

## File Note

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## A29 Realignment Scheme - SuDS Management Train

A29-CAP-HDG-00-AN-D-0058

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### INTRODUCTION

The drainage strategy is indicated on drawing A29-CAP-HDG-00-DR-D-0047.

With reference to the WSP Flood Risk Statement undertaken for the Business Case, the Drainage strategy report item 9.4 Proposed Water Quality Management, *'it indicates a simple assessment has been undertaken using HAWRAT to examine the short-term risk related to the intermittent nature of highway runoff in accordance with Method A of DMRB HD 45/09'*. The assessment advises that the *'proposed SuDS features will be sufficient to address the potential risk of pollution. Therefore, further additional mitigation measures for the water quality of the proposed road run-off discharge into the watercourse is not required'*.

This note has been prepared to outline the SuDS treatment that is proposed for each catchment and provide justification that the overall system for each catchment is appropriate, following the development of the drainage strategy since the Client's outline design. The Client's outline design has swales and storage ponds to maintain discharge rates to green field levels. No water treatment facilities (oil interceptors etc) are included within the outline design.

The aim of this advice note is to explain the revised proposals that have been developed to avoid, where possible, the need to include oil interceptors into the drainage network.

The assessment shows that the proposals achieve or nearly achieve the minimum standards set out in CIRIA C753. We recommend that the proposals set out below are adopted.

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## CATCHMENTS

Following the preliminary design by WSP the scheme is considered as 4 no. catchments with catchment 1 being sub-divided into two parts, A and B.

Catchment Ref.	Outfall Location	SuDS scheme
1A	Infiltration (Cellular structure)	See Schedule 1A
1B	Infiltration (Cellular Structure)	See Schedule 1B
2	Infiltration Pond	See Schedule 2
3	Barnham Lane Ditch	See Schedule 3
4	School Brook (Watercourse 1 in the Flood Risk Statement report).	See Schedule 4

Along the main line of the bypass there is typically a swale and footway/cycleway located on one side and a soft verge and swale on the other. On the side of the footway/cycleway the swale is located between the carriageway and the footway/cycleway and an 'over the edge' approach is proposed. In the vicinity of roundabout junctions, a kerbed drainage collection system is required. On the side of the soft verge and swale an 'over the edge' approach is also proposed. The swales have an under drain to maximise the steps in the SUD's management train. This approach provides adequate storage and improved water quality in line with current best practice.

## ASSESSMENT APPROACH

The CIRIA guidance sets out an assessment approach based on different types of treatment but does not consider 'mixed networks'. All of our drainage networks contain a mix of treatment trains leading to each outfall. Our approach, set out below, has been to assess each subsection of each network and then sum the component sections with a weighting based on their impermeable area, so giving an overall network treatment figure. We believe this is the best approach to applying the available guidance to the A29 Realignment Scheme.

## ROAD CLASSIFICATION

With reference to CIRIA C753 Table 4.3 the minimum water quality management requirements for discharging to receiving surface waters is selected based on the land use.

Road Reference	Land Use	Pollution hazard level	Requirements for discharge to surface waters
A29 Realignment Scheme	All roads except low traffic roads and trunk roads/ motorways	Medium	Simple index approach

## **WATER QUALITY MANAGEMENT ASSESSMENT**

In accordance with CIRIA C753 Chapter 26 – Water quality management: design method, the tables 26.2 and 26.3 provide the hazard indices and mitigation indices to achieve for each SuDS component against each land use and the respective pollution hazard level.

The following schedules reviews the various combinations of SuDS components and indicates if the required mitigation indices for each of the catchments is acceptable.

**SCHEDULE 1 – SUDS MANAGEMENT TRAIN CATCHMENT 1**

Selection of SuDS components for Catchment 1A: Fontwell Avenue north tie-in and roundabout circulatory carriageway.		
Water quantity	Runoff collection mechanism	Kerb drainage system either side of carriageway.
	Interception mechanism	None
	Storage	Cellular storage with infiltration to ground. (no flooding on the site for the 1 in 100 year event plus 40% climate change).
	Conveyance	Pipe system to cellular storage structure. (SDS Geolight with a central filter pipe)
	Exceedance	Provision is to be made for existing flood flows to continue to use the 'existing carriageway' which becomes a service road on the west side of the roundabout in the proposed layout.  Network - no flooding for the 1 in 100 year event plus 40% climate change
Water quality	Discharge to groundwater	Yes, Infiltration  Ground water level is 12.700m (BH 2) approx. 2.8m below EGL. (Refer to the Technical note – Drainage Strategy A29-CAP-HDG-00-AN-D-0052 for location of GWL data locations)  Medium hazard indices  TSS 0.7, Metals 0.6, HCs 0.7
	Discharge to surface waters	No
	Groundwater protection measures	Overall indices for catchment 1A.  <u>Roundabout</u>  SuDS Mitigation indices  % Not achieved:

		<p>TSS 57%, Metals 67%, HCs 57% (treatment indices as % of target, above 100% means treatment train is exceeding target).</p> <p>Provide a by-pass oil/petrol interceptor upstream of cellular units for groundwater protection. An alternative to an oil interceptor would be a Downstream Defender (Hydro International).</p>
<b>Amenity</b>	N/A	
<b>Biodiversity</b>	None	

Selection of SuDS components for Catchment 1B: Link road (Chainage 0 – 160) and Fontwell Avenue south tie-in.		
Water quantity	Runoff collection mechanism	Kerb drainage system either side of carriageway for roundabout southern arm.  Swales along the Link road
	Interception mechanism	None
	Storage	Cellular storage with infiltration to ground. (no flooding on the site for the 1 in 100 year event plus 40% climate change).
	Conveyance	Pipe system and swales to cellular storage structure. (SDS Geolight with a central filter pipe).
	Exceedance	Provision is to be made for existing flood flows to continue to use the 'existing carriageway' which becomes a service road on the west side of the roundabout in the proposed layout.  Network - no flooding for the 1 in 100 year event plus 40% climate change.
Water quality	Discharge to groundwater	Yes.  Ground water level is 12.700m (BH 2) approx. 2.8m below EGL  (Refer to the Technical note – Drainage Strategy A29-CAP-HDG-00-AN-D-0052 for location of GWL data locations)  Medium hazard indices  TSS 0.7, Metals 0.6, HCs 0.7
	Discharge to surface waters	No.
	Groundwater protection measures	No.

		<p><u>Roundabout</u></p> <p>SuDS Mitigation indices</p> <p>TSS:0.4 = 0.4  Metals: 0.4 = 0.4  HCs: 0.4 = 0.4</p> <p>% Not achieved:</p> <p>TSS 57%, Metals 67%, HCs 57% (treatment indices as % of target, above 100% means treatment train is exceeding target).</p> <p>Provide a by-pass oil/petrol interceptor upstream of cellular units for groundwater protection. An alternative to an oil interceptor would be a Downstream Defender (Hydro International).</p>
		<p>Link road</p> <p>SuDS Mitigation indices</p> <p>TSS: <math>0.5 + (0.5 \times 0.4) = 0.7</math>  Metals: <math>0.6 + (0.5 \times 0.4) = 0.8</math>  HCs: <math>0.6 + (0.5 \times 0.4) = 0.8</math></p> <p>% Achieved:</p> <p>TSS 100%, Metals 133%, HCs 114% (treatment indices as % of target, above 100% means treatment train is exceeding target).</p>
<p><b>Amenity</b></p>	<p>N/A</p>	
<p><b>Biodiversity</b></p>	<p>None</p>	

**SCHEDULE 2 – SUDS MANAGEMENT TRAIN CATCHMENT 2**

Selection of SuDS components for Catchment 2: Link Road (Chainage 160 - 470)		
<b>Water quantity</b>	Runoff collection mechanism	North side of carriageway: 'over the edge' discharge to swale. South side of carriageway: over the edge' discharge to swale, combined drainage and kerb system.
	Interception mechanism	Grass swale
	Storage	Infiltration pond (no flooding on the site for the 1 in 100 year event plus 40% climate change)
	Conveyance	North side - 'over the edge' discharge to swale. South side - 'over the edge' discharge to swale.
	Exceedance	Network - no flooding for the 1 in 100 year event plus 40% climate change.
<b>Water quality</b>	Discharge to groundwater	Yes, infiltration can occur through the base of the swales and the pond. Ground water level varies but is typically, 12.53 (BH 104/A4) with a 1.23m depth below EGL.  (Refer to the Technical note – Drainage Strategy A29-CAP-HDG-00-AN-D-0052 for location of GWL data locations)  Medium hazard indices  TSS 0.7, Metals 0.6, HCs 0.7
	Discharge to surface waters	No.
	Groundwater protection measures	North side, highway runoff (no kerb, over the edge): medium hazard: simple index approach.  SuDS Mitigation indices: TSS: $0.5 + (0.5 \times 0.5) = 0.75$ Metals: $0.6 + (0.5 \times 0.5) = 0.85$ HCs: $0.6 + (0.5 \times 0.6) = 0.9$  Acceptable % Achieved: TSS 107%, Metals 142%, HCs 129% (treatment indices as % of target, above 100% means treatment train is exceeding target).



		<p>East side highway runoff (no kerb, over the edge): medium hazard: simple index approach.</p> <p>SuDS Mitigation indices:  TSS: <math>0.5 + (0.5 \times 0.5) = 0.75</math>  Metals: <math>0.6 + (0.5 \times 0.5) = 0.85</math>  HCs: <math>0.6 + (0.5 \times 0.6) = 0.9</math></p> <p>Acceptable % Achieved:  TSS 107%, Metals 142%, HCs 129%  (treatment indices as % of target, above 100% means treatment train is exceeding target).</p>
<b>Amenity</b>	N/A	Planting at the top of the swale as part of traffic calming measures.
<b>Biodiversity</b>	None.	Some benefits where planting is proposed.

**SCHEDULE 3 – SUDS MANAGEMENT TRAIN CATCHMENT 3**

Selection of SuDS components for Catchment 3: Link Road (Chainage 470 – 800 and 800 - 1015)		
<b>Water quantity</b>	Runoff collection mechanism	North-east side of carriageway: 'over the edge' discharge to swale. South-west side of carriageway: over the edge' discharge to swale.
	Interception mechanism	Grass swale
	Storage	Off-line Pond – limited discharge 1.8l/s to Barnham Lane Ditch (no flooding on the site for the 1 in 100 year event plus 40% climate change).
	Conveyance	North/East side - 'over the edge' discharge to swale or filter drain. South/West side - 'over the edge' discharge to swale.
	Exceedance	Network - no flooding for the 1 in 100 year event plus 40% climate change.
<b>Water quality</b>	Discharge to groundwater	No infiltration  Wet pond to be lined due to high ground water level.
	Discharge to surface waters	Link Road: Medium hazard indices  TSS 0.7, Metals 0.6, HCs 0.7
	Surface water protection measures	Swale or filter drain and pond. medium hazard: simple index approach  SuDS Mitigation indices TSS: $0.5 + (0.5 \times 0.7) = 0.85$ Metals: $0.6 + (0.5 \times 0.7) = 0.95$ HCs: $0.6 + (0.5 \times 0.5) = 0.85$  Acceptable % Achieved TSS 121%, Metals: 158%, HCs 121% (treatment indices as % of target, above 100% means treatment train is exceeding target)
<b>Amenity</b>	Some benefits where planting is proposed.	Planting at the top of the swale is proposed as part of traffic calming measures.
<b>Biodiversity</b>	None	Some benefits where planting is proposed

**SCHEDULE 4 – SUDS MANAGEMENT TRAIN CATCHMENT 4**

Selection of SuDS components for Catchment 4: Link Road (Chainage 1015 – End of Phase 1)		
<b>Water quantity</b>	Runoff collection mechanism	Combined drainage and kerb system (Ch 1015 to Ch 1205), kerb and gullies on the Barnham Road Roadabout, tie-ins and link road south to the roundabout to the Phase 1 Limit of Works.
	Interception mechanism	None
	Storage	Offline Pond – limited discharge 5l/s to the School Brook (no flooding on the site for the 1 in 100 year event plus 40% climate change).
	Conveyance	Combined drainage and kerb system – Piped conveyance to attenuation pond. Road gullies - Piped conveyance to attenuation pond.
	Exceedance	At low points on the Barnham Road carriageway, provision is to be made for flood flows to pass through the existing highway drainage system (which outfalls to school watercourse to the south). Subject to the CCTV survey of the existing drainage system.  Network - no flooding for the 1 in 100 year event plus 40% climate change.
<b>Water quality</b>	Discharge to groundwater	No infiltration.  Wet pond to be lined due to high ground water level.
	Discharge to surface waters and	Link Road: Medium hazard indices TSS 0.7, Metals 0.6, HCs 0.7
	Surface water protection measures	Highway runoff (Kerb and gullies - direct connection to pond):  SuDS Mitigation indices TSS: 0.7 = 0.7 Metals: 0.7 = 0.7 HCs: 0.5 = 0.5  Nearly Achieved TSS 100%, Metals: 117%, HCs 71% (treatment indices as % of target, above 100% means treatment train is exceeding target)

		Provide a by-pass oil/petrol interceptor upstream of pond for surface water protection. An alternative to an oil interceptor would be a Downstream Defender (Hydro International).
<b>Amenity</b>	N/A	
<b>Biodiversity</b>	None	

**SUMMARY**

<b>Catchment Ref</b>	<b>SuDS Mitigation indices</b>	<b>Protection measures</b>
<b>1A and 1B</b>	Not achieved	Provide a by-pass oil/petrol interceptor
<b>2</b>	Achieved	Not required
<b>3</b>	Achieved	Not required
<b>4</b>	Nearly achieved	Provide a by-pass oil/petrol interceptor