FERNIE ALPINE RESORT
UTILITIES CORPORATION

2006 SEWAGE TREATMENT PLANT

ANNUAL REPORT

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TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

The following annual report for the wastewater treatment plant at Fernie Alpine Resort (FAR) operated by Fernie Alpine Resort Utilities Corporation (FARUC) is compiled in accordance with the requirements of the Municipal Sewage Regulation. This report covers all of calendar year 2006.

The plant is subjected to a large seasonal swing in utilization with the winter ski period imposing the highest demands. The critical time for sewage flows at the resort is from mid-December to the end of March during the peak ski season. Summer utilization of the treatment works is generally low.

FARUC treats its wastewater at a tertiary treatment plant designed to remove BOD_5, suspended solids, ammonia, and phosphorous. Wastewater is disinfected with ultraviolet (UV) lamps prior to discharge to the Elk River.

Construction of major facility improvements was complete in late February 2006. The following plant improvements were rendered fully operational by mid-March:

- 500 m^3 aerated equalization tank,
- 200 m^3 aerated sludge digester,
- Influent flow meter (March 13, 2006),
- EQ and digester valve control room and blower building,
- Sewer piping, control valves and manholes to divert raw sewage to the equalization tank,
- Modification of process piping in the two activated sludge tanks to increase total reactor capacity,
- Modification of the existing clarifiers to extend weir length and improve settling,
- Modification of the waste sludge piping and addition of a dedicated waste sludge pump, and
- Improvements to electrical systems to increase operating reliability.

Before completion of the facility upgrades, the plant experienced a number of bypass events in quick succession in early January, due to continued operation of the old sludge tank and a build-up of biological solids. Effluent BOD, TSS and coliform counts spiked during the bypasses though Elk River samples did not indicate any negative impact as a result of the releases.

Plant effluent quality has been high with the exception of phosphorous (ortho and total) concentrations which remained consistently above MSR discharge limits in 2006. A winter 2007 monitoring and Clearpac dosing investigation to reduce effluent phosphorous concentrations demonstrated the plant can meet target nutrient limits; the reduction program will continue through the summer of 2007 to investigate alternative chemicals and dosing locations.

2.0 REGISTRATION REQUIREMENTS

This section describes operating requirements as specified in RCRI's Registration Letter RE 17139. The registration describes parameters that must be tested for, operating conditions, sampling frequency, and sampling locations.

2.1 Parameters

The following parameters are to be monitored:

pH	Field sample
Temperature	Field sample, measured in Celsius
Flow	Field samples, measured as m^3/d
BOD_5	Five day biochemical oxygen demand, measured in mg/l
TSS	Total suspended solids or non-filterable residue, measured in mg/l
NH_3	Ammonia concentration, expressed as nitrogen in mg/l
NO_3	Nitrate concentration, expressed as nitrogen in mg/l
NO_2	Nitrite concentration, expressed as nitrogen in mg/l
Total-P	Total phosphorous concentration, measured in mg/l
Ortho-P	Orthophosphate concentration, measured in mg/l
Fecal coliform	Bacterial concentration, measured as colony forming units per 100 ml
Toxicity Bioassay	96 hour toxicity test, recorded as pass or fail

2.2 Registration Letter Operating Conditions

The treatment plant is required to meet the effluent discharge conditions outlined in Table 1.

Table 1
Effluent Limits

Parameter	Limit	Unit
Flow	1280	m^3/day
BOD_5	45	mg/l
TSS	45	mg/l
Total-P	1.0	mg/l
Ortho-P	0.5	mg/l
Coliforms*	200	CFU/100 ml
Toxicity Bioassay	pass	n/a

* Limit for recreational waters only, not included in RCRI registration letter.

Primary screenings and dewatered sludge are to be disposed of at the Crowsnest Pass/Pincher Creek landfill. Disposal at other sties requires authorization under the Waste Management Act.

Operators at the plant are required to be certified in accordance with Section 22 of the MSR.

2.3 Reporting Requirements

An annual report demonstrating the performance of the facility is to be publicly posted to the Internet within 120 days of the end of the calendar year. The report must include tabulated standards and results for all test samples, interpretation of the results, an indication of the state of compliance of the facility, and the total wastewater flow for the report period.

Additionally, the annual report is to include the following:

- Notification of significant operating events including discharge variances outside given limits,
- Recommendations for operational or facility modifications,
- Notification of proposed or implemented plant modifications,
- Details of proposed or implemented water conservation measures,
- A plan indicating existing and proposed developments,
- A comparison of projected and actual wastewater flows,
- Projected wastewater flows resulting from proposed development compared to the remaining WWTP capacity, and
- A comparison of water supply and wastewater flows.

As with the 2004 and 2005 Annual Reports, this report includes additional information on wasted sludge volumes.

2.4 Sampling Frequency

The MSR Registration requires RCRI and, as such, the contract operator FARUC, to undertake the environmental testing program outlined in Table 2 below.

Elk River testing requires that a minimum of 18 samples annually are taken from each of the upstream, initial dilution zone (IDZ) and downstream river locations, relative to the outfall diffuser. The sampling locations were identified in the April 2001 Environmental Impact Study.

A minimum of 12 influent samples are required for BOD_5 and TSS. Flow data is to be collected continuously.

At least 25 effluent samples are to be collected for all parameters except the continuously recorded discharge flow and the toxicity bioassay, where three annual samples are necessary.

The intent of the environmental testing procedure outlined in Table 2 is to collect influent and effluent samples during peak demand periods as indicated by resort bookings. To correspond with peak plant loading, river samples are to be collected on the same day as effluent samples.

In addition to the program and tests listed above, other in-plant testing is needed to permit operational control of the process.

Table 2
Sampling Location/Frequency/Type

Parameter	Location					
	Elk River	QTY	Influent	QTY	Effluent	QTY
pH	WS/G	18	--	--	M/G, WS/G	25
Temp	WS/G	18	--	--	--	--
Flow	--	--	D/C	n/a	D/C	n/a
BOD_5	--	--	M/G	12	M/G, WS/G	25
TSS	WS/G	18	M/G	12	M/G, WS/G, D/C	25
NH_3-N	WS/G	18	--	--	M/G, WS/G	25
NO_3-N	WS/G	18	--	--	M/G, WS/G	25
NO_2-N	WS/G	18	--	--	M/G, WS/G	25
Total-P	WS/G	18	--	--	M/G, WS/G	25
Ortho-P	WS/G	18	--	--	M/G, WS/G	25
Fecal Coliform	WS/G	18	--	--	M/G, WS/G	25
Toxicity Bioassay	--	--	--	--	3 Y/G	3

Where:

WS/G	Weekly seasonal grab sampling, required for three six-week periods during the winter peak, the spring after ice-out, and in the fall when river turbidity and flows are low.
D/C	Daily continuous sampling using an on-line instrument and data-logger.
M/G	Monthly grab sample (not required when weekly seasonal testing is taking place).
3 Y/G	Three samples per year to correspond with WS/G sampling periods.

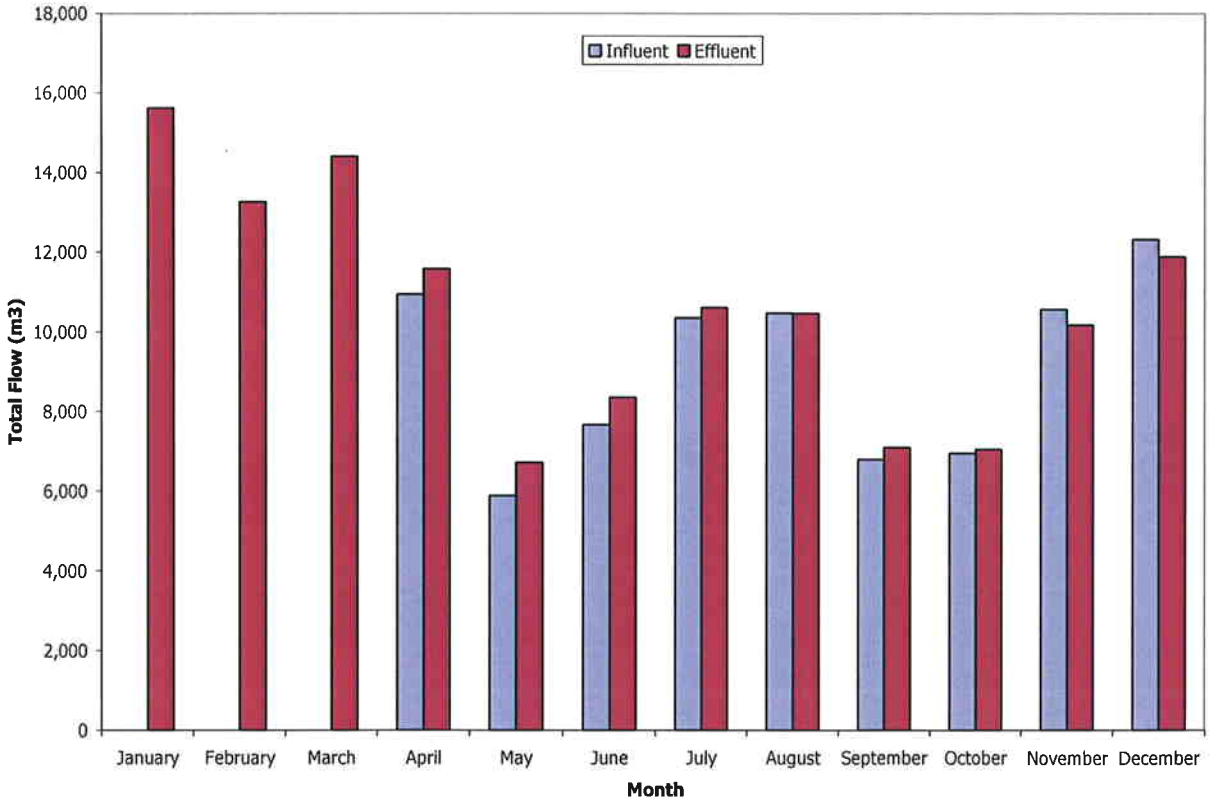
3.0 SEWAGE FLOW RECORDS

This section provides data and analysis regarding plant influent and effluent flows, and compares 2006 flows to previous years.

Total effluent flow from the WWTP for all of 2006 was recorded from the effluent weir type flow meter as 127,202 m^3 for an average of 348 m^3 per day. Records for the influent magnetic flow meter, installed downstream of the equalizing tank as part of the overall upgrades, are reported from March 13, 2006 onwards. This report relies on effluent flow meter records as they are complete for the entire calendar year; subsequent annual reports will utilize records from both influent and effluent flow meters.

Available monthly total influent and effluent flow meter records for 2006 are provided in Figure 1.

Figure 1
Influent and Effluent Flow Meter Monthly Flow Totals



The influent and effluent flow meter results are in close agreement over the comparison period.

The ski resort operates with higher winter and late spring sewage flows than during any other period. The average daily plant flow through January, February and March of 2006 was 481 m^3 per day, down from 502 m^3 per day over the same period in 2005. Peak flow for the year reached 1,058 m^3/day on November 7, 2006, 17% below the allowable 1,280 m^3/day limit. The peak flow day is anomalous and attributable to maintenance activities; the ski season had not started and the week's average flow reached only 568 m^3/day. During the January to March ski season, peak flow reached 1,023 m^3/day on January 7.

A summary of sewage flow for years 2003 through 2006 is provided in Table 3.

Table 3
2003 - 2006 Flow Comparisons

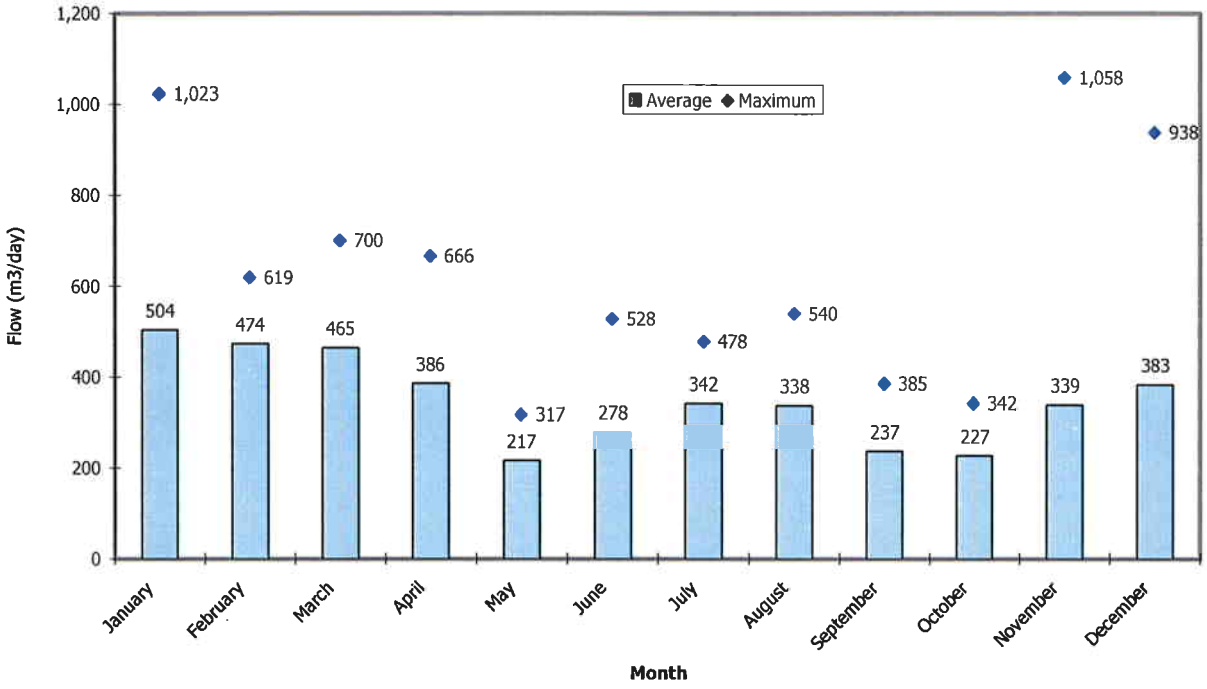
Year	Sewage Flow (m^3/day)			Days Over Limit
	Total	Average	Peak	
2003	137,035	375	1,244	0
2004	151,815	414	1,307	1
2005	125,699	344	1,293	1
2006	127,202	348	1,058	0

Though 2006 total and average flow remained essentially static compared to 2005, there were no instances where flow exceeded the 1,280 m^3/day registration limit, compared to one day in each of 2004 and 2005. Peak flow dropped due to full operation of the equalizing tank and collection system improvements to eliminate stormwater infiltration.

Daily wastewater flows are strongly correlated to weather and the number of day-users at the resort with the peak ski season having the highest flows. Summer flow results from non-skiing related recreational activities, generally hiking or mountain biking events. The lowest plant flow is experienced in the shoulder season periods (April to June and September to November).

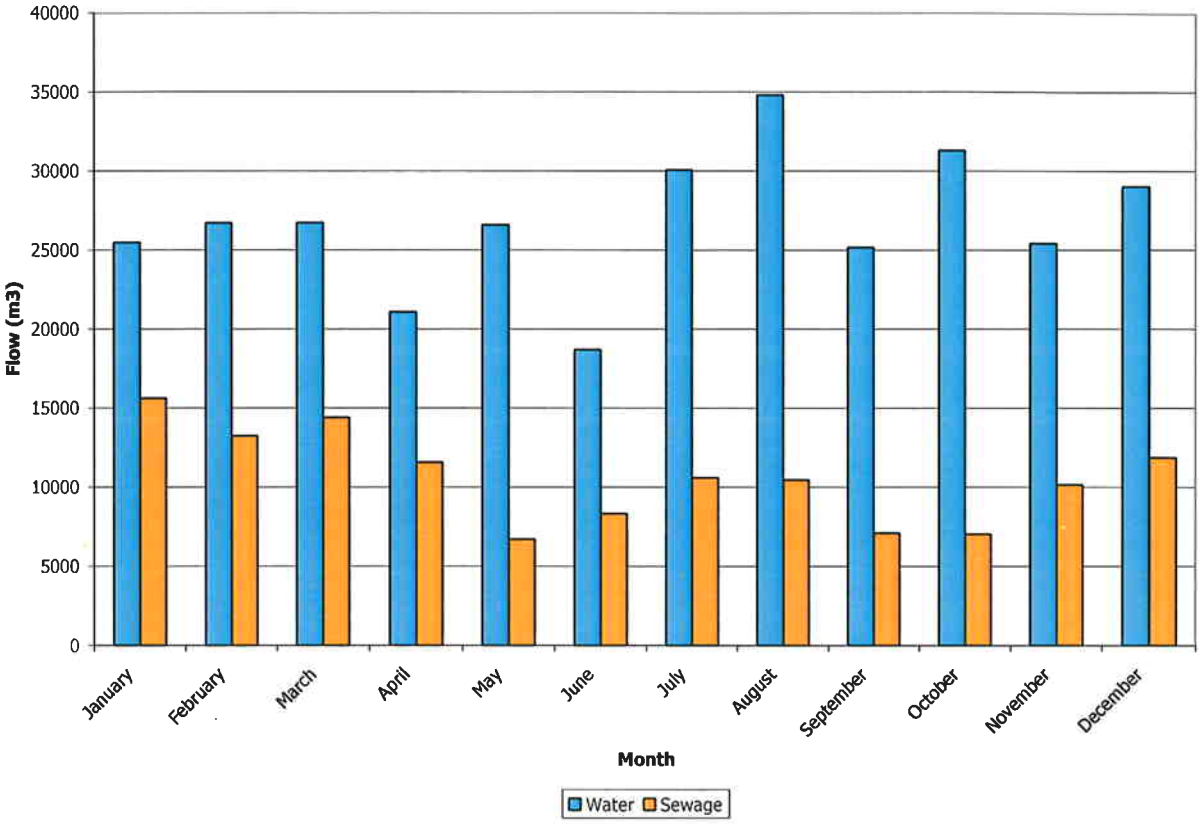
The approximately 70 permanent residents plus the contribution from several year-round restaurants providing services to casual visitors ensures that the sewage flows never drop to zero. Figure 2 provides monthly average and peak day sewage flows for 2006.

Figure 2
2006 Sewage Effluent Average and Peak Flows by Month



The Resort's ongoing program to reduce sewer infiltration is demonstrated by the reduction in return flow to the plant vs. total water usage. In 2005 total sewage flow was equal to 51% of the total water production; in 2006 this figure dropped to 40%. Water use at the hill is compared to the amount of sewage received at the WWTP in Figure 3.

Figure 3
2006 Monthly Water Consumption and Sewage Generation



The impact of rainfall and snowmelt on sewage flow has decreased each year since 2004 as a result of plant improvements, the use of water restrictive fixtures and the infiltration reduction program.

4.0 SEWAGE FLOW PROJECTION

This section calculates projected wastewater flow for 2006 through 2010 based on current development plans and provides an estimate of remaining plant capacity.

Based on unit generation rates provided in the BC Health Act for various lodging types, the estimated highest day wastewater generation for 2006 would have been 979.2 m^3/day (same as 2005). Using the actual peak flow of 1058 m^3/day, a correction factor of 1.08 was calculated and multiplied by the future estimated flows to more accurately reflect potential resort sewage generation rates. In 2005, the correction factor was 1.32, showing that the resort has reduced the impact of both stormwater infiltration and reduced peak flows.

Projected peak wastewater flows by year are provided in Appendix A for the Resort's planned expansions. Peak flow in 2009 is projected to be 1363 m^3/day if the stormwater infiltration program does not produce further benefit and if flow restrictive devices are not utilized in new construction.

Flow restrictive devices are intended to be utilized in all new construction and the infiltration/ rehabilitation program is expected to be ongoing. The intent is to reduce the amount of per unit sewage generation and to reduce the amount of ground and surface water infiltration into the sewer system. FARUC will monitor sewage flows to determine the efficacy of the program.

With the proposed level of expansion, FARUC will require an amendment to the registration letter by 2009 to permit discharge above the current limit of 1280 m^3/day. Sewage discharge rates will be monitored and an application will be submitted to increase the maximum daily discharge when warranted.

Based on 2006 flow data, the plant has an unused capacity of 222 m^3/day, a large increase from the negative 13 m^3/day excess capacity available in 2005 when daily flow reached 1293 m^3/day.

5.0 OVERVIEW OF ELK RIVER SAMPLE RESULTS

This section provides data and analysis for the Elk River samples taken during 2006.

Table 4 provides a summary record of the 19 Elk River test results for the period January 3, 2006 to December 21, 2006.

The first five samples taken in 2006 are part of the six samples required for the 2005/06 winter sampling period, started in December 2005. The second sampling period began on March 28 and continued to May 2; the final sampling period commenced September 24 and ended November 1. Two samples taken in December are part of the 2006/07 winter sampling program.

There is no significant change in pH, orthophosphate, total phosphorous or nitrogen nutrient concentrations during any of the river sampling periods.

The May 2, 2006 sample indicates a major spike in river TSS results likely due to runoff conditions; recorded plant effluent suspended solids were less than 1 mg/l and did not impact the River's TSS results.

Downstream coliform counts spiked to 294 CFU/100 ml on January 23 despite both upstream and IDZ counts being less than 1 CFU/100 ml and 2 CFU/100 ml, respectively. Plant data for this date indicates effluent coliform concentrations were also less than 1 CFU/100 ml. The plant did not contribute to the elevated coliform counts in the downstream sample.

Overall, the analyzed concentrations remain constant between the upstream (US) sampling zone and the downstream (DS) sampling zone. The data indicates that the plant's effluent does not have any adverse effect on background nutrient concentrations in the Elk River.

Table 4
2006 Elk River Sample Results

Sample Date	pH			TSS			Coliform			Ortho P			Total P mg/L			NH3			N-N03			N-N02		
	US	IDZ	DS	US	IDZ	DS	US	IDZ	DS	US	IDZ	DS	US	IDZ	DS	US	IDZ	DS	US	IDZ	DS	US	IDZ	DS
2006-01-03	8.30	8.40	8.40	1	0.80	0.80	4	2	5	0.01	0.03	0.03	0.05	0.05	0.05	0.025	0.037	0.029	0.52	0.45	0.38	0.01	0.01	0.01
2006-01-06	--	--	--	5.6	6.00	4.40	4	2	5	0.02	0.02	0.02	0.05	0.05	0.05	0.031	0.026	0.041	0.47	0.48	0.48	0.01	0.01	0.01
2006-01-09	8.30	8.40	8.30	0.8	2.00	1.60	4	10	19	0.01	0.03	0.02	0.05	0.05	0.05	0.194	0.029	0.021	0.47	0.52	0.52	0.01	0.01	0.01
2006-01-16	8.30	8.30	8.20	2.0	2.40	2.40	3	26	7	0.02	0.02	0.02	0.06	0.05	0.05	0.022	0.030	0.014	0.51	0.52	0.52	0.01	0.01	0.01
2006-01-23	8.20	8.20	8.20	1.2	1.60	1.60	1	2	294	0.03	0.06	0.02	0.05	0.07	0.03	0.020	0.014	0.022	0.57	0.59	0.52	0.01	0.01	0.01
2006-03-28	8.15	8.17	8.17	1.0	1.00	1.20	1	1	1	0.02	0.03	0.03	0.04	0.04	0.05	0.069	0.064	0.072	1.60	1.70	1.70	0.01	0.01	0.01
2006-04-04	8.02	8.06	8.09	2.4	2.40	2.80	2	3	3	0.01	0.02	0.03	0.02	0.03	0.04	0.073	0.051	0.050	1.40	1.40	1.40	0.01	0.01	0.01
2006-04-10	8.18	8.18	8.18	7.6	8.00	8.00	2	6	1	0.07	0.08	0.08	0.08	0.09	0.09	0.091	0.093	0.093	1.50	1.40	1.50	0.00	0.01	0.01
2006-04-18	8.23	8.22	8.20	5.6	10.00	8.00	8	12	4	0.03	0.04	0.04	0.04	0.05	0.05	0.029	0.027	0.037	0.80	0.80	1.00	0.01	0.01	0.01
2006-04-25	8.00	8.01	8.00	6.8	8.00	7.60	1	1	4	0.02	0.03	0.02	0.03	0.04	0.03	0.031	0.044	0.034	0.55	0.54	0.55	0.01	0.01	0.01
2006-05-02	7.90	8.09	8.10	30.0	33.20	32.00	2	2	2	0.02	0.02	0.02	0.03	0.03	0.03	0.039	0.026	0.031	0.41	0.48	0.45	0.01	0.01	0.01
2006-09-24	8.36	8.34	8.33	1.2	1.20	1.20	1	1	1	0.03	0.03	0.04	0.04	0.05	0.05	0.012	0.005	0.001	0.35	0.41	0.38	0.01	0.01	0.01
2006-10-03	8.56	8.55	8.55	0.4	0.40	0.40	1	1	1	0.03	0.03	0.02	0.07	0.07	0.08	0.001	0.018	0.011	0.36	0.38	0.34	0.01	0.01	0.01
2006-10-10	8.36	8.41	8.44	1.2	1.20	1.20	1	1	1	0.02	0.02	0.02	0.23	0.24	0.24	0.014	0.001	0.010	0.41	0.43	0.43	0.01	0.01	0.01
2006-10-17	8.24	8.25	8.23	1.2	1.20	1.20	1	1	1	0.01	0.01	0.01	0.04	0.05	0.05	0.013	0.005	0.008	0.51	0.52	0.52	0.01	0.01	0.01
2006-10-24	8.14	8.16	8.16	0.4	1.20	0.80	1	1	1	0.01	0.01	0.01	0.02	0.02	0.02	0.019	0.016	0.011	0.46	0.47	0.45	0.01	0.01	0.01
2006-11-01	8.28	8.32	8.30	0.8	0.80	0.80	1	1	1	0.08	0.07	0.06	0.10	0.09	0.08	0.030	0.027	0.018	0.53	0.54	0.53	0.01	0.01	0.01
2006-12-12	8.11	8.16	8.19	1.2	1.20	1.60	1	1	1	0.02	0.02	0.03	0.09	0.09	0.06	0.012	0.012	0.014	0.52	0.54	0.54	0.01	0.01	0.01
2006-12-21	8.21	8.23	8.22	1.2	1.20	1.20	1	2	1	0.02	0.03	0.03	0.08	0.13	0.12	0.004	0.008	0.002	0.42	0.44	0.42	0.01	0.01	0.01
# Samples	18	18	18	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
Average	8.21	8.25	8.24	3.8	4.4	4.15	2	4	19	0.03	0.03	0.03	0.06	0.07	0.06	0.038	0.028	0.027	0.65	0.66	0.66	0.01	0.01	0.01
Maximum	8.56	8.55	8.55	30	33	32.00	8	26	294	0.08	0.08	0.08	0.23	0.24	0.24	0.194	0.093	0.093	1.60	1.70	1.70	0.01	0.01	0.01
Minimum	7.90	8.01	8.00	0.4	0.4	0.40	1	1	1	0.01	0.01	0.01	0.02	0.02	0.02	0.001	0.001	0.001	0.35	0.38	0.34	0.00	0.01	0.01

Note: Shaded squares show tests reported at less than the stated value, for calculations these are listed as to equal to the value stated, ie <0.05 is now 0.05

6.0 OVERVIEW OF INFLUENT TEST RESULTS

This section provides data and analysis for the plant influent (raw sewage) samples taken during 2006.

Table 5 provides a summary record of the influent test results for the period January 3, 2006 to December 21, 2006.

Table 5
2006 Influent Results

Date	2006 Influent Results Summary				
	Flow	temp	pH	TSS	BOD
	m3/d**	C		mg/L	mg/L
2006-01-03	640	15.0	7.9	1060	221
2006-01-09	444	11.6	7.7	120	249
2006-01-16	431	11.6	7.8	136	222
2006-01-23	165	11.9	7.6	36	176
2006-03-28	523	13.4	7.7	260	229
2006-04-04	353	10.2	7.3	548	292
2006-04-10	533	9.4	7.5	328.0	170
2006-04-18	227	8.0	7.6	80.0	85
2006-04-25	172	10.4	7.4	20	65
2006-05-02	255	9.4	7.38	320	106
2006-06-15	436	13.4	7.11	72	69
2006-07-04	370	15.8	7.31	56	70
2006-08-08	450	16.8	7.3	96	93
2006-09-24	205	15.0	7.3	150	117
2006-10-03	217	13.6	7.8	104	109
2006-10-10	223	13.5	7.7	24	86
2006-10-17	258	13.5	7.95	80	71
2006-10-24	221	12.0	7.4	40	70
2006-11-01	160	18.0	7.5	128	129
2006-12-12	246	10.0	7.9	66	98
2006-12-21	303	11.6	8.2	148	172
# Samples	**21**	**21**	**21**	**21**	**21**
Average	**325.3**	**12.6**	**7.6**	**184.4**	**138.0**
High	**640.0**	**18.0**	**8.2**	**1060.0**	**292.0**
Low	**160.0**	**8.0**	**7.1**	**20.0**	**65.0**

A total of 21 samples were analyzed providing a minimum of one sample per month for the year. The influent flow rate was assumed to be the same as that recorded by the effluent flow meter. A daily effluent discharge is given for the sample dates.

Inlet BOD ranged from 65 mg/l to 292 mg/l with an average of 138 mg/l. This is consistent with domestic or municipal strength sewage and is well within normal design parameters. Surprisingly, average influent sewage strength decreased from averages of 222 mg/l in 2004 and 257 mg/l in 2005 despite the effectiveness of the program to reduce sewer line infiltration. It was expected that average BOD strength would increase as a result of the reduction in infiltration.

7.0 OVERVIEW OF EFFLUENT RESULTS

This section provides data and analysis for the effluent (treated) samples and plant flows during 2006.

7.1 Effluent Results

A total of 24 effluent samples were collected and analyzed. Effluent samples were collected on the same dates as influent samples to permit an evaluation of plant performance. Note no influent samples were taken on January 4, 6 or 14, 2006. Table 6 summarizes effluent test results for 2006.

Table 6
2006 Effluent Results

Date	2006 Effluent Results Summary										
	Flow	temp	pH	TSS	BOD	Coliforms	P-OPO4	Total P	NH3-N	NO3-N	NO2-N
	m3/d	C		mg/L	mg/L	cfu/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L
2006-01-03	640	14.6	7.7	1	5	6	3.73	3.96	0.452	15.6	0.11
2006-01-04	580	-	-	8.8	7	52	2.07	2.32	0.042	18.50	0.48
2006-01-06	753	-	-	186.0	12	4800	1.79	9.78	0.1	21.9	0.38
2006-01-09	444	13.2	7.5	2.0	5	6	1.76	2.30	0.1	19.3	0.01
2006-01-14	829	-	-	-	135	241920	5.68	8.44	1.7	84.2	0.20
2006-01-16	431	11.9	8	0.8	5	86	1.64	1.66	0.035	18.0	0.01
2006-01-23	165	13.8	7.6	0.8	5	1	2.56	2.89	0.028	24.1	0.02
2006-03-28	523	13.6	7.41	2.0	5	2	2.41	3.15	0.081	23.6	0.04
2006-04-04	353	12.0	7.48	1.2	5	1	2.54	3.29	0.075	21.0	0.03
2006-04-10	533	10.2	7.66	0.8	5	1	2.77	2.90	0.078	19.6	0.04
2006-04-18	227	10.4	7.84	2.0	5	1	1.52	1.79	0.047	19.9	0.01
2006-04-25	172	10.9	7.56	0.4	5	2	2.27	5.30	0.051	15.3	0.01
2006-05-02	255	10.0	7.89	1.0	5	1	0.67	0.91	0.046	15.6	0.01
2006-06-15	436	13.5	7.56	1.0	5	1	0.43	0.50	0.014	9.9	0.01
2006-07-04	370	15.7	7.63	1.0	5	1	0.51	1.68	0.019	8.6	0.01
2006-08-08	450	17.6	7.6	1.0	5	1	2.30	2.87	0.065	20.1	0.01
2006-09-24	205	14.2	8.06	0.8	5	7	0.70	0.80	0.009	10.9	0.01
2006-10-03	217	13.8	8.35	0.4	5	1	0.41	0.51	0.015	9.5	0.01
2006-10-10	223	13.2	8.09	0.4	5	1	2.03	2.17	2.375	9.5	0.07
2006-10-17	258	12.5	7.97	2.4	5	1	0.82	0.88	0.021	10.2	0.01
2006-10-24	221	11.8	8.15	0.4	5	1	1.00	1.03	0.019	9.3	0.01
2006-11-01	160	12.0	8.27	0.4	5	1	1.16	1.28	0.011	9.4	0.01
2006-12-12	246	12.4	8.2	1.0	5	1	1.22	1.36	0.049	14.5	0.01
2006-12-21	303	11.4	7.9	1.2	5	6	1.80	1.88	0.018	11.2	0.01
# Samples	**24**	**21**	**21**	**23**	**24**	**24**	**24**	**24**	**24**	**24**	**24**
Average	**374.8**	**12.8**	**7.8**	**9.4**	**10.8**	**4.9**	**1.8**	**2.7**	**0.2**	**18.3**	**0.1**
High	**829.0**	**17.6**	**8.4**	**186.0**	**135.0**	**241920**	**5.7**	**9.8**	**2.4**	**84.2**	**0.5**
Low	**160.0**	**10.0**	**7.4**	**0.4**	**5.0**	**1.0**	**0.4**	**0.5**	**0.0**	**8.6**	**0.0**
Limit	**1280.0**	**N/A**	**N/A**	**45**	**45**	**200**	**0.50**	**1.00**	**N/A**	**N/A**	**N/A**
# Over Limit	**0**	**N/A**	**N/A**	**1**	**1**	**2**	**22**	**19**	**N/A**	**N/A**	**N/A**

Notes:
1. Shaded squares show tests reported at less than the stated value, for calculations these are listed as equal to the value stated, i.e.; <0.05 is assumed to be 0.05
2. Geometric mean is used for coliform results.

7.2 Results Analysis

The plant had a number of bypass events in January of 2006, all related to ongoing construction activities that disrupted normal operating procedures. Bypass reports were filed with the Ministry of Environment for January 4, 6, 7, 8, and 14, 2006.

One January BOD sample exceeded the discharge limit. None of the other 23 samples approached the discharge limit and the average BOD in the effluent was 10.8 mg/l. TSS samples averaged less than 10.0 mg/l with a maximum concentration of 186 mg/l during a bypass event in January. Elevated TSS in the effluent did not impact the Elk River samples. The plant provides excellent BOD_5 and TSS treatment with average removals of 96% and 95%, respectively.

UV disinfection does not perform well with high TSS concentrations, hence the maximum effluent coliform concentration spiked during the January 6 and 14 bypass events. All other readings taken showed coliform counts were far below the acceptable limit for recreational waters. Elk River samples indicated no measurable impact of the effluent discharge in terms of background coliform counts.

Effluent ammonia concentrations are consistently low excepting the January 14 test and an anomalous October 10 result when the concentration is reported to have reached 2.4 mg/l. That the nitrate and nitrite concentrations do not show a similar rise on this latter date is unusual though not of great concern as the levels are low. Effluent data shows the plant is effectively oxidizing ammonia nitrogen and that there is no evidence of elevated ammonia levels in the Elk River as a result of discharge from the treatment plant.

The toxicity bioassay results reported in Table 7 show the effluent was found to be non-toxic.

Table 7
Toxicity Test Results

Sample Date	Mortality		Result
	Control	Sample	
2006/01/09	10%	0%	Not toxic as tested
2006/01/19	0%	10%	Not toxic as tested
2006/04/17	0%	0%	Not toxic as tested
2006/12/29	10%	50%	None

Phosphorous concentrations in the effluent remained above limits set in the registration letter for 2006.

Even with the addition of the new sludge digester, elevated phosphorous concentrations were still present in the effluent. A phosphorous reduction strategy, as outlined in Section 11, was started in the winter of 2007 to address the removal of soluble phosphorous from the effluent stream. The plant has sufficient infrastructure to remove precipitated nutrients and no additional treatment processes are required.

Phosphorus in the plant effluent has no discernable impact on background nutrient levels in the Elk River, with upstream and downstream concentrations being virtually identical. A 2001 report by Highwood Environmental indicated that phosphorus releases would have a negligible impact on aquatic life in the Elk River.

7.3 Compliance Summary

Table 8 summarizes the number of days that samples exceeded MSR effluent requirements.

Table 8
2006 MSR Parameter Compliance

Parameter	Unit	MSR Limit	No. of Samples	Average Value	Max. Value	Samples Over Limit
Flow	m^3/day	1280	365	348	1058	0
BOD_5	mg/L	45	24	11	135	1
TSS	mg/L	45	24	9.4	186	1
Total Phosphorus	mg/L	1.0	24	2.7	9.8	19
Ortho Phosphate	mg/L	0.5	24	1.8	5.7	22
Fecal Coliforms*	cfu/100 mL	200	24	5	241920	2
96 hr LC_{50} Bioassay	-	Non-toxic	4	N/A	N/A	0

* Limit for recreational waters only, not included in FAR registration letter.

8.0 SLUDGE PRODUCTION AND DISPOSAL

This section provides data regarding the disposal of bio-solids (sludge) from the treatment facility in 2006.

Operation of the new 200 m^3 aerated sludge digester allowed the plant to bag and landfill all of its bio-solids without resorting to vacuum truck services, as was required in both 2004 and 2005. All solids were transported to the Crowsnest/Pincher Creek landfill site.

Hauling data for bagged solids are in Table 9. Note that each bag has an approximate weight of 60 kg.

Table 9
2006 Bagged Solids Data

Month	Qty. Bags
January	379
February	312
March	451
April	219
May	180
June	124
July	186
August	226
September	166
October	152
November	180
December	370
Total	2,945

The aerated sludge digester has allowed the operators to store liquid sludge during peak winter weekend periods and bag at the less active midweek times, avoiding the need for emergency vacuum truck services. Sludge bag data indicates the winter season is most active for the plant.

9.0 BYPASS EVENTS

This section provides information about bypass events in 2006.

Bypass events result in elevated effluent suspended solids concentrations which decrease the effectiveness of the UV disinfection system; an increase in TSS results in a simultaneous increase in coliform counts. While soluble BOD is removed through the aeration basins, the overflow of TSS also results in an increase in BOD readings due to the presence of biological floc.

Filter bypass events occurred on January 4, 6, 7, 8, and 14 during the construction of plant infrastructure upgrades, particularly related to the equalization and sludge tanks, clarifiers and sludge wasting systems. January also recorded the highest average daily flows with the flow on January 7 being the second highest for the year. The impact of ongoing construction work and peak season sewage generation directly resulted in plant bypasses.

The original 57 m^3 sludge tank was still in operation in early January and did not provide sufficient storage for the peak season. The lack of sufficient storage capacity has caused bypass events in other years as the plant's MLVSS concentration increases to a point where filters must be backwashed with more water than they are able to produce. This causes the filters to be taken off-line and clarifier supernatant to be sent directly to the UV disinfection unit.

Following the connection of the aerated sludge digester to the sludge wasting system and decommissioning of the old sludge tank, the plant was able to operate without the need for subsequent filter bypasses.

10.0 PLANT IMPROVEMENTS

This section describes completed WWTP upgrades undertaken in 2006.

Plant upgrades started in the fall of 2005 were commissioned for full operation in February and March of 2006. Improvements include:

- Addition of a 500 m^3 aerated equalization tank and a 200 m^3 aerated sludge digester,
- Addition of a new valve control room and blower building,
- Addition of an inlet flow meter,
- New sewer piping, control valves and manholes to divert raw sewage to the new equalization tank,
- Modification of process piping in the two activated sludge tanks to increase total reactor capacity,
- Modification of the existing clarifiers to extend weir length and improve settling,
- Modification of the waste sludge piping and addition of a dedicated waste sludge pump, and
- Improvements to electrical systems to increase operating reliability.

No additional processes improvements or significant construction works were undertaken in 2006 at the facility.

11.0 PHOSPHOROUS REMOVAL

This section describes the phosphorous monitoring and removal strategy being implemented to bring the plant into compliance with effluent limits.

In the winter of 2007, the plant increased chemical dosing with Clearpac to reduce effluent phosphorous concentrations. By late January 2007 sample results showed marked improvement with both ortho and total phosphorous concentrations falling below discharge requirements.

The increased application of Clearpac in 2007, while effective, has been operationally costly; the relationship between chemical dose and nutrient removal will be adjusted for best efficiency.

The monitoring and removal program will continue in the summer of 2007 with the plant evaluating additional removal strategies, including:

- Implementation of sampling procedures to measure total phosphorous concentrations at the following locations: auger monster (raw sewage), clarifier supernatant, RBC overflow, mix tank liquor, sand filter filtrate, filter backwash, sludge digester supernatant, and effluent,
- Evaluation of precipitant dose on effluent phosphorous levels at the current chemical addition point (clarifier overflow),
- Evaluation of changing the precipitant dose location, and
- Evaluation of alternative chemicals.

The plant will continually monitor and optimize coagulant dosages for improved phosphorus removal.

12.0 ASSESSMENT SUMMARY

The plant has produced high quality effluent with BOD_5 normally below the regulated limited of 45 mg/l and typically below 5 mg/l. TSS averaged approximately 10 mg/l with at least one bypass event causing a violation of the MSR limit. Bypass events were related to construction activities taking place at the plant; all construction activity was complete by February/March 2006 and no further bypasses occurred.

Coliform and ammonia results indicate the plant functioned well in 2006. The plant's effluent passed all four toxicity tests.

Phosphorus reduction remained a problem at the plant in 2006. Completion of the aerated sludge digester was expected to reduce the concentration of phosphorous in the effluent though this effect was not demonstrated in the operating year. FARUC undertook measures to improve the precipitation of phosphorous in early 2007 which show promising results. Other operating changes will be investigated through the summer of 2007 to prepare for the upcoming winter ski season. There has been no measurable impact of phosphorous releases from the plant on Elk River background nutrient concentrations.

Operation of the sludge digester eliminated the need for emergency liquid sludge hauling. All sludge was bagged and disposed of at the approved landfill site.

Major new residential or hotel developments are not anticipated until 2008, at the earliest, though the resort is expected to see moderate growth over the next years with a projected peak flow of 1363 m^3 per day by 2009. The discharge flow limit may need to be raised to account for the proposed growth though the effect of the infiltration reduction program has reduced peak flows and may continue to reduce average flows. FARUC will continue to monitor flow and assess the need for any registration amendment.

In summary, the activated sludge treatment process functioned well in 2006 with only phosphorous concerns outstanding. A program will be initiated in the summer of 2007 to address effluent phosphorous concentrations.

13.0 AUTHORIZATION AND CLOSING

This report, entitled *2006 Sewage Treatment Plant Annual Report,* was prepared for the FARUC by Urban Systems Ltd. The material in this report reflects the best judgment of Urban Systems Ltd. based on the information available at the time of preparation. Any use that a third party makes of this report, or reliance on or decisions made based on it, is the responsibility of the third party. Urban Systems Ltd. accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions taken based on this report.

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APPENDIX A

Peak Expected Wastewater Flows by Year

Fernie Alpine Resort Estimated Sewage Generation (m^3/day)

Existing Development	Flow*	2006		Additional Sewage Flows Due to Expansion 2007	2008	2009	2010
	(l/unit/day)	Units	Generation	Generation	Generation	Generation	Generation
Griz Inn	1,136	45	51.1				
Wolf's Den	318	42	13.4				
Cornerstone	1,136	26	29.5				
Timberline Condos	1,022	58	59.3				
Polar Peaks (4-Plex Units)	1,136	24	27.3				
Timberline Single Family & B&B	1,363	51	69.5				
	Subtotal	**246**	**250.1**	**0**	**0**	**0**	**0**

Infill Units	Flow*	Units	Generation	2007	2008	2009	2010
	(l/unit/day)	(each)	(m^3/day)	Generation	Generation	Generation	Generation
Timberline Infills	1,022	57	58.3		44.968		40.88
Timberline Single Family	1,363	2	2.7				
Timberline Infill	1,022	46	47.0			61.32	
Timberlanding Multi-family	1,022					59.972	
Timberlanding Single Family	1,363					42.924	
Highline Infill	1,022	26	26.6				
	Subtotal	**131**	**134.6**	**0**	**44.968**	**164.216**	**40.88**

Highline Subdivision	Flow*	Units	Generation	2007	2008	2009	2010
	(l/unit/day)	(each)	(m^3/day)	Generation	Generation	Generation	Generation
Single Family	1,363	43	58.6		8.178		
Duplexes	1,363	10	13.6				
Parcel 31-Condotel	318	61	19.4				
Parcel 32-Duplex	1,363	16	21.8				
Parcel 36-Hotel	318	101	32.1				
Parcel 37-Townhouses	1,363	8	10.9				
Parcel 38-Townhouses	1,363	23	31.3				
Parcel 3-Condominium	1,363	12	16.4				
Parcel 8-Condominium	1,363	42	57.2				
	Subtotal	**316**	**261.4**	**0**	**8.178**	**0**	**0**

Day Users	Flow*	Population	Generation	2007	2008	2009	2010
	(l/skier/day)	(each)	(m^3/day)	Generation	Generation	Generation	Generation
Skiers	36	5200	187.2			64.8	
	Subtotal	**5200**	**187.2**	**0**	**0**	**64.8**	**0**

Dining Facilities/Bars	Flow*	Area	Generation	2007	2008	2009	2010
	(l/m^2/day)	(m^2)	(m^3/day)	Generation	Generation	Generation	Generation
Lizard Creek - Dining	97	54.7	5.3				
Lizard Creek - Bar	145	40.4	5.9				
Kelseys - Dining	97	204.4	19.8				
Kelseys - Bar	145	65.0	9.4				
Daylodge - Dining	97	358.6	34.8				
Daylodge - Bar	145	260.7	37.8				
Mean Bean	97	26.8	2.6				
Gabrielles	97	133.8	13.0				
Powder House Inn	97	232.2	22.5				
Bears Den	97	62.4	6.1				
	Subtotal	**1439**	**146.0**	**0**	**0**	**0**	**0**

Daily Wastewater Flow (m^3/day) *	**979.2**	**979.2**	**1032.4**	**1261.4**	**1302.3**
Corrected Daily Peak Flow Projections**	**1058.0**	**1058.0**	**1115.4**	**1362.9**	**1407.0**

* Estimated Wastewater Flows from BC Health Act, Sewage Disposal Regulation

** Based on correction factor for 2006 flow records, actual peak (1058) ÷ estimated sewage generation (979) = 1.08