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**2009 Wastewater  
Collection and  
Treatment Report**



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## **1.0 Community General**

The City of Salmon Arm is located in the southern interior of British Columbia on the southwest shoreline of the extensive Shuswap Lake system. With over 17,000 residents, Salmon Arm is the largest urban centre in the Columbia Shuswap Regional District. It serves as the commercial, cultural and administrative hub for an additional 35,000 residents of the Shuswap Lake region. Located at the junction of the Trans Canada Highway (TCH) and Highway 97B, Salmon Arm is a one-half day drive to Vancouver or Calgary and a 70 minute drive to Kelowna or Kamloops.

With a land base of 175 km<sup>2</sup>, Salmon Arm is a relatively large municipality by area with most of the population concentrated within a few kilometers of the Trans Canada Highway and the downtown core. The surrounding terrain varies from the low lying marsh flats of Salmon Arm Bay to the extinct volcanic peak of Mt. Ida and the ridge lines of Fly Hills to the west and Larch Hills to the east. These highlands form the Canoe Creek and Salmon River watersheds which empty into Shuswap Lake. Sustainable land use planning over the years has resulted in the formation of an attractive, bustling, compact community surrounded by thousands of hectares of arable farmland, green space and natural shorelines.



Salmon Arm's commercial and industrial base is continuing to diversify. The housing market continues to remain tight. Retail, construction, professional services and healthcare, along with a wide array of entrepreneurial activities, are major sources of employment. Small businesses flourish in Salmon Arm's business friendly environment. Key economic drivers are value-added wood processing, high tech and traditional manufacturing, tourism and agri-business. The continuing surge in construction activity points to a healthy market demand for new housing and floor space for commercial, industrial and institutional uses. By all indications, an average annual growth rate of 1.5% - 2% with an increase to be expected over the next three to four years.



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**1.1 Staffing**

The City of Salmon Arm Engineering and Public Works Department is responsible for this municipal function. The Utilities Division is responsible for the operation and maintenance of the sanitary collection system and the Water Pollution Control Centre (WPCC) staff is responsible for the operation and maintenance of the Wastewater Treatment facility and the main lift Station located at Wharf Street. The WPCC is manned seven days of the week with 24-hour standby provisions for after hour alarm response.

**Staff Overview:**

<b>Engineering and Public Works</b>
<b>Dale Mc Taggart, P. Eng.</b> , Director of Engineering and Public Works
<b>Robert Niewenhuizen, A.Sc.T.</b> , City Engineer
<b>John Rosenberg, A.Sc.T.</b> , Manager of Public Works

<b>Utilities Division</b>	
<b>Gerry Rasmuson, B. Sc.</b> <i>Utilities Forman</i> <ul style="list-style-type: none"> <li>◆ Level IV - Water Distribution</li> <li>◆ Level IV - Wastewater Treatment</li> <li>◆ Level I - Wastewater Collection</li> </ul>	<b>Rodger Parks</b> <i>Utilities Sub-Forman</i> <ul style="list-style-type: none"> <li>● Level I - Wastewater Collection</li> </ul>
<b>Mike Davie</b> <ul style="list-style-type: none"> <li>◆ Level II - Wastewater Collection</li> <li>◆ Level I - Wastewater Treatment</li> </ul>	<b>Don Smith</b> <ul style="list-style-type: none"> <li>◆ Level II - Wastewater Collection</li> </ul>
<b>Rick Webb</b> <ul style="list-style-type: none"> <li>◆ Level II - Wastewater Collection</li> </ul>	<b>Larry Kipp</b> <ul style="list-style-type: none"> <li>◆ Level I - Wastewater Collection</li> </ul>

<b>Water Pollution Control Centre</b>	
<b>Hart Frese, WPCC Manager</b> <i>Chief Operator</i> <ul style="list-style-type: none"> <li>◆ Level IV - Wastewater Treatment</li> </ul>	<b>Doug Stalker, Dip. Water Quality</b> <i>Operator III</i> <ul style="list-style-type: none"> <li>◆ Level IV - Wastewater Treatment</li> <li>◆ Level I - Wastewater Collection</li> </ul>
<b>Conor O'Neill, Dip. Water Quality</b> <i>Operator III</i> <ul style="list-style-type: none"> <li>◆ Level IV - Wastewater Treatment</li> </ul>	<b>David Knowles</b> <i>Operator I</i> <ul style="list-style-type: none"> <li>◆ Operator in Training</li> </ul>

## **2.0 Wastewater Treatment & Collection System History**

### **2.1 Wastewater Collection System - History**

The District of Salmon Arm and the Village of Salmon Arm amalgamated in 1971 to form the District Municipality of Salmon Arm on January 1, 1971, and then became the City of Salmon Arm in 2005. The Village was the original urban core area and sewer lines were installed during the 1930's to collect septic tank effluent and some crude wastes which were then discharged into an open ditch leading into Shuswap Lake. The surrounding District Municipality relied on septic systems as sewer collection was not an issue until the urban development of the Village overflowed into the surrounding Municipality. By 1964, the Village had initiated plans for sewage treatment

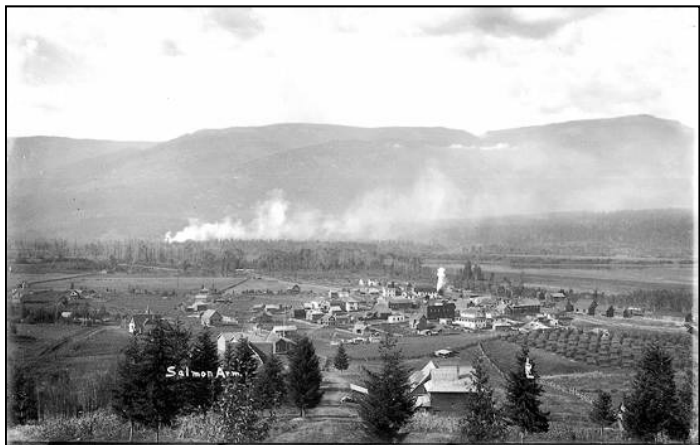


which included the construction of a lagoon along the waterfront for treatment. The lagoons would also service the Adams lake Indian Band lands. Concerned about the level of treatment that a lagoon offered, the Village decided to review their plans and objectives. By 1966, the review board recommended that the Village and District combine in their efforts to collect and treat wastewater. However, unable to agree upon implementation of various plans the Village applied to the Pollution Control Board for a permit to discharge highly treated effluent into Shuswap Lake. By the time this permit was granted in 1972,



the Village and District had amalgamated.

Ultimately the Engineering firm of Dayton and Knight Ltd were hired to undertake a Wastewater survey in 1972 to study various different treatment and effluent disposal methods. The Survey resulted in the construction and official opening of the existing Water Pollution Control Centre on May 14, 1977. Furthermore, the survey identified collection system priorities and set in motion the construction of the infrastructure that currently exists. The City's sewage collection and treatment systems have evolved into a well maintained collection system and a state of the art Wastewater Treatment Centre.



## **2.2 Wastewater Treatment Plant History**

The original plant was constructed on the current site, 121 Narcisse Street NW, in 1977 after the proposed site at Minion Field, 2191 30<sup>th</sup> Street SW was rejected by the B.C. Agricultural Land Commission and Provincial Pollution Control Board. It was constructed at a cost of \$0.9 M and consisted of primary sedimentation, activated sludge, secondary clarification with chlorine disinfection. Solids were aerobically digested and stored in two 1 acre lagoons. Capacity of the plant was 3,000 m<sup>3</sup> per day for a design service population of 6,250.

In 1982, phosphorus removal was added at a cost of \$0.1 M and consisted of precipitating phosphorus out of the effluent by the addition of ferrous chloride. Phosphorus was determined to be the limiting nutrient which contributes to the eutrophication and degradation of water quality in Shuswap Lake, particularly, Salmon Arm Bay. Currently the Salmon Arm WPCC contributes less than 4% of the phosphorus loading in the bay.



Aerial Photo Stage IIIB prior to Landscaping

In 1986 the \$1.8 M Stage II Upgrade was the first major upgrade to the facility. The liquid process was altered from a common activated sludge process to an experimental trickling filter biological nutrient removal (BNR) system (Fixed Growth Reactor – Suspended Growth Reaction or FGR-SGR). As well, the aerobic digester was upgraded to an Autothermal Thermophilic Aerobic Digester (ATAD). Plant Capacity was increased to 3,500 m<sup>3</sup> per day for a design service population of 8,750.

Improvements were made in 1991 to the solids process at a cost of \$0.5 M. The improvements consisted of changing aeration and solids pumping equipment. Rebuilding the ATAD tanks and added waste biological sludge thickening.

The Stage III Upgrade was split into two upgrades with the first part, Stage IIIA completed in 1998 at a cost of \$5.2 M. It consisted of improvements to the FGR- SGR process, new secondary clarifier, Supervisory Control and Data Acquisition system, increased ATAD capacity and biosolids dewatering. These improvements led to better control and monitoring, the ability to beneficially recycle biosolids and the decommissioning of the solids storage lagoons. Capacity was increased to 5,000 m<sup>3</sup> per day for a design service population of 12,900.

Stage IIIB was completed in 2005 without the Laboratory/Administration expansion. Of the \$7.4 M upgrade, \$2.3 M was funded by the Federal and Provincial Governments.



## 2.2 Wastewater Treatment Plant History (continued)

The upgrade consisted of a complete rebuild of the main lift station at Marine Drive with odour control, added redundancy to critical equipment, stand-by power, effluent filtration, replacement of the chlorination/de-chlorination system with Ultra Violet disinfection, an elaborate odour control system and architectural improvements to the original exterior of the original building. Capacity was increased to 6,700 m<sup>3</sup> per day average flow for a design service population of 15,000. Stage IIIB was completed in 2008 with the \$400,000 expansion of the Laboratory/Administration area. The Water Reclamation project was substantially completed in 2009. This project utilizes the highly treated effluent for process water at the facility resulting in an estimated 55 ML annual reduction in potable water use.

Project	Cost	Year
Stage I - 6,250 connected population	\$0.9 M	1977
Chemical Phosphorus Removal	\$0.1 M	1982
Stage II - 8,250 connected population	\$1.8 M	1986
Solids Improvements	\$0.5 M	1991
Stage IIIA - 12,500 connected population	\$5.3 M	1998
Stage IIIB – 15,000 connected population	\$7.4 M	2004
Laboratory/Administration Expansion	\$0.4 M	2008
Reclaimed Water	\$0.1 M	2009
<b>Total</b>	<b>\$16.5 M</b>	
Estimated Insurable/Replacement Value (2005)	\$35.0 M	

**Cost Summary Table 1.1**

## 3.0 Wastewater Collection System

### 3.1 Overview of Collection System

The Utilities Division, through a schedule of systematic new improvements, upgrades and replacements strives to maintain and improve the sanitary sewer collection system and provide an enhanced tertiary wastewater treatment facility. This Division plays an integral role in maintaining the health, safety and well being of the community. The sewer utility is a self-liquidating funded system which must provide for their own revenues through fees, taxes and other charges to support the expenditures required to operate and maintain infrastructure on a daily basis and long into the future.

### 3.2 Collection System

The City of Salmon Arm's sanitary sewer collection system consists of 14 sewerage sub areas and 128 km of gravity and force main sanitary sewer pipes covering approximately 1800

hectares. There are approximately 5,350 sewer connections within the system serving close to 9,500 residents. There are eight (8) sewer lift stations that collect and pump sewerage to the Lakeshore Sewer Interceptor located on the foreshore where the main lift station, Wharf Street Pump Station, pumps the sewerage directly to the WPCC (see Map 3.2). The Interceptor provides storage and flow equalization capabilities.

### 3.3 Lift Stations

All eight of the tributary Lift stations are inspected once a week by the City of Salmon Arm’s Utilities Division. All lift stations are thoroughly inspected and cleaned on a monthly basis. The stations are monitored using the City’s SCADA system which enables staff to troubleshoot and trend data on the Cities SCADA system.

No.	Wastewater Lift Stations & Facilities	Address
1	Water Pollution Control Centre	121 Narcisse Street NW
2	Mosquito Park Lift Station	4290 Canoe Beach Drive NE
3	Clare's Cove Lift Station	5391-75 Avenue NE
4	Tippy Canoe Lift Station	Pump in MH under road at 50 <sup>th</sup> Street & 75 <sup>th</sup> Avenue NE intersection
5	Captain’s Cove Lift Station	2251-73 Avenue NE
6	Canoe Beach Lift Station	7720-36 Street NE
7	Wharf Street Pump Station	1000 Marine Park Drive NE
8	Rotten Row Lift Station	681-10 Avenue SW
9	10 Avenue SW Lift Station	2270-10 Avenue SW [TCH]

**Wastewater Facilities Table 2.1**

### 3.4 Wharf Street Pump Station

The Wharf Street Lift station is gravity fed by the Lakeshore Interceptor. Three 30 Hp pumps with variable speed drives are used to feed the wastewater facility at rates determined by WPCC operators. The station was upgraded in 2002 with each pump rated at 80 liters/sec flow. The foul air is treated by utilizing ultraviolet light which catalyses the breaking of ambient oxygen and water vapor molecules into O<sup>+</sup> and OH<sup>-</sup> ions. These free radicals oxidize the odourous contaminants in the air. This reaction results in a sequential and instantaneous gas breakdown of the contaminants with minimal by-products, such as elemental sulfur, CO<sub>2</sub>, water vapor, molecular oxygen and trace ozone. In the event of an extended power outage, there is the capability to connect the City’s portable generator to the station to run the pumps.



### **3.5 Lift Station Repairs and Modifications**

In 2009, the Rotten Row lift station was improved with new 20 hp pumps complete with new valves and pipe work, replaced volute on pump at Mosquito Park, a new 2 hp pump for Tippy Canoe with new flygt bulbs and rebuilt the pumps and installed a milltronics level control system at the Canoe Beach lift station.

### **3.6 Sanitary Flushing**

Approximately 25 km of sanitary mains were flushed in 2009 as part of the maintenance program. Certain areas and services of concern as well as historically troublesome areas are flushed annually.

### **3.7 Main and Service Interruptions**

Two mainline blockages caused by grease build up from adjacent restaurants a third was caused by debris left in a manhole by contractors paving along Trans Canada Highway. There were twenty three (23) service interruptions which were attributed to grease from homeowners or roots from trees and shrubbery.

### **3.8 Inflow and Infiltration Monitoring Program**

The program identifies locations where storm water or ground water enters the sanitary system. We continue to provide system improvements in an effort to reduce the amount of rainwater and groundwater entering the sanitary sewer system when it is cost-effective to do so. Reduction of Inflow & Infiltration (I&I) in the system lowers the risk of sanitary sewer overflows and can decrease the costs of conveying and treating wastewater.

### **3.9 Wastewater Collection Capital Projects**

<b>Capital Projects completed in 2008</b>
♦ Canoe Beach Lift Station
♦ Rotten Row Lift Station – replace discharge connections
♦ Tippy Canoe Lift Station Upgrade
♦ Industrial Park collection & treatment system design
<b>Capital projects completed in 2009</b>
♦ 3 <sup>rd</sup> Avenue NE (800 Block) sewer main replacement
♦ Lakeshore sewer main replacement west of 10 <sup>th</sup> Ave. NE
♦ Ongoing rifgt-of-way brush clearing
♦ Ongoing SCADA and GIS development
<b>Wastewater Collection Capital Projects Scheduled for 2010</b>
♦ Complete rebuild of Pump 3 Wharf Street Pump Station

#### **4.0 Wastewater Treatment - Water Pollution Control Centre (WPCC)**

The City of Salmon Arm WPCC is located at 121 Narcisse Street N.W. which is located west of the City's Town Centre adjacent to the Shuswap Lake. This section of the report will detail the performance and operational strategies of the plant during the past year.



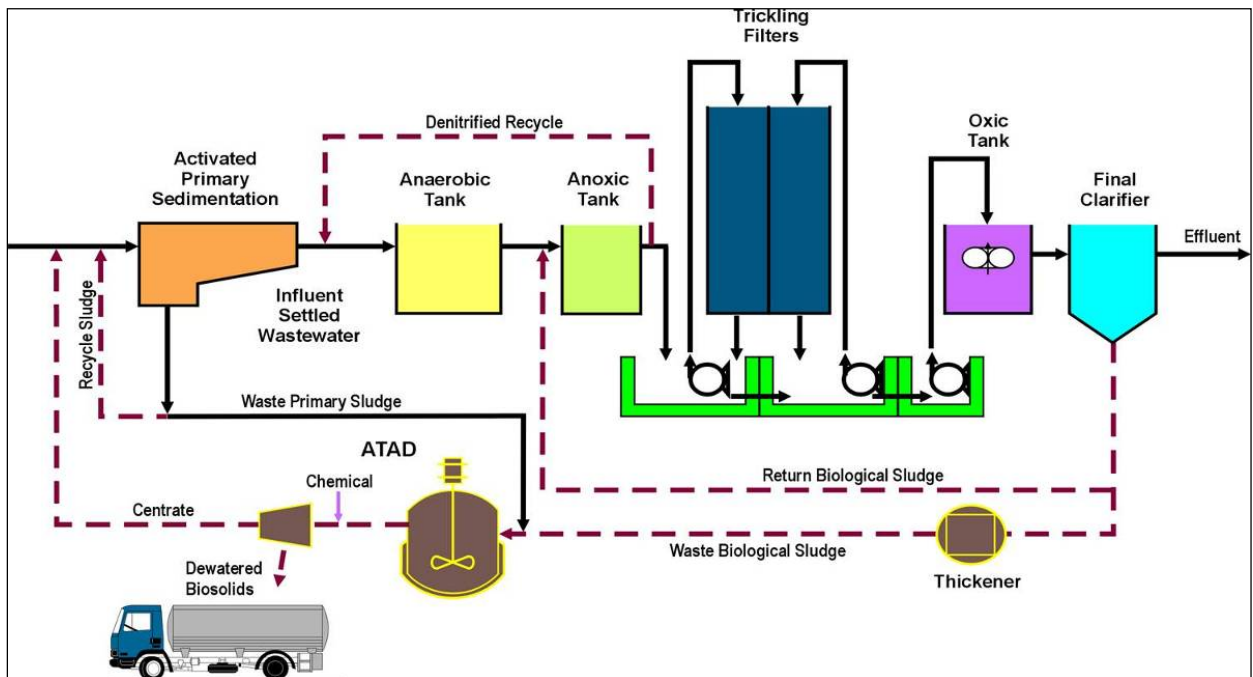
WPCC – After renovations



Wharf Street Lift Station

#### **4.1 Process Overview**

The process of wastewater treatment can be separated into two flow streams – liquid and solids – also referred to as the liquid train and solids train.





## 4.1 Process Overview

Initially the wastewater flows into the plant from a sewage lift station located at Marine Park Drive. The influent then passes through several mechanical devices to remove large particles including rocks, rags, plastics and grit. This is done in the headworks of the facility and prevents damage to downstream equipment.



Headworks



Primary Sedimentation Tanks

The flow then enters the Primary Sedimentation Tanks where heavier organic and inorganic solids are settled out of the liquid stream. These particles are then pumped to the ATAD for stabilization. The liquid, on the other hand, then enters the tertiary BNR and SGR-FGR part of the facility for further treatment.



SGR's



FGR

The tertiary treatment involves the use of bacteria to convert degradable organic matter into bacterial cells. These cells are then separated from the liquid in the secondary clarifiers.

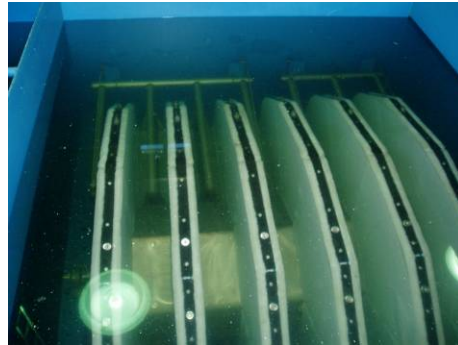
The growth portion of the bacteria is removed from the process by thickening and pumped to the ATAD while the remainder is recycled back to the incoming wastewater. This maintains a balance of food (wastewater organics) to micro organisms.

#### 4.1 Process Overview (continued)

The secondary effluent then passes through the Aqua Aerobics disk filtration system which provides 10 micron filtration, the effluent is then disinfected using a Wedeco Ideal Horizons Ultra Violet Light (UV) disinfection system prior to it being discharged into the Salmon Arm Bay in the Shuswap Lake.



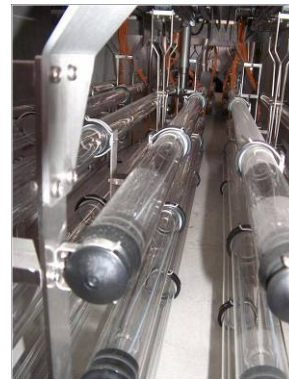
Secondary Clarifiers



Cloth Disk Filters



UV Treatment System



UV Bulbs

Solids are digested to form biosolids in the high temperature ATAD. This process uses high temperature bacteria (60 to 70 degrees Celsius) to stabilize and pasteurize the biosolids. Following processing, the biosolids are thickened with the use of high speed centrifuges and the biosolids are then incorporated with soil to produce a high quality top soil.



Centrifuge



Train B Odour Scrubber



#### **4.1 Process Overview (continued)**

Odour control is another major component of the plant operation. The odour control has been separated into two trains based on the concentration of odour generating compounds. One train deals with a large air volume of low odour concentration while the second train deals with a low air volume with a high concentration of odour compounds. The latter system uses a multi treatment system – biofilter, ozone contact, four (4) stage chemical scrubber and dilution while the other system uses a single stage chemical scrubber.



Single Stage Chemical Scrubber



ATAD & Piping



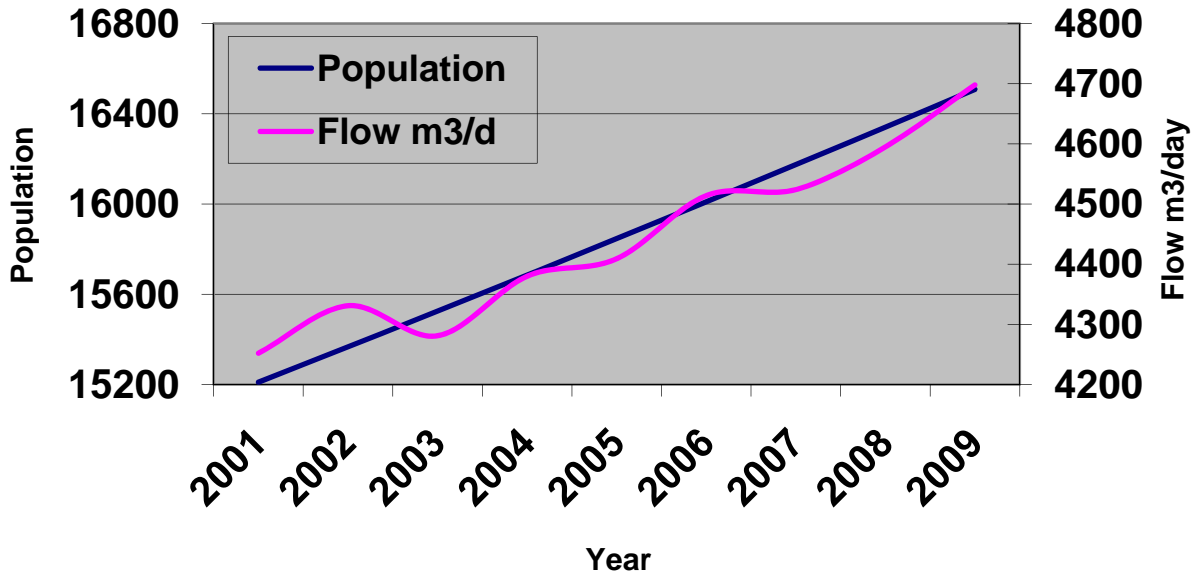
Generator Set, Train B  
Odour Control and Filtration Building

#### **4.2 Flows**

Plant flows averaged 4, 698 m<sup>3</sup> per day for the year. The highest flow was recorded on October 26 when rainfall increased the 24-hour total influent flow to 6,169 m<sup>3</sup>. This compares to the 2008 average flow of 4595 m<sup>3</sup> with a peak of 6,194 m<sup>3</sup> on May 6, 2008 when 31.2 mm of rain fell. The outfall was visually inspected on January 22, 2009 and on January 19, 2010 with no evidence of any failures.

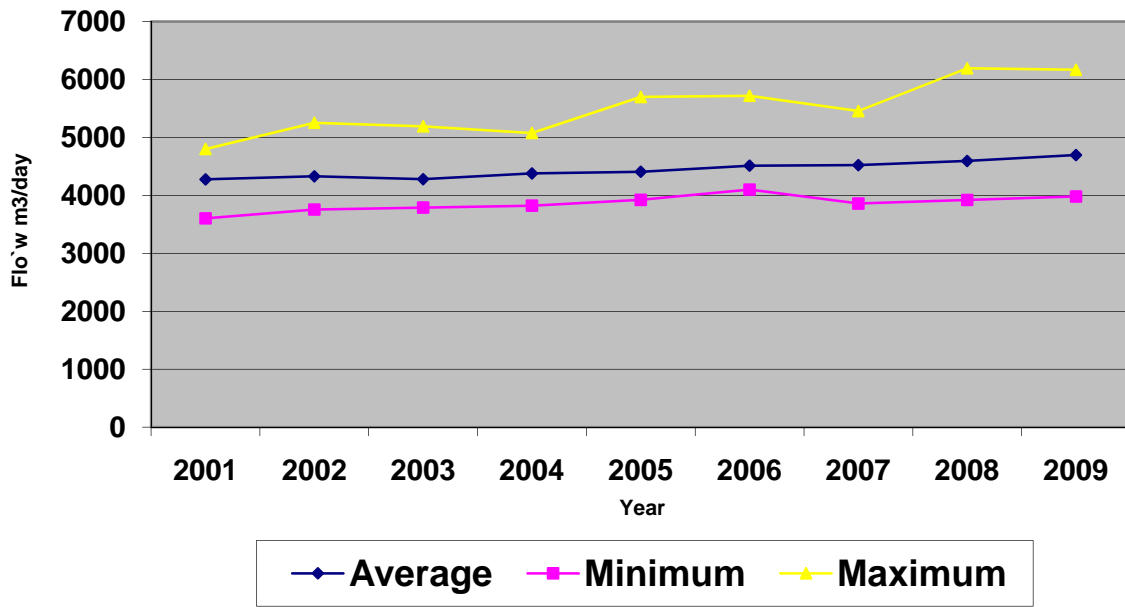
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**Yearly Average Daily Flow**



\* Population based on the 2001 and 2006 census, a linear growth rate was assumed to complete the chart.

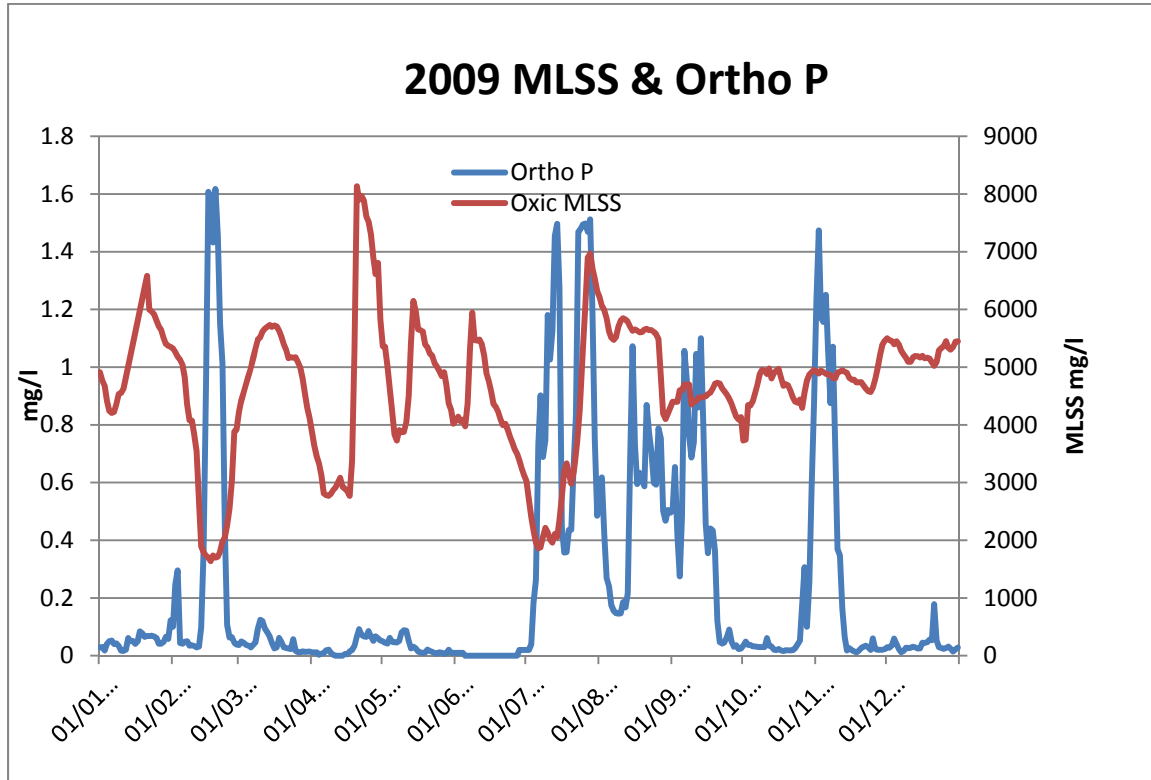
**Minimum, Maximum and Average Daily Flows**





### 4.3 Process Alterations

Biomass stability in the FGR and SGR's is the key parameter to constant quality effluent and this continues to be the challenge for plant operations.



In February, and again in July of 2009, the MLSS dropped to unacceptable levels. This is similar to the situation 2007 and 2008 indicating a seasonal, possibly temperature related issue. In late August early September the Bio P process was not functioning well. Additional testing on the process was inconclusive as to the problem but was suspected to be related to the lack of convection movement of air in the FGR. FGR aeration fans, which were decommissioned after the 2005, Stage IIIB were activated and seemed improve the process. The ortho P spiked again in November. This diurnal problem indicated lower phosphorus uptake in the FGR and operators altered internal recycle rates to improve the uptake.

Oxic MLSS mg/l	2001	2002	2003	2004	2005	2006	2007	2008	2009
Average	3100	3500	3200	4700	5100	4400	4100	4500	4700
Maximum	5300	6600	4900	7100	7500	7000	7500	8500	8100
Minimum	400	1400	1100	2200	2100	2200	100	1200	1600

Oxic SGR MLSS Concentration Note: 2007 Oxic MLSS of 100 occurred in January

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#### 4.4 Nutrient Removal

Plant nutrient removal dramatically improved for several of the permitted parameters over the 2008 results while only slightly deteriorated for the remaining.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	Permit
Flow m <sup>3</sup>	4252	4331	4281	4380	4409	4514	4524	4595	4698	8200
Total Phosphorus mg/l	0.94	1.22	0.82	0.46	0.41	0.38	0.45	0.64	0.66	1.0
P per Day	4.0	5.28	3.51	2.01	1.81	1.72	2.04	2.94	3.07	8.2
Kg P per Year	1460	1927	1281	736	660	626	745	1073	1121	2993

Parameter (mg/l)	2001	2002	2003	2004	2005	2006	2007	2008	2009	Permit Limit
Suspended Solids	20.9	19.4	13.4	7.4	6.4	5.1	8.7	7.9	10.2	40
BOD <sub>5</sub>	18.1	17.1	13.5	9.4	9.0	7.7	7.3	7.7	3.6	30
Total Phosphorus	0.94	1.22	0.82	0.46	0.41	0.38	0.45	0.64	0.66	1.0
Ortho Phosphorus	0.19	0.36	0.26	0.09	0.09	0.09	0.11	0.21	0.17	N/A
Ammonia	10.2	12.3	9.7	7.5	8.2	7.8	13.2	20.8	10.3	N/A
Nitrate & Nitrite	3.5	3.7	6.2	8.0	4.4	8.8	6.5	4.4	8.7	N/A
NH <sub>4</sub> NO <sub>3</sub> NO <sub>2</sub>	13.7	16.0	15.9	15.5	12.6	16.6	19.6	25.1	19.0	N/A

Note: Final Effluent Filtration commenced in 2004

#### Effluent Quality Table

Test Data	S.S.	BOD	Ortho P	Total P	NH <sub>4</sub>	NO <sub>x</sub>	Oxic MLSS
	mg/l	mg/l	Mg/l	mg/l	mg/l	mg/l	mg/l
January 8, 2009	7.8	9.1	0.10	0.46	31.2	2.5	4360
January 15, 2009	10.9	7.0	0.08	0.48	22.8	4.6	5406
January 22, 2009	12.6	12.0	0.10	0.60	11.2	10.8	5994
January 29, 2009	10.5	5.3	0.04	0.52	11.5	13.6	5402
February 5, 2009	9	2.9	0.03	0.46	8.5	10.7	5040
February 12, 2009	6.1	2.2	0.04	0.37	15.2	4.3	2677
February 19, 2009	18.6	3.0	1.30	2.96	21.8	2.7	1698
February 27, 2009	12.8	4.3	0.02	0.45	17.4	2.9	3882
March 6, 2009	11.8	N/A	0.04	0.54	15.2	4.4	4974
March 12, 2009	38	10	0.13	1.2	12.6	9.8	5668
March 19, 2009	19.2	3	0.05	0.82	6.1	14.3	5531
March 25, 2009	13.8	3	0.03	0.44	4.8	10.0	5169
April 1, 2009	11.8	2.6	0.01	0.28	10.5	5.8	3866
April 9, 2009	8.5	1.5	0.07	0.28	12.0	3.0	2807
April 16, 2009	8.6	2.6	0.01	0.30	19.0	4.2	2850
April 23, 2009	18.0	4.9	0.07	0.66	1.1	10.9	7885
April 30, 2009	5.3	3.8	0.06	0.54	2.6	12.0	5825
May 7, 2009	10.1	2.9	0.07	0.43	12.6	7.1	3728
May 14, 2009	21.2	5.1	0.03	0.72	15.2	7.8	6147
<b>Test Data</b>	<b>S.S.</b>	<b>BOD</b>	<b>Ortho P</b>	<b>Total P</b>	<b>NH<sub>4</sub></b>	<b>NO<sub>x</sub></b>	<b>Oxic MLSS</b>

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<b>Test Data</b>	<b>mg/l</b>	<b>mg/l</b>	<b>Mg/l</b>	<b>mg/l</b>	<b>mg/l</b>	<b>mg/l</b>	<b>mg/l</b>
May 21, 2009	13.0	2.1	0.01	0.37	2.4	15.4	5236
May 28, 2009	12.2	1.3	0.01	0.18	6.4	12.2	4701
June 5, 2009	8.2	0.5	0.01	0.08	12.7	7.0	3977
June 12, 2009	15	3.2	0.01	0.68	2.0	16.8	5405
June 17, 2009	10.6	0.8	0.01	0.40	5.1	14.2	4360
June 27, 2009	6.3	1.5	0.02	0.34	5.6	12.2	3501
July 2, 2009	4.5	2.5	0.04	0.47	12.1	7.9	2706
July 9, 2009	9.0	2.0	0.35	0.97	13.2	5.1	2214
July 16, 2009	7.5	3	0.74	1.40	13.2	3.9	2749
July 23, 2009	9.4	1.6	1.12	2.12	12.6	4.0	3946
August 1, 2009	6.6	2.9	0.40	0.89	9.6	7.1	6213
August 6, 2009	7.4	4.1	0.06	0.34	8.8	5.8	5512
August 12, 2009	6.3	4.5	0.05	0.34	7.3	8.1	5824
August 20, 2009	7.4	3.3	0.55	0.93	4.8	11.4	5652
August 27, 2009	6.5	3.2	0.60	1.32	6.7	9.2	4829
September 3, 2009	6.4	2.8	0.54	2.20	5.6	10.4	4400
September 10, 2009	9.1	4.7	0.35	1.71	8.8	13.1	4397
September 18, 2009	7.7	3.5	0.23	0.82	6.1	10.3	4626
September 23, 2009	7.5	2.4	0.01	0.33	5.6	8.9	4584
October 1, 2009	7.3	3.7	0.01	0.35	9.6	7.8	3729
October 9, 2009	9.8	4.0	0.01	0.39	12.6	8.0	4951
October 15, 2009	7.9	<1.0	0.02	0.32	9.6	8.2	4941
October 23, 2009	7.7	1.1	0.01	0.18	10.5	8.8	4402
October 30, 2009	7.8	4.4	0.42	0.75	11.0	8.6	4913
November 6, 2009	8	3.2	0.52	1.38	9.2	9.3	4876
November 12, 2009	6.7	5.0	0.20	0.71	7.6	8.7	4947
November 19, 2009	6.6	3.4	0.02	0.08	8.8	9.2	4738
November 26, 2009	6.6	3.5	0.01	0.10	21.1	6.7	4795
December 3, 2009	12.9	3.2	0.03	0.34	7.3	11.0	5452
December 10, 2009	8.8	4.0	0.02	0.21	8.4	11.1	5094
December 17, 2009	9.4	4.2	0.02	0.2	5.8	10.2	5155
December 22, 2009	8.9	3.8	0.01	0.16	4.8	10.1	5088
December 29, 2009	9.0	3.0	0.02	0.62	10.1	8.8	5347
<b>Average</b>	<b>10.2</b>	<b>3.6</b>	<b>0.17</b>	<b>0.7</b>	<b>10.3</b>	<b>8.7</b>	<b>4657</b>
<b>Maximum</b>	<b>38.0</b>	<b>12.0</b>	<b>1.30</b>	<b>3.0</b>	<b>31.2</b>	<b>16.8</b>	<b>7885</b>
<b>Minimum</b>	<b>4.5</b>	<b>0.5</b>	<b>0.01</b>	<b>0.1</b>	<b>1.1</b>	<b>2.5</b>	<b>1698</b>

#### 4.5 Fecal Coliform

The ultraviolet disinfection system functioned extremely well during 2009; however, a review of the system by Dayton & Knight, Consulting Engineers Ltd., and the manufacture was undertaken and deemed it necessary to advance the next staged upgrade of the system. The upgrade will increase capacity as well as provide for greater redundancy.

#### 4.6 Toxicity

The annual toxicity test was completed on May 28, 2009 by Cantest Ltd. and once again there were no mortalities with the fish all appearing and behaving normally.

#### **4.7 Biosolids**

The City of Salmon Arm applied approximately 330 dry tonnes of its Class A biosolids on the Shuswap Regional Airport lands (SRA lands) in May of 2009. These lands are owned by the City of Salmon Arm and are currently permitted for this use under the City's Waste Management Permit PE-11402. The application was guided by a Land Application Plan (LAP) prepared in accordance with, and fulfilling the requirements of the Organic Matter Recycling Regulation (OMRR). The intention of the application was to beneficially recycle the biosolids to a nutrient and organically poor soil and establish some vegetation on the sandy soil. CARO Environmental Services conducted tests on the biosolids for nutrients and metals on February 12 2009. Fecal coliform tests on the Auto Thermophilic Aerobic Digester (ATAD) biosolids were also conducted on this date and once again the fecal coliform levels were well below OMRR limits.

#### **4.8 Operating Certificate**

The City operates the WPCCC under an Operating Certificate issued by the BC Ministry of Environment. The certificate is attached as Appendix "2".

#### **4.9 Wastewater Collection System Upgrading**

##### **4.9.1 WPCCC Capital Projects - 2009**

Projects completed in 2009 include:

- Review of ultraviolet disinfection system.
- Changed inefficient lighting under Hydro Smart Product Incentive Program.
- Completed WWTP Energy Audit.
- Substantially completed reclaimed water system to reuse the treated effluent within the WPCCC facility with financing from the Canada-British Columbia Rural Infrastructure Fund.

##### **4.9.2 WPCCC Staff Initiated Projects Completed in 2009**

- One of 10 municipalities nationwide to participate in the Biosolids Science and Research: Contaminated Inventory Biosolids Sampling Program for the Canadian Council of Ministers of the Environment.
- Heating and ventilation improvements to the automation system to conserve natural gas.
- Supervisory Control and Data Acquisition system upgrade.
- Odour containment and treatment modifications.
- Waste Biological Sludge Thickening Drum improvements.



- Standby Generator heating system improvements.
- Polymer lifting davit and hoist installation.

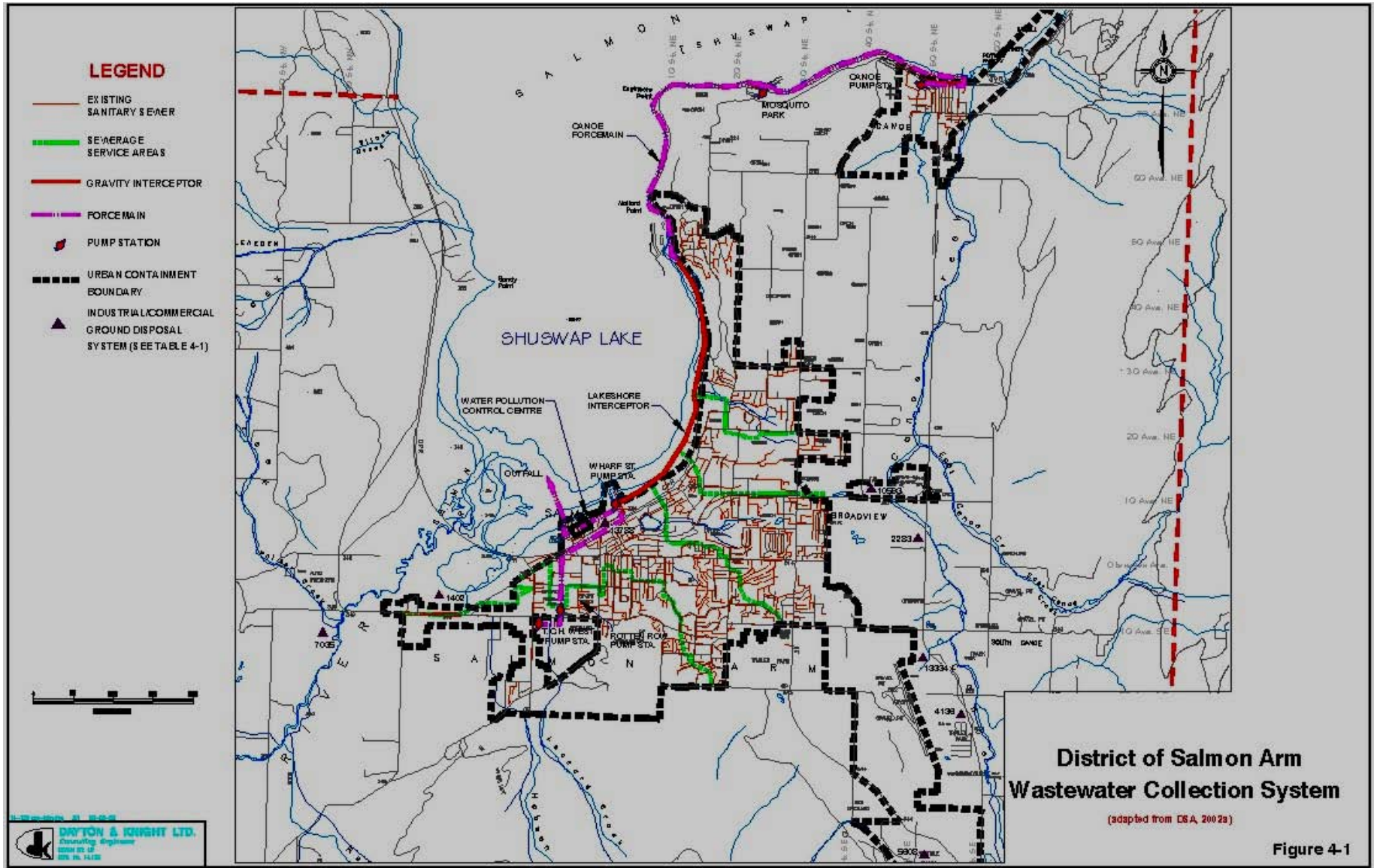
#### **4.9.3 WPCC Capital Projects Scheduled for 2010**

- Replacement of FGR crossflow media with straight flow media with associated piping.
- Design of ultraviolet disinfection upgrade.





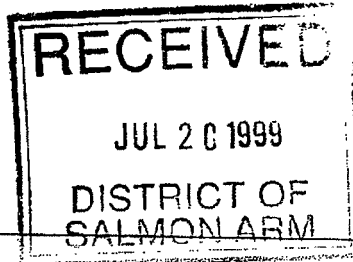
Appendix "A"





# **APPENDIX “B”**

## **OPERATIONAL CERTIFICATE**

PROVINCE OF  
BRITISH COLUMBIAMINISTRY OF  
ENVIRONMENT,  
LANDS AND PARKSEnvironment and Lands  
Pollution Prevention  
1259 Dalhousie Drive  
Kamloops, British Columbia  
V2C 5Z5  
Telephone: (250) 371-6200  
Fax: (250) 828-4000

July 15, 1999

File: PE-1251

REGISTERED MAILDistrict of Salmon Arm  
450 - 2nd Avenue NE  
PO Box 40  
Salmon Arm, BC V1E 4N2

Dear Permittee:

Enclosed is amended Permit PE-1251 issued under the provisions of the *Waste Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the Permit. An annual permit fee will be determined according to the Waste Management Permit Fees Regulation.

This Permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the Permittee. This Permit is issued pursuant to the provisions of the *Waste Management Act* to ensure compliance with Section 54(3) of that statute, which makes it an offence to discharge waste without proper authorization. It is also the responsibility of the Permittee to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This Permit may be appealed by persons who consider themselves aggrieved by this decision in accordance with Part 7 of the *Waste Management Act*. Written notice of intent to appeal must be received by the Environmental Appeal Board within thirty (30) days of the date of the Permit.

Administration of this Permit will be carried out by staff from the Regional Office located at 1259 Dalhousie Drive, Kamloops, British Columbia V2C 5Z5. Plans, data and reports pertinent to the Permit are to be submitted to the Regional Waste Manager at this address.

Yours truly,

T.R. Forty, P. Eng.  
Assistant Regional Waste Manager  
Southern Interior Region

enclosure

PROVINCE OF  
BRITISH COLUMBIA



Environment and Lands  
Pollution Prevention  
1259 Dalhousie Drive  
Kamloops  
British Columbia V2C 5Z5  
Telephone: (250) 371-6200  
Fax: (250) 828-4000

MINISTRY OF ENVIRONMENT,  
LANDS AND PARKS

**PERMIT  
PE-1251**

*Under the Provisions of the Waste Management Act*

**District of Salmon Arm**

is authorized to discharge effluent to Tappen Bay of Shuswap Lake from a municipal sewerage system located in Salmon Arm, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the Waste Management Act and may result in prosecution.

This Permit supersedes and amends all previous versions of Permit **PE-1251**, issued under the Waste Management Act.

This Permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the Permittee.

Date Issued: July 4, 1972  
Dates Amended: June 17, 1976  
March 18, 1988  
February 7, 1990  
July 15, 1999

T.R. Forty, P. Eng.  
Assistant Regional Waste Manager

PROVINCE OF  
BRITISH COLUMBIA

Pollution Prevention

## 1. AUTHORIZED DISCHARGES

1.1 This subsection applies to the discharge of effluent from a **MUNICIPAL SEWAGE TREATMENT PLANT**. The site reference number for this discharge is **E212492**.

1.1.1 The maximum authorized rate of discharge is **8200 m<sup>3</sup>/day**.

1.1.2 The characteristics of the discharge shall not exceed:

5 - day Biochemical Oxygen Demand (BOD)	30 mg/L
Non-filterable residue (TSS)	40 mg/L
Chlorine	0.01 mg/L
Total Phosphorus	1.0 mg/L

1.1.3 The authorized works are a **fixed growth - suspended growth secondary treatment plant with biological and/or chemical phosphorus removal, chlorination - dechlorination facilities, auto thermophilic aerobic digester, sludge handling facilities, outfall, and related appurtenances** approximately located as shown on attached Site Plan A.

1.1.4 The location of the facilities from which the discharge originates is **Lot 1 of the NW 1/4 of Section 14, Township 20, Range 10, West of the Sixth Meridian, Kamloops Division Yale District, Plan 26245**.

1.1.5 The location of the point of discharge is **unsurveyed Crown Land (all in the bed of Shuswap Lake)**.

## 2. GENERAL REQUIREMENTS

### 2.1 Maintenance of Works and Emergency Procedures

The Permittee shall inspect the pollution control works regularly and maintain them in good working order. In the event of an emergency or condition beyond the control of the Permittee which prevents continuing operation of the approved method of pollution control, the Permittee shall immediately notify the Regional Waste Manager and take appropriate remedial action.

### 2.2 Bypasses

The discharge of effluent which has bypassed the designated treatment works is prohibited unless the approval of the Regional Waste Manager is obtained and confirmed in writing.

Date Issued: July 4, 1972  
Date Amended: June 17, 1976  
March 18, 1988  
February 7, 1990  
July 15, 1999



T.R. Forty, P. Eng.  
Assistant Regional Waste Manager



PROVINCE OF  
BRITISH COLUMBIA

Pollution Prevention

### 2.3 Process Modifications

The Permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge.

### 2.4 Plans - New Works

Plans and specifications of any proposed works shall be submitted to the Regional Waste Manager and the Manager's approval obtained before construction commences. The works shall be constructed in accordance with such plans.

### 2.5 Posting of Outfall

The Permittee shall erect a sign along the alignment of the outfall above high water mark. The sign shall identify the nature of the works. The wording and size of the sign requires the approval of the Regional Waste Manager.

### 2.6 Outfall Inspection

The Permittee may be required to conduct a dye test on the outfall line (or inspect by another method approved by the Regional Waste Manager). The test shall be conducted when directed by the Regional Waste Manager.

### 2.7 Chlorination

The Permittee shall maintain a chlorine residual prior to dechlorination between 0.5 and 1.0 mg/L at all times and provide not less than one hour contact time at average flow rates.

### 2.8 Dechlorination

The effluent shall be dechlorinated prior to discharge to reduce the chlorine residual to 0.01 mg/L or less.

### 2.9 Sludge Wasting and Disposal

Sludge wasted from the treatment plant shall be disposed of to a site and in a manner approved by the Regional Waste Manager.

### 2.10 Operator Certification

The sewage treatment facility shall be classified by the Environmental Operators Certification Program. The Permittee shall ensure that all operators of the facility be certified by the Program to the appropriate level for the facility, and to the satisfaction of the Regional Waste Manager.



T.R. Forty, P. Eng.  
Assistant Regional Waste Manager

Date Issued: July 4, 1972  
Date Amended: June 17, 1976  
March 18, 1988  
February 7, 1990  
July 15, 1999

PROVINCE OF  
BRITISH COLUMBIA

Pollution Prevention

## 2.11 Phosphorus Study

The Permittee shall retain a suitably qualified professional to study the environmental impact of the phosphorus loading at the maximum discharge rate of 8200 m<sup>3</sup>/day. The study shall consider the morphology of the lake in the discharge area, other sources of contaminants (i.e. Salmon River, White Creek, stormwater runoff etc.) and the location of the outfall. As well as the phosphorus issue, this study shall address the toxicity of the effluent and the potential impacts on aquatic life, especially during low water conditions. This study shall be complete and submitted for approval by the Regional Waste Manager by December 31, 2000.

## 3. MONITORING AND REPORTING REQUIREMENTS

### 3.1 Discharge Monitoring

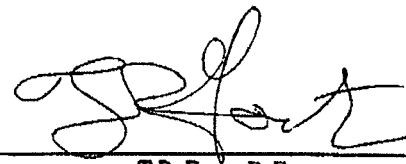
#### 3.1.1 Composite Sampling

The Permittee shall obtain composite samples of the effluent. The composite samples shall comprise samples taken over a 24 hour period.

The following samples and analyses shall be obtained:

<u>PARAMETERS</u>	<u>FREQUENCY</u>
5-day Biochemical Oxygen Demand	weekly
Non-filterable Residue (total suspended solids)	weekly
Total Phosphorus	weekly
Ammonia	monthly
Nitrates	monthly
Fecal Coliforms	monthly
pH	monthly
Toxicity	annually
Chlorine	continuous

Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination, breakage, etc.



T.R. Forty, P. Eng.  
Assistant Regional Waste Manager

Date Issued: July 4, 1972  
Date Amended: June 17, 1976  
March 18, 1988  
February 7, 1990  
July 15, 1999

### 3.2 Monitoring Procedures

#### 3.2.1 Analyses

Analyses are to be carried out in accordance with procedures described in the latest version of "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials, (March 1994 Permittee Edition)", or by suitable alternative procedures as authorized by the Regional Waste Manager.

Copies of the above manual may be purchased from Queen's Printer, P.O. Box 9452, Stn Prov Govt, Victoria, British Columbia V8W 9V7 (1-800-663-6105).

Analyses for determining the toxicity of liquid effluent to fish shall be carried out in accordance with the procedures described in the "Laboratory Procedures for Measuring Acute Lethal Toxicity of Liquid Effluent to Fish", dated November, 1982.

Copies of the above manual may be purchased from the Ministry of Environment, Lands and Parks, P.O. Box 9342, Stn Prov Govt, Victoria, British Columbia, V8W 9M1.

#### 3.2.2 Sampling Location and Techniques

All sampling locations, techniques and equipment require the consent of the Regional Waste Manager prior to use.

Sampling and flow measurement shall be carried out in accordance with the procedures described in "British Columbia Field Sampling Manual for Continuous Monitoring plus the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment and Biological Samples", as published by the Ministry of Environment, Lands and Parks, or by suitable alternative procedures as authorized by the Regional Waste Manager.

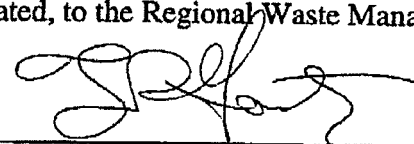
Copies of the above manual are available from the Ministry of Environment, Lands and Parks, P.O. Box 9342, Stn Prov Govt, Victoria, British Columbia V8W 9M1.

### 3.3 Flow Measurement

The Permittee shall provide and maintain a suitable flow measuring device and record once per day the effluent volume discharged over a 24-hour period.

### 3.4 Reporting

The Permittee shall maintain data of analyses and flow measurements for inspection and submit the data, suitably tabulated, to the Regional Waste Manager for the previous month.



T.R. Forty, P. Eng.  
Assistant Regional Waste Manager

Date Issued: July 4, 1972  
Date Amended: June 17, 1976  
March 18, 1988  
February 7, 1990  
July 15, 1999

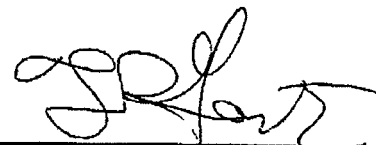
**3.5 Annual Report**

The Permittee shall submit an annual report on or before March 31 of each year.

The annual report shall review and interpret monitoring data for the preceding calendar year and provide graphical analysis with suitable interpretations of any trends in the monitoring results.

The annual report shall review the performance of the sewage treatment system and identify any necessary changes to the treatment process and for works.

Date Issued: July 4, 1972  
Date Amended: June 17, 1976  
March 18, 1988  
February 7, 1990  
July 15, 1999



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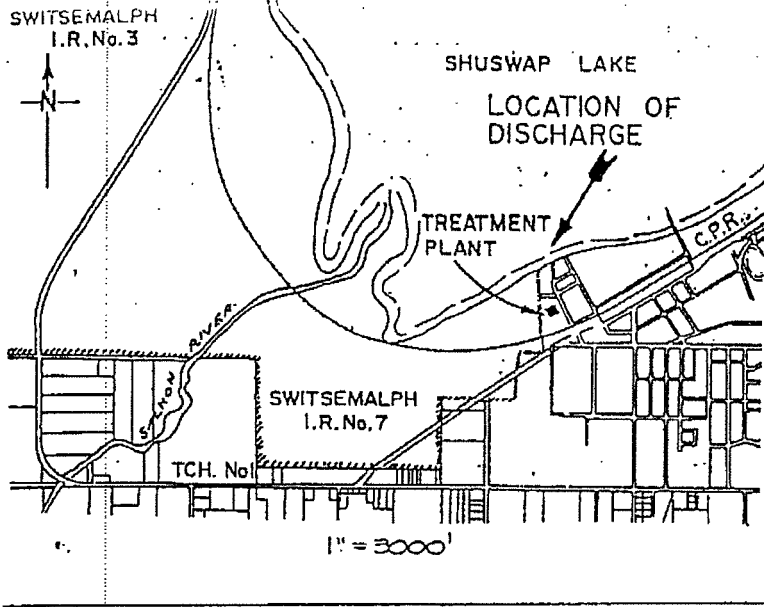
T.R. Forty, P. Eng.  
Assistant Regional Waste Manager



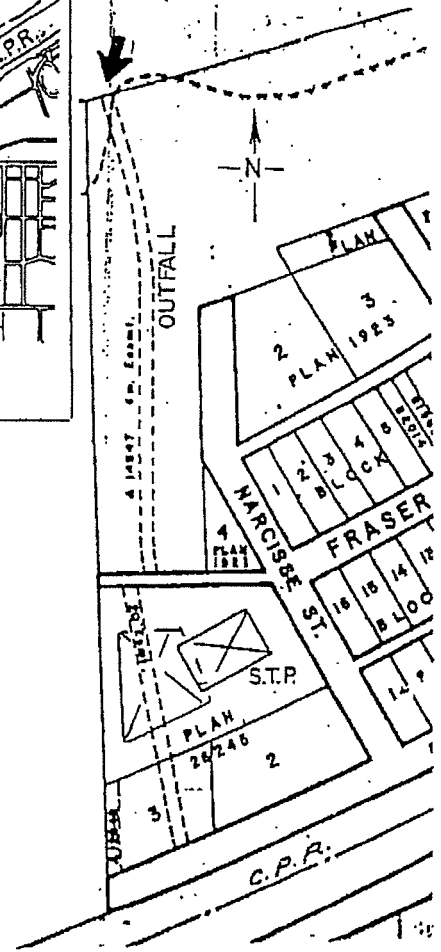
PROVINCE OF  
BRITISH COLUMBIA

Pollution Prevention

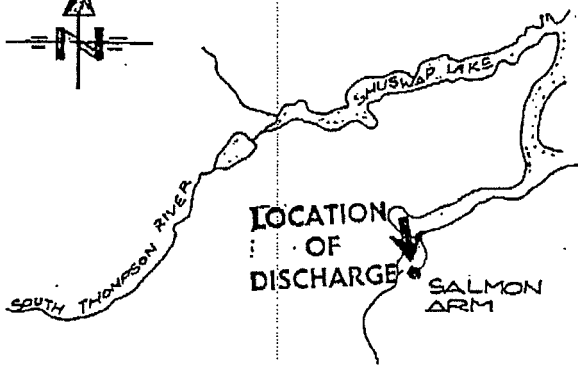
### SITE PLAN A



LOCATION OF DISCHARGE



### Location Map



Permit: PE-1251

Date: July 15, 1999

T.R. Forty, P. Eng.  
Assistant Regional Waste Manager



Province of  
British Columbia

Ministry of  
Environment,  
Lands and Parks

BC  
Environment

Southern Interior Region  
1259 Dalhousie Drive  
Kamloops  
British Columbia  
V2C 5Z5  
Telephone: (604) 371-6200

October 21, 1996

File: PE 11402

**REGISTERED MAIL**

District of Salmon Arm  
P.O.Box 40  
450-2nd Ave NE  
Salmon Arm , BC V1E 4N2

Dear Permittee:

Enclosed is Permit PE-11402 issued under the provisions of the Waste Management Act. Your attention is respectfully directed to the terms and conditions outlined in the permit. An annual permit fee will be determined according to the Waste Management Permit Fees Regulation.

This permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorised by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the permittee. This permit is issued pursuant to the provisions of the Waste Management Act to ensure compliance with Section 34(3) of that statute, which makes it an offence to discharge waste without proper authorisation. It is also the responsibility of the permittee to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This permit may be appealed by persons who consider themselves aggrieved by this decision in accordance with Part 5 of the Waste Management Act. Written notice of intent to appeal must be received by the Regional Waste Manager within twenty-one (21) days.

Administration of this permit will be carried out by staff from the Regional Office located at 1259 Dalhousie Drive, Kamloops, BC ., V2C 5Z5 . Plans, data and reports pertinent to the permit are to be submitted to the Regional Waste Manager at this address.

Yours truly,

Donald K. May, P.Eng.  
Assistant Regional Waste Manager

enclosure

PROVINCE OF  
BRITISH COLUMBIA

Environmental Protection  
1259 Dalhousie Drive  
Kamloops  
British Columbia V2C 5Z5  
Telephone: (604) 371-6200

MINISTRY OF ENVIRONMENT,  
LANDS AND PARKS

PERMIT  
PE 11402

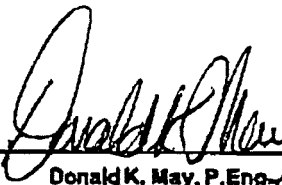
*Under the Provisions of the Waste Management Act*

**The District of Salmon Arm**

is authorized to discharge thermophilically digested biosolids from a Sewage Treatment Plant located in Salmon Arm, British Columbia to land located in and around the District of Salmon Arm, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the Waste Management Act and may result in prosecution.

This Permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rest with the Permittee.

Date issued: October 21, 1996  
Amendment Date:  
(most recent)  
Page: 1 of 4



Donald K. May, P. Eng.  
Assistant Regional Waste Manager

PERMIT NO.: PE 11402

PROVINCE OF  
BRITISH COLUMBIA

Environmental Protection

**1. AUTHORIZED DISCHARGES**

1.1 This subsection applies to the discharge of thermophilically digested biosolids from the District of Salmon Arm Water Pollution Control Centre located at 121 Narcisse Street SW in Salmon Arm.

1.1.1 The maximum authorized rate of discharge is 1500 cubic metres of thermophilically digested biosolids per year.

1.1.2 The characteristics of the biosolids shall be equivalent to or better than typical pasteurized sludge from the autothermophilic digestion of sewage sludge.

1.1.3 The authorized works are biosolids storage facilities, biosolids spreaders and related appurtenances.

**2. Location of the Facilities**

The lands to which the biosolids are to be applied are legally described as:


a) Lot 2, Plan KAP 47072, Section 7, Township 20, Range 9, Kamloops Division Yale District, West of the Sixth Meridian.

b) Various other locations in and around the District of Salmon Arm area, subject to written authorization by the Regional Waste Manager on a site specific basis.

c) Technical information regarding sites referred to in Section 2. (b) must be submitted to the Regional Waste Manager for review, at least 60 days prior to the intended commencement of biosolids application. The Regional Waste Manager, at his discretion, may require public notification of the intent to discharge biosolids. If it is determined that such notification is required, the Permittee will be informed in writing by the Regional Waste Manager. The Permittee shall bear the costs of such notification.

**3. GENERAL REQUIREMENTS Applicable to the Authorized Discharges**

3.1 Biosolids shall have been stabilized by an acceptable process of digestion or composting. More stabilization may be required by the Regional Waste Manager if odour or vector problems develop.

  
Donald K. May, P. Eng.,  
Assistant Regional Waste Manager



PROVINCE OF  
BRITISH COLUMBIA

Environmental Protection

- 3.2 Biosolids shall be applied to land in accordance with the *draft Guidelines for Disposal of Domestic Sludge under the Waste Management Act (attached)*
- 3.3 Movement of biosolids and/or constituents off-site, subsequent to application, the result of rain, wind, water, or freeze-thaw conditions is prohibited.
- 3.4 Biosolids shall not be applied to frozen or snow covered land or to land with a slope of 10% or more.
- 3.5 Biosolids shall not be applied within 30 metres of a surface waterbody.
- 3.6 Biosolids shall be applied in a manner consistent with acceptable agricultural practise, as outlined in the *Agricultural Waste Control Regulation, B.C. Reg. 131/92*.
- 3.7 Biosolids shall not be applied to land where the groundwater table at the time of application is within one metre of the surface.
- 3.8 Public access to biosolids treated sites shall be controlled by means satisfactory to the Regional Waste Manager.
- 3.9 The Regional Waste Manager may prohibit application of biosolids to a site if, in his opinion, any substance in the soil is approaching levels detrimental to health and/or the environment.

#### 4. Process Modifications

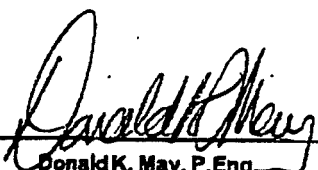
The Permittee shall notify the Regional Waste Manager prior to implementing changes to any process that may affect the quality and/or quantity of the discharge.

#### 5. Bypasses

The discharge of biosolids which has bypassed the designated treatment works is prohibited unless the consent of the Regional Waste Manager is obtained and confirmed in writing.

#### 6. Monitoring

The soils to which the biosolids are to be applied shall be analyzed prior to each application and once after each application of biosolids as directed by the Regional Waste Manager. The soils shall be analyzed for the following parameters:

  
Donald K. May, P. Eng  
Assistant Regional Waste Manager

PROVINCE OF  
BRITISH COLUMBIA

Environmental Protection

Arsenic	Chromium	Mercury	Selenium
Cadmium	Copper	Molybdenum	Zinc
Cobalt	Lead	Nickel	Total Kjeldahl Nitrogen

The biosolids to be applied to the ground shall be analyzed once annually or as otherwise specified by the Regional Waste Manager. Analysis shall be in accordance with Schedule C of the *draft Guidelines for Disposal of Domestic Sludge under the Waste Management Act*.

Soils and biosolids sampling shall be conducted in accordance with the soils and biosolids sampling methodology defined in the *draft Guidelines for Disposal of Domestic Sludge under the Waste Management Act*.

The Regional Waste Manager may require the monitoring of vegetation grown on the land treated with biosolids.

#### 7. Reporting

The Permittee shall keep records of the quantity of biosolids discharged, the application rate (kg/ha), the areas and locations of land treated with biosolids, and analysis for inspection by Environmental Protection staff and submit the data suitably tabulated to the Regional Waste Manager for the previous year by January 31st of the next year.