Appendix 11.2

Water Quality Assessment



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1 Introduction

- 1.1.1 Potential impacts on surface and groundwater may occur as a result of the Proposed Scheme for Project 7 during both construction and operational phases. Impacts may occur, for example, from pollution from site runoff (construction) or accidental spillage (operation). Further details on potential impacts are provided in **Chapter 11**. Pollutants from runoff, such as heavy metals (copper and zinc), suspended solids, and hydrocarbons can enter watercourses and detrimentally impact sensitive species, and/ or infiltrate the groundwater table and affect potable water supplies.
- 1.1.2 The Proposed Scheme is located within areas designated for their protected species or habitats (i.e. Special Areas of Conservation (SAC), Special Protection Areas (SPA), and Sites of Special Scientific Interest (SSSIs)); therefore, road runoff is required to be treated before discharging to watercourses in order to satisfy the requirements of statutory bodies such as Scottish Environment Protection Agency (SEPA) and Scottish Natural Heritage (SNH). Further detail on protected species and habitats is provided in **Chapter 12**.
- 1.1.3 The Proposed Scheme design has been developed through an environmentally-led iterative process. Details of the initial assessments undertaken in a pre-mitigation scenario are provided in this appendix. These findings informed the design development by identifying potential impacts of a preliminary design on the water environment (as well as adverse impacts to the Proposed Scheme by the water environment), from which appropriate mitigation requirements were established and 'embedded' into the design that is assessed in **Chapter 11**.

2 Approach and Methods

- 2.1.1 Water quality has been assessed in line with Design Manual for Roads and Bridges (DMRB) HD45/09 guidance. Methods outlined in DMRB are used to determine potential pollution impacts from:
 - Routine Runoff to Surface Waters (Method 'A')
 - Detailed Assessment of Pollution Impacts from Routine Runoff to Surface Waters (Method 'B')
 - Assessment of Pollution Impacts from Routine Runoff on Groundwater (Method 'C')
 - Assessment of Pollution Impacts from Spillages (Method 'D')
- 2.1.2 The assessment focuses on outfalls from the A9 mainline and local or side roads which have been identified in Scottish Planning Policy (SPP) as sources of pollution to rivers and streams requiring appropriate treatment in the form of Sustainable Drainage Systems (SuDS).
- 2.1.3 Outfalls from accommodation tracks and NMUs (surfaced or unsurfaced) will not be assessed individually but will normally require a basic single level of treatment. Guidance on the appropriate treatment for tracks and NMUs has been followed as per *Annex 2: Technical Note 'Side Road and Accommodation Track SUDS'* (AMJV, 2015). Balsporran carpark has been designed as a porous surface parking area and appropriate treatment incorporated in accordance with general SuDS guidance (i.e. SuDS Manual (C753), CIRIA 2015).
- 2.1.4 SEPA has been consulted on the design approach for SuDS; this has also been discussed on a scheme-wide basis at Environmental Steering Group meetings. Proposed treatment for the Project 7 drainage networks has been confirmed through discussions with the design teams and is outlined in **Table 1**.



		2 nd Level	Inclusion of	Outfall	Outfall receiving	Outfall Co-ordinates		
Network	1 st Level SuDS	SuDS	Micro-pool	Form	water	Easting	Northing	
000	Filter Drain	Basin	No	Swale	Allt Chaorach Beag	265634	772530	
001	Filter Drain	Basin	Yes	Swale	Unnamed (W7.1)	264686	773114	
003	Filter Drain	Basin	Yes	Swale	Unnamed (W7.1)	264686	773114	
004	Filter Drain	Basin	Yes	Swale	Allt Coire Mhic-sith (MW7.3)	264561	773260	
020	Filter Drain	Basin	Yes	Swale	Allt Fuar Bheann (MW7.6)	263541	774594	
042	Filter Drain	Basin	Yes	Swale	Unnamed (W7.101)	262879	776702	
060	Filter Drain	Basin	No	Swale	Unnamed (W7.9)	262585	778515	
063	Filter Drain	Basin	No	Swale	River Truim	262633	778774	
065	Filter Drain	Basin	Yes	Swale	River Truim	262714	778926	
Balsporran car park	Porous cellular system filled with single sized stone	Filter Drain	No	Pipe	Unnamed (W7.150)	262806	779192	
069	Filter Drain	Basin	No	Swale	Unnamed (W7.15)	262852	779326	
077	Filter Drain	Basin	Yes	Swale	River Truim	262986	780161	
083	Filter Drain	Basin	No	Swale	Unnamed (W7.19)	263198	780475	
092	Filter Drain	Basin	Yes	Swale	Allt Coire Bhotie (MW7.23)	263697	781490	
102*	Filter Drain	Tank sewer & vortex separator	No	Swale	Unnamed watercourse	263893	781991	

Table 1:	Summary of proposed	SuDS features for	r drainage networks
10010 1.	ourninary or proposed	0000 1000100	aramage networks

*Note: The tank sewer and vortex separator are included in the Project 7 design as a temporary measure to provide sufficient treatment should Project 7 be constructed prior to Project 8. In actuality, it is likely both will be constructed as one and this section of road will drain north, tying into the Project 8 drainage network, and discharge into Allt Coire nan Cisteachan (MW8.5) via a SuDS basin. However; for assessment purposes, both Project 7 and Project 8 have to be considered independently and sufficient measures to treat runoff provided in each.

HAWRAT

2.1.5

Potential impacts from routine runoff and accidental spillage risk (Method A and Method C) to watercourses have been assessed using the Highways Agency (now Highways England) Water Risk Assessment Tool (HAWRAT); HAWRAT is an integral part of HD45/09 which is also applicable



to trunk roads in Scotland. HAWRAT is a Microsoft Excel tool designed to evaluate risks related to the intermittent nature of routine road runoff. It assesses the acute pollution impacts on aquatic ecology associated with soluble pollutants, and the chronic impacts associated with sediment bound pollutants. This is undertaken using the parameters outlined below.

Runoff Pollutant Models

2.1.6 The HAWRAT assessment uses statistically based models for predicting the runoff quality for each pollutant. The models use traffic density, climate region and event rainfall characteristics to predict runoff quality in terms of Event Mean Concentrations (EMCs) and Event Mean Sediment Concentrations (EMSCs). Using long-term rainfall data, the models generate distributions of runoff quality.

Impact Model

2.1.7 The tool also uses models to predict the impact of runoff on receiving rivers. For soluble pollutants (that cause acute impacts), the assessment involves a simple mass balance approach accounting for river flows. For sediment related pollutants, the model considers both the likelihood and extent of sediment accumulation.

Threshold Analysis

2.1.8 The tool holds a number of ecologically based thresholds with which it compares the predicted impacts to evaluate the toxicity risks.

Assessment Thresholds

- Soluble (Acute) Look-up tables show Runoff Specific Thresholds (RSTs) for dissolved copper and zinc and the allowable number of exceedances of these thresholds
- Sediments (Chronic) Look-up tables show Threshold Effect levels (TELs) and Probable Effect Levels (PELs)

Method A - Simple Assessment of Pollution Impacts from Routine Runoff to Surface Waters

- 2.1.9 Method 'A' uses HAWRAT to assess the short-term and long-term risks to the receiving watercourses based on the impacts from soluble pollutants and sediment-bound pollutants. The assessment is first carried out for individual outfalls, thereafter, when more than one outfall discharges into the same stretch of watercourse, the combined effects are also assessed.
- 2.1.10 HAWRAT tests for a suite of pollutants identified through the Highways Agency (now Highways England) and Environment Agency research programme as the key contaminants in road runoff, either because of their abundance and/ or they are the most harmful in terms of species sensitivity in the water environment. These pollutants are:
 - Soluble pollutants associated with acute pollution impacts, expressed as EMCs (μg/l) for dissolved copper (Cu) and zinc (Zn)
 - Sediment related pollutants associated with chronic pollution impacts, expressed as EMSCs (mg/kg) for total copper, zinc, cadmium, and (in μg/kg) for pyrene, fluoranthene, anthracene, phenanthrene and total PAH (Polycyclic Aromatic Hydrocarbons)
- 2.1.11 HAWRAT allows the user to assess the potential effects of short-term risks on water quality related to the intermittent nature of road runoff, as well as the effectiveness of any recommended mitigation measures. It does so by predicting road runoff pollutant loading at



each step of the assessment and comparing it against runoff specific thresholds, for example Environmental Quality Standards (EQSs), based on annual average concentrations.

2.1.12 For the assessment of potential impacts from routine runoff to surface waters, HAWRAT uses three steps as follows: Quality of Runoff; In-River Impacts; and Mitigation. A 'pass' result at one step negates the requirement of a subsequent step.

Step 1 - Quality of Runoff

- 2.1.13 This is an initial first step to assess the quality of the direct road runoff against toxicity thresholds prior to treatment and discharge to the water body. Toxicity thresholds based on Environmental Quality Standards (EQS) for the protection of freshwater aquatic life have been derived from SEPA's Supporting Guidance (WAT-SG-53) (2014). The relevant EQSs for the protection of freshwater aquatic life are given as 1.0µg/l for copper and 11.9µg/l for zinc.
- 2.1.14 HAWRAT displays a 'pass' or 'fail' and the corresponding concentrations. If the toxicity levels yield a 'pass' then no further assessment is required. The parameters used in Step 1 are:
 - The design traffic flow of the road (two-way Annual Average Daily Traffic) (AADT)
 - The climatic region of the site
 - The nearest rainfall site within that climatic region

Step 2 - In River Impacts

- 2.1.15 If Step 1 yields a 'fail', the assessment continues to Step 2. Step 2 takes account of the acute impacts of soluble pollutants and the chronic impacts of sediment pollutants after dilution and dispersion in the watercourse prior to mitigation.
- 2.1.16 For sediment-bound pollutants, Step 2 provides two tiers of assessment; the first is a desk-based assessment; the second is a more detailed assessment allowing the entry of estimated or measured dimensions of a watercourse. Passing the first tier avoids a second tier assessment. The parameters used in Step 2 are:
 - The annual 95%ile river flow (m³/s)
 - Base Flow Index (BFI)
 - The impermeable road area which drains to the outfall (ha)
 - Any permeable (non-road surface) area which also drains to the outfall (ha)
 - The hardness of the receiving water (mg CaCO₃/I)
 - Whether the discharge is likely to impact on a protected site for conservation
 - Whether there is a downstream structure, lake or pond that reduces the river velocity near the point of discharge
 - For Tier 1 assessments, an estimate of the river width
 - For Tier 2 assessment details of channel dimensions, side slope, long slope and an estimation of Manning's *n*

Step 3 - Mitigation

2.1.17 If the outfall point fails Step 2 after discharge to the water body, the assessment continues to Step 3. This requires the input of any existing and proposed mitigation measures in order to



assess whether the mitigation will be sufficient to reasonably treat the runoff. A brief description of the existing and proposed measures, and their associated estimated removal capability (expressed as a percentage), is input to the tool. Estimated removal capacity is required for:

- treatment of soluble pollutants
- settlement of sediments
- 2.1.18 Information on estimates of pollutant removal capability for various Sustainable Drainage Systems (SuDS) management systems is derived from DMRB HD33/16 (Table 8.1).
- 2.1.19 If a combined approach is proposed, the mitigation techniques are combined to determine the total removal capacity. The procedure to calculate the removal capacity is carried out in line with SuDS Manual (C753). The efficiency value of the first level of treatment is calculated as 100% effective; thereafter, secondary and tertiary (where applicable) levels are assumed to perform at 50% effectiveness due to already reduced inflow concentrations. If the outfall point fails Step 3, HAWRAT can provide an indication of the scale of additional mitigation required.

Cumulative Assessment

2.1.20 In line with DMRB HD45/09, cumulative assessments have also been undertaken for multiple discharges to single tributaries of larger watercourses where drainage outfalls are located within 1km along a river reach. In the context of this assessment, a reach is defined as a length of watercourse between two confluences. HD45/09 states *"the reason for this is that the available dilution and stream velocity will naturally change at confluences and influence the assessment".* The three-stage process described above is also followed for the cumulative assessment. Long-term concentrations are also calculated using the HD45/09 procedure.

Method B - Detailed Assessment of Pollution Impacts from Routine Runoff to Surface Waters

- 2.1.21 If the in-river annual average concentrations of soluble pollutants exceed the EQS values (i.e. a failure at Step 2), and appropriate mitigation is not being provided in the form of SuDS, the bioavailability of the soluble pollutants can be reassessed using a Biotic Ligand Model (BLM). The three steps outlined in the Simple Assessment are also followed for the Detailed Assessment.
- 2.1.22 The BLM refines the EQS on a site specific basis and then compares the copper and zinc concentrations predicted by HAWRAT to the BLM derived 'Probable Non-Effect Concentration' (PNEC). If the annual average concentrations exceed the EQS, it is highly likely that the Runoff Specific Thresholds (RSTs) are also being exceeded.
- 2.1.23 As mitigation (Step 3) is employed to treat the pollutants in order for them to meet the RSTs, this results in a reduction in annual average concentrations, which in turn may result in compliance with the EQS.

Method C - Assessment of Pollution Impacts from Routine Runoff on Groundwater

- 2.1.24 Method C assesses the pollution impacts from routine runoff on groundwater. This involves assessing the overall risk to groundwater quality posed by the disposal of road runoff to the ground, either by direct discharge or through infiltrations.
- 2.1.25 The assessment is based on an examination of the 'Source-Pathway-Receptor protocol' (S-P-R). The principle applied in this assessment is that all components of the S-P-R linkage have to be present to create a pollutant linkage. The receptor in the assessment is groundwater. The presence of the pollutant in itself does not pose a threat to groundwater if there is no identifiable pathway. Further details of groundwater are provided in **Chapter 10**.



- 2.1.26 Each component is identified and given a weighting factor. This is to recognise that each may have a greater or lesser influence on the magnitude of the risk to groundwater. Each component is given a risk score (low, medium or high) and multiplied by the weighing factor. The overall cumulative assessment of risk score is obtained and classed using suggested ratings from HD45/09:
 - Overall risk score <150 = Low Risk of Impact
 - Overall risk score 150 250 = Medium Risk of Impact
 - Overall risk score >250 = High Risk Impact

Method D - Assessment of Pollution Impacts from Spillages

- 2.1.27 Method D assesses the impact of accidental spillages on the road network and is carried out using HAWRAT. It estimates the risk of a collision (involving spillage) occurring and the risk, that if a spillage has occurred, of the pollutant reaching and impacting onto the receiving waterbodies.
- 2.1.28 It is initially assessed without any mitigation and the risk is expressed as the probability of an incident in any one year. If the results show that mitigation is required, the risk is reduced using a pollution risk reduction factor for each mitigation measure. The following information is required for assessing the risk:
 - Road and junction type and urban/ rural setting
 - The length of road draining to an outfall in each category
 - The Annualised Average Daily Traffic (AADT) two way flow for each vehicle category
 - The percentage of AADT flow that comprises Heavy Good Vehicles (HGVs)
 - The probability of a serious pollution incident occurring as a result of a serious spillage (expressed as a factor based on the response time to the site)

Spillage factor

- 2.1.29 The normal acceptable risk of a serious pollution risk occurring is anywhere the annual probability is predicted to be less than 1%. In areas where road discharges are within close proximity to a natural wetland, designated wetland, SSSI, SAC, SPA, Ramsar sites or where important drinking water supplies and abstraction, the acceptable spillage risk threshold is much lower at 0.5% annual probability (i.e. 1 in 200 years).
- 2.1.30 The probability of a serious accidental spillage is calculated as follows:

$$P_{SPL}$$
 = RL x SS x (AADT x 10⁻⁹) x (%HGV ÷ 100)

Where:

- P_{SPL} = annual probability of a spillage with the potential to cause a serious pollution incident
- RL = road length, within each drainage catchment draining to each watercourse
- SS = Serious spillage rate, based on the type of junction and the road setting

 $P_{INC} = P_{SPL} x P_{POL}$



Where:

 P_{INC} = the probability of a spillage with an associated risk of a serious pollution incident occurring

 P_{POL} = the probability, given a spillage, that a serious pollution incident will take place. This takes into account a risk reduction factor, dependent upon emergency response times and the type of watercourse

2.1.31 The risk is initially assessed without any mitigation and subsequently and re-assessed on the basis of embedded mitigation being incorporated into the Proposed Scheme design. The initial risk without mitigation was found to be P, and the risk of the final design with embedded mitigation (P_{EMB}) was calculated as:

 $P_{EMB} = P \times R_{F}$

Where:

 R_F is the reduction factor based on assumptions about the type of SuDS system incorporated as embedded mitigation within the final design. Based on DMRB guidance a prescribed reduction factor of 0.8 was used, as this is considered a conservative estimate of a 20% reduction in pollutants which may be achieved by a short length of filter drain.

2.1.32 The acceptable risk of a serious pollution incident will be where the annual probability is predicted to be less than 0.5%. This suggested threshold level is referenced within DMRB as being applicable for proposed schemes where road runoff discharges in close proximity (<1km) to designated SSSIs SPAs and SACs.

3 Results of Potential Impacts

- 3.1.1 The assessment results presented below assume pre-mitigation conditions to determine worstcase scenarios and inform mitigation requirements to the Proposed Scheme.
- 3.1.2 Within each of the assessment subheadings, details of the assessments are first presented; thereafter, the potential magnitude and significance of impacts are given for all those deemed to be greater than Neutral based on the methodology and criteria described in **Chapter 11**.

Pre-mitigation Routine Runoff to Surface Waters (Method A)

- 3.1.3 The assessment for routine runoff to surface waters has been undertaken using the three step HAWRAT process. As detailed in **Section 2**, if the toxicity levels yield a 'pass' at any stage of the process, no further assessment is required. In Scotland, however, it is a statutory requirement to provide two levels of SuDS to control and treat surface water runoff. Therefore, filter drains and SuDS basins have been incorporated into the Proposed Scheme drainage design as 'embedded mitigation' for each drainage network, including those which predicted a 'pass' at Step 2. In cases where a 'fail' has been predicted at Step 2, Step 3 has been applied.
- 3.1.4 Step 3 is repeated with 'enhanced' treatment until all failures are eliminated. HAWRAT spreadsheet outputs are provided in **Section 11.4** of this Appendix. Results of the assessment are summarised in **Table 2** and cumulative impacts summarised in **Table 3**.



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Table 2:

Method A Results Table

Network	Receiving Water	Drained Road Area		Average Annual Concentration Soluble Soluble – Acute Impact		Sediment – Chronic Impact			Embedded Mitigation						
	Course Q ₉₅ (m ³ /s)	(incl. verges) (ha)	Step	Threshold Threshold Pass/Fail	HAWRAT Threshold	Sediment Accumulating? Yes/No	Extensive? Yes/No	(incl. minimum two levels requested by SEPA)							
				Copper concentration (µg/l)	Zinc concentration (µg/l)	Pass/Fail	Low flow velocity (m/s)	Deposition Index							
000	Allt Chaorach Beag	0.77	2	Pass	Pass	Pass	No	No	Passes without mitigation – two levels still included in						
000	0.001	0.77	2	0.38	1.15		0.16	-	design						
	Unnamed Tributary of River Garry	- 2.29			3/1	Fail	Pass	Fail	No	No	Filter Drain & SuDS Basin				
001			5/1	0.88	1.47	Fall	0.23	-	Filler Drain & Subs Basin						
001		2.29	3/2	Pass	Pass		No	No	Filter Drain & SuDS Basin (with micro pool) (i.e. assessment identified						
	0.001				3/2	0.80	1.42	Pass	0.23	-	requirement for enhanced treatment)				
003	Unnamed Tributary of River Garry	0.36	n	Pass	Pass	Pass (Alert D/S	No	No	Passes without mitigation –						
005	0.001	0.50	2	0.24	0.72	Structure)	0.17	-	two levels still included in design						
004	Allt Coire Mhic-sith	2.77	3.77	2 77	2.77	2.77	2.77	2.77	2	Pass	Pass	Pass (Alert D/S	No	No	Passes without mitigation – two levels still included in
004	0.055	5.77	2	0.05	0.16	Structure)	0.28	-	design						



A9 Dualling – Glen Garry to Dalwhinnie

	Receiving Water	Drained Road Area			Average Annual Concentration Soluble Sedime Soluble – Acute Impact		ent – Chronic Impact		Embedded Mitigation									
Network	Course Q₃₅ (m³/s)	(incl. verges) (ha)	Step	HAWRAT Threshold Pass/Fail	HAWRAT Threshold Pass/Fail	HAWRAT Threshold	Sediment Accumulating? Yes/No	Extensive? Yes/No	(incl. minimum two levels requested by SEPA)									
				Copper concentration (µg/l)	Zinc concentration (µg/l)	Pass/Fail	Low flow velocity (m/s)	Deposition Index										
			2/4	Fail	Pass		NO	No										
	Allt Fuar Bheann		3/1	0.63	1.05	Fail	0.16	-	Filter Drain & SuDS Basin									
020	0.003	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95		Pass	Pass		No	No	Filter Drain & Wet Retention Pond (i.e. assessment
			3/2	0.38	0.90	Pass	0.16	-	identified requirement for enhanced treatment)									
042	River Truim			Pass	Pass	Pass	No	No	Passes without mitigation –									
	0.011	3.73	2	0.27	0.84	(Alert Protected Area)	0.20	-	two levels still included in design									
	River Truim	2.62	2.62	2.02		Pass	Pass	Pass	No	No	Passes without mitigation –							
060	0.044	2.62	2	0.05	(Alert Protected	0.24	-	two levels still included in design										
	River Truim			Pass	Pass	Pass	No	No	Passes without mitigation –									
063	0.046	2.04	2	0.04	0.12	(Alert Protected Area)	0.25	-	two levels still included in design									
065	River Truim	0.96	2	Pass	Pass	Pass (Alert Protected	No	No	Passes without mitigation – two levels still included in design									



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		Drained Road Area			Impact (Av						
	Receiving Water			Average Annual Concentration Soluble Soluble – Acute Impact		Sedim	Embedded Mitigation				
Network	Course Q₅₅ (m³/s)	(incl. verges) (ha)	Step	HAWRAT Threshold Pass/Fail	HAWRAT Threshold Pass/Fail	HAWRAT Threshold	Sediment Accumulating? Yes/No	Extensive? Yes/No	(incl. minimum two levels requested by SEPA)		
				Copper concentration (µg/l)	Zinc concentration (µg/I)	Pass/Fail	Low flow velocity (m/s)	Deposition Index			
	0.046			0.02	0.06	Area)	0.18	-			
069	River Truim	1.94	2	Pass	Pass	Pass	No	No	Passes without mitigation – two levels still included in		
069	0.108	1.94	2	0.02	0.05	(Alert Protected Area)	0.39	-	design		
077	River Truim	5.136	2	Pass	Pass	Pass (Alert Protected	Yes	No	Passes without mitigation – two levels still included in		
077	0.137	5.130	2	0.03	0.08	Area)	0.01	53	design		
000	Unnamed Tributary of Allt Coire Chuirn	1.02	2	Pass	Pass		No	No	Passes without mitigation – two levels still included in		
083	0.001	1.02	2	0.55	1.30	Pass	0.20	-	design		
092	Allt Coire Bhotie	2.36				Pass	Pass	Pass	No	No	Passes without mitigation – two levels still included in
092	0.0096		2	0.21	0.64	(Alert Protected Area)	0.2	-	design		
102	Unnamed watercourse (W8.1)	1.7	2	Pass	Pass	Pass (Alert Protected	No	No	Passes without mitigation – treatment still included in		
102	0.0026	1.7	2	0.25	0.76	(Alert Protected Area)	0.17	-	design		



Table 3:

Method A cumulative assessments results (Soluble Pollutants – 1km)

					Impact (Average Annual Concentration)					
Cumulative	Distance	Receiving	Combined	Step	Average Annual Concentration Soluble- Soluble – Acute Impact		Sediment – Chronic Impact			Proposed Mitigation (incl.
Network (within 1km)	between outfalls (m)	Watercourse Q ₉₅ (m³/s)	Drained Road Area (incl. verges) (ha.)		HAWRAT Threshold Pass/Fail	HAWRAT Threshold Pass/Fail	HAWRAT Threshold	Sediment Accumulating? Yes/No	Extensive? Yes/No	minimum two levels requested by
					Copper concentration (µg/I)	Zinc concentration (µg/l)	Pass/Fail	Low flow velocity (m/s)	Deposition Index	SEPA)
		Unnamed			Fail	Pass		No	No	Zinc passes with one level of treatment
001 & 003	1	tributary of River Garry 0.0011	2.02	3/1	0.93	1.55	Pass	0.31	-	(i.e. filter drain)
	-		0.0011	2.02	3/2	Pass	Pass	Pass	No	No
						0.51	1.27		0.31	-
		River Truim			Pass	Pass	Alert (Protected Area)	No	No	Passes without mitigation –
060 & 063	345	0.046	4.66	2	0.08	0.25		1 tv	two levels still included in design	
052.8.055	220	River Truim	2.007		Pass	Pass	Alert	Yes	No	Passes without mitigation –
063 & 065	220	220 2.997 2 0.046	2	0.05	0.17	(Protected Area)	0.03	70	two levels still included in design	



3.1.5 The results in **Table 2** and **Table 3** highlight that, where necessary, incorporation of appropriate levels of mitigation reduces risk from routine runoff on receiving watercourses. The resulting magnitude of impact from routine runoff on each receiving watercourse is, therefore, predicted to be **Negligible**.

Detailed Assessment from Routine Runoff to Surface Waters (Method B)

3.1.6 This is no requirement for a detailed assessment as the Proposed Scheme incorporates SuDS (typically two treatment levels) on all networks and outfalls. SuDS provision will be in line with national and local planning policy and SEPA 'best-practice' guidance for trunk road drainage.

Assessment of Pollution Impacts from Routine Runoff on Groundwater (Method C)

3.1.7 Assessments of potential impacts to groundwater were undertaken for both embedded mitigation techniques that are incorporated into the design (i.e. filter drains and SuDS basins). Details of ground conditions were obtained using information outlined in **Chapter 10**, along with British Geological Survey (BGS) data and ground investigation (GI) data. The site locations are those proposed for the SuDS basins for each drainage network. The results are summarised in **Table 4**.

Network	Overall Risk of Impact Score for Filter Drains	Overall Risk of Impact Score for SuDS Basin
000	200 (Medium Risk of Impact)	230 (Medium Risk of Impact)
001	200 (Medium Risk of Impact)	230 (Medium Risk of Impact)
003	200 (Medium Risk of Impact)	215 (Medium Risk of Impact)
004	200 (Medium Risk of Impact)	230 (Medium Risk of Impact)
020	240 (Medium Risk of Impact)	270 (High Risk of Impact)
042	240 (Medium Risk of Impact)	270 (High Risk of Impact)
060	240 (Medium Risk of Impact)	270 (High Risk of Impact)
063	225 (Medium Risk of Impact)	255 (High Risk of Impact)
065	232.5 (Medium Risk of Impact)	262.5 (High Risk of Impact)
069	232.5 (Medium Risk of Impact)	262.5 (High Risk of Impact)
077	240 (Medium Risk of Impact)	270 (High Risk of Impact)
083	212.5 (Medium Risk of Impact)	242.5 (Medium Risk of Impact)
092	240 (Medium Risk of Impact)	270 (High Risk of Impact)
102	202.5 (Medium Risk of Impact)	N/A
Balsporran Carpark	232.5 (Medium Risk of Impact)	N/A

Table 4:Method C Results Table

3.1.8 The summary of results in **Table 4** supported by detailed results in Annex 1, show that the risk for potential impacts to groundwater is **Medium to High** due to the presence of higher permeable soil conditions within the Proposed Scheme extents thus SuDS should be lined to prevent or control infiltration.



Assessment of Pollution Impacts from Spillages (Method D)

3.1.9 Assessments of potential pollution impacts from spillages impacts to groundwater were undertaken using a conservative approach; the calculations are based on the longest road drainage catchment area of the Proposed Scheme (Network 063) and details for the proposed Drumochter junction. The results have been presented (in years) for a system without mitigation and for the final design incorporating SuDS as 'embedded' mitigation. The Annual Spillage Probability (ASP) has been presented as a percentage output on the basis of the final design. Results from the HAWRAT excel spreadsheet are provided in Annex 1 to this Appendix.

Table 5: Method L	D Results Table							
Return period scenario Road section assessment	Return period without pollution reduction measures (years)	Return Period with Embedded Pollution reduction measures (years)	ASP based on Final Design Incorporating Embedded Mitigation (%)					
Longest outfall (surface water spillage)	3112	3890	0.025					
Longest outfall (groundwater spillage)	4667	5834	0.017					
Junction (surface water spillage)	5896	7370	0.013					
Junction (groundwater spillage)	8844	11055	0.009					

3.1.10 **Table 5** indicates that calculated ASP for the Proposed Scheme is considerably less than the accepted 0.5% value for serious pollution incident for protected areas. The magnitude of risk from accidental spillages on surface water and groundwater is predicted to be negligible, but given that the sensitivity of the receiving watercourses, spillage containment has been provided as 'embedded' mitigation (shut-off valves) within the Proposed Scheme design.

4 Potential Impact Assessment

- 4.1.1 This section provides an overview of the potential impacts on water quality that may arise as a result of the Proposed Scheme. The potential impact assessment has been carried out on the assumption that the final design incorporates embedded mitigation as described in **Section 3**.
- 4.1.2 Table 6 presents a summary of the potential water quality impacts for a range of water features which were identified for surface water and groundwater receptors. Note that each water feature has been assigned a sensitivity classification on the basis of the baseline information presented in Appendix 11.1. In accordance with the approach outlined in Section 11.2 of Chapter 11, the assessment applies the sensitivity classification along with the predicted magnitude of change to produce an overall significance of impact for each water feature.



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Potential Water Quality Impacts

Drainage Network	Water Feature Location	Receptor Water Quality Sensitivity	HAWRAT Water Quality Results Based on Final Drainage Design Inc. Embedded Mitigation	Magnitude	Significance of Impact
Receptor: \$	Surface Water Quality	Sensitivity			
000	Allt Chaorach Beag Hydro ID -2, MW7.25	Very High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
001	Unnamed tributary of River Garry Hydro ID 1 W7.1	Very High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
003	Unnamed tributary of River Garry Hydro ID 1, W7.1	Very High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
004	Allt Coire Mhic-sith Hydro ID 2 MW7.3 High No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)		Negligible	Neutral	
020	River Truim High No routine runoff risk identified by MW8.1 HAWRAT (Method A) ASP <0.5% (Method D)		Negligible	Neutral	
042	River Truim MW8.1	High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
060	River Truim MW8.1	High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
063	River Truim MW8.1	High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
065	River Truim MW8.1	High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
069	River Truim MW8.1	High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
077	River Truim	High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
083	River Truim MW8.1	High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
092	River Truim MW8.1	High	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
102	Unnamed tributary of River Truim W8.1	Low	No routine runoff risk identified by HAWRAT (Method A) ASP <0.5% (Method D)	Negligible	Neutral
Receptor: 0	Groundwater Water Qual	ity	· · · · ·		-
000	ch. 0,055 to 0,500	Moderate	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
001	ch0,022 to -0,880	Moderate	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
003	ch. 0,200 to 0,400	High	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
004	ch. 0,710 to 1,935	Moderate	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
020	ch. 1,940 to 3,010	High	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral
042	ch. 3,025 to 4,400	High	No measurable impact on aquifer due to pathway removal (Method C) ASP <0.5% (Method D)	Negligible	Neutral



Drainage Network	Water Feature Location	Receptor Water Quality Sensitivity	HAWRAT Water Quality Results Based on Final Drainage Design Inc. Embedded Mitigation	Magnitude	Significance of Impact
060	ch. 4,405 to 6,025	High	No measurable impact on aquifer due to pathway removal (Method C) APS <0.5% (Method D)	Negligible	Neutral
063	ch. 4,000 to 6,280	High	No measurable impact on aquifer due to pathway removal (Method C) APS <0.5% (Method D)	Negligible	Neutral
065	ch. 6,070 to 6,470	High	No measurable impact on aquifer due to pathway removal (Method C) APS <0.5% (Method D)	Negligible	Neutral
069	ch. 6,475 to 7,210	High	No measurable impact on aquifer due to pathway removal (Method C) APS <0.5% (Method D)	Negligible	Neutral
077	ch. 7,750 to 7,900	High	No measurable impact on aquifer due to pathway removal (Method C) APS <0.5% (Method D)	Negligible	Neutral
083	ch. 7,900 to 8,390	High	No measurable impact on aquifer due to pathway removal (Method C) APS <0.5% (Method D)	Negligible	Neutral
092	ch. 8,410 to 9,365	High	No measurable impact on aquifer due to pathway removal (Method C) APS <0.5% (Method D)	Negligible	Neutral
102	ch. 9,300 to 9,870	Medium	No measurable impact on aquifer due to pathway removal (Method C) APS <0.5% (Method D)	Negligible	Neutral
Balsporran carpark	ch. 6,800	High	No measurable impact on aquifer due to pathway removal (Method C) APS <0.5% (Method D)	Negligible	Neutral

5 Conclusion

- 5.1.1 This appendix has presented further information on the water quality assessments undertaken during the EIA to support the findings reported in **Chapter 11**.
- 5.1.2 As outlined in **Table 6**, it is considered that there is no likely significant water quality impacts associated with the Proposed Scheme if appropriate mitigation measures are included. This information has been further presented in an evaluation of effects for each of the receptors within **Chapter 11**.
- 5.1.3 Impacts/ failures of water quality assessments can be appropriately mitigated using typically two levels of treatment for road surface water runoff. Impacts on groundwater should be mitigated by lining SuDS to prevent infiltration risk where Medium or High values have been recorded.
- 5.1.4 Cumulative impacts assessments have been found to fail at one location (downstream of Hydro ID 1 – the cumulative impact of SuDS 001 and 003 discharging to the same watercourse within approximately 1m vicinity). This impact can be mitigated with enhanced treatment for copper (i.e. pond) but with one level of treatment for zinc (i.e. filter drain). As both networks provide two levels of treatment prior to discharge, the predicted overall impact is negligible.



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Annex 1: Calculations

Figure 1: Method A Calculations for SuDS 000

AGENCY	Highways A	gency Water Risl	k Assessment To	Ol version 1.0 November 200	9		
AGENCY	Annual Average Co		e - Acute Impact	Zinc	Sedim	ent - Chronic Impact	
	Copper Step 2 0.38 Step 3 -		Copper Pass	Pass	Pass Accu	ment deposition for this s mulating? No nsive? No	ite is judged as: 0.16 Low flow Vel m/s - Deposition Index
Location Details							
Road number				HA Area / DBFO number			
Assessment type		Non-cumulative ass	essment (single outfall))			-
OS grid reference of assessmen	nt point (m)	Easting	265630		Northing	772532	
OS grid reference of outfall struc	ture (m)	Easting			Northing	772532	
Outfall number		000		List of outfalls in			
Receiving watercourse		Allt Chaorach Beag		cumulative assessment			
EA receiving water Detailed Riv	er Network ID			Assessor and affiliation	1	Guy Douglas Fairhurst (CFJV
Date of assessment		18/11/2016		Version of assessment		01	
Notes							
For dissolved zinc only		Iow (m³/s) rea drained (ha) i) 0.2 Low = <50mg CaCO3/I	0.53365632 Perme 286 Is the	zero in Annual 95%ile river eable area draining to outfal discharge in or within 1 km es the velocity within 100m	(ha) 0.23649921 upstream of a protected	ed site for conservation?	No - D
	Tier 1 Estimated	l river width (m) (m)	5 1.7 Manri	ng's n 0.05	Side slope (m/m)	0.5 Long slope	• (m/m) 0.060
Step 3 Mitigation		Briefdescription		Treatment for Atte solubles (%) soluble		tlement of ments (%)	redict Impact
Existing measures				0 D Unlimite	ed 🚽 🔽 0		Dotanow Results
Proposed measures				0 D Unlimite			Exit Tool



HIGHWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009									
AGENCY	Annual Average Co Copper Step 2 0.88 Step 3 0.80	ncentration	e - Acute Impact Copper	Zinc ver Fails Toxicity Test. Try more mitigation	Sedim	nt - Chronic Impact ment deposition for this site is judged as: nulating? No 0.23 Low flow Vel m/s sive? No - Deposition Index			
Location Details									
Road number				HA Area / DBFO number	-				
Assessment type		Non-cumulative ass	essment (single outfall)			•			
OS grid reference of asses	sment point (m)	Easting	264797		773027				
OS grid reference of outfall	structure (m)	Easting	264797		Northing	773027			
Outfall number	Outfall number 001			List of outfalls in					
Receiving watercourse		Unnamed Tributary of	of River Garry	cumulative assessment					
EA receiving water Detailed	d River Network ID			Assessor and affiliation		Guy Douglas Fairhurst CFJV			
Date of assessment		02/02/2017		Version of assessment 01					
Notes									
Step 1 Runoff Qualit	AADT >10,000 and	<50,000 • Clin	Colder	r Wet Ra	Ardtalnaig (SAAR 1343.9mm)			
Step 2 River Impacts	Annual 95%ile river i Impermeable road a Base Flow Index (Bf	rea drained (ha)	1.591112249 Perme	zero in Annual 95%ile rive able area draining to outfa discharge in or within 1 km	(ha) 0.0695				
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I			· ·				
For sediment impact on	2	l river width (m)	nd or canal that reduce 5 0.45 Mannin	es the velocity within 100m or s n 0.05		e? No D.5 Long slope (m/m) 0.040			
Step 3 Mitigation		Brief description		Treatment for Att		ement of Predict Impact			
Existing measures					arge rate (l/s)	Show Detailed Results			
Proposed measures Filt	ter Drains & Wet Retention Po	ond 25% (Cu)		10 Unlimit	ed 🗸 🖸 63	Exit Tool			

Figure 2: Method A Calculations for SuDS 001 (copper)



HIGHWAYS H	HWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009										
Annu		ncentration Zinc 2.68 ug/l	e - Acute Impact Copper Pass	Zinc Pass		Pass	Sedim Accum	iment - Chronic Im ediment deposition f ccumulating? No ktensive? No		ition for this site is jud	
Step	3 0.47	1.42 ug/l					Extens	sive?	NO	- D	eposition Index
Road number				HA Area / DBFO	number						
Assessment type		Non-cumulative ass	essment (single outfall)								
OS grid reference of assessment point	Easting	264797			Northing		773027				
OS grid reference of outfall structure (m)	Easting	264797			Northing		773027			
Outfall number	,	001		List of outfall	s in						
Receiving watercourse		Unnamed Tributary	of River Garry	cumulative asse	ssment						
EA receiving water Detailed River Netw	ork ID			Assessor and affi	liation			Guy Doua	las Fairhurst	CFJV	
Date of assessment		02/02/2017	Version of assess	sment			01				
Notes											
Step 1 Runoff Quality AADT	>10,000 and	<50,000 - Ci	matic region Colde	r Wet 👻	Rai	infal site	Ardtalnaig (SAAR 1343.9	9mm)		-
	95%ile river f eable road a	rea drained (ha)	1.591112249 Perme	zero in Annual 95% able area draining		_	o assess Sta	ep 1 runoff	i quality only)	
Base Fl	owindex (BF	=1) 0.1	286 Is the	discharge in or with	in 1 km	upstream o	f a protected	d site for c	onservation?	,	No 🖵 D
For dissolved zinc only Water h	ardness	Low = <50mg CaCO3/I	- D								
For sediment impact only Is there Tier 1 © Tier 2	Estimated	d river width (m)	ond or canal that reduce 5 0.45 Mannie	-	in 100m	of the point Side slope	-	e?	No Long slop	• e (m/m)	0.040
Step 3 Mitigation		Brief description		E Treatment for solubles (%)	Atte	ed effectiven enuation for es - restricted	d sedim	ement of ents (%)		Predict	Impact
Existing measures	neasures 0				discha	ed -	- 0	D	Sho	w Detai	led Results
Proposed measures Filter Drains & W	Sures Filter Drains & Wet Retention Pond 25% (Zn)				Unlimite	ed 🗸 🖸	63			Exit	ΤοοΙ

Figure 3: Method A Calculations for SuDS 001 (zinc)



HIGHWAYS	Highways A	gency Water	Risk Assessment To	OOI version 1.0 Nove	ember 200	19			
AGENCY	Annual Average Co		luble - Acute Impact ^{Coppe r}	Zinc		٤	Sediment - C	hronic Impact	t
	Copper				Alert.	Protected Area	Sediment deposition for this site is judged as:		
	Step 2 0.24 Step 3 -	0.72 ug/l - ug/l	Pass	Pass	& D)/S Structure.	Accumulatin Extensive?	• <u> </u>	0.17 Low flow Vel m/s - Deposition Index
Location Details				U					
Road number				HA Area / DBFC	number				
Assessment type		Non-cumulative	assessment (single outfa	II)					
OS grid reference of assessm	ent point (m)	Easting	264684			Northing	7731	15	
OS grid reference of outfall str	ucture (m)	Easting	264684			Northing	7731	15	
Outfall number		003	!	List of outfa					
Receiving watercourse		Unnamed Tribut	tary of River Garry	cumulative ass	essment				
EA receiving water Detailed R	liver Network ID			Assessor and af	filiation		Guy	Douglas CFJV	
Date of assessment		17/01/2017		Version of asses	sment				
Notes		-							
Step 1 Runoff Quality	AADT >10,000 and	1 <50,000 ▼	Climatic region Col	der Wet 🗸	Rai	infall site Ar	dtalnaig (SAAR	. 1343.9mm)	-
Step 2 River Impacts	Annual 95%ile river	flow (m³/s)	0.001 (Ente	er zero in Annual 95	%ile rive	r flow box to as	sess Step 1 ı	runoff quality o	nly)
	impermeable road a	area drained (ha)	0.30144686 Perm	neable area draining	to outfal	(ha) 0.06			
	Base Flow Index (B	FI)	0.286 Is the	e discharge in or wit	thin 1 km	upstream of a p	protected site	for conservatio	m? Yes ▼
For dissolved zinc only	Water hardness	Low = <50mg CaCC	D3/I 🔽 D						
For sediment impact only	is there a downstrea	um structure, lake	e, pond or canal that redu	ces the velocity with	hin 100m	of the point of a	lischarge?	Y	es 🔻
	O Tier 1 Estimate	d river width (m)	5						
	• Tier 2 Bed widt	h (m)	0.45 Man	ning's n 0.05		Side slope (m/	m) 0.5	Long s	lope (m/m) 0.015
Step 3 Mitigation					Estimate	ed effectiveness			Predict Impact
Brief description			n	Treatment for		enuation for	Settlemen		r reulet impact
				solubles (%)	discha	es - restricted arge rate (l/s)	sediments		ow Detailed Results
Existing measures				0	Unlimite	ed 🔽 🗋	0		
Proposed measures				0	Unlimite	ed 🔽 🖸	0		Exit Tool

Figure 4: Method A Calculations for SuDS 003



HIGHWAYS AGENCY	Highways A	gency Water Ris	k Assessment To	X version 1.0 Novemb	er 2009					
AGENCY	Annual Average Co Copper Step 2 0.05 Step 3 -	oncentration	le - Acute Impact Copper Pass	Zinc Pass	Sediment - Chronic Impact Alert. Protected Area & D/S Structure. Sediment deposition for this s Accumulating? No C Extensive? No).28 Low flow	l as: w Vel m/s tion Index	
Location Details		1								
Road number				HA Area / DBFO nur	nber					
Assessment type			n-cumulative assessment (single outfall)							
OS grid reference of assessm	1 ()	Easting	264557		Northing	,	773262			
OS grid reference of outfall str	ucture (m)	Easting	264557		Northing	1	773262			
Outfall number		004		List of outfalls in cumulative assess						
Receiving watercourse		Allt Coire Mhic Sith		culturative assessi	inent					
EA receiving water Detailed R	River Network ID			Assessor and affiliation Guy Douglas CFJV						
Date of assessment 17/01/2017 Version of assessment					01					
Notes				- 1						
Step 1 Runoff Quality	AADT >10,000 and	i <50,000 🔽 Ci	matic region Colde	r Wet	Rainfall site	Ardtalnaig	(SAAR 1343.9	9mm)		•
Step 2 River Impacts	Annual 95%ile river Impermeable road a	rea drained (ha)	3.0553423366 Perme	zero in Annual 95%ile able area draining to o	outfall (ha)	0.71	•			
	Base Flow Index (Bl	FI) 0.	437 Is the	discharge in or within	1 km upstrean	n of a protecte	d site for c	onservation?	Ye	es 🗸
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I	▼ D							
For sediment impact only	© Tier 1 Estimate	d river width (m)	ond or canal that reduce		_	_	je? 0.5	Yes		0.015
	• Tier 2 Bed widt	n (m)	7.67 Manni	ngsn 0.00	Side sid	ope (m/m)	0.5	Long slope		0.015
Step 3 Mitigation				Est	timated effectiv	/eness		Р	redict Imp	act
		Brief description			Attenuation f olubles - restri ischarge rate (cted sedir	lement of nents (%)		Detailed I	
Existing measures				0 D U	nlimited 🚽	D	D			
Proposed measures				0 D U	Inlimited	0	D		Exit Tool	ı

Figure 5: Method A Calculations for SuDS 004



	lighways A	gency Water Ris	k Assessment Too	version 1.0 Nove	mber 200	19				
St	ep 3 0.31	oncentration	e - Acute Impact Copper Pass	Zinc Pass	& D/S Structure.			i dged as: .ow flow Vel m/s Deposition Index		
Location Details		1		HA Area / DBFO	numbor					
Road number				HA Area / DBFU	number					
Assessment type OS grid reference of assessment point	at (m)		essment (single outfall)							
· ·		Easting	263542 263542			Northing	774591			
OS grid reference of outfall structure (Outfall number	m)	Easting	List of outfall	2 10	Northing	774591		1		
		020		- cumulative asse						
Receiving watercourse		AlltFuarBheann								
EA receiving water Detailed River Ne	twork ID			Assessor and affi			GuyDoug	as		
Date of assessment	17/01/2017		Version of assess	sment		01				
Notes										
Step 1 Runoff Quality AADT >10,000 and <50,000 Climatic region Colder Wet Rainfall site Ardtalnaig (SAAR 1343.9mm)										
mpen	l 95%ile river neable road a Flow Index (Bl	rea drained (ha)	2.813907188 Perme	able area draining	to outfal	r flow box to assess S I (ha) 0.13759674 upstream of a protecte				Yes
For dissolved zinc only Water	hardness	Low = <50mg CaCO3/I	▼ D							
For sediment impact only is ther C Tier © Tier	1 Estimate	d river width (m)	nd or canal that reduce 5 2.83 Mannin		n 100m	of the point of dischard	ge? 0.5	Yes Long slop		0.030
Step 3 Mitigation					stimate	d effectiveness				
		Brief description		Treatment for solubles (%)	Atte	enuation for Sett	lement of ments (%)		Predict	Impact
Existing measures						rge rate (l/s)		Sho	w Detai	iled Results
	uDS Basin & Sw	ales (Cu)		50 D	Unlimite		D		Exit	Tool
					<u> </u>					

Figure 6: Method A Calculations for SuDS 020 (dry basin) (copper)



HIGHWAY	S Highways A	gency Water Ris	k Assessment Too	Version 1.0 Nove	mber 200)9				
AGENCY	Annual Average Co Copper Step 2 0.63 Step 3 0.26	oncentration	e - Acute Impact Copper Pass	Zinc Pass		Alert. Protected Area & D/S Structure. Sediment deposition for this si Accumulating? Extensive?			site is judged as: 0.16 Low flow Vel m/s Deposition Index	
Location Details Road number				HA Area / DBFO	number					
Assessment type		Non-cumulative ass	essment (single outfall)						-	
OS grid reference of assess	sment point (m)	Easting	Northing 774591							
OS grid reference of outfall s	structure (m)	Easting		Northing 77						
Outfall number		020		List of outfalls in						
Receiving watercourse		Allt Fuar Bheann	cumulative asse	ssment						
EA receiving water Detailed	River Network ID		Assessor and affi	liation		GuyDou	glas			
Date of assessment		17/01/2017	017 Version o				01			
Notes		l								
Step 1 Runoff Quality	Step 1 Runoff Quality AADT >10,000 and <50,000 Climatic region Colder Wet Rainfall site Ardtalnaig (SAAR 1343.9mm)									
Step 2 River Impacts	Impermeable road a Base Flow Index (Bl	rea drained (ha)	2.813907188 Perme	able area draining	to outfal	r flow box to asses II (ha) 0.137596 upstream of a prote	74	,		
For dissolved zinc only Water hardness Low = <50mg CaCO3/l Image: CacO3/l										
Step 3 Mitigation				E	Estimate	ed effectiveness			Predict Impact	
Existing measures	Brief description					es - restricted so arge rate (l/s)	Settlement of ediments (%)		w Detailed Results	
	er Drains, SuDS Basin & Sw	ales (Zn)		0 D 58.75	Unlimite		D		Exit Tool	

Figure 7: Method A Calculations for SuDS 020 (dry basin) (zinc)



HIGHWAYS	Highways A	gency Water Ris	k Assessment To	Ol version 1.0 Nove	mber 200)9				
AGENCY	Annual Average Co Copper Step 2 0.63 Step 3 0.38	ncentration	e - Acute Impact Copper Pass	Zinc Pass				udged as: Low flow Vel m/s Deposition Index		
Location Details										
Road number				HA Area / DBFO	number					
Assessment type	essment (single outfal	I)						-		
OS grid reference of assessme	nt point (m)	Easting	263542			Northing	774591			[
OS grid reference of outfall strue	cture (m)	Easting	263542			Northing	774591			
Outfall number		020		List of outfall						
Receiving watercourse		Allt Fuar Bheann		cumulative asse	ssment					
EA receiving water Detailed Riv		Assessor and aff	iliation		GuyDoug	las				
Date of assessment 17/01/2017				Version of asses	sment		01			
Notes										
Step 1 Runoff Quality	AADT >10,000 and	<50,000 💌 Clin	matic region Cold	er Wet 💌	Ra	infall site Ardtalnaig	(SAAR 1343.9	9mm)		•
	Annual 95%ile river Impermeable road a Base Flow Index (Bf	rea drained (ha)	2.813907188 Perm	eable area draining	to outfal	r flow box to assess S II (ha) 0.13759674 upstream of a protect	·			Yes -
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I	✓ D							
For sediment impact only is there a downstream structure, lake, point or canal that reduces the velocity within 100m of the point of discharge? No Image: Construction of the point of discharge Image: Construction of the point of discharge Image: Construction of the point of										
Step 3 Mitigation		D. ()			-	ed effectiveness			Predic	t Impact
Existing measures		Brief description		Treatment for solubles (%)	soluble	es - restricted sedi	tlement of ments (%)	Sho	w Deta	ailed Results
				D		• U	D			
Proposed measures Filter Dr	rains & Wet Retention Po	ond (Cu)		40	Unlimite	ed 🔽 🖸 72			Exi	t Tool

Figure 8: Method A Calculations for SuDS 020 (wet pond) (copper)



HIGHWAYS HIG	HWAYS Highways Agency Water Risk Assessment Tool version 1.0 November 2009										
	al Average Co		le - Acute Impa _{Copper}	act	Zinc		Sedi	ment - Chron	ic Impact		
	Copper		Coppor				Se	diment depos	ition for this	s site is j	udged as:
Step	2 0.63	1.91 ug/l	Pass		Pass	Alert. I	Protected Area. Ac	umulating?	No	0.16	Low flow Vel m/s
Step	3 0.29	0.90 ug/l					Ex	ensive?	No	-	Deposition Index
Location Details											
Road number					HA Area / DBFO	number					
Assessment type		Non-cumulative ass		e outfall)							-
			263542				Northing	774591			
OS grid reference of outfall structure (m)	Easting	263542		_		Northing	774591				
Outfall number		020			List of outfalls cumulative asse						
Receiving watercourse		Allt Fuar Bheann			cumulauve asse	ssment					
EA receiving water Detailed River Network ID					Assessor and affi	liation	1	Guy Doug	las		
Date of assessment 17/01/2017				Version of assess	sment		01				
Notes	(
Step 1 Runoff Quality AADT	>10,000 and	<50,000 • Ci	imatic region	Colde	r Wet	Rai	nfall site Ardtaln	ig (SAAR 1343.	9mm)		_
Step 2 River Impacts Annual 9)5%ile river f	low (m³/s)	0.003	(Enter	zero in Annual 95%	6 ile rive ı	r flow box to assess	Step 1 runoff	quality on	y)	
Imperme	able road ar	rea drained (ha)	2.813907188	Perme	able area draining	to outfal	0.1375967	4			
Base Flo	windex (BF	FI) 0.1	.376	ls the (Is the discharge in or within 1 km upstream of a protected site for conservation?						
For dissolved zinc only Water ha	ardness	Low = <50mg CaCO3/I	▼ D								
For sediment impact only is there a	a downstrear	m structure, lake, po	ond or canal that	at reduce	s the velocity withi	n 100m	of the point of disch	ame?	No	•	
© Tier 1		l river width (m)	5								
© Tier 2			2.83		n's n 0.05		C L L L L L L L L L L	0.5			\
• Her 2	Bed width	i (m)	2.03	Mannir	gisn 0.00		Side slope (m/m)	0.5	Long slo	pe (m/m) 0.030
Step 3 Mitigation						Estimate	d effectiveness				
		Brief description			Treatment for	Atte	enuation for S	ettlement of		Predic	t Impact
					solubles (%)		es - restricted se	diments (%)			
					discharge rate (l/s) Show Detailed R				iled Results		
Existing measures	measures			1		Unlimite	ed 🗸 🖸 0	D			
Proposed measures Filter Drains & We	measures Filter Drains & Wet Retention Pond (Zn)				53.25	Unlimite	ed 🔽 🖸 72			Exi	t Tool

Figure 9: Method A Calculations for SuDS 020 (wet pond) (zinc)



HIGHWAYS	Highways A	gency Water Ris	k Assessment Too	version 1.0 November 2	009				
	nnual Average Co Copper Step 2 0.27	oncentration	le - Acute Impact Copper Pass	Zinc Pass Aler	Sedi	ent - Chronic Im ment deposition mulating? No	ion for this site is judged as:		
5	Step 3 -	- ug/l			Exte	nsive? No	- Deposition Index		
Location Details		1							
Road number				HA Area / DBFO numbe	er				
Assessment type			sessment (single outfall)				•		
OS grid reference of assessment po	. ,	Easting	262813		Northing	776661			
OS grid reference of outfall structure	(m)	Easting	262813	_	Northing	776661			
Outfall number		042		List of outfalls in cumulative assessme	ht				
Receiving watercourse		River Truim			n l				
EA receiving water Detailed River N	letwork ID			Assessor and affiliation		Guy Douglas			
Date of assessment	e of assessment 17/01/2017					01			
Notes									
Step 1 Runoff Quality AAD	>10,000 and	<50,000 • Ci	matic region Colde	r Wet 🔹 R	ainfall site Ardtalnaig	(SAAR 1343.9mm)	•		
Step 2 River Impacts Annu	al 95%ile river f	low (m ³ /s)	0.011 (Enter	zero in Annual 95%ile riv	er flow box to assess S	itep 1 runoff qua	lity only)		
Impe	ermeable road a	rea drained (ha)	3.731700507 Perme	able area draining to out	all (ha) 0.60				
Base	e Flow Index (BF	=1) 0.	373 is the	Is the discharge in or within 1 km upstream of a protected site for conservation?					
For dissolved zinc only Wate	er hardness	Low = <50mg CaCO3/I	T						
For sediment impact only is the	ere a downstrea	rn structure, lake, po	ond or canal that reduce	es the velocity within 100	m of the point of dischar	ge?	No 🔻 D		
C Tie		d river width (m)	5	-	•	-			
© Tie		• • •	1.68 Mannir	g's n 0.05	Side slope (m/m)	0.5 Lo	ong slope (m/m) 0.006		
Step 3 Mitigation				Fetime	ated effectiveness				
		Brief description				tlement of	Predict Impact		
						ments (%)			
Existing measures				0 Unlin	ited United 0		Show Detailed Results		
Proposed measures				0 D Unlin	ited 🗸 🖸 0	D	Exit Tool		

Figure 10: Method A Calculations for SuDS 042



Step 3 ugit Extensive? No Deposit Location Defails Road number HA Area / DBFO number Assessment type Non-cumulative assessment (single outfall) OS grid reference of assessment point (m) Easting 262555 Northing 778520 OS grid reference of assessment point (m) Easting 262555 Northing 778520 OS grid reference of assessment point (m) Easting 262555 Northing 778520 OUtfall number OB0 List of outfalls in cumulative assessment Image: Comparison of assessment Image	as: v Vel m/s ion Index
Copper Zinc Step 2 Zinc Ug1 Pass Pass Alert. Protected Area. Sediment deposition for this site is judged Accumulating? No 0.24 Low from Extensive? Location Details Road number HA Area / DBFO number Alert. Protected Area. Sediment deposition for this site is judged Accumulating? No 0.24 Low from Extensive? Deposit Cost of performe of assessment point (m) Easting jp2555 Northing 778520 OS grid reference of outfall structure (m) Easting jp2555 Northing 778520 Outfall number 060 List of outfalls in cumulative assessment Northing 778520 Outfall number 060 List of outfalls in cumulative assessment Guy Douglas CFJV Deposit Date of assessment 17/01/2017 Version of assessment 01 Notes Step 1 Runoff Quality AADT<>10.000 and <50.000	v Vel m/s
Image: Step 3 Image: Step 3<	
Location Details Road number HA Area / DBFO number Assessment type Non-cumulative assessment (single outfall) OS grid reference of assessment point (m) Easting 262555 OS grid reference of outfall structure (m) Easting 262555 Outfall number 060 List of outfalls in cumulative assessment Outfall number 060 List of outfalls in cumulative assessment Receiving watercourse River Truim Assessor and affiliation Guy Douglas CFJV Date of assessment 17/01/2017 Version of assessment 01 Notes Step 1 Runoff Quality AADT >10,000 and <50,000	vion Index ▼
Road number HA Area / DBFO number Assessment type Non-cumulative assessment (single outfall) OS grid reference of assessment point (m) Easting 262555 Northing 778520 OS grid reference of outfall structure (m) Easting 262555 Northing 778520 Outfall number 060 List of outfalls in cumulative assessment Image: Complexity of the sessment Image: Complexity of the sessment Assessment 060 Cumulative assessment Image: Complexity of the sessment Image: Complexity of the sessment Carl and the sessment 060 Cumulative assessment Image: Complexity of the sessment EA receiving water Detailed River Network ID Assessor and affiliation Guy Douglas CFJV Date of assessment 17/01/2017 Version of assessment 01 Notes Image: Colder Wet Rainfall site Ardtalnaig (SAAR 1343.9mm) Step 1 Runoff Quality AADT >10,000 and <50,000	
Assessment type Non-cumulative assessment (single outfall) OS grid reference of assessment point (m) Easting 262555 Northing 778520 OS grid reference of outfall structure (m) Easting 262555 Northing 778520 Outfall number 060 List of outfalls in cumulative assessment Image: Comparison of the cumulative assessment Image: Comparison of the cumulative assessment EA receiving water Detailed River Network ID Assessor and affiliation Guy Douglas CFJV Date of assessment 17/01/2017 Version of assessment 01 Notes Step 1 Runoff Quality AADT >10,000 and <50,000	
OS grid reference of assessment point (m) Easting 262555 Northing 778520 OS grid reference of outfall structure (m) Easting 262555 Northing 778520 Outfall number 060 List of outfalls in Image: Comparison of the compa	
OS grid reference of outfall structure (m) Easting 262555 Northing 778520 Outfall number 060 List of outfalls in cumulative assessment Image: Comparison of the cumulative assessment Image: Comparison of the cumulative assessment Image: Comparison of the cumulative assessment EA receiving water Detailed River Network ID Assessor and affiliation Guy Douglas CFJV Date of assessment 17/01/2017 Version of assessment Image: Comparison of the cumulative assessment Notes Step 1 Runoff Quality AADT >10,000 and <50,000	
Outfall number 060 List of outfalls in cumulative assessment If is of outfalls in cumulative assessment Receiving water ourse River Truim Assessor and affiliation Guy Douglas CFJV Date of assessment 17/01/2017 Version of assessment 01 Notes Step 1 Runoff Quality AADT >10,000 and <50,000	
Receiving water course River Truim cumulative assessment Guy Douglas CFJV EA receiving water Detailed River Network ID Assessor and affiliation Guy Douglas CFJV Date of assessment 17/01/2017 Version of assessment 01 Notes Step 1 Runoff Quality AADT >10,000 and <50,000	
Receiving watercourse River Truim EA receiving water Detailed River Network ID Assessor and affiliation Date of assessment 17/01/2017 Version of assessment 01 Notes Step 1 Runoff Quality Step 2 River Impacts Annual 95%ile river flow (m³/s) 0.044 Impermeable road area drained (ha) 2.25928688 Permeable area draining to outfall (ha) 0.36 Base Flow hdex (BFI) 0.386 Is the discharge in or within 1 km upstream of a protected site for conservation? Ya For dissolved zinc only Water hardness Low = <50mg CaCO3/l	
Date of assessment 17/01/2017 Version of assessment 01 Notes Step 1 Runoff Quality AADT >10,000 and <50,000	
Notes Step 1 Runoff Quality AADT >10,000 and <50,000 Climatic region Colder Wet Rainfall site Ardtalnaig (SAAR 1343.9mm) Step 2 River Impacts Annual 95%ile river flow (m ³ /s) 0.044 (Enter zero in Annual 95%ile river flow box to assess Step 1 runoff quality only) Impermeable road area drained (ha) 2.25928688 Permeable area draining to outfall (ha) 0.36 Base Flow hdex (BFI) 0.386 Is the discharge in or within 1 km upstream of a protected site for conservation? Yet For dissolved zinc only Water hardness Low = <50mg CaCO3/l	
Step 1 Runoff Quality AADT >10,000 and <50,000 Climatic region Colder Wet Rainfall site Ardtalnaig (SAAR 1343.9mm) Step 2 River Impacts Annual 95%ile river flow (m³/s) 0.044 (Enter zero in Annual 95%ile river flow box to assess Step 1 runoff quality only) Impermeable road area drained (ha) 2.25928688 Permeable area draining to outfall (ha) 0.36 Base Flow hdex (BFI) 0.386 Is the discharge in or within 1 km upstream of a protected site for conservation? Yet For dissolved zinc only Water hardness Low = <50mg CaCO3/l	
Step 2. River Impacts Annual 95%ile river flow (m³/s) 0.044 (Enter zero in Annual 95%ile river flow box to assess Step 1 runoff quality only) Impermeable road area drained (ha) 2.25928688 Permeable area draining to outfall (ha) 0.36 Base Flow Index (BFI) 0.386 Is the discharge in or within 1 km upstream of a protected site for conservation? Ya For dissolved zinc only Water hardness Low = <50mg CaCO3/1	
Step 2. River Impacts Annual 95%ile river flow (m³/s) 0.044 (Enter zero in Annual 95%ile river flow box to assess Step 1 runoff quality only) Impermeable road area drained (ha) 2.25928688 Permeable area draining to outfall (ha) 0.36 Base Flow Index (BFI) 0.386 Is the discharge in or within 1 km upstream of a protected site for conservation? Ya For dissolved zinc only Water hardness Low = <50mg CaCO3/1	
Impermeable road area drained (ha) 2.25928688 Permeable area draining to outfall (ha) 0.36 Base Flow hdex (BFI) 0.386 Is the discharge in or within 1 km upstream of a protected site for conservation? Ya For dissolved zinc only Water hardness Low = <50mg CaCO3/l	•
Base Flow hdex (BFI) 0.386 Is the discharge in or within 1 km upstream of a protected site for conservation? Yu For dissolved zinc only Water hardness Low = <50mg CaCO3/l Image: CaC	
For dissolved zinc only Water hardness Low = <50mg CaCO3/l	
	es 💌
For sediment impact only is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge?	
• Tier 1 Estimated river width (m) 5	
Tier 2 Bed width (m) 3.58 Manning's n 0.05 Side slope (m/m) 0.5 Long slope (m/m) 0	
Step 3 Mitigation Estimated effectiveness	0.005
Brief description Treatment for Attenuation for Settlement of	
solubles (%) solubles - restricted sediments (%) discharge rate (I/s)	
Existing measures 0 0 0 0 0 0	act
Proposed measures 0 D Unlimited V D 0 D Exit Tool	act

Figure 11: Method A Calculations for SuDS 060



HIGHWAYS AGENCY	Highways A	gency Water Ris	sk Assessmen	t Too	version 1.0 Nover	m ber 200	9						
AGENCY	Annual Average Co	Solub	le - Acute Impact Copper		Zinc			Sedime	nt - Chron	ic Impact			
	Copper		Copper		Line			Sedim	nentdeposi	ition for th	is site is j	udged as:	
	Step 2 0.04	0.12 ug/l	Pass		Pass	Alert.	Protected Area.	Accun	nulating?	No	0.25	Low flow Vel m/s	
	Step 3 -	- ug/l						Exten	sive?	No	-	Deposition Index	
Location Details									1				
Road number					HA Area / DBFO	number							
Assessment type		Non-cumulative as		utfall)					1			•	
OS grid reference of assessm	• • • •	Easting	262633				Northing		778775				
OS grid reference of outfall stru	ucture (m)	Easting	262633			_	Northing		778775		-		
Outfall number		063			List of outfalls in cumulative assessment								
Receiving watercourse		River Truim											
EA receiving water Detailed R	liver Network ID	Assessor and affiliation GuyDouglas C						as CFJV	2FJV				
Date of assessment		17/01/2017			Version of assess	ment			01				
Notes													
Step 1 Runoff Quality	AADT >10,000 and	i <50,000 ▼ Ci	imatic region	Colder	Wet 💌	Rai	nfall site	Ardtalnaig (SAAR 1343.9	9mm)		•	
Step 2 River Impacts	Annual 95%ile river	flow (m³/s)	0.046	Enter 2	zero in Annual 95%	6ile rive	r flow box to a	issess St	ep 1 runoff	quality or	ily)		
	Impermeable road a	rea drained (ha)	1.85154058 P	emea	able area draining	to outfal	(ha) 0.1	9					
	Base Flow Index (Bl	FI) 0.	.384	the d	lischarge in or with	in 1 km	upstream of a	protecte	d site for c	onservatio	n?	Yes 🗸	
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I	- D										
For sediment impact only	is there a downstrea	m structure lake ry	ond or canal that r	edure	s the velocity within	n 100m	of the point of	i discham	le?	N	D 🗸	D	
, or ocument impact offig		d river width (m)			and tendency mus			aconcly	1			-	
	• Tier 2 Bed widt			lannin	a's n 0.05		Side slope (r		0.5			0.005	
	Sed wat	n (m)	5.25 N		gsn oloo		Side slope (r		0.0	Long s	ope (m/m	0.005	
Step 3 Mitigation					E	Estimate	ed effectivenes	s					
		Brief description			Treatment for	Atte	enuation for	Sett	ement of	-	Predic	t Impact	
					solubles (%)		es - restricted	sedin	nents (%)				
Eviction were							irge rate (I/s)			Sh	ow Deta	ailed Results	
Existing measures				0	D	Unlimite	ed 🗾 🗖	0	D				
Proposed measures				C	D	Unlimite	ed 🔽 🗖	0	D		Exi	t Tool	

Figure 12: Method A Calculations for SuDS 063



HIGHWAYS Highways	Agency Water Risk /	Assessment Too	version 1.0 Nove	mber 2009					
Annual Average Copp Step 2 0.0 Step 3 -	Concentration er Zinc	Acute Impact Copper Pass	Zinc Pass	Alert. Protected Area.	Sedim	ulating?	ic Impact tion for this No No	0.18	udged as: Low flow Vel m/s Deposition Index
Location Details									
Road number			HA Area / DBFO	number					
Assessment type	Non-cumulative asses	, ,		.					•
OS grid reference of assessment point (m)		62712		Northing		778924			
OS grid reference of outfall structure (m)	Easting 20	62712	_	Northing		778924			
Outfall number	065		List of outfall cumulative asse						
Receiving watercourse	River Truim		cumulauve asse	ssment					
EA receiving water Detailed River Network ID			Assessor and affi	liation		Guy Doug	las CFJV	1	
Date of assessment	17/01/2017		Version of assess	sment		01			
Notes									
Step 1 Runoff Quality AADT >10,000 a	nd <50,000 - Clima	tic region Colder	r Wet	Rainfall site	Ardtalnaig (S	SAAR 1343.9	9mm)		·
Step 2 River Impacts Annual 95%ile rive Impermeable road Base Flow Index (area drained (ha)	.846460175 Perme	able area draining	Kile river flow box to as to outfall (ha) 0.1 in 1 km upstream of a	1	•			Yes
	Low = <50mg CaCO 3/l am structure, lake, pond ed river width (m)	or canal that reduce	s the velocity withi	in 100m of the point of	discharge	e?	No	•	D
⊙ Tier 2 Bed wi		3.71 Mannin	g's n ^{0.05}	Side slope (m	vm) 🔽	.5	Long slop	pe (m/m)	0.002
				-					
Step 3 Mitigation				Estimated effectiveness			_	Predic	t Impact
	Brief description		Treatment for solubles (%)	Attenuation for solubles - restricted discharge rate (l/s)		ement of ents (%)	Sho	w Deta	iled Results
Existing measures				Unlimited 🚽 🕞	0	D			
Proposed measures		(Unlimited v	0	D		Exi	Tool

Figure 13: Method A Calculations for SuDS 065



HIGHWAYS Highways	Agency Water Ris	k Assessment Too	Version 1.0 Nover	nber 200:	9		
Сорре	oncentration r Zinc	le - Acute Impact Copper Pass	Zinc Pass	Alert. F	Protected Area. Accur	nent deposit nulating?	•
Location Details						1	
				umper			
21		, u			N		•
	5				•		
	-	262796			Northing	779267	
	069						
Receiving watercourse	River Truim		cumulative asses	sinent			
AGENCY Trighting's registry versus reserves intent (convention for them rest) Sediment - Chronic Impact Annual Average Concentation Soluble - Accumulating Soluble - Accumulating Sediment - Chronic Impact Sediment Stars Sediment - Chronic Impact Sediment - Chronic Impact Sediment deposition for this site is judged as: Accumulating? No 0.30 own flow Ven Read number Assessment point (m) Easting 262796 Northing 779267 OS gid reference of assessment point (m) Easting 262796 Northing 779267 OS gid reference of outfal structure (m) Easting 262796 Northing 779267 OS gid reference of outfal structure (m) Easting 262796 Northing 779267 Odd after ference of outfal structure (m) Easting 262796 Northing 779267 Odd after ference of outfal structure (m) Easting 262796 Northing 779267 Outfal number Assessment Odd Guy Douglas CFJV Date of assessment Guy Douglas CFJV Date of assessment 1701/2017 Version of assessment O1 Notes Step 1 Runoff Quality AADT <td>as CFJV</td>			as CFJV				
Date of assessment	17/01/2017		Version of assess	ment		01	
Notes							
Step 1 Runoff Quality AADT >10,000 at	id <50,000 - Ci	matic region Colde	r Wet 👻	Raiı	Ardtalnaig	(SAAR 1343.9	mm) 🚽
Impermeable road	area drained (ha)	1.827256915 Perme	able area draining t	o outfall	(ha) 0.11		
For dissolved zinc only Water hardness	Low = <50mg CaCO3/I	T					
© Tier 1 Estimat	ed river width (m)	5	-	100m			
Step 2 Mitigation			F	stimate	d effectiveness		
				ement of	Predict Impact		
Existing measures			solubles (%)	soluble dischai	rge rate (Vs)	nents (%)	Show Detailed Results
Proposed measures			U D	Unlimite		D	Exit Tool

Figure 14: Method A Calculations for SuDS 069



HIGHWAYS	Highways A	gency Water Ris	k Assessment To	OI version 1.0 Nove	mber 200	09					
AGENCY	Annual Average Co Copper Step 2 0.03 Step 3 -	oncentration	e - Acute Impact Copper Pass	Zinc Pass	Alert.	Protected Area.	Sedim	ulating?		s site is 0.01 53	Low flow Vel m/s Deposition Index
Location Details		1									
Road number				HA Area / DBFO	number						
Assessment type			essment (single outfa	1)		All and the second					
OS grid reference of assessm		Easting				Northing					
OS grid reference of outfall str	ucture (m)	Easting	262985			Northing		780143			
Outfall number		077		List of outfall						_	
Receiving watercourse		RiverTruim									
EA receiving water Detailed R	River Network ID			Assessor and affi				CFJV_IM			
Date of assessment		05/05/2017		Version of assess	sment			1.0			
Notes											
Step 1 Runoff Quality Step 2 River Impacts For dissolved zinc only	AADT >10,000 and Annual 95%ile river Impermeable road a Base Flow Index (B Water hardness	flow (m ³ /s) area drained (ha)	0.137 (Ente 3.732 Perm	er Wet	%ile rive to outfal	r flow box to a	ossess Ste		quality on		Yes
For sediment impact only		d river width (m)	ond or canal that redu 15 3 Manr	ces the velocity with	in 100m	of the point of Side slope (n	_	e?	No Long slo	ope (m/m	0.0001
Step 3 Mitigation		Brief description		Treatment for solubles (%)	Atte soluble	ed effectiveness enuation for es - restricted arge rate (l/s)	Settle	ement of ents (%)			ailed Results
Existing measures Proposed measures				0 D 0 D	Unlimite	- <u>-</u> D	0	D		Exi	t Tool

Figure 15: Method A Calculations for SuDS 077



HIGHWAYS	Highways A	gency Water R	tisk Assessment T e	XXX version 1.0 November	2009					
AGENCY	Annual Average Co Copper Step 2 0.55 Step 3 -	oncentration	uble - Acute Impact Copper Pass	Zinc Pass	Pass	Sedime	ent deposi ulating?	ic Impact tion for this No	0.20 Lo	lged as: w flow Vel m/s eposition Index
Location Details										
Road number				HA Area / DBFO num	ber					
Assessment type			assessment (single outfa	II)						-
OS grid reference of assessm	ent point (m)	Easting	263197		Northing	7	780475			
OS grid reference of outfall str	ucture (m)	Easting	263197		Northing	7	780475			
Outfall number		083	·	List of outfalls in						
Receiving watercourse		Unnamed Tributa	ary of Allt Coire Chuim	cumulative assessme	ent					
EA receiving water Detailed R	iver Network ID			Assessor and affiliatio	n		Guy Doug	las CFJV		
Date of assessment		17/01/2017		Version of assessmen	ssessment 01					
Notes										
Step 1 Runoff Quality	AADT >10,000 and	<50,000 ▼	Climatic region Wa	m Dry	Rainfall site	Ashford (SA/	AR 710mm)			•
Step 2 River Impacts	Annual 95%ile river Impermeable road a Base Flow Index (Bl	rea drained (ha)	1.10223309 Pem	er zero in Annual 95% ile r neable area draining to ou e discharge in or within 1	ttal (ha)	00	•			No 🗸 🖸
For dissolved zinc only	Water hardness	Low = <50mg CaCO	3/1							
For sediment impact only		d river width (m)	5	ces the velocity within 10	Om of the point o Side slope (r	_		No Long sloj	• • •	0.033
Step 3 Mitigation		Brief description	1		nated effectivenes Attenuation for		ment of		Predict	Impact
Existing measures		solubles (%) solubles - restricted discharge rate (l/s) sediments (%) 0 Unlimited 0								
Proposed measures						0	P			
						j	D		Exit 1	rool

Figure 16: Method A Calculations for SuDS 083



HIGHWAYS	Highways A	gency Water Ris	k Assessment To	Ol version 1.0 Nove	mber 20	09					
AGENCY	Annual Average Co Copper Step 2 0.21 Step 3 -	oncentration	le - Acute Impact Copper Pass	Zinc Pass	Alert	Protected Area. Acc	nent - Chror liment depos umulating? ensive?		site is judged as: 0.20 Low flow Vel m/s - Deposition Index		
Location Details											
Road number				HA Area / DBFO	number	-					
Assessment type			sessment (single outfal	l)					•		
OS grid reference of assessm	,	Easting				Northing					
OS grid reference of outfall st	ructure (m)	Easting	263697			Northing	781489				
Outfall number		092		List of outfall cumulative asse							
Receiving watercourse		Allt Coire Bhotie		cumulative asse	551110111						
EA receiving water Detailed F	River Network ID			Assessor and affi	liation		CFJV_IM				
Date of assessment		05/05/2017		Version of assess	Version of assessment 1.0						
Notes		-									
Step 1 Runoff Quality Step 2 River Impacts	AADT >10,000 and Annual 95%ile river Impermeable road a	flow (m ³ /s)	0.0096 (Ente		%ile rive	r flow box to assess	ig (SAAR 1343. Step 1 runof				
	Base Flow Index (B		434 Is the	meable area draining to outfall (ha) 0.03 me discharge in or within 1 km upstream of a protected site for conservation? Yes •							
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I									
For sediment impact only		d river width (m)	ond or canal that reduces the second	the velocity with	in 100m	n of the point of disch Side slope (m/m)	arge?	No Long slop	• D		
Step 3 Mitigation		Brief description		Treatment for	-	ed effectiveness	ettlement of		Predict Impact		
				solubles (%)	solubl discha	es - restricted se arge rate (l/s)	diments (%)	Show	v Detailed Results		
Existing measures				0	Unlimit	ed 🚽 🖸 0	D				
Proposed measures				0 D	Unlimit	ed 🚽 🖸 0	D		Exit Tool		

Figure 17: Method A Calculations for SuDS 092



HIGHWAYS	Highways A	gency Water Ris	k Assessment To	ol version 1.0 Nove	mber 200	09					
AGENCY	Annual Average C Coppe Step 2 0.25 Step 3 -	oncentration	e - Acute Impact Copper Pass	Zinc Pass	Alert	Protected Area. Accu	ient - Chron iment depos umulating? nsive?	ition for this si	te is judged as: 17 Low flow Vel m/s - Deposition Index		
Location Details		1									
Road number				HA Area / DBFO	number						
Assessment type			essment (single outfal	l)		hi a:			-		
OS grid reference of assess		Easting				Northing	781991				
OS grid reference of outfall st	ructure (m)	Easting	263893								
Outfall number		102		List of outfall							
Receiving watercourse		Unnamed watercou	se								
EA receiving water Detailed	River Network ID			Assessor and affiliation CFJV_IM							
Date of assessment		05/08/2017		Version of assessment 1.0							
Notes											
Step 1 Runoff Quality Step 2 River Impacts	AADT >10,000 and Annual 95%ile river Impermeable road a Base Flow Index (B	flow (m ³ /s) area drained (ha)	0.0026 (Ente	eable area draining	%ile rive to outfal	r flow box to assess		quality only)	Yes		
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I	– D								
For sediment impact only		d river width (m)	2	the velocity with	in 100m	of the point of discha Side slope (m/m)	rge? 0.5	No Long slope	(m/m) 0.0086		
Step 3 Mitigation		Brief description		Treatment for	_	ed effectiveness	ttlement of	- Pr	edict Impact		
Existing measures				solubles (%)	soluble	es - restricted sed arge rate (l/s)	iments (%)	Show	Detailed Results		
Proposed measures				0	Unlimite	ed 🗸 🖸 0	D		Exit Tool		

Figure 18: Method A Calculations for SuDS 102



HIGHWAYS	Highways A	gency Water Ris	k Assessment Too	D version 1.0 Noven	nber 200)9				
AGENCY	Annual Average Co	oncentration	e - Acute Impact Copper	Zinc			ent - Chror ment depos			udged as:
	Step 2 0.93 Step 3 0.51	2.82 ug/l 1.55 ug/l	Pass	Pass		Pass Accu	mulating? nsive?	No No	0.31	Low flow Vel m/s Deposition Index
Location Details		1								
Road number				HA Area / DBFO r	umber					
Assessment type			essment (single outfall)							-
OS grid reference of assessme	,	Easting				Northing				
S grid reference of outfall struc	cture (m)	Easting	264685			Northing	773113			
Dutfall number		003		List of outfalls cumulative asses		001				
Receiving watercourse		Unnamed tributary o	f River Garry							
A receiving water Detailed Riv	er Network ID			Assessor and affili	ation		CFJV_IM	1		
Date of assessment		10/05/2017		Version of assess	ment		1.0			
lotes										
I	Annual 95%ile river f Impermeable road a Base Flow Index (Bf	rea drained (ha)	1.8925 Perme	eable area draining t	o outfal	r flow box to assess S II (ha) 0.1295 upstream of a protect		. ,		No 🔽 🗅
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I	▼ D							
Ċ		d river width (m)	and or canal that reduce 3.5 0.5 Mannin		100m	of the point of dischar	ge? 0.5	Long sl	o	
Step 3 Mitigation		Brief description		E Treatment for		ed effectiveness enuation for Set	lement of		Predic	t Impact
Existing measures		bher description		o D	soluble	es - restricted sedi arge rate (l/s)	ments (%)	Sh	iow Deta	iled Results
Proposed measures Filter dra	ain & SuDS pond (Cu)			45	Unlimite				Exit	Tool

Figure 19: Method A Calculations for cumulative of SuDS 001 & 003 (copper)



HIGHWAYS Highways	gency Water Ris	k Assessment To	Ol version 1.0 Novembe	r 2009					
Annual Average C	oncentration	e - Acute Impact Copper	Zinc		_	nt-Chroni ent deposit	•	s site is i	udded as:
Step 2 0.93 Step 3 0.51		Pass	Pass	Pass		ulating?	No No	0.31	Low flow Vel m/s Deposition Index
Location Details									
Road number			HA Area / DBFO num	ber					
Assessment type	Non-cumulative ass	essment (single outfal)						•
OS grid reference of assessment point (m)	Easting			Northing					
OS grid reference of outfall structure (m)	Easting	264685		Northing	·	773113			
Outfall number	003		List of outfalls in	001	Í				
Receiving watercourse	Unnamed tributary o	of River Garry	cumulative assessm	ient					
EA receiving water Detailed River Network ID			Assessor and affiliati	on		CFJV_M		_	
Date of assessment	10/05/2017		Version of assessme	nt		1.0			
Notes					I				
Step 1 Runoff Quality AADT >10,000 ar	id <50,000 ▼ Cli	matic region Cold	er Wet	Rainfall site	Ardtalnaig (S	AAR 1343.9	mm)		•
Step 2 River Impacts Annual 95%ile river Impermeable road Base Flow Index (E	area drained (ha)	1.8925 Perm	r zero in Annual 95%ile eable area draining to o discharge in or within 1	utfall (ha) 0	.1295	-			No 🗸 🗅
For dissolved zinc only Water hardness	Low = <50mg CaCO3/I	▼ D							
	ed river width (m)	3.5	ing's n 0.05	00m of the point o		.5	No Long slo	▼ [pe (m/m	
Step 3 Mitigation			Esti	mated effectivene	SS			Dradia	t Impact
Existing measures	Brief description		di	Attenuation for lubles - restricted scharge rate (l/s) limited	sedim	ement of ents (%)			ailed Results
Proposed measures Filter drain & SuDS basin (Zn)			45 Ur	limited	70			Exi	t Tool

Figure 20: Method A Calculations for cumulative of SuDS 001 & 003 (zinc)



HIGHWAYS	Highways A	gency Water Risl	k Assessment To	OI version 1.0 Nove	mber 200	09			
AGENCY	Annual Average Co Copper Step 2 0.08	oncentration	e - Acute Impact Copper Pass	Zinc	Alert	Sedir	ent-Chroni nent deposi mulating?	ic Impact tion for this site	
	Step 3 -	- ug/l					nsive?	No -	Deposition Index
Location Details									
Road number				HA Area / DBFO	number				
Assessment type			essment (single outfa	II)					-
OS grid reference of assessm		Easting				Northing			
OS grid reference of outfall st	ructure (m)	Easting	262631			Northing	778775		
Outfall number		063		List of outfal		060			
Receiving watercourse		RiverTruim		cumulative asse	SSILIETI				
EA receiving water Detailed F	River Network ID			Assessor and aff	liation		CFJV_IM	· · · ·	
Date of assessment		10/05/2017		Version of asses	sment				
Notes				L					
Step 1 Runoff Quality	AADT >10,000 and	t <50,000 ▼ Clir	natic region Colo	der Wet 👻	Ra	infall site Ardtalnaig	(SAAR 1343.9)mm)	•
Oten 2. Diversion este									
Step 2 River Impacts	Annual 95%ile river	flow (m ³ /s)	0.046 (Ente	r zero in Annual 95	%ile rive	r flow box to assess S	tep 1 runoff	quality only)	
	Impermeable road a	rea drained (ha)	4.11 Perm	ieable area draining	to outfal	ll (ha) 0.55			
	Base Flow Index (BI	FI) 0.3	Is the	e discharge in or with	nin 1 km	upstream of a protecte	ed site for co	onservation?	Yes 🗸
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I							
For sediment impact only	Is there a downstrea	m structure, lake, po	nd or canal that redu	ces the velocity with	in 100m	of the point of discharg	ge?	No	▼ D
	C Tier 1 Estimate	d river width (m)	7						
	Tier 2 Bed width	h (m)	6 Manr	ning's n 0.05		Side slope (m/m)	0.5	Long slope (I	n/m) 0.002
Step 3 Mitigation					Estimate	ed effectiveness			
		Brief description		Treatment for	Atte	enuation for Sett	lement of	Pre	dict Impact
				solubles (%)			nents (%)		
						arge rate (l/s)		Show D	etailed Results
Existing measures				0 D	Unlimite	ed 🚽 🖸 0	D		
Proposed measures				0	Unlimite	ed 🚽 🖸 0	D	1	Exit Tool

Figure 21: Method A Calculations for cumulative of SuDS 060 & 063



HIGHWAYS	Highways A	gency Water Ris	k Assessment To	OOI version 1.0 Nove	mber 200	D9			
AGENCY	Annual Average Co	oncentration	e - Acute Impact Copper	Zinc			ent - Chron	ic Impact ition for this site	is judged as:
	Step 2 0.05 Step 3 -	0.17 ug/l	Pass	Pass	Alert.	Protected Area. Accur	nulating? nsive?	Yes 0.0 No 7	13 Low flow Vel m/s
Location Details									
Road number		A9		HA Area / DBFO	number				
Assessment type			essment (single outfa	ll)			-		-
OS grid reference of assessm	ent point (m)	Easting				Northing			
OS grid reference of outfall str	ucture (m)	Easting	262711			Northing	778923		
Outfall number		065		List of outfall		063			
Receiving watercourse		River Truim		cumulative asse	essment				
EA receiving water Detailed R	liver Network ID			Assessor and affi	iliation		CFJV_IM		
Date of assessment				Version of assess	sment				
Notes		L							
Step 1 Runoff Quality	AADT >10,000 and	d <50,000 ▼ Clin	matic region Col	der Wet 🗨	Ra	infall site Ardtalnaig	(SAAR 1343.9	9mm)	•
Step 2 River Impacts	Annual 95%ile river	flow (m ³ /s)	0.046 (Ente	er zero in Annual 959	%ile rive	r flow box to assess St	tep 1 runoff	quality only)	
	Impermeable road a	area drained (ha)	2.697 Perm	neable area draining	to outfal	ll (ha) 0.3			
	Base Flow Index (B	Fl) 0.3	384 Is the	e discharge in or with	nin 1 km	upstream of a protecte	ed site for c	onservation?	Yes 🗸
For dissolved zinc only	Water hardness	Low = <50mg CaCO3/I							
For sediment impact only	ls there a downstrea	am structure, lake, po	ond or canal that redu	ices the velocity with	in 100m	of the point of discharg	e?	No	▼ D
	Tier 1 Estimate	d river width (m)	4.7						
	© Tier 2 Bed widt		³ Man	ning's n 0.07	D	Side slope (m/m)	0.5	Long slope (m/m) 0.0001
Step 3 Mitigation					Estimate	ed effectiveness			
		Brief description		Treatment for	_		lement of	Pre	dict Impact
		Ener description		solubles (%)	soluble		nents (%)		
Existing measures				0	Unlimite	od 0		Show	Detailed Results
							D		1
Proposed measures				0 D	Unlimite	ed 🚽 🖸 0	D		Exit Tool

Figure 22: Method A Calculations for cumulative of SuDS 063 & 065



Table 7:	Method C Calculations
10010 11	

Component) Droporti /	Maighting	Site Date	Diek Coore	Component
Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	<50,000 (AADT)	Low – 1	15
2	Rainfall volume	15	1687mm	High – 3	45
	Rainfall		35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains SuDS Basin associated with High Road	Low – 1	15
	geomotry		Area 0.77ha (7,700m ²)	High – 3	45
4	Unsaturated zone (depth to water)	20	Nearest borehole (BH) to SuDS 000 BH7-004 (located to the east of SuDS earthworks) BH depth = dry at 18.4 mbgl	Low – 1	20
5	Flow type	20	Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity)	High – 3	60
6	Effective grain size	7.5	SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel)	High – 3	22.5
7	Lithology	7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High– 3	22.5
Overall Score for Fi	Iter Drains				200 (Medium Risk of Impact)
Overall Score for S	uDS Basin (with	high road area)		230 (Medium Risk of Impact)
SuDS Network 001		Mainhatin e	Cite Date	Diel: Cases	Component
Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	<50,000 (AADT)	Low – 1	15
2	Rainfall volume	15	1687mm	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
0			Filter Drains		45
3	Soakaway geometry	15	SuDS Basin associated with High Road	Low – 1	15
3	,	15	SuDS Basin associated with High Road Area 1.66ha (16,600m ²)	Low – 1 High – 3	45
3	,	15 20	SuDS Basin associated with High Road Area 1.66ha (16,600m ²) Nearest BH to SuDS 001 BH7-004 (located to the north east of SuDS earthworks)		-
	geometry Unsaturated zone (depth		SuDS Basin associated with High Road Area 1.66ha (16,600m²) Nearest BH to SuDS 001 BH7-004 (located to the north east of SuDS earthworks) BH depth = dry at 18.4 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic	High – 3	45
4	geometry Unsaturated zone (depth to water)	20	SuDS Basin associated with High Road Area 1.66ha (16,600m²) Nearest BH to SuDS 001 BH7-004 (located to the north east of SuDS earthworks) BH depth = dry at 18.4 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity) SAND AND GRAVEL (hummocky moraine, which contains	High – 3 Low – 1	45 20
4 5	geometry Unsaturated zone (depth to water) Flow type Effective	20	SuDS Basin associated with High Road Area 1.66ha (16,600m²) Nearest BH to SuDS 001 BH7-004 (located to the north east of SuDS earthworks) BH depth = dry at 18.4 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity) SAND AND GRAVEL (hummocky moraine, which contains sand, gravel and boulders) SAND AND GRAVEL (<1% clay minerals based on diamicton,	High – 3 Low – 1 High – 3	45 20 60
4 5 6	geometry Unsaturated zone (depth to water) Flow type Effective grain size Lithology	20 20 7.5	SuDS Basin associated with High Road Area 1.66ha (16,600m²) Nearest BH to SuDS 001 BH7-004 (located to the north east of SuDS earthworks) BH depth = dry at 18.4 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity) SAND AND GRAVEL (hummocky moraine, which contains sand, gravel and boulders) SAND AND GRAVEL	High – 3 Low – 1 High – 3 High – 3	45 20 60 22.5 22.5 200 (Medium
4 5 6 7	geometry Unsaturated zone (depth to water) Flow type Effective grain size Lithology	20 20 7.5 7.5	SuDS Basin associated with High Road Area 1.66ha (16,600m ²) Nearest BH to SuDS 001 BH7-004 (located to the north east of SuDS earthworks) BH depth = dry at 18.4 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity) SAND AND GRAVEL (hummocky moraine, which contains sand, gravel and boulders) SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High – 3 Low – 1 High – 3 High – 3	45 20 60 22.5 22.5
4 5 6 7 Overall Score for Fi Overall Score for So SuDS Network 003	geometry Unsaturated zone (depth to water) Flow type Effective grain size Lithology Iter Drains uDS Basin (with	20 20 7.5 7.5	SuDS Basin associated with High Road Area 1.66ha (16,600m ²) Nearest BH to SuDS 001 BH7-004 (located to the north east of SuDS earthworks) BH depth = dry at 18.4 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity) SAND AND GRAVEL (hummocky moraine, which contains sand, gravel and boulders) SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High – 3 Low – 1 High – 3 High – 3 High– 3	45 20 60 22.5 22.5 200 (Medium Risk of Impact) 230 (Medium Risk of Impact)
4 5 6 7 Overall Score for Fi	geometry Unsaturated zone (depth to water) Flow type Effective grain size Lithology Iter Drains	20 20 7.5 7.5	SuDS Basin associated with High Road Area 1.66ha (16,600m ²) Nearest BH to SuDS 001 BH7-004 (located to the north east of SuDS earthworks) BH depth = dry at 18.4 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity) SAND AND GRAVEL (hummocky moraine, which contains sand, gravel and boulders) SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High – 3 Low – 1 High – 3 High – 3	45 20 60 22.5 22.5 200 (Medium Risk of Impact) 230 (Medium
4 5 6 7 Overall Score for Fi Overall Score for So SuDS Network 003 Component	geometry Unsaturated zone (depth to water) Flow type Effective grain size Lithology Iter Drains uDS Basin (with	20 20 7.5 7.5 high road area Weighting	SuDS Basin associated with High Road Area 1.66ha (16,600m ²) Nearest BH to SuDS 001 BH7-004 (located to the north east of SuDS earthworks) BH depth = dry at 18.4 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity) SAND AND GRAVEL (hummocky moraine, which contains sand, gravel and boulders) SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High – 3 Low – 1 High – 3 High – 3 High– 3	45 20 60 22.5 22.5 200 (Medium Risk of Impact) 230 (Medium Risk of Impact) Component
4 5 6 7 Overall Score for Fi Overall Score for S SuDS Network 003 Component Number	geometry Unsaturated zone (depth to water) Flow type Effective grain size Lithology Iter Drains uDS Basin (with Property Traffic	20 20 7.5 7.5 high road area Weighting Factor	SuDS Basin associated with High Road Area 1.66ha (16,600m ²) Nearest BH to SuDS 001 BH7-004 (located to the north east of SuDS earthworks) BH depth = dry at 18.4 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity) SAND AND GRAVEL (hummocky moraine, which contains sand, gravel and boulders) SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High – 3 Low – 1 High – 3 High – 3 High– 3	45 20 60 22.5 22.5 200 (Medium Risk of Impact) 230 (Medium Risk of Impact) Component Score



	intensity			2	
3	Soakaway	15	Filter Drains	Low – 1	15
	geometry		SuDS Basin associated with medium Road Area 3.66ha (3,600m²)	Medium – 2	30
4	L la seturate d	20			
4	Unsaturated zone (depth to water)	20	Nearest BH to SuDS 003 BH7-004 (located to the west of SuDS earthworks) BH depth = dry at 18.4 mbgl	Low – 1	20
5	Flow type	20	Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity)	High – 3	60
6	Effective grain size	7.5	SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel)	High – 3	22.5
7	Lithology	7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High– 3	22.5
Overall Score for Fi	Iter Drains	•			200 (Medium
Overall Score for Su	IDS Bacin (with	high road area)			Risk of Impact) 215 (Medium
		nightioau alea)			Risk of Impact)
SuDS Network 004					
Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	<50,000 (AADT)	Low – 1	15
2	Rainfall	15	1687mm	High – 3	45
	volume Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway	15	Filter Drains	Low – 1	15
	geometry		SuDS Basin associated with High Road Area 3.76ha (37,600m ²)	High – 3	45
4	Unsaturated zone (depth to water)	20	Nearest BH to SuDS 004 BH7-004 (located to the east of SuDS earthworks) BH depth = dry at 18.4 mbgl	Low – 1	20
5	Flow type	20	Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity)	High – 3	60
6	Effective grain size	7.5	SAND AND GRAVEL (assumed based on Hummocky Moundy Glacial Deposits)	High – 3	22.5
7	Lithology	7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High– 3	22.5
Overall Score for Fi	Iter Drains	•			200 (Medium
Overall Score for Su	DS Basin (with	high road area)			Risk of Impact) 230 (Medium Risk of Impact)
SuDS Network 020)				- all of impacty
Component	Property	Weighting	Site Data	Risk Score	Component
Number 1	Traffic Density	Factor 15	<50,000 (AADT)	Low – 1	Score 15
2	Rainfall volume	15	1687mm	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway	15	Filter Drains	Low – 1	15
	geometry		SuDS Basin associated with High Road Area 2.95ha (29,500m ²)	High – 3	45
4	Unsaturated zone (depth to water)	20	Nearest BH to SuDS 020 BH7-007 (located to the north west of SuDS earthworks) BH depth = 2.7 mbgl	High – 3	60
5	Flow type	20	Heavily Consolidated sedimentary	High – 3	60



			rocks (dominated by fracture porosity)		
6	Effective	7.5	SAND AND GRAVEL	High – 3	22.5
	grain size		(Comprising diamicton, sand and	-	
_			gravel)		
7	Lithology	7.5	SAND AND GRAVEL	High– 3	22.5
			(<1% clay minerals based on diamicton, sand and gravel)		
Overall Score for F	ilter Drains	L	Sand and gravely	1	240 (Medium
					Risk of Impact
Overall Score for S	SuDS Basin (with	high road area)		270 (High Risk
SuDS Network 04	റ				of Impact)
Component	Property	Weighting	Site Data	Risk Score	Component
Number	rioperty	Factor	Cho Dulu		Score
1	Traffic	15	<50,000 (AADT)	Low – 1	15
-	Density				
2	Rainfall	15	1687mm	High – 3	45
	volume Rainfall	-	35 – 39mm	Medium –	
	intensity		35 - 39000	2	
}	Soakaway	15	Filter Drains	Low – 1	15
	geometry		SuDS Basin associated with High Road		
	- *		Area 4.33ha	High – 3	45
			(43,300m ²)		
1	Unsaturated	20	Nearest BH to SuDS 042 TP7-019	Low – 3	60
	zone (depth to water)		(located to the north of SuDS Basin) BH depth = 2.3 mbgl		
6	Flow type	20	Heavily Consolidated sedimentary	High – 3	60
	i ion type		deposits, igneous and metamorphic		
			rocks (dominated by fracture porosity)		
;	Effective	7.5	SAND AND GRAVEL	High – 3	22.5
	grain size		(assumed conservative approach as		
			alluvium contains a mixture of silt, sand,		
			and gravel)		
7	Lithology	75		Lliab 2	22 E
7	Lithology	7.5	SAND AND GRAVEL	High– 3	22.5
7	Lithology	7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton,	High– 3	22.5
		7.5	SAND AND GRAVEL	High– 3	22.5 240 (Medium
7 Overall Score for F	ilter Drains		SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High– 3	240 (Medium Risk of Impact
	ilter Drains		SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High– 3	240 (Medium Risk of Impact 270 (Medium
Dverall Score for F Dverall Score for S	ilter Drains SuDS Basin (with		SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High– 3	240 (Medium Risk of Impact
Overall Score for F Overall Score for S GuDS Network 06	ilter Drains SuDS Basin (with	high road area	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High– 3 Risk Score	240 (Medium Risk of Impact 270 (Medium Risk of Impact
Overall Score for F Overall Score for S	ilter Drains SuDS Basin (with		SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)		240 (Medium Risk of Impact 270 (Medium
Overall Score for F Overall Score for S SuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic	high road area	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)		240 (Medium Risk of Impact 270 (Medium Risk of Impact Component
Overall Score for F Overall Score for S GuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density	high road area Weighting Factor 15	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)) Site Data <50,000 (AADT)	Risk Score Low – 1	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15
Overall Score for F Overall Score for S SuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall	high road area Weighting Factor	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	Risk Score	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score
overall Score for F overall Score for S uDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume	high road area Weighting Factor 15	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)) Site Data <50,000 (AADT) 1687mm	Risk Score Low – 1 High – 3	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15
Overall Score for F Overall Score for S GuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall	high road area Weighting Factor 15	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)) Site Data <50,000 (AADT)	Risk Score Low – 1 High – 3 Medium –	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15
Overall Score for F Overall Score for S GuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity	high road area Weighting Factor 15	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)) Site Data <50,000 (AADT) 1687mm	Risk Score Low – 1 High – 3 Medium – 2	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15
Dverall Score for F Dverall Score for S GuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall	high road area Weighting Factor 15 15	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)) Site Data <50,000 (AADT) 1687mm 35 – 39mm	Risk Score Low – 1 High – 3 Medium – 2 Low – 1	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45
Overall Score for F Overall Score for S GuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity Soakaway	high road area Weighting Factor 15 15	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)) Site Data <50,000 (AADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 2.61ha	Risk Score Low – 1 High – 3 Medium – 2	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45
Overall Score for F Overall Score for S GuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity Soakaway	high road area Weighting Factor 15 15	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)) Site Data <50,000 (AADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road	Risk Score Low – 1 High – 3 Medium – 2 Low – 1	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45 45
Overall Score for F Overall Score for S GuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity Soakaway	high road area Weighting Factor 15 15	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel) Site Data <50,000 (AADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 2.61ha (26,100m ²) Nearest BH to SuDS 060 BH7-016	Risk Score Low – 1 High – 3 Medium – 2 Low – 1	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45 45
Overall Score for F Overall Score for S GuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth	high road area Weighting Factor 15 15 15	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel) Site Data <50,000 (AADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 2.61ha (26,100m ²) Nearest BH to SuDS 060 BH7-016 (located adjacent to the Basin)	Risk Score Low – 1 High – 3 Medium – 2 Low – 1 High – 3	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45 15 45
Overall Score for F Overall Score for S SuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water)	high road area Weighting Factor 15 15 15 20	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel) Site Data Site Data 50,000 (AADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 2.61ha (26,100m ²) Nearest BH to SuDS 060 BH7-016 (located adjacent to the Basin) BH depth = 2 mbgl	Risk Score Low – 1 High – 3 Medium – 2 Low – 1 High – 3 High – 3	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45 45 15 45 60
Overall Score for F Overall Score for S SuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth	high road area Weighting Factor 15 15 15	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel) Site Data <pre> Site Data </pre> Site Data Site Data	Risk Score Low – 1 High – 3 Medium – 2 Low – 1 High – 3	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45 15 45
Overall Score for F Overall Score for S SuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water)	high road area Weighting Factor 15 15 15 20	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel) Site Data Site Data (ADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 2.61ha (26,100m ²) Nearest BH to SuDS 060 BH7-016 (located adjacent to the Basin) BH depth = 2 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic	Risk Score Low – 1 High – 3 Medium – 2 Low – 1 High – 3 High – 3	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45 45 15 45 60
Overall Score for F Overall Score for S GuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water) Flow type	high road area Weighting Factor 15 15 15 15 20 20	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel) Site Data Site Data (ADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 2.61ha (26,100m ²) Nearest BH to SuDS 060 BH7-016 (located adjacent to the Basin) BH depth = 2 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity)	Risk Score Low – 1 High – 3 Medium – 2 Low – 1 High – 3 High – 3 High – 3	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45 45 60 60
Overall Score for F Overall Score for S SuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water) Flow type	high road area Weighting Factor 15 15 15 20	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	Risk Score Low – 1 High – 3 Medium – 2 Low – 1 High – 3 High – 3	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45 45 15 45 60
Dverall Score for F Dverall Score for S SuDS Network 06 Component Number	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water) Flow type	high road area Weighting Factor 15 15 15 15 20 20	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel) Site Data Site Data (ADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 2.61ha (26,100m ²) Nearest BH to SuDS 060 BH7-016 (located adjacent to the Basin) BH depth = 2 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity)	Risk Score Low – 1 High – 3 Medium – 2 Low – 1 High – 3 High – 3 High – 3	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45 45 60 60
Dverall Score for F Dverall Score for S SuDS Network 06 Component Number	Filter Drains SuDS Basin (with 0 Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water) Flow type Effective grain size	high road area Weighting Factor 15 15 15 20 20 7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel) Site Data Site Data (<50,000 (AADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 2.61ha (26,100m ²) Nearest BH to SuDS 060 BH7-016 (located adjacent to the Basin) BH depth = 2 mbgl Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity) SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel)	Risk ScoreLow $- 1$ High $- 3$ Medium -2 Low $- 1$ High $- 3$ High $- 3$ High $- 3$ High $- 3$	240 (Medium Risk of Impact270 (Medium Risk of Impact270 (Medium Risk of ImpactComponent Score154545606022.5
Dverall Score for F Dverall Score for S SuDS Network 06 Component	ilter Drains SuDS Basin (with Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water) Flow type	high road area Weighting Factor 15 15 15 15 20 20	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	Risk Score Low – 1 High – 3 Medium – 2 Low – 1 High – 3 High – 3 High – 3	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45 45 60 60
Dverall Score for F Dverall Score for S SuDS Network 06 Component Number	Filter Drains SuDS Basin (with 0 Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water) Flow type Effective grain size	high road area Weighting Factor 15 15 15 20 20 7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	Risk ScoreLow $- 1$ High $- 3$ Medium -2 Low $- 1$ High $- 3$ High $- 3$ High $- 3$ High $- 3$	240 (Medium Risk of Impact270 (Medium Risk of Impact270 (Medium Risk of ImpactComponent Score154545606022.5
Dverall Score for F Dverall Score for S SuDS Network 06 Component Number	Filter Drains SuDS Basin (with 0 Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water) Flow type Effective grain size Lithology	high road area Weighting Factor 15 15 15 20 20 7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	Risk ScoreLow $- 1$ High $- 3$ Medium -2 Low $- 1$ High $- 3$ High $- 3$ High $- 3$ High $- 3$	240 (Medium Risk of Impact 270 (Medium Risk of Impact270 (Medium Risk of ImpactComponent Score154545606022.522.5
Dverall Score for F Dverall Score for S SuDS Network 06 Component Number	Filter Drains SuDS Basin (with 0 Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water) Flow type Effective grain size Lithology	high road area Weighting Factor 15 15 15 20 20 7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	Risk ScoreLow $- 1$ High $- 3$ Medium -2 Low $- 1$ High $- 3$ High $- 3$ High $- 3$ High $- 3$	240 (Medium Risk of Impact 270 (Medium Risk of Impact Component Score 15 45 45 60 60 22.5 22.5 240 (Medium
Dverall Score for F Dverall Score for S SuDS Network 06 Component Number	Filter Drains SuDS Basin (with 0 Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water) Flow type Effective grain size Lithology	high road area Weighting Factor 15 15 15 20 20 7.5 7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel) Site Data <pre> Site Data </pre> Site Data Site Data Sand And Gravel Sand and gravel Sand and gravel 	Risk ScoreLow $- 1$ High $- 3$ Medium -2 Low $- 1$ High $- 3$ High $- 3$ High $- 3$ High $- 3$	240 (Medium Risk of Impact 270 (Medium Risk of Impact270 (Medium Risk of ImpactComponent Score154545606022.522.5



SuDS Network 063	3				
Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	<50,000 (AADT)	Low – 1	15
2	Rainfall volume	15	1765mm	High – 3	45
	Rainfall		35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains SuDS Basin associated with High Road	Low – 1	15
	geometry		Area 2.04ha (2.040m ²)	High – 3	45
4	Unsaturated zone (depth to water)	20	Nearest BH to SuDS 063 BH7-017 (located adjacent to SuDS Basin) BH depth = 2.9mbgl	High – 3	60
5	Flow type	20	Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity)	High – 3	60
6	Effective grain size	7.5	VERY FINE SAND	Low – 1	7.5
7	Lithology	7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High– 3	22.5
Overall Score for Fi	ilter Drains				225 (Medium Risk of Impact)
Overall Score for S	uDS Basin (with	high road area)			255 (High Risk of Impact)
SuDS Network 065 Component	5 Property	Weighting	Site Data	Risk Score	Component
Number 1	Traffic	Factor 15	<50,000 (AADT)	Low – 1	Score 15
2	Density Rainfall	15	1765mm	High – 3	45
	volume Rainfall		35 – 39mm	Medium – 2	
3	intensity Soakaway	15	Filter Drains	Low – 1	15
	geometry		SuDS Basin associated with High Road Area 0.96ha (9,600m ²)	High – 3	45
4	Unsaturated zone (depth to water)	20	Nearest BH to SuDS 063 BH7-017 (located to the south of the SuDS Basin) BH depth = dry at 2.9 mbgl	High – 3	60
5	Flow type	20	Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity)	High – 3	60
6	Effective grain size	7.5	VERY COARSE SAND (assumed conservative approach based on a mixture of clay, silt, sand, and gravel)	High – 3	22.5
7	Lithology	7.5	SAND AND GRAVEL (1 – 15% clay minerals)	High– 2	15
Overall Score for F	ilter Drains	I			232.5 (Medium Risk of Impact)
Overall Score for S	uDS Basin (with	high road area)			262.5(High Risk of Impact)
SuDS Network 069					
Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	<50,000 (AADT)	Low – 1	15
2	Rainfall volume	15	1786mm	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains SuDS Basin associated with High Road	Low – 1	15
			Area 1.94ha (19,400m²)	High – 3	45



4	Unsaturated zone (depth to water)	20	Nearest BH to SuDS 069 TP7-028 (located to the south of SuDS Basin) BH depth = 1.5mbgl	Low – 3	60
5	Flow type	20	Heavily Consolidated sedimentary deposits, igneous and metamorphic	High – 3	60
6	Effective grain size	7.5	rocks (dominated by fracture porosity) VERY COARSE SAND (based on clay, silt, sand and gravel)	High – 3	22.5
7	Lithology	7.5	(1-15% Clay Minerals)	High– 2	15
Overall Score for F	ilter Drains				232.5 (Medium Risk of Impact)
Overall Score for S		high road area)		262.5 (High Risk of Impact)
SuDS Network 07 Component	Property	Weighting	Site Data	Risk Score	Component
Number 1	Traffic	Factor 15	<50,000 (AADT)	Low – 1	Score 15
	Density	_			-
2	Rainfall volume	15	1687mm	High – 3	45
	Rainfall intensity		35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains SuDS Basin associated with High Road	Low – 1	15
	geometry		Area 1.01ha (10,101m ²)	High – 3	45
4	Unsaturated zone (depth to water)	20	Nearest TP to SuDS 078 BH7-045 (located to the north of SuDS earthworks) TP depth = 3mbgl	Low – 3	60
5	Flow type	20	Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity)	High – 3	60
6	Effective grain size	7.5	SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel)	High – 3	22.5
7	Lithology	7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High– 3	22.5
Overall Score for F					240 (Medium Risk of Impact)
Overall Score for S	SuDS Basin (with	high road area)		270 (High Risk
					of Impact)
SuDS Network 08				Dial Orașe	
SuDS Network 08 Component Number	3 Property	Weighting Factor	Site Data	Risk Score	of Impact) Component Score
Component	Property Traffic		Site Data <50,000 (AADT)	Risk Score	Component
Component Number	Property Traffic Density Rainfall	Factor			Component Score
Component Number 1	Property Traffic Density Rainfall volume Rainfall	Factor 15	<50,000 (AADT)	Low – 1 High – 3 Medium –	Component Score 15
Component Number 1	Property Traffic Density Rainfall volume Rainfall intensity Soakaway	Factor 15	<50,000 (AADT) 1687mm 35 – 39mm Filter Drains	Low – 1 High – 3	Component Score 15
Component Number 1 2	Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry	Factor 15 15 15 15 15	<50,000 (AADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 1.10ha (11,000m ²)	Low – 1 High – 3 Medium – 2 Low – 1 High – 3	Component Score 15 45 15 15 45
Component Number 1 2	Property Traffic Density Rainfall volume Rainfall intensity Soakaway	Factor 15 15	<50,000 (AADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 1.10ha (11,000m ²) Nearest TP to SuDS 083 BH7-004 (located to the west of SuDS earthworks) BH depth = dry at 3m	Low – 1 High – 3 Medium – 2 Low – 1	Component Score 15 45 15
Component Number 1 2 3	Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth	Factor 15 15 15 15 15	<50,000 (AADT) 1687mm 35 – 39mm Filter Drains SuDS Basin associated with High Road Area 1.10ha (11,000m ²) Nearest TP to SuDS 083 BH7-004 (located to the west of SuDS earthworks)	Low – 1 High – 3 Medium – 2 Low – 1 High – 3 Medium –	Component Score 15 45 15 15 45



	grain size		(assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel)		
7	Lithology	7.5	1 – 15% Clay Minerals	Medium– 2	15
Overall Score for F	Filter Drains				212.5 (Medium Risk of Impact)
Overall Score for S	•	high road area)		242.5 (Medium Risk of Impact)
SuDS Network 09 Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic Density	15	<50,000 (AADT)	Low – 1	15
2	Rainfall volume	15	1687mm	High – 3	45
	Rainfall		35 – 39mm	Medium – 2	
3	Soakaway geometry	15	Filter Drains SuDS Basin associated with High Road	Low – 1	15
			Area 2.36ha (23,600m ²)	High – 3	45
4	Unsaturated zone (depth to water)	20	Nearest BH to SuDS 092 TP7-048 (located to the south of SuDS earthworks) BH depth = 1.5 mbgl	High – 3	60
5	Flow type	20	Heavily Consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity)	High – 3	60
6	Effective grain size	7.5	SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel)	High – 3	22.5
7 Overall Score for F	Lithology	7.5	SAND AND GRAVEL (<1% clay minerals based on diamicton, sand and gravel)	High– 3	22.5 240 (Medium
Overall Score for S		high road area)		Risk of Impact
Notwork 102		nigh foud a ou)		270 (High Risk of Impact)
Component	Property	Weighting	Site Data	Risk Score	of Impact) Component
Component Number	Property Traffic	-		Risk Score	of Impact)
Component Number 1	Property	Weighting Factor	Site Data		of Impact) Component Score
Component Number	Property Traffic Density Rainfall	Weighting Factor 15	Site Data 1223 (AADT)	Low – 1	of Impact) Component Score 15
Component Number 1 2	Property Traffic Density Rainfall volume Rainfall	Weighting Factor 15	Site Data 1223 (AADT) 1665mm	Low – 1 High – 3 Medium – 2 Low – 1	of Impact) Component Score 15
Component Number 1 2 3	Property Traffic Density Rainfall volume Rainfall intensity Soakaway	Weighting Factor 15 15	Site Data 1223 (AADT) 1665mm 35 – 39mm Filter Drain Nearest BH to SuDS 102 TP8-003 (located to the north of SuDS earthworks)	Low – 1 High – 3 Medium – 2	of Impact) Component Score 15 45
Component Number 1 2 3 4	Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth	Weighting Factor 15 15 15	Site Data 1223 (AADT) 1665mm 35 – 39mm Filter Drain Nearest BH to SuDS 102 TP8-003 (located to the north of SuDS earthworks) BH depth = 3.4 mbgl SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand,	Low – 1 High – 3 Medium – 2 Low – 1	of Impact)Component Score15451515
Component Number 1 2 3 4	Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water)	Weighting Factor 15 15 15 20	Site Data 1223 (AADT) 1665mm 35 - 39mm Filter Drain Nearest BH to SuDS 102 TP8-003 (located to the north of SuDS earthworks) BH depth = 3.4 mbgl SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel) SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel)	Low – 1 High – 3 Medium – 2 Low – 1 High – 3	of Impact) Component Score 15 45 15 60
Component Number 1 2 3 4 5 5	Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth) to water) Flow type Effective	Weighting Factor 15 15 15 20 20	Site Data 1223 (AADT) 1665mm 35 - 39mm Filter Drain Nearest BH to SuDS 102 TP8-003 (located to the north of SuDS earthworks) BH depth = 3.4 mbgl SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel) SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel)	Low – 1 High – 3 Medium – 2 Low – 1 High – 3 High – 3	of Impact) Component Score 15 45 45 15 60 22.5
Component Number 1 2 3 4 5 6 7 7 Overall Score for F	Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water) Flow type Effective grain size Lithology	Weighting Factor 15 15 15 20 20 7.5	Site Data 1223 (AADT) 1665mm 35 – 39mm Filter Drain Nearest BH to SuDS 102 TP8-003 (located to the north of SuDS earthworks) BH depth = 3.4 mbgl SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel) SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel) SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel) SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand,	Low – 1 High – 3 Medium – 2 Low – 1 High – 3 High – 3	of Impact) Component Score 15 45 15 60 22.5 22.5 22.5 202.5 (Medium
	Property Traffic Density Rainfall volume Rainfall intensity Soakaway geometry Unsaturated zone (depth to water) Flow type Effective grain size Lithology	Weighting Factor 15 15 15 20 20 7.5	Site Data 1223 (AADT) 1665mm 35 – 39mm Filter Drain Nearest BH to SuDS 102 TP8-003 (located to the north of SuDS earthworks) BH depth = 3.4 mbgl SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel) SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel) SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand, and gravel) SAND AND GRAVEL (assumed conservative approach as alluvium contains a mixture of silt, sand,	Low – 1 High – 3 Medium – 2 Low – 1 High – 3 High – 3	of Impact) Component Score 15 45 15 60 22.5 22.5



1	Traffic	15	<50,000 (AADT)	Low – 1	15
	Density				
2	Rainfall	15	1786mm	High – 3	45
	volume			-	
	Rainfall		35 – 39mm	Medium –	
	intensity			2	
3	Soakaway	15	Filter Drains	Low – 1	15
	geometry				
4	Unsaturated	20	Nearest BH to SuDS 069 TP7-028	Low – 3	60
	zone (depth		(located to the south of SuDS Basin)		
	to water)		BH depth = 1.5mbgl		
5	Flow type	20	Heavily Consolidated sedimentary	High – 3	60
			deposits, igneous and metamorphic		
			rocks (dominated by fracture porosity)		
6	Effective	7.5	VERY COARSE SAND	High – 3	22.5
	grain size		(based on clay, silt, sand and gravel)		
7	Lithology	7.5	(1-15% Clay Minerals)	High– 2	15
Overall Score	e for Filter Drains				232.5 (Medium
					Risk of Impact)



Figure 23: Method D results for mainline impact on surface water

0.000	AGENCY		w Spillage Assessmen							
essii	lent of Priority Outfalls									
od D	- assessment of risk from acci	dental spillage		Additional columns	s for use if other roads	drain to the same o	utfall			
			A (main road)	В	С	D	E	F	-	
Wate	er body type		Surface watercourse	5		5	-		-	
	th of road draining to outfall (m)		2,280							
Boad	Type (A-road or Motorway)		M							
If A r	oad, is site urban or rural?		Rural							
	tion type		No junction							
Loca			> 1 hour						-	
Traffi	ic flow (AADT two way)		13,641							
% H0			19						-	
	age factor (no/10 ⁹ HGVkm/year)		0.29							
	of accidental spillage		0.00063	0.00000	0.00000	0.00000	0.00000	0.00000		
	ability factor		0.75							
Risk	of pollution incident		0.00047	0.00000	0.00000	0.00000	0.00000	0.00000		Return Pe
	k greater than 0.01?		No						Totals	(years)
	rn period without pollution reduct	ion measures	0.00047	0.00000	0.00000	0.00000	0.00000	0.00000	0.0005	2132
Exist	ing measures factor		1							
Retu	rn period with existing pollution re	eduction measure	es 0.00047	0.00000	0.00000	0.00000	0.00000	0.00000	0.0005	2132
0	osed measures factor		0.8							
Prop						0.00000				
Hesio	dual with proposed Pollution redu		0.00038	<u>]0.00000</u> Ju	0.0000	o.ooooo	0.0000	0.00000	0.0004	2665
Hesio	dual with proposed Pollution redu					•		0.00000	0.0004	2665
Hesio	dual with proposed Pollution redu					•		0.00000		2665
Hesio	dual with proposed Pollution redu					Table 7.1	asures factors:	Optimum Risk Reduction Factor		2665
Hesio	dual with proposed Pollution redu tification for choice of existin	ng measures fac				Table 7.1	asures factors:	Optimum Risk Reduction Factor		2665
Hesio	tification for choice of existin tification for choice of existin Table D1 Serious Accidental Spillages (Billion HGV km/ year)	ng measures fac	Rural Trunk	Ju Ju Urban Trunk		Table 7.1	asures factors:	Optimum Risk Reduction Factor 0.6		2665
Jus	tification for choice of existin tification for choice of existin Serious Accidental Spillages (Bilion HGV km/ year) No junction	ng measures fac	ctors:	J.		Table 7.1 Filter Drain Grassed Ditch	asures factors:	Optimum Risk Reduction Factor 0.6 0.6		2665
Jus	tification for choice of existin tification for choice of existin Table D1 Serious Accidental Spillages (Billion HGV km/ year)	Motorways 0.36	Rural Trunk 0.29	Ju Urban Trunk 0.31		Table 7.1 Filter Drain Grassed Ditch Pond	asures factors:	Optimum Risk Reduction Factor 0.6 0.6 0.5		2665
Jus	Table D1 Serious Accidental Spillages (Billion HGV km/ year) No junction Slip road Roundabout Cross road	Motorways 0.36 0.43	Etors: Rural Trunk 0.29 0.83	June 1990		Table 7.1 Filter Drain Grassed Ditch Pond Wetland	asures factors: stem	Optimum Risk Reduction Factor 0.6 0.5 0.4		2665
Jus	Table D1 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	Junto 1 Junto		Table 7.1 Filter Drain Grassed Ditch Pond Wetland Soakaway / In	asures factors: stem / Swale filtration basin	Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6		2665
Jus	Table D1 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	Urban Trunk 0.31 0.36 5.35 1.46		Table 7.1 Filter Drain Grassed Ditch Pond Wetland Soakaway / In Sediment Tra	asures factors: stem / Swale filtration basin	Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6 0.6		2665
Jus	Table D1 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	June 10, 2010 Urban Trunk 0.31 0.36 5.35 1.46 1.81		Table 7.1 Filter Drain Grassed Ditch Pond Wetland Soakaway / In Sediment Traj Unlined Ditch	stem	Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6 0.5 0.4 0.6 0.7		2665
Jus	Table D1 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	June 10, 2010 Urban Trunk 0.31 0.36 5.35 1.46 1.81		Table 7.1 Filter Drain Grassed Ditch Pond Wetland Soakaway / In Sediment Tra	stem	Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6 0.6		2665

The worksheet should be read in conjunction with DMRB 11.3.10.

HAWRAT_Version 1_0Spillage Risk



Figure 24: Method D results for mainline impact on groundwater

	HIGHWAYS AGENCY	View	w Spillage Assessme	nt Parameters	Reset	Go To Runoff	Risk Assessmen	t Interface		
ssessn	nent of Priority Outfalls									
athod D	- assessment of risk from acci	idental enillado		Additional column	e for use if other reads	s drain to the same outfall				
	- assessment of fisk from acci	idental spinage	A (main road)	B	C	D	E	F	_	
D1 IWate	er body type		Groundwater	0	U U	0	L			
	th of road draining to outfall (m)		2,280							
D3 Road	Road Type (A-road or Motorway)									
	oad, is site urban or rural?		Rural						-1	
	tion type		No junction							
6 Loca	tion		> 1 hour							
7 Traff	ic flow (AADT two way)		13,641							
8 % H(19							
	age factor (no/10 ⁹ HGVkm/year)		0.29							
	of accidental spillage		0.00063	0.00000	0.00000	0.00000 0.0	00000	0.00000		
	ability factor		0.50							
	of pollution incident		0.00031	0.00000	0.00000	0.00000 0.0	00000	0.00000		Return Perio
	k greater than 0.01?		No						Totals	(years)
	rn period without pollution reduct	tion measures	0.00031	0.00000	0.00000	0.00000 0.0	00000	0.00000	0.0003	3197
	ting measures factor		1							
	rn period with existing pollution r	eduction measure		0.00000	0.00000	0.00000 0.0	00000	0.00000	0.0003	3197
6 Prop	osed measures factor dual with proposed Pollution redu	untion monouron	0.8 0.00025	0.00000	0.00000	0.00000 0.0	00000	0.00000	0.0003	3997
7 11001	ddar with proposed i olidaon red	action modeance	0.00025	0.00000	0.00000	0.00000 0.0	00000	0.00000	0.0005	0331
						ce of proposed measure				
						Table 7.1				
	Table D1					Table 7.1		ntimum Risk		
	Table D1						OF	ntimum Risk		
	Serious Accidental Spillages	Matanyaya	Purel Trunk			Table 7.1 System	OF	uction Factor		
	Serious Accidental Spillages (Billion HGV km/ year)	Motorways	Rural Trunk	Urban Trunk		Table 7.1 System	op Red	Uction Factor		
	Serious Accidental Spillages (Billion HGV km/ year)	0.36	0.29	Urban Trunk 0.31		Table 7.1 System Filter Drain Grassed Ditch / Sw	op Red	0.6 0.6		
tion	Serious Accidental Spillages (Billion HGV km/year) No junction Slip road	0.36 0.43	0.29 0.83	Urban Trunk 0.31 0.36		Table 7.1 System Filter Drain Grassed Ditch / Sw Pond	op Red	0.6 0.6 0.5		
cation	Serious Accidental Spillages (Billion HGV km/ year)	0.36	0.29	Urban Trunk 0.31		Table 7.1 System Filter Drain Grassed Ditch / Sw Pond Wetland	n OF Red	0.6 0.6 0.5 0.4		
Location	Serious Accidental Spillages (Billion HGV km' year) No junction Slip road Roundabout	0.36 0.43 3.09	0.29 0.83 3.09	Urban Trunk 0.31 0.36 5.35		Table 7.1 System Filter Drain Grassed Ditch / Sw Pond Wetland Soakaway / Infiltrat	n OF Red	uction Factor 0.6 0.6 0.5 0.4 0.6		
Location	Serious Accidental Spillages (Billion HGV km'year) No junction Slip road Roundabout Cross road	0.36 0.43 3.09	0.29 0.83 3.09 0.88	Urban Trunk 0.31 0.36 5.35 1.46		Table 7.1 System Filter Drain Grassed Ditch / Sw Pond Wetland Soakaway / Infiltrat Sediment Trap	n OF Red	uction Factor 0.6 0.5 0.4 0.6 0.6		
Location	Serious Accidental Spillages (Billion HGV km' year) No junction Slip road Roundabout Cross road Side road	0.36 0.43 3.09	0.29 0.83 3.09 0.88 0.93	Urban Trunk 0.31 0.36 5.35 1.46 1.81		System Filter Drain Grassed Ditch / Sw Pond Wetland Soakaway / Infiltrat Sediment Trap Unlined Ditch	n OF Red	uction Factor 0.6 0.5 0.4 0.6 0.6 0.7		
Location	Serious Accidental Spillages (Billion HGV km' year) No junction Slip road Roundabout Cross road Side road	0.36 0.43 3.09	0.29 0.83 3.09 0.88 0.93	Urban Trunk 0.31 0.36 5.35 1.46 1.81		Table 7.1 System Filter Drain Grassed Ditch / Sw Pond Wetland Soakaway / Infiltrat Sediment Trap Unlined Ditch Penstock / valve	n OF Red	uction Factor 0.6 0.5 0.4 0.6 0.6 0.7 0.4		
Location	Serious Accidental Spillages (Billion HGV km' year) No junction Slip road Roundabout Cross road Side road	0.36 0.43 3.09	0.29 0.83 3.09 0.88 0.93	Urban Trunk 0.31 0.36 5.35 1.46 1.81		System Filter Drain Grassed Ditch / Sw Pond Wetland Soakaway / Infiltrat Sediment Trap Unlined Ditch	n OF Red	uction Factor 0.6 0.5 0.4 0.6 0.6 0.7		

The worksheet should be read in conjunction with DMRB 11.3.10.



Figure 25: Metho

Method D results for junction impact on surface water

	nent of Priority Outfalls								
thod D	- assessment of risk from accid	ental spillage		Additional column	is for use if other roads	drain to the same outfall		_	
			A (main road)	В	С	D	E F		
Wate	er body type		Surface watercourse						
	gth of road draining to outfall (m)		781						
Boar	d Type (A-road or Motorway)		A						
	road, is site urban or rural?		Rural						
	tion type		Slip road						
Loca			> 1 hour						
	fic flow (AADT two way)		82						
3 % H	GV		4						
	age factor (no/10 ⁹ HGVkm/year)		0.83						
9 Bisk	of accidental spillage		0.00000	0.00000	0.00000	0.00000 0.00000	0.00000		
0 Prob	ability factor		0.75		0.0000	0.00000	0.00000		
	of pollution incident		0.00000	0.00000	0.00000	0.00000 0.00000	0.00000		Return Perio
2 Is ris	k greater than 0.01?		No	0.0000	0.0000	0.00000	0.00000	Totals	(years)
3 Betu	irn period without pollution reduction	on measures	0.00000	0.00000	0.00000	0.00000 0.00000	0.00000	0.0000	1722915
	ting measures factor	on medoureo	1	0.00000	0.00000	0.00000	0.00000	0.0000	1722313
	in period with existing pollution red	duction measures	0.00000	0.00000	0.00000	0.00000 0.00000	0.00000	0.0000	1722915
	osed measures factor		0.8	0.00000	0.00000	0.00000	0.00000	0.0000	1722010
7 Besi	dual with proposed Pollution reduc	ction measures	0.00000	0.00000	0.00000	0.00000 0.00000	0.00000	0.0000	2153644
Jus	dification for choice of existing	g measures facto	rs:	J	ustification for choic	e of proposed measures fac	tors:		
Jus	tification for choice of existing	g measures facto	15:	J	ustification for choic	e of propoæd measures fac	tors:		
Jus		g measures facto	rs:		ustification for choic	e of proposed measures fac	tors:		
Jus	Table D1 Serious Accidental Spillages				ustification for choic	Table 7.1 System	Optimum Risk Reduction Factor		
Jus	Table D1 Serious Accidental Spillages (Billion HGV km/ year)	Motorways	Rural Trunk	Urban Trunk	ustification for choic	Table 7.1 System Filter Drain	Optimum Risk Reduction Factor 0.6		
	Serious Accidental Spillages (Billion HGV km' year) No junction	Motorways 0.36	Rural Trunk 0.29	Urban Trunk 0.31	ustification for choic	Table 7.1 System Filter Drain Grassed Ditch / Swale	Optimum Risk Reduction Factor 0.6 0.6		
	Serious Accidental Spillages I Ko junction Silip road	Motorways 0.36 0.43	Rural Trunk 0.29 0.83	Urban Trunk 0.31 0.36	ustification for choic	Table 7.1 System Filter Drain Grassed Ditch / Swale Pond	Optimum Risk Reduction Factor 0.6 0.6 0.5		
	Serious Accidental Spillages (Billion HGV km' year) No junction Slip road Roundabout	Motorways 0.36	Rural Trunk 0.29 0.83 3.09	Urban Trunk 0.31 0.36 5.35	ustification for choic	Table 7.1 System Filter Drain Grassed Ditch / Swale Pond Wetland	Optimum Risk Reduction Factor 0.6 0.5 0.5 0.4		
Location	Serious Accidental Spillages I Ko junction Silip road	Motorways 0.36 0.43 3.09	Rural Trunk 0.29 0.83	Urban Trunk 0.31 0.36	ustification for choic	Table 7.1 System Filter Drain Grassed Ditch / Swale Pond Wetland Soakaway / Infiltration ba	Optimum Risk Reduction Factor 0.6 0.5 0.4 asin 0.6		
	Serious Accidental Spillages (Billion HGV km' year) I No junction Slip road Roundabout Cross road I	Motorways 0.36 0.43 3.09	Rural Trunk 0.29 0.83 3.09 0.88	Urban Trunk 0.31 0.36 5.35 1.46	ustification for choic	Table 7.1 System Filter Drain Grassed Ditch / Swale Pond Wetland Soakaway / Infiltration ba Sediment Trap	Optimum Risk Reduction Factor 0.6 0.5 0.4 0.6 0.6		
	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	Urban Trunk 0.31 0.36 5.35 1.46 1.81	ustification for choic	Table 7.1 System Filter Drain Grassed Ditch / Swale Pond Wetland Soakaway / Infiltration ba	Optimum Risk Reduction Factor 0.6 0.5 0.4 asin 0.6		

The worksheet should be read in conjunction with DMRB 11.3.10.



Figure 26:

Method D results for junction impact on groundwater

F	۲	AGENCY	Vi	ew Spillage Assessment	t Parameters	Reset	Go To Runo	off Risk Assess	ment Interface		
Assessment of Priority Outfalls											
Math	d D	according to first from accid			Additional ashees	for the second sec	lania en elso a successo de			-	
Metho		assessment of risk from accid	ental spillage	A (main road)	Additional column B	is for use if other roads o	D D	E	F	-	
D1	Wate	r body type		Groundwater	D	0	U	E	F	-	
		th of road draining to outfall (m)		781							
D3	Road	Type (A-road or Motorway)		A							
		oad, is site urban or rural?		Rural							
D5	Junct	ion type		Slip road							
	Loca			> 1 hour							
D7		c flow (AADT two way)		82							
	<u>% HC</u>			4						_	
		ge factor (no/10 ⁹ HGVkm/year)		0.83						_	
D10	Hisk Drob	of accidental spillage ability factor		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	_	
		of pollution incident		0.50	0.00000	0.00000	0.00000	0.00000	0.00000		Return Period
		greater than 0.01?		No	0.00000	0.00000	0.00000	0.00000	0.00000	Totals	(years)
		n period without pollution reducti	on measures	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	2584372
		ng measures factor	on measures	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	2304072
		n period with existing pollution re	eduction measu	res 0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	2584372
		osed measures factor		0.8							
		lual with proposed Pollution redu	ction measures	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000	3230466
Justification for choice of existing measures factors:											
							Table 7.1				
		Table D1 Serious Accidental Spillages					Syste	əm	Optimum Risk 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		
	5	Slip road	0.43	0.83	0.36		Pond		0.5		
	Location	Roundabout Cross road	3.09	3.09 0.88	5.35 1.46		Wetland		0.4		
	ĕ	Side road	-	0.88	1.40		Soakaway / Infilt	ration basin	0.6		
	 -	Total	0.37	0.45	0.85		Sediment Trap		0.6		
		- otai	0.07	0.10	0.00		Unlined Ditch		0.7		
							Penstock / valve Notched Weir		0.4		
							Oil Separator		0.6 0.5		
							On Oeparator		0.5		
The w	he worksheet should be read in conjunction with DMRB 11.3.10.										



Table 8:

Change in catchment sizes (existing to proposed)

Existing Hydro ID	Existing Catchment Area (km²)	Proposed Hydro ID	Proposed Catchment Area (km²)	Difference in Area (km²)	Change in Area %	Magnitude of Change	Additional Comment
-03	1.041	-03	1.041	1	0	Negligible	
-02	0.249	-02	0.249	1	0	Negligible	
-01	0.022	-01	0.022	1	0	Negligible	
01	0.208	01	0.208	1	0	Negligible	
02	7.155	02	7.158	0.003	+0.04%	Negligible	
03	0.004	03	0.033	0.029	+725%	Major Adverse	Identified as earthworks drainage only crossings and not crossings of smaller natural watercourses
03a	0.033				-100%		Identified as earthworks drainage only crossings and not crossings of smaller natural watercourses
04	0.057	04	0.058	0.001	+1.75%	Minor Adverse	
05	0.141	05	0.140	0.001	- 0.7%	Negligible	
06	0.045	06	0.045	1	0	Negligible	
07	0.146	07	0.146	1	0	Negligible	
08	0.340	08	0.340	1	0	Negligible	
10	0.125	10	0.125	1	0	Negligible	
12	0.170	12	0.170	1	0	Negligible	
13	0.573	13	0.573	1	0	Negligible	
14	0.071	14	0.071	1	0	Negligible	
15	0.090	15	0.090	1	0	Negligible	
17	0.014				-100%	Major Adverse	
18	0.123				-100%	Major Adverse	
20	0.038				-100%	Major Adverse	
21	0.008	21	0.183	0.175	+2187.5%	Major Adverse	
22	0.093	22	0.093	1	0	Negligible	
23	2.300	23	2.300	1	0	Negligible	
25	0.074	25	0.074	1	0	Negligible	Identified as earthworks drainage only crossings and not crossings of smaller natural watercourses
27	0.149	27	0.149	1	0	Negligible	
28	0.209	28	0.209	1	0	Negligible	
30	0.020	30	0.020	1	0	Negligible	
31	0.823	31	0.823	1	0	Negligible	
32	0.027				-100%	Major Adverse	
33	0.027	33	0.027	1	0	Negligible	
34	0.227	34	0.227	1	0	Negligible	
35	0.099	35	0.099	1	0	Negligible	
36	0.148	36	0.148	1	0	Negligible	
37	0.030	37	0.030	1	0	Negligible	
38	0.044	38	0.044	1	0	Negligible	
39	0.034	39	0.034	1	0	Negligible	



Existing Hydro ID	Existing Catchment Area (km²)	Proposed Hydro ID	Proposed Catchment Area (km²)	Difference in Area (km²)	Change in Area %	Magnitude of Change	Additional Comment
40	0.099	40	0.031	0.068	-68.6%	Major Adverse	
		41a	0.026		+100%		
		41b	0.040		+100%		
42	0.190	42	0.087	0.103	-54%	Major Adverse	
		42a	0.130	0.275	+100%		
43	0.405	43	0.380	-0.025	-27%	Major Adverse	
44	0.091	44	0.091	0.000	0	Negligible	
45	0.175	45	0.175	0.000	0	Negligible	
46	0.039	46	0.039	0.000	+0%	Negligible	
47	0.033	47	0.033	0.000	0	Negligible	
49	0.014	49	0.014	0.000	0	Negligible	
50	0.003	50	0.003	0.000	0	Negligible	
51	0.117	51	0.117	0.000	0	Negligible	
52	3.462	52	3.462	0.000	0	Negligible	
54	0.005	54	0.005	0.000	0	Negligible	Identified as earthworks drainage only crossings and not crossings of smaller natural watercourses
55	0.042	55	0.042	0.000	0	Negligible	Identified as earthworks drainage only crossings and not crossings of smaller natural watercourses
56	0.046	56	0.046	0.000	0	Negligible	
57	0.545	57	0.545	0.000	0	Negligible	
58	0.130	58	0.130	0.000	0	Negligible	
59	3.602	59	3.602	0.000	0	Negligible	
60	0.024	60	0.024	0.000	0	Negligible	Identified as earthworks drainage only crossings and not crossings of smaller natural watercourses
61	0.247	61	0.247	0.000	0	Negligible	
62	0.031	62	0.031	0.000	0	Negligible	Identified as earthworks drainage only crossings and not crossings of smaller natural watercourses
63	0.737	63	0.737	0.000	0	Negligible	
64	1.167	64	1.167	0.000	0	Negligible	



A9 Dualling – Glen Garry to Dalwhinnie

Table 9:

Change in catchment sizes (existing to proposed and significance of impact)

Receptor	Chainage (ch.)	Detail of potential impact	Sensitivity	Magnitude	Significance of Impact
Catchment of Hydro ID 4/ W7.43	700 to 890	Change to catchment area +1.75	Low	Minor Adverse	Neutral
Catchment of Hydro ID 17/ W7.5	2,450	Change to catchment area -100%	Low	Major Adverse	Slight Adverse
Catchment of Hydro ID 18/ W7.70	2,520 to 2,540	Change to catchment area -100%	Low	Major Adverse	Slight Adverse
Catchment of Hydro ID 20/ W7.74	2,700 to 2,705	Change to catchment area -100%	Low	Major Adverse	Slight Adverse
Catchment of Hydro ID 21/W7.76	2,350 to 2,830	Change to catchment area +2187.5%	Low	Major Adverse	Slight Adverse
Catchment of Hydro ID 40/ W7.109	4,960 to 4,695	Change to catchment area -69%	Low	Major Adverse	Slight Adverse
Catchment of Hydro ID 42/ W7.115	4,955 to 4,960	Change to catchment area -54%	Low	Major Adverse	Slight Adverse
Catchment of Hydro ID 43/ W7.9	5,500 to 6,150	Change to catchment area -27%	Low	Moderate Adverse	Slight Adverse



Annex 2: Technical Note

'Side Road and Accommodation Track SUDS' – Technical Note, AMJV (2015), A9PON-AMJ-HDG-Z_ZZZZ_XX-TN-DE-0001



