14. Water Resources & Flood Risk

Appendix 14.1

FLOOD RISK AND DRAINAGE ASSESSMENT

Goodison Park Legacy Project

Flood Risk & Drainage Assessment

A100795-1

February 2020

Prepared on behalf of

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1.0 Introduction

1.1 Purpose of this Report

WYG Engineering Ltd (WYG) have been appointed by Everton Stadium Development Ltd (hereafter referred to as Everton / The Club) to prepare a Flood Risk and Drainage Assessment (FRDA) in support of an outline planning application for proposed redevelopment of Goodison Park football stadium on Goodison Road, Liverpool (hereafter referred to as 'the application site'), as described in Section 1.2 below.

1.2 Proposed Development

The proposed development, known as the Goodison Park Legacy Project (GPLP), comprises demolition of existing buildings and redevelopment of the application site for a mix of uses, comprising residential units; residential institution; shops; financial and professional services; food and drink use; drinking establishments; hot food takeaways; business use; non-residential institutions; and open space, with associated access, servicing, parking and landscaping. All matters are reserved for future determination.

The illustrative masterplan is contained within Appendix A.

1.3 Requirement for a Flood Risk Assessment

The application site covers an area of 3.39 ha and is located wholly in Flood Zone 1 (i.e. land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1% AEP)[1] in any one year). In accordance with the National Planning Policy Framework (NPPF) (Chapter 14)[2], a Flood Risk Assessment is required to support planning applications for developments greater than 1 ha located within Flood Zone 1.

[1] Flood frequency can alternatively be expressed in terms of an annual exceedance probability (AEP), which is the probability over the course of a year that there will be a flood event equal to or exceeding the indicated flood extent, depth or level. It is the inverse of the annual maximum return period. For example, the 100-year flood can be expressed as the 1% AEP flood, which has a 1% chance of being exceeded in any year.

[2] Ministry of Housing, Communities and Local Government (February 2019), *National Planning Policy Framework,* Para 163 Note 50

1.4 Scope of the Report

The FRA has been undertaken in accordance with the NPPF, Planning Practice Guidance (PPG) (Flood Risk and Coastal Change)[3] and Environment Agency guidance[4].

In line with the PPG, the FRDA considers all potential sources of flood risk including Main Rivers, Ordinary Watercourses (not shown on Environment Agency flood maps), overland flow routes, sewers, groundwater, reservoirs and canals.

The FRDA identifies a surface water management strategy for surface water runoff from the application site such that flood risk to areas elsewhere is not exacerbated by the introduction of new impermeable surfaces, all as required by the NPPF (para.155).

The FRDA also identifies a foul drainage strategy. A review has been undertaken of the existing foul water drainage systems in the locality, identifying potential discharge points and identifying the peak flows from the proposed development together with points of connection to the public sewer network

1.5 Limitations of this Report

This report has been prepared by WYG on behalf of the Club in connection with the scope of the report as described in Section 1.4 above and taking into account the particular instructions and requirements set out in WYG's fee proposal and the Client's acceptance. It is not intended for and should not be relied on by any third party and no responsibility is undertaken to any third party.

WYG accepts no duty or responsibility (including in negligence) to any party other than Everton Stadium Development Ltd and disclaims all liability of any nature whatsoever to any such party in respect of this report.

This report cannot be reproduced without WYG's written consent.

[3] Ministry of Housing, Communities and Local Government (March 2014), *Flood risk and coastal change*
[4] Environment Agency (February 2017), *Flood risk assessment in flood zone 1 and critical drainage areas*

2.0 Site Description

2.1 Existing Site

The site is located to the north west of Stanley Park in Liverpool, approximately 4km to the north east of the city centre. The application site's postcode is L4 4EL, approximately centred on grid reference SJ 35897 93976.

The application site location is shown in Figure 1 below.

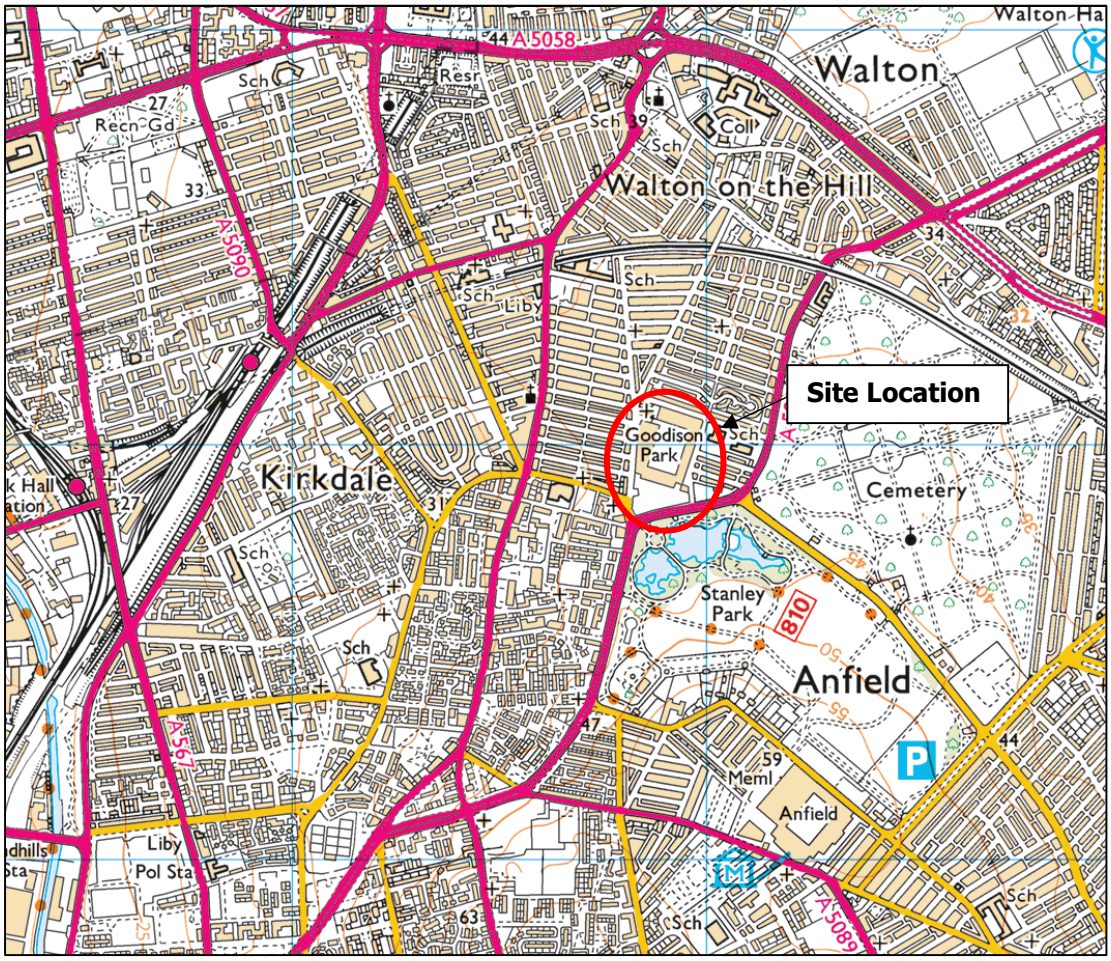

Figure 1 – Site Location

The application site covers an area of 3.39 ha and is currently occupied by Goodison Park, Everton Football Club's stadium, and other ancillary structures. The central and northern part of the application site is occupied by the football stadium and pitch. The southern part of the application site comprises hardstanding areas and car parking and a small vehicle access road that extends from Goodison Road eastwards into the southern part of the application site.

The application site is bound by Goodison Road to the west, Spellow Lane to the south west, Walton Lane to the south, Bullens Road to the east, Gwladys Street to the north, and Goodison Place and Church of St Luke the Evangelist to the north west.

The existing site plan is shown in Figure 2 below.

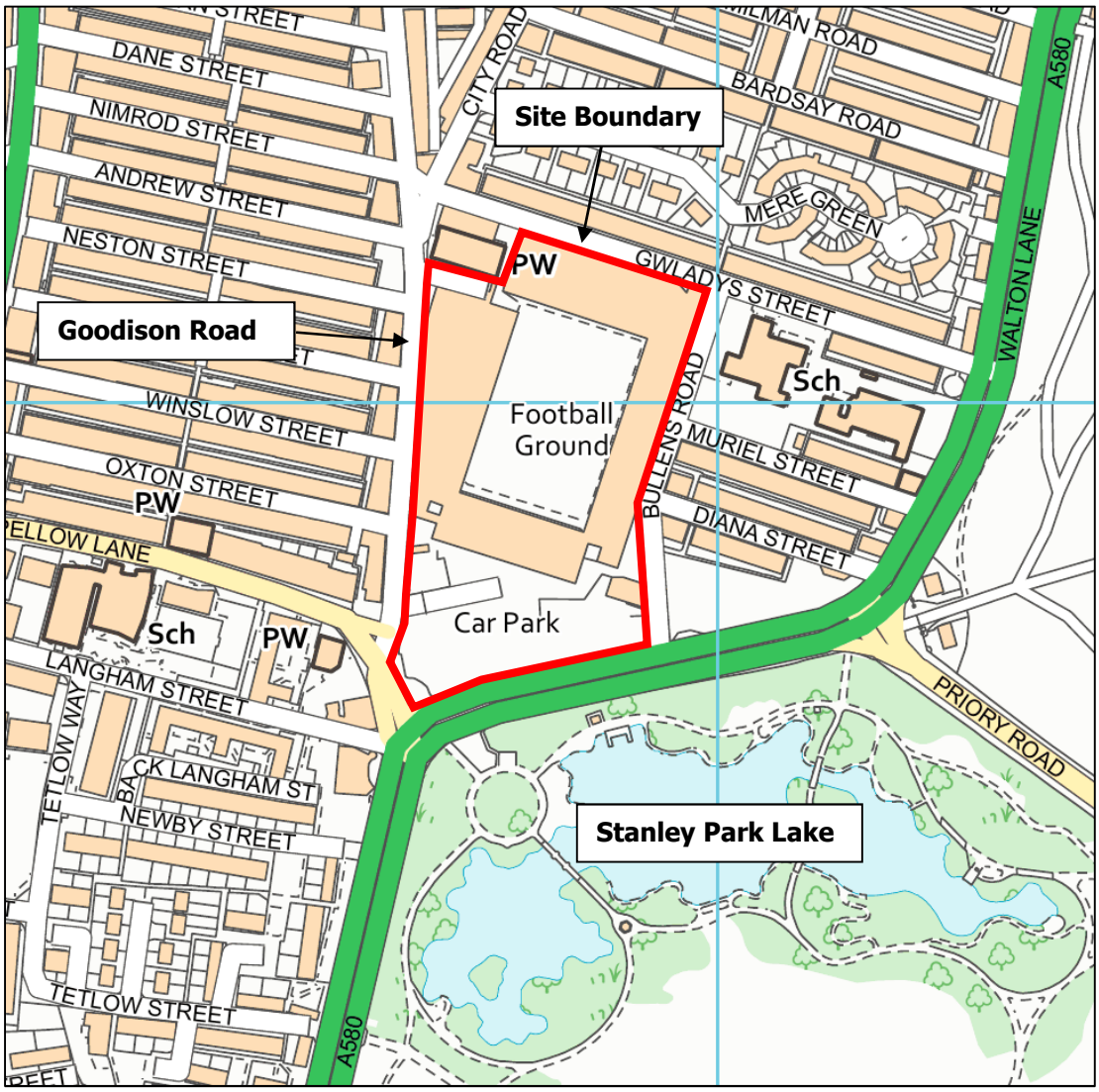

Figure 2 – Existing Site Plan

There is no topographical survey of the application site available at present. LIDAR for the application site and surrounding area shows that it is relatively flat, with levels varying across the application site between 40m AOD and 41m AOD. Ground levels fall from the centre of the pitch to low points around the edges of the pitch. In the south of the application site ground levels falls towards the access road off Goodison Road. Generally, levels surrounding the application site fall to the west towards the River Mersey.

2.2 Existing Drainage

2.2.1 Main Rivers

The nearest Main River to the application site (as shown on the Environment Agency's Flood Map for Planning[5]) is the River Mersey, located approximately 2.7km to the west. It flows in a south to north direction into Liverpool Bay, located over 4km to the north west of the application site.

2.2.2 Ordinary Watercourses

The nearest surface water feature to the application site is Stanley Park Lake located 40m to the south in Stanley Park. The lake is separated from the application site by Walton Lane. The lake is a recreational fishing lake managed by Liverpool City Council's (LCC's) Park and Greenspaces team. It is understood that the lake receives inflows from a self-regulated borehole abstraction and surface water drainage.

2.2.3 Canals

The Leeds & Liverpool Canal runs from north to south approximately 1.5km to the west of the application site.

2.2.4 Sewers

Public Sewers

Sewer records obtained from United Utilities indicate that the application site and surrounding area is served by network of public combined sewers:

- A 225mm diameter sewer drains westwards from manhole no. 9002 in Gwladys Street to join a 450mm diameter sewer in City Road, which in turn joins a 450mm diameter sewer running southwards in Goodison Road.
- A 225mm diameter sewer drains from the south stand (head of the system) via an ancillary building and the access road off Goodison Road to the 450mm diameter sewer in Goodison Road.
- A 225mm diameter sewer drains from manhole no. 8813 in the car park to south of the stadium to the 450mm diameter sewer in Goodison Road.

[5] Environment Agency (2019), *Flood Map for Planning*

- To the south west of the application site the 450mm diameter sewer in Goodison Road upsizes to a 500 x 800mm diameter then a 900mm diameter sewer, which drains westwards in Langham Street (further to the south west).
- A 300mm diameter sewer drains southwards from manhole no. 9001 in Bullens Road. It upsizes to a 375mm diameter sewer in Bullens Road, before joining a 375mm diameter sewer in Walton Lane, which drains westwards and continues along Langham Street.

The sewer records from United Utilities are contained within Appendix B.

Private Sewers

Liaison with Everton Football Club has confirmed that the entire site, including the pitch, is drained via private combined sewers to the public combined sewer network. There are estimated to be 10 points of connection to the public system.

2.3 Ground Conditions

2.3.1 Geology

A review of British Geological Survey (BGS) mapping[6] indicates that the bedrock geology underlying the application site comprises the Chester Formation (sandstone and pebbles). Superficial deposits are generally not present, with the exception of a portion of the southern part of the application site adjacent to Walton Lane, where Devensian Till is recorded. It is likely that a layer of Made Ground (Fill) overlies the existing deposits beneath the application site.

2.3.2 Hydrogeology

DEFRA's 'Magic' mapping[7] indicates that the Till (Devensian) is classified as a Secondary (undifferentiated) aquifer. This aquifer type is assigned where it is not possible to attribute an exact aquifer type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

The Chester Formation is classified as a Principal aquifer. This aquifer type is defined as layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning that they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

[6] British Geological Survey (2019), *Geology of Britain viewer*
[7] DEFRA (November 2019), *Magic*

The site is not located within a groundwater Source Protection Zone.

2.3.3 Site Investigation

No site investigation has been undertaken at this stage. A Phase 1 Desk Study has been undertaken and corroborates with the findings above.

A review of BGS borehole records from 1993 within the south of the application site confirms the presence of made ground overlying the strata described above. There is no record of the presence of any groundwater.

A BGS borehole record in Stanley Park to the south of the application site indicates the presence of groundwater at 23.10m below ground level (bgl) within the Chester Formation.

3.0 Flood Risk

3.1 Tidal & Fluvial Flooding

Tidal and fluvial flood risk is the risk arising from Main Rivers and Ordinary Watercourses.

3.1.1 Main Rivers

A floodplain is the area that would naturally be affected by flooding if a river rises above its banks. In England, floodplains of Main Rivers are divided into flood zones for planning purposes. These areas show the extent of the natural floodplain area at risk of inundation if there were no flood defences or certain other manmade structures and channel improvements. They are divided as follows:

- Flood Zone 3 shows the land having a 1 in 100 or greater annual probability of river flooding.
- Flood Zone 2 shows the additional extent of an extreme flood from rivers. It is land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding.
- Flood Zone 1 is the area of land where flooding from rivers and the sea is very unlikely.

Figure 3 below shows an extract of the Environment Agency's Flood Map for Planning.

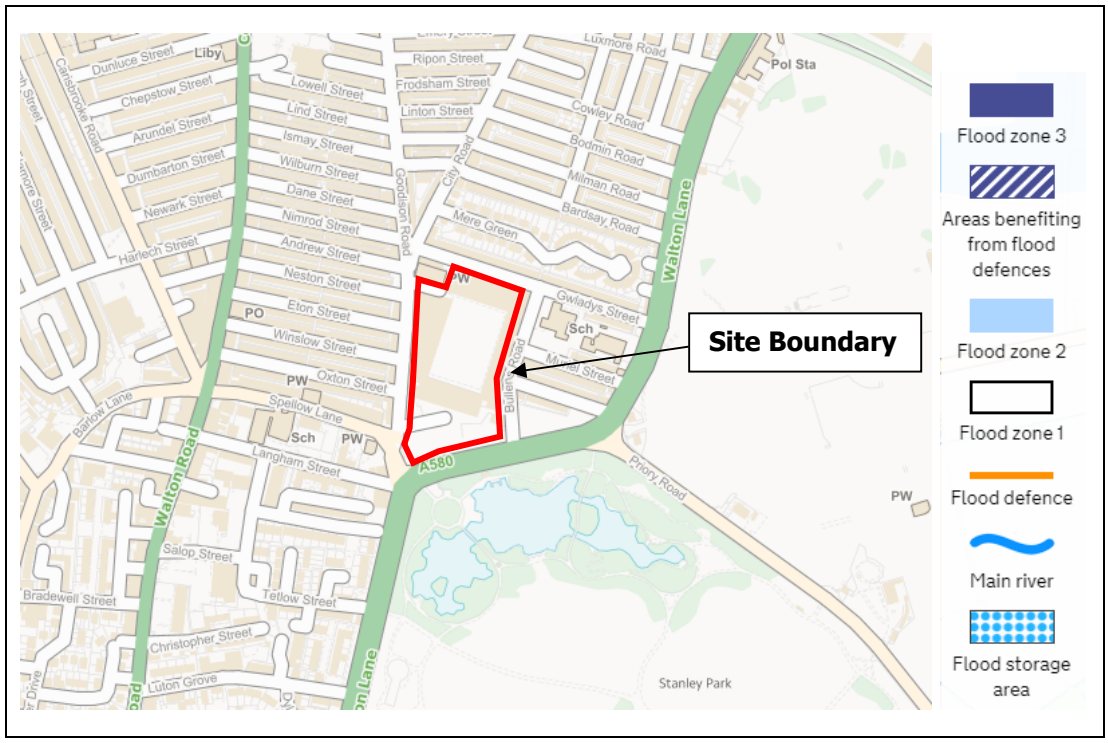

Figure 3 – Flood Map for Planning (Environment Agency, November 2019)

The mapping shows that the application site is located entirely within Flood Zone 1 and therefore at low risk of tidal and fluvial flooding from the River Mersey, or other fluvial sources. As there are no known Ordinary Watercourses in the vicinity of the application site, the overall risk of tidal and fluvial flooding is considered to be low.

3.2 Surface Water Flooding & Overland Flows

Surface water flooding occurs where high rainfall events exceed the drainage capacity in an area (i.e. sewer system and/or watercourse). Surface water then collects at topographical low points on the surface or flows overland, leading to flooding.

An extract of the Environment Agency's Flood Risk from Surface Water Map is shown in Figure 4 below.

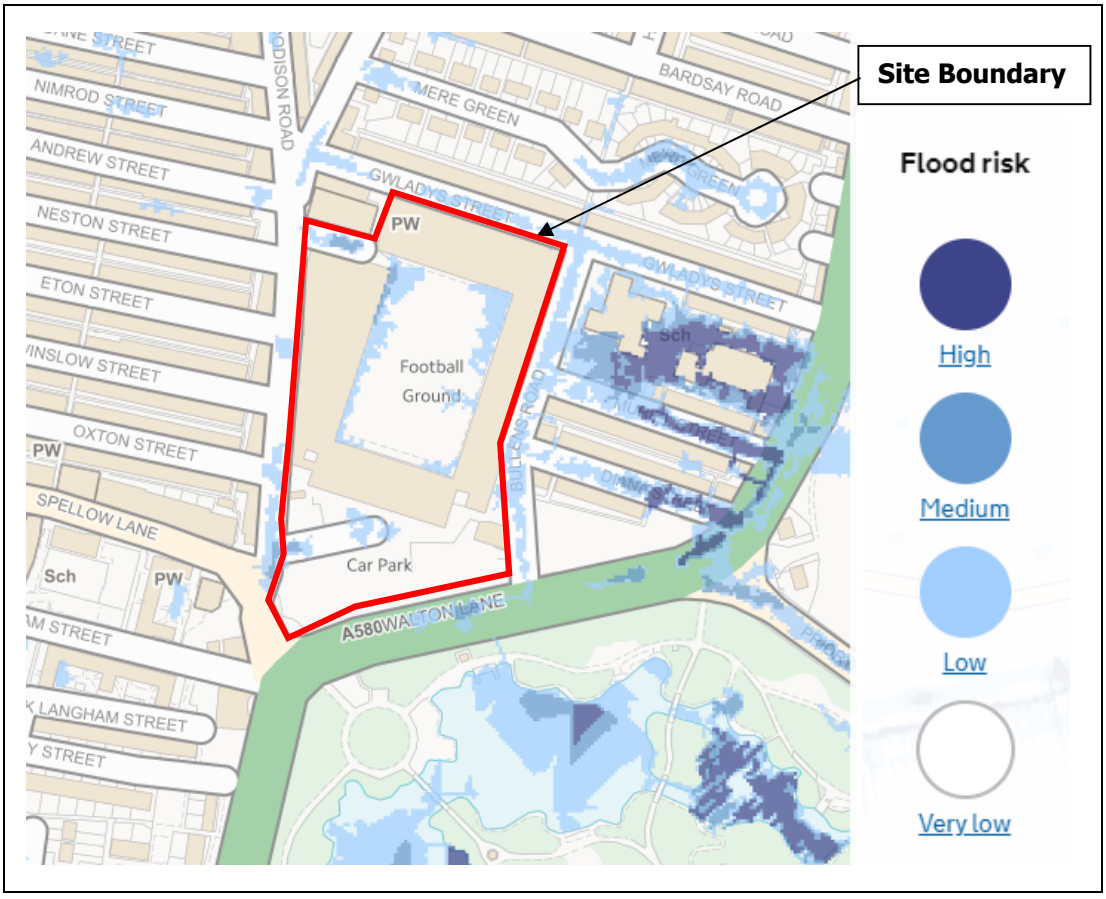

Figure 4 – Flood Risk from Surface Water (Environment Agency, November 2019)

The mapping indicates that the majority of the application site is at very low risk of surface water flooding. Small, isolated areas at the access road off Goodison Road are indicated to be at low risk, whilst a very small part of the access road is at medium risk. The edge of the

football pitch is shown to be at low to medium risk, but this is due to the stands acting as physical barriers to localised ponding where the ground may be slightly lower than the pitch. Overall, there is a very low risk of surface water flooding on the application site.

It should also be noted that the surface water flooding maps do not take into account any existing site drainage and therefore provide a 'worst case' assessment of the risk of flooding.

3.3 Groundwater Flooding

Groundwater flooding occurs when water levels in the ground rise above the land surface. This type of flooding is most likely to occur in areas above an aquifer.

The Preliminary Flood Risk Assessment (PFRA)[8] for Liverpool states that records do not show any instances of groundwater flooding. The PFRA's 'Areas Susceptible to Groundwater Flooding' map indicates that the application site is not located within a 1km^2 grid that is susceptible to groundwater flood emergence. On the basis of the above, the risk of groundwater flooding at the application site is considered to be low.

3.4 Sewer Flooding

Sewer flooding occurs when intense rainfall overloads the sewer system capacity and/or when sewers cannot discharge properly to watercourses due to high water levels. Sewer flooding can also be caused when problems such as blockages, collapses or equipment failure occur in the sewerage system.

There are no known records of sewer flooding on the application site or in the vicinity. Assuming continued management of the public sewer network, the risk of flooding is considered to be low.

3.5 Reservoir Flooding

Flooding from reservoirs occurs when a reservoir dam is overtopped or breaches due to structural failure. The consequence of such an event would be severe but the probability of a catastrophic dam failure is considered to be extremely low due to the management and maintenance required under the Reservoirs Act 1975.

[8] Liverpool City Council (June 2011), *Liverpool City Council Preliminary Flood Risk Assessment Report*

The site is not located within the reservoir flood extent, therefore the risk of flooding is considered to be low.

3.6 Canal Flooding

Flooding from a canal occurs when a canal breaches or is overtopped.

The PFRA for Liverpool states that there are no records of canal flooding. In the event of flooding, it is likely that floodwaters would follow the local topography and flow away from the application site towards the River Mersey. On this basis the flood risk is considered to be low.

3.7 Summary of Flood Risk

The flood risk to the existing site is assessed as low from all sources.

4.0 Development Proposals

4.1 Proposed Development

The GPLP comprises demolition of existing buildings and redevelopment of the application site for a mix of uses, comprising residential units; residential institution; shops; financial and professional services; food and drink use; drinking establishments; hot food takeaways; business use; non-residential institutions; and open space, with associated access, servicing, parking and landscaping. All matters are reserved for future determination.

The illustrative masterplan is contained within Appendix A.

4.2 Sequential and Exception Tests

One of the aims of the NPPF is to steer development away from zones of high flood risk towards Flood Zone 1 (para.158). In accordance with Table 2 of the PPG (Flood Risk and Coastal Change), the proposed development is classed as 'More Vulnerable'. Therefore, in accordance with Table 3 of the PPG (Flood Risk and Coastal Change), 'More Vulnerable' development is acceptable in flood risk terms within Flood Zone 1, and the Sequential Test is passed. The Exception Test is not required.

4.3 Local Planning Policies

4.3.1 Liverpool Unitary Development Plan

The Unitary Development Plan (UDP)[9] was adopted by LCC in November 2002 and is a 'saved plan' within the Local Plan Framework whilst the new Local Plan is being developed.

Under Policy EP12 (Protection of Water Resources) of the UDP, planning permission will not be granted for development which would adversely affect the quality or supply of surface water or groundwaters as a result of the nature of the surface water or foul discharge.

Under Policy EP13 (Flood Prevention) of the UDP, planning permission will not be granted for development which would be at direct unacceptable risk of flooding, be likely to increase the risk of flooding elsewhere, or result in an adverse impact on the water environment due to additional surface water runoff.

[9] Liverpool City Council (November 2002), *Liverpool Unitary Development Plan*

4.4 Development and Flood Risk

4.4.1 Flood Risk to the Development

As stated in Section 3.7, the application site is considered to be at low risk of flooding from all sources.

4.4.2 Flood Risk Arising from the Development

The proposed redevelopment of the application site will reduce the impermeable area of the application site by incorporating new areas of soft landscaping in addition to maintaining the area that is currently the pitch as soft landscaping. This will therefore reduce the volume of runoff from the application site by design.

Nevertheless, under Policy EP13 (Flood Prevention) of the UDP, planning permission will not be granted for development which would increase the risk of flooding elsewhere or result in an adverse impact on the water environment due to additional surface water runoff. It will therefore be necessary to manage surface water runoff on site to avoid increasing the risk of flooding to areas elsewhere.

4.5 Surface Water Drainage

4.5.1 Drainage Hierarchy

The management of runoff should be considered via a sequential approach, in line with Building Regulations[10]. The following options for the disposal of surface water runoff have been considered, in order of preference:

- Discharge to an adequate soakaway or some other adequate infiltration system (i.e. to ground);
- Discharge to a watercourse; and
- Discharge to a sewer.

Discharge to Ground

The Chester Formation comprises sandstone, which could infer potential for infiltration drainage, although no evidence had been found as to the use of soakaways locally. There is likely to be a depth of made ground beneath the application site, therefore any soakaways would need to be deep soakaways.

[10] HM Government (2010), *The Building Regulations 2010, Approved Document H (Part H3)*

In the absence of a site investigation to establish the ground conditions and site-specific infiltration rates, and on the assumption that the existing site currently discharges to public combined sewers (based on United Utilities' sewer records, as described in Section 2.2.4), discharge to ground has been discounted as an option at this stage of the assessment.

The use of soakaways may be reviewed and incorporated into the detailed drainage design, should future in-situ infiltration testing in accordance with BRE 365 indicate suitable infiltration rates.

Should soakaway drainage be utilised on site, it is recommended that the Local Authority and the Environment Agency are consulted, given that the underlying natural strata is classified as a Principal Aquifer.

Discharge to Watercourse

There are no watercourses nearby but LCC Parks and Greenspaces team have confirmed that discharge to Stanley Park Lake is a potential option, subject to their approval of further information and detailed design. Given that new drainage infrastructure would be required in Walton Lane, approval from LCC Highways would also be required. Correspondence from LCC Parks and Greenspaces team is contained within Appendix C.

The Parks and Greenspaces team would also need to approve the long-term management of the discharge and outfall into Stanley Park Lake, which would be the responsibility of the landowner or site management firm.

Discharge to Sewer

Discharge to the public combined sewer network, as per the existing site arrangements, is also an option, as confirmed by United Utilities. Correspondence from the United Utilities team is contained within Appendix D.

Given the uncertainties surrounding discharge to Stanley Park Lake at this stage, the proposed surface water drainage strategy is based upon discharge to sewer.

4.5.2 Pre and Post-Development Areas

The 3.39 ha site is currently developed and apart from the football pitch is entirely hard standing. The pitch drains to sewer so the pitch area is assumed to be 70% impermeable.

The proposed illustrative site layout has been split into five catchments to reflect as close as possible the phasing of the development as outlined in the Construction Strategy & Construction Management Plan. The central spine road and central landscaped area may form

additional catchments of be combined with others. The impermeable areas have been estimated from the illustrative layout.

Table 1 below summarises the pre and post-development areas.

Table 1 – Pre and Post-Development Areas

Status	Permeable Area (ha)	Impermeable Area (ha)
Pre-development	0.21	3.18
Post-development	1.23	2.16
Catchment 1	*0.18*	*0.41*
Catchment 2	*0.15*	*0.35*
Catchment 3	*0.26*	*0.38*
Catchment 4	*0.19*	*0.29*
Catchment 5	*0.28*	*0.41*
Central spine road	*0.18*	*0.18*
Central landscaped area	*0.00*	*0.13*

4.5.3 Pre and Post-Development Discharge Rates

As an existing developed site, the pre-development discharge rate from the whole site has been calculated as approximately 283 l/s based on the Modified Rational Method (2.78*30 mm/hr*3.39 ha). It is acknowledged that this method produces a very high runoff rate.

There is an aspiration for new developments, even those on brownfield land, to achieve greenfield runoff rates. The greenfield runoff rates for the application site have been obtained using the online UK SuDS Tool (Sustainable Drainage Systems). The Qbar rate has been calculated as 7.4 l/s. This assumes no infiltration. A copy of the full greenfield run off calculations is contained within Appendix E.

The proposed development incorporates new areas of soft landscaping, thereby providing a betterment to the existing surface water runoff rate from the application site. It is proposed to further reduce runoff from the existing brownfield site by restricting discharge from each outfall to the greenfield (Qbar) rate of 7.4 l/s during all storm events.

There are believed to be 10 existing connections to the public combined sewer system. Based on the indicative site layout it is envisaged that there could be up to six connections to the combined network. Where possible, existing connections will be maintained. If the use of

existing connections is not considered practicable, these will be infilled and new connections made, subject to detailed design and approval from United Utilities.

Assuming six connections to sewer, each with a restricted discharge rate of 7.4 l/s, the total runoff rate from the developed site is estimated as 44.4 l/s, which is significantly less than the pre-development brownfield runoff rate.

United Utilities have indicated that this rate is acceptable, subject to detailed design and the following:

- Evidence to discount infiltration drainage; and
- Evidence to discount drainage to Stanley Park Lake; and
- A full CCTV survey of the existing connections showing the impermeable areas that are draining to the surrounding combined sewers.

Correspondence with United Utilities is contained within Appendix C.

LCC, as LLFA, have also confirmed that this rate is acceptable. Correspondence is contained within Appendix D.

4.5.4 Required Attenuation

The attenuation volumes have been calculated using the Micro Drainage Quick Storage Estimates. The results are shown in Table 2 below, with full calculations within Appendix F.

Table 2 – Attenuation Estimates

Catchment	Impermeable Area (ha)	Discharge Rate (l/s)	Estimated Storage Volume: 1 in 100 year plus 40% CC (m^3)
1	0.41	7.7	203
2	0.35	6.6	173
3	0.38	8.4	179
4	0.29	6.3	138
5	0.41	9.1	193

In order to minimise any flooding of the application site, it is proposed to attenuate runoff on site up to and including the 1 in 100 year event plus allowance for Climate Change (CC). The climate change allowance is based on the latest guidance provided by the Environment

Agency[11]. The upper end allowance for peak rainfall intensity in small and urban catchments across all of England is 40% for the 2080s epoch.

Attenuation could be provided by geo-cellular storage below ground and surface and sub-surface SuDS features wherever practicable and reasonable. Given the application site layout proposed, SuDS features are likely to include permeable paving but could include other features. The SuDS features appropriate to the application site are considered in more detail in Section 5 below.

It is noted that the current illustrative masterplan does not include any SuDS features, as the outline application reserves the matter of landscaping for future determination, and any future detailed site layout should seek to incorporate SuDS wherever viable and reasonable.

4.5.5 Proposed Surface Water Drainage Strategy

As discussed previously, it is proposed to drain the new development via five outfalls to the existing United Utilities combined sewer network based on the catchments and analysis described in Section 4.5. An indicative surface water drainage strategy plan for the application site, illustrating potential SuDS and connections to sewer, is contained within Appendix G.

This plan and above analysis demonstrate that there is a viable surface water drainage strategy for the application site and therefore the disposal of surface water runoff will not provide a restriction to the development of the application site. This strategy will be revisited at detailed design stage as Reserved Matters submissions are made.

4.6 Overland Flow Routes

In setting the final external levels for the development it is important to ensure that if flows in exceedance of the 1 in 100 years plus 40% allowance for climate change storm event occur or a failure of the application site surface water drainage system occurs, suitable overland flood routes are provided within the development to ensure that no localised flooding of the buildings occurs within the development.

It is recommended that proposed external ground levels across the application site fall away from the proposed buildings in a manner which does not create low points where water might collect unintentionally. This will ensure that any surface water will not flow towards the proposed buildings.

[11] Environment Agency (February 2019), *Flood risk assessments climate change allowances*

4.7 Residual Flood Risk

There will remain a residual risk that an extreme rainfall event could exceed the managed exceedance flow routes, as events beyond the 1 in 100 year event plus 40% allowance for climate change will not be catered for explicitly.

There would also remain a residual risk of failure of the surface water drainage system. This could be caused by operational failure or if the drainage system is not maintained on a regular, on-going basis.

5.0 Sustainable Drainage

5.1 Review of SuDS Options

In order to comply with the national guidelines and policies set by the NPPF and the Non-Statutory Technical Standards for Sustainable Drainage[12], the design of the surface water drainage system should seek to maximise the use of SuDS techniques. This section reviews the suitability of the different SuDS elements available for the application site.

5.2 The SuDS Management Train

The main purpose of a SuDS system is to manage the surface water runoff generated by a development within the application site, attenuating the additional runoff whilst providing water quality treatment to the runoff and amenity and landscape benefits to the community. The different SuDS elements can be categorised as follows:

- Source Control: manage runoff at its source
  - Water butts, green/brown roofs, permeable pavements, rainwater harvesting systems, bio-retention systems.
- Site Control: manage runoff generated by a wider area
  - Swales, ponds, infiltration devices, filter strip, French drains.
- Regional Control: manage runoff generated by several sites
  - Basins, ponds and wetlands

The following is an illustration of the SuDS principles and how they may be applied to a development via a SuDS Management Train.

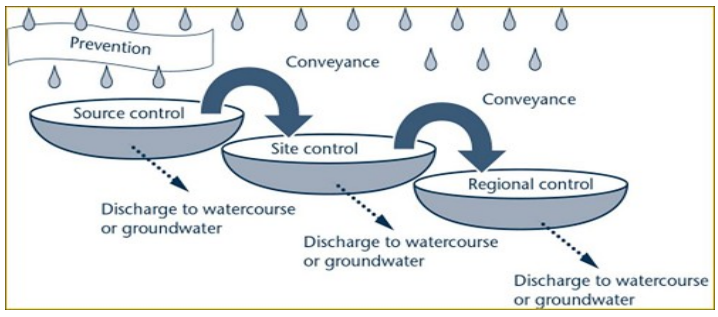

Figure 5 – SuDS Management Train

[12] DEFRA (March 2015), *Non-statutory technical standards for sustainable drainage systems*

Table 3 below summarises the suitability of the different SuDS elements for the proposed development site.

Table 3 – Review of SuDS components for the proposed development site

Type of SUDS		Description	Applicability to the Site
Source Control	Water butts	Small storage tanks on building.	May be appropriate.
	Rainwater harvesting	Recycling of water from roofs and impermeable areas.	
	Green roofs	Vegetated roofs that reduce runoff and remove pollutants.	
	Pervious surfaces	Pavements that allow surface water to flow into underlying layers of the pavement and either infiltrate or drain to an on-site drainage network.	May be appropriate.
	Rain Gardens & Bioretention Systems	Shallow depressions with free draining soil and planted with vegetation that withstands occasional flooding.	May be appropriate.
Site & Regional Control	Swales	Vegetated channels to convey, store and treat runoff.	Not appropriate within current indicative site layout due to space constraints.
	Detention basins & ponds	Shallow areas of open space that temporarily hold water and collect silt.	May be appropriate in landscaped areas.
	Filter Drains	Linear drains or trenches filled with granular material that allow infiltration to the surrounding ground.	Not considered appropriate at this stage however, these options are to be reviewed pending the results of the future permeability testing results.
	Infiltration basin	Shallow depression that stores runoff before it infiltrates into the subsoil.	
	Infiltration devices	Generally granular trenches or soakaways that store water and allow infiltration to the surrounding ground.	

5.3 Surface Water Drainage Principles

5.3.1 Permeable Paving

Permeable pavements allow rainwater to infiltrate through the surface and underlying layers where runoff is temporarily stored within the basal stone layer before being discharged to the downstream SuDS components or on-site sewers at controlled rates.

Permeable paving could be utilised within the access road and car parking, subject to appropriate adoption and maintenance requirements being in place.

5.3.2 Attenuation tanks

Stormwater attenuation tanks provide a storage system for rainwater and surface water. The stored water inside the attenuation tank is released via a flow-control chamber and either pumped via a pumping chamber or run-off through a gravity stormwater pipe system.

Underground attenuation tanks could be used on site to store large volumes of surface water where space for surface SuDS features is constrained.

5.3.3 Other Potential SuDS Elements

Water Butts and Rainwater Harvesting

The use of water butts and rainwater recycling in individual dwellings could be promoted in order to reduce runoff and to minimise water consumption.

Rain Gardens and Bioretention Systems

Bioretention areas are shallow landscaped depressions that are typically under-drained and rely on engineered soils, enhanced vegetation and filtration to remove pollution and reduce runoff. They are aimed at managing and treating runoff from frequent rainfall events.

Rain gardens and bioretention systems could be incorporated into the central landscaped area and green spaces (shown illustratively on the masterplan in front of Blocks A and B).

Detention Basins

Detention basins are dry depressions that attenuate storm water runoff by providing temporary storage and controlled release of detained runoff. They are normally vegetated depressions (i.e. grass) that remain mainly dry, except during and immediately after storm events.

It could be possible to incorporate detention basins in the central landscaped area and green spaces (shown illustratively on the masterplan as located in front of Block A and Block B).

Oversized Pipes

Oversized pipes and box culverts may need to be considered in the central access road running east-west to provide online storage that will help reduce overall storage requirement on the application site.

All SuDS elements should comply with the DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems and The SuDS Manual[13].

5.4 Water Quality

The SuDS design should seek to provide an appropriate management train of SuDS features to effectively mitigate the pollution risks associated with the different site users.

The proposed uses of the application site are covered by Table 26.2 of The SuDS Manual under both 'individual property driveways, residential car parks, low traffic roads and non-residential car parking' and 'commercial yard and delivery area and non-residential parking'. Therefore, the requirements for discharge to surface waters state that the 'Simple index approach' should be used.

Step 1 of the simple index approach is to identify the pollution hazard indices for the proposed land uses. These are set out in Table 4 below, which is an extract of Table 26.2.

Table 4 – Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change.	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent	Medium	0.7	0.6	0.7

[13] CIRIA (2015), *The SuDS Manual (C753)*

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
change, most roads.				

Step 2 of the simple index approach is to select SuDS features with a total pollution mitigation index that equals or exceeds the pollution hazard index. Table 26.3 of The SuDS Manual states the various mitigation indices for discharges to surface waters. The mitigation indices for the potential SuDS systems are shown below in Table 5.

Table 5 – SuDS Mitigation Indices

SuDS Element	TSS	Metals	Hydrocarbons
Pervious paving	0.7	0.6	0.7

The total SuDS mitigation index for each pollutant is a combination of the mitigation indices of each element. The first SuDS element of the train will always be more effective than the subsequent elements, given that the concentration of pollutants in the runoff entering these is lower.

Based on Table 5 above, it can be seen that runoff from the application site will receive sufficient treatment via the pervious surfaces alone.

It should be noted that alternative SuDS options may also be considered during the detailed design stage which achieves or exceeds the water quality objective.

Provided that the mitigation indices of the treatment techniques are greater than or equal to the hazard indices for the proposed development then there should be no reduction in the overall water quality within the receiving system.

5.5 SuDS Maintenance

By their nature, SuDS require regular maintenance to keep them working effectively. Prior to commencing the development, LCC LLFA should approve the SuDS maintenance plan.

Responsibility for the maintenance of the new surface water drainage system on site is likely to be undertaken by an assigned management company. Details of the maintenance requirements should be set out within a building maintenance file.

The management company will perform the maintenance tasks required by the various elements of the drainage scheme. Table 6 below shows the maintenance requirements of the proposed SuDS elements.

Table 6 - Maintenance tasks and frequency required

SuDS Element	Maintenance Task	Recommended Frequency
Pervious surfaces	- Brushing and vacuuming	- Every 12 months
	- Weed removal	- Every 12 months
	- Rehabilitation of surface and upper substructure	- As required
	- Remediation of depressions and cracked blocks	- As required
	- Remediation of landscaping.	- As required
Underground attenuation tank	- Remove debris from catchment surface	- Every 12 months
	- Remove sediment from pre-treatment structures	- Every 12 months
	- Inspect inlets and outlets	- Every 12 months
	- Survey inside of the tank	- Every 5 years

Suitable adoption and maintenance regimes for SuDS should be submitted in support of future reserved matters submissions.

7.0 Foul Drainage

7.1 Post-Development Foul Flows

The anticipated foul flow generated by the residential aspects of the proposed development is estimated as 8.0 l/s based upon Sewers for Adoption[14] guidance of 4000 l/dwelling/day and 173 units (outline application proposes up to 173 residential units). This flow rate may be higher given the other proposed land uses including residential institution and health care. The exact peak foul flow rate should be calculated at the detailed design stage once the proposed end users are known.

7.2 Proposed Foul Drainage Strategy

It is proposed to connect foul drainage from the application site to the public combined sewer, as per the proposed surface water drainage proposals, either via existing connections, where possible, or via new connections.

7.3 United Utilities

A pre-development enquiry was submitted to United Utilities and they have confirmed that the foul drainage will be allowed to drain to the public combined sewer network at an unrestricted rate. The exact points of connection are subject to detailed design and will be agreed with United Utilities at a later date.

The pre-development enquiry response from United Utilities is contained within Appendix D.

[14] WRc Plc (August 2012), *Sewers for Adoption (7th edition)*

8.0 Consents Required

8.1 Section 106

Where a new connection is to be made to the public sewer network, an application will be required to United Utilities for the new outfall and connection under Section 106 of the Water Industry Act 1991. The application should be made following completion of the detailed drainage design.

8.2 Section 104

If any sewers on the development site are to be adopted an application will be required to United Utilities under Section 104 of the Water Industry Act 1991. The application should be made following completion of the detailed drainage design.

8.3 Works Affecting Public Sewers on Site

Permission will be required from United Utilities for works over or within 3m of the centreline of the public combined sewers. Any proposed abandonment or diversions of the sewers in the south of the application site will also require permission.

9.0 Conclusions and Recommendations

This FRDA has been produced in support of an outline planning application for the redevelopment of Goodison Park in Liverpool.

The FRDA has been undertaken in accordance with the NPPF (Chapter 14), PPG (Flood Risk and Coastal Change), the Liverpool City Council Unitary Development Plan and Environment Agency guidance.

This assessment has identified that the proposed development can be implemented in accordance with national and local planning policies relating to flood risk and drainage.

9.1 Conclusions

This assessment has made the following conclusions.

Flood Risk

1. The application site extends to 3.39 ha and falls entirely within Flood Zone 1. The nearest Main River to the application site is the tidal River Mersey located 2.7km away. Stanley Park Lake is located 40m to the south of the application site, but there is no known drainage link between the pond and the application site. The risk of tidal and fluvial flooding is low.

2. The risk of flooding from all other sources is low or not present.

Surface Water Drainage

1. The existing site drains unattenuated and unrestricted to the public combined sewer network via 10 separate outfalls around the application site. Based on the information available to date it is anticipated that infiltration drainage is not deemed viable and there are no watercourses within proximity to the application site, therefore it is proposed to discharge surface water runoff from the application site to the public combined sewer network.

2. The proposed development incorporates areas of soft landscaping, thereby providing a net increase in permeable area and betterment to the existing drainage situation. In addition, it is proposed to further reduce runoff from the proposed development by restricting discharge from each of the proposed 6 outfalls to the greenfield (Qbar) rate of 7.4 l/s during all storm events. The total runoff rate from the proposed development is estimated as 44.4 l/s and will be a significant reduction from the existing discharge rates.

The proposed post-development discharge rate has been agreed with United Utilities and LCC as LLFA.

3. Where possible, existing connections will be maintained. If the use of existing connections is not considered practicable, these will be infilled and new connections made, subject to detailed design and approval from United Utilities.

4. It is proposed to attenuate up to and including the 1 in 100 year storm event plus 40% allowance for climate change on site. It is proposed to utilise geo-cellular storage below ground, with permeable paving providing additional storage as well as water quality benefits. Other SuDS elements that could be incorporated into final design include water butts, rainwater harvesting, rain gardens, bioretention systems and detention basins, subject to further design.

5. Responsibility for the maintenance of the new surface water drainage system on site will be undertaken by an assigned management company, which potentially could be funded by the residents with a legal responsibility written into the deeds of each property. Full details of the maintenance requirements will be set out within a building maintenance file. Suitable adoption and maintenance regimes for SuDS should be submitted in support of future reserved matters submissions.

Foul Drainage

1. It is proposed to connect foul drainage from the application site to the public combined sewer, as per the proposed surface water drainage proposals, either via existing connections, if possible, or via new connections. This has been agreed with United Utilities.

9.2 Recommendations

This assessment has made the following recommendations.

1. A detailed drainage strategy for the application site should be the subject of a planning condition. The detailed design should agree exact discharge rates and points of connection with United Utilities.

2. In order to verify if infiltration techniques are viable, site specific permeability testing to BRE 365 and groundwater monitoring should be undertaken, and the results used to develop the detailed surface water drainage strategy.

3. In developing the detailed site layout, due consideration should be given to maximising the use of SuDS techniques.

4. The use of SuDS techniques should also be maximised to improve the water quality of the surface water runoff and where necessary oil/petrol interceptors should be incorporated into the drainage of the car parking areas.

5. Permission should be sought from United Utilities for works over or within 3m of the public combined sewers located in the southern area of the application site.

6. A Section 106 application should be made to United Utilities following completion of the detailed drainage design where a new connection is to be made to the public sewer network.

7. The invert levels of the proposed foul and surface water connections shall be surveyed prior to commencing the detailed drainage design.

8. A detailed inspection and maintenance surface water management plan shall be provided, and this management plan shall be implemented and monitored on a regular basis.

9. It is recommended that proposed external ground levels across the application site fall away from the proposed buildings so as not to create low points where water might collect.

10. Further liaison shall be undertaken with Liverpool City Council in respect of the option to drain the surface water runoff from the whole site into Stanley Park Lake as this will enable the proposed attenuation volume of 886m^3 to be provided within the lake rather than within the application site.

Appendices

Appendix A – Indicative Proposed Site Layout

NOTES

All dimensions are to be checked on site. Do not scale from this drawing, work to figured dimensions only. Any queries please contact the architects.

MATERIALS PROHIBITED

Materials prohibited from use, except where used in accordance with 'Good Practice in the Selection of Construction Materials (March 2011)' or unless required by the Contract:

a) high alumina cement in the structural elements;
b) wood wool slabs in permanent formwork to concrete;
c) calcium chloride admixtures for use in reinforced concrete;
d) asbestos or asbestos-containing products, as defined in the 'Control of Asbestos at Work Regulations, as amended 2012' or any other statutory modification or re-enactment thereof;
e) any naturally occurring or man made mineral fibres (for example, rock-wool or slag wool) with a thickness of 3 microns or less and a length of 200 microns or less, unless they are appropriately sealed to prevent migration of fibres;
f) aggregates for use in reinforced concrete which do not comply with:
   - 'BS EN 12620:2002: properties of aggregates used in concrete.
   - 'BS EN 13139:2002: Properties of aggregates used in mortar.
   - 'BS EN 13055 (Parts 1 & 2): properties of lightweight aggregates.
   - 'Guidance on avoiding alkali-silica reaction and limitations on alkali content in BRE Digest 330 (2004)' & 'Concrete Society Technical Report 30 (1999)';
g) lead, lead paint or any other materials containing lead which may be ingested, inhaled or absorbed, except where copper alloy fittings also containing lead are specifically required in drinking water pipework by any relevant statutory requirement or where lead flashings or other lead roof coverings are specifically provided for in the Contract;
h) urea formaldehyde foam or materials which may release formaldehyde in quantities which may be hazardous with reference to the limits set by the Health and Safety Executive;
i) calcium silicate bricks or tiles;
j) vermiculite unless it is established as being fibre-free; calcium silicate bricks or tiles;
k) any products containing cadmium referred to in Statutory Instrument 'SI 2006/3311 Controls on dangerous substances and preparations Regulations 2006'. Reference should also be made to 'HSE IDGE391 Cadmium and you';
l) any new timber treated with pentachlorophenol;
m) non galvanised mild steel structural fixings for building elements particularly susceptible to erosion;
n) concrete used in circumstances where it is susceptible to alkali/silica reaction;
o) materials containing chlorofluorocarbons (CFC's);
p) solvent based paints except where water based paints are unsuitable for unavailable;
q) any new materials not in accordance with statutory requirements, British Standards, Codes of Practice and good building practice current at the date of incorporation of the relevant materials into the Works or the specifications thereof;

Note: Layout subject to full measured survey, input from structural engineer, details of all easments, rights of way and wayleaves, statutory approvals and utility information.

Illustrative Purposes Only: Not For Approval

Application / Site Boundary

Block A1
Block A2
Block A3
Block B1
Block B2
Block C
Block D1
Block D2
Block E
Block F
Block G
Block H

St Luke's Parish Hall
St Luke The Evangelist Church
El Sub Sta
PH

Gwladys Street
Bullens Road
Muriel Street
Diana Street
Goodison Road
Boro Const & Ward Bdy
Walton Lane
CR
Landing Stage

40.8m
40.2m
40.5m

Illustrative Masterplan - Ground Floor Plan
Scale 1:500

0 5 10 15 20 25M

N

P5	Park End updated	2019-10-29 PD
P4	Parking changed	2019-10-15 EE
P3	Updated to CBRE comments	2019-09-27 EE
P2	Block colour changed	2019-09-24 EE
P1	First Issue	2019-09-23 EE

REVISION DETAILS date / by

- Preliminary
- For Approval
- Tender
- Construction

CLIENT

Everton Football Club

PROJECT

Goodison Park Legacy Project

DRAWING TITLE

Illustrative Masterplan - Ground Floor Plan

SCALE	drawn by	date
1:500@A1	PD	JULY 19

DRAWING NO. revision

17-087-120 P5

Condy Lofthouse Architects

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Appendix B – United Utilities Sewer Records

United Utilites Water Limited
Property Searches
Ground Floor Grasmere House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP
Telephone 0370 751 0101
Property.searches@uuplc.co.uk

Your Ref: TOM BEAVIS A100795-1
Our Ref: 1324539
Date: 11/9/201

White Young Green

Arndale Court
Headingley
Leeds
LS6 2UJ

FAO: **Tom Beavis**

Dear Sirs

Location: **EVERTON F C GOODISON ROAD LIVERPOOL L4 4EL**

I acknowledge with thanks your request dated 08/09/17 for information on the location of our services.

Please find enclosed plans showing the approximate position of our 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.

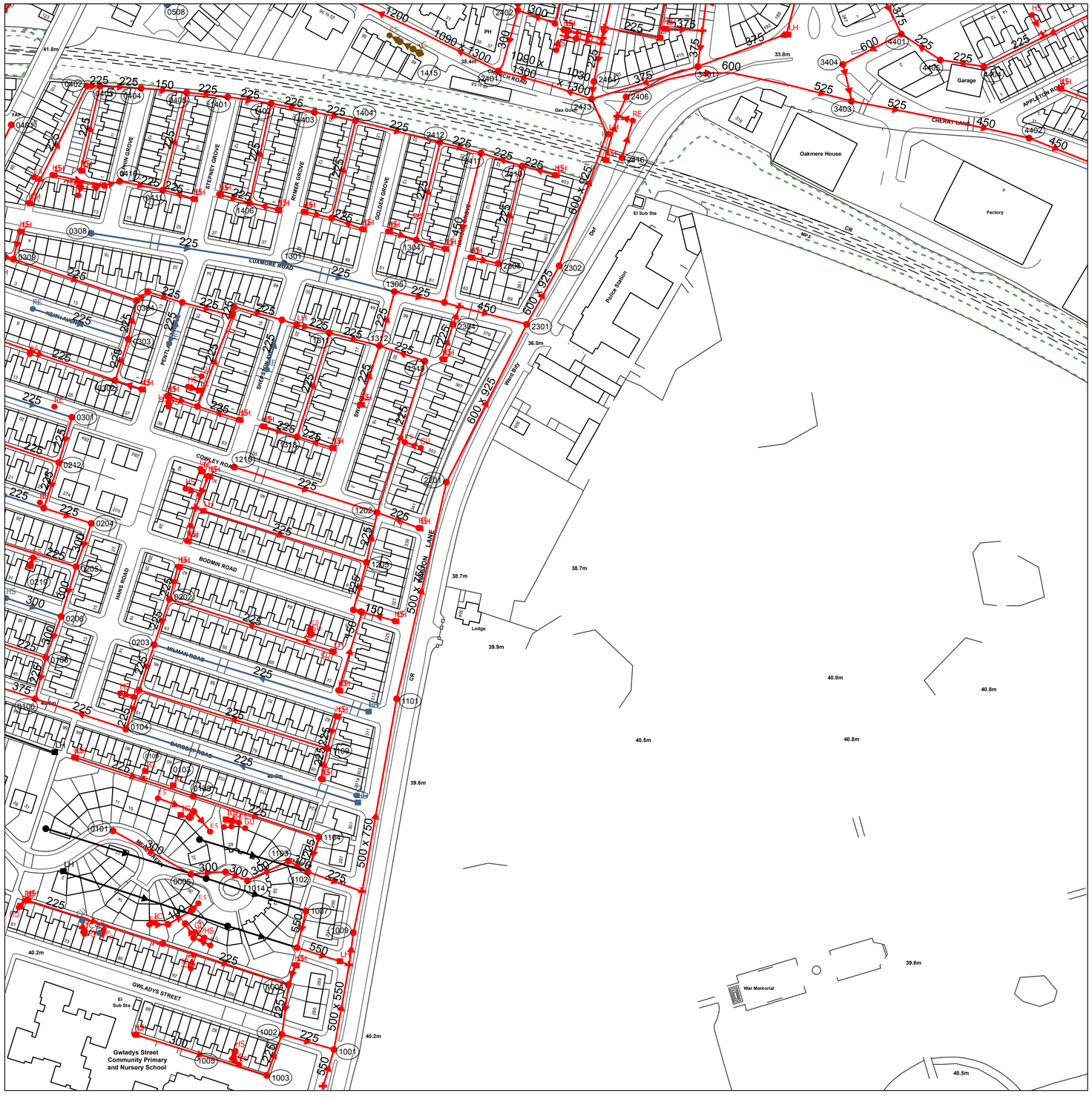
If you are planning works anywhere in the North West, please read our access statement before you start work to check how it will affect our network.
http://www.unitedutilities.com/work-near-asset.aspx.

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

If you have any queries regarding this matter please telephone us on 03707510101.

Yours Faithfully,

Karen McCormack
Property Searches Manager



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0006		CO							
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0018		CO							
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0024		CO							
0028		CO							
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0103		CO							
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0312		CO							
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1002	40.17	CO							
1003	40.02	CO							
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0032		SW							
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Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
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0423		CO							
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1114		CO							
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1212		CO							
1214		CO							
1215		CO							
1217		CO							
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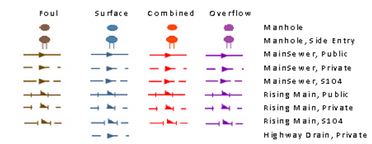
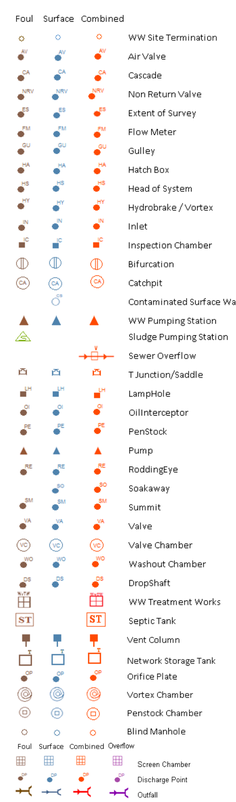
WASTE WATER SYMBOLOGY





ABANDONED PIPE

- MainSewer
- Rising Main
- Highway Drain
- Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ3694SW

Scale: 1:1250 Date: 11/09/2017

253 Nodes

Sheet 1 of 1

United Utilities — helping life flow smoothly

SEWER RECORDS

Printed By: Property Searches

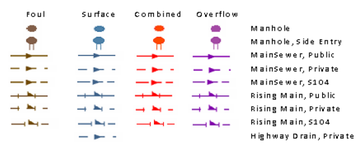
OS Sheet No: SJ3694SW

Scale: 1:1250 Date: 11/09/2017

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
5504	35.51	CO	32.26	225		CI	VC	10.2	44
5508		FO							
5602	35.14	CO	31.81	300		CI	VC	39.6	
5603	36.62	CO							
5604		CO							
5701	35.06	CO							
5702		CO	0	550	900	EG	VC	12.17	
5703	35.44	CO	31.23	550	750	EG	BR	14.14	1
5704		CO	0	560	860	EG	BR	7	
5801	35.19	CO	30.16	700	1050	EG	VC	86.34	320
5802	35.14	CO							
5803	34.81	CO							
5805	35.98	CO							
5807		CO							
5814	34.33	CO							
5816		CO	0	150		CI	CO	11.43	
5902	35.66	CO	33.15	450		CI	VC	62	
5903	35.42	CO	31.25	700	1060	EG	CO	12.65	
5904	36.13	CO	33.68	375		CI	VC	41.77	60
5911	35.31	CO							
5912	35.46	SW	0	225		CI	VC	8.87	
5916		CO	0	225		CI	VC	13.68	
5919	34.11	CO	32.21	225		CI	VC	33.14	
5923	34.49	CO	30.72	300		CI	VC	25.37	19
6501	41.72	CO							
6502		CO							
6507	29.15	CO							
6509	40.65	CO	37.03	225		CI	VC	5.66	
6510	40.83	CO	37.8	225		CI	VC	20.4	28
6512	40.8	CO							
6515	42.01	FO							
6516	41.89	FO	39.33	150		CI	VC	11.4	25
6517	42.03	SW	40.08	150		CI	VC	6.32	
6521		CO							
6522		CO							
6524		FO	0	150		CI	VC	18.42	
6525		FO							
6526		SW	0	525		CI	CO	15.62	
6527		SW							
6601	40.88	CO							
6602	39.4	CO	34.74	550	900	EG	BR	10.05	
6603	38.41	CO							
6604	37.57	CO	33.86	300		CI	VC	44.55	43
6605	40.5	CO	38.42	225		CI	VC	33.54	55
6608		CO	0	550	900	EG	BR	18.11	
6609	40.08	SW							
6610	40.29	SW	38.4	225		CI	VC	21.1	73
6611	40.7	SW	39.21	150		CI	VC	20.1	27
6612	41.15	CO	36.99	225		CI	VC	16.28	
6701	37.65	CO							
6702	37.59	CO	35.91	300		CI	VC	21.21	9
6703	37.76	CO	36.31	225		CI	VC	36.35	91
6705	39.07	CO	35.74	550	900	EG	VC	52	
6706		CO		100		CI	VC	5.54	
6708		CO		100		CI	VC	5.32	
6709		CO		100		CI	VC	4.11	
6710		CO							
6711		CO		100		CI	VC	4.21	
6713		CO							
6714		CO		100		CI	VC	3.43	
6801	38.73	CO							
6802	36.92	CO	30.44	690	1020	EG	BR	31.78	45
6803	38.51	CO	31.45	690	1060	EG	BR	55.79	58
6804	39.05	CO							
6805	38.48	SW	36.56	150		CI	VC	35.17	26
6901	38.12	SW							
6902		CO							
6904		CO							
6905	38.01	CO							
6906	37.33	CO	34.57	300		CI	VC	21.27	33
6907	37	CO							
6908	35.84	CO							
6909	36.26	CO							
6910	38.06	CO							
6911	36.45	CO	34.07	300		CI	VC	21.84	
6912	39.06	CO							
6913	39.1	CO							
6914	39.35	CO							
6915	39.28	CO	36.81	300		CI	VC	42.95	33
6916	38.35	CO							
7502	43.24	CO							
7503	42.46	CO							
7504	41.89	SW	40.7	150		CI	VC	15.52	27
7505	42.13	FO	40.75	150		CI	VC	45.4	47
7506	42.66	SW							
7508	43.13	SW	41.67	150		CI	VC	47.07	71
7510		FO							
7601	42.18	CO							
7602	42.66	SW							
7604	42.06	SW	40.62	225		CI	VC	16.28	51
7605	42.23	SW							
7606	42	FO	39.76	150		CI	VC	15.3	55
7607	41.74	FO							
7608	41.53	FO	0	225		CI	VC	3	
7610	41.59	SW							
7613	41.16	FO	39.31	150		CI	VC	36.35	51
7614	41.1	SW							
7615	40.47	SW							
7616	40.57	SW							
7617	41.05	SW	39.63	150		CI	VC	21.1	47
7618	42.25	SW							
7701	40.15	SW	38.87	150		CI	VC	13.15	94
7702	40.52	FO							
7703	40.56	FO							
7704	40.8	FO	39.32	150		CI	VC	13.04	18
7705	40.76	SW							
7706	40.75	CO							
7709	41.2	CO							
7710	41.33	CO							
7711	41.12	CO	38.94	150		CI	VC	6.32	63
7713	41.81	FO	40.29	150		CI	VC	30.27	50
7714	41.83	SW	39.66	225		CI	VC	38.33	41
7715	41.61	SW	40.09	150		CI	VC	21.38	76
7716	40.08	CO							
7717	41.19	CO							
7718	41.39	SW	38.65	150		CI	VC	5.83	
7720		FO							
7721	39.92	SW	38.09	225		CI	VC	5.39	
7725		CO							
7801	39.8	CO							
7802	40.06	CO	32.59	500	800	EG	BR	30.89	281
7805	40.27	SW	37.56	225		CI	VC	4.47	
7806	40.26	SW	38.47	225		CI	VC	18.68	21
7807	39.49	SW	38.07	150		CI	VC	15.52	11
7808	39.67	SW	38.16	150		CI	VC	18.68	9
7809	39.46	SW							
7810	39.44	SW							
7811		CO	0	375	675	EG	VC	120.65	
7901	40.24	CO							
7902	40.21	CO	37.48	300		CI	VC	55.39	115
7905	39.91	CO							
7907	39.9	CO	37.26	225		CI	VC	52.95	106
7913		CO							
8701		CO		150		CI	VC	25.29	
8801	40.85	CO							
8802	41.15	CO	32.69	375		CI	VC	10.44	32
8803	40.94	CO	32.66	375		CI	VC	70.52	
8804	40.89	CO	32.74	900		CI	CO	22.47	51
8806	40.49	CO							
8807	40.18	CO	35.31	375		CI	VC	29.12	
8808	40.29	CO	37.95	225		CI	VC	28.44	42
8809	40.68	CO							
8810	40.86	CO							
8813		CO	0	225		CI	VC	79.08	
8901	40.27	CO							
8902	40.2	CO	37.74	300		CI	VC	25.71	117
8904		CO	0	225		CI	VC	11.18	
8905	40.42	CO							
8907		CO	0	225		CI	VC	27.45	
9801	41.02	CO	32.81	375		CI	VC	28.44	284

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
9802	40.66	CO							
9901	40.13	CO							
9902	40.17	CO	36.54	375		CI	VC	23.37	779
9903	40.13	CO	36.68	375		CI	VC	20.88	149
9904	40.07	CO							
9905	40.21	CO							
9906	40.19	CO							
5501		CO	32.03	300		CI	VC	9.49	43
5509		FO							
5510		FO							
5511		FO							
5512		CO							
5709		CO							
5710		CO	0	860		CI	BR	7.21	
5711		CO	14.93	300		CI	VC	12.37	
5804		CO	13.49	560	860	EG	BR	15.13	
5806		CO							
5810		CO	0	650	1100	EG	BR	4	
5812		CO	0	750		CI	BR	5.39	
5817		CO	0	680	900	EG	BR	24.74	
5819		SW							
5901		CO							
5907		CO							
5913		CO	0	450		CI	VC	6.71	
5918		CO	0	225		CI	VC	4	
5921		CO							
6500		CO	0	1500		CI	CO	8.73	
6503		CO	0	910		CI	BR	14.93	
6504		CO		100		CI	VC	32.58	
6505		CO	0	1500		CI	BR	39.17	
6520		CO							
6528		CO							
6607		CO		150		CI	VC	16.12	
6707		CO							
6715		SW							
6716		FO							
6718		SW							
6807		CO	31.5	710	1060	EG	BR	7.28	182
6808		CO	0	900	1120	EG	BR	5	
6809		SW							
6903		CO							
6918		SW							
6919		CO							
6920		CO							
7509		FO							
7723		SW							
7724		CO	0	150		CI	VC	15.82	
7815		SW							
7908		CO							
7909		CO							
7910		CO							
7911		FO							
7912		CO							
8805		CO	0	225		CI	VC	13.78	
8815		CO	0	375		CI	VC	1.41	
8908		CO	0	225		CI	VC	57.66	
9804		CO							
5502		CO							
5503		CO							
5505		CO							
5506		CO							
5507		CO							
5513		CO		150		CI	VC	4.62	
5514		FO							
5709		CO							
5707		CO							
5712		CO							
5808		CO							
5809		CO	0	225		CI	VC	29.61	
5811		CO	0	650	750	EG	BR	24.74	
5813		CO	0	750		CI	CO	24.74	
5906		CO	0	675	1050	EG	CO	14.47	
5908		CO	0	675	1050	EG	CO	21.1	
5909		CO	0	300		CI	VC	23.54	
5910		CO	0	700	1060	EG	CO	37	
5915		CO							
5917		CO							
5920		CO							
6506		CO	0	1500		CI	VC	18.25	
6508		CO							
6511		CO							
6513		CO							
6514		CO							
6523		CO							
6528		CO							
6606		CO	0	550	900	EG	BR	13.15	
6613		CO							
6614		CO							
6617		CO							
6704		CO	0	300		CI	VC	29.43	
6712		CO							
6717		CO							
6917		CO	0	1050		CI	BR	4.47	
6921		CO							
7501		CO							
7507		SW							
7611		FO							
7612		CO							
7619		FO							
7707		CO							
7708		CO							
7712		SW							
7719		CO	0	150		CI	VC	5	
7722		CO							
7803		SW							
7804		CO							
7812		CO							
7903		CO							
7904		CO							
7906		CO							
8811		CO	0	375		CI	VC	3.16	
8903		CO							
8906		CO							
9803		CO	0	375		CI	VC	58.83	
9900		CO							
5604		CO							
5605		CO							

WASTE WATER SYMBOLOGY



Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

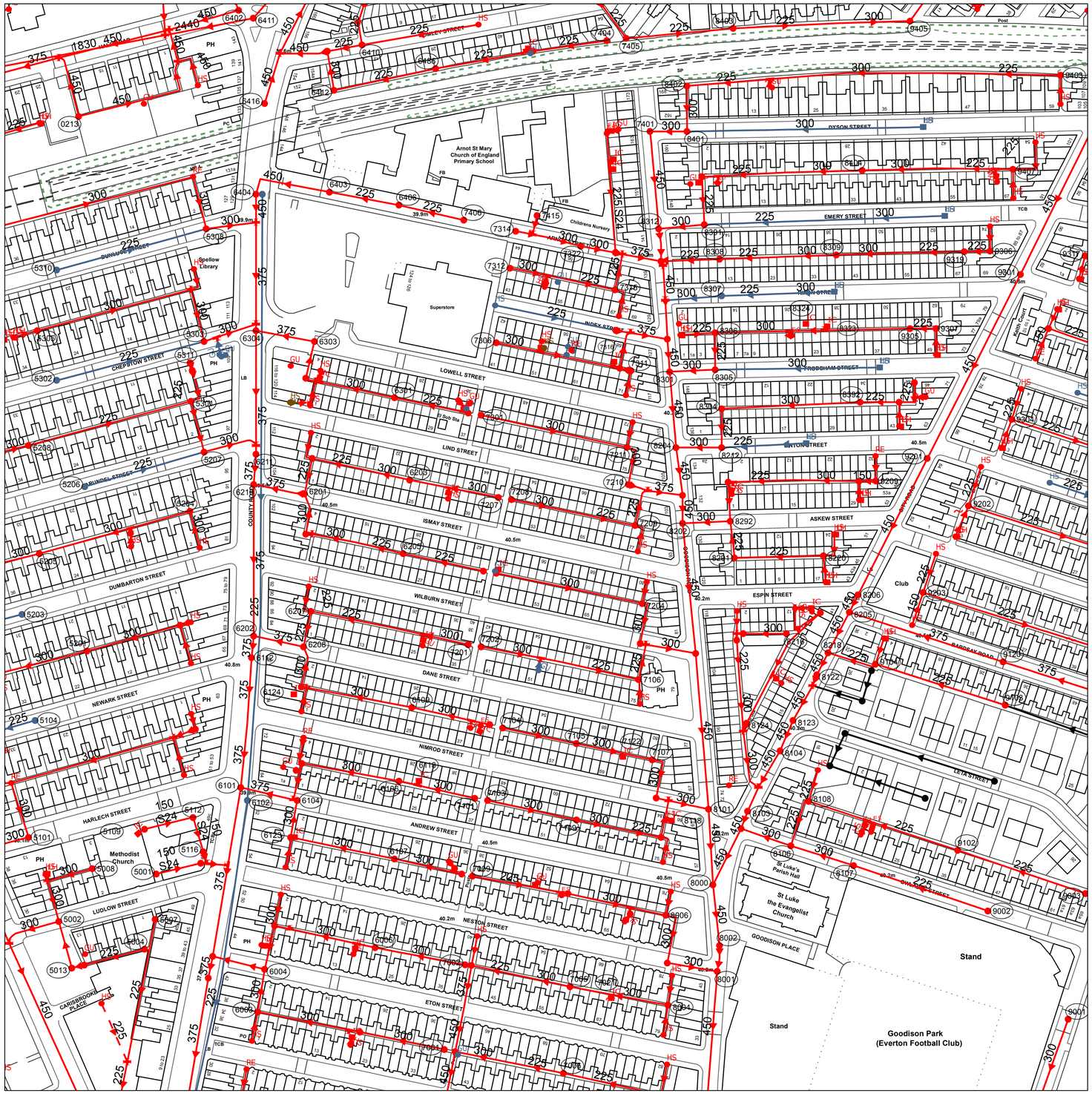
SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ3593NE
Scale: 1:1250 Date: 11/09/2017
267 Nodes
Sheet 1 of 1

United Utilities
helping life flow smoothly

SEWER RECORDS



Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
5001		CO		150		CI	VC	21.08	
5002	37.01	CO							
5003	36.77	CO	34.34	225		CI	VC	5.95	
5004	37.9	CO	36.66	225		CI	VC	28.69	12
5005	38.01	CO	34.93	375		CI	VC	72.01	58
5006	38.04	CO							
5007	38.18	CO	35.67	225		CI	VC	66.93	
5008		CO	0	300		CI	VC	21.36	
5013		CO							
5101	38.02	CO							
5103	40.63	CO	37.85	225		CI	VC	5.39	
5104		SW	0	225		CI	VC	25	
5109		CO							
5111		CO							
5112		CO							
5113		CO							
5116		CO							
5201	40.89	CO							
5202	41.13	CO							
5203		SW	0	225		CI	VC	38.33	
5204	41.5	CO							
5205	42.01	CO	38.35	300		CI	VC	53.6	50
5206		SW	0	225		CI	VC	57.28	
5207	41.15	CO	37.72	300		CI	VC	25.73	70
5208	42.71	CO							
5211		CO							
5301	41.18	CO	38.57	225		CI	VC	11.83	30
5302		SW							
5303	40.74	CO							
5305	42.5	CO							
5308	40.35	CO							
5310		SW							
5311		CO							
5312		CO							
5303	37.98	CO							
6004	38.48	CO	35.19	375		CI	BR	11.98	133
6005	38.87	CO							
6006	39.42	CO							
6007	38.9	CO	36.02	300		CI	VC	48.13	107
6014		CO							
6017		CO							
6101	39.76	CO	36.18	375		CI	VC	79.08	68
6102	39.67	SW							
6103	39.9	CO							
6104	40.21	CO							
6105	40.3	CO							
6106	40.69	CO							
6107	40.21	CO	37.58	300		CI	VC	49.03	120
6109	40.7	CO							
6111	40.82	CO							
6112	40.77	CO							
6118		CO							
6122		CO							
6123		CO							
6124		CO							
6201	40.74	CO							
6202	40.93	CO							
6203	40.84	CO							
6204	40.97	CO							
6205	40.7	CO							
6207	41.18	CO	37.73	225		CI	VC	16.79	
6208	40.9	CO							
6210	40.68	CO	37.18	375		CI	VC	70	636
6211	40.58	CO	37.18	375		CI	VC	14.04	
6214		CO							
6215	40.62	CO	37.92	225		CI	VC	16.76	
6301	40.75	CO							
6302	40.5	CO	37.76	225		CI	VC	17.46	134
6303	40.38	CO							
6304	40.25	CO	37.28	375		CI	VC	57	1140
6305		CO							
6402	40.4	CO							
6403	39.88	CO							
6404		CO	0	450		CI	VC	13	
6406	40.02	CO	37.87	225		CI	VC	32.56	102
6409	39.72	CO	36.83	225		CI	VC	4.12	
6410	39.8	CO	36.86	225		CI	VC	16.28	543
6411		CO							
6412	39.62	CO	36.99	300		CI	VC	18.25	
6416	39.66	CO							
6418	39.76	SW	38.82	225		CI	VC	280.22	163
6486	39.82	CO	37.48	225		CI	VC	48.06	120
7001	39.53	CO	37.17	300		CI	VC	39.81	36
7002	39.96	CO	37.49	300		CI	VC	42.3	57
7003	40.42	CO	37.95	300		CI	VC	31.78	91
7004	40.61	CO	37.69	300		CI	VC	46.34	136
7005	40.25	CO							
7006	40.09	CO							
7007	39.57	CO	36.9	450		CI	VC	20.4	185
7008	39.92	CO	37.13	375		CI	VC	20.07	167
7009	40.44	CO	38.11	225		CI	VC	44.72	106
7015		CO							
7021		CU							
7023		CO							
7101	40.61	CO	38.48	300		CI	VC	35.9	57
7102	40.59	CO	38.53	300		CI	VC	36.88	115
7103	40.71	CO	38.32	300		CI	VC	41.98	86
7104	40.63	CO	38.36	300		CI	VC	34.72	79
7105	40.57	CO	37.91	300		CI	VC	35.8	85
7106	40.61	CO							
7107	40.37	CO							
7108	40.54	CO							
7109	40.72	CO	37.83	300		CI	VC	20.27	101
7112		CO							
7114		CO		100		CI	VC	1.86	
7122		CO							
7201	40.89	CO	38.53	300		CI	VC	36.88	97
7202	40.6	CO	38.47	300		CI	VC	37.66	105
7203	40.44	CO	37.29	375		CI	VC	1.64	
7204	40.45	CO							
7205	40.55	CO	38.39	300		CI	VC	68.78	86
7206	40.5	CO	38.29	225		CI	VC	37.85	252
7207		CO	0	300		CI	VC	41.77	
7208	40.61	CO	38.25	300		CI	VC	29.61	114
7209	40.46	CO							
7210	40.59	CO							
7211	40.46	CO							
7216		CO							
7219		CO							
7301	40.75	CO	38.51	300		CI	VC	68.91	103
7302	40.57	CO	38.32	225		CI	VC	34.71	158
7306	40.54	CO	38.41	300		CI	VC	58.19	119
7308	40.44	CO	37.71	225		CI	VC	3.9	
7311		CO							
7312	40.54	CO	38.41	300		CI	VC	25.15	126
7313	40.56	CO							
7314	40.19	CO	38.3	225		CI	VC	15.3	109
7315	40.48	CO							
7316		CO							
7321	40.31	CO	37.79	300		CI	VC	3.3	
7322	40.25	CO	37.85	300		CI	VC	16.28	326
7324		CO							
7332		CO							
7339		CO							
7401	40.56	CO							
7402	40	CO							
7404		CO	0	225		CI	VC	34.37	
7405	40.08	CO							
7406	40.08	CO	37.93	225		CI	VC	30.81	770
7410		CO							
7411		CO							
7415		CO		225		CI	VC	8.93	
7417		CO							
7418		CO							
8000	40.44	CO							
8001	40.42	CO	36.07	450		CI	VC	51.16	284
8002	40.43	CO							
8004	40.5	CO							
8005	40.44	CO							

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
8006	40.42	CO							
8101	40.41	CO							
8102	40.44	CO	36.53	450		CI	VC	29.07	291
8103	40.42	CO							
8104	40.49	CO							
8105		CO							
8106	40.32	CO	36.74	300		CI	VC	24.35	116
8107	40.28	CO	37.33	300		CI	VC	30.36	101
8108	40.37	CO							
8114		CO							
8118		CO							
8122	40.49	CO							
8123	40.49	CO	36.72	450		CI	VC	15.23	69
8124	40.35	CO							
8133	40.5	CO							
8201	40.36	CO							
8202	40.4	CO							
8203	40.4	CO							
8204	40.37	CO							
8205	40.53	CO							
8206	40.54	CO	36.91	450		CI	VC	8.94	224
8207	40.64	CO	38.51	300		CI	VC	30.42	380
8210		CO							
8212	40.45	CO							
8213	40.45	CO							
8215		CO	0	225		CI	VC	3	
8216	40.59	CO	38.41	300		CI	VC	20	
8217		CO	0	225		CI	VC	62.09	
8218	40.5	CO	36.72	450		CI	VC	11.42	
8220	40.54	CO	38.51	225		CI	VC	41.01	273
8228		CO							
8291	40.39	CO							
8292	40.42	CO	38.19	300		CI	VC	22.02	22
8293	40.4	CO	38.35	300		CI	VC	18.03	139
8301	40.37	CO	37.53	450		CI	VC	35.13	220
8302	40.4	CO	37.61	450		CI	VC	15.03	188
8303	40.39	CO							
8304	40.35	CO	38.37	225		CI	VC	18	56
8305	40.49	CO	38.16	300		CI	VC	21.02	33
8306	40.46	CO							
8307	40.77	SW							
8308	40.48	CO							
8309	40.68	CO							
8312		CO							
8323		CO							
8324		CO							
8391	40.45	CO							
8392		CO							
8401	40.59	CO							
8402	40.52	CO							
8403	40.88	CO	37.33	225		CI	VC	48.68	270
8404	40.66	CO							
8406	40.31	CO							
8417		CO							
9001	40.23	CO	36.8	300		CI	VC	47.76	398
9002	40.23	CO	38.71	225		CI	VC	65.46	102
9003	40.13	CO	37.67	225		CI	VC	62.3	189
9101		CO							
9102	40.29	CO							
9103	40.04	CO	38.01	225		CI	VC	62.94	102
9104	40.34	CO							
9120	40.57	CO							
9201	40.64	CO							
9202	40.78	CO	0	225		CI	VC	92.35	
9203	40.77	CO							
9209		CO	0	150		CI	VC	7.79	
9301	40.71	CO							
9302	40.72	CO	0	225		CI	VC	73.05	
9304	40.99	CO							
9305		CO							
9306	40.99	CO							
9307	40.56	CO							
9309		CO	0	225		CI	VC	16	
9311	40.6	CO	38.66	225		CI	VC	18	
9317	40.56	CO							
9319	40.93	CO							
9403	40.76	CO							
9404		CO							
9405	40.32	CO	36.9	300		CI	VC	113.23	46
9407	40.73	CO							
0213		CO	0	450		CI	VC	48.42	
7816		CO	0	225		CI	VC	14.37	
5008		CO							
5012		CO		225		CI	VC	29.48	
5018		CO	0	225		CI	VC	13.22	
5100		CO	0	225		CI	VC	7.35	
5105		CO	0	300		CI	VC	5.39	
5106		CO	0	300		CI	VC	17.9	
5108		CO	0	300		CI	VC	11.22	
5114		CO		100		CI	VC	1.94	
5209		CO	0	225		CI	VC	14.02	
5209		CO		150		CI	VC	6.21	
5210		CO	0	300		CI	VC	18.35	
5300		CO	0	225		CI	VC	12.97	
5307		CO	38.17	300		CI	VC	12.37	31
5309		CO							
5309		CO	0	300		CI	VC	11.44	
5313		SW							
5314		SW							
5405		CO							
5406		CO	0	450		CI	CO	19.04	
5411		CO							
5412		CO	0	225		CI	VC	54.54	
5413		CO	0	300		CI	VC	26.65	
6000		CO	0	300		CI	VC	13.62	
6002		CO	35.1	375		CI	VC	12.76	142
6010		CO							
6013		CO							
6015		CO							
6018		CO							
6110		CO							
6114		CO	36.6	375		CI	VC	30.15	74
6117		CO	0	300		CI	VC	14.19	
6118		CO	0	375		CI	VC	13.86	
6121		CO							
6200		CO							
6206		CO	0	300		CI	VC	5.09	
6209		CO							
6212		CO	0	300		CI	VC	21.38	
6216		CO							
6218		CO							
6219		CO	0	225		CI	VC	2	
6220		CO	0	225		CI	VC	14.45	
6221		CO							
6300		CO	0	300		CI	VC	17.38	
6307		CO	0	225		CI	VC	2.24	
6308		CO							
6310		CO							
6312		CO							
6313		CO							
6314		CO							
6316		CO							
6317		SW							
6400		CO							
7000		CO	0	300		CI	VC	14.71	
7010		CO							
7011		CO	37.01	450		CI	VC	20.4	185
7012		CO							
7016		CO		100		CI	VC	4.21	
7020		CO							
7022		SW							
7024		CO							
7100		CO	0	225		CI	VC	14.19	
7108		CO		100		CI	VC	4.21	
7110		CO	37.63	225		CI	VC	19.56	93
7111		CO	38.11	225		CI	VC	36.55	104
7115		SW		100		CI	VC	5.87	
7120		CO							
7121		CO							
7200		CO	0	300		CI	VC	10.28	

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Foul Surface Combined

WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
TJunction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Foul Surface Combined Overflow

Screen Chamber
Discharge Point
Outfall

Control Kiosk
Unspecified

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown. Crown copyright and database rights [2016] Ordnance Survey 100022432.

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Scale: 1:1250 Date: 11/09/2017
479 Nodes
Sheet 1 of 2

United Utilities
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SEWER RECORDS

Printed By: Property Searches

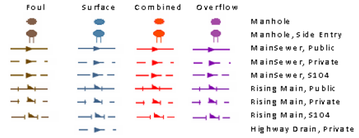
OS Sheet No: SJ3594SE

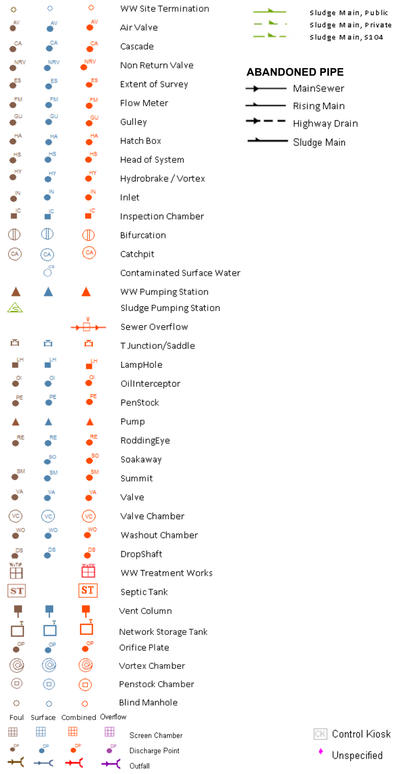
Scale: 1:1250 Date: 11/09/2017

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
7212		SW							
7214		CO							
7217		CO							
7218		CO							
7219		CO	0	225		CI	VC	11.26	
7220		CO							
7221		CO							
7300		SW	0	225		CI	VC	56.84	
7303		CO	0	375		CI	VC	20.33	
7304		CO	38.21	225		CI	VC	24.38	116
7305		CO	38.16	300		CI	VC	15.52	111
7307		CO		225		CI	VC	11.5	
7309		CO	0	300		CI	VC	11.95	
7310		CO	0	225		CI	VC	15.19	
7318		CO							
7323		SW							
7326		CO		150		CI	VC	1.27	
7328		SW							
7329		SW							
7330		SW							
7333		FO							
7335		CO							
7336		CO							
7337		CO							
7338		CO		150		CI	VC	3.92	
7341		SW							
7400		CO	0	300		CI	VC	12.13	
7403		SW							
7407		SW							
7408		CO							
7413		CO							
7421		CO							
7422		CO							
8003		CO							
8007		CO							
8008		CO	0	300		CI	VC	13.78	
8010		CO	0	300		CI	VC	13.95	
8011		CO	0	225		CI	VC	11.48	
8100		CO	0	300		CI	VC	11.3	
8105		CO							
8109		CO							
8110		CO							
8111		CO							
8113		CO							
8116		CO		100		CI	VC	4.8	
8200		CO							
8219		CO							
8222		SW	39.36	225		CI	VC	20.02	16
8224		CO							
8225		CO		150		CI	VC	5.27	
8226		CO							
8229		CO							
8314		CO							
8316		SW	39.68	225		CI	VC	26.02	24
8317		CO	38.57	225		CI	VC	27.02	96
8319		CO							
8322		CO							
8325		CO							
8405		CO		100		CI	VC	4.21	
8407		SW							
8408		CO	38.67	225		CI	VC	37.05	161
8409		CO							
8410		CO							
8412		CO							
8414		CO							
8416		CO							
8418		CO							
9200		SW	0	225		CI	VC	37.36	
9207		CO							
9210		CO	0	225		CI	VC	19.02	
9211		CO							
9212		CO	0	225		CI	VC	18.97	
9213		CO	0	150		CI	VC	15.81	
9214		SW	0	225		CI	VC	37.38	
9215		CO							
9303		CO	38.96	300		CI	VC	30.02	273
9313		CO		100		CI	VC	5.15	
9315		CO	0	225		CI	VC	14.73	
9321		CO							
9401		CO							
9402		CO							
9408		CO	0	225		CI	VC	22.68	
9410		CO	0	225		CI	VC	13.35	
9413		CO							
9414		CO							
9619		CO	0	225		CI	VC	15.54	
0214		CO	0	225		CI	VC	10.46	
0215		CO	0	225		CI	VC	15.01	
0508		CO	0	300		CI	VC	74.53	
5000		CO	0	225		CI	VC	21.76	
5011		CO							
5016		CO							
5017		CO							
5107		CO							
5115		CO							
5210		CO							
5304		CO	38.57	300		CI	VC	24.74	36
5306		CO							
5315		SW							
5316		CO							
5402		CO							
5404		CO							
5406		CO							
5407		CO							
5414		CO							
6008		CO							
6011		CO							
6016		CO							
6019		CO							
6115		CO							
6116		CO							
6119		CO							
6120		CO							
6206		CO							
6213		CO							
6217		CO							
6306		CO	0	300		CI	VC	2.48	
6311		CO							
6315		CO							
6350		CO							
6415		CO							
6419		CO	0	375		CI	VC	50	
7014		CO							
7017		CO							
7019		CO							
7116		CO							
7117		CO							
7213		CO							
7215		CO							
7222		CO							
7310		CO							
7317		CO							
7320		CO	0	375		CI	VC	18.08	
7325		CO							
7331		CO							
7334		CO							
7340		CO							
7414		CO							
7419		CO							
7420		CO							
8112		CO							
8117		CO							
8125		CO							
8127		CO							
8128		CO	0	450		CI	VC	18.36	
8131		CO							
8208		CO							
8209		CO							
8211		CO							
8214		CO							

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
8221		SW							
8223		CO							
8227		CO							
8310		CO							
8311		CO							
8313		CO	0	450		CI	VC	34.06	
8315		SW							
8320		CO							
8321		CO							
8411		CO							
8413		CO							
9204		CO							
9205		CO							
9206		CO							
9308		CO							
9310		CO							
9312		CO							
9314		SW							
9318		CO							
9320		CO							
9406		SW							
9409		SW							
9412		CO							
8105	40.33	CO							
8120		CO							
8121		CO							
8130		CO							
9101		CO							
9121		SW							

WASTE WATER SYMBOLOGY





Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

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SEWER RECORDS

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OS Sheet No: SJ3594SE

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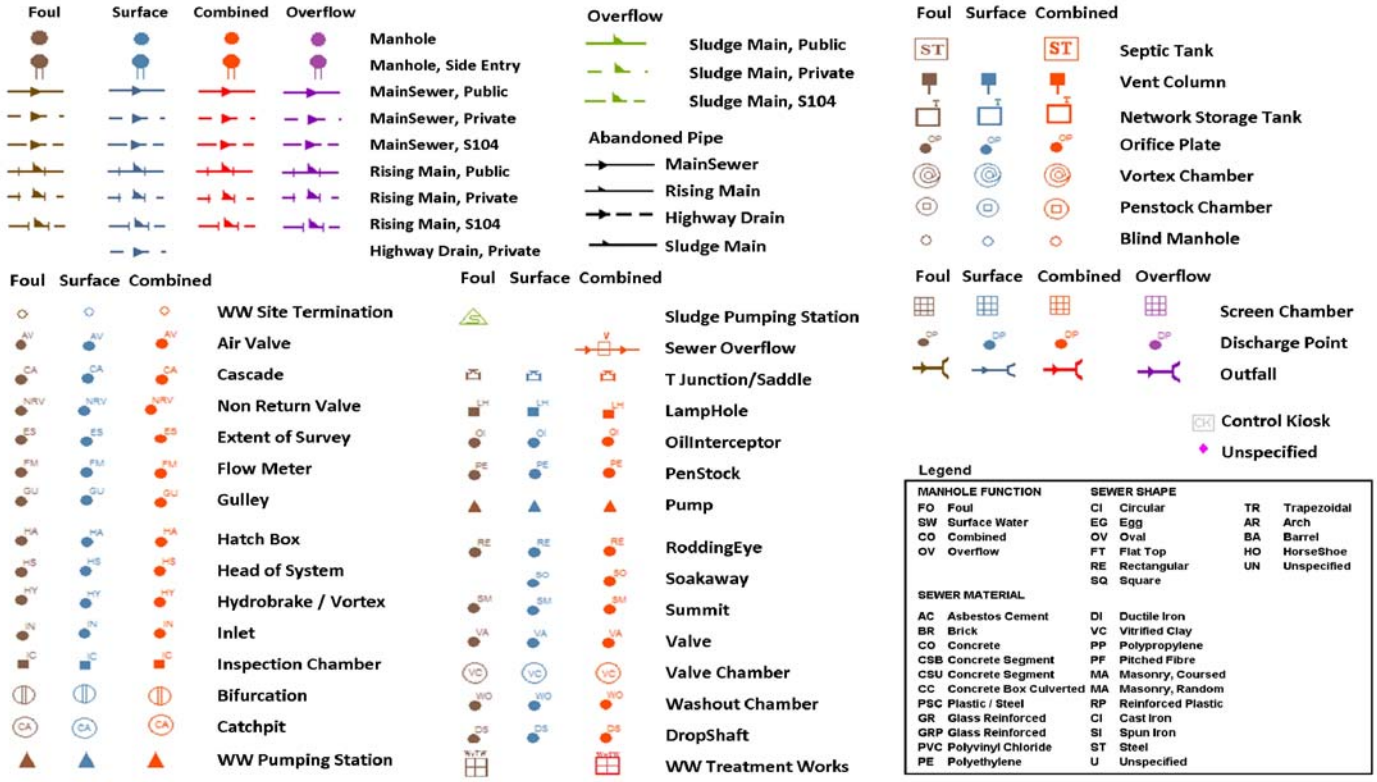
WASTE WATER SYMBOLOGY



Legend

MANHOLE FUNCTION		SEWER SHAPE			
FO	Foul	CI	Circular	TR	Trapezoidal
SW	Surface Water	EG	Egg	AR	Arch
CO	Combined	OV	Oval	BA	Barrel
OV	Overflow	FT	Flat Top	HO	HorseShoe
		RE	Rectangular	UN	Unspecified
		SQ	Square		

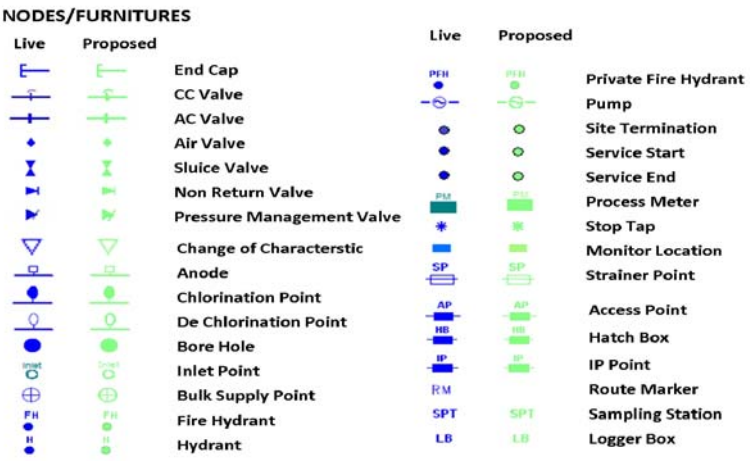
SEWER MATERIAL			
AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	VC	Vitrified Clay
CO	Concrete	PP	Polypropylene
CSB	Concrete Segment	PF	Pitched Fibre
CSU	Concrete Segment	MA	Masonry, Coursed
CC	Concrete Box Culverted	MA	Masonry, Random
PSC	Plastic / Steel	RP	Reinforced Plastic
GR	Glass Reinforced	CI	Cast Iron
GRP	Glass Reinforced	SI	Spun Iron
PVC	Polyvinyl Chloride	ST	Steel
PE	Polyethylene	U	Unspecified

CLEAN WATER SYMBOLOGY

PIPE WORK

ABANDONED PIPE

NODES/FURNITURES



PROPERTY TYPES

Legend

MATERIAL TYPES		LINING TYPES	
AC	ASBESTOS CEMENT	CL	CEMENT LINING
CI	CAST IRON	TB	TAR OR BITUMEN
CU	COPPER	ERL	EPOXY RESIN
CO	CONCRETE		
DI	DUCTILE IRON	INSERTION TYPES	
GI	GALVANISED IRON		
GR	GREY IRON	DD	DIE DRAWN
OT	OTHERS	DR	DIRECTIONAL DRILLING
PB	LEAD	MO	MOLING
PV	uPVC	PI	PIPELINE
SI	SPUN IRON	SL	SLIP LINED
ST	STEEL		
UN	UNKONWN		
PE	POLYETHYLENE		

TERMS AND CONDITIONS - WASTERWATER & 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:

1. 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.
2. 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.
3. In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only and given in accordance with the best information available. The nature of the relevant system and/or its actual position may be different from that shown on the plan and UUWL is not liable for any damage caused by incorrect information provided save as stated in section 199 of the Water Industry Act 1991. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.

Appendix C – Liverpool City Council Pre-Development Enquiry

ross.armstrong

From: ross.armstrong
Sent: 09 January 2020 15:18
To: christina.williams@liverpool.gov.uk
Cc: Jackson, Dave
Subject: RE: GOODISON ROAD, GOODISON PARK

Hi Christina,

To confirm, as per our conversation just now, that you approve in principle to a surface water discharge from the proposed residential development of Goodison Park to Stanley Park Lake subject to the following conditions:

1. Parks and Greenspaces approval to discharge into the lake.
2. Highways approval to run new drainage infrastructure through Walton Lane.
3. Parks and Greenspaces approval of the long-term management of the discharge and outfall into Stanley Park Lake, the long-term management of which would be the responsibility of the Developer.

We will include this as a potential viable option in our Flood Risk & Drainage Assessment Report to support the outline planning application by Everton Stadium Development Ltd, being sure to highlight the conditions.

I note that, contrary to the content of my original enquiry, the lake receives inflows from a self-regulated borehole and surface water drainage.

Kind regards,
Ross

Ross Armstrong
Senior Engineer

WYG
3 Sovereign Square, Sovereign Street, Leeds, West Yorkshire, LS1 4ER
Tel: +44 113 219 2558

www.wyg.com

From: Jackson, Dave <Dave.Jackson@liverpool.gov.uk>
Sent: 03 January 2020 09:33
To: ross.armstrong <ross.armstrong@wyg.com>
Subject: GOODISON ROAD, GOODISON PARK [Filed 03 Jan 2020 14:25]

Ross

Further to you enquiry regarding the proposed drainage for the site I would comment as follows

- I can confirm the proposed maximum surface water discharge of 44.4 l/s will be acceptable.
- I have discussed the possible discharge to Stanley Park Lake and this is something in principle that the Parks and Greenspaces team would be interested to discuss further. The best contact for this is Christina Williams (Streetscene Manager Parks and Greenspaces) 0151 233 0829 - christina.williams@liverpool.gov.uk

I hope this is of assistance

Thanks

Dave Jackson I Engineer

Liverpool City Council I Cunard Building I Water Street I Liverpool I L3 1AH

T: 0151 233 0927 I M: 0754 8145562 I **E:** dave.jackson@liverpool.gov.uk

Postal address:

Liverpool City Council I Cunard Building I Water Street I Liverpool I L3 1AH

From: Planning
Sent: 17 December 2019 11:35
To: Planning DC North <Planning.DCNorth@liverpool.gov.uk>
Subject: FW: Contact us: Planning and building control

From: donotreply@liverpool.gov.uk [mailto:donotreply@liverpool.gov.uk]
Sent: 17 December 2019 11:28
To: Planning
Subject: Contact us: Planning and building control

Name:
Ross Armstrong, WYG Engineering Ltd
Email:
ross.armstrong@wyg.com
Address of property your enquiry relates to:
Goodison Park, Goodison Road, Liverpool, L4 4EL
Application reference number:
N\A
Message:
Dear Sir\Madam, We are undertaking a Flood Risk & Drainage Assessment on behalf of Everton Stadium Ltd in support of outline planning for proposed mixed use development of Goodison Park. The site is located within Flood Zone 1 and the flood risk from other sources has been assessed as low. The total site area is 3.39 ha and comprises the stadium and hard standing. The entire site including the pitch drains unattenuated and unrestricted to the public combined sewer network, with multiple connections on all sides of the site. The proposed development incorporates areas of soft landscaping, thereby providing a betterment to the existing surface water runoff rate from the site

through masterplanning. Nevertheless, we propose to further reduce runoff from the developed site by attenuating up to and including the 1 in 100 year storm plus 40% allowance for climate change on site and restricting discharge from each outfall to the Greenfield (Qbar) rate of 7.4 l\/s during all storms. There is no indication that infiltration drainage is a feasible option and there is no nearby watercourse. Given the size of the site, the minimal topographic fall across the site and the proposed site layout, we propose to maintain several existing connections to sewer, where possible, or have new connections. At this preliminary stage we envisage up to six outfalls to sewer, which would total 44.4 l\/s of runoff from the site. This is still significantly less than the existing runoff rate from the site, which is approximately 471 l\/s, based on the Modified Rational Method (2.78 * 50 mm\/hr * 3.39 ha). We intend to submit a pre-development enquiry to United Utilities to determine their allowable runoff rate from the site. We propose to incorporate SuDS features on site to provide storage, water quality treatment, biodiversity and amenity benefits. Any remaining deficit in storage is likely to be made up by using geo-cellular storage tanks below ground. We believe that this strategy in principle adheres to Liverpool Unitary Development Plan Policies EP12 and EP13. As LLFA, could you please confirm acceptance in principle of this strategy and\/or provide any site-specific requirements regarding surface water drainage. In addition, could you please provide your opinion on potential discharge from the site to Stanley Lake Pond to the south of Walton Lane. We believe that this pond is purely recreational\/ornamental, with no inflows or outfalls. Would the Council's Parks Maintenance team allow such a discharge from the site? Kind regards, Ross

Appendix D – United Utilities Pre-Development Enquiry

ross.armstrong

From: Jack, Andy <Andy.Jack@uuplc.co.uk>
Sent: 23 December 2019 10:12
To: ross.armstrong
Cc: Wastewater Developer Services
Subject: Pre Development Enquiry for Goodison Park Road L4 4EL - Our ref - 4200029596 [Filed 24 Dec 2019 10:54]

Importance: High

Follow Up Flag: Follow up
Flag Status: Completed

Dear Ross,

We have carried out an assessment of your application which is based on the information provided; this pre development advice will be valid for 12 months. As per your email before the ground is demolished you will needed to carry out a full CCTV survey of the existing connections showing the impermeable areas that are draining to the surrounding combined Sewers, if this exercise is carried out we can look at the submitted flow rates and betterment rates so we are in support of this, but you must discount and prove that you cannot infiltrate or get to a SW body. A possible meeting to discuss further might be needed.

Foul

Foul will be allowed to drain to the public combined sewer network at Unrestricted rate. Our preferred point of discharge would be to the you chosen existing connection you have mentioned to utilise we just need to have a plan to see where these are so we can agree on the discharge points.

Surface Water

Surface water from this site must drain to soak away or some other form of infiltration system you also may want to consider the local SW ponds in Stanley park, but if ground conditions confirm that this is not a viable solution all Surface water can drain to the combined sewer, this rate will need to be determined as per the figures in your email after a full FRA is carried out. Please see the above to see full response.

Connection Application

Although we may discuss and agree discharge points & 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

http://www.unitedutilities.com/connecting-public-sewer.aspx

Sewer Adoption Agreement

You may wish to offer the proposed new sewers for adoption. United Utilities assess adoption application based on Sewers adoption 6th Edition and for any pumping stations our company addenda document. Please refer to link below to obtain further guidance and application pack:

http://www.unitedutilities.com/sewer-adoption.aspx

Trade Effluent

If you intend to discharge trade effluent to the public sewer you will require a trade effluent permit. Please see United Utilities' website for details.

http://www.unitedutilities.com/trade-effluent-faqs.aspx

Existing Sewers Crossing the Site

A public sewer crosses this site and we will require unrestricted access to the sewer for maintenance purposes, we would ask that you maintain a minimum clearance of (225m refer to table 2.1 SFA) which is measured 3m from the centre line of the pipe. If you cannot achieve this then you may wish to consider diverting the public sewer or abandoning them .

Please refer to the link below to obtain full details of the processes involved in sewer diversion.

http://www.unitedutilities.com/sewer-diversion.aspx

Please be aware that on 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.

Please note, 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 of Sewers for adoption and United Utilities Asset Standards. The proposed design should give consideration to long term operability and give United Utilities a cost effective proposal for the life of the assets. Therefore, further to this enquiry should you wish to progress a Section 104 agreement, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 agreement, has been assessed and accepted in writing by United Utilities. Any works carried out prior to the technical assessment being approved is done entirely at the developers own risk and could be subject to change.

Regards

United Utilities
Water for the North West

Andy Jack
Developer Engineer
Developer Services & Metering
Customer Services
T: 01925 679412(679412)
unitedutilities.com

Appendix E – Greenfield Runoff Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Ross Armstrong
Site name:	Goodison Park
Site location:	Liverpool

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

Site Details

Latitude:	53.43877° N
Longitude:	2.96621° W
Reference:	1201743933
Date:	Nov 27 2019 12:01

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 3.39

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	820	820
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

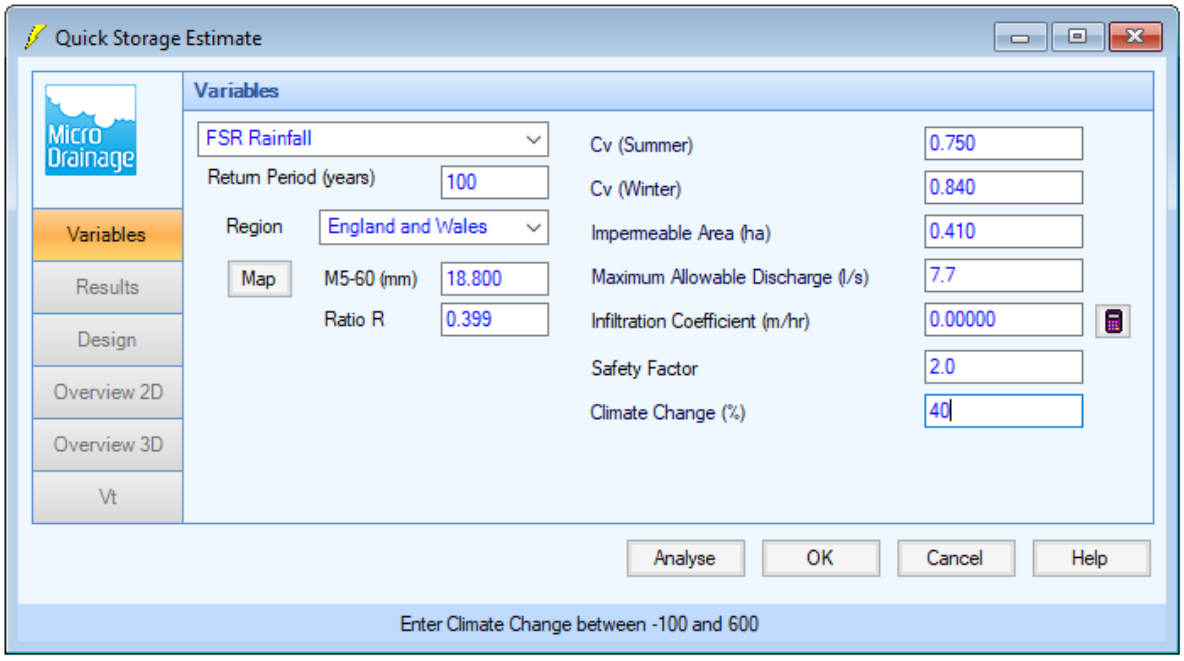
Greenfield runoff rates

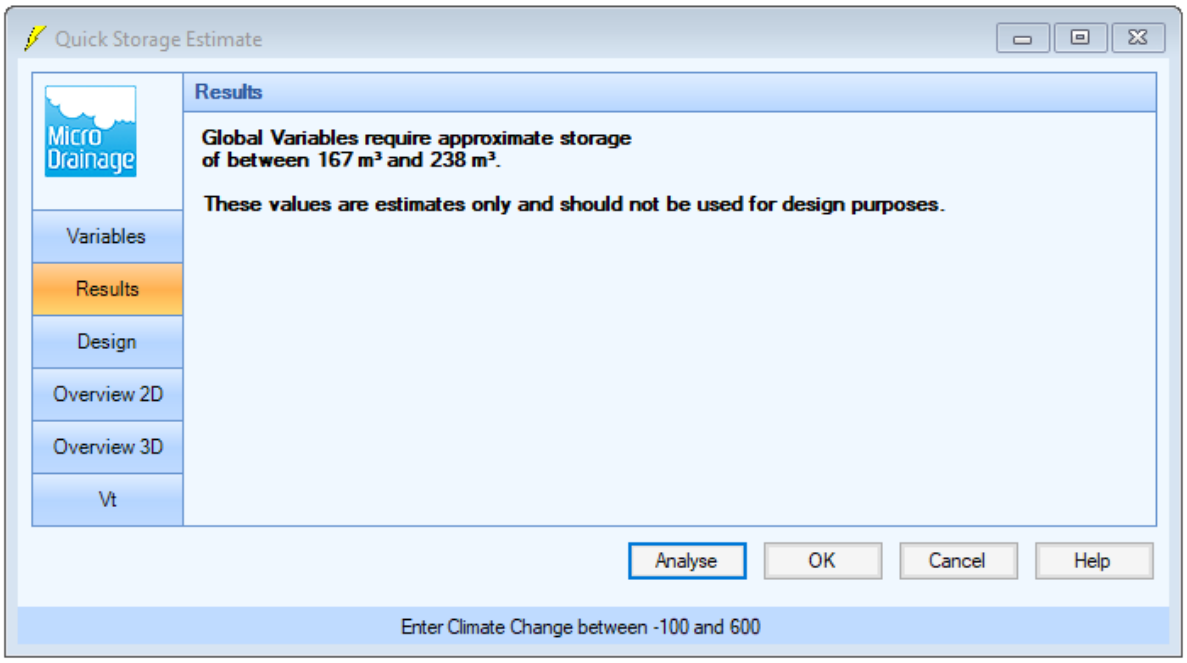
	Default	Edited
Q_{BAR} (l/s):	7.43	7.43
1 in 1 year (l/s):	6.47	6.47
1 in 30 years (l/s):	12.64	12.64
1 in 100 year (l/s):	15.46	15.46
1 in 200 years (l/s):	17.62	17.62

Appendix F – Quick Storage Estimates

CATCHMENT 1

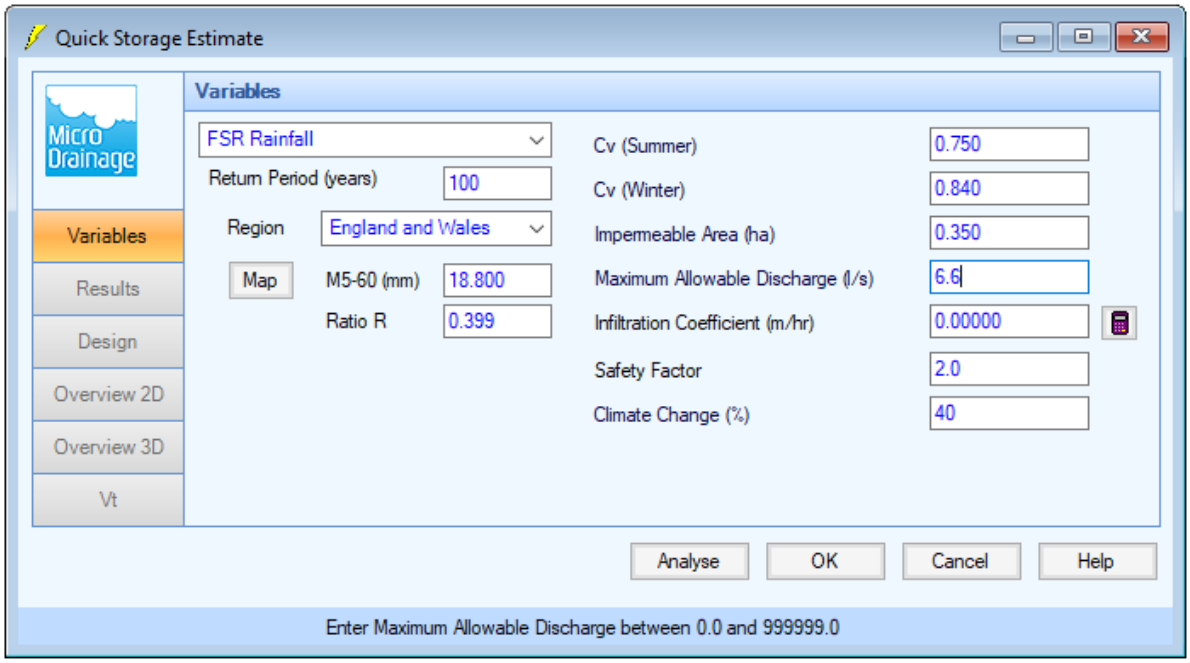
1 in 100 year storm event plus 40% climate change allowance

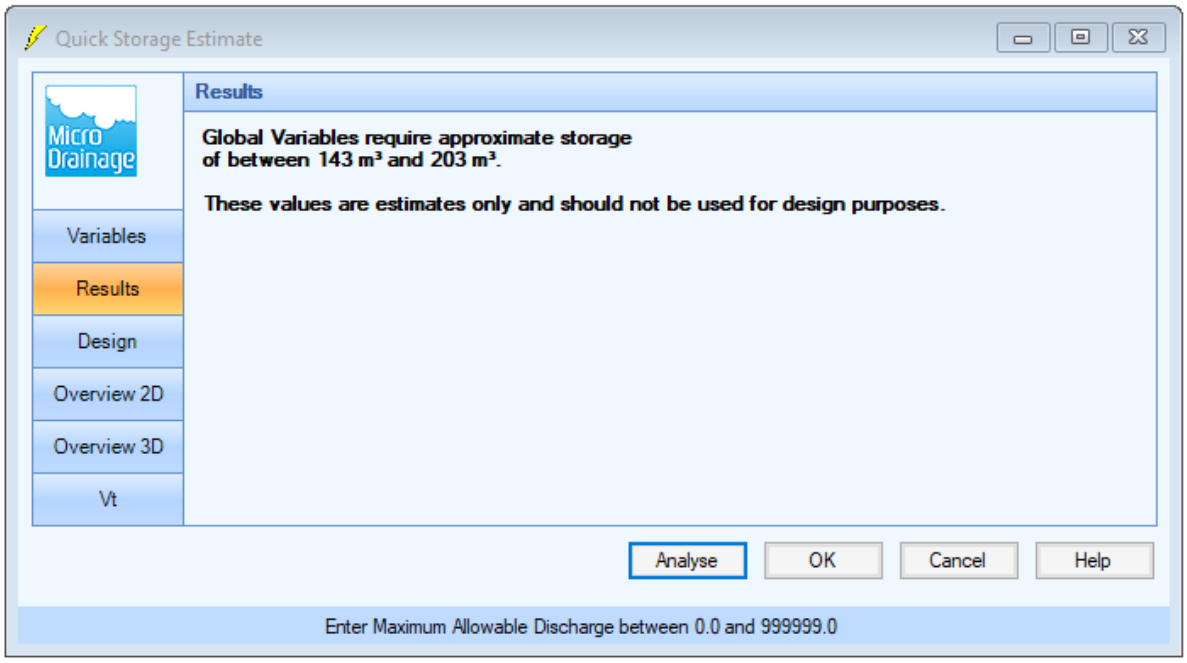




CATCHMENT 2

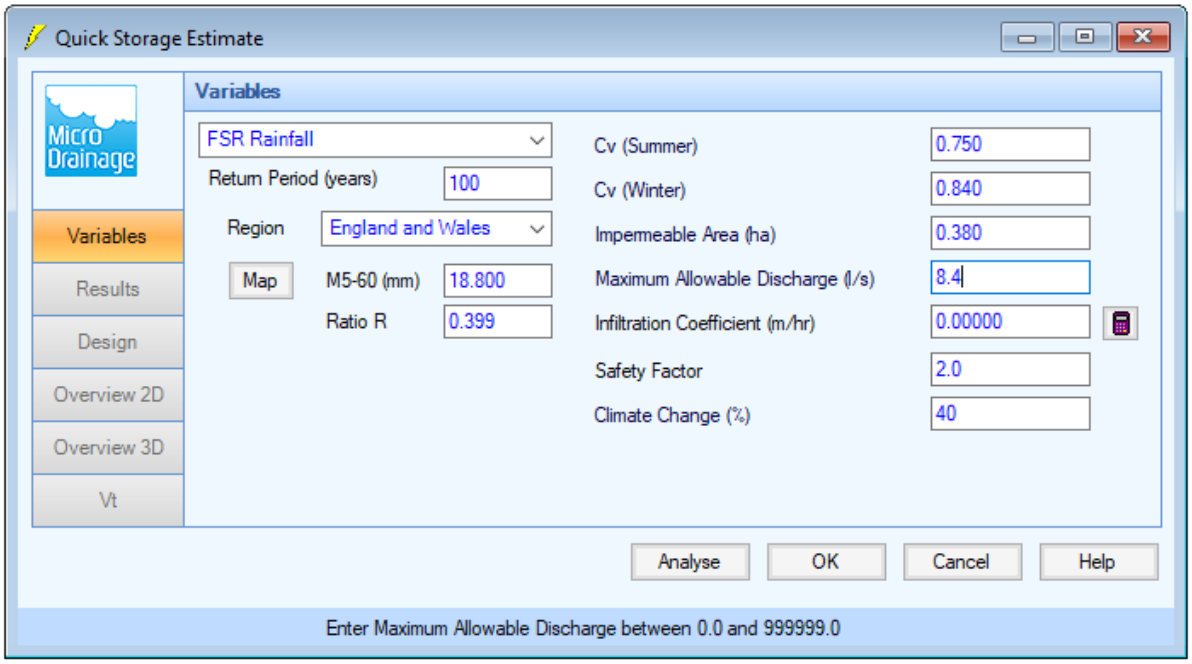
1 in 100 year storm event plus 40% climate change allowance

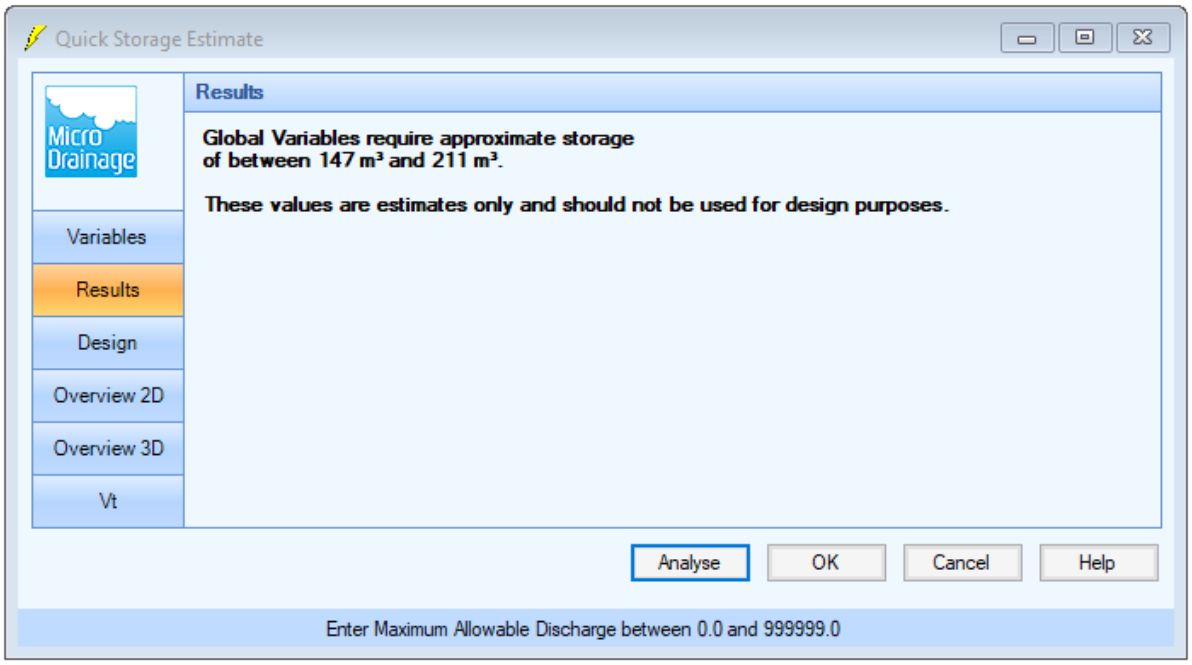




CATCHMENT 3

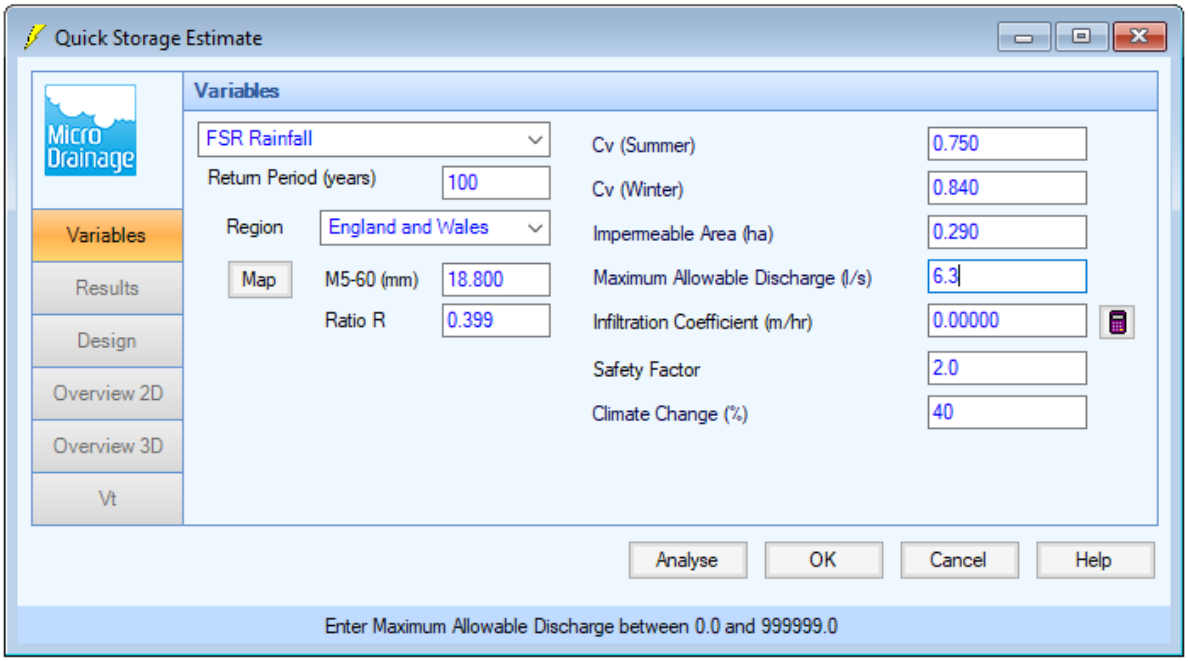
1 in 100 year storm event plus 40% climate change allowance

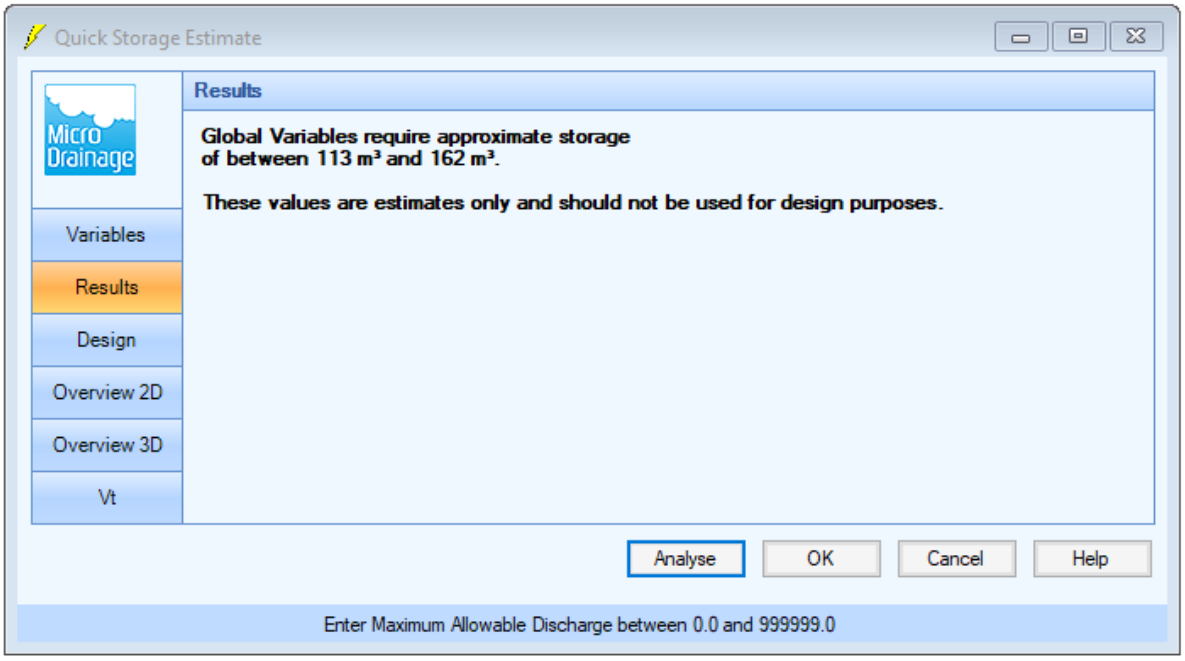




CATCHMENT 4

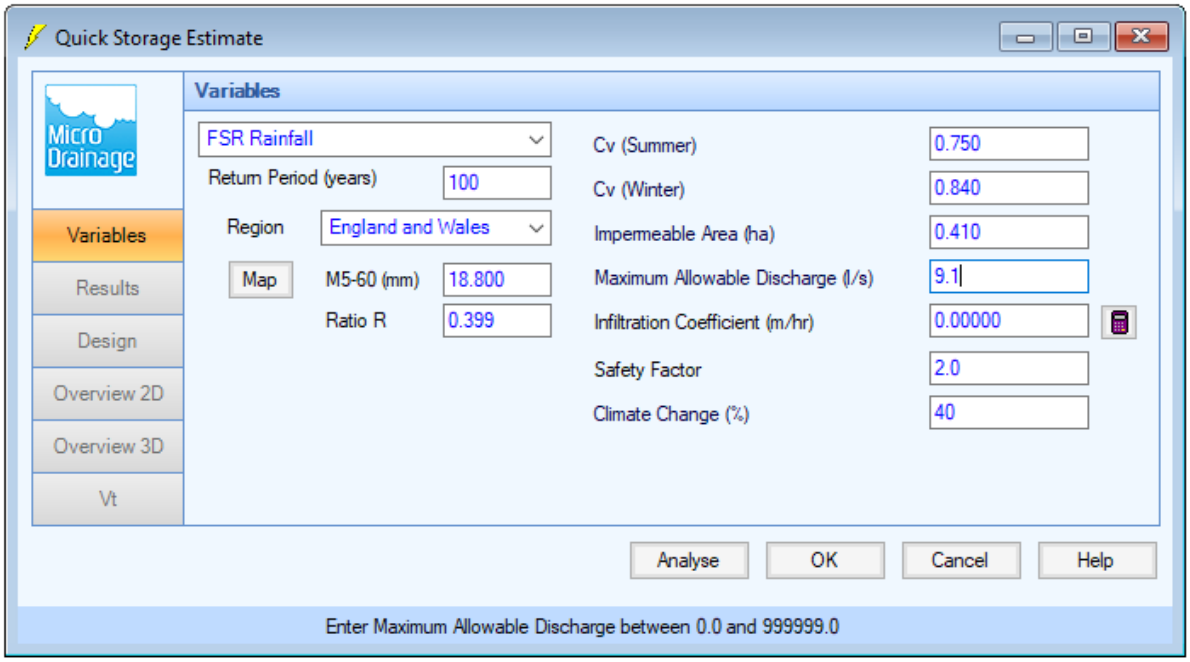
1 in 100 year storm event plus 40% climate change allowance

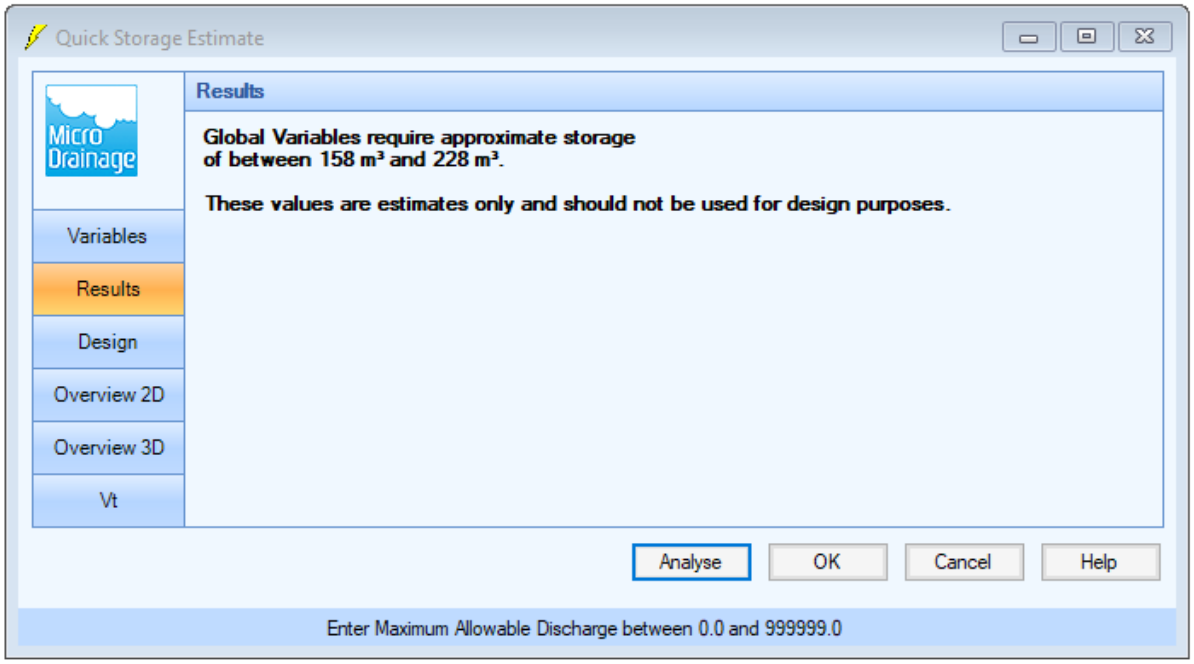




CATCHMENT 5

1 in 100 year storm event plus 40% climate change allowance





Appendix G – Indicative Surface Water Drainage Strategy Plan

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

NOTES:

1. ALL LEVELS QUOTED IN METRES AOD
2. ILLUSTRATIVE MASTERPLAN FROM 17-087-120 P5 DRAWN BY CONDY LOFTHOUSE ARCHITECTS, JUL 2029
3. PUBLIC SEWER INFORMATION TAKEN FROM UNITED UTILITIES SEWER RECORDS, NOV 2019
4. DISCHARGE RATES AND POINTS OF CONNECTION TO PUBLIC SEWER TO BE AGREED WITH UNITED UTILITIES

KEY:

- SITE BOUNDARY
- EXISTING PUBLIC COMBINED SEWER
- PROPOSED SURFACE WATER SEWER
- PROPOSED SURFACE WATER CATCHMENT 1
- PROPOSED SURFACE WATER CATCHMENT 2
- PROPOSED SURFACE WATER CATCHMENT 3
- PROPOSED SURFACE WATER CATCHMENT 4
- PROPOSED SURFACE WATER CATCHMENT 5
- PROPOSED PERMEABLE PAVING
- PROPOSED ATTENUATION TANK

THIS DRAWING IS FOR PLANNING PURPOSES ONLY AND SUBJECT TO FURTHER DETAILED DESIGN

NEW MANHOLE

CATCHMENT 1
DISCHARGE RATE 7.7 L/S

CATCHMENT 5
DISCHARGE RATE 9.1 L/S

NEW MANHOLE

CATCHMENT 2
DISCHARGE RATE 6.6 L/S

CONNECTION TO EXISTING MANHOLE NO. 9901

CATCHMENT 4
DISCHARGE RATE 6.3 L/S

NEW MANHOLE

CONNECTION TO EXISTING MANHOLE No. 8808

CATCHMENT 3
DISCHARGE RATE 8.4 L/S

Illustrative Masterplan - Ground Floor Plan
Scale 1:500

0 5 10 15 20 25 m
SCALE 1:500

N

0 5 10 15

FOR INFORMATION ONLY

REV	DESCRIPTION	BY	CHK	APP	DATE
P1	FIRST ISSUE	RA			

3 SOVEREIGN SQUARE
SOVEREIGN STREET
LEEDS
LS1 4ER

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Project:
GOODISON PARK LEGACY PROJECT

Drawing Title:
INDICATIVE SURFACE WATER DRAINAGE

Scale @ A1	Drawn Date	Checked Date	Approved Date
	RA 20.12.19		

Project No.	Office	Type	Drawing No.	Revision
A10075-1	21	C	SK001	P1