

A47 North Tuddenham to Easton Dualling

Scheme Number: TR010038

6.3 Environmental Statement Appendices Appendix 13.3 - Water Quality Assessment

APFP Regulation 5(2)(a)

Planning Act 2008

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Infrastructure Planning

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ENVIRONMENTAL STATEMENT APPENDICES Appendix 13.3 - Water Quality Assessment

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Author:	A47 North Tuddenham to Easton Dualling Project Team, Highways England

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1. Introduction

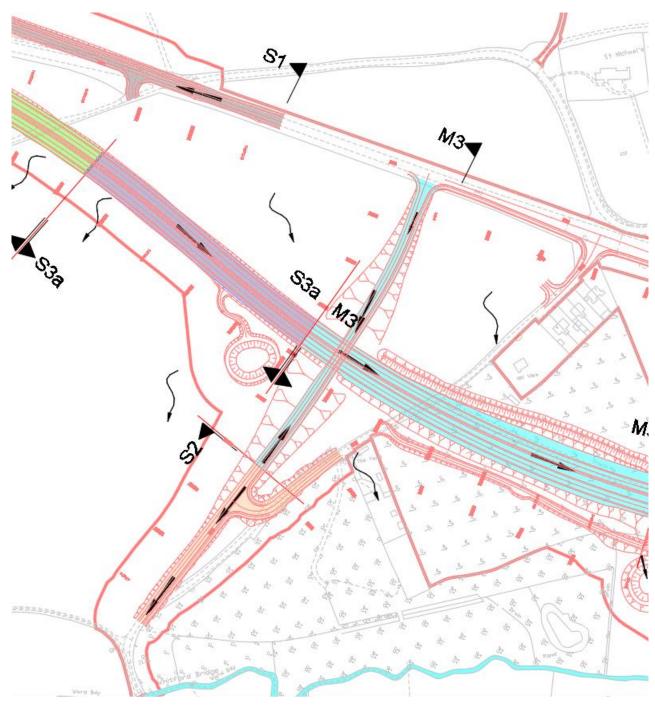
- 1.1.1. This appendix describes the approach and findings of the surface water quality impact assessment for the Proposed Scheme. This appendix should be read in conjunction with Chapter 13 (Road Drainage and Water Environment) of the Environmental Statement (ES) (**TR010038/APP/6.1**). The methodologies are presented in this appendix, whilst the assessment of the magnitude and significance of impacts and any subsequent requirements for mitigation are presented in ES Chapter 13 (Road Drainage and Water Environment) (**TR010038/APP/6.1**).
- 1.1.2. The Proposed Scheme will utilise three existing outfalls (subject to drainage survey) and nine new outfalls which discharge to the River Tud or its tributaries. The assessment methodology for estimating the routine runoff impacts and accidental spillage risk to the water features during the operational phase of the Scheme is described in Section 3 and 4, respectively. The approach follows the guidance within the Design Manual for Roads and Bridges (DMRB) LA 113 (Highways England, 2019). The purpose of the assessment is to determine whether mitigation measures in the form of pollution control or spillage containment are required during the operational phase. Surface water quality impacts during construction are considered in ES Chapter 13 (Road Drainage and Water Environment) (**TR010038/APP/6.1**).
- 1.1.3. The DMRB LA113 guidance proposes the use of the Highways England Water Risk Assessment Tool (HEWRAT), a pollution risk screening tool to determine the routine runoff impacts of surface water discharges.



2. Discharge locations

- 2.1.1. The Proposed Scheme comprises of 19 drainage catchment areas (see Annex A) discharging via 12 outfalls:
 - drainage catchment M1
 - drainage catchment M2 and S1
 - drainage catchment S2 and S3a
 - drainage catchment M3
 - drainage catchment M4
 - drainage catchment M5
 - drainage catchment M6 and NW
 - drainage catchment M7
 - drainage catchment M8
 - drainage catchment M9, M10, NE, S5 and W1
 - drainage catchment S3
 - drainage catchment S4





Caption 2.1 Location of drainage catchment S3a

- 2.1.2. Three existing Highways England outfalls, as identified on Highways Agency Drainage Data Management System (HA DDMS) (Highways England, 2020) will be utilised by the Proposed Scheme where it ties into the existing drainage:
 - drainage catchment M1 outfall reference TG0213_9151b
 - drainage catchment S3 outfall location and reference unknown.
 - drainage catchment S4 outfall reference TG1011_8756b



- 2.1.3. The proposed drainage area of M1 only makes a small contribution (estimated to be less than 10%) to the existing drainage catchment outfall which is located outside the DCO boundary. The outfall location for the existing drainage area to which M1 contributes is assumed to be to the west of the Proposed Scheme at location M1, again outside the DCO boundary.
- 2.1.4. A further six existing Highways England outfalls, as identified on HA DDMS (Highways England, 2020) will be utilised by the existing A47 where it is to be retained (de-trunked) as a local access road. No construction works are proposed in this area:
 - TG0712_9092b (immediately east of Hockering)
 - TG0712_8587d (immediately east of Hockering)
 - TG1011_6183b (existing A47 River Tud crossing, east of Honingham)
 - TG1011_5982b (existing A47 River Tud crossing, east of Honingham)
 - TG1011_5981a (existing A47 River Tud crossing, east of Honingham)
 - TG1011_8556b (east of existing A47 River Tud crossing)
- 2.1.5. The approximate location of the proposed outfalls and the existing outfalls to be utilised by the Proposed Scheme and the de-trunked section of the existing A47 can be seen in Annex B.
- 2.1.6. Where the existing drainage is to be utilised, the drainage areas have been estimated from the topography, measuring between the high points along the carriageway. The existing drainage catchment areas and unknown existing outfall locations within the DCO boundary are to be confirmed once the drainage survey has been completed at detailed design.
- 2.1.7. Prior to the runoff reaching the outfall, filter drains, swales, detention ponds and wetlands are proposed in the drainage design. However, the filter drains were omitted from the surface water HEWRAT assessment to represent a worst case scenario for surface water pollution risk. The inclusion of filter drains as part of the proposed drainage is to be reviewed at detailed design stage due to the potential for groundwater pollution risk. The drainage strategy for the Proposed Scheme is described in ES Appendix 13.2 (Drainage Strategy) (TR010038/APP/6.3).



3. Routine runoff quality

3.1. Overview

- 3.1.1. This section presents the results of HEWRAT assessment that considers the risk of routine runoff from the road drainage catchments that discharge to the River Tud and its tributaries.
- 3.1.2. Due to the outfalls discharging into, or near to, sensitive designated sites, HEWRAT was undertaken on all outfalls that receive drainage from the Proposed Scheme.

3.2. Method

- 3.2.1. The water quality impacts of routine road drainage on surface water bodies have been assessed using HEWRAT as described in DMRB LA113. The HEWRAT assessment adopts a tiered approach assessing the impacts of both soluble and sediment-bound pollutants and determines whether the drainage system would 'pass' or 'fail' (or prompt an 'alert') in terms of water quality in the receiving water features during operation. The three-step approach is as follows:
 - Step 1 assesses the quality of direct highway runoff against toxicity thresholds, assuming no in-river dilution, treatment or attenuation.
 - Step 2 assesses the diluting capacity of the watercourse for acute impacts of soluble pollutants, and the likelihood and extent of sediment deposition for chronic impacts of sediment-bound pollutants.
 - Step 3 assesses the effectiveness of existing and proposed treatment systems for soluble pollutants and if the site is predicted to accumulate sediments, the percentage of settlement required to ensure that the extent of sediment coverage complies with the threshold deposition index value.
- 3.2.2. Step 2 and 3 also contain two tiers of assessment for sediment accumulation: Tier 1 is a simple assessment requiring only an estimate of the river width, while Tier 2 is a more detailed assessment which requires further watercourse parameters including Manning's roughness, bed gradient, side slopes and channel width. Tier 2 assessments are only undertaken where outfalls fail for sediment impacts under Tier 1.
- 3.2.3. For assessment of impacts associated with soluble pollutants, outfalls within 1km (measured along the watercourse) shall be aggregated for purposes of cumulative assessment. For assessment of impacts associated with sediment related pollutants, outfalls within 100m (measured along the watercourse) shall be aggregated for purposes of cumulative assessment.



- 3.2.4. The assessment considers the impact of dissolved copper and zinc on the water quality of the receiving waters. These metals are used as indicators of the level of impact as they are generally the main metallic pollutants associated with road drainage and can be toxic to aquatic life.
- 3.2.5. An alert is given for outfalls that would otherwise pass the assessment for sediment-bound pollutants, were it not for the following features being present downstream:
 - a protected site within 1km of the point of discharge; and
 - a structure, lake or pond within 100m of the point of discharge.
- 3.2.6. If any specific issues are raised then further measures should be agreed, otherwise the alert message can then be dismissed.
- 3.2.7. Where the discharge fails the HEWRAT assessment for annual average concentrations of soluble pollutants, and proportionate mitigation cannot be readily incorporated, a detailed assessment shall be carried out using the UKTAG Rivers and Lakes Metal Bioavailability Assessment Tool (M-BAT).
- 3.2.8. The annual average concentrations predicted by HEWRAT or M-BAT must be lower than the Environmental Quality Standards (EQS) to achieve compliance with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The ambient background copper concentrations can be manually input into HEWRAT, if known. There was no existing water quality data available for any of the water bodies or watercourses within the study area therefore water quality sampling has been undertaken. Six samples from the River Tud, upstream of the Proposed Scheme, and five samples from a tributary of the River Tud at Oak Farm (upstream of existing discharge) were taken as part of a 6-month sampling regime which started in September 2020. Only five samples were taken from the tributary of the River Tud due to low water levels in September. The results show that the average bioavailable copper concentrations for the River Tud and 0.16µg/l respectively (see Annex B).
- 3.2.9. The EQS for dissolved copper in freshwaters is 1µg/l and 10.9µg/l for dissolved zinc (UKTAG, 2014).
- 3.2.10. The rainfall site selected for the HEWRAT assessment is Huntingdon, as it is the closest rainfall gauge geographically. The standard average annual rainfall (SAAR) for Huntingdon is identified in HEWRAT as 600mm. The site-specific SAAR at the downstream end of the Proposed Scheme is 649mm which is sufficiently similar the value at Huntingdon.



3.2.11. Annual average daily traffic (AADT) forecasts with and without the Norwich Western Link Road scheme were considered. The results considered in this assessment are based on those with the Norwich Western Link Road scheme in place, which represents the worst case scenario.

3.3. Assessment results

- 3.3.1. All but one of the outfalls passed the HEWRAT assessment with the inclusion of the required measures outlined in Table 3.1. The only catchment outfall to fail was M1. However, this assessment includes the existing A47 drainage catchment area outside of the proposed DCO boundary as well as proposed catchment M1. The drainage area of proposed catchment M1 only makes a small contribution to the existing drainage catchment and only the impermeable area was assessed as a worst case scenario. Outfall M1 is also located outside of the DCO boundary to the west of the Proposed Scheme (Annex B).
- 3.3.2. A summary of the parameters used in the HEWRAT assessment can be found in Table 3.1. The mitigation measures shown in Table 3.1 are split into two columns; the first shows mitigation required to pass the HEWRAT assessment; the last column shows the mitigation proposed in the drainage design.



Table 3.1 Parameters used in the HEWRAT assessment

	Discharge	Proposed Scheme		Existing	Total	Dominal water	Mitigation
Network	Discharge location	Road Area (ha)	Green/verge Area (ha)	road area tie in (ha)	impermeable area (ha)	Required water quality mitigation	proposed in drainage design
M1 (including existing catchment)	River Tud tributary (unnamed outside of DCO boundary)	0.241	0.125	2.61	2.851	Filter drains	N/A
M2 & S1	River Tud tributary (Oak Farm)	3.529	0.902	N/A	3.529	Wetland (M2), swale (S1)	Filter drains, wetland (M2), swale (S1)
S2 and S3A	River Tud	0.678	0.608	N/A	0.678	Not required	Filter drains and vegetated detention basin
M3	River Tud	1.369	1.716	N/A	1.369	Not required	Filter drains and vegetated detention basin
M4	River Tud	3.461	2.151	N/A	3.461	Not required	Filter drains and vegetated detention basin
M5	River Tud	2.493	1.463	N/A	2.493	Not required	Filter drains and wetland
M6&NW	River Tud	4.665	5.475	N/A	4.665	Not required	Filter drains and vegetated detention basin
M7	River Tud	1.789	1.309	N/A	1.789	Not required	Filter drains and vegetated detention basin
M8	River Tud	0.832	0.691	N/A	0.832	Not required	Filter drains and wetland
M9, M10, NE, S5 & W1	River Tud	10.285	10.002	N/A	10.285	Not required	Filter drains and vegetated detention basin
S3	River Tud	0.123	0.175	0	0.123	Not required	Filter drains
S4	River Tud	0.107	0.028	0.485	0.592	Not required	N/A



- 3.3.3. The results from each HEWRAT assessment can be seen in Captions 3.1 to 3.15 with (where required) and without mitigation measures in place.
- 3.3.4. A summary of the HEWRAT assessment for each outfall is provided below:
 - Outfall M1 (including M1 drainage catchment plus existing catchment area downstream) passed the HEWRAT assessment for soluble zinc (acute and annual average concentrations), soluble copper (annual average concentrations) and sediment bound pollutants. However, it failed for acute copper, with and without the inclusion of filter drains, which were included on the M1 catchment area only. HA DDMS (Highways England, 2020) indicates the existing outfall (TG0213 9151b) is currently classed as medium pollution risk and thus requires mitigation and the assessment presented here confirms this status remains. In addition, the existing outfall and the majority of the existing catchment area lie outside the DCO boundary. However, filter drains are incorporated into the drainage design for the M1 catchment. This results in a reduction in pollutant load from the proposed M1 catchment compared to the baseline scenario. Confirmation via survey is required to verify the river information used in Tier 2 of the assessment. Tier 2 information used for the purpose of this assessment was obtained from LiDAR data, a nearby watercourse (Oak Farm tributary) and OS maps.
 - Outfall which drains catchments M2 and S1 and discharges to Oak Farm tributary initially failed step 2 (pre mitigation) due to acute and annual average copper concentrations and sediment, this would require treatment to mitigate this. However, with the inclusion of swales treating S1 catchment and a wetland treating M2 catchment as proposed measures in step 3, this outfall passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
 - Outfall which drains catchments S2 and S3a passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
 - Outfall which drains catchment M3 passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
 - Outfall which drains catchment M4 passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
 - Outfall which drains catchment M5 passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
 - Outfall which drains catchments M6 and NW passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
 - Outfall which drains catchment M7 passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
 - Outfall which drains catchment M8 passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
 - Outfall which drains catchments M9, M10, NE, S5 and W1 passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.



- Outfall which drains catchment S3 passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
- Outfall which drains catchment S4 passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants.
- 3.3.5. A cumulative assessment was undertaken for the three outfalls which discharge to the River Tud from catchment M7 and M8 as they are within 100m of each other. This cumulative area assessment passed the HEWRAT assessment for soluble pollutants and sediment bound pollutants. The results from this can be seen in Caption 3.14.



highways england	highways england Highways England Water Risk Assessment Tool Version 2.0.4 June 2019								
	Soluble							Sediment -	Chronic Impact
	EQS - Annual Average (Concentration Zinc		Acute Impact					
	Copper							F	Dass
Star 2	0.96	2.26	ug/l		Copper	Zinc	ı .	- di	
Step 2					r Fails Toxicity	Pass		Accumulating? No	or this site is judged as: 0.16 Low flow Velm/s
	-	-	ug/l	Test	. Try mitigation	1 055		xtensive? No	- Deposition Index
Step 3				_					
Road number		A47			HE Area / DBFO n	umber			
Assessment type		Non-cumulative assessm	ont (cingle outfo	ID		lumber			
OS grid reference of assessme	at point (m)	Easting 604452	ent (snigle outa	11)		Northing	313618		
OS grid reference of outfall struc		Easting 604452				Northing	313618		
Outfall number	aure (11)	Network M1			List of outfalls in c		515010		
Receiving watercourse		River Tud Tributary			assessment	unuauve			
EA receiving water Detailed Riv	or Notwork ID	eaw10010000057431	0		Assessor and affilia	ation		KD Sweco	
Date of assessment		18/02/2021	0		Version of assess			AD Sweco	
Notes		Q95 taken from Low Flow.	Accomentin	oint in oncu			Tud DELtal	2	0.4500.12000. Water
Notes									ata and M2/S1 outfall as a
		surrogate. Unknow ambier							
Step 1 Runoff Quality	AADT >10,000 and	i <50,000 👻	Climatic re	gion Warm I)rv 💌	Rainfall site	Hu	Intingdon (SAAR 600mm)	-
	70101		oiintatic re	gion		I tailliail Site			_
Step 2 River Impacts									
	Annual Q ₉₅ river flow (m ³	(S)	0.00108	Fres	hwater EQS limits:				
(Enter zero in Annual	Impermeable road area d	Irained (ha)	2.851		Bioavailable dissol	lved copper (µg/l)		1 D	
Q ₉₅ river flow box to	Democrable and desiring	4							
assess Step 1 runoff quality only)	Permeable area draining	to outrall (na)	all (na)			Bioavailable dissolved zinc (µg/l)			
quality only)	Base Flow Index (BFI)		0.49	Is the o	lischarge in or withi	in 1 km upstream of	a protected	site for conservation?	No 👻 D
For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	-	E F	or dissolved copp	eronly Ambient	background	d concentration (µg/l)	0 D
				,					
For sediment impact only	Is there a downstream st	ructure, lake, pond or canal that re	educes the veloci	ty within 100	m of the point of dis	scharge?		No 🖵 D	
	⊂ Tier 1 Estimate	d river width (m)	2						
	V Her I Estimate	a liver widar (iii)	2						
	Tier 2 Bed widtl	h (m)	1	Manning's n	0.04	Side	e slope (m/m	n) 0.31 Lon	ig slope (m/m) 0.0228
Step 3 Mitigation									
						Estimated effectiven			
						Attenuation for solut stricted discharge rat		Settlement of	
		Brief description		s	olubles (76) [res	sincted discharge rai		ediments (%)	
Existing measures				0		o restriction 👻	DO	D	•
Proposed measures				0		o restriction 👻			

Caption 3.1 Routine runoff assessment results for the outfall from the existing drainage area and catchment M1 of the Proposed Scheme (prior to mitigation)



Appendix 13.3 - Water Quality Assessment

highways england	highways england Water Risk Assessment Tool Version 2.0.4 June 2019							
	Soluble							
	EQS - Annual Average Co			Acute Impact				
	Copper	Zinc		Pass				
Step 2	0.96	2.26	ug/l	Copper Zinc Sediment deposition for this site is judged as:				
Step 2				River Fails Toxicity Pass				
	-	-	ug/l	Test. Try mitigation Pass Recumulating: No - Deposition Index				
Step 3								
Road number		A47		HE Area / DBFO number				
Assessment type		Non-cumulative assessment	(single outfall)	· · · · · · · · · · · · · · · · · · ·				
OS grid reference of assessmer	nt point (m)	Easting 604452		Northing 313618				
OS grid reference of outfall struc	ture (m)	Easting 604452		Northing 313618				
Outfall number		Network M1		List of outfalls in cumulative				
Receiving watercourse		River Tud Tributary		asse ssment				
EA receiving water Detailed Rive	er Network ID	eaw100100000574310		Assessor and affiliation KD Sweco				
Date of assessment		18/02/2021		Version of assessment 2				
Notes				nt is assumed to be on a tributary of the River Tud. BFI taken from FEH at TG 04500 12900. Water				
				water quality archive. Tier 2 river information taken from OS mapping, lidar data and M2/S1 outfall as a rations. Outfall location/drainage catchment still TBC.				
		surogate. Oriviow ambreni co	opper concentr	Tations. Outrainocation/drainage catchinent still TBC .				
Step 1 Runoff Quality								
	AADT >10,000 and <	50,000 -	Climatic regio	n Warm Dry Rainfall site Huntingdon (SAAR 600mm)				
Step 2 River Impacts								
Step 2 River Impacts	Annual Q ₉₅ river flow (m ³ /s))	0.00108	Freshwater EQS limits:				
(Enter zero in Annual	Impermeable road area dra	ained (ha)	2.851	Bioavailable dissolved copper (µg/l)				
Q ₉₅ river flow box to assess Step 1 runoff	Permeable area draining to	o outfall (ha)	0	Bioavailable dissolved zinc (µg/l)				
quality only)	Base Flow Index (BFI)		0.49	Is the discharge in or within 1 km upstream of a protected site for conservation?				
	Dase I low Index (DI I)		0.10					
For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	•	For dissolved copper only Ambient background concentration (μg/l) 0 □				
For sediment impact only	le there a dewnetream struc	sture lake pend or canal that reduc	oc the velocity i	within 100m of the point of discharge?				
i or secument impact only	is arele a uownsuedill suut	clure, lake, point of canal fildt reduc						
	Tier 1 Estimated r	river width (m)	2					
	• Tier 2 Bed width ((m)	1 Ma	anning's n 0.04 Side slope (m/m) 0.31 Long slope (m/m) 0.0228				
Step 3 Mitigation								
otep o magaaon				Estimated effectiveness				
				Treatment for Attenuation for solubles - Settlement of				
		Brief description		solubles (%) restricted discharge rate (Vs) sediments (%)				
Existing measures				0 D No restriction V D 0 D				
Proposed measures	Filter drains (s caled to the props	oed s cheme catchment only)		0 D No restriction V D 5				

Caption 3.2 Routine runoff assessment results for the outfall from the existing drainage area and catchment M1 of the Proposed Scheme with mitigation included.



highways england	Highways England V						
						Sediment - Chronic Impact	
	EQS - Annual Average Conc		Acute Impact				
Step 2 Tier 1 fail. Go to	Copper 2.41 Tier 2 (using UK TAG or Step 3 mitigation.	Zinc 8.07 -	ugil	Copper River Fails Toxi Test. Try mitiga			Fail 7 % settlement needed Settlement needed = 7 %, proposed = 0 % Sediment deposition for this site is judged as: Accumulating? Yes 0.08 Low flow Velm/s Extensive? Yes 107 Deposition Index
Road number		A47		HE Area /	DBFO number		
Assessment type		Non-cumulative assessment	(single outfall	11270001			-
OS grid reference of assessmen	nt point (m)	Easting 606238	(Northing	313483	
OS grid reference of outfall struc	ture (m)	Easting			Northing		
Outfall number		Network S1 and M2		List of outf	alls in cumulative		
Receiving watercourse		River Tud Tributary		asse ssmer	nt		
EA receiving water Detailed Rive	er Network ID	eaw100100000554631		Assessor	and affiliation		KD Sweco
Date of assessment		18/02/2021		Version of	assessment		2
Notes		taken at most downstream po	oint. BFI taken	rom FEH at TG 045	00 12900. Water hardne	ss taken f	ssumed to be on a tributary of the River Tud, from Anglian Water and EA water quality archive. lic model. Outfall locations still TBC.
Step 1 Runoff Quality	AADT >=100,000	•	Climatic reg	Warm Dry	 Rainfall site 		Huntingdon (SAAR 600mm)
Step 2 River Impacts	Annual Q ₉₅ river flow (m ³ /s)		0.001	Freshwater EQS	3 limits:		
(Enter zero in Annual Qos river flow box to	Impermeable road area drain	ned (ha)	3.529	Bioavailab	le dissolved copper (µg/l)		1
assess Step 1 runoff	Permeable area draining to o	outfall (ha)	0.902 Bioavailable dissolved zinc (µg/l)				
quality only)	Base Flow Index (BFI)		0.49	Is the discharge in	or within 1 km upstream o	f a protecte	ed site for conservation?
For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	•	For dissolve	d copper only Ambier	nt backgrou	und concentration (µg/l)
For sediment impact only	Is there a downstream struct	ure, lake, pond or canal that redu	ces the velocit	within 100m of the po	int of discharge?		No 🔹 D
	C Tier 1 Estimated riv	rer width (m)	5				
	Tier 2 Bed width (m)	1)	2.07	anning's n 0.04	Sid	de slope (m	n/m) 0.31 Long slope (m/m) 0.0088
Step 3 Mitigation		Brief description		Treatment fo		ubles -	Settlement of sediments (%)
Existing measures				0	No restriction		0 D
Proposed measures				0	No restriction	D	0

Caption 3.3 Routine runoff assessment results for the outfall from catchment M2 and S1 (prior to mitigation)



Appendix 13.3 - Water Quality Assessment

highways england	Highways England \	Nater Risk Assess	ment Tool		Version 2.0.4 June 2	2019				
		Solu	ble					Sediment - Ch	ronic Impact	
	EQS - Annual Average Con	oncentration Zinc			Acute Impact					
	Copper 2.41				<u> </u>	7.		Pas	s	
Step 2 Tier 1 fail. Go to	Z.41 Tier 2 (using UK TAG	8.07	ug/l		Copper	Zinc	Sed	liment deposition for t	his site is judged as:	
	or Step 3 mitigation.				Pass	Pass		sumulating? Yes	0.08 Low flow Vel m/s	
	0.77	2.42	ug/l				Este	ensive? No	11 Deposition Index	
Step 3										
Road number		A47			HE Area / DBFO n	umber				
Assessment type	t = = : = t (= -)		sessment (single outfa	all)		Manthian	040400		<u> </u>	
OS grid reference of assessmen		Easting 60 Easting	06238			Northing	313483			
OS grid reference of outfall struc Outfall number	ture (m)		10		List of outfalls in c	Northing				
Receiving watercourse		Network S1 and M River Tud Tributar			assessment	umulauve				
EA receiving water Detailed Rive	ar Notwork ID	eaw1001000000			Assessor and affilia	ation		KD Sweco		
Date of assessment		18/02/2021	554651		Version of assess			2		
Notes			e gauging station at T	ud at Costes			noint is assum	ed to be on a tributa	ry of the River Tud	
									A water quality archive.	
		Tier 2 river informat	ion taken from cross s	section inform	nation collected fo	or the A47 River Tu	ud hydraulic m	odel. Outfall location	s still TBC.	
Step 1 Runoff Quality	AADT >=100,000		 Climatic re 	egion Warm I	Dry 🝷	Rainfall site	Huntin	ngdon (SAAR 600mm)	-	
				-						
Step 2 River Impacts	Annual Q ₉₅ river flow (m ³ /s)		0.001	Fres	hwater EQS limits:					
(Entre and in Annual										
(Enter zero in Annual Q ₉₅ river flow box to	Impermeable road area drain	ed (ha)	3.529	3.529 Bioavailable dissolved copper (µg/l)						
assess Step 1 runoff	Permeable area draining to o	utfall (ha) 0.902		Bioavailable dissolved zinc (µg/l)				10.9		
quality only)	Base Flow Index (BFI)		0.49 Is the discharge in or within 1 km upstream of a protected site for conservation?				No 🗸 🖸			
	Buse How maex (BHI)				ischarge in or while		a protected sit			
For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	-	E F	or dissolved copp	eronlv Ambien	t backoround c	oncentration (µg/l)	0.07	
							, buongi buind o	οποστατατιστι (μ.g.r.)		
For sediment impact only	Is there a downstream struct	ure, lake, pond or cana	I that reduces the veloc	ity within 100	m of the point of dis	charge?		No - D		
	ঁ Tier 1 Estimated riv	er width (m)	5							
	Tier 2 Bed width (m)	2.07	Manning's n	0.04	Sid	e slope (m/m)	0.31 Long s	lope (m/m) 0.0088	
Step 3 Mitigation						Estimated effectiver	22.00			
				T		Attenuation for solu		ttlement of		
		Brief description				stricted discharge ra		liments (%)		
Existing measures		0 D No restriction D 0 D								
Proposed measures	Swale and wetland			80	No	• restriction	D 90			

Caption 3.4 Routine runoff assessment results for the outfall from catchment M2 and S1 with mitigation included



highways england	Highways Engl	and Water Risk Assessment 1	Гооі	Version 2.0.4	June 2019			
		Soluble					Sediment	- Chronic Impact
	EQS - Annual Average	e Concentration Zinc	Acute Impact					
	Copper			_	_			Pass
Step 2	0.17	0.03	ug/l	Copper	Zinc	- c	adiment deposition f	or this site is judged as:
Step 2				Pass	Pass		ccumulating? Yes	0.05 Low flow Velm/s
	-	-	ug/l				xtensive? No	9 Deposition Index
Step 3			-			-		· · _ ·
Road number		A47		HE Area / DB	FO number			
Assessment type		Non-cumulative assessme	nt (single outfo		i O humber			-
OS grid reference of assessme	nt point (m)	Easting 606631	ni (single oulla	11)	Northing	312763		
OS grid reference of outfall struc		Easting			Northing	312703		
Os que reference or outail struc Outfall number	aure (m)			List of outfalls				
		Network S2 & S3A		List of outrails assessment	in cumulative			
Receiving watercourse		River Tud						
EA receiving water Detailed Riv	er Network ID	eaw100100000482243	3	Assessor and			KD Sweco	
Date of assessment		18/02/2021		Version of as			2	
Notes		Q95 scaled from the gaugin FEH at TG 04500 12900. V						
		mapping. Outfall location ar						
								,
Step 1 Runoff Quality								
	AADT >=50,000	and <100,000 -	Climatic re	egion Warm Dry	 Rainfall site 	Hun	ntingdon (SAAR 600mm)	•
Step 2 River Impacts								
step 2 River impacts	Annual Q ₉₅ river flow (n	n³/s)	0.057	Freshwater EQS lin	nits:			
(Enter zero in Annual	Impermeable road area	a drained (ha)	0.678	Bioavailable o	dissolved copper (μg/l)		1 D	
Q ₉₅ river flow box to assess Step 1 runoff	Permeable area drainir	ng to outfall (ha)	0.608	Bioavailable dissolved zinc (µg/l)				
quality only)	Base Flow Index (BEI)		0.49	In the discharge in er	within 1 km upstream o	f a protostad a	ite for concervation?	No V
	Base Flow Index (BFI)		0.45		wiuliir i Kiirupsueani u	n a protecteu s	site for conservations	
For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	•	For dissolved of	copper only Ambier	nt background	concentration (µg/I)	0.16
For sediment impact only	Is there a downstream	structure, lake, pond or canal that rec	duces the veloc	ity within 100m of the point	of discharge?		No - D	
	Tier 1 Estimation	ted river width (m)	4					
	∴ Tier 2 Bed wi	dth (m)	2.07	Manning's n 0.04		de slope (m/m) 0.31 Lor	ng slope (m/m) 0.0088
	MICIZ Bed Wi		2.07		3	de slope (m/m		ig slope (III/III)
Step 3 Mitigation								
otep o mitigation					Estimated effective	eness		
				Treatment for	Attenuation for sol		Settlement of	
		Brief description		solubles (%)	restricted discharge r	ate (Vs) se	ediments (%)	
Existing measures				0 0	No restriction	- 0		
Proposed measures					No restriction			
Proposed measures					HOTES INCIDIT			

Caption 3.5 Routine runoff assessment results for the outfall from catchment S2 and S3a (prior to mitigation)



Appendix 13.3 - Water Quality Assessment

Soluble	highways england	Highways England V	Nater Risk Assessmer	nt Tool		Version 2.0.4 June 2	1019			
Cooper Zeic Pass <			Soluble						Sediment -	Chronic Impact
Step 2 Diff Diff <thdiff< th=""> Diff Diff</thdiff<>						Acute Imp	pact			
sep 2 Sep 3 Sep 3 <td< th=""><th></th><th>-</th><th></th><th></th><th></th><th>6</th><th>7.</th><th></th><th>I</th><th>Dass</th></td<>		-				6	7.		I	Dass
Step 3 Automation Read member Ad7 Assessment type Hon-Cumulative assessment (single outfall) CB and reference of assessment point (m) Easting Receiving water point point (m) Easting Receiving water point point (m) Easting CB and reference of assessment point (m) CB and reference of assessment point point (m) Receiving water point point point (m) Easting Receiving water point poi		18	0.07	ug/l		Copper	Zinc	Sec	diment deposition f	or this site is judged as:
Read number A47 IFE Area / DEFO number Assessment twoe Non-cumulative assessment (single outfall) Image: State assessment (single outfall) OS und reference of assessment point (m) Eastina 607115 Nonthina OS und reference of outfall number Nonthina 017203 Image: State assessment (single outfall) OS und reference of outfall number Network M3 List of outfall number Nonthina Receiving water Detailed Rev Network M3 List of outfall number Image: State assessment (single outfall) Image: State assessment (single outfall) Bate of assessment Information ID Sweco Image: State assessment (single outfall) Image: State assessment (single outfall number) NRts Desc stated from the gauging station at Tud at Costlessey Park (SatoCo) and assessment (single outfall number) Image: State assessment (single outfall number) Step 1 Runoff Quality ADT >=00.000 outfall location still TBC Image: Step 1 Runoff Quality ADT Image: Step 1 Runoff Quality ADDT Image: Step 1 Runoff Quality Image: Step 1 Runoff Quality ADDT Image: Step 1 Runoff Quality ADDT Image: Step 1 Runoff Quality Image: Step 1 Runof						Pass	Pass		· ·	
Assessment toe Non-cumulative assessment (single outfall) Inortima OS and reference of assessment point (m) Easting B07115 Nortima OS and reference of assessment point (m) Easting B07115 Nortima Otadial structure (m) Easting B07115 Nortima Casting reference of outfall structure (m) Easting B07115 Nortima Casting reference of outfall structure (m) Easting B07115 Nortima Casting reference of outfall structure (m) Easting B07115 Nortima Casting remote Nortima Assessment B07115 B07115 Date of assessment Nortima More casting from the pauging station at Tud 8 Costessey Park (24005) and assessment point is assumed to be on the River Tud. BF1 black from OS mapping. Outfal location still TBC. Notes B065 scaled from the pauging station at Tud 8 Costessey Park (24005) and assessment (point is assumed to be on the River Tud. BF1 black from OS mapping. Outfal location still TBC. Step 1 Runoff Quality AADT >=0.00 and <100, 00 • • Climatic region If we pauging station at Tud 8 Costessey Park (24005) and assessment (point is assumed to be on the River Tud. BF1 black from OS mapping. Outfal location still TBC. Step 1 Runoff Quality AADT >=0.00 • • Climatic reg	- Step 3		-	ug/l				Exte	ensive? No	23 Deposition Index
Assessment toe Non-cumulative assessment (single outfall) Inortima OS and reference of assessment point (m) Easting B07115 Nortima OS and reference of assessment point (m) Easting B07115 Nortima Otadial structure (m) Easting B07115 Nortima Casting reference of outfall structure (m) Easting B07115 Nortima Casting reference of outfall structure (m) Easting B07115 Nortima Casting reference of outfall structure (m) Easting B07115 Nortima Casting remote Nortima Assessment B07115 B07115 Date of assessment Nortima More casting from the pauging station at Tud 8 Costessey Park (24005) and assessment point is assumed to be on the River Tud. BF1 black from OS mapping. Outfal location still TBC. Notes B065 scaled from the pauging station at Tud 8 Costessey Park (24005) and assessment (point is assumed to be on the River Tud. BF1 black from OS mapping. Outfal location still TBC. Step 1 Runoff Quality AADT >=0.00 and <100, 00 • • Climatic region If we pauging station at Tud 8 Costessey Park (24005) and assessment (point is assumed to be on the River Tud. BF1 black from OS mapping. Outfal location still TBC. Step 1 Runoff Quality AADT >=0.00 • • Climatic reg										
CS drid reference of assessment point (m) Easting 607.115 Nothing 312703 CS drid reference of outial survaive (m) Easting Nothing 1 CS drid reference of outial survaive Nothing Nothing Nothing Receiving valarizourse River Tud assessment Image: Comparison of the comparison of th	Road number		A47			HE Area / DBFO nu	umber			
CS of deference of outfall structure (m) Easting Northing Outfall number Network M3 List of nucleis in curulative Base isoment River Tud assessment EA receiving water Outside River Network D eaw1001000000558222 Assessor and affiliation KD Sveco Date of assessment 2 Version of assessment 2 Notes OGS octaed from the gauging station at Tud at Costessesy Park (34005) and assessment point is assumed to be on the River Tud. BFI taken from FEH at TG O4500 12200 Water hardness taken from Anglian Water and EA water quality archive. Tier 1 river information is estimated from OS mapping. Outfall boration still TBC. Step 1. Runoff Quality AADT >=0000 wrd <100.000	Assessment type		Non-cumulative assess	ment (single outfall	l)					-
Outfail number Network M3 List of outfails in curvulative assessment Image: Construction of assessment Receiving valer (Detailed River Network D) eaw1001000000558222 Assessor and affiliation kD Sweco Date of assessment 18/02/2021 Assessor and affiliation kD Sweco Notes 0055 scaled from the gauging station at Tud at Costessey Park (34005) and assessment point is assumed to be on the River Tud. BFI taken from FEH at TG 04500 12900. Water hardness taken from Anglan Water and EA water quality archive. Tier 1 river information is estinated from OS mapping. Outfail location still TBC. Step 1 Runoff Quality AADT >=00.000 and <100.000	OS grid reference of assessment po	oint (m)	Easting 60711	5			Northing	312703		
Receiving water cutsie River Tud assessment ktp EA receiving water Cetailed River Network D eaw100100000558222 Assessor and affiliation ktD Sweco Date of assessment 2 Date of assessment 2 Obje scaled from the gauging station at Tud 1 Codessexy Park (24005) and assessment point is assumed to be on the River Tud. BFI taken from FEH at TC 04500 1200. Water farchress taken from Anglan Water and EA water qualty archive. Tier 1 river information is estimated from OS mapping. Outfail location still TBC. Step 1 Runoff Quality AADT >=00.000 and <100.000	OS grid reference of outfall structure	e (m)	Easting				Northing			
Index minute Index model Index model Index model Excercing water Detailed River Network D leaw 1001000000568222 Assessor and affiliation KD Sweco Date of assessment 18/02/2021 Version of assessment 2 Notes Costing water Detailed River Network D leaw 1001000000568222 Assessor and affiliation KD Sweco Step 1 Runoff Quality AADT Second and +100 assessment 0.01 Social assessment 2 Step 1 Runoff Quality AADT ==0.000 and +100.000 Climatic region Warm Dy Rainfail site Hutingdon (SAAR 600mm) Step 2 River Impacts Annual Q _{est} time flow (m ¹ /s) 0.0077 Frestwater EQS limits: Bioavailable dissolved copper (ug/l) 1 0 <td>Outfall number</td> <td></td> <td>Network M3</td> <td></td> <td></td> <td>List of outfalls in cu</td> <td>umulative</td> <td></td> <td></td> <td></td>	Outfall number		Network M3			List of outfalls in cu	umulative			
Date of assessment 18/02/2021 Version of assessment 2 Notes Od5 scaled from the gauging station at Tud at Coclessey Park (34005) and assessment point is assumed to be on the River Tud BFI taken from Anglan Water and EA water quality archive. Tier 1 ner information is estimated from OS Step 1 Runoff Quality AADT >=00.000 and <100.000	Receiving watercourse	River Tud			asse ssment					
Date of assessment 18/02/201 Version of assessment 2 Notes Operation of assessment 2 Operation of assessment 1 Operation of astreated assessment assessment 1<	EA receiving water Detailed River N		222		Assessor and affilia	ation		KD Sweco		
Notes ⁰⁰⁶ scaled from the gauging station at Tud at Costessey Park (24005) and assessment point is assumed to be on the River Tud. BFI taken from PFI at TGO4500 12900, Vister hardness taken from Anglian Water and EA water qualty archive. Tier 1 fiver information is estimated from OS mapping. Outfail location still TBC. Step 1 Runoff Quality AADT >=00.00 ard <100.000	Date of assessment				Version of assessn	nent		2		
FEH at TG 04500 12500 Water hardness taken from Anglian Water and EA water quality archive. Tier 1 fiver information is estinated from OS mapping. Outfail location still TBC. Step 1. Runoff Quality AADT >=50.000 ard <100.000 Climatic region Warm Dry Rainfall site Hurtingdon(SAAR 600mm) Step 2. River Impacts Annual Q ₁₆ river flow (m ¹ /s) 0.007 Freshwater EQS limits: (Enter zero in Annual Q ₁₆ river flow (m ¹ /s) 0.007 Freshwater EQS limits: Bioavailable dissolved copper (µg/l) 1 0 assess Step 1 runoff Permeable area draining to outfail (ha) 1.176 Bioavailable dissolved zinc (µg/l) 10.9 0 For dissolved zinc only Water hardness Hgh =>200mgCaCO31 For dissolved copper only Ambient background concentration (µg/l) 0.18 For sediment impact only Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge? No • • 0 • 0 <td< th=""><th>Notes</th><th></th><th></th><th>uging station at Tug</th><th>d at Costes</th><th></th><th></th><th>point is assum</th><th>red to be on the R</th><th>River Tud. BEI taken from</th></td<>	Notes			uging station at Tug	d at Costes			point is assum	red to be on the R	River Tud. BEI taken from
Step 2 River Impacts Annual Q _{as} river flow (m ³ /s) 0.007 Freshwater EQS limits: (Enter zero in Annual Q _{as} river flow (m ³ /s) 0.007 Freshwater EQS limits: Bioavailable road area drained (ha) 1.389 Bioavailable dissolved copper (µg/l) 1 Assess Step 1 runoff Permeable area draining to outfall (ha) 1.746 Bioavailable dissolved zinc (µg/l) 1 0.9 For dissolved zinc only Base Flow Index (BFI) 0.49 Is the discharge in or within 1 km upstream of a protected site for conservation? No • • • <t< th=""><th>Step 1 Runoff Quality</th><th>ADT >=50.000 and <1</th><th></th><th></th><th>tion Warm I</th><th>Inv 🖉</th><th>Bainfall aita</th><th>Huntin</th><th>ndon (SAAR 800mm)</th><th></th></t<>	Step 1 Runoff Quality	ADT >=50.000 and <1			tion Warm I	Inv 🖉	Bainfall aita	Huntin	ndon (SAAR 800mm)	
Annual Q ₆₅ river flow (m ¹ /s) 0.057 Freshwater EQS limits: (Enter zero in Annual Q ₆₅ river flow (m ¹ /s) Impermeable road area drained (ha) 1.389 Q ₆₅ river flow box to assess Step 1 runoff quality only) Permeable area draining to outfall (ha) 1.716 Bioavailable dissolved zinc (µg/l) 1 0 Base Flow Index (BFI) 0.48 Is the discharge in or within 1 km upstream of a protected site for conservation? No For dissolved zinc only Water hardness High=>200mg CaCO31 For dissolved copper only Ambient background concentration (µg/l) 0.18 For sediment impact only Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge? No • • C Tier 2 Bed width (m) 5 • • • • • Brief description Brief description Estimated effectiveness Settlement of solubles- settients (%) • • • • • • Existing measures Brief description Brief description • • • • • • • • • • • • • • •	A		•••••••••••••••••••••••••••••••••••••••		gion warm	ny -	Rainfall site	HUILI	igdon (SAAR Coomin)	•
Q ₀₅ river flow box to assess Step 1 runoff quality only) Permeable area draining to outfall (ha) 1.718 Bioavailable dissolved zinc (µg/l) 10.9 Base Flow Index (BFI) 0.49 Is the discharge in or within 1 km upstream of a protected site for conservation? No Image: Conservation (µg/l) 0.16 For dissolved zinc only Water hardness High=>200mg CaCO31 For dissolved copper only Ambient background concentration (µg/l) 0.16 For sediment impact only Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge? No Image: Conservation (µg/l) 0.16 For sediment impact only Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge? No Image: Conservation (µg/l) 0.16 For sediment impact only Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge? No Image: Conservation (µg/l) 0.16 Grain Term Estimated river width (m) Image: Conservation (µg/l) Image: Conservation (µg/	Step 2 River Impacts	Annual Q ₉₅ river flow (m ³ /s)		0.057	Fres	water EQS limits:				
assess Step 1 runoff quality only) Permeable area draining to outfall (ha) 17.16 Bioavailable dissolved zinc (µg/l) 10.9 Image: conservation (µg/l) Base Flow Index (BFI) 0.49 Is the discharge in or within 1 km upstream of a protected site for conservation? No Image: conservation (µg/l) 0.16 For dissolved zinc only Water hardness High = >200mg CaCO3/I For dissolved copper only Ambient background concentration (µg/l) 0.16 For sediment impact only Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge? No Image: conservation (µg/l) 0.16 For tire 1 Estimated river width (m) 5 Image: conservation (µg/l) 0.16 Image: conservation (µg/l) 0.16 Step 3 Mitigation 5 Image: conservation (µg/l) 0.16 Image: conservation (µg/l) 0.0085 Step 3 Mitigation 5 Image: conservation (Principles) Settlement of solubles - settiment of solubles - settiment of solubles - settiment of solubles (%) Settlement of settiment of solubles - settiment of solubles - settiment of solubles (%) Image: conservation (Vs) Image: conservation (Vs)<		mpermeable road area drain	ied (ha)	1.369		Bioavailable dissol	ved copper (µg/l)		1 D	
Base Flow Index (BFI) 0.49 Is the discharge in or within 1 km upstream of a protected site for conservation? No • 0 For dissolved zinc only Water hardness High = >200mg CaCO31 • For dissolved copper only Ambient background concentration (µg/l) 0.18 For sediment impact only Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge? No • 0 • Tier 1 Estimated river width (m) 5 • • 0 • 0 • 0 • 0 • 0 •		Permeable area draining to o	outfall (ha)	1.716		Bioavailable dissolv	ved zinc (µg/l)		10.9 D	
For sediment impact only Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge? No Image: Construct Copper only Image: Con		Base Flow Index (BFI)		0.49	Is the c	ischarge in or withir	n 1 km upstream of	a protected sit	e for conservation?	No 🔻 🖸
Image: Step 3 Mitigation 5 Step 3 Mitigation Estimated effectiveness Treatment for solubles (%) Settlement of restricted discharge rate (Vs) Setting measures 0	For dissolved zinc only V	Vater hardness	High = >200mg CaCO3/I	•	F	or dissolved coppe	eronly Ambient	background c	oncentration (µg/l)	0.18
Step 3 Mitigation Estimated effectivene ss Brief description Treatment for solubles (%) Side slope (m/m) 0.31 Long slope (m/m) 0.008	For sediment impact only	s there a downstream struct	ure, lake, pond or canal tha	t reduces the velocit	ty within 100	n of the point of dis	charge?		No 🔹 D	
Step 3 Mitigation Estimated effectiveness Brief description 0 Existing measures 0	G	Tier 1 Estimated riv	er width (m)	5						
Brief description Image: Construction of the section of the secti		Tier 2 Bed width (m)	2.07	Manning's n	0.04	Side	e slope (m/m)	0.31 Lon	g slope (m/m) 0.0088
Brief description Treatment for solubles (%) Attenuation for solubles - restricted discharge rate (Vs) Settlement of sediments (%) Existing measures 0 D No restriction 0 D	L									
Brief description Treatment for solubles (%) Attenuation for solubles - restricted discharge rate (<i>Vs</i>) Settlement of sediments (%) Existing measures 0 0 0 0 0	Step 3 Mitigation						Estimated effectiven	9.99.0		
Existing measures 0 D No restriction D D			Brief description			eatment for	Attenuation for solub	oles - Se		
			Sher description							
Proposed measures 0 D No restriction D 0 D 0 D 0 D 0 D 0 D 0 D 0 D 0 D 0 D	Existing measures				0	D No	restriction -	DO	D	
	Proposed measures				0	D No	restriction -	DO	D	

Caption 3.6 Routine runoff assessment results for the outfall from catchment M3 (prior to mitigation)



highways england	Highways Engla	nd Water Risk Assessn	ient Tool	Version 2.0.4 June 2019	
		Solubl	e		Sediment - Chronic Impact
	EQS - Annual Average			Acute Impact	
	Copper	Zinc			Pass
	0.21	0.14	ug/l	Copper Zinc	
Step 2				Pass Pass	Sediment deposition for this site is judged as: Accumulating? Yes 0.06 Low flow Velm/s
			ug/l	rass rass	Extensive? No 34 Deposition Index
Step 3	-	-	ugn		
Deadarantea		4.47			
Road number		A47		HE Area / DBFO number	
Assessment type	at a sint (as)		essment (single outfall)	Nestline	240400
OS grid reference of assessmer			3024		312462
OS grid reference of outfall struc	cture (m)	Easting		Northing	
Outfall number		Network M4		List of outfalls in cumulative assessment	
Receiving watercourse					
	er Network ID	eaw1001000005	57488	Assessor and affiliation	KD Sweco
Date of assessment		18/02/2021		Version of assessment	2
Notes					point is assumed to be on the River Tud. BFI taken from
		mapping. Outfall loca		aken from Anglian water and EA water quality	archive. Tier 1 river information is estinated from OS
		mapping. outai lova			
Step 1 Runoff Quality					
Step 1 Runon Quanty	AADT >=50,000 g	and <100,000	 Climatic reg 	on Warm Dry 💌 Rainfall site	Huntingdon (SAAR 600mm)
Step 2 River Impacts	Annual Q ₉₅ river flow (m	³ /s)	0.068	Freshwater EQS limits:	
(Enter zero in Annual Q ₉₅ river flow box to	Impermeable road area	drained (na)	3.461	Bioavailable dissolved copper (µg/l)	1
assess Step 1 runoff	Permeable area draining	g to outfall (ha)	2.151	Bioavailable dissolved zinc (µg/l)	10.9
quality only)			0.49		
	Base Flow Index (BFI)		0.49	Is the discharge in or within 1 km upstream of	a protected site for conservation?
				-	
For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	-	For dissolved copper only Ambient	background concentration (µg/l)
For ordiment impact anti-	la thora a downates	tructure lake need or	hat reduces the uning	within 100m of the point of discharge?	
For sediment impact only	Is there a downstream s	tructure, lake, pond or canal t	that reduces the velocity	within 100m of the point of discharge?	No
For sediment impact only		tructure, lake, pond or canal t ed river width (m)	hat reduces the velocity	within 100m of the point of discharge?	No 🔽 🖸
For sediment impact only	Tier 1 Estimate	ed river width (m)	4		
For sediment impact only		ed river width (m)	4		No Constant
	Tier 1 Estimate	ed river width (m)	4		
For sediment impact only Step 3 Mitigation	Tier 1 Estimate	ed river width (m)	4	Manning's n 0.04 Side	e slope (m/m) 0.31 Long slope (m/m) 0.0068
	Tier 1 Estimate	ed river width (m)	4	Manning's n 0.04 Side	e slope (m/m) 0.31 Long slope (m/m) 0.0068
	Tier 1 Estimate	ed river width (m) th (m)	4	Manning's n 0.04 Side	e slope (m/m) 0.31 Long slope (m/m) 0.0088 e ss oles - Settlement of
Step 3 Mitigation	Tier 1 Estimate	ed river width (m)	4	Aanning's n 0.04 Side Estimated effectiven Treatment for solubles (%) restricted discharge rat	e slope (m/m) 0.31 Long slope (m/m) 0.0068 e ss oles - Settlement of sediments (%)
	Tier 1 Estimate	ed river width (m) th (m)	4	Aanning's n 0.04 Side	e slope (m/m) 0.31 Long slope (m/m) 0.0088 e ss

Caption 3.7 Routine runoff assessment results for the outfall from catchment M4 (prior to mitigation)



۶	highways england	Highways Engla	nd Water Risk Assessment T	ool	Version 2.0.4 June 2019				
Г			Soluble		Sediment - Chronic Impact				
	Step 2 Step 3	EQS - Annual Average Copper 0.20 -	Concentration Zinc 0.11 -	ugil	Acute Impact Copper Zinc Pass Pass Pass Pass Ketensive? Yes 0.03 Low flow Vel m/s Extensive?				
R	Road number		A47		HE Area / DBFO number				
A	Assessment type		Non-cumulative assessmen	nt (single outfa	fall) 🚽				
	OS grid reference of assessme		Easting 608717		Northing 312257				
	DS grid reference of outfall strue	cture (m)	Easting		Northing				
	Outfall number		Network M5		List of outfalls in cumulative assessment				
	Receiving watercourse	na Maturalu ID	River Tud						
	A receiving water Detailed Riv Date of assessment	er Network ID	eaw100100000482247		Assessor and affiliation KD Sweco Version of assessment 2				
	lotes		18/02/2021	a station at Tu	Tud at Costessey Park (34005) and assessment point is assumed to be on the River Tud. BFI taken from				
	Step 1 Runoff Quality	AADT >=50.000 s	nd <100,000		des exisiting drainage area tie in - TBC region Warm Dry Rainfall site Huntingdon (SAAR 600mm)				
	Step 2 River Impacts	Annual Q _{a5} river flow (m	ⁱ /s)	0.067	Freshwater EQS limits:				
	(Enter zero in Annual	Impermeable road area	drained (ha)						
	Q ₉₅ river flow box to assess Step 1 runoff	Permeable area draining	u to outfall (ha)	1.463	Bioavailable dissolved zinc (µq/l)				
	quality only)	Base Flow Index (BFI)	, (,	0.55	Is the discharge in or within 1 km upstream of a protected site for conservation? No ▼				
	For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	•	For dissolved copper only Ambient background concentration (µg/l)				
	For sediment impact only	Is there a downstream s	ructure, lake, pond or canal that red	uces the veloci	city within 100m of the point of discharge?				
		• Tier 1 Estimate	d river width (m)	6					
		ੰ Tier 2 Bed wid	h (m)	2.07	Manning's n 0.04 Side slope (m/m) 0.31 Long slope (m/m) 0.0088				
	Step 3 Mitigation		Brief description		Estimated effectiveness Treatment for solubles - solubles (%) Solubles (%) No restricted discharge rate (\/s) Solubles (%)				
	Proposed measures				0 D No restriction V D 0				

Caption 3.8 Routine runoff assessment results for the outfall from catchment M5 (prior to mitigation)

| L



Appendix 13.3 - Water Quality Assessment

s england	Highways England \	Nater Risk Assessment To	ool	Version 2.0.4 June	2019			
		Soluble					Sediment - C	hronic Impact
	EQS - Annual Average Con			Acute Im	ipact			
	Copper	Zinc					Pa	ss
Step 2	0.22	0.17	ug/l	Copper	Zinc	5	liment deposition for	this site is judged as:
Step 2				Pass	Pass		sumulating? Yes	0.04 Low flow Vel m/s
	-	-	ug/l			Exte	ensive? No	63 Deposition Index
Step 3								
Road number		A47		HE Area / DBFO n	number			
Assessment type		Non-cumulative assessment	t (single outfa	II)				•
OS grid reference of assessmer	nt point (m)	Easting 610615			Northing	311834		
OS grid reference of outfall struc	ture (m)	Easting	Easting					
Outfall number		Networks M6 and NW		List of outfalls in c	umulative			
Receiving watercourse		River Tud		asse ssment				
EA receiving water Detailed Rive	er Network ID	eaw100100000549161		Assessor and affili	ation		KD Sweco	
Date of assessment		18/02/2021		Version of assess	ment		2	
Notes				d at Costessey Park (34005)				
		mapping. Outfall location still		s taken from Anglian Water ar	nd EA water quality	archive. Her	1 river information i	is estimated from OS
		mapping. Outan locatorioun						
Step 1 Runoff Quality								
	AADT >=50,000 and <	100,000	Climatic re	gion Warm Dry 🔽	Rainfall site	Huntir	ngdon (SAAR 600mm)	<u> </u>
Step 2 River Impacts								
Step 2 Kiver impacts	Annual Q ₉₅ river flow (m ³ /s)		0.073	Freshwater EQS limits:				
(Enter zero in Annual	Impermeable road area drain	ed (ha)	4.665	Bioavailable disso	lved copper (µg/l)		1 D	
Q ₉₅ river flow box to assess Step 1 runoff	Permeable area draining to o	outfall (ha)	5.475	Bioavailable disso	lved zinc (µg/l)		10.9 D	
quality only)	Base Flow Index (BFI)		0.55	Is the discharge in or withi	in 1 km unstream of	a protected sit	e for concervation?	No v D
	Dase How Index (DFT)		0.00	Is the discharge in or whith	in TKin upsueam of	a protected sit	e for conservation?	
For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	-	For dissolved copp	er only Ambient	background c	oncentration (µg/l)	0.16
For sediment impact only	Is there a downstream struct	ure, lake, pond or canal that redu	uces the veloci	ity within 100m of the point of dis	scharge?		No - D	
	Tier 1 Estimated riv	er width (m)	5					
	ੰ Tier 2 Bed width (m	0	2.07	Manning's n 0.04	Oid	e slope (m/m)	0.31 Long	slope (m/m) 0.0088
	MICI 2 Bed width (in	·/	201		310	e slope (m/m)	Long	
Step 3 Mitigation					Estimated effectiven			
					Attenuation for solut		ttlement of	
		Brief description			stricted discharge ra		timents (%)	
		oner description						
Existing measures				0 D N	o restriction 👻	DO	D	
Proposed measures				0 D N	o restriction 👻	D 0	D	

Caption 3.9 Routine runoff assessment results for the outfall from catchment M6 and NW (prior to mitigation)

Appendix 13.3 - Water Quality Assessment



highways england	Highways Engla	and Water Risk Assessment T	ool	Version 2.0.4 June 2019			
		Soluble		Sediment - Chronic Impact			
	EQS - Annual Average			Acute Impact			
	Copper	Zinc		Pass			
Step 2	0.18	0.05	ug/l	Copper Zinc Sediment deposition for this site is judged as:			
one p 2				Pass Pass Accumulating? Yes 0.07 Low flow Velm/s			
	-	-	ug/l	Extensive? No 12 Deposition Index			
Step 3							
Road number		A47		HE Area / DBFO number			
Assessment type		Non-cumulative assessmer	nt (single outfall	II)			
OS grid reference of assessme	nt point (m)	Easting 611002		Northing 311750			
OS grid reference of outfall struc	ture (m)	Easting		Northing			
Outfall number		Network M7		List of outfalls in cumulative			
Receiving watercourse		River Tud		asse ssment			
EA receiving water Detailed Riv	eaw100100000483725		Assessor and affiliation KD Sweco				
Date of assessment		19/11/2020		Version of assessment 2			
Notes				Id at Costessey Park (34005) and assessment point is assumed to be on the River Tud. BFI taken from			
		mapping. Outfall location sti		s taken from Anglian Water and EA water quality archive. Tier 1 river information is estinated from OS			
		mapping. Cutai locatori su	. 100.				
Step 1 Runoff Quality	11DT	1 - 52 - 620	or r				
	AADT >10,000 a	nd <50,000	Climatic reg	gion Warm Dry Rainfall site Huntingdon (SAAR 600mm)			
Step 2 River Impacts							
	Annual Q ₉₅ river flow (n	1 ³ /S)	0.078	Freshwater EQS limits:			
(Enter zero in Annual	Impermeable road area	drained (ha)	1.789	Bioavailable dissolved copper (µg/l)			
Q ₉₅ river flow box to	•						
assess Step 1 runoff quality only)	Permeable area drainin	ig to outfall (ha)	1.309	Bioavailable dissolved zinc (µg/l)			
quality only)	Base Flow Index (BFI)		0.55	Is the discharge in or within 1 km upstream of a protected site for conservation?			
For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	-	For dissolved copper only Ambient background concentration (µg/l) 0.16			
For sediment impact only	Is there a downstream	structure, lake, pond or canal that red	uces the velocity	ty within 100m of the point of discharge?			
	• Tier 1 Estimat	ed river width (m)	4				
	C Tier 2 Bed wid	ith (m)	2.07	Manning's n 0.04 Side slope (m/m) 0.31 Long slope (m/m) 0.0068			
Cham D. Midlandian							
Step 3 Mitigation				Estimated effectiveness			
				Treatment for Attenuation for solubles - Settlement of			
		Brief description	solubles (%) restricted discharge rate (//s) sediments (%)				
Existing measures			0 D No restriction V D 0 D				
Proposed measures				0 D Norestriction 0 D			
i toposeu measules							

Caption 3.10 Routine runoff assessment results for the outfall from catchment M7 (prior to mitigation)



highways england	Highways England	d Water Risk Assessment To	ol	Version 2.0.4 June 2019			
		Soluble		Sediment - Chronic Impact			
Step 2 Step 3	EQS - Annual Average C Copper 0.17 -	oncentration Zino 0.02 -	ug/l	Acute Impact Pass Copper Zinc Pass Pass Sediment deposition for this site is judged as: Accumulating? Yes 0.07 Extensive? No 5 Deposition Index			
Road number		A47		HE Area / DBFO number			
Assessment type		Non-cumulative assessment	(single outfa	fall)			
OS grid reference of assessmer	nt point (m)	Easting 610923		Northing 311682			
OS grid reference of outfall struc	ture (m)	Easting		Northing			
Outfall number		Network M8		List of outfalls in cumulative			
Receiving watercourse				asse ssment			
	A receiving water Detailed River Network ID eaw 10010000004837			Assessor and affiliation KD Sweco			
Date of assessment Notes		18/02/2021		Version of assessment 2 Tud at Costessey Park (34005) and assessment point is assumed to be on the River Tud. BFI taken from			
Step 1 Runoff Quality	AADT >10,000 and	mapping. Outfall location still		ess taken from Anglian Water and EA water quality archive. Tier 1 river information is estinated from OS			
Step 2 River Impacts	Annual Q _{as} river flow (m ³ /s		0.078	Freshwater EQS limits:			
(Enter zero in Annual	Impermeable road area dr		0.832				
Q ₉₅ river flow box to	-						
assess Step 1 runoff quality only)	Permeable area draining t	to outfall (ha)	0.691	Bioavailable dissolved zinc (µg/l)			
	Base Flow Index (BFI)		0.55	Is the discharge in or within 1 km upstream of a protected site for conservation?			
For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	-	For dissolved copper only Ambient background concentration (μg/l) 0.18			
For sediment impact only	Is there a downstream stru	ucture, lake, pond or canal that redu	ces the veloc	ocity within 100m of the point of discharge?			
	Tier 1 Estimated	river width (m)	4]			
	ੰ Tier 2 Bed width	(m)	2.07	Manning's n 0.04 Side slope (m/m) 0.31 Long slope (m/m) 0.0068			
Step 3 Mitigation		Brief description		Estimated effectiveness Treatment for solubles (%) Attenuation for solubles - restricted discharge rate (\s) Settlements (%)			
Existing measures			0 D No restriction - D 0 D				
Proposed measures				0 D No restriction • D 0 D			

Caption 3.11 Routine runoff assessment results for the outfall from catchment M8 (prior to mitigation)



Appendix 13.3 - Water Quality Assessment

5	highways england	5	Highwa	ys England	Water Risk Assessmen	t Tool			Version 2.0.4 June 2	019				
Г					Soluble							Sediment	t - Chronic Impact	
Г				al Average Co					Acute Imp	pact				
			Copper		Zinc				_	_			Pass	
	Step 2		0.33		0.71	ug/l			Copper	Zinc		diment deposition	for this site is judged as:	
	Step 2								Pass	Pass		cumulating? Yes		
	Step 3		-		-	ug/l					Ex	Extensive? No 97 Deposition Index		
F	oad numbe	er			A47				HE Area / DBFO nu	umber				
A	ssessment	type			Non-cumulative assessm	ment (sinale out	fall)					1	-	
		rence of assessmer	nt point (m)		Easting 611822		,			Northing	311263			
		rence of outfall struc			Easting	-				Northing	011200			
	utfall numb				Networks M9, M10, NE	5 and W1			List of outfalls in cu					
	Receiving watercourse River Tu					_, 05 and 111			assessment					
E F						61			Assessor and affilia	ation		KD Sweco		
	EA receiving water Detailed River Network ID eaw1001000000549161 Date of assessment 18/02/2021					01			Version of assessn			2		
	otes					ning station at "	Fuel :	at Costes			noint is assu	med to be on the	River Tud. BFI taken from	
	Step 1 R	unoff Quality	AADT	>=100,000	mapping. Outfall location	Climatic	regia)n Warm [Dry 💌	Rainfall site	Hun	tingdon (SAAR 600mm		
4	Step 2 R	iver Impacts	Annual Q ₉₅ ri	ver flow (m³/s))	0.087]	Fres	hwater EQS limits:					
	(Enter zero Qos river flo	o in Annual ow box to	Impermeable	road area dra	ined (ha)	10.285]		Bioavailable dissol	ved copper (µg/l)		1 D		
	assess Ste	•	Permeable a	rea draining to	outfall (ha)	10.002]		Bioavailable dissol	ved zinc (µg/l)		10.9 D		
	quality only	y)	Base Flow In	dex (BFI)		0.55		Is the d	lischarge in or withir	n 1 km upstream of	f a protected s	ite for conservatior	1? <u>No</u>	
	For disso	lved zinc only	Water hardne	ess	High = >200mg CaCO3/I	•		E F	or dissolved coppe	eronly Ambien	t background	concentration (µg/l) 0.18	
	For sedim	nent impact only	Is there a dov	vnstream struc	cture, lake, pond or canal that	reduces the velo	city	within 100	m of the point of dis	charge?		No - D		
			Tier 1	Estimated r	iver width (m)	5]							
			ீ Tier 2	Bed width (m)	2.07] M	anning's n	0.04	Sid	le slope (m/m)	0.31 LC	ong slope (m/m) 0.0068	
ŀ		141										1		
	Step 3 M				Brief description				reatment for olubles (%) res	Estimated effectiver Attenuation for solu tricted discharge ra	bles - S	ettlement of diments (%)		
		measures						0		restriction -				
							_							

Caption 3.12 Routine runoff assessment results for the outfall from catchment M9, M10, NE, S5 & W1 (prior to mitigation)



highways england	Highways England	Water Risk Assessment To	ol	Version 2.0.4 June	2019					
		Soluble					Sediment - Chronic Impact			
Step 2 Step 3	EQS - Annual Average Cor Copper 0.16 -	ncentration Zinc 0.00 -	ug/l	Acute Im Copper Pass	paot Zinc Pass		Pass Sediment deposition for this site is judged as: Accumulating? Yes 0.06 Low flow Velm/s Extensive? No 1 Deposition Index			
Road number		A47		HE Area / DBFO number						
Assessment type		Non-cumulative assessment	(single outfall)				-			
OS grid reference of assessmer	nt point (m)	Easting 609958			Northing	311974				
OS grid reference of outfall struc	ture (m)	Easting			Northing					
Outfall number		Network S3		List of outfalls in c	umulative					
Receiving watercourse		River Tud		asse ssment						
EA receiving water Detailed River Network ID eaw100100000548402				Assessor and affili			KD Sweco			
Date of assessment Notes		18/02/2021		Version of assess			2 Issumed to be on the River Tud. BFI taken from			
Step 1 Runoff Quality	AADT ► 10,000 and <	mapping. Outfall location and results.		oint still TBC. This does not	include exisiting		Tier 1 river information is estimated from OS catchemnt area as awaiting drainage survey			
	AADT	50,000	Climatic regio		Rainfall site					
Step 2 River Impacts	Annual Q ₉₅ river flow (m ³ /s)		0.07	Freshwater EQS limits:						
(Enter zero in Annual Q ₉₅ river flow box to	Impermeable road area dra	ined (ha)	d (ha) 0.123 Bioavailable dissolved copper (µg/l) 1							
assess Step 1 runoff	Permeable area draining to	outfall (ha)	0.175	Bioavailable disso	lved zinc (µg/l)		10.9 D			
quality only)	Base Flow Index (BFI)		0.55	Is the discharge in or withi	n 1 km upstream (of a protect	ed site for conservation?			
For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	•	For dissolved copp	eronly Ambie	nt backgrou	und concentration (µg/l)			
For sediment impact only	Is there a downstream struc	cture, lake, pond or canal that redu	ces the velocity	within 100m of the point of dis	charge?		No 🔻 D			
		iver width (m)	4		2					
	C Tier 2 Bed width (m)	2.07 M	anning's n 0.04	Si	de slope (n	n/m) 0.31 Long slope (m/m) 0.0088			
Step 3 Mitigation					Estimated effective	00000				
					Attenuation for sol		Settlement of			
			solubles (%) restricted discharge rate (Vs) sediments (%)							
		Brief description								
Existing measures					o restriction	• •				
Proposed measures				0 D No restriction V D 0						

Caption 3.13 Routine runoff assessment results for the outfall from catchment S3 (prior to mitigation)



Appendix 13.3 - Water Quality Assessment

highways england	Highways Englan	d Water Risk Assessment To	ol	Version 2.0.4 June 2019	
		Soluble			Sediment - Chronic Impact
	EQS - Annual Average C			Acute Impact	
	Copper	Zinc			Pass
Step 2	0.28	0.36	ug/l	Copper Zinc	Sediment deposition for this site is judged as:
Step 2				Pass Pass	Accumulating? Yes 0.01 Low flow Velm/s
	-	-	ug/l		Extensive? No 36 Deposition Index
Step 3					
Road number		A47		HE Area / DBFO number	
Assessment type		Non-cumulative assessment	(single outfall)		
OS grid reference of assessmer	nt point (m)	Easting 610877		Northing 311566	
OS grid reference of outfall struc	ture (m)	Easting 610879		Northing 311562	
Outfall number		Network S4 / TG1011 875	56b	List of outfalls in cumulative	
Receiving watercourse		River Tud		asse ssment	
EA receiving water Detailed Riv	er Network ID	eaw100100000483725		Assessor and affiliation	KD Sweco
Date of assessment		18/02/2021		Version of assessment	2
Notes		Q95 scaled from the gauging	station at Tud	at Costessey Park (34005) and assessment point is a	assumed to be on a tributary of the River Tud. BFI
		from OS mapping. Outfall loca		hardness taken from Anglian Water and EA water qu	ality archive. Tier 1 river information is estinated
		nom do mapping. data loca	aron and aran		
Step 1 Runoff Quality					
	AADT >=50,000 and	d <100,000	Climatic regi	Marm Dry Rainfall site	Huntingdon (SAAR 600mm)
Step 2 River Impacts					
otep 2 rever impuots	Annual Q ₉₅ river flow (m ³ /s	s)	0.004	Freshwater EQS limits:	
(Enter zero in Annual	Impermeable road area dr	rained (ha)	0.592	Bioavailable dissolved copper (µg/l)	1
Q ₉₅ river flow box to assess Step 1 runoff	Permeable area draining f	to outfall (ha)	0.028	Bioavailable dissolved zinc (µg/l)	10.9
quality only)	Base Flow Index (BFI)		0.55	Is the discharge in or within 1 km upstream of a protec	ted site for conservation?
	Dase Flow Index (DFI)		0.00	is the discharge in or within 1 kin upstream of a protec	
For dissolved zinc only	Water hardness	High = >200mg CaCO3/I	•	For dissolved copper only Ambient backgro	ound concentration (µg/l)
For sediment impact only	Is there a downstream stru	ucture, lake, pond or canal that redu	ces the velocity	within 100m of the point of discharge?	No -
	Ó Traind - Falleradad				
	Tier 1 Estimated	l river width (m)	3		
	Tier 2 Bed width	i (m)	2.07 N	anning's n 0.04 Side slope (m/m) 0.31 Long slope (m/m) 0.0088
Step 3 Mitigation				Estimated effectiveness	
				Treatment for Attenuation for solubles -	Settlement of
		Brief description		solubles (%) restricted discharge rate (//s)	sediments (%)
Existing measures				0 D No restriction	0 D
Proposed measures				0 D No restriction	0 D

Caption 3.14 Routine runoff assessment results for the outfall from catchment S4 (prior to mitigation)



Appendix 13.3 - Water Quality Assessment

england	Highways England	Water Risk Asse	ssment Tool		Version 2.0.4 June 2	019			
		So	luble					Sediment -	Chronic Impact
	EQS - Annual Average Cor	ncentration			Acute Imp	pact			
	Copper	Zinc			_	_		P	ass
Step 2	0.19	0.07	ug/l		Copper	Zinc		liment deposition fo	or this site is judged as:
over 2					Pass	Pass		umulating? Yes	0.07 Low flow Vel m/s
	-	-	ug/l				Exte	ensive? No	17 Deposition Index
Step 3									
Road number		A47			HE Area / DBFO n	umber			
Assessment type		Cumulative asse	ssment including sedi	ments (outfalls	within 100m)				-
OS grid reference of assessmer	nt point (m)	Easting	610923			Northing	311682		
OS grid reference of outfall struc	ture (m)	Easting				Northing			
Outfall number		Network M7 and	1 M8		List of outfalls in cu	umulative		611002	311750
Receiving watercourse		River Tud			asse ssment				
EA receiving water Detailed Riv	A receiving water Detailed River Network ID ea ate of assessment 18				Assessor and affilia	ation		KD Sweco	
Date of assessment			Version of assessn	nent		1			
Notes									iver Tud. BFI taken from
		mapping. Outfall		ess taken from	n Anglian Water an	d EA water quality	archive. Her	1 river information	n is estinated from OS
		mapping. outain							
Step 1 Runoff Quality					-				
	AADT >10,000 and <5	50,000	 Climatic 	region Warm	Dry 💌	Rainfall site	Huntir	ngdon (SAAR 600mm)	•
Step 2 River Impacts				_					
otep 2 Parter impacts	Annual Q ₉₅ river flow (m ³ /s)	1	0.078	Free	shwater EQS limits:				
(Enter zero in Annual Q ₉₅ river flow box to	Impermeable road area drai	ined (ha)	2.621		Bioavailable dissol	ved copper (µg/l)		1 D	
assess Step 1 runoff	Permeable area draining to	outfall (ha)	2		Bioavailable dissol	ved zinc (µg/l)		10.9 D	
quality only)	Base Flow Index (BFI)		0.55	Is the	discharge in or withir	n 1 km upstream of	a protected sit	e for conservation?	No 🔻 D
					aloonalyo in or main		a protocioa en		
For dissolved zinc only	Water hardness	High = >200mg CaCC	13/1	F	or dissolved coppe	eronly Ambient	background c	oncentration (µg/l)	0.16
For sediment impact only	Is there a downstream struc	cture, lake, pond or ca	nal that reduces the vel	ocity within 10	Om of the point of dis	charge?		No - D	
	• Tier 1 Estimated ri	iver width (m)	4	1					
	C Tier 2 Bed width (r	m)	2.07	Manning's	0.04	510	e slope (m/m)	0.31 Long	g slope (m/m) 0.0068
Step 3 Mitigation									
Step o Miligation					E	Estimated effectiven	ie ss		
						Attenuation for solul		ttlement of	
		Brief description			solubles (%) res	tricted discharge ra	te(Vs) sed	liments (%)	
Existing measures				0	D No	restriction 👻	0		
Proposed measures				0		restriction 👻			

Caption 3.15 Cumulative routine runoff assessment results for the outfall at catchments M7 and M8 (prior to mitigation)



3.4. Retained outfalls unaffected by proposed drainage design

3.4.1. The existing A47 is to be retained (de-trunked) as a local access road and there are six existing outfalls which will be retained as part of the existing drainage. These outfalls are located immediately east of Hockering (TG0712_9092b and TG0712_8587d), at the existing River Tud crossing (TG1011_6183b, TG1011_5982b and TG1011_5981a) and east of this crossing (TG1011_8556b). The existing outfalls are currently classed as low pollution risk on HA DDMS (Highways England, 2020) which means they do not require mitigation; this assumes an AADT of between approximately 23,000 ('Do minimum' – 2040 forecast). Once the existing A47 is changed to a local access road the AADT traffic forecast will significantly reduce to less than 5,000 AADT ('Do something' - 2040 forecast). This would result in a reduction in road runoff pollutant concentrations from these outfalls when compared to the baseline scenario.



4. Accidental spillage assessment

4.1. Overview

4.1.1. This section presents the results of the accidental spillage assessment. This considers the risk of pollution impacts from accidental spillages onto the drainage catchments which discharge to the River Tud water body and its tributaries.

4.2. Method

- 4.2.1. Spillage assessments were completed for all outfalls, using the approach as detailed within the DMRB LA 113. The methodology uses a prepared spreadsheet to input parameters relating to waterbody type, road type, AADT and location. This determines an overall risk expressed as probability. For this methodology, the probability is defined in two ways:
 - The probability that there will be a spillage with the potential to cause a serious pollution incident
 - The probability, assuming such a spillage has occurred, that the pollutant will cause a serious pollution incident
- 4.2.2. The following formula is used to calculate the annual probability of a spillage for each section of road:

P_{SPL}=RL × SS ×(AADT ×365 × 10⁻⁹)×(%HGV/100)

- 4.2.3. Where:
 - P_{SPL} = annual probability of a spillage with the potential to cause a serious pollution incident
 - RL = Road Length (in km)
 - SS = Spillage rates from Table D1 (which is included with the results below)
 - AADT = annual average daily traffic (design year for new road used)
 - %HGV = Percentage of heavy goods vehicles
- 4.2.4. The predicted annual probability of a serious pollution incident for each section of road, using this formula:

 $P_{INC} = P_{SPL} \times P_{POL}$

- 4.2.5. Where:
 - P_{INC} = the probability of a spillage with an associated risk of a serious pollution incident occurring



- PPOL = the probability, given a spillage, that a serious pollution incident will result. An appropriate value for this is selected from Table D2 in LA113 for outfalls. This will depend on the sensitivity of the water course and how soon it can be reached by the emergency services.
- 4.2.6. The AADT and HGV % forecasts with and without the Norwich Western Link Road scheme were considered. The results considered in this assessment are based on those with the Norwich Western Link Road scheme in place, which represents the worst case scenario.

4.3. Assessment results

- 4.3.1. All of the outfalls passed the accidental spillage assessment with the results indicating all drainage areas would have <0.5% annual risk of pollution, which is the annual acceptable threshold for discharge to a sensitive designated site. The annual acceptable pollution risk threshold is set at 0.5% due to the presence of coastal and floodplain grazing and lowland fen Priority Habitats located within the vicinity of, and downstream of, the outfalls.. This assessment included the additional measures noted in section 3.3.
- 4.3.2. The results from each accidental spillage assessment can be seen in Captions 4.1 to 4.12.

Appendix 13.3 - Water Quality Assessment



eng	hways land		View Para	ameters	Reset Spill	lage Risk	Go To Inte	erface			
ssess	ment of Priority Outfalls	;									
ethod D	- assessment of risk from a	ccidental spil	age	Additiona	al columns for u	se if other roa	ds drain to the sa	me outfall		٦	
			A (main roa		В	С	D	E	F	-	
1 Wat	er body type		Surface waterco	-/	0	<u> </u>				-	
	gth of road draining to outfall ((m)	1,361.00	ourse						-	
	d Type (A-road or Motorway)		A							-	
	road, is site urban or rural?		Rural							-	
	ction type		No junction							1	
	ation (response time for emer	dency service									
7 Traf	fic flow (AADT two way)	3,	49,284								
8 % H			4.1								
8 Spil	lage factor (no/10° HGVkm/ye	ear)	0.29								
	k of accidental spillage		0.00029	0.00000	0.00	000	0.00000	0.00000	0.00000		
10 Pro	bability factor		0.60								
11 Ris	k of pollution incident		0.00017	0.00000	0.00	000	0.00000	0.00000	0.00000		Return Pe
	sk greater than 0.01?		No							Totals	(years
13 Ret	urn period without pollution re-	duction measu	ures 0.00017	0.00000	0.00	000	0.00000	0.00000	0.00000	0.0002	5725
	ting measures factor		1								
15 Ret	urn period with existing polluti	on reduction	0.00017	0.00000	0.00	000	0.00000	0.00000	0.00000	0.0002	5725
16 Pro	posed measures factor	-	1								
17 Res	idual with proposed Pollution	reduction mea	asures 0.00017	0.00000	0.00	000	0.00000	0.00000	0.00000	0.0002	5725
Just	ification for choice of existin	g mea sures fa	ictors:		Justif	fication for ch	oice of proposed	measures factors:			
Just	ification for choice of existin	g mea sures fá	ictors:		Justi	fication for ch	oice of proposed	measures factors]	
Just		g mea sures fa	ictors:		tits u L	fication for ch		e Pollution Risk Re	duction Factors		
Just	Spillage Factor Serious Accidental Spillages	-				fication for ch	Indicativ for Spills	e Pollution Risk Re ages System	Optimum Risk Reduction Factor		
Just	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year)	Motorways	Rural Trunk	Urban Tru		fication for ch	Indicativ for Spilla Filter Dra	e Pollution Risk Re ages System	Optimum Risk Reduction Factor 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction	Motorways 0.36	Rural Trunk 0.29	0.31		fication for ch	Indicativ for Spilla Filter Drai Grassed	e Pollution Risk Re ages System	Optimum Risk Reduction Factor 0.6 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83	0.31 0.36		fication for ch	Indicativ for Spilla Filter Dra Grassed Pond	e Pollution Risk Re ages System	Optimum Risk Reduction Factor 0.6 0.6 0.5		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout	Motorways 0.36 0.43 3.09	Rural Trunk 0.29 0.83 3.09	0.31 0.36 5.35		fication for ch	Indicativ for Spilla Filter Dra Grassed Pond Wetland	e Pollution Risk Re ages System in Ditch / Swale	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46		fication for ch	Filter Drai Grassed Pond Wetland Soakawa	e Pollution Risk Re ages System Ditch / Swale y / Infiltration basin	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6		
ts ut to the second sec	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		fication for ch	Indicativ for Spilla Filter Drai Grassed I Pond Wetland Soakawa Sediment	e Pollution Risk Re ages System Ditch / Swale y / Infiltration basin Trap	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43 3.09	Rural Trunk 0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46		fication for ch	Indicativ for Spilla Filter Drai Grassed Pond Wetland Soakawa Sediment Unlined D	e Pollution Risk Re ages System Ditch / Swale y / Infiltration basin Trap Ditch	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.7		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		fication for ch	Indicativ for Spills Filter Drai Grassed Pond Wetland Soakawa Sedimed Unlined D Penstock	e Pollution Risk Re ages System Ditch / Swale y / Infiltration basin : Trap titch : / valve	Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6 0.6 0.7 0.4		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		fication for ch	Indicativ for Spilla Filter Drai Grassed Pond Wetland Soakawa Sediment Unlined D	e Pollution Risk Re ages System Ditch / Swale y / Infiltration basin : Trap itch / valve Weir	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.7		

Caption 4.1 Accidental spillage assessment results for the outfall draining the existing highway outside the DCO boundary and catchment M1

Appendix 13.3 - Water Quality Assessment



hig eng	hways land		View Param	eters	Rese	t Spillage Risk	G	o To Interface			
Assess	ment of Priority Outfalls	5									
Method D	- assessment of risk from a	ccidental spillage		Additiona	al column:	s for use if other ro	ads drain	to the same outfall		٦	
			A (main road)		B	С		D E	F	1	
D1 Wat	er body type		Surface watercour								
	gth of road draining to outfall ((m)	87.00	120.00							
D3 Roa	d Type (A-road or Motorway)		A	A		+					
	road, is site urban or rural?		Rural	Rural							
	ction type		No junction	Side roa	d						
	ation (response time for emer	rgency services)	< 1 hour	< 1 hour							
	fic flow (AADT two way)		51,807	51,807							
D8 % H			4	8							
	lage factor (no/10 [°] HGVkm/ye	ear)	0.29	0.93		0.00000	0.0000		0.0000		
	k of accidental spillage bability factor		0.00002	0.00017		0.00000	0.0000	0.00000	0.00000	-	
	k of pollution incident		0.00001	0.00010		0.00000	0.0000	0.00000	0.00000	<u> </u>	Return Period
	sk greater than 0.01?		No	No		0.00000	0.0000	0.00000	0.00000	Totals	(years)
	urn period without pollution re	duction measures	0.00001	0.00010		0.00000	0.0000	0.00000	0.00000	0.0001	8870
	ting measures factor	duction measures	1	1		0.00000	0.0000	0.00000	0.00000	0.0001	0070
	urn period with existing polluti	on reduction	0.00001	0.00010		0.00000	0.0000	0.00000	0.00000	0.0001	8870
	Proposed measures factor		0.4	0.6		0.00000	0.0000	0.00000		0.0001	00.0
	Residual with proposed Pollution reduction measur		0.00000	0.00006		0.00000	0.0000	0.00000	0.00000	0.0001	15301
						·			I		
Just	ification for choice of existin	g mea sures factors				Justification for c	hoice of p	proposed measures factors	<u>x</u>		
		-				webles das david	-				
						wetland and swal	e				
								Indicative Pollution Risk R	eduction Factors		
	Spillage Factor						1	for Spillages			
	Serious Accidental Spillages							System	Optimum Risk Reduction Factor		
	(Billion HGV km/ year)	Motorways	Rural Trunk	Urban Trur							
í –		0.36	0.29	0.31				Filter Drain	0.6		
	No junction Slip road	0.36	0.29	0.31				Grassed Ditch / Swale	0.6		
5	Roundabout	3.09	3.09	5.35				Pond	0.5		
Location	Cross road	3.09	0.88	5.35				Wetland	0.4		
L I	Side road		0.93	1.40				Soakaway / Infiltration basin			
	Total	0.37	0.95	0.85				Sediment Trap	0.6		
	Total	0.51	0.40	0.03				Unlined Ditch	0.7		
					_			Penstock / valve	0.4		
								Notched Weir	0.6 0.5		
							l	Oil Separator	0.5		
<u> </u>											

The worksheet should be read in conjunction with DMRB 11.3.10.

Caption 4.2 Accidental spillage assessment results for the outfall from catchments M2 and S1

Appendix 13.3 - Water Quality Assessment



highways england			View Paran	View Parameters Rese		Spillage Risk G		erface			
essr	nent of Priority Outfalls										
	-										
od D	- assessment of risk from a	ccidental spillage		Additiona	al columns for u	use if other roa	ids drain to the s	ame outfall		7	
			A (main road)		B	С	D	E	F	1	
Wate	er body type		Surface watercou		vatercourse				-		
	gth of road draining to outfall (m)	343.00	426.00						1	
	d Type (A-road or Motorway)		A	A						1	
	oad, is site urban or rural?		Rural	Rural						1	
Jund	tion type		No junction	Side road	d					1	
Loca	ation (response time for emer	gency services)	< 1 hour	< 1 hour						1	
Traf	ic flow (AADT two way)		51,807	2,330						1	
% H	GV		4	0						1	
Spill	age factor (no/10° HGVkm/ye	ar)	0.29	0.93		,	0.6				
	of accidental spillage		0.00008	0.00000	0.00	0000	0.00000	0.00000	0.00000	1	
Prot	ability factor		0.60	0.60							
Risk	of pollution incident		0.00005	0.00000	0.00	0000	0.00000	0.00000	0.00000		Return F
Is ris	sk greater than 0.01?		No	No						Totals	(year
	Irn period without pollution red	duction measures	0.00005	0.00000	0.00	0000	0.00000	0.00000	0.00000	0.0000	22152
	ting measures factor		1	1							
	irn period with existing pollution	on reduction	0.00005	0.00000	0.00	0000	0.00000	0.00000	0.00000	0.0000	22152
	osed measures factor		1	1							
Res	idual with proposed Pollution	reduction measure	s 0.00005	0.00000	0.00	0000	0.00000	0.00000	0.00000	0.0000	22152
1	fication for choice of existin	g mea sures factors			·		oice of propose	i measures factors:]	
		g mea sures factors	:		·			d measures factors			
		g mea sures factors	c		·			d measures factors ve Pollution Risk Re ages			
	fication for choice of existing	g mea sures factors	Rural Trunk	Urban Trun	ja su		Indicati	d measures factors ve Pollution Risk Re ages System	Optimum Risk Reduction Factor		
	fication for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction	Motorways 0.36	Rural Trunk 0.29	0.31	ja su		Indicati for Spil	d measures factors ve Pollution Risk Re ages System	Optimum Risk		
Justi	fication for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83	0.31 0.36	ja su		Indicati for Spil	d measures factors ve Pollution Risk Re ages System	Optimum Risk Reduction Factor 0.6		
Justi	fication for choice of existing fication for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout	Motorways 0.36	Rural Trunk 0.29 0.83 3.09	0.31 0.36 5.35	ja su		Indicati for Spil Filter Dr Grassed	d measures factors ve Pollution Risk Re ages System ain Ditch / Swale	Optimum Risk Reduction Factor 0.6 0.6		
Justi	fication for choice of existing fication for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46	ja su		Indicati for Spil Filter Dr Grassec Pond Wetland	d measures factors ve Pollution Risk Ro ages System ain Ditch / Swale	Optimum Risk Reduction Factor 0.6 0.6 0.5		
	fication for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81	ja su		Indicati for Spil Filter Dr Grassec Pond Wetland	d measures factors ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4		
Justi	fication for choice of existing fication for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46	ja su		Indicati for Spil Filter Dr Grassec Pond Wetland Soakaw	d measures factors ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin t Trap	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6		
Justi	fication for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81	ja su		Indicati for Spil Filter Dr Grassec Pond Wetland Soakaw Sedimer	d measures factors ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin it Trap Ditch	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6		
Justi	fication for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81	ja su		Indicati for Spil Filter Dr Grassec Pond Wetland Soakaw Sedimer Unlined	d measures factors ve Pollution Risk Ro ages System ain Ditch / Swale ay / Infiltration basin t Trap Ditch k / valve	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.7		

The worksheet should be read in conjunction with DMRB 11.3.10.

Caption 4.3 Accidental spillage assessment results for the outfall from catchments S2 and S3a

Appendix 13.3 - Water Quality Assessment



highways england			View Parar	neters	Reset Spillage Risk	Go To Int	erface			
sessment of Pri	ority Outfalls	5								
									5	
thod D - assessmen	it of risk from a	ccidental spil	-		al columns for use if other ro					
			A (main road))	B C	D	E	F		
1 Water body type			Surface watercou	urse						
2 Length of road dra		(m)	150.00							
8 Road Type (A-road			M							
If A road, is site ur	ban or rural?		Rural							
Junction type			No junction							
Elocation (respons		rgency service								
Traffic flow (AADT	two way)		51,807						-	
% HGV		1	4	_			_			
3 Spillage factor (no		ear)	0.29	0.00000	0.00000	0.00000	0.00000	0.00000	-	
Risk of accidental 0 Probability factor	spillage		0.00003	0.00000	0.00000	0.00000	0.00000	0.00000	-	
1 Risk of pollution in	oidant		0.00002	0.00000	0.00000	0.00000	0.00000	0.00000	ļ	Return Peri
2 Is risk greater than			0.00002 No	0.00000 No	0.0000	0.00000	0.00000	0.00000	Totals	(years)
3 Return period with		duction measu		0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	(years) 50655
14 Existing measures		duction meas	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	30033
15 Return period with		on reduction	0.00002	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	50655
16 Proposed measu		onreduction	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	30033
7 Residual with pro		reduction me	asures 0.00002	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	50655
Spillago Fa	ator				-	Indicativ for Spill	ve Pollution Risk Re ages	duction Factors		
	dental Spillages						System	Optimum Risk Reduction Factor		
(Billion H	GV km/ year)	Motorways	Rural Trunk	Urban Trur	nk	Filter Dra	ain	0.6		
No junction		0.36	0.29	0.31			Ditch / Swale	0.6		
Slip road		0.43	0.83	0.36		Pond		0.5		
Roundabout Cross road		3.09	3.09	5.35		Wetland		0.4		
Cross road		-	0.88	1.46			ay / Infiltration basin	0.6		
- Side Ioad		-	0.93	1.81		Sedimen		0.6		
Total		0.37	0.45	0.85		Unlined [0.7		
						Penstock Notched Oil Sepa	Weir	0.4 0.6 0.5		
ne worksheet should t	be read in conju	Inction with DN	IRB 11.3.10.					·		

Caption 4.4 Accidental spillage assessment results for the outfall from catchment M3

Appendix 13.3 - Water Quality Assessment



ent of Priority Outfalls ssessment of risk from ac body type of road draining to outfall (<i>i</i> ype (<i>A-road or Motorway</i>) d, is site urban or rural? n type in (response time for emerging tow (AADT two way)		e A (main road) Surface watercour 1,707.00	В	columns for use if other ro	oads drain to the sa]	
oody type of road draining to outfall (/ ype (<i>A-road or Motorway</i>) d, is site urban or rural? n type n type n (response time for emerg low (AADT two way)		A (main road) Surface watercour	В]	
oody type of road draining to outfall (/ ype (<i>A-road or Motorway</i>) d, is site urban or rural? n type n type n (response time for emerg low (AADT two way)		A (main road) Surface watercour	В				-	-1	
of road draining to outfall (/ ype (A-road or Motorway) d, is site urban or rural? n type n (response time for emergi low (AADT two way)	n)	Surface watercour	_	· · · · ·		E	F		
of road draining to outfall (/ ype (A-road or Motorway) d, is site urban or rural? n type n (response time for emergi low (AADT two way)	n)				0	L		-	
ype (A-road or Motorway) d, is site urban or rural? n type n (response time for emerg low (AADT two way)		1,707.00						-	
d, is site urban or rural? n type in (response time for emerg low (AADT two way)		M	_					-	
n type on (response time for emerg low (AADT two way)		Rural	_					-	
n (response time for emerg low (AADT two way)		No junction						-	
low (AADT two way)	ency services)	< 1 hour	-						
	,,,	51,807							
		4							
e factor (no/10° HGVkm/yea	ar)	0.29							
accidental spillage	,	0.00037	0.00000	0.00000	0.00000	0.00000	0.00000		
ility factor		0.60	0.60						
pollution incident		0.00022	0.00000	0.00000	0.00000	0.00000	0.00000		Return Perio
greater than 0.01?		No	No					Totals	(years)
period without pollution rec	uction measure	s 0.00022	0.00000	0.00000	0.00000	0.00000	0.00000	0.0002	4451
g measures factor		1							
period with existing pollution	n reduction	0.00022	0.00000	0.00000	0.00000	0.00000	0.00000	0.0002	4451
ed measures factor		1							
al with proposed Pollution	eduction measu	ures 0.00022	0.00000	0.00000	0.00000	0.00000	0.00000	0.0002	4451
-Wass Faster							duction Factors		
erious Accidental Spillages				1		System	Optimum Risk Reduction Factor		
(Billion HGV km/ year)	Motorways	Rural Trunk	Urban Trunk		Filter Dra	n	0.6		
o junction	0.36	0.29	0.31				0.6		
lip road	0.43	0.83	0.36		Pond		0.5		
oundabout	3.09	3.09	5.35		Wetland		0.4		
ross road	-				Soakawa	y / Infiltration basin	0.6		
ide road	-	0.93	1.81		Sediment		0.6		
otal	0.37	0.45	0.85		Unlined D		0.7		
				•	Penstock	/ valve	0.4		
					Notched		0.6		
	reater than 0.01? period without pollution red measures factor period with existing pollution ad measures factor al with proposed Pollution r tion for choice of existing tion for choice of existing prious Accidental Spillages (Billion HGV km/ year) junction p road undabout oss road	reater than 0.01? period without pollution reduction measures measures factor ad measures factor al with proposed Pollution reduction measures fition for choice of existing measures fact srillage Factor prious Accidental Spillages (Billion HGV km/ year) pinction proad 0.36 0.43 3.09 oss road -	Image: Preater than 0.01? No period without pollution reduction measures 0.00022 measures factor 1 period with existing pollution reduction 0.00022 ad measures factor 1 al with proposed Pollution reduction measures 0.00022 tion for choice of existing measures factors: 0.00022 stillage Factor Mode serious Accidental Spillages (Billion HGV km/ year) Motorways proad 0.36 0.29 proad 0.43 0.83 undabout 3.09 3.09 oss road - 0.88	No No No period without pollution reduction measures 0.00022 0.00000 measures factor 1 0.00022 0.00000 ad with existing pollution reduction 0.00022 0.00000 0.00000 ad with proposed Pollution reduction measures 0.00022 0.00000 at with proposed Pollution reduction measures 0.00022 0.00000 tion for choice of existing measures factors: 0.00022 0.00000 stillage Factor 0.00022 0.00000 stillage Factor 0.00022 0.00000 stillage Factor 0.00022 0.00000 stillage Factor 0.00000 0.00000 stillage Factor 0.00000 0.00000 stillage Factor 0.00000 0.00000 stillage Factor 0.00000 0.00000 stillion HGV km/year) Motorways Rural Trunk Urban Trunk signation 0.36 0.29 0.31 0.36 undabout 3.09 3.09 5.35 ses road - 0.88 1.46	No No No peried without pollution reduction measures 0.00022 0.00000 0.00000 measures factor 1 0 0.00000 0.00000 peried with existing pollution reduction 0.00022 0.00000 0.00000 ed measures factor 1 0 0.00000 0.00000 al with proposed Pollution reduction measures 0.00022 0.00000 0.00000 tion for choice of existing measures factors: Justification for of the second secon	No No <th< td=""><td>No No No<</td><td>Indicative Pollution Risk Reduction Factors Indicative Pollution Ri</td><td>No No No Totals period without pollution reduction measures 0.00022 0.00000<!--</td--></td></th<>	No No<	Indicative Pollution Risk Reduction Factors Indicative Pollution Ri	No No No Totals period without pollution reduction measures 0.00022 0.00000 </td

Caption 4.5 Accidental spillage assessment results for the outfall from catchment M4

Appendix 13.3 - Water Quality Assessment



engl	hways and		View Para	neters	Reset Spillage Risk	Go To Inter	face			
sessi	ment of Priority Outfalls									
									-	
hod D	 assessment of risk from a 	ccidental spilla			l columns for use if other r					
			A (main road		-	D	E	F		
	er body type				atercourse Surface watercou		e			
	gth of road draining to outfall (m)	736.00	375.00	260.00	160.00				
	d Type (A-road or Motorway)		A	A	A	A				
	oad, is site urban or rural?		Rural	Rural	Rural	Rural				
	ction type		No junction	Slip road	Slip road	Side road				
	ation (response time for emer	gency services		< 1 hour	< 1 hour	< 1 hour				
	fic flow (AADT two way)		51,807	9,706	8,326	2,330				
% H			4	3.3	1.8	0				
Spil	lage factor (no/10 ^º HGVkm/ye	ar)	0.29	0.83	0.83	0.6				
Ris	of accidental spillage		0.00016	0.00004	0.00001	0.00000	0.00000	0.00000		
	bability factor		0.60	0.60	0.60	0.60				
	of pollution incident		0.00010	0.00002	0.00001	0.00000	0.00000	0.00000		Return Period
	sk greater than 0.01?		No	No	No	No			Totals	(years)
	urn period without pollution red	duction measu	res 0.00010	0.00002	0.00001	0.00000	0.00000	0.00000	0.0001	7950
	ting measures factor		1	1	1	0.6				
	urn period with existing pollution	on reduction	0.00010	0.00002	0.00001	0.00000	0.00000	0.00000	0.0001	7950
	posed measures factor		1	1	1	1				
7 Res	idual with proposed Pollution	reduction mea	sures 0.00010	0.00002	0.00001	0.00000	0.00000	0.00000	0.0001	7950
Justi	fication for choice of existin	g mea sures fa	ctors:		Justification for	choice of proposed r	nea sures factors			
Justi	fication for choice of existing	g mea sures fa	ctors:		Justification for	choice of proposed r	neasures factors			
Justi		g mea sures fa	ctors:		Justification for		Pollution Risk R			
Justi	fication for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/year)	g mea sures fai	ctors:	Urban Truni	1	Indicative for Spillag	Pollution Risk Re jes System	Optimum Risk Reduction Factor		
Justi	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year)			Urban Truni 0.31	1	Indicative for Spillag Filter Drain	Pollution Risk Re jes System	Optimum Risk Reduction Factor 0.6		
	Spillage Factor	Motorways	Rural Trunk		1	Indicative for Spillag Filter Drain Grassed D	Pollution Risk Re jes System	Optimum Risk Reduction Factor 0.6 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction	Motorways 0.36	Rural Trunk 0.29	0.31	1	Indicative for Spillag Filter Drain Grassed D Pond	Pollution Risk Re jes System	Optimum Risk Reduction Factor 0.6 0.6 0.5		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83	0.31 0.36	1	Indicative for Spillag Filter Drain Grassed D Pond Wetland	Pollution Risk Re jes System itch / Swale	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4		
Location	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Silip road Roundabout	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09	0.31 0.36 5.35	1	Indicative for Spillag Filter Drain Grassed Di Pond Wetland Soakaway	Pollution Risk Ro jes System itch / Swale / Infiltration basin	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46	1	Indicative for Spillag Filter Drain Grassed D Pond Wetland Soakaway Sediment J	Pollution Risk Ro ges System itch / Swale / Infiltration basin Ггар	Optimum Risk Reduction Factor 0.6 0.5 0.5 0.4 0.6 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81	1	Indicative for Spillag Filter Drain Grassed Di Pond Wetland Soakaway	Pollution Risk Ro jes System itch / Swale / Infiltration basin frap ch / valve /eir	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6		

Caption 4.6 Accidental spillage assessment results for the outfall from catchment M5

Appendix 13.3 - Water Quality Assessment



high engl	and		View Par	ameters	Reset Spillage Risk	Go To Inter	face			
essr	ment of Priority Outfalls	;								
lod D	 assessment of risk from a 	ccidental spill	-		I columns for use if other ro				-	
			A (main roa	-/	з С	D	E	F		
	er body type				atercourse Surface watercour				e	
	of road draining to outfall ((m)	600.00	460.00	531.00	318.00	283.00	350.00	-	
	d Type (A-road or Motorway)		A	A	A	A	A	A	-	
	oad, is site urban or rural?		Rural	Rural	Rural	Rural	Rural	Rural	-	
	tion type		No junction	Slip road		Slip road	Slip road	Side road	-	
	ation (response time for emer	gency services		< 1 hour	< 1 hour	< 1 hour	< 1 hour	< 1 hour		
	ic flow (AADT two way)		51,807	4,206	6,161	9,706	8,327	2330	_	
% H			4	0.4	1.4	3.3	1.8	0		
	age factor (no/10 [°] HGVkm/ye	ear)	0.29	0.83	0.83	1	0.83	0.93		
	of accidental spillage		0.00013	0.00000	0.00001	0.00004	0.00001	0.00000		
	ability factor		0.60	0.60	0.60	0.60	0.60	0.60		
	of pollution incident		0.00008	0.00000	0.00001	0.00002	0.00001	0.00000		Return P
	sk greater than 0.01?		No	No	No	No	No	No	Totals	(year
	Irn period without pollution re	duction measu		0.00000	0.00001	0.00002	0.00001	0.00000	0.0001	8424
	ting measures factor		1	1	1	0.6	1	1		
	Irn period with existing pollution	on reduction	0.00008	0.00000	0.00001	0.00001	0.00001	0.00000	0.0001	9108
	oosed measures factor		1	1	1	1	1	1		
Res	idual with proposed Pollution	reduction mea	asures 0.00008	0.00000	0.00001	0.00001	0.00001	0.00000	0.0001	9108
Justi	fication for choice of existin	g mea sures fa	ctors:		Justification for c	hoice of proposed n	neasures factors:			
Justi	fication for choice of existin	g mea sures fa	ctors:		Justification for c					
Justi		g mea sures fa	ctors:		Justification for c		Pollution Risk Re	duction Factors		
Justi	fication for choice of existin Spillage Factor	g mea sures fa	ctors:		Justification for c	Indicative for Spillag	Pollution Risk Re	duction Factors Optimum Risk Reduction Factor		
Justi	Spillage Factor	g mea sures fa	ctors:	Urban Trun		Indicative for Spillag	Pollution Risk Re es	Optimum Risk Reduction Factor		
Justi	Spillage Factor Serious Accidental Spillages	-		Urban Trun 0.31		Indicative for Spillag	Pollution Risk Re es System	Optimum Risk Reduction Factor 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year)	Motorways	Rural Trunk			Indicative for Spillag Filter Drain Grassed Di	Pollution Risk Re es	Optimum Risk Reduction Factor 0.6 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction	Motorways 0.36	Rural Trunk 0.29	0.31		Indicative for Spillag Filter Drain Grassed Di Pond	Pollution Risk Re es System	Optimum Risk Reduction Factor 0.6 0.6 0.5		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83	0.31 0.36		Indicative for Spillag Filter Drain Grassed Di Pond Wetland	Pollution Risk Re es System tch / Swale	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4		
Location L	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09	0.31 0.36 5.35		Filter Drain Grassed Di Pond Wetland Soakaway	Pollution Risk Re es System tch / Swale / Infiltration basin	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46		Indicative for Spillag Filter Drain Grassed Di Pond Wetland Soakaway Sediment T	Pollution Risk Re es System tch / Swale / Infiltration basin rap	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		Indicative for Spillag Filter Drain Grassed Di Pond Wetland Soakaway Sediment J Unlined Dit	Pollution Risk Re es System tch / Swale / Infiltration basin rap ch	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.7		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		Indicative for Spillag Filter Drain Grassed Di Pond Wetland Soakaway Sediment T Unlined Dit Penstock /	Pollution Risk Re es System tch / Swale / Infiltration basin rap ch valve	Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6 0.6 0.7 0.4		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		Indicative for Spillag Filter Drain Grassed Di Pond Wetland Soakaway Sediment J Unlined Dit	Pollution Risk Re es System tch / Swale / Infiltration basin rap ch valve eir	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.7		

Appendix 13.3 - Water Quality Assessment



highways england		View Param	neters	Reset	Spillage Risk	Go To Int	terface			
sessment of Priority Outfalls	i									
hod D - assessment of risk from a	ccidental spill	ade	Additional	columns	for use if other roa	ads drain to the s	ame outfall			
	contentar opin	A (main road)	B		C	D	E	F	-	
Water body type		Surface watercou	_	, 	<u> </u>				-	
Length of road draining to outfall ((m)	600.00							-	
Road Type (A-road or Motorway)	,	A								
If A road, is site urban or rural?		Rural								
Junction type		Roundabout	-							
Location (response time for emer	gency services	s) < 1 hour	_							
Traffic flow (AADT two way)		17,155								
% HGV		2								
Spillage factor (no/10° HGVkm/ye	ar)	3.09								
Risk of accidental spillage		0.00023	0.00000		0.00000	0.00000	0.00000	0.00000		
) Probability factor		0.60	0.60		0.60	0.60	0.60	0.60		Determ Devi 1
1 Risk of pollution incident		0.00014	0.00000		0.00000	0.00000	0.00000	0.00000	Tatala	Return Period
2 Is risk greater than 0.01?	duction mass	No 0.00014	No		No	No	No	No	Totals	(years)
3 Return period without pollution red 4 Existing measures factor	uucuon measu	Ires 0.00014	0.00000	1	0.00000	0.00000	0.00000	0.00000	0.0001	7178
5 Return period with existing pollution	on reduction	0.00014	0.00000		0.00000	0.00000	0.00000	0.00000	0.0001	7178
6 Proposed measures factor	on reduction	1	0.00000		0.00000	0.6	0.00000	0.00000	0.0001	1170
7 Residual with proposed Pollution	reduction mea	asures 0.00014	0.00000		0.00000	0.00000	0.00000	0.00000	0.0001	7178
Justification for choice of existing	g mea sures fa	ctors:		L	Justification for c	hoice of proposed	d measures factors:			
	g mea sures fa	ctors:			Justification for cl	hoice of proposed	d measures factors:			
Justification for choice of existing	g mea sures fa	ctors:		l	Justification for c		ve Pollution Risk Re			
Justification for choice of existing Spillage Factor Serious Accidental Spillages	_				Justification for c	Indicati	ve Pollution Risk Re			
Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/year)	Motorways	Rural Trunk	Urban Trunk		Justification for c	Indicati for Spill Filter Dr.	ve Pollution Risk Re ages System ain	eduction Factors Optimum Risk Reduction Factor 0.6		
Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction	Motorways 0.36	Rural Trunk 0.29	0.31		Justification for c	Indicati for Spill Filter Dra Grassed	ve Pollution Risk Re lages System	Optimum Risk Reduction Factor 0.6 0.6		
Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction	Motorways 0.36 0.43	Rural Trunk 0.29 0.83	0.31 0.36		Justification for cl	Indicati for Spill Filter Dr. Grassed Pond	ve Pollution Risk Re ages System Ditch / Swale	Optimum Risk Reduction Factor 0.6 0.5		
Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction	Motorways 0.36 0.43 3.09	Rural Trunk 0.29 0.83 3.09	0.31 0.36 5.35		Justification for cl	Indicati for Spill Filter Dr. Grassed Pond Wetland	ve Pollution Risk Re ages System ain Ditch / Swale	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4		
Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46		Justification for c	Indicati for Spill Filter Dr. Grassed Pond Wetland Soakawa	ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6		
Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		Justification for c	Indicati for Spill Filter Dr. Grassed Pond Wetland Soakaw Sedimer	ve Pollution Risk Re lages System ain Ditch / Swale ay / Infiltration basin it Trap	eduction Factors Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6 0.6 0.6		
Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43 3.09	Rural Trunk 0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46		Justification for c	Filter Dr. Grassed Pond Wetland Soakaw Sedimer Unlined	ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin it Trap Ditch	eduction Factors Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.6 0.7		
Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		Justification for cl	Filter Dr. Grassed Pond Wetland Soakaw Sedimer Unlined Penstoc	ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin it Trap Ditch k / valve	eduction Factors Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6 0.6 0.6 0.7 0.4		
Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		Justification for cl	Filter Dr. Grassed Pond Wetland Soakaw Sedimer Unlined	ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin ti Trap Ditch k / valve Weir	eduction Factors Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.6 0.7		

Caption 4.7 Accidental spillage assessment results for the outfall from catchments M6 and NW

Appendix 13.3 - Water Quality Assessment



highways england		View Para	meters	Reset S	Spillage Risk	Go To In	erface			
essment of Priority Outfalls										
od D - assessment of risk from a	ccidental snilla	00	Additional	L columns fr	for use if other ro	ads drain to the s	ame outfall		٦	
ou D - assessment of fisk from a	ccidental spina	A (main road			C	D	E	F		
Water body type		Surface waterco		,	<u> </u>	0	L		-	
Length of road draining to outfall (m)	861.00								
Road Type (A-road or Motorway)		A								
If A road, is site urban or rural?		Rural								
Junction type		No junction								
Location (response time for emer	gency services)									
Traffic flow (AADT two way)		44,146								
% HGV	-	3.8	_				_			
Spillage factor (no/10 [®] HGVkm/ye	ar)	0.29	-			0.00000				
Risk of accidental spillage Probability factor		0.00015	0.00000		0.00000 0.60	0.00000	0.00000	0.00000	_	
Risk of pollution incident		0.0009	0.00000		0.00000	0.00000	0.00000	0.00000	-	Return Period
Is risk greater than 0.01?		0.00009 No	0.00000 No		No	0.00000 No	0.00000 No	0.00000 No	Totals	(years)
Return period without pollution red	duction measure		0.00000		0.00000	0.00000	0.00000	0.00000	0.0001	10901
Existing measures factor	action measure	1	0.00000		0.00000	0.6	0.00000	0.00000	0.0001	10001
Return period with existing pollutio	on reduction	0.00009	0.00000	0	0.00000	0.00000	0.00000	0.00000	0.0001	10901
Proposed measures factor		1		-		0.6				
FIUPUSEU measures lacior		sures 0.00009	0.00000	0	0.00000	0.00000	0.00000	0.00000	0.0001	10901
Residual with proposed Pollution						hoice of propose	l measures factors:			·
Residual with proposed Pollution							I measures factors	eduction Factors		
Residual with proposed Pollution							ve Pollution Risk Re			
Residual with proposed Pollution Justification for choice of existing	g mea sures fac	tors:		ј. ј.		Indicati for Spil	ve Pollution Risk Re ages System	Optimum Risk Reduction Factor		
Residual with proposed Pollution Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year)	g mea sures fac	tors:	Urban Truni	ј. ј.		Indicati for Spil Filter Dr	ve Pollution Risk Re ages System sin	Optimum Risk Reduction Factor 0.6		
Residual with proposed Pollution Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction	g mea sures fac	tors:		ј. ј.		Indicati for Spil Filter Dr Grassed	ve Pollution Risk Re ages System	Optimum Risk Reduction Factor 0.6 0.6		
Residual with proposed Pollution Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction	g mea sures fac	tors: Rural Trunk 0.29	Urban Truni 0.31	ј. ј.		Indicati for Spil Filter Dr Grassed Pond	ve Pollution Risk Re ages System sin	Optimum Risk Reduction Factor 0.6 0.6 0.5		
Residual with proposed Pollution	g mea sures fac Motorways 0.36 0.43	tors: Rural Trunk 0.29 0.83 3.09 0.86	Urban Truni 0.31 0.36 5.35 1.46	ј. ј.		Filter Dr Grassed Pond Wetland	ve Pollution Risk Re ages System ain Ditch / Swale	Optimum Risk Reduction Factor 0.6 0.6		
Residual with proposed Pollution Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	g mea sures fac Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	Urban Truni 0.31 0.36 5.35 1.46 1.81	ј. ј.		Filter Dr Grassed Pond Wetland	ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4		
Residual with proposed Pollution	g mea sures fac Motorways 0.36 0.43 3.09 -	tors: Rural Trunk 0.29 0.83 3.09 0.86	Urban Truni 0.31 0.36 5.35 1.46	ј. ј.		Indicati for Spil Filter Dr Grassed Pond Wetland Soakaw	ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin t Trap	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6		
Residual with proposed Pollution Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	g mea sures fac Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	Urban Truni 0.31 0.36 5.35 1.46 1.81	ј. ј.		Indicati for Spil Filter Dr Grassed Pond Wetland Soakaw Sedimer	ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin th Trap Ditch	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6		
Residual with proposed Pollution Justification for choice of existing Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	g mea sures fac Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	Urban Truni 0.31 0.36 5.35 1.46 1.81	ј. ј.		Filter Dr Grassed Pond Wetland Soakaw Sedimer Unlined	ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin ti Trap Ditch k / valve Weir	Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6 0.7		

Caption 4.8 Accidental spillage assessment results for the outfall from catchment M7

Appendix 13.3 - Water Quality Assessment



engl	hways and		View Para	meters	Reset	t Spillage Risk	Go To Int	erface			
sessr	ment of Priority Outfalls	;									
4h - d D		a side stal a silla		Additional			a da dasia ta tha a s				
ethod D	- assessment of risk from a	ccidental spilla	-				ads drain to the sa			-	
			A (main road	·	5	С	D	E	F		
	er body type	()	Surface waterco	urse						_	
	gth of road draining to outfall ((<i>m</i>)	433.00							_	
	d Type (A-road or Motorway) oad, is site urban or rural?		A Rural							-	
	tion type		No junction							-	
	ation (response time for emer									-	
	ic flow (AADT two way)	gency services/	44,146							-	
1 % H			3.8								
	age factor (no/10 [°] HGVkm/ye	ar)	0.29	-	•						
	of accidental spillage		0.00008	0.00000		0.00000	0.00000	0.00000	0.00000		
	ability factor		0.60	0.60		0.60	0.60	0.60	0.60		
	of pollution incident		0.00005	0.00000		0.00000	0.00000	0.00000	0.00000	-	Return Per
	sk greater than 0.01?		No	No		No	No	No	No	Totals	(years)
3 Retu	irn period without pollution re-	duction measure	es 0.00005	0.00000		0.00000	0.00000	0.00000	0.00000	0.0000	21677
14 Exis	ting measures factor		1				0.6				
15 Retu	Irn period with existing pollution	on reduction	0.00005	0.00000		0.00000	0.00000	0.00000	0.00000	0.0000	21677
16 Prop	osed measures factor		1				0.6				
17 Res	idual with proposed Pollution	reduction meas	sures 0.00005	0.00000		0.00000	0.00000	0.00000	0.00000	0.0000	21677
I	fication for choice of existin	g mea sures fac	tors:			Justification for c	hoice of proposed	I measures factors:			
	fication for choice of existin	g mea sures fac	tors:			Justification for c	hoice of proposed	I measures factors:			
		g mea sures fac	tors:			Justification for c		ve Pollution Risk Re	eduction Factors		
	Spillage Factor Serious Accidental Spillages				1	Justification for c	Indicati for Spill	re Pollution Risk Re ages System	Optimum Risk Reduction Factor		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year)	Motorways	Rural Trunk	Urban Trun	1	Justification for c	Indicati for Spill Filter Dra	ve Pollution Risk Re ages System	Optimum Risk Reduction Factor 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction	Motorways 0.36	Rural Trunk 0.29	0.31	1	Justification for c	Indicati for Spill Filter Dra Grassed	re Pollution Risk Re ages System	Optimum Risk Reduction Factor 0.6 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83	0.31 0.36	1	Justification for c	Indicatin for Spill Filter Dra Grassed Pond	ve Pollution Risk Re ages System ain Ditch / Swale	Optimum Risk Reduction Factor 0.6 0.6 0.5		
Justi	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout	Motorways 0.36	Rural Trunk 0.29 0.83 3.09	0.31 0.36 5.35	1	Justification for c	Indicatin for Spill Filter Dra Grassed Pond Wetland	re Pollution Risk Re ages System iin Ditch / Swale	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4		
Justi	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09 0.86	0.31 0.36 5.35 1.46	1	Justification for c	Indicati for Spill Filter Dra Grassed Pond Wetland Soakawa	ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81	1	Justification for c	Indicati for Spill Filter Dra Grassed Pond Wetland Soakawa Sedimen	re Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin t Trap	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6		
Justi	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09 0.86	0.31 0.36 5.35 1.46	1	Justification for c	Indicatin for Spill Filter Dra Grassed Pond Wetland Soakawa Sedimer Unlined I	ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin t Trap Ditch	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.7		
Justi	Spillage Factor Serious Accidental Spillages (Billion HGV km/year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81	1	Justification for c	Filter Dra Grassed Pond Wetland Soakawa Sedimer Unlined I Penstoc	re Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin t Trap Ditch k / valve	Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6 0.6 0.7 0.4		
Justi	Spillage Factor Serious Accidental Spillages (Billion HGV km/year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81	1	Justification for c	Indicatin for Spill Filter Dra Grassed Pond Wetland Soakawa Sedimer Unlined I	ve Pollution Risk Re ages System ain Ditch / Swale ay / Infiltration basin t Trap Ditch k / valve Weir	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.7		

Caption 4.9 Accidental spillage assessment results for the outfall from catchment M8

Appendix 13.3 - Water Quality Assessment



eng	hways land		View Parame	eters	Reset Spillage Ris	sk Go To Inte	nacé			
sessi	ment of Priority Outfalls	;								
thod D	- assessment of risk from a	ccidental spillage		Additional	l columns for use if oth	er roads drain to the sa	me outfall		٦	
			A (main road)	B		D	E	F	-	
1 Wat	er body type		Surface watercours	Surface wa	atercourse Surface wate	rcourse Surface watercour	se Surface watercour	rse Surface watercours	se	
2 Len	gth of road draining to outfall ((m)	2,193.00	900.00	550.00	515.00	470.00	560.00		
	d Type (A-road or Motorway)		A	A	A	A	A	A		
	road, is site urban or rural?		Rural	Rural	Rural	Rural	Rural	Rural	_	
	ction type		No junction	No junctio		Slip road	Slip road	Slip road	-	
	ation (response time for emer fic flow (AADT two way)	gency services)	< 1 hour 44,146	< 1 hour 51,807	< 1 hour 1,801	< 1 hour 2,392	< 1 hour 3,100	< 1 hour 3088	-	
8 % H			3.8	8	1,001	2,392	3,100	1	-	
	lage factor (no/10° HGVkm/ye	ar)	0.29	0.29	0.83	0.6	0.83	0.83		
	of accidental spillage	, any	0.00039	0.00039	0.00000	0.00000	0.00000	0.00001		
	bability factor		0.60	0.60	0.60	0.60	0.60	0.60		
	c of pollution incident		0.00023	0.00024	0.00000	0.00000	0.00000	0.00000		Return Perio
	sk greater than 0.01?		No	No	No	No	No	No	Totals	(years)
	urn period without pollution re	duction measures	0.00023	0.00024	0.00000	0.00000	0.00000	0.00000	0.0005	2084
	ting measures factor		1	1	1	0.6	1	1		
	urn period with existing polluti	on reduction	0.00023	0.00024	0.00000	0.00000	0.00000	0.00000	0.0005	2087
	posed measures factor idual with proposed Pollution	reduction measures	1	1	1	1	1	1	0.0005	0007
7 Res	idual with proposed Politition	reduction measures	0.00023	0.00024	0.00000	0.00000	0.00000	0.00000	0.0005	2087
Just	fication for choice of existin	g mea sures factors:]	Justification	for choice of proposed	measures factors:]	
Just	fication for choice of existin	g mea sures factors:			Justification	Indicativ	e Pollution Risk Re	eduction Factors		
Ju st	Spillage Factor	g mea sures factors:			Justification		e Pollution Risk Re iges	Optimum Risk		
Just		-	Rural Trunk L	Jrban Truni		Indicativ for Spille	e Pollution Risk Re ges System	Optimum Risk Reduction Factor		
Just	Spillage Factor Serious Accidental Spillages	-	tural Trunk U 0.29	Jrban Trunl 0.31		Indicativ for Spilla Filter Drai	e Pollution Risk Re ges System	Optimum Risk Reduction Factor 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year)	Motorways F				Indicativ for Spilla Filter Drai	e Pollution Risk Re ges System	Optimum Risk Reduction Factor		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Silip road Roundabout	Motorways F 0.36	0.29 0.83 3.09	0.31 0.36 5.35		Indicativ for Spilla Filter Drai Grassed I	e Pollution Risk Re ges System	Optimum Risk Reduction Factor 0.6 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways F 0.36 0.43 3.09 -	0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46		Indicative for Spilla Filter Drai Grassed Pond Wetland	e Pollution Risk Re ges System	Optimum Risk Reduction Factor 0.6 0.6 0.5		
Location	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways F 0.36 0.43 3.09 -	0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		Indicative for Spilla Filter Drai Grassed Pond Wetland	e Pollution Risk Re ges System n Ditch / Swale / / Infiltration basin	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways F 0.36 0.43 3.09 -	0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46		Filter Drai Grassed I Pond Wetland Soakaway Sediment Unlined D	e Pollution Risk Re ges System n Ditch / Swale / / Infiltration basin Trap itch	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.7		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways F 0.36 0.43 3.09 -	0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		Indicative for Spilla Filter Drai Grassed Pond Wetland Soakaway Sediment Unlined D Penstock	e Pollution Risk Re ges System n Ditch / Swale / / Infiltration basin Trap itch / valve	Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6 0.6 0.7 0.4		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways F 0.36 0.43 3.09 -	0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81		Filter Drai Grassed I Pond Wetland Soakaway Sediment Unlined D	e Pollution Risk Re ges System n Ditch / Swale / / Infiltration basin Trap itch / valve Weir	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.7		

Appendix 13.3 - Water Quality Assessment



highways england View Parameters Reset Spillage Risk Go To Interface Assessment of Priority Outfalls Method D - assessment of risk from accidental spillage Additional columns for use if other roads drain to the same outfall A (main road) в С D F F D1 Water body type Surface watercourse Surface watercourse Surface watercourse D2 Length of road draining to outfall (m) 490.00 1,500.00 900.00 D3 Road Type (A-road or Motorway) A D4 If A road, is site urban or rural? Rural Rural Rural D5 Junction type Roundabout Side road Side road D6 Location (response time for emergency services) D7 Traffic flow (AADT two way) < 1 hour < 1 hour < 1 hour 4,995 5,363 28,043 D8 % HGV 2.6 D8 Spillage factor (no/10° HGVkm/year) 3.09 0.93 0.93 D9 Risk of accidental spillage 0.00006 0.00007 0.00034 0.00000 0.00000 0.00000 D10 Probability factor 0.60 0.60 0.60 0.60 0.60 0.60 D11 Risk of pollution incident 0.00003 0.00004 0.00021 0.00000 0.00000 0.00000 Return Period D12 Is risk greater than 0.01? No No No No No No Totals (years) D13 Return period without pollution reduction measures 0.00004 0.00021 0.00000 0.0003 554 D14 Existing measures factor 0.00004 0.00021 0.00000 0.00000 0.00000 0.0003 3554 D15 Return period with existing pollution reduction D16 Proposed measures factor 1 D17 Residual with proposed Pollution reduction measures 0.00003 0.00004 0.00021 0.00000 0.00000 0.00000 0.0003 3554 Justification for choice of existing measures factors: Justification for choice of proposed measures factors Indicative Pollution Risk Reduction Factors for Spillages Spillage Factor **Optimum Risk** System Serious Accidental Spillages **Reduction Factor** (Billion HGV km/ year) Motorways **Rural Trunk** Urban Trunk Filter Drain 0.6 No junction 0.36 0.29 0.31 Grassed Ditch / Swale 0.6 Slip road 0.43 0.83 0.36 Location Pond 0.5 Roundabout 3.09 3.09 5.35 Wetland 0.4 0.88 Cross road 1.46 Soakaway / Infiltration basin 0.6 Side road 0.93 1.81 Sediment Trap 0.6 0.37 0.45 Total 0.85 0.7 Unlined Ditch 0.4 Penstock / valve 0.6

The worksheet should be read in conjunction with DMRB 11.3.10.

Caption 4.10 Accidental spillage assessment results for the outfall from catchments M9, M10, NE, S5 and W1

Notched Weir Oil Separator

0.5

Appendix 13.3 - Water Quality Assessment



hig eng	hways land		View Parame	eters	Rese	t Spillage Risk	Go To Inte	erface			
sess	ment of Priority Outfalls	;									
										-	
ethod D	- assessment of risk from a	ccidental spilla	ge			for use if other roa	-				
			A (main road)		В	С	D	E	F		
	er body type		Surface watercours	e							
	gth of road draining to outfall ('m)	260.00						_		
	d Type (A-road or Motorway)		A	_							
	road, is site urban or rural?		Rural							-	
	ction type		Side road							-	
	ation (response time for emer	gency services)								-	
7 Traf 8 % H	fic flow (AADT two way)		5,780 1							-	
	lage factor (no/10° HGVkm/ye	arl	0.93	•			0.6				
	k of accidental spillage	ar)	0.00001	0.00000		0.00000	0.00000	0.00000	0.00000		
	bability factor		0.60	0.00000		0.00000	0.00000	0.00000	0.00000	-	
	k of pollution incident		0.00000	0.00000		0.00000	0.00000	0.00000	0.00000	L	Return Peri
	sk greater than 0.01?		No	0.00000				0.00000	0.00000	Totals	(years)
	urn period without pollution red	duction measur		0.00000		0.00000	0.00000	0.00000	0.00000	0.0000	326717
	ting measures factor		1								
	urn period with existing pollution	on reduction	0.00000	0.00000		0.00000	0.00000	0.00000	0.00000	0.0000	326717
	posed measures factor		1				0.6				
	idual with proposed Pollution	reduction meas	sures 0.00000	0.00000		0.00000	0.00000	0.00000	0.00000	0.0000	326717
								e Pollution Risk Re			
	Spillage Factor						for Spilla				
	Serious Accidental Spillages							System	Optimum Risk Reduction Factor		
6	(Billion HGV km/ year)	Motorways		Jrban Tru	nĸ		Filter Dra		0.6		
	No junction	0.36	0.29	0.31				Ditch / Swale	0.6		
5	Slip road	0.43	0.83	0.36			Pond		0.5		
1 22	Roundabout Cross road	3.09	3.09	5.35			Wetland		0.4		
1 2	161055 1030	-	0.88	1.46 1.81				y / Infiltration basin	0.6		
Lo cat											
Location	Side road	- 0.27	0.93				Sediment		0.6		
Locat		- 0.37	0.93 0.45	0.85			Unlined D	litch	0.7		
Locat	Side road	- 0.37					Unlined D Penstock	litch : / valve	0.7 0.4		
Locat	Side road	- 0.37					Unlined D	litch : / valve Weir	0.7		

Caption 4.11 Accidental spillage assessment results for the outfall from catchment S3

Appendix 13.3 - Water Quality Assessment



eng	hways land		View Paran	neters	Rese	t Spillage Risk	Go To Inte	rface			
ssess	ment of Priority Outfalls	;									
										_	
ethod L) - assessment of risk from a	ccidental spilla	-				ads drain to the sar			4	
			A (main road)		В	С	D	E	F	_	
	ter body type of the of read draining to outfall ((m)	Surface watercou 400.00	irse						-	
	gth of road draining to outfall (ad Type (A-road or Motorway)	(11)	400.00 A							-	
	road, is site urban or rural?		Rural							-	
	ction type		Roundabout							-	
	ation (response time for emer			_						-	
	fic flow (AADT two way)	gency services)	51,807								
08 %⊦			8							-	
	lage factor (no/10 [°] HGVkm/ye	ar)	3.09	•							
	k of accidental spillage		0.00187	0.00000)	0.00000	0.00000	0.00000	0.00000		
	bability factor		0.60	0.60		0.60	0.60				
11 Ris	k of pollution incident		0.00112	0.00000)	0.00000	0.00000	0.00000	0.00000		Return Per
12 Is ri	sk greater than 0.01?		No	No		No	No			Totals	(years)
13 Ret	urn period without pollution re-	duction measur	res 0.00112	0.00000)	0.00000	0.00000	0.00000	0.00000	0.0011	891
	sting measures factor		1								
	urn period with existing pollution	on reduction	0.00112	0.00000)	0.00000	0.00000	0.00000	0.00000	0.0011	891
	posed measures factor		1								
17 Res	sidual with proposed Pollution	reduction meas	sures 0.00112	0.00000)	0.00000	0.00000	0.00000	0.00000	0.0011	891
	ification for choice of existin	g mea sures fac	ctors:			Justification for c	hoice of proposed	measures factors:			
	ification for choice of existin	g mea sures fac	:tors:			Justification for c	hoice of proposed	measures factors:			
		g mea sures fac	:tors:			Justification for c		e Pollution Risk Re	duction Factors		
	Spillage Factor	-			_	Justification for c	Indicative	e Pollution Risk Re	eduction Factors Optimum Risk Reduction Factor		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year)	Motorways	Rural Trunk	Urban Tru	ınk	Justification for c	Indicative	e Pollution Risk Re ges System	Optimum Risk Reduction Factor 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction	Motorways 0.36	Rural Trunk 0.29	0.31	INK	Justification for c	Indicative for Spilla Filter Drai Grassed I	e Pollution Risk Re ges System	Optimum Risk Reduction Factor		
k uL	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83	0.31 0.36	Ink	Justification for c	Indicative for Spilla Filter Drai Grassed I Pond	e Pollution Risk Re ges System	Optimum Risk Reduction Factor 0.6 0.6 0.5		
k uL	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout	Motorways 0.36	Rural Trunk 0.29 0.83 3.09	0.31 0.36 5.35	ink	Justification for c	Indicative for Spilla Filter Drai Grassed I Pond Wetland	e Pollution Risk Re ges System n Ditch / Swale	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4		
k uL	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46	Ink	Justification for c	Indicative for Spilla Filter Drai Grassed I Pond Wetland Soakaway	e Pollution Risk Re ges System n Ditch / Swale	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6		
	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81	Ink	Justification for c	Indicative for Spilla Filter Drai Grassed I Pond Wetland Soakaway Sediment	e Pollution Risk Re ges System n Ditch / Swale r / Infiltration basin Trap	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6		
k uL	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83 3.09 0.88	0.31 0.36 5.35 1.46	INK	Justification for c	Indicative for Spilla Filter Drai Grassed I Pond Wetland Soakaway Sediment Unlined D	e Pollution Risk Re ges System n Ditch / Swale r / Infiltration basin Trap itch	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6		
k uL	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81	ink	Justification for c	Indicative for Spilla Filter Drai Grassed I Pond Wetland Soakaway Sediment Unlined D Penstock	e Pollution Risk Re ges System n Ditch / Swale r/ Infiltration basin Trap tch / valve	Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6 0.6 0.7 0.4		
k uL	Spillage Factor Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road Side road	Motorways 0.36 0.43 3.09 -	Rural Trunk 0.29 0.83 3.09 0.88 0.93	0.31 0.36 5.35 1.46 1.81	INK	Justification for c	Indicative for Spilla Filter Drai Grassed I Pond Wetland Soakaway Sediment Unlined D	e Pollution Risk Re ges System n Ditch / Swale r/ Infiltration basin Trap tch / valve	Optimum Risk Reduction Factor 0.6 0.6 0.5 0.4 0.6 0.6 0.6 0.7		

Caption 4.12 Accidental spillage assessment results for the outfall from catchment S4



5. Summary of impacts

- 5.1.1. The routine runoff assessment for outfalls was undertaken using HEWRAT. The assessment indicates that there is a negligible impact following dilution in the channel for both soluble and sediment-bound pollutants for all outfalls as a result of the Proposed Scheme. A wetland and swale have been proposed at catchment M2 and S1 respectively to mitigate against copper pollution impacts and filters drains have been provided on catchment M1 to provide treatment for suspended solids and dissolved zinc. The results of the HEWRAT assessment can be seen in Table 5.1.
- 5.1.2. The outfall M1 which discharges runoff from the existing drainage catchment to the west of the DCO boundary and proposed catchment M1 failed for acute copper. It is noted the existing outfall and the majority of the contributing catchment lie outside of the DCO boundary. The Proposed Scheme incorporates filter drains on the M1 catchment to provide treatment. This results in a reduction in pollutant load from the proposed M1 catchment compared to the baseline scenario and thus provides a minor benefit.
- 5.1.3. This assessment represents a worst case scenario for environmental impacts to surface water features. There is an intention in the proposed drainage design to provide filter drains, vegetated detention ponds and wetlands as indicated in Table 5-1. This is considered further in section 6.
- 5.1.4. The accidental spillages assessment was undertaken using the HEWRAT spillage assessment. The assessment indicates that the risk of serious pollution incident is considerably less than the annual acceptable threshold of 0.5% for discharge to a sensitive designated site (see Table 5.1) with the inclusion of the required measures proposed in the drainage design.
- 5.1.5. There are six existing outfalls draining the existing A47 where it is to be retained (de-trunked) as a local access road. These outfalls are currently classed as low pollution risk and require no mitigation, according to HA DDMS (Highways England, 2020). Once the existing A47 is changed to a local access road, the AADT traffic forecast will significantly reduce which would result in a reduction in pollutant concentrations in road runoff from these outfalls when compared to the baseline scenario.

Appendix 13.3 - Water Quality Assessment



Table 5.1 Routine runoff and accidental spillages assessment summary

	Required		Soluble					
Drainage Catchment	water quality	Mitigation proposed in drainage design	EQS annual av concentration	rerage	Acute impa	ict	Sediment	Spillage assessment
	mitigation		Copper (µg/l)	Zinc (µg/l)	Copper	Zinc	-	
M1 (including existing catchment)	Filter drains (M1)	N/A	Pass (0.96)	Pass (2.26)	Fail	Pass	Pass	Pass
M2 & S1	Wetland (M2), swale (S1)	Filter drain, wetland (M2), swale (S1)	Pass (0.77)	Pass (2.42)	Pass	Pass	Pass	Pass
S2 and S3A	Not required	Filter drain and vegetated detention basin	Pass (0.17)	Pass (0.03)	Pass	Pass	Pass	Pass
M3	Not required	Filter drain and vegetated detention basin	Pass (0.18)	Pass (0.07)	Pass	Pass	Pass	Pass
M4	Not required	Filter drain and vegetated detention basin	Pass (0.21)	Pass (0.14)	Pass	Pass	Pass	Pass
M5	Not required	Filter drain and wetland	Pass (0.20)	Pass (0.11)	Pass	Pass	Pass	Pass
M6 & NW	Not required	Filter drain and vegetated detention basin	Pass (0.22)	Pass (0.17)	Pass	Pass	Pass	Pass
M7	Not required	Filter drain and vegetated detention basin	Pass (0.18)	Pass (0.05)	Pass	Pass	Pass	Pass
M8	Not required	Filter drain and wetland	Pass (0.17)	Pass (0.02)	Pass	Pass	Pass	Pass
M9, M10, NE, S5 & W1	Not required	Filter drains and vegetated detention basin	Pass (0.33)	Pass (0.71)	Pass	Pass	Pass	Pass
S3	Not required	Filter drains	Pass (0.16)	Pass (0.00)	Pass	Pass	Pass	Pass
S4	Not required	N/A	Pass (0.28)	Pass (0.36)	Pass	Pass	Pass	Pass
M7 and M8 (cumulative)	Not required	Filter drain and vegetated detention basin (M7) and wetland (M8)	Pass (0.19)	Pass (0.07)	Pass	Pass	Pass	N/A



6. Enhancement measures

- 6.1.1. Two of the attenuation features are to be developed as a wetland feature as part of enhancement measures. They shall be planted with suitable local species to provide additional pollution treatment and biodiversity enhancement at the following locations:
 - catchment M5 (Gypsy Lane, south east of Hockering
 - catchment M8 (South of the River Tud crossing)
- 6.1.2. The remaining attenuation features will be vegetated with suitable local species to provide biodiversity and further water quality enhancements.
- 6.1.3. The provision of wetland features would improve finer sediment removal, improve heavy metal removal and reduce nitrate and phosphate concentrations through biological uptake (Woods Ballard *et al.*, 2015). Vegetated detention basins would also reduce nitrate and phosphate concentrations through biological uptake (although less effectively than a wetland). Phosphate and nitrogen are not typically associated with road runoff but may enter the watercourse directly as the result of agricultural runoff local to the Proposed Scheme.
- 6.1.4. In addition to providing additional pollution treatment, the wetlands and vegetated detention basins will have the following biodiversity enhancements:
 - encourage great crested newts back into an area which has been disturbed or destroyed or requires enhancement
 - remediate areas of temporary land clearance important to breeding birds
 - minimise risk of mortality to breeding and wintering birds by providing these as a refuge
- 6.1.5. The provision of filter drains is to be considered further during detailed design. Should filter drains remain in the design, it is considered these will provide further suspended sediment and dissolved zinc removal benefits.

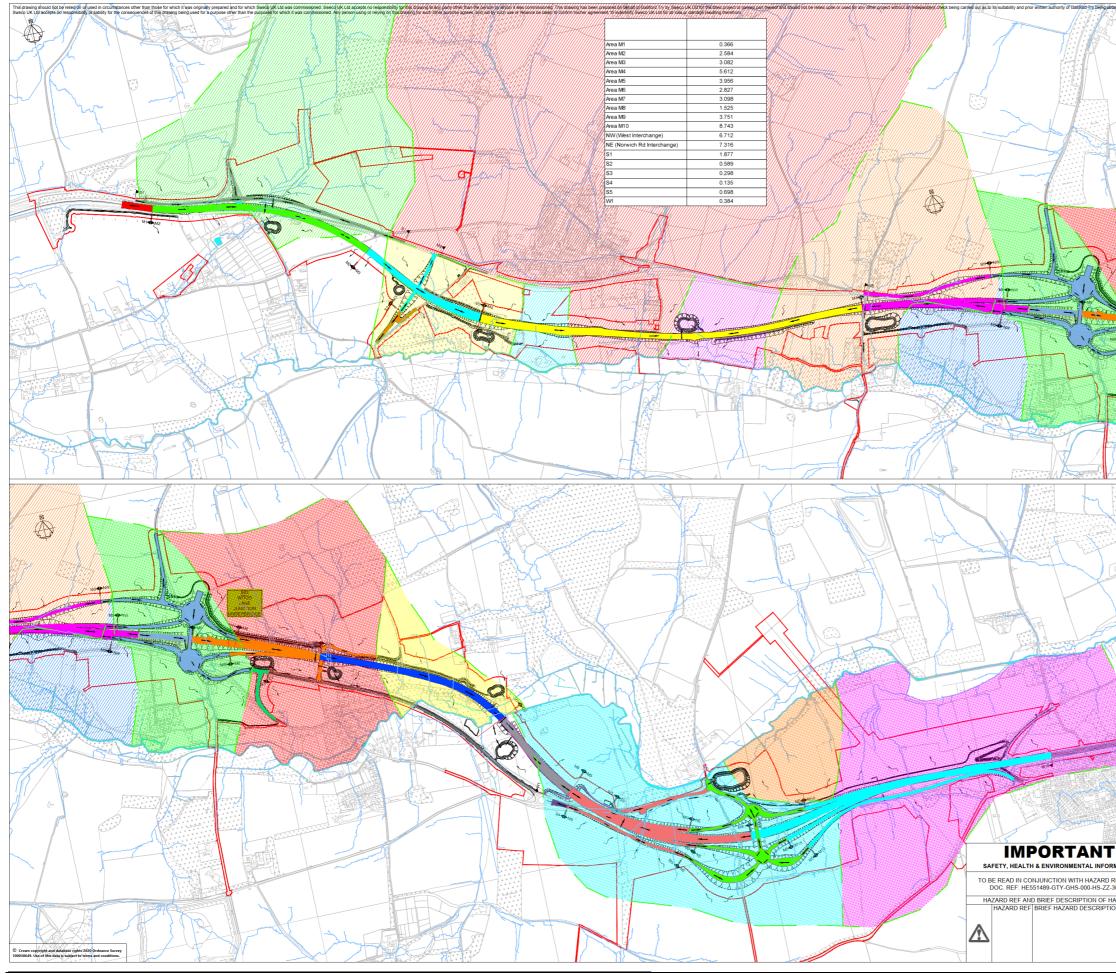


7. References

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Annex A Drainage catchment areas



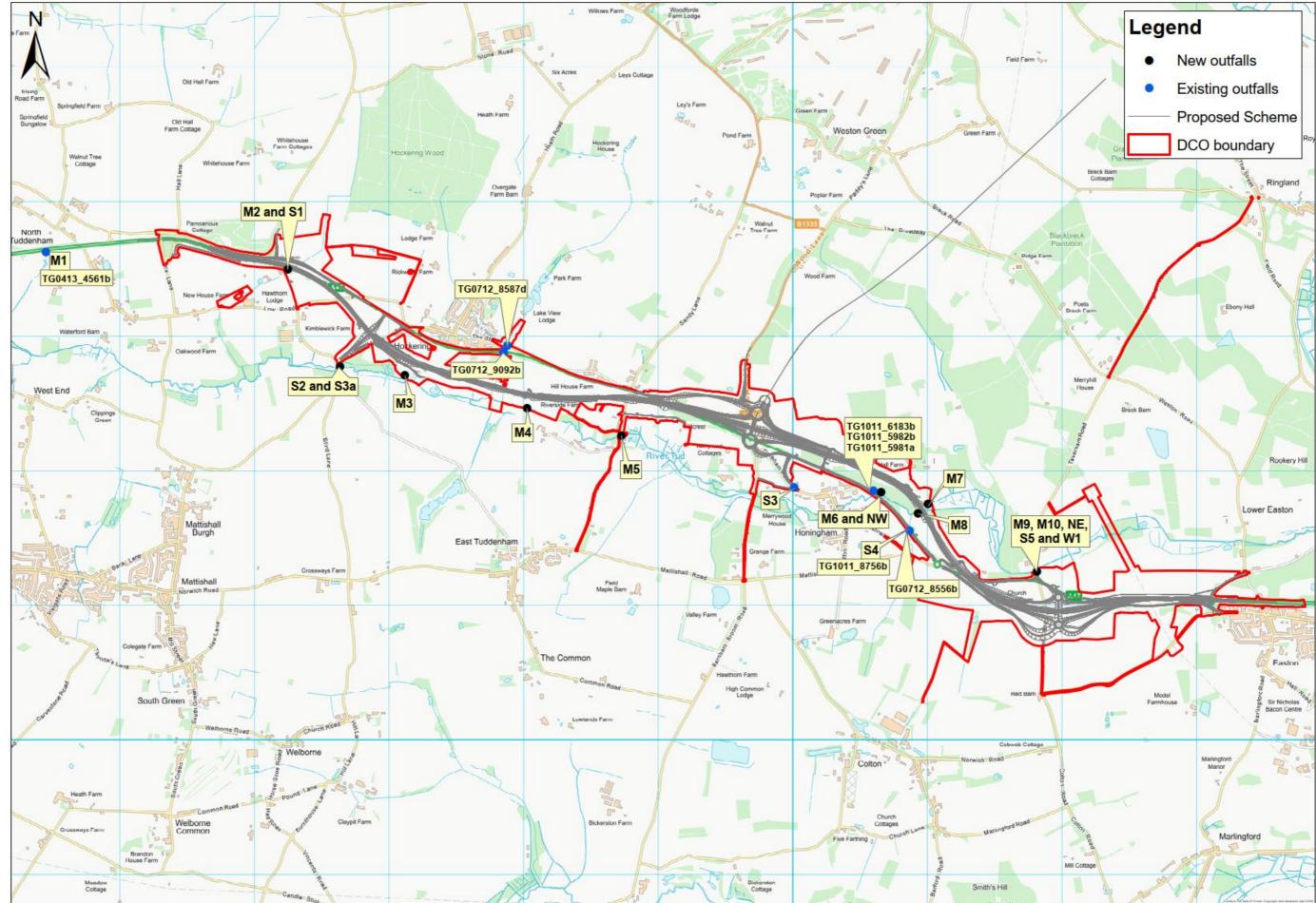
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Annex B Outfall locations



Appendix 13.3 - Water Quality Assessment

A47 NORTH TUDDENHAM TO EASTON DUALLING

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Annex C Metal bioavailability assessment

Metal Bioavailability Assessment Tool (M-BAT)

Back															
Calculate					INPUT D	ATA							RESU	LTS (Copper)	
Clear Data	ID	Location	Waterbody	Date	Measured Cu Concentration (dissolved) (µg l ⁻¹)	Measured Zn Concentration (dissolved) (µg l ⁻¹)	Measured Mn Concentration (dissolved) (µg l ⁻¹)	Measured Ni Concentration (dissolved) (µg l ⁻¹)	рН	DOC	Ca	Site-specific PNEC Dissolved Copper (µg l ⁻¹)	BioF	Bioavailable Copper Concentration (µg l ⁻¹)	Risk Characterisation Ratio
	1	River Tud	River Tud	03/09/2020	1	2	2	1	7.9	4.9	148	16.88	0.06	0.06	0.06
	2	Oak Farm	Tributary of the River Tud	24/09/2020	12	13	2	1	7.3	10	19	44.13	0.02	0.27	0.27
	3	River Tud	River Tud	24/09/2020	2	2	2	1	7.8	6.3	120	24.63		0.08	0.08
	4	Oak Farm	Tributary of the River Tud	29/10/2020	1	3	2	1	7.9	2.6	159	7.67		0.13	0.13
	5	River Tud	River Tud	29/10/2020	1	6	28	1	8	6	177	19.41		0.05	0.05
	6		Tributary of the River Tud	01/12/2020		2	2	1	8.1	3.4	169	8.22		0.12	0.12
	7	River Tud	River Tud	01/12/2020	1	2	42	1	8.1	5.8	194	16.60		0.06	0.06
	8	Oak Farm	Tributary of the River Tud	16/12/2020	1	2	2	1	7.9	2.4	151	6.95		0.14	0.14
	9	River Tud	River Tud	16/12/2020	1	3	12	1	8	5.7	165	18.28	0.05	0.05	0.05
	10	Oak Farm	Tributary of the River Tud	12/01/2021	1	2	2	1	8	2.8	143	7.37	0.14	0.14	0.14
	11	River Tud	River Tud	12/01/2021	2	4	29	1	8	5.5	150	17.52	0.06	0.11	0.11

