1995 Sea-to-Sky Airshed Emissions Inventory of Common Air Contaminants

Summary Report

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Abstract

An emission inventory is an accounting of all sources of air pollution within a defined geographical area (as defined in the *1995 British Columbia Emissions Inventory of Common Air Contaminants and Greenhouse Gases*). Air Quality Management requires such a tool in order to identify air quality issues, goals, and management strategies for the area of interest. This would result in informed recommendations regarding the eventual development, adoption, administration, and implementation of an airshed-wide plan. This report describes the results of the 1995 emission inventory for the Sea-to-Sky Airshed, which includes Gibsons, Squamish, Whistler, and Pemberton. There are five common contaminants, namely carbon monoxide (CO), nitrogen oxides (NO_x), sulphur oxides (SO_x), volatile organic compounds (VOC) and particulate matter (with PM_{10} and $PM_{2.5}$ breakdowns) that are included in this inventory. The common contaminants' summaries, by source category and individual sources, are discussed in the body of this report.

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ACE	Air Contaminant Emissions project
AP-42	U.S. EPA Compliance of Air Pollutant Emission Factors (see reference 13)
CANBEIS	Canadian Biogenic Emission Inventory System
CCME	Canadian Council of Ministers of the Environment
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
EC	Environment Canada
EMS	Ministry Environmental Monitoring System
FRDA II	Canada-British Columbia Partnership Agreement on Forest Resources Development
GHGs	greenhouse gases
GIS	geographic information system
GOAT	GIS Oracle Accessing Tool
GVRD	Greater Vancouver Regional District
HDD	heavy-duty diesel
HDDV	heavy-duty diesel vehicle
LDD	light duty diesel
LDDT	light duty diesel truck
LDDV	light duty diesel vehicle
LDGT	light duty gasoline truck
LDGV	light duty gasoline vehicle
LFV	Lower Fraser Valley
MC	motorcycle
MSW	municipal solid waste
NO_x	nitrogen oxides
N_2O	nitrous oxide
Part	total particulate matter (also known as *suspended particulate matter*)
PM_{10}	inhalable particulate matter, particles smaller than 10 microns in diameter
$PM_{2.5}$	fine particulate matter, particles smaller than 2.5 microns in diameter
SCC	source classification code
SIC	standard industrial classification
SO_x	sulphur oxides
STS	Sea-to-Sky Airshed
TCN	Transportation Centerline Network
TRS	total reduced sulphur
U.S. EPA	United States Environmental Protection Agency
VkmT	vehicle kilometres traveled
VOC	volatile organic compound
WACC	Water, Air and Climate Change Branch (*formerly the Air Resources Branch*)
WLAP	BC Ministry of Water, Land and Air Protection (*formerly the Ministry of Environment, Lands & Parks*)
WASTE	Ministry permit/approval/fee database system
WMR	Ministry waste management region (7)

1.0 INTRODUCTION

Due to the increased knowledge of the adverse health effects related to air contaminants as well as their negative impact on the natural environment, air quality management has become a more prominent activity. The different organisations that hold an interest in air quality are discovering the advantages of playing a preventive and proactive role in order to reduce any possible future impacts. Emissions inventories are a major tool in attempting to complete an air quality management plan. Indeed, an emissions inventory provides information on the types of emissions, their sources, and the quantity of contaminants emitted for a specific geographical area. This information can then be used to determine which steps should be taken in an air quality management plan in order to reduce harmful emissions and to improve ambient air quality.

The Water, Air and Climate Change Branch (WACC) in Victoria produces a provincial emissions inventory every five years, the first of which was in 1985. There is also one produced by the Greater Vancouver Regional District (GVRD) for the Lower Fraser Valley (LFV), with updates for 1997, 1998, and 1999. Although the information contained in emission inventory reports is interesting and valuable, it is not advisable to do a direct comparison between them as every report also includes changes in the estimation methods. This is inevitable in order to improve each emission inventory's results. For example, cutback asphalt and marine aerosol are sources that were not included in previous provincial inventories. The differences in tonnes of emissions can therefore be due to an increase/decrease of emissions or a change in calculation and identified sources.

The 1995 BC emissions inventory was spatially prorated for each Waste Management Region (WMR). However, for the purpose of our study, a more specific inventory was needed as the larger Lower Mainland Waste Management Region was not representative of the air quality present in the smaller Sea-to-Sky (STS) airshed. Local concerns and interests cannot be properly represented or addressed at the regional level. This STS emissions inventory is the first to be produced for the area. Due to the time and work involved in producing an emissions inventory, this emissions inventory for the STS is based solely on the results obtained from the 1995 provincial and LFV studies. When possible, the results were obtained from the Air Contaminants Emissions (ACE) project, which uses a number of calculations to prorate the results that were obtained in 1995. More information regarding this methodology is available in this report as well as in the documents listed in the references section. The Water, Air and Climate Change Branch in Victoria is working on producing the 2000 provincial emissions inventory. Once the final results are obtained, they will be incorporated into the ACE program and an updated inventory for the STS will be possible.

It is important to note that an emissions inventory involves a large number of estimations, as it is unfeasible to obtain the exact volumes of contaminants emitted by each source in such a large airshed. Furthermore, the results displayed in this report are for 1995. Population, traffic volumes, and other factors will have changed since 1995 along with the emissions associated with them. Consequently, the data displayed in this report should only be used to obtain a general idea as to the contributions of each source, and not as definite quantities. Although these limitations should be recognised and understood when interpreting the results, the emissions inventory still provides a valuable tool in the air quality management planning process.

1.1 Study Area

The Sea-to-Sky (STS) airshed is divided into two regions for the purposes of this study, namely the Lower and Upper STS airsheds (LSTS and USTS). The purpose of this division is to highlight the fact that the main industrial sources (including the two pulp mills) are located in the lower section, whereas the upper section represents sources that are more closely related to tourism and residential activities. This results in different proportions of emissions from each source category.

The LSTS airshed includes Gibsons, Horseshoe Bay, and the municipality of Squamish. The USTS airshed includes the resort municipality of Whistler and the town of Pemberton. Both sections were delimited using topographical information as it is assumed that the air travels within a certain corridor defined by the elevated landscape on either side of the STS. However, it is important to note that a number of adjoining valleys were not included in the airshed, as they were not thought to contribute significant quantities of air contaminants. These valleys, nonetheless, would also contribute to air pollutants travelling in and out of the airshed.

The STS airshed also includes a small portion of the Lower Fraser Valley (LFV) airshed (***Figure 1-2***). The 1995 LFV emissions inventory was produced by the Air Quality Department (now the Policy and Planning Department) of the Greater Vancouver Regional District (GVRD). A large percentage of the population is located within the LFV and their air quality concerns have been present for almost 25 years. As a result, the analysis for this inventory is done in greater detail than the provincial emissions inventory. The section of the STS which is included in the LFV is of a rectangular shape and is bordered by longitudes $123^{o}25'$ and $123^{o}12'$ and by latitudes $49^{o}30'$ and $49^{o}20'$. It includes a portion of West Vancouver as well as Bowen Island and Lions Bay.

The resulting STS airshed boundary is shown in ***Figure 1-1***. Although the tables and graphs for the total STS airshed are located throughout this report, in the interest of grouping the results together, the tables and graphs representing either the lower or the upper STS airsheds are located in the appendices.

1.2 Contaminants Inventoried

Although there are a variety of air contaminants in existence, the efforts were focused on those that are of particular interest to other provinces as well as the US EPA. These contaminants are significant as they possess federal or provincial objectives, standards, or criteria and have been associated with a number of health problems. These are the same main contaminants studied in the 1995 provincial emissions inventory. The provincial emission inventory report for 1995 also included the following common greenhouse gases; carbon dioxide, methane, and nitrous oxide. However, the results included in this report focus only on the common air contaminants as the greenhouses gases are managed at a federal level. Furthermore, due to the number of pulp mills, and oil and gas sources that were present, the BC Emissions Inventory also included total reduced sulphur (TRS) data. The TRS values in the STS airshed are low (as there are only two pulp mills present) and therefore, TRS was not included in this inventory. The following section explains in detail the common sources and adverse impacts associated with each of the five contaminants inventoried.

Common Contaminants

- **carbon monoxide (CO)**; A gas under ambient conditions, it is colourless, odourless and tasteless. It is primarily released by the incomplete combustion of fossil fuels.

- **nitrogen oxides (NO_x)** – *including nitric oxide (NO) and nitrogen dioxide (NO_2), reported as NO_2 equivalent*; A group of gases under ambient conditions, they are mainly released by the combustion of fossil fuels. Nitrogen dioxide (NO_2), a reddish-brown gas with an irritating odour, is one of the key ingredients in smog.

- **sulphur oxides (SO_x)** – *includes sulphur dioxide (SO_2) and sulphur trioxide (SO_3), reported as SO_2 equivalent*; A group of gases under ambient conditions, they are released mainly by the combustion of fossil fuels containing sulphur. Sulphur dioxide (SO_2) is a colourless gas with a pungent odour and can lead to acid rain.

- **volatile organic compounds (VOCs)** – *any organic compound which participates in atmospheric photochemical reactions, but excluding methane, ethane, methyl chloroform, methylene chloride, CFC-113, CFC-114, CFC-115, CFC-11, CFC-12, CFC-22, FC-23, HCFC-123, HCRC-141b, HCFC-142b, and HFC-1341 (excluded because of their negligible photochemical reactivity)*; A group of gases under ambient conditions, they are released during combustion, industrial processes, and through the evaporation of a number of substances such as solvents and paints. These gases, through a photochemical reaction with nitrogen oxides (NO_x), can produce ground-level ozone (O_3), which is also an ingredient and smog and is associated with a number of adverse health effects. Ground-level ozone can also cause plastics and paints to deteriorate prematurely.

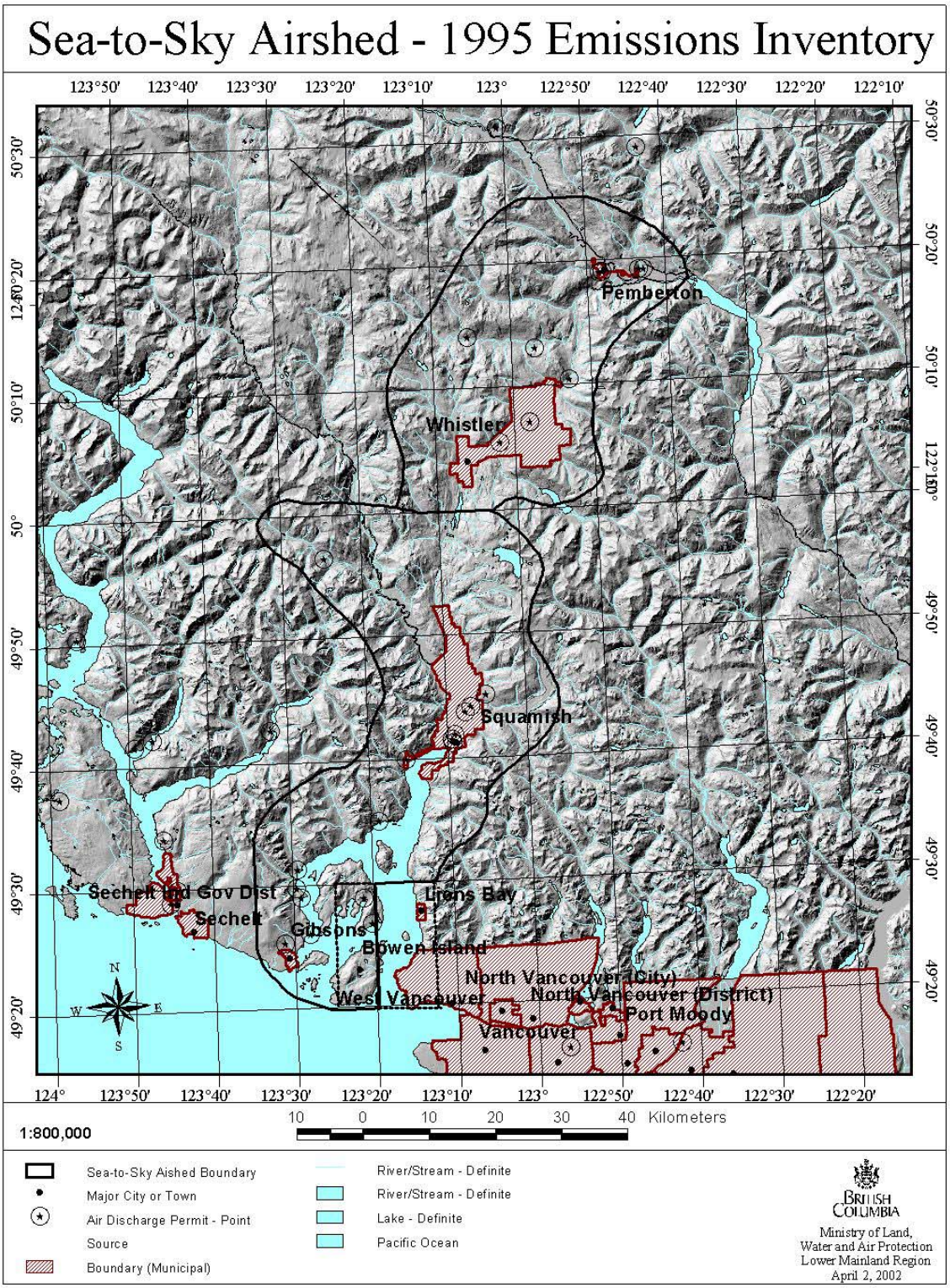
- **total particulate matter (Part)** – *or total suspended particulate matter of all sizes, including emissions of PM_{10} and $PM_{2.5}$, as described below*; any substance that can be filtered from the air (e.g. dust, soot, ash, and pollen), which would normally remain suspended in the air.

    - **PM_{10}** – particulate matter with aerodynamic diameters less than or equal to 10 micrometers. This group is also known as the coarser fraction of particulate matter. It is roughly the size of bacteria and can bypass human protective mechanisms and enter the lungs resulting in a number of health problems;

    - **$PM_{2.5}$** – particulate matter with aerodynamic diameters less than 2.5 micrometers. This group can be referred to as the fine fraction of particulate matter. Its size allows it to collect in the alveoli, which can result in a number of health issues. In addition, it is prone to remaining suspended for longer periods of time and can create a "haze" as it is small enough to reflect light.

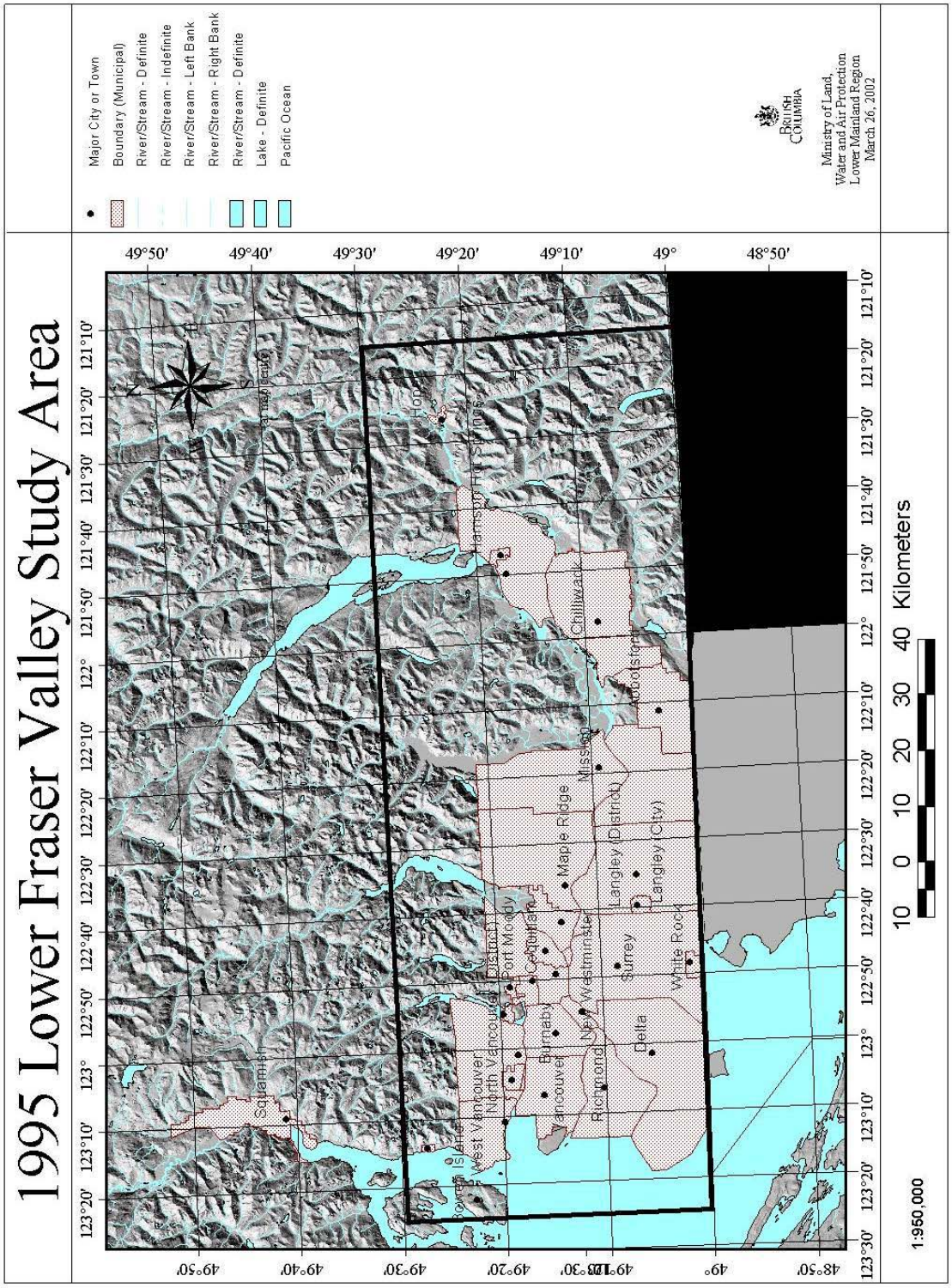
  It should be noted that only primary emissions of PM_{10} and $PM_{2.5}$ are quantified in this emissions inventory. Primary emissions are those which are emitted directly to the atmosphere from a source. Secondary fine particulate matter forms in the atmosphere from a complex series of interactions between primary emissions of particles and other gases present.

***Figure 1-1*: Sea-to-Sky Airshed Boundary**



Please note that the LFV section, represented by the doted line, includes the area up to 123°25' (Bowen Island), as shown in **Figure 1-2. This section is included in the Sea-to-Sky airshed.*

***Figure 1-2*: 1995 Lower Fraser Valley Study Area**



1.3 Source Categories

Air contaminants can be emitted due to human activities (anthropogenic sources), or they may occur naturally (nonanthropogenic). For easier reporting and analysis, the emission sources are further classified into specific categories. The 1995 STS inventory is divided into five different categories based on the contaminants' origin:

- **point sources** – stationary industrial / commercial facilities authorized to discharge air emissions under a *Waste Management Act* permit, approval or regulation; a MWLAP Solid Waste Management Plan, or under an air discharge permit issued under GVRD's Air Quality Management Bylaw No. 937.

- **area sources** – residential, light industrial, commercial, and institutional sources that are normally not required to obtain Ministry or GVRD authorization. Due to the numbers and diffused nature of these small sources, emissions are estimated collectively. Anthropogenic area sources include agricultural practices, miscellaneous burning (prescribed burning, structural fires, etc.), gasoline marketing, landfills, tobacco, solvent evaporation, space heating (residential/commercial/institutional), and other miscellaneous sources. (*A more detailed list is located in **Appendix D***.)

- **mobile sources** – non-stationary sources, primarily those involved in the transportation of people and goods. For this emissions inventory, the mobile sources are divided into 5 subcategories, namely, on-road motor vehicles (light-duty and heavy-duty vehicles), aircrafts, railways, marine vessels and off-road sources (agriculture vehicles, lawnmowers, etc.)

- **natural sources** – refers to emissions that occur naturally without the influence of humans (nonanthropogenic). Natural sources include categories such as wildfires, biogenics (vegetation), wildlife, and marine aerosol (airborne particulates produced by wind activity and wave movement of salt-water bodies).

- **road dust** – produced when vehicles travelling on roadways cause the settled material to become airborne. Road dust is dependent on a host of factors including the location of the road, the type of road surface, the volume of traffic, and the daily weather. Due to the difficulties associated with calculating road dust, a considerable amount of uncertainty is associated with the results. Consequently, this category is displayed separately from area sources, and only for the overall airshed, in order to acknowledge its presence and influence. Road dust contributes total particulate matter, PM_{10} and $PM_{2.5}$ only.

2.0 METHODOLOGY

In the interest of reducing repetition, detailed information pertaining to the exact calculations used to produce the 1995 BC Emissions Inventory and LFV Emissions Inventory, can be found in other documents listed in the reference section of this report. The STS Emissions Inventory employed a large number of the results from these previous inventories through a model named ACE, which is further explained in the next section. A number of different methods were used in order to prorate these values. Once again, consulting the documents listed in the reference section will provide further details concerning these methods. This report will only focus on the main steps taken, as well as any specific modifications that were made to the overall methodology.

2.1 Air Contaminant Emission (ACE) Model

The Water, Air and Climate Change Branch in Victoria maintains a provincial emissions inventory. This emissions inventory is summarized at the provincial level and offers emissions summaries for each of the seven Waste Management Regions (WMR). These regional summaries, however, are too broad to be used effectively as a tool for an airshed specific air quality management plan. This was the case for the Sea-to-Sky airshed, which is included in the Lower Mainland Region (WMR 2).

In order to obtain significant results for defined airsheds, without commencing a lengthy emission inventory process from scratch, a simple end-user interface that would offer the ability for both spatial and attribute exploration and reporting was needed. As a result, WLAP, with assistance from Environment Canada, initiated the Air Contaminants Emissions (ACE) project to add a spatial component to the 1995 British Columbia emissions inventory and to prototype a Geographical Interface System (GIS) enabled emissions inventory system.

This data model incorporates the entire provincial area, but provides a means to extract only the information pertaining to the study area. By providing a spatial component to the *1995 British Columbia Emissions Inventory of Contaminants and Greenhouse Gases*, there was no required recalculation of Provincial emission parameters (base quantities, emission factors etc.). The existing emissions estimates are geo-spatially allocated throughout the Province by integrating geographic data with the available emissions inventory. A spatial grid system was designed to enable this allocation and to provide a consistent base for display and reporting. Each cell of the grid system is assigned a value (for each process) that is derived from spatial data. For example, the grid cell value for an agriculture-related emitting process might indicate the agricultural surface area in the grid cell. This value can then be compared to the total agricultural surface area in the Province to determine the portion of the process that is occurring in each cell. In order to produce inventories for specifically defined airsheds, these cells were made available in resolutions of 1 km or 5 km. Tradeoffs involving speed and accuracy occur between these two resolutions. For the purpose of the Sea-to-Sky airshed emissions inventory, the 1 km resolution was used.

2.2 Lower Fraser Valley

The Lower Fraser Valley emission results listed in the *1995 Emission Inventory for the Lower Fraser Valley Airshed* were temporally and spatially resolved to break down the emission into a series of 5 km by 5 km grid, with work from Environment Canada and Levelton Engineering.

However, some of the values were unreliable, namely road dust data, and were therefore not included in the final tabulations. As a result of its absence, road dust totals within the lower STS airshed may be underestimated. Work is being done in order to provide better spatial allocations for the area, and may be completed for the 2000 emissions inventory update.

3.0 OVERALL EMISSION RESULTS

This section contains an overview of the 1995 Sea-to-Sky airshed emissions. Unlike the 1995 BC emissions inventory, natural sources are included in this comparison in order to better identify which contaminants warrant further attention. For example, ground-level ozone, which is associated with a number of health problems, is produced by a photochemical reaction between NO_x and VOCs. Therefore, if the VOCs are present in very large quantities, but the NO_x are not, then the NO_x become a possible limiting factor (in their absence, the reaction could not take place and no ozone would be produced).

Although these results represent the best estimates at this time, a number of factors were not accounted for. There are a number of reasons for this; namely, the lack of information available, such as the number of tourists present in 1995, and the indirect proportion of tonnes of emissions vs. the time and resources required to obtain them, as is the case for the recreational marine vessels within the STS airshed. These limitations and subsequent variability in the data are explained in more detail in the following sections, as well as the work and results associated with sources within each category.

3.1 Total STS Airshed

These results do not take into account road dust. As mentioned previously, although it is present in large amounts, its values carry considerable uncertainty and can therefore not be used effectively. However, they cannot be ignored and ***Figure 3-1*** and ***Table 3-1*** do display the tentative proportions that road dust would represent within the airshed. Studies are ongoing in an attempt to improve these estimates and consequently, these values may be revised in the future.

Data indicate that point sources contribute more than half of the CO, SO_x, and particulate in the airshed with respectively 50%, 70%, and 54%. The particulate can also be broken down further into PM_{10} at 55% and $PM_{2.5}$ at 55%. However, NO_x are lower with only 38%. VOCs represented only 5% of the point sources contribution.

Area sources produced more than a third of the particulates. Total particulates were 35%, PM_{10} were 33%, and $PM_{2.5}$ were 38%. This would place area sources second after point sources as the contributor for particulates. Area sources are also the most significant after natural sources for VOC emissions. Area sources contributed 18% of the VOCs in the airshed. They were lower for the other emissions with CO at 21%, and both NO_x and SO_x at 5% each.

Mobile sources account for most of the NO_x emissions with 56%. Their CO and SO_x contributions are also significant with 28% and 25%, respectively. The other contaminants remain low however with VOC at 6%, total particulate at 3%, PM_{10} at 4% and $PM_{2.5}$ at 5%.

Natural sources contributed mainly VOCs with 72%. Its next largest contribution is total particulate matter with 8% and PM_{10} with 9%. The other emissions were low with $PM_{2.5}$ at 3%, CO at 1% and NO_x at 1% as well.

3.2 Upper and Lower STS Airshed

In order to group the results together, the lower STS Airshed tables and graphs are located in ***Appendix B***, and the upper STS Airshed tables and graphs are located in ***Appendix C***.

As stated previously, these divisions were created in order to highlight the social, industrial, and commercial differences between the upper and lower STS airsheds and to help in identifying the proper management strategies for each one. Certain sources do not exist in one or in the other of these divisions. For example, agriculture is only present in the upper STS, whereas marine aerosol and ferries are only located in the lower STS. In addition, a more significant source may be located within only one of the divisions. Indeed, as the two main point sources are located in the lower STS, the upper STS's point source category will not be as significant.

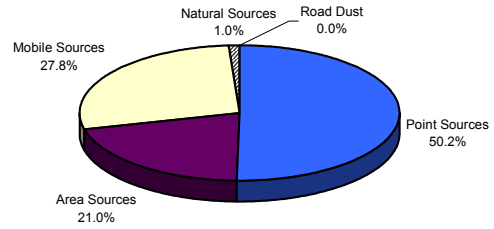
As a result, the upper STS's point sources do not contribute more than 20% of any contaminant emitted. More than 60% of the total particulate in the lower STS is produced by point sources, whereas in the upper STS, area sources contribute the most with 70%. CO emissions are also attributed more to area sources in the upper STS with 46%, whereas in the lower STS, the point sources appear to have contributed more, with 58% of CO the emissions. Mobile sources were the main NO_x contributors in both the upper STS and the lower STS. However, they produced over 85% of the total emissions for the upper, whereas they produced 51% for the lower in which point sources were also a large contributor with 44%. Although SO_x emissions are mainly produced by point sources in the lower STS with 74%, mobile sources are the main contributor in the upper STS with 67%. For VOC emissions, natural sources remain the primary contributor in both divisions, with area sources being the second contributor with less than 19% in both cases.

Table 3-1: 1995 STS Emissions Inventory – Summary Table (*incl. Road Dust*)

SOURCE/ Category	CO			NO_x			SO_x			VOC			Part			PM_{10}			$PM_{2.5}$		
	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total
ANTHROPOGENIC																					
Point Sources	**11,757.2**	**50.7**	**50.2**	**1,654.6**	**38.5**	**38.2**	**487.9**	**70.1**	**70.1**	**608.6**	**16.4**	**4.6**	**1,533.3**	**58.2**	**17.7**	**1,196.9**	**59.7**	**34.1**	**962.8**	**56.7**	**47.5**
Forestry and Logging	250.0	1.1	1.1	2.0	0.0	0.0	0.2	0.0	0.0	21.2	0.6	0.2	46.1	1.7	0.5	39.3	2.0	1.1	37.3	2.2	1.8
Mining		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Wood Products		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	347.7	13.2	4.0	139.2	6.9	4.0	69.5	4.1	3.4
Paper and Allied Products	10,462.0	45.1	44.6	1,564.4	36.4	36.1	468.2	67.3	67.3	490.5	13.2	3.7	894.5	34.0	10.3	808.7	40.3	23.1	652.3	38.4	32.2
Non-Metallic Minerals		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Refined Petroleum and Coal	16.7	0.1	0.1	50.6	1.2	1.2	13.9	2.0	2.0	8.3	0.2	0.1	31.4	1.2	0.4	7.0	0.3	0.2	3.0	0.2	0.1
Chemical Products	2.0	0.0	0.0	9.4	0.2	0.2	0.1	0.0	0.0	0.5	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0
Construction Industries	4.7	0.0	0.0	20.1	0.5	0.5	3.6	0.5	0.5	1.5	0.0	0.0	13.2	0.5	0.2	3.1	0.2	0.1	1.4	0.1	0.1
Utility Industries	1,021.5	4.4	4.4	7.8	0.2	0.2	0.8	0.1	0.1	86.4	2.3	0.6	198.6	7.5	2.3	198.6	9.9	5.7	198.6	11.7	9.8
Accommodation Services	0.2	0.0	0.0	0.2	0.0	0.0	1.1	0.2	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Other Service Industries	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.9	0.0	0.0	0.3	0.0	0.0	0.2	0.0	0.0
Area Sources	**4,931.6**	**21.2**	**21.0**	**227.9**	**5.3**	**5.3**	**33.1**	**4.8**	**4.8**	**2,326.8**	**62.8**	**17.5**	**1,009.0**	**38.3**	**11.6**	**716.7**	**35.7**	**20.4**	**656.3**	**38.6**	**32.4**
Prescribed burning	22.1	0.1	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	2.4	0.1	0.0	1.7	0.1	0.0	1.6	0.1	0.1
Space heating	4,828.5	20.8	20.6	216.1	5.0	5.0	32.3	4.6	4.6	1,647.8	44.5	12.4	647.6	24.6	7.5	646.5	32.2	18.4	614.1	36.1	30.3
Agriculture	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	20.5	0.6	0.2	44.3	1.7	0.5	16.9	0.8	0.5	8.0	0.5	0.4
Oil and Gas	2.7	0.0	0.0	5.4	0.1	0.1	0.0	0.0	0.0	232.2	6.3	1.7	0.6	0.0	0.0	0.6	0.0	0.0	0.6	0.0	0.0
Solvent Evaporation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	339.6	9.2	2.5	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Miscellaneous Burning	74.4	0.3	0.3	4.8	0.1	0.1	0.8	0.1	0.1	23.6	0.6	0.2	13.3	0.5	0.2	13.1	0.7	0.4	11.9	0.7	0.6
Other	3.9	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	62.2	1.7	0.5	300.9	11.4	3.5	37.8	1.9	1.1	20.1	1.2	1.0
Mobile Sources	**6,518.9**	**28.1**	**27.8**	**2,419.9**	**56.2**	**55.9**	**174.6**	**25.1**	**25.1**	**767.8**	**20.7**	**5.8**	**92.3**	**3.5**	**1.1**	**91.8**	**4.6**	**2.6**	**80.4**	**4.7**	**4.0**
Light-Duty Vehicles	5,717.8	24.6	24.4	515.4	12.0	11.9	19.8	2.8	2.8	596.9	16.1	4.5	11.2	0.4	0.1	10.8	0.5	0.3	6.8	0.4	0.3
Heavy-Duty Vehicles	328.5	1.4	1.4	353.9	8.2	8.2	6.3	0.9	0.9	52.0	1.4	0.4	27.0	1.0	0.3	27.0	1.3	0.8	23.9	1.4	1.2
Railways	145.5	0.6	0.6	783.3	18.2	18.1	55.0	7.9	7.9	41.4	1.1	0.3	18.7	0.7	0.2	18.7	0.9	0.5	17.2	1.0	0.9
Marine Vessels	179.0	0.8	0.8	697.1	16.2	16.1	91.9	13.2	13.2	57.7	1.6	0.4	29.0	1.1	0.3	29.0	1.4	0.8	26.7	1.6	1.3
Aircraft		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0
Off-Road	148.2	0.6	0.6	70.3	1.6	1.6	1.6	0.2	0.2	19.9	0.5	0.1	6.3	0.2	0.1	6.3	0.3	0.2	5.8	0.3	0.3
ANTHROPOGENIC SUB-TOTAL	**23,207.7**	**100.0**	**99.0**	**4,302.4**	**100.0**	**99.3**	**695.7**	**100.0**	**100.0**	**3,703.3**	**100.0**	**27.8**	**2,634.6**	**100.0**	**30.4**	**2,005.4**	**100.0**	**57.2**	**1,699.5**	**100.0**	**83.9**
NATURAL																					
Wildfires	231.6	100.0	1.0	3.4	11.7	0.1	0.0	100.0	0.0	9.8	0.1	0.1	39.0	17.7	0.5	29.8	15.9	0.9	27.5	53.0	1.4
Biogenics	0.0	0.0	0.0	25.9	88.3	0.6	0.0	0.0	0.0	9,610.0	99.9	72.1	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Wildlife		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0
Marine Aerosol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	181.2	82.3	2.1	157.7	84.1	4.5	24.4	47.0	1.2
NATURAL SUB-TOTAL	**231.6**	**100.0**	**1.0**	**29.3**	**100.0**	**0.7**	**0.0**	**100.0**	**0.0**	**9,619.8**	**100.0**	**72.2**	**220.2**	**100.0**	**2.5**	**187.5**	**100.0**	**5.3**	**52.0**	**100.0**	**2.6**
ROAD DUST																					
Road Dust	**0.0**		**0.0**	**0.0**		**0.0**	**0.0**		**0.0**	**0.0**		**0.0**	**5,807.4**		**67.0**	**1,312.1**		**37.4**	**274.6**		**13.6**
TOTAL	**23,439.4**		**100.0**	**4,331.7**			**695.7**			**13,323.0**			**8,662.2**			**3,504.9**			**2,026.0**		

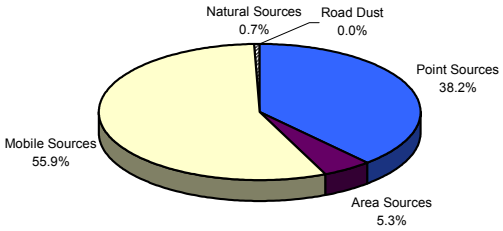
Figure 3-1: 1995 STS Overall Air Contaminant Emissions by Category (*incl. Road Dust*)

CO Emissions



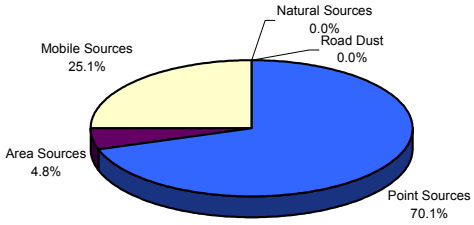
Total: 23,439.38 tonnes

NO_x Emissions



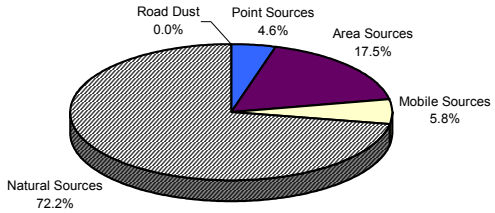
Total: 4,331.71 tonnes

SO_x Emissions



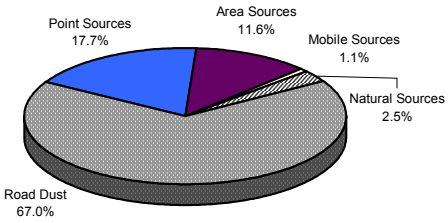
Total: 695.70 tonnes

VOC Emissions



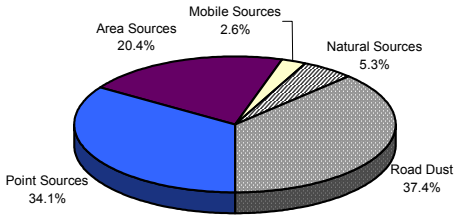
Total: 13,323.04 tonnes

Particulate Emissions



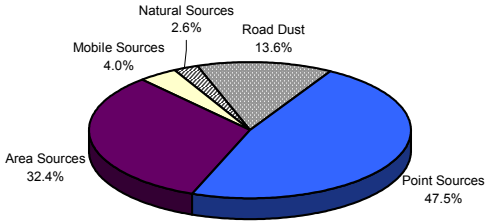
Total: 8,662.19 tonnes

PM_{10} Emissions



Total: 3,504.93 tonnes

$PM_{2.5}$ Emissions



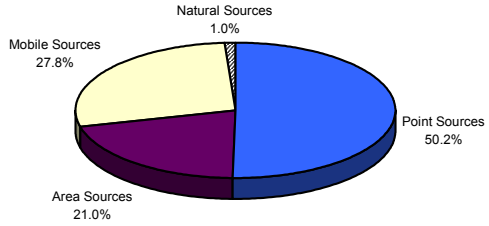
Total: 2,026.04 tonnes

Table 3-2: 1995 STS Emissions Inventory – Summary Table

SOURCE/ Category	CO			NO_x			SO_x			VOC			Part			PM_{10}			$PM_{2.5}$		
	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total
ANTHROPOGENIC																					
Point Sources	**11,757.2**	**50.7**	**50.2**	**1,654.6**	**38.5**	**38.2**	**487.9**	**70.1**	**70.1**	**608.6**	**16.4**	**4.6**	**1,533.3**	**58.2**	**53.7**	**1,196.9**	**59.7**	**54.6**	**962.8**	**56.7**	**55.0**
Forestry and Logging	250.0	1.1	1.1	2.0	0.0	0.0	0.2	0.0	0.0	21.2	0.6	0.2	46.1	1.7	1.6	39.3	2.0	1.8	37.3	2.2	2.1
Mining		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Wood Products		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	347.7	13.2	12.2	139.2	6.9	6.3	69.5	4.1	4.0
Paper and Allied Products	10,462.0	45.1	44.6	1,564.4	36.4	36.1	468.2	67.3	67.3	490.5	13.2	3.7	894.5	34.0	31.3	808.7	40.3	36.9	652.3	38.4	37.2
Non-Metallic Minerals		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Refined Petroleum and Coal	16.7	0.1	0.1	50.6	1.2	1.2	13.9	2.0	2.0	8.3	0.2	0.1	31.4	1.2	1.1	7.0	0.3	0.3	3.0	0.2	0.2
Chemical Products	2.0	0.0	0.0	9.4	0.2	0.2	0.1	0.0	0.0	0.5	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0
Construction Industries	4.7	0.0	0.0	20.1	0.5	0.5	3.6	0.5	0.5	1.5	0.0	0.0	13.2	0.5	0.5	3.1	0.2	0.1	1.4	0.1	0.1
Utility Industries	1,021.5	4.4	4.4	7.8	0.2	0.2	0.8	0.1	0.1	86.4	2.3	0.6	198.6	7.5	7.0	198.6	9.9	9.1	198.6	11.7	11.3
Accommodation Services	0.2	0.0	0.0	0.2	0.0	0.0	1.1	0.2	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Other Service Industries	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.9	0.0	0.0	0.3	0.0	0.0	0.2	0.0	0.0
Area Sources	**4,931.6**	**21.2**	**21.0**	**227.9**	**5.3**	**5.3**	**33.1**	**4.8**	**4.8**	**2,326.8**	**62.8**	**17.5**	**1,009.0**	**38.3**	**35.3**	**716.7**	**35.7**	**32.7**	**656.3**	**38.6**	**37.5**
Prescribed burning	22.1	0.1	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	2.4	0.1	0.1	1.7	0.1	0.1	1.6	0.1	0.1
Space heating	4,828.5	20.8	20.6	216.1	5.0	5.0	32.3	4.6	4.6	1,647.8	44.5	12.4	647.6	24.6	22.7	646.5	32.2	29.5	614.1	36.1	35.1
Agriculture	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	20.5	0.6	0.2	44.3	1.7	1.6	16.9	0.8	0.8	8.0	0.5	0.5
Oil and Gas	2.7	0.0	0.0	5.4	0.1	0.1	0.0	0.0	0.0	232.2	6.3	1.7	0.6	0.0	0.0	0.6	0.0	0.0	0.6	0.0	0.0
Solvent Evaporation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	339.6	9.2	2.5	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Miscellaneous Burning	74.4	0.3	0.3	4.8	0.1	0.1	0.8	0.1	0.1	23.6	0.6	0.2	13.3	0.5	0.5	13.1	0.7	0.6	11.9	0.7	0.7
Other	3.9	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	62.2	1.7	0.5	300.9	11.4	10.5	37.8	1.9	1.7	20.1	1.2	1.1
Mobile Sources	**6,518.9**	**28.1**	**27.8**	**2,419.9**	**56.2**	**55.9**	**174.6**	**25.1**	**25.1**	**767.8**	**20.7**	**5.8**	**92.3**	**3.5**	**3.2**	**91.8**	**4.6**	**4.2**	**80.4**	**4.7**	**4.6**
Light-Duty Vehicles	5,717.8	24.6	24.4	515.4	12.0	11.9	19.8	2.8	2.8	596.9	16.1	4.5	11.2	0.4	0.4	10.8	0.5	0.5	6.8	0.4	0.4
Heavy-Duty Vehicles	328.5	1.4	1.4	353.9	8.2	8.2	6.3	0.9	0.9	52.0	1.4	0.4	27.0	1.0	0.9	27.0	1.3	1.2	23.9	1.4	1.4
Railways	145.5	0.6	0.6	783.3	18.2	18.1	55.0	7.9	7.9	41.4	1.1	0.3	18.7	0.7	0.7	18.7	0.9	0.9	17.2	1.0	1.0
Marine Vessels	179.0	0.8	0.8	697.1	16.2	16.1	91.9	13.2	13.2	57.7	1.6	0.4	29.0	1.1	1.0	29.0	1.4	1.3	26.7	1.6	1.5
Aircraft		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0
Off-Road	148.2	0.6	0.6	70.3	1.6	1.6	1.6	0.2	0.2	19.9	0.5	0.1	6.3	0.2	0.2	6.3	0.3	0.3	5.8	0.3	0.3
ANTHROPOGENIC SUB-TOTAL	**23,207.7**	**100.0**	**99.0**	**4,302.4**	**100.0**	**99.3**	**695.7**	**100.0**	**100.0**	**3,703.3**	**100.0**	**27.8**	**2,634.6**	**100.0**	**92.3**	**2,005.4**	**100.0**	**91.5**	**1,699.5**	**100.0**	**97.0**
NATURAL																					
Wildfires	231.6	100.0	1.0	3.4	11.7	0.1	0.0	100.0	0.0	9.8	0.1	0.1	39.0	17.7	1.4	29.8	15.9	1.4	27.5	53.0	1.6
Biogenics	0.0	0.0	0.0	25.9	88.3	0.6	0.0	0.0	0.0	9,610.0	99.9	72.1	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Wildlife		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0
Marine Aerosol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	181.2	82.3	6.3	157.7	84.1	7.2	24.4	47.0	1.4
NATURAL SUB-TOTAL	**231.6**	**100.0**	**1.0**	**29.3**	**100.0**	**0.7**	**0.0**	**100.0**	**0.0**	**9,619.8**	**100.0**	**72.2**	**220.2**	**100.0**	**7.7**	**187.5**	**100.0**	**8.5**	**52.0**	**100.0**	**3.0**
TOTAL	**23,439.4**		**100.0**	**4,331.7**			**695.7**			**13,323.0**			**2,854.8**			**2,192.9**			**1,751.5**		

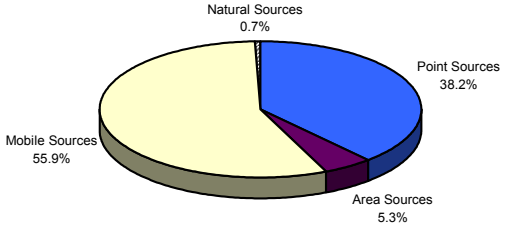
Figure 3-2: 1995 STS Overall Air Contaminant Emissions by Category

CO Emissions



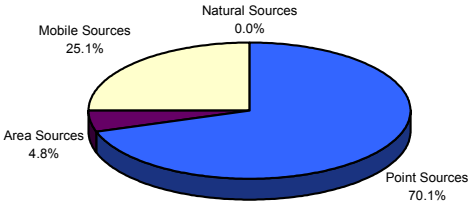
Total: 23,439.38 tonnes

NO_x Emissions



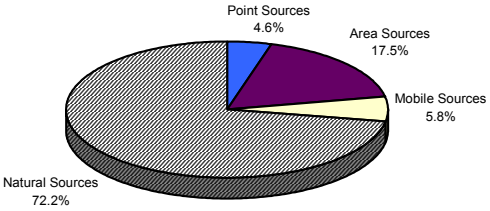
Total: 4,331.71 tonnes

SO_x Emissions



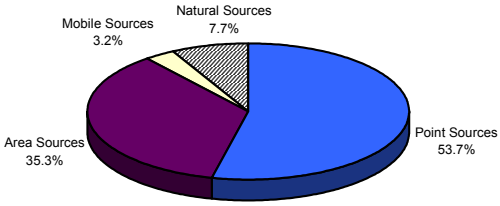
Total: 695.70 tonnes

VOC Emissions



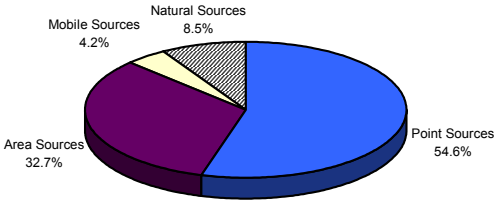
Total: 13,323.04 tonnes

Particulate Emissions



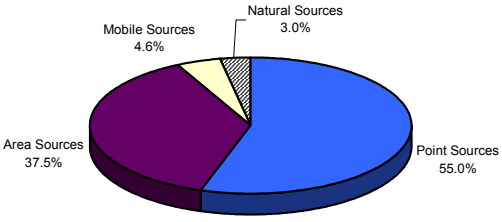
Total: 2,854.78 tonnes

PM_{10} Emissions



Total: 2,192.86 tonnes

$PM_{2.5}$ Emissions



Total: 1,751.46 tonnes

4.0 POINT SOURCES

There were a total of 27 permitted sources operating within the Sea-to-Sky Airshed in 1995. The discharge permits were all issued by the Ministry of Water, Land and Air Protection. Please note that the point sources listed here are those that were in existence in 1995. The permits issued since would be included in a 2000 update of the emissions inventory.

For these point sources, the Ministry permit fee system (known as WASTE) was used as a starting point for quantifying their emissions. The data contained in WASTE is based on either a permit limit (flow rate time x concentration x duration) or the use of an emission factor (base quantity such as production x emission factor). These numbers can however represent an overestimation, and therefore some were adjusted using information gathered by Levelton from specific companies and industrial organizations. For the STS emissions inventory, the results were obtained directly from the 1995 provincial emissions inventory or the Errata Sheet April 2000 (attached to the 1995 provincial report). The point sources located within the STS airshed were selected, and their respective emissions in tonnes per year were retrieved.

The point sources, along with their emission estimates and their locations are listed in ***Appendix A***. In ***Table 4-2***, the point sources are categorized using a two-digit standard classification code (SIC) and they are then listed with their estimated annual emissions. Each SIC may contain one or more industry included in the same general category (as detailed in the table below). Note that for this inventory, only the SICs for which a permit had been issued in 1995 are listed. These categories are described in more detail in the following table.

***Table 4-1*: Standard Classification Codes (SIC) used in the STS**

SIC	General Category	Specific Industry in STS Area
04	Forestry and Logging	- Logging Industry
06	Mining	- Gold Mines
25	Wood Products	- Sawmill and Planning Mill Products Industry
27	Paper and Allied Products	- Pulp Industry
35	Non-Metallic Minerals	- Ready-Mix Concrete Industry
36	Refined Petroleum and Coal	-Other Petroleum and Coal Products Industry
37	Chemical Products	- Industrial Inorganic Chemical Industry
41	Construction Industries	- Highways, Street and Bridges - Hydroelectric Power Plants
49	Utility Industries	- Other Utility Industry
91	Accommodation Services	- Other Recreational and Vacation Camps
96	Other Service Industries	- Other Amusement and Recreational Services

4.1 Total STS Airshed Results for Point Sources

It would appear, according to ***Table 4-2***, that the paper and allied products industry produced the most emissions in this category as it represents over 58% of the particulates emitted and over 80% of each of the other contaminants released. The wood products industry accounts for 23% of the particulate emissions, utilities industry 13%, forestry and logging 3% and the others 3%. The percentage of finer particulates in the wood products' emissions is low as their particulates are generally coarser. Consequently, their PM_{10} and $PM_{2.5}$ emissions are lower than those produced by the utility industries. The wood products industry represents 12% and 7%, respectively, whereas the utility industries represent 17% and 21%, respectively.

Refined petroleum and coal is second for both SO_x emissions with 3% and for NO_x emissions with 3.1%, while the other industries represent each lesser than or equal to 1%. For the CO emissions, the utility industries include 9% of the emissions, and forestry and logging include 2%. The same order is kept for the VOC emissions with the utility industries representing 14% and the forestry and logging industry representing 3.5%.

4.2 Upper and Lower STS Airshed Results for Point Sources

The main point source, namely the paper and allied products industry, is located in the lower STS airshed, it continues to represent a large portion of this category's emissions for that division. Indeed, over 60% of the particulates, and over 85% of the other contaminants are attributed to the paper and allied products industry in the lower STS airshed. Utility industries appear to have been second for CO with 8%, VOC with 13% and particulate with 11%. The refined petroleum and coal group were second for SO_x with 3% and NO_x with 3%.

The upper STS airshed displayed different proportions. Forestry and logging was the main contributor for CO with 59%, VOC with 58 % and total particulate with 45%. Furthermore, it appears to be second for the other contaminants, with NO_x at 20%, SO_x at 7%, PM_{10} at 46% and $PM_{2.5}$ at 45%. Construction industries were the primary contributor of NO_x and SO_x with 67% and 90%, respectively. However, it is important to note that the total NO_x emissions for the upper STS airshed were estimated at only 9.5 tonnes and the total SO_x emissions were estimated at 3.0 tonnes, which is relatively low. Utility industries were the primary sources for PM_{10} with 52% and $PM_{2.5}$ with 54%. They were also second, after the forestry and logging group, for CO and VOC with 41% and 40%, respectively.

Table 4-2: 1995 STS Point Source Emissions by Industrial Category

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Forestry and Logging	250.0	2.1	2.0	0.1	0.2	0.0	21.2	3.5	46.1	3.0	39.3	3.3	37.3	3.9
Mining									0.1	0.0	0.1	0.0	0.1	0.0
Wood Products									347.7	22.7	139.2	11.6	69.5	7.2
Paper and Allied Products	10,462.0	89.0	1,564.4	94.5	468.2	96.0	490.5	80.6	894.5	58.3	808.7	67.6	652.3	67.8
Non-Metallic Minerals									0.2	0.0	0.1	0.0	0.0	0.0
Refined Petroleum and Coal	16.7	0.1	50.6	3.1	13.9	2.8	8.3	1.4	31.4	2.0	7.0	0.6	3.0	0.3
Chemical Products	2.0	0.0	9.4	0.6	0.1	0.0	0.5	0.1	0.4	0.0	0.4	0.0	0.4	0.0
Construction Industries	4.7	0.0	20.1	1.2	3.6	0.7	1.5	0.2	13.2	0.9	3.1	0.3	1.4	0.1
Utility Industries	1,021.5	8.7	7.8	0.5	0.8	0.2	86.4	14.2	198.6	13.0	198.6	16.6	198.6	20.6
Accommodation Services	0.2	0.0	0.2	0.0	1.1	0.2	0.1	0.0	0.2	0.0	0.1	0.0	0.0	0.0
Other Service Industries	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.9	0.1	0.3	0.0	0.2	0.0
Total	**11,757.2**	100.0	**1,654.6**	100.0	**487.9**	100.0	**608.6**	100.0	**1,533.3**	100.0	**1,196.9**	100.0	**962.8**	100.0

Notes:

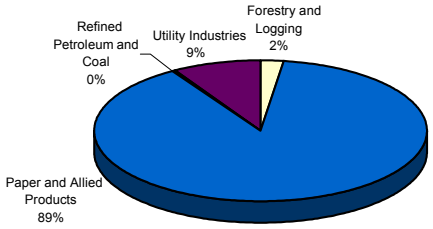
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

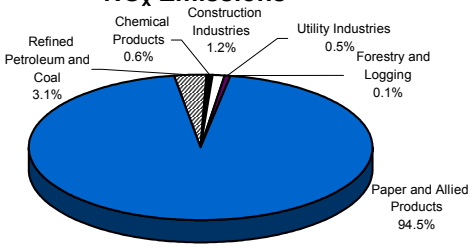
Figure 4-1: 1995 STS Point Source Emissions by Industrial Category

CO Emissions



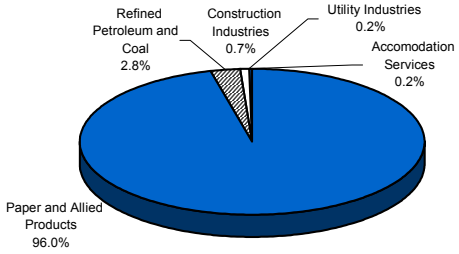
Total: 11,757.20 tonnes

NO_x Emissions



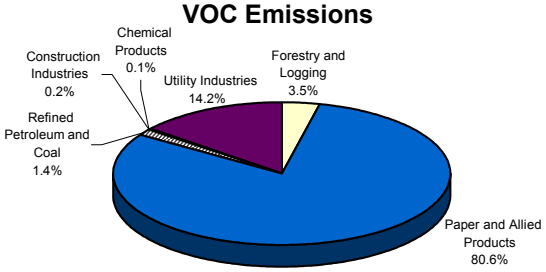
Total: 1,654.60 tonnes

SO_x Emissions



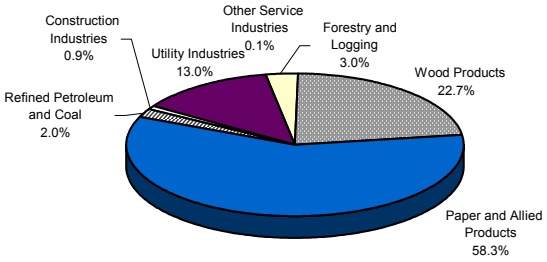
Total: 487.90 tonnes

VOC Emissions



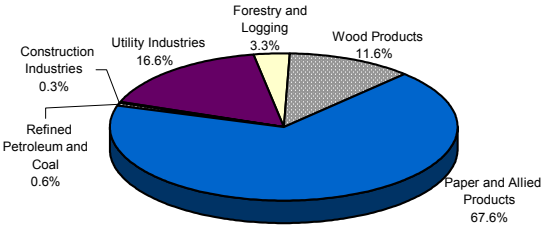
Total: 608.60 tonnes

Particulates Emissions



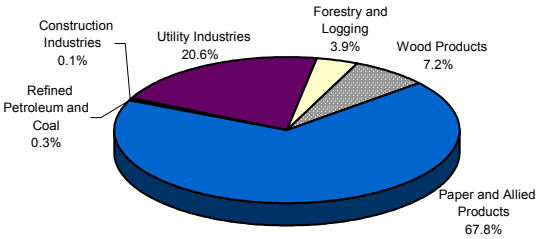
Total: 1,533.30 tonnes

PM_{10} Emissions



Total: 1,196.90 tonnes

$PM_{2.5}$ Emissions



Total: 962.80 tonnes

**Please note that in order to increase the clarity of these graphics, all categories with less than 0.1% of total emissions have been removed.*

5.0 AREA SOURCES

For this 1995 inventory, area sources are defined as a collection of many small, stationary points of air pollution which are not covered by specific WLAP air discharge permits (unlike the point sources). Because these sources are too small and/or too numerous to be surveyed and characterized individually, all area source activities are identified and emissions from these activities are collectively estimated.

Most of the area source emissions were calculated as the product of a base quantity and an emission factor. An emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. The general equation for emission estimation is:

E = BQ x EF

E = emissions (kg of pollutant released)
BQ = base quantity (kg of substance consumed)
EF = emission factor (kg of pollutant/kg of substance)

The majority of the emission factors used were from the United States Environmental Protection Agency (USEPA) publication *AP-42, Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources*. More details as to the exact methodology used for each category can be found in the documents listed in the reference section of this report.

For clarity, the area sources were divided into seven major categories that are defined in more detail below. There are also general explanations as to how the emissions were spatially allocated for the STS airshed using the results from the *1995 British Columbia Emissions Inventory of Common Air Contaminants and Greenhouse Gases* and the *1995 Emission Inventory for the Lower Fraser Valley Airshed*.

Agriculture - includes emissions from the application of fertilizers and pesticides, a number of farm animals, and from sources of fugitive emissions such as tilling and wind erosion of soil.

The emissions are prorated using agricultural surface areas. However, this does not account for the type of agricultural activities performed. For the STS, the agricultural area is small and therefore this estimate is acceptable. The majority of the agricultural surface area for the STS is located within the Pemberton area. This is reflected in the results for the upper STS airshed. A smaller percentage of the agricultural area is found within the Lower Fraser Valley portion of the STS.

Prescribed Burning - the knowledgeable application of fire to a specific land area to accomplish predetermined forest management or other land use objectives (as defined by the National Research Council of Canada in the Glossary of Forest Fire Management Terms (Fourth Edition 1987)).

Each burn was specifically located using latitudes and longitudes. They were then spatially allocated using the tonnes of biomass burned at each site.

Miscellaneous Burning - includes agricultural burning, back yard burning, structural fires, and biomedical/crematorium/animal incineration.

Population information and specific land use was used to prorate the emission results obtained in the 1995 provincial inventory.

Oil and Gas - includes emissions associated with upstream (extraction, processing, transport, storage, accidents and equipment failures) and downstream (refining, transfer and storage) operations that are not covered under permit, such as refuelling and spills at auto service stations.

There were no natural gas plants (well sites, compressors, and dehydrators) located within the STS. Furthermore, the only refinery located outside of the LFV is in Prince George. Consequently, the only emissions in this category were obtained due to a population proration method, which was believed to provide the best estimation.

Solvent Evaporation - includes consumer products (aerosol and household products, etc.), paint application, metal decreasing, glues, adhesives and sealants, printing, and dry cleaning activities which release volatile organic compounds into the ambient air.

The values were obtained by using the best method available. This involved prorating the 1995 provincial data using the population statistics for the STS airshed.

Space Heating – emissions produced by the combustion of natural gas, fuel oil or wood to provide building heat or hot water in a residential, commercial, or institutional setting.

The results obtained in the 1995 provincial inventory were prorated using information such as the temperature averages and the number of dwellings for the region. The lower the temperature for a region, the greater the space heating required and consequently, the greater the emissions produced.

Other – includes all remaining miscellaneous sources such as gravel pits, cutback asphalt, landfills, construction and demolition, welding, food preparation, breweries, welding and tobacco.

A number of proration methods were used based on the categories and the best available data. Population, dwellings, and employment statistics were used to spatially allocate the 1995 emissions for the STS airshed.

5.1 Total STS Airshed Results for Area Sources

The primary source of the emissions in the area source category would appear to be space heating. Indeed, it contributed over 65% of the total particulates, 70% of the VOC emissions, over 96% of the CO, NO_x, and SO_x emissions, and over 91% of the PM_{10} and $PM_{2.5}$ emissions. Miscellaneous burning for CO, with 2%, and SOx, with 2%, followed it. Oil and gas was second for NO_x emissions with 2.4%, but miscellaneous burning was close with 2.1%. Solvent evaporation was the second contributor of VOCs with 15%. The "other" category was second for total particulates with 30%, PM_{10} with 5% and $PM_{2.5}$ with 3%. Within this category, the greater contributor of total particulates and PM_{10} was gravel pits, whereas for $PM_{2.5}$, it was split between tobacco, restaurants, and barbecues. A further breakdown of the "other" category can be seen in ***Appendix D***.

5.2 Upper and lower STS Airshed Results for Area Sources

Space heating remains the primary area emission source for both divisions of the STS airshed. However, it represents a larger percentage in the upper STS for VOC emissions with 81%, compared to 66% in the lower STS. The presence of agricultural sources within the upper STS does result in its rating as the second source for PM_{10} with 6% and $PM_{2.5}$ with 3%, and as the third source for total particulate matter with 12%. Prescribed burning was also more prominent in the upper STS in 1995, which resulted in a slightly higher percentage (1% or less) of CO, NO_x and particulate emissions for the upper STS than for the lower STS.

Table 5-1: 1995 STS Area Source Emissions by Category

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Prescribed burning	22.1	0.4	0.3	0.1	0.0	0.0	0.9	0.0	2.4	0.2	1.7	0.2	1.6	0.2
Space heating	4,828.5	97.9	216.1	94.8	32.3	97.6	1,647.8	70.8	647.6	64.2	646.5	90.2	614.1	93.6
Agriculture	0.0	0.0	1.1	0.5	0.0	0.0	20.8	0.9	44.3	4.4	16.9	2.4	8.0	1.2
Oil and Gas	2.7	0.1	5.4	2.4	0.0	0.0	232.2	10.0	0.6	0.1	0.6	0.1	0.6	0.1
Solvent Evaporation	0.0	0.0	0.0	0.0	0.0	0.0	339.6	14.6	0.0	0.0				
Miscellaneous Burning	74.4	1.5	4.8	2.1	0.8	2.4	23.6	1.0	13.3	1.3	13.1	1.8	11.9	1.8
Other	3.9	0.1	0.1	0.1	0.0	0.0	62.2	2.7	300.9	29.8	37.8	5.3	20.1	3.1
Total	**4,931.6**	100.0	**227.9**	100.0	**33.1**	100.0	**2,327.1**	100.0	**1,009.0**	100.0	**716.7**	100.0	**656.3**	100.0

Notes:

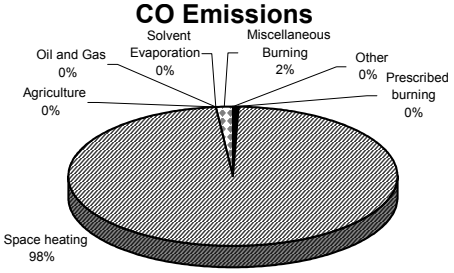
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

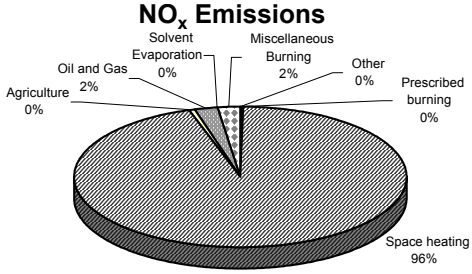
Figure 5-1: 1995 STS Area Source Emissions by Category

CO Emissions



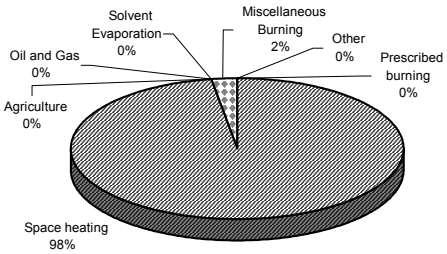
Total: 4,931.61 tonnes

NO_x Emissions



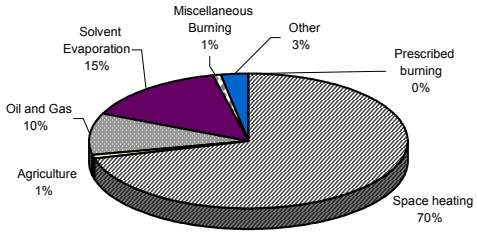
Total: 227.89 tonnes

SO_x Emissions



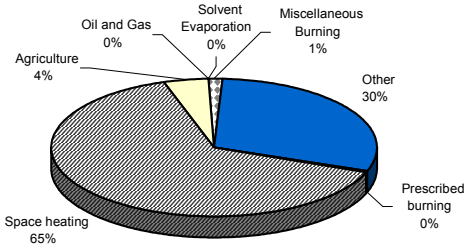
Total: 33.14 tonnes

VOC Emissions



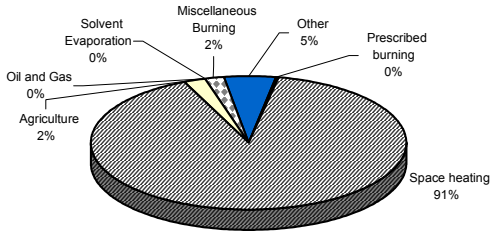
Total: 2,327.09 tonnes

Particulate Emissions



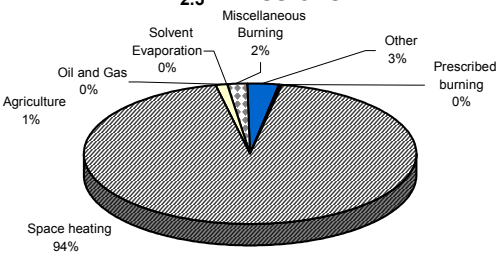
Total: 1,008.99 tonnes

PM_{10} Emissions



Total: 716.66 tonnes

$PM_{2.5}$ Emissions



Total: 656.31 tonnes

6.0 MOBILE SOURCES

Mobile sources are non-stationary and include mostly vehicles involved in the transportation of persons or cargo by water, air, or land. They also include smaller sources such as lawn equipment. The following major categories are included:

Light-duty vehicles – this group includes 6 sub-categories:

i. light duty gasoline powered vehicles (LDGV), such as passenger cars;
ii. light duty gasoline-powered trucks (LDGT1), such as pickup trucks and vans up to 2720 kg gross vehicle weight;
iii. light duty gasoline-powered trucks (LDGT2), such as heavier pickups and commercial trucks from 2720 to 3860 kg gross vehicle weight;
iv. light duty diesel-powered vehicles (LDDV), includes diesel-powered passenger cars;
v. light duty diesel-powered trucks (LDDT), includes both type 1 and 2 vehicle weights mentioned above;
vi. motorcycles (MC).

Heavy-duty vehicles – this group includes 2 sub-categories of on-road vehicles which are greater than 3856 kg gross vehicle weight:

i. heavy duty gasoline-powered vehicles (HDGV), includes heavy commercial trucks and highway hauling trucks;
ii. heavy duty diesel-powered vehicles (HDDV).

Both on-road motor vehicle groups were calculated using the same method. It involves the multiplication of an emission factor (in this case it is grams of contaminant per vehicle kilometre traveled (g/VkmT)) by the number of kilometres traveled for each vehicle sub-category (VkmT). The provincial inventory in 1995 prorated this category for each WMR using population counts. A different method was used for the STS airshed. Road coverage (separated into highway and non-highway) provided by the Ministry of Transportation and Highways' Transportation Centerline Network (TCN) was incorporated into GOAT and was used in the ACE project to prorate the provincial emissions. This method is not without fail. Indeed, it is assumed that the traffic on the Sea-to-Sky highway is the same as the traffic on any other highway in the province. Although this is not completely accurate, it is the best method available at this time, and it did provide sufficient data. However, a more precise method may soon be available as Environment Canada is developing a database containing information on vehicle counts. This information could be used to increase the accuracy of the proration method. It is possible that this method would result in a greater amount of emissions for this airshed as the Sea-to-Sky highway carries a large number of tourists as well as residents. It is also expected to increase as the Whistler area develops further.

Aircraft – includes aircraft engine exhaust emissions originating from the 22 main airports in BC, none of which are in the STS airshed and therefore no emissions in this category were obtained for this report. However, a number of small-engined airplanes do travel to the smaller airports within the airshed. As these sources were small and their respective data was not readily available, they were not accounted for in this inventory. However, a more detailed emissions inventory could account for this source in future reports.

Railways – include both locomotive exhaust emission, and fugitive emissions of coal dust during transport.

The exhaust emission results in the 1995 provincial report were obtained using fuel consumption data from Statistics Canada. The provincial results were prorated by length along railway routes for the STS airshed. There were no coal dust emissions in the STS airshed as none of travelled railways were within the airshed boundaries.

Marine vessels – include engine exhaust emissions from ocean-going vessels, harbour vessels, ferries, recreational vessels, and fishing vessels.

The results in the 1995 provincial inventory were obtained using fuel consumption data multiplied by emission factors (quantity of contaminant emitted per fuel consumed). The proration methods for the STS inventory vary depending on the category. For ferries, the data was prorated by length according to their respective routes. The fishing vessel emissions were prorated evenly throughout BC coastal waters. Traffic volumes at BC ports were used in prorating harbour vessel emissions. Recreational vessel emissions were divided into the WMR, followed by the coastal areas or major lakes within each region. For the Lower Mainland Region, the emissions were placed in Vancouver Harbour only, which excluded the STS airshed. The time required for a better spatial allocation was deemed extensive in proportion to the values that would be obtained. Once again, a more precise emissions inventory would be needed to increase this accuracy. The contaminants from recreational vessels in this inventory were obtained from the LFV portion of the airshed.

Off-road sources – other mobile sources, including off-road vehicles and small off-road engines (such as agricultural, lawn and garden, construction, or utility equipment).

The emissions listed in the 1995 provincial report were obtained by estimating the number of units within the province (according to studies) and the fuel used in the year (from Statistics Canada fuel consumption data), and multiplying these values by emission factors based on the U.S. EPA AP-42. The 1995 provincial results were spatially allocated using the best method available at this time. For lawn equipment, the number of dwellings within the STS area was used to prorate the emissions. Agricultural engine emissions were prorated according to agricultural land. Construction and utility equipment emissions were prorated by population.

6.1 Total STS Airshed Results for Mobile Sources

It would appear that light-duty vehicles were the primary mobile source to contribute CO and VOCs to the STS airshed. They contributed 88% and 77% of CO and VOC, respectively. Heavy-duty vehicles were second for the CO with 5%, whereas marine vessels were second for the VOC with 8%. For NO_x, railway emissions were dominant with 32%, but marine vessels were close with 29%. It is important to note that marine vessel emissions may also be higher than the estimated values as recreational crafts were not included in this inventory. Although the difference should remain marginal, the gap between the railway emissions and the marine vessel emissions would be reduced. Light-duty vehicles also contributed a fair amount of NO_x with 21%. Once again, it is highly probable that the values for the on-road vehicles are higher than the values obtained for this report. Indeed, the Sea-to-Sky highway is highly travelled and there was no account possible at this time for the increased traffic volume due to tourist travel. Marine vessels were the primary sources for SO_x with 52% and railways were second with 32%. There

was no dominant contributor for particulate emissions. Nonetheless, marine vessels did receive the highest percentage for this inventory with 32% for the total particulate and for PM_{10}, and 34% for $PM_{2.5}$. Heavy-duty vehicles were second with 29% for total particulate as well as PM_{10}, and 30% for $PM_{2.5}$. The third contributing source was railways with between 20 and 22% of the emissions.

6.2 Upper and Lower STS Airshed Results for Mobile Sources

The absence of marine vessel emissions in the upper portion of the airshed represents the main difference between the lower and upper STS divisions. Further deviances stem from the fact that over 70% of the highways and non-highways are located within the lower STS airshed. As a result, the contaminant source proportions remain similar between the total STS airshed and its lower division. The upper STS airshed does however maintain light-duty vehicle sources as the main contributors of CO and VOC emissions with 88% and 80%, respectively. The first differences occur with NO_x and SO_x emissions. Marine vessels are the main contributors in the lower division with 37% and 62% of the emissions. For the upper division, railways are the main sources with 58% and 78% of the emissions. Particulate emissions also display a number of differences. Although marine vessels are the main sources of total particulate, PM_{10} and $PM_{2.5}$ in the lower STS with 38%, 38% and 42% respectively, railways are the main sources in the upper STS airshed. Indeed, they appear to have contributed 40% of the total particulate matter, 40% of the $PM_{10,}$ and 42% of the $PM_{2.5}$. Heavy-duty vehicles remain the second highest particulate emissions sources for both the upper and the lower STS divisions, although the exact percentages are different, as the graphs in ***Appendix B*** and ***Appendix C*** show.

Table 6-1: 1995 STS Mobile Source Emissions by Category

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Light-Duty Vehicles	5,717.8	87.7	515.4	21.3	19.8	11.3	596.9	77.7	11.2	12.1	10.8	11.7	6.8	8.4
Heavy-Duty Vehicles	328.5	5.0	353.9	14.6	6.3	3.6	52.0	6.8	27.0	29.3	27.0	29.4	23.9	29.7
Railways	145.5	2.2	783.3	32.4	55.0	31.5	41.4	5.4	18.7	20.3	18.7	20.4	17.2	21.4
Marine Vessels	179.0	2.7	697.1	28.8	91.9	52.6	57.7	7.5	29.0	31.4	29.0	31.6	26.7	33.2
Aircraft														
Off-Road	148.2	2.3	70.3	2.9	1.6	0.9	19.9	2.6	6.3	6.9	6.3	6.9	5.8	7.2
Total	**6,518.9**	100.0	**2,419.9**	100.0	**174.6**	100.0	**767.8**	100.0	**92.3**	100.0	**91.8**	100.0	**80.4**	100.0

Notes:

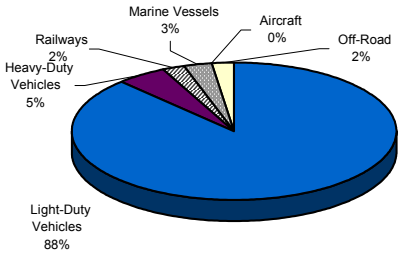
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

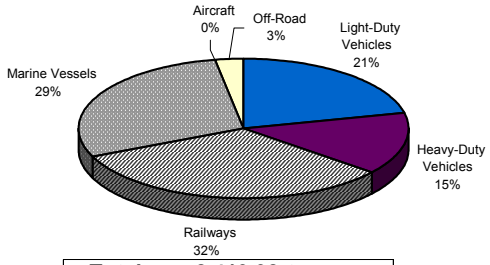
Figure 6-1: 1995 STS Mobile Source Emissions by Category

CO Emissions



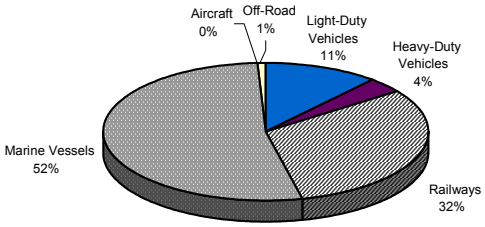
Total: 6,518.93 tonnes

NO_x Emissions



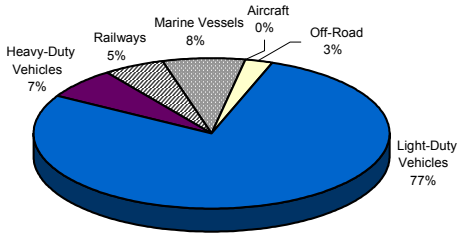
Total: 2,419.92 tonnes

SO_x Emissions



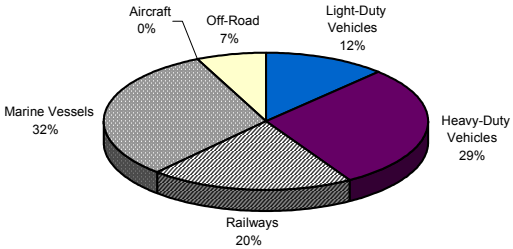
Total: 174.65 tonnes

VOC Emissions



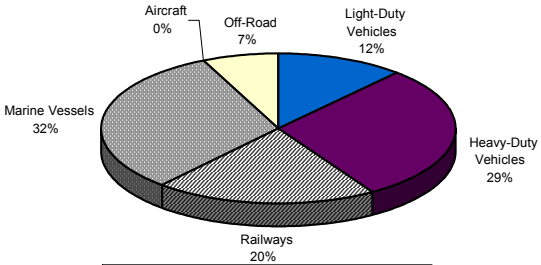
Total: 767.85 tonnes

Particulate Emissions



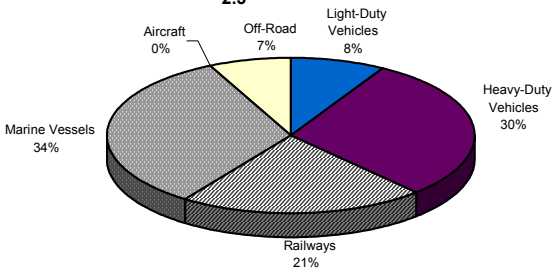
Total: 92.28 tonnes

PM_{10} Emissions



Total: 91.82 tonnes

$PM_{2.5}$ Emissions



Total: 80.38 tonnes

7.0 NATURAL SOURCES

Natural sources refer to emissions which occur naturally without the influence of humans (nonanthropogenic). In the 1995 Emission Inventory for the Lower Fraser Valley Airshed, natural sources were included in the area sources category. Although they can be qualified as numerous small stationary sources, for the purpose of this report, they were categorised separately as it would be impossible to modify their contributions to the airshed. However, they are still considered important in the overall outlook of the airshed. They help to determine whether altering certain source emissions may have a minimal impact on the airshed, as explained previously in this report. Natural sources are divided into four categories:

Wildlife – includes emissions from wild animals such as deer, moose, sheep, goats, elk, and caribou. This category was included in the 1995 provincial report. However, due to its small contribution to the overall emissions (0.1% of the total provincial VOC emissions) and the difficulty in establishing an acceptable proration method, it was not included in this inventory.

Wildfires – wildfires are classified as a natural source but may also be the result of human activity. They are nonetheless included in this category as their ignition is rarely intentional. As they are not deliberate, it is impossible to predict the mass of emissions that will result from wildfires every year. Wildfires occur on forested land and they differ from prescribed burning as they are not planned for management purposes. The Protection Branch of the Ministry of Forests maintains a database of all wildfire occurrences in the province. The information they provided for the STS airshed is included in the following table.

***Table 7-1*: Wildfires Located within the STS Airshed**

BC Forest Wildfires					
Year	Fire Centre	Fire ID	Latitude	Longitude	Size (ha)
1995	2	13	49.72	123.15	0.10
1995	2	39	49.80	123.10	0.10
1995	2	56	50.08	123.10	0.10
1995	2	61	50.21	122.79	3.50
1995	2	85	50.08	123.10	1.00
1995	2	93	49.65	123.17	0.10
1995	2	94	50.07	123.04	0.10
1995	2	131	50.06	123.08	-
1995	2	170	50.07	123.05	-
1995	2	176	49.75	123.13	-
1995	2	197	49.82	123.13	0.10
1995	2	207	50.16	122.94	-
1995	2	211	49.83	123.18	0.10
1995	2	226	50.16	123.00	-
1995	2	227	49.82	123.20	-
1995	2	239	49.97	123.17	-
1995	2	259	49.80	123.12	-
1995	2	267	49.89	123.17	0.10
1995	2	269	49.95	123.17	0.10
1995	5	244	50.23	122.55	0.20
				Total	5.60

This information is then used to calculate the volume of biomass burned. Biogeoclimatic zones and emission factors were then found to determine the tonnes

of contaminants emitted. Wildfires are associated with CO, NO_x, particulate matter emissions, as well as trace amounts of SO_x emissions.

Marine Aerosol – refers to the particles that become airborne at the surface of ocean water through the action of the wind and the waves.

These emissions were calculated in 1995 using factors such as wind speed, length of coastline and sea area. The resulting values are a best estimation but are highly uncertain. They were prorated for the STS airshed by coastal length and ocean surface area. For the purpose of this inventory, marine aerosols are only responsible for particulate matter emissions.

Biogenics – refers to the VOC and NO_x emissions from trees, grass, and other vegetation through natural processes.

The amended results (1998) of the 1995 data were calculated by Environment Canada using the second version of the Canadian Biogenic Emission Inventory System (CANBEIS II). These values were prorated for the STS airshed using landcover information that was derived from LandSat imagery.

7.1 Total STS Airshed Results for Natural Sources

Wildfires contributed the total amount of CO and SO_x emissions in this inventory. However, SO_x emissions were insignificant with less than 0.01tonnes for the year. Biogenics produced all of the VOC emissions, and 88% of the NO_x emissions. Wildfires were the only other NO_x contributors with 12%. Particulate emissions were mainly attributed to marine aerosols, with 82% of total particulate matter, 84% of PM_{10}, and 47% of $PM_{2.5}$. Wildfires did however contribute the larger amount of the $PM_{2.5}$ with 53%.

7.2 Upper and Lower STS Airshed Results for Natural Sources

The natural sources are not distributed evenly between the lower and upper STS airsheds. Indeed, the marine aerosol sources (ocean areas and coastline) are located in the lower division only, whereas the majority of the wildfires for 1995 occurred in the upper division. This resulted in different proportions for the particulate emissions. For the upper STS, wildfires were the only source of particulate matter and its sub-divisions. Marine aerosol remained the primary contributor for the lower STS's particulate, PM_{10} and $PM_{2.5}$ emissions with 99%, 99.5%, and 97% respectively. The proportions for the other contaminants continued to be similar for the upper and lower STS airsheds as those found for the total airshed.

Table 7-2: 1995 STS Natural Source Emissions by Category

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Wildfires	231.6	100.0	3.4	11.7	0.01	100.0	9.8	0.1	39.0	17.7	29.8	15.9	27.5	53.0
Biogenics	0.0	0.0	25.9	88.3	0.0	0.0	9,610.0	99.9	0.0	0.0		0.0		0.0
Wildlife														
Marine Aerosol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	181.2	82.3	157.7	84.1	24.4	47.0
Total	**231.6**	100.0	**29.3**	100.0	**0.01**	100.0	**9,619.8**	100.0	**220.2**	100.0	**187.5**	100.0	**52.0**	100.0

Notes:

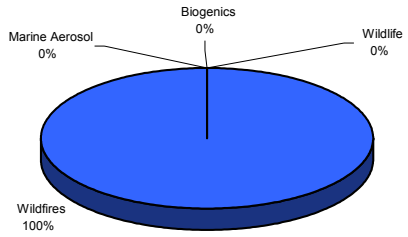
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

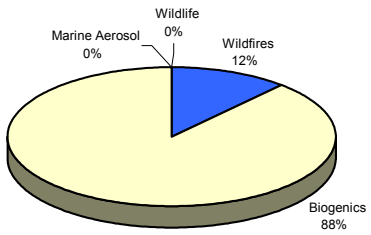
Figure 7-1: 1995 STS Natural Source Emissions by Category

CO Emissions



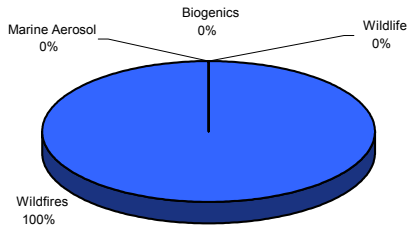
Total: 231.64 tonnes

NO_x Emissions



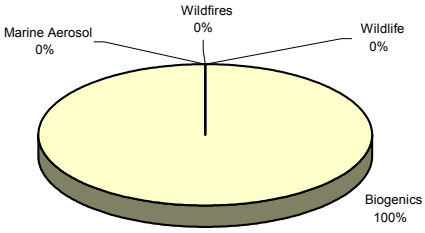
Total: 29.30 tonnes

SO_x Emissions



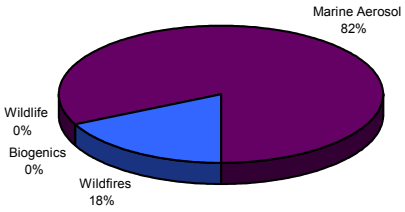
Total: 0.01 tonnes

VOC Emissions



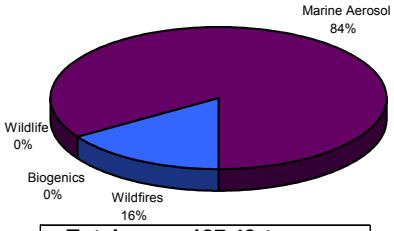
Total: 9,619.76 tonnes

Particulates Emissions



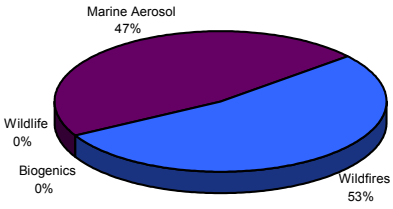
Total: 220.21 tonnes

PM_{10} Emissions



Total: 187.48 tonnes

$PM_{2.5}$ Emissions



Total: 51.97 tonnes

8.0 YEAR 2000 UPDATE

As mentioned previously, emission inventories are produced every five years. The Air, Water and Climate Change Branch in Victoria, as well as the Greater Vancouver Regional District will be releasing updated emission inventories for the year 2000. This is required in order to provide a measure of the progress of the contaminant levels, and to identify troublesome areas that would require further action. Once the new data is available, steps will be taken to incorporate this information into the ACE model. This will allow for a possible update of the STS airshed emissions inventory. Although the new data will be of great interest, it is not recommended to do a direct comparison with the 1995 report as the methods of calculation and the identified sources may have changed. The differences in the data could therefore be a reflection of these changes and not a direct increase or decrease of specific emissions.

A 2000 emissions inventory for the STS airshed would nonetheless provide valuable information. As the population continues to grow, industries continue to expand, and the number of tourists continues to increase, the emissions will reach new levels. Furthermore, some of the methods used to produce the data will have improved as further studies are completed, and better proration parameters are identified. Some sources that would benefit from such an update include:

- road dust
- on-road vehicles
- marine aerosol

In order to produce this emissions inventory in a timely and resource-defined manner, a number of limitations were accepted, as noted throughout this report. This resulted in an emissions inventory that presents a number of uncertainties, but also presents valuable data that allows for a degree of analysis. However, if the interest were present, a more intensive emissions inventory for the STS airshed could be produced. This would allow for a direct approach while calculating the contaminants emitted from the sources within the STS airshed. Indeed, the need for prorating the values from a larger scale would be eliminated. Such a process would allow for values to be obtained for sources that are of more significance to the STS airshed. Such sources include:

- marine vessels - recreational vessels
- aircrafts (including helicopters)
- recreational off road vehicles (such as all terrain vehicles (ATV) and snowmobiles)

Please note that although such a detailed report would provide more specific information for the airshed, it would still represent a best estimate and not irrefutable data. Further discussion would be needed in order to weigh the benefits and drawbacks of calculating the specific values as opposed to prorating the provincial values.

9.0 SUMMARY

An emissions inventory accounts for the air contaminants released from sources within a defined geographical area. It is an important tool for an air quality management plan (AQMP), which is designed to achieve specific air quality goals for a region by either preventing or reducing the air contaminants emitted. Such a plan would include monitoring and assessment, policy and regulation development, land-use planning, as well as education and public consultation. The Sea-to-Sky (STS) airshed is the focus of this report and is the first emissions inventory produced for the area. Indeed, as development, tourism and population increases within the airshed, their associated non-point sources will increase as well. Unlike point sources which are controlled in great part by a regulatory system provided by the BC Ministry of Water, Land and Air Protection, and the Greater Vancouver Regional District (when within their boundaries), area and mobile sources (non-point sources) require different approaches, which are better achieved with an AQMP.

This emissions inventory was produced mainly with the use of the Air Contaminants Emissions (ACE) model, which prorates the results obtained in the *1995 British Columbia Emissions Inventory of Air Contaminants and Greenhouse Gases* report or any results that were obtained from subsequent updates. In using this method, a number of sources were omitted from the inventory as they were deemed to require greater resources and time than the magnitude of their results would justify. These are notably recreational marine vessels, aircrafts, recreational off-road vehicles (and their associated road dust) and wildlife. Although these sources are believed to contribute small amounts of contaminants, a more precise inventory would benefit from their inclusion. Road dust also presented a number of difficulties, which resulted in its separation from the other categories and exclusion from some of the analysis. However, road dust carries a great deal of interest within the airshed and therefore, the inventory would also gain from an improvement of its estimation method.

This report accounts for five air contaminants, namely carbon monoxide (CO), nitrogen oxides (NO_x), sulphur oxides (SO_x), volatile organic compounds (VOCs), and total particulate matter (divided into PM_{10} and $PM_{2.5}$). The emission sources were grouped into four categories including point sources, area sources, mobile sources, and natural sources. Results of the STS Emissions Inventory indicate point sources are the greatest source of CO, SO_x, total particulate, PM_{10}, and $PM_{2.5}$ emissions in the airshed. The greatest source of NOx and VOC emissions within the STS airshed appear to be from mobile and natural sources, respectively.

It is important to understand that the results obtained in this emissions inventory are estimations; they are not irrefutable data, as it is impossible to obtain the exact amount of emissions that each source would release within such a large area. Consequently, the results should be analysed collectively as relative proportions and not as specific numbers

10.0 REFERENCES

1. 1995 Emission Inventory for the Lower Fraser Valley Airshed, Greater Vancouver Regional District, March 1998.

2. British Columbia Inventory of Common Air Contaminants Emitted in 1995 from Miscellaneous Area Sources Outside of the Lower Fraser Valley, prepared by Robert Gibson for B.C. Ministry of Environment, Lands and Parks, January 1998.

3. British Columbia Inventory of Common Air Contaminants Emitted in 1995 from Point Sources Outside of the Lower Fraser Valley, prepared by Daniel O'Neil for B.C. Ministry of Environment, Lands and Parks, August 1996 – Revised November 1998.

4. 1995 British Columbia Inventory of Common Air Contaminants Emitted in 1995 from Mobile Sources Outside of the Lower Fraser Valley, prepared by James Fam for B.C. Ministry of Environment, Lands and Parks, December 1996 – Revised February 1998.

5. 1995 Emission Inventory for the Lower Fraser Valley Airshed, Technical Appendix: Detailed Listing of Methodology and Results, prepared by Kelly Der, Roger Quan, Ross Shwaikoski, Shelina Sidi, Richard Visser and Chris Voigt for the Greater Vancouver Regional District and Fraser Valley Regional District, March 1998.

6. Canadian Biogenic Emission Inventory System (CANBEIS) Summary, prepared by Dominique Ratté for Environment Canada, June 1997.

7. 1995 Emission Inventory of Agricultural Sources in British Columbia and the Lower Fraser Valley, prepared by Levelton Associates for Environment Canada, BC Ministry of Environment, Lands and Parks, and Greater Vancouver Regional District, September 1996.

8. Air Contaminant Emission (ACE) Model GIS User Manual and Report, prepared by Meira Sudds for BC Ministry of Water, Land and Air Protection, October 2001.

9. The Planning and Development of a GIS Accessible Emissions Inventory, prepared by Natalie Work for the BC Ministry of Water, Land and Air Protection, Spring 2000.

10. British Columbia GIS Accessible Emissions Inventory Development, Air Contaminant Emissions (ACE) Project, prepared by Allan Glen of Glencomm Consulting for Environment Canada and BC Ministry of Water, Land and Air Protection, October 2001.

11. British Columbia GIS Emissions Inventory Data Acquisitions, Air Contaminant Emissions (ACE) Project, prepared by Geordie Hobart and Graeme Leeming of Refractions Research for Environment Canada and BC Ministry of Environment, Lands and Parks, March 2001.

12. British Columbia GIS Accessible Emissions Inventory, Air Contaminant Emissions (ACE) Project, Data Dictionary, prepared by Allan Glen and Tony Wakelin for Environment Canada and BC Ministry of Water, Land and Air Protection, November 2001.

APPENDIX A

Point Source Emissions
by
Standard Industrial Classification (SIC)
and
Emission Source

1995 Sea-to-Sky Emissions Inventory – Point Source Emissions

British Columbia Emissions Inventory of Common Air Contaminants and Greenhouse Gases
Point Source Emissions by Source

Permit / SIC	Company	Location	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
			tonnes	%	tonnes	%	tonnes	%	tonnes	%	tonnes	%	tonnes	%	tonnes	%
1647 / 27	Western Pulp Inc.	Woodfibre	3322.0	28.3%	279.4	16.9%	77.2	15.8%	148.5	24.4%	581.0	37.9%	526.6	44.0%	419.9	43.6%
1835 / 04	Continental Pole Ltd.	Mount Currie	103.5	0.9%	0.8	0.0%	0.1	0.0%	8.8	1.4%	11.1	0.7%	6.1	0.5%	4.5	0.5%
2061 / 25	Weldwood of Canada Limited	Squamish, Garibaldi Way - Empire Lumber									304.6	19.9%	121.9	10.2%	60.9	6.3%
3095 / 27	Howe Sound Pulp and Paper Limited	Port Mellon	7140.0	60.7%	1285.0	77.7%	391.0	80.1%	342.0	56.2%	313.5	20.4%	282.1	23.6%	232.4	24.1%
4397 / 96	Camp Artaban Society	Gambier Island	0.0	0.0%	0.1	0.0%	0.0	0.0%	0.0	0.0%	0.8	0.1%	0.3	0.0%	0.2	0.0%
5030 / 36	Alpine Paving 1978 Ltd.	Mobile Plant, Squamish Area	16.7	0.1%	50.6	3.1%	13.9	2.8%	8.3	1.4%	31.4	2.0%	7.0	0.6%	3.0	0.3%
5077 / 35	Cardinal Concrete Ltd.	Squamish									0.1	0.0%	0.0	0.0%	0.0	0.0%
5789 / 96	Boys and Girls Club of Greater Vancouver	Howe Sound-Polatch Creek	0.1	0.0%	0.0	0.0%	0.0	0.0%	0.1	0.0%	0.1	0.0%	0.0	0.0%	0.0	0.0%
6045 / 04	Rivtow Straits Limited	Port Mellon, S-C	16.8	0.1%	0.1	0.0%	0.0	0.0%	1.4	0.2%	4.1	0.3%	4.1	0.3%	4.1	0.4%
6431 / 35	Cardinal Concrete Ltd.	Whistler									0.1	0.0%	0.1	0.0%	0.0	0.0%
6563 / 04	Council of Forest Industries of BC	Port Mellon, S-C														
6815 / 06	Slim's Exploration and Mining Ltd.	Squamish - Ashlu Creek									0.1	0.0%	0.1	0.0%	0.1	0.0%
7391 / 41	Action Holdings Ltd.	Whistler Area	1.7	0.0%	6.4	0.4%	2.7	0.6%	0.6	0.1%	12.2	0.8%	2.1	0.2%	0.5	0.1%
8166 / 37	Diachem Industries Ltd.	Squamish	2.0	0.0%	9.4	0.6%	0.1	0.0%	0.5	0.1%	0.4	0.0%	0.4	0.0%	0.4	0.0%
8422 / 04	International Forest Products Limited	Pemberton	97.5	0.8%	0.8	0.0%	0.1	0.0%	8.3	1.4%	24.0	1.6%	24.0	2.0%	24.0	2.5%
8432 / -	Victoria Petro Services Limited	Pemberton, Highway 99														0.0%
8606 / 25	Bayside Sawmills Ltd.	Port Mellon, Hillside Industrial Park									43.1	2.8%	17.3	1.4%	8.6	0.9%
8972 / 91	Camp Fircom Society of the United Church	Gambier Island	0.2	0.0%	0.2	0.0%	1.1	0.2%	0.1	0.0%	0.2	0.0%	0.1	0.0%	0.0	0.0%
8986 / 04	Pacific Forest Products Limited	Twin Creeks, Howe Sound														
11034 / 04	Terminal Forest Products Ltd.	Langdale, Howe Sound														
11832 / 04	Squamish Timber Co. Ltd.	Squamish														
12736 / 49	Fiedler Bros. Contracting Ltd.	Gibsons, Gilmour Road	859.1	7.3%	6.6	0.4%	0.7	0.1%	72.7	11.9%	158.6	10.3%	158.6	13.3%	158.6	16.5%
12764 / 41	Northern Utilities Inc.	Squamish, 5 km East of	3.0	0.0%	13.7	0.8%	0.9	0.2%	0.9	0.1%	1.0	0.1%	1.0	0.1%	0.9	0.1%
12779 / 04	International Forest Products Limited	Pemberton Industrial Park	15.6	0.1%	0.1	0.0%	0.0	0.0%	1.3	0.2%	2.9	0.2%	1.1	0.1%	0.7	0.1%
12823 / 49	Coastal Mountain Excavations Ltd.	Whistler, Wedge Gravel Pit	162.4	1.4%	1.2	0.1%	0.1	0.0%	13.7	2.3%	40.0	2.6%	40.0	3.3%	40.0	4.2%
12899 / 04	Halray Logging Co. Ltd.	Soo River, 13 km Mark, Forest Service Rd.	8.3	0.1%	0.1	0.0%	0.0	0.0%	0.7	0.1%	2.0	0.1%	2.0	0.2%	2.0	0.2%
12901 / 04	Halray Logging Co. Ltd.	Soo River, 6 km Mark, Forest Service Road	8.3	0.1%	0.1	0.0%	0.0	0.0%	0.7	0.1%	2.0	0.1%	2.0	0.2%	2.0	0.2%
		Totals	**11,757.2**	**100.0%**	**1,654.6**	**100.0%**	**487.9**	**100.0%**	**608.6**	**100.0%**	**1,533.3**	**100.0%**	**1,196.9**	**100.0%**	**962.8**	**100.0%**

Notes:

True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

APPENDIX B

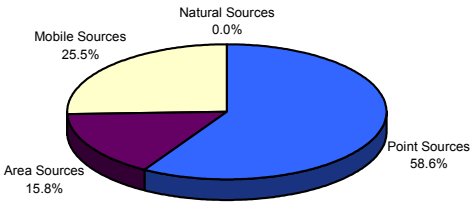
Air Contaminant Emissions Summaries for the Lower STS Airshed

Lower Sea-to-Sky 1995 Emissions Inventory – SUMMARY TABLE

SOURCE/ Category	CO			NO_x			SO_x			VOC			Part			PM_{10}			$PM_{2.5}$		
	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total
ANTHROPOGENIC																					
Point Sources	**11,359.9**	**58.6**	**58.6**	**1,645.1**	**44.3**	**44.1**	**484.9**	**74.1**	**74.1**	**574.5**	**21.1**	**6.8**	**1,439.0**	**66.4**	**61.3**	**1,119.5**	**68.3**	**62.3**	**889.1**	**65.2**	**64.0**
Forestry and Logging	16.8	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	1.4	0.1	0.0	4.1	0.2	0.2	4.1	0.3	0.2	4.1	0.3	0.3
Mining		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Wood Products		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	347.7	16.0	14.8	139.2	8.5	7.7	69.5	5.1	5.0
Paper and Allied Products	10,462.0	54.0	54.0	1,564.4	42.1	42.0	468.2	71.5	71.5	490.5	18.0	5.8	894.5	41.3	38.1	808.7	49.3	45.0	652.3	47.8	47.0
Non-Metallic Minerals		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Refined Petroleum and Coal	16.7	0.1	0.1	50.6	1.4	1.4	13.9	2.1	2.1	8.3	0.3	0.1	31.4	1.4	1.3	7.0	0.4	0.4	3.0	0.2	0.2
Chemical Products	2.0	0.0	0.0	9.4	0.3	0.3	0.1	0.0	0.0	0.5	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0
Construction Industries	3.0	0.0	0.0	13.7	0.4	0.4	0.9	0.1	0.1	0.9	0.0	0.0	1.0	0.0	0.0	1.0	0.1	0.1	0.9	0.1	0.1
Utility Industries	859.1	4.4	4.4	6.6	0.2	0.2	0.7	0.1	0.1	72.7	2.7	0.9	158.6	7.3	6.8	158.6	9.7	8.8	158.6	11.6	11.4
Accommodation Services	0.2	0.0	0.0	0.2	0.0	0.0	1.1	0.2	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Other Service Industries	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.9	0.0	0.0	0.3	0.0	0.0	0.2	0.0	0.0
Area Sources	**3,070.6**	**15.8**	**15.8**	**165.2**	**4.4**	**4.4**	**22.5**	**3.4**	**3.4**	**1,561.4**	**57.2**	**18.6**	**653.7**	**30.2**	**27.8**	**445.9**	**27.2**	**24.8**	**410.3**	**30.1**	**29.5**
Prescribed burning	4.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.5	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0
Space heating	3,010.6	15.5	15.5	157.2	4.2	4.2	21.9	3.4	3.4	1,024.6	37.6	12.2	405.4	18.7	17.3	404.7	24.7	22.5	384.4	28.2	27.7
Agriculture	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	2.0	0.1	0.0	2.6	0.1	0.1	1.1	0.1	0.1	0.5	0.0	0.0
Oil and Gas	2.1	0.0	0.0	4.2	0.1	0.1	0.0	0.0	0.0	186.3	6.8	2.2	0.5	0.0	0.0	0.5	0.0	0.0	0.5	0.0	0.0
Solvent Evaporation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	288.0	10.6	3.4	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Miscellaneous Burning	50.2	0.3	0.3	3.4	0.1	0.1	0.6	0.1	0.1	16.3	0.6	0.2	8.9	0.4	0.4	8.8	0.5	0.5	8.0	0.6	0.6
Other	3.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	43.9	1.6	0.5	235.8	10.9	10.0	30.5	1.9	1.7	16.6	1.2	1.2
Mobile Sources	**4,943.9**	**25.5**	**25.5**	**1,902.8**	**51.2**	**51.0**	**147.4**	**22.5**	**22.5**	**591.9**	**21.7**	**7.0**	**74.1**	**3.4**	**3.2**	**73.7**	**4.5**	**4.1**	**64.6**	**4.7**	**4.7**
Light-Duty Vehicles	4,336.3	22.4	22.4	407.2	11.0	10.9	15.7	2.4	2.4	456.1	16.7	5.4	8.8	0.4	0.4	8.5	0.5	0.5	5.4	0.4	0.4
Heavy-Duty Vehicles	245.8	1.3	1.3	269.1	7.2	7.2	4.8	0.7	0.7	38.7	1.4	0.5	20.6	1.0	0.9	20.6	1.3	1.1	18.2	1.3	1.3
Railways	89.4	0.5	0.5	481.2	13.0	12.9	33.9	5.2	5.2	25.4	0.9	0.3	11.5	0.5	0.5	11.5	0.7	0.6	10.6	0.8	0.8
Marine Vessels	179.0	0.9	0.9	697.1	18.8	18.7	91.9	14.0	14.0	57.7	2.1	0.7	29.0	1.3	1.2	29.0	1.8	1.6	26.7	2.0	1.9
Aircraft		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0
Off-Road	93.4	0.5	0.5	48.3	1.3	1.3	1.2	0.2	0.2	14.0	0.5	0.2	4.1	0.2	0.2	4.1	0.3	0.2	3.8	0.3	0.3
ANTHROPOGENIC SUB-TOTAL	**19,374.4**	**100.0**	**100.0**	**3,713.1**	**100.0**	**99.6**	**654.8**	**100.0**	**100.0**	**2,727.7**	**100.0**	**32.5**	**2,166.8**	**100.0**	**92.2**	**1,639.1**	**100.0**	**91.2**	**1,364.0**	**100.0**	**98.2**
NATURAL																					
Wildfires	5.7	100.0	0.0	0.1	0.5	0.0	0.0	100.0	0.0	0.2	0.0	0.0	1.0	0.5	0.0	0.7	0.5	0.0	0.7	2.7	0.0
Biogenics	0.0	0.0	0.0	15.6	99.5	0.4	0.0	0.0	0.0	5,674.1	100.0	67.5	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Wildlife		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0
Marine Aerosol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	181.2	99.5	7.7	157.7	99.5	8.8	24.4	97.3	1.8
NATURAL SUB-TOTAL	**5.7**	**100.0**	**0.0**	**15.7**	**100.0**	**0.4**	**0.0**	**100.0**	**0.0**	**5,674.4**	**100.0**	**67.5**	**182.2**	**100.0**	**7.8**	**158.4**	**100.0**	**8.8**	**25.1**	**100.0**	**1.8**
TOTAL	**19,380.1**		**100.0**	**3,728.8**			**654.8**			**8,402.1**			**2,349.0**			**1,797.5**			**1,389.1**		

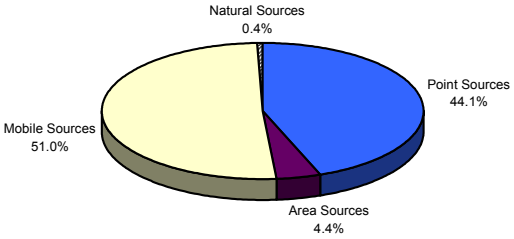
Lower Sea-to-Sky 1995 Emissions Inventory by Contaminants

CO Emissions



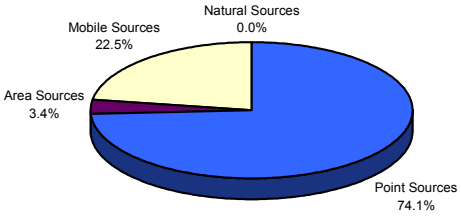
Total: 19,380.10 tonnes

NO_x Emissions



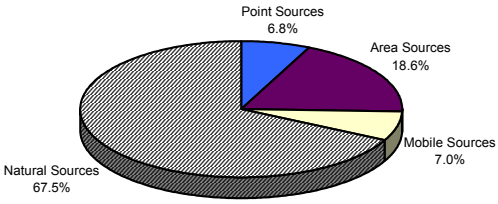
Total: 3,728.82 tonnes

SO_x Emissions



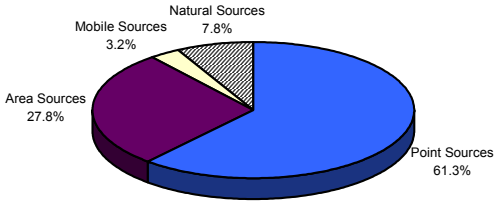
Total: 654.80 tonnes

VOC Emissions



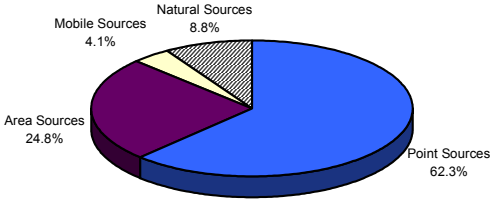
Total: 8,402.11 tonnes

Particulate Emissions



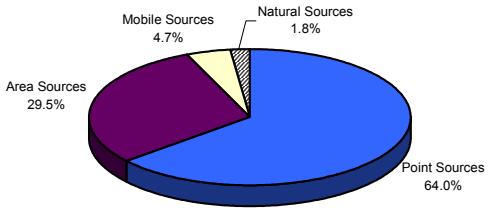
Total: 2,348.96 tonnes

PM_{10} Emissions



Total: 1,797.50 tonnes

$PM_{2.5}$ Emissions



Total: 1,389.13 tonnes

Lower Sea-to-Sky 1995 Emissions Inventory – POINT SOURCES

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Forestry and Logging	16.8	0.1	0.1	0.0	0.0	0.0	1.4	0.2	4.1	0.3	4.1	0.4	4.1	0.5
Mining									0.1	0.0	0.1	0.0	0.1	0.0
Wood Products									347.7	24.2	139.2	12.4	69.5	7.8
Paper and Allied Products	10,462.0	92.1	1,564.4	95.1	468.2	96.6	490.5	85.4	894.5	62.2	808.7	72.2	652.3	73.4
Non-Metallic Minerals									0.1	0.0	0.0	0.0	0.0	0.0
Refined Petroleum and Coal	16.7	0.1	50.6	3.1	13.9	2.9	8.3	1.4	31.4	2.2	7.0	0.6	3.0	0.3
Chemical Products	2.0	0.0	9.4	0.6	0.1	0.0	0.5	0.1	0.4	0.0	0.4	0.0	0.4	0.0
Construction Industries	3.0	0.0	13.7	0.8	0.9	0.2	0.9	0.2	1.0	0.1	1.0	0.1	0.9	0.1
Utility Industries	859.1	7.6	6.6	0.4	0.7	0.1	72.7	12.7	158.6	11.0	158.6	14.2	158.6	17.8
Accommodation Services	0.2	0.0	0.2	0.0	1.1	0.2	0.1	0.0	0.2	0.0	0.1	0.0	0.0	0.0
Other Service Industries	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.9	0.1	0.3	0.0	0.2	0.0
Total	**11,359.9**	100.0	**1,645.1**	100.0	**484.9**	100.0	**574.5**	100.0	**1,439.0**	100.0	**1,119.5**	100.0	**889.1**	100.0

Notes:

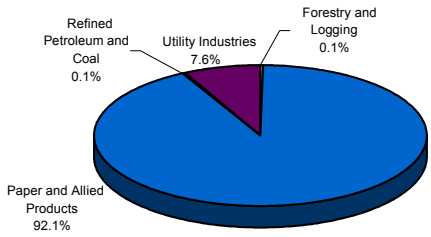
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

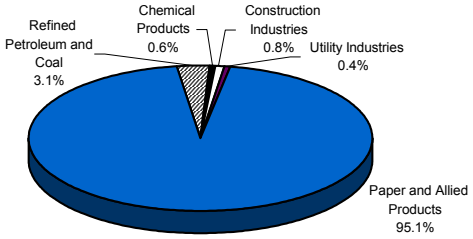
Lower STS 1995 Emissions Inventory – POINT SOURCES

CO Emissions



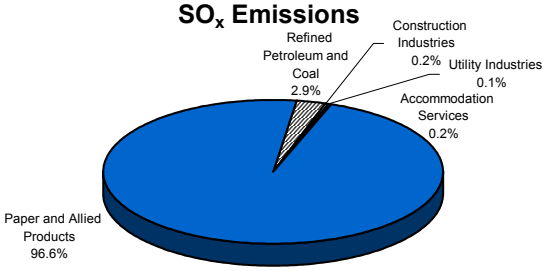
Total: 11,359.90 tonnes

NO_x Emissions



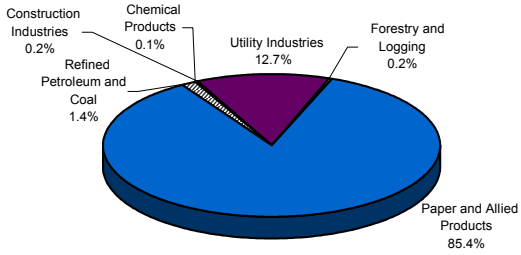
Total: 1,645.10 tonnes

SO_x Emissions



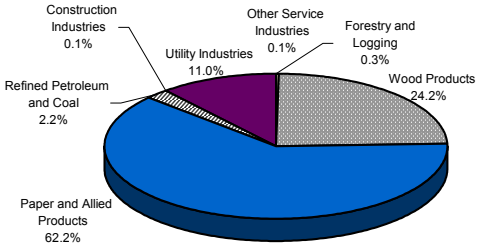
Total: 484.90 tonnes

VOC Emissions



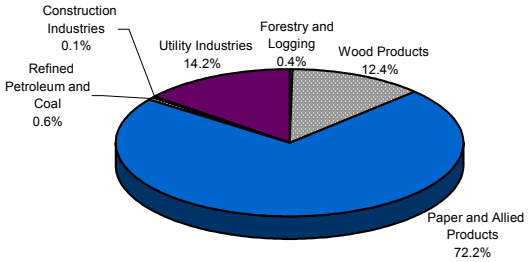
Total: 574.50 tonnes

Particulates Emissions



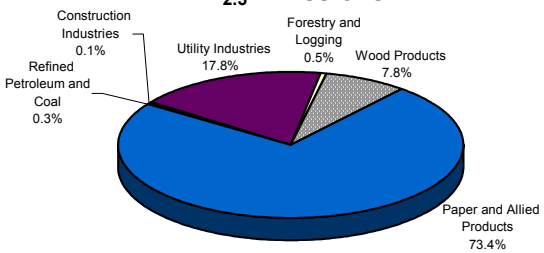
Total: 1,439.00 tonnes

PM_{10} Emissions



Total: 1,119.50 tonnes

$PM_{2.5}$ Emissions



Total: 889.10 tonnes

**Please note that in order to increase the clarity of these graphics, all categories with less than 0.1% of total emissions have been removed.*

Lower Sea-to-Sky 1995 Emissions Inventory – AREA SOURCES

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Prescribed burning	4.3	0.1	0.1	0.0	0.0	0.0	0.2	0.0	0.5	0.1	0.3	0.1	0.3	0.1
Space heating	3,010.6	98.0	157.2	95.2	21.9	97.5	1,024.6	65.6	405.4	62.0	404.7	90.8	384.4	93.7
Agriculture	0.0	0.0	0.2	0.1	0.0	0.0	2.0	0.1	2.6	0.4	1.1	0.2	0.5	0.1
Oil and Gas	2.1	0.1	4.2	2.5	0.0	0.0	186.3	11.9	0.5	0.1	0.5	0.1	0.5	0.1
Solvent Evaporation	0.0	0.0	0.0	0.0	0.0	0.0	288.0	18.4	0.0	0.0				
Miscellaneous Burning	50.2	1.6	3.4	2.0	0.6	2.5	16.3	1.0	8.9	1.4	8.8	2.0	8.0	1.9
Other	3.3	0.1	0.1	0.1	0.0	0.0	43.9	2.8	235.8	36.1	30.5	6.8	16.6	4.0
Total	**3,070.6**	100.0	**165.2**	100.0	**22.5**	100.0	**1,561.4**	100.0	**653.7**	100.0	**445.9**	100.0	**410.3**	100.0

Notes:

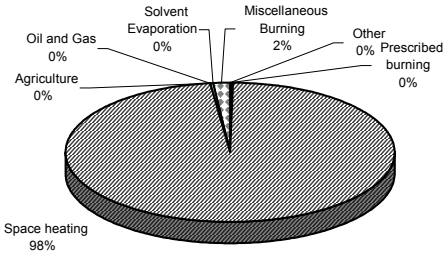
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

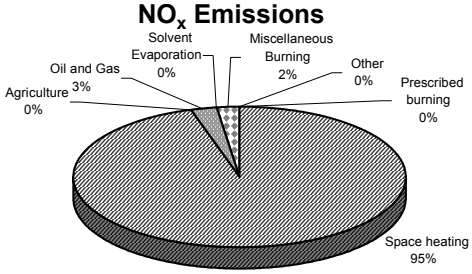
Lower STS 1995 Emissions Inventory – AREA SOURCES

CO Emissions



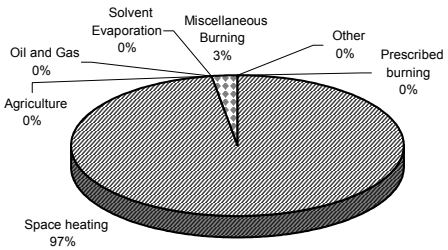
Total: 3,070.59 tonnes

NO_x Emissions



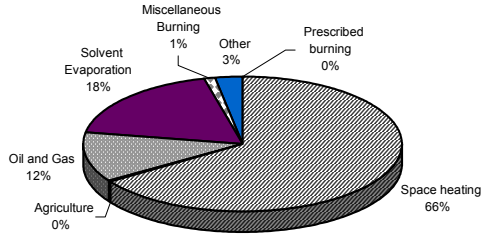
Total: 165.15 tonnes

SO_x Emissions



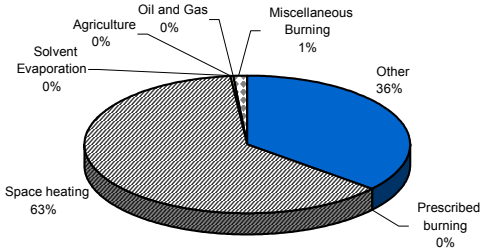
Total: 22.51 tonnes

VOC Emissions



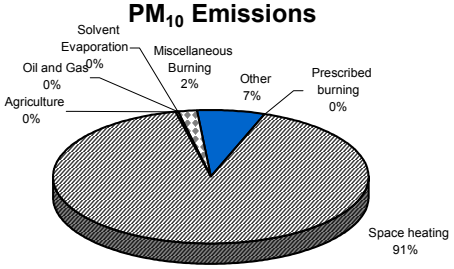
Total: 1,561.36 tonnes

Particulate Emissions



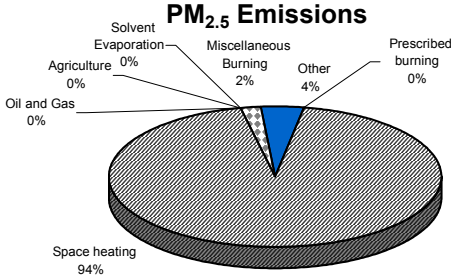
Total: 653.70 tonnes

PM_{10} Emissions



Total: 445.88 tonnes

$PM_{2.5}$ Emissions



Total: 410.30 tonnes

Lower Sea-to-Sky 1995 Emissions Inventory – MOBILE SOURCES

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Light-Duty Vehicles	4,336.3	87.7	407.2	21.4	15.7	10.6	456.1	77.1	8.8	11.9	8.5	11.6	5.4	8.3
Heavy-Duty Vehicles	245.8	5.0	269.1	14.1	4.8	3.3	38.7	6.5	20.6	27.8	20.6	27.9	18.2	28.2
Railways	89.4	1.8	481.2	25.3	33.9	23.0	25.4	4.3	11.5	15.5	11.5	15.6	10.6	16.4
Marine Vessels	179.0	3.6	697.1	36.6	91.9	62.3	57.7	9.7	29.0	39.2	29.0	39.4	26.7	41.3
Aircraft														
Off-Road	93.4	1.9	48.3	2.5	1.2	0.8	14.0	2.4	4.1	5.6	4.1	5.6	3.8	5.9
Total	**4,943.9**	100.0	**1,902.8**	100.0	**147.4**	100.0	**591.9**	100.0	**74.1**	100.0	**73.7**	100.0	**64.6**	100.0

Notes:

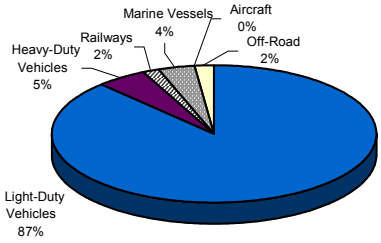
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

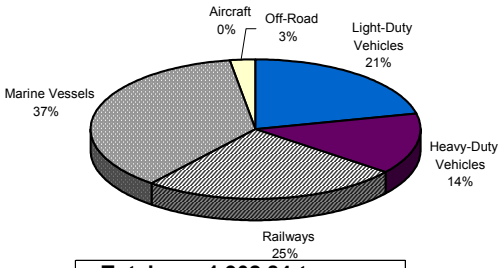
Lower STS 1995 Emissions Inventory – MOBILE SOURCES

CO Emissions



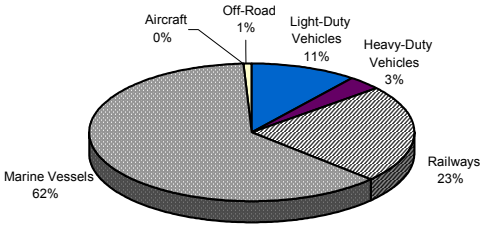
Total: 4,943.89 tonnes

NO_x Emissions



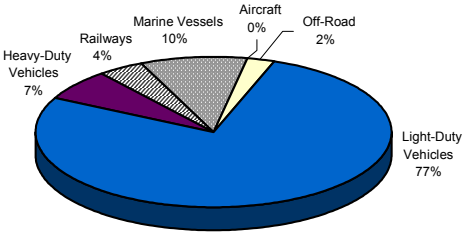
Total: 1,902.84 tonnes

SO_x Emissions



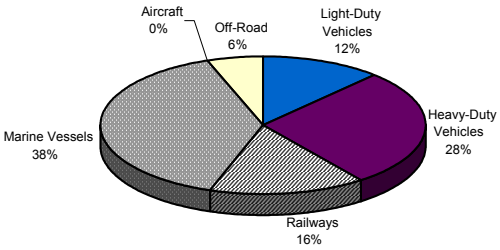
Total: 147.39 tonnes

VOC Emissions



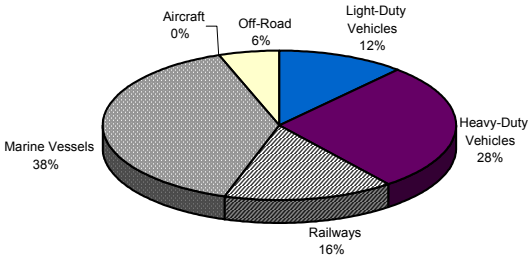
Total: 591.89 tonnes

Particulate Emissions



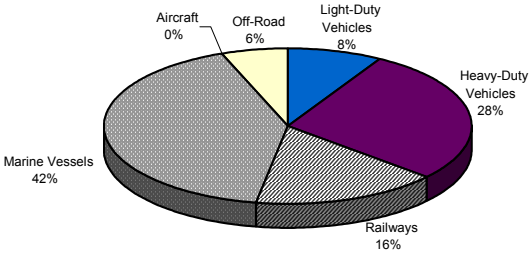
Total: 74.08 tonnes

PM_{10} Emissions



Total: 73.72 tonnes

$PM_{2.5}$ Emissions



Total: 64.61 tonnes

Lower Sea-to-Sky 1995 Emissions Inventory – NATURAL SOURCES

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Wildfires	5.7	100.0	0.1	0.5	0.0003	100.0	0.2	0.0	1.0	0.5	0.7	0.5	0.7	2.7
Biogenics	0.0	0.0	15.6	99.5	0.0000	0.0	5,674.1	100.0	0.0	0.0				
Wildlife														
Marine Aerosol	0.0	0.0	0.0	0.0	0.0000	0.0	0.0	0.0	181.2	99.5	157.7	99.5	24.4	97.3
Total	**5.7**	100.0	**15.7**	100.0	**0.0003**	100.0	**5,674.4**	100.0	**182.2**	100.0	**158.4**	100.0	**25.1**	100.0

Notes:

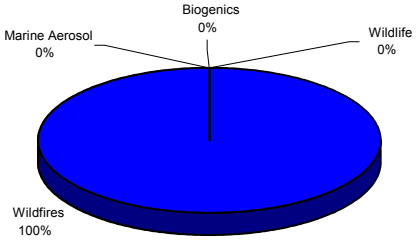
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

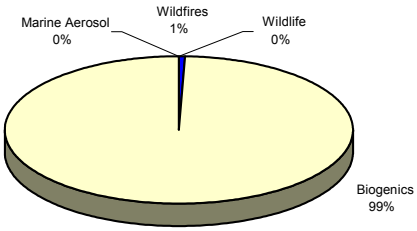
Lower STS 1995 Emissions Inventory – NATURAL SOURCES

CO Emissions



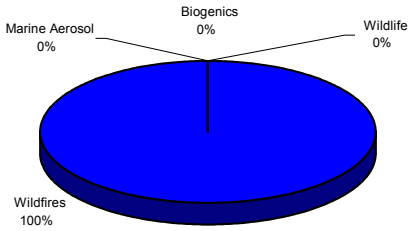
Total: 5.72 tonnes

NO_x Emissions



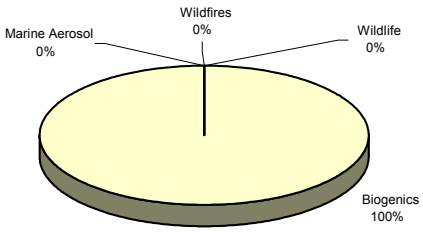
Total: 15.73 tonnes

SO_x Emissions



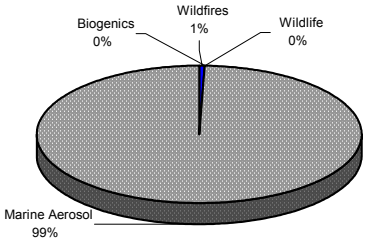
Total: 0.00 tonnes

VOC Emissions



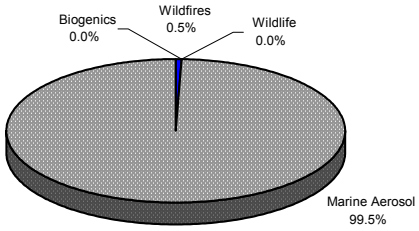
Total: 5,674.36 tonnes

Particulates Emissions



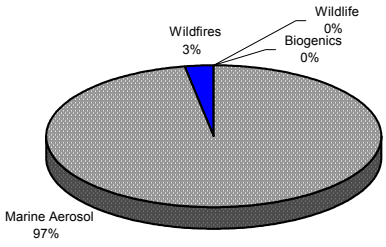
Total: 182.19 tonnes

PM_{10} Emissions



Total: 158.40 tonnes

$PM_{2.5}$ Emissions



Total: 25.13 tonnes

APPENDIX C

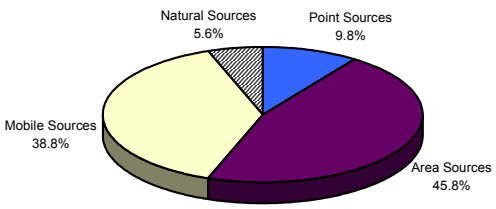
Air Contaminant Emissions Summaries for the Upper STS Airshed

Upper Sea-to-Sky 1995 Emissions Inventory – SUMMARY TABLE

SOURCE/ Category	CO			NO_x			SO_x			VOC			Part			PM_{10}			$PM_{2.5}$		
	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total	(tonnes)	% of Sub-Total	% of Overall Total
ANTHROPOGENIC																					
Point Sources	**397.3**	**10.4**	**9.8**	**9.5**	**1.6**	**1.6**	**3.0**	**7.3**	**7.3**	**34.1**	**3.5**	**0.7**	**94.3**	**20.2**	**18.6**	**77.4**	**21.1**	**19.6**	**73.7**	**22.0**	**20.3**
Forestry and Logging	233.2	6.1	5.7	1.9	0.3	0.3	0.2	0.5	0.5	19.8	2.0	0.4	42.0	9.0	8.3	35.2	9.6	8.9	33.2	9.9	9.2
Mining																					
Wood Products																					
Paper and Allied Products																					
Non-Metallic Minerals													0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Refined Petroleum and Coal																					
Chemical Products																					
Construction Industries	1.7	0.0	0.0	6.4	1.1	1.1	2.7	6.6	6.6	0.6	0.1	0.0	12.2	2.6	2.4	2.1	0.6	0.5	0.5	0.1	0.1
Utility Industries	162.4	4.2	4.0	1.2	0.2	0.2	0.1	0.2	0.2	13.7	1.4	0.3	40.0	8.6	7.9	40.0	10.9	10.1	40.0	11.9	11.0
Accommodation Services																					
Other Service Industries																					
Area Sources	**1,861.0**	**48.5**	**45.8**	**62.7**	**10.6**	**10.4**	**10.6**	**26.0**	**26.0**	**765.5**	**78.5**	**15.6**	**355.3**	**76.0**	**70.2**	**270.8**	**73.9**	**68.5**	**246.0**	**73.3**	**67.9**
Prescribed burning	17.8	0.5	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.8	0.1	0.0	1.9	0.4	0.4	1.4	0.4	0.4	1.3	0.4	0.4
Space heating	1,817.9	47.4	44.8	59.0	10.0	9.8	10.4	25.4	25.4	623.2	63.9	12.7	242.2	51.8	47.9	241.8	66.0	61.2	229.6	68.4	63.4
Agriculture	0.0	0.0	0.0	0.9	0.2	0.1	0.0	0.0	0.0	18.5	1.9	0.4	41.7	8.9	8.2	15.8	4.3	4.0	7.5	2.2	2.1
Oil and Gas	0.6	0.0	0.0	1.2	0.2	0.2	0.0	0.0	0.0	45.9	4.7	0.9	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0
Solvent Evaporation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.6	5.3	1.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Miscellaneous Burning	24.2	0.6	0.6	1.4	0.2	0.2	0.2	0.6	0.6	7.3	0.7	0.1	4.4	0.9	0.9	4.3	1.2	1.1	3.9	1.2	1.1
Other	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.2	1.9	0.4	65.0	13.9	12.9	7.3	2.0	1.8	3.5	1.1	1.0
Mobile Sources	**1,575.0**	**41.1**	**38.8**	**517.1**	**87.7**	**85.8**	**27.3**	**66.7**	**66.6**	**176.0**	**18.0**	**3.6**	**18.2**	**3.9**	**3.6**	**18.1**	**4.9**	**4.6**	**15.8**	**4.7**	**4.4**
Light-Duty Vehicles	1,381.5	36.0	34.0	108.2	18.4	17.9	4.2	10.2	10.2	140.9	14.4	2.9	2.3	0.5	0.5	2.3	0.6	0.6	1.4	0.4	0.4
Heavy-Duty Vehicles	82.7	2.2	2.0	84.8	14.4	14.1	1.5	3.7	3.7	13.3	1.4	0.3	6.4	1.4	1.3	6.4	1.7	1.6	5.7	1.7	1.6
Railways	56.1	1.5	1.4	302.1	51.3	50.1	21.2	51.8	51.8	16.0	1.6	0.3	7.2	1.5	1.4	7.2	2.0	1.8	6.6	2.0	1.8
Marine Vessels																					
Aircraft																					
Off-Road	54.7	1.4	1.3	22.0	3.7	3.7	0.4	1.1	1.1	5.8	0.6	0.1	2.2	0.5	0.4	2.2	0.6	0.6	2.0	0.6	0.6
ANTHROPOGENIC SUB-TOTAL	**3,833.4**	**100.0**	**94.4**	**589.3**	**100.0**	**97.7**	**40.9**	**100.0**	**100.0**	**975.5**	**100.0**	**19.8**	**467.8**	**100.0**	**92.5**	**366.3**	**100.0**	**92.6**	**335.5**	**100.0**	**92.6**
NATURAL																					
Wildfires	225.9	100.0	5.6	3.4	24.7	0.6	0.0	100.0	0.0	9.6	0.2	0.2	38.0	100.0	7.5	29.1	100.0	7.4	26.8	100.0	7.4
Biogenics	0.0	0.0	0.0	10.2	75.3	1.7	0.0	0.0	0.0	3,935.8	99.8	80.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Wildlife																					
Marine Aerosol																					
NATURAL SUB-TOTAL	**225.9**	**100.0**	**5.6**	**13.6**	**100.0**	**2.3**	**0.0**	**100.0**	**0.0**	**3,945.4**	**100.0**	**80.2**	**38.0**	**100.0**	**7.5**	**29.1**	**100.0**	**7.4**	**26.8**	**100.0**	**7.4**
TOTAL	**4,059.3**		**100.0**	**602.9**			**40.9**			**4,920.9**			**505.8**			**395.4**			**362.3**		

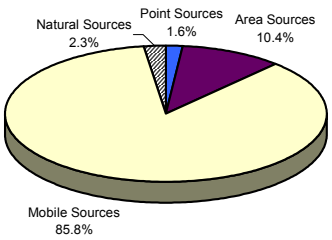
Upper STS 1995 Emissions Inventory by Contaminant

CO Emissions



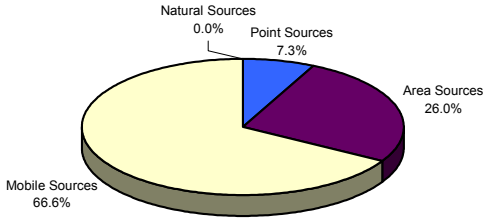
Total: 4,059.28 tonnes

NO_x Emissions



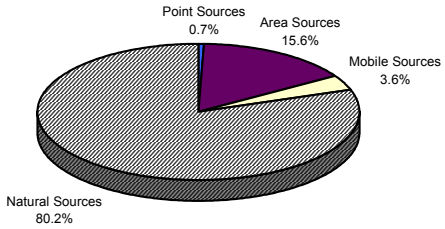
Total: 602.89 tonnes

SO_x Emissions



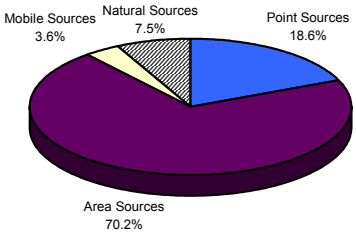
Total: 40.90 tonnes

VOC Emissions



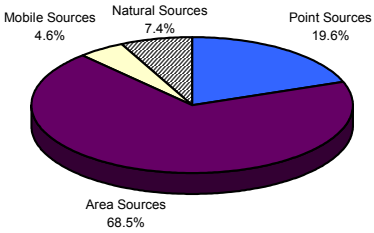
Total: 4,920.93 tonnes

Particulate Emissions



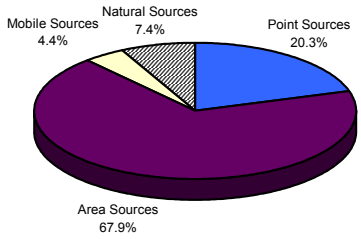
Total: 505.82 tonnes

PM_{10} Emissions



Total: 395.36 tonnes

$PM_{2.5}$ Emissions



Total: 362.33 tonnes

Upper Sea-to-Sky 1995 Emissions Inventory – POINT SOURCES

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Forestry and Logging	233.2	58.7	1.9	20.0	0.2	6.7	19.8	58.1	42.0	44.5	35.2	45.5	33.2	45.0
Mining														
Wood Products														
Paper and Allied Products														
Non-Metallic Minerals									0.1	0.1	0.1	0.1	0.0	0.0
Refined Petroleum and Coal														
Chemical Products														
Construction Industries	1.7	0.4	6.4	67.4	2.7	90.0	0.6	1.8	12.2	12.9	2.1	2.7	0.5	0.7
Utility Industries	162.4	40.9	1.2	12.6	0.1	3.3	13.7	40.2	40.0	42.4	40.0	51.7	40.0	54.3
Accommodation Services														
Other Service Industries														
Total	**397.3**	100.0	**9.5**	100.0	**3.0**	100.0	**34.1**	100.0	**94.3**	100.0	**77.4**	100.0	**73.7**	100.0

Notes:

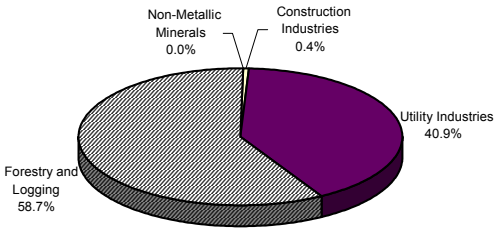
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

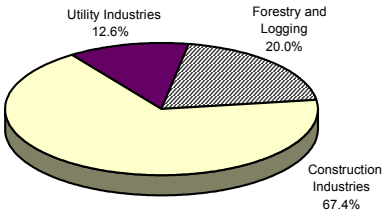
Upper STS 1995 Emissions Inventory – POINT SOURCES

CO Emissions



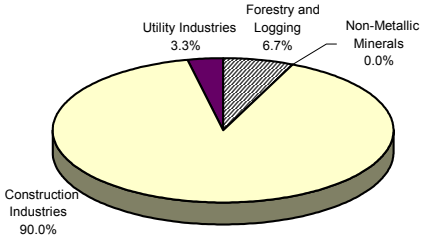
Total: 397.30 tonnes

NO_x Emissions



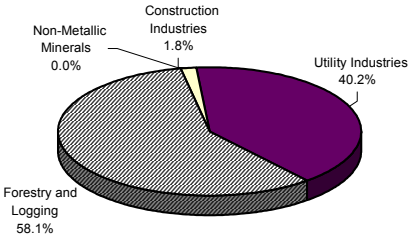
Total: 9.50 tonnes

SO_x Emissions



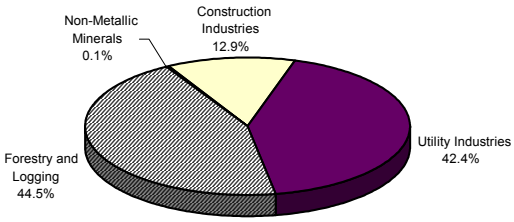
Total: 3.00 tonnes

VOC Emissions



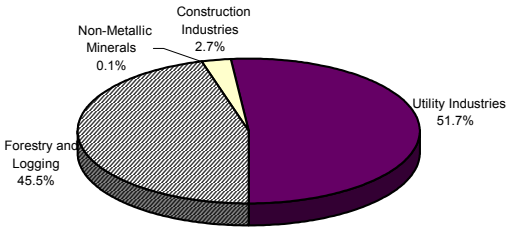
Total: 34.10 tonnes

Particulates Emissions



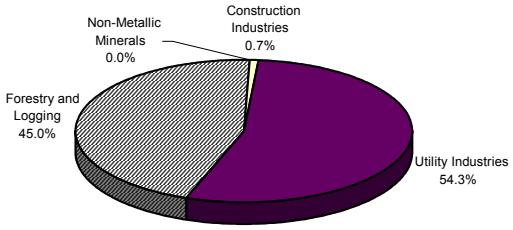
Total: 94.30 tonnes

PM_{10} Emissions



Total: 77.40 tonnes

$PM_{2.5}$ Emissions



Total: 73.70 tonnes

**Please note that in order to increase the clarity of these graphics, all categories which did not included any of the specific contaminant emissions have been removed.*

Upper Sea-to-Sky 1995 Emissions Inventory – AREA SOURCES

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Prescribed burning	17.8	1.0	0.3	0.4	0.0	0.0	0.8	0.1	1.9	0.5	1.4	0.5	1.3	0.5
Space heating	1,817.9	97.7	59.0	94.0	10.4	97.8	623.2	81.4	242.2	68.2	241.8	89.3	229.6	93.3
Agriculture	0.0	0.0	0.9	1.4	0.0	0.0	18.5	2.4	41.7	11.7	15.8	5.8	7.5	3.0
Oil and Gas	0.6	0.0	1.2	1.9	0.0	0.0	45.9	6.0	0.1	0.0	0.1	0.1	0.1	0.1
Solvent Evaporation	0.0	0.0	0.0	0.0	0.0	0.0	51.6	6.7	0.0	0.0				
Miscellaneous Burning	24.2	1.3	1.4	2.2	0.2	2.2	7.3	0.9	4.4	1.2	4.3	1.6	3.9	1.6
Other	0.5	0.0	0.0	0.0	0.0	0.0	18.2	2.4	65.0	18.3	7.3	2.7	3.5	1.4
Total	**1,861.0**	100.0	**62.7**	100.0	**10.6**	100.0	**765.5**	100.0	**355.3**	100.0	**270.8**	100.0	**246.0**	100.0

Notes:

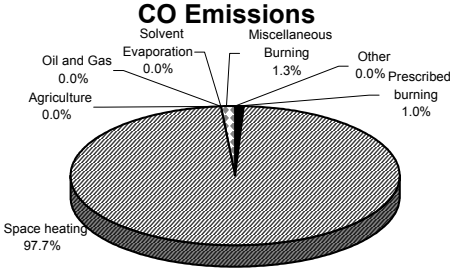
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

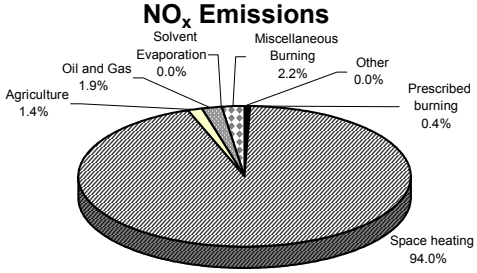
Upper STS 1995 Emissions Inventory – AREA SOURCES

CO Emissions



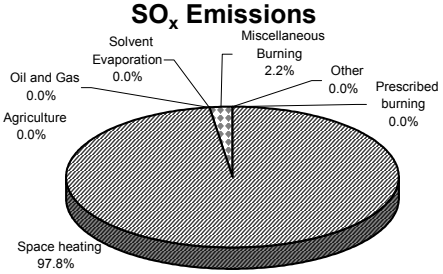
Total: 1,861.01 tonnes

NO_x Emissions



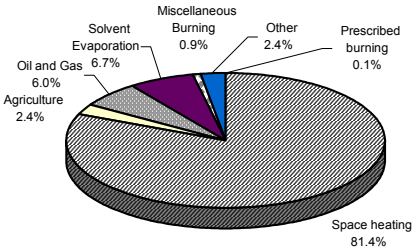
Total: 62.74 tonnes

SO_x Emissions



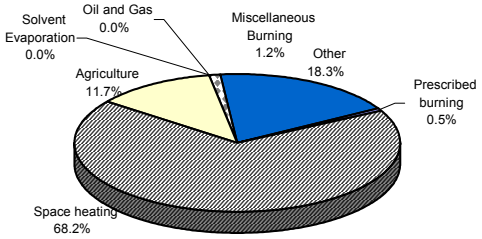
Total: 10.63 tonnes

VOC Emissions



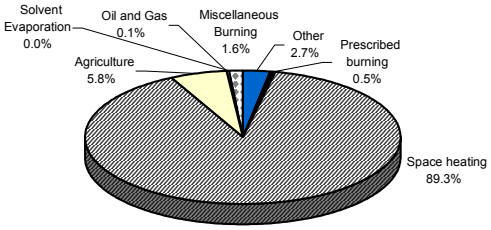
Total: 765.48 tonnes

Particulate Emissions



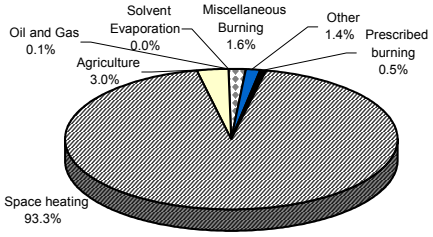
Total: 355.29 tonnes

PM_{10} Emissions



Total: 270.78 tonnes

$PM_{2.5}$ Emissions



Total: 246.01 tonnes

Upper STS 1995 Emissions Inventory – MOBILE SOURCES

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Light-Duty Vehicles	1,381.5	87.7	108.2	20.9	4.2	15.3	140.9	80.1	2.3	12.9	2.3	12.5	1.4	9.0
Heavy-Duty Vehicles	82.7	5.3	84.8	16.4	1.5	5.5	13.3	7.6	6.4	35.3	6.4	35.4	5.7	36.0
Railways	56.1	3.6	302.1	58.4	21.2	77.7	16.0	9.1	7.2	39.7	7.2	39.9	6.6	42.1
Marine Vessels														
Aircraft														
Off-Road	54.7	3.5	22.0	4.3	0.4	1.6	5.8	3.3	2.2	12.2	2.2	12.2	2.0	12.9
Total	**1,575.0**	100.0	**517.1**	100.0	**27.3**	100.0	**176.0**	100.0	**18.2**	100.0	**18.1**	100.0	**15.8**	100.0

Notes:

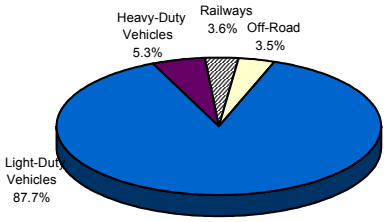
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

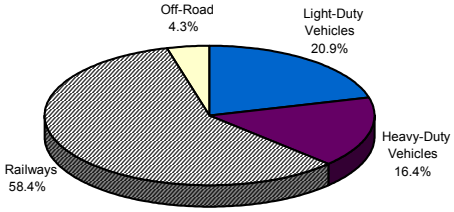
Upper STS 1995 Emissions Inventory – MOBILE SOURCES

CO Emissions



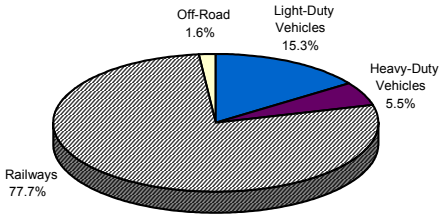
Total: 1,575.05 tonnes

NO_x Emissions



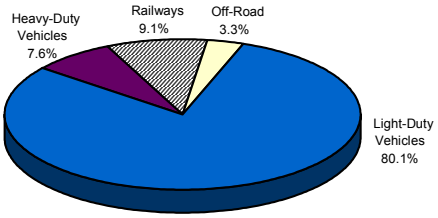
Total: 517.07 tonnes

SO_x Emissions



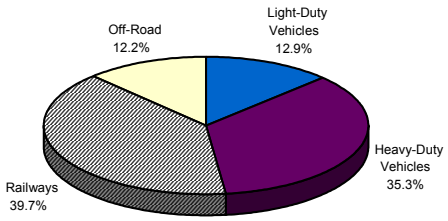
Total: 27.26 tonnes

VOC Emissions



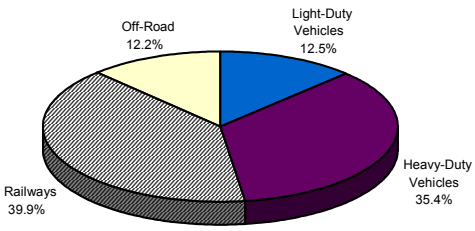
Total: 175.96 tonnes

Particulate Emissions



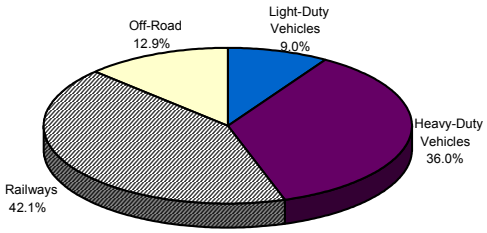
Total: 18.20 tonnes

PM_{10} Emissions



Total: 18.10 tonnes

$PM_{2.5}$ Emissions



Total: 15.77 tonnes

Upper Sea-to-Sky 1995 Emissions Inventory – NATURAL SOURCES

SOURCE/ Category	CO		NO_x		SO_x		VOC		Part		PM_{10}		$PM_{2.5}$	
	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total	(tonnes)	% of Total
Wildfires	225.9	100.0	3.4	24.7	0.01	100.0	9.6	0.2	38.0	100.0	29.1	100.0	26.8	100.0
Biogenics	0.0	0.0	10.2	75.3	0.00	0.0	3,935.8	99.8	0.0	0.0				
Wildlife														
Marine Aerosol														
Total	**225.9**	100.0	**13.6**	100.0	**0.01**	100.0	**3,945.4**	100.0	**38.0**	100.0	**29.1**	100.0	**26.8**	100.0

Notes:

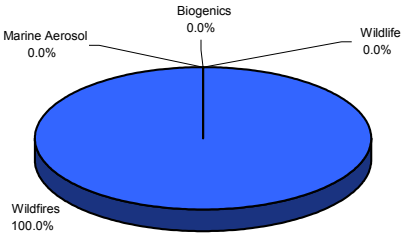
True zero values have been removed for clarity.

Values shown as 0.0 are between 0.0 and 0.05.

Estimates for total emissions are subject to rounding errors, which may result in slight differences between totals.

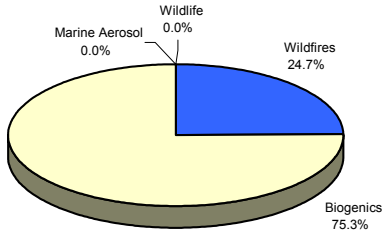
Upper STS 1995 Emissions Inventory – NATURAL SOURCES

CO Emissions



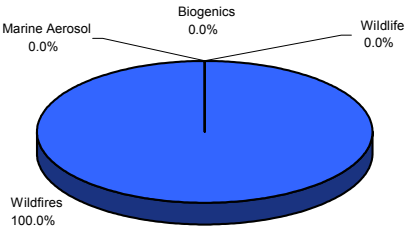
Total: 225.92 tonnes

NO_x Emissions



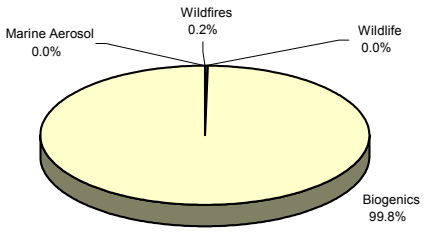
Total: 13.57 tonnes

SO_x Emissions



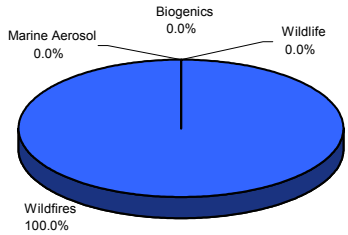
Total: 0.01 tonnes

VOC Emissions



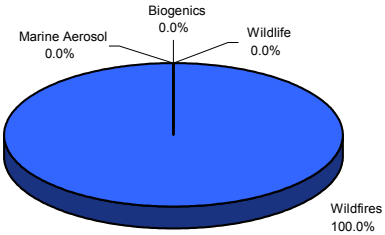
Total: 3,945.40 tonnes

Particulates Emissions



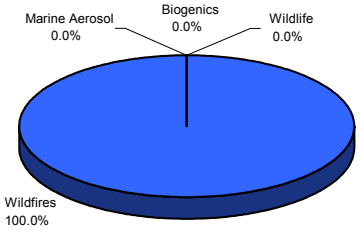
Total: 38.03 tonnes

PM_{10} Emissions



Total: 29.08 tonnes

$PM_{2.5}$ Emissions



Total: 26.84 tonnes

APPENDIX D

Air Contaminant Emissions Summary by Process

Lower Sea-to-Sky Airshed
Air Contaminant Emissions Summary by Process

LOWER STS AIRSHED - MOBILE SOURCES								
Emissions Category	**Emissions Process**	**tonnes**						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Heavy-Duty Vehicles		245.81	269.10	4.80	38.70	20.62	20.57	18.22
	HDDV (Lower Fraser Valley)	41.68	99.42	1.72	9.08	8.07	8.05	7.15
	HDDV, CITY, OTHER VEHICLE EMISSIONS	59.38	71.97	1.13		5.29	5.28	4.69
	HDDV, CITY, VEHICLE HYDROCARBONS				12.59			
	HDDV, HIGHWAY, OTHER VEHICLE EMISSIONS	40.08	86.79	1.48		6.95	6.95	6.17
	HDDV, HIGHWAY, VEHICLE HYDROCARBONS				9.27			
	HDGV (Lower Fraser Valley)	31.55	4.18	0.18	1.95	0.12	0.12	0.08
	HDGV, CITY, OTHER VEHICLE EMISSIONS	43.00	2.63	0.13		0.08	0.08	0.05
	HDGV, CITY, VEHICLE HYDROCARBONS				3.49			
	HDGV, HIGHWAY, OTHER VEHICLE EMISSIONS	30.12	4.10	0.17		0.11	0.10	0.07
	HDGV, HIGHWAY, VEHICLE HYDROCARBONS				2.32			
Light-Duty Vehicles		4,336.27	407.20	15.66	456.06	8.82	8.52	5.37
	LDDT (Lower Fraser Valley)	0.58	1.15	0.07	0.35	0.25	0.25	0.22
	LDDT, CITY, OTHER VEHICLE EMISSIONS	1.02	0.97	0.06		0.19	0.19	0.17
	LDDT, CITY, VEHICLE HYDROCARBONS				0.56			
	LDDT, HIGHWAY, OTHER VEHICLE EMISSIONS	0.35	0.59	0.04		0.13	0.13	0.11
	LDDT, HIGHWAY, VEHICLE HYDROCARBONS				0.21			
	LDDV (Lower Fraser Valley)	0.48	0.99	0.06	0.25	0.19	0.19	0.17
	LDDV, CITY, OTHER VEHICLE EMISSIONS	0.90	0.88	0.05		0.16	0.16	0.14
	LDDV, CITY, VEHICLE HYDROCARBONS				0.40			
	LDDV, HIGHWAY, OTHER VEHICLE EMISSIONS	0.26	0.46	0.03		0.09	0.09	0.08
	LDDV, HIGHWAY, VEHICLE HYDROCARBONS				0.13			
	LDGT1 (Lower Fraser Valley)	245.69	37.31	1.75	26.02	0.70	0.68	0.41
	LDGT1, CITY, OTHER VEHICLE EMISSIONS	574.58	35.78	1.74		0.68	0.67	0.40
	LDGT1, CITY, VEHICLE HYDROCARBONS				51.54			

Lower STS Airshed - Mobile Sources cont'd…

Emissions Category	Emissions Process	tonnes						
		CO	NO_x	SO_x	VOC	Part	PM_{10}	$PM_{2.5}$
Light-Duty Vehicles cont'd								
	LDGT1, HIGHWAY, OTHER VEHICLE EMISSIONS	180.94	21.50	0.98		0.41	0.40	0.25
	LDGT1, HIGHWAY, VEHICLE HYDROCARBONS				18.10			
	LDGT2 (Lower Fraser Valley)	109.15	14.08	0.56	12.75	0.29	0.29	0.19
	LDGT2, CITY, OTHER VEHICLE EMISSIONS	39.62	2.18	0.09		0.05	0.05	0.03
	LDGT2, CITY, VEHICLE HYDROCARBONS				4.18			
	LDGT2, HIGHWAY, OTHER VEHICLE EMISSIONS	21.48	2.19	0.09		0.05	0.04	0.03
	LDGT2, HIGHWAY, VEHICLE HYDROCARBONS				2.35			
	LDGV (Lower Fraser Valley)	875.95	126.03	4.40	102.33	2.43	2.34	1.40
	LDGV, CITY, OTHER VEHICLE EMISSIONS	1,718.51	100.67	3.63		2.01	1.91	1.10
	LDGV, CITY, VEHICLE HYDROCARBONS				173.84			
	LDGV, HIGHWAY, OTHER VEHICLE EMISSIONS	549.69	61.18	2.06		1.16	1.10	0.67
	LDGV, HIGHWAY, VEHICLE HYDROCARBONS				60.26			
	MC (Lower Fraser Valley)	4.70	0.58	0.03	0.90	0.02	0.02	0.01
	MC, CITY, OTHER VEHICLE EMISSIONS	10.04	0.40	0.02		0.02	0.02	0.01
	MC, CITY, VEHICLE HYDROCARBONS				1.40			
	MC, HIGHWAY, OTHER VEHICLE EMISSIONS	2.32	0.26	0.01		0.01	0.01	0.00
	MC, HIGHWAY, VEHICLE HYDROCARBONS				0.51			
Marine Vessels		178.99	697.05	91.89	57.67	29.02	29.02	26.65
	BC FERRIES UNDERWAY	82.45	635.27	85.12	27.22	25.90	25.90	23.79
	DEEP OCEAN VESSELS DOCKSIDE	0.78	4.80	0.60	1.35	0.29	0.29	0.26
	FISHING VESSELS	0.11	0.86	0.08	0.12	0.04	0.04	0.04
	HARBOUR VESSELS TUGBOATS 0-449 HP	0.77	3.65	0.48	0.28	0.22	0.22	0.20
	HARBOUR VESSELS TUGBOATS 1000-1499 HP	1.54	7.57	0.91	0.61	0.42	0.42	0.38
	HARBOUR VESSELS TUGBOATS 1500-1999 HP	3.48	6.92	0.52	0.24	0.24	0.24	0.23
	HARBOUR VESSELS TUGBOATS 2000+ HP	1.85	7.70	0.69	0.42	0.32	0.32	0.30
	HARBOUR VESSELS TUGBOATS 500-999 HP	1.65	8.10	0.97	0.65	0.45	0.45	0.41
	HARBOUR VESSELS WORKBOATS 0-499 HP	0.51	3.19	0.35	0.34	0.16	0.16	0.16
	HARBOUR VESSELS WORKBOATS 1000+ HP	1.12	5.49	0.66	0.44	0.31	0.31	0.27
	HARBOUR VESSELS WORKBOATS 500-999 HP	0.20	0.85	0.10	0.06	0.05	0.05	0.05
	HARBOUR - WORKBOATS, GASOLINE (LFV)	8.56	0.22		0.34			
	HARBOUR VESSELS, CHARTER 0-15 M (350 HP)	1.15	7.80	0.77	1.16	0.36	0.36	0.33

Lower STS Airshed - Mobile Sources cont'd…

Emissions Category	Emissions Process	tonnes						
		CO	NO_x	SO_x	VOC	Part	PM_{10}	$PM_{2.5}$
Marine Vessels cont'd								
	HARBOUR VESSELS, CHARTER 15-30 M (756 HP)	0.63	2.04	0.31	0.15	0.15	0.15	0.13
	HARBOUR VESSELS, CHARTER 30+ M (1400 HP)	0.29	1.45	0.17	0.12	0.08	0.08	0.07
	RECREATIONAL - OUTBOARDS (LFV)	70.87	0.14	0.09	23.62			
	RECREATIONAL - INBOARDS - GAS (LFV)	0.19	0.02	0.00	0.01			
	RECREATIONAL - INBOARDS - DIESEL (LFV)	0.05	0.12	0.01	0.06	0.01	0.01	0.01
	RECREATIONAL - IN/OUTBOARDS - GAS (LFV)	2.57	0.28	0.01	0.17			
	RECREATIONAL - IN/OUTBOARDS - DIESEL (LFV)	0.24	0.58	0.04	0.31	0.03	0.03	0.03
Off-Road		93.45	48.28	1.16	14.05	4.12	4.12	3.78
	LAWN EQUIPMENT	74.08	0.77	0.06	9.96	0.23	0.22	0.20
	OFF-ROAD DIESEL - AGRICULTURE	0.24	0.59	0.01	0.09	0.06	0.06	0.06
	OFF-ROAD DIESEL - CONSTRUCTION	17.74	46.87	1.09	3.95	3.83	3.83	3.52
	OFF-ROAD GASOLINE - AGRICULTURE	1.39	0.05	0.00	0.05	0.00	0.00	0.00
Railways		89.37	481.22	33.88	25.41	11.50	11.50	10.58
	DIESEL LINE TRAVEL	64.49	335.50	24.38	16.77	7.99	7.99	7.35
	DIESEL YARD TRAVEL	24.88	145.72	9.49	8.64	3.52	3.52	3.24
TOTAL		**4,943.89**	**1,902.84**	**147.39**	**591.89**	**74.08**	**73.72**	**64.61**

LOWER STS AIRSHED - NATURAL SOURCES								
Emissions Category	**Emissions Process**	**tonnes**						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Biogenics		0.00	15.64	0.00	5,674.12	0.00	0.00	0.00
	CONIFEROUS FOREST		11.82		4,570.05			
	CROPLAND REGION 1		0.05		0.19			
	DECIDUOUS FOREST		0.42		145.60			
	GRASSLAND		0.38		1.11			
	MIXED WOOD FOREST		2.62		948.43			
	TRANSITIONAL FOREST		0.02		0.85			
	URBAN VEGETATION		0.35		7.90			
Marine Aerosol		0.00	0.00	0.00	0.00	181.22	157.66	24.45
	MARINE AEROSOL COAST					140.25	122.02	18.34
	MARINE AEROSOL OPEN					40.97	35.64	6.11
Wildfires		5.72	0.08	0.00	0.24	0.96	0.74	0.68
	WILDFIRES	5.72	0.08	0.00	0.24	0.96	0.74	0.68
TOTAL		**5.72**	**15.73**	**0.00**	**5,674.36**	**182.19**	**158.40**	**25.13**

LOWER STS AIRSHED - AREA SOURCES								
Emissions Category	**Emissions Process**	**tonnes**						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Agriculture		0.00	0.23	0.00	2.00	2.58	1.09	0.51
	CATTLE				1.81	0.09	0.01	0.00
	FERTILIZER APPLIED					0.07	0.04	0.01
	FERTILIZER NITROGEN		0.23					
	FUGITIVE EMISSION AGRICULTURAL					0.36	0.08	0.04
	HORSES				0.05	0.02	0.00	0.00
	PESTICIDES				0.10			
	PESTICIDES APPLIED					0.03	0.01	0.00
	PIGS				0.02	0.11	0.01	0.00
	POULTRY					0.00	0.00	0.00
	SHEEP				0.01	0.01	0.00	0.00
	WIND EROSION					1.90	0.95	0.45
Miscellaneous Burning		50.22	3.37	0.57	16.32	8.91	8.79	7.98
	AGRICULTURAL BURNING	0.00	0.00		0.00	0.00	0.00	0.00
	BACK YARD BURNING	44.34	3.17	0.53	15.84	8.45	8.36	7.60
	BIO-MED/CREMAT/ANIMAL INCINERATION	0.06	0.07	0.04	0.01	0.09	0.06	0.04
	STRUCTURAL FIRES	5.82	0.14		0.48	0.37	0.37	0.34
Oil and Gas		2.09	4.21	0.00	186.31	0.49	0.49	0.49
	LOADING AND TANKAGE EMISSIONS AT BULK PLANTS				30.89			
	LOADING AND TANKAGE EMISSIONS AT BULK TERMINALS				24.64			
	NATURAL GAS IND - COMBUSTION - DISTRIBUTION	2.09	4.21		0.04	0.49	0.49	0.49
	NATURAL GAS IND - LEAKS - DISTRIBUTION				11.57			
	NATURAL GAS IND - VENTS - DISTRIBUTION				12.31			
	TANKS, REFUELLING & SPILLS AT AUTO SERV STATIONS				105.20			
	TANKS, REFUELLING & SPILLS AT BULK USERS (LFV)				0.12			
	TANKS, REFUELLING & SPILLS AT CARDLOCKS (LFV)				0.00			
	TANKS, REFUELLING & SPILLS AT MARINE REFUELLING (LFV)				1.55			

Lower STS Airshed - Area Sources cont'd...

Emissions Category	Emissions Process	tonnes						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Other		3.34	0.11	0.00	43.92	235.83	30.51	16.57
	BAKERIES				1.20			
	BARBECUES					3.55	3.55	3.55
	BREWERIES	0.00	0.01	0.00	0.01	0.02	0.01	0.00
	COMMERCIAL-LIGHT INDUSTRIAL GENERAL PARTICULATE					6.49	3.72	2.64
	CUT BACK ASPHALT APPLICATION				14.15			
	FUGITIVE EMISSION CONC/DEM					5.28	0.83	0.17
	GRAVEL PITS					204.78	11.67	
	LANDFILLS - WOODWASTE				10.65	0.93	0.07	0.02
	LANDFILLS MUNICIPAL				17.69	4.39	0.35	0.09
	LANDFILLS COMBINED (Lower Fraser Valley)				0.21	0.10	0.01	0.00
	RESTAURANTS					3.87	3.87	3.67
	TOBACCO	3.33	0.10			4.34	4.34	4.34
	WELDING SHOPS	0.00				2.09	2.09	2.09
Prescribed Burning		4.30	0.06	0.00	0.18	0.46	0.34	0.32
	PRESCRIBED BURNING	4.30	0.06	0.00	0.18	0.46	0.34	0.32
Solvent Evaporation		0.00	0.00	0.00	288.00	0.00	0.00	0.00
	APPLICATION OF ARCHITECTURAL COATINGS				53.04			
	APPLICATION OF COATINGS - AUTO REFINISHING				17.03			
	APPLICATION OF COATINGS - GENERAL INDUSTRIAL				27.77			
	CONSUMER PRODUCTS				134.12			
	DRY CLEANING				8.04			
	GLUES ADHESIVES SEALANTS				6.81			
	METAL DEGREASING				24.08			
	PRINTING INKS				17.10			

Lower STS Airshed - Area Sources cont'd...

Emissions Category	Emissions Process	tonnes						
		CO	NO_x	SO_x	VOC	Part	PM_{10}	$PM_{2.5}$
Space Heating		3,010.65	157.16	21.94	1,024.63	405.43	404.66	384.44
	FUEL OIL COMM/IND	0.89	3.56	5.33	0.06	0.36	0.20	0.15
	FUEL WOOD RESIDENTIAL	2,972.02	37.30	5.40	1,016.94	391.67	391.67	372.02
	LPG COMMERCIAL	0.64	5.42	0.01	0.19	0.16	0.15	0.14
	LPG RESIDENTIAL	0.35	2.99	0.00	0.11	0.09	0.08	0.08
	NATURAL GAS COMM/IND	7.93	38.46	0.96	2.04	4.62	4.48	4.28
	NATURAL GAS RESIDENTIAL	27.39	64.20	1.71	5.09	7.82	7.68	7.47
	OIL RESIDENTIAL	1.43	5.23	8.53	0.20	0.71	0.39	0.30
TOTAL		**3,070.59**	**165.15**	**22.51**	**1,561.36**	**653.70**	**445.88**	**410.30**

Upper Sea-to-Sky Airshed
Air Contaminant Emissions Summary by Process

UPPER STS AIRSHED - MOBILE SOURCES								
Emissions Category	**Emissions Process**	**tonnes**						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Heavy-Duty Vehicles		82.70	84.77	1.50	13.33	6.42	6.41	5.68
	HDDV, CITY, OTHER VEHICLE EMISSIONS	22.86	27.71	0.43		2.04	2.03	1.81
	HDDV, CITY, VEHICLE HYDROCARBONS				4.85			
	HDDV, HIGHWAY, OTHER VEHICLE EMISSIONS	24.71	53.52	0.92		4.29	4.28	3.81
	HDDV, HIGHWAY, VEHICLE HYDROCARBONS				5.71			
	HDGV, CITY, OTHER VEHICLE EMISSIONS	16.56	1.01	0.05		0.03	0.03	0.02
	HDGV, CITY, VEHICLE HYDROCARBONS				1.34			
	HDGV, HIGHWAY, OTHER VEHICLE EMISSIONS	18.57	2.53	0.10		0.07	0.06	0.04
	HDGV, HIGHWAY, VEHICLE HYDROCARBONS				1.43			
Light-Duty Vehicles		1,381.51	108.18	4.16	140.87	2.34	2.25	1.42
	LDDT, CITY, OTHER VEHICLE EMISSIONS	0.40	0.38	0.02		0.07	0.07	0.06
	LDDT, CITY, VEHICLE HYDROCARBONS				0.22			
	LDDT, HIGHWAY, OTHER VEHICLE EMISSIONS	0.21	0.36	0.02		0.08	0.08	0.07
	LDDT, HIGHWAY, VEHICLE HYDROCARBONS				0.13			
	LDDV, CITY, OTHER VEHICLE EMISSIONS	0.35	0.34	0.02		0.06	0.06	0.05
	LDDV, CITY, VEHICLE HYDROCARBONS				0.16			
	LDDV, HIGHWAY, OTHER VEHICLE EMISSIONS	0.16	0.28	0.02		0.06	0.06	0.05
	LDDV, HIGHWAY, VEHICLE HYDROCARBONS				0.08			
	LDGT1, CITY, OTHER VEHICLE	224.47	13.97	0.68		0.27	0.26	0.16
	LDGT1, CITY, VEHICLE HYDROCARBONS				20.14			

Upper STS Airshed - Mobile Sources cont'd…

Emissions Category	Emissions Process	tonnes						
		CO	NO_x	SO_x	VOC	Part	PM_{10}	$PM_{2.5}$
Light-Duty cont'd								
	LDGT1, HIGHWAY, OTHER VEHICLE EMISSIONS	111.56	13.27	0.61		0.25	0.24	0.15
	LDGT1, HIGHWAY, VEHICLE HYDROCARBONS				11.17			
	LDGT2, CITY, OTHER VEHICLE EMISSIONS	15.37	0.85	0.04		0.02	0.02	0.01
	LDGT2, CITY, VEHICLE HYDROCARBONS				1.62			
	LDGT2, HIGHWAY, OTHER VEHICLE EMISSIONS	13.25	1.35	0.05		0.03	0.03	0.02
	LDGT2, HIGHWAY, VEHICLE HYDROCARBONS				1.45			
	LDGV, CITY, OTHER VEHICLE EMISSIONS	671.40	39.33	1.42		0.78	0.75	0.43
	LDGV, CITY, VEHICLE HYDROCARBONS				67.90			
	LDGV, HIGHWAY, OTHER VEHICLE EMISSIONS	338.96	37.72	1.27		0.71	0.68	0.41
	LDGV, HIGHWAY, VEHICLE HYDROCARBONS				37.14			
	MC, CITY, OTHER VEHICLE EMISSIONS	3.94	0.16	0.01		0.01	0.01	0.00
	MC, CITY, VEHICLE HYDROCARBONS				0.55			
	MC, HIGHWAY, OTHER VEHICLE EMISSIONS	1.43	0.16	0.01		0.01	0.00	0.00
	MC, HIGHWAY, VEHICLE HYDROCARBONS				0.32			
Off-Road		54.72	22.05	0.43	5.81	2.21	2.21	2.03
	LAWN EQUIPMENT	14.23	0.15	0.01	1.91	0.04	0.04	0.04
	OFF-ROAD DIESEL - AGRICULTURE	5.45	13.60	0.22	2.05	1.47	1.47	1.36
	OFF-ROAD DIESEL - CONSTRUCTION	2.77	7.20	0.17	0.61	0.63	0.63	0.58
	OFF-ROAD GASOLINE - AGRICULTURE	32.28	1.09	0.03	1.23	0.07	0.06	0.06
Railways		56.12	302.07	21.17	15.95	7.22	7.22	6.64
	DIESEL LINE TRAVEL	40.46	210.37	15.22	10.52	5.01	5.01	4.61
	DIESEL YARD TRAVEL	15.66	91.70	5.95	5.44	2.21	2.21	2.04

UPPER STS AIRSHED - NATURAL SOURCES								
Emissions Category	**Emissions Process**	**tonnes**						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Biogenics			10.22		3,935.84			
	CONIFEROUS FOREST		8.08		3,140.97			
	CROPLAND REGION 1				40.64			
	DECIDUOUS FOREST		0.31		106.54			
	GRASSLAND		0.02		0.06			
	MIXED WOOD FOREST		1.80		646.99			
	TRANSITIONAL FOREST		0.01		0.62			
	URBAN VEGETATION		0.00		0.03			
Wildfires		225.92	3.36	0.01	9.55	38.03	29.08	26.84
	WILDFIRES	225.92	3.36	0.01	9.55	38.03	29.08	26.84
TOTAL		**225.92**	**13.57**	**0.01**	**3,945.40**	**38.03**	**29.08**	**26.84**

UPPER STS AIRSHED - AREA SOURCES								
Emissions Category	**Emissions Process**	**tonnes**						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Agriculture			0.90		18.54	41.67	15.80	7.46
	CATTLE				17.70	1.60	0.13	0.03
	FERTILIZER APPLIED					0.29	0.14	0.04
	FERTILIZER NITROGEN		0.90					
	FUGITIVE EMISSION AGRICULTURAL					14.40	3.02	1.44
	HORSES				0.48	0.14	0.01	0.00
	PESTICIDES				0.15			
Agriculture cont'd		56.12	302.07	21.17	15.95	7.22	7.22	6.64
	PESTICIDES APPLIED					0.51	0.25	0.07
	PIGS				0.03	0.15	0.01	0.00
	POULTRY					0.00	0.00	0.00
	SHEEP				0.18	0.12	0.01	0.00
	WIND EROSION					24.46	12.23	5.87
Miscellaneous Burning		24.16	1.39	0.23	7.26	4.38	4.33	3.93
	AGRICULTURAL BURNING	4.50	0.03		0.58	0.77	0.76	0.70
	BACK YARD BURNING	18.40	1.31	0.22	6.57	3.51	3.47	3.15
	BIO-MED/CREMAT/ANIMAL INCINERATION	0.02	0.02	0.01	0.00	0.02	0.02	0.01
	STRUCTURAL FIRES	1.24	0.03		0.10	0.08	0.08	0.07
Oil and Gas		0.59	1.18		45.89	0.14	0.14	0.14
	LOADING AND TANKAGE EMISSIONS AT BULK PLANTS				8.06			
	LOADING AND TANKAGE EMISSIONS AT BULK TERMINALS				6.93			
	NATURAL GAS IND - COMBUSTION - DISTRIBUTION	0.59	1.18		0.01	0.14	0.14	0.14
	NATURAL GAS IND - LEAKS - DISTRIBUTION				3.26			
	NATURAL GAS IND - VENTS - DISTRIBUTION				3.46			
	TANKS, REFUELLING & SPILLS AT AUTO SERV STATIONS				24.17			
Other		0.55	0.02	0.00	18.24	65.02	7.30	3.52
	BAKERIES				0.21			
	BARBECUES					0.81	0.81	0.81
	BREWERIES	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	COMMERCIAL-LIGHT INDUSTRIAL GENERAL PARTICULATE					1.51	0.87	0.62

Upper STS Airshed - Area Sources cont'd…

Emissions Category	Emissions Process	tonnes						
		CO	NO_x	SO_x	VOC	Part	PM_{10}	$PM_{2.5}$
Other cont'd								
	CUT BACK ASPHALT APPLICATION				5.48			
	FUGITIVE EMISSION CONC/DEM					1.10	0.09	0.02
	GRAVEL PITS					57.61	3.28	
	LANDFILLS - WOODWASTE				7.58	0.66	0.05	0.01
	LANDFILLS MUNICIPAL				4.98	1.24	0.10	0.02
	RESTAURANTS					0.79	0.79	0.73
	TOBACCO	0.55	0.02			0.71	0.71	0.71
	WELDING SHOPS		0.00			0.59	0.59	0.59
Prescribed Burning		17.82	0.26	0.00	0.75	1.90	1.40	1.32
	PRESCRIBED BURNING	17.82	0.26	0.00	0.75	1.90	1.40	1.32
Solvent Evaporation					51.63			
	APPLICATION OF ARCHITECTURAL COATINGS				9.16			
	APPLICATION OF COATINGS - AUTO REFINISHING				2.94			
	APPLICATION OF COATINGS - GENERAL INDUSTRIAL				5.36			
	CONSUMER PRODUCTS				23.13			
	DRY CLEANING				1.10			
	GLUES ADHESIVES SEALANTS				1.19			
	METAL DEGREASING				3.94			
	PRINTING INKS				4.81			
Space Heating		1,817.90	58.98	10.40	623.17	242.18	241.82	229.64
	FUEL OIL COMM/IND	0.43	1.73	2.59	0.03	0.17	0.10	0.07
	FUEL WOOD RESIDENTIAL	1,807.36	22.69	3.28	621.03	238.17	238.17	226.26
	LPG COMMERCIAL	0.31	2.67	0.00	0.09	0.08	0.08	0.07
	LPG RESIDENTIAL	0.17	1.47	0.00	0.05	0.04	0.04	0.04
	NATURAL GAS COMM/IND	2.81	13.62	0.34	0.72	1.63	1.57	1.47
	NATURAL GAS RESIDENTIAL	6.18	14.48	0.39	1.15	1.76	1.69	1.59
	OIL RESIDENTIAL	0.63	2.32	3.79	0.09	0.32	0.17	0.13
TOTAL		**1,861.01**	**62.74**	**10.63**	**765.48**	**355.29**	**270.78**	**246.01**

Total Sea-to-Sky Airshed
Air Contaminant Emissions Summary by Process

TOTAL STS AIRSHED - MOBILE SOURCES								
Emissions Category	**Emissions Process**	**tonnes**						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Heavy-Duty Vehicles		328.52	353.87	6.30	52.03	27.04	26.98	23.89
	HDDV (Lower Fraser Valley)	41.68	99.42	1.72	9.08	8.07	8.05	7.15
	HDDV, CITY, OTHER VEHICLE EMISSIONS	82.24	99.68	1.56		7.32	7.31	6.50
	HDDV, CITY, VEHICLE HYDROCARBONS				17.44			
	HDDV, HIGHWAY, OTHER VEHICLE EMISSIONS	64.79	140.31	2.40		11.24	11.23	9.98
	HDDV, HIGHWAY, VEHICLE HYDROCARBONS				14.98			
	HDGV (Lower Fraser Valley)	31.55	4.18	0.18	1.95	0.12	0.12	0.08
	HDGV, CITY, OTHER VEHICLE EMISSIONS	59.56	3.65	0.17		0.11	0.11	0.07
	HDGV, CITY, VEHICLE HYDROCARBONS				4.83			
	HDGV, HIGHWAY, OTHER VEHICLE EMISSIONS	48.69	6.64	0.27		0.18	0.16	0.11
	HDGV, HIGHWAY, VEHICLE HYDROCARBONS				3.75			
Light-Duty Vehicles		5,717.77	515.38	19.81	596.93	11.16	10.77	6.79
	LDDT (Lower Fraser Valley)	0.58	1.15	0.07	0.35	0.25	0.25	0.22
	LDDT, CITY, OTHER VEHICLE EMISSIONS	1.42	1.34	0.08		0.26	0.26	0.23
	LDDT, CITY, VEHICLE HYDROCARBONS				0.77			
	LDDT, HIGHWAY, OTHER VEHICLE EMISSIONS	0.56	0.95	0.06		0.20	0.20	0.18
	LDDT, HIGHWAY, VEHICLE HYDROCARBONS				0.33			
	LDDV (Lower Fraser Valley)	0.48	0.99	0.06	0.25	0.19	0.19	0.17
	LDDV, CITY, OTHER VEHICLE EMISSIONS	1.25	1.22	0.06		0.22	0.22	0.19
	LDDV, CITY, VEHICLE HYDROCARBONS				0.56			
	LDDV, HIGHWAY, OTHER VEHICLE EMISSIONS	0.42	0.74	0.04		0.15	0.15	0.13
	LDDV, HIGHWAY, VEHICLE HYDROCARBONS				0.21			
	LDGT1 (Lower Fraser Valley)	245.69	37.31	1.75	26.02	0.70	0.68	0.41
	LDGT1, CITY, OTHER VEHICLE EMISSIONS	799.05	49.75	2.42		0.95	0.93	0.56
	LDGT1, CITY, VEHICLE HYDROCARBONS				71.68			
	LDGT1, HIGHWAY, OTHER VEHICLE EMISSIONS	292.50	34.78	1.59		0.66	0.64	0.40
	LDGT1, HIGHWAY, VEHICLE HYDROCARBONS				29.27			
	LDGT2 (Lower Fraser Valley)	109.15	14.08	0.56	12.75	0.29	0.29	0.19
	LDGT2, CITY, OTHER VEHICLE EMISSIONS	54.99	3.03	0.13		0.07	0.06	0.04
	LDGT2, CITY, VEHICLE HYDROCARBONS				5.80			

Total STS Airshed - Mobile Sources cont'd…

Emissions Category	Emissions Process	tonnes						
		CO	NO_x	SO_x	VOC	Part	PM_{10}	$PM_{2.5}$
Light-Duty Vehicles cont'd								
	LDGT2 (Lower Fraser Valley)	109.15	14.08	0.56	12.75	0.29	0.29	0.19
	LDGT2, CITY, OTHER VEHICLE EMISSIONS	54.99	3.03	0.13		0.07	0.06	0.04
	LDGT2, CITY, VEHICLE HYDROCARBONS				5.80			
	LDGT2, HIGHWAY, OTHER VEHICLE EMISSIONS	34.73	3.55	0.14		0.07	0.07	0.04
	LDGT2, HIGHWAY, VEHICLE HYDROCARBONS				3.80			
	LDGV (Lower Fraser Valley)	875.95	126.03	4.40	102.33	2.43	2.34	1.40
	LDGV, CITY, OTHER VEHICLE EMISSIONS	2,389.91	140.00	5.05		2.79	2.66	1.52
	LDGV, CITY, VEHICLE HYDROCARBONS				241.75			
	LDGV, HIGHWAY, OTHER VEHICLE EMISSIONS	888.64	98.90	3.32		1.87	1.78	1.08
	LDGV, HIGHWAY, VEHICLE HYDROCARBONS				97.40			
	MC (Lower Fraser Valley)	4.70	0.58	0.03	0.90	0.02	0.02	0.01
	MC, CITY, OTHER VEHICLE EMISSIONS	13.98	0.55	0.03		0.02	0.02	0.01
	MC, CITY, VEHICLE HYDROCARBONS				1.95			
	MC, HIGHWAY, OTHER VEHICLE EMISSIONS	3.75	0.43	0.02		0.01	0.01	0.01
	MC, HIGHWAY, VEHICLE HYDROCARBONS				0.83			
Marine Vessels		178.99	697.05	91.89	57.67	29.02	29.02	26.65
	BC FERRIES UNDERWAY	82.45	635.27	85.12	27.22	25.90	25.90	23.79
	DEEP OCEAN VESSELS DOCKSIDE	0.78	4.80	0.60	1.35	0.29	0.29	0.26
	FISHING VESSELS	0.11	0.86	0.08	0.12	0.04	0.04	0.04
	HARBOUR VESSELS TUGBOATS 0-449 HP	0.77	3.65	0.48	0.28	0.22	0.22	0.20
	HARBOUR VESSELS TUGBOATS 1000-1499 HP	1.54	7.57	0.91	0.61	0.42	0.42	0.38
	HARBOUR VESSELS TUGBOATS 1500-1999 HP	3.48	6.92	0.52	0.24	0.24	0.24	0.23
	HARBOUR VESSELS TUGBOATS 2000+ HP	1.85	7.70	0.69	0.42	0.32	0.32	0.30
	HARBOUR VESSELS TUGBOATS 500-999 HP	1.65	8.10	0.97	0.65	0.45	0.45	0.41
	HARBOUR VESSELS WORKBOATS 0-499 HP	0.51	3.19	0.35	0.34	0.16	0.16	0.16
	HARBOUR VESSELS WORKBOATS 1000+ HP	1.12	5.49	0.66	0.44	0.31	0.31	0.27
	HARBOUR VESSELS WORKBOATS 500-999 HP	0.20	0.85	0.10	0.06	0.05	0.05	0.05
	HARBOUR - WORKBOATS, GASOLINE (LFV)	8.56	0.22		0.34			
	HARBOUR VESSELS, CHARTER 0-15 M (350 HP)	1.15	7.80	0.77	1.16	0.36	0.36	0.33
	HARBOUR VESSELS, CHARTER 15-30 M (756 HP)	0.63	2.04	0.31	0.15	0.15	0.15	0.13

Total STS Airshed - Mobile Sources cont'd…

Emissions Category	Emissions Process	tonnes						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Marine Vessels cont'd								
	HARBOUR VESSELS, CHARTER 30+ M (1400 HP)	0.29	1.45	0.17	0.12	0.08	0.08	0.07
	RECREATIONAL - OUTBOARDS (LFV)	70.87	0.14	0.09	23.62			
	RECREATIONAL - INBOARDS - GAS (LFV)	0.19	0.02	0.00	0.01			
	RECREATIONAL - INBOARDS - DIESEL (LFV)	0.05	0.12	0.01	0.06	0.01	0.01	0.01
	RECREATIONAL - IN/OUTBOARDS - GAS (LFV)	2.57	0.28	0.01	0.17			
	RECREATIONAL - IN/OUTBOARDS - DIESEL (LFV)	0.24	0.58	0.04	0.31	0.03	0.03	0.03
Off-Road		148.17	70.32	1.59	19.85	6.34	6.33	5.82
	LAWN EQUIPMENT	88.31	0.92	0.07	11.87	0.27	0.26	0.24
	OFF-ROAD DIESEL - AGRICULTURE	5.68	14.19	0.22	2.14	1.54	1.54	1.41
	OFF-ROAD DIESEL - CONSTRUCTION	20.51	54.08	1.27	4.56	4.46	4.46	4.10
	OFF-ROAD GASOLINE - AGRICULTURE	33.67	1.14	0.03	1.28	0.07	0.07	0.06
Railways		145.48	783.30	55.04	41.36	18.73	18.73	17.23
	DIESEL LINE TRAVEL	104.94	545.87	39.60	27.29	13.00	13.00	11.96
	DIESEL YARD TRAVEL	40.54	237.42	15.44	14.07	5.73	5.73	5.27
TOTAL		**6,518.93**	**2,419.92**	**174.65**	**767.85**	**92.28**	**91.82**	**80.38**

TOTAL STS AIRSHED - NATURAL SOURCES								
Emissions Category	**Emissions Process**	**tonnes**						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Biogenics		0.00	25.86	0.00	9,609.96	0.00	0.00	0.00
	CONIFEROUS FOREST		19.90		7,711.02			
	CROPLAND REGION 1		0.05		40.82			
	DECIDUOUS FOREST		0.72		252.14			
	GRASSLAND		0.39		1.16			
	MIXED WOOD FOREST		4.41		1,595.42			
	TRANSITIONAL FOREST		0.03		1.47			
	URBAN VEGETATION		0.35		7.94			
Marine Aerosol		0.00	0.00	0.00	0.00	181.22	157.66	24.45
	MARINE AEROSOL COAST					140.25	122.02	18.34
	MARINE AEROSOL OPEN					40.97	35.64	6.11
Wildfires		231.64	3.44	0.01	9.80	38.99	29.82	27.52
	WILDFIRES	231.64	3.44	0.01	9.80	38.99	29.82	27.52
TOTAL		**231.64**	**29.30**	**0.01**	**9,619.76**	**220.21**	**187.48**	**51.97**

TOTAL STS AIRSHED - AREA SOURCES								
Emissions Category	**Emissions Process**	**tonnes**						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Agriculture		0.00	1.13	0.00	20.54	44.25	16.90	7.97
	CATTLE				19.52	1.68	0.13	0.03
	FERTILIZER APPLIED					0.36	0.18	0.05
	FERTILIZER NITROGEN		1.13					
	FUGITIVE EMISSION AGRICULTURAL					14.76	3.10	1.48
	HORSES				0.53	0.16	0.01	0.00
	PESTICIDES				0.25			
	PESTICIDES APPLIED					0.54	0.26	0.08
	PIGS				0.05	0.26	0.02	0.01
	POULTRY					0.01	0.00	0.00
	SHEEP				0.19	0.13	0.01	0.00
	WIND EROSION					26.36	13.18	6.32
Miscellaneous Burning		74.38	4.77	0.80	23.58	13.29	13.12	11.91
	AGRICULTURAL BURNING	4.50	0.03		0.58	0.77	0.76	0.70
	BACK YARD BURNING	62.75	4.48	0.75	22.41	11.95	11.83	10.76
	BIO-MED/CREMAT/ANIMAL INCINERATION	0.07	0.09	0.05	0.01	0.11	0.07	0.05
	STRUCTURAL FIRES	7.06	0.17		0.58	0.45	0.45	0.41
Oil and Gas		2.67	5.40	0.00	232.20	0.63	0.63	0.63
	LOADING AND TANKAGE EMISSIONS AT BULK TERMINALS				31.57			
	NATURAL GAS IND - COMBUSTION - DISTRIBUTION	2.67	5.40		0.05	0.63	0.63	0.63
	NATURAL GAS IND - LEAKS - DISTRIBUTION				14.82			
	NATURAL GAS IND - VENTS - DISTRIBUTION				15.77			
	TANKS, REFUELLING & SPILLS AT AUTO SERV STATIONS				129.37			
	TANKS, REFUELLING & SPILLS AT BULK USERS (LFV)				0.12			
	TANKS, REFUELLING & SPILLS AT CARDLOCKS (LFV)				0.00			
	TANKS, REFUELLING & SPILLS AT MARINE REFUELLING (LFV)				1.55			
Other		3.89	0.13	0.00	62.16	300.85	37.80	20.09
	BAKERIES				1.41			
	BARBECUES					4.37	4.37	4.37

Total STS Airshed - Area Sources cont'd…

Emissions Category	Emissions Process	tonnes						
		CO	**NO_x**	**SO_x**	**VOC**	**Part**	**PM_{10}**	**$PM_{2.5}$**
Other cont'd		74.38	4.77	0.80	23.58	13.29	13.12	11.91
	BREWERIES	0.00	0.02	0.00	0.01	0.02	0.01	0.00
	COMMERCIAL-LIGHT INDUSTRIAL GENERAL PARTICULATE					8.00	4.59	3.26
	CUT BACK ASPHALT APPLICATION				19.63			
	FUGITIVE EMISSION CONC/DEM					6.37	0.91	0.19
	GRAVEL PITS					262.39	14.96	
	LANDFILLS - WOODWASTE				18.23	1.59	0.13	0.03
	LANDFILLS MUNICIPAL				22.67	5.63	0.45	0.11
	LANDFILLS COMBINED (Lower Fraser Valley)				0.21	0.10	0.01	0.00
	RESTAURANTS					4.66	4.66	4.41
	TOBACCO	3.88	0.11			5.05	5.05	5.05
	WELDING SHOPS					2.68	2.68	2.68
Prescribed Burning		22.12	0.33	0.00	0.94	2.36	1.73	1.64
	PRESCRIBED BURNING	22.12	0.33	0.00	0.94	2.36	1.73	1.64
Solvent Evaporation		0.00	0.00	0.00	339.63	0.00	0.00	0.00
	APPLICATION OF ARCHITECTURAL COATINGS				62.20			
	APPLICATION OF COATINGS - AUTO REFINISHING				19.97			
	APPLICATION OF COATINGS - GENERAL INDUSTRIAL				33.13			
	CONSUMER PRODUCTS				157.26			
	DRY CLEANING				9.14			
	GLUES ADHESIVES SEALANTS				8.00			
	METAL DEGREASING				28.02			
	PRINTING INKS				21.91			
Space Heating		4,828.55	216.14	32.34	1,647.80	647.61	646.48	614.07
	FUEL OIL COMM/IND	1.32	5.29	7.93	0.09	0.53	0.29	0.22
	FUEL WOOD RESIDENTIAL	4,779.38	59.99	8.68	1,637.97	629.85	629.85	598.28
	LPG COMMERCIAL	0.95	8.09	0.01	0.29	0.24	0.23	0.21
	LPG RESIDENTIAL	0.52	4.46	0.01	0.16	0.13	0.13	0.12
	NATURAL GAS COMM/IND	10.74	52.08	1.30	2.77	6.25	6.05	5.75
	NATURAL GAS RESIDENTIAL	33.57	78.68	2.10	6.24	9.59	9.37	9.05
	OIL RESIDENTIAL	2.06	7.55	12.32	0.29	1.03	0.57	0.43
TOTAL		**4,931.61**	**227.89**	**33.14**	**2,326.84**	**1,008.99**	**716.66**	**656.31**