2012

# CITY OF MERRITT

# WASTEWATER TREATMENT PLANT ANNUAL REPORT

Report Prepared By | Kevin Vilac, Chief Operator

MERRITT
COUNTRY MUSIC CAPITAL OF CANADA

## Table of Contents

**Overview**....3

**Introduction**....3

**Collection System**....3

Nicola Lift Station....3

Collettville Lift Station....4

**Influent**....4

**Wastewater Treatment Plant** (WWTP)....5

**Quality Monitoring**....7

**Rapid Infiltration Basins**....10

**Bio-Solids**....12

## Tables

**#1** Total Influent....5
**#2** Permit Requirements....8
**#3** Permit Requirements....8
**#4** Caro Lab Results....8
**#5** WWTP Parameters....9
**#6** WWTP Parameters....9

## Overview

The Wastewater Treatment Plant Monitoring Program was in accordance with Permit PE #115. Monthly and weekly laboratory results were sent to the Ministry of Environment, as well as used for this yearly report. Additional monitoring and testing of the Wastewater Treatment Plant was carried out for operational and maintenance purposes.

## Introduction

The City of Merritt's Wastewater Treatment Plant (WWTP) is located at 1298 Coldwater Avenue in the City of Merritt Public Works Yard. The City of Merritt's WWTP only treats wastewater from the City of Merritt; no other influent is accepted into the system unless authorized by the Public works manager. Merritt's WWTP was officially opened in August 1963 with a discharge permit of 1364 cubic meters per day. Since that time the plant has under gone two major upgrades and many smaller upgrades. The first major upgrade was in May 1985 which consisted of a new building and dewatering equipment. The second being more recently in 2007-2008 that consisted of a building for a degrit system, a second story added to the existing motor control room (MCC) and new motor control equipment. Other upgrades to note are the addition of two rectangular clarifiers in 1992 that replaced the smaller old ones, rapid infiltration basins were added in 1988 for final effluent disposal, stopping the year round discharge into the Coldwater River and a belt filter press installed in 1996 that now allows us to send our bio-solids for composting. The Bio-solids composting was started in 2008. The City of Merritt has strived to keep the WWTP operating with modern control systems and equipment that keeps its discharge levels well below the permitted levels set out by the Ministry. Also with the newer equipment we are able to run motors and pumps at rates exactly needed which intern is a large energy and cost savings.

## Collection System

The gravity sanitary sewer system is maintained by the Public Works Department. The Wastewater Treatment Division looks after two Syphons, as well as two Lift Stations that collect the wastewater and then pumps it into the trunk mains.

**Nicola Lift Station** is a small station with a 2.4 horse power Flygt pump. Down slightly from 2011, the Nicola pump in 2012 ran on average 69 minutes a day and up to a maximum of 140 minutes a day in the spring due to infiltration primarily from the trailer park it serves. The station is monitored by the WWTP's SCADA system 24/7 and will alarm the on-call operator if there is a high level in the station. A backup pump is stored at the WWTP for the Nicola lift station in case of a pump failure. In 2012 there were no failures or major repairs at the Nicola Lift Station.

**Collettville Lift Station** is a larger station that takes the wastewater flow from all of the Collettville area. The station is made up of 2, 10 horse power Flygt pumps with a diesel powered backup generator for power outages. In 2012 Collettville ran on average 143 minutes a day which is also down slightly from 2011. Collettville is monitored and will send out alarms 24/7 for high level, loss of communication, loss of power and pump failure by the WWTP's SCADA system. In 2012 Collettville lift station experienced a pump failure which was replaced with a rental pump until the pump was repaired. Each year both pump stations are cleaned with a vacuum truck and the pumps pulled for inspection and/or repairs.

**Lift Station Maintenance and Capital Projects completed in 2012 include:**

- Nicola lift station was cleaned four times by a contracted Vac truck.
- Nicola Lift Station pump was removed and inspected 4 times throughout 2012.
- Collettville Lift Station's pumps were pulled and inspected in July 2012.
- Pump #2 from Collettville Lift Station was rebuilt.
- Collettville Lift Station was cleaned twice by a contracted Vac truck.
- Physically inspected each lift station every week for operation and vandalism.
- There was no capital projects scheduled for either lift station in 2012.

**Lift Station Goals & Objectives planned for 2013 include:**

- Purchase a spare pump for Collettville Liftstation.
- Weekly inspection of pumps and level bulbs.
- Annual inspection and cleaning of Stations.

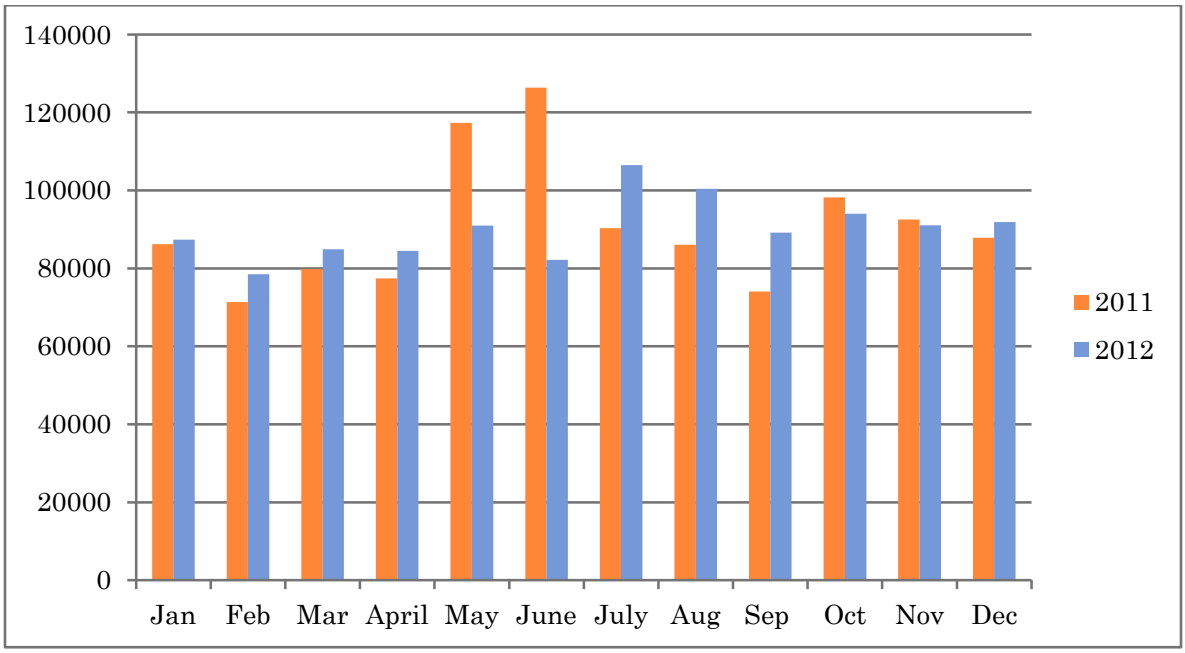
## Influent (Raw Wastewater)

In 2012 the City of Merritt Wastewater Treatment Plant received 1,081,353 cubic meters (237,864,407 million IG) of influent from the sanitary sewer system. The 2012 average daily influent flow rate was 2953 cubic meters /day. The average influent flow rate per person was 369.1 liters/day/person based on a population of 8000 for the city of Merritt, this is a 0.8% decrease from 2011 influent flow.

Peak flow day was observed on June 29$^{th}$ at 4439 m3.
Minimum flow day was observed on Feb 19$^{th}$ at 2211 m3.

Table #1 shows the monthly flow comparison from 2011 to 2012.

**Table #1**



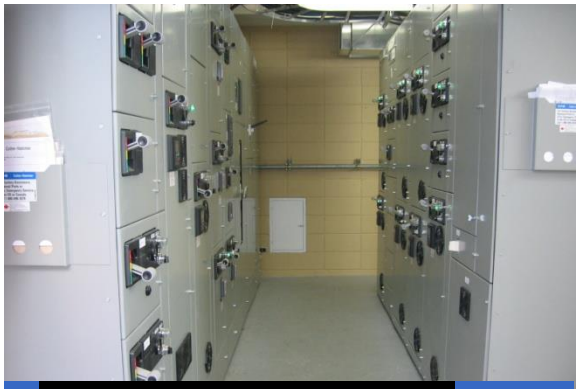

m3/month

## Wastewater Treatment Plant

The City of Merritt operates a class III activated sludge wastewater treatment plant. The WWTP is a 24/7 operation with the operators working 8 hours a day five days a week. Two hours a day are worked on weekends for process testing and equipment operational checks. The Wastewater Treatment Plant is operated by Chief Operator Kevin Vilac and a level II Operator Cliff Nokleby. We are also training two other operators (Tim Strayer, Tom Harington) to fill in for holidays, sick days and to work rotating weekends.

*Wastewater Treatment Plant*

The Wastewater Treatment Plant treats the wastewater influent received from the city by creating an environment in basins ideal for micro-organisms to grow and break down organic solids. The influent is directed through a series of different equipment and tanks that produce a high quality effluent that is then directed to Rapid Infiltration (RI) Basins. Also from this process thickened sludge is stored and run through a belt filter press to create a substance called bio-solids. These bio-solids are hauled to a local composting facility to be converted into a useable end product that is used as a soil supplement.
In 2012 the WWTP removed from the influent a total of 93% BOD5, 96% of the Total Suspended Solids, 96% Total Dissolved Phosphorous and 96% Total Phosphorus.



*Motor Control Centre*

The WWTP uses a *supervisory control and data acquisition* (SCADA) and *programmable logic controllers* (PLC) to help control and operate many different parameters within the WWTP. These controllers control equipment at rates that are exactly needed that in turn makes the equipment use only the power needed. This results in a large power savings for the City of Merritt. In 2008 the latest WWTP upgrades were officially completed. The new lift station that replaced the aging screw pumps and the new degrit building are proving and helping to produce a quality effluent. The new motor controls are also proving to be more efficient and have been considerably more reliable than the older equipment that was replaced.

**Summary of WWTP/Lift Station emergency call outs for 2012:**

- WWTP – 9
- Lift Stations – 6
- Hydro related (bumps, outages) – 1
- PLC Communications Failure-3

Thanks to B.C Hydro making upgrades and replacing faulty equipment we experienced a 91% reduction in call outs related to power. We also saw a decrease of 50% of call outs related to the plant. These types of call outs were reduced because of upgrades and process changes that we made to the treatment process. The reduction in call outs is directly related to the equipment upgrades made throughout the year. The overall 56 % reduction in call outs is a significant cost savings.

**Wastewater Treatment Plant Maintenance and Capital Projects completed in 2012 include:**

- Installed two more Dissolved Oxygen Probes.
- Rebuilt Blower #1.
- Replaced Digestor Blower VFD.
- Installed bypass insert for the main flow meter.
- Installed new main influent Flow Meter.
- Replaced Grit room Heater Cores.

**WWTP Goals & Objectives planned for 2013 include:**

- Daily/Weekly inspection and cleaning of equipment.
- Rebuild Blower #2.
- Install a new Plug Valve and controller on the EQ line.
- Replace aging WAS Flow meter.
- Replace aging Air Compressor.
- Continue to train and promote operator education.
- Continue to work and explore ways to help conserve water and power usage.

## Quality Monitoring

As outlined in our permit we monitor daily influent flow and weekly phosphorus levels. Monthly samples are also taken as per our permit for a 5 day biological oxygen demand (BOD5), Total Suspended Solids (TSS), total phosphorus (TP) and total dissolved phosphorus (TDP). Table #2 shows the parameters monitored, our permits required levels and the WWTP's 2012 average monthly lab results. You will notice we have maintained a yearly average of over 62% lower BOD**5**, 82% lower TSS, 67% lower TP and 87% lower for TDP then the maximum allowable permit levels.
Table #3 shows the requirements of our permit if effluent flow is directed to the Coldwater River. In 2012 no effluent was directed to the Coldwater River. Effluent would only be directed to this river if there was an emergency situation where the basins were unable to receive the total effluent flow. Final effluent has not been directed to the Coldwater River since 1997.
The Wastewater Treatment Plant exceeded the permitted flow requirements in 2012 for a period of six days. This was due to an extremely high water table during the spring freshet. The Ministry of Environment was made aware each day until the flows came back into the permitted standards.

**Table #2**

| Parameter's for WWTP & R.I basin inflow | PE #115 Requirements | 2012 WWTP Average |
|---|---|---|
| Max Daily Flow | 4615 m³ | 2953 m³ |
| BOD5 | < 45 mg/l | 17 mg/l |
| TSS | < 45 mg/l | 8 mg/l |
| TDP | < 1.0 mg/l | 0.13 mg/l |
| TP | <1.0 mg/l | 0.33 mg/l |

**Table #3**

| Parameter's for River Discharge | PE #115 Requirements | 2012 WWTP Average |
|---|---|---|
| Max Daily Flow | 4615 m³ | n/a |
| BOD5 | < 30 mg/l | n/a |
| TSS | < 40 mg/l | n/a |
| TDP | < 1.0 mg/l | n/a |
| Chlorine Residual | Non-detectable | n/a |

Table #4 shows the average monthly lab results for influent, effluent, phosphorus levels and total suspended solids. These results are sent to the Ministry of Environment each and every month.

**Table #4**

| 2012 | Final Effluent | | | | R.I Basin #2 | | Raw Wastewater | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | B O D | TSS | T.D.P. | T.P. | T.D.P | T.P. | BOD | TSS | TDP | TP |
| month | mg/l | mg/l | plant | plant | basin o'f | basin o'f | mg/l | mg/l | plant | plant |
| Jan | 21 | 17 | 0.08 | 0.42 | 0.04 | 0.26 | 220 | 244 | 3.87 | 9.92 |
| Feb | 12 | 6 | 0.06 | 0.17 | 0.18 | 0.21 | 240 | 181 | 4.31 | 8 |
| Mar | 23 | 11 | 0.08 | 0.44 | 0.08 | 0.24 | 220 | 266 | 4.63 | 9.07 |
| Apr | 21 | 9 | 0.05 | 0.37 | 0.08 | 0.15 | 270 | 209 | 5.37 | 7.54 |
| May | 13 | 6 | 0.02 | 0.09 | <0.01 | 1.12 | 274 | 228 | 5.87 | 9.74 |
| Jun | 15 | 6 | 0.11 | 0.30 | 0.04 | 0.14 | 258 | 223 | 7.35 | 8.5 |
| Jul | <10 | 5 | 0.11 | 0.25 | 0.25 | 0.46 | 188 | 134 | 3.6 | 6.67 |
| Aug | 26 | 10 | 0.13 | 0.39 | 0.17 | 0.25 | 190 | 158 | 3.99 | 8.06 |
| Sep | <10 | 7 | 0.10 | 0.19 | 0.16 | 0.21 | 249 | 218 | 6.47 | 13.00 |
| Oct | 12 | 5 | 0.07 | 0.43 | 0.15 | 0.23 | 307 | 95 | 3.4 | 8.66 |
| Nov | 12 | 10 | 1.09 | 1.21 | 1.26 | 1.50 | 281 | 198 | 3.78 | 6.00 |
| Dec | 11 | 7 | 0.06 | 0.30 | 0.05 | 0.19 | 259 | 315 | 0.42 | 14.00 |
| **Av.** | **17** | **8** | **0.16** | **0.38** | **0.22** | **0.41** | **246** | **206** | **4.42** | **9.10** |
| **Max** | **26** | **17** | **1.09** | **1.21** | **1.26** | **1.5** | **307** | **315** | **7.35** | **14.00** |
| **Min** | **11** | **5** | **0.02** | **0.09** | **0.04** | **0.14** | **188** | **95** | **0.42** | **6.00** |

Wastewater treatment plant operators also test, sample, monitor, and record 40+ other parameters each day to keep the plant operating at a high level of efficiency. Table #5 & #6 show some of these parameters that are monitored.

**Table #5**

| 2012 | Waste | Rate | Digester | Press | Feed | Solids | Cake | D.M.T. | rec'y |
|---|---|---|---|---|---|---|---|---|---|
| Month | m3/day | % | % | hours | m3 | m3 | % | tons | % |
| Jan | 65.9 | 2.6 | 0.79 | 92.3 | 2117 | 98 | 12.5 | 12.3 | 99.6 |
| Feb | 67.5 | 2.8 | 0.8 | 96.1 | 2231 | 93 | 12.7 | 11.8 | 99.1 |
| Mar | 70 | 2.9 | 0.80 | 114.3 | 2446 | 110 | 13.1 | 14.4 | 98.9 |
| Apr | 55.9 | 2.2 | 0.73 | 122 | 2606 | 115 | 12.8 | 14.7 | 98.5 |
| May | 64.4 | 2.5 | 0.74 | 113.1 | 2653 | 118 | 12.2 | 14.4 | 98.7 |
| June | 60.3 | 2.5 | 0.73 | 102.2 | 2284 | 95 | 12.8 | 12.2 | 99.1 |
| July | 77.1 | 2.5 | 0.60 | 130 | 2741 | 115 | 13.5 | 15.5 | 99.2 |
| Aug | 95 | 3.3 | 0.59 | 142.5 | 2989 | 115 | 13.1 | 15.1 | 99 |
| Sept | 87.8 | 3.3 | 0.65 | 107.6 | 2389 | 111 | 12.7 | 14.1 | 93.3 |
| Oct | 91.8 | 3.4 | 0.60 | 144 | 2831 | 158 | 12.8 | 20.2 | 98.8 |
| Nov | 81.8 | 3.1 | 0.60 | 124.1 | 2686 | 128 | 12.6 | 16.1 | 98.3 |
| Dec | 86.8 | 3.3 | 0.72 | 126.3 | 2487 | 151 | 13.7 | 20.7 | 98.5 |
| **Average** | **75.4** | **2.9** | **0.70** | **117.9** | **2538** | **117** | **12.9** | **15.1** | **98.4** |

**Table #6**

| 2012 | Flows | Raw SS | MLSS | MLVSS | RASS | SVI | Settling |
|---|---|---|---|---|---|---|---|
| Month | m3/day | mg/l | mg/l | mg/l | mg/l | ml/l | % |
| Jan | 2819 | 147 | 3074 | 2221 | 9,394 | 136 | 42 |
| Feb | 2706 | 166 | 3158 | 2165 | 9,710 | 103 | 33 |
| Mar | 2740 | 171 | 3145 | 2164 | 9,546 | 101 | 32 |
| Apr | 2816 | 171 | 2908 | 2053 | 8,300 | 161 | 47 |
| May | 2935 | 168 | 2894 | 2102 | 8,604 | 115 | 33 |
| June | 2739 | 167 | 2724 | 2018 | 9,010 | 109 | 30 |
| July | 3435 | 169 | 3368 | 2439 | 7,269 | 149 | 51 |
| Aug | 3240 | 178 | 2702 | 2139 | 6,389 | 175 | 52 |
| Sept | 2972 | 184 | 2812 | 2034 | 6,399 | 116 | 33 |
| Oct | 3032 | 208 | 2977 | 2109 | 6,886 | 143 | 42 |
| Nov | 3034 | 223 | 3037 | 2157 | 6,684 | 102 | 31 |
| Dec | 2964 | 185 | 3301 | 2374 | 7,990 | 130 | 43 |
| Average | **2953** | **178** | **3008** | **2165** | **8,015** | **128.3** | **39** |

## Rapid Infiltration Basins (R.I)

The R.I basins are located 0.7km west of the WWTP across the Coldwater River. The basins are a very simple system that receives the final effluent which is gravity fed from the WWTP then piped under the Coldwater River to a lined containment basin. The containment basin remains full at all times, from this basin the overflow is directed to feed the rapid infiltration basins. When the flow is directed to one of three rapid infiltration basins it allows the final effluent to seep naturally back into the ground. Each of the three rapid infiltration basins are rotated on a two week cycle.

*Rapid Infiltration basin*

**Rapid Infiltration Maintenance and Capital Projects completed in 2012 include:**

- Disked each basin twice spring/fall.
- Weeded around each basin.
- Scooped out weeds with backhoe that was growing into the basins.
- No capital projects were scheduled for 2012.

**Rapid Infiltration Basin Goals & Objectives planned for 2013 include:**

- Weekly inspection and cleaning of valves and pipes.
- Weekly inspection solid build ups.
- Spring clean up of weeds and grasses from around containment basins.
- Disk each basin.

## Bio-Solids Dewatering

*Belt Filter Press*

Solids that are settled out of the wastewater treatment process in the clarifiers are stored in an aerated digester that then is pumped to a belt filter press. The belt filter press presses (separates) the water from the solids. The solids are pumped to the press at an average of 0.70% for 2012 the rest being 99.3% water. The 0.70% is pressed to a 2012 average of 12.9% solids and the separated water is returned to the influent of the plant. The solids are then trucked to the composting site near the airport. In 2012 we averaged 4.5 dump truck loads or 29.3 m3 a week taken to the composting site. As shown in table #5 the press operated 1414.5 hours and pressed 30,460 m3 of digested solids.

**Belt Filter Press Goals & Objectives planned for 2013 include:**

- Daily/weekly inspection and cleaning of equipment.
- Replacement of worn bearings on press and conveyor.
- Remove old equipment from press room.
- Paint all walls and floor in press room.

## Bio-Solids

*Good Earth Composting Site*

In August of 2008 the City of Merritt contracted out the composting operation. The composting is now performed on the same city owned land that the city composting study was taking place located just west of the city and south of the airport. The company called Good Earth Company has now taken on the challenge of composting the city's bio-solids and also the old piles that were used in our composting study. The site has been developed to use the method of aerated static piles. With this method of composting the Good Earth Company has successfully created a composted material that can be resold and reused as a soil supplement. The City of Merritt has used this compost in the past year in many different applications around the city. Some of the compost was used to top dress the lawn at the city's Aquatic Centre, replace the soil in the downtown tree wells and a mulch cover at the new TNRD recycling centre.