APPENDICES

APPENDIX 1

RISK ASSESSMENTS

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This appendix contains some results of risk assessment studies undertaken by Woodward-Clyde Ltd and BP Oil New Zealand Limited. It is in three parts. Appendix 1.1 (Woodward-Clyde Ltd) gives estimates of the risks posed by spillages of fuel. It also contains comments by Waitakere City Council on spillages observed in their area. Appendix 1.2 (BP Oil New Zealand Limited) deals with the environmental effects of other, general automotive products commonly used at retail sites (i.e., sold at service station shops) and recommends best management practices. Appendix 1.3 (Woodward-Clyde Ltd) summarises the results of a modelling study of the potential effects of stormwater discharges from oil interceptors on four different types of aquatic environment.

A1.1 Spill risk assessment data. The focus is on retail service stations and truck stops, in particular.

Potential spill event		Frequency of operation that could cause spill	Systems in place to minimise spill event/effect	Estimated yearly frequency of spill occurrence at any service station	Maximum estimated spill volume (litres)
Tanker unloading					
(a)	Drips from dipstick	Daily	PT200 spill container.	360	0.2
(b)	Failure of tanker bottom valve	3 per week	Backed up by discharge valve.	0.05	2000
(c)	Leaks from tanker hose connections	3 per week	Regular hose and fitting inspection. Oil/water separator.	2.0	6
(d)	Drips at fill point connection	3 per week	OPWI spill container.	48	2
(e)	Drips from tanker hose after disconnection	3 per week	Oil/water separator.	48	10
(f)	Failure of overfill protection valve	3 per week	Valve checked annually.	0.1	50
(g)	Rupture of a tanker compartment	-	Unlikely to occur at a service station. Oil/water separator.	0.000003	7000
(h)	Failure of the delivery hose	3 per week	Regular hose and fitting inspection. Oil/water separator.	0.32	10
(i)	Escape from vent	3 per week	Programmed deliveries. Tanks dipped prior to filling. Overfill prevention valve.	0.2	20
Car refuelling					
(a)	Misuse of nozzle	100/day	Automatic shut-off nozzle. Oil/water separator.	360	1
(b)	Vehicle drive off with nozzle attached	100/day	Automatic shut-off nozzle. Hose break away coupling. Dispenser shear valve. Oil/water separator.	12	1
(c)	Faulty nozzle	100/day	Regular service check. Oil/water separator	24	15
(d)	Person tripping on hose	100/day	Automatic shut-off nozzle. Oil/water separator	4	1
(e)	Nozzle falling from car	100/day	Automatic shut-off nozzle. Oil/water separator	12	1
(f)	Demolition of pump/dispenser	100/day	Raised concrete island. Crash barriers. Dispenser shear valve. Emergency stop buttons. Oil/water separator.	1	2
(g)	Blowback while filling	100/day	Automatic shut-off nozzle. Oil/water separator.	360	1
Truck refuelling					
(a)	Misuse of nozzle	20/day	Automatic shut-off nozzle. Oil/water separator.	48	10
(b)	Truck drive-off with nozzle attached	20/day	Automatic shut-off nozzle. Hose breakaway coupling.	4	10
(c)	Faulty nozzle	20/day	Regular service check. Oil/water separator.	12	40
(d)	Person tripping on hose	20/day	Automatic shut-off nozzle. Oil/water separator.	4	10
(e)	Nozzle falling from truck	20/day	Automatic shut-off nozzle. Oil/water separator.	12	10
(f)	Demolition of pump/dispenser	20/day	Raised concrete island. Crash barriers. Dispenser shear valve. Emergency stop buttons. Oil/water separator.	1	1

A1.1 Spill risk assessment data (continued).

The table below gives alternative risk estimates, based on the practical experience of a local authority (Waitakere City Council).

Potential spill event		Frequency of operation that could cause spill	Estimated yearly frequency of spill occurrence at any service station	Maximum estimated spill volume (litres)
Tanker unloading				
(c)	Leaks from tanker hose connections	3 per week	12	50
(e)	Drips from tanker hose after disconnection	3 per week	150	10
(h)	Failure of the delivery hose	3 per week	0.32	100
(i)	Escape from vent	3 per week	1	20
Car refuelling				
(a)	Misuse of nozzle	500/day	1500	1
(b)	Vehicle drive off with nozzle attached	500/day	52	1
(c)	Faulty nozzle	500/day	24	50
(d)	Person tripping on hose	500/day	4	10
(e)	Nozzle falling from car	500/day	50	50
(f)	Demolition of pump/dispenser	500/day	1	2
(g)	Blowback while filling	500/day	360	1
Truck refuelling				
(a)	Misuse of nozzle	20/day	360	100
(b)	Truck drive-off with nozzle attached	20/day	4	10
(c)	Faulty nozzle	20/day	12	100
(d)	Person tripping on hose	20/day	4	10
(e)	Nozzle falling from truck	20/day	12	100
(f)	Demolition of pump/dispenser	20/day	1	1

A1.2 Environmental Effects of General Automotive Products Sold at Service Station Shops

The potential environmental impact of general automotive products sold at service station shops has also been considered. This work included the compilation of an inventory of product types, assessment of their use and toxicity, and management options available to avoid adverse environmental effects.

A1.2.1 Products

The products fall into two categories: Category A products, which are not used on the forecourt, and Category B products, which may be used on the forecourt. Material Safety Data Sheets are available for all of these products and can be obtained direct from the suppliers.

Category A products that were identified and considered were:

- Radiator flush
- Cooling system treatment
- Heavy-duty engine degreaser
- Hand cleanser
- Rubberised undercoat
- Sun of a Gun
- Tuff Stuff
- Spitfire

In all circumstances, the storage, use, and disposal of these products should be in accordance with the manufacturers' recommendations.

Category B products that were identified and considered were:

- Diesel conditioner
- Engine stop-leak
- Radiator stop-leak
- Injector cleaner
- Friction proofing (various oil additives)
- Engine tune-up
- Anti-freeze

Data on the composition and the environmental effects of these products were obtained from the suppliers' Material Safety Data Sheets. Observations of how the products were handled and used on service station forecourts were then made.

The conclusion of this work is that all the products are toxic to some degree and have the potential to have an adverse impact on the environment. However, if the products are handled correctly and used according to the manufacturers' recommendations, no special facilities are required at service station forecourts.

A1.2.2 Best Management Practices

The best management practices that should be implemented when storing and handling these products are:

- Always follow the manufacturers' instructions for use and disposal.

- Ensure that spills from broken containers are cleaned up using absorbent materials which are disposed of correctly. **Do not hose them down drains**.

- Ensure that spills and drips from handling and transfer activities are cleaned up using absorbent materials which are disposed of correctly. **Do not hose them down drains**.

- Empty packages should be disposed of to an appropriate waste-disposal facility.

- On sites which have reticulated trade waste sewers, ensure that the utility network operator will accept any material planned to be disposed of to the sewers.

- On sites which do not have reticulated trade waste sewers, collect and retain the waste for off-site disposal to an appropriate waste-disposal facility.

- Site operators should provide training for all site staff in the handling and disposal of these general automotive products.

A1.3 Assessment of the Effects of Stormwater Discharges from Oil Interceptors at Petroleum Product Sites

This section presents a summary of a dispersion modelling study carried out by Woodward-Clyde Ltd on the potential effects of stormwater discharges from oil interceptors on four different types of aquatic environment.

A1.3.1 How the Study was Done

The study considered the potential impact of runoff from facilities on four aquatic environments: streams, estuaries, lakes, and major harbours. High-energy coastal waters were not included in the study, as they were not considered to be at risk from discharges.

The total petroleum hydrocarbons (TPH) concentration in the discharged water was assumed to be 20 ppm, discharging at the design flow condition nominated in these Guidelines.

Polycyclic aromatic hydrocarbons (PAH) were adopted as a TPH surrogate, and it was assumed that the proportion of PAH in the petroleum phase was the same as that in typical

Wiri Oil Terminal diesel (5.6 %). [PAH proportions in effluent diesel phases are much lower].

The CORMIX model was used. This has been developed by Cornell University in association with the US Environmental Protection Agency (USEPA) and other organisations.

The mixing criteria adopted were the USEPA “special mixing zone” requirements.

The toxicity of the discharges was evaluated against the ANZECC water quality chronic limit for PAH of 3 μg/L (0.003 ppm). An acute limit of 0.03 ppm was derived from the chronic limit.

The discharge was considered to be in isolation from other site discharges.

A1.3.2 Conclusions of the Study

Streams - Moony’s Creek in Auckland was modelled and shown to be at risk under low flow conditions of 2.5 litres/second (corresponding to a flow velocity of 0.01 metres/second) and with a stream width of 1 metre; however, the effects of discharges at moderate and high flows were not deleterious.

Estuaries - It was not practicable to model estuaries because of the absence of water at low tide. However, this would also apply to all stormwater discharges at low tide.

Lakes - Lakes were considered not to be at risk because of their large body of water.

Major harbours - Timaru Harbour was modelled and found not to be at risk, because of the large body of water which it contained.