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003439 *file*

Consulting Engineers and Architect

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July 27, 1990

Mr. W. Weymark
Vice President & General Manager, Faro
Curragh Resources Inc.
P.O. Box 1000
Faro, Yukon
Y0B 1K0

Dear Bill:

The following is Hank Beattie's report on transportation:

SUMMARY AND CONCLUSIONS

A truck haulage system, utilizing tractor trailers is recommended for transporting ore from the Vangorda plateau.

The ~~conveying~~ option is ~~undesirable~~ because of the length of the payout period (4 1/2 years at best).

Truck load out facilities will be required at the Vangorda plateau ore transfer area, to allow for loading 200 tonne truck loads in less than 2 minutes.

A ~~truck dump pocket~~ will be ~~required at~~ the ~~Faro crusher~~ to accept ~~plus 200 tonne~~ loads directly from the truck - it will not be necessary to rehandle Vangorda plateau ore at the Faro crusher.

Ore haul vehicles recommended are ~~tractor trailers~~. Tractors, with approximately ~~700~~ H.P. engines, will be custom built from standard design but with the applicable options; the manufacturers identified are Pacific Truck of North Vancouver, B.C., and Kenworth Truck Semi-trailers will be rear dump, custom designed and built for this particular haulage task.

The trucking portion, of the trucking-conveying comparison in this report is based on ~~150 tonne trailer loads~~, for ~~30~~ round trips per unit per day; the top speed is 67 kph (42 mph). The tractor was stated to be capable of larger loads, but the one trailer manufacturer consulted was reluctant to discuss more than a 150 tonne load without a preliminary design. In the study three operating tractor trailer units were required on a continuous service and the following costs were based on this number:

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Based on hauling 4,500,000 tonnes of ore per year the costs are estimate at:

Capital Cost: \$11,350,000

which includes tractors, trailers, road changes, initial road surface, road maintenance equipment, increased shop facilities, additional housing and a contingency.

Operating Cost: \$0.84 per tonne

which includes trucking, loading, road maintenance, and tractor trailer replacements.

Alternatively, this haul could be contracted out to minimize initial capital expenditure.

Yours very truly,

KILBORN LIMITED



A.F. Banks

AFB/sh

ORE TRANSPORTATION

VANGORDA PLATEAU TO FARO MILL

**Prepared On Site
For Carragh Resources Inc.**

**by: Kilborn Limited
(H.F. Beattie)**

May 1990

HFB/rc

Ore Transportation: Vangorda Plateau to Faro Mill

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1. STAGES, OPTIONS AND ASSUMPTIONS

<u>Stage</u>		<u>Options</u>
1990	(a)	Contract trucking
1991-92	(a)	Contract trucking, or
	(b)	Company operated trucking
1993	(a)	Contract trucking, or
	(b)	Company operated trucking, or
	(c)	conveying.

The principal assumptions are:

Tonnages -

1990	150,000 t/month for last 5 months
1991-92	150,000 to 200,000 t/month
1993	375,000 t/month

Stockpiling -

1990	Ore from pit stockpiled at km. 15+000
1991-92	Ore from pit stockpiled at km. 15+000
1993	Ore from pit stockpiled at km. 12+800

Dumping at Faro -

1990	Ore hauled is dumped on stockpile at Faro
1991-92	Ore hauled is dumped into crusher <u>or</u> on stockpile at Faro
1993	Ore hauled is dumped into crusher at Faro <u>or</u> ore conveyed is discharged into Faro mill circuit

2. 1990 CONTRACT TRUCKING, PREPARATION

i) Verification of Road Grades

A road design prepared by Curragh (undated) is shown on Figures 2.18 to 2.22 (on file); these drawings start at km. 0+000 (Faro crusher area) and end at km. 16+200 (entrance to Vangorda pit). The survey of the 'as-built' road was compared to the design. In general the 'as-built' is very close to design except for depth of fill in some sections; there appears to be no immediate need to place the missing fill.

The 'as-built' is not available as plan and profile drawings - these should be prepared before a formal request for quotation for trucking is issued.

Details of the comparison, of design to 'as-built' - May 1990, are appended (Appendix A).

ii) **Determination of Road Upgrading Required**

Survey the locations of dips and bumps and mark corrective cuts and fills.

Mark section to be capped.

Mark ditching required along both sides of road.

Estimate quantities of grading layer material required.

Execution of road upgrading:

If company equipment not available, then tasks must be contracted;
a very preliminary estimate:

smoothing	5 days D-8 with ripper ✓
ditching	5 days D-8 with ripper ✓
grading	10 days Cat 12 or 14 grader
capping	30,000 cubic metres
clear end of road near crusher.	

*20
3000*

iii) Preliminary Information for Contractors

Contact was made with two potential ore haulage contractors:

Northland Fleet Services
Tumbler Ridge, B.C.
Tel. 604-242-5561 FAX 604-242-4529
Attention: Scott Laprairie

Zanford Mining Services
Nisku, Alberta
Tel. 403-955-3500 FAX 403-955-7976
Attention: Allan Laird

Both organizations state that they have now available a fleet of Caterpillar 777 trucks. These units could be used as 75 tonne capacity trucks right away, or for a longer term basis these units can be modified to pull a higher capacity semi-trailer.

The information below (labelled tentative conditions) was sent to both potential contractors. One contractor replied with a listing (also below) of the equipment he visualized he would use.

Ore Haul: Vangorda Plateau to Faro Mill **May 8, 1990**

Curragh is considering contracting the ore haul from the Vangorda Plateau to the Faro mill, at least for the last 5 months of 1990 and possibly for one half or all of 1991. The tentative conditions, under which a contractor would operate, are visualized as follows:

One way haul:- 12.5 kilometres

Haul road: - Almost exclusively reserved for ore haulage service traffic to and from Faro shops only

Haul road profile:- (a) existing, numerical profile attached

Projected tonnages of ore to be hauled: -

1990 max. 150,000 t/month, last 5 months

1991 max. 200,000 t/month, first 6 months

Note: Mine production plans are not yet complete, but a minimum tonnage of 100,000 tonnes per month can be considered, before penalties apply.

Curragh will stockpile ore in a prepared area a distance of 12.5 kilometres from the mill. The contractor will load ore from designated stockpiles and deliver this ore either into the crusher or into a designated stockpile adjacent to the crusher.

The contractor will provide all facilities required for his equipment and personnel, although it may be possible to provide access to the existing fuel supply system, if it can be metered accurately for charge-out.

The contractor will maintain the haul road used by his vehicles; Curragh will provide any road surfacing materials required.

The contractor's operations can be set up on any schedule that best suits him, provided that the schedule conforms to Curragh's mill down times (mill and crusher down times are not frequent, but must be allowed for).

Two potential contractors are being advised of this project.

VANGORDA PLATEAU STOCKPILE TO FARO MILL (12,500 METRES)

<u>Ore Haul Profile</u>	(Loaded Truck)	<u>Existing (May/90)</u> (From Design)
100 metres	0.0%	Flat
400 metres	3.5%	Downhill
500 metres	4.8%	Downhill
700 metres	1.4%	Downhill
300 metres	2.0%	Uphill
750 metres	3.9%	Downhill
1,150 metres	1.2%	Uphill
700 metres	3.6%	Downhill
450 metres	4.9%	Uphill
750 metres	0.8%	Downhill
600 metres	6.6%	Downhill
650 metres	0.5%	Downhill
500 metres	1.3%	Downhill
2,000 metres	3.8%	Downhill
250 metres	5.8%	Uphill
400 metres	2.5%	Uphill
1,000 metres	0.8%	Uphill
1,300 metres	0.0%	Flat

Telephone call from:

Allan Laird, Zanford Mining Services

May 14/90 9:30 a.m.

RE: Contract hauling of ore from Vangorda Plateau (follow-up to Fax to him on May 8, 1990).

- 1) Zanford would be interested in bidding on this work, after a site visit.**
- 2) They visualize using the following equipment which they have available now.**

four	CAT 777 85 ton capacity rear dump trucks
one	CAT 992 loader
one	CAT 988 loader (for back-up)
one	Rubber tired dozer
one	CAT 16G grader
one	water truck
one	lube truck
- 3) Zanford would work 2 shifts per day (24 hours).**
- 4) Their initial estimate shows fuel consumption of 45,000 gal/month; they would like to avoid installing a fuel storage tank.**
- 5) They would erect an ATCO fold away building for their service shop; he asked about availability of a crane for any component change-out.**

3. 1991-92 (a) CONTRACT TRUCKING (b) COMPANY OPERATED TRUCKING

i) Haul Road Modifications

Certain relatively small modifications can be made to reduce the grade against the load to 3 percent maximum, and against the empty return to 4 percent maximum. The appropriate quantities of earthmoving are as follows:

<u>Fill</u>	<u>Cut (from old fill)</u>	<u>Cut (from original surface)</u>
160,000 m ³	130,000 m ³	20,000 m ³

Borrow
10,000 m³

Details of this estimate are appended (Appendix B).

These modifications will improve the cycle times of haulage equipment.

ii) Dumping 100-200 Tonne Loads Directly Into Crusher

Initially, between the pit and the crusher, the Vangorda Plateau ore will be handled in and out of two stockpiles in succession. If truck loads greater than 70-80 tonnes are to be hauled, then the two stockpile system will continue indefinitely unless there is a truck dump into the Faro crusher that can accept larger loads, and thus remove the need for the second rehandle.

A number of hopper feeder arrangements have been investigated by Curragh. The control, of the entry of ore from a hopper into the crusher, may be achieved also by means of suspended chain curtains. Elimination of the feeder should allow for a lower cost installation.

Commitment to construction of the dump pocket does not have to be made before the decision on the permanent ore transportation system from the Vangorda Plateau - trucking or conveying. The same restriction would apply to the truck loading facility at Vangorda, shown in the next subsection, 3(iii).

iii) Truck Loading Installation of Vangorda Plateau

If large capacity trailers come into service, it is proposed that they be loaded from a bin rather than directly by front-end loader, in order to reduce trailer loading time. The bin would be filled from stockpile by front-end loader between truck trailer arrival times; truck loads of ore arriving from the mine could be dumped into the bin if it was empty at the time.

iv) Estimate of Company Operated Trucking Costs

For this estimate, it is assumed that the road will be modified as in 3(i) to give 3 percent max. against the load and 4 percent max. against the empty return; however, the truck dumping and loading installations will not be available.

The haulage equipment will be:

Pacific P12W or Dart KW850, 750 H.P. tractors with 100 tonne capacity trailers (\$710,000 per tractor-trailer unit).

Cycle time in minutes: 43

(Travel loaded 17, empty 14, dump 3, load 9)

Productive time per 12 hour shift: 525 minutes

$(12 - (.25 + .5 + .5 + .25)) = 10.5 \text{ hrs} \times 50 \text{ min./hr}$

Trips per shift: use 12

$(525/43 = 12.21)$

Tonnes hauled per shift 1,200, per day 2,400.

Truck days per month for 150,000 tonnes - 62.5

Truck days per month for 200,000 tonnes - 83.3

Operating Cost:

parts and repairs (tractor)	\$27 per operating hour
parts and repairs (trailer)	\$11 per operating hour
tires	\$14 per operating hour
fuel	\$17 per operating hour
lubes	\$ 3 per operating hour
driver	\$24 per operating hour

TOTAL	\$96 per operating hour
TOTAL PER SHIFT	\$1,008

trucking cost per tonne hauled (\$1,008/1,200)	\$0.84/t
front-end loader (10.5 x \$120/2,500)	\$0.52/t
road & stockpile maintenance	\$0.21/t
(4 hrs/day for R.T. dozer, grader, service trucks)	

\$1.57/t

Equipment replacement allowance:*

trucks	\$0.14/tonne
trailer	\$0.06/tonne
loader	\$0.13/tonne
road equipment	\$0.07/tonne

	\$0.40/tonne

*included for comparison with contractor.

4. 1993 COMPARISON OF TRUCKING AND CONVEYING

i) Rebuilding of Haul Road

The existing road can be rebuilt, to a maximum grade of less than 2 percent, from km. 12+500 (the point shown as the start of a proposed conveying system) to the crusher at the Faro mill.

Over the existing road, a 750 H.P. tractor can pull a 100 tonne load in a trailer; over the rebuilt road the same tractor could pull a 150 tonne load in a trailer - at very nearly the same speeds. The maximum speed in both cases is 67 km. per hour (42 miles per hour).

The approximate quantities of earthmoving, to rebuild the road, are as follows:

<u>Fill</u>	<u>Cut (from old fill)</u>	<u>Cut (from original surface)</u>
3,000,000 m ³	700,000 m ³	400,000 m ³

Unfortunately, most of the cuts are not adjacent to the fills.

Details of the quantity estimate are appended, including a very preliminary estimate of cost.

In comparing trucking and conveying the rebuilt road, with 150 tonne loads, is used.

ii) Estimate of Trucking Cost

Annual tonnage		4,500,000 tonnes
Haulage days available		335 per year
Truck load of ore		150 tonnes
Round trips per working truck per day		30
Annual tonnage per working truck		1,507,500
Working trucks required	3	
Truck drivers required	12	
Loader operators required	4	
Road maintenance crew required	4	
Mechanical service and repair crew	6	
TOTAL PERSONNEL	26	

Initial cost of trucking system:

trucks (tractors) (5)	\$2,250,000
trailers (4)	\$1,200,000
road maintenance equipment	\$ 500,000
front-end loader	\$ 800,000
jaw crusher - gravel	\$ 350,000
load-out at Vangorda Plateau	\$ 250,000
truck dump hopper at Faro mill	\$ 250,000
haul road grade changes	\$2,000,000
initial road surface	\$ 450,000
increased shop facilities (allow)	\$ 500,000

	\$8,550,000

Additional housing allowance	\$1,800,000
Contingency at 10%	\$1,000,000

Operating cost of trucking system:

truck haulage (incl. oper. & mtce. labour)	\$0.44/tonne ore
truck and trailer replacement	\$0.16/tonne ore
loading ore	\$0.11/tonne ore
haul road maintenance (incl. all labour & gravel supply)	\$0.13/tonne ore

	\$0.84/tonne ore

Note: The calculations, to support the foregoing figures, are appended (Appendix E).

Bob Boyce - Selkirk Mine

for Allan Low B.P. - lead office

→

*J. Hardy
to following*

*Mercan - costed very good
(Santa Fe Mine)*

iii) Conveying

Annual tonnage		4,500,000 tonnes
Conveying days available		335 per year
Conveyor operators	4	
Loader operators	4	
Mechanical service & mtce.	4	
Right of way service	1	
TOTAL PERSONNEL	13	

Initial cost of conveyor system:*

LCRA 12 mile conveyor complete	\$ 5,400,000
freight	\$ 1,000,000
construction, erection	\$ 3,000,000
primary crusher & belt loading	\$ 5,000,000
transfer & tie in at Faro	\$ 1,000,000
engineering, contract supervision	\$ 500,000
contingency 10%	<u>\$ 1,600,000</u>
	\$17,500,000

*This estimate by Curragh, April 1990 is used for cash flow comparison. Spot checking indicates that the total is a reasonable first try, before a feasibility type estimate. The initial cost of the used conveyor may be lower still, but this may be offset by the need to increase the engineering and contract supervision item.

Additional housing allowance \$ 900,000
(to use same unit cost as trucking)

Operating cost of conveying system:

labour	\$600,000/year	\$0.13/tonne
power	\$550,000/year	\$0.12/tonne
supplies	\$450,000/year	<u>\$0.10/tonne</u>
		\$0.35/tonne

Note: Crusher operating costs are not included since the crushing costs were not applied to the trucking system.

belt and cable replacement \$0.12/tonne

\$0.47/tonne

iv) **Comparison of Trucking and Conveying**
(On a Discounted Present Cost Basis)

The following table shows the discounted present cost of the trucking system and for two variations of the conveying system. Since the Lower Colorado River Authority is offering for sale a used conveying system, it may be necessary to provide for belt and cable replacements early after installation. The two variations show the discounted present cost of the conveyor system; one with a belt replacement allowance and the other without such allowance. It is probable that the variation without replacement allowance is the more valid, because of the reported low usage of this used system.

Therefore, on the basis of no belt replacement, the 15 percent discounted present costs of conveying will be lower than trucking, after four and one half years of operation. It becomes then a financial decision if the additional initial cost for conveying system falls within the corporate guidelines for investments.

ORE TRANSPORTATION, VANGORDA PLATEAU TO FARO MILL

CAPITAL AND OPERATING COST COMBINED, CUMULATIVE PRESENT VALUE

	1990	1991	1992	1993	1994	1995	1996	1997	1998
PRODUCTION (000's t)	N/A	N/A	4,500	4,500	4,500	4,500	4,500	4,500	
DISCOUNT FACTOR (TO 1991 @ 15%)	N/A	1.00	0.87	0.756	0.658	0.572	0.497	0.432	0.376
<u>TRUCKING</u>									
Capital Cost		11,350	-	-	-	-	-		
Oper. Cost no discount		N/A	3,780	3,780	3,780	3,780	3,780	3,780	3,780
Oper. Cost discounted		N/A	3,289	2,858	2,487	2,162	1,879	1,633	1,421
Cumulative Disc. Present Value		11,350	14,639	17,497	19,984	22,146	23,995	25,628	27,049
<u>CONVEYING (c/w Belt Replace)</u>									
Capital Cost		18,400							
Oper. Cost no discount		N/A	2,115	2,115	2,115	2,115	2,115	2,115	2,115
Oper. Cost discounted		N/A	1,840	1,599	1,392	1,210	1,051	914	795
Cumulative Disc. Present Value		18,400	20,240	21,839	23,231	24,441	25,492	26,406	27,201
<u>CONVEYING (without Belt Replace)</u>									
Capital Cost		18,400							
Oper. Cost no discount		N/A	1,575	1,575	1,575	1,575	1,575	1,575	
Oper. Cost discounted		N/A	1,370	1,191	1,036	901	783	680	
Cumulative Disc. Present Value		18,400	19,770	20,961	21,997	22,898	23,681	24,361	

APPENDIX "A"

EXISTING HAUL ROAD - VANGORDA PLATEAU TO MILL

COMPARISON OF DESIGN TO 'AS-BUILT' - MAY 1990

Remarks:

In general, the 'as-built' is very close to the design, except for depth of fill in some areas. Where less fill was used in the dips, it has the effect of making some of the grades slightly steeper, but there is no immediate need to bring the road to design grades.

One section, approximately one kilometre, has not been plotted; this section is said to have been built by a contractor (8+500 to 9+500).

The starting section (0+000 to 2+150) has not been plotted as well.

<u>Distance</u>	<u>Design</u>		<u>As-built</u>		<u>Elev. Diff.</u> (to design)
	<u>Co-ord.</u>	<u>Elev.</u>	<u>Co-ord.</u>	<u>Elev.</u>	
2+150		1155		1155	0
2+650	12770N 5065E	1133	12750N 5070E	1133	0
3+000	12500N 5300E	1140	12500N 5300E	1135	-5
3+500		1162		1158	-4
4+000	11750N 6000E	1172	11800N 6000E	1168	-4
4+500		1191		1187	-4
5+000	11000N 6700E	1197	11050N 6780E	1193	-4
5+500		1199		1198	
6+000	10270N 7400E	1226	10320N 7350E	1219	-6
6+500		1237		1232	-5
7+000	9500N 8000E	1231	9530N 7960E	1230	0
7+500		1224		1218	-6
8+000	8800N 8600E	1240	8790N 8625E	1236	-4
8+300		1238		1232	-6
8+500		1235			
9+000		1229			
9+500		1241			
10+000	7350N 10050E	1254	7400N 10050E	1252	0
10+200 to 10+300	Little bend at Rose Creek appears on both design and as-built				

<u>Distance</u>	<u>Design</u>		<u>As-built</u>		<u>Elev. Diff.</u> (to design)
	<u>Co-ord.</u>	<u>Elev.</u>	<u>Co-ord.</u>	<u>Elev.</u>	
10+500	7030N 10450E	1255	7050N 10410E	1250	-5
11+000	6650N 10800E	1266	6690N 10755E	1255	-11
11+500		1288			
12+000		1302			
12+750		1335(Peak)		1330	-5
13+000		1322		1319	-3
13+500					
14+000		1258		1262	+4
14+500					
15+000		1182		1182	0

APPENDIX "B"

ORE TRANSPORTATION FROM VANGORDA PLATEAU

HAUL ROAD MODIFICATIONS FOR TRUCKING ORE

The present road will serve for hauling with pit trucks or as a base for a conveyor, however some of the steeper grades will have an adverse effect on the performance of a low powered highway or logging type tractor with trailer. At certain places the steeper grades affect the loaded vehicle and at other places the empty returning vehicle can be slowed down.

The following relatively small modifications can reduce the grade against the load to 3 percent and against the empty return to 4 percent.

1. Station 1+900 to station 2+400 Fig. 2.18
5.83 % against the load.
Reduce to 3% with 35,000 m³ cut and pushed to fill, material to be cut is a previous fill.

2. Station 5+600 to station 6+115 Fig. 2.19
6.60% against the empty return.
Reduce to 4% with 800 metres of one way by pass road, or *125,000 cubic metres of fill (new) and 30 metres of culvert.

*('As-built' reduces this quantity to 75,000 cubic metres).

3. Station 7+000 to station 7+500 Fig. 2.20
4.93% against the load.
Reduce to 3% with *30,000 cubic metres additional fill or same quantity cut (from previous fill) and pushed to fill.

*('As-built' increases this quantity to 50,000 cubic metres)

4. Station 11+000 to station 12+000

Fig. 2.21

4.8% against the empty return.

Reduce to 4% with 70,000 cubic metres of cut (25% original in place material).

May accept reduced speed in this area - no cut required.

5. Station 12+000

Build turn-off 400 metres into ore transfer area. 3.5% against the empty return.

Summary

<u>Fill</u>	<u>Cut (from old fill)</u>	<u>Cut (from original surface)</u>
35,000 m ³	35,000 m ³	20,000 m ³
50,000	50,000	
75,000	50,000	
-----	-----	-----
160,000 m ³	130,000 m ³	20,000 m ³

Borrow required - 10,000 m³

VANGORDA PLATEAU STOCKPILE TO FARO MILL (12,500 METRES)

<u>Ore Haul Profile</u> (Loaded Truck) (metres)	<u>*Proposed Modifications</u> (%) (May 1990)	
100	0.0	flat
400	3.5	downhill
500	*4.0	downhill
700	1.4	downhill
300	2.0	uphill
750	3.9	downhill
1,150	1.2	uphill
700	3.6	downhill
450	*3.0	uphill
750	0.8	downhill
600	*4.0	downhill
650	0.5	downhill
500	1.3	downhill
2,000	3.8	downhill
250	*3.0	uphill
400	*3.0	uphill
1,000	0.8	uphill
1,300	0.0	flat

APPENDIX "C"

ORE HAUL - VANGORDA PLATEAU TO FARO MILL

DUMPING DIRECTLY INTO FARO CRUSHER

The Faro crusher can accept only 70 to 80 tonnes of ore at a time. A fully loaded WABCO (109 tonnes) can dump a part load and wait to dump the balance; this routine is not available for the larger trucks (154 tonne) since these units are considered to be too wide for the openings in the crusher building. A facility has been constructed, at one of the two openings in the crusher building to allow for ore to be pushed into the crusher; a truck load of ore is dumped just outside and is bulldozed in at the correct crushing rate. However, a large part of the ore production is stockpiled and reclaimed. The stockpile system has the benefit of permitting full shovel output when ore is available in the pit, and then the stockpile can provide mill feed when no ore is available from the pit.

A stockpile system for the Vangorda Plateau operations which will permit the same flexibility of full shovel output, is shown close to these operations. It would be desirable, since some of the benefits of stockpiling have been achieved already, if the Vangorda Plateau ore from stockpiles could be dumped directly into the crusher. Some modifications are needed at the Faro crusher if the 150 tonne loads from Vangorda are to be dumped directly into the crusher.

Curragh has investigated the use of hopper feeder arrangements, but has not proceeded - the wide variations in the estimated costs was one negative factor. It may be possible to construct a hopper located such that a feeder is not required, and eliminate a part of the costs.

Operation of Chain Curtain Dump Pocket

Chains are meant only to retain the ore in the dump pocket, they are not meant to provide a controlled flow rate. The dump pocket has been divided so that three batches (of approximately 50 tonnes) can be let into the crusher from a full pocket. This is similar to current practice where the crusher is fed in batches delivered by partly loaded trucks.

As at present, there will be no dumping when the red light is on. A special green light will show that the pocket is empty and all chain curtains are down. A truck arriving when the special green light is on, will dump its full load of ore in one hoist, and a special red light will be turned on.

The crushing plant operator will raise one set of chains allowing approximately 50 tonnes of ore to fall into the crusher. The other two sets of chains will be raised in their turn by the crushing plant operator, as additional feed is required. After the load is crushed, the operator will lower the chain curtains and turn on the special green light to indicate that another full load can be dumped into the pocket.

A truck should be able to back in and dump, into the empty pocket, in less than one minute. If ore is being delivered from only one source, then there should be no queuing delays at the crusher.

The system should be able to be operated from the current location of the crushing plant operator; perhaps with an additional T.V. monitor and electrical controls.

CHAIN CURTAIN DUMP POCKET

ORDER OF MAGNITUDE COST ESTIMATE

\$250,000

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Structural Steel: use 100 kg./m

front columns	4 x 6 m
intermediate columns	4 x 3 m
back columns	4 x 5 m
bin bottom stringers	7 x 10 m
bin lower beam	1 x 8 m
chain support beam	1 x 8 m
bin centre beam	1 x 8 m
bin back beam	1 x 8 m
internal bracing	4 x 15 m

218 m

21,800 kg.

Steel Plate: use 70 kg./m²

Walls	7 x 25 m ²
Bottom	1 x 80 m ²

255 m²

add 50% for liners

380 m²

26,600 kg.

Fabricated cost at \$2,500/tonne

\$120,000

Chains 6 m/chain x 8 chains x 3 sections

144 m at 150 kg/m

21,600 kg

Manufactured cost at \$1,500/tonne

\$ 35,000

Winches 3 at \$10,000

\$ 30,000

Controls

\$ 30,000

Installation (not earthworks)

\$ 40,000

A P P E N D I X "D"

TRUCK LOADING INSTALLATION AT VANGORDA PLATEAU

The truck loading installation shown can be filled either by front-end loader from stockpile or by an ore truck coming directly from the pit. Weather conditions at the time, or grade restrictions, may dictate that a truck dump into stockpile even if an empty bin is available. This estimate is made on the basis that 50 percent of the ore will be dumped directly into the transport loading bin. Loading marks in the bin will show if it contains a full transport load.

It is calculated that it requires 8 minutes to load a 150 tonne capacity trailer using a CAT 992 loader. It is estimated that, from the bin, the same 150 tonne trailer can be loaded in less than 2 minutes. The reduced loading time contributes approximately five additional round trips per truck per day.

A loaded trailer must leave for the Faro mill every 14 minutes, exclusive of shift changes, lunch times, second break times. The CAT 992 is calculated to be able to fill the bin (150 tonnes) in 10 minutes from a 50 metre distance stockpile, and in 12 minutes from a stockpile at 100 metres distance. Therefore, the loader alone theoretically could supply the haulage operation. However, any truck loads dumped directly into the bin, relieve the work of the loader, and reduce the cost of rehandling ore.

For trailer loading, the tractor driver will position his vehicle, step out of his cab onto a convenient control stand, operate the gate controls to load the trailer, close the gates and leave. A signal system will warn against dumping ore while trailer loading is in progress.

ORDER OF MAGNITUDE COST ESTIMATE

\$250,000

=====

Structural Steel: use 100 kg./m

front 'truck way' columns	4 x 5 m
back 'truck way' columns	4 x 5 m
bin front columns	4 x 5 m
bin back columns	4 x 10 m
bin support beams	4 x 9 m
bin top beams	4 x 5 m
bin bottom beam	7 x 7 m
internal bracing	4 x 15 m
bottom bracing	3 x 8 m

289 m 28,900 kg.

Steel Plate: use 70 kg./m²

Walls	6 x 25 m ²
Bottom	1 x 80 m ²
Front	3 x 15 m ²

275 m²
add 50% for liners 410 m² 28,700 kg.

Fabricated cost at \$2,500/tonne	<u>\$145,000</u>
Gates and cylinders at \$10,000	<u>\$ 30,000</u>
Hydraulic pump and controls	<u>\$ 20,000</u>
Concrete footings 12	<u>\$ 15,000</u>
Installation (not earthworks)	<u>\$ 30,000</u>

A P P E N D I X " E "

ESTIMATE OF TRUCKING COSTS (4,500,000 t/yr.)

Annual tonnage of ore	4,500,000 tonnes
Haulage days available direct to mill	335

(assumes 92% availability in crushing circuit)

Haulage Unit:

Tractor Pacific P12W or Dart KW850 c/w Caterpillar 3412 (750 H.P.) engine and Allison DP8963 (2) transmission.

Trailer end dump, 150 tonne capacity, tires on all axles 18.00 x 25.

Cycle times were calculated on a computer program by Pacific Truck of North Vancouver, B.C. - a custom manufacturer of heavy logging trucks. The road profile supplied to Pacific Truck was approximately that of the rebuilt road; the final rebuilt road grades (refer to Appendix F) are slightly more favourable.

It is assumed that the truck loading installation at Vangorda will be installed, as well as the truck dumping pocket at the Faro crusher.

A P P E N D I X " F "

ORE TRANSPORTATION FROM VANGORDA PLATEAU
REBUILT ROAD FOR HAULING ORE

The existing haul road (as-built) will allow a 750 H.P. logging type tractor pulling a 100 tonne capacity trailer to make approximately 12 round trips per 12 hour shift. If the minor modifications to the road are carried out (Appendix B) the same haulage unit can complete approximately 15 round trips per shift.

However, if the road is rebuilt to the grades on the attached table, the same 750 H.P. tractor can pull a 150 tonne capacity trailer and can make approximately 16 round trips per shift.

The existing haul road appears to have been designed to be almost straight, and up grades and down grades were allowable if they contributed to straightness. The existing road can be rebuilt on the present alignment with large cuts and fills, or by using some cuts and fills and building some stretches of new road which follow and take advantage of topography.

An order of magnitude estimate is given below, listing quantities involved to (a) rebuild the road on the existing alignment and (b) to rebuild the road with alignment changes.

<u>Location</u>	<u>Existing Alignment</u>	<u>Re-alignment</u>
0+000 to 0+300	no change	no change
0+300 to 2+500	500,000 m ³ cut (old fill)	
2+500 to 3+000	100,000 m ³ fill	
3+000 to 4+000	50,000 m ³ cut (old fill)	
4+000 to 6+000	300,000 m ³ cut (25% old fill)	2 km. new road
6+000 to 7+000	200,000 m ³ cut (25% old fill)	1 km. new road
7+000 to 8+000	very little change	
8+000 to 9+000 and		1 km. new road
9+000 to 10+000	1,000,000 m ³ fill	1.2 km. new road
10+000 to 11+000 and		1.2 km. new road
11+000 to 12+000	2,000,000 m ³ fill	1.0 " " "

The cost of rebuilding the road on the existing alignment will depend on the availability of waste from the Faro pit for the section from 2+500 to 3+000, and waste from the Grum pit for the section from 12+000 to 8+000. If the large quantities of waste are not available (for instance because of availability of trucks) then the alternative is to relocate the road from 12+000 to 8+000. It probably is less costly to relocate the road from section 4+000 to 7+000 than to make the large cuts into what will be rock in many parts. The section from 0+300 to 4+000 can be done mostly by bull dozing.

The cost of rebuilding or relocating the road are allowed at \$2,000,000 for making a trucking comparison.

The 150 tonne load mentioned previously was restricted by the tires available for the trailer; the same tractor is pulling three 70 ton capacity trailers on a 20 mile haul in Idaho. A detailed investigation of trailer design, for the Vangorda haul, could result in payloads greater than 150 tonnes becoming practical. There is a further possibility in powering the trailer to increase the load that can be handled. The benefits of flat grades on the haul road are to allow for these greater payloads at higher speeds.

FARO MILL TO VANGORDA PLATEAU STOCKPILE (REBUILT ROAD)

0+000 to 0+300	300 metres	0.00 %
0+300 to 2+500	2,200 metres	-1.05 %
2+500 to 3+000	500 metres	+1.50 %
3+000 to 6+000	3,000 metres	+1.80 %
6+000 to 9+000	3,000 metres	+1.70 %
9+000 to 12+000	3,000 metres	+1.70 %
12+000 to 12+700	700 metres	+1.00 %