

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).

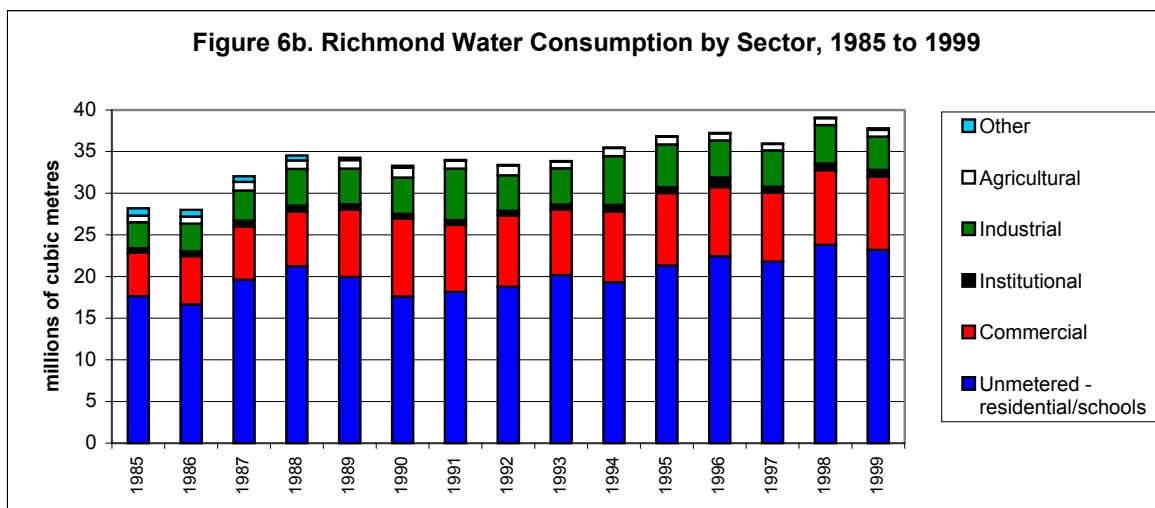
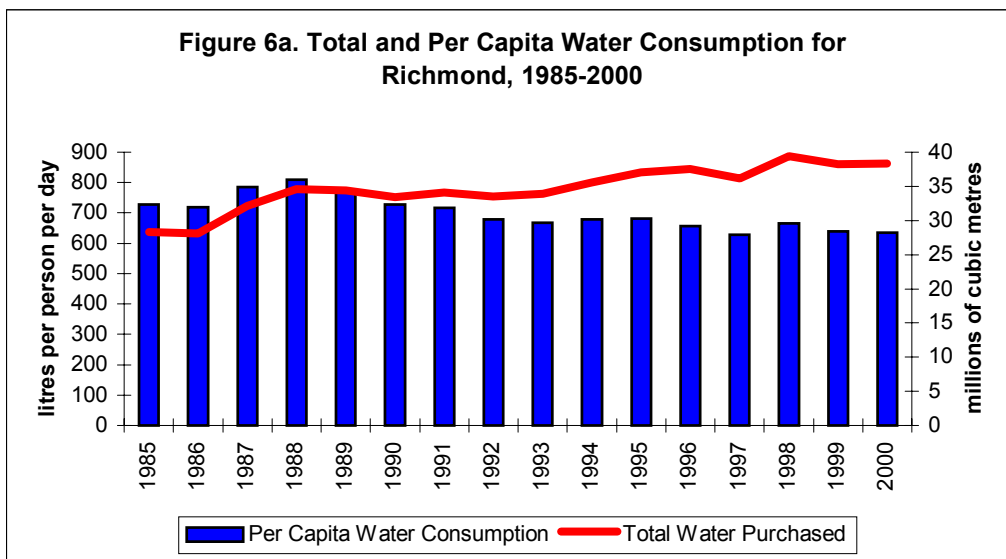


Figure 6c. Per Capita Water Consumption - Residential

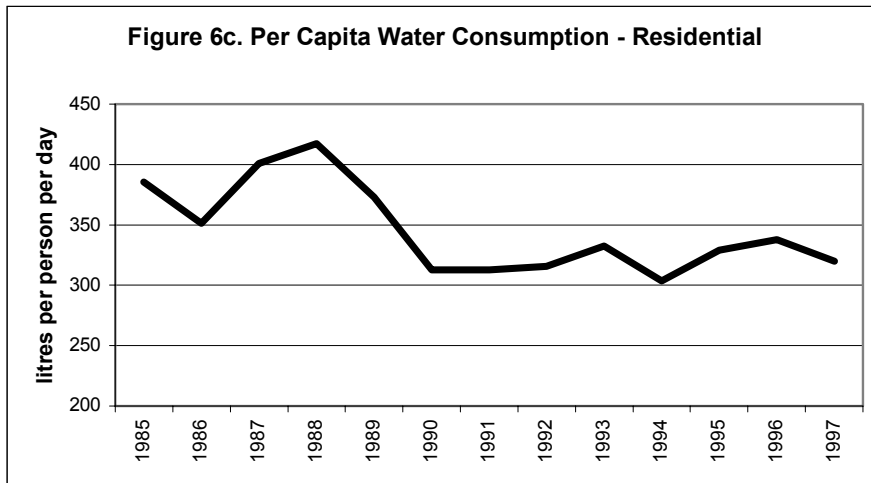
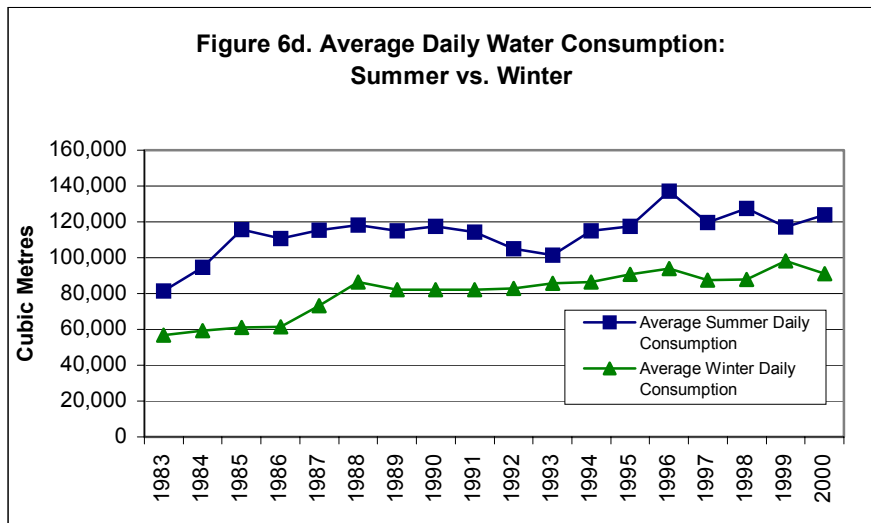


Figure 6d. Average Daily Water Consumption: Summer vs. Winter



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.

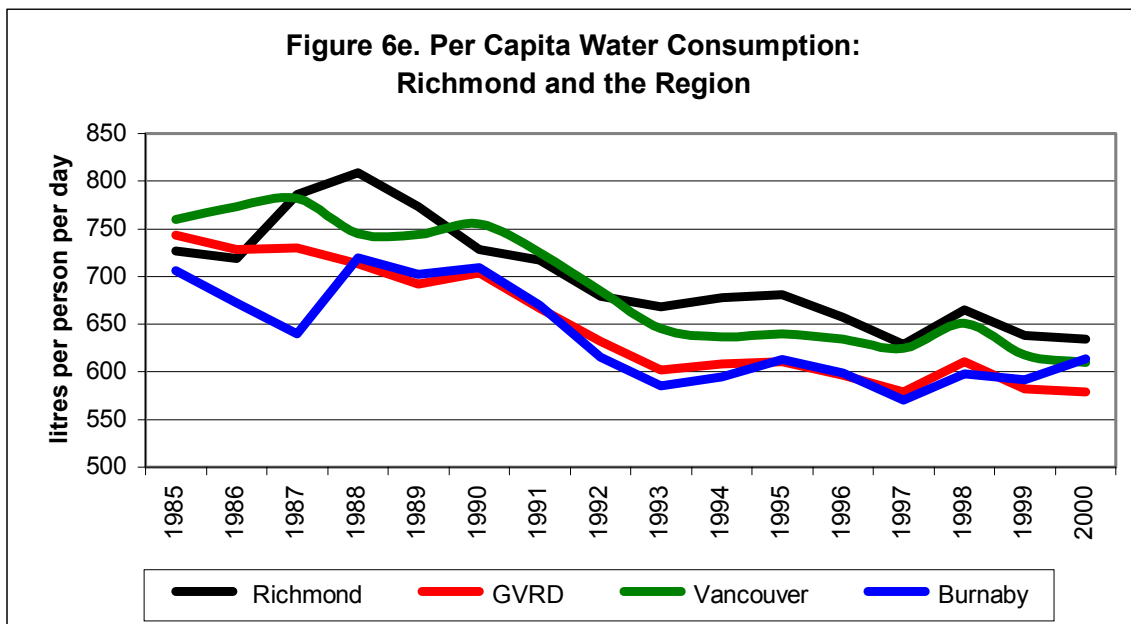
Existing City Programs

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).

Richmond State of the Environment 2001

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 F2: 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).

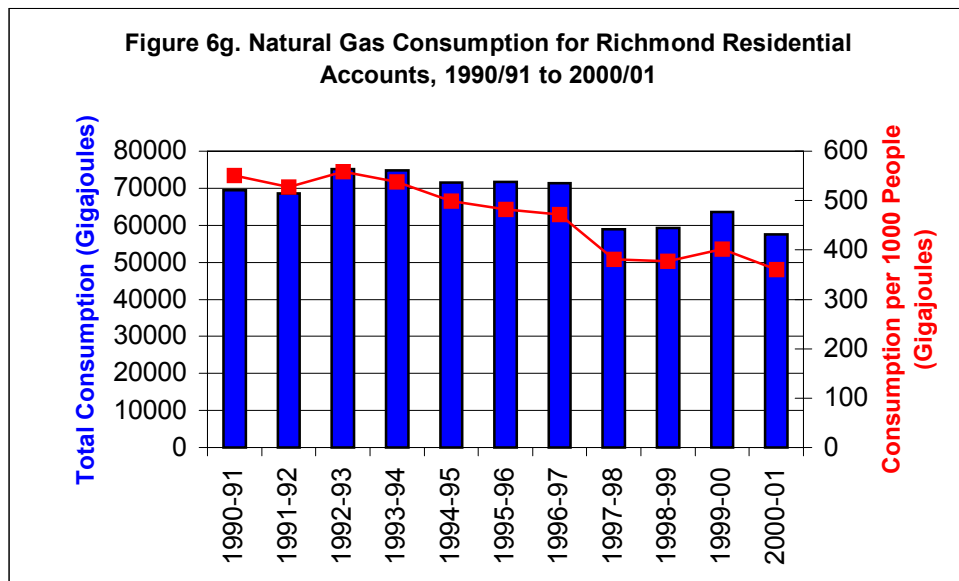
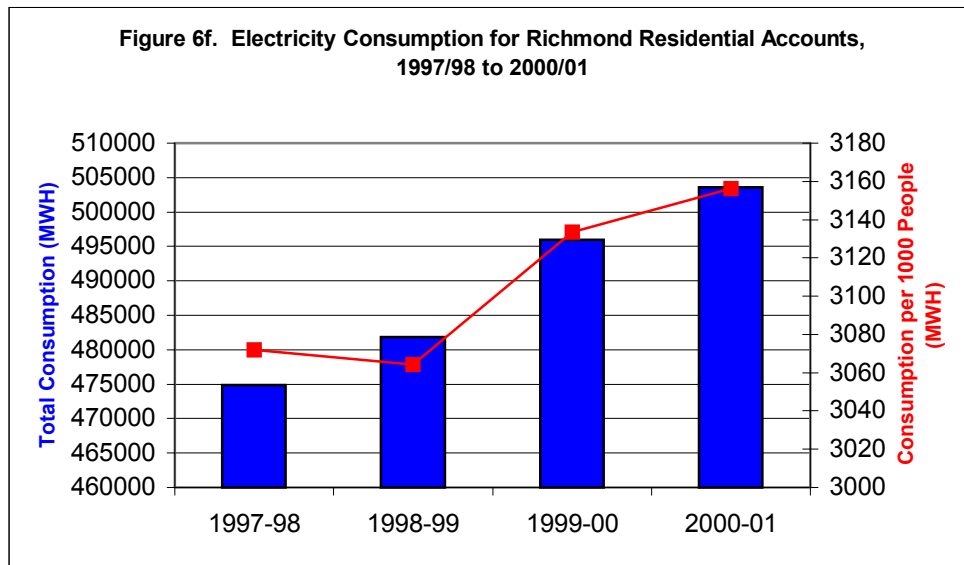
RESULTS

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.



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 F3: 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.

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.

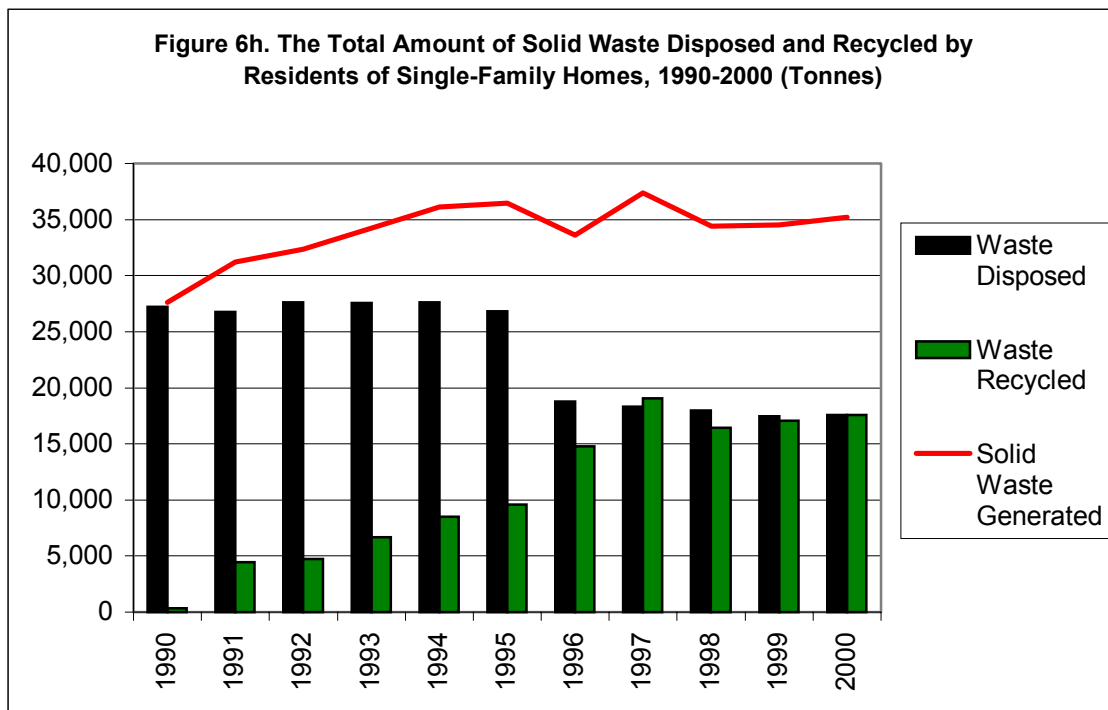
RESULTS

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

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 F3: 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.

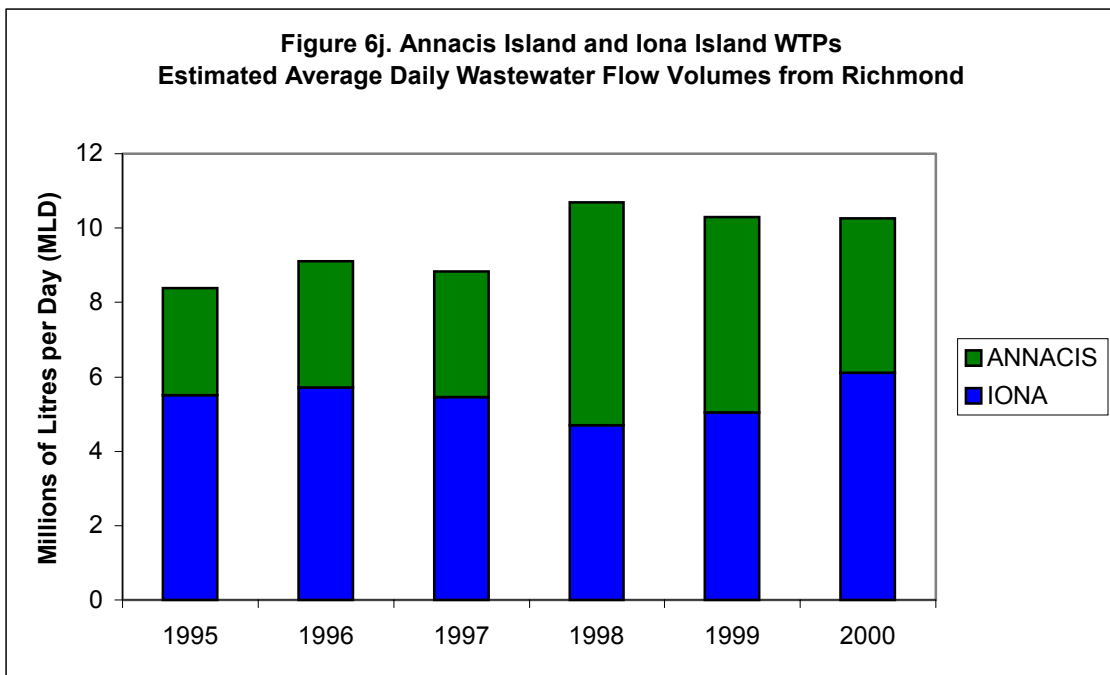
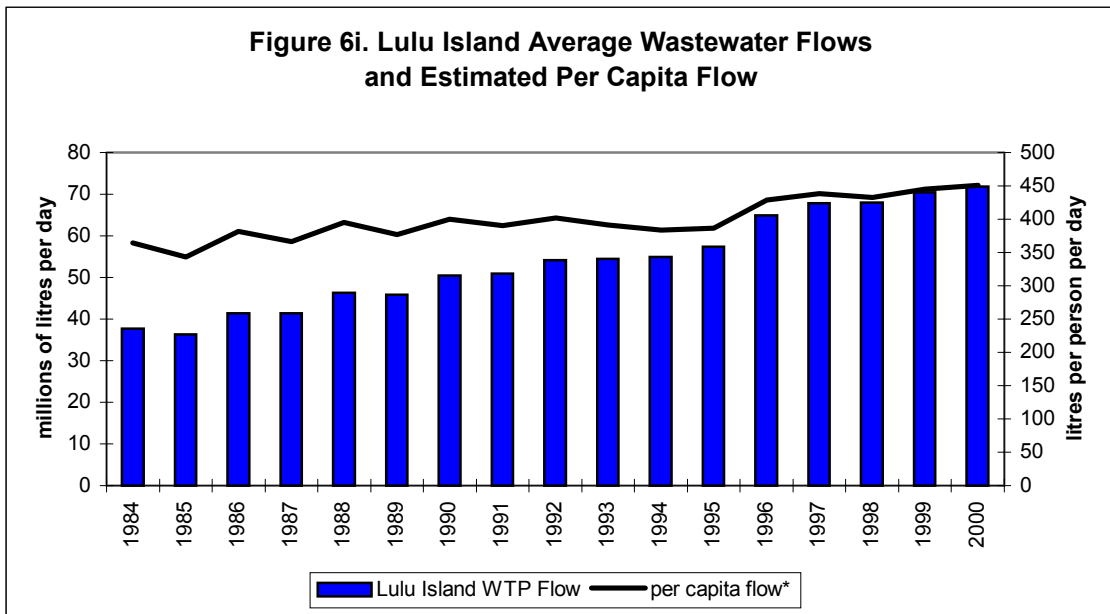


Figure 6k. Lulu Island WTP: Influent vs. Effluent BOD

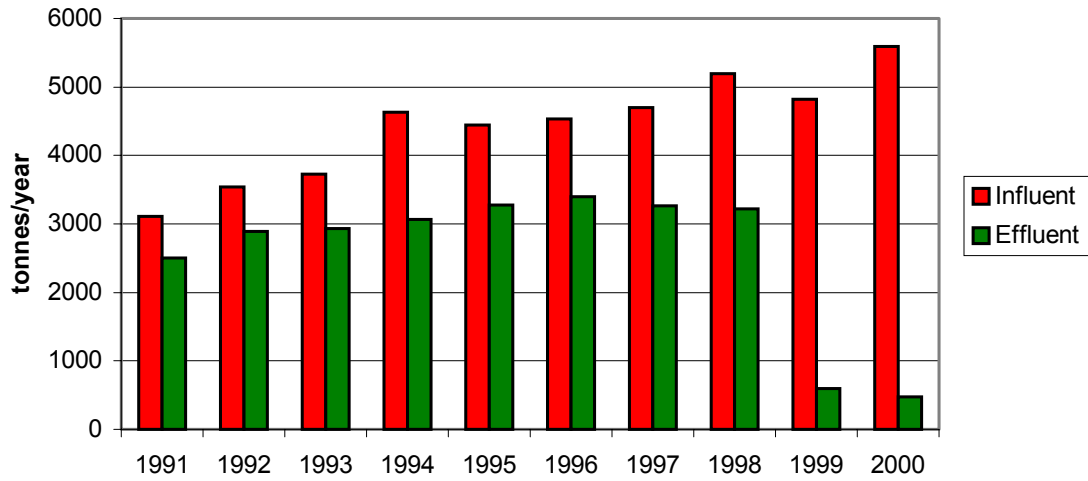
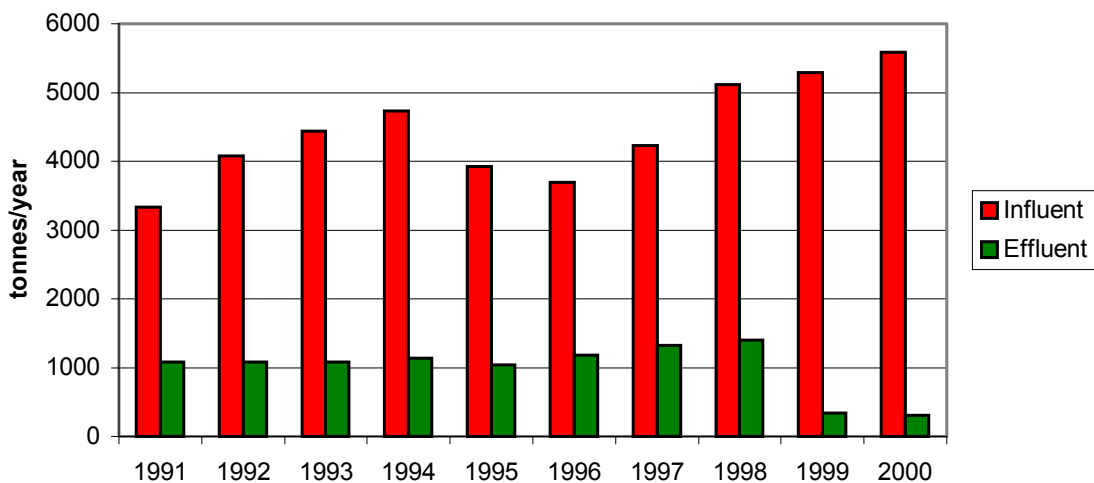


Figure 6l. Lulu Island WTP: Influent vs. Effluent TSS



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 seweraged 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.

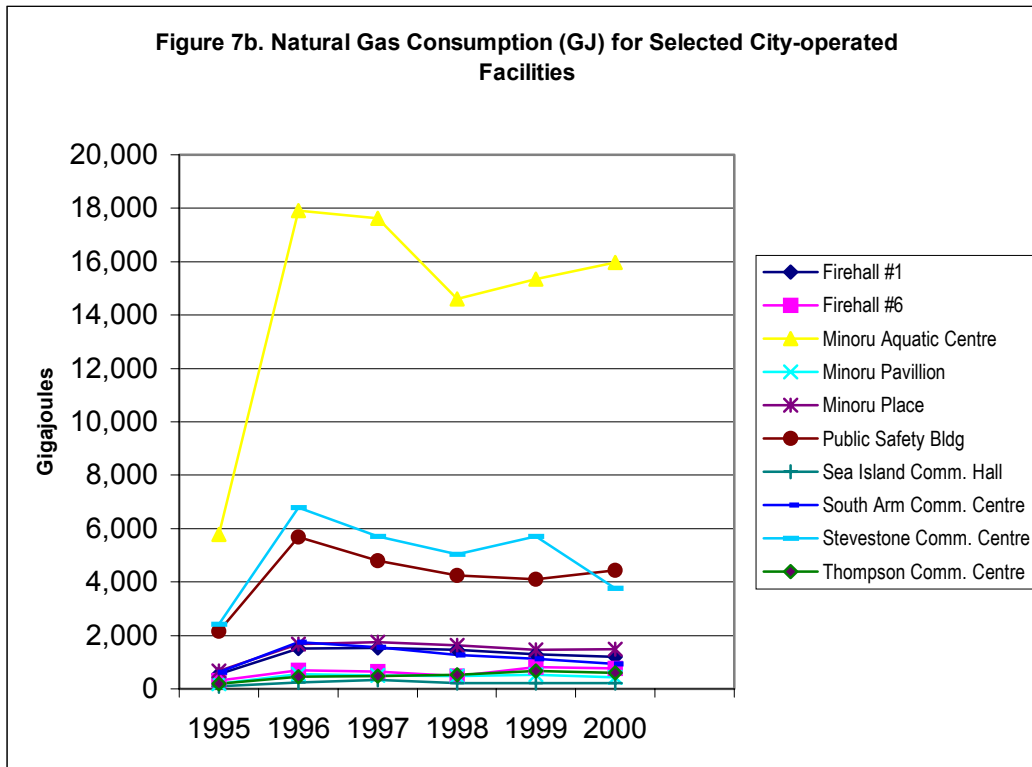
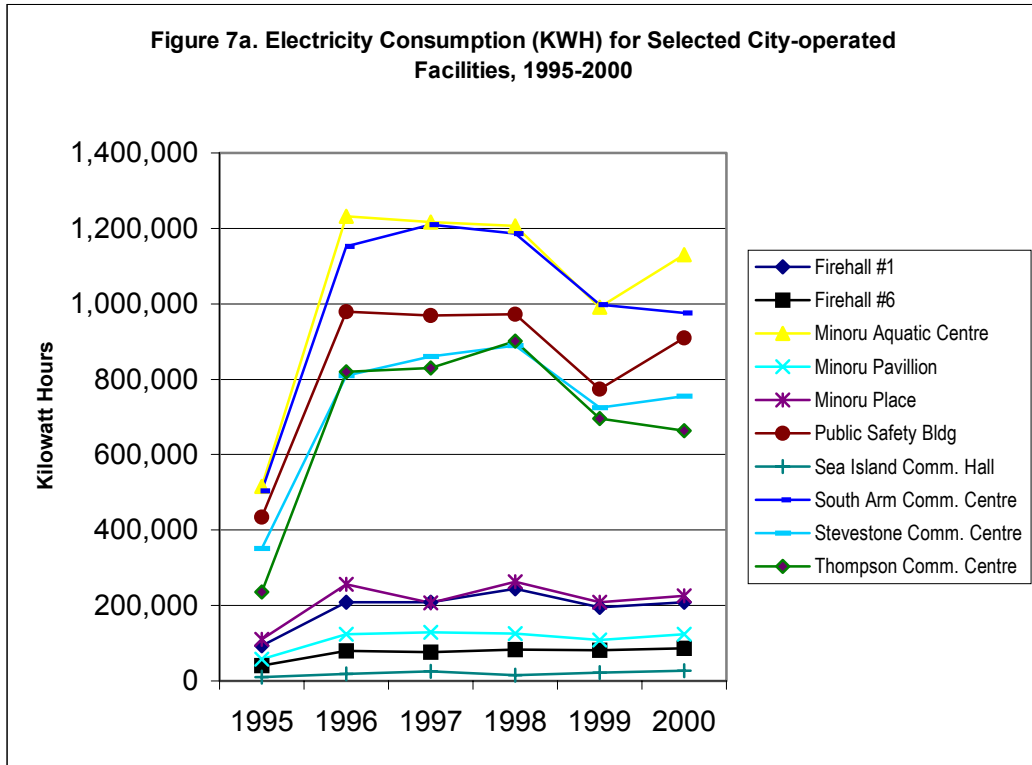
The importance of measuring energy consumption has been discussed in *Indicator F2*. The proportion of vehicles in the City fleet that run on natural gas is directly linked to vehicle emissions and thus has an influence on Air Quality (see *Indicator C1*).



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.



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 H: 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.**

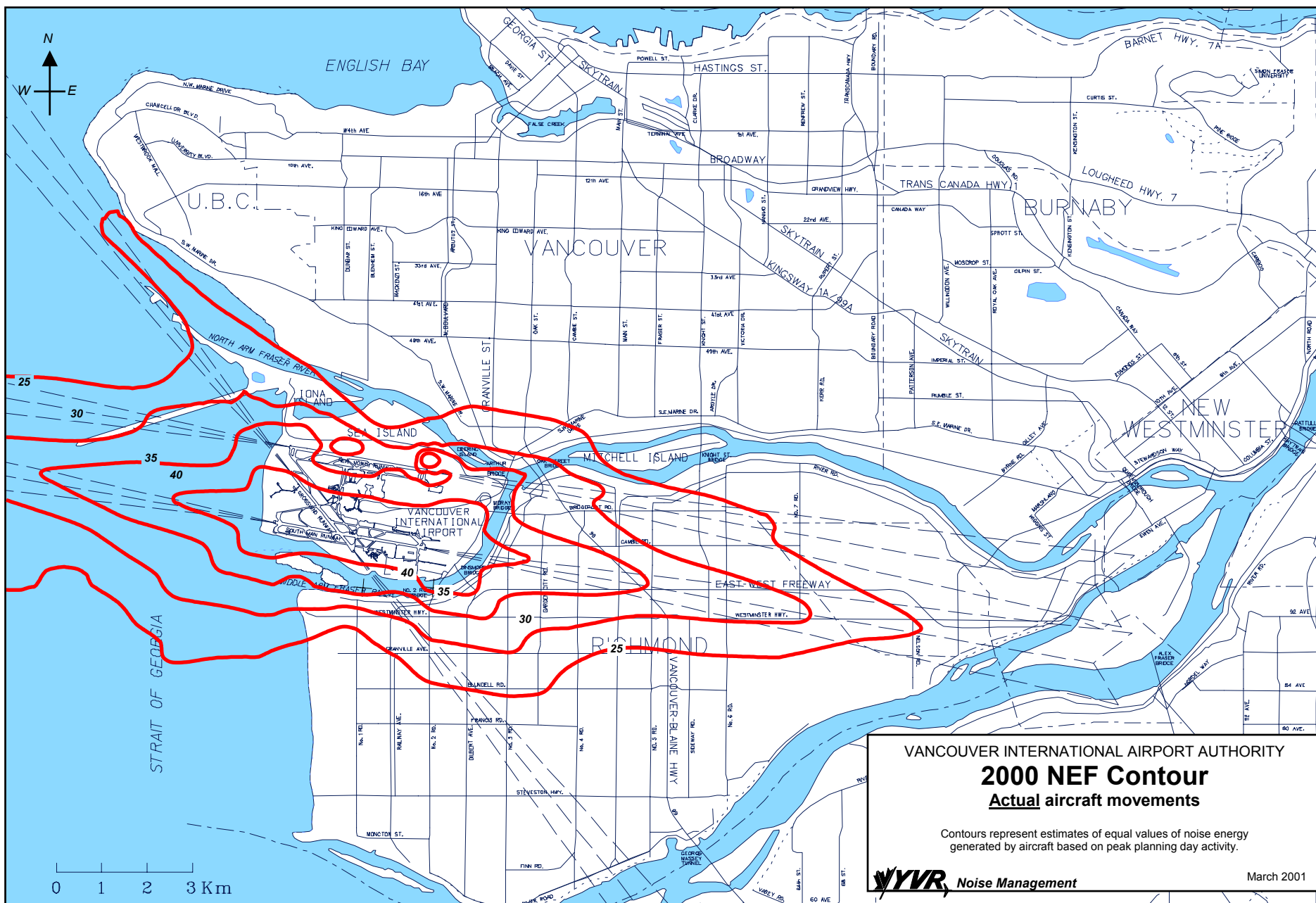


RESULTS

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

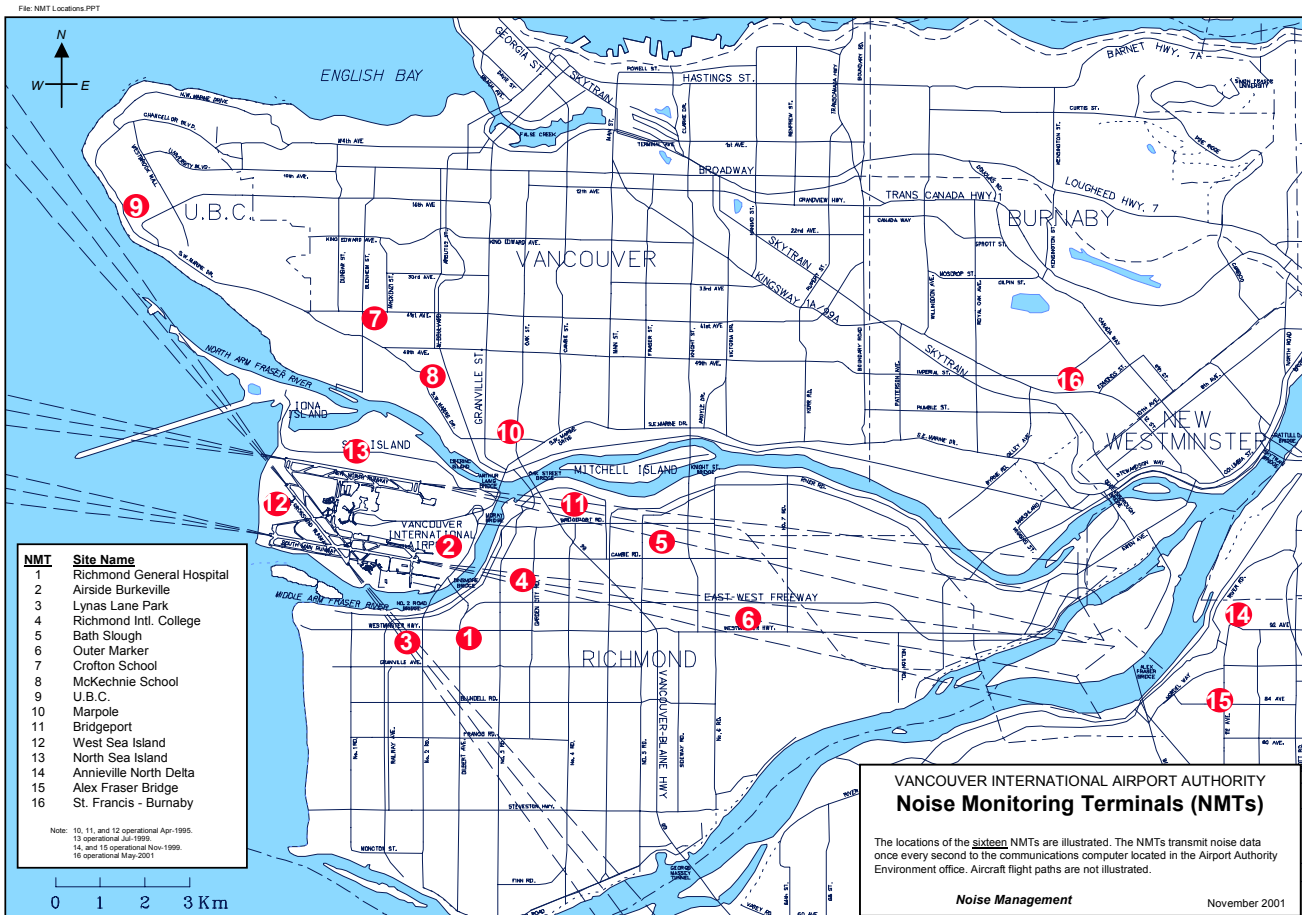


Figure 8c. Annual Average Noise Levels (dBA) at Richmond Noise Monitoring Terminals (NMT), 1995-1999

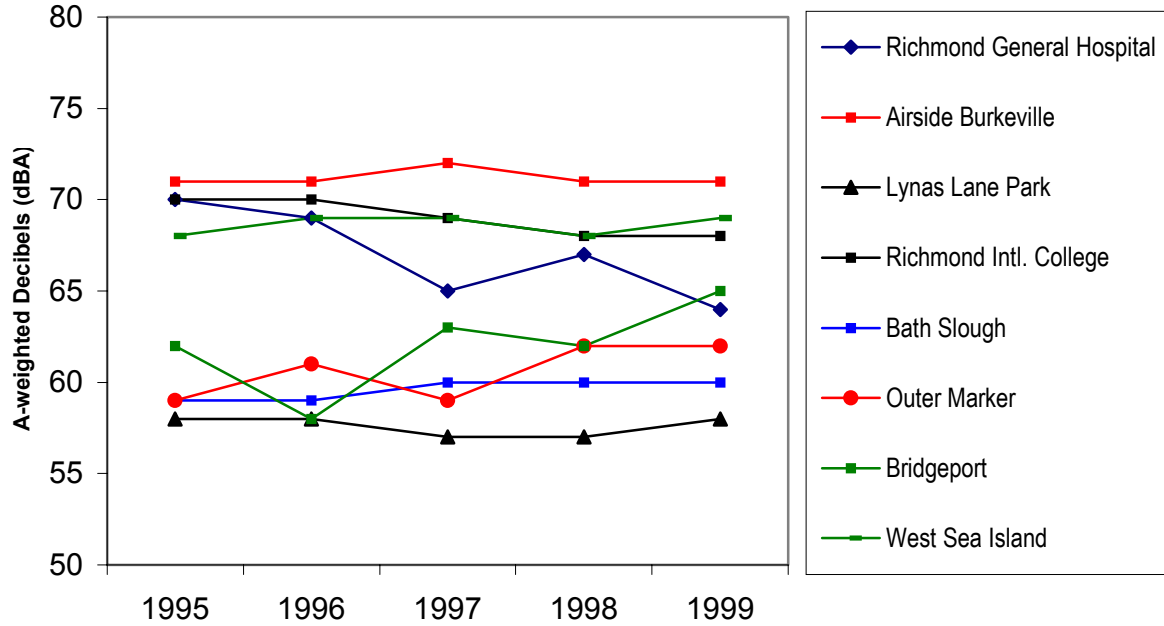
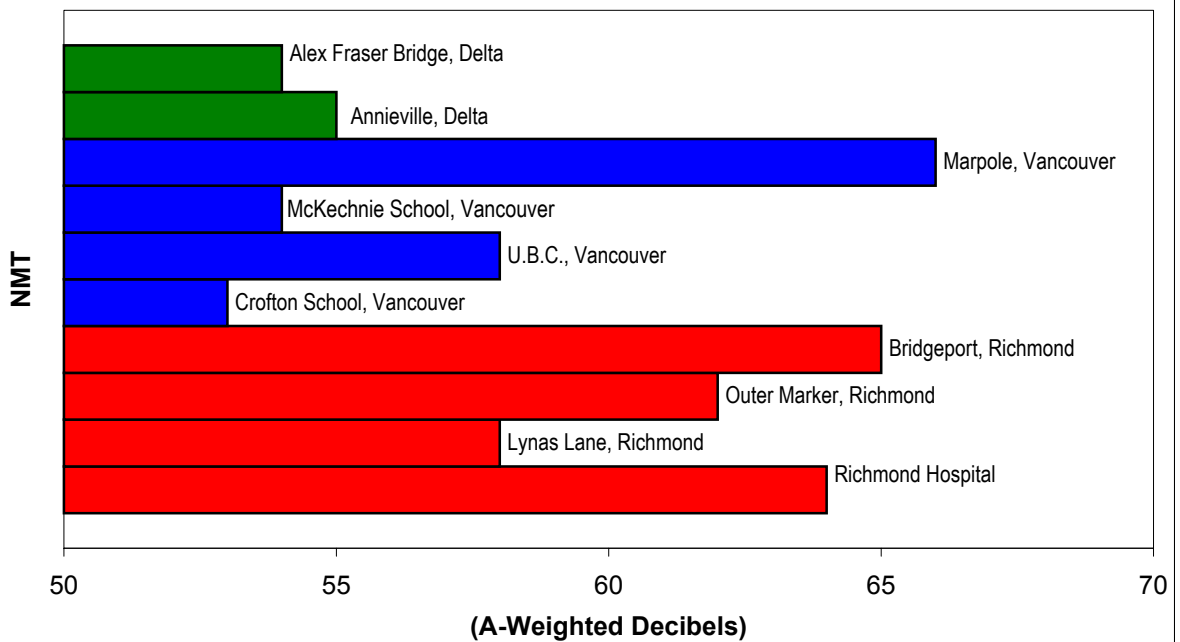


Figure 8d. Noise Levels at Selected Noise Monitoring Terminals (NMT) in Richmond, Vancouver and Delta for 1999



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.yvr.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 I: 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



Partners for Beautification

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

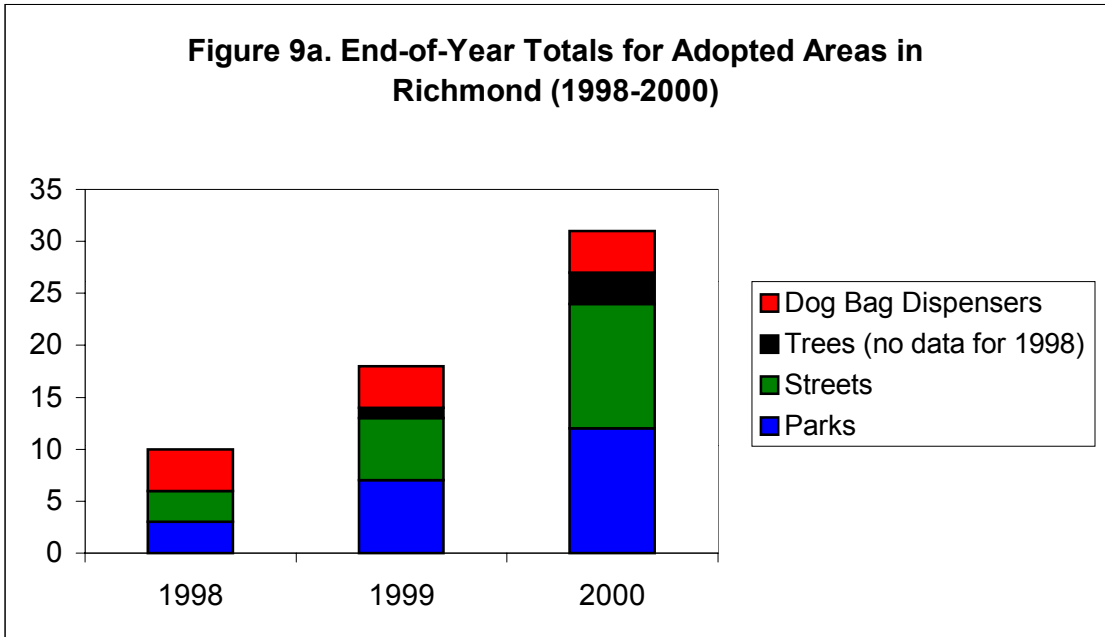
It is not possible to report on all the environmental stewardship programs in Richmond. However, a few examples are worth noting.

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 I2: 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.

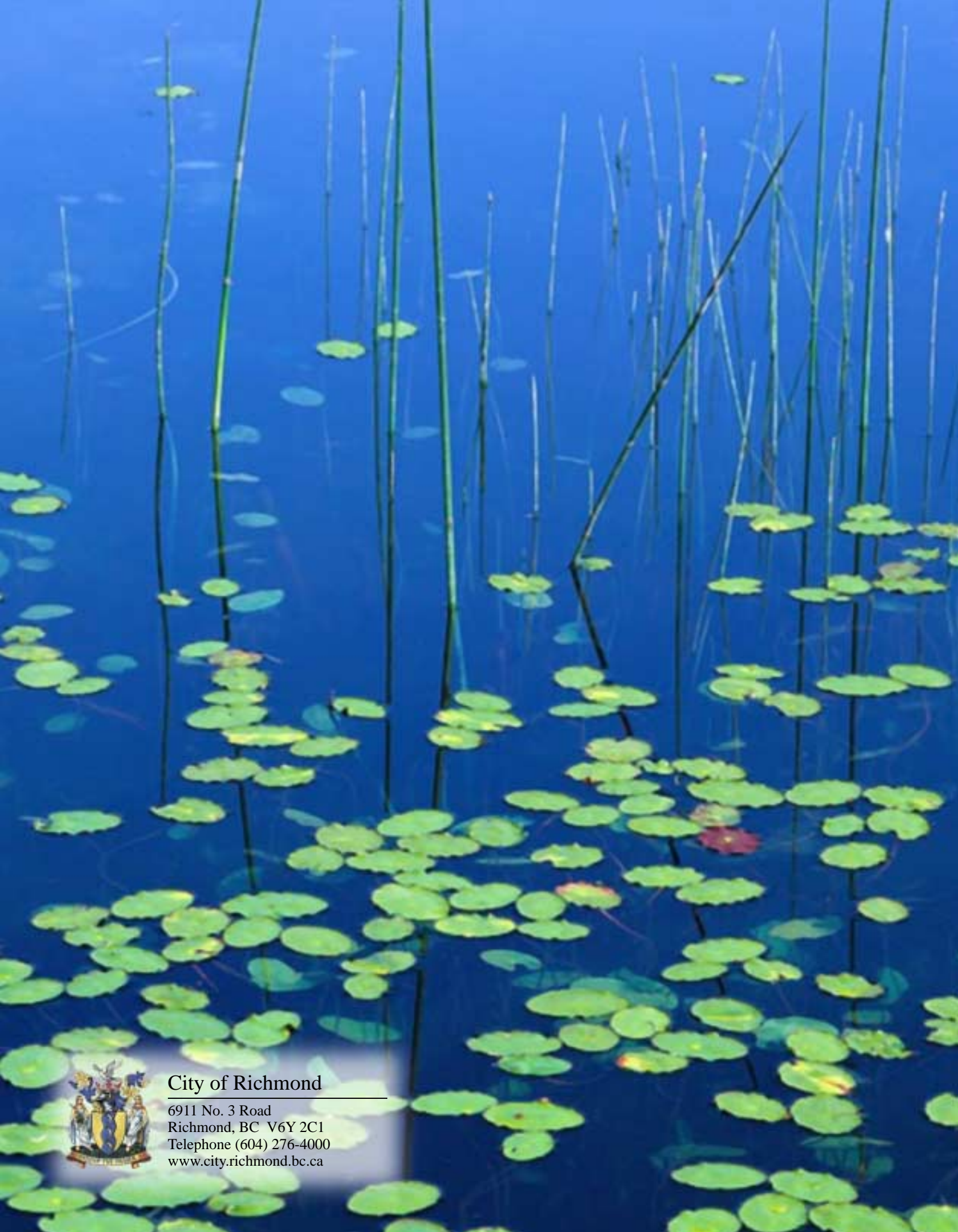
Sustainable Transportation – Modes of transportation which use lower amounts of energy and produce fewer greenhouse gases per person travelling than the private automobile (i.e. transit, walking or cycling).

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.



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