# Vancouver International Airport Parallel Runway Project

## REPORT OF THE ENVIRONMENTAL ASSESSMENT PANEL

August, 1991

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**VANCOUVER INTERNATIONAL**
**AIRPORT ENVIRONMENTAL ASSESSMENT PANEL**

The Honourable Jean Charest
Minister of the Environment
House of Commons
Ottawa, Ontario

The Honourable Jean Corbeil
Minister of Transport
House of Commons
Ottawa, Ontario

Dear Ministers:

In accordance with the terms of reference issued in November, 1989, the Environmental Assessment Panel has completed its review of the proposed parallel runway at Vancouver International Airport. On behalf of the Panel, I have the honour to submit this report for your consideration.

Yours sincerely,

Raymond M. Robinson
Chairman
Vancouver international
Environmental
Assessment Review Panel

# TABLE OF CONTENTS

## GLOSSARY OF ACRONYMS

| | | |
|---|---|---|
| ACC | — | Area Control Center |
| ACE Project | — | Airside Capacity Enhancement Project |
| ATAC | — | Air Transportation Association of Canada |
| ATFM | — | Air Traffic Flow Management |
| CAATS | — | Canadian Automated Air Traffic System |
| CCWS | — | Common Controller Workstation |
| CIP | — | Capacity Improvement Project |
| CZTM | — | Control Zone Traffic Management |
| dBA | — | Decibels measured on the A-weighted scale |
| DFO | — | Department of Fisheries and Oceans |
| DME | — | Distance Measuring Equipment |
| EARP | — | Environmental Assessment and Review Process |
| EIS | — | Environmental Impact Statement |
| FREMP | — | Fraser River Estuary Management Program |
| GVRD | — | Greater Vancouver Regional District |
| IFR | — | Instrument Flight Rules |
| ILS | — | Instrument Landing System |
| IMC | — | Instrument Meteorological Conditions |
| Ldn | — | Day-Night Noise Level |
| Leq | — | Equivalent Sound Level |
| Lmax | — | Maximum sound level |
| MLS | — | Microwave Landing System |
| NEF | — | Noise Exposure Forecast |
| NMC | — | Noise Management Committee |
| RAMP | — | Radar Modernization Program |
| SEL | — | Sound Exposure Level or Single Event Level |
| SICA | — | Sea Island Conservation Area |
| VFR | — | Visual Flight Rules |
| VIAA | — | Vancouver International Airport Authority |
| VMC | — | Visual Meteorological Conditions |
| YVR | — | Vancouver International Airport |

# Executive Summary And Recommendations

# EXECUTIVE SUMMARY AND RECOMMENDATIONS

The Terms of Reference of the Vancouver International Airport Environmental Assessment Panel were broad. They directed it to conduct a public review of the environmental and social effects of the proposed parallel runway, and to consider mitigating and compensating actions which might be necessary if the Panel agreed that the project should proceed.

The process followed by the Panel was a substantial, rigorous and highly productive one which brought out all sides of the issues raised by the proposal and enabled interested parties to express their views fully. It culminated in 11 days of public hearings.

## Overview (Chapter 4)

Overshadowing the proposal itself were three background matters of considerable significance.

1. Both land and air space in the Vancouver region are so limited that an acceptable site for a new airport could probably not now be found. The present proposal is therefore one of unusual long-term importance.

2. The public is highly polarized on the proposal, necessitating careful weighing of two sharply opposing viewpoints.

3. The information base supporting the review was regrettably much more extensive on the economic than on the environmental side of the proposal, thereby forcing the Panel to seek out additional published information in order to understand the environmental impacts.

From the materials presented to it the Panel determined that four issues predominated: project justification; airport noise; environment, especially birds and their habitat; and several institutional matters dealing with inter-relationships between Vancouver International Airport (YVR) management and other bodies. These constitute the main divisions of this report.

## Project Justification (Chapter 5)

In the context of project justification, the Panel examined the runway proposal from four viewpoints which emerged in the course of the review:

### Demand/Capacity

While the outlook for travel demand is somewhat problematic at this time of recession and turbulence in the aviation industry, long-term trends suggest that growth in demand at YVR will continue. As it is, aircraft delays are a daily feature of air travel at YVR. New runway capacity will probably be needed soon.

In the course of examining this issue the Panel considered four significant questions arising in the hearings.

1. Do Transport Canada's forecasts over-estimate demand? (Conclusion: No, they probably do not, especially in the long-term).

2. Will premature airport investment lead to reduced benefits? (Conclusion: Airport investment is not expected to be premature and in any case is expected to return the capital cost very quickly.)

3 Could fewer planes carry the forecast passenger demand? (Conclusion: No. This suggestion overlooks the mix of aircraft at YVR, especially those carrying B. C. regional traffic in relatively small planes.)

4. What is "general aviation" and does it need to use YVR? (Conclusion: This category consists predominantly of commercial aircraft which do need to use YVR.)

### Feasibility/Effectiveness

A new runway at YVR would be both feasible and effective. Two other ways of providing additional runway capacity were examined: a) to make maximum use of all facilities at YVR without building a new runway — which would not be effective; and b) in addition, to make more intensive use of existing airports at Boundary Bay and Abbotsford — which would probably not be feasible and therefore not effective.

### Benefit/Cost

A rigorous benefit-cost analysis has shown that a new runway would be economically advantageous, likely to return its capital cost very quickly, and superior to any other alternative conceivable at this time. The benefits accruing to the economy and people of British Columbia would be not only substantial but crucial to economic growth. A new runway would also maintain the standards of air service expected by residents and businesses in the interior of the province.

The Panel found that the proponent did not incorporate environmental costs into the benefit-cost analysis, as should have been done.

**1. The Panel recommends that the Minister of the Environment direct the Federal Environmental Assessment Review Off ice (FEARO) to develop guidelines for the incorporation of environmental costs into cost-benefit studies conducted in connection with the implementation of the Environmental Assessment and Review Process (EARP).**

### Regional Development

Expansion at YVR has been approved by the appropriate local and regional authorities as the best way of shaping and supporting the physical development of the Vancouver region. But approval by the GVRD, and some of its constituent members, was conditional on the resolution of various environmental problems.

## Noise (Chapter 6)

The topic of airport noise is both socially important and technically complex. Chapter 6 examines ways of measuring noise, its effects on people, its sources, especially at YVR, and future projections.

The effects on surrounding areas constituted a major issue at the hearings. However, that issue was dominated by two somewhat problematic matters. The first is the speed with which the present generation of Stage 2 aircraft will be superseded by quieter Stage 3 aircraft. If the transition proceeds as claimed by the proponents, the noise regime around YVR will be considerably improved in general. The second matter is the effectiveness of a number of proposed operational restrictions aimed at abating airport-related noise. Most of these have been accepted by Transport Canada and should be effective, given rigorous administration and cooperation from airport users.

The Panel believes that the existing Noise Management Committee (NMC) should be maintained, broadened and given a wider and stronger mandate.

2. **The Panel recommends that the Noise Management Committee:**

   **a) promote the goal of achieving and maintaining the noise environment around YVR in a state not worse than that described in the EIS for the year 2001 with mitigation;**

   **b) monitor and evaluate the noise environment around YVR on a continuous basis, including investigation of the noise regime created by all airport operations, their effects on residents and the effectiveness of noise mitigation and compensation measures;**

   **c) report periodically on the noise environment around YVR including the publication of:**

      i) **the results of monitoring and any other studies that it may carry out; and**

      **ii) an independent annual public report describing the state of the noise environment during the previous year and mitigative measures taken to abate noise;**

   **d) investigate measures for identifying and abating noise problems and advise Transport Canada on the development and evaluation of appropriate mitigation and compensation programs, such as those recommended by the Air Transportation Association of Canada (ATAC) limiting quiet hour use of stage two aircraft and the provision of run-up noise barriers; and**

   **e) address its recommendations to YVR management, which shall carry out these recommendations or show cause why it is not able to do so.**

3. **The Panel recommends that the Noise Management Committee:**

   **a) consist of representatives appointed by Transport Canada, the Canadian Airline Pilots Association, the Air Transportation Association of Canada, the Canadian Air Traffic Control Association, the City of Vancouver, the City of Richmond, the Musqueam Indian Band, and at least two representatives of citizen groups for each of the Cities of Vancouver and Richmond;**

   **b) be a permanent, self-governing body located in Richmond and operated independently of Transport Canada;**

   **c) be provided by Transport Canada with a budget adequate to carry out whatever program it deems necessary for the performance of its duties;**

   **d) have access, within a reasonable period, to any records which Transport Canada may compile in the course of its own noise control, abatement, monitoring and other relevant programs; and**

   **e) be separate from any environmental review committee whose duty is to consider impacts on land, air and water quality, and fish and wildlife.**

There were many complaints at the hearings about Transport Canada's failure to police noise violations. It was claimed that new technology is available which would enable this to be done. The Panel agrees.

4. **The Panel recommends that as new aircraft tracking technologies are developed at YVR through the implementation of the Radar Modernization Program (RAMP) and the Canadian Automated Air Traffic System (CAATS), airport management use these systems to identify and obtain evidence against aircraft deviating from approved noise abatement procedures and thereby causing noise disturbance.**

It was generally agreed that, subject to certain limits, operations on a parallel runway would have to be strictly controlled and its use limited to quieter aircraft.

5. **The Panel recommends that:**

   **a) the parallel runway be operated as an arrival runway, except when departures are necessary for emergencies or routine maintenance of the main runway, and in due course when routine departures become necessary because capacity limits of YVR have been reached;**

   **b) only Stage 3 aircraft be permitted to operate on the parallel runway, except when Stage 2 operations are necessary for emergencies or routine maintenance of the main runway;**

   **c) all operations on the parallel runway be banned from 1O:OO p.m. to 7:00 a.m., except when night-time operations are necessary for emergencies or for routine maintenance of the main runway; and**

   **d) landings on the parallel runway be conducted with the aircraft in the least noisy configuration possible and with minimal use of reverse thrust for braking, consistent with the principle that there be no compromise of air safety, and in compliance with applicable procedures of the International Civil Aviation Organization.**

One way of mitigating noise impacts is to arrange that there are as few people as possible on the ground who might be affected. Despite the difficulty of limiting the growth of areas which are already largely developed — as in the surroundings of YVR — the Panel believes that this topic ought to be explored further in collaboration with the Government of British Columbia, which has the necessary powers.

**6. The Panel recommends that the B. C. Ministry of Municipal Affairs seek the cooperation of the City of Richmond in a pilot project focused on the Bridgeport area of Richmond with the objective of investigating how airport noise impacts in British Columbia might be minimized through the use of provincial and municipal regulatory powers.**

No matter how much quieter aircraft become or how well mitigation measures work, there will be a totally new noise impact under the proposed flight path on the Bridgeport neighbourhood in Richmond and possibly in Marpole. Here the Panel feels that a compensation program is justified to provide a variety of options to households affected, possibly including relocation expenses or soundproofing. This program would be based on actual field measurement of noise at the time the runway opens together with surveys of the people and properties affected.

The cost cannot be determined at this stage but could be in the order of $43 million. This amount, which was foreshadowed in the EIS, is well within the ability of the Vancouver international Airport Authority (VIAA) to pay and was accepted in principle by the Authority's chairman at the hearings.

The Panel suggests appropriate compensation options and eligibility rules, which it recommends in principle.

**7. The Panel recommends that a noise compensation program for those affected by the proposed runway, along the lines suggested in this report, be accepted in principle and referred to the Noise Management Committee for study and action.**

The Panel believes that the existing network of noise monitoring stations is not sufficient to cover all the areas potentially subject to airport noise.

**8. The Panel recommends that at least one new noise monitoring site be established in the Marpole area (e.g. Oak Street and 70th Avenue) and two more in the Bridgeport area of Richmond.**

The Panel recognizes that a number of specific practical steps would have to be taken by way of ground measurements and surveys in order to make both noise mitigation and compensation programs feasible and realistic.

**9. The Panel recommends that:**

**a) the Noise Management Committee, with the assistance of Transport Canada, carry out detailed surveys of the existing noise environment, commencing in 1991, to identify existing noise zones out to the $L_{dn}$ 60 dBA contour, supplemented by SEL zones out to the SEL 75 dBA contour; and**

**b) in conjunction with the above and with a view to possible clarification of apparent noise anomalies in the south slope of Vancouver, the Noise Management Committee and Transport Canada develop an ongoing research program involving topographic and meteorological aspects of noise in the south slope area.**

**10. The Panel recommends that:**

**a) the Noise Management Committee carry out a social and building survey of the numbers and the characteristics of residents in the delineated baseline noise zones, their living patterns, their sensitivity to noise and the condition of their homes. Questions to be asked in this survey should include people's reactions to major impacts including speech masking, sleep disturbance, health effects and annoyance; and**

**b) the Noise Management Committee simultaneously conduct research on possible noise mitigation and compensation measures, including commissioned independent professional research and visits to airports which have effective mitigation, compensation and public consultation programs.**

**11. The Panel recommends that:**

**a) the base case for determining incremental effects of noise be the most recent set of $L_{dn}$ contours prior to the opening of a new runway;**

**b) these be updated annually thereafter; and**

**c) incremental noise impacts be identified using the $L_{dn}$ 60 as the cut-off cumulative noise level and SEL contours out to the 75 dBA level, together with frequency of occurrence for sporadic noise, in order to enable the NMC to determine incremental impacts warranting compensation.**

The Panel heard many complaints regarding noise from low flying aircraft and non-observance of flight routes over urban areas where, it was argued, less noisy arrival and departure paths to and from YVR might be feasible. Even though these were generally not related to the parallel runway. Similar complaints can be anticipated arising from traffic on that runway. It would therefore be advisable for YVR management and the NMC to address the question of the height and specific flight paths which may be used by aircraft in the vicinity of YVR.

## Environmental Issues (Chapter 7)

Chapter 7 deals separately with birds, fish, water and air quality, mitigation proposals and related organizational matters. Birds are the most important of the environmental issues.

### Birds

The Fraser River delta is a major staging area on the Pacific Flyway, which accommodates more than 1.4 million migratory birds each year as they shuttle between their breeding grounds in various northern countries and their wintering areas in the Americas. Over 250 species have been counted in the Sea Island area.

There are two types of habitat associated with Sea Island — aquatic and terrestrial — and these are inter-related in that most birds use both, nesting and feeding in one and resting, sheltering and feeding in the other. Ninety percent of the Sea Island habitat lies close to the flight path of the proposed new runway, west of the dike or around McDonald Slough. This habitat is rated very highly for waterfowl and supports birds from all across the Fraser delta. The landward part of Sea Island also contains some aquatic habitat in the form of swamps, marshes and roadside ditches. Two species of special concern which use the upland aquatic habitat are the

Yellow-headed Blackbird, a rare species, and the Great Blue Heron.

The bulk of the terrestrial habitat on Sea Island consists of cultivated fields and pastures, which are used by birds primarily for feeding and resting. They are also the home of small mammals which support the raptor population. These fields are deemed essential to the maintenance of waterfowl, raptors and passerines in the Fraser River delta.

Transport Canada's plans for the Airport North area designate the land as follows:

| | |
|---|---|
| parallel runway | 167 ha |
| aviation-related commercial development | 120 ha |
| long-term reserve | 132 ha |
| linear park | 25 ha |

The main impact of these proposals on birds would be the loss of habitat taken for the runway and associated aviation-related commercial development ( 287 ha). Clearly, the long-term reserve is also destined to be used for airport purposes. This would ultimately leave only 25 ha dedicated to environmental and recreational purposes.

Two other major impacts from the runway project would be a) Transport Canada's Bird Strike Control Program, which uses harassment to prevent birds from settling and swarming in the runway paths; and b) its guidelines for the control of Land Use in the Vicinity of Airports. These guidelines prohibit activities — especially those providing food sources — which would attract birds. Both of these programs address themselves to flight safety. These two programs are essential concomitants of the parallel runway proposal and could have significant environmental effects. The Panel believes that these effects have not been addressed in the light of the proposed new aircraft trajectories and helicopter paths. In addition, little is known about the effect of the existing or proposed approach light systems on birds which fly across Sturgeon Bank at night.

**12. The Panel recommends that Transport Canada commission an independent, public environmental review of its Bird Strike Control Program and Guidelines for Land Use in the Vicinity of Airports to assess their effects on habitat capability in the light of the proposed runway flight patterns and helicopter paths and also examine the potential effect on migratory birds of the new approach light system across Sturgeon Bank.**

Transport Canada committed itself to a number of actions to address environmental problems, notably:

- to re-establish the displaced Yellow-headed Blackbird colony;
- to find ways of maintaining the raptor population on Sea Island as far as possible;
- to transplant hedgerow and ditch-side vegetation to other parts of Sea Island as far as possible;
- to ensure that the approach lighting system would not have a negative effect on bird habitat on Sturgeon Bank;
- to regulate construction activities appropriately, mainly by controlling surface run-off; and
- to establish a Wildlife Management Group to oversee various environmental mitigative and monitoring program.

Several people and agencies expressed their concerns about the habitat losses foreshadowed by the runway proposal and the practical difficulties inherent in habitat rehabilitation and compensation. The Panel shares these reservations.

The runway project, as proposed, would ultimately remove from its present natural state a large block of land, one which has the potential, along with adjacent lands and foreshores, to constitute a diversified and viable bird habitat. Under the circumstances, the Panel believes that the environmental values at risk are much too great to brush aside. Moreover, a project with the substantial economic benefits of the parallel runway can readily afford a level of environmental protection appropriate to the need. The Panel also believes that the Airport North lands offer the last chance to achieve such protection in relation to bird habitat on the northern margin of the Fraser Delta. It therefore proposes that the absolute minimum amount of land be taken for airport use, that is, only the land needed for the runway itself, and not the land proposed for aviation-related commercial development or future reserve.

**13. The Panel recommends that:**

**a) development in the Airport North area be limited to the runway, associated taxi-ways and landscaping essential for the operation of the runway;**

**b) airport-related commercial and other urban uses be permanently prohibited north of the runway;**

**c) the remainder of land north of the runway be dedicated to the conservation and enhancement of wildlife values; and**

**d) land uses incompatible with wildlife values in Airport North be phased out where feasible.**

The Panel found that the concept of compensation as applied to bird habitat is unclear and subject to many uncertainties in practice. To clarify this the Panel suggested three general principles:

1. that the no-net loss principle of full compensation for habitat loss should be as firmly established for birds as for fish;
2. that the principle of full compensation should apply to the habitat of important bird species such as migratory birds of the Pacific Flyway, raptors and rare passerines (and not to "nuisance" birds); and
3. that compensation should be the option of last resort (after protection and mitigation).

While acknowledging that Transport Canada has recently reached acceptable general agreements with Environment Canada, the Panel offers the following recommendation for greater specificity at YVR.

**14. The Panel recommends the following principles and practices for compensating bird habitat losses at YVR:**

**a) that compensation be made for all loss of habitat and habitat quality resulting from the runway project and from associated policies and programs to control bird hazards and land uses;**

**b) that compensatory habitat be located adjacent to Sturgeon Bank in the vicinity of Sea Island if possible;**

**c) that the compensation be on a one-for-one basis with compensatory habitat having a similar function and quality as habitat lost on Sea Island;**

**d) that if compensatory habitat is not available near Sea Island, it be compensated on a two-for-one basis in the Roberts Bank area, or on a three-for-one basis in the Boundary Bay area;**

**e) that compensation be through purchase and enhancement of land, or through other forms of secure tenure, with enhancement;**

**f) that credit for compensation be based generally on habitat value added through enhancement; and**

**g) that for the Airport North area, a system be developed to grant credit for habitat enhancement which results in increased carrying capacity for selected species of waterfowl, passerines, and raptors; and**

**h) that accurate surveys of birds be conducted throughout the year prior to any construction at Airport North and at regular intervals thereafter to ensure both that the habitat enhancement credit system is soundly developed and that the compensation policies are effective in the long run.**

## Fish Habitat And Water Quality

The Fraser River supports one of the great salmon runs of the world. More than 800 million juvenile fish migrate downstream each year and spend time resting, feeding and acclimatizing in the estuary. As with birds, the tidal and marsh areas off Sturgeon Bank, along the North Arm and in McDonald Slough, are highly productive fish habitats. Nevertheless, the waters of the North Arm are already polluted from urban and industrial developments along its length, while McDonald Slough, which is blocked off from the sea by a causeway to lona Island, suffers from low levels of dissolved oxygen.

Indications are that airport operations would not contribute significantly to poor water quality, as surface run-off now meets federal water quality guidelines. Nevertheless, there was concern that development of the runway would damage both fish habitat and water quality. Specifically fear was expressed that the construction of the approach light system and upgrading of the Sea Island dike might damage fish, as well as bird, habitats. Water quality might be affected by construction of the loading dock, the handling of dredgeate, and run-off from the construction site, as well as operational hazards such as fuel and glycol spills.

Transport Canada has initiated and will continue a water quality monitoring program on Sea Island. In addition, it proposed a number of mitigation measures such as construction of sedimentation ponds and catch basins to intercept run-off, appropriate design of the approach light system, and careful timing of construction activities to avoid the March — June migration period for juvenile salmon.

The Panel recognizes that Transport Canada has taken serious steps toward improving its water management practices, and, given an effective monitoring system linked to available pollution abatement technologies, no serious problems are foreseen on Sea Island. However, the Panel wishes to be sure that the appropriate systems are installed in timely fashion.

**15. The Panel recommends that the spill containment and recovery improvements proposed for the airport surface drainage system be completely operational before the parallel runway is commissioned.**

However, the Panel does recognize a problem which Transport Canada might help to solve. The area in question is McDonald Slough, a very valuable habitat which was once more heavily used by salmon fry than it is now. The waters of the Slough are seriously degraded, presumably because of a combination of poor flushing, log storage and run-off from YVR. Transport Canada has undertaken to relocate its main drainage outfall if it appears that airport run-off is damaging the Slough. The Panel would like to see Transport Canada use its influence on all parties to consider whether and how to open up the Slough by breaching the causeway which now blocks it.

**16. The Panel recommends that a serious effort be initiated by Transport Canada to reach agreement with all relevant stakeholders to open the McDonald Slough causeway.**

## Sea Island Conservation Area

Management of the area to be set aside for habitat conservation purposes would be complex because of the number of jurisdictions involved and the overlap between their several programs. The Panel therefore believes that the area should be given special identification and an appropriate management structure and powers.

**17. The Panel recommends that:**

**a) the whole of the area north of the runway be set aside by Transport Canada as the core of a Sea Island Conservation Area (SICA) and that this decision be reflected in the lease arrangements between Transport Canada and the VIAA;**

**b) Transport Canada establish a Wildlife Management Committee with a mandate to manage the SICA area for a period of at least 50 years;**

**c) the Committee consist of the Canadian Wildlife Service (acting as Chair), the Department of Fisheries and Oceans, the B. C. Ministry of Environment, the Musqueam Indian Band, the City of Richmond, the Greater Vancouver Regional District and the Fraser River Estuary Management Program;**

**d) the Wildlife Management Committee have the power:**

**i) to manage SICA and associated mitigation and compensation programs;**

**ii) to coordinate habitat purchases and programs for rehabilitation, enhancement and management with other agencies; and**

**iii) to involve appropriate interest groups** in joint research, planning activities, pilot projects and public education; and

**e) the administrative costs of the Wildlife Management Committee be borne by Transport Canada together with the costs of any environmental projects in the SICA area arising from the impacts of the new runway.**

**18. The Panel recommends that:**

**a) the Wildlife Management Committee prepare plans for:**

i) **the form and condition of the SICA area at the completion of construction operations; and**

ii) **the ongoing management and maintenance of the SICA area thereafter; and**

**b) roads and recreational developments in the SICA area be designed with wildlife conservation in mind.**

### Air Quality

Atmospheric emissions at YVR come from a number of sources such as aircraft, cars, incinerators and fuel storage areas. The levels of most pollutants, such as carbon monoxide, nitrogen dioxide and total suspended particulates, are well within federal standards; only nitric oxide — for which there are no federal standards — and ozone, have relatively high levels. Ozone is quite often at the "maximum acceptable" level.

By the year 2005, as a result of cleaner aircraft and cars and a reduction in runway queuing, total emissions are expected to be much the same as today.

It is suggested that YVR take part in the metropolitan thrust towards cleaner air by converting its own cars to cleaner fuels and by promoting the installation of public transit at YVR.

## Institutional Arrangements (Chapter 8)

### The Vancouver International Airport Authority (VIAA) (Section 8.1)

An issue raised by many people at the hearings was the role of the VIAA. There are two main questions: the over-riding importance attached in the creation of the Authority to the business aspect of airport management; and the notable lack of accountability of the VIAA. Both of these questions have to be seen against the fact that airport operations will have a strong and continuing impact on the social and natural environment around YVR.

Nevertheless, the VIAA was directed in early discussion documents to be "responsible for dealing with noise management, air pollution, solid waste management and other airport-related environmental issues consistent with applicable standards and regulations". In addition, the Chairman of the VIAA gave assurances at the hearings that the Authority would cooperate fully with other agencies and support the findings of the review. The Panel especially urges the VIAA to assume a leadership role in dealing with public issues arising from airport operations.

### VIAA Committees (Section 8.2)

The Panel approves the establishment of three permanent advisory committees on the management of noise, wildlife and air quality and makes suggestions as to their structures and functioning. It urges the VIAA to give strong **support to** these committees.

### Transport Canada (Section 8.3)

The Panel has addressed its recommendations to Transport Canada as the proponent of the Parallel runway project, but expects that these, as well as any commitments made by Transport Canada, will be accepted by the VIAA.

### The Musqueam Indian Band (Section 8.4)

The members of the Musqueam Indian Band live on a 400 acre reserve immediately across the North Arm from the proposed parallel runway. Their ancestors used Sea Island and the surrounding waters for hunting, fishing and other purposes for thousands of years and gained a subsistence living from them within living memory.

An extensive reserve on Sea Island was granted to the Musqueam in 1876, but all except a very small area adjacent to McDonald Slough was signed away in 1972 in anticipation of a new runway. The whole of the island and more are part of a comprehensive land claim lodged by the Musqueam Indian Band with the Government of Canada.

The Musqueam Indian Band sees in the parallel runway proposal yet another threat to its rights and way of life. It shares the concerns of other south slope groups regarding the potential effects of noise from the runway, not only on its homes but also on the bird population; the Band members are concerned that the project will cause further deterioration of water quality and loss of fish habitat; and they are concerned about the prospect of losing more bird habitat and about the effects of the Bird Strike Control Program.

The situation for the Musqueam Indian Band is a particularly poignant one because, although its special rights have been affirmed by court decisions, no effective steps have been taken to address its claims and stop the erosion of its rights.

The Panel accepts that the Musqueam Indian Band is more immediately and widely affected than any other group. It wishes to ensure it is fully involved in ongoing planning for the airport and its operations.

**19. The Panel recommends that:**

**a) the Musqueam Indian Band be given representation on all YVR committees; and**

**b) the interests of the Musqueam Indian Band be given high priority in the planning and development of the SICA area.**

The Musqueam Indian Band has a special interest in various archaeological sites on Sea Island, and Transport Canada has undertaken to inventory and safeguard any affected by the runway proposal. The Musqueam Indian Band has also proposed several projects in connection with future developments at YVR. The Panel supports these proposals.

**20. The Panel recommends that Transport Canada give serious consideration to funding the Musqueam Indian Band's proposal for interpretive signage, a cultural exhibit at the new airport facilities, a cultural centre at Marpole and a Musqueam Indian Band Museum.**

### Richmond (Section 8.5)

The Panel draws attention to the special position of the City of Richmond as YVR's host community. It notes that the City provides many services to YVR but is not able to tax it in the usual way; also that there is a great need for close cooperation on land use and recreation planning, equitable provision of municipal utilities, and other matters. The Panel urges the VIAA to cooperate fully with the City on all matters of common concern.

### Ground Transportation (Section 8.6)

The Sea Island area is a massive node of transportation activities. YVR is therefore inescapably involved in several transportation planning issues: expansion of the main highway network skirting and feeding Sea Island; the planning of public transit to YVR; the provision on Sea Island of roads and parking facilities to serve its own needs; and the provision of bridges between Sea Island, Lulu Island, and Vancouver. The Panel acknowledges the importance and complexity of all of these tasks.

### Regional Planning (Section 8.7)

The Panel was impressed during the review by the extent to which the parallel runway proposal issue was intertwined with regional development questions. At the same time it was somewhat disappointed by the tentative and highly qualified contribution made by the GVRD, which had made such a vigorous and useful contribution to the airport debate in the seventies. The Panel sympathizes with the GVRD's view that it should have formal regional planning powers.

### Moving Toward A Second Airport (Section 8.8)

A parallel runway should satisfy the region's runway capacity needs well into the next century. However, if more capacity is then required, the very limited land base of the Lower Mainland region makes it unlikely that it will be possible to find a site for a new major airport. It will therefore be important that existing airfield resources be used to the full. The Panel therefore supports the view of the GVRD that a plan should be prepared for airport use and expansion throughout the region.

**21. The Panel recommends that the Minister of Transport initiate the preparation of an airport development plan for the Lower Mainland Region, involving Transport Canada, the VIAA, the GVRD, and the B. C. Ministry of Highways and Transportation along with communities, interest groups, and business interests involved.**

The Panel foresees the need for full development at Abbotsford Airport in due course and believes that the VIAA would be a suitable instrument for bringing that about.

**22. The Panel recommends that as soon as an airport development plan is complete, the VIAA address itself to the task of preparing Abbotsford Airport and others to assume a larger role in the Lower Mainland's airport system.**

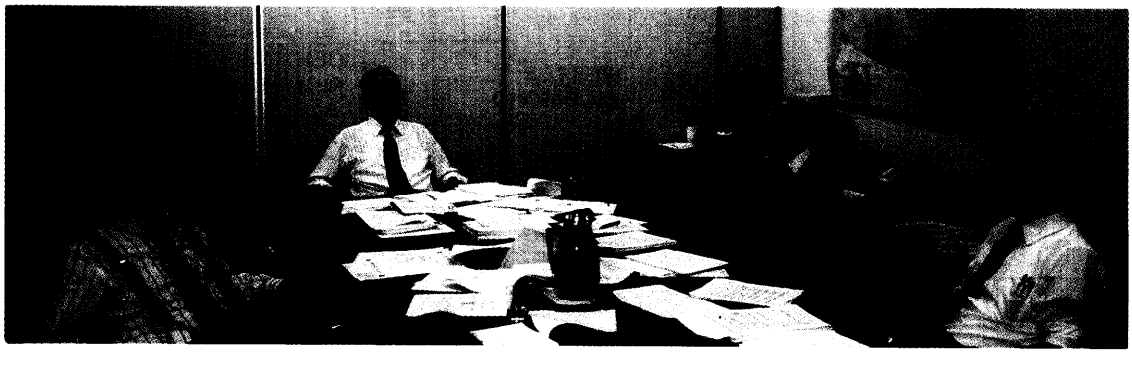
## CONCLUSION

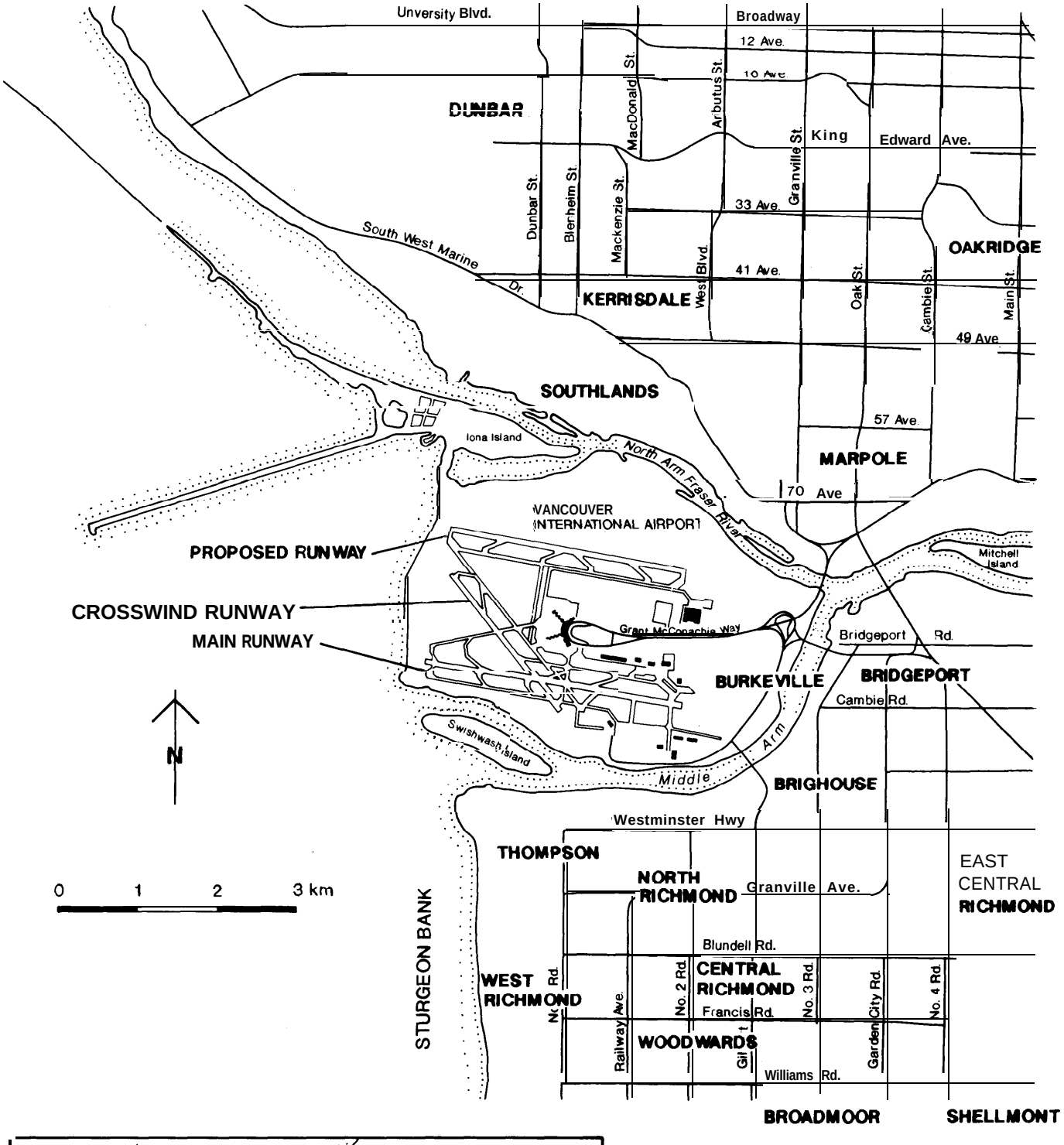
In summary, the Panel concludes that:

- more runway capacity is needed in the Lower Mainland region;
- that capacity can best be provided by a parallel runway at YVR;
- a parallel runway would cause new permanent noise impacts which should be compensated;
- a new parallel runway would cause considerable environmental damage on and around Sea Island, which should be mitigated and compensated;
- bird habitat mitigation should take the form of a significant reduction of the land planned for airport purposes on Sea Island and its dedication to habitat conservation instead, as well as the acquisition of compensatory habitat elsewhere; and
- a new runway at YVR should be approved only if programs for noise compensation and for the assurance of sustainable bird habitat and populations are established as recommended in this report.

# Chapter 1

## THE REVIEW PROCESS





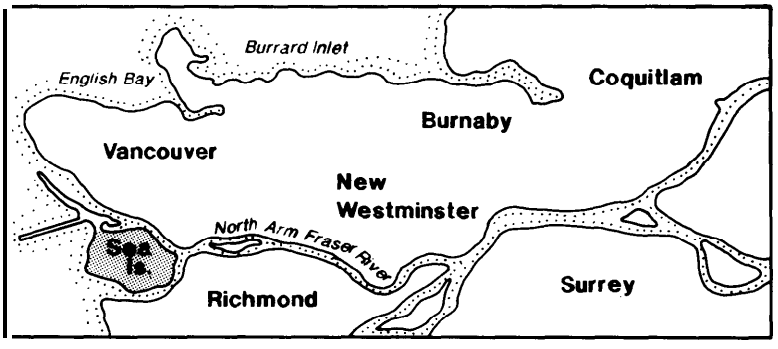




**FIGURE 1.1**

**VANCOUVER INTERNATIONAL AIRPORT LOCAL SETTING**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

# 1.0 THE REVIEW PROCESS

This chapter describes the history of the parallel runway proposal, the Panel's review of it and the nature of the current proposal. The parallel runway proposal has a long and disjointed history. For more than four decades, Transport Canada has proposed several projects in response to growing traffic demands at Vancouver International Airport (YVR). The present review is the culmination of many years of study.

## 1.1 History Of Parallel Runway Proposal

The Vancouver Planning Commission published plans for a parallel runway in 1946 and the Vancouver Planning Board also identified such a facility as a capital improvement project in 1959. Aeronautical zoning for a parallel runway was put in place in 1959. In 1972 Transport Canada expropriated much of the property on Sea Island north of the present airport as a first step toward construction of a parallel runway.

An Airport Planning Committee was formed in 1973 as a result of public opposition to the expropriations and general concern about airport expansion. The Committee included federal, provincial, regional, municipal and community representatives. The Committee's task was to examine three different runway concepts. Each of these involved some portion of the runway extending outside the Sea Island dikes and onto the Sturgeon Bank foreshore.

In March, 1976, one year after completion of the Airport Planning Committee's work, Transport Canada proposed a new option for the parallel runway which was contained entirely within the dikes. It is essentially the same scheme as the Panel reviewed between 1989 and 1991 (Figure 1 .1).

## 1.2 History Of Panel Review

Under the federal Environmental Assessment and Review Process (EARP), projects with potentially significant environmental effects must be subjected to formal public review. Accordingly, Transport Canada referred the parallel runway proposal for public review by an Environmental Assessment Panel in 1976. The Panel, as first constituted, issued *Guidelines for the Preparation of an Environmental Impact Statement (EIS)* to Transport Canada in July, 1978, after obtaining public comment on them in draft form. However, shortly after receiving the final EIS Guidelines in 1978, Transport Canada postponed further planning for the runway proposal.

Planning for the runway resumed in 1981. In December of that year, the Panel was asked to resume its review. The first task was to revise the 1978 EIS Guidelines to ensure that the Guidelines reflected the environmental and socio-economic concerns of that time.

Following public hearings in June, 1983, new guidelines were issued to Transport Canada, in October, 1983. Shortly thereafter, Transport Canada again suspended planning for a parallel runway because of the economic recession. Accordingly, the Panel review was again suspended.

Following the economic recovery which started in 1985, aircraft activity increased significantly at the airport. As a result, Transport Canada renewed its planning for a runway. In response to a request from the Minister of Transport, the Minister of the Environment reactivated the Panel for the second time in November, 1989.

## 1.3 Panel Mandate

The Panel's Terms of Reference issued at the time of its reactivation in 1989 are reproduced in Appendix 1. These require the Panel to conduct a public review of the environmental and socio-economic effects associated with the parallel runway project and to consider mitigating and compensating actions which could reduce negative impacts. The Panel was directed to examine the parallel runway project in the context of general airport planning and development. The Terms of Reference also directed the Panel to address issues relating to project justification, project alternatives, future development plans for the airport and economic costs and benefits of the project.

## 1.4 Panel Membership

Panel membership has changed over its 15 years of on-again, off-again life. With one exception, however, the current membership has remained the same since 1981. The members of the Panel, as reactivated in 1989, are Mr. Ray Robinson (Chairman), Professor James Wilson, Mr. Mel Hagglund and Dr. Chad Day. Appendix 2 provides biographies of the Panel members. The Panel Executive Secretary is Mr. Paul Scott.

## 1.5 Panel Review Activities

Since its reactivation in November, 1989, the Panel has completed a review leading to the preparation of this report. The main steps in this review were as follows:

- Initially, the Panel revised its 1983 Environmental Impact Statement (EIS) Guidelines and released them in February, 1990 in draft form for public review and comment.
- In April, 1990, the Panel held a series of issue scoping workshops focusing on a review of the draft EIS Guidelines. The workshops were organized and facilitated by Synergistics Consulting Limited which also produced a report summarizing the workshop results. Invited participants included representatives of key government agencies, airline industry companies, aviation organizations and public interest groups. The workshops helped the Panel to identify and examine important issues and concerns to be addressed during the review.
- Following the workshops, the Panel finalized the EIS Guidelines in June, 1990 and issued them to Transport Canada and the public.
- Transport Canada completed its EIS in August, 1990. It was distributed widely for public review and comment.

- In October, 1990, the Panel completed its review of the EIS and of information contained in written submissions commenting on the EIS. It concluded that some sections of the report required additional clarification before the Panel could schedule public hearings. Accordingly, the Panel issued "A Request for Additional Information and Consultation" to Transport Canada asking for clarification of critical issues. It also suggested that some problems would benefit from further face-to-face discussions between Transport Canada and key government stakeholders.

- Transport Canada provided its "Response to Request for Additional Information and Consultation on the Proposed Parallel Runway Project" in mid-December, 1990. The "Response" was widely distributed.

- The Panel held 11 days of public hearings between January 31, 1991 and February 12, 1991. During the public hearings, the Panel heard over 150 presentations by interested parties. These included Transport Canada, aviation companies and associations, business interests, unions, the Cities of Vancouver and Richmond, the Musqueam Indian Band, the Greater Vancouver Regional District, federal and provincial departments, British Columbia and Yukon communities, regional districts, public interest groups and individuals. Appendix 5 provides a list of participants. The Panel also received many written submissions before, during and immediately after the public hearings. These are listed in Appendix 4.

During the review, the Panel Secretariat maintained a public file which contained all correspondence and material received by the Panel. The file was available for public scrutiny throughout the review period. It will continue to be maintained and is open to the public at the Federal Environmental Assessment Review Office in Vancouver.

The Panel has examined carefully all information received throughout its review. This includes Transport Canada's Environmental Impact Statement and supporting documents, written submissions and presentations and discussion at the public hearings. This information, together with other publicly available data, forms the basis for the Panel's conclusions and recommendations as presented in this report.

## 1.6 Intervenor Funding

Transport Canada made up to a maximum of $250,000. available to assist groups and organizations wishing to participate in the review process. An independent Funding Committee solicited applications for disbursement of these funds and adjudicated the applications. The Committee awarded a total of $170,500. to 10 successful applicants.

## 1.7 Technical Specialists

The Panel employed three Technical Specialists to assist in the review. Their role was to help the Panel, and other review participants, in understanding complex technical issues. They provided factual information, prepared issue analysis reports and participated in the public hearings.

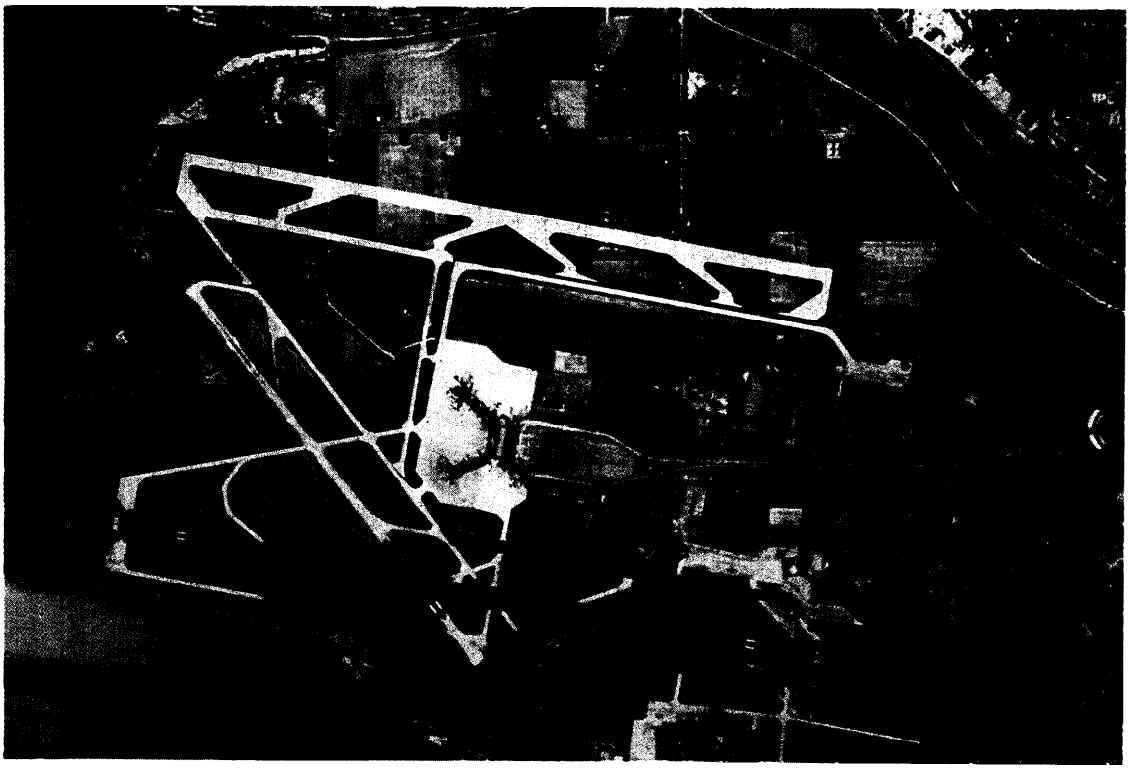
The three Technical Specialists and their areas of expertise were:

| | |
|---|---|
| Mr. Larry Wolfe | Environment and Land Use Impacts |
| Mr. Werner Richarz | Aeronautical Noise Propagation |
| Mr. Clair Wakefield | Community Impacts of Aeronautical Noise |

Biographies of the Technical Specialists are to be found in Appendix 6.

# Chapter 2

## THEPROPOSAL



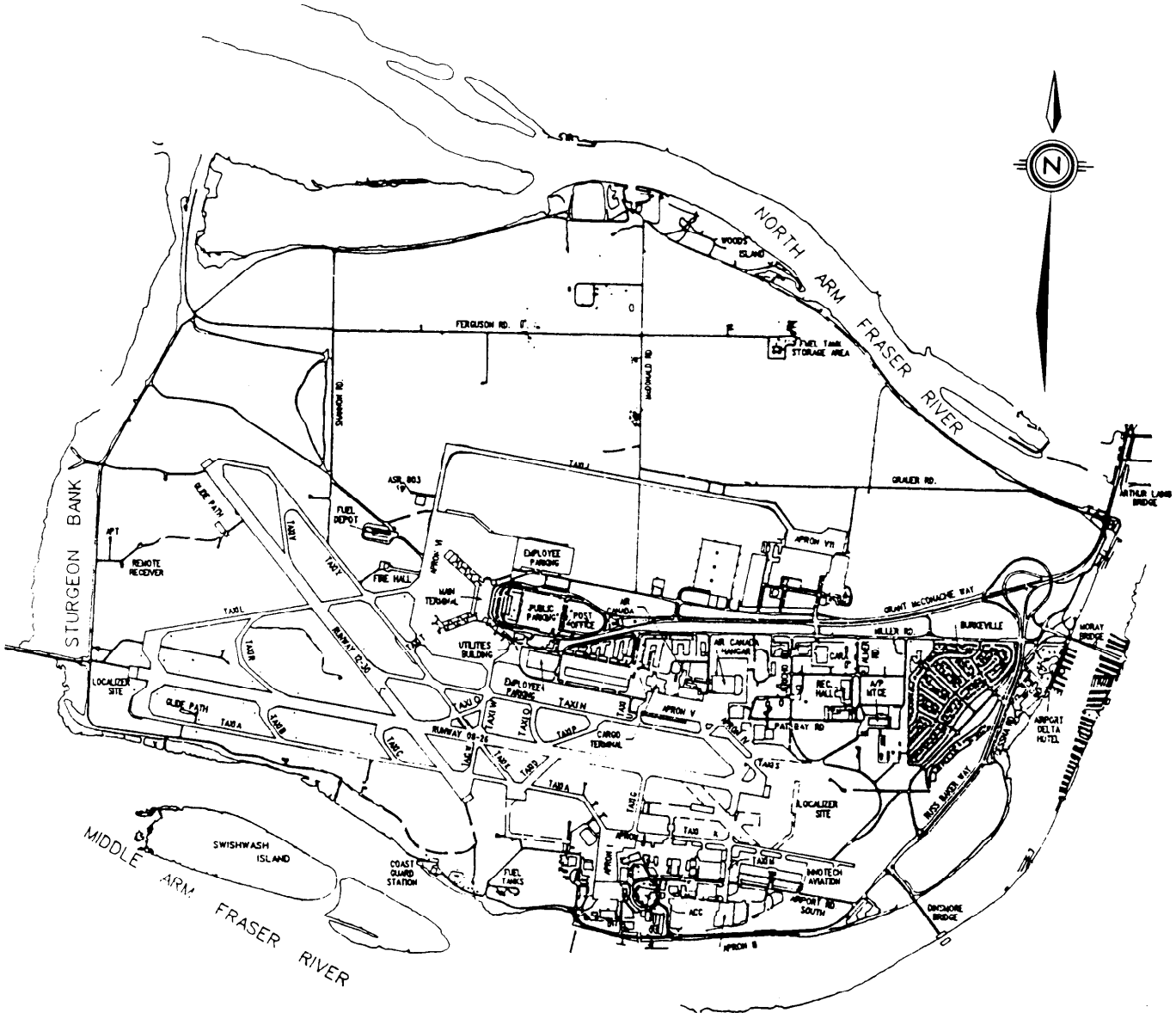



**FIGURE 2.1**

**VANCOUVER INTERNATIONAL AIRPORT**
**SEA ISLAND OUTLINE**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, **1990)**

# 2.0 THE PROPOSAL

This chapter begins with a brief description of existing operations and facilities at YVR, reviews current programs to improve air traffic handling capacity of YVR, and presents Transport Canada's proposal for a parallel runway at YVR. Section 4.0 of the EIS provides a detailed description of the proposal.

## 2.1 YVR Today

The Vancouver International Airport is situated on Sea Island in the Fraser River estuary. It is located within the City of Richmond approximately 13 km south of downtown Vancouver. YVR is Western Canada's busiest airport and second in Canada to Toronto's Pearson International Airport. It is the hub for British Columbia's air transportation system and provides a connecting point between regional, national and international flights.

### 2.1.1 Airside Layout And Utilization

YVR operates three runways: the main runway, the crosswind runway and taxiway Alpha, operated as a stub or short runway. A water aerodrome is located on the south side of the airport on the Middle Arm of the Fraser River. There are helipads on both sides of the main runway. Many of these facilities are shown in Figure 2.1.

The main runway (08/26), a 3,350 m (11,000 ft) east-west runway, carries most YVR traffic. It is equipped to handle Instrument Flight Rules (IFR) traffic with an Instrument Landing System (ILS) installation.

The crosswind runway (12/30) extends 2,225 m (7,300 ft) in a southeast-northwest direction. The crosswind runway can be operated simultaneously with the main runway under certain conditions: it is used by small aircraft able to stop within 1,646 m (5,400 ft), the length available on the crosswind runway before it intersects the main runway. The crosswind runway is also occasionally used as a primary runway when the main runway is closed or unusable due to strong winds. On average, this occurs only 0.03 percent of the time each year. The crosswind runway is also equipped with an Instrument Landing System.

The main and crosswind runways and associated taxiways, with minor exceptions, are able to accept wide-body aircraft for both day and night operations.

The runway complex is augmented by the use of the west portion of taxiway Alpha as a 1,067 m (3,500 ft) stub or short runway. Designated 26A, use of this runway is limited to westbound departures for small aircraft able to takeoff within its length.

### 2.1.2 Terminal And Groundside Facilities

YVR has two public air terminal buildings, the Main and South Terminals. The larger Main Terminal serves the vast majority of traffic. It is a "finger-type" terminal with multi-level, centralized passenger processing which handles nearly 10 million passengers per year. A major expansion of this terminal is planned in the mid-1990's to reduce congestion.

The South Terminal provides services almost exclusively for regional airlines and general aviation. It currently serves 11 scheduled and charter airlines. The South Terminal area is also the base for a variety of services. These include: aircraft servicing and overhaul facilities; parts suppliers; administrative offices for major operators; air cargo and courier facilities; aircraft brokers; aircraft charterers; and training facilities. At Airport South there is also a Flight Service Station for flight planning and a Weather Observation Office which provides weather briefing services.

## 2.2 Capacity Improvement Program

To find a solution to growing congestion at YVR, Transport Canada initiated the Airside Capacity Enhancement (ACE) Project in March, 1988. Its purpose was to estimate existing and future requirements for airport capacity at YVR and to identify measures for improving that capacity. The Airside Capacity Enhancement project team produced a report in June, 1989 that identified several short-term measures to enhance airsidecapacity. These measures, referred to as the Capacity Improvement Program (CIP), include both infrastructure improvements and operational changes.

Infrastructure improvements include:

1. Improved taxiways and runway entrances and exits. These improvements allow for more rapid "rolling takeoffs" and for faster exits from the runway after landing, thus reducing runway occupancy times. Improvements were also proposed to the manoeuvring areas near the terminal.

2. Use of stub runway Alpha, which started in October, 1988 for light aircraft operations from the South Terminal area.

3. Planned technological improvements in the 1991-l 996 period include the Radar Modernization Program (RAMP), the Canadian Automated Air Traffic System (CAATS), and the Microwave Landing Systems (MLS).

Operational improvements include implementation of:

1. **Air Traffic Flow Management (ATFM)**

   Air Traffic Flow Management (ATFM) is a process that meters air traffic into YVR at a rate consistent with its Instrument Flight Rules (IFR) capacity. This is accomplished by holding YVR-bound aircraft on the ground at British Columbia, Yukon and Alberta airports. It thus reduces delays at YVR at the expense of delays at the outlying airports.

2. **Control Zone Traffic Management (CZTM)**

   Control Zone Traffic Management (CZTM) is a package of procedures which streamline Visual Flight Rules control procedures. It increases the efficiency of communications between the pilots and controllers. The CZTM package includes standardized air traffic routes, restriction of helicopters and float planes to designated routes, restrictions on certain Visual Flight Rules operations, restrictions of flights through control zones, and changes to apron management procedures.

3. **Simultaneous use of the main and crosswind runways during Visual Meteorological Conditions (VMC)**

   Essentially this means increased use of Runway 12 for arriving IFR traffic by allowing simultaneous convergent IFR approaches on Runway 12 and Runway 08.

4. **Schedule Smoothing.** Although not part of the Capacity Improvement Program, schedules were examined for opportunities to avoid congestion and reduce delays.

5. **A minimum landing fee effective February 1, 1991.** A **$25.00** minimum landing fee is meant to encourage private, recreational flyers to move from YVR to alternative Lower Mainland airports.

The Capacity Improvement Program is expected to boost YVR capacity by 8 percent. Airport capacity is also discussed in section 5.2.

## 2.3 Proposed Parallel Runway

While the Capacity Improvement Program will reduce traffic congestion at YVR, Transport Canada believes it is not sufficient to meet future capacity needs at YVR. The Airside Capacity Enhancement project team recommended that Transport Canada should proceed with further planning and review of the parallel runway. Accordingly, in November, 1989, the Minister of Transport requested that the Environmental Assessment Panel for the parallel runway project be reactivated.

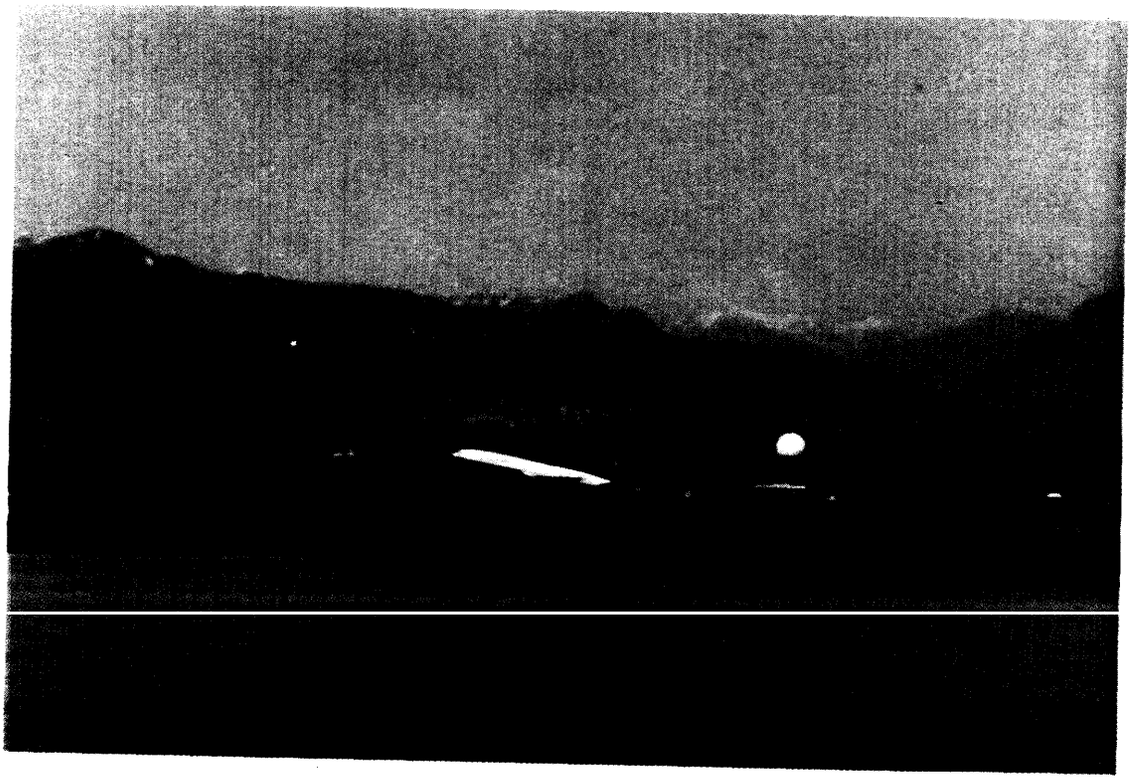
The parallel runway proposal envisages the construction of a new 3,030 m (9,940 ft) runway 1.7 km north of, and parallel to, the existing main runway (Figure 1 .1). The new runway would be 60 m (197 ft) wide with six high-speed exits and a 23 m (75 ft) wide taxiway. The proposal includes additional runway lighting, a navigational and meteorological installation and relocation of existing utilities in the project area. It would allow, subject to initial mitigative measures, simultaneous and independent landings and takeoffs by all classes of aircraft on the two parallel runways.

The proposed project construction schedule includes two phases extending over approximately 3 years. The initial 15 month pre-construction phase would involve site preparation and preloading of the proposed runway site. Sand for preloading would be dredged mainly from the Main Arm of the Fraser River and barged to the North Arm. A dock would be constructed for offloading the sand.

Runway, taxiway and associated works are scheduled for construction in the following 19 month period. After construction, all disturbed lands would be rehabilitated. The offloading dock would be removed and habitat at the site restored.

# Chapter 3

## REGIONAL AVIATION SETTING



# 3.0 REGIONAL AVIATION SETTING

This chapter describes the regional setting in which the parallel runway proposal must be considered. It includes a discussion of aviation in the Lower Mainland, a general description of the Greater Vancouver urban area and an introduction to the Fraser River estuary and its resources. It sets the scene for the examination and evaluation of the issues and problems associated with the runway proposal and the operation of Vancouver International Airport.

## 3.1 Aviation In The Lower Mainland: Past, Present And Future

### 3.1.1 YVR

The first flight in the Vancouver region occurred in 1919 when a Curtis Biplane flew from Minoru Park in Richmond. By 1928, air services operated between Richmond and Seattle and Victoria from an airfield on Lulu Island.

In 1929, Sea Island was chosen as the site for a permanent airfield. The Vancouver Airport, established in 1931, was built and initially operated by the City of Vancouver. It became an international airport in 1934 with the inauguration of flights to Seattle. The runway was expanded in 1937, allowing flights to the interior and northern B. C., Yukon and eastern Canada. In 1940, with World War II in progress, the Department of National Defence took over the airport, administering it jointly with the City of Vancouver until 1947. During this time, airport facilities were expanded with the construction of two 1,525 m (5,000 ft) runways, an expanded terminal and other facilities. The idea of a parallel runway was first proposed in 1946.

The City of Vancouver resumed control of the airport in 1947 although the federal government continued to subsidize operations. In 1953, the Department of Transport funded construction of the main runway which established YVR as a Class A international airport. According to Transport Canada, aircraft movements increased from almost 9,000 movements in 1933 to 151,000 movements in 1953. During the same period, annual passenger use increased from 2,700 to 396,000.

There was much development on Sea Island from the 1950's to the 1970's. The federal government began to purchase and expropriate land in 1954, a process which continued on Airport North throughout the 1970's. The City of Vancouver sold a share of the airport to the Government of Canada in 1962. This set the stage for the completion of the crosswind runway the following year and a new terminal building in 1968. The ground transportation infrastructure was improved with the construction of the Dinsmore Bridge in 1968 and the Arthur Laing Bridge in 1975. Finally, both Canadian Pacific Airlines and Air Canada expanded their Sea Island facilities in the early 1970's. There have been continuous improvements and additions to Sea Island infrastructure since that time.

### The Role Of YVR

YVR has a number of roles. Specifically, it is:

- a major Pacific port of entry for passengers and cargo;
- a major transborder and international port of entry for passengers and cargo;
- the major airport in British Columbia for services to the rest of Canada;
- the British Columbia regional hub for passengers and cargo;
- a major base for charter operations for destinations in British Columbia, Canada and the U.S.A.; and
- a base for commercial activity directly and indirectly associated with the aerospace industry.

### YVR Markets: Hub-And-Spoke Systems And Routes

During the past decade, air traffic volume at YVR rose steadily and traffic patterns changed dramatically. Two major trends were the increasingly significant role of YVR as an international airport and the establishment of a hub-and-spoke system in British Columbia. Passenger traffic at YVR is now 64 percent domestic, 20 percent transborder and 16 percent other international. The current trend toward increased transborder and overseas passengers is evident by the growth in this category from 689,900 passengers in 1982 to 1,490,891 in 1988. A second major market for YVR is cargo — carried primarily in the holds of passenger aircraft — 62 percent of which is domestic. Two primary opportunities for expanding cargo operations are in the sea-air market between Europe and Asia and the air-truck market between Western U.S.A. and Europe and Asia.

A hub-and-spoke network centered on YVR evolved in British Columbia in the 1980's. The YVR hub is the interchange point where passengers and cargo arrive by air from the spoke communities in British Columbia and neighbouring Alberta and Yukon and transfer to aircraft departing to other locations. The YVR hub is also the central exchange where the passengers and cargo return to these spoke communities from other locations in British Columbia, Canada and elsewhere. This interchange of traffic normally takes place within a relatively short period due to the high frequency of arriving and departing aircraft. This system is principally served by regional and commuter air carriers, such as Air B. C. and Time Air, using turboprop aircraft or small jets.

Before deregulation, turboprop aircraft accounted for only 11.5 percent of the scheduled flights to the spoke communities, while the remaining 88.5 percent of flights were carried out by jets. The replacement of jet service occurred just as the air carriers were developing a regional hub-and-spoke system using primarily propeller aircraft. The regional hub-and-spoke system of 1990 is more than twice as active in frequency of aircraft movements as in 1979.

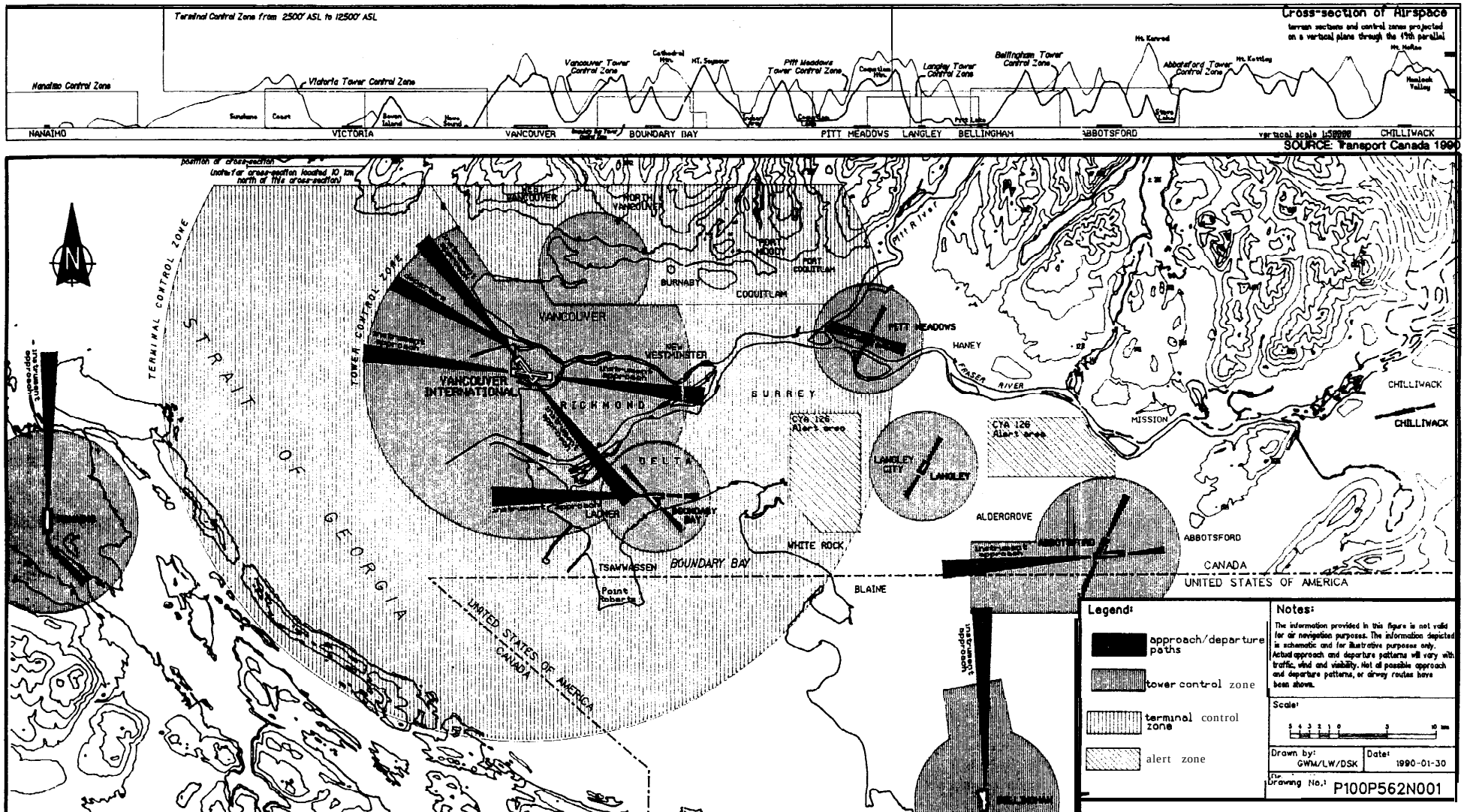



**FIGURE 3.1**

**SOUTHWESTERN BRITISH COLUMBIA AIRSPACE**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

In addition to the regional hub-and-spoke system described above, YVR also acts as a hub for a system connecting passengers to and from Canadian points outside the regional area to international and transborder points.

### 3.1.2 Other Airports

#### Abbotsford

The Abbotsford Airport, owned and operated by Transport Canada, is located in the District of Matsqui, an agricultural area which is attracting a lot of suburban development. It is the home of the world famous Abbotsford Airshow and now also hosts a biennial tradeshow. This reputation has encouraged the development of aviation-related industries near the airport.

Nearby mountains and confined airspace limit the use of Abbotsford Airport for Instrument Flight Rules operations. Nevertheless, it serves as an alternative airport for aircraft when YVR is closed due to poor weather.

Abbotsford's annual capacity in 1988 was between 230,000 and 250,000 movements. There were 153,625 movements in 1988 and demand is not expected to exceed capacity until sometime beyond 2001.

#### Boundary Bay

The Boundary Bay Airport is located in the Municipality of Delta, 16 km southeast of YVR in an agricultural area. Recreation and wildlife habitat are important nearby land uses.

The Boundary Bay Airport was opened in 1942 as a Royal Canadian Air Force (RCAF) Elementary Flying Training School and the airfield was expanded to allow training of flight crews for four-engine bombers. In 1945, the RCAF discontinued operations at the airport and the site was operated as a wireless station from 1948 to 1968 by the Department of National Defence. In 1972, administrative responsibility for the site was turned over to Transport Canada.

During the period 1977 to 1979, a Transport Canada proposal for reactivation of the airport was subjected to a formal public review by an Environmental Assessment Panel. Transport Canada's intent was to divert some of the general aviation traffic at YVR to the Boundary Bay Airport to avoid conflict at YVR between jet aircraft and smaller planes. Following its review, the Panel concluded that the airport could be reactivated without significant environmental or social effects. In the Boundary Bay Airport report, the Panel made several recommendations to minimize the effect of the airport on the extremely valuable and sensitive bird habitat of Boundary Bay.

The Boundary Bay Airport was re-opened in 1983 and today it has an annual capacity of 190,000 to 210,000 aircraft movements. Demand, which exceeded 156,000 movements in 1988, is expected to reach capacity sometime between 1992 and 1996.

#### Other Lower Mainland Airports

Vancouver harbour is one of the busiest float plane aerodromes in the world. With planes based in Coal Harbour and air traffic control located in a downtown building, the harbour is used extensively by float planes bound for Victoria and other coastal locations. Helicopter service is also available from a helipad on the harbour front. Harbour-to-harbour float plane and helicopter flights to and from Victoria pass over Vancouver and YVR enroute.

The Pitt Meadows Airport is in the District of Pitt Meadows, approximately 40 km east of downtown Vancouver. Facilities at the airport are limited and the airfield and facilities are not equipped to handle large volumes of commercial traffic. Airspace is limited by topography and airspace restrictions. The Pitt Meadows Airport annual capacity of 290,000 to 310,000 movements is not expected to be exceeded until sometime beyond 2001. Movements in 1988 were 113,891.

The Langley Airport is in the District of Langley. It has no facilities to handle large commercial aircraft. The municipality is promoting development of the airport, although expansion opportunities are limited by nearby residences. The annual capacity of the airport in 1988 was between 190,000 and 210,000 movements and demand was 121,041 movements. Capacity is not expected to be exceeded until after 2001.

The Chilliwack Airport is at the eastern end of the Fraser Valley. The Chilliwack terminal can handle commercial planes with small passenger loads. Expansion opportunities are limited by topography and airspace conflicts. The 1988 annual capacity of this airport was between 100,000 and 110,000 movements. Demand was 50,000 movements and annual capacity is not expected to be surpassed until beyond 2001.

#### Other Regional Airports

The Victoria and Nanaimo Airports are on Vancouver Island and are not connected by land to the Lower Mainland. The Victoria Airport, on the northern tip of the Saanich Peninsula, is owned and operated by Transport Canada. Aircraft movements were 200,033 in 1988, as compared to a capacity of between 230,000 and 250,000 movements. The airport capacity of 1.3 million passengers per year is expected to be reached by 2001.

The Nanaimo Airport, operated by the City of Nanaimo, can handle passenger planes in the 50 passenger range. Demand was at 62,776 movements in 1988. The airport's capacity of between 100,000 and 110,000 movements, is not expected to be exceeded until beyond 2001.

There are two important facilities nearby in Washington State. The Bellingham Airport is located 70 km south of YVR and the Sea-Tat Airport, a major national and international hub, is situated between Seattle and Tacoma some 275 km to the south.

### 3.1.3 Lower Mainland Airspace

This section describes the management of aircraft movements in the Lower Mainland area. Airspace is discussed in

some detail here as background to later sections of this report.

## Flight Rules

Air traffic operates under either Visual Flight Rules (VFR) or Instrument Flight Rules (IFR). Generally, flights conducted outside of cloud, with good visibility, are operated under VFR. Under these rules, pilots are responsible for their own navigation and separation from other aircraft. Instrument Flight Rules permit aircraft to be navigated without reference to visible features. Navigation is achieved by electronic means and air traffic controllers use radar and other procedures to ensure adequate separation between aircraft.

Aircraft which normally fly at or above 3,810 m (12,500 ft) are required to fly under Instrument Flight Rules. This means that most large jet and turboprop aircraft normally fly using these rules. In poor weather, most commercial passenger aircraft, except those with single engines, are flown under Instrument Flight Rules. Within airport control zones, VFR flight requires a ceiling of at least 300 m (1,000 ft) and visibility of 5 km (3 mi). These conditions are termed Visual Meteorological Conditions (VMC). Weather conditions below these minima are known as Instrument Meteorological Conditions (IMC) and require IFR operations. Any aircraft may be operated under Instrument Flight Rules if it has the required instrumentation and if the pilots is certified to operate it. Thus, even when the weather is clear, an aircraft may be operated under Instrument Flight Rules.

Airspace is organized to accommodate both IFR and VFR flights. The Lower Mainland area generally enjoys good flying weather and many flights are conducted under VFR. In good weather, VFR pilots operate on a “see and be seen” basis, and the separation standards used for instrument flight do not apply. When weather is below the VFR cloud height and visibility limits, the IFR separation standards must be applied.

Procedures and standards governing flights result from the application of approach design and certification criteria based ‘on extensive trials, analysis and pilot experience. Canadian standards are compatible with American standards, and recognize international recommended practices.

Available airspace in the Lower Mainland and southern Vancouver Island is limited by the application of Standards for Terrain Clearance, particularly for IFR operations. Figure 3.1 displays a profile of the airspace structure and surrounding terrain. For the sake of simplicity, the map omits the numerous airways and routes criss-crossing the area. It indicates the interaction of the instrument approaches at many of the Lower Mainland airports with each other and YVR, the conflicting paths at Abbotsford and Bellingham being one example.

The map shows the “control zones” surrounding each airport. These zones are legally defined airspace in which traffic receives control service from the respective Air Traffic Control Tower staff. It also depicts some “alert areas” — parts of the airspace where there is heavy use by small training-type aircraft and within which pilots must be particularly watchful. Since traffic in alert areas operates under VFR only, the pilots do not have communication with the IFR controllers. As a result, aircraft flying under IFR are not given clearance to enter these areas.

The availability of radar coverage is a key factor in controlling both IFR and VFR traffic. If radar is not available, the distance between individual aircraft must be increased and airspace capacity is diminished. For this reason, the current Radar Modernization Program is of particular importance to Lower Mainland airspace capacity, as it will improve Lower Mainland radar coverage.

Airspace and runway capacity must be compatible to avoid constraints. Simulation modelling of Lower Mainland airspace capacity reveals that there is sufficient capacity to permit full operation of parallel IFR runways at YVR. As IFR operations increase at other Lower Mainland airports, procedures and equipment will have to be carefully integrated to ensure that airspace conflicts do not result in reduced IFR capacity at YVR.

## New Technology

Three major technological changes will have significant beneficial effects on the airspace management and instrument approach capacity at YVR in the next ten years. These changes are:

- Radar Modernization Project (RAMP);
- the Canadian Automated Air Traffic Systems (CAATS); and
- the Microwave Landing System (MLS).

Implementation of the Radar Modernization Project (RAMP) will provide improved primary and secondary monopulse radar systems at Vancouver and Victoria. The enhanced position and tracking accuracy of these systems is expected to enable controllers to apply the minimum permitted separation between aircraft more frequently. The radars are also expected to provide more reliable information during precipitation, which will improve radar control. In particular, the new installation at Victoria should have much better coverage of lower altitudes at Bellingham and Abbotsford. The installation of RAMP at YVR is expected in early 1991.

Daylight viewing radar data displays will be installed in the Control Towers at Vancouver and Victoria, permitting more effective traffic control.

The Canadian Automated Air Traffic System (CAATS) uses advanced data processing and display technology to assist in air traffic management. CAATS will be based on a central computing complex linked to each Common Controller Workstation (CCWS). CCWS provides controllers with an electronic display of digital radar data, flight plan, weather and supplementary data. Operated by one controller, the system will result in increased productivity. CAATS will be implemented into the Canadian Air Traffic Control System in 1995.

The Microwave Landing System (MLS) incorporates precision Distance Measuring Equipment (DME) to overcome limitations of the current ILS. Radiated signals are minimally affected by surrounding terrain, structures and weather. MLS will provide multiple curved and segmented approaches and selectable glide slope angles. It will also provide a greater number of channel frequencies. The installation of MLS at YVR is expected in 1995.

### Air Traffic Services

There are two air traffic control facilities located on YVR property. The Control Tower cab, on top of the Main Terminal Building, provides services to aircraft in the local airspace as well as to aircraft on the runway and taxiway networks. The Area Control Center (ACC), near the South Terminal Building, provides control services to arriving and departing aircraft outside the immediate airport vicinity, as well as to aircraft in the enroute airspace over most of the Province of British Columbia.

Air traffic control staffing levels correspond to overall traffic volume as a whole. Any increase in staff levels at either the Vancouver ACC or the Vancouver Control Tower will have no impact on the ability of YVR to handle more aircraft with its current runway configuration.

The Vancouver ACC has been operating with 60 percent to 70 percent of its required staff levels for the past two or three years. To compensate for this shortfall, employees have been working overtime shifts. Projections indicate that staffing levels at the Vancouver ACC will be above 85 percent for the enroute specialty by the fall 1991, and above 80 percent for the terminal specialty by the fall of 1992. The Vancouver Tower will be at 90 percent of requirements within the same time frame.

## 3.2 The Greater Vancouver Region

### 3.2.1 Regional Population

In the past two decades the Greater Vancouver metropolitan area has experienced steady growth. Its present population (1991) is approximately 1.6 million. By the year 2001 over 2 million people are expected to be living in the area. At this time, about two-thirds of the growth is due to people moving into the region; this is expected to increase to over 80 percent by 2011.

The distribution of population in the area has changed significantly in the past 25 years. In 1966, 40 percent of its population lived in the City of Vancouver; by 1988, that percentage had declined to less than 30 percent.

While metropolitan growth has shifted to the suburbs, there has also been dramatic population increases in the Fraser Valley communities to the east. The growth is expected to double in the Central Fraser Valley Regional District and to increase by one-half in the Dewdney-Alouette Regional District by the year 2011. By comparison, the population is expected to grow by one-quarter in the Greater Vancouver metropolitan area over this period.

### 3.2.2 Creating Our Future Program

In July, 1990, the Board of the Greater Vancouver Regional District adopted 54 actions concerned with the livability of the Greater Vancouver Region. These actions were part of the region wide Creating Our Future Program that involved extensive public consultation through seminars, forums, phone-in programs, a public opinion survey and community meetings. The 54 actions are meant to address five critical priority areas which emerged from the consultation process:

1. maintaining a healthy environment;
2. conserving the land resource;
3. serving a changing population;
4. maintaining the region's economic health; and
5. managing the region.

While not a regional plan as such, the goals and recommended actions of Creating Our Future build upon the 1975 Livable Region Strategy by providing a framework for managing urban growth on a regional basis. Many of these actions have direct relevance to the proposed parallel runway project. Of particular interest are the implications of the project for the Greater Vancouver Air Management Plan; the preservation of the north side of Sea Island as a "green zone"; the protection of wetlands and the Pacific flyway; the decentralization of jobs and the labour force through the creation of regional town centers; the regional transportation system; and the enhancement of economic development opportunities.

### 3.2.3 Regional Transportation System

Vancouver International Airport is located at the western edge of Greater Vancouver. Being on an island, its connections to the regional highway system are restricted. Access to Sea Island is currently by way of three bridges: Arthur Laing, which connects the Airport directly to the City of Vancouver (Marine Drive) across the North Arm of the Fraser River; the Moray Channel Bridge which crosses the Middle Arm of the Fraser River and is the main route to Highway 99, a major north-south regional highway; and the Dinsmore Bridge, which crosses the Middle Arm and forms part of the arterial road system of the City of Richmond. Over half the vehicular traffic coming onto Sea Island is non-airport commuting traffic. Figure 3.2 outlines the current Sea Island road system.

## 3.3 The Fraser River Estuary Environment

The Fraser River is one of the most productive biological systems in Canada. It is about 1,400 km long and drains nearly one-quarter of the area of British Columbia. At New Westminster, approximately 24 km from the mouth, the river divides into two main branches — the South or Main Arm and the North Arm. The Main Arm carries about 85 percent of the total flow and the North Arm 15 percent. At Sea Island, near the mouth of the North Arm, the river branches again, forming the Middle Arm. The Fraser River estuary, as defined

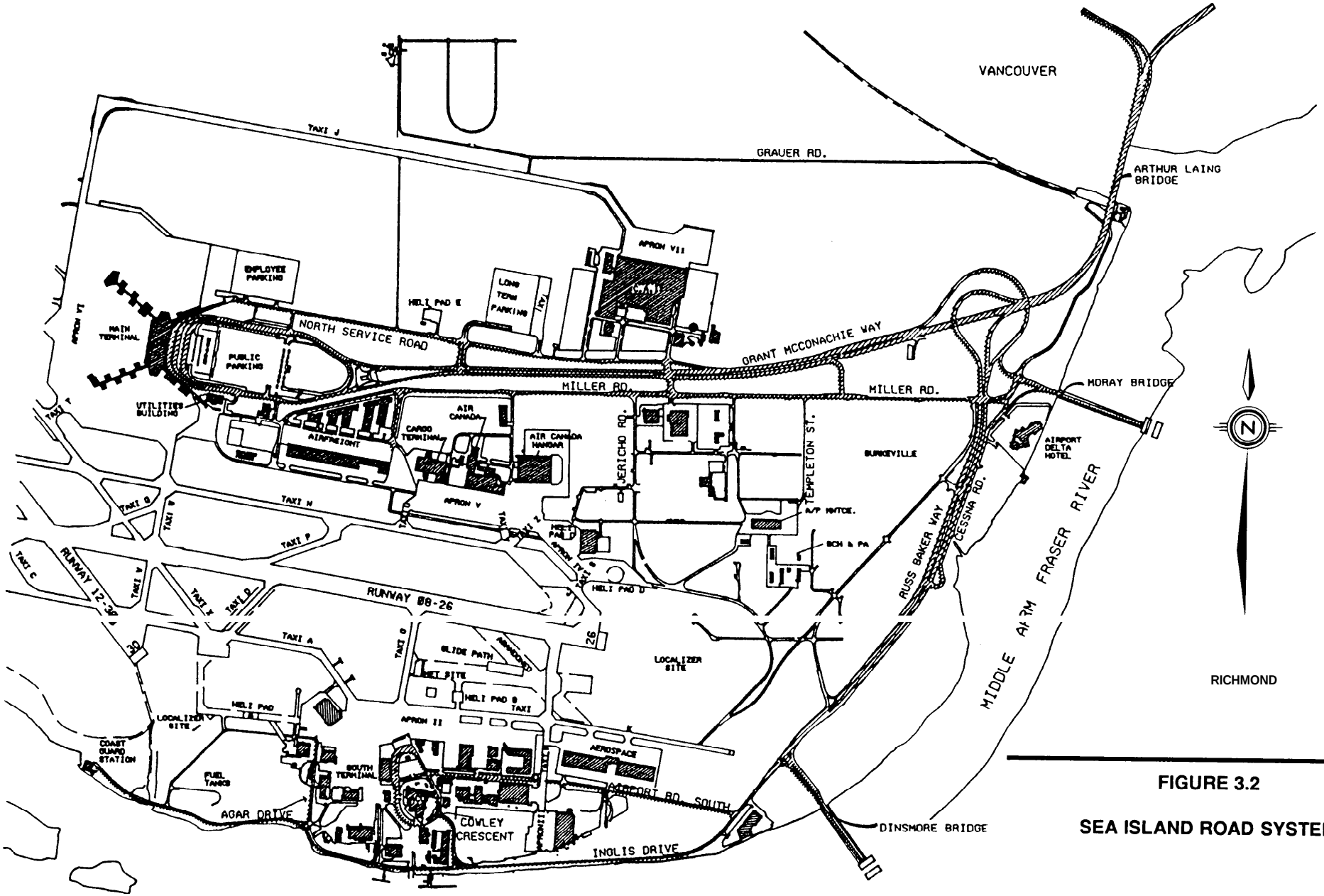



**FIGURE 3.2**

**SEA ISLAND ROAD SYSTEM**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

here, includes approximately 337 km² of alluvial lowlands from **New** Westminster to the outer intertidal banks and south to Boundary Bay.

**The** outer estuary, which includes Sturgeon and Roberts Banks, is maintained by the constant discharge and accumulation of nearly 20 million metric tonnes of sediments annually. These outer banks, including the intertidal area of Boundary Bay, cover about 14,000 hectares.

The natural environment of the Fraser River estuary is enriched by the diversity of freshwater, marine waters, upland and floodplain.

The mixing of salt and freshwaters, and the mild climate, have resulted in an extremely productive and diverse ecosystem. This diversity is expressed in the form of habitats for a wide variety of organisms including fish, birds and mammals.

### 3.3.1 Fish

The Fraser River is renowned as one of the greatest salmon rivers in the world, but it also supports many other commercial and non-commercial species. These fish species are not restricted to any particular environ within the estuary but utilize a range of habitats including the tidal flats of the outer estuary, the freshwater and brackish marshes and the backwaters and sloughs for spawning, resting, feeding, holding and rearing. All these habitat types are represented in the Sea Island area including the intertidal flats of Sturgeon Banks, the brackish marshes of the Middle and North Arms and McDonald Slough.

### 3.3.2 Birds

The Fraser River estuary represents one of the key components of the international Pacific Flyway. Over 300 species of birds frequent the estuary and adjacent freshwater and upland areas. During the winter months, more than 1.4 million birds are known to migrate through the estuary. Like fish, birds utilize a variety of habitats to carry out their lifecycle functions. Sea Island, and its adjacent environs are a rich ecosystem for birds, containing intertidal foreshore, marsh, pasture, hayfields and old field habitat. It is the juxtaposition of these habitats in relation to one another which makes Sea Island so valuable as an ecosystem to waterfowl, shorebirds, passerines and raptors. A reduction in the quality or quantity of any component of this ecosystem could have serious implications for the capability of this area to support such diverse bird populations.

### 3.3.3 State Of The Environment

Since the late nineteenth century, the estuary has been altered by human settlement. Dyking and drainage of lowlands and wetlands for agricultural purposes and floodproofing has resulted in the loss of significant portions of saltmarsh, tidal freshwater marsh and other wetlands. Deteriorating water quality has also threatened the environment of the estuary. The lona Sewage Treatment Plant, constructed in 1961, discharges primary-treated sewage. Until 1988, this was released in the vicinity of Sturgeon Bank, resulting in severe degradation of the Bank. In 1988, the sewage plant began discharging through a deep-sea outfall stretching further out into Georgia Strait. While water quality conditions appear to be improving on Sturgeon Bank, there is still a concern that heavy metals and other toxic residuals may be bound upin the sediments.

The foreshore marshes and waters of the Middle Arm have also been subjected to spills of jet fuel in recent years. Studies conducted by Environment Canada have determined that jet fuel compounds are still present in the sediments and marsh plants, and may be affecting plant growth.

The North Arm of the Fraser River is heavily industrialized. There are many industrial activities, storm sewers and drainage ditches discharging wastewater and urban and agricultural run-off into the North Arm. Given the low flows of the North Arm relative to the Main Arm, it is known to have poorer water quality. McDonald Slough also experiences low dissolved oxygen levels.

Thus a picture of the state of the environment begins to emerge for Sea Island. It supports a wide diversity of fish and wildlife, which are dependent upon a mix of habitat types. However, it is clear that there have been, and continue to be, several threats to the continuing viability of Sea Island as a functioning ecosystem. These threats have been in the form of physical habitat alienation and alteration and poor water quality conditions, particularly on Sturgeon Bank and in McDonald Slough. Chronic spills have also contributed to the degradation. It is reasonable to conclude that the remaining portion of the Sea Island ecosystem is in a somewhat precarious state. If care is not taken to protect it, there could be long-term negative implications for both Sea Island and other portions of the Fraser River estuary.

### 3.3.4 Economic And Social Importance

The Fraser River estuary plays a vital role in the economy of the Greater Vancouver region. It is a major port, servicing both local and international markets. The wood processing, fish processing, steel industry, cement plants, and other industrial activities in the estuary provide thousands of jobs and contribute substantially to the economic vitality of the region.

Of growing recognition is the role the estuary plays in the livability of the region. This is indicated by the increasing residential, commercial and recreational development in the estuary area. What were traditionally industrial properties are rapidly being converted to residential and commercial use. Municipalities are recognizing the value of the river and estuary as a recreational resource. The City of Richmond, for example, has a major program to utilize the foreshore dikes as a trail system. Both Richmond and Vancouver along with other municipalities and the GVRD have created new parks on the river in recent years. Sea Island, by virtue of its location and natural features, offers a range of recreational opportunities. It also forms part of a larger recreational unit that encompasses lona Island, Woods Island and McDonald Slough and Beach.

# Chapter 4

## THE ISSUES — AN OVERVIEW

# 4.0 THE ISSUES — AN OVERVIEW

## 4.1 Context

The Panel's mandate was *"to examine the environmental and socio-economic considerations relating to Transport Canada's proposal to construct and operate a parallel runway at Vancouver International Airport".* As it addressed this mandate the Panel became aware that it was working in the shadow of three significant background factors.

First, suitable space for a new airport is limited in the Lower Mainland region. It was startling to discover that adequate land probably could not be found for another major airport in this region. Even if a site for an airport could be located, airspace is limited by the mountains and constricted by conflicts with nearby airports such as Abbotsford, Nanaimo, Victoria and Bellingham. With the exception of YVR and limited growth potential at Abbotsford, there is probably neither the land nor the airspace to support new airport development. There has been much talk, without much sense of immediacy, about "limits to growth". In the Lower Mainland, these limits are in plain sight. This means that both the parallel runway proposal and its alternatives have to be viewed in a long-term rather than a short-term light.

The second factor is the polarization of public attitudes on airport expansion. In favour of the new runway is a coalition of business and aviation interests that believes the parallel runway proposal is synonymous with economic development, but recognizes the need to address environmental impacts. Their position is supported by communities outside the Lower Mainland that wish to maintain the improved air services they have gained during the last five years as a result of deregulation of the airline industry. On the other side, a band of citizen groups and many individuals object to the runway largely on environmental and lifestyle grounds. They believe that noise will erode the livability of their community. They are also concerned about continuing damage to the fragile Fraser River estuary and some are against the increased burden on resources occasioned by continuing growth.

Despite these conflicting values, the dialogue between these two groups during the public hearings was civilized and constructive. The discussions provided important information and helped to clarify issues. Still, the Panel heard a dialogue between two solitudes and its task was to understand and do justice to the views of both groups.

The third factor is the imbalance in the adequacy of certain information provided by Transport Canada in the EIS. In matters connected with the parallel runway project, for example economic justification, the calculation of runway capacity, and technical areas such as noise analysis and air quality, there has been no lack of sophisticated and useful information. But in relation to the natural environment in general, and birds and their habitats in particular, the situation was much different. The Panel is aware that some of the environmental information desired simply may not exist. Nevertheless, data that do exist were sometimes not made available and no coherent picture of the affected environment was presented. Faced with these deficiencies, the Panel undertook further review of existing public documents, including some prepared for Transport Canada. Even so, it faced a constant dilemma as to how to do justice to environmental factors whose inter-relationships and implications were not nearly as well understood as those of aviation and economic factors.

This then is the nature of the airport problem; it essentially relates to future airport development in a confined region that offers little room to manoeuvre; it attracts opposing views that are strongly held and difficult to reconcile; and there is an imbalance in the adequacy of the information provided by the proponent on economic and environmental matters.

## 4.2 Key Issues

Looking more closely at the parallel runway proposal itself, the Panel believes that the decision on whether to build a parallel runway comes down to four main issues: project justification, noise, birds and their habitats, and institutional arrangements.

### 4.2.1 Project Justification

Transport Canada provided extensive analysis to demonstrate that there is a large demand for additional runway capacity in the Lower Mainland. It also argued that the best option for meeting this demand would be a parallel runway at YVR. Opponents of the runway proposal criticized several aspects of the Transport Canada analysis. They contended that Transport Canada's analysis is flawed and that it has not made an adequate case for a parallel runway.

### 4.2.2 Airport Noise

Transport Canada proposed several mitigation measures that would reduce aircraft noise emanating from the parallel runway. It also argued that advances in aircraft technology, especially the changeover to Stage 3 aircraft currently underway, would much reduce overall noise at YVR by 2001. Opponents argued that existing airport operations are already noisy and a new runway would simply compound existing noise problems.

The Panel addresses airport noise in Chapter 6. Because airport noise could have a major impact on the quality of life of thousands of Lower Mainland residents, the Panel considers it to be a major issue.

### 4.2.3 Birds and Their Habitats

The birds of the Fraser River estuary are universally recognized as having international significance. Yet they and their habitats are increasingly under attack by urban and industrial development throughout the region.

A parallel runway would have several effects on the natural environment, but none more urgent and important than the fate of the birds that would be displaced. It is acknowledged that airports like YVR can only be developed in certain locations. There are few alternative sites for increasing airport

capacity in the Lower Mainland and each of these has severe economic, locational and environmental constraints. Nevertheless, the Panel considers birds and their habitats a crucial issue. The test of whether a parallel runway should be built rests on devising a strategy that would fully mitigate and compensate for the loss of important bird habitat.

#### 4.2.4 Institutional Arrangements

Transport Canada described a variety of management, monitoring and other programs to ensure that environmental guidelines for runway development would be met. At the same time it is known that Transport Canada will soon be turning the implementation of these programs over to an untried and seemingly unaccountable private body, the Vancouver International Airport Authority (VIAA, described in section 8.1), whose primary goal is to promote the airport. Despite this impending change the Panel has addressed its recommendations to Transport Canada as the proponent of the parallel runway, and expects that these recommendations, together with any commitments made by the Transport Canada, will be accepted by the VIAA.

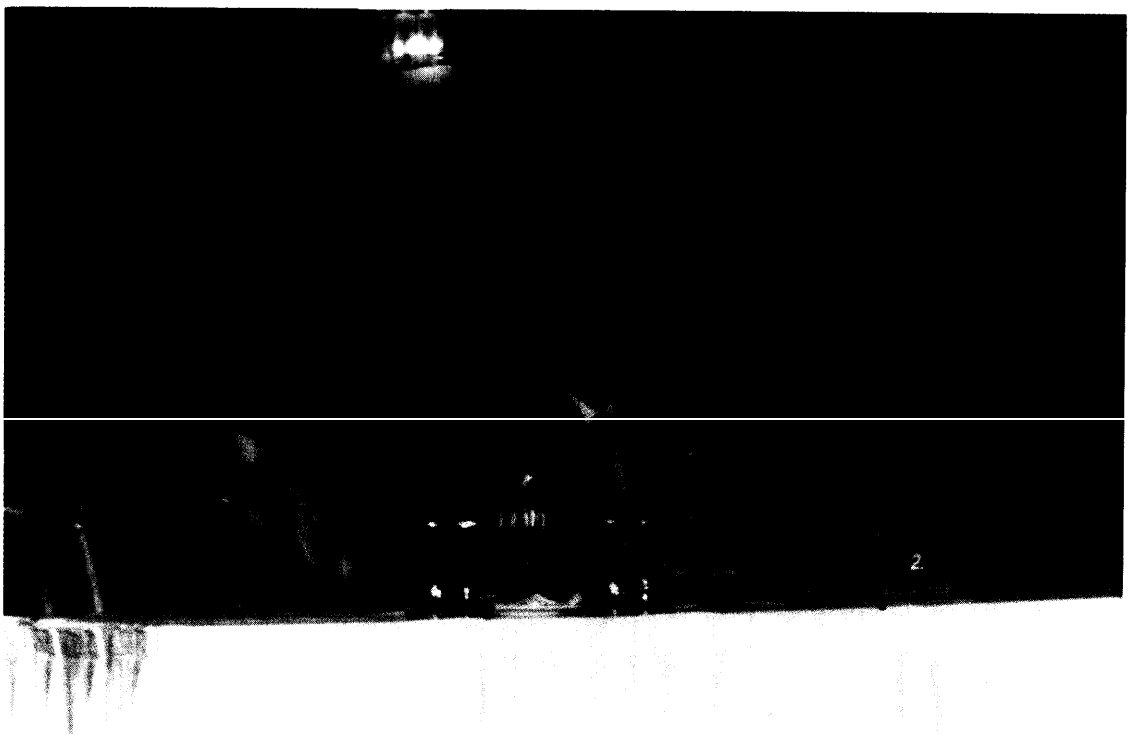
The potential impacts of the parallel runway are many and they would bear on the work of many agencies and public bodies. Believing that effective institutional arrangements and sound project management would be vital, the Panel addressed these matters in Section 8. Specifically, it deals with management committees, the roles of Transport Canada, the Musqueam Indian Band and the City of Richmond, and programs required to deal effectively with ground transportation, regional planning and the development in due course of a second airport.

## 4.3 Further Discussion

Throughout the remainder of this report, the Panel will examine each of the four key issues in detail within the context provided by the factors identified above.

# Chapter 5

## PROJECT JUSTIFICATION



**Mayor John Backhouse — City of Prince George**

*"Our region contributes significantly to the economic well-being of this province, and we do not wish to be treated as second-class citizens with down-graded air service.*

*Being in local government the NIMBY syndrome is very familiar: not in my back yard, I would suggest that YVR should be considered as B. C. International Airport, and* **not** *simply* **as** *Vancouver* **International. "**

**Richard Bevis**

*"We all, of course, stand to gain from prosperity, if it doesn't cost too much to get it, and from tourists, if they don't overrun what they came to see.*

*My point is that we not only work here, we live here. "*

**Rick Maynard**

*"Is business profit an end in itself, or is the ultimate goal* **an improvement in the quality of life for all? Is money an** *end in itself or a means to an end? If the means, paving Sea Island, compromises the end, a livable earth, do we have the courage to make the right choice?"*

# 5.0 PROJECT JUSTIFICATION

Project justification was a major issue in written submissions to the Panel and in discussions at the public hearings. Two questions underlay much of the debate: Is there a need for additional runway capacity at YVR? If so, how can this need best be met? In turn, there are two sides to the question of need. First, what is the forecast demand for airport use? Second, is there enough capacity to serve that demand?

## 5.1 Demand Analysis

Demand can be measured in two ways: passenger movements and aircraft movements. Transport Canada's demand forecasts are presented below. These forecasts were made as if there were no limits on airport capacity. Capacity limits are incorporated later in the analysis.

### 5.1 .1 Passenger Movement

Passenger demand is measured in numbers of enplaned and deplaned (e/d) passengers. Transport Canada estimated that passenger demand will increase by 5 percent per year from 1987 to 1996, and by 3 percent from 1996 to 2001. Its forecast of e/d passengers was as follows:

| Year | No. of Passengers |
|---|---|
| 1987 | 7,757,000 |
| 1991 | 9,300,000 |
| 1996 | 11,900,000 |
| 2001 | 13,700,000 |
| 2006 | 15400,000 |

### 5.1.2 Aircraft Movements

Aircraft movements depend on the number of passengers and volume of cargo, as well as other factors such as average plane size and the proportion of seats that are full. Transport Canada estimated that total YVR aircraft movements will increase by 5.0 percent per year from 1985 to 1991, by 2.3 percent from 1991 to 1996, and by 1 .1 percent from 1996 to 2001. Table 5.1 shows year-to-year fluctuations in aircraft movements. Transport Canada's forecast of aircraft movements is as follows:

| Year | No. of Aircraft Movements |
|---|---|
| 1987 | 270,000 |
| 1991 | 328,000 |
| 1996 | 367,000 |
| 2001 | 388,000 |
| 2006 | 406,000 |

### 5.1.3 Timing

A third important aspect of demand is the timing of peaks, since it is the peaks that strain the runway system. Transport Canada statistics and other sources show that, apart from variations during the day: demand is higher in good economic times than in recessions; higher in summer than winter; higher on weekdays than weekends; and lower on statutory holidays, except for periods such as Christmas.

### 5.1.4 Demand Factors

Many factors influence passenger and aircraft movement demand at YVR. These include:

**Economic Cycles:** Travel demand declines during recessions such as that experienced in the early 1980's. On the other hand, a tourism boom set off by EXPO **86** fuelled a surge in passengers in the late 1980's.

**Regulatory Policies:** Regulatory reform reduced the rules on where and when air carriers can fly. This has stimulated changes in aircraft fleet mix and traffic volumes, notably between YVR and the interior of the Province. In the United States, regulatory reform increased the propensity of Americans to travel, and recent reforms in Canada are expected to have a similar effect.

**Geography:** YVR has become the regional hub airport for traffic within the province. The rugged topography of the province increases the value of air travel to passengers. YVR is also the connector airport for trans-continental and trans-Pacific traffic.

**Technology:** The fleet mix is influenced by improvements in aircraft technology including long-range heavy jets and efficient turbo-prop aircraft. It is sometimes argued that telecommunications technology can substitute for air travel, thus reducing demand, but the Panel heard impressive testimony to the contrary from Dr. Michael Goldberg of the B. C. International Financial Centre.

**Socio-economic Variables:** Travel demand is influenced by population change, disposable income and other factors. Fare increases and decreases also affect the affordability of air travel.

**Alternative Airports:** The reopening of Boundary Bay Airport in 1983 provided an alternative for many light aircraft hitherto using YVR. Many Lower Mainland residents use the Bellingham and Sea-Tat airports in Washington State.

**Landing Fees:** Transport Canada recently instituted a $25.00 minimum landing fee to divert most of the 20,000 private aircraft movements from YVR.

At the hearings, Dr. Handvelt, representing the Community Forum, noted the importance of alternative ground transportation systems such as high speed rail now contemplated in eastern Canada. Such forms of transportation may eventually reduce traffic demand at YVR but probably not in the near future.

## TABLE 5.1

## AIRCRAFT MOVEMENTS 1980 TO 1989
## VANCOUVER INTERNATIONAL AIRPORT

| YEAR | TOTAL | CHANGE (%) | COMMERCIAL a, b | PRIVATE b, c | GOVERNMENT b, d | HELICOPTERS | FLOAT PLANES | VFR e | IFR e | RUNWAY f | CHANGE (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1980 | 267 749 | N/A | 189 676 | 67 268 | 10 805 | 9 864 | 27 030 | 111 037 | 119818 | 230 855 | N/A |
| 1981 | 262 528 | — 1.95 | 185 816 | 64 869 | 11 843 | 11 114 | 22 451 | 101 516 | 127 447 | 228 963 | -0.82 |
| 1982 | 227 440 | -13.37 | 164 872 | 50 494 | 12 074 | 9 845 | 16 284 | 85 408 | 115 903 | 201 311 | -12.08 |
| 1983 | 222 526 | — 2.16 | 160 894 | 50 111 | 11 521 | 8 708 | 17 296 | 85 140 | 111 382 | 196 522 | -2.38 |
| 1984 | 218 689 | — 1.72 | 164 905 | 43 638 | 10 956 | 8,948 | 18 448 | 75 536 | 115 757 | 191 293 | -2.66 |
| 1985 | 235 506 | 7.69 | 181 144 | 41 705 | 12 657 | 7 621 | 18 489 | 72 268 | 137 128 | 209 396 | 9.46 |
| 1986 | 278 834 | 18.40 | 220 738 | 46 704 | 11 392 | 9 838 | 19 449 | 95 359 | 154 188 | 249 547 | 19.17 |
| 1987 | 302 598 | 8.52 | 244 072 | 46 898 | 11 628 | 10 764 | 22 330 | 110 335 | 159 169 | 269 504 | 8.00 |
| 1988 | 325 150 | 7.45 | 273 608 | 42 873 | 8 669 | 14 948 | 22 838 | 107 385 | 179 979 | 287 364 | 6.63 |
| 1989 | 325 896 | 0.23 | 284 361 | 35 384 | 6 151 | 20 205 | 24 196 | 94 237 | 187 258 | 281 495 | -2.04 |

Source: Vancouver International Airport — Airside Demand/Capacity Analysis, Transport Canada, 1990.

a Includes unit toll, charter, other commercial.
b Includes helicopters and float planes.
c Inclues corporate aircraft, rental aircraft, and charters without a company call sign.
d includes civil and military aircraft.
e Includes runway movements only.
f Total movements less helicopters and float planes.

### 5.1.5 Fleet Mix

The mix of aircraft types within the fleet is an important factor in estimating aircraft movements. If the fleet were dominated by larger planes, fewer flights would be needed. The choice of plane for a particular operation depends on the type of service provided: large, heavy jets serve the trans-Pacific trade; small turbo-props serve small communities around B. C.

The Panel heard evidence from Transport Canada and the air industry that major changes have been taking place in the fleet mix at YVR:

- Turbo-prop aircraft movements increased 333 percent between 1980 and 1989. Turbo-props replaced jets on many short-distance routes, allowing more frequent service. They now account for one-third of the movements and are a major component of traffic growth at YVR.
- Jet aircraft movements have been relatively stable at the 90,000 movements per year level. However, heavy jet movements have been growing recently due to increased Pacific Rim traffic. These movements increased by one-third between 1987 and 1989.
- Piston-engine aircraft movements have declined. By 1989, single-engine piston aircraft movements had decreased to less than 40 percent of their number in 1980; multi-engine aircraft increased by over 60 percent in that period. This occurred because air carriers are switching to light twin-engine planes.

### 5.1.6 Types of Operation

The mix of operations on YVR runways includes various types of commercial operation (unit toll, charter, other commercial), private (corporate, rental, some charter), and government (civil, military). Helicopters and float planes also operate at the airport. Table 5.1 provides Transport Canada's statistics on types of operation.

Several trends at YVR are evident from these data:

- Commercial movements increased significantly in the 1980's. By 1989 they represented 85 percent of aircraft movements.
- Corporate traffic grew modestly. Private aircraft movements declined in the 1980's; many private aircraft moved to Boundary Bay Airport.
- Government operations declined in the 1980's; some relocated to Boundary Bay Airport.
- Helicopter traffic more than doubled while float plane traffic remained stable in the 1980's.

## 5.2 Demand Issues

Transport Canada's demand forecasts were questioned by intervenors, and in particular the Community Forum. Some of these questions and Transport Canada's responses are discussed below.

### 5.2.1 Do Transport Canada Forecasts Over-Estimate Demand?

The Community Forum argued that Transport Canada overestimated airport demand in the past and is guilty of boosterism and over-optimism. Dr. Hodge, representing the Community Forum, suggested that if Transport Canada had built the parallel runway in the 1970's when its forecasts said it was necessary, it "would have been *at least 18 years too early. Current forecasts appear to suffer similar deficiencies".*

Dr. Lewis, representing Transport Canada, argued *"You cannot build a little bit of runway, thus you will have excess capacity at first."* He also noted that when he conducted an audit of airport forecasts for the Auditor General he found no evidence of over-building. Further, in his auditing role, Dr. Lewis found Transport Canada's forecasting methodologies "second to none in the world *of* aviation".

Mr. Bob Duclos, Transport Canada, Statistics and Forecasts, discussed studies that evaluated the accuracy of Transport Canada's forecast. These studies reported that its accuracy is similar to that of other aviation forecasting agencies.

Whatever Transport Canada's previous forecasting record has been, it is the present forecasts that are relevant. The Panel believes that Transport Canada's forecasting methods have improved and notes that the forecasts incorporated a risk analysis methodology that reduces uncertainty. It recognizes, however, that no forecasts can be more accurate than the assumptions on which they are based.

### 5.2.2 Will Premature Airport Investment Lead to Excessive Costs?

All parties to the forecasting debate recognized that a forecast is always a "best guess". However, as the Community Forum noted, a wrong "best guess" can lead to premature investment, which can add enormously to the cost of capital projects. As with any investment, timing often determines whether an investment is "good" or "bad". The Community Forum argued that investment in the parallel runway is premature. Transport Canada responded that its studies indicate the airport is at capacity now, and that even if traffic did not increase from present levels, some increase in capacity is needed to improve the productivity of the airport.

Hickling stated that the economic analysis shows that *"...new* runway capacity is economically long overdue", and that an immediate start would maximize the net present value of the project. Furthermore, capital costs would be recovered in less than a year. He concluded that *"The project thus relies very little on forecasts for its success; the current volume of traffic alone is sufficient to justify the investment. "*

### *5.2.3* Could Fewer Planes Carry The Forecast Passenger Demand?

**The** Community Forum asserted that the forecasts underestimated the passenger-carrying capacity of aircraft serving YVR. Dr. Hodge contended that Transport Canada's own data indicated that larger aircraft would be in the fleet mix in the

future. The average passenger capacity per aircraft will rise from 104 seats in 1989 to 141 seats in 1996, an increase of 35 percent. His conclusion was that *"No greater number of passenger aircraft will be required in 1996 to meet projected passenger demand than were required in 1989."*

Dr. Hodge also criticized the passenger load factor used in Transport Canada's forecasts. He noted that in 1989, 53.5 percent of the seats in the average plane serving YVR were occupied, compared with 62.5 percent in the United States. He also suggested that in the airline industry, it is a truism that a 70 percent load factor is necessary to ensure reasonable profit. Fuller planes at YVR would reduce the number of aircraft movements. Economic pressures in the industry, he contended, will force airlines to increase seat occupancy.

Airline industry representatives argued that load factors at YVR reflect the nature of its traffic. They asserted that airports cannot be compared using an average load factor because the composition of traffic at airports differs considerably. YVR serves a diverse market including mainline trunk carriers, international long-haul operators, and regional commuters. Regional carriers, for example, do not have the same load factors as national carriers. The daily ebb and flow of traffic on a hub-and-spoke system makes it hard to achieve a two-way balance of traffic. Passengers may all want to travel at the same time in the morning and back at different times in the evening, so planes may fly with a 70 percent load one way and 15 or 20 percent on the return. Also a regional carrier may be viable with a 30 percent load factor whereas a national carrier may need a load factor of 65 percent.

Because YVR has a large regional element in its system, load factors will inevitably be lower. Another factor has been the increase in frequency of service to B. C. communities in the 1980's. This has been driven by smaller planes making more frequent flights, as well as by tourism, and economic development and diversification.

### 5.2.4 What is "General Aviation" and Does it Need to Use YVR?

The most controversial issue focused on the role of the airport in serving certain types of demand. The opposing argument was that if "general aviation" aircraft did not have to be served by the airport, there would be enough capacity, without expansion, to serve more legitimate users.

"General aviation" is a catch-all category that created considerable confusion. Mr. Matthews of Transport Canada stated that he would prefer to avoid the term for it includes a number of dissimilar sub-categories. He said that most aircraft in the "general aviation" category are in fact commercial. If all commercial activities were grouped together, ignoring classifications, then they would cover 85 percent of all aircraft movements at YVR. If corporate aircraft were included, this would reach 92 percent.

The Community Forum stressed that the real issue at YVR is not capacity, but the function the airport should serve. It argued that YVR is trying to be *"an airport that is everything to every aircraft".* Dr. Hodge, representing the Community Forum, stated that *"*. ..most *general aviation activities do not require to be located at an international airport. "* He argued that general aviation accounts for 52 per cent of the delay time, but only 40 per cent of the runway use, and that air carriers bear three-quarters of the cost of delay. The Community Forum stated its belief that general aviation is generally not bound by passenger schedules and does not contribute to the hub-and-spoke system. It thus questioned whether there would be an airport capacity problem if the 105,000 flights per year which, it was contended, do not contribute to YVR's main functions, were relocated. It also noted that while general aviation is declining as a proportion of overall aircraft movements, its actual numbers are increasing.

In response Transport Canada suggested that components of the general aviation category that do not need to use YVR will be discouraged by the newly instituted minimum landing fee. The intent of the $25.00 fee is to reduce aircraft movements by 20,000 a year, representing about six percent of total traffic. However, this shift would only free up enough capacity to serve demand until the end of this year.

Transport Canada defined the role of YVR as follows:

> *"The primary* role of YVR is to *serve licensed air carriers engaged in providing scheduled and charter passenger services, air cargo, air mail and courier services. In filling this role,* YVR is *Canada's West Coast international gateway for air carrier activity on the Pacific Rim; British Columbia's major airport for air carrier services to the rest of Canada; and a major connecting point for mainline air carrier and commuter services for B. C. and Western Canada.*
>
> *YVR will continue to serve non-airline operations, but as the airport reaches capacity, access by non-airline carriers may be limited in order to ensure continued airport efficiency in responding to the primary role of the airport. "*

Arguing that it was not its role to propose alternatives, the Community Forum stressed that it was not proposing that general aviation activities should be relocated. However, the perceived implication that general aviation could be removed from YVR created concern among representatives of the general aviation sector. They maintained that their operations must have access to YVR as a connection point for other flights.

## 5.3 Capacity

Transport Canada defined capacity as the maximum number of takeoffs and landings that can be conducted in one hour in the presence of continuous demand. It noted that capacity is not constant, but fluctuates due to factors such as weather, aircraft mix, air traffic control and mode of operation of the aircraft.

There was little debate in the hearings about Transport Canada's capacity forecasts. However, their quality was attested to by Tirey Vickers of the U. S. Flight Safety Foundation, who

stated that he had no technical disagreement with Transport Canada's Airside Capacity Enhancement (ACE) report.

The ACE project team used a technique known as Engineered Performance Standards (EPS) to estimate runway capacity. This is based on a widely-used algorithm, the Hourly Runway Capacity Computer Programs, which uses several data inputs. These include aircraft weight groups, arrival/departure ratios, runway occupancy times, length of approach path, approach speeds, clearing intervals, buffer times and average delays. By the use of this technique a theoretical annual airport capacity is estimated in terms of aircraft movements. This estimate then is adjusted to reflect a practical annual airport capacity, based on how an airport actually operates. The practical annual airport capacity is assumed to be 80 percent of the theoretical.

The EPS model considers a number of factors which affect capacity. Maximum capacity is achieved when arrivals equal departures; when there are more arrivals than departures, or vice versa, capacity is reduced. Poor weather reduces capacity, although it also reduces VFR movements and therefore demand. Some types of planes do not mix well. For example, the wake turbulence of large planes can have drastic effects on small planes. Capacity can be enhanced by good runway design, and the Capacity Improvement Program (CIP) at YVR addresses a number of such improvements. Variations in the timing of demand also affect capacity; for a variety of reasons, planes may not fly when the opportunity is available, resulting in wasted capacity.

### 53.1 The Capacity Forecasts

Transport Canada's analysis suggested a practical annual airport capacity for YVR of 277,000 movements without the Capacity Improvement Program (CIP). With the CIP, approximately 300,000 movements would be possible, an increase of 8.3 percent. However, the practical airport capacity is projected to decrease by 1996 to between 260,000 and 270,000 mainly due to increases in IFR and heavy jet movements. Transport Canada estimated that with the parallel runway, the practical annual capacity would be between 350,000 and 500,000 aircraft movements, depending on the same two factors.

### 5.3.2 Delay Analysis

Transport Canada provided much evidence of growing congestion at YVR and argued that the airport has reached, if not exceeded, its actual capacity. In May, 1988, Transport Canada initiated a comprehensive data gathering program at YVR to record late aircraft departures and the costs resulting from these delays. Arrival delays and delays generated at other airports as a result of congestion at YVR were not recorded.

The data showed that between June, 1988 and December, 1989, over 4,300 departures were late each month on average, with cumulative delays exceeding 1,000 minutes per day. Almost 40 percent of all departures were held up, the annual costs being estimated at about $8 million.

In order to reduce delays, YVR introduced an Air Traffic Flow Management (ATFM) system in April, 1989. This is a computer program which meters traffic into YVR by holding aircraft on the ground at British Columbia, Yukon and Alberta airports. This, of course, does not eliminate congestion; it simply "exports" it to other airports. It seriously affects the operations of regional carriers who must juggle schedules and delay flights in order to circumvent capacity problems at YVR. Thus, incoming travellers face delay in reaching Vancouver and in making connections to the rest of the world.

## 5.4 Conclusions on Need

The question posed at the beginning of this chapter was: *"Is* there a need *for additional runway capacity at YVR?"* Having examined the evidence and listened to all sides of the argument, the Panel believes there is a need. It has been persuaded in particular by the following considerations: that the demand forecasts appear to have been made with care and some sophistication; that the forecasts are in accord with the strong upward trend in air travel which has been in effect for several decades; that delays are already normal at YVR, indicating that a capacity shortage already exists; and that none of the many uncertainties surrounding the demand-capacity calculations appears likely to upset the general conclusion that demand will soon outweigh capacity.

In reaching this conclusion, the Panel recognizes that even the best forecasts entail informed guesswork and uncertainties. It also recognizes that scientists world-wide are expressing increasing concerns about releasing pollutants such as engine exhausts into the earth's atmosphere. The time may come when society will have to face this concern and modify its travel practices. Nonetheless, on the basis of existing knowledge the Panel has concluded that additional runway capacity is now needed.

## 5.5 Airport Capacity Alternatives

It cannot be taken for granted that because more runway capacity is needed, it should necessarily be provided at YVR. What are the alternatives? In the Economic Analysis Report prepared by James F. Hickling Management Consultants, the following alternative strategies are identified:

Strategy 1 (Base Case) Strategy 1 was the baseline against which other alternatives were compared. It consists of maintaining the status quo at YVR plus a variety of measures to increase capacity, including improvements to existing runways and airfield, air navigation technology, air traffic control procedures, and demand management. This includes the Capacity Improvement Program and the $25.00 minimum landing fee.

Strategy **2** (Parallel Runway Development) This strategy involves the construction of the parallel runway at YVR. Three sub-alternatives include runway lengths of 1,524 m (5,000 ft), 2,440 m (8,000 ft), and 3,030 m (9,940 ft).

Strategy **3** (Alternative Airport Development) In this scenario, YVR facilities would be enhanced as described in the base

case, but no parallel runway would be constructed. Abbotsford airfield and terminal facilities would be developed to accept some of the future commercial air movements and Boundary Bay airport would be upgraded to attract some non-commercial traffic.

There was considerable debate about the alternatives. In examining them, the Panel considered three types of criteria: feasibility and effectiveness; benefit-cost analyses; and regional development.

## 5.6 Feasibility and Effectiveness

Each of the three alternatives was first examined in terms of its feasibility and effectiveness meaning: 1. Can it be done? 2. If so, will it provide significantly more runway capacity?

**Strategy 1 (Base Case)** is obviously feasible, but will not be effective. The growing congestion at YVR is already creating delays. When additional growth in demand occurs it will overwhelm YVR's ability to serve its primary functions.

**Strategy 2 (Parallel Runway)** is both feasible and effective — it will provide additional capacity. The question of associated environmental impacts is discussed later.

Various arguments were presented suggesting that the short runway sub-alternative was desirable. However, the Canadian Airline Pilots Association argued that the longer length is required to allow the main runway to be shut down for maintenance, snow removal or disabled aircraft. It was also asserted that the longer runway would improve the efficiency and safety of air traffic control, and minimize noise by reducing the need for reverse thrust on landing.

**Strategy 3 (Alternative Airports)** is a more complex question. The Community Forum argued that the case against the Abbotsford alternative had not been effectively made by Transport Canada's analysis. In response Mr. lain Harris of Air B. C. suggested that Abbotsford airport would not be viable because 50 percent of YVR passengers are connecting passengers. It is not feasible to land at Abbotsford for a connecting flight out of YVR, especially since most non-connecting passengers are coming to and from Vancouver. Passengers, he said, would not want to use Abbotsford, given current ground transportation facilities, and airlines follow their passengers. The demand would still be for the use of YVR. In addition, ground facilities and staff would have to be duplicated at YVR and Abbotsford. Representatives of up-country communities also vigorously opposed the split-airport idea. It was noted that these are not theoretical objections; some air operators have already attempted to use Abbotsford and have not found it economic.

Dr. Lewis cited a Massachusetts Institute of Technology study which, he contended, shows that a regional population of *10* million people is needed to support a second regional airport. The Vancouver region population, by contrast, is less than 2 million. The Community Forum understandably protested that this study had not been made available for review, leaving them unable to comment.

Other opponents of the dual airport concept pointed to examples of cities where such combinations are being operated, such as Edmonton, Toronto/Hamilton and Montreal/ Mirabel. They suggested that these cities would not develop a split airport system again if they had the choice.

Communities around Abbotsford spoke in favour of a parallel runway at YVR. Mayor Kandal of Matsqui, host community to the Abbotsford Airport, indicated that his municipality is striving to maintain the viability of its agricultural community. Substantial expansion of Abbotsford could weaken that community by using agricultural land for airport-related development. The community accepts that aircraft movements will increase at Abbotsford, but favours the parallel runway as the best solution to the overall problem at this stage.

The Panel concludes that Abbotsford is not really feasible at this time and therefore not likely to be effective. Its runways, terminal facilities and ground transportation links could all be improved. But all the evidence, from British Columbia and elsewhere, suggests that the majority of passengers would be unwilling to use it, preferring instead the advantages of YVR, even in the face of increasing congestion. They would be reinforced by the air carriers for their own reasons. The Panel therefore rejects Abbotsford as a reasonable alternative in the near future. It does acknowledge, however, that this situation will undoubtably change in time as the context of air travel in the Lower Mainland changes.

The Boundary Bay Airport was also discussed as a possible recipient of non-essential aircraft diverted from YVR. Several participants at the hearings provided persuasive evidence that the environmental resources of the Boundary Bay vicinity are extremely sensitive and internationally important. The Panel rejects any consideration of Boundary Bay as a significant commercial airport.

In summary, the Panel finds that Strategies 1 and 3 are not likely to be effective, leaving only Strategy 2 as a feasible and effective alternative in the near future.

## 5.7 Benefit-Cost Analysis

Transport Canada retained James F. Hickling Management Consultants Ltd. to conduct an economic analysis of the alternatives. The results are reported in Economic Analysis of Airfield Capacity Enhancement Strategies for Vancouver International Airport, March, 1990 (hereafter referred to as the Hickling Report) and summarized in section 3 of the EIS.

Benefit-cost analysis was required by the Panel, Transport Canada and Treasury Board. This methodology is well established as an approach to project evaluation, but Hickling's analysis incorporated some useful additions, notably a risk analysis process to test reliability. Transport Canada retained Dr. Michael Tretheway of the Faculty of Commerce and Business Administration at the University of British Columbia, (who, incidentally, had opposed the parallel runway as being premature at an earlier date) to assist in monitoring and critically reviewing each stage of the study. Dr. Tretheway stated that: *"In my opinion, the study by Hickling is perhaps the most well thought out social cost-benefit study I've ever read. It*

*represents a state-of-the-art in methodology and should be used for future* **studies** *of* **this sort."**

### 5.7.1 Net Present Value of Alternatives

The Hickiing report provided an evaluation of the net present value of the three alternative strategies for increasing airport capacity in the Lower Mainland. Net present value is a commonly used approach for evaluating project benefits and costs in dollars. A positive net present value would result in a net economic gain from constructing a project.

**Strategy 1: Base Case** The base case was used to compare the alternative airport development options. The net present value (NPV) of other strategies were ail compared to the base case. Because the $25.00 minimum landing fee has already been implemented, it is assumed to be part of the base case. The incremental increase in NPV of Strategy One, with the $25.00 fee, was calculated to be $919.7 million.

**Strategy 2: Parallel Runway Development** The 1,524 m (5,000 ft) option yields a negative NPV of $164 million, suggesting that the short runway option is not justified economically. However, a 3,030 m (9,940 ft) runway has an NPV of $2.9 billion; and a 2,440 m (8,000 ft) runway an NPV of $2.8 billion. Both options perform well for other economic indicators such as benefit-cost ratios and internal rates of return. Hickiing indicated that the long and medium length runways *"are not statistical/y distinguishable at the 95 percent level of confidence."* in other words, they are equivalent in economic terms. in summary, Hickiing's analysis indicated that the long and medium length runway options would both have strong economic returns.

**Strategy 3: Alternative Airport Development** in the EIS Transport Canada did not evaluate Strategy 3 for a $25.00 minimum landing fee, assuming a $100.00 fee instead. The analysis provided two results. if half of the ground transportation development costs were assigned to this alternative, the NPV would be $253 million. if ail ground transportation development costs were assigned, the NPV would be negative $1 .1 billion. in other words, Hickiing's analysis showed Strategy 3 to be decisively inferior to Strategy 2 and possibly inferior to the base case as well.

A major debate occurred during the review as to how ground travel time and ground transportation development costs should be included in the analysis. This especially affects the comparison between Strategies 2 and 3. The Community Forum charged that Hickiing's analysis *"omits any consideration of the differences in travel time to the airports for passengers and those who meet them or see them off."* It argued that the distribution of population in the Lower Mainland makes Abbotsford more central within the region than YVR; an airport at Abbotsford would thus reduce passenger travel time. According to the Community Forum, the savings in ground travel time would be equivalent to the passenger time savings for the parallel runway development. it further suggested that a market study should be conducted to determine which airport travellers would prefer to use.

The Community Forum also felt that it was unfair to include the costs of developing ground transportation systems to serve Abbotsford. (Hickiing had included the cost of developing ground transportation systems to connect Abbotsford and YVR.) it argued that benefits from the savings in ground travel time of passengers, and the elimination of ground transportation improvement costs, would result in an NPV of $5 to $6 billion for the alternative airport versus $4 billion for the paraliei runway. This would reverse the order of projects, favouring the Abbotsford alternative over the parallel runway.

Hickiing included a sizable economic penalty for ground transportation development in the analysis of Strategy 3, on the assumption that travellers and others using Abbotsford would come from Vancouver. (The Community Forum assumed that most would come from the more central area around Surrey.) Hickiing's contention was that for Abbotsford to be viable, ground travel time from Vancouver would have to be less than an hour. Furthermore, a ground link between Abbotsford and YVR would have to be developed if Abbotsford were to function as a second hub airport.

Hickiing estimated that NPV of Strategy 3, without ground transportation development costs, as $1.6 billion, which is less than the NPV of Strategy 2. However, this did not include ground travel time savings in the calculations.

The Panel was not persuaded that the economic arguments advanced by the Community Forum are valid at this time. it seems likely that for some years to come the distribution of the travelling population will favour YVR rather than Abbotsford. in addition, it would clearly be wrong to compare YVR and Abbotsford on the basis of travel time without recognizing the different levels of service they offer, especially YVR's advantage as a connecting hub. in addition to these observations, the Panel believes that the over-riding consideration is simply the apparent infeasibility of Abbotsford for some years. The Panel therefore rejects the Abbotsford alternative.

### 5.7.2 Benefits of Additional Capacity

The development of increased runway capacity in the Lower Mainland would have major benefits for the region. This is particularly true of the parallel runway.

**Delay Reduction:** The reduction of delays is one of the key benefits. Aircraft delays result in increased fuel and operating costs; passenger delays cost business travellers productive work and pleasure travellers leisure time.

in addition to the Capacity improvement Project (CIP) described earlier, private carriers have also responded to delay problems. Mr. lain Harris, President of Air B. C., advised the Panel that air carriers have adjusted schedules to allow more time on the ground, essentially incorporating delay into their schedules. This delay increases costs as planes are correspondingly under-utiiized. in turn, increased costs result in increased fares, reduced travel and reduced viability of some routes and carriers. The quality of air service to outlying communities thus depends on the efficiency of YVR.

Captain Kim Crozier, a commercial pilot and spokesman for the Canadian Airline Pilots Association, stated that arrival delays can prejudice safety because of reduced fuel reserves and additional crew fatigue after long flights.

**Economic Development:** A second benefit attributed especially to the parallel runway is enhanced economic development of the Lower Mainland region and the province. Pervasive delays reduce the airport's effectiveness as a key economic cog in the B. C. economy.

**Hub-and-Spoke Role:** Topography and distances between communities in British Columbia are such that air travel per capita is much higher than for other provinces. This air travel is focused on Vancouver, the hub that serves the entire province. The efficiency of the hub affects the efficiency of the entire network.

YVR is important to the "spoke" communities of British Columbia for several reasons, notably access to the goods and services of Vancouver as well as connections to national and international flights. Community after community came to the public hearings or wrote to the Panel stressing the need for good facilities at YVR as essential for their economic health and growth.

**Tourism:** Forty-three percent of visitors to British Columbia arrive by air. Tourism, already a major industry in British Columbia, is growing rapidly. According to Tom Walker of Tourism Vancouver *"...the future of tourism depends on a stable and convenient access for visitors",* and a parallel runway at YVR is seen as essential for this purpose.

**Aerospace Industry:** YVR is the center in British Columbia for support services to the aircraft industry. Transport Canada argued that the airport vicinity houses a large and growing high-tech industry specializing in transportation export markets and providing opportunities for economic development.

**Business Needs:** The Canadian Business Aircraft Association argued forcefully that many larger firms depend on the efficient use of company aircraft at YVR for the conduct of their business.

### 5.7.3 Costs of Additional Capacity

The Hickling report discussed three categories of economic cost associated with airport development: direct capital and operating costs, user costs and environmental costs to non-airport users.

**Direct Costs:** These include building materials, engineering services, labour, materials, and project management services.

**Land Costs:** In the Hickling analysis and the EIS, land costs were not included. Transport Canada argued that there would be no alternative uses for Sea Island lands and that vacant land would continue to be used primarily for agricultural purposes if a new runway were not built. The Panel's technical advisor on environmental and land use issues argued that it would be more logical to value the land on the basis of airport-related commercial development.

The Panel believes that the land component of the economic analysis has been underestimated and should have been based on a more intensive use than agriculture for land appraisal purposes. This would not have changed the final benefit-cost ratios much but would have improved the credibility of the economic report.

#### Environmental Costs

The Hickling report identified three types of environmental cost: air quality; birds, other wildlife and their habitats; and noise impacts. However, the report then stated that noise impacts are *"the most amenable to quantification in terms of its economic consequences"* and focused on quantifying only noise costs. Air quality and wildlife habitat losses were ignored. This omission was a concern to the Community Forum and others.

Hickling's rationale for not quantifying environmental costs was that the net economic benefits would be so large that the viability of the project would be clear, despite any air quality or wildlife costs. According to Dr. Lewis, *"...we can find no reason to advise... that the environmental costs... stand even a remote probability of wiping out three to three-and-a-half billion dollars in net benefits."*

Although the Panel believes that environmental costs would not outweigh the estimated benefits, it does not accept the arguments for not including the economic cost of environmental impacts in the calculations. By so doing, the analysis implicitly undervalues environmental costs. The federal government's stated objective in the Green Plan is to incorporate environmental criteria into policy and decision-making processes. In this case that has not been done.

There are reasonable and well-accepted methods for incorporating environmental costs into benefit-cost analyses. Governments and private organizations in North America spend millions of dollars to acquire, enhance and manage habitat on the Pacific Flyway. Clearly this habitat has an economic value, and its loss is a real economic cost. The simplest approach would be to estimate the cost of replacing the lost habitat, namely the cost of purchasing, improving and managing compensatory habitat. In fact, Transport Canada has purchased one small farm as habitat compensation, an acknowledgement that some compensation is necessary. Methods for including environmental costs in benefit-cost analyses have been discussed for years. It is no longer acceptable to exclude these costs from economic analyses.

1. **The Panel recommends that the Minister of the Environment direct the Federal Environmental Assessment Review Office (FEARO) to develop guidelines for the incorporation of environmental costs into cost-benefit studies conducted in connection with the implementation of the Environmental Assessment and Review Process (EARP).**

### 5.7.4 CONCLUSIONS

The Panel recognizes some flaws in Transport Canada's benefit-cost analysis. However, these flaws do not change the essential conclusion: the parallel runway is economically justified at lengths of 2,440 m (8,000 ft) and 3,030 m (9,940 ft) with

a $25.00 minimum landing fee and all base-case capacity enhancements. The economic benefits of the project far outweigh the costs.

The Panel believes that the parallel runway is a viable project of considerable social and economic value. On the other hand, those who receive the benefits are not always those who pay the costs. The benefits accrue to travellers, to the air industry, and to all those who gain, directly or indirectly, from easier or more efficient air transportation; the costs would be borne by noise-impacted people and environmental resources, especially birds. This strongly suggests that those who benefit should also pay. No person nor resource should be left worse off because of this project. (The Panel notes that mitigation and compensation costs do not affect the net present value of the preferred alternative. Compensation is a transfer of costs from users of airport services to those who are detrimentally affected by airport activities. Mitigation and compensation simply redistribute the costs.)

## 5.8 Regional Development

Thus far, the Report has discussed the feasibility and the benefit-cost balance of alternative airports. Another way of looking at the airport expansion issue is to ask "Which solution will promote the best kind of regional land use development?"

The EIS did not fully address this question. It offered only a general assessment by Dr. Walter Hardwick (section 10.5) and a section that examines the comparative losses of agricultural land (section 10.8). In addition to these, the material available to the Panel consisted of a written submission from the Greater Vancouver Regional District (GVRD), an oral presentation by the District of Matsqui and a written submission from Dr. Gerald Hodge on behalf of the Community Forum.

Dr. Hardwick evaluated the issue broadly from the perspective of the GVRD. His conclusion was simple and succinct:

> *"Overall, the proposed runway expansion at the Vancouver international Airport is consistent with the goals of the Livable Region Strategy of the GVRD. No alternate plan meets the regional development and environmental goals of the Region."*

Dr. Hodge's brief was critical of the EIS for assuming that the only real option was a third runway at YVR. His criticism is justified in the sense that the EIS did not adequately evaluate the airport expansion question in the context of regional land use development. However, his specific criticisms are considerably blunted by two considerations. First, the basic assumption that there is freedom to choose between Strategy 2 and Strategy 3 seems unrealistic. It seems likely that before long the Lower Mainland will need all the runway capacity it can muster, both at YVR and at other local airports. If this is so, a comparative either-or analysis is inappropriate. The question instead should be whether each airport development fits well within its own sub-regional context. Second, Dr. Hodge's views were opposed by two official briefs. These are especially important because they incorporate the opinions of two representative public bodies supported by professional staffs. In both cases, a number of municipalities were represented, the GVRD in particular being the voice of all the municipalities of the Vancouver metropolitan area. These reports reflect many interests and points of view which have been validated by normal political processes.

The first of these was an oral presentation by the District of Matsqui, which is the host community to the Abbotsford Airport. Matsqui's presentation was made in concert with the surrounding municipalities. In essence it said: (1) that the municipalities of the Fraser Valley support both the parallel runway proposal and the gradual development of Abbotsford Airport "as a partner of YVR"; and (2) that planning for the Abbotsford Airport is an integral part of the Matsqui community plan and is specifically provided for in its zoning bylaw.

The second submission was made by the GVRD. It was based on the same general criteria that Dr. Hodge used, but disagreed with his conclusions. In essence it said:

> *"Construction of the parallel runway . . . would provide support to many of GVRD's policies":* -
>
> *The Urban Containment policy: "...in that it builds upon a site which is already in the urbanized part of the region".*
>
> *The Regional Town Center policy: "The development of the parallel runway would enhance Richmond's ability to fulfil [its] potential" as a Town Cen ter.*
>
> *The Balance of Jobs and Labour Force policy: "By providing a stimulus to employment in Richmond [both at the airport and in Richmond Center]the parallel runway will help to ease the growth pressure on Vancouver".*
>
> *The Best Use of Existing Transportation Investment: "The completion of the airside development potential of YVR would make the best use of existing transportation investment..."*
>
> *The Preservation of Agricultural Land: "The land proposed for the parallel runway has relatively modest agricultural capability.. . Development of airport facilities at other locations could well create development pressures for areas now actively used for agriculture. "*

For the reasons given above, the Panel accepts the views expressed by Dr. Hardwick, the GVRD, and the'municipalities of the Matsqui area, namely that the parallel runway proposal is acceptable in terms of its effects on regional development. However, it emphasizes that the GVRD and some of its constituent members also expressed a number of reservations about the runway project, to the effect that the environmental impacts of the project should be satisfactorily remedied and management plans implemented for the protection of the Fraser River estuary.

## 5.9 Conclusions Regarding Project Justification

The Panel considered the different alternatives from the perspectives of feasibility and effective benefit-cost and regional

development. In terms of effectiveness, the parallel runway is clearly the best alternative. Strategy 1 (the base case) would not provide the capacity to meet the rapidly rising air travel demand. Strategy 3, (alternative airports) does not seem feasible at this time; it is clear that neither the airlines nor their passengers would accept the two-airport solution.

Benefit-cost analysis also supports the parallel runway proposal. Despite some flaws in the analysis, it does yield a significant net benefit.

The Panel believes that the parallel runway is the best alternative for the efficient provision of air transportation services in the Lower Mainland region.

# Chapter 6

## NOISE

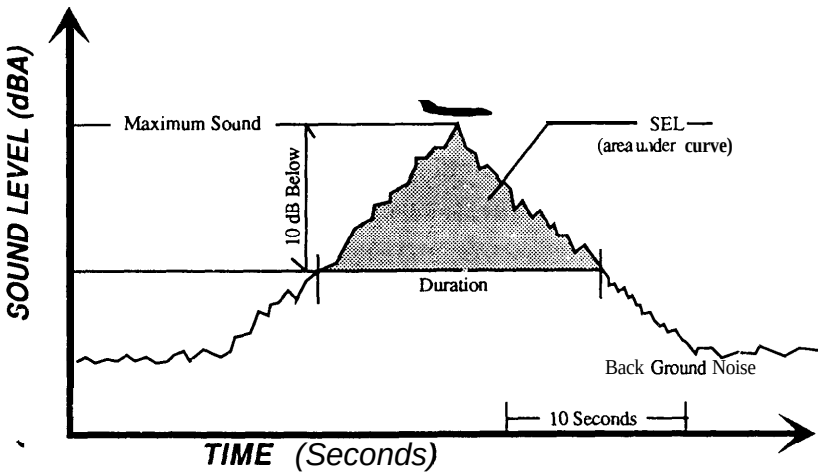
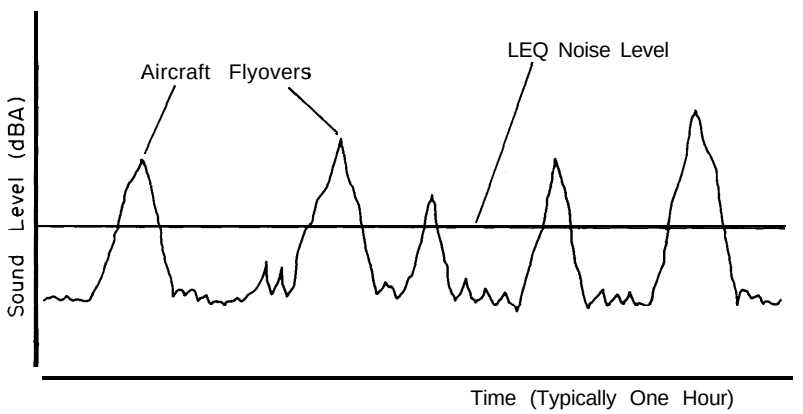



**FIGURE 6.1**

**FLYOVER TIME HISTOGRAM**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)




Time Axis Not Drawn To Scale
Noise Events Are Much Shorter Duration Than Shown Here

**FIGURE 6.2**

**LEQ NOISE LEVEL**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

# 6.0 NOISE

The issue of aircraft noise commanded more time and attention at the public hearings than any other environmental issue. Most of the concern was shown by residents of South Vancouver, since the new runway would be located 1.6 km (1 mile) closer to their homes. Their concern was aggravated by their perception that Transport Canada has not done an adequate job of managing noise. The public hearings made it clear that, given the expansion now proposed, everything possible must be done to minimize airport noise in the future.

## 6.1 Noise Measurement

The impact of noise is a function of the level of noise and the effects of that noise on people. This section focuses on measures of the level of noise, explaining several measures that were discussed in the EIS, background documents and the hearings. Section 6.2 discusses the potential effects of noise on people.

### 6.1.1 Noise Metrics

Measures of noise intensity and magnitude are called noise metrics. They measure instantaneous sound level, the cumulative sound energy of a single noise event and the cumulative sound energy averaged over time (hour, day). The metrics most commonly used are briefly described below:

dBA, or decibels, A-weighted.

The human ear is sensitive to an enormous range of sound intensities. To render this range more manageable, a logarithmic scale of sound intensity, the decibel scale, has been developed that is analogous to the Richter Scale of earthquake intensity. The basic metric of sound on this scale is called Sound Pressure Level. It is directly measurable with a sound level meter.

There are several decibel scales. The most commonly used is the A-weighed scale which most accurately mimics the characteristic human ear response to sound intensities usually encountered. This report uses the dBA scale. On this scale, everyday sounds normally range from 30 dBA (very quiet) to 100 dBA (very loud). Normal speech between two people about 2 meters apart creates a sound level of about 65 dBA.

The subjective loudness or noisiness of a sound depends on both its intensity and duration. A sound that is 3 dBA louder than another sound of the same duration actually contains twice as much sound energy. The human subjective response is different however. It would normally require a 10 dBA increase to double the perceived noise loudness, while a corresponding 10 dBA decrease would half the perceived loudness. On the other hand, a sound that lasts twice as long as another sound of the same intensity also contains twice as much sound energy but will typically be subjectively judged to be twice as noisy, for durations of up to a minute or so.

Lmax — Maximum Sound Level

The point at which the noise associated with an event reaches its maximum intensity is known as the Lmax. For example, in a typical aircraft flyover, Lmax would occur when the aircraft was directly overhead or at its nearest point of approach for sideline noise. Technically, Lmax is the instantaneous maximum sound level in dBA.

SEL, or Sound Exposure Level (Figure 6.1)

SEL is more often referred to as the Single Event Level. It is a cumulative measure of the noise or acoustic energy associated with a single noise event. SEL is measured in dBA from the time the noise rises above background levels to a level within 10 dBA of Lmax until the noise falls again to a level of 10 dBA below Lmax. For a typical aircraft flyover, this might be 20 to 30 seconds.

SEL is a function of both intensity and duration, whereas Lmax is an expression of intensity only. As a result, the SEL of a given noise event is greater than its Lmax. For a typical commercial aircraft flyover, SEL is generally taken to be 10 dBA more than the Lmax.

Leq, or Equivalent Sound Level (Figure 6.2)

Leq is that level of continuous, steady noise that would, over a given time period, contain the same acoustic energy as a series of SEL's plus the background noise. It can be expressed for any period of time such as 15 minutes, 1 hour or 24 hours.

Ldn, Day-Night Noise Level

$L_{dn}$ is a cumulative noise metric commonly used for plotting "noise contours" around an airport. It is derived by averaging the equivalent noise levels (Leq) for each hour over a 24-hour period. The $L_{dn}$ metric includes a weighting factor that penalizes night-time noise in the calculations. This recognizes that night-time noise is perceived as more annoying.

NEF, Noise Exposure Forecast

NEF is another commonly-used cumulative noise metric. It is the summation of all noise that takes place in a 24-hour period based on the effective perceived noise level (EPNL). It considers some tonal qualities of sound and is intended to rate the "noisiness" or annoyance level of a sound rather than its loudness. Like the $L_{dn}$ metric, the NEF metric includes a weighting factor that penalizes night-time noise.

### 6.1.2 The Use of Noise Metrics

Noise metrics are measures of instantaneous noise level or noise energy exposure level over time. In impact assessment, they are used to predict human reactions to airport noise. This section compares the value of different noise metrics for vari-

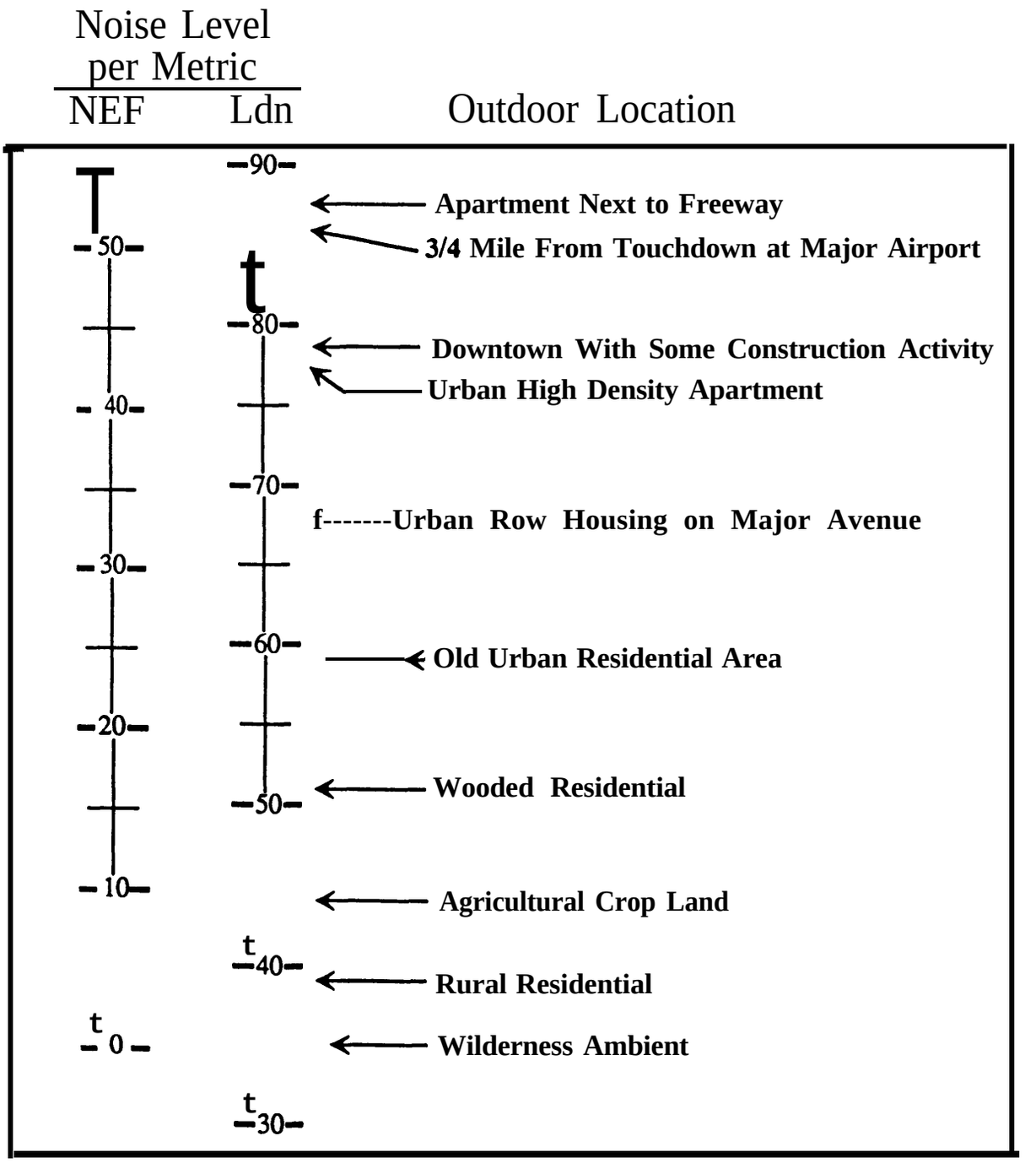



**FIGURE 6.3**

**TYPICAL NOISE LEVELS IN THE ENVIRONMENT**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

ous noise measurement purposes. Further discussion of human reactions to noise will follow in section 6.2.

### Comparison of Cumulative Noise Metrics

The relationship between the $L_{dn}$ and NEF metrics is illustrated in Figure 6.3. The NEF contours are more conservative than the corresponding $L_{dn}$ contours. For example, the NEF 25 contour covers a broader area than its closest equivalent, the $L_{dn}$ 60 contour. This is because of the different night-time noise penalties and because the algorithms for each model are slightly different. The NEF model uses a peak day in its algorithm whereas the $L_{dn}$ model uses an average day.

The main effective difference between the two metrics is that $L_{dn}$ (and the SEL's, Leq's and Lmax's from which it is developed) can be measured directly at the YVR noise monitoring sites (see Figure 6.4), whereas NEF contours can be produced only by computer modelling. $L_{dn}$ is used by the U.S. Federal Aviation Administration (FAA) and the U.S. Environmental Protection Agency (EPA) and also by many municipalities in Canada. Transport Canada and Canada Mortgage and Housing Corporation (CMHC) use NEF to plot noise contours around airports in Canada. Transport Canada guidelines provide that no urban development should take place inside the NEF 30 contour, although with appropriate noise insulation this can be extended to the NEF 35 contour. CMHC uses NEF 25 as a contour-value guideline for mortgage approval purposes.

### 6.1.3 Topographic and Meteorological Effects

Noise prbpagation can be affected by topographic and weather conditions. These effects were explored at the hearings by both Transport Canada and the Community Forum. The Community Forum's position came from a submission developed by its consultant, Dr. J. E. Piercy. Transport Canada's consultant, Mr. Mestre, summarized the EIS analysis of the effect of weather on noise using Site 7 monitoring data. His conclusion was that weather would appear to add at most 10 dBA to noise levels, with peak noise levels exceeding the "average" peak by more than 5 dBA only about 5 percent of the time. Furthermore, he concluded that virtually all the noise anomalies noted on the south slope were likely due to weather, not topography. Dr. Piercy agreed that weather events such as inversions could affect noise propagation. However, he noted that the effects of topography, initially identified in a 1974 National Research Council study, had not been considered. The Panel later recommends research on south slope noise anomalies. The Panel notes that a 10 dBA increase caused by a meteorological inversion would effectively double the perceived loudness of sound. Such an increase in the loudness of a lengthy engine run-up, for example, could lead to a highly annoying noise situation, especially at night.

## 6.2 Effects of Airport Noise on People

People experience airport-related noise in subjective and highly variable ways. The most significant effects are explored in this section,

### 6.2.1 Direct Effects

Some of the effects of noise on people are described in the EIS and in the hearings transcripts. Transport Canada's position was prepared by Dr. Lawrence Ward, Professor of Psychology at the University of British Columbia, acting as an independent consultant. His report was included verbatim in the EIS as section 5.5.

### Hearing Loss

Occupational health agencies, such as the B. C. Workers Compensation Board, identify a noise exposure limit to protect from hearing loss. This limit is 90 dBA for eight hours per day. Community noise levels, even near major international airports such as YVR, are not sufficiently high to cause hearing loss.

### Speech Interference

This effect includes noise which inhibits speech recognition and activities such as watching television or listening to radio. As a result of it, people must shout, move closer or at times stop talking altogether. The threshold for speech masking varies, but it is seldom lower than about 45 dBA.

As an example, a Stage 2 aircraft, such as a B737-200 produces an 85 dBA SEL over a large area and a 75 dBA Lmax on take-off through much of Richmond and the south slope of Vancouver. About 80 percent of people out-of-doors in these areas would report speech masking, and about 20 percent of people inside a well-insulated house with windows closed would report similar interference.

### Task Performance

There is some ambiguity about the extent that task performance is affected by noise. Sudden and unpredictable noises can be distracting and can affect concentration and persistence. But noise may also have arousing affects. Laboratory studies have found such effects at noise levels experienced in the area surrounding YVR. Uncontrollable noise appears to have after effects such as annoyance or frustration, which can be reduced if a subject feels he or she has some control over noise levels, or if the subject believes everything possible is being done to control the noise.

### Sleep Interference

Aircraft noise interferes with falling asleep and causes awakenings and other sleep disturbances. This appears to be a function of the duration of the noise as well as its loudness. A quieter but longer lasting sound may cause the same degree of sleep interference as a short, loud one.

Aircraft flyovers lasting between 10 and 30 seconds are normal for the YVR area. Flyovers of this duration disturb 5 to 10 percent of people in the 85 dBA SEL area and about 20 percent of people closer to the runway. Engine run-ups are believed to be a major cause of sleep disruption, though there is little information about them. However it is known that a 39

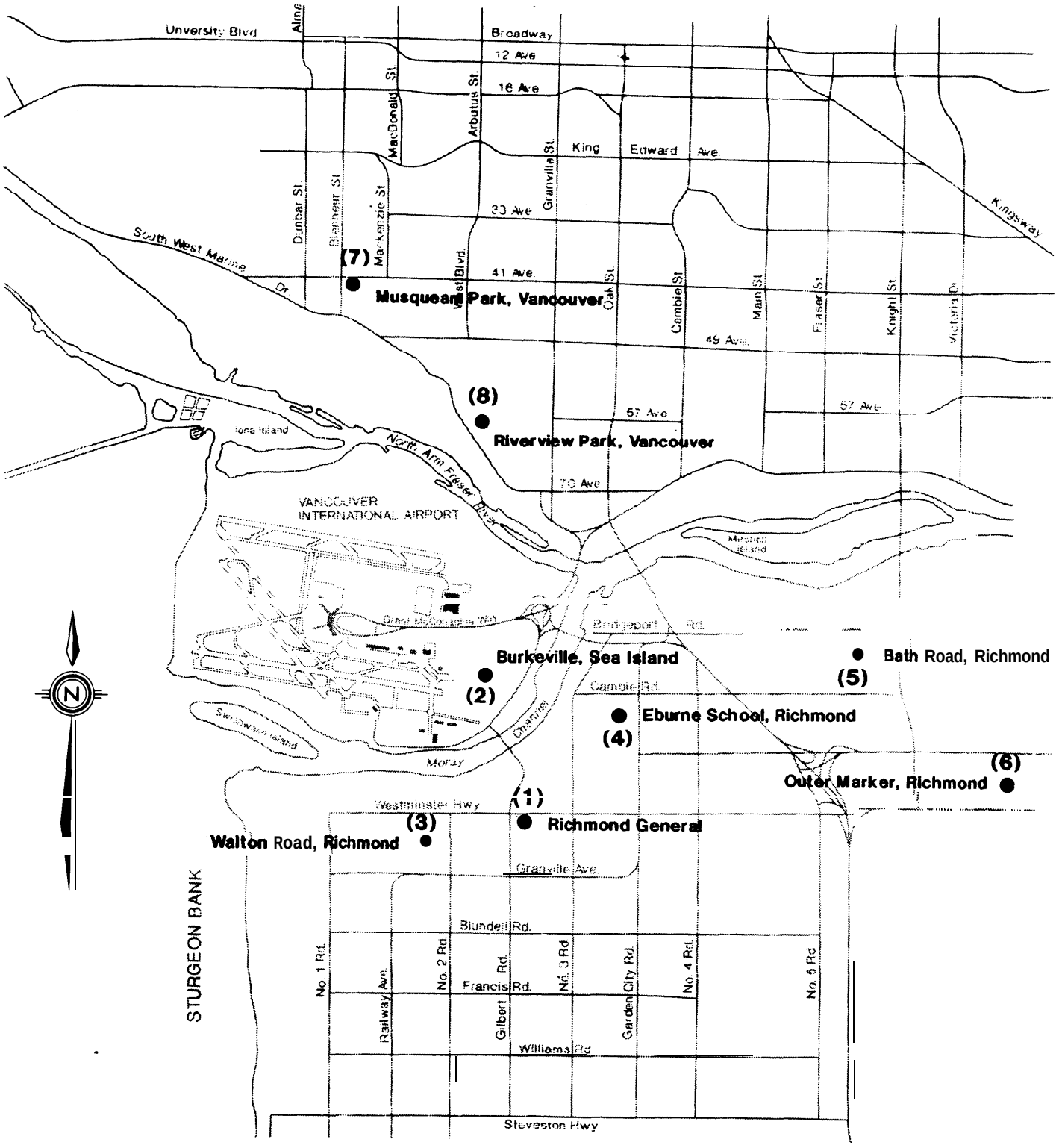



**FIGURE 6.4**

**FIXED POINT NOISE MONITORING STATIONS**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

dBA noise running for 15 minutes has the same sleep-disruption effect as a 59 dBA noise lasting just 10 seconds.

### Hypertension

High blood pressure may increase with exposure to aircraft noise. Using the results of several studies, there is probably an increased risk of hypertension among residents who have lived for more than three years within the $L_{dn}$ 60 dBA contours. The incidence of hypertension may be four times greater than normal in the $L_{dn}$ 75+ dBA zone; and the incidence of other stress-related conditions can be two to four times greater within the $L_{dn}$ 65 dBA contour than outside it.

### Annoyance

In a sense, the reaction of annoyance summarizes all other adverse effects. If there is interference with activities, there is also annoyance, hence stress and in turn increased blood pressure.

It is possible to predict the percentage of people who will say they are highly annoyed for a given $L_{dn}$ level; between 40 and 80 percent of people between the $L_{dn}$ 60 and 75 dBA contours will be highly annoyed. But, this is affected by non-acoustic factors. For example, a survey of residents living in insulated versus non-insulated homes surrounding the Hartfields Airport in Atlanta, Georgia, reported little difference in the annoyance levels. Although sound levels inside insulated homes were measurably quieter, the owners' reactions were related to the fact that planes were still flying overhead.

The effects of noise on individuals are subjective and may not relate primarily to noise levels. Other circumstances add to the complexity of noise. Was it a neighbour's dog or your own that barked so much? Do you fly a lot, possibly in the course of your business? Does noise interrupt your favourite activities such as watching television or conversing on the patio? Has the noise producer shown any sympathy for your annoyance and attempted to ameliorate it? These factors all affect the level of annoyance felt.

The Community Forum responded to the Noise Impacts section of Transport Canada's presentation in a report prepared by its consultant, Dr. J.E. Piercy. While accepting the graphs shown in the EIS that relate loudness to impacts, the Community Forum criticized the methodology used in analyzing noise. It felt that the methodology used leads to a gross underestimate of populations affected by noise. This criticism was centered on Transport Canada's use of $L_{dn}$ and NEF rather than SEL contours to estimate the number of people affected. The Community Forum pointed out that while $L_{dn}$ or NEF contours describe the overall noise environment well, it is single events that people respond to with annoyance or complaints. Hence, SEL should have received more emphasis. The issue of noise contours is addressed in more detail in section 6.5.

## 6.2.2 Sensitivity

People subjected to noise fall into many categories which may have special problems. Dr. Ward identified the following vulnerable populations:

### Sensitive Individuals

Individual variability in noise sensitivity is similar to that for many other characteristics. There are those who are extremely sensitive, just as there are those who are not sensitive. Most people inhabit the middle range. It is generally considered that perhaps 10 percent of the population will be abnormally sensitive to noise, sleep disruption or hypertension, for example. Furthermore, they do not become habituated to noise.

### Children

It is difficult to demonstrate that children are more severely affected than anyone else, but they cause special concern because speech masking caused by aircraft flyovers could hinder their learning and development processes. This topic is of potential significance at YVR since children 14 years old or younger made up approximately 14 percent of the population of Vancouver and 21 percent of the population of Richmond in the 1986 Census.

### The Elderly

People over 65 years old generally have increased difficulty separating sources of noise. This means that the masking effects of aircraft flyovers would be more pronounced, and the incidence of speech interference more severe. The elderly are also twice as likely to be awakened at night by sounds. In the 1986 Census, about 15 percent of Vancouver's population and 9 percent of Richmond's population was over 65.

### Recreationalists

People using parks or engaging in pursuits such as golfing, bird-watching, walking, conversing or relaxing outdoors tend to expect quiet surroundings. When that quiet is invaded, masking effects and annoyance may be more pronounced. In addition, outside noise is experienced without any attenuation. Aircraft-noise events around a busy airport such as YVR could occur once every two minutes during the day in summer, when parks experience maximum usage.

There may also be an element of choice in response to noise. There are those who:

- have habituated to noise and do not mind it;
- have accepted a noisy situation because it offers some compensating advantage such as less expensive housing;
- are well established and would not move under any circumstances;
- would like to move but cannot afford to; and
- are noise-sensitive and will move out, given time. (They will probably be replaced by noise-tolerant people, which should mean that the community around an airport becomes generally more noise-tolerant as time goes on.)

**Imbi Harding**

*"I call the noise line very rarely, especially in the middle of the night, because if you're going to call in the middle of the night, if you've been woken up by run-ups, you're going to waken yourself up even further and make yourself angrier speaking to this frustrating machine."*

**Dagmar Kalousek**

*"Transport Canada... showed on paper that the noise contours hardly involved any residential areas in Vancouver which must be reassuring to everyone but to those who* **live anywhere on the South** *Slope* **and who** *know differently.*

*Secondly it provided, during a 24-hour period, average noise profiles without any explanation of what these profiles mean to people with ordinary ears who do not hear 24-hour averages."*

**Roy Sturgess**

*"... when we reach Stage 3, probably around the turn of the century, I would suggest that even with that airport a kilometre closer to my house the noise problem will be* **much less than it is now, and at the** *moment it's barely noticeable.*

*I just wanted to make sure that the committee understood that all the people on the south side of Point Grey are not up in arms about the noise."*

From this discussion, it is clear that reactions to noise are highly individualistic and varied. This variety makes it impossible to deal with noise problems in a simple, across-the-board fashion.

## 6.3 Aircraft Noise

There are several sources of noise which are inherent in the design and operation of aircraft. Section 6.3.1 gives a brief description of these noise sources, specifically: overflights; ground noise, which includes take-offs, landings, and taxiing operations; and on-ground operations such as run-ups and the use of auxiliary power units. The effects of evolving aircraft technology are discussed in section 6.3.2.

### 6.3.1 Sources of Aircraft Noise

#### Overflights

This refers to the passage of aircraft not involved in landing or departing over areas near airports. Full power is generally not being applied, but because the plane is in the air, more people on the ground are exposed to noise.

#### Take-Offs

Departures are the noisiest phase of aircraft operations because full power is applied while the aircraft accelerates down the runway. In addition, a ground run-up with brakes locked sometimes precedes the take-off roll, and this is the loudest part of all. However, there are mitigating factors: a lightly loaded plane needs less power on take-off, as does a lower climb angle. The use of quiet flying techniques, such as reduced use of flaps and thrust, can also reduce noise.

#### Landings

Although arrivals are quieter than departures some engine noise is inevitable, as power must be applied to keep an aircraft above its stalling speed. In addition, there is the aerodynamic noise generated by the movement of air over the airframe. The noisiest part of a landing occurs when reverse thrust is used. This refers to the application of engine thrust opposite to the direction of travel as a braking aid. This can involve an abrupt application of engine power and a sudden increase in noise which can be startling. If a runway is sufficiently long, reverse thrust is not necessary because aircraft can be brought to a stop by hydraulic braking only.

#### Taxiing

Taxiing and other ground traffic noise is generally less intense than landing or take-off noise.

#### Run-Ups

**There** are two types of engine run-up. The first type of ground run-up occurs as a departing aircraft begins its take-off roll, and is included in noise models used to draw noise contours around the airport. The second type of run-up is conducted following maintenance. This was not included in the development of noise contours in the EIS but was much discussed at the public hearings. The neighbourhoods around YVR were particularly concerned about such activities being undertaken at night.

#### Auxiliary Power Units

Auxiliary Power Units are engines that provide power to the aircraft while it is parked and not connected to the airport electrical system. These engines, which are attached to the plane, are much smaller than the main engines and do not generally cause a noise problem.

### 6.3.2 Fleet Mix Forecast

There is a dramatic difference in noise level — about 10 to 15 dBA — between the older Stage 2 and the newer Stage 3 aircraft. This is important because reduced aircraft noise decreases the area affected by noise. In its noise analyses, Transport Canada assumed that 50 percent of the fleet mix will be Stage 3 by 1996 and 100 percent by 2001. The YVR fleet is presently 41 percent Stage 3.

Advances in engine design have resulted in an evolution of aircraft technology, and these are expected to continue into the next century. It is such designs and technology that separate Stage 3 aircraft from their noisier Stage 2 predecessors. Transport Canada presented a chart showing the aircraft noise trend over the last 40 years (See Figure 6.5). When aircraft size and engine size variables are allowed for, all aircraft fall into a small range on the chart. This means in effect, that there are few secrets in the aircraft industry. The chart also shows that progress in noise reduction is slowing; the industry does not know how to build much quieter aircraft than it is producing now.

Overall noise impacts obviously depend on the mix of aircraft types which serve an airport. Fleet mix assumptions are therefore basic to airport noise projections.

In the United States, the Airport Noise Capacity Act of November, 1990 requires that there be only Stage 3 aircraft at all airports by the year 2000, with limited exemptions to the year 2003. The International Civil Aviation Organization (ICAO) passed a similar rule in October, 1990 requiring that Stage 2 aircraft be phased out starting in 1995 if they are 25 years of age. The phase-out is to be complete by April 1, 2002.

Evidence presented by the Air Transportation Association of Canada (ATAC) and the major carriers indicated that fleet conversion in Canada would probably follow a similar schedule. While there is currently no legislated requirement for phasing-out Stage 2 aircraft, the phase-out should occur for economic reasons: Stage 3 aircraft are more fuel efficient, and require less maintenance and fewer crew members.

The Community Forum and other participants expressed concern that the expected transition to 100 percent Stage 3 by 2001 might not be realized. Transport Canada acknowledged that a relatively slow change-over to Stage 3 would result in wider noise contours around the airport. However, it stated

that if the 100 percent Stage 3 goal were not achieved by 2001, it would be achieved soon thereafter.

It is the Panel's view that if the YVR forecast of 50 percent Stage 3 by 1996 and 100 percent by 2001 were not to materialize exactly, it would have little bearing on noise contours associated with the proposed new runway, because Stage 2 aircraft would not be permitted to take-off from the parallel runway. It could, however, affect the noise contours for the existing main runway, particularly SEL's, as Stage 2 aircraft would still be operating there.

## 6.4 YVR Existing Noise Environment

What do airport area residents say about airport noise? Are current levels acceptable? Could the information about current noise conditions be used to predict how residents would respond to future conditions?

### 6.4.1 Submissions to the Panel

Most of the comments received by the Panel objecting to the proposed expansion and associated increase in aircraft noise came from Vancouver residents. Comparatively few were received from Richmond residents.

The kinds of noise that annoy Vancouver south slope and Point Grey residents were listed by the Community Forum and others as follows:

1. Noise from piston engine aircraft, flying north-south at low altitude. This concern centered on small piston aircraft flying from dawn to dusk under visual flight rules. The feeling was that these planes were flying too low, and were too noisy. In fact, under current regulations they are allowed to fly at 300 m.

2. Small jets departing westward on runway 26 and then circling north in order to go east. These planes are probably at 1,500 m elevation and quite noisy when they fly over Vancouver. They could be required to climb higher over the water and cross residential areas at greater altitude. (Large jets are required to make a western departure, then turn south and pick up elevation over flatter ground before climbing over the mountains,)

3. Turbo-props and small jets arriving from the south and circling over south Vancouver. This is the "banking bellies" issue, caused by aircraft circling to land on runway 12. If the parallel runway were constructed, this procedure would no longer be used.

4. Engine run-up noise, especially at night. The diverse concerns presented at the public hearings included: whether the number of run-ups would increase with increased traffic; whether there is a need for run-ups at night; whether they need continue for more than 10 minutes; what procedures would be introduced to reduce noise impacts from run-ups; whether "hushhouses" would be constructed; and Transport Canada's failure to provide run-up noise contours.

5. A type of noise annoyance described by south slope residents as "booming." This was described as sometimes an almost constant roar, with isolated pockets of greater loudness. It appears to be a weather-related phenomenon.

### 6.4.2 Hot-Line Complaints

The number of complaints received on the YVR noise hot-line has increased over the years, reaching 763 in 1990. A breakdown showed that 405 of these were from Richmond and 308 from Vancouver. Over half the calls were made by 122 people who called two or more times. In 1989 noisy run-ups generated 54 complaints out of a total of 1,983 run-ups; 62 percent of these were at night.

Dr. Ward was asked about the relationship between complaints and annoyance levels. His response was that clearly the number of complaints is substantially lower than the number of people who would say that they are annoyed, if asked. There is no exact relationship between the two, although it is known that at certain $L_{dn}$ levels there would be a certain number of complaints and at higher $L_{dn}$ levels, there will be more complaints and possibly legal action. A reasonable threshold of serious impacts is when 15 to 20 percent of people are annoyed by a particular event. This appears to occur about the $L_{dn}$ 60 dBA point for aircraft noise.

The Vancouver International Airport Noise Hot-Line connects to an answering machine. Following investigation, complainants are called back in a day or two, with a written follow-up letter, if required. The duty officer often listens to messages as they are recorded, and may be able to respond very quickly. However, he does not answer the phone because discussing noise with a complainant is generally a lengthy process and radar data required to respond to complaints cannot be obtained immediately. Also, Transport Canada has felt that there were too few calls at night to justify employing staff for immediate response.

Several participants at the hearings described the noise hot-line as "a joke". This impression arose from the perception that airport staff, though friendly and open, say there is not much they can do about noise complaints. Consequently, people do not use the hot-line. Those affected feel that there is a need for citizens to be able to say "Stop, you cannot run the airport this way at this time of day with this type of aircraft". The overall problem, it was contended, is that citizens' noise problems are not being well addressed, and there is no confidence that the situation would improve if the airport were expanded.

Transport Canada responded by describing the Aeronautical Noise Management Committee, which meets quarterly, reviews noise complaints and participates in devising operational directives for both airside operations and noise abatement. These include routes, run-up procedures, night procedures, preferential runways and overflight routes. YVR is attempting to improve citizen participation on the Committee. Mr. Ulf Topf commented that this committee does not seem to have had much success, partly because complaint statistics are not updated regularly, and partly because there is no

effective enforcement process. The Panel makes a number of recommendations involving a noise management committee in section 66.1.

### 6.4.3 Opinion Surveys

Properly conducted scientific opinion surveys would provide data on public reactions to noise at YVR. According to Dr. Ward:

> *'all of the conclusions about noise impacts made in the present report are somewhat speculative, since no new data on the specific reactions of Vancouver area residen ts were collected"*

and:

> *"An important preliminary component of a continuing monitoring effort should be to collect data on noise impacts that now exist. This could be accomplished by contracting a survey (stratified by noise climate, vulnerability, etc.) by a public opinion survey firm, with questions about the major impacts including speech masking, sleep disturbance, health effects and annoyance. The survey should be conducted before the beginning of runway construction, assuming approval is granted, and subsequent surveys (suitably modified) should be done at intervals of 1 or 2 years."*
>
> *"These surveys, along with continuing noise measurements and modelling, could form the basis for assessment of whether the projected changes in noise climate and impact are occurring, whether mitigation strategies are working well or poorly, and would also help to identify any unexpected negative impacts or benefits and possibly suggest new mitigative strategies. "*

### *6.4.4* Comparison of Actual and Computer-Modelled Noise Levels

Noise contours are projections or estimates of noise at various locations. These are based on computer models of how noise is supposed to behave given certain conditions and assumptions and their validity can be tested by comparing the modelled level of noise with measured levels.

Eight noise monitoring sites were operated around YVR in 1988 (Figure *6.4)* and additional data were collected by mobile monitoring equipment. Noise model projections for both $L_{dn}$ and NEF were compared to these measured data for various 1988 operating scenarios. Models were calibrated after checking monitored data, and following this calibration — a verification of the validity of the computer noise model — it was possible to produce noise contours for future operational scenarios.

There was some discussion at the public hearings about the use of only two monitoring stations in Vancouver and several participants questioned whether the sites were truly representative of the local noise environment. It was suggested that the data from these stations could not be trusted, and that model results calibrated by these data would not be correct. One of these sites is located near a railroad and was considered contaminated by train noise; its data were not used. Transport Canada responded that both sites have been relocated and a third site added at the University of British Columbia campus.

To respond to these complaints a field inspection of south Vancouver sites was conducted on February 6, 1991 by the Panel's noise Technical Specialists Clair Wakefield and Werner Richarz, and Claudio Bufone of Transport Canada. They found the former Site 7 to be subject to significant ground attenuation and the former Site 8 to be suspect because of the railroad. They concluded that both relocated sites are suitable for measurement purposes. Mr. Wakefield also concluded that the high threshold used for monitoring at these stations would tend to overestimate the average SEL for a given aircraft type. Despite these assurances, the Community Forum remained unconvinced that these monitoring sites are well situated, believing that ground attenuation and shielding effects may still be present.

## 6.5 YVR Projected Noise Environment

### 6.5.1 Noise Contour Projections

In producing noise contours for the future, operational scenarios for 1996 and 2001 were developed, using 1996 and 2001 on existing runways, in one case, and in the next 1996 and 2001 with parallel runways. The resulting $L_{dn}$ and NEF noise contours, along with those for 1988, are shown in Figures 6.6 to 6.15. The fleet mix forecast was assumed to be 41 percent Stage 3 aircraft in 1988, 50 percent in 1996 and 100 percent in 2001.

From the 1996 scenarios, for parallel runways with no mitigation (Figures 6.8 and 6.13), it was clear that the noise levels created in south Vancouver would be completely unacceptable. In this 1996 "worst case scenario" all aircraft were assumed to have equal opportunity to use either runway, and analysis showed that it was Stage 2 aircraft on the new runway that caused the unacceptable noise environment in south Vancouver. Accordingly, Transport Canada developed a noise mitigation scenario for the new runway.

### 6.5.2 Transport Canada's Noise Mitigation Program

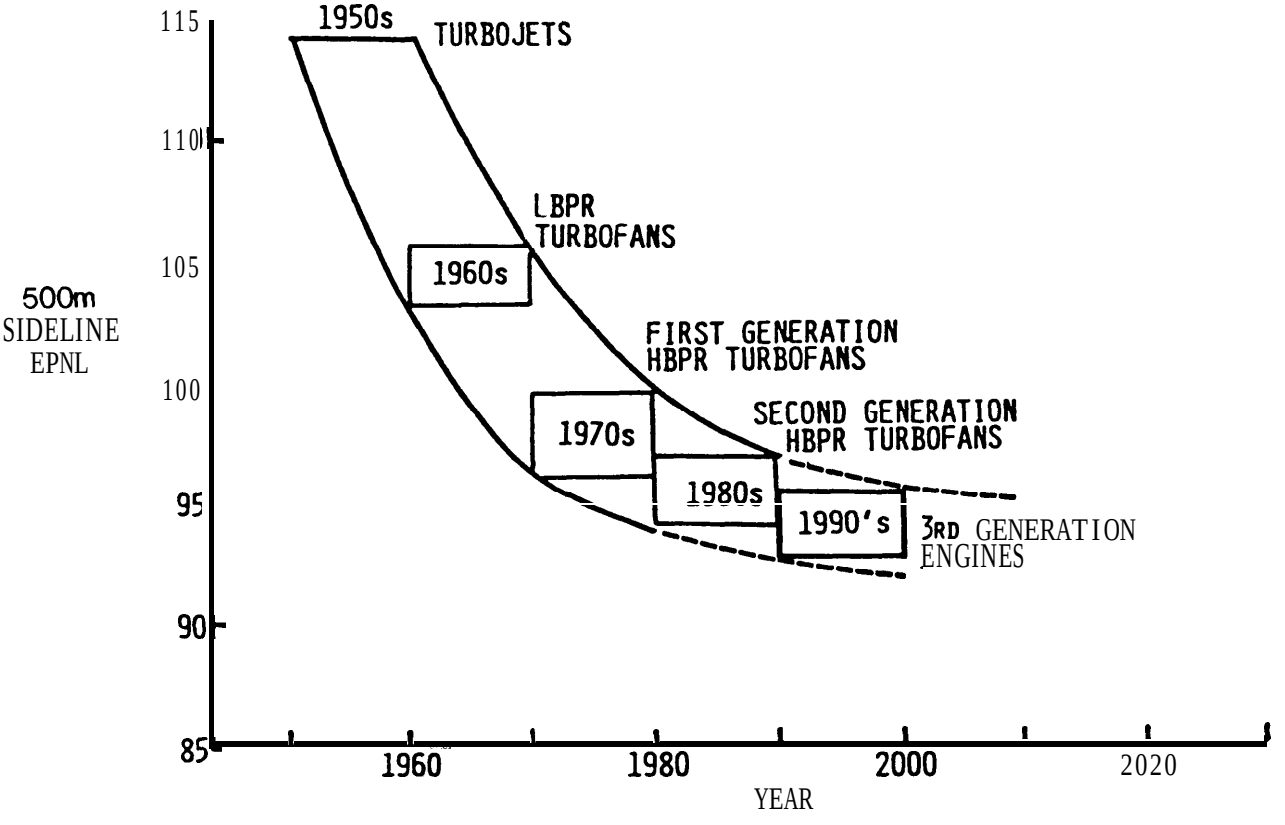
Transport Canada's proposed noise mitigation program consisted of the following four components:

1. the parallel runway would be operated primarily as an arrival runway, with departures taking place only when necessary;

2. only Stage 3 aircraft would be permitted to take-off from the parallel runway;

3. no departures would be permitted from the parallel runway between 11 p.m. and 7 a.m.; and

4. use of reverse thrust for braking would not be permitted on the parallel runway during the hours 11 p.m. to 7 a.m. (this requires a runway length of 3,030 m (9,940 ft).




**LEGEND**

| | |
|---|---|
| **LBPR** | **Low Bypass Ratio** |
| **HBPR** | **High Bypass Ratio** |
| **EPNL** | **Effective Perceived Noise Level** |

**SOURCE: Mestre Greve/ Walter Gillfillan 1989**

**FIGURE 6.5**

**AIRCRAFT NOISE TREND**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, **1990)**

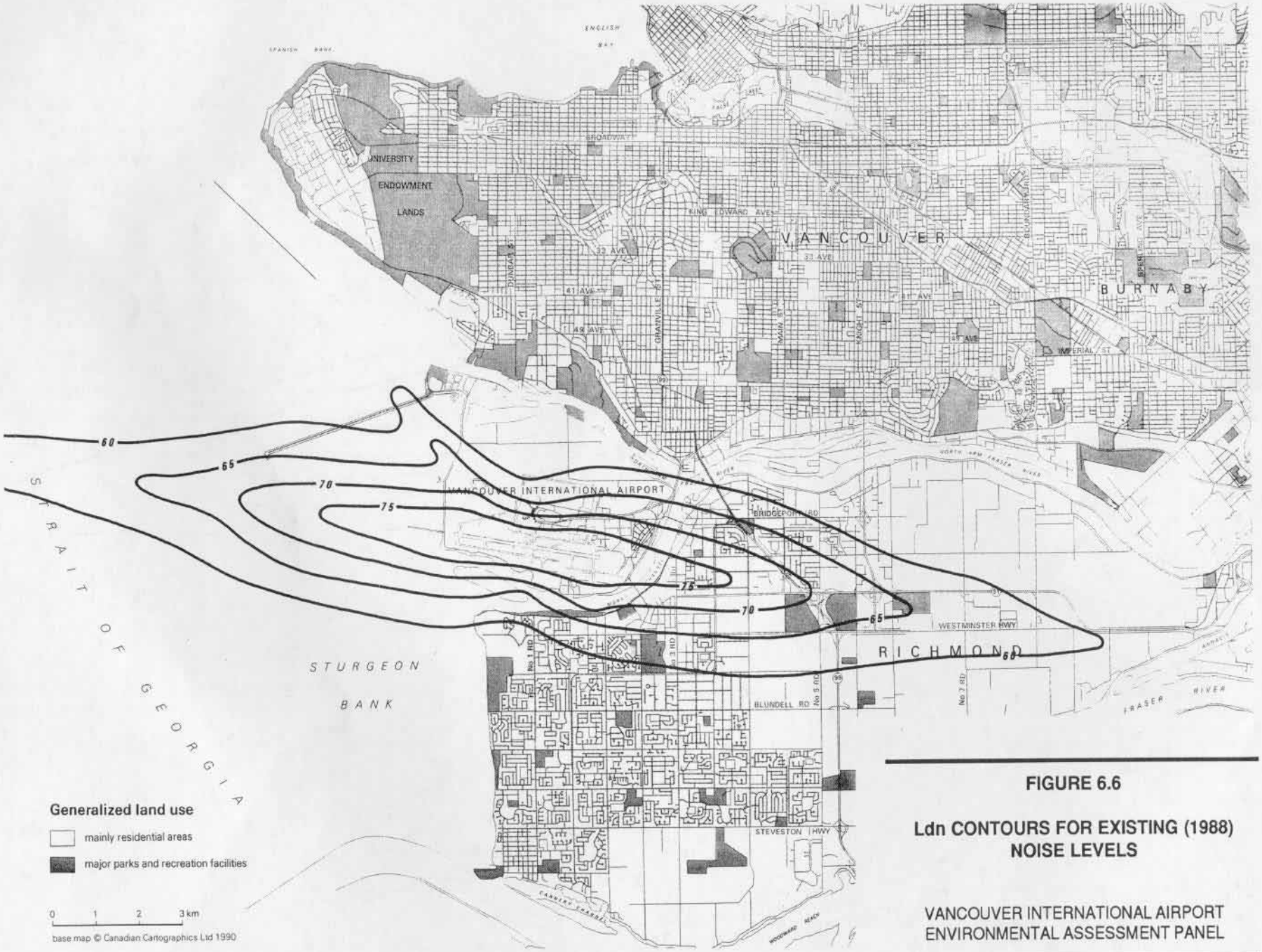



**FIGURE 6.6**

**Ldn CONTOURS FOR EXISTING (1988) NOISE LEVELS**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

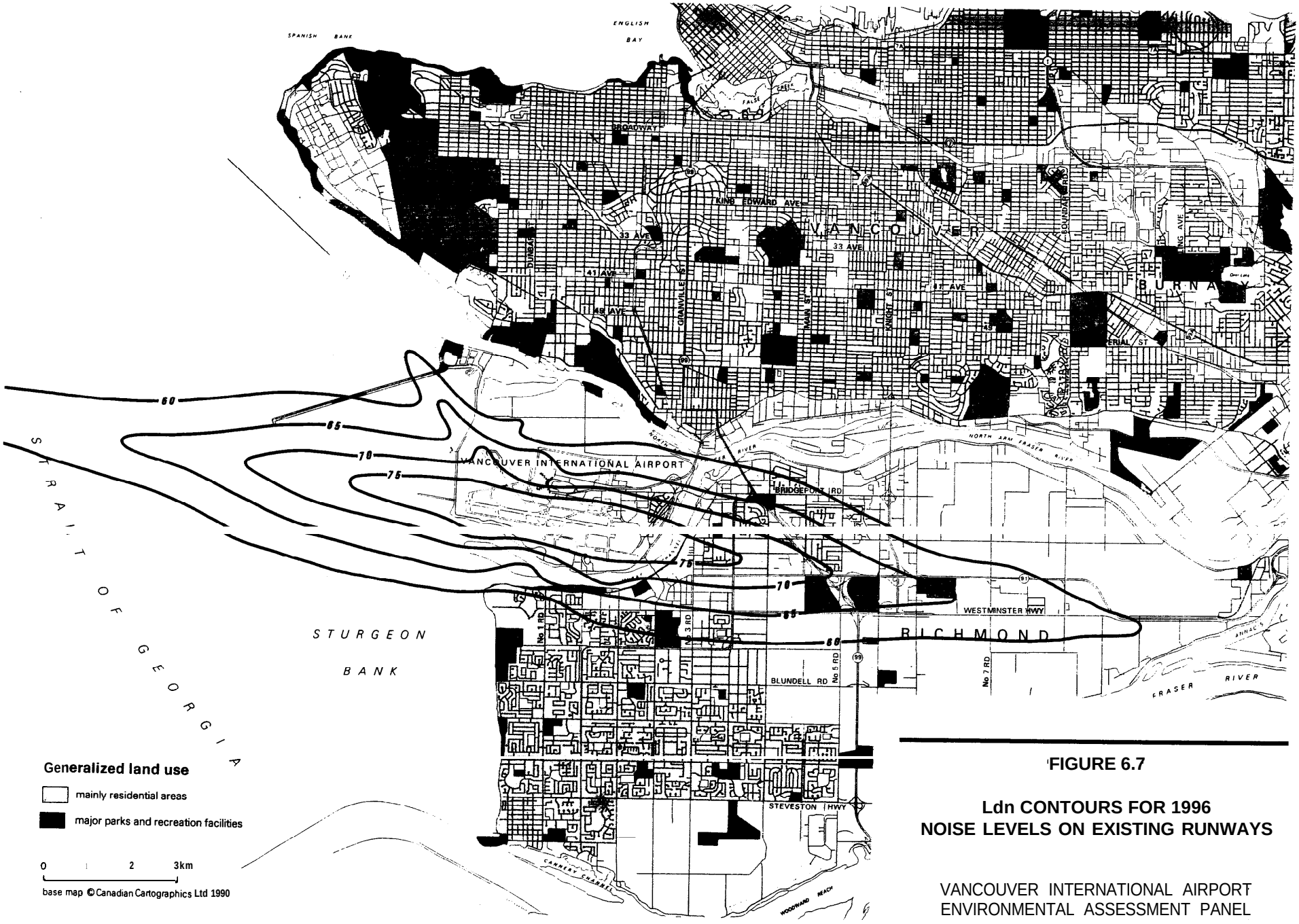



**FIGURE 6.7**

**Ldn CONTOURS FOR 1996**
**NOISE LEVELS ON EXISTING RUNWAYS**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, **1990)**

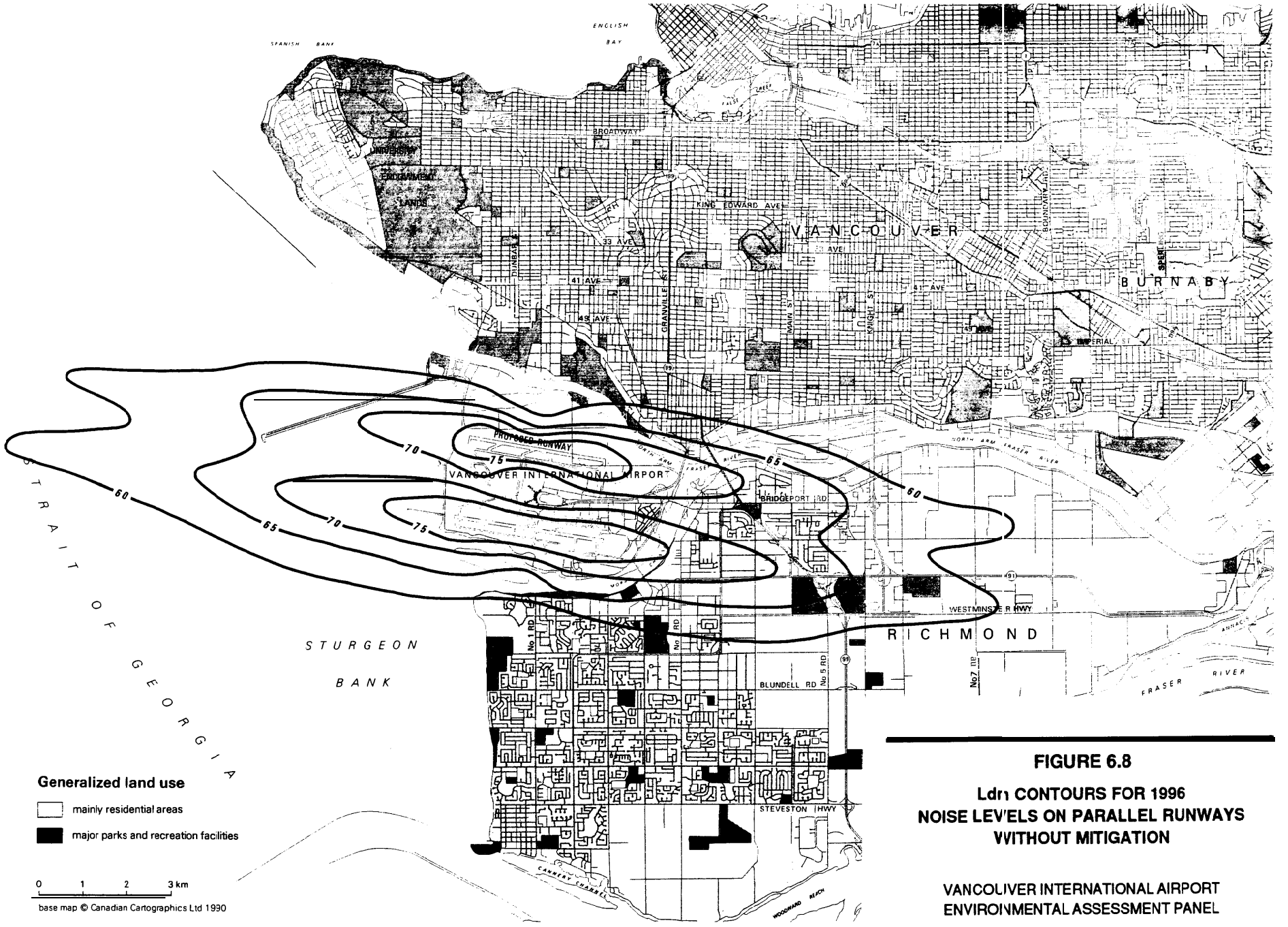



**FIGURE 6.8**

**$L_{dn}$ CONTOURS FOR 1996**
**NOISE LEVELS ON PARALLEL RUNWAYS**
**WITHOUT MITIGATION**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

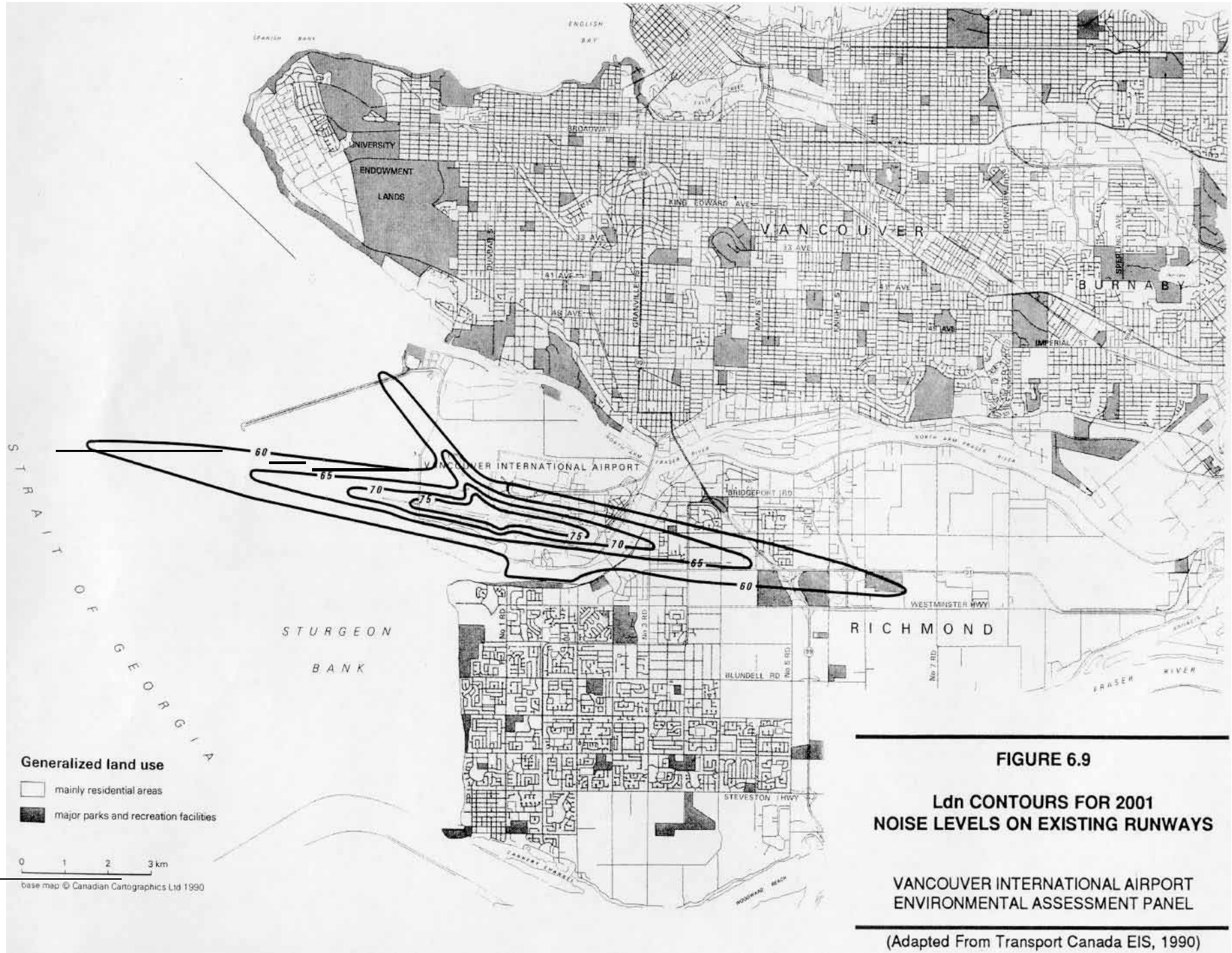



**FIGURE 6.9**

**Ldn CONTOURS FOR 2001**
**NOISE LEVELS ON EXISTING RUNWAYS**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

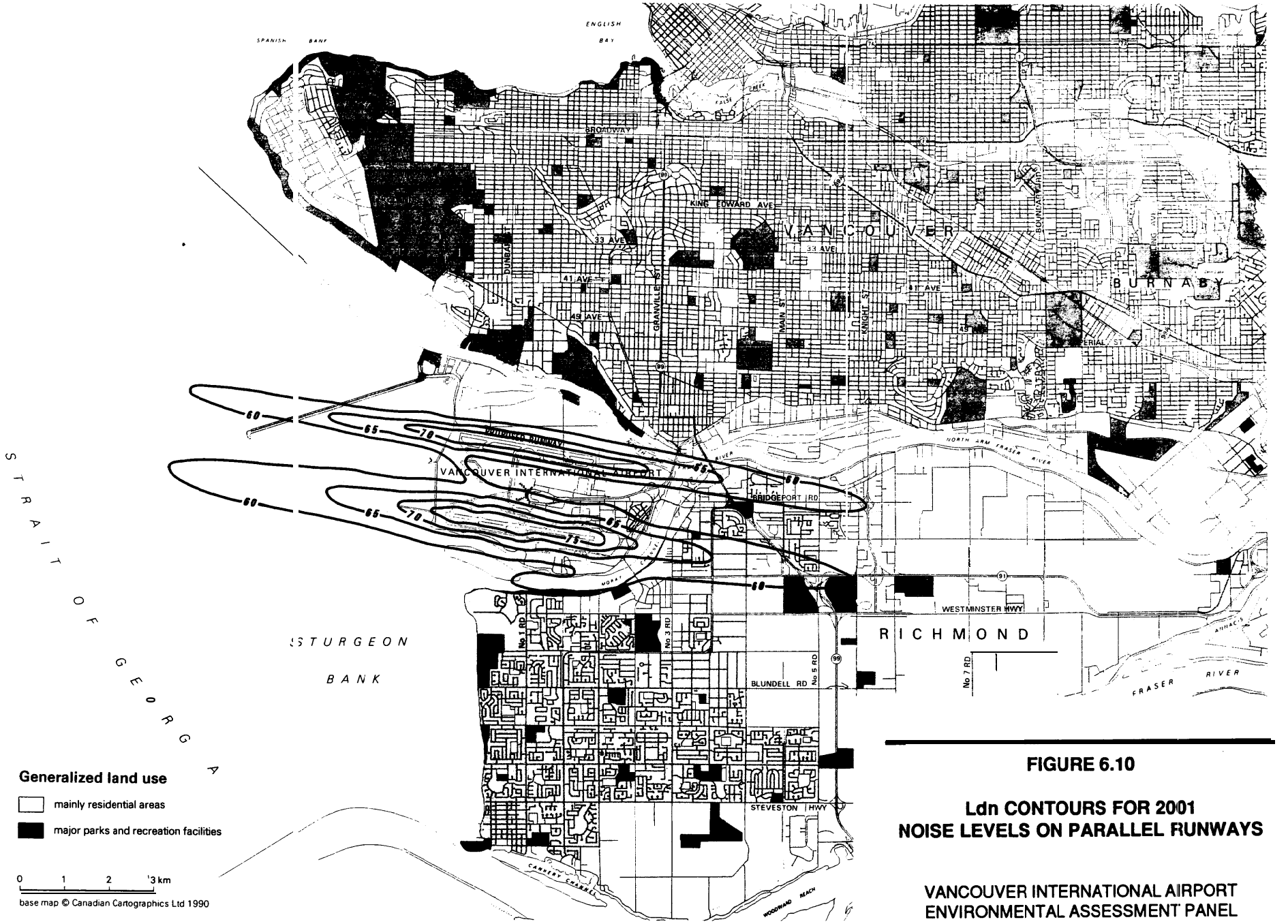



**FIGURE 6.10**

**Ldn CONTOURS FOR 2001**
**NOISE LEVELS ON PARALLEL RUNWAYS**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

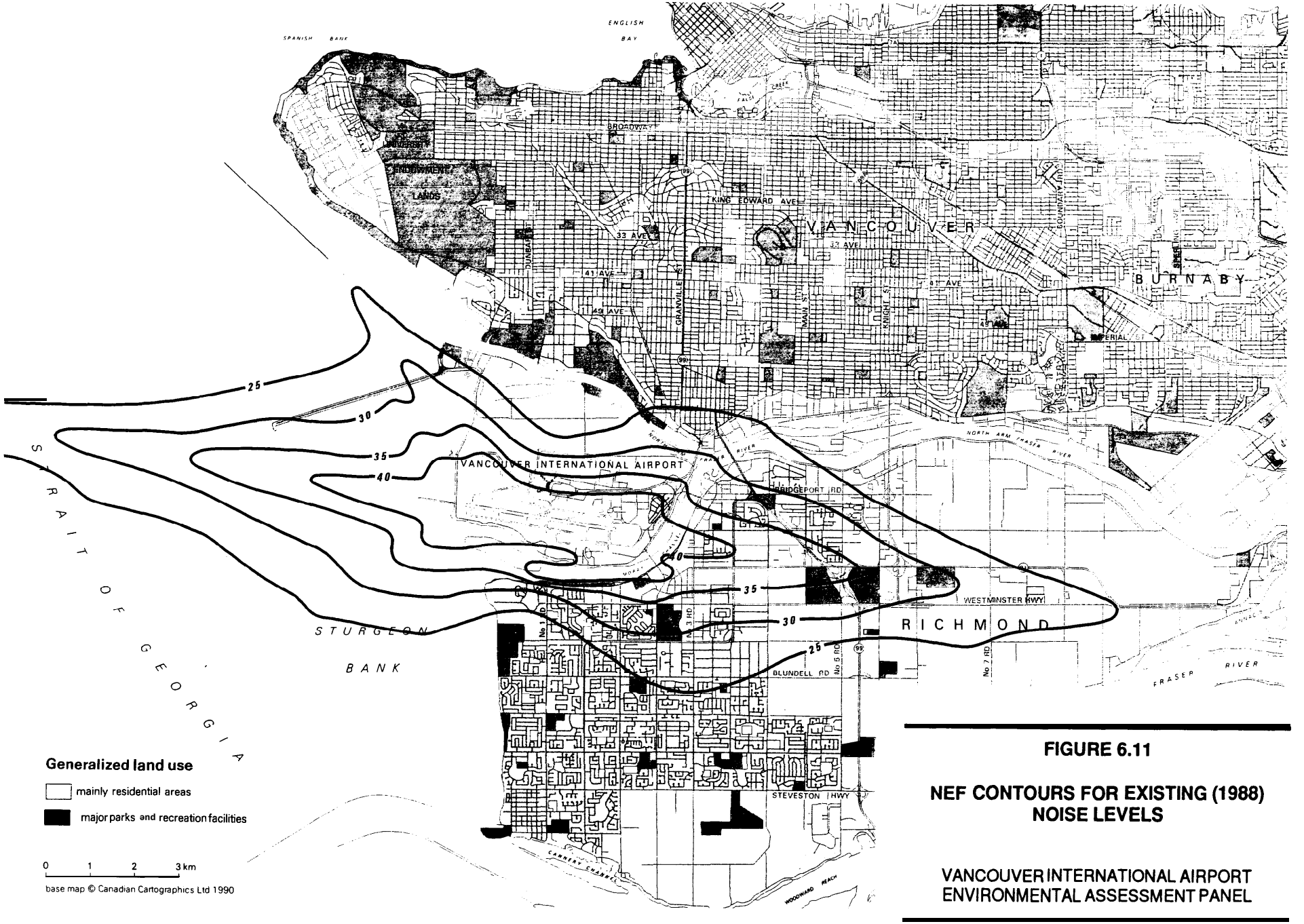



**FIGURE 6.11**

**NEF CONTOURS FOR EXISTING (1988) NOISE LEVELS**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

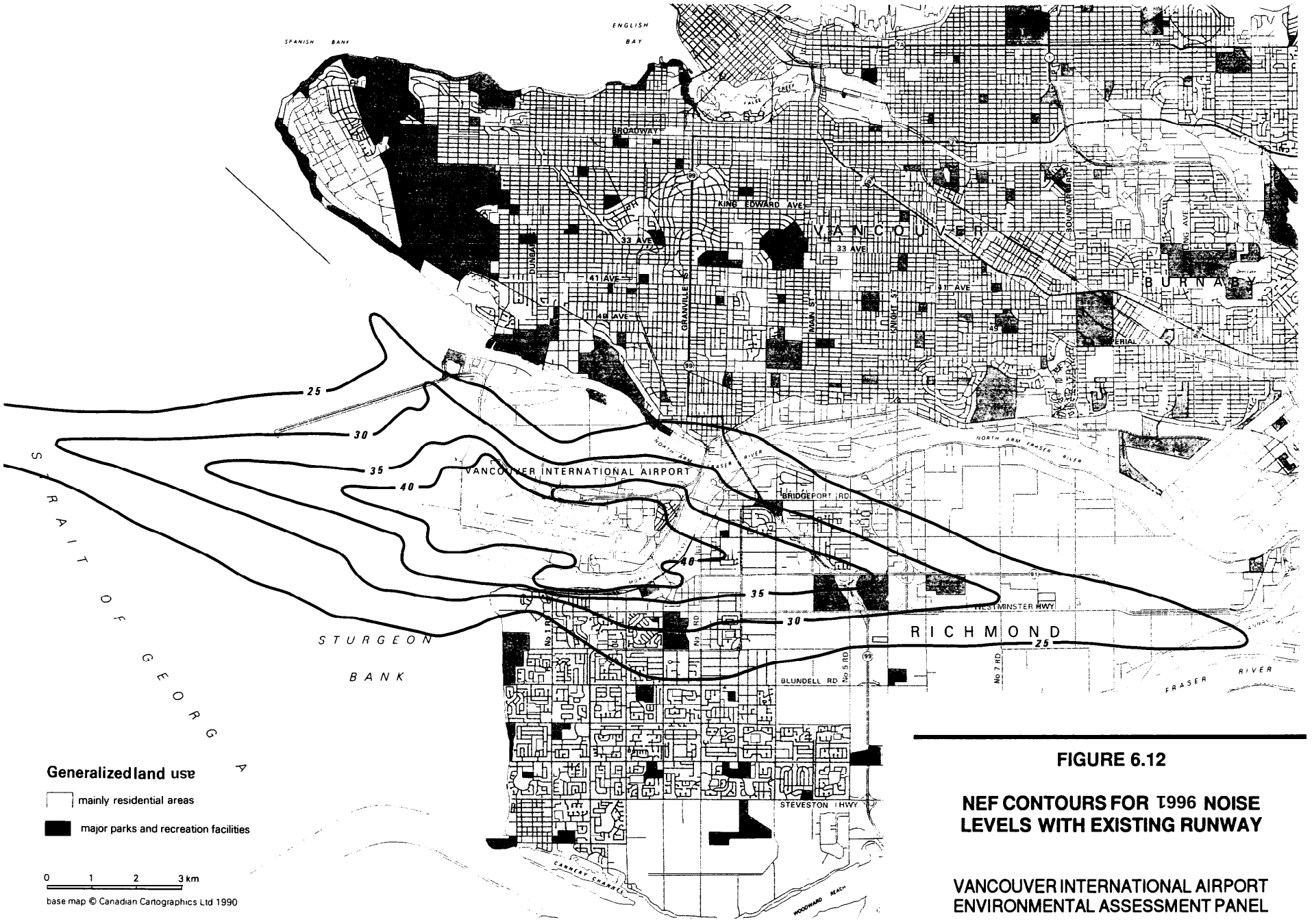



**FIGURE 6.12**

**NEF CONTOURS FOR 1996 NOISE LEVELS WITH EXISTING RUNWAY**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)


**FIGURE 6.13**

**NEF CONTOURS FOR 1996 NOISE LEVELS WITH PARALLEL RUNWAYS WITHOUT MITIGATION**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

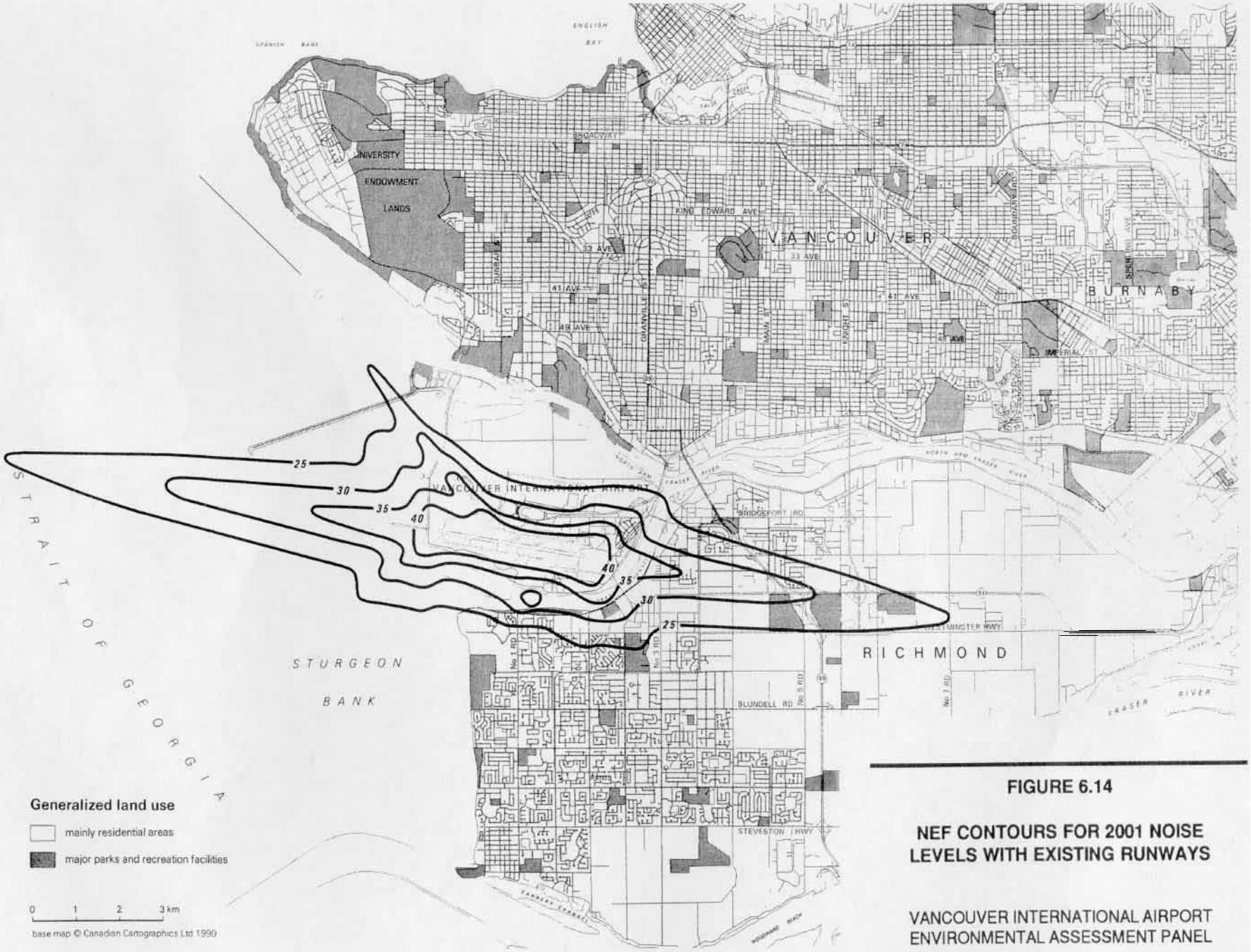



**FIGURE 6.14**

**NEF CONTOURS FOR 2001 NOISE LEVELS WITH EXISTING RUNWAYS**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

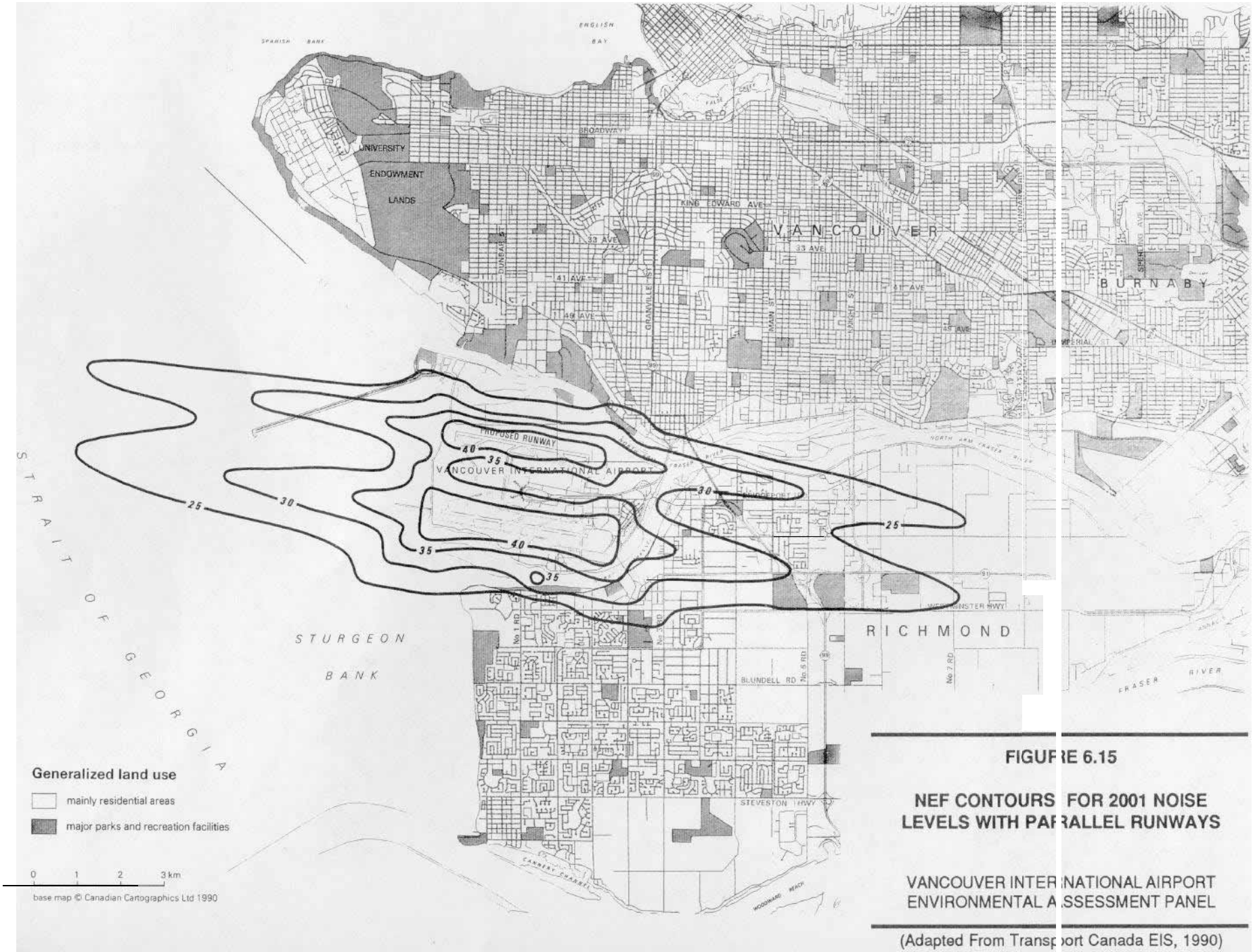



**FIGURE 6.15**

**NEF CONTOURS FOR 2001 NOISE LEVELS WITH PARALLEL RUNWAYS**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

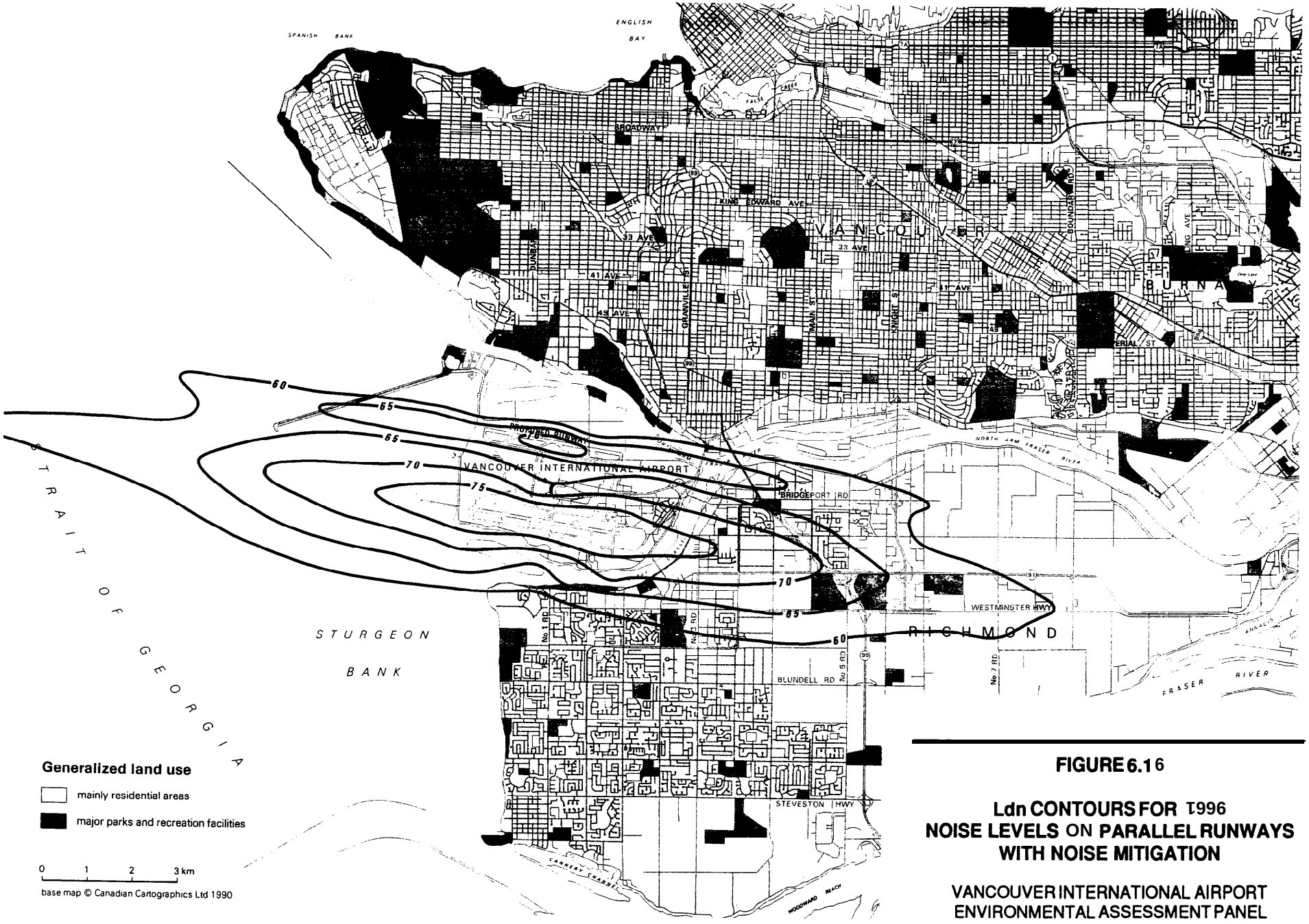



**FIGURE 6.16**

**Ldn CONTOURS FOR 1996 NOISE LEVELS ON PARALLEL RUNWAYS WITH NOISE MITIGATION**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

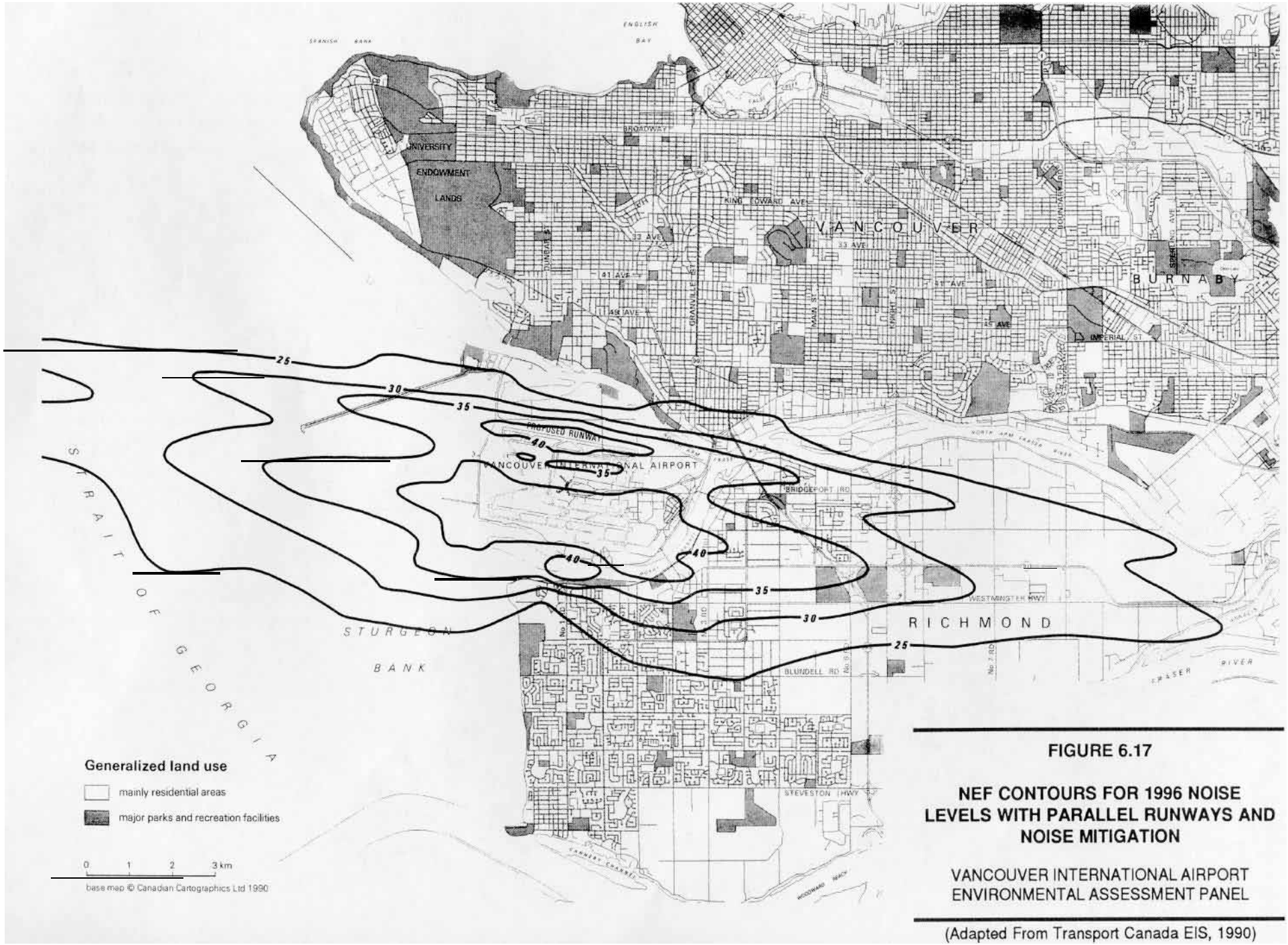



**FIGURE 6.17**

**NEF CONTOURS FOR 1996 NOISE LEVELS WITH PARALLEL RUNWAYS AND NOISE MITIGATION**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

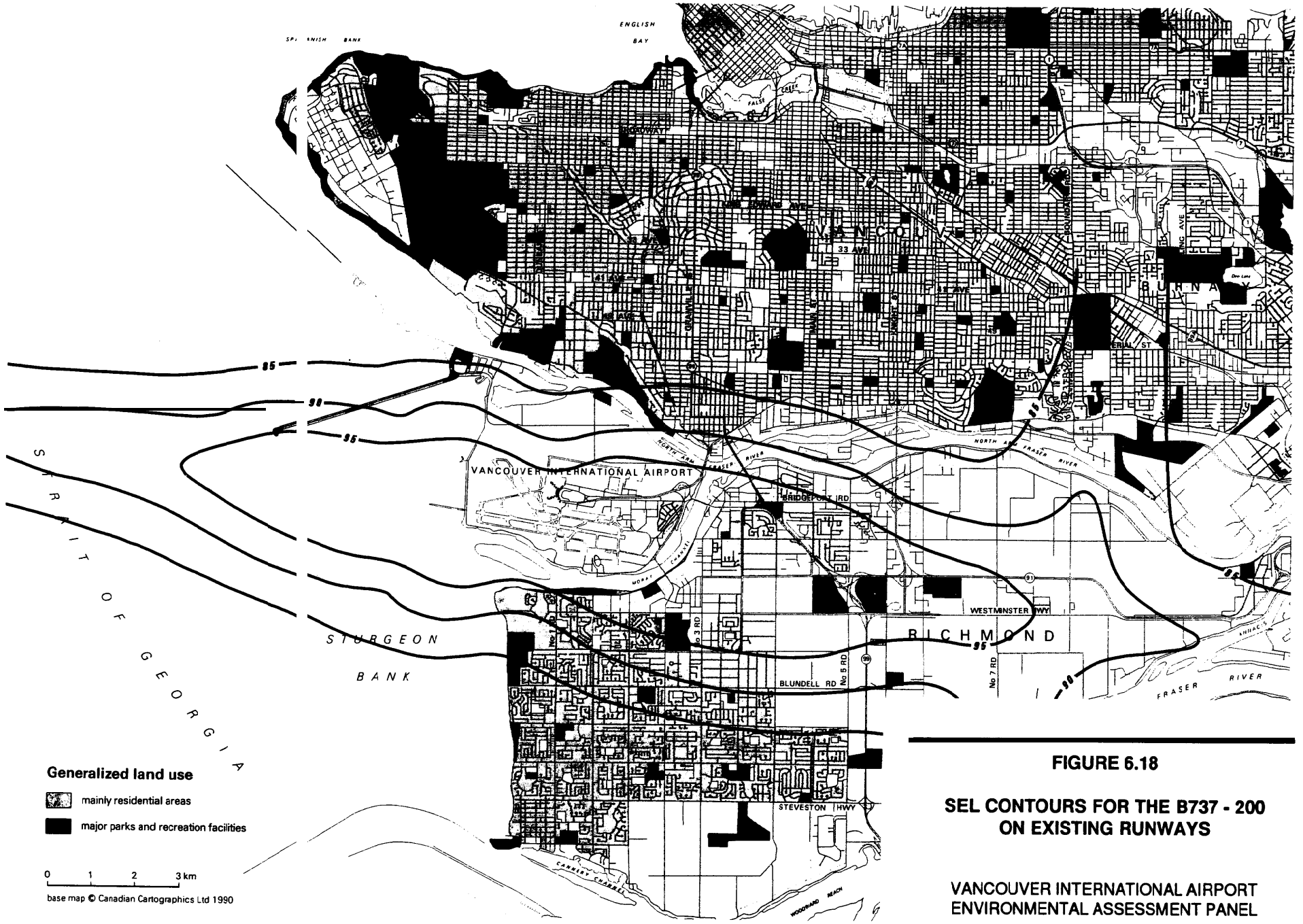



**FIGURE 6.18**

**SEL CONTOURS FOR THE B737 - 200 ON EXISTING RUNWAYS**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

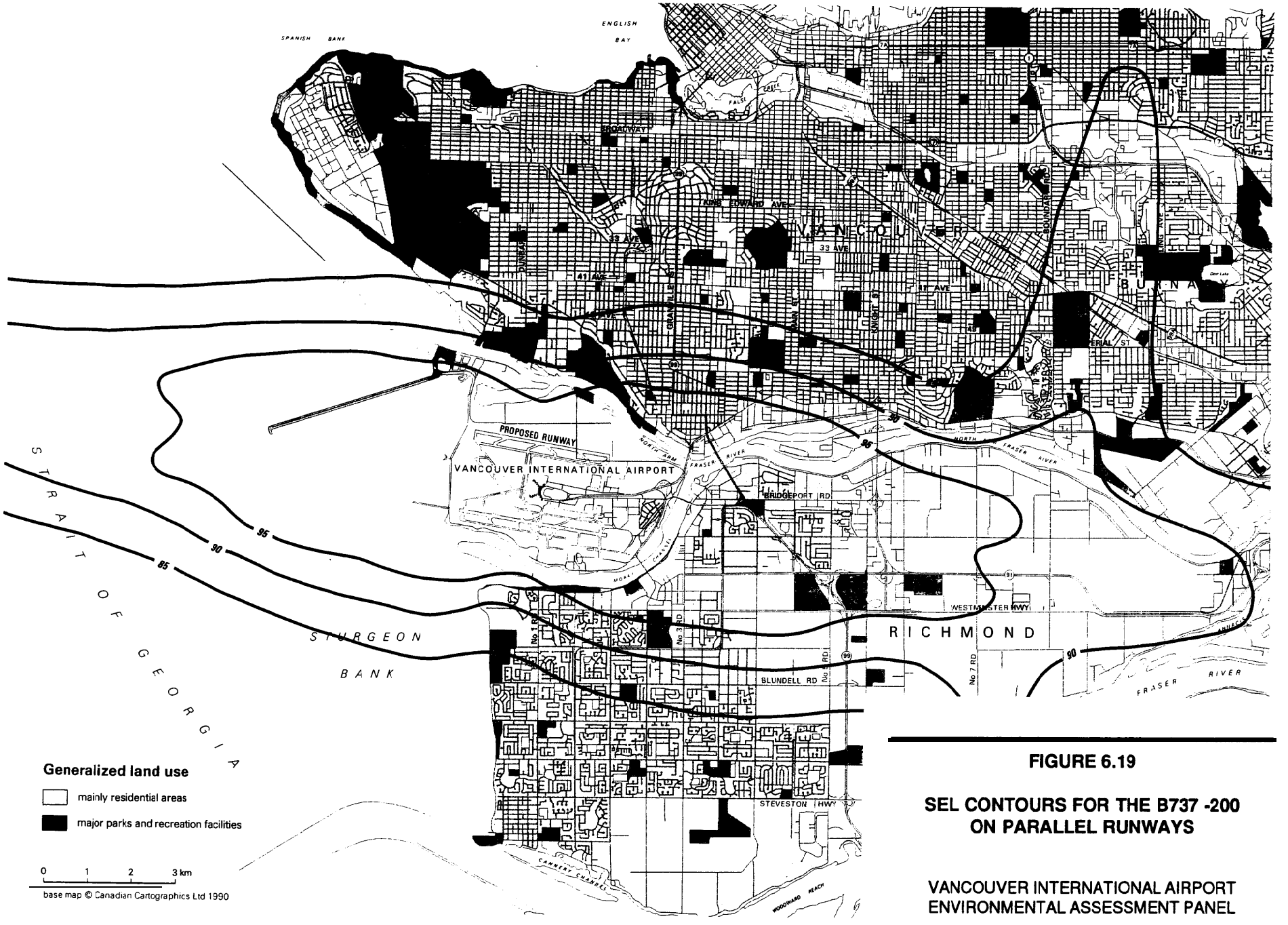



**FIGURE 6.19**

**SEL CONTOURS FOR THE B737 -200 ON PARALLEL RUNWAYS**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

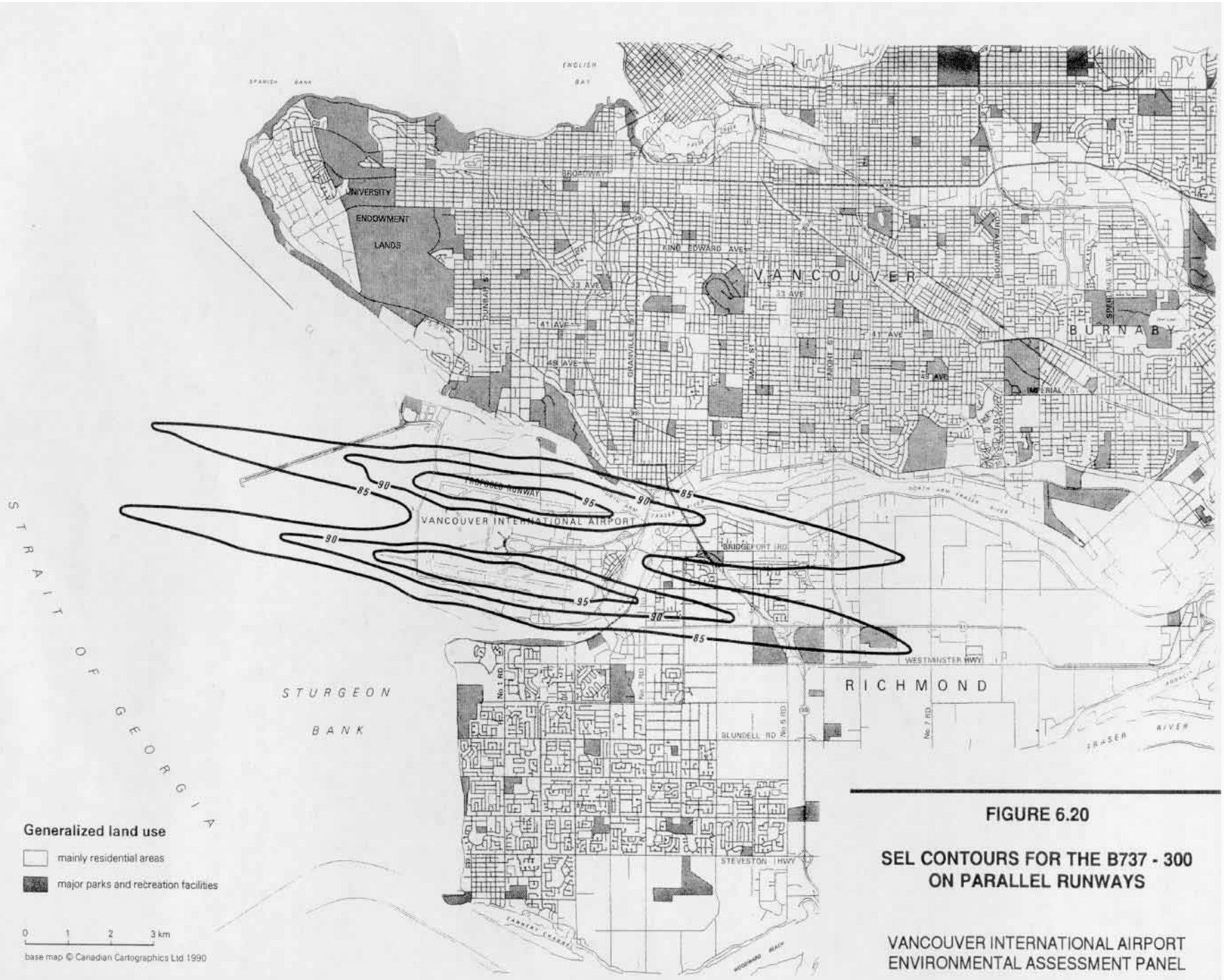



**FIGURE 6.20**

**SEL CONTOURS FOR THE B737 - 300 ON PARALLEL RUNWAYS**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

### 6.5.3 Mitigated Noise Environment

From Figures 6.16 and 6.17 ($L_{dn}$ and NEF contours for 1996 with noise mitigation), it is clear that the projected noise contours reflecting these mitigative measures predict a major reduction in south Vancouver noise levels in 1996 compared with the unmitigated scenario. It should also be noted that no mitigation (for Stage 2 operations) is required in 2001, as the assumption is that the operation will be 100 percent Stage 3 aircraft. YVR is fortunate in comparison with many other major airports in that over 50 percent of its aircraft movements approach or take-off over water, which reduces the impact on urban areas. However, with the operation of parallel runways there are three areas to be considered: Richmond directly south of the airport, Richmond east of the airport including Bridgeport, and south Vancouver including Marpole and the Southlands.

Based on the contours for 1988, 1996 with the project mitigated and 2001 with the project mitigated, Richmond south of the airport should gradually grow quieter. Richmond east of the airport should be noisier in the interim, but should be quieter by 2001 except for Bridgeport which is under the new runway flight path. Here, noise levels should be much the same by 2001 as they were in 1988. Similarly, south Vancouver should be quieter by 2001, except for Marpole which is near the new flight path.

In his analysis of noise impacts on people, Dr. Ward compared 1996 with the project to 1996 without the project, and 2001 with the project to 2001 without the project. For this he was commended by the Community Forum, for a separate analysis in Section 5.3 of the EIS had only compared the 1988 existing case with the 1996 and 2001 project scenarios. This other analysis was somewhat misleading, for it allowed the changing fleet mix benefits to accrue to the new runway, which presented the project in a more favourable light than more strict comparison would have done.

With respect to the current noise environment, witness after witness at the public hearings stated that noise levels are too high. This problem will improve with time as the benefits of the anticipated fleet mix change occur, whether or not the new runway is constructed. This is well illustrated by comparing 2001 without the project to the 1988 existing case. This comparison makes it clear that the future noise environment around YVR should, in due course, be much quieter than at present.

The Community Forum and other participants were concerned about the extent of the $L_{dn}$ and NEF contours shown in the EIS. The figures were limited to the $L_{dn}$ 60 dBA and the NEF 25 contour lines, which gave the impression to people living outside these lines that they would not be hearing aircraft noise. The Community Forum felt that more emphasis should have been placed on SEL contours to reflect the actual noise events which people regularly experience.

### 6.5.4 Single Event Noise Analysis

The Community Forum indicated that people become annoyed because of single noise events that interfere with some activity or task, and the appropriate measure for these is the SEL metric. Transport Canada's noise consultant acknowledged that all measures need to be used in any analysis of the noise environment. Several factors are important in determining the impact of a noise: intensity, duration, frequency and time of day. The $L_{dn}$ and NEF measures are designed to give one number that sums up all of these factors, but they are not totally successful. So it is also necessary to look at SELs, which indicate the intensity and duration of single events, as well as the frequency and the time of day events occur.

Figures 6.18 to 6.20 from the EIS illustrate projected SEL contours for the Stage 2 B737-200 aircraft on existing and parallel runways, and the Stage 3 B737-300 aircraft on parallel runways. The SEL contours presented are for 85, 90 and 95 dBA. The corresponding Lmax values are approximately 75, 80 and 85 dBA respectively.

The 85 SEL contour for the Stage 2 B737-200 covers a large area. The Stage 3 aircraft that will replace it is the B737-300. The 85 SEL contour for this plane (Figure 6.20) encompasses an area only slightly larger than the $L_{dn}$ 60 (Figure 6.10) for all Stage 3 operations on the two parallel runways in 2001. The single event noise that is considered to be the most annoying would therefore be greatly reduced by 2001, whether or not the parallel runway is built.

In his report prepared for the Community Forum, Dr. Piercy criticized the SEL's presented in the EIS on the grounds that the contour lines did not extend beyond the 85 dBA level, which is equivalent to an Lmax of 75 dBA. He pointed out that noise impacts start at about the 65 dBA level and suggested that the 80 dBA and 75 dBA SEL contours should also be drawn. The 75 dBA SEL contour would enclose an area where people would experience 65 dBA outdoors, a much larger area than that enclosed by the 85 dBA SEL contour.

Mr. Mestre, Transport Canada's noise consultant, responded that there are no definitive noise standards, laws or guidelines and in his experience, the 85 dBA SEL contour has been effective at defining the extent of serious airport noise impacts.

The Panel notes that there is considerable doubt about the adequacy of the indicators now in general use. They are often arbitrary and do not well define the level at which concern for noise -should be expressed. This doubt was raised in the testimony of both Dr. Ward and Dr. Piercy. Moreover, the U.S. Environmental Protection Agency is currently investigating the adequacy of noise metrics in the United States because of this doubt.

However, based on the facts before it, the Panel believes that a reasonable threshold for defining the spatial limits of aircraft noise impact would be an outdoor Lmax of 65 dBA, and a corresponding SEL of 75 dBA. While lower SEL values can be annoying to noise-sensitive residents, corresponding Lmax values would be verging on outdoor background noise levels in a typical urban neighbourhood. This conclusion supports the extrapolation of the EIS SEL contours in Dr. Piercy's submission and his analysis of the existing noise regime of south Vancouver and south Richmond. In the case of the south slope, the SEL 75 dBA contour for the Stage 2 B737-200 would be placed near 41st Avenue and South West Marine Drive in Vancouver. It is therefore clear why witnesses from the south slope area stated that current noise levels are intolerable.

To illustrate how this noise regime will change in the future, Mr. Mestre provided a comparison of SELs generated by the Stage 2 B737-200 taking off westward from the existing main runway with the SELs produced by the Stage 3 B737-300 taking off westward from the proposed parallel runway. Details of this comparison are shown in the EIS. At a point on north Iona Island, the 737-300 departing along the new runway would create an SEL of 69 dBA (Lmax 59 dBA) and at 41st Avenue and South West Marine Drive, an SEL of about 59 dBA (Lmax 49 dBA). For the same two points,a Stage 2 B737-200 departing on the existing runway generates an SEL of 78 dBA (Lmax 68 dBA) at Iona Island, and an SEL of 72 dBA (Lmax 62 dBA) at 41st Avenue and South West Marine Drive. Accordingly, the south slope SEL contours from operations on the parallel runway (all Stage 3) should be well below the reasonable threshold level of SEL 75 dBA. While much higher SEL contour values will continue to intrude well into south Vancouver from operations on the existing runway, by about the turn of the century,when YVR has only Stage 3 operations on both runways, homeowners in this area and in south Richmond will experience a significant decrease in SEL noise.

### 6.5.5 Populations Affected by Noise

The best indicator of the level of impact from airport noise is the number of people living within a threshold noise contour and the degree to which individuals are affected.

Transport Canada holds that an NEF of 30 is acceptable as a threshold. On the other hand, Dr. Ward, who uses the $L_{dn}$ metric, indicated that "$L_{dn}$ levels of 60 or greater have some adverse effects on those exposed to them...". $L_{dn}$ 60 roughly corresponds to a NEF of 25. A comparison of $L_{dn}$ and NEF noise levels is shown in Figure 6.3.

In this review, the Panel accepts $L_{dn}$ 60 dBA as the criterion for assessing impact of noise on people. If the parallel runway were not constructed, then for the year 2001, approximately 900 residences would be affected by noise greater than $L_{dn}$ 60. If the runway were constructed about 1500 residences would be affected. In other words, more than 600 additional homes would be affected by the new runway.

Using the same criterion, Dr. Ward estimated that in 2001, some 3100 people would be affected by noise if the runway were not built and almost 3,900 if the runway were built. Thus almost 800 additional people would live in areas affected by noise greater than $L_{dn}$ 60.

However, the Panel notes that the number of persons affected by noise greater than $L_{dn}$ 60 would drop significantly in the 13 years from 1988 to 2001 with or without the project. Transport Canada data indicated that the number of people living within the $L_{dn}$ 60 contour would fall from about 22,000 to 3,000 without the project or 4,000 with the project. Either way, the public in general should experience a significant improvement in noise levels.

The question was raised whether population growth could increase these estimates. Transport Canada used only 1986 census data projected to 1988 and 1990 to compute the number of people and residences affected by noise. It did not include growth factor in its calculations of population. Table 6.1 gives the 1986 census count and the 1991 and 2001 population projections used. It should be acknowledged that some areas are expected to experience significant growth in the next decade. However, except for Cambie Street the neighbourhoods most directly affected by noise are expected to grow slowly over the forecast period. This means that the population affected by noise from the new runway would be somewhat larger than suggested by Transport Canada.

### 6.5.6 Panel Views

Airports are noisy neighbours. Residents of Vancouver and Richmond have expressed concerns about noise through submissions to the Panel and complaints through the airport's hot-line. The Panel believes that the public anxieties expressed are representative of the concerns of a much larger proportion of the population.

Noise analyses suggested that, with or without a parallel runway, the noise environment at YVR will gradually improve for many neighbourhoods surrounding the airport. However, there are legitimate concerns by residents of the Vancouver south slope area that their noise environment could deteriorate. After all, the parallel runway would be located a mile closer to their homes.

Transport Canada attempted to assure residents that its mitigative measures would result in little or no increase in noise levels near the airport. In fact, it suggested that with improved aircraft technologies, noise levels should decline. However, many residents *remain concerned and in submissions and hearing presentations, several participants suggested additional or alternative mitigation measures.*

TABLE 6.1

POPULATION GROWTH IN AIRPORT NEIGHBOURHOODS

| | 1986 Actual | 1991 Projected | 2001 Projected | % Chg 1991-2001 |
|---|---|---|---|---|
| Richmond | | | | |
| *Sea Island | 719 | 715 | 747 | 4.5 |
| *Bridgeport | 1,289 | 1,518 | 1,628 | 7.2 |
| • Cambie | 7,536 | 9,287 | 14,703 | 58.3 |
| Town Centre | 1,769 | 20,642 | 30,651 | 48.5 |
| Thompson' | 8,221 | 8,215 | 15,350 | 86.9 |
| Vancouver | | | | |
| *Westside[2] | 43,015 | 43,707 | 44,121 | 0.9 |
| • Kerrisdaie | 12,355 | 12,656 | 12,798 | 1.1 |
| *Marpole | 17,350 | 18,250 | 19,594 | 7.4 |

*Neighbourhoods most directly affected by parallel runway.

Source: Based on Transport Canada data obtained from local planning departments.

[1] The Thompson Planning Area includes the Terra Nova site where a large development was proposed and is now on hold. The Thompson area is south of the existing main runway.

[2] The Westside Planning Unit includes Dunbar-Southlands and West Point Grey. While Southlands is adjacent to the airport, much of this area is somewhat distant from the airport.

The Panel believes that the mitigative measures proposed by Transport Canada must be strengthened to protect surrounding neighbourhoods from noise. In Section 6.6, it recommends a mitigation program which adds to Transport Canada's proposed initiatives.

A number of points became evident to the Panel:

1. a more comprehensive noise monitoring network is required around YVR;

2. persistent fears were expressed by many interested parties, including the Musqueam Band, that the fleet conversion to Stage 3 may not take place as forecast, and that the Stage 2 noise environment at YVR would therefore not improve as quickly as Transport Canada has indicated;

3. any fleet conversion slow-down would have minimal effect on the noise environment associated with the new runway, as it would almost always be restricted to handling Stage 3 aircraft only;

4. mitigation measures could be strengthened to further improve the new runway noise environment, as well as that for the existing runways;

5. sideline noise levels north of the new runway would be considerably less than those now created by Stage 2 aircraft on the existing runway. This means that residents of Southlands, the south slope and the Musqueam Indian Band's lands, would notice an improvement in the noise regime in their areas, particularly with respect to SEL contours, as YVF? gradually becomes a Stage 3 airport; and

6. SEL contours such as those shown in Figure 6.18 and 6.19 would, continue to intrude well into the south slope area of Vancouver and into south Richmond, because of ongoing Stage 2 operations on the existing main runway until about the turn of the century. However, as fleet conversion progresses, the frequency of these single event noise levels would decrease. Occurrences during silent hours, 11:00 p.m. to 7:00 a.m., could be eliminated immediately (see mitigation recommendations in section 6.6.5).

## 6.6 Conclusions and Recommendations on Noise Propagation

The following recommendations are addressed to Transport Canada; some should be acted upon immediately.

### 6.6.1 Noise Management Committee

Noise is a sufficiently important issue that it deserves a special independent policing authority. The Panel believes the existing Aeronautical Noise Management Committee, subsequently referred to as the Noise Management Committee, should be strengthened as recommended below. The existing Committee is chaired by Transport Canada and its membership includes representatives from the airlines, air associations, the City of Vancouver, the City of Richmond and the Musqueam Indian Band. There is also a citizen representative from Vancouver and one from Richmond is being appointed. The mandate of the present Committee is to provide advice to Transport Canada on methods and procedures to improve noise management at YVR.

The Noise Management Committee should be responsible for advising on the implementation and monitoring of all noise abatement, mitigation and compensation recommendations. It should be provided with all the powers it needs to accomplish its mandate.

**2. The Panel recommends that the Noise Management Committee:**

**a) promote the goal of achieving and maintaining the noise environment around YVR in a state not worse than that described in the EIS for the year 2001 with mitigation;**

**b) monitor and evaluate the noise environment around YVR on a continuous basis, including investigation of the noise regime created by all airport operations, their effects on residents and the effectiveness of noise mitigation and compensation measures;**

**c) report periodically on the noise environment around YVR including the publication of:**

i) **the results of monitoring and any other studies that it may carry out; and**

ii) **an independent annual public report describing the state of the noise environment during the previous year and mitigative measures taken to abate noise;**

**d) investigate measures for identifying and abating noise problems and advise Transport Canada on the development and evaluation of appropriate mitigation and compensation programs, such as those recommended by the Air Transportation Association of Canada (ATAC) limiting quiet hour use of stage two aircraft and the provision of run-up noise barriers; and**

**e) address its recommendations to YVR management, which shall carry out these recommendations or show cause why it is not able to do so.**

**3. The Panel recommends that the Noise Management Committee:**

**a) consist of representatives appointed by Transport Canada, the Canadian Airline Pilots Association, the Air Transportation Association of Canada, the Canadian Air Traffic Control Association, the City of Vancouver, the City of Richmond, the Musqueam Indian Band, and at least two representatives of citizen groups for each of the Cities of Vancouver and Richmond;**

**b) be a permanent, self-governing body located in Richmond and operated independently of Transport Canada;**

**c) be provided by Transport Canada with a budget adequate to carry out whatever program it deems necessary for the performance of its duties;**

**d) have access, within a reasonable period, to any records which Transport Canada may compile in the course of its own noise control, abatement, monitoring and other relevant programs; and**

**e) be separate from any environmental review committee whose duty is to consider impacts on land, air and water quality, and fish and wildlife.**

### 6.6.2 Complaints Hotline

The establishment of a Noise Management Committee will provide an essential channel for the public to address its concerns to airport management. At the same time, the operation of a complaints hotline provides a day-to-day opportunity to register complaints about specific events. As discussed previously in section 6.4.2, Transport Canada operates a noise hotline which attracted considerable criticism in the public hearings. The Panel suggests that the Noise Management Committee review the operation of the hot-line and make recommendations for improvement.

### 6.6.3 Aircraft Track Monitoring

Some participants asked why Transport Canada was relying on a complaint system instead of using technology to monitor all flights directly. Technology now being planned for YVR would have the capability to track all aircraft, and these data could be correlated with noise data. A track monitoring system could thus be used to police noise regulations, allowing noise abatement officers to warn or fine all violators, not just those flagged by citizen complaints. Such a system could be on-line in four years.

**4. The Panel recommends that as new aircraft tracking technologies are developed at YVR through the implementation of the Radar Modernization Program (RAMP) and the Canadian Automated Air Traffic System (CAATS), airport management use these systems to identify and obtain evidence against aircraft deviating from approved noise abatement procedures and thereby causing noise disturbance.**

### 6.6.4 Enforcement

The Noise Management Committee should encourage noise abatement officers to enforce noise regulations and prosecute offenders. The Panel suggests that public goodwill be harnessed as a means of deterring regular noise offenders. In the past, airport management has fielded public complaints about noise and has also dealt with offenders. This not only puts airport management in the role of middleman, hearing complaints from both sides, but also preserves the anonymity of offenders.

The public may be sympathetic to a responsible firm that occasionally creates a noise disturbance, but not to chronic offenders. Transport Canada indicated at the hearings that it would consider publishing the names of noise offenders. The Panel urges the Noise Management Committee to identify operators who violate noise abatement procedures, and to publicize the names of chronic offenders widely in the media.

### 6.6.5 Operational Measures

Several operational restrictions could be imposed which would reduce the level of noise reaching residential areas at critical times. Transport Canada already suggested some of these as described in section 6.5.2.

Additional operational restrictions suggested at the hearings included:

- a quiet period between 8:00 p.m. and 1l:OO p.m.;
- a ban on departures between 11:00 p.m. and 7:00 a.m.;
- Stage 3 operations only between 11:00 p.m. and 7:00 a.m.;
- no night-time run-ups;
- designated run-up areas and periods;
- controls on flight paths approaching and leaving YVR;
- controls on the use of reverse thrust; and
- greater control over height restrictions and trajectories which aircraft must observe when approaching or departing YVR.

The Panel believes Transport Canada's recommended mitigation program would reduce noise impacts from the parallel runway at YVR. However, it believes these measures should be strengthened with additional conditions. The intent of these conditions is that the parallel runway should be operated primarily as a Stage 3 arrival runway until capacity constraints at YVR necessitate otherwise.

5. **The Panel recommends that:**

**a) the parallel runway be operated as an arrival runway, except when departures are necessary for emergencies or routine maintenance of the main runway, and in due course when routine departures become necessary because capacity limits of YVR have been reached;**

**b) only Stage 3 aircraft be permitted to operate on the parallel runway, except when Stage 2 operations are necessary for emergencies or routine maintenance of the main runway;**

**c) all operations on the parallel runway be banned from 10:00 p.m. to 7:00 a.m., except when night-time operations are necessary for emergencies or for routine maintenance of the main runway; and**

**d) landings on the parallel runway be conducted with the aircraft in the least noisy configuration possible and with minimal use of reverse thrust for braking, consistent with the principle that there be no compromise of air safety, and in compliance with applicable procedures of the International Civil Aviation Organization.**

With respect to the existing noise environment, the Panel noted that the operation of the main runway at night was the source of 58 percent of airport noise complaints in 1990. Night-time operations should be more carefully regulated in the future to ensure a quiet period in the airport area. This

should include a ban on the operation of Stage 2 aircraft at night as suggested at the hearings by the Air Transportation Association of Canada. It should also include a review of flight paths and altitudes of aircraft using the airport at night as well as during the day. The goal should be to minimize over-flights and increase the height of all flight paths over residential areas. The Panel suggests that the Noise Management Committee review public concerns about night-time operations at YVR, and take appropriate action.

### 6.6.6 Community Planning

It would obviously be helpful if airports had no people around them to be affected by noise. But that is beyond the control of airport authorities. Instead, it is in the domain of the provinces, which normally delegate some of their power to municipalities by empowering them to control the use of land through official plans and zoning.

There are three potentially useful steps municipalities could take to minimize the impact of noise on people, if they are authorized to do so by the provincial government. First, they could attach caveats to all land titles in the vicinity of airports to make sure that everyone who buys land is aware of the risk of noise. Second, they could zone land appropriately — for agriculture or industry, for example — to ensure that as few people as possible are disturbed by airport noise. Third, they could regulate building design and construction to ensure that buildings insulate their inhabitants against noise as far as possible.

The more developed an area already is, the less effective these approaches are and the more difficult it is politically for municipalities to limit neighbourhood growth to lessen the impact of noise. In addition, the attachment of caveats to land titles and the use of building codes are not always easy to implement. Nevertheless, the Panel believes that in the Bridgeport area of Richmond, which would be subjected to increased noise from the parallel runway, an attempt should be made to do whatever is still possible to limit noise impacts. The Panel also believes it would be useful if the provincial government, which has jurisdiction over the necessary powers, were to participate in a pilot study in Richmond in much the same way as the Government of Alberta collaborates with the municipalities affected by airport noise in that province. The Alberta government has an Airport Vicinity Protection Area policy. The policy is usually applied in cooperation with an affected municipality in order to respond to local circumstances.

**6. The Panel recommends that the B. C. Ministry of Municipal Affairs seek the cooperation of the City of Richmond in a pilot project focused on the Bridgeport area of Richmond with the objective of investigating how airport noise impacts in British Columbia might be minimized through the use of provincial and municipal regulatory powers.**

### 6.6.7 Physical Barriers

Physical barriers are sometimes used to shield people from noise impacts. Two types of barrier were discussed at the public hearings — engine run-up noise barriers and a berm.

#### Run-up Noise Barriers

Several participants in the review process objected to noise from engine run-ups especially at night. Engine run-ups are a necessary part of maintenance operations at the airport, but they are also a source of annoyance, particularly at night and during periods of atmospheric inversion. During the hearings, the Airport General Manager made a commitment to investigate run-up barriers as a potential mitigative measure for engine run-up noise. The Panel believes that this commitment must be followed-up immediately.

#### Berm

The Angus Place Strata Corporation submitted a well-developed proposal for a berm. The berm would be located north of the parallel runway on Sea Island, and would serve to shield residents of the Southlands neighbourhood from ground noise. It would also lessen the visual impact of the runway. According to the proposal, the berm would need to be 9 to 10 m high, 2,000 m long, and 40 m wide and would require about **400,000 cu** m of fill. The presentation argued that the cost of the berm could be covered by a dumping fee for the fill.

During considerable discussion at the hearings it was argued that under ideal conditions the berm could result in an attenuation of 15 decibels for residents of Southlands. There was discussion as to what a more common attenuation would be farther to the north, and it was pointed out that the effect of the berm would last only as long as the planes were on the ground and shielded by the berm.

The Panel believes that the proposed berm would have only limited value as a noise shield, primarily because of the limited size of the population it might shield from noise.

## 6.7 Compensation

It is to be expected that Transport Canada will, in its own interests, do everything possible to abate and mitigate noise from airport operations. Nevertheless, parts of the Bridgeport area of Richmond will suffer new levels of noise as a result of the proposed runway. Other areas too, notably the Marpole area just north of the runway, may be exposed to new noise impacts. It is necessary to give some thought to the plight of people living in such newly-affected areas.

The Panel believes very strongly that it is no longer acceptable for a new airport development to subject neighbouring areas, routinely and as a matter of right, to excessive sound levels. This certainly applies to levels which interfere with sleep, disrupt conversation and undermine health. If there is no alternative to the development, and if abatement and mitigation have been taken as far as possible, then some form of compensation should be made available to those affected.

There is nothing altruistic or revolutionary about this viewpoint. The people affected will suffer measurable economic loss through reduction of their property values, to say nothing of purely personal effects on their daily lives — they should be able to sleep at night and use their patios and gardens like

anybody else. On the other hand, it has been shown by Transport Canada that the new runway is highly desirable in economic terms and capable of generating considerable revenues. That being so, noise compensation should simply be regarded as a legitimate charge against the runway -a cost of running the airport.

It is not possible at this stage to say precisely what the cost of noise compensation will be. However, the Hickling report to Transport Canada estimated the probable cost at about $43 million. This did not appear to trouble Mr. Chester Johnson, Chairman of the Vancouver International Airport Authority (VIAA), who stated at the hearings that such additional costs would not cause any difficulty for the VIAA in the bond market. The actual noise cost to be compensated would not be known until after the proposed runway were in operation. Nevertheless, the Panel believes that a substantial noise compensation program should be accepted in principle, to be implemented as found necessary.

However, it is not a simple step from compensation principle to practice. No one knows just what the noise regime will be several years from now, or how many people will be affected, how they will be affected, and what kinds of housing there will be in the noisy zones. The first order of business (in line with Dr. Ward's recommended approach, section 6.4.3 above, and supported by Dr. Piercy) should therefore be a program of data collection on the existing YVR noise regime and its impact on people, by means of social and building surveys. Research on compensation measures would be a part of this initial activity. The overall objective of the studies involved (described in section 6.8 below) would be the application of the results to the YVR noise regime, both before and after the new runway is operational, for the benefit of the airport neighbours.

It is the Panel's view that an effective compensation program must have many facets. The following general principles may be of preliminary assistance to the Noise Management Committee.

### Possible Compensation Options

- relocation assistance for people who wish to move away;
- house sale value guarantee for people who wish to move away;
- house insulation for people who wish to stay. This does not appear to be a wholly satisfactory solution as it does not help with outdoor activities and may still leave people unhappy with the noise situation in general;
- insulation of churches, schools, community and recreation centres, old age homes and vulnerable industries;
- community betterment programs; for example, contributions to municipal programs for community centers, libraries and day care centers in noise-affected areas; and
- annual tax rebates, as used by the City of Edmonton, for those not benefitting from other types of compensation.

### Possible Eligibility Rules

- only people newly affected by noise from the parallel runway should be eligible for compensation;
- in areas of fairly continuous noise, people living within the $L_{dn}$ 60 contour should be eligible; in areas of sporadic noise judged to be harmful, people living with the SEL 75 contour should be eligible;
- the more severe the noise exposure, the more generous the compensation options should be;
- factors considered in judging eligibility could include people's ages and length of residence;
- special attention should be given to people who are particularly sensitive to noise and likely to suffer unusual distress. Sensitivity to noise can be measured by audiologists with some measure of reliability. This might be one effective way of dealing with serious complaints from SEL zones, although such people are likely to be more interested in effective mitigation than in compensation; and
- renters of apartments should be eligible as well as owners, although compensating them may be administratively cumbersome.

**7. The Panel recommends that a noise compensation program for those affected by the proposed runway, along the lines suggested in this report be accepted in principle and referred to the Noise Management Committee for study and action.**

## 6.8 Monitoring, Mitigation and Compensation

### 6.8.1 Monitoring

Noise monitoring is required to provide information needed for decision-making on both mitigation and compensation. However, the Panel believes that essential requirement cannot be met by the existing YVR noise monitoring network; a more comprehensive network must be installed. Not only would such a network permit a more adequate definition of the existing YVR noise regime, and how it changes over time, but also — and of greater significance insofar as the new runway is concerned — it would enable precise evaluation of the incremental noise impact of the aircraft operations on the new runway. This would replace the estimates (forecast) used so far of the numbers of people or residences affected. Accordingly,

**8. The Panel recommends that at least one new noise monitoring site be established in the Marpole area (e.g. Oak Street and 70th Avenue) and two more in the Bridgeport area of Richmond.**

### 6.8.2 Existing Noise Regime — Identification of Noise Zones

The first step in monitoring (following the establishment of the new noise monitoring sites) is to measure accurately on the

ground the extent of the existing noise zones. From the discussion of cumulative noise metric contours and the Single Event Noise analysis at section 6.5 above, it will be apparent that SEL contours more accurately reflect noise annoyance than do $L_{dn}$ or NEF contours. Accordingly, the existing noise regime should be defined in zones of $L_{dn}$ out to the $L_{dn}$ 60 dBA contours and in zones of SEL's, out to the SEL 75 dBA contour. These "baseline" depictions of the existing noise regime should be updated annually in order that changes in the regime can be measured accurately, both before and after the commissioning of the new runway.

**9. The Panel recommends that:**

**a) the Noise Management Committee, with the assistance of Transport Canada, carry out detailed surveys of the existing noise environment, commencing in 1991, to identify existing noise zones out to the $L_{dn}$ 60 dBA contour, supplemented by SEL zones out to the SEL 75 dBA contour; and**

**b) in conjunction with the above and with a view to possible clarification of apparent noise anomalies in the south slope of Vancouver, the Noise Management Committee and Transport Canada develop an ongoing research program involving topographic and meteorological aspects of noise in the south slope area.**

The next step in monitoring is to accurately identify households affected in the delineated noise zones, the types of buildings in these zones, and the type of noise impacts that are occurring together with the reaction of people to such impacts. Only by doing this is it possible to determine how airport operations are affecting people and what might be done about these effects, now and in the future.

**10. The Panel recommends that:**

**a) the Noise Management Committee carry out a social and building survey of the numbers and the characteristics of residents in the delineated baseline noise zones, their living patterns, their sensitivity to noise and the condition of their homes. Questions to be asked in this survey should include people's reactions to major impacts including speech masking, sleep disturbance, health effects and annoyance; and**

**b) the Noise Management Committee simultaneously conduct research on possible noise mitigation and compensation measures, including commissioned independent professional research and visits to airports which have effective mitigation, compensation and public consultation programs.**

### 6.8.3 Future Noise Regime — Mitigation and Compensation Policies

On the basis of the above surveys, the Noise Management Committee (NMC) should be able to identify the full range of alternative mitigation and compensation schemes which could be applied to noise problems. While some mitigative actions may well be possible insofar as the continuing Stage 2 aircraft noise from the existing runway is concerned, the Panel's concern with the future relates specifically to people newly-affected by noise from the new runway.

**11. The Panel recommends that:**

**a) the base case for determining incremental effects of noise be the most recent set of $L_{dn}$ contours prior to the opening of a new runway;**

**b) these be updated annually thereafter; and**

**c) incremental noise impacts be identified using the $L_{dn}$ 60 as the cut-off cumulative noise level and SEL contours out to the 75 dBA level, together with frequency of occurrence for sporadic noise, in order to enable the NMC to determine incremental impacts warranting compensation.**

Such a continuing noise monitoring program will identify how the noise contours change with time and will enable the NMC to advise Transport Canada on the development, implementation and evaluation of mitigation and compensation policies and programs.

In conclusion, the Panel wishes to re-emphasize the crucial importance of noise abatement. It believes that if its various recommendations are accepted, the noise regime around YVR can be made acceptable to neighbouring residents, both later, if a new runway comes into being, and perhaps more important, now. The Panel believes that nothing would do more to create a good image for YVR than sympathetic and rigorous attention to citizens' noise sensitivities.

## 6.9 Non-airport-Related Noise Problems

During the public hearings, a number of participants raised noise concerns not directly related to the proposed parallel runway. In this section, the Panel brings these concerns to the attention of Transport Canada for action.

Several participants objected to noise from seaplane and helicopter traffic on the Vancouver harbour-Victoria and Vancouver harbour-YVR routes. Air safety dictates that aircraft on these routes fly either directly over the terminal facilities at YVR, where landing and departing aircraft are closest to the ground, or fly some distance around the airport. Participants complained that these aircraft fly too low over residential areas of Vancouver. They contend that this creates excessive noise in these areas. One resident indicated that "on the long summer days there can be less than six hours each day that residents aren't hearing these flying chain saws." Noise from the Victoria-Vancouver flights is a common complaint that should be investigated by the Noise Management Committee. The Committee should review flight paths and schedules for Vancouver-Victoria flights to determine if noise from these flights can be reduced.

A second concern arises from aircraft flying low over Wreck Beach on Point Grey. Ms. Judy Williams, Chair of the Wreck Beach Preservation Society, presented a brief which argued that helicopter noise near the Beach was "deafening" and potentially affected wildlife, especially a heronry in Pacific Spirit Regional Park. She indicated that sudden bursts of noise with helicopter flyovers exceed noise standards for areas such as Wreck Beach; and that flyovers occur frequently in the summer peak usage period for the Park. Ms. Williams cited studies indicating that noise from helicopters is more stressful for animals than noise from fixed-wing aircraft and

Professor Richarz, a Technical Specialist on noise, indicated that helicopter noise is similar to that sometimes used to chase wildlife away from runways. The Panel suggests that the Noise Management Committee examine this issue, including the possible need for a review of the environmental and recreation implications of this traffic.

A third issue also relates to Wreck Beach. Beach users complained about float planes that practise touch-and-go landings and take-offs, or inspect log booms. They also complained of other aircraft "wiggling their wings and deliberately buzzing" the clothing-optional beach. Ms. Williams estimated that some of this traffic is as little as 30 to 50 feet above assembled groups of people. Transport Canada indicated that operation of the parallel runway would alleviate some of the noise problems of Wreck Beach. Mr. Matthews also said that Transport Canada would "certainly undertake increased surveillance to that area" and could put an officer at Wreck Beach to observe aircraft and lay charges against violators.

Finally, the Panel heard many complaints regarding noise from low flying aircraft in general and non-observance of flight routes over urban areas where,it was argued,less noisy arrival and departure paths to and from YVR might be feasible. Even though these were generally not related to the parallel runway, similar complaints can be anticipated arising from traffic on that runway. It would, therefore, be advisable for YVR management and the Noise Management Committee to address the questions of height and specific flight paths which may be used by aircraft in the vicinity of YVR.

# Chapter 7

## ENVIRONMENTAL ISSUES

**Alex Tunner — Angus Place Strata Corporation**

*"... we have heard a lot about the Yellow-headed Blackbird — I a/ways* forget what co/our it is — or *Black-headed Yellow Bird. But in any case, I think we should a/so remember the Grey-headed Taxpayer whose habitat surrounds this airport".*

**Terry Slack**

*"... at stake here is not only the development of Sea Island and a third runway but the future of an estuary, with its relationship to the continuation of salmon production and wildlife, and to my livelihood. "*

**Wendy Tuner — Community Forum**

*"Where are the voices who speak for the wildlife? There is no chamber of commerce for the birds of Wrangel Island. There is no association of nesting sites for Yellow-headed Blackbirds. There is no society for the protection of eelgrass beds. There is no Barn Owl hotel keepers association. Wildlife has no association to speak for them, only community groups such as the Fraser River Coalition, the Vancouver Natural History Society, the Boundary Bay Conservation Society. Is this not an unfair contest?"*

# 7.0 ENVIRONMENTAL ISSUES

This chapter discusses the environmental effects of the parallel runway project and proposes ways and means to address these effects. This search for remedies has considerable significance, for the project has been under consideration for decades and its opponents perceive it as a symbol of the outlook for the Fraser River estuary. They sense that what is done with this project will foreshadow development in the future. The Panel shares that sense and hopes that out of this review principles will emerge which promote the sustainable management of the estuary.

## 7.1 The Fraser River Estuary Environment

No assessment of a development project on the Fraser River estuary would be complete without considering the unusual importance of its environmental resources. The estuary is not only one of the most valuable — and vulnerable — habitats in Canada, but one of international significance. Yet scientists, governments, the Musqueam Indian Band and the general public have expressed serious concerns about its future.

Of the estuary's environmental resources, the two most celebrated are the birds and the fish. The estuary is host to two of the world's natural wonders: the great migratory bird flights of the Pacific Flyway and the trans-Pacific salmon migration cycles.

The Pacific Flyway is a migratory route of birds which links breeding grounds in the eastern Soviet Union, Alaska and Canada with wintering areas in the southern United States, Central America and South America. The extensive marshes and mud flats of the Fraser River estuary and its mild winters attract migrating birds from three continents. Indeed, the estuary supports the highest winter density and diversity of water birds, shorebirds and raptors in Canada. The number of birds in the estuary exceeds the criteria established by the Ramsar Convention[3] by 30-fold for waterfowl and 60-fold for shorebirds. The estuary is therefore a major resource by any standard. Despite the essential role the delta plays in the Pacific Flyway, only one percent of the habitat has been protected by legislation for the primary use of wildlife. Additional areas are protected by private organizations and park designations, but the vast majority of critical habitats are virtually unprotected.

The second natural wonder is the migratory cycles of the five species of salmon that depend on the estuary. Each year cohorts of salmon are hatched in the waters of the Fraser River system, and live in its various habitats until they are ready to swim to sea. The estuary is a unique area in the system, in which some species acclimate to the saline environment of the sea and continue their growth, and through which they pass on their return journey as adults ready to spawn.

[3] The Ramsar Convention: The International Convention on Wetlands of International Importance, especially for Waterfowl Habitat, 1971.

An integral part of the estuary scene is the Musqueam Indian Band, which has a unique relationship with Sea Island's resources. For millennia, the Musqueam Indian Band has used Sea Island for hunting waterfowl, sturgeon fishing, salmon fishing, spiritual activities and cultural ceremonies. It is within their traditional lands and is part of their land claim. The Musqueam Indian Band continues to use McDonald Slough, Swishwash Island and other habitat areas surrounding Sea Island; its members also hunt upland game birds, such as pheasants and grouse, on the island. Prior to the present generation, the Musqueam Indian Band was self-sufficient based on local natural resources, but these have declined over the years. Some of the habitats used today are threatened directly by the parallel runway proposal.

Living resources of the Fraser River estuary depend on a clean environment for their survival. This environment can be affected by several factors. The most significant of these are habitat loss and water quality, but air pollution, noise pollution and human presence also have effects.

## 7.2 Birds

### 7.2.1 Resource Information

In the mountainous topography of British Columbia, less than 2.3 percent of the coastline is important estuarine habitat, and most of this is on the southwest coast. YVR is located on the northwestern edge of the Fraser River estuary, the largest estuary on the coast. By far the most serious impact on living resources of the estuary has been the steady loss of habitat over the past century. Already much of the original habitat has been irretrievably lost to urban development.

For thousands of years, native people have fished and hunted birds in the delta. Since the arrival of the Europeans in the mid-19th century, however, about three quarters of the flooded portion of the Fraser delta has been diked, drained and cultivated. The river is now controlled by 500 km of dikes which extend along most of the shores of the delta. Following permanent diking, which began after 1894, the land was cleared and drained, and the natural cycles of flooding were halted. These changes permitted the expansion of agriculture on the delta. The construction of bridges and the Massey Tunnel stimulated the urbanization and industrialization of the diked lands south of the North Arm.

Existing data bases are too limited to permit an accurate estimate of the historical impact of settlement on wildlife since the Europeans first arrived. However, it is known that the Snowshoe Hare, Roosevelt Elk, cougar, wolf, Yellow-billed Cuckoo, Purple Martin, Western Bluebird, Horned Lark and Burrowing Owl have all been extirpated. In addition, the Black Bear, Sandhill Crane, Common Barn Owl and Yellow-headed

Blackbird are threatened. Reduction of tidal, brackish marshes to about 20 percent of their extent a century ago is estimated to have reduced fall duck populations from possibly 350,000 to 86,000. Brant populations have declined as well. In contrast, the number of open-country or habitat-edge species increased with the development of agriculture. It is estimated that 1.4-million birds currently use the delta each year during the peak of migration. The monthly average over the entire year is half a million birds, the most abundant groups being shorebirds and ducks.

The first Europeans began farming on Sea Island in 1862. Since then it has experienced agricultural, residential, road, industrial and airport use. There have been waves of impacts which have reduced the habitats and numbers of some bird species, while creating habitat for others. The latter include some rare species such as Yellow-headed Blackbirds and Common Barn Owls as well as nuisance species like starlings. Because of this history, it is difficult to estimate the historical carrying capacity of Sea Island for birds.

Although the airport has operated for decades in its present site, few studies have been conducted to determine the effects of existing operations on bird populations. For example, there have been no empirical studies of the effects on birds of takeoffs and landings crossing Sturgeon Bank, although Transport Canada used data from other locations to assert that the birds affected would quickly habituate to increased noise. There are no empirical data available concerning the effect of Transport Canada's Bird Strike Control Program. Also, there are no studies to determine the possible effects of the new approach lighting system which would extend more than 500 m beyond the dike. Lastly, no studies have been done to determine how much land dedicated to wildlife preservation would be required in the Airport North area to ensure sustainable populations of the species which have traditionally used this habitat.

### 7.2.2 Bird Habitat on Sea Island

The EIS limited most of its discussion of bird habitat to Sea Island and the immediate foreshore. There was little discussion of areas surrounding Sea Island and the inter-relationships of birds and habitats. The following discussion provides a context for the Panel's conclusions concerning birds and bird habitat.

#### Aquatic Habitats and Species

The habitats of Sea Island and vicinity support a diversity of bird species including waterfowl, shorebirds, passerines, herons and several species of raptors. At least two species, Yellow-headed Blackbird, and Common Barn Owl are rare, and other rare species have occasionally been observed. The birds of Sea Island occupy two types of habitat: aquatic and terrestrial.

There are several types of aquatic habitat in the Sea Island area. About 90 percent of these lie outside the dike on the Sturgeon Bank foreshore and in McDonald Slough. The largest expanse is the Sea and Iona Islands portion of Sturgeon Bank which includes marsh, sandflat and mudflat habitats.

There are three zones of marsh habitat near Sea Island. An inner zone near Sea Island supports the greatest plant species diversity, with cattail and sedge predominating. This is the most productive zone for bird species. A middle zone is dominated by bulrushes. Finally, there is an outer zone consisting of a second type of bulrush and unvegetated areas. Seaward of the marsh are extensive areas of sand and mudflats. Plants of these marshes are an important waterfowl food source, making the marshes one of the most successful waterfowl production areas in the region. It has been estimated that while Sea Island marshes represent only 8 percent of the total Fraser delta marsh area, they support almost 13 percent of the delta's waterfowl population from fall through spring migration. This productivity could conceivably be enhanced significantly as the foreshore recovers from the effects of the sewage residue previously discharged by an outfall (now replaced) from the GVRD's sewage treatment plant on Iona Island. It could be enhanced even further if McDonald Slough were allowed to flow freely onto Sturgeon Bank through breaching of the causeway which now cuts it off.

The total area of marsh and estuarine habitat on the North Arm has been estimated to be about 226 hectares. Over 95 percent of this habitat is in the Sea Island, Middle Arm and Iona Island areas, including McDonald and Woods Island Sloughs, and the Musqueam Marsh. These habitat areas have been given the highest rating, primarily for conservation purposes, by the Fraser River Estuary Management Program (FREMP).

Several projects have been undertaken, or are envisaged, to enhance and rehabilitate estuarine habitat in the area. These include: work by the Vancouver Parks Board at the Fraser River Park; possible habitat enhancement on Iona Island by the GVRD Parks Department; possible breaching of the Iona causeway (as above); enhancement activities by the federal Department of Fisheries and Oceans (DFO) in McDonald Slough; and salmon enhancement activities by the Musqueam Indian Band.

Upland components constitute the remaining 10 percent of aquatic habitat of Sea Island. They consist of roadside ditches and a few cattail marshes and hardhack (brush) swamps. Unfortunately, diking destroyed almost all of the original seasonally-flooded meadows and bog habitats. There are approximately 8.5 km of ditch-side vegetation in the Airport North area.

The upland aquatic habitat has unique value to certain species, including the rare Yellow-headed Blackbird, which occupies a 2.7 ha cattail marsh in the Airport North area. This is the only permanent breeding colony west of the coastal mountain ranges and north of Southern California, and the only significant breeding colony in Canada. It has been placed on the "Blue List" as rare or vulnerable by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The Yellow-headed Blackbird is a recent arrival in the delta, and its rarity is due to limited suitable habitat. Transport Canada considers the loss of this habitat significant and is attempting to reestablish new colonies throughout the Lower Mainland region. The Yellow-headed Blackbird marsh is also used for nesting by other birds, such as the Sora and Virginia Rails, and as a roosting area by many shorebirds.

Another species of concern is the Great Blue Heron which uses a variety of salt, brackish and freshwater **environments.** This bird forages in natural marine and riverine **environments** as well as in old farm fields, and the Fraser River estuary is its major wintering area. Heron colonies are usually located in mature forests where they nest in tall trees in secluded areas relatively free from disturbance and near foraging areas. However, they are occasionally found in areas of high disturbance such as Stanley Park and Sea Island. Although most tall trees were cut down when the estuary was settled, a number of herons gather on Iona Island from a nesting colony on the nearby University of British Columbia endowment lands to feed on fish in tidal pools. Great Blue Heron nesting areas are also reported in two locations on Sea Island. Bird experts expect heron numbers to decline if more of their habitat is lost. Although the Great Blue Heron is not uncommon on the coast, it is a very popular bird with bird-watchers, recreationalists and tourists. Furthermore, it has symbolic value to the general public as a natural symbol of the estuary.

### Terrestrial Habitats and Species

When the Musqueam Indian Band occupied the area, Sea Island consisted of an expanse of tidally inundated lands and stream channels which supported various waterfowl. Later, the island was diked and settled by farmers, and some residential subdivisions were built before Transport Canada acquired the lands for airport use. As a result, the terrestrial habitat of Sea Island has been significantly altered by human use. The Airport North area now consists of hay fields, cultivated fields and pastures, woodlands, transitional areas of shrubs and small trees, abandoned orchards and gardens, hedgerows and disturbed lands. The Vancouver Natural History Society reported that 253 species of birds used the Airport North area in the mid-1980's.

The fields and pastures of Sea Island represent 60 percent of the total terrestrial habitat. They are essential to maintain current waterfowl populations, which use the fields primarily for feeding and resting. Among the other birds using it are the Great Blue Heron, numerous raptor species, starlings and various water birds. Waterfowl and shorebirds frequent flooded parts of the fields, but urban development has steadily reduced this habitat type.

At least six species of owl have been observed in the former Cora Brown subdivision. With a high density of trees and shrubbery, this subdivision is prime owl and passerine habitat. The Common Barn Owl is one the most important species on Sea Island. It has recently been declared a "rare" species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and is restricted in Canada to southwestern B. C. It is on the Provincial Blue List and the EIS indicated it is deserving of status on the more critical Red List because of its declining population. Although British Columbia is at the northern end of its North American range, barn owl populations in the province are among the densest on the continent, with a population in B. C. of about 1,000 birds. Common Barn Owls depend on agricultural fields for their diet of small mammals, with 65 to 85 percent of their diet consisting of Townsend's Vole. These owls use the agricultural areas of Sea Island, but are more common on Westham and Reifel Islands. Most of them nest in man-made structures such as old wooden barns, abandoned buildings and silos, although they also frequently roost and occasionally nest in hollow **trees.** As a result of the removal of many of the old buildings on Sea Island, barn owl numbers have declined and clearly will decline further if their habitat is not preserved. However, this species is known to respond well to nest box programs.

The Short-eared Owl also inhabits Sea Island. The island was formerly home to over half of the Lower Mainland population of this species, but its numbers have also decreased. This owl prefers open grasslands, agricultural areas, wet marshes, open brush fields and upper beaches. It often roosts in dry cattail stands and on the landward side of dikes. As part of the bird-control program in the 1960's, over 400 Short-eared Owls were trapped at YVR and released at various sites from California to Alaska. Only 8 percent returned. The Short-eared Owl population will decline even further if habitat is not preserved.

A few Burrowing Owls, a rare species, were formerly concentrated in the Sea-Iona Island area, the last known breeding pair having been observed in 1976. They are considered to be extirpated.

Hedgerows, shrubs and woodlots on Sea island provide cover and nesting areas for many birds which also use adjacent fields for forage. There are approximately 45 km of hedgerow in the Airport North area. In recent years, many edge habitats such as hedgerows have been eliminated in the Fraser Valley as agricultural practices have changed to reduce farming costs. This has seriously reduced essential habitat for many bird species.

One important area of terrestrial bird habitat on Sea Island consists of the abandoned Cora Brown and McDonald subdivisions. The hedgerows and shrubbery of these areas are extensively used by raptors, passerines and other birds as nesting, roosting and feeding areas. Townsend's and Oregon voles are particularly common here and these mammals provide a food source for raptors and herons.

In short, the upland habitat of Sea Island plays an important role in the life-cycle of waterfowl, raptors and passerines for resting, preening, loafing and feeding. It also provides crucial habitat for other species. It therefore is an integral part of the ecosystem which sustains Pacific Flyway birds.

## 7.2.3 Effects of the Parallel Runway on Bird Habitat

### The Importance of Habitat

The value of habitat cannot be stated in simple acreage terms. For example, raptors require prey, and if prey species are displaced, so are the raptors which depend on them. The combination of old fields, wooded areas, raised structures for perching and old buildings for nesting is ideal for raptors. Raptor habitat therefore includes far more than nesting sites. Some species such as the Yellow-headed Blackbird, have such specialized habitat requirements that they are easily displaced. Others, such as the starling, which are considered a

nuisance by farmers and airport managers, are adaptable to many habitats and therefore difficult to dislodge. While waterfowl are often thought of as marsh birds, they also depend at times on pasture, hay fields, vegetable and grain crops from upland areas. Thus their habitat needs also are varied and complex.

When considering the Sea and Iona Islands habitat, it is essential to look at a much wider area of the estuary. Several questions arise. How does the habitat lost on Sea Island relate to surrounding habitat such as Sturgeon Bank, the North Arm and Pacific Spirit Park? For example, the Great Blue Heron of the Park use areas of Sea Island for forage. How essential is the Sea Island habitat to maintenance of lower North Arm species? Would the elimination of certain habitat areas on Sea Island reduce the carrying capacity of surrounding habitats? In response to these questions the B. C. Ministry of Environment stated:

> *"Because the Fraser River delta and estuary must be viewed as an ecological unit, it follows that any loss of productive habitat could lead* to *an incremental loss of bird populations regardless of where the habitat occurs. However, productive habitat (such as Sea Island) close to foreshore marshes is generally assumed to be of even greater importance."*

The Airport North area is one of the last remaining large blocks of upland habitat in the North Arm/Sturgeon Bank ecosystem, and without it, the integrity of the ecosystem would be seriously compromised. This habitat has a unique mix of upland and wetland habitat types which are an integral part of the Fraser River estuary ecosystem. The Panel views this upland habitat as essential to the sustainability of many bird populations in the estuary. Bird habitat on Sea and Iona Islands is also important for recreational reasons. It is internationally famous for bird-watching, and its open space, parks and natural values attract thousands of recreationalists annually.

## Habitat Losses

The maintenance of existing bird populations depends on the preservation or replacement of the remaining habitat. The most vulnerable birds are the raptors and unique species of passerines such as the Yellow-headed Blackbird. However, waterbirds, shorebirds and other upland birds also depend on the Sea Island area.

Transport Canada indicated that approximately 167 ha (about 40 percent) of the Airport North area would be used for construction of the parallel runway. This would contain hard-surfaced areas and short grasses. The principal habitats affected include agricultural monoculture areas, portions of the Cora Brown subdivision, ditch habitat and the Yellow-headed Blackbird marsh. Because the grasses would be kept short and roiled, rodent populations would be minimal and this would eliminate some of the foraging habitat for avian predators, including the Common Barn Owl, Short-eared Owl, Great Blue Heron and hawks. The impact on the Common Barn Owl, a rare species, is of particular concern. Transport Canada considered this loss of habitat significant because the species has been extirpated from the rest of Canada. There is also concern about the Short-eared Owl, a species common on Sea and Iona Islands but declining in numbers in the Lower Mainland.

Transport Canada concluded that the runway project would have minimal effects on the diversity of songbirds, although there would be some changes in species composition. The decline in numbers would correspond to the amount of habitat lost but would be minor in terms of the Lower Mainland context. Approximately 80 percent of existing ditch-side habitat would be lost if the runway and airport-related commercial lands were developed, affecting blackbirds, robins, sparrows and other song birds. Of the 45 km of hedgerow, 50 percent would be lost. Transport Canada plans to mitigate these losses where possible.

The runway project would result in the elimination of Yellow-headed Blackbird marsh habitat. Unless successfully mitigated, this would extirpate nearly all birds of this species from coastal British Columbia. It would also remove a nesting and perching area for many other species.

The construction of approach lighting on Sturgeon Bank would cause only a small loss of foreshore marsh habitat. However, Transport Canada suggested that the pile structures would alter circulation and sedimentation patterns and thus accelerate the rate of growth of foreshore marsh. This in turn could increase the use of these habitats by various species of waterfowl, waders and gulls. A potential disadvantage of the structures is that they might attract nesting and roosting birds such as swallows, starling, cormorants, herons and gulls, which could pose a bird strike hazard directly under the runway. Transport Canada reviewed this potentiality and determined that it could design the structures to preclude bird perching. In any event, most birds which are common near the site do not perch on light standards. Although Transport Canada originally indicated that the Bird Strike Control Program might be extended to address bird hazards associated with the lights, it subsequently noted that it saw no reason to do this, because of design changes.

Construction of the parallel runway would result in additional habitat effects north of the runway. Some impact may be expected from the construction of a loading dock on Woods Island, settling ponds, storage sites, roads and other facilities. Some disturbance to wildlife and birds would also result from construction activities such as truck traffic.

Operation of the runway would also impact bird populations with some major effects on Sturgeon Bank. Mr. Will Paulik, representing the Society for Promoting Environmental Conservation (SPEC) and the Fraser River Coalition, stated that the recent relocation of the Iona sewage outfall and possible opening of an outlet between McDonald Slough and Sturgeon Bank would enhance the productivity of Sturgeon Bank. This might, of course, conflict with the runway operations by increasing unwanted bird populations in the area.

## Noise

Airports are noisy intrusions into the natural environment. Many species habituate to noise once they learn it is not

harmful to them, but others may be exceptionally vulnerable at certain phases in their life cycle such as their nesting period.

Transport Canada argued that birds in the vicinity of the airport have become habituated to noise. Certainly, the airport has operated in this site for many years, and any remaining bird species are probably habituated, but it is not known if any species were displaced by noise.

### Human Presence

Airports are busy places and the presence of intense human activity can be disturbing to some birds. However, many species habituate to the presence of people and traffic, as they do to noise. They learn over time that humans are not a threat when they are doing routine things.

Because airport security and safety are important issues at YVR, there is some limitation of human activity in the surrounding area. For example, the runway area is fenced and certain areas are off-limits. Despite aircraft noise these restrictions may contribute to secure habitat.

### The Bird Strike Control Program

A major disturbance to birds and wildlife is Transport Canada's Bird Strike Control Program, whose purpose is to disperse birds on or near the runways. As a result of this program, aircraft-bird collisions were reduced from 107 events in 1983 to 19 events in 1989. A number of strategies are used, including the use of pyrotechnic ammunition, distress calls, decoy birds, bird repellents and occasionally live ammunition to kill problem birds. The Program also manages habitat in such a way as to minimize the attractiveness of the airport to certain bird species. The major habitat modification is the regular mowing and rolling of infield grass to make it inhospitable to small mammals that are the major source of food for raptors. In an effort to avoid attracting birds, airport buildings and facilities are also designed or altered to prevent roosting. The Bird Strike Control Program is applied to runway areas, and *"peripheral areas along the dikes of the Middle Arm of the Fraser River and the Sea Island foreshore, and the fields north of Runway 12-30 and the main terminal building. "*

Since Transport Canada is also concerned about the Sturgeon Bank marshes, the Program would be expanded to include the area under approaches to the new runway. Transport Canada stated that the most important target species are starlings, dunlins and seagulls, all of which are common species in North America. However, in certain areas, it is impossible to be selective in targeting specific species.

Transport Canada issued guidelines entitled Land Use in the Vicinity of Airports (1989), to control certain land uses near airports. These guidelines require that "hazardous" land uses which attract birds not be permitted within 3.2 km of an airport. This would preclude certain agricultural practices, crops and recreation activities, including migratory waterfowl refuges and feeding stations. If interpreted rigidly, such guidelines could prohibit any wildlife habitat on Sea Island and adjacent foreshores.

Some activities to the north of the proposed runway were a concern to Transport Canada. The GVRD operates a primary sewage treatment plant on lona Island, and this attracts various birds — including gulls, rock doves and starlings — that might present a hazard to aircraft on a new runway. Transport Canada stated that remedial activities are desirable before the runway becomes operational in order to discourage birds from using this area. In addition, the GVRD Regional Parks Department which manages the lona Beach Regional Park, originally planned a number of enhancement projects, including the creation of marsh habitat. These were abandoned because they would increase bird hazards for the runway.

The Bird Strike Control Program and land use guidelines would have effects on birds far beyond the parallel runway site but these were not assessed in the EIS. This was a matter of great concern to wildlife agencies and interest groups. Environment Canada feared that opportunities to enhance wildlife habitat would be reduced or foreclosed within 3.2 km of the runway, notably on or near Sea Island. The Musqueam Indian Band also observed that the Bird Strike Control Program would make habitat less attractive to birds, and that *"...the reduced habitat and development pressures would not result in more birds using a smaller area, or being redistributed to the north shore of the Fraser River as stated in the EIS. The impact of the continual reduction of habitat is a declining population of birds."*

Ms. Susan Abs, a consultant to the Community Forum, also stated that it was unclear how expansion of the Bird Strike Control Program and the land use guidelines would affect the implementation of proposed mitigation programs. Similar concerns were expressed by the Panel's technical specialist.

It is clear that the Bird Strike Control Program has the potential to chase many birds away from large areas around Sea Island. These birds are not simply displaced; they are normally lost in perpetuity. Furthermore, the Program cannot always be selective in controlling nuisance birds, and unfortunately other species could also be affected. In addition, the control of nearby land uses would eliminate many sources of food and habitat for birds. The combined effect of these programs underscores the fact that the parallel runway would be not just a limited area of blacktop and grass, but a significant intrusion into a much larger area of habitat.

Extension of the Bird Strike Control program is an integral part of the parallel runway proposal. The EIS described this program, but did not assess its impact on wildlife and birds, nor did it propose mitigative or compensatory measures. The Panel acknowledges that this program is absolutely essential but feels that its effects must be known and, if necessary, mitigated and compensated for. This is also true for Transport Canada's land use guidelines.

It is necessary to know which birds are where, how they behave (for example whether they are swarming birds or not) and how their life activities are likely to be affected by the new flight trajectories which would accompany the proposed runway. It is necessary also to distinguish between birds which would be a threat to aviation and those which would not. This knowledge is essential, not only to ensure flight safety, the prime consideration, but to establish the practicality of any

proposal, whether by Transport Canada or by the Panel, for bird habitat enhancement on Sea Island. The studies envisaged seem to conform to the ideas expressed in Transport Canada's recent agreement with Environment Canada on compensation policy (See section 7.2.7).

Finally, no empirical evidence was provided concerning the effect of the existing or proposed approach light systems on birds which fly across Sturgeon Bank. It is not know whether the lights disrupt their flight path causing mortality through collision (with the lights).

**12. The Panel recommends that Transport Canada commission an independent, public environmental review of its Bird Strike Control Program and Guidelines for Land Use in the Vicinity of Airports to assess their effects on habitat capability in the light of the proposed runway flight patterns and helicopter paths and also examine the potential effect on migratory birds of the new approach light system across Sturgeon Bank.**

### Airport North Developments

Transport Canada proposed that, except for a small linear park, it would eventually use all of the terrestrial habitat of Sea Island (444 ha) for airport-related activity. The following uses were suggested (see Figure 7.1):

**a) the parallel runway (167 ha);**

**b) aviation-related commercial development (120 ha);**

**c) long-term reserve lands (132 ha); and**

**d) linear park (25 ha).**

In addition to the parallel runway, Transport Canada would develop aviation-related commercial lands (120 ha) within the next 20 years. The immediate habitat loss would therefore be the sum of the first two categories, approximately 287 ha.

Transport Canada proposed to manage and enhance existing wildlife habitat on-site to the extent possible. It made a commitment to preserve the 132 ha of long-term reserve land for wildlife habitat for at least 20 years, leaving the land in natural cover. Decisions on compensation would be deferred until the land was developed in the future. This is the area where some wildlife mitigative measures would be carried out in the interim. In addition, Transport Canada would consult with the Wildlife Management Committee (see Section 7.5) "to review and assess the possibilities of enhancing the habitat that would be sustained in the long-term reserve area and linear park."

Transport Canada stated that a Linear Park would be developed along the North Arm with a landscaped trail built along the dike. It indicated that the park would continue to support some wildlife. The Musqueam Indian Band expressed concern that the linear park and other recreation developments might encroach on their traditional uses of the area for hunting.

In addition to the airport-related commercial proposal, Transport Canada in its Development Overview identified other potential developments in the Airport North area. For example, a major road right-of-way was proposed close to the dike in the North Reserve. Lastly, Transport Canada planned improvements to the North Arm dike. These could result in habitat loss as the dikes were upgraded and the foreshore armoured with riprap. This would affect foreshore habitat in McDonald Slough, including some Musqueam Indian Band lands. Transport Canada indicated that it would continue consultation with the Musqueam Indian Band regarding design and maintenance activities in this area.

### Potential Adjacent Developments

Transport Canada is not the only agency with development plans in the Sea Island area. The British Columbia Ministry of Crown Lands and Parks owns the river and sea beds of the North Arm and Sturgeon Bank, giving it jurisdiction over Sea Island foreshores. The Ministry has commissioned a study of development alternatives of the area between the North Arm Jetty and the Iona Jetty. In total the range of possible uses which have been suggested by various parties in the past includes the GVRD Iona Beach Regional Park expansion, a large marina, a recreation — residential complex, a ferry terminal and an industrial port. Transport Canada's land use guidelines would control height, reflective surfaces, bird attraction, noise and access. Nevertheless, Transport Canada stated that it supports the FREMP Area Designations for this area, which favour conservation and recreation.

In addition to all these proposals, transportation agencies are discussing the improvement or development of bridges to Sea Island; there is industrially designated land on the North Arm foreshore of Sea Island; and further commercial and industrial development is planned in the Airport South and Main Terminal areas.

## 7.2.4 Transport Canada's Habitat Mitigation Proposals

A number of measures are planned by YVR management to mitigate the loss of bird habitat resulting from the parallel runway.

### Yellow-Headed Blackbirds

Transport Canada made a commitment to preserve the Yellow-headed Blackbird by re-establishing the existing colony in replacement habitats off Sea Island. It will continue to transplant the eggs; and it will monitor the program until it successfully establishes the species at several alternative sites. The GVRD volunteered to work with Transport Canada to establish a colony at the new Regional Park on Iona Island. The B. C. Ministry of Environment, the agency responsible for passerines, also pledged to provide advice. Transport Canada considers the prospect for success to be promising based on a feasibility study, although data so far are preliminary. However, Ms. Abs representing the Community Forum, was concerned about the program, noting that habitat requirements for this species are specialized and the transplant program is experimental.

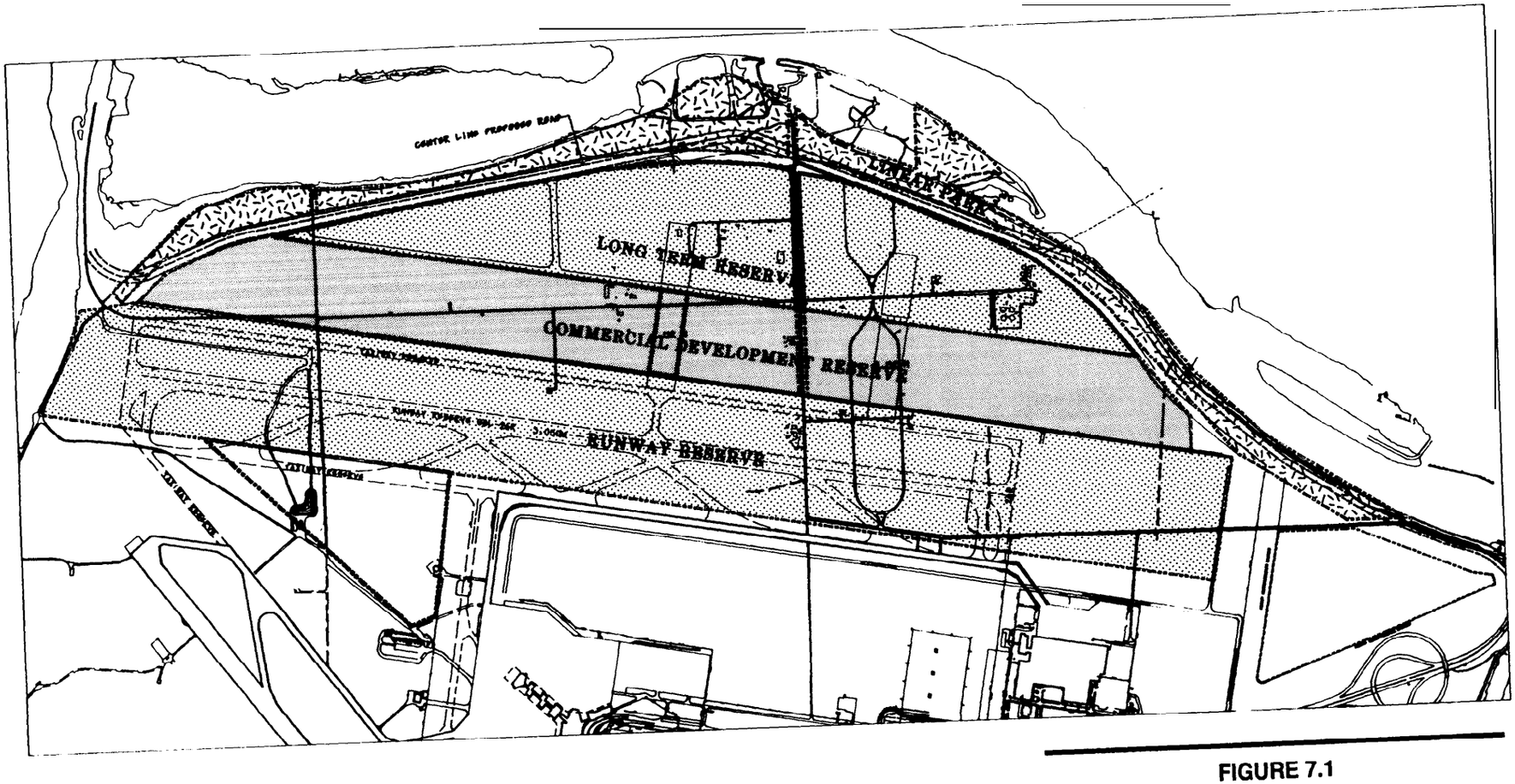



**FIGURE 7.1**

**AIRPORT NORTH**
**LAND USE DIVISIONS**
**PROPOSEDBYTRANSPORTCANADA**

**VANCOUVER INTERNATIONAL AIRPORT**
**ENVIRONMENTAL ASSESSMENT PANEL**

**(Adapted From Transport Canada EIS, 1990)**

### Raptor Management

Transport Canada proposed to initiate a raptor management program to examine the effects of airport development on the carrying capacity for hawks, owls and other raptors on Sea Island. Suitable nesting sites for owls would be identified and programs designed for mitigation and compensation. It made a commitment to ensure "that the *raptor populations on Sea /s/and be sustained* in the habitat that could be left at the *Airport. "*

Transport Canada proposed to relocate the Grauer farm barns to the north side of McDonald Road in an attempt to preserve the Common Barn Owls on Sea Island, the assumption being that the owls will re-establish themselves if their nesting habitat is preserved. However, their present use of the barns is not certain. Furthermore, the earlier removal of old barns from Sea Island in anticipation of the parallel runway, is thought to have had a detrimental effect on the owls.

The B. C. Ministry of Environment observed that while it may be easy to provide alternative nesting structures for barn owls, a serious problem may arise in providing adequate foraging habitat for them. It wanted this to be more fully addressed in the Raptor Management Program. Ms. Abs expressed similar fears, noting several uncertainties about how non-raptor land could be made attractive to raptors.

### Hedgerow and Ditch-Side Vegetation

Transport Canada undertook to "do its utmost to transplant *hedgerow and ditch-side vegetation from sites to be developed to the linear park and Long-term Reserve areas. "* In preparation for this action it would inventory this vegetation.

### Foreshore Disturbance

Transport Canada undertook to monitor the extent of foreshore disturbance from the construction of approach lights, and to assess the need for habitat compensation. It promised to provide two-for-one compensation for any losses by modifying nearby upland to support marsh vegetation. It will do this with the advice of the Department of Fisheries and Oceans.

### Construction Impacts

Transport Canada undertook to implement a number of mitigative measures associated with construction activities. It would control sediment in run-off; revegetate ditches or other water areas which may be damaged; and schedule construction to avoid critical over-wintering and spring breeding periods on the foreshore.

## CONCLUSIONS

Transport Canada stated that it is *"committed to ensuring that program measures be implemented* to ensure that *the raptor populations on Sea Island be sustained in the habitat that will be left at the airport".* Nevertheless, there are many uncertainties associated with its plans to manage the negative impacts of a parallel runway on birds.

- It is unclear how such a policy would be possible in view of Transport Canada's plans ultimately to develop all of Sea Island.
- Transport Canada cannot commit to a compensation package without prior Treasury Board approval.
- It is unclear what the implications of the proposed roads and the linear park would be for bird populations.
- The Raptor Management Program, which was only recently initiated, cannot identify suitable mitigation programs at this time.

The Panel has grave concerns about the potential loss of the habitat remaining on Sea Island. This is a large and crucial block of habitat, and an integral part of the lower North Arm ecosystem. This concern is reinforced by the several uncertainties listed above. The Panel believes that, first and foremost, losses must be minimired. tosses that remain must be mitigated as fully as possible, and where there are still residual losses, there must be full compensation.

### 7.2.5 Habitat Mitigation at Source

At the centre of the above descriptions is the large piece of land (about 444 ha) known as Airport North. It is owned by Transport Canada, which has proposed that it be used for the parallel runway (167 ha), aviation-related commercial development (120 ha), long term reserve (132 ha), and a linear park (25 ha).

The runway area is, of course, the essence of the proposed airport expansion project and would have to be developed if the project were approved. The aviation-related commercial proposal is clearly not essential to air transportation as such, however desirable it may be from the perspective of economics and airport revenue.

The status of the long-term reserve is not clear, since Transpot-t Canada has only undertaken to preserve it for wildlife habitat for 20 years. However, Transport Canada's *Development Overview* shows that this area is slated in Phase 2 for "airport reserve" and "groundside commercial", which suggests that in the long-term it will be used for airport-related purposes. The linear park proposal is presumably firm because the land contains the Sea Island dikes and would not lend itself to other kinds of development.

What is at issue is the use of the 252 ha lying between the runway area and the linear park. It could be used in two ways. It could be given over to airport-related development, with the result that only the 25 ha linear park would ultimately be devoted to habitat and recreational purposes on Sea Island. Or it could all be dedicated to habitat use, in which case a total of 277 ha would be available for these purposes.

The land in question is deceptive. To the commercial eye it may be just ordinary rough pasture — land waiting to be developed for something useful. But beneath the unkempt appearance it is the home of many small animals, which feed the resident raptors; it is foraging land for many non-resident birds and a resting place and refuge for others. In short, it is a

rich and productive part of the life support system of many living species. In addition it is big enough, along with adjacent shores and wetlands, to constitute a diversified and viable habitat.

Furthermore, the area needs to be seen in the context of the lands and waters to the north. Its northern boundaries are the North Arm and McDonald Slough. Beyond them lie lona Island, the low-density development typical of the south Vancouver shores — the Musqueam Indian Band Reserve, two golf courses, the semi-rural Southlands area — and farther west, Wreck Beach and Pacific Spirit Park. In other words it is part of a varied, river-based landscape of considerable natural character and long standing use. It is also a functional part of one of the most important resting grounds for migratory birds in the world — the Pacific Flyway.

There is another dimension to this land. It is probably the last large block of estuary land available for environmental mitigation and enhancement, and what is done with it will be of immense symbolic significance. It will be seen as a signal of the region's attitude toward the natural environment as it pursues its economic destiny.

The Panel believes that the environmental values at risk as a result of the parallel runway proposal are much too great to brush aside. Moreover, a project with the substantial economic benefits of the parallel runway can readily afford a level of environmental protection appropriate to the need. The Panel also believes that the Airport North lands offer the last chance to achieve such protection in relation to bird habitat.

### 7.2.6 Mitigation for Bird Habitat

The first step must be to limit the amount of land taken to the absolute minimum. In the Panel's view this minimum should be the land required for the runway and nothing more; it should not include land for airside commercial development as proposed by Transport Canada. This exclusion would be consistent with the GVRD's Green Zone designation for the area as noted by Dr. Walter Hardwick who was retained by Transport Canada to provide an independent review of the parallel runway project. Dr. Hardwick stated:

> *"Sea Island in general and the airport in particular, although principally urban in appearance and land use, contribute to the vision of a region in nature. Acres of green field and tidal estuary around the runways and flight paths are the first sights many visitors have of the region. A Parallel Runway may assure that the north side of the Island maintains this character. "*

With respect to the proposed airport commercial lands, Dr. Hardwick concluded:

> *"'Industrial parks of this magnitude are in conflict with the city-in-nature theme and the corresponding land uses on the Vancouver side of the Fraser River. If the Region's goals are to be enhanced it is important that air-side development be restricted to the lands to the east, between the runways, and at the south terminal area. Better still the air-side industry should be directed to Abbotsford or Boundary Bay. "*

**13. The Panel recommends that:**

**a) development in the Airport North area be limited to the runway, associated taxi-ways and landscaping essential for the operation of the runway;**

**b) airport-related commercial and other urban uses be permanently prohibited north of the runway;**

**c) the remainder of land north of the runway be dedicated to the conservation and enhancement of wildlife values; and**

**d) land uses incompatible with wildlife values in Airport North be phased out where feasible.**

A second element in prime mitigation would be to minimize damage to the environment during the construction phase. Here the Panel acknowledges that Transport Canada made many useful proposals in the EIS for the avoidance of damage to Sea Island and its environs during construction. It is concerned, nevertheless, that construction on that scale has the potential for damage on the same scale. It therefore urges Transport Canada to consult and collaborate fully with the Wildlife Management Committee (see Section 7.5 later) in an effort to minimize damage.

### 7.2.7 Bird Habitat Compensation Policies

The Panel believes that an ounce of mitigation is worth a pound of compensation, especially in the unpredictable realm of ecology. Nevertheless, compensation is often necessary. As a fundamental principle the Panel believes that Transport Canada must fully compensate for habitat losses in the Airport North area that cannot be mitigated. However, the practice of compensation is still evolving, and is fraught with uncertainty. It is necessary therefore to clarify what the Panel intends when it recommends compensation.

#### The Concept of Compensation

The concept of compensation is that a developer is required to replace the habitat used for development with habitat elsewhere. However, this concept is frequently confusing. As Susan Abs, representing the Community Forum, stated:

> *"The term 'compensation' is somewhat misleading because it implies that for every hectare of habitat lost, another hectare is 'found'. On the contrary, the proponent is often asked to 'compensate' by acquiring either land or development rights elsewhere, thus merely protecting existing habitat at another location (this habitat may or may not be under imminent threat of development). Thus, even with a 1:1 policy, there is still a net loss of 50 percent, if there is no enhancement. Even with enhancement, it may be difficult and expensive to double production on the protected lands so that no net loss occurs. "*

Ms. Abs cites several problems with compensation. Habitat creation and enhancement are still experimental, and some compensation projects do not work. Compensation agreements are usually achieved through negotiation and environmental agencies frequently accept less than full compensation. The elimination of habitat in the development

site may have impacts that cannot easily be compensated, such as the removal of an essential component of an ecosystem. Habitat compensation may lead to the concentration of habitat in some areas, such as Boundary Bay, at the expense of other areas such as Sea Island.

### Government Agency Standards

The Canadian Wildlife Service of Environment Canada seeks one-for-one replacement habitat of comparable quality in secure tenure in association with value-added management measures which enhance productivity so that no net loss occurs. However, this compensation requirement is not federal policy, but is based on "regional working guidelines". With respect to the parallel runway project, the Canadian Wildlife Service expects Transport Canada to:

1. pursue all available means to acquire additional lands suitable to the Canadian Wildlife Service to add to the 31 hectares already acquired;

2. compensate financially for the balance of the migratory bird habitat lands alienated by the YVR expansion through a mix of... approaches with funds to be placed in trust and administered by a multi-agency body such as the Pacific Coast Joint Venture; and

3. acquire suitable lands as soon as practicable and provide compensation funds within six months of project approval. This is considered an integral part of development costs.

The B. C. Ministry of Environment which is responsible for non-migratory birds such as raptors and passerines, stated that its compensation requirements are the same as those of the Canadian Wildlife Service.

> *"We will need to be satisfied that the compensation package fully meets the requirements of the one-for-one* **management guideline plus intensive management** *funding, and that ail parties agree to the proposed compensation measures prior to the commencement of project construction. "*

### Transport Canada's Agreements

Transport Canada stated that in the absence of federal or provincial policies on compensation, it *"cannot comment on what appropriate levels of compensation would balance the expected changes caused by Airport expansion. "* However, immediately prior to the hearings, Transport Canada achieved agreement with the Canadian Wildlife Service on the terms for one-for-one compensation. By letter to Environment Canada, Transport Canada made a commitment to ensure that:

> *".. .***any reductions** *in habitat capacity associated with this project are mitigated or compensated. in further discussions with your staff, we came to the understanding that the critical factor to be mitigated or compensated is the capacity of these lands to provide habitat for migratory species using the area for overwintering or spring and fail staging areas and for resident populations. in addition, agreement was reached that the following general principles will be followed* **in development of the mitiga** *tion/compensa* **tion plan:**

i) the plan will be based on the principle of replacing or compensating for lost habitat on a 1 :1 basis,

ii) Transport Canada will explore to the extent possible, the opportunities for securing other lands for bird habitat,

iii) Transport Canada, in concert with Environment Canada, will develop a compensation package for acreage not mitigated through replacement:

- this would be based on a detailed assessment of land use by birds at the site;
- the value of possible instruments or mechanisms to replace that capacity would be determined; and
- compensation should be directed to an arms length group for administration.

iv) All of the above would be subject to Treasury Board approval".

### Principles of Compensation

Reviewing the concept of compensation for bird habitat, the Panel believes that the following principles are valid:

1. that the no-net-loss principle of full compensation for habitat loss should be as firmlv established for birds as it is for fish. The Musqueam Indian Band supports this principle, saying

   > *'any industrial or commercial de veiopers, including Transport Canada, using these increasingly scarce and valuable habitats should be prepared to pay the price of acquiring comparable habitat in secured tenure, however expensive and difficult".*

Federal and provincial governments should insist that their wildlife agencies require full habitat compensation. In fact, the goal should be to strengthen the habitat base, not merely maintain it;

2. that the principle of full compensation should apply to the habitat of important bird species such as migratory birds of the Pacific Flyway, raptors and rare passerines. This distinction acknowledges that there are species, such as starlings, seagulls and dunlins, which are a danger to aviation and whose habitat should not be protected at YVR;

3. that compensation should be the option of last resort. Compensation is open to abuse if applied indiscriminately without regard for local circumstances. Instead, every effort should be made to protect and enhance habitat so that compensation is not needed.

The Panel applauds Transport Canada for the general principles set out in its agreement with Environment Canada, but adds the following for greater specificity.

**14. The Panel recommends the following principles and practices for compensating bird habitat losses at YVR:**

**a) that compensation be made for all loss of habitat and habitat quality resulting from the runway project and from associated policies and programs to control bird hazards and land uses;**

**b) that compensatory habitat be located adjacent to Sturgeon Bank in the vicinity of Sea Island if possible;**

**c) that the compensation be on a one-for-one basis with compensatory habitat having a similar function and quality to habitat lost on Sea Island;**

**d) that if compensatory habitat is not available near Sea Island, it be compensated on a two-for-one basis in the Roberts Bank area, or on a three-for-one basis in the Boundary Bay area;**

**e) that compensation be through purchase and enhancement of land, or through other forms of secure tenure, with enhancement;**

**f) that credit for compensation be based generally on habitat value added through enhancement;**

**g) that for the Airport North area a system be developed to grant credit for habitat enhancement which results in increased carrying capacity for selected species of waterfowl, passerines, and raptors; and**

**h) that accurate surveys of birds be conducted throughout the year prior to any construction at Airport North and at regular intervals thereafter to ensure both that the habitat enhancement credit system is soundly developed and that the compensation policies are effective in the long run.**

## 7.3 Fish

### 7.3.1 Fish Resources

The Fraser River estuary supports 85 fish species, of which 27 are considered estuarine, occupying the inter-tidal mudflats, marshes, sloughs and main water channels. Over 300 species of invertebrates live in the estuary, most of which provide important food for fish and birds. All five species of Pacific salmon are found in the vicinity of Sea Island. The Fraser River supports one of the greatest salmon runs in the world, more than 10 million spawners returning in some years. These salmon are harvested by Canadian and international commercial fisheries, as well as native and sport fisheries.

Each year over 800 million juvenile salmon migrate downstream, utilizing the Fraser River estuary for food, shelter and acclimatization to marine conditions. Certain species spend several months rearing and feeding in the marshes and tidal channels of the estuary. Other fish species include herring, carp, surf smelt, cutthroat trout, steelhead trout, bull trout, longfin smelt, dogfish, eulachon and white sturgeon. Many of these are caught for recreation and food.

The distribution of migrating salmon in the various arms of the lower Fraser River is believed to depend on their swimming ability. Species such as chum and pink, which are passive swimmers, are distributed throughout the river in proportion to river flow. This means that approximately 15 percent of the fry travel downstream through the North Arm. Actively swimming species such as chinook fry tend to follow shorelines during downstream migration, which suggests that probably more than 15 percent of Harrison Lake and Pitt River salmon fry migrate through the North Arm.

As the Panel which studied the potential impacts of a proposed Sea Island jet fuel barge facility concluded: *"...the North Arm of the Fraser River is considerably more important to all species of Pacific salmon than previously understood. "*

### 7.3.2 Fish Habitat

Like birds, the fish of the Fraser River estuary depend on abundant and productive habitat to carry out their life processes. A variety of habitats important to fish exist in the Sea Island area. These include riparian vegetation and intertidal marshes which provide the detritus-based food chain as well as cover and shelter for juvenile salmon; intertidal mudflats which provide food sources and rearing habitat; and midchannel and shoreline areas of the North Arm which provide the major migration pathways for juvenile and adult salmon.

Sturgeon Bank mudflats and tidal marshes, and intertidal marsh areas in the North and Middle Arms are highly productive habitat for juvenile salmon and herring. In turn, waterfowl feed off the fish and other invertebrates in this extremely important habitat. Musqueam Marsh, located downstream of Sea Island, is recognized as one of the most important marsh areas in the entire estuary. McDonald Slough and Woods Island Slough also support large populations of rearing juvenile salmon. However, McDonald Slough, which is cut off from Sturgeon Bank by the lona Island causeway, suffers from low dissolved oxygen levels. Any further reduction of these levels due to increased sedimentation or contaminants associated with the parallel runway would seriously threaten fish habitat in that area.

In the EIS, Transport Canada identified the following potential effects of the runway project on fish resources: loss of habitat; lowered water quality and degraded habitat arising from it; and disturbance from construction activities. All of these effects could result in fish mortality, or in avoidance by fish of intolerable habitats.

The physical causes of these effects were identified as: sedimentation from run-off due to dredgeate handling; construction of a barge facility on the North Arm and the approach lighting system on Sturgeon Bank; and waterway contamination from runway spills and maintenance activities.

McDonald Slough, which is critical fish habitat, would be particularly susceptible. The loss of habitat in general could result in reduced fish populations, ultimately affecting commercial and recreational fisheries and especially the Musqueam Indian Band.

### 7.3.3 Transport Canada's Mitigation and Compensation Proposals

Transport Canada stated in the EIS that it is prepared to implement several mitigation and compensation measures to reduce potential effects on fish and fish habitat. These measures include timing restrictions on dredging and construction activities to avoid the juvenile salmon migration period from March to June; construction of sedimentation ponds and catch basins; changes to pier and piling design on the approach lighting system; and habitat compensation to offset fish habitat losses on Sturgeon Bank and Woods Island. It is noted that construction of both the lighting structure and the temporary barge facility would require an application to the project review process of the Fraser River Estuary Management Review Program (FREMP).

### 7.3.4 Effects on Fish Resources

The Panel recognizes that fish habitat in the North Arm has long been detrimentally affected by industrial, commercial, agricultural and residential development. The small amount of remaining highly productive habitat in the North Arm is in the vicinity of Sea Island, the Middle Arm and lona Island.

The Panel acknowledges the cooperative programs initiated by government agencies and non-government organizations to protect and rehabilitate fish habitat in the North Arm and around Sea Island. It also commends the efforts of the Department of Fisheries and Oceans to achieve a net gain in fish habitat through application of its no-net-loss principle.

### CONCLUSION

The Panel recognizes and encourages these commitments. Even so, it is concerned over the direct, physical loss of habitat, particularly in such a productive area as Sturgeon Bank. It notes that this area is classified by the FREMP Habitat Work Group as "highly productive habitat" and is designated "Conservation" by the FREMP Area Designation Process. The Panel urges the Wildlife Management Committee (see Section 7.5) to give special attention to the preservation and enhancement of fish habitat in the course of its work.

## 7.4 Water Quality

### 7.4.1 Baseline Information

Little information was presented in the EIS concerning water quality conditions in the North and Middle Arms of the Fraser River and the effect of pollutants from Sea Island. The North Arm, which is relatively shallow and has no significant tributaries, carries approximately 15 percent of the Main Arm flow at New Westminster. It is strongly influenced by tides, especially incoming tides which reduce flow velocities and at times cause the river to flow upstream. This significantly reduces the dilution effect because pollutants can pass a discharge point several times while moving up and downstream. This creates multiple exposures to pollutants at certain points in the river. Of the three arms of the lower Fraser River, the North Arm is the most polluted and the waters surrounding Sea Island are among the most degraded of all. They are affected by numerous industrial and storm sewer discharges unrelated to the airport, which cause high levels of metals and coliform bacteria. The sources of this pollution include metal finishing plants, a paper recycling operation, lumber mills, a groundwood pulp and paper mill, food industry operations and a large number of combined sewer overflows and stormwater discharges. Some run-off and leachates from treated lumber stored outdoors are acutely toxic to salmonids.

Sturgeon Bank, on the western edge of Sea Island, is severely degraded due to the large residue of effluents formerly discharged to Sturgeon Bank from the lona Sewage Treatment Plant. The recent relocation of the outfall farther offshore is now permitting the degraded area to recover. As environmental conditions improve, Sturgeon Bank should become more productive for fish and birds.

### Sea Island Water Quality

There is little water quality information on the Sea Island area. There has been no systematic storm water monitoring on Sea Island or at outfall sites. Sporadic data for Sea Island water quality include studies by the Environmental Protection Service (1975), Transport Canada (AESL 1982) and the Township of Richmond (1984). The available information does not allow quantitative prediction of the impact of a parallel runway on receiving water quality.

Based on limited assessment data, Transport Canada indicated that stormwater discharges from Sea Island are within federal water quality guidelines and contained no contamination levels which would be harmful to aquatic life. Airport South drainage had slightly elevated concentrations of cadmium, copper, chromium, lead and zinc relative to other storm water discharge sites. Chemical oxygen demand (COD), surfactants, phosphates, nitrates, oil and grease were also higher, possibly due to aircraft washing activities. Nevertheless, these concentrations were low and non-toxic. Transport Canada stated that water quality from run-off would be comparable to typical storm water run-off from the streets of Vancouver or Richmond, except for glycol. It would probably be better than typical discharges from industrial areas.

A variety of circumstances could degrade water discharged from Sea Island in future. Runway construction, increased aircraft traffic, and growing levels of commercial and industrial activity would present a greater risk of surface and groundwater contamination. It is likely that illegal discharges along the North Arm also degrade water quality. From intervenors, the Panel heard concerns about clandestine night-time dumping of toxic substances and illegal connections to sewers. One intervenor questioned whether the Sea Island outfalls have been checked for illegal connections and night-time dumping.

If Environment Canada or B. C. Environment believe that drainage water from Sea Island is potentially a serious problem, the Panel suggests that Transport Canada should undertake a random sampling of outfall water to ensure that it meets the water quality standards of the ministries.

In recognition of water quality data gaps, Transport Canada initiated a monitoring program to document existing water quality conditions on Sea Island. The new program is part of Transport Canada's general commitment to institute monitoring at Canada's airports, and part of its environmental management program for the proposed parallel runway. Data will be available by July, 1991, and Transport Canada stated that these data would be provided to regulatory agencies, and to the interested public in an annual report.

> proposed Surface and Groundwater Monitoring Program Five objectives. These are:
>
> to characterize existing conditions in surface water, groundwater and receiving waters for storm water discharge from Sea Island;
>
> to assess water quality in relation to current standards and regulations;
>
> to identify and isolate existing problem areas which require immediate mitigative action;
>
> to provide a baseline against which the effectiveness of mitigative measures and the effects of future operation can be measured; and
>
> and to demonstrate compliance and due diligence to regulatory authorities.

### 7.4.2 Effects of a Parallel Runway

Effluents from aviation-related and industrial activities on Sea Island are discharged directly to the Greater Vancouver Sewage and Drainage District (GVSDD) sanitary sewer system. Thus, if the parallel runway affected water quality, the effects would most likely be experienced in the stormwater drainage system, although groundwater contamination is also possible.

There are eight drainage basins in the existing Sea Island storm drainage system, with an individual surface discharge point to the Fraser River for each area (Figure 7.2). The runway proposal primarily affects drainage areas K, H and G. Drainage area K discharges to McDonald Slough; areas H and G discharge to the North Arm; other drainage areas discharge to the Middle Arm.

Surface run-off from the airport facilities is carried through storm sewers to open ditches which discharge via flood boxes to the Fraser River. Discharge is either pumped over the dike or released by gravity flow through a manual flap gate, depending on the tides.

#### Construction Impacts

There are two primary sources of potential water quality impacts during the construction phase: suspended solids and fuel spills. Suspended solids might be produced by channel dredging for preloading fill, construction of the temporary barge facility, construction of the approach lights on Sturgeon Bank and improving the dikes around Sea Island. Topsoil removal and stockpiling could result in suspended solids and increased nutrients. Accidental spills of oil and fuel could also occur during construction.

Transport Canada proposed a number of mitigative measures to control suspended solids during construction (EIS, pp. 7-9 to 7-12). Dredgeate used for preloading would be tested for contamination, and only clean sand would be used. Barge dock and approach light construction would be timed to avoid fish-sensitive periods. Appropriate construction techniques would minimize the mobilization of sediments: stockpiles would be bermed to avoid rapid run-off, sediment and turbid water would be collected in settling ponds before run-off would be released from work sites, and disturbed areas would be rehabilitated and revegetated. In all cases, DFO would review the designs to ensure that sedimentation would be minimized.

The proponent would locate maintenance activities and fuel storage associated with construction away from surface drainages, and in confined areas where accidental spills could be contained and cleaned up.

#### Operational Impacts and Hazardous Materials

Potential impacts during the operations phase of a parallel runway relate primarily to the handling of fuel and hazardous materials, the use of chemicals and the management of surface drainage.

Transport Canada prepared inventories of hazardous materials and handling practices as part of its environmental audit in 1990. Fuel is the most important hazardous material handled and stored at the airport. Other hazardous materials are associated with increased maintenance, and the industrial and commercial activities of tenants in Drainage Area H and the Airport South area.

Fuel handling involves risks of spills and leaks of aviation fuel and other petroleum products, which can occur from fuel pipelines, storage tanks, loading facilities and aircraft. In addition, Trans Mountain Pipeline operates a tank farm in Area H that may require additional throughput or storage. A fuel depot is located in Area K.

Transport Canada holds fuelling companies responsible for monitoring all procedures and complying with its guidelines and relevant federal and provincial regulations. In 1989 it commissioned a study of fuel handling procedures at the airport. This recommended improved training, on-site clean-up facilities, and spill monitoring and reporting procedures. Subsequently, Transport Canada improved fuel spill prevention and clean-up procedures: additional equipment has been acquired, including a dedicated spill response vehicle and a "Super Sopper" designed to recover spills up to 50 litres; employee training and awareness programs are being implemented; and fuel storage facilities are being upgraded, including the replacement of underground storage tanks. Transport Canada now reviews the environmental aspects of lessee operations before renewing leases.

In addition to these measures, Transport Canada has undertaken to install a number of measures to intercept and recover spills which reach the airport drainage systems, including oil-

water interceptors, flood boxes, and suction-skimmer equipment. Furthermore, it now has an environmental officer who inspects drainage systems daily when required by flow and weather conditions.

The flood boxes are equipped with stop-logs to contain spills. There are also oil-water interceptors in five of the eight drainage areas. Transport Canada is also completing a major retrofit of eight separators with manually operated overshot gates capable of quick and complete containment of drainage flows. It asserts that this containment system can completely contain storm water for efficient recovery of spilled materials.

**15. The Panel recommends that the spill containment and recovery Improvements proposed for the airport surface drainage system be completely operational before the parallel runway is commissioned.**

Concerns were raised about past instances of fires in drainage ditches containing spilled petroleum products. To avoid such occurrences in future, Transport Canada should continue to make daily inspections of the drainage system to ensure that it is operating efficiently, with more frequent attention to susceptible areas when necessary.

## Chemicals

Chemicals are used for a variety of purposes at the airport: glycol is used for de-icing aircraft and urea for de-icing runways; detergents are needed for washing aircraft; herbicides and pesticides are used on the grassed areas.

Glycol breaks down in water and can create an extremely high biochemical oxygen demand (BOD). Fortunately it decomposes more slowly in cold weather, when it is normally applied, thus reducing its potential contribution to BOD problems. Glycol toxicity is low and large concentrations would be necessary to kill fish. The EIS stated that the impact of glycol on storm water quality at YVR is negligible due to the high level of dilution.

Transport Canada has implemented a national strategy to make air carriers responsible for environmental mitigation of glycol pollution. Its role is to regulate and facilitate mitigation; air carriers are responsible for financing and carrying out mitigative measures. As a result, drainage areas C and K at YVR will be monitored for glycol and BOD loadings, and water quality standards will be applied to glycol discharge to stormwater drains.

In addition, Transport Canada is considering various ways of recapturing glycol from runway run-off. As an interim measure, it is acquiring a Super Sopper to be deployed by airlines to recover waste glycol. These measures and policies will be implemented by 1992. Transport Canada is also reviewing the feasibility of providing glycol application stations at the end of taxi-ways, similar to those used in Scandinavian countries. With such systems, 75 percent of the glycol is recovered for reuse.

The Panel believes that the glycol management programs being considered by Transport Canada would reduce glycol effluents and improve water quality. It supports their adoption.

Urea, an organic nitrogen fertilizer, is used for de-icing taxiways and runways. It can increase organic nitrogen and ammonia in run-off water and at certain times of the year can lead to algal growth and oxygen depletion. Transport Canada considers risks to water quality low because the use of urea is limited to the winter season. Heavy precipitation is needed to wash urea from runways into the drainage system, and under these conditions it would be diluted and flushed from the drainage system. In addition, some urea is absorbed by soils and vegetation. Transport Canada will monitor the effects of urea but expects that the impact on receiving waters would be negligible, except for McDonald Slough where it would be classified as “minor”. The Panel agrees that urea monitoring should be conducted, particularly in McDonald Slough. If significant change is identified, mitigative measures should be instituted immediately.

Detergents are used in aircraft washing activities. This can increase chemical oxygen demand (COD), surfactants, phosphates, nitrates, oil and grease in receiving waters. However, available data reveal that detergent concentrations in Airport South drainages, where washing takes place, have been low and non-toxic.

## Ground Water

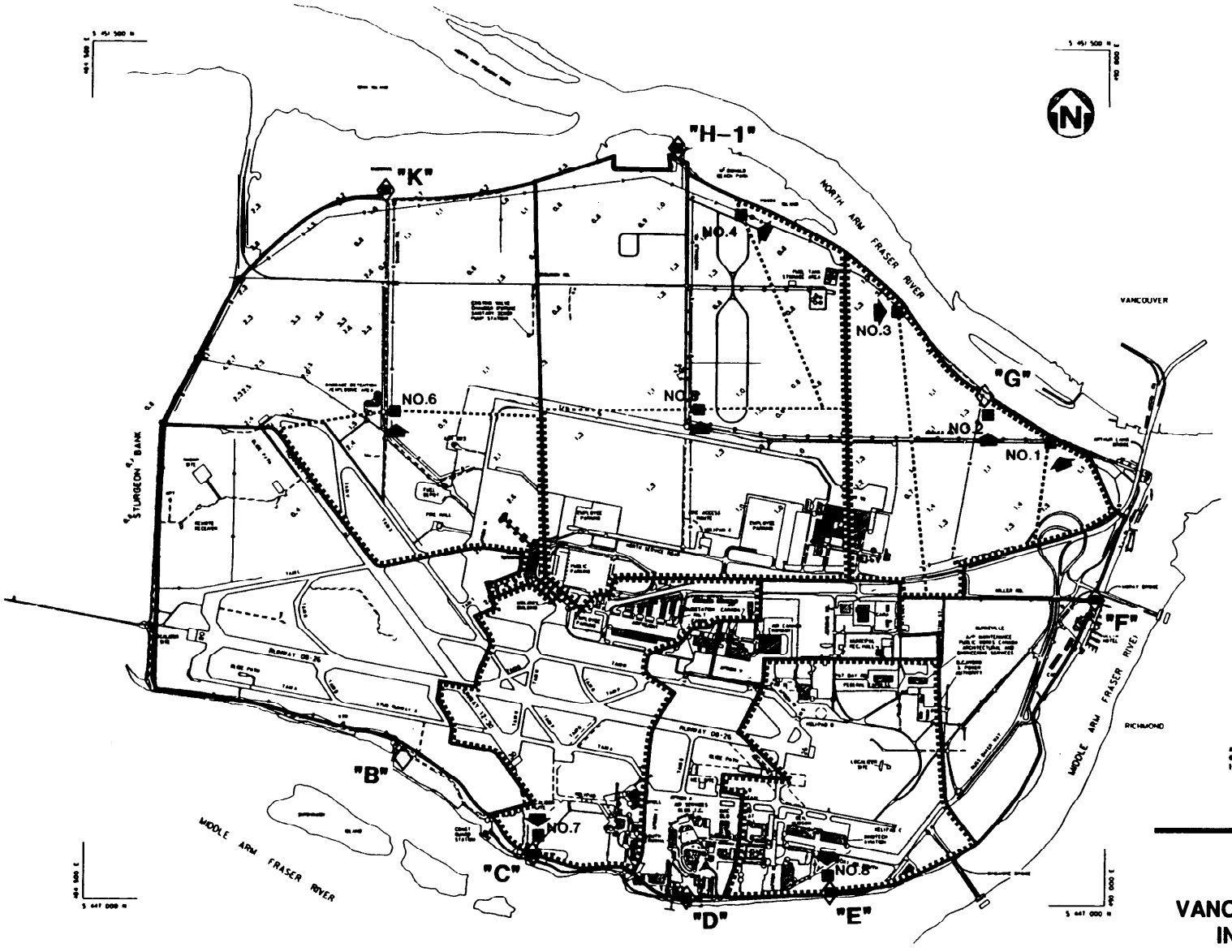
Information on groundwater quality is sparse. Transport Canada will begin groundwater baseline studies and monitoring as part of water quality programs to be implemented in 1991. This program will focus on high risk areas for groundwater contamination such as: maintenance areas; glycol and urea de-icing areas; fuel storage and handling areas; and the fire fighting practice area.

The Panel believes that feasible and effective water pollution abatement technologies are available. Given an adequate surveillance system, the spills and water quality degradation which has commonly been reported in the past at YVR need not occur in future. To ensure this the Water Quality/Pollution Control Management Committee proposed by Transport Canada should have the mandate and powers to insist that adequate water protection measures are adopted and maintained.

In summary, the Panel believes that Transport Canada is making a serious effort to improve its water management practices. The inventories of surface and ground water contaminants, improved operational procedures and new equipment to minimize fuel spills, and monitoring programs are all useful improvements. However, the Panel believes that the results of all of the water quality monitoring should be released to the B. C. Ministry of Environment, Environment Canada and the general public on a regular basis.

### 7.4.3 McDonald Slough

**The** Panel acknowledges that the only issue which connects McDonald Slough and the parallel runway proposal is the matter of run-off discharge from Sea Island. Transport Canada has undertaken to address this issue.




LEGEND

RUNWAYS, TAXIWAYS
ROADS, PARKING AREAS
GRAVEL ROADS
BUILDINGS, STRUCTURES
AIRPORT BOUNDARY FENCED
SECURITY FENCE
OVERHEAD POWER LINE
DRAINAGE DITCH
OIL INTERCEPTOR
FLOODGATE
PUMPSTATION & FLOOD GATE

**Combination Floodbox/ Pumping Station**

**Floodboxes** 0

**Fuel Oil Interceptors** ■

**Catchment Boundaries**

**Floodbox**

**Interceptor**

**Storm Water Runoff to Interceptor**

Scale 1:10000 250 0 250 500 m

**FIGURE 7.2**

**VANCOUVER INTERNATIONAL AIRPORT INTERCEPTOR DRAINAGE PLAN**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, **1990)**

The Panel believes that McDonald Slough is a particularly important component of the North Arm ecosystem. It is also the water body most vulnerable to any water quality degradation attributable to the new runway. Essentially, McDonald Slough is a stagnant backwater with important salmon-rearing habitat potential. Oxygen levels are low in parts of the slough; the major sources of the existing high biological oxygen demand are poor flushing of the Slough, drainage run-off from Sea Island and the large volume of logs which are normally stored there.

The Musqueam Indian Band expressed its concern that increased sedimentation would occur as a result of construction of a parallel runway. The Musqueam Indian Band believes that any diminution of the already low oxygen levels in McDonald Slough would further reduce fish populations, and are concerned that Transport Canada made no assurances that sediment would not enter the Slough.

Since salmonids are sensitive to changes in water temperature, DFO is concerned that elevated run-off water temperatures could adversely affect fish. In summer, after a prolonged dry spell followed by heavy rains, run-off water temperature can be several degrees warmer than the water in the Slough.

Anecdotal information provided to the Panel indicated that salmon fry formerly used the Slough much more heavily than at present, and that degraded water conditions may be responsible for this change. Transport Canada was reported to have increased the size of its discharge point to MacDonald Slough and there was concern that this action could lead to further degradation.

Both McDonald Slough and Sturgeon Bank are heavily used by salmonids. Transport Canada and the Department of Fisheries and Oceans are discussing a number of alternatives for improving water quality in the Slough. Transport Canada will monitor run-off from Drainage Area K, and if water quality problems are identified, is committed to change the discharge point for this run-off directly into the North Arm. The Musqueam Indian Band concurs with DFO that this option should be evaluated, and wishes to be included in discussions of this proposal.

A complementary alternative for improving McDonald Slough water quality would be to open a channel through the causeway connecting Sea Island with lona Island. This would allow tidal flow through the Slough. DFO believes this measure would improve conditions in the Slough and hasten the recovery of Sturgeon Bank from the detrimental effects of the effluents discharged earlier from lona Sewage Treatment Plant. Transport Canada has agreed with DFO to study this alternative.

Canfor, which holds the log storage leases in the Slough, was concerned that the infusion of salt water would cause teredo infestation of its logs. One possibility would be to design a tidal gate allowing outflow on the ebb tide. Mr. Terry Slack, a local fisherman, suggested that a timetable be established which required the causeway to be breached before runway construction would be permitted. He was also concerned that salmon should not be prevented from using the causeway channel for migration.

The Musqueam Indian Band also supported the provision of a connection from McDonald Slough to Sturgeon Bank, but cautioned that archaeological deposits may exist there — beneath the causeway or in the salt marsh immediately to the east — associated with Skwsothen, a former Musqueam Indian Band settlement. They wish to be consulted on the management of this proposal.

Mr. Slack also cautioned that a road being planned around the perimeter of the Slough might be underlain by hog fuel. Run-off from such a surface releases toxic substances into the water environment, which could further degrade water in the Slough. Mr. Slack requested that oxygen depletion problems in the area be resolved before any construction was permitted. The Panel agree that this is a reasonable recommendation.

**16. The Panel recommends that a serious effort be initiated by Transport Canada to reach agreement with all relevant stakeholders to open the McDonald Slough causeway.**

## 7.5 The Sea Island Conservation Area (SICA)

Panel recommendation number 13 would set aside an area of about 277 ha for wildlife and associated purposes. While the land belongs to Transport Canada, environmental jurisdictions around it are fragmented and complex. The Department of Fisheries and Oceans is responsible for migratory fish, while the provincial Ministry of Environment is concerned with non-migratory species. The Canadian Wildlife Service of Environment Canada manages migratory birds while the provincial Ministry of Environment is concerned with non-migratory species and other wildlife. There are also inter-agency coordinating bodies such as the Fraser River Estuary Management Program, the Pacific Estuary Conservation Program and the Pacific Joint Venture. In addition, several organizations are involved in promoting habitat conservation, including non-profit bodies such as the Nature Trust of British Columbia, Wildlife Habitat Canada and Ducks Unlimited Canada. In light of this situation and its implications for management, the Panel offers the following observations.

The area of concern is not just the land area lying north of the runway but any area linked ecologically to it, including the adjacent foreshore and islands (see Figures 7.3 and 7.4). The Panel's intent is that this broader area — to be known as the Sea Island Conservation Area (SICA) — should be managed primarily for wildlife and related purposes. Accordingly, SICA should be managed by a Wildlife Management Committee reporting to Transport Canada, which should assign management responsibility to the Committee for a substantial period, say 50 years. The objective of the Committee should be to manage the SICA area for wildlife conservation purposes and compatible kinds of recreation, always acknowledging the primacy of air safety.

The administrative operations of the Committee should be funded by Transport Canada or the VIAA, as well as the cost of all remedial projects arising from impacts of the new runway.

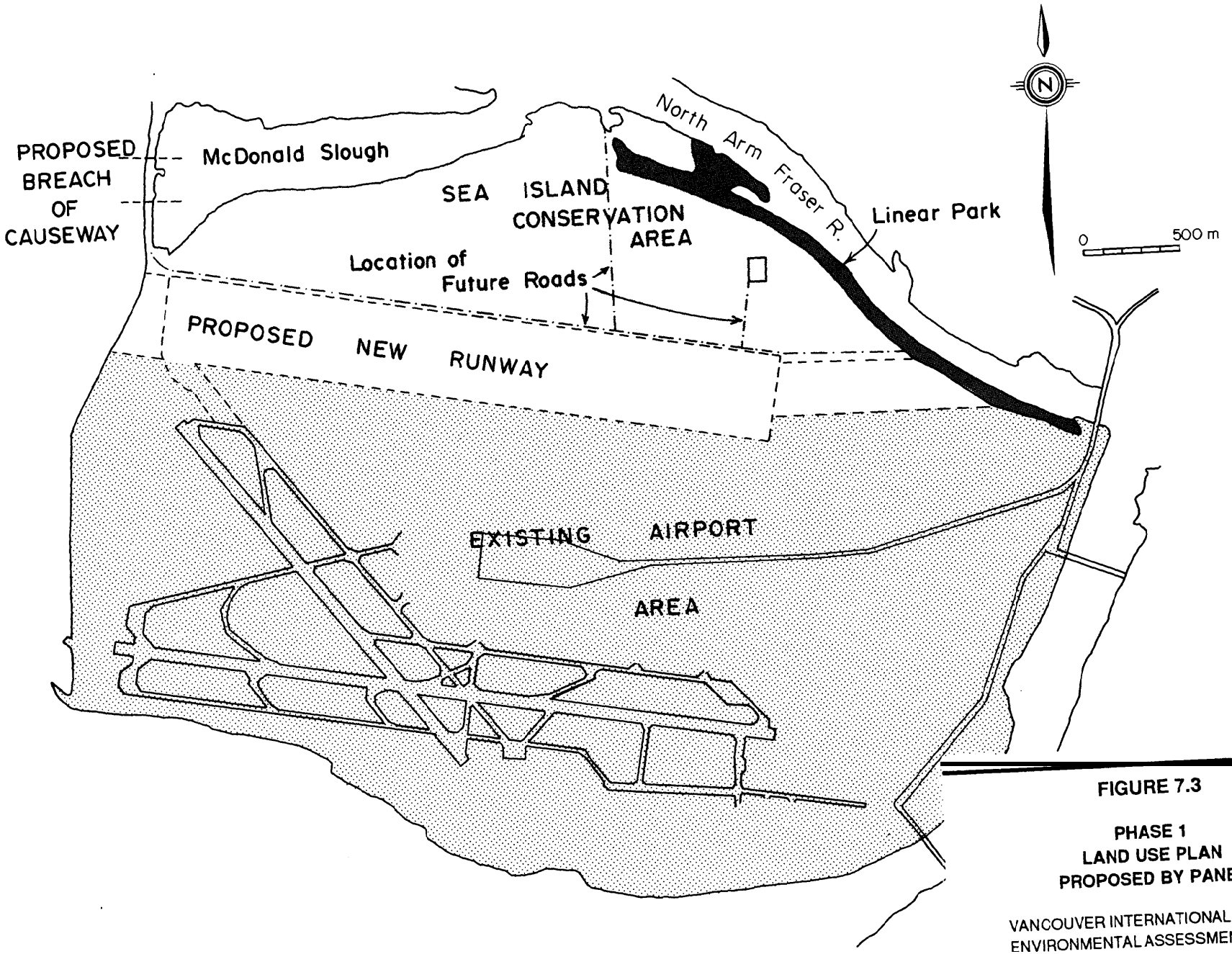



**FIGURE 7.3**

**PHASE 1**
**LAND USE PLAN**
**PROPOSED BY PANEL**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990

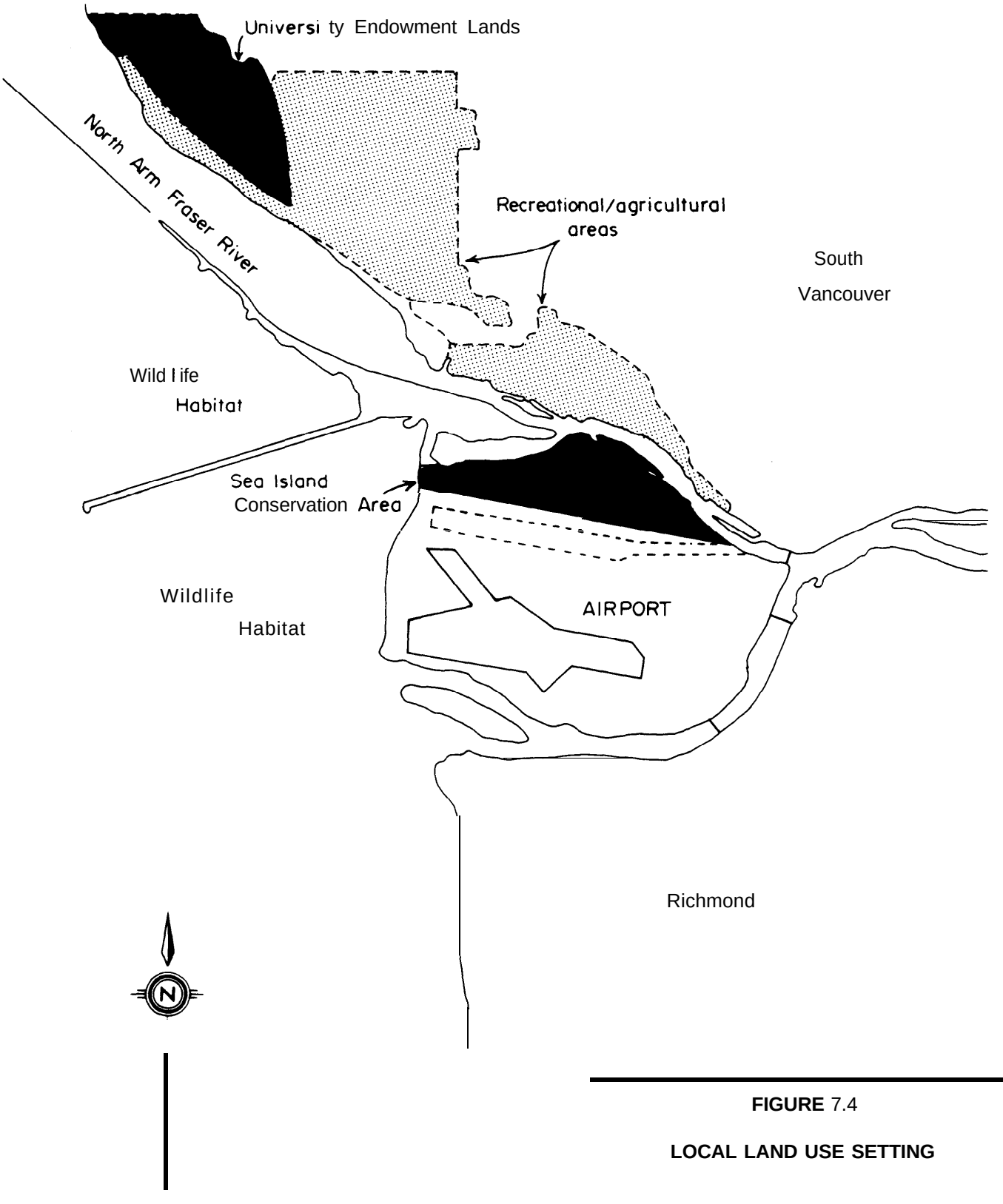



**FIGURE** 7.4

**LOCAL LAND USE SETTING**

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

(Adapted From Transport Canada EIS, 1990)

**17. The Panel recommends that:**

**a) the whole of the area north of the runway be set aside by Transport Canada as the core of a Sea Island Conservation Area (SICA) and that this decision be reflected in the lease arrangements between Transport Canada and the VIAA;**

**b) Transport Canada establish a Wildlife Management Committee with a mandate to manage the SICA area for a period of at least 50 years;**

**c) the Committee consist of the Canadian Wildlife Service (acting as Chair), the Department of Fisheries and Oceans, the B. C. Ministry of Environment, the Musqueam Indian Band, the City of Richmond, the Greater Vancouver Regional District and the Fraser River Estuary Management Program;**

**d) The Wildlife Management Committee have the power:**

**i) to manage SICA and associated mitigation and compensation programs;**

**ii) to coordinate habitat purchases and programs for rehabilitation, enhancement and management with other agencies; and**

**iii) to involve appropriate interest groups in joint research, planning activities, pilot projects and public education; and**

**e) the administrative costs of the Wildlife Management Committee be borne by Transport Canada together with the costs of any environmental projects in the SICA area arising from the impacts of the new runway.**

One of the first acts of the Wildlife Management Committee should be to prepare a program showing specifically how the SICA area is to be left on completion of the runway construction project. This should be followed by a plan showing how the area is to be managed on a continuing basis. These plans should be prepared in consultation with all interested parties and every effort should be made'to obtain official recognition of the plans from bodies such as GVRD and FREMP.

Road access would have to be provided within the SICA area, as would various provisions for recreation. These should respect the overall purpose of SICA — the preservation and enhancement of wildlife. The Panel feels that there should be no road along the northern dike. This strip should be left mainly for the development of a suitably designed linear park. The road which would be necessary to provide access to lona Island should run alongside and as close as possible to the runway, with stub roads off it to serve existing installations such as the fuel storage site. It should not provide access to McDonald Slough, which is of special significance to the Musqueam Indian Band.

**18. The Panel recommends that:**

**a) the Wildlife Management Committee prepare plans for:**

**i) the form and condition of the SICA area at the completion of construction operations; and**

**ii) the ongoing management and maintenance of the SICA area thereafter; and**

**b) roads and recreational developments in the SICA area be designed with wildlife conservation in mind.**

## 7.6 Air Quality

### 7.6.1 Existing Conditions

Atmospheric emissions associated with the Vancouver International Airport are derived from a variety of sources including aircraft, cars, incinerators, and fuel storage areas. However, the Vancouver west and Richmond urban areas also contribute, usually detrimentally, to the quality of the air at Sea Island.

Available ambient air quality monitoring data at YVR from 1979, 1985 and an ongoing study suggested that carbon monoxide (CO), nitric oxide (NO), nitrogen dioxide ($NO_2$), and total suspended particulates (TSP) changed little between 1984-85 and 1990-91. None of the CO, $NO_2$, $O_2$, or TSP concentrations exceeded the federal accepted air quality objectives for short, medium or long-term averaging periods. Concentrations of CO, NO, $NO_2$ and TSP on Sea Island were generally equivalent to, or lower than, the corresponding concentrations measured by the GVRD at nearby monitoring stations in Vancouver West, Marpole and Richmond.

Two other pollutants were of greater concern. Nitric oxide (NO) was often two to four times higher than $NO_2$. However, there are no federal objectives for NO. Ozone ($O_3$) plays an important role in secondary photochemical reactions with other air pollutants and $O_3$ levels are often high, especially in the summer. Over a 3 month sample, the 24 hour "acceptable" level of 50 $Ug/m^3$ was approached regularly and the "desirable" level of 30 $Ug/m^3$ was exceeded 20 percent of the time.

In 1988 aircraft emissions at YVR were estimated to contribute less than 2 percent of volatile organic compounds to ambient air quality in the GVRD, and substantially less for other monitored pollutants. The first eight months of the 1990 study confirmed that maximum concentrations of all measured pollutants remained considerably below the relevant desirable and acceptable federal objective thresholds.

### 7.6.2 Parallel Runway Impact

Modelling studies suggest that with a parallel runway the total number of annual aircraft movements would increase from 300,000 in 1990 to 450,000 in 2005. However, as a result of reduced take-off queuing time, and cleaner operating aircraft and automobile motors, total emissions from Sea Island would remain roughly the same during this period. In addition, the provision of a rapid transit line could reduce the anticipated emissions from roadways and parking lots. It is expected that the proposed runway would partially mitigate the impacts of $NO_x$, CO, $SO_x$, hydrocarbons and particulates which would have arisen for the no-project case.

In evaluating potential air pollution impacts, Transport Canada focused closely on the airport and nearby environs. Little attention was devoted to how these emissions would interact synergistically with those from its neighbours. A qualitative

statement on expected synergistic effects would have been useful. The Greater Vancouver Regional District has adopted a goal of reducing by 50 percent by the year 2000 existing total emissions of sulphur and nitrogen oxides, particulates, carbon monoxide and volatile organic compounds. In addition, Canada is committed to decrease ozone concentration to levels below the threshold at which the most susceptible segments of the population experience the health effects of smog. Currently, measured $O_3$ concentrations in the Lower Fraser Valley, which are affected by emissions in the Greater Vancouver area as a whole, are sometimes double what is considered safe air quality.

While it is clear that the airport is not a major contributor to air quality problems in the region, it would nonetheless be appropriate for airport management to cooperate with others in the general effort to improve air quality. For example, if the GVRD as an organization converts its vehicles to cleaner fuels in the interest of improving air quality, YVR should be willing to do no less. Further, if a public transit system to the air terminal would improve regional air quality, Transport Canada would be justified in facilitating such a service in order to reduce its contribution of air pollutants to surrounding neighbourhoods.

# Chapter 8

## INSTITUTIONAL ARRAGEMENTS

**Chester Johnson — Vancouver International Airport Authority**

*"The local Airport Authority will be accountable to ail levels of government and be responsive to local concerns in a way that an Ottawa-based management structure could never achieve. The local Airport Authority believes that a large part of providing sound management is listening to and responding to local concerns.*

*We are committed to the current process that calls for public input and recommendations on the future of the airport, and we intend to fully support the findings of the Environmental Review Panel. We are also committed to upholding the guarantees that Transport Canada has made on the future operation of the airport, including the restrictions of use on the third runway when it is built."*

**Chief Wendy Grant — Musqueam Indian Band**

*"I used this example with a group of school kids who came down to the Reserve: I asked them, "What would you do if an alien group of people came in here and took over your land?" You know, I try and relate this to what's going on* **in Kuwait, and** *how they're trying to fight on that side, and I wonder, how would you feel if those people came here and took away your lifestyle, and made you* **live the way** *they do?"*

**Irene Miller**

*"This also raises the question of who the local authority will be accountable to. The only indication that I could find is that the local airport authority, a non-elected body, is not collectively accountable to anybody. Each member is accountable individually only to the association that nominated that member which, in my opinion, amounts to no accountability at ail. "*

**Chris Shelton**

*"if privatization [were] to totally separate the Government of Canada from the airport administration, then the continuity of the Official Languages Act, pension benefits and the Canadian Labour code would not be addressed in the legislation... The Airport Transfer Bill lacks any requirements for the Airport Authority to report under the Financial Administration Act of Canada. An essential concept of a Crown Corporation is that it is accountable to Parliament for its affairs . . . This is not required of the designated Airport Authority. "*

# 8.0 INSTITUTIONAL ARRANGEMENTS

Three main issues have been discussed in previous chapters — justification, noise and environment. However, there are several other important matters which are inextricably bound up with these larger issues.

## 8.1 The Vancouver International Airport Authority (VIAA)

The dimensions of the task of developing a new runway are now clear. Briefly they are: to turn YVR into an air service center and an economic generator for the whole of British Columbia; to respond sensitively to the needs of people who will be newly affected by airport noise; and to take several environmental initiatives of immense significance for the Fraser River estuary. These tasks will not be achieved without appropriate management arrangements and real commitment by all concerned. Central to this will be the Vancouver International Airport Authority (VIAA), which is expected to take over the management of the airport in September, 1991.

Many questions were asked during the hearings about the VIAA, which was established by the Minister of Consumer and Corporate Affairs by Letters Patent dated January 23, 1990. The main concerns expressed were that it should be bound by the Panel's recommendations on noise and environmental issues, and that it should be "accountable". The Panel's own concerns stem from three aspects of the VIAA outlined in the *Memorandum of Understanding* and associated *Supplementary Principles* which apparently guided its establishment in the early stages. These directives do not have legal force and the Letters Patent, which do, are singularly broad and unspecific.

First is the overwhelming emphasis on business. The VIAA is to be a "commercial enterprise", an "independent incorporated business entity", which is to manage not only the airport, but also "associated business enterprises", and, if it chooses, "non-aviation related activities". It is to "develop the airport", to "promote increased traffic volume", and to be financially viable and independent.

Second, the members of the VIAA are to be "representatives of local business and community interests... with the business acumen and . ..the requisite technical skills (engineering, law, business, finance) to manage an ongoing viable commercial enterprise". Seven members are to be nominated by several representative or professional bodies, specifically the City of Vancouver, the City of Richmond, the Greater Vancouver Regional District, the Vancouver Board of Trade, the Law Society of B. C., the Institute of Chartered Accountants of B. C., and the Association of Professional Engineers of B. C. A further five may be appointed by the first seven. Elected public representatives and public servants are specifically barred from membership by the Bylaws.

Third, the arrangements for public accountability are purely nominal. The VIAA is only obliged to hold, at least once a year, a public meeting at which *"the Authority shall afford reasonable opportunity for the asking of questions and the expression of views."*

This appears to be the public's only window into the workings of the VIAA. Furthermore, the VIAA, being neither a Crown Corporation responsible to Parliament nor subject to the Financial Administration Act of Canada, is governed only by the controls contained in Section 18.3 of its own by-laws. This directs it every five years "to retain a recognised independent consulting firm to conduct a review of the Authority's management operations and financial performance". If any fault is found, "the Board of Directors shall convene a special meeting... to determine the course of action to be taken to resolve the problems disclosed by the Consultant's report".

The VIAA's environmental responsibilities are set out in Clause 3.10 of the *Supplementary Principles,* which says *"The* Local *Airport* Authority will *be responsible for* dealing with *noise management, air pollution, solid waste management and other airport-related environmental issues consis tent with applicable standards and regulations".* In addition, the Authority's chairman, Mr. Chester Johnson, said at the hearings *"... we intend to fully support the findings of the Environmental Review Panel"*

Lastly, as to how the VIAA is to operate in relation to the wider community, the Supplementary Principles state that *"Consultative processes will be set up between the VIAA ahd adjacent communities to ensure the enhancement of economic develop men t, coordinated regional planning, management of en vironmental issues* and *conformity with all local and building bylaws".* This presumably would be voluntary compliance for it appears the VIAA will not be subject to local planning and zoning bylaws or to routine property taxation. Again, Mr. Johnson committed the Authority to cooperation: *"The VIAA pledges to consult with and establish a dialogue with interested community groups and recognized experts on the operation of the airport as a whole"* and *"The VIAA will be accountable to all levels of government and be responsible to local concerns... [It] believes that a large part of providing sound management is listening to and responding to local concerns."*

Given the nature and breadth of the task it faces, it would have been reassuring if the VIAA had been broader and less biased against public experience in its membership, less preoccupied with business and more open and directly accountable to the general public. For example, it is regrettable that places were not found for representatives of the Musqueam Indian Band, adjacent neighbourhoods and the environmental community. On the other hand, its environmental obligations are clearly set out and its chairman has pledged that it will be open, cooperative and responsive to community concerns. Furthermore, it will have financial means appropriate to its obligations. At the hearings Mr. Johnson was asked whether he would be concerned if environmental costs were to amount to, say, an extra $50 million on top of runway construction costs of about $100 million. He answered that he would not anticipate any difficulty in raising such an amount for these purposes.

In the minds of the Panel, the VIAA's attitude towards its task will be of paramount importance. If in pursuing its economic goals, it adopts a passive role in relation to social and environmental problems — tell us what we have to do and we'll do it because we have to — then, perhaps the letter of its obligations will have been met. But that is surely a minimal expectation. The VIAA can be a tremendous force for good in the region. It can be not only a good neighbour to adjacent residents but a leader in the fight to save the beleaguered Fraser River estuary. But this will require a broad rather than a narrow approach to "business". This does not necessarily mean spending more money than its obligations require, but rather providing focus, leadership and clout through wholehearted participation in the work of the Noise Management Committee and the Wildlife Management Committee in particular. It is the Panel's hope that the VIAA will choose to see itself in this light. If it does, the benefits to the region and the estuary will be incalculable.

## 8.2 Management Committees

Transport Canada proposed an integrated project monitoring and implementation program for the parallel runway project. It stated that it is:

> *"committed to assuring that the recommendations of this* report [the *EIS]and of the Environmental Assessmen t Panel are implemented during project construction and operations. Accordingly, Transport Canada will conduct an integrated program of environmental construction surveillance, and effects and compliance monitoring, as an essential follow-up to project approval. "*

The integrated program consists of an Environmental Monitoring and Implementation Committee (EMIC) to serve as the central committee, and five supporting committees.

The Environmental Monitoring and Implementation Committee (EMIC) would audit the implementation of all recommendations of the EIS and "accepted recommendations" of the Panel. As recommendations are implemented, certain monitoring programs would be discontinued. The noise, air quality and wildlife committees would be ongoing committees.

The membership of the EMIC would include the Department of Environment, the Department of Fisheries and Oceans, the B. C. Ministry of Environment, the City of Richmond, the City of Vancouver, the Greater Vancouver Regional District and citizen groups. The membership of sub-committees would vary, but each one would have citizen membership.

Transport Canada would employ an independent consultant, reporting to the chairman of the EMIC. This consultant would have authority to shut down all or any part of the construction project if he or she determined this was necessary for any reason. The consultant would liaise with regulatory agencies and Transport Canada.

**The** EMIC would publish an annual report with monitoring data on all aspects of the project. All data would be made available to the public.

The EMIC would be assisted by five supporting committees:

- Noise Management Committee
- Air Quality Management Advisory Committee
- Wildlife Management and Compensation Committee
- Water Quality/Pollution Control Management Committee
- Cultural and Recreational Committee

These committees would oversee monitoring programs for their respective fields and provide recommendations concerning construction and operations, and implementation of EIS and Panel recommendations.

The Musqueam Indian Band expressed concern that commitments concerning the terms of reference and membership of the Wildlife Management Committee were vague. It proposed that the composition of the Committee be limited to wildlife-oriented groups only. "The Musqueam Indian Band believes that specific wildlife issues should be addressed with the technical expertise of the government agencies, and the management and user experience of the Musqueam Indian Band as well as the local knowledge and interests of the public wildlife groups." Its concern with the broader representation was "...the difficulty of decision-making when vastly divergent interests, knowledge of wildlife matters and environmental management expertise are all represented on the same committee." The Panel concurs with this position.

The Panel accepts these proposals and commends Transport Canada for the concept of a monitoring program open to the public and at arms-length from airport management. In Chapters 6 and 7 of this report the Panel has already recommended the strengthening of the Noise and Wildlife committees. In addition, it offers the following comments on the philosophy and functioning of the three permanent committees and their relationship with the VIAA.

1. The concept of an overall committee seems sound for the pre-construction period, when all the committees will be finding their feet; and for the construction period, when a great deal will be happening and "crises" are liable to happen very fast and to demand speedy resolution.

2. An overall manager will be crucial during this period and he or she should have their own staff quite separate from those of the committees, where these are busy enough to require their own. This person should never be expected to represent the YVR management on committees; he or she must be seen as independent or the whole exercise will be seen as a sham.

3. Places on all committees should be offered to the Musqueam Indian Band, and the City of Richmond.

4. The essential members of the several committees, in addition to the standing members, should be:

   **Noise Committee** (section 6.6.1) The Canadian Air Line Pilots Association, the Air Transport Association of Canada, the Canadian Air Traffic Control Association, the

City of Vancouver, and at least two representatives of citizen groups for each, of the Cities of Vancouver and Richmond.

**Wildlife Committee** (section 7.5) The Canadian Wildlife Service, the Department of Fisheries & Oceans, the B. C. Ministry of Environment, the Greater Vancouver Regional District and the Fraser River Estuary Management Program.

**Air Quality Committee** The Greater Vancouver Regional District, the B. C. Ministry of Environment.

**Water Quality** The B. C. Ministry of Environment, the Department of Fisheries and Oceans, and Environment Canada.

**Culture and Recreation** the Greater Vancouver Regional District and B. C. Heritage Conservation Branch.

The Panel believes that only three permanent committees, dealing with noise, environmental matters and air pollution, should be necessary. These cover reasonably distinct areas of expertise but appropriate liaison should not be too difficult when overlap occurs, as it inevitably will on occasion. The Panel does not believe that a super-committee is required to oversee or coordinate the ongoing work of these three committees.

The purpose of the permanent committees must be a dual one — to bring the public's sensitivities, views and expertise to bear on YVR's environmental problems, and to enable YVR management to inform the committees — and the general public beyond — on the nature of these problems, and allow them to have a say in their resolution. It will, of course, be understood that the committees have an advisory function only and that executive decisions are the sole prerogative of YVR management.

The aim in structuring each committee should be to involve all the parties which have a central interest in the issue (stakeholders) without adding unnecessary members for the sake of communication. The aim should be to have effective committees that are as small as the circumstances will allow.

The functioning of the committees should be governed by four principles:

- that they should operate at arms-length from YVR management;
- that they should be free — and in fact have a duty — to report their activities and views to the general public;
- that they should report to YVR management and have easy access to it and its staff; and
- that they should be provided by YVR management with a budget which will enable them to do their job as they see it, including the employment of staff and independent consultants.

It is not hard to see that these principles contain the seeds of discord, and will require considerable understanding and mutual respect on the part of both YVR management, which will be paying the costs, and the committees, which will feel that they should be able to say their piece, regardless. It should also be pointed out that if the two work together the outcome — in terms of good neighbourliness and mutual support — could be very satisfying and creditable for all concerned. It is obvious, however, that YVR management will be in the driver's seat and will bear the primary responsibility for the success of the committees — even if they sometimes appear to be biting the hand that feeds them. The Panel urges YVR management to support its committees generously and respond to their advice with understanding and vigour.

## 8.3 The Role of Transport Canada

Throughout this report the Panel has addressed itself to Transport Canada as the proponent of the parallel runway proposal, knowing that in September, 1991 the management of YVR will become the responsibility of the VIAA. In doing this the Panel assumes that Transport Canada will honour the several commitments it made in the EIS and at the Public Hearings and will take the appropriate actions without delay. It also assumes that any such responsibilities will be carried on by the VIAA when it takes over.

It is understood that certain functions will not be assumed by the VIAA. According to the Supplementary Principles which guided the establishment of the VIAA, these are as follows:

S. 1.5 *"Air navigation and security facilities will be provided by Transport Canada... and will not be included in the devolution of airports or leasing arrangements.*

s. 3.3 *"The federal government will retain regulatory authority and enforcement powers with respect to standards of safety and security..."*

s. 3.7 *"Protective policing, particularly as related to the prevention of terrorism, will continue to be provided by the federal government... "*

## 8.4 The Musqueam Indian Band and its Role in Management

The resident members of the Musqueam Indian Band live on a 400 acre reserve immediately across the North Arm from the proposed parallel runway. Their ancestors have been using Sea Island and the surrounding waters for hunting, fishing and other purposes for thousands of years, in fact since Sea Island was formed at the mouth of the delta. Well within living memory the Island provided the Band with a subsistence living. As Chief Wendy Grant said during the public hearings *"... when I was growing up my father made his living by catching muskrats there,. . I grew up eating ducks, eating deer, eating fish".* The land still left to the Musqueam Indian Band, such as it is, is used in the same way today as far as its diminished resources permit.

An extensive reserve (No. 3) on Sea Island was granted to the Musqueam Indian Band in 1876, but all except a very small area adjacent to Macdonald Slough was signed away in 1972 in anticipation of a new runway at that time. The whole of the

. Island and more are part of a comprehensive land claim lodged by the Musqueam Indian Band with the Government of Canada.

Briefly, the Musqueam Indian Band sees in the parallel runway proposal yet another threat to the rights of its members and their way of life. It shares the concern of other Vancouver south slope groups regarding the potential effects of noise from the runway, not only on its homes but also on the bird population; the Band is concerned that it will cause further deterioration in water quality and further loss of fish habitat; and is concerned about the prospect of losing more bird habitat and about the effects of the Bird Strike Program.

The situation for the Musqueam Indian Band is a particularly poignant one. Not only does it anticipate still further erosion of its lands, which are basic to the way of life of its members and are now reduced from an extensive domain to a mere toe-hold on the Island; not only does it resent the fact that there has not yet been a satisfactory resolution of its land claims; but in the face of all that, recent decisions of the Supreme Court of Canada (Guerin and Sparrow) have assured the Band that the relationship between it and the Government of Canada is a special one 'trust-like *rather than adversarial — in which the Government must have a special regard for the needs of the Musqueam Indian Band as an aboriginal people':* Further *"... the honour of the Crown is at stake in dealings with aboriginal peoples " says the Sparrow Judgement.*

The frustration and anger of the Musqueam Indian Band were made clear by Chief Grant in her moving extemporaneous remarks to the Panel:

> *"... legally we keep winning.. . and it doesn't seem to do any good. "*
>
> *"When is it ever going to change? When are we ever going to see any movement on this?" "What can we do to stop this, this steamroller that is coming over us?"*
>
> *"... open your ears, and your hearts and your souls to these 600 people that are desperately trying to cling to the last little bit of their existence as they knew it..."*

As Chief Grant also said "as *aboriginal people, the members of the Musqueam community have a unique and particular interest in Sea Island, which is much different from and stronger than the interests of other Vancouver area residents and organizations".* In addition, they are more immediately affected, especially through hunting and fishing activities, than any other group. Apart from the over-arching issue of land claims, two steps could be taken which would recognize the special status and interests of the Musqueam Indian Band and, just as important, make use of its unparalled knowledge of the Sea Island habitat.

**19. The Panel recommends that:**

**a) the Musqueam Indian Band be given representation on all YVR committees; and**

**b) the interests of the Musqueam Indian Band be given high priority in the planning and development of the SICA area.**

The Musqueam Indian Band has a particular interest in archaeological sites on Sea Island, and the runway project would affect many of these, both house and village sites. Transport Canada has already completed an inventory of these and has undertaken to monitor sites during construction and to document, salvage and restore any sites unavoidably affected by the project. Further, an archaeologist is to be retained during construction to monitor, carry out periodic inspections and ensure that newly discovered sites are protected. The Panel expects that Transport Canada will honour these commitments. In addition, the Musqueam Indian Band has proposed that interpretive signage be erected at YVR, a cultural exhibit be included at new airport facilities, and a cultural center at the midden site at Marpole in Vancouver and a possible Musqueam Indian Band Museum be built.

20. **The Panel recommends that Transport Canada give serious consideration to funding the Musqueam Indian Band's proposal for interpretive signage, a cultural exhibit at the new airport facilities, a cultural centre at Marpole and a Musqueam Indian Band Museum.**

## 8.5 The City of Richmond

The Panel acknowledges the special position of the City of Richmond in relation to YVR. It is not just that 40 percent of airport employees live in Richmond and about 10 percent of its taxes come from airport installations but that Sea Island lies within the boundaries of the City. Furthermore, the two are linked in very immediate and practical ways. As Mayor Halsey-Brandt said at the public hearings:

> *"While sharing in the economic benefits accruing from the airport, Richmond shares the responsibility of managing operations on Sea Island. These responsibilities include protection and management of the natural environment, management of land use, the provision of roads, sewers, utilities and recreation and police and fire protection services".*

But for the City the airport rose is not without its thorn. Since YVR is on federal land, it is not subject to the jurisdiction of the City in respect of zoning, taxation and payment for services. In other words the City cannot legislate for YVR as it can for an ordinary citizen.

To complete the picture of complexity as seen by the City, the Mayor also reminded the Panel of the many other agencies which have an interest in the management of Sea Island:

> *"... the Canadian Wildlife Service, the Department of Fisheries and Oceans, the B. C. Fish and Wildlife Branch, the Musqueam Indian Band, the GVRD Parks Department, the City of Vancouver, the North Fraser Harbour Commission, the Fraser River Estuary Program, airport tenants and the residents of Burkeville".*

Mayor Halsey-Brandt set out three areas of special concern to Richmond:

1. The need to resolve many planning questions on Sea Island, such as "... land use, access, movement, environmental protection, infrastructure, urban design and so on". Most of these are routine concerns for a municipality but in the case of Richmond, some are far from routine. One is the whole issue of the Airport North area and its many elements, which has already been discussed. Another is the VIAA's strategy in furthering its economic development objectives. If the VIAA were to build a substantial amount of retail and business space into a new terminal, the consequences for commercial development on Lulu Island and even for the idea of a Regional Town Center would be considerable. In this matter, Richmond hopes *"to initiate a process to prepare an amendment to our Official Community Plan reconciling land use and overall planning policies for Sea Island"*

2. Another major concern for the City is the need for an agreed Parks and Recreation Plan for Sea Island which will recognize the interests of airport employees, the metropolitan public and Richmond's own citizens. Here, Richmond has requested "that Transport Canada participate in the preparation of a Parks and Leisure Master Plan to be initiated in 1991 and that the study be jointly directed by Richmond and Transport Canada".

3. Lastly, in relation to the financing of municipal utilities, the Mayor said "... the City provides a number of services to its residents, and funds these services, such as road, sewer, water, drainage and open space through taxation, user charges in terms of water and sewer, or . . . development cost charges. The federal government has not recognized that such charges, fees and taxes are applicable on lands subject to federal jurisdiction. Therefore in order for the City to provide these essential services to federal lands an equitable and practical agreement is needed to finance new infrastructure, maintenance and operational aspects of these services".

This recital illustrates very clearly the environment in which the YVR management will be doing its work. It will be enveloped in a web of every-day relationships, especially with the City of Richmond, involving the most practical matters. In the Panel's view it is most important that YVR management approach this relationship with the cooperative attitude promised by the VIAA chairman at the Public Hearings.

## 8.6 Ground Transportation

The Sea Island area is a massive node of transportation activities which embodies the interests of four levels of government. In it the Panel sees at least four significant issues:

i) the provision of adequate traffic capacity in the main highway network skirting and feeding Sea Island: this is vital for YVR not just because its own growth will require highway connections to serve passenger and employee traffic, but because the bridges originally built by the federal government to handle airport traffic have been inundated by non-airport commuters and are now close to their capacity. Also important are adequate connections to Highway 99 to give the eastern part of the region better access to YVR. This is a complex planning issue which will require full cooperation between the partners in the study now underway — the B. C. Ministry of Highways and Transportation, the City of Vancouver, the City of Richmond, and the GVRD;

ii) public transit: a study is now in progress involving B. C. Transit, the City of Vancouver, the City of Richmond and Transport Canada. Although apparently a narrower issue, this is anything but simple. It involves not only a choice of possible routes but reconciling the different interests of the partners. For example, YVR would like to see the airport on the main route between Vancouver and Richmond, while Richmond would like to have the shortest possible route into Vancouver, with the airport served by a branch line. Furthermore, the type of transit serving YVR will have to be worked out, for the traffic volume may only justify bus service for some years yet;

iii) the provision on Sea Island of the roads and parking facilities which will serve YVR's own in-house needs; and

iv) the interests of Richmond in providing bridges between Lulu Island and Sea Island as well as a road system in the Airport North area to serve recreational traffic plus airport functions: It appears that there are long-standing working arrangements between Richmond and YVR which can accommodate the necessary studies.

The Panel acknowledges the complexity of these tasks and the obligation for cooperation and support they impose on the YVR management. It is vital to the future of YVR that coordinated arrangements work well and that the needs of all the interested parties be heard.

## 8.7 Regional Planning

One of the more significant aspects of the Panel's task reflects the extent to which the expansion at YVR is intertwined with regional development. YVR is much more than an airport. It is also a concentration of industry and commerce and a node in the highway network; it has considerable impacts on air, water and wildlife habitats; and it creates a level of noise which would not be tolerated in any other metropolitan activity. In a region that prides itself on its attractiveness and livability these are matters of some consequence.

In these circumstances, the Panel might have expected to receive guidance from regional planning agencies. This, however, occurred only to a limited extent. It did receive a brief from the GVRD, a somewhat tentative document which listed many caveats which it hoped the Panel's decisions would satisfy. This presumably reflected the fact that GVRD is not now an official regional planning agency, because its regional planning function was rescinded by the province in 1983.

This is distressing because the limits to growth in the Lower Mainland are now very obvious. If, 15 years or so from now, even more runway capacity is needed it will probably not be achievable by developing yet another airport. Even if it were, the region would again face a number of familiar problems —

ground transportation, loss of agricultural land, community noise impacts, environmental damage and integration with urban communities.

It is ironic that in the 1970's the GVRD did outstanding work in opposing premature development of a parallel runway at YVR. In doing so, it mobilized community resources and initiated an investigation equivalent in depth and scope to this present review.

The GVRD is conscious of the inadequacy of its present emasculated regional planning program and in its recent report Creating our Future (Regional Action no. 52) expressed "the need for renewed GVRD regional land use, transportation and social development mandates". The Panel's recent experience has underlined this need and therefore supports the GVRD's desire for a renewed regional planning mandate.

## 8.8 Moving Toward a Second Airport

It appears likely that, perhaps 15 years from now, the Lower Mainland will still need more runway capacity than YVR can provide. As already noted, it also appears that this capacity will be hard to come by. The Panel believes that the planning for this next step should start right away and that it should be done without any preconception that Boundary Bay or Abbotsford are the only other airports worth investigating. It should also look into the many other matters that need to be taken into account, such as highway connections, and zoning. In other words, the Panel agrees with the suggestion by the GVRD that an airport development plan is necessary and that all interested parties need to be involved.

**21. The Panel recommends that the Minister of Transport initiate the preparation of an airport development plan for the Lower Mainland Region, involving Transport Canada, the VIAA, the GVRD, and the B. C. Ministry of Highways and Transportation along with communities, interest groups, and business interests involved.**

In passing, two additional comments are necessary. The first is to stress the very special position of Boundary Bay Airport, which was the subject of an environmental assessment review a few years ago and featured prominently at the most recent YVR hearings. This prominence was partly because of its close association with the Pacific Flyway, which should be regarded as sacrosanct due to its international significance. There will undoubtedly be new pressures for development at Boundary Bay, and the Panel simply wishes to make it clear that this area is a very special one of far more than local environmental significance. Clearly a new assessment would be needed to justify any expansion there.

The second point has to do not with planning, but with the actual development of Abbotsford Airport. Much was made of Abbotsford at the hearings because it is seen generally as the only place to go when YVR is again congested. Yet, it was made clear by many intervenors that it is difficult to develop a second airport to relieve a better placed major airport. Thus it is clear that if Abbotsford were to serve in this way, a lot of preparatory work would have to be done to prepare it for an expanded role. The airport itself would have to be appropriately equipped and adequate highway connections built to it, and perhaps rapid transit as well. But the essential point is that these steps would have to be taken in advance of demonstrated need. Incentives would have to be provided by way of good facilities, services and connections in order to attract clients away from the advantages of YVR. This would obviously not be an easy thing to do and would take time, money and push-and-pull policies designed to persuade reluctant airport users to move out.

The Panel believes that this task is ideally suited to the nature and mandate of the VIAA and its recommendation is therefore addressed to that body. It will have considerable financial resources behind it, as well as a need to be sure that the ultimate phasing out of marginal users from YVR takes place in an orderly and cooperative fashion. Furthermore, it appears that the mandate of the VIAA would permit it to do this, for its Letters Patent permit it to apply its powers not only to YVR but to "other airports in the general lower mainland area of British Columbia".

**22. The Panel recommends that as soon as an airport development plan is complete, the VIAA address itself to the task of preparing Abbotsford and other airports to assume a larger role in the Lower Mainland's airport system.**

# Chapter 9

## CONCLUSIONS

## 9.0 CONCLUSIONS

As a result of its studies and exposure to many viewpoints, the Panel finds that:

- more runway capacity is needed in the Lower Mainland region;
- that capacity can best be provided by a new parallel runway at YVR;
- a parallel runway would cause new permanent noise impacts for which mitigation and compensation should be provided;
- a new parallel runway would cause considerable environmental damage, especially to bird habitat on and around Sea Island, for which there should be mitigation and compensation; and
- bird habitat mitigation should include a substantial amount of land planned for airport purposes on Sea Island, and its dedication to habitat conservation instead.

In other words, a new runway at YVR should be approved only if a commitment is made to provide compensation and mitigation for both noise and habitat loss. In making these recommendations the Panel is well aware that there is no precedent for noise compensation at federal airports in Canada, and that habitat mitigation on the scale suggested goes beyond existing plans. However, it is no longer acceptable that development should occur without paying the price necessary to protect both the human and the natural environment.

The Panel sees this conclusion as more than just a runway in exchange for a little compensation. The parallel runway undoubtedly foreshadows more development in the Fraser River estuary — to see it otherwise would be to overlook too many present signs and to ignore the growth imperative espoused by much of society. In this light, the Panel's judgement should be seen as a precedent for responsible development, which recognizes not only the desire for growth but also the knowledge that we are stewards of our environment and must not use it lightly.

Finally, the Panel wishes to thank all those citizens who made the review process work.

# Chapter 10

## COMPILATION OF RECOMMANDATIONS

# 10. COMPILATION OF RECOMMENDATIONS

1. The Panel recommends that the Minister of the Environment direct the Federal Environmental Assessment Review Office (FEARO) to develop guidelines for the incorporation of environmental costs into cost-benefit studies conducted in connection with the implementation of the Environmental Assessment and Review Process (EARP).

2. The Panel recommends that the Noise Management Committee:

   a) promote the goal of achieving and maintaining the noise environment around YVR in a state not worse than that described in the EIS for the year 2001 with mitigation;

   b) monitor and evaluate the noise environment around YVR on a continuous basis, including investigation of the noise regime created by all airport operations, their effects on residents and the effectiveness of noise mitigation and compensation measures;

   c) report periodically on the noise environment around YVR including the publication of:

      i) the results of monitoring and any other studies that it may carry out; and

      ii) an independent annual public report describing the state of the noise environment during the previous year and mitigative measures taken to abate noise;

   d) investigate measures for identifying and abating noise problems and advise Transport Canada on the development and evaluation of appropriate mitigation and compensation programs, such as those recommended by the Air Transportation Association of Canada (ATAC) limiting quiet hour use of stage two aircraft and the provision of run-up noise barriers; and

   e) address its recommendations to YVR management, which shall carry out these recommendations or show cause why it is not able to do so.

3. The Panel recommends that the Noise Management Committee:

   a) consist of representatives appointed by Transport Canada, the Canadian Airline Pilots Association, the Air Transportation Association of Canada, the Canadian Air Traffic Control Association, the City of Vancouver, the City of Richmond, the Musqueam Indian Band, and at least two representatives of citizen groups for each of the Cities of Vancouver and Richmond;

   b) be a permanent, self-governing body located in Richmond and operated independently of Transport Canada;

   c) be provided by Transport Canada with a budget adequate to carry out whatever program it deems necessary for the performance of its duties;

   d) have access, within a reasonable period, to any records which Transport Canada may compile in the course of its own noise control, abatement, monitoring and other relevant programs; and

   e) be separate from any environmental review Committee whose duty is to consider impacts on land, air and water quality, and fish and wildlife.

4. The Panel recommends that as new aircraft tracking technologies are developed at YVR through the implementation of the Radar Modernization Program (RAMP) and the Canadian Automated Air Traffic System (CAATS), airport management use these systems to identify and obtain evidence against aircraft deviating from approved noise abatement procedures and thereby causing noise disturbance.

5. The Panel recommends that:

   a) the parallel runway be operated as an arrival runway, except when departures are necessary for emergencies or routine maintenance of the main runway, and in due course when routine departures become necessary because capacity limits of YVR have been reached;

   b) only Stage 3 aircraft be permitted to operate on the parallel runway, except when Stage 2 operations are necessary for emergencies or routine maintenance of the main runway;

   c) all operations on the parallel runway be banned from 10:00 p.m. to 7:00 a.m., except when night-time operations are necessary for emergencies or for routine maintenance of the main runway; and

   d) landings on the parallel runway be conducted with the aircraft in the least noisy configuration possible and with minimal use of reverse thrust for braking, consistent with the principle that there be no compromise of air safety, and in compliance with applicable procedures of the International Civil Aviation Organization.

6. The Panel recommends that the B. C. Ministry of Municipal Affairs seek the cooperation of the City of Richmond in a pilot project focused on the Bridgeport area of Richmond with the objective of investigating how airport noise impacts in British Columbia might be minimized through the use of provincial and municipal regulatory powers.

7. The Panel recommends that a noise compensation program for those affected by the proposed runway along the lines suggested in this report, be accepted in principle and referred to the Noise Management Committee for study and action.

8. The Panel recommends that at least one new noise monitoring site be established in the Marpole area (e.g. Oak Street and 70th Avenue) and two more in the Bridgeport area of Richmond.

9. The Panel recommends that:

   a) the Noise Management Committee, with the assistance of Transport Canada, carry out detailed surveys of the existing noise environment, commencing in 1991, to identify existing noise zones out to the $L_{dn}$ 60 dBA contour, supplemented by SEL zones out to the SEL 75 dBA contour; and

   b) in conjunction with the above and with a view to possible clarification of apparent noise anomalies in the south

slope of Vancouver, the Noise Management Committee and Transport Canada develop an ongoing research program involving topographic and meteorological aspects of noise in the south slope area.

10. The Panel recommends that:

a) the Noise Management Committee carry out a social and building survey of the numbers and the characteristics of residents in the delineated baseline noise zones, their living patterns, their sensitivity to noise and the condition of their homes. Questions to be asked in this survey should include people's reactions to major impacts including speech masking, sleep disturbance, health effects and annoyance; and

b) the Noise Management Committee simultaneously conduct research on possible noise mitigation and compensation measures, including commissioned independent professional research and visits to airports which have effective mitigation, compensation and public consultation programs.

11. The Panel recommends that:

a) the base case for determining incremental effects of noise be the most recent set of $L_{dn}$ contours prior to the opening of a new runway;

b) these be updated annually thereafter; and

c) incremental noise impacts be identified using the $L_{dn}$ 60 as the cut-off cumulative noise level and SEL contours out to the 75 dBA level, together with frequency of occurrence for sporadic noise, in order to enable the NMC to determine incremental impacts warranting compensation.

12, The Panel recommends that Transport Canada commission an independent, public environmental review of its Bird Strike Control Program and Guidelines for Land Use in the Vicinity of Airports to assess their effects on habitat capability in the light of the proposed runway flight patterns and helicopter paths and also examine the potential effect on migratory birds of the new approach light system across Sturgeon Bank.

13. The Panel recommends that:

a) development in the Airport North area be limited to the runway, associated taxi-ways and landscaping essential for the operation of the runway;

b) airport-related commercial and other urban uses be permanently prohibited north of the runway;

c) the remainder of land north of the runway be dedicated to the conservation and enhancement of wildlife values; and

d) land uses incompatible with wildlife values in Airport North be phased out where feasible.

14. The Panel recommends the following principles and practices for compensating bird habitat losses at YVR:

a) that compensation be made for all loss of habitat and habitat quality resulting from the runway project and from associated policies and programs to control bird hazards and land uses;

b) that compensatory habitat be located adjacent to Sturgeon Bank in the vicinity of Sea Island if possible;

c) that the compensation be on a one-for-one basis with compensatory habitat having a similar function and quality to habitat lost on Sea Island;

d) that if compensatory habitat is not available near Sea Island, it be compensated on a two-for-one basis in the Roberts Bank area, or on a three-for-one basis in the Boundary Bay area;

e) that compensation be through purchase and enhancement of land, or through other forms of secure tenure, with enhancement;

f) that credit for compensation be based generally on habitat value added through enhancement;

g) that for the Airport North area a system be developed to grant credit for habitat enhancement which results in increased carrying capacity for selected species of waterfowl, passerines, and raptors; and

h) that accurate surveys of birds be conducted throughout the year prior to any construction at Airport North and at regular intervals thereafter to ensure that both the habitat enhancement credit system is soundly developed and that the compensation policies are effective in the long run.

15. The Panel recommends that the spill containment and recovery improvements proposed for the airport surface drainage system be completely operational before the parallel runway is commissioned.

16. The Panel recommends that a serious effort be initiated by Transport Canada to reach agreement with all relevant stakeholders to open the McDonald Slough causeway.

17. The Panel recommends that:

a) the whole of the area north of the runway be set aside by Transport Canada as the core of a Sea Island Conservation Area (SICA) and that this decision be reflected in the lease arrangements between Transport Canada and the VIAA;

b) Transport Canada establish a Wildlife Management Committee with a mandate to manage the SICA area for a period of at least 50 years;

c) the Committee consist of the Canadian Wildlife Service (acting as Chair), the Department of Fisheries and Oceans, the B. C. Ministry of Environment, the Musqueam Indian Band, the City of Richmond, the Greater Vancouver Regional District and the Fraser River Estuary Management Program;

d) the Wildlife Management Committee have the power:

i) to manage SICA and associated mitigation and compensation programs;

ii) to coordinate habitat purchases and programs for rehabilitation, enhancement and management with other agencies; and

iii) to involve appropriate interest groups in joint research, planning activities, pilot projects and public education; and

e) the administrative costs of the Wildlife Management Committee be borne by Transport Canada together with the costs of any environmental projects in the SICA area arising from the impacts of the new runway.

18. The Panel recommends that:

a) the Wildlife Management Committee prepare plans for:

i) the form and condition of the SICA area at the completion of construction operations; and

ii) the ongoing management and maintenance of the SICA area thereafter; and

b) roads and recreational developments in the SICA area be designed with wildlife conservation in mind.

19. The Panel recommends that:

a) the Musqueam Indian Band be given representation on all YVR committees; and

b) the interests of the Musqueam Indian Band be given high priority in the planning and development of the SICA area.

20. The Panel recommends that Transport Canada give serious consideration to funding the Musqueam Indian Band's proposal for interpretive signage, a cultural exhibit at the new airport facilities, a cultural centre at Marpole and a Musqueam Indian Band Museum.

21. The Panel recommends that the Minister of Transport initiate the preparation of an airport development plan for the Lower Mainland Region, involving Transport Canada, the VIAA, the GVRD, and the B. C. Ministry of Highways and Transportation along with communities, interest groups, and business interests involved.

22. The Panel recommends that as soon as an airport development plan is complete, the VIAA address itself to the task of preparing Abbotsford and other airports to assume a larger role in the Lower Mainland's airport system.

VANCOUVER INTERNATIONAL AIRPORT
ENVIRONMENTAL ASSESSMENT PANEL

R. M. Robinson (Chairman)

M. G. Hagglund

J. C. Day

J. W. Wilson

# Appendices

## APPENDIX 1

## PANEL TERMS OF REFERENCE

### Background

An Environmental Assessment Panel was first established in 1976 to examine the environmental and socio-economic considerations relating to Transport Canada's proposal to construct and operate a parallel runway at Vancouver International Airport. As a result of the recession and the subsequent reduction in air traffic movements, it was decided to place the parallel runway project on hold. Transport Canada continued with data gathering and site engineering during this period. Since the economic recovery in 1985, the Airport has experienced a significant increase in aircraft activity.

The Panel was last active in 1983 at which time it finalized and issued "Guidelines for the Preparation of an Environmental Impact Statement on the Proposed Third Runway at Vancouver International Airport". At the present time, Transport Canada is undertaking studies in response to these Guidelines.

The Panel review was reactivated in November, 1989 in response to a request from the Minister of Transport.

When the Panel was first established in 1976, it was not standard practice to issue terms of reference to Panels. However, such is now a requirement of the 1984 Environmental Assessment and Review Process Guidelines Order. To meet this requirement and to clarify the role and mandate of the reactivated Panel, these Terms of Reference have been prepared and issued by the Minister of the Environment, in consultation with his colleague, the Minister of Transport.

In issuing the Panel with these Terms of Reference, it was decided, in consultation with the Minister of Transport, not only to clarify the Panel's mandate, but also to expand it.

### Mandate of the Panel

The mandate of the Panel, under these Terms of Reference, is to conduct a formal public review designed to assess the environmental and socio-economic effects associated with the parallel runway project. The Panel review shall also include the investigation of mitigating and compensating actions which would reduce any negative environmental aspects which might be expected to result from the project.

Issues relating to project alternatives, related future development plans for the Airport, and economic benefits and disbenefits associated with the project will also be included in the review to enable a more comprehensive examination of the parallel runway project in the broader context of general Airport planning.

In fulfilling its mandate, the Panel shall provide full opportunities for public review and comment.

At the completion of its review, the Panel shall present recommendations to the federal Ministers of Environment and Transport on the environmental and socio-economic acceptability of the parallel runway project, and shall report on the benefits and disbenefits of the project. if the Panel concludes that the project is acceptable, it may recommend terms and conditions under which it could proceed.

### Panel Review Steps

The main steps in the Panel review process from the time of its reactivation in November, 1989 to the completion of the review (expected by early 1991) shall be as follows:

1. Submission by Transport Canada of a draft Environmental Impact Statement based on the Panel's 1983 "Guidelines for the Preparation of an Environmental Impact Statement on the Proposed Third Runway at Vancouver International Airport".

2. Issues Scoping Workshops to be organized by the Panel to examine the Panel's 1983 Guidelines, the Transport Canada draft Environmental Impact Statement and other relevant project documentation. The purpose of the workshops will be to determine the need for changes to the 1983 Guidelines in light of possibly altered circumstances and knowledge since their issuance and to examine Transport Canada's draft Environmental Impact Statement. The workshops will also be used to identify the key issues that should become the focus of attention during the remainder of the review. The workshops will include opportunities for participation by all interested parties.

3. Issuance by the Panel of changes to its 1983 Guidelines and a list of additional information requirements directed

at Transport Canada's draft Environmental Impact Statement.

4. Finalization by Transport Canada of the Environmental Impact Statement.

5. Public review of the EIS.

6. Public hearings held by the Panel.

7. Preparation by the Panel if its final report to the Minister of the Environment and the Minister of Transport.

**Procedures**

Detailed written procedures for the conduct of the review shall be established by the Panel and made available to the public.

## APPENDIX 2

## PANEL MEMBER BIOGRAPHIES

**RAYMOND ROBINSON:** recently stepped down as the Executive Chairman of the Federal Environmental Assessment Review Office (FEARO) in Ottawa to move to Vancouver. The office oversees the federal environmental assessment process for the government. A native of Victoria, Mr. Robinson is a graduate of the University of British Columbia. He began his federal public service career with the Department of External Affairs in 1958 serving in various posts abroad. In 1973 he joined the Department of the Environment becoming in 1978, Assistant Deputy Minister in charge of the Environmental Protection Service. He was appointed as Executive Chairman of FEAR0 in 1982.

**MELVIN HAGGLUND:** retired from Transport Canada in 1981 and lives in Ottawa. During his career with the department he was Chief of Airport Planning and Research, Regional Administrator for the Central Region of the Canadian Air Transport Administration, Administrator of the Arctic Transportation Agency and Director of the Task Force on Airport Management.

**JAMES WILSON:** since 1981 has taught at Simon Fraser University in the Department of Geography. He has had extensive experience in planning, engineering and administration as well as teaching. He has been Executive Director of the Lower Mainland Regional Planning Board of British Columbia and responsible for the resettlement planning on the Columbia River Project, and Executive Director of B. C. Hydro.

**CHAD DAY:** is past Director of the Natural Resource Management Program at Simon Fraser University and is a professor with the Program. He has taught at Simon Fraser since 1979 and in the 17 years before that taught at the Universities of Waterloo and Western Ontario. He has taught geology, planning and engineering, and has recently specialized in water management and coastal zone management. He is a Director of the International Association of Impact Assessment.

## APPENDIX 3

## KEY REVIEW DOCUMENTS

Acres International Ltd., July, 1989. Review of Integrated Management Options for the Lower Fraser River (North and Middle Arms), Final Report, Prepared for Transport Canada, ACE-Airside Capacity Enhancement Team.

Airside Capacity Enhancement Project, Vancouver International Airport, March, 1990. Economic Evaluation of Airside Capacity Enhancement Strategies for Vancouver International Airport.

Crippen Consultants, March, 1990. Proposed Third Runway, Vancouver International Airport, Update of Conceptual Design and Construction Program.

ESSA Environmental and Social Systems Analysts Ltd. and LGL Limited, June 16 1985. An Initial Assessment of the Proposed Third Runway at Vancouver International Airport: Impacts on Air Quality, Water Quality, Wildlife and Aquatic Biota, Final Report.

FEARO, May, 1990. Compendium of Submissions Received by the Vancouver International Airport Environmental Assessment Panel Regarding the Panel's February, 1990 Draft Environmental Impact Statement Guidelines and Transport Canada's Preliminary Environmental Impact Statement.

FEARO, May, 1990. Vancouver International Airport Environmental Assessment Panel, Guidelines for the Preparation of an Environmental Impact Statement on the Proposed Parallel Runway at Vancouver International Airport.

FEARO, October, 1990. Vancouver International Airport Environmental Assessment Panel, Compendium of Submission on Transport Canada's Parallel Runway Project Environmental Impact Statement.

FEARO, October 23, 1990. Vancouver International Airport Environmental Assessment Panel, Request for Additional Information and Consultation.

FEARO, January 22, 1991. Compendium of Submissions Received by the Vancouver International Airport Environmental Assessment Panel.

S. W. Hamilton & Dean Uyeno, February, 1990. Vancouver International Airport, Impact of Aircraft Noise on Property Values, Prepared for Transport Canada, Airside Capacity Enhancement Project.

James F. Hickling Management Consultants Ltd., March, 1990. Vancouver International Airport, Economic Analysis of Airfield Capacity Enhancement Strategies for Vancouver International Airport.

Marktrend Marketing Research Inc., February 2, 1990. Vancouver International Airport, Importance/Expansion Attitudinal Study.

Dr. Werner G. Richarz, October 2, 1990. Review of Noise Assessment of Vancouver International Airport Parallel Runway Project Environmental Impact Statement.

Dr. Werner G. Richarz, March, 1991. Assessment of Noise Impact of Aircraft Noise, Supplementary Comments on the Public Hearings on the Proposed Expansion of Vancouver International Airport, as prepared for the Panel.

Sandwell, Inc., October 16, 1990. Transport Canada, Vancouver, British Columbia, Vancouver International Airport, Consultant's Review.

Synergistics Consulting Limited, April 17, 1990. Results of the Environmental Assessment Panel Workshops on the VIA Parallel Runway Proposal, Prepared for FEARO.

Sypher:Mueller International Inc., June, 1989. The Case for the Parallel Runway at Vancouver International Airport.

Transport Canada, August, 1990. Vancouver International Airport, Parallel Runway Project, Environmental Impact Statement.

Transport Canada, August, 1990. Vancouver International Airport, Parallel Runway Project, Environmental Impact Statement, Summary Report.

Transport Canada, December 17, 1990. Vancouver International Airport, Airside Capacity Enhancement Project, Response to Request for Additional Information and Consultation on the Proposed Parallel Runway Project.

Transport Canada, ACE Project Team, June, 1989. Vancouver International Airport, Airside Capacity Enhancement Project, Airside Demand/Capacity Analysis.

Transport Canada Airports Group, April, 1990. Vancouver International Airport Development Overview, TP 1041 OE.

Transport Canada, Airports Group, Pacific Region, August, 1990. Regional Airport Overview, B. C. Lower Mainland and Southern Vancouver Island, TP 10091 E (Revised), Prepared by Sypher:Mueller International Inc., Vancouver.

Transport Canada, Airports Group, Pacific Region, October, 1990. B. C. Airports 2000, Prepared by Prinet Consultants Vancouver.

Wakefield Acoustics Ltd., October, 1990. Technical Review of Community Noise Impact Assessment Component of Transport Canada's Environmental Impact Statement on the Vancouver International Airport Parallel Runway Project.

Larry D. S. Wolfe, January 21, 1991. Vancouver International Airport, Airside Capacity Enhancement Project, Environmental and Land Use Issues.

# APPENDIX 4

## WRITTEN SUBMISSIONS AND RELATED MATERIAL RECEIVED IMMEDIATELY PRIOR TO OR DURING THE PUBLIC HEARINGS

Aerospace Industries Association of Canada

Air B. C.

Air Canada

Air Transportation Assoc. of Canada

- Aircraft Noise Reductions: Past, Present & Future
- Closing Remarks by Gordon Sinclair

Anglers Place Strata Corp.

Angus Place Strata Corp.

- Noise Mitigation & Project Justification
- Concluding Comments

Bevis, Richard

Binkert, June

Boundary Bay Conservation Committee

British Columbia Aviation Council

- Presentation by G. N. Lloyd
- Presentation notes prepared by Wayne McNeal
- Minimum Landing Fee Impact Study by McNeal & Associates

B. C. Chamber of Commerce

- Impacts on Municipalities and Communities in B. C. Relating to the Construction or non-Construction of the Proposed Parallel Runway at Vancouver International Airport
- Critique of Various Reports Relating to the Proposed Parallel Runway at

Vancouver International Airport

British Columbia Ministry of Environment (February 14, 1991 response to questions)

British Columbia Ministry of Transportation & Highways (February 15, 1991 response to questions)

B. C. Pavilion Corporation

B. C. Telephone Company

B. C. Transit

B. C. & Yukon Hotels' Association

Boundary Bay Conservation Committee

Canadian Airlines International

Canadian Air Line Pilots Association

Canadian Air Traffic Control Association

Canadian Auto Workers, Local 1990

Canadian Brotherhood of Railway, Transport and General Workers

Canadian Business Aircraft Association:

- Submission prepared by Robin Edwardes & David Hilton
- Submission prepared by McNeal & Associates
- Outline of presentation by Clare Eatock on Aircraft Engine Emission
- Summary of presentation by Clare Eatock
- Submission, prepared by Clare Eatock (copy of overheads)

Castlegar & District Chamber of Commerce

Canadian Exporters' Association

Canadian Pacific Hotels

City of Kamloops

City of Kelowna

City of Penticton

- Joint submission with Chamber of Commerce, Tourism & Convention Bureau, Economic Development Commission and the Airport Advisory Committee

City of Prince Rupert

City of Quesnel

City of Richmond

City of Vancouver

- Presentation by Mayor Gordon Campbell
- Manager's Report

City of Williams Lake

Community Forum on Airport Development:

- A Critical Appraisal of the Project Justification prepared by Marvin Shaffer & Assoc.
- Additional information submitted by Richard Bevis
  - notes on the Hickling Report
  - notes on the Marketrend Polls
  - Community Forum Position Paper
- Air Quality Impacts, Outline prepared by Dr. Christina Nichol
- An Alternative Picture of Utilization, Capacity and Demand at YVR prepared by Dr. Gerald Hodge
- Boundary Bay Airport Environmental Review Recommendations and Use by Jets by Meg Brown
- February 18, 1991 letter with attachments:
- Text of presentation by Meg Brown on Noise
- Additional Recommendations & Comments on Noise (Feb. 15/91)
- CMHC paper on New Housing and Airport Noise
- Paper on New Noise Policy — Will War Break Out
- Noise Reports received from Transport Canada
- February 18, 1991 letter re sightings of owls on Sea Island (Meg Brown)
- Noise submission prepared by G. Brogan Associates
- Outline of second submission on noise impacts by Meg Brown
- Putting YVR Expansion in a Regional Land Use Perspective, Abstract prepared by Dr. Gerald Hodge
- Submission on Noise Impacts prepared by Dr. Joe Piercy
- Status of Long-term Reserve Lands on Sea Island and Role of Sea Island by Meg Brown
- Technical Comments on the Environmental Impact Statement for the Parallel Runway Project presented by Meg Brown on behalf of Dr. Joe Piercy
- Technical Submission on Environmental Issues prepared by Susan Abs

Corp. of the District of Matsqui

Council of Tourism Associations of British Columbia

Dawson Creek & District Chamber of Commerce de Ridder, Robert (Tourism Vancouver)

Downtown Vancouver Association

Drab, Shirley

East Ladner Homeowners Association

East Richmond Community Association

Environment Canada

- Opening Statement
- Closing Statement

Farish, William G.

Fenton, Sharon

Fisheries & Oceans Canada

- comments on Terry Slack's presentation
- general submission
- mitigation and compensation submission

Fraser River Coalition

Fraser River Estuary Management Program (FREM)

Greater Vancouver Regional District (GVRD)

Government of British Columbia presented by Bryan Williams

Government of Yukon

Hanvelt, Robin

Harding, lmbi

Harlington, Christine

Harris, G. John

Hindmarch, Jean

International Association of Machinists and Aerospace Workers

Kalousek, Dagmar

Ker, David N.

Kesselman, Jonathan R.

Kirkbride, Ellen

MacLean, Ian

Noakes, Steve

North Central Municipal Association

North West Cruise Ship Association & Chamber of Shipping of B. C.

Porter, Doug

Prince George Region Development Corporation

Regional District of Central Okanagan

Richmond Chamber of Commerce (Horizon Pacific Ventures Ltd.)

Royal Canadian Airforce Association, Pacific Group

Saanich Peninsula Chamber of Commerce

Schim, Johanna

Segal, Margaret

Shelton, Chris

Sierra Club of Western Canada

Slack, Terry

Society for Soundscape Awareness & Protection

Southlands Citizens Planning Committee

SPEC (submission by Will Paulik)

Stromberg, Ron

The Musqueam Indian Band

Time Air

Transport Canada,

- Aircraft Night Flights, Analysis of Weekday/Weekend Operations, January-December, 1990
- Air Quality Impacts prepared by Dr. Christina Nichol
- Air Quality Monitoring Program by Mr. L. Taylor
- Closing statement by Airport General Manager (Frank O'Neill)
- February 11, 1991 letter containing additional information regarding section 215 of the Land Title Act
- February 14, 1991 letter containing convictions for contravention of noise abatement and/or low flying regulations
- Overheads used for presentation on Airside Demand/Capacity Analysis
- Pollutant Emissions and Concentrations Modelling Results by F. Greve of Mestre Greve Associates
- Putting YVR Expansion in a Regional Land Use Perspective
- Vancouver Airport Capacity, the Hub-and-spoke System and its importance to the Regional Economy by Prinet Consultants
- Closing Statement

Tretheway, Michael W., Critical Review of Economic Analysis of Capacity

Tourism Vancouver's Submission Package

- Main submission
- Vancouver City Council Presentation re EARP Submission
- Closing statement (J. A. Golightly)

Tourism Victoria

Tsawwassen Nature Park Society

Union of B. C. Municipalities

Vancouver Board of Trade

Vancouver International Airport Local Airport Authority

Vancouver Port Corporation

Veitch, The Hon. Elwood, Cabinet Committee on Vancouver Intn'l Airport & B. C. Ministry of International Business & Immigration

Victoria Chamber of Commerce

Whitehorse Chamber of Commerce

Wreck Beach Preservation Society (2 submissions)

Yackness, Ellen

# APPENDIX 5

# PUBLIC HEARINGS PARTICIPANTS

## January 31, 1991 — afternoon

| | |
|---|---|
| Transport Canada | — Frank O'Neill |
| | — Michael Matthews |
| Environment Canada | |
| Stu Hodgson | — Art Martel |
| Air Transportation Association of Canada | — Iain Harris |
| B. C. Aviation Council | — David Jacox |
| Canadian Air Traffic Control Association | — Brent Bell |
| Community Forum on Airport Development | — Wendy Turner |
| Tourism Vancouver | — Tom Walker |
| Canadian Business Aircraft Association | — Ron Chafe |

## January 31, 1991 — evening

| | |
|---|---|
| Transport Canada | — Mike Matthews |
| | — Tirey Vickers |
| Community Forum on Airport Development | — Gerald Hodge |
| | — Robin Hanvelt |
| Canadian Exporters Association | — Winston Stothert |
| Tourism Vancouver | — Buzz Golightly |
| | — Paul Valley |
| Vancouver Restaurant Industry | — Bob de Ridder |
| Cariboo Regional District | — Wayne Reeves |

## February 1, 1991 — morning

| | |
|---|---|
| Transport Canada | — Mike Matthews |
| | — Leonard Taylor |
| | — Fred Greve |
| Canadian Business Aircraft Association | — Clare Eatock |
| | — Ron Chafe |
| Community Forum on Airport Development | — Christina Nicol |
| City of Prince George/Regional District of Fraser Fort George/Prince George Development Corporation | — Mayor John Backhouse |
| | — Dale McMann |

## February 1, 1991 — afternoon

| | |
|---|---|
| Transport Canada | — Mike Matthews |
| | — David Lewis |
| District of Matsqui | — Mayor Dave Kandal |
| | — Mr. Peter Dueck(MLA) |
| | — Alderman Ron Sweeney |
| | — Marilyn Hamilton |
| | — Malcolm Harvey |
| City of Kamloops | — Alderman Russ Gerard |
| Canadian Airlines International | — Sid Fattedad |
| Air B. C. | — Iain Harris |
| City of Prince Rupert | — Alderman Rhoda Witherley |
| Canadian Airlines Pilots Association | — Kim Crozier |
| Community Forum on Airport Development | — Gerald Hodge |

## February 2, 1991 — morning

| | |
|---|---|
| Vancouver Board of Trade | — Stu Hodgson |
| | — Dave Park |
| Richard Bevis | |
| City of Kelowna | — Mayor James Stuart |
| | — Rick Howard |
| Transport Canada | — Mark Duncan |
| Eric Hueber | |
| Irene Miller | |

## February 2, 1991 — afternoon

| | |
|---|---|
| Richmond Chamber of Commerce | — David Price |
| | — Rob Benyon |
| | — Archie Novakowski |
| Society of Soundscape Awareness | — Hans Schmidt |
| Canadian Business Aircraft Association | — Ron Chafe |
| B. C. Telephone | — Barrie Chapman |
| | — Ed Paul |
| City of Quesnel | — Alderman Mary |
| Glassford | |
| Tourism Association of Southwestern B. C. | — Jean Anderson |
| Vancouver Hotel Association | — Kirk Johnson |

## February 4, 1991 — afternoon

| | |
|---|---|
| Air Transportation Association of Canada | — Gordon Sinclair |
| Air Canada | — Bill Rowe |
| | — Captain Bob Thompson |
| B. C. Chamber of Commerce | — Jack Ferguson |
| Grundell International Safes Inc. | — Thor Grundell |
| Kryton International Inc. | — Ron Yeurs |
| Transport Canada | — Mike Matthews |
| B. C. Federation of Labour | — Ken Georgetti |
| Dr. Catherine Milsum | |

## February 4, 1991 — evening

| | |
|---|---|
| Transport Canada | — Mike Matthews |
| | — Vincent Mestre |
| | — Claudio Bulfone |
| Canadian Business Aircraft Association | — Robin Edwardes |
| | — Ron Chafe |
| Bob Lockitch | |
| Anglers Place Strata Corp. | — Allan Gjernes |
| Society for Soundscape Awareness | — John Beltz |
| John Kesselman | |

Imbi Harding

## February 5, 1991 — afternoon

| | |
|---|---|
| Transport Canada | — Lawrence Ward |
| Community Forum on Airport Development | — Meg Brown |
| Rick Maynard | |
| Angus Place Strata Corp. | — Alex Tunner |

## February 5, 1991 — evening

| | |
|---|---|
| Cathay Pacific | — John McCulloch |
| Air Transportation Association of Canada | — Gordon Sinclair |
| | — Bob Cuthbertson |
| Community Forum on Airport Development | — Meg Brown |
| David Ker | |
| Wreck Beach Preservation Society | — Judy Williams |
| Ulf Topf | |
| William Farish | |

## February 6, 1991 — afternoon

| | |
|---|---|
| Whitehorse Chamber of Commerce/ | — Terry Bergen |
| City of Whitehorse | — Mayor Don Branigan |
| Transport Canada | — Mike Matthews |
| | — Niko Zorkin |
| SPEC (The Fraser River Coalition) | — Will Paulik |
| Terry Slack | |
| Community Forum on Airport Development | — Wendy Turner |

## February 6, 1991 — evening

| | |
|---|---|
| B. C. & Yukon Hotels Association | — Jack Sirrs |
| B. C. Aviation Council | — Rollie Back |
| | — Jerry Lloyd |
| | — Wayne McNeal |
| Frank Smith | — Mayor Bob Trail |
| North Central Municipal Association | |
| | — Aldmn. Colin Kinsley |
| International Aviation Terminals | — Rick Turner |
| Ian MacLean | |

## February 7, 1991 — afternoon

| | |
|---|---|
| Vancouver Airport Authority | — Chester Johnson |
| Transport Canada | — Terry Stewart |
| | — Stephen Johnson |
| Vancouver Natural History Society | — Stephen Partington |
| Boundary Bay Conservation Committee | — Mary Tait |
| Tswassen Nature Park Society | — Gillian Anderson |

## February 7, 1991 — evening

| | |
|---|---|
| B. C. Pavilion Corporation | — Michael Horsey |
| Boundary Bay Airport | — Dave Dale |
| Quesnel & District Chamber of Commerce | — Linda Ledoux |
| Fraser River Estuary Management Program | — Jim McCracken |
| | — Mike McPhee |
| Peter Kendall | |
| Community Forum on Airport Development | — June Binkert |
| | — Susan Abs |
| Jennifer Maynard | |
| Sharon Fenton | |

## February 8, 1991 — morning

| | |
|---|---|
| Canadian Auto Workers | — Tom Kilpatrick |
| Whistler Resort Association | — Dan Thomas |
| Ellen Yackness | |
| International Association of | |
| Machinist & | — Ron Fontaine |
| Aerospace Workers | — David Varnes |
| Dagmar Kalousek | |
| City of Victoria/Victoria Chamber of om- | — Aldmn. Geoff Young |
| merce/Tourism Victoria | |
| | — Mark Scott |
| | — Mayor Marie Rosco (Sidney) |
| | — Dan McAllister |
| | — Lorne Whyte |
| Margaret Segal | |

## February 8, 1991 — afternoon

| | |
|---|---|
| Transport Canada | — Frank O'Neill |
| | — Mel Feddersen |
| | — Moyra Dhaliwal |
| B. C. Transit | — Stu Hodgson |
| | — Clive Rock |
| | — Mike O'Conner |
| Arthur Leask | |
| Community Forum | — Gerald Hodge |
| Ron Stromberg | |
| Fraser River Coalition | — Evelyn Feller |
| East Richmond Community Center | — Louise Fontaine |
| | — Chris Armstrong |
| Meg Brown | |

## February 9, 1991 — morning

| | |
|---|---|
| Transport Canada | — Moyra Dhaliwal |
| Wreck Beach Preservation Society | — Judy Williams |
| Musqueam Indian Band | — Chief Wendy Grant |
| City of Richmond | — Mayor Greg Halsey-Brandt |
| Castlegar & District Chamber of Commerce | — Dale Donaldson |

## February 9, 1991 — afternoon

| | |
|---|---|
| Chris Shelton | |
| June Binkert | |
| Royal Canadian Air-force Association | — Bob Mot-timer |
| Canadian Air Traffic Control Association | — Carl Fisher |
| Yukon Chamber of Commerce | — Stu Wallace |
| Lori Cohen | |
| Stephen Brown | |
| East Ladner Homeowners' Association | — Kees Wijsman |
| Doug Porter | |

### February 11, 1991 — afternoon

| | |
|---|---|
| Transport Canada | — Mike Matthews |
| | — Bruce McDonald |
| B. C. Restaurant Association | — Bill Forster |
| City of Vancouver | — Mayor Gordon Campbell |
| Province of B. C. | — Bryan Williams |
| Helijet Airways | — Kenneth Glaze |
| Chancery Software | — David Rebak |
| City of Penticton | — Mayor Jake Kimberley |
| John Harris | |
| Trionics Technical Limited | — Bob Angus |
| Time Air | — Glenn Pickard |

### February 11, 1991 — evening

| | |
|---|---|
| International Financial Center | — Michael Goldberg |
| Angus Place Strata Corporation | — Alex Tunner |
| Olaf Knezevic | |
| West Southlands Ratepayers Association | — Mary Jo Brown |
| Rhodri Liscombe | |
| Downtown Vancouver Association | — John Rogers |
| Southlands Citizens Planning Committee | — Elizabeth Wride |
| Paul Binkert | |
| Greater Vancouver Regional District | — Ken Cameron |
| William O'Brien | |
| Roy Sturgess | |

### February 12, 1991

| | |
|---|---|
| Transport Canada | — Frank O'Neill |
| Angus Place Strata Corporation | — Alex Tunner |
| Canadian Airline Pilots Association | — Peter Foreman |
| Tourism Vancouver | — Buzz Golightly |
| Vancouver Board of Trade | — Darcy Rezac |
| Community Forum | — Wendy Turner |
| Union of B. C. Municipalities | — Aldmn. Joanne Monaghan |
| B. C. Aviation Council | — Jerry Lloyd |
| Air Transportation Association of Canada | — Gordon Sinclair |
| Canadian Business Aircraft Association | — Mac McNichol |
| Environment Canada | — Bob Sherwood |

## APPENDIX 6

## TECHNICAL SPECIALISTS BIOGRAPHIES

**Dr. Werner Richarz** has been conducting research in the field of aircraft noise since 1971. He holds degrees in Aerospace Engineering from the University of Toronto where he joined the staff in 1979. Dr. Richarz was appointed Associate Professor in the Faculty of Engineering at Carleton University in 1984.

He has published and presented numerous papers dealing with aircraft noise generation and control. In 1989 he was elected Fellow of the Acoustical Society of America for his work on aircraft noise.

**Clair W. Wakefield,** M.A., Sc., P. Eng., has 15 years of experience in acoustics and noise control in British Columbia. After receiving a M.A. Sc. in engineering acoustics from U.B.C. in 1973, he joined and later became a partner in the Vancouver consulting firm Hat-ford, Kennedy, Wakefield Ltd. There he carried out a wide variety of projects in industrial noise control, architectural acoustics, environmental noise and marine noise and vibration control.

In 1980, Mr. Wakefield joined the B. C. Ministry of Transportation and Highways as its first Sound Control Studies Engineer. His responsibilities included the assessment of noise impacts from provincial highways, the design of highway noise abatement structures and noise and vibration control within the Ministry's ferry and heavy equipment fleets. Wakefield Acoustics Ltd. continues to provide these services under contract to the Ministry.

**Larry Wolfe** was engaged as a technical specialist by the Panel in December, 1990. His focus is on environmental and land use issues related to the project.

Mr. Wolfe has master's degrees in Community and Regional Planning and Business Administration from the University of British Columbia. He has 17 years experience as a professional planner. He served as a planner at the community, regional district and provincial level. For the last 11 years, Mr. Wolfe has been an environment and land use consultant. In this capacity, he served as the Program Coordinator for the Fraser River Estuary Study from 1980 to 1982. The Study recommended the Fraser River Estuary Management Program now being implemented. Mr. Wolfe has also served as an advisor to seven major federal and/or provincial environmental panels and has coordinated numerous environmental and land use planning projects. Mr. Wolfe is a principal with Quadra Planning Consultants Ltd., West Vancouver.

### 11 février 1991 — après — midi

| | |
|---|---|
| Transport Canada | — Mike Matthews |
| | — Bruce McDonald |
| B. C. Restaurant Association | — Bill Forster |
| City of Vancouver | — Maire Gordon Campbell |
| Province of B. C. | — Bryan Williams |
| Helijet Airways | — Kenneth Glaze |
| Chancery Software | — David Rebak |
| City of Penticton | — Maire Jake Kimberley |
| John Harris | |
| Trionics Technical Limited | — Bob Angus |
| Time Air | — Glenn Pickard |

### 12 février 1991 — veillée

| | |
|---|---|
| International Financial Centre | — Michael Goldberg |
| Angus Place Strata Corporation | — Alex Tunner |
| Olaf Knezevic | |
| West Southlands Ratepayers Association | — Mary Jo Brown |
| Rhodri Liscombe | |
| Downtown Vancouver Association | — John Rogers |
| Southlands Citizens Planning Committee | — Elizabeth Wride |
| Paul Binkert | |
| Greater Vancouver Regional District | — Ken Cameron |
| William O'Brien | |
| Roy Sturgess | |

### 12 février 1991 —

| | |
|---|---|
| Transport Canada | — Frank O'Neill |
| Angus Place Strata Corporation | — Alex Turner |
| Canadian Airline Pilots Association | — Peter Foreman |
| Tourism Vancouver | — Buzz Golightly |
| Vancouver Board of Trade | — Darcy Rezac |
| Communtiy Forum | — Wendy Turner |
| Union of B. C. Municipalities | — aldmn. Joanne Monaghan |
| B. C. Aviation Council | — Jerry Lloyd |
| Air Transportation Association of Canada | — Gordon Sinclair |
| Canadian Business Aircraft Association | — Mac McNichol |
| Environment Canada | — Bob Sherwood |

## ANNEXE 6

## FICHES D'INFORMATION — SPÉCIALISTES TECHNIQUES

● **Werner Richarz** a depuis 1971 mené des recherches dans le domaine du bruit de l'aviation. Diplômé de l'université de Toronto en génie aérospatial, il se joint au personnel de cette institution en 1 979. Dr. Richarz a été nommé professeur adjoint à la faculté de génie à l'université de Carleton en 1984.

Il a publié et présenté plusieurs exposés concernant la production et le contrôle du bruit des avions. Il fut élu membre de l'Acoustical Society of America en 1989 pour son travail concernant le bruit des avions.

**Clair W. Wakefield**, M.A., Sc., P. Eng., a 15 ans d'expérience dans le domaine de l'acoustique et du contrôle du bruit en Colombie Britannique. Après avoir obtenu son diplôme M.A. Sc. en génie de l'acoustique de l'université de la Colombie Britannique en 1973, il se joint à la firme de consultants Harford, Kennedy, Wakefield Ltd à Vancouver, dont il devint ensuite partenaire. Il y fit divers projets de contrôle de bruit industriel, d'acoustique architecturale, de bruit environnemental, de bruit aquatique et de contrôle de la vibration.

M. Wakefield se joint au B.C. Ministry of Transportation and Highways en 1980 et devient leur premier Ingénieur des études du contrôle du bruit. Ses responsabilités comprennent l'évaluation de l'impact des bruits provenant de routes provinciales, le concept de structure de réduction du bruit des grands routes et le contrôle du bruit et de la vibration de l'équipement lourd et de la flotte de traversiers du ministère.

**Larry Wolfe** a été retenu par la Commission en décembre 1990 comme spécialiste technique. Son domaine couvre les questions environnementales et d'utilisation du sol relatives au projet.

M. Wolfe a une maîtrise en Planification communautaire et régionale et en Administration des affaires de l'université de la Colombie Britannique. Il est planificateur professionnel depuis 17 années. Il a été planificateur aux niveaux communautaire, district de région et provincial. Pendant les onze dernières années, M. Wolfe a été conseil en matière d'environnement et d'utilisation du sol. En tant que tel, il a été Coordonnateur de programme pour la Fraser River Estuary Study de 1980 à 1 982. L'étude recommanda le Fraser River Estuary Management Program qui est en cours d'exécution. M. Wolfe a aussi été conseiller de sept commissions fédérale ou provinciale importantes et a assuré la coordination de plusieurs projets de planification environnementale et d'utilisation du sol. M. Wolfe est un membre de la firme Quadra Planning Consultants Ltd., West Vancouver.