Volume 6.0

A303 Sparkford to Ilchester Dualling Scheme TR010036

6.3 Environmental Statement

Appendix 4.7 Drainage Strategy Report

APFP Regulation 5(2)(a)
Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009
July 2018

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A303 Sparkford to Ilchester Dualling Scheme

Development Consent Order 201[X]

6.3 Environmental Statement
Appendix 4.7 Drainage Strategy Report

Regulation Number:	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference:	TR010036
Application Document Reference:	6.3
Author:	A303 Sparkford to Ilchester Dualling Scheme Project Team, Highways England

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Rev 0	July 2018	Application Issue

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1 Introduction

1.1 Purpose of this report

1.1.1 This report has been prepared by Mott MacDonald Sweco Joint Venture to describe the key aspects that have influenced the preliminary design of the drainage system for the proposed A303 Sparkford to Ilchester Dualling scheme. This includes; design criteria, catchment areas, collection and conveyance systems, water quality and quantity controls.

1.1.2 For motorways and trunk roads for which the Secretary of State for Transport (England) is the highway authority, the technical compliance of the proposal must be demonstrated, certified and recorded as set out in HD50/16, *Certification of Design of Drainage Systems*. This report documents the drainage strategy and selection process, demonstrating compliance with technical standards.

1.1.3 This report has been prepared to support the A303 Sparkford to Ilchester Dualling Environmental Statement. The report should be read in conjunction with the documents listed in Table 1.1 below.

Table 1.1: Documents relating to Drainage Strategy Report

Title	Document reference
HAWRAT Assessment Report	ES, Vol. 6.3, Appendix 4.4
Water Framework Directive Screening and Scoping Report	ES, Vol. 6.3, Appendix 4.5
Flood Risk Assessment	ES, Vol. 6.3, Appendix 4.6

1.2 Background

1.2.1 Dualling of the A303 between Sparkford and Ilchester in Somerset was announced in the *Road Investment Strategy*: *for the 2015 / 16 – 2019 / 20 Road Period* (Department for Transport, December 2014, update March 2015). Dualling of this section of the A303 has been investigated on previous occasions, most recently in 2003 / 04, when it was taken to public consultation but then dropped from the roads programme by the government of the day.

1.3 Overview of the scheme

Existing route corridor

1.3.1 The A303 forms part of Highways England's Strategic Road Network (SRN) and a strategic link between the south west and the rest of the south, south-east and London. The route comprises multiple road standards, including dual carriageway, single carriageway and single carriageway sections with overtaking lanes. Speed limits also vary between 40 miles per hour and 70 miles per hour, depending on the character of the road and its surroundings.

Existing project road

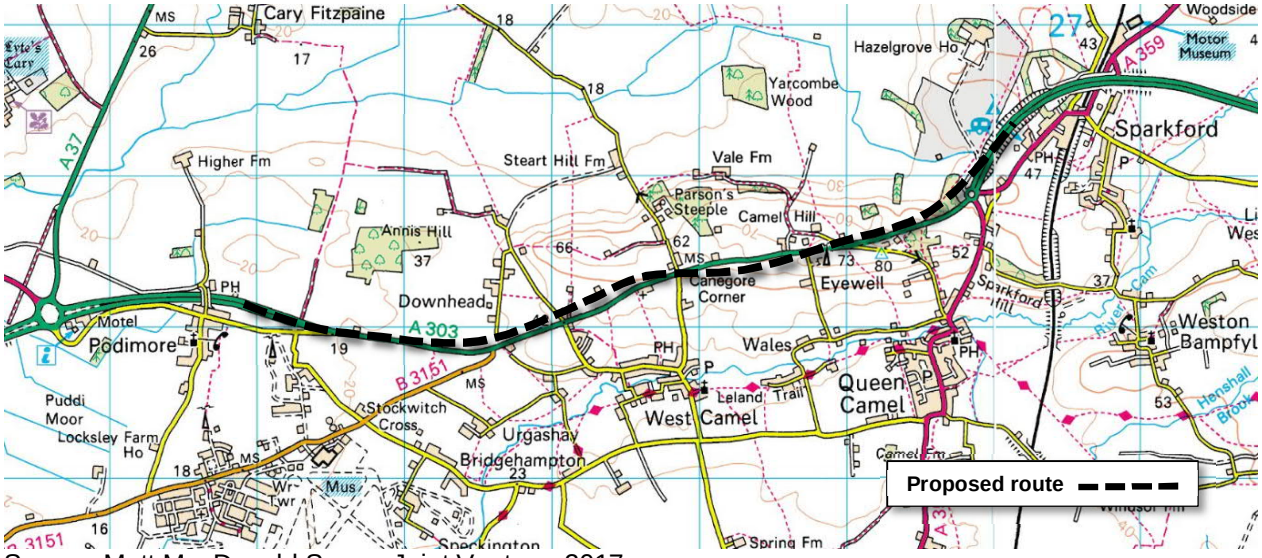
1.3.2 The section of the A303 that is being upgraded as part of this scheme commences at the eastern limits of the existing dual carriageway, the Podimore Bypass. Travelling east, the corridor reaches the junction with the B3151 before bearing north east and rising upwards through Canegore Corner to reach the crest of Camel Hill at Eyewell. This section of the corridor is characterised by a single lane road, with double white lines negating overtaking and subject to a 50 miles per hour speed limit. There are several priority junctions along the route giving access to the settlements of Queen Camel and West Camel to the south and Downhead to the north, as well as several farm accesses and parking laybys.

1.3.3 From the crest of Camel Hill, the corridor descends to meet the roundabout at the western limit of the dual carriageway Sparkford Bypass (Hazlegrove Roundabout). This section comprises 2 lanes in the westbound direction, 1 lane in the eastbound direction and is also subject to a 50 miles per hour speed limit. Hazlegrove Roundabout forms a junction between the A303 and the A359 which runs south through Queen Camel and north-east through Sparkford. The roundabout also provides access to a service station, and to a school at Hazlegrove House.

1.3.4 The section of the A303 that is to be upgraded is almost 3.5 miles, or approximately 5.6 kilometres long.

1.3.5 The extents of the scheme are illustrated in Figure 1.1 below. Figure 2.1 of Volume 6.2 shows the proposed red line boundary for the scheme.

Figure 1.1: Scheme extents



Source: Mott MacDonald Sweco Joint Venture, 2017

Scheme proposals

1.3.6 The proposed scheme is to provide a continuous dual-carriageway linking the Podimore Bypass and the Sparkford Bypass. The scheme would involve the removal of at-grade junctions and direct accesses. The Hazlegrove Junction would be constructed to grade-separated standards and Downhead Junction and Camel Cross Junction would be constructed to compact grade-separated standards, as illustrated on Figure 2.3 General Arrangement Plans, contained in Volume 6.2.

1.4 Proposed scheme description

The route

1.4.1 The route follows the existing corridor of the A303 very closely. It is generally considered to be an on-line solution although is often deliberately aligned just to the side of the existing carriageway in order to allow re-use of the existing route for local access, avoid property or facilitate construction. At its maximum offset the route is typically 100m either north or south of the existing A303.

Main alignment

1.4.2 From west to east, the scheme starts at the existing dual carriageway north of Podimore. The surrounding land is relatively low-lying at approximately 17 metres above ordnance datum (mAOD). Travelling east, the route reaches the junction with the B3151 where it bears north-east and rises upwards, through Canegore Corner, to reach the crest of Camel Hill at Traits Lane and Gason Lane junctions. The elevation at this location is approximately 70mAOD. The landscape to the north rises further (to 74mAOD) and falls away to the south toward the settlements of Queen Camel, Wales and West Camel. From the crest of Camel Hill, the route descends to 50mAOD where it meets the dual carriageway near Sparkford.

Junctions

1.4.3 A new all movements grade-separated junction will be provided in the vicinity of the Hazlegrove Roundabout. This will enable free flowing passage of traffic on the A303. The junction will incorporate entry and exit slip roads in both directions providing connections to Hazlegrove House, the A359, access to villages south of the route and access to properties at Camel Hill to the north of the route. A limited movements junction comprising eastbound slips only will be provided in the vicinity of Downhead. A limited movement junction will be provided in the vicinity of the junction with the B3151 comprising westbound exit and entry slip roads.

Local roads

1.4.4 A connection will be provided between local roads to the north and south of the route in the vicinity of Canegore Corner via an overbridge, incorporating a link to the A303 Eastbound via the junction at Downhead. At the western end of the scheme the existing westbound slip road to Podimore village will be closed. Access to Podimore village will therefore be via the A303 / A37 junction (Podimore Roundabout).

1.4.5 A detailed description of the scheme is provided within Chapter 2 The Scheme of Volume 6.1.

1.5 Site visit

1.5.1 Mott MacDonald Sweco Joint Venture drainage team attended a site visit on 3 November 2017. During this site visit observations were made of the existing highway drainage and external catchment run-off system.

2 Stakeholders and consultation

2.1.1 The following have been identified as drainage related statutory consultees for the scheme:

- Environment Agency
- Somerset County Council (lead local flood authority)
- Somerset Drainage Boards Consortium

2.2 Environment Agency

2.2.1 The Environment Agency's (EA) regulatory, licensing and advisory powers and duties derive from the following key Acts and Regulations, including:

- *Environment Act 1995*
- *Environmental Permitting (England & Wales) Regulations 2010*
- *Water Resources Act 1991*
- *Flood and Water Management Act 2010*
- *Salmon & Freshwater Fisheries Act 1975*
- *The Planning Act 2008 (the 2008 Act)* and secondary legislation made under the 2008 Act
- *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003*

2.2.2 As set out in The Memorandum of Understanding between the Environment Agency and Highways England (April 2018), the framework aims for effective co-operation between the parties to minimise the impact of the development, maintenance and operation of the highways network on the environment.

2.2.3 The *Flood and Water Management Act* gives the Environment Agency a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remedying of flood damage for main rivers and coastal areas.

2.3 Somerset County Council

2.3.1 Under the *Flood and Water Management Act*, Somerset County Council (SCC) are the designated Lead Local Flood Authority (LLFA) for the Somerset area. They are responsible for the management of local flooding propagating from surface water, groundwater and ordinary watercourses.

2.4 Somerset Drainage Boards Consortium

2.4.1 The Somerset Drainage Boards Consortium (SDBC) manages the operations and affairs of the Axe Brue and Parrett Internal Drainage Boards. The organisation was formed in April 2005 and was formed to give the boards access to professional engineering, financial and administrative services. The

individual boards remain the legal corporate bodies that retain the powers and duties that fall to them from the *Land Drainage Act 1991*.

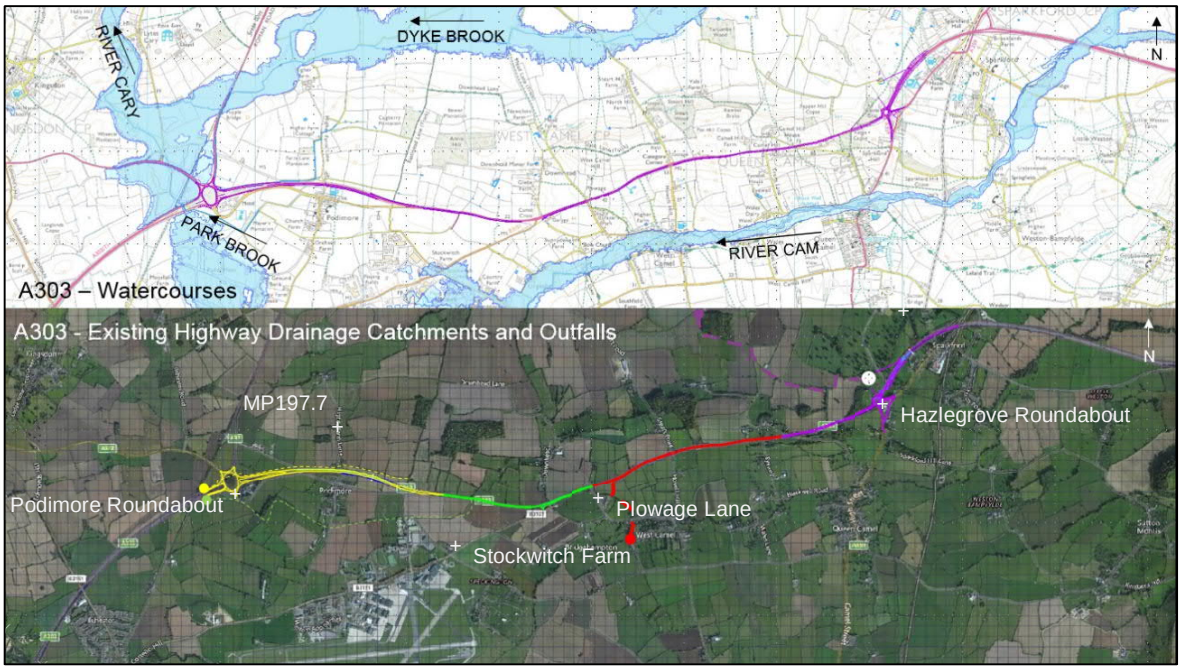
2.4.2 The meeting minutes for the aforementioned consultations have been included within Appendix C.

3 Existing drainage system

3.1 Overview

3.1.1 The extents of the existing highway drainage system within the area of interest span from Podimore Roundabout going east along the A303 through to the railway bridge in Sparkford. As shown in Figure 3.1 there are four principal highway catchments outfalling into watercourses, near Podimore Roundabout, north of Stockwitch Farm, Plowage Lane and Hazlegrove Roundabout.

Figure 3.1: A303 existing highway drainage catchments



3.1.2 Approximately 60% of the existing carriageway (4.2 hectares) discharges unrestricted, increasing the risk of flooding downstream when compared to an undeveloped site. The rational method as set out in the *HR Wallingford (1981)* was used to estimate the existing highway peak run-off for each of the catchments. Subsequently, the equivalent greenfield run-off was calculated using the *Institute of Hydrology methodology* (IoH124). Results are presented within Table 3.1.

Table 3.1: A303 existing highway drainage peak discharge rates and equivalent greenfield response comparison

Catchment	Watercourse destination	Annual Exceedance Probability (%)	Existing peak run-off (l/s)	Equivalent greenfield run-off (l/s)
1 (yellow)	River Cary	100	356	20
		33	904	50
		1	1,143	62
2 (green)	River Cary via Park Brook	100	69	3
		33	175	8
		1	221	10
3	River Cam	100	77	6

Catchment	Watercourse destination	Annual Exceedance Probability (%)	Existing peak run-off (l/s)	Equivalent greenfield run-off (l/s)
(red)		33	194	14
		1	246	18
4 (purple)	River Cary via Dyke Brook	100	214	17
		33	544	41
		1	688	52

3.1.3 Currently, run-off from the external catchments is intercepted by the highway and collected within the highway drainage system.

3.1.4 The maintenance responsibility of the existing drainage system is predominantly with Highways England however, assets located on local roads or in fields are the responsibility of the local authority or the riparian owners.

3.2 Existing assets

Drainage assets

3.2.1 The existing system is predominantly piped, with the run-off captured via kerb and gully. The gullies are positioned in the verge or within kerb inlet structures. At several locations, highway ditches are used instead of carrier pipes, with the gullies outfalling directly to the ditch. Concrete dish channels, surface water filter drains and combined surface and ground water filter drains, are positioned at various locations along the existing carriageway.

3.2.2 The locations of the existing drainage assets are set out in Table 3.2 below. The extents of each drainage system are defined using marker posts (MPs). MP191.5 to MP197.7 cover the proposed scheme and are displayed above in Figure 3.1. The condition of the existing assets is captured in section 3.3.

Table 3.2: Existing drainage assets, as available on HADDMS

Location	Drainage system
MP 191.5-192.5	Filter drain
MP 192.4-195.2,195.4-195.8, 195.9-196.5	Kerb and gully (pipe as carrier)
MP 192.5-192.6, 192.7-192.9, 193.1-193.2, 193.9-194, 196.5-196.6, 197.2-197.7	Filter drain
MP 195.0-195.1, 195.2-195.4, 195.8-195.9, 196.4-197.7	Kerb and gully (ditch carrier)
MP 196.9-197.7	Concrete dish channel

3.2.3 North of Hazlegrove Roundabout, 2.8 hectares of highway catchment (approximately 40% of the existing highway effected by the development), discharges via an existing attenuation pond. The plan area of the pond is approximately 1,300m^2 and it was evident from the site visit that the embankments are very steep and sits within a cutting of a sloping site. The effective storage volume is approximately 1,200m^3. The design performance of the pond and associated flow control device is unknown.

Culverts

3.2.4 Within the scheme extents there is one known culvert with a diameter exceeding 900mm; this structure conveys run-off from the A303 to the existing detention pond north of Hazlegrove Roundabout. An additional culvert is located just outside of the scheme extents, running parallel with Higher Farm Lane overbridge. Further details are set out in Table 3.3:

Table 3.3: Details of existing major culvert structure

HD43 ref.	Location	Structure name	Dia. (mm)	Length (m)	Construction type	Headwall construction
ST5425_ 6521d.1	MP 197.7 / 197.6 BGS 354659,125196 Ch.0.000m	SMIS ref. 6245 Culvert Reg. ID 13795	900	27	Precast reinforced concrete	In-situ concrete headwalls
ST6026_0627a.1 and ST6026_0627m.1	Between ch. 5,800m and Hazlegrove detention pond	No ref.	1,050*	266	Unknown	Unknown
* Diameter stated in HADDMS is 150mm for a portion, however it is assumed to be 1,050mm in line with the construction drawings.						

3.3 Condition assessment

3.3.1 There have been five condition assessments within the scheme extents, which have been made available on HADDMS. The coverage of the assessments is set out in Table 3.4 below.

Table 3.4: Available condition surveys and their coverage available on HADDMS

Scheme ref.	Scheme Title	Year	Survey coverage (A303 Sparkford to Ilchester Dualling Chainage)	Comment
02_DC001_1	A303 Podimore	2015	MP 197.2-192.7 (ch. 450m-4,875m)	Full condition CCTV survey covering a length highway. 02_DC001_1 is a supplementary survey to 02_DC001
02_DC001	Podimore			
02_PCS_A303	Area 2 Pollution Control Structures Survey – A303	2012	n/a	Survey included asset ST5926_8015a (existing flow control device at pond north of Hazlegrove Roundabout)
02_ERN9973	West Camel CCTV and Connectivity Survey	2012	MP 194.3-195.2 (ch. 2,410m-3,305m)	Full condition CCTV survey covering a length of highway.
02_ERN9760	A303 Podimore Routine CCTV and Connectivity Inspection	2011	MP 197.0-198.7 (ch. 0m-630m)	Full condition CCTV survey covering a length of highway

3.3.2 The available surveys do not cover the full scheme extents – between MP 192.7 (ch. 4,875m) and MP 191.6 (ch. 5,900m), there is approximately 1 kilometre without data. To note, there is no condition survey data more recent than 2015.

3.3.3 The condition survey undertaken in February and March 2015 (02_DC001_01) showed that a large number of drains and chambers had severe defects. The defects were found throughout the surveyed section however, the density of the defects was particularly high in the western limit of the survey extents. The reported defects were attributed to blockages or loss of cross-sectional area through settled deposits or roots, heavy siltation, fractures, and obstacles. Many of the defects had reportedly been caused by historic fibreoptic installation works. For many sections, the survey also had to be abandoned due to high water levels.

3.3.4 A review of flooding incidents recorded in HADDMS show that some low level flooding issues are generally caused by blocked drains or an exceedance of the drainage system capacity. There is an instance of water run-off from an adjacent field entering the carriageway.

3.3.5 A condition survey of the ponds undertaken 21 January 2014, identified that a flap valve appeared stuck or seized, with water in the inlet chute higher than water in the chamber. In addition, a site visit undertaken by Mott MacDonald Sweco Joint Venture in December 2017, concluded that the feature was heavily vegetated with trees and shrubs, which would impede its ability to effectively attenuate storm water.

3.3.6 The Area 2 Managing Agent reports that there is an ongoing issue with standing water on the westbound and eastbound verges between MP 195.6 and 196.9. The watercourse crosses the A303 at MP 196.3, travelling south. This area is flat, low lying with a high water table, and reliant on clearance of a downstream ditch located on third party land to the south.

3.3.7 It is recommended that a full condition survey is undertaken for all assets which will be retained. In addition, surveys should be conducted at detail design stage downstream of the proposed outfalls to confirm their suitability and condition, subsequently informing any rehabilitation.

4 Proposed drainage philosophy

4.1.1 The proposed drainage philosophy being applied is to replicate, as far as reasonably practicable, an un-developed site response to rainfall, limiting both the rate and volume of surface water run-off. The proposals are not measured against the existing drainage performance.

4.1.2 The highway drainage strategy will seek to capture the run-off from the highway, its associated earthworks and structures as well as existing lengths of the A303 that are to be retained and de-trunked. The run-off will undergo treatment and be attenuated before release into local watercourses.

4.1.3 A comparison of the existing and proposed impermeable catchment areas are set out in Table 4.1. The increase in impermeable area for the proposed highway has in-turn increased the associated run-off rates and volumes that need to be managed.

Table 4.1: Existing and proposed impermeable catchment areas

	Existing (ha)*	Proposed (ha)**
Impermeable catchment area	6.9	20.5

*Mainline impermeable areas
**Mainline, de-trunked A303 to remain, associated links and grade-separated junctions

4.2 Proposed discharge strategy

4.2.1 The following discharge hierarchy was considered in development of the strategy;

1) Ground (infiltration)
2) Surface watercourse
3) Surface water sewer

Ground

4.2.2 Within the highway extents of the proposed scheme it is not considered feasible for run-off to infiltrate into the ground. The area is predominantly underlain with Lower Lias Clay. Whilst there are some shallow gravel and sand deposits the extents of these are limited to discrete locations. The area is also subject to high groundwater levels – in particular, in low lying areas.

4.2.3 At the time of writing this report further Ground Investigation is underway and comprises of approximately 45 boreholes across the route. At locations, the boreholes have been fitted with piezometers to monitor both superficial and bedrock groundwater levels and will be monitored over 12 months (June 2018 to June 2019) to inform of seasonal fluctuations. It is recommended prior to construction to further investigate the potential for infiltration, considering the proximity of groundwater and infiltration coefficients. At this stage infiltration has not been considered a viable discharge option.

Surface watercourse

4.2.4 The existing highway drainage discharges into two principle ordinary watercourses; Park and Dyke Brook. These subsequently discharge into the River Cary. There is one existing highway outfall which forms part of a minor tributary to the River Cam (near Plowage Lane). Both rivers are within the Parrett operational catchment which outfalls in Bridgwater Bay through 'King's Sedgemoor Drain'.

4.2.5 It is proposed to adopt the same discharge locations as the existing highway, as described in Section 3. Section 4.3 details the allowable discharge rate at these locations.

Surface water sewer

4.2.6 The scheme will not discharge to any surface water sewer.

4.3 Allowable discharge rate

4.3.1 To mitigate the increase in impermeable area associated with the dualling scheme off-site discharge will be restricted. The proposed strategy reduces off-site discharge, up to and including the 1% Annual Exceedance Probability (AEP) (1 in 100 year event), to no greater than the undeveloped rate of run-off as determined by the calculation of the mean annual peak rate of run-off for a greenfield site (Qbar).

4.3.2 The Institute of Hydrology (IH) Report 124 Flood Estimation for Small Catchments (1994) method was used to estimate greenfield site flow rate.

$$Qbar = 1.08 \times (0.01 \times AREA)^{0.89} \times SAAR^{1.17} \times SPR^{2.17} \text{ l/s}$$

Where;

Qbar = the mean annual flood flow (l/s)
AREA = area of the catchment (ha)
SAAR = the standard average annual rainfall (mm)
SPR = Standard Percentage Run-off coefficient for the SOIL category.

4.3.3 Table 4.2 below provides a summary of the proposed catchment areas and allowable discharge rate. The proposed highway catchments are shown on drawings within Appendix A.

Table 4.2: Overview of proposed catchment areas

Catchment Area	Permeable Catchment (ha)	Impermeable Catchment (ha)	TOTAL Catchment (ha)	Qbar (l/s)
1	1.20	2.27	3.47	10
2	6.77	4.82	11.59	56
3	8.54	4.21	12.75	62
4	2.80	0.66	3.46	71

Catchment Area	Permeable Catchment (ha)	Impermeable Catchment (ha)	TOTAL Catchment (ha)	Qbar (l/s)
5	5.99	2.55	8.54	105
6	6.49	5.98	12.47	
TOTAL	**31.79**	**20.49**	**52.28**	

4.4 Opportunities for environmental enhancement

4.4.1 Wherever practicable, Sustainable Drainage Systems (SuDS) have been implemented in accordance with the SuDS manual (C753). Managing surface water through the use of SuDS can provide benefits in water quantity, water quality, amenity and biodiversity. The drainage strategy seeks to gain these benefits with the use of SuDS solutions, such as attenuation ponds, filter drains, grassed surface water channels and open ditches. These features are described further in sections 6 and 7.

4.5 Interface with existing drainage system

4.5.1 Where the proposed abuts the existing highway two drainage scenarios are encountered;

1) Existing highway drainage gravitates into the proposed catchment

2) Proposed highway drainage gravitates into existing drainage catchment.

4.5.2 The proposed drainage strategy is to incorporate run-off from the retained portions of the de-trunked A303 into the proposed drainage network, and subsequently adopting the same allowable discharge strategy.

4.5.3 In addition, in locations where the proposed highway vertical profile is such that run-off gravitates towards existing, separate drainage networks have been proposed, for example, at the mainline transition at ch.300m.

4.5.4 At Downhead, Howell Hill and Canegore Corner links a small portion of the proposed carriageway drains toward existing highway catchments. Providing a positive drainage network in these locations would require deep below ground drainage networks that fall against the natural topography and / or the need for pumped solutions. It is considered that these areas are minor and offset by the existing highway areas to be incorporated into the strategy as shown in table 4.3.

Table 4.3: Existing and proposed impermeable catchment areas to be incorporated into strategy

	Existing catchment to be incorporated into strategy	Proposed catchment not incorporated into strategy
Impermeable catchment area	3.2ha	0.3ha

4.5.5 In locations where the existing road will no longer form part of the A303 the road will be de-trunked and it is proposed Somerset County Council are to adopt the

drainage assets as the local highway authority. Maintenance is discussed further in section 7.

4.6 Groundwater management

4.6.1 The FRA identified that there is some groundwater flood risk due to fluctuating high groundwater tables, varying permeability and in places low-lying topography.

4.6.2 At the time of writing this report further Ground Investigation is underway and comprises of approximately 45 boreholes across the route. At locations, the boreholes have been fitted with piezometers to monitor both superficial and bedrock groundwater levels and will be monitored over 12 months (June 2018 to June 2019) to inform of seasonal fluctuations.

4.6.3 Within cuttings, it is currently proposed to incorporate filter drains to relieve pore water pressure at the toe of embankments. Furthermore, slope drains are proposed to aid the stability of adjacent embankments.

5 Run-off from exterior catchments

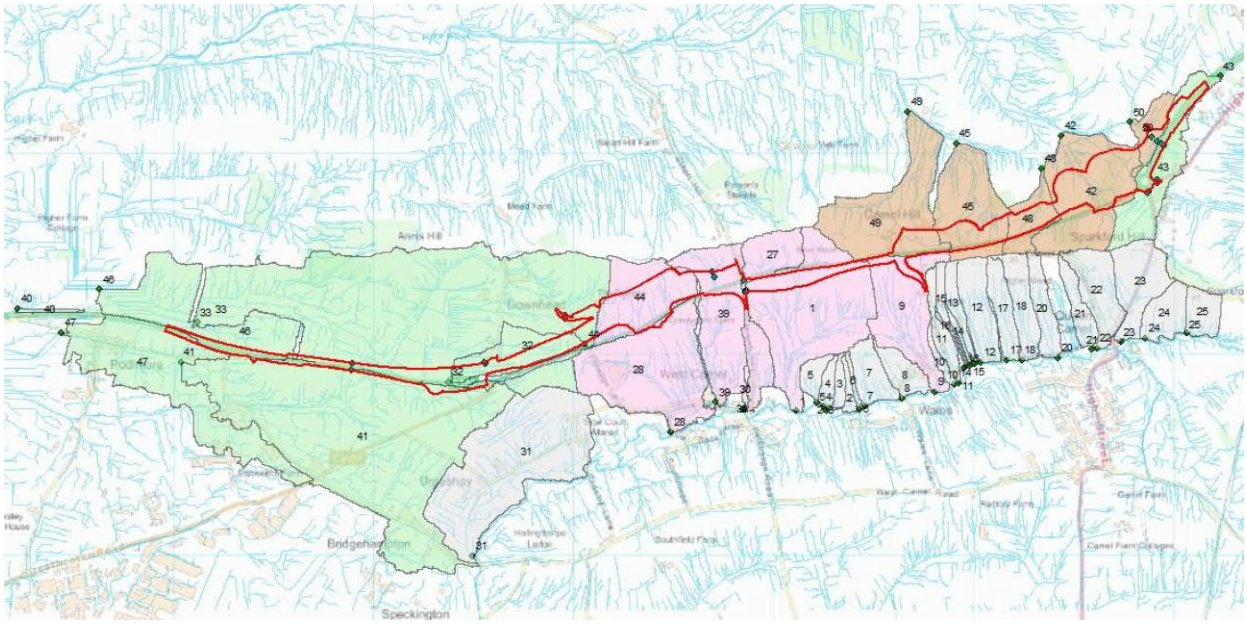
5.1.1 Traditionally surface water run-off to highway drainage systems considered the interior catchment; road surface, verges and adjacent cuttings or embankments. However, run-off from the surrounding land (exterior catchment) may also impact upon the performance of the highway drainage system.

Table 5.1: Referenced DMRB Design Standards – Natural catchment

DMRB ref.	Reference title
HA 71/06	The Effects of Highway Construction on Flood Plains
HA 106/04	Drainage of Run-off from Natural Catchments
HA 107/04	Design of Outfall and Culvert Details

5.1.2 As highlighted within the Flood Risk Assessment there are several locations where overland run-off has historically caused flooding incidents along the existing highway, further prompting the need for effective exterior catchment management. Figure 5.1 below shows the derivation of the exterior catchments.

Figure 5.1: Exterior catchment analysis



5.1.3 The strategy for managing run-off from the natural catchments is to intercept and convey within a separate network of drainage ditches and culverts. Run-off collected from the exterior catchment will be passed forward to the existing ordinary watercourses to replicate, as far as is reasonably practicable, the natural catchment response to rainfall.

5.1.4 Ditches will be located at the crest of cut slopes and toe of embankments to prevent flows scouring the earthworks or inundating the highway.

5.1.5 The estimation of run-off has been undertaken using the IH124 methodology as described within section 4 of this report. For the preliminary sizing of the cut-off ditches design flows were derived for the 1% AEP event (1 in 100 year event). HA 106/04 states that they should be designed for a 1.33% AEP event (1 in 75

year event), however this was considered not in line with more recent guidance in accordance with the *Flood and Water Management Act* 2010. Further analysis may be undertaken prior to construction.

5.1.6 The design storms include an allowance for the effects of climate change by allowing for a 40% increase (Flood risk assessments: climate change allowances, Environment Agency).

5.2 Proposed culverts

5.2.1 It is proposed to provide culverts along the extents of the scheme to maintain the natural catchment connectivity to Park Brook and Dyke Brook, as well as the River Cam. The proposed culverts are shown on drawings in Appendix A.

5.2.2 HA 107/04 requires the culverts to be adequately sized to convey the 1% AEP (1 in 100 year event) + an allowance for climate change (see 5.1.6). It must be noted that there are no existing watercourses crossing the carriageway, and the proposed culverts are conveying natural catchment run-off.

5.2.3 The design of the proposed culverts was assessed following the principles as set out in the CIRIA Culvert Design and Operation Guide C689 (2010). At preliminary design all of the proposed culverts have a diameter 900mm or less, details of these are set out in Table 5.2. It is proposed culverts will be formed of precast concrete pipework and headwalls.

Table 5.2: Proposed culverts

Culvert reference	Location		Dia. (mm)	Length (m)
	Easting (m)	Northing (m)		
CU_1260	355896	124946	600	50
CU_1640	356252	124865	525	11
CU_2100	356720	125017	600	7
CU_2390	356974	125130	450	9
CU_3270	357822	125346	675	47
CU_5330	359870	125820	600	15
CU_5380	359903	125867	525	20
CU_5540	359919	126086	675	32
CU_5550	359844	126175	675	6
CU_MB00_50	356522	124851	525	13
CU_MB20_450	356422	124736	600	17
CU_MC98_80	357858	125385	600	16
CU_MCG0_70	356965	125187	525	16
CU_MCG0_200	357079	125203	450	12
CU_MD03_380	357672	125427	450	19
CU_MH40_250	357819	125311	675	21
CU_MH40_370	357859	125202	675	4
CU_MS30_170	359948	126056	525	17

6 Highway drainage

6.1.1 The proposed design has been developed in line with the design standards and guidance set out in Table 6.1.

Table 6.1: Referenced DMRB Design Standards – Natural catchment

DMRB ref.	Reference title
HA 37/17	Hydraulic Design of Road-Edge Surface Water Channels
HA 39/98	Edge of Pavement Details
HA 40/01	Determination of Pipe and Bedding Combinations for Drainage Works
HA 78/96	Design of Outfalls for Surface Water Channels
HA 83/99	Safety Aspects of Road Edge Drainage Features
HA 102/17	Spacing of Road Gullies
HA 103/06	Vegetative Treatment Systems for Highway Run-off
HA 104/09	Chamber Tops and Gully Tops for Road Drainage and Services: Installation and Maintenance
HA 105/17	Sumpless Gullies
HA 106/04	Drainage of Run-off from Natural Catchments
HA 113/05	Combined Channel and Pipe System for Surface Water Drainage
HA 119/06	Grassed Surface Water Channels for Highway Run-off
HD 33/16	Design of Highway Drainage Systems
HD 43/04	Drainage Data Management System for Highways Agency
HD 45/09	Road Drainage and the Water Environment
TA 80/99	Surface Drainage of Wide Carriageways

6.2 Proposed drainage system

6.2.1 The carriageway drainage system is required to collect the highway run-off and to convey the flow to an outfall. The proposed preliminary design of the highway drainage system is shown on drawings within Appendix A.

6.3 Design storm return periods

6.3.1 In accordance with HD33/16; where highway run-off outfalls to a fluvial surface water body (refer to s4), the following design return periods apply:

- 1 in 1 year – No surcharge of the drainage system
- 1 in 5 years – No flooding from the drainage system
- 1 in 100 years – Design Exceedance Routing (Flood risk assessment for receiving surface water body)

6.4 Allowance for climate change

6.4.1 The rainfall intensities used to calculate the design storms include an allowance for the effects of climate change by allowing for a 40% increase (Flood risk assessments: climate change allowances, Environment Agency).

6.5 Proposed drainage collector systems

6.5.1 To provide effective surface water drainage of the carriageway various options were considered. Each have advantages and disadvantages, including their potential to control pollution and flooding. Table 6.2 highlights the key advantage and disadvantages of the various collector systems and a justification of their use, or not, within the proposed strategy.

Table 6.2: Proposed drainage collector systems

Drainage collector system *Ref. documents and drawing*	**Advantages**	**Disadvantages**	**Used within the drainage strategy for the A303 scheme?**
Kerbs and Gullies *(TA 57)* *HD 33* *HA 102* *HA 104* *HA 105*	Kerbs provide structural support during pavement laying, as well as protect footpaths and verges from vehicular overrun. Conveyance of run-off to outfall is not dependent upon the longitudinal gradient of the road and can be formed within a longitudinal carrier pipe. Road gullies, on low embankments with toe ditches, can discharge to the toe ditches via discrete outfalls. This may prove more economical than long lengths of carrier pipe.	Kerb edge details do not allow for the immediate removal of pavement run-off; widths of water may intrude into the hardshoulder, hardstrip or carriageway. Further to the above, gullies are susceptible to reduction in efficiency and in some instances complete blockages which would cause flooding to the level of the kerb upstand. Although gully pots can trap sediments their efficiency is reliant upon regular maintenance. As these features are below ground, visual inspection is limited and hence maintenance is often reactive vs proactive.	Yes – Kerbs and gullies will be provided at the local roads where the limited space available next to the carriageway means an above ground surface water drainage system (open channels) are not viable.
Ditches *HD 33* *(HA 106)*	Greater capacity and comparatively lower cost against other collector systems. Ditches have some potential to control pollution, due to infiltration of the run-off through the soil profile and any vegetation.	Large sized ditches may create stability problems in the cutting slopes. Space constraints may prohibit the use of ditches in favour of other smaller collector systems. Lining likely to be required in areas with high groundwater and high or unknown permeability. Flow velocities must be controlled where necessary to prevent erosion.	Yes – to be located at the top of cuttings or at the toe of embankments where the highway is subject to run-off from the natural catchment. Also, to be located at the bottom of highway embankments (interior catchment).

Drainage collector system *Ref. documents and drawing*	**Advantages**	**Disadvantages**	**Used within the drainage strategy for the A303 scheme?**
Concrete Surface Water Channels *TA 80 HA 78*	Open channels are considered easier and safer to maintain. Shallow edge of pavement channels presents a lower risk of vehicles losing contact with the ground / overturning. Greater distances between outlets when compared with conventional gully systems. Long lengths, devoid of interruptions, can be constructed quickly and fairly inexpensively by being slip-formed.	Not considered economical on steep longitudinal gradients as large terminal outlet structures would be needed to ensure 100% efficient capture of high velocity water. Larger or more frequent outlet structures required in comparison to the grass surface water channel, due to the increased flow velocity.	Yes – to be used within the central reservation where the cross section of the main line carriageway is super-elevated to reduce flow path lengths. Also, to be used in locations where grass surface water channels are not feasible (such as at the top of embankments, where infiltration could cause instability of the slope).
Grass Surface Water Channels *TA 80 HA 78* *HA 119*	Can reduce the flow velocity in the channel, whilst providing flow attenuation and facilitating deposition of suspended sediments and pollutants. Increased aesthetic value.	Increased maintenance in comparison to concrete surface water channels. Susceptible to physical damage from vehicle over-run, with the amount of damage dependent on vehicle interaction (such as the weight and velocity of vehicle), as well as the soil moisture content and strength. The use of grassed channels needs to be carefully considered in the vicinity of zones SPZ I and SPZ II, as protection measures (such as an impermeable membrane beneath the channel) may be required. Positioning grassed channels in the central reserve to be avoided due to safety and routine maintenance aspects.	Yes – to be used within the verge of the mainline carriageway, when not on embankment.

Drainage collector system *Ref. documents and drawing*	**Advantages**	**Disadvantages**	**Used within the drainage strategy for the A303 scheme?**
Combined Kerb & Drainage Blocks *HD 33* *HA 39*	Provides internal linear gradient; particularly useful at roundabouts Collects and conveys run-off within a narrower corridor; particularly useful in congested verges. Can contribute storage volume to help reduce the size of primary attenuation components	Inherent maintenance issues; multiple inlets mean traditional maintenance tasks, such as jetting, are labour intensive.	No
Linear Drainage Channels *TA 80* *HA 78*	Applicable in areas of limited space; typically used in slip road nosing.	When used on shallow gradients they may be prone to maintenance difficulties	No
Filter drains *HA 39*	Ability to remove suspended sediments and pollutants from run-off through the filtration. Combined filter / carrier system provides economic benefits.	Large volume of suitably graded stone required. Further, to remain an effective means of run-off collection the filter material needs to be recycled / replaced due to siltation. Buried asset; often first sign of ineffective drainage is a flood event. When used as carriageway edge it presents a hazard to stone scatter.	Yes – to be used at the edge of the carriageway when in cutting, intercepting run-off onto the paved area and collecting carriageway run-off.

Drainage collector system *Ref. documents and drawing*	**Advantages**	**Disadvantages**	**Used within the drainage strategy for the A303 scheme?**
Over the edge drains *HA 103*	Effective in treating water with slow flow speeds. Economical as a means of drainage; no positive drainage systems required.	Intense flow speeds can wash accumulated suspended soils downstream. Requires regular maintenance of verges to ensure uninhibited drainage. Can cause soil erosion, topsoil slippage and embankment instability. Highly dependent on construction quality to produce a smooth sheet flow, any imperfections can increase the risk of soil erosion. Not applicable on moisture susceptible soil such as clay or silty. Costs of granular fill may make large embankment un-economical.	No – inherent issues with ensuring construction and performance, as well as risk to the embankment. The length of scheme would also make the costs of the required granular fill un-economical.

6.6 Central reserve drainage

6.6.1 Central reserve drainage is required on the super-elevated carriageway throughout large sections of the mainline scheme extents. The proposed central reserve drainage will consist of concrete surface water channels. The channels intermediate and terminal outlets consist of a series of catchpits.

6.6.2 Surface water channels are typically designed to flow full during a 1 in 1 year event and within permissible flooding widths (that is surcharge widths) for a 1 in 5 year event (HA37/97 s6.2).

6.6.3 In accordance with HA39/98 s6.7 to safeguard against flows from the surcharged channel overtopping the central reserve and flowing into the opposing carriageway, a margin of at least 25mm between the level of the edge of the opposite carriageway and the surcharged channel level should be maintained.

6.7 Edge of pavement drainage

6.7.1 Edge of pavement drainage will be along the entirety of the mainline carriageway, on both sides where the carriageway is balanced, or on the lower side if the carriageway is super-elevated. The mainline run-off will principally be

collected and conveyed by surface water channels, these will be grass lined unless not practicable, for example locations on high embankments. In locations where the carriageway is in cutting, filter drains will also be required.

6.7.2 Edge of pavement drainage will also be situated on the local roads, typically these roads are balanced and will require drainage on both sides. The local road run-off will principally be collected using gullies along the new kerb alignment. The gullies will outfall directly to a highway ditch where practicable, in other instances they will outfall into a longitudinal carrier pipe until a location in which it becomes feasible to outfall to a ditch. In locations where the carriageway is in cutting, filter drains will be adopted instead. The filter drains will collect run-off from both the verge and the carriageway.

6.8 Embankment toe drainage

6.8.1 Surface water run-off to the highway drainage systems is derived from the road cross section; the road surface, verges and adjacent embankments. This is defined as the ‘interior catchment’ in accordance with HA106/04. Highways England maintained drainage will therefore be required to manage the run-off from embankments and cuttings associated with the scheme.

6.8.2 Ditches have been proposed at the foot of embankments. Ditches are considered to be cheaper to construct, have greater capacity and are easier to maintain than filter drains, however require greater land-take.

6.8.3 The highway ditches will be trapezoidal in shape, with a 4 metre maintenance strip running parallel. A stage approach has been considered in the development of the ditch sizes; A ‘low-flow’ channel has been sized to convey a discharge from a 1 in 30 year return period, with an additional 40% allowance for climate change. Design exceedance events, up to and including the 1 in 100 year event, will make use of the adjacent maintenance strip which has been designed with a crossfall towards the ditch at a slope for 1:20, providing an area for ‘design exceedance’.

6.9 Earthwork / Sub-surface drainage

6.9.1 Sub-surface drainage will be required to remove any run-off which would otherwise risk permeating the pavement layers of the road, reducing the design life of the pavement. It is proposed to provide narrow filter drains or fin drains. Where large quantities of groundwater risks infiltrating the sub-surface, for example in cuttings with high groundwater, filter drains may be used.

6.10 Circulatory road

6.10.1 Hazlegrove Roundabout is proposed to be retained. Where the proposed system ties into the existing and the existing drainage is found to be in poor condition, the existing assets shall be replaced at a like-for-like basis.

6.10.2 Where new drainage will be required as a result of the proposed development, the circulatory road is to be drained via kerbs and gullies. The hardstrip provides flow widths to form adjacent to the kerb line, without encroaching onto the carriageway. Gullies will discharge through carrier drains to the new local road drainage system.

6.11 Bridge decks

6.11.1 The bridge decks will be fitted with drainage units. Utilising the crests of the bridges and subsequent longitudinal falls it is proposed to shed water to outlets located just prior to the expansion joints at the lower end of the deck. The terminal outlets will be formed of bridge deck gully units, with pipework cast through the deck slab end cantilevers. Pipework will convey discharge down the rear face of the bridge piers and branch into longitudinal carrier drains below.

6.11.2 The bituminous surfacing materials proposed on the bridge deck are permeable (to a degree) and as a result water will collect above the water proofing system for the concrete deck. The falls are such that water will shed to the expansion joints without the need for a positive drainage system, however water will become trapped at the deck movement joints (sub-surface). In these locations water can be collected and conveyed to the outlets using perforated pipes to provide positive sub-surface drainage.

6.12 Attenuation Ponds

6.12.1 The proposed attenuation ponds are shown on drawings within Appendix A.

6.12.2 5 storage ponds have been proposed, along with the re-use of an existing pond near Hazlegrove roundabout. The proposed storage volumes have been sized to attenuate flows up to and including the 1% AEP event + 40% climate change to the equivalent mean annual flood flow (Qbar).

6.12.3 The attenuation ponds will have a permanent pool of water that will allow the suspended sediments to settle out and prevent resuspension. To aid maintenance of the ponds a sediment forebay has been proposed to allow for targeted monitoring and subsequent removal of sediment within a smaller area. The shapes of the pools have been designed to encourage plug flows, displacing the permeant pool during storm events.

6.12.4 An aquatic bench has been proposed for the larger ponds at the foot of Camel Hill and near Hazlegrove School to support wetland planting within the marginal zone.

6.12.5 An impermeable liner has been proposed to ensure the effective storage capacity is not diminished during times of high groundwater. This is proposed to be a 500mm thick cohesive material (such as clay), however an impermeable geotextile could also be provided. Prior to construction the need for a

permanent liner can be reassessed upon receipt of the groundwater monitor assessment.

6.13 Outfalls

6.13.1 Flow control devices will be fitted in a chamber upstream of the point of outfall of each attenuation pond. It is proposed to utilise vortex flow control devices to reduce the risk of blockages. Penstocks are proposed at all outlets into watercourses to isolate the positive drainage system in the event of a spillage. These are to be marked as ‘Pollution Control Devices’.

7 Maintenance

7.1 Limits of responsibility

7.1.1 The proposed responsibility of the drainage assets will be that of Highways England and Somerset County Council. Allocation of assets between the 2 bodies is shown on drawings within Appendix A.

7.1.2 It is proposed that Highways England would take responsibility of any assets located along or within the proposed mainline highway, whilst Somerset County Council would adopt assets located within the proposed junctions and local highways, in addition to any de-trunked sections of the A303 that will be retained.

7.1.3 It is proposed that the attenuation ponds will be maintained by Highways England. 1 attenuation pond, located near Plowage Lane, receives run-off from de-trunked carriageway and new links. It is proposed Somerset County Council will adopt this pond and its ancillaries.

7.2 Maintenance provision

7.2.1 A 4 metre swathe is proposed adjacent to all proposed ditches and ponds, allowing suitable access for maintenance. Vehicle access to the ponds and outfall structures has also been provided from the local network. No access points are necessary from the back of the proposed A303 verge, meaning that interaction between maintenance vehicles and high-speed traffic is avoided.

7.3 Sustainable Drainage Systems

7.3.1 The proposed maintenance regime, in accordance with the CIRIA SuDS Manual 2015, is depicted below. The regime for the attenuation ponds, filter drains, and grassed surface water channels and ditches are set out respectively in Table 7.1, Table 7.2 and Table 7.3.

Table 7.1: Required maintenance for attenuation ponds

Required action	Typical frequency
Remove litter and debris	Monthly (or as required)
Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and / or physical damage	Monthly
Inspect water body for signs of poor water quality	Monthly (May – October)
Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
Check any mechanical devices, for example penstocks and flow controls	Half yearly
Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface)	Annually

Required action	Typical frequency
Remove 25% of bank vegetation from water's edge to a minimum of 1 m above water level	Annually
Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
Remove sediment from any forebay.	Every 1–5 years, or as required
Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, for example every 25–50 years

Table 7.2: Required maintenance for filter drains

Required action	Typical frequency
Remove litter (including leaf litter) and debris from filter drain surface and access chambers	Monthly (or as required)
Inspect filter drain surface, inlet / outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
Inspect inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	6 monthly
Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (for example NJUG, 2007 or BS 3998:2010)	As required
At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	5 yearly (or as required)
Clear perforated pipework of blockages	As required

Table 7.3: Required maintenance for grassed surface water channels and ditches

Required action	Typical frequency
Remove litter and debris	Monthly, or as required
Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
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 vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Repair erosion or other damage by re-turfing or reseeding	As required
Relevel uneven surfaces and reinstate design levels	As required

8 Water quality and pollution control

8.1.1 The pollutants found in highway run-off arise from multiple sources:

- The effects of traffic – vehicle emissions and leakages
- The effects of maintenance – that is, de-icing salts and weed control herbicides
- Normal depositions on the highway – litter, agricultural activities, animal waste, etc.
- Spillages – as a result of accidents.

8.1.2 The assessment of routine run-off and accidental spillage risk has been undertaken using the Highways Agency Water Risk Assessment Tool (HAWRAT), as prescribed in Method A and Method D of DMRB Volume 11, *Section 3, Part 10, Road Drainage and the Water Environment (HD45/09).* This assessment has been undertaken incorporating the features and discharge strategy as put forward within this report. Should the strategy develop, for example through the incorporation of infiltration basins, further assessment will be required.

8.1.3 Refer to the HAWRAT Assessment Report (document reference HE551507-MMSJV-EWE-000-RP-LW-0101) the ***Environmental Statement (document reference: TR010036/APP/6.1)***, Appendix 4, for the full assessment and further details.

8.1.4 The sections below provide a summary of the drainage features incorporated into the design to mitigate the potential impacts.

8.2 Ponds

8.2.1 The ponds have been designed to attenuate and treat run-off from the highway. Attenuation is achieved by allowing large inflows but limiting the outflow. Treatment is achieved by allowing the sediments to settle out prior to discharge.

8.2.2 The ponds have been designed in accordance with the SuDS manual (C753) and are proposed to include;

1. Sediment forebay
   - Primary function is to pre-treat the incoming flow, including removal of floating oils and sedimentation of coarse sediments.

2. Permanent pool
   - Throughout the year, this volume of water will remain and the top water level of the pool shall be at the invert level of the pond outlet. This is the primary treatment area and helps to protect against re-suspension of fine deposited sediments.

- The volume of the permanent pool is the primary design factor for treatment efficiency. The pond shapes have been designed to encourage run-off entering the pond to form plug flows; replacing the wet pond volume.

3. Aquatic bench
   - Zone of shallow water along the edge of the permanent pool which is vegetated. This feature can act as a biological filter and provide other benefits such as ecology, amenity and safety.
   - Aquatic benches have been provided within two of the proposed ponds. A shallow slope of 1:4 is proposed for all ponds, allowing for appropriate planting and maintenance.

8.3 Grassed channels

8.3.1 Grassed channels are a vegetated SuDS which incorporate conveyance with control of pollution and storm water run-off rates.

8.3.2 Grassed channels have a higher surface roughness compared to conventional concrete channels which will reduce the flow velocity, on average by 25%. The reduced flow velocity will increase the time of flow in the channel and thereby increase the time of concentration. This will also, consequently, reduce the peak discharge flow to the receiving waterbody.

8.3.3 The lower velocity of flow allows sediments to settle in the channel bed and become trapped in the grass. Through absorption, the grass roots may remove some of the contaminants held in the sediments.

8.4 First flush

8.4.1 The first flush is defined as the initial run-off from the highway following the start of a rainfall event. The ‘first-flush’ is known to contain the portion of carriageway run-off that is the most contaminated with particulate and dissolved constituents.

8.4.2 An assessment of the likelihood of excessive sediment, copper and zinc being passed from the highway drainage system has been undertaken using the HAWRAT spreadsheet and is discussed further in the HAWRAT Assessment Report.

8.4.3 To mitigate the potential impact of sediment on the receiving watercourse the following measures have been incorporated into the proposed highway drainage design:

- Pond treatment volumes
- Trapped gullies and catchpits

- Grass lined channels
- Open ditches and filter drains

8.5 Accidental spillage

8.5.1 A Method D spillage risk assessment has been completed using the HAWRAT spreadsheet in accordance with HD45/09 'Road Drainage and the Water Environment'. The results from the spillage risk assessment indicate there would be no discharge with a serious spillage risk more frequent than the 1% (1 in 100 year return period).

8.5.2 Manually operated penstocks have been provided immediately prior to all outfalls leading to a watercourse. In the event of an accidental spillage either the Environment Agency, Highways England Maintaining Agent or Highways England Traffic Officer would be able to operate the penstock and reduce the likelihood of pollutant reaching the watercourse.

8.5.3 Upstream of the penstocks, any spillage will gravitate to the basins where it will contain the contaminant (with the clay liner or impermeable membrane) preventing infiltration into the underlying secondary aquifer. Post spillage any contaminated topsoil or filter media would require replacement or de-contamination.

8.6 Routine road run-off – Method A

8.6.1 Watercourse impacts of the HAWRAT assessment take account of the diluting capacity of the watercourse receiving the highway run-off, as well as the impacts of sediment deposition. There are 3 tiers of assessment:

- Step 1 – Run-off quality (prior to any pre-treatment)
- Step 2 – In river impacts (after dilution and dispersion)
- Step 3 – In river impacts (post mitigation)

8.6.2 Step 1 is a broad and conservative estimate of the watercourse impacts from untreated and undiluted highway run-off and does not consider any mitigating measures which are in place. The pass / fail are measures against thresholds collaboratively developed by Highways England and the EA; Run-off Specific Thresholds (RST), Threshold Effects Levels (TELs) and Probable Effects Levels (PELs). Should the assessment identify a fail at Step 1, a Step 2 assessment is required, which takes into account the natural catchment and expected dilution factors, however does not consider any pollution control measures. Should the assessment fail at Step 2, a Step 3 assessment is applied which considers pollution control measures considered within the scheme.

8.6.3 In the HAWRAT assessment a non-cumulative assessment for sediments and dissolved metals was undertaken as the outfalls are not located within 100m of each other. Note - the outfalls were established as the locations in which the

proposed highway positive drainage system outfalls into an existing ordinary watercourse. Similarly, a cumulative assessment of dissolved metals was required as the outfalls are located more than 1 kilometre from each other.

8.6.4 The results of the assessment indicate that the Environmental Quality Standards (EQS) for Copper and Zinc would not be breached by routine run-off from the Scheme. Table 8.1 below provides a summary of the Method A results.

Table 8.1: Non-cumulative HAWRAT assessment – Method A results summary

Outfall No.	Receiving watercourse	Annual average concentrations (Method A, Step 3) Copper (µg/l)	Zinc (µg/l)	Assessment against HAWRAT RSTs (soluble impact)	Assessment against HAWRAT RSTs (sediment impact)	Mitigation required?	Proposed mitigation	Assessment against WFD EQSs*
1	Unnamed watercourse, draining into Park Brook	0.33	1.21	Pass	Pass**	Yes	Comprehensive drainage mitigation for the scheme includes surface / subsurface drains, drainage ditches and wet retention ponds with flow control structures installed.	Pass
2	Unnamed watercourse, draining into Park Brook	0.44	1.62	Pass	Pass	Yes		Pass
3	Unnamed watercourse, draining into River Cam	0.45	1.67	Pass	Pass	Yes		Pass
4	Unnamed watercourse, draining into Dyke Brook	0.50	1.87	Pass	Pass	Yes		Pass

** WFD EQSs provided in Table 3.5, maximum copper value of 1*µg/l, and maximum zinc value of 8 µg/l to pass.
***Alert for potential sediment deposition due to the natural low velocity of flows within the unnamed watercourse*

9 Summary

9.1.1 The scheme is to provide a continuous dual carriageway on the A303 linking the Podimore Bypass and the Sparkford bypass.

9.1.2 Approximately 60% of the existing carriageway discharges unrestricted, increasing the risk of flooding downstream when compared to an undeveloped site. The remaining 40% passes through an existing attenuation pond north of Hazlegrove Roundabout.

9.1.3 The drainage strategy has been developed in collaboration with statutory consultees. The proposed philosophy is to replicate, as far as reasonably practicable, an un-developed site response to rainfall; limiting both the rate and volume of surface water run-off from 100% of the proposed catchment.

9.1.4 To mitigate the 297% increase in impermeable area, off-site discharge will be regulated up to and including the 1% Annual Exceedance Probability (AEP) (1 in 100 year event), to no greater than the mean annual peak rate of run-off for a greenfield site (Qbar). Including a 40% climate change allowance which is in line with the Environment Agency's upper estimates for the 2080s.

9.1.5 5 attenuation ponds have been proposed along with the re-use of the existing pond. The ponds effective storage area will be maximised through the use of vortex flow control devices, regulating flow.

9.1.6 The outfalls have been located to mirror the existing outfall locations which form tributaries to Park and Dyke Brook. There is one existing highway outfall which forms part of a minor tributary to the River Cam (near Plowage Lane).

9.1.7 In addition to attenuation ponds, further Sustainable Drainage Systems (SuDS) have been included within the design providing benefits in water quantity, water quality, amenity and biodiversity. This includes grass surface water channels adjacent to the highway.

9.1.8 Maintenance requirements have been considered by predominantly using surface features (open channels and ditches) ahead of buried assets. Access has been provided to features remote to the highway, such as toe ditches, ponds and flow control devices.

9.1.9 Water quality assessments have concluded that through incorporation of suitable mitigation measures the environmental quality standards and the run-off thresholds would not be breached for either routine run-off or accidental spillage.

9.1.10 It is recommended a full condition and validation assessment is undertaken for the existing system, particularly in areas where the system is to be retained and downstream of outfall locations.

Appendix A: Proposed highway drainage plan layout drawings

SHEET 1 OF 4

SHEET 2 OF 4

SHEET 3 OF 4

SHEET 4 OF 4

INSET A

INSET B

KEY TO SYMBOLS ON ALL SHEETS:

GENERAL:

- TERRAIN CONTOURS (1M)

EXISTING ASSETS:

- EXISTING CULVERT
- EXISTING HIGHWAY DRAINAGE
- EXISTING DITCHES (INDICATIVE)
- DEVELOPMENT CONSENT ORDER (DCO) BOUNDARY

ATTENUATION PONDS:

- PERMANENT POND
- ATTENUATION POND
- HYDRAULIC CONTROL DEVICE

ASSET OWNERSHIP (COLOURED AS: **HIGHWAYS ENGLAND** OR **SOMERSET COUNTY COUNCIL**):

- CULVERT (REF. CU/CHAINAGE)
- EXTERIOR CATCHMENT DITCHES
- KERB AND GULLY PIPED SYSTEM
- SURFACE WATER CHANNEL
- ANCILLARY PIPEWORK
- HEADWALL
- HIGHWAY DRAINAGE DITCHES
- KERB AND GULLY DITCH SYSTEM
- EXISTING HIGHWAY DRAINAGE FOR ADOPTION

CATCHMENT AREAS (IMPERMEABLE/PERMEABLE):

- CATCHMENT 1
- CATCHMENT 2
- CATCHMENT 3
- CATCHMENT 4
- CATCHMENT 5
- CATCHMENT 6
- EXISTING CATCHMENT

NOTES:

1. DRAWING TO BE READ IN CONJUNCTION WITH DRAINAGE STRATEGY REPORT, INCLUDED WITH ENVIRONMENTAL STATEMENT (REF: HE551507-MMSJV-LSI-000-RP-UU-6100)
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE
3. THESE PLANS SHOULD BE READ IN CONJUNCTION WITH OTHER PLANS AND DOCUMENTS IN THE DEVELOPMENT CONSENT ORDER, IN PARTICULAR THE BOOK OF REFERENCE.

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
C01	16/07/18	DCO SUBMISSION	BS	CS	ER

Scale 1:10000 (0, 500m, 1000m)

Project Title: A303 SPARKFORD TO ILCHESTER DUALLING

Drawing Title: OUTLINE DRAINAGE WORKS PLANS
REGULATION 5(2)(p)
KEY PLAN

Drawing Status: Published - DEFINITION

Suitability: A3

Scale	Designed	Drawn	Checked	Approved
1:10000	SO	BS	CS	ER
Original Size	**Date**	**Date**	**Date**	**Date**
A1	04/05/20	16/07/18	16/07/18	16/07/18

Drawing Number: HE PIN | Originator | Volume | Location | Type | Role | Number
HE551507 - MMSJV - LSI - 000 - DR - UU - 2111

Project Ref. No.: 389107

Revision: C01

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Catchment Reference	Proposed Area (Ha)		Watercourse Destination	Pond Volume (m³)		Qbar discharge rate (l/s)
	Permeable	Impermeable		Flood Storage	Permanent	
1	1.20	2.27	River Cary via Park Brook	1835	402	9.97
2	6.77	4.82	River Cary via Park Brook	3922	946	56.05

EXISTING CULVERT. SMIS REFERENCE: 6245. CULVERT REGISTRATION ID: 13795.

PIPE 195

OUTFALL TO EXISTING WATERCOURSE (RIVER CARY, VIA PARK BROOK)

POND 1 - PROPOSED MAINTENANCE BY HIGHWAYS ENGLAND.

FARM LANE OVERBRIDGE

PODIMORE

PIPE 163:
PROPOSED CROSS CARRIAGEWAY PIPEWORK TO POND AT POINT OF TRANSITION TO EXISTING DUAL CARRIAGEWAY. EXISTING DUAL CARRIAGEWAY DRAINAGE BEYOND SCHEME EXTENTS TO BE RETAINED.

PIPE 164

POND 2 - PROPOSED MAINTENANCE BY HIGHWAYS ENGLAND.

PIPE 196

CUT LINE

OUTFALL TO EXISTING WATERCOURSE (RIVER CARY, VIA PARK BROOK)

CU_1260

PIPE 165

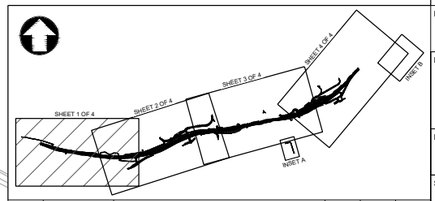
PIPE 166

CUT LINE

EXISTING CULVERT. PRIVATE OWNER: ROYAL NAVAL AIR STATION YEOVILTON.

NOTES

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWING HE5515-MMSJV-LSI-000-DR-UU-2111 TO IDENTIFY THE KEY FOR SYMBOLS.



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
C01	16/07/18	DCO SUBMISSION	AC	CS	ER

Scale
1:2500 0 125m 250m

Project Title
A303 SPARKFORD TO ILCHESTER DUALLING

Drawing Title
OUTLINE DRAINAGE WORKS PLANS
REGULATION 5(2)(p)
SHEET 1 OF 4

Drawing Status	Suitability
Published - DEFINITION	A3

Scale	Designed	Drawn	Checked	Approved
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Original Size	**Date**	**Date**	**Date**	**Date**
A1	04/05/18	16/07/18	16/07/18	16/07/18

Drawing Number
HE PIN | Originator | Volume
HE551507 - MMSJV - LSI -
000 - DR - UU - 2112
Location | Type | Role | Number

Project Ref. No. 389107

Revision C01

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Catchment Reference	Proposed Area (Ha)		Watercourse Destination	Pond Volume (m³)		Qbar discharge rate (l/s)
	Permeable	Impermeable		Flood Storage	Permanent	
2	6.77	4.82	River Cary via Park Brook	3922	946	56.05
3	8.54	4.21	River Cary via Park Brook	3759	940	61.86
4	2.80	0.66	River Cam	715	224	16.81
3 (EXISTING)	0.33	0.30	ACCOUNTED FOR IN CATCHMENT 3			
4 (EXISTING)	1.33	0.31	ACCOUNTED FOR IN CATCHMENT 4			

DOWNHEAD

CAMEL CROSS

PLOWAGE

HOWELL HILL

CUT LINE

CUT LINE

CUT LINE

PROPOSED EXTERIOR CATCHMENT DITCH BAFFLES TO REDUCE VELOCITY (GRADIENT APPROXIMATELY 1:20)

CU_2390

CU_2100

CU_MCG0_70

CU_MCG0_200

PIPE 173

PROPOSED BRIDGE DECK DRAINAGE TO DISCHARGE INTO MAINLINE NETWORK

CU_MD03_380

PIPE 172

PIPE 171

POND 3 - PROPOSED MAINTENANCE BY HIGHWAYS ENGLAND.

PIPE 167

CU_MB00_50

CU_MB20_450

PIPE 170

PIPE 168

EXISTING HIGHWAY DRAINAGE TO DISCHARGE INTO PROPOSED HIGHWAY DRAINAGE

PIPE 189

PIPE 190

EXISTING HIGHWAY DRAINAGE TO DISCHARGE INTO PROPOSED HIGHWAY DRAINAGE

POND 4 - PROPOSED MAINTENANCE BY SOMERSET COUNTY COUNCIL.

EXISTING HIGHWAY OUTFALL TO BE ABANDONED

OUTFALL TO EXISTING DITCH

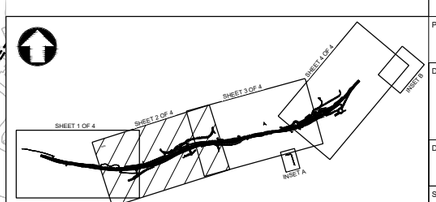
EXISTING HIGHWAY DRAINAGE TO DISCHARGE INTO PROPOSED HIGHWAY DRAINAGE

PIPE169:
EXISTING B3151 HIGHWAY DRAINAGE TO DISCHARGE INTO PROPOSED EXTERIOR CATCHMENT DITCH AT POINT OF TRANSITION TO PROPOSED CARRIAGEWAY

EXISTING CULVERT (CONDITION AND DIMENSIONS UNKNOWN. DRN ID: EAEW100100000172218.)

NOTES

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWING HE5515-MMSJV-LSI-000-DR-UU-2111 TO IDENTIFY THE KEY FOR SYMBOLS.



REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
C01	16/07/18	DCO SUBMISSION	AC	CS	ER

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Project Title: A303 SPARKFORD TO ILCHESTER DUALLING

Drawing Title: OUTLINE DRAINAGE WORKS PLANS
REGULATION 5(2)(p)
SHEET 2 OF 4

Drawing Status	Suitability
Published - DEFINITION	A3

Scale	Designed	Drawn	Checked	Approved
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Original Size	**Date**	**Date**	**Date**	**Date**
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Drawing Number: HE PIN | Originator | Volume | Location | Type | Role | Number
HE551507 - MMSJV - LSI - 000 - DR - UU - 2113

Project Ref. No.: 389107

Revision: C01

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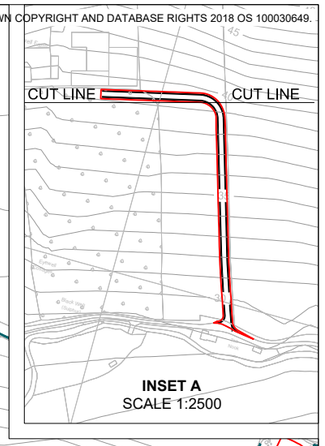
Catchment Reference	Proposed Area (Ha)		Watercourse Destination	Pond Volume (m³)		Qbar discharge rate (l/s)
	Permeable	Impermeable		Flood Storage	Permanent	
2	6.77	4.82	River Cary via Park Brook	3922	946	56.05
3	8.54	4.21	River Cary via Park Brook	3759	940	61.86
4	2.80	0.66	River Cam	715	224	16.81
5	5.99	2.55	River Cary via Dyke Brook	8283	1706	104.95
6	6.49	5.98	River Cary via Dyke Brook	1195	0	
(6 EXISTING)	0.22	2.56	ACCOUNTED FOR IN CATCHMENT 6			

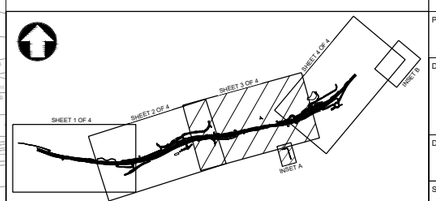


INSET A
SCALE 1:2500

CANEGORE CORNER
HOWELL HILL
WEST CAMEL
TRAITS LANE
CUT LINE
PIPE 174
CU_MC98_80
PIPE 175
EXISTING HIGHWAY DRAINAGE TO DISCHARGE INTO PROPOSED EXTERIOR CATCHMENT
CU_MH40_250
CU_3270
PROPOSED EXTERIOR CATCHMENT DITCH TO DISCHARGE INTO EXISTING HIGHWAY DITCH
CU_MH40_370
PIPE 178
PIPE 177
CUT LINE
CUT LINE
CUT LINE
CUT LINE

NOTES

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH DRAWING HE5515-MMSJV-LSI-000-DR-UU-2111 TO IDENTIFY THE KEY FOR SYMBOLS.



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Project Title
A303 SPARKFORD TO ILCHESTER DUALLING

Drawing Title
OUTLINE DRAINAGE WORKS PLANS
REGULATION 5(2)(p)
SHEET 3 OF 4

Drawing Status: Published - DEFINITION
Suitability: A3

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Original Size	**Date**	**Date**	**Date**	**Date**
A1	04/05/18	16/07/18	16/07/18	16/07/18

Drawing Number: HE551507 - MMSJV - LSI - 000 - DR - UU - 2114
(HE PIN | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: 389107

Revision: C01

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
C01	16/07/18	DCO SUBMISSION	AC	CS	ER

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Catchment Reference	Proposed Area (Ha)		Watercourse Destination	Pond Volume (m³)		Qbar discharge rate (l/s)
	Permeable	Impermeable		Flood Storage	Permanent	
5	5.99	2.55	River Cary via Dyke Brook	8283	1706	104.95
6	6.49	5.98	River Cary via Dyke Brook	1195	0	
6 (EXISTING)	0.22	2.56	ACCOUNTED FOR IN CATCHMENT 6			

CUT LINE

CUT LINE

INSET B
SCALE 1:2500

OUTFALL TO EXISTING WATERCOURSE (RIVER CARY, VIA DYKE BROOK)

POND 5 - PROPOSED MAINTENANCE BY HIGHWAYS ENGLAND.

EXISTING ATTENUATION POND TO PROVIDE FIRST STAGE ATTENUATION. OUTFALL TO PROPOSED ATTENUATION POND.

PIPE 187

PIPE 188

PIPE 191

PIPE 184

PIPE 186

PIPE 183

PIPE 180

CU_5550

OVERSIZED FLOOD RELIEF PIPE REQUIRED TO MANAGE DESIGN EXCEEDANCE OF POSITIVE DRAINAGE SYSTEM

CU_MC0A_480

PIPE 179

CU_5540

PIPE 181

CU_5380

CU_MS30_170

CU_5330

HAZLEGROVE ROUNDABOUT

SPARKFORD

CUT LINE

CUT LINE

CUT LINE

CUT LINE

NOTES

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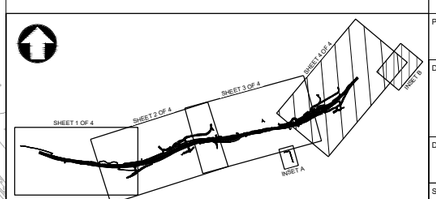

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Project Title
A303 SPARKFORD TO ILCHESTER DUALLING

Drawing Title
OUTLINE DRAINAGE WORKS PLANS
REGULATION 5(2)(p)
SHEET 4 OF 4

Drawing Status: Published - DEFINITION
Suitability: A3

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1:2500	AC	AC	CS	ER
Original Size	**Date**	**Date**	**Date**	**Date**
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Drawing Number: HE551507 - MMSJV - LSI - 000 - DR - UU - 2115
(HE PIN | Originator | Volume | Location | Type | Role | Number)

Project Ref. No.: 389107

Revision: C01

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
C01	16/07/18	DCO SUBMISSION	AC	CS	ER

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Appendix B: Drainage Design Certificate

APPENDIX B – DRAINAGE DESIGN CERTIFICATE

Scheme title: A303 Sparkford to Ilchester Dualling Stage 3

Drainage Design Certificate

Form of certificate to be used by the designer for certifying the design of drainage.

1. We certify that the documents listed below have been prepared by us with reasonable professional skill, care and diligence, and that in our opinion:

   (a) Accurately represent the work required by the Overseeing Organisation;

   (b) With exception of any Departure from Standards given at 3 below, have been prepared in compliance with HD 45, HD 49 and HD 33, and in accordance with the Manual of Contract Documents for Highway Works;

   (c) Constitute an appropriate drainage design for the scheme; and

   (d) Enable an appropriate drainage system to be constructed and managed.

2. List of Documents

HE551507-MMSJV-HDG-000-DR-CD-0100	Proposed Highway Drainage Plan Layout Sheet 1 of 5
HE551507-MMSJV-HDG-000-DR-CD-0101	Proposed Highway Drainage Plan Layout Sheet 2 of 5
HE551507-MMSJV-HDG-000-DR-CD-0102	Proposed Highway Drainage Plan Layout Sheet 3 of 5
HE551507-MMSJV-HDG-000-DR-CD-0103	Proposed Highway Drainage Plan Layout Sheet 4 of 5
HE551507-MMSJV-HDG-000-DR-CD-0104	Proposed Highway Drainage Plan Layout Sheet 5 of 5
HE551507-MMSJV-HDG-000-DR-CD-0105	Flood Risk Map
HE551507-MMSJV-HDG-000-DR-CD-1101	Sections Sheet 1 of 3
HE551507-MMSJV-HDG-000-DR-CD-1102	Sections Sheet 2 of 3
HE551507-MMSJV-HDG-000-DR-CD-1103	Sections Sheet 3 of 3
HE551507-MMSJV-HDG-000-DR-CD-2101	Typical Details Sheet 1 of 3
HE551507-MMSJV-HDG-000-DR-CD-2102	Typical Details Sheet 2 of 3
HE551507-MMSJV-HDG-000-DR-CD-2103	Typical Details Sheet 3 of 3
HE551507-MMSJV-HDG-000-RP-CD-0101	Flood Risk Assessment
HE551507-MMSJV-HDG-000-RP-CD-0102	Drainage Strategy Report

3. Departures from Standard (where applicable)

   N/A

On behalf of Mott MacDonald Sweco Joint Venture, I hereby certify the drainage design has been undertaken in accordance with items 1 and 3 above and accurately translated into the requirements for construction given at item 2 above.

Signed.....

Name.....Tom Lake.....

Position..Chartered Civil Engineer.....

Qualification(s).BEng (Hons) MSc MICE CEng

Date.....18/05/2018.....

On behalf of Mott MacDonald Sweco Joint Venture, I hereby certify that the above signatory has the necessary knowledge and competence to undertake the drainage design covered by this certificate.

Signed.....

Name.....John Weeks.....

Position.....Projects Director.....

Qualification(s).....MEng MICE CEng.....

Date.....18/05/18.....

Appendix C: Stakeholder consultation minutes

A303 Sparkford to Ilchester Dualling
Environmental Technical Working Group - Road Drainage and the Water Environment

Date:	Thursday 7 December 2017	**Time**:	14:30 – 15:30
Location:	South Somerset District Council, Yeovil		
Attendees:	Dave Pring (DP) – Wessex Planning Specialist, Environment Agency John Southwell (JS) – Somerset Partnership and Strategic Overview Flood and Coastal Risk Management Advisor, Environment Agency Dan Martin (DM) - Service Manager, Flood Risk Management Somerset County Council (LLFA) Tom Lake (TL) – Drainage Lead, MMSJV Clare Postlethwaite (CP) – Environmental Coordinator, MMSJV Charles Routh (CR) – Natural England (part only)		
Apologies:	Paul Mennell (PM) - Principal Drainage Engineer, Highways England		

No.	Actions/Key Messages	Owner
1.0	**Introduction**	
	Overview of the preferred route and key dates: • November 2017 - EIA Scoping Report submitted to the Planning Inspectorate (PINS) • January 2018 - Receipt of Scoping Opinion from PINS • January and February 2018 - Statutory Consultation • February 2018 - Design amendments following feedback from the Statutory Consultation • January to June 2018 - Environmental Statement and additional environmental deliverables • July 2018 - DCO submission	CP
2.0	**Road Drainage and the Water Environment – environmental assessment work**	
	An overview of the environmental assessment work undertaken to date was provided	CP
	An overview of the proposed environmental assessment work was given: • Water Framework Directive (WFD) assessment • Flood Risk Assessment (FRA), • Drainage Strategy report containing Highways Agency Water Risk Assessment Tool (HAWRAT)	CP

No.	Actions/Key Messages	Owner
	The Road Drainage and Water Environment (RDWE) chapter will be scoped out of the Environmental Statement (ES)	
	Suggestion that the ES should include a 'sign-posting' chapter to guide the reader to the WFD, FRA, HAWRAT and Drainage Strategy Report	JS
3.0	**Drainage Design**	
	A summary of the existing drainage design, known flooding issues and proposed drainage design was given. The drainage strategy has been developed to reduce post development peak runoff rates to the equivalent greenfield response up to and including the 1% AEP event (+ 40% allowance for climate change) Attenuation would largely be through open storage basins with permanent ponds to aid water quality treatment. Linear features would be used where possible to collect, treat, store and convey water as close to source as possible. The proposed storage basins have currently been designed with 1:4 slopes, with 750mm effective storage depth. Need for impermeable liner to be determined upon confirmation of seasonal groundwater levels (Ground investigation to inform) Post development the overall peak runoff rates from the A303 would reduce, although there would be an increase in the volume of runoff due to the additional impermeable area. JS/DM considered the philosophy acceptable. DM encouraged discussions with the Somerset Internal Drainage Board, in particular to discuss the presence of any sensitive catchments downstream (e.g. those that include pumped controls). DM to provide contact details for Simon Bunn (Somerset Internal Drainage Board Development Control Officer) *[Post meeting note: contact details provided by DM 08/12/2017]*	TL
	It was noted that RNAS Yeovilton suffers from surface water flooding, due to the very large impermeable areas at the site which have increased without an increase in drainage capacity. The site usually drains to the River Yeo, but is unable to drain when the Yeo is under flood conditions, hence pluvial flooding occurs.	JS
4.0	**Opportunities for enhancements**	
	There is an existing application to Highways England's environmental designated fund (EDF) for a scheme on the A303 to change the management of an existing pollution control devices for flood control uses. DM was also aware of this scheme, but felt it would not be applicable to the A303 scheme, as the drainage should be designed appropriately so as to not require such measures.	CR/DM
	There have been discussions with the residents of West Camel to provide a flood alleviation scheme for the village, with several	JS

No.	Actions/Key Messages	Owner
	options proposed by the residents. The EA has recently completed a flood model of the River Cam, which could be run to test some of the residents' ideas, with the potential for funding to be provided by Highways England via the EDF. An application would need to be made to the EDF. The proposal should be communicated sensitively, so Highways England's intervention does not look like an admission of responsibility for the current flooding problems, but there is the potential for collaborative working between Highways England, the EA and the residents of West Camel. Actions/Next steps: 1) TL to update Highways England project manager (Tom Roberts) of opportunity 2) Scope/scale of study to be developed with EA PSO/Parish Council Residents/Mott MacDonald and Highways England	TL
5.0	**AOB**	
	Liaison with other parishes should also be considered. The existence of local bylaws should be investigated, to see if disapplication would be proposed. MMSJV project management team to investigate.	DP MMSJV project management team

A303 Sparkford to Ilchester Dualling
Road Drainage and the Water Environment

Date:	23 January 2018	**Time:**	9:30
Location:	Somerset Drainage Board Consortium Bradbury House, Market St, Highbridge TA9 3BW		
Attendees:	Simon Bunn (SB) – Development Control Officer, Somerset Drainage Boards Consortium Dan Martin (DM) - Service Manager, Flood Risk Management Somerset District Council (LLFA) Tom Lake (TL) – Drainage Lead, Mott MacDonald Sweco		
Apologies:	John Southwell (JS) – Environment Agency		

<table>
<tr><th>No.</th><th>Actions/Key Messages</th><th>Owner</th></tr>
<tr><td>1.0</td><td>Introduction</td><td>All</td></tr>
<tr><td></td><td>Overview of the preferred route and key dates:
<table>
<tr><td>November 2017</td><td>EIA Scoping Report submitted to the Planning Inspectorate (PINS)</td></tr>
<tr><td>January 2018</td><td>Receipt of Scoping Opinion from PINS</td></tr>
<tr><td>January to March 2018</td><td>Statutory Consultation</td></tr>
<tr><td>March 2018</td><td>Design amendments following feedback from the Statutory Consultation</td></tr>
<tr><td>January to June 2018</td><td>Environmental Statement and additional environmental deliverables.</td></tr>
<tr><td>July 2018</td><td>DCO submission</td></tr>
</table></td><td></td></tr>
<tr><td>2.0</td><td>Drainage Philosophy</td><td></td></tr>
<tr><td></td><td>A summary of the existing drainage design, known flooding issues and proposed drainage design was given.

Approximately 60% of the existing carriageway is unattenuated. The proposed drainage strategy has been developed to date to reduce post development peak runoff rates to the equivalent greenfield response up to and including the 1% Annual Exceedance Probability (AEP) event (+ 40% allowance for climate change).

Attenuation would largely be provided through open storage basins with permanent ponds to aid water quality treatment.</td><td>TL</td></tr>
</table>

No.	Actions/Key Messages	Owner
	Linear features would be used where possible to collect, treat, store and convey water as close to source as possible. The proposed storage basins have currently been designed with 1:4 slopes, with 750 millimetre effective storage depth. Need for impermeable liner to be determined upon confirmation of seasonal groundwater levels (ground investigation to inform). Post development, the overall peak runoff rates from the A303 would reduce, although there would be an increase in the volume of runoff due to the additional impermeable area. SB declared that the Somerset Drainage Board Consortium (SDBC) would seek to impose a reduction in flow rates and volume. TL / SB confirmed in practice this is delivered through the provision of 'long-term-storage' limiting offsite discharge to 2 l/s/ha or QBAR for all. *[Post meeting notes for completeness:]* **S4. Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.** **S5. Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.** **S6. Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.** TL to develop strategy considering volume restriction.	
4.0	**Opportunities for enhancements**	
	TL inquired as to whether any alternative mitigation may prove more beneficial to the catchment response considering a holistic approach to flood risk management. For example, improvements to pumped areas of the catchment. SB to investigate with catchment engineers for any potential opportunities.	SB
5.0	**AOB**	
	Consenting – under the Land Drainage Act SDBC require application. Although not within the 'boundary' of the Parrett Drainage Board (DB), as the scheme will be discharging to an ordinary watercourse contributing to the discharge, there will be the need to apply for consents.	

No.	Actions/Key Messages	Owner
	TL to investigate through which mechanism this application will be undertaken. SB noted that for Development Consent Order (DCO) applications in the past, there could be legal arrangements drafted to combine LLFA and SDBC powers. DM / SB agreed that working together in best interest for all. TL informed SB / DM that public consultation will be occurring in the next few weeks. SB flagged that 'Garden Town' is a project of interest within the community and to expect queries. DM was keen to understand any concerns raised by the public at the meetings. TL to develop a list and forward as appropriate. TL to pass on named SCC to DM to ensure all communication documented and due process followed. *[Note post meeting: TL passed on contact name Richard Gorst (RG) as the named SCC engineering representative. All future correspondence to be undertaken through RG. It is planned for a drainage meeting in the next few weeks where DM / TL will update on progress to-date].*	TL TL TL

A303 Sparkford to Ilchester Dualling Scheme

Meeting Minutes

Technical Working Group (Engineering) Meeting No 2

Date:	13/03/18 **Time:** **14:00**
Location:	County Hall, Taunton
Attendees:	Richard Gorst (SCC), Paul Di Maria (SCC), Dan Martin (SCC), Ian McWilliams (SCC), Peter Hobley (SCC), Bill Hansford (SCC), Paul Tucker (SCC), Richard Gorst (SCC) Tom Lake (MMSJV), Matthew Lewis (MMSJV), Chris Setters (MMSJV)
Apologies:	None

No.	Actions/Key Messages	Owner
1.0	**Introduction**	
1.1	The purpose of the meeting was to provide the opportunity for discussion regarding scheme proposals for the following: • Structures • Rights of Way • Drainage	
2.0	**Actions from previous meeting**	
2.1	Minutes from the previous meeting were accepted.	
	Outstanding actions are: Item 4.2 Review of local traffic displacement: Information still required from MMSJV Item 4.3 Discussion regarding limits of responsibility still required as a priority Item 5.1 Overall format of SOCG requires clarification	 CS RG / CS RG / CS
3.0	**Scheme update**	
3.1	CS advised that Statutory Consultation closed on 9th March. Project team are now in the process of collating responses. Workshops planned week commencing 19th March to review action required to address comments.	

3.2	Actions required from the Stage 1 Road Safety Audit and SCC Technical Audit Report will also be determined at the workshops.	
3.3	An update of the layout in order to address comments received is likely towards the end of March / Early April.	
3.4	DCO submission scheduled Summer 2018. Start on Site scheduled Spring 2020.	
4.0	**Technical Discussion**	
	<u>Structures</u>	
4.1	There are two proposed bridges on the project – Steart Hill Overbridge and Hazlegrove Underbridge. No minor structures have been identified yet although there is the potential as design develops (ie small retaining walls, large traffic direction signs, culverts).	
4.2	General Arrangement drawings have been issued to SCC for review.	
4.3	BH requested that SCC are also given the opportunity to review the AIPs prior to submission.	CS
4.4	CS confirmed that there were no existing structures on the route that would be transferred to SCC.	
4.5	SCC will provide written comments on the submitted General Arrangement drawings. Date for response TBC.	RG
	<u>Rights of Way</u>	
4.6	Rights of Way and Access drawings have been issued for review. General Arrangement drawings, showing footways, have also been issued for review.	
4.7	Clarity on the legal status of the right of way connecting Higher Farm Lane and Eastmead Lane (Y30/29) is required. Currently believed to be Bridleway and is therefore not proposed to be re-dedicated.	PH
4.8	CS requested that as many specific comments as possible regarding where proposals fall short of expectations are made. Also opportunities for enhancement of the existing network would be welcome.	
4.9	Designated Funds are available. CS to provide details of the criteria for such schemes.	CS
4.10	PH advised that the discussions held in December with user groups had yielded numerous pragmatic suggestions for developing the scheme proposals which should be addressed.	CS
4.11	ML advised that an NMU Context Report, surveys and an NMU Audit have previously been prepared, although Highways England standards for assessment have recently been updated. As such a ‘Walking, Cycling and Horse	

	Riding Assessment and Review' (HD42) are currently being conducted.	
4.12	There are no plans to update the NMU surveys that were conducted in 2016.	
4.13	PH advised that applications for modifications to existing rights of way have been received. Any relevant applications will be highlighted in SCC's technical audit of scheme rights of way proposals.	PH
4.14	CS to consider if Statutory Consultation responses can be shared with SCC to facilitate their technical audit of the rights of way proposals.	CS
4.15	SCC will provide written comments on the submitted scheme proposals. Date for response TBC.	RG
4.16	Paul De-Maria would like to be involved in the WCHAR where practicable. MDL to invite PDM to attend site visit (date TBC).	MDL
	<u>Drainage</u>	
4.16	Outline drainage layout plans, pond details and drainage details have been issued for review.	
4.17	Three general outfalls. East of scheme outfalls north into the Dyke Brook, centre of scheme outfalls south into the River Cam and the west of the scheme outfalls to River Cary via the Park Brook.	
4.18	The outfall to the River Cam is locally very sensitive, as it is perceived to be contributory to flooding in West Camel.	
4.19	Flood Risk Assessment in progress. Whilst the scheme does not cross any mapped areas of flood risk the FRA will address potential downstream consequences of the scheme.	
4.20	Water quality assessment under Highways England's Water Risk Assessment Tool (HD45) is also underway.	
4.21	MMSJV have already presented the drainage proposals to the scheme's Environment Technical Working Group (attended by SCC's Dan Martin) in December 2017.	
4.22	MMSJV have presented scheme proposals to the Somerset Drainage Board Consortium in January 2018.	
4.23	MMSJV have applied for Highways England Designated Funding to undertake a flood studyin Queen and West Camel, the outcomes and supporting work will not form part of the DCO Outcome of thefunding application is pending.	
4.24	Arrangements for maintenance responsibility require progressing as a priority.	CS
4.25	In principal SCC would not object to ponds being maintained by Highways England even if SCC drainage outfalls into	

	them, provided all elements are designed and constructed to consented standards.	
4.26	SCC will provide written comments on the submitted scheme proposals. Date for response TBC.	RG
5.0	**Review and Update of draft Statement of Common Ground**	
5.1	No updates or additions were proposed.	
6.0	**AOB**	
6.1	CS invited any suggestions for Designated Funding ideas, particularly with regards to NMU facilities.	PH
7.0	**Next meeting**	
7.1	3rd April at County Hall, Taunton. Subject matter TBC.	RG / CS