Road Controlling Authorities Forum - Stormwater Group

ENVIRONMENTAL RISK ASSESSMENT FLOWCHART FOR ROAD RUNOFF

This flowchart is intended to assist road designers, engineers and managers identify the risk of adverse environmental effects of road runoff from new or existing roads to aquatic receiving environments. This flowchart does not apply to accidental spills.

Follow each step in the chart below to consider the potential for adverse environmental effects from vehicle-derived contaminants in road runoff from your road network. Use the 'next steps' guide to consider appropriate action.

This chart should only be used in the context of a high level assessment of potential environmental effects, which may then be supplemented with additional network screening, water/sediment sampling and site-specific investigative actions to consider cost-effective management options.

Step	Response	Potential for adverse environmental effects [1]	Explanation	Exceptions	Next steps
1. Pathway Does all road runoff pass through treatment systems that retain >75% total suspended sediment (e.g. vegetated swales, wet ponds, detention ponds, constructed wetlands, rain gardens, sand or storm filters, gross pollutant traps and catchment filter systems) before ending up in an aquatic receiving environment?	**Yes** ⇨ All runoff passes through treatment systems such as those listed.	**Low** There is a low likelihood of adverse environmental effects from road runoff	Reduction in suspended sediment reduces the contaminant load in road runoff and therefore results in a lower likelihood of contaminants reaching and causing adverse environmental effects to aquatic environments.	Where grass swales are established on porous soil types, such as sand and loam, dissolved contaminants may not be adequately detained therefore a potential risk of adverse environmental effects to groundwater could occur.	Further investigations and works would be unwarranted due to low level of effects. If porous soil types and groundwater sources exist where grass swales operate as stormwater treatment devices, **proceed to Step 2**.
	No ⇨ Only some or none of the runoff from roads pass through the treatment systems listed.	There could be an environmental risk Proceed to Step 2.	Contaminated road runoff may be discharging unimpeded into sensitive aquatic environments.	Carriageways without a designed s/w treatment system that have natural verges (e.g. vegetation strips) or earth-lined surface water channels will significantly reduce the contaminant load discharged to the receiving water body. Kerb and channel drainage should be considered potentially high risk (no pollutant attenuation), unless these discharge to a treatment device.	**Proceed to Step 2** to consider the sensitivity of the receiving environment.
2. Receiving environment Where runoff is not intercepted by some form of treatment, what type of water body does it ultimately end up in?	**Dispersive** ⇨ Untreated runoff ends up in a *dispersive* environment such as rapidly flowing rivers or open coastlines with significant water movement.	**Low** There is a low likelihood of adverse environmental effects from road runoff	Road runoff discharges and associated contaminants are likely to be rapidly mixed, diluted and dispersed. Low likelihood of contaminants in road runoff causing adverse environmental effects to aquatic environments.		Further investigations and works would be unwarranted due to low level of effects (confirm in consultation with regional council).
	Depositional ⇨ Untreated runoff ends up in a *depositional* environment such as enclosed harbours, upper reaches of estuaries, lakes and wetlands.	There could be an environmental risk Proceed to Step 3.	Road runoff unlikely to be diluted and dispersed by water flows in the receiving environment. Potential for contaminants in road runoff to build up in sediments to levels representing a risk to aquatic organisms or human use values; risk dependent on sensitivity of receiving water body [2]	Existing discharge consents may permit discharges in these conditions.	Consult the regional council to determine the sensitivity of the receiving water body. **Proceed to Step 3** to consider the source of contaminants from traffic conditions and terrain.
3. Traffic flow (including effects of congestion and terrain) Where runoff is not intercepted by some form of treatment and is discharged directly or indirectly [4] into a water body with depositional characteristics, are traffic conditions predominantly uncongested (free-flow) with mostly flat terrain?	**Yes** ⇨ Vehicles travel in predominantly uncongested conditions in mostly flat terrain resulting in minimal braking and acceleration.	**Low to Moderate** There is low to moderate potential for contaminants in road runoff to cause an adverse environmental effect; risk increases with traffic volume.	Flat, straight, sections of road with free-flow traffic conditions generate less copper, zinc and particulate matter due to low braking and acceleration.	Sustained high traffic volumes may generate contaminant loads that could cause moderate to high adverse environmental effects. Current research by NIWA into vehicle emission factors [3] may provide some guidance on how contaminant loads in runoff vary with road type, traffic congestion and terrain. Existing discharge consents may permit discharges in these conditions.	New applications or discharge consent renewals should review the operative regional plan and consult the regional council to determine potential biophysical characteristics, human uses and values that may be sensitive to the contaminants in road runoff. Proactively installing or retrofitting stormwater treatment measures may provide cost effective environmental improvements before potentially onerous regulatory standards are enforced. Consider Tier 1 screening [5] of the network to identify areas of high traffic activity, drainage pathways and discharge locations to receiving environments potentially at risk from road runoff. Sediment and water testing at identified locations and site visits may assist in prioritising treatment options and designs.
	No ⇨ Vehicles are required to brake and accelerate due to interrupted or congested traffic conditions, intersections/signals, and/or the network is predominantly in hilly terrain.	**Moderate to High** There is moderate to high potential for contaminants in road runoff to cause an adverse environmental effect; risk increases with traffic volume.	Congested traffic conditions and hilly terrain that require frequent braking and acceleration generate more copper, zinc and particulate matter.	Current research by NIWA into vehicle emission factors [3] may provide some guidance on how contaminant loads in runoff vary with road type, traffic congestion and terrain. Existing discharge consents may permit discharges in these conditions.	Review the network to identify areas of congestion and untreated drainage pathways to potentially sensitive receiving environments. Consider more detailed appraisal (e.g. Tier 2 assessment [5] to model cumulative effects of traffic flow, congestion and terrain on vehicle-derived contaminant loads for comparing relative risk to each sensitive receiving environment and to prioritise future responses. Sediment and water testing at identified locations and site visits may assist in prioritising treatment options and designs.

1) Effects from the long-term build-up of contaminants (e.g. copper, zinc) in sediments of water bodies that receive road runoff; (2) For discussion on sensitivity of receiving environments refer to Ch 3 of Land Transport NZ Research Report No 315; (3) NIWA "Enhancing the Control of Contaminants from New Zealand's Roads" : Land Transport New Zealand-funded research in progress; (4) Direct pathways are assumed to result in no attenuation of particulate load in runoff after it leaves the road.; indirect pathways involve tributaries such as streams and rivers to convey road runoff to a final receiving environment; (5)) For discussion on Tier 1 screening and Tier 2 assessments of road networks refer to Ch 5 of Land Transport NZ Research Report No 315.