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Report on

SALTBOX SITE – BOGNOR REGIS

FLOOD RISK ASSESSMENT

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Revision History

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1. Executive Summary

Kirksaunders (KSA) has been commissioned by Landlink Estates to undertake a site-specific Flood Risk Assessment (FRA) for the proposed Saltbox site development north of Bognor Regis.

Full planning permission is sought for the Phase 1 development of 6.492 hectares of employment space (B1, B2 and B8) with associated parking, landscaping and public open space. In addition, outline planning permission is sought for the Phase 2 development of 5.512 hectares for additional employment units, warehousing, hotel, drive thru's, public house, gym and associated works. Based on Table 2 (Flood Risk Vulnerability Classification) of the NPPF Planning Practice Guide, the Proposed Development is classified as 'Less Vulnerable'.

The site is located within Flood Zones 1, 2 and 3. However coastal flood defences protect the site from tidal flooding up to the 0.5% (1 in 200 year) annual probability event and the modelled level of flood risk from fluvial sources is less than 1% (1 in 100 year) annual probability to all built development. As all built development is effectively in Flood Zone 2 the Proposed Development is considered appropriate development in accordance with Table 3 of the NPPF Technical Guidance.

Flood risk to and arising from the Proposed Development has been classified as low to negligible.

A drainage strategy has been prepared to support the Proposed Development through the planning process. The strategy demonstrates the Proposed Development can comply with the requirements of the NPPF and does not increase flood risk either to or from the Proposed Development.

This FRA demonstrates that the Proposed Development site can be drained in a sustainable manner through attenuation and infiltration and that the development is not at flood risk from all sources and will not increase flood risk to other parties.

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2. Planning Policy

National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) provides a clear and concise framework to ensure sustainability through planning and development. The framework sets out the Government's expectations as to how planning policies should be applied. The NPPF replaces previous Guidance and Policy set out in PPS25:- Development and Flood Risk.

The NPPF identifies flood risk as a specific material consideration in Section 10; "Meeting the challenge of climate change, flooding and coastal change" which provides guidance in determining planning applications whilst reducing the current and future threats of flood risk.

As outlined in the NPPF, a Flood Risk Assessment is generally required for any site which is designated as being within Flood Zone 2 and Flood Zone 3, including minor developments or changes in use. FRA's are required within Flood Zone 1 areas for development over 1 hectare; or less than 1 hectare but may be affected by sources of flooding other than rivers and sea and for sites which may encounter critical drainage problems as notified by the Environment Agency.

There are four levels to the designated Flood Zones, with Zone 1 being the 'least risk' and Zone 3b being a functional floodplain. The Flood Zones are defined as follows:

- Flood Zone 1 has a low risk of flooding having a less than 1 in 1,000 annual probability of river or sea flooding.
- Flood Zone 2 has a moderate risk of flooding with land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
- A Flood Zone 3A has high risk of flooding with a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea in any year.
- Flood Zone 3B is land considered to act as functional flood plain

The above criteria does not account for any previous flood defences, unless otherwise stated, and estimate current levels of risk not taking into account future uncertainties of climate change.

The NPPF builds on previous legislation to empower Local Authorities in implementing suitable plans to mitigate flood risk. The NPPF expects Local Authorities to adopt a risk-based approach at all levels of planning by applying the 'Source – Pathway – Receptor' model to development in flood-susceptible areas.

Local Plans are guided by the NPPF and should account for the future uncertainty of climate change and avoid development in areas which are vulnerable to flooding. Unavoidable development in flood risk zones must undergo a Sequential Test to assess the extent of flood risk, followed by an Exception test to demonstrate that the site has wider sustainable benefits that outweigh flood risk, that the site is previously developed land and that the development will be safe for the lifetime of the development. Highly vulnerable developments such as Police/Ambulance stations which are

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required to remain operational during flooding are not suitable for High Risk Zone 3 sites. More vulnerable development such as housing, nurseries and educational establishments are suitable for Flood Zone 3A provided they pass the Exception test. The NPPF also states that "For individual developments on sites allocated in development plans through the Sequential Test, applicants need not apply the Sequential Test. Applications for minor development and changes of use should not be subject to the Sequential or Exception Tests but should still meet the requirements for site-specific flood risk assessments".

Local Plans should be supported by a Strategic Flood Risk Assessment to develop policies which involve contributions from all stakeholders such as the Environment Agency and other statutory bodies.

The Water Resources Act 1991

The Water Resources Act 1991 (Section 105) also requires the Environment Agency to exercise a general supervision over all flood defence matters, including flood plains and washlands which accommodate waters during periods of flood. The Environment Agency is a statutory consultee in the planning process, providing current information on Flood Risk Maps. The EA are able to define the extent of the flood plain that is under threat from flood risk.

Further Guidance

Further Guidance from CIRIA publication 'C624 Development and Flood Risk Guidance for the Construction Industry'[1] define three levels of FRA which can be undertaken:

FRA Level	Description/Scope
Level 1	**Screening Study** to identify whether there is any flooding or surface water management issues related to a development site that may warrant further consideration. This should be based on readily available existing information, including the SFRA, Environment Agency Flood Map and Standing Advice. The Screening Study will ascertain whether a FRA is required.
Level 2	**Scoping Study** to be undertaken if the Level 1 FRA indicates that the site may lie within an area that is at risk of flooding or that the site may increase flood risk due to increased run-off. This Study should confirm the sources of flooding which may affect the site and should include the following: - an appraisal of the availability and adequacy of existing information; - a qualitative appraisal of the flood risk posed to the site, and potential impact of the development on flood risk elsewhere; - an appraisal of the scope of possible measures to reduce the flood risk to acceptable levels. The Scoping Study may identify that sufficient quantitative information is

[1] CIRIA Publication: *C624 Development and Flood Risk – Guidance for Construction Industry*, 2004

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	already available to complete a FRA appropriate to the scale and nature of the development.
Level 3	**Detailed Study** to be undertaken if the Level 2 FRA concludes that further quantitative analysis is required to assess flood risk issues related to the development site. The Study should include: - quantitative appraisal of the potential flood risk to the development; - quantitative appraisal of the potential impact of development site on flood risk elsewhere; - quantitative demonstration of the effectiveness of any proposed mitigation measures.

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3. Local Planning Policy

Strategic Flood Risk Assessment for Arun

Arun District Council commissioned Capita Symonds to produce a Strategic Flood Risk Assessment

(SFRA) in accordance with Planning Policy Statement 25 (PPS 25), (superseded by NPPF). Advice on flood risk within the administrative boundary of the planning authority is required to support the preparation of their Local Development Framework (LDF), in accordance with government guidance and advice from the Environment Agency.

The Strategic Flood Risk Assessment (SFRA) for Arun District2 was published in May 2008. The SFRA establishes the flood risk within Arun District at a strategic level. It does not specifically assess flood risk to the Application Site.

West Sussex Preliminary Flood Risk Assessment (PFRA), May 2011

The PFRA provides a high-level overview of flood risk from local flood sources (surface water, groundwater, ordinary watercourses and canals). It does not specifically assess flood risk to the Application Site.

West Sussex Local Flood Risk Management Strategy (LFRMS), May 2014

The West Sussex LFRMS (2013 – 2018) sets out how West Sussex County Council carries out its flood risk responsibilities that are a statutory requirement of the Flood and Water Management Act 2010.

Bognor Regis is one of the higher priority wet spot locations identified in the LFRMS where risk management authorities will initially prioritise work.

Beachy Head to Selsey Bill Shoreline Management Plan (SMP), May 2006

The Beachy Head to Selsey Bill SMP sets the strategic policy for the management of the coastal defences that protect Bognor Regis. The policy for the next 100 years for the relevant policy unit (Felpham to Aldwick – Unit 23) is to 'Hold the Line' of the existing defences. Therefore, it is expected that the coastal defences that protect the Proposed Development will be maintained in their current alignment for the next 100 years.

Arun and Western Streams Catchment Flood Management Plan (CFMP), December 2009

The LDO site is located within the Coastal Plains policy unit of the CFMP which sets the strategic policy for fluvial flood risk management.

The policy for the Coastal Plains policy unit is described as "Areas of low, moderate or high flood risk where we are already managing flood risk effectively but where we may need to take further actions to keep pace with climate change".

Arun District Council Local Development Plan (draft), 2014

Arun District Council has determined that economic growth for job creation is its number one priority. It wants to enable residents of working age to be able to work within Arun. This is called increasing 'job density' and it is the central theme of the Local Development Plan. The Local Plan will

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seek to achieve this by diversifying the range of employment sites available to investors and where necessary facilitating commercial enterprise using Local Development Orders.

The application site was identified in the emerging local plan as a strategic employment site and was also included in the Enterprise Bognor Regis LDO.

Sequential and Exception Test

Sequential Test

The NPPF requires a Sequential Approach to ensure preference is given to land within Flood Zone 1 prior to Flood Zones 2 and 3. It also ensures that flood vulnerability of the development proposals is taken into consideration when locating development in Flood Zones 2 and 3.

Exception Test

The Exception test is a method to demonstrate and help ensure that the flood risk will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites with lower flood risks are not available. For the Exception Test to be passed, the following must be demonstrated:

- The development provides sustainability benefits to the community that outweigh the flood risk, informed by the SFRA if applicable;

The development should be on developable, previously developed land or, if not, then there are no other reasonable alternative sites on developable or previously developed land; and

A FRA must establish that the development will be safe, without increasing the flood risk on site or elsewhere, and where possible will reduce the overall flood risk.

As stated above the NPPF paragraph 104 states that "For individual developments on sites allocated in development plans through the Sequential Test, applicants need not apply the Sequential Test. Applications for minor development and changes of use should not be subject to the Sequential or Exception Tests but should still meet the requirements for site-specific flood risk assessments."[2]

The advice regarding flooding matters in the NPPF is supplemented by additional guidance in the National Planning Policy Guidance (NPPG). Table 3 sets out the Flood Risk Vulnerability and Flood Zone "Compatibility". Outdoor sports and recreation is defined within the Water-Compatible Development classification and car parking is defined as Less Vulnerable Development. According to Table 3 such use classifications are acceptable within a Flood Zone 2 and 3 provided that the Sequential Test is passed. (There is no requirement to pass the Exception Test).

[2] National Planning Policy Framework, Planning Practice Guidance website: http://planningguidance.communities.gov.uk/blog/policy/achieving-sustainable-development/delivering-sustainable-development/10-meeting-the-challenge-of-climate-change-flooding-and-coastal-change/#paragraph_104

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The normal approach for a Sequential Test is to demonstrate that there are no sequentially preferable "reasonably available" sites at a lower flood risk (i.e. in flood Zone 1 or 2) within a defined area. Such an approach is feasible when there are realistic available options to site a new development in alternative locations. However, such options clearly do not exist for this scheme (which is seeking to enhance an existing operation which does not have any alternative business premises).

Paragraph 033 of the NPPG provides advice on how the Sequential Test should be reasonably applied. It states that "When applying the Sequential Test, a pragmatic approach on the availability of alternatives should be taken. For example, in considering planning applications for extensions to existing business premises it might be impractical to suggest that there are more suitable alternative locations for that development elsewhere."[3]

Given the circumstances of this case the principles of Paragraph 033 should be applied. It is impractical to suggest that the applicant should look for alternative locations/premises in which to site the proposed scheme. A pragmatic and proportionate approach is to accept that there are no "reasonably available" alternative locations to site this scheme and accordingly the Sequential Test is passed. Furthermore, the FRA demonstrates that the development will be safe for its lifetime without increasing risk elsewhere.

[3] National Planning Policy Framework, Planning Practice Guidance website: http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/applying-the-sequential-test-to-individual-planning-applications/#paragraph_033

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4. Scope of Flood Risk Assessment

The detail and complexity of a Flood Risk Assessment should reflect the level of risk to the site. The NPPF lists the general requirements of a Flood Risk Assessment and provides that Flood Risk Assessments should:

- be proportionate to the risk and appropriate to the scale, nature, and location of the site;
- consider the risk of flooding arising from development in addition to the risk of flooding to the site;
- take the impacts of climate change into account;
- consider both the potential adverse and beneficial effects of flood risk management infrastructure including raised defences, flow channels, flood storage areas and other artificial features together with the consequences of their failure;
- consider the vulnerability of those that could occupy and use the site, taking account of the Sequential and Exception Tests and the vulnerability, including arrangements for safe access;
- consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made;
- consider the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes;
- include the assessment of the remaining (known as 'residual') after risk reduction measures have been considered and demonstrate that this is acceptable for the particular development or land use;
- consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of development may affect drainage systems; and
- be supported by appropriate data and information, including historical information on previous events.

Sources of Flooding

Based on the CIRIA Report 624, Table A2, and as shown above, the following potential sources of flooding could be considered to apply to the site:

- Fluvial – Flooding as a result of rising water levels in nearby river;
- Overland Flow – Flooding as a result of overland surface water run-off from higher ground; and
- Infrastructure Failure – Flooding as a result of failure of infrastructure designated to store or carry water or pipe blockage

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5. Flood Risk Assessment

Coastal and Tidal Sources

The Environment Agency website shows no fluvial flood defences in the vicinity, or upstream, of the Application Site.

Coastal flood defences to the south at Felpham in Bognor Regis offer a standard of protection of approximately 1 in 200 years (0.5%) from tidal flooding. A foreshore and wave return wall forms the primary defence, with a concrete wall forming the secondary defence. These are fronted by a shingle beach which is controlled by timber and rock groynes.

The foreshore and wave return wall measures approximately 800m in length and the crest levels vary between 6.5m AOD and 5.64m AOD. The concrete secondary defence mirrors the primary defence in both length and crest level.

Environment Agency records show the foreshore and wave return wall to be in good condition, whilst the concrete wall is in both fair and poor condition along its length.

The Environment Agency's detailed flood mapping (refer to Appendix C) shows that a large part of the Site is located within Flood Zones 2 and 3. The Environment Agency's modelled flood level for the 0.5% (1 in 200 year) annual probability tidal event is 2.74m AOD.

This mapping shows the flood risk without the presence of flood defences. The tidal flood risk area in Bognor Regis which affects this site protected by coastal flood defences.

The coastal flood defences provide a standard of protection of 0.5% (1 in 200 year) annual probability. Therefore, the site is at a residual risk of flooding in the event that these tidal defences fail or are overtopped.

The Arun District Council SFRA modelled the risk of flooding from coastal and tidal sources with the presence of defences for the 0.5% (1 in 200 year) annual probability event now and with climate change. The maps in the SFRA show that the site is not at risk of tidal flooding in these scenarios. (Arun District Council SFRA Map A2-T in Appendix E).

The risk of coastal and tidal flooding to the site is moderate (less than 0.5% (1 in 200 year) annual probability).

Part of the Proposed Development is located in Flood Zone 2 and 3, however due to the presence of coastal flood defences the residual risk to the site from tidal flooding is less than 0.5% (1 in 200 year) annual probability. Also, the proposed development will be comprised of 'Less Vulnerable' Site uses appropriate to the Flood Zone.

The Proposed Development will have no impact on flood risk from this source on neighbouring property.

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Fluvial Flooding

Three Main Rivers are located in the vicinity of the site (refer to figures in Appendix D), these are:

- Aldingbourne Rife, 200m to the west.
- Lidsey Rife, 600m to the east.
- Shripney Manor Ditch which forms the boundary to the north and most of the west of the site, before flowing (north east to south west) into the Aldingbourne Rife.

The Site drains to the Shripney Manor Ditch and the Aldingbourne Rife. The Site is located within the Arun Internal Drainage District (IDB), which is managed by the Environment Agency as the Internal Drainage Board (IDB). There are a number of ordinary watercourses located in and within the vicinity of the site managed by the Arun IDB, these include:

- Oldlands Farm Ditch
- Bersted Brooks to the west of the Rowan Caravan Park that flows southwards and then beneath Rowan Way to join a drainage channel that runs westwards along the southern side of Rowan Way (refer to figure in Appendix D).
- Several unnamed drainage ditches on the western boundary of the site that flow into the Aldingbourne Rife.

The Environment Agency's detailed flood mapping (refer to Appendix D) shows that the Site is located within Flood Zone 2 and 3. This mapping shows the flood risk without the presence of flood defences (i.e. the tidal flood risk).

To establish the risk from fluvial flooding, modelled flood levels have been obtained from the Environment Agency. The modelled flood level for the 0.1% (1 in 1000 year) annual probability fluvial flood event is 1.67m AOD for the Site. This indicates that the majority of the site is not affected by this event. No further information is available for more frequent fluvial flood events from the Environment Agency's modelling.

The Arun District Council SFRA modelled the risk of flooding from fluvial sources with the presence of defences for the 1% (1 in 100 year) annual probability event now and with climate change. A small area on the eastern boundary of the Site is at risk in this scenario. This area is intended to be open space (refer to the proposed site plan).

The risk of flooding from fluvial sources to the developed area of the Site is considered to be low for the majority of the site and moderate for a small area as part of the Proposed Development is located within Flood Zone 2 and 3, however the risk to the majority of the site from fluvial flooding is less than 1% (1 in 100 year) annual probability.

The Proposed Development will not impact on the floodplain as there will be no development in areas of the site subject to fluvial flood risk. The Proposed Development will have no impact on flood risk from this source on neighbouring property.

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Pluvial and Overland Flow

The Environment Agency's updated Flood Map for Surface Water (refer to Appendix D) shows that the site is mostly at very low risk of surface water flooding less than 0.1% (1 in 1000 year) chance in any given year. However, there are some small isolated areas of low risk (less than 1 in 100 (1%) but greater than or equal to 1 in 1000 (0.1%) chance in any given year).

The risk of pluvial or overland flooding to the Application Site is considered to be low to negligible.

By developing the site, there is a risk of pluvial/overland flows from the Proposed Development increasing. The risk of flooding to and arising from the Proposed Development, regarding pluvial/overland flow, is moderate as overland flow will to be manged through SuDS and flow routes to less vulnerable areas such as soft landscaped areas and car parks and the proposed surface water management and drainage strategy for the site will be designed as to manage surface water flows from the development Site.

Infrastructure Failure

Southern Water sewer records do not show any Southern Water infrastructure within the Application Site. Assets are located to the south of the site in Bognor Regis and to the north in Shripney

The Arun District Council SFRA does not include any records of sewerage flooding in the vicinity of the Application Site.

No other records have been made available of sewer flooding at the Application Site.

The risk of flooding from sewers and drainage infrastructure at the Application Site is considered to be low.

Southern Water has not been consulted regarding capacity of their infrastructure to meet the increased demand for foul sewerage provision from the Proposed Development.

All surface water drainage will be routed to the nearby watercourses and therefore there will be no impact from the Proposed Development on the local public surface water sewer system.

The proposed loading on the foul sewer is not known, any infrastructure improvements needed to cope with increases in foul sewer loading due to the development of the site will be made as required.

The risk of flooding to and arising from the Proposed Development, regarding sewers, is low.

Artificial Sources

Flooding can occur as a result of infrastructure failure, for example breach and/or overtopping of retaining structures for raised bodies of water such as canals or reservoirs.

The site does not lie within the inundation area of any reservoirs. There are no raised sections of canal within 500m of the Application Site.

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The risk of flooding from dam and canal infrastructure at the Application Site is considered to be negligible.

The site is not within a 500m search radius of any dams or canal infrastructure.

The risk of flooding to and arising from the Proposed Development, regarding artificial sources, is negligible.

Groundwater

The Arun District Council SFRA indicates that the Application Site is located in a zone of groundwater emergence (SFRA Map G1 – Indicative Risk of Groundwater Flooding). These maps indicate the potential for groundwater flooding based on historic events and recorded groundwater levels.

Chalk aquifers such as that which underlies the Application Site are more likely to cause groundwater flooding because of its geological formation. However, it notes that there are no historical records of groundwater flooding in Arun District.

Existing borehole records for the Application Site do not indicate groundwater near the surface.

The West Sussex Preliminary Flood Risk Assessment does not give any detailed information on the risk of groundwater flooding at the Application Site.

The risk of groundwater flooding to the Application Site is low.

Basements or underground car parks are not proposed as part of the Proposed Development and foundations for the buildings will be of typical construction with piled foundations which may be terminated in chalk. It is considered unlikely there will be any laterally continuous barrier to ground water created by the Proposed Development.

The Proposed Development will not exacerbate the risk of groundwater flooding to the surrounding area.

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6. Residual Risks and Impacts

Residual Risks

Table 1 outlines the initial qualitative assessment of risk posed by the potential source of flooding, the mechanisms for flooding and the likely consequences. The tables also include potential mitigation measures to minimise the residual risk.

Categories of risk have been qualitatively defined as:

- 'High' Risk: flooding is likely to result in significant damage to property and pose a significant risk to life;
- 'Medium' Risk: flooding may result in possible minor damage to property but flood progress would allow adequate time for residents to be warned and safely evacuated to higher ground or appropriate places of safety;
- 'Low' Risk: flooding is unlikely to result in any damage to property damage and pose little or no risk to life.

Flood Probability

The SFRA and EA show that the development site areas are largely situated within Flood Zone 3 with small areas of the site situated within Flood Zone 2. The EA Flood data and levels show that the site would be affected from fluvial flooding.

The SFRA and EA Flood information show that the 1 in 100-year climate change flood level is 1.330m AOD for the site.

Flood Impact

The Proposed Development will be comprised of 'Less Vulnerable' Site uses appropriate to the Flood Zone and will not impact on the floodplain as there will be no development in areas of the site subject to fluvial flood risk and due to the presence of coastal flood defences the residual risk to the site from tidal flooding is less than 0.5% (1 in 200 year) annual probability for areas of built development subject to tidal flooding.

The Proposed Development will have no impact on flood risk from this source on neighbouring property.

Impact of Displaced Water

Redevelopment of the site will not result in the displacement of floodwaters. The proposed development will be comprised of 'Less Vulnerable' and 'Water Compatible' site uses.

According to information published by the EA new development must provide level for level and volume for volume compensation as a replacement for volumes lost from the flood plain through development with new flood plain volume by reducing nearby ground levels. The compensatory volume must be at the same level (within reasonable working limits) as the lost storage. The proposals ensure that there is no loss in flood plain storage as a direct result of the development by not increasing levels within the 1 in 100-year climate change flood event. The proposed levels within

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the flood extents will be at or below that of the existing ground level, therefore providing an overall increase of the existing flood plain volume. In tidal areas, raising ground levels is unlikely to impact on maximum tidal levels so the provision of compensatory storage should not be necessary.

The proposed redevelopment will not have any significant impact on the volumes of storage available on site.

Impact of Fluvial Morphology

It is considered there will be no impact on the fluvial morphology as a result of this development.

Table 1: Qualitative Assessment of Residual Flood Risk

Flood Hazard	Flood Mechanism and Possible Consequence	Initial Assessment of Risk	Comments/Recommended Mitigation Measures	Residual Risk
Tidal		MODERATE	All built development is located is areas assessed as having less than 0.5% annual probability (equivalent to the 1 in 200 year) of tidal flooding. Safe and dry access to the Proposed Development is available from the A29 for all events up to the 0.5% annual probability (1 in 200 year) tidal and 0.1% annual probability (1 in 1,000 year) fluvial events. Despite this it is recommended that all buildings have finished floor levels set a minimum of 150mm above the existing ground levels, providing mitigation from localised flooding from extreme events.	
Fluvial Flooding	Site located within a Flood Zone 3 shown on the EA/SFRA maps, considered high risk of fluvial flooding. Site is affected by a 1 in 100-year flood level	MODERATE	All built development (i.e. residential dwellings, and onsite highways) are located is areas assessed as having less than 1% annual probability (equivalent to the 1 in 100 year) of river	LOW

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Flood Hazard	Flood Mechanism and Possible Consequence	Initial Assessment of Risk	Comments/Recommended Mitigation Measures	Residual Risk
	of 16.330m AOD including climate change.		flooding. Safe and dry access to the Proposed Development is available from the A29 for all events up to the 0.5% annual probability (1 in 200 year) tidal and 0.1% annual probability (1 in 1,000 year) fluvial events. Despite this it is recommended that all buildings have finished floor levels set a minimum of 150mm above the existing ground levels, providing mitigation from localised flooding from extreme events.	
Pluvial and Overland Flooding	Minor overland/ surface water flooding due to surface water ponding in low lying areas of the site	LOW	Overland flow to be manged through SuDS and flow routes to less vulnerable areas such as soft landscaped areas and car parks.	LOW
Infrastructure Failure	Minor flooding from culverted watercourse	LOW	The culverted watercourse situated west of the site is a maintained watercourse and the risk and likelihood of this blocking and flooding is fairly low.	LOW
Artificial Sources		LOW		LOW
Groundwater		LOW		LOW

Climate Change

The NPPF outlines the importance of Climate Change with respect to planning. The issues of Climate Change are discussed with impacts likely on sea levels, peak rainfall intensities, peak river flows, wind speeds and wave heights. The current DEFRA and EA recommended allowances for climate change are available on the national planning portal website and the NPPF Technical Guidance.

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The Environment Agency has recently published revised climate change allowances on 19/02/2016; this advice updates the previous climate change allowances to support NPPF. In this assessment, the following climate change has been applied based on the tables below for the updated peak river flow and rainfall intensities.

Table 2: Extract from the NPPF/EA Table 1 Peak River Flow Allowances by River Basin District

Parameter	2015 to 2039	2040 to 2069	2070 to 2115
Peak river flow (Upper end category for the River Thames basin district)	+25%	+35%	+70%

Table 3: Extract from the NPPF/EA Table 2 Peak Rainfall Intensity Allowance in Small and Urban Catchments

Parameter	2010 to 2039	2040 to 2059	2060 to 2115
Peak rainfall intensity (Upper end category)	+10%	+20%	+40%

Over the next 60+ years (the anticipated lifetime of the present site accommodation) the recommendations contained in the NPPF, in terms of increased rainfall and peak river flow, would equate to an increase of 40% in peak rainfall intensity and 70% in peak river flow.

The site is likely to be affected by fluvial flooding and the additional climate change effects in terms of increases in peak river flows and rainfall intensities will therefore affect the site. These have been taken into account and the FRA demonstrates how these risks are to be managed so that the development is safe.

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7. Drainage Strategy

The NPPF requires that flood risk to land and property is not increased as a result of development.

Changes in the volume and rate of surface water runoff from the development as a result of increases in impermeable land uses could increase the risk of flooding downstream unless sufficient steps are taken within the Proposed Development to prevent this happening.

A fundamental principle of sustainable development in terms of flood defence is the reduction of surface water run-off from new developments. It is best practice that the surface water drainage arrangements should be such that the volumes and peak discharge rates of surface water leaving a development site are no greater than the rates prior to the Proposed Development, and where possible are returned to those associated with the greenfield conditions of the site. Any increase in run-off (rates and/or volumes) above the pre-development (or greenfield) volumes must be attenuated on site.

The drainage network is to be designed as a gravity system to accommodate run off from a:

- 1 in 2 year storm event with no surcharge,
- The network is to be checked for a 1 in 30-year storm event with surcharge permitted but with no surface flooding,
- The network is to be checked for a 1 in 100-year storm event with surface flooding permitted providing that there is no risk of flooding to buildings and there is no off site overland flow.

Existing Site Drainage Regime

The site is classified as a Greenfield development, with a gross area of approximately 11.80ha. The site is not currently served by an existing sewer system; therefore, it is assumed that the site drains via infiltration and overland flows towards watercourses on the boundaries of the site.

As the Proposed Development area is less than 50ha, the Institute of Hydrology (IoH) Report 124

Flood Estimation for Small Catchments (1994) method has been used to estimate the Greenfield site peak flow rate, which is an approved methodology specified within the Environment Agency's Rainfall Runoff Management for Developments Report4.

Table 4 summarises the Greenfield discharge rates for 1 ha of developable area and the estimated discharge rates for the current site. Full calculations are provided in the drainage calculation pack in Appendix.

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Table 4 – Greenfield Runoff Rates

Annual Rainfall Event	Greenfield Runoff Rates (litres/sec/ha)	Development Runoff Rates (litres/ sec)
Qbar	2.90	34.20
1 in 1 year	2.40	28.30
1 in 30 year	6.50	76.70
1 in 100 year	9.10	107.40

Proposed Drainage Strategy

For the purposes of this Planning Application the site has been split into two phases. Phase 1 is seeking full planning permission with an area of 6.492ha and Phase 2 is seeking only outline permission with a total area of 5.512ha.

The Proposed Development will result in a net increase of impermeable area at the Application site. Of the total site area, an area of 8.3ha will be developed. It has been assumed that the Percentage Impervious (PIMP) factor at the site will be 80% of the developed area. Therefore, it has been assumed for this drainage strategy that the Proposed Development will have a total impermeable area of 6.65ha.

It is proposed that the development will discharge to the watercourse flowing along the Western boundary of the site; Bersted Brooks (Ordinary Watercourse). In order to comply with the guidance for providing long-term storage as outlined in the Environment Agency's Rainfall Runoff Management for Developments, the proposed discharge rate from the Site has been restricted to 2 l/s/ha.

Table 5 – Proposed Peak Surface Water Discharge Flow Rates

Annual Rainfall Event	Proposed Flow Rates (litres/ sec)	Proposed Betterment (%)
1 in 1 year	23.60	17%
1 in 30 year	23.60	70%
1 in 100 year	23.60	78%
1 in 100 year +30% C/C	23.60	N/A

Due to the requirement to provide a betterment on the existing surface water discharge rates post development for all storm events up to and including the 100-year return period +30% allowance for climate change, the surface water will be restricted via flow control devices and attenuated with a

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total required storage volume of approximately 7,650m^3. There is potential scope for the storage volume to be rationalised at a later stage following detailed design and further hydraulic modelling.
It is proposed that onsite attenuation will be provided by a series of attenuation basins and permeable pavements. The site control structures will be located primarily in the topographical low points of each catchment. These will be in the form of retention/detention basins.

These structures will be designed to attenuate flow prior to discharge to the ordinary watercourse via a control structure to achieve the maximum allowable peak discharge rates for the 1 in 1 the 1 in 30 and 1 in 100-year events (plus a 30% allowance for climate change). The location of the retention/detention basin will be within an area designated as public open space. It will provide significant ecological and amenity benefit for the residents.

The site has been split into three catchment areas each with individual outfalls to the watercourse. The proposed surface water discharge rates and attenuation requirements are further broken down in Table 6 below:

Table 6 – Proposed Peak Surface Water Discharge Flow Rates

Catchment	Proposed Flow Rates (litres/ sec)	Proposed Attenuation (m^3)
1	11.30	3900
2	2	500
3	10.30	3250

As per the Environment Agency's Rainfall Runoff Management for Developments, long term storage can be provided to store the additional runoff caused by the development compared to the volume that would have been contributed from the Site in its Greenfield state. The current design rule is to use the 100-year 6-hour event to determine this additional volume.

Long term storage can be incorporated through one of three basic approaches:

1. Ensure that the drainage system provides sufficient infiltration volume to dispose of the volume difference,
2. Design a storage system which only comes into effect above a storm size threshold (effectively an off-line design) which captures the required volume and discharges at the appropriate rate,
   Design a storage system which comes into effect for all events (effectively an on-line design) that captures the required volume difference which is designed to empty at a rate of less than 2 l/s/ha.

Approaches 1 and 2 provide the long-term storage volume in a separate system from the attenuation storage or offset the volume of runoff via infiltration devices. This allows the long-term storage to be activated for specific events and the volume difference discharged at the appropriate rate or infiltrated to ground, in order to mimic the behaviour of the Site in its Greenfield state.

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The drainage strategy for the site proposes to adopt approach 3. By storing the additional volume in a central storage area, the long-term storage volume will be appropriately activated and discharged at a rate (2 l/s/ha) that would mimic the Greenfield behaviour of the Site, which is the overall aim of providing long term storage.

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8. Conclusions

Kirksaunders (KSA) has been commissioned by Landlink Estates to undertake a site-specific Flood Risk Assessment (FRA) for the proposed Saltbox site development north of Bognor Regis, Sussex.

Full planning permission is sought for the Phase 1 development of 6.492 hectares of employment space (B1, B2 and B8) with associated parking, landscaping, and public open space. In addition, outline planning permission is sought for the Phase 2 development of 5.512 hectares for additional employment units, warehousing, hotel, drive thru's, public house, gym and associated works. Based on Table 2 (Flood Risk Vulnerability Classification) of the NPPF Planning Practice Guide, the Proposed Development is classified as 'Less Vulnerable'.

The site is located within Flood Zones 1, 2 and 3. However coastal flood defences protect the site from tidal flooding up to the 0.5% (1 in 200 year) annual probability event and the modelled level of flood risk from fluvial sources is less than 1% (1 in 100 year) annual probability to all built development. As all built development is effectively in Flood Zone 2 the Proposed Development is considered appropriate development in accordance with Table 3 of the NPPF Technical Guidance.

The surface water network for the site is designed to convey and store surface water from site for all storms up to and including the 1 in 30-year storm event without flooding on site habitable spaces or to adjoining properties with controlled flooding during the 1 in 100-year storm event (plus a 30% allowance for climate change). It is proposed that the Site discharge into Bersted Brooks at 2 l/s/ha to comply with the rate and volume of runoff requirements.

The total required storage volume for the Site is 7650m3. There may be scope for the storage volume to be rationalised at a later stage following detailed design and specific hydraulic modelling. This attenuation volume will be provided in the form of retention/detention basins and permeable pavements.

Flood risk to and arising from the Proposed Development has been classified as low to negligible.

A drainage strategy has been prepared to support the Proposed Development through the planning process. The strategy demonstrates the Proposed Development can comply with the requirements of the NPPF and does not increase flood risk either to or from the Proposed Development.

The proposed areas of car parking will require treatment in line with the water quality parameters for the outfall watercourse / stream.

The on-site drainage should be maintained and inspected on a regular basis to ensure it remains fit for purpose.

This FRA demonstrates that the Proposed Development site can be drained in a sustainable manner through attenuation and infiltration and that the development is not at flood risk from all sources and will not increase flood risk to other parties.

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Appendix A – Site Masterplan

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LIST OF INFORMANTS
Ordnance Survey - Masterplan - Licence No. 100019980

REVISIONS	DATE	DRN	REV
MINOR EXTERNAL AREA AMENDMENTS (LANDSCAPE / FOOTWAY - UNIT 2)	08.08.17	HA	A

APPROX. INVERT TO DISCHARGE TO WATERCOURSE. LEVELS TO BE ADVISED BY ENGINEER.

FOUL TREATMENT PLANT LOCATION. DIMENSIONS TO BE ADVISED BY ENGINEER.

SUBSTATION 1

FUTURE SOLAR POINT OF CONNECTION

SUBSTATION 2

FUTURE EXPANSION FOR ADDITIONAL PARKING

ATTENUATION POND

ELECTRICITY TRANSMISSION LINE

VILLAGE BUFFER

ATTENUATION POND

SUBSTATION 3

MAINTENANCE ACCESS TRACK

UNIT 2
B8 - WAREHOUSE / DISTRIBUTION
FFL +3500

CARPARK 70 SPACES

8 VAN DOOR PARKING SPACES

2 No. HGV

8 VAN DOOR PARKING SPACES

TOTAL PARKING SPACES FOR VANS: 60

UNIT 3
B8 - WAREHOUSE / DISTRIBUTION
FFL +3100

CAR PARK 110 SPACES

SHRIPNEY ROAD

UNIT 6
B1/B8 - INDUSTRIAL UNITS
FFL +3200

CAR PARK 58 SPACES

UNIT 4
FFL +3500

CARPARK 36 SPACES

UNIT 5
FFL +3500

UNIT 7
B1/B8 - INDUSTRIAL UNITS
FFL +3400

A3 USE RESTAURANT DRIVE THRU

A259

A29

LOADING PARKING EXPANSION ZONE

HGV PARKING

LOADING / PARKING

C1 USE - HOTEL
80 BEDS
FFL +3500

A3/A4 USE PUB
FFL +3500

CAR PARK 21 SPACES

CARPARK 126 SPACES

UNIT 8
D2 - GYM
FFL +3200

POTENTIAL 50,000 SQF EXTENSION

UNIT 1
B8 - WAREHOUSE / DISTRIBUTION
FFL +3350

CARPARK 200 SPACES

6m EASEMENT ZONE FOR SSE

RECYCLING POINT SUBSTATION 4

CARAVAN CAR PARK

FUTURE ACCESS TO ADJOINING SITE

PUBLIC RIGHT OF WAY

LOCAL NATURAL RESERVE

NOTES:

- LANDSCAPING - WORK IN PROGRESS
- LEVELS SUBJECT TO FLOOD RISK ASSESSMENT AND TO BE CONFIRMED BY CIVIL AND HIGHWAY ENGINEER
  EXISTING LEVELS SHOWN IN **BLACK**
  PROPOSED LEVELS SHOWN IN RED
- **FOR FULL DETAILED PARKING & AREA SCHEDULE SEE DRAWING No.1744 - P34**

1 / P02 **P02 - BLOCK PLAN**
1 : 1000

SALT BOX SITE - BOGNOR REGIS

North

0m 20m 40m 60m 80m 100m

VISUAL SCALE 1:1000 @ A1

MountfordPigott
Architecture Masterplanning Design

SITE MASTER PLAN - PROPOSED - BLOCK PLAN
1744 - P02 - A
1 : 1000@ A1 04/08/17
DRAWN BY HA

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Appendix B – Site Phasing Plan

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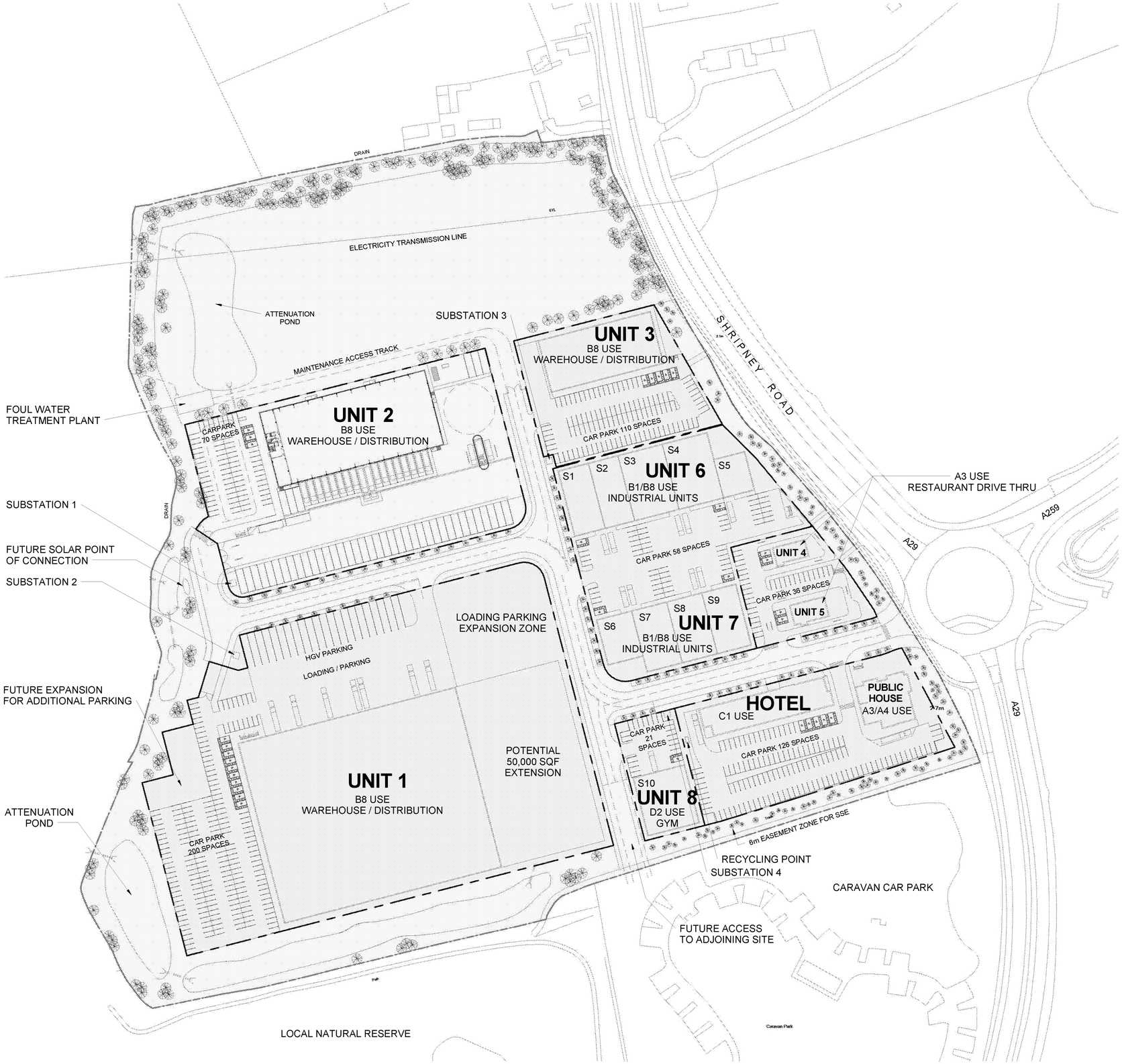
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LIST OF INFORMANTS
Ordnance Survey - Masterplan - Licence No. 100019980

REVISIONS DATE DRN REV

PHASING KEY

PHASE 1	FULL PLANNING SUBMISSION	6.492 hectare
PHASE 2	OUTLINE PLANNING SUBMISSION	5.512 hectare
	SALT BOX SITE BOUNDARY	12.004 hectare



1 / P03 **PHASE PLAN**
1 : 1000

0m 20m 40m 60m 80m 100m
VISUAL SCALE 1:1000 @ A1

SALT BOX SITE - BOGNOR REGIS

MountfordPigott
Architecture Masterplanning Design

SITE PHASING PLAN

1744 - P03

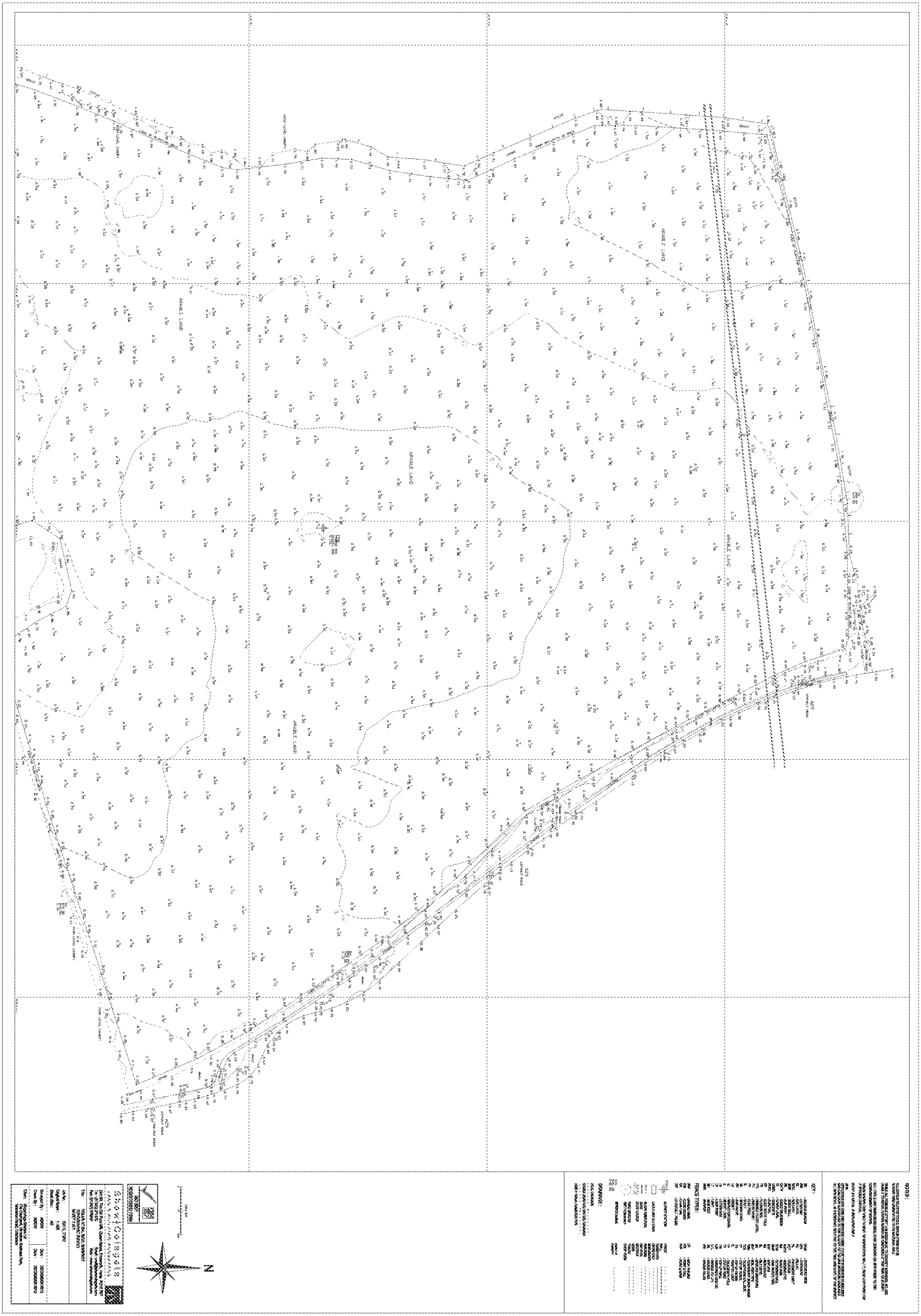
As indicated@ A1 04/08/17
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Appendix C – Topographical Survey

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Appendix D – Proposed Drainage Strategy

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NOTE:
TOPOGRAPHCIAL SURVEY, OS DATA, SITE PLAN OVERLAY SHOWN INDICATIVELY AND SHOULD BE COMPLETED BY ARCHITECT.

NOTE:
SCHEME SUBJECT TO DETAILED DESIGN

NOTE:
DETAIL OF VEHICLE WASH EQUIPMENT WILL AFFECT DRAINAGE DETAILS AND WILL NEED TO BE CONFIRMED BY THE TENANT

NOTE:
TO CONFIRM A GRAVITY CONNECTION IS ACHIEVABLE A FULL SURVEY OF THE EXISTING WATERCOURSE IS REQUIRED TO CONFIRM EXISTING LEVELS. IT SHOULD BE NOTED THAT A PUMP MAY BE REQUIRED, DESIGN DEPENDENT EXISTING WATERCOURSE LEVELS.

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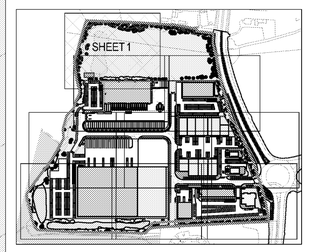


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PROPOSED PEAK SURFACE WATER DISCHARGE FLOW RATES AND ATTENUATION TABLE.

CATCHMENT AREA	PROPOSED FLOW RATE	PROPOSED ATTENUATION
1	11.30 L/S	3,900m³
2	2.00 L/S	500m³
3	10.30 L/S	3,250m³



KEY

- SURFACE WATER PIPE (150Ø-10m-1:100)
- SURFACE WATER MANHOLE
- BEANY
- LINEAR CHANNEL (CHANNEL)
- HYDROBRAKE MANHOLE TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION
- POROUS PAVING WITH PERFORATED PIPE (TYPE 3 STONE)
- FULL RETENTION PETROL INTERCEPTOR TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION
- SWALE/STORAGE BASIN WITH CHECK DAMS PLANTING BY LANDSCAPE ARCHITECT.
- HEADWALL. FINAL DETAILS TO MANUFACTURERS SPECIFICATION
- FOUL WATER PIPE (150Ø-10m-1:100)
- FOUL WATER MANHOLE
- TREATED WATER PUMP STATION. TO HAVE EMERGENCY PUMPS, TO BE ALARMED AND VENTED WITH EMERGENCY STORAGE ALSO PROVIDED. TO MANUFACTURERS SPECIFICATION.
- FOUL WATER RISING MAIN
- FOUL TREAT PLANT TO SUIT EA AND THE LOCAL DRAINAGE AUTHORITIES REQUIREMENTS TO ALLOW DISCHARGE TO A WATERCOURSE.
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- CATCHMENT 2 BOUNDARY
- CATCHMENT 3 BOUNDARY
- DETAILED PLANNING APPLICATION HATCHED AREA
- SITE BOUNDARY

Rev:	Description:	Drn:	Chk:	Date:
P3	REVISED TO SUIT MOUNTFORD PIGOTTS LATEST PLANS RECEIVED 07/08/17	DO	KJ	08.08.17
P2	ISSUED FOR INFORMATION	KW	GW	12.06.17
P1	ISSUED FOR INFORMATION	KW	GW	07.06.17

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01689 896464 : www.kirksaunders.co.uk

Client: LANDLINK ESTATES

Architect: MOUNTFORD PIGOTT

Project: SALTBOX SITE
BOGNOR REGIS

Drawing Title: PRELIMINARY DRAINAGE STRATEGY
SHEET 1 OF 9

Drawn:	Chkd/Appd:	Date:	Sheet Size:	Scale:
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KSA Project Number.	Suit:	Revision:
6090	S1	P3

Project:	Originator:	Zone:	Level:	Type:	Role:	Number:
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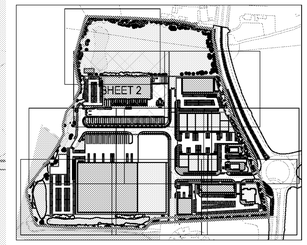
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CATCHMENT AREA	PROPOSED FLOW RATE	PROPOSED ATTENUATION
1	11.30 L/S	3,900m³
2	2.00 L/S	500m³
3	10.30 L/S	3,250m³



KEY

- 150Ø-10m-1:100 — SURFACE WATER PIPE
- SURFACE WATER MANHOLE
- BEANY
- CHANNEL — LINEAR CHANNEL
- HYDROBRAKE MANHOLE TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION
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Client: LANDLINK ESTATES

Architect: MOUNTFORD PIGOTT

Project: SALTBOX SITE BOGNOR REGIS

Drawing Title: PRELIMINARY DRAINAGE STRATEGY SHEET 2 OF 9

Drawn:	Chkd/Appd:	Date:	Sheet Size:	Scale:
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KSA Project Number.	Suit:	Revision:
6090	S1	P3

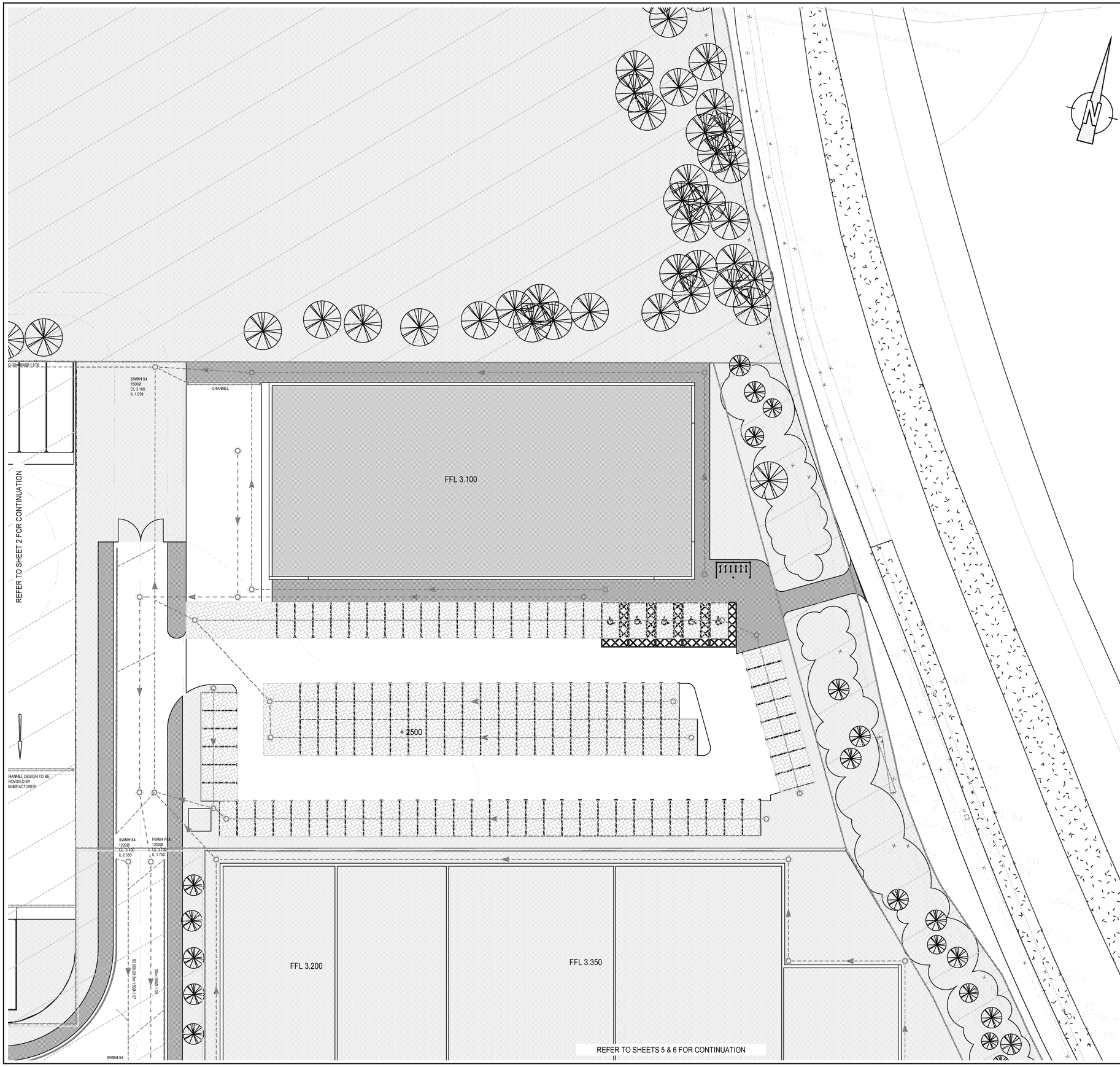
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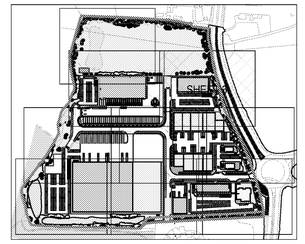
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2	2.00 L/S	500m³
3	10.30 L/S	3,250m³



KEY

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- SURFACE WATER MANHOLE
- BEANY
- CHANNEL — LINEAR CHANNEL
- HYDROBRAKE MANHOLE TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION
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- FULL RETENTION PETROL INTERCEPTOR TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION
- SWALE/STORAGE BASIN WITH CHECK DAMS. PLANTING BY LANDSCAPE ARCHITECT.
- HEADWALL. FINAL DETAILS TO MANUFACTURERS SPECIFICATION
- 1500Ø-10m-1:100 — FOUL WATER PIPE
- FOUL WATER MANHOLE
- TREATED WATER PUMP STATION. TO HAVE EMERGENCY PUMPS, TO BE ALARMED AND VENTED WITH EMERGENCY STORAGE ALSO PROVIDED. TO MANUFACTURERS SPECIFICATION
- FOUL WATER RISING MAIN
- FOUL TREAT PLANT TO SUIT EA AND THE LOCAL DRAINAGE AUTHORITIES REQUIREMENTS TO ALLOW DISCHARGE TO A WATERCOURSE.
- CATCHMENT 1 BOUNDARY
- CATCHMENT 2 BOUNDARY
- CATCHMENT 3 BOUNDARY
- DETAILED PLANNING APPLICATION HATCHED AREA
- SITE BOUNDARY

Rev.	Description:	Drn	Chk	Date
P3	REVISED TO SUIT MOUNTFORD PIGOTTS LATEST PLANS RECEIVED 07/08/17	DO	KJ	08.08.17
P2	ISSUED FOR INFORMATION	KW	GW	12.06.17
P1	ISSUED FOR INFORMATION	KW	GW	07.06.17

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CONSULTING ENGINEERS
Templegate House,115-123 High Street, Orpington, Kent, BR6 0LG
01689 896464 : www.kirksaunders.co.uk

Client: LANDLINK ESTATES

Architect: MOUNTFORD PIGOTT

Project: SALTBOX SITE
BOGNOR REGIS

Drawing Title: PRELIMINARY DRAINAGE STRATEGY
SHEET 3 OF 9

Drawn:	Chkd/Appd:	Date:	Sheet Size:	Scale:
KW	__	02.06.17	A1	1:250

KSA Project Number.	Suit:	Revision:
6090	S1	P3

Project:	Originator:	Zone:	Level:	Type:	Role:	Number:
6090	KSA	ZO	XX	DR	C	6002

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ARUN DISTRICT COUNCIL BE/192/17/OUT

NOTE:
TO CONFIRM A GRAVITY CONNECTION IS ACHIEVABLE A FULL SURVEY OF THE EXISTING WATERCOURSE IS REQUIRED TO CONFIRM EXISTING LEVELS. IT SHOULD BE NOTED THAT A PUMP MAY BE REQUIRED DEPENDENT EXISTING WATERCOURSE LEVELS.

REFER TO SHEET 2 FOR CONTINUATION

+ 1700

SWMH S8
1200Ø
HYDROBRAKE
LIMITED TO 2 L/S
CL 3.100
IL 0.519

ASSUMED OUTFALL DETAILS
CL 2.500
IL 0.500

+ 2600

ATTENUATION POND
IL 0.550
WITH 300mm FREEBOARD
TO STORE 287.5m3

SWMH S8
1200Ø
CL 1.700
IL 0.555

S1.004-84m-300Ø-1.100

SWMH S7
1200Ø
CL 2.000
IL 0.697

SWMH S6
1200Ø
CL 2.500
IL 0.739

+ 2600

ATTENUATION POND
IL 0.550
WITH 300mm FREEBOARD
TO STORE 287.5m3

+ 1700

+ 1900

+ 1800

ASSUMED OUTFALL DETAILS
CL 1.700
IL 0.700

NOTE:
TO CONFIRM A GRAVITY CONNECTION IS ACHIEVABLE A FULL SURVEY OF THE EXISTING WATERCOURSE IS REQUIRED TO CONFIRM EXISTING LEVELS. IT SHOULD BE NOTED THAT A PUMP MAY BE REQUIRED DEPENDENT EXISTING WATERCOURSE LEVELS.

REFER TO SHEET 7 FOR CONTINUATION

ACO QMAX 225 CHANNEL OR SIMILAR APPROVED

CL 2.270
IL 1.170

MANUFACTURES

SWMH
1200Ø
CL 2.355
IL 1.565

SWMH
1200Ø
CL 2.565
IL 1.665

ACO QMAX 350 CHANNEL OR SIMILAR APPROVED

ACO QA

+ 2800

S1.004-84m-300Ø-1.245

84m-150Ø-1.150

FWMH F7
1200Ø
CL 2.650
IL -0.255

SWMH S5
1200Ø
CL 2.800
IL 1.068

CHANNEL DESIGN TO BE PROVIDED BY MANUFACTURER

CHANNEL

CHANNEL DESIGN PROVIDED BY MANUFACTURER

FULL RETENTION PETROL INTERCEPTOR TYPE TO BE CONFIRMED BY SPECIALIST

REFER TO SHEET 5 FOR CONTINUATION

NOTE:
TOPOGRAPHCIAL SURVEY, OS DATA, SITE PLAN OVERLAY SHOWN INDICATIVELY AND SHOULD BE COMPLETED BY ARCHITECT.

NOTE:
SCHEME SUBJECT TO DETAILED DESIGN

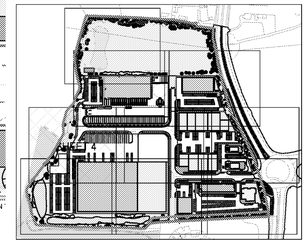
NOTE:
DETAIL OF VEHICLE WASH EQUIPMENT WILL AFFECT DRAINAGE DETAILS AND WILL NEED TO BE CONFIRMED BY THE TENANT

GENERAL NOTES.

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7. UNLESS STATED OTHERWISE, ALL EXCAVATED MATERIAL SHALL BE DISPOSED OF AT AN APPROVED TIP OFF SITE.
8. THE PUBLIC HIGHWAY AND WORKS WILL BE KEPT CLEAN AND FREE OF DEBRIS BY USE OF WHEEL WASHING FACILITIES AND ROAD SWEEPERS TO THE COUNCIL'S SATISFACTION.
9. DRAINAGE DESIGN SUBJECT TO INPUT FROM ARBOCULTURIST. THE CURRENT DESIGN ASSUMES THERE ARE NO ISSUES WITH EXISTING TREES/TREE ROOT PROTECTION AREAS.
10. DRAWING BASED ON SHAW COLEGATE TOPOGRAPHICAL SURVEY.

PROPOSED PEAK SURFACE WATER DISCHARGE FLOW RATES AND ATTENUATION TABLE.

CATCHMENT AREA	PROPOSED FLOW RATE	PROPOSED ATTENUATION
1	11.30 L/S	3,900m³
2	2.00 L/S	500m³
3	10.30 L/S	3,250m³



KEY

- 150Ø-10m-1:100 — SURFACE WATER PIPE
- SURFACE WATER MANHOLE
- BEANY
- CHANNEL — LINEAR CHANNEL
- HYDROBRAKE MANHOLE TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION
- POROUS PAVING WITH PERFORATED PIPE (TYPE 3 STONE)
- FULL RETENTION PETROL INTERCEPTOR TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION.
- SWALE/STORAGE BASIN WITH CHECK DAMS PLANTING BY LANDSCAPE ARCHITECT.
- HEADWALL. FINAL DETAILS TO MANUFACTURERS SPECIFICATION
- 150Ø-10m-1:100 — FOUL WATER PIPE
- FOUL WATER MANHOLE
- TREATED WATER PUMP STATION. TO HAVE EMERGENCY PUMPS,TO BE ALARMED AND VENTED WITH EMERGENCY STORAGE ALSO PROVIDED. TO MANUFACTURERS SPECIFICATION.
- FOUL WATER RISING MAIN
- FOUL TREAT PLANT TO SUIT EA AND THE LOCAL DRAINAGE AUTHORITIES REQUIREMENTS TO ALLOW DISCHARGE TO A WATERCOURSE.
- CATCHMENT 1 BOUNDARY
- CATCHMENT 2 BOUNDARY
- CATCHMENT 3 BOUNDARY
- DETAILED PLANNING APPLICATION HATCHED AREA
- SITE BOUNDARY

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Client: LANDLINK ESTATES

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Project: SALTBOX SITE
BOGNOR REGIS

Drawing Title: PRELIMINARY DRAINAGE STRATEGY
SHEET 4 OF 9

Drawn:	Chkd/Appd:	Date:	Sheet Size:	Scale:
KW	__	02.06.17	A1	1:250

KSA Project Number.	Suit:	Revision:
6090	S1	P3

Project:	Originator:	Zone:	Level:	Type:	Role:	Number:
6090	KSA	ZO	XX	DR	C	6003

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ARUN DISTRICT COUNCIL 05/10/2017OUT

NOTE:
TOPOGRAPHICAL SURVEY, OS DATA, SITE PLAN OVERLAY SHOWN INDICATIVELY AND SHOULD BE COMPLETED BY ARCHITECT.

NOTE:
SCHEME SUBJECT TO DETAILED DESIGN

NOTE:
DETAIL OF VEHICLE WASH EQUIPMENT WILL AFFECT DRAINAGE DETAILS AND WILL NEED TO BE CONFIRMED BY THE TENANT

MANUFACTURER

REFER TO SHEETS 2 & 3 FOR CONTINUATION

ACO DRAIN 350 CHANNEL OR SIMILAR APPROVED

+ 2800

SWMH S5
1200Ø
CL 2.800
IL 1.088

FWMH F6
1200Ø
CL 2.800
IL 0.305

+ 2800

S1.003-88m-300Ø-1.245

+ 3000

CHANNEL DESIGN TO BE PROVIDED BY MANUFACTURER

CHANNEL

CHANNEL

CHANNEL DESIGN TO BE PROVIDED BY MANUFACTURER

CHANNEL

REFER TO SHEET 4 FOR CONTINUATION

SWMH S4
1200Ø
CL 3.100
IL 2.350

FWMH F5A
1200Ø
CL 3.100
IL 1.750

S1.002-28.5m-150Ø-1.17

30m-150Ø-1.30

SWMH S4
1200Ø
CL 3.200
IL 1.429

FWMH F5
1200Ø
CL 3.200
IL 0.865

18.5m-150Ø-1.150

FWMH F4
1200Ø
CL 3.250
IL 0.995

FFL 3.200

FFL 3.350

FFL 3.400

FFL 3.400

S1.001-29.5m-225Ø-1.172

52m-150Ø-1.150

FWMH F3
1200Ø
CL 3.300
IL 1.410

FWMH F2
1200Ø
CL 3.400
IL 1.755

S1.001-66m-150Ø-1.150

SWMH S2
1200Ø
CL 3.400
IL 2.546

SWMH S3
1200Ø
CL 3.300
IL 2.032

52m-150Ø-1.4

REFER TO SHEET 6 FOR CONTINUATION

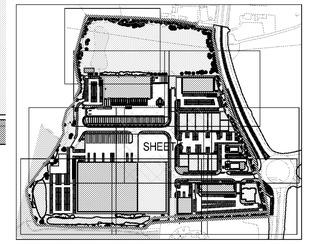
REFER TO SHEET 8 FOR CONTINUATION

GENERAL NOTES:

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PROPOSED PEAK SURFACE WATER DISCHARGE FLOW RATES AND ATTENUATION TABLE.

CATCHMENT AREA	PROPOSED FLOW RATE	PROPOSED ATTENUATION
1	11.30 L/S	3,900m³
2	2.00 L/S	500m³
3	10.30 L/S	3,250m³



KEY

150Ø-10m-1:100	SURFACE WATER PIPE
	SURFACE WATER MANHOLE
	BEANY
CHANNEL	LINEAR CHANNEL
	HYDROBRAKE MANHOLE TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION
	POROUS PAVING WITH PERFORATED PIPE (TYPE 3 STONE)
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	SWALE/STORAGE BASIN WITH CHECK DAMS PLANTING BY LANDSCAPE ARCHITECT.
	HEADWALL. FINAL DETAILS TO MANUFACTURERS SPECIFICATION
150Ø-10m-1:100	FOUL WATER PIPE
	FOUL WATER MANHOLE
	TREATED WATER PUMP STATION. TO HAVE EMERGENCY PUMPS, TO BE ALARMED AND VENTED WITH EMERGENCY STORAGE ALSO PROVIDED. TO MANUFACTURERS SPECIFICATION.
	FOUL WATER RISING MAIN
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	CATCHMENT 1 BOUNDARY
	CATCHMENT 2 BOUNDARY
	CATCHMENT 3 BOUNDARY
	DETAILED PLANNING APPLICATION HATCHED AREA
	SITE BOUNDARY

Rev.	Description:	Drn:	Chk:	Date:
P3	REVISED TO SUIT MOUNTFORD PIGOTT'S LATEST PLANS RECEIVED 07/06/17	DO	KJ	08.06.17
P2	ISSUED FOR INFORMATION	KW	GW	12.06.17
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Client: LANDLINK ESTATES

Architect: MOUNTFORD PIGOTT

Project: SALTBOX SITE
BOGNOR REGIS

Drawing Title: PRELIMINARY DRAINAGE STRATEGY
SHEET 5 OF 9

Drawn:	Chkd/Appd:	Date:	Sheet Size:	Scale:
KW		02.06.17	A1	1:250

KSA Project Number.	Suit:	Revision:
6090	S1	P3

Project:	Originator:	Zone:	Level:	Type:	Role:	Number:
6090	KSA	ZO	XX	DR	C	6004

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ARUN DISTRICT COUNCIL 05/10/2017OUT

REFER TO SHEET 3 FOR CONTINUATION

REFER TO SHEET 5 FOR CONTINUATION

REFER TO SHEET 9 FOR CONTINUATION

FFL 3.200

FFL 3.350

FFL 3.400

FFL 3.400

FFL 3.500

FFL 3.500

+ 3000

52m-150Ø-1:150

S1.001-66m-150Ø-1:150

S1.000-38m-150Ø-1:150

FWMH F2
1200Ø
CL 3.400
IL 1.755

SWMH S2
1200Ø
CL 3.400
IL 2.546

SWMH S1
1200Ø
CL 3.450
IL 2.850

FWMH F1
1200Ø
CL 3.450
IL 2.100

FWMH
1200Ø
CL 3.220
IL 2.225

SWMH

SWMH

N

NOTE:
TOPOGRAPHCIAL SURVEY, OS DATA, SITE PLAN OVERLAY SHOWN INDICATIVELY AND SHOULD BE COMPLETED BY ARCHITECT.

NOTE:
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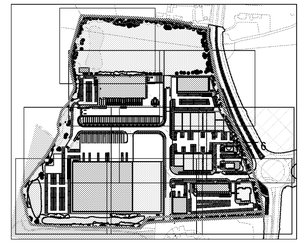
NOTE:
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2	2.00 L/S	500m³
3	10.30 L/S	3,250m³



KEY

150Ø-10m-1:100	SURFACE WATER PIPE
	SURFACE WATER MANHOLE
	BEANY
CHANNEL	LINEAR CHANNEL
	HYDROBRAKE MANHOLE TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION
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150Ø-10m-1:100	FOUL WATER PIPE
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	CATCHMENT 3 BOUNDARY
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P3	REVISED TO SUIT MOUNTFORD PIGOTTS LATEST PLANS RECEIVED 07/06/17	DO	KJ	08.08.17
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Client: LANDLINK ESTATES

Architect: MOUNTFORD PIGOTT

Project: SALTBOX SITE
BOGNOR REGIS

Drawing Title: PRELIMINARY DRAINAGE STRATEGY
SHEET 6 OF 9

Drawn:	Chkd/Appd:	Date:	Sheet Size:	Scale:
KW	—	02.06.17	A1	1:250

KSA Project Number: 6090 | Suit: S1 | Revision: P3

Project:	Originator:	Zone:	Level:	Type:	Role:	Number:
6090	KSA	ZO	XX	DR	C	6005

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ARUN DISTRICT COUNCIL BS1501/10/07

NOTE:
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NOTE:
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NOTE:
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REFER TO SHEET 4 FOR CONTINUATION

ASSUMED OUTFALL DETAILS
T. 7.700
I. 6.700

+ 1800

FFL 3.500

+ 1520

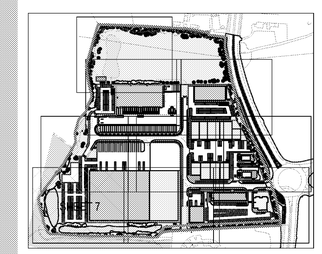
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3	10.30 L/S	3,250m³



KEY

150Ø-10m-1:100	SURFACE WATER PIPE
	SURFACE WATER MANHOLE
	BEANY
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	HYDROBRAKE MANHOLE TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION
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kirksaunders associates
CONSULTING ENGINEERS
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01689 896464 : www.kirksaunders.co.uk

Client: LANDLINK ESTATES

Architect: MOUNTFORD PIGOTT

Project: SALTBOX SITE
BOGNOR REGIS

Drawing Title: PRELIMINARY DRAINAGE STRATEGY
SHEET 7 OF 9

Drawn:	Chkd/Appd:	Date:	Sheet Size:	Scale:
KW	__	02.06.17	A1	1:250

KSA Project Number.	Suit:	Revision:
6090	S1	P3

Project:	Originator:	Zone:	Level:	Type:	Role:	Number:
6090	KSA	ZO	XX	DR	C	6006

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ARUN DISTRICT COUNCIL BR/180/17/OUT

REFER TO SHEET 5 FOR CONTINUATION

REFER TO SHEET 7 FOR CONTINUATION

REFER TO SHEET 9 FOR CONTINUATION

FFL 3.500

FFL 3.400

FFL 3.400

FFL 3.200

+ 2100

42m-150Ø-1.150

FWMH F3
1200Ø
CL 3.300
IL 1.410

52m-150Ø-1.150

FWMH F2
1200Ø
CL 3.400
IL 1.755

S1.001-66m-150Ø-1.150

SWMH S3
1200Ø
CL 3.300
IL 2.032

22m-150Ø-1.40

22m-150Ø-1.50

FWMH F3A
1200Ø
CL 3.300
IL 1.950

SWMH S3
1200Ø
CL 3.200
IL 2.450

SWMH
1200Ø
CL 3.450
IL 1.670

300Ø-1.250

SWMH
1200Ø
CL 3.050
IL 1.190

SWMH
1200Ø
CL 3.050
IL 1.340

SWMH
1200Ø
CL 3.050
IL 1.410

SWMH
1200Ø
CL 3.050
IL 1.425

SWMH
1200Ø
CL 3.050
IL 1.540

SWMH
1200Ø
CL 3.250
IL 1.350

1000Ø-1.150

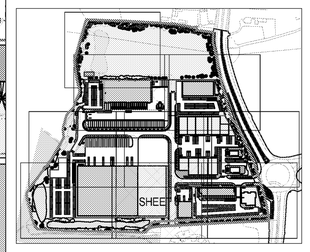
ASSUMED OUTFALL DETAILS:
CL 1.800
IL 0.200

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6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY APPROVALS FROM THE LOCAL AUTHORITY PRIOR TO COMMENCING WORKS ON THE HIGHWAY I.E. ROAD CLOSURE NOTICES.
7. UNLESS STATED OTHERWISE, ALL EXCAVATED MATERIAL SHALL BE DISPOSED OF AT AN APPROVED TIP OFF-SITE.
8. THE PUBLIC HIGHWAY AND WORKS WILL BE KEPT CLEAN AND FREE OF DEBRIS BY USE OF WHEEL WASHING FACILITIES AND ROAD SWEEPERS TO THE COUNCILS SATISFACTION.
9. DRAINAGE DESIGN SUBJECT TO INPUT FROM ARBOCULTURIST. THE CURRENT DESIGN ASSUMES THERE ARE NO ISSUES WITH EXISTING TREES/TREE ROOT PROTECTION AREAS.
10. DRAWING BASED ON SHAW COLEGATE TOPOGRAPHICAL SURVEY.

PROPOSED PEAK SURFACE WATER DISCHARGE FLOW RATES AND ATTENUATION TABLE.

CATCHMENT AREA	PROPOSED FLOW RATE	PROPOSED ATTENUATION
1	11.30 L/S	3,900m³
2	2.00 L/S	500m³
3	10.30 L/S	3,250m³



KEY

- 150Ø-10m-1:100 — SURFACE WATER PIPE
- SURFACE WATER MANHOLE
- BEANY
- CHANNEL — LINEAR CHANNEL
- HYDROBRAKE MANHOLE TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION
- POROUS PAVING WITH PERFORATED PIPE (TYPE 3 STONE)
- FULL RETENTION PETROL INTERCEPTOR TO BE ALARMED AND VENTED TO MANUFACTURERS SPECIFICATION.
- SWALE/STORAGE BASIN WITH CHECK DAMS PLANTING BY LANDSCAPE ARCHITECT.
- HEADWALL. FINAL DETAILS TO MANUFACTURERS SPECIFICATION
- 150Ø-10m-1:100 — FOUL WATER PIPE
- FOUL WATER MANHOLE
- TREATED WATER PUMP STATION. TO HAVE EMERGENCY PUMPS TO BE ALARMED AND VENTED WITH EMERGENCY STORAGE ALSO PROVIDED. TO MANUFACTURERS SPECIFICATION
- FOUL WATER RISING MAIN
- FOUL TREAT PLANT TO SUIT EA AND THE LOCAL DRAINAGE AUTHORITIES REQUIREMENTS TO ALLOW DISCHARGE TO A WATERCOURSE
- CATCHMENT 1 BOUNDARY
- CATCHMENT 2 BOUNDARY
- CATCHMENT 3 BOUNDARY
- DETAILED PLANNING APPLICATION HATCHED AREA
- SITE BOUNDARY

NOTE:
TOPOGRAPHCIAL SURVEY, OS DATA, SITE PLAN OVERLAY SHOWN INDICATIVELY AND SHOULD BE COMPLETED BY ARCHITECT.

NOTE:
SCHEME SUBJECT TO DETAILED DESIGN

NOTE:
DETAIL OF VEHICLE WASH EQUIPMENT WILL AFFECT DRAINAGE DETAILS AND WILL NEED TO BE CONFIRMED BY THE TENANT

Rev.	Description:	Drn:	Chk:	Date:
P3	REVISED TO SUIT MOUNTFORD PIGOTTS LATEST PLANS RECEIVED 07/06/17	DO	KJ	08.06.17
P2	ISSUED FOR INFORMATION	KW	GW	12.06.17
P1	ISSUED FOR INFORMATION	KW	GW	07.06.17

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SHEET 8 OF 9

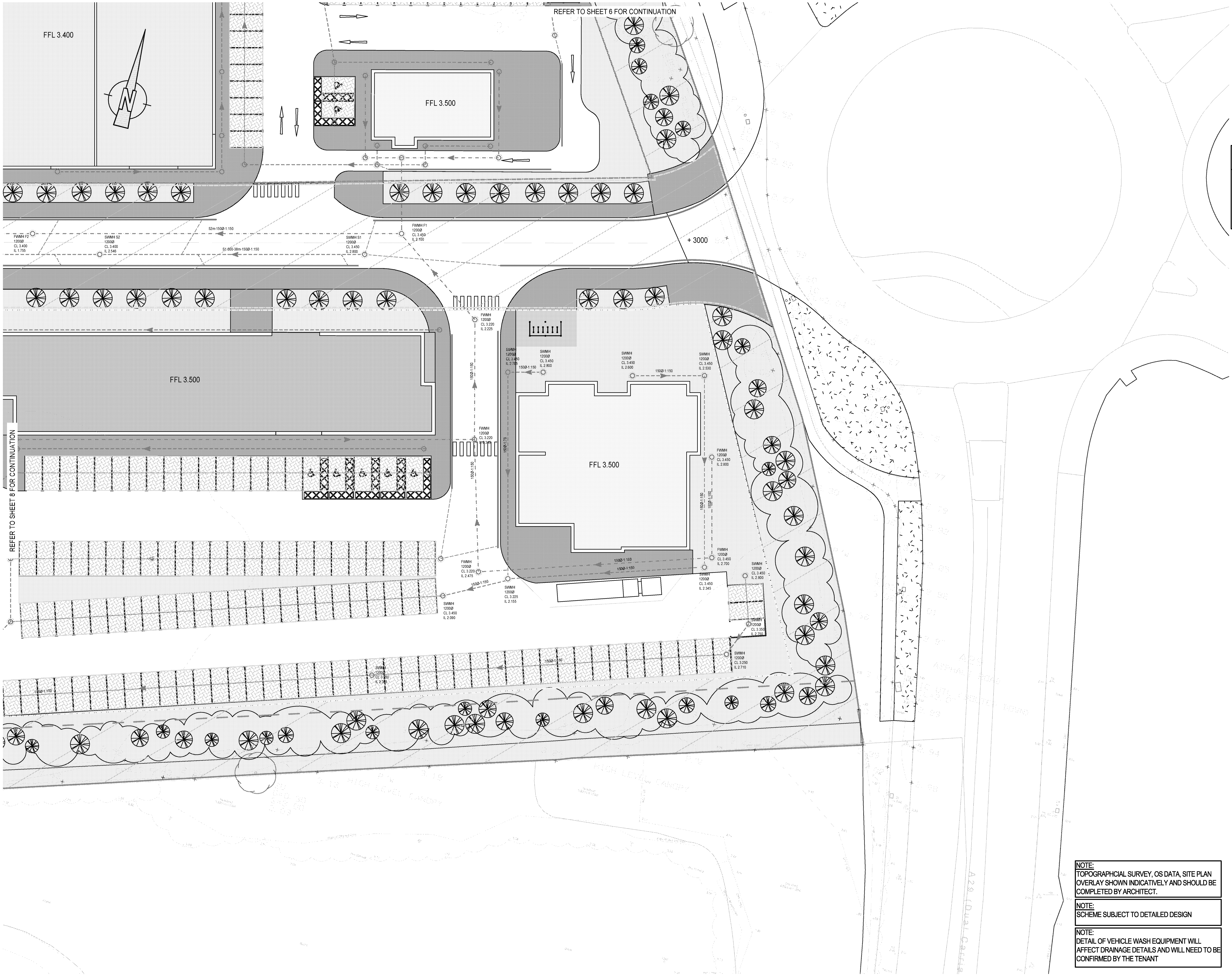
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KW	—	02.06.17	A1	1:250

KSA Project Number:	Suit:	Revision:
6090	S1	P3

Project:	Originator:	Zone:	Level:	Type:	Role:	Number:
6090	KSA	ZO	XX	DR	C	6007

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ARUN DISTRICT COUNCIL 08/1021/OUT



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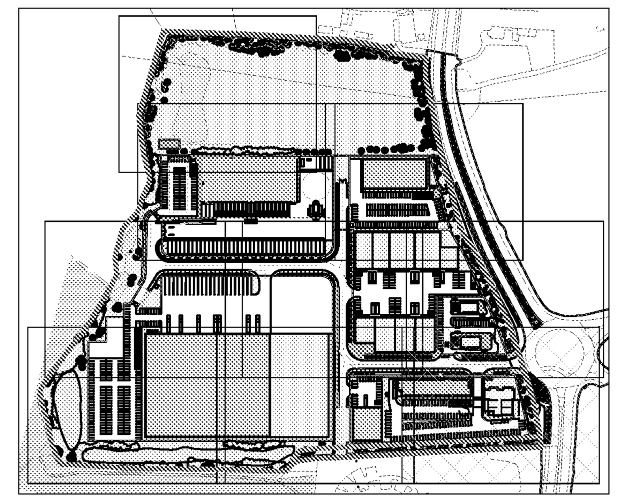
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BOGNOR REGIS

Drawing Title: PRELIMINARY DRAINAGE STRATEGY
SHEET 9 OF 9

Drawn:	Chkd/Appd:	Date:	Sheet Size:	Scale:
GW	__	02.06.17	A1	1:250

KSA Project Number:	Suit:	Revision:
6090	S1	P3

Project:	Originator:	Zone:	Level:	Type:	Role:	Number:
6090	KSA	ZO	XX	DR	C	6008

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ARUN DISTRICT COUNCIL BE/102/17/OUT

Appendix E – Proposed Drainage Calculations

ARUN DISTRICT COUNCIL BE/102/17/OUT

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.187	4-8	1.618	8-12	1.423	12-16	0.168

Total Area Contributing (ha) = 3.396

Total Pipe Volume (m^3) = 180.338

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	26.836	0.179	150.0	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	60.241	0.402	150.0	0.049	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	47.059	0.314	150.0	0.038	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	28.836	0.267	108.0	0.037	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	12.837	0.380	33.8	0.045	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	20.310	0.135	150.0	0.030	5.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	4.985	0.033	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.002	70.130	0.543	129.1	0.097	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	53.659	0.405	132.5	0.045	5.00	0.0	0.600	o	150	Pipe/Conduit	
S5.000	55.944	0.373	150.0	0.047	5.00	0.0	0.600	o	150	Pipe/Conduit	
S5.001	4.801	0.032	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.001	14.702	0.307	47.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.003	5.949	0.232	25.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.000	10.479	0.070	149.7	0.000	5.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.55	3.450	0.000	0.0	0.0	0.0	0.82	14.5	0.0
S1.001	50.00	6.77	2.271	0.049	0.0	0.0	0.0	0.82	14.5	6.6
S2.000	50.00	5.96	2.450	0.038	0.0	0.0	0.0	0.82	14.5	5.1
S2.001	50.00	6.46	2.136	0.074	0.0	0.0	0.0	0.97	17.1	10.1
S1.002	50.00	6.90	1.869	0.168	0.0	0.0	0.0	1.74	30.7	22.8
S3.000	50.00	5.41	3.500	0.030	0.0	0.0	0.0	0.82	14.5	4.1
S3.001	50.00	5.52	2.365	0.030	0.0	0.0	0.0	0.82	14.5	4.1
S3.002	50.00	6.53	2.256	0.128	0.0	0.0	0.0	1.15	45.7	17.3
S4.000	50.00	6.03	2.500	0.045	0.0	0.0	0.0	0.87	15.4	6.1
S5.000	50.00	6.14	2.500	0.047	0.0	0.0	0.0	0.82	14.5	6.4
S5.001	50.00	6.24	2.127	0.047	0.0	0.0	0.0	0.82	14.5	6.4
S4.001	50.00	6.41	2.095	0.092	0.0	0.0	0.0	1.46	25.8	12.5
S3.003	50.00	6.57	1.713	0.220	0.0	0.0	0.0	2.59	103.2	29.8
S6.000	50.00	5.21	3.850	0.000	0.0	0.0	0.0	0.82	14.5	0.0

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.001	18.989	0.127	149.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.002	36.445	0.243	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.000	23.672	0.158	149.8	0.030	5.00	0.0	0.600	o	150	Pipe/Conduit	
S7.001	5.201	0.182	28.6	0.024	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.003	26.557	0.177	150.0	0.027	0.00	0.0	0.600	o	150	Pipe/Conduit	
S8.000	38.611	0.257	150.0	0.047	5.00	0.0	0.600	o	150	Pipe/Conduit	
S8.001	10.705	0.110	97.7	0.048	0.00	0.0	0.600	o	150	Pipe/Conduit	
S9.000	10.998	0.157	70.1	0.092	5.00	0.0	0.600	o	150	Pipe/Conduit	
S10.000	23.564	0.157	150.1	0.024	5.00	0.0	0.600	o	150	Pipe/Conduit	
S9.001	12.372	0.083	149.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S11.000	20.160	0.240	84.0	0.029	5.00	0.0	0.600	o	150	Pipe/Conduit	
S9.002	5.263	0.031	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.003	14.372	0.346	41.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.004	71.534	0.298	240.0	0.111	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S6.001	50.00	5.60	2.780	0.000	0.0	0.0	0.0	0.82	14.5	0.0
S6.002	50.00	6.34	2.653	0.000	0.0	0.0	0.0	0.82	14.5	0.0
S7.000	50.00	5.48	2.750	0.030	0.0	0.0	0.0	0.82	14.5	4.1
S7.001	50.00	5.53	2.592	0.054	0.0	0.0	0.0	1.89	33.4	7.4
S6.003	50.00	6.88	2.410	0.081	0.0	0.0	0.0	0.82	14.5	11.0
S8.000	50.00	5.79	2.600	0.047	0.0	0.0	0.0	0.82	14.5	6.4
S8.001	50.00	5.96	2.343	0.095	0.0	0.0	0.0	1.02	18.0	12.9
S9.000	50.00	5.15	2.850	0.092	0.0	0.0	0.0	1.20	21.3	12.5
S10.000	50.00	5.48	2.850	0.024	0.0	0.0	0.0	0.82	14.5	3.3
S9.001	50.00	5.67	2.618	0.117	0.0	0.0	0.0	1.07	42.5	15.8
S11.000	50.00	5.31	2.850	0.029	0.0	0.0	0.0	1.10	19.4	3.9
S9.002	50.00	5.76	2.535	0.145	0.0	0.0	0.0	1.00	39.8	19.7
S9.003	50.00	5.88	2.504	0.145	0.0	0.0	0.0	2.04	80.9	19.7
S6.004	50.00	8.06	2.083	0.434	0.0	0.0	0.0	1.01	71.4	58.7

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S12.000	21.446	0.214	100.2	0.045	5.00	0.0	0.600	o	150	Pipe/Conduit	
S12.001	30.758	0.401	76.7	0.032	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.005	20.508	0.085	240.0	0.128	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.000	109.108	0.651	167.7	0.092	5.00	0.0	0.600	o	150	Pipe/Conduit	
S6.006	20.392	0.068	299.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S14.000	14.499	0.145	100.0	0.053	5.00	0.0	0.600	o	150	Pipe/Conduit	
S14.001	17.608	0.176	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S14.002	76.694	0.497	154.2	0.095	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.007	34.019	0.101	337.9	0.160	0.00	0.0	0.600	o	450	Pipe/Conduit	
S15.000	17.111	0.171	100.0	0.029	5.00	0.0	0.600	o	150	Pipe/Conduit	
S15.001	15.500	0.155	100.0	0.025	0.00	0.0	0.600	o	150	Pipe/Conduit	
S15.002	13.508	0.135	100.0	0.052	0.00	0.0	0.600	o	150	Pipe/Conduit	
S15.003	76.094	0.408	186.5	0.041	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.008	12.099	0.050	242.0	0.056	0.00	0.0	0.600	o	450	Pipe/Conduit	
S16.000	70.264	0.703	100.0	0.071	5.00	0.0	0.600	o	150	Pipe/Conduit	
S16.001	4.717	0.047	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S12.000	50.00	5.36	2.550	0.045	0.0	0.0	0.0	1.00	17.7	6.2
S12.001	50.00	5.80	2.336	0.077	0.0	0.0	0.0	1.15	20.3	10.4
S6.005	50.00	8.36	1.710	0.639	0.0	0.0	0.0	1.17	128.7	86.6
S13.000	50.00	7.35	2.500	0.092	0.0	0.0	0.0	0.77	13.7	12.4
S6.006	50.00	8.68	1.624	0.731	0.0	0.0	0.0	1.04	115.0	99.0
S14.000	50.00	5.24	2.600	0.053	0.0	0.0	0.0	1.00	17.8	7.2
S14.001	50.00	5.53	2.455	0.053	0.0	0.0	0.0	1.00	17.8	7.2
S14.002	50.00	6.75	2.204	0.149	0.0	0.0	0.0	1.05	41.8	20.1
S6.007	50.00	9.20	1.481	1.040	0.0	0.0	0.0	1.10	175.0	140.8
S15.000	50.00	5.28	2.550	0.029	0.0	0.0	0.0	1.00	17.8	3.9
S15.001	50.00	5.54	2.379	0.054	0.0	0.0	0.0	1.00	17.8	7.3
S15.002	50.00	5.76	2.224	0.106	0.0	0.0	0.0	1.00	17.8	14.3
S15.003	50.00	7.09	2.014	0.146	0.0	0.0	0.0	0.95	37.9	19.8
S6.008	50.00	9.35	1.381	1.242	0.0	0.0	0.0	1.30	207.2	168.2
S16.000	50.00	6.17	2.500	0.071	0.0	0.0	0.0	1.00	17.8	9.6
S16.001	50.00	6.24	1.797	0.071	0.0	0.0	0.0	1.00	17.8	9.6

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S16.002	6.028	0.119	50.7	0.018	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.009	25.581	0.075	341.1	0.026	0.00	0.0	0.600	o	525	Pipe/Conduit	
S3.004	30.273	0.067	451.8	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S1.003	39.040	0.068	574.1	0.075	0.00	0.0	0.600	o	600	Pipe/Conduit	
S17.000	37.830	0.579	65.3	0.384	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	87.288	0.152	574.3	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
S18.000	12.698	0.042	302.3	0.433	5.00	0.0	0.600	o	450	Pipe/Conduit	
S18.001	39.830	0.589	67.6	0.433	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.005	9.665	0.050	193.3	0.129	0.00	0.0	0.600	o	675	Pipe/Conduit	
S19.000	50.136	0.334	150.0	0.050	5.00	0.0	0.600	o	150	Pipe/Conduit	
S19.001	5.570	0.297	18.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S20.000	44.107	0.294	150.0	0.060	5.00	0.0	0.600	o	150	Pipe/Conduit	
S20.001	13.278	0.089	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S21.000	46.667	0.383	121.8	0.086	5.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S16.002	50.00	6.31	1.750	0.089	0.0	0.0	0.0	1.42	25.0	12.0
S6.009	50.00	9.71	1.256	1.357	0.0	0.0	0.0	1.21	261.3	183.8
S3.004	50.00	10.19	1.181	1.578	0.0	0.0	0.0	1.05	226.7	213.6
S1.003	50.00	10.83	1.039	1.820	0.0	0.0	0.0	1.01	285.3	246.5
S17.000	50.00	5.32	1.850	0.384	0.0	0.0	0.0	1.95	137.7	52.0
S1.004	50.00	12.17	0.896	2.204	0.0	0.0	0.0	1.09	388.8	298.5
S18.000	50.00	5.18	1.600	0.433	0.0	0.0	0.0	1.16	185.1	58.6
S18.001	50.00	5.45	1.558	0.866	0.0	0.0	0.0	2.48	393.7	117.3
S1.005	50.00	12.26	0.744	3.199	0.0	0.0	0.0	1.88	673.3	433.2
S19.000	50.00	6.02	1.850	0.050	0.0	0.0	0.0	0.38	14.5	6.8
S19.001	50.00	6.06	1.516	0.050	0.0	0.0	0.0	2.34	41.3	6.8
S20.000	50.00	5.90	1.650	0.060	0.0	0.0	0.0	0.38	14.5	8.2
S20.001	50.00	6.17	1.356	0.060	0.0	0.0	0.0	0.82	14.5	8.2
S21.000	50.00	5.86	1.650	0.086	0.0	0.0	0.0	0.91	16.1	11.7

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S20.002	8.706	0.048	181.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	7.037	0.050	140.7	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.007	41.875	0.050	837.5	0.000	0.00	0.0	0.600	o	1000	Pipe/Conduit	
S1.008	37.541	0.004	9385.3	0.000	0.00	0.0	0.600	o	1000	Pipe/Conduit	
S1.009	16.832	0.070	240.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S20.002	50.00	6.32	1.192	0.147	0.0	0.0	0.0	0.97	38.5	19.8
S1.006	50.00	12.31	0.769	3.396	0.0	0.0	0.0	2.05	579.9	459.8
S1.007	50.00	12.92	0.719	3.396	0.0	0.0	0.0	1.15	901.2	459.8
S1.008	50.00	14.79	0.669	3.396	0.0	0.0	0.0	0.33	263.1‡	459.8
S1.009	50.00	15.07	0.663	3.396	0.0	0.0	0.0	1.01	71.4«	459.8

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	3.100	0.650	Open Manhole	1200	S1.000	2.450	150				
S2	3.100	0.829	Open Manhole	1200	S1.001	2.271	150	S1.000	2.271	150	
S3	3.100	0.650	Open Manhole	1200	S2.000	2.450	150				
S4	3.100	0.964	Open Manhole	1200	S2.001	2.136	150	S2.000	2.136	150	
S3	3.100	1.231	Open Manhole	1200	S1.002	1.869	150	S1.001	1.869	150	
								S2.001	1.869	150	
S6	3.150	0.650	Open Manhole	1200	S3.000	2.500	150				
S7	3.100	0.735	Open Manhole	1200	S3.001	2.365	150	S3.000	2.365	150	
S8	3.100	0.844	Open Manhole	1200	S3.002	2.256	225	S3.001	2.331	150	
S9	3.150	0.650	Open Manhole	1200	S4.000	2.500	150				
S10	3.150	0.650	Open Manhole	1200	S5.000	2.500	150				
S11	3.150	1.023	Open Manhole	1200	S5.001	2.127	150	S5.000	2.127	150	
S10	3.150	1.055	Open Manhole	1200	S4.001	2.095	150	S4.000	2.095	150	
								S5.001	2.095	150	
S9	3.100	1.387	Open Manhole	1200	S3.003	1.713	225	S3.002	1.713	225	
								S4.001	1.788	150	
S10	3.500	0.650	Open Manhole	1200	S6.000	2.850	150				
S11	3.500	0.720	Open Manhole	1200	S6.001	2.780	150	S6.000	2.780	150	
S12	3.500	0.847	Open Manhole	1200	S6.002	2.653	150	S6.001	2.653	150	
S17	3.400	0.650	Open Manhole	1200	S7.000	2.750	150				
S18	3.400	0.808	Open Manhole	1200	S7.001	2.592	150	S7.000	2.592	150	
S13	3.400	0.990	Open Manhole	1200	S6.003	2.410	150	S6.002	2.410	150	
								S7.001	2.410	150	
S20	3.250	0.650	Open Manhole	1200	S8.000	2.600	150				
S21	3.200	0.857	Open Manhole	1200	S8.001	2.343	150	S8.000	2.343	150	
S22	3.500	0.650	Open Manhole	1200	S9.000	2.850	150				
S23	3.500	0.650	Open Manhole	1200	S10.000	2.850	150				
S23	3.500	0.882	Open Manhole	1200	S9.001	2.618	225	S9.000	2.693	150	
								S10.000	2.693	150	
S25	3.500	0.650	Open Manhole	1200	S11.000	2.850	150				
S24	3.400	0.865	Open Manhole	1200	S9.002	2.535	225	S9.001	2.535	225	
								S11.000	2.610	150	
S25	3.400	0.896	Open Manhole	1200	S9.003	2.504	225	S9.002	2.504	225	
S14	3.400	1.317	Open Manhole	1200	S6.004	2.083	300	S6.003	2.233	150	
								S8.001	2.233	150	
								S9.003	2.158	225	
S43	3.400	0.850	Open Manhole	1200	S12.000	2.550	150				
S20	3.400	1.064	Open Manhole	1200	S12.001	2.336	150	S12.000	2.336	150	
S15	3.400	1.690	Open Manhole	1350	S6.005	1.710	375	S6.004	1.785	300	
								S12.001	1.935	150	
S20	3.350	0.850	Open Manhole	1200	S13.000	2.500	150				
S16	3.150	1.526	Open Manhole	1350	S6.006	1.624	375	S6.005	1.624	375	

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
								S13.000	1.849	150	
S21	3.250	0.650	Open Manhole	1200	S14.000	2.600	150				
S22	3.300	0.845	Open Manhole	1200	S14.001	2.455	150	S14.000	2.455	150	
S23	3.300	1.096	Open Manhole	1200	S14.002	2.204	225	S14.001	2.279	150	
S17	3.200	1.719	Open Manhole	1350	S6.007	1.481	450	S6.006	1.556	375	
								S14.002	1.706	225	
S22	3.200	0.650	Open Manhole	1200	S15.000	2.550	150				
S23	3.200	0.821	Open Manhole	1200	S15.001	2.379	150	S15.000	2.379	150	
S24	3.200	0.976	Open Manhole	1200	S15.002	2.224	150	S15.001	2.224	150	
S25	3.200	1.186	Open Manhole	1200	S15.003	2.014	225	S15.002	2.089	150	
S18	3.200	1.819	Open Manhole	1350	S6.008	1.381	450	S6.007	1.381	450	
								S15.003	1.606	225	
S23	3.150	0.650	Open Manhole	1200	S16.000	2.500	150				
S24	3.150	1.353	Open Manhole	1200	S16.001	1.797	150	S16.000	1.797	150	
S25	3.150	1.400	Open Manhole	1200	S16.002	1.750	150	S16.001	1.750	150	
S19	3.200	1.944	Open Manhole	1500	S6.009	1.256	525	S6.008	1.331	450	
								S16.002	1.631	150	
S10	3.100	1.919	Open Manhole	1500	S3.004	1.181	525	S3.003	1.481	225	
								S6.009	1.181	525	
S4	3.100	2.061	Open Manhole	1500	S1.003	1.039	600	S1.002	1.489	150	
								S3.004	1.114	525	
S49	3.350	1.500	Open Manhole	1200	S17.000	1.850	300				
S5	3.350	2.454	Open Manhole	1500	S1.004	0.896	675	S1.003	0.971	600	
								S17.000	1.271	300	
S52	2.550	0.950	Open Manhole	1350	S18.000	1.600	450				
S52	2.500	0.942	Open Manhole	1350	S18.001	1.558	450	S18.000	1.558	450	
S6	3.350	2.606	Open Manhole	1500	S1.005	0.744	675	S1.004	0.744	675	
								S18.001	0.969	450	
S55	2.600	0.750	Open Manhole	1200	S19.000	1.850	150				
S56	3.250	1.734	Open Manhole	1200	S19.001	1.516	150	S19.000	1.516	150	
S57	2.400	0.750	Open Manhole	1200	S20.000	1.650	150				
S58	2.400	1.044	Open Manhole	1200	S20.001	1.356	150	S20.000	1.356	150	
S59	2.400	0.750	Open Manhole	1200	S21.000	1.650	150				
S59	3.000	1.808	Open Manhole	1200	S20.002	1.192	225	S20.001	1.267	150	
								S21.000	1.267	150	
S7	3.200	2.506	Open Manhole	1500	S1.006	0.769	600	S1.005	0.694	675	
								S19.001	1.219	150	
								S20.002	1.144	225	
S8	2.000	1.281	Open Manhole		S1.007	0.719	1000	S1.006	0.719	600	
SPond	2.000	1.331	Junction	0	S1.008	0.669	1000	S1.007	0.669	1000	
S10	2.000	1.335	Open Manhole	1900	S1.009	0.669	300	S1.008	0.665	1000	
S	1.600	1.001	Open Manhole	0		OUTFALL		S1.009	0.599	300	

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	3.100	2.450	0.500	Open Manhole	1200
S1.001	o	150	S2	3.100	2.271	0.679	Open Manhole	1200
S2.000	o	150	S3	3.100	2.450	0.500	Open Manhole	1200
S2.001	o	150	S4	3.100	2.136	0.814	Open Manhole	1200
S1.002	o	150	S3	3.100	1.869	1.081	Open Manhole	1200
S3.000	o	150	S6	3.150	2.500	0.500	Open Manhole	1200
S3.001	o	150	S7	3.100	2.365	0.585	Open Manhole	1200
S3.002	o	225	S8	3.100	2.256	0.619	Open Manhole	1200
S4.000	o	150	S9	3.150	2.500	0.500	Open Manhole	1200
S5.000	o	150	S10	3.150	2.500	0.500	Open Manhole	1200
S5.001	o	150	S11	3.150	2.127	0.873	Open Manhole	1200
S4.001	o	150	S10	3.150	2.095	0.905	Open Manhole	1200
S3.003	o	225	S9	3.100	1.713	1.162	Open Manhole	1200
S6.000	o	150	S10	3.500	2.850	0.500	Open Manhole	1200
S6.001	o	150	S11	3.500	2.780	0.570	Open Manhole	1200
S6.002	o	150	S12	3.500	2.653	0.697	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	26.836	150.0	S2	3.100	2.271	0.679	Open Manhole	1200
S1.001	60.241	150.0	S3	3.100	1.869	1.081	Open Manhole	1200
S2.000	47.059	150.0	S4	3.100	2.136	0.814	Open Manhole	1200
S2.001	28.836	108.0	S3	3.100	1.869	1.081	Open Manhole	1200
S1.002	12.837	33.8	S4	3.100	1.489	1.461	Open Manhole	1500
S3.000	20.310	150.0	S7	3.100	2.365	0.585	Open Manhole	1200
S3.001	4.985	150.0	S8	3.100	2.331	0.619	Open Manhole	1200
S3.002	70.130	129.1	S9	3.100	1.713	1.162	Open Manhole	1200
S4.000	53.659	132.5	S10	3.150	2.095	0.905	Open Manhole	1200
S5.000	55.944	150.0	S11	3.150	2.127	0.873	Open Manhole	1200
S5.001	4.801	150.0	S10	3.150	2.095	0.905	Open Manhole	1200
S4.001	14.702	47.9	S9	3.100	1.788	1.162	Open Manhole	1200
S3.003	5.949	25.6	S10	3.100	1.481	1.394	Open Manhole	1500
S6.000	10.479	149.7	S11	3.500	2.780	0.570	Open Manhole	1200
S6.001	18.989	149.5	S12	3.500	2.653	0.697	Open Manhole	1200
S6.002	36.445	150.0	S13	3.400	2.410	0.840	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S7.000	o	150	S17	3.400	2.750	0.500	Open Manhole	1200
S7.001	o	150	S18	3.400	2.592	0.658	Open Manhole	1200
S6.003	o	150	S13	3.400	2.410	0.840	Open Manhole	1200
S8.000	o	150	S20	3.250	2.600	0.500	Open Manhole	1200
S8.001	o	150	S21	3.200	2.343	0.707	Open Manhole	1200
S9.000	o	150	S22	3.500	2.850	0.500	Open Manhole	1200
S10.000	o	150	S23	3.500	2.850	0.500	Open Manhole	1200
S9.001	o	225	S23	3.500	2.618	0.657	Open Manhole	1200
S11.000	o	150	S25	3.500	2.850	0.500	Open Manhole	1200
S9.002	o	225	S24	3.400	2.535	0.640	Open Manhole	1200
S9.003	o	225	S25	3.400	2.504	0.671	Open Manhole	1200
S6.004	o	300	S14	3.400	2.083	1.017	Open Manhole	1200
S12.000	o	150	S43	3.400	2.550	0.700	Open Manhole	1200
S12.001	o	150	S20	3.400	2.336	0.914	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S7.000	23.672	149.8	S18	3.400	2.592	0.658	Open Manhole	1200
S7.001	5.201	28.6	S13	3.400	2.410	0.840	Open Manhole	1200
S6.003	26.557	150.0	S14	3.400	2.233	1.017	Open Manhole	1200
S8.000	38.611	150.0	S21	3.200	2.343	0.707	Open Manhole	1200
S8.001	10.705	97.7	S14	3.400	2.233	1.017	Open Manhole	1200
S9.000	10.998	70.1	S23	3.500	2.693	0.657	Open Manhole	1200
S10.000	23.564	150.1	S23	3.500	2.693	0.657	Open Manhole	1200
S9.001	12.372	149.1	S24	3.400	2.535	0.640	Open Manhole	1200
S11.000	20.160	84.0	S24	3.400	2.610	0.640	Open Manhole	1200
S9.002	5.263	170.0	S25	3.400	2.504	0.671	Open Manhole	1200
S9.003	14.372	41.5	S14	3.400	2.158	1.017	Open Manhole	1200
S6.004	71.534	240.0	S15	3.400	1.785	1.315	Open Manhole	1350
S12.000	21.446	100.2	S20	3.400	2.336	0.914	Open Manhole	1200
S12.001	30.758	76.7	S15	3.400	1.935	1.315	Open Manhole	1350

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.005	o	375	S15	3.400	1.710	1.315	Open Manhole	1350
S13.000	o	150	S20	3.350	2.500	0.700	Open Manhole	1200
S6.006	o	375	S16	3.150	1.624	1.151	Open Manhole	1350
S14.000	o	150	S21	3.250	2.600	0.500	Open Manhole	1200
S14.001	o	150	S22	3.300	2.455	0.695	Open Manhole	1200
S14.002	o	225	S23	3.300	2.204	0.871	Open Manhole	1200
S6.007	o	450	S17	3.200	1.481	1.269	Open Manhole	1350
S15.000	o	150	S22	3.200	2.550	0.500	Open Manhole	1200
S15.001	o	150	S23	3.200	2.379	0.671	Open Manhole	1200
S15.002	o	150	S24	3.200	2.224	0.826	Open Manhole	1200
S15.003	o	225	S25	3.200	2.014	0.961	Open Manhole	1200
S6.008	o	450	S18	3.200	1.381	1.369	Open Manhole	1350
S16.000	o	150	S23	3.150	2.500	0.500	Open Manhole	1200
S16.001	o	150	S24	3.150	1.797	1.203	Open Manhole	1200
S16.002	o	150	S25	3.150	1.750	1.250	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.005	20.508	240.0	S16	3.150	1.624	1.151	Open Manhole	1350
S13.000	109.108	167.7	S16	3.150	1.849	1.151	Open Manhole	1350
S6.006	20.392	299.9	S17	3.200	1.556	1.269	Open Manhole	1350
S14.000	14.499	100.0	S22	3.300	2.455	0.695	Open Manhole	1200
S14.001	17.608	100.0	S23	3.300	2.279	0.871	Open Manhole	1200
S14.002	76.694	154.2	S17	3.300	1.706	1.269	Open Manhole	1350
S6.007	34.019	337.9	S18	3.200	1.381	1.369	Open Manhole	1350
S15.000	17.111	100.0	S23	3.200	2.379	0.671	Open Manhole	1200
S15.001	15.500	100.0	S24	3.200	2.224	0.826	Open Manhole	1200
S15.002	13.508	100.0	S25	3.200	2.089	0.961	Open Manhole	1200
S15.003	76.094	186.5	S18	3.200	1.606	1.369	Open Manhole	1350
S6.008	12.099	242.0	S19	3.200	1.331	1.419	Open Manhole	1500
S16.000	70.264	100.0	S24	3.150	1.797	1.203	Open Manhole	1200
S16.001	4.717	100.0	S25	3.150	1.750	1.250	Open Manhole	1200
S16.002	6.028	50.7	S19	3.200	1.631	1.419	Open Manhole	1500

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.009	o	525	S19	3.200	1.256	1.419	Open Manhole	1500
S3.004	o	525	S10	3.100	1.181	1.394	Open Manhole	1500
S1.003	o	600	S4	3.100	1.039	1.461	Open Manhole	1500
S17.000	o	300	S49	3.350	1.850	1.200	Open Manhole	1200
S1.004	o	675	S5	3.350	0.896	1.779	Open Manhole	1500
S18.000	o	450	S52	2.550	1.600	0.500	Open Manhole	1350
S18.001	o	450	S52	2.500	1.558	0.492	Open Manhole	1350
S1.005	o	675	S6	3.350	0.744	1.931	Open Manhole	1500
S19.000	o	150	S55	2.600	1.850	0.600	Open Manhole	1200
S19.001	o	150	S56	3.250	1.516	1.584	Open Manhole	1200
S20.000	o	150	S57	2.400	1.650	0.600	Open Manhole	1200
S20.001	o	150	S58	2.400	1.356	0.894	Open Manhole	1200
S21.000	o	150	S59	2.400	1.650	0.600	Open Manhole	1200
S20.002	o	225	S59	3.000	1.192	1.583	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.009	25.581	341.1	S10	3.100	1.181	1.394	Open Manhole	1500
S3.004	30.273	451.8	S4	3.100	1.114	1.461	Open Manhole	1500
S1.003	39.040	574.1	S5	3.350	0.971	1.779	Open Manhole	1500
S17.000	37.830	65.3	S5	3.350	1.271	1.779	Open Manhole	1500
S1.004	87.288	574.3	S6	3.350	0.744	1.931	Open Manhole	1500
S18.000	12.698	302.3	S52	2.500	1.558	0.492	Open Manhole	1350
S18.001	39.830	67.6	S6	3.350	0.969	1.931	Open Manhole	1500
S1.005	9.665	193.3	S7	3.200	0.694	1.831	Open Manhole	1500
S19.000	50.136	150.0	S56	3.250	1.516	1.584	Open Manhole	1200
S19.001	5.570	18.8	S7	3.200	1.219	1.831	Open Manhole	1500
S20.000	44.107	150.0	S58	2.400	1.356	0.894	Open Manhole	1200
S20.001	13.278	150.0	S59	3.000	1.267	1.583	Open Manhole	1200
S21.000	46.667	121.8	S59	3.000	1.267	1.583	Open Manhole	1200
S20.002	8.706	181.4	S7	3.200	1.144	1.831	Open Manhole	1500

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.006	o	600	S7	3.200	0.769	1.831	Open Manhole	1500
S1.007	o	1000	S8	2.000	0.719	0.281	Open Manhole	1900
S1.008	o	1000	SPond	2.000	0.669	0.331	Junction	
S1.009	o	300	S10	2.000	0.669	1.031	Open Manhole	1900

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.006	7.037	140.7	S8	2.000	0.719	0.681	Open Manhole	1900
S1.007	41.875	837.5	SPond	2.000	0.669	0.331	Junction	
S1.008	37.541	9385.3	S10	2.000	0.665	0.335	Open Manhole	1900
S1.009	16.832	240.5	S	1.600	0.599	0.701	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	S	1.600	0.599	0.500	0	0

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Online Controls for Storm

Complex Manhole: S10, DS/PN: S1.009, Volume (m³): 32.5

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0139-1130-2000-1130
Design Head (m)	2.000
Design Flow (l/s)	11.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	139
Invert Level (m)	0.669
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	11.3	Kick-Flo®	1.214	8.9
Flush-Flo™	0.593	11.3	Mean Flow over Head Range	-	9.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.0	0.800	11.1	2.000	11.3	4.000	15.7	7.000	20.5
0.200	9.4	1.000	10.5	2.200	11.8	4.500	16.6	7.500	21.2
0.300	10.4	1.200	9.1	2.400	12.3	5.000	17.5	8.000	21.9
0.400	11.0	1.400	9.5	2.600	12.8	5.500	18.3	8.500	22.5
0.500	11.2	1.600	10.2	3.000	13.7	6.000	19.1	9.000	23.1
0.600	11.3	1.800	10.7	3.500	14.7	6.500	19.8	9.500	23.8

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Storage Structures for Storm

Porous Car Park Manhole: S6, DS/PN: S3.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	21.0
Max Percolation (l/s)	28.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.500	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S9, DS/PN: S4.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	56.0
Max Percolation (l/s)	74.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.500	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S10, DS/PN: S5.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	56.0
Max Percolation (l/s)	74.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.500	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S9, DS/PN: S3.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	72.0
Max Percolation (l/s)	96.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	1.713	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S18, DS/PN: S7.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	19.1
Max Percolation (l/s)	25.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.592	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S20, DS/PN: S8.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	38.0
Max Percolation (l/s)	50.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.600	Cap Volume Depth (m)	0.500

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Porous Car Park Manhole: S22, DS/PN: S9.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	14.4
Max Percolation (l/s)	19.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.850	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S23, DS/PN: S10.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	21.5
Max Percolation (l/s)	28.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.850	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S25, DS/PN: S11.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	21.5
Max Percolation (l/s)	28.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.850	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S15, DS/PN: S6.005

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	60.0
Max Percolation (l/s)	80.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	1.710	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S16, DS/PN: S6.006

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.3
Membrane Percolation (mm/hr)	1000	Length (m)	110.0
Max Percolation (l/s)	223.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	1.624	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S17, DS/PN: S6.007

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	87.0
Max Percolation (l/s)	116.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	1.481	Cap Volume Depth (m)	0.500

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Porous Car Park Manhole: S23, DS/PN: S16.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	71.0
Max Percolation (l/s)	94.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.500	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S25, DS/PN: S16.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	14.5
Max Percolation (l/s)	19.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	1.750	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S55, DS/PN: S19.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	55.0
Max Percolation (l/s)	73.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.450	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S58, DS/PN: S20.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8
Membrane Percolation (mm/hr)	1000	Length (m)	45.0
Max Percolation (l/s)	60.0	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.009	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S59, DS/PN: S21.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.6
Membrane Percolation (mm/hr)	1000	Length (m)	40.0
Max Percolation (l/s)	106.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	2.450	Cap Volume Depth (m)	0.500

Tank or Pond Manhole: SPond, DS/PN: S1.008

Invert Level (m) 0.669

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2500.0	1.331	2500.0

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 18 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	C (1km)	-0.026	D3 (1km)	0.415
FEH Rainfall Version	1999	D1 (1km)	0.396	E (1km)	0.308
Site Location		D2 (1km)	0.253	F (1km)	2.312

Cv (Summer)	0.750		
Cv (Winter)	0.840		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	60 Winter	2	+0%	100/15 Summer	100/15 Summer			2.450	-0.150	0.000
S1.001	S2	15 Winter	2	+0%	30/15 Summer	100/15 Summer			2.336	-0.085	0.000
S2.000	S3	15 Winter	2	+0%	30/15 Summer	100/15 Summer			2.512	-0.088	0.000
S2.001	S4	15 Winter	2	+0%	30/15 Summer	100/15 Winter			2.215	-0.071	0.000
S1.002	S3	15 Winter	2	+0%	30/15 Summer	100/15 Summer			1.960	-0.060	0.000
S3.000	S6	60 Winter	2	+0%	100/15 Summer				2.534	-0.116	0.000
S3.001	S7	60 Winter	2	+0%	100/15 Summer				2.401	-0.113	0.000
S3.002	S8	15 Winter	2	+0%	100/15 Summer				2.333	-0.149	0.000
S4.000	S9	120 Winter	2	+0%					2.528	-0.122	0.000
S5.000	S10	120 Winter	2	+0%					2.530	-0.120	0.000
S5.001	S11	120 Winter	2	+0%	100/15 Winter				2.160	-0.117	0.000
S4.001	S10	120 Winter	2	+0%	100/15 Winter				2.127	-0.118	0.000
S3.003	S9	60 Winter	2	+0%	100/15 Summer				1.761	-0.177	0.000
S6.000	S10	60 Winter	2	+0%					2.850	-0.150	0.000
S6.001	S11	60 Winter	2	+0%	100/15 Winter				2.780	-0.150	0.000
S6.002	S12	60 Winter	2	+0%	100/15 Summer				2.653	-0.150	0.000
S7.000	S17	15 Winter	2	+0%	100/15 Summer				2.806	-0.094	0.000
S7.001	S18	15 Winter	2	+0%	100/15 Summer				2.634	-0.108	0.000
S6.003	S13	15 Winter	2	+0%	30/15 Summer				2.486	-0.074	0.000
S8.000	S20	60 Winter	2	+0%	100/15 Summer				2.636	-0.114	0.000
S8.001	S21	15 Winter	2	+0%	30/15 Summer				2.404	-0.089	0.000
S9.000	S22	15 Winter	2	+0%	30/15 Summer				2.928	-0.072	0.000
S10.000	S23	60 Winter	2	+0%	100/15 Winter				2.878	-0.122	0.000
S9.001	S23	15 Winter	2	+0%	100/15 Summer				2.700	-0.143	0.000
S11.000	S25	30 Winter	2	+0%	100/15 Winter				2.879	-0.121	0.000
S9.002	S24	15 Winter	2	+0%	30/15 Winter				2.632	-0.128	0.000
S9.003	S25	15 Winter	2	+0%	100/15 Summer				2.564	-0.165	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.00		0.0	OK	4
S1.001	S2	0.37		5.2	OK	4
S2.000	S3	0.34		4.8	OK	6
S2.001	S4	0.53		8.6	OK	1
S1.002	S3	0.66		18.6	OK	1
S3.000	S6	0.11		1.6	OK	
S3.001	S7	0.14		1.6	OK	
S3.002	S8	0.25		11.0	OK	
S4.000	S9	0.08		1.2	OK	
S5.000	S10	0.09		1.2	OK	
S5.001	S11	0.11		1.2	OK	
S4.001	S10	0.10		2.4	OK	
S3.003	S9	0.10		7.1	OK	
S6.000	S10	0.00		0.0	OK	
S6.001	S11	0.00		0.0	OK	
S6.002	S12	0.00		0.0	OK	
S7.000	S17	0.29		4.0	OK	
S7.001	S18	0.17		4.7	OK	
S6.003	S13	0.50		6.9	OK	
S8.000	S20	0.13		1.9	OK	
S8.001	S21	0.34		5.6	OK	
S9.000	S22	0.53		10.1	OK	
S10.000	S23	0.08		1.1	OK	
S9.001	S23	0.28		10.3	OK	
S11.000	S25	0.08		1.5	OK	
S9.002	S24	0.39		11.5	OK	
S9.003	S25	0.16		11.4	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)
S6.004	S14	15 Winter	2	+0%	30/15 Summer				2.231	-0.152	0.000
S12.000	S43	15 Winter	2	+0%	30/15 Summer	100/15 Summer			2.613	-0.087	0.000
S12.001	S20	15 Winter	2	+0%	30/15 Summer				2.410	-0.076	0.000
S6.005	S15	30 Winter	2	+0%	100/15 Summer				1.867	-0.218	0.000
S13.000	S20	15 Winter	2	+0%	30/15 Summer	30/15 Summer			2.612	-0.038	0.000
S6.006	S16	60 Winter	2	+0%	100/15 Summer				1.752	-0.248	0.000
S14.000	S21	15 Winter	2	+0%	30/15 Summer	100/15 Summer			2.669	-0.081	0.000
S14.001	S22	15 Winter	2	+0%	30/15 Summer				2.524	-0.081	0.000
S14.002	S23	15 Winter	2	+0%	30/15 Summer				2.308	-0.121	0.000
S6.007	S17	120 Winter	2	+0%	100/15 Summer				1.623	-0.308	0.000
S15.000	S22	15 Winter	2	+0%	30/15 Summer	100/15 Summer			2.599	-0.101	0.000
S15.001	S23	15 Winter	2	+0%	30/15 Summer	100/15 Summer			2.445	-0.083	0.000
S15.002	S24	15 Winter	2	+0%	30/15 Summer				2.323	-0.051	0.000
S15.003	S25	15 Winter	2	+0%	30/15 Summer				2.120	-0.118	0.000
S6.008	S18	120 Winter	2	+0%	100/15 Summer				1.533	-0.298	0.000
S16.000	S23	120 Winter	2	+0%					2.535	-0.115	0.000
S16.001	S24	120 Winter	2	+0%	100/15 Summer				1.837	-0.111	0.000
S16.002	S25	120 Winter	2	+0%	100/15 Summer				1.785	-0.115	0.000
S6.009	S19	120 Winter	2	+0%	100/15 Summer				1.423	-0.358	0.000
S3.004	S10	120 Winter	2	+0%	100/15 Summer				1.359	-0.347	0.000
S1.003	S4	15 Winter	2	+0%	30/15 Winter				1.257	-0.382	0.000
S17.000	S49	15 Winter	2	+0%	100/15 Summer	100/15 Summer			1.983	-0.167	0.000
S1.004	S5	15 Winter	2	+0%	30/15 Summer				1.188	-0.383	0.000
S18.000	S52	15 Winter	2	+0%	100/15 Summer	100/15 Summer			1.805	-0.245	0.000
S18.001	S52	15 Winter	2	+0%	100/15 Summer	100/15 Summer			1.727	-0.281	0.000
S1.005	S6	15 Winter	2	+0%	30/15 Summer				1.125	-0.293	0.000
S19.000	S55	15 Winter	2	+0%	30/15 Summer				1.921	-0.079	0.000
S19.001	S56	15 Winter	2	+0%	100/15 Summer				1.560	-0.106	0.000
S20.000	S57	15 Winter	2	+0%	30/15 Summer	100/15 Summer			1.732	-0.068	0.000
S20.001	S58	15 Winter	2	+0%	30/15 Summer				1.438	-0.068	0.000
S21.000	S59	15 Winter	2	+0%	30/15 Summer	100/15 Summer			1.745	-0.055	0.000
S20.002	S59	15 Winter	2	+0%	30/15 Summer				1.317	-0.100	0.000
S1.006	S7	15 Winter	2	+0%	30/15 Summer				1.108	-0.261	0.000
S1.007	S8	15 Winter	2	+0%					0.982	-0.737	0.000
S1.008	SPond	960 Winter	2	+0%					0.909	-0.760	0.000
S1.009	S10	960 Winter	2	+0%	30/15 Summer		2/240 Summer	34	0.908	-0.061	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S6.004	S14	0.47		32.4	OK	
S12.000	S43	0.35		5.9	OK	2
S12.001	S20	0.49		9.6	OK	
S6.005	S15	0.37		39.9	OK	
S13.000	S20	0.89		12.0	OK	8
S6.006	S16	0.25		24.4	OK	
S14.000	S21	0.43		7.0	OK	4
S14.001	S22	0.42		7.0	OK	
S14.002	S23	0.44		17.7	OK	
S6.007	S17	0.21		32.4	OK	
S15.000	S22	0.23		3.7	OK	4
S15.001	S23	0.40		6.6	OK	3
S15.002	S24	0.76		12.4	OK	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S15.003	S25	0.46		16.8	OK	
S6.008	S18	0.25		38.0	OK	
S16.000	S23	0.12		2.1	OK	
S16.001	S24	0.16		2.1	OK	
S16.002	S25	0.13		2.6	OK	
S6.009	S19	0.19		41.3	OK	
S3.004	S10	0.25		48.0	OK	
S1.003	S4	0.22		52.3	OK	
S17.000	S49	0.39		50.2	OK	2
S1.004	S5	0.23		80.6	OK	
S18.000	S52	0.42		56.7	OK	4
S18.001	S52	0.30		105.5	OK	4
S1.005	S6	0.44		176.1	OK	
S19.000	S55	0.42		5.9	OK	
S19.001	S56	0.18		6.0	OK	
S20.000	S57	0.55		7.7	OK	4
S20.001	S58	0.58		7.6	OK	
S21.000	S59	0.66		10.4	OK	6
S20.002	S59	0.59		18.2	OK	
S1.006	S7	0.61		197.8	OK	
S1.007	S8	0.16		108.6	OK	
S1.008	SPond	0.01		9.9	OK*	
S1.009	S10	0.16	8.9	9.9	OK	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 18 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	C (1km)	-0.026	D3 (1km)	0.415	Cv (Summer)	0.750
FEH Rainfall Version	1999	D1 (1km)	0.396	E (1km)	0.308	Cv (Winter)	0.840
Site Location		D2 (1km)	0.253	F (1km)	2.312		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	15 Winter	30	+0%	100/15 Summer	100/15 Summer			2.566	-0.034	0.000	0.06
S1.001	S2	15 Winter	30	+0%	30/15 Summer	100/15 Summer			2.578	0.157	0.000	0.83
S2.000	S3	15 Winter	30	+0%	30/15 Summer	100/15 Summer			2.737	0.137	0.000	0.72
S2.001	S4	15 Winter	30	+0%	30/15 Summer	100/15 Winter			2.608	0.322	0.000	1.01
S1.002	S5	15 Winter	30	+0%	30/15 Summer	100/15 Summer			2.330	0.311	0.000	1.34
S3.000	S6	15 Winter	30	+0%	100/15 Summer				2.570	-0.080	0.000	0.44
S3.001	S7	15 Winter	30	+0%	100/15 Summer				2.442	-0.073	0.000	0.52
S3.002	S8	15 Winter	30	+0%	100/15 Summer				2.416	-0.066	0.000	0.79
S4.000	S9	30 Winter	30	+0%					2.556	-0.094	0.000	0.30
S5.000	S10	30 Winter	30	+0%					2.559	-0.091	0.000	0.32
S5.001	S11	60 Winter	30	+0%	100/15 Winter				2.194	-0.083	0.000	0.41
S4.001	S10	60 Winter	30	+0%	100/15 Winter				2.159	-0.086	0.000	0.38
S3.003	S9	30 Winter	30	+0%	100/15 Summer				1.808	-0.130	0.000	0.38
S6.000	S10	60 Winter	30	+0%					2.850	-0.150	0.000	0.00
S6.001	S11	60 Winter	30	+0%	100/15 Winter				2.780	-0.150	0.000	0.00
S6.002	S12	15 Winter	30	+0%	100/15 Summer				2.674	-0.129	0.000	0.01
S7.000	S17	15 Winter	30	+0%	100/15 Summer				2.848	-0.052	0.000	0.73
S7.001	S18	15 Winter	30	+0%	100/15 Summer				2.712	-0.030	0.000	0.50
S6.003	S13	15 Winter	30	+0%	30/15 Summer				2.690	0.130	0.000	1.19
S8.000	S20	30 Winter	30	+0%	100/15 Summer				2.674	-0.076	0.000	0.49
S8.001	S21	15 Winter	30	+0%	30/15 Summer				2.613	0.121	0.000	1.00
S9.000	S22	15 Winter	30	+0%	30/15 Summer				3.039	0.039	0.000	1.13
S10.000	S23	15 Winter	30	+0%	100/15 Winter				2.908	-0.092	0.000	0.31
S9.001	S23	15 Winter	30	+0%	100/15 Summer				2.803	-0.040	0.000	0.68
S11.000	S25	15 Winter	30	+0%	100/15 Winter				2.911	-0.089	0.000	0.34
S9.002	S24	15 Winter	30	+0%	30/15 Winter				2.764	0.004	0.000	1.02
S9.003	S25	15 Winter	30	+0%	100/15 Summer				2.606	-0.123	0.000	0.42

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

PN	US/MH Name	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1		0.9	OK	4
S1.001	S2		11.8	SURCHARGED	4
S2.000	S3		10.1	SURCHARGED	6
S2.001	S4		16.6	SURCHARGED	1
S1.002	S3		37.4	SURCHARGED	1
S3.000	S6		5.9	OK	
S3.001	S7		6.0	OK	
S3.002	S8		34.9	OK	
S4.000	S9		4.5	OK	
S5.000	S10		4.6	OK	
S5.001	S11		4.6	OK	
S4.001	S10		9.0	OK	
S3.003	S9		25.5	OK	
S6.000	S10		0.0	OK	
S6.001	S11		0.0	OK	
S6.002	S12		0.2	OK	
S7.000	S17		10.0	OK	
S7.001	S18		13.4	OK	
S6.003	S13		16.4	SURCHARGED	
S8.000	S20		6.8	OK	
S8.001	S21		16.2	SURCHARGED	
S9.000	S22		21.6	SURCHARGED	
S10.000	S23		4.3	OK	
S9.001	S23		24.6	OK	
S11.000	S25		6.2	OK	
S9.002	S24		30.9	SURCHARGED	
S9.003	S25		30.0	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S6.004	S14	15 Winter	30	+0%	30/15 Summer				2.525	0.142	0.000
S12.000	S43	15 Winter	30	+0%	30/15 Summer	100/15 Summer			2.753	0.053	0.000
S12.001	S20	15 Winter	30	+0%	30/15 Summer				2.609	0.123	0.000
S6.005	S15	15 Winter	30	+0%	100/15 Summer				2.009	-0.076	0.000
S13.000	S20	15 Winter	30	+0%	30/15 Summer	30/15 Summer			3.350	0.700	0.474
S6.006	S16	30 Winter	30	+0%	100/15 Summer				1.876	-0.123	0.000
S14.000	S21	15 Winter	30	+0%	30/15 Summer	100/15 Summer			2.803	0.053	0.000
S14.001	S22	15 Winter	30	+0%	30/15 Summer				2.666	0.061	0.000
S14.002	S23	15 Winter	30	+0%	30/15 Summer				2.528	0.089	0.000
S6.007	S17	30 Winter	30	+0%	100/15 Summer				1.754	-0.178	0.000
S15.000	S22	15 Winter	30	+0%	30/15 Summer	100/15 Summer			2.843	0.143	0.000
S15.001	S23	15 Winter	30	+0%	30/15 Summer	100/15 Summer			2.808	0.279	0.000
S15.002	S24	15 Winter	30	+0%	30/15 Summer				2.698	0.324	0.000
S15.003	S25	15 Winter	30	+0%	30/15 Summer				2.234	0.056	0.000
S6.008	S18	15 Winter	30	+0%	100/15 Summer				1.709	-0.122	0.000
S16.000	S23	30 Winter	30	+0%					2.570	-0.080	0.000
S16.001	S24	30 Winter	30	+0%	100/15 Summer				1.877	-0.070	0.000
S16.002	S25	60 Winter	30	+0%	100/15 Summer				1.818	-0.082	0.000
S6.009	S19	15 Winter	30	+0%	100/15 Summer				1.694	-0.087	0.000
S3.004	S10	15 Winter	30	+0%	100/15 Summer				1.678	-0.028	0.000
S1.003	S4	15 Winter	30	+0%	30/15 Winter				1.657	0.018	0.000
S17.000	S49	15 Winter	30	+0%	100/15 Summer	100/15 Summer			2.115	-0.035	0.000
S1.004	S5	15 Winter	30	+0%	30/15 Summer				1.629	0.058	0.000
S18.000	S52	15 Winter	30	+0%	100/15 Summer	100/15 Summer			2.029	-0.021	0.000
S18.001	S52	15 Winter	30	+0%	100/15 Summer	100/15 Summer			1.886	-0.122	0.000
S1.005	S6	15 Winter	30	+0%	30/15 Summer				1.579	0.160	0.000
S19.000	S55	15 Winter	30	+0%	30/15 Summer				2.063	0.063	0.000
S19.001	S56	15 Winter	30	+0%	100/15 Summer				1.585	-0.080	0.000
S20.000	S57	15 Winter	30	+0%	30/15 Summer	100/15 Summer			2.014	0.214	0.000
S20.001	S58	15 Winter	30	+0%	30/15 Summer				1.688	0.182	0.000
S21.000	S53	15 Winter	30	+0%	30/15 Summer	100/15 Summer			2.267	0.467	0.000
S20.002	S59	15 Winter	30	+0%	30/15 Summer				1.576	0.159	0.000
S1.006	S7	15 Winter	30	+0%	30/15 Summer				1.520	0.151	0.000
S1.007	S8	960 Winter	30	+0%					1.190	-0.529	0.000
S1.008	SPond	960 Winter	30	+0%					1.189	-0.480	0.000
S1.009	S10	960 Winter	30	+0%	30/15 Summer		2/240 Summer	34	1.190	0.221	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S6.004	S14	1.18		91.1	SURCHARGED	
S12.000	S43	0.81		13.6	SURCHARGED	2
S12.001	S20	1.14		22.3	SURCHARGED	
S6.005	S15	0.99		107.2	OK	
S13.000	S20	1.45		19.5	FLOOD	8
S6.006	S16	0.79		76.0	OK	
S14.000	S21	0.97		15.8	SURCHARGED	4
S14.001	S22	1.04		17.3	SURCHARGED	
S14.002	S23	1.10		44.6	SURCHARGED	
S6.007	S17	0.62		95.0	OK	
S15.000	S22	0.53		8.7	SURCHARGED	4
S15.001	S23	0.93		15.3	SURCHARGED	3
S15.002	S24	1.72		27.9	SURCHARGED	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S15.003	S25	1.06		39.1	SURCHARGED	
S6.008	S18	0.67		101.7	OK	
S16.000	S23	0.43		7.6	OK	
S16.001	S24	0.56		7.6	OK	
S16.002	S25	0.43		8.9	OK	
S6.009	S19	0.53		111.9	OK	
S3.004	S10	0.74		140.2	OK	
S1.003	S4	0.74		180.2	SURCHARGED	
S17.000	S49	0.98		125.4	OK	2
S1.004	S5	0.59		210.6	SURCHARGED	
S18.000	S52	1.00		136.1	OK	4
S18.001	S52	0.82		287.4	OK	4
S1.005	S6	1.07		429.5	SURCHARGED	
S19.000	S55	1.07		15.1	SURCHARGED	
S19.001	S56	0.44		15.0	OK	
S20.000	S57	1.16		16.3	SURCHARGED	4
S20.001	S58	1.20		15.9	SURCHARGED	
S21.000	S59	1.33		20.7	FLOOD RISK	6
S20.002	S59	1.23		17.3	SURCHARGED	
S1.006	S7	1.47		477.0	SURCHARGED	
S1.007	S8	0.09		63.7	OK	
S1.008	SPond	0.02		13.9	OK*	
S1.009	S10	0.19	2.3	11.3	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 18 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	C (1km)	-0.026	D3 (1km)	0.415	Cv (Summer)	0.750
FEH Rainfall Version	1999	D1 (1km)	0.396	E (1km)	0.308	Cv (Winter)	0.840
Site Location		D2 (1km)	0.253	F (1km)	2.312		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	15 Winter	100	+30%	100/15 Summer	100/15 Summer			3.100	0.500	0.137	0.38
S1.001	S2	15 Winter	100	+30%	30/15 Summer	100/15 Summer			3.104	0.683	4.222	1.27
S2.000	S3	15 Winter	100	+30%	30/15 Summer	100/15 Summer			3.107	0.507	6.634	1.28
S2.001	S4	15 Winter	100	+30%	30/15 Summer	100/15 Winter			3.101	0.815	1.035	1.21
S1.002	S5	15 Summer	100	+30%	30/15 Summer	100/15 Summer			3.100	1.081	0.029	1.01
S3.000	S6	15 Winter	100	+30%	100/15 Summer				2.729	0.079	0.000	1.11
S3.001	S7	15 Winter	100	+30%	100/15 Summer				2.767	0.252	0.000	1.38
S3.002	S8	15 Winter	100	+30%	100/15 Summer				2.828	0.346	0.000	1.23
S4.000	S9	15 Winter	100	+30%					2.601	-0.049	0.000	0.76
S5.000	S10	15 Winter	100	+30%					2.606	-0.044	0.000	0.81
S5.001	S11	30 Winter	100	+30%	100/15 Winter				2.387	0.110	0.000	0.97
S4.001	S10	30 Winter	100	+30%	100/15 Winter				2.359	0.114	0.000	0.90
S3.003	S9	30 Winter	100	+30%	100/15 Summer				2.114	0.176	0.000	0.98
S6.000	S10	15 Winter	100	+30%					2.962	-0.038	0.000	0.04
S6.001	S11	15 Winter	100	+30%	100/15 Winter				2.962	0.032	0.000	0.09
S6.002	S12	15 Winter	100	+30%	100/15 Summer				2.968	0.165	0.000	0.16
S7.000	S17	15 Winter	100	+30%	100/15 Summer				3.187	0.287	0.000	1.20
S7.001	S18	15 Winter	100	+30%	100/15 Summer				3.029	0.287	0.000	0.59
S6.003	S13	15 Winter	100	+30%	30/15 Summer				2.995	0.435	0.000	1.35
S8.000	S20	30 Winter	100	+30%	100/15 Summer				2.864	0.314	0.000	1.04
S8.001	S21	15 Winter	100	+30%	30/15 Summer				3.082	0.589	0.000	1.24
S9.000	S22	15 Winter	100	+30%	30/15 Summer				3.463	0.463	0.000	1.63
S10.000	S23	15 Winter	100	+30%	100/15 Winter				3.034	0.034	0.000	0.72
S9.001	S23	15 Winter	100	+30%	100/15 Summer				3.020	0.177	0.000	0.95
S11.000	S25	15 Winter	100	+30%	100/15 Winter				3.010	0.010	0.000	0.63
S9.002	S24	15 Winter	100	+30%	30/15 Winter				2.983	0.223	0.000	1.60
S9.003	S25	15 Winter	100	+30%	100/15 Summer				2.968	0.239	0.000	0.67

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

PN	US/MH Name	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1		5.3	FLOOD	4
S1.001	S2		18.0	FLOOD	4
S2.000	S3		18.0	FLOOD	6
S2.001	S4		19.9	FLOOD	1
S1.002	S3		45.1	FLOOD	1
S3.000	S6		15.2	SURCHARGED	
S3.001	S7		15.8	SURCHARGED	
S3.002	S8		54.6	FLOOD RISK	
S4.000	S9		11.5	OK	
S5.000	S10		11.5	OK	
S5.001	S11		10.8	SURCHARGED	
S4.001	S10		21.3	SURCHARGED	
S3.003	S9		66.2	SURCHARGED	
S6.000	S10		0.5	OK	
S6.001	S11		1.3	SURCHARGED	
S6.002	S12		2.3	SURCHARGED	
S7.000	S17		16.5	FLOOD RISK	
S7.001	S18		15.7	SURCHARGED	
S6.003	S13		18.6	SURCHARGED	
S8.000	S20		14.5	SURCHARGED	
S8.001	S21		20.0	FLOOD RISK	
S9.000	S22		31.1	FLOOD RISK	
S10.000	S23		9.9	SURCHARGED	
S9.001	S23		34.5	SURCHARGED	
S11.000	S25		11.5	SURCHARGED	
S9.002	S24		46.8	SURCHARGED	
S9.003	S25		47.3	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S6.004	S14	15 Winter	100	+30%	30/15 Summer				2.936	0.553	0.000
S12.000	S43	15 Winter	100	+30%	30/15 Summer	100/15 Summer			3.402	0.702	2.039
S12.001	S20	15 Winter	100	+30%	30/15 Summer				3.281	0.795	0.000
S6.005	S15	60 Winter	100	+30%	100/15 Summer				2.514	0.429	0.000
S13.000	S20	15 Winter	100	+30%	30/15 Summer	30/15 Summer			3.361	0.711	10.863
S6.006	S16	60 Winter	100	+30%	100/15 Summer				2.442	0.443	0.000
S14.000	S21	15 Winter	100	+30%	30/15 Summer	100/15 Summer			3.256	0.506	5.550
S14.001	S22	15 Winter	100	+30%	30/15 Summer				3.273	0.668	0.000
S14.002	S23	15 Winter	100	+30%	30/15 Summer				3.287	0.858	0.000
S6.007	S17	60 Winter	100	+30%	100/15 Summer				2.343	0.412	0.000
S15.000	S22	15 Winter	100	+30%	30/15 Summer	100/15 Summer			3.205	0.505	5.266
S15.001	S23	15 Winter	100	+30%	30/15 Summer	100/15 Summer			3.203	0.674	2.844
S15.002	S24	15 Winter	100	+30%	30/15 Summer				3.197	0.823	0.000
S15.003	S25	15 Winter	100	+30%	30/15 Summer				2.878	0.639	0.000
S6.008	S18	60 Winter	100	+30%	100/15 Summer				2.225	0.394	0.000
S16.000	S23	30 Winter	100	+30%					2.632	-0.018	0.000
S16.001	S24	30 Winter	100	+30%	100/15 Summer				2.137	0.249	0.000
S16.002	S25	30 Winter	100	+30%	100/15 Summer				2.149	0.249	0.000
S6.009	S19	15 Winter	100	+30%	100/15 Summer				2.112	0.331	0.000
S3.004	S10	15 Winter	100	+30%	100/15 Summer				2.098	0.382	0.000
S1.003	S4	15 Winter	100	+30%	30/15 Winter				2.089	0.450	0.000
S17.000	S49	15 Winter	100	+30%	100/15 Summer	100/15 Summer			3.356	1.206	6.303
S1.004	S5	15 Winter	100	+30%	30/15 Summer				2.080	0.509	0.000
S18.000	S52	15 Winter	100	+30%	100/15 Summer	100/15 Summer			2.574	0.524	23.504
S18.001	S52	15 Winter	100	+30%	100/15 Summer	100/15 Summer			2.516	0.508	16.085
S1.005	S6	15 Winter	100	+30%	30/15 Summer				2.013	0.594	0.000
S19.000	S55	15 Winter	100	+30%	30/15 Summer				2.475	0.475	0.000
S19.001	S56	15 Winter	100	+30%	100/15 Summer				1.853	0.188	0.000
S20.000	S57	15 Winter	100	+30%	30/15 Summer	100/15 Summer			2.404	0.604	4.188
S20.001	S58	15 Winter	100	+30%	30/15 Summer				1.989	0.483	0.000
S21.000	S53	15 Winter	100	+30%	30/15 Summer	100/15 Summer			2.409	0.609	8.857
S20.002	S59	15 Winter	100	+30%	30/15 Summer				1.837	0.420	0.000
S1.006	S7	15 Winter	100	+30%	30/15 Summer				1.768	0.399	0.000
S1.007	S8	960 Winter	100	+30%					1.663	-0.056	0.000
S1.008	SPond	960 Winter	100	+30%					1.661	-0.008	0.000
S1.009	S10	960 Winter	100	+30%	30/15 Summer		2/240 Summer	34	1.658	0.689	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S6.004	S14	1.58		108.4	SURCHARGED	
S12.000	S43	1.37		23.0	FLOOD	2
S12.001	S20	1.70		33.1	FLOOD RISK	
S6.005	S15	1.21		130.6	SURCHARGED	
S13.000	S20	1.45		19.6	FLOOD	8
S6.006	S16	1.37		132.3	SURCHARGED	
S14.000	S21	1.61		26.3	FLOOD	4
S14.001	S22	1.50		26.4	FLOOD RISK	
S14.002	S23	1.56		64.0	FLOOD RISK	
S6.007	S17	1.07		163.6	SURCHARGED	
S15.000	S22	1.43		23.6	FLOOD	4
S15.001	S23	1.47		24.1	FLOOD	3
S15.002	S24	1.89		30.7	FLOOD RISK	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S15.003	S25	1.38		50.9	SURCHARGED	
S6.008	S18	1.32		199.9	SURCHARGED	
S16.000	S23	0.83		14.5	OK	
S16.001	S24	1.08		14.7	SURCHARGED	
S16.002	S25	1.22		35.5	SURCHARGED	
S6.009	S19	0.91		194.1	SURCHARGED	
S3.004	S10	1.39		264.6	SURCHARGED	
S1.003	S4	1.23		289.0	SURCHARGED	
S17.000	S49	1.51		192.7	FLOOD	2
S1.004	S5	0.84		297.6	SURCHARGED	
S18.000	S52	1.44		223.8	FLOOD	4
S18.001	S52	1.05		366.5	FLOOD	4
S1.005	S6	1.55		620.9	SURCHARGED	
S19.000	S55	1.40		19.7	FLOOD RISK	
S19.001	S56	0.66		22.6	SURCHARGED	
S20.000	S57	1.40		19.7	FLOOD	4
S20.001	S58	1.59		21.1	SURCHARGED	
S21.000	S59	1.55		24.2	FLOOD	6
S20.002	S59	1.52		47.0	SURCHARGED	
S1.006	S7	2.07		674.4	SURCHARGED	
S1.007	S8	0.18		125.7	OK	
S1.008	SPond	0.02		16.3	OK*	
S1.009	S10	0.19	1.4	11.3	SURCHARGED	

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Time Area Diagram for Storm 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.120	4-8	0.285	8-12	0.106

Total Area Contributing (ha) = 0.511

Total Pipe Volume (m^3) = 21.129

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STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	38.174	0.254	150.3	0.060	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	65.838	0.439	150.0	0.027	0.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	34.230	0.343	99.8	0.033	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	89.765	0.528	170.0	0.100	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	28.524	0.771	37.0	0.039	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	88.393	0.361	244.9	0.111	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	80.511	0.329	244.7	0.063	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	6.316	0.042	150.0	0.079	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	12.339	0.072	171.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.007	8.708	0.036	241.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.008	7.391	0.031	238.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.009	3.067	0.013	235.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.78	2.300	0.060	0.0	0.0	0.0	0.82	14.4	8.1
S1.001	50.00	7.12	2.546	0.087	0.0	0.0	0.0	0.82	14.5	11.7
S2.000	50.00	5.57	2.450	0.033	0.0	0.0	0.0	1.01	17.8	4.4
S1.002	50.00	8.62	2.032	0.220	0.0	0.0	0.0	1.00	39.8	29.8
S3.000	50.00	5.29	2.350	0.039	0.0	0.0	0.0	1.66	29.3	5.2
S1.003	50.00	10.09	1.429	0.369	0.0	0.0	0.0	1.00	70.7	50.0
S1.004	50.00	11.43	1.068	0.432	0.0	0.0	0.0	1.00	70.7	58.5
S1.005	50.00	11.51	0.739	0.511	0.0	0.0	0.0	1.28	90.6	69.2
S1.006	50.00	11.68	0.697	0.511	0.0	0.0	0.0	1.20	84.7	69.2
S1.007	50.00	11.83	0.550	0.511	0.0	0.0	0.0	1.01	71.1	69.2
S1.008	50.00	11.95	0.550	0.511	0.0	0.0	0.0	1.01	71.7	69.2
S1.009	50.00	12.00	0.550	0.511	0.0	0.0	0.0	1.02	72.0	69.2

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Manhole Schedules for Storm 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	3.450	0.650	Open Manhole	1200	S1.000	2.800	150				
S2	3.400	0.854	Open Manhole	1200	S1.001	2.546	150	S1.000	2.546	150	
S3	3.200	0.750	Open Manhole	1200	S2.000	2.450	150				
S3	3.300	1.268	Open Manhole	1200	S1.002	2.032	225	S1.001	2.107	150	
								S2.000	2.107	150	
S4	3.100	0.750	Open Manhole	1200	S3.000	2.350	150				
S4	3.200	1.771	Open Manhole	1200	S1.003	1.429	300	S1.002	1.504	225	
								S3.000	1.579	150	
S5	3.200	2.132	Open Manhole	1200	S1.004	1.068	300	S1.003	1.068	300	
S6	3.100	2.361	Open Manhole	1200	S1.005	0.739	300	S1.004	0.739	300	
S7	3.100	2.403	Open Manhole	1200	S1.006	0.697	300	S1.005	0.697	300	
S8	3.100	2.550	Open Manhole	1200	S1.007	0.550	300	S1.006	0.625	300	75
S9	3.100	2.586	Open Manhole	1200	S1.008	0.550	300	S1.007	0.514	300	
S10	3.100	2.581	Open Manhole	1200	S1.009	0.550	300	S1.008	0.519	300	
S	1.800	1.263	Open Manhole	0		OUTFALL		S1.009	0.537	300	

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PIPELINE SCHEDULES for Storm 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S1	3.450	2.800	0.500	Open Manhole	1200
S1.001	o	150	S2	3.400	2.546	0.704	Open Manhole	1200
S2.000	o	150	S3	3.200	2.450	0.600	Open Manhole	1200
S1.002	o	225	S3	3.300	2.032	1.043	Open Manhole	1200
S3.000	o	150	S4	3.100	2.350	0.600	Open Manhole	1200
S1.003	o	300	S4	3.200	1.429	1.471	Open Manhole	1200
S1.004	o	300	S5	3.200	1.068	1.832	Open Manhole	1200
S1.005	o	300	S6	3.100	0.739	2.061	Open Manhole	1200
S1.006	o	300	S7	3.100	0.697	2.103	Open Manhole	1200
S1.007	o	300	S8	3.100	0.550	2.250	Open Manhole	1200
S1.008	o	300	S9	3.100	0.550	2.250	Open Manhole	1200
S1.009	o	300	S10	3.100	0.550	2.250	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	38.174	150.3	S2	3.400	2.546	0.704	Open Manhole	1200
S1.001	65.838	150.0	S3	3.300	2.107	1.043	Open Manhole	1200
S2.000	34.230	99.8	S3	3.300	2.107	1.043	Open Manhole	1200
S1.002	89.765	170.0	S4	3.200	1.504	1.471	Open Manhole	1200
S3.000	28.524	37.0	S4	3.200	1.579	1.471	Open Manhole	1200
S1.003	88.393	244.9	S5	3.200	1.068	1.832	Open Manhole	1200
S1.004	80.511	244.7	S6	3.100	0.739	2.061	Open Manhole	1200
S1.005	6.316	150.0	S7	3.100	0.697	2.103	Open Manhole	1200
S1.006	12.339	171.4	S8	3.100	0.625	2.175	Open Manhole	1200
S1.007	8.708	241.9	S9	3.100	0.514	2.286	Open Manhole	1200
S1.008	7.391	238.4	S10	3.100	0.519	2.281	Open Manhole	1200
S1.009	3.067	235.9	S	1.800	0.537	0.963	Open Manhole	0

Free Flowing Outfall Details for Storm 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	S	1.800	0.537	0.800	0	0

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Online Controls for Storm 1

Hydro-Brake® Optimum Manhole: S10, DS/PN: S1.009, Volume (m³): 3.3

Unit Reference	MD-SHE-0057-2000-2000-2000
Design Head (m)	2.000
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	57
Invert Level (m)	0.550
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	2.0	Kick-Flo®	0.506	1.1
Flush-Flo™	0.247	1.3	Mean Flow over Head Range	-	1.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	0.800	1.3	2.000	2.0	4.000	2.7	7.000	3.6
0.200	1.3	1.000	1.5	2.200	2.1	4.500	2.9	7.500	3.7
0.300	1.3	1.200	1.6	2.400	2.2	5.000	3.0	8.000	3.8
0.400	1.3	1.400	1.7	2.600	2.3	5.500	3.2	8.500	3.9
0.500	1.1	1.600	1.8	3.000	2.4	6.000	3.3	9.000	4.0
0.600	1.2	1.800	1.9	3.500	2.6	6.500	3.4	9.500	4.1

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Storage Structures for Storm 1

Tank or Pond Manhole: S9, DS/PN: S1.008

Invert Level (m) 0.550

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	250.0	2.000	250.0

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	C (1km)	-0.026	D3 (1km)	0.415
FEH Rainfall Version	1999	D1 (1km)	0.396	E (1km)	0.308
Site Location		D2 (1km)	0.253	F (1km)	2.312

Cv (Summer)	0.750		
Cv (Winter)	0.840		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	2	+0%	30/15 Summer	100/15 Summer			2.882	-0.068	0.000
S1.001	S2	15 Winter	2	+0%	30/15 Summer	100/15 Summer			2.643	-0.053	0.000
S2.000	S3	15 Winter	2	+0%	30/15 Summer	100/15 Summer			2.501	-0.099	0.000
S1.002	S3	15 Winter	2	+0%	30/15 Summer	100/15 Summer			2.162	-0.095	0.000
S3.000	S4	15 Winter	2	+0%	100/15 Summer	100/15 Summer			2.393	-0.107	0.000
S1.003	S4	15 Winter	2	+0%	30/15 Summer	100/15 Summer			1.590	-0.139	0.000
S1.004	S5	15 Winter	2	+0%	30/15 Summer				1.237	-0.131	0.000
S1.005	S6	960 Winter	2	+0%	30/15 Summer				0.942	-0.097	0.000
S1.006	S7	960 Winter	2	+0%	30/15 Summer				0.944	-0.053	0.000
S1.007	S8	960 Winter	2	+0%	2/240 Winter				0.944	0.094	0.000
S1.008	S9	960 Winter	2	+0%	2/240 Winter				0.938	0.088	0.000
S1.009	S10	960 Winter	2	+0%	2/240 Winter		2/15 Winter	53	0.947	0.097	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.55		7.7	OK	6
S1.001	S2	0.70		9.9	OK	4
S2.000	S3	0.25		4.3	OK	6
S1.002	S3	0.59		22.8	OK	4
S3.000	S4	0.18		5.0	OK	4
S1.003	S4	0.52		35.8	OK	2
S1.004	S5	0.58		39.3	OK	
S1.005	S6	0.10		6.4	OK	
S1.006	S7	0.10		6.4	OK	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.007	S8	0.26		14.2	SURCHARGED	
S1.008	S9	0.20		10.5	SURCHARGED	
S1.009	S10	0.03	13.5	1.3	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	C (1km)	-0.026	D3 (1km)	0.415
FEH Rainfall Version	1999	D1 (1km)	0.396	E (1km)	0.308
Site Location		D2 (1km)	0.253	F (1km)	2.312

Cv (Summer)	0.750		
Cv (Winter)	0.840		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	30	+0%	30/15 Summer	100/15 Summer			3.419	0.469	0.000
S1.001	S2	15 Winter	30	+0%	30/15 Summer	100/15 Summer			3.238	0.532	0.000
S2.000	S3	15 Winter	30	+0%	30/15 Summer	100/15 Summer			2.728	0.128	0.000
S1.002	S3	15 Winter	30	+0%	30/15 Summer	100/15 Summer			2.651	0.394	0.000
S3.000	S4	15 Winter	30	+0%	100/15 Summer	100/15 Summer			2.422	-0.078	0.000
S1.003	S4	15 Winter	30	+0%	30/15 Summer	100/15 Summer			1.953	0.224	0.000
S1.004	S5	15 Winter	30	+0%	30/15 Summer				1.559	0.191	0.000
S1.005	S6	960 Winter	30	+0%	30/15 Summer				1.383	0.344	0.000
S1.006	S7	960 Winter	30	+0%	30/15 Summer				1.382	0.385	0.000
S1.007	S8	960 Winter	30	+0%	2/240 Winter				1.381	0.531	0.000
S1.008	S9	960 Winter	30	+0%	2/240 Winter				1.375	0.525	0.000
S1.009	S10	960 Winter	30	+0%	2/240 Winter		2/15 Winter	53	1.382	0.532	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.90		12.6	FLOOD RISK	6
S1.001	S2	1.19		16.9	FLOOD RISK	4
S2.000	S3	0.54		9.3	SURCHARGED	6
S1.002	S3	1.13		43.7	SURCHARGED	4
S3.000	S4	0.45		12.8	OK	4
S1.003	S4	1.08		75.8	SURCHARGED	2
S1.004	S5	1.13		76.4	SURCHARGED	
S1.005	S6	0.19		11.7	SURCHARGED	
S1.006	S7	0.18		11.8	SURCHARGED	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.007	S8	0.28		15.4	SURCHARGED	
S1.008	S9	0.18		9.3	SURCHARGED	
S1.009	S10	0.03	8.4	1.3	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 1 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	C (1km)	-0.026	D3 (1km)	0.415
FEH Rainfall Version	1999	D1 (1km)	0.396	E (1km)	0.308
Site Location		D2 (1km)	0.253	F (1km)	2.312

Cv (Summer)	0.750		
Cv (Winter)	0.840		

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	100	+30%	30/15 Summer	100/15 Summer			3.459	0.909	3.147
S1.001	S2	15 Winter	100	+30%	30/15 Summer	100/15 Summer			3.405	0.703	4.585
S2.000	S3	15 Winter	100	+30%	30/15 Summer	100/15 Summer			3.210	0.610	10.028
S1.002	S3	15 Winter	100	+30%	30/15 Summer	100/15 Summer			3.308	1.051	7.796
S3.000	S4	15 Winter	100	+30%	100/15 Summer	100/15 Summer			3.104	0.604	4.289
S1.003	S4	15 Winter	100	+30%	30/15 Summer	100/15 Summer			3.201	1.472	0.653
S1.004	S5	15 Winter	100	+30%	30/15 Summer				2.737	1.369	0.000
S1.005	S6	960 Winter	100	+30%	30/15 Summer				2.074	1.035	0.000
S1.006	S7	960 Winter	100	+30%	30/15 Summer				2.074	1.077	0.000
S1.007	S8	960 Winter	100	+30%	2/240 Winter				2.073	1.223	0.000
S1.008	S9	960 Winter	100	+30%	2/240 Winter				2.070	1.220	0.000
S1.009	S10	960 Winter	100	+30%	2/240 Winter		2/15 Winter	53	2.072	1.222	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	1.33		18.6	FLOOD	6
S1.001	S2	1.41		20.0	FLOOD	4
S2.000	S3	1.44		24.7	FLOOD	6
S1.002	S3	1.20		46.6	FLOOD	4
S3.000	S4	0.96		27.0	FLOOD	4
S1.003	S4	1.52		90.1	FLOOD	2
S1.004	S5	1.65		112.5	SURCHARGED	
S1.005	S6	0.32		19.6	SURCHARGED	
S1.006	S7	0.29		19.6	SURCHARGED	

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.007	S8	0.39		21.3	SURCHARGED	
S1.008	S9	0.21		11.0	SURCHARGED	
S1.009	S10	0.03	10.6	1.7	SURCHARGED	

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