Industrial Development Subsidiary Agreement

PEACE-LIARD REGION

HEAVY INDUSTRY PARTS

REPLACEMENT STUDY

JANUARY 1982

Research Report

Province of British Columbia

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PEACE-LIARD REGION

HEAVY INDUSTRY PARTS

REPLACEMENT STUDY

JANUARY 1982

Prepared for:

Peace-Liard Regional District
Economic Development Commission

Prepared by:

Price Waterhouse Associates
#720 - 880 Douglas Street,
VICTORIA, B.C.,
V8W 2B7

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The responsibility for the content of this report is the Consultant's alone and the conclusions reached herein do not necessarily reflect the opinions of those who assisted during the course of this investigation or the federal and provincial governments which funded the study.

PEACE-LIARD REGION

HEAVY INDUSTRY PARTS
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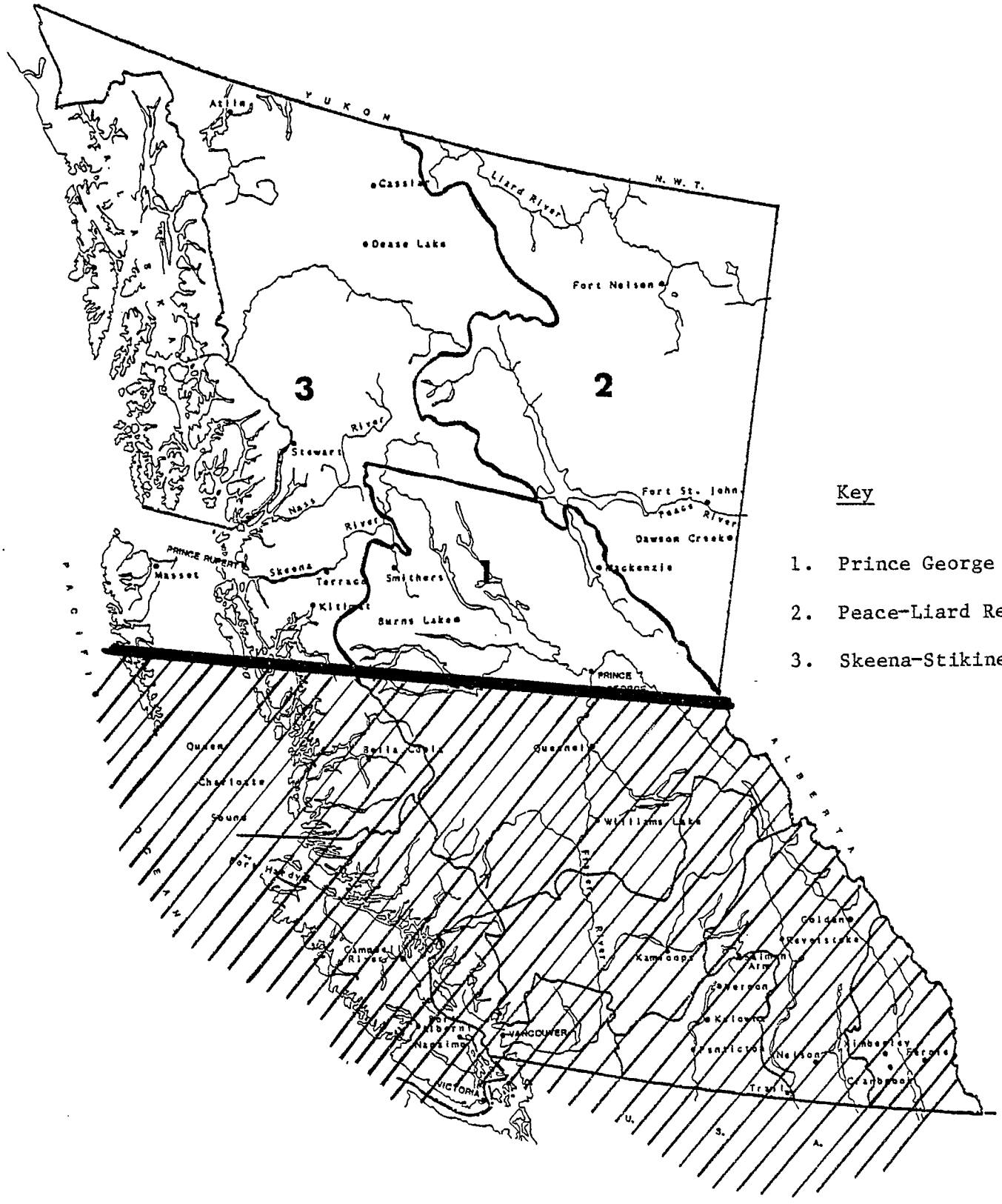

Key

1. Prince George Region
2. Peace-Liard Region
3. Skeena-Stikine Region

HEAVY INDUSTRY PARTS REPLACEMENT STUDY

I INTRODUCTION

The Peace-Liard Region Economic Development Commission authorized a study of the potential in northern British Columbia for the local manufacture of replacement parts to service heavy industry in that part of the province.

The expansion of the mining, oil and petrochemical industries with associated developments in transportation and construction, will form a substantial economic and industrial base when added to the already significant activities in forest products. Local facilities to manufacture components derived from metal castings or forgings would enhance this economic development and provide employment through secondary manufacturing.

The scope of the study has been to identify the areas of greatest potential in terms of specific industry sectors, product groups and local supply opportunities. It is anticipated that further more detailed studies may be required to quantify these opportunities more precisely. This approach is necessary in view of the very wide range of products to be examined, coupled with diverse applications in the various industry sectors.

The study was undertaken by Price Waterhouse Associates, drawing additionally on the expertise of H. A. Simons (International) Ltd. in the field of spare parts management. The following eight industry sectors were investigated by means of personal and telephone interviews with purchasing staff in major companies currently active in the study area.

- Metal Mines
- Coal Mines
- Oil and Gas
- Transportation
- Construction
- Pulp and Paper
- Sawmills
- Other

To provide a base for subsequent investigation, a detailed appraisal of spare parts consumption was conducted in key companies drawn from each of the eight industries. From the many hundreds of products theoretically capable of being manufactured locally, some 22 major groups were selected on the basis of the following criteria:

- Proprietary items normally built for a specific equipment manufacturer and not interchangeable between different brand names.
- Metal base.
- Significant consumption by industries currently in the study area or projected to be in the area within 5 - 10 years.

Interviews were conducted with all major companies in the study area to quantify current levels of purchases. Not all companies agreed to supply data, but an adequate response was received from each industry sector to enable projections to be made of total market needs over the next 5 - 10 year period. These projections used current industry output levels (e.g. volume of wood processed), related to current spares consumption, as a base for extrapolation using forecast levels of future industry output.

The following sections contain more detailed explanations of the methodology employed, together with an analysis of the findings and opportunities for local spare parts manufacture.

II SUMMARY

Heavy industry in northern British Columbia currently consumes some $91 million of metal replacement parts each year. By 1991, this figure is expected to more than triple to some $237 million (in 1981 dollars) as a result of Northeast Coal development, major hydroelectric projects and expansion in other industries. The industries with the largest consumption of replacement parts will be coal mining ($88 million), construction ($43 million) and metal mining ($41 million).

At the moment, the replacement parts purchased by industry currently located in northern British Columbia are predominantly manufactured outside of the province. For reasons of economy of scale and, to a lesser extent, patent and warranty infringement, it is likely that the majority of parts will continue to be supplied from these sources. However, the need for rapid delivery and lower prices will provide opportunities for increased local manufacture, with a total potential market share by 1991 of some $26.0 million. The projections for the sectors of greatest potential importance to local manufacturers, and their estimated market shares in 1991, are:

- Coal Mining - $ 6.5 million
- Oil and Gas - $ 6.5 million
- Sawmills - $ 4.5 million
- All other - $ 8.5 million
- Total - $26.0 million

Identifying individual products that can be manufactured in northern British Columbia is a difficult task since patents, warranties and technical and economic constraints must all be considered. However, some companies have already experienced considerable success with copying parts. The key product groups identified by the study as offering most potential for local manufacture and their market shares by 1991 are:

- Pumps - $5.5 million
- Drills and Drill Bits - $6.5 million
- Wood room items and special parts for saw mills - $1.5 million
- Saws - $2.5 million
- Earthmoving equipment, especially bits and teeth - $7.0 million

Further studies are recommended for some of these product groups to identify the subcomponents most feasible for local manufacture.

The preferred location for manufacturers will be within the Peace-Liard Region where, by the late 1980's, some 61% of total replacement part purchases in northern British Columbia will be required.

III PRODUCT PROFILE AND OVERALL DEMAND

A. PRODUCT GROUPS

In order to arrive at a manageable number of product groups to be examined for potential local manufacture, a detailed study of spare parts inventory or purchasing records was made for one company in each of the target industries. Since these records often included a vast number of individual items, only data for metallic replacement parts with high frequency of use or with high dollar values were selected. Where possible, non-proprietary parts (parts used in more than one manufacturer's equipment) were excluded from the study, and commodity items (such as chains) were ignored unless they showed some particular potential for local manufacture.

Parts were classified into broad product groups that would be easily recognizable to other companies in the survey. Appendix A contains examples of specific parts included in each of the product groups set out below in Table 1.

Table 1

Product Groups Identified

Boilers and Ancillaries
Compressors and Blowers
Conveyors
Cranes/Hoists
Drill Bits
Drill Rigs
Drive Components (excluding bearings)
Earthmoving and Hauling Equipment
Gas Engine-Compressor Units
Gear Reducers
Mobile Equipment
Process Equipment
Pulping Equipment
Pumps
Sawmill Specials
Saws
Springs
Wood Room Items

Grinding Media
Steel Strapping

B. TYPES AND SIZE OF PARTS

Based mainly on the accumulated engineering knowledge of product specialists in H. A. Simons (International) Ltd., estimates were made for the various products in terms of size and process of manufacture. This information is provided in Tables 2 and 3, and should be used for general guidance only. Detailed engineering studies would be required to fully verify these estimates.

Table 2

Estimated Breakdown of Material and Types of Castings and Forgings

Product Groups	Material of Construction (Approximations)			
		Castings		
	Forgings	Steel	Iron	Other
Boilers & Ancilliaries	5%	70%	15%	10%
Compressors & Blowers	25%	60%	10%	5%
Conveyors	15%	70%	10%	5%
Cranes/Hoists	20%	60%	10%	10%
Drill Rigs	25%	45%	25%	5%
Drive Components	10%	50%	35%	5%
Earthmoving and Hauling Equipment	20%	50%	20%	10%
Gas Engine - Compressor Units	25%	50%	15%	10%
Gear Reducers	20%	60%	15%	5%
Mobile Equipment	25%	55%	15%	5%
Sawmill Specials	20%	60%	15%	5%
Wood Room Items	20%	60%	15%	5%
Pulping Equipment	15%	70%	10%	5%
Process Equipment - Forestry				
Machines - dryers, cutters	20%	60%	10%	10%
Finishing line	10%	60%	20%	10%
Miscellaneous	15%	65%	10%	10%
Process Equipment - Mining:				
Crushers - rod-ball mills	10%	70%	15%	5%
Centrifuges, cyclones, screens, separators	10%	50%	30%	10%
Pumps	5%	70%	20%	5%
Drill Bits	10%	80%		10%
Saws	10%	80%		10%
Springs	10%	85%		5%

Source: H. A. Simons (International) 1981 Survey.

Table 3

Approximate Size of Castings

Product Groups	Size of Castings (Approximations) (Pounds)			
	-100	100-500	500-1000	1000+
Boilers & Ancilliaries	15%	50%	30%	5%
Compressors & Blowers	60%	25%	10%	5%
Conveyors	10%	30%	40%	20%
Cranes/Hoists	15%	35%	40%	10%
Drill Rigs	10%	30%	40%	20%
Drive Components	20%	60%	15%	5%
Earthmoving and Hauling Equipment	10%	35%	35%	20%
Gas Engine - Compressor Units	40%	30%	20%	10%
Gear Reducers	20%	50%	20%	10%
Mobile Equipment	40%	45%	10%	5%
Sawmill Specials	15%	35%	40%	10%
Wood Room Items	15%	35%	40%	10%
Pulping Equipment	20%	40%	25%	15%
Process Equipment Forestry:				
Pulp machines-dryers, cutters	30%	40%	20%	10%
Finishing line	40%	50%	5%	5%
Miscellaneous	40%	40%	15%	5%
Process Equipment - Mining:				
Crushers - rod-ball mills	60%	25%	10%	5%
Centrifuges, cyclones, screens, separators	40%	30%	20%	10%
Pumps	40%	40%	15%	5%
Drill Bits	60%	40%		
Saws	45%	35%	15%	5%
Springs	15%	80%	5%	

Source: H. A. Simons (International) 1981 Survey.

In summary, however, we estimate that the majority of the parts would be made from steel castings weighing over 100 pounds.

C. OVERALL CURRENT AND PROJECTED DEMAND

The following summary of current and projected demand is based on the detailed analysis provided in Section IV.

1. Current Demand

The total market for replacement parts is some $90.3 million in 1981 and estimates of current expenditures by industry sector are presented in Table 4. The metal mining and construction industries represent the major markets for the product groups included in the survey. With total purchases of $27.5 million and $21.5 million respectively, the primary requirements of these two industry sectors are for parts for earthmoving and hauling equipment. Next in importance is the sawmilling industry with expenditures of $13 million per year.

Purchases by Region are contained in Table 5. The study area has been divided into three regions, as follows:

Prince George Region - includes the Bulkley-Nechako and Fraser-Fort George Regional Districts.

Peace-Liard Region - the Peace-Liard Regional District.

Skeena-Stikine Region - includes the Skeena-Queen Charlotte and Kitimat-Stikine Regional Districts and the unincorporated Stikine area.

These regions are outlined in the map of the study area facing page 1.

Currently, the largest quantity of parts (46%) are required by companies in the Prince George Region. The remainder of the requirements are split evenly between the Peace-Liard Region and the Skeena-Stikine Region.

2. Future Demand

Projections of future demand were made by correlating current levels of parts consumption with industry output, using the measure appropriate to each industry sector. Industry growth forecasts available from recognized public documents were applied to 1981 base figures to provide indices for the years 1986 and 1991, as shown in Table 6. These forecasts incorporate projects with a reasonable prospect of occurring over the next decade, including Northeast Coal, B.C. Hydro's Site C project, a doubling of capacity of the Alcan smelting operations, and the construction of at least two or three petrochemical plants.

Tables 4, 5 and 7 show projections of demand by industry, region and product group for 1986 and 1991.

The consumption of replacement parts is expected to more than triple by 1991, to a total of $237.2 million per year (in 1981 dollars). Construction and mining will continue to dominate, with the coal mining sector reaching $87.5 million by 1991.

The most significant change in the market will be a marked shift in importance from the Prince George Region to the Peace-Liard Region (61% by 1991). Most of the planned development, including Northeast Coal and the B.C. Hydro Site C project will occur in the Peace-Liard Region.

Table 4

Projected Annual Consumption of Metal Replacement Parts by Industry

($ millions) (1)

Industry	1981	1986	1991
Metal Mines	27.5	32.0	41.0
Sawmills	13.0	13.0	13.0
Pulp Mills	11.0	14.0	18.0
Transportation	0.2	0.2	0.2
Oil/Gas (exploration)	10.0	13.0	17.0
Construction	21.5	53.5	42.5
Coal Mines	0.0	64.0	87.5
Other	7.1	8.0	18.0
Total	90.3	197.7	237.2

Source: Price Waterhouse Associates 1981 Survey.

Note: (1) All consumption figures are in 1981 dollars.

Table 5

Estimated Consumption by Region - 1981 ($ millions)

Region	1981	%	1986	%	1991	%
Prince George*	42	46	47	24	52	22
Peace-Liard**	24	27	124	63	145	61
Skeena-Stikine***	24	27	27	13	40	17
Total northern B.C.	90	100	198	100	237	100

* For the purposes of this study, the Regional Districts of Bulkley-Nechako and Fraser-Fort George were considered to be the Prince George Region.

** The expenditures for the Peace-Liard region include some expenditures made by Yukon and Northwest Territories mining companies that are near the B.C. border.

*** The Skeena-Stikine Region includes the Regional Districts of Skeena-Queen Charlotte, Kitimat-Stikine and the unincorporated Stikine area.

Source: Price Waterhouse Associates 1981 Survey.

Table 6

Projected Annual Output by Industry

Industry	Units	1981	1986	1991
Metal Mines	million milled tonnes	30.9	35.9	40.9
Sawmills	billion FBM	3.5	3.5	3.5
Pulp Mills	tonnes per day	5000	6150	6850
Transportation	million tonne kilometres	670	670	670
Oil/Gas (exploration)	active rigs	60	90	120
Construction	million dollars	400	1000	800
Coal Mines	million tonnes	0	13.0	18.0
Other	relative	1.0	1.0	2.5

Source: Price Waterhouse Associates 1981 Survey.

Table 7

Estimated Total Consumption of Metal Replacement Parts by Product Group

($ millions)

Replacement Product Group	1981	1986	1991
Boilers & Ancillaries	2.5	3.0	4.0
Compressors & Blowers	0.5	1.5	2.0
Conveyors	0.5	1.5	2.0
Cranes/Hoists	0.1	0.5	1.0
Drill Rigs	5.0	10.0	12.5
Drill Bits	-	2.5	3.5
Drills/Bits*	3.0	3.5	4.5
Drive Components	2.0	3.0	4.0
Earthmoving and Hauling	42.5	126.0	140.0
Gas Engine-Compressor Units	2.5	2.5	2.5
Gear Reducers	0.5	1.0	1.5
Mobile Equipment	3.0	3.5	3.0
Sawmill Specials	2.0	2.0	2.0
Wood Room Items	3.0	3.0	3.0
Pulping Equipment	3.5	4.5	5.5
Process Equipment	11.5	18.0	31.9
Pumps	4.5	8.0	10.5
Saws	3.5	3.5	3.5
Springs	0.2	0.2	0.3
Total	90.3	197.7	237.2
Commodities			
Grinding Media	12.5	14.5	18.5
Steel Strapping	5.0	5.0	5.0

* Information collected for the metal mining industry did not separate Drill equipment from Drill Bits.

Source: Price Waterhouse Associates 1981 Survey.

IV DEMAND BY INDIVIDUAL SECTOR

A. METAL MINES

1. Key Companies

In northern B.C. and in nearby locations in the Yukon and Northwest territories, there are about a dozen significant mines with a combined milled volume of some 31 million tonnes per year. The major companies in the area are:

- Noranda - two copper mines near Smithers
- Placer Development - silver and molybdenum at Houston
- Amax - molybdenum mine at Alice Arm
- Cyprus-Anvil - zinc and lead in the Yukon near Faro

All but two of the mines in the area use open-pit methods.

2. Requirements

As indicated in Table 8, the major repair expenditures by the mining sector are related to earthmoving and hauling equipment ($22 million).

The earthmoving and hauling equipment is almost entirely composed of very large parts which are generally purchased from the original equipment manufacturer (OEM) or through distributors such as Finning Tractor. Some parts are manufactured in B.C., but the majority are imported. Manufacturers include Euclid, Caterpillar and Wabco.

Due to the large size of the parts, copying by B.C. manufacturers currently is limited, although there is reportedly one company in Quesnel manufacturing various shovel parts.

At the moment, existing suppliers carry a good local inventory and, accordingly, offer a fast and reliable service, albeit expensive. In many cases, parts replacement is incorporated in an overall service contract provided by the OEM's distributor. As the volume of business grows, companies are likely to seek less expensive

Table 8

Estimated Consumption - Metal Mining Industry

($ millions)

Replacement Product Group	1981	1986	1991
Earthmoving and Hauling	21.5	25.0	32.0
Process Equipment - Crushers	3.0	3.5	4.5
Pumps			
Drill and Bits	3.0	3.5	4.5
Total	27.5	32.0	41.0
Other Products			
Grinding Media	12.5	14.5	18.5

Source: Price Waterhouse Associates 1981 Survey.

alternatives, using their own repair and overhaul facilities. This will create an opportunity for local parts manufacture, provided the selling prices are significantly lower than those offered by the OEM's distributor.

Another significant cost category for metal mines is grinding media (balls and rods) ($12 million). Although these items are essentially commodities and as such do not fall within the intended scope of the study, they are included because of their possible suitability for local manufacture.

Pump and crusher parts are manufactured by a number of companies outside of B.C., with Allis-Chalmers the name most frequently mentioned. Drills and drill parts are manufactured by Continental, Bucyrus-Erie and Atlas-Copco outside of B.C., and by Smith Manufacturing in Vancouver. There may be opportunity for more local manufacture in these product groups, although there would be difficulty supplying the many remote locations.

B. SAWMILLS

1. Key Companies

There are over fifty sawmills in the study area with a combined annual production of about 3.5 billion board feet. The mills are distributed throughout the area with major concentrations around Prince George, Mackenzie, Houston and Terrace. The largest mill owners include Northwood Pulp and Timber, B.C. Forest Products, B.C. Timber, and West Fraser Timber.

2. Requirements

Table 9 shows the replacement part consumption estimates for the six component groups making up the sawmill industry sector. In total, the current consumption is some $13 million. The industry sector is not forecast to grow significantly and, accordingly, sales of replacement parts are not expected to rise.

Table 9

Estimated Consumption - Sawmill Industry

($ millions)

Replacement Product Group	1981	1986	1991
Saws	3.5	3.5	3.5
Mobile Equipment	3.0	3.0	3.0
Wood Room Items	2.5	2.5	2.5
Sawmill Specials	2.0	2.0	2.0
Drive Components	1.5	1.5	1.5
Other Replacement Parts	0.5	0.5	0.5
Total	13.0	13.0	13.0
Other Products			
Steel Strapping	5.0	5.0	5.0

Source: Price Waterhouse Associates 1981 Survey.

Purchasing agents identified saw replacement parts as the largest product group suitable for local manufacture. Currently, some saws are made in Vancouver (Pacific Saw, Mainland), but the majority are made outside of B.C. (Simonds, Disston).

The next largest product group for this industry is parts for mobile equipment (forklifts and lumber loaders), of which the main replacement parts are engines, transmissions and differentials. These parts are most suited to manufacture by Clark and Caterpillar, the original equipment manufacturers.

Wood room items represent the third largest spare parts product group for the sawmill industry. Although OEM's are both in Vancouver (CanCar) and outside of B.C. (Cambio), there is a trend toward local manufacture of repair parts in Northern B.C. Barker parts (tool arms and tips) were suggested as a good opportunity for local manufacture by the majority of buyers interviewed.

In the sawmill specials product group, there are several OEM's including Stetson-Ross, Woods, CanCar, Forano and Schurmann. The major potential for local manufacture is likely to be for planer parts. Some local shops are already established to exploit this opportunity.

Drive components, such as sprockets and gears, are in fairly high demand, but most of these parts can be made in any machine shop. Purchasing people considered that compressor and blower parts could be manufactured locally, but the market appears to be too small to warrant much consideration.

In summary, the saw milling industry could provide a good market for a local manufacturer of repair parts, particularly in barker parts, planer parts and possibly saws.

Theoretically, steel strapping could be manufactured locally to satisfy the high quantity of purchases currently made, but volume is unlikely to be sufficient for competitive pricing in relation to

distant suppliers. Currently, steel strapping is manufactured in the east by ACME, Sigmonds and Samuel. Local manufacture would be very difficult, because strapping machines are also manufactured by the strapping companies, and slight differences in these machines make impossible the interchangeability of strapping between different manufacturers.

C. PULP MILLS

1. Key Companies

Each of the seven pulp mills operating in northern B.C. was contacted for this study. The mills are located in Prince George, Mackenzie, and in the Prince Rupert-Kitimat area, and are owned by B.C. Timber, B.C. Forest Products, Finlay Forest Products, Northwood Pulp and Timber, Canadian Forest Products, Intercontinental Pulp, and Eurocan.

2. Requirements

According to the purchasers, the major product groups for this industry are pulping equipment ($3.5 million), boilers ($2.5 million) and pumps ($2 million) as indicated in Table 10. Total sales are $11 million, rising to $18 million by 1991.

Pulping equipment parts are very complicated and highly technical. Sprout-Waldron, Kamyr and Ingersoll Rand are the key OEM's and all are located outside of B.C. This product group has inherent constraints to local manufacture, due to patent and warranty issues which will be discussed in a later section of this report.

Babcock Wilcox was the key OEM mentioned in the boiler part product group. Some boiler parts may have potential for local manufacture. However, a large portion of the expenditures relates to tubing which is manufactured through a very difficult extrusion process, probably unsuitable for northern B.C.

Table 10

Estimated Consumption - Pulp Mill Industry

($ millions)

Replacement Product Group	1981	1986	1991
Pulping Equipment	3.5	4.5	5.5
Boilers	2.5	3.0	4.0
Pumps	2.0	2.5	3.0
Process Equipment	1.5	2.0	2.5
Drive Components	0.5	0.5	0.5
Other Replacement Parts	1.0	1.5	2.5
Total	11.0	14.0	18.0

Source: Price Waterhouse Associates 1981 Survey.

Many pump replacement parts are made in northern B.C. and in Vancouver, by companies such as QM Industries, Tristar and Westcan. There would not appear to be a great deal of opportunity for a new manufacturer in the market at this time. As long as local service remains good, a pulp mill will be committed to the local manufacturer which already has drawings for his particular pumps.

The other product groups do not show much promise for additional local manufacture, since the markets are relatively small and the number of individual parts is very high.

D. TRANSPORTATION INDUSTRY

1. Key Companies

The three main components of the transportation industry in northern British Columbia are the railways, highway trucking and log hauling (mostly off-highway). The log hauling sector is composed primarily of a large number of independent truckers. Highway trucking is carried out by companies such as Canadian Freightways, CP Transport and Trimac Transportation.

2. Requirements

Rail transportation is a major and increasing industry in northern B.C., but parts used are purchased exclusively through suppliers in eastern Canada due to tight regulatory requirements. Accordingly, there is no measurable market for locally manufactured parts in this sector.

Springs for the trucking industry (especially log hauling) were determined to be the only significant parts suited to local manufacture for the transportation industry, with annual purchases estimated currently at $200,000. However, there are already several local spring manufacturers. In addition, the trend in the trucking

industry is away from springs and toward rubber and hydraulic suspensions. This will offset any growth in spring consumption over the next decade.

E. OIL AND GAS INDUSTRY

1. Key Companies

The oil and gas industry in northern B.C. includes:

- Westcoast Transmission - with its natural gas pipeline and processing plants
- Petro-Canada - oil refinery at Taylor
- Union Gas, Pacific Petroleums, Husky Oil and drilling contractors - over 60 exploration drilling rigs.

Exploration and pipeline activity is expected to increase by as much as one hundred percent over the next decade to supply planned petrochemical plants.

2. Requirements

Total replacement parts requirements in the sector are estimated at $10 million in 1981, rising to $17 million by 1991 (Table 11).

For pipeline operations, the only important category of replacement part requirements is for gas engine compressors ($2.5 million).

Exploration for oil and gas in the "Oil Patch" area of northern B.C. results in significant requirements for drill parts ($5 million) and mud pump parts ($2.5 million). These may offer some potential for increased local manufacture.

F. CONSTRUCTION

1. Key Companies

Activity in the construction industry in a particular region of B.C. can vary widely from one year to the next, depending on the timing of the major projects. Due to this variability, many contractors are headquartered in Vancouver or Calgary, including Commonwealth Construction, Dillingham, Dawson and Loram.

Table 11

Estimated Consumption - Oil and Gas Industry

($ millions)

Replacement Product Group	1981	1986	1991
Drills	5.0	7.0	9.5
Gas Compressors	2.5	2.5	2.5
Pumps	2.5	3.5	5.0
Total	10.0	13.0	17.0

Source: Price Waterhouse Associates 1981 Survey.

Table 12

Estimated Consumption - Construction Industry

($ millions)

Replacement Product Group	1981	1986	1991
Drills	0.5	1.0	0.5
Earthmoving Equipment	21.0	52.5	42.0
Total	21.5	53.5	42.5

Source: Price Waterhouse Associates 1981 Survey.

2. Requirements

Total replacement parts requirements are substantial, rising from $21.5 million in 1981 to $53.5 million in 1986, then falling to $42.5 million by 1991 (Table 12).

The majority of replacement parts for the construction industry fall into the earthmoving and hauling product group. Although the dollar value of purchases in this group is large, the potential for local manufacture may be very small. The majority of parts are purchased from OEM's or local distributors such as Finning Tractor. This product group was discussed in more detail in Section 1 (Metal Mines).

G. COAL MINES

1. Key Companies

This sector of the market has been kept separate from "Metal Mines" due to its unique importance to the future economy of northeast B.C. Starting with the Quintette mine which is already under construction, current plans include the development of as many as eight coal mines with a combined output of 18 million tonnes per year by the early 1990's, if sufficient markets can be found. The key companies in the industry will include Denison Mines, Teck Corporation, British Petroleum, and Norco.

2. Requirements

Total consumption of metal replacement parts will rise to $87.5 millions by 1991 (Table 13).

Based on information from coal mines in southern B.C., the major category of replacement parts will be for earthmoving and hauling equipment ($66 million by 1991). This product group has been discussed in detail in Section IV B. Other product groups that will be significant by 1986 include process equipment ($5 million), drill

Table 13

Estimated Consumption - Coal Mining Industry

($ millions)

Replacement Product Group	1981	1986	1991
Compressors	0.0	1.5	1.5
Conveyors	0.0	1.0	1.5
Cranes/Hoists	0.0	0.5	0.5
Drills	0.0	2.0	2.5
Drive Components	0.0	1.0	1.5
Earthmoving Equipment	0.0	48.0	66.0
Mobile Equipment	0.0	0.5	0.5
Process Equipment	0.0	5.0	7.0
Pumps	0.0	2.0	2.5
Drill Bits	0.0	2.5	3.5
Other Replacement Parts	0.0	0.0	0.5
Total	0.0	64.0	87.5

Source: Price Waterhouse Associates 1981 Survey.

bits ($2.5 million), drills ($2 million), pumps ($2 million), compressors ($1.5 million), drive components ($1 million) and conveyor parts ($1 million).

The process equipment product group will include crusher parts and screens and some of these parts are currently manufactured in Vancouver. Drill bits and drills are manufactured in the United States by companies such as Bucyrus-Erie, Reed and Hughes. Further study is required to determine the manufacturing opportunities in these product groups.

Many pump parts can be manufactured in B.C., and growth of the Northeast Coal industry should make it more attractive to manufacture these parts in the north.

Gears, sprockets and other drive components also can be manufactured locally, and there is little doubt that machine shops in the Peace-Liard Region will eventually be supplying them to the coal industry.

Compressor parts and conveyor parts are currently supplied by OEM's, usually from outside of B.C.

H. OTHER INDUSTRIES

1. Key Companies

The previous sections encompass virtually all of the major industries in northern B.C., with the exception of:

- Agriculture
- Logging
- Hydro - power generation and transmission
- Alcan aluminum smelter
- Proposed petrochemical plants

2. Requirements

The agriculture and logging industries provide a market for replacement parts that are unique to those industries. Since the

parts required are best suited to manufacture by the original equipment manufacturers, we have not attempted to quantify these markets.

Although B.C. Hydro's Site C project will generate requirements for new parts, the network of hydroelectric generation and transmission facilities in northern B.C. is not a significant market for replacement parts since most items apparently have a very long service life.

The only other major operation in northern B.C. is the Alcan aluminium smelter in Kitimat. The smelter requires replacement parts in many of the product groups included in the study but the majority of purchases can be classified as process equipment. The major parts include pot shells, cradles, casings, collector bars and studs. Most of these parts are fabricated or welded in the Kitimat area or in Vancouver.

The next decade will likely see the addition of two or three giant petrochemical plants, with capital costs of over $2 billion each. Since planning for these projects is still in the preliminary stages, and timing is very tentative, they have not been included in the projections of overall demand for replacement parts. Based on discussions with a purchasing representative in an Alberta ethylene plant, any one of the proposed ethylene or LNG plants could require in excess of $50 million per year of replacement parts. Over half of the purchases would be specialized process equipment and tubing, while turbine compressor and pump parts would account for most of the remainder.

V OPPORTUNITIES FOR LOCAL MANUFACTURE

The requirement for replacement parts in northern British Columbia is already substantial and will grow dramatically in the next 10 years. However, the opportunities for local manufacture are limited mainly to those products which could substitute for long delivery items or can be sold at substantially lower prices than those supplied by OEM distrubutors in the area. In addition, there are patent and warranty considerations quite apart from the purely technical problems of engineering and manufacture.

Below, these constraints are discussed in more detail before the key product opportunities are summarized, including an estimate of the potential market shares for local manufacture.

A. PATENTS

Patent legislation in Canada allows an inventor to have exclusive rights to manufacture an item for a period of 17 years. There is no opportunity for extension of this period and, once that time has expired, it is perfectly legal for another manufacturer to copy that item. In addition, a patent on a particular assembly (e.g. pump) does not necessarily extend to its component parts, unless the component parts are individually patented.

If a potential manufacturer is unsure of what items are protected by existing patents, he may request a search of the Canadian patent records by subject area for a nominal cost. It is conceivable that patent infringement is not as severe a constraint as many manufacturers believe. Only Canadian patents require consideration before a Canadian manufacturer begins local production.

B. WARRANTIES

Many purchasing agents are worried that OEM's of major process machinery would make their warranties void on an entire assembly if any part is replaced with a "pirate" part. This form of retribution could potentially be far more severe than legal problems over patent infringement, but it is limited to process machinery. It would probably

not represent a constraint on other types of equipment, such as pumps or earthmoving equipment, which are not part of a complex manufacturing process.

C. TECHNICAL CONSTRAINTS

Many of the replacement parts that might be manufactured locally require a high degree of engineering and manufacturing expertise. Several of the buyers surveyed have experienced technical problems with parts made by local manufacturers, and would be reluctant to purchase from a manufacturer without a proven track record. On the other hand, some companies have found that the locally manufactured replacement part was superior to that provided by the OEM.

D. ECONOMIC ISSUES

The biggest barrier to entry into the replacement part industry is the need for sufficient volume to make a manufacturing company economically viable. It is very difficult to make a profit on small runs if drawings and patterns must be made each time. Due to the vast number of individual parts used in northern B.C., there are few that have sufficient volume to be economically produced.

Competition from existing firms adds to the difficulty of establishing a new manufacturing facility. Some parts manufacturers have the advantage of long-standing relationships with customers in the local area.

A positive economic factor is the effect of high interest rates in reducing inventories held by local distributors and the OEM's themselves. More and more parts are difficult to find, and the buyers are often forced to pay premium prices for parts, including the cost of preparing drawings, in order to avoid lengthy and expensive plant shutdowns.

E. SUMMARY OF PRODUCT OPPORTUNITIES

1. Product Groups

The main product groups appearing to lend themselves to local manufacture, because the local markets are large enough and there are no insurmountable constraints, are shown in Table 14.

Table 14

Potential for Local Manufacture in Key Product Groups

Product Group	Estimated Total Market ($ millions) 1981	1986	1991	Estimated Potential Market Share for Local Manufacturers ($ millions) 1981	1986	1991
Pumps	4.5	8.0	10.5	2.0	4.0	5.5
Drills and Drill Bits	8.0	16.0	20.5	2.0	5.0	6.5
Wood Room Items and Sawmill Specials	5.0	5.0	5.0	1.5	1.5	1.5
Earthmoving and Hauling Equipment	42.5	126.0	140.0	2.0	6.0	7.0
Saws	3.5	3.5	3.5	2.5	2.5	2.5
All Other Product Groups	26.8	39.2	57.7	1.5	2.0	3.0
Total	90.3	197.7	237.2	11.5	21.0	26.0

Source: Price Waterhouse Associates 1981 Survey.

This table estimates the total volume of parts to be purchased in 1991 from all sources as $237.2 millions. The constraints on local manufacture will apply in differing degrees to each of these products, such that the potential market is considerably lower. A very rough estimate of the potential market share for local manufacture of each group is shown in the right hand column. This is based on the opinions of buyers expressed during interviews, and on assessment of the impact of the various constraints referred to earlier in this section.

Overall, the potential local market share in 1981 is likely to be around $11.5 million, rising to $26 million in 1991. The relationship of these groups to industry sectors is as follows:

- Pump Parts - pump parts have been locally manufactured for the pulp mill industry with a large amount of success. In particular, the oil and gas industry should provide a good opportunity for increased local manufacture of these parts.

- Drills and Bits - these parts will be used more and more as the oil and gas, coal mining and metal mining industries grow.

- Wood Room Items and Sawmill Specials - local manufacturers are beginning to manufacture barker and planer parts and there may be a great deal of potential in the sawmill industry.

- Earthmoving Equipment - even a small fraction of this market could support a local manufacturer, selling to the construction and mining sectors.

- Saws for the sawmill industry - most of the items in this product group could be manufactured locally.

2. Industry Opportunities

Table 15 indicates the total market for replacement parts in the various industries, along with a very rough estimate of the potential market share for local manufacturers. This estimate incorporates the shares of product groups contained in Table 14 as they relate to the industry sectors.

The industries offering the greatest potential for local replacement parts manufacture and their 1991 market sizes are:

Table 15

Potential for Local Manufacture by Industry

Industry	Estimated Total Market ($ millions)			Estimated Potential Market Share for Local Manufacturers ($ millions)		
	1981	1986	1991	1981	1986	1991
Metal Mines	27.5	32.0	41.0	1.5	2.5	3.0
Sawmills	13.0	13.0	13.0	4.5	4.5	4.5
Pulp Mills	11.0	14.0	18.0	1.5	1.5	2.5
Transportation	0.2	0.2	0.2	0.0	0.0	0.0
Oil/Gas (exploration)	10.0	13.0	17.0	2.5	5.0	6.5
Construction	21.5	53.5	42.5	1.0	2.5	2.0
Coal Mines	0.0	64.0	87.5	0.0	4.5	6.5
Other	7.1	8.0	18.0	0.5	0.5	1.0
Total	90.3	197.7	237.2	11.5	21.0	26.0

Source: Price Waterhouse Associates 1981 Survey.

- Coal Mining - a new market with great potential in a variety of product groups. By 1991, this industry will dominate the replacement parts market in northern B.C. - $6.5 million.
- Oil and Gas - growth in exploration activity should provide an opportunity for local parts manufacture - $6.5 million.
- Sawmills - local manufacturers are only beginning to tap the potential in this market - $4.5 million.

3. Metal and Size

Most of the parts identified as having potential for local manufacture would be steel castings. The castings would range in size from drill bits (mostly less than 100 pounds) to parts for earthmoving equipment (mostly greater than 500 pounds).

The size and type of manufacturing facility required would depend on the products selected for manufacture. There may be some potential for local machining of parts cast or forged in Vancouver.

Many of the product groups in the study include weldments and other fabricated parts, but since these parts can be produced in any of the numerous small machine shops in the area, they are not considered to provide a significant opportunity.

4. Location

The area with the greatest potential is quite clearly the Peace-Liard Region as shown in Table 5, accounting for 61% of northern B.C.'s parts consumption by 1991. The coal mining and oil and gas markets developing in the area could be an excellent starting point for a new manufacturer.

In the short term, the greatest opportunities would be found in the Prince George area where most of the forest industry is located.

A local manufacturer which can provide fast, reliable, quality service will be able to compete easily with original equipment manufacturers which are located primarily in the United States or Eastern Canada.

F. FURTHER STUDIES

To examine more precisely the market opportunities identified above, further studies should be made in the following areas:

- Earthmoving Equipment - the size of the total market for this product group indicates the need for a study of local manufacturing opportunities, possibly under license from the OEM's.

- Drills and Bits - although there is not a tremendous market within any one industry, there may be sufficient numbers of similar parts shared among industries operating in northern B.C.

- Parts for the Coal Mining Industry - this industry alone could probably support several local manufacturers. The report entitled "Procurement Opportunities in British Columbia's Coal Industry", prepared by the Ministry of Industry and Small Business Development in 1980, provides more detail of the equipment used in coal mining as well as lists of original manufacturers of this equipment. Further studies should identify specifically which of the major equipment parts could be manufactured in northern British Columbia.

PARTS CATEGORY DETAILS

BOILERS AND ANCILLIARIES

Parts for following type of equipment:

- power boilers
- recovery boilers
- package boilers
- soot blowers
- burners
- fans
- electrostatic precipitators
- concentrators and evaporators

Typical types of parts would be:

- tubing
- steel and alloy
- housing plates
- proprietary gearing
- wear plates
- smelt spouts
- yokes
- nozzles
- doors
- specialized bearings
- scraper bars
- electrodes

COMPRESSOR AND BLOWERS

Parts for:

- air and gas compressors
- blowers
- vacuum pumps
- reciprocating
- vane screw
- centrifugal

Typical types of parts would include:

- valving
- packings
- cross-head shoes
- sleeves
- wear plates
- control items
- special bearings
- mechanical items

CONVEYORS

- idlers
- troughing
- return tracking
- head shafts
- tail
- bending
- take-up rolls
- wear plates
- steel and teflon
- special sprockets
- chains
- drag bars
- chutes
- frames
- troughs
- support steel

CRANES/HOISTS

Parts for:

- overhead
- gantry
- knuckle boom
- cherry pickers

Typical parts would be:

- pins
- sleeves
- bushings
- hydraulic and electric specialities
- special bearings
- wear plates
- wheels
- special gearing

DRILL BITS

- drill ends
- carbides, etc.

DRILL RIGS

Parts for:

- air or diesel powered track and/or tire mounted pneumatic
- percussion and/or rotary drilling units

Typical parts would include:

- hammers
- anvils
- pistons
- rods
- valving
- fitting
- connectors
- track parts
- cutting bits and steel

DRIVE COMPONENTS (EXCLUDING BEARINGS)

- couplings
- gears
- sheaves
- sprockets
- drive chain

EARTHMOVING AND HAULING EQUIPMENT

Parts for:

- bulldozers
- loaders
- graders
- rollers
- scrapers
- shovels
- clamshells
- backhoe
- off-highway haulers
- unit rigs

Typical parts include:

- engine
- suspension
- steering and other mechanical items
- wear plates
- sleeves
- bushings
- pins
- undercarriage parts
- cable
- bits and teeth
- other cutting edges

GAS ENGINE, - COMPRESSOR UNITS

Typical parts include:

- wear sleeves
- liners
- bushing
- valving
- control components
- electrical devices
- mechanical components

GEAR REDUCERS

Typical parts include:

- worms
- gears
- pinions
- gear sets
- special bearing & seals
- casings
- casing parts

MOBILE EQUIPMENT

- undercarriage parts
- hydraulics
- steering components
- wear sleeves
- bushings
- plates
- engine mechanical items
- electric and control items

PROCESS EQUIPMENT

Parts for pulp machines including:

- head box, fourdrinier, and press section components
- steam, air borne & flash drying systems
- pulp sheet cutters
- layboys
- stackers

Parts for the mining industry

- crushers
- rod mills

PULPING EQUIPMENT

Includes parts for:

- screens
- washer
- deckers
- knotters
- digester components (batch and continuous)
- bleaching equipment
- centrifugal cleaners
- agitators
- repulpers
- tankage

Typical parts include:

- screens
- wear items such as: sleeves
  bushings
  backing plates
  paddles
  blades
  shafts
  spiders
  baskets
  rotary valves
  feeders
  piping configuration
  special mounts
  gears
  casings

PUMPS

Typical parts would include:

- impellers
- shafts
- wear plates
- casings
- sleeves
- pedals
- worms
- special bearings, seals, etc.

SAWMILL SPECIALS

Parts for:

- trimmers
- edgers
- carriages
- stackers
- slashers
- special log and heavy duty type conveyors

SAWS

- complete blades, circular and band, including teeth, clamping devices, and carbide inserts

SPRINGS

- automotive leaf springs

STEEL STRAPPING

- steel band including fasteners for lumber bundles and rail car strapping.

WOOD ROOM ITEMS (CHIPPERS, BARKERS, HOGS)

Parts for:

- chippers
- bakers
- hogs

Typical parts include:

- blades
- knives
- clamps
- holders
- hammers
- liners
- sleeve
- bushing
- wear plates
- special conveying components
- special fasteners
- special hydraulics
- scrapers
- arms
- special springs
- special bearing components

GRINDING MEDIA

- rods and balls

APPENDIX B-1

COMPANIES PARTICIPATING IN THE STUDY

Metal Mining

Noranda
Placer Development
Cyprus-Anvil
Whitehorse Copper

Coal Mining

B.C. Coal
Fording Coal

Pulp and Paper

B.C. Timber
Eurocan
Finlay Forest Products
B.C. Forest Products
Prince George Pulp and Paper
Intercontinental Pulp
Northwood Pulp and Timber

Sawmills

B.C. Forest Products
Northwood Pulp and Timber
Netherland Overseas Mills
Takla Forest Products
Houston Forest Products
West Fraser Mills
The Pas Lumber
B.C. Timber
Plateau Wood Products

Oil and Gas

Westcoast Transmission
Challenger Drilling
Westland Industrial

Construction

Commonwealth Construction

Dawson Construction

Transportation

Trimac Transportation
Canadian Freightways

CP Transport
R. W. Saunders (Log Hauling)

Other

Alberta Gas Ethylene Co. Ltd.
Alcan
B.C. Hydro
B.C. Rail

Finning Tractor
QM Industries
Tristar Engineering