchester City Council, the flow from this development should be reduced by the minimum of 50% from the existing runoff rates for estimating the attenuation volumes required.

It is estimated from the supplied plan (see Appendix A) that the site will have the following designated areas (Table 5-4). Table 5-4 shows the assumed split in area included within the calculations.

Designated Areas	Plot Area
Total area (ha)	0.62
Existing Impermeable Area (ha)	0.37
Green Infrastructure (ha)	0.25
Proposed Catchment	
Impermeable split (ha)	0.50
Permeable split (ha)	0.12

Table 5-4: Assumed plot areas.

It can be seen that there is an increase in impermeable area from the existing usage to the proposed. This is likely to require attenuation to reduce the proposed flow off site to a level which is acceptable to the LLFA and to UU, including an allowance for climate change.

5.3.1 Attenuation Estimate

Surface water storage and runoff estimations based on the HR Wallingford procedure have been undertaken for the development and the output report is presented in Appendix E.

For the contributing catchment an estimate has been produced assuming an impermeable area of 0.50ha and a greenspace of 0.12ha. This gives the following runoff rates and attenuation requirements for this section based on the Wallingford method:

» Q_{bar} :	47.80 l/s
» 1 in 1-year peak runoff rate:	33.50 l/s
» 1 in 30-year peak runoff rate:	84.70 l/s
» 1 in 100-year peak runoff rate:	107.30 l/s

This reduced by 50% would give the following rates:

» Q_{bar} :	23.90 l/s
» 1 in 1-year peak runoff rate:	16.75 l/s
» 1 in 30-year peak runoff rate:	42.35 l/s
» 1 in 100-year peak runoff rate:	53.65 l/s

All runoff estimates, and subsequent storage estimates are included in Appendix E.

The following attenuation has been estimated for the development using a flow rate of 13.9l/s agreed with united utilities this is less than the the 1 in 1 year 50% reduced runoff rate of 16.75l/s and utilises the FSR methodology¹⁰ as:

- Attenuation storage volume: **65.2 m³** (1 in 30-year event)
- Retention on site volume: **128.6 m³** (1 in 100 year + 20% Climate Change)
- Retention on site volume: **160.8 m³** (1 in 100 year + 40% Climate Change)

Attenuation storage aims to limit the peak rate of runoff from the development to the reduced 50% runoff rates for a range of annual flow rate probabilities before discharging into the adjacent combined sewer.

As the flow from the development would be restricted there should be little change in the flows that enter the public combined sewer and thus the risk of flooding as a result from the development should be negligible.

The attenuation required for a 1 in 30-year storm event, requires a storage volume of **65.2 m³**. For the 1 in 100-year event, a storage capacity of between **128.6 m³** and **160.8 m³** will be required from on-site storage as well as SuDS systems. All volumes can be stored within the site boundary and discharges will be limited by flow control devices to the adjacent combined sewer.

5.4 Site Specific SuDS

The use of an attenuation tank or similar is deemed to be the most feasible and practical option for the development. The attenuation tank will provide required storage volume to limit peak runoff arising from the development. Currently geocellular storage systems will not be accepted by United Utilities for adoption.

Utilisation of a flow control device at the end of the system will control the peak flow rates.

The use of permeable paving may be viable dependant on the detailed design of the proposed development. If this drainage technique is considered to be feasible then it will reduce the requirement for attenuation as it will reduce the contributing impermeable area. The permeable paving will also provide some level of water treatment reducing effects of pollution in runoff on the environment.

Assuming that the outline drainage strategy is acceptable to the Local Authority, a more detailed design can be presented and agreed with the appropriate regulatory bodies during the detailed design phase.

5.5 Foul Drainage

United Utilities has specified that foul flow could be discharged into the public combined sewer system at any convenient point and at an unrestricted rate. United Utilities would have no preference to the specific connection point in this instance. A suitable connection point could be the adjacent 225mm diameter combined sewer in Laidon Road as relative levels indicate that this will be feasible in terms of fall. The combined manhole has a recorded invert level of 44.45m AOD which appears to be low enough to provide a suitable connection point. There are several possible alternative manholes for the connection of foul drainage from the site.

¹⁰ Flood Studies Report Wallingford NERC 1975.

6 Mitigation Measures

6.1 Proposed Site levels and Developments Level

Current Environment Agency guidance recommends that the minimum ground floor levels of residential developments are set at a minimum of 600mm above the 1% annual probability (1 in 100 year) flood level including an additional fluvial allowance for climate change. It is generally accepted that vehicle parking can be accommodated within the flood zone with suitable safeguards. The 'design' flood level for the site should therefore be the 1% annual probability event with allowance for climate change.

This and the 0.1% annual probability (1 in 1000-year) are below the lowest existing ground level measured on site. On this basis the finished floor levels (FFL) should be set at a nominal height above the finalised ground levels to allow for any overland flow from a drainage failure. No further mitigation measures are therefore recommended.

6.2 Safe Access

Safe and dry access is available via Laindon Road to the west as it is above the 1% annual probability event. Therefore, no mitigation is proposed.

6.3 Flood Resistance and Resilience

The development proposed may be subject to flooding at more extreme events than those considered. However, the risk appears to be sufficiently low that flood resilience measures need not be included into ground floor construction to aid recovery after any event. If utilised, typical measures would include solid floors, use of suitable materials and services fed from upper floors with outlets at high level. The need can be discussed and agreed with building control officers during detailed design.

6.4 Residual Risk

It is impossible to completely guard against flooding since extreme events greater than the design standard event are always possible. However, it is likely that with the 1% annual probability flood event with an allowance for climate change significantly below the lowest site levels, the relatively elevated position of the development will safeguard it from localised fluvial flooding during extreme rainfall events and fluvial flooding events outside the scope of this assessment. However, ground floor levels should be set above proposed levels across the site and provide a nominal freeboard to allow overland flow under exceptional conditions. Overland flow routes should be considered in case of drainage failure and the extreme events.

7 Conclusions

The site is currently a vacated former Probation Centre and associated grounds. The proposal is to redevelop the site for residential use.

The site is shown on published mapping to be located within the Environment Agency's Flood Zone 1. Comparison of topographical data with the EA modelled flood level data indicates that the whole site is in Flood Zone 1 – Very Low Risk of fluvial flooding.

Negligible to Low Risks of flooding from all sources have been identified from information provided by MCC, the EA, BGS and UU.

An assessment of these risks in conjunction with the development proposals have resulted in the following recommendations for the safe development of the site:

- » The finished floor level should be set at a nominal height above the finished ground levels to allow for overland flow routes in extreme events and drainage failures.
- » Pedestrian and vehicular safe access to and from the site is achievable under all conditions via the access road off Laindon Road.
- » Potential for soakaway use for rainwater disposal is low; a shallow water table was recorded in follow up testing in the boreholes suggesting that there is some artesian water pressure below the superficial soil however, this could be investigated further at the detailed design phase if required.
- » Surface water flow will likely need to be attenuated to the 5l/s runoff rate or a rate agreed with the LLFA and United Utilities.
- » Surface water arising from the site could potentially discharge into the combined sewer located to the west of the site in Laindon Road.
- » Foul sewage could be discharged into the existing public combined sewer in Laindon Road to the west subject to the agreement of United Utilities.
- » A formal evacuation plan is not considered to be required.

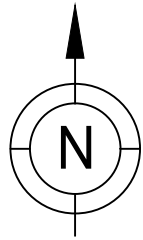
Further details on the proposed mitigation measures are provided in Section 6. All proposed measures should be agreed with the Local Authority prior to commencement of the development.

Appendix A

Figures, Plans and Drawings



Client: Britannia Victoria Ltd				Title: Site Location & Boundary Plan			
Site: Victoria Park Probation Centre				Scale (see scale bar): 1:25,000 & 1:2,000 @ A4			
Job No.: FRA 22 1121	Drawn By: JL	Checked By: MJ	Drawn: Sept 2022	Figure: 1	Revision:		



KEY

 Site Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



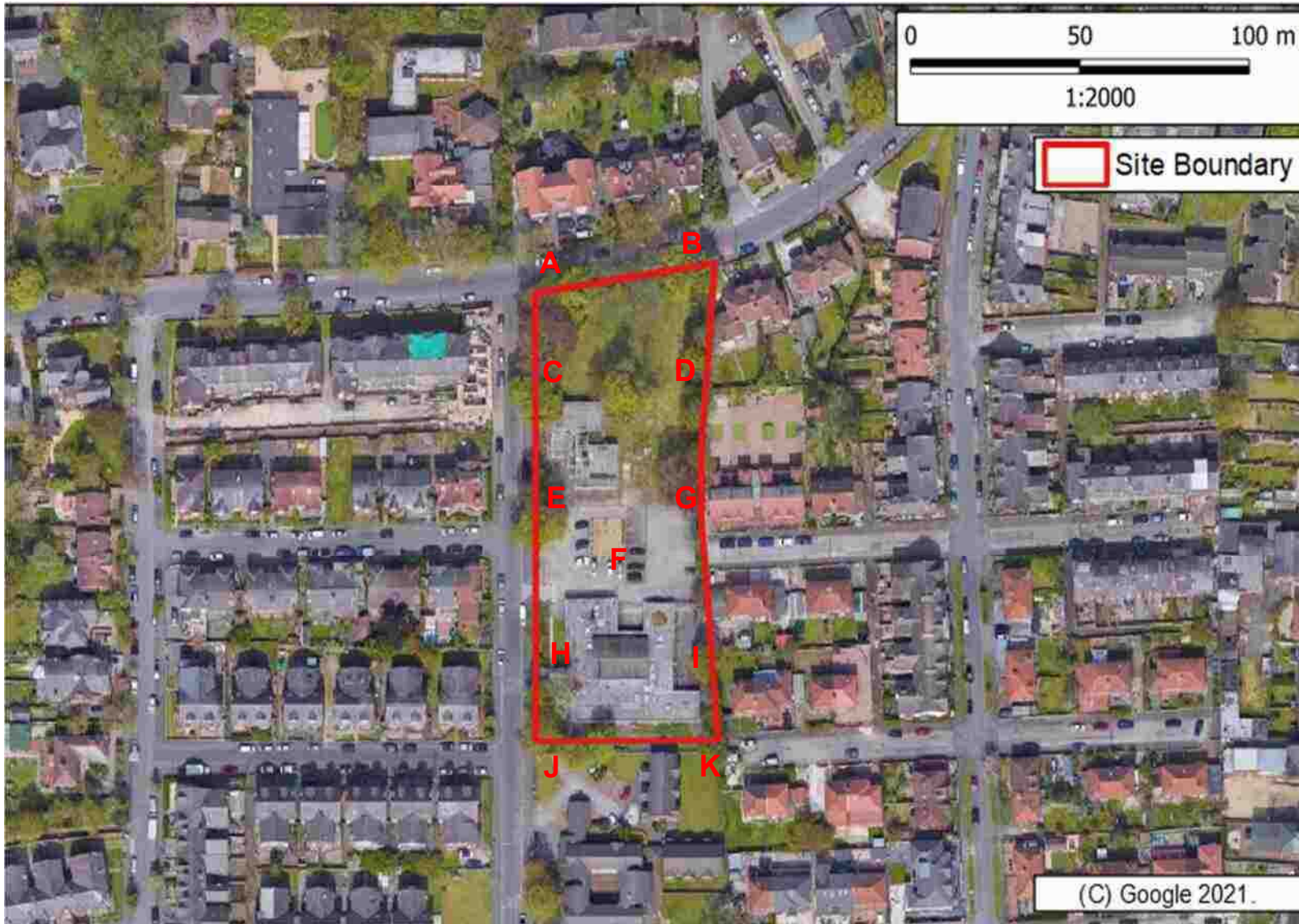
Client: Britannia Victoria Ltd			
Site: Victoria Park Probation Centre			
Title: Proposed Development Plan			
Job No.: FRA 22 1121	Scale (See Scale Bar): See Scale Bar	Figure: 2	Revision: A
Drawn By: AC	Checked By: EK	Drawn: Sep 2022	

Extract from: Ollier Smurthwaite Architects
Drawing Ref: Block Plan, No.A662_P_002B, Rev:B (July 2021)



Appendix B

Site Information



**LiDAR Elevation Key (m
AOD)**

A = 47.43

B = 47.90

C = 47.58

D = 48.20

E = 47.48

F = 47.55

G = 47.92

H = 47.36

I = 47.72

J = 47.62

K = 47.50

C/MC/IMA

Trial Pit Investigation
St. John's C.E. Primary School
Birch Lane

Trial Pit 'a'

386430
395771

- 0.00 - 0.100 - Topsoil with roots.
- 0.100 - 0.550 - Bricks, brick pieces, ashes, cinders, stones, sand, soil etc. - Made Ground.
- 0.550 - 1.775 - Stiff to very stiff light brown/brown silty and sandy CLAY with grey fissures stone and coal inclusions.

Trial Pit 'b'

386460
395774

- 0.00 - 0.100 - Topsoil with roots.
- 0.100 - 0.500 - Brick pieces, ashes, cinders, stones, sand, soil, etc. - Made Ground.
- 0.500 - 1.700 - Stiff to very stiff light brown/brown silty and sandy CLAY with grey fissures stone and coal inclusions.

Trial Pit 'c'

386492
395774

- 0.00 - 0.150 - Topsoil with roots.
- 0.150 - 1.500 - Bricks, brick pieces, stones, ashes, cinders, soil, timber, etc. - Made Ground.
- 1.500 - 2.050 - Very stiff brown silty and sandy CLAY with grey fissures, stone and coal inclusions.

Trial Pit 'd'

386424
395746

- 0.00 - 0.125 - Topsoil with roots, ashes, brick pieces etc.
- 0.125 - 0.600 - Clay bound ashes, roots, cinders, brick pieces etc. - Made Ground.
- 0.600 - 2.000 - Firm to stiff brown silty and sandy CLAY with organic and inclusions.

WE at 1.50m - SLOW
Side collapsing at 2.0m

Trial Pit 'e'

386457
395744

- 0.00 - 0.150 - Topsoil with roots.
- 0.150 - 0.800 - Ashes, brick pieces, stones, sand, clay, soil etc. - Made Ground.
- 0.850 - 1.900 - Stiff to very stiff brown silty and sandy CLAY with grey fissures, stone and small coal inclusions.

Trial 'f'

386490
395743

- 0.00 - 0.100 - Topsoil, roots.
- 0.100 - 0.850 - Ashes, cinders, brick pieces, stones, sand, soil etc. - Made Ground.
- 0.850 - 1.900 - Stiff to very stiff brown silty and sandy CLAY with grey fissures, stone and small coal inclusions.

City Engineer and Surveyor's Dept.,
Town Hall,
Manchester.
August, 1986

SJ89NE 8604 9970 659

		Location Scarsdale Road, Manchester		Borehole No. BH4	
		Client: Manchester City Council		Project Ref.	
Job No.: MEDC97-2		Equipment and methods Cable percussion		Drilled by: CB	
		Start Date: 24/01/97 End Date: 24/01/97 Final Depth: 6.20		Ground level: m AOD	
				Co-ordinates: E N	

CASING DEPTH (mm)	WATER DEPTH (mm)	Field Records	SAMPLES / TESTS			Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
			Depth (m) from to	SAMPLE Type & No.	SPT (N) (Col)				
			0.50	D 1		Made Ground (75mm bituminous surfacing, over 225mm of MOT sub-base over 100mm of ash fill)	(0.40)		
			1.20 1.65	U 1	(254)	very stiff brown silty and sandy CLAY with grey fissures stone and coal inclusions.	0.40		
			2.00	D 2					
			2.50 2.95	U 2					
			3.00	D 3			(5.60)		
			3.50 3.95	U 3	(297)				
			4.20	D 4					
			4.50 4.95	U 4					
			5.00	D 5					
			5.50 6.00	U 5	(194)				
		(2401/97)				Borehole Completed	6.00		

Remarks 1) No water encountered during excavation. Diameter (mm) 150 Depth (m) 4.50 Date Borehole Backfilled 24/01/97		Logged by MJC FIG No.
---	--	--

5584NE 8604 9559 658

		Location Scarsdale Road, Manchester		Borehole No. BH3	
		Client Manchester City Council		Project Ref:	
Job No.: MEDC97-2		Equipment and methods Cable percussion.		Drilled by CH	
		Start Date: 23/01/97 End Date: 23/01/97 Final Depth: 6.00		Ground level m AOD Co-ordinates: E N	

CASSID DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS			Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
			Depth (m) from	to	SAMPLE Type & No				
						Made Ground (75mm Bituminous surfacing over 225mm of MOT sub-base)	(0.30) 0.30		
						Made Ground (ash cinders in a clay matrix - Disturbed Ground)	(0.90)		
			1.20	1.65	U 1	very stiff brown silty and sandy CLAY with grey fissures and coal inclusions, rounded medium gravel and occasional rounded cobbles and lenses of sand.	1.20		
			2.00		D 1				
			2.50	2.95	U 2				
			3.00		D 2				
			3.50	3.95	U 3			(4.80)	
			4.00		D 3				
			4.50	4.95	U 4	(211)			
			5.00		D 4				
			5.50	6.00	U 5	Sand band 5.50-5.70m (see grading)			
						Borehole Completed	6.00		

Remarks

1) No water encountered during excavation.

Diameter (mm) 150 Depth (m) 4.50

Date Borehole Backfilled: 23/01/97

Logged by **MJC**

FIG No.

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

Number
WS101**Excavation Method**Drive-in Windowless Sampler
driven to 5.45mbgl.**Dimensions****Ground Level (mOD)**

51.00

Client

Britannia Victoria Ltd

Job
Number
LKC 21 1679**Location** (Observed measurements)

386201 E 395674 N

Dates

19/08/2022

Engineer

LKC

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.30	ES PID=0.2ppm				(0.30)	MADE GROUND: Dark brown gravelly sandy SILT with occasional coal fragments, rootlets, rare clinker, plastic fragments and brick fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies. Firm to very stiff consistency very high strength brown and grey mottled slightly gravelly CLAY with rare coal fragments. Gravel is fine to medium, subangular to subrounded of mixed lithologies. Firm consistency at 0.30-0.90mbgl. Stiff consistency at 0.90-1.40mbgl. Very stiff consistency at 1.40-5.45mbgl.		
0.30-1.00	ES PID=0.3ppm			50.70	0.30			
1.00	PP 157kPa							
1.20-1.65	SPT N=17		3,3/4,4,4,5					
1.80	PP 196kPa							
2.00-2.45	SPT N=18							
2.00-3.00	D		2,3/4,4,4,6					
2.80	PP 206kPa				(5.15)			
3.00-3.45	SPT N=24		4,4/5,6,6,7					
3.80	PP 211kPa							
4.00-4.45	SPT N=30					Complete at 5.45m		
4.00-5.00	D		5,6/6,7,7,10					
4.80	PP >221kPa							
5.00-5.45	SPT N=25		5,5/5,6,6,8					
				45.55	5.45			

RemarksBorehole dry and stable.
Grid reference information obtained from: gridreferencefinder.com.
Elevation information obtained from: www.freemaptools.com/elevation-finder.htm.**Scale**
(approx)

1:40

Logged
By

JW

Figure No.

LKC 21 1679.WS101

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

Number
WS102**Excavation Method**Drive-in Windowless Sampler
driven to 5.45mbgl.**Dimensions****Location** (Observed measurements)
386158 E 395696 N**Ground Level (mOD)**

50.00

Client

Britannia Victoria Ltd

Job
Number
LKC 21 1679**Engineer**

LKC

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.60	ES PID=0.5ppm				(0.60)	MADE GROUND: Dark brown gravelly sandy SILT with occasional brick fragments, rootlets, rare pottery fragments and coal fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies.			
0.60-1.00	ES PID=0.3ppm			49.40	0.60	Very stiff consistency very high strength brown and grey mottled slightly gravelly CLAY with rare coal fragments. Gravel is fine to medium, subangular to subrounded of mixed lithologies.			
1.00 1.00-2.00 1.20-1.65	PP 211kPa D SPT N=17		3,4/4,4,4,5						
1.80 2.00-2.45	PP 206kPa SPT N=19		3,3/4,4,5,6						
2.80 3.00-3.45 3.00-4.00	PP 211kPa SPT N=22 D		3,4/5,5,5,7		(4.85)				
3.80 4.00-4.45	PP 206kPa SPT N=27		4,5/5,7,7,8						
4.80	PP 221kPa			44.55	5.45	Complete at 5.45m			

RemarksBorehole dry and stable.
Grid reference information obtained from: gridreferencefinder.com.
Elevation information obtained from: www.freemaptools.com/elevation-finder.htm.**Scale**
(approx)
1:40**Logged**
By
JW**Figure No.**
LKC 21 1679.WS102

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

Number
WS103**Excavation Method**Drive-in Windowless Sampler
driven to 5.45mbgl.**Dimensions****Ground Level (mOD)**

50.00

Client

Britannia Victoria Ltd

Job
Number
LKC 21 1679**Location** (Observed measurements)

386159 E 395750 N

Dates

19/08/2022

Engineer

LKC

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.50-1.00	ES PID=0.4ppm			49.88 49.80	(0.12) 0.12 0.20	MADE GROUND: Yellowish light brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to medium, subangular to subrounded of mixed lithologies. Paving stone present at 0.00-0.05mbgl.			
1.20-1.65	SPT N=7		2,1/1,2,2,2	48.70	(1.10) 1.30	MADE GROUND: Light grey slightly sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of limestone. Probable MOT.			
1.50-2.00	ES PID=0.4ppm					MADE GROUND: Loose density dark brown gravelly sandy SILT with occasional coal fragments, rootlets, clinker, brick fragments and rare ceramic fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies.			
1.80	PP 216kPa								
2.00-2.45	SPT N=19		2,3/4,5,5,5						
2.00-3.00	D								
2.80	PP 206kPa								
3.00-3.45	SPT N=20		3,4/4,5,5,6		(4.15)				
3.80	PP 206kPa								
4.00-4.45	SPT N=23		3,4/5,5,6,7						
4.80	PP 211kPa								
5.00-5.45	SPT N=27		3,5/6,6,7,8	44.55	5.45				
						Complete at 5.45m			

RemarksNo SPT recovery at 1.20mbgl.
Elevation information obtained from: www.freemaptools.com/elevation-finder.htm.
Grid reference information obtained from: gridreferencefinder.com.
Borehole dry and stable.**Scale**
(approx)

1:40

Logged
By

JW

Figure No.

LKC 21 1679.WS103

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

Number
WS104**Excavation Method**Drive-in Windowless Sampler
driven to 5.45mbgl.**Dimensions****Ground Level (mOD)**

50.00

Client

Britannia Victoria Ltd

Job
Number
LKC 21 1679**Location** (Observed measurements)

386201 E 395674 N

Dates

19/08/2022

Engineer

LKC

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.40	ES PID=0.4ppm				(0.45)	MADE GROUND: Dark brown gravelly sandy SILT with occasional brick fragments, rare coal fragments, clinker and plastic fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies. Gravel surface layer present to 0.05mbgl. Gravel is fine to coarse, subangular to subrounded of mixed lithologies. (Imported)		
0.50-1.00	ES PID=0.4ppm			49.55	0.45			
1.00	PP 157kPa					Very stiff consistency grey and brown mottled very high strength brown and grey mottled slightly gravelly CLAY with rare coal fragments. Gravel is fine to medium, subangular to subrounded of mixed lithologies.		
1.20-1.65	SPT N=15		3,3/3,4,4,4					
1.20-2.00	D							
1.80	PP 206kPa							
2.00-2.45	SPT N=17		2,3/3,4,5,5					
2.80	PP 181kPa							
3.00-3.45	SPT N=19		3,4/4,5,5,5		(5.00)			
3.00-4.00	D							
3.80	PP 167kPa							
4.00-4.45	SPT N=21		4,5/5,5,5,6					
4.80	PP 172kPa					Complete at 5.45m		
5.00-5.45	SPT N=23		6,5/5,6,6,6					
				44.55	5.45			

RemarksBorehole dry and stable.
Grid reference information obtained from: gridreferencefinder.com.
Elevation information obtained from: www.freemaptools.com/elevation-finder.htm.**Scale**
(approx)

1:40

Logged
By

JW

Figure No.

LKC 21 1679.WS104

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

Number
WS105**Excavation Method**Drive-in Windowless Sampler
driven to 5.45mbgl.**Dimensions****Ground Level (mOD)**

52.00

Client

Britannia Victoria Ltd

Job
Number
LKC 21 1679**Location** (Observed measurements)

386199 E 395724 N

Dates

19/08/2022

Engineer

LKC

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10-0.40	ES PID=0.4ppm			51.95	0.05 (0.15)	MADE GROUND: Tarmacadam.			
0.50-1.00	ES PID=0.4ppm			51.80	0.20 (0.30)	MADE GROUND: Blackish grey gravelly SAND with frequent ash, occasional clinker, rare brick fragments and coal fragments. Sand is fine to coarse. Gravel is fine to medium, subangular to subrounded of predominantly ash.			
1.00	PP 157kPa			51.50	0.50	MADE GROUND: Grey and red gravelly SAND with frequent brick fragments, occasional ash, coal fragments and clinker. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of predominantly brick.			
1.20-1.65	SPT N=11		2,2/2,2,3,4			Stiff to very stiff consistency high to very high strength brown and grey mottled slightly gravelly CLAY with rare coal fragments. Gravel is fine to medium, subangular to subrounded of mixed lithologies.			
1.20-2.00	D					Stiff consistency and high strength until 1.00mbgl. Very stiff consistency and very high strength below 1.00mbgl.			
1.80	PP 206kPa		3,3/3,4,4,6						
2.00-2.45	SPT N=17								
2.80	PP 181kPa								
3.00-3.45	SPT N=15		2,2/3,3,4,5		(4.95)				
3.00-4.00	D								
3.80	PP 167kPa								
4.00-4.45	SPT N=15		3,3/3,4,4,4						
4.00-5.00	D								
4.80	PP kPa								
4.80	PP 172kPa								
5.00-5.45	SPT N=22		Water strike(1) at 5.00m. 3,3/4,5,6,7			Very sandy clay band at 5.00mbgl. Sand is fine to coarse.		Σ1	
				46.55	5.45	Complete at 5.45m			

RemarksGroundwater strike at 5.00mbgl.
Elevation information obtained from: www.freemaptools.com/elevation-finder.htm.
Grid reference information obtained from: gridreferencefinder.com.
Borehole stable.**Scale**
(approx)

1:40

Logged
By

JW

Figure No.

LKC 21 1679.WS105

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

**Trial Pit
Number
TP101****Excavation Method**

Machine excavated trial pit.

Dimensions

2.00m x 0.60m x 2.20m

Ground Level (mOD)

51.00

Client

Britannia Victoria Ltd

**Job
Number**

LKC 21 1679

Location (Observed measurements)

386197 E 395691 N

Dates

18/08/2022

Engineer

LKC

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.60	ES D PID=1.2ppm			50.95 50.90	0.05 0.10	MADE GROUND: Tarmacadam.		
0.60-1.00	ES PID=0.4ppm			50.40	0.60	MADE GROUND: Light brown sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies.		
1.00-2.00	D				(0.50)	MADE GROUND: Soft to firm consistency dark brown gravelly sandy CLAY with occasional brick fragments, glass fragments, ceramic fragments, coal fragments, rootlets and clinker. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies.		
1.50	SV >140kPa		SV = 140 kPa, 140 kPa, 140 kPa. Av. = 140Kpa.		(1.60)	Very stiff consistency high strength brown and grey mottled slightly gravelly CLAY with rare coal fragments. Gravel is fine to medium, subangular to subrounded of mixed lithologies.		
				48.80	2.20	Complete at 2.20m		

RemarksTrial pit dry and stable.
Grid reference information obtained from: gridreferencefinder.com.
Elevation information obtained from:
www.freemaptools.com/elevation-finder.htm.

No image available

Scale (approx)

1:25

Logged By

JW

Figure No.

LKC 21 1679.TP101

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

**Trial Pit
Number
TP102****Excavation Method**

Machine excavated trial pit to 2.60mbgl.

Dimensions

2.50m x 0.60m x 2.60m

Ground Level (mOD)

50.00

Client

Britannia Victoria Ltd

**Job
Number
LKC 21 1679****Location (Observed measurements)**

386154 E 395676 N

Dates

18/08/2022

Engineer

LKC

**Sheet
1/1**

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.60	ES D PID=1.1ppm				(0.60)	MADE GROUND: Dark brown gravelly sandy SILT with frequent rootlets, rare brick fragments, glass fragments, coal fragments, rebar and plastic fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies.		
0.60-1.00	ES PID=0.4ppm			49.40	0.60	Very stiff consistency brown and grey mottled slightly gravelly CLAY with occasional rootlets and rare coal fragments. Gravel is fine to medium, subangular to subrounded of mixed lithologies. Clay is friable. Recovered as gravel.		
1.50-2.50	D				(2.00)	No shear vane reading due to friable nature of clay.		
				47.40	2.60	Complete at 2.60m		

No image available

Remarks

No shear vane readings at 0.60-2.60mbgl due to friable nature of the clay.
Trial pit dry and stable.
Grid reference information obtained from: gridreferencefinder.com.
Elevation information obtained from:
www.freemaptools.com/elevation-finder.htm.

Scale (approx)

1:25

Logged By

JW

Figure No.

LKC 21 1679.TP102

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

**Trial Pit
Number
TP103****Excavation Method**

Machine excavated trial pit to 3.00mbgl.

Dimensions

2.50m x 0.60m x 3.00m

Ground Level (mOD)

50.00

Client

Britannia Victoria Ltd

**Job
Number
LKC 21 1679****Location (Observed measurements)**

386166 E 395770 N

Dates

18/08/2022

Engineer

LKC

**Sheet
1/1**

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-1.00	ES PID=0.3ppm					MADE GROUND: Dark brown gravelly sandy SILT with frequent whole bricks, brick fragments, occasional rootlets, concrete fragments, coal fragments, clinker, rare glass fragments and timber. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies.		
0.40-1.40	D PID=0.3ppm				(1.40)			
1.40-2.00	ES PID=0.4ppm			48.60	1.40	Firm to very stiff consistency high strength brown and grey mottled slightly gravelly CLAY with rare coal fragments. Gravel is fine to medium, subangular to subrounded of mixed lithologies.		
2.00 2.00-3.00	SV >140kPa D		SV = 140 kPa, 140 kPa, 140 kPa. Av. = 140kPa.		(1.60)	Firm to stiff consistency to 2.30mbgl. Very stiff consistency below 2.30mbgl.		
2.80	SV >140kPa		SV = 140 kPa, 140 kPa, 140 kPa. Av. = 140kPa.	47.00	3.00	Complete at 3.00m		

No image available

RemarksTrial pit dry and stable.
Grid reference information obtained from: gridreferencefinder.com.
Elevation information obtained from:
www.freemaptools.com/elevation-finder.htm.**Scale (approx)**

1:25

Logged By

JW

Figure No.

LKC 21 1679.TP103

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

**Trial Pit
Number****TP104****Excavation Method**Machine excavated trial pit tp
1.42mbgl.**Dimensions**

2.50m x 1.10m x 1.42m

Ground Level (mOD)

50.00

Client

Britannia Victoria Ltd

**Job
Number**

LKC 21 1679

Location (Observed measurements)

386187 E 395783 N

Dates

18/08/2022

Engineer

LKC

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				49.90	(0.10) 0.10	MADE GROUND: Dark brown slightly gravelly sandy SILT with frequent rootlets, occasional brick fragments and clinker. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies.		
					(1.30)	MADE GROUND: Dark brown and red sandy GRAVEL with frequent whole bricks, brick fragments, occasional metal fragments, concrete fragments, glass fragments, plastic fragments and rare ceramic fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of predominantly brick.		
				48.60 48.58	1.40 1.42	CONCRETE. Abandoned at 1.42m		

No image available

Remarks

Trial pit dry.
Grid reference information obtained from: gridreferencefinder.com.
Elevation information obtained from:
www.freemaptools.com/elevation-finder.htm.
Refusal on concrete floor. Trial pit repositioned approximately 4m E (Ref. TP104B).
Trial pit unstable, collapse at 0.10-1.40mbgl.

Scale (approx)

1:25

Logged By

JW

Figure No.

LKC 21 1679.TP104

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

**Trial Pit
Number****TP104B****Excavation Method**

Machine excavated trial pit to 3.00mbgl.

Dimensions

2.50m x 1.40m x 3.00m

Ground Level (mOD)

50.00

Client

Britannia Victoria Ltd

**Job
Number**

LKC 21 1679

Location (Observed measurements)

386188 E 395784 N

Dates

18/08/2022

Engineer

LKC

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.10	ES PID=0.4ppm			49.90	(0.10)	MADE GROUND: Dark brown slightly gravelly sandy SILT with frequent rootlets, occasional brick fragments and clinker. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies.		
0.10-1.00	ES PID=0.9ppm					MADE GROUND: Dark brown and red sandy GRAVEL with frequent whole bricks, brick fragments, occasional metal fragments, concrete fragments, glass fragments, plastic fragments and rare ceramic fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of predominantly brick.		
					(1.40)			
				48.50	1.50			
				48.40	(0.10)	CONCRETE.		
					1.60	Firm to very stiff consistency high strength brown and grey mottled slightly gravelly CLAY with occasional coal fragments. Gravel is fine to medium, subangular to subrounded of mixed lithologies.		
2.00-3.00	D							
					(1.40)			
2.40	SV >140kPa		SV = 140 kPa, 140 kPa, 140 kPa. Av. = 140Kpa.					
				47.00	3.00	Complete at 3.00m		

No image available

Remarks

Trial pit unstable, made ground collapse at 0.10-1.50mbgl.
 Trial pit dry.
 Grid reference information obtained from: gridreferencefinder.com.
 Elevation information obtained from: www.freemaptools.com/elevation-finder.htm.

Scale (approx)

1:25

Logged By

JW

Figure No.

LKC 21 1679.TP104B

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

**Trial Pit
Number
TP105****Excavation Method**

Machine excavated trial pit to 3.00mbgl.

Dimensions

2.50m x 0.60m x 3.00m

Ground Level (mOD)

52.00

Client

Britannia Victoria Ltd

**Job
Number
LKC 21 1679****Location (Observed measurements)**

386196 E 395769 N

Dates

18/08/2022

Engineer

LKC

**Sheet
1/1**

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50-1.50	ES D PID=0.7ppm					MADE GROUND: Dark brown very gravelly sandy SILT with frequent whole bricks, brick fragments, occasional rootlets, coal fragments, clinker, concrete fragments, rare copper pipe, glass fragments, timber and plastic fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies.		
2.20-3.00	ES D PID=0.4ppm			49.80	2.20 (0.80)	Very stiff consistency brown and grey mottled slightly gravelly CLAY with occasional coal fragments. Gravel is fine to medium, subangular to subrounded of mixed lithologies. Recovered as gravel. No shear vane readings due to friable nature of clay.		
				49.00	3.00	Complete at 3.00m		

No image available

Remarks

No shear vane readings at 2.20-3.00mbgl due to friable nature of the clay.
 Trial pit dry and stable.
 Grid reference information obtained from: gridreferencefinder.com.
 Elevation information obtained from:
www.freemaptools.com/elevation-finder.htm.

Scale (approx)

1:25

Logged By

JW

Figure No.

LKC 21 1679.TP105

**LK CONSULT LTD**Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com**Site**

Victoria Park Probation Centre

**Trial Pit
Number
TP106****Excavation Method**

Machine excavated trial pit to 3.00mbgl.

Dimensions

2.50m x 0.60m x 3.00m

Ground Level (mOD)

52.00

Client

Britannia Victoria Ltd

**Job
Number**

LKC 21 1679

Location (Observed measurements)

386186 E 395748 N

Dates

18/08/2022

Engineer

LKC

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.70	ES D PID=0.7ppm				(0.70)	MADE GROUND: Dark brown gravelly sandy SILT with occasional brick fragments, coal fragments, clinker, rare glass fragments and ceramic fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded of mixed lithologies.		
1.00-2.00	ES PID=0.4ppm			51.30	0.70	Very stiff consistency high strength brown and grey mottled slightly gravelly CLAY with occasional coal fragments. Gravel is fine to medium, subangular to subrounded of mixed lithologies. Recovered as gravel.		
1.50-2.50	D				(2.30)	No shear vane readings above 2.00mbgl due to friable nature of clay.		
2.00	SV >140kPa		SV = 140 kPa, 140 kPa, 140 kPa. Av. = 140Kpa.	49.00	3.00	Complete at 3.00m		

No image available

Remarks

No shear vane readings above 2.00mbgl due to friable nature of the clay.
Trial pit dry and stable.
Grid reference information obtained from: gridreferencefinder.com.
Elevation information obtained from: www.freemaptools.com/elevation-finder.htm.

Scale (approx)

1:25

Logged By

JW

Figure No.

LKC 21 1679.TP106

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Not Supplied - Holocene
	WMGR	Infilled Ground	Artificial Deposit	Not Supplied - Holocene

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Not Supplied - Holocene
	TILLD	Till, Devensian	Diamicton	Not Supplied - Devensian
	GFICD	Glaciofluvial Ice Contact Deposits, Devensian	Sand and Gravel	Not Supplied - Devensian
	GFSD	Glaciofluvial Sheet Deposits, Devensian	Sand and Gravel	Not Supplied - Devensian

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	CHES	Chester Formation	Sandstone	Not Supplied - Olenekian
	WLSF	Wilmslow Sandstone Formation	Sandstone	Not Supplied - Early Triassic
	MM	Manchester Marls Formation	Mudstone	Not Supplied - GUADALUPIAN
	CS	Collyhurst Sandstone Formation	Sandstone	Not Supplied - Cisuralian
	HA	Halesowen Formation	Mudstone, Siltstone and Sandstone	Not Supplied - Westphalian
	GML	Great Mine Limestone	Limestone	Not Supplied - Westphalian
	PUCM	Pennine Upper Coal Measures Formation	Mudstone, Siltstone and Sandstone	Not Supplied - Westphalian
	ETM	Etruria Formation	Sandstone and Mudstone	Not Supplied - Westphalian
		Faults		
		Rock Segments		



Geology 1:50,000 Maps

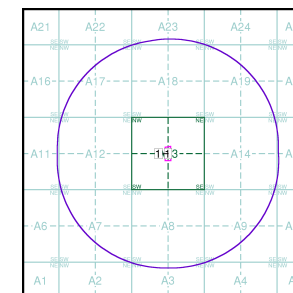
This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.

The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID:	1
Map Sheet No:	085
Map Name:	Manchester
Map Date:	2010
Bedrock Geology:	Available
Superficial Geology:	Not Available
Artificial Geology:	Not Available
Faults:	Not Supplied
Landslip:	Not Available
Rock Segments:	Not Supplied

Geology 1:50,000 Maps - Slice A

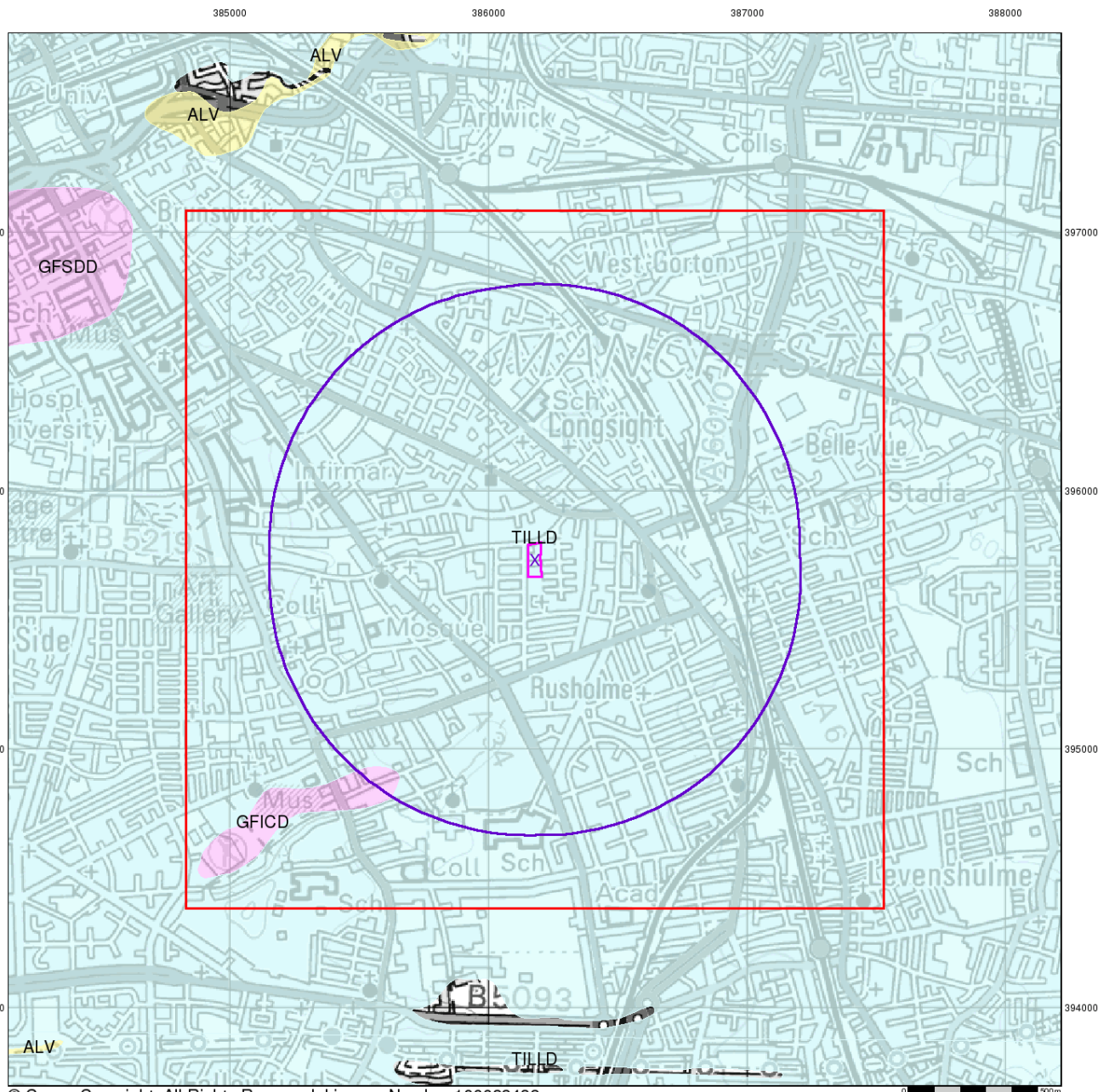


Order Details:

Order Number:	298702326_1_1
Customer Reference:	LKC 21 1679
National Grid Reference:	386180, 395730
Slice:	A
Site Area (Ha):	0.66
Search Buffer (m):	1000

Site Details:

Site at 386170, 395690



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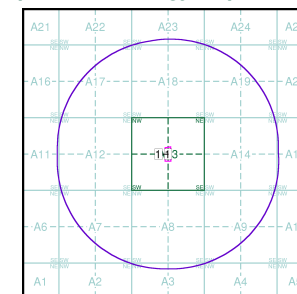
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



Order Details:

Order Number: 298702326_1_1
 Customer Reference: LKC 21 1679
 National Grid Reference: 386180, 395730
 Slice: A
 Site Area (Ha): 0.66
 Search Buffer (m): 1000

Site Details:

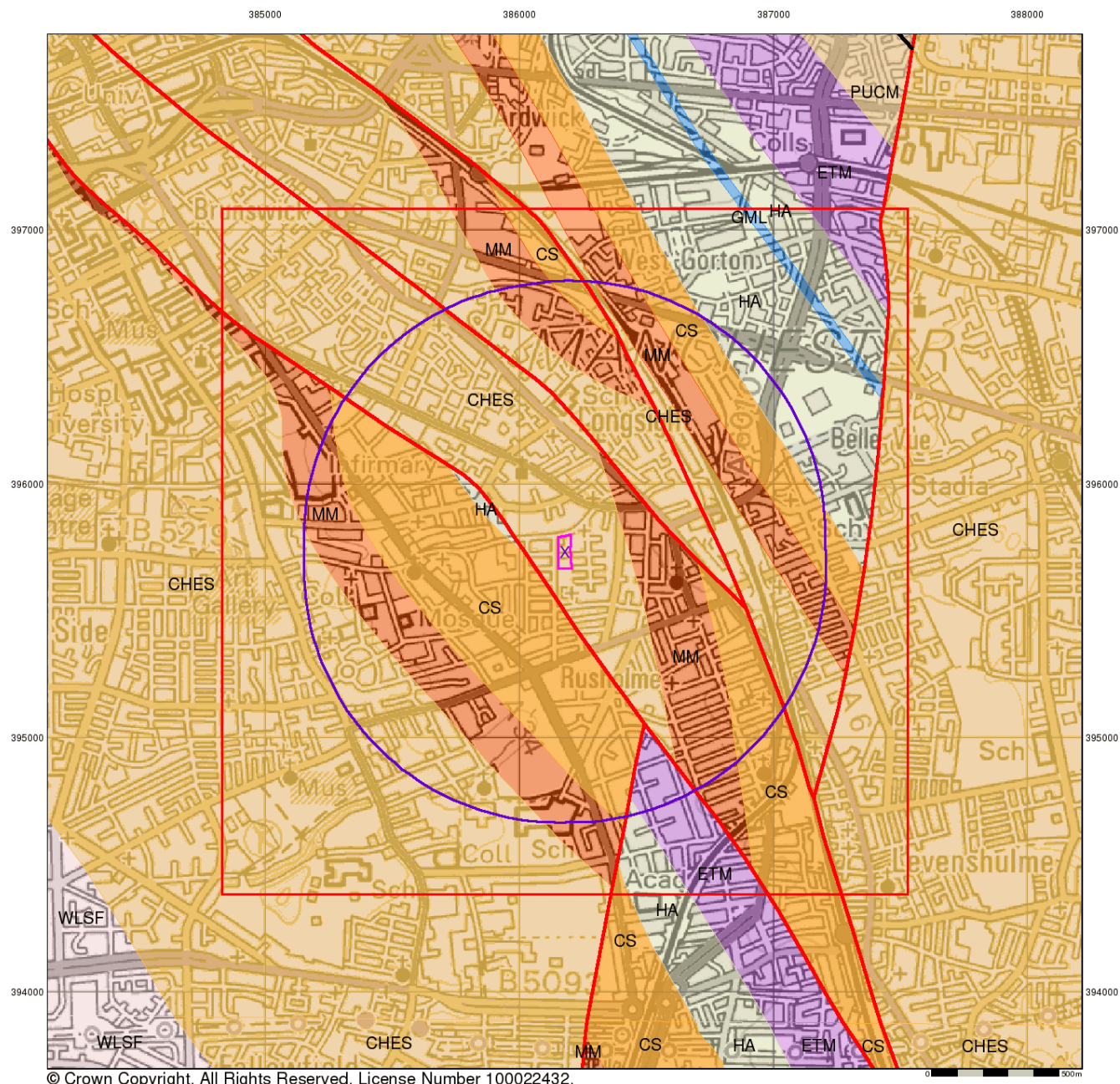
Site at 386170, 395690

Landmark
 INFORMATION GROUP

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 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk

v15.0 21-Jul-2022

Page 3 of 5



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Bedrock and Faults

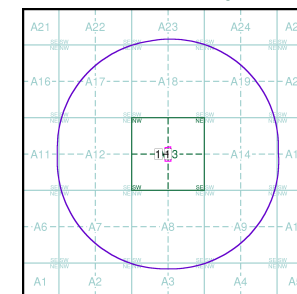
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A



Order Details:

Order Number: 298702326_1_1
 Customer Reference: LKC 21 1679
 National Grid Reference: 386180, 395730
 Slice: A
 Site Area (Ha): 0.66
 Search Buffer (m): 1000

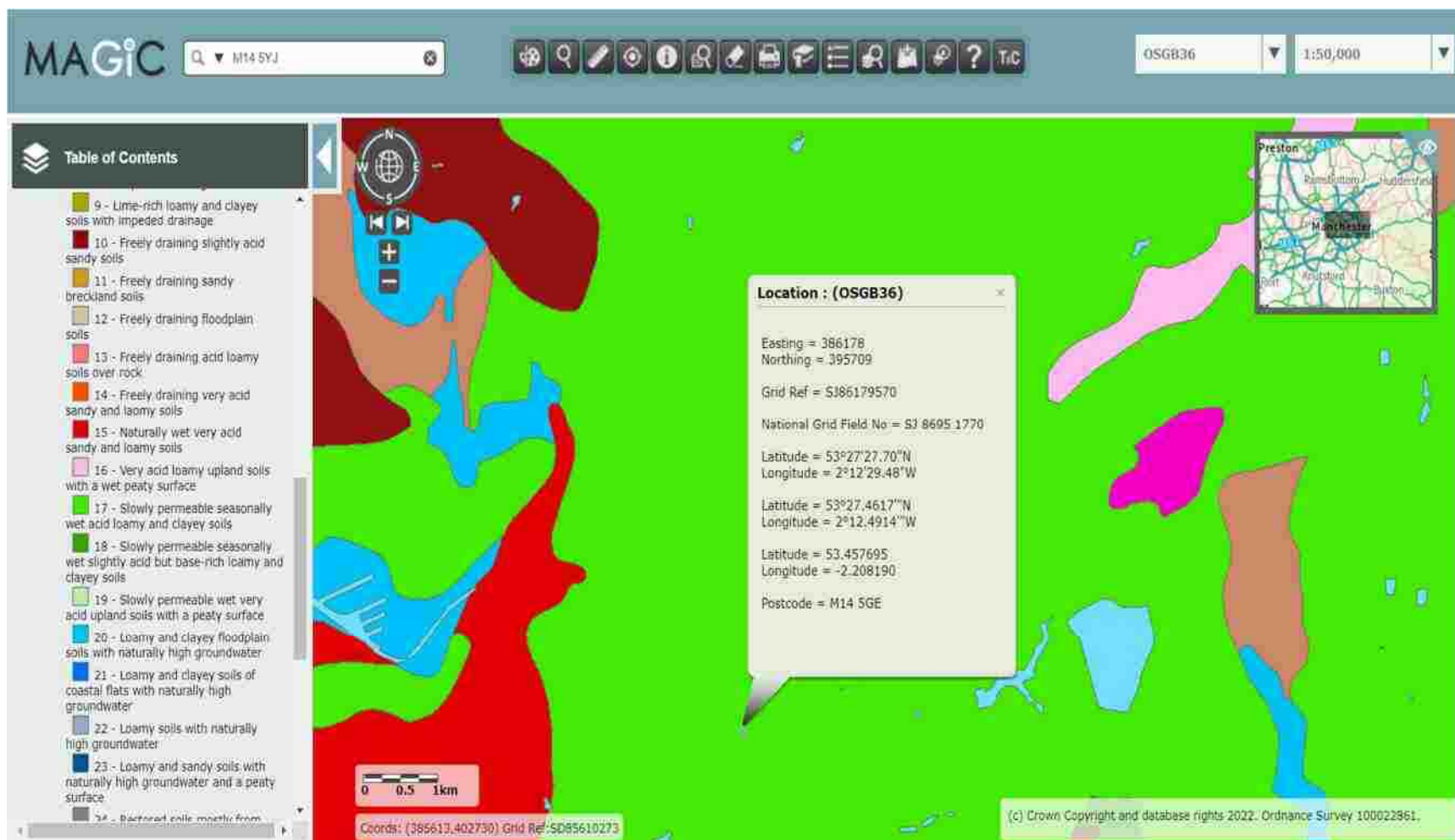
Site Details:

Site at 386170, 395690

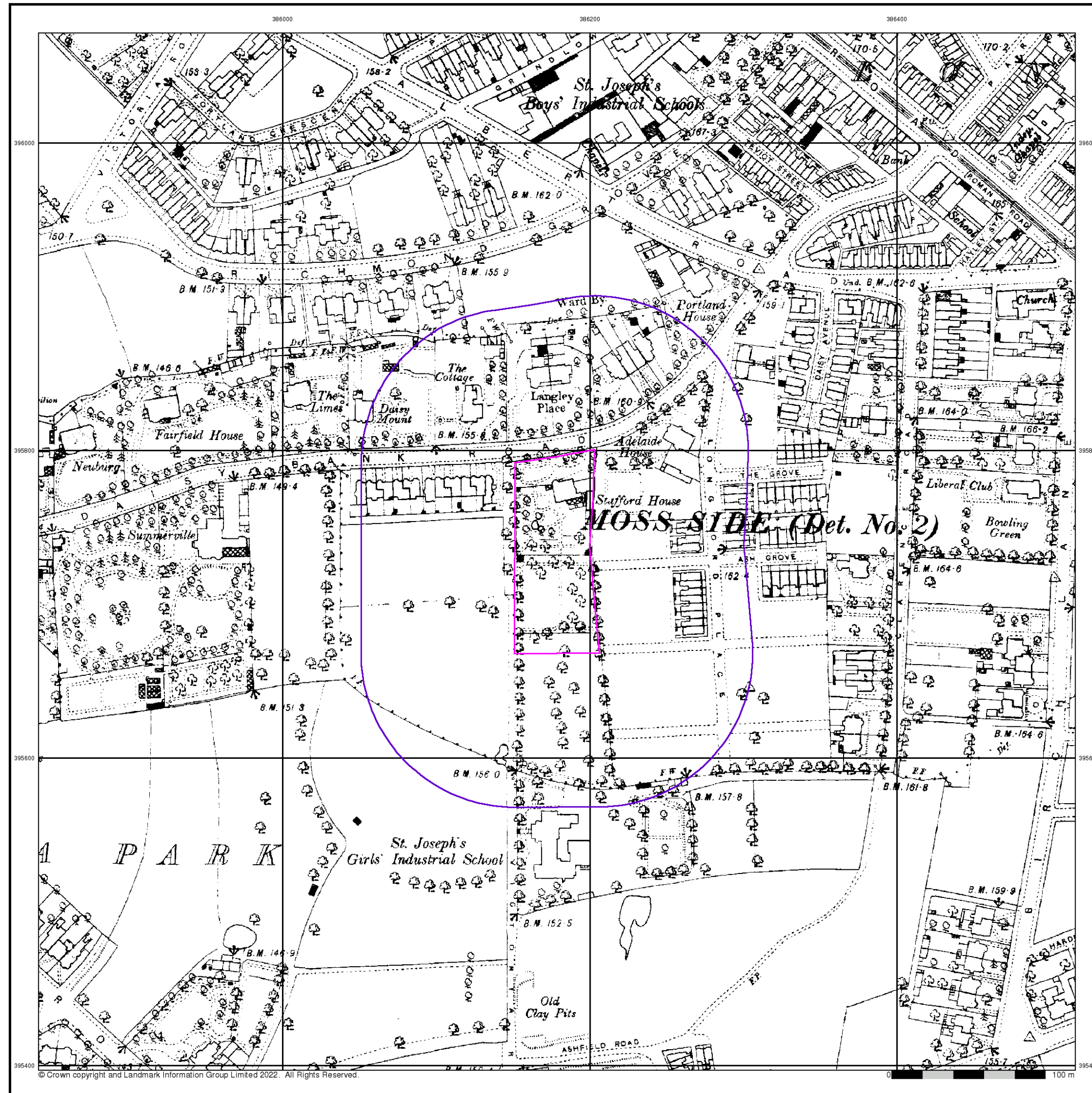


Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk

v15.0 21-Jul-2022



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LK GROUP

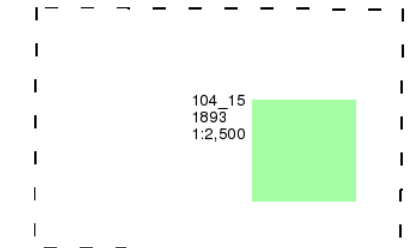
Lancashire And Furness

Published 1893

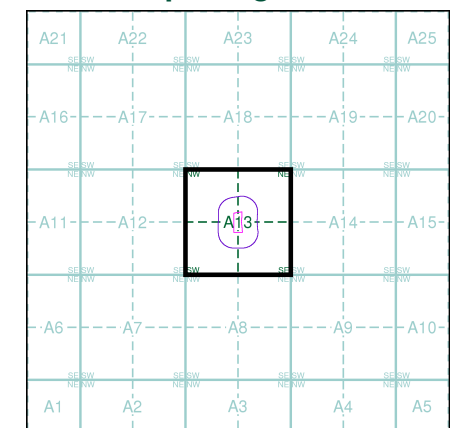
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 298702326_1_1
Customer Ref: LKC 21 1679
National Grid Reference: 386180, 395730
Slice: A
Site Area (Ha): 0.66
Search Buffer (m): 100

Site Details

Site at 386170, 395690

Landmark
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Tel: 0844 844 9952
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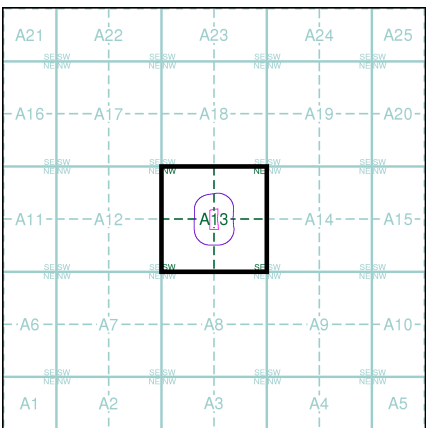
G R O U P

Historical Aerial Photography

Published 2000

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A13



Order Details

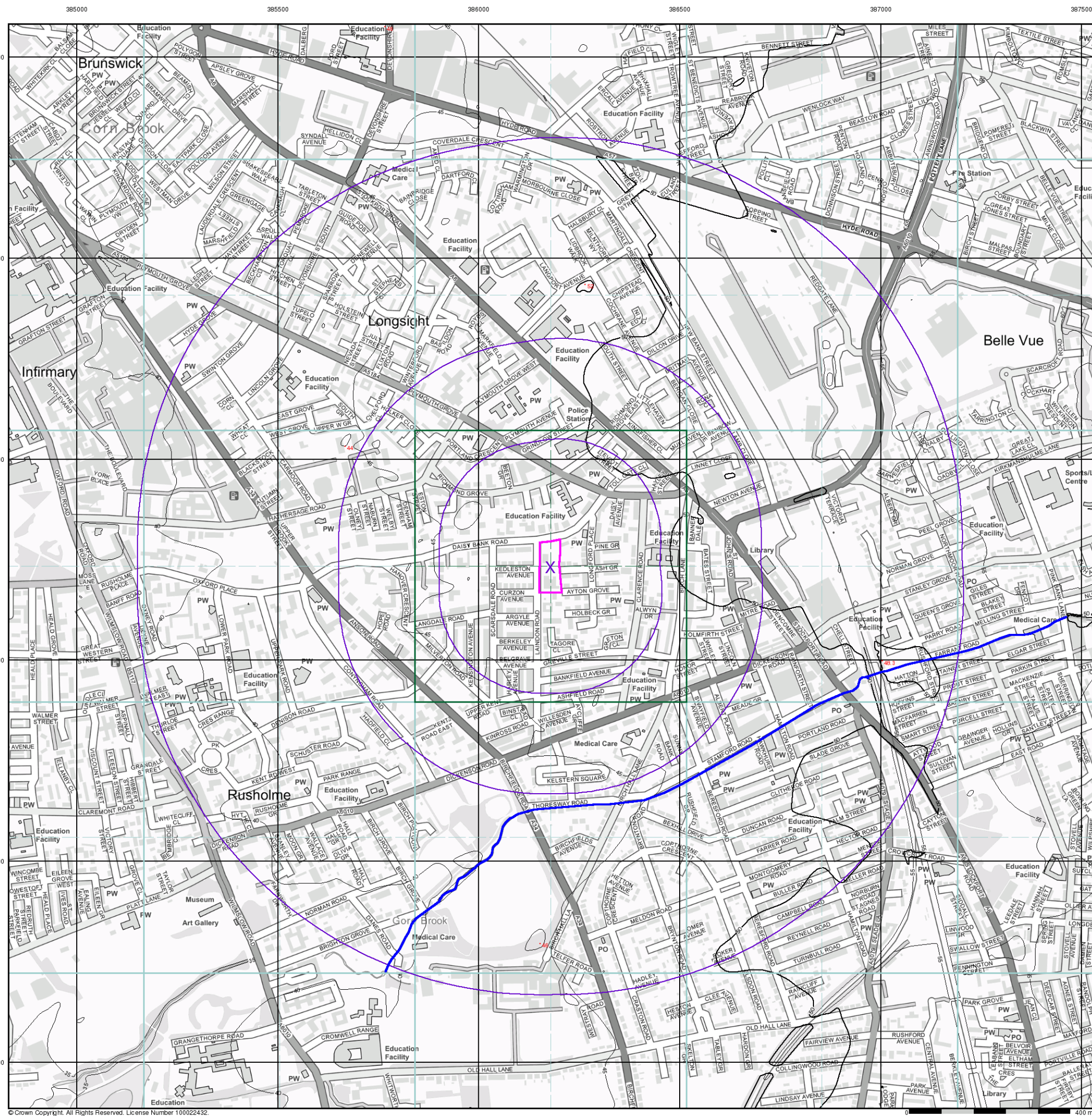
Order Number: 298702326_1_1
Customer Ref: LKC 21 1679
National Grid Reference: 386180, 395730
Slice: A
Site Area (Ha): 0.66
Search Buffer (m): 100

Site Details

Site at 386170, 395690



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

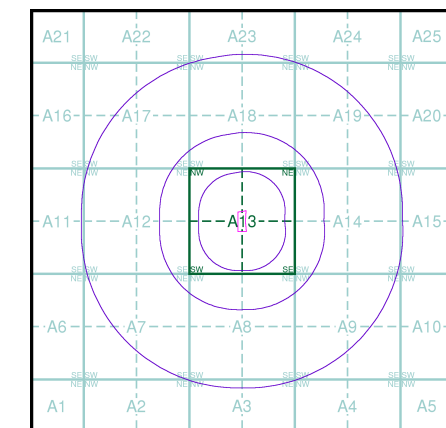
OS Water Network Data

- | | |
|--------------|-------------------------|
| Canal | Drain |
| Reservoir | Other |
| Foreshore | Lake |
| Marsh | Transfer |
| Tidal River | Lock Or Flight Of Locks |
| Inland River | Sea |

Contours (height in meters)

- | | | | |
|------------------|-------|-----|-----------------|
| Standard Contour | 105 | MLW | Mean Low Water |
| Master Contour | 100 | MHW | Mean High Water |
| Spot Height | 167.3 | | |

OS Water Network Map - Slice A



Order Details

Order Number: 298702326_1_1
Customer Ref: LKC 21 1679
National Grid Reference: 386180, 395730
Slice: A
Site Area (Ha): 0.66
Search Buffer (m): 1000

Site Details

Site at 386170, 395690



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Appendix C

Environment Agency Data

Flood map for planning

Your reference
Victoria Park

Location (easting/northing)
386180/395730

Created
27 Sep 2022 15:23

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

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

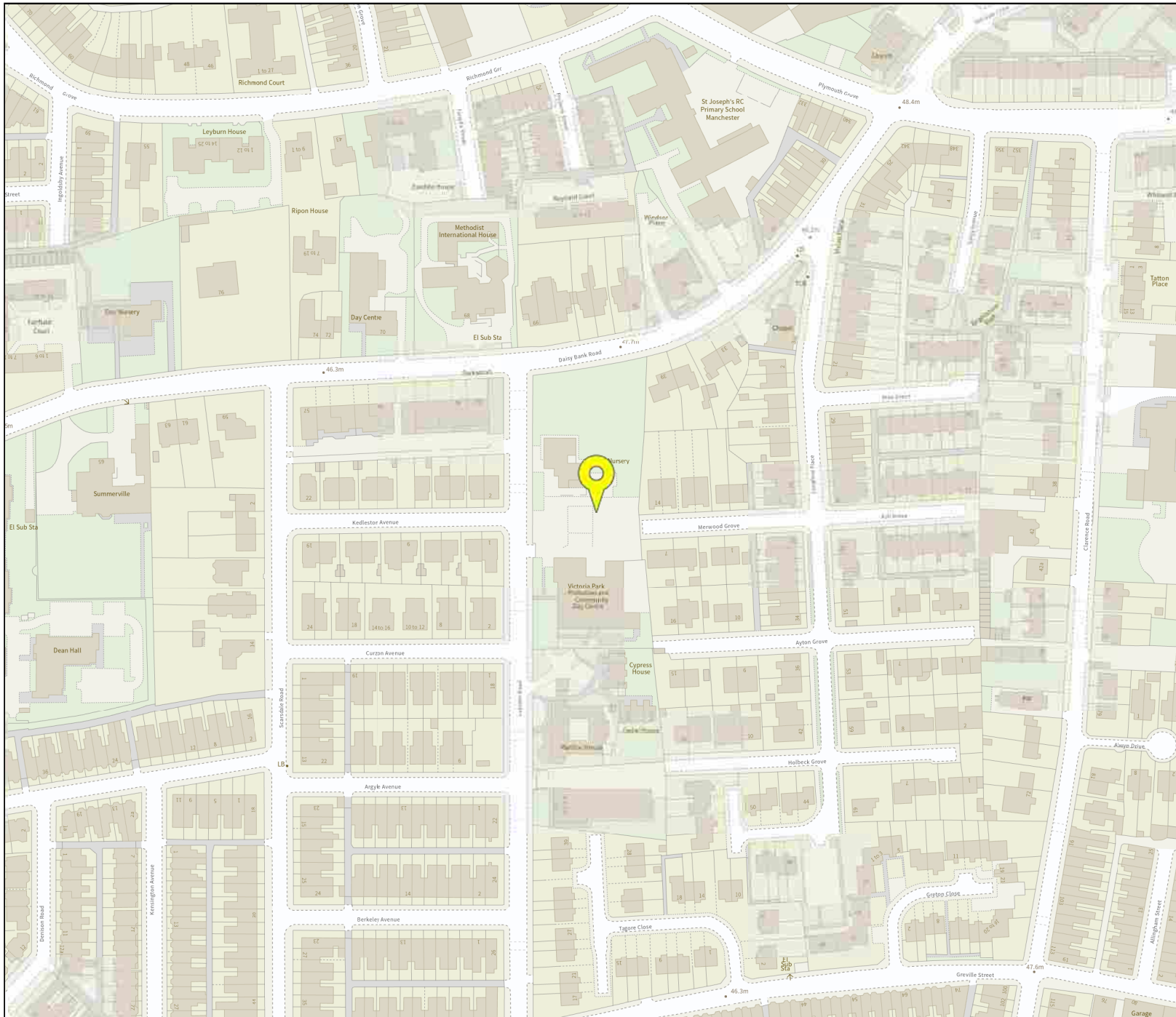
Notes

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.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference
Victoria Park

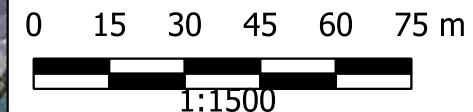
Location (easting/northing)
386180/395730

Scale
1:2500

Created
27 Sep 2022 15:23

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


0 20 40 60m



KEY



Site Location

Sampling locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client: **Britannia Victoria Ltd**

Site: **Victoria Park Probation Centre,
Manchester**

Title: **Low Surface Water Risk**

Job No:	Scale (see scale bar):	Figure:	Rev:
FRA 22 1121	1:1500 @ A4		
Drawn By:	Checked By:	Drawn:	
JL	MJ	Sept 2022	

Flood risk

Location

Extent of flooding

M14 5YJ



Maximum extent of flooding from reservoirs:

● when river levels are normal ■ when there is also flooding from rivers ⊕ Location you selected

Appendix D

Consultee Correspondence

Mark Jones

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 20 December 2022 18:47
To: Mark Jones
Cc: Jenna Lowe
Subject: RE: PDE for: Victoria Park, Manchester UU Ref : 02800739

Hi Mark,

To accurately measure all brownfield impermeable area that drains to the public sewer we would need a detailed topo survey showing levels/contours and drains/gullies/rainwater down pipes etc and an existing impermeable area catchment plan. The submitted CCTV drainage plan is not clear on the MH numbers/references therefore I cannot match up which sewers are which on the report.

It is understood that a portion of the car park has been surveyed to show it drains to the sewer on site as well as the northern building, therefore based on a rough area calculation we can assume this area existing discharge rate using the calculations made by my colleague previously comes to 27.8l/s, and with a betterment of 50% the rate is 13.9l/s which we would accept subject to points of connections and a drainage plan being reviewed.

Kind regards,

Shoaib.

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

From: wastewaterdeveloperservices@uuplc.co.uk [wastewaterdeveloperservices@uuplc.co.uk]
Sent: 14/12/2022 11:50
To: m.jones@thelkgroup.com
Cc: j.lowe@thelkgroup.com
Subject: PDE for: Victoria Park, Manchester UU Ref : 02800739

Good Morning,

Thank you for contacting United Utilities.

I have passed your details to our engineer who will respond in due course.

Kind Regards,



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

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

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

From: Mark Jones [m.jones@thelkgroup.com]

Sent: 14/12/2022 10:09

To: wastewaterdeveloperservices@uuplc.co.uk

Cc: j.lowe@thelkgroup.com

Subject: RE: PDE for: Victoria Park, Manchester UU Ref : 02800739

EXTERNAL EMAIL This email originated outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Mohamed

Please find the attached report from Metrorod for the above site for your information. Hopefully you have enough information to determine the allowable peak flow from the site.

Regards

Mark

From: Mark Jones

Sent: 06 December 2022 12:16

To: wastewaterdeveloperservices@uuplc.co.uk

Cc: Jenna Lowe <j.lowe@thelkgroup.com>

Subject: RE: PDE for: Victoria Park, Manchester UU Ref : 02800739

Mohamed

We have been sent the attached information by our client he has asked if the other hard surfaces and the other building could be considered within your calculations in addition to the roof area of one building. The information includes a CCTV that was undertaken to show that the car parking drainage connects directly to the sewer system and other drainage details on site.

He has asked if this can be re-assesses including an allowance for the green areas that are underlain by clay based soils.

Regards

Mark

From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>
Sent: 09 November 2022 10:45
To: Mark Jones <M.Jones@thelkgroup.com>
Cc: Jenna Lowe <j.lowe@thelkgroup.com>
Subject: RE: PDE for: Victoria Park, Manchester UU Ref : 02800739

Good morning Mark,
Thanks for your email.

According to the provided document, we are satisfied that infiltration is not feasible, we accept the provided sufficient evidence to discount infiltration.

We have noted that you have provided brownfield calculations. The applicant has not provided sufficient details on how was calculated. Also, the applicant must provide evidence that the area used in the calculation such as the existing parking area and hard-standing area was drained into the public network (positively drained to the public sewer) to be considered.

We have calculated the building footprint is draining to our network which is the positive drainage area = 0.126ha. Using the Wallingford Procedure Methodology Calculation = $2.78 * CiA = 2.78 * 1 * 50 * 0.126 = 17.5$ l/s, after 50% betterment it became 9l/s.
And as such United Utilities request that any agreed rate does not exceed 9l/s (anticipated QBar rate from the site impermeable areas only).

Kind regards,



Mohammed Aljafarawi (He/Him)
Developer Engineer
Developer Services & Metering
Customer Services
M: 07950474499
unitedutilities.com

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

From: Mark Jones [m.jones@thelkgroup.com]
Sent: 27/10/2022 11:17
To: wastewaterdeveloperservices@uuplc.co.uk
Cc: j.lowe@thelkgroup.com
Subject: RE: PDE for: Victoria Park, Manchester UU Ref : 02800739

To developer services.

Thank you for the reply below. I can confirm that infiltration is unlikely to be feasible on the site as it is underlain by made ground and clay based soils (see above). In fact the water level rose within the boreholes to within 0.4m and 1.5m of the surface, probably through artesian flows.

As the existing combined drainage around the plot is generally the head of systems and relatively shallow (assumed 1.2m cover), there is likely to be difficulties with incorporating adoptable SuDS within the housing development I am enquiring to see if there is any capacity within the system for an increased allowance in flows from the development.

The calculated existing flows are below.

Q_{bar} : 47.80 l/s

1 in 1-year peak runoff rate: 33.50 l/s

1 in 30-year peak runoff rate: 84.70 l/s

1 in 100-year peak runoff rate: 107.30 l/s

If this reduced by 50% would give the following rates:

Q_{bar} : 23.90 l/s

1 in 1-year peak runoff rate: 16.75 l/s

1 in 30-year peak runoff rate: 42.35 l/s

1 in 100-year peak runoff rate: 53.65 l/s

There are existing drainage connections from the site to the existing drains serving the former probation centre.

Regards

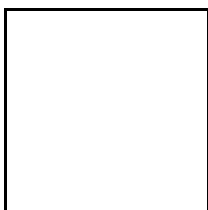
Mark

From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>

Sent: 26 September 2022 17:10

To: Jenna Lowe <j.lowe@thelkgroup.com>

Subject: PDE for: Victoria Park, Manchester UU Ref : 02800739



Good afternoon Jenna,

Pre Development Enquiry for: Victoria Park, Manchester UU Reference Number : 02800739

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

If your investigations require access to our public sewer network, we ask that you contact our network engineers with a request for an access certificate via our main contact telephone number 0345 6723 723 or refer to the link below:

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

Foul Water

Foul flow from this site will be allowed to drain into the public combined sewer system at any convenient point and at an unrestricted rate. United Utilities would have no preference to the specific connection point in this instance.

Please ensure all proposed manhole chambers cover levels and finished floor levels are higher than the receiving public sewer.

Surface Water

All surface water flow from the proposed development should drain in-line with the drainage hierarchy, as outlined in Paragraph 80, (Reference ID: 7-080-20150323), of the National Planning Practice Guidance. We also recommend you prioritise the use of multi-functional sustainable drainage systems for the management of surface water in accordance with national planning policy.

Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable.

This is outlined as follows, in order of priority:

1. **into the ground (infiltration);**

2. **to a surface waterbody;**
3. **to a surface water sewer or highway drain;**
4. **to a combined sewer.**

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

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

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

Infiltration

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

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

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

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

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

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

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

Waterbody

United Utilities acknowledge that the nearest watercourse is a significant distance off-site.

Highway Drainage

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

Public Sewer

In accordance with the hierarchy of drainage options within the National Planning Practice Guidance, both discharge

to ground via infiltration and discharge to a waterbody should be discounted prior to consideration of discharging surface water to the public sewer system. Evidence should be provided to demonstrate how these have been discounted, as outlined in the North West SuDS pro-forma.

Once evidence is provided as outlined above, United Utilities will consider a connection to the 225mm diameter public combined sewer within Laindon Road located West of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 5l/s.

Please note the given discharge rate is based on the full site area as the specifics of the area being developed are not yet clear. If there are significant areas of the site that will not be developed, the discharge rate should be reduced accordingly.

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

Levels

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

Land drainage / Overland flows / track drainage

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

Existing Wastewater Assets Crossing the Site

We have reviewed our records and can confirm that there does not appear to be any charted public sewers located within the boundary of proposed development. However, due to the accuracy of the records and the public sewer transfer legislation in 2011, not all public sewers are shown on our records so we would ask that you proceed with caution and carry out your own site investigation works. If any uncharted sewers are identified while carrying out your works we would ask that you contact United Utilities at the earliest opportunity so that we can offer guidance and update our records.

Existing Water Assets Crossing the Site

It is the developer responsibility to identify utilities on-site. Where clean water assets are shown on our records, we recommend that you contact our Water Pre-Development Team, via the following email address:

DeveloperServicesWater@uuplc.co.uk. Further information for this service can be found on our website via the link below:

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

Connection Application

Although we may discuss and agree discharge points and rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety

requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below:

<https://www.unitedutilities.com/builders-developers/wastewater-services/sewer-connections/sewer-connection/>

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

Sewer Adoptions

You have indicated on your application form that you intend to put the sewers forward for adoption (including any SuDS components that can come within the meaning of a sewer).

United Utilities assess adoption applications based on the current Design & Construction Guidance and local practices which have now replaced 'Sewers For Adoption 6th Edition'.

We recommend that you submit a pre design assessment to the sewer adoption mailbox (SewerAdoptions@uuplc.co.uk) stating pre design assessment in the title

Please refer to links below to obtain further guidance:

<https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-adoptions/>

Site drainage must be designed in accordance with Building Regulations, National Planning Policy, and local flood authority guidelines, we would recommend that you speak and make suitable agreements with the relevant statutory bodies.

If you intend to put forward your wastewater assets for adoption by United Utilities, the proposed detail design will be subject to a technical appraisal by an Adoption Engineer as we need to be sure that the proposals meets the requirements set out in the Design & Construction Guidance. The proposed design should give consideration to long term operability and give United Utilities a safe and cost effective proposal for the lifetime of the assets. In these cases, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 application, has been assessed and accepted in writing by United Utilities. Any work carried out prior to the technical assessment being approved is done entirely at the developer's own risk and could be subject to change.

SuDS

If your development proposal incorporates any SuDS component(s) which interact with a sewer network you plan on offering for adoption to United Utilities; contact should be made with our technical team at your earliest convenience, please complete the 'Section 104 pre-application form : ' and include as much relevant detail as you can. These discussions can help prevent delays later in the development process.

Section 104 Pre application form (1b)

As per the sewerage sector guidance, all SuDS should be designed in accordance with the standards within the Design & construction guidance & the CIRIA SuDS manual (C753)

Codes For Adoption

The new Codes for Adoption are outlined on the Water UK Website. The link below takes you to their webpage:

<https://www.water.org.uk/technical-guidance/developers-services/codes-for-adoption/>

A free copy of the new Design & Construction Guidance can be downloaded via the link below:

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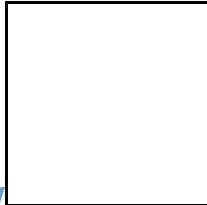
Many thanks and kind regards,



Mohammed Aljafarawi (He/Him)

Developer Engineer
Developer Services & Metering
Customer Services
M: 07950474499
unitedutilities.com

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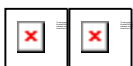


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<http://www.unitedutilities.com/subsidiaries>



Jenna Lowe

From: wastewaterdeveloperservices@uuplc.co.uk
Sent: 26 September 2022 17:10
To: Jenna Lowe
Subject: PDE for: Victoria Park, Manchester UU Ref : 02800739



Good afternoon Jenna,

Pre Development Enquiry for: Victoria Park, Manchester UU Reference Number : 02800739

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

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Foul Water

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Please ensure all proposed manhole chambers cover levels and finished floor levels are higher than the receiving public sewer.

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4. **to a combined sewer.**

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

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United Utilities acknowledge that the nearest watercourse is a significant distance off-site.

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Once evidence is provided as outlined above, United Utilities will consider a connection to the 225mm diameter public

combined sewer within Laindon Road located West of the proposed site at a pass forward flow to be agreed by the Lead Local Flood Authority. United Utilities request that any agreed rate does not exceed 5l/s.

Please note the given discharge rate is based on the full site area as the specifics of the area being developed are not yet clear. If there are significant areas of the site that will not be developed, the discharge rate should be reduced accordingly.

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

Levels

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

Land drainage / Overland flows / track drainage

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Existing Wastewater Assets Crossing the Site

We have reviewed our records and can confirm that there does not appear to be any charted public sewers located within the boundary of proposed development. However, due to the accuracy of the records and the public sewer transfer legislation in 2011, not all public sewers are shown on our records so we would ask that you proceed with caution and carry out your own site investigation works. If any uncharted sewers are identified while carrying out your works we would ask that you contact United Utilities at the earliest opportunity so that we can offer guidance and update our records.

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Connection Application

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obtained from our website by following the link below:

<https://www.unitedutilities.com/builders-developers/wastewater-services/sewer-connections/sewer-connection/>

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

Sewer Adoptions

You have indicated on your application form that you intend to put the sewers forward for adoption (including any SuDS components that can come within the meaning of a sewer).

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We recommend that you submit a pre design assessment to the sewer adoption mailbox (SewerAdoptions@uuplc.co.uk) stating pre design assessment in the title

Please refer to links below to obtain further guidance:

<https://www.unitedutilities.com/builders-developers/larger-developments/wastewater/sewer-adoptions/>

Site drainage must be designed in accordance with Building Regulations, National Planning Policy, and local flood authority guidelines, we would recommend that you speak and make suitable agreements with the relevant statutory bodies.

If you intend to put forward your wastewater assets for adoption by United Utilities, the proposed detail design will be subject to a technical appraisal by an Adoption Engineer as we need to be sure that the proposals meets the requirements set out in the Design & Construction Guidance. The proposed design should give consideration to long term operability and give United Utilities a safe and cost effective proposal for the lifetime of the assets. In these cases, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 application, has been assessed and accepted in writing by United Utilities. Any work carried out prior to the technical assessment being approved is done entirely at the developer's own risk and could be subject to change.

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Section 104 Pre application form (1b)

As per the sewerage sector guidance, all SuDS should be designed in accordance with the standards within the Design & construction guidance & the CIRIA SuDS manual (C753)

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A free copy of the new Design & Construction Guidance can be downloaded via the link below:

<https://www.water.org.uk/sewerage-sector-guidance-approved-documents/>

Many thanks and kind regards,



Mohammed Aljafarawi (He/Him)
Developer Engineer
Developer Services & Metering
Customer Services
M: 07950474499
unitedutilities.com

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LKGroup

Unit 29 Eton Business Park
Unit 29, Eton Business Park,
Radcliffe, Greater Manchester
M26 2ZS

FAO:

How to contact us:

United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

Your Ref: FRA 22 1121
Our Ref: UUPS-ORD-431533
Date: 14/09/2022

Dear Sirs**Location: Victoria Park Probation Centre**

I acknowledge with thanks your request dated 13/09/2022 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. <http://www.unitedutilities.com/work-near-asset.aspx>.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please [contact us](#).

Yours Faithfully,



Karen McCormack
Property Searches Manager

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



Lead Local Flood Authority

Highways Service
Growth and Neighbourhoods Directorate
Manchester City Council
PO Box 532
Town Hall
Manchester
M60 2LA

Email: floodriskmanagement@manchester.gov.uk

DATE 03/10/2022

Dear Sir or Madam,

RE: Our Ref: MCC003/10/2022

We acknowledge with thanks your payment received on 23/09/2022 for our LLFA data screen service.

Please find enclosed plan showing the results of the data screen. The position of features shown on this plan is approximate only and is given in accordance with the best information currently available.

The enclosed plan cannot be used to substitute a competent site investigation.

The enclosed plan is being provided to you subject to Manchester City Council's terms and conditions which are shown attached.

I trust the above meets your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter, please do not hesitate to contact us.

Yours Faithfully,

A handwritten signature in black ink, appearing to read "Neil Bayliss-Rowe", with a horizontal line drawn through it.

Neil Bayliss-Rowe, Highways Development Control & Flood Risk Manager, Lead Local Flood Authority

TERMS AND CONDITIONS – LLFA DATA SCREEN

These provisions apply to LLFA data supplied by Manchester City Council (“MCC”).

TERMS AND CONDITIONS:

- This data Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- MCC has taken all reasonable care to compile this data Map. This data Map and any information supplied with it is provided for general guidance only and MCC makes no representation, undertaking or warranty of any kind as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position of any culverted assets shown on the data Map are approximate only. MCC strongly recommends that a comprehensive site investigation is undertaken in addition to reviewing this data Map to determine and ensure the precise location of any assets. The exact location, positions and depths should be obtained by an appropriate survey which may include but shall not be limited to GPR and CCTV.
- The data screened may be modified over time without notice and therefore this data Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the data Map have been made subsequent to issue and prior to any works being carried out.
- This data Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) or for the purpose of determining the suitability of a point of connection to discharge.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising from damages of any kind caused to assets by reason of the actual position and/or existence of assets being different from those shown on the data Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent MCC from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

DATA SCREEN SYMBOLOGY

Bridge

-  Good
-  Fair
-  Poor
-  Very Poor
-  Unknown

Trash Screen

-  Good
-  Fair
-  Poor
-  Very Poor
-  Unknown

Culvert Orifice

-  Very Good
-  Good
-  Fair
-  Poor
-  Very Poor
-  Unknown

Culvert Conduit

-  CCTV surveyed
-  Not CCTV surveyed
-  Ordinary Watercourse Conduit
-  MCC SuDS
-  MCC Flood Incident Points
-  MCC Section 19 Report
-  MCC Flood Incident Polygons
-  MCC Local Authority Boundary

Supplementary Information where available:

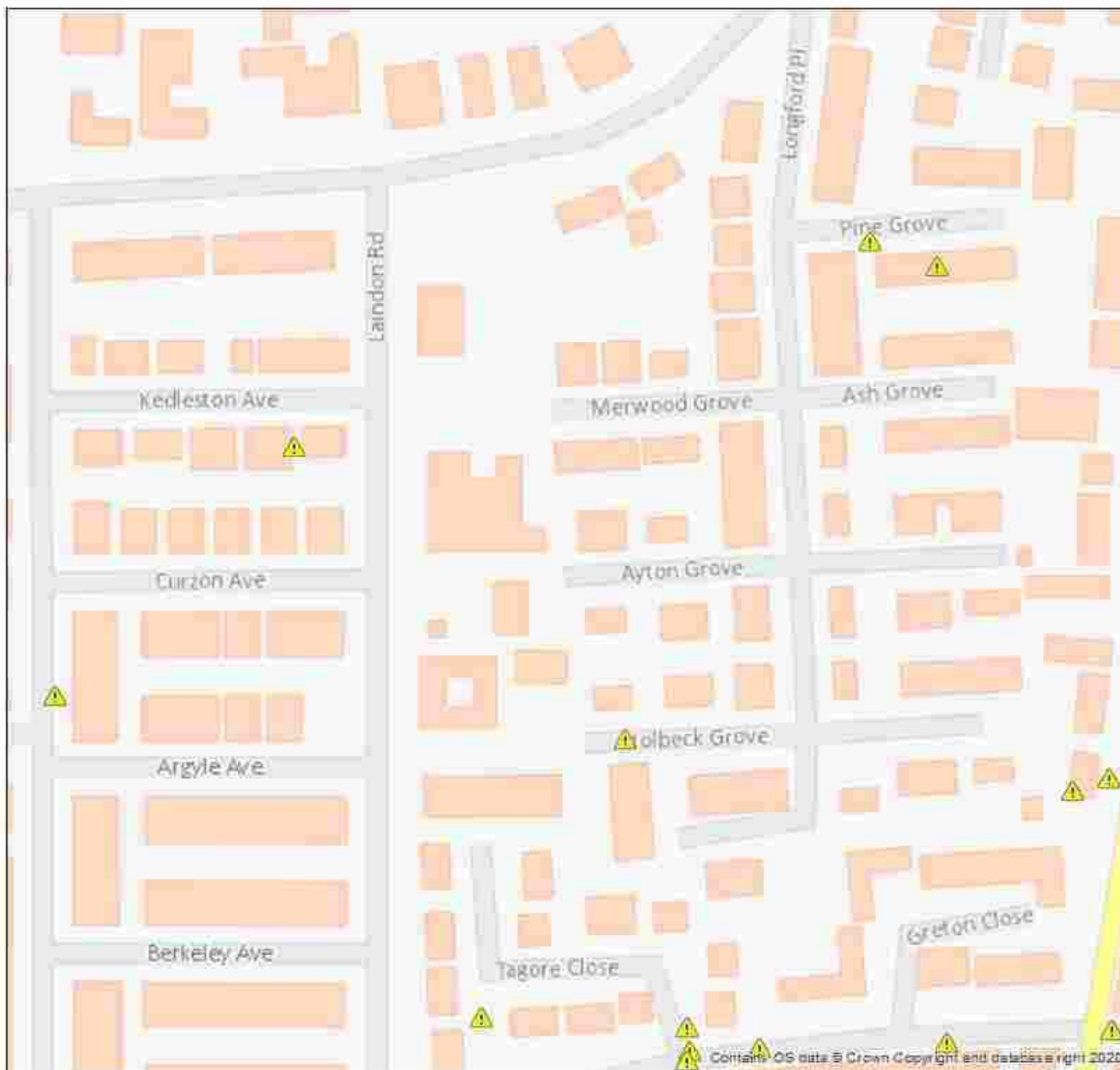
Critical Drainage Area – the Site is within the Conurbation Core Critical Drainage Area (CDA).

Flood Incidents - The nearest incident was recorded 10/02/2020 approximately 55m to the south-east of the Site on Holbeck Grove, described as blocked highway gully or drain.

Culvert Conduits – There are no culverted ordinary watercourse conduits on-record in the LLFA asset register within the vicinity of the Site.

Survey and Design Archive – A copy of the 1984 major drainage survey is included, which does not record any culverted ordinary watercourses within vicinity of the Site.

Any other information – The Site is >0.5 Ha and located within a Critical Drainage Area, therefore the planning application would benefit from a Flood Risk Assessment and SuDS Strategy. We recommend the attached SuDS Guidance for Developers is reviewed to support any planning application for this Site.



**MANCHESTER
CITY COUNCIL**

LLFA DATA SCREEN

Address/Site Ref:
Victoria Park Probation Centre

Our Ref: **MCC003/10/2022**

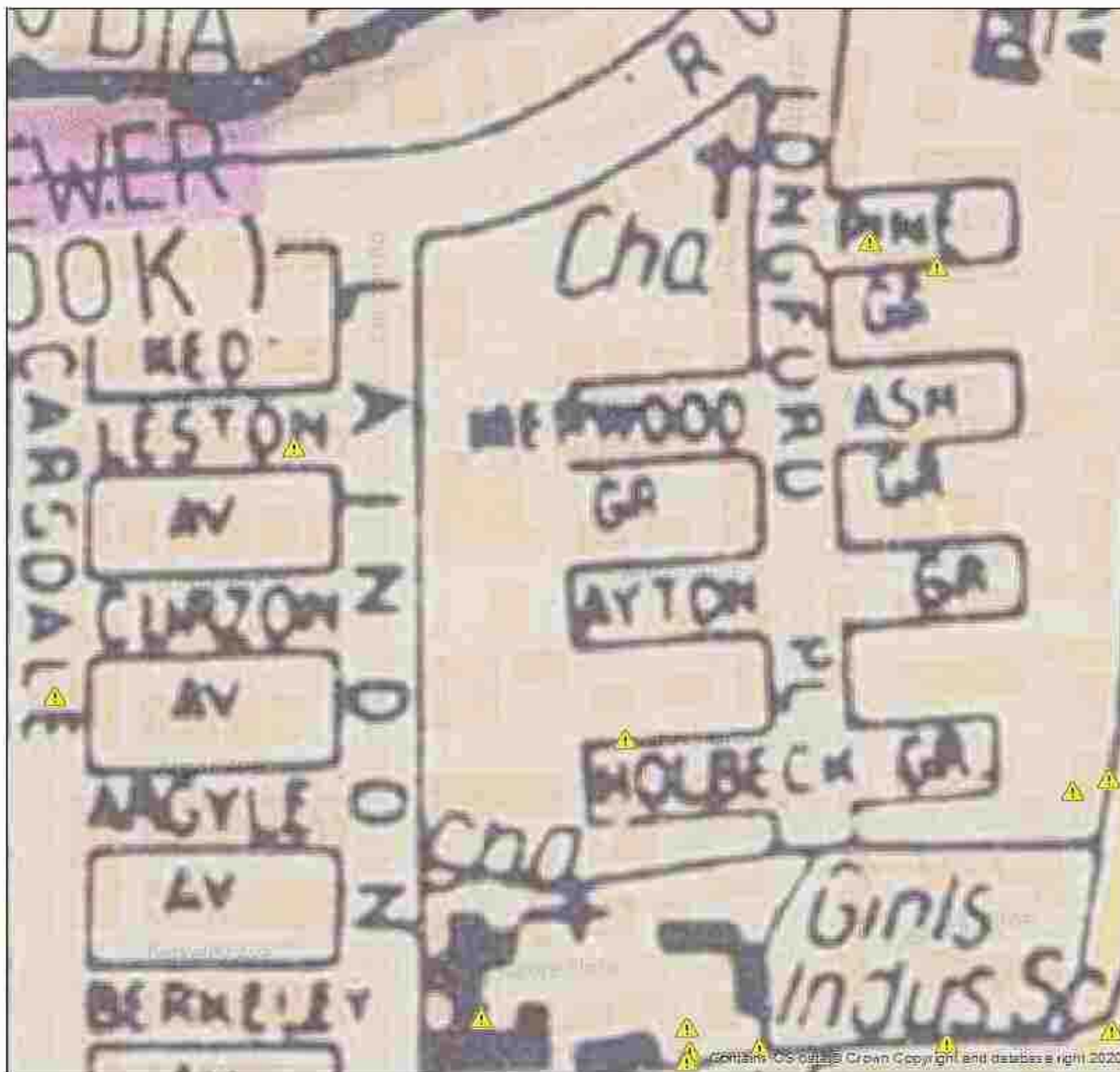
Author: Manchester City Council LLFA
Date: 03/10/2022
Scale: 1:1,722

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

0 12.5 25 50
Meters



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**MANCHESTER
CITY COUNCIL**

LLFA DATA SCREEN

Address/Site Ref:
Victoria Park Probation Centre

Our Ref: **MCC003/10/2022**

Author: Manchester City Council LLFA
Date: 03/10/2022
Scale: 1:1,722

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0 12.5 25 50
Meters



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Lead Local Flood Authority - Manchester City Council

SuDS Requirements for New Developments Update 2019

The Government has strengthened planning policy on the provision of sustainable drainage systems (SuDS) for 'major' planning applications which is being introduced from 6 April 2015 (Paragraph 103 of National Planning Policy Framework and Ministerial Statement on SuDS).

Changes were made to the Town and Country Planning Policy and Guidance to give Local Authority Planning Departments the responsibility for ensuring that new developments are drained in a sustainable way, through the planning process, in consultation with the Lead Local Flood Authorities. As per the guidance issued by the Department of Communities and Local Government (DCLG), all 'major' planning applications being determined from 6 April 2015, must consider sustainable drainage systems.

Decisions about the suitability of sustainable drainage provision are made by the Local Planning Authority. However, under the new consultation arrangements Manchester City Council, in its role as Lead Local Flood Authority, is a statutory consultee for all major applications with regards to sustainable drainage. All 'major' planning applications submitted from 15 April 2015 are required to include a Surface Water Drainage Statement.

Developers submitting the planning application to Manchester City Council are advised to:

- Assess the suitability of sustainable drainage systems in accordance with: paragraphs 051, 079 and 080 of the revised NPPF Planning Practice Guidance (PPG) for Flood Risk and Coastal Change.
- Design sustainable drainage systems in line with national Non-Statutory Technical Standards for SuDS: <https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards> and local policies DM1, EN08, EN14 and EN17 of the Core Strategy.
- Implement strategy that supports surface water runoff control as near to its source as possible through a sustainable drainage approach to surface water management, preferably through green types of SuDS wherever practicable.
- Maximise use of Green Infrastructure to manage surface water runoff (sustainable drainage systems – SuDS) as feasibility of use of green types of SuDS will be evaluated by LLFA during planning application stage. Even on sites where infiltration is not possible due to the unfavourable soil conditions, utilisation of attenuating types of SuDS should be maximised as part of green infrastructure in order to bring surface water runoff peak and volume reduction but also provide additional environmental and social benefits in line with Policies DM1, EN08, EN14 and EN17 of the Core Strategy. Developers are encouraged to look into CIRIA SuDS Manual 2015 for details of these systems to manage surface water runoff.
- Assess surface water attenuation requirements that offer a reduction in surface water runoff rate in line with the 'Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA, User Guide, Final, dated May 2010'. (Section 3.4.1 Critical Drainage Areas, page 31). Please note that all new connections to the watercourses shall comply with reduction of flows to Greenfield runoff rates.

http://www.manchester.gov.uk/downloads/download/3871/strategic_flood_risk_assessment-manchester_salford_trafford

- Submit hydraulic calculations and drawings to support the design along with proposed standards of operation and maintenance in accordance with paragraph 081 of NPF (PPG).
- It will be essential that the type of sustainable drainage system for a site, along with details of its extent/position, is identified at the design stage of the whole scheme. This information will be required for both outline and full applications so it is clearly demonstrated that the SuDS can be accommodated within the development that is proposed. It will no longer be acceptable to leave the design of SuDS to a later stage to be dealt with by planning conditions.

Applicants are strongly advised to discuss their proposals with relevant planning officers at the pre-application stage to ensure that an acceptable SuDS scheme is submitted.

Minimum requirements for approval

In order to avoid objection, the following three elements of evidence are required:

- Surface Water Management Statement for the site is submitted that is in line with requirement of NPPF PPG Paragraph 079:
 - “New development should only be considered appropriate in areas at risk of flooding if priority has been given to the use of green types of sustainable drainage systems as a primary mean of surface water management that could be accompanied by traditional attenuation systems if volumes required. Additionally, and more widely, when considering major development, as defined in the Town and Country Planning (Development Management Procedure) (England) Order 2015, sustainable drainage systems should be provided unless demonstrated to be inappropriate”.
 - The strategy should be accompanied by at least an outline layout of the proposed drainage systems with space allocation for the proposed attenuation in line with relevant flow reduction requirements.
- Evidence that drainage hierarchy has been applied in line with NPPF PPG Paragraph 080. The aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:
 - into the ground (infiltration);
 - to a surface water body;
 - to a surface water sewer, highway drain, or another drainage system;
 - to a combined sewer.
- Evidence that one viable solution for draining the site is secured and agreed in principle with relevant authority:
 - Results of ground investigation carried out under Building Research Establishment Digest 365. Site investigations should be undertaken in locations and at proposed depths of the proposed infiltration devices. Proposal of the attenuation that is achieving half emptying time within 24 hours. If no ground

investigations are possible or infiltration is not feasible on site, evidence of alternative surface water disposal routes (as follows) is required.

- Where surface water is connected to Main River, any works within or adjacent to the river that would affect it would require consent from Environment Agency. An email of acceptance of proposed flows and/or new connection will suffice.
- Where surface water is connected to the public sewer, agreement in principle from United Utilities is required that there is adequate spare capacity in the existing system taking future development requirements into account. An email of acceptance of proposed flows and/or new connection will suffice.

Where surface water is connected to the ordinary watercourse, agreement in principle from Manchester City Council as Lead Local Flood Authority is required. Please note that all new connections to the watercourses shall comply with reduction of flows to Greenfield runoff rates. An email of acceptance of proposed flows and/or new connection will suffice.

- Where surface water is connected to ordinary watercourse, any works within or adjacent to the watercourse that would affect it would require consent from Manchester City Council as Lead Local Flood Authority. Consent forms can be obtained on the website at:

http://www.manchester.gov.uk/downloads/download/5567/land_drainage_consent_and_guidance.com

Avoiding or discharging drainage condition

- Evidence of consideration of green SuDS solution wherever practicable and viable in line with NPPF PPG Paragraph 051. SuDS should be designed to:
 - reduce the causes and impacts of flooding;
 - remove pollutants from urban run-off at source;
 - combine water management with green space with benefits for amenity, recreation and wildlife wherever practicable.
- For Greenfield site developments, details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. to the Greenfield runoff rates;
- For Brownfield site developments, for all sites located within Conurbation Core Critical Drainage Areas, details of surface water attenuation that offers a reduction in surface water runoff rate in line with the Manchester Trafford and Salford Strategic Flood Risk Assessment, i.e. at least a 50% reduction in runoff rate compared to the existing rates with an aim to reduce to Greenfield runoff rates wherever practicable;
- Where surface water runoff is to be disposed through infiltration, details of surface water attenuation that is adequate for infiltration capacity of the underlying soil is required. This capacity has to be assessed through site investigation carried out in line with Building Research Establishment Digest 365. Site investigations should be undertaken in locations and at proposed depths of the proposed infiltration devices. Half emptying time of proposed attenuation within 24 hours should be achieved.

- Evidence that the drainage system has been designed (unless an area is designated to hold and/or convey water as part of the design) so that flooding does not occur during a 1 in 100 year rainfall event in any part of a building; The NPPF suggests that ‘for events with a return-period in excess of 30 years, surface flooding of open spaces such as landscaped areas or car parks is acceptable for short periods, but the layout and landscaping of the site should aim to route water away from any vulnerable property, and avoid creating hazards to access and egress routes. No flooding of property should occur as a result of a one in 100 year storm event (including an appropriate allowance for climate change)’.
- Assessment of overland flow routes for extreme events that is diverted away from buildings providing long and cross sections for the proposed drainage system and finished floor levels;
- Evidence that runoff volume in the 1 in 100 year, 6 hours rainfall shall be constrained to a value as close as is reasonably practical to the Greenfield runoff volume for the same event, but never to exceed the runoff volume from the development site prior to redevelopment;
- Hydraulic calculation of the proposed drainage system;
- Design construction drawings of proposed SuDS elements and flow controls;
- For sites where proposed development would cause unusual pollution risk to surface water (large car park areas (>50 parking spaces) or industrial estates), evidence of pollution control measures (preferably through SuDS) is required.
- Where an application is part of a larger site which already has planning permission it is essential that the new proposal does not compromise the drainage scheme already approved.

SuDS Maintenance

Maintenance of SuDS is essential for its proper operation and a clear management and maintenance plan for the lifetime of the development is required as part of the planning application.

In considering a development that includes a sustainable drainage system, Manchester City Council as local planning authority will want to be satisfied that the proposed minimum standards of operation are appropriate and that there are clear arrangements in place for ongoing maintenance. Information sought by Manchester City Council would be no more than necessary, having regard to the nature and scale of the development concerned in line with NPPF Paragraph 081.

In some instances where no clear adoption of the drainage system is proposed, a drainage maintenance condition could be attached to the planning applications. In order to discharge this condition, the following evidence should be provided following *construction*:

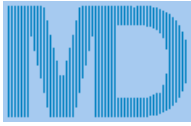
- Verification report providing photographic evidence of construction as per design drawings;
- As built construction drawings if different from design construction drawings;

- Management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme throughout its lifetime.

Applicants are strongly advised to discuss their proposals with relevant planning officers at the pre-application stage to ensure that an acceptable SuDS scheme is submitted.

Appendix E

Calculations



MasterDrain
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The LK Group

www.thelkgroup.com

Eton Business Park,
Eton Hill Road,
Radcliffe M26 2ZS
Tel: 0161 763 7200
email: m.jones@thelkgroup.com

Job No.		
Sheet no. 1		
Date 29/09/22		
By	Checked	Reviewed

Project	Qbar Existing Runoff Victoria Park, Manchester
Title	Qbar Existing Runoff Victoria Park, Manchester

Area data:-

FSR data

M5-60 = 18.5

Soil index = 0.45

WRAP value = 4

r = 0.36

SAAR = 860

Nat grid = SJ8695

Site data:-

Ret. period (yrs) = 2.33

Time of entry = 7.00

Impervious area drained = 3700 m²

Site slope = Mild <2% (1:50)

Length of overland flow = 0.00

ToC = 7.0 mins

Overland flow time = 0.0 mins

Pervious area drained = 2500 m²

Soil type = Clay

Climate change factor = 0.0 %

Calculated data:-

Calculated runoff factor = 47.0%

Rainfall rate = 59.1 mm/Hr

UCWI = 90.1

Runoff rate (gross) = 47.8 l/s

Methods

Runoff factor (RF) = 47.0, calculated from:-

Runoff factor = $(0.829 \times \text{PIMP}) + (25 \times \text{SOIL}) + (0.078 \times \text{UCWI}) - 20.7$

where

PIMP = $\text{Impervious Area} \times 100 / (\text{Impervious Area} + \text{Pervious Area})$

UCWI = Calculated value for Wetness Index

Calculations produced by MasterDrain Surface Water design program



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Eton Hill Road,
Radcliffe M26 2ZS
Tel: 0161 763 7200
email: m.jones@thelkgroup.com

Job No.		
Sheet no. 1		
Date 29/09/22		
By	Checked	Reviewed

Project **1 Year Existing Runoff Victoria Park, Manchester**

Title **1 Year Existing Runoff Victoria Park, Manchester**

Area data:-

FSR data

M5-60 = 18.5

Soil index = 0.45

WRAP value = 4

r = 0.36

SAAR = 860

Nat grid = SJ8695

Site data:-

Ret. period (yrs) = 1

Time of entry = 10.00

Impervious area drained = 3700 m²

Site slope = Mild <2% (1:50)

Length of overland flow = 0.00

ToC = 10.0 mins

Overland flow time = 0.0 mins

Pervious area drained = 2500 m²

Soil type = Clay

Climate change factor = 0.0 %

Calculated data:-

Calculated runoff factor = 47.0%

Rainfall rate = 41.4 mm/Hr

UCWI = 90.1

Runoff rate (gross) = 33.5 l/s

Methods

Runoff factor (RF) = 47.0, calculated from:-

Runoff factor = $(0.829 \times \text{PIMP}) + (25 \times \text{SOIL}) + (0.078 \times \text{UCWI}) - 20.7$

where

PIMP = $\text{Impervious Area} \times 100 / (\text{Impervious Area} + \text{Pervious Area})$

UCWI = Calculated value for Wetness Index

Calculations produced by MasterDrain Surface Water design program



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Eton Business Park,
Eton Hill Road,
Radcliffe M26 2ZS
Tel: 0161 763 7200
email: m.jones@thelkgroup.com

Job No.		
Sheet no. 1		
Date 29/09/22		
By	Checked	Reviewed

Project	30 Years Existing Runoff Victoria Park, Manchester
Title	30 Years Existing Runoff Victoria Park, Manchester

Area data:-

FSR data

M5-60 = 18.5

Soil index = 0.45

WRAP value = 4

r = 0.36

SAAR = 860

Nat grid = SJ8695

Site data:-

Ret. period (yrs) = 30

Time of entry = 6.00

Impervious area drained = 3700 m²

Site slope = Mild <2% (1:50)

Length of overland flow = 0.00

ToC = 6.0 mins

Overland flow time = 0.0 mins

Pervious area drained = 2500 m²

Soil type = Clay

Climate change factor = 0.0 %

Calculated data:-

Calculated runoff factor = 47.0%

Rainfall rate = 104.7 mm/Hr

UCWI = 90.1

Runoff rate (gross) = 84.7 l/s

Methods

Runoff factor (RF) = 47.0, calculated from:-

Runoff factor = $(0.829 \times \text{PIMP}) + (25 \times \text{SOIL}) + (0.078 \times \text{UCWI}) - 20.7$

where

PIMP = $\text{Impervious Area} \times 100 / (\text{Impervious Area} + \text{Pervious Area})$

UCWI = Calculated value for Wetness Index

Calculations produced by MasterDrain Surface Water design program



MasterDrain
SW

The LK Group

www.thelkgroup.com

Eton Business Park,
Eton Hill Road,
Radcliffe M26 2ZS
Tel: 0161 763 7200
email: m.jones@thelkgroup.com

Job No.		
Sheet no. 1		
Date 29/09/22		
By	Checked	Reviewed

Project **100 Years Existing Runoff Victoria Park, Manchester**

Title **100 Years Existing Runoff Victoria Park, Manchester**

Area data:-

FSR data

M5-60 = 18.5

Soil index = 0.45

WRAP value = 4

r = 0.36

SAAR = 860

Nat grid = SJ8695

Site data:-

Ret. period (yrs) = 100

Time of entry = 6.00

Impervious area drained = 3700 m²

Site slope = Mild <2% (1:50)

Length of overland flow = 0.00

ToC = 6.0 mins

Overland flow time = 0.0 mins

Pervious area drained = 2500 m²

Soil type = Clay

Climate change factor = 0.0 %

Calculated data:-

Calculated runoff factor = 47.0%

Rainfall rate = 132.6 mm/Hr

UCWI = 90.1

Runoff rate (gross) = 107.3 l/s

Methods

Runoff factor (RF) = 47.0, calculated from:-

Runoff factor = $(0.829 \times \text{PIMP}) + (25 \times \text{SOIL}) + (0.078 \times \text{UCWI}) - 20.7$

where

PIMP = $\text{Impervious Area} \times 100 / (\text{Impervious Area} + \text{Pervious Area})$

UCWI = Calculated value for Wetness Index

Calculations produced by MasterDrain Surface Water design program



MasterDrain
SW

The LK Group

www.thelkgroup.com

Eton Business Park,
Eton Hill Road,
Radcliffe M26 2ZS
Tel: 0161 763 7200
email: m.jones@thelkgroup.com

Job No.		
Sheet no. 1		
Date 03/01/23		
By	Checked	Reviewed

Project **30 Years Storage Event Victoria Park, Manchester**
Title **30 Years Storage Event Victoria Park, Manchester**

Data:-

FSR Hydrology:-

Location = VIC PARK, MANCH
M5-60 (mm) = 18.5
Soil index = 0.45
Return period = 30
UCWI = 92.2

Grid reference = SJ8695
r = 0.36
SAAR (mm/yr) = 860
WRAP = 4
Climate change = 0

Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

Runoff factor (RF) = 65.0, calculated from:-

$$\text{Runoff factor} = (0.829 \times \text{PIMP}) + (25 \times \text{SOIL}) + (0.078 \times \text{UCWI}) - 20.7$$

where

PIMP = Impervious Area*100/(Impervious Area+Pervious Area)

UCWI = Calculated value for Wetness Index

Design data:-

Imperv. area = 5000 m²
Total area (TA) = 6200 m²
Mean disch. rate = 13.900 l/s
Additional flow = 0.00 l/s

Pervious area = 1200 m²
Equiv area = 4030 m² (TA x RF).
Areal reduction factor = 1.000
Climate change factor = 0

Calculated data:-

Time to max = 41.0 mins
Rainfall at max = 36.65 mm/hr
Pipeline storage = 0.0 m³
Offline storage = 0.0 m³

Calculated storage volume = 65.2 m³
Allowed discharge rate = 13.900 l/s
Available MH storage = 0.0 m³

Fixed 6 hour data:-

Rainfall event = 6 hours
Rainfall rate = 8.00 mm/hr

Calculated storage volume = 0.0 m³
Allowed discharge rate = 13.900 l/s

Rainfall intensities calculated using the Wallingford Procedure

Storage lengths for initial calculation (x 1.1, 1.2, 1.3 or 1.5 as above if required) :-

Diam	Len	Diam	Len	Ovoid	Len	Box culvert	Len
100	8302.4	1125	65.6	400 x 600	362.2	500 x 500	260.8
150	3689.9	1200	57.7	600 x 900	157.7	500 x 750	173.9
225	1640.0	1275	51.1	800 x 1200	88.7	500 x 1000	130.4
300	922.5	1350	45.6			750 x 1000	86.9
375	590.4	1425	40.9			750 x 1200	72.4
450	410.0	1500	36.9			750 x 1500	58.0
525	301.2	1575	33.5			1000 x 1000	65.2
600	230.6	1650	30.5			1000 x 1200	54.3
675	182.2	1725	27.9			1000 x 1500	43.5
750	147.6	1800	25.6			1000 x 1800	36.2
825	122.0	1875	23.6			1000 x 2000	32.6
900	102.5	1950	21.8			1500 x 1500	29.0
975	87.3	2025	20.2			1500 x 1800	24.1
1050	75.3	2100	18.8			1500 x 2000	21.7



MasterDrain
SW

Data:-

The LK Group

www.thelkgroup.com

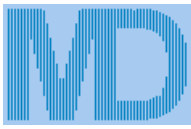
Eton Business Park,
Eton Hill Road,
Radcliffe M26 2ZS
Tel: 0161 763 7200
email: m.jones@thelkgroup.com

Job No.		
Sheet no. 2		
Date 03/01/23		
By	Checked	Reviewed

Project	30 Years Storage Event Victoria Park, Manchester
Title	30 Years Storage Event Victoria Park, Manchester

Time (mins)	Rain mm/hr	Inflow (m3)	Outflow (m3)	Balance (m3)
10	83.0	55.171	8.340	46.831
20	57.0	75.817	16.680	59.137
30	45.0	88.845	25.020	63.825
40	37.0	98.538	33.360	65.178
50	32.0	106.328	41.700	64.628
60	28.0	112.876	50.040	62.836
70	26.0	118.546	58.380	60.166
80	23.0	123.557	66.720	56.837
90	22.0	128.055	75.060	52.995
100	20.0	132.141	83.400	48.741
110	19.0	135.887	91.740	44.147
120	18.0	139.347	100.080	39.267
130	17.0	142.565	108.420	34.145
140	16.0	145.572	116.760	28.812
150	15.0	148.395	125.100	23.295
160	14.0	151.056	133.440	17.616
170	14.0	153.573	141.780	11.793
180	13.0	155.960	150.120	5.840
190	13.0	158.231	158.460	0.000
200	12.0	160.396	166.800	0.000
210	12.0	162.464	175.140	0.000
220	11.0	164.444	183.480	0.000
230	11.0	166.342	191.820	0.000
240	11.0	168.166	200.160	0.000
250	10.0	169.920	208.500	0.000
260	10.0	171.609	216.840	0.000
270	10.0	173.238	225.180	0.000
280	9.0	174.811	233.520	0.000
290	9.0	176.331	241.860	0.000
300	9.0	177.801	250.200	0.000
310	9.0	179.225	258.540	0.000
320	9.0	180.668	266.880	0.000
330	8.0	182.082	275.220	0.000
340	8.0	183.462	283.560	0.000
350	8.0	184.809	291.900	0.000
360	8.0	186.126	300.240	0.000
370	8.0	187.415	308.580	0.000
380	8.0	188.675	316.920	0.000
390	7.0	189.910	325.260	0.000
400	7.0	191.119	333.600	0.000
410	7.0	192.305	341.940	0.000
420	7.0	193.468	350.280	0.000
430	7.0	194.609	358.620	0.000
440	7.0	195.729	366.960	0.000
450	7.0	196.829	375.300	0.000
460	7.0	197.909	383.640	0.000
470	6.0	198.971	391.980	0.000
480	6.0	200.015	400.320	0.000
490	6.0	201.042	408.660	0.000
500	6.0	202.053	417.000	0.000
510	6.0	203.047	425.340	0.000
520	6.0	204.026	433.680	0.000
530	6.0	204.990	442.020	0.000
540	6.0	205.940	450.360	0.000
550	6.0	206.876	458.700	0.000
560	6.0	207.798	467.040	0.000
570	6.0	208.708	475.380	0.000
580	5.0	209.605	483.720	0.000
590	5.0	210.489	492.060	0.000
600	5.0	211.362	500.400	0.000

Storage volume (m³) = 65.2 m³



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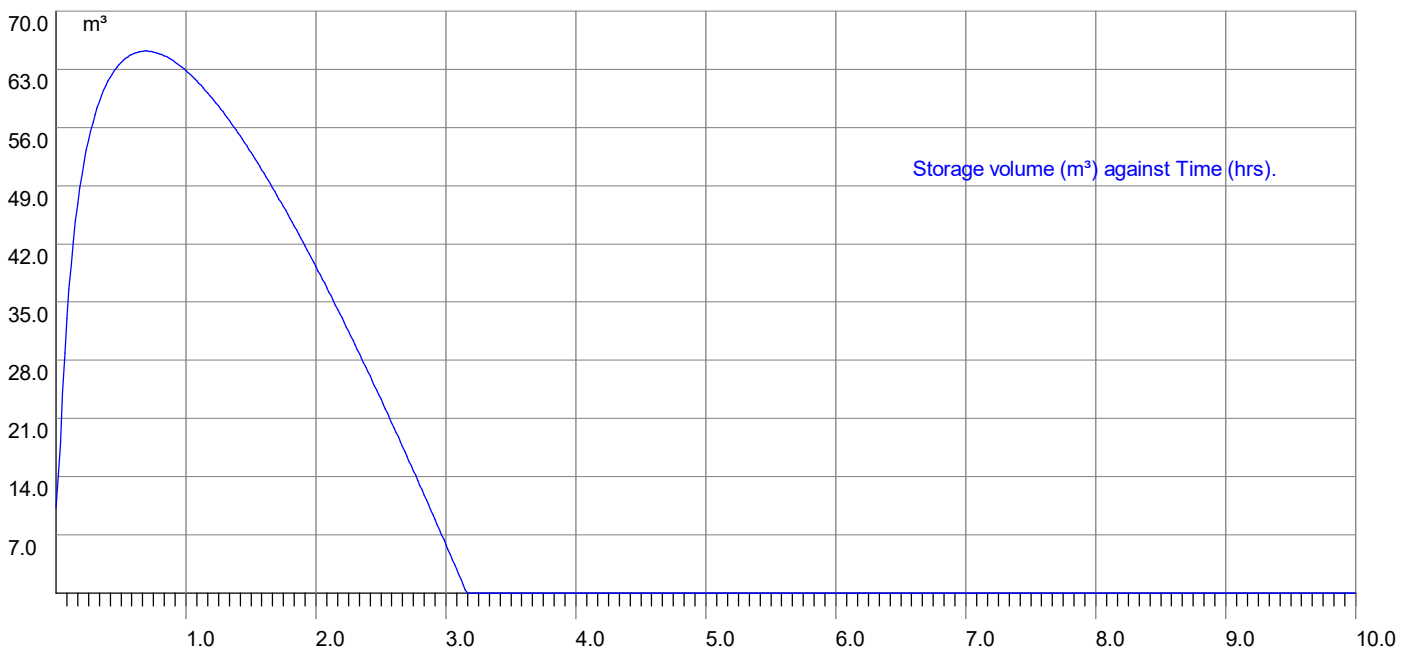
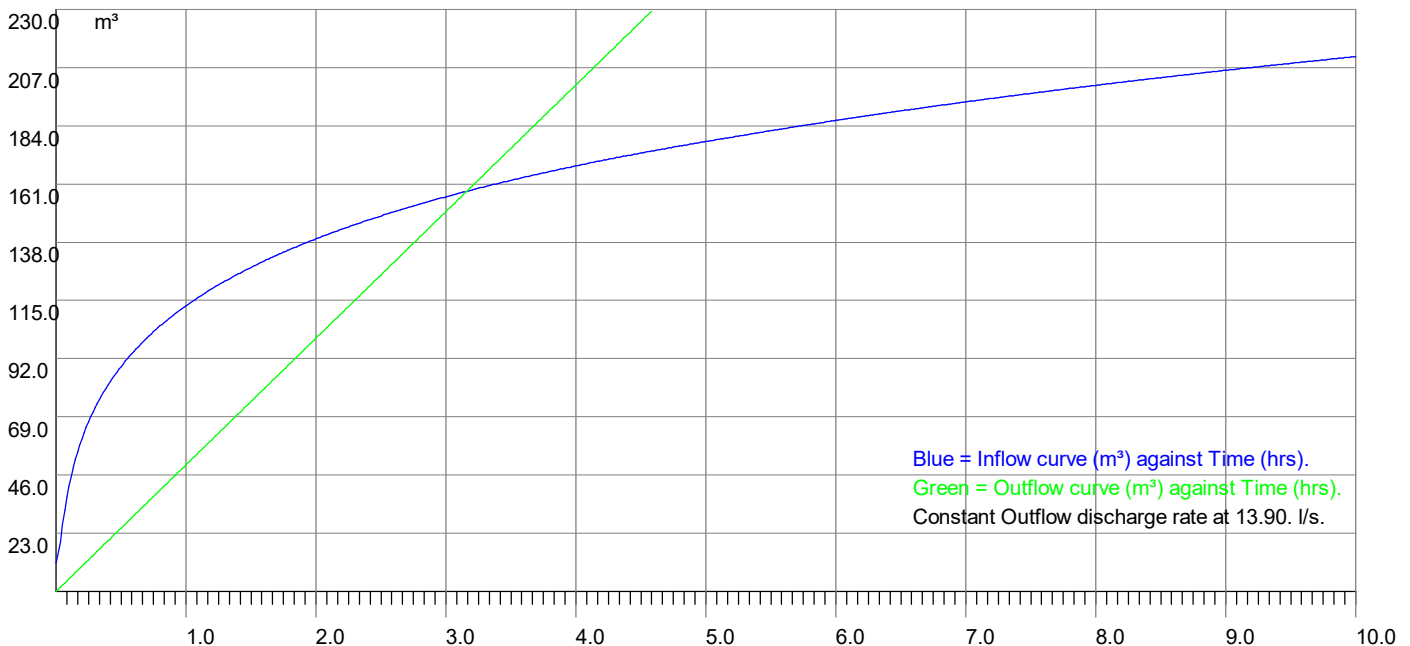
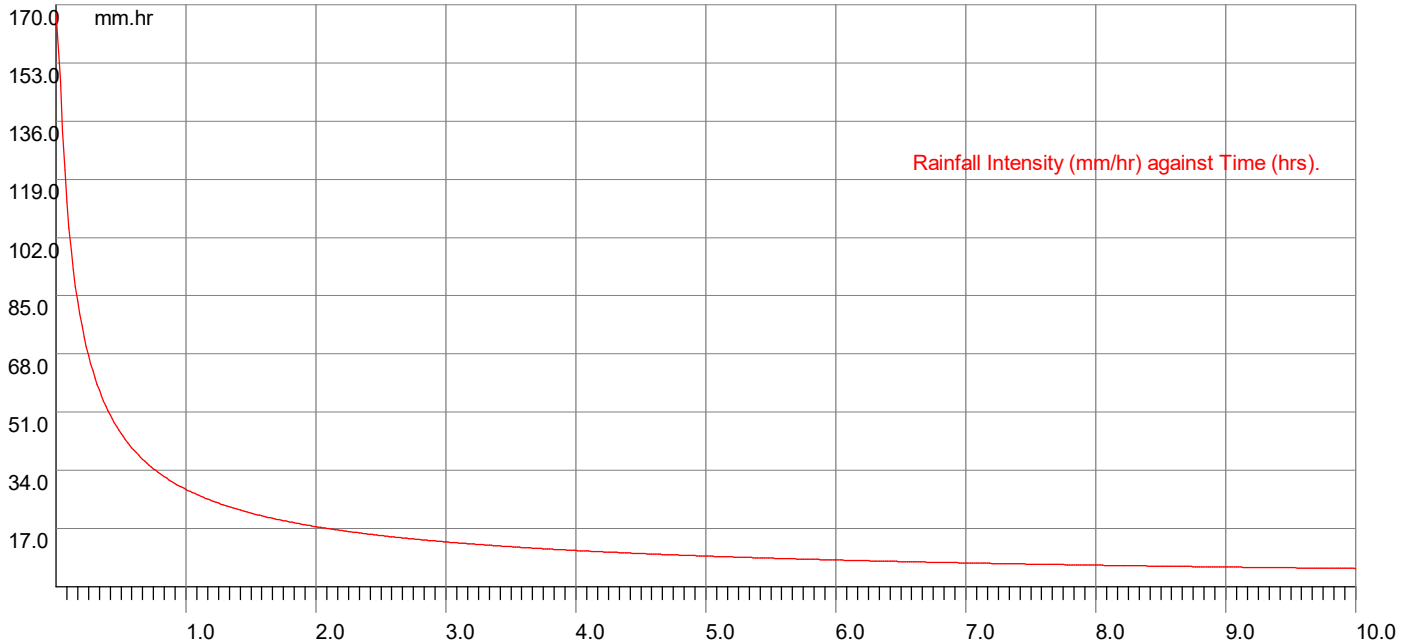
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Eton Hill Road,
Radcliffe M26 2ZS
Tel: 0161 763 7200
email: m.jones@thelkgroup.com

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Project **30 Years Storage Event Victoria Park, Manchester**

Title **30 Years Storage Event Victoria Park, Manchester**





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Tel: 0161 763 7200
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Project **30 Years Storage Event Victoria Park, Manchester**

Title **30 Years Storage Event Victoria Park, Manchester**

Explanatory notes for Peak Flow Storage

- 1) This system uses the rainfall intensity/ duration curve calculated using either the Wallingford or FEH method as selected.
- 2) The balance is calculated from the inflow minus the outflow.
- 3) The storage volume is the maximum value of the balance curve.
- 4) This method was described by Davis (1963) - see Butler & Davies, 2nd edition, p294
- 5) References to 'storm duration' relate only to the hydrograph method (qv).
- 6) There are always 600 steps in the calculation process, thus a 'run' time of 10 hours will be sampled every minute,

Explanatory notes for Hydrograph Storage

- 1) The user has the choice of Summer or Winter curves
- 2) The mean intensity varies with the duration of the storm curve
- 3) There are always 120 steps in the calculation process, irrespective of storm duration.
- 4) The balance is calculated from the inflow minus the outflow.
- 5) The storage volume is the sum of the balance values for each step.
- 6) Varying durations should be tried to find the maximum storage value - this can be narrowed down very closely.

*Modelling using the flow characteristics of the restrictor is available using Vortex Control modelling function. Please be aware that this function needs the full design data file to function.

Why do the two methods give different results?

The rainfall characteristics for each method are very different.

The Peak flow (using the Intensity/Duration/Frequency curve) does not model the actual rainfall. This curve is joined points which represent the mean intensity of a storm at a given duration i.e. a value of 19.5 mm/hr for a 60 minute storm indicates that over the sixty minute period, the mean intensity was 19.5 mm/hr. The calculation method samples the IDF curve for a given location and frequency (Return Period) and calculates the storage for that rate and duration less the outflow volume. The maximum value is displayed as the 'worst case' storage. The outflow volume is constant throughout the process at the specified discharge rate.

The hydrograph method uses a standard curve for either Winter or Summer storms. Traditionally these are symmetrical about the central peak. UK rainfall does not fit into this convenient curve, so the calculations are dealing with a stylised set of data. The mean intensity for the storm is calculated from the IDF curve and applied to the curve data, calculating the storage for that step less the outflow volume. The final storage volume is the sum of the storage for all the steps. The outflow volume varies with the hydraulic head on the control device using flow equations provided by the control manufacturer. This is a far more accurate method than the peak flow method and often results in bigger storage volumes.

It can be seen that these two methods are very different, and the user may have the choice of which result to use. This is not an exact science, though is often treated as such by those that do not understand the principles of the calculations.



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Tel: 0161 763 7200
email: m.jones@thelkgroup.com

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Project	100 Years + 20% Storage Event Victoria Park, Manchester
Title	100 Years + 20% Storage Event Victoria Park, Manchester

Data:-

FSR Hydrology:-

Location = VIC PARK, MANCH
M5-60 (mm) = 18.5
Soil index = 0.45
Return period = 100
UCWI = 92.2

Grid reference = SJ8695
r = 0.36
SAAR (mm/yr) = 860
WRAP = 4
Climate change = 20

Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

Runoff factor (RF) = 65.0, calculated from:-

$$\text{Runoff factor} = (0.829 \times \text{PIMP}) + (25 \times \text{SOIL}) + (0.078 \times \text{UCWI}) - 20.7$$

where

PIMP = Impervious Area*100/(Impervious Area+Pervious Area)

UCWI = Calculated value for Wetness Index

Design data:-

Imperv. area = 5000 m²
Total area (TA) = 6200 m²
Mean disch. rate = 13.900 l/s
Additional flow = 0.00 l/s

Pervious area = 1200 m²
Equiv area = 4030 m² (TA x RF).
Areal reduction factor = 1.000
Climate change factor = 20

Calculated data:-

Time to max = 71.0 mins
Rainfall at max = 40.00 mm/hr
Pipeline storage = 0.0 m³
Offline storage = 0.0 m³

Calculated storage volume = 128.6 m³
Allowed discharge rate = 13.900 l/s
Available MH storage = 0.0 m³

Fixed 6 hour data:-

Rainfall event = 6 hours
Rainfall rate = 12.00 mm/hr

Calculated storage volume = 0.0 m³
Allowed discharge rate = 13.900 l/s

Rainfall intensities calculated using the Wallingford Procedure

Storage lengths for initial calculation (x 1.1, 1.2, 1.3 or 1.5 as above if required) :-

Diam	Len	Diam	Len	Ovoid	Len	Box culvert	Len
100	16375.7	1125	129.4	400 x 600	714.4	500 x 500	514.4
150	7278.1	1200	113.7	600 x 900	311.1	500 x 750	342.9
225	3234.7	1275	100.7	800 x 1200	174.9	500 x 1000	257.2
300	1819.5	1350	89.9			750 x 1000	171.5
375	1164.5	1425	80.6			750 x 1200	142.9
450	808.7	1500	72.8			750 x 1500	114.3
525	594.1	1575	66.0			1000 x 1000	128.6
600	454.9	1650	60.1			1000 x 1200	107.2
675	359.4	1725	55.0			1000 x 1500	85.7
750	291.1	1800	50.5			1000 x 1800	71.4
825	240.6	1875	46.6			1000 x 2000	64.3
900	202.2	1950	43.1			1500 x 1500	57.2
975	172.3	2025	39.9			1500 x 1800	47.6
1050	148.5	2100	37.1			1500 x 2000	42.9



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Data:-

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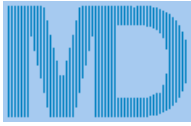
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Radcliffe M26 2ZS
Tel: 0161 763 7200
email: m.jones@thelkgroup.com

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Project	100 Years + 20% Storage Event Victoria Park, Manchester
Title	100 Years + 20% Storage Event Victoria Park, Manchester

Time (mins)	Rain mm/hr	Inflow (m3)	Outflow (m3)	Balance (m3)
10	128.0	84.868	8.340	76.528
20	89.0	118.100	16.680	101.420
30	70.0	139.131	25.020	114.111
40	59.0	154.787	33.360	121.427
50	51.0	167.347	41.700	125.647
60	45.0	177.875	50.040	127.835
70	40.0	186.960	58.380	128.580
80	37.0	194.960	66.720	128.240
90	34.0	202.112	75.060	127.052
100	32.0	208.580	83.400	125.180
110	29.0	214.485	91.740	122.745
120	28.0	219.915	100.080	119.835
130	26.0	224.940	108.420	116.520
140	25.0	229.615	116.760	112.855
150	24.0	233.983	125.100	108.883
160	23.0	238.081	133.440	104.641
170	22.0	241.938	141.780	100.158
180	21.0	245.579	150.120	95.459
190	20.0	249.025	158.460	90.565
200	19.0	252.294	166.800	85.494
210	18.0	255.402	175.140	80.262
220	18.0	258.362	183.480	74.882
230	17.0	261.186	191.820	69.366
240	17.0	263.885	200.160	63.725
250	16.0	266.468	208.500	57.968
260	16.0	268.942	216.840	52.102
270	15.0	271.316	225.180	46.136
280	15.0	273.596	233.520	40.077
290	14.0	275.788	241.860	33.928
300	14.0	277.898	250.200	27.698
310	14.0	279.930	258.540	21.390
320	13.0	282.052	266.880	15.172
330	13.0	284.133	275.220	8.913
340	13.0	286.162	283.560	2.602
350	12.0	288.143	291.900	0.000
360	12.0	290.077	300.240	0.000
370	12.0	291.967	308.580	0.000
380	12.0	293.816	316.920	0.000
390	11.0	295.624	325.260	0.000
400	11.0	297.394	333.600	0.000
410	11.0	299.128	341.940	0.000
420	11.0	300.828	350.280	0.000
430	11.0	302.494	358.620	0.000
440	10.0	304.128	366.960	0.000
450	10.0	305.732	375.300	0.000
460	10.0	307.306	383.640	0.000
470	10.0	308.852	391.980	0.000
480	10.0	310.372	400.320	0.000
490	10.0	311.865	408.660	0.000
500	9.0	313.333	417.000	0.000
510	9.0	314.777	425.340	0.000
520	9.0	316.198	433.680	0.000
530	9.0	317.596	442.020	0.000
540	9.0	318.973	450.360	0.000
550	9.0	320.328	458.700	0.000
560	9.0	321.664	467.040	0.000
570	9.0	322.979	475.380	0.000
580	8.0	324.276	483.720	0.000
590	8.0	325.554	492.060	0.000
600	8.0	326.814	500.400	0.000

Storage volume (m³) = 128.6 m³



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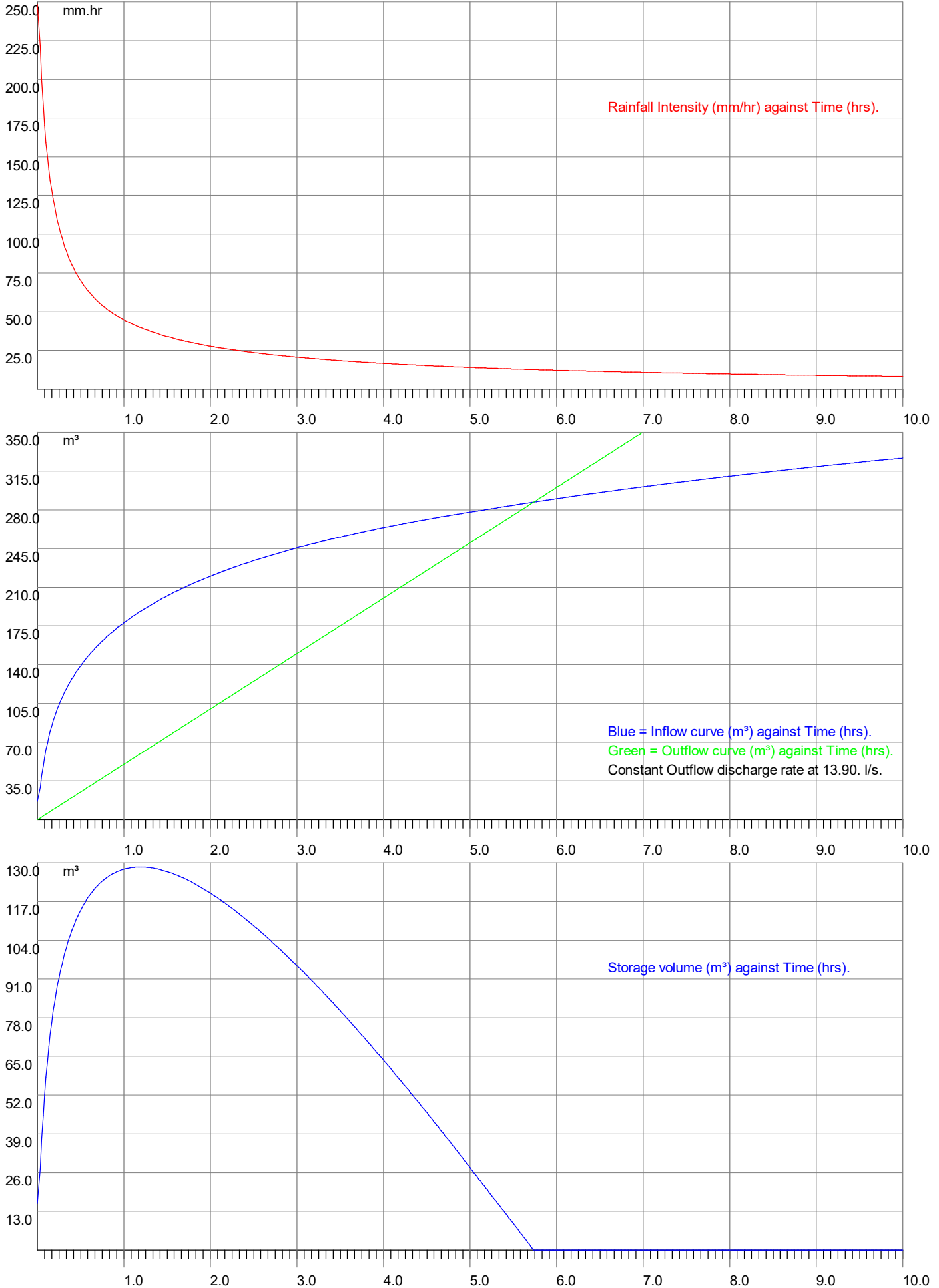
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Radcliffe M26 2ZS
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email: m.jones@thelkgroup.com

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Project **100 Years + 20% Storage Event Victoria Park, Manchester**

Title **100 Years + 20% Storage Event Victoria Park, Manchester**





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Project **100 Years + 20% Storage Event Victoria Park, Manchester**

Title **100 Years + 20% Storage Event Victoria Park, Manchester**

Explanatory notes for Peak Flow Storage

- 1) This system uses the rainfall intensity/ duration curve calculated using either the Wallingford or FEH method as selected.
- 2) The balance is calculated from the inflow minus the outflow.
- 3) The storage volume is the maximum value of the balance curve.
- 4) This method was described by Davis (1963) - see Butler & Davies, 2nd edition, p294
- 5) References to 'storm duration' relate only to the hydrograph method (qv).
- 6) There are always 600 steps in the calculation process, thus a 'run' time of 10 hours will be sampled every minute,

Explanatory notes for Hydrograph Storage

- 1) The user has the choice of Summer or Winter curves
- 2) The mean intensity varies with the duration of the storm curve
- 3) There are always 120 steps in the calculation process, irrespective of storm duration.
- 4) The balance is calculated from the inflow minus the outflow.
- 5) The storage volume is the sum of the balance values for each step.
- 6) Varying durations should be tried to find the maximum storage value - this can be narrowed down very closely.

*Modelling using the flow characteristics of the restrictor is available using Vortex Control modelling function. Please be aware that this function needs the full design data file to function.

Why do the two methods give different results?

The rainfall characteristics for each method are very different.

The Peak flow (using the Intensity/Duration/Frequency curve) does not model the actual rainfall. This curve is joined points which represent the mean intensity of a storm at a given duration i.e. a value of 19.5 mm/hr for a 60 minute storm indicates that over the sixty minute period, the mean intensity was 19.5 mm/hr. The calculation method samples the IDF curve for a given location and frequency (Return Period) and calculates the storage for that rate and duration less the outflow volume. The maximum value is displayed as the 'worst case' storage. The outflow volume is constant throughout the process at the specified discharge rate.

The hydrograph method uses a standard curve for either Winter or Summer storms. Traditionally these are symmetrical about the central peak. UK rainfall does not fit into this convenient curve, so the calculations are dealing with a stylised set of data. The mean intensity for the storm is calculated from the IDF curve and applied to the curve data, calculating the storage for that step less the outflow volume. The final storage volume is the sum of the storage for all the steps. The outflow volume varies with the hydraulic head on the control device using flow equations provided by the control manufacturer. This is a far more accurate method than the peak flow method and often results in bigger storage volumes.

It can be seen that these two methods are very different, and the user may have the choice of which result to use. This is not an exact science, though is often treated as such by those that do not understand the principles of the calculations.



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email: m.jones@thelkgroup.com

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Project	100 Years + 40% Storage Event Victoria Park, Manchester
Title	100 Years + 40% Storage Event Victoria Park, Manchester

Data:-

FSR Hydrology:-

Location = VIC PARK, MANCH
M5-60 (mm) = 18.5
Soil index = 0.45
Return period = 100
UCWI = 92.2

Grid reference = SJ8695
r = 0.36
SAAR (mm/yr) = 860
WRAP = 4
Climate change = 40

Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

Runoff factor (RF) = 65.0, calculated from:-

$$\text{Runoff factor} = (0.829 \times \text{PIMP}) + (25 \times \text{SOIL}) + (0.078 \times \text{UCWI}) - 20.7$$

where

PIMP = Impervious Area*100/(Impervious Area+Pervious Area)

UCWI = Calculated value for Wetness Index

Design data:-

Imperv. area = 5000 m²
Total area (TA) = 6200 m²
Mean disch. rate = 13.900 l/s
Additional flow = 0.00 l/s

Pervious area = 1200 m²
Equiv area = 4030 m² (TA x RF).
Areal reduction factor = 1.000
Climate change factor = 40

Calculated data:-

Time to max = 85.0 mins
Rainfall at max = 41.22 mm/hr
Pipeline storage = 0.0 m³
Offline storage = 0.0 m³

Calculated storage volume = 160.8 m³
Allowed discharge rate = 13.900 l/s
Available MH storage = 0.0 m³

Fixed 6 hour data:-

Rainfall event = 6 hours
Rainfall rate = 14.00 mm/hr

Calculated storage volume = 32.0 m³
Allowed discharge rate = 13.900 l/s

Rainfall intensities calculated using the Wallingford Procedure

Storage lengths for initial calculation (x 1.1, 1.2, 1.3 or 1.5 as above if required) :-

Diam	Len	Diam	Len	Ovoid	Len	Box culvert	Len
100	20483.4	1125	161.8	400 x 600	893.6	500 x 500	643.4
150	9103.7	1200	142.2	600 x 900	389.1	500 x 750	428.9
225	4046.1	1275	126.0	800 x 1200	218.8	500 x 1000	321.7
300	2275.9	1350	112.4			750 x 1000	214.5
375	1456.6	1425	100.9			750 x 1200	178.7
450	1011.5	1500	91.0			750 x 1500	143.0
525	743.2	1575	82.6			1000 x 1000	160.8
600	569.0	1650	75.2			1000 x 1200	134.0
675	449.6	1725	68.8			1000 x 1500	107.2
750	364.1	1800	63.2			1000 x 1800	89.4
825	300.9	1875	58.3			1000 x 2000	80.4
900	252.9	1950	53.9			1500 x 1500	71.5
975	215.5	2025	50.0			1500 x 1800	59.6
1050	185.8	2100	46.4			1500 x 2000	53.6



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Data:-

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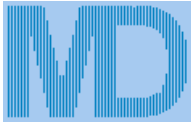
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Eton Hill Road,
Radcliffe M26 2ZS
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email: m.jones@thelkgroup.com

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Project	100 Years + 40% Storage Event Victoria Park, Manchester
Title	100 Years + 40% Storage Event Victoria Park, Manchester

Time (mins)	Rain mm/hr	Inflow (m3)	Outflow (m3)	Balance (m3)
10	150.0	99.013	8.340	90.673
20	104.0	137.783	16.680	121.103
30	82.0	162.319	25.020	137.299
40	68.0	180.585	33.360	147.225
50	59.0	195.238	41.700	153.538
60	52.0	207.521	50.040	157.481
70	47.0	218.120	58.380	159.740
80	43.0	227.454	66.720	160.734
90	40.0	235.797	75.060	160.737
100	37.0	243.344	83.400	159.944
110	34.0	250.232	91.740	158.492
120	32.0	256.567	100.080	156.487
130	31.0	262.430	108.420	154.010
140	29.0	267.884	116.760	151.124
150	28.0	272.980	125.100	147.880
160	26.0	277.761	133.440	144.321
170	25.0	282.261	141.780	140.481
180	24.0	286.509	150.120	136.389
190	23.0	290.529	158.460	132.069
200	22.0	294.343	166.800	127.543
210	21.0	297.969	175.140	122.829
220	21.0	301.422	183.480	117.942
230	20.0	304.717	191.820	112.897
240	19.0	307.866	200.160	107.706
250	19.0	310.879	208.500	102.379
260	18.0	313.766	216.840	96.926
270	18.0	316.536	225.180	91.356
280	17.0	319.196	233.520	85.676
290	17.0	321.753	241.860	79.893
300	16.0	324.214	250.200	74.014
310	16.0	326.584	258.540	68.044
320	16.0	329.060	266.880	62.180
330	15.0	331.488	275.220	56.268
340	15.0	333.856	283.560	50.296
350	15.0	336.167	291.900	44.267
360	14.0	338.423	300.240	38.184
370	14.0	340.629	308.580	32.049
380	14.0	342.785	316.920	25.865
390	13.0	344.895	325.260	19.635
400	13.0	346.960	333.600	13.360
410	13.0	348.983	341.940	7.043
420	13.0	350.965	350.280	0.685
430	12.0	352.909	358.620	0.000
440	12.0	354.816	366.960	0.000
450	12.0	356.687	375.300	0.000
460	12.0	358.524	383.640	0.000
470	12.0	360.328	391.980	0.000
480	11.0	362.100	400.320	0.000
490	11.0	363.842	408.660	0.000
500	11.0	365.555	417.000	0.000
510	11.0	367.240	425.340	0.000
520	11.0	368.897	433.680	0.000
530	11.0	370.529	442.020	0.000
540	10.0	372.135	450.360	0.000
550	10.0	373.716	458.700	0.000
560	10.0	375.274	467.040	0.000
570	10.0	376.809	475.380	0.000
580	10.0	378.322	483.720	0.000
590	10.0	379.813	492.060	0.000
600	10.0	381.284	500.400	0.000

Storage volume (m³) = 160.8 m³



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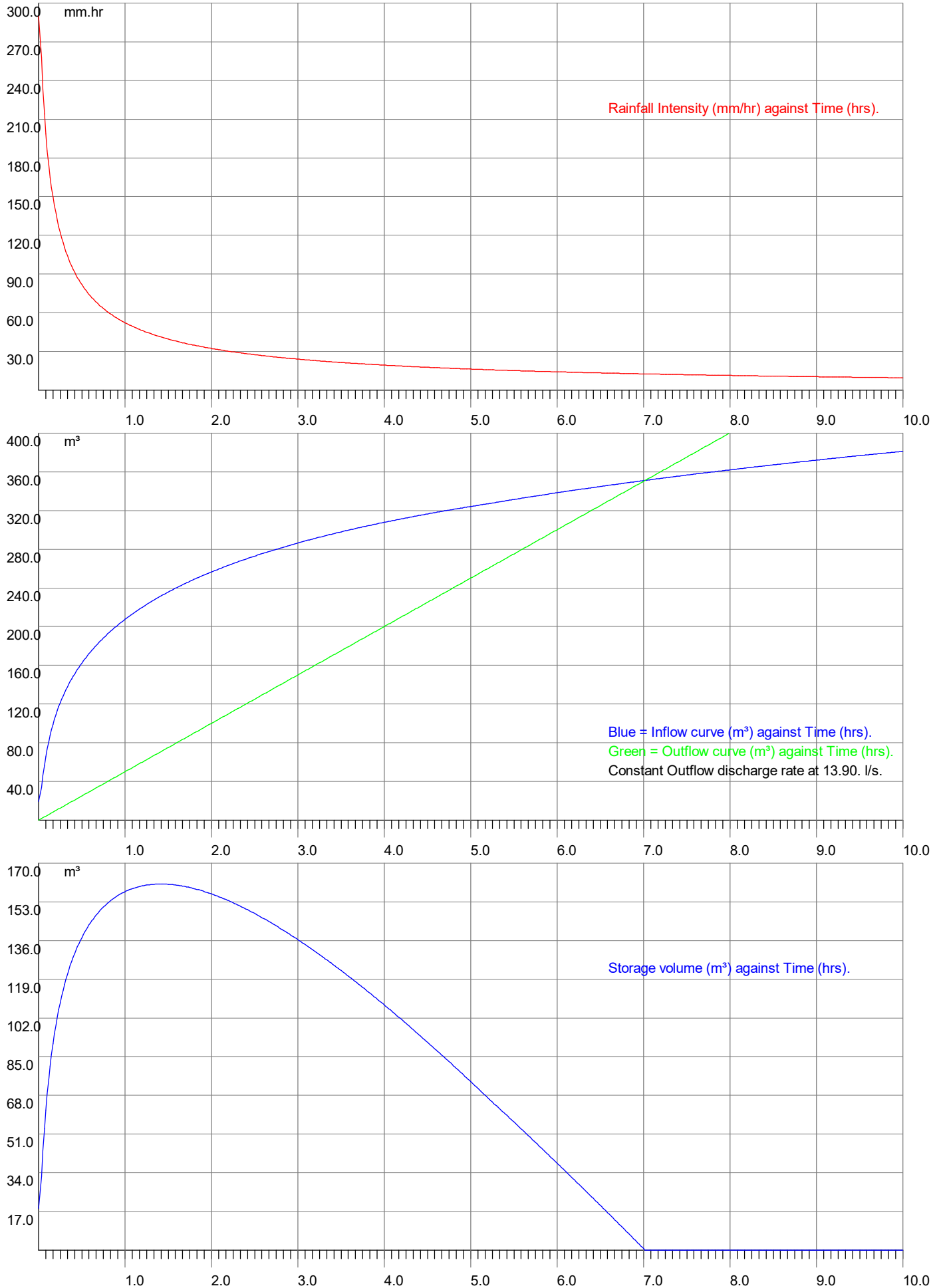
www.thelkgroup.com

Eton Business Park,
Eton Hill Road,
Radcliffe M26 2ZS
Tel: 0161 763 7200
email: m.jones@thelkgroup.com

Job No.		
Sheet no. 3		
Date 03/01/23		
By	Checked	Reviewed

Project **100 Years + 40% Storage Event Victoria Park, Manchester**

Title **100 Years + 40% Storage Event Victoria Park, Manchester**





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www.thelkgroup.com

Eton Business Park,
Eton Hill Road,
Radcliffe M26 2ZS
Tel: 0161 763 7200
email: m.jones@thelkgroup.com

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Sheet no. 4		
Date 03/01/23		
By	Checked	Reviewed

Project **100 Years + 40% Storage Event Victoria Park, Manchester**

Title **100 Years + 40% Storage Event Victoria Park, Manchester**

Explanatory notes for Peak Flow Storage

- 1) This system uses the rainfall intensity/ duration curve calculated using either the Wallingford or FEH method as selected.
- 2) The balance is calculated from the inflow minus the outflow.
- 3) The storage volume is the maximum value of the balance curve.
- 4) This method was described by Davis (1963) - see Butler & Davies, 2nd edition, p294
- 5) References to 'storm duration' relate only to the hydrograph method (qv).
- 6) There are always 600 steps in the calculation process, thus a 'run' time of 10 hours will be sampled every minute,

Explanatory notes for Hydrograph Storage

- 1) The user has the choice of Summer or Winter curves
- 2) The mean intensity varies with the duration of the storm curve
- 3) There are always 120 steps in the calculation process, irrespective of storm duration.
- 4) The balance is calculated from the inflow minus the outflow.
- 5) The storage volume is the sum of the balance values for each step.
- 6) Varying durations should be tried to find the maximum storage value - this can be narrowed down very closely.

*Modelling using the flow characteristics of the restrictor is available using Vortex Control modelling function. Please be aware that this function needs the full design data file to function.

Why do the two methods give different results?

The rainfall characteristics for each method are very different.

The Peak flow (using the Intensity/Duration/Frequency curve) does not model the actual rainfall. This curve is joined points which represent the mean intensity of a storm at a given duration i.e. a value of 19.5 mm/hr for a 60 minute storm indicates that over the sixty minute period, the mean intensity was 19.5 mm/hr. The calculation method samples the IDF curve for a given location and frequency (Return Period) and calculates the storage for that rate and duration less the outflow volume. The maximum value is displayed as the 'worst case' storage. The outflow volume is constant throughout the process at the specified discharge rate.

The hydrograph method uses a standard curve for either Winter or Summer storms. Traditionally these are symmetrical about the central peak. UK rainfall does not fit into this convenient curve, so the calculations are dealing with a stylised set of data. The mean intensity for the storm is calculated from the IDF curve and applied to the curve data, calculating the storage for that step less the outflow volume. The final storage volume is the sum of the storage for all the steps. The outflow volume varies with the hydraulic head on the control device using flow equations provided by the control manufacturer. This is a far more accurate method than the peak flow method and often results in bigger storage volumes.

It can be seen that these two methods are very different, and the user may have the choice of which result to use. This is not an exact science, though is often treated as such by those that do not understand the principles of the calculations.

Based across the UK with
offices in Manchester,
London, Liverpool and Glasgow.

Manchester (Head Office)

Unit 29,
Eton Business Park
Eton Hill Rd, Radcliffe
M26 2ZS

t: 0161 763 7200
e: info@thelkgroup.com

London

Brooklands Business Park
Wellington Way
Weybridge
KT13 0TT

t: 01932 871872
e: info@thelkgroup.com

Glasgow

Wright Business Centre
1 Lonmay Road
Glasgow
G33 4EL

t: 0141 773 6269
e: info@thelkgroup.com

Liverpool

The Corn Exchange
Fenwick Street
Liverpool
L2 7QL

t: 0151 235 8716
e: info@thelkgroup.com

Swindon

39 Bowman House Business Centre
Bowman Court
Whitehill Lane
Royal Wootton Bassett
Swindon
SN4 7DB

t: 01793 987 390
e: info@thelkgroup.com



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