# A96 Dualling Inverness to Nairn (including Nairn Bypass) DMRB Stage 3: Environmental Statement Appendix A13.3: Water Quality Calculations



### **A13.3: Water Quality Calculations**

#### 1 Introduction

- 1.1 This appendix provides additional information on the calculations used to inform the water quality assessment of the proposed Scheme, as reported in the Environmental Statement (ES) Chapter 13 (Road Drainage and the Water Environment).
- 1.2 As part of the water quality assessment, routine runoff and accidental spillage risk to the surface water features (SWFs) proposed to receive road drainage were assessed using the Highways England's (formally Highways Agency) Water Risk Assessment Tool (HAWRAT), in line with DMRB Volume 11, Section 3, Part 10, HD45/09 Road Drainage and the Water Environment, 2009 (Highways Agency, Scottish Government, Welsh Assembly Government and The Department for Regional Development Northern Ireland 2009).
- 1.3 This appendix is set out as follows:
  - the treatment efficiency calculations can be found in Section 2;
  - the routine runoff parameters and results for the A96 Dualling Inverness to Nairn (including Nairn Bypass) can be found in Section 3;
  - the results of the spillage risk assessment for the A96 Dualling Inverness to Nairn (including Nairn Bypass) can be found in Section 4; and
  - the routine runoff parameters and results for the existing A96 (Do Minimum) can be found in Section 5.

### 2 Treatment Efficiency Calculations

#### **Treatment Efficiency Calculations - Individual Assessments**

- 2.1 The proposed drainage strategy includes two types of treatment train each outfall would use one or the other. Treatment Train 1 would comprise two levels of treatment (Table 1); Treatment Train 2 (Table 2) would comprise three levels of treatment. The levels of treatment upstream of each outfall have been agreed with SEPA. SEPA requested a minimum level of SUDS treatment upstream of each outfall (three levels into the River Nairn and its tributaries; two levels for all other watercourses). In addition, Outfall O required three levels of treatment to pass all aspects of the HAWRAT routine runoff assessment (Treatment Train 2). This level of treatment has been included in the drainage design for this outfall. The level of treatment for each outfall is summarised in Chapter 13 (Road Drainage and the Water Environment), Section 13.8 (Mitigation), Table 13.21.
- Values for the indicative treatment efficiencies of various drainage systems are provided in Table 3.2 of DMRB Volume 4, Section 2, Part 1, Vegetated Drainage Systems for Highway Runoff (Highways Agency, Transport Scotland, Welsh Assembly Government and The Department for Regional Development Northern Ireland 2006) and The SUDS Manual (CIRIA 2015). The limitations of these treatment efficiencies are described in Chapter 13 (Road Drainage and the Water Environment), Section 13.2 (Methodology) paragraph 13.2.72.
- 2.3 The calculations for the treatment efficiencies of each treatment train are shown in the following text. The figures shown in bold text have been used in the Step 3 routine runoff assessment. The treatment efficiencies and treatment efficiency calculations presented below were sent to SEPA for comment in May 2016 along with the results of the HAWRAT assessments. SEPA did not raise any concerns in relation to the use of these values.

#### **Treatment Train 1**

2.4 The first level of treatment would be achieved by using filter drains to capture runoff at source. The filter drains would run parallel to the carriageway. The second level of treatment would be achieved by using a SUDS retention pond.



2.5 Table 3.2 of DMRB HA103/06 does not include total system treatment efficiencies for a drainage system comprising a filter drain and a SUDS retention pond. Therefore, the individual treatment efficiencies given for filter drains and SUDS retention ponds in Table 3.2 of DMRB HA103/06 have been used to calculate the treatment efficiency for the whole system (Table 1).

**Table 1: Treatment Efficiencies for Treatment Train 1** 

Drainage System	Treatment Efficiencies (%)					
Drainage System	Metals	Total Suspended Solids				
Filter drain	7	38				
SUDS retention pond	35	62				
Total system	40	76				

Calculation for Treatment of Solubles:

2.6  $100\% \times (1 - 0.07) \times (1 - 0.35) = 60\%$  solubles remaining after treatment, meaning that the treatment efficiency (relevant to soluble acute impacts) is **40**%.

Calculation for Settlement of Sediment:

2.7  $100\% \times (1 - 0.38) \times (1 - 0.62) = 24\%$  sediment remaining after treatment, meaning that the settlement efficiency (relevant to sediment chronic impacts) is **76%**.

#### Treatment Train 2

- 2.8 In addition to the two treatments described for Treatment Train 1, Treatment Train 2 would include a third level of treatment. The third level of treatment would comprise a grassed swale downstream from the SUDS retention pond, prior to final outfall.
- 2.9 Table 3.2 of DMRB HA103/06 does not include total system treatment efficiencies for a drainage system comprising a filter drain, a SUDS retention pond and a swale. In addition, Table 3.2 does not include individual treatment efficiencies for a swale.
- 2.10 Similar to the approach for Treatment Train 1, the individual treatment efficiencies given for filter drains and SUDS retention ponds in Table 3.2 of DMRB HA103/06 have been used to calculate the treatment efficiency for the whole system (Table 2).
- 2.11 In relation to the treatment efficiencies for a swale, The SUDS Manual (CIRIA 2015) states that 'median pollutant mass removal rates of swales from available performance studies have been reported as 76% for total suspended solids...Significant reductions in total zinc and copper event mean concentrations have been observed in performance studies with a median value of 60%'. In the absence of treatment efficiencies for swale in Table 3.2 of the DMRB, the values from The SUDS Manual have been used to work out the treatment efficiency for the whole system (Table 2).

Table 2: Treatment Efficiencies for Treatment Train 2

Drainage System	Treatment Efficiencies (%)					
	Metals	Total Suspended Solids				
Filter drain	7	38				
SUDS retention pond	35	62				
Swale	60	76				
Total system	76	94				

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Calculation for Treatment of Solubles:

2.12  $100\% \times (1 - 0.07) \times (1 - 0.35) \times (1 - 0.60) = 24\%$ ; therefore treatment efficiency (relevant to soluble acute impacts) is **76%**.

Calculation for Settlement of Sediment:

2.13  $100\% \times (1 - 0.38) \times (1 - 0.62) \times (1 - 0.76) = 6\%$ ; therefore settlement efficiency (relevant to sediment chronic impacts) is **94**%.

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Routine Runoff Assessment (Do Something) – HAWRAT Output Sheets (User Parameters and Results)

#### **Routine Runoff Parameters (Individual Assessments)**

#### **Drainage Catchment A**

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number			1				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 02		
OS grid reference of assessment point (m)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (m)	Northing		Date of assessment		18/10/2016		
Outfall number	A		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Routine Runoff Assessment for Catchment A						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments			•	
AADT	vpd	>10,000 and <50,000	>=50,000 and <100,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.011	
Baseflow Index	-	0.5	0.764	
Impermeable road area drained	ha	1	0.89	
Permeable area draining to outfall	ha	1	0	
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes	
conservation?				
is there a downstream structure, lake, pond or canal that reduces	-	No	No	
the velocity within 100m of the point of discharge?			NO	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/l	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	0.7	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### **Drainage Catchment B**

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting R		Receiving watercourse		SWF 02		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (III)	Northing		Date of assessment		18/10/2016		
Outfall number	В		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Routine Runoff Assessment for Catchment B						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.011	
Baseflow Index	-	0.5	0.764	
Impermeable road area drained	ha	1	1.15	
Permeable area draining to outfall	ha	1	0.15	
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes	
conservation?				
s there a downstream structure, lake, pond or canal that reduces	-	No	Yes	
the velocity within 100m of the point of discharge?			res	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	0.7	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Fier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### **Drainage Catchment C**

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)	Assessment type	Assessment type		Non-cumulative assessment (single outfa	
HA Area/DBFO number						
OS grid reference of assessment point (m)	Easting	Receiving watercourse		SWF 02		
OS grid reference of assessment point (iii)	Northing	EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting	Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of oddan structure (iii)	Northing	Date of assessment		18/10/2016		
Outfall number	С	Version of assessment		1		
List of outfalls in cumulative assessment						
Notes	DS 2036: Routine Runoff Assessment for Catchment C					

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments		•		
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.011	
Baseflow Index	-	0.5	0.764	
Impermeable road area drained	ha	1	2.68	
Permeable area draining to outfall	ha	1	0.92	
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes	
the velocity within 100m of the point of discharge?			res	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	0.7	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### Drainage Catchment D

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 03		
OS grid reference of assessment point (m)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrall structure (m)	Northing		Date of assessment		18/10/2016		
Outfall number	D		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Routine Runoff Assessment for Catchment D						

Parameter	Units	Default Value	Value used	Notes (En	ter notes in the left-hand cells only)
Runoff Risk Assessments				•	
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.011		
Baseflow Index		0.5	0.606		
Impermeable road area drained	ha	1	1.43		
Permeable area draining to outfall	ha	1	0.33		
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes		<del>-</del>
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness		Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	1	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	1.5		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	0	description for	
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed	
Proposed settlement of sediments	%	0	0	measures	

#### **Drainage Catchment E**

Road Number	A96 Dualling Inverness to Nairn (including		Assessment type		Non-cumulative assessment (single outfa		outfall)		
	Nairn Bypass)								
HA Area/DBFO number									
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 03				
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed Ri		A receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs				
OS grid reference of outlan structure (iii)	Northing		Date of assessment		18/10/2016				
Outfall number	E		Version of assessment		1				
List of outfalls in cumulative assessment									
Notes	DS 2036: Rou	DS 2036: Routine Runoff Assessment for Catchment E							

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments	•			
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.011	
Baseflow Index	-	0.5	0.606	
Impermeable road area drained	ha	1	1.27	
Permeable area draining to outfall	ha	1	0.21	
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes	
the velocity within 100m of the point of discharge?			res	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	1.5	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### Drainage Catchment F

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative as	ssessment (single	outfall)
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 06		
OS grid reference of assessment point (m)	Northing	lorthing EA receiving water Detailed River Network ID					
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outfall structure (m)	Northing		Date of assessment		18/10/2016		
Outfall number	F		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rou	2036: Routine Runoff Assessment for Catchment F					

Parameter	Units	Default Value	Value used	Notes (Er	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.01		
Baseflow Index	-	0.5	0.679		
mpermeable road area drained	ha	1	4.3		
Permeable area draining to outfall	ha	1	0.74		
s the discharge in or within 1 km upstream of a protected site for	-	No	Yes		
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	1.2		
Fier2 Bed width	m	3	3		
Fier2 Side slope	m/m	0.5	0.5		
Fier2 Long slope	m/m	0.0001	0.0001		
Fier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	10.8	proposed	
Proposed settlement of sediments	%	0	76	measures	

#### **Drainage Catchment G**

Road Number	A96 Dualling Nairn Bypass)	Inverness to Nairn (including	Assessment type		Non-cumulative assessment (single outfa		utfall)
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 08		
os grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS mid reference of systell etweetime (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outfall structure (m)	Northing		Date of assessment		18/10/2016		
Outfall number	G		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rout	DS 2036: Routine Runoff Assessment for Catchment G					

Parameter	Units	Default Value	Value used	Notes (E	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.003		
Baseflow Index	-	0.5	0.762		
Impermeable road area drained	ha	1	2.26		
Permeable area draining to outfall	ha	1	1.14		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1		TRUE	TRUE		
Use Tier 2		FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.4		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	9.9	proposed	
Proposed settlement of sediments	%	0	76	measures	

#### **Drainage Catchment H**

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfal		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 09		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outfall structure (m)	Northing		Date of assessment		18/10/2016		
Outfall number	Н		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rou	DS 2036: Routine Runoff Assessment for Catchment H					

Parameter	Units	Default Value	Value used	Notes (E	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region		Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.006		
Baseflow Index	-	0.5	0.694		
Impermeable road area drained	ha	1	2.8		
Permeable area draining to outfall	ha	1	0.72		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?					
Hardness	ı	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1		TRUE	TRUE		
Use Tier 2		FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	2		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n		0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	76	description for	Filter drain, swale and wet retention pond
Proposed attenuation -restricted discharge rate	I/s	Unlimited	8.2	proposed	
Proposed settlement of sediments	%	0	94	measures	

#### **Drainage Catchment I**

Road Number	A96 Dualling Inverness to Nairn (including Ass		Assessment type		Non-cumulative assessment (single outfa		outfall)
	Nairn Bypass)	1					
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse SV		SWF 09		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of oddan structure (iii)	Northing		Date of assessment		18/10/2016		
Outfall number	I		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rou	2036: Routine Runoff Assessment for Catchment I					

Parameter	Units	Default Value	Value used	Notes (Er	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.006		
Baseflow Index	-	0.5	0.694		
Impermeable road area drained	ha	1	2.28		
Permeable area draining to outfall	ha	1	0.7		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	2		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	7.3	proposed	
Proposed settlement of sediments	%	0	76	measures	1

#### Drainage Catchment J

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfall		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse S		SWF 13		
OS grid reference of assessment point (iii)	Northing	orthing EA receiving water Detailed River Network ID					
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (m)	Northing		Date of assessment		18/10/2016		
Outfall number	J		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rout	5 2036: Routine Runoff Assessment for Catchment J					

Parameter	Units	Default Value	Value used	Notes (Er	nter notes in the left-hand cells only)
Runoff Risk Assessments		•		•	
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.002		
Baseflow Index	-	0.5	0.833		
Impermeable road area drained	ha	1	1.66		
Permeable area draining to outfall	ha	1	0.52		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			NO		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.7		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	5.3	proposed	i ·
Proposed settlement of sediments	%	0	76	measures	

#### **Drainage Catchment K**

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number			1				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 13		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (m)	Northing		Date of assessment		18/10/2016		
Outfall number	K		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rout	OS 2036: Routine Runoff Assessment for Catchment K					

Parameter	Units	Default Value	Value used	Notes (E	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.002		
Baseflow Index		0.5	0.833		
Impermeable road area drained	ha	1	0.76		
Permeable area draining to outfall	ha	1	0.25		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			NO		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2		FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.7		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	2.6	proposed	
Proposed settlement of sediments	%	0	76	measures	1

#### **Drainage Catchment L**

Road Number	A96 Dualling Nairn Bypass	Inverness to Nairn (including )	Assessment type	Assessment type		Non-cumulative assessment (single outfa	
HA Area/DBFO number			1				
OS grid reference of assessment point (m)	Easting		Receiving watercourse S		SWF 16		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
O3 grid reference of outrail structure (iii)	Northing		Date of assessment		18/10/2016		
Outfall number	L		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rou	DS 2036: Routine Runoff Assessment for Catchment L					

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.01	
Baseflow Index	-	0.5	0.678	
Impermeable road area drained	ha	1	2.65	
Permeable area draining to outfall	ha	1	0.36	
Is the discharge in or within 1 km upstream of a protected site for	-	No	No	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes	
the velocity within 100m of the point of discharge?			res	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	0.4	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### **Drainage Catchment V**

Road Number	A96 Dualling Inverness to Nairn (including Asirn Bypass)		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse	e SWF 16			
OS grid reference of assessment point (iii)	Northing	orthing EA receiving water Detailed River Networ		iver Network ID			
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of oddian structure (iii)	Northing		Date of assessment		18/10/2016		
Outfall number	V		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Routine Runoff Assessment for Catchment V						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region		Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.01	
Baseflow Index	-	0.5	0.678	
Impermeable road area drained	ha	1	2.83	
Permeable area draining to outfall	ha	1	0.82	
Is the discharge in or within 1 km upstream of a protected site for	-	No	No	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes	
the velocity within 100m of the point of discharge?			res	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	0.4	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n		0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### **Drainage Catchment M**

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfa		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 16		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
03 grid reference of outlan structure (III)	Northing		Date of assessment		18/10/2016		
Outfall number	М		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rou	tine Runoff Assessment for Cat	Catchment M				

Parameter	Units	Default Value	Value used	Notes (En	ter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.01		
Baseflow Index	-	0.5	0.678		
mpermeable road area drained	ha	1	3.81		
Permeable area draining to outfall	ha	1	1.04		
s the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	V		
the velocity within 100m of the point of discharge?			Yes		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Jse Tier 1	-	TRUE	TRUE		
Jse Tier 2	-	FALSE	FALSE		
Fier 1 Estimated river width at Q95	0	5	0.4		
Fier2 Bed width	m	3	3		
Fier2 Side slope	m/m	0.5	0.5		
Fier2 Long slope	m/m	0.0001	0.0001		
Fier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	0	description for	
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed	
Proposed settlement of sediments	%	0	0	measures	

#### **Drainage Catchment N**

Road Number	A96 Dualling	Inverness to Nairn (including	Assessment type		Non-cumulative assessment (single outfa		outfall)
	Nairn Bypass)						
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 18		
OS grid reference of assessment point (iii)	Northing I		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of oddan structure (iii)	Northing		Date of assessment		18/10/2016		
Outfall number	N		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rout	tine Runoff Assessment for Cat	Catchment N				

Parameter	Units	Default Value	Value used	Notes (Ei	nter notes in the left-hand cells only)
Runoff Risk Assessments		•			
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.009		
Baseflow Index	-	0.5	0.772		
Impermeable road area drained	ha	1	4		
Permeable area draining to outfall	ha	1	0.86		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			NO		
Hardness		Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2		FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	1.2		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	10.7	proposed	
Proposed settlement of sediments	%	0	76	measures	

#### <u>Drainage Catchment O - Tier 1, Treatment Train 1</u>

Road Number	A96 Dualling Ir Nairn Bypass)	nverness to Nairn (including	Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number			1				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 19		
OS grid reference of assessment point (m)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outfall structure (m)	Northing		Date of assessment		26/10/2016		
Outfall number	0		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Routin	ne Runoff Assessment for Cat	chment O				

Parameter	Units	Default Value	Value used	Notes (Ei	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.001		
Baseflow Index	-	0.5	0.652		
Impermeable road area drained	ha	1	3.88		
Permeable area draining to outfall	ha	1	1.05		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			No		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.8		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	11.3	proposed	1
Proposed settlement of sediments	%	0	76	measures	

#### Drainage Catchment O - Tier 2, Treatment Train 1

Road Number	A96 Dualling	Inverness to Nairn (including	Assessment type		Non-cumulative assessment (single outfa-		outfall)
	Nairn Bypass)						
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 19		
OS grid reference of assessment point (iii)	Northing	Northing EA receiving war		iver Network ID			
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (III)	Northing		Date of assessment		19/10/2016		
Outfall number	0		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rout	tine Runoff Assessment for Cat	Catchment O				

Parameter	Units	Default Value	Value used	Notes (Ei	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.001		
Baseflow Index		0.5	0.652		
Impermeable road area drained	ha	1	3.88		
Permeable area draining to outfall	ha	1	1.05		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			NO		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	FALSE		
Use Tier 2	-	FALSE	TRUE		
Tier 1 Estimated river width at Q95	0	5	5		
Tier2 Bed width	m	3	1		
Tier2 Side slope	m/m	0.5	3.71		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.04		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	11.33	proposed	•
Proposed settlement of sediments	%	0	76	measures	

#### <u>Drainage Catchment O - Tier 2, Treatment Train 2</u>

Road Number	A96 Dualling Nairn Bypass	Inverness to Nairn (including )	Assessment type		Non-cumulative assessment (single outfail		utfall)
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 19		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (III)	Northing		Date of assessment		19/10/2016		
Outfall number	0		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Routine Runoff Assessment for Catchment O						

Parameter	Units	Default Value	Value used	Notes (Er	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.001		
Baseflow Index	-	0.5	0.652		
Impermeable road area drained	ha	1	3.88		
Permeable area draining to outfall	ha	1	1.05		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			NO		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	FALSE		
Use Tier 2		FALSE	TRUE		
Tier 1 Estimated river width at Q95	0	5	5		
Tier2 Bed width	m	3	1		
Tier2 Side slope	m/m	0.5	3.71		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.04		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	76	description for	Filter drain, swale and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	11.33	proposed	
Proposed settlement of sediments	%	0	94	measures	

#### **Drainage Catchment P**

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfall)		utfall)
HA Area/DBFO number			1				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 19		
Northing			EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation Jane Huxtable, Jacob		cobs		
OS grid reference of outrail structure (III)	Northing		Date of assessment		18/10/2016	18/10/2016	
Outfall number	Р		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Routine Runoff Assessment for Catchment P						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments			L	<u> </u>
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.005	
Baseflow Index	-	0.5	0.652	
Impermeable road area drained	ha	1	1.4	
Permeable area draining to outfall	ha	1	0.19	
Is the discharge in or within 1 km upstream of a protected site for	-	No	No	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	V	
the velocity within 100m of the point of discharge?			Yes	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2		FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	0.8	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### **Drainage Catchment Q**

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 19		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
03 grid reference of outrain structure (iii)	Northing		Date of assessment		19/10/2016		
Outfall number	Q		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rout	tine Runoff Assessment for Cat	Catchment Q				

Parameter	Units	Default Value	Value used	Notes (Ei	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR 1343.9mm)		
95%ile River flow	m3/s	0	0.005		
Baseflow Index	-	0.5	0.652		
Impermeable road area drained	ha	1	6		
Permeable area draining to outfall	ha	1	1.85		
Is the discharge in or within 1 km upstream of a protected site for conservation?	-	No	No		
Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge?	=	No	Yes		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.8		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	18.55	proposed	
Proposed settlement of sediments	%	0	76	measures	

#### **Drainage Catchment R**

Road Number	A96 Dualling Nairn Bypass	Inverness to Nairn (including )	Assessment type		Non-cumulative assessment (single outfal		
HA Area/DBFO number			1				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 22		
OS grid reference of assessment point (iii)	Northing	Northing EA receiving water Detailed River Netw		iver Network ID			
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrain structure (iii)	Northing		Date of assessment 18/10/2016		18/10/2016	016	
Outfall number	R		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Routine Runoff Assessment for Catchment R						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments		•		
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.012	
Baseflow Index		0.5	0.755	
Impermeable road area drained	ha	1	2.66	
Permeable area draining to outfall	ha	1	0.33	
Is the discharge in or within 1 km upstream of a protected site for	-	No	No	
conservation?				
s there a downstream structure, lake, pond or canal that reduces	-	No	No	
the velocity within 100m of the point of discharge?			NO	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	1.2	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### **Drainage Catchment S**

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfall)		utfall)
HA Area/DBFO number			1				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 23		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation Jane Huxtable, Jacobs		cobs		
OS grid reference of outrail structure (m)	Northing		Date of assessment		18/10/2016		
Outfall number	S		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Routine Runoff Assessment for Catchment S						

Parameter	Units	Default Value	Value used	Notes (Er	nter notes in the left-hand cells only)
Runoff Risk Assessments				•	
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.853		
Baseflow Index	-	0.5	0.587		
Impermeable road area drained	ha	1	3.83		
Permeable area draining to outfall	ha	1	0.37		•
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes		-
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			NO		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/l		
Use Tier 1		TRUE	TRUE		
Use Tier 2		FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	9.5		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		•
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	0	description for	
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed	
Proposed settlement of sediments	%	0	0	measures	

#### **Drainage Catchment T**

Road Number	A96 Dualling Nairn Bypass	Inverness to Nairn (including	Assessment type		Non-cumulative assessment (single outfa		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 24		
OS grid reference of assessment point (iii)	Northing EA receiving wat		EA receiving water Detailed R	A receiving water Detailed River Network ID			
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outlan structure (iii)	Northing		Date of assessment 18/10/2016		18/10/2016	0/2016	
Outfall number	Т		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Rou	DS 2036: Routine Runoff Assessment for Catchment T					

Parameter	Units	Default Value	Value used	Notes (Ei	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.003		
Baseflow Index	-	0.5	0.874		
Impermeable road area drained	ha	1	2.24		
Permeable area draining to outfall	ha	1	0.13		
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			No		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/l		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.5		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	76	description for	Filter drain, swale and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	4.8	proposed	·
Proposed settlement of sediments	%	0	94	measures	

#### Drainage Catchment U

Road Number	A96 Dualling II Nairn Bypass)	nverness to Nairn (including	Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 24		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (iii)	Northing		Date of assessment		18/10/2016		
Outfall number	U	Version of assessment 1		1			
List of outfalls in cumulative assessment							
Notes	DS 2036: Routine Runoff Assessment for Catchment U						

Parameter	Units	Default Value	Value used	Notes (Ei	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.003		
Baseflow Index		0.5	0.874		
Impermeable road area drained	ha	1	5.15		
Permeable area draining to outfall	ha	1	1.38		
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			No		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.5		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	76	description for	Filter drain, swale and wet retention pond
Proposed attenuation -restricted discharge rate	I/s	Unlimited	24.15	proposed	
Proposed settlement of sediments	%	0	94	measures	

#### **Drainage Catchment W**

Road Number	A96 Dualling Nairn Bypass	Inverness to Nairn (including	Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 26		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrain structure (iii)	Northing		Date of assessment		18/10/2016		
Outfall number	W	W Version of assessment 1		1			
List of outfalls in cumulative assessment							
Notes	DS 2036: Rou	tine Runoff Assessment for Cat	or Catchment W				

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments		•		
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.038	
Baseflow Index	-	0.5	0.732	
Impermeable road area drained	ha	1	1.9	
Permeable area draining to outfall	ha	1	0.43	
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	No	
the velocity within 100m of the point of discharge?			No	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	1	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### **Drainage Catchment X**

Road Number	A96 Dualling I Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number			1				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 26		
O3 grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
03 grid reference of outrail structure (III)	Northing		Date of assessment		18/10/2016		
Outfall number	Х		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Routine Runoff Assessment for Catchment X						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.031	
Baseflow Index		0.5	0.732	
Impermeable road area drained	ha	1	1.72	
Permeable area draining to outfall	ha	1	0.22	
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes	
the velocity within 100m of the point of discharge?			res	
Hardness		Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	1	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### **Drainage Catchment Y**

Road Number	A96 Dualling Inve Nairn Bypass)	erness to Nairn (including	Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 26		
O3 grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (iii)	Northing		Date of assessment		18/10/2016		
Outfall number	Υ		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DS 2036: Routine Runoff Assessment for Catchment Y						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.031	
Baseflow Index	ı	0.5	0.732	
Impermeable road area drained	ha	1	2.96	
Permeable area draining to outfall	ha	1	0.49	
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes	
the velocity within 100m of the point of discharge?			res	
Hardness		Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	1	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### **Drainage Catchment Z**

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 35		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (III)	Northing		Date of assessment		18/10/2016		
Outfall number	Z Version of assessment 1		1	1			
List of outfalls in cumulative assessment							
Notes	DS 2036: Rout	ine Runoff Assessment for Cat	Catchment Z				

Parameter	Units	Default Value	Value used	Notes (Er	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.003		
Baseflow Index	-	0.5	0.573		
Impermeable road area drained	ha	1	4.97		
Permeable area draining to outfall	ha	1	0.94		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			No		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/l		
Use Tier 1		TRUE	TRUE		
Use Tier 2		FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	1		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n		0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	76	description for	Filter drain, swale and wet retention pond
Proposed attenuation -restricted discharge rate	I/s	Unlimited	19.39	proposed	
Proposed settlement of sediments	%	0	94	measures	

#### **Routine Runoff Parameters (Cumulative Assessments)**

#### Drainage Catchments A, B & C

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)				Cumulative assessment excluding sediment (outfalls between 100m and 1km apart)		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting	Re	Receiving watercourse		SWF 02		
O3 grid reference of assessment point (iii)	Northing	EA	EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting	As	ssessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (m)	Northing	Da	ate of assessment		18/10/2016		
Outfall number			ersion of assessment		1		
List of outfalls in cumulative assessment	A, B & C						
Notes	DS 2036: Cumulative Routine Runoff Assessment for Catchments A, B & C						

Parameter	Units	Default Value	Value used	Notes (E	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>=50,000 and <100,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.011		
Baseflow Index	-	0.5	0.764		
Impermeable road area drained	ha	1	4.72		
Permeable area draining to outfall	ha	1	1.07		•
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes		
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/l		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	1		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	9.3	proposed	1
Proposed settlement of sediments	%	0	0	measures	

#### Drainage Catchments B & C

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)				Cumulative assessment including sediments (outfalls within 100m)		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 02		
OS grid reference of assessment point (iii)	Northing	Northing EA receiv		EA receiving water Detailed River Network ID			
OS mid reference of cutfall eterroture (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outfall structure (m)	Northing		Date of assessment		26/10/2016		
Outfall number			Version of assessment		1		
List of outfalls in cumulative assessment	B&C						
Notes	DS 2036: Cumulative Routine Runoff Assessment for Catchments B & C						

Parameter	Units	Default Value	Value used	Notes (Er	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>=50,000 and <100,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.011		
Baseflow Index	-	0.5	0.764		
Impermeable road area drained	ha	1	3.83		
Permeable area draining to outfall	ha	1	1.07		
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes		
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/l		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.7		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	9.3	proposed	
Proposed settlement of sediments	%	0	76	measures	

#### **Drainage Catchments D & E**

Road Number	A96 Dualling I Nairn Bypass)	nverness to Nairn (including			Cumulative assessment including sedime (outfalls within 100m)		iments
HA Area/DBFO number			1				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 03		
os grid reference of assessment point (iii)	Northing EA receiving water Detailed River Ne		iver Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
os grid reference of outlan structure (iii)	Northing		Date of assessment		18/10/2016		
Outfall number			Version of assessment	Version of assessment		1	
List of outfalls in cumulative assessment	D & E						
Notes	DS 2036: Cum	DS 2036: Cumulative Routine Runoff Assessment for Catchments D & E					

Parameter	Units	Default Value	Value used	Notes (E	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.011		
Baseflow Index	-	0.5	0.606		
Impermeable road area drained	ha	1	2.7		
Permeable area draining to outfall	ha	1	0.54		
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness		Low = <50mg CaCO3/I	Low = <50mg CaCO3/l		
Use Tier 1		TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	1.5		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	3.2	proposed	
Proposed settlement of sediments	%	0	76	measures	

#### <u>Drainage Catchments H & I, Tier 1, Treatment Train 1</u>

Road Number  HA Area/DBFO number	A96 Dualling I Nairn Bypass)	nverness to Nairn (including			Cumulative assessment including sediment (outfalls within 100m)			
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 09			
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID					
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs			
OS grid reference of outlan structure (iii)	Northing		Date of assessment		19/10/2016			
Outfall number			Version of assessment		1			
List of outfalls in cumulative assessment	H & I							
Notes	DS 2036: Cumu	DS 2036: Cumulative Routine Runoff Assessment for Catchments H & I						

Parameter	Units	Default Value	Value used	Notes (Er	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR 1343.9mm)		
95%ile River flow	m3/s	0	0.006		
Baseflow Index	-	0.5	0.694		
Impermeable road area drained	ha	1	5.08		
Permeable area draining to outfall	ha	1	1.42		
Is the discharge in or within 1 km upstream of a protected site for conservation?	-	No	No		
Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge?	-	No	Yes		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	2		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	8.2	proposed	
Proposed settlement of sediments	%	0	76	measures	

#### Drainage Catchments H & I, Tier 2, Treatment Train 1

Road Number	A96 Dualling Nairn Bypass)	Inverness to Nairn (including			Cumulative assessment including sedim (outfalls within 100m)		iments
HA Area/DBFO number	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 09		
OS grid reference of assessment point (iii)	Northing	ing EA receiving v		EA receiving water Detailed River Network ID			
06idf	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outfall structure (m)	Northing		Date of assessment		19/10/2016		
Outfall number	·		Version of assessment		1		
List of outfalls in cumulative assessment	H&I						
Notes	DS 2036: Cum	DS 2036: Cumulative Routine Runoff Assessment for Catchments H & I					

Parameter	Units	Default Value	Value used	Notes (E	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.006		
Baseflow Index	-	0.5	0.694		
Impermeable road area drained	ha	1	5.08		
Permeable area draining to outfall	ha	1	1.42		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	FALSE		
Use Tier 2	-	FALSE	TRUE		
Tier 1 Estimated river width at Q95	0	5	5		
Tier2 Bed width	m	3	1.52		
Tier2 Side slope	m/m	0.5	3.15		
Tier2 Long slope	m/m	0.0001	0.01		
Tier2 Mannings' n	-	0.07	0.04		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	8.2	proposed	· ·
Proposed settlement of sediments	%	0	76	measures	

#### **Drainage Catchments J & K**

Road Number	A96 Dualling Nairn Bypass	, 0			Cumulative assessment excluding sedimen (outfalls between 100m and 1km apart)		
HA Area/DBFO number			1				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 13		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (m)	Northing		Date of assessment		18/10/2016		
Outfall number			Version of assessment		1		
List of outfalls in cumulative assessment	J & K						
Notes	DS 2036: Cumulative Routine Runoff Assessment for Catchments J & K						

Parameter	Units	Default Value	Value used	Notes (E	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.002		
Baseflow Index	-	0.5	0.833		
mpermeable road area drained	ha	1	2.42		
Permeable area draining to outfall	ha	1	0.77		•
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			No		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Jse Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.5		
Tier2 Bed width	m	3	3		
Fier2 Side slope	m/m	0.5	0.5		
Fier2 Long slope	m/m	0.0001	0.0001		
Fier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	2.6	proposed	
Proposed settlement of sediments	%	0	N/A	measures	

#### Drainage Catchments L, M & V

Road Number	A96 Dualling In Nairn Bypass)	verness to Nairn (including			Cumulative assessment including sedi (outfalls within 100m)		diments
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting	Easting Receiving watercourse		SWF 16			
OS grid reference of assessment point (iii)	Northing EA rece		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outfall structure (m)	Northing		Date of assessment		18/10/2016		
Outfall number			Version of assessment		1		
List of outfalls in cumulative assessment	L, M & V						
Notes	DS 2036: Cumu	DS 2036: Cumulative Routine Runoff Assessment for Catchments L, M & V					

Parameter	Units	Default Value	Value used	Notes (E	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.01		
Baseflow Index	-	0.5	0.678		
Impermeable road area drained	ha	1	9.29		
Permeable area draining to outfall	ha	1	2.22		·
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.4		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	6	proposed	
Proposed settlement of sediments	%	0	76	measures	

#### <u>Drainage Catchments P & Q, Tier 1, Treatment Train 1</u>

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)				Cumulative assessment including sedim (outfalls within 100m)		iments
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting	ng Receiving watercourse		SWF 19			
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outlan structure (iii)	Northing		Date of assessment		19/10/2016		
Outfall number			Version of assessment		1		
List of outfalls in cumulative assessment	P & Q						
Notes	DS 2036: Cum	2036: Cumulative Routine Runoff Assessment for Catchments P & Q					

Parameter	Units	Default Value	Value used	Notes (Er	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.005		
Baseflow Index		0.5	0.652		
Impermeable road area drained	ha	1	7.4		
Permeable area draining to outfall	ha	1	2.04		_
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.8		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	l/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	3.07	proposed	1
Proposed settlement of sediments	%	0	76	measures	

#### Drainage Catchments P & Q, Tier 2, Treatment Train 1

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)				Cumulative assessment including sediment (outfalls within 100m)		iments
HA Area/DBFO number			1				
OS grid reference of assessment point (m)	Easting		Receiving watercourse	Receiving watercourse		SWF 19	
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (III)	Northing		Date of assessment		19/10/2016		
Outfall number			Version of assessment		1		
List of outfalls in cumulative assessment	P & Q						
Notes	DS 2036: Rou	tine Runoff Assessment for Cat	Catchment P & Q				

Parameter	Units	Default Value	Value used	Notes (Ei	nter notes in the left-hand cells only)
Runoff Risk Assessments		•	•	•	
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.005		
Baseflow Index		0.5	0.652		
Impermeable road area drained	ha	1	7.4		
Permeable area draining to outfall	ha	1	2.04		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	FALSE		
Use Tier 2		FALSE	TRUE		
Tier 1 Estimated river width at Q95	0	5	5		
Tier2 Bed width	m	3	0.35		
Tier2 Side slope	m/m	0.5	0.84		
Tier2 Long slope	m/m	0.0001	0.02		
Tier2 Mannings' n	-	0.07	0.04		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	40	description for	Filter drain and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	3.07	proposed	
Proposed settlement of sediments	%	0	76	measures	

#### Drainage Catchments T & U

	A96 Dualling Inverness to Nairn (including Nairn Bypass)				Cumulative assessment including sedimer (outfalls within 100m)		diments
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting	Easting Receiving watercourse S		SWF 24			
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting Assessor and affiliation			Jane Huxtable, Jacobs			
OS grid reference of outrail structure (m)	Northing	ing Date of assessment		18/10/2016			
Outfall number			Version of assessment		1		
List of outfalls in cumulative assessment	T&U						
Notes	DS 2036: Cumulative Routine Runoff Assessment for Catchments T & U						

Parameter	Units	Default Value	Value used	Notes (Er	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.003		
Baseflow Index		0.5	0.874		
Impermeable road area drained	ha	1	7.39		
Permeable area draining to outfall	ha	1	1.51		
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			No		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/l		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.5		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	76	description for	Filter drain, swale and wet retention pond.
Proposed attenuation -restricted discharge rate	I/s	Unlimited	4.8	proposed .	
Proposed settlement of sediments	%	0	94	measures	

#### **Drainage Catchments X & Y**

Road Number	A96 Dualling Inverness to Nairn (including Nairn Bypass)				Cumulative assessment including sediments (outfalls within 100m)		iments
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse	Receiving watercourse		SWF 26	
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (iii)	Northing		Date of assessment		18/10/2016		
Outfall number			Version of assessment		1		
List of outfalls in cumulative assessment	X & Y						
Notes	DS 2036: Cum	nulative Routine Runoff Assessi	essment for Catchments X & Y				

Parameter	Units	Default Value	Value used	Notes (En	nter notes in the left-hand cells only)
Runoff Risk Assessments	•	•		•	
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.031		
Baseflow Index	-	0.5	0.732		
mpermeable road area drained	ha	1	4.68		
Permeable area draining to outfall	ha	1	0.71		
s the discharge in or within 1 km upstream of a protected site for	-	No	Yes		<del>-</del>
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	Yes		
the velocity within 100m of the point of discharge?			res		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/l		
Jse Tier 1	-	TRUE	TRUE		
Jse Tier 2	-	FALSE	FALSE		
Fier 1 Estimated river width at Q95	0	5	1		
Fier2 Bed width	m	3	3		
Fier2 Side slope	m/m	0.5	0.5		
Fier2 Long slope	m/m	0.0001	0.0001		
Fier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	0	description for	
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed	
Proposed settlement of sediments	%	0	0	measures	

#### Routine Runoff Results - DS (Individual Assessments)

#### **Drainage Catchment A**

Summary of predictions

Prediction of impact	Step1				
	Step2				
	Step3				
DETAILED RESULTS					

### Soluble - Acute Impact Zinc

			Sealment - C	nronic impa	CT		
Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

DETAILED RESULTS
In Runoff
Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year
Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year
Thresholds Thresholds

Step 1		
	Copper	Zinc
	RS	Γ24
	1	1
	78.70	70.40
	97	81
	RS	ST6
	1	1
	27.80	29.80
	36	37

(ug/l)

85.11 185.53 244.68

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
			Toxi	city Threshold			
1	1	1	1	1	1	1	1
97.40	127.00	2.40	48.30	111.00	48.30	23.00	91.00
112	143	8	59	127	59	32	101

(ug			
21	RST24	resholds	Ti
42	RST6	resholds	Th
28.		Mean	Event Statistics
55.		90%ile	
66.		95%ile	
117		99%ile	

	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	398	1647	1	16068	2780	2667	170	752
	864	3634	2	35481	6138	5890	376	1661
	1121	4759	3	70795	12247	11752	750	3313
	1592	7288	4	89125	15419	14795	945	4171

(ug/kg)

(ug/kg)

(ug/kg)

(ug/kg)

(ug/kg)

In River (no mitigation)
Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer
Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer
Annual average concentration (ug/l)



Copper

RS	ST6
0.5	0.5
0	0
0	0
0	0
0	0
0.10	0.33

0	0
0	0
0	0
0	0
0.10	0.33
(ua/l)	(ua/l)

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.33	1.13
	0.86	2.26
	1 68	4 53

4.49

Velocity	<b>0.17</b> m/s	Tier 1 is used for the calculatio
DI	-	

(mg/kg) (mg/kg)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer
Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

**Event Statistics** 

In River (with mitigation)

Copper	Zinc			
RS	T24			
1	1			
-	-			
-	-			
-	-			
-	-			
RST6				

	Copper	Zinc	
	RS <sup>*</sup>	Γ24	
Γ	1	1	
	-		
Γ	-	-	
Γ	-	-	
Γ	-	-	
Ξ			
	RS	T6	
Г	0.5	0.5	

	R	RST6
	0.5	0.5
	-	-
Г	-	-
Г	-	-
Г	-	-
	-	-
	(ug/l)	(ug/l)
4	24	60

	-	-
	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	-	-
	-	-
	-	-

	_		_
DI		-	ı
	_		

90%ile 95%ile 99%ile

Thresholds hresholds Thresholds

Annual average concentration (ug/l)

Details of the chosen rainfall site Details of the chosen of SAAR (mm) Altitude (m) Easting Northing Coastal distance (km) 1343.9 130 2704 7389 58

#### **Drainage Catchment B**

Summary of predictions

Prediction of impact	Step1
	Step2
	Step3



Sediment - Chronic Impac	t
--------------------------	---

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

Tier 1 is used for the calculation

#### DETAILED RESULTS

In Runoff	Step 1			Step 1								
		Copper	Zinc		Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
	-	RST	T24	_				Tox	icity Threshold			
Allowable Exceedances/year	L	1	1	L	1	1	1	1	1	1	1	1
No. of exceedances/year	L	63.00	56.70		83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
No. of exceedances/worst year	L	81	64		97	128	7	59	127	59	32	101
	r	RS 1	16									
Allowable Exceedances/year	<u> </u>	18.00	20.60									
No. of exceedances/year	ļ.											
No. of exceedances/worst year	L	24	27									
	_	(ug/l)	(ug/l)	_	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Thresholds	RST24	21	60	Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
Thresholds	RST6	42	120	_								l .
Event Statistics Mean	Г	23.36	67.70	Ī	331	1165	1	16068	2780	2667	170	752
90%ile	Ī	45.65	147.58	Ī	733	2672	2	35481	6138	5890	376	1661
95%ile	Ī	54.99	194.62	Ī	962	3572	3	70795	12247	11752	750	3313
99%ile	Ī	96.36	372.28	Ī	1383	5637	4	89125	15419	14795	945	4171
	-			-						•		
River (no mitigation)	Step 2			Step 2								
` ,												
		Copper	Zinc									

Allowable Exceedances/yea No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/worst summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Event Statistics Mean

Copper	Zinc
RS <sup>*</sup>	Γ24
1	1
0	0.1
0	1
0	0
0	0
po	T6

0	0
0	0
0	0
0	0
0.10	0.33
0.10	0.33

ST24		60		
RST6	42	120		
	0.34	1.12		
	0.89	2.26		
	1.77	4.58		
	4.51	21.01		

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

In River (with mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/I)

Thresholds hresholds Thresholds

Copper	Zinc
RS <sup>*</sup>	Γ24
1	1
•	
-	-
-	-

RST6				
0.5	0.5			
-				
-				
-				
-	-			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
		,
	-	-

**0.17** m/s -

DI

Details of the chosen rainfall site SAAR (mm) Altitude (m) Easting Northing Coastal distance (km) 1343.9 130 2704 7389 58

#### **Drainage Catchment C**

#### Summary of predictions

## Prediction of impact Step1 Step2 Step3

## Soluble - Acute Impact Copper Zinc

#### Sediment - Chronic Impact

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
1	1	i	I	ĺ	ı	I	1

#### **DETAILED RESULTS**

ear
ear
ear

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

tistics	Mean
Thi	resholds
1111	resmolus

90%ile 95%ile 99%ile

Copper	Zinc
RST	Γ24
1	1
63.00	56.70
81	64

K516				
1	1			
18.00	20.60			
24	27			

RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62

96.36 372.28

	Copper	Zinc	Cadmium	Total PAH	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
I	1	1	1	1	1	1	1	1
I	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
ſ	97	128	7	59	127	59	32	101
L								

ſ	331	1165	1	16068	2780	2667	170	752
ſ	733	2672	2	35481	6138	5890	376	1661
ſ	962	3572	3	70795	12247	11752	750	3313
ſ	1383	5637	4	89125	15419	14795	945	4171

#### In River (no mitigation)

Event Sta

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS*	Γ24
1	1
0.1	0.6
1	2
0.1	0.3

RS16				
0.5	0.5			
0	0			
0	0			
0	0			
0	0			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.69	2.21
	1.91	4.89
	3 60	9.40

8.52

|--|

Velocity	0.17	m/s
DI	-	
		_

% settlement needed - 9

Tier 1	is used	for the	calculation
Hell	is useu	ioi tile	calculation

In River	(with	mitia	ation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile

Step 3
--------

Copper	Zinc
RS*	Γ24
1	1
-	-
-	-
-	-

38.47

RST6				
0.5	0.5			
-				
-	-			
-	-			
-	-			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	-	-
	-	-
	-	_

DI

\_

Details of the chosen rainfall site

#### **Drainage Catchment D**

#### **Summary of predictions**

Prediction of impact	Step1
	Step2
	Step3

# Soluble - Acute Impact Copper Zinc

#### Sediment - Chronic Impact

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### **DETAILED RESULTS**

Allowable Exceedances/year
No. of exceedances/year
No of exceedances (worst year

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

111	resnoius
Th	resholds
tistics	Mean

In Runoff

Step 1		
	Copper RS	Zinc T24
	1	1
	63.00	56.70
	81	64

KOTO		
1	1	
18.00	20.60	
24	27	

N3124	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

Copper	Zinc	Cadmium	Total PAH	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

hold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

(ug/kg)

(ug/kg)

#### In River (no mitigation)

Event Sta

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS*	Γ24
1	1
0	0.1
0	1
0	0

RST6			
0.5	0.5		
0	0		
0	0		
0	0		
0	0		

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.39	1.29
	1.01	2.58
	2.04	5.23
	F 21	25.10

Velocity	0.05	m
DI	66.27	]
		_

% settlement needed 0

Tier 1	is used for the calculation

#### In River (with mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc T24
1	1
-	-
-	-
-	-

RST6					
0.5	0.5				
-					
	-				
-	-				
-	-				

	(ug/l)	(ug/l)
RST24 RST6		60
RST6	42	120
	ı	
	-	-
	-	-
	-	-

DI

-

Details of the chosen rainfall site

 SAAR (mm)
 1343.9

 Altitude (m)
 130

 Easting
 2704

 Northing
 7389

 Coastal distance (km)
 58

#### **Drainage Catchment E**

#### Summary of predictions

In Runoff

## Prediction of impact

### Soluble - Acute Impact Copper Zinc

#### Sediment - Chronic Impact

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### DETAILED RESULTS

Allowable Exceedances/yea
No. of exceedances/worst year

No. of exceedances/worst year

Event Statistics Mean

Thresholds

Step 1		
	Copper	Zinc
	RS	T24
Ī	1	1
	00.00	F0 70

RST6				
1	1			
18.00	20.60			
24	27			

	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

Copper	Zinc	Cadmium	Total PAH	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101
-							

	(mg/ng)	(mg/kg)	(mg/kg)	(ug/ng)	(ug/kg)	(ug/ng)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1202	FC27		00435	45440	4 4705	0.45	4474

(ug/kg)

(ug/kg)

#### In River (no mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS'	Γ24
1	1
0	0.1
0	1
0	0

RS16					
0.5	0.5				
0	0				
0	0				
0	0				
0	0				

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.36	1.17
	0.91	2.30
	1.82	4.73

4.86

v	te	'n	-	

Velocity	0.05	m/
DI	58.86	

Velocity	0.05	m/s		Tier 1 is used for the calculation
DI	58.86			
/ cottlement n	nodod	0	¬₀∠	

(mg/kg)

#### In River (with mitigation)

Allowable Exceedances/year Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

Copper	Zinc		
RST	Γ24		
1	1		
-			
-	-		
-	-		

RST6				
0.5	0.5			
-				
-	-			
-	-			
-	-			

	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	-	-
	-	-

DI

Details of the chosen rainfall site

SAAR (mm) 1343.9 130 2704 7389 Altitude (m) Easting Northing Coastal distance (km)

#### **Drainage Catchment F**

#### Summary of predictions

In Runoff

Thresholds

Prediction of impact	Step1
	Step2
	Step3



Sediment - Chronic Impact							
Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### DETAILED RESULTS

Allowable Exceedances/yea  No. of exceedances/yea  No. of exceedances/worst yea
Allowable Exceedances/yea

Event Statistics

No. of exceedances/year	63.00	
o. of exceedances/worst year	81	
	RS	ST6
Allowable Exceedances/year	1	
No. of exceedances/year	18.00	
o. of exceedances/worst year	24	

	(ug/l)	(ug/l)		
RST24	21	60		
RST6	42	120		
	23.36	67.70		
	45.65	147.58		
	54 99	194 62		

96.36 372.28

	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
				Tox	icity Threshold			
Γ	1	1	1	1	1	1	1	1
Г	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
Γ	97	128	7	59	127	59	32	101

ld	197	315	3.5	16770	8/5	2355	245	515
ſ	331	1165	1	16068	2780	2667	170	752
ſ	733	2672	2	35481	6138	5890	376	1661
ſ	962	3572	3	70795	12247	11752	750	3313
ſ	1383	5637	4	89125	15419	14795	945	4171

In River (no mitigation)
Allowable Exceedances/year  No. of exceedances/year  No. of exceedances/worst year  No. of exceedances/summer
No. of exceedances/worst summer
Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer
no. or exceedances, norse summer

RS	ST6
0.5	0.5
0	0.2
0	2
0	0
0	0
0.37	1.14



Velocity	<b>0.06</b> m/s	Tier 1 is used for the calculation
DI	161.44	
% settlement i	needed 39	7%

In River	(with	mitig	gation)
----------	-------	-------	---------

Event Statistics Mean 90%ile 95%ile 99%ile

Annual average concentration (ug/l)

Thresholds Thresholds

Step 3

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
lo. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
o. of exceedances/worst summer

Alliluai	average	concentration	(ug/I)

Thresholds hi	esnoi
Thr	eshol
Event Statistics	Mea

Copper	Zinc	
RS*	Γ24	
1	1	
0.00	0.10	
0	1	
0	0	
0	0	

RST6				
0.5	0.5			
0.00	0.00			
0	0			
0	0			
0	0			
0.22	0.70			

(ug/l)	(ug/l)
21	60
42	120
0.62	1.88
1.78	4.46
3.27	8.78
6.90	30.43
	21 42 0.62 1.78 3.27

DI	38.75

Details of the	chosen rainfall site
SAAR (mm)	
Altitude (m)	
Easting	
Northing	
Coastal dista	nce (km)

#### **Drainage Catchment G**

#### **Summary of predictions**

In Runoff

Prediction of impact	Step1
	Step2
	Step3



Sediment - Chronic Impact	Sedi	ment -	Chronic	c Impact
---------------------------	------	--------	---------	----------

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### **DETAILED RESULTS**

Allowable Exceedances/year
No. of exceedances/year
No of avecadances (worst year

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Th	resholds
tatistics	Mean
	90%ile
	95%ile

Step 1			Step 1
	Copper	Zinc T24	
	1	1	
	63.00	56.70	

RST6					
1	1				
18.00	20.60				
24	27				

RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

	Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
Г	1	1	1	1	1	1	1	1
	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
ı	97	128	7	59	127	59	32	101

	(mg/kg)	(mg/kg)	(IIIg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

(ug/kg)

(ug/kg)

#### In River (no mitigation)

Event S

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

> 90%ile 95%ile

Copper	Zinc
RS'	Г24
2	2
0.8	2
2	5
0.4	1.1

RST6		
1	1	
0	0.4	
0	2	
0	0.1	
0	1	

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	1.61	4.93
	5.00	12.20
	8.54	22.14
	15.87	68.27

Velocity	0.12	m/s
DI	-	

% settlement needed - 9

Tier 1	is used for the calculation

Event Statistics	Me
	90%

In River	(with	mitigat	ion)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile

٠.			
St	eı	ο:	3

Copper	Zinc
RS'	T24
2	2
0.10	0.60
1	2
0	0.3
0	2

RST6		
1	1	
0.00	0.00	
0	0	
0	0	
0	0	

0.34 1.07

9.52 40.96

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.96	2.92
	2.97	7.21
	5.03	13 28

DI

\_

Details of the chosen rainfall site

#### **Drainage Catchment H**

#### Summary of predictions

In Runoff

## Prediction of impact



Gediffert - Offortion Impact							
Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

Anthracene

Phenanthrene

Sediment - Chronic Impact

#### **DETAILED RESULTS**

Allowable Exceedances/year No. of exceedances/year
No. of exceedances/worst year

No. of exceedances/worst year

Threshold
Threshold

Event Statistics

Copper	Zinc
•	

Step	1

Copper

Copper	Zinc
RS'	Γ24
1	1
63.00	56.70
81	64

RSIB						
1	1					
18.00	20.60					
24	27					

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
1	22.26	67.70

	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
oxicity	407	245	2.5	40770	075	2255	245	545

Total PAH

331	1165	1	16068	2780	2667	170	752
733	2672	2	35481	6138	5890	376	1661
962	3572	3	70795	12247	11752	750	3313
1383	5637	4	89125	15419	14795	945	4171

#### In River (no mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Copper	Zinc T24
2	2
0.3	1.4
1	4

RST6					
1	1				
0	0.2				
0	2				
0	0				
0	0				

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
ĺ	1.14	3.55
	3.21	8.12
ľ	6.24	15.61

12.69

Velocity	0.02	m
DI	282.62	

65 % % settlement needed

Tier 1 is used for the calculation

Event Stati	stics Me
	90%

In River (with mitigation)

Allowable Exceedances/year No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

Copper	Zinc
RS'	T24
2	2
0.00	0.00
0	0
0	0
0	0

RST6			
1	1		
0.00	0.00		
0	0		
0	0		
0	0		

0.09 0.30

3.01 13.52

	( m	(·····#)
	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.27	0.81
	0.76	1.92
	1.40	3.75

DI

16.96

Details of the chosen rainfall site

SAAR (mm) 1343.9 130 2704 7389 Altitude (m) Easting Northing Coastal distance (km)

#### **Drainage Catchment I**

#### **Summary of predictions**

Prediction of impact	Step1
	Step2
	Step3

# Soluble - Acute Impact

er	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### **DETAILED RESULTS**

Allowable Exceedances/yea
No of exceedances/year

Allowable Exceedances/year
No. of exceedances/year No. of exceedances/worst year

No. of exceedances/worst year

Thi	resholds
Thi	resholds

In Runoff

90%ile 95%ile 99%ile

Copper	Zinc

04-	_	
Ste	P	7

Copper	Zinc
RS'	Γ24
1	1
63.00	56.70
81	64

RST6				
1	1			
18.00	20.60			
24	27			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	22.26	67.70

Toxicity	
Threshold	

	120	
6	67.70	
5	147.58	
9	194.62	

372.28

	Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
ı	1	1	1	1	1	1	1	1
ı	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
	97	128	7	59	127	59	32	101

331	1165	1	16068	2780	2667	170	752
733	2672	2	35481	6138	5890	376	1661
962	3572	3	70795	12247	11752	750	3313
1202	E627	4	90125	15/10	14705	0.45	4171

(ug/kg)

(ug/kg)

(ug/kg)

#### In River (no mitigation)

Event Sta

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds

Zinc
Γ24
2
1
3

RS16			
1	1		
0	0.1		
0	1		
0	0		
0	0		

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.97	3.05
	2.68	7.05
	5.38	13 28

11.37

Velocity	0.02	m/
DI	230.14	

57 % % settlement needed

n/s	Tier 1	is used	for the	calculati

	Thi	resho
Event Sta	atistics	Me

99%ile	
In River (with mitigation)	Ste

Allowable Exceedances/year Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

Copper	Zinc
RS'	T24
2	2
0.00	0.10
0	1
0	0
0	0

RST6			
1	1		
0.00	0.00		
0	0		
0	0		
0	0		
0.20	0.62		

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.57	1.74
	1.60	4.02
	3.02	7.94

6.73 29.43

55.23 DI

Details of the chosen rainfall site

SAAR (mm) 1343.9 130 2704 7389 Altitude (m) Easting Northing Coastal distance (km)

#### **Drainage Catchment J**

#### **Summary of predictions**

Prediction of impact	Step1
	Step2
	Step3



Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### **DETAILED RESULTS**

Allowable Exceedances/yea  No. of exceedances/yea  No. of exceedances/worst yea
Allowable Exceedances/yea  No. of exceedances/yea  No. of exceedances/worst yea

Copper RS	Zinc T24
1	1
63.00	56.70
81	64
	ST6
4	1 4

Copper	Zinc	Cadmium	Total PAH Tox	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

Th	resholds
Event Statistics	Mean 90%ile
	95%ile 99%ile

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62

-	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
								_
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

In River (no mitigatio	n)
Allowable Exceedances/y No. of exceedances/y No. of exceedances/worst y No. of exceedances/sum No. of exceedances/sum	ear ear ner
Allowable Exceedances/y No. of exceedances/y	ear

Allowable Exceedances/year	
No. of exceedances/year	
No. of exceedances/worst year	
No. of exceedances/summer	
o. of exceedances/worst summer	

Annual average concentration (ug/l)
Thresholds

Event Statistics

Zinc
24
2
2.1
5
1.1
5

372.28

RST6			
1	1		
0	0.4		
0	2		
0	0.1		
0	1		
_			
0.63	1.93		

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	1.74	5.31
	5.43	13.22
	9.14	23.99
	17.06	74.20

Step 3

Velocity	<b>0.03</b> m/s	Tier 1 is used for the calculation
DI	346.01	
% settlement	needed 72 %	

In River (	(with	mitiga	tion)

Allowable Exceedances/year Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds Event Statistics Mean 90%ile

Copper	Zinc	
RST24		
2	2	
0.10	0.80	
1	2	
0	0.4	
0	2	

RST6			
1	1		
0.00	0.00		
0	0		
0	0		
0	0		

0.38 1.17

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	1.03	3.11
	3.17	7.64
	5.34	14.15
	10.23	44.57

83.04

Details of the chosen rainfall site SAAR (mm)

1343.9 130 2704 7389 Altitude (m)
Easting
Northing Coastal distance (km)

# **Drainage Catchment K** Summary of predictions Prediction of impact DETAILED RESULTS



	Sediment - Chronic Impact							
	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
_								

In Runoff se	ep 1	
	Copper	Z
Allowable Exceedances/year	1	T24
No. of exceedances/year	63.00	5
No. of exceedances/worst year	81	
	RS	ST6
Allowable Exceedances/year	1	
No. of exceedances/year	18.00	2
No. of exceedances/worst year	24	
	(ug/l)	(1

Zinc	Cadmium	Total PAH Toxi	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1
112.10	2.20	48.30	111.00	48.30	23.00	91.00
128	7	59	127	59	32	101
•						
	1 112.10	1 1 112.10 2.20	Toxi 1 1 1 112.10 2.20 48.30	Toxicity Threshold  1 1 1 1 1 112.10 2.20 48.30 111.00	Toxicity Threshold  1	Toxicity Threshold  1

111	resnoius
Th	resholds
Event Statistics	Mear
	90%ile
	95%ile
	99%ile

In River (no mitigation)

RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

	(Hig/kg)	(IIIg/kg)	(IIIg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

(ug/kg)

(ug/kg)

(ug/kg)

Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer
Allowable Exceedances/year  No. of exceedances/year  No. of exceedances/worst year

Thresho
Thresho

Event Statistics

Copper	Zinc
RS'	Γ24
2	2
0.2	1.2
1	4
0.1	0.8
1	4

RS16		
1	1	
0	0.1	
0	1	
0	0	
0	0	

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.99	3.10
	2.87	7.27
	5.30	13.40
	11 32	50.10

Velocity	0.03	m/s	Tier 1 is used for the calculatio
DI	158.41		
% settlement	t needed	37 %	

(mg/kg)

In	River	(with	mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Event Statistics Mean 90%ile

Thresholds hresholds

Step 3	
	Conn

RST24		
2		
0.10		
1		
0		
0		

RST6		
1	1	
0.00	0.00	
0	0	
0	0	
0	0	
0.20	0.63	

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.58	1.78
	1.71	4.25
	3.08	7.98

6.79 28.92

38.02 DI

Details of the chosen rainfall site SAAR (mm) Altitude (m) Easting Northing Coastal distance (km) 1343.9 130 2704 7389

#### **Drainage Catchment L**

#### **Summary of predictions**

## Prediction of impact

### Soluble - Acute Impact Copper

#### Sediment - Chronic Impact

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### DETAILED RESULTS

Allowable Exceedances/year
No. of exceedances/year No. of exceedances/worst year

Allowable Exceedances/year
No. of exceedances/year No. of exceedances/worst year

Th	resholds
Th	resholds
atistics	Mear

In Runoff

Step	1

Copper	Zinc
RST	T24
1	1
63.00	56.70
81	64

RS16				
1	1			
18.00	20.60			
24	27			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120

23.36	67.70
45.65	147.58
54.99	194.62
96.36	372.28

 C	Zinc	Cadmium	Total PAH	Pvrene	Fluoranthene	Anthracene	Phenanthrene
Copper	ZINC	Cadinium		icity Threshold	riuorantnene	Anunacene	rnenanthrene
1	1	1	1	1	1	1	1
92.90	112 10	2 20	49.20	444.00	49.20	22.00	04.00

_	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
-								

[	331	1165	1	16068	2780	2667	170	752
[	733	2672	2	35481	6138	5890	376	1661
ſ	962	3572	3	70795	12247	11752	750	3313
[	1383	5637	4	89125	15419	14795	945	4171

#### In River (no mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Copper	Zinc
RST	Γ24
2	2
0.1	0.7
1	2
0.1	0.4

RS16			
1	1		
0	0		
0	0		
0	0		
0	0		

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.74	2.35
Г	2.00	5.14

Velocity	0.39	m/s
DI	-	

Tier 1	is used:	for the	calculation	

1	Event Statistics	M

Event Statistics	Mean		
	90%ile		
	95%ile		
	99%ile		
In River (with mitig	ation)	Step 3	

	Coppe	si Zilic
		RST24
Illowable Exceedances/year	2	2
No. of exceedances/year	-	-
of exceedances/worst year	-	-
Io. of exceedances/summer	-	-
exceedances/worst summer	-	-

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

No. of e

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

Copper	Zinc	
RST24		
2	2	
-		
-	-	
-	-	
-	-	

RST6			
1	1		
-			
-	-		
-	-		
-	-		

	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	-	-
	-	-
	-	-

DI

Details of the chosen rainfall site SAAR (mm) 1343.9 Altitude (m)
Easting
Northing 130 2704 7389 Coastal distance (km)

#### **Drainage Catchment V**

#### **Summary of predictions**

## Prediction of impact Step1 Step2 Step3

## Soluble - Acute Impact Copper Zinc

	Sediment	- Chronic	Impact
--	----------	-----------	--------

	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
ı								
ı								
ŀ								

#### DETAILED RESULTS

Allowable Exceedances/yea
No. of exceedances/yea
No. of exceedances/worst year

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Th	resholds
Th	resholds
ictice	Mean

In Runoff

Step 1

90%ile 95%ile 99%ile

4	Zinc	
	1	

RST24			
1	1		
63.00	56.70		
81	64		

RS	T6
1	1
18.00	20.60
24	27

ST24	21	60		
RST6	42	120		
	23.36	67.70		
	45.65	147.58		

Copper	Zinc	Cadmium	Total PAH	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

٠.٠								
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

#### In River (no mitigation)

Event Stat

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mear 90%ile 95%ile

Copper	Zinc
RS*	Γ24
2	2
0.1	0.9
1	3
0.1	0.6

372.28

RST6			
1	1		
0	0		
0	0		
0	0		
0	0		

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.77	2.45
	2.10	5.44
	4.27	10.52

9.52

Velocity	0.39	m/s
DI	-	

% settlement needed - 9

Tier 1	is used	for the	calculation

In River	(with	mitia	ation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS*	Γ24
2	2
-	1
-	-
-	-
-	-

43.22

RST6			
1	1		
-	-		
-	-		
-	-		

	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	-	-
	-	-
	-	-

DI

\_

Details of the chosen rainfall site

#### **Drainage Catchment M**

#### Summary of predictions

Prediction of impact	Step1
	Step2
	Step3



Sediment - Chronic Impact				<u>:t</u>		
	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### **DETAILED RESULTS**

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Thresholds

Event Statistics Mean
90%ile
95%ile
99%ile

Thresholds

In Runoff

	C	7:n.a
Step 1		
L		

RS	T6
1	1
18.00	20.60
24	27

3124	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	06.36	272.20

Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

- 1	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

In River	(no mitigation)
III IXIVCI I	(110 milingation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Step 3

Copper	Zinc
RS'	T24
2	2
0.2	1.1
1	3
0.1	0.7
1	3

RST6			
1	1		
0	0.1		
0	1		
0	0		
0	0		
	•		

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.98	3.06
	2.69	7.07
	5.40	13.32

|--|

Velocity	0.39	m/s
DI	-	1
		_

% settlement needed -

Tier 1	is used	for the	calculation
Hell	is useu	ioi tile	calculation

In River	(with	mitiga	tion)

Allowable Exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc T24
2	2
-	
-	-
-	-

RST6				
1	1			
-				
-	-			
-	-			
-	-			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	-	-
	1	1
	-	-

Details of the chosen rainfall site

#### **Drainage Catchment N**

#### Summary of predictions

## Prediction of impact



Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### DETAILED RESULTS

Allowable Exceedances/year  No. of exceedances/year  No. of exceedances/worst year
Allowable Exceedances/year  No. of exceedances/year  No. of exceedances/worst year

Coppe	r RST	Zinc 24	
1		1	
63.00		56.70	
81		64	
	RS	T6	
1		1	

7									
	Copper	Zinc	Cadmium	Total PAH Tox	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene	
	1	1	1	1	1	1	1	1	
	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00	Ī
П	97	128	7	59	127	59	32	101	
L	97	128	7	59	127	59	32	101	_

Th	resholds
t Statistics	Mear
	90%ile
	95%ile
	99%ile

RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	00.30	272.20

_	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
ſ	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
Ī	1383	5637	4	89125	15419	14795	945	4171
_								

(ug/kg)

(ug/kg)

In River (no mitigation)	1
Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer	
Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer	

RST6				
1	1			
0	0.2			
0	2			
0	0			
0	0			
	•			



	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	1.12	3.49
	3.30	8.15
	5.96	15.20
	12.67	54.71

Velocity	0.06	m/s	Tier 1 is used for the calculation
DI	195.67		
% settlement	needed	49 %	

Event Statistics	Me
	90%

Annual average concentration (ug/l)

90%	ile
95%	ile
99%	ile

Thresholds Thresholds

RST24	21	60	
RST6	42	120	
	1.12	3.49	
	3.30	8.15	
	5.96	15.20	
	12.67	54.71	

ln	River	(with	mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
o. of exceedances/worst summer

	RST6		T6
Allowable Exceedances/year		1	1
No. of exceedances/year		0.00	0.00
No. of exceedances/worst year		0	0
No. of exceedances/summer		0	0
No. of exceedances/worst summer		0	0

Step 3

ual average conce	ntration (ug/
Thresh	olds hreshold

Event Statistics	Mea
	90%il
	95%il

U	U
RS	ST6
1	1
0.00	0.00
0	0
0	0
0	0

0.23 0.72

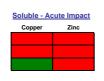
Zinc

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.65	1.97
	1.91	4.72

DI	46.96

#### **Drainage Catchment O, Tier 1, Treatment Train 1**

## Summary of predictions Prediction of impact DETAILED RESULTS In Runoff Step Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year Thresholds RST24 RST Thresholds Event Statistics Mean 90%ile



	Sediment - Chronic Impact									
Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene			

p 1			Step 1								
	Copper RS	Zinc T24		Copper	Zinc	Cadmium	Total PAH	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
F	1	1	Г	1	1	1	1	1	1	1	1
	63.00	56.70		83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
Ī	81	64		97	128	7	59	127	59	32	101
	1 18.00 24 (ug/l)	20.60 27 (ug/l)		(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
T24	21	60	Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
ST6	42	120	_								
ſ	23.36	67.70	ſ	331	1165	1	16068	2780	2667	170	752
Ī	45.65	147.58		733	2672	2	35481	6138	5890	376	1661
		101.00	1	0.00	0						0010

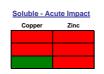
90%116		45.05	147.56		/33	20/2		33461	0130	2030	3/0	1001
95%ile		54.99	194.62		962	3572	3	70795	12247	11752	750	3313
99%ile		96.36	372.28		1383	5637	4	89125	15419	14795	945	4171
33735							1					
In River (no mitigation)												
in River (no mitigation)	Step 2			Step 2								
		Copper	Zinc									
			T24									
Allowable Exceedances/year		2	2				_					
No. of exceedances/year		5.7	6.6		Velocity	0.01	m/s	Tier 1	is used for the	calculation		
No. of exceedances/worst year		10	15									
No. of exceedances/summer		3.1	2.9		DI	1124.82						
No. of exceedances/worst summer		8	14									
					% settlement i	needed	92	%				
		R	ST6					_				
Allowable Exceedances/year		1	1									
No. of exceedances/year		0.9	1.9									
No. of exceedances/worst year		3	4									
No. of exceedances/summer		0.3	0.9									
No. of exceedances/worst summer		2	4									
ivo. or exceedances, worst summer												
Annual average concentration (ug/l)		1.72	5.33									
Allitual average concentration (ug/1)		1.72	3.33									
		6 · · · · · #1	ć m									
Theresholds	пото 4	(ug/l)	(ug/l)									
Thresholds	RST24		60									
Thresholds	RST6	42	120									
Event Statistics Mean		4.27	12.52									
90%ile		12.21	32.09									
95%ile		18.44	54.07									
99%ile		35.26	130.17									
In River (with mitigation)	Step 3											
,												
		Copper	Zinc									
			ZIIIC									

95%ile	18.44	54.07
99%ile	35.26	130.17
		·
In River (with mitigation) Step	3	
, , ,		
	Copper	Zinc
		T24
Allowable Exceedances/year	2	2
No. of exceedances/year	1.60	2.80
No. of exceedances/worst year	3	6
No. of exceedances/summer	0.8	1.3
No. of exceedances/worst summer	2	5
	R	ST6
Allowable Exceedances/year	1	1
No. of exceedances/year	0.20	0.40
No. of exceedances/worst year	1	2
No. of exceedances/summer	0	0.1
No. of exceedances/worst summer	0	1
Annual average concentration (ug/l)	1.03	3.23
	(ug/l)	(ug/l)
Thresholds hresholds RST2	24 <mark>21</mark>	60
Thresholds RS1	T6 42	120
Event Statistics Mean	2.55	7.47
90%ile	7.31	19.25
95%ile	11.00	32.08

269.96

#### **Drainage Catchment O, Tier 2, Treatment Train 1**

### Summary of predictions Prediction of impact DETAILED RESULTS In Runoff Step Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year Thresholds RST2 Thresholds Event Statistics Mean 90%ile



#### Sediment - Chronic Impact Total PAH Anthracene Pyrene

ep 1			Step 1								
	Copper	Zinc T24		Copper	Zinc	Cadmium	Total PAH	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
	1	1		1	1	1	1	1	1	1	1
L	63.00	56.70		83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
L	81	64		97	128	7	59	127	59	32	101
	1 18.00 24 (ug/l)	20.60 27 (ug/l)	<b>Toxicity</b>	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
T24	21	60	Threshold	197	315	3.5	16770	875	2355	245	515
ST6	42	120	_								
-						,				1	
L	23.36	67.70	_	331	1165	1	16068	2780	2667	170	752
L	45.65	147.58	_	733	2672	2	35481	6138	5890	376	1661
L	54.99	194.62	_	962	3572	3	70795	12247	11752	750	3313

959	%ile	54.99	194.62		962	3572	3	70795	12247	11752	750	3313
999	%ile	96.36	372.28		1383	5637	4	89125	15419	14795	945	4171
In River (no mitigatio	on) Step 2			Step 2								
( )	,											
		Copper	Zinc									
		RS*										
Allowable Exceedances/y	vear	2	2									
No. of exceedances/y	rear	5.7	6.6		Velocity	0.03	m/s	Tier 2	is used for the o	alculation		
No. of exceedances/worst y	/ear	10	15		•		•					
No. of exceedances/sumr	mer	3.1	2.9		DI	1542.69						
No. of exceedances/worst sumr	mer	8	14				•					
					% settlement r	needed	94	%				
		RS	T6					•				
Allowable Exceedances/y	vear	1	1									
No. of exceedances/y		0.9	1.9									
No. of exceedances/worst y		3	4									
No. of exceedances/sumr		0.3	0.9									
No. of exceedances/worst sumr	mer	2	4									
Annual average concentration (u	ıg/l)	1.72	5.33									
		(ug/l)	(ug/l)									
Thresho			60									
Thresho	olds RST6	42	120									
Event Statistics Me	ean	4.27	12.52									
	%ile	12.21	32.09									
	%ile	18.44	54.07									
	%ile	35.26	130.17									
		33.20	130.17									
In River (with mitigation	on) Step 3											
	step s											
		Copper	Zinc									
		Copper										

	Copper	Zinc
_	RS	Γ24
		2
	1.60	2.80
	3	6
	0.8	1.3
	2	5
-		
	RS	T6
Ī	1	1
	0.20	0.40
	1	2
ľ	0	0.1
ľ	0	1
-		
Ī	1.03	3.23
L		
	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
-		•
ſ	2.55	7.47
ľ	7.31	19.25
ľ	11.00	32.08
l l	21.16	73.76
		RST24 21 RST6 42 2.55 7.31 11.00

370.24

#### **Drainage Catchment O, Tier 2, Treatment Train 2 Summary of predictions** Soluble - Acute Impact Sediment - Chronic Impact Copper Zinc Total PAH Pyrene Prediction of impact **DETAILED RESULTS** In Runoff Step 1 Step 1 Pyrene y Thresho Copper Zinc Copper Zinc Cadmium Total PAH Fluoranthene Anthracene Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year Allowable Exceedances/yea No. of exceedances/worst year (ug/l) (ug/kg) (mg/kg) (ug/kg) (ug/kg) RST24 Thresholds Thresholds RST6 Event Statistics Mear 23.36 67.70 331 1165 16068 2780 2667 90%ile 95%ile 35481 70795 6138 12247 96.36 372.28 1383 89125 15419 In River (no mitigation) Step 2 Coppe Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer **0.03** m/s Tier 2 is used for the calculation 15 94 % Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer Annual average concentration (ug/l) (ug/l) Thresholds Thresholds RST24 12.52 32.09 Event Statistics 95%ile 18.44 54.07 130.17 In River (with mitigation) Step 3 Zinc Allowable Exceedances/vea No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer 92.56 DI No. of exceedances/worst summer Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer

Phenanthrene

Phenanthrene

(ug/kg)

752

4171

Anthracene

(ug/kg)

170

Details of the chosen rainfall site SAAR (mm)

Annual average concentration (ug/l)

Event Statistics

Thresholds hresholds

Thresholds

90%ile

1343.9 130 2704 7389 Altitude (m) Easting Northing Coastal distance (km)

0.41

1.02

RST24

1.29 (ug/l)

2.99

#### **Drainage Catchment P**

#### Summary of predictions

In Runoff

## Prediction of impact Step1 Step2 Step3

# Soluble - Acute Impact Copper Zinc

Sediment	_	Chronic	: Im	pact

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### DETAILED RESULTS

Allowable Exceedances/yea No. of exceedances/yea No. of exceedances/worst yea
Allowable Exceedances/yea

Step 1		
	Copper RS	Zinc T24
	1	1
	63.00	56.70
	81	64

	Copper	Zinc	Cadmium	Total PAH Tox	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
Γ	1	1	1	1	1	1	1	1
I	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
ſ	97	128	7	59	127	59	32	101

No. of exceedances/year
No. of exceedances/worst year
Thresholds

hresholds	RST6	
Mean		2:
90%ile		4
95%ile		5

RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	447.50

	(Hig/kg)	(IIIg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	4202	5637		00435	45440	4.4705	0.45	4474

(ug/kg)

(ug/kg)

(ug/kg)

In River	(no mitigation)
III IXIVCI I	(110 milingation)

Event Statistics

Allowable Exceedances/yea
No. of exceedances/yea
No. of exceedances/worst year
No. of exceedances/summe
. of exceedances/worst summe

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS*	Γ24
2	2
0.1	0.9
1	3
0.1	0.6
1	3

RS16					
1	1				
0	0				
0	0				
0	0				
0	0				

	(ug/l)	(ug/l)
RST24	21	60
RST6 42		120
	0.77	2.45
	2.09	5.41
	4.25	10.45
	0.5/	13 13

Velocity	0.06	m,
DI	81.27	

% settlement needed 0 %

(mg/kg)

Tier 1	is used	for the	calculation
Hell	is useu	ioi tile	calculation

In River	(with	mitiaa	ation)

Allowable Exceedances/year
No. of exceedances/worst year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
c n	124
2	2
-	-
-	-
-	-

RST6							
1	1						
-							
-	-						
-	-						
-	-						

	-	-
	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	1	-
	1	1
		-

DI

#### **Drainage Catchment Q**

#### Summary of predictions

Prediction of impact	Step1
	Step2
	Step3



	Sediment - Chronic Impact						
Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

DETAILED RESULTS											
In Runoff	Step 1		Step 1								
	Cop	oper Zinc RST24		Copper	Zinc	Cadmium	Total PAH	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
Allowable Exceedances/year		1 1		1	1	1	1	1	1	1	1
No. of exceedances/year	63	.00 56.70		83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
No. of exceedances/worst year	8	64	Ĺ	97	128	7	59	127	59	32	101
Allowable Exceedances/year		RST6									
No. of exceedances/year	<u> </u>	.00 20.60									
No. of exceedances/worst year		24 27									
	(u	g/l) (ug/l)	_	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Thresholds		1 60	Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
Thresholds	RST6	120									
Event Statistics Mean	23	.36 67.70	Ī	331	1165	1	16068	2780	2667	170	752
90%ile	45	.65 147.58		733	2672	2	35481	6138	5890	376	1661
95%ile	54	.99 194.62		962	3572	3	70795	12247	11752	750	3313
99%ile	96	.36 372.28	[	1383	5637	4	89125	15419	14795	945	4171
In River (no mitigation)	Step 2		Step 2								
in raver (no maganon)	Otep 2		Olep 2								
	Cop	oper Zinc RST24									
Allowable Exceedances/year		2 2									
No. of exceedances/year		.8 2.6		Velocity	0.06	m/s	Tier 1	is used for the c	alculation		
No. of exceedances/worst year		4 5		,							
No. of exceedances/summer No. of exceedances/worst summer		1 1.3 3 5		DI	348.30						
No. or exceedances/worst summer		3   5		% settlement r	needed	72	%				

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l

Event Statistics My 909 959 999

1.0	2.0					
4	5					
1	1.3					
3	5					
RST6						
1	1					
0.2	0.8					

1	2
0	0.4
0	2
0.81	2.49

olds	RST24		(ug/l) 60
olds	RST6	42	120
lean		2.19	6.60
%ile		6.55	16.48
%ile		11.11	30.25
%ile		21.53	93.30

In River (with mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/I)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile 99%ile

Copper	Zinc
RS <sup>*</sup>	Γ24
2	2
0.30	1.10
1	3
0	0.6
0	2

RST6				
1	1			
0.00	0.10			
0	1			
0	0			
0	0			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	1 30	3.89

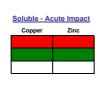
0.49 1.51

1.30	3.89
3.85	9.80
6.59	18.15
12.86	54.59

83.59 DI

# **Drainage Catchment R** Summary of predictions Prediction of impact DETAILED RESULTS

Eve



	Sediment - Chronic Impact							
	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
,		l						

1.5	

In Runoff	Step 1		
	Co	pper RST24	Zinc
Allowable Exceedances/year		1	1
No. of exceedances/year	63	3.00	56.70
No. of exceedances/worst year	8	31	64
		RST6	
Allowable Exceedances/year		1	1
No. of exceedances/year	18	3.00	20.60
No. of exceedances/worst year	1	24	27
		na/I)	(ua/l)

Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

Th	resholds	RST24	21	60
Th	resholds	RST6	42	120
nt Statistics	Mean		23.36	67.70
	90%ile		45.65	147.58
	95%ile		54.99	194.62
	000/11-		06.36	272.20

ıu								
						•		
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

	<u></u>		0.1-1-0						-00		
In River (no mitigation)	Step 2			Step 2							
		Copper	Zinc								
		RS	Γ24								
Allowable Exceedances/year		2	2								
No. of exceedances/year	Ī	0.1	0.4		Velocity	0.08	m/s	Tier 1	is used for the o	alculation	
No. of exceedances/worst year		1	2								
No. of exceedances/summer		0.1	0.2		DI	79.42					
No. of exceedances/worst summer		1	1					_			
					% settleme	nt needed	0	%			
	_	RS	T6								
Allowable Exceedances/year	L	1	1								
No. of exceedances/year	L	0	0								
No. of exceedances/worst year	L	0	0								
No. of exceedances/summer	L	0	0								
No. of exceedances/worst summer	L	0	0								
	-										
Annual average concentration (ug/l)	L	0.21	0.66								
		(com/ft)	(com/ll)								
Thresholds	RST24	(ug/l) 21	(ug/l) 60								
Thresholds	RST6	42	120								
Tillesiloids	7310	72	120								

- 1			(ug/I)	(ug/I)
	Thresholds	RST24	21	60
	Thresholds	RST6	42	120
1				
ı	Event Statistics Mean	Г	0.65	2.07
	90%ile	-	1.77	4.50
	95%ile	-	3.41	8.69
1	99%ile	-	8.01	36.62
ı	33/6IIC	L	8.01	30.02
í	L. Di ( M M M )			
	In River (with mitigation)	Step 3		
			Copper	Zinc
			RS	T24
	Allowable Exceedances/year	Г	2	2
	No. of exceedances/year	i i	-	-
	No. of exceedances/worst year	l l	-	-
	No. of exceedances/summer	-		_
	No. of exceedances/worst summer	-		
	No. of exceedances/worst summer	L		
		-	R	ST6
	Allowable Exceedances/year	L	1	1
	No. of exceedances/year	L	-	-
	No. of exceedances/worst year		-	-
	No C			

	-	-
	-	
	-	-
	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	-	-
	-	-
	-	-
		RST24 21

	-	-
_	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	-	-
	-	-
	-	-
	-	-

#### **Drainage Catchment S**

#### **Summary of predictions**

## Prediction of impact

#### Soluble - Acute Impact Copper Zinc

#### Sediment - Chronic Impact

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### DETAILED RESULTS

Allowable Exceedances/year
No of exceedances/year

No. of exceedances/year No. of exceedances/worst year

No. of exceedances/worst year

Ihi	resholds
Thi	resholds
intina	

In Runoff

90%ile 95%ile 99%ile

Copper	Zinc T24		
1	1		
63.00	56.70		
81	64		

RST6					
1	1				
18.00	20.60				
24	27				

	(ug/1)	(ug/i)			
RST24	21	60			
RST6	42	120			
	23.36	67.70			

Copper	Zinc	Cadmium	Fluoranthene	Anthracene	Phenanthrene		
1	1 1 1 1 1						1
83.80 112.10 2.20 48.30 111.00 48.30 23.00						23.00	91.00
97	128	7	59	127	59	32	101

''u								
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

In River	(no mitigation)
III IZIVEI I	(110 milligation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS*	Γ24
1	1
0	0
0	0
0	0

RS16				
0.5	0.5			
0	0			
0	0			
0	0			
0	0			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.02	0.06
	0.04	0.10
	0.08	0.21
	0.35	4.45

Step 3

Ste	n '	າ

Velocity	
DI	

Tier 1	is used fo	or the c	alculation

In River	(with m	itigatio	n)
----------	---------	----------	----

Allowable Exceedances/year No. of exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

RST6					
0.5	0.5				
-	-				
-	-				
-	-				
-	-				

	1	-
	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	-	-
	-	-
	-	-

Details of the chosen rainfall site

SAAR (mm) 1343.9 130 2704 7389 Altitude (m) Easting Northing Coastal distance (km)

#### **Drainage Catchment T**

#### Summary of predictions

Prediction of impact	Step1
	Step2
	Step3



			Sediment - C	Chronic Impa	<u>ct</u>		
Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### **DETAILED RESULTS**

Step 1	In Runoff	
	Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year	
	Allowable Exceedances/year  No. of exceedances/year  No. of exceedances/worst year	

Th	resholds
Th	resholds
Statistics	Mean
	90%ile
	95%ile

Zinc

Copper	Zinc T24
1	1
63.00	56.70
81	64

	24	27
-	(ug/l)	(ug/l)
RST24	21	60
DOTE	40	420

1310	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

1								
	Copper	Zinc	Cadmium	Total PAH	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
Г	1	1	1	1	1	1	1	1
ı	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
ſ	97	128	7	59	127	59	32	101
-								

old								
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

In River (	(no mitigation)

Event

Allowable Exceedances/yea
No. of exceedances/yea
No. of exceedances/worst year
No. of exceedances/summe
. of exceedances/worst summe

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS'	Γ24
1	1
1	2
2	5
0.5	1.1
2	5

ST6
0.5
0.4
2
0.1
1
·
1.82

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	1.66	5.10
	5.16	12.85
	8.77	22.86
	1000	

Velocity	0.08
DI	135.64

Velocity	0.08	m/s		Tier 1 is used for the calculation
DI	135.64			
% settlement r	needed	27	%	

#### In River (with mitigation)

Allowable Exceedances/year Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics Mean 90%ile

Copper	Zinc
RS'	Γ24
1	1
0.00	0.00
0	0
0	0

RS	ST6
0.5	0.5
0.00	0.00
0	0
0	0
0	0

0.14 0.45

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.38	1.15
	1.20	2.86

8.14 DI

Details of the chosen rainfall site SAAR (mm)

1343.9 130 2704 7389 Altitude (m) Easting Northing Coastal distance (km)

#### **Drainage Catchment U**

#### **Summary of predictions**

## Prediction of impact Step1 Step2 Step3



Sediment - Chronic Impact							
Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### DETAILED RESULTS

Allowable Exceedances/yea
No of exceedances/year

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Thresholds
Thresholds

In Runoff

Event Statistics Mean 90%ile 95%ile 99%ile

Step	1

Zinc
Γ24
1
56.70
64

KSIB				
1	1			
18.00	20.60			
24	27			

_	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
ſ	22.26	C7 70

Copper	Zinc	Cadmium	Total PAH	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
			TUX	city Threshold			
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

Toxicity Threshold		315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752

(ug/kg)

(ug/kg)

(ug/kg)

23.36	67.70		331	1165	1	16068	2780	2667	170	752
45.65	147.58		733	2672	2	35481	6138	5890	376	1661
54.99	194.62		962	3572	3	70795	12247	11752	750	3313
96.36	372.28		1383	5637	4	89125	15419	14795	945	4171
		-								

(mg/kg)

#### In River (no mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mear 90%ile 95%ile

Copper	Zinc
RST	Γ24
1	1
2.6	3.4
6	6
1.4	1.4

RS16				
0.5	0.5			
0.4	1.1			
1	3			
0.1	0.5			
1	3			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	2.80	8.38
	8.44	21.13
	13.36	38.42

24.59 110.31

Velocity	0.08	m/
DI	311.86	J

% settlement needed	68				

Tier 1 is used for the calculation

In River	(with mit	tigation)
----------	-----------	-----------

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile

one o	oer Zinc
Step 3	

RST24					
1	1				
0.00	0.00				
0	0				
0	0				
0	0				

RST6					
0.5	0.5				
0.00	0.00				
0	0				
0	0				
0	0				

0.25 0.79

5.90 26.37

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.67	2.01
	2.03	5.07
	3.20	9.22

DI

18.71

Details of the chosen rainfall site

 SAAR (mm)
 1343.9

 Altitude (m)
 130

 Easting
 2704

 Northing
 7389

 Coastal distance (km)
 58

#### **Drainage Catchment W**

Summary of predictions

Prediction of impact	Step1
	Step2
	Step3

# Soluble - Acute Impact Copper Zinc

Sediment -	Chronic	Impact
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	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
I								
Г								
r								

#### DETAILED RESULTS

D	ETAILED RESULTS												
	In Runoff	Step 1			Step 1								
			Copper	Zinc		Copper	Zinc	Cadmium	Total PAH	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
	Allowable Exceedances/year		1	1	l F	1	1 1	1	1	1	1	1	1
	No. of exceedances/year		63.00	56.70		83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
	No. of exceedances/worst year		81	64		97	128	7	59	127	59	32	101
	Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year		1 18.00 24 (ug/l)	1 20.60 27 (ug/l)		(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
	Thresholds	RST24			Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	Thresholds	RST6	21 42	60 120	Inresnoia					l .			
	Inresnoids	RSIG	42	120									
	Event Statistics Mean		23.36	67.70	Г Г	331	1165	1	16068	2780	2667	170	752
	90%ile		45.65	147.58	-	733	2672	2	35481	6138	5890	376	1661
	95%ile		54.99	194.62		962	3572	3	70795	12247	11752	750	3313
	99%ile		96.36	372.28		1383	5637	4	89125	15419	14795	945	4171
	In River (no mitigation)	Step 2			Step 2								
			Copper RS1	Zinc T24									
	Allowable Exceedances/year		1	1				_					
	No. of exceedances/year		0	0	,	Velocity	0.32	m/s	Tier 1	is used for the o	alculation		
	No. of exceedances/worst year		0	0				_					
	No. of exceedances/summer		0	0	1	DI	-						
	No. of exceedances/worst summer		0	0									

% settlement needed

Allowable Exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/summer

Annual average concentration (ug/l)

Thresholds

Event Statistics Mean 90%ile 95%ile

0	0
RS	Т6
0.5	0.5
0	0
0	0
0	0
0	0
0.05	0.46

	(ug/I)	(ug/1)
RST24	21	60
RST6	42	120
	0.17	0.57
	0.43	1.06
Г	0.84	2.24

Zinc

Step 3

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

In River (with mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds
Event Statistics Mean
90%ile
95%ile
99%ile

	-	-
		ST6
	0.5	0.5
	-	-
	-	-
	-	-
	-	-
	-	-
	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120

DI		ı

SAAR (mm)	1343.9
Altitude (m)	130
Easting	2704
Northing	7389
Coastal distance (km)	58

#### **Drainage Catchment X**

#### Summary of predictions

In Runoff

## Prediction of impact

#### Soluble - Acute Impact Copper Zinc

Sediment -	<ul> <li>Chronic</li> </ul>	<b>Impact</b>	

	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
ı								
ſ								
Ų								

#### DETAILED RESULTS

AI	owable	Exce	edan	ces/y
	No. of	exce	edan	ces/y
No o	f excee	danc	es/w	orst v

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/worst year

Th	resholds
Statistics	Mean
	90%ile
	95%ile

Step 1		
	Copper RS	Zinc T24
	1	1
	63.00	56.70
	81	64

11010			
1	1		
18.00	20.60		
24	27		

N3124	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

Copper	Zinc	Cadmium	Total PAH	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

hold	197	315	3.5	16770	875	2355	245	515
ſ	331	1165	1	16068	2780	2667	170	752
ſ	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
ſ	1383	5637	4	89125	15419	14795	945	4171

(ug/kg)

Tier 1 is used for the calculation

(ug/kg)

In Divor	(no mitigation)
III KIVEI I	(IIO IIIIUyauoii)

Allowable Exceedances/yea
No. of exceedances/yea
No. of exceedances/worst yea
No. of exceedances/summe
o. of exceedances/worst summe

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RST	Γ24
1	1
0	0
0	0
0	0

RST6			
0.5	0.5		
0	0		
0	0		
0	0		
0	0		
0.06	0.18		
0	0		

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.19	0.63
	0.47	1.17
	0.93	2.48
	2.70	11 07

Velocity	0.26	m/s
DI	-	
		_

% settlement needed	-	%

In River	(with I	mitigation)
----------	---------	-------------

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

Copper	Zinc
RS'	Γ24
1	1
1	-
-	-
-	-
-	-

RST6		
0.5	0.5	
1	-	
-	-	
-	-	
-	-	

	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	-	-
	-	-
	-	-

DI

Details of the chosen rainfall site SAAR (mm) 1343.9 130 2704 7389 Altitude (m)
Easting
Northing
Coastal distance (km)

#### **Drainage Catchment Y**

Summary of predictions

Prediction of impact	Step1
	Step2
	Step3



			<del>oodo</del>	min onno minpu	<u> </u>		
Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### DETAILED RESULTS

DETAILED RESULTS										
In Runoff	Step 1	Step 1								
	Copper Zinc RST24		Copper	Zinc	Cadmium	Total PAH	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
Allowable Exceedances/year	1 1		1	1	1	1	1	1	1	1
No. of exceedances/year No. of exceedances/worst year	<b>63.00 56.70</b> 81 64		<b>83.80</b> 97	112.10 128	<b>2.20</b> 7	<b>48.30</b> 59	111.00 127	<b>48.30</b> 59	23.00 32	91.00 101
Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year	RST6  1 1  18.00 20.60  24 27									
	(ug/l) (ug/l)		(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Thresholds	RST24 21 60	Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
Thresholds	RST6 42 120		l-					1	l .	
Event Statistics Mean	23.36 67.70		331	1165	1	16068	2780	2667	170	752
90%ile 95%ile	45.65 147.58 54.99 194.62		733 962	2672 3572	2	35481 70795	6138 12247	5890 11752	376 750	1661 3313
99%ile	96.36 372.28		1383	5637	4	89125	15419	14795	945	4171
In River (no mitigation)	Step 2	Step 2								
Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/summer No. of exceedances/year No. of exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/worst year No. of exceedances/summer Annual average concentration (ug/l)  Thresholds Thresholds Event Statistics Mean 90%sile 95%sile	Copper   RST24   1   1   0   0.1   0   0.1   0   0   0   0   0   0   0   0   0		Velocity DI % settlement n	-	m/s	Tier 1	is used for the (	calculation		
In River (with mitigation)	Step 3									
Allowable Exceedances/year No. of exceedances/year No. of exceedances/swarr No. of exceedances/swarmer No. of exceedances/worst summer Allowable Exceedances/year No. of exceedances/worst year No. of exceedances/worst year	Copper   Zinc   RST24   1		DI	-	1					
No. of exceedances/worst summer Annual average concentration (ug/l)	(ug/i) (ug/i)									
Thresholds hresholds Thresholds	RST24 21 60 RST6 42 120									

 SAAR (mm)
 1343.9

 Altitude (m)
 130

 Easting
 2704

 Northing
 7389

 Coastal distance (km)
 58

Mean 90%ile 95%ile 99%ile

#### **Drainage Catchment Z Summary of predictions** Soluble - Acute Impact Sediment - Chronic Impact Zinc Total PAH Pyrene Copper Prediction of impact **DETAILED RESULTS** In Runoff Step 1 Step 1 Pyrene y Thresho Copper Zinc Copper Zinc Cadmium Total PAH Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year Allowable Exceedances/yea No. of exceedances/worst year (ug/l) (ug/kg) (mg/kg) (ug/kg) RST24 Thresholds Thresholds RST6 Event Statistics 23.36 67.70 331 1165 16068 2780 90%ile 95%ile 147.58 194.62 35481 70795 6138 12247 96.36 372.28 1383 89125 15419 In River (no mitigation) Step 2 Coppe Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer **0.03** m/s Tier 1 is used for the calculation 88 % Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer Annual average concentration (ug/l) (ug/l) Thresholds Thresholds RST24 Event Statistics 95%ile 36.63

In River (with mitigation)

Allowable Exceedances/vear No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

Coastal distance (km)

Copper	Zinc		
RS*	Γ24		
2	2		
0.00	0.00		
0	0		
0	0		
0	0		

Step 3

0.74

(ug/l) RST24 0.63 1.88

0.24

DI

46.76

Phenanthrene

Phenanthrene

(ug/kg)

752

1661 3313

4171

Anthracene

Anthracene

(ug/kg)

170

(ug/kg)

2667

Details of the chosen rainfall site SAAR (mm) Altitude (m) Easting Northing

#### Routine Runoff Results - DS (Cumulative Assessments)

#### Drainage Catchments A. B & C

#### Summary of predictions

Prediction of impact	Step1
	Step2
	Step3



|--|

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### **DETAILED RESULTS**

Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year
Allowable Exceedances/year No. of exceedances/year

In Runoff

Step 1		
	Copper	Zinc
	RS <sup>*</sup>	124
	1	1
	78.70	70.40
	97	81
	RS	ST6
	1	1
	27.80	29.80
	36	37

tep 1								
	Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
	1	1	1	1	1	1	1	1

vo	orst y
hr	resho
hr	resho
	Me
	90%
	95%
	99%

	(ug/I)	(ug/i)
RST24	21	60
RST6	42	120
	28.38	85.11
	55.48	185.53
	66.83	244.68
	117.11	468.03

oxicity eshold	197	315	3.5	16770	875	2355	245	515
-								

# Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer

In River (no mitigation)



Annual average concentration (ug/l)	
Thresholds	

Event Statistics

Coppei	ZIIIC	
RST24		
1	1	
0.6	1.8	
1	5	
0.3	1.1	
1	5	

RSIB			
0.5	0.5		
0	0.3		
0	2		
0	0.1		
0	1		
0.46	1.45		

	(ug/I)	(ug/I)
RST24	21	60
RST6	42	120
	1.32	4.27
	3.89	10.07
	7.04	18.59
	15.04	67.30

Velocity	m/s	Tier 1 is used for the calculation
DI		

In River (with	mitigation)
Allowable	Exceedances/year

No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer
Annual average concentration (ug/l)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile

Copper RS	Zinc T24
1	1
0.00	0.30
0	1
0	0.1
0	1

RST6		
0.5	0.5	
0.00	0.00	
0	0	
0	0	
0	0	
0.27	0.89	

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120

•	72	120
	0.74	2.30
	2.20	5.54
	3.98	10.72
	7.91	34.33

ь.

% settlement needed

 Details of the chosen rainfall site

 SAAR (mm)
 1343.9

 Altitude (m)
 130

 Easting
 2704

 Northing
 7389

 Coastal distance (km)
 58

#### **Drainage Catchments B & C**

#### Summary of predictions

## Prediction of impact Step1 Step2 Step3



Sediment -	Chronic	Impact

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### **DETAILED RESULTS**

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Th	resholds
Th	resholds
tatistics	Mear

In Runoff

90%ile 95%ile 99%ile

Step 1			Step 1
	Copper	Zinc ST24	
	1	1	
	70.70	70.40	

RS16				
1	1			
27.80	29.80			
36	37			

RST24	21	60
RST6	42	120
	28.38	85.11
	EE 40	100 00

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
			Tox	icity Threshold			
1	1	1	1	1	1	1	1
97.40	127.00	2.40	48.30	111.00	48.30	23.00	91.00
112	143	8	59	127	59	32	101

- 1								
ſ	398	1647	1	16068	2780	2667	170	752
	864	3634	2	35481	6138	5890	376	1661
ſ	1121	4759	3	70795	12247	11752	750	3313
	1592	7288	4	89125	15419	14795	945	4171

#### In River (no mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS'	Γ24
1	1
0.2	1.5
1	4
0.1	0.9

K516				
0.5	0.5			
0	0.2			
0	2			
0	0			
0	0			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	1.12	3.66
	3.22	8.50
	6.01	15.66

Velocity	0.17	m/s
DI	-	
		_

% settlement needed - 9

Tier 1	is used for the calculation

In River	(with	mitia	ation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile

	13.02	60.4
Step 3		

Copper	Zinc		
RS'	Γ24		
1	1		
0.00	0.20		
0	1		
0	0		
•	0		

RST6			
0.5	0.5		
0.00	0.00		
0	0		
0	0		
0	0		

0.23 0.74

7.38 31.67

	(ug/l)	(ug/l)	
RST24	21	60	
RST6	42	120	
	0.64	2.01	
	1.88	4.84	
	3.34	9.35	

DI

\_

Details of the chosen rainfall site

 Details of the chosen rainfall site

 SAAR (mm)
 1343.9

 Altitude (m)
 130

 Easting
 2704

 Northing
 7389

 Coastal distance (km)
 58

#### **Drainage Catchments D & E**

#### **Summary of predictions**

## Prediction of impact



Step 1 Step

(ug/l)

	Sediment - Chronic Impact								
Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene		

#### DETAILED RESULTS

In Runof	ff
Allowable Exceedances/yea No. of exceedances/yea No. of exceedances/worst yea	ar
Allowable Exceedances/yea No. of exceedances/yea No. of exceedances/worst yea	ar

Copper	Zinc T24
1	1
63.00	56.70
81	64
R	ST6
4	1

	Copper	Zinc	Cadmium	Total PAH Tox	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
Г	1	1	1	1	1	1	1	1
Г	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
Γ	97	128	7	59	127	59	32	101

Th	iresholds
Event Statistics	Mean
	90%ile
	95%ile
	99%ile

In River (no mitigation)

RST24		
	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96 36	372 28

	(mg/ng)	(mg/kg)	(mg/kg)	(ug/ng)	(ug/kg)	(ug/ng)	(ug/ng)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

Allemant - Formandament -
Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer
Allowable Exceedances/year
No. of exceedances/year
in exceedanteed your



Annual average concentration (ug/l)

Thre	esho

Event Statistics

Step 3

Copper	Zinc
RS*	Γ24
1	1
0	0.6
0	2
0	0.4
0	2

RST6		
0.5	0.5	
0	0	
0	0	
0	0	
0	0	
0.23	0.69	

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.68	2.15
	1.81	4.59
	3.68	8.84
	8 80	37 30

Velocity	<b>0.05</b> m/s	Tier 1 is used for the calculatio
DI	125.13	
% settlemen	needed 21	%

ln	River	(with	mitigation)

Allowable Exceedances/year Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics Mean 90%ile

Copper	Zinc
RS*	Γ24
1	1
0.00	0.00
0	0
0	0
0	0

RST6		
0.5	0.5	
0.00	0.00	
0	0	
0	0	
0	0	
0.14	0.43	

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.33	0.96
	0.93	2.26
	1.66	4.64
	3.50	12.02

30.03 DI

Details of the chosen rainfall site SAAR (mm)

1343.9 Altitude (m)
Easting
Northing 130 2704 7389 Coastal distance (km)

#### Drainage Catchments H & I, Tier 1, Treatment Train 1 Summary of predictions Soluble - Acute Impact Sediment - Chronic Impact Copper Zinc Total PAH Pyrene Anthracene Prediction of impact **DETAILED RESULTS** In Runoff Step 1 Copper Zinc Copper Zinc Cadmium Total PAH Anthracene Phenanthrene Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year Allowable Exceedances/yea No. of exceedances/worst year (ug/l) (ug/kg) (ug/kg) (mg/kg) (ug/kg) (ug/kg) (ug/kg) RST24 Thresholds RST6 Event Statistics 23.36 67.70 331 1165 16068 2780 2667 170 752 90%ile 95%ile 35481 70795 6138 12247 96.36 372.28 1383 89125 15419 4171 In River (no mitigation) Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer **0.02** m/s Tier 1 is used for the calculation 81 % Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer Annual average concentration (ug/l) (ug/l) Thresholds Thresholds RST24 Event Statistics 95%ile In River (with mitigation) Step 3 Zinc Allowable Exceedances/vea No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer 123.06 DI No. of exceedances/worst summer Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer Annual average concentration (ug/l) 0.39 1.21 (ug/l) Thresholds hresholds RST24 Thresholds

Details of the chosen rainfall site SAAR (mm)

90%ile

Event Statistics

1343.9 130 2704 7389 Altitude (m) Easting Northing Coastal distance (km)

0.98

2.88

#### <u>Drainage Catchments H & I, Tier 2, Treatment Train 1</u>

# Summary of predictions Prediction of impact



Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

	Step2												
	Step3												
DETA	ILED RESULTS	,											
DEIA	ILLD RESOLIS												
	In Runoff	Step 1			Step 1								
			Copper	Zinc		Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
		i	RS							icity Threshold			
	Allowable Exceedances/year		1 00.00	56,70		83.80	112.10	2,20	1	1	1	1	1 91.00
	No. of exceedances/year		<b>63.00</b> 81	56.70 64		97	112.10	7	<b>48.30</b> 59	111.00 127	48.30	23.00	91.00 101
Г	No. of exceedances/worst year	Į.	81	64		97	128	/	59	127	59	32	101
			DO	ST6									
	Allowable Exceedances/year	1	1	1									
	No. of exceedances/year		18.00	20.60									
1	No. of exceedances/worst year		24	27									
			(ug/l)	(ug/l)		(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
	Thresholds	RST24			Toxicity		315	3.5	16770	875	2355	245	515
		RST6	21	60	Threshold								
	Thresholds	RS16	42	120									
	Event Statistics Mean	1	23.36	67.70		331	1165	1	16068	2780	2667	170	752
	90%ile		45.65	147.58		733	2672	2	35481	6138	5890	376	1661
	95%ile		54.99	194.62		962	3572	3	70795	12247	11752	750	3313
	99%ile		96.36	372.28		1383	5637	4	89125	15419	14795	945	4171
ln.	River (no mitigation)	Step 2			Step 2								
			Copper	Zinc									
		i	RS										
	Allowable Exceedances/year		2	2		M-1W-	0.04	l /.	T 0	to consider the co	-laulatian		
	No. of exceedances/year		2	<b>2.1</b> 5		Velocity	0.21	m/s	Her 2	is used for the c	aiculation		
r	No. of exceedances/worst year		0.5	1.1		DI	-	1					
No.	of exceedances/worst summer		2	5		ы		J					
NO. C	or exceedances, worst summer			3					1				

In River (no mitigation)	Step 2	Step 2
	Copper Zinc RST24	
Allowable Exceedances/year	2 2	1
No. of exceedances/year	1 2.1	Velocity 0.21 m/s Tier 2 is used for the calculation
No. of exceedances/worst year	2 5	The 2 is used for the calculation
No. of exceedances/summer	0.5 1.1	DI -
No. of exceedances/worst summer	2 5	<u> </u>
		% settlement needed - %
	RST6	
Allowable Exceedances/year	1 1	
No. of exceedances/year	0 0.5	
No. of exceedances/worst year	0 2	
No. of exceedances/summer	0 0.2	1
No. of exceedances/worst summer	0 2	I
Annual average concentration (ug/l)	0.64 1.93	1
Aiman average concentration (ug/1)	0.04 1.55	1
	(ug/l) (ug/l)	
Thresholds	RST24 21 60	
Thresholds	RST6 42 120	
Event Statistics Mean	1.75 5.31	
90%ile	5.24 12.82	
95%ile	9.07 24.30	
99%ile	17.63 73.73	I
In Diver (with mitingtion)		
In River (with mitigation)	Step 3	

	_	(ug/I)	(ug/i)				
Thresholds	RST24	21	60				
Thresholds	RST6	42	120				
	_						
Event Statistics Mean		1.75	5.31				
90%ile		5.24	12.82				
95%ile		9.07	24.30				
99%ile	L	17.63	73.73				
In River (with mitigation)	Step 3						
		Copper	Zinc				
		RS	T24				
Allowable Exceedances/year		2	2				
No. of exceedances/year		0.10	0.30				
No. of exceedances/worst year		1	1				
No. of exceedances/summer		0	0.1	DI	-		
No. of exceedances/worst summer	L	0	1				
			ST6				
Allowable Exceedances/year		1	1				
No. of exceedances/year		0.00	0.00				
No. of exceedances/worst year		0	0				
No. of exceedances/summer		0	0				
No. of exceedances/worst summer	L	0	0				
A	F	0.39	1.21				
Annual average concentration (ug/l)	L	0.39	1.21				
		(ug/l)	(ug/l)				
Thresholds hresholds	RST24	(ug/i) 21	(ug/i) 60				
Thresholds	RST6	42	120				
Thresholds	KSIO	42	120				

SAAR (mm)	1343.9
, ,	
Altitude (m)	130
Easting	2704
Northing	7389
Coastal distance (km)	58

Event Statistics Mean 90%ile 95%ile 99%ile

#### **Drainage Catchments J & K**

#### **Summary of predictions**

In Runoff

## Prediction of impact



#### Sediment - Chronic Impact

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### DETAILED RESULTS

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

No. of exceedances/worst year

Event Statistics

Thresholds

Soluble - Acute Impact					
Copper	Zinc				

			- 11	
	Zinc			
4				
	1			
		_		

RST6					
1	1				
18.00	20.60				
24	27				

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	23.36	67.70

Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1

Toxicity Threshold	197	315	3.5	16770	875	2355	245	515

Tier 1 is used for the calculation

#### In River (no mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Zinc
Γ24
2
2.6
5
1.3

RST6		
1	1	
0.2	0.8	
1	2	
0	0.4	
0	2	

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	2.23	6.73
	6.85	17.03
	11.21	30.52

Ste	

T24				
	2	1		
	2.6	V	elocity	
	5		_	
	1.3	D	ol .	
	5		_	
		•/	settlement ne	

1	1
0.2	0.8
1	2
0	0.4
0	2
·	
0.87	2.54

	(ug/i)	(ug/1)
T24	21	60
ST6	42	120
	2.23	6.73
	6.85	17.03
	11.21	30.52
	21.21	93.75

In River	(with I	mitigation)
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Allowable Exceedances/year No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

> Northing Coastal distance (km)

Step 3	
	Copper

RST24		
2	2	
0.30	0.50	
1	3	
0	0.1	
0	1	

RST6					
1	1				
0.00	0.10				
0	1				
0	0				
0	0				

0.52 1.67

11.09 38.66

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	1.20	3.48
	3.55	8.98
	5.35	16.71

DI

Details of the chosen rainfall site SAAR (mm) 1343.9 130 2704 7389 Altitude (m) Easting

#### Drainage Catchments L, V & M

#### Summary of predictions

In Runoff

## Prediction of impact Step1 Step2 Step3



Sediment - Chronic Impact	ent - Chronic Impact
---------------------------	----------------------

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### DETAILED RESULTS

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Th	resholds
tatistics	Mean
	90%ile
	95%ile

Step 1		
	Copper	Zinc T24
	1	1
	63.00	56.70
	81	64

RST6						
1	1					
18.00	20.60					
24	27					

RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

	Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
Г	1	1	1	1	1	1	1	1
	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
Г	97	128	7	59	127	59	32	101
_								

	(mg/ng)	(mg/ng)	(mg/ng)	(ug/ng)	(ug/ng)	(ug/ng)	(ug/ng)	(ug/ng)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

(ug/kg)

(ug/kg)

(ug/kg)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS*	Γ24
2	2
1.2	2.2
3	5
0.6	1.2
_	-

RST6		
1	1	
0	0.6	
0	2	
0	0.3	
0	2	

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	1.86	5.65
	5.62	13.82
	9.65	26.06

18.65

Velocity	0.39	m/
DI	-	
		_

% settlement needed - 9

(mg/kg)

Tier i is used for the calculation	Tier 1	is used for the calculation	
------------------------------------	--------	-----------------------------	--

In River	(with m	itigation)
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Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Step 3		
	Copper	Zinc
	RST	24

2	2	
0.10	0.20	
1	1	
0	0	
0	0	

RST6		
1	1	
0.00	0.00	
0	0	
0	0	
0	0	

0.45 1.46

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.85	2.39
	2.38	6.36

\_\_\_

Details of the chosen rainfall site

#### Drainage Catchments P & Q, Tier 1, Treatment Train 1

#### Summary of predictions Soluble - Acute Impact Sediment - Chronic Impact Copper Zinc Total PAH Pyrene Anthracene Prediction of impact **DETAILED RESULTS** In Runoff Step 1 Step 1 Copper Zinc Copper Zinc Cadmium Total PAH Anthracene Phenanthrene Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year Allowable Exceedances/yea No. of exceedances/worst year (ug/l) (ug/kg) (ug/kg) (mg/kg) (ug/kg) (ug/kg) (ug/kg) RST24 Thresholds Thresholds RST6 Event Statistics 23.36 67.70 331 1165 16068 2780 2667 170 752 90%ile 95%ile 35481 70795 6138 12247 96.36 372.28 1383 89125 15419 4171 In River (no mitigation) Step 2 Coppe Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer **0.06** m/s Tier 1 is used for the calculation 77 % Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer Annual average concentration (ug/l) (ug/l) Thresholds Thresholds RST24 Event Statistics Mean 90%ile 95%ile 12.18 34.15 105.58 In River (with mitigation) Step 3 Zinc Allowable Exceedances/vea No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer 103.10 DI No. of exceedances/worst summer Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/worst summer Annual average concentration (ug/l) 0.70 2.29 (ug/l) Thresholds hresholds RST24 Thresholds Event Statistics 1.00 2.77 90%ile

Details of the chosen ra	infall site
SAAR (mm)	
Altitude (m)	

1343.9 130 2704 7389 Easting Northing Coastal distance (km)

#### Drainage Catchments P & Q, Tier 2, Treatment Train 1

s	Summary of	predictio	ns	Soluble - Acute Impact Copper Zinc		Copper	Zinc	Cadmium	Sediment - C	Chronic Impa	ct Fluoranthene	Anthracene	Phenanthrene
Prediction	of impact	Step1											
		Step2											
DETAIL	LED RESU	Step3											
	li	n Runoff	Step 1	,	Step 1								
		ritunion	Giep i	Copper Zinc	Step 1	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
	Allowable Excee	dances broom		RST24	7	1	1 1	1 1		city Threshold	1	Anunacene 1	1
	No. of exceed	dances/year		63.00 56.70		83.80	112.10 128	2.20	48.30	111.00 127	48.30	23.00	91.00 101
INC.	o. of exceedances	s/ worst year		81 64 RST6		97	120	7	59	127	59	32	101
	Allowable Excee			1 1 18.00 20.60	]								
No	No. of exceed o. of exceedances			24 27									
				(ug/l) (ug/l)	Tovicity	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
		Thresholds Thresholds	RST24 RST6	21 00	Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	Event Statistic		Noro	23.36 67.70	<u>.</u> 1	331	1165	1	16068	2780	2667	170	752
	Event otatisti	90%ile 95%ile		45.65 147.58 54.99 194.62		733 962	2672 3572	2	35481 70795	6138 12247	5890 11752	376 750	1661 3313
		99%ile		96.36 372.28	<u> </u>	1383	5637	4	89125	15419	14795	945	4171
In D	Pivor (no mi	tigation)	C4== 2		C4== 2								
III N	River (no mi	ugauon)	Step 2		Step 2								
	Allowable Excee	dances		Copper Zinc RST24 2 2	7								
	No. of exceed o. of exceedances	dances/year		2.1 2.9		Velocity	0.39	m/s	Tier 2	is used for the o	alculation		
	No. of exceedant	ces/summer		5 6 1.1 1.4		DI	-	]					
No. of	f exceedances/wo	orst summer		3 6		% settlement r	needed	_	%				
	Allowable Excee			RST6 1 1	]								
	No. of exceed o. of exceedances	s/worst year		0.3 0.9 1 2									
	No. of exceedances/wo			0 0.4 0 2									
Annual	average concent	ration (ug/l)		1.16 2.89	]								
		Thresholds	RST24	(ug/l) (ug/l)	7								
		Thresholds	RST6		1								
	Event Statistic	cs Mean 90%ile		2.51 7.49 7.42 18.99									
		95%ile 99%ile		12.18 34.15 23.65 105.58									
In Pix	ver (with mi		Step 3		_								
III IXIX	ver (with him	ilgation)	зієр з										
	All			Copper Zinc RST24	<b>-</b>								
	No. of exceed	dances/year		2 2 0.20 0.30									
	o. of exceedances No. of exceedances	ces/summer		1 2 0 0		DI	-	]					
No. of	f exceedances/wo	orst summer		0 0	_								
	Allowable Excee			RST6  1 1  0.00 0.00	1								
	No. of exceed o. of exceedances No. of exceedance	s/worst year		0.00 0.00 0 0									
	f exceedances/wo			0 0	1								
Annual	average concent	ration (ug/l)		0.70 2.29									
	Threshold	ds hresholds Thresholds	RST24 RST6		7								
	Event Statistic			1.00 2.77	<u>.</u> 1								
		90%ile 95%ile 99%ile		2.85 7.49 4.35 12.34 9.13 28.60									
Γ	Dotaile =	f the chosen	rainfall cit-		1								
	SAAR (m	m)	rairiiali Site	1343.9									
	Altitude ( Easting Northing			130 2704 7389									
		listance (km)		58									
<u>L</u>					_								

#### **Drainage Catchments T & U**

#### Summary of predictions

## Prediction of impact Step1 Step2 Step3

# Soluble - Acute Impact Copper Zinc

Sediment - Chronic Impact							
Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

#### DETAILED RESULTS

	No	. of	exc	eedan	ces/yea ces/yea orst yea

Allowable Exce	edanc	es/year
No. of excee	danc	es/year
No. of exceedance	es/wo	rst vear

Th	resholds
tatistics	Mean
	90%ile
	95%ile
	99%ile

OLIG			
In Runoff	Step 1		
		Copper	Zinc T24
ceedances/year	I	1	1 1
eedances/year		63.00	56.70

	1	1
	18.00	20.60
	24	27
_	(ug/l)	(ug/l)
RST24	24	60

RST6

	4.	00
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

, ,								
	Copper	Zinc	Cadmium	Total PAH Tox	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
	1	1	1	1	1	1	1	1
	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
	97	128	7	59	127	59	32	101

331 1165 1 16068 2780 2667 170	
	752
733 2672 2 35481 6138 5890 376	1661
962 3572 3 70795 12247 11752 750	3313
1383 5637 4 89125 15419 14795 945	4171

In River	(no mitigation)
III IZIVEI I	(110 milligation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst yea
No. of exceedances/summe
o. of exceedances/worst summe

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Step 3

Copper	Zinc
RS'	Γ24
1	1
4.3	4.5
8	10
2.3	2

RST6					
0.5	0.5				
0.5	1.6				
2	4				
0.1	0.8				
1	4				
1.55	4.16				

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	3.46	10.27
	10.22	26.47
	15.75	46.76
	20.20	422.25

Velocity	0.08	m/s
DI	447.50	
		_

% settlement needed	78	%

Tier	1	is used	for th	he	calcul	ation

	99%ile
In River (with m	nitigation)



Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds
Event Statistics Mean

Copper RST24		Zinc F24
	1	1
	0.00	0.00
	n	Λ

0	0
RS	ST6
0.5	0.5
0.00	0.00
0	0
0	0

1.22

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.71	2.02
	2.09	5.25

0.37

DI 26.85

Details of the chosen rainfall site

90%ile

 SAAR (mm)
 1343.9

 Altitude (m)
 130

 Easting
 2704

 Northing
 7389

 Coastal distance (km)
 58

#### **Drainage Catchments X & Y**

#### **Summary of predictions**

## Prediction of impact Step1 Step2 Step3

## Soluble - Acute Impact Copper Zinc

#### Sediment - Chronic Impact

	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
ı								
ı								
ŀ								

#### DETAILED RESULTS

,	Allowa	ble Exc	eedan	ces/y	eai
	No.	of exce	edano	ces/y	eaı

No. of exceedances/year No. of exceedances/year No. of exceedances/worst year

	Comorac
Thi	resholds
atistics	Mear

In Runoff

Step 1		
	Copper RS	Zinc T24
	1	1
	63.00	56.70
	81	64

RS16		
1	1	
18.00	20.60	
24	27	

RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58

Copper	Zinc	Cadmium	Total PAH	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1000			00105				

(ug/kg)

(ug/kg)

#### In River (no mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS'	Г24
1	1
0	0.2
0	2
0	0
0	0

RS16			
0.5	0.5		
0	0		
0	0		
0	0		
0	0		

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.46	1.50
	1.20	3.02
	2.41	6.01
	607	20.22

#### Stop 2

Velocity	0.26	m
DI	-	

% settlement needed - 9

#### Tier 1 is used for the calculation

In River	(with mit	tigation)
----------	-----------	-----------

Allowable Exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds
Thresholds

Event Statistics Mean 90%ile

Copper	Zinc T24
1	1
-	
-	-
-	-

RS	ST6
0.5	0.5
-	
-	-
-	-
-	-

	-	-
	6 M	6 · · · · #D
	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	-	-
	1	-
	-	-

DI

.

Details of the chosen rainfall site

A96 Dualling Inverness to Nairn (including Nairn Bypass)

DMRB Stage 3: Environmental Impact Assessment 
Environmental Statement - Technical Appendices

Water Quality Calculations



4 Accidental Spillage Risk Assessment – Calculation Tables

#### Spillage Risk Results

#### **Drainage Catchment A**

		Total A	nual Acci	dent Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)				
2036 Do Something Catchment A	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)	
Road within 100m of roundabout	0.08	3.09	57,250	5.5	0.00028410396	0.45	0.000127847	7822	0.013	
Road no junction	0.09	0.29	57,250	5.5	0.00002999641	0.45	1.34984E-05	74083	0.001	
Road within 100m of slip road	0.1	0.83	57,250	5.5	0.00009539089	0.45	4.29259E-05	23296	0.004	
Road within 100m of slip road	0.1	0.83	32,316	7.5	0.00007342602	0.45	3.30417E-05	30265	0.003	
Road no junction	0.04	0.29	32,316	7.5	0.00001026195	0.45	4.61788E-06	216550	0.000	
	Total for	Catchmen	t A		0.00049317924	0.45	0.000221931	4506	0.022	

#### Drainage Catchment B

		Total Annual Accident Probability (Pacc)					Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment B	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)	
Road no junction	0.51	0.29	32,316	7.5	0.00013083987	0.45	5.88779E-05	16984	0.006	
	Total for	Catchmen	t R		0.00013083987	0.45	5 88779F-05	1608/	0.006	

#### Drainage Catchment C

		Total A	nnual Acci	dent Prob	ability (Pacc)	Anı	nual Pollution I	ncident Probability	(Pinc)
2036 Do Something Catchment C	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Slip road	0.46	0.83	11,206	2.6	0.00004060218	0.45	1.8271E-05	54732	0.002
Slip road within 100m of roundabout	0.1	3.09	11,206	2.6	0.00003286033	0.45	1.47871E-05	67626	0.001
Roundabout	0.2	3.09	12,551	2.6	0.00007360936	0.45	3.31242E-05	30189	0.003
Slip road within 100m of roundabout	0.1	3.09	1,345	0.0	0.00000000000	0.45	0	0	0.000
Slip road	0.61	0.83	1,345	0.0	0.00000000000	0.45	0	0	0.000
Side road within 100m of roundabout	0.1	3.09	1,849	0.0	0.0000000000	0.45	0	0	0.000
Slip road	3.5	0.83	13,392	1.9	0.00026979607	0.45	0.000121408	8237	0.012
Slip road within 100m of roundabout	0.1	3.09	13,392	1.9	0.00002869776	0.45	1.2914E-05	77435	0.001
Roundabout	0.2	3.09	14,821	1.9	0.00006352029	0.45	2.85841E-05	34984	0.003
Slip road within 100m of roundabout	0.1	3.09	1,429	0.0	0.0000000000	0.45	0	0	0.000
Slip road	0.48	0.83	1,429	0.0	0.00000000000	0.45	0	0	0.000
	Total for	Catchmen	t C	-	0.00050908597	0.45	0.000229089	4365	0.023

Cumulative annual probability from catchments A, B and C = 0.051%

#### Drainage Catchment D

			nnual Acci	dent Prob	ability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment D	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	0.21	0.29	32,316	7.5	0.00005387524	0.45	2.42439E-05	41248	0.002
Road within 100m of slip road	0.1	0.83	32,316	7.5	0.00007342602	0.45	3.30417E-05	30265	0.003
Road within 100m of slip road	0.1	0.83	35,084	6.9	0.00007333883	0.45	3.30025E-05	30301	0.003
Road no junction	0.13	0.29	35,084	6.9	0.00003331173	0.45	1.49903E-05	66710	0.001
	Total for	Catchmen	t D		0.00023395183	0.45	0.000105278	9499	0.011

#### Drainage Catchment E

		Total Annual Accident Probability (Pacc)					Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment E	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)	
Road no junction	0.52	0.29	35,084	6.9	0.00013324694	0.45	5.99611E-05	16677	0.006	
	Total for	Catchmen	t E		0.00013324694	0.45	5.99611E-05	16677	0.006	

Cumulative annual probability from catchments D and E = 0.017%

#### Drainage Catchment F

		Total A	nual Acci	dent Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment F	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	1.46	0.29	35,084	6.9	0.00037411640	0.45	0.000168352	5940	0.017
Road within 100m of slip road	0.1	0.83	35,084	6.9	0.00007333883	0.45	3.30025E-05	30301	0.003
Road within 100m of slip road	0.1	0.83	22,336	6.2	0.00004195403	0.45	1.88793E-05	52968	0.002
Road no junction	0.52	0.29	22,336	6.2	0.00007622492	0.45	3.43012E-05	29153	0.003
	Total for	Catchmen	t F		0.00056563418	0.45	0.000254535	3929	0.025

#### Drainage Catchment G

			nnual Acci	dent Prob	ability (Pacc)	Anr	nual Pollution I	ncident Probability (	Pinc)
2036 Do Something Catchment G	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Slip road	0.52	0.83	6,544	8.2	0.00008452885	0.45	3.8038E-05	26290	0.004
Slip road within 100m of roundabout	0.1	3.09	6,544	8.2	0.00006051764	0.45	2.72329E-05	36720	0.003
Roundabout	0.2	3.09	8199	8.2	0.00015165477	0.45	6.82446E-05	14653	0.007
Slip road within 100m of roundabout	0.1	3.09	1,656	0.2	0.00000037345	0.45	1.68054E-07	5950455	0.000
Slip road	0.65	0.83	1,656	0.2	0.00000065203	0.45	2.93415E-07	3408138	0.000
Side road within 100m of roundabout	0.09	3.09	6,994	5.4	0.00003833598	0.45	1.72512E-05	57967	0.002
Roundabout	0.2	3.09	7,310	5.5	0.00009069042	0.45	4.08107E-05	24503	0.004
Slip road	0.49	0.83	6,208	5.5	0.00005068491	0.45	2.28082E-05	43844	0.002
Slip road within 100m of roundabout	0.1	3.09	6,208	5.5	0.00003850907	0.45	1.73291E-05	57706	0.002
Side road within 100m of roundabout	0.1	3.09	3,724	1.2	0.00000504032	0.45	2.26814E-06	440889	0.000
Side road	0.06	0.93	3,724	1.2	0.00000091019	0.45	4.09587E-07	2441484	0.000
Slip road within 100m of roundabout	0.1	3.09	1,102	0.0	0.00000000000	0.45	0	0	0.000
Slip road	0.57	0.83	1,102	0.0	0.00000000000	0.45	0	0	0.000
	Total for	Catchmen	t G		0.00052189764	0.45	0.000234854	4258	0.023

#### Drainage Catchment H

				ident Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment H	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	0.48	0.29	22,336	6.2	0.00007036146	0.45	3.16627E-05	31583	0.003
Road within 100m of slip road	0.1	0.83	22,336	6.2	0.00004195403	0.45	1.88793E-05	52968	0.002
Road within 100m of slip road	0.1	0.83	25,084	5.4	0.00004103596	0.45	1.84662E-05	54153	0.002
Road no junction	0.49	0.29	25,084	5.4	0.00007025554	0.45	3.1615E-05	31631	0.003
	Total for	Catchmen	t H		0.00022360698	0.45	0.000100623	9938	0.010

#### **Drainage Catchment I**

		Total Annual Accident Probability (Pacc)					Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment I	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)	
Road no junction	1.33	0.29	25,084	5.4	0.00019069360	0.45	8.58121E-05	11653	0.009	
	Total for	Catchmen	t I		0.00019069360	0.45	8.58121E-05	11653	0.009	

Cumulative annual probability from catchments H and I = 0.019

#### **Drainage Catchment J**

		Total A	nnual Acci	ident Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)				
2036 Do Something Catchment J	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)	
Road no junction	0.92	0.29	25,084	5.4	0.00013190835	0.45	5.93588E-05	16847	0.006	
	Total for	Catchmen	t J		0.00013190835	0.45	5.93588E-05	16847	0.006	

#### Drainage Catchment K

		Total A	nnual Acci	dent Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment K	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	0.83	0.29	25,084	5.4	0.00011900427	0.45	5.35519E-05	18673	0.005
	Total for	Catchmen	t K		0.00011900427	0.45	5.35519E-05	18673	0.005

Cumulative annual probability from catchments J and K = 0.011%

#### Drainage Catchment L

		Total A	nual Acci	dent Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment L	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	0.55	0.29	25,084	5.4	0.00007885825	0.45	3.54862E-05	28180	0.004
Road within 100m of slip road	0.1	0.83	25,084	5.4	0.00004103596	0.45	1.84662E-05	54153	0.002
Road within 100m of slip road	0.1	0.83	24,383	5.6	0.00004136642	0.45	1.86149E-05	53720	0.002
	Total for	Catchmen	t L		0.00016126063	0.45	7.25673E-05	13780	0.007

#### **Drainage Catchment V**

			nual Acci	dent Prob	ability (Pacc)	Anr	ual Pollution I	ncident Probability	Pinc)
2036 Do Something Catchment V	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	0.77	0.29	24,383	5.6	0.00011129062	0.45	5.00808E-05	19968	0.005
Road within 100m of slip road	0.1	0.83	24,383	5.6	0.00004136642	0.45	1.86149E-05	53720	0.002
Slip road	0.45	0.83	481	0.0	0.00000000000	0.45	0	0	0.000
Slip road within 100m of roundabout	0.1	3.09	481	0.0	0.00000000000	0.45	0	0	0.000
Roundabout	0.14	3.09	1,193	1.6	0.00000301398	0.45	1.35629E-06	737306	0.000
Side road within 100m of roundabout	0.16	3.09	333	8.7	0.00000523198	0.45	2.35439E-06	424738	0.000
Roundabout	0.14	3.09	833	1.2	0.00000157836	0.45	7.10261E-07	1407933	0.000
Slip road	0.55	0.83	217	0.0	0.00000000000	0.45	0	0	0.000
Slip road within 100m of roundabout	0.1	3.09	217	0.0	0.00000000000	0.45	0	0	0.000
	Total for	Catchmen	t V		0.00016248136	0.45	7.31166E-05	13677	0.007

#### Drainage Catchment M

				ident Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment M	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road within 100m of slip road	0.1	0.83	25,718	5.4	0.00004207305	0.45	1.89329E-05	52818	0.002
Road no junction	1.8	0.29	25,718	5.4	0.00026460401	0.45	0.000119072	8398	0.012
Slip road within 100m of roundabout	0.1	3.09	712	1.6	0.00000128496	0.45	5.78234E-07	1729404	0.000
Slip road	0.5	0.83	712	1.6	0.00000172576	0.45	7.76592E-07	1287677	0.000
Slip road within 100m of roundabout	0.1	3.09	616	1.2	0.00000083371	0.45	3.75168E-07	2665472	0.000
Slip road	0.51	0.83	616	1.2	0.00000114210	0.45	5.13944E-07	1945738	0.000
	Total for	Catchmen	t M		0.00031166359	0.45	0.000140249	7130	0.014

Cumulative annual probability from catchments L, V and M = 0.029%

#### Drainage Catchment N

			nnual Acci	ident Prob	pability (Pacc)	Anı	nual Pollution I	ncident Probability	(Pinc)
2036 Do Something Catchment N	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	0.68	0.29	25,718	5.4	0.00009996152	0.45	4.49827E-05	22231	0.004
Road within 100m of slip road	0.1	0.83	25,718	5.4	0.00004207305	0.45	1.89329E-05	52818	0.002
Road within 100m of slip road	0.1	0.83	23,813	5.8	0.00004184226	0.45	1.8829E-05	53110	0.002
Road no junction	0.48	0.29	23,813	5.8	0.00007017401	0.45	3.15783E-05	31667	0.003
Road within 100m of slip road	0.1	0.83	23,813	5.8	0.00004184226	0.45	1.8829E-05	53110	0.002
Road within 100m of slip road	0.1	0.83	26,656	5.4	0.00004360750	0.45	1.96234E-05	50960	0.002
Road no junction	0.39	0.29	26,656	5.4	0.00005942179	0.45	2.67398E-05	37397	0.003
Slip road	0.41	0.83	863	0.0	0.00000000000	0.45	0	0	0.000
Slip road within 100m of side road	0.1	0.93	863	0.0	0.00000000000	0.45	0	0	0.000
Side road	0.3	0.93	1,683	4.0	0.00000685351	0.45	3.08408E-06	324246	0.000
Slip road within 100m of side road	0.1	0.93	1,541	1.8	0.00000094157	0.45	4.23705E-07	2360133	0.000
Slip road	0.54	0.83	1,541	1.8	0.00000453774	0.45	2.04198E-06	489720	0.000
Slip road	0.53	0.83	1,035	0.0	0.0000000000	0.45	0	0	0.000
Slip road within 100m of side road	0.1	0.93	1,035	0.0	0.00000000000	0.45	0	0	0.000
Slip road within 100m of side road	0.1	0.93	1,297	2.5	0.00000110107	0.45	4.9548E-07	2018243	0.000
Slip road	0.42	0.83	1,297	2.5	0.00000412723	0.45	1.85725E-06	538430	0.000
·	Total for	Catchmen	t N		0.00041648349	0.45	0.000187418	5336	0.019

#### Drainage Catchment O

		Total A	nnual Acc	ident Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment O	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	1.45	0.29	26,656	5.4	0.00022092715	0.45	9.94172E-05	10059	0.010
	Total for	Catchmer	nt O		0.00022092715	0.45	9 94172F-05	10059	0.010

#### Drainage Catchment P

		Total A	nnual Acc	ident Prob	pability (Pacc)	Anı	nual Pollution I	ncident Probability (	Pinc)
2036 Do Something Catchment P	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	0.7	0.29	26,656	5.4	0.00010665449	0.45	4.79945E-05	20836	0.005
	Total for	Catchmen	ıt P		0.00010665449	0.45	4.79945E-05	20836	0.005

#### Drainage Catchment Q

		Total A	nnual Acci	dent Prob	ability (Pacc)	Anı	nual Pollution I	ncident Probability	(Pinc)
2036 Do Something Catchment Q	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	0.37	0.29	26,656	5.4	0.00005637451	0.45	2.53685E-05	39419	0.003
Road within 100m of slip road	0.1	0.83	26,656	5.4	0.00004360750	0.45	1.96234E-05	50960	0.002
Road within 100m of slip road	0.1	0.83	15,756	6.5	0.00003102568	0.45	1.39616E-05	71625	0.001
Road no junction	0.39	0.29	15,756	6.5	0.00004227716	0.45	1.90247E-05	52563	0.002
Road within 100m of slip road	0.1	0.83	15,756	6.5	0.00003102568	0.45	1.39616E-05	71625	0.001
Road within 100m of slip road	0.1	0.83	15,939	6.4	0.00003090371	0.45	1.39067E-05	71908	0.001
Road no junction	1.1	0.29	15,939	6.4	0.00011877451	0.45	5.34485E-05	18710	0.005
Slip road	0.43	0.83	5,394	5.7	0.00004004909	0.45	1.80221E-05	55487	0.002
Slip road within 100m of roundabout	0.1	3.09	5,394	5.7	0.00003467405	0.45	1.56033E-05	64089	0.002
Roundabout	0.16	3.09	5,447	5.7	0.00005602780	0.45	2.52125E-05	39663	0.003
Slip road within 100m of roundabout	0.1	3.09	53	0.0	0.00000000000	0.45	0	0	0.000
Slip road	0.5	0.83	53	0.0	0.00000000000	0.45	0	0	0.000
Slip road	0.81	0.83	5,505	1.8	0.00002431737	0.45	1.09428E-05	91384	0.001
Slip road within 100m of roundabout	0.1	3.09	5,505	1.8	0.00001117666	0.45	5.0295E-06	198827	0.001
Slip road within 100m of roundabout	0.1	3.09	138	0.0	0.00000000000	0.45	0	0	0.000
Slip road	0.68	0.83	138	0.0	0.00000000000	0.45	0	0	0.000
	Total for	Catchmen	t Q	-	0.00052023372	0.45	0.000234105	4272	0.023

Cumulative annual probability from catchments P and Q = 0.028%

#### Drainage Catchment R

			nnual Acci	ident Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)				
2036 Do Something Catchment R	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)	
Road no junction	1.27	0.29	15,939	6.4	0.00013713058	0.45	6.17088E-05	16205	0.006	
Side road	0.93	0.93	237	4.9	0.00000366116	0.45	1.64752E-06	606973	0.000	
	Total for	Catchmen	t R		0.00014079173	0.45	6.33563E-05	15784	0.006	

#### **Drainage Catchment S**

		Total A	nnual Acci	ident Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)				
2036 Do Something Catchment S	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)	
Road no junction	1.88	0.29	15,939	6.4	0.00020299644	0.45	9.13484E-05	10947	0.009	
	Total for	Catchmen	t S		0.00020299644	0.45	9.13484E-05	10947	0.009	

#### Drainage Catchment T

		Total A	nnual Acci	dent Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment T	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	1.03	0.29	15,939	6.4	0.00011121614	0.45	5.00473E-05	19981	0.005
	Total for	Catchmer	nt T		0.00011121614	0.45	5 00473F-05	19981	0.005

#### Drainage Catchment U

				ident Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment U	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	1.31	0.29	15,939	6.4	0.00014144965	0.45	6.36523E-05	15710	0.006
Road no junction	0.48	0.29	15,939	6.4	0.00005182888	0.45	2.3323E-05	42876	0.002
Road within 100m of slip road	0.1	0.83	15,939	6.4	0.00003090371	0.45	1.39067E-05	71908	0.001
Road within 100m of slip road	0.1	0.83	11,212	8.7	0.00002955228	0.45	1.32985E-05	75196	0.001
Road no junction	0.54	0.29	11,212	8.7	0.00005575768	0.45	2.5091E-05	39855	0.003
Total for Catchment U				0.00030949220	0.45	0.000139271	7180	0.014	

Cumulative annual probability from catchments T and U = 0.019%

#### Drainage Catchment W

			nnual Acci	ident Prob	pability (Pacc)	Anr	nual Pollution I	ncident Probability	(Pinc)
Catchment W Road Length		Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Slip road	0.5	0.83	2,679	0.1	0.00000040579	0.45	1.82607E-07	5476239	0.000
Slip road within 100m of roundabout	0.1	3.09	2,679	0.1	0.00000030215	0.45	1.35965E-07	7354819	0.000
Roundabout	0.17	3.09	4,770	0.9	0.00000823116	0.45	3.70402E-06	269977	0.000
Slip road within 100m of roundabout	0.47	3.09	2,091	0.9	0.00000997604	0.45	4.48922E-06	222756	0.000
Slip road	0.1	0.83	2,091	0.9	0.00000057014	0.45	2.56562E-07	3897694	0.000
Side road within 100m of roundabout	0.21	3.09	2,017	0.7	0.00000334467	0.45	1.5051E-06	664407	0.000
Slip road	0.54	0.83	2,055	0.2	0.00000067247	0.45	3.02612E-07	3304565	0.000
Slip road within 100m of roundabout	0.1	3.09	2,055	0.2	0.00000046362	0.45	2.08628E-07	4793223	0.000
Roundabout	0.17	3.09	4,137	0.2	0.00000158641	0.45	7.13885E-07	1400786	0.000
Slip road within 100m of roundabout	0.1	3.09	2,082	0.2	0.00000046965	0.45	2.11341E-07	4731682	0.000
Slip road	0.13	0.83	2,082	0.2	0.00000016400	0.45	7.37985E-08	13550415	0.000
	Total for	Catchmen	t W		0.00002618609	0.45	1.17837E-05	84863	0.001

#### Drainage Catchment X

			nual Acci	ident Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment X	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	0.23	0.29	11,212	8.7	0.00002374864	0.45	1.06869E-05	93573	0.001
Road within 100m of slip road	0.1	0.83	11,212	8.7	0.00002955228	0.45	1.32985E-05	75196	0.001
Road within 100m of slip road	0.1	0.83	15,377	6.4	0.00002981508	0.45	1.34168E-05	74533	0.001
Road no junction	0.36	0.29	15,377	6.4	0.00003750234	0.45	1.68761E-05	59256	0.002
Slip road	0.29	0.83	2,082	0.2	0.00000036584	0.45	1.64627E-07	6074324	0.000
	Total for	Total for Catchment X			0.00012098419	0.45	5.44429E-05	18368	0.005

#### Drainage Catchment Y

		Total A	nnual Acci	dent Prob	ability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment Y	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	1.44	0.29	15,377	6.4	0.00015000937	0.45	6.75042E-05	14814	0.007
	Total for	Catchmen	t Y		0.00015000937	0.45	6.75042E-05	14814	0.007

Cumulative annual probability from catchments W, X and Y = 0.013%

#### **Drainage Catchment Z**

		Total A	nnual Acci	dent Prob	pability (Pacc)	Annual Pollution Incident Probability (Pinc)			
2036 Do Something Catchment Z	Road Length (km)	Serious Spillage Risk Factor	Two-way AADT	%HGV	Annual Probability (Pacc)	Probability Factor (Ppol)	Probability	Return Period (years)	Percentage Probability (%)
Road no junction	2.6	0.29	15,377	6.4	0.00027085026	0.45	0.000121883	8205	0.012
	Total for	Catchmen	t Z		0.00027085026	0.45	0.000121883	8205	0.012

A96 Dualling Inverness to Nairn (including Nairn Bypass)

DMRB Stage 3: Environmental Impact Assessment Environmental Statement - Technical Appendices

Water Quality Calculations



5 Routine Runoff Assessment (Do Minimum) – HAWRAT Output Sheets (User Parameters and Results)

#### **Routine Runoff Parameters (Individual Assessments)**

#### **Drainage Catchment 1**

Existing A96		Assessment type		Non-cumulative assessment (single or			
		Assessment type					
Easting		Receiving watercourse		SWF 02			
Northing	Northing EA receiving water Detailed River Network ID						
Easting	Easting Assessor and affiliation			Jane Huxtable, Ja	cobs		
Northing		Date of assessment		10/07/2016			
1		Version of assessment		1			
DM 2036: Rou	DM 2036: Routine Runoff Assessment for Catchment 1						
	Northing Easting Northing	Easting Northing Easting Northing 1	Assessment type  Easting Receiving watercourse  Northing EA receiving water Detailed Riv.  Easting Assessor and affiliation  Northing Date of assessment	Assessment type  Easting Receiving watercourse Northing EA receiving water Detailed River Network ID  Easting Assessor and affiliation Northing Date of assessment  Version of assessment	Assessment type	Assessment type	

Parameter	Units	Default Value	Value used	Notes (En	ter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.011		
Baseflow Index	-	0.5	0.5		
Impermeable road area drained	ha	1	0.3		
Permeable area draining to outfall	ha	1	0.04		
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			NO		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	0.7		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	0	description for	
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed	
Proposed settlement of sediments	%	0	0	measures	

#### **Drainage Catchment 2**

Road Number	Existing A96		Assessment type		Non-cumulative assessment (single outfa		
HA Area/DBFO number			Addeddinent type				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 03		
O3 grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting A		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (m)	Northing		Date of assessment		10/07/2016		
Outfall number	2		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 2						

Parameter	Units	Default Value	Value used	Notes (En	ter notes in the left-hand cells only)
Runoff Risk Assessments				•	
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.011		
Baseflow Index	-	0.5	0.5		
Impermeable road area drained	ha	1	0.99		
Permeable area draining to outfall	ha	1	0.12		
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes		
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	V		
the velocity within 100m of the point of discharge?			Yes		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	1.5		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	l/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	0	description for	
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed	
Proposed settlement of sediments	%	0	0	measures	

#### **Drainage Catchment 3**

Road Number	Existing A96		Assessment type		Non-cumulative assessment (single outfa		
HA Area/DBFO number			Assessment type				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 06		
OS grid reference of assessment point (iii)	Northing	orthing EA receiving water Detailed River Network ID					
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Ja	acobs	
OS grid reference of outrail structure (iii)	Northing		Date of assessment		10/07/2016		
Outfall number	3		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 3						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.01	
Baseflow Index	-	0.5	0.5	
Impermeable road area drained	ha	1	1.06	
Permeable area draining to outfall	ha	1	0.13	
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes	
the velocity within 100m of the point of discharge?			res	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	1.2	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

#### **Drainage Catchment 5**

Road Number	Existing A96		Assessment type		Non-cumulative assessment (single outf		
HA Area/DBFO number	[*		Assessment type				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 08		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of oddian structure (III)	Northing		Date of assessment		10/07/2016		
Outfall number	5		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Rou	itine Runoff Assessment for Ca	tchment 5				

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.003	
Baseflow Index		0.5	0.5	
Impermeable road area drained	ha	1	0.66	
Permeable area draining to outfall	ha	1	0.08	
Is the discharge in or within 1 km upstream of a protected site for	-	No	No	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	No	
the velocity within 100m of the point of discharge?			NO	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	0.4	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

Road Number	Existing A96	Assessment type			Non-cumulative assessment (single outfa		
HA Area/DBFO number			Assessment type				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 09		
O3 grid reference of assessment point (iii)	Northing	orthing EA receiving water Detailed Rive		er Network ID			
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outlain structure (iii)	Northing		Date of assessment		10/07/2016		
Outfall number	6		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 6						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.006	
Baseflow Index	ı	0.5	0.5	
Impermeable road area drained	ha	1	1.75	
Permeable area draining to outfall	ha	1	0.22	
Is the discharge in or within 1 km upstream of a protected site for	-	No	No	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	No	
the velocity within 100m of the point of discharge?			NO	
Hardness		Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1		TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	2	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

Road Number	Existing A96		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number			Assessment type				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 13		
O3 grid reference of assessment point (iii)	Northing EA receiving water Detailed River Network ID						
OS grid reference of outfall structure (m)	Easting A		Assessor and affiliation		Jane Huxtable, Jacobs		
O3 grid reference of outrail structure (III)	Northing		Date of assessment		10/07/2016		
Outfall number	9		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 9						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.002	
Baseflow Index	ı	0.5	0.5	
Impermeable road area drained	ha	1	1.01	
Permeable area draining to outfall	ha	1	0.12	
Is the discharge in or within 1 km upstream of a protected site for	-	No	No	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	No	
the velocity within 100m of the point of discharge?			NO	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1		TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	0.7	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

Road Number	Existing A96	Assessment type		Non-cumulative assessment (single outfall)			
HA Area/DBFO number			Assessment type				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 14		
O3 grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting A		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outlain structure (iii)	Northing		Date of assessment		10/07/2016		
Outfall number	10		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 10						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.002	
Baseflow Index	-	0.5	0.5	
Impermeable road area drained	ha	1	0.52	
Permeable area draining to outfall	ha	1	0.06	
Is the discharge in or within 1 km upstream of a protected site for	-	No	No	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	No	
the velocity within 100m of the point of discharge?			NO	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	1	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

Road Number	Existing A96		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number			Assessment type				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 16		
O3 grid reference of assessment point (iii)	Northing EA receiving water Detailed River Network ID						
OS grid reference of outfall structure (m)	Easting /		Assessor and affiliation		Jane Huxtable, Jacobs		
O3 grid reference of outrail structure (III)	Northing		Date of assessment		10/07/2016		
Outfall number	12		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 12				•		

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.008	
Baseflow Index	-	0.5	0.5	
Impermeable road area drained	ha	1	1.09	
Permeable area draining to outfall	ha	1	0.13	
Is the discharge in or within 1 km upstream of a protected site for	-	No	No	
conservation?				
s there a downstream structure, lake, pond or canal that reduces	-	No	No	
the velocity within 100m of the point of discharge?			NO	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Jse Tier 1	-	TRUE	TRUE	
Jse Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	0.4	
Tier2 Bed width	m	3	3	
Fier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Fier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

Road Number	Existing A96		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number							
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 18		
O3 grid reference of assessment point (iii)	Northing	orthing EA receiving water Detailed River		er Network ID			
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outrail structure (III)	Northing		Date of assessment		10/07/2016		
Outfall number	13		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 13						

Parameter	Units	Default Value	Value used	Notes (E	nter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.002		
Baseflow Index	-	0.5	0.5		
Impermeable road area drained	ha	1	1.63		
Permeable area draining to outfall	ha	1	0.2		
Is the discharge in or within 1 km upstream of a protected site for	-	No	No		
conservation?					
Is there a downstream structure, lake, pond or canal that reduces	-	No	No		
the velocity within 100m of the point of discharge?			NO		
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	1.2		
Tier2 Bed width	m	3	3		
Tier2 Side slope	m/m	0.5	0.5		
Tier2 Long slope	m/m	0.0001	0.0001		
Tier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	7	description for	Filter drains
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed	
Proposed settlement of sediments	%	0	38	measures	

Road Number	Existing A96		Assessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number			Assessment type				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 19		
O3 grid reference of assessment point (iii)	Northing	Northing EA receiving water Detailed River Network ID					
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outlant structure (III)	Northing		Date of assessment		10/07/2016		
Outfall number	15		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 15						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.005	
Baseflow Index		0.5	0.5	
Impermeable road area drained	ha	1	1.34	
Permeable area draining to outfall	ha	1	0.17	
Is the discharge in or within 1 km upstream of a protected site for	-	No	No	
conservation?				
s there a downstream structure, lake, pond or canal that reduces	-	No	No	
the velocity within 100m of the point of discharge?			NO	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Jse Tier 1	-	TRUE	TRUE	
Jse Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	0.8	
Tier2 Bed width	m	3	3	
Fier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Fier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

### **Drainage Catchment 16A**

Road Number	Existing A96		Accessment type		Non-cumulative assessment (single outfall)		
HA Area/DBFO number			Assessment type				
OS grid reference of assessment point (m)	Easting	g Receiving watercourse S		SWF 26			
O3 grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
O3 grid reference of outrail structure (III)	Northing Date of assessment			10/07/2016			
Outfall number	16A		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 16A						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.038	
Baseflow Index	-	0.5	0.5	
Impermeable road area drained	ha	1	0.43	
Permeable area draining to outfall	ha	1	0.05	
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes	
the velocity within 100m of the point of discharge?			res	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	1	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	l/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

Road Number	Existing A96	ting A96		Non-cumulative assessment (single outfa			
HA Area/DBFO number			Assessment type				
OS grid reference of assessment point (m)	Easting		Receiving watercourse		SWF 26		
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outlan structure (III)	Northing		Date of assessment		10/07/2016		
Outfall number	16		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 16						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				•
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.038	
Baseflow Index	ı	0.5	0.5	
Impermeable road area drained	ha	1	0.8	
Permeable area draining to outfall	ha	1	0.1	
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes	
the velocity within 100m of the point of discharge?			ies	
Hardness		Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	1	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

Road Number	Existing A96	Assessment type		Non-cumulative assessment (single outfal		e outfall)	
HA Area/DBFO number			Assessment type				
OS grid reference of assessment point (m)	Easting	g Receiving watercourse S		SWF 26			
O3 grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outlain structure (III)	Northing		Date of assessment		10/07/2016		
Outfall number	17		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 17						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.02	
Baseflow Index	-	0.5	0.5	
Impermeable road area drained	ha	1	0.98	
Permeable area draining to outfall	ha	1	0.12	
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	Yes	
the velocity within 100m of the point of discharge?			res	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1	-	TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	1	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

### **Drainage Catchment 17B**

Road Number	Existing A96		Assessment type		Non-cumulative assessment (single outfall		
HA Area/DBFO number			Assessment type				
OS grid reference of assessment point (m)	Easting Receiving watercourse SI		SWF 31				
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
O3 grid reference of outrail structure (iii)	Northing		Date of assessment		10/07/2016		
Outfall number	17B		Version of assessment		1		
List of outfalls in cumulative assessment							
Notes	DM 2036: Routine Runoff Assessment for Catchment 17B						

Parameter	Units	Default Value	Value used	Notes (Enter notes in the left-hand cells only)
Runoff Risk Assessments				
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000	
Climatic Region	-	Warm Dry	Colder Wet	
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR	
			1343.9mm)	
95%ile River flow	m3/s	0	0.009	
Baseflow Index	ı	0.5	0.5	
Impermeable road area drained	ha	1	0.35	
Permeable area draining to outfall	ha	1	0.04	
Is the discharge in or within 1 km upstream of a protected site for	-	No	No	
conservation?				
Is there a downstream structure, lake, pond or canal that reduces	-	No	No	
the velocity within 100m of the point of discharge?			NO	
Hardness	-	Low = <50mg CaCO3/I	Low = <50mg CaCO3/I	
Use Tier 1		TRUE	TRUE	
Use Tier 2	-	FALSE	FALSE	
Tier 1 Estimated river width at Q95	0	5	1	
Tier2 Bed width	m	3	3	
Tier2 Side slope	m/m	0.5	0.5	
Tier2 Long slope	m/m	0.0001	0.0001	
Tier2 Mannings' n	-	0.07	0.07	
Existing treatment for solubles	%	0	0	description for
Existing attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	existing
Existing settlement of sediments	%	0	0	measures
Proposed treatment for solubles	%	0	0	description for
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed
Proposed settlement of sediments	%	0	0	measures

### **Routine Runoff Parameters (Cumulative Assessments)**

### **Drainage Catchments 16A & 16**

Road Number	Existing A96				Cumulative assessment including sediments		
HA Area/DBFO number			Addeddinent type		(outfalls within 100m)		
OS grid reference of assessment point (m)	Easting	asting Receiving watercourse SV		SWF 26			
OS grid reference of assessment point (iii)	Northing		EA receiving water Detailed River Network ID				
OS grid reference of outfall structure (m)	Easting		Assessor and affiliation		Jane Huxtable, Jacobs		
OS grid reference of outlan structure (iii)	Northing		Date of assessment		10/07/2016		
Outfall number	İ		Version of assessment		1		
List of outfalls in cumulative assessment	16A & 16						
Notes	DM 2036: Cumulative Routine Runoff Assessment for Catchments 16A and 16						

Parameter	Units	Default Value	Value used	Notes (Er	ter notes in the left-hand cells only)
Runoff Risk Assessments					
AADT	vpd	>10,000 and <50,000	>10,000 and <50,000		
Climatic Region	-	Warm Dry	Colder Wet		
Rainfall Site	-	Ashford (SAAR 710mm)	Ardtalnaig (SAAR		
			1343.9mm)		
95%ile River flow	m3/s	0	0.038		
Baseflow Index		0.5	0.5		
mpermeable road area drained	ha	1	1.23		
Permeable area draining to outfall	ha	1	0.15		-
Is the discharge in or within 1 km upstream of a protected site for	-	No	Yes		
conservation?					
s there a downstream structure, lake, pond or canal that reduces	-	No	.,		
the velocity within 100m of the point of discharge?			Yes		
Hardness	-	Low = <50mg CaCO3/l	Low = <50mg CaCO3/I		
Use Tier 1	-	TRUE	TRUE		
Use Tier 2	-	FALSE	FALSE		
Tier 1 Estimated river width at Q95	0	5	1		
Fier2 Bed width	m	3	3		
Fier2 Side slope	m/m	0.5	0.5		
Fier2 Long slope	m/m	0.0001	0.0001		
Fier2 Mannings' n	-	0.07	0.07		
Existing treatment for solubles	%	0	0	description for	
Existing attenuation -restricted discharge rate	l/s	Unlimited	Unlimited	existing	
Existing settlement of sediments	%	0	0	measures	
Proposed treatment for solubles	%	0	0	description for	
Proposed attenuation -restricted discharge rate	I/s	Unlimited	Unlimited	proposed	
Proposed settlement of sediments	%	0	0	measures	

### Routine Runoff Results - DM (Individual Assessments)

### **Drainage Catchment 1**

### Summary of predictions

Prediction of impact	Step1
	Step2
	Step3



Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

### **DETAILED RESULTS**

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Thresholds

Event Statistics Mean
90%ile

In Runoff	Step 1		
		Copper	Zinc
		RS	T24
ceedances/year		1	1
eedances/year		63.00	56.70
nces/worst year		81	64

KSI6		
1	1	
18.00	20.60	
24	27	

	(ug/i)	(ug/i)
RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
			Toxi	city Threshold			
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

snoia								
						•		
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

### In River (no mitigation)

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile 99%ile

Copper	ZINC
RS'	Γ24
1	1
0	0
0	0
0	0

	RS	16
	0.5	0.5
I	0	0
I	0	0
ſ	0	0
I	0	0
I	0.03	0.09

	(ua/l)	(ua/l)	
RST24		60	
RST6	42	120	
	0.10	0.33	

1.37

Velocity 0.17 m

% settlement needed - %

In River (with mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile 99%ile

Copper RS	Zinc T24
1	1
_	_

1	1
-	1
-	,
-	-
-	-

6.50

RST6					
0.5	0.5				
-					
-	-				
-	-				
-	-				
•	•				

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120

,	,
-	-
1	-
-	-

**\_** 

 Details of the chosen rainfall site
 SAAR (mm)
 1343.9

 Altitude (m)
 130

 Easting
 2704

 Northing
 7389

 Coastal distance (km)
 58

### Summary of predictions

In Runoff

### Prediction of impact

### Soluble - Acute Impact Copper Zinc

Sediment - Ch	ronic Impact
---------------	--------------

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

### DETAILED RESULTS

Allowable Exceedances/yea No. of exceedances/yea No. of exceedances/worst yea
Allowable Exceedances/yea

ep 1		
	Copper RS	Zinc T24
	1	1
	63.00	56.70
	81	64

Copper Zinc Cadmium Total PAH Pyrene Fluoranthene Anthracene Phe Toxicity Threshold								Phenanthrene
1 1 1 1 1 1 1 1 1 1							1	
83.80 112.10 2.20 48.30 111.00 48.30 23.00 91.00								91.00
[	97	128	7	59	127	59	32	101

Th	resholds
Th	resholds
Event Statistics	Mean
	90%ile

In River (no mitigation)

No. of exceedances/worst year

	(ug/l)	(ug/l)		
RST24	21	60		
RST6	42	120		
	23.36	67.70		

	(mg/ng)	(mg/kg)	(mg/kg)	(ug/ng)	(ug/ng)	(ug/ng)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	4202	5637		00435	45440	4.4705	0.45	4474

Allowable Exceedances/ye
No. of exceedances/ye
No. of exceedances/worst ye
No. of exceedances/summ
No. of exceedances/worst summ
Allowable Exceedances/ye
No of overedences has

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
lo. of exceedances/worst summer

Threshol
Threshol

Event Statistics

Step 3

Zinc
Γ24
1
0.1
1
0
0

RS16		
0.5	0.5	
0	0	
0	0	
0	0	
0	0	

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.29	0.94
	0.72	1.81
	1.44	3.79
	4.05	18 49

Velocity	0.05	m/s	Tier 1 is used for the calculation
DI	45.88		
% settlement	needed	0 %	

In	River	(with	mitigation)

Annual average concentration (ug/l)

Allowable Exceedances/year Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

Copper	Zinc
RS	Γ24
1	1
-	-
-	-
-	-
-	-

RST6		
0.5	0.5	
1		
-	-	
-	-	
-	-	

	-	-
	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	-	-
	-	-
	-	-

DI	-

Details of the chosen rainfall site SAAR (mm)

1343.9 130 2704 7389 Altitude (m)
Easting
Northing Coastal distance (km)

### **Summary of predictions**

### Prediction of impact

### Soluble - Acute Impact Copper Zinc

Sediment - Chronic Impact							
Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene		

### DETAILED RESULTS

In Runoff
Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year
Allowable Exceedances/year

No. of exceedances/worst year

Step 1			Step	1
	Copper	Zinc 24		Coppe
	1	1	٦	1
	63.00	56.70	<u>-</u>	83.80
	81	64	1	97
			_	

Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101
•							

	icariolas
Th	resholds
Statistics	Mean
	90%ile
	95%ile

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58

	(mg/ng)	(mg/kg)	(mg/kg)	(ug/ng)	(ug/kg)	(ug/ng)	(ug/ng)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1202	FC27	4	90135	15410	14705	045	4171

In	River	(no	mitig	ation

Even

Allowable Exceedances/yea
No. of exceedances/yea
No. of exceedances/worst year
No. of exceedances/summe
lo. of exceedances/worst summe

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS <sup>*</sup>	Γ24
1	1
0	0.1
0	1
0	0
0	0

RS	016
0.5	0.5
0	0
0	0
0	0
0	0
•	•
0.10	0.33

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.34	1.11
	0.86	2.16
	1.71	4.42
	4.56	21 10

Velocity	0.06	m/s		Tier 1 is used for the calculation
DI	39.80			
% settlement	needed	0	%	

In River	with	mitig	ation)

Allowable Exceedances/year Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds Event Statistics

	Copper	Zinc
_	RS'	124
Г	1	1
Г	-	-
Г	-	-
Г	-	-
Е	-	-

RST6					
0.5	0.5				
-	-				
-	-				
-	-				

	-	-
•	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	-	-
	-	-
	-	-

	_	
DI		

Details of the chosen rainfall site SAAR (mm)

90%ile

1343.9 130 2704 7389 Altitude (m) Easting Northing Coastal distance (km)

Summary of predictions

Prediction of impact	Step1
	Step2
	Step3



Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

Step3												
DETAILED RESULTS				•								
In Runoff	Step 1			Step 1								
		Copper	Zinc		Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
		RST							icity Threshold			
Allowable Exceedances/year  No. of exceedances/year		63.00	56.70		1 83.80	112.10	2.20	48.30	111.00	1 48.30	23.00	91.00
No. of exceedances/year No. of exceedances/worst year		81	64		97	128	7	59	127	59	32	101
					•				•	•	•	
Allowable Exceedances/year		RST 1	1									
No. of exceedances/year		18.00	20.60									
No. of exceedances/worst year		24	27									
		(ug/l)	(ug/l)		(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ua/ka)	(ua/ka)	(ug/kg)
Thresholds	RST24	(ug/i)		Toxicity	197	315	3.5	16770	875	(ug/kg) 2355	(ug/kg) 245	515
		21	60 120	Threshold	197	313	3.3	10770	673	2333	243	515
Thresholds	RST6	42	120									
Event Statistics Mean		23.36	67.70		331	1165	1	16068	2780	2667	170	752
90%ile 95%ile		45.65 54.99	147.58 194.62		733 962	2672 3572	3	35481 70795	6138 12247	5890 11752	376 750	1661 3313
99%ile		96.36	372.28		1383	5637	4	89125	15419	14795	945	4171
					•				•	•	•	
In River (no mitigation)	Step 2			Step 2								
in River (no mingation)	step 2			Step 2								
		Copper	Zinc									
Allowable Exceedances/year		RST:	24 2									
No. of exceedances/year		0.1	0.4		Velocity	0.12	m/s	Tier 1	is used for the	alculation		
No. of exceedances/worst year		1	2									
No. of exceedances/summer No. of exceedances/worst summer		0.1	0.2		DI	-						
No. of exceedances, worse summer			-		% settlement	needed	-	%				
All		RST 1	T6 1					=				
Allowable Exceedances/year No. of exceedances/year		0	0									
No. of exceedances/worst year		0	0									
No. of exceedances/summer		0	0									
No. of exceedances/worst summer		0	0									
Annual average concentration (ug/l)		0.21	0.65									
		(ug/l)	(ug/l)									
Thresholds	RST24	21	60									
Thresholds	RST6	42	120									
Event Statistics Mean		0.64	2.06									
90%ile		1.76	4.47									
95%ile		3.38	8.64									
99%ile		7.97	36.48									
In River (with mitigation)	Step 3											
		Copper RST:	Zinc 24									
Allowable Exceedances/year		2	24									
No. of exceedances/year		-	-									
No. of exceedances/worst year No. of exceedances/summer		-	-		DI	_	1					
No. of exceedances/worst summer		-	-		ы		_					
Allowable Exceedances/year		RST 1	1									
No. of exceedances/year			-									
No. of exceedances/worst year			-									
No. of exceedances/summer No. of exceedances/worst summer		-	-									
Annual average concentration (ug/l)		-	-									
		(ug/l)	(ug/l)									
Thresholds hresholds	RST24	21	60									
Thresholds	RST6	42	120									
Event Statistics Mean			-									
90%ile			-									
95%ile 99%ile		-	-									

SAAR (mm)	1343.9
Altitude (m)	130
Easting	2704
Northing	7389
Coastal distance (km)	58

Summary of predictions

Prediction of impact	Step1
	Step2
	Step3



Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

DETA	II ED	DEGII	LTC

Step3										
DETAILED RESULTS										
In Runoff	Step 1	Step 1								
	Copper Zinc		Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
	RST24						icity Threshold			
Allowable Exceedances/year	1 1		1	1	1	1	1	1	1	1
No. of exceedances/year	63.00 56.70		<b>83.80</b> 97	112.10 128	<b>2.20</b>	<b>48.30</b> 59	111.00 127	<b>48.30</b> 59	23.00 32	91.00
No. of exceedances/worst year	81 64		97	128		39	127	29	32	101
	RST6									
Allowable Exceedances/year	1 1									
No. of exceedances/year	18.00 20.60									
No. of exceedances/worst year	24 27									
	(ug/l) (ug/l)		(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Thresholds	RST24 21 60	Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
Thresholds	RST6 42 120	Threshold	'	1				l		
moonolas										
Event Statistics Mean	23.36 67.70		331	1165	1	16068	2780	2667	170	752
90%ile	45.65 147.58		733	2672	2	35481	6138	5890	376	1661
95%ile 99%ile	54.99 194.62 96.36 372.28		962 1383	3572 5637	3 4	70795 89125	12247 15419	11752 14795	750 945	3313 4171
3376110	30.30 372.20		1303	3037		OJIES	15415	14733	343	4272
In River (no mitigation)	Step 2	Step 2								
	Copper Zinc									
	Copper Zinc RST24									
Allowable Exceedances/year	2 2									
No. of exceedances/year	0.1 0.9		Velocity	0.02	m/s	Tier 1	is used for the	calculation		
No. of exceedances/worst year No. of exceedances/summer	1 3 0.1 0.6		DI	176.64	1					
No. of exceedances/summer No. of exceedances/worst summer	0.1 0.6 1 3		DI	176.64						
No. of exceedances, worse summer			% settlement r	needed	44	%				
	RST6									
Allowable Exceedances/year	1 1									
No. of exceedances/year No. of exceedances/worst year	0 0 0 0									
No. of exceedances/summer	0 0									
No. of exceedances/worst summer	0 0									
Annual average concentration (ug/l)	0.26 0.82									
	(ug/l) (ug/l)									
Thresholds	RST24 21 60									
Thresholds	RST6 42 120									
Event Statistics Mean	0.80 2.53									
90%ile	2.16 5.61									
95%ile	4.40 10.85									
99%ile	9.82 44.57									
In Diversity and and and										
In River (with mitigation)	Step 3									
	Copper Zinc									
	RST24									
Allowable Exceedances/year	2 2									
No. of exceedances/year										
No. of exceedances/worst year No. of exceedances/summer			DI	-	1					
No. of exceedances/worst summer					_					
	RST6									
Allowable Exceedances/year  No. of exceedances/year	1 1									
No. of exceedances/worst year										
No. of exceedances/summer										
No. of exceedances/worst summer										
Annual average concentration (ug/l)	<del></del>									
Aimuai average concentration (ug/I)										
	(ug/l) (ug/l)									
Thresholds hresholds	RST24 21 60									
Thresholds	RST6 42 120									
Event Statistics Mean										
90%ile										
95%ile										
99%ile										

SAAR (mm)	1343.9
Altitude (m)	130
Easting	2704
Northing	7389
Coastal distance (km)	58

### Summary of predictions

### Prediction of impact Step3 DETAILED RESULTS

### Soluble - Acute Impact Copper

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

Copper		
	Zinc [24	
1	1	
63.00	56.70	
81	64	
RS	T6	
1	1	
18.00	20.60	
24	27	
	1 63.00 81 RS 1 18.00	RST6 1 1 1 1 18.00 20.60

RST24

23.36

Toxicity Threshold	(mg/kg)	(mg/kg) 315	(mg/kg) 3.5	(ug/kg)	(ug/kg) 875	(ug/kg) 2355	(ug/kg) 245	(ug/kg) 515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	122/17	11752	750	3313

Total PAH

In River (no mitigation)
Allowable Exceedances/vear
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer
Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Event Statistics

Allowable Exceedances/year		1	
No. of exceedances/year		0	i
No. of exceedances/worst year		0	Ī
No. of exceedances/summer		0	ľ
of exceedances/worst summer		0	
	•		
1 1 10 10		0.43	Г

	(ug/I)	(ug/I)
RST24	21	60
RST6	42	120
	1.24	3.84
	3.68	9.05
	6.55	16.87
	13.52	58.70
	-	3.68 6.55

	0.42	1.32
	(ug/l)	(ug/l)
T24	21	60
ST6	42	120
	•	•
	1.24	3.84
	3.68	9.05
	6.55	16.87

Velocity 0.03	m/s	Tier 1 is used for the calculation
DI 210.52		
 % settlement needed	53 %	

Allewalds Francisco
Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer
Allowable Exceedances/year
No. of exceedances/year

In River (with mitigation) Step 3

Event S

Allowable Exceedances/year	
No. of exceedances/year	
No. of exceedances/worst year	
No. of exceedances/summer	
lo. of exceedances/worst summer	
nual average concentration (ug/l)	

	Thresholds h	reshold
	Th	reshold
Е	vent Statistics	Mea

	-	-
	-	-
	-	-
	RS	ST6
	1	1
	1	•
	-	-
	-	-
	-	-
	-	-
	(ug/l)	(ug/l)
RST24	21	60
RST24 RST6	42	120
	•	•
	-	-
	-	-

-	-			
-	-		)I	-
-	-			
		<del>_</del>		
R	ST6			
1	1			
-	-			
-	-			
-	-			
-	-			
		_		
-	-	7		
		_		
(ug/l)	(ug/l)	_		
21	60			
42	120			
		_		
-	-	7		

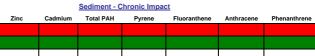
Details of the chosen rainfall sit	-
SAAR (mm)	1343.9
Altitude (m)	130
Easting	2704
Northing	7389
Coastal distance (km)	58

### Summary of predictions

# Prediction of impact

#### Soluble - Acute Impact Copper Zinc

### Total PAH



### DETAILED RESULTS

In Runoff
Allowable Exceedances/year  No. of exceedances/year  No. of exceedances/worst year
Allowable Exceedances/year No. of exceedances/year

Copper	Zinc
RS'	Γ24
1	1
63.00	56.70
81	64
RS	ST6
4	4

(ug/l)

Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

Th	reshold
Event Statistics	Mear
	90%ile
	95%ile
	99%ile

In River (no mitigation)

RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

_	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
•								
1	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

N	Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer o. of exceedances/worst summer
N	Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/summer o, of exceedances/worst summer

RS	ST6
1	1
0	0
0	0
0	0
0	0

	0.23	0.70
	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.69	2.19
	1.81	4.50
	0.00	0.24

9.45

Velocity	<b>0.02</b> m/s	Tier 1 is used for the calculation
DI	99.32	

		99%ile
In River	(with	mitigation)

Event Statistics Mean 90%ile

Annual average concentration (ug/l)

Thresholds Thresholds

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
o. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
<ul> <li>o. of exceedances/worst summer</li> </ul>

Annual averag	ge cor	nce	ntra	atio	n (u	g/	l)

Event Statistics	Me
	90%
	050/

Copper	Zinc
RS'	Γ24
2	2
-	-
-	-
-	-
-	-

RST6		
1	1	
-	-	
-	-	
-	-	
-	,	

	-	-
•	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	-	-
	-	-

DI	-

Details of the chosen rainfall site SAAR (mm) Altitude (m) Easting Northing Coastal distance (km) 1343.9 130 2704 7389

### **Summary of predictions**

### Prediction of impact

### Soluble - Acute Impact Copper Zinc

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

### DETAILED RESULTS

Step 1	In Runoff
	Allowable Exceedances/year
	No. of exceedances/year
	No. of exceedances/worst year
	Allowable Exceedances/year
	No. of exceedances/year
	No. of exceedances/worst year

	Copper	Zinc T24	
ı	1	1	
	63.00	56.70	
	81	64	
	RS	ST6	
ſ	1	1	ĺ

Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

TI	hresholds
Event Statistics	Mear
	90%ile
	95%ile
	99%ile

In River (no mitigation)

K3124	21	60		
RST6	42	120		
	23.36	67.70		
	45.65	147.58		
	54.99	194.62		
	96.36	372.28		

_	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171
-								

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer
Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer
Annual average concentration (ug/l)

Thresho

Event Statistics

Copper	ZINC
RS*	Γ24
2	2
0	0.1
0	1
0	0
0	0

RS16				
1	1			
0	0			
0	0			
0	0			
0	0			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.42	1.38
	1.09	2.75
	2.18	5.54
	5.54	26.08

Step 3

Velocity	0.31	m/s	Tier 1 is used for the calculation
DI	-		
% settlement	needed	- %	

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

Copper	Zinc
RS*	Γ24
2	2
-	
-	-
-	-
-	-

RST6		
1	1	
-		
-	-	
-	-	
-	-	

		-
•	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	•	
	-	-
	-	-
	-	-

Details of the chosen rainfall site SAAR (mm) Altitude (m) Easting Northing Coastal distance (km) 1343.9 130 2704 7389

### **Summary of predictions**

### Prediction of impact

### Soluble - Acute Impact Copper Zinc

	ocument	Om ome impact			
ium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

(ug/kg)

(ug/kg)

### **DETAILED RESULTS**

Allowable Exceedances/year
No. of exceedances/year
o. of exceedances/worst year

No. of exceedances/worst year

Th	resholds
tatistics	Mean
	90%ile
	0.0000

In Runoff

Step 1			Step 1
	Copper	Zinc	C
	RS	T24	
	1	1	
	63.00	56.70	

RS16		
1	1	
18.00	20.60	
24	27	

K5124	21	60
RST6	42	120
		•
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

	Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene icity Threshold	Fluoranthene	Anthracene	Phenanthrene	
Г	1	1	1	1	1	1	1	1	
	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00	
ı	97	128	7	59	127	59	32	101	

city	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1202	E627	4	90125	15/10	14705	0.45	4171

(ug/kg)

(ug/kg)

### In River (no mitigation)

Event S

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS'	Γ24
2	2
1.1	2.1
3	5
0.5	1.1

RS	ST6
1	1
0	0.6
0	2
0	0.3
0	2

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	1.74	5.32
	5.40	13.18
	9.21	23.90

17.12

Velocity	0.01	m/
DI	313.61	
		_

Velocity	0.01	m/s		Tier 1 is used for the calculatio
DI	313.61	]		
% settlement r	needed	69	<b>1</b> %	

(mg/kg)

### In River (with mitigation)

Allowable Exceedances/year No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

Copper	Zinc
RS*	Γ24
2	2
0.80	2.00
2	5
0.4	1.1

RS	ST6
1	1
0.00	0.40
0	2
0	0.1
0	1

0.57 1.78

RST24	(ug/l) 21	(ug/l) 60
RST6	42	120
	1.62	4.95
	5.03	12.25

15.92

194.44 DI

Details of the chosen rainfall site SAAR (mm)

1343.9 130 2704 7389 Altitude (m) Easting Northing Coastal distance (km)

### Summary of predictions

# Prediction of impact

### Soluble - Acute Impact Copper

Co	pper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene Phenanthrene		

DETAILED RESULTS												
In Runoff	Step 1			Step 1								
		Copper	Zinc		Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthre
	г	RS						Ioxi	icity Threshold			
Allowable Exceedances/year	l <u>-</u>	11	1		1	1	1	1	1	1	1	1
No. of exceedances/year	l.	63.00	56.70		83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
No. of exceedances/worst year	L	81	64		97	128	7	59	127	59	32	101
Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year	[	1 18.00 24 (ug/l)	20.60 27		(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(conflore)
	Г	(ug/i)	(ug/i)	Toxicity								(ug/kg)
Thresholds	RST24	21	60	Threshold	197	315	3.5	16770	875	2355	245	515
Thresholds	RST6	42	120									
Event Statistics Mean	ſ	23.36	67.70		331	1165	1	16068	2780	2667	170	752
90%ile		45.65	147.58		733	2672	2	35481	6138	5890	376	1661
95%ile	Ī	54.99	194.62		962	3572	3	70795	12247	11752	750	3313
99%ile	Ī	96.36	372.28		1383	5637	4	89125	15419	14795	945	4171

3370110	30.30	372.20		1505	5057		03123	13113	14733	3.13	7272
	·		<u>-</u> '								
In River (no mitigation)	Step 2		Step 2								
	Cannas	Zinc									
	Copper	ST24									
Allowable Exceedances/year	2	2	1								
No. of exceedances/year	0.1	0.8		Velocity	0.06	m/s	Tier 1	I is used for the o	alculation		
No. of exceedances/worst year	1	2									
No. of exceedances/summer	0.1	0.5		DI	77.79	1					
No. of exceedances/worst summer	1	2					_				
				% settlement	needed	0	%				
	R	ST6	1								
Allowable Exceedances/year	1	1									
No. of exceedances/year No. of exceedances/worst year	<b>0</b>	0									
No. of exceedances/summer	0	0									
No. of exceedances/worst summer	0	0									
No. of exceedances, worst summer		·									
Annual average concentration (ug/l)	0.24	0.76									
		•									
	(ug/l)	(ug/l)									
Thresholds	RST24 21	60									
Thresholds	RST6 42	120									
Frank Otesfeller Adams	0.74	2.27	1								
Event Statistics Mean 90%ile	0.74 2.02	2.37 5.20									
95%ile	4.10	10.04									
99%ile	9.28	42.27									

95%lle	<u> </u>	4.10	10.04			
99%ile		9.28	42.27			
	_					
In River (with mitigation)	Step 3					
	Otop 0					
		Copper	Zinc			
		RS'	T24			
Allowable Exceedances/year		2	2			
No. of exceedances/year		-				
No. of exceedances/worst year		-	-			
No. of exceedances/summer	<u> </u>	-	-	DI	-	
No. of exceedances/worst summer	<u> </u>	-	-			
, , , , , , , , , , , , , , , , , , , ,	<u> </u>					
		po	ST6			
Allemantes Europe de la confessione	_	4	310			
Allowable Exceedances/year	<u> </u>					
No. of exceedances/year	<u></u>	-	-			
No. of exceedances/worst year		-	-			
No. of exceedances/summer		-	-			
No. of exceedances/worst summer		-	-			
	_					
Annual average concentration (ug/l)		-	-			
(10,7)	<u> </u>					

Details of the chosen rainfall sit		
SAAR (mm)	1343.9	
, ,		
Altitude (m)	130	
Easting	2704	
Northing	7389	
Coastal distance (km)	58	

RST24 RST6

Thresholds hresholds
Thresholds

Event Statistics

### **Summary of predictions**

In Runoff

### Prediction of impact Step1 Step2 Step3

# Soluble - Acute Impact Copper Zinc

### Sediment - Chronic Impact

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

### DETAILED RESULTS

Allow	able Exceed
	. of exceed
No of	xceedances



hresholds
Mean
90%ile
95%ile

Step 1		
	Copper RS	Zinc T24
	1	1
	63.00	56.70
	81	64

18.00	20.60
24	27
(ua/l)	(ua/l)

RST6

RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147.58
	54.99	194.62
	96.36	372.28

Copper	Zinc	Cadmium	Total PAH Toxi	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

1	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

In River	no	mitic	ation	١
III IZIVEI I	(IIIO	muy	alion	,

Event St

Allowable Exceedances/yea
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summe
of augondaness lunaret august

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS*	Γ24
1	1
0	0
0	0
0	0

RST6				
0.5	0.5			
0	0			
0	0			
0	0			
0	0			

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.08	0.26
	0.18	0.45
	0.36	0.97
	1.10	5.09

•	,,	ч	۳	-	

Velocity	0.32	m/
DI	-	

% settlement needed	-	%

Tier 1 is used for the calculation	Tier 1	is used	for the	calculation
------------------------------------	--------	---------	---------	-------------

		99%ile
In River	(with	mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds
Event Statistics Mean

tatistics Mean 90%ile 95%ile

Step 3	
	Copper

COPPEI	Line			
RST24				
1	1			
-	-			
-	-			
-	-			
-	-			

RS	ST6
0.5	0.5
-	
	-
-	-
-	-

	_	-
	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	1	1
	-	-
	-	-

DI -

Details of the chosen rainfall site

### **Drainage Catchment 16A**

### **Summary of predictions**

### Prediction of impact Step1 Step2 Step3

# Soluble - Acute Impact Copper Zinc

#### Sediment - Chronic Impact

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

### **DETAILED RESULTS**

Allowable Exceedances/year
No of exceedances/year

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year

No. of exceedances/worst year

Thresholds
Thresholds

In Runoff

90%ile 95%ile

Step 1			Step 1
	Copper	Zinc	
	RS	T24	
	1	1	

K516					
1	1				
18.00	20.60				
24	27				

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	23.36	67.70

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
			Toxi	city Threshold			
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101

331	1165	1	16068	2780	2667	170	752
733	2672	2	35481	6138	5890	376	1661
962	3572	3	70795	12247	11752	750	3313
1383	5637	4	89125	15419	14795	945	4171

### In River (no mitigation)

Event Statistics

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mear 90%ile 95%ile

Copper	Zinc
RS'	Γ24
1	1
0	0
0	0
0	0

RST6				
0.5				
0				
0				
0				
0				

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.04	0.14
	0.10	0.24
	0.20	0.53
	0.04	3.05

#### Stop 2

Velocity	0.32	m/s
DI	-	

% settlement needed - %

Tier 1 is used for the calculation
------------------------------------

In River	(with	mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds
Thresholds

Event Statistics Mean 90%ile 95%ile

_		
Ste	n	3

Copper	Zinc
RS*	Γ24
1	1
-	-
-	-
-	-

RST6					
0.5	0.5				
1					
-	-				
-	-				
-	-				

	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	-	-
	1	-

DI

.

Details of the chosen rainfall site

### Summary of predictions

In Runoff

### Prediction of impact

### Soluble - Acute Impact Copper

Sediment - C	hronic Impact		
Total PAH	Pyrene	Fluoranthene	Anthr

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

### DETAILED RESULTS

Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year
Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year

Step 1			Step 1
	Copper	Zinc	
-	RS'	Γ24	, ,
_	1	1	
	63.00	56.70	
	81	64	
_			-

•								
	Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
				Toxi	city Threshold			
ſ	1	1	1	1	1	1	1	1
ı	83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
ſ	97	128	7	59	127	59	32	101

Th	resholds
Th	resholds
Event Statistics	Mean
	90%ile
	050/11-

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	147 58

	(mg/kg)	(mg/kg)	(IIIg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

In River (no mitigation)
Allowable Exceedances/year  No. of exceedances/year  No. of exceedances/worst year  No. of exceedances/summer  No. of exceedances/worst summer
Allowable Exceedances/year No. of exceedances/year No. of exceedances/summer No. of exceedances/summer

RST6			
0.5	0.5		
0	0		
0	0		
0	0		
0	0		

	0.05	0.16
	(ug/l)	(ug/l)
RST24		60
RST6	42	120
	0.17	0.56
	0.42	1.04

Velocity	<b>0.17</b> m/s	Tier 1 is used for the calculation
DI	-	
% cattlama	nt needed	<u></u>

In River	(with	mitia	ation)

Event Statistics Mean 90%ile 95%ile 99%ile

Annual average concentration (ug/l)

Thresholds Thresholds

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
o. of exceedances/worst summer

Annual average concentration (ug/l)

Т	hreshold
Event Statistics	Mea

Copper	Zinc	
RS'	124	
1	1	
-		
-	-	
-	-	
-	-	

RST6				
0.5	0.5			
-				
-	-			
-	-			
-	-			
-				

	-	-
•	(ug/l)	(ug/l)
RST24 RST6	21	60
RST6	42	120
	-	-
	-	-
	-	-

SAAR (mm)	1343.9
Altitude (m)	130
Easting	2704
Northing	7389
Coastal distance (km)	58

### **Drainage Catchment 17B**

### **Summary of predictions**

In Runoff

### Prediction of impact

### Soluble - Acute Impact

#### Sediment - Chronic Impact

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

### **DETAILED RESULTS**

Allowable Exceedances/year
No. of exceedances/year

Allowable Exceedances/yea No. of exceedances/worst year

Thresho	bl
Thresho	ol

Event Statistics

Step 1			Step 1
	Copper	Zinc	
	RS	T24	
	1	1	

RS16					
1 1					
18.00	20.60				
24 27					

RST24	21	60
RST6	42	120
	23.36	67.70
	45.65	1/17 58

Copper	Zinc	Cadmium	Total PAH	Pyrene city Threshold	Fluoranthene	Anthracene	Phenanthrene
1	1	1	1	1	1	1	1
83.80	112.10	2.20	48.30	111.00	48.30	23.00	91.00
97	128	7	59	127	59	32	101
	•						

	(mg/ng)	(mg/ng)	(mg/ng)	(ug/ng)	(ug/ng)	(ug/ng)	(ug/ng)	(ug/ng)
Toxicity Threshold	197	315	3.5	16770	875	2355	245	515
	331	1165	1	16068	2780	2667	170	752
	733	2672	2	35481	6138	5890	376	1661
	962	3572	3	70795	12247	11752	750	3313
	1383	5637	4	89125	15419	14795	945	4171

(ug/kg)

(ug/kg)

### In River (no mitigation)

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Allowable Exceedances/year

No. of exceedances/year

No. of exceedances/worst year

No. of exceedances/summer

No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds Thresholds

Event Statistics Mean 90%ile 95%ile

Copper	Zinc
RS'	Γ24
2	2
0	0
0	0
0	0

RS	516
1	1
0	0
0	0
0	0
0	0

	(ug/l)	(ug/l)	
RST24	21	60	
RST6	42	120	
	0.13	0.45	
	0.32	0.81	
	0.64	1.73	

te	

Velocity	0.08	m/:
DI	10.21	]

Velocity	0.08	m/s	Tier 1 is used for the calculation
DI	10.21		
% settlement	needed	0	<b>]</b> %

### In River (with mitigation)

Allowable Exceedances/year No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer No. of exceedances/worst summer

Allowable Exceedances/year
No. of exceedances/year
No. of exceedances/worst year
No. of exceedances/summer
No. of exceedances/worst summer

Annual average concentration (ug/l)

Thresholds hresholds Thresholds

Event Statistics 90%ile

Copper RST24	
2	2

R3124				
2	2			
1	-			
-	-			
-	-			
,	,			

RST6			
1	1		
-			
-	-		
-	-		
-	-		

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	-	-
	-	-
	-	_

DI

Details of the chosen rainfall site

SAAR (mm) 1343.9 130 2704 7389 Altitude (m) Easting Northing Coastal distance (km)

### Routine Runoff Results - DM (Cumulative Assessments)

# **Drainage Catchments 16A & 16** Summary of predictions Prediction of impact Step2



Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene

DETAILED RESULTS							ı		
In Runoff	Step 1  Copper Zinc  RST24	Step 1	pper Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
Allowable Exceedances/year	1 1		1 1	1	1	city Threshold	1	1	1
No. of exceedances/year	63.00 56.70		3.80 112.10	2.20	48.30	111.00	48.30	23.00	91.00
No. of exceedances/worst year	81 64		97 128	7	59	127	59	32	101
Allowable Exceedances/year No. of exceedances/year No. of exceedances/worst year	RST6  1 1  18.00 20.60  24 27								
	(ug/l) (ug/l)		g/kg) (mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Thresholds	RST24 21 60	Toxicity Threshold	197 315	3.5	16770	875	2355	245	515
Thresholds	RST6 42 120		l .					I	
Event Statistics Mean	23.36 67.70		331 1165	1	16068	2780	2667	170	752
90%ile 95%ile	45.65 147.58 54.99 194.62		733 2672 962 3572	3	35481 70795	6138 12247	5890 11752	376 750	1661 3313
99%ile	96.36 372.28		383 5637	4	89125	15419	14795	945	4171
55735		<u> </u>							
In River (no mitigation)	Step 2	Step 2							
Allowable Exceedances/year No. of exceedances/worst year No. of exceedances/summer No. of exceedances/summer No. of exceedances/year No. of exceedances/year No. of exceedances/year No. of exceedances/year No. of exceedances/summer No. of exceedances/summer No. of exceedances/summer Annual average concentration (ug/l)  Thresholds Thresholds Event Statistics Mean 90%ile 95%ile 99%ile	Copper Zinc  RST24  1	Veloci DI % sett	ty 0.32	m/s	Tier 1	is used for the	calculation		
Allowable Exceedances/year No. of exceedances/year No. of exceedances/summer No. of exceedances/year No. of exceedances/year No. of exceedances/year No. of exceedances/worst year No. of exceedances/worst year No. of exceedances/worst year No. of exceedances/summer	Copper   Zinc   RST24   1	DI		•					

Details of the chosen rainfall site SAAR (mm) Altitude (m) Easting Northing Coastal distance (km) 1343.9 130 2704 7389 58

RST24 RST6

Thresholds hresholds Thresholds

Event Statistics Mean 90%ile 95%ile 99%ile

(ug/l)

A96 Dualling Inverness to Nairn (including Nairn Bypass)
DMRB Stage 3: Environmental Impact Assessment Environmental Statement - Technical Appendices
Water Quality Calculations



### 6 References

Highways Agency, Transport Scotland, Welsh Assembly Government and The Department of Regional Development for Northern Ireland (2006). Design Manual for Roads and Bridges Volume 4, Section 2, Part 1, Vegetated Drainage Systems for Highway Runoff, 2006.

Highways Agency, Transport Scotland, Welsh Assembly Government and The Department of Regional Development for Northern Ireland (2009). Design Manual for Roads and Bridges Volume 11, Section 3, Part 10, Road Drainage and the Water Environment, 2009.