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Drainage Technical Note

Burgess Hill Phase 1C

For

Hill Group Ltd & Homes England

Project Ref: 7714
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Consulting Structural and Civil Engineers

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Appendices

1.0 Introduction and General Comments

1.1 This technical note has been prepared in support of a Reserved matters application to be submitted to Mid Sussex District Council (MSDC) by Hill Group Ltd and Homes England pursuant to Condition 2 attached to outline application HDC Ref. DM18/5144 as amended by (MSDC Ref DM/21/3279, dated 09/12/2022) to consider access, appearance, landscaping, layout and scale for parcels 1.7, 1.7b and 1.8 comprising:

a) Eastern Neighbourhood Centre: 270 residential dwellings, including 60 extra care units; commercial floorspace; the community building, the neighbourhood square, cycle and pedestrian connections, parking and associated infrastructure.

b) Eastern Parkland comprising 18 hectares of open space incorporating the multi-use games areas (MUGA), public art, green circle cycle link and associated infrastructure.

1.2 The site forms a parcel of the wider Northern Arc (Brookleigh) strategic allocation within Burgess Hill, which is of sub-regional importance. Phase 1C is situated on the eastern site of the wider strategic site, to the north east of the A273. This phase includes the sub-phases P1.7 and P1.8, OS 1.2 and EP (Eastern Park) totalling circa. 18 ha. The existing built form of Burgess Hill is to the south with the town centre circa 1km away. The site currently comprises mainly arable and grassland with areas of woodland.

1.3 The drainage principles set out below have been designed in line with the approved Regional Surface Water Masterplan produced by AECOM in February 2021 (Ref-60610807-ACM-XX-XX-RP-DR-10002). The parcels included in this report are covered by Drainage Area 9 (Catchment boundaries 9.3, 9.4 and 9.5) in section 12 of the AECOM Report. The regional Sustainable Drainage System (SuDS) layouts for these Drainage Areas are presented in the AECOM Regional SuDS Layout Ref 60610807-ACM-09-XX -DR-DR-200094 – 98.

1.4 This note sets out the proposals to manage the foul and surface water drainage as part of the proposed development, in accordance with Condition 22, 24, 26, 27 and 29 set out below:

Condition 22

Prior to the commencement of development within each reserved matters area, the proposed method of surface water drainage and means of disposal for that reserved matters area shall be submitted to and agreed in writing by the LPA. The surface water drainage design for each reserved matters area should follow the principles agreed as part of the regional surface water drainage masterplan as approved by condition 21 and no dwelling or building in that reserved matters area shall be occupied until all drainage works have been carried out for that reserved matters area in accordance with the approved details. The details shall be based on sustainable drainage (SuDS) principles including source control and shall;

a) include a timetable for the implementation of the surface water drainage design and a management and maintenance plan for the lifetime of the development which shall include arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime.

b) demonstrate that the surface water drainage system will be able to cater for a 1 in 100 year storm event + 40% climate change and that the discharge rates from that phase or phases meets the principles set out in the Drainage Strategy Calculations Summary Tables document produced by AECOM as Appendix C of their Outline Planning Application Environmental Statement Addendum Chapter 7: Water Resources, Flood Risk & Drainage 7.1 Water Resources Consultation;

c) include flood flow routing plans for that phase showing the effect of the development on fluvial (river) and pluvial (surface water and ordinary watercourse) flows and how that phase will deal with exceedance flows either generated on site and/or arriving from adjacent phases of the development;

d) provide plans, design specifications and calculations for all surface water drainage systems.

Reason: To ensure an acceptable impact on the existing public sewer network as well as to ensure the proposal is acceptable in relation to flood risk and to accord with Policy DP41 of the Mid Sussex District Plan.

Condition 24

Prior to the commencement of development within each reserved matters area, the proposed method of foul drainage and means of disposal for that reserved matters area shall be submitted to and agreed in writing by the LPA in conjunction with the relevant sewerage authority. The foul water drainage design for each reserved matters area should follow the principles agreed as part of the foul water masterplan scheme. No dwelling or building in that reserved matters area shall be occupied until all drainage works have been carried out for that reserved matters area in accordance with the approved details. The details shall include a timetable for its implementation and a management plan for the lifetime of the development which shall include arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime. Reason: To ensure an acceptable impact on the existing public sewer network and to accord with Policy DP41 of the Mid Sussex District Plan.

Condition 26

For each relevant reserved matters application (relevance to be determined in accordance with confirmation sought from the local planning authority), detailed plans shall be submitted to and approved in writing by the LPA at the relevant reserved matters stage showing the approved modelled fluvial + climate change flood extent (with any buffers) and surface water flood extent (with any buffers) in relation to the proposed development layout for that reserved matters area, including amenity space and drainage infrastructure that will be utilised by that reserved matters area. Such plans should demonstrate that buildings within the reserved matters area will not be at risk of flooding and that surface water flood flow routes will be maintained or accommodated within the layout of that reserved matters area. Historic flood extents should also be included within these details. The development of each reserved matters area subject to the requirements of this condition shall then proceed in accordance with the information submitted to and approved by the local planning authority.

Condition 27

Prior to the development of each reserved matters area, details of watercourses, ponds and any other natural water bodies (existing and proposed) for that reserved matters area shall be submitted to and approved in writing by the LPA in conjunction with the Environment Agency. The submitted details shall include:

• a minimum 8m buffer zone from top of the river bank for all Main Rivers and a minimum 5m buffer zone from top of the watercourse bank for Ordinary Watercourses;
• information about any ponds that are to be removed from any reserved matters area and the consequences of removal of any pond in terms of flood risk;
• evidence of how ordinary watercourses and natural ponds are to be preserved and details of any crossings that are necessary for the provision of infrastructure.

Condition 29

No development shall take place within each reserved matters area where the River Adur is located until mitigation/enhancement plans for the River Adur within that reserved matters area have been submitted to, and agreed in writing by, the local planning authority and implemented as approved. Thereafter, the development within that reserved matters area shall be implemented in accordance with the approved scheme.

2.0 Surface Water Drainage and SuDS Methology

2.1 In line with CIRIA guidance C753 (The SuDS manual), the drainage hierarchy needs to be considered and is listed below in order of preference:

• Store rainwater for later use;

• Use infiltration techniques, such as porous surfaces in non-clay areas;

• Attenuate rainwater by storing in tanks or sealed water features for gradual release to a watercourse;

• Discharge rainwater direct to a watercourse;

• Discharge rainwater to a surface water drain; and

• Discharge rainwater to the combined sewer.

Store rainwater for later use

2.2 For the purposes of the strategy, it has been determined the use of rainwater storage and source control will not be utilised for the hydraulic design given these will be privately conveyed and therefore not reliable to form part of strategy for the design life of the development. The potential to reuse a percentage of the rainwater from the site could be explored further during detailed design, in particular through the use of water butts. This assessment considers the worst-case runoff rates and assumes this option is not viable.

Use of infiltration techniques, such as porous surfaces

2.3 The Regional Surface Water Masterplan (RSWM) report produced by AECOM determined infiltration was unlikely to be viable at the site and restricted discharge to local watercourses would be the preferred method for managing surface water runoff.

2.4 AECOM carried out further geotechnical investigation (ref: 60578790 Ground Investigation Report Rev 2) for the nearby Freek's Farm & Maple Drive development and through fieldwork the presence of clay strata throughout the subsurface conditions was encountered. This was a mixture of clay topsoil, reengineered clay, natural made ground and cohesive made ground, with stiff natural clay encountered at the base of all boreholes. With this it has been deemed that infiltration is not suitable for this scheme.

Discharge to local watercourse

2.5 There are a number of existing watercourses in the vicinity of the site and from a review of the local topography, it can be seen that this phase generally falls eastwards towards the River Adur. The development drainage strategy will be based upon discharge to the existing watercourse, limited to existing greenfield run-off rates. This follows the same principles set out within the approved AECOM report.

2.6 The River Adur is located to the Eastern boundary of all Parcels in this Phase. No development is located within the 8m buffer zone or within approved modelled fluvial extent. The drainage plans contained within **Appendix 1** illustrate the flood extent for the 1 in100 year event plus 105% allowance for climate change fluvial flood event.

2.7 **Table 2-1** below appraises the constraints and opportunities for the use of SuDS techniques within the site and it adopts the management train approach outlined in CIRIA C753 'The SuDS Manual'.

Table 2-1 - SuDS Components – Management Train Approach

SUDS TYPE	Viability	Comments
Swales (shallow grass ditches)	✓	Where site constraints allow swales will be used for conveyance and to improve quality of surface water run off. They will also be utilised within the detention basin as a low flow channel to further improve water quality
Infiltration devices	X	Soil conditions preclude the use of infiltration systems
Porous surfacing	✓	Ground conditions are generally not suitable for infiltration. Site levels and gradients also preclude the suitability of permeable paving. There is potential for a tanked permeable paving system to some areas of the northern parcel to improve run off and provide attenuation.
Attenuation basins and treatment ponds	✓	Basins will be used to store water prior to discharging into the nearby watercourses and to provide additional treatment of the surface water runoff.
On site storage	✓	Underground storage proposed in the form of geo-cellular crates
Green/Brown Roofs	✓	Green roofs proposed on flat roof areas where appropriate.

Proposed SuDS Strategy

2.8 After consideration of the CIRIA C753 management train approach, the most viable SuDS options for the site are detention basins, with low flow channels (swales) in order to provide appropriate water quality treatment prior to discharge to the nearby watercourses, along with permeable paving where falls permit and green roofs where appropriate.

Catchment Boundary 9.3

Storage Requirements – Drainage Sub Phase 1.7&1.8

2.9 AECOM drawings 60610807-ACM-09-XX-DR-DR-200094-5 & 60610807-ACM-09-XX-DR-DR-500196 shows a Hydrobrake restricting flows to 14l/s for DA 9.3 with additional flows being accommodated from parcels E2 to the west of Isaacs Lane. The approved drainage design strategy proposes on-plot attenuation for all development plots in this network due to site constraints. There is one regional SuDS feature present in this network; water quality pond WQ03 just upstream of the outfall to the River Adur.

Surface Water Strategy

2.10 A piped surface water network has been designed to convey run-off within the development parcels and will be offered to Southern Water for adoption up to the headwall of any detention basin or attenuation pond. Storage will be provided on-plot within cellular storage tanks and permeable paving. Any swales or ponds will be utilised for conveyance and treatment of run-off and will either be adopted by MSDC or maintained by a Management Company.

2.11 Sediment forebays at the inlets to basins and ponds will be incorporated to ensure that the basin provides the necessary treatment prior to discharge into the stream.

2.12 The attenuation tanks and permeable paving systems within the parcels have been designed to provide storage for events up to the critical 1 in 100 year storm event, plus a 40% allowance for climate change. A factor of 4.6% urban creep has been applied to the impermeable area for the residential development and 2% for the commercial areas as outlined within the approved AECOM RSWM report and is therefore considered suitable. Discharge rates have been restricted to greenfield rates based on the calculations provided in **Appendix 4**. These differ slightly from the rates estimated within the AECOM RSWM due to changes in impermeable areas as outlined in **Table 2-2** below. The estimated rates from the AECOM RSWM for plot E2 have been used and included in the discharge rates quoted below.

Table 2-2 Proposed Discharge Rates

Development Area	AECOM RSWM greenfield 1 in 1yr rate l/s	AECOM RSWM greenfield 1 in 100yr rate (Qbar) l/s	Adjusted greenfield run off rate 1 in 1 yr l/s	Adjusted greenfield run off rate 1 in 100yr l/s
9.3 Northern Parcel	19.7	22.1	13.7	15.3

Stages of treatment

2.13 The use of regional water quality pond WQ03 as shown on drawing No 60610807-ACM-09-XX-DR-DR-310030 of the outline approval provides benefits in terms of water quality. Amongst other measures, this reduces the amount of total suspended solids (TSS), metals and hydrocarbons in the runoff. However, as the volume below the permanent water level is exceeded by the volume of 15mm of rain falling across the sub-catchments, reduced pond mitigation indices are estimated. This means that additional mitigation would be required within the sub-catchments to protect the water quality of the receiving watercourse. This additional treatment will be provided by implementing permeable paving to parking areas where appropriate as well a installing a secondary basin/swale prior to the regional water quality pond within the eastern parkland.

CIRIA Simple Index Method

2.14 In accordance with The SuDS Manual (CIRIA C753), SuDS components must have a total pollution index that equals or exceeds the pollution hazard index for different land use classifications.

2.15 **Table 2-3** (as informed by Table 26.2 and 26.4 of the SuDS Manual respectively) demonstrates the comparison between the pollution and mitigation indexes for this phase.

2.16 The drainage strategy includes the use of permeable paving, swales and basins. The mitigating indexes for the water quality basin on this phase have been factored down as per the AECOM report due to the size of the upstream catchment. It can be seen from **Table 2-3** that even with the reduced values for the basin there is still sufficient mitigation provided in terms of water quality

Table 2-3 SuDS Train Mitigation Table

Project: Burgess Hill Phase 1C		Sub-catchment 9.3		Job Ref: 7714
Water Quality Management -Simple Index Approach (From table 26.2 CIRIA 753)				
Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Individual driveways, low traffic roads & Car Parking	Low	0.5	0.4	0.4
Total		0.7	0.6	0.45
SUDS Pollution Mitigation (Treatment) – Simple index Approach (From Table 26.4 CIRIA 753)				
Permeable Paving (Private Driveways & shared parking areas)		0.7	0.6	0.7
Water quality pond estimation from AECOM report		0.2	0.2	0.1
Swale		0.5	0.6	0.6
Total		1.4	1.4	1.4
		1.4 > 0.7	1.4 > 0.6	1.4> 0.45
		Therefore OK	Therefore OK	Therefore OK

Urban Creep

2.17 In accordance with the AECOM report an additional 4.6% of impermeable area has been accounted for to mitigate against future urban creep for sub-catchments 1.7 and 1.8. This allowance is included within the total impermeable area for the site, used within the surface water drainage calculations, with 2% used for all commercial building areas as per the AECOM RSWM.

Proposed Outfalls

2.18 The proposed outfall point for this sub-catchment will be to a new headwall connecting to the River Adur along the eastern boundary. This connection is noted as outfall 9.3 in the AECOM RSWM and discharge rates will be restricted to greenfield rates as noted in **Table 2-2** above.

Exceedance Routes

2.19 As a result of heavy or extreme storm events it is sometimes unavoidable for the capacities of sewers and other drainage systems to be exceeded. Drainage exceedance will occur when the rate of surface water runoff exceeds the inlet capacity of the drainage system, when the receiving water or pipe system becomes overloaded, blocked or when the outfall becomes restricted due to flood levels in the receiving water.

2.20 The routes will ultimately mimic the current flow routes associated with the existing site as a result of the topography. The road network will convey run-off towards the low point within the site and will be designed to discharge flows into the open space. Beyond the developed area of this scheme, the site naturally falls to the River Adur which will be the ultimate discharge of any exceedance flows. Exceedance routes are shown on the drainage strategy plans for the site. Refer to **Appendix 1** for details.

Catchment Boundary 9.4

Storage Requirements – Drainage Sub Phase 1.8&1.2(Primary school site)

2.21 AECOM drawings 60610807-ACM-09-XX-DR-DR-200096-5 show a Hydrobrake restricting flows to 15.4l/s for DA 9.4, which include an allowance of 7.8l/s for the primary school site to the west. The approved drainage design proposes on-plot attenuation for all Sub catchments in this network due to site constraints. There is one regional SuDS feature present in this network: water quality pond WQ02 just upstream of the outfall to the River Adur.

Surface Water Strategy

2.22 A piped surface water network has been designed to convey run-off within the development parcels and will be offered to Southern Water for adoption up to the headwall of any detention basin or attenuation pond. Storage will be provided on-plot within cellular storage tanks. Any swales or ponds will be utilised for conveyance and treatment of run-off and will either be adopted by MSDC or maintained by a Management Company.

2.23 Sediment forebays at the inlets to basins and ponds will be incorporated to ensure that the basin provides the necessary treatment prior to discharge into the stream.

2.24 The attenuation tanks and permeable paving systems within the sites have been designed to provide storage for events up to the critical 1 in 100 year storm event, plus a 40% allowance for climate change. A factor of 4.6% urban creep has been applied to the impermeable area for the residential development as outlined within the approved AECOM report and is therefore considered suitable. Discharge rates have been restricted to greenfield rates based on the calculations provided in **Appendix 4**. These differ slightly from the rates estimated within the AECOM RSWM due to changes in impermeable areas as outlined in **Table 2-4** below.

Table 2-4 Proposed Discharge Rates

Development Area	AECOM RSWM greenfield 1 in 1yr rate l/s	AECOM RSWM greenfield 1 in 100yr rate (Qbar) l/s	Adjusted greenfield run off rate 1 in 1 yr l/s	Adjusted greenfield run off rate 1 in 100yr l/s
9.4 Central Parcel	13.7	15.4	13.0	13.3

Stages of treatment

2.25 The use of regional water quality pond WQ02 as shown on drawings ref 60610807-ACM-09-XX-DR-DR-310020 of the outline approval provides benefits in terms of water quality. Amongst other measures, this reduces the amount of total suspended solids (TSS), metals and hydrocarbons in the runoff.

CIRIA Simple Index Method

2.26 In accordance with The SuDS Manual (CIRIA C753), SuDS components must have a total pollution index that equals or exceeds the pollution hazard index for different land use classifications. Its use means that only preliminary sediment removal / filtration close to source is required in the sub-catchments.

2.27 **Table 2-5** (as informed by Table 26.2 and 26.4 of the SuDS Manual respectively) demonstrates the comparison between the pollution and mitigation indexes for this phase.

2.28 The drainage strategy includes the use of a water quality pond WQ02. It can be seen from **Table 2-5** that the basin provides sufficient mitigation in terms of water quality.

Table 2-5 SuDS Train Mitigation Table

Project: Burgess Hill Phase 1C		Sub-catchment 9.4		Job Ref: 7714
Water Quality Management -Simple Index Approach (From table 26.2 CIRIA 753)				
Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Individual driveways, low traffic roads & Car Parking	Low	0.5	0.4	0.4
Total		0.7	0.6	0.45
SUDS Pollution Mitigation (Treatment) – Simple index Approach (From Table 26.4 CIRIA 753)				
Water quality pond estimation from AECOM report		0.95	0.9	0.9
Total		0.95	0.9	0.9
		0.9 > 0.7	0.9 > 0.6	0.9> 0.45
		Therefore OK	Therefore OK	Therefore OK

Urban Creep

2.29 In accordance with the AECOM report an additional 4.6% of impermeable area has been accounted for to mitigate against future urban creep for sub-catchment 1.8, with 10% being used for the primary school site sub catchment 1.2 These allowances are included within the total impermeable area for the site, used within the surface water drainage calculations.

Proposed Outfalls

2.30 The proposed outfall point for this sub-catchment will be to a new headwall connecting to the River Adur along the eastern boundary. This connection is noted as outfall 9.4 in the AECOM Regional Surface Water Masterplan and discharge rates will be restricted to greenfield rates as noted in **Table 2-4** above.

Exceedance Routes

2.31 As a result of heavy or extreme storm events it is sometimes unavoidable for the capacities of sewers and other drainage systems to be exceeded. Drainage exceedance will occur when the rate of surface water runoff exceeds the inlet capacity of the drainage system, when the receiving water or pipe system becomes overloaded, blocked or when the outfall becomes restricted due to flood levels in the receiving water.

2.32 The routes will ultimately mimic the current flow routes associated with the existing site as a result of the topography. The road network will convey run-off towards the low point within the site and will be designed to discharge flows into the open space. Beyond the developed area of this scheme, the site naturally falls to the River Adur which will be the ultimate discharge of any exceedance flows. Exceedance routes are shown on the drainage strategy plan for the site. Refer to **Appendix 1** for details.

Catchment Boundary 9.5

Storage Requirements – Drainage Sub Phase 1.8

2.33 AECOM drawings 60610807-ACM-09-XX-DR-DR-200097-8 show a Hydrobrake restricting flows to 4.2l/s for plot C1 with an additional allowance of 8.3l/s from plot E1 to the west of Isaacs Lane. The approved drainage design proposes on-plot attenuation for all Sub catchments in this network due to site constraints. There is one regional SuDS feature present in this network; detention basin P19 and additional water treatment swale/basin just upstream of the final outfall.

Surface Water Strategy

2.34 A piped surface water network has been designed to convey run-off within the development parcels and will be offered to Southern Water for adoption up to the headwall of any detention basin or attenuation pond. Storage will be provided within a new detention basin P19 and on-plot within cellular storage tanks. Any swales or ponds will be utilised for conveyance and treatment of run-off and will either be adopted by MSDC or maintained by a Management Company.

2.35 Sediment forebays at the inlets to basins and ponds will be incorporated to ensure that the basin provides the necessary treatment prior to discharge into the stream.

2.36 The attenuation tanks and permeable paving systems within the sites have been designed to provide storage for events up to the critical 1 in 100 year storm event, plus a 40% allowance for climate change. A factor of 4.6% urban creep has been applied to the impermeable area for the residential development as outlined within the approved AECOM report and is therefore considered suitable. Discharge rates have been restricted to greenfield rates based on the calculations provided in **Appendix 4**. These differ slightly from the rates estimated within the AECOM RSWM due to changes in impermeable areas as outlined in **Table 2-6** below. The estimated rates from the AECOM RSWM for plot E1 have been used and included in the discharge rates quoted below

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Table 2-6 Proposed Impermeable Areas

Development Area	AECOM RSWM greenfield 1 in 1yr rate l/s	AECOM RSWM greenfield 1 in 100yr rate (Qbar) l/s	Adjusted greenfield run off rate 1 in 1 yr l/s	Adjusted greenfield run off rate 1 in 100yr l/s
9.5 Southern Parcel	12.5	12.5	11.4	11.5

Stages of treatment

2.37 The use of regional detention basin P19 as shown on drawing ref 60610807-ACM-09-XX-DR-DR-300190 of the outline approval provides benefits in terms of water quality. Amongst other measures, this reduces the amount of total suspended solids (TSS), metals and hydrocarbons in the runoff.

CIRIA Simple Index Method

2.38 In accordance with The SuDS Manual (CIRIA C753), SuDS components must have a total pollution index that equals or exceeds the pollution hazard index for different land use classifications. Its use means that only preliminary sediment removal / filtration close to source is required in the sub-catchments.

2.39 **Table 2-7** (as informed by Table 26.2 and 26.4 of the SuDS Manual respectively) demonstrates the comparison between the pollution and mitigation indexes for this phase.

2.40 The drainage strategy includes the use of a regional detention basin P19. In addition to this a small swale/pond has been proposed just upstream of the outfall. It can be seen from **Table 2-7** that these basins provide sufficient mitigation in terms of water quality.

Table 2-7 SuDS Train Mitigation Table

Project: Burgess Hill Phase 1C		Sub-catchment 9.4		Job Ref: 7714
Water Quality Management -Simple Index Approach (From table 26.2 CIRIA 753)				
Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Individual driveways, low traffic roads & Car Parking	Low	0.5	0.4	0.4
Total		0.7	0.6	0.45
SUDS Pollution Mitigation (Treatment) – Simple index Approach (From Table 26.4 CIRIA 753)				
Detention Basin P19		0.5	0.5	0.6
Swale		0.5	0.6	0.6
Total		1.0	1.1	1.2
		1.0 > 0.7	1.1 > 0.6	1.2> 0.45
		Therefore OK	Therefore OK	Therefore OK

Urban Creep

2.41 In accordance with the AECOM report an additional 4.6% of impermeable area has been accounted for to mitigate against future urban creep for sub-catchment 1.8. These allowances are included within the total impermeable area for the site, used within the surface water drainage calculations.

Proposed Outfalls

2.42 The proposed outfall point for this sub-catchment will be to a new headwall connecting to the River Adur along the eastern boundary. This connection is noted as outfall 9.5 in the AECOM Regional Surface Water Masterplan. Discharge rates will be restricted as noted in **Table 2-6** above.

Exceedance Routes

2.43 As a result of heavy or extreme storm events it is sometimes unavoidable for the capacities of sewers and other drainage systems to be exceeded. Drainage exceedance will occur when the rate of surface water runoff exceeds the inlet capacity of the drainage system, when the receiving water or pipe system becomes overloaded, blocked or when the outfall becomes restricted due to flood levels in the receiving water.

2.44 The routes will ultimately mimic the current flow routes associated with the existing site as a result of the topography. The road network will convey run-off towards the low point within the site and will be designed to discharge flows into the open space. Beyond the developed area of this scheme, the site naturally falls to the River Adur which will be the ultimate discharge of any exceedance flows. Exceedance routes are shown on the drainage strategy plans for the site. Refer to **Appendix 1** for details.

3.0 Foul Water Discharge.

3.1 The water effluent from all the northern parcels of Phase 1C will discharge to an existing manhole MHF8 located within the EBLR. From here a new sewer will be laid along the full length of the new central spine road to a foul water pump station located at the southern end of the southern parcel C1

3.2 Foul effluent from all other sub catchments in this phase wil connect to the new sewer within the spine road and be discharged via the new pumping station at the southern end of Phase 1C.

3.3 It is the intention that the piped elements of the foul water network will be adopted by Southern Water under a S104 agreement. The extent of the network proposed for adoption will be addressed at detailed design stage and agreed with Southern Water. Refer to the drainage plans in **Appendix 1** which shows the extent of the adopted network.

4.0. Maintenance and Management.

4.1 General maintenance inspections should be carried out on a yearly basis unless noted otherwise in this report.

During any routine inspection, the condition of manhole covers, gulley gratings, channel drains etc. should be checked for damage, deformation and settlement. Settlement of paved surfaces may be an indication of a collapsed sewer / drain, check the position of the fault against known drainage runs i.e. between manholes.

4.2 Manholes - The most common problems are settlement of levelling brickwork and break up of mortar bedding / benching to the frame. Block paving is a particular problem around the manhole frame where there are often small 'cuts' of paving with insufficient bedding, resulting in the rapid displacement of the pieces. Remedial action is to re-bed the segments in mortar and dust with dry paving sand. Other problems may not be apparent unless the manhole cover is lifted to expose the chamber, benching and channels. With correctly constructed manholes there should be no need to visually inspect for at least five years. On inspection, the following should be checked:

- Infiltration, ground water entering the chamber through construction joints, seepage or squirting / gushing (proprietary sealants are available but excavation and partial reconstruction may be required).

- Damaged benching should not really occur unless by high pressure infiltration or poor construction. Check for deposition of detritus which may cause blockages of the sewer / drain. Can normally be jetted or hosed clear, larger items will need to be removed.

4.3 Deep chambers, over 1.5m in depth must not be entered unless two fully trained persons are present and only if gas monitoring equipment is available. Note, also that it may take two persons to lift the cover, using only the correct keys.

4.4 Pipelines are designed to be self-cleansing so should not require regular maintenance. Maintenance will therefore be restricted to resolving problems as they occur such as blockage or collapse.

4.5 Gully pots or chambers should be inspected and cleared out annually by suitable plant.

4.6 Channel drains, particularly gratings are susceptible to damage in heavily trafficked areas. The channels are designed to be self-cleansing but should be checked for signs of blockage and jetted as necessary.

4.7 Remedial actions are to be carried out following identification of the problem(s). The works must only be undertaken by a reputable civil engineering contractor, carrying appropriate public liability insurance.

4.8 Biodiverse roof maintenance varies and will be as per the suppliers recommendations.

4.9 Estate roads within the development will be offered to WSCC for adoption, together with the associated highway drainage. Refer to drainage plans in **Appendix 1**, which show the adoptable drainage features.

4.2 It is the intention that the piped elements of the surface water network (up to the outfall into the proposed basins/swales) will be adopted by Southern Water under a S104 agreement. The extent of the network proposed for adoption will be addressed at detailed design stage and agreed with Southern Water. Refer to the drainage plans in **Appendix 1** which shows the extent of the adopted network.

4.3 The SuDs will be adopted by MSDC or maintained by a Management Company. The management company will be appointed to maintain the SuDS elements of the surface water drainage strategy. Funding of the maintenance regime will be via the yearly maintenance fees from the development. All maintenance should be in accordance with the best practices and the CIRIA Manual C753.

4.4 Maintenance and management schedules for the SuDS features are included below;

Permeable paving maintenance shall be as per the **Table 4-1** below

Table 4-1: Permeable Pavements: Operation & Maintenance Requirements

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Brushing & Vacuuming (Standard cosmetic sweep over whole surface)	Three times/year at end of winter, mid-summer, after autumn leaf fall, or as required based on site specific observations of clogging or manufacturers' recommendations.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the 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 jointing 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 3 months after installation.
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action.	3-monthly, 48hrs after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually.
	Monitor inspection chambers	Annually.

Source: CIRIA C753, Table 20.15

Cellular tanks maintenance shall be as per the **Table 4-2** below

Table 4-2: Cellular Storage Tanks: Operation & Maintenance Requirements		
Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (Where may cause risk to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface filter for blockage or silt, algae or other matter. Removal and replace surface infiltration medium as necessary	Monthly (and after large storms)
	Remove sediment from catch pit manholes	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
Source: CIRIA C753		

Green roof maintenance shall be as per the **Table 4-3** below

Table 4-3 Green Roof Maintenance Requirements		
Maintenance Schedule	Required Action	Frequency
Regular Inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural integrity	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted run off from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular Maintenance	Remove litter & debris to prevent clogging of inlet drains and interference with plant growth	6 monthly and annually or as required
	During establishment (i.e year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Remove fallen leaves and debris from deciduous plant foliage	6 Monthly, or as required
	Post establishment, replace dead plants as required (where>5% of coverage)	Annually in autumn
	remove nuisance and invasive vegetation and weeds	6 Monthly, or as required
	Mow grass, prune shrubs and manage other planting (if appropriate) as required -Clippings should be removed and not allowed to accumulate	6 Monthly, or as required
Remedial Actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosions damage should be identified and controlled	As required
	if drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required
Source: CIRIA C753, Table 12.5		

Basin maintenance shall be as per **Table 4-4** below

Table 4.4 Bioretention/attenuation basins: Operation & Maintenance Requirements		
Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove litter and debris	Monthly
	Cut grass - for spillways and access routes	Monthly (during growing season) or as required
	Cut grass - meadow grass in and around the basin	Half yearly (spring-before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect Inlets, outlets and overflows for blockages and clear if required	Monthly
	Inspect bank sides, structures, pipework etc for evidence of physical damage	
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Monthly (For first year) then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before the start of growing season	Annually
	Remove sediment from inlets, outlets and forebay	Annually (or as required)
	Manage wetland plants in outlet pool - where provided	Annually
Occasional Maintenance	Re-seed areas of poor vegetation growth	As required
	Prune and trim trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided
Remedial Actions	Repair erosion or other damage by re-seeding or re-turfing	As required
	Realignment of riprap	As required
	Repair /rehabilitation of inlets, outlets and overflows	As required
	Re-level uneven surfaces and reinstate design levels	As required
Source: CIRIA C753, Table 22.1		

5.0 Summary and Conclusions

5.1 Based on the findings of this technical note it can be concluded that;

- The Drainage Strategy for the site is in line with the approved outline strategy developed by AECOM.

- Treatment is provided via the use of detention basins and swales and permeable paving providing suitable mitigation for the type of development proposed in line with the CIRIA simple index approach.

- Exceedance routes will be contained within the site road network and open spaces with the eventual outfall for any overflow being the local watercourse network.

- SuDS features will be maintained by WSCC Highways, an appointed maintenance company or MSDC.

- Foul effluent will discharge into the wider development sewer network. An adoptable pumping station will serve the whole of Phase 1C.

Appendix 1

Proposed Drainage Strategy Plans

Appendix 2

Drainage Details

Appendix 3

FLOW Critical Storm Simulation Calculations

Appendix 4

Greenfield Runoff Calculations