

## **APPENDIX 2**

### **RESULTS FROM MONITORING**

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This appendix contains some results from monitoring studies.

Appendix 2.1 gives the results of two monitoring projects undertaken by NIWA Ltd for the oil industry and for the Auckland Regional Council (ARC). The oil industry project dealt with suspended solids and hydrocarbons, and the ARC project dealt only with suspended solids.

Appendix 2.2 provides the results from a spill trial of an API interceptor in May 1998

Appendix 2.3 shows the notified spill records of the petroleum marketing companies in New Zealand for the period 1992-95 in both graphical and tabular form.

Appendix 2.4 shows the size distribution of oil particles in the discharges from different types of pumps run at various speeds.

Appendix 2.5 shows the results of trials of the effect of a degreaser on the effectiveness of separators.

### **A2.1 NIWA Monitoring for the Oil Industry and the Auckland Regional Council**

Two separate projects were undertaken by NIWA, as follows:

- (1) Monitoring the runoff from a service station site (Mobil Mount Richmond) and an adjacent control site (Panama Road, Auckland).
- (2) Monitoring the runoff from several different types of sites for the Auckland Regional Council (ARC).

#### **A2.1.1 Oil Industry Project**

The primary aim of this project was to determine the levels of suspended solids and their constituents in effluent waters (a) downstream of an oil separator and (b) from an adjacent roadway. The results of these monitoring programmes are given in the following pages.

A secondary aim was to establish the level of hydrocarbon contamination in the separator's effluent water and in the Panama Road effluents. This limited programme established that treated stormwater from the service station site had hydrocarbon levels no higher than those in the Panama Road stormwaters. The comparison is tabulated in Appendix A 2.3.

### **A2.1.2 ARC Project**

The ARC project dealt only with suspended solids and their constituents. The results have been incorporated with the oil industry results on the following pages. From these results, it is clear that point-source discharges of suspended solids from service station sites are no worse than those from adjacent property and do not warrant special treatment devices. This has subsequently been confirmed in an ARC technical bulletin.

### **A2.1.3 Schedule of Sites Monitored**

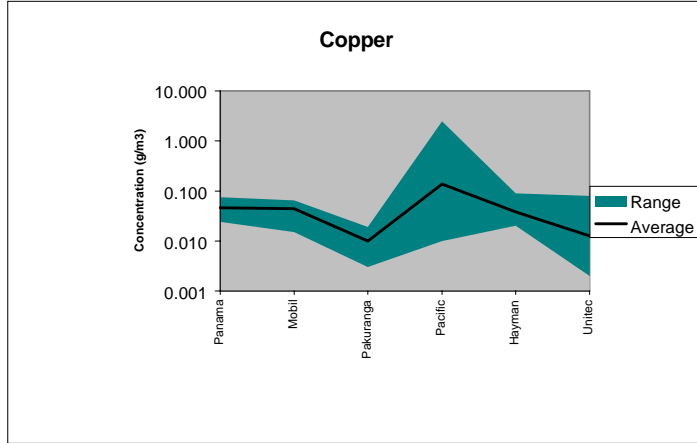
<i>Site no.</i>	<i>Description</i>
1	Panama Road (road)
2	Mobil Mount Richmond (service station)
3	Pakuranga (residential)
4	Pacific Steel (heavy industrial)
5	Hayman Park Road (commercial)
6	Unitec Sand Filter (car park)

These site numbers are used in the diagrams on the following pages.

**Table A2.1.1 Concentrations of Various Contaminants in runoff from sites monitored by NIWA.**

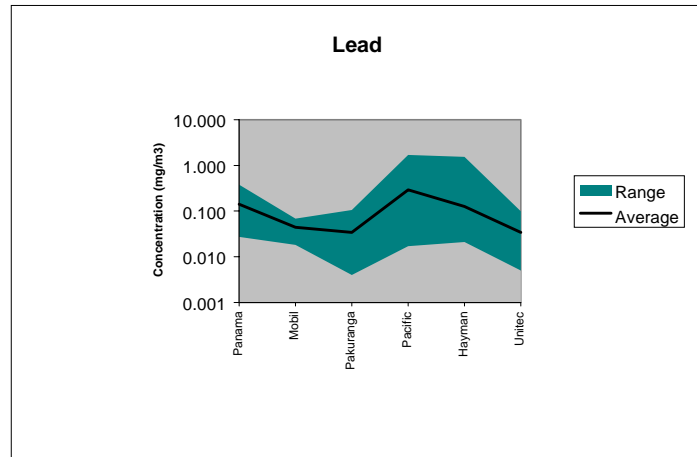
**Copper**

Site	Low	Average	High
Panama	0.024	0.046	0.050
Mobil	0.015	0.044	0.050
Pakuranga	0.003	0.010	0.016
Pacific	0.010	0.138	2.420
Hayman	0.020	0.038	0.070
Unitec	0.002	0.013	0.077



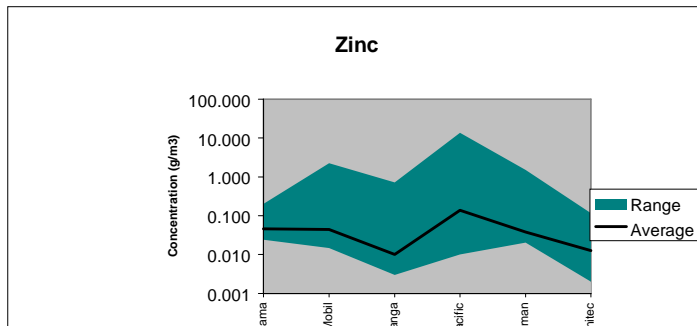
**Lead**

Site	Low	Average	High
Panama	0.027	0.140	0.350
Mobil	0.018	0.044	0.050
Pakuranga	0.004	0.034	0.101
Pacific	0.017	0.291	1.660
Hayman	0.021	0.124	1.510
Unitec	0.005	0.034	0.094



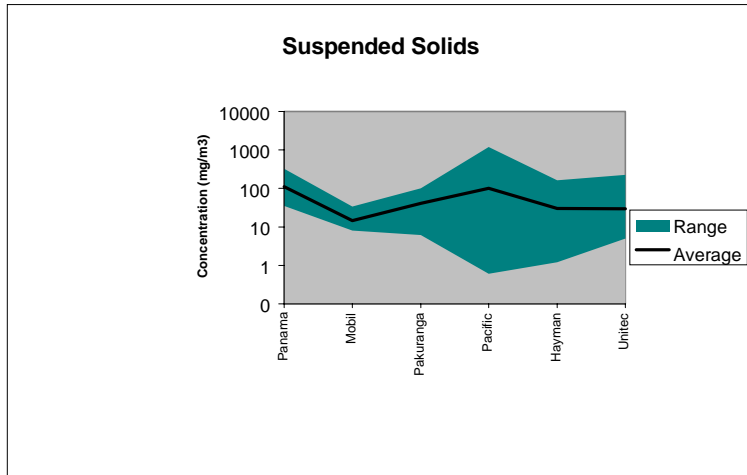
**Zinc**

Site	Low	Average	High
Panama	0.073	0.132	0.179
Mobil	0.095	1.570	2.250
Pakuranga	0.063	0.285	0.709
Pacific	0.050	1.500	13.500
Hayman	0.021	0.249	1.510
Unitec	0.013	0.052	0.115



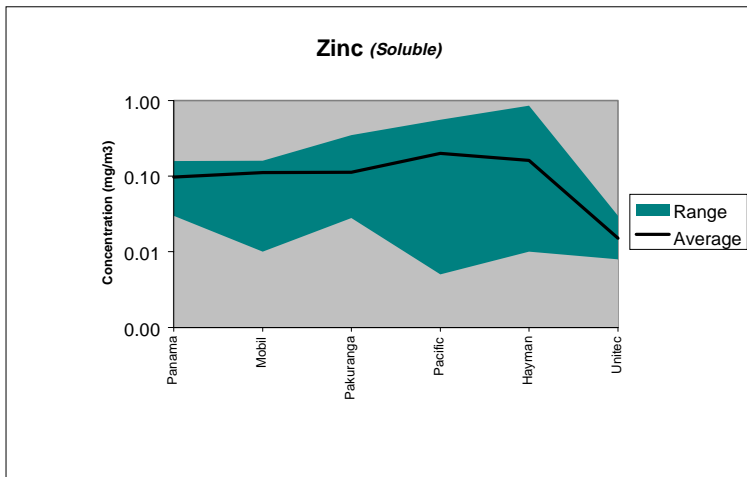
**Suspended Solids**

Site	Low	Average	High
Panama	35	112	286
Mobil	8	15	26
Pakuranga	6	41	95
Pacific	1	101	1174
Hayman	1	30	160
Unitec	5	30	223



**Zinc (Soluble)**

Site	Low	Average	High
Panama	0.030	0.098	0.129
Mobil	0.010	0.112	0.150
Pakuranga	0.028	0.113	0.321
Pacific	0.005	0.201	0.553
Hayman	0.010	0.161	0.840
Unitec	0.008	0.015	0.022



## **A2.2 API spill trial**

Following the development of the draft 'Environmental Guidelines for Water Discharges from Petroleum Industry Sites in New Zealand' in which performance criteria for interceptors are defined, the Auckland Regional Council requested that the Industry (BP, Mobil, Shell and Caltex) prove through practical trial the performance of the interceptor design recommended by the Guideline for Service Station forecourts.

To this end a trial was arranged in Masterton for 20 May 1998. The test was witnessed by representatives from a number of organisations, including the Auckland Regional Council.

The minimum sized tank of 2.5 metres length was selected for the test on the basis that should the smallest device be able to contain the spill volume then the larger tanks with a greater capacity above and below the normal static water level, would be also be able to perform satisfactorily.

### **Results**

Visual observations confirmed that for the spill of 2500 litres of diesel the device captured the spill without rising through the top of the tank, and after settling contained the product behind the baffle. The results of the sampling indicated that the discharge effluent met the design standard of 15 mg/litre.

The test procedure and results of the tests are appended to the report (A2.2.2 and A2.2.3)

This analysis confirmed the interceptor met the requisite performance standards, specifically to contain a 2,500 litre spill with the outlet valve in the open position while achieving the effluent quality criteria of less than 15 ppm TPH.

### **A2.2.2 API interceptor test protocol**

A test is to be conducted on an API Interceptor for spill capture.

The test is required to confirm that the API tank will capture the maximum credible spill of 2500 litres without discharge of product above the 15 mg/litre standard set.

Should this be achieved, this will confirm that tankers may be unloaded without the need for a stop valve to be operated prior to commencing the discharge of fuel.

- 1 Run water from a contributing area at a rate of 15mm per hour for one hour.  
(*Contributing area to be determined relative to API to be tested.*)
- 2 Diesel is to be discharged from a tank holding 2500 litres via a 4 inch hose running at full flow. This will equate to an emergency from a delivery tanker hose. The discharge will commence at ten minutes until the diesel tank is empty.

- 3 The effluent from the first API tank is to be sampled with duplicate samples being collected at 15, 30, 45 and 60 minutes after the commencement of the test, with a further sample being taken shortly before quiescent water level is reached. The duplicate samples shall be collected in clean glass containers each holding 1 litre.
- 4 A visual check of the sample shall be made to determine the presence of any sheen on the surface of the sample.
- 5 Each sample shall be analysed for TPH by using GC/FID technique for TPH.

### **A2.2.3 Results of API test - petroleum hydrocarbons.**

Analysis undertaken by RJ Hill Laboratories Ltd using GC-FID, carbon banding ( $\text{g m}^{-3}$ )

	Pre-test	15 min	30 min	45 min	60 min	Quiescent
C7-C9	<0.03	<0.03	0.09	0.16	0.19	0.42
C10-C11	<0.03	0.06	0.10	0.19	0.24	0.32
C12-C14	<0.03	0.17	0.10	0.20	0.29	0.47
C15-C20	0.06	0.95	0.04	0.08	0.52	1.17
C21-C25	0.05	0.27	<0.03	<0.03	0.15	0.30
C26-C29	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
C30-C44	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Total hydrocarbons (C7-C44)	<0.2	1.4	0.3	0.3	1.4	2.7

## Appendix 2.3

### Petroleum Marketing Companies' Notified Spill Records: 1992 - 1995

Site category	Oil co.	0 -10 litres	11-20 litres	21-50 litres	51 -100 litres	101 -200 litres	201 - 500 litres	> 500 litres	
<b>Commercial</b>	#1	9	5	2	1	3	1	2	
	#2	3	0	6	3	4	4	4	
	#3	6	3	0	3	0	3	0	
	#4	6	2	6	0	1	0	1	
	<i>TOTALS</i>	24	10	14	7	8	8	7	
<b>Farm</b>	#1	1	1	0	0	1	1	0	
	#2	-	-	-	-	-	-	-	
	#3	-	-	-	-	-	-	-	
	#4	-	-	-	-	-	-	-	
	<i>TOTALS</i>	1	1	0	0	1	1	0	
<b>Service stations</b>	#1	29	5	7	2	0	1	0	
	#2	9	6	6	3	2	2	2	
	#3	21	39	18	0	3	0	6	
	#4	6	5	2	0	2	3	1	
	<i>TOTALS</i>	65	55	33	5	7	6	9	
<b>Truck stops</b>	#1	2	2	1	0	0	2	0	
	#2	0	0	0	3	2	2	2	
	#3	3	6	9	3	0	0	0	
	#4	6	3	6	1	0	1	1	
	<i>TOTALS</i>	11	11	16	7	2	5	3	
<b>Main depots</b>	#1	8	5	6	7	4	2	2	
	#2	0	3	0	6	2	2	2	
	#3	7	5	7	7	4	2	2	
	#4	13	5	11	6	5	2	2	
	<i>TOTALS</i>	28	18	24	26	15	8	8	
<i>GRAND TOTALS</i>		129	95	87	45	33	28	27	<b>444</b>

Notes--#1: Records for 1992-1995; depots not included.

#2: Records for 1995 only; farm sites included under "Commercial".

#3: Records for 1995 only; truck stops and service stations targeted; includes service station 'driveaways' and hose fitting failures.

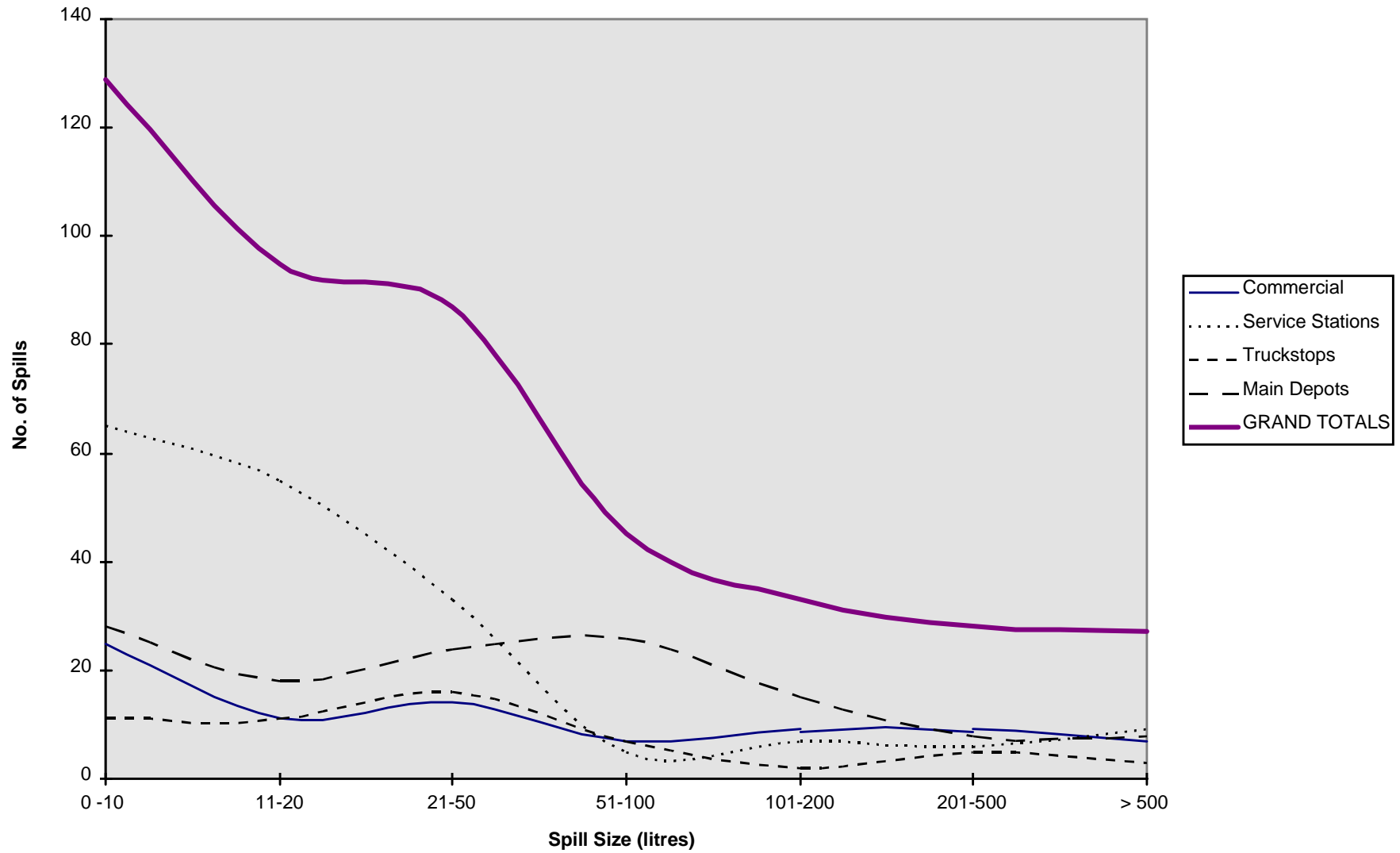
#4: Records for 1993-1995 (includes pipe fractures); truckstops and farm sites included under "Commercial".

*Gen:* Italicised figures estimated from other data supplied .

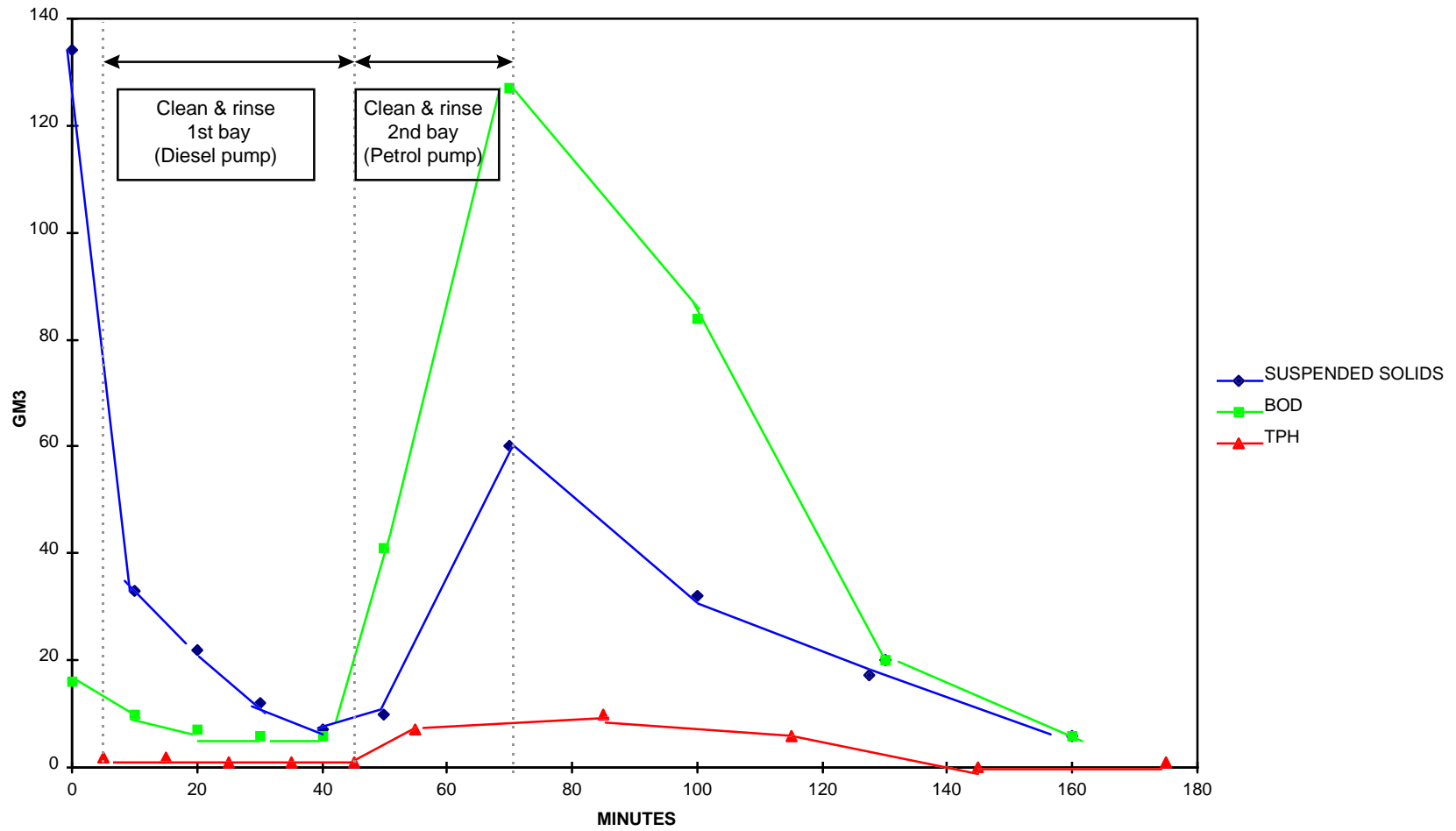
**Final figures adjusted to 3-year time base.**

An estimated 1,600,000 deliveries to sites by truck were made in the 3-year period (i.e., approx. 1 spill per 4000 deliveries).

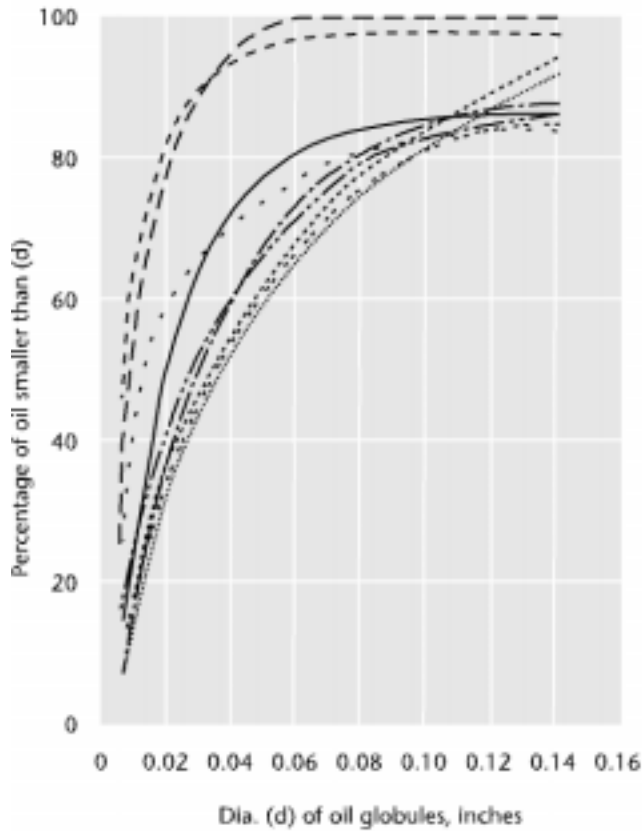
Petroleum Marketing Companies' Notified 3-Year Spill Records : 1992 - 1995



Appendix 2.5 Effects of degreaser on separator performance

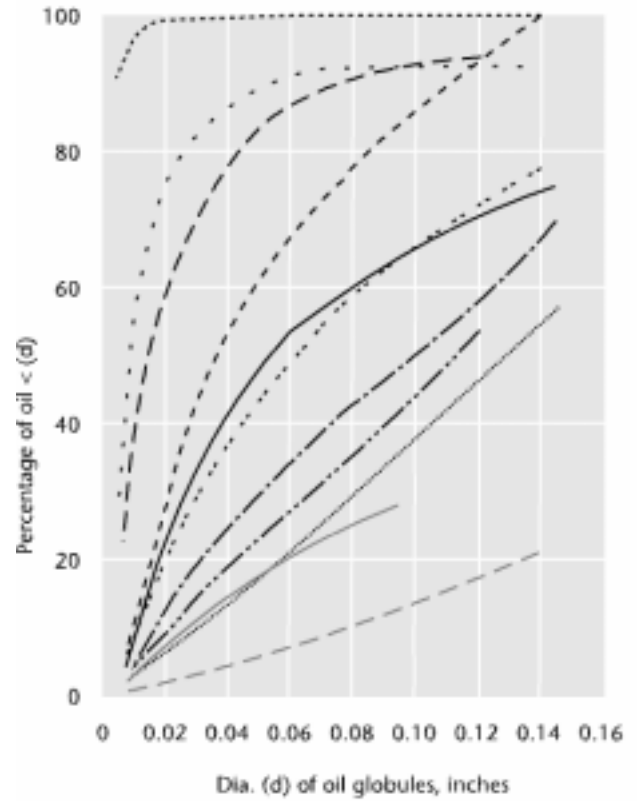


Appendix 2.4 Historical graphs demonstrating pumped oil particle size distribution



.....	Double vane	315 r.p.m.	10.0 l per hr.
.....	Double vane	350 r.p.m.	10.0 l per hr.
-----	Disc and shoe	550 r.p.m.	10.0 l per hr.
-----	Centrifugal	1,050 r.p.m.	10.0 l per hr.
—————	Reciprocating	44 r.p.m.	10.0 l per hr.
-----	Hypocycloidal	1,000 r.p.m.	9.7 l per hr.
-----	Triple screw	970 r.p.m.	10.0 l per hr.
-----	Gear	360 r.p.m.	10.0 l per hr.
.....	Single vane	100 r.p.m.	8.5 l per hr.

**Fig. 1** Comparative size distribution curves for the oil in the discharged mixtures from pumps operating at rated loads (discharge pressure 15lb./sq.in.)



.....	Double vane	1,100 r.p.m.	4.5 l per hr.
-----	Centrifugal	995 r.p.m.	6.7 l per hr.
-----	Disc and shoe	350 r.p.m.	6.2 l per hr.
-----	Diaphragm (low)	65 r.p.m.	6.4 l per hr.
—————	Hypocycloidal	600 r.p.m.	6.0 l per hr.
-----	Reciprocating	29 r.p.m.	6.0 l per hr.
-----	Double vane	350 r.p.m.	6.0 l per hr.
-----	Gear	335 r.p.m.	6.0 l per hr.
.....	Single vane	87 r.p.m.	5.2 l per hr.
—————	Triple screw	500 r.p.m.	5.6 l per hr.
-----	Double vane	200 r.p.m.	5.1 l per hr.

**Fig. 2** Comparative size distribution curves for the oil in the discharged mixtures from pumps operating at reduced loads (discharge pressure 15lb./sq.in.)