

## **Overview**

The Wastewater Treatment Plant Monitoring Program was performed 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 undergone 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 upgrade in 2007-2008 which consisted of a building with a grit removal system, a second story was 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 old smaller 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 of Environment. Also, with the newer equipment, we are able to run motors and pumps more efficiently which in turn is a large energy and cost savings to the City.

## **Collection System**

The gravity Sanitary Sewer System is maintained by the Public Works Utilities Department. The Wastewater Treatment Division looks after two (2) Syphons and two (2) Lift Stations. Due to changes in regulation, the Wastewater Collection System was required to be classified in 2013. The City of Merritt's Wastewater Collection System is now regulated and classified as a Level II system. This system is maintained and monitored by Certified Operators.

**Nicola Lift Station** is a small station with a 2.4 horse power Flygt pump. In 2019, down from 2018, the Nicola pump, ran an average of 27.5 minutes a day and up to a maximum of 54.1 minutes on Mar 10, 2019. 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 2019 there were no failures or major repairs at the Nicola Lift Station.

**Collettsville Lift Station** is a larger station that takes the wastewater flow from all the Collettsville area. The station is made up of 2, 10 horse power Flygt pumps, a flow meter, a Programmable Logic Controller (PLC), wireless communications and a diesel powered backup generator for power outages. In 2019 Collettsville ran an average of 60 minutes a day and up to a maximum of 292 minutes, on Aug 8, 2019. Collettsville 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. 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 2019 include:**

- Nicola lift station was cleaned four times by the City's own Vactor truck.
- Nicola lift station pump was removed and inspected four times throughout 2019.
- Replaced float switch at Nicola.
- Collettsville lift station's pumps were pulled and inspected in July 2019.
- Replaced Collettsville Pump 1 Nov 15, 2019
- Collettsville lift station was cleaned four times by the City's own Vactor truck.
- Physically inspected each lift station every week for operation and vandalism.

**Lift Station Goals & Objectives planned for 2020 include:**

- Weekly inspection of pumps and level bulbs.
- Clean both force mains and inspect.
- Annual pump inspection.
- Replace Pump 2 at Collettsville.

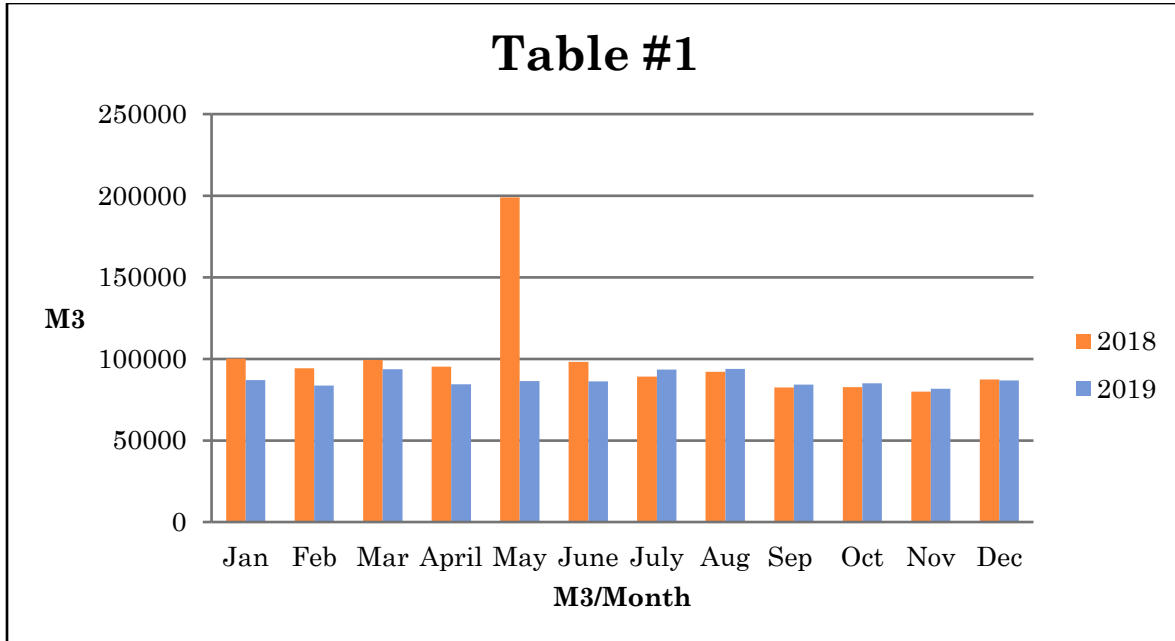
**Influent (Raw Wastewater)**

In 2019 the City of Merritt Wastewater Treatment Plant received 1 046 135 m<sup>3</sup> of influent from the sanitary sewer system. The 2019 average daily influent flow rate was 2867 m<sup>3</sup>/day. The average influent flow rate per person was 409.4 liters/day/person based on a population of 7000 for the city of Merritt, this is a 13% decrease from the 2018 influent flow average.

Peak flow day was observed on Dec 18 at 3278 m<sup>3</sup>.

Minimum flow day was observed on Sep 25 at 1790 m<sup>3</sup>.

Table #1 shows the monthly flow comparison from 2018 to 2019.



**Wastewater Treatment Plant**

The City of Merritt operates a Class IV Conventional Activated Sludge Wastewater Treatment Plant. The WWTP is a 24/7 operation with the operators working 8 hours a day five days a week. A few hours a day are worked on weekends for process testing and operational checks. The Wastewater Treatment Plant is operated and maintained by Certified Operators.

The Wastewater Treatment Plant treats the wastewater influent received from the City by creating an environment in the basins ideal for micro-organisms to grow and break down organic solids. The influent is directed through a series of different equipment and tanks to 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.



*Wastewater Treatment Plant*

These bio-solids are hauled to the City of Merritt Composting Facility to be converted into a useable end product that is used as a soil supplement.

In 2019 the WWTP removed a total of 93.4% Biological Oxygen Demand (BOD5), 95.0% of the Total Suspended Solids, 97.8% Total Dissolved Phosphorous and 95.7% Total Phosphorus from the Influent.



*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 as required. 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 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 2019:**

- WWTP – 13
- Lift Stations – 10
- Hydro related (bumps, outages) – 3

In 2019 there was decrease of callouts related to the plant by 68%. The call outs related to Lift Stations decreased by 50%.

### **Wastewater Treatment Plant Maintenance and Capital Projects completed in 2019 include:**

- Rebuilt Moyno solids pump
- Major service and belt replacement on the Belt Filter Press
- New Scum pump
- Main PLC upgrade
- New VFD for Eq pump 5
- New Decontamination room
- Replaced RAS discharge pipes in both Clarifiers

**WWTP Goals & Objectives planned for 2020 include:**

- Daily/Weekly inspection and cleaning of equipment.
- Replace distribution troughs in Clarifiers
- Replace Blower pipes
- Replace Biosolids loading conveyor
- Continue to train and promote operator education.
- Continue to explore ways that conserve water and power usage.

**Quality Monitoring**

As outlined in our discharge permit, the City monitors daily influent flow and weekly phosphorus levels. Also as part of the operating permit, monthly samples are taken 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 for our permit and the WWTP's 2019 average monthly lab results. You will notice we have maintained a yearly average of over 62.2% lower BOD5, 73.3% lower TSS, 64% lower TP and 88% lower for TDP then the maximum allowable permit levels.

**Table #2**

| Parameter's for R.I Basin Inflow | PE #115 Requirements | 2019 WWTP Average   |
|----------------------------------|----------------------|---------------------|
| Daily Flow                       | 4615 m <sup>3</sup>  | 2687 m <sup>3</sup> |
| BOD5                             | < 45 mg/l            | 17 mg/l             |
| TSS                              | < 45 mg/l            | 12 mg/l             |
| TDP                              | < 1.0 mg/l           | 0.12 mg/l           |
| TP                               | <1.0 mg/l            | 0.36 mg/l           |

Table #3 shows the requirements of our permit if effluent is directed to the Coldwater River. In 2019 no final effluent was directed to the Coldwater River. Final effluent had not been directed to the Coldwater River since 2018.

**Table #3**

| Parameter's for River Discharge | PE #115 Requirements | 2019 WWTP Average |
|---------------------------------|----------------------|-------------------|
| Daily Flow                      | 4615 m <sup>3</sup>  | 0 m <sup>3</sup>  |
| BOD5                            | < 30 mg/l            | 0                 |
| TSS                             | < 40 mg/l            | 0                 |
| TDP                             | < 1.0 mg/l           | 0                 |
| Chlorine Residual               | Non-detectable       | Non-detectable    |

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 monthly.

**Table #4**

| 2019  | 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        | basin | mg/l           | mg/l | plant | plant |
| Jan   | 8.4            | 8.4  | 0.08   | 0.26  | 0.05         | 0.28  | 168            | 284  | 4.99  | 8.9   |
| Feb   | 20.9           | 16.6 | 0.08   | 0.39  | 0.04         | 0.47  | 340            | 276  | 4.80  | 7.9   |
| Mar   | 20.2           | 18   | 0.14   | 0.37  | 0.04         | 0.15  | 130            | 144  | 4.28  | 6.6   |
| Apr   | 14.2           | 11.6 | 0.14   | 0.32  | 0.09         | 1.19  | 20             | 29   | 5.72  | 8.3   |
| May   | 8              | 8    | 0.08   | 0.25  | 0.09         | 0.26  | 190            | 260  | 6.39  | 9.3   |
| Jun   | 24             | 9.3  | 0.13   | 0.31  | 0.09         | 0.27  | 199            | 248  | 4.61  | 7.7   |
| Jul   | 18.9           | 10.6 | 0.15   | 0.38  | 0.19         | 0.31  | 338            | 286  | 5.57  | 8.5   |
| Aug   | 24.3           | 13.6 | 0.16   | 0.52  | 0.12         | 0.32  | 374            | 276  | 6.43  | 8.9   |
| Sep   | 19.4           | 16.3 | 0.15   | 0.49  | 0.12         | 0.28  | 246            | 182  | 4.81  | 6.3   |
| Oct   | 13.7           | 16.3 | 0.13   | 0.47  | 0.13         | 0.29  | 500            | 276  | 6.38  | 9.4   |
| Nov   | 22.2           | 7    | 0.10   | 0.25  | 0.10         | 0.22  | 405            | 334  | 6.15  | 9.3   |
| Dec   | 11.3           | 7.7  | 0.11   | 0.26  | 0.09         | 0.28  | 198            | 296  | 5.68  | 8.8   |
| Av.   | 17             | 12   | 0.12   | 0.36  | 0.10         | 0.36  | 259            | 241  | 5.48  | 8.3   |
| Max   | 24.3           | 18   | 0.16   | 0.52  | 0.19         | 1.19  | 500            | 334  | 6.43  | 9.4   |
| Min   | 8              | 7    | 0.08   | 0.25  | 0.04         | 0.15  | 20             | 29   | 4.28  | 6.3   |

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**

| 2019        | Waste       | Rate        | Digester    | Press       | Feed        | Solids     | Cake        | D.M.T.      | Capture     |
|-------------|-------------|-------------|-------------|-------------|-------------|------------|-------------|-------------|-------------|
| Month       | m3/day      | %           | %           | hours       | m3          | m3         | %           | tons        | %           |
| Jan         | 39.4        | 1.6         | 1.06        | 64.1        | 1889        | 135        | 13.1        | 17.8        | 96.6        |
| Feb         | 37.3        | 1.4         | 0.99        | 59.4        | 1759        | 172.5      | 12.3        | 21.2        | 96.9        |
| Mar         | 43.1        | 1.6         | 0.80        | 85.2        | 2518        | 210        | 13.1        | 27.4        | 94.8        |
| Apr         | 32.3        | 1.2         | 0.64        | 59.5        | 1748        | 127.5      | 12.3        | 15.8        | 94          |
| May         | 32.9        | 1.3         | 0.77        | 78.1        | 2300        | 157.5      | 12          | 18.9        | 95.7        |
| June        | 31.2        | 1.2         | 0.89        | 76.1        | 2197        | 165        | 11.5        | 19.0        | 95.5        |
| July        | 34          | 1.3         | 0.83        | 77.6        | 2300        | 135        | 12.6        | 17.0        | 95          |
| Aug         | 43.3        | 1.6         | 0.87        | 69.2        | 2056        | 135        | 13.5        | 18.2        | 95.1        |
| Sept        | 37          | 1.5         | 0.83        | 61.4        | 1849        | 120        | 13.2        | 15.8        | 96.4        |
| Oct         | 30          | 1.2         | 1.05        | 61.4        | 1867        | 127.5      | 13.2        | 16.9        | 95.3        |
| Nov         | 46.6        | 1.9         | 0.95        | 74.7        | 2215        | 127.5      | 13.6        | 17.2        | 95.3        |
| Dec         | 46.1        | 1.8         | 0.77        | 87.6        | 2618        | 157.5      | 13          | 20.6        | 96.2        |
| <b>Avg.</b> | <b>37.8</b> | <b>1.47</b> | <b>0.87</b> | <b>71.2</b> | <b>2110</b> | <b>148</b> | <b>12.8</b> | <b>18.8</b> | <b>95.6</b> |

**Table #6**

| 2019        | Flows       | Raw SS     | MLSS        | MLVSS       | RAS          | SVI          | Settling  |
|-------------|-------------|------------|-------------|-------------|--------------|--------------|-----------|
| Month       | m3/day      | mg/L       | mg/L        | mg/L        | mg/L         | ml/L         | %         |
| Jan         | 2804        | 310        | 3256        | 2329        | 11,086       | 94           | 31        |
| Feb         | 2986        | 279        | 2823        | 2047        | 10,762       | 178          | 50        |
| Mar         | 3023        | 309        | 2725        | 1884        | 7,767        | 164          | 45        |
| Apr         | 2811        | 320        | 2306        | 1669        | 6,622        | 279          | 64        |
| May         | 2787        | 328        | 2634        | 1886        | 9,262        | 164          | 43        |
| June        | 2875        | 268        | 2838        | 2098        | 9,621        | 163          | 36        |
| July        | 3014        | 313        | 2911        | 2114        | 9,272        | 141          | 41        |
| Aug         | 3028        | 295        | 2906        | 2078        | 9,870        | 126          | 36        |
| Sept        | 2811        | 324        | 2861        | 2063        | 8,919        | 108          | 31        |
| Oct         | 2740        | 407        | 3192        | 2251        | 10,854       | 92           | 29        |
| Nov         | 2722        | 356        | 2913        | 2099        | 8,496        | 91           | 26        |
| Dec         | 2797        | 260        | 3315        | 2416        | 8,794        | 127          | 42        |
| <b>Avg.</b> | <b>2867</b> | <b>314</b> | <b>2890</b> | <b>2078</b> | <b>9,277</b> | <b>143.9</b> | <b>40</b> |

**Rapid Infiltration Basins (RI)**

The RI 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 is rotated on a two week cycle.



*Rapid Infiltration basin*

**Rapid Infiltration Maintenance and Capital Projects completed in 2019 include:**

- Disked each basin.
- Weeded around each basin.

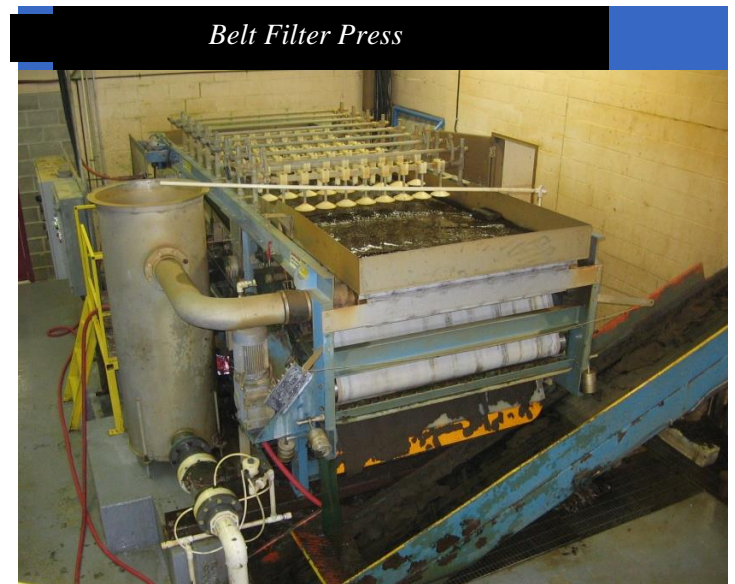
**Rapid Infiltration Basin Goals & Objectives planned for 2019 include:**

- Weekly inspection and cleaning of valves and pipes.
- Repair roads
- Disk each basin.

**Bio-Solids Dewatering**

Solids that are settled out of the wastewater treatment process from the clarifiers are stored in an aerated digester. The solids are then pumped to a belt filter press. The belt filter press separates the water from the solids. In 2019 the solids were pumped to the press at an average concentration of 0.87% solids with the rest being 99.13% water. The 0.87% is pressed to an average of 12.8% cake solids and the separated water is returned to the influent of the plant. The Bio-solids are then trucked to the composting site near the airport.

In 2019, we averaged taking 4 dump truck loads or 30 m3 a week to the composting site. As shown in table #5 the press operated 854.3 hours and pressed 25,316 m3 of digested solids in 2019.



*Belt Filter Press*



**Belt Filter Press Goals & Objectives planned for 2019 include:**

- Daily/weekly inspection and cleaning of equipment.
- Replace filter belts on press.
- Replacement of biosolids conveyor.
- Paint the floor in press room.
- Paint the walls in the press room.

**Bio-Solids**



In November of 2015 the City of Merritt purchased the composting operation from the Good Earth Company.

The composting is now performed by City Staff on City owned property. The site has been developed to use the method of aerated static piles. With this method of composting the City of Merritt Composting Facility has successfully created a composted material that can be reused as a soil supplement.

The City of Merritt has used this compost in many different applications around the City.