

Appendix 6 – Water Assessment - Copies of Methods A, C and D Assessments

Scheme: A82 Pulpit Rock Road Alignment Improvements

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

Description	Value	Comments
Step 1 - Runoff Quality		
AADT for 2-way flow	>10,000 and <50,000 Colder Wet Paisley (SAAR 1205.3mm)	The smallest from drop down menu. 8200 vehicles/day - weekend traffic flow, highest single flow in August 2004. (A82 Route Action Plan Study Report, February 2006)
Climatic region		The closest location
Rainfall site		The closest location
Step 2 - River Impacts		
Annual 95%ile river flow (m3/s)	0.0037	320 m3/day (IoH Report 101 Method) estimated from drawing no
Impermeable road area drained (ha)	0.1851	S100785/SW/SK/H/064 rev -
Permeable area draining to outfall (ha)	23	1:25,000 OS maps
Base Flow Index (BFI)	0.44	from Scotland BFI Map and FEH CD
Is the discharge in or within 1 km upstream of a protected site for conservation?	Yes	RBMP Water body information sheet for Loch Lomond (North)
Water hardness	Low = <50mg CaCO3/l	4-5 mg CaCO3/l from water sampling done for Ground Investigation report
Tier 1 Estimated river width (m)	0.5	Site inspection

Scheme: A82 Pulpit Rock Road Alignment Improvements

Method C - Assessment of Pollution Impacts from Routine Run-off on Groundwaters

Component Number	Property	Weighting Factor	Site Data	Risk Score	Component Score
1	Traffic density	15	< 10,000 (AADT)	Low - 1	15
2	Rainfall volume	15	3342mm (FEH CD)	High - 3	45
	Rainfall intensity		12.3 mm/hr	Low - 1	
3	Soakaway geometry	15	Filter Drain in SuDs system	Low - 1	15
4	Unsaturated zone (depth to water table)	20	< 5m (based on ground investigation results)	High - 3	60
5	Flow type	20	Igneous & Metamorphic rocks with fracture flow (based ground investigation results)	High - 3	60
6	Effective grain size	7.5	Fine sand & below (estimate based on ground investigation results)	Low - 1	7.5
7	Lithology	7.5	< 5% & > 1% (clay minerals) (estimate based on ground investigation results)	Medium - 2	15
Overall Risk Score					217.5
Score lies between 150-250 indicating a medium risk of impact.					

Scheme: A82 Pulpit Rock Road Alignment Improvements

Method D - Assessment of Pollution Impacts from Spillages

Description	Value	Comments
Water body type	n/a	Surface watercourse
Road length (RL)	0.4 km	full length of the Scheme for the worst case
AADT for two-way flow	10,000 vehicles/day	Peak traffic flow in August 2004 was 8,200 vehicles/day (A82 Action Plan Study Report February 2006) 10,000 vehicles/day - to allow growth from 2004 to 2010
HGV %	10%	7 to 8% (A82 Action Plan Study Report February 2006) 10% - conservative for this assessment
Length of slip roads	0 km	
AADT for slip roads	0 km	
From Table D1.1 Spillage rates, SS	0.29	For rural trunk road
The probability of a spillage, PSPL	4.234×10^{-5}	$PSPL = RL \times SS \times (AADT \times 365 \times 10^{-9}) \times (\%HGV/100)$
From Table D1.2, probability of a serious pollution incident arising as a result of a spillage: PPOL	0.75	For remote (response time to site > 1hr), for conservative
Annual probability of a serious pollution incident, Pinc	0.00318%	$PINC = PSPL \times PPOL$ This is less than 1%, so no further spillage prevention measures will be required to reduce the risk of a serious pollution incident.

Annual Average Concentration		Sediment deposition for this site is judged as:	
Copper	Zinc	Yes	Low flow Vel m/s
Step 2	0.04	0.10	Deposition Index
Step 3	-	No	3

Location Details	HA Area / DBFO number	A82
Road number	Non-cumulative assessment (single outfall)	232100
Assessment type	Easting	232100
OS grid reference of assessment point (m)	Easting	715150
OS grid reference of outfall structure (m)	Outfall number	715150
Outfall number	Receiving watercourse	Loch Lomond
Receiving watercourse	EA receiving water Detailed River Network ID	100339
EA receiving water Detailed River Network ID	Date of assessment	11/03/2010
Date of assessment	Notes	

Step 1 Runoff Quality	AAADT	> 10,000 and < 50,000	Climatic region	Colder Wet	Rainfall site	Paisley (SAAR 1205.3mm)
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Step 2 River Impacts	Annual 95%ile river flow (m ³ /s)	0.0037
Impermeable road area drained (ha)	0.1851	
Base Flow Index (BFI)	0.44	
Water hardness	Low = <50mg CaCO3/l	D

For dissolved zinc only	Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge?	No	D
For sediment impact only	Estimated river width (m)	0.5	
	Bed width (m)	0.5	
	Manning's n	0.07	
	Side slope (m/m)	0.5	
	Long slope (m/m)	0.0001	

Step 3 Mitigation	Brief description	Filter drain and attenuation area for a section of road drainage
Existing measures		
Proposed measures		

Estimated effectiveness	Treatment for solubles (%)	Attenuation for solubles - restricted discharge rate (l/s)	Settlement of sediments (%)
	0	Unlimited	0
	0	Unlimited	50

Predict Impact
Show Detailed Results
Exit Tool

Summary of predictions

Soluble - Acute Impact

Sediment - Chronic Impact

Prediction of impact Step1 Step2 Step3

Copper	Zinc

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

Step 1

Copper	Zinc
RST24	
1	1
69.50	57.20
78	67

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

Copper	Zinc
RST6	
1	1
19.30	22.50
32	31

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

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	24.00	67.53
	45.95	144.85
	57.54	191.09
	90.93	346.16

Step 1

Copper	Zinc	Cadmium	Total PAH	Pyrene	Fluoranthene	Anthracene	Phenanthrene
Toxicity Threshold							
1	1	1	1	1	1	1	1
88.20	116.00	2.20	49.20	113.20	49.20	23.40	92.80
101	138	4	64	127	64	36	106

Toxicity	(mg/kg)	(mg/kg)	(mg/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
	197	315	3.5	16770	875	2355	245	515
	345	1189	1	16007	2769	2657	170	749
	760	2738	2	35481	6138	5890	376	1661
	999	3684	2	70795	12247	11752	750	3313
	1442	6003	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

Step 2

Copper	Zinc
RST24	
1	1
0	0
0	0
0	0
0	0

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

Copper	Zinc
RST6	
0.5	0.5
0	0
0	0
0	0
0	0

Annual average concentration (ug/l)

0.04	0.12
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Thresholds
Thresholds
Event Statistics Mean
90%ile
95%ile
99%ile

	(ug/l)	(ug/l)
RST24	21	60
RST6	42	120
	0.09	0.27
	0.24	0.69
	0.41	1.23
	1.01	3.00

Velocity 0.10 m/s

Tier 1 is used for the calculation

DI 6.90

% settlement needed 0 %

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

Step 3

Copper	Zinc
RST24	
1	1
-	-
-	-
-	-
-	-

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

Copper	Zinc
RST6	
0.5	0.5
-	-
-	-
-	-
-	-

Annual average concentration (ug/l)

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

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

DI 3.45

Details of the chosen rainfall site

SAAR (mm)	1205.3
Altitude (m)	32
Easting	2478
Northing	6642
Coastal distance (km)	28.25