



PROJECT REPORT

NEW ZEALAND

LOG TRUCK AXLE LAYOUTS 1985

(AN ECONOMIC COMPARISON OF LOG
TRANSPORT LAYOUTS)

P.R. 24

1985

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N.Z. Logging Industry Research Association Inc.
P.O. Box 147
ROTORUA

Project Report 24
1985

LOG TRUCK AXLE LAYOUTS - 1985

(An economic comparison of log transport layouts)

P.R. 24

1985

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1985

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Information used in this report was supplied by various sectors of the industry including :

(1) Trailer Manufacturers

- Domett Fruehauf Trailers Limited
- Jack Tidd - Ross Todd Limited
- Mills-Tui Trailers Limited
- Road Runner Trailers Limited

(2) Truck Distributors

- Domtrac Equipment Limited
- AIC International Limited
- Scandinavian Motors Limited

(3) Logging Companies

- N.Z. Forest Products Limited
- Carter Oji Kokusaku Pan Pacific Limited
- Nelson Pine Forest Limited
- Tasman Forestry Limited

and from personal communications with numerous log transport contractors.

The costing technique used is based on one originally developed in LIRA Project Report 10, by Bob Gordon.

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- INTRODUCTION -

1.1 BACKGROUND

In 1980 LIRA completed extensive work on comparing the economics of the various log transport axle layouts(1). Since that time no work was focused on that area until the Transportation Working Group, in its recommendations to the 1983 LIRA seminar(2), listed worked on transport layout cost comparisons as a priority. As a result the project was begun in early 1984 with the target completion later in the year. During 1984 when price freeze controls were removed, a new round of cost increases took place changing the picture once again.

At the time of the 1980 report the costs of running 'Bailey Bridge'(semi-trailer) units were generally 20% higher than the more popular jinker trailer layouts. However, between 1980 and 1985 these units became more popular for reasons other than pure economics.

1.2 METHOD

In order to compare the cost per payload tonne of transporting logs with the various layouts studied, their respective operating costs and payload capacities were calculated. The cost and payload information was compiled from surveys of the industry, from regulations governing gross weight limits and from cost models (where reliable survey information was not available).

A wide variety of axle layouts were included for both short and long log transport, from 5 axle units, still common in some companies, to 8 axle units, which may become more attractive in the future.

1.3 ASSUMPTIONS

A number of assumptions have been made in the comparison :

- (1) Truck units are 3 or 4 axles, powered by a 260 kW (350 hp) engine, suitable for logging work.
- (2) Information on costs and weights pertains to January 1985. Road User Charges are, however, based on the schedule effective April 1985. Any estimates are due to averaging of survey results or the updating of previous data.
- (3) The annual distance travelled is 80,000 km based on an average payload haul distance of 40 km, carrying 4 loads per day and operating 250 days per year.
- (4) 75% of the distance run is on-highway. The 2 and 3 axle trailers are piggybacked when empty (50% of annual distance).
- (5) The cartage costs for off-highway are assumed to be

equal to those of class I operations with road user charges excluded. For Class II operation the cartage costs are also based on Class I. Roaduser Charges are, however, those incurred for purchasing Class II limit licence weights only.

These assumptions are based on averages from industry operations at the present time. (i.e. since 1979 average engine sizes have risen from 216 kW to 260 kW).











Item		Purchase Costs (\$)		Truck-Operating Costs per Year		Trailer Units - Operating Cost Per Year						Total Rig Operating Cost Per Year (\$)
						Standing Costs (\$)			Running Costs (\$)			
Truck Unit	Trailer Units	Stdg Costs	Running Costs	Depn	Ins. & Regist	Interest	Repairs & Maint.	Tyres	Road User Charges			
A		161,400	22,400	53,148	86,120	2,240	611	1,680	1,800	2,971	4,634	153,200
B		161,400	23,660	53,148	86,120	2,366	641	1,775	1,800	2,971	6,743	155,600
C		161,400	26,000	53,148	86,120	2,600	696	1,950	2,300	2,971	8,326	158,100
D		161,400	33,750	53,148	86,120	3,375	877	2,531	3,200	4,457	4,525	150,200
E		153,000	36,750	51,975	81,988	3,675	947	2,756	3,700	4,828	11,510	161,400
F		171,400	26,000	54,545	86,616	2,600	696	1,950	2,300	2,971	11,101	162,800
G		171,400	26,000	54,545	89,149	2,600	696	1,950	2,300	2,971	8,326	162,500
H		171,400	33,750	54,545	86,616	3,375	877	2,531	3,200	4,457	4,525	160,100
I		171,400	33,750	54,545	89,149	3,375	877	2,531	3,200	4,457	4,525	162,700

TABLE 1 : LONG LOG UNITS - OPERATING COSTS










Item	Configuration	Gross Weight Limits For Rig (Tonnes)			Tare Weights (Tonnes)		Payloads (Tonnes)			Log Cartage Costs (Dollars per Tonne)		
		Off Highway	Class I	Class II	Truck Unit	Trailer Units	Off Highway	Class I	Class II	Off Highway	Class I	Class II*
A		45.0	34.4	30.0	10.6	2.8	31.6	21.0	16.6	4.30	7.30	8.90
B		45.0	35.4	31.0	10.6	3.3	31.1	21.5	17.7	4.40	7.25	8.45
C		45.0	36.3	32.1	10.6	3.6	30.8	22.4	17.9	4.45	7.05	8.45
D		45.0	39.0	36.5	10.6	5.1	29.3	23.3	20.8	4.80	6.80	7.45
E		45.0	39.0	39.0	10.6	5.9	28.5	22.5	22.5	4.80	7.15	7.15
F		45.0	39.0	37.1	11.4	3.6	30.0	24.0	22.1	4.75	6.80	7.25
G		45.0	39.0	34.6	11.7	3.6	29.7	23.7	19.3	4.85	6.85	8.15
H		45.0	39.0	39.0	11.4	5.1	28.5	22.5	22.5	5.10	7.10	7.10
I		45.0	39.0	39.0	11.7	5.1	28.2	22.2	22.2	5.25	7.35	7.35

TABLE 2 : LONG LOG UNITS : WEIGHTS AND SPECIFIC COSTS

* BASED ON ROAD USER CHARGES INCURRED FOR CLASS II LIMITS ONLY





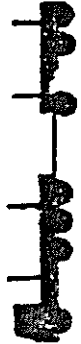





Trailer Units - Operating Cost Per Year													
Item	Logging Rig Configuration	Purchase Costs (\$)		Truck-Operating Costs per Year		Standing Costs (\$)				Running Costs (\$)			Total Rig Operating Cost Per Year (\$)
		Truck Unit	Trailer Units	Stdg Costs	Running Costs	Depn	Ins. & Regist	Interest	Repairs & Maint.	Tyres	Road User Charges		
J		161,400	26,000	53,140	86,120	2,600	696	1,950	2,300	2,971	8,325	161,100	
K		161,400	35,000	53,148	86,120	3,500	906	2,625	3,200	4,457	4,525	155,000	
L		153,000	36,750	51,975	81,988	3,675	947	2,756	3,700	4,828	11,510	161,400	
M		171,400	26,000	54,545	89,149	2,600	696	1,950	2,300	2,971	8,325	162,500	
N		171,400	35,000	54,545	86,976	3,500	906	2,625	3,200	4,457	4,525	160,700	
O		171,400	26,000	54,545	86,616	2,600	696	1,950	2,300	2,971	8,325	160,000	
P		171,400	35,000	54,545	86,616	3,500	906	2,625	3,200	4,457	4,525	160,400	
Q		153,000	50,000	51,975	85,416	5,000	1,257	3,750	4,200	8,914	6,814	167,300	
R		153,000	50,000	51,975	85,416	5,000	1,257	3,750	4,700	8,914	9,050	170,100	
S		171,400	40,000	54,545	84,443	4,000	1,023	3,000	4,100	8,914	5,216	165,200	

TABLE 3-3: SHORT LOGS, ONE-TRAILER LOGS











Item	Configuration	Gross Weight Limits For Rig (Tonnes)			Tare Weights (Tonnes)		Payloads (Tonnes)			Log Cartage Costs (Dollars per Tonne)		
		Off Highway	Class I	Class II	Truck Unit	Trailer Units	Off Highway	Class I	Class II	Off Highway	Class I	Class II
J		45.0	36.3	32.1	10.7	3.7	30.6	21.9	17.7	4.60	7.35	8.75
K		45.0	39.0	36.5	10.7	5.2	29.1	23.1	20.6	4.85	6.70	7.35
L		45.0	39.0	39.0	10.5	6.1	28.4	22.4	22.4	4.95	7.20	7.20
M		45.0	39.0	34.6	11.0	3.7	29.5	23.5	19.1	4.90	6.90	8.25
N		45.0	39.0	39.0	11.8	5.2	28.0	22.0	22.0	5.30	7.30	7.30
O		45.0	39.0	37.1	11.5	3.7	29.8	23.8	21.9	4.75	6.70	7.15
P		45.0	39.0	37.1	11.5	5.2	28.3	22.3	20.5	5.15	7.20	7.20
Q		45.0	37.4	32.5	10.5	6.6	27.9	20.3	15.4	5.30	8.25	10.50
R		45.0	39.0	36.5	10.5	6.7	27.0	21.8	19.3	5.35	7.80	8.65
S		45.0	39.0	39.0	11.5	5.8	27.7	21.7	21.7	5.50	7.60	7.60

TABLE 4 : SHORT LOG UNITS : WEIGHTS AND SPECIFIC COSTS

* BASED ON ROAD OFF-HIGHWAY, PERMITTED FOR CLASS II UNITS ONLY

TABLE 5 - COMPARISON OF CARTAGE COST BY DIFFERENT
LONG LOG LAYOUTS

CLASS I LIMITS

CARTAGE COST (\$/TONNE)

% DIFF.



"G"



"F"

6.80 - 6.85

Cheapest



"D"



"C"



"H"

7.05 - 7.15

4%



"E"



"B"



"A"

7.25 - 7.35

5%



"I"

CLASS II LIMITS



"H"



"E"

7.10 - 7.25

Cheapest



"F"



"G"

7.35

2%



"D"

7.45

4%



"G"



"B"

8.15 - 8.45

16%



"C"



"A"

8.90

24%

- COMMENTS ON LONG LOG LAYOUTS -

Based on economics alone the best options for long log cartage, shown in Tables 2, 5 and 6, have not changed greatly since the 1980 report. A rig with 6 axles still shows the lowest cartage cost under Class I Limits only. For operating under Class II limits, with the exception of layout H (twin steer truck and 3 axle trailer), configurations with 6 axles remain the most economic choice.

Differences in cartage cost under Class I limits are not significant with only 5% separating the best and worst layouts. However, under Class II limits there are significant differences with 5 axle rigs being 16-24% more costly than the best 6 and 7 axle layouts.

The analysis in Table 5 can be summarised by commenting that the best options for combined cartage on Class I and II limits are 'H', 'E' and 'F'. Layout 'H' also has the possible advantage of easily increasing its payload capacity in future without any alterations to truck or trailer.

TABLE 6 - BEST LONG LOG LAYOUTS FOR
COMBINED CLASS I AND II CARTAGE

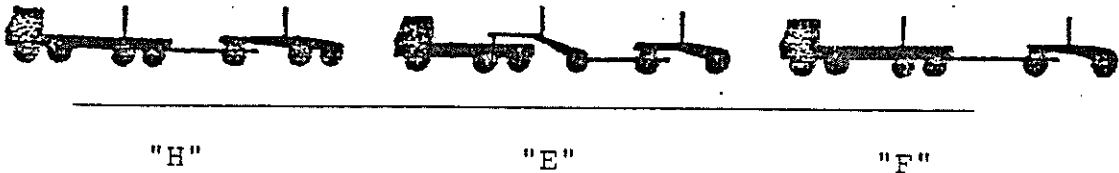









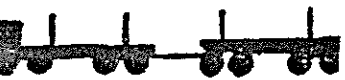












TABLE 7 : COMPARISON OF CARTAGE COST BY DIFFERENT
SHORT LOG LAYOUTS

CLASS I LIMITS

	)	"K"		
)			
	)	"M"	6.70 - 6.90	Cheapest
)			
	)	"O"		
)			
	)	"L"		
)			
	)	"N"		
	)		7.20 - 7.35	7%
	)	"P"		
)			
	)	"J"		
)			
	)	"Q"		
)			
	)	"R"	7.60 - 8.25	12-21%
)			
	)	"S"		
)			

CLASS II LIMITS

	)	"O"		
	)	"P"	7.15 - 7.20	Cheapest
	)	"L"		
	)	"N"		
	)	"K"	7.30 - 7.60	2 - 6%
	)	"S"		
	)	"M"		
	)	"R"	8.25 - 10.50	15 - 46%
	)	"J"		
	)	"Q"		

- COMMENTS ON SHORT LOG LAYOUT OPTIONS -

In Table 7 there are wide variations in cartage costs of short logs, for both Class I & II limits.

Under Class I limits only, 6 axle layouts operate most economically. Units with two axle trailers are suitable for this type of cartage because their low tare weight, capital cost and tyre wear all contribute to a low cartage cost.

The layout 'Q' (6 x 4 truck and 3 axle semi trailer or bailey bridge) is the most economic of the semi-trailer options and is only slightly (12%) more costly than the best short log layouts. This difference is significantly less than that reported in Project Report 10 (18-19%) in 1980.

The best options for short log cartage under both Class I and II options are shown in Table 8 below. Both L & P suffer no payload loss on Class II (from Class I), hence their cost effectiveness. Layout S (popular in stock cartage) has reasonable economics under Class II limits but would only be economic if Class I limits were higher than they are at present.

TABLE 8 : SHORT LOG LAYOUTS
WITH THE BEST ECONOMICS



"O"

"L"

"P"

- ALTERNATIVE LAYOUT OPTIONS -

The layouts with the best economics are not always the best options when other criteria for a particular application are considered. The practicality of alternative layouts was discussed extensively in the 1980 report (1).

In 1985, conditions are changing rapidly and aspects to consider include :

- (1) the cost differences between modifying (adding an extra steering axle or tag axle to the driving set) or purchasing a new unit of the desired configuration,
- (2) whether or not the loader in a particular operation can lift a 3 axle trailer off a truck, .
- (3) whether the modification or change in layout being considered will have enough payload capacity to take advantage of possible future increases in gross weight limits.

In particular, economic conditions and improvements in technology are making some alternative layouts attractive.

TWIN STEER TRUCKS

These units continue to be popular, especially in short-log cartage. They are now available not only through aftermarket modification but in some cases as standard models or dealer options.

3-AXLE DRIVE SETS

Since 1980 this has become a popular modification to trucks which could not be fitted with twin steering axles. Tyre wear increases have been limited by the use of air suspension on some axle conditions. On these units the extra axle can be lifted when the unit is not loaded, to reduce tyre wear and improve traction.

BAILEY BRIDGE TRAILERS

While these units perform relatively poorly based on economics alone, their popularity has increased considerably since 1980. At that time they were reported to run enduring annual costs some 20% more expensive than common short log cartage layouts. However, they now appear to be chosen for a number of reasons other than economics,

- (1) in some areas there have been increases in the amount of short log production, due to the realisation of increased value,
- (2) with increased log volume production in some forests,

scheduling has been less than ideal - a situation where the unit with a bailey bridge "always comes out with a load" whether they be short or long logs.

(1) Average Annual Operating Cost : 1980 - \$ 81,825) 95%
1985 - \$159,399) increase

<u>Class 1</u>	<u>Class 2</u>	<u>Off-Highway</u>
1980 - 3.39	3.94	2.39
1985 - 7.07	7.81	4.74
109% increase	98% increase	98% increase

(3)	(a) <u>Truck Running Costs</u>	(b) <u>Standing Costs</u>
	1980 = \$36,913	\$34,290
	1985 = \$86,444	\$53,639
	139% increase	56% increase

	<u>Fuel, Oil</u>	<u>R & M</u>	<u>Tyres</u>	<u>R.U.C.</u>	<u>Depreciation</u>
1980	9,680	12,000	4,576	4,380	6,960
1985	36,048	14,400	9,534	12,621	13,450
% Increase	272	20	108	188	93
% of Total Running Costs					
1980	25.7	32.0	12.2	11.7	18.4
1985	41.9	16.7	11.1	14.7	15.6

- FUTURE LAYOUT CONSIDERATIONS -

From the increases in log cartage costs and the relative changes in their makeup since 1980, there are a number of points to note :

- (1) overall, cartage costs have doubled from 1980 to 1985,
- (2) truck operating costs continue to constitute 88-91% of total annual rig operating costs,
- (3) road user charge increases have not affected layout economics as severely as the introduction of this taxing system did.

Looking for ways to improve the economics of a log transport unit means looking to areas which will yield the most benefit. Using as an example layout 'O' cost from Table 3 :

- a 10% saving in fuel & oil costs yields a 2.3% saving in annual rig operating cost,
- a 10% saving in trailer operating cost yields a 1.2% saving in annual rig operating cost.

This comparison shows that greater benefit can result from attention focused on reducing fuel consumption rather than on reducing trailer operating costs.

- CONCLUSIONS -

In this report the costs of log transport layouts have been investigated and presented with respect to 1985 economic conditions and compared with cartage costs presented by LIRA in 1980. The comparison has shown that while the best truck and trailer choices, based on economics, have remained basically unchanged, the choice is now more likely between 6 or 7 axles on a rig rather than 5 or 6 axles. Although the importance of payload was emphasised in 1980, newer trucks have not gotten lighter (with the exception of some models), but instead with larger capacity more powerful engines becoming popular, have become heavier.

Choosing layouts based on the economics associated with payload capacities has not necessarily been the most common criteria over the last five years. Many other criteria have affected choices. Criteria such as regional conditions affecting load types (shorts vs longs) and rig versatility have seen the selection of many other units, such as bailey bridges, which do not show the best economics. In some cases other factors are becoming more heavily weighted than just pure economics. Rapidly increasing fuel costs and tyre prices will in future see efforts being focused on controlling these costs in order to remain cost effective.

Road user charges, although steadily increasing, and with ever changing relativity, have only slightly affected trailer choices in the last few years preceding 1985. However another event which in the foreseeable future may necessitate a close look at layout options (and/or changes), is the possibility of increased gross combination weight limits on some road classes presently being studied by both government and industry.

APPENDIX I

CALCULATION DETAIL : 1985 LOG TRUCK AND TRAILER OPERATING COSTS

(A) LOG TRUCK LAYOUTS





(i) Truck Capital Cost

for - a 3 axle (6 x 4) truck
- a 350 hp engine

ERF	152,000
International	254,000
Average	153,000
Plus truck logging equipment	8,400
	<u>\$161,400</u>

The added cost for an extra axle (either in drive set or another steering axle) is \$10,000 to the price of a 3 axle unit.

Established capital costs of trucks are :

	... ..	\$153,000
	... ..	\$161,400
	... ..	\$171,400
	... ..	\$171,400

(ii) Truck Running Costs

Fuel and Oil :





Diesel fuel cost	67.4c/litre
Consumption rate	65L/100 km
Oil cost	\$2.50/litre
Consumption rate	1L/400 km
+ change rate	40L/16,000 km
Cost per km - Fuel	43.80 c
- Oil	1.25 c
Total	<u>45.05 c/km</u>

Annual cost (@ 80,000 km/year) = \$36,040

Tyres : (based on 60,000 km life)

Average cost per tyre \$650 (Radial)

Tyre cost/80,000 km = $650 \times 8/6$ - \$867

		... ..	(11 tyres)	\$ 9,534.00
		... ..	(13 tyres)	\$11,267.00
		... ..	(15 tyres)	\$13,000.00

Repairs and Maintenance

Based on costs associated with company or fleet operations the breakdown of R & M cost for an average log truck unit is :

Component	Engine & Elec	Trans	Front Axle	Mid Axle	Rear Axle	Brakes	Total
Percentage of Total	28	14	7	17	17	17	100
Total R&M* Cost (c/km)	9.5	4.8	2.3	5.8	5.8	5.8	34





Table 1

However, as the above costs include overheads for major service and repair facilities, a more realistic repair and maintenance cost breakdown for smaller operations is shown below.

Component	Engine & Elec	Trans	Front Axle	Mid Axle	Rear Axle	Brakes	Total
Total R&M ** Cost (c/km)	5.0	2.5	1.3	3.1	3.1	3.0	18

Table 2

So the Total Annual Repair and Maintenance costs (using Table 2 figures)





		... ..	\$14,400
		... ..	\$15,440
		... ..	\$16,800

* These figures are only intended to give a general idea of the relative costs within the total R & M cost. Company and contractor figures reported during the cost survey varied widely according to expenses charged to the workshop.

** These figures do not take into account overheads or maintenance staff costs.

Depreciation

(Running element) Based on 2/3 of capital cost over 640,000 km using costs from Pg 1 and 80,000 km/year, annual cost is :

	... ..	(15.9c/km)	\$12,750.00
	... ..	(16.4c/km)	\$13,243.00
	... ..	(17.6c/km)	\$14,063.00
	... ..	(17.6c/km)	\$14,063.00

Road User Charges





Using rates effective : 1 February 1985 and 75% of total annual distance (80,000 km) travelled on-highway gives the following annual costs :

<u>Veh. Type</u> <u>No.</u>	<u>Configuration</u>	<u>\$/1000 km</u>	<u>Licence Weight</u> <u>(tonnes)</u>	<u>\$/year</u>
6	6 x 4	153.22	18	\$ 9,193.20
6	6 x 4	210.35	20	\$12,621.00
14	8 x 4	126.22	20	\$ 7,573.20
14	8 x 4	162.44	22	\$ 9,746.40

(iii) Truck Standing Costs

Depreciation : (standing element)

Based on 1/3 of capital cost (c.c.) over 8 years :

	... ..	\$7,286.00
	... ..	\$7,686.00
	... ..	\$8,162.00
	... ..	\$8,162.00

Driver's Wages :

Based on RTA figures (June '84) and including 15 hours overtime/week, long service allowance (2 years +), a clothing and footwear allowance, meal money, a trailer allowance and general wage orders since June '84 gives :

Annual Wages* \$23,000.00





* Not included in this figure are holiday pay and sick leave costs.

Registration : MOT schedule of fees give :

<u>Configuration</u>	<u>MOT Code</u>	
6 x 4	(5B)	\$108.75
8 x 4	(5C)	\$117.75

Insurance :

Using a rate of 2.35% of truck capital costs :

	... ..	\$3,580
	... ..	\$3,777
	... ..	\$4,010
	... ..	\$4,010

Overheads :





Estimated at 5% of overall operating costs : \$7,500

Interest :

0.3 x Avg. Capital* @ 10%	=	0.150 x capital
0.7 x Avg. Capital* @ 15%	=	0.0525 x capital
plus Avg. Capital* @ 1.5%	=	<u>0.0075 x capital</u>

(* Avg. Capital = $\frac{1}{2}$ capital value)






Total = 0.0750 x capital

	... ..	\$11,475
	... ..	\$12,105
	... ..	\$12,855
	... ..	\$12,855

(B) LONG LOG TRAILER LAYOUTS

(i) Trailer Capital Costs






Average cost from LIRA survey of manufacturers

Type	Cost
	... .. \$12,620
	... .. \$22,400
	... .. \$23,660
	... .. \$26,000
	... .. \$33,750

(ii) Trailer Running Costs

Tyres

Based on 70,000 km life and tyre cost of \$650.






Type	No of Tyres	Annual Distance (km)	Cost
	4	40,000 laden (40,000 unladen)**	\$1,857
	8	40,000*	\$2,971
	8	40,000*	\$2,971
	8	40,000*	\$2,971
	12	40,000*	\$4,457

* Trailer piggybacked when empty

** Based on unladen wear rate of 1/4 of laden rate.






Repairs and Maintenance :

Based on an annual allowance of \$900/axle and \$500/turntable.

Type	Cost
	... .. \$1,400
	... .. \$1,800
	... .. \$1,800
	... .. \$2,300
	... .. \$3,200

Road User Charges :

Using February 1, 1985 rates; 75% on-highway running, 2 & 3 axle trailers piggy-backed when empty.

Type	RUC Vehicle Type No.	Annual Distance	Licence Weight	Cost
	24	60,000	7	\$4,316
	29	30,000	15	\$4,634
	30	30,000	16	\$6,743
	30	30,000	17	\$8,326
	37	30,000	19	\$4,525






Depreciation :

The depreciation on trailers is considered as a standing cost only.

(iii) Trailer Standing Costs

Depreciation

Based on trailer life of ten years. Residual value is nil. Hence the average annual depreciation is :

Type	Cost
	... .. \$1,262
	... .. \$2,240
	... .. \$2,366
	... .. \$2,600
	... .. \$3,375






Registration

From MOT schedule (1984-85) of fees :

Type	MOT Code	Cost
Heavy Semi-Trailer	10C	\$78.20
Heavy Full Trailer	10D	\$87.20

Insurance :

Based on quoted rates of local insurance firms : (2.34% of trailer capital cost)






Type				Cost
	...	...	...	\$295
	...	...	...	\$524
	...	...	...	\$554
	...	...	...	\$608
	...	...	...	\$790

Overheads :






Assume all overheads are accounted for in truck standing costs.

Interest :

Use same formula as for truck costs (7.5% of trailer capital cost)




Type				Cost
	...	...	...	\$ 947
	...	...	...	\$1,680
	...	...	...	\$1,775
	...	...	...	\$1,950
	...	...	...	\$2,532

(iv) Trailer Tare Weights

Type	Average Tare Weight (Tonnes)		
	2.3
	2.8
	3.3
	3.6
	5.1

(C) SHORT LOG TRAILER LAYOUTS

The trailer capital, standing and running costs are assumed to be equal to those for long log trailers of the same axle layout. The main differences are in the tare weights.

Type	Average Tare Weight (Tonnes)		
	2.4
	3.7
	5.2

(D) OTHER TRAILER LAYOUTS

Other trailer layouts costed in the same manner as the common long and short log include trailers in layouts Q (3 axle rigid bailey bridge), R (3 axle self-steer bailey bridge) and S (4 axle full trailer).

These units were costed using the same parameters related to capital costs and annual distance travelled. Hence, for tyre costs and road user charges their costs were very high compared to the common layouts.

(E) COST/DISTANCE/WEIGHT BASE

For the costs listed in this publication, the annual haul distance of 80,000 km was arrived at through :

- Average payload haul distance/trip = 40 km
- therefore total distance run/trip
- No. of loads/day = 4
- No. of days/year = 250

From figures quoted during discussions with various firms it was found that, in general, contractors' trucks accumulated more annual distance than this and company trucks less. Specific annual distance variations were usually a function of the particular payload haul distance involved.

APPENDIX 2

COMPUTER PROGRAM TO CALCULATE ANNUAL RIG OPERATING COST (TRUCK & TRAILER COST ANALYSIS PROGRAM - "TTCAP")

During the revision of the 1980 cost analysis method it was decided to write a computer program to simplify the procedure of calculating costs in the future.

The program, easily run on the LIRA (DEC/PDP 11) computer facilities, uses a separate file to store the basic cost and distance information (or to provide default values). This file, called DEFAULT, is listed in Appendix 3.

In running the TTCAP program the user is asked to supply information on truck costs, fuel & oil costs, fuel consumption. To account for unknown values the default values from DEFAULT are shown at the same time as the request for a value to be input. If no value is input by the user the default values are automatically used by the TTCAP program.

A menu-driven program, the user can do a number of cost runs and see a summary of results on the screen. A printout of the cost summary for a particular truck and trailer configuration can be obtained any time during a run of the program.

Program running is achieved by typing RUN.TTCAP once the user has the computer up and running in 'BASIC' mode.

Manipulating values in the DEFAULT file is done by 'editing' (type EDIT.DEFAULT). A complete program listing of TTCAP is held in the LIRA library.

DEFAULT VALUE FILE FOR THE TRUCK/TRAILER COST ANALYSIS PROGRAM (TTCAP)

At the start of the program various variables are initiated with default values taken from this file. The program scans the text of this file looking for an equals sign. It then uses a read statement to read in a real number. This number must be the next text after the equals sign. There may be spaces between the equals sign and the number. The number should be on the same line as the equals sign. The date is split in to day, month and year. This date should be updated each time you change a value in this file. The one date applies to all the default values. This date is read by the program as a day, month and year, and is then displayed on the screen as the date at which the defaults were last updated. The order in which the default values appear should be kept the same. The program expects them in this order. It cannot differentiate by looking at the text, it only reads numbers in the order it finds them.

DEFAULT VALUES DATE : day = 18, month = 4, year = 85

TRUCK RUNNING COSTS

Price of Oil = 250.0c/l
Oil consumption = 0.5l/100km
Price of diesel = 67.4c/l
Diesel consumption = 65.0l/100km
Price of one tyre (\$) = 650
Tyre life = 60,000km
Number of tyres = 11.0
Repairs and Maintenance = 18.0c/km
Percentage to depreciate = 66.7%
Road User Charge = 210.35
Total truck life distance = 640,000.0km
Annual travel distance = 0.0 (This quantity is calculated from the load data)

TRUCK STANDING CHARGES

Percent to depreciation = 33.3%
Depreciation period = 8 years
Drivers wages = 23,000.0
Registration = 108.75
\$ truck capital for insurance = 2.34%
Insurance = 1,628.0
Overheads = 7,500.0
Percentage of capital for interest = 7.5

TRAILER RUNNING COSTS

Tyre life = 70,000km
Repairs and Maintenance = 1,800.0
Piggyback factor = 0.5 (trailer is piggybacked for half of annual distance)
Percent on highway travel = 75%
Number of tyres = 8.0
Road User Charge = 154.45

TRAILER STANDING COSTS

Depreciation period = 10 years
Percent of trailer capital for insurance = 2.34%
Registration = 87.2
Insurance = 0.0

LOAD DATA DEFAULTS

Number of loads per day = 4
Average haul distance = 40km
Operating days per year = 250
Average payload weight = 21.0 tonnes

CAPITAL COSTS OF UNITS

Truck capital cost = 161,400.0
Trailer capital cost = 22,400.0