ENVIRONMENTAL CONSIDERATIONS

IN LNG TERMINAL SITE SELECTION

FOR

DOME PETROLEUM LIMITED

FEBRUARY 1981

BY

TERA ENVIRONMENTAL CONSULTANTS LTD.

project team to evaluate the environmental (social, terrestrial, aquatic and climatic) considerations of site selection. Both consultants were requested to evaluate each of the possible locations in sufficient detail to meet the requirements of federal or provincial government regulatory applications.

Dome Petroleum Limited accepts the approach, findings and recommendations described in the "Environmental Considerations in LNG Terminal Selection" by Tera Environmental Consultants Ltd., and "Engineering Considerations in LNG Terminal Selection" by Swan Wooster Engineering Co. Ltd.

The reports describe 26 potential terminal sites. Several evaluation criteria and a matrix method of comparison were used to narrow this list to seven technically feasible sites. The technically feasible sites then were given a more comprehensive evaluation, resulting in the following ranking of preferred sites:

Grassy Point (Port Simpson Bay)
Chesnucknuw Creek/Coleman Creek (Alberni Inlet)
Britannia (Howe Sound)
Emsley Cove/Bish Creek (Kitimat Arm)
Texada Island (Strait of Georgia)

After detailed examination of the seven sites, the Grassy Point and Alberni Inlet sites showed the least social and environmental impact for an LNG terminal. Evaluation of the list of alternative sites also showed the Grassy Point and Alberni Inlet sites to have significant engineering advantages. The construction of a natural gas pipeline to Grassy Point does not require the significant marine water crossing necessary for pipeline construction to Vancouver Island. For these reasons the project is proceeding with Grassy Point as the preferred terminal location.

Pipeline routes to the alternative areas of study were not to be considered by the consultants. The pipeline would be designed and constructed by an existing regulated carrier such as Westcoast Transmission Company Limited. Discussions were held with Westcoast concerning the general feasibility of con-

structing pipelines to each of the six general areas within B.C. where sites were evaluated. Westcoast advised that pipelines could be built to tidewater (as generally described in the Tera report), and that the environmental and social impacts are a function of the presence or absence of existing pipeline corridors, and the length of new pipeline. Sufficient study of pipeline routing to each area was done to confirm that pipeline construction would be possible. Detailed studies on engineering and environmental considerations of the pipeline would be conducted by Westcoast Transmission Company Limited or an affiliate.

The subject of risk analysis is not dealt with in detail in either the Tera or Swan Wooster reports. Dome provided guidance to both firms using the criteria that sites closer than 1.5 km from existing population centres were not to be considered. The basis for this was the evaluation made by Dome of the procedures outlined in the report for the U.S. Federal Power Commission entitled "Alternative Site Study Northeast Coast Liquefied Natural Gas Conversion Facility." The criteria established for this report was "The overall population density in the area of the site (i.e. within a 4 mile radius) should be low." This criteria appeared rather arbitrary as populations of greater than 1,500 people occurred within this 4 mile limit at all of the preferred sites evaluated for the FPC.

Dome has retained Ecology and Environment Inc. of Buffalo, N.Y. to undertake a comprehensive public safety analysis. Their Mr. Frank Silvestro is a recognized expert in this field. Mr. Silvestro has advised that conventional mitigation and safety procedures would provide adequate protection beyond a 1.5 km distance. To allow for comparison between alternate sites a numerical ranking of population proximity criteria was arbitrarily assigned in the social consultants' site comparison.

The detailed risk analysis studies for credible LNG spills (accidents) on both land and sea, based on conventional LNG plant engineering design, will be provided as supporting documentation for regulatory applications.

Dome has approached the British Columbia Development Corporation to request that a detailed geotechnical program be

completed to assess the foundation and soil characteristics of the Grassy Point site. Environmental consultants have also been retained to evaluate the meteorology, oceanography, fisheries, wildlife, vegetation, water quantity and quality; land forms, terrain, seismicity and surficial geology, and heritage resources of the Grassy Point site to confirm that the site is suitable for the Western LNG Project terminal. Other studies are in progress on civil and process engineering design of the proposed facility.

We look forward to the opportunity to develop the LNG Project in British Columbia. The project schedule calls for regulatory approvals in early 1982. In achieving this schedule we will continue to rely on you and your staff for both the rigorous review of project documents demanded by the public and guidance through the regulatory process.

While the formal application, which will include these site selection studies, is still a few months away, we wanted to provide the site evaluation studies to you in the interest of keeping you fully abreast of our activities. We anticipate making a public announcement of the preferred location in the immediate future.

Yours truly,

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

JRV/sa

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L I S T O F T A B L E S

SUMMARY

Dome Petroleum Limited proposes to construct a natural gas liquefaction and marine loading facility at a British Columbia tidewater location. In anticipation of applications for the necessary regulatory approvals, Dome retained Swan Wooster Engineering Co. Ltd. and Tera Environmental Consultants Ltd. of Vancouver, B.C. to conduct an engineering, social and environmental overview of potential LNG terminal sites. Preliminary reconnaissance visits identified 26 potential LNG terminal sites. These sites are located in six areas are:

a)	Skeena Nass area	7 sites
b)	Kitimat-Kemano area	7 sites
c)	Bella Coola area	2 sites
d)	Greater Vancouver area	2 sites
e)	Powell River area	4 sites
f)	Alberni Inlet area	4 sites

On the basis of previous experience by the consultants and a comprehensive literature search, an environmental evaluation of each potential site was conducted. Numerical scores were assigned to various social and environmental determinants for each site. The sum of the scores of each potential site was ranked from the lowest score (best terminal site) to the highest score (worst terminal site).

Engineering evaluation of the potential sites resulted in elimination of some of the sites. Some of the sites were considered to be too close to established communities; others had geotechnical shortcomings and were eliminated. The sites with the highest (worst) scores were not considered further. This process yielded a "short-list" of technically feasible sites:

a) Skeena Nass area - Grassy Point
b) Kitimat-Kemano area - Emsley Cove/Bish Creek
c) Greater Vancouver - Britannia
d) Powell River area - Texada Island
e) Alberni Inlet area - Chesnucknuw Creek/Coleman Creek

More detailed social and environmental evaluation for the technically feasible sites with special emphasis on mitigation opportunities yielded more comprehensive scores. These scores were expressed for both the raw (unmitigated) social and environmental values and for the mitigated environmental and social values. Ranking the five technically feasible sites on the basis of the mitigated scores (residual impact), resulted in the following list of preferred sites:

1) Skeena Nass - Grassy Point
1) Alberni Inlet - Chesnucknuw Creek/Coleman Creek (ranked equal)
2) Kitimat-Kemano - Emsley Cove/Bish Creek
3) Powell River - Texada Island

It was decided that the Britannia site, while technically satisfactory, was not to be included due to the proximity of the community of Britannia Beach and the significant recreational value of Howe Sound.

On the basis of residual impacts, the Grassy Point and Alberni Inlet sites showed the least social and environmental impact for an LNG terminal assuming conventional mitigation procedures. On the basis of environmental effects to provide a natural gas pipeline to these sites, the Grassy Point site appears to offer the least social and environmental impact.

ENVIRONMENTAL CONSIDERATIONS IN LNG TERMINAL SITE SELECTION

1.00 INTRODUCTION

Dome Petroleum Limited is proposing the development of an LNG (Liquefied Natural Gas) export terminal on the west coast of British Columbia. This will involve the design, construction and operation of natural gas liquefaction, storage and terminal facilities capable of processing up to 12.0 million standard cubic metres per day of natural gas at a suitable location on tidewater.

An environmental overview to evaluate the alternate terminal sites on the British Columbia coast was conducted by TERA Environmental Consultants Ltd. on behalf of Dome Petroleum Limited. The study encompassed the entire British Columbia west coast including Vancouver Island. Twenty-six sites were identified which, through a step-by-step planning process, were each examined using a comparative ranking process. From this "long list" of potential sites a "short list" of feasible sites was derived. Each of the feasible sites on the short list was assessed a second time using a more comprehensive matrix of environmental and social factors.

In the relatively short time available for this study, the site evaluation has been of an overview nature. For this reason, senior consultants with prior experience in environmental port selection studies were employed to assess the environmental considerations. Helmut Urhahn assessed the terrestrial, John Thomas the social, and Ross Peterson the aquatic considerations. Swan Wooster Engineering Co. Ltd. was also retained by Dome to assess the engineering suitability of the various sites.

This work has drawn on the initial work by Dome engineering and environmental staff and has also drawn on published reports by a wide variety of companies and government agencies. No specific contacts with government agencies were made by the consultants during the course of this study.

Following selection of the preferred site, Dome Petroleum will commence a series of detailed, site-specific environmental and socio-economic impact assessment studies. These studies will be conducted in support of the regulatory applications and will address in detail the factors considered in an overview manner in this report.

2.00 PROJECT DESCRIPTION

The Western LNG Project consists of three principal components:

1. A natural gas pipeline to be constructed and operated by Westcoast Transmission Company Limited, or affiliates.

2. A natural gas liquefaction and storage facility constructed and operated by Dome Petroleum Limited.

3. A marine terminal to load the LNG carriers for delivery to Japan. The terminal will be constructed and operated by Dome Petroleum Limited.

The most important criteria in selection of the LNG terminal site are public safety; suitable foundation and terrain conditions for the processing, storage and dock area; and safe marine approaches to the load-out dock.

While the natural gas pipeline and access road to the site are also critical elements, they have received less attention in this study. At this stage of site comparison, the pipeline and access route(s) have only been examined in

sufficient detail to confirm that they are feasible. Detailed studies to optimize the environmental considerations in route selection and construction will be conducted in conjunction with that portion of the project by Westcoast Transmission Company Limited or affiliates.

The facilities at the terminal site of the Western LNG Project would consist of: 1) liquefaction and storage facilities, and 2) an LNG carrier Loading Wharf.

1. Liquefaction and Storage Facilities

Gas liquefaction and storage facilities would occupy about 40 hectares on a site of 160 hectares. The cryogenic liquefaction facility would have the capability of processing 12.0 million standard cubic metres per day of natural gas received at pipeline conditions, by cooling to approximately -160°C in two equal size liquefaction units.

The LNG storage tanks would be surrounded by an earthen or concrete dyke impoundment system capable of holding at least 100% of the storage volume of the tank in the event of an accidental spill.

Comprehensive gas detection, vapour recovery, fire prevention and protection would be provided for the liquefaction and storage facilities.

The LNG would be taken from the storage tanks by pipeline to the loading wharf. A large cryogenic vapour return line would be provided to recover revapourized gas.

2. LNG Carrier Loading Wharf

A loading wharf would be designed to accommodate a single 125,000 cubic metre capacity LNG carrier constructed with a cargo containment system consisting of five spherical tanks. Typical vessel dimensions are as follows:

Cargo Capacity	125,000 m^3
Length Overall	285 m
Breadth	44 m
Depth	25 m
Draft	10 m
Total Deadweight	65,000 tonnes
Displacement	95,000 tonnes
Design Speed	20 knots
Auxiliary Fuel Used	1,500 second fuel or diesel

Four ships would be constructed specifically for this project. Each ship would make about one visit per month.

a) Wharf Design

The LNG loading wharf would consist of a working platform, a supply loading platform, two berthing dolphins and two mooring dolphins. The loading wharf would be linked to shore by a trestle which would support the cryogenic liquid pipeline, a vapour return line and a single lane road.

The working platform would support the LNG loading arm, complete with a vapor return arm, a control tower, fire monitors, and ship access gangway.

The supply loading platform would also function as a mooring platform. Supplies such as fuel oil, liquid nitrogen, lube oil, potable water, and food, could be loaded onto the ship from this platform while LNG is loaded from the working platform.

Catwalks would be used to connect the mooring dolphins to berthing dolphins.

All standard safety features such as gas and fire detection; and navigational aids would be maintained.

b) Cryogenic Loading Facilities

The marine loading system would be rotating counter weight marine arm design consisting of four loading arms and one vapour return arm.

The hydraulically powered arms would be controlled from either the dock control tower or from a portable control unit carried on board the ship.

An emergency release system would be installed to provide termination of pumping and cause safe uncoupling of the arms without liquid spillage in the event of an emergency. Also, an alarm system would be incorporated to alert the operator if the ship moves out of pre-established limits during loading.

A control tower provided on the loading platform would give the loading operator an unobstructed view of all loading operations. All standard safety features such as fire and gas detection would be provided.

Project Schedule

The project schedule proposes to commence shipping of LNG in mid-1985. This would require gathering of baseline environmental data and submission of regulatory applications in 1981, regulatory review and receiving approvals in 1982, engineering procurement of equipment and construction to commence in 1982-83. A project schedule bar graph is shown in Figure 1.

Construction manpower is estimated to average 300 and peak at about 600 over a three to four year construction period. Operations would require a staff of about 50 employees.

Regulatory Requirements

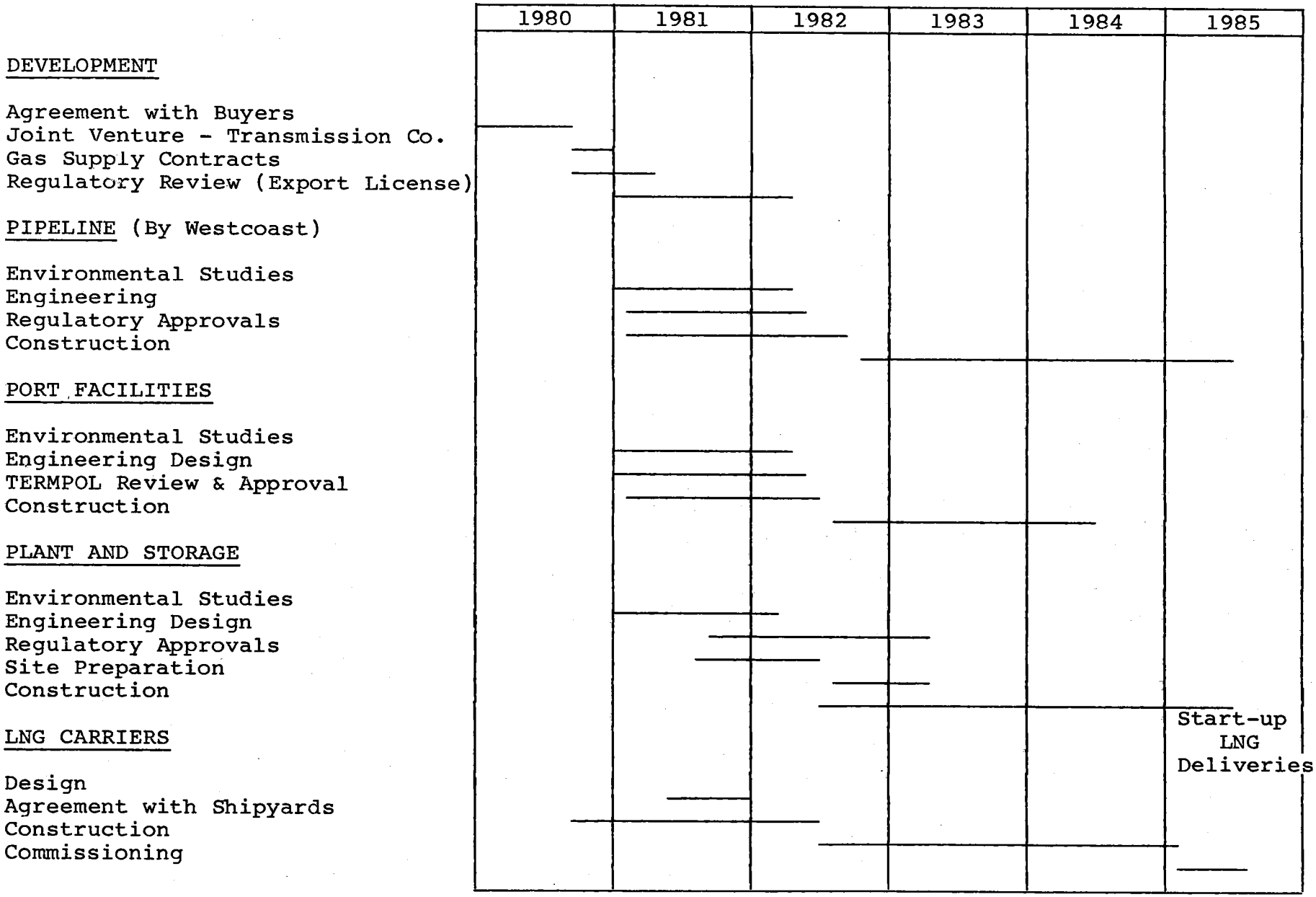
Federal and Provincial regulatory approvals would require preparation of applications to: 1) the National Energy Board; 2) the Federal Ministry of Transport (Coast Guard TERMPOL application), 3) the B.C. Ministry of Energy, Mines and Petroleum Resources, and 4) other authorities for applicable licenses or permits.

Approvals for pipeline looping and new pipeline construction would be obtained by Westcoast Transmission Company Limited, or affiliates.

Operations and Safety Training

Throughout the design and construction phases of the project there would be development of job site training programs for operations staff followed by operator experience at an existing LNG facility. Project start-up would be conducted in a planned, safe, methodical fashion.

FIGURE 1
WESTERN LNG PROJECT SCHEDULE



3.00 STUDY APPROACH AND METHOD

The study was based on a stepwise planning process with increasing focus on technically feasible sites. The investigation commenced with the determination of a study area defined as the entire B.C. Coast. Initial studies generated 26 potential sites in six areas along the B.C. Coast. The sites were then evaluated on the basis of social and environmental determinants using a scoring system on each of the 26 sites. Engineering considerations were then added for the potential and technically feasible site comparison.

The scores were based on a scale containing the following points: +8, +4, +2, +1, 0, -1, -2, -4, -8. Adverse impacts have a negative sign, while desirable impacts are labelled positive. The numerical score distribution can be described in words as follows:

0	no impact
-1	low impact
-2	moderate impact
-4	high impact
-8	very high impact

The study team felt that weighting was not necessary at this time.

Once all potential sites were evaluated, they were ranked by their scores from the lowest to highest numerical value. The potential LNG sites which were judged to be too close to existing communities were then eliminated as potential sites. Engineering considerations were also used to evaluate all potential sites. This eliminated some of the potential sites, leaving a short list of technically feasible sites.

All technically feasible sites were inventoried and assessed in more detail. Each of the social, terrestrial, aquatic and climatological resources were scored on the basis of resource value and resource sensitivity to determine the raw impact score for each resource at all technically feasible sites. "Value" was defined as the tangible and intangible value of a resource as perceived by the professional. "Sensitivity" was defined on the basis of the project description and potential impact which could accrue to the resource and its vulnerability. The higher of these two numbers formed the raw impact score. The second step in the scoring for the technically feasible sites involved determination of mitigation effectiveness. It was assumed that conventional mitigation procedures or identified special mitigation procedures could be used to reduce adverse impacts identified in the raw impact score. This then established the residual impact for each of the resources (see Figure 2).

The impact scoring process described above was then applied to the detailed matrix of the technically feasible sites and yielded raw impact scores for each of the "short-listed" port sites. These site scores were totalled and ranked on the same basis as the potential sites from lowest to highest.

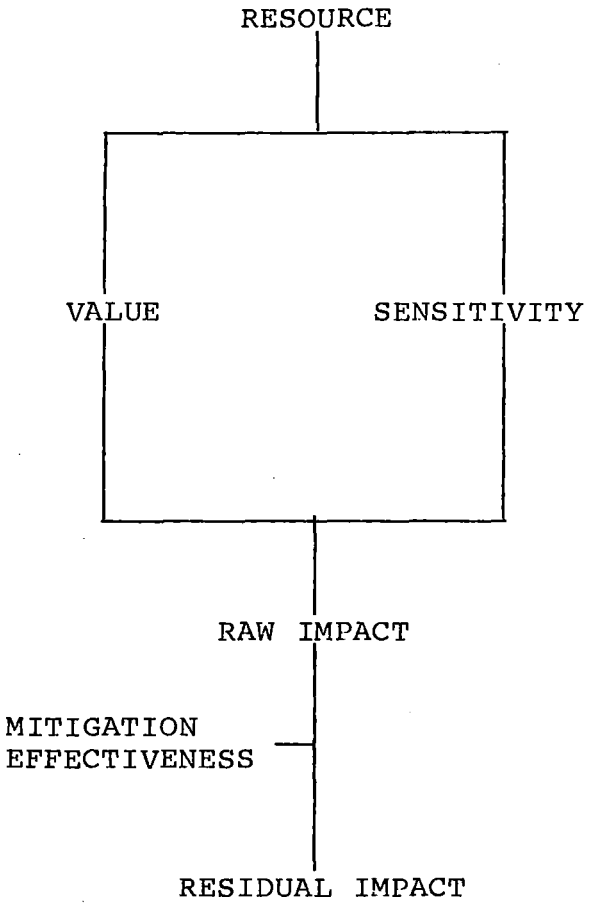


Figure 2: Impact Scoring Process

An engineering and environmental comparison was also conducted with the residual impact scores or mitigated scores to produce a final ranking of technically feasible sites.

3.10 POTENTIAL SITES

3.11 Social

All 26 sites were appraised for social impacts using four broad categories of factors: local population, community and infrastructure, population proximity, and access. All impacts were judged for long-term (operational) only, with construction impacts to be addressed during assessment of the technically feasible sites. Rating scores were assigned on a five point geometric scale, ranging from 0 (no impact) to -8 (very high impact) These scores were entered individually on information sheets for each of the potential terminal sites (data are shown in the Appendix).

The establishment of scores for each social category was as follows:

1. Local Population

Disbenefits were assumed to occur if the existing local population was considered incapable of absorbing the project related influx. Population figures were from the 1976 Census of Canada, as reported in the B.C. Regional Index (1978) unless significant changes had occurred (such as at Ocean Falls). No impact (0) was assumed if the local population, defined as resident within approximately 80 km of the site, exceed 5,000 persons. Maximum impact (-8) was scored where local population was less than 500. Local populations were based on the following:

Population	Score
5000+	0
3500-5000	-1
2000-3500	-2
500-2000	-4
-500	-8

2. Community and Infrastructure

Disbenefits were assumed where: (a) there was no acceptable community to house the proposed work force within 75 km, a reasonable maximum daily commuting distance; or (b) the existing community within this zone was not considered capable of supporting the future growth required. In cases where the maximum impact score was applied, this may not indicate an absolute constraint, but would likely require consideration of establishing a new townsite to house the workers. Scores for community infrastructure are as follows:

Distance	Score
-30 km	0
30-45 km	-1
45-60 km	-2
60-75 km	-4
+75	-8

Other factors considered for community infrastructure are the growth capability of community.

Degree of Impact	Score
No problem	0
Slight impact	-1
Moderate impact	-2
Severe impact	-4
Very severe	-8

3. Population Proximity Criteria

The consultant conceived of arbitrary concentric rings extending about the proposed sites. Potential impacts were assigned where a settlement or a known heavily-used area (e.g., for recreation) was located within the arbitrary ring. Potential impact factors were scored as follows:

Ring Radius	Score
+10 km	0
8-10 km	-1
6-8 km	-2
4-6 km	-4
-4 km	-8

To properly address the subject of risk for project design, Dome Petroleum has retained an internationally accepted risk analysis consulting firm. This firm states that LNG facility siting and operating regulations are designed to minimize or eliminate risks to the public and facility employees and to make a facility "equivalently safe" regardless of its location. The measures necessary to achieve this objective depend upon the site characteristics, population proximity, and local environmental conditions. For site screening studies, population proximity is often used as a precursor to detailed safety analyses. In risk assessment work the following population proximity criteria are generally employed:

(i) Sites within 1.5 km of existing population centres may be eliminated from consideration, primarily on a cost effectiveness basis.

(ii) All sites farther than 1.5 km from an existing population centre are normally considered equally acceptable.

(iii) The preferred site would receive detailed safety studies in conjunction with LNG facility design.

4. Access

It was assumed that, where a road could be built to the proposed site from an existing community or highway, it would be built. Disbenefits were assumed to occur where the site access road would pass through a small settlement not otherwise affected by outside traffic or where direct access via all-weather road could not be made to the site. Maximum impact (-8 score) was applied where direct land access could not be made, and ferry connections would be required. Scores assigned for access are as follows:

Access Impact	Score
Existing road	0
Slight impact to enroute settlement	-1
Minor impact to enroute settlement	-2
Severe impact to enroute settlement	-4
Very severe impact to enroute settlement	-8

3.12 Terrestrial

The terrestrial parameters were scored using the 0 to -8 scale as outlined in Section 3.00. For the potential sites, the following project activities were considered:

- land access (pipeline and road)
- water access, and
- tidewater facilities

The raw scores (unmitigated) were added for each of the activities to produce a total terrestrial score for the site.

Each terrestrial score was a combination of the following determinants.

- landform and geology
- wildlife
- waterfowl
- hunting and trapping, and
- resource use

These scores were entered individually on information sheets for each of the potential terminal sites. (Data are shown in the Appendix.)

The seismicity ratings for all potential Liquefied Natural Gas (LNG) terminal sites were based on the National Building Code which defines ground acceleration events on the basis of four classes. Class 3 which was the highest ground acceleration and Class 0 the lowest. All potential sites were in areas of high ground acceleration (Class 3). Only the parent materials of each site show different seismic response. The response of each parent material based on highest to lowest risks are:

i) organic materials
ii) silts and clays
iii) unconsolidated sands and gravel
iv) compacted till
v) bedrock

3.13 Aquatic

The information base for the aquatic study consisted of existing resource data from published reports, and personal familiarity and experience in the study area. Aquatic information has included:

- important marine, estuarine and freshwater organisms which are found in the general area, or which otherwise may be affected by the project;

- important or sensitive habitats of these organisms that may be affected by the product;

- important uses made of these organisms, including commercial, subsistence or recreational fishing; shellfish harvesting; crab and prawn fishing; visual, recreational or other aesthetic appreciation of these organisms and habitats; in some cases the social uses are in areas removed from production (i.e., in the case of the salmon fisheries), thus widening the relevant area for impact analysis.

Aquatic resource information was defined as freshwater, estuarine and marine values that could be affected by the project. These aquatic resource values were compared against their sensitivities to determine the effects of the project. Raw Impacts were given scores on a geometric scale from 0 (no value or sensitivity), to -8 (greatest value or sensitivity), with intermediate ratings of -1, -2, and -4.

These scores were entered individually on information sheets for each of the potential terminal sites. (Data are shown in the Appendix.)

Criteria for scoring were as follows:

(0) - No resource values;

(-1) - Low resource values, of minor importance and sensitivity;

(-2) - Moderate resource value, of local importance. e.g., most small rivers and streams, and typical marine shorelines.

(-4) - High resource value, of regional or provincial importance, e.g., smaller estuaries, moderate sized salmon rivers, most harvestable shellfish areas, seal haul-outs.

(-8) - Very high resource value, of provincial, national or international importance. e.g., larger estuaries (Nass, Skeena, Bella Coola, Squamish, Fraser), large salmon rivers (Nass, Skeena, Bella Coola, Squamish, Fraser), intensive fishing waters.

No attempt was made to describe suitable mitigation for the potential sites for these issues, although it is recognized that many such opportunities exist. The raw scores therefore represent unmitigated worst-case impacts which are expressed numerically in matrix form in Section 4.00.

3.14 Climate

The climate information was collected on the basis of data published from the B.C. Climatological Stations by the Atmospheric Environment Service, Environment Canada. On the basis of normal values of temperature and precipitation, frequencies for inversions were extrapolated. In addition, data from the report "West Coast Offshore Environment" Environmental Protection Service, Environment Canada, 1978, were analyzed. This determined the prevailing wind directions for the potential LNG terminal sites examined.

3.20 TECHNICALLY FEASIBLE SITES

3.21 Social

a) Factors Considered

Land Use: possible conflicts with existing or potential non-recreational use of the site, adjoining land and access corridor(s);

Land Status: possible conflicts with ownership and value of properties (e.g., "Reserves");

Recreation: possible conflicts with existing or potential recreation resources, facilities or use; possible benefits of new access to resources;

Access: possible conflicts with existing road patterns, traffic volumes, or land uses; possible benefits of access to isolated communities;

Labour:	possible impacts where there is a small local labour pool, or where local labour has low average incomes; possible benefits where the unemployment rate is high;
Native Indians/ Heritage Resources:	possible impacts where Native lands are required for site or access, or proximity to an Indian Reserve or village is likely to cause concern; conflicts with known archaeological or historic sites (direct damage or destruction).

b) Ratings

Each factor (above) was rated, where possible, for each of the technically feasible sites. The numerical values do not indicate any absolute number of impacts, but are for comparative ratings only between sites.

Specific impacts were assessed in two categories: "short term" or construction impacts, which could be expected during the time that the plant facilities, access roads, and utilities are being constructed; and "long term" or operational impacts that could be expected to continue throughout the operating life of the project.

Possible short term impacts might include:

- shoreline blasting and/or other construction noise;
- presence of construction-related traffic;
- presence of large, non-local construction-related labour force;

- disruption, damage or destruction of a resource or its use;
- disruption of local economic activities due to competing construction employment.

Possible short term benefits could be:

- direct construction employment opportunities in areas of high unemployment;
- local economic returns from construction-related purchases of materials, equipment, supplies, services, accommodation, etc.

Possible long term impacts would include:

- interference with, or preclusion of, other uses of land;
- reduction of neighbouring property values;
- presence of non-local permanent labour force;
- project-related traffic.

Possible long term benefits would include:

- new highway access to isolated communities and/or resources with recreational or economic value;
- direct and indirect employment opportunities;
- increased property values along road access corridor.

c) Mitigation

Mitigation possibilities are not considered in the rating scale for potential sites, although it is possible that the negative impacts on a given site could be reduced with the application of appropriate mitigative measures. Possible mitigation opportunities include:

a) Financial compensation for use of land or loss of utility of land;
b) Provision of alternative recreation facilities to compensate for losses;
c) Excavation and recording of heritage resources directly affected;
d) Specific employment policies to train and utilize local labour.

Technically feasible site impacts and benefits as well as mitigation possibilities are considered and described in more detail in Section 6.00 of this report.

3.22 Terrestrial

The scores were defined for each of the above determinants, as follows:

(-8) Landform and geology: peat or muck; mass wasting;
Seismicity: Class 3 National Building Code materials with high seismicity response;
Wildlife: breeding or critical winter habitat;
Waterfowl: breeding, nesting or critical winter habitat;
Hunting and Trapping: extensive subsistence hunting and trapping;
Resource Use: **no scores of this magnitude apply to resource use.**

(-4) Landform and geology: some organics; oversteepened alluvial fan on fiord wall;
Seismicity: Class 3 National Building Code materials with low seismic response;

Wildlife: high value wildlife habitat;
Waterfowl: high value waterfowl habitat;
Hunting and Trapping: some subsistence hunting and trapping;
Resource Use: high value forest, mining, and pre-empted industrial use.

(-2) Landform and Geology: fine textured unconsolidated materials;
Seismicity: Class 2 National Building Code;
Wildlife: moderately valuable resource;
Waterfowl: moderately valuable resource;
Hunting and Trapping: little hunting and trapping;
Resource Use:
Forestry: marginal potential and use;
Mining: marginal potential and use;
Industry: marginal potential and use.

(-1) Landform and Geology: compacted surficial material or bedrock; reasonably flat;
Seismicity: Class 1 National Building Code;
Wildlife: marginal wildlife habitat;
Waterfowl: marginal waterfowl habitat;
Hunting and Trapping: sporadic hunting and trapping;
Resource Use:
Forestry: marginal potential and use
Mining: marginal potential and use
Industry: marginal potential and use

(0) No impact

Mitigation options for the terrestrial resources were considered only for the technically feasible sites. There were no positive scores in the terrestrial resources.

3.23 Aquatic

Freshwater, estuarine and marine issues as described for the potential site evaluation were analyzed in more detail and, through consideration of MITIGATION EFFECTIVENESS, have been expressed as RESIDUAL IMPACT SCORES for the comparative evaluation of the technically feasible sites. Mitigation effectiveness for each issue was rated on a matching geometric scale of 0, 1, 2, 4, 8 and added to the issue (raw) score to provide a rating for residual impact. For consistency in the arithmetic scoring system, mitigation was expressed as a proportion of the issue score. Thus complete mitigation effectiveness for an issue of -4 is given as +4, 50% effectiveness as +2, etc.

For the purposes of this analysis, mitigation has been assumed to be "state-of-the-art", based on experiences with other similar projects.

4.00 INVENTORY AND ASSESSMENT OF POTENTIAL LNG TERMINAL SITES*

The search for suitable locations for the Western LNG Project has encompassed the entire British Columbia coast. The initial overview identified 26 sites. These sites were grouped into six areas. The areas were established primarily on the basis of proximity to existing and possible expansion of natural gas distribution within B.C.

The six areas are:

1. Skeena-Nass Area
2. Kitimat-Kemano Area
3. Bella Coola Area
4. Greater Vancouver Area
5. Powell River Area
6. Alberni Inlet Area

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* Detailed information for each potential site is given in the Appendix.

4.10 SKEENA-NASS AREA

The Skeena-Nass area focuses on Prince Rupert. Here existing port facilities provide adequate marine and land access for the northern British Columbia Coast. Previous investigations by engineering and environmental staff of Dome Petroleum Limited and a subsequent review by the authors, identified seven sites. These are:

Sites at Portland Inlet:

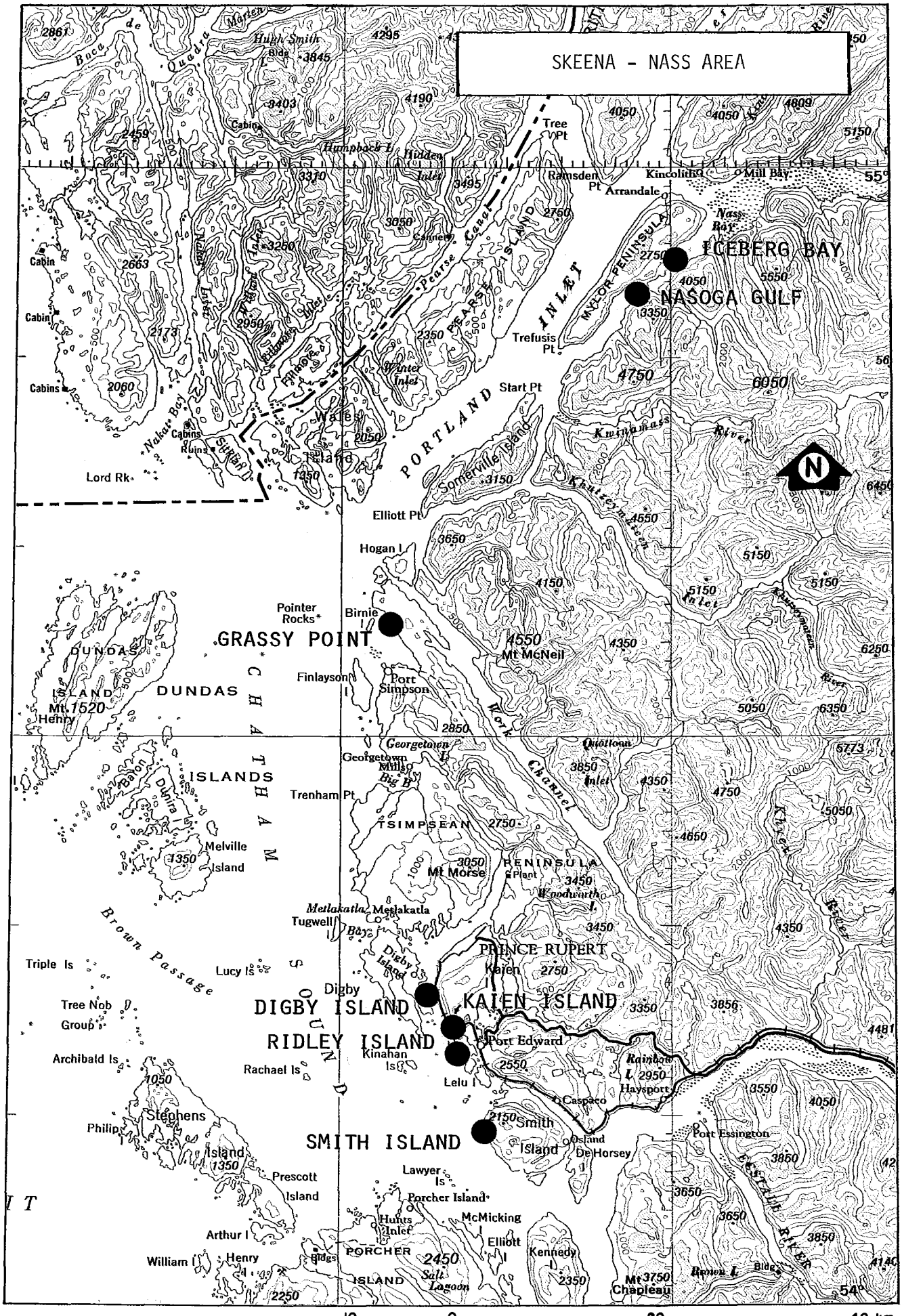
i) Nasoga Bay
ii) Iceberg Bay

Sites on or near the Tsimpsean Peninsula:

iii) Grassy Point (Port Simpson Bay)
iv) Digby Island
v) Kaien Island
vi) Ridley Island
vii) Smith Island

Natural gas is now delivered from the Westcoast system to Prince Rupert by the Pacific Northern Gas Ltd. (PNG) distribution system. Expansion of this existing system could bring natural gas for an LNG Terminal to the Prince Rupert area. To give maximum scope to this study an area referred to as the Skeena-Nass area, Figure 3, was examined for potential sites.

A general description of considerations for the Skeena-Nass area follows:


SKEENA - NASS AREA
ICEBERG BAY
NASOGA GULF
PEARSE ISLAND
PORTLAND INLET
MAYOR PENINSULA
Trefusis Pt
Start Pt
Ramsden Pt
Arrandale
Kincolith
Mill Bay
Nass Bay
Tree Pt
Hidden Inlet
Humphreys I
Cannery Canal
Pearse Canal
Winter Inlet
Fillmore Inlet
Nakat Bay
Nakat Inlet
Wales Island
Sutlan I
Lord Rk
Somerville Island
Kwinamass River
Kwinamass Inlet
Elliott Pt
Hogan I
Pointer Rocks
Birnie I
GRASSY POINT
Mt McNeil
Finlayson I
Port Simpson
DUNDAS ISLAND
Mt Henry
DUNDAS
CHATHAM
ISLANDS
Baron I
Dunira I
Melville Island
Trenham Pt
Georgetown
Georgetown I
Milbo
Big B
Work Channel
Quottoon
Inlet
TSIMPSEAN PENINSULA
Mt Morse
Plant
Goodwin I
Metlakatla
Tugwell Bay
Brown Passage
Triple Is
Lucy Is
Digby
Digby Island
PRINCE RUPERT
Kaien I
KAIEN ISLAND
DIGBY ISLAND
RIDLEY ISLAND
Tree Nob Group
Archibald Is
Rachael Is
Kinahan Is
Port Edward
Lelu I
Rainbow L
Haysport
Caspaco
Smith Island
SMITH ISLAND
De Horsey Island
Port Essington
Skeena River
Stephens Island
Philip I
Prescott Island
Lawyer Is
Porcher Island
PORCHER ISLAND
Hunts Inlet
McMicking
Elliott
Kennedy
Arthur I
William I
Henry
Ridges
Salt Lagoon
Mt Chapleau
Ronen L
Ridge
1:500,000
10 0 20 40 km

4.11 Social

The Skeena-Nass area has a permanent population of 21,000 of whom about 15,000 live in the City of Prince Rupert. North of the city is the Indian village of Port Simpson (900); to the south is the village of Port Edward (1,200), small native settlements are located on the lower Nass River, and opposite the Prince Rupert harbour (Metlakatla). The local economy is dependent on commercial fishing and fish processing, although this is largely a seasonal activity; over 750 commercial fishing vessels were based in the area in 1976. A fish processing plant is located at Port Simpson, owned by a native cooperative. Other native communities have no industry and are largely dependent on fishing and subsistence hunting and trapping. A large pulp mill is located at Port Edward, and transportation and tourism are increasingly important in the area. Port development proposals (coal, grain, lumber), and the operations of the Alaska and British Columbia ferry services, should ensure increasing shipping activity. Both Prince Rupert and Port Edward are connected by road and rail to the provincial network, and the airport on Digby Island provides direct air access to Vancouver and the interior. The Nass River area north of Work Channel would not be accessible directly to Prince Rupert, but would require road extensions from Aiyansh, which is some 100 km north of the municipality of Terrace. New townsites would likely be required to house workers at either the Iceberg Bay or Nasoga Gulf sites. A road/ferry access would have to be provided for Grassy Point site. All other proposed sites in this area are within commuting distance of Prince Rupert.

4.12 Terrestrial

This area shows some of the more subdued landforms found along the northern B.C. Coast. The Tsimpsean Peninsula offers a large bedrock shelf consisting of sedimentary and metamorphic rock. It is relatively flat and able to accommodate terminal sites. In contrast the Nass and Skeena estuaries have deeply gouged oversteepened fiords with some flat upland available at the heads of bays and inlets. Both the Skeena and Nass have important waterfowl staging, breeding and wintering habitats. In particular the Nass estuary has significant Canada goose breeding populations. In contrast the sites between the two estuaries at Grassy Point and, to some extent, Digby and Kaien Island have important bird staging habitat. Diving ducks, alcids, and other pelagic birds, even though of high resource value, have relatively low sensitivity.

Wildlife consists primarily of small to large mammal populations such as black-tailed deer, black bear, and some moose. These animals are critically dependent on lowland wintering habitat, as well as estuarine and salmon bearing streams in the case of the bear. There is, however, no outstanding wildlife capability in the entire study area.

4.13 Aquatic

a) Marine

Chatham Sound, and the inner waters of the archipelago and peninsula, support a relatively rich and productive marine community including important populations of salmon, herring, shellfish, crab and groundfish. Areas of particular importance are the mouth and estuary of the Skeena River; Inverness and DeHorsey Passages, and

Flora bank; the waters surrounding Digby Island; and most of the Tsimpsean coast up to and beyond Grassy Point, particularly Stumaun Bay.

The Skeena River estuary is one of the designated 'Critical Estuaries' in B.C.

The marine habitats of Wainwright Basin, Porpoise Harbour and the north end of Ridley Island have been affected by discharge from the pulp mill.

A substantial salmon net fishery operates in the mouth of the Skeena in the fall, south of Flora Bank. Key shellfish or crab fisheries are located on Flora and DeHorsey banks, as well as in Big Bay south of Port Simpson Harbour. Herring fishing and groundfish fishing also take place at Port Simpson and sport fishing for salmon is an important activity in Prince Rupert Harbour, Metlakatla Bay and Duncan Bay.

Marine resources of Portland Inlet are not well documented, however a commercial salmon fishery operates in the Inlet, and several areas are important for herring spawning. The commercial salmon fishery supports the communities of Greenville and Kincolith.

b) Freshwater

The Skeena River is the second most valuable salmon and anadromous trout river in B.C., with salmon development funds being spent to increase the runs further. Average runs of over three million fish (mostly pink and sockeye, with fewer coho, chinook and chum) provide the basis for the regionally important salmon fleet in Prince Rupert. All these fish depend on the estuarine

and nearshore habitats of Inverness Passage and Flora and DeHorsey banks for feeding and rearing on their seaward migration.

Other important freshwater systems in the area are Stumaun Creek (salmon) and Neaxtoalk Lake near Port Simpson.

The Nass River, which enters Portland Inlet about 30 km from Iceberg Bay, is an important producer of salmon with an average run of about one million salmon (mainly sockeye and pink). Eulachon are also important, as are anadromous trout to a lesser degree.

4.14 Comparative Ranking of Potential LNG Terminal Sites

The following table summarizes the evaluation of social/environmental evaluation of potential sites in the Skeena-Nass area. The complete matrices are in the Appendix.

SKEENA-NASS AREA

SITE NAME	TOTAL SOCIAL/ ENVIRONMENTAL SCORE
GRASSY POINT	-29
RIDLEY ISLAND	-33
KAIEN ISLAND	-33
SMITH ISLAND	-38
DIGBY ISLAND	-42
NASOGA GULF	-52
ICEBERG BAY	-56

4.20 KITIMAT-KEMANO AREA

This area focuses on the Kitimat-Terrace Corridor with existing tidewater facilities at Kitimat. Work by environmental and engineering personnel of Dome Petroleum Limited and a subsequent review by the authors identified seven sites in the Kitimat-Kemano area. These are:

Sites Identified on Douglas Channel:

i) Bish Creek
ii) Emsley Cove
iii) Miskatla Inlet
iv) Wathlsto Creek
v) Clio/Gobeil Bay

Sites in Adjacent Fiords:

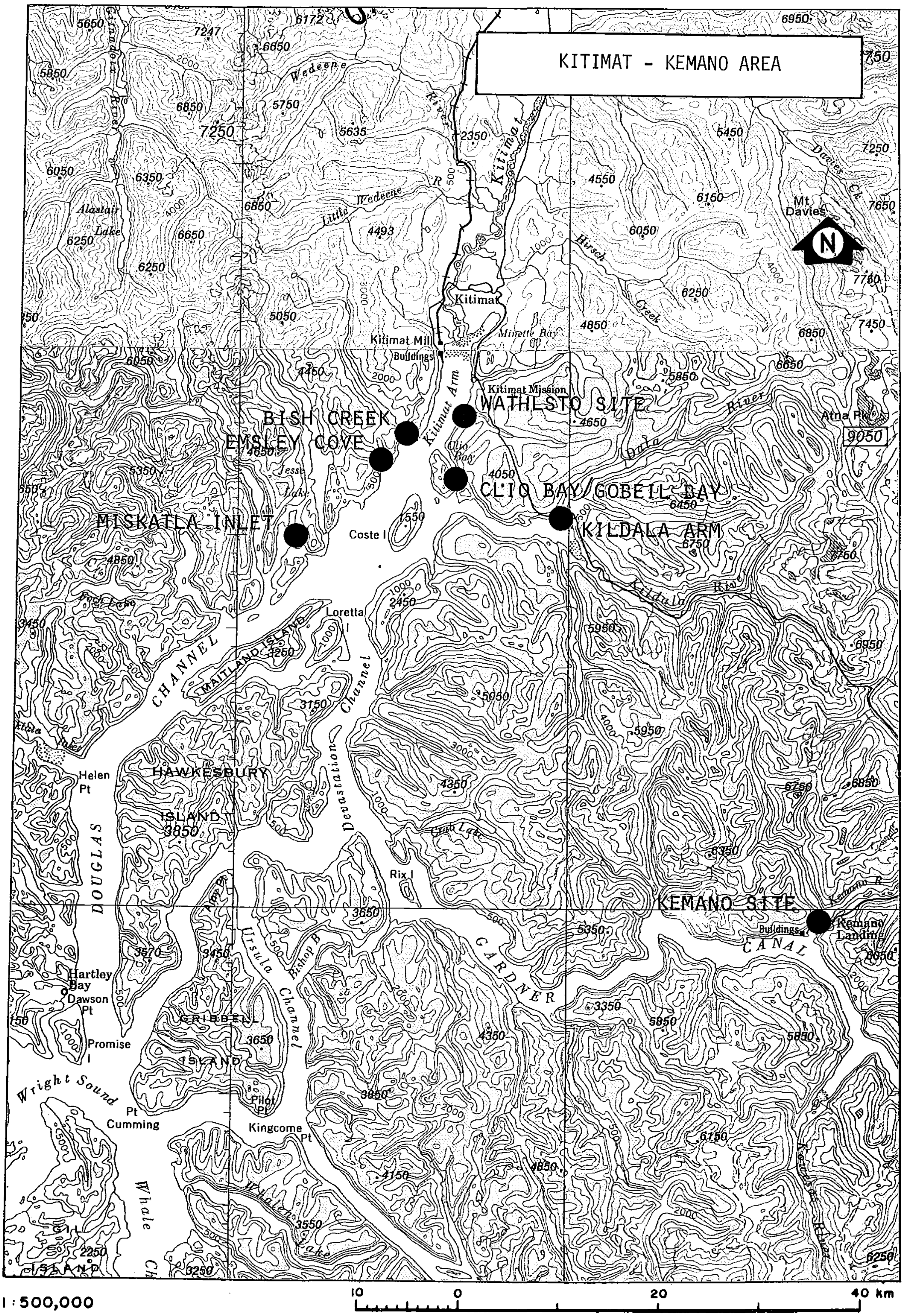
vi) Kildala Arm
vii) Kemano

The Pacific Northern Gas Ltd. distribution system also serves the Kitimat River Valley. This pipeline may be expanded to provide feedstock to a proposed methanol plant at Kitimat or an LNG terminal. For this study we have referred to this area as the Kitimat-Kemano Area, Figure 4.

A description of the Kitimat-Kemano area follows:

4.21 Social

The total population of this area is about 13,000 of which 12,000 live in the District of Kitimat. Immediately south of Kitimat is the Indian village of Kitimaat ("Kitimat Mission"), with a population of about 500. The community of


KITIMAT - KEMANO AREA
WATHLSTO SITE
BISH CREEK
EMSLEY COVE
CLIO BAY/GOBEIL BAY
KILDALA ARM
MISKATLA INLET
KEMANO SITE
Kitimat
Kitimat Mill
Buildings
Kitimat Mission
Kitimat Arm
Minette Bay
Coste I
Loretta I
MAITLAND ISLAND
CHANNEL
Devastation Channel
HAWKESBURY
ISLAND
DOUGLAS
GARDNER
CANAL
Kemano Landing
Helen Pt
Hartley Bay
Dawson Pt
Promise I
Wright Sound
Pt Cumming
Kingcome Pt
Pilot Pt
GRIBBELL
ISLAND
Ursula Channel
Rix I
Mt Davies
Atna Pk
9050
Wedeene River
Kitimat River
Hirsch Creek
Kildala River
Dala River
Alastair Lake
Jesse Lake
Whale Channel
GIL ISLAND
1:500,000
10 0 20 40 km

Kemano contains more than 300 people. An additional 15,000 people reside in the area north of Kitimat with over 10,000 in the District of Terrace. The Kitimat economy is dominated by the aluminum smelter with the pulp and paper complex also playing an important industrial role. Sawmills are located in the Kitimat-Terrace corridor. Some logging activity occurs along Douglas Channel. The native population has no primary industry and relies on fishing, hunting and trapping for its livelihood. Commercial fishing is secondary, with only 35 vessels based in the area. Other economic activities are primarily located in Terrace, the regional service centre, some 60 km north of Kitimat. Kitimat is connected by road and rail, through Terrace, to the provincial networks; the region's airport is also located at Terrace. Kitimaat Village is connected by road to Kitimat, but the community of Kemano has road connection only to the sea (Gardner Canal) and is otherwise isolated. Road connections to the Wathlsto, Clio Bay/Gobeil Bay, Kildala Arm and, if possible, Kemano sites would likely be via extension of the Kitimaat Village road, thereby directing traffic through the Indian village. Access to the Bish Creek, Emsley Cove and Miskatla sites would be from Kitimat along the undeveloped western shore of Kitimat Arm.

4.22 Terrestrial

The sites in the Kitimat-Kemano area are located on Douglas Channel or Gardner Canal. The landforms and geology consist of Coast Mountain granodiorite gouged out by valley glaciers to oversteepened fiords. The flat uplands are restricted to the heads of inlets and bays.

Waterfowl resources are localized to the estuaries in the study area. The more significant waterfowl resources

occur at the mouth of the Douglas Channel at Trepanier Sound and Squally Channel. However, because of the long restricted marine access (105 km) to reach the Kitimat-Kemano sites, impact on waterfowl could be high.

Wildlife resources are confined to ungulates and bears. The lowland habitats are generally critical for wintering. However, no significant mammal populations exist in the study area.

4.23 Aquatic

a) Marine

The Douglas Channel, Kitimat Arm and Gardner Canal system is an important waterway for commercial and sport fishing boat navigation. A very important salmon fishery operates seaward of Douglas Channel in the Wright Sound-Squally Channel area, while salmon sport fishing takes place in Kitimat Arm and Gardner Canal.

Important marine resources of this waterway include herring (particularly near the north end of Kitimat Arm and the south end of Douglas Channel), prawn and shrimp in Gardner Canal.

The estuaries of the Kitimat, Kemano and Kildala rivers are very important to anadromous fish production. Those of Bish, Emsley, Wathlsto and other smaller creeks are less important. Marine mammals (whales, seals) in Kitimat Arm are an important resource as well. Indian herring and salmon net fishing take place in Kitimat Arm.

b) Freshwater

The Kitimat, Kemano, Dala, and Kildala rivers and Bish Creek are major salmon producers having annual runs of over 5,000 fish and supporting the commercial fishery seaward of Douglas Channel and the sport fisheries of Kitimat Arm, Gardner Canal and Kitimat River. Hatchery plans to increase the Kitimat River salmon and trout runs are in place, with construction anticipated within a few years.

Eulachon are locally important to Indian bands at the mouths of the Kitimat and Kemano rivers.

4.24 Comparative Rating of Potential LNG Terminal Sites in the Kitimat-Kemano Area

The following table summarizes the evaluation of social/environmental evaluation of potential sites in the Kitimat-Kemano area. The complete matrices are in the Appendix.

Site Name	Social	Terrestrial	Aquatic	Climate	Total
Miskatla Inlet	-1	-12	-12	-1	-26
Emsley Cove	-0	-12	-13	-2	-27
Bish Creek	-1	-8	-15	-4	-28
Clio/Gobeil Bay	-5	-10	-14	-2	-31
Wathlsto Creek	-8	-10	-15	-4	-37
Kildala Arm	-7	-14	-16	-1	-38
Kemano Bay	-20	-14	-18	-2	-54

4.30 BELLA COOLA AREA

The Bella Coola area has the only road connection to tidewater along the central coast of British Columbia. There are presently modest port facilities at Bella Coola. A review of the sites by environmental and engineering personnel of Dome Petroleum Limited and a subsequent review by the author identified only two potential sites. These are:

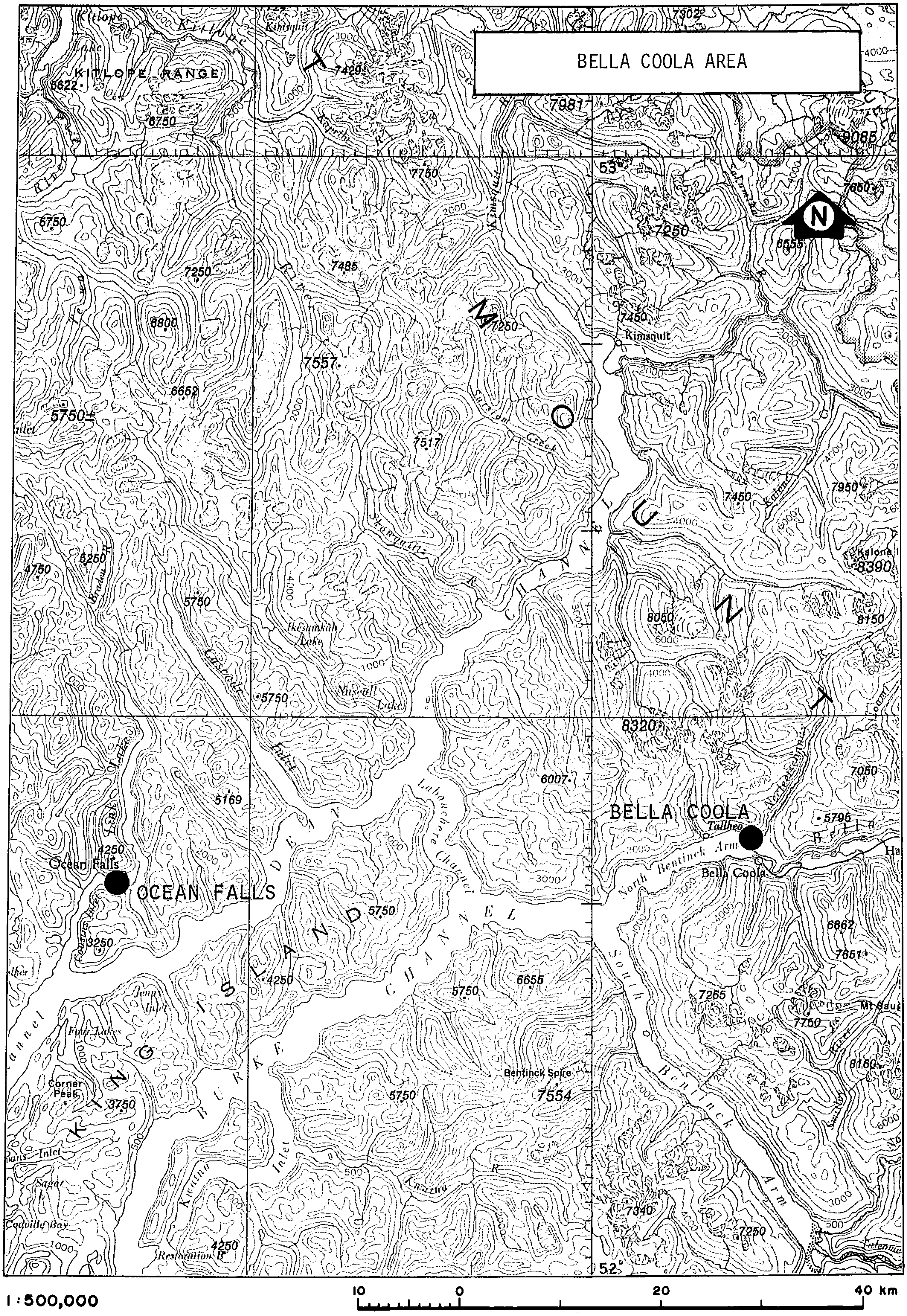
i) Bella Coola
ii) Ocean Falls

The Bella Coola area, Figure 5, is not presently serviced by natural gas pipeline and has very poor land access. The main rationale in considering this area was to assess if industrial expansion or revitalization to the region by an LNG project could overcome the serious disadvantage of its location.

A description of the area follows below.

4.31 Social

The population of the Queen Charlotte Sound area resides in small isolated settlements along the coast, with Ocean Falls (population 200) and Bella Coola (800 including the Indian Reserve) being two of the larger settlements. Total area population would be about 3,000 persons, with native Indians comprising a large part of that total. The area lacks a trade and service centre, due largely to transportation problems. Ocean Falls is accessible only from tidewater, while Bella Coola is connected by a long, rough gravel road to the paved network at Williams Lake. Regional economic activities include fishing and logging, while the Ocean Falls pulp mill has had the largest economic impact on



BELLA COOLA AREA
KITLOPE RANGE
BELLA COOLA
OCEAN FALLS
Ocean Falls
Bella Coola
Kimsquit
Tallheo
North Bentinck Arm
South Bentinck Arm
Labouchere Channel
DEAN CHANNEL
BURKE CHANNEL
KING ISLAND
Bentinck Spire
Corner Peak
Four Lakes
Kwatna
Cascade
Ikesumkah Lake
Nascall Lake
1:500,000
10
0
20
40 km

the area. Closed in 1973, it was temporarily reactivated by the provincial government, and was the area's largest employer until June, 1980. Commercial fishing supports about 170 vessels, with six fish processing plants operating during the 1976 season.

Some fishing, hunting and trapping for subsistence is being practiced by the native populations.

4.32 Terrestrial

The landform and geology of the Bella Coola area is a classical fiord coast range physiography which is generally lacking flat upland areas adjacent to tidewater. Reasonable level topography, such as the Bella Coola site, is often located at the head of inlets on river estuaries. The Ocean Falls site is located on alluvial and till deposits.

The waterfowl resource is moderately significant in the inland portions of the fiord in contrast to the entrances to the coastal fiords which have significant sea bird colonies and bird populations year-round. However, because of the length of this marine access, the total resource value for waterfowl becomes high.

Wildlife resource in the study area is not significant, but is dependent on lowland habitat for wintering.

The resources in the study area are primarily fishing (mainly in the outer fiords) and some forestry at the heads of inlets.

4.33 Aquatic

a) Marine

The marine resources of Bentinck Arm and Burke Channel are not well documented. These waters provide navigational access for the commercial salmon and herring fleets of Bella Coola and for sport fishing boats.

Important commercial salmon and herring fishing takes place in the lower end of Burke Channel, and sport fishing is popular in Bentinck Arm near Bella Coola.

The Bella Coola-Necleetsconnay estuary is one of the designated 'Critical Estuaries' of B.C., and is necessary feeding and rearing habitat for the large Bella Coola and Necleetsconnay salmon and anadromous trout populations.

b) Freshwater

The Bella Coola River system and the Necleetsconnoy River are classed as "major" salmon producers, with average runs of several hundred thousand fish. Enhancement of the Bella Coola River salmon fishery is planned by channel improvements and hatchery construction.

4.34 Comparative Ranking of Potential LNG Terminal Sites in the Bella Coola Area

The following table summarizes the evaluation of social/environmental evaluation of potential sites in the Bella Coola area. The complete matrices are in the Appendix.

Site Name	Social	Terrestrial	Aquatic	Climate	Total
Ocean Falls	-24	-4	-12	-2	-42
Bella Coola	-16	-20	-26	-8	-70

4.40 GREATER VANCOUVER AREA

The Greater Vancouver area is dominated by the Port of Vancouver. A preliminary overview of potential LNG terminal sites by environmental and engineering staff of Dome Petroleum Limited and subsequent review by the authors confirmed two sites in the Greater Vancouver Area. These are:

i) Britannia
ii) Roberts Bank

The identified sites are located in totally different physiographic and economic regions. Britannia is located in Howe Sound while Roberts Bank is located in the Fraser River Delta.

The existing infrastructure in the Lower Mainland offers significant advantages to any industrial development. Dome owns industrial property at Britannia Beach which is an ideal site from an engineering perspective for any type of marine terminal development, but is not at present connected to an existing gas supply.

Consideration was also given to Roberts Bank since this location could be easily connected to the existing natural gas distribution network or in conjunction with B.C. Hydro's proposal to construct a natural gas pipeline to Vancouver Island. These locations are shown in Figure 6.

A description of the Greater Vancouver Area follows:


GREATER VANCOUVER AREA
N
BRITANNIA
Britannia Beach
ROBERTS BANK
VANCOUVER
NEW WESTMIN
NORTH VANCOUVER
PACIFIC
COAST
STRAIT OF GEORGIA
GULF
ISLANDS
HOWE SOUND
Squamish
Woodfibre
Mt Garibaldi
Mt Tantalus
Mt Murchison
Mt Donaldson
Mt Wrottesley
Mt Churchill
Sky Pilot Mtn
Brunswick Mtn
Cathedral Mtn
MT SEYMOUR PROVINCIAL PARK
Port Mellon
Gambier Island
Bowen I
Gibsons Landing
Gower Pt
Sechelt
SECHELT PENINSULA
Halfmoon Bay
Thormanby Islands
Egmont
Nelson I
Mt Elphinstone
Williamsons Landing
Hopkins Landing
Roberts Creek
Wilson Creek
Trail Bay
Keats Island
Collingwood Channel
Queen Charlotte Chan
Horseshoe Bay
Pt Atkinson
Burrard Inlet
Pt Grey
Sea I
Steveston
Westham I
Ladner
Newton
Boundary Bay
Mud Bay
Crescent Bea
Pt Roberts
Birch Pt
Pt Whitehorn
Ioco
Neck Pt
Entrance I
NEWCASTLE ISLAND PROV PARK
Gabriola
Gabriola Island
DeCourcy Group
Valdes Island
Extension
South Wellington
Cassidy
Ladysmith
Chemainus
Thetis
Kuper I
Galiano Island
Trincomali Chan
Stuart Channel
Mt Hall
Westholme
Crofton
Parker I
Sturdies Bay
Active Pass
10 0 20 40 km

4.41 Social

As defined for this study, the "Greater Vancouver" area - including the Squamish area to the north, the Burnaby New Westminster area to the east, and the Surrey/White Rock area to the south - contains a population of almost 1,100,000 persons. Communities in the vicinity of the potential LNG site at Britannia are Britannia Beach (population 430) and the District of Squamish (8,370). Near the Roberts Bank site are two communities, Ladner and Tsawwassen, which contain approximately 27,500 of the Municipality of Delta's total population of 64,500 persons.

Vancouver is the economic heart of the Province, and the principal manufacturing, trade and service centre. With an outstanding harbour, it contains one of the busiest ports on the continent, and is the base for a large commercial fishing fleet (1450 vessels in 1976). Roberts Bank is included within the Port of Vancouver jurisdiction. The Roberts Bank coal port is served directly by road and rail, and is the only major industrial development on the western shores of Delta municipality. Adjacent to the coal port is a heavily utilized ferry terminal. The character of the surrounding lands remains mostly agricultural. An estimated 176 commercial fishing vessels were based in Delta in 1976.

Forestry is the leading economic sector in the Squamish area, with a pulp mill located at Woodfibre (opposite Britannia on Howe Sound) and a deep sea port and manufacturing industries at Squamish. The area is connected to Vancouver by road and rail. Howe Sound is an extremely popular recreation resource attracting boaters, sports fishermen, and sightseers. Tourist, recreation and commuting traffic is heavy along Highway 99, the area's main road.

No subsistence native hunting or fishing is taking place in the Greater Vancouver area.

4.42 Terrestrial

The two sites in the Greater Vancouver Area show distinct differences in their landforms. The Britannia site is located in an excavated gravel pit consisting of pre-loaded gravel to tidewater. In contrast, Roberts Bank is located in the Fraser River estuary and is located on topset beds of river silt.

The Britannia site has only a moderate waterfowl population, primarily resting and staging by migratory waterfowl. In contrast, Roberts Bank makes up an important wintering habitat for waterfowl, shore birds and some alcids.

The wildlife resource at Britannia has already been totally altered by the industry and mining that has occurred on the site. In contrast the Roberts Bank site has wetland mammals which are entirely dependent on the estuarine habitat.

4.43 Aquatic

a) Marine

Howe Sound hosts a very important salmon sport fishery, mainly in the southern end and along the northeastern side of the Sound.

Herring spawning takes place at the north end. Limited bottom fishing is done close to the southern end.

Local populations of shellfish and crabs found throughout the islands in Howe Sound are particularly important

because of the high-value recreational use of these areas. However, mercury contamination from a Squamish industrial discharge has limited the shellfish, crab and bottom fish harvest in the northern portion of Howe Sound over the past decade.

The Squamish River estuary at the north end of the Sound is one of the designated 'Critical Estuaries' important for salmon and anadromous trout on their seaward migration (Environment Canada).

The southern Strait of Georgia and Juan de Fuca are heavily used by commercial and sport salmon fishing fleets and by commercial herring fishing. Shellfish, crab and other shoreline marine resources along the Gulf Islands, Vancouver Island, and the mainland are extremely important. This area serves not only commercial harvesting of these resources but also a very large recreational use as well. From the point of view of marine resource value and sensitivity to disturbance, the Georgia and Juan de Fuca straits area is probably the most important on the B.C. Coast.

Roberts Bank is an integral part of the Fraser River estuary - undoubtedly the single most important habitat on the B.C. Coast. The estuary supports the feeding and rearing for the seaward migrating salmon and anadromous trout of the Fraser River - the largest producer on the coast.

The Fraser estuary also supports significant herring spawning, and provides commercial crab fishing and a shrimp fishery off the seaward edge. A large sport fishery and a commercial salmon fishery are associated with the Roberts Banks-Canoe Passage area. The estu-

ary's productive habitat is becoming progressively more valued and critical as greater dependence by fauna and flora on the remaining undeveloped area is evident.

b) Freshwater

The Squamish River system is a major salmon producer, with enhancement plans to increase the output.

The Fraser River is the coast's largest and most important salmon producer.

4.44 Comparative Ranking of Potential LNG Sites in the Greater Vancouver Area

The following table summarizes the evaluation of social/environmental evaluation of potential sites in the Greater Vancouver area. The complete matrices are in the Appendix.

Site Name	Social	Terrestrial	Aquatic	Climate	Total
Britannia	-8	-5	-9	-4	-26
Roberts Bank	-8	-13	-28	-8	-57

4.50 POWELL RIVER AREA

The Powell River area is located in the northern part of the Strait of Georgia and includes some of the larger

islands such as Texada Island and Harwood Island. The area is somewhat disjointed and doesn't have a true focus in the sense that northern and central coast areas have. Marine access is equally good to all sites in the area while land access is accomplished via two ferries from Vancouver. Westcoast Transmission Company Limited proposes to service Vancouver Island with natural gas by a marine pipeline from the mainland near Powell River. For this reason, Dome considered the feasibility of locating the LNG terminal in the Powell River Area.

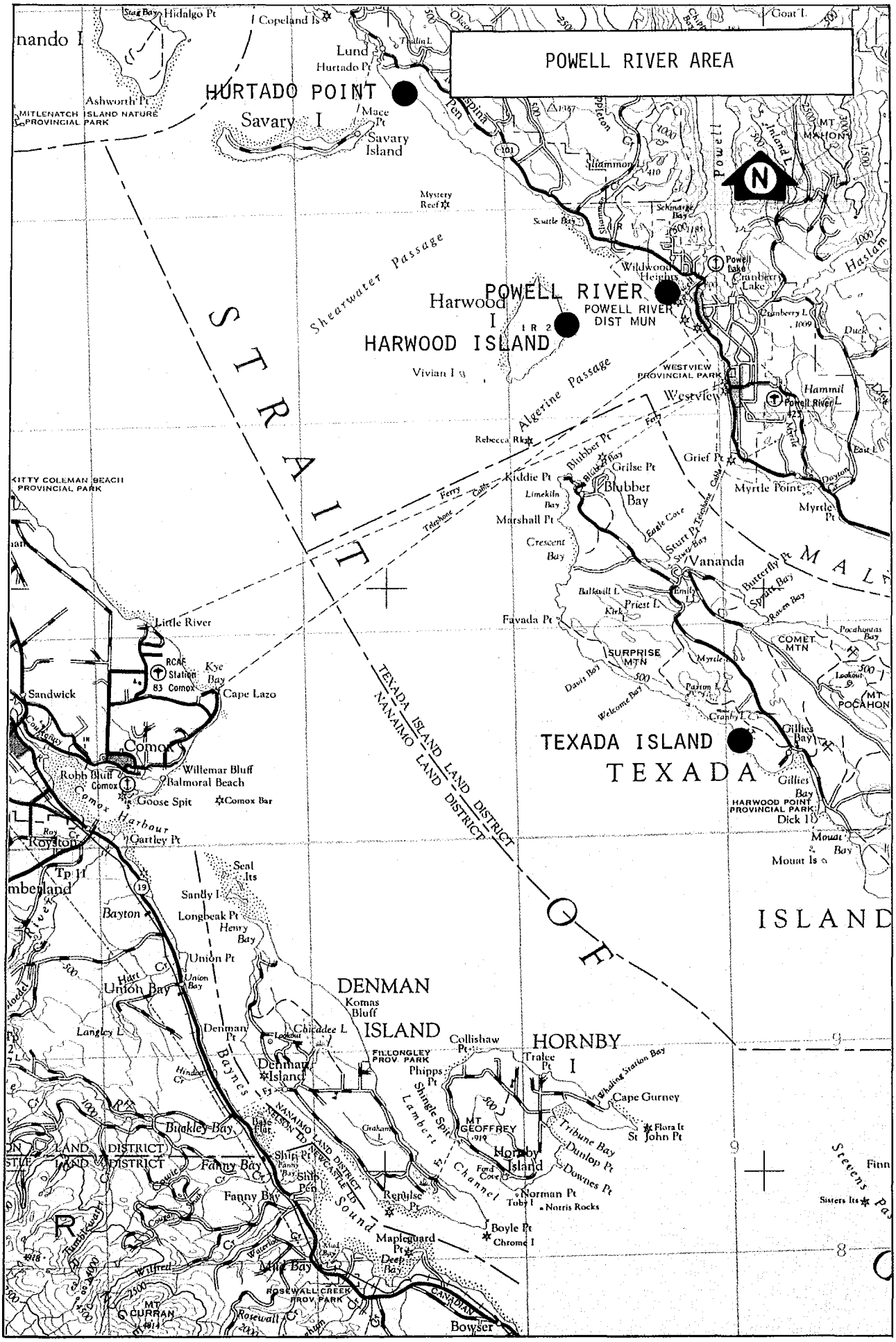
Investigation by the environmental and engineering staff of Dome Petroleum Limited and a subsequent review by the authors identified the following four potential sites:

i) Texada Island
ii) Harwood Island
iii) Powell River
iv) Hurtado Point

The description for the LNG terminal sites for the Powell River Area shown in Figure 7 are included below:

4.51 Social

Total population in 1976 was 19,650 persons, of which about 13,700 lived in the District of Powell River. North of Powell River is the community of Lund (180 persons). On Texada Island the communities of Vananda (410) and Gillies Bay (560) contain most of the local population. Road access from Powell River requires the use of two ferries to reach Vancouver, or one ferry crossing to Vancouver Island. Texada Island access to Powell River is also by ferry. The area's main airport is at Powell River. The local economy is based


POWELL RIVER AREA
HURTADO POINT
POWELL RIVER
POWELL RIVER DIST MUN
HARWOOD ISLAND
IR 2
TEXADA ISLAND
TEXADA
DENMAN ISLAND
HORNBY ISLAND
STRAIT OF GEORGIA
TEXADA ISLAND LAND DISTRICT
NANAIMO LAND DISTRICT
NANAIMO LAND DISTRICT
NEWCASTLE DISTRICT
Shearwater Passage
Algerine Passage
Lambert Channel
Sutil Channel
Malaspina Strait
Comox Harbour
Baynes Sound
MITLENATCH ISLAND NATURE PROVINCIAL PARK
KITTY COLEMAN BEACH PROVINCIAL PARK
WESTVIEW PROVINCIAL PARK
HARWOOD POINT PROVINCIAL PARK
FILLONGLEY PROV. PARK
ROSEWALL CREEK PROV. PARK
Ashworth Pt
Hidalgo Pt
Copeland Is
Lund
Hurtado Pt
Savary I
Savary Island
Mace Pt
Mystery Reef
Seattle Bay
Wildwood Heights
Powell Lake
Cranberry Lake
Hammil
Powell River L
Grief Pt
Myrtle Point
Blubber Bay
Grilse Pt
Kiddie Pt
Rebecca Rk
Marshall Pt
Crescent Bay
Vananda
Gillies Bay
Mouat Is
Little River
Sandwick
Cape Lazo
Kye Bay
Comox
Willemar Bluff
Balmoral Beach
Goose Spit
Comox Bar
Royston
Gartley Pt
Seal Its
Sandy I
Longbeak Pt
Henry Bay
Bayton
Union Pt
Union Bay
Denman Pt
Denman Island
Chrisdee L
Komas Bluff
Langley L
Buckley Bay
Fanny Bay
Shingle Pt
Shingle Spit
Ford Cove
Collishaw Pt
Trailer Pt
Phipps Pt
Whaling Station Bay
Cape Gurney
Tribune Bay
Dunlop Pt
Downes Pt
St John Pt
Flora Is
Norman Pt
Toby I
Norris Rocks
Boyle Pt
Chrome I
Maple Guard Pt
Deep Bay
Mud Bay
Bowser
MT MAHON
MT GEOFFREY
MT CURRAN
COMET MTN
SURPRISE MTN
MT POCAHON
Finn
Sisters Its
Steevens Pass
1:250,000
5 0 15 km

on the forest industries, particularly the pulp and paper mill at Powell River. Limestone quarries are the main source of employment on Texada Island. Commercial fishing supports about 50 vessels. The climate and scenery of this area make it an attractive summer resort and recreation destination, particularly for boating, fishing and shore activities. Demand for waterfront land for recreational purposes is relatively high, and cottage-type shoreline development is widespread.

4.52 Terrestrial

The Powell River area is located in the Strait of Georgia depression and is made up of rolling upland physiography with relatively abundant flat areas adjacent to tidewater. However, because of the drastic elevation difference between the high water mark and upland (from 15 - 75 m) most sites considered have special engineering needs, such as terracing.

The waterfowl and wildlife resources in the Powell River area show that waterfowl populations are centred around islands such as Savory, Harwood and the northern tip of Texada Island. Wildlife values are high, confined to more inaccessible upland areas such as Texada and Harwood islands and the mainland. However, the local abundance of wintering habitat makes this resource less sensitive.

Native hunting and fishing is centred around the above-mentioned waterfowl populations and salmon.

4.53 Aquatic

a) Marine

The mid-straits area of Powell River-Lund-Texada Island is of intermediate value to marine resources. Commercial shellfish harvesting takes place on Savary Island, and Gillies Bay on Texada Island, while shrimp and prawn are found at both north and south ends of Texada. Herring spawning is found at the south end of Texada Island as well as from Powell River to Lund, and on Savary Island.

Salmon sport fishing is done throughout the area with concentrations in the areas of southern Texada-Lasqueti Islands and northern Texada Island to Lund areas. The southern Strait of Georgia and Juan de Fuca Strait areas are heavily used by commercial and sport salmon fishing fleets and commercial herring fishing.

b) Freshwater

No significant freshwater streams are located in this study area.

4.54 Comparative Ranking of Potential LNG Terminal Sites in the Powell River Area

The following table summarizes the evaluation of social/environmental evaluation of potential sites in the Powell River area. The complete matrices are in the Appendix.

Site Name	Social	Terrestrial	Aquatic	Climate	Total
Texada Island	-6	-6	-12	-1	-25
Powell River	-8	-6	-8	-8	-30
Harwood Island	-10	-12	-7	-1	-30
Hurtado Point	-8	-6	-8	-8	-30

4.60 ALBERNI INLET AREA

The Alberni area includes sites which are located on the east shore of Alberni Inlet and Barkley Sound. They represent the most feasible LNG terminal sites on Vancouver Island. Marine access is equally good for all sites while land access becomes increasingly more costly for the sites furthest removed from Port Alberni. Both Westcoast Transmission Company Limited and B.C. Hydro and Power Authority are proposing to supply Vancouver Island with natural gas. If natural gas is provided to Vancouver Island, the possibility of an LNG terminal somewhere near the main trunkline of that system is feasible. As the gas line would be expected to go to Port Alberni on the west coast of the Island, Alberni Inlet sites were also evaluated.

A preliminary investigation by the environmental and engineering staff of Dome Petroleum Limited and subsequent review by the authors resulted in the identification of the following four sites:

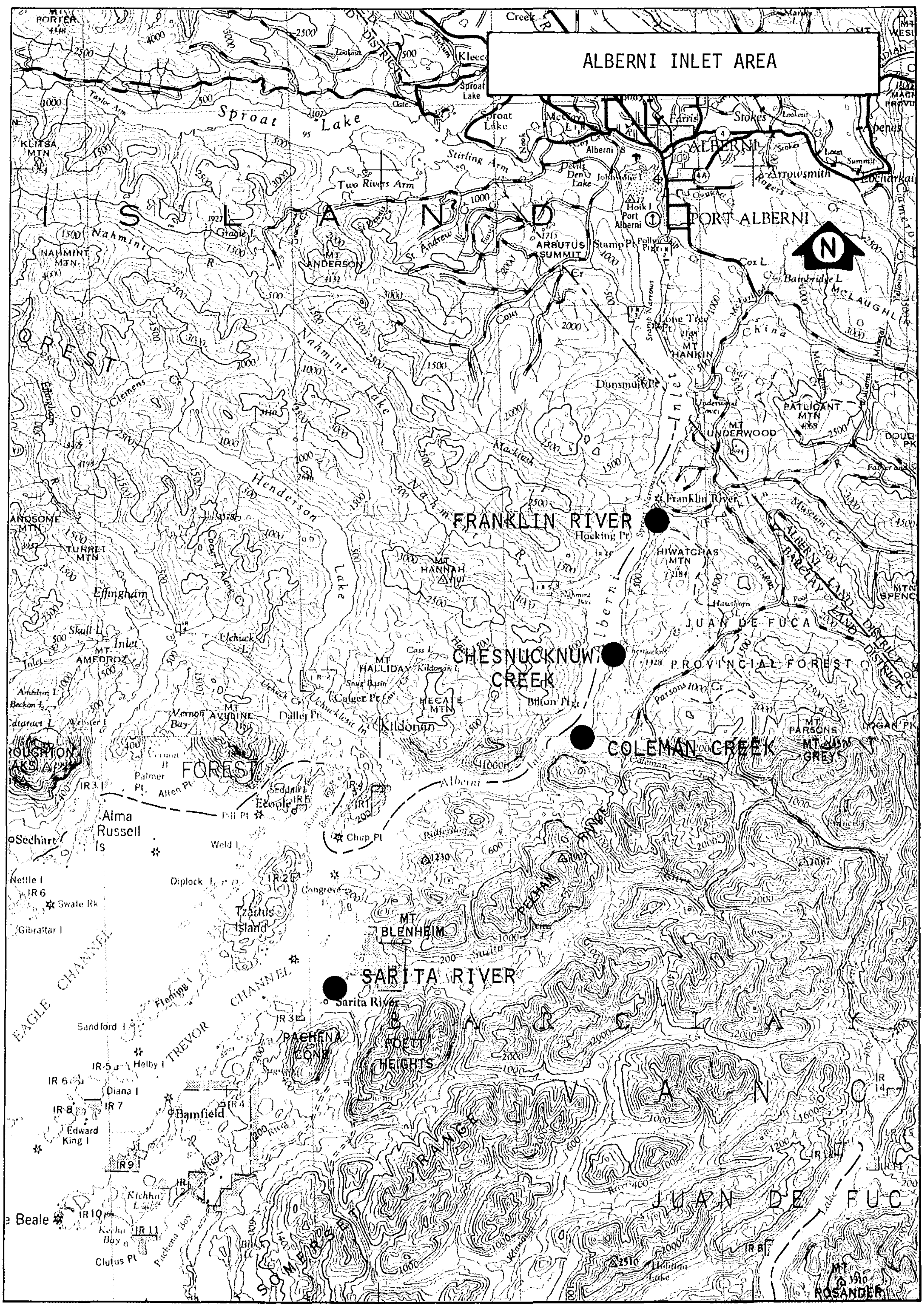
i) Franklin River
ii) Chesnucknuw Creek
iii) Coleman Creek
iv) Sarita River

The sites in this area are shown on Figure 8.

A description of the study area at Alberni follows:

4.61 Social

The principal community in this area is the City of Port Alberni, with a population of about 19,600 persons. Small communities at Barkley Sound include Bamfield (200) and the Village of Ucluelet (1,200). The area is heavily dependent on forest resources, with logging being a widespread activity, and pulp paper, lumber and plywood manufacturing in Port Alberni. Commercial fishing and fish processing are other important area activities, with approximately 480 commercial fishing vessels based in the area in 1976. The principal tourist attraction is Long Beach, the key feature of Pacific Rim National Park, which extends along the Pacific coast. Other recreation attractions include fishing and boating throughout Alberni Inlet and Barkley Sound, and hunting and fishing inland. Good logging road access throughout the area will undoubtedly attract increasing numbers of outdoor enthusiasts. Of the four proposed sites along the west side of Alberni Inlet, only the Sarita River site is outside comfortable commuting distance of Port Alberni. That site is located close to the somewhat isolated community of Bamfield, a settlement which has attracted many of its residents because of its remoteness.



1 : 250,000

5 0 15 km

4.62 Terrestrial

The Alberni Inlet sites are located on Vancouver Island. The physiography of the area shows a fiord surrounded by hills with some flat upland areas.

The waterfowl resource is primarily centred around Barkley Sound which is the entrance to Alberni Inlet. Alberni Inlet itself has moderately valuable waterfowl populations. Ungulate wildlife populations are of high value but their habitat is not very sensitive.

4.63 Aquatic

a) Marine

The Alberni Inlet-Barkley Sound area is one of the more important marine areas on the west coast of Vancouver Island.

Alberni Inlet is the pathway for the large Somass system salmon run, and for runs from several smaller river systems emptying into the Inlet. Several estuaries bordering the Inlet are critical to the early rearing and feeding of these fish, including the large Somass River estuary at the head of the Inlet, and several small estuaries at the mouths of Franklin, Nahmint, and Sarita rivers, and Cous, China, Macktush, Chesnucknuw and Coleman creeks.

Commercial net fishing in the Inlet and Barkley Sound takes about 1/2 million salmon annually (mainly sockeye) and represents a strong local and regional interest. A salmon sport fishery also operates in the lower reaches of Alberni Inlet, mainly for large chinook.

The Inlet also supports crab, shellfish and shrimp populations of local importance.

Barkley Sound is an extremely valuable marine area with its archipelago, reefs, and shallow waters supporting large populations of shellfish, crabs, and bottomfish. Herring spawn in significant numbers in several parts of the Sound, and sea lions frequent several islets along the seaward edge. Commercial fishing for shellfish and bottomfish, and commercial operations for tourist scuba diving are enterprises which utilize Barkley Sound's diversity of resources.

b) Freshwater

The Somass River system and Franklin, Sarita, Nahmint and Henderson rivers are major producers of salmon with Cous, China, Macktush, Chesnucknuw, Coleman and several other smaller creeks supporting smaller runs.

4.64 Comparative Ranking of Potential LNG Terminal Sites in the Alberni Area

The following table summarizes the evaluation of social/environmental evaluation of potential sites in the Alberni area. The complete matrices are in the Appendix.

Site Name	Social	Terrestrial	Aquatic	Climate	Total
Chesnucknuw Creek	-2	-8	-12	-1	-23
Coleman Creek	-3	-8	-12	-1	-24
Sarita River	-3	-12	-18	-1	-34
Franklin River	-2	-16	-14	-2	-34

4.70 SCORES OF POTENTIAL SITES

The scores for sites in all areas along the B.C. Coast were totalled and ranked from lowest (least impact) to highest (greatest impact) on the basis of their unmitigated scores and are tabulated in Table 4.1.

TABLE 4.1
Summary of Comparative Ranking of
Potential LNG Terminal Sites on the B.C. Coast

Site Name	Social	Terrestrial	Aquatic	Climate	Total	Ranking
SKEENA-NASS						
Grassy Point	-6	-8	-14	-1	-29	7
Ridley Island	-8	-4	-13	-8	-33	10
Kaien Island	-8	-4	-13	-8	-33	10
Digby Island	-16	-6	-16	-4	-42	14
Smith Island	-9	-8	-19	-2	-38	13
Nasoga Gulf	-18	-20	-13	-1	-52	15
Iceberg Bay	-19	-20	-16	-1	-56	17
KITIMAT-KEMANO						
Miskatla Inlet	-1	-12	-12	-1	-26	4
Emsley Cove	-0	-12	-13	-2	-27	5
Bish Creek	-1	-8	-15	-4	-28	6
Clio/Gobeil Bay	-5	-10	-14	-2	-31	9
Wathlsto Creek	-8	-10	-15	-4	-37	12
Kildala Arm	-7	-14	-16	-1	-38	13
Kemano Bay	-20	-14	-18	-2	-54	16
BELLA COOLA						
Ocean Falls	-24	-4	-12	-2	-42	14
Bella Coola	-16	-20	-26	-8	-70	19
GREATER VANCOUVER						
Britannia	-8	-5	-9	-4	-26	4
Roberts Bank	-8	-13	-28	-8	-57	18
POWELL RIVER						
Texada Island	-6	-6	-12	-1	-25	3
Powell River	-8	-6	-8	-8	-30	8
Harwood Island	-10	-12	-7	-1	-30	8
Hurtado Point	-8	-6	-8	-8	-30	8
ALBERNI						
Chesnucknuw Creek	-2	-8	-12	-1	-23	1
Coleman Creek	-3	-8	-12	-1	-24	2
Sarita River	-3	-12	-18	-1	-34	11
Franklin River	-2	-16	-14	-2	-34	11

5.00 COMPARATIVE EVALUATION OF POTENTIAL LNG TERMINAL SITES

Very significant constraints on the location of an LNG terminal were impacts based on public attitude. For example, the Britannia site is scored as having a -8 impact on recreational boating in Howe Sound. However, the study team felt the score should be many times higher to reflect relative use between sites. This was based on the perceived high resource value of the Howe Sound sports fishing and recreational use of Howe Sound to the Greater Vancouver area. Therefore, the study team felt that Britannia should not be considered as a technically feasible site. It was decided to retain the Britannia site in the scoring system to maintain it as a base comparison to technically feasible sites.

Other potential LNG terminal sites were rejected due to the population proximity criteria. These sites are:

Ridley Island - only 1.5 km from Port Edward
Digby Island - only 0.5 km from the Norwegian Village
Kaien Island - only 1.5 km from Port Edward

Hurtado Point - only 1 km from Lund
Powell River - only 1 km from the urban area of Powell River

The remaining potential terminal sites were ranked in order of least to most social and environmental impacts. The ranked list is as follows:

1.	Chesnucknuw Creek	-23
2.	Coleman Creek	-24
3.	Texada Island	-25
4.	Miskatla Inlet	-26
4.	Britannia	-26
6.	Emsley Cove	-27
7.	Bish Creek	-28
8.	Grassy Point	-29
9.	Harwood Island	-30
10.	Clio/Gobeil Bay	-31
11.	Sarita River	-34
11.	Franklin River	-34
13.	Wathlsto Creek	-37
14.	Smith Island	-38
14.	Kildala Arm	-38
16.	Ocean Falls	-42
17.	Nasoga Gulf	-52
18.	Kemano Bay	-54
19.	Iceberg Bay	-56
20.	Roberts Bank	-57
21.	Bella Coola	-70

The ranked scores show distinct groupings for the potential LNG terminal sites. For example, the first nine sites score on the basis of environmental and social determinants from 23 to 29. The mid-group of six sites has scores in the -30's, and finally the scores decrease rapidly for the remaining six sites.

The ranked potential LNG terminal sites were then evaluated by the engineering consultants. Severe engineering constraints were identified in the Swan Wooster Engineering Co. Ltd. report and the following sites eliminated:

Miskatla Inlet	- difficult land access and restricted marine access
Harwood Island	- unconsolidated eroding sediments
Clio/Gobeil Bay	- small upland area with confined marine access
Smith Island	- difficult access through Skeena River estuary
	- slide area above site
Ocean Falls	- no land access; new land access very difficult
Kemano	- severly restricted marine access
Iceberg Bay	- severely restricted marine access

The environmental and social consultants decided that the sites which scored lower than -30 should be ruled out from further consideration. This left five areas (7 sites) for detailed examination as "technically feasible" sites:

Skeena-Nass Area	
- Grassy Point	-29
Kitimat-Kemano Area	
- Emsley Cove	-27
- Bish Creek	-28
Greater Vancouver Area	
- Britannia	-26
Powell River Area	
- Texada Island	-25
Alberni Area	
- Chesnucknuw Creek	-23
- Coleman Creek	-24

6.00 INVENTORY AND ASSESSMENT OF TECHNICALLY FEASIBLE SITES

In Chapters 4.00 and 5.00 an inventory, assessment and evaluation of 26 potential sites in six areas resulted in a ranking in order of preference and development of a short list of seven sites in five areas. These seven sites in five areas are given a detailed assessment using the procedures described in Chapter 3.20 and are the technically feasible sites.

6.10 SKEENA-NASS AREA

Grassy Point Site

6.11 Social

The proposed Grassy Point site is located on the tip of the Tsimpsean Peninsula, approximately 3.5 km north of the Indian village of Port Simpson. Most land in this area was previously identified for commercial use but has since reverted to the Crown. The proximity of Port Simpson would result in a perceived safety risk without proper mitigation, while the development of the industrial facilities could reduce the utility or value of adjoining properties.

The shoreline has a moderately high capability for outdoor recreation, with a better climate than Prince Rupert, direct water access, good fishing, and potential for family beach activities. Given direct access to the city, this could become a popular recreation destination. The loss of these potential recreation resources to industrial use at the proposed site would result in a fairly high impact rating. However, this localized impact is countered by the potential benefits that access to the site could provide in the area between Prince Rupert and the site. A connecting road could also be provided to Port Simpson, thereby giving the local populations direct access to Prince Rupert, which they have been requesting for a considerable time. The only industrial use at the site consists of the cannery owned by the native co-op in Port Simpson. Some minor logging activities are taking place in the Stumaun Creek drainage, however, the site itself has a very low forest potential.

While the development of the proposed site may result in impact on the local native population and probably on archaeological resources, it would also provide some benefits such as employment opportunities (particularly during construction) which should balance the potential impacts. In summary, the potential for social benefits appear greater at the Grassy Point site than at any other site under consideration.

6.12 Terrestrial

Grassy Point is located in the Prince Rupert area approximately 28 km north of Prince Rupert. Its land access would require 8 km of new road and 20 km of upgrading of an existing logging road to reach the community of Prince Rupert. A 2 km ferry would be required between Bacon Cove and the present ferry terminal at Prince Rupert. A 61 cm

diameter gas pipeline would be required from Summit Lake to the site, a distance of approximately 630 km. Water access would be via Dixon Entrance to Port Simpson harbour. There are no restrictions in the access channel to Port Simpson harbour, a protected port basin approximately 5 km x 2 km in size. The upland area is large, flat, and approximately 1 km x 5 km in area.

The landform and geology of the site consists of gently sloping, metamorphic rock, eroded flat by previous ice sheets. This is overlain by a mantle of till veneer with peat and muck pockets. The seismicity of the Grassy Point site is high (Class 3 of the National Building Code). The seismic response of the organics is high, while the tills are moderate. Bedrock has a low seismic response.

Port Simpson harbour itself is a relatively significant waterfowl staging and resting area. It has a high species diversity in that alcids, diving ducks, dabbling ducks and pelagic birds are found in this area. However, because of the small area that may be effected, the sensitivity of that resource is moderate compared to other areas closer to the mouth of the Skeena River.

The Tsimpsean Peninsula has a significant ungulate resource. Coastal black-tail deer are found on the site and utilize it as an important wintering habitat. In fact the intertidal areas have been a traditional winter habitat during severe snow accumulation.

There is some hunting and trapping by the local community. This is centred in areas of large intertidal meadows such as Stumaun Bay, Neaxtoalk Lake, and between Birnie Island and Grassy Point.

6.13 Aquatic

The Grassy Point site is on a fairly important part of the Port Simpson harbour shoreline with herring spawning and shellfish having both local and regional significance. The harbour basin is used by Port Simpson residents for fishing and shellfish harvesting and the Stumaun River estuary is about 5 km to the south. These are sensitive areas with respect to the risk of fuel spills.

6.14 Climate

The climate of the site moderately wet (150-250 cm annual precipitation). Inversions occur mainly in summer.

The prevailing wind directions are westerly and southeasterly. The distance of 3.5 km from the Port Simpson village which represents an adequate safety envelope for the plant, in that the community is not exposed to the airshed of the plant.

6.20 KITIMAT-KEMANO AREA

Emsley Cove/Bish Creek Sites

As these two sites are very close to each other and evaluation in Chapters 4.00 and 5.00 resulted in very similar scores, the two sites will be discussed together, highlighting any areas of significant resource difference.

6.21 Social

The Emsley Cove and Bish Creek sites are located on the east coast of Kitimat Arm, some 15 km south of the District of Kitimat. The Indian village of Kitamaat (Kitamat Mission) is 8 to 10 km away, on the opposite side of Kitimat

Arm. No existing development is known to be at either site, but the Emsley Cove site is on a surveyed Crown lot with a small Indian Reserve adjacent, and the Bish Creek site is on an Indian Reserve. The potential for interference with native activities and archaeological resources is, therefore, fairly high. The recreation capability of the area is assumed to be moderate, with access to water, views (which are not particularly unique at either site) and fishing, but are accessible now only by boat. A new road to the proposed site would provide the benefit of improved access to recreation resources, countering the loss of utility at the site itself.

Industries are centred around Kitimat (aluminum smelter, pulp mill) with logging activity occurring along Douglas Channel. Sawmills are located in the Kitimat-Terrace corridor.

The local labour pool could not support construction needs, but may be sufficient to service much of the operational requirements. Local topographic constraints may require that the construction camp be located in or near the District of Kitimat, thereby resulting in increased social and traffic access impacts.

6.22 Terrestrial

Bish Creek and Emsley Cove are located 8 km and 12 km respectively south of Kitimat. The sites require a new road from Kitimat. A 61 cm diameter gas pipeline would be required from Summit Lake to the site, a distance of approximately 505 km. The sites are located on Douglas Channel which has restricted water access for more than 100 km. The port basin would be approximately 1 km x 1 km in area while the upland area is restricted to 800 m x 900 m.

The landform and geology of the two sites are identical. They exhibit alluvial materials which are underlain by a fine-textured marine clay which is prone to submarine slides.

The seismicity of the site is high, coupled with a relatively high seismic response by the unconsolidated materials. This could lead to failure of the marine clays resulting in a high geotechnical risk.

The waterfowl resource at Emsley Cove and Bish Creek is moderate and is localized in the estuary portion of the two bays. Waterfowl and other birds are of moderate significance in contrast to the high significance at the entrance of Douglas Channel. Wildlife hunting and trapping are of low significance. Some native hunting may occur.

There is a high forestry potential in Douglas Channel which would be pre-empted for either site. Other industrial areas would not be affected.

6.23 Aquatic

The Emsley Cove/Bish Creek sites are located on small but important estuaries where loss of productive intertidal habitat would be unavoidable. These sites are also 10 or 12 km from the extremely important and sensitive Kitimat River estuary where the risk of fuel spills must be considered of at least moderate significance.

The risk of fuel spills to fishing activities and marine resources in Kitimat Arm, Douglas Channel and seaward of Douglas Channel is a key issue, as is the potential interference that LNG carrier traffic could have on fishing operations in these waters.

6.24 Climate

The climate of the site is very wet (250-350 cm precipitation per year). Inversions are moderately frequent and winds are controlled by topography to north and south.

6.30 GREATER VANCOUVER AREA

Britannia Site

6.31 Social

The Britannia site is located just south of the Britannia Beach townsite, which formerly housed the employees of a nearby mine and concentrator. Now closed, the mine has been converted into a mining museum, and the townsite is largely unused. However, in the view of the study team, the immediate proximity of the proposed LNG facilities to this settlement would constitute an unmitigable safety hazard. A considerable number of tourists are attracted to this facility each year, adding to the large number of locals and tourists who use Howe Sound, Highway 99, and the B.C. Rail services. Most recreation opportunities here are associated with the water, including active pursuits and viewing opportunties. Industrial development proposals in Howe Sound would probably be considered to be in conflict with recreational and natural values, by those who seek to preserve these qualities in this area. The presence of the shipping facilities, more than the plant itself, would detract from recreational enjoyment, and the presence of the LNG carriers would constitute a hazard to other boats. The opportunity to view the plant, once in operation, could be considered a recreation benefit. During construction, the presence of equipment and a large, mobile labour force would affect traffic conditions on Highway 99, an already crowded route at times.

Labour availability, both for construction and operation, should be less of a problem at this site than at any other of the other sites considered in the province. The Squamish area has a moderate labour pool (6,700) but the Vancouver area to the south contains well over 1/2 million workers.

6.32 Terrestrial

The Britannia site is located on Howe Sound 35 km north of Vancouver. Its inland water access is through the Juan de Fuca Strait, Strait of Georgia and Howe Sound. Approximately 32 km of Howe Sound are restricted channel access. The Britannia port basin is in the open water of Howe Sound. The upland area is only 40 hectares and would require relocation of the present Vancouver-Squamish Highway. Land access to Vancouver and Squamish is excellent; and includes rail access. A new gas pipeline is estimated to run from Williams Lake to Elaho junction, as a 76 cm line for 270 km; and from Elaho junction to Britannia, a 61 cm line for 85 km.

The landform and geology show as an excavated gravel pit preloaded by 2,100 m of ice. There is bedrock immediately below the site. The seismicity of the Britannia site is classified at 3 by the National Building Code. The seismic response of the compacted gravel is moderate and of the bed rock low.

Wildlife and waterfowl resources are insignificant on the sites. Hunting and trapping does not take place.

Resource uses of the area are restricted to forestry and mining with Britannia mines being an on-and-off proposition during the last century.

6.33 Aquatic

The Britannia site is a relatively unproductive part of Howe Sound. The shoreline is steep and has been rendered almost sterile from past industrial practices including suspected ongoing bacterial leaching of copper ore that contaminates Britannia Creek.

The site is only 7 km from the important Squamish River estuary and represents a risk of fuel spills to this sensitive environment as well as to the biologically, recreationally important Howe Sound.

Other shorelines of the southern Strait of Georgia and Strait of Juan de Fuca and the commercial and recreational fisheries are of critical importance.

Another key issue is the potential interference LNG carrier passage could have on the ferry, commercial and sport fishing operations throughout the Strait of Georgia and in Howe Sound.

6.34 Climate

The climate at Britannia is wet (150-250 cm precipitation). Inversions are frequent and winds are controlled by topography. Prevailing winds therefore are either northerlies or southerlies.

6.40 POWELL RIVER AREA
Texada Island Site

6.41 Social

The Texada Island site is located near an abandoned mine site, less than 2.5 km north of the community of Gillies Bay. This location could constitute a safety risk without proper mitigation. In addition, Harwood Point Provincial Park, the island's main recreation facility is located only about 5 km south of the proposed site. The community of Vananda, some 8 km away from the eastern shore, is separated from the proposed site by the Island's central uplands. The recreation capability at and near the proposed site is moderately high, offering beach and shoreline activities, access to the water and fishing and viewing opportunities. Roads and trails from Gillies Bay allow for hiking and off-road vehicle access. The intrusion of an industrial facility onto this part of the island would probably be opposed strongly by the local residents. A large portion of the Gillies Bay population is composed of retired persons, while a significant number of the remainder are young, rural-oriented people who place a high priority on the natural and scenic values. Construction activities and traffic would have a high impact on the local communities, and could strain the capabilities of the ferry to Powell River. The local labour pool would be incapable of providing for construction or operational needs.

6.42 Terrestrial

The site used to be an iron and copper mine which was closed down about 3 years ago. Gillies Bay is located approximately 2.5 km south of this site. LNG carrier access to this site would be through the Juan de Fuca Strait and the Strait of Georgia to a relatively exposed port basin adjacent

to the coarse aggregate pile of the old mine. The upland area is sloping and would yield up to 800 m x 500 m of plant area. Land access consists of an existing road, a ferry link to Powell River, and a road and ferry system to Greater Vancouver. Presently there is no gas pipeline to this area. About 375 km of 76 cm diameter pipeline would be required to reach Powell River. From Powell River two 35 cm diameter lines of 15 km length would be required to reach Texada Island. The landform and geology of the site consists of metamorphic rock which was blasted and prepared by the previous mining operators. The seismicity of the site is rated as 3 National Building Code, which is attenuated by the low seismic response of the bedrock shelf.

The waterfowl and wildlife resource in the study area is moderate. Waterfowl tend to loaf in Gillies Bay and some diving ducks may seek rest and shelter in front of the ex-Texada Mines site. Ungulates are numerous on Texada Island but because of the ubiquitous wildlife habitat they are not a sensitive resource.

Resource uses on the island are restricted to forestry and mining. Various limestone quarries continue to operate on Texada Island to supply lime to the cement industry. No native hunting or trapping takes place on Texada Island.

6.43 Aquatic

The Texada site is a relatively unproductive part of the island's west coast, having been substantially altered by past industrial use. The shoreline is steep and rocky and the closest area of significant marine resources is 2.5 km to the south in Gillies Bay where shell fish are important.

The location of this site in the Strait of Georgia presents a risk of fuel spills to the biologically and recreationally important Gulf Islands and other biologically productive areas on the southern Strait of Georgia and the Juan de Fuca Strait, and to the commercial and recreational fishing in these waters. The potential interference LNG carrier passage could have on the fishing operations is of concern.

6.44 Climate

The climate of Texada Island shows a relatively dry site (50-75 cm precipitation). Summer inversions predominate. Winds prevail from the northwest, southeast and east.

6.50 ALBERNI INLET

Chesnucknuw Creek and Coleman Creek Sites

As these two sites are very close to each other and evaluation in Chapters 4.00 and 5.00 resulted in very similar scores, the two sites will be discussed together, highlighting any areas of significant resource difference.

6.51 Social

The two sites, Chesnucknuw Creek and Coleman Creek, are located on the west side of Alberni Inlet, some 25 to 30 km southwest of the region's main centre - Port Alberni. Both sites are within an active logging area (Tree Farm License) and contain no existing development. A fairly extensive logging road network, including a main-haul road which connects Port Alberni and the coastal community of Bamfield, provides access throughout the area. Some disturbance to recreation use and potential could be expected from an LNG terminal in this area, during both construction and

operation. The presence of a large construction labour force would probably constitute the greatest impact potential. The local areas contribute a resident labour force of some 12,600 workers, would easily absorb the projected operations staff, but would be incapable of providing or servicing the construction force.

The possibility of archaeological sites exists at the creek mouths, and if any do exist, they could be damaged or destroyed during construction.

6.52 Terrestrial

The Chesnucknuw/Coleman Creek sites are located on Vancouver Island with the marine access via Alberni Inlet and Barkley Sound to the Pacific Ocean. Only 10 - 25 km of the channel access is narrow and restricted. The port basins of each site are in protected waters in the open channel. The upland areas are large and consist of a 1.5 km x 1 km upland directly south of the small estuaries of the respective creeks.

It is assumed that possible gas pipeline access to the Alberni sites would be 375 km of 76 cm diameter line to Powell River, 30 km of two or possibly three 35 cm diameter lines to Comox, and a 61 cm diameter line for 105 km from Comox to Alberni. From Alberni additional line of 20 to 25 km would be required to either of the sites.

The landform and geology of the two sites are very similar. The gently sloping upland area with a till cap over bedrock provides a compacted site. The seismicity of both the Alberni sites is rated at Class 3 of the National Building Code. The seismic response of the compacted till is moderate, while the recent alluvial materials show a high seismic response. The value of the wildlife resource is high and

that of the waterfowl resource is moderate. Waterfowl is moderate in that most of the birds are concentrated at Barkley Sound. In contrast the ungulates have a high population density but because of the availability of alternate habitats, the resource is not sensitive. There is insignificant hunting in the area.

Resource uses in this area centre around the forest industry. The high productivity of the coastal forests support logging as a primary industry. Some of the Alberni sites are utilized for log dumping and log raft storage.

6.53 Aquatic

These sites are located on small locally important estuaries where some loss of production of fish and wildlife habitat would be unavoidable. The sites are sufficiently removed from the Somass River estuary that no risk is anticipated.

The hazards of fuel spills to fishing activities and marine resources in Alberni Inlet and Barkley Sound is a key issue as is the potential interference which LNG carrier traffic could have on fishing operations in the inland waters.

6.54 Climate

The climate of both sites shows extreme precipitation (250-350 cm). Inversions occur year-round. Wind directions are modified by topography to SW and NE winds.

6.60 EVALUATION OF TECHNICALLY FEASIBLE SITES BY AREA

Each technically feasible site discussed in Sections 6.10 through 6.50 was scored using both unmitigated scores for resource value and sensitivity, and mitigated scores for residual impacts.

The scores were assigned as described in Section 3.20 for the social, terrestrial and climate, and aquatic components and are shown in the Tables 6-1, 6-2 and 6-3.

Tables 6-4 to 6-8 illustrate the totals of social, terrestrial and climate, and aquatic impact scores, both unmitigated and mitigated for each of the five technically feasible area sites.

The following assumptions were made as to mitigation for each of the five sites.

1. Skeena-Nass Area Site

- provision of land access to Prince Rupert
- provision of infrastructure for Port Simpson
- provision of safe navigational access to Port Simpson harbour
- conventional mitigation procedures for loading and unloading of LNG and fuel
- pollution control to required level of the Waste Management Branch for cooling water and air emissions

2. Alberni Area Sites

- pollution control to the required level of the Waste Management Branch for cooling water and air emissions
- conventional safety procedures for loading and unloading for LNG and fuel

	GRASSY POINT SITE		EMSLEY COVE-BISH CREEK SITES		BRITANNIA SITE		TEXADA SITE		CHESNUCKNUW-COLEMAN CREEK SITE	
	CONSTRUCTION	OPERATION	CONSTRUCTION	OPERATION	CONSTRUCTION	OPERATION	CONSTRUCTION	OPERATION	CONSTRUCTION	OPERATION
LAND USE & COMMUNITIES										
Impact	0	-4	0	0	0	-8	-4	-4	0	0
Benefit		0				0	0	0		
Residual Score		-4				-8*	-4	-8*		
LAND STATUS										
Impact	0	-4	-8	0	0	0	0	0	0	0
Benefit		+4	+8							
Residual Score		0	0							
RECREATION										
Impact	-2	-4	-1	-2	-2	-4	-2	-4	-2	-2
Benefit	0	+4	-	+2	0	+2	0	0	0	0
Residual Score	-2	0	-1	0	-2	-2	-2	-4	-2	-2
ACCESS										
Impact	0	0	-2	0	-4	0	-4	-2	0	0
Benefit		+4	0		0		0	0		
Residual Score		+4	-2		-4		-4	-2		
LABOUR										
Impact	-4	-1	-4	-1	0	0	-4	-2	-4	-1
Benefit	0	0	0	0			0	0	0	0
Residual Score	-4	-1	-4	-1			-4	-2	-4	-1
HERITAGE AND NATIVE RESOURCE										
Impact	-2	-4	-4	-2	0	0	0	0	-1	0
Benefit	+2	+4	+2	0					0	
Residual Score	0	0	-2	-2					-1	
TOTALS										
Impact	-8	-17	-19	-5	-6	-12	-14	-16	-7	-3
Benefit	+2	+16	+10	+2	0	+2	0	0	0	0
Residual Score	-6	-1	-9	-3	-6	-10*	-14	-16*	-7	-3

* Absolute Constraints

TABLE 6-1: MATRIX OF SOCIAL IMPACTS ON THE TECHNICALLY FEASIBLE LNG TERMINAL SITES

	GRASSY POINT SITE			EMSLEY COVE-BISH CREEK SITES			BRITANNIA SITE			TEXADA SITE			CHESNUCKNUW-COLEMAN CREEK SITE		
	LAND ACCESS	WATER ACCESS	TIDEWATER FACILITY	LAND ACCESS	WATER ACCESS	TIDEWATER FACILITY	LAND ACCESS	WATER ACCESS	TIDEWATER FACILITY	LAND ACCESS	WATER ACCESS	TIDEWATER FACILITY	LAND ACCESS	WATER ACCESS	TIDEWATER FACILITY
TERRESTRIAL															
Issue:															
Resource Value	-2	-2	-2	-2	-2	-2	-1	-2	-1	-1	-2	-1	-2	-4	-2
Sensitivity	-4	-2	-2	-4	-2	-2	-1	-2	-2	-2	-2	-2	-2	-2	-2
Effect of Mitigation	0	0	0	+1	0	0	+1	0	+1	+1	0	+1	+1	0	+1
Residual Impact	-4	-2	-2	-2	-2	-2	0	-2	-1	-1	-2	-1	-1	-4	-2
CLIMATE															
Issue:															
Resource Value	-1			-4			-4			-1			-1		
Sensitivity	-1			-4			-4			-1			-1		
GRAND TOTAL UNMITIGATED IMPACTS	-9			-12			-9			-7			-9		
GRAND TOTAL RESIDUAL IMPACTS	-9			-10			-7			-5			-8		

TABLE 6-2: MATRIX OF TERRESTRIAL IMPACTS ON THE TECHNICALLY FEASIBLE LNG TERMINAL SITES

	GRASSY POINT SITE			EMSLEY COVE-BISH CREEK SITES			BRITANNIA SITE			TEXADA SITE			CHESNUCKNUW-COLEMAN CREEK SITE		
	LAND ACCESS	WATER ACCESS	TIDEWATER FACILITY	LAND ACCESS	WATER ACCESS	TIDEWATER FACILITY	LAND ACCESS	WATER ACCESS	TIDEWATER FACILITY	LAND ACCESS	WATER ACCESS	TIDEWATER FACILITY	LAND ACCESS	WATER ACCESS	TIDEWATER FACILITY
FRESHWATER															
Issue: Resource Value & Sensitivity	-4	-	-2	-2	-	-1	-	-	-	-2	-	-1	-2	-	-1
Effect of Mitigation	+2	-	+1	+1	-	0	-	-	-	+1	-	0	+1	-	0
Residual Impact	-2	0	-1	-1	0	-1	0	0	0	-1	0	-1	-1	0	-1
ESTUARINE															
Issue: Resource Value & Sensitivity	-	-2	-	-	-4	-1	-	-4	-	-	-	-	-	-2	-2
Effect of Mitigation	-	-	-	-	-	0	-	-	-	-	-	-	-	-	+1
Residual Impact	0	-2	0	0	-4	-1	0	-4	0	0	0	0	0	-2	-1
MARINE															
Issue: Resource Value & Sensitivity	-	-4	-2	-	-4	-1	-	-4	-1	-4	-4	-1	-	-4	-1
Effect of Mitigation	-	-	0	-	-	0	-	-	0	+2	-	0	-	-	-1
Residual Impact	0	-4	-2	0	-4	-1	0	-4	-1	-2	-4	-1	0	-4	0
GRAND TOTAL UNMITIGATED IMPACTS	-14			-13			-9			-12			-12		
GRAND TOTAL RESIDUAL IMPACTS	-11			-12			-9			-9			-9		

TABLE 6-3: MATRIX OF AQUATIC IMPACTS ON THE TECHNICALLY FEASIBLE LNG TERMINAL SITES

- state-of-the-art navigational safety systems for Barkley Sound and Alberni Inlet

3. Greater Vancouver Area Site

- state-of-the art navigational safety system for Juan de Fuca Strait, Strait of Georgia and Howe Sound
- pollution control to the required level of Waste Management Branch for cooling water and air emission
- relocation of the highway around the site with a minimum distance of 500 m

The Kitimat-Kemano and Powell River area sites did not have the same opportunities for mitigation as the above three sites and therefore only the conventional mitigation procedures would be applicable.

TABLE 6-4
IMPACT SCORES - SKEENA-NASS AREA
GRASSY POINT SITE

	UNMITIGATED SCORE	MITIGATED SCORE
Social	-25	- 7
Terrestrial and Climate	- 9	- 9
Aquatic	-14	-11
TOTAL	-48	-27

TABLE 6-5
IMPACT SCORES - KITIMAT-KEMANO AREA
EMSLEY COVE/BISH CREEK SITES

	UNMITIGATED SCORE	MITIGATED SCORE
Social	-25	-12
Terrestrial and Climate	-12	-11
Aquatic	-15	-12
TOTAL	-52	-35

TABLE 6-6
IMPACT SCORES - GREATER VANCOUVER AREA
BRITANNIA SITE

	UNMITIGATED SCORE	MITIGATED SCORE
Social	-18	-16
Terrestrial and Climate	- 9	- 7
Aquatic	- 9	- 9
TOTAL	-36	-32

TABLE 6-7
IMPACT SCORES - POWELL RIVER AREA
TEXADA ISLAND SITE

	UNMITIGATED SCORE	MITIGATED SCORE
Social	-30	-30
Terrestrial and Climate	- 7	- 5
Aquatic	-12	- 9
TOTAL	-49	-44

TABLE 6-8
IMPACT SCORES - ALBERNI AREA
CHESNUCKNUW CREEK/COLEMAN CREEK SITES

	UNMITIGATED SCORE	MITIGATED SCORE
Social	-10	-10
Terrestrial and Climate	- 9	- 8
Aquatic	-12	- 9
TOTAL	-31	-27

Ranking the five technically feasible sites on the basis of the unmitigated scores, the following order is obtained:

1.	Chesnucknuw Creek/Coleman Creek	-31
2.	Britannia	-36
3.	Grassy Point	-38
4.	Texada Island	-49
5.	Emsley Cove/Bish Creek	-52

Ranking the technically feasible sites on the basis of the mitigated score (residual impact), we arrive at the following sequence:

1.	Grassy Point	-27
1.	Chesnucknuw Creek/Coleman Creek	-27
2.	Britannia	-32
3.	Emsley Cove/Bish Creek	-35
4.	Texada Island	-44

On the basis of residual impacts, the Grassy Point and Alberni Inlet sites showed the least social and environmental impact for an LNG terminal assuming conventional mitigation procedures. On the basis of environmental effects to provide a natural gas pipeline to these sites, the Grassy Point site appears to offer the least social and environmental impact.

7.00 SOURCES OF INFORMATION

To maintain project schedule at this early stage of investigation, sources of information for assessment have been limited to existing published literature and the consultant's prior knowledge and work experience in the study areas.

Literature sources have included the following:

1. Higgins, R.J. Schouwenburg, 1973
A biological assessment of fish utilization of the Skeena River estuary, with special reference to port development in Prince Rupert.

Technical Report 1973-1, Northern Operations Branch Fisheries and Marine Service, Department of the Environment, Vancouver, B.C.

2. F.F. Slaney & Company Ltd., 1973. Preliminary Environmental Effect Assessment, Superport Development, Prince Rupert Region. Department of the Environment, Ottawa.

3. Northcoast Environmental Analysis Team. 1975. Prince Rupert Bulk Loading Facility, Phase 2, Environmental Assessment of Port Alternatives, Vol. 1 to 7. Prepared for Federal-Provincial Joint Committee on Tsimpsean Peninsula Port Development.

4. Canadian Coast Guard, 1977. TERMPOL Assessment of the Kitimat B.C. Marine Oil Terminal Proposal. Coast Guard, Transport Canada.

5. Kitimat Pipe Line Ltd. TERMPOL Submission re Marine Terminal at Kitimat, B.C. December, 1976.

6. Kitimat Pipe Line Ltd. National Energy Board Application December 1976.

7. Transmountain Pipeline Company Ltd. In the Matter of the National Energy Board Act and in the Matter of an Application by Transmountain Pipeline Company Ltd. for a Certificate of Public Convenience and Necessity authorizing the construction and operation of a parallel 762 mm diameter pipeline to accommodate eastward flow of Crude Oil. 22 volumes of specific reports dealing with the social and environmental components of the application.

8. Transmountain Pipe Line Company Ltd. Parallel 762 mm Diameter Pipeline to Accommodate Eastward Flow of Crude Oil. 1980 Map Folio, Vol. XVII.

9. Howard Paish and Assoc. Ltd. 1973. A Preliminary Assessment of the Site Specific Environmental Impact of a Proposed Bulk Terminal at Britannia Beach, B.C. Prepared for B.C. Railway Company.

10. Howard Paish and Assoc. Ltd. 1974. A Biological Assessment of the Kitimat River Estuary. Prepared for District of Kitimat.

11. Environment Canada. 1975. The Skeena River Estuary, Status of Environmental Knowledge to 1976. Special Estuary Series No.6. Report to the Estuary Working Group, Department of the Environment, Regional Board Pacific Region.

12. Environment Canada. 1975. The Skeena River Estuary, Status of Environmental Knowledge to 1975. Special Estuary Series No.3. Report to the Estuary Working Group, Department of the Environment, Regional Board Pacific Region.

13. Environment Canada. 1974. The Fraser River Estuary, Status of Environmental Knowledge to 1974. Special Estuary Series No.1. Report to the Estuary Working Group, Department of the Environment, Regional Board Pacific Region.

14. Environment Canada. 1975. The Squamish River Estuary Status of Environmental Knowledge to 1975. Special Estuary Series No.2. Report to the Estuary Working Group, Department of the Environment, Regional Board Pacific Region.

15. Howard Paish and Assoc. Ltd., 1974. Overview Environmental Assessment of the Proposed Powell River and Vancouver Island Natural Gas Transmission System on Intertidal and Foreshore Lands. Prepared for B.C. Hydro Gas.

16. Shinners, C.W. 1980. 1980 Salmon Expectations and Proposed Fishing Patterns. Department of Fisheries and Oceans, Field Services Branch, Vancouver, B.C.

17. Canada, Department of Fisheries and Oceans. 1980. Review of the 1978-79 British Columbia Herring Fishery and Spawn Abundance. Information Bulletin. Vancouver.

18. Hourston, A.S. and D.N. Outram. 1972. Millions of Eggs and Miles of Spawn in British Columbia Herring Spawnings, 1951 to 1970. Fisheries Research Board of Canada Technical Report No.296.

19. Farley, A.L., 1979. Atlas of British Columbia. The University Press, Vancouver, B.C.

20. Environment and Land Use Committee Secretariat, 1980. Howe Sound an Overview. B.C. Ministry of the Environment, Victoria, B.C.

21. Swan Wooster Engineering Company Ltd., 1977. Master Plan Study for the Port of Kitimat Prepared for B.C. Harbours Board. Vancouver, B.C.

22. Swan Wooster Engineering Company Ltd., 1980. Port Economic Study of Port Alberni, B.C. Prepared for Port Alberni Harbours Commission. Vancouver, B.C.

23. Thompson, A.R., 1978. West Coal Oil Ports Inquiry Statement of Proceedings Prepared for Ministry of Fisheries and the Environment. Vancouver, B.C.

24. Fisheries and Environment Canada, 1978. Potential Pacific Coast Oil Ports: A Comparative Environmental Risk Analysis Volume I & II. Vancouver, B.C.

25. Canada Department of Fisheries and Environment, 1978. West Coast Offshore Environments, Prepared for the Environmental Protection Service. Environment Canada, Vancouver, B.C.

26. Atmospheric Environment Service, Environment Canada, 1979. Report of the Environmental Assessment Panel Roberts Bank Port Expansion. Vancouver, B.C.

27. B.C. Ministry of Economic Development, 1978. Regional Index. Victoria, B.C.

The consultants' combined experience with similar assignments is more than 25 years. Helmut Urhahn has been involved as both terrain specialist and terrestrial project coordinator in the port location studies ranging from federal and provincial governments to private clients. These studies were conducted in the following areas of British Columbia:

1. Squamish
2. Britannia
3. Campbell River
4. Powell River
5. Texada
6. Port Alberni
7. Kitimat
8. Prince Rupert

Ross Peterson of Howard Paish and Associates Ltd. has prior experience as an aquatic scientist with work assignments in the following areas:

1. Prince Rupert - mouth of Skeena area
2. Lower Nass valley
3. Kitimat estuary, river and arm
4. Bella Coola River and area
5. Powell River, Texada Island
6. Howe Sound, including Squamish estuary and Britannia
7. Roberts Bank
8. Somass estuary and Alberni Inlet

John Thomas has been involved in the socio-economic field of studies dealing with port location as follows:

1. Prince Rupert
2. Kitimat
3. Roberts Bank
4. Port of Vancouver
5. Nanaimo

A P P E N D I X

POTENTIAL LNG TERMINAL SITES
SKEENA-NASS AREA

SITE NAME

GRASSY POINT

RIDLEY ISLAND

KAIEN ISLAND

DIGBY ISLAND

SMITH ISLAND

NASOGA GULF

ICEBERG BAY

INFORMATION SHEET

NAME: Grassy Point

LOCATION: 54° 36' 130° 26'

INLAND WATER ACCESS: Dixon Entrance

PORT BASIN: 5 km x 2 km natural harbour

UPLAND: 5 km x 1 km

LAND ACCESS: nil - 8 km new road and 20 km upgrading, new ferry link to P.R.; 40 km pipeline from existing pipeline right-of-way.

LANDFORM/GEOLOGY: gently sloping metamorphic rock, some peat

SEISMICITY: Class 3 NBC rating

COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE: +2

WATERFOWL: +4

MARINE: +4

FRESHWATER: +4

ESTUARY: +2

RESOURCE USES:

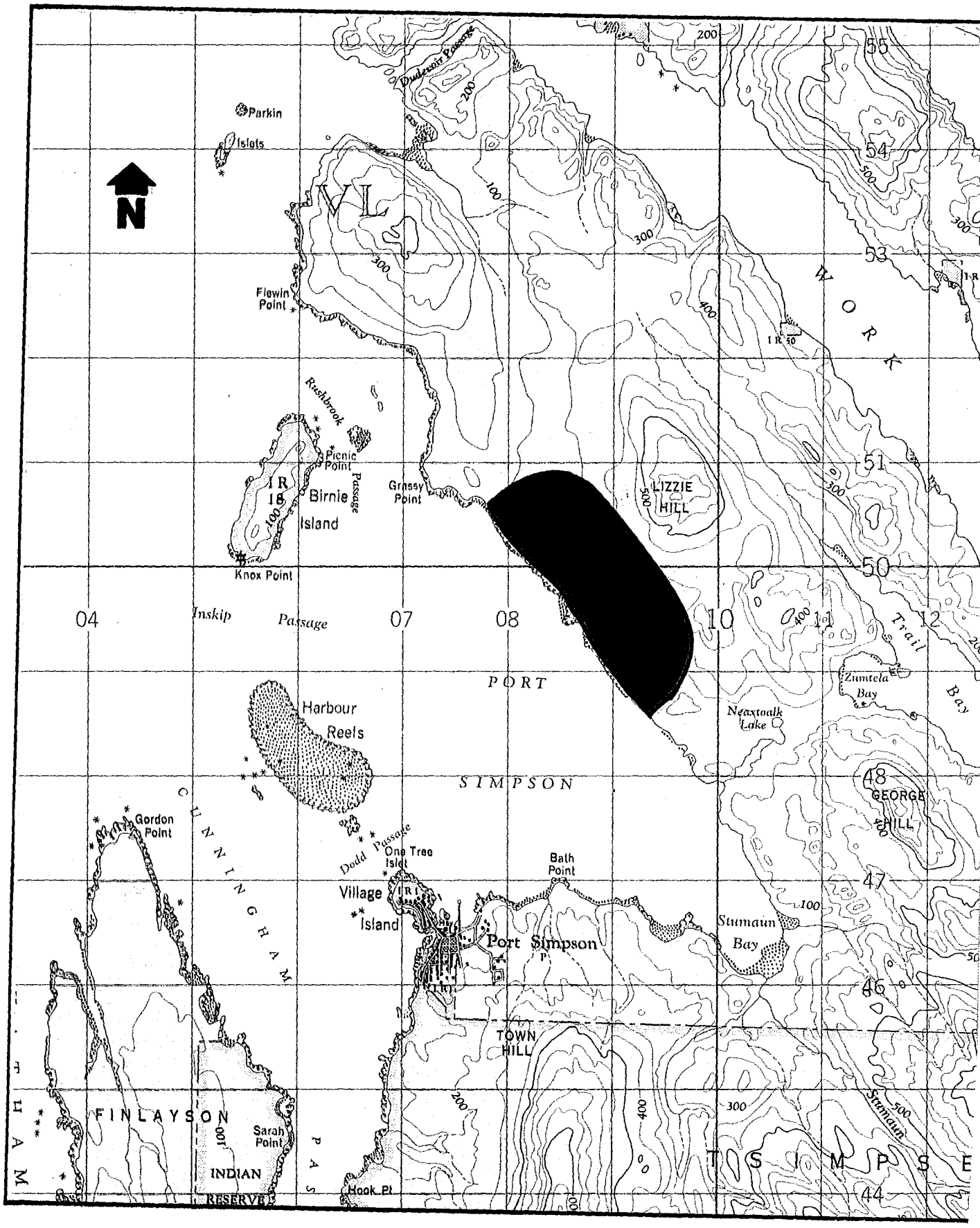
FORESTRY: 0

MINING: 0

INDUSTRY: 0

HUNTING & TRAPPING: +2

CLOSEST COMMUNITY: Port Simpson 3.5 km south of site



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GRASSY POINT SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Grassy Point

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	-4			
Population Proximity	-2			
Access	0			- 6
TERRESTRIAL	-4	-2	-2	- 8
AQUATIC				
Freshwater	-4	0	-1	
Marine	0	-4	-2	
Estuary	0	-2	-1	-14
AIR				
Climate	-1			- 1
GRAND TOTAL:				-29

INFORMATION SHEET

NAME: Ridley Island

LOCATION: 54° 13' 130° 20'

INLAND WATER ACCESS: Dixon Entrance - Chatham Sound

PORT BASIN: exposed, closest anchorage south of Digby Island

UPLAND: 365 ha, approximately 40 ha pre-empted for coal and grain terminal

LAND ACCESS: 10 km existing of road/3 km of rail, 10 km new pipeline to existing right-of-way.

LANDFORM/GEOLOGY: Metamorphic rock/flat with peat

SEISMICITY: NBC Rating 3

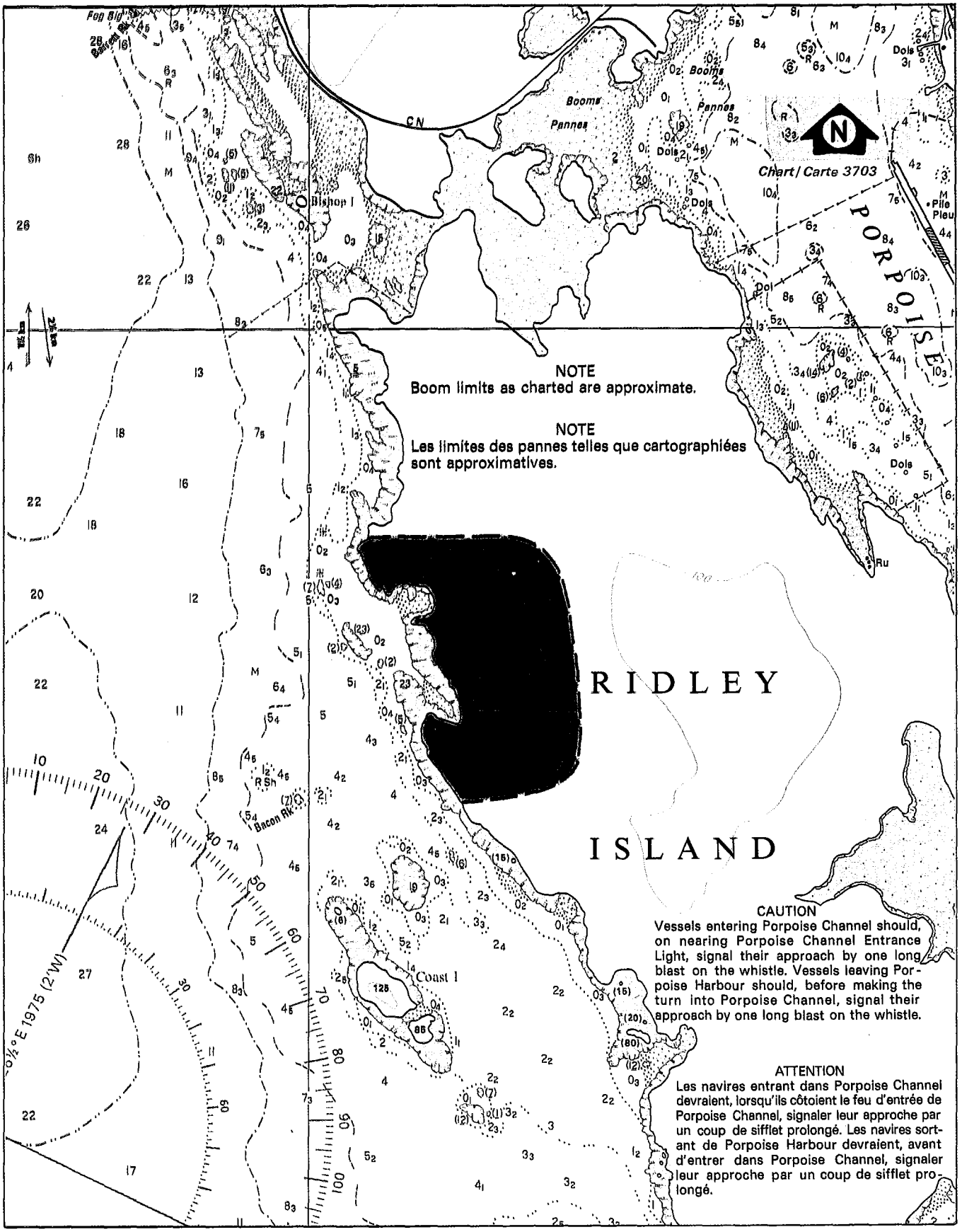
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+2
MARINE:	+4
FRESHWATER:	+1
ESTUARY:	+4

RESOURCE USES:

FORESTRY:	0
MINING:	0
INDUSTRY:	bulk loading terminal
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Port Edward 1.5 km east of site



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RIDLEY ISLAND SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Ridley Island

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-8			
Access	0			- 8
TERRESTRIAL	0	-2	-2	- 4
AQUATIC				
Freshwater	0	0	-1	
Marine	-1	-4	-1	
Estuary	0	-4	-2	-13
AIR				
Climate	-8			- 8
GRAND TOTAL:				-33

INFORMATION SHEET

NAME: Kaien Island

LOCATION: 54°13' 130°20'

INLAND WATER ACCESS: Dixon Entrance - Chatham Sound

PORT BASIN: exposed - no anchorage

UPLAND: approximately 40 ha

LAND ACCESS: 10 km of road/ 3 km of rail, 10 km of new pipe to existing right-of-way

LANDFORM/GEOLOGY: Metamorphic rock/flat with peat overlay

SEISMICITY: Class 3 NBC

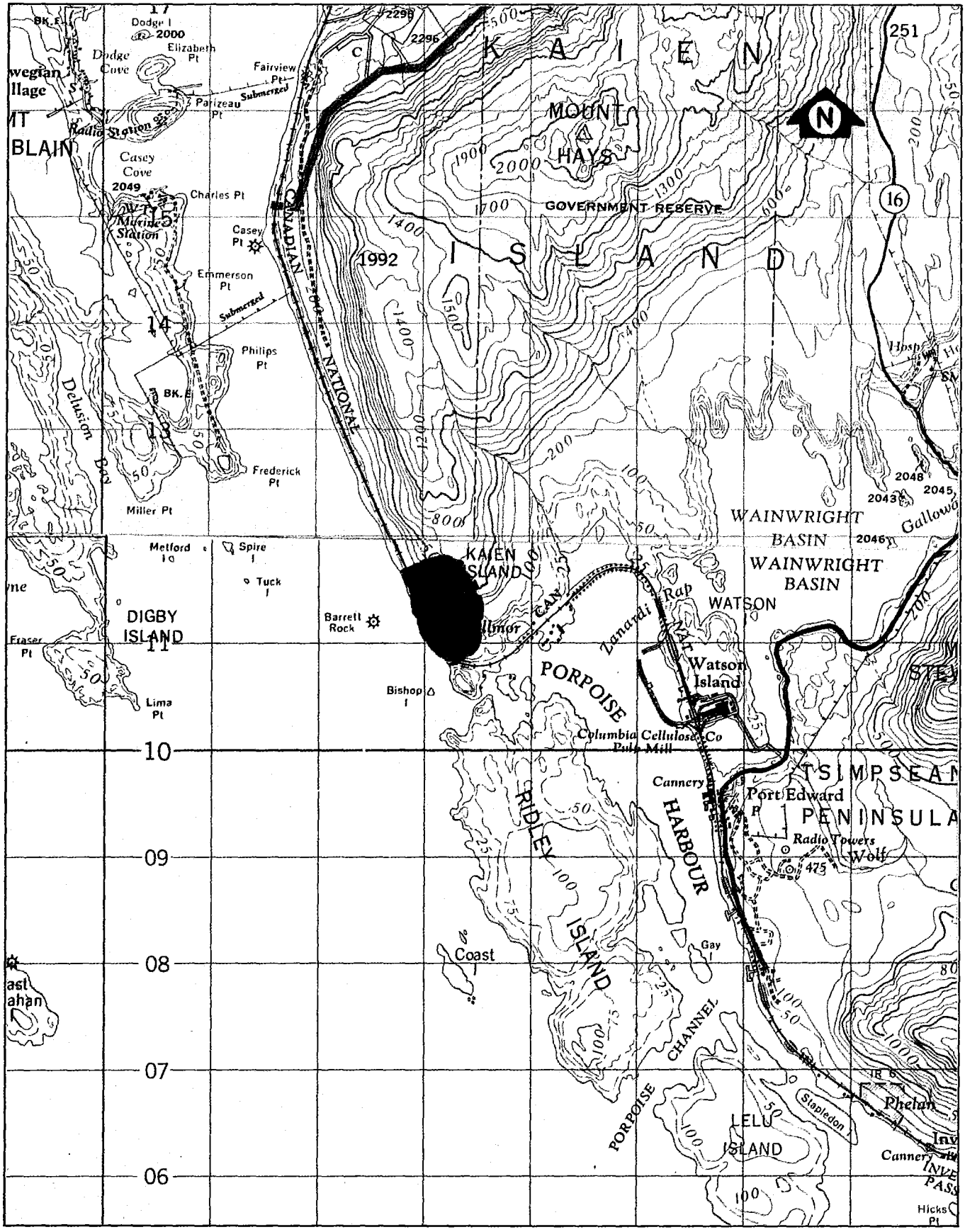
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+2
MARINE:	+4
FRESHWATER:	+1
ESTUARY:	+4

RESOURCE USES:

FORESTRY:	0
MINING:	0
INDUSTRY:	port
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Port Edward 10 km east of site



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KAIEN ISLAND SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Kaien Island

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-8			
Access	0			- 8
TERRESTRIAL	0	-2	-2	- 4
AQUATIC				
Freshwater	0	0	-1	
Marine	-1	-4	-1	
Estuary	0	-4	-2	-13
AIR				
Climate	-8			- 8
GRAND TOTAL:				-33

INFORMATION SHEET

NAME: Digby Island

LOCATION: 54° 16' 130° 24'

INLAND WATER ACCESS: Dixon Entrance/Chatham Sound
Prince Rupert Harbour, restricted
channel 6 km

PORT BASIN: small and in harbour entrance, closest anchorage
in Port Simpson Harbour

UPLAND: small up to 500 m x 2000 m

LAND ACCESS: nil - 5 km of road from existing ferry terminal
10 km of pipe to existing pipeline right-of-way
+ 2 km to
submarine crossing.

LANDFORM/GEOLOGY: sloping metamorphic rock

SEISMICITY: NBC Rating 3

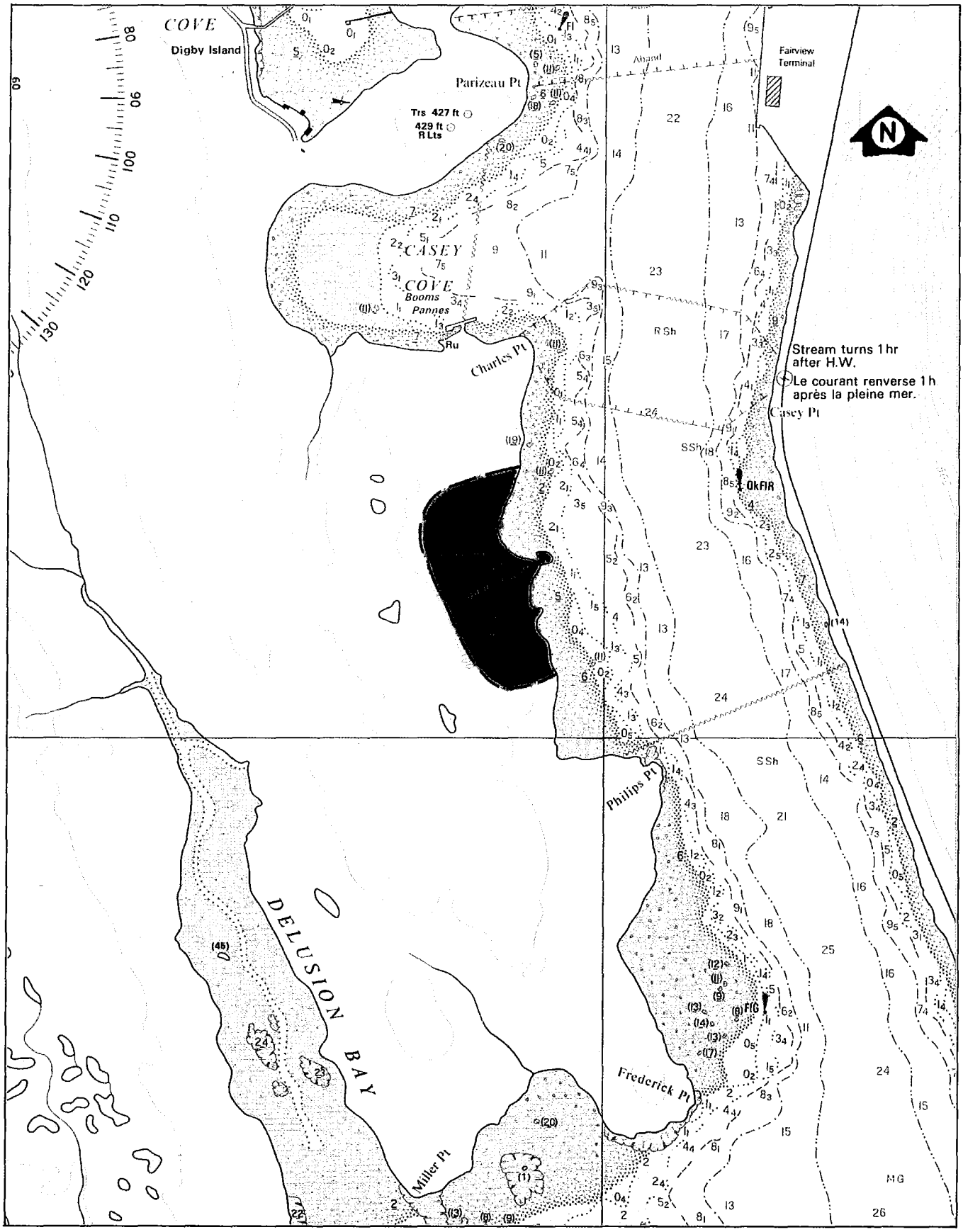
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+2
MARINE:	+2
FRESHWATER:	0
ESTUARY:	+4

RESOURCE USES:

FORESTRY:	0
MINING:	0
INDUSTRY:	airport
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Norwegian Village 0.5 km north of site



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DIGBY ISLAND SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Digby Island

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-8			
Access	-8			-16
TERRESTRIAL	-2	-2	-2	- 6
AQUATIC				
Freshwater	0	0	0	
Marine	-2	-2	-1	
Estuary	0	-4	-1	-16
AIR				
Climate	-4			- 4
GRAND TOTAL:				-42

INFORMATION SHEET

NAME: Smith Island

LOCATION: 54° 8' 130° 12'

INLAND WATER ACCESS: Dixon Entrance/Chatham Sound

PORT BASIN: exposed - closest anchorage south of Digby Is.

UPLAND: 4000 m x 500 m (2 km^2)

LAND ACCESS: nil, new pipeline via Skeena River approximately 6 km long with 3 km submarine crossing.

LANDFORM/GEOLOGY: moderately steep shelf of gneissic rock, slide problems

SEISMICITY: NBC Rating 3

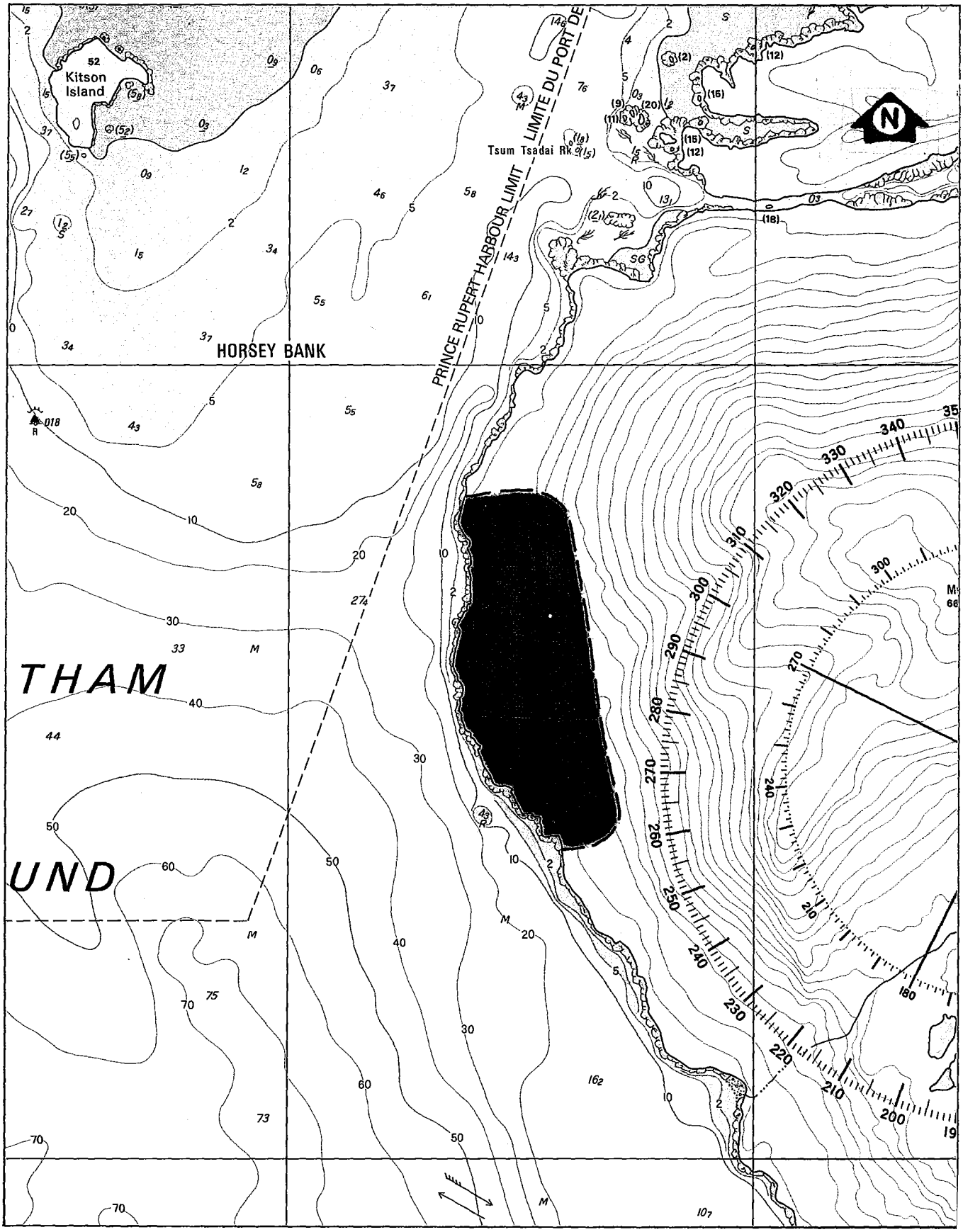
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+1
MARINE:	+4
FRESHWATER:	0
ESTUARY:	+8

RESOURCE USES:

FORESTRY:	0
MINING:	0
INDUSTRY:	0
HUNTING & TRAPPING:	+2

CLOSEST COMMUNITY: Port Edward 5 km north of site



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SMITH ISLAND SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Smith Island

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-1			
Access	-8			- 9
TERRESTRIAL	-4	-2	-2	- 8
AQUATIC				
Freshwater	0	0	0	
Marine	0	-4	-1	
Estuary	-4	-8	-2	-19
AIR				
Climate	-2			- 2
GRAND TOTAL:				-38

INFORMATION SHEET

NAME: Nasoga Gulf

LOCATION: 54°55' 130°2'

INLAND WATER ACCESS: Dixon Entrance, Portland Inlet
7 km restricted in Nasoga Gulf

PORT BASIN: 1.5 km x 5 km, natural harbour

UPLAND: 2 km x 1 km

LAND ACCESS: nil - 29 km of new road, upgrading of existing road; 124 km of new gas pipeline from Terrace

LANDFORM/GEOLOGY: granitic bedrock with extensive peat deposits in lowlands

SEISMICITY: NBC Rating 3 + high ground acceleration

COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE: +2

WATERFOWL: +4

MARINE: +4

FRESHWATER: +4

ESTUARY: +2

RESOURCE USES:

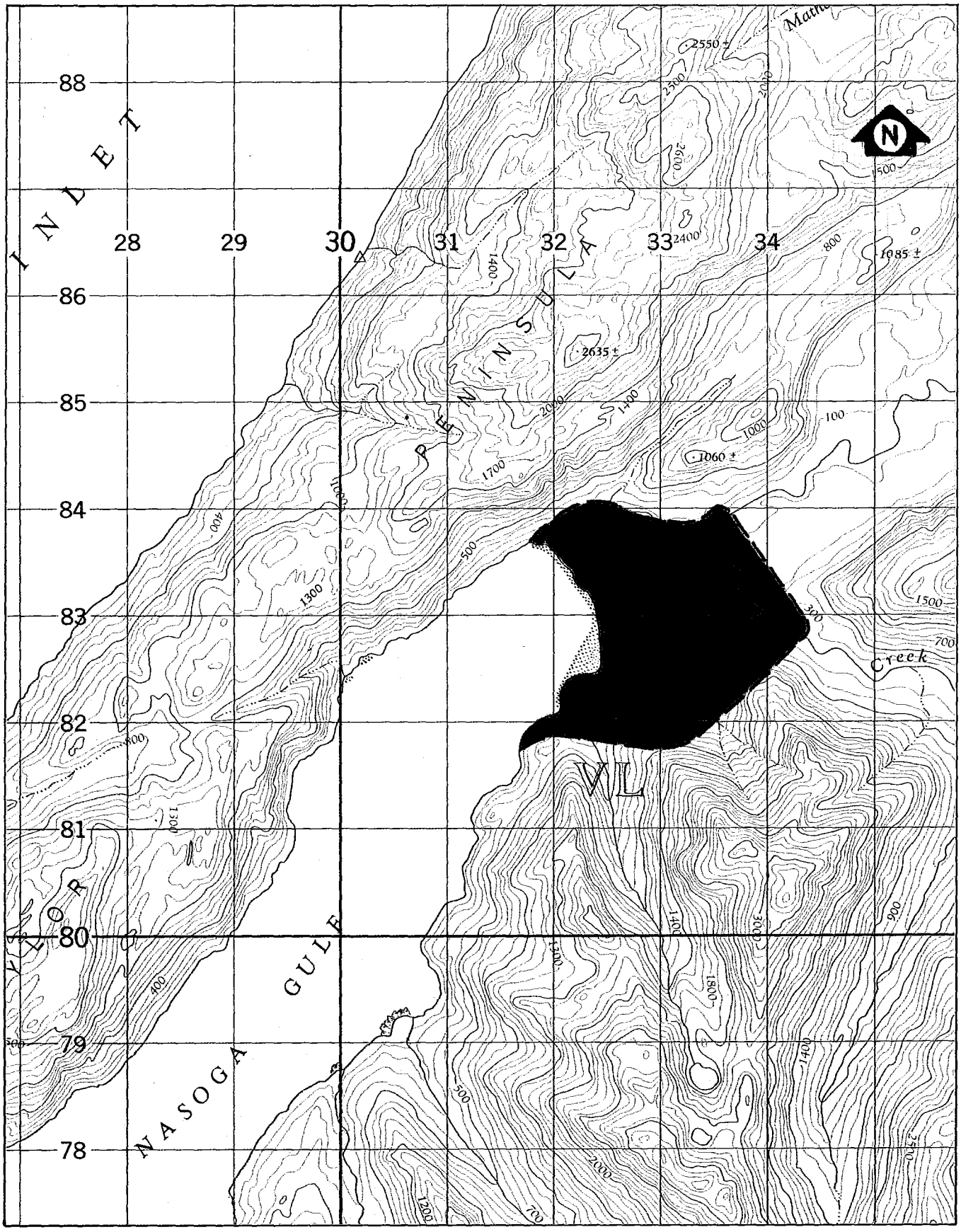
FORESTRY: +2

MINING: 0

INDUSTRY: 0

HUNTING & TRAPPING: +4

CLOSEST COMMUNITY: Kincolith 13 km north of site



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NASOGA GULF SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Nasoga Gulf

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	-8			
Infrastructure	-8			
Population Proximity	0			
Access	-2			-18
TERRESTRIAL	-8	-4	-8	-20
AQUATIC				
Freshwater	-4	0	-1	
Marine	-1	-4	-1	
Estuary	-2	0	0	-13
AIR				
Climate	-1			- 1
GRAND TOTAL:				-52

INFORMATION SHEET

NAME: Iceberg Bay

LOCATION: 45°56' 129°57'

INLAND WATER ACCESS: Dixon Entrance/Portland Inlet
12 km restricted

PORT BASIN: 2 km x 3 km, anchorage possible in Nasoga Gulf?

UPLAND: 1.5 km x 3 cm

LAND ACCESS: nil - 26 km of new road; 95 km of upgraded logging road; 120 km of new pipeline to Terrace

LANDFORM/GEOLOGY: Rugged coast granodiorite steep except head of bay, with wetlands

SEISMICITY: NBC Rating 3, high ground acceleration

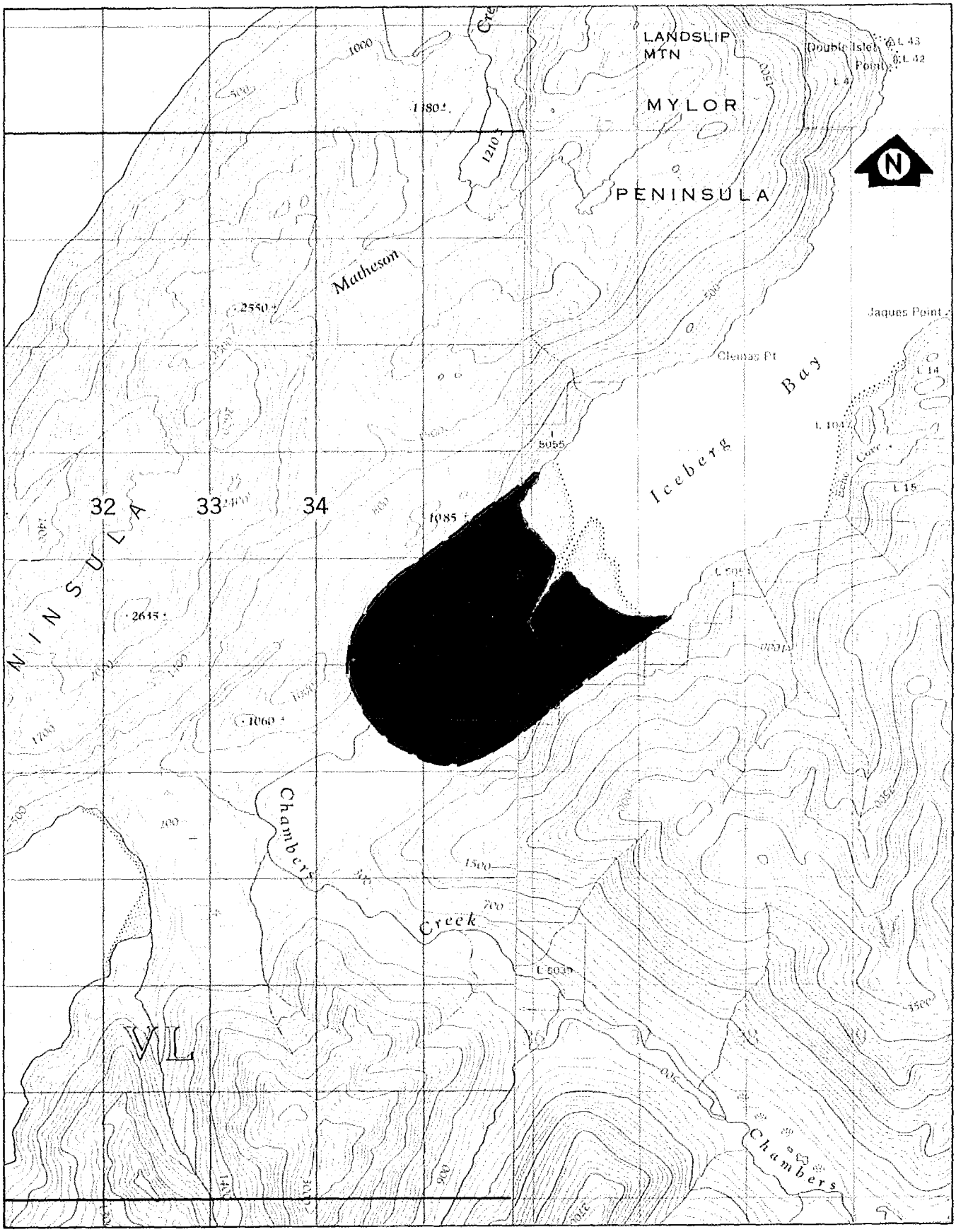
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+4
WATERFOWL:	+8
MARINE:	+4
FRESHWATER:	+4
ESTUARY:	+2

RESOURCE USES:

FORESTRY:	+2
MINING:	0
INDUSTRY:	0
HUNTING & TRAPPING:	+8

CLOSEST COMMUNITY: Kincolith is 8 km north of site



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ICEBERG BAY SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Iceberg Bay

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	-8			
Infrastructure	-8			
Population Proximity	-1			
Access	-2			-19
TERRESTRIAL	-8	-4	-8	-20
AQUATIC				
Freshwater	-4	0	-1	
Marine	0	-4	-1	
Estuary	-2	-2	-2	-16
AIR				
Climate	-1			- 1
GRAND TOTAL:				-56

POTENTIAL LNG TERMINAL SITES
KITIMAT-KEMANO AREA

SITE NAME

EMSLEY COVE

MISKATLA INLET

BISH CREEK

CLIO/GOBEIL BAY

WATHLSTO CREEK

KILDALA ARM

KEMANO

INFORMATION SHEET

NAME: Emsley Cove

LOCATION: 53°52' 128°47'

INLAND WATER ACCESS: Douglas Channel;
100 km restricted access

PORT BASIN: 1 km x 2 km

UPLAND: 1 km x 1 km no convenient anchorage

LAND ACCESS: nil - new road of 12 km
new pipe of 12 km to existing right-of-way

LANDFORM/GEOLOGY: Flat alluvial shelf in Emsley Creek floodplain

SEISMICITY: Class 3 NBC - high seismic response

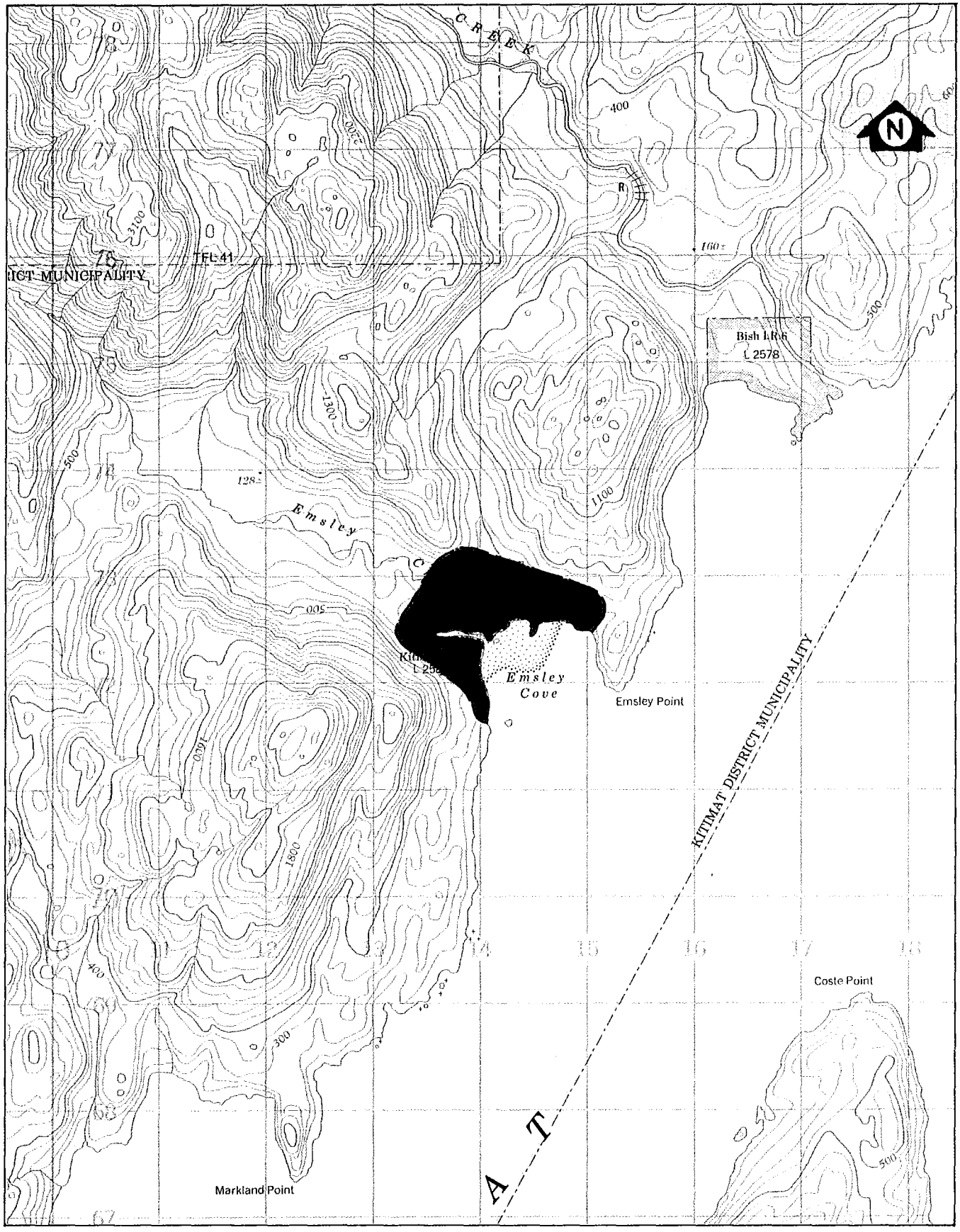
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+4
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	+2
ESTUARY:	+4

RESOURCE USES:

FORESTRY:	+2
MINING:	0
INDUSTRY:	0
HUNTING & TRAPPING:	+2

CLOSEST COMMUNITY: Kitimat Mission 3 km east



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EMSLEY COVE SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Emsley Cove

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	0			
Access	0			0
TERRESTRIAL	-4	-4	-4	-12
AQUATIC				
Freshwater	-2	0	-1	
Marine	0	-4	-1	
Estuary	0	-4	-1	-13
AIR				
Climate	-2			- 2
GRAND TOTAL:				-27

INFORMATION SHEET

NAME: Miskatla Inlet

LOCATION: 53°50' 128°53'

INLAND WATER ACCESS: Douglas Channel - Miskatla Inlet Restricted, 95 km

PORT BASIN: 2 km x 3 km, no convenient anchorage

UPLAND: 2 km x 1.5 km

LAND ACCESS: nil - new road 30 km; new pipe 30 km to existing right-of-way

LANDFORM/GEOLOGY: Rugged coast diorite with sloping uplands to level of inlet

SEISMICITY: Class 3 NBC

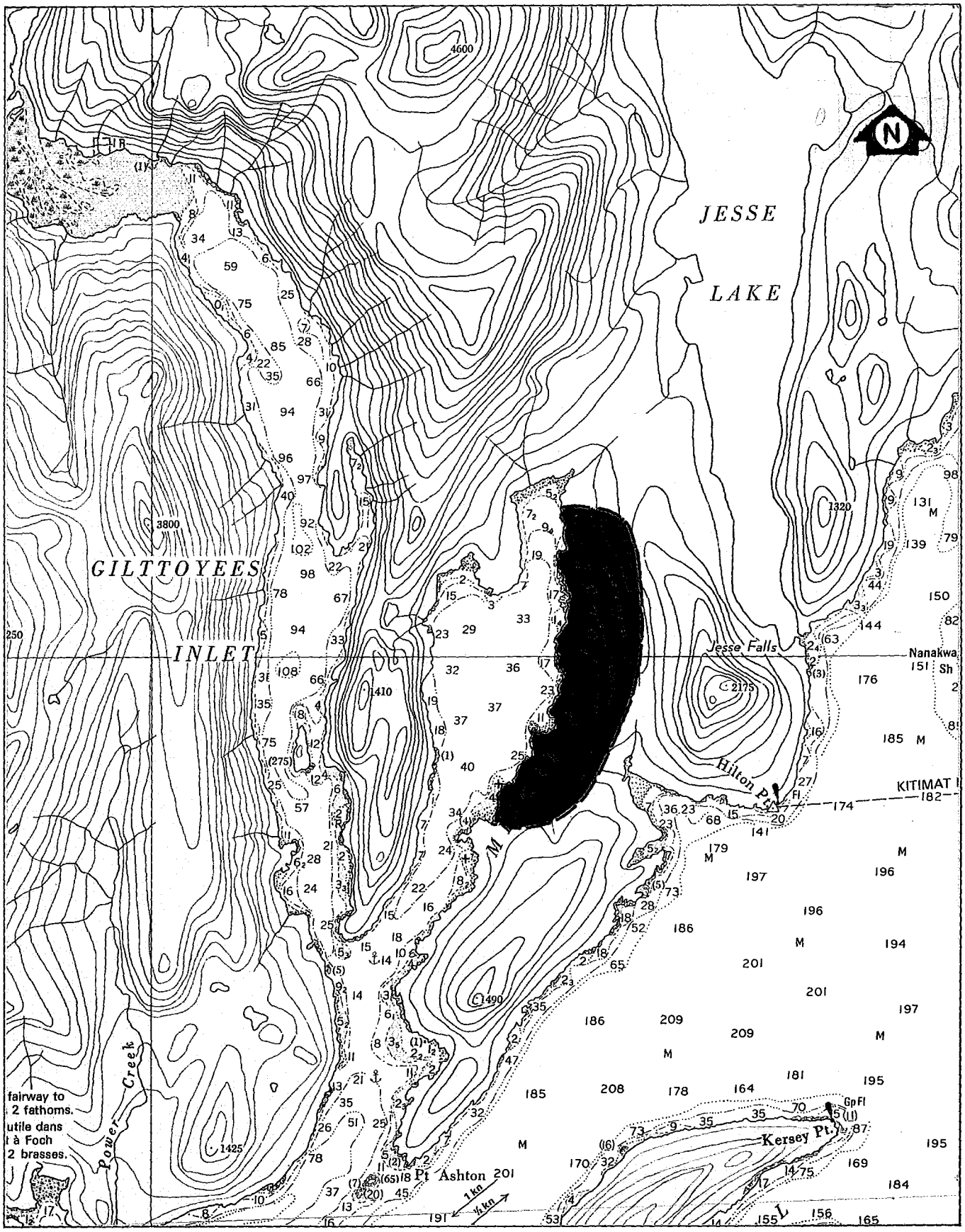
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	+4
ESTUARY:	+2

RESOURCE USES:

FORESTRY:	+2
MINING:	0
INDUSTRY:	0
HUNTING & TRAPPING:	+2

CLOSEST COMMUNITY: Kitimat 30 km north of site



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MISKATLA INLET SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Miskatla Inlet

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	-1			
Population Proximity	0			
Access	0			- 1
TERRESTRIAL	-4	-4	-4	-12
AQUATIC				
Freshwater	-4	0	-1	
Marine	0	-4	-1	
Estuary	0	-2	0	-12
AIR				
Climate	-1			- 1
GRAND TOTAL:				-26

INFORMATION SHEET

NAME: Bish Creek

LOCATION: 53°55' 128°47'

INLAND WATER ACCESS: Douglas Channel 100 km restricted channel

PORT BASIN: 1 km x 1 km; no convenient anchorage

UPLAND: 1 km x 0.8 km

LAND ACCESS: nil - 8 km of new road; 8 km of new pipe to existing right-of-way

LANDFORM/GEOLOGY: Gently sloping upland adjacent to Bish Creek consisting of bedrock and alluvial material

SEISMICITY: Class 3 NBC

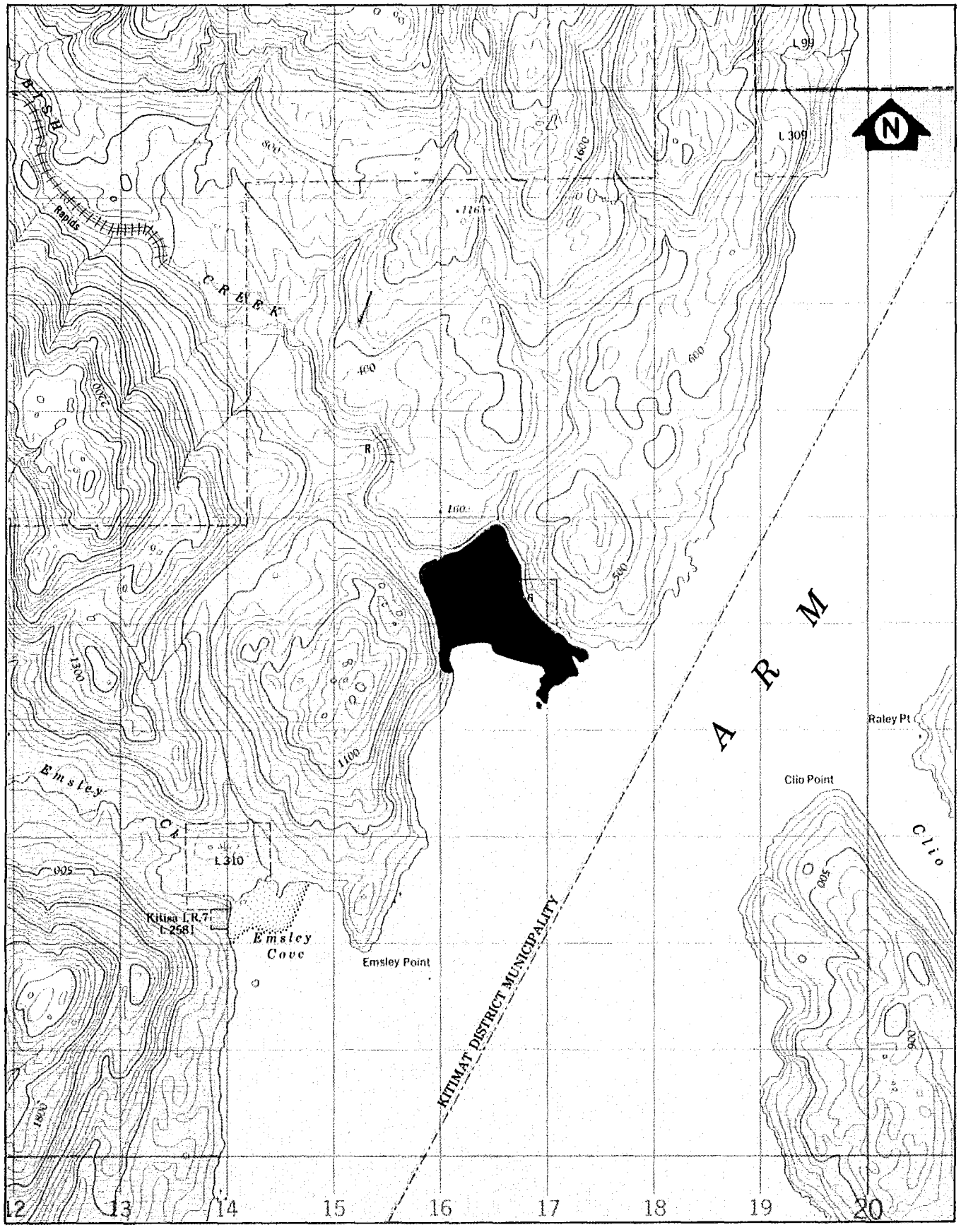
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+2
MARINE:	+4
FRESHWATER:	+2
ESTUARY:	+4

RESOURCE USES:

FORESTRY:	+2
MINING:	0
INDUSTRY:	0
HUNTING & TRAPPING:	+2

CLOSEST COMMUNITY: Kitimat; 8 km north of site; Kitimat Mission 4 km east of site



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BISH CREEK SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Bish Creek

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-1			
Access	0			- 1
TERRESTRIAL	-4	-2	-2	- 8
AQUATIC				
Freshwater	-2	0	-2	
Marine	0	-4	-1	
Estuary	0	-4	-2	-15
AIR				
Climate	-4			- 4
GRAND TOTAL:				-28

INFORMATION SHEET

NAME: Clio & Gobeil Bays

LOCATION: 53°52' 128°40'

INLAND WATER ACCESS: Douglas Channel; 100 km restricted access

PORT BASIN: Restricted 500 m x 2 km; no convenient anchorage

UPLAND: Restricted 500 m x 1000 m

LAND ACCESS: Nil - 6 km new road and upgrade existing powerline road; 18 km new pipeline to existing right-of-way

LANDFORM/GEOLOGY: Sloping granodiorite with some glacial till

SEISMICITY: Class 3 NBC

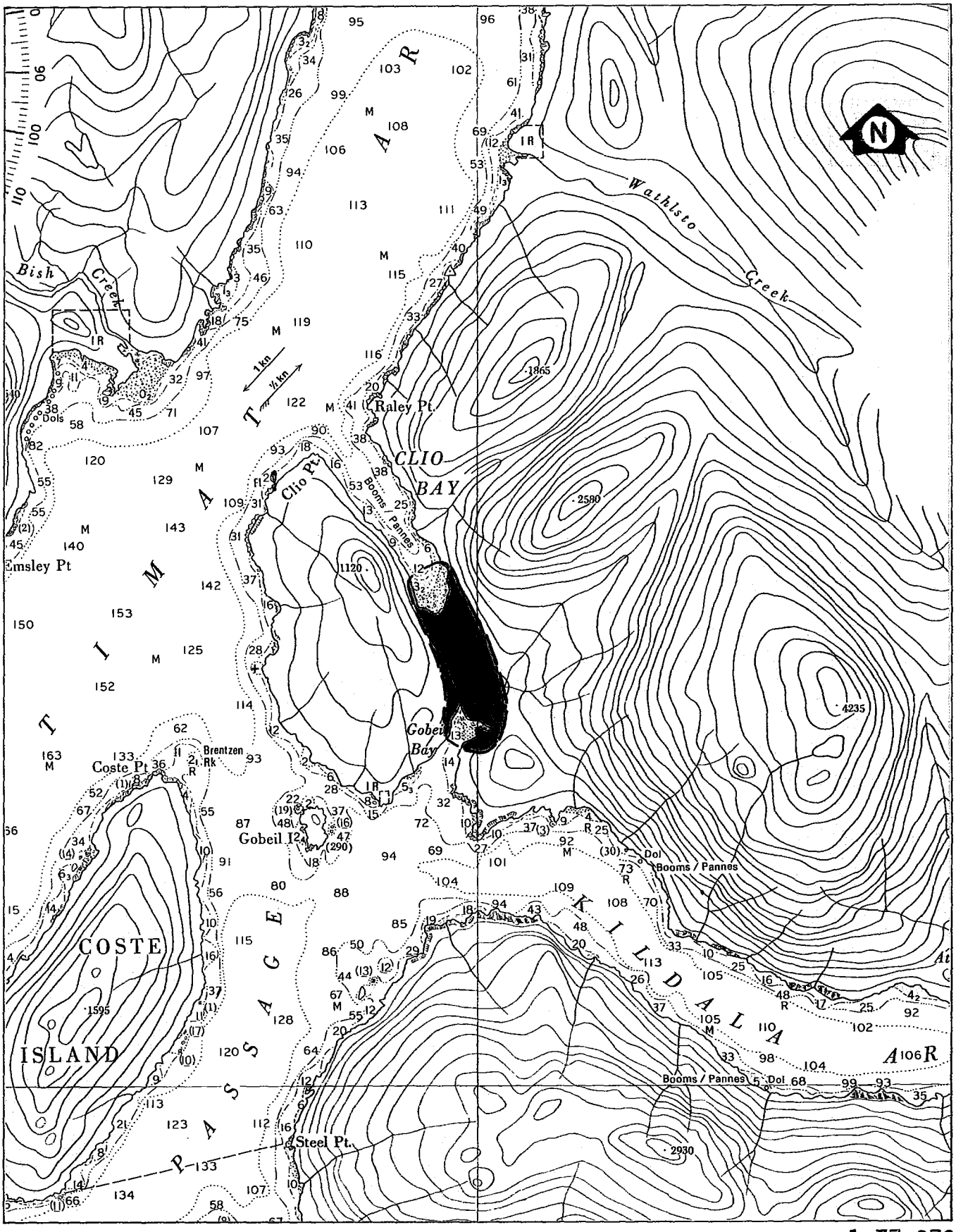
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	+2
ESTUARY:	+4

RESOURCE USES:

FORESTRY:	+2
MINING:	0
INDUSTRY:	0
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Kitimat Mission 7 km north of site



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CLIO BAY/GOBEIL BAY SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Clio and Gobeil Bays

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-1			
Access	-4			- 5
TERRESTRIAL	-2	-4	-4	-10
AQUATIC				
Freshwater	-2	0	-1	
Marine	0	-4	-1	
Estuary	0	-4	-2	-14
AIR				
Climate	-2			- 2
GRAND TOTAL:				-31

INFORMATION SHEET

NAME: Wathlsto Creek

LOCATION: 128°37' 53°55'

INLAND WATER ACCESS: Douglas Channel, 105 km restricted channel

PORT BASIN: 1 km +; no convenient anchorage

UPLAND: 1000 m x 700 m

LAND ACCESS: 2.5 km of new road, upgrading of gravel road; 8 km of new pipeline to existing right-of-way

LANDFORM/GEOLOGY: Alluvial and marine upland shelf

SEISMICITY: Class 3 NBC, high seismic response

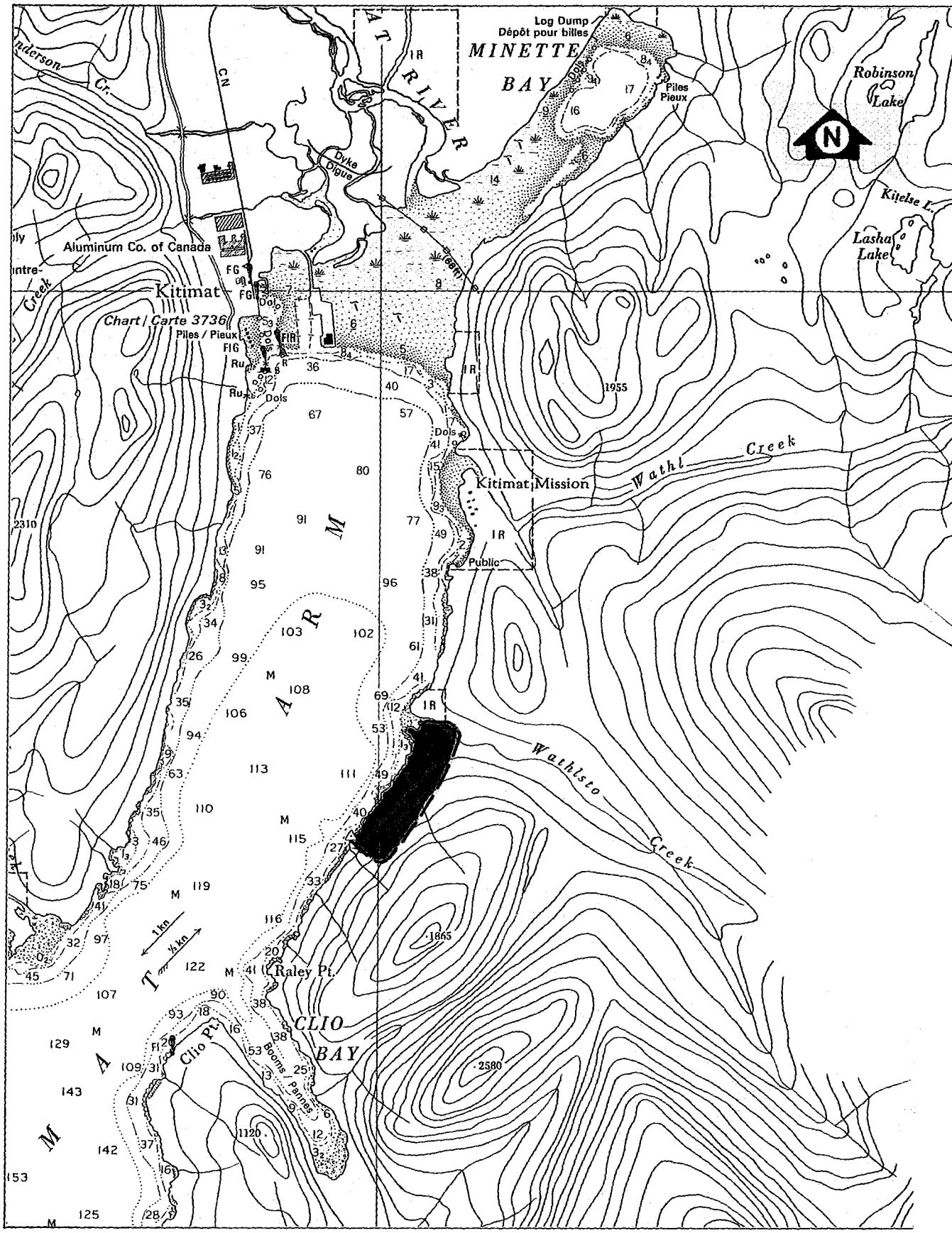
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	+2
ESTUARY:	+4

RESOURCE USES:

FORESTRY:	+4
MINING:	0
INDUSTRY:	0
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Kitimat Mission, 2.5 km north of site



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WATHLSTO SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Wathlsto Creek

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-4			
Access	-4			- 8
TERRESTRIAL	-2	-4	-4	-10
AQUATIC				
Freshwater	-2	0	-2	
Marine	0	-4	-1	
Estuary	0	-4	-2	-15
AIR				
Climate	-4			- 4
GRAND TOTAL:				-37

INFORMATION SHEET

NAME: Kildala Arm

LOCATION: 53°43' 128°30'

INLAND WATER ACCESS: Douglas Channel, Kildala Arm
Restricted Channel, 105 km

PORT BASIN: 1 km x 3 km, no convenient anchorage

UPLAND: Estuary 1.5 km x 3 km

LAND ACCESS: nil - 20 km of upgrading of powerline access road; 20 km new pipeline to existing right-of-way

LANDFORM/GEOLOGY: Metamorphic rock and alluvial materials with organics

SEISMICITY: Class 3 NBC, high seismic response

COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE: +2

WATERFOWL: +4

MARINE: +4

FRESHWATER: +2

ESTUARY: +4

RESOURCE USES:

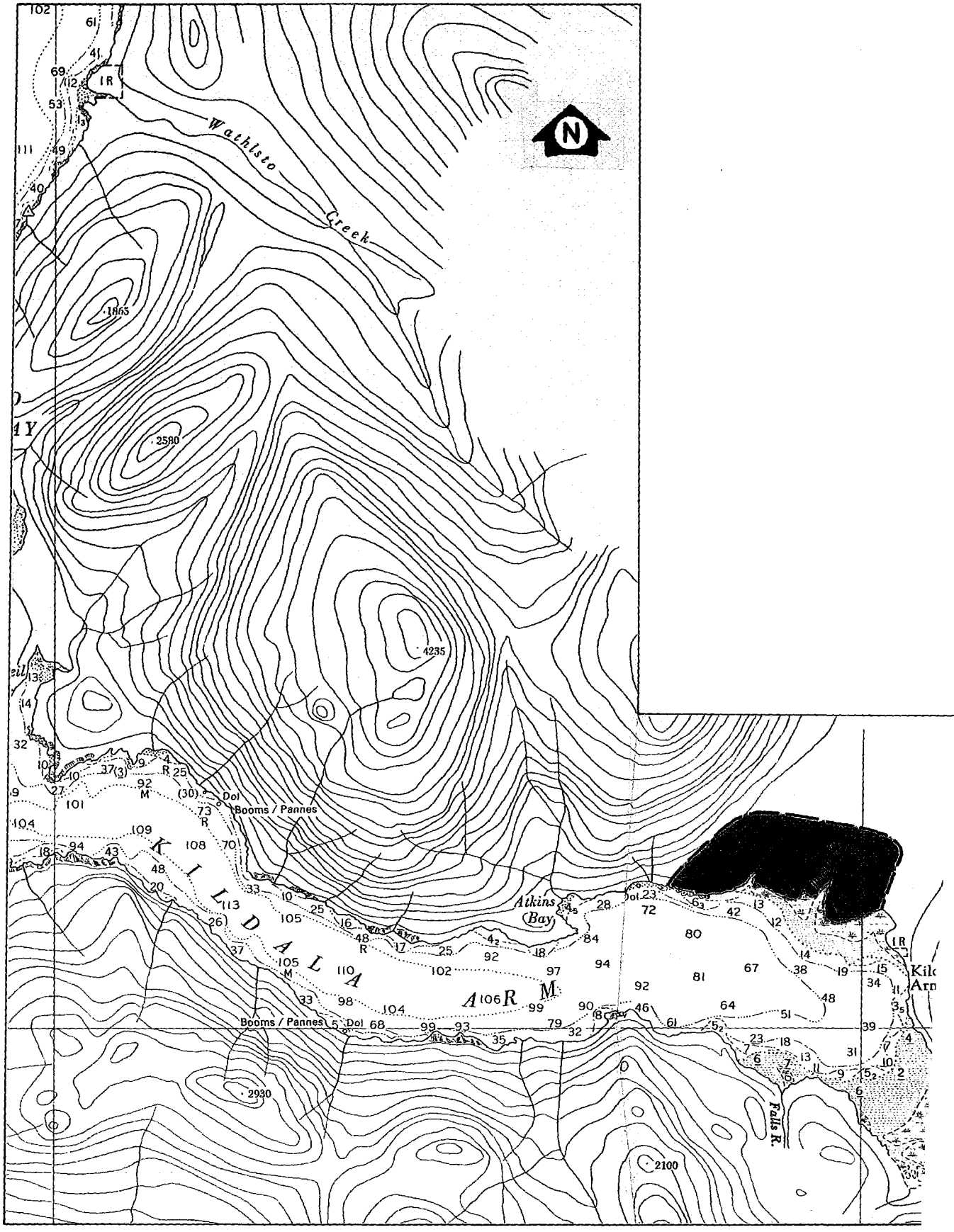
FORESTRY: +2

MINING: 0

INDUSTRY: power generation

HUNTING & TRAPPING: +4

CLOSEST COMMUNITY: Kitimat Mission 15 km north of site



KILDALA ARM SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Kildala Arm

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	-1			
Population Proximity	-2			
Access	-4			- 7
TERRESTRIAL	-2	-4	-8	-14
AQUATIC				
Freshwater	-2	0	-1	
Marine	0	-4	-1	
Estuary	-2	-4	-2	-16
AIR				
Climate	-1			- 1
GRAND TOTAL:				-38

INFORMATION SHEET

NAME: Kemano Bay

LOCATION: 53°30' 128°2'

INLAND WATER ACCESS: Douglas Channel, Gardner Channel

PORT BASIN: Restricted 1 km x 1 km, no convenient anchorage

UPLAND: Restricted to estuary

LAND ACCESS: nil - 72 km of new road; 72 km of pipeline to existing right-of-way

LANDFORM/GEOLOGY: Coast grandiorite surrounding alluvial materials

SEISMICITY: Class 3 NBC high seismic response

COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	+4
ESTUARY:	+4

RESOURCE USES:

FORESTRY:	+2
MINING:	0
INDUSTRY:	power generation
HUNTING & TRAPPING:	+2

CLOSEST COMMUNITY: Kemano approximately 10 km northeast of site

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Kemano Bay

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	-8			
Infrastructure	0			
Population Proximity	-4			
Access	-8			-20
TERRESTRIAL	-2	-4	-8	-14
AQUATIC				
Freshwater	-4	0	-1	
Marine	0	-4	-1	
Estuary	-2	-4	-2	-18
AIR				
Climate	-2			- 2
GRAND TOTAL:				-54

POTENTIAL LNG TERMINAL SITES
BELLA COOLA AREA

SITE NAME

OCEAN FALLS

BELLA COOLA

INFORMATION SHEET

NAME: Ocean Falls

LOCATION: 52°23' 127°40'

INLAND WATER ACCESS: Fitz Hugh Sound, Burke Channel, Cousins Inlet; Restricted 80 km

PORT BASIN: restricted; 1500 m x 3000 m

UPLAND: restricted; 600 m x 300 m

LAND ACCESS: 350 km pipeline to existing right-of-way; road access questionable

LANDFORM/GEOLOGY: small flat glacial upland at pulp mill site

SEISMICITY: Class 3 NBC

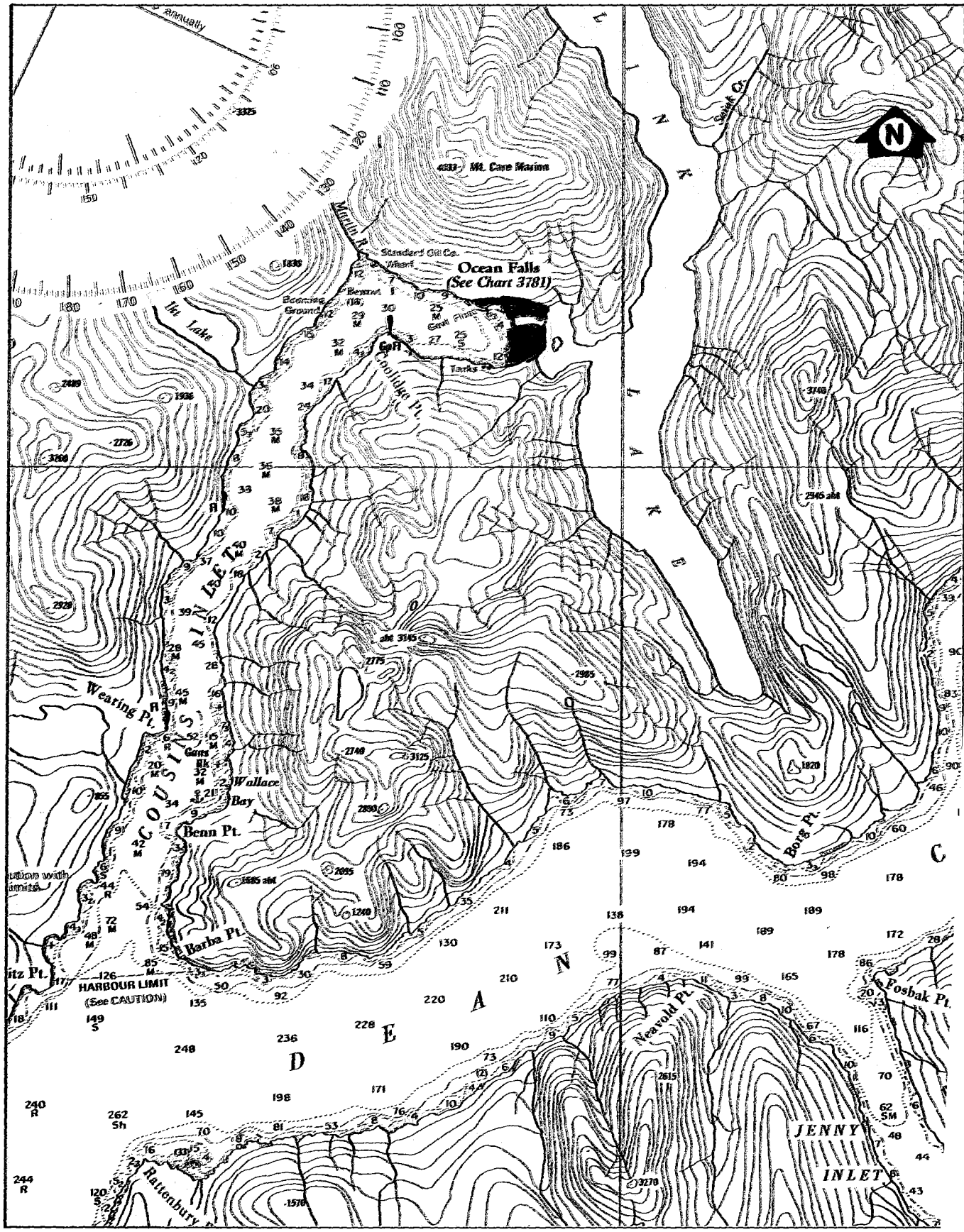
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+1
WATERFOWL:	+2
MARINE:	+2
FRESHWATER:	+4
ESTUARY:	+4

RESOURCE USES:

FORESTRY:	+2
MINING:	0
INDUSTRY:	log booming
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Ocean Falls



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OCEAN FALLS SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Ocean Falls

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	-4			
Infrastructure	-4			
Population Proximity	-8			
Access	-8			-24
TERRESTRIAL	-1	-2	-1	- 4
AQUATIC				
Freshwater	-4	0	-1	
Marine	0	-2	-1	
Estuary	-4	0	0	-12
AIR				
Climate	-2			- 2
GRAND TOTAL:				-42

INFORMATION SHEET

NAME: Bella Coola

LOCATION: 52°23' 123°58'

INLAND WATER ACCESS: Fitz Hugh Sound, Burke Channel 100 km restriced

PORT BASIN: 2 km x 3 km

UPLAND: 1.5 km x 2 km (estuary)

LAND ACCESS: existing road, 320 km new pipeline to existing right-of-way

LANDFORM/GEOLOGY: Alluvial flood plain and estuary.

SEISMICITY: Class 3 NBC and high seismic response

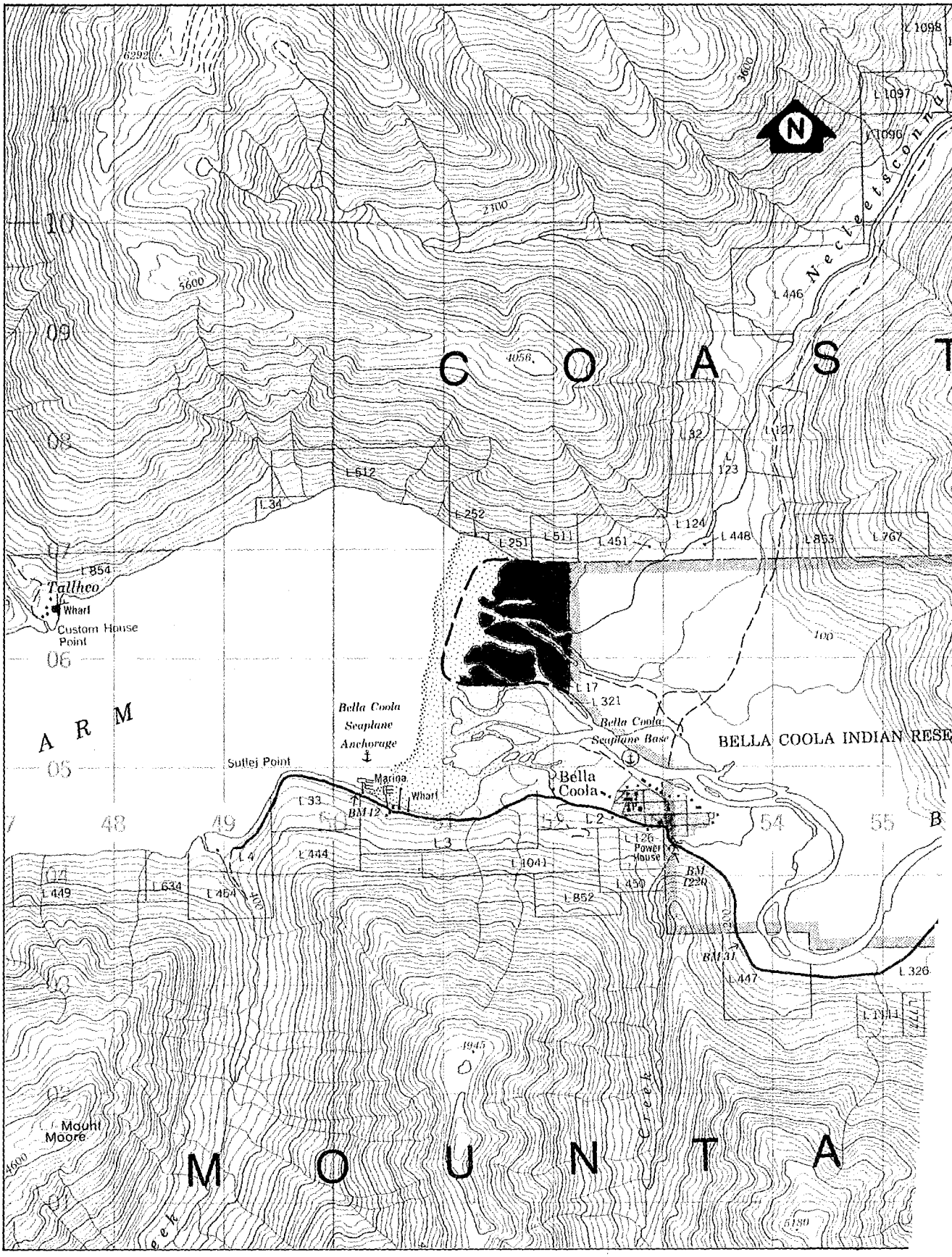
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+4
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	+4
ESTUARY:	+8

RESOURCE USES:

FORESTRY:	0
MINING:	0
INDUSTRY:	Port
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Bella Coola 1.5 km east



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BELLA COOLA SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Bella Coola

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	-4			
Infrastructure	-4			
Population Proximity	-8			
Access	0			-16
TERRESTRIAL	-8	-4	-8	-20
AQUATIC				
Freshwater	-4	0	-1	
Marine	0	-4	-1	
Estuary	-4	-8	-4	-26
AIR				
Climate	-8			-82
GRAND TOTAL:				-70

POTENTIAL LNG TERMINAL SITES
GREATER VANCOUVER AREA

SITE NAME

BRITANNIA

ROBERTS BANK

INFORMATION SHEET

NAME: Britannia

LOCATION: 49°38' 123°12'

INLAND WATER ACCESS: Juan de Fuca Strait, Strait of Georgia, Howe Sound - restricted access: 32 km

PORT BASIN: 1 km x 3 km closest anchorage at Vancouver

UPLAND: restricted 40 ha only

LAND ACCESS: presumes pipeline to Squamish + 8 km of new pipeline

LANDFORM/GEOLOGY: excavated gravel pit

SEISMICITY: Class 3 NBC

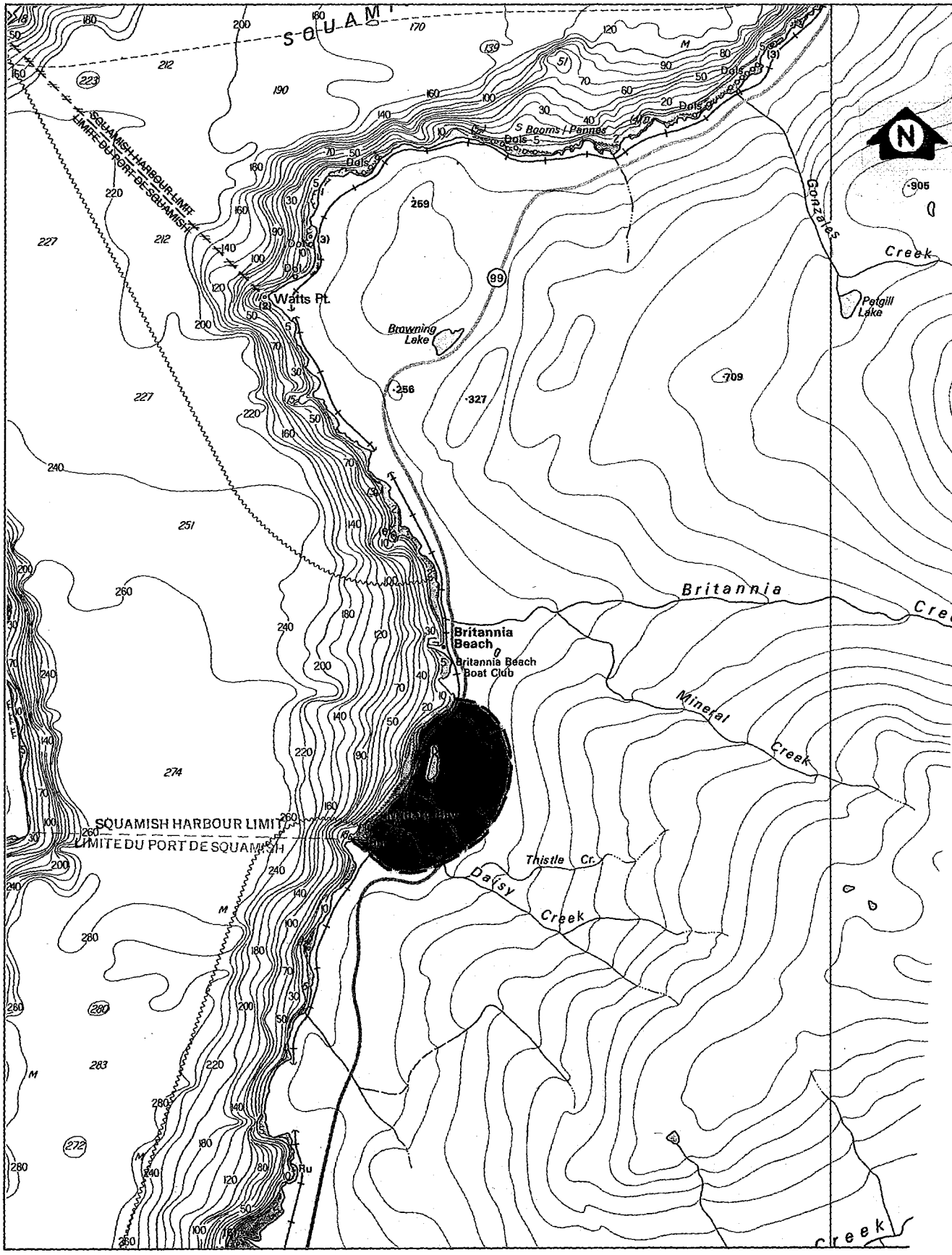
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+1
WATERFOWL:	+2
MARINE:	+4
FRESHWATER:	0
ESTUARY:	+4

RESOURCE USES:

FORESTRY:	0
MINING:	+4
INDUSTRY:	tourism
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Squamish is 8 km north of site



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BRITANNIA SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Britannia

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-8			
Access	0			- 8
TERRESTRIAL	-1	-2	-2	- 5
AQUATIC				
Freshwater	0	0	0	
Marine	0	-4	-1	
Estuary	0	-4	0	- 9
AIR				
Climate	-4			- 4
GRAND TOTAL:				-26

INFORMATION SHEET

NAME: Roberts Bank

LOCATION: 49°2' 123°12'

INLAND WATER ACCESS: Juan de Fuca Strait and Strait of Georgia

PORT BASIN: open Strait of Georgia, closest anchorage at Vancouver

UPLAND: fill area in estuary

LAND ACCESS: existing

LANDFORM/GEOLOGY: deltaic silt flats

SEISMICITY: Class 3 NBC, high seismic response

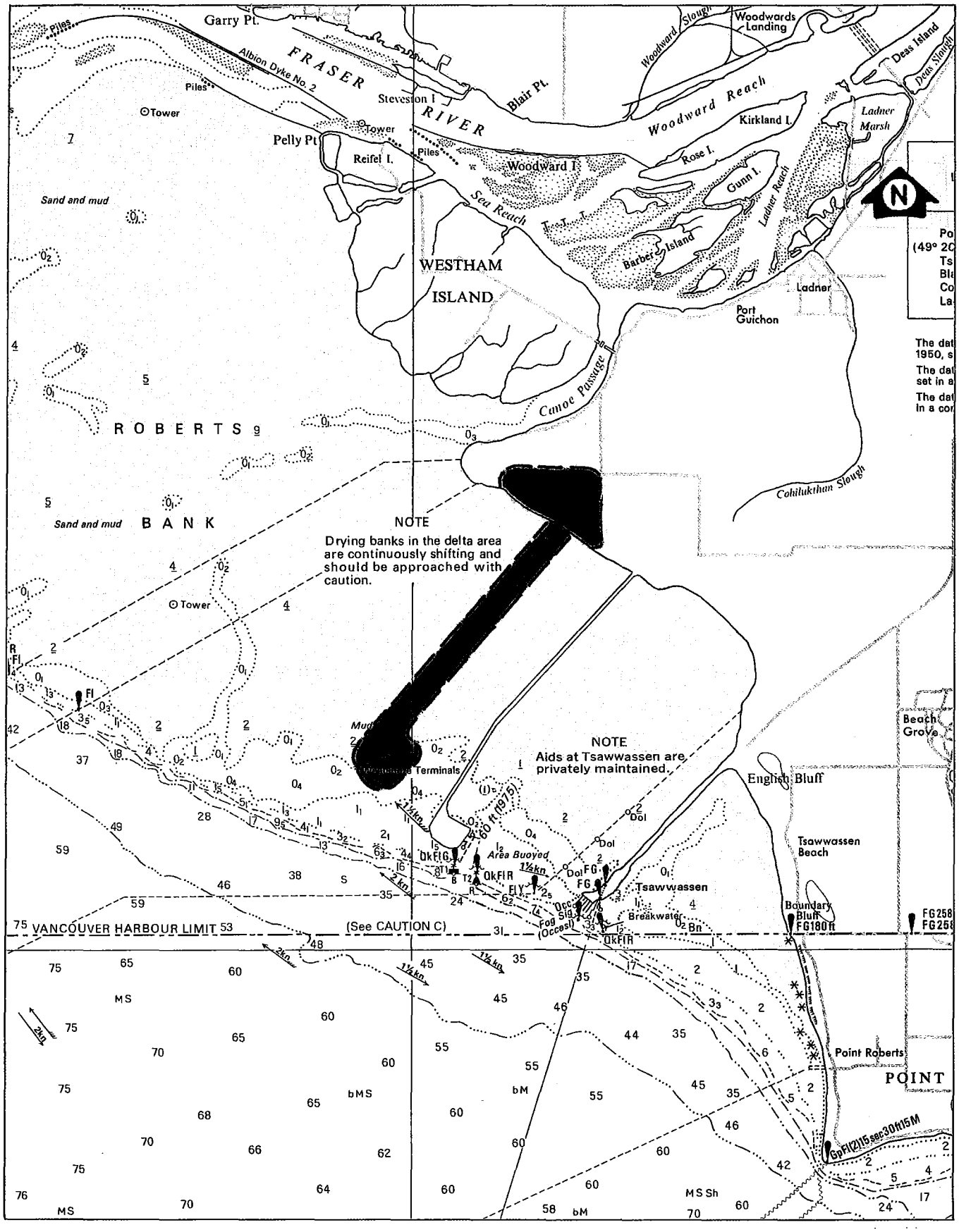
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	+4
ESTUARY:	+8

RESOURCE USES:

FORESTRY:	0
MINING:	0
INDUSTRY:	ports
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Delta



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ROBERTS BANK SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Roberts Bank

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-8			
Access	0			- 8
TERRESTRIAL	-1	-4	-8	-13
AQUATIC				
Freshwater	-4	0	0	
Marine	0	-4	-4	
Estuary	0	-8	-8	-28
AIR				
Climate	-8			- 8
GRAND TOTAL:				-57

POTENTIAL LNG TERMINAL SITES
POWELL RIVER AREA

SITE NAME

TEXADA ISLAND

POWELL RIVER

HARWOOD ISLAND

HURTADO POINT

INFORMATION SHEET

NAME: Texada Island

LOCATION: 49°38' 124°125'

INLAND WATER ACCESS: Juan de Fuca Strait, Strait of Georgia

PORT BASIN: Open, anchorage near Powell River

UPLAND: Very restricted; 1 km x 500 m

LAND ACCESS: Existing road and ferry approximately 15 km; new submarine pipeline to assumed pipeline right-of-way

LANDFORM/GEOLOGY: Rocky metamorphic shore sloping moderately

SEISMICITY: Class 3 NBC

COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+1
WATERFOWL:	+2
MARINE:	+4
FRESHWATER:	+2
ESTUARY:	0

RESOURCE USES:

FORESTRY:	+4
MINING:	+4
INDUSTRY:	limestone quarry
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Gillies Bay 2.5 km southeast of site

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TEXADA ISLAND SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Texada Island

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-4			
Access	-2			- 6
TERRESTRIAL	-2	-2	-2	- 6
AQUATIC				
Freshwater	-2	0	-1	
Marine	-4	-4	-1	
Estuary	0	0	0	-12
AIR				
Climate	-1			- 1
GRAND TOTAL:				-25

INFORMATION SHEET

NAME: Powell River

LOCATION: 49°50' 124°32'

INLAND WATER ACCESS: Juan de Fuca Strait, Strait of Georgia, Malaspina Strait

PORT BASIN: Open, convenient anchorage

UPLAND: Open 2 km x 2 km

LAND ACCESS: Existing, assume new pipeline

LANDFORM/GEOLOGY: gently sloping upland of metamorphic rock

SEISMICITY: Class 3 NBC

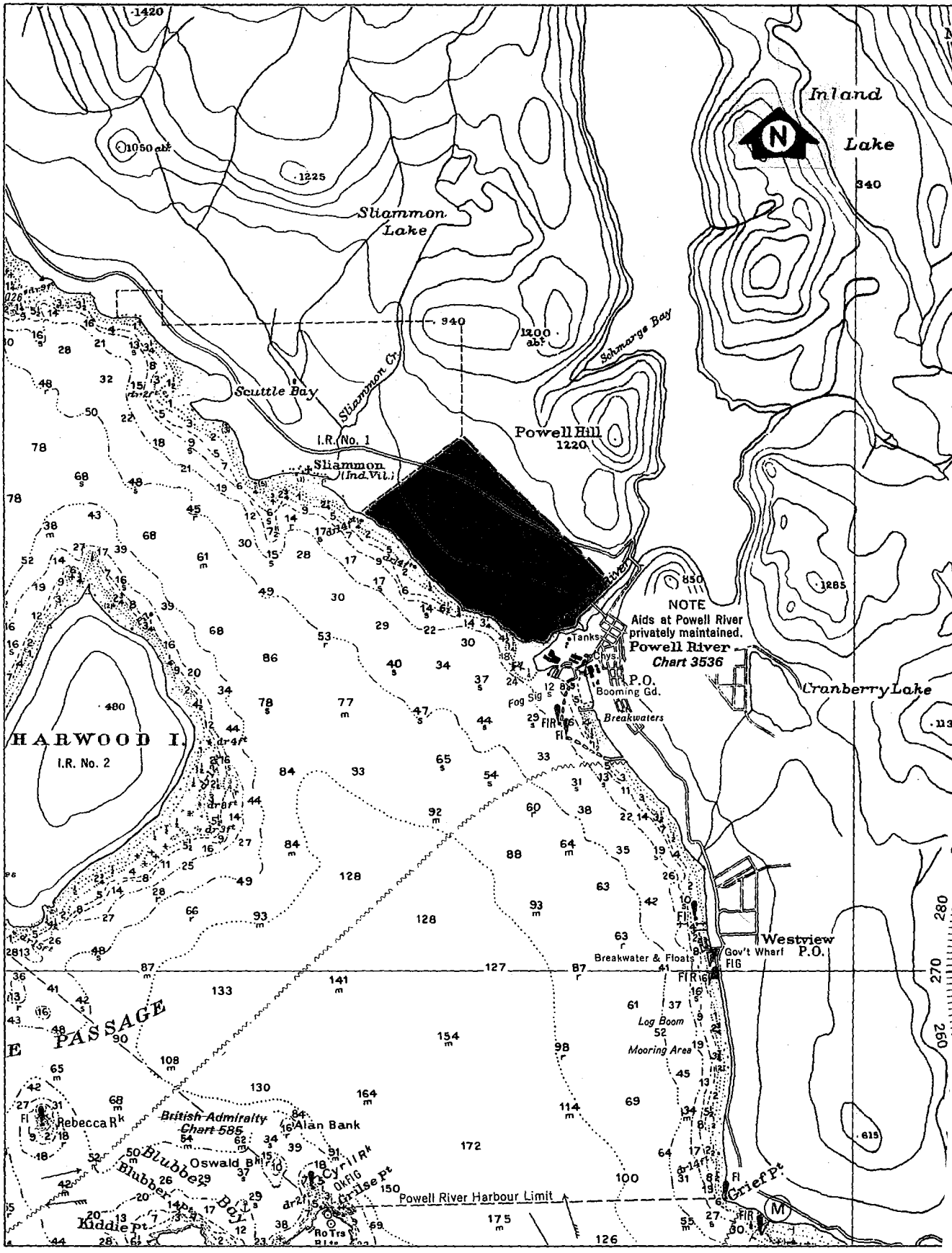
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

- WILDLIFE: +2
- WATERFOWL: +2
- MARINE: +4
- FRESHWATER: 0
- ESTUARY: 0

RESOURCE USES:

- FORESTRY: +2
- MINING: 0
- INDUSTRY: pulp mill and logging
- HUNTING & TRAPPING: 0

CLOSEST COMMUNITY: Powell River



POWELL RIVER SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Powell River

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-8			
Access	0			- 8
TERRESTRIAL	-2	-2	-2	- 6
AQUATIC				
Freshwater	0	0	0	
Marine	0	-4	-4	
Estuary	0	0	0	- 8
AIR				
Climate	-8			- 8
GRAND TOTAL:				-30

INFORMATION SHEET

NAME: Harwood Island

LOCATION: 49°42' 124°25'

INLAND WATER ACCESS: Juan de Fuca Strait, Strait of Georgia, Malaspina Strait

PORT BASIN: open, anchorage at Powell River

UPLAND: gently sloping 1 km x 1 km

LAND ACCESS: nil - only water access, from Powell River, approximately 15 km of submarine pipeline needed assuming new pipeline

LANDFORM/GEOLOGY: gently sloping unconsolidated sediments

SEISMICITY: Class 3 NBC, high seismic response

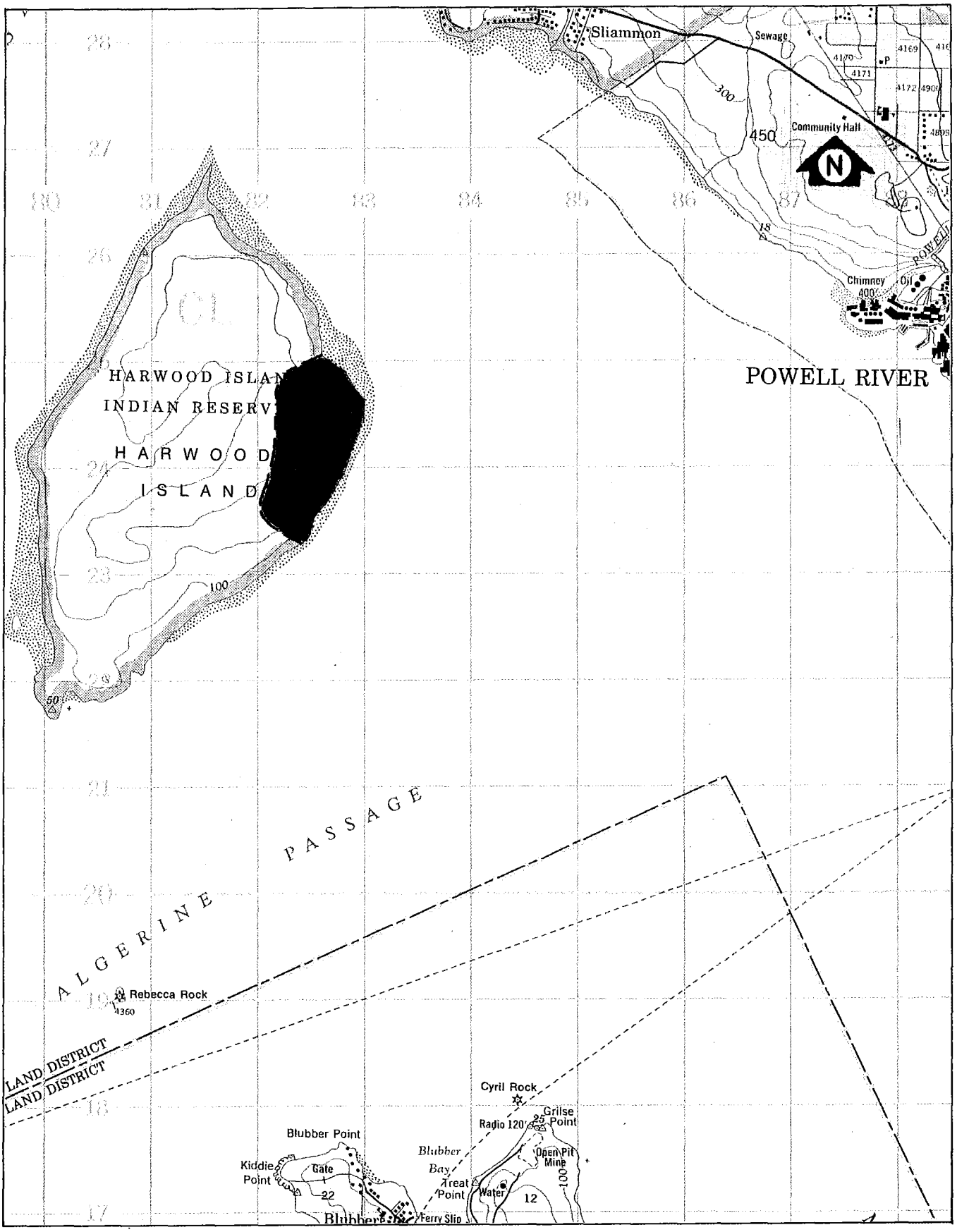
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	0
ESTUARY:	0

RESOURCE USES:

FORESTRY:	+2
MINING:	0
INDUSTRY:	0
HUNTING & TRAPPING:	+2

CLOSEST COMMUNITY: Powell River 15 km east of site



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HARWOOD ISLAND SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Harwood River

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-2			
Access	-8			-10
TERRESTRIAL	-4	-4	-4	-12
AQUATIC				
Freshwater	0	0	0	
Marine	-2	-4	-1	
Estuary	0	0	0	- 7
AIR				
Climate	-1			- 1
GRAND TOTAL:				-30

INFORMATION SHEET

NAME: Hurtado Point

LOCATION: 49°54', 124°33'

INLAND WATER ACCESS: Juan de Fuca Strait, Strait of Georgia

PORT BASIN: Open, no convenient anchorage

UPLAND: Open 2 km x 1 km

LAND ACCESS: Road existing, assumes new pipeline to new right-of-way

LANDFORM/GEOLOGY: Metamorphic rock with 200 ft + cliff

SEISMICITY: Class 3 NBC

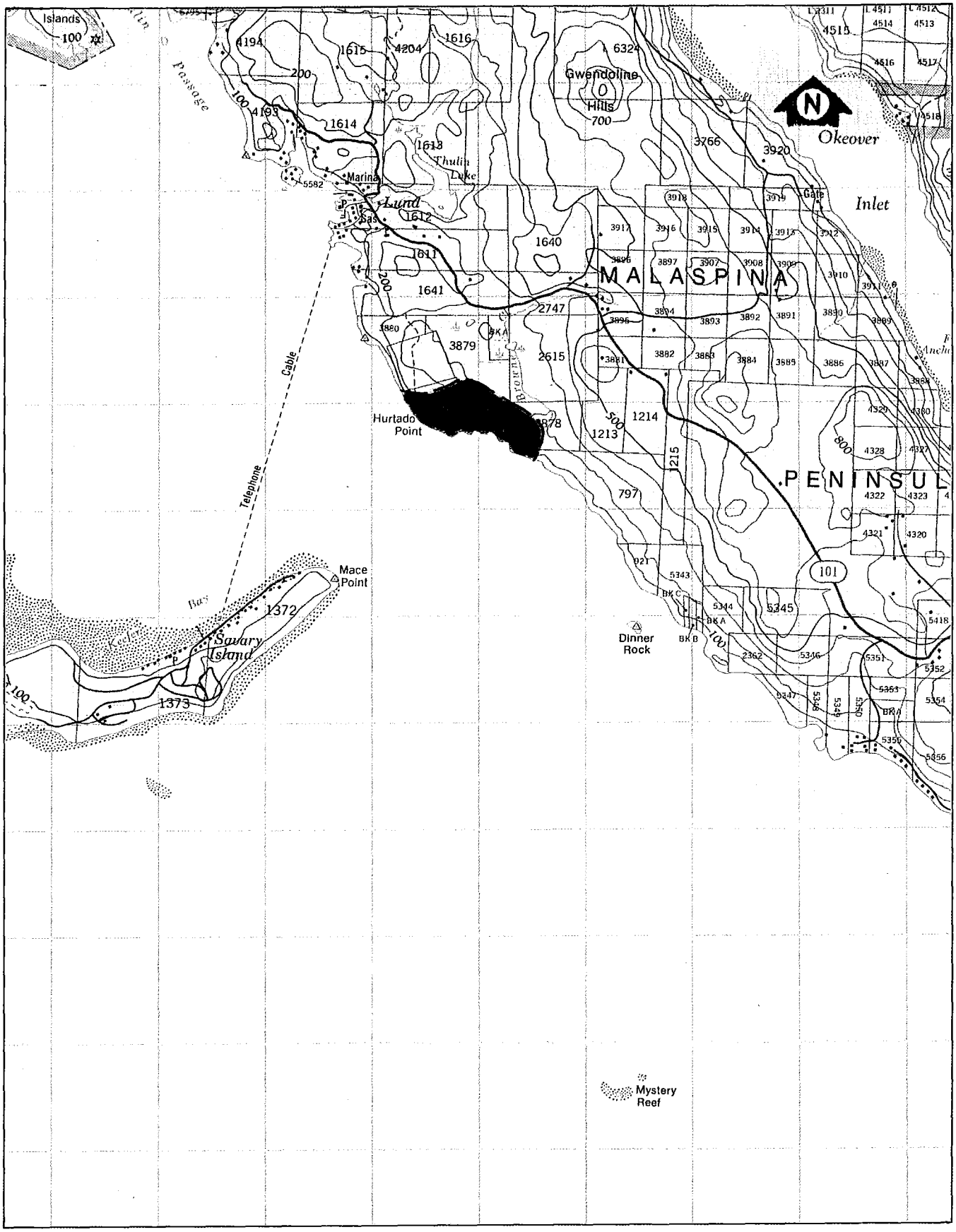
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	0
ESTUARY:	0

RESOURCE USES:

FORESTRY:	+2
MINING:	0
INDUSTRY:	0
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Lund (2 km NW) and Powell River (10 km SE)



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HURTADO POINT SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Hurtado Point

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-8			
Access	0			- 8
TERRESTRIAL	-2	-2	-2	- 6
AQUATIC				
Freshwater	0	0	0	
Marine	0	-4	-4	
Estuary	0	0	0	- 8
AIR				
Climate	-8			- 8
GRAND TOTAL:				-30

POTENTIAL LNG TERMINAL SITES
ALBERNI INLET AREA

SITE NAME

CHESNUCKNUW CREEK

COLEMAN CREEK

SARITA RIVER

FRANKLIN RIVER

INFORMATION SHEET

NAME: Chesnucknuw Creek

LOCATION: 49°3' 124°47'

INLAND WATER ACCESS: Barkley Sound, Alberni Inlet; Restricted 15 km

PORT BASIN: Open, anchorage in Barkley Sound

UPLAND: 1.5 km x 1 km

LAND ACCESS: logging road, new pipeline of 25 km to assumed distribution line at Alberni

LANDFORM/GEOLOGY: gently sloping upland area of till over bedrock

SEISMICITY: Class 3 NBC

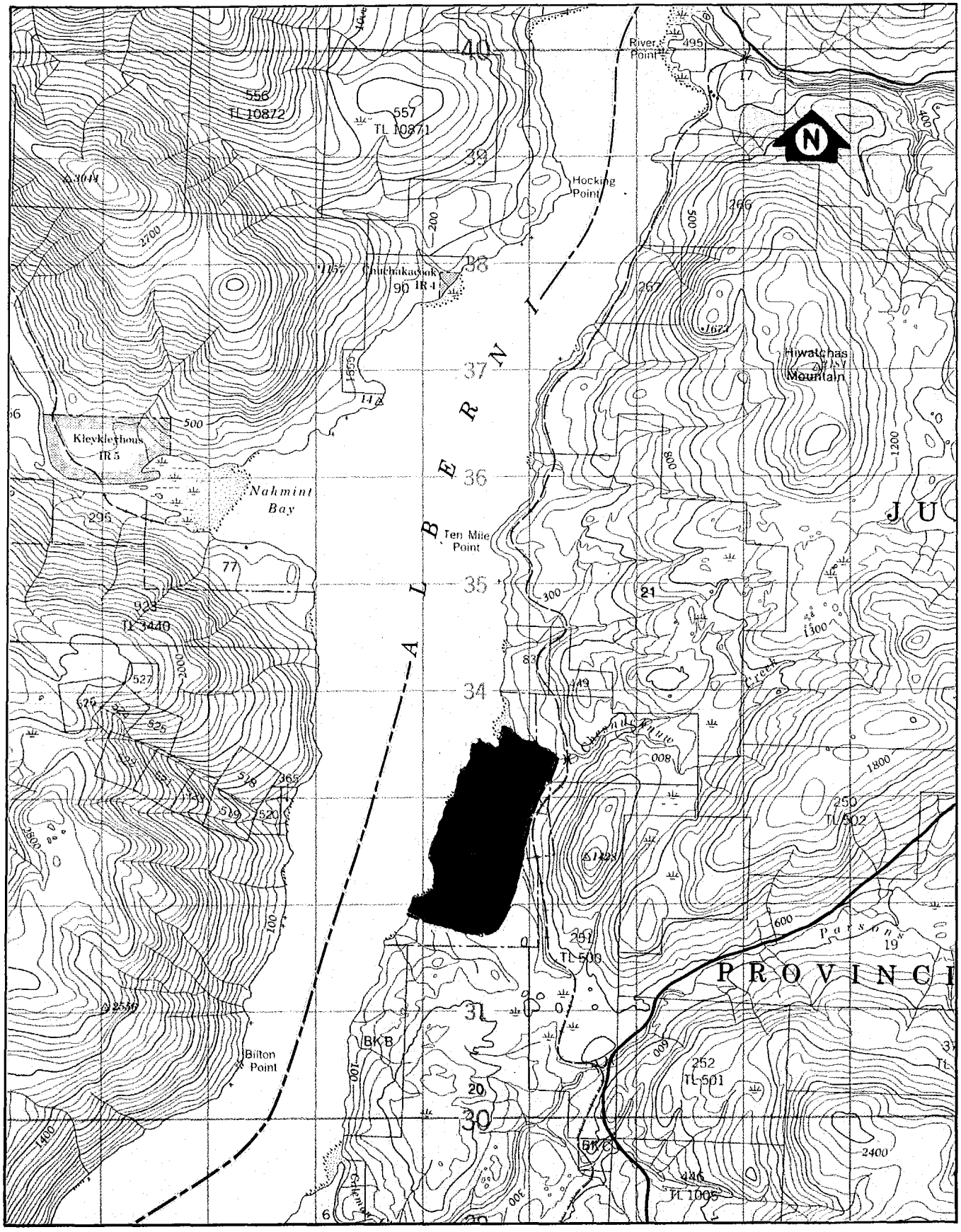
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	+2
ESTUARY:	+2

RESOURCE USES:

FORESTRY:	+4
MINING:	+1
INDUSTRY:	0
HUNTING & TRAPPING:	+1

CLOSEST COMMUNITY: Alberni 15 km north of site



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CHESNUCKNUW CREEK SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Chesnucknuw Creek

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-2			
Access	0			- 2
TERRESTRIAL	-2	-4	-2	- 8
AQUATIC				
Freshwater	-2	0	-1	
Marine	0	-4	-1	
Estuary	0	-2	-2	-12
AIR				
Climate	-1			- 1
GRAND TOTAL:				-23

INFORMATION SHEET

NAME: Coleman Creek

LOCATION: 49°0', 124°52'

INLAND WATER ACCESS: Barkley Sound, Alberni Inlet; Restricted 10 km

PORT BASIN: open, closed anchorage Barkley Sound

UPLAND: 1.5 km x 1 km

LAND ACCESS: existing logging roads, 30 km of new pipeline to assumed new distribution line at Alberni

LANDFORM/GEOLOGY: alluvial fan of Coleman Creek plus till over bedrock

SEISMICITY: Class 3 NBC

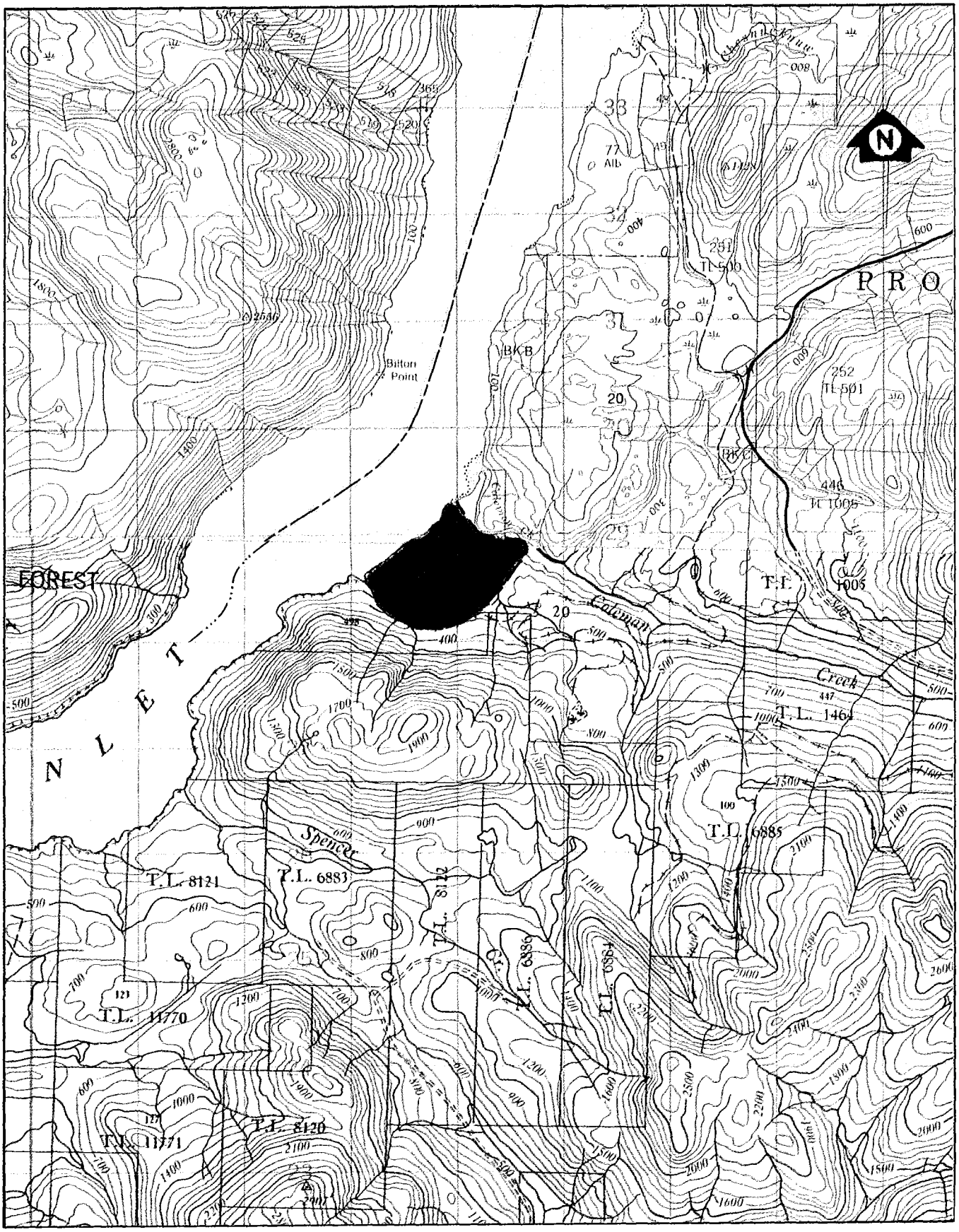
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	+2
ESTUARY:	+2

RESOURCE USES:

FORESTRY:	+4
MINING:	+1
INDUSTRY:	0
HUNTING & TRAPPING:	+1

CLOSEST COMMUNITY: Alberni 30 km north of site



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COLEMAN CREEK SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Coleman Creek

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	-1			
Population Proximity	-2			
Access	0			- 3
TERRESTRIAL	-2	-4	-2	- 8
AQUATIC				
Freshwater	-2	0	-1	
Marine	0	-4	-1	
Estuary	0	-2	-2	-12
AIR				
Climate	-1			- 1
GRAND TOTAL:				-24

INFORMATION SHEET

NAME: Sarita River

LOCATION: 48° 55' 124°25'

INLAND WATER ACCESS: Barkley Sound

PORT BASIN: Open closest anchorage in Barkley Sound

UPLAND: 1 km x 2 km

LAND ACCESS: existing logging roads, 40 km of new pipeline to assumed distrubution line at Alberni

LANDFORM/GEOLOGY: alluvial fan

SEISMICITY: Class 3 NBC

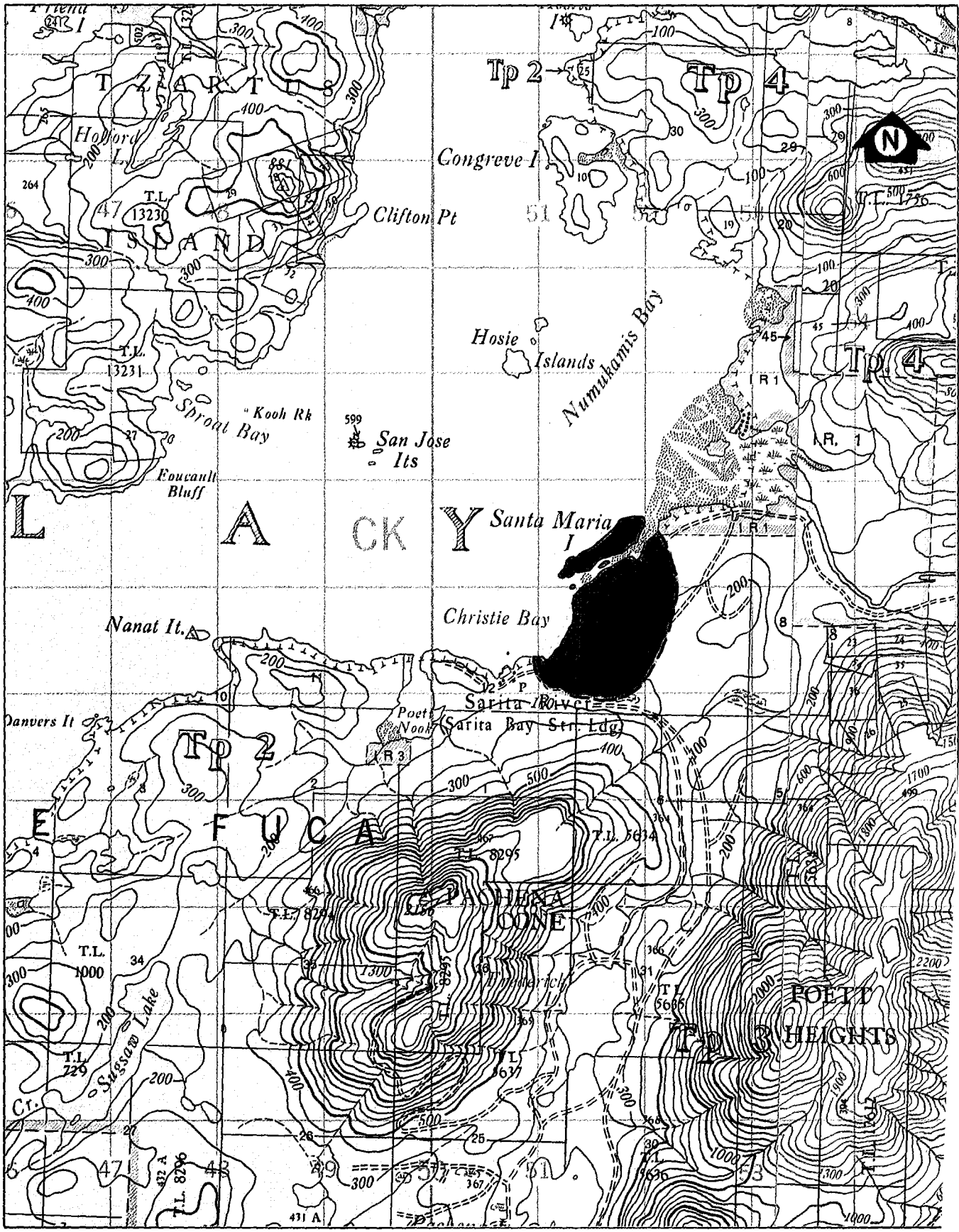
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

- WILDLIFE: +2
- WATERFOWL: +4
- MARINE: +4
- FRESHWATER: +2
- ESTUARY: +4

RESOURCE USES:

- FORESTRY: +4
- MINING: +1
- INDUSTRY: logging
- HUNTING & TRAPPING: +2

CLOSEST COMMUNITY: Port Alberni; 40 km north of site, Bamfield 15 km south of site



SARITA RIVER SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Sarita River

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	-1			
Population Proximity	-2			
Access	0			- 3
TERRESTRIAL	-4	-4	-4	-12
AQUATIC				
Freshwater	-2	0	-1	
Marine	0	-4	-1	
Estuary	-4	-4	-2	-18
AIR				
Climate	-1			- 1
GRAND TOTAL:				-34

INFORMATION SHEET

NAME: Franklin River

LOCATION: 49°5' 124°45'

INLAND WATER ACCESS: Barkley Sound, Alberni Inlet
Restricted 20 km

PORT BASIN: restricted 700 m x 1500 m, closest anchorage at Barkley Sound

UPLAND: 1 km x 5 km

LAND ACCESS: existing logging roads, 20 km of new pipeline to assumed new distribution line at Alberni

LANDFORM/GEOLOGY:

SEISMICITY: Class 3 NBC, high seismic response

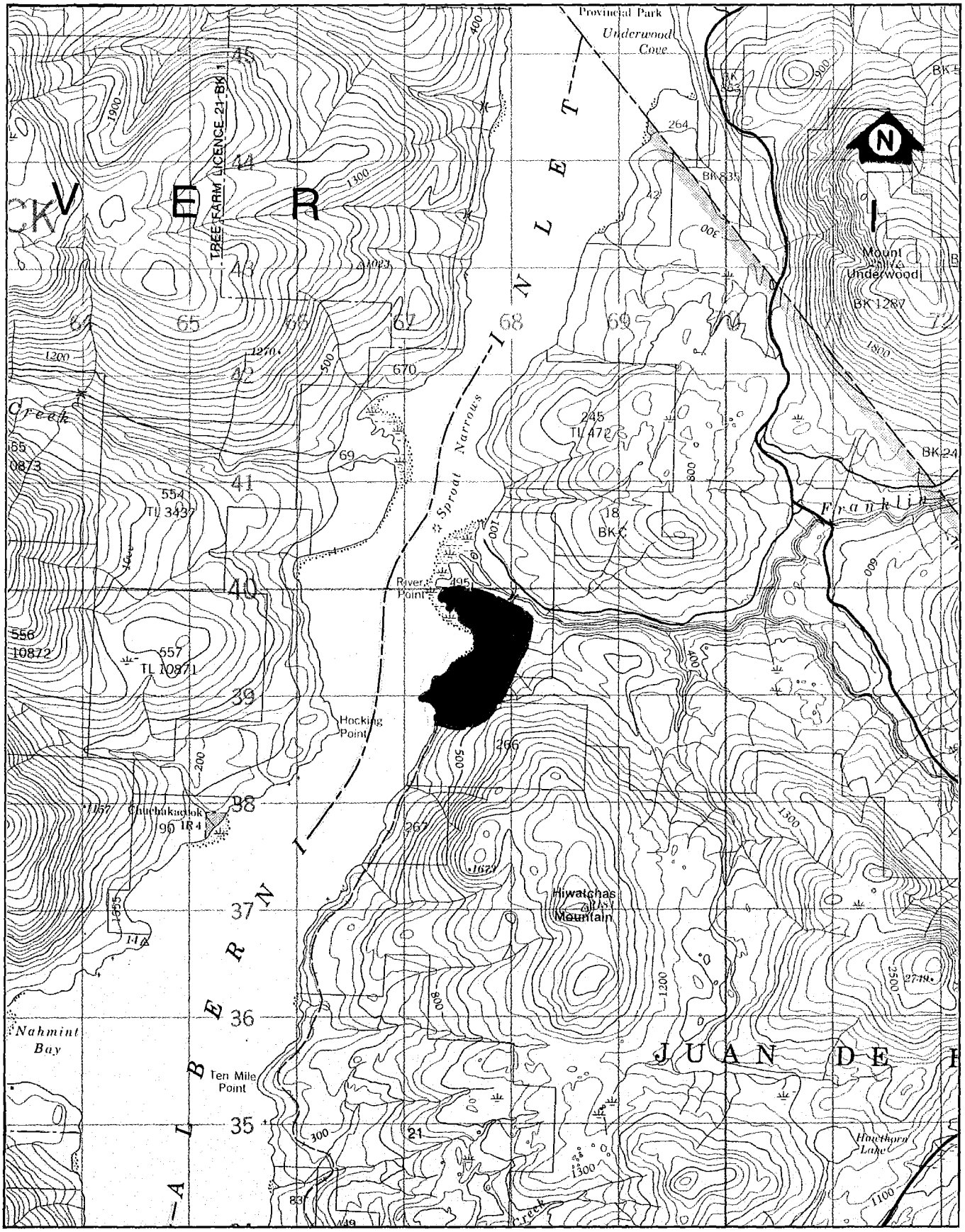
COMBINED INTERPRETATION OF RESOURCE VALUE & SENSITIVITY:

WILDLIFE:	+2
WATERFOWL:	+4
MARINE:	+4
FRESHWATER:	+2
ESTUARY:	+2

RESOURCE USES:

FORESTRY:	+4
MINING:	+1
INDUSTRY:	logging
HUNTING & TRAPPING:	0

CLOSEST COMMUNITY: Port Alberni 20 km north of site



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FRANKLIN RIVER SITE

SITE SELECTION MATRIX FOR POTENTIAL LNG TERMINAL SITES ON THE B.C. COAST

NAME OF POTENTIAL SITE: Franklin River

	LAND ACCESS (PIPELINE/ ROAD)	WATER ACCESS	TIDEWATER FACILITIES (PLANT/ DOCK)	TOTAL
SOCIAL				
Population	0			
Infrastructure	0			
Population Proximity	-2			
Access	0			- 2
TERRESTRIAL	-4	-4	-8	-16
AQUATIC				
Freshwater	-2	0	-1	
Marine	0	-4	-1	
Estuary	-2	-2	-2	-14
AIR				
Climate	-2			- 2
GRAND TOTAL:				-34