WESTERN LNG PROJECT

PRINCE RUPERT TO GRASSY POINT
UTILITY CORRIDOR

DOME PETROLEUM LIMITED

JUNE 1983

DOME PETROLEUM LIMITED
BOX 200
CALGARY, ALBERTA, CANADA
T2P 2H8
(403) 260-5100

File: 8.4.12

June 14, 1983

Mr. Denis K. O'Gorman
Project Analysis Division
Province of British Columbia
Parliament Buildings
Victoria, B.C. V8V 1X4

Dear Mr. O'Gorman:

Attached please find 40 copies of material pertinent to the Energy Project Certificate Application filed on behalf of the Western LNG Project. This package contains three separate subjects: 1) a general summary of Project benefits to the Prince Rupert area, 2) a draft report on the corridor selection and development to carry utilities to the Project site, and 3) a copy of a letter sent to the Mayor of Prince Rupert outlining Dome's position on taxation of the Project.

Should any questions arise from the review of this material, please do not hesitate to contact me.

Yours truly,

J. R. van der Linden
Director, Gas Projects

GAW/lr

cc: A. White
P. Lester

DOME PETROLEUM LIMITED

BOX 200
CALGARY, ALBERTA, CANADA
T2P 2H8

(403) 260-5100

May 30, 1983

City of Prince Rupert
Prince Rupert, B.C.
V8J 1L7

Attention: Mayor Peter Lester

Dear Sirs:

WESTERN LNG PROJECT
MUNICIPAL TAXES

Dome was pleased to have the opportunity to meet with the Prince Rupert City Council May 16, 1983, to discuss the current status of Dome's Western LNG Project. At that meeting, Mayor Lester requested a letter outlining Dome's position on municipal taxes.

Dome expects to pay property taxes that would normally be levied against a project of this type and estimates that the taxes will amount to $15.5 MM annually (1983 dollars). The project is outside any municipal boundaries, and the taxes would therefore be paid directly to the province.

Dome expects the project will add 330 people, directly and indirectly, to Prince Rupert's population when the plant starts up (about 2% addition to project population). It is important to the Company that the quality and level of services in Prince Rupert are not lessened by the location of the project in this area.

Whereas Dome cannot accept additional taxes on the project facilities, it would hope a mechanism can be set up by the province to allow Prince Rupert to share in the taxes paid. The sharing should reflect the very key role the City will perform in being the host community for the majority of the plant staff.

We will be making this position known to the British Columbia Ministry of Energy, Mines and Petroleum Resources in our discussions regarding the Energy Project Certificate. If we can be of assistance to the City in their presentation to other government departments, we would be pleased to participate.

Yours very truly,

J.R. van der Linden
Project Manager
Western LNG Project

RAF/lc

WESTERN LNG PROJECT

SUMMARY OF
PRINCE RUPERT AREA ECONOMIC BENEFITS

The Western LNG Project will bring significant economic benefits to the Prince Rupert area during both the construction and operating phases of the Project. These benefits are outlined in Table A.1. The Project will create 880 direct and indirect jobs during the construction phase and 162 direct and indirect permanent jobs during the operating phase. The Project will generate $35 MM ($1981) of income for local residents during the construction phase and an additional $4.3 MM ($1981) per year over the Project life.

TABLE 1

PRINCE RUPERT AREA ECONOMIC BENEFITS

EMPLOYMENT (Persons)

Construction	880 persons
Operating (per annum)	162 persons

LOCAL INCOME ($1981 MM)

Construction	$35.0 MM
Operating (per annum)	4.3 MM

Construction Phase

The economic benefits which will accrue to the Prince Rupert area over the construction phase are dependent upon the number of persons directly employed by the Project and the ability of local entrepreneurs to successfully bid for the Project equipment, material and service requirements.

The number of persons employed by the Project is further dependent upon the number of people interested in working on the Project and the constraints imposed by unions. Dome's consultants have estimated that of the total on-site direct construction phase labour requirements of 2349 jobs, approximately 12% or 280 jobs will be filled by people from Prince Rupert. An additional 600 indirect jobs are estimated to be created through direct expenditures and persons employed by the Project. This may be conservative especially in view of the recent experience of the Ridley Island grain and coal terminal projects where it was estimated that 10% of the construction labour would be provided from Prince Rupert and in fact local labour provided approximately 50% of the construction requirements.

The Project is forecast to lead to expenditures totalling near $35 MM ($1981) in Prince Rupert over the construction phase. This sum is comprised of $16.4 MM ($1981) of wages and salaries of people employed by the Project (conservatively estimated at 12% of total construction labour), $11 MM of purchases by the Project, and $7.4 MM of indirect multiplier impacts. The multiplier impacts include the provision of services for the people who are employed by or provide services to the Project.

The $35 MM total over the four-year construction period would imply an increase of six percent to the reported income for Prince Rupert for that period.

While the labour requirement for the Western LNG Project reaches a peak in the second and third year of construction, the construction activity associated with the coal and grain terminals will be winding down. This provides for a more balanced level of construction activity over a longer period of time.

Operation Phase

The operation phase of the plant will provide a steady ongoing stimulus to the Prince Rupert area. The total annual stimulus to the area will be approximately $4.3 MM. This is comprised of $2.8 MM for direct wages and salaries of permanent employees, $0.6 MM for wages and salaries of indirect jobs and an additional $0.9 MM for indirect expenditures.

The LNG plant and marine terminal requires a permanent operating staff of 92 persons. Approximately 75% or 70 persons of this total are expected to reside in Prince Rupert and commute to the LNG plant. In addition to the direct jobs, the Project is expected to generate 92 additional indirect jobs, about half of which are expected also to reside in Prince Rupert.

The total annual income generated by the Project on a permanent basis represents a 3% gain in total income for the area, but only a 1.5% increase in the projected population.

WESTERN LNG PROJECT

PRINCE RUPERT TO GRASSY POINT
UTILITY CORRIDOR

DOME PETROLEUM LIMITED

JUNE 1983

WESTERN LNG PROJECT

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BACKGROUND DOCUMENTS

1. Prince Rupert to Grassy Point Route Location Study, 1982; by N.D. Lea and Associates Ltd.

2. Conceptual Study of Bridge Across Fern Passage at Prince Rupert British Columbia, 1982; by N.D. Lea and Associates Ltd.

3. Environment Description and Assessment of the Proposed Rupert-Grassy Point Transmission Line, 1982; by TERA Environmental Consultants Ltd.

4. Application to the National Energy Board, Western LNG Project Environmental and Socio-economic Considerations of Pipeline Component Kelly Lake, Alberta Border to Grassy Point British Columbia, Westcoast Transmission Company Limited; 1983.

5. Western LNG Project Electrical Supply: The Rupert - Grassy Point Transmission Line Planning Report; by B.C. Hydro (in press).

6. Prince Rupert Sub-Regional Growth Management Plan, December 1982; by Acres Consulting Services Limited.

7. Route Reconnaissance of Prince Rupert to Port Simpson Highway, British Columbia Department of Highways, November 1972; by F.F. Slaney & Company Limited

8. British Columbia Department of Highways, Prince Rupert - Port Simpson Highway Environmental Assessment of Alternatives, September 7, 1975; by B.R. Hinton & Associated Limited

9. Benefit - Cost Analysis of the Port Simpson - Prince Rupert Road and Ferry Link for the Port Simpson Band Council, May 1978; by TERA Environmental Consultants Ltd.

10. Preliminary Report and Cost Analysis Proposed Highway Prince Rupert to Port Simpson, August 1975; by T.M. Thompson & Associates Ltd.

WESTERN LNG PROJECT

PRINCE RUPERT TO GRASSY POINT UTILITY CORRIDOR

I. SUMMARY

Location studies for the road, powerline and pipeline along the Tsimpsean Peninsula to serve the Western LNG Project have been ongoing for the past year. Preferred routes developed separately by Dome, B.C. Hydro and Westcoast for each of the three utilities were very similar, so Dome established a Corridor Co-ordination Committee. The role of this Committee was to develop a common corridor approach and to take this proposal to the various federal, provincial and municipal agencies for comment. Each company prepared its own preliminary reports but agreed to share costs for a single land survey, to develop one common all land right-of-way and to work together to minimize environmental disturbance.

Dome is currently negotiating with the Lax Kw'alaams (Port Simpson) Indian Band for access across Indian Reserve No.2 on behalf of the three participants.

Discussions with the various government bodies have resolved all concerns except for two issues with the City of Prince Rupert: 1) the road does not service the Digby Island airport as well as the Project, and 2) the road increases public access to the City of Prince Rupert's watershed reserve. Dome, B.C. Hydro and Westcoast Transmission are continuing discussions with the City in an attempt to reach a compromise on these two issues.

The Committee believes the City of Prince Rupert will accrue benefits from the Project corridor in the form of access to additional

developable land that is identified in the recent Growth Management Study (Acres 1982), and access to land set aside for a park near Butze Rapids.

The proposed corridor will provide a single right-of-way for the major portion of the route and as a result construction and maintenance costs for the utilities will be minimized. Convenient all weather access will be provided. Construction will be undertaken in a manner to protect productive fisheries streams. In general, the route will minimize the impact on the environment. The participants will be using modern construction techniques and are well equipped to construct and operate the corridor in an environmentally conscious fashion.

II. COMMON CORRIDOR

a) Overview

The Western LNG Project will be located at Grassy Point on Port Simpson Bay approximately 3 kilometres northeast of the Village of Port Simpson.

Utilities or infrastructure required on the Tsimpsean Peninsula for the liquefaction plant include:

- A 610 mm O.D. (24") pipeline to deliver gas to the Project. The pipeline will be built and operated by Westcoast Transmission Company Limited.

- A 230 or 287 KV powerline to provide electric power to drive the plant compressors, pumps and other energy users. B.C. Hydro will build the required powerline from their Prince Rupert substation near the Yellowhead Highway Bridge at Morse Basin to the Grassy Point site.

- A road for dependable all weather access to the site from Prince Rupert. The road will provide access to the plant for material and spare parts supply, operating crew changes, etc. during operations. The road is also intended to provide land access to Prince Rupert for the residents of Port Simpson. Dome expects to construct the road and operate it during the life of the Project.

- Telephone service will be required at Grassy Point during both the construction and operation of the plant. A microwave installation will be provided and no linear corridor development for this service will be required.

Dome, Westcoast and B.C. Hydro each selected their preferred routes to the Grassy Point site. The preferred routes were then superimposed and it became apparent that with only minor adjustments, the rights-of-way for all three utilities could be located within a common corridor for the greater part of the route. It appears that such a shared land use approach is technically feasible. It also offers potential advantages including the reduction of environmental impacts, the reduction of construction costs, the provision of road access to the powerline and pipeline during construction and for maintenance during operations.

Figure 1 is a map of the proposed corridor route. It indicates a corridor width of 200 metres where all three utilities are colinear and 100 metres where only the road and powerline are together. It is expected that the utilities can be kept within the boundary of this corridor. The exact location of each of the rights-of-way and the required width for the combined rights-of-way for the three utilities will be determined after on-site surveys for each of the three utilities have been completed.

b) Corridor Location

The powerline will begin at the Prince Rupert substation near the Yellowhead Highway Bridge at Galloway Rapids. Two possible routes to the east side of Butze Rapids are possible, the first would cross Morse Basin near the Yellowhead Highway bridge and proceed north across Kaien Island to meet the proposed Prince Rupert/Grassy Point road near Highway 16 in the area of Butze Point. It would then cross Butze Rapids adjacent to the bridge. The second alternative would go east from the Rupert substation, cross the mouths of Kloiya Bay and Denise Inlet and then proceed up the east shore of Morse Basin to meet the road at Butze Rapids.

CHANNEL

WORK

TSIMPSEAN PENINSULA

ALTERNATE ROUTE

LNG PLANT SITE

PORT SIMPSON

CUNNINGHAM PASSAGE

Inskip Passage

Rushbrook Passage

Grace Point

Lama Point

Worsfold Bay

Trail Bay

Stumaun Bay

Port Simpson 4

Port Simpson Indian Reserve

Town Hill

Mount Hays Griffin

Hospital Point

Gordon Point

Sarah Point

Tpl

Lizzie Hill

George Hill

Reefs

Harbour

Island

Birnie Island IR 3

Knox Point

Picnic Point

Grassy Point

Bath Point

Dock

Dock Passage

One Tree

Village I

Village II

Dams

Reactor Lake

Stumaun

Kitamaxmaxdek IR 51

Kitamaxmaxdek IR 52

Kitamaxmaxdek IR 53

Kaalsun IR 50

Ernstchoose IR 53

Ex Ind Res

L 3938

L 3939

L 3940

L 3941

L 3943

L 114

L 1381

L 998

L 3045

200m

100m

SULA MATRANGES

COAST MOUNTAINS

KITIMAT RANGE

INDIAN RESERVE 2

Mount Ben

Leading Peak

Basil Lump

ROAD, POWER, P/L - COMMON CORRIDOR

Georgetown Lake

Georgetown Mills IR 13

IR 2

East Base Point

Sandin Island

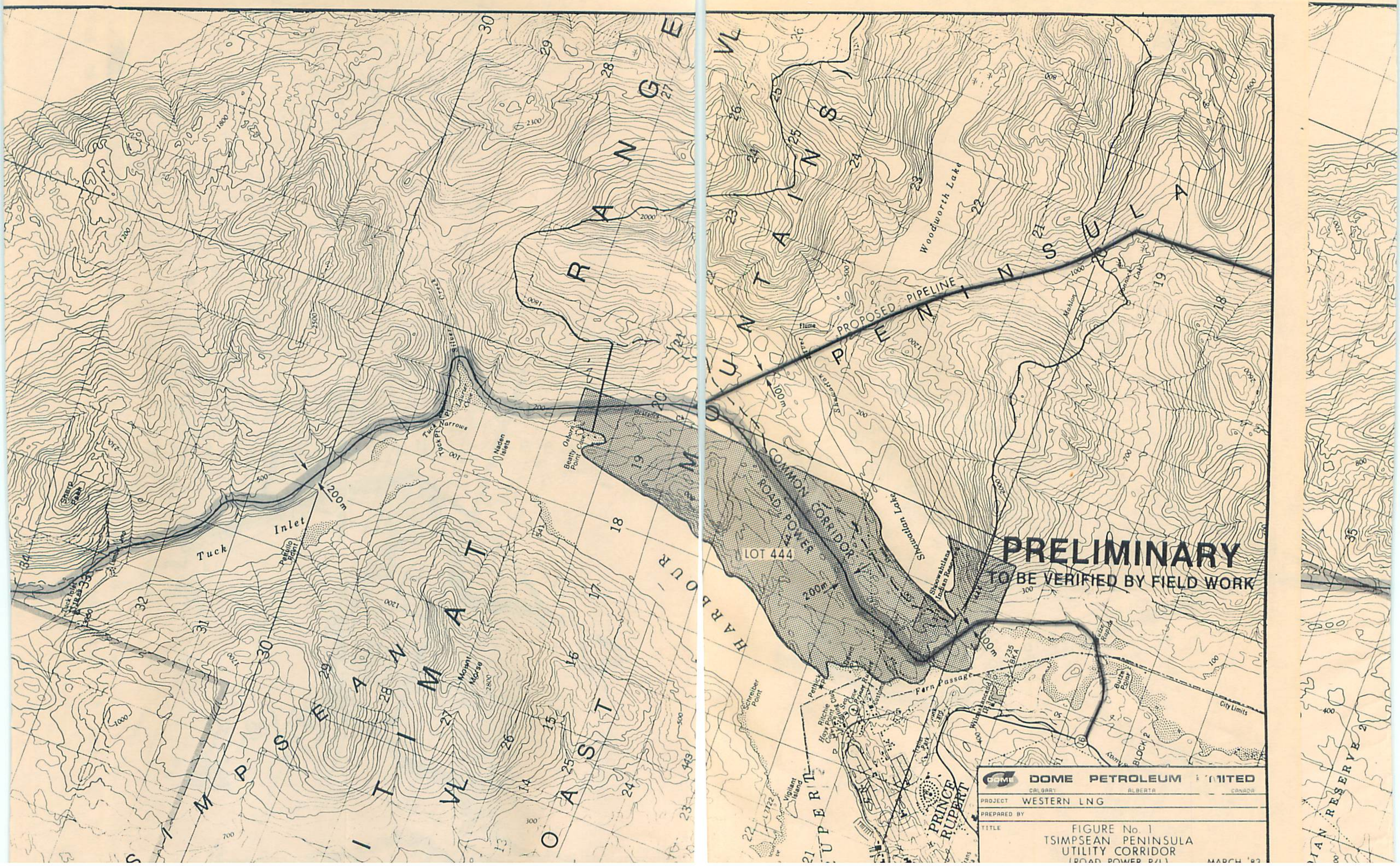
Creek

Lake

Dam

Hospital

INDIAN RESERVE 2


PRELIMINARY
TO BE VERIFIED BY FIELD WORK
PROPOSED PIPELINE
COMMON CORRIDOR
ROAD, POWER
LOT 444
200m
100m
TSIMPSEAN PENINSULA
COAST MOUNTAINS
RANGE
HARBOUR
Tuck Inlet
Tuck Pt.
Tuck Narrows
Naden Islets
Beatty Point
Woodworth Lake
Shawatlan Lake
Fern Passage
PRINCE RUPERT
Vigilant Island
Schreiber Point
Mount Morse
City Limits
BLOCK 2
DOME PETROLEUM LIMITED
CALGARY ALBERTA CANADA
PROJECT WESTERN LNG
PREPARED BY
TITLE
FIGURE No. 1
TSIMPSEAN PENINSULA
UTILITY CORRIDOR
(ROAD POWER P/L)
MARCH '82

The selected road route from Prince Rupert to the Grassy Point site begins in Prince Rupert at Highway 16, west of Butze Point on the east side of Kaien Island. The road will connect to a bridge to be built to cross Butze Rapids north of Butze Point. The road and powerline corridor will then follow the east side of Fern Passage, passing through the City of Prince Rupert owned Lot 444 and the watershed reserve, to the west of Shawatlan Lake from where it will proceed northeasterly for about 5.5 kilometres and turn north to exit the watershed reserve east of Osborn Cove. The corridor will then follow the east side of Tuck Inlet to the north end of the Inlet from where it will generally follow an existing logging road north. It will meet and then generally follow a second existing logging road northeast of Georgetown Lake through the Lax Kw'alaams reserve I.R. 2, exiting the reserve southwest of Stumaun Bay. The road will cross south of Stumaun Bay and proceed northwest to the site.

The powerline will follow the road route with two minor deviations at the north end of the reserve (Figure 1). These deviations will allow the powerline to take a more direct route and avoid costly bends in the line which would occur if it was to follow the road.

The road and powerline rights-of-way while in the watershed reserve from Fern Passage to Osborn Cove will be separated from the watershed basin draining into Shawatlan and Woodworth lakes by a ridge of high land to the east of the road. Thus no runoff from the road and powerline rights-of-way will drain into Shawatlan or Woodworth lakes.

The pipeline will leave the existing Pacific Northern Gas (PNG) right-of-way east of Prudhomme Lake. It will cross into Prince Rupert's watershed reserve north of Mahlon and Bannock Lakes (Figure 1). It will proceed northwest, pass west of Woodworth Lake, cross the Shawatlan River and meet the road and powerline rights-of-way about 1.4 kilometres southeast of Osborn Cove. The pipeline will then follow the road to the Grassy Point site.

c) Corridor Coordination

Very early in the Project planning Dome, Westcoast and B.C. Hydro recognized the necessity to establish close coordination of their planning for the routing, construction and operation of the road, pipeline and powerline up the Tsimpsean Peninsula.

On August 31, 1982 a Facilities Coordinating Committee was established with representatives from Dome, B.C. Hydro and Westcoast Transmission. Two sub-groups were set up, a Policy Group and a Working Group. This Committee or its representatives have met on seven separate occasions to date to identify their requirements, concerns, objectives and schedules; to exchange data and studies; and to identify ways in which they could coordinate (a) their liaison with various agencies to expedite the process of obtaining the necessary approvals, and (b) construction of the three utilities.

In order to provide information and determine their concerns, representatives of the Committee have met with representatives of the City of Prince Rupert, the Skeena-Queen Charlotte Regional District, the local air operators and the Department of Fisheries and Oceans in Prince Rupert, and with representatives of the Ministries of Lands, Parks and Housing, Forestry and Environment in Smithers.

Copies of reports and studies of each of the companies have been exchanged for information and the comments of the other companies. Copies of the companies reports have also been provided to the City of Prince Rupert, the Skeena-Queen Charlotte Regional District and the various government ministries.

It is the intent of the three companies to coordinate their efforts and to plan their facilities, construction and operations so as to reduce the impact to the greatest extent reasonably possible, to satisfy

the requirements of the various governmental bodies and to maximize the benefits to the City of Prince Rupert, the Port Simpson Village and the Skeena-Queen Charlotte Regional District.

On behalf of B.C. Hydro, Westcoast and itself, Dome is presently negotiating a Comprehensive Agreement with the Lax Kw'alaams Indian Band (hereafter referred to as the Band). Included in this Agreement will be separate right-of-way agreements to cross the I.R. No.2 for each of the road, pipeline and powerline. The Comprehensive Agreement is expected to be concluded shortly.

It is anticipated that Dome, Westcoast and B.C. Hydro will have separate right-of-way agreements through all lands along the corridor and that each will be responsible for the maintenance of the right-of-way for the duration of the Project. Dome has contacted the owners of the freehold land at the southeast side of Stumaun Bay to discuss the corridor with them. Unofficial contact has also been made with representatives of the Ministry of Land, Parks, and Housing and with the City of Prince Rupert to discuss the corridor land requirements.

At this point compensation for the rights-of-way has not been discussed with land owners other than the Band.

Dome has submitted an Application to the National Energy Board and an Application for a British Columbia Energy Project Certificate for the liquefaction plant and terminal for review and approval.

B.C. Hydro has begun an informal review process with relevant provincial government agencies.

Westcoast filed their National Energy Board Application for the pipeline on May 20, 1983.

Currently, efforts of the Committee are being directed to addressing the questions and concerns of the City of Prince Rupert. As well, ways in which the construction responsibilities can be shared between Dome, Westcoast and B.C. Hydro are being reviewed so that the concepts can be put in the form of an agreement between the three companies.

The practice of locating highways, natural gas transmission pipelines and powerlines in a common corridor has been conducted in British Columbia and elsewhere for many years with a very good safety record. However, the Ministry of Transportation and Highways has indicated that their present policy for new public highways is that gas pipelines should not be located immediately beside public roads.

d) Benefits and Impacts of a Common Corridor

The Band and various regulatory agencies have expressed a strong preference for a common corridor for the road, powerline and pipeline to the Grassy Point site. Their reasons for wanting a common corridor include:

- reduced land use,
- reduced environmental impact during both construction and operation,
- reduced aesthetic impact during construction and operation since access for the pipeline and powerline is provided by the road.

Dome, Westcoast and B.C. Hydro recognize additional potential benefits which will be realized by proper planning and sharing of a common corridor. Among these are:

- reduced costs of construction* resulting from:
  - . access to pipeline and powerline from the road,
  - . potential for reducing grading requirements by having the road and pipeline share common cuts,
  - . use of excavated materials from the grade preparation for road fill and for pipeline backfill.

- reduced powerline and pipeline maintenance costs as a result of ready access from the road.

- more reliable service resulting from the ability to move quickly by road to the pipeline and powerline for maintenance.

- reduced number of separate stream crossings by each linear development.

* Note

All cost estimates provided in this report are based on constructing each utility in isolation. While cost savings resulting from the use of a common corridor are expected, no estimates of the magnitude of these savings have been made at this point. These estimates can be prepared after surveys and detailed designs have been completed for the three utilities and the locations and extent of the coordination and sharing of work has been determined.

III. ROAD AND BRIDGE

a) Road

i) Road Ownership

Dome was advised the British Columbia Ministry of Energy, Mines and Petroleum Resources that all infrastructure required by the Project including the access road would be borne by the Project. Dome therefore intends to construct a private road which will qualify as an Industrial Road under the Highway Traffic Act. However Dome understands that the road may become a public road at some point in the future, and has had on-going discussions with the Ministry of Transportation and Highways regarding the design of the road. Dome understands that it will be responsible for the maintenance of the road for the life of the project or until such time as it is taken over by the Province and becomes a public road.

The alignment was chosen so that the road could be upgraded to provincial highway standards with minimal changes in route. Upgrading to provincial highway standards would require widening the road, paving the surface and replacing some of the culverts with bridges. The road could be upgraded to public highway standards initially at minimum cost. Upgrading after the road and bridge have been constructed would be considerably more expensive.

Although the purpose of the road is to serve the Project, it is intended that the residents of the Village of Port Simpson will have full use of the road for access to Prince Rupert. The general public will also have use of the road subject to provisions in the Highway Traffic Act as they apply to Industrial Roads, restrictions placed on its use by the Band where the road goes through reserve I.R.No.2, and by the City of Prince Rupert where the road crosses their watershed reserve and Lot 444.

On termination of the Project it is expected that the road will be taken over by the Province and the Band, as applicable, at which time responsibility for the road and its maintenance will be assumed by the Province and the Band. In the event that the road is taken over by the Province prior to the termination of the Project, the Province would be expected to assume the responsibility for its maintenance.

ii) Route Selection

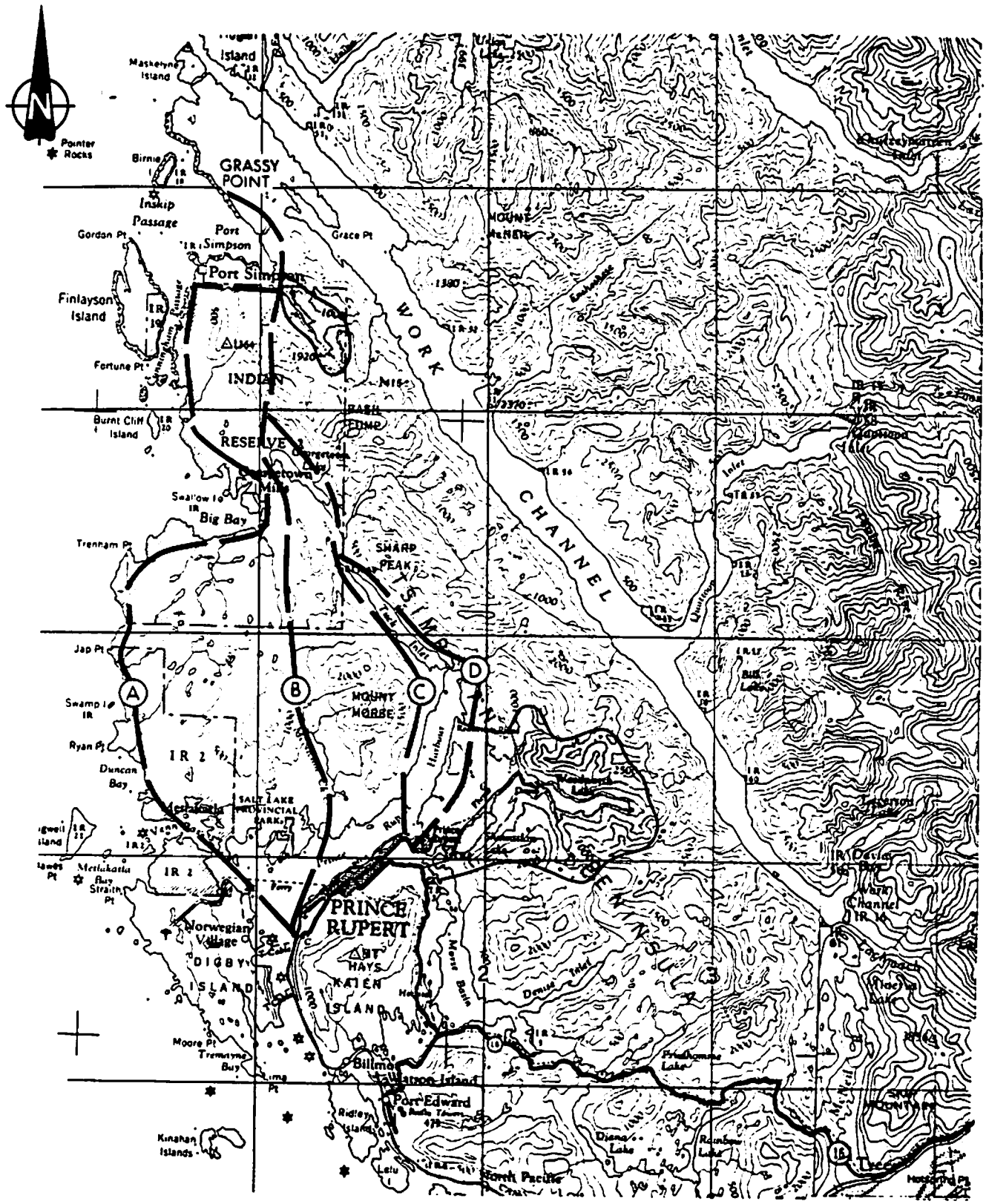
The criteria established for the selection of the road route included the following:

- safe, dependable all-land route,
- satisfy the Band's requirement to avoid environmentally sensitive areas within I.R. No.2 and in particular Big Bay,
- minimize environmental impacts along the entire route,
- share a common corridor with the pipeline and powerline,
- potential to provide benefits to the City of Prince Rupert,
- minimize costs for all three utilities.

Several studies of possible road routes between Prince Rupert and Port Simpson have been conducted in the past by the City of Prince Rupert, British Columbia Ministry of Transportation and Highways, Federal Department of Indian and Northern Affairs and the Band. These are listed with the Background Documents. The location of these routes are shown on Figure 2.

Considered in the route selection process were:

- terminal points
- engineering constraints
- environmental constraints
- feasibility of a common corridor



WATER SHED

NOTE
ROUTE "D" IS PREFERRED ROAD ALIGNMENT

DOME PETROLEUM LIMITED
CALGARY ALBERTA CANADA

PROJECT	WESTERN L.N.G.
PREPARED BY	
TITLE	FIGURE 2 PROPOSED ROAD ALTERNATIVES PRINCE RUPERT - GRASSY POINT
SCALE	
CONTR. DWG. NO.	
DOME DWG. NO.	A-WLP-100-22
REV	0

- security of service
- access to Port Simpson
- construction costs

A road evaluation report was prepared (Appendix A) which addressed these points. Subsequently a preferred route (Route D) was selected after four alternative routes were considered. The distances and cost estimates used in this analysis consider the road from Prince Rupert to Stumaun Creek only, as the route from this point to the LNG Plant are common to all four alternatives. The cost estimates quoted in the report were excerpted from cost estimates prepared by F.F. Slaney and escalated to 1981 costs by 12% per annum.

The following is a brief summary of the road and routes considered:

Route A, approximately 44.3 km in length, is the longest and least direct route and requires an 8.16 km ferry connection. This route would pass through environmentally sensitive areas which would impact on construction techniques, timing and costs. There is extensive muskeg and a high watertable in the low lying areas closer to the coast which could increase road maintenance costs. Additionally, the Band has expressed opposition to this route for environmental reasons. Route A would cross 24 watercourses and would not provide access to the proposed pipeline and powerline. A very expensive submarine crossing to Digby Island would be required in order for the powerline to share this corridor with the road. Cost estimates to construct a road along this route are shown in Appendix A Table 1.

Route B, 34.3 km in length, would require a ferry connection of approximately 4.5 km and would cross 12 watercourses. This road would parallel McNichol and Salmon Creeks with potential for serious damage to their important fisheries value. Although this route is not as environmentally sensitive as Route A, essentially the same engineering

constraints would be evident. As with Route A, this route would not provide access to either the proposed pipeline or powerline. Cost estimates (Appendix A, Table 1) and environmental concerns indicate Route B is preferable to Route A.

Route C, approximately 33.5 km in length is the shortest route to the LNG facility. A ferry crossing, approximately 2.3 km in length, would be required. Route C crosses 18 watercourses, but encounters few of the sensitive areas of Routes A or B. Access to a segment of the powerline would be possible if the powerline was located along the west side of Tuck Inlet north of Tuck Narrows. Access to the pipeline, however would not be possible from Route C until north of Tuck Inlet. The main disadvantage to this route is that it is not an all land route. Cost estimates (Appendix A, Table 1) indicate this route would be cheaper than either of Routes A or B.

Route D is approximately 39 km in length and is the only all land route. It would require a major bridge at either Fern Passage or Butze Rapids and would cross 15 watercourses, crossing most streams directly with a minimum of paralleling. This helps to minimize the disruption of the banks and beds of each stream. Route D would traverse the western portion of the City of Prince Rupert watershed and Lot 444. The road would be to the west of the height of land outside the watershed basin which is the source of water for the City of Prince Rupert. Although this route is longer and costlier than Route C (Appendix A, Table 1), it is the only feasible all land route, and would provide access to the proposed pipeline and powerline for construction and throughout the life of the Project. It would consolidate the three rights-of-way into a common corridor, thus minimizing the number of separate rights-of-way on the Tsimpsean Peninsula.

A fifth alternative, not shown on Figure 1, would consist of a road from the upper reaches of Tuck Inlet following a route identical to routes C and D. This alternative would require a ferry connection of approximately 14.5 km, and would necessitate the use of relatively high speed craft to minimize total travel times. Cost estimates were not been prepared for this alternative, however it is apparent it would be the least expensive and would have the least environmental impact. Because access to the pipeline and powerline would not be provided, except for the segment from Tuck Inlet to the site and because it would require a ferry access of significant travel time, this route was rejected.

Based on the above route selection criteria and the data available in the prior studies, Dome selected Route D as the preferred road route.

iii) Road Description

A road consultant, N.D. Lea and Associates Limited, was hired to study the feasibility and costs of constructing a road along Route D.

Socio-economic and detailed environmental matters were not a part of the study scope as these issues were addressed in other studies.

The consultant produced two reports:

- Prince Rupert to Grassy Point Route Location Study.

- Conceptual Study of Bridge Across Fern Passage at Prince Rupert, British Columbia.

The road will have two three-metre gravel surfaced lanes with one metre shoulders, with a maximum grade of 6% except at one location north of Silver Creek where the grade is 10% for a distance of approximately 0.5 kilometres. The design speed is 80 kilometres per

hour except for about one kilometre in the area of Silver Creek, where a design speed of 65 kilometres per hour will be required.

The road is designed to meet the Ministry of Transportation and Highways criteria for grades and safe speeds, and has the required 40-metre right-of-way. The project road will be an industrial road with a surface 8 metres wide. The Ministry's criteria for public road width is 10 metres.

Both the Federal and Provincial fisheries officials were consulted regarding streams to be crossed by the corridor and the impact on the fisheries resources. The consultant was advised that salmon bearing streams would require bridges rather than culverts. The following six streams fall into this category and bridges will be incorporated at these locations:

a) Shawatlan Creek
b) Silver Creek
c) Georgetown Creek
d) Unnamed Creek flowing into Pearl Harbour
e) Stumaun Creek
f) Neaxtoalk Creek

The use of bridges at other locations identified by the consultant as potential debris slide areas will be considered as more detailed design data is available. Culverts will be used for all other stream crossings.

iv) Road Cost

The estimated cost of the proposed road is provided in Table 1.

Gravel sources in the Prince Rupert/Port Simpson area are not

plentiful, therefore the cost estimate for the road construction was based on bringing gravel from coastal locations in southern British Columbia. Substantial volumes of cut rock will be required for the construction of the road and pipeline and maximum use will be made of cut rock for fill, subject to it meeting the required specification. It is expected that this will result in a reduction of the cost of the road.

b) Bridge

i) Bridge Location

The proposed bridge crossing from Kaien Island to the mainland is located at Butze Rapids.

Five possible bridge sites were identified by the consultant. These locations were reduced to two with futher study. They included a high level bridge at Fern Passage south of the Seal Cove air base, and a low level bridge located at Butze Rapids.

Discussions were held with the Coast Guard, Navigable Waters Act Administration and the Airways Inspection of Transport Canada, the air operators at Seal Cove, the City of Prince Rupert and the Regional District of Skeena-Queen Charlotte.

The Ministry of Transport Air Services objected to the Fern Passage location. It was determined to be unacceptable because of the adverse impact it would have on the sea plane traffic at Seal Cove. Similar concerns were expressed for the other potential bridge sites between Fern Passage and Butze Rapids.

The Butze Rapids bridge would not interfere with air traffic and would be acceptable from a marine safety standpoint.

ii) Bridge Description

The proposed bridge will be a one-lane concrete or steel structure designed to British Columbia Ministry of Highways and Transportion Standard MS 250 for truck loading. Piers would be located on existing rock adjacent to the rapids and on islands in the rapids such that the horizontal water clearances for marine traffic would be unchanged. Discussions with the Coast Guard identified that a 12.2-metre (40 foot) vertical clearance above highest high tide would be sufficient. The bridge design will be adjusted to provide the necessary vertical clearance.

Approaches to the bridge will be located on fill to minimize the structure length and costs.

iii) Bridge Cost

The estimated cost of the Butze Rapids bridge is provided on Table 1.

c) Benefits and Impacts of the Proposed Road

The selected road route as shown on Figure 1 has the potential to provide significant benefits to the City of Prince Rupert and the region.

Industrial and residential land in Prince Rupert, for the long term requirements of the City, is in relatively short supply. Shoreline property with road and deep water access is especially limited. A recent Growth Management Study (Acres, 1982) identifies the following areas as having potential for future development: the east side of Prince Rupert Harbour near Fern Passage, the Kaien Island side of Fern Passage, Digby Island and near Port Edward.

TABLE 1

ESTIMATED COST OF PROPOSED ROAD AND BRIDGE

(1982 4th Quarter dollars Cdn.)

ROAD

Construction Costs	$33,520,000
10% Engineering	3,352,000
20% Contingency	6,704,000
	$43,576,000

BRIDGE

Bridge and Approach Fills	$6,040,000
10% Engineering	604,000
20% Contingency	1,208,000
	$7,852,000

The proposed road crosses to the east side of Fern Passage and Prince Rupert Harbour. Dome is prepared to discuss the potential to upgrade the bridge and road to service these areas. Early input from the City of Prince Rupert, the Regional District and the Province would identify the standard of road and bridge which would meet future requirements of the area. A commitment of outside funds by the Province or the City of Prince Rupert would allow the one-lane bridge to be redesigned for two lanes of traffic and the road to be upgraded to provide dependable all weather access to these areas suitable for the identified future needs. The fresh water supply system for Prince Rupert currently crosses through the area on the east side of Fern Passage and could be expanded to service future requirements in these areas. Sewerage and telephone would be the remaining utilities requiring development to service this area. The proposed road would provide land access for the City of Prince Rupert to the east side of Fern Passage for maintenance of the City water supply system and would increase the supply of developable land available to the city. This area was identified as a potential area for development in the Acres Report, but was excluded from primary consideration due to the lack of road access.

The opportunity exists to access and service a large area of land with water access at minimum cost and to allocate this land (most of which is already owned by the City of Prince Rupert) to the greatest benefit for the City and region.

A 4.85 ha parcel of land has been allocated to Prince Rupert by the British Columbia Development Corporation for park development and access to the waterfront at Butze Point. The approach to the bridge from Highway 16 could provide access to this property. Coordination with BCDC and the City of Prince Rupert will ensure a minimum impact on the use of this area.

Future development in the Prince Rupert area will require additional residential land, and land with water access for both recreational and industrial purposes. The north shore of Prince Rupert Harbour has a high potential for this purpose but is handicapped at present because of limited access by water only. The City, Regional District or Province may wish to construct a bridge across Tuck Narrows from the proposed Prince Rupert/Grassy Point road and a road along the west side of Tuck Inlet to the north side of Prince Rupert Harbour to open the north shore for future development, providing it with dependable all land access.

A road from Prince Rupert to Grassy Point will provide land access to forest areas where currently none exists. British Columbia Ministry of Forests personnel in Prince Rupert have advised that on the west side of Tuck Inlet, very litte merchantable timber is available, except for that in Indian Reserve Number 2. This would be accessible from a road on either the west or east side of Tuck Inlet. The preferred route, with its shoreline alignment opens up little forest. The section of the road through the watershed reserve passes through some timber but cutting will not be permitted in this area. Access to merchantible timber was therefore not a factor in the selection of the preferred road route.

Guidelines for Watershed Management of Crown lands used as Community Water Supplies will generally be followed to minimize the impacts on Prince Rupert watershed.

IV. PIPELINE

a) Pipeline Route Selection Methodology - Tsimpsean Peninsula

Westcoast Transmission Company Limited, recognizing that the Tsimpsean Peninsula is difficult terrain through which to construct and operate a pipeline, completed several reconnaisance trips and examined air photographs to identify alternative pipeline corridors. Published information related to environmental and geological conditions was also reviewed. This work was completed independent of road access and powerline transmission studies, and led to the selection of a preferred pipeline route. The proposed route is the shortest and most cost effective, avoiding steep and adverse terrain conditions.

b) Pipeline

The preferred pipeline route to service the Grassy Point facility would leave the existing PNG pipeline right-of-way east of Prudhomme Lake and proceed in a northwesterly direction past the eastern tip of Denise Inlet. It continues in a northerly direction passing northeast of Bannock Lake and enters the Prince Rupert Watershed Reserve southest of Mahlon Lake. The route would continue in a northwesterly direction crossing the Shawatlan River between the Shawatlan and Woodworth Lakes and intercept the proposed utility corridor southeast of Osborn Cove. The pipeline would then generally follow the road to the Grassy Point.

An alternative route which was studied and rejected would have left the existing PNG right-of-way at a point southwest of the southern tip of Work Channel, proceed in a northwesterly direction along the west shore of Work Channel to a point south of Zumtela Bay, then proceed directly to the plant site. A variation of this route was also investigated in which the pipeline would be routed along the west shore

of Work Channel, to a point north of Louise Lake. At this location, the route would cross the peninsula in a northwesterly direction east of the watershed, then parallel Silver Creek and intercept the proposed utility corridor at Laurier Cove. From this point the pipeline would follow the road to Grassy Point. Both routes along Work Channel were discounted because of anticipated extremely difficult working conditions which would have led to excessive construction costs.

An alternate route around the watershed basin was also investigated. It would divert from the preferred route south of Bannock and Mahlon lakes, proceed in a westerly direction along the valley to Morse Basin and intersect the proposed corridor north of Butze Rapids. The pipeline would then follow the corridor to Grassy Point. This alternative would add approximately four kilometres to the pipeline route and result in a significant increase in capital costs.

Sound pipeline construction practices and precautions which the proponent proposes to use, combined with consultation and the cooperation of all affected parties will minimize impacts on the watershed. Practices and precautions which would be taken in this area would include, but not be limited to, the following:

i) All sanitary arrangments for workers would comply with the Health Act, Waste Managment Act, and specific requirements of the City of Prince Rupert.

ii) Access to the watershed would be restricted to only those personnel engaged in the construction and operation of the pipeline.

iii) Manpower and equipment activity within the watershed would be minimized. The pipeline right-or-way would not be used as a transportation corridor for further construction activities on the Tsimpsean Peninsula.

iv) All construction camps, site offices and equipment storage areas would be located outside the watershed.

v) During construction, extreme caution will be taken to avoid spills of fuel and oil. Any minor fuel spills that occur would be cleaned up immediately. All waste petroleum products resulting from equipment maintenance would be removed from the watershed for disposal.

vi) Westcoast does not, and would not, use any herbicides on the pipeline right-or-way during construction or maintenance operations.

vii) All refuse including, but not limited to, plastic cans, bottles, coating materials, containers and welding rods used during construction would be removed from the watershed or otherwise disposed of in a manner approved by the regulatory authorities having jurisdiction.

viii) Grading of all slopes will be kept to an absolute minimum. According to standard pipeline construction practice, erosion control berms or terraces comprised of native impermeable soil would be constructed across the right-of-way on steeply sloping terrain to retard erosion. Particular attention would be given where slope stability is sensitive or where soils are fine-grained.

ix) To further minimize soil erosion and enhance revegetation, the graded pipeline right-or-way would be seeded following construction. In addition, site specific measures may include the use of mulches and erosion control fabrics to stabilize sensitive soils, reduce slopewash and inhibit top-soil erosion.

x) All natural surface water runoff across the pipeline right-of-way would be maintained in natural water courses.

xi) All stream crossings would be carefully constructed with the buried pipeline installed in as short a time interval as practicable to minimize interference with banks and channel beds. Grading into stream channels would not be permitted.

xii) No permanent barriers would be constructed at any stream crossing. Temporary equipment crossings would be constructed, wherever required, to reduce in-stream activity and to keep siltation to an absolute minimum.

xiii) Following construction, suitable barricades, as directed by authorities having jurisdiction, would be constructed across the right-or-way along the watershed boundaries to discourage entry into the watershed.

xiii) No borrow materials will be excavated from the watershed.

V. POWERLINE

a) Selection of a Transmission Line Route

The Tsimpsean Penninsula is a difficult territory for transmission line construction and operation. Nevertheless, several transmission line routes, including new opportunities presented during the common corridor planning process, are possible between the Prince Rupert Substation (at the south end of Morse Basin) and Grassy Point. Based on system planning, route engineering and environmental impact assessment studies done by B.C. Hydro, and upon on-going common corridor planning discussions between Dome, Westcoast and B.C. Hydro, and government agencies and interest groups, the following recommendations are made.

Before common corridor possibilities were known, the transmission route preferred by B.C. Hydro is that shown on Figure 3 as A-B-C-D-E-F-G-H-I. This route assumed no bridge across Morse Basin and does not cross Reserve I.R.2.

Since the preferred industrial road route includes a bridge at Butze Rapids, a transmission route using this crossing, A-A'-B'-C, is a feasible alternative to a route A-B-C around the Morse Basin via Kloiya Bay. In addition, route G-I through Indian Reserve I.R.2 was reconsidered since the preferred road and the natural gas pipeline rights-of-way will follow this route.

Route G-I is more direct, crosses easier terrain, and will be less costly to construct than route G-H-I. Also, operation and maintenance of G-I will be easier and less costly than G-H-I because of access offered by the road. The combined impact on the Tsimpsean Penninsula will be reduced also.

Dome is currently negotiating an agreement with the Band; included in this agreement will be provision for a right-of-way for the trans-

transmission line through Reserve I.R.2. If Dome is successful in negotiating a right-or-way agreement satisfactory to B.C. Hydro then G-I is clearly preferable to G-H-I.

In general, the most advantageous transmission route is one that parallels the road and pipeline as much as possible. Nevertheless, after weighing the relative merits of routes A-B-C and A-A'-B'-C', B.C. Hydro perfers to go around Morse Basin via Kloiya Bay rather than cross adjacent to the bridge at Butze Rapids. Route A-A'-B'-C' would cost about one-third more, would be technically more difficult, would require double circuit steel structures along Hospital Cove and Galloway Rapids, and would preempt land needed for future transmission line rights-of-way on Kaien Island. Route A-B-C would use wood poles and could be completed in a shorter time, although the visual impact may be important.

Therefore, all things considered, B.C. Hydro recommends transmission route shown on Figure 3 as A-B-C-D-E-F-G-I. This route is 47.3 kilometres long and would cost approximately $12,980,000 for a 230 KV line and about $15,391,000 for a 287 KV line. If it is decided that a crossing at Butze Rapids is more appropriate, the Rupert/Grassy Point transmission line can be built via route A-A'-B'-C-D-E-F-G-I. This route will be 47.4 kilometres long and would cost approximately $17,467,000 for a 230 KV line and about $20,641,000 for a 287 KV line.

b) Digby Island/Metlakatla Route Alternative

The City of Prince Rupert suggests consideration be given to having the transmission line follow the route of the existing 25 KV line from Oldfield Substation at Prince Rupert to Digby Island, over to Metlakatla, to Port Simpson, and then to the Grassy Point Site. B.C. Hydro has examined this alternative.

The suggested route would require a double circuit, steel pole line through the City of Prince Rupert, and underwater cables between Kaien Island and Digby Island and between Digby Island and Metlakatla. This route would be longer than the proposed route technically more complex, more expensive, and more difficult to maintain than a direct route between the Prince Rupert substation and Grassy Point. This route would not have the advantages of sharing the common corridor with the road and pipeline if these were built where proposed. Prince Rupert/Digby Island/Metlakatla/Grassy Point route would not be B.C. Hydro's choice, even if the road was to follow this route.

c) Morse Basin Crossing

B.C. Hydro would prefer to construct the transmission line around Morse Basin via Koiya Bay. Nevertheless, a crossing adjacent to the bridge is feasible. The precise height of the transmission line across Butze Rapids has not been established at this time. Detailed engineering studies will determine specific structure locations, structure designs, and structure and conductor heights. The lowest point of sag of the conductors would meet the clearance requirements of the Navigable Waters Protection Act. Transport Canada's aviation standards for structure marking would apply for the structures.

d) B.C. Hydro Activities within the Watershed

B.C. Hydro will be pleased to cooperate with the City of Prince Rupert in order to develop an appropriate management plan for the construction, operation and maintenance of the transmission line.

B.C. Hydro has built and operated transmission lines within municipal water supply areas, for many years, throughout the province, including the Capilano Watershed that supplies the Greater Vancouver Water District.

Based upon past experience, the following general statements outline B.C. Hydro's normal practice:

i) Access by B.C. Hydro personnel shall be restricted to persons engaged in the work. A minimum number of persons will be used in the watershed for maintenance and repairs.

ii) All refuse and waste shall be collected and removed from the watershed. No servicing of vehicles and equipment shall be carried out within the watershed except for small hand tools. Extreme caution shall be taken to avoid spills of fuels and oil. All spills that occur shall be cleaned up immediately.

iii) Portable self-contained privies shall be placed in areas where men are working. Use of these privies is required.

iv) No chemicals shall be permitted to be used within the watershed for pest or vegetation control, except for capsule injection. Fertilizer may be used selectively in order to promote re-establishment of vegetation on erodible surface.

v) No materials and equipment shall be left within the watershed on completion of construction except the transmission structures, conductors, anchors and fittings; clean, well-graded granular fill and rockfill; concrete and steel reinforcement, and other necessary materials and equipment.

vi) Generally, trees and brush shall be felled using hand equipment.

VI. WATERSHED

The location of the proposed Prince Rupert/Grassy Point road has raised the concern of the City of Prince Rupert over the potential risk to the watershed reserve by improved access to the east shore of Tuck Inlet. The road is located on the west side of the height of land which will separate it from the Woodworth and Shawatlan lakes' drainage basin. Thus, no runoff from the road and powerline corridor would find its way into the reservoir drainage from which the City obtains its water supply.

The Minister of the Environment of the Province of British Columbia has published "Guidelines for Watershed Management of Crown Lands used as Community Water Supplies". Dome, Westcoast and B.C. Hydro intend to comply with these Guidelines to reduce the impact and risk to the watershed and will cooperate with the City and the Community Water Supply Section of the Ministry of Environment to identify and implement further measures to safeguard this resource.