



City of Richmond

Report to Committee

To: Planning Committee
From: Terry Crowe
Manager, Policy Planning
Re: 2001 State of the Environment Report

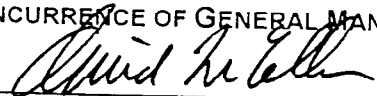
Date: February 20, 2002
File: 4425-07-01

Staff Recommendation

1. That the 2001 Richmond State of the Environment Report (attached to the report, dated February 20, 2002, from the Manager, Policy Planning) be endorsed;
2. That staff be directed to continue to work on the Implementation Program, as outlined in the Policy Planning Manager's report dated February 20, 2002.


Terry Crowe
Manager, Policy Planning

Att.

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CONCURRENCE OF GENERAL MANAGER


Staff Report

Origin

The attached 2001 State of the Environment (SOE) Report was produced under the guidance of Council's Advisory Committee on the Environment (ACE) and represents the first comprehensive update of the City's first SOE Report which was produced in 1998. An executive summary of the report is included as **Attachment 1** to this report. The complete report is included as **Attachment 2**.

Findings Of Fact

Council endorsed the City's first SOE Report in 1998. That report was also prepared under the guidance of ACE and provided a report card on eight topics and fourteen indicators regarding the City's environmental health. It provided a framework for measuring progress being made towards achieving the City's environmental goals.

State of the Environment reporting has become an important and valuable City environmental management tool. By providing timely and accurate information about the status of certain environmental resources, SOE reports help us identify key trends and issues and consequently, provide a basis for making more effective decisions related to managing our natural resources and activities.

Council's "Natural and Human Environment" objectives which are stated in the City wide Official Community Plan (OCP) provide a framework for the continued monitoring of environmental trends and the adjustment of City policies and programs as required. In order to achieve this goal, it is Council's policy, as stated in the OCP, to update the City's State of the Environment Report every three years, and use results to adjust and enhance environmental policies and programs as required.

The 2001 SOE project builds on and follows a similar format as the 1998 report. The report represents a major accomplishment by ACE as part of its 2001 work program. It was prepared under the guidance of ACE with the assistance of AXYS Environmental Consultants and a staff team from Policy Planning, Community Safety, Engineering, Parks and Richmond Health Services.

The 2001 report addresses the following topics and indicators:

Topic	Indicators
Green Space	• Agricultural Land
	• Parks and Protected Areas
	• Designated Environmentally Sensitive Areas (ESAs)
	• Total Greenspace
	• Trees
Water Quality	• Fraser River Water Quality
	• Drinking Water Quality

Topic	Indicators
Air Quality	• Air Quality Index
Land Use and Human Settlement	• Residential Housing Mix • Accessibility to Key Services
Transportation	• Transportation Choices • Registered Vehicles • Pedestrian Friendly Streets • Cycling Routes
Resource Consumption/Waste Generation	• Water Consumption • Energy Consumption • Residential Solid Waste • Wastewater
City's Environmental Practices	• City's Environmental Practices
Noise	• Noise (airport and non airport related noise)
Education and Stewardship	• Environmental Education • Community Environmental Stewardship
Soil Quality	• Soil Quality

Analysis

The report provides the detailed results for each topic and indicator. In order to summarize how each indicator has performed and to provide a basis for comparison with the 1998 results, one of the following four ratings were assigned: Good News, Bad News, Mixed Results and Not Assessed. These ratings are general impressions based on such factors as net changes since 1998, the direction of change, adherence to existing standards, and/or the achievement of targets. In some cases, insufficient data was available to make a determination.

Summary of Findings

A summary of the findings are included in Attachment 1 to this report. "Good News" highlights which are reported in the SOE Report relate to:

- Green Space:
 - Particularly the protection of agricultural land, creation of new parks, planting of trees, a net gain in the area of designated Environmentally Sensitive Areas, (ESA's), ongoing updating of the City's ESA database.
- Water quality:
 - Fraser River water quality has improved since 1998 with respect to the two measured parameters: dissolved oxygen concentration and fecal coliforms (coinciding with upgrading of wastewater treatment plants).
 - Drinking water has consistently met water quality guidelines.
- Air quality:
 - Remains good in Richmond compared to other parts of the region.

- Land Use and Settlement:
 - Resulting in a greater concentration of growth in areas such as the City Centre, variety in housing choices and generally good accessibility (ten minute walk) of key services.
- Transportation:
 - Promotion of alternative forms of transportation - developing more cycling lanes and pedestrian friendly streets.
- Resource Consumption:
 - Richmond residents are generating less solid waste.
- Environmental education and stewardship:
 - Richmond residents are active participants in environmental education and stewardship programs.

In contrast however, “Bad News” highlights in the SOE Report related primarily to:

- Transportation
 - Residents rely heavily on automobiles; among the highest per capita car ownership rates in the region.
- Resource Consumption
 - Richmond residents have increasingly high per capita rates of water and energy consumption.

Implementation Program

The SOE Report is not intended to be a static document but rather be updated every three years. One of the key objectives of the SOE Report is to assist policy and program development, and provide direction to the City on how it can better achieve general environmental goals and objectives. As an integral component of the City’s emerging Environmental Management Strategy, the SOE Report will continue to provide a framework for assessing change and monitoring progress in achieving environmental goals.

While the next comprehensive update is anticipated for 2004, a number of key tasks need to be undertaken in the interim, in order for the SOE Report to remain an effective environmental management and monitoring tool. These tasks have been grouped into the following four categories and form the basis of a work program for both staff and ACE:

- topics and indicators
- data management
- setting targets
- program monitoring and implementation

Proposed Key Tasks

- ***Topics and Indicators***

Future SOE Report updates should consider and possibly include:

- an indicator which measures the availability and quality of wildlife habitat (eg. complete the updating of the designated Official Community Plan Environmentally Sensitive Areas (ESAs))
 - a greater emphasis on the human health impacts associated with air quality
 - monitoring the level of the use of cycle lanes and pedestrian friendly streets
 - other city environmental practices that could be monitored and reported
 - additional community environmental initiatives and educational projects
 - soil quality information
- ***Data management***
 - To expedite the next SOE update, staff will:
 - Prepare brief data annual summaries for data generated by various departments within the City of Richmond.
 - Work more closely with external agencies in the interim to obtain relevant data.
 - Continue the process of refining and updating the City's digital map databases.
 - Archive data used in the 2001 update on CD-Rom as well as a hard copy.
- ***Targets***
 - In this 2001 SOE Update, only two targets have been established by the City and were reported although some qualitative goals are noted. The value of the SOE Report as a public information document and as a guide for City planning purposes would be greatly enhanced by the inclusion of additional targets to provide benchmarks for progress and goals to work toward. It is recommended that the City and ACE continue to work on setting targets prior to the next edition of the SOE Report in 2004.
- ***Program monitoring and implementation***
 - An Environmental Management Strategy (EMS) for Richmond is currently being developed. It will:
 - establish City wide environmental goals and policies;
 - provide a framework for improved management and accountability and;
 - identify priority areas for action.

The SOE is seen as an integral component of the EMS by measuring and reporting on environmental performance. Issues identified through the SOE will be addressed through the City's EMS.

- Since the publishing of the first SOE Report in 1998, ACE members have distributed and promoted the SOE Report throughout Richmond through an active outreach campaign involving local schools, youth groups and other environmental groups in the City. This work should continue. An active outreach program for the 2001 SOE Report is included in the ACE's 2002 proposed annual work program. Staff also expect to have the full SOE Report on the City's web site as soon as possible.

Financial Impact

Funding in the amount of \$28,000 for this project came from the City's 2001 Annual Operating Budget.

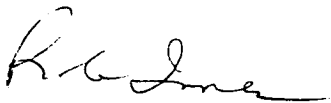
Funding to support outreach associated with the SOE Report in 2002 will be provided through ACE's annual budgets. It is assumed that ongoing staff work to accomplish the key tasks over the next three years, in advance of the next comprehensive update in 2004, will be undertaken by existing staff and within existing approved budgets.

Conclusion

The 2001 State of the Environment Report represents a major accomplishment by ACE which guided its preparation as part of its 2001 work program. It is the first comprehensive update of the City's SOE Report which was first prepared in 1998. The SOE Report has proven to be an effective tool to monitor the City's environmental health. While many of the indicators suggest "good news" or positive trends since 1998, other indicators suggest that the City, along with community and regional partners need to continue our efforts to work towards creating a healthier, and ideally, more sustainable natural environment.

Consistent with City OCP policy, the next update is anticipated in 2004-05 and is expected to cost approximately \$35,000.

Staff recommend that Council endorse the 2001 State of the Environment Report as well as the proposed key tasks outlined in this report and which are necessary to continue the work of SOE monitoring and management over the next three years.



Rob Innes
Planner

RI:cas

Richmond State of the Environment 2001

Executive Summary

The first edition of the State of the Environment (SOE) report for the City of Richmond was published in 1998. The intent of that report was to synthesize baseline information on Richmond's environmental assets, identify the human pressures affecting those assets, and provide a framework for measuring change. Eight topics, involving fourteen indicators, were selected based on public priority and the level of influence by the City. To monitor changes and evaluate progress in meeting targets, a commitment was made by City Council and the Advisory Committee on the Environment (ACE) to update the SOE report every three years. The 2001 edition of the SOE report is the first complete update of results and includes an expanded range of topics and indicators.

The detailed results for each indicator are presented throughout this report. To summarise how each indicator has performed, and to provide a basis for comparisons with the 1998 results, one of four ratings were assigned: Good News; Bad News; Mixed Results; and Not Assessed. These ratings are general impressions only. They do not imply a measure of sustainability. Rather, the ratings are based on such factors as net changes since 1998, the direction of change (i.e., positive or negative), adherence to existing standards, achievement of targets, and comparisons with other communities. In some cases, insufficient data were available to make a determination.

RESULTS

TOPIC A: GREENSPACE

A1 - Agricultural Land

Good News

Since 1997, 11.8 hectares of land have been excluded from the Agricultural Land Reserve (ALR). The total area of ALR in Richmond today is approximately 4539 hectares or 33% of the City's land base. Approximately 91% of the original ALR remains intact. Sixty-one percent of ALR lands are presently in agricultural use.

A2 - Parks and Protected Areas

Good News

Richmond has 738 hectares of City-owned parks, equalling 5.4% of the land base. This is a net increase of 203 hectares since 1997. Other agencies own an additional 1004 ha of parks and protected areas in Richmond. Including both City-owned and other agency parks and protected areas, Richmond today has about 11 hectares of parkland per 1000 people. Richmond has at present a total of 40 km of trails, 25 km of which are located along the waterfront.

A3 - Designated Environmentally Sensitive Areas (ESAs)

Good News

Richmond has 2243 ha of designated terrestrial ESAs, which is 16.5% of Richmond's land base. Since the 1998 SOE Report was written, an amendment to the OCP allowed for the removal of 109 ha from

an ESA designation. The same amendment designated 200 ha of new ESAs. The result is a net gain of about 91 ha for the period 1997-2000. Nearly 55% (1140 ha) of terrestrial ESAs are protected as city parks or managed by other agencies for conservation purposes. However, the quality of ESAs that remain unprotected is unknown. Overall, this indicator was given a Good News rating because there has been a no net loss in ESA designated areas since the 1998 SOE report.

A4 - Total Greenspace and Agricultural Lands

Not Assessed

Including agricultural land, parks and protected areas and terrestrial ESAs, there are approximately 6900 ha of greenspace in Richmond. This represents about 51% of the City's total land base and about 43 ha of greenspace per 1000 people. This indicator will be assessed in future reports when trends have been established.

A5 - Trees

Good News

For the period 1998-2000 a total of 4442 new trees were planted on City property: 2320 on boulevards and medians, and 2122 in parks. As more areas become planted, the number of trees being planted on an annual basis has been decreasing. Data are presently not available to measure the number of trees lost to development.

TOPIC B: WATER QUALITY

B1 - Fraser River Water Quality

Mixed Results

Dissolved oxygen concentrations in the Fraser River have consistently met water quality objectives. Prior to 1998, fecal coliform counts in the Fraser River frequently exceeded the water quality objective, however, since implementation of additional treatment at

the Annacis and Lulu wastewater treatment plants in 1998, fecal coliform counts have decreased dramatically. Based on these two parameters, water quality is improving. However, current data are insufficient to assess the overall quality of water in the Fraser. Because of this high level of uncertainty, the indicator has been given a rating of Mixed Results.

B2 - Drinking Water Quality

Good News

Drinking water is monitored and distribution points. At the source, levels of trihalomethanes and lead have never exceeded the Canadian Drinking Water Guidelines at any of the three Greater Vancouver Water District reservoirs. There were varying levels of non-compliance for iron, turbidity and pH, depending on the reservoir. The BC Safe Drinking Water Regulations establish criteria for acceptable bacteria levels in distribution systems. Since 1993 these regulations have generally been met in Richmond.

TOPIC C: AIR QUALITY

C1 - Air Quality Index (AQI)

Mixed Results

Since 1997, only four hours of 'Poor' quality air were recorded in South Richmond. At the airport, only 18 hours of 'Poor' quality air were recorded since this station's installation in 1998. From 1993-2000, Richmond residents registered 559 complaints regarding air quality, or 3% of all such complaints received by the GVRD during this period. The majority of these complaints were concerns regarding odours.

While the AQI values remain consistently 'Good', the number of complaints combined with increasing sources of emissions from cars, air traffic and industry; health risks associated with these emissions; and global

concerns regarding greenhouse gases in the atmosphere - suggest that the news for this indicator is Mixed.

TOPIC D: LAND USE AND HUMAN SETTLEMENT

D1 - Residential Housing

Good News

Richmond's housing mix is 47% single-family dwellings, 32% apartments, 17% townhomes, and 4% two-family dwellings. The West Cambie and Thompson planning areas appear to have the greatest mix of housing types. City-wide housing density is 12.29 units per hectare compared with 11.69 units per hectare in 1996. Density is greatest in the planning areas of City Centre, Blundell and Broadmoor and lowest in the planning areas of Fraser Lands, Sea Island and Gilmore. These results support the OCP objective to concentrate growth and create a strong City Centre.

D2 - Accessibility to Key Services

Good News

Seventy-seven percent of all dwelling units in the City are within 400 m of a transit stop, that is, about a ten minute walk. Eighty-one percent of all dwelling units in the City are within 400 m of a schoolyard or park. Fifty-two percent of all dwelling units in the City are within 400 m of a convenience store or commercial retail facility. These results support the OCP principle of making key services accessible and 'walkable'.

TOPIC E: TRANSPORTATION

E1 - Transportation Choices

Bad News

Almost 60% of morning rush trips originating from Richmond (or 63,029 trips) are automobile (driver) trips. This is an increase of 2% from 1994. Transit trips have

increased 2.5% from 1994-1999, and trips by other modes such as walking and cycling increased slightly. The only transportation choice that decreased was automobile passenger trips. The proportion of trips by car still greatly exceeds the number of trips by other modes. These results are not positive given the GVRD *Livable Region Strategy* goal to reduce automobile dependency. For these reasons, this indicator has been given a rating of Bad News.

E2 - Registered Vehicles

Bad News

The number of vehicles registered to Richmond residents increased from 97,592 at the end of January 1996 to 116,609 at the end of January 2001 - an increase of 19,017 vehicles in five years. At the end of January 2001, there were approximately 731 vehicles per 1000 people, up from 694 vehicles per 1000 people at the end of January 1996. Because of the trend towards owning more, rather than less vehicles, this indicator is rated as Bad News.

E3 - Pedestrian-Friendly Streets

Good News

In 2000, 92.9 km or 68.2% of major roads met the minimum or higher standard for pedestrian friendliness compared with the 1997 figures which showed 84 km (61%) of major roads meeting only the minimum standard. In 2000, 44.1 km or 7.9% of all roads met the higher standard compared with 20 km in 1997, a gain of over 24 km of higher-standard pedestrian-friendly streets. This indicator has been given a Good News rating because of this significant progress.

E4 - Cycling Routes

Good News

By the end of 1999, Richmond had increased its cycling lanes to 26.9 km - up from 15 km in 1997. This exceeds Richmond's interim working target of 24 km of cycling lanes by the year 2001. Cycle lanes are found along 13.3% of Richmond's road network, up

from 10% reported in 1997. Richmond has improved its cycle network and met its target. This is deserving of a Good News rating.

TOPIC F: RESOURCE CONSUMPTION & WASTE GENERATION

F1 - Water Consumption

Mixed Results

Since 1985, Richmond's annual consumption of water has grown by 35%, Reaching a total consumption level of 38.3 million cubic metres in 2000. However, since 1985, per capita water consumption in Richmond has decreased by 13% to 634 litres per person per day in 2000. This represents a 5% decrease in per capita consumption rates since the 1998 SOE report. However, despite the drop in per capita water consumption, Richmond's per capita consumption remains high compared with other municipalities within the GVRD, across Canada and around the world.

F2 - Energy Consumption

Bad News

Richmond residents consumed about 3150 megawatt hours of electricity per 1000 people in 2000-01. This represents a 2.7% increase since 1997-98. Richmond residents consumed about 360 gigajoules of natural gas per 1000 people in 2000-01. This represents a drop of about 5.3% since 1997-98. Although we are using less natural gas, probably due to rising costs, we are using more electricity. Additionally, we are moving away from the greater energy efficiency that is attributable to natural gas. There are presently no data regarding the use of alternative sources of energy such as wind, wave and solar power. The trends associated with this indicator warrant a rating of Bad News.

F3 - Residential Solid Waste

Good News

Residents of single-family homes generated 35,190 tonnes of solid waste in 2000 or about 360 tonnes per 1000 people. This was approximately 2200 tonnes less than what was generated in 1997 despite the City's population growth. Fifty percent of waste generated was recycled, up from 45% in 1997. This is Good News.

F4 - Wastewater

Mixed Results

Since 1973, the majority of wastewater from Richmond's residential population has been serviced by the Lulu Island Wastewater Treatment Plant. The bad news is that between the years 1984 and 2000, the average daily flow volume from Richmond to the Lulu Island Treatment Plant increased by 90% to reach 71.9 million litres per day (or about 450 litres per person per day). The good news is that the Lulu and Annacis island plants have been upgraded from primary to secondary levels of treatment, which has significantly improved the quality of treated effluent. The Iona plant remains primary treatment.

TOPIC G: CITY ENVIRONMENTAL PRACTICES

G1 - City Environ- mental Practices

Good News

Energy saving measures have been installed in many City-operated facilities leading to decreased energy consumption. Ninety-three City vehicles, about 50% of the light-fleet vehicles, have been converted to natural gas fuel systems. The City has been a leader in the development of 'green' policies and programs such as the *Environmental Purchasing Guide* and the award-winning environmentally-friendly design and construction of the new City Hall.

The promotion of alternative forms of transportation has continued with efforts directed toward the development of more cycling lanes and pedestrian-friendly streets. In addition to the City's efforts, Richmond residents have shown their commitment to a more sustainable environment by generating less solid waste, and enthusiastically participating in environmental education and stewardship programs.

The bad news is that despite much progress, some areas need improvement. Richmond residents continue to rely heavily on their automobiles despite considerable efforts by the City and the regional transit authority to promote alternative forms of transportation. Current trends in automobile use and ownership are clearly not sustainable given our growing population.

Richmond also performed poorly with respect to water and energy consumption. While per capita use has decreased in some years, Richmond still consumes more water and energy on a per capita basis than most GVRD municipalities. Richmond's share of loading on wastewater treatment plants is also high and increasing. Although treated wastewater can be safely released back into the environment, there are financial and environmental costs associated with collecting, transporting and treating wastewater that could be reduced.

This edition of the SOE report included data on resident complaints regarding air quality and noise that are somewhat discouraging. This indicates that although positive trends for noise and air quality are apparent for

some measures, we may need to reassess our progress in terms of other measures that are less tangible but nonetheless important to the community.

CONCLUSIONS

This edition of the SOE report builds upon the information presented in the first edition and provides a wider range of topics and indicators. However, this report is by no means inclusive. Issues associated with industrial and business wastes, groundwater quality, and habitat restoration are discussed only briefly. Indicators of water and air quality address only a small proportion of the known hazards and pollutants. Additionally, the impacts of poor quality land, water and air on human health are not necessarily reflected in the data that has been presented, and better data are not yet available.

To remain a valuable and relevant tool, it is clear that the SOE report must continue to evolve, remain responsive to community priorities, and incorporate better data as it becomes available. Your comments and suggestions for improving this report are welcome.

For more information about the process for initiating the SOE program in Richmond, and the role of the SOE Report in the City's Environmental Management Strategy, refer to the first edition of the State of the Environment Report, which was prepared in 1998. The 1998 report is available on-line at www.cityofrichmond.bc.ca, or by contacting the City directly.

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CONCLUSIONS

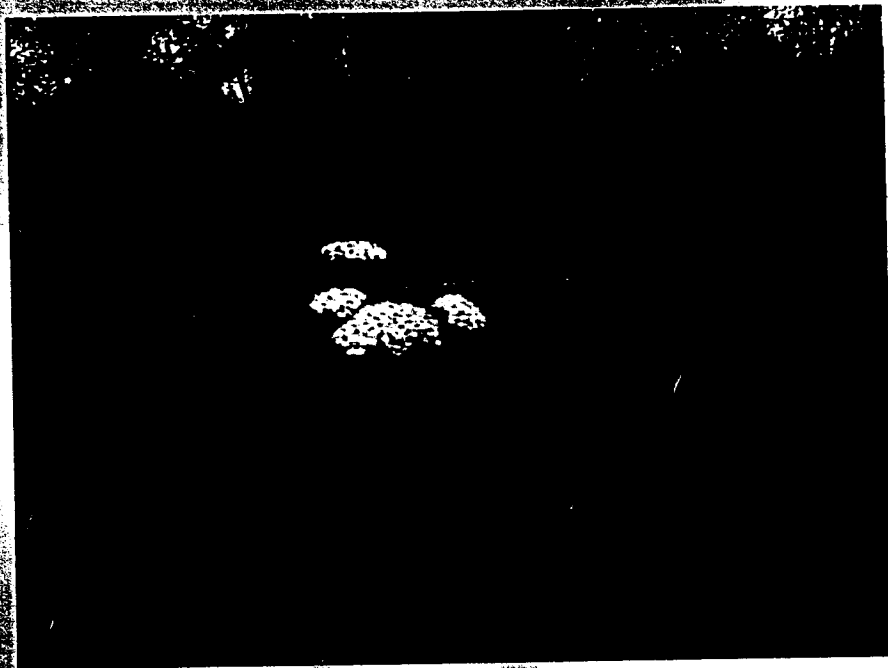
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Indicator Summary Table

Indicator	1998 Results	2001 Results
A1 Agricultural Land	Good News	Good News
A2 Parks and Protected Areas	Good News	Good News
A3 Designated ESAs	Mixed Results	Good News
A4 Total Greenspace	---	Not Assessed
A5 Trees	Good News	Good News
B1 Fraser River Water Quality	Mixed Results	Mixed Results
B2 Drinking Water Quality	Good News	Good News
C1 Air Quality Index	Good News	Mixed Results
D1 Residential Housing	No indicators	Good News
D2 Accessibility to Key Services	No indicators	Good News
E1 Transportation Choices	Bad News	Bad News
E2 Registered Vehicles	Bad News	Bad News
E3 Pedestrian-friendly Streets	Good News	Good News
E4 Cycle Routes	Good News	Good News
F1 Water Consumption	Bad News	Mixed Results
F2 Energy Consumption	---	Bad News
F3 Residential Solid Waste	Mixed Results	Good News
F4 Wastewater	---	Mixed Results
G1 City Environmental Practices	No indicators	Good News
H1 Noise	No indicators	Mixed Results
I1 Community Environmental Stewardship	---	Good News
I2 Environmental Education	---	Not Assessed
J1 Soil Quality	---	No Indicators



City of Richmond State of the Environment

2001 Update Report

City of Richmond
6911 No. 3 Road
Richmond, BC V6Y 2C1

City of Richmond State of the Environment

2001 Update Report

December 2001

For questions regarding this report or to obtain additional copies, please contact:

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**Copies of this report can also be obtained on the City's website:
www.city.richmond.bc.ca**

This report was prepared by:

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Cover photo courtesy of the City of Richmond Production Centre.

Acknowledgements

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Instrumental to the State of the Environment Program is the City of Richmond Advisory Committee on the Environment (ACE), which takes a principal role in identifying key environmental issues and indicators for inclusion in State of the Environment reports, and in communicating the results of reporting efforts to the broader community in order to foster public awareness and facilitate actions that will lead Richmond to a more sustainable future. The authors wish to thank members of ACE and, in particular, the ACE State of the Environment Sub-Committee: Christina Annand; Keith Bolton; Evelyn Feller; Goffrey Gosonhing; Andrey Levin; David Moon; Paul Richard; Neil Simpson. Other current and former members of ACE that provided input into this report are: Malcolm Brodie; Tom Chan; Gordon Kibble; Paul Schaap; Eric Sykes; Andrian Wade; Jinchuan Wang; James Watson; and Louis Zivot.

During the preparation of this report, the authors were greatly assisted by numerous staff from the City of Richmond. In particular, the authors wish to thank Rob Innes of the Policy Planning Department, who oversaw the project on behalf of the City and provided invaluable support and feedback during all stages of reporting. Margot Daykin, Environmental Coordinator, offered many insightful comments that enhanced the comprehensiveness and scientific quality of the report. Stuart Jones, Planner Analyst, spent many hours refining the City's spatial data for inclusion in the report and patiently responding to many queries and requests. Other members of the City's project steering committee were influential in the development and refinement of this report, specifically: Joan Caravan, Transportation Planner; Terry Crowe, Manager, Policy and Planning Department; Parthi Krishnan, Parks and Cultural Services; Paul Lee, Manager of Engineering Planning; and Brent Zaharia, Richmond Health Services. Additionally, many people from the City and other agencies contributed their time in helping the authors acquire and compile the vast amount of data and information contained within the pages of this report, and in reviewing various drafts. Thank-you especially to the following people:

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Ken Fryer, City of Richmond Vehicle Fleet Manager
Art Hamade, Richmond Health Services
Kari Huhtala, City of Richmond Planner
Phil Hogg, City of Richmond Facilities Manager
Alex Jamieson, City of Richmond Planner
Tameeza Jivraj, GVRD Water District
Janet Lee, City of Richmond Planner
Clark Lim, TransLink
Steve McClurg, City of Richmond Water Services Department

Fred Nenninger, GVRD Liquid Waste Management Plan Project Manager
Al Pecival, GVRD Air Quality
Judy Smith, Greater Vancouver Regional District

Finally, AXYS Environmental Consulting would like to acknowledge the contributions of Morgan Muir and Kiyoshi Otsuji of the City of Richmond Production Centre who assisted with report production and who provided all of the photographs used in the report.

Executive Summary

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RESULTS

TOPIC A: GREENSPACE

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Good News

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an ESA designation. The same amendment designated 200 ha of new ESAs. The result is a net gain of about 91 ha for the period 1997-2000. Nearly 55% (1140 ha) of terrestrial ESAs are protected as city parks or managed by other agencies for conservation purposes. However, the quality of ESAs that remain unprotected is unknown. Overall, this indicator was given a Good News rating because there has been a no net loss in ESA designated areas since the 1998 SOE report.

A4 - Total Greenspace and Agricultural Lands

Not Assessed

Including agricultural land, parks and protected areas and terrestrial ESAs, there are approximately 6900 ha of greenspace in Richmond. This represents about 51% of the City's total land base and about 43 ha of greenspace per 1000 people. This indicator will be assessed in future reports when trends have been established.

A5 - Trees

For the period 1998-2000 a total of 4442 new trees were planted on City property: 2320 on boulevards and medians, and 2122 in parks. As more areas become planted, the number of trees being planted on an annual basis has been decreasing. Data are presently not available to measure the number of trees lost to development.

Good News

TOPIC B: WATER QUALITY

B1 - Fraser River Water Quality

Mixed Results

Dissolved oxygen concentrations in the Fraser River have consistently met water quality objectives. Prior to 1998, fecal coliform counts in the Fraser River frequently exceeded the water quality objective, however, since implementation of additional treatment at

the Annacis and Lulu wastewater treatment plants in 1998, fecal coliform counts have decreased dramatically. Based on these two parameters, water quality is improving. However, current data are insufficient to assess the overall quality of water in the Fraser. Because of this high level of uncertainty, the indicator has been given a rating of Mixed Results.

B2 - Drinking Water Quality

Good News

Drinking water is monitored and distribution points. At the source, levels of trihalomethanes and lead have never exceeded the Canadian Drinking Water Guidelines at any of the three Greater Vancouver Water District reservoirs. There were varying levels of non-compliance for iron, turbidity and pH, depending on the reservoir. The BC Safe Drinking Water Regulations establish criteria for acceptable bacteria levels in distribution systems. Since 1993 these regulations have generally been met in Richmond.

TOPIC C: AIR QUALITY

C1 - Air Quality Index (AQI)

Mixed Results

Since 1997, only four hours of 'Poor' quality air were recorded in South Richmond. At the airport, only 18 hours of 'Poor' quality air were recorded since this station's installation in 1998. From 1993-2000, Richmond residents registered 559 complaints regarding air quality, or 3% of all such complaints received by the GVRD during this period. The majority of these complaints were concerns regarding odours.

While the AQI values remain consistently 'Good', the number of complaints combined with increasing sources of emissions from cars, air traffic and industry; health risks associated with these emissions; and global

concerns regarding greenhouse gases in the atmosphere - suggest that the news for this indicator is Mixed.

TOPIC D: LAND USE AND HUMAN SETTLEMENT

D1 - Residential Housing

Good News

Richmond's housing mix is 47% single-family dwellings, 32% apartments, 17% townhomes, and 4% two-family dwellings. The West Cambie and Thompson planning areas appear to have the greatest mix of housing types. City-wide housing density is 12.29 units per hectare compared with 11.69 units per hectare in 1996. Density is greatest in the planning areas of City Centre, Blundell and Broadmoor and lowest in the planning areas of Fraser Lands, Sea Island and Gilmore. These results support the OCP objective to concentrate growth and create a strong City Centre.

D2 - Accessibility to Key Services

Good News

Seventy-seven percent of all dwelling units in the City are within 400 m of a transit stop, that is, about a ten minute walk. Eighty-one percent of all dwelling units in the City are within 400 m of a schoolyard or park. Fifty-two percent of all dwelling units in the City are within 400 m of a convenience store or commercial retail facility. These results support the OCP principle of making key services accessible and 'walkable'.

TOPIC E: TRANSPORTATION

E1 - Transportation Choices

Bad News

Almost 60% of morning rush trips originating from Richmond (or 63,029 trips) are automobile (driver) trips. This is an increase of 2% from 1994. Transit trips have

increased 2.5% from 1994-1999, and trips by other modes such as walking and cycling increased slightly. The only transportation choice that decreased was automobile passenger trips. The proportion of trips by car still greatly exceeds the number of trips by other modes. These results are not positive given the GVRD *Livable Region Strategy* goal to reduce automobile dependency. For these reasons, this indicator has been given a rating of Bad News.

E2 - Registered Vehicles

Bad News

The number of vehicles registered to Richmond residents increased from 97,592 at the end of January 1996 to 116,609 at the end of January 2001 - an increase of 19,017 vehicles in five years. At the end of January 2001, there were approximately 731 vehicles per 1000 people, up from 694 vehicles per 1000 people at the end of January 1996. Because of the trend towards owning more, rather than less vehicles, this indicator is rated as Bad News.

E3 - Pedestrian-Friendly Streets

Good News

In 2000, 92.9 km or 68.2% of major roads met the minimum or higher standard for pedestrian friendliness compared with the 1997 figures which showed 84 km (61%) of major roads meeting only the minimum standard. In 2000, 44.1 km or 7.9% of all roads met the higher standard compared with 20 km in 1997, a gain of over 24 km of higher-standard pedestrian-friendly streets. This indicator has been given a Good News rating because of this significant progress.

E4 - Cycling Routes

Good News

By the end of 1999, Richmond had increased its cycling lanes to 26.9 km - up from 15 km in 1997. This exceeds Richmond's interim working target of 24 km of cycling lanes by the year 2001. Cycle lanes are found along 13.3% of Richmond's road network, up

from 10% reported in 1997. Richmond has improved its cycle network and met its target. This is deserving of a Good News rating.

TOPIC F: RESOURCE CONSUMPTION & WASTE GENERATION

F1 - Water Consumption

Mixed Results

Since 1985, Richmond's annual consumption of water has grown by 35%, Reaching a total consumption level of 38.3 million cubic metres in 2000. However, since 1985, per capita water consumption in Richmond has decreased by 13% to 634 litres per person per day in 2000. This represents a 5% decrease in per capita consumption rates since the 1998 SOE report. However, despite the drop in per capita water consumption, Richmond's per capita consumption remains high compared with other municipalities within the GVRD, across Canada and around the world.

F2 - Energy Consumption

Bad News

Richmond residents consumed about 3150 megawatt hours of electricity per 1000 people in 2000-01. This represents a 2.7% increase since 1997-98. Richmond residents consumed about 360 gigajoules of natural gas per 1000 people in 2000-01. This represents a drop of about 5.3% since 1997-98. Although we are using less natural gas, probably due to rising costs, we are using more electricity. Additionally, we are moving away from the greater energy efficiency that is attributable to natural gas. There are presently no data regarding the use of alternative sources of energy such as wind, wave and solar power. The trends associated with this indicator warrant a rating of Bad News.

F3 - Residential Solid Waste

Good News

Residents of single-family homes generated 35,190 tonnes of solid waste in 2000 or about 360 tonnes per 1000 people. This was approximately 2200 tonnes less than what was generated in 1997 despite the City's population growth. Fifty percent of waste generated was recycled, up from 45% in 1997. This is Good News.

F4 - Wastewater

Mixed Results

Since 1973, the majority of wastewater from Richmond's residential population has been serviced by the Lulu Island Wastewater Treatment Plant. The bad news is that between the years 1984 and 2000, the average daily flow volume from Richmond to the Lulu Island Treatment Plant increased by 90% to reach 71.9 million litres per day (or about 450 litres per person per day). The good news is that the Lulu and Annacis island plants have been upgraded from primary to secondary levels of treatment, which has significantly improved the quality of treated effluent. The Iona plant remains primary treatment.

TOPIC G: CITY ENVIRONMENTAL PRACTICES

G1 - City Environmental Practices

Good News

Energy saving measures have been installed in many City-operated facilities leading to decreased energy consumption. Ninety-three City vehicles, about 50% of the light-fleet vehicles, have been converted to natural gas fuel systems. The City has been a leader in the development of 'green' policies and programs such as the *Environmental Purchasing Guide* and the award-winning environmentally-friendly design and construction of the new City Hall.

TOPIC H: NOISE

H1 – Noise

Mixed Results

Ambient noise levels have been relatively constant for the past six years in areas of Richmond that are dominated by airport-related noise. In other locations, noise levels have been more variable and are the result of non-airport related activities such as vehicle traffic, construction, people, barking dogs and motorized equipment. On average, noise levels in Richmond are higher than in other areas. In 2000, the Vancouver Airport Authority reported 281 noise-related complaints from Richmond residents representing 48.5% of the total complaints received that year. This is a significant decrease from previous years. An additional 365 noise complaints were recorded by the City that were attributed to residential and commercial sources of noise, including construction related activities. These trends represent Mixed Results.

TOPIC I: STEWARDSHIP AND EDUCATION

I1- Community Environmental Stewardship

Good News

In 2000, 2800 volunteers contributed a total of 21,321 volunteer hours to the Partners for Beautification Program. The value of this work is estimated at \$162,000. The number of volunteers has increased by over 2400 people since 1998, which has been partly due to the expanded program range. Twelve parks and 24 km of trails have been adopted along with twelve streets, three gardens, three trees and four dog bag dispensers. Additionally, 49 trees have been planted by community stewards.

I2 - Environmental Education

Not Assessed

Environmental Education has been introduced as a new indicator. Limited quantitative data are available and trends have not yet been discerned. This indicator was not assessed.

TOPIC J: Soil Quality

Not Assessed

More work is required to investigate and select appropriate indicators of soil quality. This topic was therefore not assessed.

SUMMARY

Overall, the good news is that Richmond has been successful in protecting its greenspace. Agricultural land has been protected, new parks have been created, trees continue to grow and be planted, there has been a net gain in the area of designated ESAs, and the City continues to update its database of ESA lands.

There is also good news about the quality of our water. Water quality in the Fraser River has improved considerably since the wastewater treatment plants were upgraded in 1998 and drinking water at the Richmond distribution points has consistently met water quality guidelines. Air quality also remains good compared with other areas of the region. Although not assessed in the 1998 SOE report, Richmond appears to be meeting its land use and human settlement objectives that call for concentration of growth, variety in housing choices, and housing that is within walking distance of key services.

The promotion of alternative forms of transportation has continued with efforts directed toward the development of more cycling lanes and pedestrian-friendly streets. In addition to the City's efforts, Richmond residents have shown their commitment to a more sustainable environment by generating less solid waste, and enthusiastically participating in environmental education and stewardship programs.

The bad news is that despite much progress, some areas need improvement. Richmond residents continue to rely heavily on their automobiles despite considerable efforts by the City and the regional transit authority to promote alternative forms of transportation. Current trends in automobile use and ownership are clearly not sustainable given our growing population.

Richmond also performed poorly with respect to water and energy consumption. While per capita use has decreased in some years, Richmond still consumes more water and energy on a per capita basis than most GVRD municipalities. Richmond's share of loading on wastewater treatment plants is also high and increasing. Although treated wastewater can be safely released back into the environment, there are financial and environmental costs associated with collecting, transporting and treating wastewater that could be reduced.

This edition of the SOE report included data on resident complaints regarding air quality and noise that are somewhat discouraging. This indicates that although positive trends for noise and air quality are apparent for

some measures, we may need to reassess our progress in terms of other measures that are less tangible but nonetheless important to the community.

CONCLUSIONS

This edition of the SOE report builds upon the information presented in the first edition and provides a wider range of topics and indicators. However, this report is by no means inclusive. Issues associated with industrial and business wastes, groundwater quality, and habitat restoration are discussed only briefly. Indicators of water and air quality address only a small proportion of the known hazards and pollutants. Additionally, the impacts of poor quality land, water and air on human health are not necessarily reflected in the data that has been presented, and better data are not yet available.

To remain a valuable and relevant tool, it is clear that the SOE report must continue to evolve, remain responsive to community priorities, and incorporate better data as it becomes available. Your comments and suggestions for improving this report are welcome.

For more information about the process for initiating the SOE program in Richmond, and the role of the SOE Report in the City's Environmental Management Strategy, refer to the first edition of the State of the Environment Report, which was prepared in 1998. The 1998 report is available on-line at www.city.richmond.bc.ca, or by contacting the City directly.

Indicator Summary Table

Indicator	1998 Results	2001 Results
A1 Agricultural Land	Good News	Good News
A2 Parks and Protected Areas	Good News	Good News
A3 Designated ESAs	Mixed Results	Good News
A4 Total Greenspace	---	Not Assessed
A5 Trees	Good News	Good News
B1 Fraser River Water Quality	Mixed Results	Mixed Results
B2 Drinking Water Quality	Good News	Good News
C1 Air Quality Index	Good News	Mixed Results
D1 Residential Housing	No indicators	Good News
D2 Accessibility to Key Services	No indicators	Good News
E1 Transportation Choices	Bad News	Bad News
E2 Registered Vehicles	Bad News	Bad News
E3 Pedestrian-friendly Streets	Good News	Good News
E4 Cycle Routes	Good News	Good News
F1 Water Consumption	Bad News	Mixed Results
F2 Energy Consumption	---	Bad News
F3 Residential Solid Waste	Mixed Results	Good News
F4 Wastewater	---	Mixed Results
G1 City Environmental Practices	No indicators	Good News
H1 Noise	No indicators	Mixed Results
I1 Community Environmental Stewardship	---	Good News
I2 Environmental Education	---	Not Assessed
J1 Soil Quality	---	No Indicators

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List of Acronyms

ACE	Advisory Committee on the Environment
ALR	Agricultural Land Reserve
AVS	Agricultural Viability Strategy
AQI	Air Quality Index
BOD	Biochemical Oxygen Demand
DO	Dissolved Oxygen
DWTP	Drinking Water Treatment Program
ESA	Environmentally Sensitive Areas
FREMP	Fraser River Estuary Management Program
GVRD	Greater Vancouver Regional District
GVWD	Greater Vancouver Water District
HPC	Heterotrophic Plate Count
LIP	Local Improvement Program
LWMP	Liquid Waste Management Plan
NEF	Noise Exposure Forecast
NMT	Noise Monitoring Terminals
OCP	Official Community Plan
POPAS	Privately Owned Publicly Accessible Spaces
SOE	State of the Environment
THM	Trihalomethanes
TSS	Total Suspended Solids
WQMRP	Water Quality Monitoring and Reporting Plan
WSD	Water Services Department

List of Indicators

The 2001 Richmond State of the Environment Report is organized according to the following topics and indicators:

TOPIC A: GREENSPACE

- A1 – Agricultural Land
- A2 – Parks and Protected Areas
- A3 – Designated Environmentally Sensitive Areas
- A4 – Total Greenspace and Agricultural Lands
- A5 – Trees

TOPIC B: WATER QUALITY

- B1 – Fraser River Water Quality
- B2 – Drinking Water Quality

TOPIC C: AIR QUALITY

- C1 – Air Quality Index

TOPIC D: LAND USE AND HUMAN SETTLEMENT

- D1 – Residential Housing **NEW**
- D2 – Accessibility to Key Services **NEW**

TOPIC E: TRANSPORTATION

- E1 – Transportation Choices
- E2 – Registered Vehicles
- E3 – Pedestrian Friendly Streets
- E4 – Cycling Routes

TOPIC F: RESOURCE CONSUMPTION & WASTE GENERATION

- F1 – Water Consumption
- F2 – Residential Solid Waste
- F3 – Wastewater **NEW**
- F4 – Energy Consumption **NEW**

TOPIC G: CITY ENVIRONMENTAL PRACTICES

- G1 – City Environmental Practices

TOPIC H: NOISE

- H1 – Noise

TOPIC I: EDUCATION AND STEWARDSHIP

- I1 – Community Environmental Stewardship **NEW**
- I2 – Environmental Education **NEW**

TOPIC J: SOIL QUALITY **NEW**

No Indicators

Introduction

The first edition of the State of the Environment (SOE) report for the City of Richmond was published in 1998. The intent of that report was to synthesize baseline information on Richmond's environmental assets and identify the human pressures affecting those assets. The first SOE report also provided a framework for measuring the progress being made toward achieving Richmond's vision and objectives for the future. This framework would assist the city in establishing targets for improving environmental performance and in making choices in setting budgetary priorities. Eight topics, encompassing fourteen indicators, were selected based on public priority and the level of influence by the City. To monitor changes and evaluate progress in meeting targets, a commitment was made by City Council and the Advisory Committee on the Environment (ACE) to update the SOE report every three years. The 2001 edition of the SOE report is the first complete update of results and includes an expanded range of topics and indicators.

When the first SOE report was prepared in 1998, the City was in the process of updating its Official Community Plan (OCP). Now that the OCP has been completed, this SOE report can look at environmental trends in the context of the city's overall community vision, which is to be the most appealing, livable and well managed city in Canada. To achieve this vision, the City must develop in a manner that enhances Richmond's overall livability while protecting valued environmental assets.

In addition to changes in City policies and programs, Richmond itself has evolved over the past three years. Between 1997 and 2000, the City's population grew by over 10,000 people. This growth resulted in

greater pressures on the environment, as the demand for housing, services and infrastructure increased and our collective resource consumption rose. The 2001 SOE report gives us an idea of how well the City has managed this growth and gives us a sense of how Richmond may look in the future if identified trends continue.

The 2001 SOE report addresses the following ten topics:

- A – Greenspace**
- B – Water Quality**
- C – Air Quality**
- D – Land Use and Human Settlement**
- E – Transportation**
- F – Resource Consumption**
- G – City Environmental Practices**
- H – Noise**
- I – Environmental Education and Community Stewardship (*New topic*)**
- J – Soil Quality (*New topic*)**

In some cases, it was not possible to show trends between 1998 and 2001 because data collection methods had changed since the last SOE report was written. In other cases, clear trends are simply not evident because of the nature of the indicator. However, despite these limitations, the available information has allowed us to determine whether we are heading in the right direction – toward sustainable living – or moving in the wrong direction – away from a more sustainable future. A key objective of this report is to encourage all Richmond residents to work together to take actions that protect our fragile environment and ultimately bring us closer to our community vision.

This edition of the SOE report builds upon the information presented in the first edition and provides a wider range of topics and

indicators. However, this report is by no means inclusive of all possible issues or indicators. Issues associated with industrial and business wastes, groundwater quality, and habitat restoration are discussed only briefly. Indicators of water and air quality address only a small proportion of the known hazards and pollutants. Additionally, the impacts of poor quality land, water and air on human health are not necessarily reflected in the data that has been presented, and better data are not yet available.

To remain a valuable and relevant tool, it is clear that the SOE report must continue to

evolve, remain responsive to community priorities, and incorporate better data as it becomes available. Your comments and suggestions for improving this report are welcome.

For more information about the process for initiating the SOE program in Richmond, and the role of the SOE Report in the City's *Environmental Management Strategy*, refer to the first edition of the State of the Environment report, which was prepared in 1998. The 1998 report is available on-line at www.city.richmond.bc.ca, or by contacting the City directly.

TOPIC A: GREENSPACE

The presence of greenspace is essential for healthy and desirable urban living. It is critical to the survival of wildlife in the urban setting. Greenspace also limits urban sprawl and helps minimize negative impacts of human development by absorbing and filtering pollutants in water and air.

Additionally, greenspace can enhance the aesthetic value of urban areas, provide opportunities for recreation, tourism and agriculture, and bring people closer to nature. To maintain its reputation as a Garden City, Richmond must protect its greenspace.

Greenspace today in the City of Richmond includes remnant natural habitats (e.g., marches, sloughs, bogs, grasslands, shrublands and forest), parks, open space such as schoolyards or golf courses, and agricultural lands. This section of the report examines several components of greenspace:

- A1 Agricultural Land;**
- A2 Parks and Protected Areas;**
- A3 City Designated Environmentally Sensitive Areas;**
- A4 Total Greenspace; and**
- A5 Trees.**



Indicator A1: Agricultural Land

INTRODUCTION

Why Should We Measure This Indicator?

Richmond contains some of the most fertile agricultural land in Canada. This agricultural land is an important component of Richmond's economy, providing both jobs and quality produce for local residents. It also has an immeasurable aesthetic value that benefits local residents and visitors alike. Environmental benefits include acting as a buffer to urban areas and providing wildlife habitat in lieu of limited natural areas. Preserving agricultural land is insurance for the future. At the same time, potential harmful effects may arise from agricultural land use, for example, loss of native soil and habitats, and impacts to water quality associated with contaminated runoff from pesticides, fertilizers and/or livestock waste. This edition of the SOE report does not monitor these potential negative effects.

The BC Agricultural Land Reserve (ALR) was established in 1973 to protect and maintain the province's agricultural land base. Lands designated as ALR cannot be subdivided or zoned for non-farm use without the permission of the Land Reserve Commission (formerly the Agricultural Land Commission). Endorsement from the municipal government is generally required as well.

The City of Richmond, through its OCP, recognizes the importance of agriculture as an important contributor to the economy, a source of food, an environmental resource, and a heritage asset. As stated in the OCP, Richmond is committed to protecting the supply of agricultural lands and ensuring the viability of farm operations.



This indicator tracks how successful the City has been in protecting agricultural lands from development.

What is Being Measured?

This indicator measures:

- Area in ALR; and
- Proportion of ALR in use for agriculture versus not in use.

Comparisons are made between the size of the ALR today, three years ago, and at the time the ALR was established.

RESULTS

Area in ALR

The total ALR area in Richmond is approximately 4539 ha or 33% of the city's land base compared with 4551 ha in 1997 (Map 1)¹. This figure excludes right-of-ways, as well as parcels of ALR located on Sea Island, which are currently under dispute.

¹ The 1998 SOE reported the size of ALR in 1997 to be 4920 ha. Recent more detailed mapping indicates that Richmond's ALR in 1997 was actually 4550 ha. Removal of 11.8 ha in 2000 leaves an ALR of 4539 ha.

Map 1. Agricultural Land Reserve in Richmond, 2000

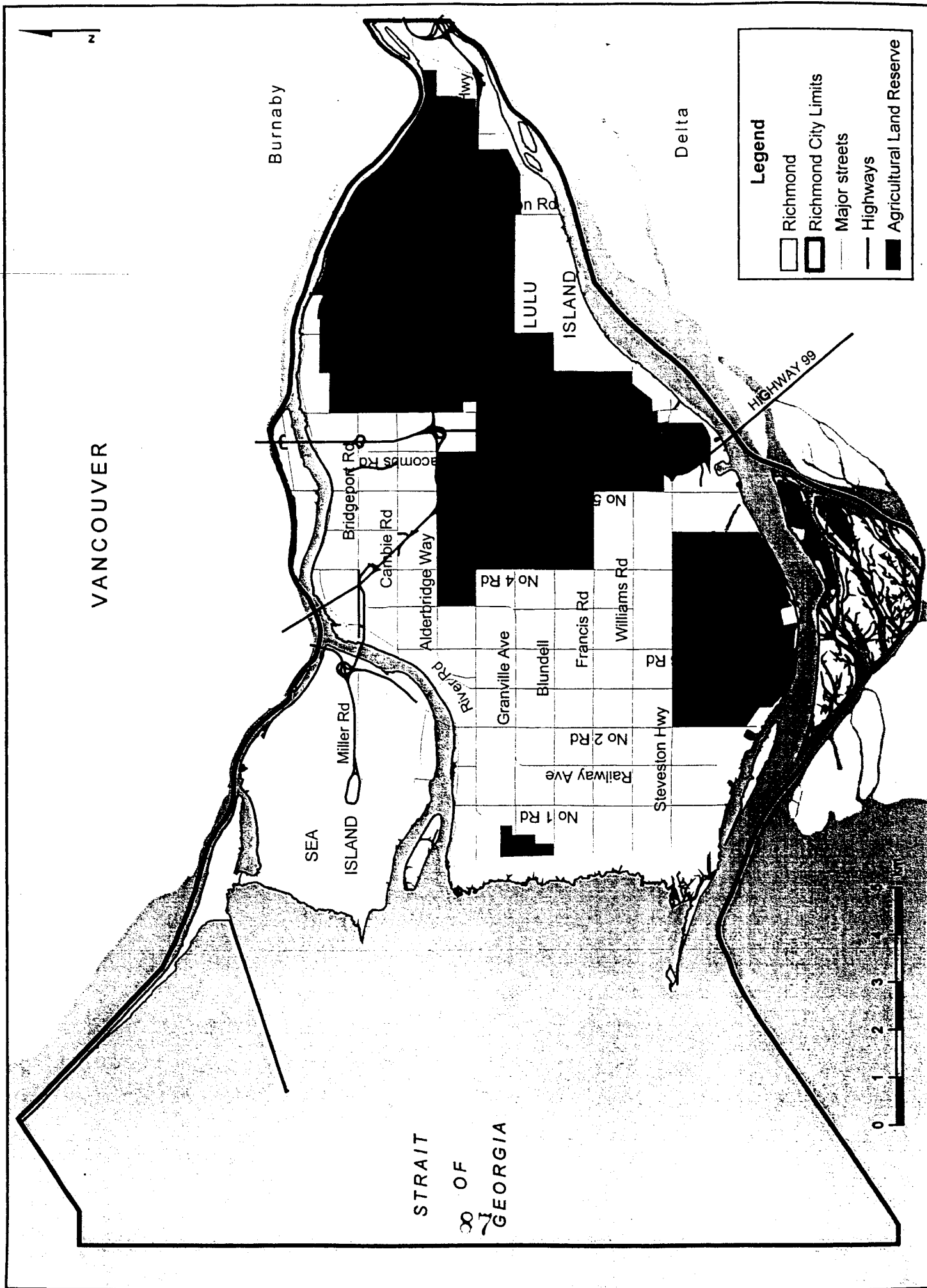
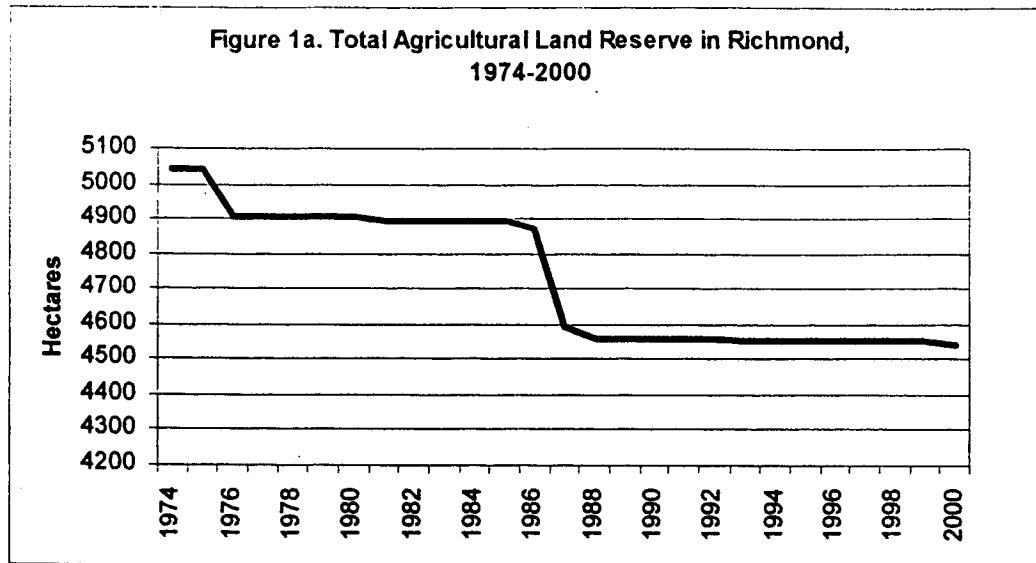


Figure 1a. Total Agricultural Land Reserve in Richmond, 1974-2000



Since the 1998 SOE report was prepared 11.80 ha has been removed from the ALR². These lands were considered to have low agricultural capability. A total of 501 ha have been lost from the original ALR that was first designated in 1973 (Figure 1a). This leaves 91% of Richmond's ALR still intact. As shown in Figure 1a, 17 ha of land have been lost from the ALR in the last decade.

Proportion of ALR in Agricultural Use versus Not in Use

Not all land designated ALR is actively farmed. Based on most recent Census data collected in 1996, 61% of Richmond's ALR is used for farming purposes. Non-farming uses of the remaining 39% of the ALR include parkland, right-of-ways, and allowable commercial, industrial, assembly (e.g., churches), institutional or residential uses.

DISCUSSION

What is Happening?

Results show that the ALR and the City have been fairly successful in protecting farmland. Despite increasing pressures to develop land for urban uses, there has been little change in the size of the ALR since 1998 when the first SOE report was written. This indicator shows progress in achieving the OCP's goal of protecting the supply of agricultural lands and conforms to a trend evident since the early 1990s.

The total area of ALR active in farm use (as of 1996) in Richmond has decreased by over half since 1961 although the rate of decline has slowed. This decline in farming use of the ALR is a significant issue with regard to the City's OCP's goal of ensuring the viability of farm operations. Peripheral

² The exclusion of an additional 2.45 ha was approved in 2000 and is slated for removal pending final processing of the application. However, this area will not be included in the area excluded until the application is completely processed and the area is removed from the provincial registry.

ALR lands that are not presently used for agriculture are most at risk for removal. It is not only important to protect farm lands from competing land use, but we must also try to keep these lands in active production.

Existing City Programs

The City of Richmond continues to support the protection of ALR lands through its OCP and land use planning activities. The City has taken a significant step since 1998 in addressing agricultural issues by working with the local community and preparing an *Agricultural Profile Report* and an *Agricultural Viability Strategy* (AVS). The AVS, when completed in 2002, will help the City achieve their commitment made in the OCP to protect agricultural viability in Richmond.

The City also recognizes that a viable agricultural economy depends upon a healthy environment. The AVS will encourage environmentally-friendly farming practices and promote awareness among farmers of best management practices for agricultural lands. Organic farming and Integrated Pest Management (IPM)³ techniques are examples of such practices.

Richmond and the Region

The agricultural and food industry is a multi-billion dollar industry in BC and contributes significantly to Canada as a trading nation. The majority of British Columbia's agricultural production is in the Lower Mainland and Okanagan Valley. As of 1996, there were 3464 farms in the Greater Vancouver Regional District (GVRD) providing 27% of the agricultural

output of the province. Seven percent of these farms were in Richmond.

The stable size of the ALR in Richmond reflects a trend evident in other jurisdictions. For example, the ALR in the GVRD has remained essentially intact (93% of original area) with only small tracts of land removed in recent years. Nine percent of the GVRD's ALR is located in Richmond.

THE FUTURE

Targets and Influences

The Provincial Land Reserve Commission has a goal to protect all lands in the ALR and ensure that decisions regarding ALR lands result in net benefits to agriculture. The City strongly supports this goal.

What Can Citizens Do?

By promoting agriculture in Richmond we can help maintain viability of the industry, which is possibly the best way to ensure the long-term protection of agricultural lands. You can promote local agriculture in the following ways:

- Contact the City of Richmond Policy and Planning Department if you are interested in finding out more about the use and status of lands that are included or have been removed from the ALR.
- Respect farmers and farmland (e.g., don't pollute, don't trespass or vandalize property, be patient when encountering slow-moving farm vehicles, etc.)
- Buy local agricultural products – shop at seasonal farmers markets or ask your local food store to carry locally-grown produce.

³ The goal of Integrated Pest Management farming techniques is to minimize the use of chemicals to control crop pests and weeds by incorporating other control methods such as biological controls or vegetation management.

- Participate in public education and awareness events (check out Farm Folk/City Folk at www.ffclb.ca or call 604-730-0450 for information on festivals or groups you can participate in).
- Consult the *2001 Richmond Environmental Project Guidebook* for ideas on agricultural projects that make a difference.
- Contact the Delta Farmland and Wildlife Trust at 604-940-3392 or dfwt@axion.net for information on ongoing projects.

SUMMARY

Good News

Since 1997, 11.8 hectares of land have been excluded from the Agricultural Land Reserve (ALR). The total area of ALR in Richmond today is approximately 4539 hectares or 33% of the City's land base. Approximately 91% of the original ALR remains intact. Sixty-one percent of ALR lands are presently in agricultural use. This indicator has been given a rating of Good News.

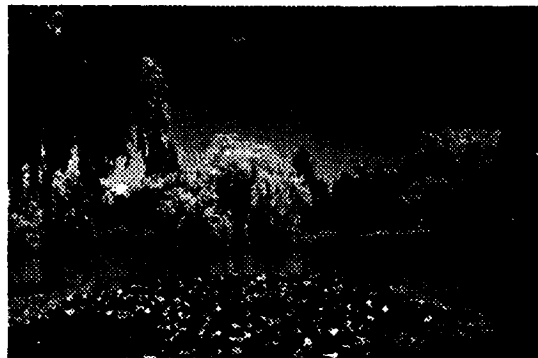
Indicator A2: Parks and Protected Areas

INTRODUCTION

Why Should We Measure This Indicator?

Residents and visitors make extensive use of Richmond's parks, trails and open spaces. The types of parks available in Richmond include nature parks that emphasize the protection of natural attributes and ecological functions; community and neighbourhood parks that are developed for more formal recreational use; and heritage parks that protect areas of historical or cultural significance. In addition to its city parks, Richmond has parks and protected areas that are owned and managed by other agencies. These include non-governmental nature trust lands, regional parks, provincial Wildlife Management Areas and federal Conservation Areas.

Parks and protected areas can enhance a city's livability in a number of ways. From an environmental perspective, they protect habitats for native plants and wildlife; moderate urban microclimates; absorb carbon dioxide; and release oxygen. From a social perspective, parks and protected areas provide focal points for community recreation, enhance aesthetic values, foster civic pride, provide a barrier from negative urban influences, and encourage outdoor activities that contribute to personal health and vitality. Finally, from an economic perspective, parks can increase the value of properties adjacent to them. Trails and greenways also play a key role in enhancing the city's greenspace network, increasing the usability of existing open space and natural resources, connecting wildlife habitat, and enhancing opportunities for passive forms of recreation such as walking and cycling.



As private land in the city becomes more developed and greenspace becomes more scarce, the importance of publicly-owned parks, protected areas, trails and greenways increases for both environmental and recreational reasons.

What is Being Measured?

This indicator looks at terrestrial parks owned by the City of Richmond as well as parks and protected areas owned by other agencies. The specific measures are:

- **Area of terrestrial parks and protected areas;**
- **Area of terrestrial parks and protected areas per 1000 people; and**
- **Length of trails.**

There is a degree of overlap between this indicator and other indicators under this topic. For example, some parks and protected areas are found within the ALR (see *Indicator A1*) and certain parks and protected areas are designated as Environmentally Sensitive Areas (see *Indicator A3*).

RESULTS

Area of Terrestrial Parks and Protected Areas

Today, parks and protected areas in Richmond comprise a total of 1742 ha, which is about 12.8% of the total land base (Table 1a). This represents an increase since 1997 when parks and protected areas comprised about 8.5% of the total land base (Figure 1b).

Presently, Richmond has 120 city parks totaling 738 ha (Map 2). This represents an increase of 203 ha since 1997. The total area of city-owned parks has generally increased every year since 1990 at an average rate of about 28 hectares per year.

Swishwash Island is the only protected area established in Richmond by another agency since the 1998 SOE report. This 48 ha island was donated to the Nature Conservancy by BC Packers in 1999 and is managed as a nature reserve. Presently there are about

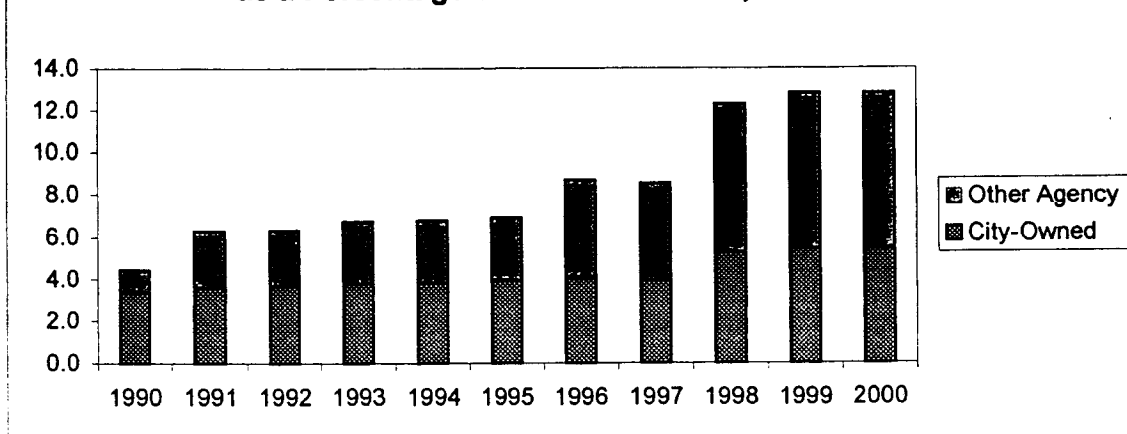
Table 1a. Breakdown of Parks and Protected Areas in Richmond, 2000

	Hectares	% of Land base
City-owned	738	5.4
Other agency-owned	1004	7.4
Total	1742	12.8

1004 ha of parks and protected areas in Richmond owned by other agencies⁴.

The area of parks and protected areas discussed in this report is restricted to terrestrial areas. Aquatic parks and protected areas also exist along Richmond's foreshore. Most notably is Sturgeon Banks, a 5200 ha federal Wildlife Management Area. However, insufficient data exist to accurately measure the area of aquatic parks and protected areas. It is anticipated that by the next edition of the SOE report, data will be available and the area of aquatic parks and protected areas will be reported.

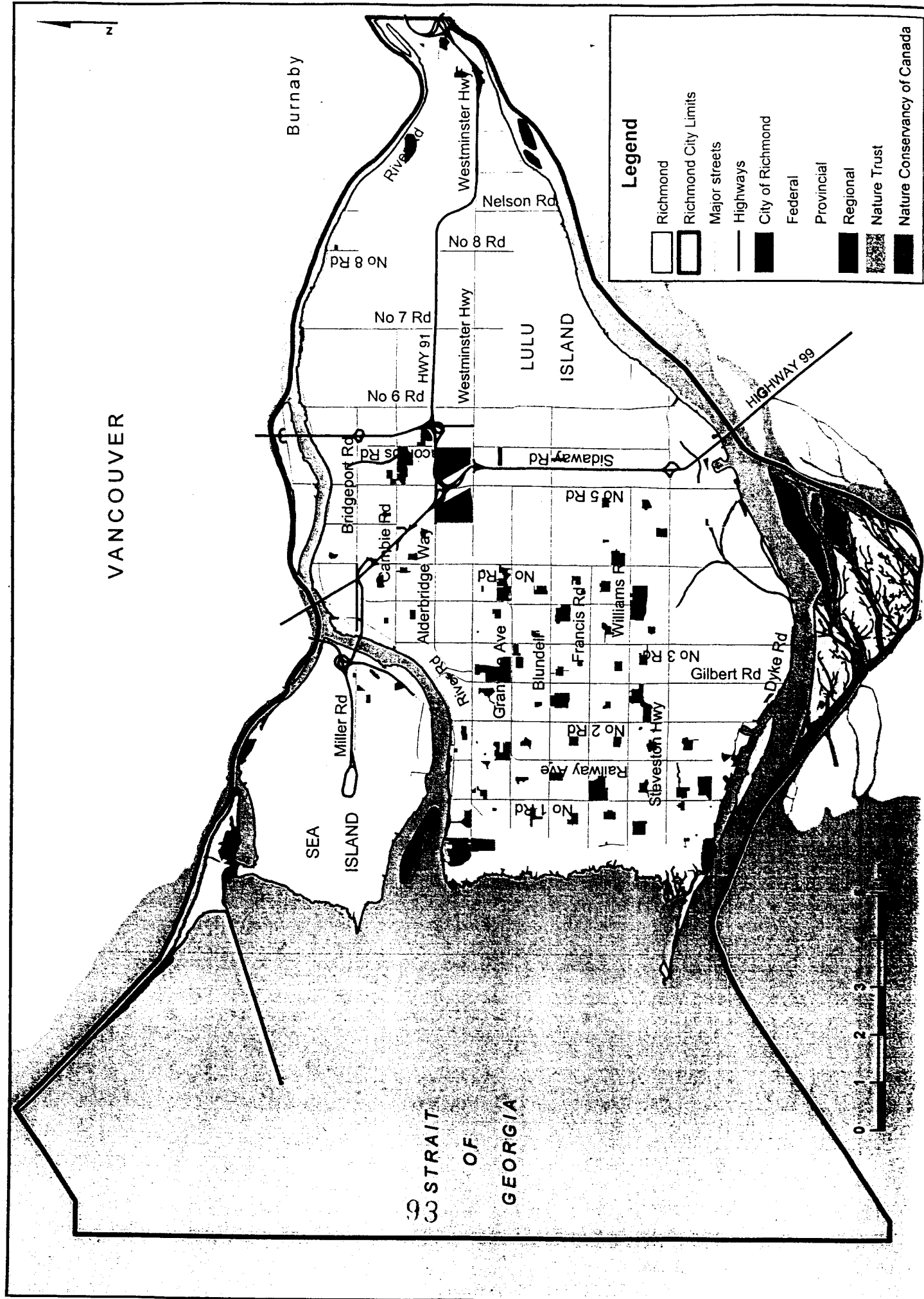
Figure 1b. Parks and Protected Areas in the City of Richmond as a Percentage of Total Land Base, 1990-2000



Note: Richmond's total land base equals 13,390 hectares.

⁴ The 1998 SOE reported that other agencies owned 629 ha in 1997. Recent more detailed mapping of Richmond shows the area of other agency parks and protected areas in 1997 was actually 956 ha. The addition of 48 ha in 1999 from the acquisition of Swishwash Island brings this total to 1004 ha.

Map 2. Parks and Protected Areas by Jurisdiction in Richmond, 2000



Area of Terrestrial Parks and Protected Areas per 1000 People

In 2000, there were about 11 ha of parks and protected areas per 1000 people, including both city parks and parks and protected areas owned by other agencies. In 1997, the figure was just under 8 ha per 1000 people.

Length of Trails

The City of Richmond maintains 40 km of trails⁵. An estimated 25 km of these trails are located along the waterfront. Residents also have access to an additional 13 km of trails located at Iona Beach which are and managed by the GVRD.

DISCUSSION

What is Happening?

The City can acquire parks when land is subdivided or by purchasing new parcels with money generated from development cost charges. In recent years the City has successfully acquired new parks to protect greenspace and serve the community's recreation needs. Acquisition of parks or protected areas in Richmond by other agencies has not occurred to the same degree that which occurred in previous years.

Existing City Programs

The City's OCP incorporates objectives directly related to this indicator. These objectives focus on building and maintaining Richmond's Garden City legacy through initiatives aimed at:

- Making strategic use of natural amenities and landscape resources;

- Fostering civic pride and partnerships;
- Ensuring parks, open space, trails and greenways are created and maintained in an environmentally sustainable manner;
- Developing and maintaining a high-quality open space system;
- Responding to changing user needs in innovative ways;
- Accommodating multiple users; and
- Providing linkages to key destinations and between components of the open space network.

City parks are managed as part of the Richmond Parks, Recreation and Cultural Services Department. As the city becomes more developed and densely populated, this department is challenged with preserving natural areas and greenspace in the city.

While expensive to purchase, parks are also costly to maintain. One of the ways in which the City is able to continue to offer high-level park-related programs is through partnerships with public, private and non-profit organizations. For example, the Partners for Beautification Program has been successful not only in raising funds and capitalizing on volunteer efforts, but in raising the level of public awareness about the importance of parks and natural areas. Volunteers at the Richmond Nature Park help ensure a diverse range of activities are offered year-round at this park with an emphasis on environmental education. Since 1996, the City has also promoted a program called Privately Owned Publicly Accessible Spaces (POPAS), which encourages developers to make privately-owned open space available to the public. No data are available on the amount of POPAS areas in Richmond at the present time.

⁵ The 1998 SOE reported 80 km of trails with no information on how this number was determined. It appears to include the entire dyke as a trail. The 2000 SOE only accounts for trails that are defined, developed and maintained by the City specifically as travel or recreation corridors. Therefore, only a portion of the dyke is included in the analysis although other segments are used informally as a trail.

Richmond and the Region

As discussed in the 1998 SOE report, comparisons among municipalities for this indicator are not possible because municipalities use different definitions of 'park' and 'protected area' in their calculations. Some municipalities include only public parks while others include school playing fields, ski hills, golf courses and exhibition grounds. Protected areas may include any number of conservation designations that municipalities may factor into their totals.

Estimates of the length of trails found in other municipalities are: 6 km in New Westminster; 26 km in Burnaby; 46 km in Surrey; and 80 km in Coquitlam.

THE FUTURE

Targets and Influences

The park acquisition program is influenced by land costs and competing priorities making it difficult to set targets or anticipate future trends. There are currently no targets in place for this indicator. However, the City is currently undertaking a community needs assessment to see if they are meeting the needs of residents for parks and recreation services. The needs assessment will result in a set of short- and long-term priorities for improving or expanding these services.

At the provincial level, BC has been successful in protecting lands for conservation and recreation. The 12% target for protected areas was met in 2000. Although no new target has been set, the

completion of outstanding regional and sub-regional planning processes is expected to result in even more protected areas. As part of the OCP, the City is committed to expanding its trail network, specifically, completing a continuous waterfront trail.

What Can Citizens Do?

Help protect lands and maintain existing parks and protected areas through the following actions:

- Adopt a park or trail (see *Indicator 12*);
- Volunteer for stewardship events or programs sponsored by the City or non-profit groups;
- Participate in trail-building and maintenance activities; and
- Consult the *2001 Richmond Environmental Project Guidebook* for more ideas.

SUMMARY

Good News

Richmond has 738 hectares of City-owned parks, equalling 5.4% of the land base. This is a net increase of 203 hectares since 1997. Other agencies own an additional 1004 ha of parks and protected areas in Richmond. Including both City-owned and other agency parks and protected areas, Richmond today has about 11 hectares of parkland per 1000 people. Richmond has at present a total of 40 km of trails, 25 km of which are located along the waterfront. This indicator has been given a rating of Good News.

Indicator A3: Designated Environmentally Sensitive Areas

INTRODUCTION

Why Should We Measure This Indicator?

The vast Fraser River estuary and its adjacent lands have enormous significance for both aquatic and terrestrial wildlife. Today, much of the natural habitat has disappeared and what is left is typically fragmented and surrounded by developed areas. Despite these drastic changes, the Fraser River estuary remains vital to the survival of many species, in particular, waterfowl and juvenile salmonids. For this reason, the preservation of natural areas is essential.

As a step in this direction, the City of Richmond, in 1984, commissioned a report to identify all Environmentally Sensitive Areas (ESAs) within its boundaries. The identified ESAs were subsequently designated in the City's OCP which was later amended with Bylaw 5746 to afford ESAs greater protection during the development process.

Today, designated ESAs are located in parks and protected areas, and on private land. ESAs include areas such as natural features and their associated lands – woodlots, waterways, riparian vegetation, mudflats, marshes, and fallow fields. As urban development continues to encroach on natural areas it is increasingly important to monitor how successful the City has been in protecting its remaining habitats.

What is Being Measured?

This indicator looks at:

- Area of designated terrestrial ESAs;
- Area of designated terrestrial ESAs lost and gained since 1997; and



- Proportion of designated terrestrial ESAs located within parks or protected areas.

Since 1997, changes have occurred in the way the City handles its ESA database. The 1998 SOE report relied on information from hardcopy maps and reports to generate data on ESAs. Measurement errors in the original ESA data, combined with today's more sophisticated mapping of the city, have rendered the 1998 SOE data for this indicator unreliable.

During the preparation of this SOE report, the City refined the ESA database by comparing past data on ESAs, incorporating new data (e.g., from the Fraser River Estuary Management Program), and correcting the ESA spatial coverage to more precisely align with the city boundary. The resulting information is believed to be a more accurate reflection of the area of terrestrial ESAs. A similar refinement process for aquatic ESAs has not been undertaken so no data are presented for these ESAs. Over the next year, the City will undertake a complete review of its ESA

database and update information on all ESAs in the system, including more detailed information on ESA features and functions.

Note that there is overlap between this indicator and A2: *Parks and Protected Areas* since some ESA designated areas are located within parks and protected areas. However, not all ESAs are protected as parks as many are located within private land.

RESULTS

Area of Designated Terrestrial ESAs
Richmond has 2243 ha of designated ESAs. This represents about 16.5% of Richmond's land base (Map 3).

Area of Designated Terrestrial ESAs Lost and Gained Since 1997

Lands can be excluded from an ESA designation through an OCP amendment, including a public hearing by Council. New ESAs lands can also be designated. Since the 1998 SOE report was written, an amendment to the OCP allowed for the removal of 109 ha from ESA designation. The same amendment designated 200 ha of new ESAs. The result is a net gain of about 91 ha for the period 1997-2000.

Proportion of Designated Terrestrial ESAs Located within Parks or Protected Areas

The best protection for ESAs is public ownership as a park or protected area. Over half (55%) of the City's designated terrestrial ESAs are protected as city parks or managed by other agencies for conservation purposes.

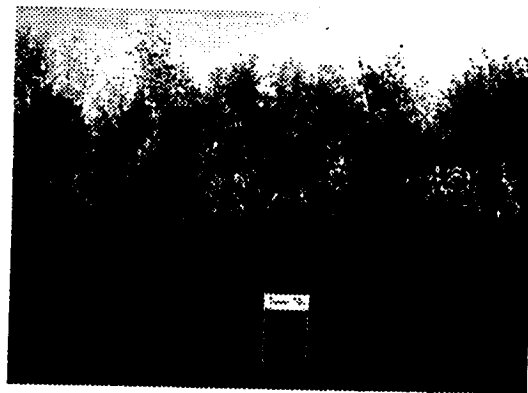
DISCUSSION

What is Happening?

There has been a net gain in designated ESA area since 1998. However, it is important to

note that despite the gain, ESAs have been lost to development. The areas gained are the result of compensation plantings, which are required as a condition of development permits. There is at present no formal process in place to monitor the success of these activities over the long-term.

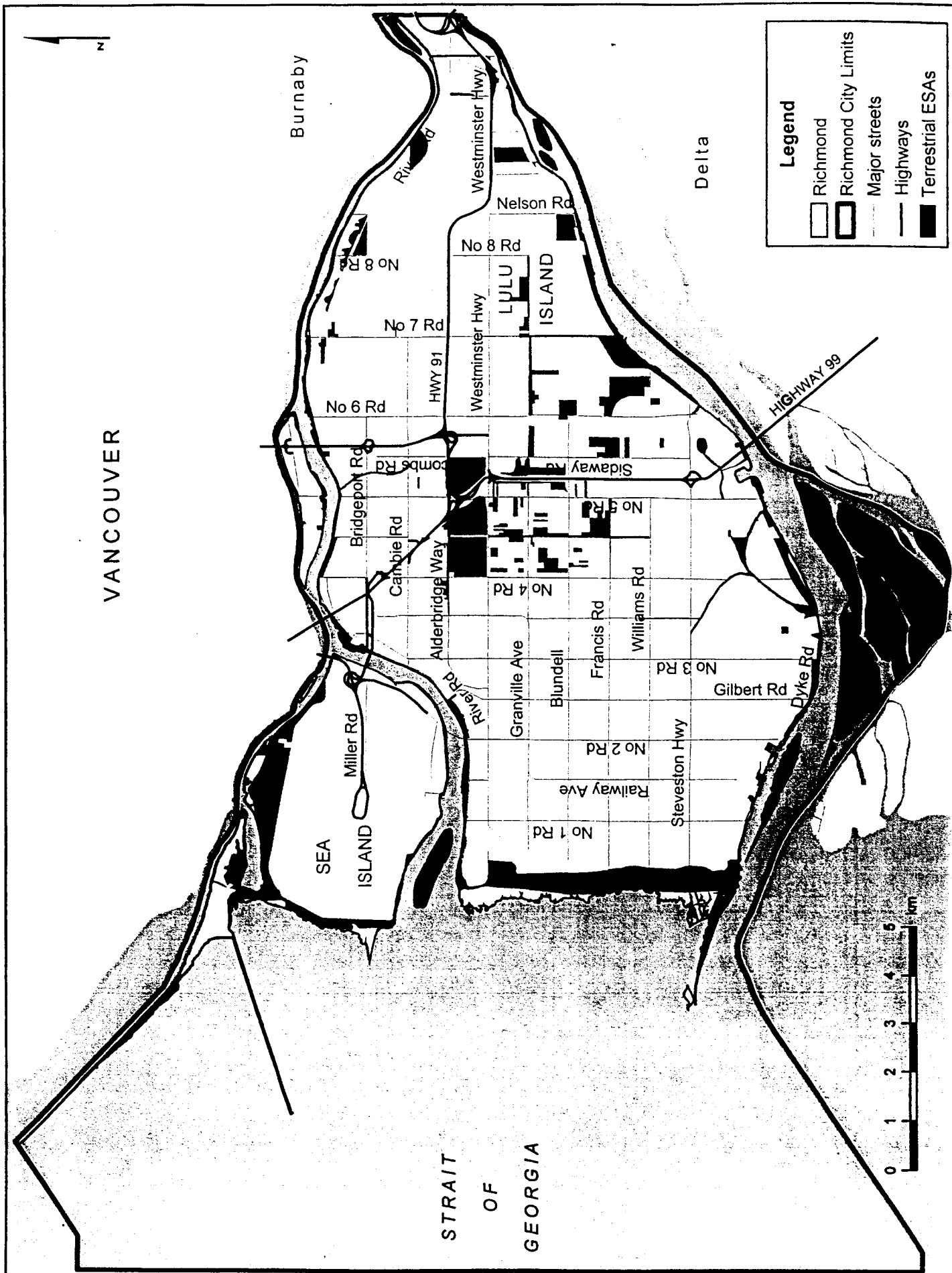
It is encouraging that over half of the identified ESAs are protected and continued efforts are being made to acquire and link ESAs as part of the City's network of parks and protected areas. Unfortunately, the status of ESAs on private properties is difficult to monitor and there is uncertainty as to the quality of these ESAs.



Existing City Programs

There are several existing City programs aimed at acquiring and protecting ESAs. Provisions of the city's OCP and the Local Government Act require a development permit if the property is defined as an ESA and there are plans to subdivide the land or carry out construction. Applicants for ESA development permits must submit a vegetation survey and, if necessary, a plan regarding the trees and shrubs to be planted in compensation for those removed. These compensation plantings must follow specific standards for species composition.

Map 3. Designated Terrestrial Environmentally Sensitive Areas in Richmond, 2000



The Policy and Planning Department has developed a design manual for developers, conservationists, and designers who are working in or near Richmond's ESAs (*Criteria for the Protection of Environmentally Sensitive Areas, 1991*). The manual is also recommended as a guide for citizens wishing to undertake landscape design activities to benefit wildlife use of their properties

One of the objectives of the OCP is to use a strategic management approach to secure long-term protection for ESAs. Policies for achieving this objective include: amending the OCP; continuing the development application process; encouraging community groups and other government bodies to acquire key ESAs; integrating ESA management into the City's Parks and Open Space Strategy; and encouraging the restoration of natural habitats to enhance ESAs. Further guidelines for natural areas, outlined by the OCP require the preservation of large tracts or corridors of wildlife habitat (these areas may also serve as recreation corridors or drainage canals); a buffer between potentially polluting activities and natural areas; minimization of storm water run-off; and the protection of natural drainage patterns.

Initiatives and programs discussed under other indicators in this report have immediate relevance to ESAs. These include a pilot project to develop a regional biodiversity conservation strategy (see A4: *Total Greenspace*), development of an Urban Forest Management Strategy (see A5: *Trees*), and activities undertaken as part of the Partners for Beautification Program (see I2: *Community Environmental Stewardship*). The City also works with other agencies and non-government organizations to protect ESAs.

Richmond and the Region

The definition of what constitutes an environmentally sensitive area varies among municipalities. Thus, it is difficult to make meaningful comparisons between Richmond's progress with respect to this indicator and what other regions in the GVRD have achieved. What is apparent however, is that the concepts important in the identification and preservation of ESAs, such as habitat connectivity, are receiving increasing attention throughout the GVRD.

THE FUTURE

Targets and Influences

Richmond's ESA inventory is dynamic and is influenced by Council's decisions related to the amount and location of development in the city. No quantitative targets have been set for ESAs in Richmond, but the OCP's natural area guidelines state that there should be no net loss of natural areas due to development.

The City is currently reviewing and refining its ESA database including both terrestrial and aquatic components. Data presented in the next edition of the SOE report will reflect these improvements. In addition to improving the database, the City should undertake a program to monitor the status of existing ESAs. This will give a better sense of the quality of ESAs, particularly those located on private lands.

What Can Citizens Do?

There are a number of ways you can help maintain natural areas in your community:

- Contact the City to obtain a copy of the ESA design manual: *Criteria for the Protection of Environmentally Sensitive Areas*.

- Plant native vegetation in your garden to provide habitat for wildlife. For more information visit the Naturescape BC web site: www.hctf.ca/nature.htm.
- If there are ESAs on your land consider placing conservation covenants on that portion or donate that land to a nature or land trust organization.
- Learn more about native plants and wildflowers by reading the City's *Guide for Landscape Architects, Biologists, Gardeners, Developers, and Others who are Involved in Landscaping in Richmond*, available at: www.city.richmond.bc.ca/planning/wildflowers.htm
- Find out about conservation organizations that are involved in the identification and monitoring of ESAs. A good place to start is the Federation of BC Naturalists where you can get information about joining local natural history societies at 604-737-3057 or fbcn@intergate.bc.ca.
- Join volunteer groups involved in land stewardship or habitat restoration programs such as Richmond Nature Park or your local natural history society.
- Find out more about the Delta Farmland and Wildlife Trust program. Contact them at 604-940-3392 or dfwt@axion.net.

SUMMARY

Good News

Richmond has 2243 ha of designated terrestrial ESAs, which is 16.5% of Richmond's land base. Since the 1998 SOE Report was written, an amendment to the OCP allowed for the removal of 109 ha from an ESA designation. The same amendment designated 200 ha of new ESAs. The result is a net gain of about 91 ha for the period 1997-2000. Nearly 55% (1140 ha) of terrestrial ESAs are protected as city parks or managed by other agencies for conservation purposes. However, the quality of ESAs that remain unprotected is unknown. Overall, this indicator was given a Good News rating because there has been a no net loss in ESA designated areas since the 1998 SOE report.

Indicator A4: Total Greenspace and Agricultural Land

INTRODUCTION

Why Should We Measure This Indicator?

Agricultural land, parks and protected areas, and ESAs are all elements of greenspace. As previously discussed, the presence of greenspace in the urban environment is essential. Greenspace provides habitat for wildlife; helps maintain water and air quality; enhances aesthetic values; and provides opportunities for recreation, tourism and agriculture.

What is Being Measured?

Total greenspace is a composite of the other indicators under this topic. Using a computer mapping system, the areas of ALR, terrestrial parks and protected areas, and designated terrestrial ESAs were combined. Areas of overlap were then subtracted to give a measure of:

- **Total greenspace area in Richmond.**

It should be noted that some types of greenspace are not accounted for, such as: area of recreational trails; Privately Owned Publicly Accessible Open Space (POPAS); aquatic ESAs or greenspace not found within the ALR, parks or ESAs. These areas are not included due to data limitations.

RESULTS

Total Greenspace Area in Richmond

There are approximately 6900 ha of greenspace in Richmond, totaling about 51% of the city's land base (Map 4). This is about 43 ha of greenspace per 1000 people.



Although insufficient data exist to determine the exact amount of total aquatic greenspace, it is known that nearly 5200 ha of aquatic habitats are protected as part of the Sturgeon Banks Wildlife Management Area.

DISCUSSION

What is Happening?

This is the first time this analysis has been conducted, so identification of trends must await future monitoring reports. Although there has been a net gain in parks, protected areas and ESAs since 1997, this does not necessarily imply a net increase in total greenspace; only a change in land use designations.

Existing City Programs

Programs aimed at creating and protecting agricultural lands, parks and protected areas, trees and ESAs are discussed elsewhere in this report (see *Indicators A1, A2 and A3*).

Map 4. Total Area of Greenspace and Agricultural Lands in Richmond, 2000

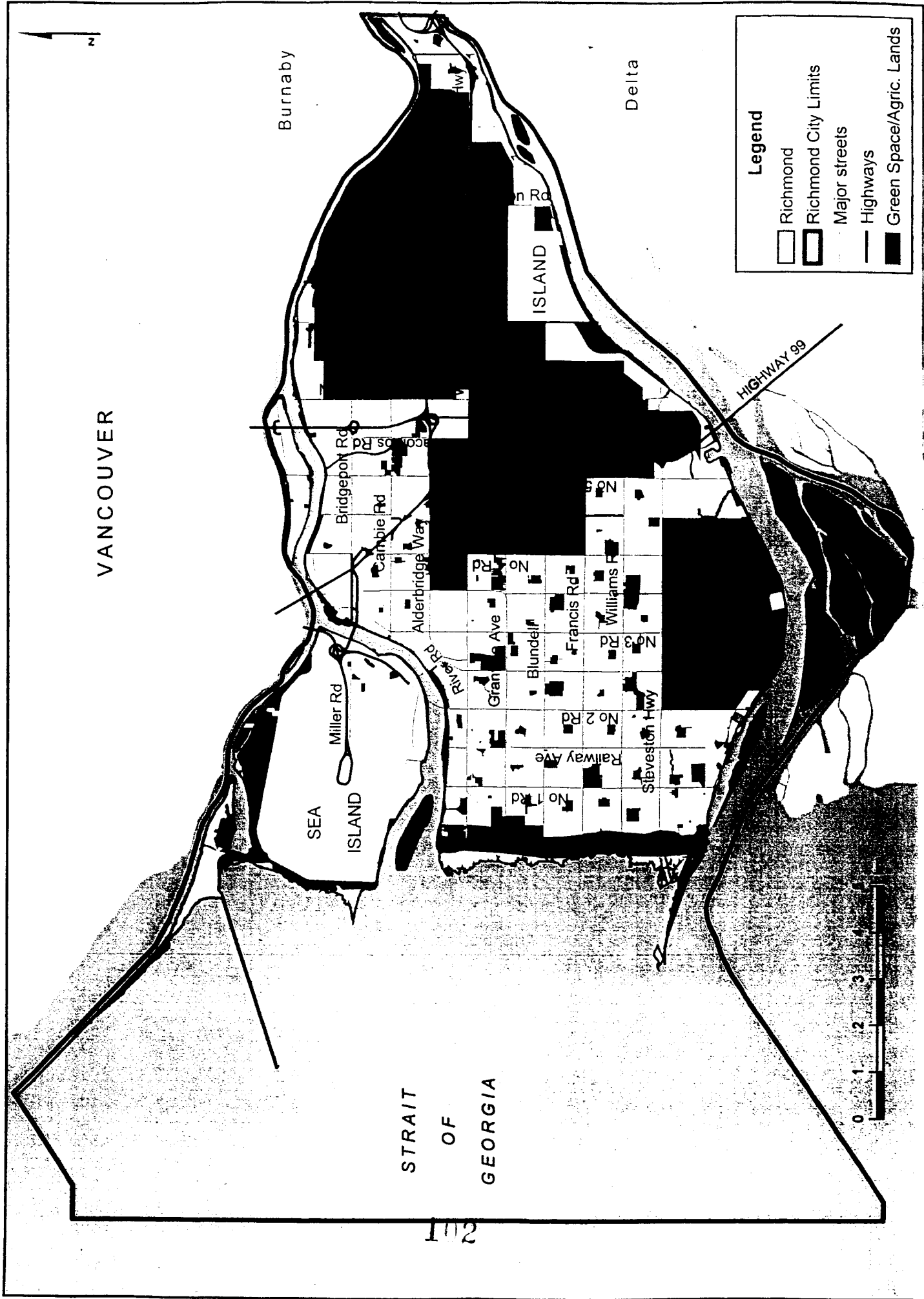


Table 1b. Breakdown of Greenspace and Agricultural Land in Richmond, 2000

Type of Greenspace	Area (hectares)	Proportion of Richmond
ALR lands	4988	36.6%
Parks and Protected Areas	1506	11.0%
Designated Terrestrial ESAs	2243	16.5%
Total Greenspace (no overlap)	6899	50.6%

Richmond and the Region

For reasons discussed previously under individual indicators of greenspace, comparisons with other municipalities cannot readily be made due to varying definitions of greenspace components. However, Richmond's concept of greenspace is closely linked to the GVRD's 'Green Zone', which is a central element and strategy of the *Livable Region Strategic Plan*. Within the GVRD, the Green Zone protects natural assets including major parks, watersheds, ecologically important areas and resource lands such as farmland. Additionally, an objective of the Green Zone is to establish a long-term boundary for urban growth. It is encouraging to note that the protected area within the GVRD Green Zone tripled between 1991 and 1999, and now represent approximately one-third of the GVRD's total land base⁶.

THE FUTURE

Targets and Influences

There are presently no targets for the indicator of *Total Greenspace*. This indicator will be directly affected by trends in the other indicators that make up this

composite. It should also be noted that the different types of greenspace discussed under this topic are afforded varying levels of protection. While effective in protecting land from urban development, not all types of greenspace are equal with respect to protecting habitat.

There is great potential for refining this indicator to focus on the more ecological aspects of greenspace. For example, future editions of the SOE report should include data on aquatic areas. Consideration should also be given to the feasibility of measuring:

- Ratio of permeable surfaces in the city to hard surfaces which obstruct infiltration of rain and moisture into soils;
- Types, distribution and availability of terrestrial and aquatic habitats⁷; and
- Connectivity between areas of greenspace.

This is an appropriate direction to move as the GVRD, in partnership with the Georgia Basin Environmental Initiative, has begun to develop a regional biodiversity conservation strategy for the Lower Mainland. The strategy focuses on working with local

⁷ The feasibility of including a habitat indicator in the 2001 SOE report was explored. It was determined that although some data are available from past habitat studies, compilation of these data into a meaningful reflection of present habitats in Richmond was not feasible at the present time.

⁶ GVRD Livable Region Strategic Plan, 2000 Annual Report.

governments and stewardship groups to provide a coordinated mechanism for the delivery of planning programs and activities for conservation and biodiversity.

What Can Citizens Do?

Ideas for citizen participation in protecting greenspace have been discussed as part of other indicators under the topic of Greenspace.

SUMMARY

Not Assessed

Including agricultural land, parks and protected areas and terrestrial ESAs, there are approximately 6900 ha of greenspace in Richmond. This represents about 51% of the City's total land base and about 43 ha of greenspace per 1000 people. This indicator will be assessed in future reports when trends have been established.

Indicator A5: Trees

INTRODUCTION

Why Should We Measure This Indicator?

Trees connect people to nature in the midst of our urban surroundings, and offer us aesthetic, environmental and economic benefits. Trees soften the edges of the urban core, provide continuity in areas undergoing change, reinforce the historical roots of the community, and beautify, connect and define the character of entire neighbourhoods and special places in Richmond.

Trees also provide food and shelter for wildlife, control erosion, act as buffers against wind and noise, provide privacy and shade, help regulate the urban climate, absorb carbon dioxide and pollutants, and release oxygen. In economic terms, trees decrease the cost of stormwater runoff systems, decrease energy consumption and contribute to increased property values⁸.

What is Being Measured?

This indicator tracks:

- Annual number of trees planted on City property; and
- Number of trees lost and gained through multi-family development.

The 1998 SOE reported on the total number of new trees planted along Richmond roads by the City or developers⁹ during road maintenance and new road construction.



However, the City also plants trees on other city properties, in particular municipal parks. Therefore, this indicator has been revised to report the total number of trees planted on City property each year whether by the City itself or by others.

It should be noted that the number of trees planted is not a measure of the **total** number of trees on City property as many older trees are not yet part of the City's inventory, and every year some trees are removed due to development or for public safety reasons.

⁸ See also Richmond's *Urban Forest Strategy* for more information on the value of trees and strategies for management.

⁹ Developers are required to plant trees when new subdivisions are created. The care of these trees is taken over by the City after a one-year period.

To understand how urban development may be affecting the number of trees, the 1998 SOE report recommended that the City also track the number of trees lost and gained through multi-family development. Applicants rezoning a property or taking out a multiple-family development permit must undertake a tree survey in order that potential impacts on trees from the proposed development can be assessed and mitigated. Through negotiations, applicants are encouraged to retain existing trees where feasible. If retention is not possible, lost trees must be replaced.

RESULTS

Annual Number of Trees Planted on City Property

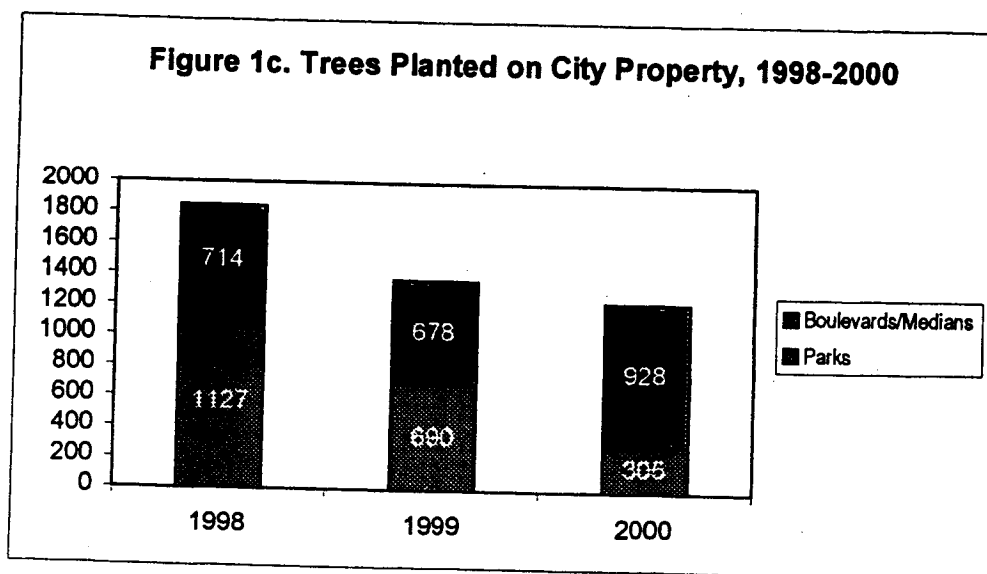
The Street Tree Program, introduced in 1994, has resulted in the planting of many new trees throughout Richmond. A total of 3127 street trees were planted in Richmond

from 1994-1997¹⁰, an average of 782 trees per year.

The amount of trees planted on other city lands was not reported in the 1998 SOE. From 1998 to 2000, a total of 4442 new trees were planted on City property: 2320 along streets (i.e., boulevards and medians); and 2122 in parks (Figure 1c). This is an average of 773 street trees and 707 park trees per year for this time period. Although many new trees are being planted each year, this indicator does not measure whether the total number of trees in the city has been increasing nor does it provide an assessment of the ecological benefits derived from the trees.

It is also worth noting that, although the number of trees is an important measure, not all trees are equal in their function. For example, while streets trees may be aesthetically pleasing, they do not provide the same ecological value as a stand of trees with understorey.

Figure 1c. Trees Planted on City Property, 1998-2000



¹⁰ The City planted 1266 trees during road maintenance and 1861 trees along roads in new subdivisions.

Trees Lost and Gained Through Multi-Family Development

At the time of the 1998 SOE report, the City had recently adopted a new development application tracking system with the capacity to monitor the number of trees lost and gained through multi-family developments. However, at present, the system is not fully operational and thus data to track this indicator are not available. These data should be included in the next SOE update, and, if possible, the total number of trees lost and gained through all types of development, including housing, commercial and industrial, should be reported.

DISCUSSION

What is Happening?

It is difficult to make comparisons among years as the number of street trees planted is somewhat dependent on the amount of street repair and maintenance work, as well as the amount of new roads created. These factors vary from year to year. However, these results show that the City continues to take its Street Tree Program seriously. New trees are planted each year and existing trees are maintained to ensure their health and vitality. It is not surprising that the number of trees planted in the early years of the Street Tree Program was higher than in recent years, as significant efforts were made to plant trees along major routes that had previously been neglected in this regard. Today, the majority of trees are planted on newly constructed roads or roads undergoing significant redevelopment.

The number of trees planted in parks has decreased each year since 1998. The planting of trees in parks is based on priority and availability of financial resources.

Existing City Programs

The OCP promotes the planting and preservation of trees along city streets and on private lands to benefit community health and aesthetics. Protection of trees on private property is encouraged through the development process. In 1994, the City adopted a program to plant street trees when new roads are constructed, or wherever roads or sewers are rebuilt. This Street Tree Program remains in effect along with standards for street tree planting, including tree type, spacing and maintenance. The City also continues to plant trees in other public places such as parks as part of its Beautification Strategy. Richmond's efforts to 'green-up' the city was one of the reasons it was awarded the prestigious top prize from the Nations in Bloom program in 1999. Richmond has also made concerted efforts to protect trees of significant age or size in the city.



The City recently completed an *Urban Forest Management Strategy* to provide direction for tree management on public lands. This strategy outlines ways to support the 'Garden City' vision, and articulates roles and responsibilities for successful tree management

Richmond and the Region

Street tree planting has been adopted by many cities in the region (e.g., Surrey, Vancouver, North Vancouver). Vancouver maintains more than half a million trees located on City property, including trees on boulevards, in parks, and in woodland areas. Over 110,000 of these are street trees.

Through a variety of initiatives under the Tree-Care Program, the Vancouver Park Board plants more than 4000 trees annually on streets, hundreds of shade trees in parks and thousands of coniferous seedlings in parks and woodland areas. It is difficult to compare these numbers with Richmond, however, because we do not yet have a good measure of the total number of trees in Richmond as a whole.

THE FUTURE

Targets and Influences

No targets exist for this indicator. The numbers of trees planted yearly is closely linked to the amount of development within the city as well as road maintenance and construction. As this can fluctuate widely from year to year, achievable targets are difficult to set. Planting trees in parks or on other public properties will continue as part of landscaping or vegetation management efforts. The City will also continue to encourage tree retention wherever possible, and to replace trees where it has been necessary to remove them. Finally, by tracking trees lost and gained through development, Richmond will be able to determine a net loss or gain in trees as development progresses.

What Can Citizens Do?

Trees on private property also contribute to the amount of greenspace in the city. Richmond residents should continue to care for trees on their property, replace trees that must be removed, and consider using native trees for landscaping. Additionally, you can:

- Adopt a tree. Under the City's Adopt-a-Tree program, individuals or groups agree to undertake tree-planting activities following guidelines established by the City (See *Indicator 12: Community Environmental Stewardship* and the *2001 Richmond Environmental Guidebook*).
- Property owners can request a Local Improvement Program (LIP) from the City for planting street trees.

You can find out more information from:

- *Waterwise Gardening: A Guide for BC's Lower Mainland*, and
- *Saving Native Trees in the Lower Mainland: A Guide to Native Tree Retention for Developers, Homeowners, Contractors and Professionals*.

SUMMARY

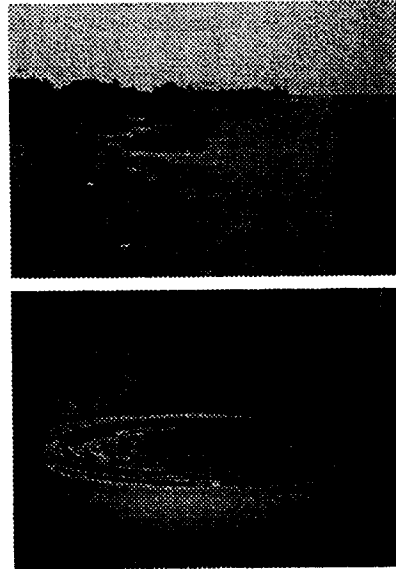
Good News

For the period 1998-2000 a total of 4442 new trees were planted on City property: 2320 on boulevards and medians, and 2122 in parks. As more areas become planted, the number of trees being planted on an annual basis has been decreasing. Data are presently not available to measure the number of trees lost to development.

TOPIC B: WATER QUALITY

Water is a basic element of life and a good indicator of overall environmental health. Clean water in rivers and streams is essential as a source of drinking water and for irrigation and recreation. It is also vital for sustaining aquatic life, and is an integral component of our coastal ecosystems and many local economies (e.g., commercial, sport and native fisheries). This section of the report reviews the following indicators:

- B1 Fraser River Water Quality; and**
- B2 Drinking Water Quality.**



Indicator B1: Fraser River Water Quality

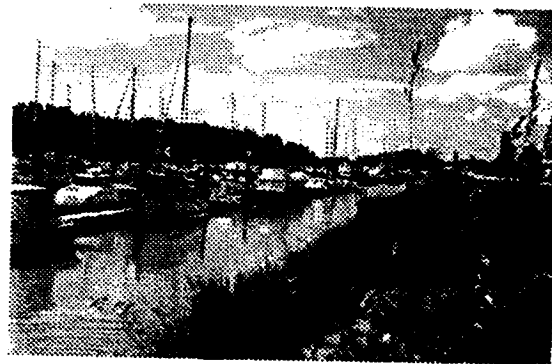
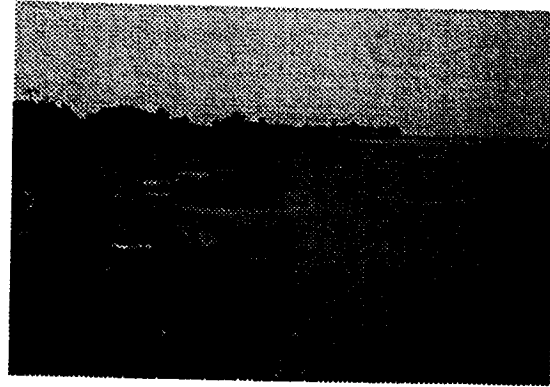
INTRODUCTION

Why Should We Measure This Indicator?

The Fraser River is the largest and most important river in British Columbia. Its watershed accounts for more than 25% of BC's land base. All five Pacific salmon species are found in the Fraser River and its tributaries. Some of the runs are among the largest in the world. The Fraser is also home to dwindling numbers of the largest freshwater fish in Canada, the white sturgeon. The Fraser River estuary provides critical habitat for many species of birds and wildlife, including waterfowl migration and staging areas of global significance. Approximately half of the province's population lives in the Lower Fraser Valley. Major human uses of the river in this region include livestock watering, crop irrigation, and recreation.

Water quality in the Fraser is influenced by activities taking place throughout its watershed. Activities that might impair water quality include urban runoff; effluent from sewage treatment plants or commercial/industrial activities; runoff from agricultural areas that may contain pesticides, herbicides or farm wastes; leaching from contaminated sites; and accidental spills. A survey of Lower Fraser valley residents found that 37% felt that water quality was good or improving while 63% believed water quality was poor¹¹. These results indicate that many residents perceive a problem with the water quality of the Fraser River.

¹¹ The public survey was conducted jointly by the BC Ministry of Environment, Lands and Parks, Environment Canada, the Fraser River Basin Management Program, and the Fraser River Estuary Management Program (FREMP) for the Fraser River below Hope.



What is Being Measured?

There is no source of data that presents a comprehensive picture of Fraser River water quality¹². The best available data at this time are provided by the GVRD, which monitors water quality from five monitoring stations located in the Main Arm of the Fraser River. The stations are located upstream and downstream of the wastewater treatment facilities at Lulu and Annacis islands. These five stations have been sampled approximately every two months, at random

¹² See Swain *et al.* (1998) for a summary of provincial water quality monitoring activities. Additionally, The Fraser River Action Plan conducted research from 1992 to 1998 throughout the Fraser River Basin. Data and information from FREMP are contained in Gray and Tuominen (1998).

with respect to the tidal cycle, from 1993 to the present. The samples are analyzed for different parameters:

- Fecal coliforms; and
- Dissolved oxygen concentration.

Fecal coliform bacteria are a family of bacteria that indicate the possible presence of human or animal waste material and therefore, the possible presence of harmful pathogens that may lead to illness. Dissolved oxygen (DO) concentration is a measure of the amount of oxygen in the water which is available to fish and other aquatic organisms. Although there are natural fluctuations, DO levels can also be affected by discharges to the aquatic system, organic wastes and chemicals from effluents.

Fecal coliforms and dissolved oxygen are two important measures of water quality. However, numerous other parameters exist that can affect water quality and aquatic species health. Examples include heavy

metals, nitrates, phosphates, pesticides, hydrocarbons, chlorophylls and sediments. Unfortunately, additional reporting for these other parameters is not possible due to the lack of data.

What are the Objectives?

Federal and provincial water quality guidelines have been established for recreational use and for the protection of aquatic life. The guidelines relating to fecal coliforms and dissolved oxygen are summarized in Table 2a.

RESULTS

Fecal Coliform Counts

The 1998 SOE report found that fecal coliform counts frequently exceeded water quality objectives between 1993 and 1997. In 1998, additional treatment was implemented at the Annacis and Lulu wastewater treatment plants. The result has been that fecal coliform counts have decreased dramatically¹³ (Figures 2a and 2b).

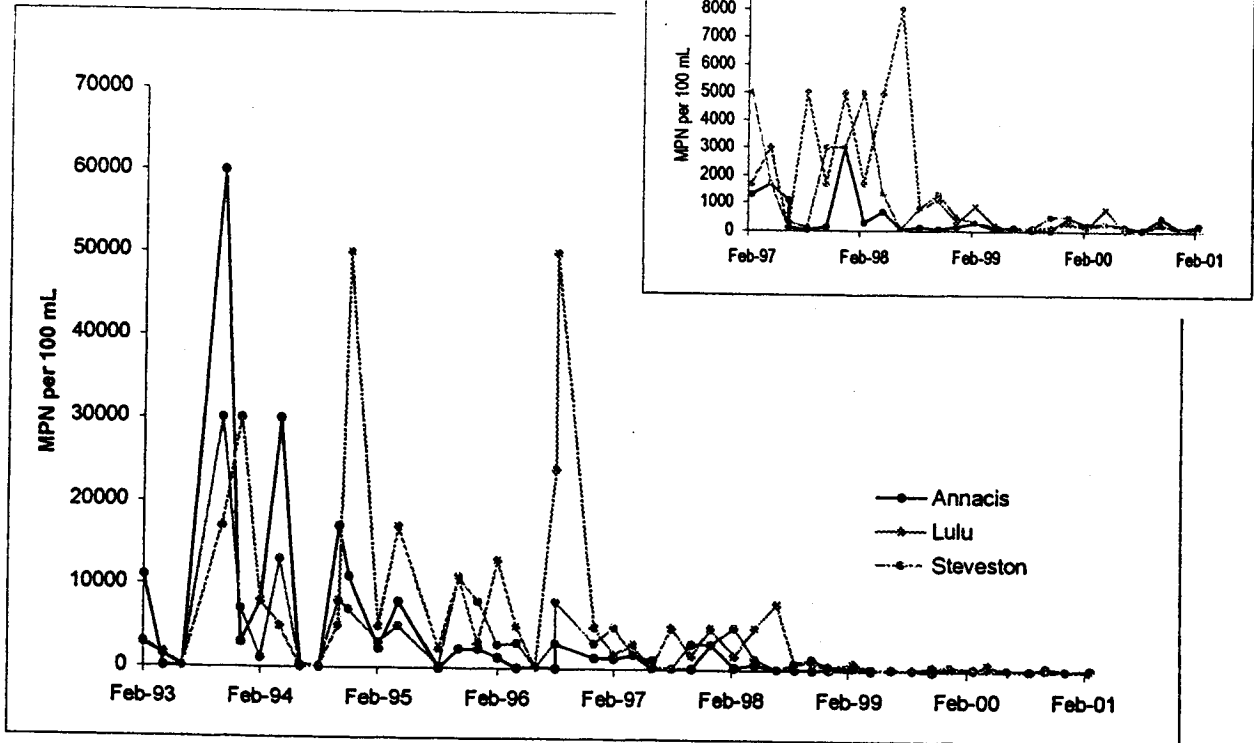
Table 2a. Summary of Federal and Provincial Water Quality Guidelines for Selected Parameters

Parameter	Recreational		Protection of Aquatic Life	
	Federal	Provincial	Federal	Provincial
Dissolved Oxygen	--	≥2 mg/L (for bathing)	≥5.5-9.5 mg/L (guideline differs among months)	≥9 mg/L
Fecal Coliforms	≤200 CFU per 100 mL	≤200 CFU per 100 mL	--	≤43 CFU per 100 mL (shellfish harvesting)

* CFU = coliform forming unit

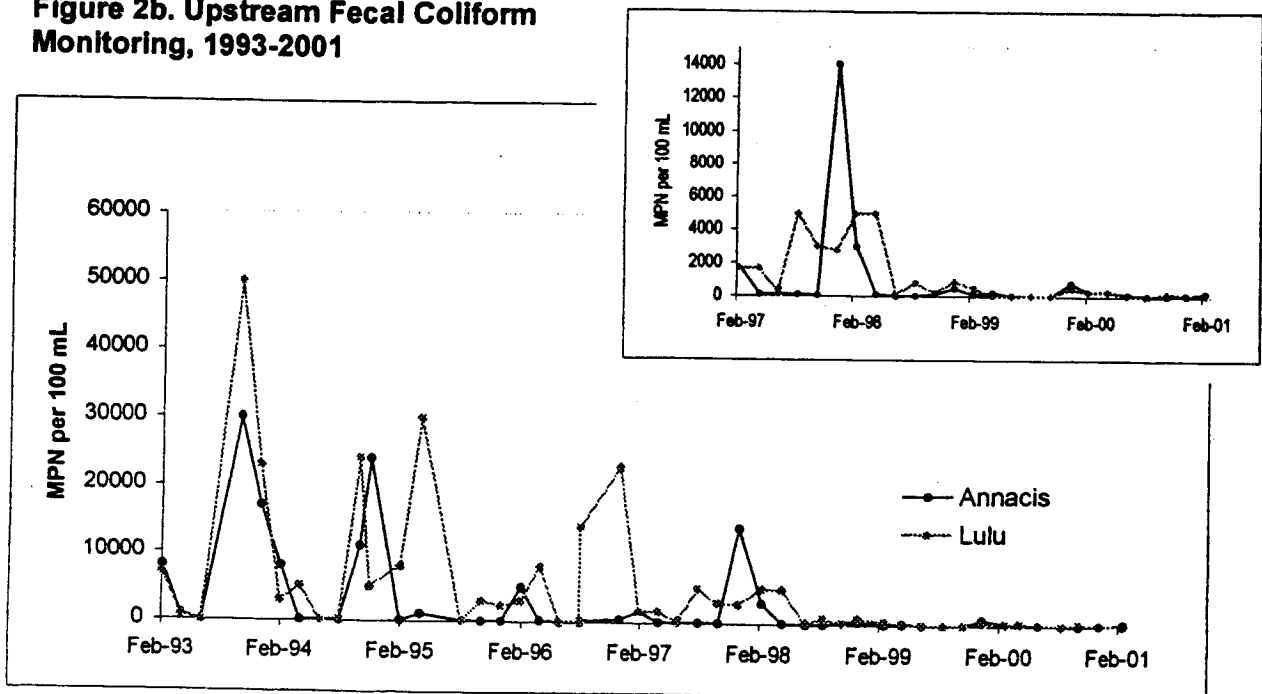
¹³ Different units are used in Table 2a and Figures 2a and 2b. The units correspond with two different test methods. CFU (coliform forming unit) is a *direct count* while MPN (mean probable number) is a *statistical projection*. MPN estimates are less precise than direct counts but can be compared with the guidelines reported in CFUs.

Figure 2a. Downstream Fecal Coliform Monitoring, 1993 - 2001



* MPN = Most Probable Number

Figure 2b. Upstream Fecal Coliform Monitoring, 1993-2001



* MPN = Most Probable Number

Dissolved Oxygen Concentration

Since 1993, dissolved oxygen concentrations have generally met provincial and federal standards (Figures 2c and 2d).

DISCUSSION

What is Happening?

Water quality in the Fraser River near Richmond has improved with respect to dissolved oxygen concentration and fecal coliforms. The latter is mainly attributed to

the upgrade of the Annacis and Lulu Island wastewater treatment plants from primary to secondary treatment in 1998. While this presents good news, many uncertainties exist about the overall state of water quality in the Fraser River. Many physical, chemical and biological indicators of water quality were not assessed as part of this report due to the lack of data.

Trends in Fraser River water quality are also closely linked to *Indicator F3: Wastewater*, and to groundwater quality, which was not evaluated in this report.

Figure 2c. Upstream Dissolved Oxygen Monitoring, 1993-2001

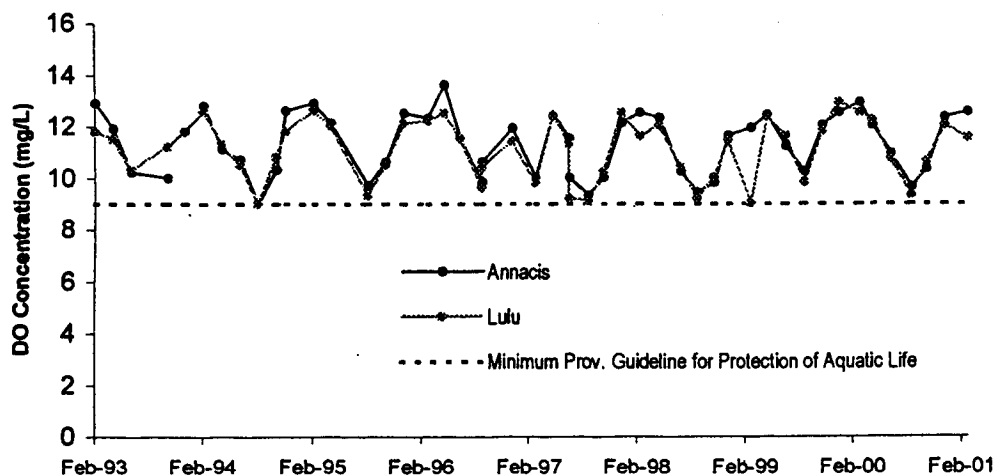
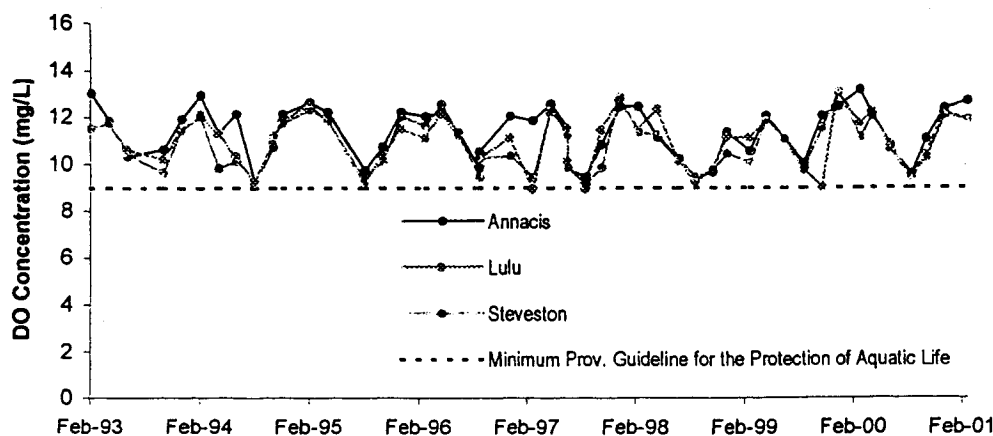


Figure 2d. Downstream Dissolved Oxygen Monitoring, 1993-2001



Existing City Programs

The OCP recognizes that Richmond is a community virtually surrounded by the Fraser River, and its estuary, and that there is a compelling need for strong environmental policies to preserve and protect the natural environment. Although the OCP does not specifically address water quality in the Fraser River, protection of Richmond's greenspace, including agricultural land and natural areas, are among the goals of the OCP.

The City addresses Fraser River water quality through a number of initiatives. The Storm Sewer, Ditch, Watercourse and Soil Protection Bylaw provides regulations aimed at reducing surface runoff that can affect water quality as well as other parameters. The City also regulates discharges from industrial and commercial sectors, encourages the proper disposal of substances such as oils and paints, and works with farmers to implement integrated pest management programs, an objective of which is to decrease the use of pesticides.

Additionally, there is much effort directed towards the protection of shoreline habitat through park and ESA designations at places such as Finn Slough and the South Arm Islands (refer to *Topic A: Greenspace* for more details). In 2000, Richmond hosted the 'Richmond Fraser 2000 Celebration', which featured guided nature walks along MacDonald Beach Dyke, educational displays, and hands-on activities. Richmond is also a signatory to a Fraser River Estuary Management Program (FREMP) area designation agreement.

Richmond and the Region

The Fraser River integrates the effects of land use practices across a vast and diverse landscape. The cause and effect relationship between practices within Richmond and

overall water quality of the river are, therefore, not readily discernable or comparable to other parts of the region.

THE FUTURE

Targets and Influences

Targets for this indicator are in the form of federal and provincial water quality guidelines as discussed above.

Although the GVRD monitoring data represent the best *repeatable* source of data for Fraser River water quality at Richmond, trends are difficult to discern because water quality is affected greatly by the tidal cycles. This situation will be rectified with the introduction of a new water quality monitoring program for the area between Hope and Sturgeon Banks.

Water quality objectives developed specifically for these areas will provide a set of targets for evaluating water quality, issuing wastewater discharge permits, dispersing water withdrawal licences and orders, and managing fisheries and land use. They will also provide reference points against which the state of water quality can be evaluated and help determine whether additional management actions are needed to protect and/or restore the designated water uses. As part of the program, a set of recommended water quality monitoring sites, sampling locations and frequencies, and variables have been identified. The initiation of long-term monitoring at these sites has yet to be implemented but this program will be an excellent source of information for future SOE reports.

What Can Citizens Do?

You can help protect the quality of water in the Fraser in the following ways:

- Avoid using fertilizers and pesticides near Richmond waterways;
- Don't pour pollutants (e.g., oil, paint, pesticides) down storm drains.
- Ensure that your septic system works properly.
- Practice responsible boating – dispose of human waste appropriately.
- Reduce the area of non-permeable surfaces around your home, for example, by replacing concrete with vegetation to reduce runoff.
- Refer to the *2001 Richmond Environmental Projects Guidebook* and find out how you can get involved with projects like:
 - Riparian zone plantings;
 - Beach clean-ups;
 - Water quality education;
 - Storm drain markings; and
 - Water quality monitoring programs.

SUMMARY

Mixed Results

Dissolved oxygen concentrations in the Fraser River have consistently met water quality objectives. Prior to 1998, fecal coliform counts in the Fraser River frequently exceeded the water quality objective, however, since implementation of additional treatment at the Annacis and Lulu wastewater treatment plants in 1998, fecal coliform counts have decreased dramatically.

Based on these two parameters, water quality is improving. However, current data are insufficient to assess the overall quality of water in the Fraser. Because of this high level of uncertainty, the indicator has been given a rating of Mixed Results.

Indicator B2: Drinking Water Quality

INTRODUCTION

Why Should We Measure This Indicator?

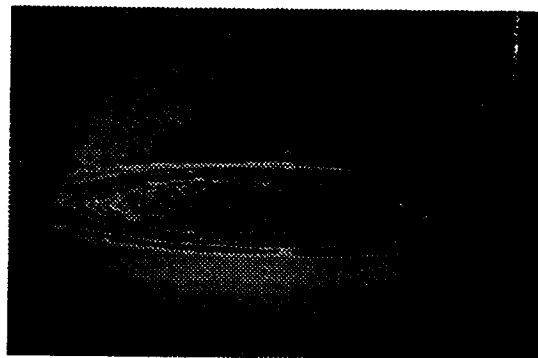
Drinking water is an absolute necessity. A 2000 survey conducted by the GVRD found that residents ranked the provision of good quality water as the most important service provided in the region¹⁴.

Richmond's drinking water is provided by the Greater Vancouver Water District (GVWD) and is transported through a local network. The GVWD provides water from three reservoirs: Capilano, Seymour and Coquitlam. Prior to 1998, Richmond received most of its drinking water from the Capilano reservoir. Since 1998, the majority of Richmond now receives a mix of water from Capilano and Coquitlam reservoirs. East Richmond also receives some water from the Seymour Watershed.

What is Being Measured?

This indicator reports on the following measures:

- **Number of days GVWD reservoirs failed Canadian Drinking Water Guidelines for select water chemistry variables; and**
- **Number of samples from Richmond water distribution points that tested positive for coliform bacteria¹⁵.**



Drinking water quality at the reservoirs is reported annually by the GVWD. Results for source drinking water are based on data from the GVWD for the Capilano, Coquitlam and Seymour reservoirs. Results for 1993-1997 include data for Capilano only, which was the only source reservoir for Richmond at that time.

Drinking water quality at Richmond distribution points is monitored weekly by the City's Water Services Department. According to the BC Safe Drinking Water Regulations for bacterial content (i.e. coliforms), samples must be negative 90% of the time. This means that a positive result does not necessarily imply failure of the regulations¹⁶. Similar to indicator *B1: Fraser River Water Quality*, this indicator is limited by the choice and number of selected variables. A comprehensive reporting of overall water quality is beyond the scope of this report.

¹⁴ Angus Reid poll, January 2000, as referenced in Water Facts newsletter, Issue No. 5, July 2000, published by the GVRD.

¹⁵ Coliforms are a large group of bacteria that includes fecal coliforms.

¹⁶ The phrasing of this indicator has been modified to reflect this important distinction. The 1998 SOE report used the phrase "failed to meet the guideline" when reporting positive results, which is not entirely accurate.

What are the Objectives?

The Canadian Drinking Water Guidelines cover 88 parameters. Guidelines set for parameters with direct health consequences are called 'health objectives'. Guidelines set for other parameters, such as iron or sodium, are 'aesthetic objectives', which are related more to general taste and appearance.

The five Canadian Drinking Water parameters assessed in this report are: trihalomethanes (THMs, by-products of chlorination of municipal water supplies)¹⁷, lead, iron, turbidity, and pH. These parameters monitor a range of potential problems with the quality of water in GVRD reservoirs, but are by no means the best or only indicators of water quality. The guidelines for the five selected parameters are summarised in Table 2b.

Table 2b. Canadian Water Quality Guidelines

Parameter	Canadian Water Quality Guidelines	
	Health objective	Aesthetic objective
THMs	100 ppb	
Lead	0.01 mg/L	
Iron		0.3 mg/L
Turbidity	1 NTU ¹⁸	5 NTU ¹⁹
pH		6.5 – 8.5

The BC Safe Drinking Water Regulations establishes bacterial criteria for distribution system water quality. The regulations specify that:

- Samples must have 0 total coliforms 90% of the time and never exceed 10 total coliforms per 100 ml; and
- Samples must not have any fecal coliforms.

¹⁷ Trihalomethanes are monitored at stations en route to distribution points; all other variables are monitored at the reservoir.

¹⁸ NTU = Nephelometric turbidity unit, a standard unit of turbidity used by most water collection agencies.

RESULTS

Number of Days GVRD Reservoirs Failed Canadian Drinking Water Guidelines for Selected Water Chemistry Variables

Since 1993, levels of THMs and lead have never exceeded the Canadian Drinking Water Guidelines at any of the three GVRD reservoirs. There were varying levels of compliance for the three remaining parameters, depending on the reservoir (Figures 2e, 2f and 2g). The aesthetic objective for iron was occasionally exceeded at the Seymour and Capilano reservoirs. Levels of pH in the GVRD are characteristically low and rarely meet the national guideline. Levels of turbidity frequently fail to meet the health objective.

Number of Samples from Richmond Water Distribution Points that Tested Positive for Coliform Bacteria

The 1998 SOE report for this parameter used data from the GVRD, which, at that time, did not analyze all of the City collected water samples. The data presented in the 1998 SOE report, therefore, only included results for a portion of the samples that were collected in the City. The 2001 report uses data from the City of Richmond's Water Service Department and includes all water samples taken from Richmond distribution points for 1993-2000.

The number of samples that tested positive for total coliform bacteria are presented in Figure 2h. In no year did the proportion of positive samples exceed 1% of the total number of samples taken¹⁹. Thus, although there were a few test samples that contained coliform bacteria, the city has generally met the BC Safe Water Drinking Regulations, that is, 90% of samples have contained zero

¹⁹ Total number of samples taken: 676 per year from 1993-1998; approximately 1000 in 1999; and 1352 in 2000.

Figure 2e. Coquitlam Reservoir Drinking Water Quality, 1993-2000

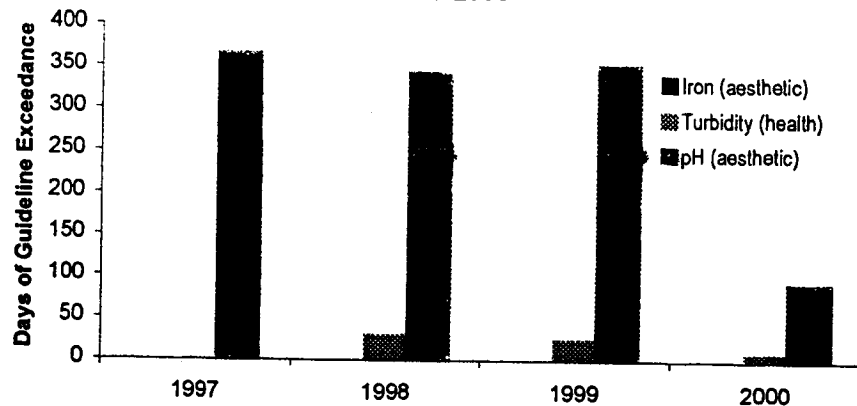


Figure 2f. Capilano Reservoir Drinking Water Quality, 1993-2000

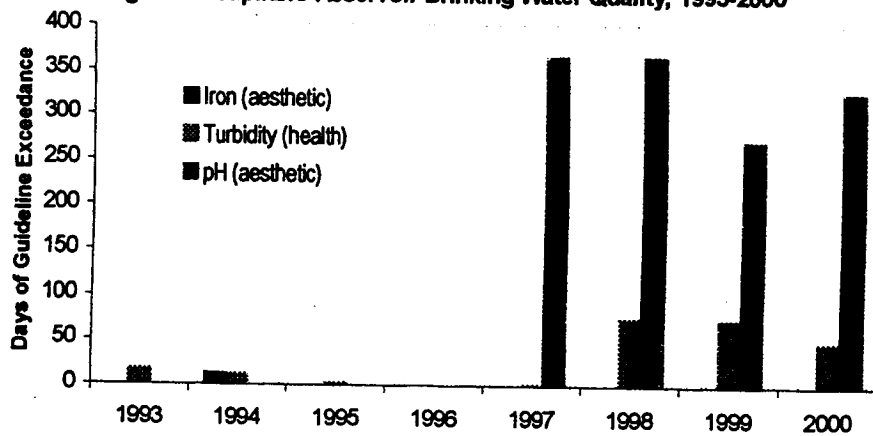
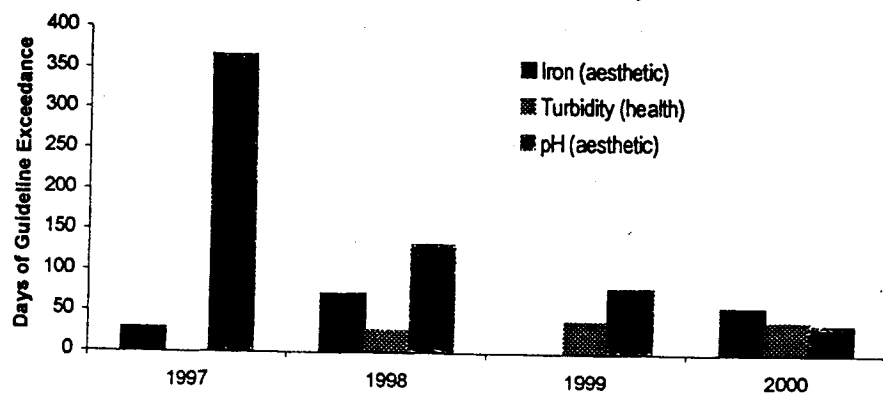
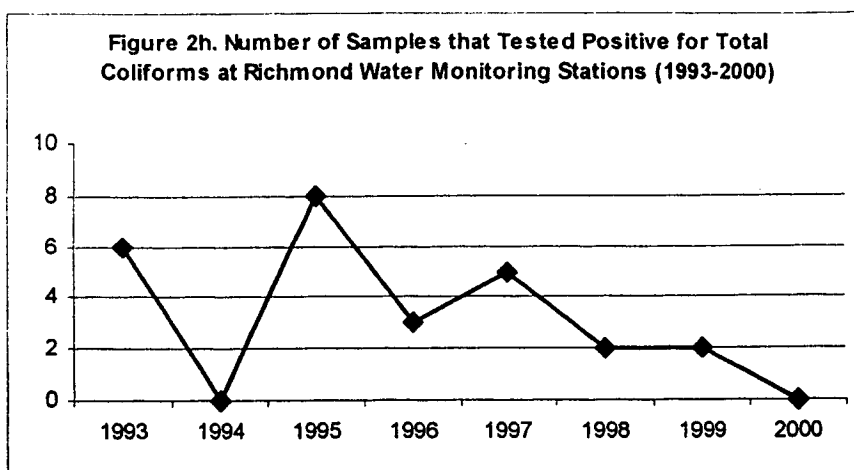


Figure 2g. Seymour Reservoir Drinking Water Quality, 1993-2000



Note: For figures 2d, 2e and 2f above, where no value is shown for a parameter, the value is zero.

Figure 2h. Number of Samples that Tested Positive for Total Coliforms at Richmond Water Monitoring Stations (1993-2000)



total coliforms per 100 mL and total coliform concentrations never exceeded ten. No samples contained fecal coliforms.

DISCUSSION

What is Happening?

Source water consistently meets health objectives for trihalomethanes and lead²⁰, and almost always meets the aesthetic objective for iron. This continues the positive trend reported in the 1998 SOE report. Turbidity and pH objectives are more frequently exceeded and data from the past four years do not show a clear trend towards improvement. Turbidity is a concern as it may help transport harmful substances and interfere with disinfection processes.

The pH level for the source water regularly fails the aesthetic objective. While this is less of an apparent health concern, acidic water accelerates corrosion in the pipes used to transport water and this may affect water

quality at distribution points by elevating levels of lead, iron and copper, which is also regulated as potentially toxic at high concentrations.

Results for coliform bacteria are encouraging. The number of samples testing positive has been decreasing since 1997 and there were no positive samples in 2000. The many initiatives undertaken by the City's Water Services Department in the past few years (discussed below) has likely contributed greatly to these results.

Existing City Programs

Starting in 1998, the City of Richmond's Water Service Department (WSD) took over from the Vancouver-Richmond Health Unit the responsibility for gathering mandatory water samples. Now the WSD works jointly with the GVWD and Richmond Health Dept to provide water that meets or exceeds the health standard, appears clear and clean, and is free of unpleasant tastes or odours. The primary water quality goal is to protect public health and safety, which is accomplished by thoroughly testing the water for microbiological, organic and inorganic contaminants, which may affect the health of water users.

²⁰ Levels of lead in source water may not necessarily represent what consumers are receiving at their taps. The source of lead in drinking water is usually household plumbing, particularly in older homes. Tap water from lead plumbing sources is still safe to drink, but the water should be flushed until cold if the tap has not been run for over six hours.

Currently, WSD crews collect drinking water samples weekly from 26 locations throughout the Richmond water distribution network. Sampling locations are selected to represent the entire water delivery system. Samples are then sent to the GVRD laboratory for analysis. In addition to the parameters reported here, samples are also tested for on-site temperature, turbidity, free chlorine and heterotrophic plate count (HPC)²¹ at its test sites.



The WSD initiated an annual watermain flushing and valve maintenance program in 2001. This task removes the build-up of silts and organic matter, which helps lower the level of chlorination required. The WSD also flushes dead end components of the water distribution system on a monthly basis. This process helps ensure complete water turnover in low flow situations and thus, decreases the build-up of sediment, algae or bacteria. In the future, dead-end mains will be eliminated entirely.

In addition to the role played by the WSD, Richmond Health Services is responsible for enforcing the BC Safe Drinking Water Regulations as part of its mandate to protect

public health. Richmond Health Services is also required to collect at least 10% of the required number of samples for Richmond as outlined in the Canadian Drinking Water Guidelines. These samples are collected from household taps or drinking water taps of business places.

Richmond and the Region

The GVRD is responsible for acquiring and treating drinking water, maintaining and ensuring the quality of its water supply, and delivering it to the municipalities. In addition, the GVRD's Drinking Water Treatment Program (DWTP), initiated in 1998, specifically addresses four water quality issues of concern in the region: waterborne disease, seasonal source water turbidity, source water acidity and bacterial regrowth in the distribution system. Phase I of the DWTP has so far resulted in the completion of the following components:

- Interim upgrade of chlorine primary disinfection and corrosion control facilities at Seymour;
- Construction of five new secondary disinfection stations in the Lower Mainland;
- Construction of secondary chlorination facilities at Coquitlam;
- Construction of pH control facilities at Coquitlam;
- Annual unidirectional flushing and cleaning programs implemented by almost all municipalities including the City of Richmond; and
- Initiation of a reservoir 'exercising' program by the GVWD involving capital works and operational changes to improve reservoir water quality.

²¹ HPC is now monitored as part of Canadian Drinking Water Guidelines. HPC estimates the number of live heterotrophic bacteria in water and provides information useful in judging the efficiency of various treatment processes for both drinking water and swimming pools, and for checking the quality of finished water in a distribution system.

In May 2000, the GVRD implemented a *Water Quality Monitoring and Reporting Plan* (WQMRP). The plan requires annual reporting of water quality data by the GVRD for source water, and by each member municipality for distributed water. However, an agreed-upon set of parameters that municipalities are required to sample has not been determined; therefore, a report on distributed water quality is not yet available.

In 1999, the Office of the Auditor General of British Columbia released a report entitled *Protecting Drinking Water Sources*. The report provides broad recommendations for managing drinking water sources, many of which have already been implemented by the GVWD and have been discussed previously in this section.

THE FUTURE

Targets and Influences

As discussed elsewhere under this indicator, targets for drinking water quality in Richmond exist in the form of the Canadian Water Quality Objectives and the BC Safe Drinking Water Quality Regulations. The BC Safe Drinking Water Quality Regulations are in the process of being revised. Any changes to the regulations will be reported in the next SOE.

Richmond will continue to monitor the quality of its water and make improvements to its distribution network and monitoring program. It is recommended that the next edition of the SOE report incorporate results from water quality samples collected from household taps or drinking water taps of business places. This would provide a better

indication of the quality of water actually being consumed by Richmond residents.

What Can Citizens Do?

To become better informed about your water supply:

- Contact the GVWD's Water Quality Inquiry line at 604-451-6010.
- Sign up for a free tour of the Capilano watershed by calling 604-432-6410.
- Participate in the GVRD's public meetings and provide input on drinking water management.

Also, if you reside in an older home consider updating your plumbing to eliminate possible sources of lead contamination. If you have any suggestions, need information or are experiencing any problems regarding Richmond's water system, contact the Water Services Department at 604-244-1241.

SUMMARY

Good News

Drinking water is monitored at its source and distribution points. At the source, levels of trihalomethanes and lead have never exceeded the Canadian Drinking Water Guidelines at any of the three Greater Vancouver Water District reservoirs. There were varying levels of non-compliance for iron, turbidity and pH, depending on the reservoir. The BC Safe Drinking Water Regulations establish criteria for acceptable bacteria levels in distribution systems. Since 1993 these regulations have generally been met in Richmond. This indicator contains Good News.

TOPIC C: AIR QUALITY

Air, like water, is essential to life. Poor air quality can affect the health of humans and wildlife, damage soil, vegetation and water bodies, and degrade buildings and other structures. The short and long term health effects of poor air quality are a concern, especially among children and people with cardiovascular and respiratory diseases. Additionally, haze from air pollution is also aesthetically displeasing and may affect community enjoyment, tourism and property values.



Efforts by the City of Richmond to understand, monitor and improve or maintain good air quality at the local level will ultimately benefit the environment at a global scale. We all share a common airshed. Air movement is not restricted by jurisdictional boundaries, either at the local or international level. Accordingly, emissions originating in Richmond can affect air quality in other areas. Conversely, Richmond may receive air pollution generated in other communities. Efforts on the part of our community to minimize factors that negatively affect air quality will ultimately benefit us all.

This section of the report reviews the following indicator:

C1: Air Quality Index

Indicator C1: Air Quality Index

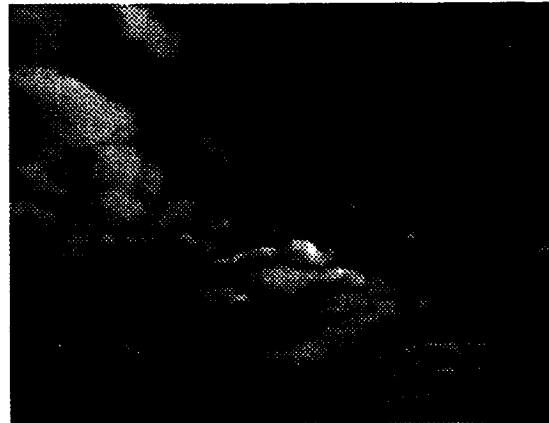
INTRODUCTION

Why Should We Measure This Indicator?

Air quality is essential to the health and well-being of humans, wildlife and plants. As discussed in the GVRD's regional *Air Quality Management Plan*²², the major air quality challenge in the region is photochemical smog that forms in the eastern portions of the GVRD and Fraser Valley on hot summer days. From a health perspective, the primary issue associated with smog is ground-level ozone that results when nitrogen oxides and volatile organic compounds found in the atmosphere (both of which are produced by industrial activities and vehicle emissions) react with sunlight. Elevated levels of ozone can cause respiratory problems in humans and can also damage crops and vegetation.

In addition to smog, concerns have recently been raised about the health and visual effects of fine particulate matter. Sources of fine particulates in the air include: emissions from industrial plants and motor vehicles; natural sources such as wind-blown dust, pollen and forest fires; and smoke from fireplaces and wood stoves. Inhaling fine particulates, and associated chemicals, can exacerbate respiratory illness and result in other adverse health effects. Fine particles also scatter light in the atmosphere thereby reducing visibility.

This indicator provides information on whether air quality in Richmond, and the greater region, is improving or deteriorating.



What is Being Measured?

The GVRD operates a network of air quality monitoring stations throughout the region as part of the Lower Fraser Valley Air Quality Monitoring Network. These stations monitor ambient²³ air quality near ground level. Two stations are located in Richmond – one in South Richmond and the other at the Vancouver International Airport. Pollutants monitored in Richmond (depending on the station), include sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone, PM₁₀ (inhalable particulates²⁴), PM_{2.5} (fine particulates) and total suspended particulates (TSP).

Each pollutant's concentration is converted to an Air Quality Index (AQI) based on a numerical scoring system. The highest AQI

²² GVRD 1994.

²³ Ambient refers to 'the atmosphere', 'outdoors' or 'background'. Ambient air quality is usually tested at an outdoor, ground-level site and may include testing for more than one pollutant.

²⁴ Particulates are considered highly inhalable if they are smaller than 10 microns in diameter.

calculated in a given hour is then reported as the hourly AQI for the monitoring station. There are four categories of AQI: good (0-25); fair (26-50); poor (51-100); and very poor (>100).

This indicator measures:

- **Mean maximum AQI for Richmond stations;**
- **Duration of exposure to 'poor' air quality; and**
- **Number of air quality complaints by Richmond residents.**

AQI data presented for Richmond's two stations were obtained directly from the GVRD Air Quality Department.

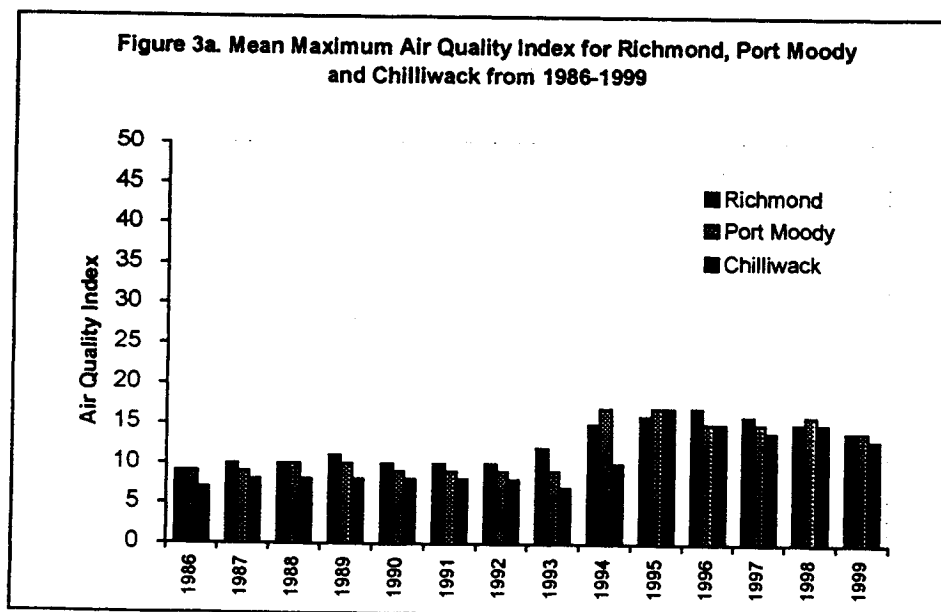
This edition of the SOE report does not directly address air quality issues associated with the increased production of greenhouse gases. Data are not presently available to monitor Richmond's contribution to this global problem.

RESULTS

The AQI is currently a measure of five pollutants and reflects the maximum level recorded, rather than a cumulative effect. Because the AQI is a short-term measure of air quality, there are some difficulties in using AQI to indicate long-term health effects. The AQI is also subject to change when pollutants are added or removed to the index. Significant changes to the AQI occurred in 1994, for example, when PM₁₀ was incorporated into the index. Weather conditions on a seasonal (e.g., hot summers) or daily (e.g., precipitation, wind) scale can have a significant impact on air pollutant concentrations. The AQI results are presented with these caveats in mind.

Mean Maximum AQI (Annual)

The mean maximum AQI is an average of hourly AQI measurements, where the hourly AQI is the highest (or maximum) value recorded during any given hour. For the year 1999²⁵, the mean maximum AQI was 14 at the South Richmond station (Figure 3a) and 13 at the airport (not shown).



²⁵ At the time of writing the 2001 SOE update, the most recent year for which AQI data were available was 1999.

The mean annual hourly AQI at the South Richmond Station has been decreasing since 1996 indicating slightly better air. Data for the municipalities of Port Moody and Chilliwack are shown to compare Richmond's air quality with communities of similar size located elsewhere in the Lower Mainland and Fraser Valley.

Duration of Exposure to Poor Air Quality (AQI > 50)

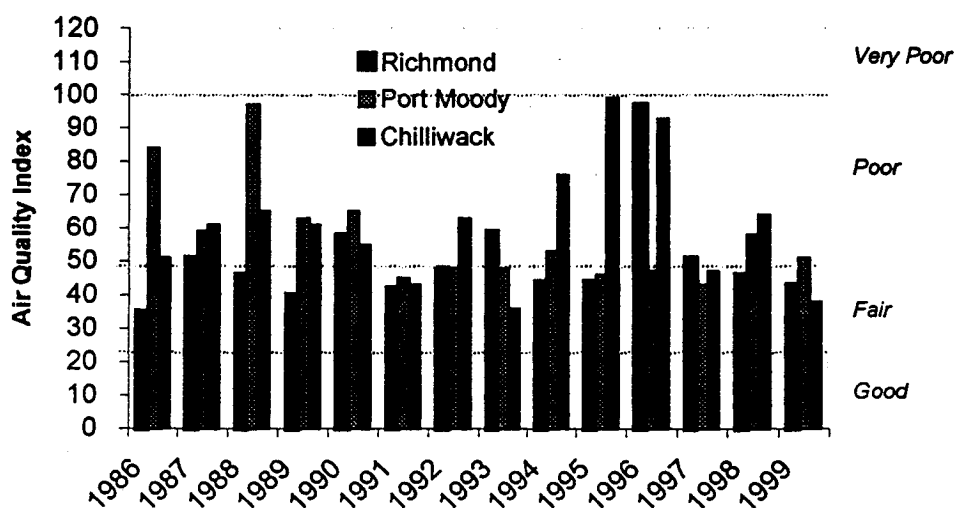
The maximum hourly AQI in South Richmond has not exceeded 50 (poor) since 1997, when 4 hrs of poor air quality were recorded (Figure 3b). The maximum hourly AQI has reached the poor range in only 5 of the past 14 years in South Richmond. In 1999, the hourly AQI in South Richmond was good 99.2% of the time and fair 0.8% of the time.

The monitoring station at the airport has only been active since 1998. The maximum hourly AQI at the airport did not exceed 50 in 1999, but 18 hours of poor air quality were recorded in 1998. In 1999, the hourly AQI at the airport was good 96% of the time and fair 4% of the time. Daily reports of the AQI for the Richmond-Delta area can be heard by calling the GVRD's Air Quality Index message at 1-800-665-1118 or 604-436-6767.

Number of Air Quality Complaints Received by the GVRD

There were 559 air quality complaints from Richmond residents logged by the GVRD from January 1993 to December 2000. This represents about 3% of all air quality complaints received by the GVRD during that period.

Figure 3b. Maximum Hourly Air Quality Index for Richmond (Station 17), Port Moody and Chilliwack from 1986-1999



An annual breakdown of air quality complaints is shown in Figure (Figure 3c). Note that this indicator may include multiple complaints from the same person or regarding the same problem.

Complaints were registered for a variety of problems including unpleasant or strong odours, smoke, paint spray, and dust. Proximity to wastewater treatment plants, industrial sites, the Vancouver International Airport, and agricultural areas are possible explanations.

DISCUSSION

What is Happening?

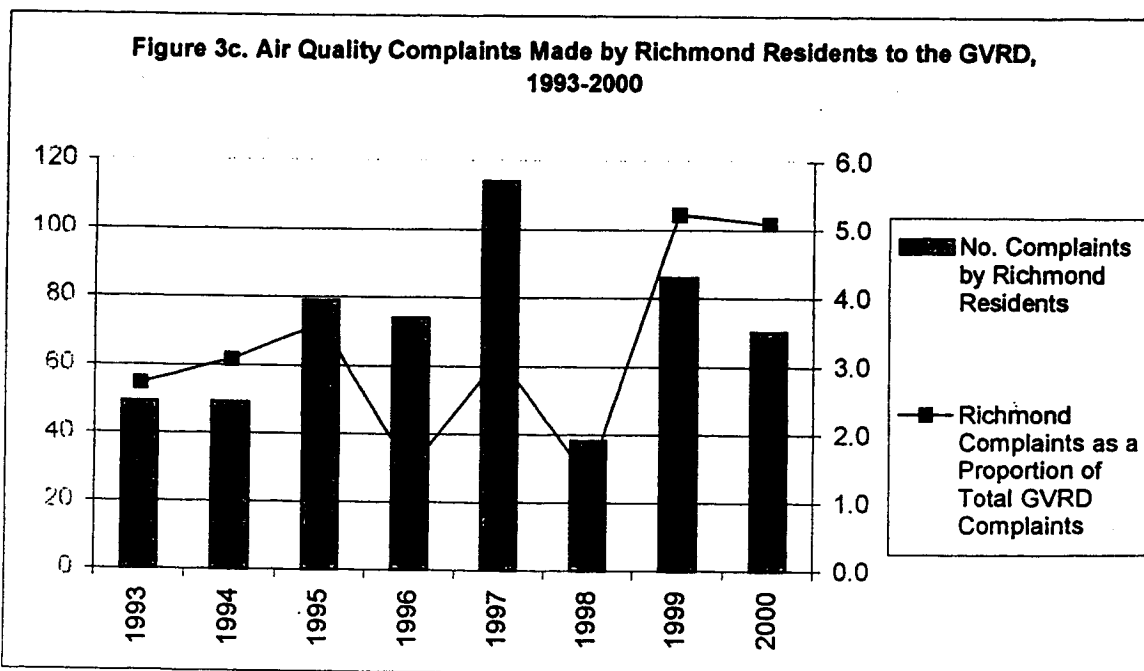
The latest available information (1999) indicates that there has not been a marked change in AQI values since the last SOE Report was written. Exposure time to the

poor category of AQI, calculated as a proportion of the whole year, has been minimal (<1%) over the last 14 years with no upward trend evident. However, due to the limitations of AQI previously discussed, it cannot be assumed that a good category of AQI is indicative of good air quality.

The air quality complaints indicator is new and was not assessed in the 1998 SOE report. The number and proportion of complaints from Richmond residents has varied over the years. The percentage of total air quality complaints made to the GVRD by Richmond residents has increased from 2.7% in 1993 to 5.1% in 2000.

Existing City Programs

The GVRD is responsible for air quality management within the Lower Mainland. However, there are steps the City can take



to affect air quality. For example, almost 75% of the air pollutants produced in the GVRD in 1999 were from motor vehicles. Accordingly, measures to reduce car dependence through alternative land use and transportation planning will play a key role in improving air quality.

There are two objectives in Richmond's OCP that specifically address air quality. The first is to work in partnership with senior governments and businesses to continue improving local and regional air quality. The second is to continue to monitor air quality trends and adjust city policies and programs as required. Policies proposed to meet these objectives include: establishing 'best practices' for city operations which affect air quality; regulating outdoor burning in residential areas; encouraging local industry to investigate and adopt new technologies to reduce air pollution; encouraging the use of 'best practices' to minimize airborne dust and particulates from construction sites and dirt roads (e.g., stabilizing temporary soil deposits); and participating in collaborative research efforts and senior government monitoring initiatives.

Richmond recently joined Partners for Climate Protection program, an initiative aimed at reducing greenhouse gas emission by our community.

Richmond and the Region

Air quality in the GVRD was measured as good 98.1% of the time, as fair 1.9% of the time and as poor less than 0.1% of the time in 1999²⁶. Richmond's air quality profile is

consistent with that of the GVRD as a whole and is similar to other municipalities in the GVRD and Fraser Valley (Figures 3a and 3b).

The GVRD has a number of initiatives and programs aimed at maintaining and improving air quality. They manage the Lower Fraser Valley Air Quality Monitoring Network – the source for air quality data for all municipalities in the region²⁷. In 1994, the GVRD adopted an *Air Quality Management Plan*. The plan identifies the priority air quality issues and provides an emission reduction strategy to meet specific air quality objectives.

Other programs administered by the GVRD include the Air Quality Regulatory Program, which develops regulations for cleaner industries and businesses, and the 'Air 2000' program, which implements new and innovative measures for reducing local air pollution and greenhouse gas emissions. The GVRD also regulates industrial and commercial air emission sources in accordance with the Air Quality Management Bylaw.

The provincial AirCare program monitors and regulates emissions from gasoline vehicles licensed in the Lower Mainland and from heavy-duty diesel trucks operating in the Lower Mainland. Initially developed by the Province, AirCare is now run by Translink. Numerous federal initiatives are also underway including the establishment of emission standards for new vehicles, the development of fuel quality criteria, and the establishment of acceptable concentration levels for air pollutants.

²⁶ Lower Fraser Valley Ambient Air Quality Report 1999

²⁷ The Air Resources Branch of the Ministry of Water, Land and Air Protection also has a system of air quality monitoring stations throughout the province, although none are located in Richmond.

THE FUTURE

Targets and Influences

A specific objective of the GVRD's *Air Quality Management Plan* was to reduce the overall emissions of five major air pollutants (carbon monoxide, volatile organic compounds, nitrogen dioxides, sulphur dioxides and particulate matter²⁸) by 38% between 1985 and 2000. Future emission reduction measures to occur between 2000 and 2005 include the installation of control technologies on the GVRD's municipal solid waste incinerator in Burnaby, and the continuation of the AirCare program.

Consideration is also being given to the development of a national AQI indicator that would provide consistency in measurement throughout Canada and be better correlated to health impacts.

What Can Citizens Do?

Each individual can have a role to play in protecting the quality of the air we breathe. You can make a difference by trying one or more of the following:

To reduce automobile emissions:

- Drive your car less! See *Topic E: Transportation* for suggestions on how to do this.
- Ensure your car is AirCare certified. The Richmond AirCare testing location is at 11115 Silversmith Place. Call 604-433-5633 for information.
- Be proactive. Regular maintenance of your car's engine and tires can increase fuel efficiency, reduce emissions and extend the life of your car.

- When purchasing a car, choose a fuel-efficient vehicle – it is more economical and produces lower emissions. Also, consider a vehicle without an air conditioner or, at least, one that does not contain ozone-depleting CFCs.
- When you are using your car avoid excessive idling, don't overload your vehicle, and try to drive consistently – hard accelerating and braking wear your car, increase fuel consumption, and produce a proportionally higher amount of pollutants. Also remember to slow down – a car produces more pollution when it travels over 90 km per hour.

Other actions:

- Use pump spray bottles rather than aerosol spray cans.
- Avoid garden tools that run on gasoline – use electric or hand mowers, and rakes instead of leaf blowers.
- Plant trees – they absorb carbon dioxide and release oxygen.
- Plant ground-covering plants to reduce dust.
- Don't burn garbage or garden refuse - try composting or take advantage of the City's curbside yard waste pick-up and recycling program (see Indicator F2: Solid Waste) If you must burn, follow the regulations and restrictions on backyard burning and be considerate of your neighbours.
- Follow regulations and recommendations regarding wood stoves.
- Ensure regular maintenance of your furnace.
- Report air quality concerns to the GVRD at 604-436-6777.

For more information visit the GVRD's web site at www.gvr.bc.ca.

²⁸ All but volatile organic compounds are monitored in Richmond and included in the AQI calculation.

SUMMARY

Mixed Results

Since 1997, only four hours of 'Poor' quality air were recorded in South Richmond. At the airport, only 18 hours of 'Poor' quality air were recorded since this station's installation in 1998. From 1993-2000, Richmond residents registered 559 complaints regarding air quality, or 3% of all such complaints received by the GVRD

during this period. The majority of these complaints were concerns regarding odours.

While the AQI values remain consistently 'Good', the number of complaints combined with increasing sources of emissions from cars, air traffic and industry; health risks associated with these emissions; and global concerns regarding greenhouse gases in the atmosphere - suggest that the news for this indicator is Mixed.

TOPIC D. LAND USE AND HUMAN SETTLEMENT PATTERNS

Richmond's OCP sets the development principles and objectives within which all planning decisions are made. Through the OCP, the City also works towards achieving regional growth management objectives as set out in the GVRD's *Livable Region Strategic Plan*. Adopted in 1996 by all member municipalities, the overall aim of the *Livable Region Strategic Plan* is to help the region develop in a way that protects the natural environment and at the same time guides the location of urban activities to create a high quality of community life and support a growing economy²⁹.

Growth management is a key component of Richmond's OCP. With over one-third of its land base reserved for agriculture, Richmond must strive to concentrate urban development and minimize sprawl. Urban sprawl occurs when housing and other city developments creep further away from core areas and into traditionally more rural areas near the outskirts of the city. Generally, sprawl has a negative impact on environment as more land is consumed to provide housing and residential services such as roads and utilities. As the city expands, people tend to spend more time in their cars contributing to air quality problems and traffic congestion.

One way to encourage higher density living, and thus manage growth, is to design 'complete communities' where housing and services are offered in close proximity to one another. Some of the benefits of complete communities include better access to key services such as schools, parks,

shopping and transit; less time spent traveling in cars; more pedestrian-friendly neighbourhoods; and a stronger sense of community as residents have more opportunities to interact.

The indicators selected to monitor land use and human settlement patterns, in relation to the OCP objectives are:

- D1 Residential Housing Mix and Density; and**
- D2 Accessibility to Key Services.**

There were no indicators in the 1998 SOE report because the City's OCP was under review at that time.



²⁹ For more information and copies of the *Livable Region Strategic Plan* annual reports see www.gvrd.bc.ca

Indicator D1: Residential Housing Mix and Density

INTRODUCTION

Why Should We Measure This Indicator?

The Residential Housing indicator examines how Richmond is meeting its goals for housing mix and density. Concentrating residential density in compact, well-designed urban areas allows the City to provide infrastructure and services more efficiently and cost-effectively.

As new neighbourhoods emerge and existing neighbourhoods change, promoting higher density living is one of the main ways we can manage population growth (Figure 4a). By maintaining lands in ALR (see *Indicator A1*) the City has limited the areas in which intensive residential development can occur, making densification all the more important.

A diversity of housing choices is a key characteristic of 'complete communities'. Neighbourhoods that demonstrate a mix of housing types (i.e., ranging from single-family homes to apartment complexes), are often more stable and attract longer-term residents. While some parts of the city are best suited to higher density living (i.e. apartments and condominiums) due to shortages of space and the high cost of land, other areas are amenable to lower density housing choices such as single detached homes. Maintaining a mix of housing choices serves all members of the community while also adding diversity to the urban landscape – both architecturally and socially.



What is Being Measured?

This indicator measures two aspects of residential housing:

- Residential housing mix; and
- Residential housing density.

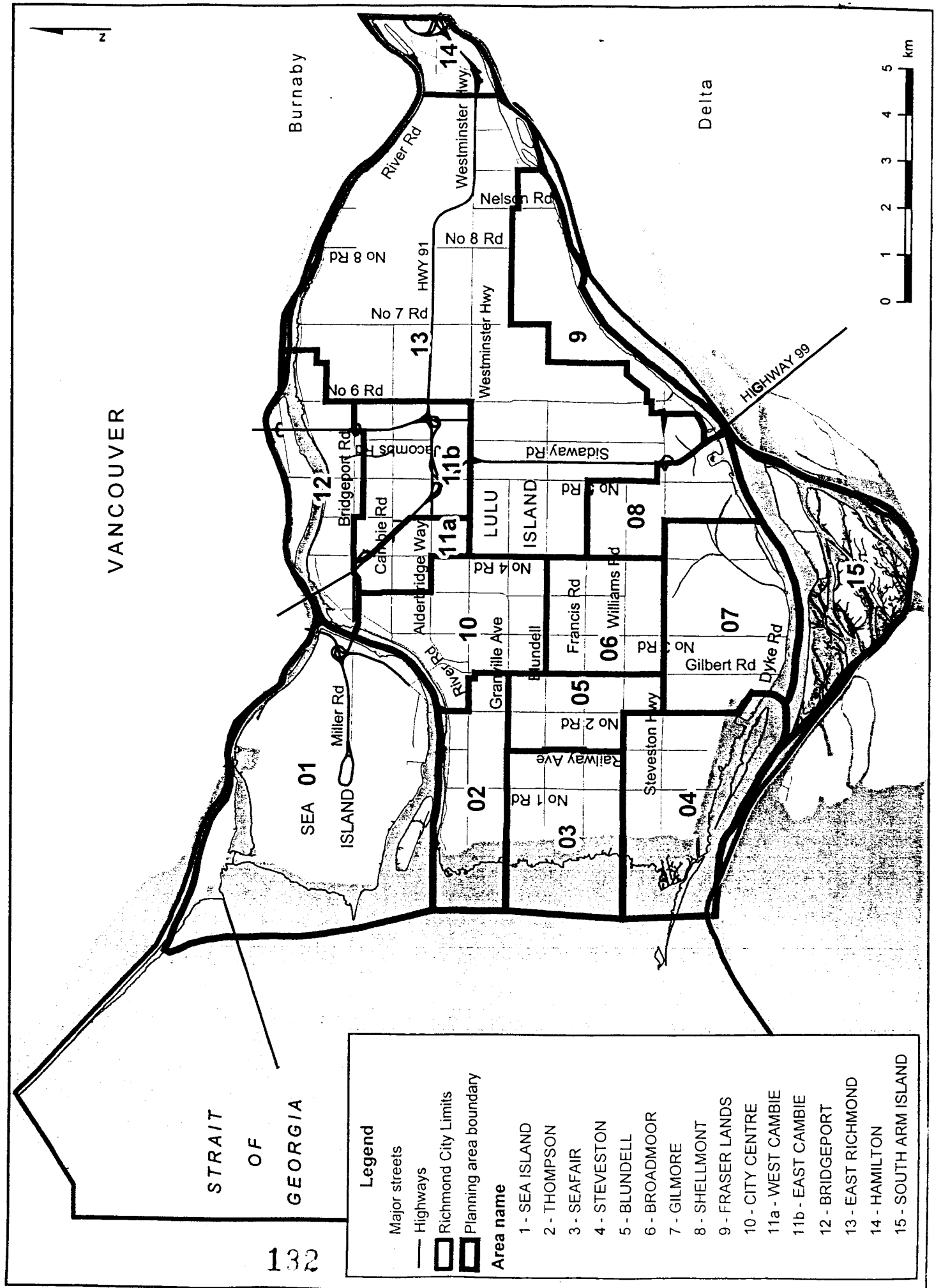
Results are provided for the City as a whole as well as for individual planning areas (Map 5).

RESULTS

Residential Housing Mix

Over the past few decades Richmond has changed from a rural community comprised largely of single-family houses to a city with an array of housing options. Richmond's housing mix today is 47% single-family dwellings, 32% apartments, 17% townhomes, and 4% two-family dwellings.

Map 5. Planning Areas in Richmond, 2000



The degree of housing mix varies among Richmond's individual planning areas. West Cambie and Thompson planning areas have the greatest mix of housing types within the city (Figure 4b). Conversely, the City Centre planning area is predominantly higher-density dwellings and offers a much lower mix of housing choices (Figure 4c).

Residential Housing Density

Richmond's residential housing density has been increasing over the years (Figure 4d). At the present time, Richmond has a housing density of 4.3 dwelling units per hectare. This number represents an average for the city as a whole. There is variation in the housing density among planning areas. Housing density is highest in the planning areas of City Centre (15.8), Blundell (12.4) and Broadmoor (12.3). Housing density is lowest in the planning areas of Fraser Lands (where there is no housing), Sea Island (0.2) and Gilmore (0.2) (Figure 4e).

DISCUSSION

What is Happening?

Since this indicator is new and data are only reported for the year 2000, it is not possible to see how housing mix has changed within the individual planning areas. However, the City of Richmond bases its estimates of housing mix on Census data collected by Statistics Canada. According to Census data, from 1976 to 1986 the percentage of apartment units in Richmond increased by 10% while townhouse units grew by only 1%. From 1986 to 1996 the percentage of townhouse units increased by 9% while apartment units only increased by 1%.

This tells us that the markets for housing have experienced a shift away from apartment complexes to lower-density housing types such as townhomes.

Figure 4a. Population Growth in Richmond, 1996-2000

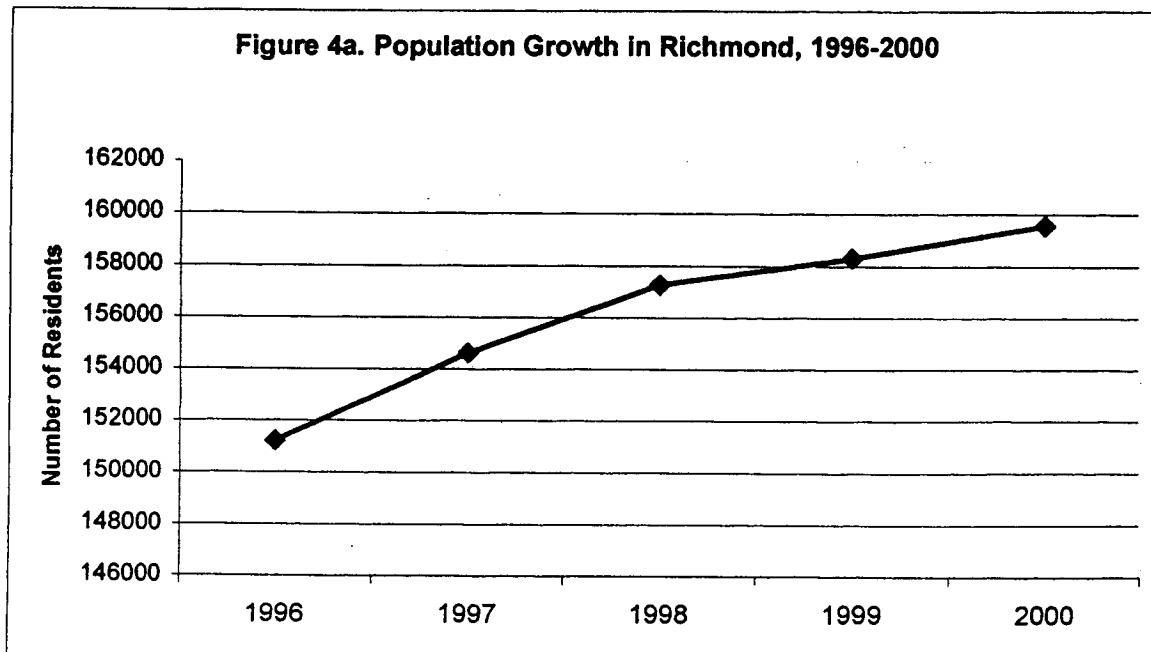


Figure 4b. Housing Mix in the West Cambie Planning Area

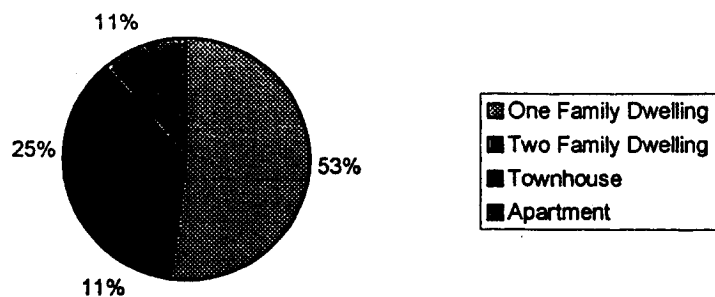


Figure 4c. Housing Mix in the City Centre Planning Area

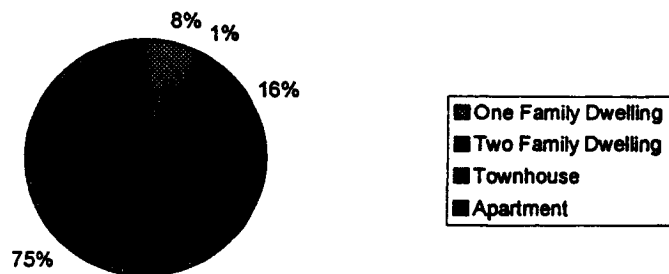
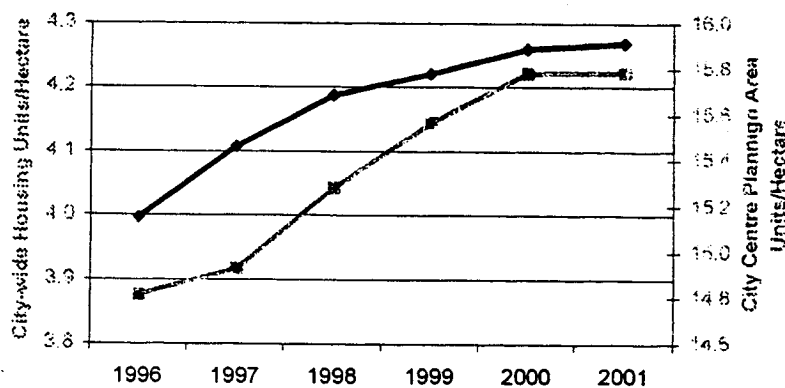
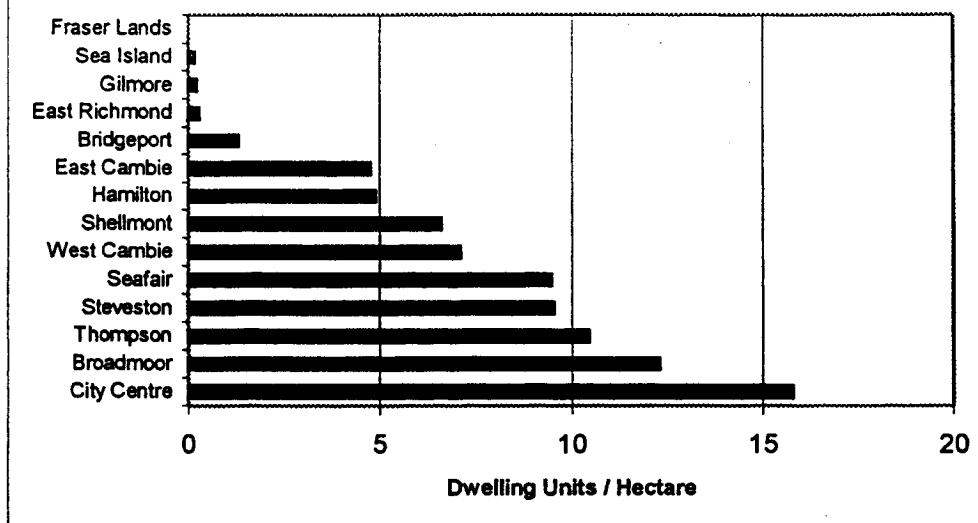


Figure 4d. Housing Density in Richmond, 1996-2001



**Figure 4e. Density of Dwelling Units
by Richmond Planning Area (as of June 2001)**



Richmond's housing density has increased steadily over the past five years. In particular, the City has been successful in concentrating growth in the City Centre planning area. Increasing housing density helps reduce urban sprawl and thus protects the city's undeveloped lands (including ALR and greenspace) from development. Achieving greater housing density also reduces the costs and environmental impacts associated with the extension of roads, utilities, mains and other city services into new areas.

Existing City Programs

In working towards its objectives to create a strong City Centre and provide more housing choices, the City is developing specific plans for each of its 14 planning areas. In addition to the OCP and area plans, by-laws, zoning and development permitting are the primary tools the City uses to control the type and amount of housing that is developed.

Richmond and the Region

Based on 1996 Census data, the District of North Vancouver and the City of West Vancouver have the highest proportions of single-family units among the municipalities in the Lower Mainland while the City of North Vancouver has the lowest proportion of single-family units (Table 4a).

**Table 4a. Proportion of Single-Family Homes
for Select GVRD Municipalities
(1996 Census Data)**

Municipality	Single-Family Dwelling Units (%)
District of North Vancouver	67
West Vancouver	64
Surrey	56
Coquitlam	56
Port Coquitlam	55
Richmond	50*
Port Moody	49
Burnaby	39
Vancouver	30
New Westminster	26
City of North Vancouver	21

* In 2000, this figure was 47%

Data comparing housing density among GVRD municipalities were not available.

THE FUTURE

Targets and Influences

There are no specific targets for residential housing density or mix at this time. As a general goal, the City wishes to reduce urban sprawl and increase urban density. It also wishes to maintain its highest densities in the City Centre planning area. Specific housing targets may be set for individual planning areas in the future. Additionally, future editions of the SOE report should address land use issues other than residential. Mixed-use areas (e.g., residential and commercial) combine the benefits of densification and those of convenience, as discussed as part of Indicator D2: *Access to Key Services*.

What Can Citizens Do?

In addition to giving careful consideration to where we choose to live, here are a few things we can do to influence land use and settlement patterns:

- Attend public meetings on planning issues such as zoning applications or land development activities. These meetings are normally advertised locally.
- View the area plan for where you live by visiting City Hall. Provide comments to the City's Urban Development Division.

SUMMARY

Good News

Richmond's housing mix is 47% single-family dwellings, 32% apartments, 17% townhomes, and 4% two-family dwellings. The West Cambie and Thompson planning areas appear to have the greatest mix of housing types. City-wide housing density is 12.29 units per hectare compared with 11.69 units per hectare in 1996. Density is greatest in the planning areas of City Centre, Blundell and Broadmoor and lowest in the planning areas of Fraser Lands, Sea Island and Gilmore. These results support the OCP objective to concentrate growth and create a strong City Centre. This indicator is given a rating of Good News.

Indicator D2: Accessibility to Key Services

INTRODUCTION

Why Should We Measure This Indicator?

As discussed in *Indicator D1: Residential Housing*, urban areas can manage growth by planning and designing complete communities. Such communities, however, require more than just housing to make them 'complete'. Residents also require convenient access to shopping, work, schools and recreation.

Complete communities therefore feature an assortment of services and facilities within walking distance from people's homes. Recognizing that most people must travel outside of their neighbourhoods for a variety of reasons – work, school, appointments, social activities – easy access to public transit is also a key consideration when choosing or planning residential areas.

By combining housing, business, recreation and access to transit, many benefits can be realized. For example, more efficient resource use, reduced reliance on the automobile, cleaner air, healthier lifestyles and friendlier neighbourhoods, as have been discussed elsewhere in this report.

Although not measured as part of the first SOE report, this indicator will provide a baseline from which we can monitor the city's progress in planning for more complete communities that fulfil the OCP's objective to make walking the primary choice for travel over short distances.



What is Being Measured?

This indicator measures the amount of residential housing units located within 400 metres – approximately a ten-minute walk – of key services, specifically:

- Percentage of dwelling units within 400 m of a transit stop;
- Percentage of dwelling units within 400 m of shopping; and
- Percentage of dwelling units within 400 m of a schoolyard or park.

Future updates of this indicator will only need to consider the number of new units within these radii.

RESULTS

Total dwelling units are estimated from 2001 housing statistics and recent airphotos. Note there are an estimated 55,367 dwelling units in the city.

Number of dwelling units within 400 m of a transit stop

There are 42,762 dwelling units within 400 m of a transit stop, representing 77% of all dwelling units in the city (Figure 4e).

Number of dwelling units within 400 m of a convenience store/ shopping

There are 28,552 dwelling units within 400 m of a convenience store or retail shopping, representing 52% of all dwelling units in the city (Figure 4e).

Number of dwelling units within 400 m of a schoolyard or park

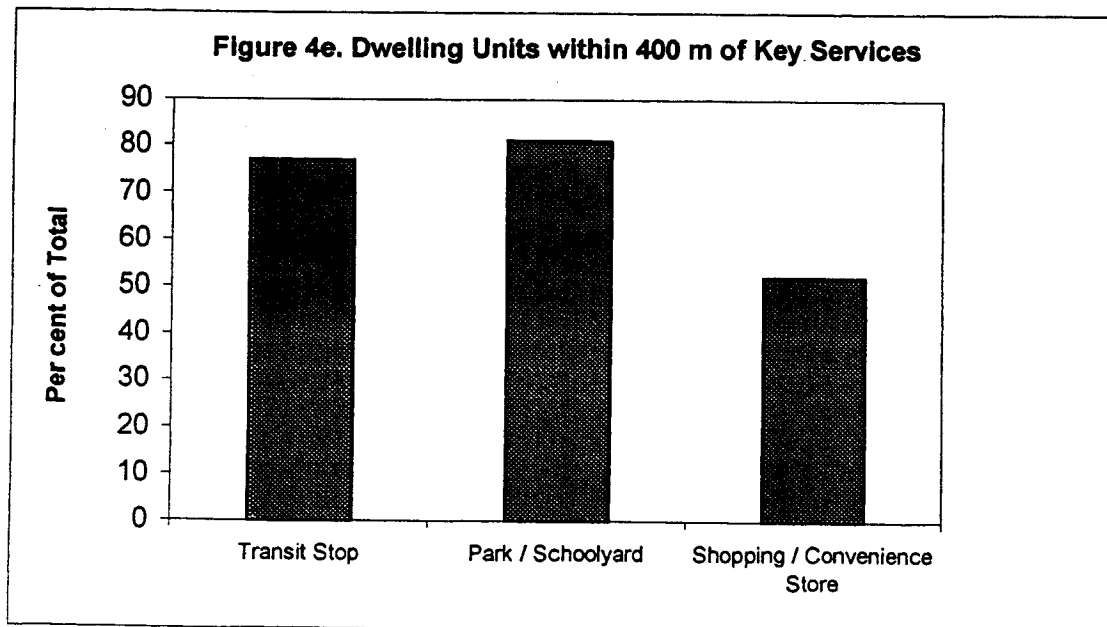
There are 44,817 dwelling units within 400 m of a schoolyard or park, representing 81% of all dwelling units in the city (Figure 4e).

DISCUSSION

What is Happening?

Over 50% of all dwelling units in Richmond are within walking distance of at least one of the key services discussed. Although a comparison to past years is not possible, the proportion of dwelling units located in proximity to key services has likely grown in concert with the housing density increases discussed in *Indicator D1*.

Of the three services addressed, shopping is the least likely to be located near housing. The close proximity of 77% of housing units to a transit stop is interesting given the relatively low transit ridership in Richmond (discussed under *Topic E: Transportation*). Low ridership is more likely attributed to personal choices, quality of service, and the limited geographic extent of transit service particularly as more people move to suburban areas of the city.



Existing City Programs

To encourage walking and cycling, the conditions along streets, walkways and paths need to be appealing. Future planning should seek to ensure that communities are pedestrian- and cycle-friendly, so that residents can obtain basic supplies and services without having to get in their car. Civic efforts in this regard have been discussed in more detail under *Topic E: Transportation*. For traveling greater distances, public transit use should be a viable option.

Richmond and the Region

Other municipalities in the GVRD have not begun to report on this indicator. The City of Nanaimo reported that in 1996, 61% of all neighbourhood properties were within 500 m of commercial services. The Greater Victoria area looked at new building permits issued in 1997 and determined that more than 80% of the new residential units were located within 400 m of a commercial facility or transit route; just over half (53%) were within 400 m of a park; and 43% were within 400 m of a school.

THE FUTURE

Targets and Influence

The OCP states that walking should become the primary choice for travel over short distances. However, no targets have been set that specifically address how well we are

locating housing and key services within close proximity. Future updates of the SOE report should look at the number of units within 400 m of one, two or all three of the key services discussed.

What Can Citizens Do?

Citizens can choose to reside in areas that conveniently offer the facilities and services they use most often. Unless your neighbourhood reaches a certain population density, there is little that can be done to encourage services to locate near you. Fortunately, options such as the Internet, telecommuting and home delivery services are available to allow you to work, learn, and purchases goods and services from the comfort of your home. Alternatively, you can lobby TransLink and the City to locate key services, such as transit stops and parks, in your community if you feel they are warranted.

SUMMARY

Good News

Seventy-seven percent of all dwelling units in the City are within 400 m of a transit stop, that is, about a ten-minute walk. Eighty-one percent of all dwelling units in the City are within 400 m of a schoolyard or park. Fifty-two percent of all dwelling units in the City are within 400 m of a convenience store or commercial retail facility. These results support the OCP principle of making key services accessible and 'walkable'. This indicator is given a rating of Good News.

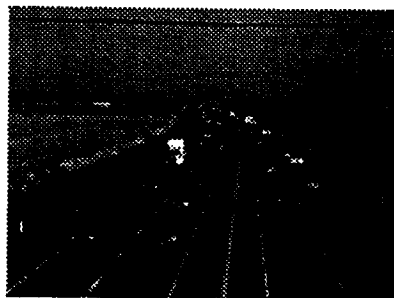
TOPIC E: TRANSPORTATION

Transportation is an integral part of our daily lives – providing the access and mobility demanded by our society and its economy. It is not surprising that transportation is one of the main concerns of city residents and one of the biggest challenges facing local elected representatives and urban planners. The more we use our cars or build our city to support the movement of cars the less livable the city becomes because of congestion and pollution. Here in the Greater Vancouver region, the population is expected to grow by 40,000 people and 23,000 cars a year based on current trends. By 2005, GVRD residents will be making 500,000 to 600,000 more trips every day. This trend is alarming given what we already know about the health and aesthetic impacts of poor quality air.

The need to improve the transportation system is obvious. The impetus for change comes from many sources – public input, new developments, area plans, evolving community values, traffic management strategies, traffic safety concerns, air quality concerns, and regional transportation improvements. Integrated transportation planning must include steps to improve roads, facilitate the circulation of traffic, deliver efficient forms of public transit, develop facilities and infrastructure that support walking and cycling, promote alternatives to the single occupant vehicle, and reduce traffic congestion.

At the regional scale, transportation planning is undertaken by TransLink according to their *Strategic Transportation Plan* (2000-2005). However, the City can influence transportation issues in a number of ways as discussed in the following sections. This topic focuses on four indicators:

- E1 Transportation Choices;
- E2 Registered Vehicles;
- E3 Pedestrian-Friendly Streets; and
- E4 Cycling Routes.



Indicator E1: Transportation Choices

INTRODUCTION

Why Should We Measure This Indicator?

While efforts have been made in recent years to encourage alternatives to the automobile, motor vehicles remain the primary mode of transportation in Canada. The vast majority of motor vehicles burn fossil fuels, which produce emissions that degrade air quality. Runoff from roads can contain oils and other pollutants that degrade water quality. Vehicular travel also requires significant amounts of land and infrastructure for roads and parking, which cost money to purchase, develop and maintain, and deplete our total greenspace.

By reducing the number of vehicles we own, the frequency we drive, and the amount of fuel we use, we can reduce these negative impacts. The benefits of choosing alternative forms of transport, such as transit, walking and cycling, include health benefits, a gradual decrease on our reliance on non-renewable energy sources, and savings in terms of tax dollars that are presently allocated to subsidies that support personal vehicle travel.

The shift from cars to alternative forms of transportation is one way of gauging the sustainability of our communities and our personal decisions. This indicator helps assess the effectiveness of government efforts, at all levels, in encouraging sustainable transportation choices.



What is Being Measured?

This indicator measures:

- Transportation choices for travel originating from Richmond during the morning rush period (6:00 am to 9:00 am); and
- Number of trips originating from Richmond during the morning rush period (6:00 am to 9:00 am).

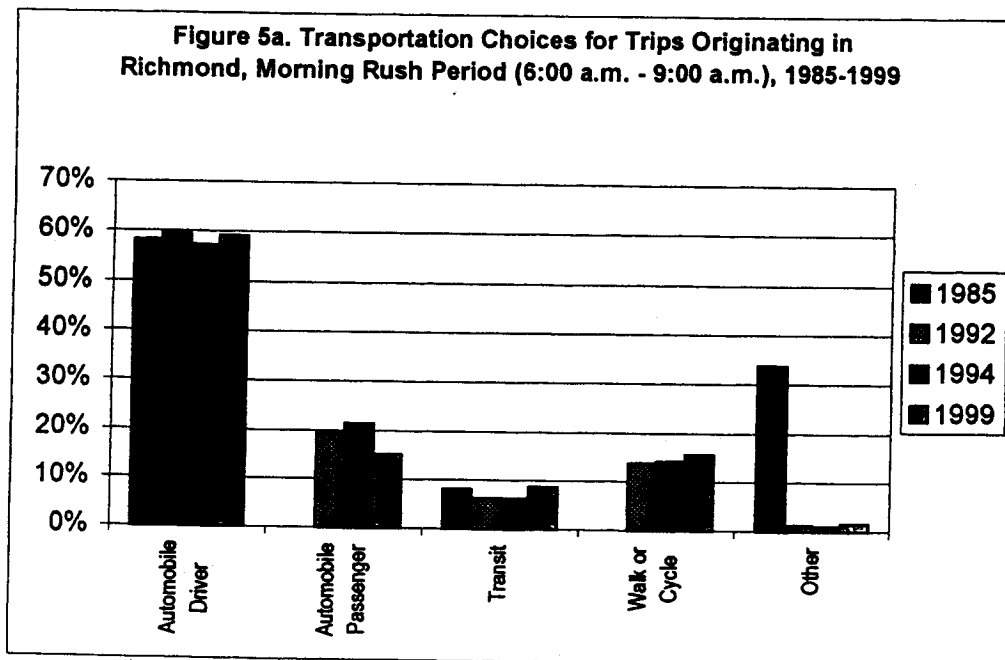
The transportation choices examined for this indicator include single occupant automobiles, public transit, car pools, walking and cycling. Data on transportation choices are available from regional Trip Diary Surveys conducted periodically by the GVRD (1985, 1992 and 1994) and TransLink (1999).

As the GVRD used a different methodology for compiling transportation choice data than that currently employed by TransLink, TransLink has re-tabulated the 1994 data using the new methodology to enable comparisons between 1994 and 1999 data sets³⁰. Data for 1985 and 1992 were compiled using the old methodology³¹.

RESULTS

Transportation Choices for Travel Originating from Richmond during the Morning Rush Period

The automobile is the dominant form of transportation in the city. In 1999, nearly 60% of morning trips originating from Richmond were by automobile drivers (Figure 5a). The next most common mode of transport was walking/cycling (15.5%), followed by automobile passenger (i.e., car pooling) (15.2%) and, lastly, public transit (8.7%) (Figure 5a). The 'other' category accounts for modes such as rollerblading, skateboarding and using scooters. Since 1985, the proportion of trips by different modes has not changed significantly.



Note: In 1985 carpooling and walking/cycling were not measured specifically and so fell under the category of 'other' which would partially explain why this value is so high in 1985 while in that same year, there are no data presented for automobile passengers. No data are available that would help to break-out the activities in the 'other' category.

³⁰ Because results for 1994 have been re-tabulated using a new methodology, the data presented in the 1998 SOE report for 1994 are not consistent with what is presented here for the same year.

³¹ The transit strike that occurred in 2001 has no bearing on these data as the data were collected for 1999.

Number of trips originating from Richmond during the morning rush period (6:00 am to 9:00 am)

The total number of morning rush period trips originating from Richmond increased from 104,443 in 1994 to 106,544 in 1999 – a 2% increase (Figure 5b). Richmond's population increased by about 4.5% during the same period. Between 1994 and 1999, the number of trips by drivers of automobiles increased by nearly 3300 trips while automobile passenger trips dropped nearly 6300 trips indicating that carpooling may be decreasing. For the same period, transit trips increased by 2768 trips. Although this represents a 43% increase, public transit use still remains comparatively low (<10%).

DISCUSSION

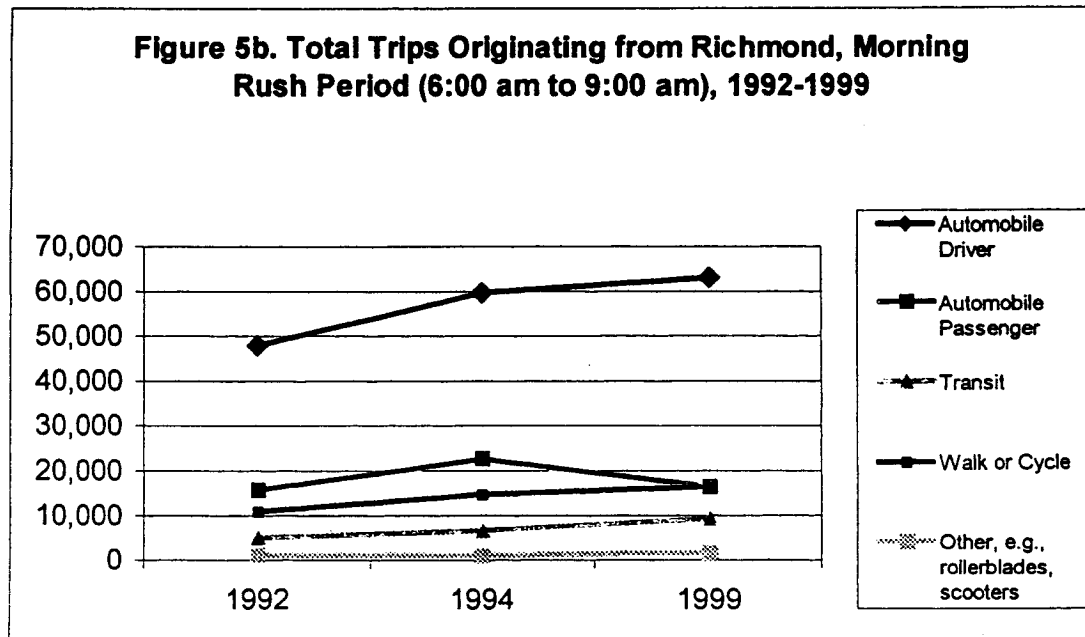
What is Happening?

Automobile use has been increasing since 1985 and this trend is worrisome. While the

increase in automobile trips is partially the result of Richmond's increasing population, the proportion of trips by vehicles has remained fairly constant implying that people are not changing over to more sustainable forms of transportation.

Public transit use during the morning rush period remains low. Transit use throughout the day is also low indicating that residents use their car for purposes other than driving to or from work³². In 1999, transit's share of trips for a 24-hour period was 5.6% compared with 5.4% in 1994. Results from a 1999 TransLink study show that factors that most influenced Richmond residents' decisions to use or not use transit were: reliability; safety while waiting for buses; having good connections; and direct bus routes. Results from *Indicator D2: Accessibility to Key Services*, suggest that, in addition to personal choice, the quality of transit service is likely a more important factor in choosing to use transit than is proximity of housing to transit stops.

Figure 5b. Total Trips Originating from Richmond, Morning Rush Period (6:00 am to 9:00 am), 1992-1999



³² TransLink 1999 Trip Diary Summary, data not shown here.

Carpooling and sharing rides also help reduce the total number of vehicles on roads. Automobile passenger trips have decreased since 1994. Unfortunately, it is not known if these former passengers are now driving themselves or have chosen other forms of travel. The growth in walking and cycling is, however, encouraging. Enhancements in roads and sidewalks to make them more amenable to walking and cycling, as well as progress towards more compact communities, are likely reasons for this trend.

Overall, we have not made substantial progress in moving our transportation choices away from reliance on the single occupant automobile. Pollution and congestion, and their negative health implications, are the principle concerns associated with this trend.

Existing City Programs

Richmond works closely with TransLink to plan and manage transportation demand, but the City has little direct influence over travel choices in Richmond. In June 2000, TransLink and Richmond completed the *Richmond Area Transit Plan* that identifies local and regional transit improvements that can be implemented over the 2000-2004 period. As part of the plan, the Richmond-Vancouver #98 B-Line rapid bus service was initiated in August 2001 to improve connections between Richmond and major destinations such as the airport and downtown Vancouver. The influence of this improved service on altering transportation choices has not yet been measured. In 2000, TransLink and Richmond completed the *Richmond Area Transit Plan* that identifies both local and regional transit service improvements that can be implemented over the next five years.

Individual city policies and planning related to land use, transportation planning, engineering and public works can indirectly

influence this indicator. For example, Richmond's OCP identifies areas for higher density development, where homes, workplaces, and services are closer together favouring shorter trips and more efficient modes of transportation (see indicators under *Topic D: Land Use and Human Settlement*). In one example, housing was developed as part of the expanded Richmond Centre Shopping Mall offering convenient shopping for residents as well as housing options for mall employees.

The City has also developed a Transportation Plan for the City Centre to manage its rapid growth. The *City Centre Transportation Plan* aims to redesign Richmond's downtown core to accommodate better public transit, more bikes and a more attractive pedestrian environment.



Adding or improving bus shelters, benches, cycling lanes and pedestrian-friendly streets are some of the ways in which the City can make alternative forms of transportation more attractive in all areas of Richmond. In addition to encouraging non-motorized forms of travel, Richmond supports initiatives such as ride-share and carpooling programs that aim to reduce the number of single-occupant vehicles on the road. For example, the City has a carpool registry for City employees.

Almost half of children in BC travel to and from school by car even though the majority live within walking distance of their schools. In 1998, ICBC introduced the 'Way to Go!'

Program to provide parents and teachers with information and support to facilitate safe and sustainable modes of transportation to school. The Richmond School District supports this program by distributing news and information to schools, providing access to meeting facilities, and rewarding schools for participating in 'Way to Go!' events. The City's Transportation Department supplies detailed school catchment maps and actively supports pedestrian infrastructure improvements around schools. Thirty-six of Richmond's 47 elementary schools have requested one or more *Way to Go!* manuals and resource kits. Over 50% of Richmond schools have actively participated in program events such as International Walk to School Day, Walking School Buses, and Bike to School Day.

Richmond and the Region

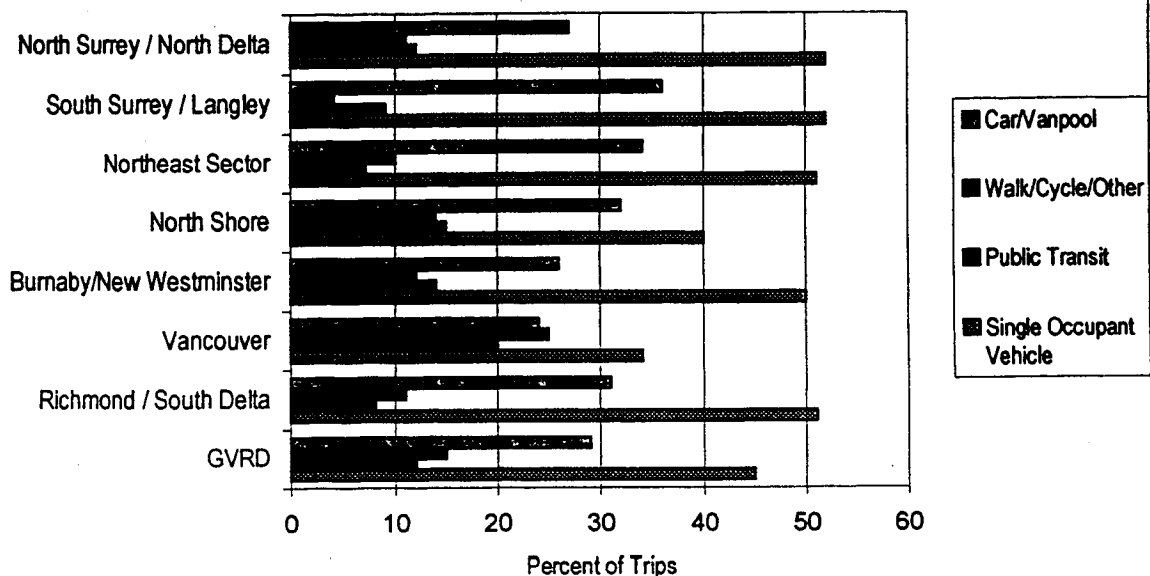
Richmond's proportion of trips by single occupant vehicles is among the highest in the region while its proportion of transit riders is among the lowest (Figure 5c). Richmond's proportion of trips by walking or cycling is behind Vancouver and the North Shore, but better than other areas such as Surrey and the Northeast Sector (Figure 5c).

THE FUTURE

Targets and Influences

The GVRD has a goal to reduce automobile dependency but at present there are no specific local or regional targets for improving sustainable transportation choices.

Figure 5c. Transportation Choices for a 24-Hour Period for Selected Regional Sub-Areas



As Richmond's population increases, it will no longer be sufficient to react to more and more vehicle traffic. In particular, the City, in cooperation with TransLink and employers, needs to identify more options for getting people to and from work to alleviate congestion on roads during peak periods of the day.

The performance of this indicator is strongly linked with that of other indicators in this section, namely *E3: Pedestrian-friendly Streets* and *E4: Cycling Routes*. By planning and building more compact and complete neighbourhoods, and providing more transportation options, residents will be able to spend less time traveling and more time enjoying our livable city.

What Can Citizens Do?

Opting for sustainable modes of transportation decreases our use of the single occupant vehicle. Try one or more of the following as a step towards this goal:

- Take the bus, walk or ride your bike to work or to do errands. Leaving your car behind once or twice a week can make a difference!
- Combine several errands into a single trip.
- Organize or join a carpool (Call the Jack Bell Foundation at 604-879-RIDE).
- Live in a community closer to your place of work or explore telecommuting or teleconferencing options with your employer.

- If you are an employer, provide incentives for your employees to use alternative transportation such as paying for bus passes or installing bike facilities or showers.
- Provide your children with skills and training to enable them to walk or bike to school (see the City's brochure *Traffic Safety Around Schools and Playgrounds* or visit www.watogo.icbc.bc.ca).
- Take advantage of merchants that deliver food or services to your home.
- Request more initiatives to improve transit service such as bus lanes.
- Read Richmond's *Transportation Plan* found available at City Hall or online at www.city.richmond.bc.ca/planning/.

SUMMARY

Bad News

Almost 60% of morning rush trips originating from Richmond (or 63,029 trips) are automobile (driver) trips. This is an increase of 2% from 1994. Transit trips have increased 2.5% from 1994-1999, and trips by other modes such as walking and cycling increased slightly. The only transportation choice that decreased was automobile passenger trips. The proportion of trips by car still greatly exceeds the number of trips by other modes. These results are not positive given the GVRD *Livable Region Strategy* goal to reduce automobile dependency. For these reasons, this indicator has been given a rating of Bad News.

Indicator E2: Registered Vehicles

INTRODUCTION

Why Should We Measure This Indicator?

Indicator E2: Registered Vehicles is a measure of our reliance on the automobile as a form of transportation. Studies have shown that the more cars people own, the less likely they are to use alternative forms of transportation such as transit or cycling. The negative impacts of automobile use are discussed under *E1: Transportation Choices* and *C1: Air Quality*. The number of registered vehicles generates a picture of automobile use, as do transportation choices, but this indicator has an advantage when monitoring trends as it can be updated annually, unlike indicator *E1*, which relies on data collected only every five years.

What is Being Measured?

Using data provided by ICBC, this indicator measures:

- Number of vehicles registered to Richmond residents; and
- Number of registered vehicles per 1000 people.

To be consistent with other indicators, the *Registered Vehicles* indicator has been modified slightly to report on vehicles per 1000 population as opposed to vehicles per household, which was reported in the 1998 SOE report.



RESULTS

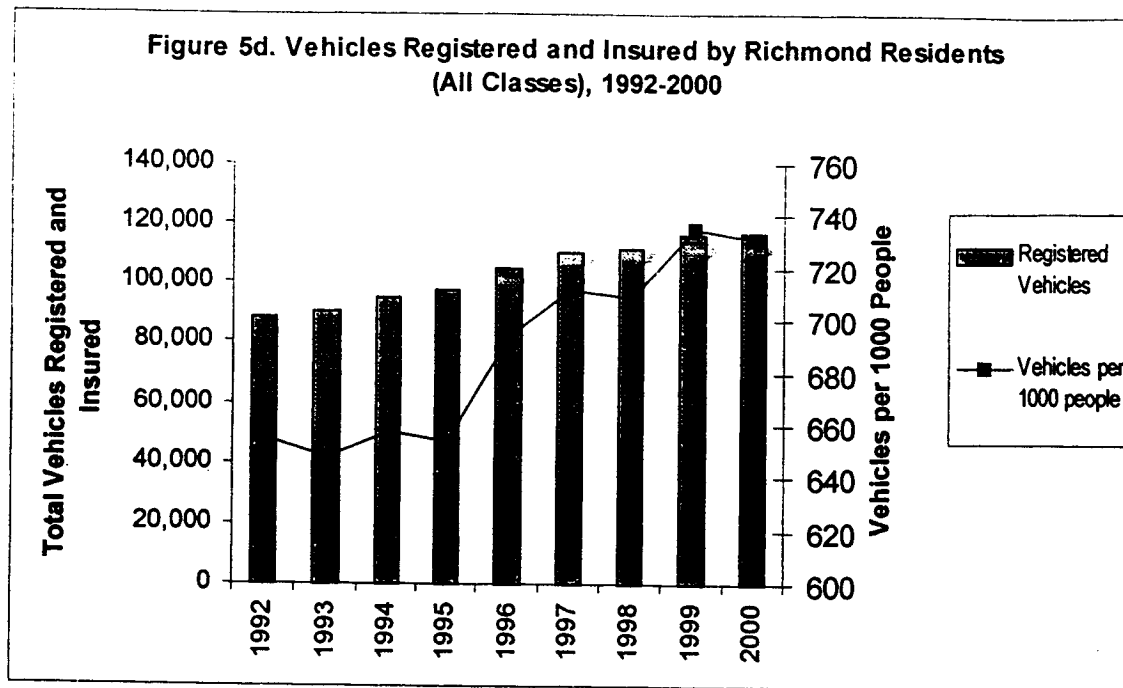
Number of Vehicles Registered to Richmond Residents

The number of vehicles registered to Richmond residents has been increasing (Figure 5d). Since the last SOE report was written, vehicle ownership has increased from 97,592 to 116,609 – an increase of 19,017 vehicles in just five years. During this same period, the city's population increased by approximately 10,000 people.

Number of Registered Vehicles per 1000 People

The number of vehicles per 1000 people has also increased (Figure 5d). There were 694 vehicles per 1000 people in 1996. By January 2001, there were approximately 731 vehicles per 1000 people.

Figure 5d. Vehicles Registered and Insured by Richmond Residents
(All Classes), 1992-2000



DISCUSSION

What is Happening?

Both the total number of registered vehicles and the number of vehicles per 1000 people show an increasing trend in Richmond, although the number of vehicles per 1000 people dropped slightly between 1999 and 2000. Population growth has meant more vehicles on city streets. The GVRD predicts that Richmond's population will increase to 185,661 by the year 2010. If the ratio of vehicles per 1000 population remains constant there will be an additional 19,090 vehicles on the road.

The present and projected growth in vehicle numbers is discouraging because of the direct relationships between vehicle ownership, vehicle use, and harmful emissions. It is also discouraging because of the considerable effort expended over the past three years, by both the City and the GVRD, to promote more sustainable transportation choices.

A reversal of current trends will require a significant commitment on the part of individuals toward adoption of alternative forms of transportation. It is unclear why Richmond has a greater proportion of cars per capita than other municipalities. Where Richmond residents work, demographics, or a greater proportion of households that can afford two cars, are possible explanations.

Existing City Programs

City programs do not directly influence local car ownership. However, the OCP endorses implementing strategic transportation improvements to reduce reliance on the automobile and managing travel demand at its source to reduce single occupant automobile travel.

Programs for encouraging more sustainable transportation are described under other indicators in this section.

Richmond and the Region

Richmond residents own more cars on a per-population basis than many other municipality in the GVRD (Figure 5e) and the rate of increase is greater than that of other municipalities. Although cities such as Vancouver and Burnaby have a more developed transit system, other cities, such as Delta and Coquitlam, which are further from the downtown core, fare better than Richmond in this category. Only Burnaby has decreased the number of vehicles per 1000 people.

indicator and slow or reverse the trend of increasing vehicle ownership. One area to watch in the future may be ownership of electric cars or cars that utilize natural gas instead of gasoline or diesel. Alternative-fuel cars would mean less emissions, but would not alleviate problems associated with congestions nor infrastructural requirements.

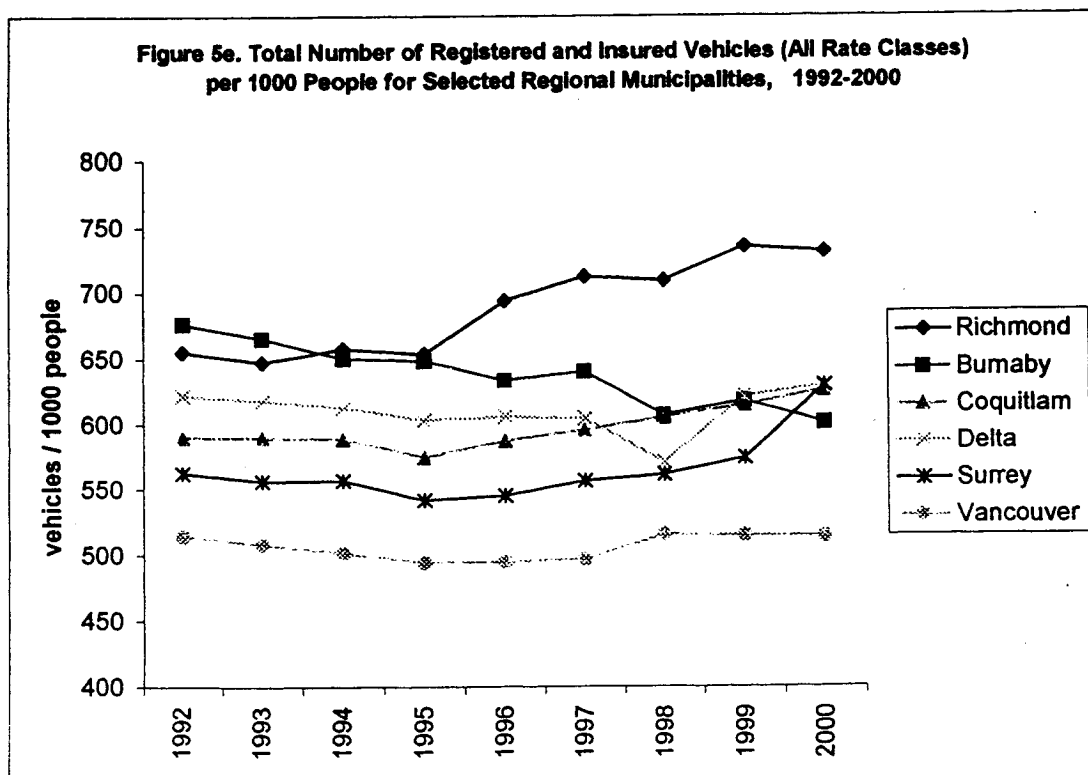
What Can Citizens Do?

When possible, citizens can use other means of transportation for commuting to work or for leisure activities. Aiming to walk, cycle or use transit during off-peak times is a good opportunity to try alternative forms of transportation when congestion and time constraints are less significant. Joining a carpool or car cooperative (where several owners share one vehicle) are other options. The Vancouver Car Cooperative Network (CAN) provides information at www.cooperativeauto.net.

THE FUTURE

Targets and Influences

There are no specific targets for improving this indicator. By striving to promote alternative forms of transportation, as discussed under other indicators in this topic, the City hopes to influence this



SUMMARY

Bad News

The number of vehicles registered to Richmond residents increased from 97,592 at the end of January 1996 to 116,609 at the end of January 2001 – an increase of 19,017

vehicles in five years. At the end of January 2001, there were approximately 731 vehicles per 1000 people, up from 694 vehicles per 1000 people at the end of January 1996. Because of the trend towards owning more, rather than less vehicles, this indicator is rated as Bad News.

Indicator E3: Pedestrian-Friendly Streets

INTRODUCTION

Why Should We Measure This Indicator?

The physical characteristics of neighborhoods, along with the proximity to services, have an impact on transportation choice. Similar to transit use and cycling, the best way to encourage people to leave their cars behind is to ensure that alternative forms of travel are convenient, safe and enjoyable. While some people have to make long commutes by car, there are a significant number of trips that are made within a short distance from our homes or places of work.

There is, therefore, a tremendous opportunity to provide transportation choices for people that do not require the use of automobiles. Providing 'walkable' environments helps reduce the effects of urban congestion. Additionally, walking benefits human health, the environment, and communities by promoting fitness, reducing the harmful effects of cars and encouraging interactions among neighbours.

Richmond has standards for designating streets as 'pedestrian-friendly'. This indicator measures Richmond's progress in meeting these standards and making walking a more attractive alternative to other modes of travel.

What is Being Measured?

There are two standards for 'pedestrian-friendly' streets. The minimum standard is the provision of sidewalks on one or more side(s) of the street. The higher standard



includes a boulevard strip with street trees on at least one side of the street that separates the road and the sidewalk. In busier areas like the City Centre and Steveston, the minimum standard may include a parking lane to further widen the distance between the sidewalk and moving vehicles. This indicator measures:

- Length and proportion of **major roads** that meet the minimum or higher standards for pedestrian-friendly streets; and
- Length and proportion of **all roads** that meet the minimum or higher standards for pedestrian-friendly streets.

RESULTS

Length and proportion of major roads that meet the minimum or higher standards for pedestrian-friendly streets. In 2000, 92.9 km or 68.2% of major roads met the minimum or higher standard (Figures 5f and 5h). As reported in the last SOE, 84 km or 61% of Richmond's major roads met the minimum standard in 1997.

Length and proportion of all roads that meet the minimum or higher standards for pedestrian-friendly streets.

Nearly all new or rebuilt roads in Richmond met the higher standard. In 2000, 44.1 km or 7.9% of all roads met the higher standard compared with 20 km in 1997, a gain of over 24 km of higher-standard pedestrian-friendly streets (Figures 5g and 5h).

Figure 5f. Length of Pedestrian-Friendly Sidewalks, 1990-2000

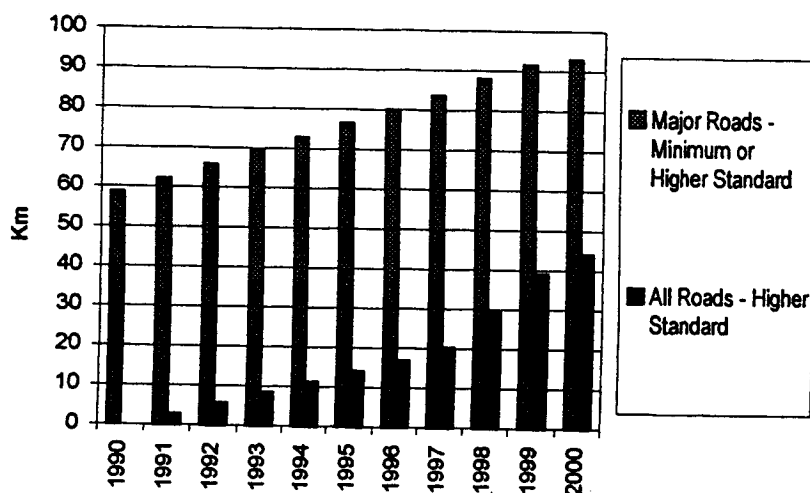


Figure 5g. Proportion of Road Network with Pedestrian-Friendly Sidewalks, 1990-2000

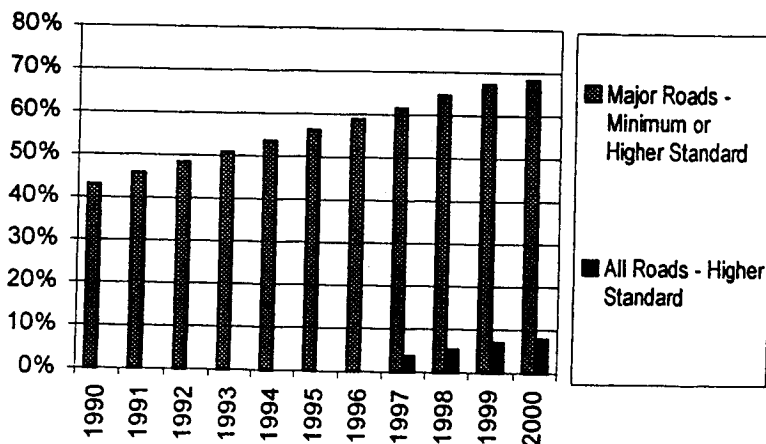
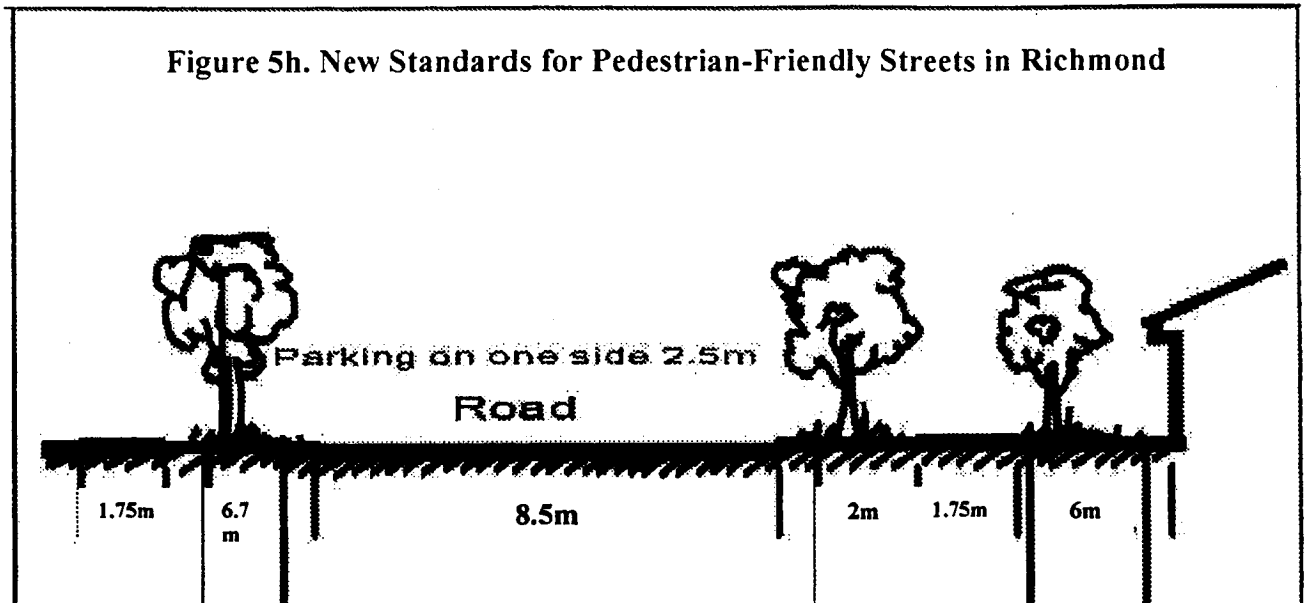


Figure 5h. New Standards for Pedestrian-Friendly Streets in Richmond



DISCUSSION

What is Happening?

This indicator continues to show a positive trend, that is, more streets are being designed and built to pedestrian-friendly standards. In particular, progress has been made in creating streets that meet the higher standard as opposed to a minimum standard. While there are no data to support that more people are walking as a result of better street design, these results are encouraging.

Existing City Programs

As discussed in the 1998 SOE, pedestrian-friendly streets are provided in Richmond through a number of programs. These programs support the OCP objective to make walking the primary choice for travel over short distances. Each year, as part of the Capital Works Program, candidate locations for sidewalk improvements are evaluated by the Transportation Department and the Public Works Division to determine the priority of implementation. Key factors considered in this evaluation are safety, pedestrian activities, adjacent land use,

accident history, road geometry and public input. Improvements include wider sidewalks and crosswalks, non-vehicular walkways, shorter city blocks with signals at crossings, and roadside tree boulevards. Additionally, each year, wheelchair accessible bus stops, sidewalks and ramps have been added at key locations along with audible pedestrian crossing signals for the visually impaired. The *City Centre Area Plan* outlines several long-term improvements for pedestrian travel in the downtown core including:

- Sidewalks throughout the downtown;
- Wider sidewalks;
- Trees and landscaped boulevards;
- Benches, shelters and information kiosks;
- Pedestrian crossing signals on major roads;
- Reduced driveway crossings;
- Improved wheelchair ramps, audible crossing signals and devices for the mobility impaired;
- Weather protection along shop fronts;
- Landscaped walkways where parking lots hinder access between adjacent developments.

Sidewalk improvements along major roads are mainly funded through the City's Capital Works Program but developer-funded projects typically support the majority of the higher standard sidewalks being built on minor roads. These improvements are identified during the approval process for the development application submitted by the developer. Citizens can influence this indicator by getting involved in local improvement programs or the City's beautification strategy. Although not built to the same standards, multi-purpose trails, which include pedestrian access, can also be found throughout the city (see *Indicator A2: Parks and Protected Areas*).

Richmond and the Region

Other GVRD municipalities do not record data on pedestrian-friendly streets the same way Richmond does so comparisons are not appropriate.

THE FUTURE

Targets and Influences

As reported in the 1998 SOE, Richmond planned to have about 41 km of pedestrian-friendly streets (higher standard) by 2002. In 2000, we have already exceeded this objective with 44.1 km. This will continue to increase as the City strives to build all new streets to the higher standard. However, the amount of new pedestrian-friendly streets is difficult to predict (largely because of the unpredictability of development applications), and therefore no new target has been set.

In future years more rigorous guidelines could be added to the higher standard such as³³:

- Curb cuts at intersections (for disabled access)*;
- Fewer driveway crossings along major roads*;
- Connections to key destinations;
- Smaller blocks;
- Benches;
- Pedestrian short cuts in areas with curvy streets and cul-de-sacs; and
- Creation of sidewalks in areas where buildings overlook the street for security.

The City is in the process of consolidating new bylaws to limit driveway crossings on arterial roads. The curb-cut criterion generally forms part of the city-wide development permit guidelines that are part of the OCP. Other criteria form part of the development permit guidelines for the area plans of different parts of the city. For example, the City Centre guidelines for streetscapes include a provision for benches, while the Terra Nova guidelines include a provision for pedestrian pathways to connect to streets.

What Can Citizens Do?

Residents of Richmond should be proud of their streetscapes and take advantage of the progress that has been made in making Richmond streets pedestrian-friendly. Take a walk or try these other ideas:

- Enhance street safety for walkers by keeping outdoor lights on at night (Remember to use energy-saver light bulbs!) or by participating in block watch programs.
- Keep our streets clean and attractive by starting a litter patrol in your neighbourhood or participating in the City's beautification program.
- To be considered for street or sidewalk improvements, nominate your area as part of the City's local improvement program.

³³ Guidelines marked with an '*' have already been implemented in some areas, where feasible.

SUMMARY

Good News

In 2000, 92.9 km or 68.2% of major roads met the minimum or higher standard for pedestrian friendliness compared with the 1997 figures which showed 84 km (61%) of

major roads meeting only the minimum standard. In 2000, 44.1 km or 7.9% of all roads met the higher standard compared with 20 km in 1997, a gain of over 24 km of higher-standard pedestrian-friendly streets. This indicator has been given a Good News rating because of this significant progress.

Indicator E4: Cycling Routes³⁴

INTRODUCTION

Why Should We Measure This Indicator?

Cycling is a sustainable transportation alternative, with similar benefits to walking. Richmond is ideal for cycling given its flat topography. Increasing the proportion of trips taken by cyclists can improve quality of life for residents in a number of ways including reducing traffic congestion, reducing fuel consumption, improving air quality, reducing noise levels, improving physical fitness, and reducing wear and tear on road surfaces.

However, despite the fact that many people recognize the benefits of cycling and the environmental problems associated with automobiles (e.g., air pollution), cycling makes up only a small proportion of trip starts in Richmond (see *Indicator E1: Transportation Choices*). To make alternative forms of transportation more appealing and widely used, safe and convenient facilities and infrastructure must be provided. This indicator measures Richmond's progress towards making cycling a viable mode of travel.

What is Being Measured?

Designated bicycle routes encourage cycling by offering wider curb lanes or separate bike lanes that provide greater space between



cyclists and vehicles, thereby increasing safety and cyclist comfort. This indicator reviews:

- Length of designated on-street bicycle lanes and total cycling routes; and
- Proportion of major roads with designated on-street bicycle lanes and cycling routes.

Bicycle lanes are separate travel lanes on the roadway for cyclists and are identified by a solid white line that is dashed at intersections to indicate where vehicles may cross the lane for turning movements. Additional on-street cycling facilities in Richmond include paved shoulders and wide curb lanes while off-street facilities include paved shared-use pathways and trails. On-

³⁴ The title of this indicator has been modified from 'Cycle Lanes' in the 1998 SOE report to 'Cycle Routes' in recognition that some cycle corridors in Richmond are not lanes, e.g., Shell Road.

street and off-street cycling facilities are complemented by end-of-trip facilities located at major destination such as bicycle racks for parking. Major roads are differentiated from smaller, local streets that are unlikely to require designated cycling lanes due to lower traffic volumes³⁵.

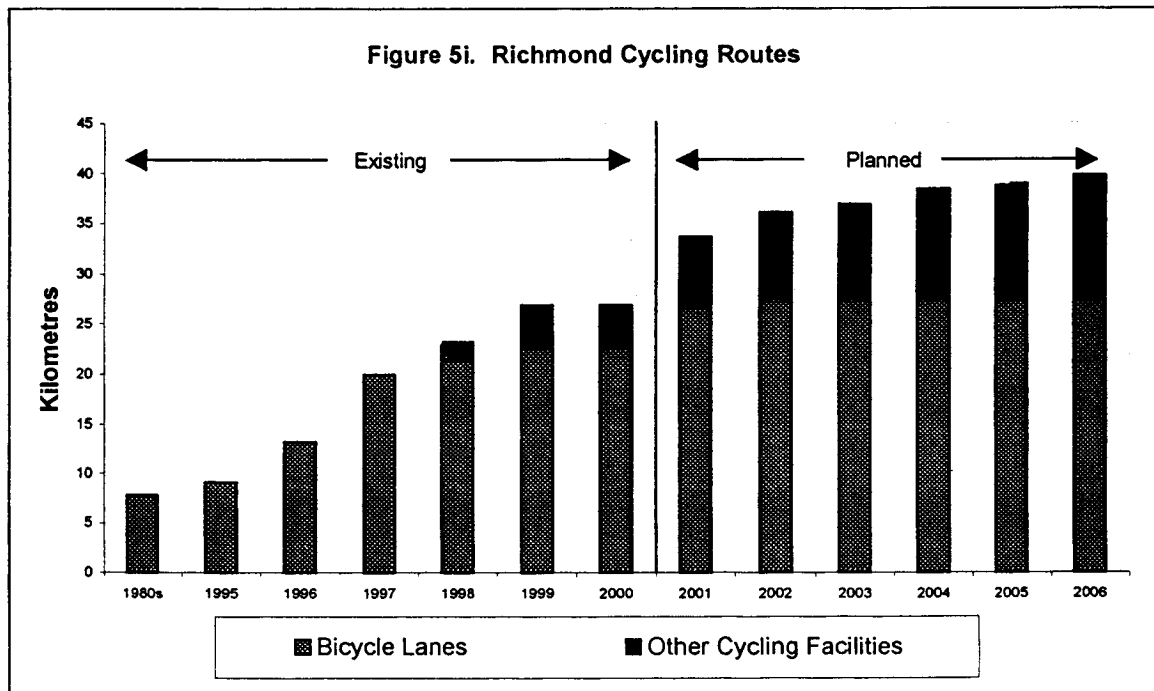
RESULTS

Length of Designated Cycling Lanes and Total Cycling Routes

By the end of 1999, Richmond's cycling network (Map 6) totaled 26.9 km (Figure 5i), including 22.7 km of bicycle lanes and 4.2 km of paved shared-use paths and signed routes, an increase of 11.9 km over the 15.0 km

reported in the 1998 SOE report³⁶. This exceeds Richmond's interim working target of 24.0 km of cycling routes by 2001. The construction of new lanes and pathways planned for 2001 and 2002 will add an additional 9.2 km of cycling facilities for a total of 36.1 km.

Proportion of Major Roads with On-Street Bicycle Lanes and Cycling Routes
Bicycle lanes are found on 12.0 % of Richmond's major roads while the total cycling network cover 14.2% of Richmond's major road network, up from 10.0% reported in the 1998 SOE. The construction of new facilities planned for 2001 and 2002 will raise the proportion of bicycle lanes to 14.1% and cycle routes to 17.8%.



³⁵ As used in this report, major roads include all roads which separate mapped sections of land in Richmond. Transportation and Planning staff refer to these roads as 'section-line roads'. Most are major arterials, but a few are minor and local roads that perform an important circulation function.

³⁶ The annual kilometers of bicycle lanes for 1995-1997 presented in Figure 5i have been revised from that reported in the 1998 SOE report to reflect more accurate records.

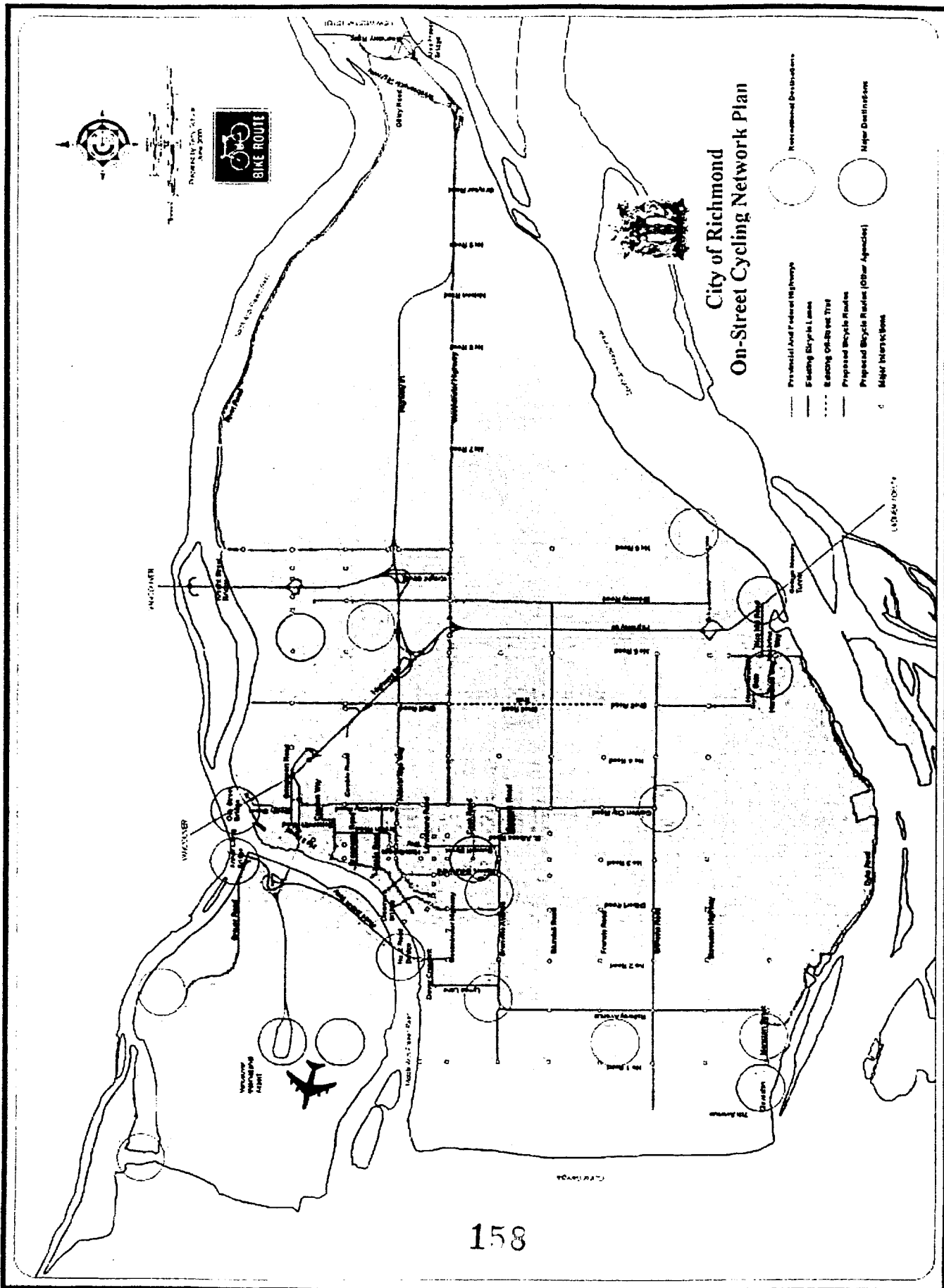


Document No. 100-100
June 2001



City of Richmond On-Street Cycling Network Plan

- Provincial And Federal Highways
- Existing Bicycle Lanes
- Existing On-Street Trail
- Proposed Bicycle Routes
- Proposed Bicycle Routes (Other Agencies)
- Major Intersections
- Recommended Destinations
- Major Destinations



DISCUSSION

What is Happening?

As reported in the 1998 SOE, at the end of 1997 Richmond had 15 km of cycling lanes covering over 10% of major roads. This three-fold increase from the pre-1993 situation was credited to the City's efforts in transportation planning, such as the adoption of the 1996 *On-Street Cycling Network Plan* and encouraging new facilities for cyclists (e.g., secured bike storage and parking facilities), which will encourage greater participation in cycling.

Existing City Programs

According to the OCP, Richmond endeavours to promote cycling as an appealing and environmentally friendly transportation choice. Promoting cycling requires the establishment of a cycling network, supportive strategies for integrating cycling with other travel modes, and convenient end-of-trip facilities for cyclists such as bike storage, lockers and showers.

Planning and investment in infrastructure and facilities for cyclists indicate that the government takes alternative transportation seriously. Richmond's *On-Street Cycling Network Plan* provides for future additions to connect major destinations including community centers, major employment centers, bridge crossing locations, and business park areas.

Many new facilities have been implemented through the City's Major Capital Works Program. Over the 1995 to 1998 period, funds allocated for cycling improvements averaged \$247,000 annually, with most of these funds co-shared by the City and the provincial government's Cycling Network

Program. The majority of funding is applied to new cycling routes with the remainder applied to maintenance and engineering features that support cycling. Specific initiatives include:

- Pavement markings at selected intersections to indicate where to place your bike to trigger traffic signal detector loops;
- Provision of bicycle racks on civic properties;
- More frequent maintenance on bike routes (e.g., street sweeping of the bike lanes/shoulders);
- Use of redesigned storm drains that are perpendicular rather than parallel to direction of travel; and
- Street sign replacement program – when street signs require replacement, new signs on designated cycling routes will incorporate a bicycle symbol.



The City is also encouraging and, in some cases, requiring private developers to include cycling facilities as part of their developments. For example, the development guidelines for the *City Centre Area Plan* (part of the City's OCP) require new developments to provide cycling facilities including secured bike parking/storage. Outside of the City Centre (where the cycling facility guidelines do not apply) some of Richmond's larger office

buildings include showers and locker facilities attached to their washrooms. The Vancouver Airport Authority's current renovations are making provisions for cycling facilities. In addition, the new City Hall was built with a secured bicycle storage area and change rooms with lockers and showers.

The Richmond Citizens Cycling Committee was formed in 1993 to provide the City with feedback on proposed cycling projects and suggest enhancements to the cycling environment. In the past, the Committee has focused on cycling infrastructure but has recently shifted its focus to education and awareness initiatives. For example, the Committee and the City jointly organized the first annual 'Island City, by Bike' tour of Richmond in June 2001 as part of Bike Month. The Committee has also published several articles on cycling in a local newspaper, is working on providing educational cycling materials in multiple languages, and is creating a separate cycling web page on the city's web site.

Richmond and the Region

Richmond's cycling infrastructure continues to be among the best in the region. Surrey has the most dedicated cycling lanes with 35.8 km; Richmond is second with 26.9 km and Burnaby is third with 26.0 km. North Vancouver currently has 2.0 km (with over 30 km planned for the future). New Westminster and Coquitlam presently have no dedicated cycling lanes. The City of Vancouver's cycling network comprised 128.8 km in 1999. However, of the 128.8 km total, only 5.4 km are dedicated bicycle lanes. The remaining 123.4 km are signed routes along local streets where cyclists share the road with vehicles.

THE FUTURE

Targets and Influences

Richmond has met its interim working target of 24.0 km of cycling routes by 2001. Pending Council approval of the City's 5-Year Capital Program, Richmond plans to increase its cycling network to 39.0 km by 2005³⁷.

Another way of measuring the success of the City's cycle programs is to monitor use of cycling routes. The provincial Cycling Network Program has started requiring before-and-after traffic counts to assess the effectiveness of new facilities that were built with grants from the program. To date, Richmond has periodically done monitoring on the Garden City cycle route between Williams Road and Granville Avenue. These data could provide a further means of reporting on cycling routes in future SOE editions.

What Can Citizens Do?

Citizens can continue to make use of and benefit from Richmond's cycle network by taking some of the following actions:

- Use cycling as an alternative means of transportation.
- Practice safe cycling – wear a helmet, use lights at night and follow road safety regulations at all times.
- Start up or join a cycling club such as the Richmond Bicycle Club (contact Michelle Johnson at 604-274-8968). Check your community directory for other club listings in your neighbourhood.

³⁷ The 39.0 km target is subject to decisions by other agencies as construction of some of the planned cycle routes is contingent upon the receipt of matching funding from provincial and regional government agencies.

- Encourage your employer to provide cycling facilities in your workplace (e.g., storage, showers, etc.).
- Speak to local merchants about adding bike racks and storage facilities to their shops.
- Consult the Lower Mainland Cycling Map for biking routes to places outside of Richmond (available from the GVRD).
- Contact Cycling BC for more ideas: 604-737-3034 or visit their website at www.cycling.bc.ca.

SUMMARY

Good News

By the end of 1999, Richmond had increased its cycling lanes to 26.9 km – up from 15 km in 1997. This exceeds Richmond's interim working target of 24 km of cycling lanes by the year 2001. Cycle lanes are found along 13.3% of Richmond's road network, up from 10% reported in 1997. Richmond has improved its cycle network and met its target. This is deserving of a Good News rating.

TOPIC F: RESOURCE CONSUMPTION AND WASTE GENERATION

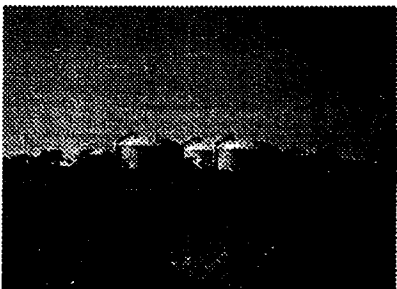
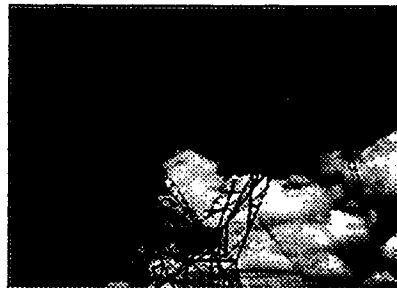
One of the greatest ways we put pressure on our environment is by consuming resources and disposing wastes. Our daily activities, such as cooking, washing and heating and lighting our homes, require the use of resources including energy and water. Additionally, large volumes of waste materials – both solid and liquid – are disposed of each year. These wastes eventually end up back in the environment in some form.

Our consumption of resources and discharge of wastes has a widespread effect on the earth and its inhabitants. The concept of the 'ecological footprint' has been used to illustrate the actual amount of biologically productive land that each person requires to provide them with resources and absorb their wastes. Based on the Canadian average of 7 hectares per person, over 1.1 million hectares of biologically productive land would be required to support Richmond's current population – an area 82 times larger than the City itself.

This section of the report focuses on four aspects of resource consumption and waste generation:

- F1 Water Consumption;**
- F2 Energy Consumption;**
- F3 Residential Solid Waste Generation;**
- and**
- F4 Wastewater Generation.**

Energy consumption and wastewater generation are new indicators that have been introduced in this edition of the SOE report.



Indicator F1: Water Consumption

INTRODUCTION

Why Should We Measure This Indicator?

Monitoring water consumption is important for several reasons. First, although BC's southwest coast receives abundant rainfall, the region has a limited ability to store and distribute potable water. This results in seasonal limitations on water availability, particularly during the dry summer months when residents and businesses increase their water use for irrigation and landscaping.

Even if water shortage were not an issue, population growth in the GVRD has created an increased demand for water from the reservoirs in the Coquitlam, Capilano and Seymour watersheds. This continued growth will require costly infrastructure expansion, including distribution piping, water treatment systems and sewage treatment upgrades, which will affect taxpayers and local governments. Finally, the expansion of reservoir capacity to meet the needs of a growing population requires development in relatively pristine watersheds, reduces access to otherwise productive land and resources, and can have negative impacts on fish and wildlife habitat.

What is Being Measured?

Richmond's water is purchased from the Greater Vancouver Water District (GVWD) and distributed to customers through the city's piping system. By tracking the amount of water purchased, we can get a sense of water consumption patterns in the city³⁸.

³⁸ This indicator does not include water supplied by private wells, from small surface water bodies such as ponds, or water for farms from ditch/slough systems. The agricultural sector is the most likely to use such water sources.



Based on purchased water data, this indicator measures:

- **Total and per capita water consumption (all sectors);**
- **Water consumption by sector; and**
- **Water consumption by season.**

RESULTS

Total and Per Capita Water

Consumption (all sectors) in Richmond
Richmond's total water consumption for all sectors combined grew by 35% between 1985 and 2000 (Figure 6a). The 1998 SOE report stated that Richmond consumed over 37 million cubic metres of water in 1996. Since this time, total consumption has risen by another 800,000 cubic metres to reach the current value of 38.3 million cubic metres in 2000.

While more water is being consumed by the Richmond community, less water is being consumed on a per capita basis (i.e., by each individual). Per capita water consumption is presently 634 litres/person/day – a 13% decrease since 1985 and a 5% decrease since the writing of the 1998 SOE report (Figure 6a).

Water Consumption by Sector

Water consumption by institutional, commercial, industrial and agricultural customers, and a small percentage of single-family residential consumers, is metered by the City and accounts for approximately 40% of the water consumed (Figure 6b). The remaining 60% of the total water consumed is unmetered and used by single- and multiple-family homes and schools. The other category includes water purchased but lost to events such as watermain breaks or used during main cleaning.

Residential water use for the years 1985-1997 averaged 345 litres/person/day. This accounts for about 55% of the total per capita water use (Figure 6c).

Seasonal Water Consumption Patterns

Water consumption continues to be particularly high during the summer months (June to August) (Figure 6d). On average residents use 15-50% more water during the summer than during the winter months (December to February).

Figure 6a. Total and Per Capita Water Consumption for Richmond, 1985-2000

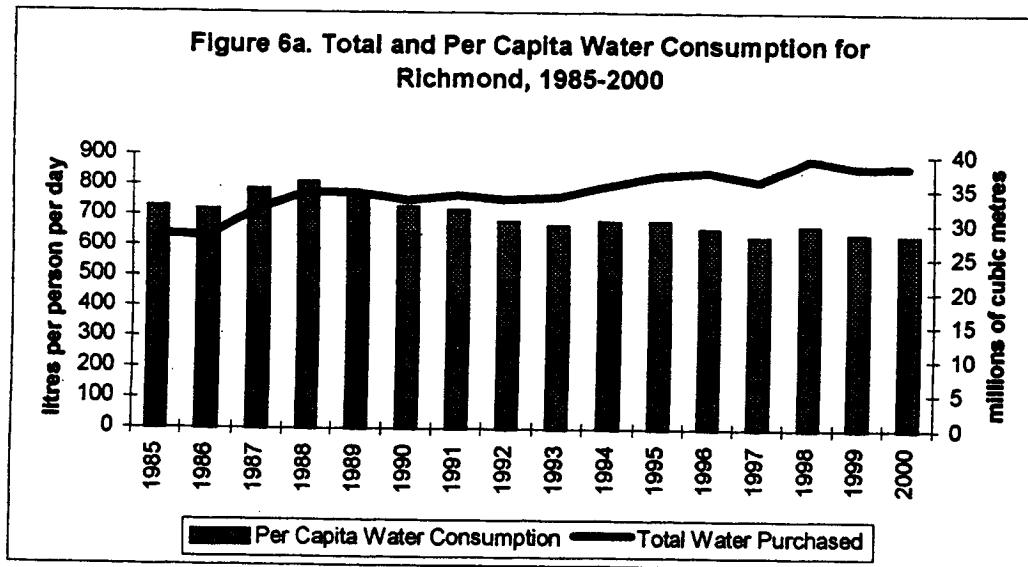


Figure 6b. Richmond Water Consumption by Sector, 1985 to 1999

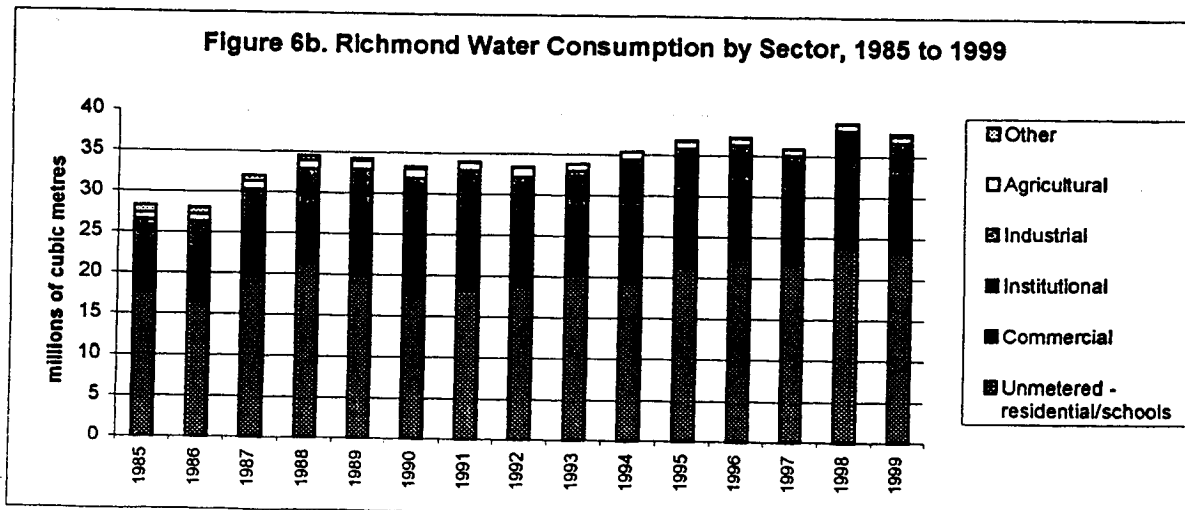


Figure 6c. Per Capita Water Consumption - Residential

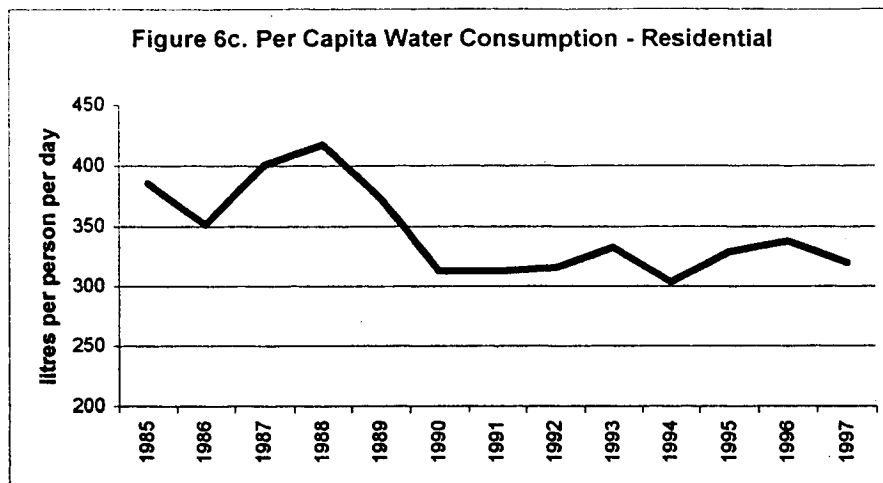
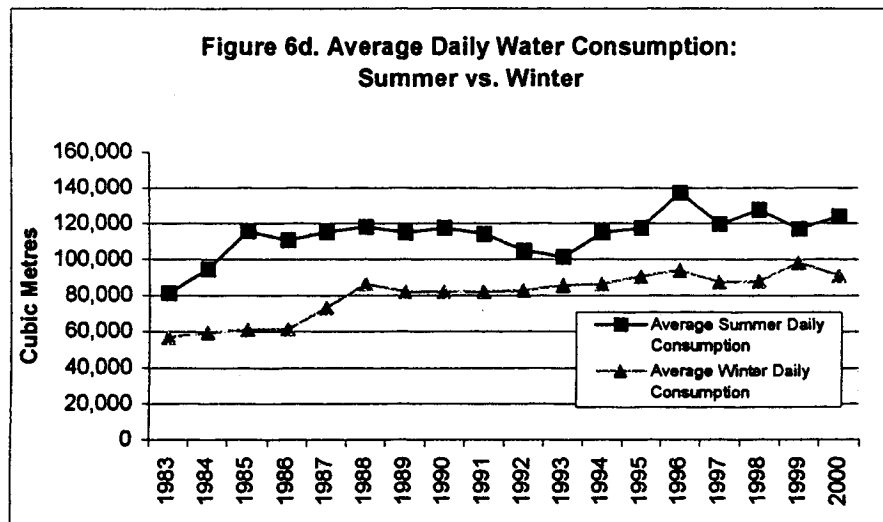


Figure 6d. Average Daily Water Consumption: Summer vs. Winter



DISCUSSION

What is Happening?

The amount of water consumed by each person has decreased over time. However, with increasing population, Richmond's total water consumption has increased. The majority of the water consumed in the region remains unmetered. Although there are studies currently underway, it is not considered feasible to implement water metering in the short-term due to cost.

The price of water has increased over the last few years. Water rates in Richmond increased by 6.8% in 2001 due to an increase in GVWD rates, resulting in an average cost per day for single-family homes of \$0.62. Factors that have affected the price of water include the implementation of the regional Drinking Water Treatment Program, and costs associated with the frequency and severity of water main breaks, maintenance of water quality (see *Indicator B2: Water Quality*), and inflation.

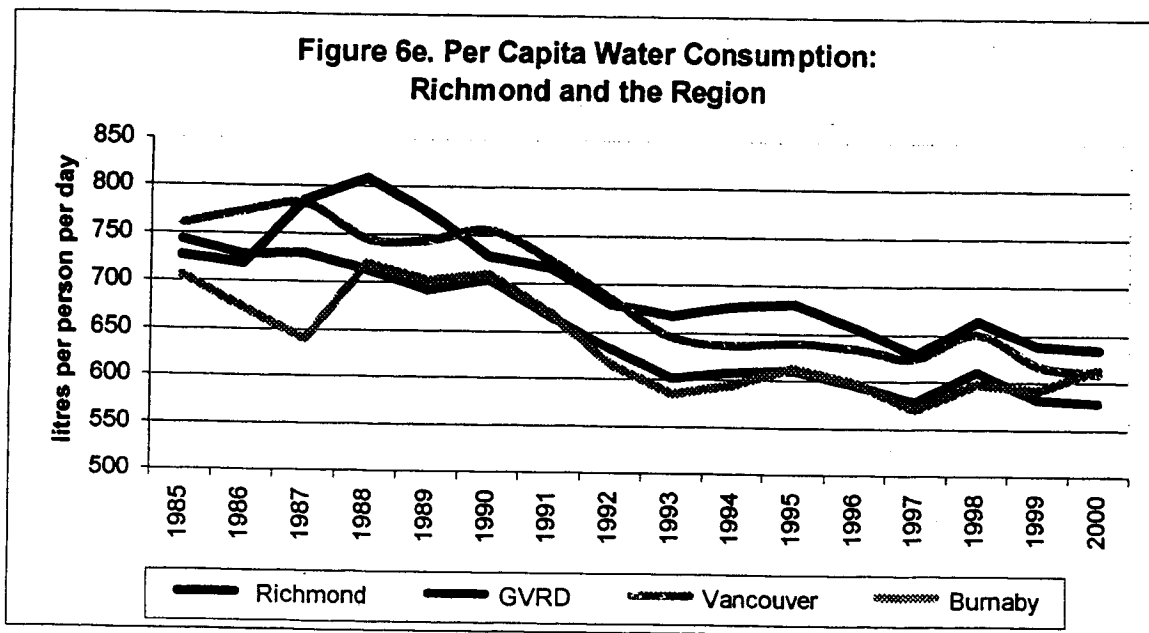
Existing City Programs

Since 1993, the GVRD has required municipalities to implement lawn watering bans or restrictions from June 1 to September 30 each year. In Richmond, lawn watering is restricted to two days per week as per City by-law 6085. The City works closely with the GVRD to promote and implement programs that will encourage water conservation in the region. For example, the City has a role in implementing a Water Conservation Education Program, developed by the GVRD, which includes informational presentations that encourage water conservation in the home, school, office and garden. The GVRD has also developed plays and films on water conservation and constructed gardening

displays to showcase water efficient landscaping and irrigation techniques. The GVRD and the City also encourage organizations such as schools, community centers and hotels to conduct water use audits. The audits identify leaks and other inefficiencies and makes recommendations for using water more efficiently.

Richmond and the Region

The good news is that, since 1985, per capita water use in Richmond has decreased by about 13%. The bad news is that while decreased, Richmond's per capita water consumption is higher than other regional municipalities and about 9% higher than the GVRD per capita water consumption rate (Figure 6e).



The GVRD as a region has the highest per person water consumption rate in Canada, and Canada has the second highest per capita water consumption rate in the world.

THE FUTURE

Targets and Influences

The City currently has no stated targets related to water consumption. However, one of the OCP's guiding principles is to expand water conservation initiatives. Water conservation is one of the SOE indicators that the City has identified as a priority for the development of targets.

In addition, the Union of BC Municipalities has passed a resolution in response to the issue of continued population growth and increased per capita consumption of water which requests that the Building Standards Branch amend the BC Building and Plumbing Code to require the use of water conservation devices in all new construction³⁹.

What Can Citizens Do?

Continuing to reduce individual water consumption can help offset the pressure from our growing population. Ideas for using less water in our daily activities include the following:

Indoors

- Install low or ultra-low flow toilets and showerheads.
- Check plumbing for leaks, especially sinks and toilet tanks.
- Use water displacement devices, such as toilet dams.
- Take shorter showers and fill the bath half full.

- Turn off the tap while you brush your teeth or shave.
- Use full load and shorter cycles on the washing machine and dishwasher.

Outdoors

- Follow lawn sprinkling restrictions.
- Limit your lawn area and reduce lawn watering as much as possible.
- Position sprinklers to avoid wasting water on cement and asphalt.
- Choose drought-tolerant plants (called 'xeriscaping').
- Water during the night or early morning to reduce evaporation.
- Use catchment barrels to collect rainwater and use this to water plants.
- Pay attention to what your automated sprinkler system is doing – don't water in the rain!
- Don't wash your car with a running hose – if possible, take it to a carwash facility that recycles water.
- Use a broom instead of a hose to clean driveways and sidewalks.

As part of the 2001 *Richmond Environmental Project Guidebook*, the City has added information to their website related to water conservation. See:

www.city.richmond.bc.ca/planning/environment/guidebook/consumption_water.htm

Also see the GVRD's '*Waterwise Gardening*' brochure for an introduction to the principles and methods of waterwise gardening.

SUMMARY

Mixed Results

Since 1985, Richmond's annual consumption of water has grown by 35%,

³⁹ Federation of Canadian Municipalities Report (1999).

Reaching a total consumption level of 38.3 million cubic metres in 2000. However, since 1985, per capita water consumption in Richmond has decreased by 13% to 634 litres per person per day in 2000. This represents a 5% decrease in per capita consumption rates since the 1998 SOE report.

However, despite the drop in per capita water consumption, Richmond's per capita consumption remains high compared with other municipalities within the GVRD, across Canada and around the world. Accordingly, this indicator is given a rating of Mixed Results.

Indicator 12: Energy Consumption

INTRODUCTION

Why Should We Measure This Indicator?

Canada ranks as the world's sixth largest user of energy. Our high energy consumption can be attributed to a number of factors including a cold climate, relatively low energy prices compared with other industrialized countries, and a high standard of living. Energy consumption represents one of the fundamental components of resource use, which is a key aspect of sustainable living⁴⁰.

Many forms of energy consumption utilize non-renewable energy sources such as oil and natural gas. Hydroelectric power is the main type of electricity consumed in the Lower Mainland. Although hydroelectric power is a renewable resource, the process of generating hydroelectric power may result in significant impacts on the environment. Specifically, the damming of rivers results in flooding of large areas of habitat, reducing river flows, and significantly altering river ecosystems. Alternative renewable energy sources, such as solar and wind power, have much lower environmental impacts but currently produce only about 1/10,000th of the energy consumed in Canada.

What is Being Measured?

There are many types of energy consumption activities. This indicator looks specifically at:



- Residential electricity consumption per 1000 people; and
- Residential natural gas consumption per 1000 people.

Electricity and natural gas were selected because these are the dominant forms of energy consumed by Richmond residents. No data are available to determine the relative use of other fuel sources such as wood burning or solar and wind power. Energy consumption by other sectors (i.e., commercial, industrial, institutional) has not been included in this edition of the SOE report but should be discussed in subsequent editions.

Although *Energy Consumption* is a new indicator in Richmond's SOE reporting, historical data have been collected and presented to demonstrate trends.

⁴⁰ Environment Canada Sustainable Community Indicators Database (2000).

RESULTS

Residential Electricity Consumption per 1000 People

There is an increasing trend in total electricity consumption for residential accounts in Richmond (Figure 6f). Richmond residents consumed about 3150 megawatt hours of electricity per 1000 people in 2000-01. This represents a 2.7% increase since 1997-98.

Residential Natural Gas Consumption per 1000 People

In general, total natural gas consumption for residential accounts in Richmond has been decreasing (Figure 6g). Richmond residents consumed about 360 gigajoules of natural gas per 1000 people in 2000-01. This represents a drop of about 5.3% since 1997-98.

Figure 6f. Electricity Consumption for Richmond Residential Accounts, 1997/98 to 2000/01

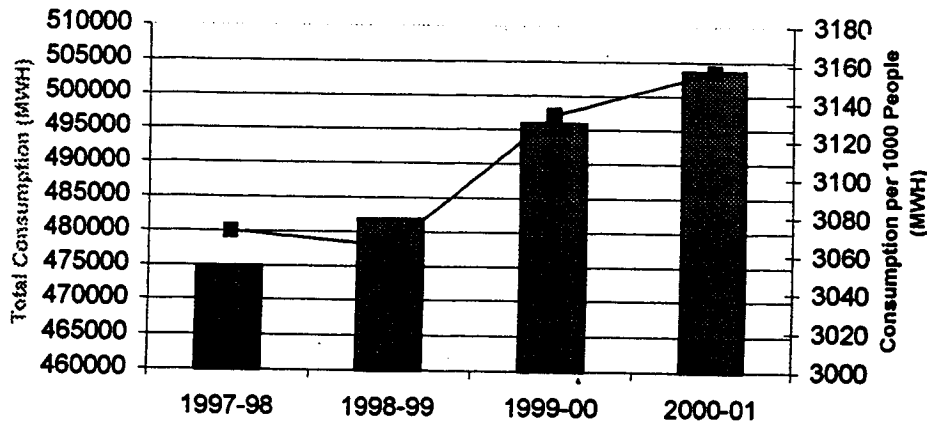
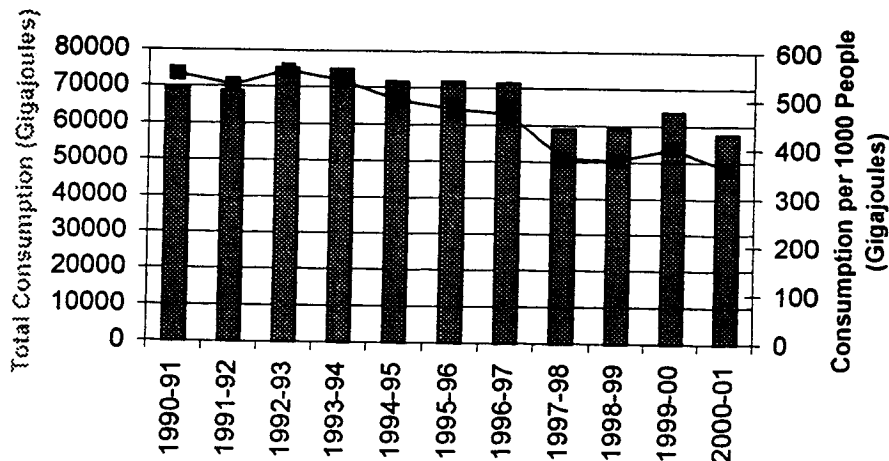


Figure 6g. Natural Gas Consumption for Richmond Residential Accounts, 1990/91 to 2000/01



DISCUSSION

What is Happening?

Residential energy consumption is influenced by a number of factors including the age of the home (older dwellings are less likely to be well insulated), the number and type of appliances in the home, the weather, the cost of energy, and personal preferences.

The price of natural gas has risen sharply in the past few years causing many people to switch to electricity or other sources of energy (e.g., wood burning fireplaces). Although the decrease in per capita natural gas consumption (Figure 6h) sounds like a positive trend, to show that we are truly being more energy efficient, we need to decrease our per capita consumption of *both* natural gas and electricity. Additionally, we need to consider the relative efficiency of the energy sources we choose. Natural gas use in residential applications (i.e., space heating, water heating, cooking and clothes drying) has been shown to result in increased energy efficiency when compared with electricity use⁴¹.

In terms of environmental impacts, both natural gas and hydroelectricity are less polluting than energy produced from burning wood, coal or oil. However, the most environmentally sound energy comes from alternative sources such as wave, wind and solar power. In the present, the use of these alternative types of energy is limited by inconvenience and costs associated with conversion, and by the lack of supplies and trained service personnel.

⁴¹ A.G.A. Planning & Analysis Group (1992) compared the impacts of natural gas and electricity at the point of ultimate energy consumption (i.e., residences), and also impacts associated with the production, conversion, transmission and distribution of energy to the household.

Existing City Programs

Richmond has won the Municipal PowerSmart Award for several years in a row because of its efforts to maintain energy efficiency standards for the community. The OCP directs the City to take a lead role in developing new energy saving programs and assisting the community with energy programs and services.

Richmond and the Region

Residential energy consumption data are not readily available for other municipalities.

THE FUTURE

Targets and Influences

As with other indicators, the demand for energy will be greatly influenced by our growing population. The City has yet to set targets for reducing energy consumption, although they have undertaken programs to increase their own efficiency (See *Indicator G1: City Environmental Practices*).

Future editions of the SOE report could expand on this indicator by incorporating data from commercial or industrial activities. It would also be valuable to determine the number of homes that use an alternative form of energy, such as solar or wind power. This was not reported in the current SOE edition due to the lack of data.

What Can Citizens Do?

Two basic ways of reducing the impacts of energy consumption are using less of it and minimize the emissions associated with its use. Actions you can take to reduce your consumption include:

- Try to use less energy in your daily activities, for example, dry clothes and dishes, turn down the thermostat, and remember to turn off lights or appliances not in use.
- Powersmart your home with good insulation and use energy saving devices to reduce electrical and furnace use (check out BC Hydro's Powersmart tips at www.bchydro.com).
- When buying or upgrading a computer system, purchase one with energy efficient display mode and power stand-by functions. Encourage your employer to do the same.
- Plant trees around your home for shading and insulation from the wind.
- Support development of renewable sources of energy, e.g., wind and solar power.
- Undertake one of the energy conservation projects listed in the *2001 Richmond Environmental Project Guidebook*.

SUMMARY

Bad News

Richmond residents consumed about 3150 megawatt hours of electricity per 1000 people in 2000-01. This represents a 2.7% increase since 1997-98. Richmond residents consumed about 360 gigajoules of natural gas per 1000 people in 2000-01. This represents a drop of about 5.3% since 1997-98. Although we are using less natural gas, probably due to rising costs, we are using more electricity. Additionally, we are moving away from the greater energy efficiency that is attributable to natural gas. There are presently no data regarding the use of alternative sources of energy such as wind, wave and solar power. The trends associated with this indicator warrant a rating of Bad News.

Indicator E3- Residential Solid Waste

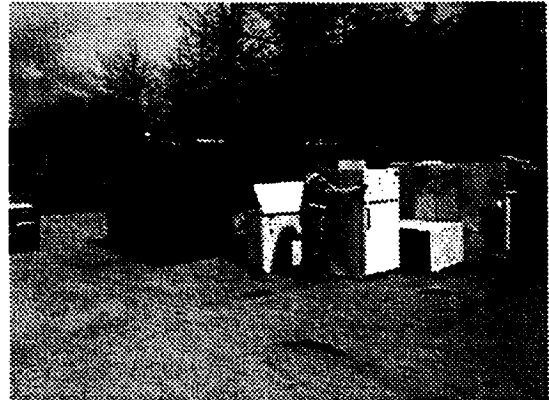
INTRODUCTION

Why Should We Measure This Indicator?

Even with recycling programs, thousands of tonnes of solid waste are sent to landfills or incinerators in the GVRD each year. Solid wastes include household and commercial garbage, yard and garden trimmings, and wastes associated with land clearing, demolition and construction projects. The environmental effects associated with burning or burying wastes include reduced air quality from incineration and decomposition, and leaching of chemicals from buried wastes into ground or surface water. Landfills also consume valuable land.

Within the GVRD, there are a limited number of landfill sites shared by all municipalities. Finding suitable new sites is difficult. Most new fill sites are located outside of the communities they serve, resulting in transportation costs and other impacts associated with transporting wastes. The handling of waste materials is a drain on the local economy, and while the population continues to grow, we will be under increasing pressure to alter consumption patterns to reduce the amount of solid waste generated.

The City is responsible for collecting waste from residents of single-family dwellings⁴². The City also operates recycling programs and collects recyclable materials from residents of single-family homes and apartments, mainly through its Blue Box Program. Waste and recyclables collected by the City are weighed prior to disposal or processing. Waste from other sectors,



including multi-family residential, industrial, institutional, commercial and construction, is collected by contractors or private collection agencies that do not track the amount of waste originating from the different municipalities.

What is Being Measured?

Since data for Richmond are only available for single-family homes, this indicator is limited to measuring:

- Amount of solid waste generated by residents of single-family homes;
- Amount of waste recycled by residents of single-family homes); and
- Amount of waste disposed of by residents of single-family homes.

The percentage of residents who presently reside in single-family homes has not significantly changed since 1997 (61% and 60% respectively).

⁴² Includes duplexes, but not townhomes.

A better indicator would be the total amount of material recycled and disposed of as waste by the Richmond community. Unfortunately, this is not presently possible due to data limitations.

RESULTS

Amount of Solid Waste Generated by Residents of Single-family Homes

The amount of solid waste generated by residents of single-family homes in 2000 was 35,190 tonnes (Figure 6h) or about 0.36 tonnes per person. This was approximately

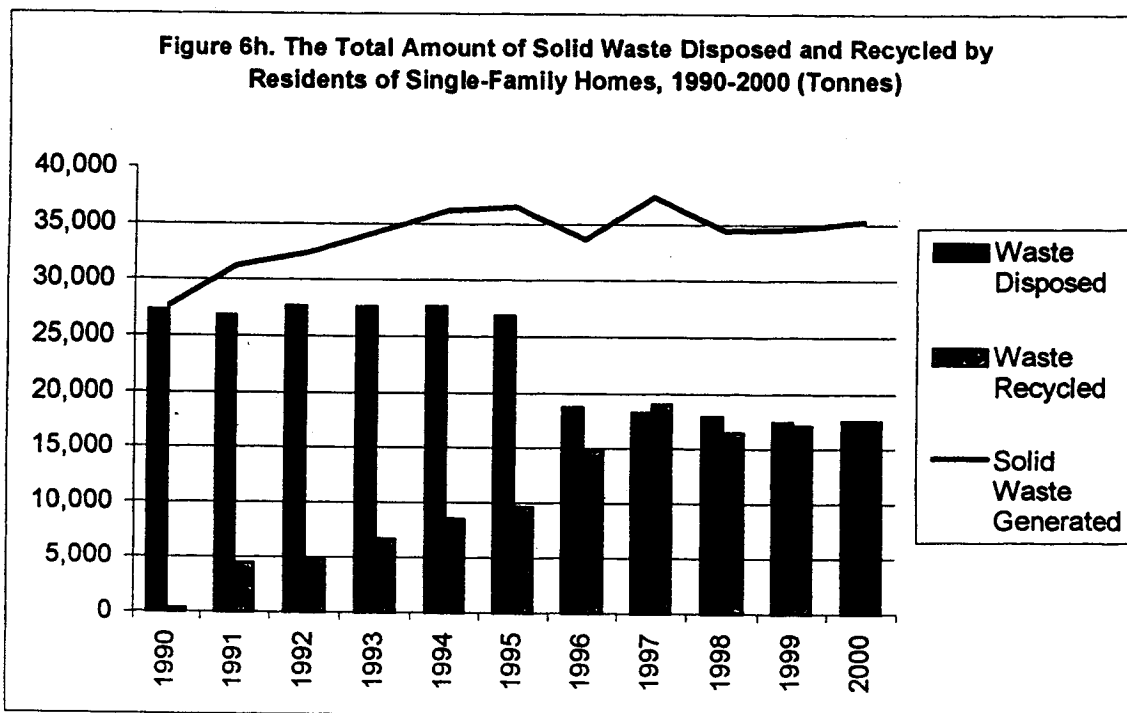
2200 tonnes less than the total amount generated in 1997 despite the city's increase in population.

Amount of Solid Waste Recycled by Residents in Single-family Homes

Approximately 50% of the waste generated has been recycled for the past three years, while approximately 50% has been disposed of.

Amount of Solid Waste Disposed of by Residents of Single-family Homes

Fifty percent of all solid waste generated in 2000 was disposed of rather than recycled.



DISCUSSION

What is Happening?

This indicator shows a positive trend. Despite a growing population, single-family residences in Richmond generated less solid waste in 2000 than in 1997. These results tell us that the city and its residents are working hard to reduce the amount of waste generated.

Existing City Programs

The OCP's objectives for reducing the impacts of solid waste on the environment include encouraging recycling and working with the GVRD and provincial agencies to manage solid waste disposal.

There are many recycling efforts in place at present. The City continues to promote and improve its curbside blue box and yard waste pickup programs. The City also operates a recycling depot, which was expanded in 2000 to include a return facility for paints, pesticides and solvents. The City also manages a composting garden to recycle yard and landscape trimmings. Data from these programs should be incorporated into the next edition of the SOE report.

The City's *Environmental Purchasing Policy and Guidebook* was approved by Richmond Council in 2000. The guidebook provides City staff with advice and options for selecting products and materials that are more environmentally-friendly and for generate less waste overall. This project won the Canadian Association of Municipal Administrator's Environmental Award and received an Honourable Mention for the Federation of Canadian Municipalities.

Richmond and the Region

People in the GVRD currently generate about 2.7 million tonnes of solid waste each year. Of this total, 25% is residential, 43% is industrial, commercial and institutional, and 32% is demolition, land clearing and construction waste. At the present time, about 48% of the region's waste is recycled.

To manage waste and promote recycling, the GVRD has adopted a *Regional Solid Waste Management Plan*. The plan set out guidelines to achieve a goal of 50 percent waste reduction by the year 2000 – a target that has been met. The GVRD has also embarked on a number of other initiatives to encourage residents to further reduce the amount of waste disposed of. These initiatives include educational programs for schools, a program to assist the industrial/commercial/ institutional sector in the establishment of recycling activities, and backyard composting information.

THE FUTURE

Targets and Influences

The Province mandated the GVRD to reduce its per capita waste disposal to 50% of 1990 levels by the year 2000. In 2000, per capita waste disposal by single-family residences in Richmond had been reduced to 57% of 1990 levels.

What Can Citizens Do?

Producing less waste will lead to cleaner air, water and soil. The three 'R's of waste management are: reduce, reuse and recycle. Try these ideas:

- When considering a purchase ask yourself "Is this really necessary?"
- Consider less packaged alternatives when shopping (e.g., refillable containers), and buy in bulk.
- Purchase reusable products.
- Buy used goods.
- Compost kitchen and yard waste.
- Repair rather than replace items.
- Rent or share seldom-used items.
- Donate toys, clothes or other items to charity or schools.
- Actively participate in local recycling programs.
- Encourage employers to implement recycling and waste reduction programs where you work.

SUMMARY

Good News

Residents of single-family homes generated 35,190 tonnes of solid waste in 2000 or about 360 tonnes per 1000 people. This was approximately 2200 tonnes less than what was generated in 1997 despite the City's population growth. Fifty percent of waste generated was recycled, up from 45% in 1997. This is Good News.

Indicator E3: Wastewater

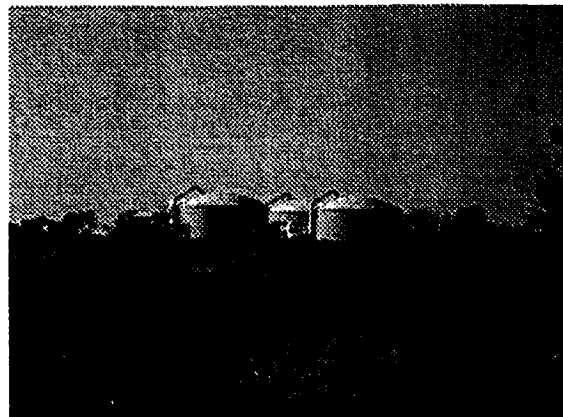
INTRODUCTION

Why Should We Measure This Indicator?

Wastewater is the term used to describe water that has been used in homes, businesses and industry. Domestic wastewater includes liquid waste from sinks, showers and bathtubs, toilets, washing machines and dishwashers. Industrial wastewater includes liquid waste from a variety of activities, such as food preparation and manufacturing. Both domestic and industrial liquid waste flows through an extensive collection system to wastewater treatment plants.

Wastewater treatment is important for protecting organisms in aquatic ecosystems that receive water after it has been used, and for ensuring that human populations receive high quality water. As noted under *Indicator B1: Fraser River Water Quality*, within the GVRD, effluents from wastewater treatment plants can affect the quality of water in the Fraser River. Although the Fraser does not provide drinking water, the river is used for contact recreation, irrigation of crops, and for harvesting of aquatic species that are consumed by human populations.

A major aim of wastewater treatment is to remove as much of the biochemical oxygen demand (BOD) and total suspended solids (TSS) as possible before the remaining water, called effluent, is discharged to water bodies. BOD is a measure of the amount of oxygen used by microorganisms to decompose organic wastes present in the water (e.g., dead plants, leaves, grass clippings, manure, sewage, or food waste). When BOD levels are high, oxygen is being consumed by microorganisms at a high rate thus depleting the supply of oxygen available for use by other forms of aquatic



life. TSS is an indication of the amount of organic and inorganic solids that are carried along by the water contributing to turbidity or cloudiness.

BOD and TSS removal is achieved using one or more levels of treatment: primary, secondary and tertiary. Primary treatment is a mechanical process that removes between 30-40 per cent of BOD and 50 per cent of TSS. Secondary treatment is a biological process that removes approximately 90 per cent of BOD and TSS. Tertiary treatment removes the remaining phosphates and nitrates, along with some chlorinated compounds, salts, acids, metals and toxic compounds.

Richmond is serviced by three wastewater treatment plants: Lulu Island, Annacis Island and Iona Island. These are operated by the GVRD. Prior to 1998, wastewater processed by the Lulu, Annacis and Iona wastewater treatment plants received only primary treatment. Between 1998 and 2000, the Lulu and Annacis plants were upgraded from primary to secondary levels of treatment. The Iona plant remains a primary-level plant.

What is Being Measured?

To evaluate how effectively Richmond is dealing with its wastewater, the following measures were examined:

- **Residential sewered population;**
- **Richmond's share of flow volume to area wastewater treatment plants;**
- **Volume of wastewater treated; and**
- **Treatment efficiency (BOD and TSS loading).**

Richmond has a number of areas that are not serviced by the sewer system (e.g., on septic). This indicator deals with wastewater that flows through the collection system and into treatment plants. Additionally, this indicator is restricted to reporting on treatment efficiency for BOD and TSS removal.

RESULTS

Residential Sewered Population⁴³

The Lulu Island Wastewater Treatment Plant services nearly 100% of Richmond's residential sewered population. In 2000, this represented about 159,000 Richmond residents, an increase of 74% since 1986. The only residential areas not serviced by the Lulu Island plant are some subdivisions in East Richmond that are serviced by the Annacis Island plant. The Iona Island plant services the airport and the City of Vancouver.

Richmond's Share of Flow Volume to Area Wastewater Treatment Plants

The wastewater treatment plants receive loadings from all municipalities within the GVRD. The Lulu Island Wastewater Treatment Plant receives 100% of its flow

from Richmond. Presently, Richmond's share of flow volume to the Iona and Annacis plants represents about 1% of the total volume treated at each plant. This pattern has been consistent since 1995.

Volume of Wastewater Treated

The GVRD maintains records of average daily wastewater flow volumes to each of its wastewater treatment plants. The estimated average daily wastewater flow from Richmond to all three treatment plants combined was 82 million litres per day in 2000.

Between 1984 and 2000, the average daily flow volume from Richmond to the Lulu Island plant increased by 90% to reach 71.9 million litres per day (Figure 6i). This is the equivalent of about 450 litres per person per day (Figure 6i)⁴⁴.

Based on Richmond's estimated share of loading on the Iona and Annacis plants, the flow of wastewater from Richmond sources has been in the range of eight to eleven million litres per day for the years 1995 to 2000 (Figure 6j).

Treatment Efficiency (BOD and TSS)

To assess treatment efficiency for wastewater Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS) influent loadings were compared to effluent loadings for the Lulu Island plant, which is the main plant servicing Richmond. Between 1991 and 1998, primary treatment resulted in an average 27% decrease in BOD and 72% decrease in TSS. Since the implementation of secondary treatment in 1998, BOD loadings have decreased by 90% and TSS loadings by 94% (Figures 6k and 6l).

⁴³ The GVRD estimates the residential sewered population from census data for each municipality.

⁴⁴ Per capita estimates are based on Richmond population trends and do not take into account the percentage of the population each year that is not serviced by the sewer system.

Figure 6i. Lulu Island Average Wastewater Flows and Estimated Per Capita Flow

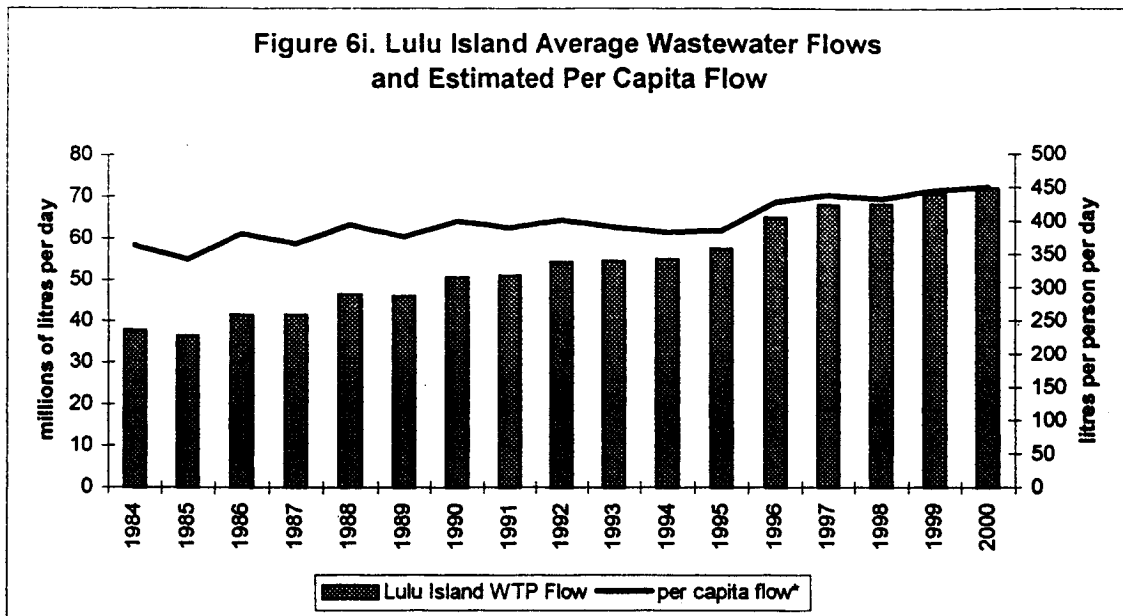


Figure 6j. Annacis Island and Iona Island WTPs
Estimated Average Daily Wastewater Flow Volumes from Richmond

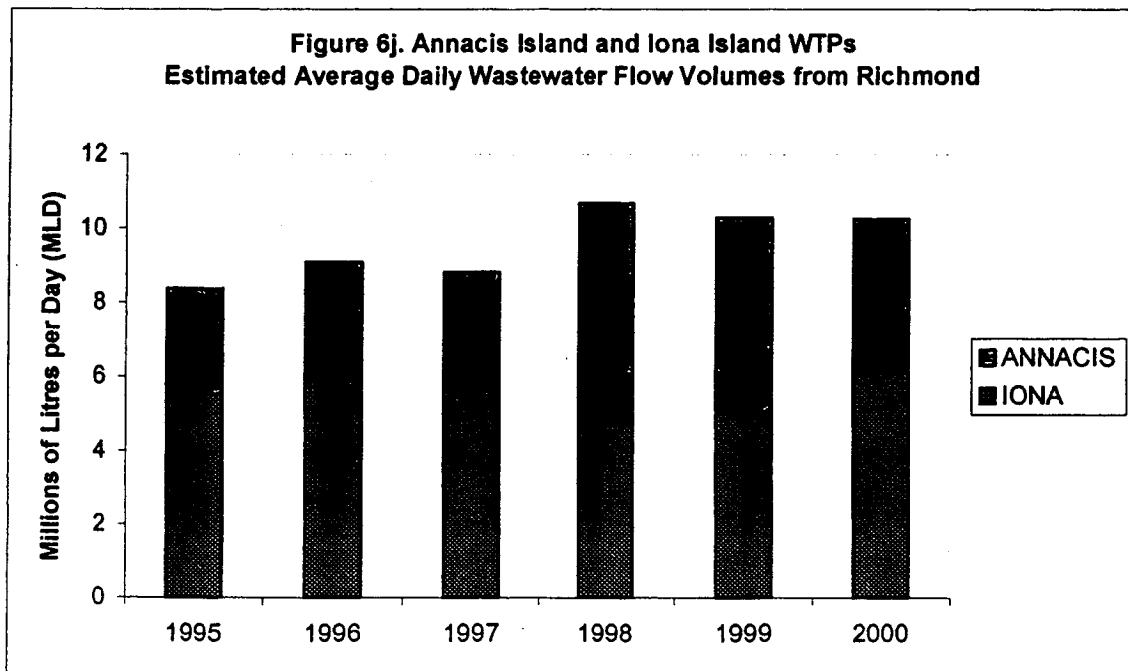


Figure 6k. Lulu Island WTP: Influent vs. Effluent BOD

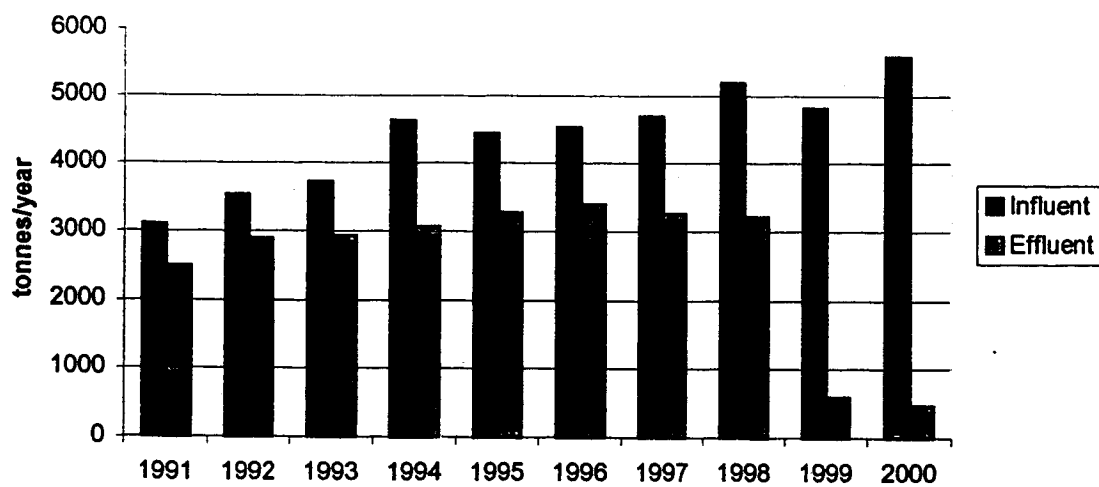
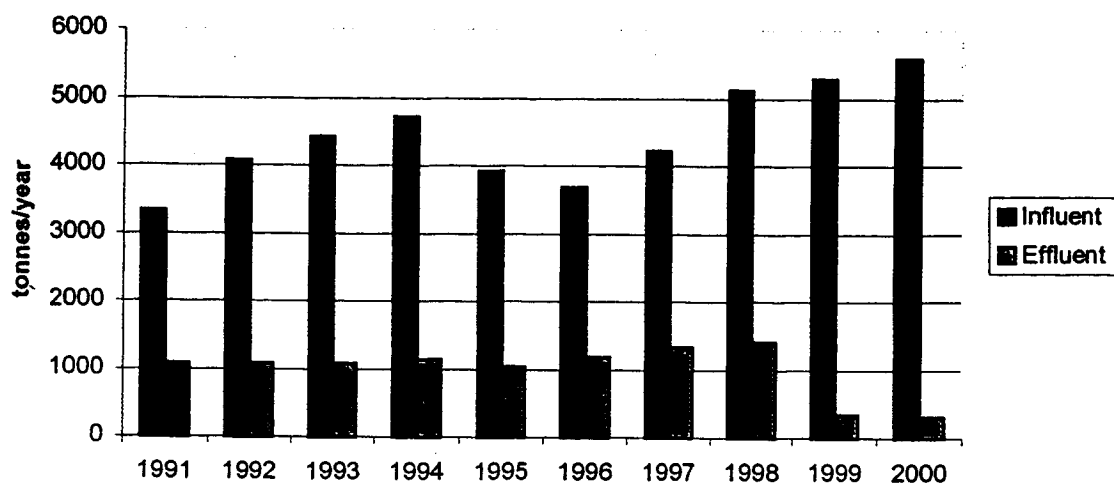


Figure 6l. Lulu Island WTP: Influent vs. Effluent TSS



DISCUSSION

What is Happening?

The increase in the proportion of Richmond's residential population that is serviced by a sewer system means fewer properties have septic systems. Although a well maintained septic system provides wastewater treatment comparable to that of treatment plants, older or poorly maintained systems have an increased potential for untreated wastewater to leach into groundwater.

The increase in both total and per capita wastewater volume has implications for infrastructure and servicing requirements. An increase in the infrastructure required to transport and treat wastewater can have negative environmental impacts, as well as financial costs. However, the positive news is that, although more wastewater is being generated, the quality of the treated water that is being returned to the environment has greatly improved.

Existing City Programs

The OCP outlines several objectives and policies related to wastewater, including:

- Maintenance of an efficient, adequate, and self-supporting sewage and wastewater collection and disposal system which meets the needs of the public in an environmentally responsible manner;
- Expansion of new sewerage services to areas earmarked for new development; and
- Provision of an efficient and self-supporting stormwater and wastewater collection and disposal system, which meets the needs of the public and regional clean water requirements.

Richmond and the Region

The GVRD's regional sewerage and drainage system currently serves nearly 2 million residents in 20 member communities with a total land area of almost 3000 square kilometres. The infrastructure includes five treatment plants, 33 pumping stations, and 450 kilometres of trunk and interceptor sewers and currently handle more than 416 billion litres of wastewater a year. Of this, Richmond comprises 8% of the region's sewered population, and 4.5% of the total land area serviced.

THE FUTURE

Targets and Influences

The GVRD's *Stage 2 Liquid Waste Management Plan* (LWMP) represents a coordinated effort on behalf of the GVRD and its member municipalities to address wastewater. Wastewater permits issued by the GVRD specify a maximum daily level for each water treatment plant. The permitted maximum daily levels (in millions of litres) are 1530 for Iona Island; 1050 for Annacis Island; and 161 for Lulu Island. Current and historic flow levels have not exceeded permit levels for any of the three plants.

Regional targets for the management of wastewater in the LWMP also include targets for BOD and TSS. Maximum daily concentration levels for water treatment plants are shown in Table 6a.

Table 6a. Maximum Daily Concentration Levels for Wastewater Treatment Plants

Treatment Plant	BOD (mg/l)	TSS (mg/l)
Iona Island	130	100
Annacis Island	45	45
Lulu Island	45	45

As the Iona plant remains a primary treatment plant, its maximum concentrations are higher. Upgrading the Iona plant to secondary treatment would improve the quality of effluent to levels comparable to those of the Annacis and Lulu island plants.

What Can Citizens Do?

Some of the things you can do to address wastewater issues include:

- Reduce household hazardous wastes by using environmentally-friendly alternatives to ordinary household products such as cleaning fluids, oven cleaners, solvents, paints, automotive and garden care products. The City has posted information for alternative household products at: www.city.richmond.bc.ca/recycle/
- If your residence is on a septic system, ensure the system is well maintained and functioning properly. For more information phone the City's Health Department at 604-233-3107.

SUMMARY

Mixed Results

Since 1973, the majority of wastewater from Richmond's residential population has been serviced by the Lulu Island Wastewater Treatment Plant. The bad news is that between the years 1984 and 2000, the average daily flow volume from Richmond to the Lulu Island Treatment Plant increased by 90% to reach 71.9 million litres per day (or about 450 litres per person per day).

The good news is that the Lulu and Annacis island plants have been upgraded from primary to secondary levels of treatment, which has significantly improved the quality of treated effluent. The Iona plant remains primary treatment. This indicator result in an overall rating of Mixed Results.

TOPIC G: CITY ENVIRONMENTAL PRACTICES

Richmond has earned a reputation as a 'green' municipality by demonstrating leadership in sustainable environmental practices manifested through a variety of policies, plans and actions. This indicator looks at specific areas to see how the City's own practices are influencing our environment, specifically: energy consumption at selected facilities; and City vehicles that run on natural gas. Both issues are discussed under one indicator,



G1: City Environmental Practices.

Indicator G1: City Environmental Practices

INTRODUCTION

Why Should We Measure This Indicator?

All levels of government require resources – energy to light and heat buildings; fuel to run vehicles; paper and office supplies; and land to accommodate offices and ancillary facilities. The City of Richmond, with over 1000 full-time employees and over 700 part-time and auxiliary staff, is a major consumer of such resources. By implementing good environmental practices, the City can set an example for others and, at the same time, realize cost saving benefits.



What is Being Measured?

Although this topic was identified in the 1998 SOE report, no indicators were measured. Since that time, two measures of the City's environmental practices have been selected for monitoring:

- **Energy Consumption at Selected City-Operated Facilities; and**
- **Number and Proportion of vehicles in the City Fleet that Utilize Natural Gas Fuels.**

These measures are only a small segment of the City's practices. They were selected because relatively good data are available.

The importance of measuring energy consumption has been discussed in *Indicator F2*. The proportion of vehicles in the City fleet that run on natural gas is directly linked to vehicle emissions and thus has an influence on Air Quality (see *Indicator C1*).

RESULTS

Energy Consumption at Selected City-Operated Facilities

Energy consumption data for ten City-operated facilities for 1995-2000 are shown in Figures 7a and 7b. These facilities were selected as they are of comparable size and function, however, the data do not take into account changes in energy consumption that may be related to changes in programs and usage, which are a function of population. Since 1995, there have been only minor changes in energy consumption at many City-operated facilities. There seems to be a marked increase in consumption at a number of facilities in 1996. City Hall was not included as one of the ten selected facilities because data are only available since 2000 when the building opened. Electricity consumption at City Hall for 2000 was 1,349,281 kwh. The building does not use natural gas.

Figure 7a. Electricity Consumption (KWH) for Selected City-operated Facilities, 1995-2000

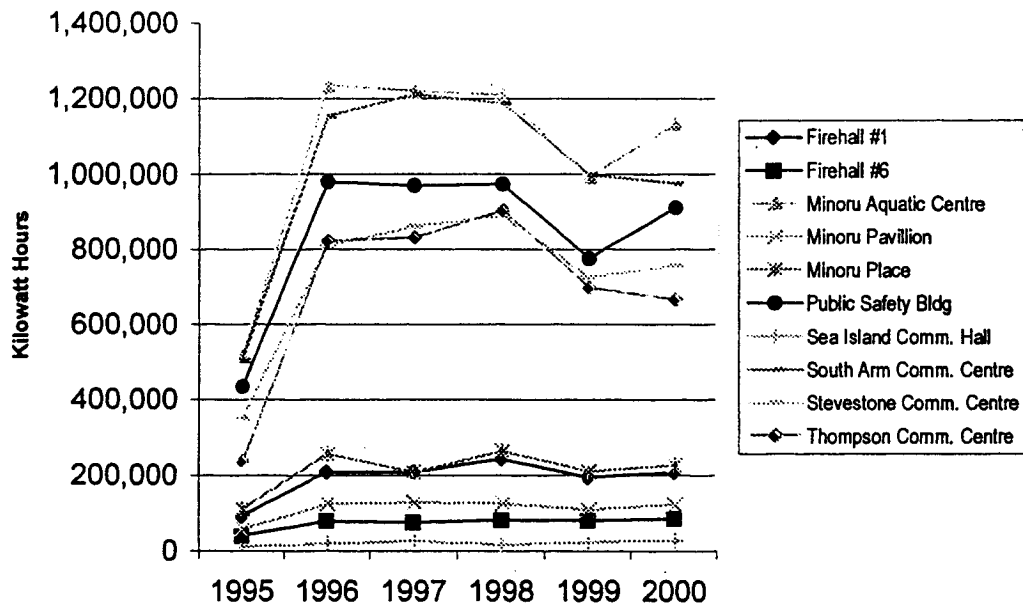
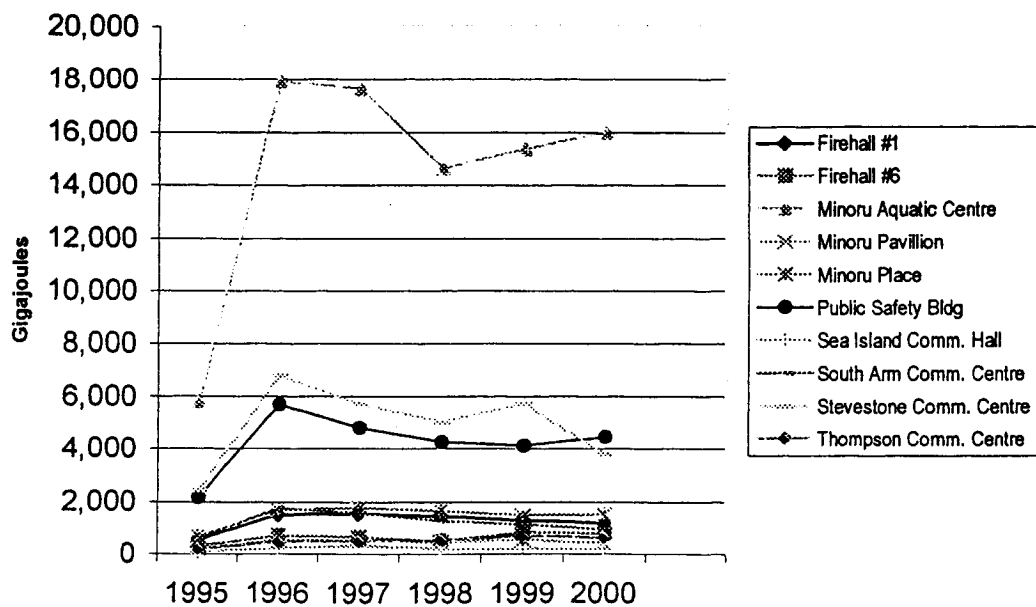


Figure 7b. Natural Gas Consumption (GJ) for Selected City-operated Facilities



Number and Proportion of Vehicles in the City Fleet that Utilize Natural Gas Fuels

Ninety-three City vehicles and an additional 20 RCMP vehicles have been converted to utilize both natural gas and gasoline – at a cost of about \$6000-\$7000 per conversion. This represents about 50% of the City's light-fleet vehicles. The technology for converting light-fleet vehicles, powered by spark-ignition engines, to operate on natural gas is better developed and proved than that for converting heavy-duty diesel-powered vehicles. The City has not yet begun to convert heavy-fleet vehicles to run on natural gas.

DISCUSSION

What is Happening?

About half of the ten facilities selected have shown a reduction in energy consumption since 1996, however, variations in the last two years make it difficult to tell if this trend is likely to continue. Cities are major energy consumers, but many opportunities exist for savings. The City has taken steps to reduce energy consumption at its facilities. In the early 1990s the City undertook an extensive program of retrofitting buildings to be more energy efficient. Unfortunately, data are not available for the years prior to 1995 to assess how effective these measures were in decreasing energy use.

Over the years the City has slowly been acquiring new light-fleet vehicles that run on natural gas and converting existing light-fleet vehicles when possible. This has a positive effect on air quality as natural gas burns cleaner than gasoline or diesel. A gas compressor station has been installed at the City Works Yard for fueling vehicles. This helps ensure that vehicles which have been converted are able to use natural gas as often as possible.

Existing City Programs

The City conducts energy audits at all facilities, undertakes regular preventative maintenance of equipment to ensure efficiency, and installs energy-saving devices when possible. For example, in cooperation with BC Hydro, the City installed light sensors at the Thompson Community Center that automatically illuminate a room when it becomes occupied. The City has a computerized system at the City Works Yard that can control heat and light levels at most city facilities relative to level of use. Richmond has won the Municipal Power Smart Award several years in a row because of its efforts to maintain energy efficiency standards in the community. It is believed that these energy-saving programs have saved the City hundreds of thousands of dollars over the years.

For its vehicle fleet, the City is currently investigating alternative fuel sources. For example, Richmond is currently involved in a pilot project with BC Hydro and BC Gas to test the use of Hythane – a hybrid fuel composed of hydrogen and methane gas. Hythane has the same emissions as natural gas but is more cost effective. However, engine development for this fuel is in the very early stages and fueling infrastructure has not been developed.

The next steps will involve looking at ways to reduce emissions associated with heavy-fleet vehicles. With the latest technology, it is now possible to convert heavy diesel engines to bi-fuel systems (which use a combination of natural gas and diesel) without penalty in performance. The costs and feasibility of undertaking this conversion should be investigated.

In addition to the two indicators discussed in detail above, the City's efforts to make more environmentally responsible purchasing

choices in worth noting. In 1999, Richmond adopted an Environmental Purchasing Policy and produced an *Environmental Purchasing Guide* to encourage, although not regulate, the procurement of more environmentally-friendly supplies and materials. The document includes specific guidelines for a variety of products and services; information on how to incorporate environmental purchasing into the writing of product specifications; a list of companies within the GVRD that sell materials with recycled content; a list of websites and other resources with information on environmental purchasing; and GVRD specifications for project waste management and building deconstruction. Unfortunately, no data are available at this time to report on how this program is affecting actual procurement choices.

It is also worth mentioning the award-winning design of Richmond's new City Hall, which contains many environmentally-sound design features, including energy and water saving measures.

Richmond and the Region

Other cities in the GVRD have also taken a lead role in managing their impacts on the environment.

The City of Burnaby's OCP states that environmentally-responsible products and practices will be used in City operations and facilities wherever possible. Procurement initiatives focus on recycled materials and environmentally-sensitive cleaning products; a municipal-wide and staff waste reduction program is in place; an integrated pest management program employing ecologically-based landscaping practices has been implemented; and vehicle fleets are maintained to ensure maximum

efficiency and, if possible, use alternative fuel systems⁴⁵. The City of Surrey hosts in-house workshops for City staff to educate them on different elements of environmental protection and all operations staff must attend a workshop on how to take an ecosystem approach in municipal projects (e.g., wildlife tree identification and the management of old-field habitats)⁴⁶.

THE FUTURE

Targets and Influence

As a general rule, the City of Richmond aims to reduce its overall impact on the environment. However, no specific targets have been set.

Although there are currently no data, other indicators that may be considered for future editions of the SOE report. It is recommended that the next report edition include data on the City's use of pesticides. The City uses pesticides to minimize insect problems (e.g., mosquito outbreaks). However, pesticides can have negative and even lethal effects on the health of humans and animals. Even at low concentrations, exposure to some pesticides can lead to birth defects, disease, and interference with the immune and reproductive systems. Additionally, pesticides can persist and increase in the environment through the process of bioaccumulation.

Other potential indicators include: recycling activities in City buildings or works yards; landscaping to benefit wildlife; actual procurement of environmentally-friendly materials; and transportation choices by City employees.

⁴⁵ Information on the City of Burnaby obtained from Curran 1999.

⁴⁶ Information on the City of Surrey obtained from Curran 1999.

What Can Citizens Do?

Citizens can become informed about the City's environmental practices and its performance in meeting guidelines and targets. If you have a suggestion on how the City's operations can be made more environmentally-friendly, contact Richmond City Hall at 604-276-4000.

Citizens can also reevaluate their own use practices. For example, consider investing in a vehicle that runs on natural gas or investigate alternatives to chemical pesticides that you may be using on your own property.

SUMMARY

Good News

Energy saving measures have been installed in many City-operated facilities leading to decreased energy consumption. Ninety-three City vehicles, about 50% of the light-fleet vehicles, have been converted to natural gas fuel systems. The City has been a leader in the development of 'green' policies and programs such as the *Environmental Purchasing Guide* and the award-winning environmentally-friendly design and construction of the new City Hall. This indicator has therefore been given a rating of Good News.

TOPIC II: NOISE

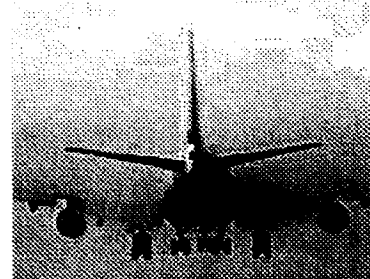
Noise was included in the 1998 SOE report although no noise indicators were selected at that time. However, its inclusion was based on an increasing recognition and concern about the impacts of noise on human health and city livability. In Richmond, three categories of noise are recognized:

- 1) construction noise (e.g., from the development of new buildings or roads);
- 2) ambient noise which generally becomes more pronounced as the concentration of people in an area increases (e.g., from traffic, lawn mowers, music or commercial facilities that attract crowds); and
- 3) aircraft noise which predominantly affects people living near or under the airport flight paths.

The 2001 edition of the SOE report includes the indicator:

H1: Noise.

Both ambient noise and airport noise are discussed.



Indicator H1: Noise

INTRODUCTION

Why Should We Measure This Indicator?

While some level of noise is generally accepted as part of urban living, pervasive noise is detrimental to the health and well-being of residents. Among humans, excess noise can contribute to hearing loss, stress-related illnesses and interfere with learning and sleep patterns. Although many types of urban wildlife have shown an ability to adapt to noise, the long-term effects of noise on wildlife are not well understood.

Increased automobile and air traffic, and construction activities, combined with more people living in compact areas, will inevitably contribute to greater noise levels. It is, therefore, important to monitor noise levels to assess conditions, identify trends and determine whether management activities are being effective.

What is Being Measured?

This indicator measures three aspects of urban noise in Richmond:

- **Annual Airport Noise Exposure Forecasts;**
- **Average Annual Noise Levels at Ambient Noise Monitoring Terminals; and**
- **Number of Noise Complaints.**

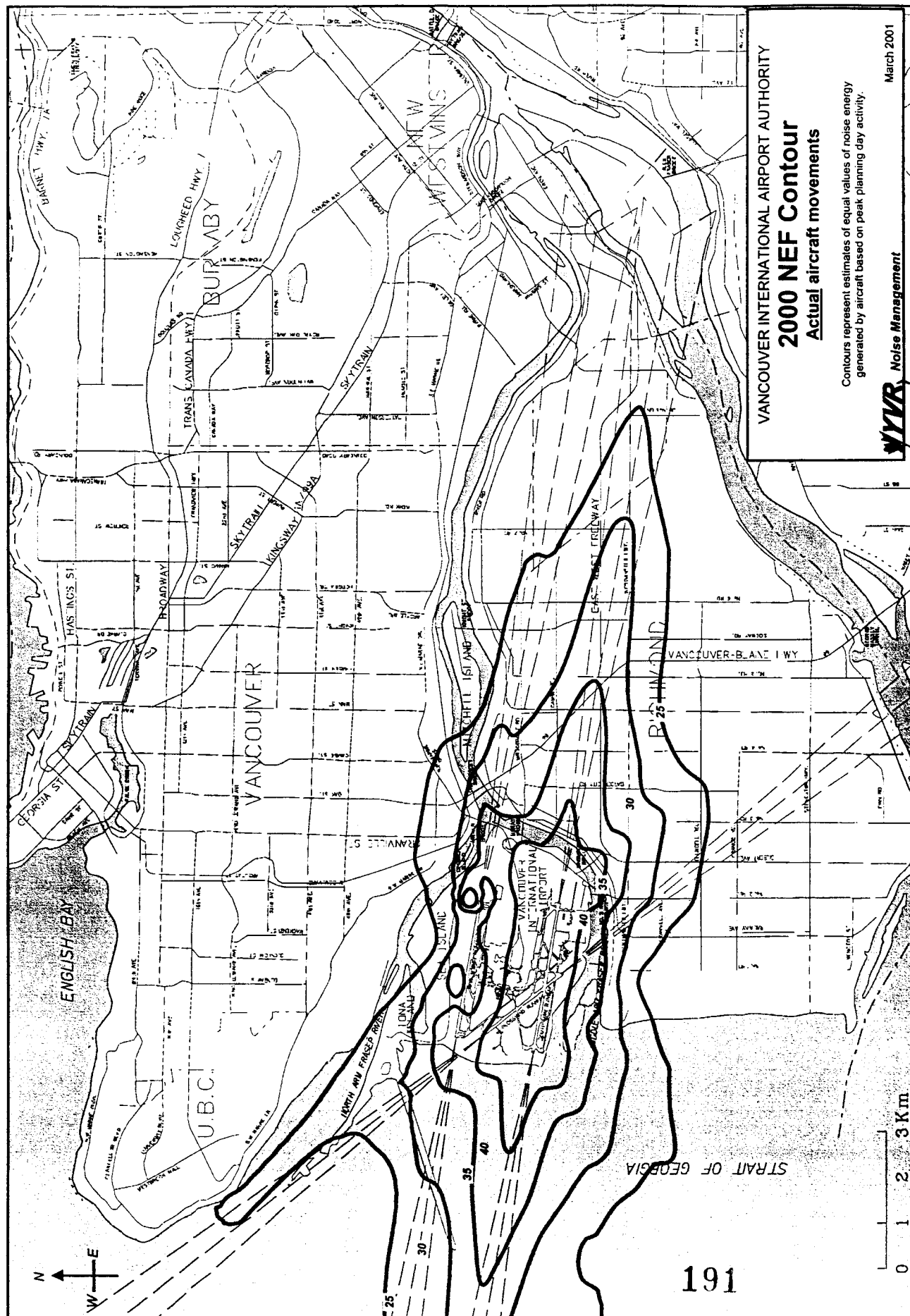


RESULTS

Annual Airport Noise Exposure Forecasts

Noise Exposure Forecast (NEF) contours are mapped by the Vancouver International Airport Authority. These decibel contours describe the forecast noise levels in the area surrounding the airport. NEF contours for 2000 are presented in Figure 8a.

Figure 8a. Vancouver Airport Authority Noise Exposure Forecasts (2000)



Average Annual Noise Levels Recorded at Ambient Noise Monitoring Terminals

There are nine Noise Monitoring Terminals (NMT) in Richmond (Figure 8b) which are used to monitor ambient noise levels. This includes aircraft noise in addition to other contributing sources such as community noise sources, construction, motor vehicles, people, lawn mowers, barking dogs and aircraft. There are historic data, from each NMT, for daily, monthly and annual average noise levels measured in dBA (A-weighted decibels) (Figure 8c).

Average annual noise levels have remained relatively constant for the past six years for NMTs that are dominated by aircraft landing and take-off noise (e.g., Richmond International College, Airside Burkeville and West Sea Island). Greater variations in the measured noise levels at other stations farther from the airport are due to non-airport related activities such as traffic. Comparisons with noise levels recorded at NMTs located in other municipalities are shown in Figure 8d.

Figure 8b. Locations of Noise Monitoring Terminals in Richmond, Vancouver and Delta

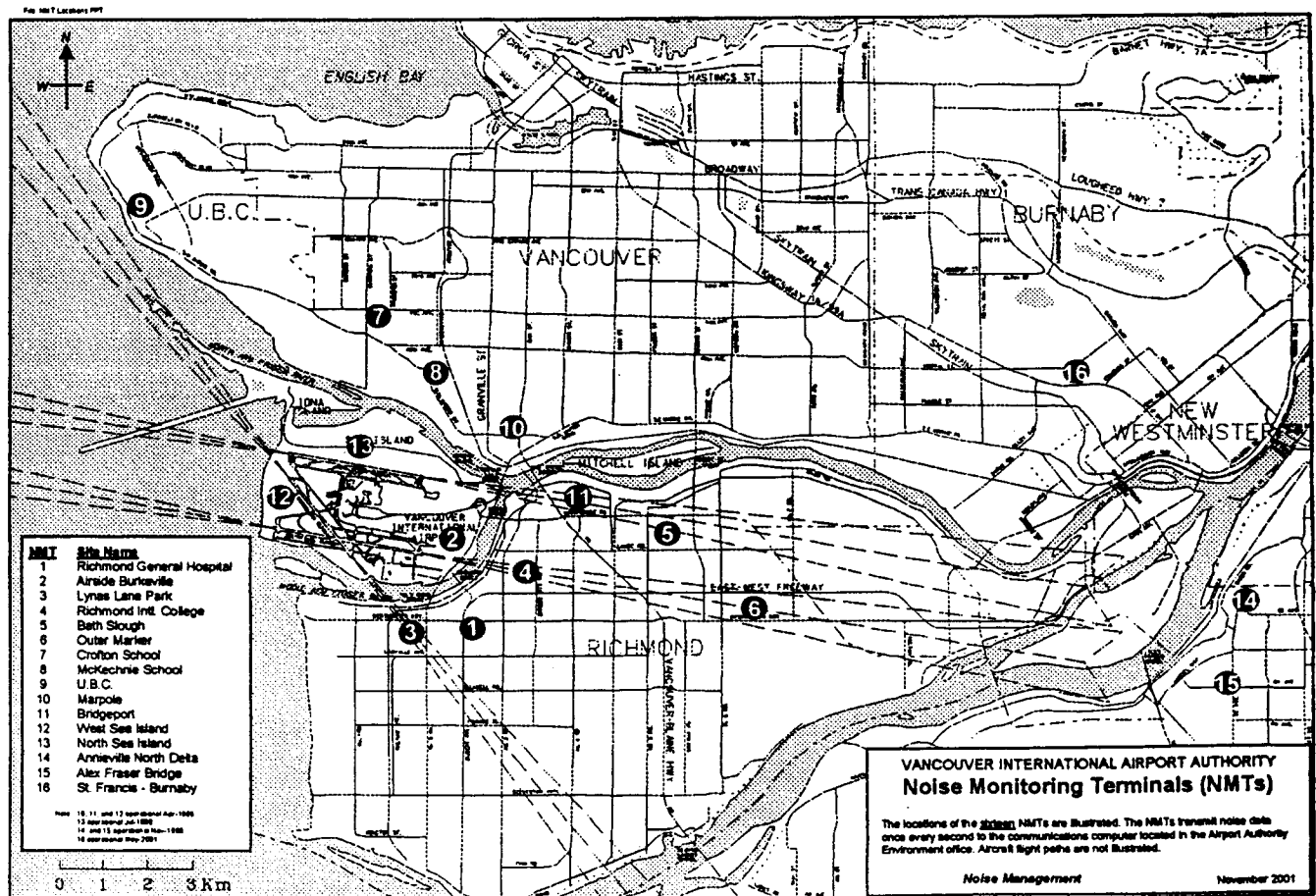


Figure 8c. Annual Average Noise Levels (dBA) at Richmond Noise Monitoring Terminals (NMT), 1995-1999

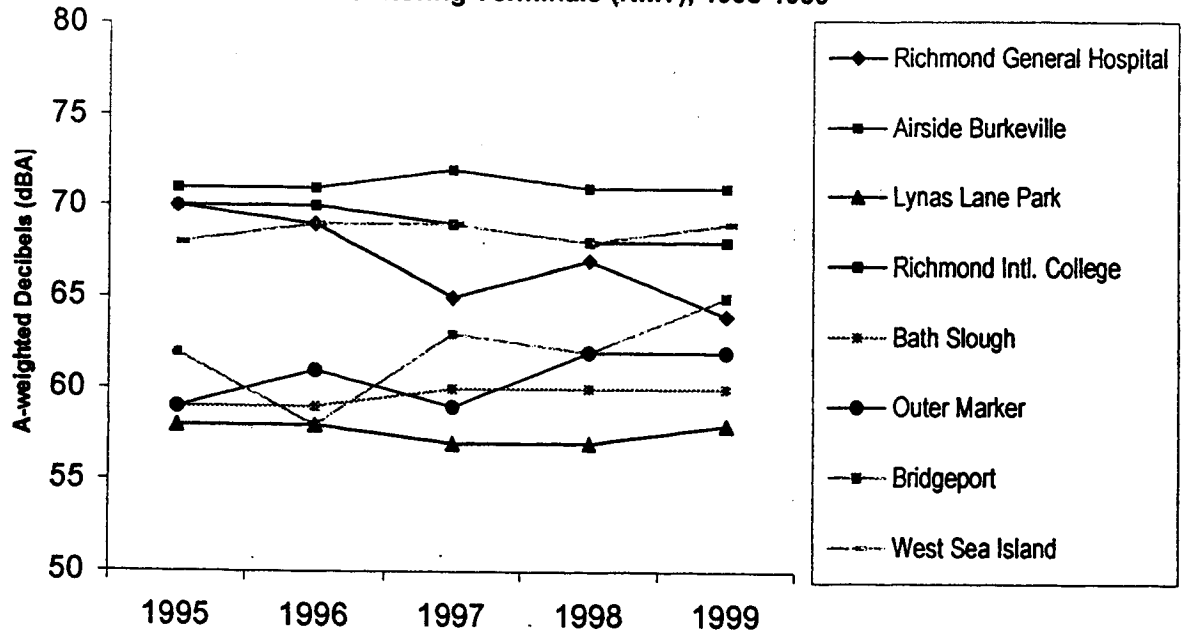
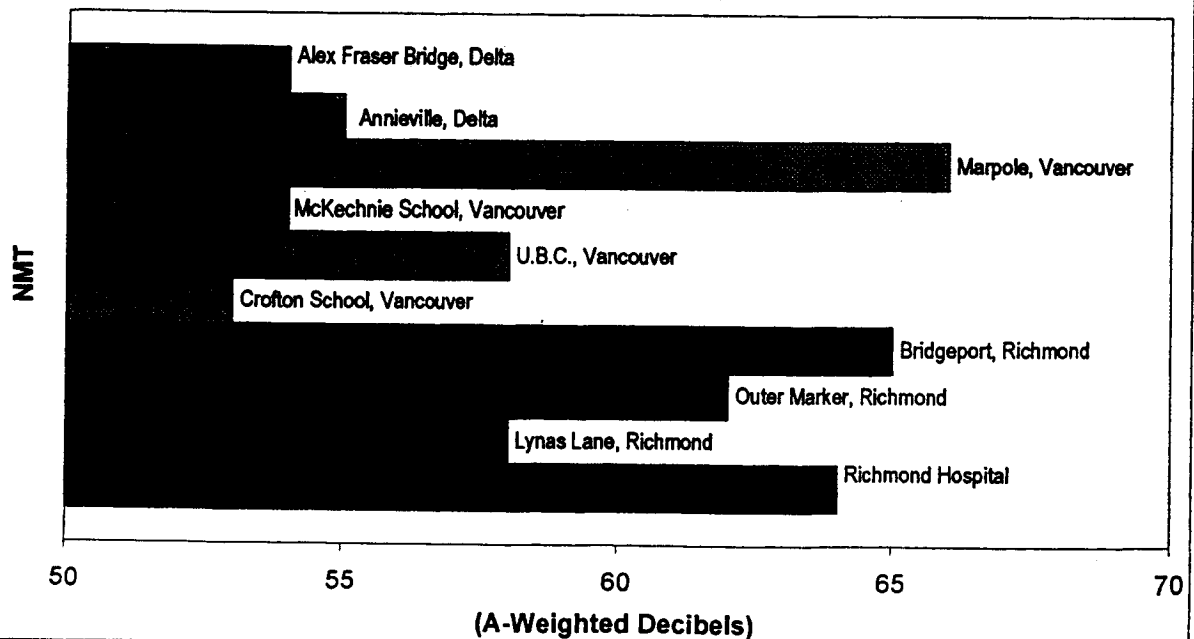


Figure 8d. Noise Levels at Selected Noise Monitoring Terminals (NMT) in Richmond, Vancouver and Delta for 1999



In addition to ambient noise levels, the Vancouver International Airport Authority also monitors single-event noise levels due to specific types of aircraft activities such as take-offs and landings. The Airport Authority reports their findings in their annual report on noise management which is available on-line at www.via.ca.

Number of Airport and Ambient Noise Complaints

In 2000, the Vancouver International Airport Authority reported 281 noise related complaints from Richmond residents (Table 8a). This is a significant decrease from previous years. For example, there were over 5000 noise-related complaints reported in 1997 from Richmond residents.

Richmond Health Services started recording noise complaint data on a monthly basis beginning in 2000. During that year, a total of 365 noise complaints were received (Table 8b). Cited in these complaints were sources of residential noise associated with loud stereos, bands practising, swimming pool pumps, and car and security alarms. Complaints grouped into the commercial category most often involved industrial equipment.

Construction noise complaints, resulting from both residential and commercial sources, were identified separately (Table 8b) as they have traditionally been one of the most common causes of noise complaints in the community.

Table 8a. Noise Complaints Received by the Airport, 1997-2000

Year	Complaints from Richmond Residents	Total Complaints Received	Percentage of Complaints from Richmond
1997	5182	7194	72.0
1998	2588	3673	70.5
1999	1057	2039	51.8
2000	281	579	48.5

Table 8b. Noise Complaints Received by Richmond Health Services, 2000

Complaint Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Residential	12	6	9	15	18	13	8	24	14	13	11	9	152
Residential Construction	4	3	7	4	4	9	7	3	8	4	5	4	62
Commercial	7	7	10	12	17	11	23	7	9	16	14	9	142
Commercial Construction	1	2	0	1	2	0	0	0	0	0	0	3	9
Total	24	18	26	32	41	33	38	34	31	33	30	25	365

DISCUSSION

What is Happening?

Ambient noise levels in some areas of Richmond (e.g., Bridgeport) have increased in recent years while in other areas a decrease or limited change has been found. Complaints due to airport noise have decreased significantly since 1997.

However, the proportion of complaints coming from Richmond residents has been close to 50% or higher for the past four years indicating that Richmond is affected by airport noise more than other nearby municipalities.

Noise complaints made to the City tend to be more frequent during the summer. This may be due in part to longer daylight hours, open windows and doors, and more boisterous warmer weather activities. Noise-producing activities, such as construction, may also start earlier and/or extend later in the day during the summer.

Existing City Programs

Noise is regulated in Richmond through provisions of the Public Health Protection By-law No. 6989. Health Services staff respond to all noise complaints that are addressed by this by-law with the exceptions of party noise and barking dogs (these complaints are referred to the RCMP and SPCA, respectively).

Managing aircraft noise falls under the jurisdiction of the Vancouver International Airport Authority. However, both the City and the Airport Authority are involved in developing strategies to mitigate aircraft noise. Options for mitigation include placing restrictions of night-time flights and runway use, the phasing out of older, noisier aircraft,

and the development of noise management plans. Additionally, the City uses restrictive covenants in high noise impact areas to require acoustical engineering assessments and the sound-proofing of buildings. The development of new residential units is also discouraged in these areas.

Richmond and the Region

Noise Monitoring Terminals (NMT) are located in Richmond, Vancouver and North Delta. With the exception of Marpole in Vancouver, noise levels at selected Richmond NMTs are higher on average than in other areas (Figure 8d). This is likely due to Richmond's proximity to the airport, the number of vehicles on the roads, and major construction activities in recent years.

THE FUTURE

Targets and Influences

The Airport Authority has defined reference thresholds for single-event noise levels that vary according to the surrounding ambient environment. Thresholds are typically between 65-70 dBA for daytime events (7:00am-10:00pm) and between 55-60 dBA for night-time.

The City's Public Health Protection Bylaw establishes a maximum noise level of 55 dBA during the day and 45 dBA during the night for 'quiet zones' (e.g., residential). However, airport noise is exempt from this by-law.

Although the number of complaints gives some indication of community reaction to noise, complaint data must be reviewed with caution due to inherent subjectivities. People have different tolerances to noise and those

tolerances may vary as a result of factors ranging from what they are doing to how they are feeling when the noise disturbance occurs.

What Can Citizens Do?

Citizens can report noise disturbances to the City or the Airport Authority. There are also steps you can take to protect your hearing and reduce the level of noise around you and your neighbours.

- Have your hearing tested if you sense a problem.
- Install noise insulating features in your home.
- Wear ear protection if you work in a high-noise area.
- Be courteous to your neighbours – avoid loud activities or the use of motorized equipment during early morning or evening hours.
- Make sure your car and home alarm systems are well-maintained and do not inadvertently sound.

SUMMARY

Mixed Results

Ambient noise levels have remained relatively constant for the past six years in areas of Richmond that are dominated by airport-related noise. In other locations, noise levels have been more variable and are the result of non-airport related activities such as vehicle traffic, construction, people, barking dogs and motorized equipment. On average, noise levels in Richmond are higher than in other areas.

In 2000, the Vancouver Airport Authority reported 281 noise-related complaints from Richmond residents representing 48.5% of the total complaints received that year. This is a significant decrease from previous years. An additional 365 noise complaints were recorded by the City that were attributed to residential and commercial sources of noise, including construction related activities. These trends represent Mixed Results.

TOPIC 1: ENVIRONMENTAL STEWARDSHIP AND EDUCATION

The 2001 SOE report introduces a new topic that broadly addresses programs and initiatives that provide information and encourage active participation in activities that have a direct influence on the state of the environment. The City places a high value on environmental stewardship and education and recognizes the contributions made by all citizens in achieving its environmental goals for a healthy sustainable environment.

The two indicators discussed under this topic are:

- I1: Community Environmental Stewardship; and**
- I2: Environmental Education.**

Community environmental stewardship can take many forms including active participation in programs with an environmental focus, volunteering for projects or activities aimed at cleaning up or restoring the environment, raising awareness for environmental issues, or sponsoring programs that achieve any or all of these goals.

Environmental education can also take many forms including school curricula; City- or community-sponsored events; hands-on activities, clubs and contests; and written materials for distribution to people of all ages.



Indicator II- Community Environmental Stewardship

INTRODUCTION

Why Should We Measure This Indicator?

Individually, we all need to do our part to protect the city's environmental assets by making choices that lead us towards a more livable and sustainable community. In a way, the SOE report monitors the collective results of our individual efforts. At another level, community stewardship initiatives bring together citizens interested in more active participation. Stewardship is the act of taking responsibility for the well-being of the environment and doing something to restore or protect that well-being.

Organizing and participating in events, volunteering, or simply making a donation, are all ways of demonstrating to your community that you care about the state of the environment. By working together, we can enhance and maintain those things we value, leaving a legacy for future generations and building community pride. This new indicator was introduced to demonstrate the level of participation of community members in environmental stewardship programs.

What is Being Measured?

It would be difficult to accurately estimate the level of participation in the wide range of stewardship programs that can be found in Richmond. This indicator focuses on the City's Partners for Beautification program, for which good quantitative data exist. Specifically, this indicator measures:

- Participation in Partners for Beautification projects; and
- Participation in other environmental stewardship projects.



The Partners for Beautification Program facilitates the adoption and community care of open spaces, parks, environmentally sensitive areas, trails, dykes and clean streets. Individuals, families, groups or business may adopt all or part of any of these areas. Adopters may also take responsibility for things like litter control of a specific area, graffiti removal, tree or wildflower plantings, the development of community gardens or sponsorship through donations and fundraising.

RESULTS

Participation in
Partners for
Beautification
Projects



In 2000, 2800 volunteers contributed a total of 21,321 volunteer hours to 'adoption' programs. The value of this work is estimated at \$162,000 (Table 9a). In addition to volunteer efforts, donations to 'Adoption' programs were \$19,000 in 1998, \$72,870 in 1999, and \$67,350 in 2000.

In 2000, twelve parks were adopted, equalling about 70 ha, along with twelve streets, three gardens, three trees, and four dog bag dispensers (Figure 9a). Trail adoptions equaled 24 km in 2000 compared with 21 km of adopted trails in 1998.

Of these adoptions, twelve were by individuals or families; 18 by community groups; eight by schools and eight by businesses.

Additionally, a total of 49 trees were planted by community stewards in 2000, not including tree planting events sponsored by the City; 42 trees were planted by community stewards in 1999.

Participation in Other Environmental Stewardship Projects

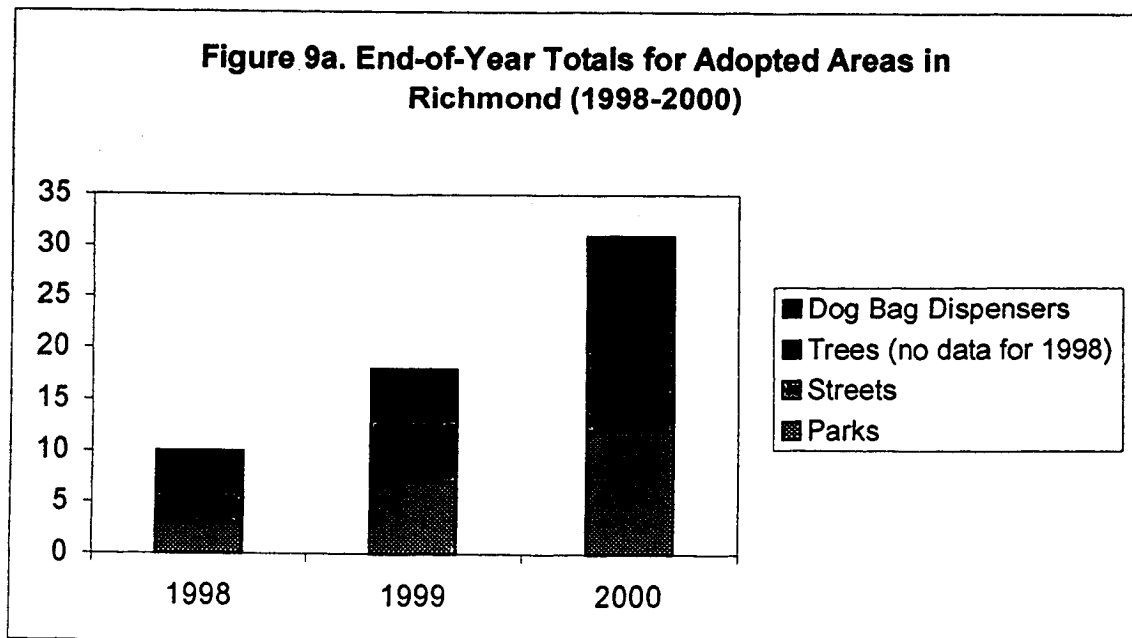
It is not possible to report on all the environmental stewardship programs in Richmond. However, a few examples are worth noting.

The Cambie Community Centre has been the home of the City's Environmental Youth Corps since 1993. The Youth Corps works to revitalize ecologically sensitive areas in Richmond, while educating the public, particularly youth, about environmental issues. Projects include clean-up degraded areas, minimizing the effects of pollution and habitat destruction, replanting areas with native vegetation, and enhancing Richmond's urban greenspaces.

Table 9a. Participation in Partners for Beautification Projects

	1998	1999	2000
No. of Volunteers	350	2,313	2,800
No. of Volunteer Hours	2,423	7,223	21,321
No. of Trash Bags Collected	80	325	350
Estimated Value of Work		\$72,000	\$162,040

Figure 9a. End-of-Year Totals for Adopted Areas in Richmond (1998-2000)



River Works is a two-year community stewardship project spearheaded by the Vancouver Aquarium Marine Science Centre. This project targets the restoration of estuary habitats along the Fraser River. Community volunteers and school groups restore, enhance and monitor habitats to maintain and increase the biodiversity of River Works sites. Two sites are located in Richmond: London's Landing and Iona Beach. Activities at London's Landing include water quality testing, removal of debris, bird surveys, and installation and monitoring of bird boxes. Activities at Iona Beach include removal of debris, site mapping, vegetation planting and sampling of fish in artificial spawning channels.

Richmond sponsors an annual Landscape and Garden Contest as part of its Partners for Beautification program. Hundreds of residents and businesses have participated in this contest, which encourages citizens to beautify their properties, thereby contributing to the overall attractiveness of the city.

DISCUSSION

What is Happening?

Since 1998, both the number of volunteers and the number of projects undertaken as part of the Partners for Beautification Program have increased. What these results do not show is the degree of turn-over in the various projects. For example, the identity of the areas adopted in 2000 may differ from those adopted in 1998, that is, adoptions may not last that long in some cases. Also, the adopting individual or organization may also change over time. However, the results do show that the program has attracted a growing number of community stewards since its inception. This is likely the result of an increased level of awareness of the program as well as awareness of the benefits of and need for such partnerships.

Existing City Programs

One objective of the OCP is to strengthen the sense of community among Richmond residents and to be a leader in efforts to build broad support for economic, environmental and social well-being. In addition to the Partners for Beautification Program, the City offers other opportunities for community involvement in environmental matters.

One of the City's key environmental initiatives was the community-based Advisory Committee on the Environment (ACE). The Committee, presently made up of volunteer citizens, has a mandate to advise City Council and generate independent information on environmental issues of concern to the community. It also reviews and monitors the state of the environment in Richmond (i.e., through SOE reporting), encourages and coordinates public participation in environmental initiatives, and enhances public awareness of environmental issues. Members of ACE also sit on the Vancouver International Airport Authority's Environmental Advisory Committee and Noise Management Committee.

The City has also sponsored the Mayor's Environmental Achievement Awards. These awards were established in 1991 to recognize individuals, groups or organizations for their efforts towards improving environmental quality in Richmond. In 2000, ten achievement awards were presented in five categories: general achievement; water conservation; waste reduction; preserving and enhancing wildlife habitat; and sustainable transportation. The City also sponsors the Richmond Landscape and Garden Contest. In 2000, a record 126 entrants competed in 21 categories including Best Residential Garden, Best Children's Garden, Best Allotment Plot, and Business Landscaping.

Richmond and the Region

With shrinking municipal budgets and expanding environmental responsibilities, local governments are finding it increasingly important to establish partnerships within their communities to accomplish environmental objectives and raise awareness of important environmental concerns. All municipalities in the GVRD are working hard to encourage community participation in environmental stewardship initiatives.

For example, since 1996, the City of Surrey has worked with youth to restore parks and riparian areas as part of its Salmon Habitat Restoration Program (SHaRP). The Township of Langley supported the creation of the Langley Environmental Partners Society (LEPS) and the Salmon River Watershed Management Partnership to carry out stream mapping and other conservation activities.

The Stoney Creek Environmental Committee (SCEC) has been active in the City of Burnaby since 1996. This group conducts regular biophysical assessments, monitors the creek, and coordinates numerous creek clean-ups and riparian plantings. Burnaby also sponsors annual Environment Awards to recognize significant contributions by individuals, agencies and businesses in achieving the City's environmental goals, and, since 1998, has worked with a citizen Environmental and Waste Management Committee. The City of Vancouver provides opportunities for citizens and local resident groups to adopt, garden and maintain traffic circles, diverters and bulges on roadways as part of their Street Partnership Program.

Streamkeepers and watershed protection groups are also active in Burnaby, Coquitlam, Surrey and along the North Shore.

THE FUTURE

Targets and Influences

There are no targets for community environmental stewardship.

What Can Citizens Do?

To learn more about Partners for Beautification:

- Call the City of Richmond Parks and Recreation Department at 604-244-1208.
- Pick up a copy of the Partners for Beautification brochure at City Hall.
- Visit the Partners for Beautification web site at www.city.richmond.bc.ca/services/beautification/beautification_index.htm
- Recommend someone deserving for the Mayor's Environmental Achievement Awards held annually in November.

To learn about other environmental stewardship initiatives consult the *2001 Richmond Environmental Project Guidebook*, which contains a complete list of funding organizations, resources and contact information, or contact your local community centre. For volunteer opportunities in your community, contact Richmond Connections Information and Volunteer Society, an organization which brings people and services together. Call 604-279-7020 or visit www.vcn.bc.ca/rcs.

SUMMARY

Good News

In 2000, 2800 volunteers contributed a total of 21,321 volunteer hours to the Partners for Beautification Program. The value of this work is estimated at \$162,000. The number

of volunteers has increased by over 2400 people since 1998, which has been partly due to the expanded program range. Twelve parks and 24 km of trails have been adopted along with twelve streets, three gardens, three trees and four dog bag dispensers. Additionally, 49 trees have been planted by community stewards. This indicator has been rated as Good News.

Indicator 12: Environmental Education

INTRODUCTION

Why Should We Measure This Indicator?

Environmental education is one way to increase our understanding of the relationships between humans and the environment. All indicators in the SOE report are influenced by what we know and understand about the environment and the effects of our own choices on the environment.

What is Being Measured?

There are no specific indicators for this category. Although environmental education is an important topic, there are few sources of quantitative information (e.g., enrolment numbers in environmental programs or clubs). Additionally, the *effectiveness* of environmental education initiatives is even more difficult to measure. As a result, environmental education can only be discussed in qualitative terms.

It would be impossible to report on all types of environmental education. This edition of the SOE report focuses on Richmond school programs. Future editions of the SOE report should investigate environmental education programs aimed at other segments of the population.

RESULTS

Richmond schools have a number of environmental education programs. Provincially-defined school curricula contain environmental subject matter ensuring that all elementary and high school students are introduced to various environmental themes.



Additionally, virtually all schools in Richmond have student-run environmental clubs and many are actively involved in stewardship programs such as the salmon hatchery operated by students from Steveston Secondary School.

The Richmond School District has entered into a very ambitious multi-year program called Destination Conservation. The program is based on an international model and is co-sponsored by the School District, BC Hydro and the Province. Under this program, students, teachers, school district staff and utility companies are involved in auditing school energy and water consumption and in retrofitting school buildings for greater efficiency. The program encourages conservation-minded habits in students such as turning off lights and computers at the end of the day.

By monitoring the changes in energy and resource consumption in their school, students gain a unique appreciation for conservation. The program was introduced during the 2001 school year. Approximately 35 Richmond schools are expected to participate over the next two years.

Two programs, sponsored by national organizations, educate students and adults alike about the benefits of 'green schools'. The Evergreen Foundation sponsors the Learning Grounds and Common Grounds Program, which works with school communities, including teachers, parents, principals and community members, to create outdoor classrooms and habitat areas on school grounds. Organizers provide training and education workshops, how-to manuals and resource guides, and grants for native plants. To date, eleven schools from Richmond have either received funding, participated in workshops, or become Model Schools that maintain environmentally and educationally rich outdoor spaces.



The Society for Environment and Energy Development Studies (SEEDS) sponsors the Learners in Action Green School Program. Under this program, students take action to enhance the environment or communicate about the environment. The project is then

recorded. To date three Richmond schools have been awarded the Green School Banner for completion of 100 environmental projects.



In addition to these programs, numerous schools also take part in the ICBC 'Way-to-Go!' trip reduction program and Partners for Beautification.

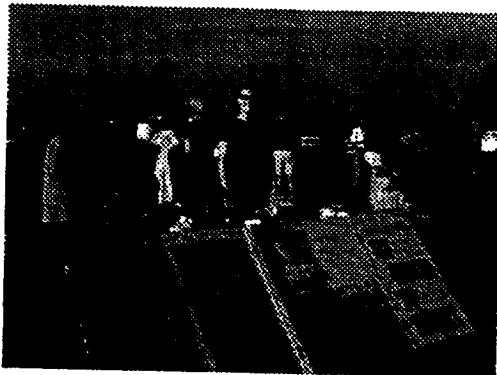
DISCUSSION

What is Happening?

The lack of quantitative data for this indicator makes it difficult to observe trends. However, we may get a sense of how effective these education initiatives have been in raising awareness and action by looking at trends evident in other indicators.

Existing City Programs

Most of the programs discussed in the results section do not fall under the responsibility of the City. The City does however organize, fund and sponsor several environmental education initiatives such as State of the Environment reporting, Environment Week, and dissemination of information through brochures, displays and the City's website.



City-run community centers offer programs with an environmental focus. For example, the Steveston Community Centre offers educational harbour tours, sponsors youth camping trips to natural areas, and holds free workshops called Eagles in our Backyard, which are co-sponsored by the Richmond Public Library. The Richmond Nature Park Society is a non-profit organization that works in partnership with the City of Richmond to provide educational and recreational programs that encourage residents and visitors to learn about the environment and natural history of the community. They offer educational programs for all ages on a range of science and nature topics.

Richmond and the Region

There are numerous examples of environmental education programs sponsored by municipal governments in the GVRD. The following are only a few examples.

The City of Surrey has a 'Salmon in the City' education program that has several displays and a video for the general public that are set-up at City-sponsored and community events, malls and libraries. Over 4000 people had access to this information in 1998. Surrey also runs a 'Watershed Education Campaign' that targets businesses in watersheds with chronic pollution

problems. Municipal staff work with volunteers and students to visit each business to discuss pollution prevention measures.

The District of North Vancouver has funded and operated the Lynn Canyon Ecology Centre since 1971. The centre has educational displays, hands-on children's activities and wildlife films, and hosts outdoor nature programs for individuals, schools and community groups.

The City of Burnaby co-funds with the Burnaby School District, the Environmental Research and Education Centre. This 'environmental classroom' – which is an example of environmental friendly building design – is located in Stoney Creek Community School and is open to any environmentally-focused community group for meetings, events and educational activities. Burnaby also provides annual funding to BCIT in support of their Burnaby Lakes System Project. As part of this project, students undertake biophysical research and enhancement activities, and work to raise awareness among industries, residents and other landowners in the local area.



The Township of Langley works closely with property owners along watercourses and provides brochures and educational information on the importance of stream processes and riparian habitats. As part of their Storm Drain Marking Program, Langley has marked an estimated 3000 storm drains with a fish symbol to remind residents that anything deposited in a storm drain negatively affects fish.

THE FUTURE

Targets and Influences

There are no targets for environmental education. However, future editions of the SOE report should continue to look at this indicator, report on the results of some of the programs discussed here, and expand the range of programs reviewed in this edition. For example, in addition to elementary and secondary school programs, which were the focus of this edition, other types of environmental education in Richmond include:

- Post-secondary, e.g., Kwantlen College Environmental Technology Program;
- Out-of-school organizations for kids, e.g., Scouts and Guides; and
- Non-governmental organizations and community groups.

What Can Citizens Do?

Citizens can show their support for environmental education programs by actively participating or making a donation in support of a particular program. Here are some other ideas:

- Ask your children what they have learned about the environment in school and try some of the activities at home, e.g., energy conservation or landscaping your yard for wildlife habitat.
- Call the Richmond Nature Park at 604-273-7015 and register for one of their upcoming programs.
- Pick up a copy of the *Richmond Recreation and Cultural Guide* to see what kinds of environmental programs are being offered in your area.
- Obtain a copy of the *2001 Richmond Environmental Guidebook* and try out some of the proposed projects.

SUMMARY

Not Assessed

Environmental Education has been introduced as a new indicator. Limited quantitative data are available and trends have not yet been discerned. This indicator was not assessed.

TOPIC J: SOIL QUALITY

Why Should We Monitor this Topic?

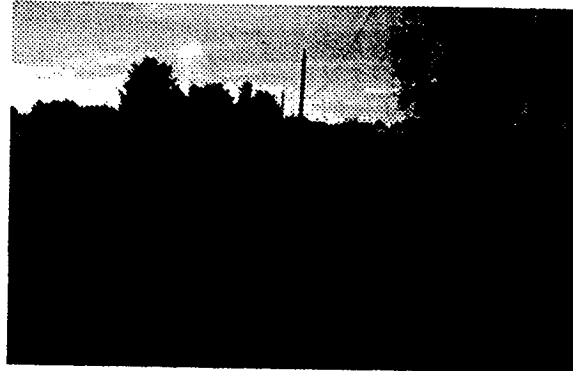
Other indicators in this report address issues of air and water quality. While *types* of land use have been assessed and monitored through the first two SOE reports, this new topic will provide a measure of the *quality* of land: an important issue at both the local and global scale.

Soil, naturally formed from existing parent material such as eroded rock and dead organic matter, is an essential component of the environment. Soil is important for retaining and filtering water, and for sequestering carbon, which helps to mitigate the greenhouse effect. Soil supports vegetation that, in turn, provides habitat and contributes to greenspace. Soil also provides habitat for many types of insects that are an important part of the food chain. The amount and productivity of soils are also extremely important for viable and sustainable crop production.

Degradation of soil quality might result from wind and water erosion, salinization, loss of organic matter, compaction, or chemical contamination originating from previous industrial or commercial uses of the land or adjacent lands. Once lost or degraded, soil is not quickly replaced.

Why Are There Currently No Indicators for This Topic?

Unfortunately, time and resources did not allow this topic to be measured as part of the



2001 SOE report. More work is needed to select appropriate and measurable indicators. Some possible indicators include: risk of soil erosion, loss of highly-productive organic soils, heavy metal toxicity, or progress in the remediation of contaminated sites.

The next edition of the SOE report will include indicators of soil quality. However, the work required to monitor and better understand the state of soil quality in Richmond should begin now since changes in soil quality are often not observed without many years of data.

SUMMARY

Not Assessed

More work is required to investigate and select appropriate indicators of soil quality. This topic was therefore not assessed.

Conclusions and Next Steps

How Are We Doing?

The good news is.....

- The City of Richmond has been successful in protecting its greenspace. Agricultural land has been protected, new parks have been created, trees continue to grow and be planted, there has been a net gain in the area of designated ESAs, and the City continues to update its database of ESA lands.
- There is also good news about the quality of our water. Water quality in the Fraser River has improved considerably since the wastewater treatment plants were upgraded in 1998, and drinking water at the Richmond distribution points has consistently met water quality guidelines.
- Air Quality Index values for Richmond have been rated 'Good' according to AQI categories.
- Richmond appears to be meeting its land use and human settlement objectives that call for concentration of growth, variety in housing choices, and housing that is within walking distance of key services.
- The promotion of alternative forms of transportation has continued with efforts directed toward the development of more cycling lanes and pedestrian-friendly streets.
- In addition to the City's efforts, Richmond residents have shown their commitment to a more sustainable environment by generating less solid waste, and enthusiastically participating in environmental education and stewardship programs.

The bad news is.....

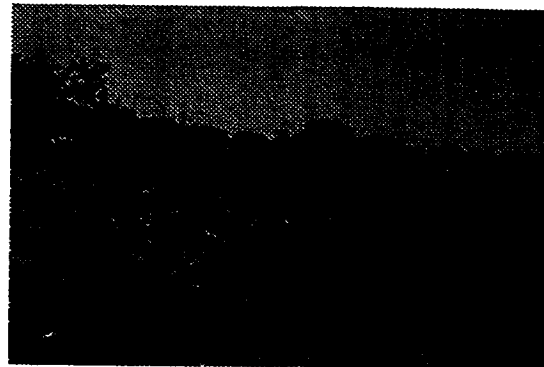
- Richmond residents continue to rely heavily on their automobiles despite considerable efforts by the City and the regional transit authority to promote alternative forms of transportation. Current trends in automobile use and ownership are clearly not sustainable given our growing population.
- Richmond also performed poorly with respect to water and energy consumption. While per capita use has decreased in some years, Richmond still consumes more water and energy on a per capita basis than most GVRD municipalities.
- Richmond's share of loading on wastewater treatment plants is also high and increasing. Although treated wastewater can be safely released back into the environment, there are financial and environmental costs associated with collecting, transporting and treating wastewater that could be reduced.
- This edition of the SOE report included data on resident complaints regarding air quality and noise that are somewhat discouraging. This indicates that although positive trends for noise and air quality are apparent for some measures, there may be a need to reassess progress in terms of other measures that are less tangible but nonetheless important to the community.
- There remain many aspects of our environment, such as the quality of soils, which have not yet been monitored in Richmond.

Where Do We Go From Here?

The City of Richmond and its residents should be proud of their accomplishments on many fronts. However, the greatest challenges are yet to come. As Richmond and the region continue to grow, we will all need to make extra efforts toward protecting our environmental assets by reducing the individual and collective pressures we put on the environment.

The next edition of the State of the Environment report will be prepared in 2005. In the interim, the City should endeavour to develop targets for as many of the indicators as possible. Priority areas for setting targets, and other proposed actions, are summarized below for each topic. For some indicators, the use of targets is not appropriate as information is generally more qualitative (e.g., environment education). The next edition of the SOE report should look at the best ways to discuss environmental issues of a more qualitative nature without diminishing their importance.

- **GREENSPACE:** The City has fared well in terms of protecting its greenspace. However, progress must be made toward ensuring that the *quality* of those areas that fall under the greenspace designation is maintained. An indicator which measures the availability and quality of wildlife habitat could be developed to augment the indicator *Total Greenspace*.
- **WATER QUALITY:** This topic shows generally positive trends. The City should determine its role in, and consider the results of, the forthcoming water quality monitoring program for the Lower Fraser River.
- **AIR QUALITY:** This topic shows generally positive trends according to the Air Quality Index. In three years time, it may be possible to look at this topic with greater emphasis on the human health impacts associated with air quality.
- **LAND USE AND HUMAN SETTLEMENT:** The OCP provides objectives for land use that could be refined into specific targets. Land use is one topic for which good data are available and where the City has a high level of control.
- **TRANSPORTATION:** The City has been successful in creating infrastructure to support sustainable modes of travel; however, it would be valuable to have some means of monitoring the level of use of cycle lanes and pedestrian-friendly streets. Residents must also be made more aware of the implications of not reversing current trends in automobile use and encouraged to use alternative modes of travel or invest in automobiles that use cleaner fuels.



- **RESOURCE CONSUMPTION:** The City should consider the factors that make their solid waste management programs so successful and, where possible, apply the same approach to managing other types of consumption and waste disposal.
- **CITY ENVIRONMENTAL PRACTICES:** Preparation of an *Environmental Management Strategy* for Richmond is currently underway. The strategy should address the role of the SOE report and identify other City environmental practices that future SOE reports could monitor.
- **NOISE:** As the city grows, noise levels are unlikely to drop significantly. However, the City can continue to work with the Vancouver International Airport Authority, health specialists, and the public, to determine targets that reflect acceptable noise levels.
- **ENVIRONMENTAL STEWARDSHIP AND EDUCATION:** It may not be possible to determine measurable indicators for environmental education. The next edition of the SOE could focus on educational initiatives aimed specifically at reversing some of the 'Bad News' trends reported here.
- **SOIL QUALITY:** This topic will be analyzed as part of the next SOE report. In the interim, the City should be working with land owners and other levels of government to manage impacts to soil quality including soil loss and contamination.

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Glossary

Agricultural Land Reserve (ALR) – Privately-owned farm lands which have been designated under provincial (BC) statute, to be retained for agricultural purposes. Under certain conditions, designated lands may be removed from the ALR.

Ambient Air Quality – Ambient refers to ‘the atmosphere’, ‘outdoors’ or ‘background’. Ambient air quality is usually tested at an outdoor, ground-level site and may include testing for more than one pollutant.

Ambient Noise – Constantly and spontaneously occurring ‘background noise’ such as that from automobile traffic, barking dogs, chirping birds, people moving about, wind or rain. Ambient noise differs from single, short-term noise events.

Capital Works Program / Capital Works Plan – These two terms are used interchangeably. They refer to a list of major infrastructure (utility and transportation) projects, the projected time frame for their completion, and their relative priority.

City Beautification Strategy – A strategy designed to enhance Richmond’s physical appearance, primarily through street tree-planting and public art initiatives.

Total Coliforms / Fecal Coliform – Total coliforms are a group of bacteria that serve as indicators of the potential contamination of human and/or animal waste material and therefore, the possible presence of harmful pathogens. Fecal coliforms are a sub-group within the Total Coliform family of bacteria.

Complete Community – An area containing place of employment and commonly required services (e.g. grocery stores, banking, schools) in close vicinity to major housing areas. The average resident could comfortably walk and/or cycle to each destinations from their homes.

Contaminated Site – The provincial government classifies sites as ‘contaminated’ if the soil and/or groundwater contain pollutants in excess of levels regulated under the Contaminated Sites Regulations.

Core Municipalities – Municipalities including and immediately surrounding the city of Vancouver, generally assumed to include: Vancouver, Richmond, Burnaby, North Vancouver City and District; and Coquitlam.

Cycling Lanes – A lane that forms part of a major road, designed and designated for the use of cyclists. In some situations, small portions of these lanes may also be used as right-hand turning lanes for automobiles.

Development Permit – A permit required in special pre-defined conditions to control the form and character of a development, as set out in the *BC Local Government Act*.

Environmentally Sensitive Areas (ESA) – Areas identified as having ecological value. The Richmond SOE report monitors ESAs that have been designated by the City through its Official Community Plan (OCP). The OCP defines ESAs as containing significant natural environmental features and their associated lands that require a level of protection to secure their conservation. Natural environmental features may include woodlots, waterways, riparian vegetation, mudflats, marshes, fallow fields, grasslands, and similar areas. ESAs are protected by requiring development permits prior to commencement of development activity.

Greenhouse Effect / Global Warming – A warming of the Earth's atmosphere believed to be caused by the increased presence in the atmosphere of certain gases (e.g., water vapour, carbon dioxide, methane) that absorb radiation emitted by the Earth, thereby retarding the loss of energy from the system to space. The greenhouse effect has been a property of the Earth's atmosphere for millions of years. Today, because people are affecting the proportions of gases in the atmosphere, the greenhouse effect is thought to be causing a rise in average global temperatures.

Greenhouse Gases – Gases that cause the greenhouse effect (see above) including water vapour, carbon dioxide and methane.

Greenspace – Greenspace is typically associated with parks and environmentally sensitive areas (ESA). However, greenspace can also include farmers' fields, urban forests, wetlands, and open spaces such as schoolyards or golf courses. In the SOE Report, the indicator *Total Greenspace (A5)* is a composite of lands defined as Agricultural Land Reserve, parks, protected areas and ESAs.

Greater Vancouver Regional District (GVRD) – Regional level of government comprising over twenty municipalities including and surrounding the City of Vancouver. The City of Richmond is a member of the GVRD.

Housing Density – The number of housing units per area (e.g., dwelling units per hectare).

Housing Mix – The mix or distribution of different types of housing including single-family, duplexes, multi-family, townhomes and apartments.

Land Reserve Commission – Formerly the Agricultural Land Commission, the Land Reserve Commission is the Provincial body responsible for managing the Agricultural Land Reserve, with the power to remove lands from the reserve.

Lower Mainland – Descriptive term used by BC residents to refer to Vancouver and the surrounding area, including the Greater Vancouver Regional District and the Fraser Valley Regional District.

Major Roads – As used in this report, major roads include all roads which separate mapped sections of land in Richmond. Transportation and Planning staff refer to these roads as "section-line roads". Most are major arterials, but a few are minor and local roads that perform an important circulation function.

Native Vegetation – Plant material originating in the Pacific Northwest (British Columbia, Washington and Oregon).

Official Community Plan (OCP) – A legal document identifying city-wide goals, as well as development and servicing objectives. It includes a land management strategy, and a map prescribing specific land uses for individual areas within the city.

Pedestrian Friendly Streets – A pedestrian-friendly street is one which has been designed to maximize the comfort of people travelling on foot, wheelchair, or motorized scooter. It must include a sidewalk, and may include other additional features (refer to this indicator under the Transportation Section).

Privately-Owned / Publicly-Accessible Open Spaces (POPAS) – Privately-owned property made available for public open space use through development agreements with the City of Richmond.

Protected Area - Land designations that are managed primarily to protect natural or recreation resources. Designations include natural City parks, GVRD parks, federal conservation areas, lands owned by non-governmental nature trusts, and provincial Wildlife Management Areas. The area of trails is not included in this definition.

Rapid Bus – An articulated bus to be used on the Richmond – Downtown Vancouver service route. Rapid Bus makes fewer stops than the typical bus, and designed with a similar level of amenity to light rail transit, including automated ticket dispensers; and electronic displays indicating total wait time for the next bus.

Stewardship – Actively caring for something of value. Environmental stewardship involves citizens voluntarily taking responsibility for the health of their environment and its components and demonstrating this commitment through action. Examples of activities include raising awareness, beach clean-ups, tree planting and participating in community gardens.

Sustainable Transportation – Modes of transportation which use lower amounts of energy and produce fewer greenhouse gases per person travelling than the private automobile (i.e. transit, walking or cycling).

TransLink – Formerly BC Transit, TransLink is the Provincial Crown Corporation currently responsible for providing transit services to all BC municipalities in the GVRD, including the City of Richmond.

Turbidity – The degree to which light is blocked because water is muddy or cloudy. The greater the amount of total suspended solids (TSS) in the water, the murkier it appears and the higher the measured turbidity. Turbidity levels may vary dramatically over time and are influenced by rainfall and flow events.

Urban Run-off – The sum of surface runoff and subsurface runoff in urban areas. Surface runoff occurs when the surface storage and the soil become saturated - infiltration ceases and subsequent rainfall becomes surface runoff. Subsurface runoff is rainwater that infiltrates the surface and flows (much more slowly) into streams or other waterways. Urban runoff can be attributed to many things including the amount of rainfall, the soil conditions, and the degree of urbanization.

Wastewater - Wastewater is the term used to describe water that has been used in homes, businesses and industry. Domestic wastewater includes liquid waste from sinks, showers and bathtubs, toilets, washing machines and dishwashers. Industrial wastewater includes liquid waste from a variety of activities, such as food preparation and manufacturing.