



**DISTRICT OF LAKE COUNTRY
WASTEWATER TREATMENT PLANT
ANNUAL REPORT**

2020



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1.0 SPECIFIC AUTHORIZED DISCHARGES AND RELATED REQUIREMENTS

This annual report for Year 2020 is submitted according to the requirements of the Lake Country Wastewater Treatment Plant (LCWWTP) Operational Certificate – PE #14651 with amendment ME #14651. This report follows the format detailed in the “Operational Certificate Permit”, a copy of which is attached in **Appendix A**.

The LCWWTP, located at 4062 Beaver Lake Road in Lake Country, British Columbia, is a Class IV tertiary treatment plant owned, operated and maintained by the District of Lake Country.

1.1 Discharge of Effluent

The site reference number for the effluent discharge is Environmental Monitoring System (EMS) E233626. The LCWWTP discharges reclaimed wastewater to a ground infiltration system located south of the treatment works. In 2012, infiltration capacity was renewed with the addition of three open basins. In 2015, the existing sub-surface field was renewed to its original condition with new pipe and media. The discharge is authorized under provisions of Operational Certificate – PE #14651, issued November 5th, 1998 (amended August 22, 2013).

1.2 Authorized Rate of Discharge (m³/d)

The authorized maximum daily discharge limit issued for the year 2020 is 1610 m³/d, based on a monthly average (as per MOE file 76750-40 amended from 2200 m³/d, August 22, 2013). Effluent totals are being calculated using the incoming sanitary flow meter plus the septage receiving totalizer.

- 2020 Annual Average 1756 m³/d (2019=1638 m³/d)
- 2020 Peak Month 58,709 m³ – August 2020; and
- 2020 Peak Daily 2169 m³/d – June 14, 2020



Effluent Basin #1

The Septage Receiving Facility accounts for a considerable portion of the flows through the treatment plant. The daily septage flows for Year 2020 are as follows:

- Annual Average 41.6 m³/d (2020=36.6 m³/d)
- Peak Month 1760.4 m³ – May 2020; and
- Peak Daily 176.9 m³/d – May 22, 2020

Details of the monthly flows are provided in **Table 1**.

2020	Influent Flow	Effluent				Septage Flow
		Flow *	Minimum*	Maximum*	Daily Ave.*	
	m3/month	m3/month	m3/day	m3/day	m3/day	m3/month
January	49,377	49,851	1,475	1,789	1,608	473
February	47,517	48,102	1,566	1,879	1,659	586
March	49,535	50,615	1,567	1,752	1,633	1,080
April	47,187	48,621	1,542	1,687	1,621	1,434
May	54,857	56,617	1,588	2,004	1,826	1,760
June	54,737	56,251	1,764	2,169	1,875	1,513
July	55,654	57,194	1,706	1,994	1,845	1,540
August	57,220	58,709	1,699	2,072	1,894	1,489
September	51,973	53,656	1,662	1,908	1,789	1,683
October	54,071	55,607	1,663	1,896	1,794	1,536
November	52,309	53,648	1,712	1,901	1,788	1,339
December	53,121	53,898	1,652	1,832	1,739	777
Total	627,558	642,769			1,756	15,210

*Effluent calculated from influent + Septage

Table 1 - Daily, Monthly and Average Flows

1.3 Effluent Quality - Ground Discharge by Infiltration

The LCWWTP treatment process is modified 3-Stage Bardenpho process that uses biological nutrient removal (BNR) arranged in sequential anaerobic, anoxic and aerobic zones for nutrient removal from the municipal wastewater. Long-term effluent discharge requirements are listed in **Table 2**.

Parameter	Daily	Weekly
Soluble BOD5 (mg/l)	10	
Total Suspended Solids (mg/l)	20	
Ortho-Phosphorus (mg/l as P)	1.5	
99 percentile	0.9	
90 percentile	0.6	
Annual Average	0.15	
Soluble Nitrogen (mg/l as N)		6.0

Table 2 - Effluent Quality Limits – Long Term Standards

Daily in-house samples of Ortho-phosphorus, ammonia-nitrogen and nitrite / nitrate-nitrogen are analyzed on-site with a HACH DR3900 Spectrophotometer. Ammonia-nitrogen and nitrates / nitrite-nitrogen are added together and reported as total soluble nitrogen, according to the discharge permit criteria. Monthly samples are analyzed for Suspended Solids and Soluble BOD(5) by an outside accredited lab. Listed in **Table 3** and **Table 4** are monthly average values for these effluent parameters and their respective standards.



In house laboratory

The 2020 operating results and effluent discharge criteria for Soluble BOD, TSS, soluble phosphorus and soluble nitrogen are presented in the following sections.

1.3.1 Soluble BOD (SBOD)

Monthly BOD samples analyzed by the accredited lab showed no results higher than 6 mg/L. The discharge permit states that effluent BOD shall be equal to or less than 10 mg/l.

1.3.2 Total Suspended Solids (TSS)

Suspended Solids are analyzed monthly by accredited lab; the yearly average was 4 mg/l with a peak month of 6 mg/l TSS. The discharge permit states that effluent TSS shall be less than 20 mg/l. TSS is also done in-house five days a week to help with process control.

1.3.3 Ortho Phosphorus

Effluent Ortho Phosphorus is analyzed daily on-site as well as monthly by an external accredited laboratory (**Table 3**). The biological nutrient removal process is supported with periodic Alum addition. Annual Ortho Phosphorus discharge averaged 0.02 mg/l by the monthly accredited lab analysis and 0.06 mg/L by daily in-house analysis.

The permit annual average “not to exceed” 0.15 mg/l was achieved at 0.06 mg/l. The 99 percentile limit of 0.90 mg/l WAS met with a result of 0.55 mg/l. The 90 percentile limit of 0.60 mg/l was achieved with a result of 0.07 mg/l.

At no time in 2020 did the effluent Ortho Phosphorus exceed the daily limit of 1.5 mg/l

1.3.4 Total Soluble Nitrogen (TSN)

Total Soluble effluent Nitrogen analysis is measured as the sum of ammonia, nitrite, and nitrate nitrogen. Results for TSN are analyzed daily in house as well as monthly by the accredited lab (**Table 3**). Issues regarding TSN removal have mostly been attributed to the strength and volume of our centrate and septage. Effluent TSN variations can typically be seen with the volume of septage received. Cold weather has also had a detrimental effect on TSN removal and during the colder months ammonia removal has been difficult.

In 2020, the facility experienced 0 days where the TSN limit of 6.0 mg/l was exceeded (see Appendix D – In-house lab results).

The yearly average was 2.61 mg/L TSN by accredited lab analysis and 2.24 mg/L TSN by in-house daily lab analysis. The permit limit for TSN is currently at 6.0 mg/l.

	Ortho P (mg/l as P) Monthly Average		Total Soluble N (mg/l as N) Monthly Average	
	In-house	Accredited Lab	In-house	Accredited Lab
Permit Levels <small>(maximum)</small>	1.5		6.0	
January	0.03	0.01	1.96	1.49
February	0.02	0.01	2.20	1.74
March	0.03	0.03	2.79	1.85
April	0.22	0.02	2.87	2.88
May	0.04	0.02	2.66	2.56
June	0.04	0.04	2.51	2.45
July	0.05	0.01	2.97	3.22
August	0.06	0.02	2.44	1.88
September	0.06	0.02	2.68	1.91
October	0.05	0.02	2.53	2.14
November	0.05	0.02	2.66	2.32
December	0.03	0.01	2.99	2.43
Annual Average	0.06	0.02	2.61	2.24

Table 3 – Effluent Sampling - Ortho Phosphate and TSN

	SBOD mg/l	TSS mg/l	pH
	10	20	
Permit Level	10	20	
January	<4	5	7.56
February	<3	<4	7.79
March	<3	6	7.64
April	<3	6	7.75
May	<3	4	7.85
June	5	3	7.88
July	4	3	17.98
August	4	4	7.90
September	<4	3	7.90
October	<6	5	7.88
November	3	4	7.72
December	4	3	7.59
Annual Avg.	4	4	8.62

Table 4 – Effluent Sampling - Monthly Accredited Lab Analysis – BOD, TSS and pH

1.4 Additional Effluent Sampling Program

All data sampled and collected is located in **Appendix D**.

2.0 INFLUENT MONITORING REQUIREMENTS

2.1 Influent Sampling Program

Grab samples are taken daily and analyzed in house for the following; Ortho phosphorus expressed as mg/l as P, ammonia nitrogen, and nitrate expressed as mg/l as N (TSN), and pH. Total suspended solids are also analyzed daily for operational information.

Grab samples are also taken once per month and sent to an off-site accredited lab for BOD(soluble), Total Phosphorus, Total Nitrogen and Total Suspended Solids (TSS). **Table 5** lists the monthly averages for parameters monitored.

2020	BOD(s)	TSS	Total-P	TSN	pH
	mg/l	mg/l	mg/l as P	mg/l N	
January	89	206	10.00	73.70	7.28
February	127	270	9.99	68.90	6.80
March	72	334	10.90	83.20	6.98
April	93	304	11.80	87.70	7.39
May	94	228	12.90	89.70	7.14
June	536	256	9.82	80.00	6.99
July	237	280	9.97	87.90	7.32
August	356	326	11.40	87.50	7.01
September	268	220	9.86	88.90	7.12
October	290	248	15.40	82.80	6.40
November	367	386	10.40	88.60	6.99
December	294	79	11.20	78.30	6.88
Annual Avg.	235	261	11.14	83.10	7.03

Table 5 – Influent Sampling – Monthly Accredited Lab Analysis

3.0 LAKE AND CREEK MONITORING

In March of 2004, the District of Lake Country installed the Groundwater Extraction Well that would pump groundwater from the Southwest corner of the Wastewater Treatment Plant Property to the middle of Vernon Creek at the south end of Swalwell Park. Extraction from this well could possibly commence once sufficient data has been collected and discharge to Vernon Creek has been approved.

4.0 GROUNDWATER MONITORING PROGRAM - INFILTRATION

4.1 Groundwater Elevations

The groundwater-monitoring program was developed by the geo-technical engineers at Golder Associates to monitor the following issues:

- groundwater flow pattern;
- groundwater quality;
- nutrient removal capability of the soil;
- groundwater levels
- give reasonable notice of impending high ground water problems; and
- Phosphorus and nitrate levels which may adversely affect the public, shorelines of Ellison and Wood Lake, domestic wells, or any other down gradient properties.

Ground water depths are measured monthly at 12 monitoring well locations. These monitoring wells, as well as six house wells are sampled and analyzed twice a year. Location map, lab results and grounds water depths are all located in **Appendix E.**

5.0 SLUDGE MONITORING REQUIREMENTS

5.1 Sludge Volume Measurement

Table 6 details the total amount of dewatered sludge hauled to the Ogogrow Production Facility.

2020	Total Monthly	
	# of loads	dry - tonnes
January	14	111.6
February	14	120.0
March	18	159.8
April	23	183.8
May	24	207.8
June	22	185.4
July	22	193.1
August	20	172.9
September	23	198.9
October	21	189.5
November	19	181.5
December	17	151.3
Total	237	2056.0

Table 6 -

Sampling - Hauled to Compost Facility

Dewatered Sludge

5.2 Sludge Sampling Program

Dewatered sludge samples are sent to an accredited lab on a monthly basis. The results of this monitoring are provided in **Appendix D**.



Pieralisi Centrifuge

5.3 Sludge Management Plan

Biosolids produced in the wastewater treatment plant process are trucked to the Ogogrow Production Facility at 551 Commonage Road in Vernon, B.C. where they are beneficially reused to produce a soil amendment known as Ogogrow™.



The process used for the stabilization of biosolids is the Extended Aerated Static Pile Composting Method. The biosolids are mixed with wood waste and the compost is aerated for a period of about 20 days. Naturally occurring aerobic bacteria generate elevated pile temperatures that destroy pathogens. All compost processed meets the minimum temperature requirement of 55 degrees Celsius for at least three days and 45 degrees Celsius for 14 days to achieve the requirements of the Organic Matter Recycling Regulation. Composted biosolids are then placed on a secondary aeration system for 14 days, followed by a curing process for a minimum of ninety days. Compost is screened to one half inch to produce the final product. Each 500 cubic yard batch is tested for *Salmonella* and Fecal Coliform bacteria prior to sale, with upper acceptable limits of 0.75 mpn/g *Salmonella*, and 1000 mpn/g Fecal Coliform. Furthermore, Ogogrow™ is tested at regular intervals for metals, nutrients, and other parameters, which are either required by regulation, or deemed to be important information for the end user.

The Facility produces Class A compost. This means that the product can be sold with no restrictions for use, so it can be applied to flowers, shrubs and vegetable gardens. Ogogrow is widely used throughout the Okanagan by gardeners and landscapers.



Lab analysis for biosolids can be found in **Appendix F**

6.0 SEPTAGE HANDLING FACILITY

The Lake Country Wastewater Treatment Plant is the site for the Regional District of the Central Okanagan septage receiving facility. This facility is owned by the R.D.C.O. but is operated by the District of Lake Country staff. The facility was designed to collect septage tank and holding tank wastes within the Regional District boundary (between Summerland and Vernon). The septage data collected and analyzed is located in **Appendix F**.

7.0 WASTEWATER COLLECTION SYSTEM

The District of Lake Country Wastewater Collection system consists of 12 lift stations and 54 kilometers of sanitary sewer main. Other appurtenances are air valves, siphon chambers as well as an odor chemical dosing station. The system is registered as a Level II collection system by the EOCP.

7.1 Infiltration, Inflow and Cross Connections

As the District of Lake Country grows, so has the collection system infrastructure. While there has been no noticeable infiltration issues, there has been some recognized sources of inflow from properties dealing with drainage from flood events and high groundwater table. The District of Lake Country has been in contact with several properties and continues to deal with these on a case by case basis.

In the past, flow from pool discharge has had noticeable effects on the collections system and lift stations. These connections have been identified and a notice sent to property owners advising them of District bylaws regarding waste sent to the sanitary system. An inspection and follow up program has been completed and discharge from pools have been mitigated.

8.0 INFLUENT WASTES BYLAW

The District of Lake Country currently has in effect a Sewer Use Bylaw.

9.0 WATER CONSERVATION

The District of Lake Country promotes a water conservation program to encourage a reduction in the volume of domestic, industrial and commercial wastewaters discharged to the sewer collection system. For more information see: <http://www.makewaterwork.ca/>

10.0 GENERAL REQUIREMENTS

10.1 Emergency Procedures

Material Safety Data Sheets for chemicals used at the treatment plant are located at the treatment plant. These chemicals include Ferric Chloride for H₂S control (not currently used), Aluminum Sulphate, used to assist phosphorus removal in the secondary clarifier, Hydrated Lime for septage phosphorus control, and Polymer used in the sludge de-watering process.

The “District of Lake Country Wastewater Treatment Facility Safety, Health and Environment Manual” is located at the site and is updated on a continuous basis.

In case of a power failure, an automated diesel generator provides emergency on-site power generation. The treatment plant is monitored by a Protalk Alarm Dialer for callout alarms and site security.

The Emergency Response Plan was updated in May 2020

10.2 Operation and Maintenance

The Operators complete several “Plant Operation Checklists” every day; a copy of these is attached in **Appendix B**.

In late 2009, a Preventative Maintenance Software program was purchased in collaboration with the District of Lake Country’s other utilities. Maintenance schedules and asset management information is being tabulated and entered.

All equipment is listed in the maintenance database and all manufacturer data and literature is indexed in binders.

10.3 Bypasses

There were no plant bypasses required in 2020.

10.4 Process Modifications

In September 2014, a 6.8 million dollar upgrade to the Wastewater was completed. In 2015, one of the existing sub-surface tile fields was retrofitted. The retrofit included removal of the existing media, piping and top cover, and bringing the field back to as-new condition. This was done with the necessary approvals from the Ministry of Environment. There have been no modifications or retrofits in 2019.

10.5 Odor Control

In 2020 no odor complaints were received regarding this facility. However, some odor issues have occurred concerning the collection system. The District of Lake Country has purchased two odor loggers (H₂S meters) to monitor the H₂S gas in the collection system. Odor neutralizing chemicals have been utilized in select areas and are used as required.



Lake Country Biofilters

10.6 Facility Classification and Operator Certification

The British Columbia Environmental Operators Certification Program (EOCP) classifies the Lake Country Wastewater Treatment Plant as a Level IV facility and the Collection system a Class II system. The four staff members at the LCWWTP are all EOCP-certified wastewater treatment plant operators and or Collection system operators. Levels of certification range between level II to level IV for municipal wastewater treatment.

11.0 AMRY AND CARR'S LANDING SATELLITE PLANTS

11.1 AMRY (RE#17842)

Amry WWTP is an extended aeration facility that services a subdivision on the Oyama isthmus. Weekly in-house samples, as well as monthly accredited lab samples, are analyzed (EMS site reference #E262982). **Appendix D** shows monthly lab results for AMRY WWTP and flow readings are tabulated below (**TABLE 7**). Even though only bi-annual sampling is required, samples are taken and analyzed on a monthly basis by accredited lab and weekly by the in-house lab. AMRY became an EOCP certified facility (#2125) on January 23, 2013.

In September 2017, an additional storage vault was added to the treatment facility. This storage was intended to increase emergency capacity in event of extreme flow situations or extended power interruption.



AMRY WWTP

2020	Amry Average Daily Flow (m3)
Jan	9.37
Feb	10.08
Mar	10.81
Apr	12.26
May	12.41
Jun	12.30
Jul	13.07
Aug	14.11
Sep	10.74
Oct	11.99
Nov	11.64
Dec	12.79

11.2 Carrs Landing – Whitson-Nuyens (PE 10821)

The Carrs Landing septic disposal system consists of two separate low pressure collection systems, 4 pump stations, force mains and tile disposal fields. As per Permit requirements (Sec. 3.2) flow monitoring is compiled and tabulated (**TABLE 8**). For ease of reporting, daily values have been averaged and the daily averages shown for each month. In August 2019, the Lance Marshal system was upgraded with new pumps and a flow meter. More accurate flow totals are now being seen and are generally lower than previous calculated. Similar upgrades are planned for the Nuyens system in 2021.

2020	Average Daily Discharge for Whitson Nuyens (m ³ /day)	Average Daily Discharge for Lance Marshall (m ³ /day)
Jan	6.8	5.5
Feb	3.5	5.5
Mar	4.8	3.2
Apr	6.7	3.9
May	8.3	6.7
Jun	9.6	12.4
Jul	10.3	8.1
Aug	9.2	8.4
Sep	9.5	4.2
Oct	6.1	4.4
Nov	7.0	4.8
Dec	7.5	5.1

Table 8 – Carrs Landing average daily flows