DEMPSTER HIGHWAY LATERAL

COMPRESSOR STATION COST ESTIMATI

CHILLED AND NON CHILLED

CANUCK ENGINEERING LTD.

VOLUME I

DEMPSTER HIGHWAY LATERAL
COMPRESSOR STATION COST ESTIMATE
CHILLED AND NON-CHILLED

PREPARED FOR

FOOTHILLS PIPE LINES (YUKON) LTD.

BY

CANUCK ENGINEERING LTD.

AND

DILLINGHAM CORPORATION CANADA LTD.

JANUARY 31, 1979

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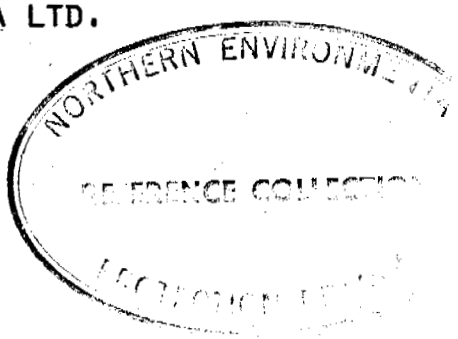

JANUARY 31, 1979

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DEMPSTER HIGHWAY COMPRESSOR STATION

I. SCOPE OF WORK AND CONCLUSIONS

On December 12, 1978, Foothills Pipe Lines (Yukon) Ltd. authorized Canuck Engineering Ltd. to proceed with the preparation of cost estimates for a typical chilled compressor station (No. 3) in the permafrost zone and a typical non-chilled compressor station (No. 7) for the Dempster Highway Pipe Line. Both stations were to utilize a single 16,000 ISO horsepower gas turbine compressor package for the main high pressure gas unit.

A discussion of the methodology used in the preparation of the estimate is presented in Section II of this report, and the detailed approach and assumptions are outlined in Section III. The station designs are in accordance with CSA Standard Z184-1975 and the NEB PC 1974-807 Gas Pipeline Regulations. The installation portion of the cost estimate has been prepared by the Dillingham Corporation Canada Ltd. who have had extensive experience in the installation of compressor stations and natural gas process plants in Western Canada. The estimate was prepared with the consideration that the contractor would move in and construct a minimum of four stations over a two-year period.

First quarter 1979 material costs were used in the preparation of this estimate and no allowance was made for escalation.

The following summarizes the installed costs for each compressor station:

Station	Subtotal	Contingency	Freight	Total
	$	$	$	$
Chilled (Stn. No. 3)	26,142,500	916,000	575,000	27,633,500
Non-Chilled (Stn. No. 7)	14,109,500	425,000	325,000	14,859,500

The contingency figure is on materials only and a figure of 10 percent was generally used. Freight costs as shown cover freight of permanent station materials to the jobsite from Edmonton but do not include freight costs of contractor's equipment which is included in the mobilization section of Contractor's Overhead.

It should be noted that the above figures exclude some direct costs as directed by Foothills Pipe Lines (Yukon) Ltd. in their correspondence dated December 21, 1978 to Canuck Engineering Ltd. Foothills Pipe Lines (Yukon) Ltd. must add their own appraisals for those elements that are excluded. The direct costs that are outstanding are discussed in Section II.

In addition, Owner's indirect costs have not been included in this estimate but must be considered by Foothills Pipe Lines (Yukon) Ltd. in order to have a complete assessment of compressor station costs.

Detailed cost estimate summaries for each compressor station are presented in Tables 1 and 2.

TABLE 1

CAPITAL COST ESTIMATE SUMMARY

DEMPSTER HIGHWAY COMPRESSOR STATION NO. 3

CHILLED

Cost Category	Materials $	Installation $	Total $
1. Foundations	452,000	902,000	1,354,000
2. Buildings	1,125,000	268,000	1,393,000
3. Gas Compressor Package	3,900,000	67,000	3,967,000
4. Propane Compressor Packages	3,600,000	99,000	3,699,000
5. High Pressure Gas Piping	1,587,000	199,000	1,786,000
6. Other Major Systems	2,367,000	343,000	2,710,000
7. Utilities	255,000	89,000	344,000
8. Instrumentation	383,000	52,000	435,000
9. Electrical	867,000	255,000	1,122,000
10. Insulation & Painting	124,000	184,000	308,000
11. Testing, Winterizing & Startup	114,000	83,000	197,000
12. Miscellaneous	187,000	41,000	228,000
13. Federal Sales Tax	1,357,500	-	1,357,500
14. Contractors Overhead	-	8,158,000	8,158,000
15. Freight (Materials Only)	575,000	-	575,000
TOTAL (Includes Contingency of $916,000 on Materials)	16,893,500	10,740,000	27,633,500
16. Tools & Major Spares (Includes FST)	640,000 (optional)		

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TABLE 2

CAPITAL COST ESTIMATE SUMMARY

DEMPSTER HIGHWAY COMPRESSOR STATION NO. 7

NON-CHILLED

Cost Category	Materials $	Installation $	Total $
1. Foundations	252,000	506,000	758,000
2. Buildings	741,000	190,000	931,000
3. Gas Compressor Package	3,900,000	67,000	3,967,000
4. Propane Compressor Packages	-	-	-
5. High Pressure Gas Piping	946,000	126,000	1,072,000
6. Other Major Systems	536,000	70,000	606,000
7. Utilities	228,000	89,000	317,000
8. Instrumentation	114,000	28,000	142,000
9. Electrical	464,000	179,000	643,000
10. Insulation & Painting	35,000	93,000	128,000
11. Testing, Winterizing & Startup	89,000	44,000	133,000
12. Miscellaneous	187,000	41,000	228,000
13. Federal Sales Tax	698,500	-	698,500
14. Contractors Overhead	-	4,884,000	4,884,000
15. Freight (Materials Only)	352,000	-	352,000
TOTAL (Includes Contingency of $425,000 on Materials)	8,542,500	6,317,000	14,859,500
16. Tools & Major Spares (Includes FST)	360,500 (optional)		

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Cost Category	Materials $	Installation $	Total $
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2. Buildings	741,000	190,000	931,000
3. Gas Compressor Package	3,900,000	67,000	3,967,000
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16. Tools & Major Spares (Includes FST)	360,500 (optional)		

II. DISCUSSION

This section of the report reviews the overall approach that was used by Canuck and Dillingham in order to logically prepare the cost estimate for two Dempster Highway Pipe Line compressor stations.

On December 18, 1978, Foothills called a meeting with Canuck to discuss:

a) the available station design information
b) certain design parameters
c) the overall project construction schedule
d) vendor quotes for the gas turbine compressor packages
e) items to be included and excluded in the estimate.

A memo of this meeting is attached (dated December 21) and labelled Exhibit 1 in the Appendices.

Canuck was requested to omit the following direct costs from the estimate as they would be handled by Foothills:

a) Land Acquisition
b) Access Roads
c) Site Preparation.

In addition no Owner indirect costs have been included in this estimate, but we draw your attention to the following which Foothills should consider:

a) Project Management and Engineering
b) Possible NEB or NPA Costs
c) Material Inspection and On-Site Inspection
d) Allocation and Amount of Contingency
e) Interest During Construction
f) Possible Assessments or Sales Tax in the Northwest Territories.

The estimate has been prepared using certain cost information provided by Foothills, current costs obtained from discussions with vendors, installation costs provided by Dillingham and current in-house price information available to Dillingham, and Canuck. In addition Dillingham has referred to their historical man-hour installation records from previous compressor station and process plant construction in north-eastern and southeastern British Columbia.

The estimate is based on first quarter 1979 prices, and includes the cost of freight to a marshalling area in the vicinity of Edmonton. Freight from Edmonton to the work site is shown as a separate item and is detailed in Section III-15. Federal Sales Tax is shown as a separate item and is summarized in Section III-13.

INSTALLATION

The installation cost estimates presented are for the construction of a chilled compressor station (Station 3 - Rock River) at Kilometre Post 380 and a non-chilled compressor station (Station 7 - Stewart Crossing) at Kilometre Post 851 of the proposed Foothills Dempster Highway Lateral Pipe Line. Nine compressor stations are ultimately proposed over the length of the 1172 kilometre pipeline from the Mackenzie Delta to the Foothills 56" mainline near Whitehorse.

The direct costs for a typical chilled and a typical non-chilled station were developed in considerable detail on the basis of conceptual quantities. Building sizes, equipment information, flow diagrams, and pipeline sizes provided by Foothills have been used in developing approximate quantities of work.

These quantities were compared to actual quantities available from the project histories of many stations previously built in British Columbia, Alberta and Saskatchewan. The final range of estimated quantities is considered accurate to within about 15 percent.

The direct labor costs developed are also based upon labor productivities achieved during construction of compressor station facilities in British Columbia, Alberta and Saskatchewan.

The work force on the Dempster Highway Lateral compressor stations has been assumed to have a higher unskilled labor input and lower productivities than the norm.

The range of productivities apparent from previous project histories indicates that many sites have encountered productivities different from the norm. These variations are attributable to site conditions, weather, extreme temperatures, remoteness, equipment availability, material deliveries, extended hours and labor strife.

The impact of these variations as well as the high input of unskilled labor has been considered in assessing realistic productivity units for the Dempster region.

SCHEDULE

Historically, mainline compressor stations are constructed within a six-month period and most often during the winter months. The Dempster Highway Lateral stations are considerably larger and because of the remoteness will require extensive mobilization periods to set up construction facilities and construction camps.

The progress schedule for the chilled station is presented on Figure 1 and indicates that the time required is 11 months and for a non-chilled station (Figure 2) is 10 months. Both stations are considered to be constructed concurrently with mobilization occurring in February and March, or alternately the fall of the preceding year.

The Dempster stations are expected to be constructed in 1985 and 1986.

The estimated manpower buildup is shown on Figure 3 for the chilled station and Figure 4 for the non-chilled station. A typical composition of the trades required for the job and their total estimated manhours is shown in Tables 3 and 4.

The direct costs include the straight time construction labor costs of hourly trades employed directly on-site (60 hours per week).

The hourly trade rates are current, in accordance with the British Columbia and Yukon Building Trade agreements and expire April 30, 1980.

The design of the single unit chilled and non-chilled compressor stations for the Dempster Highway Pipe Line is in the preliminary stages. Foothills has furnished Canuck with several drawings from the Maple Leaf Project to serve as a general guide. Canuck has utilized these drawings in modified fashion and has prepared a number of preliminary drawings that were used for estimating purposes. These drawings are attached in Section IV. In certain instances, where definitive information was not readily available, the consultant proceeded by making certain assumptions based on engineering judgment and industry practice. These assumptions are outlined in detail for each category in Section III, and are briefly discussed in the following material.

1. FOUNDATIONS

In order to avoid disturbance of the permafrost the estimate has considered that all heated buildings for the chilled stations will have the floor elevated approximately three feet above grade and it will be supported on friction piles founded below the active zone. In the non-permafrost areas the estimate has considered that foundations will consist of a normal spread footing.

In all cases the foundations conform to the requirements of the National Building Code of Canada.

2. BUILDINGS

All of the station structures with the exception of the living quarters are constructed with welded steel rigid frame sections. The transverse frames are interconnected by bracing systems in the planes of the side walls and the roof. All field connections will be bolted. The wall panelling and roofing will consist of a sandwich material composed of two metal sheets and an insulating core. The buildings will be in compliance with all applicable codes.

3. GAS COMPRESSOR PACKAGE

The gas compressor package was specified by Foothills and was quoted by Cooper Energy Services Ltd. The package consists of one 16,000 ISO horsepower industrial jet engine, a power turbine and a two-stage centrifugal compressor plus auxilliaries. The equipment is of proven design. The turbine will be fitted with inertial air cleaning devices, anti-icing equipment, inlet and exhaust silencers and an acoustical enclosure. The quotation for this package is presented in Section III-3.

4. PROPANE COMPRESSOR PACKAGE

The propane compressor package was specified by Foothills who selected two Clark DJ50 turbine compressor packages. The packages include two 5500 ISO horsepower industrial jet engines each of which is coupled to a multi-stage propane compressor.

5. HIGH PRESSURE GAS PIPING

The high pressure gas piping layout used for the estimate is shown in isometric drawings FPL39-49-61D and FPL39-49-62D which are included in Section IV. The 30" piping estimate included an inlet gas scrubber, applicable remote operated valving, the chiller headers, an orifice fitting on the discharge piping and the required relief and blowdown piping. All high pressure piping was estimated using -50^{o}F specification materials.

6. OTHER MAJOR SYSTEMS

6.1 CHILLING SYSTEM

The propane chilling system estimate was based on the general design prepared for the Maple Leaf system and modified to fit the reduced flow rates of the Dempster Highway Pipe Line. An isometric drawing of the revised propane system is attached in Section IV. The system consists of three propane chillers and associated controls, vapor lines to the compressors, 12 fin fan condensers, a propane surge tank, an economizer and a large propane storage tank.

6.2 FUEL AND STARTING GAS

The fuel and starting gas system was estimated to incorporate a separate fuel gas regulator building and includes fuel gas measurement, and an alternate source of fuel in the event of a mainline segment shutdown on the upstream or downstream side.

6.3 HEATING AND VENTILATING

The heating system is a conventional hot water-glycol design consisting of a number of modular heater packages selected for the particular station load.

6.4 GAS DETECTION AND FIRE PROTECTION

The gas detection system provides for a number of combustible gas detectors, ultraviolet fire eyes, continuous strip thermistors, ionization detectors and thermal detectors to be installed throughout the station. The main gas compressor building and the control room MCC/switchgear room and generator/boiler room are protected with Halon 1301 systems as is the propane compressor building at the chilled station.

7. UTILITIES

7.1 WATER SYSTEM

The water system estimate was prepared assuming that raw water would be hauled to the station and stored in a 500-barrel tank and that chemical treatment and chlorination would be required for the potable water.

7.2 SEWAGE SYSTEM

The sewage system estimate was based on a vendor quotation for providing a vacuum sewage system with incineration of the collected sewage.

7.3 INLET AIR SYSTEM

Structural steel supports and hardware have been provided for turbine air inlet ducting. The actual ducting, plenums and silencers are part of the turbine manufacturer's supply.

7.4 EXHAUST SYSTEM

As for the inlet air system, all necessary structural steel supports and hardware for the complete exhaust systems have been provided. Again the exhaust ducting and silencers are part of the turbine manufacturer's supply.

7.5 FLARE AND VENT GAS

The flare and vent gas system was based on installing a tapered flare line that runs through the station buildings to pick up combustible gas vents and terminates in a 50-foot flare stack complete with pilots, igniters and controls.

7.6 EMERGENCY FUEL

Provision has been made for diesel fuel storage and supply to the stand-by diesel fueled electric generating unit. Storage for quantities of gasoline for pipeline vehicles has also been provided.

7.7 CONDENSATE STORAGE

A small condensate storage tank is provided to handle the materials removed from the gas stream by the inlet scrubber. This tank has been included in the high pressure gas piping system.

8. INSTRUMENTATION

8.1 UNIT CONTROLS

Most of the unit controls and instrumentation are included in the cost of the units; however, unit auxiliary panels (based on A.G.T.L. control panel designs) are added to achieve some standardization between the stations and to contain some unit related controls and equipment not supplied by the compressor unit manufacturer.

8.2 PRESSURE, TEMPERATURE, FLOW MEASUREMENT

Pressures that are required for the operation of the main compressor system and the propane compressor system are transmitted to the main control room by electrical signals obtained from pressure transmitters located in instrumentation racks in the compressor buildings. The cost of this portion of the instrumentation includes cost of the instrument racks. Also included in the cost are the pressure gauges and switches located in the same racks.

Temperature monitoring that is required for the operation of the main compressor system and the propane compressor system shall be monitored by use of thermowells, RTD's, signal conditioners and panel meters.

The cost of this portion of the instrumentation includes the cost of the thermowells and RTD's. The cost of the signal conversion and indication is included in the cost of the station control panel (where equipment is mounted).

Flow measurement of the gas and propane is obtained through sensing differential pressures across orifices and temperatures at the orifice. The cost of instruments is included in the costs for temperature monitoring, instrumentation racks and station control panels.

Flow measurements of the fuel gas for the main compressor, propane compressor and utilities are based on turbine meters. The cost of the turbine meters is included in the fuel gas system costs.

8.3 STATION CONTROLS

Station control panels for the main compressor station and the propane station are included in this estimate and the cost covers logic, instrumentation (mounted in panel), indicators, and local push buttons and switches for the operation of the stations in general.

8.4 PROPANE INSTRUMENTATION AND CONTROLS

Instrumentation and control cost estimates for the propane system are "taken off" a flow sheet supplied by Foothills.

8.5 MISCELLANEOUS

Miscellaneous items included in the estimate are items which were unable to be categorized above.

9. ELECTRICAL

9.1 ENGINE GENERATORS (includes Switchgear)

Three (3) 450 KW Caterpillar generator sets have been provided at

Station No. 3. Two (2) of these will be natural gas fired for prime electric power generation and the third will be a diesel fueled standby unit.

At Station No. 7, three (3) 150 KW Caterpillar generator sets will be provided. Again, two (2) will be natural gas fired and the third a diesel fueled standby unit.

Included in the estimate for the engine generators are the associated cooling and starting equipment, engine control panels, switch gear and metering.

9.2 MOTOR CONTROL CENTRE

The motor control centre (MCC) estimate is based on an essential service bus and non-essential service bus segregation. The main compressor and propane compressor unit MCC's are supplied by the unit manufacturer and are included in the unit costs. They are fed from the main MCC.

9.3 CONDUIT CABLE AND FITTINGS

The supply of material and installation of all conduits, wire, cable, trays and consumable electrical materials has been provided for in the estimate.

9.4 UNINTERRUPTIBLE POWER SUPPLY

UPS, which consists of the battery charger, inverter and batteries for the general station, is included in the estimate. The costs of the UPS systems for the main compressor unit and propane compressor units are included in the cost of units.

9.5 LIGHTING FIXTURES

The costs of the materials and installation of interior and exterior building lighting have been provided in the estimate.

9.6 YARD LIGHTING

The cost of the materials and installation of yard lighting on conventional light standards in 12 separate locations around the compressor station yard has been included.

9.7 HEAT TRACING

The cost of heat tracing certain portions of pressure piping installed aboveground has been included in the estimate.

9.8 GROUNDING

The grounding system required for installation in the permafrost areas requires special preparation and these costs have been considered by the consultant.

10. INSULATION AND PAINTING

10.1 INSULATION

This item includes the cost of materials and the installation of insulation to all piping, vessels and equipment.

10.2 PAINTING

This item has provided for the supply and application of all painting requirements to equipment, piping, structural steel, masonry and exposed concrete work.

11. TESTING, WINTERIZING AND STARTUP

11.1 TESTING

This item includes the cost of materials and labor to test the high

pressure gas piping, the propane piping and miscellaneous piping and vessels to the NEB requirements.

11.2 WINTERIZING

This sub-category provides for the labor and material required for snow removal and isolated hoarding and heating. This allowance relates to the protection of concrete, welders' shelters and removing snow. Fuel for heating temporary buildings is included under construction facilities. In addition it provides for the startup and checking of heat tracing, heating systems, winterizing valve operators, etc.

11.3 STARTUP

This sub-category provides for the labor, vendors' servicement and materials required to check out and start up the station and to have it operating in a safe and satisfactory manner.

12. MISCELLANEOUS

This category includes a number of items not otherwise provided for such as safety equipment, site improvements, walkways and furnishings for the living quarters.

13. SALES TAX

This item was also requested by the client to accumulate the Federal Sales Tax on all material required for the station.

14. CONTRACTOR'S OVERHEAD

The discussion of the contractor's overhead costs is presented in detail in Section III-14.

15. FREIGHT

This item was requested by Foothills to accumulate the cost of freight from a marshalling yard in the vicinity of Edmonton to the job sites.

16. TOOLS AND MAJOR SPARES

This category provides for equipping the station with all of the necessary maintenance tools and provides for a number of spare parts for the stations including a spare gas turbine which is prorated to all stations.

TABLE 3

DEMPSTER HIGHWAY COMPRESSOR STATION

COMPOSITION OF TRADE CREWS

CHILLED STATION

Category	Manhours
Carpenters	28,000
Laborers	20,000
Cement Masons	4,000
Operating Engineers	20,000
Teamsters	25,000
Ironworkers	16,000
Pipefitters	38,000
Machinists	6,000
Electricians	25,000
Painters	6,000
Insulators	4,000
Sheetmetal	6,000
TOTAL	192,000

TABLE 4

DEMPSTER HIGHWAY COMPRESSOR STATION

COMPOSITION OF TRADE CREWS

NON-CHILLED STATION

Category	Manhours
Carpenters	15,000
Laborers	12,000
Cement Masons	3,000
Operating Engineers	11,000
Teamsters	11,000
Ironworkers	8,000
Pipefitters	20,000
Machinists	4,000
Electricians	14,000
Painters	4,000
Insulators	1,000
Sheetmetal	4,000
TOTAL	107,000

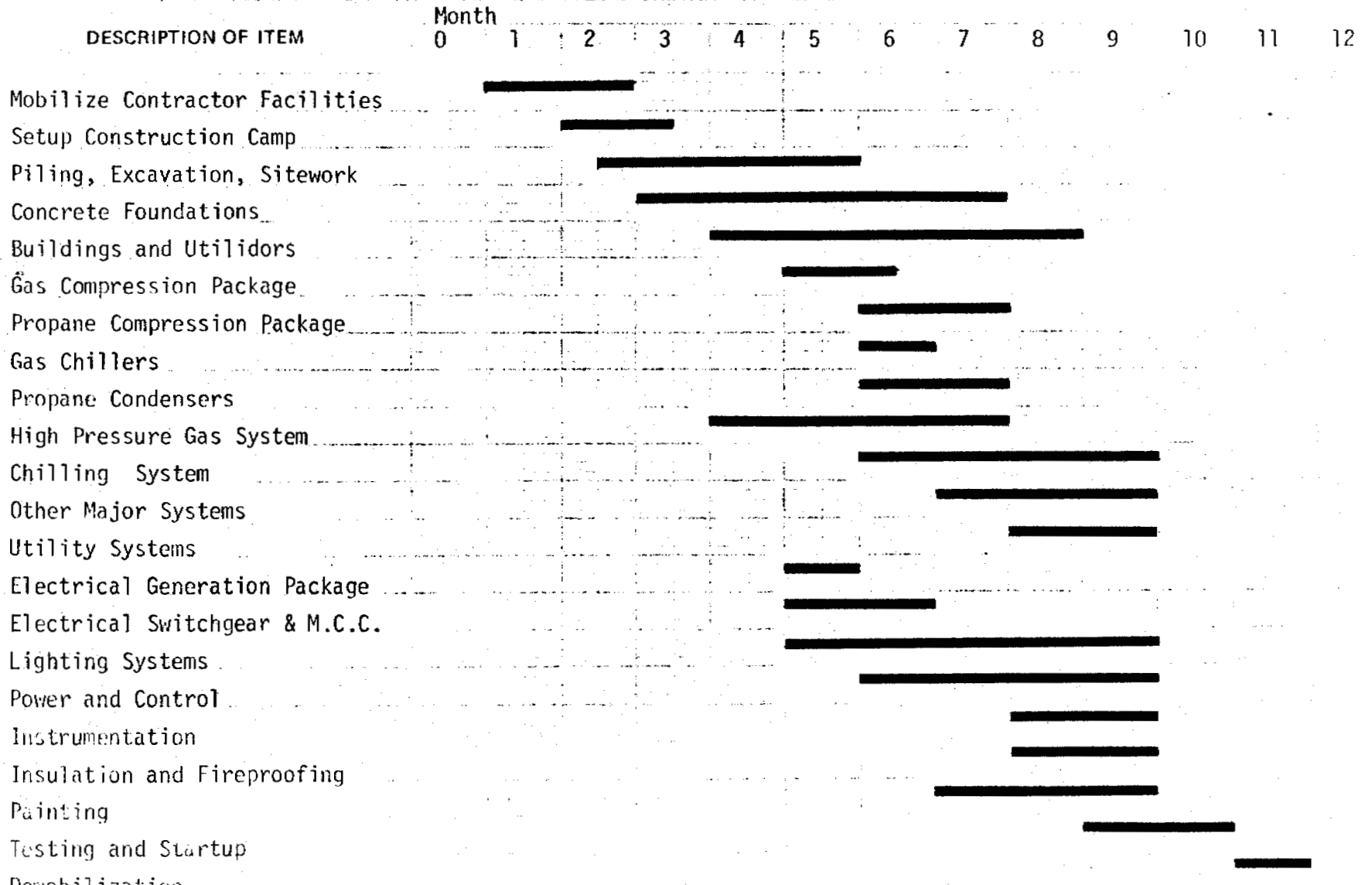
FIGURE 1

Dillingham

PROGRESS SCHEDULE

LEGEND

FIRST LINE ..... SCHEDULED TIME
SECOND LINE ..... ACTUAL PROGRESS
ORDER DATE ◆ DELIVERY DATE ◇
START UP ◇



Foothills Pipe Lines (Yukon) Ltd.
Eastern Arctic Natural Gas Compressor Stations - Chilled

SHEET NUMBER 1
NO. OF SHEETS 1

BY DAY MO. YR. DRAWING NO. REV.
PREP. M.J.T. 18 1 79 A-30[illegible]-1
PROC.

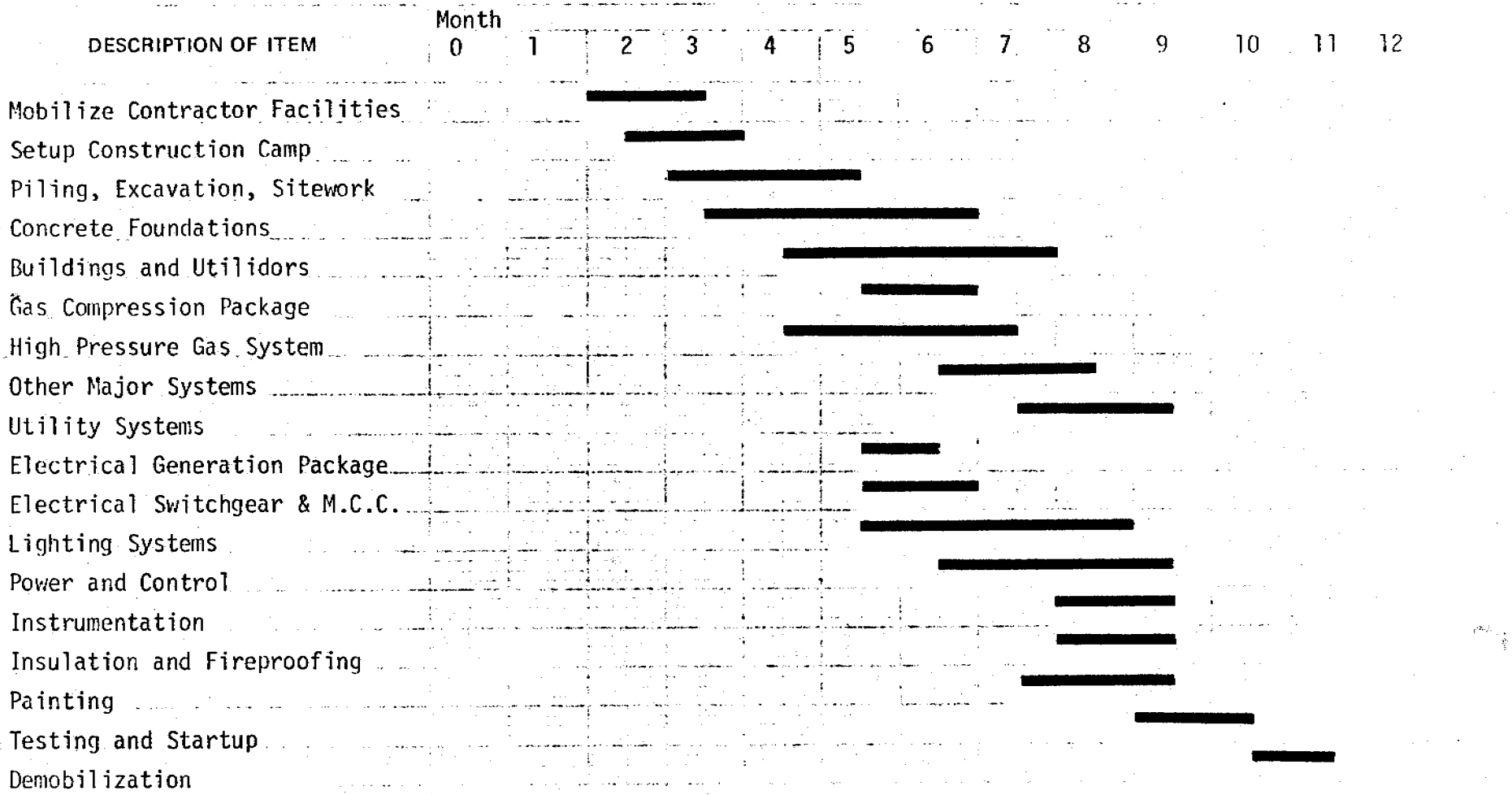
FIGURE 2

Dillingham

PROGRESS SCHEDULE

LEGEND

FIRST LINE . . . . . SCHEDULED TIME
SECOND LINE . . . . . ACTUAL PROGRESS
ORDER DATE ◆ DELIVERY DATE ◆
START UP ◇

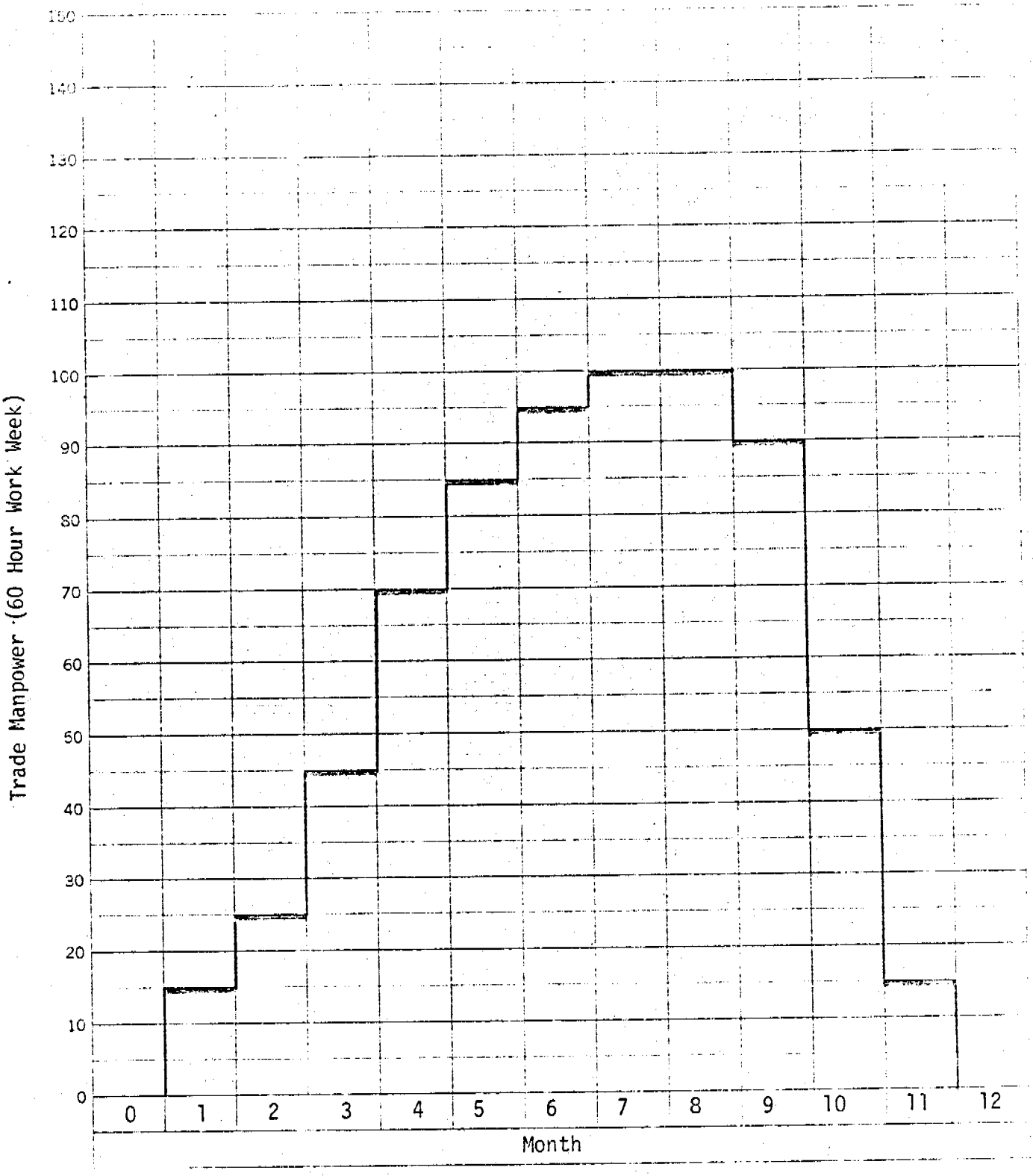


Foothills Pipe Lines (Yukon) Ltd.
Dempster Lateral Compressor Stations - Unchilled

SHEET NUMBER 1
No. OF SHEETS 1

BY DAY MO. YR. DRAWING NUMBER REV.
PREP. M.J.T. A-3688-2
PROC.

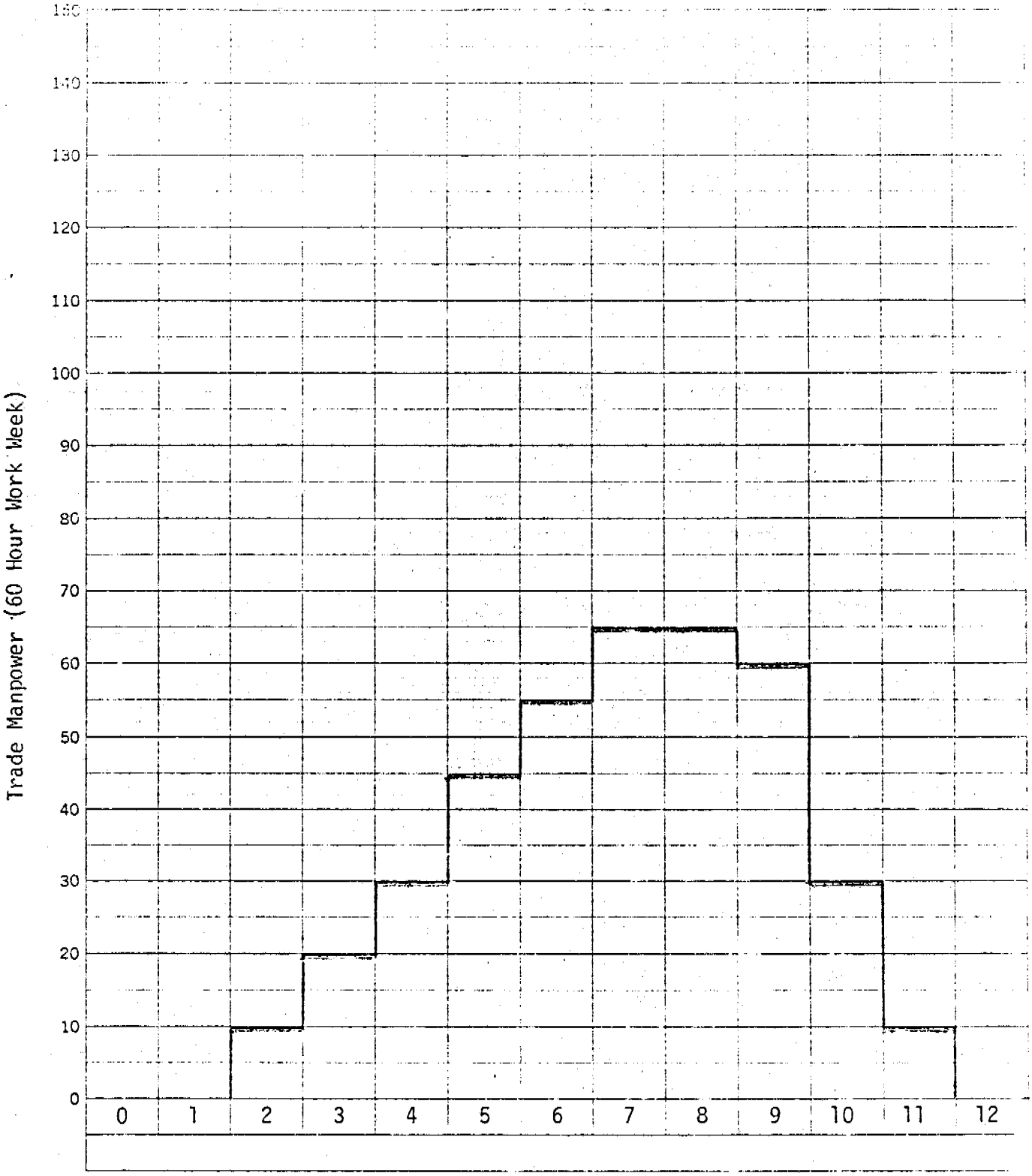
FIGURE 3



Foothills Dempster Lateral
Chilled Compressor Station
Manpower Curve

22 January 1979

FIGURE 4



Foothills Dempster Lateral
Unchilled Compressor Station
Manpower Curve

22 January 1979

III. BASIS OF THE ESTIMATE

GENERAL

This Section of the estimate is divided into sixteen separate cost categories and provides an explanation of the assumptions used in preparing the estimate. Additionally, the itemized materials cost summary sheet, installation man hours and cost summary, the estimated weight of materials and the estimated Federal Sales Tax for each sub-category are also included.

Where revised drawings have been prepared, they are included in Section IV and are referred to in the appropriate subsection.

A contingency generally in the amount of 10 percent has been added to the cost of material due to the preliminary stage of the station design.

DEMPSTER HIGHWAY COMPRESSOR STATION

III-1 FOUNDATIONS

This estimate included the excavation and backfill of foundations, drilled concrete piling, concrete formwork, reinforcing steel, embedded materials, concrete placement, grouting, insulation and waterproofing. The materials supply for all of these items is (shown separately) included.

The estimate provides for 2600 cubic yards of concrete at the chilled station (No. 3) and 1400 cubic yards at the non-chilled station (No. 7). Reinforcing steel is estimated to require 125 pounds per cubic yard.

COST SUMMARY

	Chilled	Non-Chilled
Materials	$ 452,000	$252,000
Installation	902,000	506,000
Total	$1,354,000	$758,000
Estimated Weight of Materials ex Edmonton	1,770,000 lbs.	1,045,000 lbs.
Federal Sales Tax Estimate	$ 25,000	$ 13,000

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster　Estimate No. ______
Item No. ______　Account No. ______　Date ______
Description: Foundations (Summary)　Sheet No. ______ of ______

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Excavation & Backfill 1740 cy gran	cy	9780	.592　5790	15.00　86850		4.00　49600			136450
Concrete Formwork 61200sf ÷ 32 = 2000 sheets x1.63 = 100,000 fbm	sf	61200	.328　20110	16.00　321760				1.45　88700	410460
Reinforcing Steel	lbs	280000	.015　4100	16.00　65600		.25　70000			135600
Embedded Materials	lbs	11850	.058　690	16.00　11040		1.50　17700			28740
Concrete Place 2600 cy 1400	cy	2250	2.61　5880	15.00　88200		90.00　202500			290700
Other　Grout	cf	280	5.00　1400	16.00　22400		58.57　16400			38800
Insulation & waterproof	sf	7400	.078　580	16.00　9280		2.15　15900			25180
			17.0　38550	605130		372100		88700	1065930

0001-1　13SEP76

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Estimate No.:
Item No.:
Account No.:
Date:
Description: Foundations (Compressor Building Chiller Station)
50' x 110' = 5500 sf, 15 [illegible]/sf
Sheet No. 1 of 12

Description of Work	Unit	Quantity	Hours		Labour		Equipment	Materials		Subcontracts	Job Supplies		Total Cost
Excavation & Backfill allow 300 cy gran	cy	1600	.50	800	15.00	12000		40.00	12000				24000
Concrete Formwork - incl shoring 500 cy @ 75 sf/cy	sf.	37500	.12	4500	16.00	72000					.50	18750	90750
Reinforcing Steel 500 cy @ 120 lbs/cy	lbs	60000	.015	900	16.00	14400		.25	15000				29400
Embedded Material	lbs	2000	.05	100	16.00	1600		1.50	3000				4600
													2m
Concrete Place - incl manifold & slab finish	cy	500	2.8	1400	15.00	21000		90.00	45000				66000
Grouting	cf.	100	5.0	500	16.00	8000		100.00	10000				18000
allow HP Gas 10%		(250)		(5700)	15.00	86500			59500			13100	167100
18 w 4bs Propane			(164)	8200		129000			85000			18750	465 232750

D001-1 13SEP76

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills, Dempster — Estimate No. ____
Item No. ____ Account No. ____ Date ____
Description: Foundations (Service Building) 30 × 75 = 500 sf — 19 sf/sf — Sheet No. 2 of 12

Description of Work	Unit	Quantity	Hours		Labour		Equipment	Materials		Subcontracts	Job Supplies		Total Cost
Excavation & Backfill, allow 20 cy span	cy	300	.50	150	15.00	2250		4.00	800				3050
Concrete Formwork, incl sundries 50 cy @ 30 sf/cy	sf	1500	.34	510	16.00	8160					1.50	2250	10410
Reinforcing Steel, cut, bend, place 50 cy @ 120 lbs/cy	lbs	6000	.015	90	16.00	1440		.25	1500				2940
Embedded Materials	lbs	200	.05	10	16.00	160		1.50	300				460
												299	
Concrete Place, incl maintenance, finish	cy	50	2.8	140	15.00	2100		90.00	4500				6600
Grouting	cf	10	5.0	50	16.00	800		30.00	300				1100
6m 16s			19.0	950		14910			9400			2250 490	27456

D001-1 13SLP/6

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster Estimate No. ______
Item No. ______ Account No. ______ Date ______
Description: Foundations (Crusher Building) 50'x75' = 3750 sf 1.75 hr/sf Sheet No. 3 of 12

	Description of Work	Unit	Quantity	Hours		Labour		Equipment	Materials		Subcontracts	Job Supplies		Total Cost
	Excavation & Backfill	cy	1200	.50	600	15.00	9000		40	8000				17000
	allow 200 cy spoil													
	Concrete Formwork	sf.	7500	.34	2550	16.00	40800					1.50	11250	52050
	300 cy @ 25 sf/cy													
	Reinforcing Steel	lbs	36000	.015	540	16.00	8640		.25	9000				17640
	300 cy @ 120 lbs/cy													
	Embedded Materials	lbs	1000	.05	50	16.00	800		1.50	1500				2300
														364
	Concrete Place	cy	300	2.8	840	15.00	12600		90.00	27000				39600
	Grouting	cf	20	5.0	100	16.00	1600		30.00	600				2200
	17.4 39s			156	4680		73440			46100			11250	495 130790

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D001-1 13SEP76

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills · Dempster
Estimate No.:
Item No.:
Account No.:
Date:
Description: Foundations (Central Utility Building) 60'x120' = 7200 sf. 0.8 mh/sf
Sheet No. 4 of 12

Description of Work	Unit	Quantity	Hours		Labour		Equipment	Materials		Subcontracts	Job Supplies		Total Cost
Excavation & Backfill – allow 300 cy gran.	cy	1400	.50	700	15.00	10500		40.00	17000				27500
Concrete formwork – incl. shoring – 400 cy @ 25 sf/cy	sf.	10000	.30	3000	16.00	48000					1.50	15000	63000
Reinforcing Steel – 400 cy @ 125 lbs/cy	lbs	50000	.015	750	16.00	12000		.35	17500				29500
Embedded Materials	lbs	3000	.05	150	16.00	2400		1.50	4500			350	6900
Concrete Place – incl. vibrating & slab finish	cy	400	2.8	1120	15.00	16800		90.00	36000				52800
Insulation, waterproofing	sf.	7200	.10	720	16.00	3570		.75	5500				9070
14 m 476			149	5940		93220			70500			15000 40%	175720

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D001-1 13SEP76

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Estimate No.
Item No.
Account No.
Date
Description: Foundations - (Stores Building) 40' x 60' = 2400 sf (1.2 MH/sf?)
Sheet No. 5 of 12

	Description of Work	Unit	Quantity	Hours		Labour		Equipment	Materials		Subcontracts	Job Supplies		Total Cost
	Excavation & Backfill allow 100 cy exc.	cy	800	.50	400	15.00	6000		4.00?	4000				10000
	Concrete Formwork, incl. sundry Whse j15, workshop 150 cy @ 30 sf/cy	sf.	4500	.34	1530	16.00	24480					1.50	6750	31230
	Reinforcing Steel, cut, bend, place 150 cy @ 120 lbs/cy	lbs	18000	.015	270	16.00	4320		.25	4500				8820
	Embedded Metals	lbs	1000	.05	50	16.00	800		1.50	1500				2300
	Concrete Place, incl. materials, finish	cy	150	2.8	420	15.00	6300		90.00	13500				19800
	Grouting, incl. patch	cy	40	5.0	200	16.00	3200		30.00	1200				4400
	10 m 29 s			(19.1)	2870		45100			24700			6750 5%	76550

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Estimate No.:
Item No.:
Account No.:
Date:
Description: Foundations - (Living Quarters) 30'x140' = 4200 sf.
Sheet No. 6 of 12

	Description of Work	Unit	Quantity	Hours (rate)	Hours	Labour (rate)	Labour	Equipment	Materials (rate)	Materials	Subcontracts (26 sf/sf.)	Job Supplies (rate)	Job Supplies	Total Cost
	Excavation & Backfill	cy	1000	.50	500	15.00	7500		40.00	4000				11500
	allow 100 cy gen.													
	Concrete Formwork - incl. sundries	sf.	4500	.30	1350	16.00	21600					1.50	6750	28350
	150 cy @ 30													
	Reinforcing Steel	lbs	18000	.015	270	16.00	4320		.25	4500				8820
	150 cy @ 120 lbs/cy													
	Embedded Materials	lbs	600	.05	30	16.00	480		1.50	900				1380
	Concrete Place	cy	150	2.0	300	15.00	4500		90.00	13500				18000
	Insulation & Waterproof	sf.	2000	.10	200	16.00	3200		2.00	4000				7200
	10% 275			19.7	2650		41600			26900			6750	501 75250

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Estimate No.:
Item No.:
Account No.:
Date:
Description: Foundations (Kolotes Machinery Bases & Support Ftgs)
Sheet No. 7 of 12

Description of Work	Unit	Quantity	Hours		Labour		Equipment	Materials		Subcontracts	Job Supplies		Total Cost	
Excavation & Backfill	cy	600	2.00	1200	15.00	18000								18000
Concrete Formwork	sf.	4000	.40	1600	16.00	25600					1.50	6000		31600
100 cy @ 40 sf/cy														
Reinforcing Steel	lbs	10000	.015	150	16.00	2400		.75	7500					9900
100 cy @ 100 lbs/cy														
Embedded Materials	lbs	2000	.10	200	18.50	3700		1.50	3000					6700
													5.15	
Concrete Place	cy	100	4.0	400	15.00	6000		90.00	9000					15000
Grouting	cf.	100	5.0	500	16.00	8000		40.	4000					12000
Unchilled 10%				2620		44340			15950			5400		67790
on 63s Chilled			818	2750		53200			18500			6000	811	87700

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills. Dempster — Estimate No.: ______
Item No.: ______ Account No.: ______ Date: ______
Description: Foundations (Crusher footings) 2-40' x 154' = 12320 sf — Sheet No. 8 of 12
0.40 lb/sf

Description of Work	Unit	Quantity	Hours		Labour		Equipment	Materials		Subcontracts	Job Supplies		Total Cost
Excavation & Backfill allow 700 cy gran	cy	1500	.50	750	15.00	11250		4.00	8000				19250
Concrete Formwork 300 cy @ 30 sf/cy	sf	9000	.30	2700	16.00	43200					1.50	13500	56700
Reinforcing Steel 300 cy @ 150 lbs/cy	lbs	45000	.015	660	16.00	10560		.25	11250				21810
Embedded Materials	lbs	1000	.05	50	16.00	800		1.50	1500				2300 3/41
Concrete Place	cy	300	2.0	600	15.00	9000		90.00	27000				36000
Grouting	cf	10	5.0	50	16.00	800		30.00	300				1100
1270 40s			16.0	4810		75610			48050			13500	451 137160

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Footings - Dumpster — Estimate No.
Item No. — Account No. — Date
Description Foundations (Communications Tower Proj.) — Sheet No. 9 of 12

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Excavate & Backfill	cy	80.50	140	1400					6012
Concrete Formwork 10 cy @ 20 sf/cy	sf	200.20	600	4600				100 700	11612
Reinforcing Steel 4 cy @ 100 lbs/cy	lbs	1000 400	200	2400		2500			5700
Concrete Place	cy	10 2.0	20	200		400			1200
		140	1460	21800		11650		700 350	34530

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster Estimate No. ______

Item No. ______ Account No. ______ Date ______

Description: Foundations (Utilidors) 8' × 400' = 3200 sf. 0.4 hr/sf. Sheet No. 10 of 12

Description of Work	Unit	Quantity	Hours		Labour		Equipment	Materials		Subcontracts	Job Supplies		Total Cost
Excavation + Backfill	cy	800	.50	400	15.00	6000							6000
Concrete formwork 200 cy @ 75 sf/cy	sf.	15000	.30	4500	16.00	72000					1.00	15000	87000
Reinforcing Steel 200 cy @ 125 lbs/cy	lbs	25000	.012	300	16.00	4800		.25	6250				11050
Embedded Materials	lbs	600	.05	30	16.00	480		1.50	900				1380
Concrete Place	cy	200	2.0	400	16.00	6400		90.00	18000				24400
Insulation	sf.	3200	.05	160	16.00	2560		2.00	6400				8960
Unchilled 80%				5230		75070			[illegible]			4000	64310
8% 35% Chilled			14.9	7190		42840			31550			5000	80390

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Item No.:
Account No.:
Description: Foundations (Storage Treatment) 10'x50' & 1530 sf (11 mh/sf)
Estimate No.:
Date:
Sheet No. 6 of 12

Description of Work	Unit	Quantity	Hours (rate)	Hours	Labour (rate)	Labour	Equipment	Materials (rate)	Materials	Subcontracts	Job Supplies (rate)	Job Supplies	Total Cost
Excavation & Backfill	cy	200	.50	100	15.00	1500							1500
Concrete Formwork 40 cy @ 35 sf/cy	sf	1400	.30	300	16.00	4800					1.00	1400	6200
Reinforcing Steel 40 cy @ 175 lb/cy	lbs	7000	.012	60	16.00	960		.25	1750				2710
Embedded Materials	lbs	400	.05	20	16.00	320		1.50	600				920
Concrete Place	cy	40	2.5	100	15.00	1500		90.00	3600				5100
bm'os			465	580		9080			5950			1000	386 15530

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Foothills - Langdon — Estimate No.

Item No. — Account No. — Date

Description foundations (Fuel Gas Regulator Bldg) 20'x25' = 500 SF — Sheet No. 12 of 12

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Exc & Fill	CY	300	150	2250		800			3050
Forms	SF	1500	576	8160				2750	10910
Rebar	lbs	6000	900	14400		1500			29900
Concrete	CY	50	140	2100		4500			6600
bkdn			178	13950		6800		2750	23500

1-38-1

D001-1 13SEP78

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project ______ Estimate No. ______

Item No. ______ Account No. ______ Date ______

Description: Compare gravel/aggregate costs versus purchased Sheet No. ______ of ______

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Granular gravel	cy	20000				4.00 80000			80000
4 @ 2800 = 11200	lds	1667	5.0 8335	40.00 333000	30.00 250000				583000
4 @ 1240 = 4960									
16160 x 1.25 = 20000 cy									33.15 663000
							used 16160 cy	@	40.00 646400
assume 12 cy/load & 100 mile haul									(17000)
20000 ÷ 12 = 1667 loads									
100 mile ÷ 40 mph = 2.5 x 2 = 5 h/trip.									
Concrete aggregates	cy	10000				6.00 60000			60000
2 @ 2600 = 5200	lds	833	15.0 12495	40.00 499800	30.00 374850				874650
2 @ 1400 = 2800									
8000 x 1.25 = 10000 cy									93.46 934650
							used 10000 cy	@	90.00 900000
assume 12 cy/load & 300 mile haul									34650
10000 ÷ 12 = 833 loads									
300 mile ÷ 40 mph = 7.5 x 2 = 15 h/trip									

D001-1 13SEP76

DEMPSTER HIGHWAY COMPRESSOR STATION

III-2 BUILDINGS

This category provides for the supply, assembly and erection of pre-engineered metal buildings and modular living quarters. Structural steel, insulated wall and roof cladding systems, wood framing, partitions, ceilings and floor systems, overhead cranes, miscellaneous steel and interior furnishings are included.

The sizes of buildings provided are as follows:

a) High Pressure Gas Compressor - 60' x 70' x 30'
b) Propane Compressor - 40' x 110' x 30'
c) Gas Scrubber - 20' x 25' x 15'
d) Chiller Building - 50' x 75' x 30'
e) Control, Utility - 60' x 120' x 30'
f) Stores - 40' x 60' x 14'
g) Living Quarters - 4200 square feet, single storey
h) Utilidors - 400' x 8' x 8'
i) Fuel Gas Regulator and Meter - 20' x 25' x 15'
j) Water Treating - 30' x 40' x 18'

COST SUMMARY

	Chilled	Non-Chilled
Materials	$1,125,000	$741,000
Installation	268,000	190,000
Total	$1,393,000	$931,000
Estimated Weight of Materials ex Edmonton	974,000 lbs.	727,000 lbs.
Federal Sales Tax Estimate	$ 60,100	$ 39,000

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: foothills - Dempster — Estimate No.:
Item No.: — Account No.: — Date:
Description: Buildings - Summary. — Sheet No.: of

	Description of Work		Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
5	HP Cabs Camp	4200 sf	lbs	141 000	1600	25 600		194 400			220 000
10	Propane Camp	4400		128 400	1800	28 800		165 400			194 200
2	Scrubber	500		10 700	300	4 800		14 000			18 800
5	Chiller	3750		131 000	1500	24 000		184 000			208 000
20	Control Utility	7000		229 000	2350	53 550		194 500			247 050
4	Stairs	2400		30 000	550	8 800		46 800			55 600
1	PG Refrigeration	500		18 000	300	4 800		14 000			18 800
-	Living Quarters	4200		210 000	1200	20 160		170 000			190 160
20	Utilidor	3200		42 000	2200	36 800		102 000			138 800
		30250 sf.	lbs	981 000	12 960	207 310		1 082 500			1 292 810

12 960 ÷ 30 250 = 0.425 hr/sf

981 000 lbs ± Stairs

12 960 ÷ 500 = 25.9 hr/ton

1 292 810 ÷ 30 250 = 42.60/sf.

÷ 981 000 = 1.32/lb.

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Estimate No.:
Item No.:
Account No.:
Date:
Description: Buildings (HP Gas Compressor Bldg) 60x70 = 4200 sf
Sheet No. 1 of 9

Description of Work	Unit	Quantity	Hours	Labour (rate)	Labour	Equipment	Materials (rate)	Materials	Subcontracts	Job Supplies	Total Cost
Pre-Engineered Metal Building	sf	4200	1100	16.00	17600		24.00	100800			118400
	lbs	70000									
Overhead Cranes	Ea	2	400	16.00	6400		lot	90000			96400
1-5 ton x 60' 32000 lbs $35000	lbs	67000									
1-10 ton x 60' 35000 55000											
Misc. Steel	lbs	4000	100	16.00	1600		1.00	4000			5600
6m27s	lbs	141000	1600		25600			194800			220400

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Estimate No.
Item No.
Account No.
Date
Description: Buildings (Propane Compressor Bldg.) 40'x110 = 4400 sf.
Sheet No. 2 of 9

Description of Work	Unit	Quantity	Hours	Labour (rate)	Labour	Equipment	Materials (rate)	Materials	Subcontracts	Job Supplies	Total Cost
Pre-Engineered Metal Bldg.	sf. lbs	4400 80000	1200	16.00	19200		21.00	92400			111600
Overhead Crane: 1-5 ton x 40' 18000 lbs $ 29000 1-10 ton x 40' 22000 36000	Ea. lbs	2 40000	400	16.00	6400		Lot	65000			71400
Misc. Steel	lbs	8000	200	16.00	3200		1.00	8000			11200
8m 23 s	lbs	128000	1800		28800			165400			194200

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Foothills - Dumpster — Estimate No.

Item No. — Account No. — Date

Description Buildings - (Gas Service Bldg) 20'x25' = 500 sf — Sheet No. 3 of 9

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Pre-Engineered Metal Building	sf	500	300	16.00	4800	28.00	14000		18800
	lbs	10000							
6 wks	lbs	10000	300	4800		14000			18800

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Foothills - Dempster Estimate No.

Item No. Account No. Date

Description Buildings - (Chiller Building) 50'x75' = 3750 sf. Sheet No. 4 of 9

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Pre-Engineered Metal Building with Structural steel, cladding, roofing, doors,	sf.	3750	100	4.00	1600	24.00	9000		10600
	lbs	60000							
Overhead Cranes	Ea	2	400	6.00	2400	lot	9000		9400
1- 5 ton x 60' 30000 lbs @ 35000	lbs	67000							
1- 10 ton x 60' 35000 lbs @ 35000									
Misc. Steel	lbs	4000	100	4.00	1600	1.00	400		5600
Bldgs	lbs	131000	1500	24000		184000			208000

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Estimate No.
Item No. Account No.
Date
Description: Buildings (Control, Utility Building) 60'x120' = 7200 sf.
Sheet No. 5 of 9

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Pre Engineered Metal Building	sf	7200	1460	16.00 23360		19.00 136800			160160
	lbs	170000							
Overhead Crane	Ea	1	200	16.00 3200		16K 35000			38200
1-5ton x 60'	lbs	32000							
Interior Partitions - Metal	sf	3500	.10 350	16.00 5600		2.00 7000			12600
	lbs	7000							
- Masonry 8"	sf	3000	.30 900	16.00 14400		1.50 4500			18900
	lbs	60000							
- Doors 3070	Ea	10	10.0 100	16.00 1600		250 2500			4100
	lbs	2000							
Ceiling Susp. - Metal	sf	700	.075 50	16.00 800		1.00 700			1500
	lbs	1050							
- Acoustic	sf	1800	.05 90	16.00 1440		.85 1500			2940
	lbs	500							
Flooring - Raised Access	sf	900	.10 90	16.00 1440		6.00 5400			6840
	lbs	9000							
- Vinyl Tile	sf	300	.10 30	16.00 480		1.00 300			780
	lbs	300							
- Wax Concrete	sf	5400	.01 50	15.00 750		.05 300			1050
	lbs	200							
Furnishings - Lab etc	lot		30	16.00 480		500			980
	lbs	1000							
8m 425	lbs	229000	3350	53550		194500			248050

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Foothills - Dempster — Estimate No.

Item No. — Account No. — Date

Description Britannia (Storage Bldg) 40'x60' = 2400 sf. — Sheet No. 6 of 9

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Pre-Engineered Metal Bldg	sf	2400	155	1600	8800	19.50	46800		55600
	lbs	30000							
bm 95	lbs	30000	155	8800		46800			55600

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Foothills - Dempster Estimate No.

Item No. Account No. Date

Description Buildings - (Fuel Gas Regulator Bldg) 20'x25' = 500 sf. Sheet No. 7 of 9

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Pre Engineered Metal Building	sf	500	30hrs	460		1400			1860
	lbs	10000							
6 units	lbs	10000	300	4600		14000			18600

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills · Dempster Estimate No.:
Item No.: Account No.: Date:
Description: Buildings (Living Quarters) 4200 sf Sheet No. 8 of 9

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Prefabricated building	sf	4200	.30 1260	16.00 20160		40.00 168000			188160
Single storey, wood frame, aluminum siding, pitched roof, thermo windows, insul ext. steel doors, w.c. int doors, vinyl gypsum int. panelling, lino & carpet flooring, lighting, plumbing, heating, air conditioning & misc furnishing	lbs	210000							
(12 man accommodation)									
Misc						2000			2000
6 m²/s	lbs	210000	1260	20160		170000			190160

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Item No.:
Account No.:
Description: Buildings (Utilidors) 400' x 8' = 3200 sf.
Estimate No.:
Date:
Sheet No. 9 of 9

	Description of Work	Unit	Quantity	Hours		Labour		Equipment	Materials		Subcontracts	Job Supplies	Total Cost
	Structural Steel	lbs	80000	.015	1200	16.00	19200		1.00	80000			99200
	400' @ 200 lb/' = 80000 lbs												
	Roof and wall sheathing	sf	10000	.10	1000	16.00	16000		2.00	20000			36000
		lbs	10000										
	Doors 7070	ea	8		100	16.00	1600		250	2000			3600
		lbs	2000										
	Unchilled 80%				1840		29440			81600			111040
	bu-385 Chilled	lbs	92000		2300		36800			102000			138800

- 05 -

D001-1 13SEP76

DEMPSTER HIGHWAY COMPRESSOR STATION

III-3 GAS COMPRESSOR PACKAGE

III-3.1 GENERAL

This cost estimate provides for the supply of one (1) 16,000 ISO H.P. rated natural gas compressor package complete with auxilliaries. The proposed unit for both the chilled and non-chilled station is a Cooper Bessemer Coberra 3045 gas turbine compressor package.

Please refer to the quotation included in this section from Cooper Energy Services to Foothills Pipe Lines (Yukon) Ltd. dated December 14, 1978 for specific details.

The gas turbine compressor package will be housed in a heated compressor building measuring 60' x 70' x 30' eaves, complete with overhead cranes.

III-3.2 DESCRIPTION

The gas generator supplied with the Coberra 3045 package will be a Rolls Royce Spey engine with a fuel rate of 7600 BTU/BHP/Hr. at ISO conditions.

The gas pipeline compressor will be a Cooper Bessemer RFA-36 (end suction) two-stage centrifugal compressor designed for a throughput of 1200 MMSCFD and pressure rated at 1440 psig maximum operating pressure.

Included in this gas turbine compressor package costs are the following:

a) Air inlet filter system including weatherhoods, anti-icing and silencer designed to meet ISO NR55 @ 400 feet radius from the unit.

b) Exhaust gas system including duct transition and silencer designed to meet ISO N55 @ 400 feet radius from the unit.

c) Lube/seal oil systems for the gas generator and power turbine/ compressor.

d) Unit control and unit MCC panels.

e) Trend monitoring (sensors and transmitters only).

f) Acoustical enclosure over the gas generator and power turbine only.

g) Load testing at reduced pressure.

In addition to the above costs, Foothills has added a contingency of $70,000 as per their December 21, 1978 letter to Canuck Engineering Ltd.

Also, each additional speed line on the gas compressor test would be an extra $3,675 which has not been included in this estimate.

This gas turbine compressor package would be manufactured and tested in Stratford, Ontario.

III-3.3 FUEL GAS

The gas generator will be fueled on natural gas delivered at 500 psig to the Cooper Bessemer skid.

Fuel measurement has been provided by means of a 4" Rockwell T-18 turbine meter. Cost of this meter is included in the station fuel gas system, Section VI of this estimate.

III-3.4 LUBE OIL

Included in this estimate is the cost of the initial fill of lube oil for the gas generator and power turbine/compressor. We have allowed

for synthetic type lube oil for the gas generator and mineral type lube oil for the power turbine/compressor.

Stainless steel pipe, valves and fittings have been included in this estimate for hook up of the lube oil systems.

III-3.5 MISCELLANEOUS

We have allowed for the supply of necessary small pipe, valves, fittings and tubing for hook up of vent lines, instrument lines, etc.

COST SUMMARY

	Chilled and Non-Chilled Station
Materials	$3,900,000
Installation	67,000
Total	$3,967,000

Estimated Weight of Materials ex Edmonton	418,000 lbs.
Federal Sales Tax Estimate	$486,100

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. 5 - Inc Compression Pkg

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
Cooper - Bessemer	C-E	1	$3,786,300	$3,786,300
Model				
16,000 ISO HP				
Gas Turbine/Comp				
Package				
Freight to Edm.				30,000
Package Weight	388,000 #		Other material	
			30,000 #	
	- Gas Generator	6,000 #		
	- Turbine & Skid	58,000 #	Total Weight	
	- L.O. Console & Tank	30,000 #	418,000 #	
	- Radiator	15,000 #	190 tonnes	
	- Compressor	80,000 #		
	- Farr Inlet Filter	18,000 #		
	- Controls	45,000 #		
	- Inlet Plenum &	35,000 #		
	Silencer, GG L.O. Console			
	- Misc. #1	24,000 #		
	- Misc #2	30,000 #		
	- Misc. #3	25,000 #		
	- Lube 0.1	22,000 #		
FST @ 12%			$486,083	
Lube 0.1				
- Gas Gen		200 us Gals	$20/gal	$ 4,000
- Turb/Comp		2000 us Gals	$10/gal	20,000
Lube/Seal 0.1 Piping (304SS)		1 LOT	10,000	10,000
Fullers Earth Filter		1	2500	2,500
Misc. Pipe, Values, Fittings (Instrument Lines, vents, etc)		1 LOT	5000	5,000
			SUB-TOTAL	$3,857,000
		CONTINGENCY @ 1 %		38,578
			TOTAL	$3,896,378

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Foothills - Dunphy Estimate No.

Item No. Account No. Date

Description HP C&S Compression Package Sheet No. 1 of 1

	Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
	C&S Turbine Compressor Package 1-16000 ISO HP including air inlet filter & de-ice, air silencer, exhaust silencer exhaust ducting, wind mantling, acoustic enclosure.	lbs	366000	2750	60000		by CEL			
	12% 21%	lbs	366000	2750	60000					60000

COPY

7058E Farrell Road S.E.,
Calgary, Alberta.
T2H 0T2

December 14th, 1978.

Foothills Pipe Lines (Yukon) Ltd.,
Bow Valley Square II,
P.O. Box 9083,
Calgary, Alberta.
T2P 2W4

Attention: Mr. R. M. Lazerte

Dear Rolly:

Coberra 3045 Gas Turbine Compressor Unit

Following is pricing information on our Coberra 3045 (formerly Coberra 162).

One only Coberra 3045 Pipeline package as described on Pages 1, 2 and 3 of Section 4220 attached. The one exception is that the Centrifugal Compressor would be an RFA-36 (end suction) rated 1440 psig.

Also included are the following optional items:

Air inlet filter, inertial type separator, with bleed air ducts and motors, complete with snow hoods for winter. climates.

Air inlet silencer designed to meet ISO NR55 at 400 feet radius from the unit.

Exhaust silencer designed for the ISO NR55 at 400 feet radius from the unit.

Total price. $3,604,000

The above quoted price would be f.o.b. our factory in stratford, Ontario. No government sales taxes are included.

We would estimate that freight from Stratford to Edmonton would be $30,000. Sales tax should not be added to freight.

Following are some breakout prices which you wanted.

Station Controls. For a single unit station a station control panel is not necessary.

Trend Monitoring.

For the supply of sensors and transmitters only, we would estimate the cost at $32,000.

Enclosure.

Acoustical enclosure over the gas generator and power turbine and mounted on the turbine base. Enclosure is factory assembled and includes interior lighting and ventilating fan. Sound level reduction to 90 dba. Price would be $50,300.

Testing. For load testing Cooper Energy Services would prefer to run the closed loop at reduced pressure, i.e. 200 to 300 psia. We can test at full pressure, but this will become very expensive. The reduced pressure closed loop demonstrated compressor performance will completely corelate at full pressure. The brake horsepower output can be demonstrated very easily by using a water brake.

The reduced pressure test would cost between $20,000 and $30,000.

Closed loop test instead of standard open loop test includes one speed line with eight points. Price addition $6,580.

Extra speed lines - eight points per line. Price addition per line $3,675.

I trust this gives you the information you were looking for.

Yours truly,

R. B. Kerr

RBK/jm
Encl.
c.c. W. R. Serimes

STANDARD EQUIPMENT

ITEM	STANDARD
1. Base	Fabricated steel subbase designed to mount the gas generator and power turbine.
2. Gas Generator	Rolls-Royce Spey industrial gas generator, with Woodward governor system arranged for natural gas fuel. Coberra 162 — Gas Generator: Spey — Unit Rating (ISO): 16,200 BHP — Fuel Rate *: 7600 BTU/BHP-Hr
3. Gas Generator Lube Oil System	- Main oil pump *(pump includes supply, scavenge, and governor control oil)* driven from gas generator ancillary drive. Low pressure boost pumps are submerged in the reservoir. The main boost pump is hydraulic motor driven and the auxiliary boost pump is electric motor driven. - Twin full flow oil filters with switch valve. - Reservoir with separate deaeration section. - Air-to-oil heat exchanger. - Console mounting including shop fabricated piping, valves, gauges and safety switches to complete the system.
4. Fuel Gas System	A. Fuel Gas: Clean, dry, regulated 500 PSIG min. by user. B. System includes the following mounted on the main base: - Governor controlled gas valve - Isolating and vent valves - Strainer - Separator - Factory assembled piping, manifolds, relief valves and gauges required to complete the system.
5. Starting System	A. Starting Gas: Fuel gas from fuel system. B. System includes the following equipment: - Gas operated expansion turbine - Pressure regulator for required starter pressure - Automatic overriding clutch - Starter coupling to gas generator rotor - Factory assembled piping and valves to complete the system

*Guaranteed subject to 4% tolerance on Fuel Rate, no inlet and exhaust loss.

DATE

STANDARD EQUIPMENT

ITEM	STANDARD
6. Power Turbine	- Power turbine with turbine stages overhung from the bearing supports - Two journal and one thrust tilting pad type bearings - Insulated exhaust hood - Mechanical and electronic overspeed safety governor
7. Centrifugal Compressor.	Two-stage pipeline centrifugal compressor with 30" ASA flanges, maximum working pressure of 1200 PSIG, and overhead emergency seal oil tank.
8. Drive Coupling.	Continuously lubricated, spacer type flexible coupling with guard.
9. Combined Power Turbine/Centrifugal Compressor Lube Oil and Seal Oil System	- Separate baseplate for system mounting - Compressor shaft driven lube oil and seal oil pumps - Auxiliary motor driven lube oil and seal oil pumps - Twin full flow oil filters, with switching valve - Oil reservoir with low level switch and electric immersion heater - High pressure seal oil trap - Seal pressure regulator - Degassing system for seal oil - Oil-to-air heat exchanger with hydraulic motor driven fans utilizing seal oil as the hydraulic medium - Factory assembled piping and valves to complete the system. Piping runs to and from the radiator to be supplied by user - Console mounted instrument panel including gauges and safety switches
10. Control System	A. Unit Control Panel - solidstate - designed for automatic and remote operation of the turbine-compressor unit. Panel will be free standing, front access, for location by user in a non-hazardous atmosphere. Panel will include: - Control system logic - Programmed digital timer - Safety shutdown and alarm system - Speed, vibration, and temperature monitors - Automatic sequencing of unit valves - Control mode selector for local manual, local automatic, or remote operation Remote start/stop and loading signals are to be provided by user.

STANDARD EQUIPMENT

ITEM	STANDARD
10. Control System (continued). . .	B. Unit Motor Control Center - includes required starters, contactors, and switchgear to automatically control auxiliary motors and heaters located on the turbine-compressor unit. C. Unit Power Supply - includes battery *(4-hour capacity)*, battery charger, inverter, AC and DC distribution switchgear to provide required unit control and instrument power.
11. Inlet Air System	A. Intake plenum chamber with gas generator inlet bellmouth. B. Cleaning System - storage reservoir with piping and valves to direct cleaning agent into the gas generator inlet. C. Anti-icing System - piping, valves and temperature/humidity switch to admit gas generator compressor air to the inlet guide vanes and nose cone.
12. Factory Tests	A. Mechanical and system test and checkout of turbine-compressor unit and auxiliary systems. B. Open loop air performance test of compressor aero-dynamics for new designs. C. System test of unit controls to include start and stop sequencing, speed control, instrumentation, and safety shutdown and alarm system where practical.
13. Special Tools	One set of special tools, as required, for turbine-compressor unit maintenance.
14. Service Representative.	The services of a Cooper Energy Services service representative to advise and instruct in the installation and starting of the gas turbine-compressor unit are available at additional cost upon customer's request.

DEMPSTER HIGHWAY COMPRESSOR STATION

III-4 PROPANE COMPRESSOR PACKAGE

III-4.1 GENERAL

The cost estimate for this system covers the supply of two (2) Clark DJ50 gas turbine/refrigeration compressor packages rated at 5500 ISO H.P. each. The horsepower ratings and equipment costs were prepared by Foothills as per their letter to Canuck dated December 21, 1978.

III-4.2 OPERATION

One Clark unit would serve as the prime refrigeration unit while the other would provide 100 percent backup in the event of failure or maintenance of the first. The propane piping layout of these units reflects this standby configuration.

Both units would be housed in a heated propane compressor building measuring 40' x 110' x 30' eaves complete with overhead cranes.

III-4.3 DESCRIPTION

The verbal bid received by Foothills from Dresser Clark includes not only the basic turbine/compressor package but also for each unit a unit control panel, unit MCC panel, inlet air and exhaust gas ducting, filters and silencers, gas turbine starter and lube/seal oil system complete with cooler.

These packages would be manufactured in Lethbridge, Alberta. The gas turbine would be a Garrett IE-990 dual shaft machine and the refrigeration compressor a vertically split Clark B type centrifugal compressor. At this time the exact number of stages has not been finalized but would be in the order of 2 to 4 stages. Dresser Clark has stated that their quoted price would cover compressors in this range.

III-4.4 FUEL GAS

The Garrett turbine would operate on natural gas fuel delivered at 240 psig. Fuel measurement has been provided by means of a 4" Rockwell T-18 turbine meter. The cost of the meter is covered in the station fuel gas system, Section VI of this estimate.

III-4.5 LUBE OIL

Also included in the estimate is the cost of the initial fill of lube oil for each gas generator and refrigeration compressor. We have allowed for synthetic type lube oil for the gas generators and mineral type lube oil for the compressors.

Stainless steel pipe, valves and fittings have been included as well for hook up of the lube oil systems.

III-4.6 MISCELLANEOUS

Allowance was made for the supply of necessary small pipe, valves, fittings and tubing for hook up of vent lines, instrument lines, etc.

COST SUMMARY

	Chilled Station
Materials	$3,600,000
Installation	99,000
Total	$3,699,000
Estimated Weight of Materials ex Edmonton	182,000 lbs.
Federal Sales Tax Estimate	$ 431,800

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. 4 - PROPANE COMPRESSION PACKAGE

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
CLARK MODEL DT50	DRESSER - CLARK	2	1,685,000	$3,370,000
Gas Turbine / Refrigeration				
Comp Pkg inclusive			FOB Lethbridge	
duties less FST and			FST extra @ 12%	
freight				
FREIGHT TO EDMONTON		2	1500	3,000
PACKAGE WEIGHT				
	Main Turbine / Compressor Skid		65,000 # each	
	Air Inlet & Exhaust System		20,000 # each	
			85,000 # x2	
			= 170,000 # total	
	Lube Oil		~~17,000~~ #	
		TOTAL	182,000 #	
LUBE OIL				
- Gas Gen		700 us Gals	$20/gal	$14,000
- Turb/Comp		700 us Gals	$10/gal	14,000
Lube/Seal Oil		1 LOT	15,000	15,000
Pipe, Values, Fittings (304 SS)				
Fullers Earth Filter		2	2500	5000
Misc Pipe Values Fittings (Instrument Lines, Vents, etc)		1 LOT	5,000	5,000
FST @ 12% =	$431,676			
			SUB-TOTAL	$3,426,000
		CONTINGENCY @ 5 %		171,300
		FOB EDMONTON	TOTAL	$3,597,300

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Foothills - Dempster Estimate No.

Item No. Account No. Date

Description Propane Compression Package Sheet No. 1 of 1

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Propane Compression Package Gas Turbine / Compressor units 2 - 5500 HP	lbs	1700000	5500	1600	88000	by Client			88000
10% 555	lbs	1700000	5500	1600	88000				88000

DEMPSTER HIGHWAY COMPRESSOR STATION

III-5 HIGH PRESSURE GAS PIPING

III-5.1 PIPING

For purposes of this cost estimate it was assumed that the mainline contractor would install the scraper traps, mainline block assembly and station side valves (suction and discharge). Therefore costs associated with compressor station piping would commence from inside these side valves. Please refer to isometric Drawing Nos. FPL 39-49-61D and FPL 39-49-62D in Section IV for details of the high pressure gas piping for Station No. 3 (chilled) and Station No. 7 (non-chilled), respectively.

The high pressure gas piping system for both the chilled and non-chilled stations comprises 30" O.D. yard and unit piping and appurtenances designed for 1440 psig maximum operating pressure and minus (-) 50^{o}F operating temperature with ANSI 600 rated flanges, all as per CSA Z184-1975. The design criteria used in sizing the high pressure gas piping and appurtenances included a maximum 5 psig drop on each of the suction and discharge sides of the gas compressor and maximum gas velocity of 45 fps with a gas flow rate of 1200 MMSCFD @ 1100 psig. SMYS for the pipe was taken as Grade 70 and Grade 60 for fittings. Heat tracing and insulation of the 30" O.D. piping has been provided for those segments above grade and not housed within the gas compressor or chiller buildings. Costs associated with this are included in the appropriate electrical and insulation sections.

III-5.2 SCRUBBER

Natural gas on the suction side of the station passes through an inline recycling type gas scrubber before entering the 36" compressor. The scrubber, housed in a heated building, is equipped with automatic level

controls, which will dump any collected condensates and other foreign particles from the scrubber sump through a cyclone separator to a 500-gallon condensate holding tank. The scrubber is designed to remove 99 percent of all particles 5 microns and larger. It is equipped with ANSI 600 flanges and is constructed of -50°F specification material.

III-5.3 VALVING

The 36" natural gas compressor is housed in a heated compressor building and can be isolated from the 30" unit piping by means of 30" suction and 30" discharge unit ball valves complete with electric valve operators. These valves are ANSI 600 rated and suitable for operation to -50°F ambient. A 16" recycle line complete with a 10" recycle control valve is provided to protect the compressor from surge conditions. Instrumentation costs for the surge control and system are included in the instrumentation section of this estimate. Also provided for in this estimate is a 2" unit purge valve and a 2" unit vent valve both automatically controlled from the unit control panel. The unit vent line will discharge into a common header into the flare system. A 30" unit check valve, also ANSI 600 rated and suitable for -50°F operation, has been provided downstream of the unit discharge ball valve to prevent reverse rotation of the compressor.

A 30" compressor bypass line complete with yard check valve has been provided to allow for the uninterrupted flow of gas through the station during a period of compressor shutdown. This would allow the gas stream to pass through the chillers at Station 3, if required, before discharging into the mainline.

III-5.4 CHILLERS

Downstream of the gas compressor at Station No. 3, three (3) shell and tube gas chiller units are housed in a heated chiller building. The chillers, designed for 1440 psig maximum operating pressure on the tube side are constructed of -20°F material and are sized to take one-third

of the maximum flow each. Each chiller bundle measures 36" in diameter, is 24 feet long and has a maximum 7 psig pressure drop on the gas side. The gas flow can be diverted through the chillers as required by means of the 30" header system with 24" supply and return lines to each chiller. The 24" - ANSI 600 rated inlet and outlet ball valves, complete with electric valve operators, are provided on each chiller unit for isolation purposes and a 30" chiller bypass line, complete with 30" - ANSI 600 ball valve and electric valve operator, is provided for times when either chilling is not required or maintenance is being performed on the chillers. At Station No. 7 there are no chillers so the gas flows directly from the compressor to the orifice fitting.

III-5.5 ORIFICE FITTING

Measurement of the gas flow through both Station Nos. 3 and 7 will be accomplished by means of a 30" - ANSI 600 Junior orifice fitting (-50°F material) located on the discharge side of the station. The orifice fitting itself will be situated below grade in a concrete vault for accessibility as the 30" yard piping will be buried at this point. Instrumentation costs for the gas flow measurement are covered in Section III-8.

III-5.6 OVERPRESSURE PROTECTION

Two (2) 8" x 8" dual horn station relief valves are provided on the discharge side of each station to prevent overpressuring, as per CSA Z184-1975. Each relief valve has the capacity to relieve the entire station. Also provided is one (1) 12" station blowdown valve. This valve will be operated by means of a gas hydraulic operator for fail-safe operation. Discharge from these valves will be collected in a common vent header and run over to the flare.

All components are ANSI 600 rated and utilize -50°F material.

III-5.7 MISCELLANEOUS

For this estimate it was decided to use -50°F material throughout the high pressure gas piping system. Our reasoning is twofold; one, the expected ambient temperatures of -50°F to -70°F would certainly warrant the use of low temperature materials and two, the premium for low temperature materials ranges from almost nothing to 25% depending on the particular item but when compared to the overall cost of the station, this becomes rather insignificant. For example, the premium for low temperature ball valves is only 4.5% yet total valve costs amount to 36% of the entire system cost.

COST SUMMARY (HIGH PRESSURE GAS PIPING)

	Chilled	Non-Chilled
Materials	$1,587,000	$ 946,000
Installation	199,000	126,000
Total	$1,786,000	$1,072,000
Estimated Weight of Materials ex Edmonton	500,000 lbs.	300,000 lbs.
Federal Sales Tax Estimate	$ 79,300	$ 47,300

5- HP GAS PIPING — CHILLED-STATION

PIPE	30"	CAPITOL PIPE	1000'	$150/ft	$150,000
(Gr. 70)	24"	"	200'	100/ft	20,000
(-50°F)	16"	"	250'	50/ft	12,500
	12"	"	100'	35/ft	3,500
	2"-10"	"	300'	20/ft	6,000
					192,000
VALVES (ANSI 600)					
30" Unit Ball (-50°F)		GROVE	2	$50,000	100,000
24" Gas Chiller (-50°F)		GROVE	6	40,000	240,000
30" Chiller Bypass (-50°F)		GROVE	1	50,000	50,000
30" Unit Check (-50°F)		FWI	1	52,000	52,000
30" Bypass Check (-50°F)		FWI	1	52,000	52,000
10" Unit Recycle (-20°F)		FISHER	1	12,000	12,000
2" Unit Purge (-20°F)		FISHER	1	1,100	1,100
2" Unit Vent (-20°F)		FISHER	1	1,100	1,100
8"x8" Stn Relief (-50°F)		AGCO	2	12,000	24,000
12" Stn Vent (-50°F)		GROVE	1	20,000	20,000
Misc. 2"-4"		GROVE	12		20,000
					572,200
FITTINGS (match Pipe)					
30"x30"x30" Header		STEEL-FLO	2	$4000	8,000
30"x30"x24" Header		STEEL-FLO	6	3000	18,000
30"x30"x16" Header		STEEL-FLO	2	2500	5,000
30"x30"x12" Header		STEEL-FLO	3	2000	6,000
MISC. TEES 2"-12"		STEEL-FLO	12	500	6,000
30"-45° LRWE ELLS		STEEL-FLO	6	4500	27,000
30"-90° LRWE ELLS		STEEL-FLO	6	8700	52,200
24"-90° LRWE ELLS		STEEL-FLO	24	7500	180,000
16"-90° LRWE ELLS		STEEL-FLO	4	1200	4,800
MISC. ELLS 2"-12"		STEEL-FLO	12	500	6,000
					313,000
					1,077,200
		CONTINGENCY 2			

5- H.P. GAS

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
FLANGES (ANSI 600)				
30" (A350 GR LF2)	STEEL - FLO	8	4100	32,800
24" (")	STEEL - FLO	18	2500	45,000
12" (")	STEEL - FLO	12	1500	18,000
10" (")	STEEL - FLO	2	1200	2400
MISC. FLGS 2" - 10"	STEEL - FLO	20	—	15,000
36" x 30" EXP. FLG	STEEL - FLO	2	8,000	16,000
REDUCERS (match pipe)				
16" x 12" (-50°F)		2	600	1200
STUDS, NUTS, GASKETS				
Covers all flanges		1 LOT		$ 80,000
SUCTION SCRUBBER				
(ANSI 600, -50°F)	PORTA - TEST	1	65,000	65,000
MISC. MATERIAL				
Thredolets, Weldolets,		1 LOT		$ 10,000
Swages, Nipples, etc.				
Orifice Fitting (-50F)				
30" Daniel Junior	Barber ENG	1 only	55,000	$ 55,000
CYCLONE SEPARATOR		1	15,000	15,000
Condensate Storage		1	10,000	10,000
				365,400
TOTAL CHILLED STN = $1,586,860 (STN NO. 3)				
FST @ 5% = $79,343				
SYSTEM WEIGHT = 250 TONS				
TOTAL NON-CHILLED STN = $945,560 (STN. NO. 7)				
FST @ 5% = 47,278				
SYSTEM WEIGHT = 150 TONS				
			SUB-TOTAL	$1,442,600
		CONTINGENCY @ 10 %		144,260
			TOTAL	$1,586,860

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. HP GAS PIPING – NON-CHILLED STATION BASE =

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
PIPE				
30"		1000	$ 150/ft	$ 150,000
16"		250	50/ft	12,500
12"		100	35/ft	3500
2"-10"		300	20/ft	6,000
				172000
VALVES				
30" UNIT BALL (-50F)		2	50,000	100,000
30" UNIT CHECK (-50F)		1	52,000	52,000
30" BY-PASS CHECK (-50F)		1	52,000	52,000
10" UNIT RECYCLE (-20F)		1	12000	12,000
2" UNIT PURGE (-20F)		1	1,100	1,100
2" UNIT VENT (-20F)		1	1100	1100
8"X8" STA RELIEF (-50F)		2	12,000	24000
12" STN. VENT (-50F)		1	20,000	20,000
MISC. 2"-4"		12		20,000
				282200
FITTINGS				
30X30"X30" HEADER		2	4,000	8,000
30"X30"X16" HEADER		2	2,500	5,000
30"X30"X12" HEADER		3	2,000	6,000
MISC. TEES 2"-12"		12	500	6,000
30"-45° LRWE ELLS		6	4500	27,000
30"-90° LRWE ELLS		6	8700	52,200
16"-90° LRWE ELLS		4	1200	4,800
MISC ELLS 2"-12"		12	500	6000
				115,000
				569200
			SUB-TOTAL	
		CONTINGENCY @	%	
		TOTAL		

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. _____ PAGE OF

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
FLANGES				
30" (A350 GR LF2)		8	4100	32800
12" (")		12	1500	18,000
10" (")		2	1200	2,400
MISC 2"-10"		20	-	15,000
36" x 30" EXP. FLG.		2	8,000	16,000
				84,200
REDUCERS				
16" x 12" (-50F)		2	600	1200
STUDS, NUTS, GASKETS				
COVER ALL FLANGES		1 LOT		60,000
SUCTION SCRUBBER				
(ANSI 600, -50F)		1	65,000	65,000
MISC. MATERIAL				
THREDOLETS, WELDOLETS		1 LOT		10,000
SWAGES, NIPPLES, ETC				
ORIFICE FITTING				
30" DANIEL JUNIOR (-50F)		1	55,000	55,000
CYCLONE SEPARATOR		1	15000	15,000
				290,400
	F.S. Tax 5%	47278		
	WT	150 Tons		
			SUB-TOTAL	859,600
			CONTINGENCY @ 10 %	85960
			TOTAL	945560

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Item No.:
Account No.:
Description: HP Gas System
Estimate No.:
Date:
Sheet No. 1 of 1

	Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
	Inlet Scrubber 5'6" x 25' ?	lbs	45000	150	16.00 2400		by CEL			2400
	Sump Tank & Cyclone Separator	lbs	100000	300	16.00 4800					4800
	Piping	8" lbs	7000 4.00 1000000	8000	16.00 128000					128000
	Valves & Operators	Ea lbs	16 100000	300	16.00 4800					4800
	Level Controls / Orifice Fittings etc	Lot lbs	70000	250	16.00 4000					4000
	Misc & Testing			300	16.00 4800					4800
	15mbs	lbs	2357000	9300	148800					148800

D001-1 13SEP76

DEMPSTER HIGHWAY COMPRESSOR STATION

III-6 OTHER MAJOR SYSTEMS

III-6.1 CHILLING SYSTEM

III-6.1.1 SYSTEM DESCRIPTION

This cost estimate provides for a conventional propane refrigeration system. The system loads were provided by Foothills in their December 21, 1978 correspondence to Canuck. The condensed or liquid propane flows from the outlet of the condensers to a propane receiver-surge tank and then on demand to the propane economizer. The economizer overhead (flashed vapor) flows to the interstage scrubber for liquid knock out and then to the interstage suction of the compressor for recycling. The liquid propane flows from the economizer to the chillers on demand and the heat of vaporization of the propane chills the high pressure gas in the exchanger bundle. The vaporized propane flows overhead from the chillers, through a compressor suction scrubber to the inlet of the compressor. The high pressure propane is routed to the fin fan coolers where the propane vapor is condensed, and the cycle is repeated.

III-6.1.2 PROPANE COMPRESSORS

The two (2) propane turbine/compressor packages were selected by Foothills who also obtained a verbal quote from Dresser Clark for the supply of same. The equipment consists of two Clark DJ50 5500 ISO horsepower gas turbine compressors with auxiliaries. Further details are available in Section III-4.

III-6.1.3 PROPANE CONDENSERS

The propane from the compressor discharge is condensed in the 12 condenser bays arranged in a parallel piping configuration. The condenser

load is 71 million BTU's per hour. The condensers will be equipped with two 30 horsepower electric driven fans per bay. The air is discharged through control louvres on top of the condensers. The condenser maximum design pressure is 250 psig.

III-6.1.4 PROPANE RECEIVER

The propane receiver is a large horizontal pressure vessel that was designed to provide adequate surge capacity between the propane condensers and the remainder of the system.

III-6.1.5 PROPANE ECONOMIZER

The propane economizer is basically a first stage flash vessel that separates the liquid-vapor phases for the new lower equilibrium pressure condition than that which existed in the propane receiver. The vessel is well instrumented and draws propane from the receiver on liquid level control. The liquid flows to the chillers, and the vapor to the interstage connection of the propane compressor.

III-6.1.6 PROPANE CHILLERS

The propane chillers are large heat exchangers with the high pressure gas flowing through two pass tubing bundles and the propane surrounding the outside of the tubes. A large vapor release space is provided above the tube bundle. The total chiller load is 4700 tons, split between three vessels at a maximum gas flow rate of 1200 MMscfd.

III-6.1.7 PROPANE STORAGE TANK

A propane storage tank with a capacity of 30,000 imperial gallons is provided in the estimate, along with the necessary unloading equipment, propane drier and transfer pump.

III-6.1.8 GENERAL

All of the major equipment costs have been estimated using either vendor written or verbal quotes.

System design pressure is 250 psig and -20°F material has been specified throughout.

III-6.2 FUEL AND STARTING GAS SYSTEM

III-6.2.1 GENERAL

The cost estimate for this system is based on a fuel and starting gas supply (4" line) taken off the mainline valve assembly to ensure an uninterrupted supply, then filtering, heating, regulating and metering the gas stream into the appropriate individual systems for distribution to various areas around the compressor stations. All these processes are to be housed in a separate heated 20 foot by 25 foot regulator and meter building, which is a common industrial practice. Please refer to Drawing No. FPL39-49-63D for the fuel gas isometric for Station No. 3 and Drawing No. FPL39-49-64D for Station No. 7.

Piping and equipment for this system has been designed in accordance with CSA Z184-1975. Sizing of lines and equipment was based on ISO fuel ratings of the gas generators and maximum output ratings of the electrical generators and boilers.

III-6.2.2 FUEL GAS TIE-IN AND YARD PIPING

The fuel and starting gas supply originates at the mainline valve assembly where a 4" supply line is taken off both sides of the mainline block valve. This ensures an uninterrupted supply of fuel gas even in the case of a compressor station emergency shutdown (ESD) where the entire high pressure yard piping would be vented but the mainline would remain pressurized. In event that the mainline is blown down on either

the upstream or downstream side of the mainline block valve, fuel gas supply would be available without interruption by means of the 4" check valve arrangement in the supply assembly.

From the mainline supply point the fuel and starting gas supply is yard piped to a 20 foot by 25 foot regulator and metering building located in proximity to the compressor station building as shown on plot plan Drawing Nos. FPL39-49-11D and FPL39-49-12D. A relief valve for this segment of the line, located outside the building is vented into a common station gas vent header.

III-6.2.3 REGULATOR AND METERING BUILDING

III-6.2.3.1 KNOCKOUT DRUM ASSEMBLY

All fuel and starting gas is first passed through a knockout drum to take out the entrained solids and any liquid slugs. This vessel is vented into a common station venting system, header and the condensate disposal line is tied into the station suction scrubber disposal line.

III-6.2.3.2 FILTER SEPARATOR ASSEMBLIES

After passing through the knockout drum the fuel and starting gas is passed through a common filter separator utilizing coalescing cartridges. Two filter separators installed in parallel are proposed for uninterrupted service. The pressure vessel venting and blowdown systems are also tied into the common station venting header and the condensate disposal line is tied into the station suction scrubber disposal line.

III-6.2.3.3 GAS HEATER ASSEMBLY

The high pressure fuel and starting gas is then heated prior to regulation by utilizing the hot glycol/water mixture from the building heating system as the heating medium. The heater has been sized to provide sufficient heat input to the gas to prevent the formation of hy-

drates. This vessel is also vented into the common station venting header.

III-6.2.3.4 GAS REGULATION AND METERING

After being filtered and heated the fuel and starting gas is regulated and metered for distribution via the utilidors to the appropriate areas.

The gas pressure is cut from a maximum supply pressure of 1440 psig to the appropriate supply pressure for each piece of equipment as follows: 500 psig for the main gas compressor unit, 250 psig for the refrigeration compressor units (Station No. 3 only), and 25 psig for utility gas to the electrical generators and hot water boilers. The supply to the boilers would be pressure cut again in the utility building to 11" W.C.

Fuel and starting gas measurement has been provided for the main gas compressor package and the two (2) refrigeration compressor packages by means of separate 4" Rockwell T-18 turbine meters installed in each of the fuel and starter gas supply lines located in the regulator and metering building. These meters will accurately measure fuel gas flows to each of the gas generator packages and coupled with their instrumentation located in the control room will provide a permanent record of fuel and starting gas usage.

Fuel gas to the electric generators and boilers will be measured by means of a common gas utility meter located in the regulator and meter building.

Instrumentation for fuel gas measurement will include microprocessors and recorders.

Suitable pressure relief valves, block and vent valves will be installed in all supply lines, all venting into a common station gas vent header. In the case of a station ESD, piping and valving arrangements have been

designed such, that the fuel gas to the main gas compressor unit and refrigeration compressor units will be blocked and vented while the supply gas to the electrical generators and boiler will remain uninterrupted.

III-6.2.4 DESIGN PARAMETERS

Fuel and starting gas requirements.

III-6.2.4 DESIGN PARAMETERS

Fuel and starting gas requirements.

III-6.2.4.1 CHILLED STATION (STATION NO. 3)

1	C.B. Turbine (Spey)	-	121,600 SCFH
1	Clark DJ50 Refrig. Turbine	-	49,500 SCFH
1	Heating System Boiler	-	10,000 SCFH
2	Cat. Generators	-	11,900 SCFH
	TOTAL GAS REQUIREMENTS		193,000 SCFH

III-6.2.4.2 UNCHILLED STATION (STATION NO. 7)

1	C.B. Turbine (Spey)	-	121,600 SCFH
1	Heating System Boiler	-	8,000 SCFH
2	Cat. Generators	-	8,400 SCFH
	TOTAL GAS REQUIREMENTS		138,000 SCFH

III- 6.2.5 STATION FUEL AND STARTING GAS CONSUMPTION

Based on 8000 operating hours/year for the gas generators, 8760 hours for the electrical generators and 5760 hours for the boilers, it is estimated that the total annual fuel gas usage will be 1531 MMSCF for the chilled station (Station No. 3) and 1093 MMSCF for the unchilled station (Station No. 7).

The following table outlines fuel gas usage:

	FUEL GAS CONSUMPTION	
	Chilled Station MMSCF	Unchilled Station MMSCF
C.B. Turbine 8000 hours @ 121,600 SCF/H	972.8	972.8
Clark DJ50 8000 hours @ 49,500 SCF/H	396.0	-
Boiler 5760 hours @ 10,000 SCF/H	57.6	-
Boiler 5760 hours @ 8000 SCF/H	-	46.1
Cat. Generators 8760 hours @ 11,900 SCF/H	104.2	-
Cat. Generators 8760 hours @ 8400 SCF/H	-	73.6
	1530.6	1092.5

III-6.3 HEATING AND VENTILATING SYSTEM

III-6.3.1 GENERAL

The cost estimate for the heating and ventilating system for both Station Nos. 3 and 7 was prepared on the basis of a "conventional" 60/40

glycol/water heating system comprising a central boiler package of modular design, circulating pumps and unit heaters or convector radiators located in the various buildings.

III-6.3.2 CRITERIA

The following criteria as supplied by Foothills was used for calculation of the compressor station heating system load:

a) Ambient temperature - minus (-) 50°F
b) Building inside temperature - plus (+) 70°F
c) Building insulation - 3" thickness of fibreglass R = 12.6
d) Building sizes - as outlined in Foothills' station building specifications and shown on plot plan drawings FPL39-49-11D (Station No. 3) and FPL39-49-12D (Station No. 7).

The heating system will operate between 160°F to 200°F water temperature and 12 psig system pressure.

III-6.3.3 HEAT LOADS

Using the above criteria it was found that the total heat load for Station No. 3 (chilled) was 9,500,000 BTU/Hr. and 5,500,000 BTU/Hr. for Station No. 7 (non-chilled). In addition to the normal building heat loads, these figures include the heat load required for the station fuel gas heater located in the fuel gas regulator and meter building.

III-6.3.4 CIRCULATING PUMPS

Pumping philosophy for the heating system at both stations was to split it into two subsystems; one to supply the compressor building, chiller building (Station No. 3 only), propane compressor building (Station No. 3 only), fuel gas regulator building, scrubber building and utilidors, and the other to supply the utility/control building, living quarters, stores building and water treatment building. There will be

100% backup for each pumping system in case of failure of the main pumping units. At Station No. 3 there will be two (2) 15 HP pumps and two (2) 7-1/2 HP pumps whereas at Station No. 7 there will be four (4) 7-1/2 HP pumps.

III-6.3.5 BOILERS

It is proposed to utilize boilers of a modular design rather than a single large boiler. This will allow for a more flexible operation of the boiler system since the boilers will incorporate an 8-step electronic controller to bring on only those modules as required at that time. This will also result in a fuel gas saving since unwanted heat will not be generated. Also, by utilizing the modular boiler design, the reliability of the heat supply is improved over the single large boiler since a section of modules could be down for maintenance but the remaining modules would still be available for heat generation.

It is proposed that the modular boilers and circulating pumps (4 total each station) be located in the utility/control building. This would negate the need for explosion proof motors on the circulating pumps.

III-6.3.6 PIPING

From pressure drop and velocity calculations it was found that the main heating system supply header for Station No. 3 would be 8" and 6" for Station No. 7. Piping would run in the enclosed, heated utilidors wherever possible. Premolded pipe insulation will be used throughout.

III-6.3.7 HEATERS

It is proposed to use unit heaters in all buildings and spaces at both stations with the exception of offices and control rooms in the utility/control building and in the living quarters. Here we propose to use wall-fin convector heaters.

III-6.3.8 HEATING MEDIUM

It is recommended that a 60/40 ethylene glycol/water mixture be used as the heating medium for optimum antifreeze protection and good heat transfer capabilities.

Included in this estimate is the cost of the initial fill of ethylene glycol.

III-6.3.9 VENTILATION

Suitable roof-mounted power ventilators will be provided for the main compressor building, chiller building, propane compressor building, stores building, and the workshop area and generator/boiler room of the utility/control building.

Costs for these items have been included in the building costs of Section III.2.

III-6.3.10 AIR CONDITIONING

A Leibert computer room air conditioning unit has been provided for in this cost estimate. This unit would be supplied with fully automatic controls for strict control of humidity and temperature and to ensure a dust-free atmosphere.

III-6.4 FIRE AND GAS DETECTION SYSTEM

III-6.4.1 GENERAL

For purposes of this estimate it was decided to provide a very comprehensive fire and gas detection system and Halon 1301 fire extinguishing system for both Station No. 3 and Station No. 7.

The systems provided utilize state of the art technology and introduce the use of a central monitor to act as a watchdog over the entire compressor station and collect the data received from the following devices:

a) Ultraviolet fire detectors
b) continuous strip thermistors
c) ionization detectors
d) thermal detectors
e) gas detectors.

The central monitor will be constructed in a nineteen-inch rack configuration for panel mounting. Included in the monitor will be a graphic display. The purpose of the graphic display is to visually display all the functions of the above detecting devices. The central monitor will be located in the control room of the control/utility building. It will have its own independent battery backup to operate all functions during line power failure.

Since each building has its own unique fire problem, the following review will be made of each building according to its fire detection and extinguishing system.

III-6.4.2 CONTROL/UTILITY BUILDING (Station Nos. 3 and 7)

Thermal detectors will be located in the following areas:

a) offices
b) instrument laboratory
c) shop area
d) small parts storage
e) generator and boiler room
f) corridors.

Cross-zoned ionization detectors would be provided in the Control Room and MCC/Switchgear Room. These cross-zoned ionization detectors would

take part in the releasing of the Halon 1301 extinguishing agent in only these rooms. We are also providing a Halon 1301 system in the generator/boiler room to protect the prime power generating units. Adequate numbers of remote pull stations and local alarm bells will be provided throughout both compressor stations.

III-6.4.3 MAIN GAS COMPRESSOR BUILDING (Station Nos. 3 and 7)

This building will be provided with the following detectors:

a) Ultraviolet fire detectors
b) continuous strip thermistors
c) gas detectors.

In addition, the turbine package will have the continuous strip thermistor installed in the acoustic enclosure. A Halon 1301 fire extinguishing system will be provided for the turbine acoustic enclosure and the main compressor building.

The ultraviolet detectors will respond to clean burning natural gas fires. To guard against fires with dense smoke, which could blind the ultraviolet detectors, we propose to utilize the continuous strip thermistors. By using the two types of fire detection devices, quick and reliable responses to fires has been achieved.

Gas detectors would be utilized to detect gas concentrations within the main compressor building that first alarm then initiate a station ESD should the upper explosive level be reached.

III-6.4.4 PROPANE COMPRESSOR BUILDING (Station No. 3 only)

The fire and gas detection system and fire extinguishing system for this building will be identical to that outlined for the main gas compressor building except the gas detectors will be mounted at floor level since propane is heavier than air.

III-6.4.5 CHILLER BUILDING (Station No. 3 only)

Since there is a lesser possibility of an ignition source in this building only gas detection will be considered.

Due to the nature of the combustible gases within the chiller building, both natural gas and propane, the gas detectors will be mounted in the ceiling and at floor level.

III-6.4.6 GAS SCRUBBER BUILDING (Station Nos. 3 and 7)

Gas detection only will be provided in this area.

III-6.4.7 FUEL GAS REGULATOR AND METER BUILDING (Station Nos. 3 and 7)

Gas detection only will be provided in this area.

III-6.4.8 COMMUNICATIONS BUILDING (Station Nos. 3 and 7)

Cross-zoned ionization detectors will be utilized to discharge Halon 1301 agent into this building.

III-6.4.9 PROPANE CONDENSERS (Station No. 3 only)

Due to the volatility of propane and its ability to lay at ground level and move in a dense cloud to a possible ignition source, we suggest gas detection could be provided in the area of the condensers. Granted that these units are outdoors, but because of propane's property of being heavier than air should a leak develop gas detectors at or near ground level ringing the condensers could detect this leak. The cost of these detectors has been included in this estimate.

III-6.4.10 HELICOPTER PAD

In case of emergencies we have provided an Ansul SK3000 dry chemical system at the helicopter pad.

III-6.4.11 PIPING

Included in this estimate is the necessary pipe and fittings for discharge of the Halon 1301 agent in the various buildings. Conduit and wiring from this system is included in Section III-9, Electrical.

COST SUMMARY (OTHER MAJOR SYSTEMS)

	Chilled	Non-Chilled
Materials	$2,367,000	$536,000
Installation	343,000	70,000
Total	$2,710,000	$606,000
Estimated Weight of Materials ex Edmonton	1,812,000 lbs.	105,000 lbs.
Federal Sales Tax Estimate	$ 141,800	$ 42,200

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. 6 CHILLER FACILITIES

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
PROPANE COMPRESSOR BUILDING				
24" GATE VALVE S/W OP		1	6000	6000
10" GATE VALVE S/W OP		1	2500	2500
24" BLOCK VALVE		2	6000	12000
10" BLOCK VALVE		2	2500	5000
10" RECYCLE VALVE		2	7000	14000
16" BLOCK VALVE		2	4000	8000
16" CHECK VALVE		2	10,000	20,000
PROPANE RECEIVER				
10" GATE VALVE		2	1600	3200
10" BYPASS VALVE S/W OP		1	7000	7000
4" RELIEF VALVE		1	2000	2000
CONDENSERS				
3" GATE VALVE		12	400	4800
2" GATE VALVE		12	250	3000
PROPANE STORAGE				
4" CHECK VALVE		1	750	750
4" GATE VALVE		3	600	1800
				90050
			SUB-TOTAL	
		CONTINGENCY @	%	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM No. 6 CHILLER FACILITIES

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
TEES				
24x24x24		3	1500	4500
24x24x12"		2	1500	3000
16x16x16		2	1000	2000
16x16x10		2	1000	2000
16x16x3		11	1000	11,000
10x10x10		2	206	412
10x10x8		1	225	225
10x10x2		11	250	2750
8x8x8		2	121	242
2x2x2		1	27	27
				26,156
ELBOWS				
24"		10	1207	12070
16"		6	463	2778
10"		14	149	2086
8"		4	72	288
4"		12	16	192
3"		24	10	240
2"		24	6	144
12"		3	350	1050
				18,848
FLANGES				
24"		10	661	6610
16"		10	288	2880
10"		28	112	3136
8"		8	60	480
4"		18	24	432
3"		36	18	648
2"		36	14	504
12"		6	220	1320
				16010
			SUB-TOTAL	Page 2 61014
		CONTINGENCY @	%	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. 6 CHILLER FACILITIES

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
BOLT + NUT SETS				
1 7/8" X 12 3/4		240	4.00	960
1½" x 9¾"		200	3.80	760
1¼" x 8½"		60	3.20	192
1¼" x 8¼"		448	3.00	1344
1⅛" x 7½"		96	2.80	269
⅞" X 5½"		144	1.75	252
¾" x 4¾"		288	1.50	432
⅝" x 4"		288	1.00	288
				4497
PIPES GR. B				
24" x .375 W.T		200'	40.25	8050
16" x .375 WT		800'	29.77	23816
10" x .365 WT		1200'	17.13	20556
8" x .322 WT		1700	12.72	21624
4" x .237 WT		1200'	5.63	6756
3" x .216 WT		500'	3.88	1940
2" x .154 WT		700	1.99	1393
1¼" x .145 WT		500'	2.91	1455
1" x .133 WT		500	1.88	940
				86530
			SUB-TOTAL	pg 3 91027
		CONTINGENCY @	%	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. 6 · CHILLER FACILITIES

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
PROPANE GAS CHILLER 36"ϕ × 240" LONG	EXCHANGER SALES AND SERVICE	3	105,000	315 000
PROPANE CONDENSER 14' × 40' × 16'	EXCHANGER SALES AND SERVICE	12	60 000	720,000
TRANSFER PUMP 45 gpm		1	6500	6500
PROPANE STORAGE TANK ANSI ISO	CIGAS 30,000 gals	1	35,000	35,000
PROPANE RECIEVER TANK 9% SADDLES	CIGAS 18,000 gals	1	26,000	26000
ECONOMIZER 9/W INLETS – OUTLETS	ESTIMATED FROM PLANT	1	27,000	27,000
SUCTION SCRUBBER ANSI ISO SUMP	48" ID × 10' 16" × 8'	1	17000	17,000
INTERSTAGE SCRUBBER HXI ISO SUMP	24" ID × 8' 16" × 6'	1	14,500	14,500
PROPANE DRYER (13 gpm)	16" × 10' MOLE SIEVE + DESICCANT	1	17500	17,500
INITIAL PROPANE CHARGE + MAKE UP	CIGAS	45,000 gal	$0.35	15,750
FEDERAL SALES TAX ($313,675) at 9% $65,684				
FEDERAL SALES TAX ($266,300) at 5% $13,315				1,194,250
SYSTEM WT		1,658,118 lbs		
			SUB-TOTAL	1436,341
		CONTINGENCY	@ 10 %	143,634
		- 91 -	TOTAL	1,579,975

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM No. 6 CHILLER FACILITIES

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
	FACILITY	WEIGHTS		
	LBS.			
CHILLER	285,000			
CONDENSERS	660,000			
STORAGE TANK	95,000			
RECEIVER	40,000			
ECONOMIZER	20,000			
SCRUBBERS	27,000			
DRYER	12,000			
PROPANE	206,000			
PIPING, FITTINGS & VALVES	313,118			
	1,658,118 lbs	= 740 Tons (Long Tons)		
		= 830 Tons (Short Tons)		
			SUB-TOTAL	
		CONTINGENCY	@ %	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM No. Fuel Gas Supply

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
1. Fuel Gas Tie-in & Piping				
4" 600# ANSI RFWN V.	Crane Supply	2	$ 2000	$ 4,000
4" 600# ANSI Check V.	"	2	$ 750	$ 1500
4" 600# " RFWN Flge.	"	4	$ 47	$ 188
7/8" x 7 1/2" Stud Bolts C/W 2 HX	"	16	$ 2.60	$ A.
4" Gaskets	"	6	$ 2.60	$ 16
12" x 4" Sch. 80 Red. Tee	"	2	$ 300	$ 600
4" x 4" x 4" Tee	"	1	$ 18.00	$ 18
4" 90° Ell. Sch. 80	"	6	$ 16.00	$ 96
4.5" O.D. x 0.237 W.T.	gr. 52 IPSCO	170 Ft	$ 563/C	$ 957
0-1500# Pressure Gauges	"	2	$ 100	$ 200
2-4" Insulating Kits	"	2	$ 50	$ 100
			Sub-Total	$ 7717
(Knock out Drum - Filter Seps - F.G. Heater - Regulator Sta.) To be skid mounted and housed in a Bldg. 20' x 25' outside the Comp. Bldg.				
2. Knockout Drum		1	$ 2000.00	$ 2000. 0
C/W Instrumentation			—	—
4" 600# ANSI RFWN. V.	Crane Supply	3	$ 2000	$ 6000
4" 600# ANSI Flge. Relief V.	HGCO	1	$ 2700	$ 2700
2" 600# ANSI " " V.	(Should be incl. with vessel)	1	$ 1500	$ 1500
2" 600# ANSI RFWN Plug V.	(Disposal Line)	1	$ 209	$ 209
4" 600# ANSI RFWN Flge	Crane Supply	10	$ 47	$ 470
2" 600# ANSI " "	"	6	$ 20	$ 120
4" x 4" x 4" Tee Sch. 80	"	3	$ 18.00	$ 54
4" 90° ELL. Sch. 80	"	6	$ 16.00	$ 96
2" 90° ELL. Sch. 80	"	6	$ 6.00	$ 36
7/8" x 5 1/2" Stud Bolts C/W 2 HX	"	80	$ 2.60	$ 208
5/8" x 4" Stud Bolts	"	48	$ 1.25	$ 12
4" Gaskets	"	10	$ 2.60	$ 26
2" "	"	6	$ 1.85	$ 11
			SUB-TOTAL	$ 13,442.00
			CONTINGENCY @ %	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. Fuel Gas Supply (Cont.)

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
O.D. x 0.237" W.T. Gr. B Pipe	IPSCO	150'	" 563/c	" 844
2" x 0.218" W.T. Gr. B "	Pipe "	180 + 40'	" 2.14 00/c	" 3 00
		Sub	Total	" 14587
3. Scrubbers	Peco	2	" 6,500 00	13,000 00
c/w Instrumentation	"		—	—
4" 600# ANSI RFWN V.	Crane Supply	4	" 2000	" 8,000 00
½" B.V. 2000# Scrd Ends	" "	2	" 76.70	" 154 00
1" B.V. 2000# " "	" "	4	" 34 00	" 136 00
2" 600# ANSI R.V.	AGCO	1	" 1500 00	" 1500 00
1" 600# " R.V.	"	2	" 750 00	" 1500 00
4" x 4" Reducer	Crane Supply	4	" 15.00	" 60.00
4" x 2" "	" "	1	" 6.50	" 6.50
3" x 2" "	" "	1	" 5.50	" 5.50
6" 600# ANSI RFWN Flge.	" "	4	" 107	" 428
4" " " "	" "	8	" 47	" 376
2" " " "	" "	2	20	" 40
4" x 4" x 4" Tee Sch. 40	" "	5	" 18.00	" 90 00
4" 90° Ell. Sch. 40	" "	4	" 7.90	" 32 00
1" 90° Ell. Sch. 40	" "	12	" 4.00	" 48.00
1" Scrd. Tee 3000#	" "	4	" 3.90	" 16 00
1" x 4" Scrd Nple	Sch. 80 "	12	" 2.19	" 26 00
1½" 90° Scrd. Ell. 3000#	" "	6	" 13.20	" 79 00
1½" Scrd. Tee 3000#	" "	4	" 12.40	" 50 00
1½" x 4" Scrd Nple	Sch. 80 "	6	" 3.40	" 20 00
6" Gaskets	" "	4	" 3.00	" 12 00
4" "	" "	8	" 2.60	" 21 00
2" "	" "	2	" 1.85	" 4 00
1" x 6½" Studs c/w 2 Nx	" "	48	" 2.60	" 125 00
7/8" x 5½" " "	" "	64	" 2.60	" 167 00
5/8" x 4" " "	" "	16	" 1.25	" 20 00
1" O.D. x 0.237" WT Gr. B Pipe	IPSCO	110'	" 563/c	" 619 00
3" O.D. x 0.218" WT "	Pipe "	30'	" 214/c	" 30 00
			SUB-TOTAL	26 625
		CONTINGENCY @	%	
		- 94 -	TOTAL	

SYSTEM COST SUMMARY
SYSTEM NO. Fuel Gas Supply (Cont.)

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
1½" 0.145" WT. Pipe	Gr. B. IPSCO	100'	$ 291/C	$ 291.00
1" x 0.179" WT. Pipe	" "	100'	$ 144/C	$ 144.00
3.5" O.D. x 0.216" WT Pipe	" "	50'	$ 306/C	$ 153.00
1" 3000# Scrd. Union	G.J. Crane Supply	6	$ 6.00	$ 36.00
1½" 3000# " "	" "	4	$ 10.00	$ 40.00
		Sub-Total		$ 27,289
4 Fuel Gas Indirect Heater				
Heater c/w Instrumentation	Cessco	1	$ 12,000.00	12,000.00
4" Strainer	"	1	500.00	500.00
4" 600# ANSI R.F.W.N.V.	Crane Supply	4	2,000.00	8,000.00
4" 600# " " Flgc	"	8	47.00	376.00
7/8" x 5½" Studs c/w 2 HX	"	64	2.60	165.00
4" 600# Gaskets	"	8	2.60	21.00
1" 600# ANSI R.V.	AGCO	1	750.00	750.00
4" x 4" x 4" Tee Sch. 40	Crane Supply	2	18.00	36.00
4" 90° E11. Sch. 40	"	1	7.90	8.00
1" 90 E11. Scrd. 3000# F.S.	"	2	4.60	9.00
1" x 4" Scrd Nple Sch. 80	"	4	2.19	9.00
Pressure Ind.	"	1	50.00	100.00
Temp. Ind.	"	1	50.00	50.00
1" x 0.179" WT Pipe	Gr. B IPSCO	50'	$ 144/C	72.00
1" Tee Scrd. 3000# F.S.	Crane Supply	2	7.25	15.00
		Sub-Total		$ 23,111
			SUB-TOTAL	
		CONTINGENCY @	%	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM No. 1 — Gas Supply ~ Refrig. Turbine

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
Pressure Regulation and Meter Runs				
(1) Clark D.J.5 Refrig. Turbine Propane Compressor [illegible]				
w/ 2" Fisher "Big Joe"	Spartan	2	$300	$600.00
[illegible] orifice Spring 1K2709			—	—
2" Fisher "Big Joe"	"	2	$300	$600.00
w/ 3/8" orifice, Spring 1J1429			—	—
2" 300# ANSI R.V.	AGCO	1	$750	$750.00
2" 2000# Scrd. B.V.	Crane Supply	11	$95	$1045.00
2" 3000# Scrd. Union B.J.	" "	6	$15.20	$92.00
2" " Scrd. Tee	3000# F.S. " "	7	$19.65	$138.00
2" 90° " Ell.	3000# F.S. " "	4	$18.69	$75.00
4"x4"x2" Tee Sch. 40	" "	1	$18	$18.00
2" x 0.218" WT. Gr. B	" "	250 Ft.	$2.14/c	$535.00
0–1000# gauge	" "	4	$100.00	$400.00
Temp. Ind.	" "	1	$50.00	$50.00
1/2" x 0.035" Wt. Tubing	" "	20	$.77/c	$16.00
2" x 3" Nple Sch. 80 TBE	" "	12	$2.92	$35.00
1/4" Ndle Valves	" "	4	$6.00	$24.00
Misc. Connectors			$25.00	$25.00
Piping Support Stands		4	$100.00	$400.00
Gas Meter	Rockwell T-18	1	$4,500.00	$4,500.00
		Sub-Total		$9,303.00
	Plus	10% Contingency		930
			SUB-TOTAL	
		CONTINGENCY @	%	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM No. Fuel Gas Supply - C.B. Turbine

2. C.B. Turbine

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
1" Fisher 310-316	Spartan	2	$ 1590.00	$ 3180.00
3" Strainer	Crane Supply	1	$ 500.00	$ 500.00
3" Check V.	"	1	$ 500.00	$ 500.00
2" 600# ANSI RFWN. B.V.	"	10	$ 1200	$ 12,000.00
3" " " " Flgd	"	22	$ 32	$ 704
3" 600# ANSI Gaskets	"	24	$ 2.00	$ 48.00
3/4" x 4 3/4" Stud Bolts c/w 2 Hvy	"	176	$ 1.20	$ 210.00
3"x3"x3" Weld Tee	A.H.A.O.	10	$ 15.30	$ 153.00
1"x3" Weld Red	"	1	$ 93.00	$ 93.00
3"x1" Swage Nple.	" "	4	$ 12.00	$ 48.00
3" 90° Ell. Sch. 40	"	12	$ 10.00	$ 120.00
1"x4" Nple Scrd.	Sch. 80	4	$ 2.00	$ 8.00
1/4" Ndle V.	"	4	$ 6.00	$ 24.00
1/2" x 0.035" WT. Tubing	"	20'	$ 77/c	$ 16.00
Misc Connectors	"		$ 25.00	$ 25.00
0-1000# gauges	"	4	$ 100.00	$ 400.00
Temp. Ind.	"	1	$ 50.00	$ 50.00
Piping Support Stands		4	$ 100.00	$ 400.00
3.5" O.D. x .216" WT. Gr. B	IPSCO	150 Ft.	$ 306/c	$ 458.00
Gas Meter	Rockwell T-18	1	$ 4,500	$ 4,500.00
			Sub-Total	23,257
			SUB-TOTAL	
			CONTINGENCY @ %	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. Fuel Gas Supply - Boiler & Generators } 25psig System

	ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
3.	Generators + Boilers (Regulator & Meter Bldg.)				
	1" Fisher Pilot	Spartan	2	$ 250	$ 500.00
c/w	1/8 orifice Spring 1K2319			—	—
	1" Fisher 627	Spartan	2	$ 125	$ 250.00
c/w	1/4" orifice Reg # 1D7515			—	—
	2" 300 ANSI R.V.	ASCO	1	$ 750.00	$ 750.00
	2" 2000# Scrd R.V.	Crane Supply	11	$ 95.00	$ 1045.00
	2" 3000# Union G.J. Scrd	" "	6	$ 15.20	$ 92.00
	2" x 1" Swage Nple.	TBE Sch 40 " "	8	$ 7.45	$ 60.00
	1" x 2" Red Weld Tee	Sch. 40 " "	1	$ 6.50	$ 7.00
	2" 90° Scrd Ell.	3000# F.S. " "	6	$ 18.69	$ 112.00
	2" Scrd. Tee	3000# FS " "	6	$ 19.65	$ 118.00
	0 - 1000# gauge	" "	4	$ 100	$ 400.00
	Temp. Ind.	" "	1	$ 50	$ 50.00
	1/2" x 0.035" WT Tubing	" "	20'	$ 77/c	$ 16.00
	Misc. Connectors	" "		$ 25.00	$ 25.00
	1/4" Needle V	" "	4	6.00	24.00
	2" x 0.218 Gr. B Pipe	IPSCO	400'	$ 214/c	$ 856.00
	Piping Support Stands		4	$ 100.00	$ 400.00
	Gas Meter (Utility Gas)	Canadian Meter	1	$ 1200.00	$ 1200.00
				Sub - Total	5905
				SUB-TOTAL	
			CONTINGENCY	@ %	
				TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM No. [illegible] Boiler & Generators } 25 psig System PAGE [illegible] OF 9

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
Boiler (Boiler Room)				
2" [illegible] Pipe 5301	Sparton	2	$550.00	$1100.00
c/w 3/8" orifice [illegible] #108922			—	—
2" 2000# Scrd. B.V.	Crane Supply	4	$95	$380.00
2" 3000# Union G.J. Scrd	"	4	$15.20	$61.00
2" " Scrd. Tee	"	4	$19.65	$79.00
2" 90° " Ell 3000#	"	4	$18.69	$75.00
2" x 3" Nple Sch. 80 TBE		10	$2.92	$30.00
[illegible]" x 0.218" Gr. B Pipe		20'	214/c	$43.00
Pipe Support Stands		2	$100	$200.00
			Sub-Total	1968.00
			Plus 10% Contingency	197.00
			Plus 5% FST	108
			Total	$2273.00
Skid material – I beams				
~ ∠ iron				
~ checker plate			$1500.00	$1500.00
			Plus 5% FST	75.00
			Total	1575.00
			SUB-TOTAL	
		CONTINGENCY @	%	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM No. FUEL GAS SUPPLY – CHILLED STATION

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
SUMMARY OF MATERIAL COSTS: (CHILLED STATION)				
1. TIE-IN &	YARD PIPING			7,717
2 REGULATOR & METER BLDG.:				
a) KNOCK OUT DRUM ASSEMBLY				14,587
b) SCRUBBER ASSEMBLY				27,289
c) GAS HEATER ASSEMBLY				23,111
d) GAS REGULATING & METERING				
i) REFRIG. TURBINE				9303
ii) C.B. TURBINE				23,257
iii) GENERATORS & BOILERS				5,905
iv) BOILER				1,968
e) SKID MATERIAL				1500
			SUBTOTAL	114,637
	SUBTOTAL :	114,637		
	CONTINGENCY at 10%:	11464		
	TOTAL :	# 126,101		
	WEIGHT	22000 lbs		
F.S. Tax	(# 29700) at 9%	# 2,673		
F.S. Tax	(# 96401) at 5%	# 4,820		
	Total F.S. Tax	# 7,493	SUB-TOTAL	
			CONTINGENCY @ %	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. FUEL GAS - NON-CHILLED STATION PAGE 9 OF 9

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
SUMMARY OF MATERIAL COSTS : (NON-CHILLED STATION)				
1. TIE-IN & YARD PIPING				7,717
2. REGULATOR & METER BUILDING :				
a) KNOCK-OUT DRUM ASSEMBLY				14,587
b) SCRUBBER ASSEMBLY				27,289
c) GAS HEATER ASSEMBLY				23,111
d) GAS REGULATING & METERING :				
i) C.B. TURBINE				23,257
ii) GENERATORS & BOILERS				5,905
iii) BOILER				1,968
e) SKID MATERIAL				1500
			SUBTOTAL	105,334
	SUBTOTAL :	105,334		
	CONTINGENCY at 10%	10 533		
	TOTAL	$115,867		
	F.S. Tax 9% =	2673		
	F.S. Tax 5% =	4309		
	Weight = 21,000 lbs.			
			SUB-TOTAL	
		CONTINGENCY @	%	
		- 101 -	TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. 6 - HEATING & VENTILATING SYSTEM - CHILLED STN PAGE 1 OF

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
HOT WATER BOILER	HYDROTHERM	6 - MR 2700	14,000	$84,000
CIRCULATING PUMPS	S.A. ARMSTRONG	2 - 15 HP	3600	7,200
		2 - 7½ HP	1300	2,600
H.W. UNIT HEATERS	WESTERN AIR COND.	40		
- Gas Scrubber Bldg				
- Stores Bldg				
- Gas Comp. Bldg				
- Chiller Bldg				
- Propane Comp Bldg				
- Utility Bldg				
- Workshop				
- Gen. Room				
- Corridor				
- F.G. Bldg				
Wall Convectors	Western Air Cond.			
- Utility Bldg				
- Stores				
- MCC Room				
- Control Room				
- Office #1				
- Office # 2				
- Inst. Lab				
- Living Quarters				
- Comm. Bldg				
				60,000
Air Conditioner				
- Control Room	LEIBERT	1	10,000	$ 10,000
ETHYLENE GLYCOL	Harrison - Crossfields	1500 US Gals	40¢/lb	$ 5,555
				169,355
			SUB-TOTAL	
		CONTINGENCY @	%	
		- 102 -	TOTAL	

DEVESTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM No: 6 HEATING & VENTILATING SYSTEM - CHILLED STATION PAGE 2 of

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
STRAIGHT PIPES	ITT GRINNELL	VARIOUS SIZES		23080
TEE JOINTS	"			16120
REDUCERS	"			273
ELBOWS	"			2359
FLANGES	"			956
BOLT + NUT SETS	"			720
UNIONS	"			932
GLOBE VALVES	"			14,108
BALL VALVES	"			9,128
AUTO AIR VENT	"			280
TEMP. INDICATOR	"			100
PRESSURE INDICATOR	"			200
NIPPLES				3864
				72,120
PIPE HANGERS & SUPPORTS				5,000
			SUB-TOTAL	
		CONTINGENCY @ %		
		TOTAL		

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM No. 6 HEATING & VENTILATING SYSTEM – CHILLED STATION PAGE 3 OF

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
E.S. Tax ($180,180) at 9%		$16,216		
E.S. Tax ($ 90,943) at 5%		$ 4547		
	Total	$20,763		
	WEIGHT	91500 lb ≈ 45 tons		
			SUB-TOTAL	246475
		CONTINGENCY @	10 %	24648
			TOTAL	$271,123

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NR. 6 - Heating & Ventilating System - NON-CHILLED STN

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
HOT WATER BOILER	HYDROTHERM	4 - MR2400	13,000	$52,000
CIRCULATING PUMPS	S.A ARMSTRONG	4 - 7½ HP	1300	5,200
H.W UNIT HEATERS	Western Air Cond.	22		$35,000
Air Conditioner				
CONTROL ROOM	LEIBERT	1	10000	10,000
ETHYLENE GLYCOL	HARRISON - CROSSFIELDS	1200 US Gal.	.40¢/lb	4,444
STRAIGHT PIPES	ITT GRINNELL	VARIOUS SIZES		14,407
TEE JOINTS	"			3,800
REDUCERS	"			116
ELBOWS	"			1,481
FLANGES	"			560
BOLT + NUT SETS	"			460
UNIONS	"			580
GLOBE VALVES	"			8,996
BALL VALVES	"			5865
AUTO AIR VENT	"			200
TEMP. INDICATOR	"			100
PRESSURE INDICATOR	"			200
			SUB-TOTAL	
		CONTINGENCY @ %		
		- 105 -	TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. _____ PAGE __

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
NIPPLES				2499
HANGERS & SUPPORTS				3000
F.S. Tax ($112,420) at 9%		$ 10,118		
F.S. Tax ($ 51,379) at 5%		$ 2.569		
	Total	$ 12,687		
	WEIGHT	58,700 lbs ≈ 30 Tons		
			SUB-TOTAL	148900
		CONTINGENCY	@ 10 %	14891
		- 106 -	TOTAL	$163,791

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. 6 - FIRE AND GAS DETECTION - CHILLED STATION

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
DETECTION DEVICES (UV sensors, gas detection, thermistors, ionization & thermal detectors)	LEVITT-SAFETY			$ 56,690
Central Control Panel	LEVITT-SAFETY	1		22,500
Halon 1301 systems for MCC room, Control Room & Communications BLDG	LEVITT SAFETY	3		29,120
Portable Ansul wheeled units and hand extinguishers	LEVITT SAFETY			31,500
Halon 1301 system for Compressor Bldg	LEVITT SAFETY	1		38,000
Halon 1301 system for Propane Comp. Bldg	LEVITT SAFETY	1		49,000
Halon 1301 system for Elec. Gen Room	LEVITT SAFETY	1		15,620
Gas detection for area around propane condensers	LEVITT SAFETY			12,000
ANSUL SK3000 dry chemical for helicopter pad	LEVITT SAFETY			40,000
			SUB-TOTAL	
		CONTINGENCY @	%	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. 6 - FIRE AND GAS DETECTION - NON-CHILLED STATION

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
ALL ITEMS ARE AS PER THOSE FOR A CHILLED STATION WITH THE FOLLOWING EXCEPTIONS:				
DELETE:				
Gas detection for area around propane condensers & chiller bldg	LEVITT-SAFETY			(22,000)
Halon 1301 system for Propane Comp Bldg	LEVITT-SAFETY			(49,000)
Gas & thermal detection devices in propane comp bldg				(33,000)
ENGINEERING BY LEVITT-SAFETY for above			10%	(10,400)
Pipe, valves & fittings to install above				(6600)
			Sub-Total deletions	($121,000)
			CHILLED STN 0% cost	352,873
			NON-CHILLED STN 0% cost	$227,873
FST @ 9% =	22,559			
SYSTEM WEIGHT =	25,000#			
			SUB-TOTAL	$231,873
		CONTINGENCY	@ 10 %	23,187
			TOTAL	$255,060

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. 6 - FIRE AND GAS DETECTION - NON-CHILLED STATION

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
ALL ITEMS ARE AS PER THOSE FOR A CHILLED STATION WITH				
THE FOLLOWING EXCEPTIONS:				
DELETE:				
Gas detection for	LEVITT-SAFETY			(22,000)
area around propane				
condensers & chiller bldg				
Halon 1301 system for	LEVITT-SAFETY			(49,000)
Propane Comp Bldg				
Gas & thermal detection				(33,000)
devices in propane				
comp bldg				
ENGINEERING BY			10%	(10,400)
LEVITT-SAFETY for				
above				
Pipe, valves & fittings				(6600)
to install above				
			Sub-Total	($121,000)
			deletions	
			CHILLED STN 0% cont	352,873
			NON-CHILLED STN 0% cont	$ 227,873
FST @ 9% =	22,559			
SYSTEM WEIGHT =	25,000#			
			SUB-TOTAL	$231,873
		CONTINGENCY @	10 %	23,187
		- 109 -	TOTAL	$255,060

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. _____

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
ENGINEERING BY			10 %	29,443
LEVITT SAFETY				
Pipe, Valves and				25,000
Fittings for				
installation				
HANGERS & SUPPORTS				4,000
FST @ 9 % =	34,538			
SYSTEM WEIGHT =	40,000#			
			SUB-TOTAL	$ 352,873
		CONTINGENCY	@ 10 %	35 287
		- 108 -	TOTAL	$ 388,160

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills – Dempster Estimate No. ______
Item No. ______ Account No. ______ Date ______
Description: Other Major Systems (Chilling System) Sheet No. 1 of 2

	Description of Work	Unit	Quantity	Hours	Labour		Equipment	Materials	Subcontracts	Job Supplies	Total Cost
	Gas Chillers 3 ea	lbs	315000	450	16.00	7200		by Cell			
	Propane Condenser 12 ea	lbs	720000	7200	16.00	115200		↓			
	Propane Scrubbers 2 ea	lbs	60000	200	16.00	3200					
	✓ Reclaimer	✓	70000	50	16.00	800					
	✓ Economizer	✓	75000	50	✓	800					
	✓ Receiver	✓	75000	50	✓	800					
	✓ Storage Tank	✓	30000	50	✓	800					
	✓ Pump	✓	2000	50	✓	800					
	Propane Pipe System	ϕ"	2000 4.0	8000	16.00	128000		↓			
		lbs	80000								
	18m 90s	lbs	1272000	16100		257600					257600

D001-1 13SEP76

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Item No.:
Account No.:
Description: Other Major Systems. (Misc.)
Estimate No.:
Date:
Sheet No. 2 of 2

Description of Work	Unit	Quantity	Hours		Labour		Equipment	Materials		Subcontracts	Job Supplies	Total Cost
Gas Heaters	Ea	20	10	200	16.00	3200		50	1000			4200
	lbs	4000										
Fuel and Starting Gas	ft	200	4.0	800	16.00	12800						12800
	lbs	8000										
Heating and Ventilation	lbs	15000	1.0	15000	16.00	240000		30%	45000			285000
	lbs	2000										
Gas Detection and Fire Protection	lbs	15000	1.0	15000	16.00	240000		30%	45000			285000
	lbs	2000										
								above is mat'l only				
								large pipe & equip by CCL				
6m 6Ts	lbs	16000		40000		64000			100000			740000

D001-1 13SEP78

DEMPSTER HIGHWAY COMPRESSOR STATION

III-7 UTILITIES

III-7.1 WATER SYSTEM

The supply of raw and potable water in permafrost areas is highly variable. From published information it appears that the most likely sources would be from lakes or rivers, or from sand and gravel aquifers normally found under large lakes and rivers. Ground water supplies from below the permafrost generally have higher iron and dissolved solids concentrations. Water treatment is estimated to require coagulation, sedimentation, filtration, iron removal and chlorination, and in addition to facilitate treatment the water should be heated to about $60^{o}F$. For this reason and others, all water storage and treating will be carried out in a heated building. The treating plant will generally be operated on a "batch" basis to maintain sufficient supply in the potable water storage tank. A pneumatic pressure tank is also provided on the potable water supply line.

Both raw and potable water were provided to the living quarters, the storage building and the shop and office building. The raw water supply would be suitable for "Black Water" service and industrial use.

The estimated water requirements were assessed as 60 gallons per man per day. At peak usage this would be 480 barrels per month. On this basis a 500-barrel galvanized cone bottom storage tank was provided. The vacuum sewage system detailed in Section 7.2 was estimated to reduce the water requirements by about 50 percent; however, in order to provide for washing down vehicles, equipment and floors, the storage capacity of 500 barrels was assessed to be reasonable.

III-7.2 SEWAGE SYSTEM

III-7.2.1 GENERAL

This estimate provides for a vacuum sewage system at each compressor station as quoted by Vacusan. They have presented two (2) alternative methods of collecting the sewage and seven (7) options for disposing of it. Please refer to the Vacusan quotation dated January 12, 1979, Exhibit 5, for specific details.

For this estimate we have chosen the Vacusan system which would collect the black water (toilets and urinals) and grey water (showers, hand basins, etc.) in one common 2" pipe and conduct it to a 600-gallon collection tank prior to disposal. The method of disposal provided in this estimate is to incinerate both the black and grey waters. This, we feel, is the cleanest and safest method from an environmental point of view. It also means that disposal of all sewage can take place on-site and does not rely on hauling to an off-site location and negates the need for a sewage lagoon.

The other options available for collection and disposal of sewage are detailed within the Vacusan quotation and a comparison of costs is outlined in the backup material contained in this section.

III-7.2.2 DESCRIPTION

The vacuum sewage system basically comprises a liquid ring vacuum pump, collection tank, interconnecting piping and vacuum toilets. Other fixtures such as urinals, sinks, dishwasher, showers, etc., are easily connected to the system and have been provided in this estimate.

A major benefit in using a vacuum system is the reduction in water usage of approximately 50% over a conventional system. Another benefit is that the collection piping can be run irrespective of gravity and hence

can be installed out of the way in the upper reaches of utilidors and other buildings.

III-7.3 FLARE SYSTEM

The estimate for the flare system was based on a tapered gathering line, starting near the propane condensers on overhead supports, running through the propane compressor building, chiller building and gas compressor building, around the communications building to the incinerator pad. The line starts at 4", increases to 6" and finally reaches 8" diameter. The pipe costs were based on minus (-) 50°F specification Grade 35 pipe. Fittings were estimated on a similar quality material.

Pipe supports were included for the runs between buildings and for the run from the compressor building to the flare stack. A 2" fuel gas supply line was run from the gas compressor building to the flare stack and a purge gas line from the propane compressor building to the beginning of the flare line.

The flare stack cost was estimated using an 8" diameter supported stack, 50 feet in height, a refractory lined stainless steel tip, 2 concentric sets of wind deflectors, a flow sensor, automatic ignitor panel, pilot ignitor (2), fuel gas regulating station, stack fuel gas line brackets and 2 pilots.

Tax was calculated at the appropriate rate as previously noted and freight to Edmonton was included.

III-7.4 EMERGENCY FUEL

Emergency fuel storage has been provided for the standby diesel generator and gasoline storage has also been provided at each station site for utilization by operations and maintenance crews for both the pipeline and stations.

Diesel fuel storage was sized based on the generator size at each of the chilled and non-chilled stations with the approach taken that storage had to last over one winter in case of substantial requirements on the diesel standby unit. Continuous operation over the entire winter is not anticipated.

All tankage is placed on insulated pads within a dyked area. A transfer system is provided to move the diesel fuel to the standby generators at each station.

COST SUMMARY (UTILITIES)

	Chilled	Non-Chilled
Materials	$255,000	$228,000
Installation	89,000	89,000
Total	$344,000	$317,000

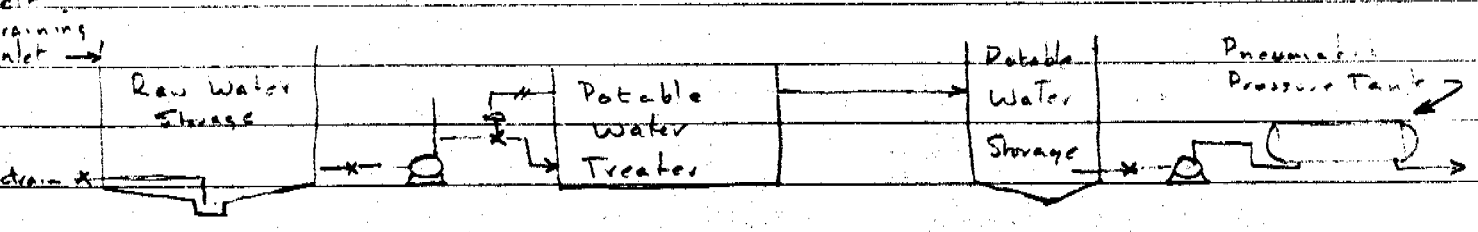
Estimated Weight of Materials ex Edmonton	139,000 lbs.	122,000 lbs.
Federal Sales Tax Estimate	$ 15,100	$ 13,400

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. Water [illegible] PAGE OF

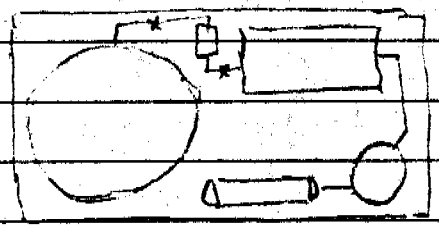
ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
Raw Water Sto[illegible]	[illegible] Tank [illegible]	1	[illegible]	[illegible]
Potable Wa[illegible]	Treater [illegible]	1	15,000	15,[illegible]
Potable Water	[illegible]	1	[illegible]	[illegible]
Potable Wa[illegible]	Pressure Tank	1	2,[illegible]	
Raw Water Pu[illegible]	[illegible] Motor	1	1500	[illegible]
Potable Water	Pump & Motor	1	950	[illegible]
Pressure Switches (2)		2	75	150
Water Meters (2)		2	250	500
2" Pipe Galvanized		750	4.00/ft	3000
1" Pipe Galvanized		600	2.50/ft	1500
1" Pipe Copper		400	1.60/ft	[illegible]
1/2" Pipe Copper		600	1.00/ft	600
Misc Couplings &	Straps Hangers	Lot		[illegible]
Valves 2" Bronze	Scr	15	85	1275
Valves 1" "	Scr	12	50	600
Valves 1" Sock		24	18	432
Valves 1/2" Socket		24	8	192
Tees, Elbows, Caps nipples etc		Lot		350
Fixtures				
Shower stalls		4	150	300
Hot Water heaters		3	300	900
Hand Basins		7	75	525
Forced Air Furnace		2	1500	3000
Kitchen Sink		1	150	150
[illegible]		1	300	300
Washer		1	500	[illegible]
Dryer		1	400	400
Dishwasher		1	600	600
Add bathroom Counter Mirrors [illegible]		lot	2000	2,[illegible]
				50,268
Sales Tax Estimate # 4500				
Estimated weight 21,000 #				
Freight to [illegible] included			SUB-TOTAL	5[illegible],0[illegible]0
		CONTINGENCY @	10 %	[illegible]
		- 116 -	TOTAL	61,600



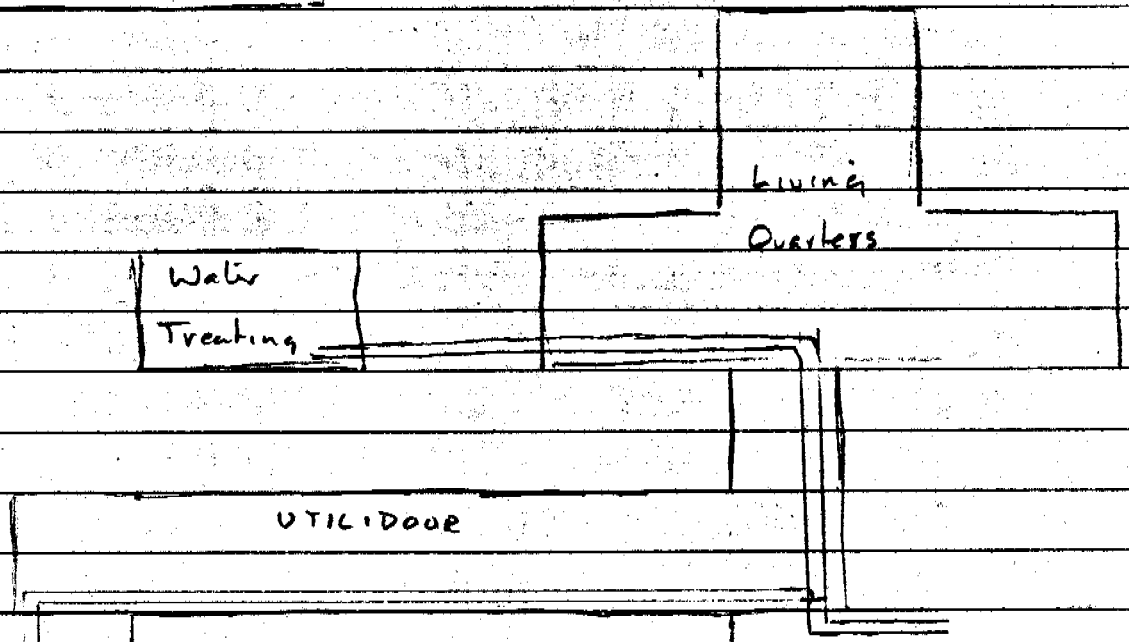
Preliminary Layout

Building Size

500 bbl tank diameter = $500 \times 5.61 \div 16 \left(\frac{\pi}{4} D^2\right)$ $D^2 = 223$ $D = 15'$



∴ building size assume 20' x 40'



DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. 7 - Sewage System - CHILLED & UNCHILLED STNS.

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
BLACK & GREY WATER IN ONE PIPE (This one for the estimate)				
600 gal. Collecta Tank	VACUSAN	1		
2HP Vacuum Pump	"	1		
Service Liquid Tank	"	1		
2 HP Disch. Pump	"	1		$ 17,000
Control Panel	"	1		
Elec. Equipment	"	1		
Vacuum Toilets	"	5		
Interface Valves	"	6		
100% standby vacuum pump	"	1		2,400
100% standby disch. pump	"	1		3,800
			TOTAL	$23,200
	DISPOSAL OPTIONS			
a) Discharge from collecting tanks to a scavange truck, haul to existing sewage facility				
- require 2000 gal holding tank				3,000
- addn'l piping				1,000
				$ 4,000
b) Discharge to sewage lagoon				
- addn'l piping				$ 4,000
c) Discharge from collecting tanks to an incinerator Trecan or GE		1		$ 40,000
- addn'l piping				1,000
				$ 41,000
d) Discharge to a small treatment plant, then dispose in river, etc		1		9,000
-addn'l piping				1,000
				$10,000
			SUB-TOTAL	
		CONTINGENCY @	%	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. _____

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
Urinals	Crane	2	400	800
2" ABS PIPE		1000'	4^{00}/ft	4000
1½" ABS PIPE		100	3^{00}/ft	300
2-1½" ABS FITTINGS		1 LOT		2000
				$7,100
Vacuum System AND DISPOSAL a)				$34,300
" "	" " b)			34,300
" "	" " c)	← THIS	ONE !	71,300
" "	" " d)			40,300
NOTE: DISPOSAL c) IS probably the best from an environmental point of view in use in estimate				
FST @ 5%	= $3922			
SYSTEM WEIGHT = 40,000 #				
			SUB-TOTAL	71,300
		CONTINGENCY	@ 10 %	7130
	FOB	Edmonton	TOTAL	$78,430

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. 7 - Sewage System - CHILLED & UNCHILLED STNS

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
	BLACK & GREY WATER COLLECTED SEPARATELY			
BLACK WATER				
300 gal Collection Tank	VACUSAN	1		
1 HP Vacuum Pump	"	1		
Service Liquid Tank	"	1		
2 HP Disch. Pump	"	1		$14,000
Control Panel	"	1		
Elec. EQUIP.	"	1		
Vacuum Toilets	"	5		
Interface Value	"	1		
100% standby vacuum Pump	"	1		2,000
100% " disch. pump	"	1		3,800
				$ 19,800
GREY WATER				
500 gal Collection Tank	"	1		
2HP Vacuum Pump	"	1		
Service LIQUID Tank	"	1		
2 HP DISCH. Pump	"	1		14,000
Interface Value	"	4		
Control Panel	"	1		
Elec. EQUIP.	"	1		
100% standby vacuum pump	"	1		2400
100% " disch. pump	"	1		3800
				$ 20,200
BLACK & GREY WATER TOTAL				$ 40,000
		DISPOSAL OPTIONS		
a) Discharge from black water tank to haul to existing sewage facility. Discharge gray water to sewage lagoon. Require holding tank & main to lagoons		Sewage truck, Discharge gray 2000 gal		$ 8,000
			SUB-TOTAL	
		CONTINGENCY @ %		
		- 120 -	TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. _____

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
b) Discharge from black water tank to the incinerator. Discharge grey water to lagoon				
- Trecan or GE incinerator				40,000
- Force main to lagoon				5,000
				$45,000
c) Discharge from black water tank to an incinerator Discharge from grey water tank to treatment plant for recycling. This recycled grey water can be reused for most non-potable uses such as flushing toilets or washing vehicles, etc.				
- Roto Disk S-20 treatment plant				9,000
- Sand filter				5,000
- Addn'l piping				1,000
- Incinerator				40,000
- Addn'l water storage & pressure system				20,000
				$75,000
Urinals	Crane	2	400	800
2" ABS Pipe		2000'	4.00/ft	8000
1½" ABS Pipe		200'	3.00/ft	600
2-1½ ABS Fittings		LOT		4000
				13,400
Vacuum System and Disposal a)				$61,400
" " " " b)				98,400
" " " " c)				128,400
NOTE: Disposal b) would probably be the best overall from the cost and environmental point of view				
FST @ 5% = $5412			SUB-TOTAL	98,400
SYSTEM WEIGHT = 50,000 #		CONTINGENCY @ 10 %		9840
		FOB Edmonton	TOTAL	108,240

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. FLARE SYSTEM - CHILLED STATION

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
(-50) 2" Pipe	Idsco	700 Ft	$5.00/Ft	$ 3500
" 4" Pipe	"	625 Ft	$8.00/Ft	5000
" 6" Pipe	"	200 Ft	$11.00/Ft	2200
" 8" Pipe	"	500 Ft	$15.00/Ft	7500
(-50) 8" LR 45° Ells		3	60	180
8"x8"x4" Tees		2	120	240
8"x6" Reducer		1	75	75
6"x6"x4" Tee		2	67	134
6"x4" Reducer		1	44	44
4"x4"x4" Tees		12	30	360
4" LR 90° Ells		6	20	120
To supply material for support racks between buildings and from the main compressor buileding to flare pad estimate 30 supports required at $300.00 each				9000
To supply a flare stack 8" od supported stack 50 Ft in height. Install Stainless tip, 2 sets wire electrodes, a gas flow sensor, automatic ignitor panel, 2 pilot ignitors, a fuel gas regulating station. Fuel gas line on stack, brackets, 2 pilots.				19500
Purge gas line for flare				3000
Pipe straps and hangers in the building				4000
Subtotal Material				54853
		Round off to		55000
Sales Tax Estimate $3700				
Estimated freight weight 43000 lbs				
Freight to Edmonton Included in Estimate				
			SUB-TOTAL	55,000
		CONTINGENCY @ 10 %		5,500
		- 122 -	TOTAL	60,500

Form No. 17

CANUCK ENGINEERING LTD.
CALCULATION SHEET

Project DEMPSTER COMP. STATION File No.
Description Page 1 of 2
Remarks Prepared By J.H.S.
Date JAN. 23. 1979 Checked By

FLARE SYSTEM - Refrigerated Station

Estimate based on -50°F spec pipe & fittings

4" 0.237 wt grade 35
6" 0.280 wt " "
8" 0.322 wt grade 35

2" pipe 700 ft @ 5.00/ft =		3500
4" pipe 625 ft @ 8.00/ft =		5000
6" pipe 200 ft @ 11.00/ft =		2200
8" pipe 500 ft @ 15.00/ft =		7500
Subtotal Pipe Material		$ 18200

Fittings

3 - 8" 45° ells LR -50	@ 60.00	180
2 - 8x8x4" RO Tees "	@ 120	240
1 - 8"x6" Reducer "	@ 75	75
2 - 6x6x4 RO Tees "	@ 67	134
1 - 6"x4" Reducer	@ 44	44
12 - 4"x4"x4" Tees -50	@ 30	360
6 - 4" LR 90° Ells -50	@ 20	120
		$ 1153

Support Rack will be required between buildings and from the main compressor building to the flare stack base est 30 supports required and material costs @ 300.00 each.

$ 9000

Pipe straps & hangers in buildings 4000

Form No. 17

CANUCK ENGINEERING LTD.
CALCULATION SHEET

Project DEMPSTER COMP. STATION. File No.
Description Page 2 of 2
Remarks Prepared By J.A.S.
Date 1-23-79 Checked By

Flare Stack

8" suspected stack 50 feet in height, top 10 feet stainless steel, two rings of wind deflectors, gas flow sensor, automatic ignition panel, 2 flare igniters, fuel gas regulation, fuel gas line & clamps, 2 pilots

(750 + 1500 + 1000 + 1500 + 5000 + 2500 + 1000 + 4250) · 17500

Purge Gas Line plus regulators & Valves $ 3000

TAX ESTIMATE $ 3700
Freight Estimate 43000 lbs.
Freight to Edmonton included in estimate.

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. FLARE SYSTEM NGW CHILLED STATION PAGE OF

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
2" PIPE	IPSCO	450 Ft	5.00/Ft	2250
4" PIPE	"	150 Ft	8.00 Ft	1200
6" PIPE	"	100 Ft	11.00 Ft	1100
8" PIPE	"	500 Ft	15.00 Ft	7500
8" LR 45° Ells	Tube Turns	3	60	180
8"x8"x4" Tees		2	120	240
8"x6" Reducers		1	75	75
6"x6"x4" Tees		2	67	134
6"x4" Reducer		1	44	44
4"x4x4" Tees		3	30	90
4" LR 90° Ells		4	20	80
To supply material for support racks between buildings and from the main compressor building to the flare pad, estimate 20 supports @ 300.00 each				6000
To supply a flare stack 8" od supported 50 feet in height Stainless tip, 2 sets wind deflectors, a gas flow sensor, automatic ignitor panel, 2 pilot ignitors, fuel gas regulation, fuel gas line on stack, brackets and 2 pilots				19500
Purge Gas line for flare				1500
Pipe Straps and hangers				2000
Sub Total Material				41893
		Round off to		42000
Sales Tax Estimate 2900				
Estimated freight weight- 32,000 lbs				
			SUB-TOTAL	42000
		CONTINGENCY @ 10 %		4200
		- 125 -	TOTAL	46200

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. ____ - FUEL STORAGE (CHILLED STN) PAGE 1 OF 1

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
500 BBL TANK.	NATIONAL TANK	3 ONLY	$9,700 installed	29,100
2" PIPING. (DIESEL)		500 FT	$8/FT installed	4,000
2" FTGS (-)		LOT	—	1,200
PUMP (-)		1 ONLY	$500 installed	500
SURGE TANK (-)		1 ONLY	1,000 installed	1,000
GAS PUMP C/W PIPING		LOT	1,500 installed	1,500
12" CULVERTS.		600 FT.	$4/FT installed	2,400
PIT RUN FILL		600 yds	$15/yd placed	9,000
Federal Sales Tax Estimate	—	$3,000.00		
Estimated Weight	—	30,000#		
			SUB-TOTAL	48,700
		CONTINGENCY @	10 %	4,800
		- 126 -	TOTAL	$52,500

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. ____ - FUEL STORAGE - 'STD.' STN

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
500 BBL TANK	NATIONAL TANK	2 ONLY	$9,800 installed	19,600
2" PIPING (DIESEL)		500 FT.	$8/FT ✓	4,000
2" FTGS. (✓)		LOT	—	1,200
PUMP (✓)		1 ONLY	$500 installed	500
SURGE TANK (✓)		1 ONLY	$1,000 ✓	1,000
GAS PUMP C/W PIPING		LOT	$1,500 ✓	1,500
12" CULVERTS		400 FT.	$4/FT ✓	1,600
PIT RUN FILL		450 YDS	$15/YD placed	6,700
FEDERAL SALES TAX ESTIMATE		$2100.00		
EST'D WEIGHT	—	21,000 #		
			SUB-TOTAL	36,100
			CONTINGENCY @ 10 %	3600
		- 127 -	TOTAL	$ 39,700

Form No. 17

CANUCK ENGINEERING LTD.
CALCULATION SHEET

Project: FPL (Dempster) Stn File No.
Description: DIESEL FUEL STORAGE Page 1 of 3
Remarks: REQ'T EST Prepared By: RAW
Date: JAN. 29/79 Checked By:

Chilled Stn — 450 KW (600 hp) 33 gal US/hr. (max) = 800 gal US/d = 19 B/D

"Std" Stn — 150 KW (200 hp) 12 gal US/hr (max) = 7 B/D

Using 500 BBL TANK (quote from J.S)

i) Chilled Stn = 500/19 = 26 days ∴ Use 2-500 BBLS

ii) Std Stn = 500/7 = 71 days ∴ Use 1- "

National Tank

'High' 500 BBL $6,300 MAT'L'S + $2,200 ERECT'N @ Nisku, ALTA

4 people (x 3 days + 2) x $50/day
+ Transpt'n @ 150 x 4 =

Fill Cost — Mike Taylor.

500 ft of 2" + Day Tank + Pump.

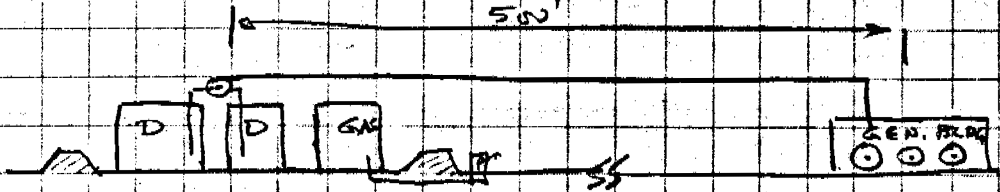
2" @ $5/FT (-50°F) ...
→ 4 + 6 + 5 = $15/yd. (Fill)
Royalty Haul ...

Form No. 17

CANUCK ENGINEERING LTD.
CALCULATION SHEET

Project .... File No. ....
Description .... Page 2 of 3
Remarks .... Prepared By ....
Date .... Checked By ....

I) CHILLED STN



① 3 - 500 BBL DIESEL / GAS TANKS (1000)

$3[(\$6300 + 2200) + 4(3 \text{ days} + 2 \text{ days}) \times \$50/d] + 4 \times \$150 \text{ return} = \$29,150$ (mat'l / erect'n; 8500)

② 500 ft 2" piping (on exist'g racks)

a) mat'l: 500 ft × \$5/FT × 1.5 FTGS. = 3,700 -
b) install'n 500 ft × \$3/FT. = 1,500 -
c) D. Transfer Pump (5gpm) elect/cont. = 500 -
d) Day/surge Tank @ Gen Bldg (mat'l + inst'l) = 1,000 -
e) Gasoline Piping & Pump (local) mat'l & inst'l'n = 1,500 -

\$8,200 -

③ FDNS & DYKE.

i) FDNS (3 only) @ 30 ft φ (ea).

with 12 culverts spaced @ 4 ft centers under pads

∴ Cost $= 3\left\{\frac{\pi\, 30^2}{4} \times 3 \times 1.2_{\text{swell}} / 27\right\} \times \$15/\text{YD}$ = (270 yds) \$4,000 -

\+ FT of Culvert $= 3\left(\frac{40'}{4'} \times 20' \text{ ea}\right) = 600' \times \$4/\text{ft installed}$ \$2,400 -

ii) Dyke (one enclosing all 3 tanks @ 50 ft "diam")

$\left(\frac{3 \text{ ft high} \times \Sigma 500' \text{ lg} \times 16' \text{ ave width (1:1 FILL)}}{27}\right) \times \$15/\text{YD}$ (333 yds) = 5,000

48,700
Misc's 4,300
\$53,000

Form No. 17

CANUCK ENGINEERING LTD.
CALCULATION SHEET

Project ..... File No. .....
Description ..... Page 3 of 3
Remarks ..... Prepared By .....
Date ..... Checked By .....

II) STP STN.

① 2 - 500 BBL GAS & DIESEL TANKS = 19,600 ✓

② 500 FT PIPING plus GAS "Pump" = 8,200 ✓

③ FDNS & DYKE
i) FDN (2 only) = 4,300 ✓
ii) Dyke (0.8 × above) = 4,000 ✓

36,100
3,600
39,700

- 130 -

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Foothills - Dempster Estimate No.

Item No. Account No. Date

Description Utilities Sheet No. of

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Water System			1000	16	16000	10000	20000		46000
Sewage System			1500	16	24000	25000			49000
Inlet Air System			—			60000 14000			
Exhaust, Flare & Vent Gas	ϕ"	300	100	16	16000				16000
Emergency Fuel and Cond. Storage	ϕ"	300	100	16	16000				16000
Misc			450		10000	25000	20000		135000

DOD1-1 13SEP76

DEMPSTER HIGHWAY COMPRESSOR STATION

III-8 INSTRUMENTATION AND CONTROLS

III-8.1 UNIT CONTROLS

Controls and instrumentation for the units are part of the package supplied by the unit manufacturer; however, a unit auxiliary panel (UAP) will be added as an interface or extension to achieve some standardization among the various stations and where unit controls may vary from one unit manufacturer to another.

UAP #1 shall be the interface panel for the natural gas compressor unit. Included in the cost of this panel are annunciator, graphic, instrumentation (digital panel meters, surge controller, signal conditioners, patch boards), wiring connectors, relays and timers, instrument cabinet and relay rack structures, wire and miscellaneous components, and the wiring and fabrication of the panel.

UAP #2 shall be the interface panel for the two propane compressors. Included in the cost of this panel are annunciator, graphic, instrumentation (digital panel meters, surge controllers (2), signal conditioners, patch boards), breakers, wiring connectors, relays and timers, instrument cabinet and relay rack structures, wire and miscellaneous components, and the wiring and fabrication of the panel.

III-8.2 PRESSURE, TEMPERATURE, FLOW MEASUREMENT

Pressures that are required for the operation of the natural gas compressor system and the propane compressor system shall be transmitted by electrical signals obtained from instrumentation racks (IR) located in the compressor buildings.

IR #1 shall be the instrument rack for the natural gas compressor unit and station. Included in the cost of this panel are the station suction,

intermediate (for chilled station) and discharge pressure transmitters and gauges (intermediate pressure being that between the main compressor and chiller and discharge pressure being that after the chiller or discharge pressure to the mainline), differential pressure across the orifice plate, pressure transmitters for the unit suction pressure and eye of the compressor for surge control, pressure switch for shutdown on high discharge pressure, and the conduiting, tubing, structure and fabrication.

IR #2 shall be the instrument rack for the propane compressor units. Included in the cost of this panel for each unit are two suction and one discharge pressure transmitters and gauges, one suction flow orifice differential pressure transmitter, one discharge flow orifice differential pressure transmitter, one pressure transmitter for the eye of the compressor, two pressure switches for shutdown on low suction and high discharge pressure, and the conduiting, tubing, structure and fabrication.

Temperatures which are critical to the operation of the unit shall be taken care of by the unit manufacturer; therefore any RTD's, thermalcouples, transmitters, meters and gauges will be included in the cost of the unit. However, temperature measurement (TM) which is critical to the operation of the pipeline systems is a separate cost.

All gas temperatures are monitored by use of thermowells with RTD's, signal conditioners (R/I) and panel meters.

TM #1 shall be the temperature measurement for the natural gas pipeline system. Included in the cost are suction, intermediate (for chilled station), discharge and orifice temperature thermowells and RTD's. The thermowells and RTD's are located in the field on the pipeline, and signal convertion and metering shall be located in the station control panel (SCP) and are included in the cost of SCP (see SCP).

TM #2 shall be the temperature measurement for the propane refrigeration system. Included in the cost for each unit are two suction, one discharge, one suction orifice and one discharge orifice temperature thermowells and RTD's.

Pressure and temperature gauges located locally, i.e., at point of sensing, are a relatively minimal cost and are included in miscellaneous.

Fuel gas monitoring shall be done using turbine meters, transmitters, flow computers, displays and chart recorders. Included in the fuel gas monitoring (FM #1) cost for the main compressor are one high frequency pulse generator, pressure transducer, RTD temperature detector, and thermowell, flow computer and chart recorder complete with totalizer. The turbine meter cost is included in the fuel gas system cost (see Subsection III-7.2).

Fuel gas monitoring for the propane compressor (FM #2), and utilities (FM #3) shall use the same type of equipment. The cost of mounting of the flow computers and chart recorders shall be included in the cost of the SCP's (see SCP #1 and SCP #2).

III-8.3 STATION CONTROL

The station control panel (SCP) contains all logic, instrumentation, indication and local push buttons and switches for the operation of the station in general.

SCP #1 shall be the station control panel for the natural gas compressor system. Included in the cost of SCP #1 are annunciator, station graphic, mounting of fire and gas monitors (cost for monitors included in fire and gas system), mounting of fuel gas flow monitoring equipment for main compressor and utilities (cost of monitors included in fuel gas monitoring system), instrumentation (panel meters, signal conditioners, pressure controllers, power supplies, and patch board), breakers, wiring connectors, relays and timers for logic (valve sequencing, alarms, shutdown

and ESD), instrument cabinet and relay rack structures, wire and miscellaneous component wiring and fabrication of the panel.

SCP #2 shall be the station control panel for the propane refrigeration system. Included in the cost of SCP #2 are annunciator, station graphic, instrumentation (pressure controllers, panel meters, signal conditioners, power supply for instrumentation, patch boards), breakers, wiring connectors, relays and timers for the logic (valve sequencing, alarms, shutdowns and ESD), instrument cabinet and relay rack structures, wire and miscellaneous component wiring and fabrication.

III-8.4 PROPANE SYSTEM

This portion of the instrumentation and controls estimate was made from a "take-off" from a flow diagram supplied by Foothills in their December 21, 1978 letter and prices were obtained by verbal quotes from various suppliers.

III-8.5 MISCELLANEOUS

Included in the cost of miscellaneous items are the sensing lines, power gas lines, vent lines, associated valves, pressure and temperature gauges, level switches for water sewage system, audible alarms, etc.

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM № 8 INSTRUMENTATION AND CONTROLS

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
8.1 UNIT CONTROLS				
UAP #1				22,500
INCLUDES:				
INSTRUMENTATION (SURGE CONTROLER, DPMs, PATCH BOARDS, ETC.)	SPARTAN (VERBAL) (FISHER)		6,000	
ANNUNCIATOR, GRAPHIC, PUSH BOTTONS, SWITCHES ETC..	HISTORICAL		4,000	
LOGIC (RELAYS. TIMERS, BASES, TERMINALS, CONNECTORS, BREAKERS ETC.)	HISTORICAL		3,000	
FABRICATION (STRUCTURES, MOUNTING, WIRING, MISC COMPONANTS, ETC)	HISTORICAL		8,000	
MISC.			1,500	
FST. 9% = 2,025				
WEIGHT 1000 LBS.				
FOB EDMONTON				
			SUB-TOTAL	22,500
		CONTINGENCY @	10 %	2250
			TOTAL	24,750

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM No 8 INSTRUMENTATION AND CONTROLS

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
8.1 CONTINUED				33,000
* UAP #2				
INCLUDES:	SPARTAN (VERBAL)		12,000	
INSTRUMENTATION	(FISHER)			
(SURGE CONTROLERS,				
DPMs, PATCH BOARDS,				
ETC.)				
ANNUNCIATOR, GRAPHIC,	HISTORICAL		6,000	
PUSH BUTTONS, SWITCHES,				
ETC..				
LOGIC	HISTORICAL		4,000	
(RELAYS, TIMERS,				
BASES, TERMINALS,				
CONNECTORS, BRKS.,				
ETC.)				
FABRICATION	HISTORICAL		9,000	
(STRUCTURES, MOUNTING,				
WIRING, MISC. COMPONANTS,				
ETC.)				
MISC.			2,000	
FST. 9%	= 3,267			
WEIGHT 1000 LBS.				
FOB. EDMONTON				
			SUB-TOTAL	33,000
* CHILLED STATION ONLY		CONTINGENCY @	10 %	3,300
			TOTAL	36,300

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO 8 INSTRUMENTATION AND CONTROLS

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
8.2 PRESSURE, TEMP, FLOW MEASUREMENT				
IR #1 (CHILLED)				11,000
INCLUDES:				
INSTRUMENTS	ROSEMOUNT		6,000	
(TRANSMITTERS,	(HISTORICAL)			
SWITCHES, GUAGES				
ETC.)				
FABRICATION	MURKENLAY, SANDA (VERBAL)		5,000	
(STRUCTURE, MOUNTING,				
WIRING, FITTINGS,				
TUBING, ETC.)				
FST 9%	= 1,089			
WEIGHT 800 LBS				
FOB EDMONTON				
			SUB-TOTAL	11,000
		CONTINGENCY @	10 %	1100
			TOTAL	12,100

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM N2

PAGE 4 OF 10

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	ESTIMATE
8.2 CONTINUED				
IR #1 (NON CHILLED)				9,500
INCLUDES:				
INSTRUMENTS (TRANSMITTERS, SWITCHES, GUAGES, ETC.)	ROSEMOUNT (HISTORICAL)		5,000	
FABRICATION (STRUCTURE, MOUNTING, WIRING, FITTINGS, TUBING, ETC.)	MURKENLAY, SANDA (VERBAL)		4,500	
FST 9% = 941				
WEIGHT 800 LBS				
FOB EDMONTON				
			SUB-TOTAL	9,500
		CONTINGENCY @	10	,950
			TOTAL	10,450

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. _____ PAGE 5 OF 10

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
8.2 CONTINUED				
*IR#2				19,000
INCLUDES:				
INSTRUMENTS (TRANSMITTERS, SWITCHES, GUAGES, ETC.)	ROSEMOUNT (HISTORICAL)		12,000	
FABRICATION (STRUCTURE, MOUNTING, WIRING, FITTINGS, TUBING, ETC)	MURKENKAY, SANDA (VERBAL)		7,000	
FST 9%	= 1881			
WEIGHT 1200 LBS				
F.O.B. EDMONTON				
* CHILLED STATION ONLY			SUB-TOTAL	19,000
			CONTINGENCY @ 10 %	1,900
			TOTAL	20,900

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM No 8 INSTRUMENTATION AND CONTROLS PAGE 6 of 10

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
8.2 CONTINUED				
TM #1	SPARTAN (VERBAL)			1000
* TM #2	SPARTAN (VERBAL)			1200
WEIGHT	50 LBS			
FOB	EDMONTON			
FM #1	ROCKWELL			6600
* FM #2	ROCKWELL			6600
FM #3	ROCKWELL			6600
WEIGHT	150 LBS			
FOB	EDMONTON			
FST @ 9%	198			
			SUB-TOTAL	22,000
* CHILLED STATION ONLY			CONTINGENCY @ 10 %	2,200
			TOTAL	24,200

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. _____

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
8.3 STATION CONTROLS				
SCP #1				23,000
INCLUDES:				
INSTRUMENTATION	SPARTAN (VERBAL)		5000	
(LOAD CONTROL,	(FISHER)			
DPMs, PATCH BOARD,				
ETC.)				
			4000	
ANNUNCIATOR,	HISTORICAL		4000	
GRAPHIC, PUSH BUTTONS,				
SWITCHES, ETC		LOT		
LOGIC	HISTORICAL		3,000	
(RELAYS, TIMERS,				
BASES, TERMINALS,				
CONNECTORS, BRKs,				
ETC.)				
FABRICATION	HISTORICAL		9,000	
(STRUCTURES,				
MOUNTING, WIRING,				
MISC. COMPONANTS,				
ETC.)				
MISC.	HISTORICAL		2,000	
FST 9%	= 2,277			
WEIGHT 1000 LBS.				
FOB, EDMONTON			SUB-TOTAL	23,000
		CONTINGENCY @ 10 %		2,300
		- 142 -	TOTAL	25,300

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. 8 INSTRUMENTATION AND CONTROL

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
8.3 CONTINUED				
* SCP # 2				23,000
INCLUDES:				
INSTRUMENTATION (LOAD CONTROL, DPMs, PATCHBOARD, ETC.)	SPARTAN (FISHER)	(VERBAL)	5,000	
ANNUNCIATOR, GRAPHIC, PUSH BUTTONS, SWITCHES, ETC.	HISTORICAL		4,000	
LOGIC (RELAYS, TIMERS, BASES, TERMINALS, CONNECTORS, BRKs, ETC.)	HISTORICAL		3,000	
FABRICATION (STRUCTURES, WIRING, MISC. COMPONENTS, ETC.)	HISTORICAL		9,000	
MISC.	HISTORICAL		2,000	
EST 9% = 2277				
WEIGHT 1000 LBS.				
F.O.B. EDMONTON			SUB-TOTAL	23,000
		CONTINGENCY @ 10 %		2300
* CHILLED STATION ONLY		- 143 -	TOTAL	25,300

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. 8 INSTRUMENTATION AND CONTROLS

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
8.4 PROPANE SYSTEM				
RELIEF VALVES	CANTECH			
3X4		5	1806	9030
1½X2		4	1000	4000
PRESSURE CONTROL VALVES	FISHER			
10"		5	7625	38125
6"		2	4066	8132
LEVEL GUAGES	FISHER	7	750	5250
SWITCHES ALARMS AND SHUTDOWNS		18	500	9000
INTRUMENT GAS TUBING				2500
LEVELTROLS		5	1207	6035
CONTROL PANEL INCLUDING PRESSURE GUAGES AND DIAL THERMOMETERS				53,900
FST @ 9% = 16,038				
WEIGHT = 18000 LBS.				
FOB	EDMONTON			
			SUB-TOTAL	162,035
		CONTINGENCY	@ 10 %	16,200
		- 144 -	TOTAL	178,200

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO 8 INSTRUMENTATION AND CONTROLS PAGE 10 10

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
8.5 MISC. (SENSING LINES, POWER GAS LINES, VENT LINES, ASSOCIATED VALVES, GAUGES, ETC.)	HISTORICAL			25,000
FST. 9% = 2,250				
WEIGHT 2,000 LBS.				
F.O.B. EDMONTON				
			SUB TOTAL	25,000
			CONTINGENCY @ 10 %	2,500
			TOTAL	27,500

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Estimate No.:
Item No.:
Account No.:
Date:
Description: Instrumentation
Sheet No. 1 of 1

Description of Work	Unit	Quantity	Hours		Labour		Equipment	Materials		Subcontracts	Job Supplies	Total Cost
HP Gas System	loop	15	60	900	16.00	14400		200'	3000			17400
Propane System	loop	24	50	1200	16.00	19200		200'	4800			24000
Other HV. Fu.	loop	10		500	16.00	8000		200'	2000			10000
								above is tubing stands etc [illegible] instruments [illegible] by [illegible]				
Unchilled				1400		22400			5000			27400
bm 44s Chilled	km	1000		2600		41600			9800			51400

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DEMPSTER HIGHWAY COMPRESSOR STATION

III-9 ELECTRICAL

III-9.1 ENGINE GENERATORS (INCLUDING SWITCH GEAR)

Since no purchased power from a power utility company is available at these sites, the prime power shall be generated by 2 x 450 KW generator sets with a 450 KW generator set as standby at the chilled station and by 2 x 150 KW generator sets with a 150 KW generator set as standby at the non-chilled station.

The generator costs include the supply of two natural gas driven generator sets, one (standby) diesel driven generator set, associated cooling and starting equipment, engine control panels, switch gear and metering.

Miscellaneous items associated with the generators such as exhaust extention etc. are included in miscellaneous (III-9.4).

III-9.2 MOTOR CONTROL CENTER (MCC)

The MCC shall contain the A.C. distribution system and equipment to provide 480/120/208V power to the various A.C. loads. It shall contain the conventional protective devices and provide a reasonably high degree of flexibility and continuity. Refer to simplified electrical single line Drawing Nos. FPL 39-49-91D and FPL 39-49-92D for details.

Two generators shall normally supply the necessary power requirements. If the standby unit fails to replace a downed generator leaving only one unit to handle the load, the essential services bus will remain powered and the remaining MCC load will be dropped. Not until two generators are in operation will the load be readded.

Using the philosophy that it is more desirable to operate a station at lower capacity than to shutdown completely , splitting of certain loads

shall be done. The condenser fan motors are such loads, by splitting them in half each being feed by separate breakers, if a fault occurred there would be less danger of the entire cooling system being down while the fault was repaired.

The MCC costs include:

1. Essential services bus containing the following:

    a. main feeders supplying 120/208V distribution transformers, charger and inverter system, airport, etc.

    b. transformers

    c. sub-feeders supplying living quarters, lighting panels, inverter system, etc.

    d. starters for hot water circulating system pumps, sewage system pumps, generator cooling fans, air conditioner, water supply pumps, etc.

2. Main breaker.

3. Feeder to non-essential bus.

4. Non-essential bus containing feeders to other MCC's, lighting panels and starters for miscellaneous equipment.

5. Propane condenser MCC No. 1 containing the starters for 50% of condenser fan motors.

6. Propane condenser MCC No. 2 containing the starters for 50% of condenser fan motors.

7. Wire, terminals and miscellaneous components.

8. Chiller compressor's auxiliary equipment MCC's cost included in chiller compressor's unit costs.

9. Main compressor auxiliary equipment MCC cost included in main compressor unit cost.

10. Reverse starters for unit valve operators (to be located in chiller compressors and main compressor units MCC's but haven't been included in their costs).

III-9.3 UNINTERRUPTABLE POWER SUPPLY (UPS)

The UPS shall consist of the battery charger, inverter and battery. There shall be a UPS for the general station duty, a UPS for the main compressor unit, and a UPS for the propane compressor units. The costs of the UPS systems for the main compressor unit and propane compressor units are included in the cost of the units.

The station UPS shall be supplied from the essential services bus and be a parallel redundant system for greater electrical supply reliability.

The battery shall be fed from a parallel redundant battery charger system. Each charger shall be rated to carry the total load but normally will operate in parallel with the second unit sharing the load equally. Should one charger fail, the other unit will carry the load without any transfer delay time. Similarly, the critical A.C. loads shall be fed from a parallel redundant inverter system. A static transfer switch shall be part of the system, therefore, should there be a loss of A.C. output from both inverters, the switch will operate, bypassing the entire D.C. system and connecting the critical A.C. loads directly to the A.C. bus.

The cost of the UPS includes a 24V D.C. battery 800 AH, two battery chargers, two inverters, breakers, controls, transfer switches, panel wiring and fabrication.

III-9.4 MISCELLANEOUS

Included in the cost of miscellaneous items are the exhaust extentions to the generator units and automatic door closure on release of halon fire suppression system, etc.

III-9.5 CONDUIT, CABLE AND FITTINGS

The estimate is made on the basis of using conduits throughout the station including those runs which are aboveground (along outside of utilidors). Approximately one-quarter of the installation cost could be saved by using multi-conductor cables (teck cable) instead of conduits (where it is permitted).

Grounding for the non-chilled station is estimated based on installing a ground grid or mat based on a low impedence system. However, ground resistances are much higher in a permafrost area; therefore, a ground system that involves high resistance grounding is necessary at the chilled station. The cost of material and installation for a chilled station is substantially greater.

III-9.6 LIGHTING

The yard lighting estimate is based on use of high wattage, high efficiency and long life mercury vapour outdoor lamps. Two foot candle average, with slightly higher levels in relatively high traffic areas using 400 and 1000 watt units serves the basis for the number of standards and lamps.

The indoor lighting estimate is based on the lighting requirements for the various buildings using mercury-vapour high intensity discharge type and industrial and commercial fluorescent type fixtures.

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM № 9 ELECTRICAL

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
9.1 ENGINE GENERATORS AND SWITCH GEAR (CHILLED STA)	R. ANGUS			
NATURAL GAS ENGINE		2	158,500	317,000
DIESEL ENGINE		1	68,500	68,500
CONTROLS AND SWITCHGEAR		1	37,500	37,500
FST 9%	41,877			
WEIGHT 49,000 LBS				
FOB - EDMONTON				
			SUB-TOTAL	423,000
			CONTINGENCY @ 10 %	42,300
			TOTAL	465,300

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM No 9 ELECTRICAL

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
9.1 ENGINE GENERATORS AND SWITCH GEAR (CHILLED STA)	R. ANGUS	1		
NATURAL GAS ENGINE		2	158,500	317,000
DIESEL ENGINE		1	68,500	68,500
CONTROLS AND SWITCHGEAR		1	37,500	37,500
FST 9%	41,877			
WEIGHT 49,000 LBS				
FOB - EDMONTON				
			SUB-TOTAL	423,000
		CONTINGENCY @ 10 %		42,300
			TOTAL	465,300

SYSTEM COST SUMMARY
SYSTEM No. 9. ELECTRICAL

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	
9.1 ENGINE GENERATORS AND SWITCH GEAR (NON CHILLED STA.)				
NATURAL GAS ENGINE 150 KW	R. ANGUS	2	65,000	130,000
DIESEL ENGINE 150 KW	R. ANGUS	1	24,000	24,000
CONTROLS AND SWITCHGEAR			28,500	28,500
FST 9% = 18,067				
WEIGHT 20,700#				
FOB. EDMONTON				

SUB TOTAL	182,500
CONTINGENCY @ 10%	18,250
TOTAL	200,750

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM No. 9 ELECTRICAL

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
9.2. MCC				
CHILLED STA. MCC	WESTINGHOUSE			93,500
FST. 5% (50%) = 2,570				
9% (50%) = 4,626				
WEIGHT. 470,400 LB.				
F.O.B. EDMONTON				
			SUB TOTAL	93,500
			CONTINGENCY @ 10%	9,300
			TOTAL	102,800

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM No 9 ELECTRICAL PAGE 4

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	ENTENSION
9.2 CONTINUED				
NON CHILLED MCC	WESTINGHOUSE			55,500
FST 5% (50%) = 1,525 9% (50%) 2,745				
WEIGHT 48,800				
FOB. EDMONTON				

SUB TOTAL	55,500
CONTINGENCY @ 10 %	5,550
TOTAL	61,050

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM № 9 ELECTRICAL

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
9.3 UPS	HISTORICAL			
CHARGER + INVERTER		1	49000	49000
BATTERY		1 LOT	11,000	11,000
FST: 9% = 5049				
WEIGHT 20,000				
FOB: EDMONTON				

SUB TOTAL	51,000
CONTINGENCY @ 10%	5,100
TOTAL	$56,100

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM No. 9 ELECTRICAL

6

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	
9.4 MISC. (ENGINE GENERATOR EXHAUST EXTENSIONS, ETC.)				25,000
FST @ 97% 2475				
WEIGHT 20,000 LBS.				
FOB EDMONTON				

SUB TOTAL	25,000
CONTINGENCY @ 10%	2500
TOTAL	27,500

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM No. III-9.7 Electric Heat Tracing PAGE OF

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
HEATING CABLE	Pyrotenax	300' x 4	lot	3170
Price includes Cable, Temperature Controllers Thermocouples				
and miscellaneous fittings and strapping				
Estimated	Freight to Edmonton			130
				$ 3300
Federal Sales Tax 300				
Freight Estimate 400 lbs				
			SUB-TOTAL	3300
		CONTINGENCY @	10 %	330
			TOTAL	3630

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. Propane System Electrical Heat Tracing PAGE 1 OF

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
Heating Cable	24"	100'		$ 700 *
	16"	500'		$ 2150
	10"	800'		1850
	8"	100'		625
	6"	1500'		2850
	4"	1200'		2500
	3"	500'		1500
	2"	400'		1200
	1½"	500'		1500
	1"	500'		1500
Sub Total	Propane Elect	Heat Tracing		$ 16375
Prices include	Cable, Temperature Controller, Thermocouple and			
various Fittings				
Estimated	Freight to Edmonton			1700
				$ 18075
		6100' x 10 watts/ft		
		= 61 KW		
		3 Ø		

Federal Sales Tax $ 1600
Freight estimate 2000 lbs

	E.E. TOTAL	19,000
CONTINGENCY @	10 %	1,900
	TOTAL	20,900

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster
Estimate No.:
Item No.:
Account No.:
Date:
Description: Electrical
Sheet No.: of

	Description of Work	Unit	Quantity	Hours	Labour		Equipment	Materials	Subcontracts	Job Supplies	Total Cost
	Engine Generators			500	16.00	8000		2000			10000
	Switchgear, Bus & MCC's			1000	16.00	16000		2000			18000
	Power and Control			7500	16.00	120000		50000			170000
	except welded heat tracing			300		6000		30000			36000
	Lighting 10+10+20+10+5+5+30 = 90 / 70			3300	16.00	52800		39000			91800
	incl Emergency and Yard			700		13000		75000			79000
	Batteries and Chargers incl UPS			300	16.00	4800		1000			5800
	Grounding			500	16.00	8000		4000			12000
	Unchilled 70%			9600		153600		146000			299600
	15 to 875 Chilled			13800		220800		247000			467800

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DEMPSTER HIGHWAY COMPRESSOR STATION

III-10 INSULATION AND PAINTING

III-10.1 INSULATION

This estimate includes insulation requirements to standards of previously installed stations for the above grade high pressure gas piping and the gas turbine compressor package exhaust ducting at both the chilled and non-chilled stations. Insulation for the propane piping, propane vessels, propane equipment and the propane turbine exhaust ducting is included at the chilled station.

III-10.2 PAINTING

This item includes the field painting requirements for all exposed piping systems, equipment, building steel, masonry partitions, exposed concrete and miscellaneous architectural features to standards of other previously installed compressor stations.

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. PROPANE SYSTEM INSULATION MATL PAGE OF

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
Insulation 20" od	4" thick	200'	25.00	5000
16" od	4" thick	800'	19.00	15200
10" od	3½" thick	1200'	12.00	14400
8" od	3½" thick	200'	10.50	2100
6" od	3½" thick	1500'	9.00	13500
4" od	3" thick	1200'	6.50	7800
3" od	3" thick	500'	5.50	2750
2" od	3" thick	700'	4.50	3150
1½" od	2½" thick	500'	3.50	1750
1" od	2½" thick	500'	3.00	1500
Sub Total Propane System Insulation (Piping only)				67050
Estimate Freight to Edmonton				2000
Subtotal				69050
Federal Sales Tax 6%				
Freight Estimate 20,000 lbs				
			SUB-TOTAL	70,000
		CONTINGENCY @ 10 %		7,000
		- 161 -	TOTAL	77,000

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Foothills - Dempster Estimate No.

Item No. Account No. Date

Description Painting Sheet No. of

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Equipment	LS	1	200	16	2,400	700	500		3,600
Piping & Valves	LS	1	200	16	2,400		500		2,900
Buildings	LS	1	200	16	2,400		1,000		3,400
Unchilled Gly			400	4,800		1,000			5,800
10m 60% Chilled			600	9,600		1,500			11,100

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Foothills - Dempster Estimate No. _____

Item No. _____ Account No. _____ Date _____

Description Insulation Sheet No. _____ of _____

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Equipment 3 hrb units	Ea	3	100	300	1400	4200	12000		
2 Chillers	✓	2	100	200		4500	9000		
1 Vessels	✓	1	100	100		1750	4000		
Piping 1000' propane	LF	1000	.30	300	1400	3500	10000		
700' HPGas	✓	700	.55	400		1400	7000		
Unchilled			1000	6000		26000			51000
Chilled			4800	6400		12600			19600

DEMPSTER HIGHWAY COMPRESSOR STATION

III-11 TESTING, WINTERIZING AND STARTUP

III-11.1 TESTING

The estimate has provided for testing the compressor station high pressure piping and vessels, the propane system piping, vessels and equipment as well as the fuel gas system all in accordance with the NEB requirements.

III-11.2 WINTERIZING

The estimate has provided for the labor and materials for snow removal, hoarding and the heating of various structures in addition to the protection of concrete during curing.

It also provides for checking out the operation of all heating systems and heat tracing and winterizing valve operators, generator cooling water lines and heating system lines.

III-11.3 STARTUP

Provision has been made for the construction trade personnel to assist the operating staff and manufacturers representatives with the start up and commissioning of the compressor station facilities. Two-thousand five-hundred manhours were included for the chilled station and 1500 manhours at the non-chilled station for machinist pipefitter and electrical trade support.

III-12 MISCELLANEOUS

III-12.1 SITE IMPROVEMENTS

This item includes the final grading of the site, installation of drainage ditches and culverts, the placing of pitrun gravel on the storage areas, finish gravelling of the roadways and parking areas and to install the roadways and parking areas and to install the perimeter fencing. The supply of the materials such as gravels, culverts and fencing is included.

III-12.2 SAFETY EQUIPMENT

This estimate provides for a number of safety items that pertain to fire fighting and personal safety, such as dry powder extinguishers, water extinguishers, fire blankets, first aid kit, pneolator, safety harness, eye safety shields and goggles, hard hats, rubber boots, flashlights, grounding wires, manually operated gas detectors and replenishment of supplies.

III-12.3 LIVING QUARTERS FURNISHINGS

This estimate was prepared to assess the cost of providing furnishings and a few recreational facilities for the station living quarters and small items not otherwise provided for. It has been assumed that each occupant will have a separate bedroom, but there would be a community kitchen, living room and recreational area. The equipment may not be all in accordance with Foothills' plan, but it does provide for the basic requirements.

SYSTEM COST SUMMARY

SYSTEM N2 MISCELLANEOUS - SAFETY EQUIPMENT PAGE OF

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
ANSUL K-150	Levitt	5	1843	9215
ANSUL LT A 20	"	10	214	2140
FLS PC PumpTank	"	5	79	395
F-90 FG " "	"	5	155	775
Stretcher	"	2	150	300
1st Aid Kit	"	2	31	62
Fire Blanket	"	2	75	150
Pneolator	MSA	1	800	800
Safety Harness	Levitt	1	100	100
Rope & Fasteners	"	2	50	100
Eye Protection	"	lot	50	50
Hard hats	"	12	10	120
Gas Detector	MSA	1	150	150
Wet Gear	Levitt	2	40	80
Safety Flashlights	"	12	8	96
Grounding Wires	"	2	15	30
Misc Supplies	"	lot	750	750
Sub Total Safety Equipment				15 313
Freight to Edmonton				400
				15 713
			round to	16 000
Sales Tax	$1400			
Freight Estimate 6000 lbs				
			SUB-TOTAL	16,000
		CONTINGENCY @	10 %	1 600
		- 166 -	TOTAL	17,600

Miscellaneous

Ansul K-150	Stock N° A 10428	- 1843 x5	= 9215
Ansul LTA 20	" " A 14710	- 219 x10	= 2190
FLS DC 5 gallon water pump tank		- 78 6" x5	= 394
F-90 FG Indian Fire pump		- 154 6" x5	= 773
Shelter		- 150 x2	= 300
x 20 man First aid kit		- 31 10 x2	= 62
Fire blanket		75 x2	150
Powder CO_2 cylinders etc		750 x2	1500
			14539
Precolator			800
			15339

Roadways 450' + 400' + 550' + 200' + 100' + 500' + 300' + 100' = 2600' x 25 Ft wide. VK-02-0100 72 B

Walkways 150 + 50 + 50 + 100 + 50 + 75 = 475' 4' wide

Flare line 150' + 450' + 200' + 150' + 150' = 1100'

4" - 10 = Ft

6" =

8" - 21 = Ft.

51321'

92-70. 15 mm.

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. Living Quarters - Furnishings

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
Kitchen				
Cupboards	Sears	lot	1200	1200
Counters	"	lot	900	900
Stove	"	1	500	500
Refrigerator	"	1	800	800
Deep Freeze	"	1	500	500
Utensils & Misc Appliances	"	lot	1500	1500
Furniture	"	lot	1000	1000
Bedrooms				
Beds & Mattress	"	12	200	2400
Dresser, Chair & Night Table		12	300	3600
Linen, blankets, pillows		12	75	900
Carpeting		12	100	1200
Curtains etc		12	50	600
Writing Desk		12	200	2400
Living Room				
Sofa & Chairs		lot	1500	1500
Misc Tables		lot	750	750
Lamps		5	60	300
TV & Tape Player		1	1600	1600
Radio & Cassete		1	800	800
Pictures Curtains etc		lot	1000	1000
Carpet			1000	1000
Rec Room				
Pool Table		1	800	800
Table Tennis		1	100	100
Games Table		1	300	300
Cards Puzzles Games etc		lot	250	250
Chairs		lot	600	600
Carpet			1000	1000
Pictures Curtains etc			500	500
		Carry Forward	SUB-TOTAL	25 [illegible]
			CONTINGENCY @ ——— %	
			TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. Living Quarters Furnishings

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
Carried Forward From page 1				29,000
Planning Equip		lot	500	500
Greenhouse		1	3000	3000
Sales tax estimate $2800				
Estimated weight 11000				
Freight to Edmonton included.				
			SUB-TOTAL	31,500
		CONTINGENCY	@ 10 %	3150
		- 169 -	TOTAL	34,650

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster Lateral - Compressor Stations [partly illegible] Estimate No. ____
Item No. ____ Account No. ____ Date ____
Description: Site Improvements Sheet No. 1 of 1

Description of Work	Unit	Quantity	Hours (rate)	Hours	Labour (rate)	Labour	Equipment	Materials (rate)	Materials	Subcontracts	Job Supplies	Total Cost
Grading to site [illegible] = 300000 sf	sf	300000	.10	30000	15.00	450000						450000
Gravel to storage areas [illegible] @ 6" = 8000	cy	8000	.25	2000	15.00	30000		4.00	32000			62000
Gravel to roadway [illegible] @ 9" = 2000	cy	2000	.30	600	15.00	9000		4.00	8000			17000
Culverts 5 ea - 18" φ × 40'	lf	200	.50	100	15.00	1500		5.00	1000			2500
Fencing	lf	2770	.33	900	15.00	13500		4.00	11000			24500
15w 425				31600		315000			124000			1355500

D001-1 13SEP76

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III-13 FEDERAL SALES TAX

The amount of federal excise tax applied to the various materials estimated for the project were as follows:

Item	Rate
Pipe	5%
Fittings	5%
Galvanized Pipe	12%
Copper Pipe	5%
Tanks	9%
Compressor Package	12%
Control Valves and Regulators	5%
Instrumentation	9%
Vessels	9%
Electrical	9%

DEMPSTER HIGHWAY COMPRESSOR STATION

III-13 FEDERAL SALES TAX

Cost Category	Chilled Station	Non-Chilled Station
	$	$
1. Foundations	25,100	13,000
2. Buildings	60,100	39,000
3. Gas Compressor Package	486,100	486,100
4. Propane Compressor Package	431,700	-
5. H.P. Gas Piping	79,300	47,300
6. Other Major Systems	141,800	42,200
7. Utilities	15,100	13,400
8. Instrumentation & Controls	32,300	8,300
9. Electrical	74,600	41,900
10. Insulation & Painting	5,000	1,200
11. Testing, Winterizing, Startup	1,200	900
12. Miscellaneous	5,200	5,200
13. Tools & Major Spares	65,500	35,500
TOTAL	1,423,000	734,000

III-14 CONTRACTOR'S OVERHEAD

III-14.1 GENERAL

The contractor's overhead costs have been developed to represent salaried labour, unallocated trade labour, temporary structures and plant facilities, construction vehicle and equipment requirements, small tools and consumable supplies, mobilization costs, trade labor burdens and miscellaneous costs related to the construction of four compressor stations (2 chilled and 2 non-chilled) over a 24 month period.

The contractor's markup for the aggregate four stations was assigned to include contractor head office costs, profit and contingency. The markup selected is appropriate for the performance of the construction on a lump sum tender basis.

The contractor's overhead costs have been prorated to the four stations on the basis of total direct manhour content.

The contractor's markup has been prorated to the direct costs and the overhead costs on the basis of total cost.

III-14.2 FIELD SUPERVISION, ADMINISTRATION

The staffing requirements of a four station project necessitates a field office located in Whitehorse for the project management, planning, purchasing, contracts administration, accounting, payroll, cost control, data processing and other services.

The project staff includes a project manager, two project superintendents, a project administrator, an accountant, a paymaster, a buyer/expeditor, a cost engineer, a project engineer, two field engineers, two surveyors, stenographic and clerical help.

Staff benefits included are relocation expense, travel expense, living allowance, northern allowance and overtime allowance. Housing is not necessarily provided but is assumed to be available for those staff residing in Whitehorse.

Unallocated trade labor costs include key general trade foremen, first aid attendants, mechanics and warehousemen. Straight time labor costs of these personnel is included in this section; however, the travel costs, subsistence costs and premium time costs are provided for separately elsewhere in those categories.

III-14.3 CONSTRUCTION FACILITIES

This item includes the purchase cost of temporary office facilities in Whitehorse and at the sites, first aid trailers, warehouse structures at each site, an equipment shop, and rental of portable concrete batch plant facilities and tool cribs.

The setup and dismantle costs of these facilities is included.

III-14.4 CONSTRUCTION CAMP

This item includes the purchase cost of a 120 man camp facility for the chilled station and an 80 man camp facility for the non-chilled station.

Setup, maintenance and removal costs of the camps are included; however, mobilization costs of transport to the sites are included separately elsewhere.

III-14.5 CONSTRUCTION VEHICLES

This item includes the rental cost of all vehicles related to the project and specifically pickup trucks, crew cabs, buses, ambulances, con-

crete trucks, hiab trucks, fuel and service vehicles. The equipment rentals are based upon contractor owned vehicles assigned to the project sites.

Fuel and maintenance costs are included.

The straight time labor cost of bus drivers, concrete truck drivers, hiab truck drivers and service truck drivers is included. Related travel costs, subsistence costs and premium time costs are included separately elsewhere in those categories.

III-14.6 CONSUMABLES

This item includes the cost of all consumable tools, expendable supplies, welding gases, welding rod, workmens clothing, office supplies, engineering supplies, safety supplies and other miscellaneous costs. A consumable tool is considered of value less than $50.00.

Fuel costs, form work materials and temporary materials are not included.

III-14.7 SMALL TOOLS

This item includes the cost of small tools and minor equipment of value between $50.00 and $1,200.00, for all trade personnel on site.

III-14.8 CONSTRUCTION EQUIPMENT

This item includes the rental cost of all truck cranes, hydraulic cranes, hydraulic backhoes, loaders, bulldozers, compressors, welders, compactors and scaffolding required for the work at site. The equipment rentals are based upon contractor owned equipment assigned to the project sites.

Fuel and maintenance costs are included.

The straight time labor cost of crane operators is included. Related travel costs, subsistence costs and premium time costs are included separately elsewhere in those categories.

III-14.9 MOBILIZATION

This item includes the transportation costs related to the mobilization and demobilization of contractor's equipment between Vancouver, Edmonton and the project sites. Specifically the road haul freight costs of temporary buildings and trailers, construction camps, vehicles, cranes, excavating equipment, welders compressors, minor equipment and small tools are included.

The straight time labor costs of crews required to loadout and receive contractor's equipment in contractor's yards in Vancouver and Edmonton are also included.

III-14.10 TEMPORARY SERVICES

This item includes the cost of setup and removal of temporary water supply, temporary sewage, and waste disposal systems at each site.

Telephone, mobile radio and telex communications are also included.

III-14.11 BONDS, INSURANCE, PERMITS

This item includes allowances for welder qualification tests, labor and material performance bonds, course of construction insurance, liability insurance and electrical permits.

III-14.12 UNION TRAVEL

Trade labor initial and terminal travel time, travel fares and travel expenses have been estimated on the basis of a turnover or equivalent return trip every 30 days.

This item includes related taxi cab and commercial airline fares for travel between Vancouver and Whitehorse. Travel time between Vancouver and Whitehorse has been estimated at seven and one-half hours each way. The additional travel time between Whitehorse and the various compressor station sites will vary considerably. An average travel time between Whitehorse and midpoint along the Dempster Pipeline has been estimated at 10 hours each way via bus travel. Costs of providing alternate transportation to the sites via helicopter from Whitehorse has been considered and costs appear to be comparable. Travel expenses including meals and lodging have been provided for on the basis of two nights for the chilled station and one night for the unchilled station each way.

The costs of union travel are prepared generally in accordance with the guidelines of the trade agreements. These guidelines are not precise and union costs will continue to be negotiable until project agreements are finalized. There continues to be a great cost exposure in this cost allowance.

III-14.13 UNION SUBSISTENCE

This item includes the costs of construction camp catering as well as the costs of free room and board provided to tradesmen prior to the set-up of the camps. These costs are based upon a 60 hour work week.

III-14.14 PREMIUM TIME

The estimate has been prepared on the basis of a 60 hour work week. This item includes the cost of the premium portion of overtime at 37.5% of straight time payroll costs.

Trade agreements require an additional meal break when working a 10 hour shift and an allowance of one-half hour per manday is included as a non-productive premium allowance.

III-14.15 RETROACTIVE ESCALATION

The pipefitter trade agreements currently provide for potential retroactive pay escalation for previous contracts in 1976 and 1978 in the amount of 36 cents per hour. The settlement of this adjustment continues to be deferred. The hourly rates used in the estimate do not include this amount but it is identified here as a probable cost.

In addition, pipefitters will be eligible for a 50 cent hourly premium for work north of 60° latitude and effective May 1, 1979 all trades will receive an average 85 cent increase through to May 1, 1980. These estimated costs have been evaluated and included.

III-14.16 CHILLED STATION

Item	Hours	Labor
Field Supervision, Admin.	21,800	$1,271,000
Construction Facilities	4,300	214,000
Construction Camp	3,860	552,000
Construction Vehicles	13,500	479,000
Consumables	-	230,000
Small Tools	-	172,000
Construction Equipment	2,000	1,026,000
Mobilization	2,700	320,000
Temporary Services	1,280	77,000
Bonds, Insurance, Permits	400	180,000
Union Travel	-	923,000
Union Subsistence	-	943,000
Premium Time	-	1,540,000
Retroactive Escalation	-	231,000
Subtotal	49,840	$8,158,000

III-14.17 NON-CHILLED STATION

Item	Hours	Labor
Field Supervision, Admin.	12,260	$ 780,000
Construction Facilities	2,430	131,000
Construction Camp	2,180	339,000
Construction Vehicles	7,620	294,000
Consumables	-	141,000
Small Tools	-	106,000
Construction Equipment	1,120	630,000
Mobilization	1,540	196,000
Temporary Services	720	47,000
Bonds, Insurance, Permits	220	110,000
Union Travel	-	567,000
Union Subsistence	-	456,000
Premium Time	-	945,000
Retroactive Escalation	-	142,000
Subtotal	28,090	$4,884,000

Dillingham Corporation Canada Ltd.

ESTIMATE SUMMARY SHEET

Project: Foothills – Dempster – Four (4) Compressor Station Package. Estimate No. 3688

Prepared by: MJT Date: 7 January 1979 Sheet No. 1 of 1

Description of Work	Unit	Quantity	Hours 1.30	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost	Adjustments	Unit Price 1.734	Bid Price
Chilled Station 3	.31	193000	130160	20880260		20849400	30000	101800	43027440	9315000		13670940
" " (duplicate)	.31	193000	130160	20880260		20849400	30000	101800	43027440	9315000		13670940
Unchilled Station 7	.19	107000	73660	11607540		13337790	30000	53900	25111170	5510000		8141730
" " (duplicate)	.19	107000	73660	11607540		13337790	30000	53900	25111170	5510000		8141730
Direct Costs 4 stations	1.00		407640	64975600		68143560	120000	311400	127443240			43575340
Contractor Overheads			159440	12716050	4074450	(10000)	7705000	3465000	22450500			
Total Cost 4 stations			567080	19273610	4074450	68134350	7825000	3776400	[illegible]			
Markup & Contingency	$	23345060							.30 [illegible]			
									[illegible]			

Total labour 19273610
Total Equipment 4074450
23345060

Note: This sheet summarizes the direct costs of 4 stations and the contractor overheads related to 4 stations. Contractor's markup is noted.

0.771 $ 1637000 to direct costs
5366,000 to overheads
7000,000

1.779 × 0.31 = 0.553 to chilled
0.19 = 0.338 to unchilled

Dillingham Corporation Canada Ltd.

ESTIMATE SUMMARY SHEET

Project: Foothills - Dempster Lateral - Chilled Compressor Station Estimate No. 3688

Prepared by: H/T Date: 27 January 1978 Sheet No. 1 of 2

	Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost	Adjustments 1.175	Unit Price 1.175	Bid Price
1	Sitework	sq	3000	2100	31500		124000			155500			175000
2	Foundations - HP Gas Compressor	cy	350	5100	64500		84500		13100	160100			180000
3	Propane Compressor	✓	400	8200	114000		89000		16750	220750			262000
4	Scrubber	✓	50	950	14410		7400		2250	24560			27000
5	Chiller	✓	300	4680	73440		46100		11250	130790			147000
6	Control, Utility	✓	400	6640	93770		10500		15000	119270			201000
7	Stores	✓	150	3610	45180		24190		4150	73550			86000
8	Living Quarters	✓	150	2650	41000		26900		4150	72250			85000
9	Isolated Equipment	✓	100	2150	62700		18500		4000	87700			98000
10	Condensers	✓	300	4610	75610		46050		13500	134160			158000
11	Communication Towers	✓	10	140	2180		1150		700	4630			4000
12	Utilities	✓	200	2790	45640		21550		5000	80390			90000
13	Sewage Treatment	✓	40	550	9080		5450		1000	15530			17000
14	Gas Regulator	✓	40	890	12950		4800		2250	22000			26000
15	Buildings - HP Gas Compressor	sf	4700	1600	25600		194800			220400			248000
16	Propane Compressor	✓	4400	1800	26100		165400			191700			216000
17	Scrubber	✓	400	300	4800		14000			18800			21000
18	Chiller	✓	3750	1500	24000		184000			208000			234000
19	Control, Utility	✓	2000	3350	57550		194500			245050			274000
20	Stores	✓	2400	550	8800		46800			55600			62000
21	Living Quarters	✓	4700	1760	20160		170000			190160			214000
22	Utilities	✓	3100	1300	26800		107000			133800			156000
23	Gas Regulator	✓	500	300	4800		14000			18800			21000
24	Gas Compression Package	hp	166000	3150	60000					60000			67000
25	Propane Compression Package	✓	170000	4500	59000					59000			66000
26	High Pressure Gas System	✓	751000	9200	146500					146500			211000
27	Chilling System	✓	1277000	15500	251600					251600			290000
28	Other Major Systems			4600	64000		10000			74000			83000
29	Utilities			4600	77000		30000	30000		137000			154000
30	Instrumentation			2600	41600		9800			51400			58000
31	Electrical			13350	219500		241000			460500			501000
32	Insulation			4000	66000		127000			193000			193000
33	Painting			6000	96000		15000			111000			125000
34	Checkout and Startup			2500	40000					40000			45000
35	Testing (part included above)												
36	Federal Sales Tax (part included above)												
37	Structural (part included above)												
38													
39													
40													
	Total Direct Costs			132160	2096240		2084902	30000	101900	4307940	521000		4823000

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Dillingham Corporation Canada Ltd.

ESTIMATE SUMMARY SHEET

Project: Foothills - Dempster Lateral - Chilled Compressor Station Estimate No. 3688

Prepared by: MJT Date: 24 January 78 Sheet No. 2 of 2

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost		Adjustments	Unit Price	Bid Price
Field Supervision, Administration	$	3320 000							.383	1271 000			
Construction Facilities		558 000								214 000			
Construction Camp		1447 000								557 000			
Construction Vehicles		1250 000								479 000			
Consumeables		602 000								230 000			
Small Tools		45 000								17 000			
Construction Equipment		2680 000								1026 000			
Mobilization		836 000								320 000			
Freight on Materials		1500 000								575 000			
Winterization		167 000								64 000			
Temporary Services		200 000								77 000			
Bonds, Insurance, Permits		469 000								180 000			
Union Travel		2411 000								923 000			
Union Subsistence		1154 000								442 000			
Premium Time		4022 000								1540 000			
Escalation		603 000								231 000			
	$	22452 000								8797 000			
										521 000			
										9319 000			

Note: This sheet prorates the costs of the 4 station contractor overheads and contractor markup to the typical chilled station.

Dillingham Corporation Canada Ltd.

ESTIMATE SUMMARY SHEET

Project: Foothills - Dempster Lateral - Unchilled Compressor Station Estimate No. 3688

Prepared by: MJT Date: 22 January 1975 Sheet No. 1 of 2

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost	Adjustments	Unit Price 1.125	Bid Price
Sitework	sy	3000	2100	21500		134000			155500			175000
Foundations - HP Gas Compressor	cy	350	5700	84500		59540		12100	167100			187000
Scrubber	"	50	950	14910		7400		2250	24560			27000
Control, Utility	"	400	5440	49770		10500		15000	75170			70100
Stores	"	150	2870	45100		24100		6750	76550			86000
Living Quarters	"	150	2650	41600		26900		6150	75750			85000
Isolated Equipment	"	100	2670	44740		12950		10000	67190			71000
Communication Towers	"	10	140	2180		1150		200	3530			4000
Utilidor	"	200	2230	35070		25242		4000	64310			72000
Sewage Treatment	"	40	580	9080		5450		1000	15530			17000
Gas Regulator	"	50	840	13950		4800		2250	23000			26000
Buildings - HP Gas Compressor	sf	4700	1600	25600		194800			220400			248000
Scrubber	"	500	300	4600		14000			18600			21000
Control, Utility	"	7200	2750	32550		141500			246050			274000
Stores	"	2400	450	6800		46800			55600			67000
Living Quarters	"	4700	1760	30160		110000			140160			214000
Utilidor	"	2500	1590	29440		91600			111040			125000
Gas Regulator	"	500	300	4600		14000			18600			21000
Gas Compression Package			2150	60000					60000			67000
High Pressure Gas System			2440	119040					119040			134000
Other Major Systems			4000	64000		10000			74000			83000
Utilities			1500	77000		25000	30000		132000			154000
Instrumentation			1400	22400		5000			27400			31000
Electrical			9600	153600		146000			299600			337000
Insulation			1000	16000		36000			52000			45000
Painting			4000	64000		10000			74000			83000
Checkout, Startup			1500	24000					24000			27000
Testing (part included above)												
Federal Sales Tax (part incl above)												
Structures (part incl above)												
Note: This sheet summarizes the direct costs for an unchilled station												
Total Direct Costs			73060	1167540		1322290	30000	56900	2511730	245270		2867000

Dillingham Corporation Canada Ltd.

ESTIMATE SUMMARY SHEET

Project: Foothills – Dempster Lateral – Unchilled Compressor Station Estimate No. 3688

Prepared by: MJT Date: 24 January 79 Sheet No. 2 of 2

	Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost	Adjustments	Unit Price	Bid Price
1	Field Supervision, Administration	$	3310 000							.235 780 000			
2	Construction Facilities		555 000							131 000			
3	Construction Camp		1442 000							339 000			
4	Construction Vehicles		1750 000							244 000			
5	Consumables		600 000							141 000			
6	Small Tools		450 000							106 000			
7	Construction Equipment		2660 000							630 000			
8	Mobilization		836 000							196 000			
9	Freight on Materials		1500 000							352 000			
10	Winterization		167 000							39 000			
11	Temporary Services		200 000							47 000			
12	Bonds, Insurance, Permits		469 000							110 000			
13	Union Travel		2418 000							567 000			
14	Union Subsistence		1939 000							456 000			
15	Premium Time		4022 000							945 000			
16	Escalation		603 000							142 000			
17													
18			22450 000							5275 000			
19										295 000			
20										5570 000			
21	Note: This sheet prorates the costs												
22	of the 4 station contractor												
23	overheads and contractor markup												
24	to the typical unchilled station.												

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project Foothills - Dempster Estimate No. 2688

Item No. _____ Account No. _____ Date 22 January 1979

Description G & A Summary Sheet Sheet No. _____ of _____

Based on 4 starting

	Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
1.	Overhead Labour			43660	1406000					1406000
2.	Overhead Labour			24460	1607560				261000	1874560
3.	Construction Facilities and Equipment			25530	403450	1567130	(10000)		107000	1949610
4.	Construction Facilities and Equipment			42740	633600	563645			1106000	2303245
5.	Construction Facilities and Equipment			37340	597440	1868270			215000	2680710
6.	Construction Facilities and Equipment			11540	184640	57000		2200000	107000	2538640
7.	Construction Facilities and Equipment			3000	48000	24700			86000	163700
8.	Trade Labour Burdens				7829130				1137500	8916630
9.	Miscellaneous			1700	19700			5000	444500	468700
				189440	17776050	4074445	(10000)	2205000	3465000	29450500

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project _____ Estimate No. _____

Item No. _____ Account No. _____ Date _____

Description Overhead Labour Sheet No. 1 of 9

	Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
	Supervision									
2000	@ Project Manager	Ho	24		40.00	96 000				96 000
	Assistant Project Manager									
	Project Superintendent									
1400	@ Superintendents 4@12	v	48		35.00	168 000				168 000
	@ General Foremen Equipment 1@24	v	24	624.00	18.50	115 440				115 440
	@ Piping 4@12	v	48	1248.00	7.50	22 500				22 500
	@ Electrical 4@12	v	48	1248.00	7.50	22 500				22 500
186	**Administration**									
1 2500	@ Project Administrator	Ho	24		33.00	79 200				79 200
2800	@ Accountant	v	24		28.00	67 200				67 200
1900	@ Paymaster	v	24		23.00	55 200				55 200
2800	@ Buyer/Expeditor	v	24		28.00	67 200				67 200
2800	@ Cost Engineer	v	24		28.00	67 200				67 200
1500	Stenographer	v	24		20.00	48 000				48 000
	Receptionist									
70	Clerks	v	24		20.00	48 000				48 000
	Safety Director									
	First Aid Attendants 2@24	v	48	1248.00	15.00	167 200				167 200
	Security Guards									
	Watchmen									
	Flagmen/Flagmaids									
	Data Processing Supervisor									
	Keypunch Operators									
	Clerks									
				4264.50	1441 040					1441 040

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project ______ Estimate No. ______

Item No. ______ Account No. ______ Date ______

Description Overhead Labour Sheet No. 2 of 9

	Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
	Engineering									
7500 I	Project Engineer	Mo	24		3300 79200					79200
	Office Engineers									
7200 II	Field Engineers 2@24	✓	48		3600 172800					172800
	Quantity Surveyors									
7200 II	Instrumentmen 2@24	✓	48		3600 172800					172800
	Rodmen/Chainmen									
	Draftsmen									
	Clerks									
	General Service									
	Bullcooks									
	Saw Filers									
	Detailers									
	Mechanics 2@24	Mo	48	200 17480	3900 187200					187200
	Warehousemen 2@24	✓	48	200 17480	3900 187200					187200
	Toolcrib Men									
	Staff Benefits & Premiums									
15	Relocation Expense	Ea	15						10000 150000	150000
	Travel Expense 5@24 + 15@10	Mo	270						300 81000	81000
	Living Allowance 5@24	Mo	120		800 96000					96000
	Free Room and Board 10@24	✓	240		1500 360000					360000
	Misc. Expense Reports	✓	360						100 36000	36000
1010400 x %	Scheduled Overtime 15% x 35% = 50%	✓	631800		.50 315900					315900
	Staff Payroll Escalation									
	1010400 + 315900 = 1384700 x ½	✓	694650		.10 69460					69460
				24960	1607560				267000	1874560

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project ______ Estimate No. ______
Item No. ______ Account No. ______ Date ______
Description Construction Facilities and Equipment Sheet No. 3 of 9

	Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
	Temporary Structures									
6 units	Main Site Office 6 unit 50x52 @24 mo	D	1456	250	16.00 4000	N. 60000				64000
2 ✓	Field Offices 2-10x52 @24 48 mo	✓	1056	100	✓ 1600	N. 21400				23000
	Engineer's Office									
	Lunchrooms									
4 ✓	Tradeshacks 4-10x52 @24 96 mo	D	2112	200	✓ 3200	N. 42800				46000
	Improvements & Maintenance	✓	1056 .50	500	✓ 8000				10' 10000	18000
2 units	First Aid Trailer 2-10'x24 @24 = 48 mo	D	1056	200	✓ 3200	N. 17000				20200
2 units	Wash Trailer 2-10x20 48	✓	1056	400	6400	19400				25800
	Guardhouse									
	Maintenance	✓	1056	500	✓ 8000					8000
4 bldg	Warehouse 2-40'x100' @24	✓	1056	600	✓ 9600	N. 104000			2000	115600
	Storage Compound									
4 units	Tool Cribs 4-8x20 @24	✓	2112			6.50 13730				13730
2 bldg	Equipment Shop 1-40x100 @24	✓	528	300	✓ 4800	N. 52000			1000	57800
	Fuel Storage Facilities	✓	1056	200	3200	6000			4000	13200
	Maintenance	✓	528	1000	✓ 16000				4000	20000
10 units	Camp Cookhouse 2- @24 = 48	D	1056	1800	✓ 28800	N. 240000			10' 10000	278800
48 ✓	Bunkhouses 2- 48	✓	1056	7200	✓ 115200	N. 960000			50' 50000	1075200
6 ✓	Recreation Facilities 2 48	✓	1056	1080	✓ 17280	N. 74000			5' 5000	96280
	Improvements & Maintenance	✓	1056	2000	✓ 32000				20' 10000	42000
	Forming Platform 8000 [illegible], 400000 [illegible]									
	Resteel Yard 1170,000 [illegible]									
8000 cy	Batch Plant 2 @ 24 mo 48	D	1056	1200	16.00 19200	50.00 52800	20.00 / 100000)		10000	(635000)
	Aggregate	cy	10000 1.00	8000	15.00 120000		50.00 500000			620000
	Cement 8000 @6 = 48000	sks	50000				3.00 150000			150000
				25520	400480	1567130	(70000)		107000	1993610

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project ______ Estimate No. ______

Item No. ______ Account No. ______ Date ______

Description: Construction Facilities & Equipment

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Vehicles									
Cars, Station Wagon									
Pickup Trucks 10 @ 24 240 mo	D	5760			25' 137000			2' 10000	147000
Crewcabs 4 @ 24 96	✓	2112			30' 63360			2' 4000	67360
Buses 2 @ 24 48	✓	1056	10560	15' 158400	28' 29570			1' 10000	197970
Concrete Trucks 2 @ 24 = 48 mo	✓	1056	10560	15' 158400	175' 184800			1' 10000	353200
Flatdeck Truck									
Hiab Truck 2 @ 24 = 48	✓	1056	10560	15' 158400	70' 73920			1' 10000	242320
Semi-Trailer									
~~Tractor & Lo Bed Trailer~~									
Fuel, Water & Service Trucks 2 @ 24 = 48	✓	1056	10560	15' 158400	15' 79200			1' 10000	247600
Supplies, Tools & Minor Equipment									
Office Equipment & Supplies	Mo	24						1000 24000	24000
Engineering Equipment & Supplies	✓	24						✓ 24000	24000
Safety Equipment & Supplies	✓	24						✓ 24000	24000
Fire Protection Equipment & Supplies									
Workmen's Clothing									
Expendable Supplies	$	9000000						.05 450000	450000
Welding Rod	$	30000						30000	30000
Oxygen, Acetylene, etc.								5000	5000
Small Tools	$	9000000						.05 450000	450000
			42240	633600	567850			1106000	2307450

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project ______ Estimate No. ______

Item No. ______ Account No. ______ Date ______

Description Construction Facilities & Equipment Sheet No. 5 of 9

Description of Work	Unit	Quantity	Hours	Labour		Equipment		Materials	Subcontracts	Job Supplies		Total Cost
Overhead Equipment												
Truck Crane 65ton 2@24 × 48 mo	H	12480	12480	16.00	199680	45.	561600			2.	25000	786280
Hydraulic Crane 4@24 96	D	2112	24860		391760	135.	285120			2.	50000	726880
Tower Crane												
Backhoe 4@6 × 26	H	6240				35.	218400			2.	12500	230900
Loader 4@12 48	H	17280				23.	399360			2.	25000	424360
Skidder												
Cat 4@6 26	"	6240				40.	249600			2.	12500	262100
Grader												
Towboat												
Scows												
Fork Lift												
Tower Hoist												
Conveyor												
Compressor 2@24 hrs × 48	D	1056				45.	47520			8.	8000	55520
Welders 8@24 × 192	"	4224				12.	50610			8.	32000	82610
Light Tower												
Generator												
Pumps												
Winches												
Buckets												
Heaters							50000				50000	100000
Scaffolding 50 frames 24 mo		1200				5.	6000					6000
			37340		591440		1868210				215000	2680710

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project _____ Estimate No. _____
Item No. _____ Account No. _____ Date _____
Description Construction Facilities & Equipment Sheet No. 6 of 9

	Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
	Mobilization & Demobilization									
	Yard Handling, Loadout, Receive	lbs	143	30 4760	16.00 68160					68160
	Jobsite Receive & Loadout	/	143	30 4760	68160					68160
	Freight on Contractor's Equipment							675000		675000
	Towing 4 Freight on Materials	lbs	17536000					1500000		1500000
	Local Cartage 24 mo x 4 trips = 96 mo 365 mi	mi	35000					215 7500		7500
	Sitework									
	Access Roads and Parking Areas									
	Bridges									
	Signs			100	1600				2000	3600
	Fences, Barricades									
	Stairs, Handrails, Sidewalks									
	Drainage & Culverts									
	Dewatering									
	Hoarding	Mo	16	1920	16.00 30720	2000	32000		5000 90000	147720
	Winterization									
	Snow Removal									
	Dust Control									
	Final Cleanup									
	Power Distribution									
	Power & Light Bills									
	Overhead Poleline									
	Transformers & Switchgear	Sum	4250	10000	16000	5000	20000		5000 20000	51000
	Service Drops & Panels									
	Cab Tire Distribution									
	Lighting									
				11540	184640		57000	2200000	100000	2538640

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project ______ Estimate No. ______

Item No. ______ Account No. ______ Date ______

Description Construction Facilities & Equipment Sheet No. 7 of 9

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Water Supply									
Main Water Supply and Distribution									
Potable Water & Treatment Facilities	Site	4	150 600	1600 9600				2500 10000	19600
Fire Protection System									
Tanker Stations									
Maintenance	Mo	24	50 1200	✓ 19200					19200
Sewage & Waste Disposal									
Plumbing, Septic Tank & Disposal Field									
Portable Toilets 4 @ 24	Mo	96			200 19200				19200
Garbage Disposal		24	50 1200	✓ 19200					19200
Janitorial Services									
Maintenance									
Heating & Air Conditioning	Mo	24						1000 24000	24000
Communications									
Telephone	Mo	24						1000 24000	24000
Mobile Radio	✓	24			10000			200 4000	14000
Telex	✓	24						✓ 24000	24000
Telecopier									
Data Processing									
Keypunch									
Computer Terminal									
Computer Time									
			3000	48000	29200			86000	163200

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project ______ Estimate No. ______
Item No. ______ Account No. ______ Date ______
Description Trade Labour Burdens Sheet No. 8 of 9

	Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
	Union Travel Benefits									
591630 ÷ 260	Initial & Terminal Travel Fares	Ea	2275						300 6825 00	6825 00
	Initial & Terminal Travel Time	✓	2275	35.0 79625	16.00 12740 00					12740 00
	Initial & Terminal Travel Expenses	✓	2275						200 4550 00	4550 00
	Daily Travel Fares									
	Daily Travel Time									
	Daily Travel Mileage Costs									
	Union Subsistence Benefits									
591630	Living Allowance									
91630 ÷ 10	Free Room and Board ÷ 8/6 = 10690	md	10690		45.00 4810 50					4810 50
500000 ÷ 10	Camp Catering Costs ÷ 7/6 = 58330	✓	58330		25.00 14582 50					14582 50
	Weekend Checkouts									
	Recoveries from other Contractors									
	Non-Productive Union Wages									
60 hrs	Scheduled Premium Time 591630 @ 16.00	$	94660 80		.375 35497 80					35497 80
	Incidental Premium Time									
	Shift Differential 591630 ÷ 10	md	59163	.5 29580	16.00 4733 00					4733 00
	High Time or other									
	Escalation pipeline welfare 76-78	hrs	116000		.36 417 60					417 60
	" north of 60°	✓	116000		.50 580 00					580 00
	after May 1, 1979	✓	591630		.85 5028 90					5028 90
					78391 30				11375 00	89766 30

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project ______ Estimate No. ______
Item No. ______ Account No. ______ Date ______
Description Miscellaneous Sheet No. 9 of 9

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Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Consultants, Testing, Inspection									
Engineering Design Consultant									
Legal Survey									
Soils Investigation & Testing									
Concrete Mix Design & Testing							5000		5000
Welder Qualification Tests 4 Silo	Ea	80	15.00 1200	16.40 19700				100 8000	27700
Weld X-Ray and Inspection									
Permits, Licences, Fees									
Business Licence									
Building Permit									
Electrical Permit	Ea	4						4000	4000
Plumbing Permit & Connection Fee									
Boiler Inspection Fee									
Land Rental Whitehorse	Mo	24						1000 24000	24000
Road Permits and Tolls								5000	5000
Bonds, Insurance									
Performance Bond	M	45000						250 117500	117500
Labour & Material Payment Bond								140 63000	63000
Maintenance Bond									
Subcontractor Bonds									
Course of Construction Insurance	✓	45000						250 117500	117500
Liability Insurance								150 67500	67500
Miscellaneous									
40 x Silo 2	Mo	24						2000 48000	46000
			1200	19700			5000	444500	468100

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster Estimate No. ____
Item No. ____ Account No. ____ Date ____
Description: Mobilization - Freight on Contractor's Equipment Sheet No. ____ of ____

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Description of Work		Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Main Office 60x50	6									
Offices Field & [illegible]	6									
Trailers 1st Aid & Warmup	4									
Warehouses	4									
Tool Cribs	4									
Shop	2									
Kitchens	10									
Bunkhouses	48									
Rec Halls	6									
Boiler Plants	2									
Pickups	10									
Crewcabs	4									
Buses	2									
Fuel Trucks	2									
Hi-boys	2									
Lube Trucks	2									
Tools	4									
Truck Cranes 1	2									
Hyd Cranes 4	2									
Backhoes 2	2									
Loaders 2	1									
Cats 2	2									
Compressors 2	1									
Welders 8	2									
[illegible]	2		(4 + 60000) @ 30000/							15¢
Other	10									
	142 loads	lb	3,550,000 lb @ 25000 /							
Freight cost ex Vancouver by mileage 2037 mi		mi	79,000.00					7½ 623,350.00		.175¢

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DEMPSTER HIGHWAY COMPRESSOR STATION

III-15 SUMMARY OF FREIGHT WEIGHT EX EDMONTON BY COST CATEGORY

III-15.1 FREIGHT

An estimate of freight costs for the road haul transportation of all permanent materials from Edmonton to the station sites has been developed. The weights of civil, structural, piping, equipment, electrical and insulation materials have been evaluated and the numbers of load shipments identified.

Cost Category		Weight in Pounds	
		Chilled	Non-Chilled
III-1	Foundation	1,770,000	1,045,000
III-2	Buildings	974,000	727,000
III-3	Gas Compressor Package	418,000	418,000
III-4	Propane Compressor Package	182,000	-
III-5	High Pressure Gas Piping	500,000	300,000
III-6	Other Major Systems	1,811,500	104,700
III-7	Utilities	139,000	122,000
III-8	Instrumentation & Controls	26,200	4,900
III-9	Electrical	197,400	131,500
III-10	Insulation and Painting	40,000	10,000
III-11	Testing, Winterization and Startup	150,000	120,000
III-12	Miscellaneous	67,000	67,000
III-13	Tools and Major Spares	20,000	16,500
	TOTAL	6,295,100	3,066,600

Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster | Estimate No.
Item No. | Account No. | Date
Description: Mobilization - Freight on Materials | Sheet No. of

	Description of Work		Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Culverts	4 sites @ 5pc = 20pc ÷ 10 = 2 loads		hrs	90000							
Fencing	4 sites @ 1 load =	4	✓	160000							
Formply	6000 sheets ÷ 600 =	10	✓	360000							
Lumber	300000 fbm ÷ 20000 =	15	✓	540000							
Rebar	1170,000 ÷ 40,000 =	26	✓	1170000							
Emb metals	40,000 ÷ 20000 =	2	✓	40000							
Cement	50,000 sk @ 90 ÷ 30000	15	✓	450000							
Grout	1000 cf @ 120 = ÷ 20000	6	✓	170000							
Insulation	25000 sh	4	✓	17000							
Misc Civil	4 sites @ 10000	4	✓	40000							
Metal Bldg	2 sites @ 350000 lbs	26	✓	760000							
✓	2 sites @ 240000	16	✓	480000							
Cranes	2 sites @ 7	14	✓	917000							
✓	2 sites @ 3	6	✓	198000							
Misc Steel	4 sites @ 10000	2	✓	64000							
Utilities	4 sites	12	✓	330000							
Partitions	4 sites @ 17000	4	✓	68000							
Liv. Quarters	4 sites @ 8 trailers	32 P	✓	840000							
Masonry	4 sites @ 6000	8	✓	240000							
Gas Comp.	4 sites @ 366000 416000	16 P	✓	1464000							
Prop Comp	2 sites @ 170000 150000	6 P	✓	340000							
Gas Eqt	4 sites @ 3 loads	12	✓	580000							
Gas Pipe	4 sites @ 120000 [illegible]	16	✓	480000							
Chillers	2 sites @ 3 pcs	6 P	✓	630000							
Condensers	2 sites	40	✓	1440000							
Prop Eqt	2 sites @ 6 pcs	12	✓	324000							
Prop Pipe	2 sites @ 80000	6	✓	160000							
Office Supt	4 sites @ 16000	4	✓	64000							
Utilities	4 sites @ 3 loads	12	✓	240000							
	c/f	340		11966000							

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Dillingham Corporation Canada Ltd.

ESTIMATE COST SHEET

Project: Foothills - Dempster　　Estimate No.

Item No.　　Account No.　　Date

Description: Mobilization & Freight on Materials　　Sheet No. ___ of ___

Description of Work	Unit	Quantity	Hours	Labour	Equipment	Materials	Subcontracts	Job Supplies	Total Cost
Instruments 4 sites @ 1 ton 4	lbs	40000							
Generators 4 sites 4	"	150000							
Switchgear 4 sites 4	"	100000							
Conduit 4 sites 4	"	40000							
Wire & cable 4 sites 4	"	20000							
Heating 4 sites 4	"	20000							
Misc elec 4 sites 4	"	40000							
Insulation 4 sites @ ? 8	"	100000							
Paint 4 sites 4	"	30000							
Other 340		1146600							
Totals 380		17576000							
Average = 33000 lbs/load									
3134,000 lbs/site									
Via road.									
Vancouver to Dempster mid line = 2031 mi ÷ 40 mph = 50 hrs = 5 days									
Edmonton to " " 1651 ÷ 40 = 40 " = 4 days									
Freight costs ex Edmonton by trip	loads	380	40 15200	40.00 608000	40.00 608000				1216000
Freight costs ex Edmonton by mileage	mi	627480					2.15 1349000		1349000
Freight costs ex Edmonton by weight	lbs	17576000					1.09 1380000		1380000
Pilot car costs 60 loads	mi	99060					1.35 134000		134000
									USE 1500000

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0.12 lb.

DEMPSTER HIGHWAY COMPRESSOR STATION

III-16 TOOLS AND MAJOR SPARES

III-16.1 TOOLS

The compressor station will be basically self-contained insofar as normal tools and equipment are concerned. We have provided a general list of items that are commonly utilized at larger stations.

III-16.2 MAJOR SPARES

This estimate has included the costs for a number of spares at each station. The general spares were assigned to Electrical Spares, Instrumentation Spares, Pump Spares, Turbine Spares and Mechanical Spares. In addition two additional categories were considered;

a) a spare gas turbine power unit estimated at two million dollars, and prorated between 9 stations
   $2,000,000 ÷ 9 = $222,000 per station

b) a spare refrigeration turbine/compressor unit estimated at one million dollars and prorated between 4 stations = $250,000 per station.

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. _____ PAGE ___ OF ___

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
[illegible]				
[illegible]		1	2000	2000
Power Grinder		1	1000	1000
Power Grinder		2	[illegible]	2[illegible]
200 Amp Electric Welder		1	3000	3000
1" Air Impact Wrench & Sockets		1	2500	2500
½" Air Impact Wrench & Sockets		1	600	600
1" hand Socket	set	1	600	600
3/4" hand Socket	Set	1	450	450
Torque Wrenches		2	300	600
Torque Multipliers		2	100	200
Herman Nelson	Heater	1	2000	2000
Baker hydraulic	Pump	1	800	800
5 ton hydraulic	jacks	2	70	140
12 ton hydraulic	jacks	2	100	200
2" Centrifugal	pump	1	1750	1750
Open End Wrench	set	1	150	150
Box End Wrench	Set	1	150	150
Hammer Wrenches		set	200	200
Skid Extractors		set	50	50
Taps & Dies		set	200	200
Hydraulic Pullers		set	1100	1100
Hoisting Tackle		lot	2000	2000
Hammers		set	60	60
Pliers		set	100	100
Screw Drivers		set	50	50
Chisels		set	50	50
Punches		set	50	50
Power Saw		1	150	150
Electric Drills		3	66	200
Pipe Wrenches		6	16	[illegible]
Crescent Wrenches		6	[illegible]	[illegible]
Oxyacetylene Cutting Torch		1	40	40
		Carry Forward		25[illegible]
			SUB-TOTAL	
		CONTINGENCY @ _____ %		
		- 200 -	TOTAL	

DEMPSTER COMPRESSOR STATION

SYSTEM COST SUMMARY

SYSTEM NO. Station Tools

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
Line Up Clamps		lot	1340	1340
Panel Board Test Equipment		lot	7500	7500
Electrical Test Equipment		lot	3500	3500
Wh[illegible]		1	[illegible]	[illegible]
Tool Boxes		2	350	700
Trouble Lights		2	25	50
Micrometers		set	[illegible]00	[illegible]
Vernier Calipers		2	200	200
Boroscope		1	1000	1000
Work Benches		2	500	1000
Oakum [illegible] etc.		lot	250	250
Vehicle Maintenance Equipment		lot	2500	2500
Consumable Supplies Inventory		lot	5000	5000
Subtotal page 2				24590
Subtotal page 1				25236
Total				49826
			Round to	$50000
Space Tr[illegible] estimate 4500				
Weight estimate 10 [illegible] lbs				
			SUB-TOTAL	
		CONTINGENCY @	%	
			TOTAL	

DEVESTER COMPRESSOR STATION

SYSTEM COST SUMMARY
SYSTEM NO. MAINTENANCE SPARES

ITEM	SUPPLIER	QUANTITY	UNIT PRICE	EXTENSION
Electrical Spares		lot		10,000
Instrumentation Spares		lot		8 000
Pump Spares				20000
Turbine Spares				25000
Mechanical Spares				7500
Prorated Share of spare gas turbine power unit				222000
Prorated Share of spare refrigeration turbine-compressor				250 000
Subtotal Spares				524 500
			Round to	521 000
Sales Tax	6136[illegible] 6190			
Freight	10000/65			
			SUB-TOTAL	
		CONTINGENCY @	%	
		- 202 -	TOTAL	