



**PERSIMMON HOMES THAMES VALLEY
LAND NORTH OF TODDINGTON LANE,
LITTLEHAMPTON**

**DRAINAGE STRATEGY, WEST OF
WETLANDS
(DISCHARGE OF CONDITION 10)**

JANUARY 2019

the journey is the reward

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**Persimmon Homes Thames Valley
Land North of Toddington Lane, Littlehampton
Drainage Strategy, West of Wetlands
(Discharge of Condition 10)**

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1 Introduction

- 1.1 Mayer Brown Ltd has been commissioned by Persimmon Homes Thames Valley (PHTV) to compile this report to assist with the discharge of planning condition 10 for their outlined approved development (**Arun DC reference LU/47/11/**) for up to 1,260 residential dwellings, B1 employment use, Class A facilities, a 100 bed hotel, 60 bed care home, primary school, plus many other facilities and improvements to the local infrastructure.

Outline Planning Consent

- 1.2 Outline Planning Consent was granted in 2011, under Arun District Council planning reference LU/47/11, which includes Condition 10 that relates to surface water drainage.

Purpose of this Drainage Report

- 1.3 This drainage report does not cover the entire area that received outline planning approval. It includes the development area of approximately 19.0 hectares to the west of the wetlands as identified Appendix B, titled "Land Uses and Drainage Areas Covered".
- 1.4 There are a total of 18 land parcels and associated road infrastructure identified within this catchment at varying states of progress. The report describes the design philosophy behind the main surface sewers within the road network that will eventually drain the development parcels within this area. It also specifies the proposed connection points and peak allowable surface water discharge from each of the land parcels.
- 1.5 A parcel specific surface and foul water drainage strategy will still be required to accompany the reserved matters (RM) applications from the individual land parcels.
- 1.6 This report is to be used to accompany the RM planning applications for each of the individual parcels in order to demonstrate that the receiving drainage network has been adequately designed and considered.

Previous Consultancy Work

- 1.7 Greencore obtained outlined planning consent for the scheme in 2011, using White Young Green as their drainage consultants, and subsequently sold the site to PHTV.

- 1.8 Glanville Consulting Engineers were employed by PHTV to develop the surface and foul water strategy further. Glanville are no longer working on the project but produced useful information to depict the pre-development scenario, which is contained in a number of Appendices within this report.
- 1.9 Mayer Brown were employed by PHTV as their drainage consultants for the project in September 2017 and where possible will utilise the information produced by previous Consultants.
- 1.10 There are numerous projects, sub-parcels and associated civils and drainage drawings that inform the works within the west of wetlands catchment. It is not practical to include all the drawings for these projects within this report and, as such, they are listed in Appendix L. These drawings can be supplied on request to Mayer Brown Ltd.

2 Condition 10 - Surface Water Drainage

Condition 10: *No development shall begin until a fully detailed surface water drainage scheme for that phase of the development, based on sustainable drainage principles and designed in accordance with the SUDS strategy for the whole development, has been submitted to and approved in writing by the Local Planning Authority. It should be demonstrated how each detailed scheme will contribute to delivering, and link into, the surface water drainage strategy for the site as a whole.*

- The SUDS shall be designed to attenuate the 1 in 100 year storm event (plus climate change allowance of 30% in accordance with DEFRA's National Standards for Sustainable Drainage Systems).*
- No infiltration of surface water drainage shall occur within ground affected by contamination unless suitable remediation is undertaken.*
- Each detailed scheme should include a timetable for its implementation; and provide a management and maintenance plan in the form of a site specific Maintenance Manual for the SUDS system for the lifetime of the development. This shall include the arrangements for adoption by any public authority or statutory undertaker or details of the financial management of the scheme throughout its lifetime.*

Elements of the scheme serving any particular phase shall subsequently be implemented in accordance with the approved details (unless otherwise agreed with the Local Planning Authority) prior to the occupation of any dwellings in that phase and no building in that phase of the development shall be occupied until the surface water drainage scheme has been fully implemented in accordance with the approved details.

Reason: To ensure that the proposed development is satisfactorily drained to prevent the increased risk of flooding, and improve and protect water quality, habitat and amenity, and ensure future maintenance of these in accordance with national guidance and policies GEN7, GEN9 of the Arun District Local Plan.

Pre-Demolition Site

- 2.1 The pre-demolition site was heavily developed comprising large glasshouses with associated outbuildings and areas of hardstanding. Refer to the site location plan in Appendix A that shows the extent of the glasshouses covering the site to the east and west of the wetlands.
- 2.2 A plan illustrating the existing surface water regime, produced by Glanville in 2014, is contained in Appendix H.
- » The former Toddington Nurseries: The western part of the site comprising is understood to have discharged to a combination of soakaways and outfall to the existing ditch system north of the site.
 - » Central West Former Holland Nursery: Discharged to an irrigation pond before discharging to Toddington ditch. It is understood that there was no restriction of flows from the system.

Infiltration

- 2.3 Intrusive ground investigations and soakage testing undertaken by Merebrook have confirmed that infiltration methods for the disposal of surface water runoff are unlikely to be practical across the majority of the site as the underlying material is generally found to comprise of Clay.
- 2.4 Review of these investigative reports appears to indicate only two areas where infiltration drainage were feasible (subject to further testing):
- » Towards the western part of the site at depths of around 1.0m into the localised sand deposits; Parcels B3, B5, B1, Care Home, Enterprise Zone
 - » Towards the western part of the site at depths of around 2.0m into localised Sand deposits; notably Parcels A1, A2, Youth Facility, B6, Waste Recycling Centre, and Commercial Areas.
- 2.5 Other than the locations noted above infiltration methods for the disposal of surface water runoff are unlikely to be feasible due to either the presence of Clay material or high groundwater levels.
- 2.6 Modelled Flood Levels in the Black Ditch are within a metre of ground level in many locations which could restrict depths available to effectively locate SuDS features.

Sustainable Drainage (SuDS) and Drainage Hierarchy

- 2.7 Sustainable Urban Drainage Systems (SuDS) are a range of techniques that aim to mimic the way rainfall drains in natural systems and so reduces the hydraulic and hydrological impact on the local area and downstream catchments. There are a number of options available to impose surface water restrictions on proposed development plots such as oversized sewers, below ground storage tanks, attenuation ponds and basins, swales, permeable paving, or infiltration systems.
- 2.8 To determine the most sustainable method of surface water disposal the hierarchy from approved document part H was used, see below:
- » **An adequate soakaway or some other adequate infiltration system** apart from a few locations across the site infiltration methods for the disposal of surface water runoff are not feasible due to either the presence of Clay material or high groundwater.
 - » **A Watercourse** – The Black Ditch is located to the north of the site within the boundary of the consented scheme. There are ordinary watercourse tributaries that run across the wetlands and connect to the Black Ditch
 - » **A Sewer** – There are no public surface water sewers in the immediate vicinity. The only drains available were those that drained the pre-demolition glasshouses and discharged into the black ditch.

Proposed Surface Water Strategy

- 2.9 Based upon the above hierarchy a high level description of the surface water strategy is that the entire 19 hectare catchment as identified in Appendix B will drain at a restricted rate of run-off into the Black Ditch via a single outfall located at the northern boundary of development parcel C2.
- 2.10 As explained in the introduction this report describes the drainage strategy for the development parcels and associated road network for the consented scheme to the west of the wetlands. (The remaining area to the east of the wetlands is currently under development).

Proposed and Pre-Demolition Discharge Rates

Pre-Demolition Discharge

- 2.11 As described in paragraph 1.9 Glanville Consulting Engineers (GCE) produced useful information to depict the pre-demolition scenario. In order to understand and quantify the existing drainage and associated discharge rates

PHTV commissioned MK Surveys to carry out a drainage survey of the pre-demolition drainage network. The resulting survey is contained in Appendix H of this report (a total of 12 AO drawings covering the whole site).

- 2.12 GCE subsequently reviewed the drainage survey and ascertained there was a total of 10 outfalls, ranging in diameter from 150mm up to 375mm, with run-off eventually ending up in the Black Ditch via the series of smaller upstream ditches.
- 2.13 GCE produced basic micro drainage models in order to quantify the discharge rate from each outfall. They also produced a plan summarising the discharge rates from the individual parcels. Refer to Appendix H of this report.
- 2.14 The resulting total pre-demolition discharge rate from the West of Wetlands is as follows:
- ✦ Outfalls 01, 02, 03 (**Not** including outfalls 04 to 09 or the overland flow)
 - ✦ Combined impermeable area = 8.33 hectares
 - ✦ Peak Pre-demolition 1 in 1 year discharge = **390 Litres / second**
- (The above figure does not account for the run-off from the demolished buildings and unrecorded drainage, as shown on the GCE plan. These areas are hatched on the GCE plan and are referred to as overland flow)
- 2.15 The overall development area of the west of wetlands catchment is 19.0 hectares, which equates to a pre-demolition peak **1 in 1 year** discharge rate of **20 litres / second / hectare**.
- 2.16 It is worth noting that the calculated pre-demolition discharge rate of 20 litres / second / hectare is for the 1 in 1 year return period and, although not calculated, would be significantly larger for the higher 1 in 30 year and 1 in 100 year return periods.

Proposed Discharge Rate

- 2.17 The Arun DC SFRA identifies the site as brownfield and states that development is unlikely to significantly increase run-off but should seek to reduce rates where possible. Therefore, the proposal is to specify a reduced rate of run-off when compared to the pre-demolition run-off described above.
- 2.18 A proposed peak discharge rate has been calculated using Greenfield runoff methods provided in IoH124 using a Soil Type of 5 to make allowance for the possible effect of the previous extensive impermeable area. The resulting 1 in 1 year brownfield rate has been calculated at approximately 15 litres

/second / hectare. A copy of the relevant calculation is contained in Appendix H.

- 2.19 The peak rate of surface water discharge for up to the **1 in 100 year return period + 30% climate change** will be restricted to **15 litres / second / hectare**. This proposed peak rate of surface water discharge will provide significant betterment when compared to the pre-demolition undeveloped scenario.

Calculations and Results

- 2.20 A Micro Drainage model has been created of the drainage network covering the overall catchment area of 19.0 hectares. The pipes have been sized to convey the surface water run-off from each area, and the proposed peak allowable discharge has been specified from each future development plot. The overall network schematic and details are contained in Appendix E.
- 2.21 Outfall B, the final outfall from the overall catchment, will discharge through a headwall into the existing ditch that is also located in a flood plain. There will be a flap valve on the final headwall to ensure floodwater within the floodplain will not back up into the drainage network. However, in this scenario the drainage network can't push open the flap valve until the water level within the site goes above the flood level in the wetlands.
- 2.22 There is a risk that a fully surcharged outfall could coincide with the on-site critical 1in100yr+CC storm so the Micro Drainage model has been simulated with a fully surcharged outfall.
- 2.23 The EA supplied 1in100yr+20%CC modelled flood level within the floodplain ranges from 1.72m AOD to 1.83m AOD. A flood level in the wetlands of 1.8m AOD by the outfall will result in the outfall (@ 1.0m AOD) being surcharged by approximately 0.8m.
- 2.24 There is also permeable sub-base designed beneath some of the Phase 2 roads, which has been incorporated into the Micro Drainage model.
- 2.25 The final peak allowable discharge of **285 litres / second** (19 hectares x 15 litres / second / hectares) has been modelled for the worst case 1 in 100 year storm event + 30% climate change. The simulation results are contained in Appendix F & G.

2.26 The discharge rates will be considerably lower for lower intensity storm events as shown below (discharge rates below are for a surcharged outfall. When the outfall is unsurcharged the full 285 litres / sec discharge is achieved):

- ✧ Critical 1 in 100 year storm (+30% CC): 265 litres / second
- ✧ Critical 1 in 30 year Storm: 207 litres / second
- ✧ Critical 1 in 1 year Storm: 167 litres / second

2.27 The proposed discharge rates represent a significant reduction when compared to the pre-demolition 1 in 1 year discharge rate of 390 litres / second, as follows:

- ✧ Critical 1 in 100 year storm (+30% CC): 32% Reduction
- ✧ Critical 1 in 30 year Storm: 47% Reduction
- ✧ Critical 1 in 1 year Storm: 58% Reduction

2.28 Most of the surface water attenuation will be located within the future car park area in a 1500 cubic metre proprietary storage tank and permeable paving sub-base. There will also be attenuation in the 900mm diameter pipe running from the car park to the outfall.

2.29 A maximum allowable discharge will be imposed on the majority of development parcels and, as such, each parcel will need to contain surface water storage within its respective reserved matters (RM) application boundary. These have been modelled indicatively within the micro drainage network but their design will need to be undertaken to accompany each RM Application.

Existing & Future Development Parcels

2.30 The discharge from each parcel into the main drainage network will be restricted to the following peak rate of run-off:

- ✧ Non-Resi Land (0.91Ha) 5 litres / second
- ✧ Non-Resi Land (0.81Ha) 5 litres / second
- ✧ Non-Resi Land (0.32Ha) 5 litres / second
- ✧ Non-Resi Land (Hotel) 5 litres / second
- ✧ Care Home: 5 litres / second
- ✧ Parking Square: 5 litres / second
- ✧ A1 Parcel (Existing): 34.5 litres / Second
- ✧ A2 Parcel: 5 litres / second
- ✧ B1 Parcel: 5 litres / second

- ✦ B2 Parcel: Free Discharge – See Appendix I & K
- ✦ B3 & B5 Parcel (Existing): 120 litres / second
- ✦ B6 Parcel: 5 litres / second
- ✦ Block B Parcel: 5 litres / second
- ✦ Block A Parcel: 5 litres / second

Free discharge areas below – See paragraph 2.27 to 2.29

- ✦ B4 Parcel (Phase2): Free Discharge – See Appendix I & K
- ✦ C1 Parcel: Free Discharge – See Appendix I & K
- ✦ C2 Parcel: Free Discharge – See Appendix I & K
- ✦ C4 Parcel: Free Discharge – See Appendix I & K
- ✦ Roads Serving Above Free Discharge into Network

Total Peak Discharge: **285 litres / Second**
(1in100yr return period, including climate change)

Free Discharge from Parcels

- 2.31 The surface water network serving the above parcels (C1, C2, C4, B4 Partial, Roads) are interconnected and overlap with each other, and the roads passing through these parcels also drain the upstream and surrounding parcels
- 2.32 There are also no flow controls (ie hydro-brakes) on the surface water sewers within Phase 2 parcels or roads. A total of 23 individual locations / sub-catchments have been identified within Phase 2. The free discharge varies for different return periods and their associated storm durations varying for short durations high intensity storms to longer durations low intensity rainfall events. The critical discharge rates have been identified in
- 2.33 Although there is a free discharge from these sub-catchments the downstream network has been designed to cater for this and the final outfall / discharge rate will not exceed 285 litres / second for the peak 1in100yr return period, including climate change. (The peak discharge rate will be considerably less for lower returns periods as set out above in paragraph 2.27.)
- 2.34 The type of attenuation tanks in the future development plots are to be determined at the time of the RM application. The volumes of tanks identified in Appendix I is approximate only and will need to be designed accurately by the Consultants undertaking the detailed design. Catch pit chambers are to

be specified immediately upstream to the tanks in order to limit the volume of debris / silt entering the tanks.

Modelled Overflow into Future Parcel B4

- 2.35 There is a requirement to add an overflow in the drainage network at the south west corner of the catchment (by SW01). The drainage is exceptionally shallow in this location so there is no scope to add surface water attenuation under the road or adjacent parking areas.
- 2.36 Approximately 226m³ of surface water run-off will overflow into the proposed surface water drainage network that will eventually serve the future development parcel B4. This will only occur for the critical duration storm (120mins) for the 1in100yr return period + climate change.
- 2.37 Therefore, the plan is to increase the size of the future attenuation tank in the adjacent B4 parcel so it will store the 226m³ and release it into the wetlands via a future outfall at the agreed rate of 15 liters / second / hectare.

Surface Water Treatment

- 2.38 Table 26.2 of the SuDS Manual identifies the pollution hazard level associated with the land uses within the Proposed Development as being 'Low'. On a scale from 0-1 a 'Low' pollution hazard level relates to the following pollution hazard indices (See table 26.2 of the SuDS Manual) This is applicable to runoff from residential roofs, driveways, paths, residential parking areas and low traffic roads:
- ✧ Total Suspended Solids = 0.5
 - ✧ Metals = 0.4
 - ✧ Hydrocarbons = 0.4
- 2.39 Table 26.3 of the SuDS Manual sets out the indicative mitigation indices provided by different SuDS features for discharges to surface water.

Permeable Paving

- 2.40 Communal parking and private driveways will be constructed using permeable paving allowing the rainwater falling onto permeable paved areas to be treated by the microorganisms as it passes through drainage medium, see Figure 4.1 below.

- 2.41 Permeable paving provides sufficient pollution mitigation for runoff from low hazard land uses and provides mitigation indices of 0.7, 0.6 and 0.7, which are in excess of the requirement set out in paragraph 2.25.

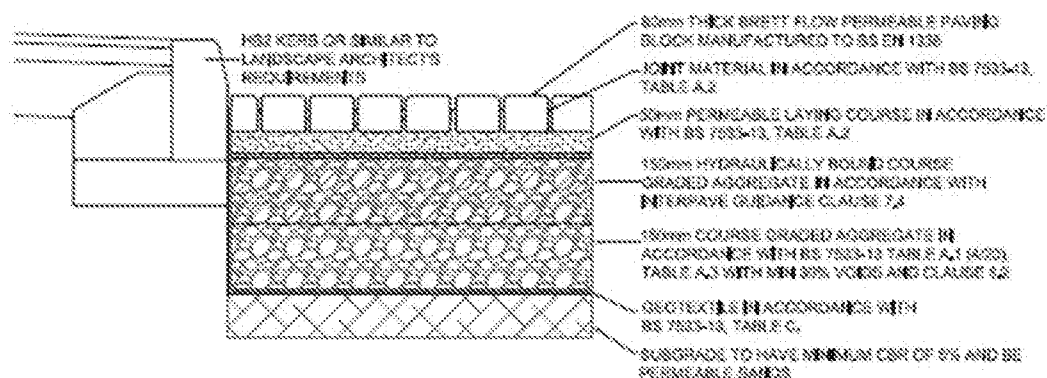


Figure 2.1: Typical Permeable Block Paving Construction

Permeable Sub-base Road

- 2.42 A number of the private roads within C2 Parcel, B2 Parcel and B4 Parcel draining into the drainage network will drain via permeable sub-base located under the road surface. The specific construction is contained in Appendix J.
- 2.43 It is considered that the permeable sub-base provides sufficient pollution mitigation for runoff from low hazard land uses and provides mitigation indices of 0.7, 0.6 and 0.7, which are in excess of the requirement set out in paragraph 2.25

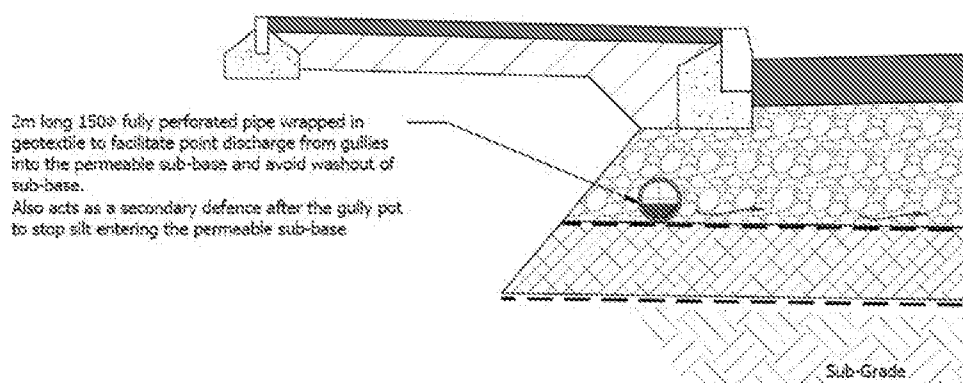


Figure 2.2: Permeable Sub-base Road (refer to Appendix J)

- 2.44 The private roads within C1 Parcel will drain via a filter trench running adjacent the carriageways. The specific construction is contained in Appendix J.
- 2.45 It is considered that the granular material sub-base will provides sufficient pollution mitigation for runoff from low hazard land uses and provides

mitigation indices of 0.7, 0.6 and 0.7, which are in excess of the requirement set out in paragraph 2.25

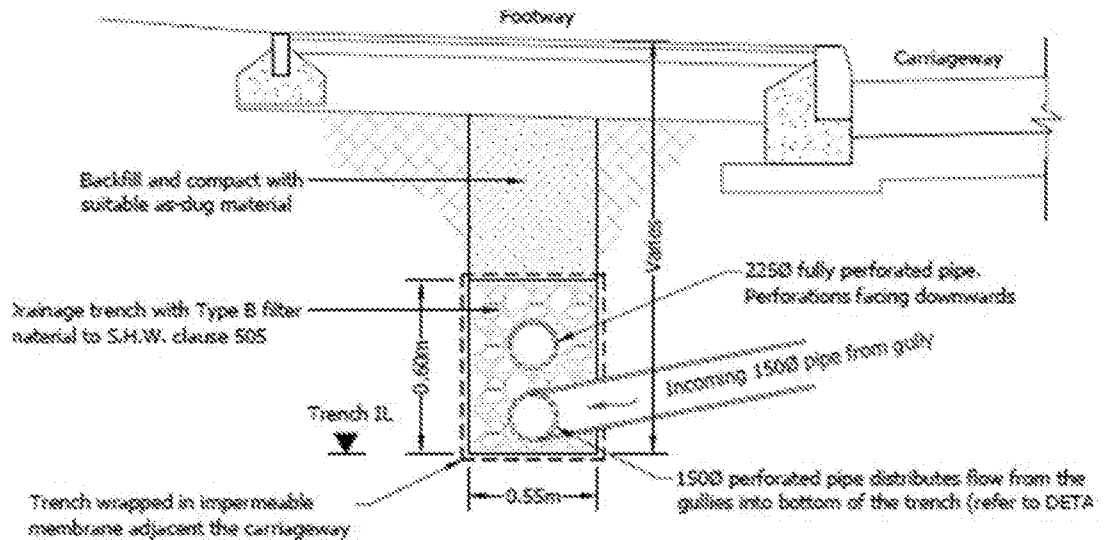


Figure 2.3: Permeable Sub-base Road (refer to Appendix J)

Traditional Gullies

- 2.46 Full size precast concrete gully pots draining the asphalt roads that will act as the first line of defence to trap silt and sediments in the drainage network.

Exceedance Flows & Surcharged Outfall

- 2.47 The drainage network is designed to cope with flooding up to the **1in100yr+30%CC** flood event and this water will be contained on site within the developed areas (not the wetlands)
- 2.48 Appendix D contains drawings that show the route of overland flow in the event of system failure, blockage or overload. This demonstrates that dwellings will be suitably protected in the event of a drainage system failure and resulting overland flow can find its way safely through the road network and into the wetlands.
- 2.49 Discussions have been had with Arun DC to ascertain what would happen if the wetland are flooded and the outfall becomes surcharged. The EA supplied 1in100yr+20%CC modelled flood level within the floodplain ranges from 1.72m AOD to 1.83m AOD. A flood level in the wetlands of 1.8m AOD by the outfall will result in the outfall (@ 1.0m AOD) being surcharged by approximately 0.8m.

- 2.50 The chances of the critical 1in100yr+CC flood level in the wetlands (which is tidal) coinciding with the peak 1in100yr+CC storm event on the site are very small. However, a fully surcharged outfall was simulated and results in a small flood volume escaping from the drainage network that can be safely be contained within the road network (refer to the simulated results for the critical 240 minute storm in Appendix F).

Adoption and Maintenance

- 2.51 The proposed surface water drainage system will be constructed in accordance with Sewers for Adoption 7th edition (SFA7); however it will remain in private ownership and will be maintained by a Management Company organised by the Developer.
- 2.52 Some of the main roads, footpaths and shared areas will be adopted by Mid Sussex District Council under a Section 38 agreement. The remaining private roads and communal parking areas will be maintained by a Management Company, organised by the Developer.
- 2.53 Taking this approach will ensure shared drainage and infrastructure items are properly maintained. This should enable tight control over the operation and maintenance of the drainage / SuDS systems on site.

Attenuation Tank Maintenance

- 2.54 The primary purpose of the attenuation tanks is to attenuate surface water run-off during extreme rainfall events.
- 2.55 Regular inspection and maintenance is required to ensure the effective long-term operation of the below ground storage tanks, see table 2.1 below for details:

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Debris removal from catchment surface (where may cause risk to performance).	Monthly.
	Remove sediment from pre-treatment structures.	Annually, or as required.
Remedial Actions	Repair/rehabilitation of inlets, outlets, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually and after large storms.

	Survey inside of tank for sediment build-up and remove if necessary.	Annually until evidence this is too regular, every 5 years thereafter.
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Table 2.1: Attenuation Tank Maintenance Requirements

Pervious Pavement Maintenance

- 2.56 Pervious pavements are pavements that allow for pedestrian and/or vehicular traffic while allowing rainwater to infiltrate through the surface and into underlying structural foundation layers.
- 2.57 Regular inspection and maintenance is important for the effective operation of pervious pavements as designed, these are described below in table 2.2:

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosphate applied directly into weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost joining material.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspections chambers.	Annually.

Table 2.2: Pervious Pavement Maintenance Requirements

Drainage Network Design Criteria

- 2.58 The positive drainage will be designed in accordance with Sewers for Adoption, and BS EN 752 – Drain and sewer systems outside buildings and the Building Regulations - part H (2002).
- 2.59 The surface water network design and rate of surface water runoff would be based on the Modified Rational method and designed in accordance with the Wallingford Procedure. In order to carry out the design of the networks, a number of Global Variables are used. These Global Variables / parameters are related to the location of the site in the UK and have been obtained from the Flood Estimation Handbook (FEH).
- 2.60 The positive surface water system would be designed such that:
- ✧ The pipes remain unsurcharged during the 1 in 2 year design storm;
 - ✧ The system should not flood during the worst case 1 in 30 year storm with a free outfall;
 - ✧ The surface water run-off from the proposed development would be safely contained on site for up to and including the worst case 1 in 100 year storm event, plus an additional 30% for climate change;
 - ✧ The pipe velocities are such that self-cleansing is achieved at lesser more moderate storm intensities :
 - Pipe roughness (ks) = 0.6
 - Minimum pipe velocity at full flow = 1.0 m/s
 - Cv Value of 0.84 (as agreed with WCSS)
 - Percentage Impermeable areas
 - Buildings = 100%
 - Carriageways and footpaths = 100%
 - Private and Communal Parking = 100%

Micro Drainage Software

- 2.61 The proposed and existing networks have been designed and analysed using the Micro drainage software package that is recognised as one of the industry standard design suites. There are two separate programmes used within the package to firstly generate and then analyse the completed model. These are 'System 1' and 'Simulation'.

- ✧ System 1: The surface water computer model has been generated in “System 1” in using proposed data, such as the cover levels, invert levels and catchment areas. This is used to size the pipes in the proposed network based on the global variable outlined above
- ✧ Simulation: Once the proposed drainage system has been generated it was analysed using ‘Simulation’. This is a full hydrograph method for the determination of flood risk and system failure under extreme conditions. It can be used to analyse system overloads, storage, reverse flow characteristics, surcharging and backwater effects. It can also analyse against a wide variety of critical variables.

Return Periods & Critical Duration Storms

- 2.62 To determine the hydraulic requirements for an element of a drainage system, one must first consider the consequences of that capacity being exceeded and then identify an acceptable frequency for this to occur. This acceptable frequency is termed the return period, the period of time during which the stated rainfall can be expected to be exceeded on average only once, that particular element is then designed to accommodate a storm / flood with this return period.
- 2.63 Once the design return period is established the most critical storm duration for each of the elements is determined. These range in duration from 15 to 1440 minutes. For example;
- ✧ A 1 in 30 year, 30 minute duration storm for the northern catchment has an average intensity of 56.762mm/hr. This intensity of storm would be used to size the pipes and other drainage elements for conveyance purposes.
 - ✧ A 480 minute duration storm has an average intensity of only 8mm/hr (figures obtained from simulated results). However, the 480 minute storm lasts 16 times longer, therefore generating a much greater volume of water and would be used to size the attenuation tanks.

Condition 10 Conclusion

- 2.64 This surface water drainage strategy demonstrates that the west of wetlands catchment site can be drained satisfactorily without increasing flood risk elsewhere.

- 2.65 Intrusive ground investigations and ground water monitoring have determined that infiltration drainage is unlikely to be practical across **much** of the site. Discharge of surface water runoff directly into the chalk, which is designated a principal aquifer, has been discounted due to high recorded groundwater levels within this material and the inability to provide a minimum standoff distance from the saturated zone.
- 2.66 There are, however parcels to the **west** of the site, (as described in paragraph 2.4) that are yet to be developed and where bespoke infiltration drainage might be feasible. Parcel specific infiltration tests will be undertaken to determine the feasibility for each future land parcel where the standing ground water level is found to be in excess of 2.0m below the surface.
- 2.67 Surface water runoff will be discharged to the Black Ditch at a peak allowable discharge of 15 litres / second / hectares for up to the 1 in 100 year return period, plus 30% allowance.
- 2.68 This proposed rate of discharge will provide considerable betterment when compared to the pre-demolition brownfield arrangement. The provision of SuDS and attenuation features will store the balance of surface water runoff.
- 2.69 The proposed discharge rates represent a significant reduction when compared to the pre-demolition 1 in 1 year discharge rate of 390 litres / second, as follows:
- ✦ Critical 1 in 100 year storm (+30% CC): 32% Reduction
 - ✦ Critical 1 in 30 year Storm: 47% Reduction
 - ✦ Critical 1 in 1 year Storm: 58% Reduction
- 2.70 The information contained within this report demonstrates that adequate surface water infrastructure will be provided to enable the consented scheme to be satisfactorily drained, and will enable the future Parcels within the west of the wetlands catchment to make a positive connection into the proposed surface water network.
- 2.71 The reserved matters planning applications for the future parcels will need to be accompanied by an individual surface water drainage strategy and technical note. Each technical note will also include this overall strategy that demonstrates the downstream receiving network has been satisfactory designed in accordance with the relevant standards.

- 2.72 Parcel specific soakaway tests will be undertaken to confirm the feasibility of using infiltration drainage on the future RM planning applications for the remaining land parcels. If feasible the infiltration drainage will be used in conjunction with the positive discharge rates described within this report.
- 2.73 Therefore, it is considered that this evidence base, when read in conjunction with the RM application for the individual parcels, will provide sufficient information to discharge the outline planning Condition 10.

APPENDIX A: Site Location & Pre-Demolition Layout



NOTES

1. This drawing is to be read in conjunction with all relevant documents and specifications.
2. Dimensions not to be scaled.

LOCATION

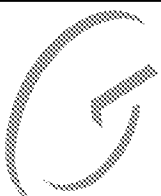
Address: Toddington Lane
Wick
Littlehampton
West Sussex
BN17 7PP

National Grid reference: TQ 03414 03979



Plan NTS

Plan 1:10000



Glanville

Cornerstone House
62 Fotherhall Road, Ditchot
Oven, OTH 17AD

Tel: (01235) 515550 Fax: (01235) 517799
post@glanvillegroup.com www.glanvillegroup.com

Project :

Land North of Toddington Lane, Littlehampton

Title :

Site Location Plan

Project Engineer : J O'Kelly

Scale : As Shown@A4

Project Director : k Rayner

Date : December 14

Drawing No.

N/A

Rev

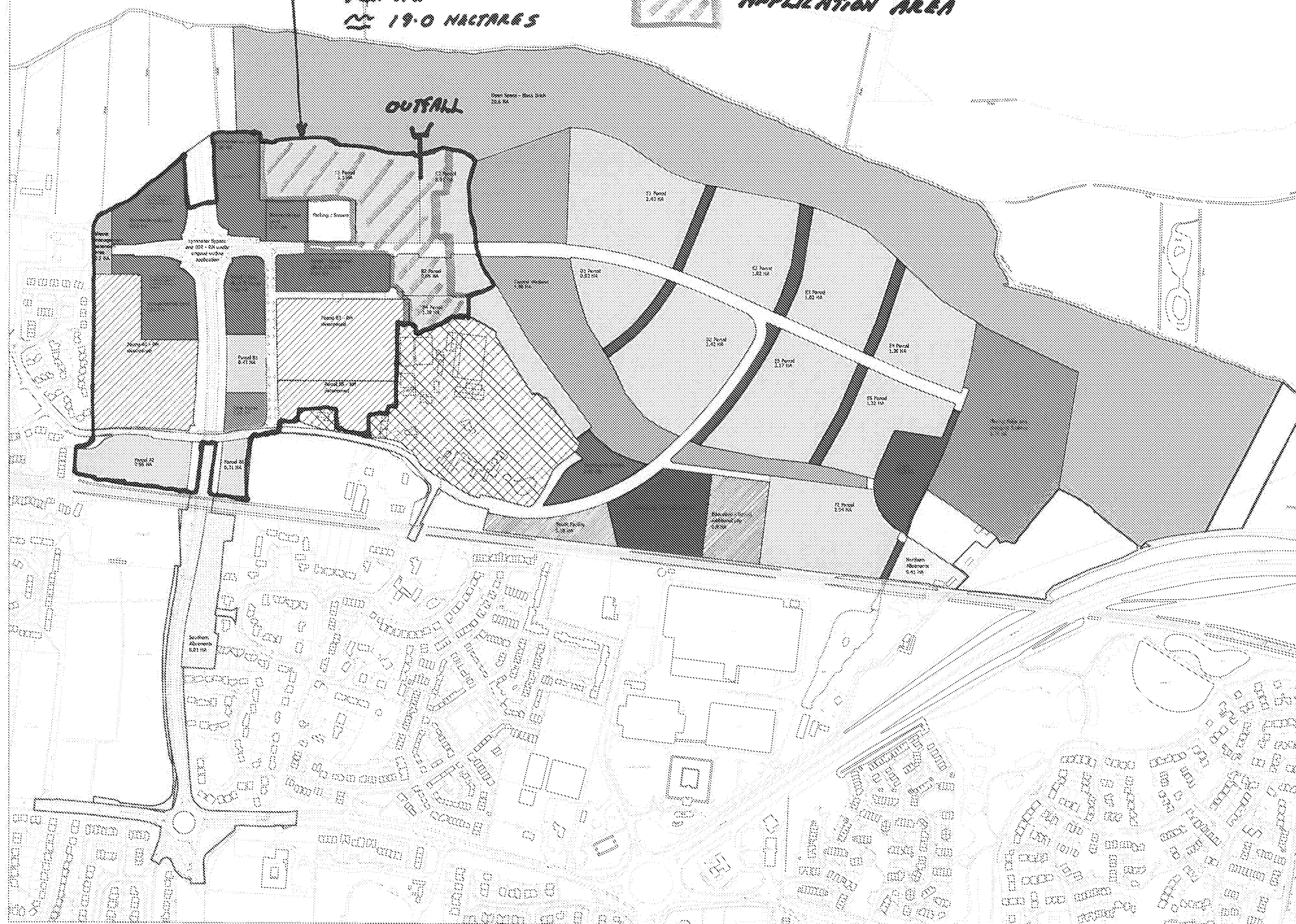
-

APPENDIX B: Land Uses & Drainage Areas Covered

RESERVED MATTERS
APPLICATION AREA



OUTFALL



- | Key | |
|-----|--|
| | Public Town Square - Street - Bench |
| | Public Town Square - General Weekend |
| | Playing Adults and Children Football (18106 - 1.79164) |
| | Afternoon (18106 - 2.41104 & 0.31164) |
| | Student |
| | Residential |
| | Education - School Week (18106 - 2.28181) |
| | Continuing Center and Youth Facility (18106 - 1.62181 & 0.30181) |
| | Nonresidential Land (18106 - 2.82181, Contours - 2.84181) |
| | Recreating Center (18106 - 0.18181) |
| | Hazel 2 (moderated map to 38951016 of Class 4) |
| | Infrastructure |
| | STL education - Periods (moderated under previous 80) |
| | Cura Home |

B	Veränderung der Verbindlichkeiten	13.04.17
A	Veränderung der Vermögensgegenstände	12.09.16



PERSIMMON
Together, we make a home

Penniston James Thamez Valley
Penniston House, Knoll Road,
Camden, Surrey GU10 3JQ
Tel 01252 800000

Toddington Lane
Littlehampton

27 06 16

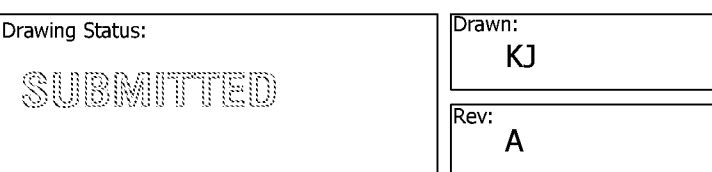
1:2500 @ A1

519-GB-1 006

Parameter Plan - Land use

Submitted

2



APPENDIX C: Arun DC Surface Drainage Correspondence

Sean Foley

From: Laura Gibbons <[REDACTED]>
Sent: 16 January 2019 11:05
To: Sean Foley
Cc: Clark, Robert; Michael Eastham; Edgley, Martin; Adrian Barnley; Steven Lecocq; Fatima Evernden; Tracey Headley-Smith; Alex Wray; Adam Winstone
Subject: RE: Planning Consultation on LU/345/18/DOC

Hi Sean,

Condition 10

I am now happy for you to submit the details formally to planning to discharge condition 10.

Condition 11

I think it would be most practical whilst awaiting consent from the EA to provide us with two potential schemes, i.e. one presuming consent is achievable. And one presuming that consent will not be granted which demonstrates sufficient easement to the watercourse.

Please also speak with Tracey Headley-Smith (copied in) regarding this condition.

Condition 12

Please provide evidence that application for consent has been applied for by the end of tomorrow.

Kind Regards,

Laura Gibbons, MEng, GMICE
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF

Internal: 37818 | External: +44 (0) 1903 737818 | Fax: +44 (0) 1903 716018 | E-mail: laura.gibbons@arun.gov.uk

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Save the environment - think before you print.

From: Sean Foley [mailto:[REDACTED]]
Sent: 11 January 2019 16:42
To: Laura Gibbons
Cc: Clark, Robert; Michael Eastham; Edgley, Martin; Adrian Barnley; Steven Lecocq; Fatima Evernden; Tracey Headley-Smith; Alex Wray; Adam Winstone
Subject: RE: Planning Consultation on LU/345/18/DOC

Laura,

Please see below in red and attached is a link to the updated DOC report that takes these comments into account:
The wetransfer link is here: <https://we.tl/LeCQnN8oBpT>

With this in mind I believe we are now agreed on surface water condition 10, which will hopefully prevent a temporary stop notice being served.

We will endeavour resolve conditions 11 & 12 asap.

Many thanks

From: Laura Gibbons [mailto:]

Sent: 11 January 2019 13:19

Subject: RE: Planning Consultation on LU/345/18/DOC

Hi Sean,

Thanks for the prompt response.

Comments Regarding Condition 10

- The area at point 11 (PN 31.000) in the model and plan are inconsistent. Within the model you have 0.215 ha impermeable area at PN31.000 and 0.043 ha at PN31.001. This is less than the 0.358 ha on plan. The other areas are okay as you have clarified that they are totals.

MBL Response: You are correct. The modelled figure at PN31.000 did not match the plan. The model was okay but the plan was not. This is now updated on the plan as a 60/40 split between PN31.000 & PN18.000. Has been updated on appendix H

- The attenuation volume on plan at 3.000 is inconsistent to that in the model, 80m³ and 92m³ respectively.

MBL Response: Noted. This has been changed. And is on the drainage plan in Appendix L.

- Please can you confirm if all manholes/ gullies upstream of connections into attenuation tanks and permeable sub bases are catchpits/sumps.

MBL Response:

- We will specify the chambers immediately upstream of the main 1,500m³ attenuation tank under the car park as catch pits, which is good practice
- We expect the attenuation tanks in the future plots will also specify catch pits. We have added a section to the updated DOC report. refer to paragraph 2.34
- Run-off enters the permeable sub-base via large precast concrete catch pit gullies. In order to ensure the sub-base does not become blocked / blinded we have also specified a geotextile wrapped around the perforated pipe feeding into the sub-base. See attached detail that was also in the DOC report.

Comments Regarding Conditions 11 and 12

I still do not believe evidence has been submitted regarding consents from the EA to infill the reservoir and its associated IDB ditch.. Please provide this so that condition 1.1 and 1.2 can be discharged? N.B. This needs to be submitted now as it is within the phase 2 development area.

MBL Response: Noted. We will resolve this asap.

Kind Regards,

Laura Gibbons, MEng, GMICE
Engineer (Drainage & Coastal)



From: Sean Foley [REDACTED]
Sent: 11 January 2019 07:56
To: Laura Gibbons
Cc: Clark, Robert; Michael Eastham; Edgley, Martin; Adrian Barnley; Steven Lecocq; Fatima Evernden; Tracey Headley-Smith; Alex Wray; Adam Winstone
Subject: RE: Planning Consultation on LU/345/18/DOC

Laura,

Excellent news. Please see below.

Attached is an wetransfer link to the updated drainage report which is circa 70MB with appendices. Therefore I have also attached the text only part of the report.

<https://we.tl/t-4uDxtCmiug>

Regards,

Sean Foley
[REDACTED]

From: Laura [REDACTED]
Sent: 10 January 2019 16:29

[REDACTED]

Subject: RE: Planning Consultation on LU/345/18/DOC

Hi Sean,

I have reviewed the information you have provided. To summarise what needs to be resolved:

1. There are numerous inconsistencies between plans and calculations regarding cover levels and invert levels of MHs. Please complete a full review and ensure all inconsistencies are removed.

MBL Response: Noted. We have reviewed the model and removed the inconsistencies in Phase 1. We have re-run the simulations and it make negligible difference to the modelled output. The output network details and simulation results take these changes into account

2. There are inconsistencies between impermeable areas on plan and those modelled at points 11, 18 and 22. Please increase the areas in calculations so that they are consistent with those on plan.

MBL Response: Noted.

- Point 11 coincides with PN 31.000: The modelled at this location is 0.358 hectares, which matches the plan. Therefore no discrepancy. No amendment necessary to model
- Point 18 coincides with PN 40.001: The modelled total area at this location is 0.11 hectares, which matches the plan. Therefore no discrepancy. No amendment necessary to model
- Point 22 coincides with PN 37.002: The modelled total at this location is 0.213 hectares, which matches the plan. Therefore no discrepancy. No amendment necessary to model

3. Your summary of the pipe network doesn't show the very top extent of Phase 2. The A0 drawings do not detail pipe diameters in this area

MBL Response: Noted and amended accordingly in Appendices of the updated DOC report. (Appendix H)

4. Updated drainage strategy report to include flows from unrestricted discharge points.

MBL Response: Noted and amended accordingly in Appendices of the updated DOC report. (Appendices L & S)

5. Updated plans with revised storage volumes.

MBL Response: Noted and amended accordingly in Appendices of the updated DOC report. (Appendix L)

Once you have supplied these details and I have reviewed they are correct we will be at a point where all relevant details can be submitted through planning to discharge the condition.

Kind Regards,

Laura Gibbons, MEng, GMICE
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre,
Maltravers Road, Littlehampton, BN17 5LF
Internal: 37818 | External: +44 (0) 1903 737618 | Fax: +44 (0) 1903 716018 | E-mail: laura.gibbons@arun.gov.uk
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Save the environment - think before you print.

From: Sean Foley [REDACTED]

Sent: 10 January 2019 12:26

To: Laura Gibbons

Cc: Clark, Robert; Michael Eastham; Edgley, Martin; Adrian Barnley; Steven Lecocq; Fatima Evernden; Tracey Headley-Smith; Alex Wray; Adam Winstone

Subject: RE: Planning Consultation on LU/345/18/DOC

Importance: High

Laura,

I call earlier but went to voicemail.

The area currently being developed is Phase 2 and the extent of this RM application within the west of wetlands drainage catchment is on the attached PDF, titled "Phase 2 -- Proposed Layout"

- Phase 2 (Parcel C1, Partial C2, Partial B2, Partial B4) -- Full Drainage details have been supplied in Appendix N (MBL Estate Road layout and details) and Appendix O (MJA Plots or sub-catchment layout and details). MJA have not undertaken detailed drainage modelling (microdrainage) of their sub-catchments because it is unnecessary to do this. MJA have however undertaken the detailed design of the plot drainage within these sub-catchments in accordance with Building Regulations Part H & BS EN 752.
- Bovis site (Parcels B3 & B5) -- RM determined. Constructed. I believe the last correspondence on this is attached and I have extracted the condition 10 information below. The Glanville Appendix I is also attached. The Bovis site is within the purple "Sub-Catchment Outfall B", which has a proposed discharge of 221.7 litres / second. By our estimation Parcels B3/B5 takes up approximately 50% of this sub-catchment areas, which explains the peak allowable discharge of 120 litres / second for the Bovis Site. However, the Glanville drainage strategy has now been superseded by MBL's drainage strategy, which is subject to our ongoing discussions

Condition 10: ADC Engineers have asked for confirmation that the total flow from the site is consistent with the proposed flows calculated in the Glanville Site-wide Surface Water Drainage Outfall Strategy of 19 May 2015, specifically appendix 1. They have suggested an overlay of each phase to be shown on the proposed discharge rate catchment layout, showing it as a proportion of the catchment. The same comment was made in relation to application LU/79/16/DOC and additional information was provided. **Please could the same information be submitted in relation to this DOC application.**

- Parcel A1 – RM determined. Constructed. The RM application was accompanied by the attached surface water drainage strategy report and associated calculations produced by Glanville. The final outfall location has now been superseded by MBL's drainage strategy, which is subject to our ongoing discussions

Hopefully this help is what you are looking for in relation to the catchments. If this is correct I believe you now have all the information you require. Please advise if otherwise.

We will now update the DOC Report to take account of what we've discussed / agreed.

Regards,

From: Sean Foley
Sent: 09 January 2019 18:20
To: 'Laura Gibbons' <[REDACTED]>

Subject: RE: Planning Consultation on LU/345/18/DOC

Laura,

We have already supplied the details for the areas that are currently being developed. Refer to Appendices N to R of the DOC report dated 07/11/2018.

I have also addressed your comments in green below. If possible I'd like to discuss point b below about the "catchment plan". Before we embark on providing this I'd like to understand exactly what you require

Regards,

Sean

From: Laura Gibbons [REDACTED]
Sent: 09 January 2019 16:14
To: Sean Foley [REDACTED]

Subject: RE: Planning Consultation on LU/345/18/DOC

Sean,

I think there is some confusion regarding the level of detail I require. I require full drainage details of the areas which are currently being developed without pre-commencement conditions having been discharged. Without this there is

a continued breach of the planning permission and a Temporary Stop Notice will be served. I will require this level of detail for each future parcel and their respective DOC application prior to commencement.

I have provided some comments below in blue. I would like to complete my next review when all details are provided, rather than taking a piecemeal approach which is not time effective.

Look forward to receiving the necessary details.

Kind Regards,

Laura Gibbons, MEng, GMICE
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre,
Maltravers Road, Littlehampton, BN17 5LF
Internal: 37818 | External: +44 (0) 1903 737818 | Fax: +44 (0) 1903 716018 | E-mail: laura.gibbons@arun.gov.uk
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Save the environment - think before you print.

From: Sean Foley [REDACTED]
Sent: 09 January 2019 15:01
To: Laura Gibbons
Cc: Clark, Robert; Michael Eastham; Edgley, Martin; Adrian Barnley; Steven Lecocq; Fatima Evernden; Tracey Headley-Smith; Alex Wray
Subject: RE: Planning Consultation on LU/345/18/DOC
Importance: High

Laura,

Thanks. Please see below in red.

With the recent correspondence and attached in mind we have absolute confidence that the proposed surface water network is fit for purpose:

- Peak rate of discharge is a significant improvement when compared to the pre-demolition figure
- There is sufficient storage volume on site to cater for the critical 1in00yr+CC storm event, even with a fully surcharged outfall
- There is no flooding for the 1in30yr event with a fully surcharge outfall
- In the unlikely event the surface water is overwhelmed by a storm event in excess 1in100yr, or the outfall/pipe experience a blockage the resulting floodwater can flow safely within the road network into the wetlands leaving the new properties unaffected

Regards,

Sean Foley
Principal Engineer
Mayer Brown Ltd
[REDACTED]

From: Laura Gibbons [REDACTED]
Sent: 09 January 2019 11:23

[REDACTED]

Hi Sean,

I have now managed to complete a more detailed review of the proposals. As we are now a few comments and responses in, I have just started a new comments list (alphabetically referenced), any points which cross over to old points are cross referenced.

- a) (3+6) The storage structures (which are not porous paving) are inconsistent between calculations and plans. With the storage volumes provided in calculations all being greater than those on plan. Please update calculations or drawings so that they match up. Compliance with this on site will need to be checked.

MBL Response:

- The only storage structure that needs to be accurate is the large one underneath the car park because this is subject to the RM application for Phase 2 and provides most of the storage for the drainage network. This has been modelled accurately. This has not been modelled accurately, volumes are incorrect as are invert levels. MBL: The large tank you are referring to is located at PN 24.010. The invert level of the tank in the drawing is 1.70m, and is 1.71m in the model. Apart from this 10mm difference the large tank has been modelled correctly. The tank dimensions of 50m x 21m x 1.5m are the same in the drawing and in the model. We will not change the model and will change the number on the drawing. I'd be grateful
- The other modelled storage structures in the future development plots are indicative and have not been subject to a detailed design. The layout of these sites are not even agreed yet, never mind a detailed drainage design and associated tank dimensions and, as such, the volumes of the tanks are indicative only. The most important piece of information is the peak allowable discharge rate from each of the plots. The follow on RM applications for each of the plots will then provide accurate drainage designs and you will have an opportunity to scrutinise these as they accompany the future applications. I need to see that the modelled details match up with those on plan. When detailed design of the future stages occurs logically they would start by looking at the storage volumes outlined on the plans you are creating. Please update the plans. MBL: Noted and we will do this so the modelled tank dimensions match the plan.

- b) (5) Please provide a catchment area plan for the detailed persimmons parcels, and the time area details for these in a MicroDrainage printout.

MBL Response:

- We don't have a catchment area plan for the detailed persimmon parcels. We have however added the modelled areas to the plan (see point C below), which also shows how far back the model extends into each sub-catchment. You need to fully detail the catchments for the persimmons land where development has already started. MBL: Can we discuss on the phone please in the morning
- On 20th December we explained that we enhanced our micro drainage model so it picks up the individual pots areas / sub catchments identified as Points 1 to 23. We have not extended the model to include the surface water pipes within each sub-catchment. The drainage networks within the 23 sub-catchments are made up with a combination of 100dia, 150dia and 225dia pipes, which are expected for small catchments. Each of these mini catchments have already been designed MJA Consulting and we have 100% confidence that the pipes within these catchments are sized correctly / adequately. I need evidence that the design of the networks is sufficient within the parcels where development is occurring. This level of detail will be required for each subsequent DOC application. MBL: Can we discuss on the phone please in the morning
- We did not feed the areas onto the sub catchment nodes using a time area hydrograph. For example on PN22.000 we added the 710m2 impermeable area as one hit and the time of entry is 2 minutes. I will review this information against the plan provided.

- c) Please provide pipe details on a MicroDrainage printout (list) so that I can review the MicroDrainage model.

MBL Response:

- Please find attached the network details the pipeline schedules for the drainage network. Thank you, I will review this in due course.
- The plan showing pipe numbers is attached again and we have added the hardstanding areas from each of the sub-catchments and the MJA drainage plot networks (as a reminder MJA completed the sub-catchment drainage designs)

- d) (9) Without a flat sub base to permeable areas the water will pool at the lower points, and breach the surface at these points. I would like to either see: slopes modelled in the MicroDrainage inputs (i.e. take account of the 300mm difference in elevation over the relevant distances); or cover levels reduced to the lowest cover elevation within each permeable area. I believe this will result in considerably more flooding,

and therefore evidence the requirement for either a flat sub base to provide greater depths of stone in some areas, or check dams being provided.

MBL Response:

- The permeable sub-base does not need to be laid to be effective. The water will inevitably pool at the low points within the road network and come out of the gullies at these locations. There is 260mm of tarmac above the sub-base stone so when the water comes out of the gullies at the low point almost all the storage volume in the open graded stone will be utilised.
- We have updated the model and added a sloped invert to the sub-base. We have also changed the cover levels at the sub-base nodes (permeable subbase nodes 04 & 05) because these coincide with the gully locations
- Modelling the slope sub-base has a negligible difference when compared to the previous results. The 240minute duration event is still the critical storm:
 - PN8.001/8.002 decreases from 7.6m³ to 3.9m³
 - PN14.002 increases from 22.4m³ to 23.50m³
 - PN1.014/PN1.015 increases from 4.7m³ to 9.5m³ I will review this in due course.

e) (12) I am happy for all free discharge rates to be provided on plan and within the report for the 1 in 1 year event, 1 in 30 year and 1 in 100 year plus cc.

MBL Response:

- Thanks, we will add these figures to the report and the drawing.

Kind Regards,

Laura Gibbons, MEng, GMICE
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF
Internal: 37818 | External: +44 (0) 1903 737818 | Fax: +44 (0) 1903 716018 | E-mail: laura.gibbons@arun.gov.uk
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From: Sean Foley [REDACTED]
Sent: 08 January 2019 13:13
To: Laura Gibbons
Cc: Clark, Robert; Michael Eastham; Edgley, Martin; Adrian Barnley; Steven Lecocq; Fatima Evernden; Tracey Headley-Smith; Alex Wray
Subject: RE: Planning Consultation on LU/345/18/DOC
Importance: High

Laura,

Regarding point 3 below:

Please find attached the phase 2 drainage composite plan. I've sent you the phase 2 information because this is the area that has been designed to a construction standard level of detail.
(The layouts are still being developed for extension of parcels C2 and B2, denotes as unrestricted discharge points 6, 7, 12 & 13)

These A0 plans at 1:250 scale include:

- Finished Road Levels
- House finished floor level
- Proposed levels in parking courts and driveways
- Location of permeable sub-base
- Surface Water sewer and associated invert and cover levels
- Windes Pipe numbers that can be read in conjunction with the supplied Windes simulation results

The only information missing is the formation level of the permeable sub-base. See point 9 below

Regarding point 9 below:

The finished road surface down around this low area of the site ranges generally from 3.8m to 4.1m (apart from in front of plots 64 & 65 where it drops to 3.6m). This is because these properties 61 to 100 are on a relatively flat earthworks platform. The roads cannot be laid flat so we designed crests and sags in order to introduce falls to gullies. The low points are generally 3.8m and the high points are generally 4.1m.

The formation level of the sub base is not constant flat level, and it mirrors the finished surface. The formation level is approximately 720mm below the surface (260mm tarmac over 460mm open graded stone). We have modelled the formation level of the sub-base at 3.08m AOD and allowed for 460mm depth of storage. For your peace of mind we have also just run some figures with the formation level modelled 170mm higher at 3.25 (conservative approach), so in theory the storage becomes effective later in the storm. The volume of flooding increase slightly but not by a significant amount (Attached are the results)

- PN14.002 increases from 22.4m³ to 27.50
- PN1.014 increases from 4.7m³ to 9.9m³

I hope this is acceptable

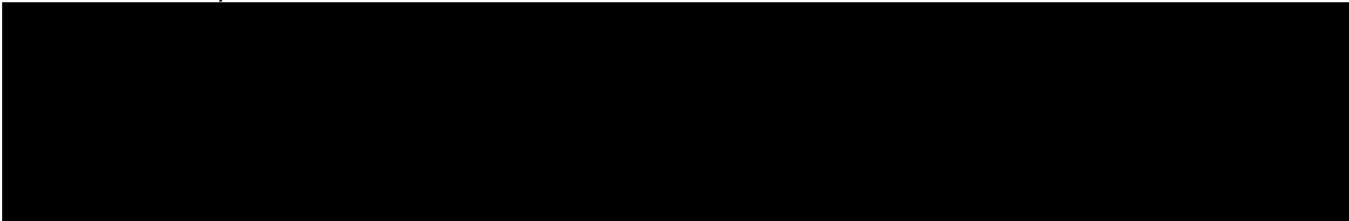
Regards,

Sean Foley
Principal Engineer
Mayer Brown Ltd



From: Sean Foley

Sent: 07 January 2019 17:30



ven
with

Laura,

Thanks,

Regarding point 10 below, please find attached the free discharge rates from the plots areas. Apologies for not attaching this to my previous e-mail.

Regarding point 12, are we supposed to add the critical 1in1, 1in30 & 1in100yr discharges rate at each of the 23 nodes. Both on the drawing and within the report?

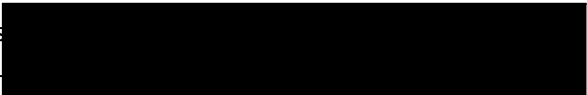
I'll get back to you asap on point 3. We did not have the latest dwg files from MJA previously that contained plot levels and FFLs. We have these now so will be able to produce a composite plan

Regards,

Sean

From: Laura Gibbons

Sent: 07 January 2019



Subject: RE: Planning Consultation on LU/345/18/DOC

Hi Sean,

Thanks for your email. Just to clarify after we have agreed the drainage details between us they will need to be submitted formally to the planners.

I have provided comments below in purple. Please give me a call if you have any queries.

Kind Regards,

Laura Gibbons, MEng, GMICE
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre,
Maltravers Road, Littlehampton, BN17 5LF
Internal: 37818 | External: +44 (0) 1903 737818 | Fax: +44 (0) 1903 716018 | E-mail: laura.gibbons@arun.gov.uk
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From: Sean Foley [REDACTED]

Sent: 04 January 2019 15:38

To: Laura Gibbons

Cc: Clark, Robert; Michael Eastham; Edgley, Martin; Adrian Barnley; Steven Lecocq; Fatima Evernden; Tracey Headley-Smith; Alex Wray

Subject: RE: Planning Consultation on LU/345/18/DOC

Importance: High

Hi Laura,

Happy new year and I hope you had a good break,

I also hope you agree we're in a pretty good position in relation to the surface water drainage design and the responses below in red, with associated attachments, will enable Condition 10 to be discharged.

Whilst reading the response below please note we have updated our Windes model so it now includes the permeable sub-base. See image below where we've added new nodes and modelled it as a "porous car park" (function within the programme) where the storage within 30% voids of the granular sub-base is recognised. We have distributed it as evenly as possible across the areas where the granular sub-base is located. The addition improves the results significantly and the total flooding volume for the fully surcharged critical 1in100yr+CC storm is now only 35m³ (spread across 4 different locations) that can safely be contained within the site.

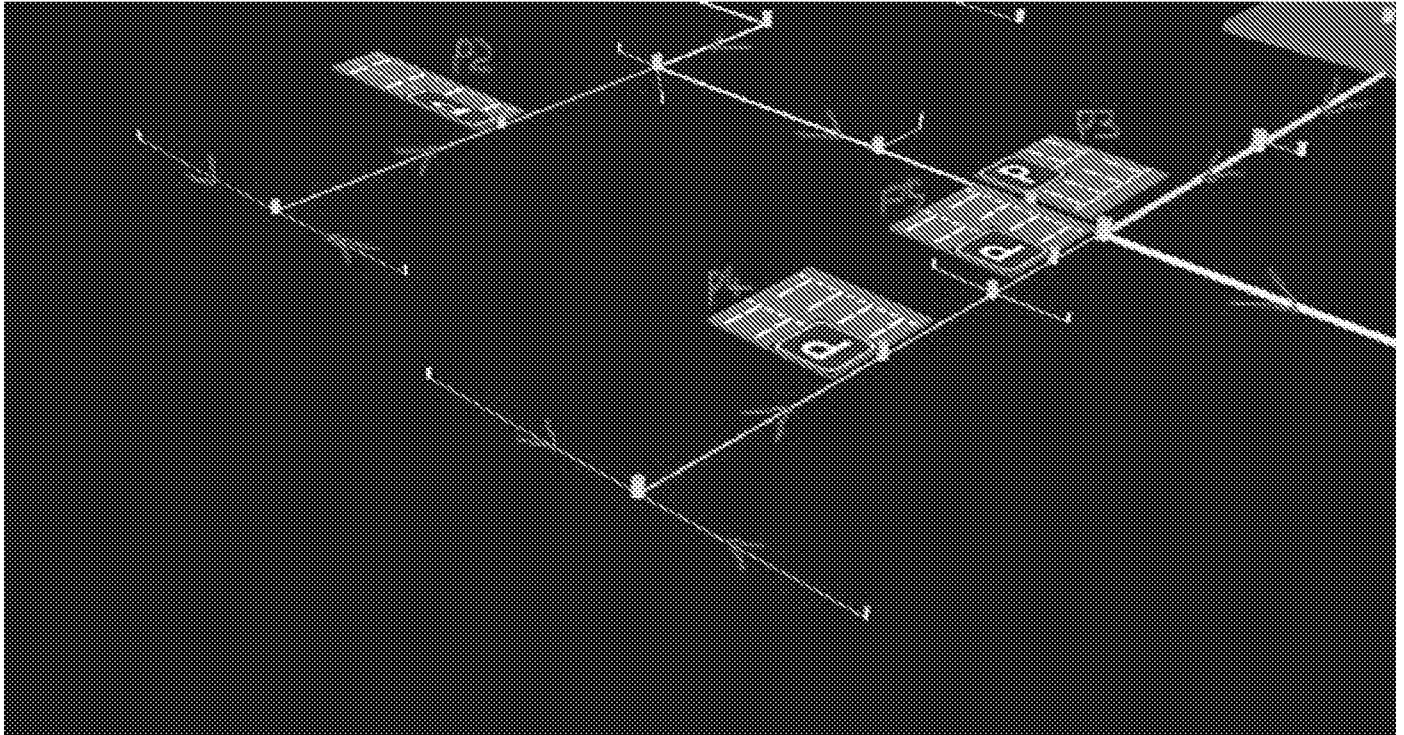
We're confident this will answer your questions, but if not we would be happy to meet you early next week if you feel this would be beneficial. Or alternatively, we're happy to discuss over the phone

I look forward to your response.

Regards,

Sean Foley

Image below shows the locations of the permeable sub-base within the Windes model..



From: Laura Gibb

Sent: 21 December 2018 15:21

Subject: RE: Planning Consultation on LU/345/18/DOC

Hi Sean,

Thanks for sending me that information. I have the following comments/ queries:

Surcharged outfall simulations

1. Can you please send me the FRA/ modelling report from PBA? I can access an FRA from PBA but it does not detail revised flood levels. Asking for this information from the EA will take quite some time (21 days even for us).

MBL Response:

- We have obtained the EA Product 4 form PBA. It is quite large to the following is a wetransfer link to the zip file: <https://we.tl/t-LIBEpKEWou> okay.

2. If you could also send me the critical storm summary for the 1 in 100year plus climate change allowance surcharged outfall event.

MBL Response:

- Attached is the critical storm summary for the 1in100yr+CC event. The critical storm down at the low end of the catchment where the surface flooding occurs is the 240 minute storm. I will review this once point 3 is resolved.

3. Can I please see a plan showing FFLs (including garages) and the drainage layout on the same drawings, with references to MicroDrainage PN included. Please also indicate kerb levels in the areas of flooding on this drawing.

MBL Response:

- Please find attached the MJA drawings that show the proposed road contours and the building floor levels. We have also identified where the critical 1 in 100yr flooding occurs on the levels plan. I need to see FFLs, finish, and formation levels of permeable paving, kerb levels, drainage network details including PN on the same plan. I do not believe this to be too onerous an ask. Without this my review is very slow and errors can easily be missed. Drawings need to be of a standard that can easily be interpreted, i.e. construction issue quality.
4. Can you please explain the water levels shown on the road cross section, is this just the MicroDrainage level from a specific location (not taking account of the sub base)?

MBL Response:

- Please ignore this. We added this to the drawing last year in order to get an approximation of flood levels within the system, which did not take into account the storage volume of the sub-base. I have removed the information from the drawing and re-issued. See point 7 below. Okay.
5. There is currently a small volume of flooding in the 30 year event simulation, please provide storage/ change pipe sizes to remove this.

MBL Response:

- The simulated flood volume was 0.2m³ for the high intensity 15 minute storm. The addition of the permeable sub-base and adjustment of the hardstanding area has removed this flooding and attached are the revised 1 in 30yr simulation results please can you provide me with an updated catchment area plan.
6. 250mm depth of water is not insubstantial and vehicular movements could result in bow waves and flooding to properties. Therefore, we want to see evidence the vast majority of water is actually stored within the sub base.

MBL Response:

- The addition of the permeable sub-base to the micro drainage model has decreased the flood volume significantly. The simulated volume in front of plots 83/84 & 90/91 has now been reduced from 58m³ to 22.4m³. This is a large open area if approximately 1200m² and 22.4m³ could easily be accommodated within this space (20mm depth of water over a space of 1,200m² works out at approximately to 24m³). I will review this upon completion of point 3.
 - The 250mm depth of water would only occur if a complete blockage / failure of the drainage network occurred in this specific area in front of plots 83/84 & 90/91. Okay.
7. Please can you provide detail on finish and formation level of roads on the same plans as requested in point 3 above.

MBL Response:

- The type of road make-up and finishes are on the attached drawings, which also show the location of the permeable sub-base.
 - The formation level of the roads is based upon the attached drawing that show the road make-up. The depth of the open graded stone is generally 460mm and is located just below the tarmac layers. See point 3.
8. Please also clearly indicate on a plan which roads will have a permeable subbase.

MBL Response:

- The location of the permeable sub-base is also on the road build-up and finishes drawing. (See point 7 above) See point 3
9. Please can you model the permeable sub base roads to demonstrate if the flooded volume can be stored. Check dams etc. may need to be provided.

MBL Response:

- We have added the permeable sub-base to the micro drainage model so the storage within the open graded sub-base is now included. There is no need to include check dams because the volume of the sub-base is utilised / required for the long duration. The site does slope, is subbase of all permeable subbases to be laid flat? Clarification and details of this under point 3 will be required. I will complete a full review of the calculations once point 3 is provided.

Free Discharge Rates

10. For information can you please supply the critical flow rates (critical storm may vary per catchment).

MBL Response:

- Critical Flow rates for the sub-catchment are now attached I cannot see these, can you resend and tell me the file name.

11. On the summary of discharges for plot areas you have got different (greater in some locations) flooded volumes to those provided in the surcharged outfall simulations. Please can you explain this discrepancy.

MBL Response:

- This is because we provided the summary for discharges for plot areas before we added a surcharged outfall. The latest attached figures now include for a surcharged outfall.
- All results provided are now based upon a surcharged outfall, apart from one which is the 1in100+CC 240min and is titled accordingly as "unsurcharged".

12. Please confirm parcel ownerships for the areas with free discharges.

MBL Response:

- Persimmon Homes Thames Valley own all of the parcels where free discharges into the main network are proposed. Okay, I would like to see the surface water drainage strategy updated to reference (maybe in an appendix) the critical flows from each of the free discharge parcels. The main document itself must also reference the criticality of the network design within these regions.

Please note I am on leave from 4pm this afternoon until 2nd January.

Kind Regards,

Laura Gibbons, MEng, GMICE
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF

Internal: 37818 | External: +44 (0) 1903 737818 | Fax: +44 (0) 1903 716018 | E-mail: laura.gibbons@arun.gov.uk

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Save the environment - think before you print.

From: Sean Foley [mailto:████████████████████]

Sent: 21 December 2018 11:37

To: Laura Gibbons

Cc: Clark, Robert; Michael Eastham; Edgley, Martin; Adrian Barnley; Steven Lecocq; Fatima Evernden; Tracey Headley-Smith; Alex Wray

Subject: RE: Planning Consultation on LU/345/18/DOC

Laura,

Good news. I had a very useful conversation with PBA yesterday afternoon, the flood risk consultants on the project, who have undertaken the flood compensation analysis for the new residential platforms that extend into the wetland. It turns out the flood level in the wetlands is much lower than we thought so the simulated flood volume resulting from a surcharged outfall reduces significantly.

Revised Flood Level in Wetlands

PBA confirmed we were using an out of date flood levels in the wetland, which accompanied the outline application. The EA have updated their flood model (post outline submission) and the modelled flood levels in the wetlands are as follows:

- 1in1000yr Flood Level: 2.38m AOD
- 1in100yr+20%CC Flood level: Ranges 1.72m to 1.83m AOD
- 1in75yr Flood Level: Ranges 1.56m to 1.72m AOD
- 1in20yr flood level: Ranges 1.49m to 1.59m AOD

This represents a significant reduction when compared old flood levels:

- Superseded 1in100yr flood level: 3.23m AOD
- Current 1in100yr flood level: 1.80m AOD
- **1.43m lower**

Revised Surcharged Outfall Simulation

With the above in mind we have applied a surcharged outfall to our micro-drainage model. A 1in100yr flood level in the wetlands of 1.8m AOD by the outfall will result in the outfall (@ 1.0m AOD) being surcharged by approximately 0.8m. There will be a flap valve on the final headwall to ensure this floodwater will not back up into the drainage network but in this scenario the drainage network can't push open the flap valve until the water level within the site goes above the flood level in the wetlands. Below is an image we have taken from our micro-drainage model where a constant surcharge of 0.8m has been applied.

Critical Storm

Windes allows us to simulate a range of storm events from short duration very intensity events (15min or 30min storms) and much longer low intensity rainfall events (24hrs). A 30 minute duration storm for this site has an average intensity of 57mm/hr. This intensity of storm would be used to size the pipes and other drainage elements for conveyance purposes. A longer 480 minute duration storm has an average intensity of only 8mm/hr (figures obtained from simulated results). However, the 480 minute storm lasts 16 times longer, therefore generating a much greater volume of water and would be used to size the attenuation. The critical storm for this scenario of a surcharge outfall is the 240 minute storm (4 hour storm).

It is worth noting that flooding in the wetlands is effected by the tide so it is unlikely this flood depth of 1.8m AOD will remain constant, and is the peak flood level. It takes approximately 6 hours for the high tide level to go to low tide level so in theory the flood level is likely to subside when this is read in conjunction with the 4 hour critical storm. However, we have taken a conservative approach and simulated a constant surcharged depth of 0.8m for the entire duration of the 4 hour critical storm

Flood Mechanism for surcharged outfall

The 1in100yr+cc 240min storm will generate a low intensity but large volume of water that will drain to the bottom of the network by the outfall. It cannot escape immediately because the flap valve on the outfall would be kept shut by the 1in100yr flood water in the wetlands. The drainage network will start to fill up and on-site water will eventually push open the flap valve. However, on-site storage has been used within this filling up period and, as such, flooding is simulated on site for this critical 4 hour storm. The drainage network at the low end of the site will eventually fill up entirely and flood water would start to escape out of the gullies located at the low points of the roads.

The low points where the flood water will escape from the network, for the 240minute storm, has been highlighted on the attached. The total combined volume across these points for the surcharged outfall is 182m³. This floodwater would follow the exceedance flow route in the channels of the road as shown on the attached appendix N. It would flow in the channel of the roads and would not affect the properties.

The flood depth and velocity in the channel will be low and it is expected that most of the footpaths would still be usable. The maximum depth of flood would occur in front of plots 83/84 & 90/91. The flood water would rise to a maximum level depth of 250mm (low point gullies @ 3.8, spill level of adjacent road table 4.05m) before it flow north along the road and into the wetlands. The flood water in this areas would also be stationary (zero velocity)

Permeable Sub-base Road

There are also permeable sub-base roads located in these low / gully areas. Also identified on the attached pan. This open graded sub-base in the roads has the ability to store water within the voids

The total area of carriageway with permeable sub-base is 1,300m². Based upon the design depth of 460mm open graded sub-base with a void ratio of 30% the volume of storage within these carriageways is approximately 180m³. (Note: it is a coincidence that it matches the surcharged flood volume above)

The permeable sub-base has not been modelled in the drainage network because we've designed it primarily for treatment purposes, but in reality it will have the ability to store water. So in theory it removes the surcharged 1in100yrCC flooding

1in30yr Storm with Surcharged Outfall

The reduced flood level in the wetlands also has the added benefit of removing the flooding for the 1in30yr storm event. Attached are the results.

Flood Compensation – Wetlands

While speaking with PBA yesterday afternoon they informed us that their flood compensation analysis for the wetlands is currently resulting in 500m³ surplus volume for the 1in1000yr analysis. Therefore, spilling floodwater into the wetlands for the extremely rare event of a fully surcharged outfall coinciding with the critical 1in100yr storm event will not have negative impact on downstream or surrounding properties.

Conclusion

With the above and attached in mind we have absolute confidence that the proposed surface water network is fit for purpose:

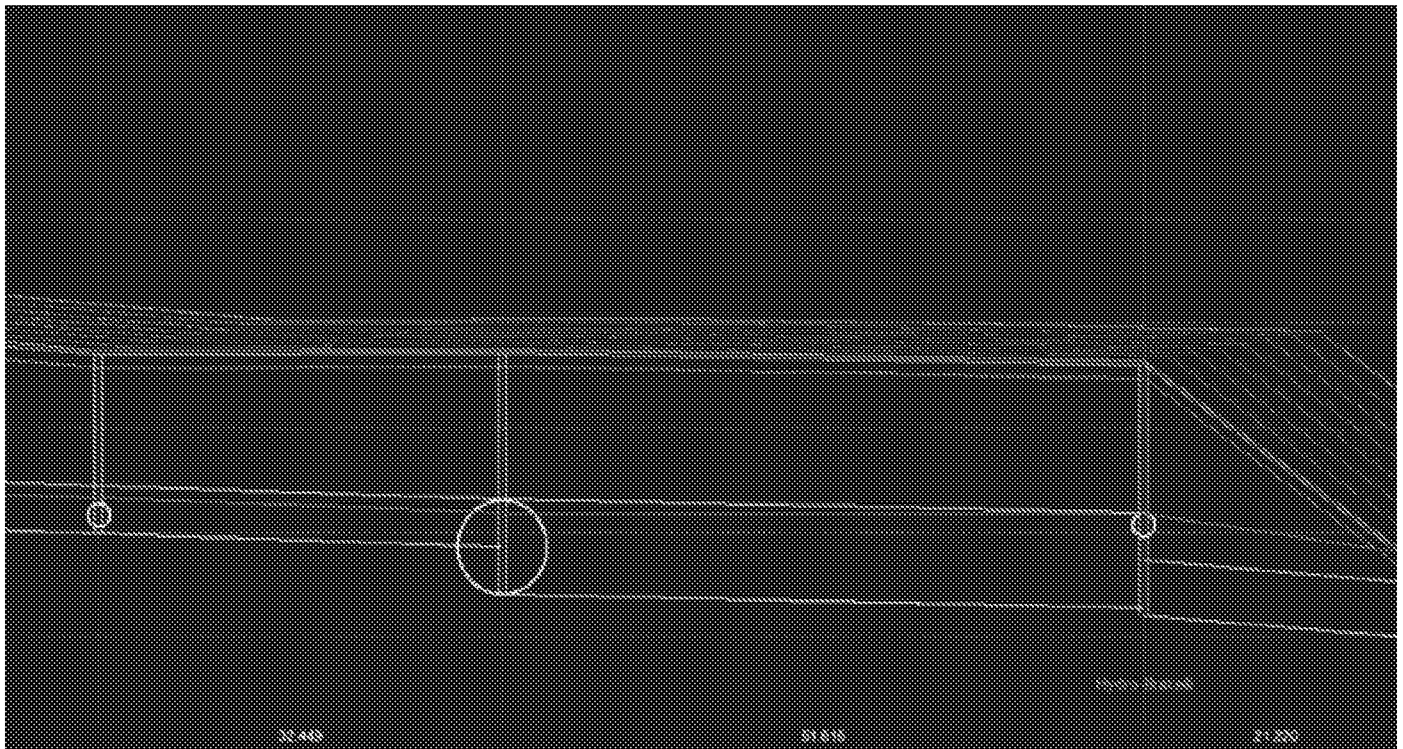
- Peak rate of discharge is a significant improvement when compared to the pre-demolition figure
- There is sufficient storage volume on site to cater for the 1in00yr+CC storm event, even with a fully surcharged outfall
- There is no flooding for the 1in30yr event with a fully surcharge outfall
- In the unlikely event the surface water is overwhelmed by a storm event in excess 1in100yr, or the outfall/pipe experience a blockage the resulting floodwater can flow safely within the road network into the wetlands leaving the new properties unaffected

I hope the above and attached provide sufficient information to facilitate the discharge Condition 10. We would be happy to meet you in the first week to January if you feel this would be beneficial. Or alternatively, we're happy to discuss over the phone

I look forward to your response

Regards,

Sean Foley
Principal Engineer
Mayer Brown Ltd



From: Sean Foley

Sent: 20 December 2018 16:18

To: [REDACTED]

Subject: RE: Planning Consultation on LU/345/18/DOC

Laura,

As requested, we have enhanced / increased the microdrainage model so it picks up the individual pots areas / sub catchments. The most notable changes are new branches at points 2, 6, 7, 12, 13, 20 & 21. We have then re-distributed the impermeable areas.

With the above in mind, attached is the following:

- Plans showing 23 different locations / sub-catchments within Parcels B2, Partial B4, C1, C2 & S4. The sub catchment are all feeding into the main carrier sewer as it passes through the site
- Flow rates for the 23 location for the 1in1, 1in30 & 1in100yr return period. We chose the relatively high intensity storm duration of 30 minutes.

Hopefully this information is what you are expecting to receive.

We wish to avoid installing hydro-brakes within each of these sub-catchments because the downstream receiving sewers have already been designed to receive the run-off from each of the sub-catchments. The downstream attenuation volume and final restricted flow into the black ditch have been designed with a free discharge from the sub-catchments. Therefore, free discharges from the sub-catchments into the downstream sewer will not increase the flood risk downstream

Apologies for my piecemeal response, but we're feed the modelling information through to you as I complete it.

Regards,

Sean Foley
Principal Engineer
Mayer Brown Ltd
[REDACTED]

From: Laura Gibbons [mailto:[REDACTED]]

Sent: 19 December 2018 12:30

To: Sean Foley <sean.foley@mayerbrown.co.uk>
[REDACTED]

Subject: RE: Planning Consultation on LU/345/18/DOC

Hi Sean,

Thanks for the prompt response.

I am very concerned by the fact that the surcharged outfall scenario results indicate that significant flooding would occur and furthermore I do not believe the joint probability of a rainfall event and tidal event occurring are infinitesimally small. DEFRA research indicates that typically the south coast has a modest correlation between the two. Obviously catchment factors vary this, with some catchments on the south coast having a far greater correlation. I could go into more detail on this, but it really is opening a big can of worms and having done some joint probability analysis in the past I know it isn't a small task. I also believe that flooding will occur for lower probability events.

The important thing is that WSCC policy states that the 1 in 100 year plus climate change event must be contained on site/ not increase flood risk elsewhere. You need to demonstrate that allowing 1750m3 to overflow through the development wouldn't increase flood risk elsewhere. You will also need to demonstrate to me that flood depths and velocities on site are safe.

Furthermore, WSCC policy requires no flooding for the 1 in 30 year plus climate change event, please model this event with a surcharged outfall and ensure that surface water drainage design is modified to provide the required storage to ensure no flooding.

Regarding condition 11, until I have seen consent for the infilling I am not willing to recommend the discharge of this condition.

Kind Regards,

Laura Gibbons, MEng, GMICE
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre,
Maltravers Road, Littlehampton, BN17 5LF

Internal: 37818 | External: +44 (0) 1903 737818 | Fax: +44 (0) 1903 716018 | E-mail: laura.gibbons@arun.gov.uk

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Save the environment - think before you print.

From: Sean Foley [mailto:sean.foley@westsussex.gov.uk]

Sent: 18 December 2018 16:09

To: Laura Gibbons

Cc: Clark, Robert; Michael Eastham; Edgley, Martin; Adrian Barnley; Steven Lecocq

Subject: RE: Planning Consultation on LU/345/18/DOC

Laura,

Thanks for your response. I'll come back to you asap on the hydro-brake / modelling issue.

I can however provide a response on the surcharged outfall scenario, which is covered in paragraphs 2.42 to 2.46 of the submitted DOC report (text attached), under the section titled "*Exceedence Flows and Surcharged Outfall*"

We had lengthy discussions earlier this year with Mark Akmenkalns (MA), the Drainage Engineer at West Sussex County Council. The correspondence is contained in Appendix F of the DOC drainage report (attached). A number of issues were addressed including a situation whereby the outfall could potentially be surcharged by the flood water in the Black Ditch. We simulated the surcharged scenario and it ended up with a large volume of flood water escaping from the drainage network. Therefore, It was agreed with WSCC that it is not reasonable keep this flood water on site and the resulting flood water will flow safely through the road network and eventually into the wetlands, as shown in Appendix H.

Condition 11 & 12

We have analysed the wording of these conditions again and perhaps there is some misunderstanding about the specific requirements contained therein.

- Condition 11 – Refers to arrangements for future access to and maintenance of any watercourse or culvert. Section 3 of the DOC report provides clarification that there will no longer be any existing watercourses or ditches within this section of the development, West of Wetlands, that will require future access for maintenance. Therefore, arrangements for future access are not required for the areas to the West of the Westlands. The final headwall at Outfall location B that discharges into existing ditch will be maintained by a Management Company organised by Persimmon Homes. The headwall is located adjacent an estate road turning head so will be easily accessible.
- Condition 12 – Refers to consents for any works effecting watercourses.
 - Outfall B: A nominal length of existing ditch is to be filled in to facilitate the construction of the new 525mm diameter outfall pipe and the new headwall. The 525mm diameter outfall pipe and associated headwall are described / included in the Flood Defence Consent for Outfall B. Therefore, we believe existing flood defence consent for Outfall B should be sufficient for works affecting this particular ditch
 - Lagoon and Overflow ditch: Regarding the irrigation lagoon and overflow ditch, we will find out if a specific application has been submitted to fill this ditch in. If not we will organise for one to be submitted asap.

We will get back to you asap about the hydro-brake / modelling issue

Regards,

Sean Foley
01483 750 508

From: Laura Gibbons [redacted]
Sent: 18 December 2018 13:29

Subject: RE: Planning Consultation on LU/345/18/DOC

Sean,

Thanks for the email.

Condition 10

I have attached a plan, with alterations to the required hydrobrake locations crossed out. This reduces the number to 17 by utilising hydrobrakes within slightly more main sewers, this is just an option. However, I do feel that if we were looking at this from scratch we could have reduced this number down further. In my opinion there is insufficient argument to not reduce the number of hydrobrakes/ construct them.

Within the model you have what are the flow rates you have coming from each of the 26 locations?

I am unwilling to accept the surface water drainage proposals without further information regarding detailed network modelling or installing the required hydrobrakes.

Furthermore, you need to be submitting MicroDrainage results from models with the outfall to the black ditch surcharged to the 1 in 100 year plus climate change flood levels. Ensuring that the surface water drainage network can cope with this event. N.B. This was one of the reasons for refusal given on the decision notice.

Condition 11

I look forward to receiving further information on this.

Condition 12

As you stated in your response below regarding condition 11 you are infilling a ditch. I therefore, I await confirmation from you as to whether consent has been obtained for this.

Kind Regards,

Laura Gibbons, MEng, GMICE
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre,
Maltravers Road, Littlehampton, BN17 5LF

Internal: 37818 | External: +44 (0) 1903 737818 | Fax: +44 (0) 1903 716018 | E-mail: laura.gibbons@arun.gov.uk

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From: Sean Foley [mailto:[redacted]]
Sent: 13 December 2018 13:06

To: Laura Gibbons
Cc: Clark, Robert; Michael Eastham; Edgley, Martin; Adrian Barnley; Steven Lecocq
Subject: RE: Planning Consultation on LU/345/18/DOC

Dear Laura,

Thank you for your comments below. Following your initial response our subsequent / updated report (dated 7th November) we did take your comments into account where we believed they were appropriate. (We certainly do not wish to give the impression we've ignored these and apologies if this is how it seems)

The paragraphs where amendments were made are highlighted in yellow on the attached DOC report_07.11.2018_Text only

Condition 10 – Surface Water Drainage Discharge Rates (pre-demolition & proposed)

In the surface water Condition 10 Section:

- We have amended paragraphs 2.14 to 2.16 and 2.23 that cover the pre-development and post development discharge rates.
- We have 2.62 & 2.68 that deals with infiltration within the individual parcels

Restricted Discharges from Parcels

When we met a few months ago you requested that individual parcels are assigned a specific discharge rates. However there are a number of parcels where it is not practicable to achieve this.

Following our meeting we endeavoured to figure out a solution by analysing the micro drainage model but it is almost impossible to assign a specific rate unless individual controls are applied. We have highlighted on the attached pdf where these individual controls would be required before it discharges into the main carrier sewers. A total of 26 controls would be needed, and where controls are applied we then need to potentially add some upstream attenuation.

I believe you accept it is not practicable to apply 26 individual controls, but you requested us to justify the approach by creating individual micro drainage models for each location. We believe creating 26 individual micro drainage models would prove to be a superfluous exercise. The drainage networks within the 26 mini catchments are made up with a combination of 100dia, 150dia and 225dia pipes, which are expected for small catchments of no more than 1,000m2. Each of these mini catchments have already been designed MJA Consulting (contained in Appendix O) and we 100% confidence that the pipes within these catchments are sized correctly / adequately and creating an individual model for each one is not a task we would normally undertake.

Modelling the main drainage runs and laterals is absolutely required and we have already created a large and pretty comprehensive microdrainage model of the drainage network that takes into account the drainage areas from each of these 26 locations.

With the above in mind we hope you agree that we do not need to assign specific discharge rates to the parcels in phase 2, which are listed in paragraph 2.26 of the updated report (including B2). Plus, there is no need to undertake additional modelling for the 26 individual catchments.

Condition 11 – Existing Watercourses & Culverts

The only watercourse and ditch affected by the proposed development will be the irrigation lagoon and its overflow, which are no longer required to serve the consented scheme. We understand that the ditch is not yet filled in and the works will form part of the future planning submission for the remaining section of phase 2 that extends into the wetlands.

We will liaise with our Client to find out if a specific application has been submitted to fill this ditch in. If not we will organise for one to be submitted asap.

Condition 12 – Consents

We surprised by this response because we believe the Flood Defence Consent for the new outfall (granted by the Environment Agency) into the ditch would be adequate because it includes a description of the works and information on the new headwall.

Below is an extract from the flood defence consent describing what is allowed and we are at a loss as to why this is not considered adequate?

We'd be very grateful for some advice on how we can overcome this please.

Watercourse: Ordinary Watercourse within the River Arun Internal Drainage District

Location: Land south of Black Ditch, North Littlehampton, West Sussex

NGR: 503413, 104302

Description of works: Construction of 1 no. precast concrete surface water outfall (with railings and flapvalve) to take discharge from new development through 525mm diameter pipe.

For the following activities:

Construction of 1 no. surface water outfall

(1) Construction of 1 no. permanent precast concrete surface water outfall (with railings and flapvalve) to take discharge from new development through 525mm diameter pipe

As detailed on Drawings: 8140927/SK12, CV8140927/SK09 and SFA 10C

Headwall Plan

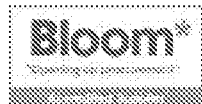
I trust the above is acceptable and will hopefully be sufficient to contribute towards the discharge to these planning conditions, specifically Condition 10 & 12

Please contact me if you wish to discuss this further or require additional information.

Regards,

Sean Foley
Principal Engineer
Mayer Brown Ltd

Sean Foley,
Principal Engineer
Mayer Brown Limited
Lion House
Oriental Road
Woking
Surrey
GU22 8AR



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From: Clark, Robert [mailto:rob@persimmonhomes.co.uk]
Sent: 12 December 2018 15:55
To: Sean Foley sean.foley@persimmonhomes.co.uk
Subject: FW: Planning Consultation on LU/345/18/DOC

Hi Sean

Please see email below. This is getting urgent as the Council have now threatened a Stop Notice. Can you review ASAP and get in touch with Laura Gibbon today. Thanks

Kind Regards

Rob

Robert Clark
Head of Planning
Persimmon Homes Thames Valley
Persimmon House
Knoll Road
Camberley
GU15 3TQ

From: Michael Eastham [mailto:michael.eastham@persimmonhomes.co.uk]
Sent: 06 December 2018 15:33
To: Clark, Robert
Subject: FW: Planning Consultation on LU/345/18/DOC

Hi Rob,

Please see the email below from ADC Drainage Engineers to LU/345/18/DOC.

I look forward to receiving the requisite information.

Kind regards,

Michael

From: Laura Gibbons
Sent: 06 December 2018 14:58
To: Planning.Responses
Cc: Michael Eastham
Subject: Planning Consultation on LU/345/18/DOC

Engineers Comments Regarding Condition 10

I cannot see that anything has changed from the Surface Water Drainage Strategy that Mayer Brown provided on the 9th October, in fact the version number is the same. I had the following comments in October:

“Thank you for sending through that information. I have the following comments regarding the pre-demolition rates:

1. No connection between Outfall 5, 6 and 7 the lakes and reservoirs to the Norway ditch was proven in the drainage survey. I would therefore like to see these removed from the 1 in 1 year calculations for the site (we don't know what the capacity of the lakes would have been but I would imagine they'd take a decent volume of water). This equates to 163.5 l/s
2. The pond between catchment 3 and the Toddington ditch was not included in the calculations, therefore the rate of 301.4 l/s is far too great in my opinion.

If we discount the runoff in points 1 and 2 above we get a 1 in 1 year discharge of 340.47l/s. This is greater than what you are proposing. And some discharge from catchment 3 would have occurred, so the figure would be something greater than 340.47l/s.

To summarise, as the pre-development rates are greater than the rates you propose I am happy.

Regarding the discharge rates from individual parcels:

I note that you state that there are no controls in the interlinked parcels B4, C1, C2, C4 and roads and you are using this as justification for allowing an uncontrolled discharge from these parcels. I am not happy with this, it is possible that you are causing a greater flood risk downstream as a result. As discussed in the meeting I am keen to see you stating maximum values from each. If physical controls aren't currently used then I am keen to push for them to be constructed. The only other way I will accept no physical control devices being installed is by you demonstrating that the maximum flow from the networks doesn't exceed the maximum value for that parcel as a result of pipe diameters constricting flow. This will require you modelling the networks in microdrainage and running various return periods and storm durations.

What about parcel B2 where discharge is proposed to be free? What is the justification for this?

Please feel free to give me a call should you have any questions.”

These comments have not been resolved. There are still un restricted flows from B4, C1, C2, C4 and B2 despite my previous comments that this was inappropriate. I will re-iterate that either controls should now be installed or models run to show what the maximum flow from each parcel is based upon pipe diameters that have been constructed. And evidence submitted based on this that the total flow from the complete development does not exceed 285l/s.

Until such a time as this evidence is clearly supplied and the drainage strategy updated to follow this I am unwilling to recommend the discharge of this condition.

Engineers Comments Regarding Condition 11

No evidence has been submitted of formal written acceptance of the proposals to infill the watercourses shown in Figure 3.1 of the drainage strategy. Therefore, I do not recommend the discharge of this condition.

Engineers Comments Regarding Condition 12

A FRAP has been obtained from the Environment Agency to construct a headwall in the Black ditch. However, no evidence of the acceptance of infilling has been provided, nor for any over proposed structures. Therefore, I do not recommend the discharge of this condition.

Regards,

Laura Gibbons, MEng, GMICE
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF
Internal: 37818 | External: +44 (0) 1903 737818 | Fax: +44 (0) 1903 716018 | E-mail: laura.gibbons@arun.gov.uk



From:

Sent: 30 November 2018 11:04
To: Land Drainage
Subject: Planning Consultation on LU/345/18/DOC

To: **Engineers (Drainage)**

NOTIFICATION FROM ARUN DISTRICT COUNCIL

TOWN AND COUNTRY PLANNING ACT 1990

APPLICATION LU/345/18/DOC
NO:

Registered: 28-NOV-18
Site Address: Land North of Toddington Lane Littlehampton BN17 7PP

Description of Works: Approval of details reserved by condition imposed under ref LU/47/11/ relating to Condition Nos 10 surface water drainage scheme, 11 future access to & maintenance of any watercourse or culvert, 12 discharge of any flows to watercourse, 13 foul water drainage system.

The Council have received the above application to discharge conditions. I shall be pleased to receive any observations you may wish to make in respect of those conditons relating to your field of expertise.

[Click here to view the Discharge of Condition application](#)

[Click here to view conditions on original application - click on decision tab](#)

Should you have any comments to make, these should be sent by replying to this email by 14th December 2018.

www.arun.gov.uk/planning

Please be aware that any comments you may make will be available on our website so please do not insert personal details or signatures on your reply.

In the absence of a reply within the period stated, I shall assume that you have no observations to make.

The officer dealing with this application is Michael Eastham who can be contacted on telephone number 01903 737772.

Thanking you in anticipation

Planning Case Officer
Arun District Council

post_con_email

<http://www.arun.gov.uk>

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APPENDIX D: Exceedance Flows

CATCHMENT

SYSTEM FAILURE
-03

SYSTEM FAILURE
- 02

AD ORIGINAL

PHASE 2:
Application

SYSTEM
FAILURE
01

Lymington Bypass

FOR INFORMATION



MB

[illegible]

.....

[illegible]

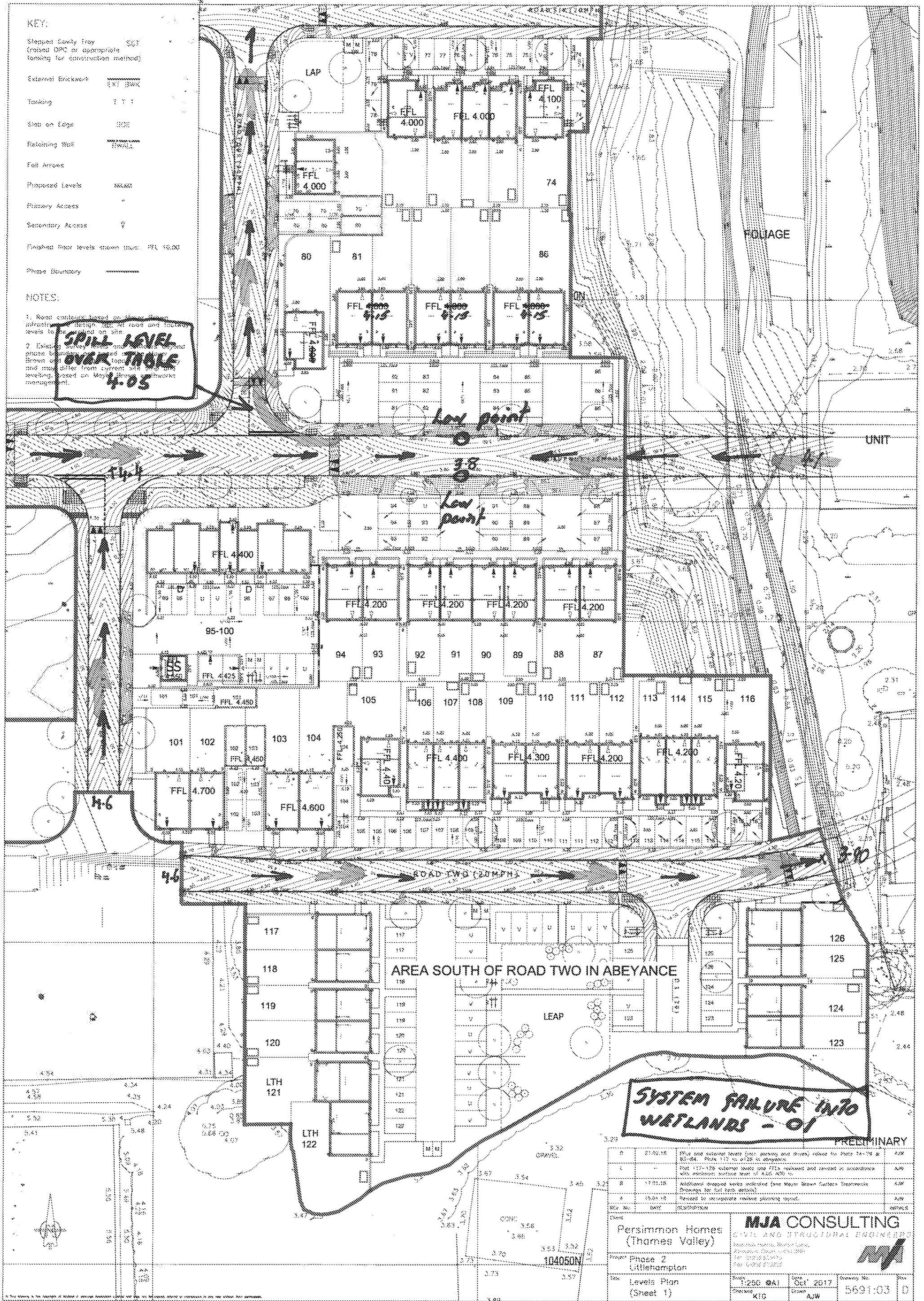
.....

.....

WEST

A/P: 07/02/2004

ARUN DISTRICT COUNCIL LU/17/19/DOC



- KEY:
- Stepped Cavity Tray (raised DPC or appropriate bonding for construction method)
 - External Brickwork
 - Tanking
 - Slop on Edge
 - Retaining Wall
 - Fall Arrows
 - Proposed Levels
 - Primary Access
 - Secondary Access
 - Finished floor levels shown thus: FFL 10.00
 - Phase Boundary

NOTES:

1. Road corridors based on administrative design for all roads and footways levels to be based on site.

2. Existing survey data and levels beyond phase boundary are shown in brown and may differ from current site data and levels based on May 2017 survey data.

SPILL LEVEL OVER TABLE 4.05

SYSTEM FAILURE INTO WETLANDS - 01

B	21.02.18	FFL and external levels (incl. parking and drives) revised for Photo 7a-7b at 80-84. Plot 117 is in abeyance.	AJW
C	-	Plot 117-126 external levels and FFLs reviewed and revised in accordance with minimum surface level of 4.05 AOD to.	AJW
B	17.01.18	Additional dropped kerbs indicated (see Major Brown Surface Treatment Drawings for full kerb details).	AJW
A	15.01.18	Revised to incorporate revised planning layout.	AJW
REV. No.	DATE	DESCRIPTION	INITIALS

Persimmon Homes
(Thames Valley)

Phase 2
Littlehampton

Levels Plan
(Sheet 1)

MJA CONSULTING
CIVIL AND STRUCTURAL ENGINEERS

1:250 @ A1
Scale

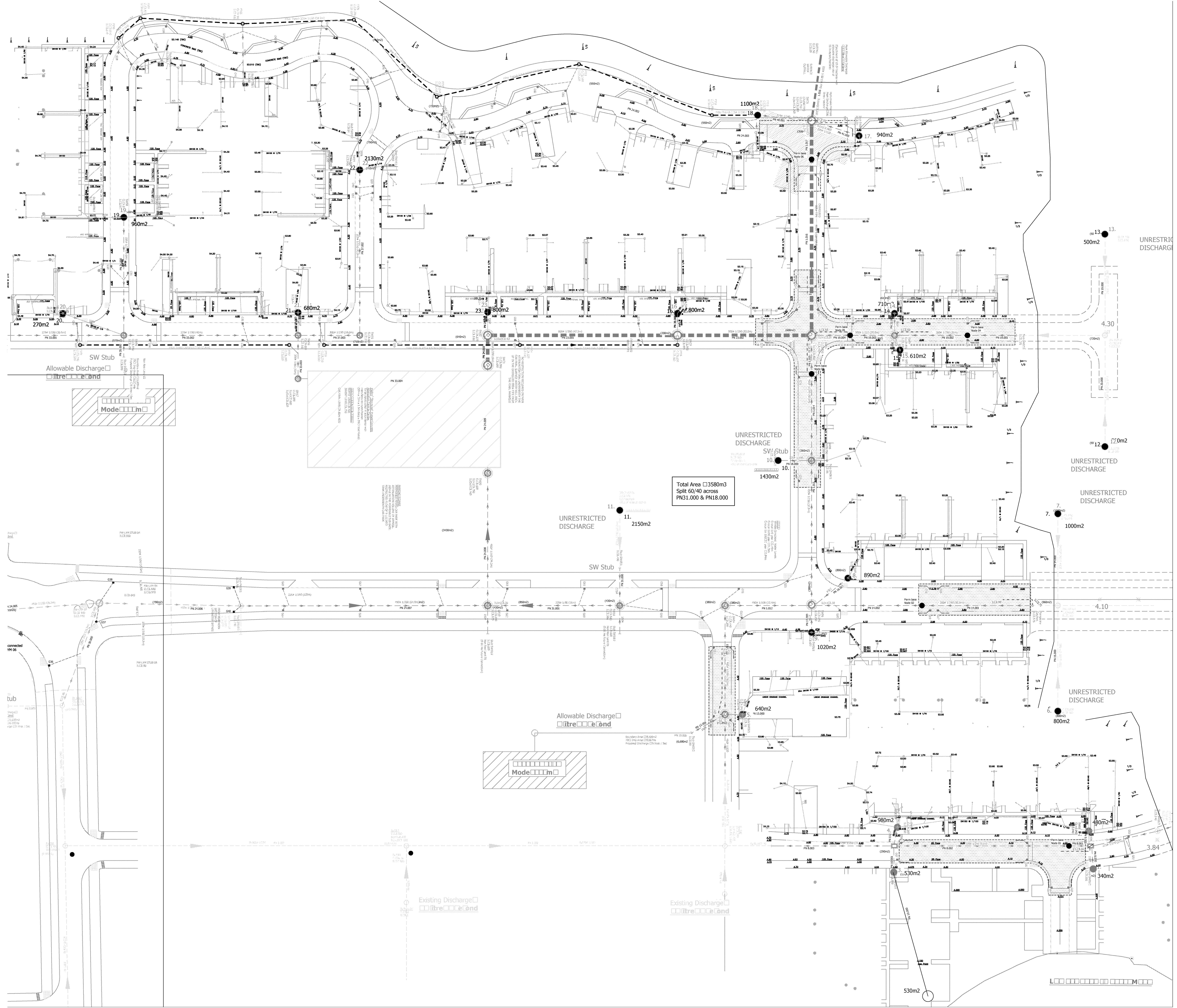
2017
Year

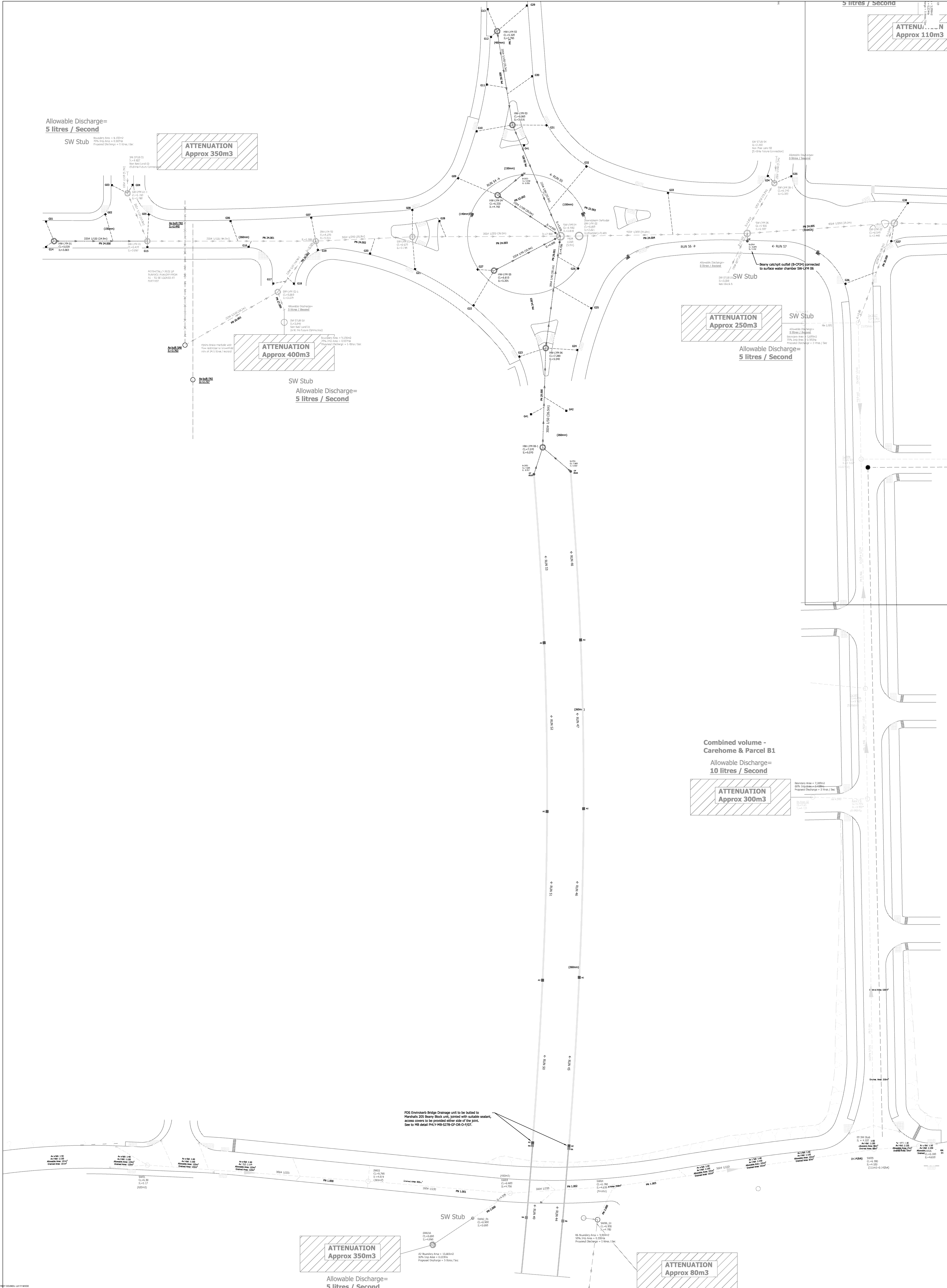
5691:03
Drawing No.

D
Rev

→ Direction of Fall of road → overland flow route in case of system failure

APPENDIX E: Windes – Network Details





Allowable Discharge=
5 litres / Second

SW Stub

Boundary Area = 1.025m²
20% Imp Area = 0.205m²
Proposed Discharge = 5 litres / Sec

ATTENUATION
Approx 350m³

ATTENUATION
Approx 400m³

SW Stub

Allowable Discharge=
5 litres / Second

ATTENUATION
Approx 250m³

SW Stub

Allowable Discharge=
5 litres / Second

Combined volume -
Carehome & Parcel B1
Allowable Discharge=
10 litres / Second

ATTENUATION
Approx 300m³

PDS Enrichment Bridge Drainage unit to be buttressed to
Marshalls 205 Beony Block unit, joined with suitable scalant,
access covers to be provided either side of the joint.
See to H&S special PWS-2796-07-01-01-07.

ATTENUATION
Approx 350m³

Allowable Discharge=
5 litres / Second

ATTENUATION
Approx 80m³

Mayer Brown Ltd		Page 1
Lion House Oriental Road Woking GU22 8AR	Littlehampton Overall Surface Network West of Wetlands	
Date January 2018	Designed by S Foley	
File WEST CATCHMENT MODEL_...	Checked by	
XP Solutions		Network 2013.1

Existing Network Details 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)
1.000	59.000	0.251	235.1	0.066	2.00	0.0	0.600	o	300
1.001	38.000	0.163	233.1	0.040	0.00	0.0	0.600	o	300
2.000	12.808	0.200	64.0	0.534	5.00	0.0	0.600	o	300
2.001	12.001	0.080	150.0	0.000	2.00	0.0	0.600	o	150
1.002	27.675	0.121	228.7	0.045	0.00	0.0	0.600	o	300
3.000	19.930	0.200	99.7	0.198	5.00	0.0	0.600	o	300
3.001	10.000	0.067	149.3	0.000	2.00	0.0	0.600	o	150
1.003	70.062	0.300	233.5	0.047	0.00	0.0	0.600	o	300
1.004	94.210	0.425	221.7	0.153	0.00	0.0	0.600	o	300
4.000	20.000	0.065	307.7	0.438	5.00	0.0	0.600	o	300
4.001	14.532	0.097	149.8	0.000	2.00	0.0	0.600	o	150
1.005	30.500	0.140	217.9	0.046	0.00	0.0	0.600	o	300
1.006	59.368	0.270	219.9	0.088	0.00	0.0	0.600	o	300
5.000	19.999	0.595	33.6	0.392	5.00	0.0	0.600	o	300
5.001	14.532	0.105	138.4	0.000	2.00	0.0	0.600	o	150
5.002	36.500	0.150	243.3	0.070	0.00	0.0	0.600	o	300
1.007	88.421	0.300	294.7	0.077	0.00	0.0	0.600	o	300
6.000	20.006	0.100	200.1	0.700	5.00	0.0	0.600	o	375
6.001	14.650	0.875	16.7	0.000	5.00	0.0	0.600	o	375

Network Results Table

PN	US/IL (m)	I.Area (ha)	E Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	5.176	0.066	0.0	1.02	72.2
1.001	4.919	0.106	0.0	1.03	72.5
2.000	5.200	1.067	0.0	1.97	139.1
2.001	5.600	1.067	0.0	0.82	14.5
1.002	4.756	1.218	0.0	1.04	73.2
3.000	5.000	0.395	0.0	1.58	111.3
3.001	4.800	0.395	0.0	0.82	14.5
1.003	4.635	1.660	0.0	1.02	72.4
1.004	4.335	1.813	0.0	1.05	74.4
4.000	4.200	0.730	0.0	0.89	63.0
4.001	4.135	0.730	0.0	0.82	14.5
1.005	3.910	2.589	0.0	1.06	75.0
1.006	3.770	2.677	0.0	1.06	74.7
5.000	4.500	0.560	0.0	2.72	192.4
5.001	3.900	0.560	0.0	0.85	15.1
5.002	3.650	0.630	0.0	1.00	70.9
1.007	3.500	3.384	0.0	0.91	64.4
6.000	4.100	1.400	0.0	1.28	141.1
6.001	4.000	1.400	0.0	4.45	491.1

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Date January 2018			Designed by S Foley						
File WEST CATCHMENT MODEL_...			Checked by						
XP Solutions			Network 2013.1						
Existing Network Details 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)
1.008	77.584	0.400	194.0	0.077	0.00	0.0	0.600	o	175
7.000	20.000	0.175	114.3	0.700	5.00	0.0	0.600	o	375
7.001	13.401	0.425	31.5	0.000	5.00	0.0	0.600	o	375
1.009	4.916	0.025	196.6	0.000	0.00	0.0	0.600	o	450
8.000	23.339	0.065	359.1	0.034	5.00	0.0	0.600	o	150
9.000	3.876	0.046	84.3	0.048	5.00	0.0	0.600	o	150
8.001	5.600	0.020	280.0	0.060	2.00	0.0	0.600	o	225
8.002	45.386	0.190	238.9	0.000	0.00	0.0	0.600	o	225
10.000	33.343	0.297	112.3	0.053	5.00	0.0	0.600	o	150
10.001	6.800	0.038	178.9	0.053	2.00	0.0	0.600	o	225
11.000	6.800	0.062	109.7	0.098	2.00	0.0	0.600	o	225
8.003	43.824	0.130	337.1	0.029	0.00	0.0	0.600	o	225
1.010	34.073	0.155	219.8	0.000	0.00	0.0	0.600	o	450
12.000	40.643	0.100	406.4	0.567	5.00	0.0	0.600	o	300
12.001	9.903	0.130	76.2	0.000	2.00	0.0	0.600	o	150
13.000	6.000	0.103	58.3	0.064	2.00	0.0	0.600	o	225
1.011	28.223	0.180	156.8	0.042	0.00	0.0	0.600	o	450
Network Results Table									
PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)				
1.008	3.125	4.861	0.0	1.30	143.3				
7.000	3.400	1.400	0.0	1.69	187.1				
7.001	3.225	1.400	0.0	3.24	357.5				
1.009	2.725	6.261	0.0	1.45	230.0				
8.000	3.155	0.034	0.0	0.52	9.3				
9.000	3.136	0.048	0.0	1.10	19.4				
8.001	3.040	0.142	0.0	0.78	30.9				
8.002	3.020	0.142	0.0	0.84	33.5				
10.000	3.165	0.053	0.0	0.35	16.7				
10.001	2.868	0.106	0.0	0.97	38.7				
11.000	3.000	0.098	0.0	1.25	49.6				
8.003	2.830	0.375	0.0	0.71	28.1				
1.010	2.625	6.636	0.0	1.37	217.4				
12.000	3.000	0.810	0.0	0.77	54.7				
12.001	2.900	0.810	0.0	1.15	20.4				
13.000	3.000	0.064	0.0	1.72	68.3				
1.011	2.470	7.552	0.0	1.62	257.8				
©1982-2012 Micro Drainage Ltd									

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File WEST CATCHMENT MODEL_...		Checked by							
XP Solutions		Network 2013.1							
Existing Network Details 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)
1.012	22.432	0.140	160.2	0.038	0.00	0.0	0.600	o	450
14.000	22.905	0.150	152.7	0.100	5.00	0.0	0.600	o	150
15.000	28.097	0.150	187.3	0.080	5.00	0.0	0.600	o	150
14.001	35.213	0.140	251.5	0.100	2.00	0.0	0.600	o	300
14.002	28.603	0.120	238.4	0.000	0.00	0.0	0.600	o	300
16.000	12.624	0.250	50.5	0.089	2.00	0.0	0.600	o	150
17.000	7.200	0.302	23.8	0.102	2.00	0.0	0.600	o	225
1.013	37.575	0.160	234.8	0.038	0.00	0.0	0.600	o	450
18.000	8.659	0.266	32.6	0.143	2.00	0.0	0.600	o	225
1.014	22.449	0.090	249.4	0.036	0.00	0.0	0.600	o	450
1.015	10.000	0.040	250.0	0.000	0.00	0.0	0.600	o	450
19.000	26.210	0.130	201.6	0.050	5.00	0.0	0.600	o	150
20.000	28.840	0.130	221.8	0.059	5.00	0.0	0.600	o	150
19.001	35.611	0.145	245.6	0.072	2.00	0.0	0.600	o	300
19.002	18.889	0.075	251.9	0.000	0.00	0.0	0.600	o	300
21.000	7.800	0.040	195.0	0.061	2.00	0.0	0.600	o	150
Network Results Table									
PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)				
1.012	2.350	7.590	0.0	1.60	255.0				
14.000	2.300	0.100	0.0	0.81	14.3				
15.000	2.800	0.080	0.0	0.73	12.9				
14.001	2.560	0.280	0.0	0.99	69.8				
14.002	2.420	0.280	0.0	1.01	71.7				
16.000	2.550	0.089	0.0	1.42	25.1				
17.000	2.600	0.102	0.0	2.69	107.0				
1.013	2.150	8.099	0.0	1.32	210.3				
18.000	2.320	0.358	0.0	2.30	91.5				
1.014	1.990	8.493	0.0	1.28	204.0				
1.015	1.900	8.493	0.0	1.28	203.8				
19.000	2.600	0.050	0.0	0.70	12.4				
20.000	2.600	0.059	0.0	0.67	11.9				
19.001	2.320	0.181	0.0	1.00	70.6				
19.002	2.175	0.181	0.0	0.99	69.7				
21.000	2.600	0.061	0.0	0.72	12.7				
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Lion House Oriental Road Woking GU22 8AR			Littlehampton Overall Surface Network West of Wetlands						
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File WEST CATCHMENT MODEL_...			Checked by						
XP Solutions			Network 2013.1						
Existing Network Details 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)
22.000	9.600	0.100	96.0	0.071	2.00	0.0	0.600	o	150
19.003	11.498	0.045	255.5	0.011	0.00	0.0	0.600	o	300
19.004	10.000	0.045	222.2	0.000	0.00	0.0	0.600	o	300
23.000	6.005	0.935	6.4	0.080	5.00	0.0	0.600	o	150
24.000	24.867	0.100	248.7	0.056	2.00	0.0	0.600	o	225
25.000	39.317	0.280	140.4	0.567	5.00	0.0	0.600	o	450
25.001	13.808	0.080	172.6	0.000	5.00	0.0	0.600	o	225
24.001	44.896	0.215	208.8	0.045	0.00	0.0	0.600	o	225
26.000	39.613	0.237	167.1	0.600	5.00	0.0	0.600	o	450
26.001	28.513	0.193	147.7	0.000	5.00	0.0	0.600	o	225
27.000	34.498	0.360	95.8	0.637	5.00	0.0	0.600	o	450
27.001	5.111	0.070	73.0	0.000	5.00	0.0	0.600	o	225
26.002	16.877	0.145	116.4	0.000	5.00	0.0	0.600	o	225
24.002	25.768	0.125	206.1	0.045	0.00	0.0	0.600	o	225
24.003	43.680	0.160	273.0	0.033	0.00	0.0	0.600	o	300
28.000	25.335	0.200	126.7	0.057	2.00	0.0	0.600	o	300
28.001	34.164	0.530	64.5	0.102	0.00	0.0	0.600	o	225
29.000	64.700	1.130	57.3	0.314	5.00	0.0	0.600	o	300
Network Results Table									
PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)				
22.000	2.800	0.071	0.0	1.03	18.1				
19.003	2.100	0.324	0.0	0.98	69.2				
19.004	2.055	0.324	0.0	1.05	74.3				
23.000	3.240	0.080	0.0	4.00	70.7				
24.000	3.740	0.056	0.0	0.82	32.8				
25.000	4.000	0.810	0.0	1.71	272.6				
25.001	3.720	0.810	0.0	0.89	39.5				
24.001	3.640	0.911	0.0	0.90	35.8				
26.000	4.000	1.000	0.0	1.57	249.7				
26.001	3.783	1.000	0.0	1.07	42.7				
27.000	4.000	0.910	0.0	2.08	330.4				
27.001	3.640	0.910	0.0	1.53	60.9				
26.002	3.670	1.910	0.0	1.21	48.1				
24.002	3.350	2.866	0.0	0.91	36.1				
24.003	3.225	2.899	0.0	0.95	66.9				
28.000	3.870	0.057	0.0	1.16	46.1				
28.001	3.670	0.159	0.0	1.63	64.9				
29.000	7.200	0.314	0.0	2.08	147.2				
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Existing Network Details 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)
29.001	30.927	0.000	0.0	0.070	0.00	0.0	0.600	o	300
24.004	45.590	0.230	198.2	0.038	0.00	0.0	0.600	o	375
24.005	38.840	0.160	242.7	0.231	0.00	0.0	0.600	o	450
30.000	26.634	0.540	49.3	0.000	5.00	0.0	0.600	o	225
24.006	37.201	0.280	132.9	0.040	0.00	0.0	0.600	o	450
24.007	63.944	0.270	236.8	0.040	0.00	0.0	0.600	o	450
31.000	24.684	0.120	205.7	0.215	5.00	0.0	0.600	o	225
31.001	35.227	0.180	195.7	0.043	5.00	0.0	0.600	o	225
24.008	19.302	0.170	113.5	0.043	0.00	0.0	0.600	o	450
24.009	42.970	0.100	429.7	0.000	0.00	0.0	0.600	o	525
32.000	7.262	0.100	72.6	0.343	5.00	0.0	0.600	o	450
32.001	27.748	1.690	16.4	0.000	5.00	0.0	0.600	o	150
33.000	20.005	0.100	200.1	0.630	5.00	0.0	0.600	o	450
33.001	30.526	0.200	152.6	0.000	0.00	0.0	0.600	o	225
34.000	30.576	1.150	26.6	0.096	5.00	0.0	0.600	o	325
35.000	22.482	0.200	112.4	0.224	5.00	0.0	0.600	o	450
35.001	5.638	0.100	56.4	0.000	5.00	0.0	0.600	o	225
36.000	16.786	1.710	9.8	0.027	5.00	0.0	0.600	o	150

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
29.001	5.540	0.384	0.0	0.00	0.0
24.004	2.990	3.480	0.0	1.28	141.7
24.005	2.660	3.711	0.0	1.30	206.8
30.000	3.700	0.000	0.0	1.87	74.2
24.006	2.520	3.751	0.0	1.76	280.3
24.007	2.240	3.791	0.0	1.32	209.4
31.000	2.500	0.358	0.0	0.91	36.1
31.001	2.380	0.401	0.0	0.93	37.0
24.008	1.970	4.235	0.0	1.91	303.3
24.009	1.760	4.235	0.0	1.07	232.5
32.000	3.500	0.343	0.0	2.39	379.8
32.001	3.400	0.343	0.0	2.50	44.1
33.000	2.700	0.900	0.0	1.43	228.0
33.001	2.600	0.900	0.0	1.06	42.0
34.000	2.550	0.096	0.0	2.55	101.3
35.000	2.700	0.320	0.0	1.92	304.9
35.001	2.500	0.320	0.0	1.75	69.4
36.000	4.310	0.027	0.0	3.23	57.2

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Existing Network Details 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)
33.002	45.139	0.300	150.5	0.057	0.00	0.0	0.600	o	225
37.000	21.924	0.110	199.3	0.071	5.00	0.0	0.600	o	225
37.001	23.225	0.160	145.2	0.071	5.00	0.0	0.600	o	225
37.002	42.860	0.370	115.8	0.071	5.00	0.0	0.600	o	225
37.003	16.004	0.070	228.6	0.071	5.00	0.0	0.600	o	300
38.000	5.880	1.040	5.7	0.068	5.00	0.0	0.600	o	150
33.003	7.752	0.280	27.7	0.000	0.00	0.0	0.600	o	300
33.004	49.146	0.160	307.2	0.000	0.00	0.0	0.600	o	450
24.010	7.734	0.030	257.8	0.000	0.00	0.0	0.600	o	300
23.001	49.171	0.135	364.2	0.064	0.00	0.0	0.600	o	300
39.000	5.695	0.000	0.0	0.080	5.00	0.0	0.600	o	225
23.002	34.760	0.085	408.9	0.020	0.00	0.0	0.600	o	300
1.016	45.616	0.110	414.7	0.064	0.00	0.0	0.600	o	300
1.017	6.000	0.020	300.0	0.000	0.00	0.0	0.600	o	900
40.000	34.385	0.230	149.5	0.055	5.00	0.0	0.600	o	225
40.001	26.630	0.030	887.7	0.055	0.00	0.0	0.600	o	225
41.000	30.249	0.080	378.1	0.094	2.00	0.0	0.600	o	225
1.018	21.220	0.200	106.1	0.030	0.00	0.0	0.600	o	525
Network Results Table									
PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)				
33.002	2.400	1.400	0.0	1.06	42.3				
37.000	2.730	0.071	0.0	0.82	36.7				
37.001	2.680	0.142	0.0	1.08	43.1				
37.002	2.600	0.213	0.0	1.21	48.3				
37.003	2.170	0.284	0.0	1.04	73.2				
38.000	3.440	0.068	0.0	4.27	75.4				
33.003	2.100	1.752	0.0	3.00	212.0				
33.004	1.820	1.752	0.0	1.15	183.6				
24.010	1.660	6.330	0.0	1.95	1238.5				
23.001	1.620	6.474	0.0	1.64	1040.7				
39.000	2.890	0.080	0.0	0.00	0.0				
23.002	1.495	6.574	0.0	1.54	981.7				
1.016	1.410	15.455	0.0	1.53	974.8				
1.017	1.300	15.455	0.0	1.80	1147.5				
40.000	2.070	0.055	0.0	1.07	42.4				
40.001	1.990	0.110	0.0	0.43	17.1				
41.000	2.040	0.094	0.0	0.67	26.5				
1.018	1.200	15.689	0.0	2.17	470.7				
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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)
TL_SW01	6.380	1.210	Open Manhole	1050	1.000	5.170	300				
TL_SW02	6.790	1.871	Open Manhole	1200	1.001	4.919	300	1.000	4.919	300	
Parcel A2_1	6.300	1.600	Open Manhole	1200	2.000	5.200	300				
Parcel A2_2	6.900	1.900	Open Manhole	1200	2.001	5.000	300	2.000	5.000	300	
TL_SW03	6.800	2.044	Open Manhole	1200	1.002	4.756	300	1.001	4.756	300	
								2.001	4.920	150	14
Parcel B6_1	6.900	1.900	Open Manhole	1200	3.000	5.000	300				
Parcel B6_2	6.900	2.100	Open Manhole	1200	3.001	4.800	300	3.000	4.800	300	
TL_SW04	6.780	2.145	Open Manhole	1200	1.003	4.635	300	1.002	4.635	300	
								3.001	4.733	150	
TL_SW05	6.380	2.045	Open Manhole	1200	1.004	4.335	300	1.003	4.335	300	
Parcel B1&CH_1	7.220	3.020	Open Manhole	1200	4.000	4.200	300				
Parcel B1&CH_2	7.220	3.085	Open Manhole	1200	4.001	4.135	300	4.000	4.135	300	
Ex. SB10	7.055	3.145	Open Manhole	1200	1.005	3.910	300	1.004	3.910	300	
								4.001	4.038	150	
Ex. SB9	6.900	3.130	Open Manhole	1200	1.006	3.770	300	1.005	3.770	300	
Block B_1	6.380	1.880	Open Manhole	1200	5.000	4.500	300				
Block B_2	6.380	2.475	Open Manhole	1200	5.001	3.905	300	5.000	3.905	300	
Ex. SB17	6.380	2.710	Open Manhole	1200	5.002	3.650	300	5.001	3.800	150	
Ex. SB8	6.570	3.070	Open Manhole	1350	1.007	3.500	300	1.006	3.500	300	
								5.002	3.500	300	
BovisA_1	5.600	1.500	Open Manhole	1200	6.000	4.100	375				
BovisA_2	5.600	1.600	Open Manhole	1200	6.001	4.000	375	6.000	4.000	375	
Ex SB7	5.810	2.685	Open Manhole	1350	1.008	3.125	375	1.007	3.200	300	
								6.001	3.125	375	
BovisB_1	4.650	1.250	Open Manhole	1200	7.000	3.400	375				
BovisB_2	4.650	1.425	Open Manhole	1200	7.001	3.225	375	7.000	3.225	375	
Dummy Node	4.700	1.975	Open Manhole	1200	1.009	2.725	450	1.008	2.725	375	
								7.001	2.800	375	
Plots 123 - 126	4.050	0.895	Open Manhole	450	8.000	3.100	150				
Plots 111 - 116	4.050	0.914	Open Manhole	450	9.000	3.136	150				
SW01, G01&G02	3.850	0.810	Open Manhole	1200	8.001	2.040	225	8.000	3.090	150	
								9.000	3.090	150	
Permbase 01	3.850	0.830	Open Manhole	1200	8.002	3.020	225	8.001	3.020	225	
Plots 117 - 122	4.050	0.885	Open Manhole	450	10.000	3.165	150				
Stub SW02/2	4.500	1.632	Open Manhole	450	10.001	2.868	225	10.000	2.868	150	
Plots 101-110	4.400	1.400	Open Manhole	450	11.000	2.600	225				
SW02	4.380	1.530	Open Manhole	1200	8.003	2.830	225	8.002	2.830	225	
								10.001	2.830	225	
								11.000	2.938	225	108
Ex SB6	4.700	2.075	Open Manhole	1500	1.010	2.625	450	1.009	2.700	450	75
								8.003	2.700	225	
Ret Block A	4.700	1.700	Open Manhole	1200	12.000	3.000	300				
Ret Block A	4.600	1.700	Open Manhole	1050	12.001	2.900	150	12.000	2.900	300	
Plots 95-100	4.600	1.600	Open Manhole	450	13.000	3.000	225				
SW03	4.370	1.900	Open Manhole	1500	1.011	2.470	450	1.010	2.470	450	
								12.001	2.770	150	
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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)
SW04	4.440	2.150	Open Manhole	1500	1.012	2.299	450	13.000	2.897	225	202
SW-FUT-01-PlotsN	4.000	1.200	Open Manhole	450	14.000	2.800	150	1.011	2.290	450	
SW-FUT-01-PlotsS	4.000	1.200	Open Manhole	450	15.000	2.800	150				
SW-FUT-01	4.000	1.440	Open Manhole	1200	14.001	2.580	300	14.000	2.650	150	
								15.000	2.650	150	
Permbase 02	3.800	1.380	Open Manhole	1200	14.002	2.420	300	14.001	2.420	300	
Plots 80-86	4.100	1.550	Open Manhole	450	16.000	2.550	150				
Plots 87-94	4.300	1.698	Open Manhole	450	17.000	2.600	225				
SW05	4.170	2.020	Open Manhole	1500	1.013	2.150	450	1.012	2.150	450	
								14.002	2.300	300	
								16.000	2.300	150	
								17.000	2.300	225	
C2 Resiblock A	4.200	1.980	Open Manhole	450	18.000	2.300	225				
SW06	3.700	1.710	Open Manhole	1500	1.014	1.990	450	1.013	1.990	450	
								18.000	2.054	225	
Permbase 03	3.600	1.700	Open Manhole	1800	1.015	1.800	450	1.014	1.900	450	
SW-FUT-02-PlotN	3.700	1.100	Open Manhole	450	19.000	2.600	150				
SW-FUT-02-Plots	3.700	1.100	Open Manhole	450	20.000	2.600	150				
SW-FUT-02	4.200	1.960	Open Manhole	1200	19.001	2.320	300	19.000	2.470	150	
								20.000	2.470	150	
Permbase 04	4.000	1.825	Open Manhole	1200	19.002	2.175	300	19.001	2.175	300	
Plots 60-73	3.900	1.300	Open Manhole	450	21.000	2.600	150				
Plots 74-78	3.900	1.300	Open Manhole	450	22.000	2.600	150				
SW07	3.870	1.770	Open Manhole	1200	19.003	2.100	300	19.002	2.100	300	
								21.000	2.560	150	310
								22.000	2.500	150	250
Permbase 05	3.700	1.705	Open Manhole	1200	19.004	2.055	300	19.003	2.055	300	
Plots 39-46	4.200	1.060	Open Manhole	1200	23.000	3.240	150				
SW-LYM 01	5.040	1.300	Open Manhole	1200	24.000	3.740	225				
Non resi	5.200	1.200	Open Manhole	1200	25.000	4.000	450				
Non resi	5.200	1.480	Open Manhole	1200	25.001	3.720	225	25.000	3.720	450	
SW-LYM 02	5.500	1.860	Open Manhole	1200	24.001	3.640	225	24.000	3.640	225	
								25.001	3.640	225	
Parcel A1	7.000	3.000	Open Manhole	1200	26.000	4.000	450				
As-built SA8	6.000	2.237	Open Manhole	1200	26.001	3.763	225	26.000	3.763	450	
Non Resi	6.000	2.000	Open Manhole	1200	27.000	4.000	450				
SW Stub 02	6.000	2.360	Open Manhole	1200	27.001	3.640	225	27.000	3.640	450	
SW-LYM 03/1	5.920	2.350	Open Manhole	1200	26.002	3.570	225	26.001	3.570	225	
								27.001	3.570	225	
SW-LYM 03	6.300	2.950	Open Manhole	1200	24.002	3.350	225	24.001	3.425	225	75
								26.002	3.425	225	75
SW-LYM 04	6.840	3.415	Open Manhole	1200	24.003	3.225	300	24.002	3.225	225	
SW-LYM 07	5.370	1.500	Open Manhole	1200	28.000	3.670	225				
SW-LYM 08	6.140	2.470	Open Manhole	1200	28.001	3.670	225	28.000	3.670	225	
SW-LYM 05A	7.570	0.370	Open Manhole	1200	29.000	7.200	300				
SW-LYM 05	7.250	1.710	Open Manhole	1200	29.001	5.540	300	29.000	6.070	300	530
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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)
SW-LYM 10	6.680	3.650	Open Manhole	1500	24.004	2.990	375	24.003	3.065	300	2475
								28.001	3.140	225	
								29.001	5.540	300	
SW-LYM11	5.900	3.220	Open Manhole	1350	24.005	2.680	450	24.004	2.760	375	5
ExSB17_Dum Node	6.360	2.660	Open Manhole	1200	30.000	3.700	225				415
SW-LYM 12	6.380	3.860	Open Manhole	1350	24.006	2.520	450	24.005	2.520	450	
								30.000	3.160	225	
SW-FUT-03	6.260	4.020	Open Manhole	1350	24.007	2.240	450	24.006	2.240	450	5
Stub SW18/1	4.300	1.800	Open Manhole	1200	31.000	2.500	225				
SW18	4.680	2.300	Open Manhole	1200	31.001	2.380	225	31.000	2.380	225	
SW19	5.100	3.130	Open Manhole	1350	24.008	1.970	450	24.007	1.970	450	125
								31.001	2.200	225	
SW20	5.000	3.240	Open Manhole	1500	24.009	1.760	525	24.008	1.800	450	
Car Park	5.000	1.500	Open Manhole	1200	32.000	3.500	450				150
Car Park	5.000	1.600	Open Manhole	1200	32.001	3.400	150	32.000	3.400	450	
Non Resi	5.300	2.600	Open Manhole	1200	33.000	2.700	450				
Stub SW9/1	5.300	2.700	Open Manhole	1200	33.001	2.600	225	33.000	2.600	450	330
SW08	4.900	1.350	Open Manhole	1200	34.000	2.550	225				
Non Resi	5.100	2.400	Open Manhole	1200	35.000	2.700	450				
Stub SW9/2	5.100	2.600	Open Manhole	1200	35.001	2.500	225	35.000	2.500	450	330
Plots 1 - 4	5.200	0.890	Open Manhole	450	36.000	4.010	150				
SW09	5.070	2.670	Open Manhole	1200	33.002	2.400	225	33.001	2.400	225	
								34.000	2.400	225	150
								35.001	2.400	225	
								36.000	2.600	150	
SW12	4.320	1.530	Open Manhole	1200	37.000	2.790	225				150
SW13	4.020	1.340	Open Manhole	1200	37.001	2.680	225	37.000	2.680	225	
SW14	4.030	1.500	Open Manhole	1200	37.002	2.600	225	37.001	2.520	225	
SW15	4.600	2.430	Open Manhole	1200	37.003	2.170	300	37.002	2.230	225	330
Plots 16-22	4.700	1.260	Open Manhole	450	38.000	3.440	150				
SW16	4.650	2.550	Open Manhole	1200	33.003	2.100	300	33.002	2.100	225	
								37.003	2.100	300	150
								38.000	2.400	150	
SW17	5.000	3.180	Open Manhole	1200	33.004	1.820	450	33.003	1.820	300	
SW21	5.000	3.340	Open Manhole	1500	24.010	1.660	500	24.009	1.660	525	330
								32.001	1.710	150	
								33.004	1.660	450	
SW22	4.370	2.640	Open Manhole	1300	23.001	1.630	300	23.000	2.305	150	330
								24.010	1.630	500	
Plots 47-55	4.100	1.600	Open Manhole	1200	39.000	2.500	225				
SW23	3.900	2.405	Open Manhole	1500	23.002	1.495	500	23.001	1.495	300	330
								39.000	2.500	225	
SW24	3.810	2.400	Open Manhole	1300	1.016	1.410	300	1.015	1.860	450	
								19.004	2.010	300	330
								23.002	1.410	500	
Permbase 06	3.300	2.500	Open Manhole	1500	1.017	1.300	900	1.016	1.300	300	
Plots	3.700	1.330	Open Manhole	1200	40.000	2.370	225				
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XP Solutions	Network 2013.1	

Manhole Schedules for Storm

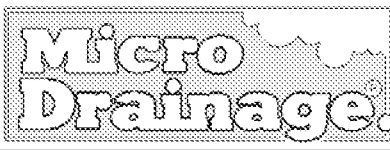
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
Stub SW25/1	3.723	1.730	Open Manhole	1800	40.001	1.990	225	40.000	2.140	225	150
Stub SW25/2	3.683	1.640	Open Manhole	1800	41.000	2.040	225				
SW25	3.600	2.400	Open Manhole	1800	1.018	1.200	900	1.017	1.280	900	455
								40.001	1.960	225	460
								41.000	1.960	225	460
Outfall B	1.753	0.750	Open Manhole	0		OUTFALL		1.018	1.000	525	

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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)
1.000	o	300	TL_SW01	8.388	5.170	3.218	Open Manhole	1050
1.001	o	300	TL_SW02	8.790	4.919	1.571	Open Manhole	1200
2.000	o	300	Parcel A2_1	8.800	5.200	1.300	Open Manhole	1200
2.001	o	150	Parcel A2_2	8.800	5.000	1.750	Open Manhole	1200
1.002	o	300	TL_SW03	8.800	4.756	1.744	Open Manhole	1200
3.000	o	300	Parcel B6_1	8.900	5.000	1.600	Open Manhole	1200
3.001	o	150	Parcel B6_2	8.900	4.800	1.950	Open Manhole	1200
1.003	o	300	TL_SW04	8.780	4.635	1.845	Open Manhole	1200
1.004	o	300	TL_SW05	8.388	4.335	1.745	Open Manhole	1200
4.000	o	300	Parcel B1&CH_1	7.220	4.200	2.720	Open Manhole	1200
4.001	o	150	Parcel B1&CH 2	7.220	4.135	2.935	Open Manhole	1200
1.005	o	300	Ex. SB10	7.055	3.910	2.845	Open Manhole	1200
1.006	o	300	Ex. SB9	8.900	3.770	2.830	Open Manhole	1200
5.000	o	300	Block B_1	8.388	4.500	1.580	Open Manhole	1200
5.001	o	150	Block B_2	8.388	3.905	2.325	Open Manhole	1200
5.002	o	300	Ex. SB17	8.388	3.650	2.810	Open Manhole	1200
1.007	o	300	Ex. SB8	8.570	3.500	2.770	Open Manhole	1350
6.000	o	375	BovisA_1	5.600	4.100	1.125	Open Manhole	1200
6.001	o	375	BovisA_2	5.600	4.000	1.225	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)
1.000	59.000	235.1	TL_SW02	8.790	4.919	1.571	Open Manhole	1200
1.001	38.000	233.1	TL_SW03	8.800	4.756	1.744	Open Manhole	1200
2.000	12.808	64.0	Parcel A2_2	8.800	5.000	1.600	Open Manhole	1200
2.001	12.001	150.0	TL_SW03	8.800	4.920	1.730	Open Manhole	1200
1.002	27.675	228.7	TL_SW04	8.780	4.635	1.845	Open Manhole	1200
3.000	19.930	99.7	Parcel B6_2	8.900	4.800	1.800	Open Manhole	1200
3.001	10.000	149.3	TL_SW04	8.780	4.733	1.897	Open Manhole	1200
1.003	70.062	233.5	TL_SW05	8.388	4.335	1.745	Open Manhole	1200
1.004	94.210	221.7	Ex. SB10	7.055	3.910	2.845	Open Manhole	1200
4.000	20.000	307.7	Parcel B1&CH 2	7.220	4.135	2.785	Open Manhole	1200
4.001	14.532	149.8	Ex. SB10	7.055	4.038	2.867	Open Manhole	1200
1.005	30.500	217.9	Ex. SB9	8.900	3.770	2.830	Open Manhole	1200
1.006	59.368	219.9	Ex. SB8	8.570	3.500	2.770	Open Manhole	1350
5.000	19.999	33.6	Block B_2	8.388	3.905	2.175	Open Manhole	1200
5.001	14.532	138.4	Ex. SB17	8.388	3.800	2.810	Open Manhole	1200
5.002	36.500	243.3	Ex. SB8	8.570	3.500	2.770	Open Manhole	1350
1.007	88.421	294.7	Ex SB7	5.810	3.200	2.310	Open Manhole	1350
6.000	20.006	200.1	BovisA_2	5.600	4.000	1.225	Open Manhole	1200
6.001	14.650	16.7	Ex SB7	5.810	3.125	2.310	Open Manhole	1350
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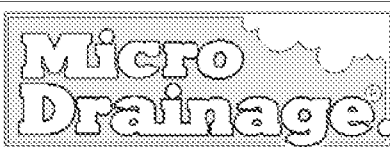
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PIPELINE SCHEDULES for Storm								
Upstream Manhole								
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.008	o	375	Ex SB7	4.810	3.135	2.310	Open Manhole	1350
7.000	o	375	BovisB_1	4.650	3.400	0.875	Open Manhole	1200
7.001	o	375	BovisB_2	4.650	3.225	1.050	Open Manhole	1200
1.009	o	450	Dummy Node	4.700	2.725	1.525	Open Manhole	1200
8.000	o	150	Plots 123 - 126	4.850	3.155	0.745	Open Manhole	450
9.000	o	150	Plots 111 - 116	4.950	3.135	0.764	Open Manhole	450
8.001	o	225	SW01, G01&G02	3.850	3.040	0.565	Open Manhole	1200
8.002	o	225	Permbase 01	3.850	3.020	0.605	Open Manhole	1200
10.000	o	150	Plots 117 - 122	4.050	3.165	0.735	Open Manhole	450
10.001	o	225	Stub SW02/2	4.500	2.868	1.407	Open Manhole	450
11.000	o	225	Plots 101-110	4.400	3.000	1.175	Open Manhole	450
8.003	o	225	SW02	4.360	2.830	1.305	Open Manhole	1200
1.010	o	450	Ex SB6	4.700	2.625	1.625	Open Manhole	1500
12.000	o	300	Ret Block A	4.700	3.000	1.400	Open Manhole	1200
12.001	o	150	Ret Block A	4.600	2.900	1.550	Open Manhole	1050
13.000	o	225	Plots 95-100	4.600	3.000	1.375	Open Manhole	450
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)
1.008	77.584	194.0	Dummy Node	4.700	2.725	1.600	Open Manhole	1200
7.000	20.000	114.3	BovisB_2	4.650	3.225	1.050	Open Manhole	1200
7.001	13.401	31.5	Dummy Node	4.700	2.800	1.525	Open Manhole	1200
1.009	4.916	196.6	Ex SB6	4.700	2.700	1.550	Open Manhole	1500
8.000	23.339	359.1	SW01, G01&G02	3.850	3.090	0.610	Open Manhole	1200
9.000	3.876	84.3	SW01, G01&G02	3.850	3.090	0.610	Open Manhole	1200
8.001	5.600	280.0	Permbase 01	3.850	3.020	0.605	Open Manhole	1200
8.002	45.386	238.9	SW02	4.360	2.830	1.305	Open Manhole	1200
10.000	33.343	112.3	Stub SW02/2	4.500	2.868	1.482	Open Manhole	450
10.001	6.800	178.9	SW02	4.360	2.830	1.305	Open Manhole	1200
11.000	6.800	109.7	SW02	4.360	2.938	1.197	Open Manhole	1200
8.003	43.824	337.1	Ex SB6	4.700	2.700	1.775	Open Manhole	1500
1.010	34.073	219.8	SW03	4.370	2.470	1.450	Open Manhole	1500
12.000	40.643	406.4	Ret Block A	4.600	2.900	1.400	Open Manhole	1050
12.001	9.903	76.2	SW03	4.370	2.770	1.450	Open Manhole	1500
13.000	6.000	58.3	SW03	4.370	2.897	1.248	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)
1.011	o	450	SW03	4.170	2.470	1.450	Open Manhole	1500
1.012	o	450	SW04	4.440	2.290	1.700	Open Manhole	1500
14.000	o	150	SW-FUT-01-PlotsN	4.000	2.800	1.050	Open Manhole	450
15.000	o	150	SW-FUT-01-PlotsS	4.000	2.800	1.050	Open Manhole	450
14.001	o	300	SW-FUT-01	4.000	2.900	1.140	Open Manhole	1200
14.002	o	300	Permbase 02	3.800	2.420	1.080	Open Manhole	1200
16.000	o	150	Plots 80-86	4.100	2.550	1.400	Open Manhole	450
17.000	o	225	Plots 87-94	4.300	2.602	1.473	Open Manhole	450
1.013	o	450	SW05	4.170	2.150	1.570	Open Manhole	1500
18.000	o	225	C2 Resiblock A	4.100	2.300	1.755	Open Manhole	450
1.014	o	450	SW06	3.700	1.900	1.260	Open Manhole	1500
1.015	o	450	Permbase 03	3.600	1.900	1.250	Open Manhole	1500
19.000	o	150	SW-FUT-02-PlotN	3.700	2.600	0.850	Open Manhole	450
20.000	o	150	SW-FUT-02-PlotS	3.700	2.600	0.950	Open Manhole	450
19.001	o	300	SW-FUT-02	4.280	2.320	1.660	Open Manhole	1200
19.002	o	300	Permbase 04	4.000	2.175	1.525	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)
1.011	28.223	156.8	SW04	4.440	2.290	1.700	Open Manhole	1500
1.012	22.432	160.2	SW05	4.170	2.150	1.570	Open Manhole	1500
14.000	22.905	152.7	SW-FUT-01	4.000	2.650	1.200	Open Manhole	1200
15.000	28.097	187.3	SW-FUT-01	4.000	2.650	1.200	Open Manhole	1200
14.001	35.213	251.5	Permbase 02	3.800	2.420	1.080	Open Manhole	1200
14.002	28.603	238.4	SW05	4.170	2.300	1.570	Open Manhole	1500
16.000	12.624	50.5	SW05	4.170	2.300	1.720	Open Manhole	1500
17.000	7.200	23.8	SW05	4.170	2.300	1.645	Open Manhole	1500
1.013	37.575	234.8	SW06	3.700	1.990	1.260	Open Manhole	1500
18.000	8.659	32.6	SW06	3.700	2.054	1.421	Open Manhole	1500
1.014	22.449	249.4	Permbase 03	3.600	1.900	1.250	Open Manhole	1500
1.015	10.000	250.0	SW24	3.810	1.860	1.500	Open Manhole	1800
19.000	26.210	201.6	SW-FUT-02	4.280	2.470	1.660	Open Manhole	1200
20.000	28.840	221.8	SW-FUT-02	4.280	2.470	1.660	Open Manhole	1200
19.001	35.611	245.6	Permbase 04	4.000	2.175	1.525	Open Manhole	1200
19.002	18.889	251.9	SW07	3.870	2.100	1.470	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)	
21.000	o	150	Plots 60-73	3.900	2.600	1.150	Open Manhole	450	
22.000	o	150	Plots 74-78	3.800	2.600	1.150	Open Manhole	450	
19.003	o	300	SW07	3.870	2.100	1.470	Open Manhole	1200	
19.004	o	300	Permbase 05	3.760	2.055	1.405	Open Manhole	1200	
23.000	o	150	Plots 39-46	4.300	3.240	0.910	Open Manhole	1200	
24.000	o	225	SW-LYM 01	5.640	3.740	1.075	Open Manhole	1200	
25.000	o	450	Non resi	5.200	3.600	0.750	Open Manhole	1200	
25.001	o	225	Non resi	5.200	3.720	1.255	Open Manhole	1200	
24.001	o	225	SW-LYM 02	5.500	3.640	1.635	Open Manhole	1200	
26.000	o	450	Parcel A1	7.000	4.000	2.550	Open Manhole	1200	
26.001	o	225	As-built SA8	6.000	3.763	2.012	Open Manhole	1200	
27.000	o	450	Non Resi	6.000	4.000	1.550	Open Manhole	1200	
27.001	o	225	SW Stub 02	6.000	3.640	2.135	Open Manhole	1200	
26.002	o	225	SW-LYM 03/1	5.920	3.570	2.125	Open Manhole	1200	
24.002	o	225	SW-LYM 03	6.300	3.350	2.725	Open Manhole	1200	
24.003	o	300	SW-LYM 04	6.640	3.225	3.115	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)	
21.000	7.800	195.0	SW07	3.870	2.560	1.150	Open Manhole	1200	
22.000	9.600	96.0	SW07	3.870	2.500	1.220	Open Manhole	1200	
19.003	11.498	255.5	Permbase 05	3.760	2.055	1.405	Open Manhole	1200	
19.004	10.000	222.2	SW24	3.810	2.010	1.500	Open Manhole	1800	
23.000	6.005	6.4	SW22	4.270	2.305	1.815	Open Manhole	1800	
24.000	24.867	248.7	SW-LYM 02	5.500	3.640	1.635	Open Manhole	1200	
25.000	39.317	140.4	Non resi	5.200	3.720	1.000	Open Manhole	1200	
25.001	13.808	172.6	SW-LYM 02	5.500	3.640	1.635	Open Manhole	1200	
24.001	44.896	208.8	SW-LYM 03	6.300	3.425	2.650	Open Manhole	1200	
26.000	39.613	167.1	As-built SA8	6.000	3.763	1.787	Open Manhole	1200	
26.001	28.513	147.7	SW-LYM 03/1	5.920	3.570	2.125	Open Manhole	1200	
27.000	34.498	95.8	SW Stub 02	6.000	3.640	1.910	Open Manhole	1200	
27.001	5.111	73.0	SW-LYM 03/1	6.000	3.570	2.125	Open Manhole	1200	
26.002	16.877	116.4	SW-LYM 03	6.300	3.425	2.650	Open Manhole	1200	
24.002	25.768	206.1	SW-LYM 04	6.640	3.225	3.190	Open Manhole	1200	
24.003	43.680	273.0	SW-LYM 10	6.640	3.065	3.275	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)
28.000	o	225	SW-LYM 07	6.370	3.670	1.275	Open Manhole	1200
28.001	o	225	SW-LYM 08	6.140	3.670	2.245	Open Manhole	1200
29.000	o	300	SW-LYM 05A	7.570	7.200	0.070	Open Manhole	1200
29.001	o	300	SW-LYM 05	7.350	5.540	1.410	Open Manhole	1200
24.004	o	275	SW-LYM 10	6.640	2.390	3.275	Open Manhole	1500
24.005	o	450	SW-LYM11	6.990	2.660	2.770	Open Manhole	1350
30.000	o	225	ExSB17_Dum Node	6.360	3.700	2.435	Open Manhole	1200
24.006	o	450	SW-LYM 12	6.380	2.520	3.410	Open Manhole	1350
24.007	o	450	SW-FUT-03	6.260	2.240	3.570	Open Manhole	1350
31.000	o	225	Stub SW18/1	4.600	2.500	1.575	Open Manhole	1200
31.001	o	225	SW18	4.680	2.380	2.075	Open Manhole	1200
24.008	o	450	SW19	5.100	1.970	2.680	Open Manhole	1350
24.009	o	525	SW20	5.000	1.760	2.715	Open Manhole	1800
32.000	o	450	Car Park	5.000	3.500	1.050	Open Manhole	1200
32.001	o	150	Car Park	5.000	3.400	1.450	Open Manhole	1200
33.000	o	450	Non Resi	5.300	2.700	2.150	Open Manhole	1200
33.001	o	225	Stub SW9/1	5.300	2.600	2.475	Open Manhole	1200
34.000	o	225	SW08	4.900	3.550	1.125	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)
28.000	25.335	126.7	SW-LYM 08	6.140	3.670	2.245	Open Manhole	1200
28.001	34.164	64.5	SW-LYM 10	6.640	3.140	3.275	Open Manhole	1500
29.000	64.700	57.3	SW-LYM 05	7.350	6.070	0.880	Open Manhole	1200
29.001	30.927	0.0	SW-LYM 10	6.640	5.540	0.800	Open Manhole	1500
24.004	45.590	198.2	SW-LYM11	6.990	2.760	2.765	Open Manhole	1350
24.005	38.840	242.7	SW-LYM 12	6.380	2.520	3.410	Open Manhole	1350
30.000	26.634	49.3	SW-LYM 12	6.380	3.160	2.995	Open Manhole	1350
24.006	37.201	132.9	SW-FUT-03	6.260	2.240	3.570	Open Manhole	1350
24.007	63.944	236.8	SW19	5.100	1.970	2.680	Open Manhole	1350
31.000	24.684	205.7	SW18	4.680	2.380	2.075	Open Manhole	1200
31.001	35.227	195.7	SW19	5.100	2.200	2.675	Open Manhole	1350
24.008	19.302	113.5	SW20	5.000	1.800	2.750	Open Manhole	1800
24.009	42.970	429.7	SW21	5.000	1.660	2.815	Open Manhole	1800
32.000	7.262	72.6	Car Park	5.000	3.400	1.150	Open Manhole	1200
32.001	27.748	16.4	SW21	5.000	1.710	3.140	Open Manhole	1800
33.000	20.005	200.1	Stub SW9/1	5.300	2.600	2.250	Open Manhole	1200
33.001	30.526	152.6	SW09	5.070	2.400	2.445	Open Manhole	1200
34.000	30.576	26.6	SW09	5.070	2.400	2.445	Open Manhole	1200
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Lion House Oriental Road Woking GU22 8AR			Littlehampton Overall Surface Network West of Wetlands						
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XP Solutions			Network 2013.1						
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)	
35.000	o	450	Non Resi	5.100	2.700	1.950	Open Manhole	1200	
35.001	o	225	Stub SW9/2	5.100	2.500	2.375	Open Manhole	1200	
36.000	o	150	Plots 1 - 4	5.200	4.310	0.740	Open Manhole	450	
33.002	o	225	SW09	5.070	2.400	2.445	Open Manhole	1200	
37.000	o	225	SW12	4.920	2.790	1.305	Open Manhole	1200	
37.001	o	225	SW13	4.920	2.680	1.115	Open Manhole	1200	
37.002	o	225	SW14	4.920	2.600	1.195	Open Manhole	1200	
37.003	o	300	SW15	4.600	2.170	2.130	Open Manhole	1200	
38.000	o	150	Plots 16-22	4.700	3.440	1.110	Open Manhole	450	
33.003	o	300	SW16	4.650	2.100	2.250	Open Manhole	1200	
33.004	o	450	SW17	5.000	1.820	2.730	Open Manhole	1200	
24.010	o	900	SW21	5.000	1.660	2.440	Open Manhole	1800	
23.001	o	900	SW22	4.270	1.630	1.740	Open Manhole	1800	
39.000	o	225	Plots 47-55	4.100	2.500	1.375	Open Manhole	1200	
23.002	o	900	SW23	3.900	1.495	1.505	Open Manhole	1800	
1.016	o	900	SW24	3.810	1.410	1.500	Open Manhole	1800	
1.017	o	900	Permbase 06	3.800	1.300	1.600	Open Manhole	1800	
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)	
35.000	22.482	112.4	Stub SW9/2	5.100	2.500	2.150	Open Manhole	1200	
35.001	5.638	56.4	SW09	5.070	2.400	2.445	Open Manhole	1200	
36.000	16.786	9.8	SW09	5.070	2.600	2.320	Open Manhole	1200	
33.002	45.139	150.5	SW16	4.650	2.100	2.325	Open Manhole	1200	
37.000	21.924	199.3	SW13	4.920	2.680	1.115	Open Manhole	1200	
37.001	23.225	145.2	SW14	4.920	2.520	1.275	Open Manhole	1200	
37.002	42.860	115.8	SW15	4.600	2.230	2.145	Open Manhole	1200	
37.003	16.004	228.6	SW16	4.650	2.100	2.250	Open Manhole	1200	
38.000	5.880	5.7	SW16	4.650	2.400	2.100	Open Manhole	1200	
33.003	7.752	27.7	SW17	5.000	1.820	2.380	Open Manhole	1200	
33.004	49.146	307.2	SW21	5.000	1.660	2.890	Open Manhole	1800	
24.010	7.734	257.8	SW22	4.270	1.630	1.740	Open Manhole	1800	
23.001	49.171	364.2	SW23	3.900	1.495	1.505	Open Manhole	1800	
39.000	5.695	0.0	SW23	3.900	2.500	1.175	Open Manhole	1800	
23.002	34.760	408.9	SW24	3.810	1.410	1.500	Open Manhole	1800	
1.016	45.616	414.7	Permbase 06	3.800	1.300	1.600	Open Manhole	1800	
1.017	6.000	300.0	SW25	3.800	1.280	1.420	Open Manhole	1800	
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XP Solutions				Network 2013.1							
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)			
40.000	o	225	Plots	3.700	3.370	1.330	Open Manhole	1200			
40.001	o	225	Stub SW25/1	3.920	3.390	1.505	Open Manhole	1200			
41.000	o	225	Stub SW25/2	3.680	3.040	1.415	Open Manhole	1200			
1.018	o	525	SW25	3.600	3.200	1.875	Open Manhole	1800			
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)			
40.000	34.385	149.5	Stub SW25/1	3.700	2.140	1.355	Open Manhole	1200			
40.001	26.630	887.7	SW25	3.600	1.960	1.415	Open Manhole	1800			
41.000	30.249	378.1	SW25	3.600	1.960	1.415	Open Manhole	1800			
1.018	21.220	106.1	Outfall B	3.750	1.000	0.225	Open Manhole	0			
Surcharged Outfall Details for Storm											
Outfall Pipe Number		Outfall Name		C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)			
1.018		Outfall B		1.750	1.000	1.000	0	0			
Datum (m)				1.000		Offset (mins)		0			
Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	0.800	28	0.800	55	0.800	82	0.800	109	0.800	136	0.800
2	0.800	29	0.800	56	0.800	83	0.800	110	0.800	137	0.800
3	0.800	30	0.800	57	0.800	84	0.800	111	0.800	138	0.800
4	0.800	31	0.800	58	0.800	85	0.800	112	0.800	139	0.800
5	0.800	32	0.800	59	0.800	86	0.800	113	0.800	140	0.800
6	0.800	33	0.800	60	0.800	87	0.800	114	0.800	141	0.800
7	0.800	34	0.800	61	0.800	88	0.800	115	0.800	142	0.800
8	0.800	35	0.800	62	0.800	89	0.800	116	0.800	143	0.800
9	0.800	36	0.800	63	0.800	90	0.800	117	0.800	144	0.800
10	0.800	37	0.800	64	0.800	91	0.800	118	0.800	145	0.800
11	0.800	38	0.800	65	0.800	92	0.800	119	0.800	146	0.800
12	0.800	39	0.800	66	0.800	93	0.800	120	0.800	147	0.800
13	0.800	40	0.800	67	0.800	94	0.800	121	0.800	148	0.800
14	0.800	41	0.800	68	0.800	95	0.800	122	0.800	149	0.800
15	0.800	42	0.800	69	0.800	96	0.800	123	0.800	150	0.800
16	0.800	43	0.800	70	0.800	97	0.800	124	0.800	151	0.800
17	0.800	44	0.800	71	0.800	98	0.800	125	0.800	152	0.800
18	0.800	45	0.800	72	0.800	99	0.800	126	0.800	153	0.800
19	0.800	46	0.800	73	0.800	100	0.800	127	0.800	154	0.800
20	0.800	47	0.800	74	0.800	101	0.800	128	0.800	155	0.800
21	0.800	48	0.800	75	0.800	102	0.800	129	0.800	156	0.800
22	0.800	49	0.800	76	0.800	103	0.800	130	0.800	157	0.800
23	0.800	50	0.800	77	0.800	104	0.800	131	0.800	158	0.800
24	0.800	51	0.800	78	0.800	105	0.800	132	0.800	159	0.800
25	0.800	52	0.800	79	0.800	106	0.800	133	0.800	160	0.800
26	0.800	53	0.800	80	0.800	107	0.800	134	0.800	161	0.800
27	0.800	54	0.800	81	0.800	108	0.800	135	0.800	162	0.800
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XP Solutions		Network 2013.1					

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
217	0.800	240	0.800	263	0.800	286	0.800	309	0.800	332	0.800	355	0.800	378	0.800
218	0.800	241	0.800	264	0.800	287	0.800	310	0.800	333	0.800	356	0.800	379	0.800
219	0.800	242	0.800	265	0.800	288	0.800	311	0.800	334	0.800	357	0.800	380	0.800
220	0.800	243	0.800	266	0.800	289	0.800	312	0.800	335	0.800	358	0.800	381	0.800
221	0.800	244	0.800	267	0.800	290	0.800	313	0.800	336	0.800	359	0.800	382	0.800
222	0.800	245	0.800	268	0.800	291	0.800	314	0.800	337	0.800	360	0.800	383	0.800
223	0.800	246	0.800	269	0.800	292	0.800	315	0.800	338	0.800	361	0.800	384	0.800
224	0.800	247	0.800	270	0.800	293	0.800	316	0.800	339	0.800	362	0.800	385	0.800
225	0.800	248	0.800	271	0.800	294	0.800	317	0.800	340	0.800	363	0.800	386	0.800
226	0.800	249	0.800	272	0.800	295	0.800	318	0.800	341	0.800	364	0.800	387	0.800
227	0.800	250	0.800	273	0.800	296	0.800	319	0.800	342	0.800	365	0.800	388	0.800
228	0.800	251	0.800	274	0.800	297	0.800	320	0.800	343	0.800	366	0.800	389	0.800
229	0.800	252	0.800	275	0.800	298	0.800	321	0.800	344	0.800	367	0.800	390	0.800
230	0.800	253	0.800	276	0.800	299	0.800	322	0.800	345	0.800	368	0.800	391	0.800
231	0.800	254	0.800	277	0.800	300	0.800	323	0.800	346	0.800	369	0.800	392	0.800
232	0.800	255	0.800	278	0.800	301	0.800	324	0.800	347	0.800	370	0.800	393	0.800
233	0.800	256	0.800	279	0.800	302	0.800	325	0.800	348	0.800	371	0.800	394	0.800
234	0.800	257	0.800	280	0.800	303	0.800	326	0.800	349	0.800	372	0.800	395	0.800
235	0.800	258	0.800	281	0.800	304	0.800	327	0.800	350	0.800	373	0.800	396	0.800
236	0.800	259	0.800	282	0.800	305	0.800	328	0.800	351	0.800	374	0.800	397	0.800
237	0.800	260	0.800	283	0.800	306	0.800	329	0.800	352	0.800	375	0.800	398	0.800
238	0.800	261	0.800	284	0.800	307	0.800	330	0.800	353	0.800	376	0.800	399	0.800
239	0.800	262	0.800	285	0.800	308	0.800	331	0.800	354	0.800	377	0.800	400	0.800

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	2	Number of Time/Area Diagrams	0
Number of Online Controls	14	Number of Storage Structures	20	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.314
Return Period (years)	2	F (1km)	2.329
Site Location	GB 502850 104400 TQ 02850 04400	Summer Storms	Yes
C (1km)	-0.027	Winter Storms	No
D1 (1km)	0.393	Cv (Summer)	0.750
D2 (1km)	0.274	Cv (Winter)	0.840
D3 (1km)	0.407	Storm Duration (mins)	30

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Online Controls for Storm																																																																											
Hydro-Brake® Manhole: Parcel A2_2, DS/PN: 2.001, Volume (m³): 3.0																																																																											
Design Head (m) 1.200 Hydro-Brake® Type Md4 Invert Level (m) 5.000																																																																											
Design Flow (l/s) 5.0 Diameter (mm) 76																																																																											
<table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>2.3</td><td>0.800</td><td>4.0</td><td>2.000</td><td>6.4</td><td>4.000</td><td>9.0</td><td>7.000</td><td>11.9</td></tr><tr><td>0.200</td><td>3.0</td><td>1.000</td><td>4.5</td><td>2.200</td><td>6.7</td><td>4.500</td><td>9.5</td><td>7.500</td><td>12.3</td></tr><tr><td>0.300</td><td>2.6</td><td>1.200</td><td>4.9</td><td>2.400</td><td>7.0</td><td>5.000</td><td>10.1</td><td>8.000</td><td>12.7</td></tr><tr><td>0.400</td><td>2.9</td><td>1.400</td><td>5.3</td><td>2.600</td><td>7.3</td><td>5.500</td><td>10.6</td><td>8.500</td><td>13.1</td></tr><tr><td>0.500</td><td>3.2</td><td>1.600</td><td>5.7</td><td>3.000</td><td>7.8</td><td>6.000</td><td>11.0</td><td>9.000</td><td>13.5</td></tr><tr><td>0.600</td><td>3.5</td><td>1.800</td><td>6.0</td><td>3.500</td><td>8.4</td><td>6.500</td><td>11.5</td><td>9.500</td><td>13.9</td></tr></table>						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	2.3	0.800	4.0	2.000	6.4	4.000	9.0	7.000	11.9	0.200	3.0	1.000	4.5	2.200	6.7	4.500	9.5	7.500	12.3	0.300	2.6	1.200	4.9	2.400	7.0	5.000	10.1	8.000	12.7	0.400	2.9	1.400	5.3	2.600	7.3	5.500	10.6	8.500	13.1	0.500	3.2	1.600	5.7	3.000	7.8	6.000	11.0	9.000	13.5	0.600	3.5	1.800	6.0	3.500	8.4	6.500	11.5	9.500	13.9
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)																																																																		
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0.600	3.5	1.800	6.0	3.500	8.4	6.500	11.5	9.500	13.9																																																																		
Hydro-Brake® Manhole: Parcel B6_2, DS/PN: 3.001, Volume (m³): 3.7																																																																											
Design Head (m) 0.800 Hydro-Brake® Type Md4 Invert Level (m) 4.800																																																																											
Design Flow (l/s) 5.0 Diameter (mm) 84																																																																											
<table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>2.6</td><td>0.800</td><td>4.9</td><td>2.000</td><td>7.8</td><td>4.000</td><td>11.0</td><td>7.000</td><td>14.5</td></tr><tr><td>0.200</td><td>4.0</td><td>1.000</td><td>5.5</td><td>2.200</td><td>8.2</td><td>4.500</td><td>11.7</td><td>7.500</td><td>15.1</td></tr><tr><td>0.300</td><td>3.4</td><td>1.200</td><td>6.0</td><td>2.400</td><td>8.5</td><td>5.000</td><td>12.3</td><td>8.000</td><td>15.6</td></tr><tr><td>0.400</td><td>3.5</td><td>1.400</td><td>6.5</td><td>2.600</td><td>8.9</td><td>5.500</td><td>12.9</td><td>8.500</td><td>16.0</td></tr><tr><td>0.500</td><td>3.9</td><td>1.600</td><td>7.0</td><td>3.000</td><td>9.5</td><td>6.000</td><td>13.5</td><td>9.000</td><td>16.5</td></tr><tr><td>0.600</td><td>4.3</td><td>1.800</td><td>7.4</td><td>3.500</td><td>10.3</td><td>6.500</td><td>14.0</td><td>9.500</td><td>16.9</td></tr></table>						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	2.6	0.800	4.9	2.000	7.8	4.000	11.0	7.000	14.5	0.200	4.0	1.000	5.5	2.200	8.2	4.500	11.7	7.500	15.1	0.300	3.4	1.200	6.0	2.400	8.5	5.000	12.3	8.000	15.6	0.400	3.5	1.400	6.5	2.600	8.9	5.500	12.9	8.500	16.0	0.500	3.9	1.600	7.0	3.000	9.5	6.000	13.5	9.000	16.5	0.600	4.3	1.800	7.4	3.500	10.3	6.500	14.0	9.500	16.9
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)																																																																		
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0.400	3.5	1.400	6.5	2.600	8.9	5.500	12.9	8.500	16.0																																																																		
0.500	3.9	1.600	7.0	3.000	9.5	6.000	13.5	9.000	16.5																																																																		
0.600	4.3	1.800	7.4	3.500	10.3	6.500	14.0	9.500	16.9																																																																		
Hydro-Brake® Manhole: Parcel B1&CH 2, DS/PN: 4.001, Volume (m³): 4.8																																																																											
Design Head (m) 1.000 Hydro-Brake® Type Md4 Invert Level (m) 4.135																																																																											
Design Flow (l/s) 10.0 Diameter (mm) 113																																																																											
<table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>3.3</td><td>0.800</td><td>8.9</td><td>2.000</td><td>14.1</td><td>4.000</td><td>19.9</td><td>7.000</td><td>26.3</td></tr><tr><td>0.200</td><td>8.2</td><td>1.000</td><td>10.0</td><td>2.200</td><td>14.8</td><td>4.500</td><td>21.1</td><td>7.500</td><td>27.3</td></tr><tr><td>0.300</td><td>8.0</td><td>1.200</td><td>10.9</td><td>2.400</td><td>15.4</td><td>5.000</td><td>22.2</td><td>8.000</td><td>28.1</td></tr><tr><td>0.400</td><td>7.1</td><td>1.400</td><td>11.8</td><td>2.600</td><td>16.0</td><td>5.500</td><td>23.3</td><td>8.500</td><td>29.0</td></tr><tr><td>0.500</td><td>7.2</td><td>1.600</td><td>12.6</td><td>3.000</td><td>17.2</td><td>6.000</td><td>24.4</td><td>9.000</td><td>29.9</td></tr><tr><td>0.600</td><td>7.8</td><td>1.800</td><td>13.3</td><td>3.500</td><td>18.6</td><td>6.500</td><td>25.4</td><td>9.500</td><td>30.7</td></tr></table>						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	3.3	0.800	8.9	2.000	14.1	4.000	19.9	7.000	26.3	0.200	8.2	1.000	10.0	2.200	14.8	4.500	21.1	7.500	27.3	0.300	8.0	1.200	10.9	2.400	15.4	5.000	22.2	8.000	28.1	0.400	7.1	1.400	11.8	2.600	16.0	5.500	23.3	8.500	29.0	0.500	7.2	1.600	12.6	3.000	17.2	6.000	24.4	9.000	29.9	0.600	7.8	1.800	13.3	3.500	18.6	6.500	25.4	9.500	30.7
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)																																																																		
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0.400	7.1	1.400	11.8	2.600	16.0	5.500	23.3	8.500	29.0																																																																		
0.500	7.2	1.600	12.6	3.000	17.2	6.000	24.4	9.000	29.9																																																																		
0.600	7.8	1.800	13.3	3.500	18.6	6.500	25.4	9.500	30.7																																																																		
Hydro-Brake® Manhole: Block B_2, DS/PN: 5.001, Volume (m³): 4.1																																																																											
Design Head (m) 1.000 Hydro-Brake® Type Md4 Invert Level (m) 3.905																																																																											
Design Flow (l/s) 5.0 Diameter (mm) 80																																																																											
<table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>2.4</td><td>0.800</td><td>4.5</td><td>2.000</td><td>7.1</td><td>4.000</td><td>10.0</td><td>7.000</td><td>13.2</td></tr><tr><td>0.200</td><td>3.5</td><td>1.000</td><td>5.0</td><td>2.200</td><td>7.4</td><td>4.500</td><td>10.6</td><td>7.500</td><td>13.7</td></tr><tr><td>0.300</td><td>3.0</td><td>1.200</td><td>5.5</td><td>2.400</td><td>7.7</td><td>5.000</td><td>11.2</td><td>8.000</td><td>14.1</td></tr><tr><td>0.400</td><td>3.2</td><td>1.400</td><td>5.9</td><td>2.600</td><td>8.0</td><td>5.500</td><td>11.7</td><td>8.500</td><td>14.5</td></tr><tr><td>0.500</td><td>3.5</td><td>1.600</td><td>6.3</td><td>3.000</td><td>8.6</td><td>6.000</td><td>12.2</td><td>9.000</td><td>15.0</td></tr><tr><td>0.600</td><td>3.9</td><td>1.800</td><td>6.7</td><td>3.500</td><td>9.3</td><td>6.500</td><td>12.7</td><td>9.500</td><td>15.4</td></tr></table>						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	2.4	0.800	4.5	2.000	7.1	4.000	10.0	7.000	13.2	0.200	3.5	1.000	5.0	2.200	7.4	4.500	10.6	7.500	13.7	0.300	3.0	1.200	5.5	2.400	7.7	5.000	11.2	8.000	14.1	0.400	3.2	1.400	5.9	2.600	8.0	5.500	11.7	8.500	14.5	0.500	3.5	1.600	6.3	3.000	8.6	6.000	12.2	9.000	15.0	0.600	3.9	1.800	6.7	3.500	9.3	6.500	12.7	9.500	15.4
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	2.4	0.800	4.5	2.000	7.1	4.000	10.0	7.000	13.2																																																																		
0.200	3.5	1.000	5.0	2.200	7.4	4.500	10.6	7.500	13.7																																																																		
0.300	3.0	1.200	5.5	2.400	7.7	5.000	11.2	8.000	14.1																																																																		
0.400	3.2	1.400	5.9	2.600	8.0	5.500	11.7	8.500	14.5																																																																		
0.500	3.5	1.600	6.3	3.000	8.6	6.000	12.2	9.000	15.0																																																																		
0.600	3.9	1.800	6.7	3.500	9.3	6.500	12.7	9.500	15.4																																																																		
Hydro-Brake® Manhole: BovisA_2, DS/PN: 6.001, Volume (m³): 3.9																																																																											
Design Head (m) 1.200 Hydro-Brake® Type Md5 SW Only Invert Level (m) 4.000																																																																											
Design Flow (l/s) 60.0 Diameter (mm) 293																																																																											
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<u>Hydro-Brake® Manhole: BovisA_2, DS/PN: 6.001, Volume (m³): 3.9</u>									
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	10.6	0.800	57.7	2.000	73.3	4.000	103.3	7.000	136.7
0.200	27.7	1.000	57.8	2.200	76.7	4.500	109.6	7.500	141.5
0.300	43.3	1.200	59.7	2.400	80.1	5.000	115.5	8.000	146.1
0.400	52.6	1.400	62.7	2.600	83.3	5.500	121.2	8.500	150.6
0.500	56.9	1.600	66.1	3.000	89.5	6.000	126.6	9.000	155.0
0.600	58.3	1.800	69.7	3.500	96.7	6.500	131.7	9.500	159.3
<u>Hydro-Brake® Manhole: BovisB_2, DS/PN: 7.001, Volume (m³): 3.7</u>									
Design Head (m) 1.200				Hydro-Brake® Type Md5 SW Only Invert Level (m) 3.225					
Design Flow (l/s) 60.0				Diameter (mm) 293					
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	10.6	0.800	57.7	2.000	73.3	4.000	103.3	7.000	136.7
0.200	27.7	1.000	57.8	2.200	76.7	4.500	109.6	7.500	141.5
0.300	43.3	1.200	59.7	2.400	80.1	5.000	115.5	8.000	146.1
0.400	52.6	1.400	62.7	2.600	83.3	5.500	121.2	8.500	150.6
0.500	56.9	1.600	66.1	3.000	89.5	6.000	126.6	9.000	155.0
0.600	58.3	1.800	69.7	3.500	96.7	6.500	131.7	9.500	159.3
<u>Hydro-Brake® Manhole: Ret Block A, DS/PN: 12.001, Volume (m³): 4.3</u>									
Design Head (m) 1.000				Hydro-Brake® Type Md4 Invert Level (m) 2.900					
Design Flow (l/s) 5.0				Diameter (mm) 80					
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	2.4	0.800	4.5	2.000	7.1	4.000	10.0	7.000	13.2
0.200	3.5	1.000	5.0	2.200	7.4	4.500	10.6	7.500	13.7
0.300	3.0	1.200	5.5	2.400	7.7	5.000	11.2	8.000	14.1
0.400	3.2	1.400	5.9	2.600	8.0	5.500	11.7	8.500	14.5
0.500	3.5	1.600	6.3	3.000	8.6	6.000	12.2	9.000	15.0
0.600	3.9	1.800	6.7	3.500	9.3	6.500	12.7	9.500	15.4
<u>Hydro-Brake® Manhole: Non resi, DS/PN: 25.001, Volume (m³): 7.7</u>									
Design Head (m) 1.000				Hydro-Brake® Type Md4 Invert Level (m) 3.720					
Design Flow (l/s) 5.0				Diameter (mm) 80					
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	2.4	0.800	4.5	2.000	7.1	4.000	10.0	7.000	13.2
0.200	3.5	1.000	5.0	2.200	7.4	4.500	10.6	7.500	13.7
0.300	3.0	1.200	5.5	2.400	7.7	5.000	11.2	8.000	14.1
0.400	3.2	1.400	5.9	2.600	8.0	5.500	11.7	8.500	14.5
0.500	3.5	1.600	6.3	3.000	8.6	6.000	12.2	9.000	15.0
0.600	3.9	1.800	6.7	3.500	9.3	6.500	12.7	9.500	15.4
<u>Hydro-Brake® Manhole: As-built SA8, DS/PN: 26.001, Volume (m³): 8.6</u>									
Design Head (m) 2.000				Hydro-Brake® Type Md4 Invert Level (m) 3.763					
Design Flow (l/s) 34.5				Diameter (mm) 176					
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	4.2	0.800	22.1	2.000	34.1	4.000	48.3	7.000	63.9
0.200	15.1	1.000	24.2	2.200	35.8	4.500	51.2	7.500	66.1
0.300	24.2	1.200	26.5	2.400	37.4	5.000	54.0	8.000	68.3
0.400	25.7	1.400	28.6	2.600	38.9	5.500	56.6	8.500	70.4
0.500	23.3	1.600	30.5	3.000	41.8	6.000	59.1	9.000	72.4
0.600	21.6	1.800	32.4	3.500	45.2	6.500	61.5	9.500	74.4
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Hydro-Brake® Manhole: SW Stub 02, DS/PN: 27.001, Volume (m³): 8.0									
Design Head (m) 1.000 Hydro-Brake® Type Md4 Invert Level (m) 3.640									
Design Flow (l/s) 5.0 Diameter (mm) 80									
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	2.4	0.800	4.5	2.000	7.1	4.000	10.0	7.000	13.2
0.200	3.5	1.000	5.0	2.200	7.4	4.500	10.6	7.500	13.7
0.300	3.0	1.200	5.5	2.400	7.7	5.000	11.2	8.000	14.1
0.400	3.2	1.400	5.9	2.600	8.0	5.500	11.7	8.500	14.5
0.500	3.5	1.600	6.3	3.000	8.6	6.000	12.2	9.000	15.0
0.600	3.9	1.800	6.7	3.500	9.3	6.500	12.7	9.500	15.4
Hydro-Brake® Manhole: Car Park, DS/PN: 32.001, Volume (m³): 2.8									
Design Head (m) 1.500 Hydro-Brake® Type Md4 Invert Level (m) 3.400									
Design Flow (l/s) 5.0 Diameter (mm) 72									
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	2.1	0.800	3.6	2.000	5.7	4.000	8.1	7.000	10.7
0.200	2.5	1.000	4.0	2.200	6.0	4.500	8.6	7.500	11.1
0.300	2.3	1.200	4.4	2.400	6.3	5.000	9.0	8.000	11.4
0.400	2.6	1.400	4.8	2.600	6.5	5.500	9.5	8.500	11.8
0.500	2.9	1.600	5.1	3.000	7.0	6.000	9.9	9.000	12.1
0.600	3.1	1.800	5.4	3.500	7.6	6.500	10.3	9.500	12.5
Hydro-Brake® Manhole: Stub SW9/1, DS/PN: 33.001, Volume (m³): 6.0									
Design Head (m) 1.000 Hydro-Brake® Type Md4 Invert Level (m) 2.600									
Design Flow (l/s) 5.0 Diameter (mm) 80									
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	2.4	0.800	4.5	2.000	7.1	4.000	10.0	7.000	13.2
0.200	3.5	1.000	5.0	2.200	7.4	4.500	10.6	7.500	13.7
0.300	3.0	1.200	5.5	2.400	7.7	5.000	11.2	8.000	14.1
0.400	3.2	1.400	5.9	2.600	8.0	5.500	11.7	8.500	14.5
0.500	3.5	1.600	6.3	3.000	8.6	6.000	12.2	9.000	15.0
0.600	3.9	1.800	6.7	3.500	9.3	6.500	12.7	9.500	15.4
Hydro-Brake® Manhole: Stub SW9/2, DS/PN: 35.001, Volume (m³): 6.3									
Design Head (m) 1.000 Hydro-Brake® Type Md4 Invert Level (m) 2.500									
Design Flow (l/s) 5.0 Diameter (mm) 80									
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	2.4	0.800	4.5	2.000	7.1	4.000	10.0	7.000	13.2
0.200	3.5	1.000	5.0	2.200	7.4	4.500	10.6	7.500	13.7
0.300	3.0	1.200	5.5	2.400	7.7	5.000	11.2	8.000	14.1
0.400	3.2	1.400	5.9	2.600	8.0	5.500	11.7	8.500	14.5
0.500	3.5	1.600	6.3	3.000	8.6	6.000	12.2	9.000	15.0
0.600	3.9	1.800	6.7	3.500	9.3	6.500	12.7	9.500	15.4
Hydro-Brake® Manhole: SW25, DS/PN: 1.018, Volume (m³): 10.9									
Design Head (m) 1.870 Hydro-Brake® Type Md10 Invert Level (m) 1.200									
Design Flow (l/s) 285.0 Diameter (mm) 386									
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	14.1	0.500	111.9	1.200	227.7	2.000	293.9	3.000	360.0
0.200	36.0	0.600	136.1	1.400	245.9	2.200	308.3	3.500	388.9
0.300	60.7	0.800	178.2	1.600	262.9	2.400	322.0	4.000	415.7
0.400	86.4	1.000	207.8	1.800	278.9	2.600	335.2	4.500	440.9
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<u>Hydro-Brake® Manhole: SW25, DS/PN: 1.018, Volume (m³): 10.9</u>									
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)
5.000	464.8	6.000	509.1	7.000	549.9	8.000	587.9	9.000	623.6
5.500	487.5	6.500	529.9	7.500	569.2	8.500	606.0	9.500	640.6

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XP Solutions	Network 2013.1																																	
Offline Controls for Storm Pipe Manhole: Ex. SB17, DS/PN: 5.002, Loop to PN: 30.000 <table><tr><td>Diameter (m)</td><td>0.225</td><td>Roughness k (mm)</td><td>0.600</td></tr><tr><td>Section Type</td><td>Pipe/Conduit</td><td>Entry Loss Coefficient</td><td>0.500</td></tr><tr><td>Slope (1:X)</td><td>40.0</td><td>Coefficient of Contraction</td><td>0.600</td></tr><tr><td>Length (m)</td><td>2.000</td><td>Upstream Invert Level (m)</td><td>3.800</td></tr></table> Pipe Manhole: SW01, G01&G02, DS/PN: 8.001, Loop to PN: None <table><tr><td>Diameter (m)</td><td>0.225</td><td>Roughness k (mm)</td><td>0.600</td></tr><tr><td>Section Type</td><td>Pipe/Conduit</td><td>Entry Loss Coefficient</td><td>0.500</td></tr><tr><td>Slope (1:X)</td><td>170.0</td><td>Coefficient of Contraction</td><td>0.600</td></tr><tr><td>Length (m)</td><td>17.000</td><td>Upstream Invert Level (m)</td><td>3.500</td></tr></table>			Diameter (m)	0.225	Roughness k (mm)	0.600	Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500	Slope (1:X)	40.0	Coefficient of Contraction	0.600	Length (m)	2.000	Upstream Invert Level (m)	3.800	Diameter (m)	0.225	Roughness k (mm)	0.600	Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500	Slope (1:X)	170.0	Coefficient of Contraction	0.600	Length (m)	17.000	Upstream Invert Level (m)	3.500
Diameter (m)	0.225	Roughness k (mm)	0.600																															
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500																															
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Diameter (m)	0.225	Roughness k (mm)	0.600																															
Section Type	Pipe/Conduit	Entry Loss Coefficient	0.500																															
Slope (1:X)	170.0	Coefficient of Contraction	0.600																															
Length (m)	17.000	Upstream Invert Level (m)	3.500																															
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<u>Storage Structures for Storm</u>								
<u>Cellular Storage Manhole: Parcel A2_1, DS/PN: 2.000</u>								
Invert Level (m) 5.200 Safety Factor 2.0								
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95								
Infiltration Coefficient Side (m/hr) 0.00000								
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	402.1	349.7	1.000	402.2	424.5	1.100	0.0	424.5
<u>Cellular Storage Manhole: Parcel B6_1, DS/PN: 3.000</u>								
Invert Level (m) 5.000 Safety Factor 2.0								
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95								
Infiltration Coefficient Side (m/hr) 0.00000								
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	92.0	80.0	1.000	92.0	128.0	1.100	0.0	128.0
<u>Cellular Storage Manhole: Parcel B1&CH_1, DS/PN: 4.000</u>								
Invert Level (m) 4.200 Safety Factor 2.0								
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95								
Infiltration Coefficient Side (m/hr) 0.00000								
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	345.0	300.0	1.000	345.0	380.0	1.100	0.0	380.0
<u>Cellular Storage Manhole: Block B_1, DS/PN: 5.000</u>								
Invert Level (m) 4.500 Safety Factor 2.0								
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95								
Infiltration Coefficient Side (m/hr) 0.00000								
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	310.5	270.0	1.000	310.5	344.0	1.100	0.0	344.0
<u>Cellular Storage Manhole: BovisA_1, DS/PN: 6.000</u>								
Invert Level (m) 4.100 Safety Factor 2.0								
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95								
Infiltration Coefficient Side (m/hr) 0.00000								
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	258.8	225.0	1.200	258.8	297.0	1.300	0.0	297.0
<u>Cellular Storage Manhole: BovisB_1, DS/PN: 7.000</u>								
Invert Level (m) 3.400 Safety Factor 2.0								
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95								
Infiltration Coefficient Side (m/hr) 0.00000								
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	258.8	225.0	1.200	258.8	297.0	1.300	0.0	297.0
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<u>Porous Car Park Manhole: Permbase 01, DS/PN: 8.002</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>6.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>48.0</td></tr><tr><td>Max Percolation (l/s)</td><td>80.0</td><td>Slope (1:X)</td><td>240.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>3.300</td><td>Cap Volume Depth (m)</td><td>0.460</td></tr></table> <u>Cellular Storage Manhole: Ret Block A, DS/PN: 12.000</u> <table><tr><td>Invert Level (m)</td><td>3.000</td><td>Safety Factor</td><td>2.0</td></tr><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Porosity</td><td>0.95</td></tr><tr><td>Infiltration Coefficient Side (m/hr)</td><td>0.00000</td><td></td><td></td></tr></table> <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. 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Area (m²)</th></tr><tr><td>0.000</td><td>517.5</td><td>450.0</td><td>1.000</td><td>517.5</td><td>560.0</td><td>1.100</td><td>0.0</td><td>560.0</td></tr></table> <u>Porous Car Park Manhole: Permbase 02, DS/PN: 14.002</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>8.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>29.0</td></tr><tr><td>Max Percolation (l/s)</td><td>64.4</td><td>Slope (1:X)</td><td>145.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>3.080</td><td>Cap Volume Depth (m)</td><td>0.460</td></tr></table> <u>Porous Car Park Manhole: Permbase 03, DS/PN: 1.015</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>6.8</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>30.0</td></tr><tr><td>Max Percolation (l/s)</td><td>56.7</td><td>Slope (1:X)</td><td>150.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>2.880</td><td>Cap Volume Depth (m)</td><td>0.460</td></tr></table> <u>Porous Car Park Manhole: Permbase 04, DS/PN: 19.002</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>6.8</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>42.0</td></tr><tr><td>Max Percolation (l/s)</td><td>79.3</td><td>Slope (1:X)</td><td>140.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>3.080</td><td>Cap Volume Depth (m)</td><td>0.460</td></tr></table> <u>Porous Car Park Manhole: Permbase 05, DS/PN: 19.004</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>18.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>18.0</td></tr><tr><td>Max Percolation (l/s)</td><td>90.0</td><td>Slope (1:X)</td><td>140.0</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Depression Storage (mm)</td><td>5</td></tr><tr><td>Porosity</td><td>0.30</td><td>Evaporation (mm/day)</td><td>3</td></tr><tr><td>Invert Level (m)</td><td>3.000</td><td>Cap Volume Depth (m)</td><td>0.460</td></tr></table> <u>Cellular Storage Manhole: Non resi, DS/PN: 25.000</u> <table><tr><td>Invert Level (m)</td><td>4.000</td><td>Safety Factor</td><td>2.0</td></tr><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Porosity</td><td>0.95</td></tr><tr><td>Infiltration Coefficient Side (m/hr)</td><td>0.00000</td><td></td><td></td></tr></table> <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. 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Area (m²)	0.000	517.5	450.0	1.000	517.5	560.0	1.100	0.0	560.0	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.0	Membrane Percolation (mm/hr)	1000	Length (m)	29.0	Max Percolation (l/s)	64.4	Slope (1:X)	145.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	3.080	Cap Volume Depth (m)	0.460	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.8	Membrane Percolation (mm/hr)	1000	Length (m)	30.0	Max Percolation (l/s)	56.7	Slope (1:X)	150.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	2.880	Cap Volume Depth (m)	0.460	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.8	Membrane Percolation (mm/hr)	1000	Length (m)	42.0	Max Percolation (l/s)	79.3	Slope (1:X)	140.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	3.080	Cap Volume Depth (m)	0.460	Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.0	Membrane Percolation (mm/hr)	1000	Length (m)	18.0	Max Percolation (l/s)	90.0	Slope (1:X)	140.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	3.000	Cap Volume Depth (m)	0.460	Invert Level (m)	4.000	Safety Factor	2.0	Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95	Infiltration Coefficient Side (m/hr)	0.00000			Depth (m)	Area (m²)	Inf. 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<u>Cellular Storage Manhole: Parcel A1, DS/PN: 26.000</u> Invert Level (m) 4.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>575.0</td><td>500.0</td><td>1.000</td><td>575.0</td><td>590.0</td><td>1.100</td><td>0.0</td><td>590.0</td></tr></table> <u>Cellular Storage Manhole: Non Resi, DS/PN: 27.000</u> Invert Level (m) 4.000 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>506.0</td><td>400.0</td><td>1.000</td><td>506.0</td><td>500.0</td><td>1.100</td><td>0.0</td><td>500.0</td></tr></table> <u>Porous Car Park Manhole: Car Park, DS/PN: 32.000</u> Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 50.0 Membrane Percolation (mm/hr) 1000 Length (m) 50.0 Max Percolation (l/s) 694.4 Slope (1:X) 0.0 Safety Factor 2.0 Depression Storage (mm) 5 Porosity 0.30 Evaporation (mm/day) 3 Invert Level (m) 4.500 Cap Volume Depth (m) 0.450 <u>Cellular Storage Manhole: Non Resi, DS/PN: 33.000</u> Invert Level (m) 2.700 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>506.0</td><td>400.0</td><td>1.000</td><td>506.0</td><td>500.0</td><td>1.100</td><td>0.0</td><td>500.0</td></tr></table> <u>Cellular Storage Manhole: Non Resi, DS/PN: 35.000</u> Invert Level (m) 2.700 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>126.5</td><td>110.0</td><td>1.000</td><td>126.5</td><td>152.0</td><td>1.100</td><td>0.0</td><td>152.0</td></tr></table> <u>Cellular Storage Manhole: SW21, DS/PN: 24.010</u> Invert Level (m) 1.710 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>1050.0</td><td>1050.0</td><td>1.500</td><td>1050.0</td><td>1263.0</td><td>1.600</td><td>0.0</td><td>1263.0</td></tr></table> <u>Porous Car Park Manhole: Permbase 06, DS/PN: 1.017</u> Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.30 Membrane Percolation (mm/hr) 1000 Invert Level (m) 2.880 Max Percolation (l/s) 71.1 Width (m) 16.0 Safety Factor 2.0 Length (m) 16.0			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	575.0	500.0	1.000	575.0	590.0	1.100	0.0	590.0	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	506.0	400.0	1.000	506.0	500.0	1.100	0.0	500.0	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	506.0	400.0	1.000	506.0	500.0	1.100	0.0	500.0	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	126.5	110.0	1.000	126.5	152.0	1.100	0.0	152.0	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	1050.0	1050.0	1.500	1050.0	1263.0	1.600	0.0	1263.0
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																				
0.000	575.0	500.0	1.000	575.0	590.0	1.100	0.0	590.0																																																																																				
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																				
0.000	506.0	400.0	1.000	506.0	500.0	1.100	0.0	500.0																																																																																				
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																				
0.000	506.0	400.0	1.000	506.0	500.0	1.100	0.0	500.0																																																																																				
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																				
0.000	126.5	110.0	1.000	126.5	152.0	1.100	0.0	152.0																																																																																				
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																				
0.000	1050.0	1050.0	1.500	1050.0	1263.0	1.600	0.0	1263.0																																																																																				
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Mayer Brown Ltd		Page 27
Lion House Oriental Road Woking GU22 8AR	Littlehampton Overall Surface Network West of Wetlands	
Date January 2018 File WEST CATCHMENT MODEL_...	Designed by S Foley Checked by	
XP Solutions	Network 2013.1	
<u>Porous Car Park Manhole: Permbase 06, DS/PN: 1.017</u> Slope (1:X) 53.0 Evaporation (mm/day) 3 Depression Storage (mm) 5 Cap Volume Depth (m) 0.460		
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APPENDIX F: Windes -- 1in100yr Simulation Results

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Lion House	Littlehampton							
Oriental Road	Overall Surface Network							
Woking GU22 8AR	West of Wetlands							
Date January 2018	Designed by S Foley							
File WEST CATCHMENT MODEL_...	Checked by							
XP Solutions	Network 2013.1							
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 Coefficient 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 2	Number of Time/Area Diagrams 0					
Number of Online Controls 14		Number of Storage Structures 20	Number of Real Time Controls 0					
Synthetic Rainfall Details								
Rainfall Model		FEH	D3 (1km) 0.407					
Site Location GB 502850 104400 TQ 02850 04400			E (1km) 0.314					
C (1km)		-0.027	F (1km) 2.329					
D1 (1km)		0.393	Cv (Summer) 0.750					
D2 (1km)		0.274	Cv (Winter) 0.840					
Margin for Flood Risk Warning (mm)		300.0						
Analysis Timestep		2.5 Second Increment (Extended)						
DTS Status		ON						
DVD Status		ON						
Inertia Status		ON						
Profile(s)		Winter						
Duration(s) (mins)		15, 30, 60, 120, 240, 360, 480, 960, 1440						
Return Period(s) (years)		100						
Climate Change (%)		30						
PN	Storm	Return Period	Climate Change	First X Surchage	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			3
1.001	15 Winter	100	+30%	100/15 Winter				
2.000	480 Winter	100	+30%	100/15 Winter				
2.001	480 Winter	100	+30%	100/15 Winter				
1.002	15 Winter	100	+30%	100/15 Winter				
3.000	60 Winter	100	+30%	100/15 Winter				
3.001	60 Winter	100	+30%	100/15 Winter				
1.003	15 Winter	100	+30%	100/15 Winter				
1.004	15 Winter	100	+30%	100/15 Winter	100/15 Winter			2
4.000	120 Winter	100	+30%	100/15 Winter				
4.001	120 Winter	100	+30%	100/15 Winter				
1.005	15 Winter	100	+30%	100/15 Winter				
1.006	15 Winter	100	+30%	100/15 Winter				
5.000	360 Winter	100	+30%	100/15 Winter				
5.001	240 Winter	100	+30%	100/15 Winter				
5.002	15 Winter	100	+30%	100/15 Winter		100/15 Winter		8
1.007	15 Winter	100	+30%	100/15 Winter				
6.000	30 Winter	100	+30%	100/15 Winter				
6.001	60 Winter	100	+30%	100/15 Winter				
1.008	15 Winter	100	+30%	100/15 Winter				
7.000	240 Winter	100	+30%	100/15 Winter				
7.001	240 Winter	100	+30%	100/15 Winter				
1.009	240 Winter	100	+30%	100/15 Winter				
8.000	15 Winter	100	+30%	100/15 Winter				
9.000	15 Winter	100	+30%	100/15 Winter				
8.001	30 Winter	100	+30%	100/15 Winter		100/15 Winter		8
8.002	30 Winter	100	+30%	100/15 Winter	100/15 Winter			5
10.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			4
10.001	15 Winter	100	+30%	100/15 Winter				
11.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			1
8.003	15 Winter	100	+30%	100/15 Winter				
1.010	240 Winter	100	+30%	100/15 Winter				
12.000	480 Winter	100	+30%	100/15 Winter				
12.001	480 Winter	100	+30%	100/15 Winter				
13.000	30 Winter	100	+30%	100/15 Winter				
1.011	240 Winter	100	+30%	100/15 Winter				
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Lion House	Littlehampton							
Oriental Road	Overall Surface Network							
Woking GU22 8AR	West of Wetlands							
Date January 2018	Designed by S Foley							
File WEST CATCHMENT MODEL_...	Checked by							
XP Solutions	Network 2013.1							
<u>Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>								
PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.012	240 Winter	100	+30%	100/15 Winter				
14.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			3
15.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			3
14.001	15 Winter	100	+30%	100/15 Winter				
14.002	240 Winter	100	+30%	100/15 Winter	100/15 Winter			5
16.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			2
17.000	15 Winter	100	+30%	100/15 Winter				
1.013	240 Winter	100	+30%	100/15 Winter				
18.000	15 Winter	100	+30%	100/15 Winter				
1.014	240 Winter	100	+30%	100/15 Winter	100/240 Winter			1
1.015	240 Winter	100	+30%	100/15 Winter	100/240 Winter			1
19.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			2
20.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			2
19.001	240 Winter	100	+30%	100/15 Winter				
19.002	240 Winter	100	+30%	100/15 Winter				
21.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			1
22.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			1
19.003	240 Winter	100	+30%	100/15 Winter				
19.004	240 Winter	100	+30%	100/15 Winter				
23.000	240 Winter	100	+30%	100/15 Winter				
24.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			3
25.000	480 Winter	100	+30%	100/30 Winter				
25.001	480 Winter	100	+30%	100/15 Winter	100/60 Winter			1
24.001	15 Winter	100	+30%	100/15 Winter	100/15 Winter			1
26.000	120 Winter	100	+30%	100/60 Winter				
26.001	120 Winter	100	+30%	100/15 Winter				
27.000	480 Winter	100	+30%	100/30 Winter				
27.001	960 Winter	100	+30%	100/15 Winter				
26.002	15 Winter	100	+30%	100/15 Winter	100/15 Winter			
24.002	15 Winter	100	+30%	100/15 Winter				
24.003	15 Winter	100	+30%	100/15 Winter				
28.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			3
28.001	15 Winter	100	+30%	100/15 Winter	100/15 Winter			
29.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			2
29.001	15 Winter	100	+30%	100/15 Winter				
24.004	15 Winter	100	+30%	100/15 Winter				
24.005	15 Winter	100	+30%	100/15 Winter				
30.000	15 Winter	100	+30%	100/15 Winter				
24.006	15 Winter	100	+30%	100/15 Winter				
24.007	15 Winter	100	+30%	100/15 Winter				
31.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			3
31.001	15 Winter	100	+30%	100/15 Winter				
24.008	240 Winter	100	+30%	100/15 Winter				
24.009	240 Winter	100	+30%	100/15 Winter				
32.000	360 Winter	100	+30%	100/15 Winter				
32.001	15 Winter	100	+30%	100/15 Winter	100/15 Winter			2
33.000	480 Winter	100	+30%	100/30 Winter				
33.001	480 Winter	100	+30%	100/15 Winter				
34.000	15 Winter	100	+30%	100/15 Winter	100/15 Winter			1
35.000	360 Winter	100	+30%	100/15 Winter				
35.001	360 Winter	100	+30%	100/15 Winter				
36.000	15 Winter	100	+30%	100/15 Winter				
33.002	15 Winter	100	+30%	100/15 Winter				
37.000	15 Winter	100	+30%	100/15 Winter				
37.001	15 Winter	100	+30%	100/15 Winter	100/15 Winter			3
37.002	15 Winter	100	+30%	100/15 Winter	100/15 Winter			1
37.003	240 Winter	100	+30%	100/15 Winter				
38.000	240 Winter	100	+30%	100/15 Winter				
33.003	240 Winter	100	+30%	100/15 Winter				
33.004	240 Winter	100	+30%	100/15 Winter				
24.010	240 Winter	100	+30%	100/15 Winter				
23.001	240 Winter	100	+30%	100/15 Winter				
39.000	240 Winter	100	+30%	100/15 Winter				
23.002	240 Winter	100	+30%	100/15 Winter				
1.016	240 Winter	100	+30%	100/15 Winter				
1.017	240 Winter	100	+30%	100/15 Winter				
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Oriental Road		Overall Surface Network						
Woking GU22 8AR		West of Wetlands						
Date January 2018		Designed by S Foley						
File WEST CATCHMENT MODEL_...		Checked by						
XP Solutions		Network 2013.1						
Summary of Critical Results by Maximum Level (Rank 1) for Storm								
PN	Storm	Return Period	Climate Change	First X Surchage	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
40.000	15 Winter	100	+30%	100/15 Winter				
40.001	240 Winter	100	+30%	100/15 Winter				
41.000	240 Winter	100	+30%	100/15 Winter				
1.018	240 Winter	100	+30%	100/15 Winter	100/240 Winter			
PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	TL SW01	6.398	0.328	18.461	1.15	0.0	73.6	FLOOD
1.001	TL SW03	6.707	1.438	0.000	1.09	0.0	73.1	FLOOD RISK
2.000	Parcel A2_1	6.080	0.580	0.000	0.05	0.0	5.1	SURCHARGED
2.001	Parcel A2_2	6.088	0.938	0.000	0.36	0.0	4.7	SURCHARGED
1.003	TL SW03	6.743	1.637	0.000	1.11	0.0	73.5	FLOOD RISK
3.000	Parcel B6_1	5.921	0.621	0.000	0.07	0.0	6.7	SURCHARGED
3.001	Parcel B6_2	5.915	0.965	0.000	0.45	0.0	5.8	SURCHARGED
1.003	TL SW04	6.669	1.734	0.000	1.05	0.0	72.8	FLOOD RISK
1.004	TL SW05	6.406	1.771	25.728	1.31	0.0	94.5	FLOOD
4.000	Parcel B1&CH_1	4.887	0.387	0.000	0.19	0.0	10.4	SURCHARGED
4.001	Parcel B1&CH_2	5.094	0.809	0.000	0.62	0.0	8.3	SURCHARGED
1.005	Ex. SB10	6.543	2.378	0.000	1.50	0.0	88.5	SURCHARGED
1.006	Ex. SB9	6.504	2.454	0.000	1.58	0.0	111.8	SURCHARGED
5.000	Block B_1	5.196	0.396	0.000	0.03	0.0	5.7	SURCHARGED
5.001	Block B_2	5.201	1.146	0.000	0.40	0.0	5.6	SURCHARGED
5.002	Ex. SB17	5.880	1.930	0.000	0.38	79.7	24.8	SURCHARGED
1.007	Ex. SB8	5.945	2.145	0.000	1.80	0.0	111.9	SURCHARGED
6.000	BovisA_1	4.992	0.517	0.000	0.49	0.0	57.8	SURCHARGED
6.001	BovisA_2	5.513	1.138	0.000	0.16	0.0	58.2	FLOOD RISK
1.008	Ex SB7	4.691	1.191	0.000	1.09	0.0	148.3	SURCHARGED
7.000	BovisB_1	4.370	0.595	0.000	0.28	0.0	44.1	FLOOD RISK
7.001	BovisB_2	4.357	0.757	0.000	0.17	0.0	44.4	FLOOD RISK
1.009	Bunny Node	4.700	1.008	0.000	1.03	0.0	132.9	SURCHARGED
8.000	Plots 123 - 126	4.047	0.742	0.000	2.13	0.0	18.7	FLOOD RISK
9.000	Plots 111 - 116	4.046	0.760	0.000	2.45	0.0	32.9	FLOOD RISK
8.001	SW01, G01&G02	3.809	0.584	0.000	1.74	57.7	40.1	FLOOD RISK
8.002	Permbase 01	3.854	0.609	3.836	0.43	0.0	13.8	FLOOD
10.000	Plots 117 - 122	4.067	0.752	17.542	1.19	0.0	19.2	FLOOD
10.001	Plot SW02/2	4.264	1.271	0.000	1.33	0.0	39.8	FLOOD RISK
11.000	Plots 101-110	4.404	1.179	1.328	1.69	0.0	53.2	FLOOD
8.003	SW02	4.294	1.239	0.000	2.40	0.0	64.2	FLOOD RISK
1.010	Ex SB6	4.192	1.117	0.000	0.78	0.0	148.6	SURCHARGED
12.000	Ret Block A	3.871	0.571	0.000	0.27	0.0	13.8	SURCHARGED
12.001	Ret Block A	4.138	1.088	0.000	0.27	0.0	4.9	SURCHARGED
13.000	Plots 95-100	4.149	0.924	0.000	0.72	0.0	32.5	SURCHARGED
1.011	SW03	4.077	1.157	0.000	0.71	0.0	155.0	FLOOD RISK
1.012	SW04	3.944	1.204	0.000	0.75	0.0	157.0	SURCHARGED
14.000	SW-FUT-01-PlotsN	4.016	1.066	18.424	1.87	0.0	25.4	FLOOD
15.000	SW-FUT-01-PlotsS	4.012	1.062	12.296	1.80	0.0	22.2	FLOOD
14.001	SW-FUT-01	3.944	1.084	0.000	1.72	0.0	119.5	FLOOD RISK
14.002	Permbase 02	3.824	1.104	23.596	0.50	0.0	32.3	FLOOD
15.000	Plots 80-88	4.106	1.406	6.112	1.74	0.0	44.3	FLOOD
17.000	Plots 87-94	3.951	1.124	0.000	0.98	0.0	76.2	SURCHARGED
1.013	SW05	3.816	1.216	0.000	1.12	0.0	208.6	SURCHARGED
18.000	CG Basiblock A	4.095	1.050	0.000	1.45	0.0	105.5	FLOOD RISK
1.014	SW06	3.704	1.264	1.343	1.34	0.0	224.7	FLOOD
1.015	Permbase 03	3.607	1.257	7.040	1.80	0.0	254.7	FLOOD
19.000	SW-FUT-02-PlotN	3.704	0.954	4.082	2.23	0.0	26.4	FLOOD
20.000	SW-FUT-02-Plots	3.706	0.956	6.079	2.50	0.0	28.4	FLOOD
19.001	SW-FUT-02	3.621	1.001	0.000	0.36	0.0	23.3	SURCHARGED
19.002	Permbase 04	3.609	1.134	0.000	0.39	0.0	23.7	SURCHARGED
21.000	Plots 60-73	3.900	1.150	0.166	4.03	0.0	44.2	FLOOD
22.000	Plots 74-78	3.901	1.151	1.462	2.73	0.0	43.9	FLOOD
19.003	SW07	3.604	1.204	0.000	0.96	0.0	53.2	FLOOD RISK
19.004	Permbase 05	3.596	1.241	0.000	0.93	0.0	53.7	FLOOD RISK
23.000	Plots 39-46	3.634	0.244	0.000	0.16	0.0	9.7	SURCHARGED
24.000	SW-LIN 01	5.063	1.093	22.944	1.74	0.0	52.6	FLOOD
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XP Solutions			Network 2013.1					
Summary of Critical Results by Maximum Level (Rank 1) for Storm								
PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
25.000	Non resi	4.915	0.465	0.000	0.07	0.0	16.5	FLOOD RISK
25.001	Non resi	5.200	1.255	0.018	0.14	0.0	4.9	FLOOD
24.001	SW-LYM 02	5.802	1.637	1.654	1.44	0.0	49.3	FLOOD
26.000	Parcel A1	4.498	0.048	0.000	0.12	0.0	26.9	SURCHARGED
26.001	As-built SA8	4.522	0.534	0.000	0.59	0.0	23.3	SURCHARGED
27.000	Non Resi	4.822	0.372	0.000	0.04	0.0	12.7	SURCHARGED
27.001	SW Stub 02	5.138	1.273	0.000	0.13	0.0	4.9	SURCHARGED
26.002	SW-LYM 03/1	5.824	2.029	0.007	0.78	0.0	33.6	FLOOD
24.002	SW-LYM 03	5.973	2.493	0.000	1.94	0.0	64.6	SURCHARGED
24.003	SW-LYM 04	6.151	2.666	0.000	1.05	0.0	65.9	SURCHARGED
28.000	SW-LYM 07	5.394	1.299	24.635	1.72	0.0	73.2	FLOOD
23.001	SW-LYM 08	6.116	2.221	0.103	1.22	0.0	74.7	FLOOD
29.000	SW-LYM 05A	7.590	0.090	20.019	0.98	0.0	138.1	FLOOD
29.001	SW-LYM 05	6.919	1.079	0.000	6.79	0.0	168.4	SURCHARGED
24.004	SW-LYM 10	6.214	2.849	0.000	1.63	0.0	212.0	SURCHARGED
24.005	SW-LYM11	5.862	2.732	0.000	1.78	0.0	325.9	FLOOD RISK
30.000	ExSB17_Dum Node	5.720	1.795	0.000	1.00	0.0	68.7	SURCHARGED
24.006	SW-LYM 12	5.393	2.423	0.000	1.56	0.0	266.5	SURCHARGED
24.007	SW-FUT-03	4.692	2.002	0.000	2.06	0.0	398.8	SURCHARGED
31.000	Stub SW18/1	4.324	1.599	23.582	2.23	0.0	74.1	FLOOD
31.001	SW18	4.173	1.568	0.000	2.45	0.0	85.6	SURCHARGED
24.008	SW19	3.823	1.403	0.000	0.95	0.0	220.2	SURCHARGED
24.009	SW20	3.650	1.408	0.000	1.07	0.0	218.8	SURCHARGED
32.000	Car Park	4.720	0.770	0.000	0.03	0.0	5.7	FLOOD RISK
32.001	Car Park	5.000	1.450	0.301	0.10	0.0	4.4	FLOOD
33.000	Non Resi	3.681	0.531	0.000	0.05	0.0	9.7	SURCHARGED
33.001	Stub SW9/1	3.893	1.068	0.000	0.12	0.0	4.6	SURCHARGED
34.000	SW08	4.901	1.126	0.650	0.61	0.0	57.5	FLOOD
35.000	Non Resi	3.870	0.720	0.000	0.02	0.0	4.9	SURCHARGED
35.001	Stub SW9/2	3.869	1.144	0.000	0.10	0.0	4.4	SURCHARGED
36.000	Plots 1 - 4	4.784	0.324	0.000	0.33	0.0	17.5	SURCHARGED
33.002	SW09	4.627	2.002	0.000	2.09	0.0	84.4	SURCHARGED
37.000	SW12	4.271	1.256	0.000	1.44	0.0	48.3	FLOOD RISK
37.001	SW13	4.037	1.132	17.216	1.61	0.0	63.3	FLOOD
37.002	SW14	4.029	1.195	0.246	1.45	0.0	66.6	FLOOD
37.003	SW15	3.802	1.332	0.000	0.50	0.0	31.2	SURCHARGED
38.000	Plots 16-22	3.794	0.204	0.000	0.13	0.0	8.2	SURCHARGED
33.003	SW16	3.783	1.383	0.000	0.43	0.0	57.1	SURCHARGED
33.004	SW17	3.727	1.457	0.000	0.34	0.0	56.6	SURCHARGED
24.010	SW21	3.640	1.080	0.000	0.36	0.0	218.3	SURCHARGED
23.001	SW22	3.631	1.101	0.000	0.26	0.0	219.8	SURCHARGED
39.000	Plots 47-55	3.608	0.883	0.000	0.78	0.0	18.0	SURCHARGED
23.002	SW23	3.615	1.220	0.000	0.29	0.0	219.6	FLOOD RISK
1.016	SW24	3.596	1.286	0.000	0.41	0.0	323.7	FLOOD RISK
1.017	Permbase 06	3.567	1.367	0.000	0.52	0.0	258.6	FLOOD RISK
40.000	Plots	3.561	0.966	0.000	0.92	0.0	36.7	FLOOD RISK
40.001	Stub SW25/1	3.541	1.326	0.000	1.58	0.0	19.3	FLOOD RISK
41.000	Stub SW25/2	3.528	1.263	0.000	0.79	0.0	19.6	FLOOD RISK
1.018	SW25	3.585	1.860	0.059	0.77	0.0	265.5	FLOOD

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<u>Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>								
<u>Simulation Criteria</u>								
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 Coefficient	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	2				
Number of Online Controls		14	Number of Storage Structures	20				
			Number of Time/Area Diagrams	0				
			Number of Real Time Controls	0				
<u>Synthetic Rainfall Details</u>								
Rainfall Model		FEH	D3 (1km)	0.407				
Site Location		GB 502850 104400 TQ 02850 04400	E (1km)	0.314				
C (1km)		-0.027	F (1km)	2.329				
D1 (1km)		0.393	Cv (Summer)	0.750				
D2 (1km)		0.274	Cv (Winter)	0.840				
Margin for Flood Risk Warning (mm)				300.0				
Analysis Timestep		2.5 Second	Increment (Extended)					
DTS Status				ON				
DVD Status				ON				
Inertia Status				ON				
Profile(s)		Winter						
Duration(s) (mins)		240						
Return Period(s) (years)		100						
Climate Change (%)		30						
PN	Storm	Return Period	Climate Change	First X Surchage	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	240 Winter	100	+30%					
1.001	240 Winter	100	+30%					
2.000	240 Winter	100	+30%	100/240 Winter				
2.001	240 Winter	100	+30%	100/240 Winter				
1.002	240 Winter	100	+30%					
3.000	240 Winter	100	+30%	100/240 Winter				
3.001	240 Winter	100	+30%	100/240 Winter				
1.003	240 Winter	100	+30%					
1.004	240 Winter	100	+30%	100/240 Winter				
4.000	240 Winter	100	+30%	100/240 Winter				
4.001	240 Winter	100	+30%	100/240 Winter				
1.005	240 Winter	100	+30%	100/240 Winter				
1.006	240 Winter	100	+30%	100/240 Winter				
5.000	240 Winter	100	+30%	100/240 Winter				
5.001	240 Winter	100	+30%	100/240 Winter				
5.002	240 Winter	100	+30%	100/240 Winter		100/240 Winter	1	
1.007	240 Winter	100	+30%	100/240 Winter				
6.000	240 Winter	100	+30%	100/240 Winter				
6.001	240 Winter	100	+30%	100/240 Winter				
1.008	240 Winter	100	+30%	100/240 Winter				
7.000	240 Winter	100	+30%	100/240 Winter				
7.001	240 Winter	100	+30%	100/240 Winter				
1.009	240 Winter	100	+30%	100/240 Winter				
8.000	240 Winter	100	+30%	100/240 Winter				
9.000	240 Winter	100	+30%	100/240 Winter				
8.001	240 Winter	100	+30%	100/240 Winter		100/240 Winter	1	
8.002	240 Winter	100	+30%	100/240 Winter	100/240 Winter			1
10.000	240 Winter	100	+30%	100/240 Winter	100/240 Winter			1
10.001	240 Winter	100	+30%	100/240 Winter				
11.000	240 Winter	100	+30%	100/240 Winter				
8.003	240 Winter	100	+30%	100/240 Winter				
1.010	240 Winter	100	+30%	100/240 Winter				
12.000	240 Winter	100	+30%	100/240 Winter				
12.001	240 Winter	100	+30%	100/240 Winter				
13.000	240 Winter	100	+30%	100/240 Winter				
1.011	240 Winter	100	+30%	100/240 Winter				

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Summary of Critical Results by Maximum Level (Rank 1) for Storm								
PN	Storm	Return Period	Climate Change	First X Surchage	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.012	240 Winter	100	+30%	100/240 Winter				
14.000	240 Winter	100	+30%	100/240 Winter				
15.000	240 Winter	100	+30%	100/240 Winter				
14.001	240 Winter	100	+30%	100/240 Winter				
14.002	240 Winter	100	+30%	100/240 Winter	100/240 Winter			1
16.000	240 Winter	100	+30%	100/240 Winter				
17.000	240 Winter	100	+30%	100/240 Winter				
1.013	240 Winter	100	+30%	100/240 Winter				
18.000	240 Winter	100	+30%	100/240 Winter				
1.014	240 Winter	100	+30%	100/240 Winter	100/240 Winter			1
1.015	240 Winter	100	+30%	100/240 Winter	100/240 Winter			1
19.000	240 Winter	100	+30%	100/240 Winter				
20.000	240 Winter	100	+30%	100/240 Winter				
19.001	240 Winter	100	+30%	100/240 Winter				
19.002	240 Winter	100	+30%	100/240 Winter				
21.000	240 Winter	100	+30%	100/240 Winter				
22.000	240 Winter	100	+30%	100/240 Winter				
19.003	240 Winter	100	+30%	100/240 Winter				
19.004	240 Winter	100	+30%	100/240 Winter				
23.000	240 Winter	100	+30%	100/240 Winter				
24.000	240 Winter	100	+30%	100/240 Winter				
25.000	240 Winter	100	+30%	100/240 Winter				
25.001	240 Winter	100	+30%	100/240 Winter				
24.001	240 Winter	100	+30%	100/240 Winter				
26.000	240 Winter	100	+30%	100/240 Winter				
26.001	240 Winter	100	+30%	100/240 Winter				
27.000	240 Winter	100	+30%	100/240 Winter				
27.001	240 Winter	100	+30%	100/240 Winter				
26.002	240 Winter	100	+30%	100/240 Winter				
24.002	240 Winter	100	+30%	100/240 Winter				
24.003	240 Winter	100	+30%	100/240 Winter				
28.000	240 Winter	100	+30%	100/240 Winter				
28.001	240 Winter	100	+30%	100/240 Winter				
29.000	240 Winter	100	+30%	100/240 Winter				
23.001	240 Winter	100	+30%	100/240 Winter				
24.004	240 Winter	100	+30%	100/240 Winter				
24.005	240 Winter	100	+30%	100/240 Winter				
30.000	240 Winter	100	+30%	100/240 Winter				
24.006	240 Winter	100	+30%	100/240 Winter				
24.007	240 Winter	100	+30%	100/240 Winter				
31.000	240 Winter	100	+30%	100/240 Winter				
31.001	240 Winter	100	+30%	100/240 Winter				
24.008	240 Winter	100	+30%	100/240 Winter				
24.009	240 Winter	100	+30%	100/240 Winter				
32.000	240 Winter	100	+30%	100/240 Winter				
32.001	240 Winter	100	+30%	100/240 Winter				
33.000	240 Winter	100	+30%	100/240 Winter				
33.001	240 Winter	100	+30%	100/240 Winter				
34.000	240 Winter	100	+30%	100/240 Winter				
35.000	240 Winter	100	+30%	100/240 Winter				
35.001	240 Winter	100	+30%	100/240 Winter				
36.000	240 Winter	100	+30%	100/240 Winter				
33.002	240 Winter	100	+30%	100/240 Winter				
37.000	240 Winter	100	+30%	100/240 Winter				
37.001	240 Winter	100	+30%	100/240 Winter				
37.002	240 Winter	100	+30%	100/240 Winter				
37.003	240 Winter	100	+30%	100/240 Winter				
38.000	240 Winter	100	+30%	100/240 Winter				
33.003	240 Winter	100	+30%	100/240 Winter				
33.004	240 Winter	100	+30%	100/240 Winter				
24.010	240 Winter	100	+30%	100/240 Winter				
23.001	240 Winter	100	+30%	100/240 Winter				
39.000	240 Winter	100	+30%	100/240 Winter				
23.002	240 Winter	100	+30%	100/240 Winter				
1.016	240 Winter	100	+30%	100/240 Winter				
1.017	240 Winter	100	+30%	100/240 Winter				
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Summary of Critical Results by Maximum Level (Rank 1) for Storm									
PN	Storm	Return Period	Climate Change	First X Surchage	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.	
40.000	240 Winter	100	+30%	100/240 Winter					
40.001	240 Winter	100	+30%	100/240 Winter					
41.000	240 Winter	100	+30%	100/240 Winter					
1.018	240 Winter	100	+30%	100/240 Winter	100/240 Winter				
PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status	
1.000	TL_SW01	5.238	-0.232	0.000	0.12	0.0	8.0	OK	
1.001	TL_SW02	5.007	-0.212	0.000	0.19	0.0	12.8	OK	
2.000	Parcel A2_1	6.014	0.514	0.000	0.04	0.0	4.9	SURCHARGED	
2.001	Parcel A2_2	6.023	0.873	0.000	0.35	0.0	4.5	SURCHARGED	
1.002	TL_SW03	4.874	-0.182	0.000	0.33	0.0	21.8	OK	
3.000	Parcel B6_1	5.865	0.565	0.000	0.06	0.0	6.0	SURCHARGED	
3.001	Parcel B6_2	5.867	0.917	0.000	0.44	0.0	5.7	SURCHARGED	
1.003	TL_SW04	4.778	-0.157	0.000	0.46	0.0	32.0	OK	
1.004	TL_SW05	4.709	0.074	0.000	0.67	0.0	48.4	SURCHARGED	
4.000	Parcel B1&CH_1	4.883	0.383	0.000	0.19	0.0	10.6	SURCHARGED	
4.001	Parcel B1&CH 2	5.000	0.715	0.000	0.62	0.0	8.3	SURCHARGED	
1.005	Ex. SB10	4.611	0.401	0.000	0.82	0.0	56.3	SURCHARGED	
1.006	Ex. SB9	4.521	0.451	0.000	0.93	0.0	66.1	SURCHARGED	
5.000	Block B_1	5.195	0.395	0.000	0.04	0.0	6.3	SURCHARGED	
5.001	Block B_2	5.201	1.146	0.000	0.40	0.0	5.6	SURCHARGED	
5.002	Ex. SB17	4.321	0.371	0.000	0.15	49.3	9.9	SURCHARGED	
1.007	Ex. SB8	4.396	0.596	0.000	0.99	0.0	61.7	SURCHARGED	
6.000	BovisA_1	4.644	0.169	0.000	0.46	0.0	54.7	SURCHARGED	
6.001	BovisA_2	4.609	0.234	0.000	0.15	0.0	53.5	SURCHARGED	
1.008	Ex SB7	4.322	0.822	0.000	0.81	0.0	110.6	SURCHARGED	
7.000	BovisB_1	4.370	0.595	0.000	0.28	0.0	44.1	FLOOD RISK	
7.001	BovisB_2	4.357	0.757	0.000	0.17	0.0	44.4	FLOOD RISK	
8.000	Plots 123 - 126	3.766	0.461	0.000	0.46	0.0	4.0	FLOOD RISK	
9.000	Plots 111 - 116	3.759	0.473	0.000	0.43	0.0	5.7	FLOOD RISK	
8.001	SW01, G01&G02	3.754	0.489	0.000	0.58	48.9	13.5	FLOOD RISK	
8.002	Permbase 01	3.850	0.605	0.367	0.47	0.0	14.9	FLOOD	
10.000	Plots 117 - 122	4.053	0.738	3.381	0.49	0.0	8.0	FLOOD	
10.001	Stub SW02/2	4.060	0.967	0.000	0.47	0.0	14.1	SURCHARGED	
11.000	Plots 101-110	4.063	0.838	0.000	0.41	0.0	14.5	SURCHARGED	
8.003	SW02	4.058	1.003	0.000	0.84	0.0	22.6	SURCHARGED	
1.010	Ex SB6	4.192	1.117	0.000	0.78	0.0	148.6	SURCHARGED	
12.000	Ret Block A	3.786	0.486	0.000	0.26	0.0	13.5	SURCHARGED	
12.001	Ret Block A	4.131	1.081	0.000	0.25	0.0	4.6	SURCHARGED	
13.000	Plots 95-100	4.080	0.855	0.000	0.23	0.0	10.4	SURCHARGED	
1.011	SW03	4.077	1.157	0.000	0.71	0.0	155.0	FLOOD RISK	
1.012	SW04	3.944	1.204	0.000	0.75	0.0	157.0	SURCHARGED	
14.000	SW-FUT-01-PlotsN	3.887	0.937	0.000	0.86	0.0	11.6	FLOOD RISK	
15.000	SW-FUT-01-PlotsS	3.877	0.927	0.000	0.75	0.0	9.3	FLOOD RISK	
14.001	SW-FUT-01	3.843	0.983	0.000	0.50	0.0	32.4	FLOOD RISK	
14.002	Permbase 02	3.824	1.104	23.596	0.50	0.0	32.3	FLOOD	
16.000	Plots 80-86	3.836	1.136	0.000	0.60	0.0	13.7	FLOOD RISK	
17.000	Plots 87-94	3.821	0.994	0.000	0.20	0.0	15.2	SURCHARGED	
1.013	SW05	3.816	1.216	0.000	1.12	0.0	208.6	SURCHARGED	
18.000	C2 Resiblock A	3.712	1.167	0.000	0.31	0.0	22.3	SURCHARGED	
1.014	SW06	3.704	1.264	0.000	1.34	0.0	224.7	FLOOD	
1.015	Permbase 03	3.607	1.257	7.040	1.80	0.0	254.7	FLOOD	
19.000	SW-FUT-02-PlotN	3.634	0.884	0.000	0.61	0.0	7.2	FLOOD RISK	
20.000	SW-FUT-02-Plots	3.638	0.888	0.000	0.70	0.0	8.0	FLOOD RISK	
19.001	SW-FUT-02	3.621	1.001	0.000	0.36	0.0	23.3	SURCHARGED	
19.002	Permbase 04	3.609	1.134	0.000	0.39	0.0	23.7	SURCHARGED	
21.000	Plots 73-78	3.611	0.861	0.000	1.07	0.0	11.8	FLOOD RISK	
22.000	Plots 74-78	3.613	0.863	0.000	0.87	0.0	13.9	FLOOD RISK	
19.003	SW07	3.604	1.204	0.000	0.96	0.0	53.2	FLOOD RISK	
19.004	Permbase 05	3.596	1.241	0.000	0.93	0.0	53.7	FLOOD RISK	
23.000	Plots 39-46	3.634	0.244	0.000	0.16	0.0	9.7	SURCHARGED	
24.000	SW-LYM 01	4.405	0.440	0.000	0.21	0.0	6.3	SURCHARGED	
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Summary of Critical Results by Maximum Level (Rank 1) for Storm								
PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
25.000	Non resi	4.849	0.399	0.000	0.10	0.0	23.9	SURCHARGED
25.001	Non resi	5.100	1.155	0.000	0.14	0.0	4.7	FLOOD RISK
24.001	SW-LYM 02	4.398	0.533	0.000	0.42	0.0	14.5	SURCHARGED
26.000	Parcel A1	4.486	0.036	0.000	0.12	0.0	26.4	SURCHARGED
26.001	As-built SA8	4.518	0.530	0.000	0.62	0.0	24.6	SURCHARGED
27.000	Non Resi	4.782	0.332	0.000	0.05	0.0	14.2	SURCHARGED
27.001	SW Stub 02	5.029	1.164	0.000	0.12	0.0	4.6	SURCHARGED
26.002	SW-LYM 03/1	4.387	0.592	0.000	0.68	0.0	29.4	SURCHARGED
24.002	SW-LYM 03	4.372	0.737	0.000	1.39	0.0	48.2	SURCHARGED
24.003	SW-LYM 04	4.339	0.814	0.000	0.79	0.0	49.2	SURCHARGED
28.000	SW-LYM 07	4.352	0.257	0.000	0.16	0.0	6.9	SURCHARGED
28.001	SW-LYM 08	4.344	0.449	0.000	0.31	0.0	19.0	SURCHARGED
29.000	SW-LYM 05A	7.306	-0.194	0.000	0.27	0.0	38.0	FLOOD RISK
29.001	SW-LYM 05	5.890	0.050	0.000	2.37	0.0	48.4	SURCHARGED
24.004	SW-LYM 10	4.316	0.951	0.000	0.82	0.0	107.2	SURCHARGED
24.005	SW-LYM11	4.201	1.071	0.000	0.73	0.0	133.3	SURCHARGED
30.000	ExSB17_Dum Node	4.250	0.325	0.000	0.72	0.0	49.6	SURCHARGED
24.006	SW-LYM 12	4.088	1.118	0.000	0.74	0.0	183.4	SURCHARGED
24.007	SW-FUT-03	3.939	1.249	0.000	0.96	0.0	186.8	SURCHARGED
31.000	Stub SW18/1	3.906	1.181	0.000	0.73	0.0	24.3	SURCHARGED
31.001	SW18	3.871	1.266	0.000	0.83	0.0	28.9	SURCHARGED
24.008	SW19	3.823	1.403	0.000	0.95	0.0	220.2	SURCHARGED
24.009	SW20	3.850	1.408	0.000	1.07	0.0	218.8	SURCHARGED
32.000	Car Park	4.718	0.768	0.000	0.03	0.0	5.7	FLOOD RISK
32.001	Car Park	4.755	1.205	0.000	0.11	0.0	4.6	FLOOD RISK
33.000	Non Resi	3.572	0.422	0.000	0.05	0.0	8.4	SURCHARGED
33.001	Stub SW9/1	3.762	0.937	0.000	0.11	0.0	4.2	SURCHARGED
34.000	SW08	3.816	0.041	0.000	0.12	0.0	11.6	SURCHARGED
35.000	Non Resi	3.758	0.608	0.000	0.02	0.0	4.6	SURCHARGED
35.001	Stub SW9/2	3.773	1.048	0.000	0.09	0.0	4.0	SURCHARGED
36.000	Plots 1 - 4	4.334	-0.126	0.000	0.06	0.0	3.3	OK
33.002	SW09	3.798	1.173	0.000	0.53	0.0	21.4	SURCHARGED
37.000	SW12	3.877	0.862	0.000	0.23	0.0	7.8	SURCHARGED
37.001	SW13	3.867	0.962	0.000	0.40	0.0	15.6	FLOOD RISK
37.002	SW14	3.846	1.021	0.000	0.51	0.0	23.4	FLOOD RISK
37.003	SW15	3.802	1.332	0.000	0.50	0.0	31.2	SURCHARGED
38.000	Plots 16-22	3.794	0.204	0.000	0.13	0.0	8.2	SURCHARGED
33.003	SW16	3.783	1.383	0.000	0.43	0.0	57.1	SURCHARGED
33.004	SW17	3.727	1.457	0.000	0.34	0.0	56.6	SURCHARGED
24.010	SW21	3.640	1.080	0.000	0.36	0.0	218.3	SURCHARGED
23.001	SW22	3.631	1.101	0.000	0.26	0.0	219.8	SURCHARGED
39.000	Plots 47-55	3.608	0.883	0.000	0.78	0.0	18.0	SURCHARGED
23.002	SW23	3.615	1.220	0.000	0.29	0.0	219.6	FLOOD RISK
1.016	SW24	3.596	1.286	0.000	0.41	0.0	323.7	FLOOD RISK
1.017	Permbase 06	3.567	1.367	0.000	0.52	0.0	258.6	FLOOD RISK
40.000	Plots	3.537	0.942	0.000	0.31	0.0	12.3	FLOOD RISK
40.001	Stub SW25/1	3.541	1.326	0.000	1.58	0.0	19.8	FLOOD RISK
41.000	Stub SW25/2	3.528	1.263	0.000	0.79	0.0	19.6	FLOOD RISK
1.018	SW25	3.585	1.860	0.059	0.77	0.0	265.5	FLOOD
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APPENDIX G: Windes -- 1in30yr & 1in1yr Simulation Results

Mayer Brown Ltd		Page 1						
Lion House	Littlehampton							
Oriental Road	Overall Surface Network							
Woking GU22 8AR	West of Wetlands							
Date January 2018	Designed by S Foley							
File WEST CATCHMENT MODEL_...	Checked by							
XP Solutions	Network 2013.1							
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 Coefficient 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 2 Number of Time/Area Diagrams 0								
Number of Online Controls 14 Number of Storage Structures 20 Number of Real Time Controls 0								
Synthetic Rainfall Details								
Rainfall Model FEH D3 (1km) 0.407								
Site Location GB 502850 104400 TQ 02850 04400 E (1km) 0.314								
C (1km) -0.027 F (1km) 2.329								
D1 (1km) 0.393 Cv (Summer) 0.750								
D2 (1km) 0.274 Cv (Winter) 0.840								
Margin for Flood Risk Warning (mm) 300.0								
Analysis Timestep 2.5 Second Increment (Extended)								
DTS Status ON								
DVD Status ON								
Inertia Status ON								
Profile(s)								
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440 Winter								
Return Period(s) (years) 30								
Climate Change (%) 0								
PN	Storm	Return Period	Climate Change	First X Surge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	30	0%					
1.001	15 Winter	30	0%	30/15 Winter				
2.000	480 Winter	30	0%	30/60 Winter				
2.001	480 Winter	30	0%	30/15 Winter				
1.002	15 Winter	30	0%	30/15 Winter				
3.000	120 Winter	30	0%	30/15 Winter				
3.001	120 Winter	30	0%	30/15 Winter				
1.003	15 Winter	30	0%	30/15 Winter				
1.004	15 Winter	30	0%	30/15 Winter				
4.000	120 Winter	30	0%	30/15 Winter				
4.001	120 Winter	30	0%	30/15 Winter				
1.005	15 Winter	30	0%	30/15 Winter				
1.006	15 Winter	30	0%	30/15 Winter				
5.000	240 Winter	30	0%	30/120 Winter				
5.001	240 Winter	30	0%	30/15 Winter				
5.002	15 Winter	30	0%	30/15 Winter		30/15 Winter	5	
1.007	15 Winter	30	0%	30/15 Winter				
6.000	30 Winter	30	0%					
6.001	30 Winter	30	0%	30/15 Winter				
1.008	15 Winter	30	0%	30/15 Winter				
7.000	30 Winter	30	0%	30/30 Winter				
7.001	30 Winter	30	0%	30/15 Winter				
1.009	15 Winter	30	0%	30/15 Winter				
8.000	15 Winter	30	0%	30/15 Winter				
9.000	15 Winter	30	0%	30/15 Winter				
8.001	30 Winter	30	0%	30/15 Winter		30/15 Winter	4	
8.002	30 Winter	30	0%	30/15 Winter				
10.000	15 Winter	30	0%	30/15 Winter				
10.001	15 Winter	30	0%	30/15 Winter				
11.000	15 Winter	30	0%	30/15 Winter				
8.003	15 Winter	30	0%	30/15 Winter				
1.010	30 Winter	30	0%	30/15 Winter				
12.000	480 Winter	30	0%	30/120 Winter				
12.001	480 Winter	30	0%	30/15 Winter				
13.000	30 Winter	30	0%	30/15 Winter				
1.011	30 Winter	30	0%	30/15 Winter				
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File WEST CATCHMENT MODEL_...		Checked by					
XP Solutions		Network 2013.1					
Summary of Critical Results by Maximum Level (Rank 1) for Storm							
PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act. Lvl Exc.
1.012	30 Winter	30	0%	30/15 Winter			
14.000	15 Winter	30	0%	30/15 Winter			
15.000	15 Winter	30	0%	30/15 Winter			
14.001	30 Winter	30	0%	30/15 Winter			
14.002	30 Winter	30	0%	30/15 Winter			
16.000	30 Winter	30	0%	30/15 Winter			
17.000	30 Winter	30	0%	30/15 Winter			
1.013	30 Winter	30	0%	30/15 Winter			
18.000	240 Winter	30	0%	30/15 Winter			
1.014	240 Winter	30	0%	30/15 Winter			
1.015	240 Winter	30	0%	30/15 Winter			
19.000	15 Winter	30	0%	30/15 Winter			
20.000	15 Winter	30	0%	30/15 Winter			
19.001	15 Winter	30	0%	30/15 Winter			
19.002	240 Winter	30	0%	30/15 Winter			
21.000	15 Winter	30	0%	30/15 Winter			
22.000	15 Winter	30	0%	30/15 Winter			
19.003	240 Winter	30	0%	30/15 Winter			
19.004	240 Winter	30	0%	30/15 Winter			
23.000	15 Winter	30	0%				
24.000	15 Winter	30	0%	30/15 Winter			
25.000	480 Winter	30	0%				
25.001	480 Winter	30	0%	30/15 Winter			
24.001	15 Winter	30	0%	30/15 Winter			
26.000	30 Winter	30	0%				
26.001	15 Winter	30	0%	30/15 Winter			
27.000	480 Winter	30	0%				
27.001	480 Winter	30	0%	30/15 Winter			
26.002	15 Winter	30	0%	30/15 Winter			
24.002	15 Winter	30	0%	30/15 Winter			
24.003	15 Winter	30	0%	30/15 Winter			
28.000	15 Winter	30	0%	30/15 Winter			
28.001	15 Winter	30	0%	30/15 Winter			
29.000	15 Winter	30	0%				
29.001	15 Winter	30	0%	30/15 Winter			
24.004	15 Winter	30	0%	30/15 Winter			
24.005	15 Winter	30	0%	30/15 Winter			
30.000	15 Winter	30	0%	30/15 Winter			
24.006	15 Winter	30	0%	30/15 Winter			
24.007	15 Winter	30	0%	30/15 Winter			
31.000	15 Winter	30	0%	30/15 Winter			
31.001	15 Winter	30	0%	30/15 Winter			
24.008	360 Winter	30	0%	30/15 Winter			
24.009	360 Winter	30	0%	30/15 Winter			
32.000	240 Winter	30	0%	30/15 Winter			
32.001	15 Winter	30	0%	30/15 Winter			
33.000	480 Winter	30	0%				
33.001	480 Winter	30	0%	30/15 Winter			
34.000	15 Winter	30	0%				
35.000	240 Winter	30	0%				
35.001	240 Winter	30	0%	30/15 Winter			
36.000	15 Winter	30	0%				
33.002	15 Winter	30	0%	30/15 Winter			
37.000	15 Winter	30	0%	30/15 Winter			
37.001	15 Winter	30	0%	30/15 Winter			
37.002	15 Winter	30	0%	30/15 Winter			
37.003	240 Winter	30	0%	30/15 Winter			
38.000	15 Winter	30	0%				
33.003	360 Winter	30	0%	30/15 Winter			
33.004	360 Winter	30	0%	30/15 Winter			
24.010	360 Winter	30	0%	30/60 Winter			
23.001	240 Winter	30	0%	30/60 Winter			
39.000	240 Winter	30	0%	30/15 Winter			
23.002	240 Winter	30	0%	30/15 Winter			
1.016	240 Winter	30	0%	30/15 Winter			
1.017	240 Winter	30	0%	30/15 Winter			
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File WEST CATCHMENT MODEL_...		Checked by						
XP Solutions		Network 2013.1						
Summary of Critical Results by Maximum Level (Rank 1) for Storm								
PN	Storm	Return Period	Climate Change	First X Surge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
40.000	240 Winter	30	0%	30/15 Winter				
40.001	240 Winter	30	0%	30/15 Winter				
41.000	240 Winter	30	0%	30/15 Winter				
1.018	240 Winter	30	0%	30/15 Winter				
PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	TL_SW01	5.302	-0.168	0.000	0.37	0.0	25.5	OK
1.001	TL_SW02	5.283	0.064	0.000	0.58	0.0	38.7	SURCHARGED
2.000	Parcel A2_1	5.636	0.136	0.000	0.03	0.0	3.9	SURCHARGED
2.001	Parcel A2_2	5.642	0.492	0.000	0.27	0.0	3.6	SURCHARGED
1.002	TL_SW03	5.275	0.219	0.000	0.73	0.0	47.9	SURCHARGED
3.000	Parcel B6_1	5.402	0.102	0.000	0.05	0.0	5.2	SURCHARGED
3.001	Parcel B6_2	5.405	0.455	0.000	0.33	0.0	4.2	SURCHARGED
1.003	TL_SW04	5.252	0.317	0.000	0.73	0.0	50.4	SURCHARGED
1.004	TL_SW05	5.179	0.535	0.000	1.05	0.0	74.3	SURCHARGED
4.000	Parcel B1&CH_1	4.496	-0.004	0.000	0.15	0.0	8.3	OK
4.001	Parcel B1&CH_2	4.476	0.191	0.000	0.61	0.0	8.2	SURCHARGED
1.005	Ex. SB16	4.791	0.581	0.000	1.85	0.0	71.5	SURCHARGED
1.006	Ex. SB7	4.604	0.564	0.000	1.17	0.0	33.0	SURCHARGED
5.000	Block B_1	4.815	0.015	0.000	0.04	0.0	6.3	SURCHARGED
5.001	Block B_2	4.811	0.756	0.000	0.34	0.0	4.7	SURCHARGED
5.002	Ex. SB17	4.137	0.187	0.000	0.32	58.6	21.1	SURCHARGED
1.007	Ex. SB8	4.238	0.438	0.000	1.16	0.0	71.9	SURCHARGED
6.000	BovisA_1	4.452	-0.023	0.000	0.45	0.0	53.6	OK
6.001	BovisA_2	4.411	0.036	0.000	0.14	0.0	52.6	SURCHARGED
1.008	Ex SB7	3.999	0.499	0.000	0.91	0.0	123.8	SURCHARGED
7.000	BovisB_1	3.805	0.030	0.000	0.31	0.0	48.7	SURCHARGED
7.001	BovisB_2	3.773	0.173	0.000	0.19	0.0	47.4	SURCHARGED
1.009	dummy node	3.622	0.447	0.000	1.26	0.0	162.2	SURCHARGED
8.000	Plots 123 - 126	3.701	0.896	0.000	1.31	0.0	11.5	SURCHARGED
9.000	Plots 111 - 116	3.657	0.371	0.000	1.22	0.0	16.4	SURCHARGED
8.001	SW01, G01&G02	3.611	0.346	0.000	1.41	16.9	32.0	FLOOD RISK
8.002	Permbase 01	3.613	0.368	0.000	0.75	0.0	23.8	FLOOD RISK
10.000	Plots 117 - 122	4.045	0.730	0.000	1.01	0.0	16.3	FLOOD RISK
10.001	Plot SW02/2	3.776	0.683	0.000	1.04	0.0	31.0	SURCHARGED
11.000	Plots 101-110	3.765	0.560	0.000	1.14	0.0	33.8	SURCHARGED
8.003	SW02	3.707	0.652	0.000	2.08	0.0	55.8	SURCHARGED
1.010	Ex SB6	3.593	0.518	0.000	0.97	0.0	184.0	SURCHARGED
12.000	Ret Block A	3.402	0.102	0.000	0.23	0.0	11.6	SURCHARGED
12.001	Ret Block A	3.594	0.544	0.000	0.20	0.0	3.6	SURCHARGED
13.000	Plots 95-100	3.487	0.262	0.000	0.39	0.0	17.7	SURCHARGED
1.011	SW03	3.480	0.560	0.000	0.85	0.0	187.3	SURCHARGED
1.012	SW04	3.347	0.607	0.000	0.89	0.0	187.8	SURCHARGED
14.000	SW-FUT-01-PlotsN	3.986	1.036	0.000	2.05	0.0	27.9	FLOOD RISK
15.000	SW-FUT-01-PlotsS	3.860	0.910	0.000	1.93	0.0	22.6	FLOOD RISK
14.001	SW-FUT-01	3.358	0.498	0.000	0.86	0.0	55.5	SURCHARGED
14.002	Permbase 02	3.272	0.552	0.000	0.67	0.0	43.3	SURCHARGED
16.000	Plots 80-86	3.338	0.638	0.000	0.91	0.0	20.8	SURCHARGED
17.000	Plots 87-94	3.233	0.406	0.000	0.34	0.0	26.4	SURCHARGED
1.013	SW05	3.226	0.520	0.000	1.28	0.0	158.3	SURCHARGED
18.000	C2 Resiblock A	3.053	0.508	0.000	0.22	0.0	15.8	SURCHARGED
1.014	SW06	3.040	0.600	0.000	1.17	0.0	197.3	SURCHARGED
1.015	Permbase 03	2.937	0.587	0.000	1.39	0.0	197.1	SURCHARGED
19.000	SW-FUT-02-PlotsN	3.152	0.402	0.000	1.28	0.0	15.2	SURCHARGED
20.000	SW-FUT-02-PlotsS	3.256	0.506	0.000	1.55	0.0	17.6	SURCHARGED
19.001	SW-FUT-02	2.938	0.318	0.000	0.75	0.0	48.9	SURCHARGED
19.002	Permbase 04	2.897	0.422	0.000	0.21	0.0	12.9	SURCHARGED
21.000	Plots 60-73	2.930	0.180	0.000	2.36	0.0	25.8	SURCHARGED
22.000	Plots 74-78	2.891	0.241	0.000	1.84	0.0	39.6	SURCHARGED
19.003	SW07	2.894	0.494	0.000	0.47	0.0	26.3	SURCHARGED
19.004	Permbase 05	2.892	0.537	0.000	0.46	0.0	26.7	SURCHARGED
23.000	Plots 39-46	3.313	-0.077	0.000	0.48	0.0	28.1	OK
24.000	SW-LYM 01	4.407	0.442	0.000	0.75	0.0	22.6	SURCHARGED
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Woking GU22 8AR		West of Wetlands						
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File WEST CATCHMENT MODEL_...		Checked by						
XP Solutions		Network 2013.1						
Summary of Critical Results by Maximum Level (Rank 1) for Storm								
PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
25.000	Non resi	4.414	-0.036	0.000	0.02	0.0	5.2	OK
25.001	Non resi	4.410	0.465	0.000	0.12	0.0	4.1	SURCHARGED
24.001	SW-LYM 02	4.401	0.536	0.000	0.88	0.0	30.2	SURCHARGED
26.000	Parcel A1	4.182	-0.268	0.000	0.13	0.0	28.9	OK
26.001	As-built SA8	4.178	0.190	0.000	0.62	0.0	24.8	SURCHARGED
27.000	Non Resi	4.403	-0.047	0.000	0.02	0.0	5.3	OK
27.001	SW Stub 02	4.417	0.552	0.000	0.12	0.0	4.3	SURCHARGED
26.002	SW-LYM 03/1	4.325	0.530	0.000	0.75	0.0	32.1	SURCHARGED
24.002	SW-LYM 03	4.377	0.892	0.000	1.49	0.0	49.7	SURCHARGED
24.003	SW-LYM 04	4.360	0.835	0.000	0.82	0.0	51.0	SURCHARGED
28.000	SW-LYM 07	4.417	0.322	0.000	0.56	0.0	23.9	SURCHARGED
28.001	SW-LYM 08	4.396	0.501	0.000	0.88	0.0	54.0	SURCHARGED
29.000	SW-LYM 05A	7.402	-0.098	0.000	0.77	0.0	107.9	FLOOD RISK
29.001	SW-LYM 05	6.347	0.507	0.000	5.20	0.0	129.0	SURCHARGED
24.004	SW-LYM 10	4.336	0.971	0.000	1.49	0.0	194.4	SURCHARGED
24.005	SW-LYM11	3.956	0.820	0.000	1.33	0.0	243.3	SURCHARGED
30.000	ExSB17_Dum Node	4.010	0.085	0.000	0.81	0.0	55.5	SURCHARGED
24.006	SW-LYM 12	3.742	0.772	0.000	1.13	0.0	269.5	SURCHARGED
24.007	SW-FUT-03	3.492	0.712	0.000	1.43	0.0	278.1	SURCHARGED
31.000	Stub SW18/1	3.709	0.984	0.000	1.35	0.0	61.8	SURCHARGED
31.001	SW18	3.410	0.805	0.000	2.05	0.0	71.5	SURCHARGED
24.008	SW19	3.013	0.593	0.000	0.38	0.0	89.0	SURCHARGED
24.009	SW20	2.873	0.588	0.000	0.43	0.0	88.3	SURCHARGED
32.000	Car Park	4.588	0.638	0.000	0.03	0.0	5.5	SURCHARGED
32.001	Car Park	4.709	1.159	0.000	0.10	0.0	4.3	FLOOD RISK
33.000	Non Resi	3.138	-0.012	0.000	0.02	0.0	4.2	OK
33.001	Stub SW9/1	3.143	0.318	0.000	0.09	0.0	3.6	SURCHARGED
34.000	SW08	3.643	-0.132	0.000	0.36	0.0	33.7	OK
35.000	Non Resi	3.067	-0.083	0.000	0.02	0.0	4.5	OK
35.001	Stub SW9/2	3.066	0.341	0.000	0.08	0.0	3.5	SURCHARGED
36.000	Plots 1 - 4	4.353	-0.107	0.000	0.18	0.0	9.5	OK
33.002	SW09	3.095	0.380	0.000	1.34	0.0	54.0	SURCHARGED
37.000	SW12	3.389	0.374	0.000	0.57	0.0	19.2	SURCHARGED
37.001	SW13	3.338	0.433	0.000	0.97	0.0	38.3	SURCHARGED
37.002	SW14	3.185	0.360	0.000	1.24	0.0	57.2	SURCHARGED
37.003	SW15	2.877	0.407	0.000	0.28	0.0	17.3	SURCHARGED
38.000	Plots 16-22	3.504	-0.086	0.000	0.38	0.0	23.9	OK
33.003	SW16	2.871	0.471	0.000	0.23	0.0	30.0	SURCHARGED
33.004	SW17	2.862	0.592	0.000	0.18	0.0	29.8	SURCHARGED
24.010	SW21	2.853	0.293	0.000	0.25	0.0	147.1	SURCHARGED
23.001	SW22	2.859	0.329	0.000	0.14	0.0	116.4	SURCHARGED
39.000	Plots 47-55	2.896	0.171	0.000	0.56	0.0	12.9	SURCHARGED
23.002	SW23	2.888	0.493	0.000	0.14	0.0	102.3	SURCHARGED
1.016	SW24	2.901	0.591	0.000	0.29	0.0	226.0	SURCHARGED
1.017	Permbase 06	2.888	0.688	0.000	0.43	0.0	215.8	SURCHARGED
40.000	Plots	2.864	0.269	0.000	0.27	0.0	10.7	SURCHARGED
40.001	Stub SW25/1	2.865	0.650	0.000	1.68	0.0	20.6	SURCHARGED
41.000	Stub SW25/2	2.887	0.622	0.000	0.61	0.0	15.2	SURCHARGED
1.018	SW25	2.880	1.155	0.000	0.60	0.0	207.4	SURCHARGED
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Lion House	Littlehampton	
Oriental Road	Overall Surface Network	
Woking GU22 8AR	West of Wetlands	
Date January 2018	Designed by S Foley	
File WEST CATCHMENT MODEL_...	Checked by	
XP Solutions	Network 2013.1	

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 Coefficient	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	2	Number of Time/Area Diagrams	0
Number of Online Controls	14	Number of Storage Structures	20	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.407
Site Location	GB 502850 104400 TQ 02850 04400	E (1km)	0.314
C (1km)	-0.027	F (1km)	2.329
D1 (1km)	0.393	Cv (Summer)	0.750
D2 (1km)	0.274	Cv (Winter)	0.840

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

Profile(s)

Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1
Climate Change (%)	0

PN	Storm	Return Period	Climate Change	First X Surchage	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	1	0%					
1.001	15 Winter	1	0%					
2.000	480 Winter	1	0%					
2.001	480 Winter	1	0%	1/15 Winter				
1.002	15 Winter	1	0%					
3.000	60 Winter	1	0%					
3.001	60 Winter	1	0%	1/15 Winter				
1.003	15 Winter	1	0%					
1.004	15 Winter	1	0%					
4.000	240 Winter	1	0%					
4.001	240 Winter	1	0%					
1.005	15 Winter	1	0%					
1.006	15 Winter	1	0%					
5.000	120 Winter	1	0%					
5.001	120 Winter	1	0%	1/15 Winter				
5.002	30 Winter	1	0%				0	
1.007	30 Winter	1	0%					
6.000	60 Winter	1	0%					
6.001	60 Winter	1	0%					
1.008	30 Winter	1	0%					
7.000	30 Winter	1	0%					
7.001	30 Winter	1	0%					
1.009	30 Winter	1	0%					
8.000	15 Winter	1	0%					
9.000	15 Winter	1	0%					
8.001	15 Winter	1	0%				0	
8.002	15 Winter	1	0%					
10.000	15 Winter	1	0%					
10.001	15 Winter	1	0%	1/15 Winter				
11.000	15 Winter	1	0%					
8.003	15 Winter	1	0%	1/15 Winter				
1.010	30 Winter	1	0%					
12.000	480 Winter	1	0%					
12.001	480 Winter	1	0%	1/60 Winter				
13.000	15 Winter	1	0%					
1.011	30 Winter	1	0%					

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XP Solutions		Network 2013.1					
Summary of Critical Results by Maximum Level (Rank 1) for Storm							
PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act. Lvl Exc.
1.012	480 Winter	1	0%				
14.000	15 Winter	1	0%				
15.000	15 Winter	1	0%				
14.001	15 Winter	1	0%				
14.002	15 Winter	1	0%				
16.000	15 Winter	1	0%				
17.000	15 Winter	1	0%				
1.013	480 Winter	1	0%				
18.000	480 Winter	1	0%				
1.014	480 Winter	1	0%	1/240 Winter			
1.015	480 Winter	1	0%	1/480 Winter			
19.000	15 Winter	1	0%				
20.000	15 Winter	1	0%				
19.001	15 Winter	1	0%				
19.002	480 Winter	1	0%				
21.000	15 Winter	1	0%				
22.000	15 Winter	1	0%				
19.003	480 Winter	1	0%				
19.004	480 Winter	1	0%				
23.000	15 Winter	1	0%				
24.000	15 Winter	1	0%				
25.000	360 Winter	1	0%				
25.001	360 Winter	1	0%	1/15 Winter			
24.001	15 Winter	1	0%				
26.000	120 Winter	1	0%				
26.001	120 Winter	1	0%				
27.000	360 Winter	1	0%				
27.001	360 Winter	1	0%	1/15 Winter			
26.002	120 Winter	1	0%				
24.002	120 Winter	1	0%				
24.003	15 Winter	1	0%				
28.000	15 Winter	1	0%				
28.001	15 Winter	1	0%				
29.000	15 Winter	1	0%				
29.001	15 Winter	1	0%	1/15 Winter			
24.004	15 Winter	1	0%				
24.005	15 Winter	1	0%				
30.000	480 Winter	1	0%				
24.006	15 Winter	1	0%				
24.007	15 Winter	1	0%				
31.000	15 Winter	1	0%				
31.001	15 Winter	1	0%				
24.008	480 Winter	1	0%	1/480 Winter			
24.009	480 Winter	1	0%	1/240 Winter			
32.000	240 Winter	1	0%	1/30 Winter			
32.001	240 Winter	1	0%	1/15 Winter			
33.000	480 Winter	1	0%				
33.001	480 Winter	1	0%	1/240 Winter			
34.000	15 Winter	1	0%				
35.000	60 Winter	1	0%				
35.001	60 Winter	1	0%	1/15 Winter			
36.000	15 Winter	1	0%				
33.002	15 Winter	1	0%				
37.000	15 Winter	1	0%				
37.001	15 Winter	1	0%				
37.002	15 Winter	1	0%				
37.003	480 Winter	1	0%				
38.000	15 Winter	1	0%				
33.003	480 Winter	1	0%	1/480 Winter			
33.004	480 Winter	1	0%	1/240 Winter			
24.010	480 Winter	1	0%				
23.001	480 Winter	1	0%				
39.000	15 Winter	1	0%				
23.002	480 Winter	1	0%				
1.016	480 Winter	1	0%				
1.017	480 Winter	1	0%				
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XP Solutions		Network 2013.1						
Summary of Critical Results by Maximum Level (Rank 1) for Storm								
PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
40.000	15 Winter	1	0%					
40.001	480 Winter	1	0%					
41.000	480 Winter	1	0%					
1.018	480 Winter	1	0%	1/15 Winter				

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Date January 2018		Designed by S Foley						
File WEST CATCHMENT MODEL_...		Checked by						
XP Solutions		Network 2013.1						
Summary of Critical Results by Maximum Level (Rank 1) for Storm								
PN	US/MH Name	Water Level (m)	Surch'd Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
25.000	Non resi	4.121	-0.329	0.000	0.02	0.0	4.7	OK
25.001	Non resi	4.120	0.175	0.000	0.10	0.0	3.5	SURCHARGED
24.001	SW-LYM 02	3.734	-0.131	0.000	0.35	0.0	12.1	OK
26.000	Parcel A1	4.068	-0.382	0.000	0.06	0.0	12.3	OK
26.001	As-built SA8	3.938	-0.050	0.000	0.31	0.0	12.2	OK
27.000	Non Resi	4.117	-0.333	0.000	0.02	0.0	5.0	OK
27.001	SW Stub 02	4.116	0.251	0.000	0.09	0.0	3.5	SURCHARGED
26.002	SW-LYM 03/1	3.664	-0.131	0.000	0.36	0.0	15.6	OK
24.002	SW-LYM 03	3.484	-0.091	0.000	0.66	0.0	22.0	OK
24.003	SW-LYM 04	3.351	-0.174	0.000	0.36	0.0	22.7	OK
28.000	SW-LYM 07	3.932	-0.163	0.000	0.17	0.0	7.3	OK
28.001	SW-LYM 08	3.748	-0.147	0.000	0.26	0.0	16.2	OK
29.000	SW-LYM 05A	7.299	-0.201	0.000	0.24	0.0	33.0	FLOOD RISK
29.001	SW-LYM 05	5.824	0.034	0.000	2.57	0.0	33.0	SURCHARGED
24.004	SW-LYM 10	3.197	-0.168	0.000	0.58	0.0	75.0	OK
24.005	SW-LYM11	2.908	-0.222	0.000	0.50	0.0	92.1	OK
30.000	ExSB17_Dum Node	3.700	-0.225	0.000	0.00	0.0	0.0	OK
24.006	SW-LYM 12	2.713	-0.257	0.000	0.38	0.0	94.0	OK
24.007	SW-FUT-03	2.464	-0.226	0.000	0.49	0.0	94.5	OK
31.000	Stub SW18/1	2.639	-0.086	0.000	0.68	0.0	22.6	OK
31.001	SW18	2.529	-0.076	0.000	0.77	0.0	26.8	OK
24.008	SW19	2.431	0.011	0.000	0.16	0.0	37.4	SURCHARGED
24.009	SW20	2.424	0.139	0.000	0.18	0.0	37.4	SURCHARGED
32.000	Car Park	4.508	0.558	0.000	0.03	0.0	5.4	SURCHARGED
32.001	Car Park	4.548	0.998	0.000	0.10	0.0	4.2	SURCHARGED
33.000	Non Resi	2.834	-0.316	0.000	0.03	0.0	4.5	OK
33.001	Stub SW9/1	2.835	0.010	0.000	0.08	0.0	3.3	SURCHARGED
34.000	SW08	3.599	-0.176	0.000	0.11	0.0	10.3	OK
35.000	Non Resi	2.784	-0.366	0.000	0.02	0.0	5.8	OK
35.001	Stub SW9/2	2.783	0.058	0.000	0.08	0.0	3.4	SURCHARGED
36.000	Plots 1 - 4	4.333	-0.127	0.000	0.05	0.0	2.9	OK
33.002	SW09	2.519	-0.106	0.000	0.54	0.0	21.6	OK
37.000	SW12	2.863	-0.152	0.000	0.22	0.0	7.5	OK
37.001	SW13	2.777	-0.128	0.000	0.38	0.0	14.9	OK
37.002	SW14	2.710	-0.115	0.000	0.47	0.0	21.5	OK
37.003	SW15	2.427	-0.043	0.000	0.08	0.0	4.8	OK
38.000	Plots 16-22	3.474	-0.116	0.000	0.12	0.0	7.3	OK
33.003	SW16	2.426	0.026	0.000	0.12	0.0	15.3	SURCHARGED
33.004	SW17	2.422	0.152	0.000	0.09	0.0	15.1	SURCHARGED
24.010	SW21	2.419	-0.141	0.000	0.16	0.0	97.5	OK
23.001	SW22	2.407	-0.123	0.000	0.12	0.0	97.5	OK
39.000	Plots 47-55	2.596	-0.129	0.000	0.37	0.0	8.5	OK
23.002	SW23	2.367	-0.028	0.000	0.15	0.0	112.4	OK
1.016	SW24	2.310	0.000	0.000	0.22	0.0	171.6	OK
1.017	Permbase 06	2.200	0.000	0.000	0.34	0.0	169.0	OK
40.000	Plots	2.428	-0.167	0.000	0.15	0.0	5.9	OK
40.001	Stub SW25/1	2.174	-0.041	0.000	0.16	0.0	2.0	OK
41.000	Stub SW25/2	2.174	-0.091	0.000	0.06	0.0	1.6	OK
1.018	SW25	2.171	0.446	0.000	0.49	0.0	167.5	SURCHARGED
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APPENDIX H: Pre-Demolition Drainage



NOTES

1. Do not scale.

KEY



Western Area - Former Toddington Nursery. Outfalls to northern floodplain area via pipe connection and overland flow mechanisms.



Central West - former Holland Nursery, discharge to Toddington Ditch.



Central East Area. Outfall to Toddington Ditch.



Eastern Area - Former Zuider Zee Nursery. Discharge to existing lake and Norway Ditch.



Rev.	Description	Date	Chkd
 Glanville Cornerstone House 82 Foxhall Road, Didcot Oxon, OX11 7AD Tel: (01235) 515550 Fax: (01235) 817799 pres@glanvillegroup.com www.glanvillegroup.com			
Client : Persimmon Homes			
Project : North Littlehampton			
Title : Illustrative Existing Surface Water Regime			
Project Engineer : S. Hudson		Scale : 1:2000	
Project Director : K. Rayner		Date : September 2014	
Status : Preliminary			
Drawing No. 8140927/107		Rev	

Appendix F
Drainage Survey Record Drawings



TODDLINGTON LANE, LITTLEHAMPTON, WEST SUSSEX
DRAINAGE SURVEY
Date: 15th February 2015
Job No: 20644

Notes:
1. This drainage survey has been carried out with a view to providing a plan of the drainage system for the site. It is not intended to provide a plan of the site for other purposes.
2. The survey has been carried out in accordance with the requirements of the Water Resources Act 1991 and the Environment Act 1995.
3. The survey has been carried out in accordance with the requirements of the Water Resources Act 1991 and the Environment Act 1995.
4. The survey has been carried out in accordance with the requirements of the Water Resources Act 1991 and the Environment Act 1995.

Notes:

1. This drainage survey has been carried out with a view to providing a plan of the drainage system for the site. It is not intended to provide a plan of the site for other purposes.
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3. The survey has been carried out in accordance with the requirements of the Water Resources Act 1991 and the Environment Act 1995.
4. The survey has been carried out in accordance with the requirements of the Water Resources Act 1991 and the Environment Act 1995.

LEGEND

Symbol	Description
[Symbol]	Manhole
[Symbol]	Gully
[Symbol]	Pipe
[Symbol]	Valve
[Symbol]	Watercourse
[Symbol]	Boundary
[Symbol]	Building
[Symbol]	Tree
[Symbol]	Other

Scale

0m 5m 10m 15m 20m 25m 30m 35m 40m 45m 50m

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PERSIMMON

Toddlington Lane
Littlehampton
West Sussex

Drainage Survey

Scale	Sheet No.	Sheet Name	Date
1:200	AJ	1	February 2015

Project No.	Client	Survey No.	Approval No.
20644	-	DP	NS