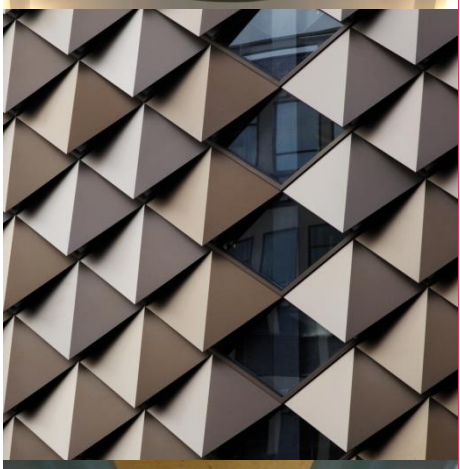

Liverpool Film Studios

Flood Risk Assessment

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This report has been prepared for the sole benefit, use, and information for the client. The liability of Curtins Consulting Limited with respect to the information contained in the report will not extend to any third party.

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1.0 Introduction

1.1 Project Background

Curtins has been appointed by Morgan Sindall to prepare a Flood Risk Assessment (FRA) in support of a planning application for a scheme to allow the erection of two temporary tent structures and temporary car parking, on the sites north and south of the Digital Way within the Liverpool Innovation Park.

The report is based on currently available information.

The FRA provides information on the nature of flood risk at the site and has been prepared in accordance with the 'Site Specific Flood Risk Assessment Checklist' from the National Planning Policy (NPPF), accompanying Planning Practice Guidance (PPG), and local planning policy with regards to development and flood risk.

The proposals for the surface water management strategy are based on the requirements of Liverpool Council in their role as Lead Local Flood Authority (LLFA).

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design of this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the content contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Curtins shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Curtins.

1.2 Scope of the Flood Risk Assessment

This assessment has been undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments and the 'Site Specific Flood Risk Assessment Checklist' contained in National Planning Policy Framework (NPPF) and accompanying Planning Practice Guidance (PPG).

The planning application site is approximately 1.6 hectares (ha) in size and is shown as being located entirely within Flood Zone 1 (defined as having less than a 1 in 1000 (0.1%) Annual Probability of flooding from the rivers or sea) by the online Flood Map for Planning.

The FRA will:

- Investigate all potential risks of flooding to the site;
- Summarise the requirements of the FRA for the overall development;

- Consider the impact the development may have elsewhere with regards to flooding;
- Consider proposals to mitigate any potential risk of flooding determined to be present;
- Consider the requirements of the DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems and the Lead Local Flood Authority (LLFA) guidance;
- Consider the impacts of climate change;
- Consider the receiving public sewer capacity issues;
- Prepare a Drainage Strategy for the surface water systems on the site, making recommendations for outfall, discharge rates, attenuation and forms of SuDS; and,
- Make recommendations as to how surface water drainage features are to be operated and maintained.

This FRA has been based on the following information:

- The online Flood Maps (https://flood-map-for-planning.service.gov.uk/ and https://flood-warning-information.service.gov.uk/long-term-flood-risk/map);
- Liverpool City Council's (LCC) Preliminary Flood Risk Assessment (PFRA), dated 2011;
- United Utilities (UU) public sewer records; and
- LCC Local Plan – Pre-submission draft 2018.

In April 2015, the Government made changes to the NPPF which made Sustainable Urban Drainage Systems (SuDS) a material consideration in the determination of planning applications for 'Major' developments.

A detailed drainage strategy will therefore be required as part of the planning application as the site is considered to be a 'Major Development' by the Town & Country Planning Order 2015.

2.0 Development and Flood Risk

This FRA has been prepared in accordance with the relevant national, regional and local planning policy and statutory authority guidance as follows:

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

The Department of Communities and Local Government updated the National Planning Policy Framework (NPPF) in June 2019. The accompanying Planning Practice Guidance (PPG) was published in March 2014 and updated in April 2015 and provides guidance on how flood risk should be assessed during the planning and development process.

Climate change specific guidance 'Flood Risk Assessments: Climate Change Allowances' released in February 2016 and updated in December 2019 updates previous climate change allowances in support of the NPPF.

2.2 Local Policy

The future Liverpool Local Plan (LCP) is currently awaiting adoption. Once agreed the Local plan will provides long-term spatial vision, strategic priorities and policies for future development in the city over the next 15 to 20 years.

Policy R3 is concerned with ensuring protection and enhancement of water quality, reducing flood risk and Sustainable Urban Drainage Systems (SuDS). Developments will be required to integrate measures for sustainable water management to reduce flood risk, avoid adverse impact on water quality and quantity within Liverpool, including groundwater resources, and provide opportunities to enhance biodiversity, health and recreation.

The policy seeks to ensure that development is directed away from areas at highest risk of flooding, especially development that includes key infrastructure and major utilities. It also seeks to make sure that surface water created by new developments is mitigated, thereby reducing surface water run-off impacts of new development on downstream areas in terms of quantity and run-off rates. This will also assist in meeting the requirements of the Water Framework Directive (WFD) and will help to mitigate any adverse effects on water quality

2.3 Proposed Development

The proposed development will encompass a new base for filming in the city region, there are to be two large temporary tent structures in Plot B, and a temporary car parking allowance in Plot A. As per the local plan under E19, the site is dedicated for Industrial/Business Development. A fixed plan is included within this flood risk assessment, any alteration will be subject to the parameters outlined in this report.

The site layout is included in *Appendix A*.

2.4 Site Specific NPPF Flood Risk Classification

The online Flood Map for Planning indicates the site is located entirely within Flood Zone 1, defined as having a 'Low' probability with less than a 1 in 1000 (0.1%) Annual Probability of flooding from rivers or sea.

2.5 Flood Risk Vulnerability

The NPPF follows a risk-based approach in determining the suitability of land for development in areas at risk of flooding, with the intention of steering all new development to the lowest flood risk areas.

PPG Table 2 confirms the 'Flood Risk Vulnerability Classification' of a site, depending on the proposed usage. The classification is subsequently applied to PPG Table 3 to determine:

- Whether the proposed development is suitable for the Flood Zone in which it is located; and,
- Whether an Exception Test is required for the proposed development.

In accordance with PPG Table 2, proposed commercial uses fall within the 'Less Vulnerable' classification. According to PPG Table 3 the above use is appropriate for Flood Zone 1, without the need to apply the Sequential and Exception Test.

3.0 Existing Site Details

3.1 Site Description

The site is within the Liverpool Innovation Park, it is approximately 1.6ha in development area. There are two plots identified for development, Plot A to the north and Plot B to the south. Digital way segregates the plots and Innovation Boulevard is to the west, Edge lane is the northern boundary. Figure 3.1 below shows the development in red.

The old MTL buildings have been demolished for some time and the area provides now serviced plots. There are existing accesses from Digital Way and a landscaped bund surrounds the majority of both plots.

Figure 3.1 – Site Location Plan

3.2 Topography

A topographical survey of the site has been undertaken by SEP in July 2020 and provides level data to OS GPS datum. A copy of the topographical survey is presented in *Appendix B*.

In general, the plots are mostly flat. Plot A is highest at the access with an elevation of circa 54.500mAOD, falling northwards to a low point of around 53.000mAOD. Plot B is highest in the south western extents with an elevation of 54.500mAOD, with a low point in the north eastern corner of approximately 53.500mAOD. The landscaped bund has varying heights around the plots.

3.3 Hydrological Setting

A review of Ordnance Survey (OS) mapping indicates no watercourses or significant waterbodies are in the vicinity of the site. As part of the Innovation Park there are a series of drains and ponds which manage surface water run off for the masterplan, these are managed and designed through hydraulic design.

3.4 Existing Geology

The online British Geological Survey (BGS) 1:50,000 scale digital viewer indicates the site is underlain by the bedrock geology of the 'Chester Formation' comprising of Sandstone and pebbly deposits.

The online BGS 1:50,000 scale superficial geology maps indicate the site is underlain by the Devensian Till comprising of clay and sands, pockets of gravelly cobbly material are expected.

The National Soil Resources Institute (NSRI) Soilscape viewer indicates the site is situated on 'Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils'. There is likely to be high groundwater.

Investigations found varying depths of made ground.

3.5 Hydrogeological Setting

The EA has classified the solid geology as a Principal Aquifer. This is defined as layers of rock or drift deposits that have high intergranular and/or fracture permeability. The EA has classified the superficial geology as a Secondary Undifferentiated Aquifer. This is defined as an Aquifer where it has not been possible to attribute either category A or B to a rock type.

The Groundwater Vulnerability Zone map identifies the site as being located on an Aquifer that has a medium-low vulnerability of pollution.

The site is not located within an EA defined Groundwater Source Protection Zone.

3.6 Existing Drainage

3.6.1 Public Drainage

Public sewer records have been obtained for the development site from LCC. There is an existing network within the Innovation Park for both surface water (SW) and foul water (FW). Although the sewers are currently under a S104 agreement they have never been formally adopted by United Utilities (UU) and the sewer ownership is therefore unknown at the time of writing. Based on the layout information, it is likely that the infrastructure was installed as part of the masterplan to deliver serviced plots.

A copy of the asset plans are contained in *Appendix B*.

4.0 Assessment of Flood Risk

4.1 Sources of Flood Risk

This study assesses the risk from different types of flooding to the development and the risk of flooding from the development, taking climate change into consideration, as well as how flood risk should be managed. The approach to the assessment of flood risk at the development site has been informed by the requirements of NPPF in conjunction with the client and EA/LLFA requirements.

4.2 Fluvial and Tidal Flooding

The online Flood Map for Planning indicates the site is located entirely within Flood Zone 1, defined as having a 'Low' probability with less than a 1 in 1000 (0.1%) Annual Probability of flooding from rivers.

An extract of the online Flood Map for Planning is presented in Figure 4.1 with the site location noted by the yellow marker.

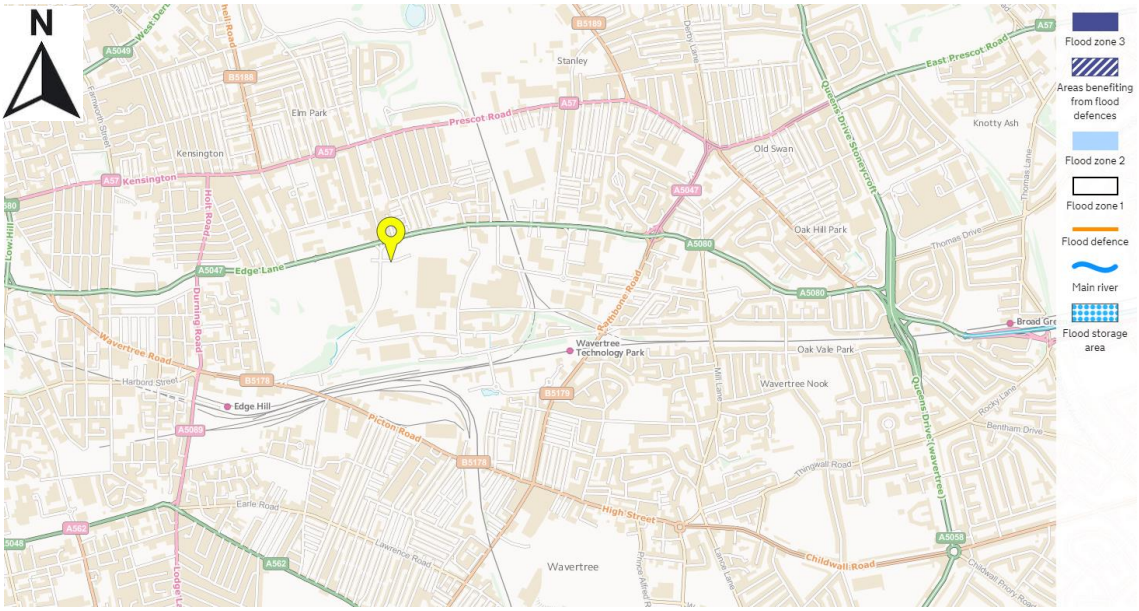

Figure 4.1 – EA Flood Zone Classifications

The site can be considered at very low risk of flooding from fluvial and tidal sources.

4.3 Reservoir Flooding

The online Risk of Flooding from Reservoirs Map indicates the risk of flooding in the event of a breach from reservoirs, based only on large reservoirs (over 25,000 cubic metres of water).

The online Risk of Flooding from Reservoirs map indicates the site is not considered to be at risk in the event of reservoir breach.

4.4 Surface Water Flooding to the Site

The online Risk of Flooding from Surface Water map shows where areas could potentially be susceptible to surface water flooding in an extreme rainfall event. Surface water flooding can be caused when rainwater does not drain away through the normal drainage system or soak into the ground with flooding occurring, principally from manholes and gullies. Surcharging sewers can result in overland flows which if originating at a higher elevation than a development site can potentially pose a flood risk.

An extract of the online Risk of Flooding from Surface Water map is presented in Figure 4.2.

Figure 4.2 – EA Surface Water Flood Risk

The online Risk of Flooding from Surface Water map indicates the site is considered as being at a 'Very Low' susceptibility to surface water flooding. This is defined as having less than a 1 in 1000 (0.1%) Annual Probability of flooding.

4.5 Surface Water Flooding from the Site

Developers are responsible for ensuring that new development does not increase flood risk elsewhere. The proposed surface water drainage network shall be designed to not flood in the critical 1 in 30 (3.3%) Annual Probability storm event. Flood water generated up to the critical 1 in 100 (1%) Annual Probability plus 20% climate change event shall be constrained within areas on site to not cause damage to buildings, essential services or adjoining developments.

The development has the potential to reduce flood risk through the introduction of landscaping areas. It is therefore encouraged to propose permeable areas, landscaping areas and incorporate sustainable drainage features utilising infiltration or attenuation, where possible.

4.6 Groundwater Flooding

The LCC PFRA highlighted that the available EA and DEFRA mapping when combined with the BGS data for “Areas Susceptible to Groundwater Flooding” gave an accurate indication of areas with increased risk. The PFRA map shows that the site is not susceptible to groundwater flooding.

The PFRA does identify that Groundwater levels are continuing to rise due to a significant reduction in industrial abstraction with the decline of industry. This causes increasing risk of groundwater flooding, however because of the location of this site there is no future concern. There are no instances of groundwater flooding recorded in the Liverpool area, however, this could be down to reporting rather than an absolute guarantee.

The risk of groundwater flooding is considered to be low.

4.7 Public Sewers and Water Mains

There are public sewers within the vicinity of the site which are privately maintained, and will continue to be, until the S104 agreement is signed with UU.

The PFRA does not give any evidence to suggest that there have been any previous flooding incidents as a result of inadequate capacity within the sewer network in the vicinity. The mapping provided (PFRA Figure 4.2.2) covers the DG5 register and LCC records.

Any additional flows to be discharged to the sewer network will be subject to an impact assessment by the asset owner and therefore the risk can be considered low.

There is no information available on the risk of property flooding due to water main bursts.

4.8 Highway Drainage Flooding

There are road gullies located within site boundary. Providing LCC maintain their drainage assets in the vicinity of the site, the risk of flooding to the proposed development site from highway drainage is considered as low.

4.9 Summary of Flood Risk

A summary of the flood risk to the site, based on the information presented above, is below:

- Fluvial and Tidal flooding – low risk
- Reservoir flooding – low risk
- Surface water flooding to the site – low risk
- Surface water flooding from the site – low risk
- Groundwater flooding – low risk
- Flooding from public sewers and water mains – low risk
- Flooding from highway infrastructure – low risk

5.0 Drainage Strategy

5.1 Proposed Foul Water Drainage

There is no foul drainage connection provided to the structures.

5.2 Proposed Surface Water Drainage

Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30 (3.3%) Annual Probability storm event and flood water generated for the critical 1 in 100 (1%) Annual Probability plus climate change storm event shall be constrained within the site boundary and not cause damage to buildings, essential services or adjoining developments.

The most appropriate method of surface water discharge has been determined based on the hierarchy of surface water disposal set out in Building Regulations – Approved Document H.

Plot A will not require a live drainage connection to the sewers, Plot B will be positively drained.

Infiltration

In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water run-off by infiltration.

Infiltration tests were attempted on Plot A, however over a 7-hour period the water level only dropped by approximately 130mm. The tests were completed to BRE365 requirements. Based on the unsustainable infiltration rate and the confirmation of varying made ground depths; infiltration is not suitable for this site.

Watercourse

There is no watercourse within the vicinity.

Surface Water Sewer

The sewer network to the south of the site has a SW connection provided for both plots, therefore this is the proposed point of connection with a discharge of maximum 5 l/s during all storm events including the 1 in 100 year + 20% climate change. The asset owner will need to give final approval for this rate, UU were unable to discuss potential rates as they are not responsible until the S104 is completed.

Combined Sewer

There are no combined sewers suitable for discharge.

5.3 Climate Change

In February 2016, the EA released new guidance on the application of climate change allowances. The guidance provides allowances for potential increases in river flow, and potential increases in rainfall intensity which require consideration as part of any surface water drainage strategy for the new development.

The EA guidance Table 2 describes the application of climate change rainfall allowances for small and urban developments and is replicated below.

Table 5.1 Climate Change Allowances on Rainfall Intensity

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

The design life for the temporary scheme is not likely to exceed 5 years and as such, the percentiles for the '2020s' could be applied to the drainage calculations. To remain conservative with the design, due to ever increasing rainfall events, the design will assess for 20% climate change applied to the 1 in 100 (1%) annual probability event. This figure will be used in the design of the surface water network so to protect the development from flooding over its lifetime.

5.4 Attenuation

The site is 1.6ha in development area, the impermeable area is a total 1.06ha requiring positive drainage. This allows for all hardstanding and building roofs. As flow from the site is restricted to 5l/s an aspect of on-site attenuation will be required to ensure flooding does not occur or is managed on site in the 100 year + climate change events.

5.4.1 Plot A

Plot A does not require a positive drainage connection, the use of a hardcore surface will allow water to be naturally lost to the ground through low levels of infiltration and evaporation.

5.4.2 Plot B

Plot B is designated for the two tent structures and associated hard standing. All drainage is to below ground via gullies for the external areas and rainwater downpipes for the structures. There are 3 proposed attenuation basins which provide storage in peak events. These are a maximum 1m deep with 1 in 3 side slopes.

There is flooding within the hydraulic simulation for the 100-year event of 32m3 from MH SW10. This will result in surface ponding in the access road, however based on the levels, the exceedance will fall towards the landscaped bund to the north. There will be no limitations to access and egress in this highly unlikely event. If the recommended 5% climate change allowance is applied there is no flooding.

The attenuation is to be maintained by the owner and is not to be offered for adoption. Maintenance requirements are outlined in Section 7 of this report.

6.0 Sustainable Drainage Systems (SuDS)

Section 1.1 of the SuDS Manual (CIRIA C753) states the following:

"Sustainable drainage systems (SuDS) can deliver multiple benefits.

Surface water is a valuable resource and this should be reflected in the way it is managed and used in the built environment. It can add to and enhance biodiversity, beauty, tranquillity and the natural aesthetic of buildings, places and landscapes and it can help make them more resilient to the changing climate."

"The philosophy of sustainable drainage systems is about maximising the benefits and minimising the negative impacts of surface water run-off from developed areas.

The SuDS approach involves slowing down and reducing the quantity of surface water runoff from a developed area to manage downstream flood risk, and reducing the risk of that runoff causing pollution. This is achieved by harvesting, infiltrating, slowing, storing, conveying and treating runoff on site and, where possible, on the surface rather than underground. Water then becomes a much more visible and tangible part of the built environment, which can be enjoyed by everyone."

The SuDS Manual describes the foul pillars of SuDS design as Water Quality, Water Quantity, Amenity and Biodiversity as illustrated in *Figure 6.1*.

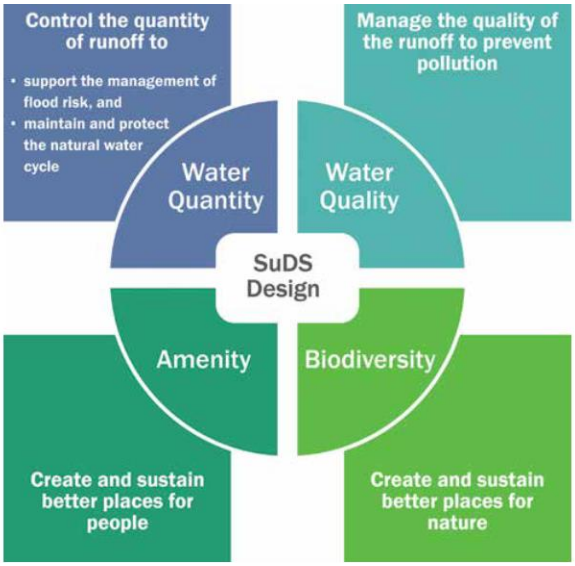

Figure 6.1 – Pillars for SuDS Design

6.1 Water Quantity

The development will be considered as a greenfield site in order to calculate the allowable discharge rates and approximate attenuation volumes. These are based on an area of the development and the assumed minimum allowable rate is 5 l/s. Consultation with the LLFA has confirmed this approach. The greenfield calculation is within Appendix C.

The greenfield runoff rates for the site are shown in Table 6.1.

Plot	Area	Greenfield Run Off Rate (QBAR) (l/s)
Plot B	0.846 ha	5.01

Table 6.1 – Greenfield Runoff Rate

The restriction in discharge rates will result in the requirement for surface water to be attenuated on site prior to discharge. To limit the amount of storage required the extents of new impermeable areas within the development proposals should be kept to a practicable minimum and source control features introduced.

Control of discharge rates and the management of surface water on site will ensure that there is no increased risk of flooding as a result of the development.

6.2 Potential SuDS Measures

There are potential SuDS measures that could be utilised to meet with the recommendations as set out in *Table 6.2* below.

		Benefits		
Components	**Comments**	**Quantity**	**Quality**	**Amenity & Biodiversity**
Green/Blue Roofs	Not suitable for this development due to temporary tent structures	✓	✓	✓
Raingardens	Raingardens can capture run off from the proposed hard standing areas providing an amount of treatment for any pollutants present.	✓	✓	✓
Pond	The development will require some form of attenuation and the inclusion of a pond in the design allows for this whilst offering the benefits outlined opposite.	✓	✓	✓

Permeable Paving / Infiltration	Permeable paving is included as part of the scheme where car parking is provided. All external car parking provides an opportunity for permeable paving.	✓	✓	
Oversized pipes or proprietary below ground storage and outfall to the nearest public sewer.	Below ground storage may need to be provided to supplement any other SuDS components.	✓	✓	
Filter Strips/Swale	Subject to the design of the external spaces, swale may be included in the development in soft landscaped areas.	✓	✓	✓
Manhole Catchpits	Manhole catchpits will be included as required to capture silt and reduce potential blockages within the network.	✓	✓	

Table 6.2 – Suitable SuDS measures

6.3 Water Quality

The SuDS design for the development will ensure that the quality of any receiving water body is not adversely affected and preferably enhanced in accordance with CIRIA SuDS Manual C753, Chapter 4.

The final strategy for pollution control will be confirmed as part of the detailed design, however at this stage of the assessment, an appropriate upstream SuDS treatment train can be incorporated into the design prior to the final discharge to the combined sewer.

The recommended approaches for water quality risk management are given in the SuDs Manual C753 Table 26.1. With reference to Table 26.1, the Simple Index approach will be used as the initial Pollution Hazard Index characterisation for this site.

Pollution Hazard Indices are given for different land uses in Table 26.2 of the SuDS Manual C753. In accordance with Table 26.2 of the SuDS Manual, the proposed development will have the pollution hazard indices as shown in *Table 6.3***.**

Table 6.3 Summary of Pollution Indices for Residential Development

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Commercial yard or delivery areas	Medium	07	0.6	0.7
Commercial roofs	Low	0.2	0.2	0.05
Non residential car parking with infrequent change	Low	0.5	0.4	0.4

Table 6.4 presents the mitigation indices provided by each SuDS method proposed as part of the drainage strategy, as set out in Table 26.3 of the SuDs Manual C753 (for surface water).

Table 6.4 SuDS Mitigation Indices for Discharge to Surface Waters

SuDS Measure	TSS	Metals	Hydrocarbons
Pond	0.7	0.7	0.5
Permeable Paving	0.7	0.6	0.7

Table 6.4 indicates that the proposed use of ponds and permeable paving provides adequate water treatment for the proposed development.

7.0 Maintenance

This section is intended to give an overview of the operation and maintenance for the drainage features included within the drainage and in relation to typical details. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise due to project constraints.

The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues with the operations and then adjusted to suit the site requirements.

The surface water network has been designed to accommodate the 1 in 100 (1%) Annual Probability storm event including an allowance for climate change. It may be that the exceedance flows above the 1 in 30 (3.3%) Annual Probability storm event are stored within the site partially above ground, on non-habitable external landscaping, parking or other space. As the flows are generally being attenuated on site, there will be a period of time after storm events where the network is still partially or fully surcharged and is draining down. Where this surcharging is still present after 48 hours appropriate action should be taken as noted in this section.

7.1 Components

The following components may be included within the drainage design for the proposed development:

- Manholes;
- Pipes;
- Permeable paving;
- Ponds; and,
- Flow control units.

A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

It is assumed that the maintenance of the drainage network will be the responsibility of the land owner as a private network. The land owner may however appoint an on-site facilities management team to be responsible for maintenance. In this case it is proposed that united utilities are responsible for the main below ground drainage.

A copy of the final construction drainage layout should be provided in the final Operations and Maintenance Manual.

It is recommended that the drainage system is inspected as a minimum twice a year, with the system also being inspected after any major storm event.

Significant sediment deposition is likely in areas used for storage, so a post clean-up operation may be required including the removal of litter, vegetation, sewerage debris and larger objects.

Long-term management practices include monthly sweeping of external paved areas. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilised during storm events and transported to the drainage system.

During the winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris and litter.

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

7.2 Manhole and Catch Pits

Access points have been located at the head of each run, at a change in direction and at a change of pipe size in accordance with Building Regulations – Approved Document H.

The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access.

7.3 Pipes

Pipes are proprietary products and the materials can vary across the site and as such, where used the manufacturer's recommendations should be followed. Regardless of the product used, the pipes will be fully complaint with the Curtins' drainage specification.

Pipes are intended to be the main conveyance across the development and where oversized they form the attenuation volume required by the limitation of the discharge rate. They are intended to be dry except for during rainfall events. These have been designed to be self-cleansing where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to overall pipe size.

Access for maintenance is provided through access chambers and manholes.

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

Table 7.1 Pipe Maintenance Measures

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

7.4 Permeable Paving

The permeable pavements are intended to be water quality and attenuation storage features. These features are intended to be dry except during rainfall events.

The surface has been designed to be porous or to contain gaps where rain can flow through the upper construction layers into the voided stone or attenuation tank which makes up the subbase.

Access for maintenance is provided as this is a surface feature only.

Regular inspection and maintenance is important for the effective operation of the permeable pavement.

Permeable paving needs to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.

Permeable paving should be inspected and cleaned in accordance with the manufacturer's details.

Table 7.2 Permeable Paving Maintenance Measures

Maintenance Schedule	Required Action	Frequency
Regular maintenance\ inspection	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing adjacent areas.	As required
	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying.	As required
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has	As required

	been raised to within 50mm of the level of the paving.	
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required.
Monitoring	Initial inspection	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three monthly, 48h after large storms in first six months.
	Inspect silt accumulation and establish appropriate brushing frequencies.	Annually
	Monitor inspection chambers.	Annually

7.5 Ponds

Regular inspection and maintenance is important for the effective operation of ponds as designed. Maintenance responsibility for a detention basin and its surrounding area should be placed with the assigned Maintenance Manager.

Regular mowing in and around ponds is required only along maintenance access routes, amenity areas (e.g. footpaths), and across some embankments. The remaining areas can be managed as “meadow”, unless additional management is required or desired for landscaping purposes.

Plant management, to achieve the required habitat/appearance, should be specified clearly in a maintenance schedule by the landscape architect planned to coincide with other site wide maintenance operations.

Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, especially where run-off is taken from potentially contaminated areas such as car parks/service yards.

Table 7.3 Detention Basin Maintenance Measures

Maintenance Schedule	Required Action	Frequency
Regular maintenance\inspection	Litter and debris removal	Monthly or as required
	Grass cutting – for spillways and access routes	Monthly (during growing season) or as required
	Grass cutting (meadow/long grass)	Half yearly (spring before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants/dead growth.	Monthly
	Inspect inlets, outlets and overflows for blockages and clear if required.	Monthly
	Inspect banksides structures and pipework etc. for evidence of physical damage.	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly for first year then annually or as required
	Check any penstocks and other mechanical devices.	Annually

	Tidy all dead growth before start of growing season.	Annually
	Remove sediment from inlets, outlet.	Annually (or as required after heavy rainfall events)
	Manage wetland plants in outlet pool – where provided.	Annually
Occasional maintenance	Re-seed areas of poor vegetation growth (seed mix to landscape architect's specification).	Annually, or as required. As per landscape architect's specification.
	Prune and trim any trees and remove cuttings.	Every 2 years or as required
	Remove sediment from inlets, outlets, forebay and main basin	Every 5 years (or as required after heavy rainfall events).
Remedial actions	Repair of erosion or other damage by re-seeding or re-turfing.	As required.
	Realignment of rip-rap if present.	As required.
	Repair/rehabilitation of inlets, outlets and overflows.	As required.
	Re-level uneven surfaces and reinstate design levels.	As required.

7.6 Flow Control Units

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

The flow controls are specific as Hydro-brake or similar approved plus an orifice plate and are proprietary products, therefore manufacturers recommendations should also be taken into consideration.

Access for maintenance has been provided within manhole chambers.

Table 7.4 Flow Control Unit Maintenance Measures

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required).	Inspect inlets for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
Regular maintenance\ inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly
	Remove sediment from pre-treatment structures and flow control chambers.	Annually (or as required after heavy rainfall events)
Remedial Actions	Repair/rehabilitation of inlets.	As required.

8.0 Conclusions and Recommendations

Curtins has been appointed by Morgan Sindall to prepare an FRA in support of a planning application for the proposed temporary tent structures and associated car parking at Digital Way, Liverpool.

The FRA provides information on the nature of flood risk at the site and follows Government guidance with regards to development and flood risk. The report is based on currently available information and preliminary discussions.

The assessment has been undertaken in accordance with the standing advice and requirements of the EA as outlined in the Communities and Local Government's NPPF and accompanying PPG.

The surface water management strategy has been reviewed in relation to the DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems and the LLFA guidance with respect to surface water methods, SuDS provision and outfall options.

The report concludes that:

- The site is located entirely within Flood Zone 1, defined as having a 'Low' probability with less than a 1 in 1000 (0.1%) Annual Probability of flooding from rivers and the sea.
- In accordance with PPG Table 2, residential uses are classified as 'Less Vulnerable' development. According to PPG Table 3, the land uses are appropriate for Flood Zone 1 without the need to apply the Sequential or Exception Test.
- Consideration of climate change has been taken into account and demonstrates the site is not considered to be impacted from fluvial flooding.
- The site is not considered to be susceptible to surface water flooding.
- The site is considered as being at a low risk of flooding from all other sources.
- Surface water discharge from the proposed development will be restricted to the greenfield equivalent (with a minimum 5 l/s) for all events up to and including the 1 in 100 (1%) Annual Probability plus climate change event.
- The development proposals include for the introduction of sustainable urban drainage in the form of permeable paving and attenuation pond, providing a betterment compared to the existing situation.
- Surface water attenuation will be provided for all events up to and including the 1 in 100 (1%) Annual Probability plus climate change event with exceedance flows managed on site so not to increase flood risk elsewhere.
- No foul drainage is required.

9.0 Appendices

Appendix A Site Layout

Convent

70

309

311

BARTHOWEN ROAD

11

3

4

315a

315d

317a

317d

319a

321

321a

323a

333a

1

11

1a

4

323 to 337

EDGE LANE

54.9m

55.8m

53.3m

TCB

PLOT A

CAR AND GOODS VEHICLE PARKING

153 Standard Car Parking Spaces
13 Disabled Car Parking Spaces

P

V

Road Bollards to be Removed.

Road Bollards to be Removed.

DIGITAL WAY

INNOVATION BOULEVARD

STUDIO BUILDING No. 1

(60m x 30m)

PLOT B

GOODS VEHICLE MANOEUVRING AND PARKING AREA.

STUDIO BUILDING No. 2

(60m x 30m)

PLOT C

El Sub Sta

Notes

This Document is presented to the Client named below in respect of the Project named below, and may not be used or relied on by any other person or by the client in relation to any other matters not covered specifically by the scope of this Document.

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This Document has been prepared by Kier Business Services Limited and no individual is personally liable in connection with the preparation of this Document Type. By receiving this Document and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise Kier Business Services Limited has used reasonable endeavours to provide information that is correct and accurate and the Document sets out reasonable conclusions that have been reached on the basis of the information available.

KEY

- SITE BOUNDARY
- VEHICULAR GRADE SURFACING. To be Tarmac surface laid to falls, suitable surface for Heavy Vehicle Movements.
- PEDESTRIAN FOOTWAY. To be Tarmac surface laid to falls, suitable for pedestrian footfall and DDA Level Access.
- HARDSTANDING FOR LIGHT VEHICLE ACCESS. Type 1 MOT Compacted and laid to falls, suitable for light vehicle movements only.
- EXISTING PERIMETER BUNDS TO BE RETAINED.
- PROPOSED PERIMETER GRASSED BUND. Bund to be formed from spoil from existing site strip and alterations, height to match existing. Bunds finshed with a cover of topsoil recovered from the site alterations, and to be planted up with appropriate species of wildflowers.
- PROPOSED WILDFLOWER PLANTING TO EXISTING/PROPOSED BUNDS. Exact mix to be confirmed when subsoil composition known.
- SURFACE WATER TEMPORARY DETENTION AREAS.
- NEW PERIMETER WELDMESH FENCE. Height: 2.4m Colour: Green
- P — INDICATES POSITION OF NEW PEDESTRIAN ACCESS GATE WITHIN WELDMESH FENCING. Width: 1.2m
- V — INDICATES POSITION OF NEW VEHICLE ACCESS GATES WITHIN WELDMESH FENCING. Width: To match Bellmouth Width.
- TREATED TIMBER POST AND RAIL FENCE. 1m high post and rail fence for edge protection to water retention areas. Rails at 900mm and 450mm above Surface.
- CRASH PROTECTION GUARD RAIL. 1m High Heavy Duty Steel Guard Rail painted Yellow, suitable to protect Light columns from HGV's.
- + 36.250 — INDICATES EXISTING LEVELS
- ⊕ 36.250 — INDICATES PROPOSED LEVELS

NOTE
AREAS OF EXISTING BUND ARE TO BE REMOVED ADJACENT TO EACH OF THE 3No. EXISTING BELMOUTHS.

A LENGTH OF BUND ADJACENT TO STUDIO BUILDING No. 1 ALSO REQUIRES REMOVAL.

N

Rev.	Details	Author & Date	Checked & Date	Approv'd & Date
P06	Amendments to Plot A surface finishes by Morgan Sindall request. Issued for Stage Approval.	AB 26.08.20	GT 26.08.20	GT 26.08.20
P05	Issued for Stage Approval.	AB 10.08.20	GT 10.08.20	GT 10.08.20
P04	Surface Finish materials amended to all plots. Surface water attenuation ponds added including guarding.	AB 07.08.20	GT 07.08.20	GT 07.08.20
P03	Amendments to Plot B, Building footprints and associated circulation routes amended. West Fence Line amended to avoid mature trees.	AB 06.08.20	GT 06.08.20	GT 06.08.20
P02	Amendments to Plot A finish, Bund added to Plot A and pedestrian level access added to Plot B.	AB 03.08.20	GT 03.08.20	GT 03.08.20
P01	First Issue	AB 28.07.20	GT 28.07.20	GT 28.07.20

KIER

Issuing Office: LIVERPOOL
Tel. no.:
email:

Internal Project Number: 031658

Client: Morgan Sindall

Project name: Liverpool - Pop Up Studios

Drawing Title: Proposed GA Plan - Site General Arrangement

Scale	Original Size	RIBA Stage	
1:500	A1	Stage 03	
Date of First Issue	Author	Checked	Approved
28/07/2020	AB	GT	GT

Drawing Number: 031658-DBS-XX-XX-DR-A-1200
Project | Originator | Volume | Type | Role | Number

Status: S4
Rev.: P06

031658-DBS-XX-XX-DR-A-1200_Proposed Site Plan_S4P06.dwg

Appendix B **Topographical Survey**

Stakeholder Correspondence

T. (0161) 7129533 F. (0161) 7120266 W. www.sepsurvey.com E. info@sepsurvey.com

N

PLAN GRID NORTH

File Name: S20726-301.dwg

LEGEND

AV	AIR VALVE	LBY	LIFEBUOY
BB	BELISHA BEACON	MH	MANHOLE
BOL	BOLLARD	MKR	MARKER
BT	BT PAY POLE	MP	MILEPOST
BM	BM	MP	MOORING POINT
BM	BENCH MARK	MW	MONITORING WELL
BH	BOREHOLE	NP	NEWSPAPER BOX
BT	BT INSPECTION COVER	PB	POST OFFICE BOX
CB	CATCH PIT	PC	PETROL CAP
CCTV	CCTV CAMERA POST	PP	PETROL PUMP
CH	CHAINAGE	PT	PEAT
COM	COMMUNICATIONS COVER	RE	RODDING EYE
CSC	CAR CHARGING STATION	RL	RIDGE LEVEL
CV	CONTROL VALVE	RM	RISER MAIN
DC	DRAINAGE CHANNEL	RTW	RETAINING WALL
DP	DOWN PIPE	RWP	RAINWATER PIPE
EC	EDGE	SAT	SATELLITE
EIC	ELEC INSPECTION COVER	SNP	NAME PLATE
EL	EAVES LEVEL	SP	SIGN POST
ELB	ELECTRIC BOX	SW	SOFFIT LEVEL
ER	EARTH ROD	TV	STOP VALVE
FB	FLOWER BED/POLE	TC	TELEPHONE CALL
FL	FINISHED FLOOR LEVEL	TCB	TELEPHONE CALL BOX
FP	FENCE POST	TK	TANK
FP	FLAG POLE	TL	TRAFFIC LIGHT
G	GULLY	TLB	TRAFFIC LIGHT BOX
GLT	GARDEN LIGHT	TP	TELEGRAPH POLE
GP	GATE POST	TP	TELEGRAPH POLE
GST	GAS TAP	VP	VENT PIPE
GV	GAS VALVE	WC	WATER METER
IC	IRRIGATION COVER	WO	WASH OUT
K	INVERT LEVEL	WST	WATER STOP TAP
LC	LAMP COLUMN	WV	WATER VALVE
LAD	LADDER	WM	TREE (WITH STEM)
LD	LAND DRAIN	WO	TREE MULTI-TRUNK
LP	LAMP		

PAL	PALISADE		BATTLE FEATURE
R/W	WIRE MESH		KERB
R/C	RETAINING WALL		FENCE
C/W	CHAIN LINK		SURFACE CHANGE
P/W	POST AND WIRE		RAIL
P/R	POST AND RAIL		TOP BANK
I/R	IRON RAIL		BOTTOM BANK
C/B	CLOSE BOARDED		BUILDING
OHL	OVER HEAD		CANOPY
OHL(E)	TOP OF FEATURE		OVER HEAD ELECTRICAL
GATE	GATE		OVER HEAD TELECOM
BH	BOREHOLE		
	BATTER		HEDGE

NOTES:
All levels relate to O.S (Newlyn) Datum, Established using network RTK.
Survey plotted on a plane local grid, orientated to National Grid.

SURVEY STATIONS

Name	Eastings	Northing	Height
SEP1	337989.884	390722.369	51.267
SEP2	337687.822	390693.387	51.331
SEP3	337852.283	390611.690	53.556
SEP4	337872.582	390552.555	51.787
SEP5	337866.804	390667.883	51.472

01
02
03

SHEET LAYOUT

0 2m 4m 8m 12m 16m

SCALE BAR

REV	DATE	DESCRIPTION

SURVEY & ENGINEERING PROJECTS

Client
Morgan Sindall Construction & Infrastructure Limited
6th Floor 2 Anchorage Quay
Salford
Manchester
M50 3YW

Project Title
Topographical Survey of Land at:
Innovation Boulevard
Liverpool
L7 9PW

Surveyed	Drawn	Checked
A.Nesbitt	D.Shipton	R.Critchley

Scale	Date	Drawing Ref.	No.	Size	Rev
1:200	July 20	S20726-T	01	A0	--

T. (01695) 729835 F. (01695) 725566 W. www.sepsurvey.com E. info@sepsurvey.com

PLAN GRID NORTH

File Name: S20726-3DT.dwg

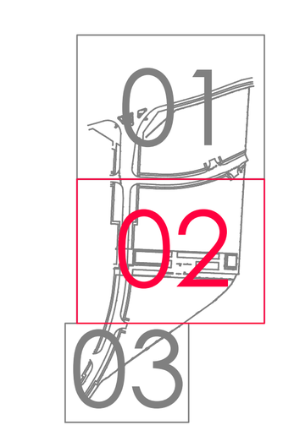
LEGEND

AV	AIR VALVE	LBY	LIFEBUOY
BB	BELISHA BEACON	MH	MANHOLE
BOL	BOLLARD	MKR	MARKER
BH	BORE HOLE	MS	MILE STONE
BIN	BIN	MP	MOORING POINT
BM	BENCH MARK	MW	MONITORING WELL
BS	BUS STOP	OP	OUTFALL PIPE
BT	BT INSPECTION COVER	PB	POST OFFICE BOX
CB	CONTROL BOX	PN	PYLON
CCTV	CCTV CAMERA POST	PP	PETROL PUMP
COL	COLUMN	PT	POST
COM	COMMUNICATIONS COVER	RE	RODDING EYE
CST	CAR CHARGING STATION	RL	RIDGE LEVEL
CTV	CABLE TV COVER	RS	ROAD SIGN
DC	DRAINAGE CHANNEL	RTW	RETAINING WALL
DP	DOWN PIPE	RWP	RAINWATER PIPE
DR	DRAIN	SAP	SAPLING
EIC	ELEC INSPECTION COVER	SNP	NAME PLATE
EL	EAVES LEVEL	SP	SIGN POST
ELB	ELECTRIC BOX	SOF	SOFFIT LEVEL
ER	EARTH ROD	SV	STOP VALVE
EP	ELECTRICITY POLE	TB	TRAFFIC BOLLARD
FL	FINISHED FLOOR LEVEL	TCB	TELEPHONE CALL BOX
FH	FIRE HYDRANT	TIE	TIE WIRE
FP	FLAG POLE	TL	TRAFFIC LIGHT
G	GULLY	TLB	TRAFFIC LIGHT BOX
GLT	GROUND LIGHT	TM	TICKET MACHINE
GP	GATE POST	TP	TELEGRAPH POLE
GST	GAS TAP	VP	VENT PIPE
GSV	GAS VALVE	WM	WATER METER
IC	INSPECTION COVER	WO	WASH OUT
IL	INVERT LEVEL	WST	WATER STOP TAP
KO	KERB OUTLET	WSV	WATER STOP VALVE
LAD	LADDER	G0.8ø	TREE GIRTH (Dia.)
LD	LAND DRAIN	MG	TREE MULTI-GIRTH
LP	LAMP POST		DRIP LINE
PAL	PALISADE		WATER COURSE
W/M	WIRE MESH		KERB
B/W	BARBED WIRE		FENCE
C/P	CONC PANEL		SURFACE CHANGE
P/W	POST AND WIRE		WALL
P/R	POST AND RAIL		TOP BANK
I/R	IRON RAIL		BOTTOM BANK
C/B	CLOSE BOARDED		BUILDING
CH/L	CHAIN LINK		BUILDING CANOPY
(99.99)	TOP OF FEATURE		OVER HEAD ELECTRICAL
	GATE		OVER HEAD TELECOM
	STATION		HEDGE
	BOREHOLE		
	BATTER		

NOTES:

All levels relate to O.S (Newlyn) Datum, Established using network RTK.
Survey plotted on a plane local grid, orientated to National Grid.

SURVEY STATIONS			
Name	Easting	Northing	Height
SEP1	337989.092	390722.385	53.263
SEP2	337897.924	390691.887	54.553
SEP3	337852.283	390611.691	55.516
SEP4	337872.341	390522.555	55.707
SEP5	337864.604	390467.803	55.453



SHEET LAYOUT

0 2m 4m 8m 12m 16m

SCALE BAR

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1:200	July 20	S20726-T	02	A0	--

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N

PLAN GRID NORTH

File Name: S20726-3DT.dwg

LEGEND

AV	AIR VALVE	LBY	LIFEBUOY
BB	BELISHA BEACON	MH	MANHOLE
BOL	BOLLARD	MKR	MARKER
BH	BOREHOLE	MS	MARKER STONE
BRN	BRAZIER HOLE	MP	MOORING POINT
BM	BENCH MARK	MW	MONITORING WELL
BS	BUS STOP	OP	OUTFALL PIPE
BT	BT INSPECTION COVER	PB	POST OFFICE BOX
CB	CONTROL BOX	PN	PYLON
CCTV	CCTV CAMERA POST	PP	PETROL PUMP
COL	COLUMN	PT	POST
COM	COMMUNICATIONS COVER	RE	RODDING EYE
CP	CAR CHARGING STATION	RL	ROOF LEVEL
CTV	CABLE TV COVER	RS	ROAD SIGN
DC	DRAINAGE CHANNEL	RTW	RETAINING WALL
DP	DOWN PIPE	RWP	RAINWATER PIPE
DR	DRAIN	SAP	SAPLING
EIC	ELEC INSPECTION COVER	SNP	NAME PLATE
EL	EAVES LEVEL	SP	SIGN POST
ELB	ELEC BOX	SSF	SPOT FACE LEVEL
ER	EARTH ROD	SV	STOP VALVE
EP	ELECTRICITY POLE	TB	TRAFFIC BOLLARD
FL	FINISHED FLOOR LEVEL	TCB	TELEPHONE CALL BOX
FH	FIRE HYDRANT	TIE	TIE WIRE
FP	FLAG POLE	TL	TRAFFIC LIGHT
G	GULLY	TLB	TRAFFIC LIGHT BOX
GLT	GRID RD LIGHT	TM	TICKET MACHINE
GP	GAS POST	TP	TELEGRAPH POLE
GST	GAS TANK	VP	VENT PIPE
GSV	GAS VALVE	WM	WATER METER
IC	INSPECTION COVER	WO	WASH OUT
IL	INVERT LEVEL	WST	WATER STOP TAP
KO	KERB OUTLET	WSV	WATER STOP VALVE
LAD	LADDER	GO.tbl	TREE GIRTH (Dia.)
LD	LAND DRAIN	MG	TREE MULTI-GIRTH
LP	LAMP POST		

PAL	PALISADE		DRIP LINE
W/M	WIRE MESH		WATER COURSE
B/W	BARBED WIRE		KERB
C/P	CONC PANEL		FENCE
P/W	POST AND WIRE		SURFACE CHANGE
P/R	POST AND RAIL		WALL
C/F	CONC FENCE		TOP / BANK
W/B	WOOD BOARDED		BOTTOM BANK
CH/L	CHAIN LINK		BUILDING
[99.99]	TOP OF FEATURE		BUILDING CANOPY
	GATE		OVER HEAD ELECTRICAL
	STATION		OVER HEAD TELECOM
	BOREHOLE		HEDGE
	BATTER		

NOTES:
All levels relate to O.S (Newlyn) Datum. Established using network RTK.
Survey plotted on a plane local grid, orientated to National Grid.

01
02
03

SHEET LAYOUT

0 2m 4m 8m 12m 16m
SCALE BAR

REV	DATE	DESCRIPTION

SURVEY & ENGINEERING PROJECTS

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Morgan Sindall Construction & Infrastructure Limited
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Project Title
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A.Nesbitt	D.Shipton	R.Critchley

Scale	Date	Drawing Ref.	No.	Size	Rev
1:200	July 20	S20726-T	03	A1	--

Jake Busby

From: Jackson, Dave <Dave.Jackson@liverpool.gov.uk>
Sent: 28 July 2020 17:44
To: Jake Busby
Subject: RE: Film Studios - Liverpool

Jake

I'm on site for most of tomorrow so I'm afraid I won't be free but it might not be required if the information below will answer your queries

The sites are classed as greenfield for drainage purposes so in accordance with NPPF the max surface water run-off will be approx. 5 l/s for each plot which is quite prohibitive. This might be a bit flexible depending on the proposed length of time the studios intend to operate but with the ever increasing frequency of extreme rainfall events this is something that should be taken into consideration.

You don't say what Plots A & C are to be used for but I'm assuming they are to be for parking as they to have a gravel finish so I would class this an "as is" for drainage purposes. There are possibly some further mitigation design measures that can be taken such as having the car parking area in a permeable surfacing such as grasscrete. It might also be possible to create above ground storage areas for any flooding. Additional consideration might be required if the infiltration rates are poor with respect to additional tents being erected on the site as this then concentrates any run off instead of it being distributed evenly over the permeable surfaces.

The surface water sewers are not yet adopted by UU and are probably under a Section 104 agreement and have yet to be formally adopted. I would strongly suggest that UU are contacted to find out when these sewers will be adopted and if there will be any restrictions regarding connection to them.

There is a possibility the UU might offer a way of maximising the surface water discharge limit from Plot B as if the design of the surface water system for the whole of the Innovation Boulevard development included allowances for the surface water run-off from each of the individual plots then it might be possible to use this as part of any permissions. This is quite a simplistic approach which might need more detailed input but it is a least worth investigation. I think the best person to contact in the first instance in UU would be Andy Jack – Developer Engineer Andy.Jack@uuplc.co.uk T: 01925 679412

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: Jake Busby [mailto:Jake.Busby@curtins.com]
Sent: 28 July 2020 17:16
To: Jackson, Dave <Dave.Jackson@liverpool.gov.uk>
Subject: Film Studios - Liverpool

Hi Dave,

Will give you a call tomorrow if you're free but as a precursor –

We have 3 plots for the film studios known as Plot A, B and C. These are as below (with some info on plot B);

Plot B will be drained via a positive connection to the sewers in Digital Way.

Plot A and C will receive a temporary gravel finish and not be drained positively. I.e. the surface will be free draining. I have instructed some soakaway tests but as the surfacing is to be unbound I want to try and avoid the need for restricted discharges to the sewer network. Even with a very poor infiltration rate it will be pretty much "as is" in terms of drainage.

In the event that additional tents are required on plots A and C these will drain onto the surfacing and into the ground.

Just want to confirm that this approach won't hold up planning.

Kind Regards,

Jake Busby
Project Engineer
T. 0151 726 2000
jake.busby@curtins.com

51-55 Tithebarn Street
Liverpool L2 2SB

Jake Busby

From: Perry, Graham <Graham.Perry@uuplc.co.uk>
Sent: 10 July 2020 17:03
To: Jake Busby
Subject: RE: Existing Infrastructure @ Liverpool Innovation park

Hello Jake

I don't but would assume it's the landowner of your site. I don't think I could disclose that information anyway under Data protection

Regards

Graham Perry

Graham Perry
Development Engineer
Developer Services
M: 07557 577548
T: 01925 679405
unitedutilities.com

From: Jake Busby [mailto:Jake.Busby@curtins.com]
Sent: 10 July 2020 17:01
To: Perry, Graham <Graham.Perry@uuplc.co.uk>
Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: RE: Existing Infrastructure @ Liverpool Innovation park

Hi Graham,

Don't suppose you know who the S104 applicant\holder is??

Thanks,

Jake Busby Project Engineer
Curtins
T. 0151 726 2000 | jake.busby@curtins.com

From: Perry, Graham <Graham.Perry@uuplc.co.uk>
Sent: 10 July 2020 16:59
To: Jake Busby <Jake.Busby@curtins.com>
Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: FW: Existing Infrastructure @ Liverpool Innovation park

Hello Jake

Unfortunately I do not have access to the details of the original agreement so I would expect surface water runoff to be restricted to the greenfield runoff rate at source for each parcel of land prior to discharging into the sewer.

Also please bear in mind that the sewers are not UU assets so you must seek the permission of the owner to make the connection

Regards

Graham Perry

Graham Perry
Development Engineer
Developer Services
M: 07557 577548
T: 01925 679405
unitedutilities.com

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From: SewerAdoptions
Sent: 02 July 2020 14:46
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: FW: Existing Infrastructure @ Liverpool Innovation park

Hi

Think this is a pre dev query about planning/discharge consents

Thanks

Lana Jaundrell
Developer Services Assistant
Developer Services & Metering
Customer Services
T: 01925 679319
unitedutilities.com

If you have received a great service today why not tell us?
Visit: unitedutilities.com/wow

From: Wastewater Developer Services
Sent: 02 July 2020 14:43
To: SewerAdoptions
Subject: FW: Existing Infrastructure @ Liverpool Innovation park

Hi

One for you

Thanks sue

Sue King
Customer Services Advanced
Developer Services & Metering
Customer Services
T: 01925 679413
unitedutilities.com

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Visit: //unitedutilities.com/wow

Please note that as from the 1 April 2018 the fee for the administration of a Building Over Agreement will be £153.00 (this fee is none vatable) http://www.unitedutilities.com/build-over-sewer.aspx).

Please send postal applications to the following address:

Wastewater Developer Services and Planning, 2nd floor Grasmere House, Lingley Mere Business Park, Lingley Green Ave, Great Sankey, Warrington WA5 3LP

Any applications sent to Gatewarth Industrial Estate will result in delays in your application.

From: Jake Busby [mailto:Jake.Busby@curtins.com]
Sent: 02 July 2020 13:59
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: Existing Infrastructure @ Liverpool Innovation park

Hello,

I require some guidance on some sewers currently under S104 on Innovation Boulevard, Liverpool. The council has sent me the UU records for the area, but I can't locate the planning application which enabled the development plots. On the sketch it shows the 3 plots, location is SJ 37935 90619.

I assume a discharge is pre-agreed on the use of the existing SW sewers constructed under the enabling plans. Would UU know this at all?

Please could you advise?

We are looking to put some temporary structures there to serve as film studios prior to the littlewoods building commencing. We won't need foul discharge, only SW. Unfortunately I can't fill in the PDE form as WfH and not got a printer!

Kind Regards,

Jake Busby
Project Engineer
T. 0151 726 2000
jake.busby@curtins.com

51-55 Tithebarn Street
Liverpool L2 2SB

United Utilities Maps for Safe Dig

Date :	01/07/2020 17:11:55
Centre X :	337907
Centre Y :	390583
Scale :	1000
UserName:	L1PS4F

Extract from maps of United Utilities' Underground Assets

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private service pipes may be shown by a blue broken line. United Utilities Water will not accept liability for any damage caused by the actual position being different from those shown.

United Utilities
Water for the North West

Appendix C Greenfield Run-off Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Jake Busby
Site name:	Plot B - Film Studios
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:	53.40873° N
Longitude:	2.93486° W
Reference:	658482759
Date:	Aug 09 2020 16:38

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.846

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	834	834
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):	5.01	5.01
1 in 1 year (l/s):	4.36	4.36
1 in 30 years (l/s):	8.52	8.52
1 in 100 year (l/s):	10.43	10.43
1 in 200 years (l/s):	11.88	11.88

Appendix D Proposed Drainage and Calculations

DIGITAL WAY

INNOVATION BOULEVARD

OUTFALL2
CL 54.120m
IL 52.600m

300mm1:200

SW11 1,200 dia PCC
CL 54.253m
IL 52.701m
FLOW CONTROL 5L/S

300mm1:200

SW10 1,200 dia PCC
CL 54.200m
IL 52.749m

150mm1:81

450 PPIC
CL 54.200m
IL 53.053m

300mm1:200

SW9 1,200 dia PCC
CL 54.207m
IL 52.953m

SW8 1,200 dia PCC
CL 54.332m
IL 52.995m

450 PPIC
CL 54.200m
IL 53.547m

150mm1:150

450 PPIC
CL 54.200m
IL 53.756m

150mm1:150

UNLINED ATTENUATION BASIN
1m DEPTH
INCOMING IL = 53.500m
OUTGOING IL = 53.200m

225mm1:85

300mm1:200

225mm1:36

UNLINED ATTENUATION BASIN
1m DEPTH
INCOMING IL = 53.500m
OUTGOING IL = 53.200m

300mm1:260

SW7 600 PPIC
CL 54.300m
IL 53.074m

225mm1:181

SW6 600 PPIC
CL 54.400m
IL 53.275m

225mm1:263

450 PPIC
CL 54.200m
IL 53.439m

150mm1:150

450 PPIC
CL 54.200m
IL 53.650m

150mm1:150

UNLINED ATTENUATION BASIN
1m DEPTH
INCOMING IL = 53.400m
OUTGOING IL = 53.300m

150mm1:150

450 PPIC
CL 54.200m
IL 53.450m

450 PPIC
CL 54.200m
IL 53.660m

DESIGN PHILOSOPHY
SURFACE WATER DESIGN
THE DESIGN PROVIDES POSITIVE DRAINAGE UP TO THE 100 YEAR 20% CLIMATE CHANGE EVENT WITH MANAGED EXCEEDANCE.
SW FLOW RATE: 5.0 L/S (BASED ON A MINIMUM 5L/S)
APPROXIMATE STORAGE REQUIREMENT: 250m³
OUTFALL: EXISTING SEWER IN DIGITAL WAY (OWNERSHIP TBC)
POLLUTION TREATMENT: ATTENUATION BASINS
SUSTAINABLE DRAINAGE: ATTENUATION BASINS
INFILTRATION IS NOT CONSIDERED APPROPRIATE FOR THIS SCHEME. TESTING TO BRE DIGEST 365 COMPLETED WITH NO SUCCESS.

NB:
1. LAYOUT SUBJECT TO COORDINATION.
2. COVER LEVELS AND INVERT LEVELS BASED ON APPROXIMATION OF FUTURE DEVELOPMENT LEVELS.
3. EXTERNAL LEVELS TO BE DESIGNED BY OTHERS.

GENERAL NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. FOR GENERAL NOTES REFER TO DRAWING.

DRAINAGE NOTES:

1. DESIGN FOR PLANNING PURPOSES ONLY.
2. DESIGN BASED ON TOPOGRAPHICAL SURVEY AND CCTV SURVEY INFORMATION AVAILABLE AT THE TIME OF DESIGN.
3. ALL EXISTING SEWERS, CONNECTIONS, PIPE SIZES AND INVERT LEVELS TO BE CONFIRMED BY CONTRACTOR PRIOR TO COMMENCEMENT OF WORKS TO ENSURE CONNECTIVITY. ANY VARIANCE FROM THE INFORMATION SHOWN SHOULD BE REPORTED TO THE ENGINEER FOR REVIEW.
4. WHERE EXISTING DRAINAGE IS BEING USED, ALLOWANCES SHOULD BE MADE TO REMEDIATE THIS DRAINAGE IN LINE WITH AVAILABLE CCTV SURVEY INFORMATION. IF NO SURVEY IS AVAILABLE, IT IS ADVISED TO OBTAIN ONE PRIOR TO COMMENCEMENT OF WORKS.
5. ALL EXISTING SERVICES TO BE LOCATED PRIOR TO COMMENCEMENT OF ANY DRAINAGE WORKS, AND WHERE NECESSARY PROTECTION OR DIVERSIONS TO BE UNDERTAKEN TO AVOID CONFLICT WITH THE PROPOSED WORK.
6. ALL RAINWATER POP UPS LOCATIONS AND SIZES INDICATIVE ONLY AND TO BE CONFIRMED BY THE ARCHITECT AND TENT DESIGNER.
7. COVER LEVELS, GULLY POSITIONS, AND BUILDINGS LOCATION ARE APPROXIMATE AND SHALL BE CONFIRMED BY ARCHITECT/ LANDSCAPE ARCHITECT.
8. ALL PIPE DIAMETERS GIVEN ARE NOMINAL INTERNAL PIPE DIAMETERS. THESE ARE TO BE CONFIRMED ONCE A DETAILED CAPACITY CHECK HAS BEEN UNDERTAKEN AT A LATER DESIGN STAGE.
9. OUTFALL CONNECTION(S) SUBJECT TO AGREEMENT WITH THE APPROVING AUTHORITY.

KEY

SW
100Ø@1:150 — PRIVATE SW SEWER

PROPOSED UNLINED ATTENUATION BASIN

ROAD GULLY

Rev:	Description:	Date:	By:	Chkd:
P02	ISSUED FOR PLANNING (S2)	26/08/20	JDB	AF
P01	INITIAL ISSUE	13/08/20	JDB	AF

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Status: ISSUED FOR INFORMATION — S2

Project: POP-UP TENTS
LIVERPOOL FILM STUDIOS

Drg Title: PLOT B
DRAINAGE OPTION 1

Size:	Date:	Drawn By:	Designed By:	Checked By:
A1	13/08/2020	JDB	JDB	AF

Scale: 1:250

Project No:	Originator:	Volume:	Level:	Type:	Role:	Category / Number:	Rev:
076604	CUR	B1	XX	DR	C	92001	P02

\\fs03\projects\076604-MTL_Design_Appraisal_Tents\04-Production\4A-Models-Drawings\CAD\92\

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

	Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
✓	SW6	0.242	5.00	54.400	600	1.125
✓	SW7	0.133	5.00	54.300	600	1.226
✓	SW8	0.090	5.00	54.332	1200	1.337
✓	SW9	0.090	5.00	54.207	1200	1.254
✓	SW10	0.045	5.00	54.200	1200	1.451
✓	SW11	0.000		54.253	1200	1.552
✓	OUTFALL2			54.120	600	1.520

Links (Input)

	Name	US Node	DS Node	Length (m)	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)
?	1.000	SW6	SW7	22.779	53.275	53.149	0.126	181.0	225	5.39
?	1.001	SW7	SW8	20.679	53.074	52.995	0.079	261.8	300	5.75
?	1.002	SW8	SW9	8.369	52.995	52.953	0.042	200.0	300	5.87
?	1.003	SW9	SW10	40.879	52.953	52.749	0.204	200.0	300	6.49
?	1.004	SW10	SW11	9.546	52.749	52.701	0.048	200.0	300	6.63
?	1.005	SW11	OUTFALL2	20.158	52.701	52.600	0.101	200.0	300	6.94

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	5	0	0
100	20	0	0

Node SW11 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	52.701	Product Number	CTL-SHE-0098-5000-1500-5000
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node SW8 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	53.130
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	9.0	0.0	1.000	80.0	0.0	1.001	0.0	0.0

Node SW9 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	53.120
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	18.0	0.0	1.000	100.0	0.0	1.001	0.0	0.0

Node SW6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	53.275
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	45.0	0.0	1.000	262.0	0.0	1.001	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	SW6	114	53.509	0.234	14.1	17.5489	0.0000	SURCHARGED
120 minute winter	SW7	114	53.509	0.435	15.6	1.0660	0.0000	SURCHARGED
120 minute winter	SW8	114	53.509	0.514	17.6	9.7726	0.0000	SURCHARGED
120 minute winter	SW9	114	53.508	0.555	14.7	14.6141	0.0000	SURCHARGED
120 minute winter	SW10	116	53.508	0.759	10.0	1.3287	0.0000	SURCHARGED
120 minute winter	SW11	116	53.508	0.807	5.6	0.9123	0.0000	SURCHARGED
15 minute summer	OUTFALL2	1	52.600	0.000	4.9	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW6	1.000	SW7	21.3	0.860	0.553	0.7552	
15 minute winter	SW7	1.001	SW8	33.6	0.719	0.492	1.4562	
15 minute winter	SW8	1.002	SW9	31.4	0.832	0.402	0.5893	
15 minute winter	SW9	1.003	SW10	28.4	0.704	0.363	2.8787	
15 minute winter	SW10	1.004	SW11	13.8	0.446	0.177	0.6722	
15 minute summer	SW11	Hydro-Brake®	OUTFALL2	4.9				34.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	SW6	180	53.912	0.637	23.1	75.6696	0.0000	SURCHARGED
180 minute winter	SW7	176	53.912	0.838	12.7	2.0544	0.0000	SURCHARGED
180 minute winter	SW8	180	53.912	0.917	14.5	31.0011	0.0000	SURCHARGED
180 minute winter	SW9	180	53.912	0.959	12.3	42.4040	0.0000	FLOOD RISK
180 minute winter	SW10	180	53.911	1.162	7.9	2.0343	0.0000	FLOOD RISK
180 minute winter	SW11	180	53.911	1.210	5.3	1.3680	0.0000	SURCHARGED
15 minute summer	OUTFALL2	1	52.600	0.000	4.9	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW6	1.000	SW7	23.3	0.789	0.606	0.9059	
15 minute winter	SW7	1.001	SW8	53.4	0.776	0.782	1.4562	
15 minute winter	SW8	1.002	SW9	35.6	0.836	0.454	0.5893	
15 minute winter	SW9	1.003	SW10	33.0	0.784	0.421	2.8787	
15 minute winter	SW10	1.004	SW11	15.9	0.508	0.203	0.6722	
30 minute winter	SW11	Hydro-Brake®	OUTFALL2	4.9				65.7

Results for 100 year +5% CC Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	SW6	236	54.117	0.842	26.1	118.7869	0.0000	FLOOD RISK
240 minute winter	SW7	236	54.117	1.043	11.7	2.5576	0.0000	FLOOD RISK
240 minute winter	SW8	236	54.117	1.122	14.6	46.2386	0.0000	FLOOD RISK
240 minute winter	SW9	236	54.117	1.164	13.1	61.6651	0.0000	FLOOD RISK
240 minute winter	SW10	236	54.116	1.367	8.0	2.3934	0.0000	FLOOD RISK
240 minute winter	SW11	236	54.116	1.415	5.4	1.5999	0.0000	FLOOD RISK
15 minute summer	OUTFALL2	1	52.600	0.000	4.9	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW6	1.000	SW7	26.3	0.792	0.682	0.9059	
15 minute winter	SW7	1.001	SW8	61.6	0.875	0.902	1.4562	
15 minute summer	SW8	1.002	SW9	40.1	0.790	0.512	0.5893	
15 minute winter	SW9	1.003	SW10	31.2	0.830	0.398	2.8787	
15 minute winter	SW10	1.004	SW11	12.9	0.525	0.165	0.6722	
30 minute summer	SW11	Hydro-Brake®	OUTFALL2	4.9				68.4

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	SW6	168	54.211	0.936	38.1	141.5598	0.0000	FLOOD RISK
180 minute winter	SW7	164	54.209	1.135	16.7	2.7819	0.0000	FLOOD RISK
180 minute winter	SW8	164	54.207	1.212	19.9	47.5468	0.0000	FLOOD RISK
180 minute winter	SW9	164	54.206	1.253	17.9	62.2737	0.0000	FLOOD RISK
240 minute winter	SW10	184	54.200	1.451	12.4	2.5407	19.0072	FLOOD
120 minute winter	SW11	118	54.200	1.499	7.2	1.6950	0.0000	FLOOD RISK
15 minute summer	OUTFALL2	1	52.600	0.000	4.9	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	SW6	1.000	SW7	-23.0	0.812	-0.598	0.9059	
15 minute summer	SW7	1.001	SW8	63.5	0.901	0.929	1.4562	
15 minute winter	SW8	1.002	SW9	36.3	0.834	0.464	0.5893	
15 minute winter	SW9	1.003	SW10	35.7	0.826	0.456	2.8787	
15 minute winter	SW10	1.004	SW11	16.0	0.534	0.204	0.6722	
180 minute winter	SW11	Hydro-Brake®	OUTFALL2	5.0				117.3

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