

Lyall Harbour/Boot Cove Water System

2019 Annual Report



Introduction

This report provides a summary of the Lyall Harbour/Boot Cove Water Service for 2019 and includes a description of the service, summary of the water supply, demand and production, drinking water quality, operations highlights, capital project updates and financial report.

Service Description

The community of Lyall Harbour/Boot Cove is primarily a rural residential development with community and commercial properties located on Saturna Island in the Southern Gulf Islands Electoral Area which was originally serviced by a private water utility and in 1978 the service converted to the Capital Regional District (CRD). The Lyall Harbour/Boot Cove water service is made up of 171 parcels (Figure 1) encompassing a total area of approximately 100 hectares. Of the 171 parcels, 154 properties (164 SFE's) are connected to the water system.

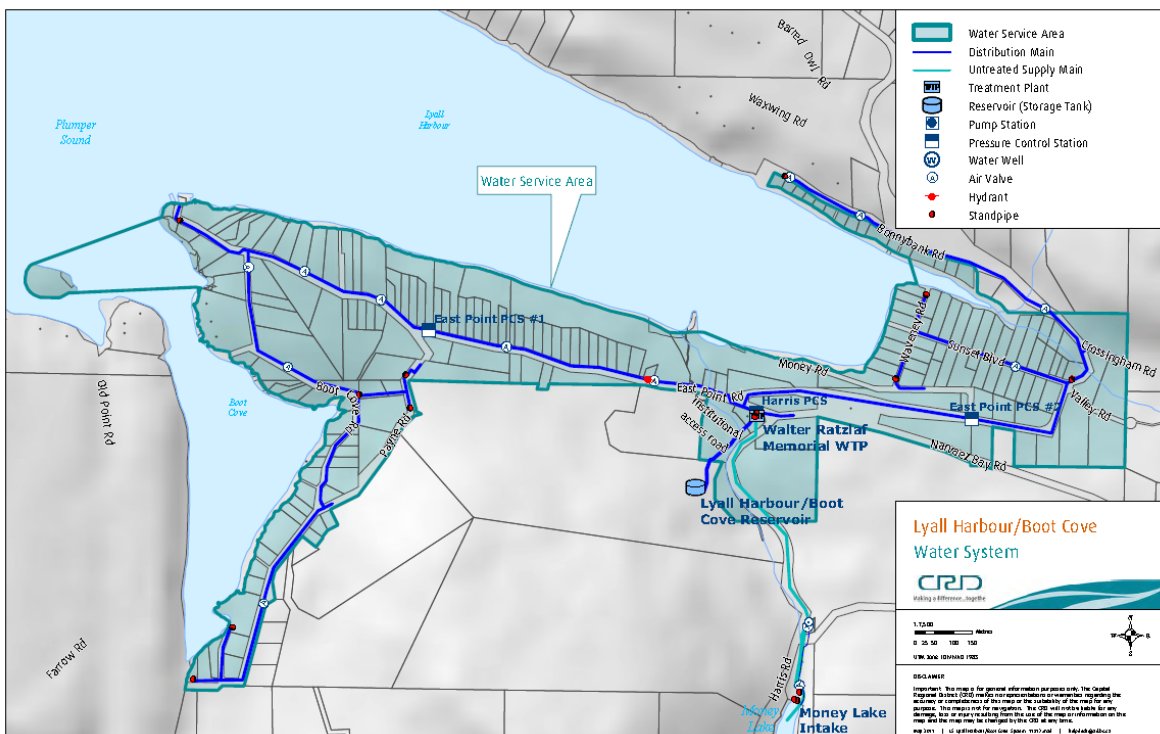


Figure 1: Map of Lyall Harbour/Boot Cove Water System

The Lyall Harbour/Boot Cove water system is primarily comprised of:

- Two raw water sources:
 - o Money Lake, a small, impounded, surface water body that lies within a 94 hectare (230 acre) watershed on private land.
 - o Ground water spring (seepage pit) located near the base of Money Lake Dam.
- One earthen dam structure, Money Lake Dam No. 1.
- Treatment equipment including ozonation (currently offline), two stages of filtration (granular and adsorption), ultraviolet light disinfection and chlorine disinfection.
- One steel storage tank (total volume 136 cubic metres or 36,000 USGAL).
- Supervisory Control and Data Acquisition (SCADA) system.
- Distribution system and supply pipe network (8,390 metres of water mains).
- Other water system assets: 154 service connections and meters, three pressure reducing valve stations, 50 gate valves, 12 standpipes and a small auxiliary generator.

Water Supply

Referring to Figure 2 below, Money Lake monthly water levels are highlighted for 2019. Water supply levels for the year are higher in 2019 than historical limits. It is important to note that water supply levels in Money Lake, prior to 2008, were historically lower during the summer period. An upgrade to mitigate the low water levels involved the installation of a groundwater seepage spring recirculation pumping system. Excess water from the seepage spring is pumped back to Money Lake in order to keep the Lake as full as possible. The groundwater seepage spring water level is not monitored; however the seepage spring weekly flow rate is monitored to confirm production rate. The seepage spring typically provides 100% of the winter water system demand for the community. However Money Lake water is used periodically to supplement seepage spring flows, typically during the dry period.

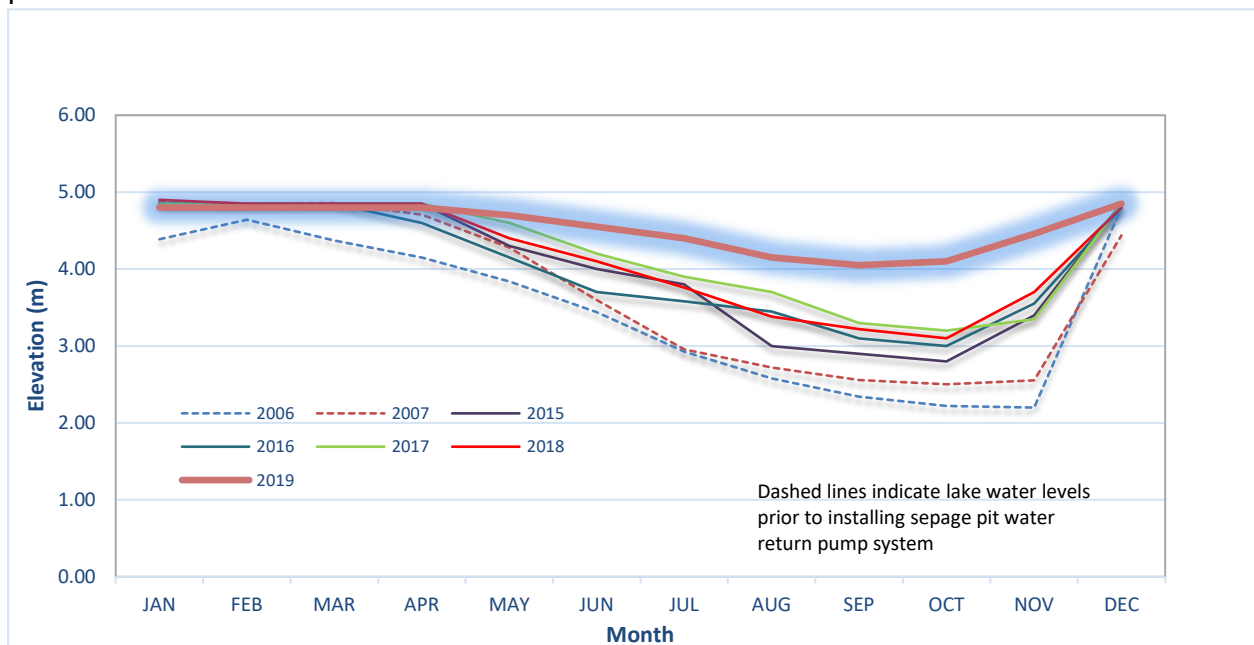


Figure 2: Money Lake Monthly Water Level

Water Production and Demand

Referring to Figure 3, 20,769 cubic meters of water was extracted (water production) from the seepage spring and Money Lake Reservoir in 2019; a 22% decrease from the previous year and a 17% decrease from the 5 five year average. Water demand (customer water billing) for the service totaled 17,541 cubic meters of water; a 3% increase from the previous year and a 1% increase from the five year average. The lower water production is partially the result of water system leak repairs.

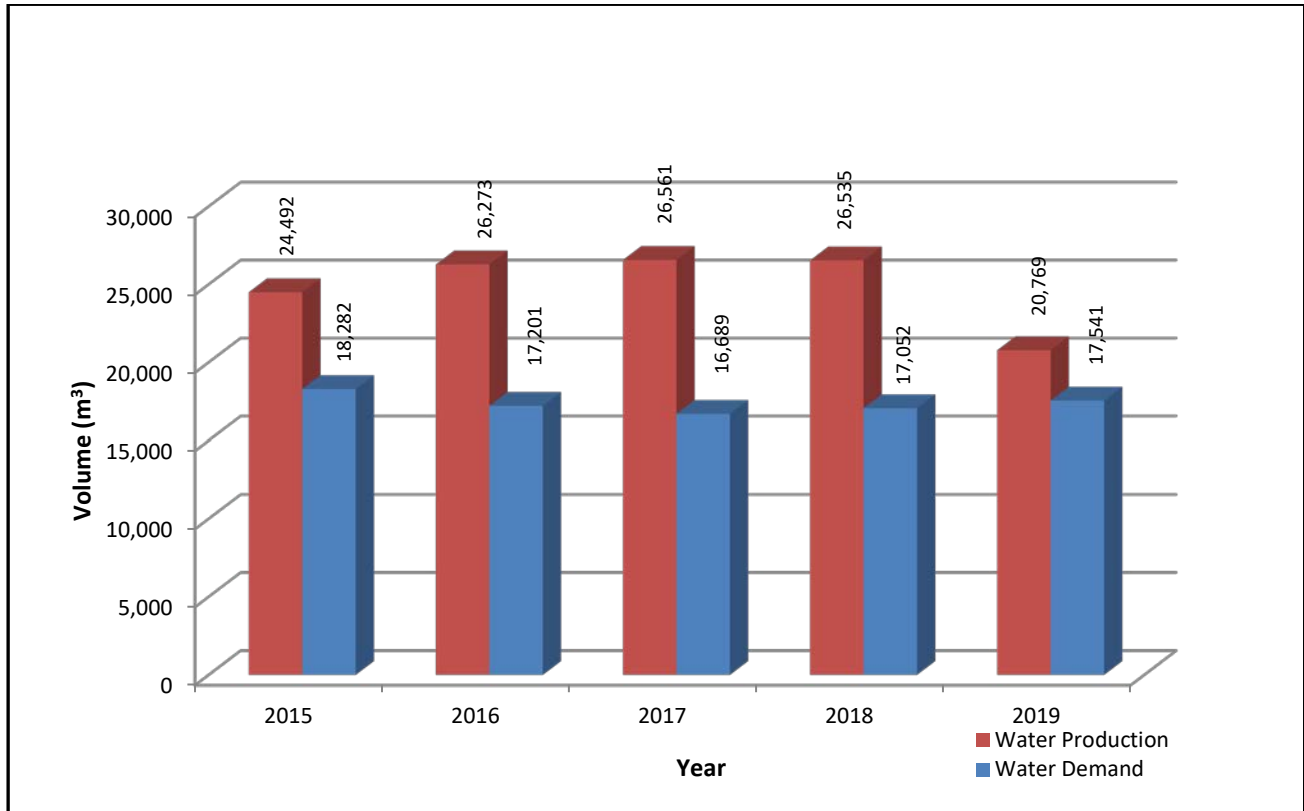


Figure 3: Lyall Harbour/Boot Cove Water System Annual Water Production and Demand.

The difference between annual water production and annual customer demand is referred to as non-revenue water and can include water system leaks, water system maintenance and operational use (e.g. water main flushing, filter system backwashing), potential unauthorized use and fire-fighting use.

The 2019 non-revenue water (3,228 cubic meters) represents about 16% of the total water production for the service area. However, almost 10% of the non-revenue water can be attributed to operational use which includes a water main flushing to keep chlorine residuals at acceptable levels at the extremities of the water system and water treatment filtration system backwashing activities. Therefore, the non-revenue water associated with system losses is approximately 6% which is considered acceptable for small water systems.

Figure 4 illustrates the monthly water production for 2019 along with the historical water production information. The monthly water production trends are typical for small water systems such as the Lyall Harbour/Boot Cove water system.

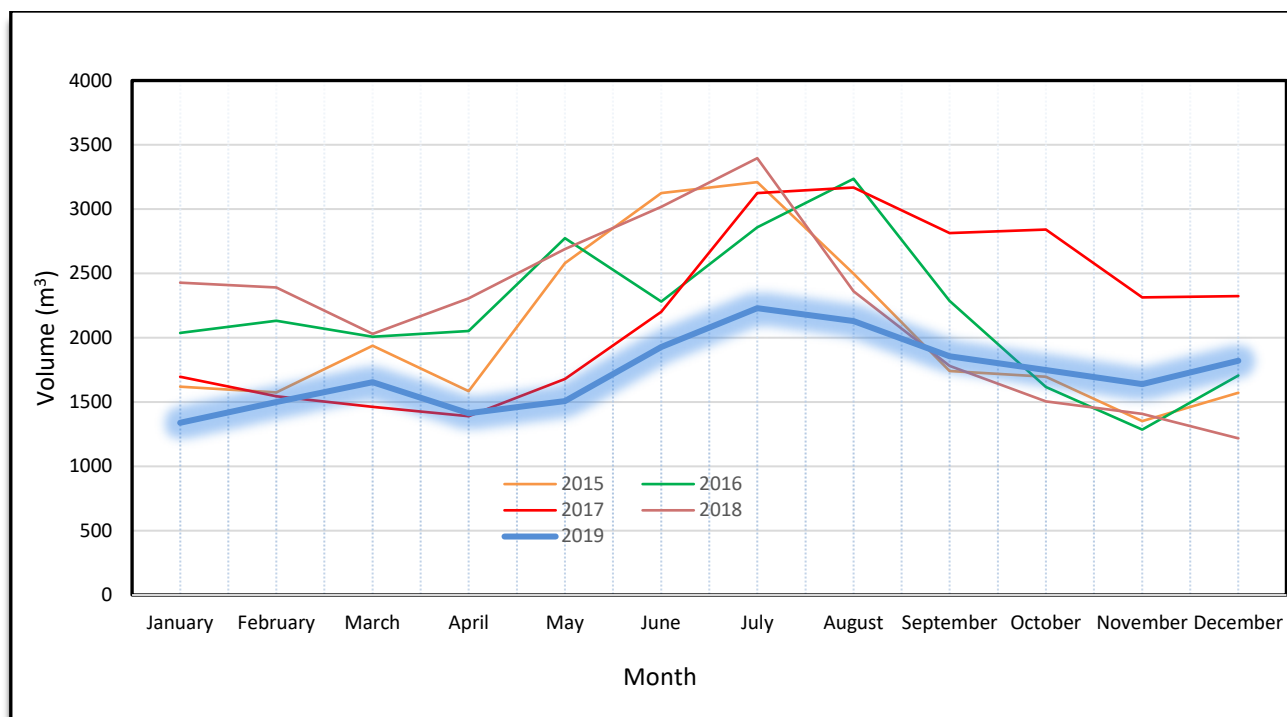


Figure 4: Lyall Harbour/Boot Cove Water Service Monthly Water Production.

Drinking Water Quality

The Lyall Harbour/Boot Cove Water System uses predominantly seepage water collected from below the Money Lake dam as the primary raw water source. During the summer months this source is supplemented with flows from Money Lake. During late summer and early fall 2019, almost all source water was supplied by Money Lake only as the seepage water collection system ran almost completely dry. There is sufficient evidence to conclude that the seepage water is hydraulically connected to the lake source.

The Lyall Harbour/Boot Cove Water System had another challenging year in 2019. A high turbidity Boil Water Advisory from October 16, 2018 lasted until March 2, 2019 when finally the treated water turbidity had dropped to acceptable levels. Turbidity issues appeared again in mid-October 2019 which got progressively worse towards the end of the year and eventually resulted in another turbidity related Boil Water Advisory in early 2020. During both events, the existing water treatment equipment seemed unable to reduce the raw water turbidity to levels required to ensure proper disinfection of the drinking water. The exact sources of the turbidity in the seepage water remain unclear, but it appears that high concentrations of dissolved organic compounds in the raw water caused increased water colour which contributed to the turbidity exceedances. Between July 19 and September 13, 2019, Money Lake was subject to a cyanobacteria bloom. Multiple cyanotoxin tests did not detect microcystin toxins in the raw water during this bloom. Another cyanobacteria bloom likely occurred in late October 2019. Those blooms did not pose a public health risk through the drinking water supplied. Both regulated disinfection by-products total Trihalomethanes – TTHM and Haloacetic Acids – HAA registered an annual average concentration of just under the maximum acceptable concentration (MAC) in the Guidelines for Canadian Drinking Water Quality (GCDWQ). However, the concentrations increased progressively towards the end of the year, likely due to the increased levels of dissolved organic compounds in the raw seepage water that also contributed to

the turbidity exceedances. The health risk from these disinfection by-products over the MAC is from chronic exposure over many years. CRD staff are developing strategies to increase the efficiency of the treatment system in terms of organic compound removal. Regular flushing of the dead end pipe sections during the low flow periods could also reduce the risk of disinfection by-product exceedances.

The Lyall Harbour/Boot Cove Water System was operated in 2019 without the ozone treatment stage. The ozone treatment system was taken offline due to worker health and safety concerns with the existing design and following a 12 month test period (March 2017-March 2018), during which CRD determined through water quality data analysis that the existing ozone equipment did not provide an appreciable water quality benefit to the water treatment process in its current form and in relation to the raw water characteristics during that time. Island Health approved the permanent decommissioning of the ozone treatment and updated the operating permit accordingly.

The data below provides a summary of the water quality characteristics in 2019:

Raw Water:

- The raw water exhibited overall low concentrations of total coliform bacteria, with higher concentrations during the summer and fall months when lake water was the primary water source and water temperatures were high. Consistently throughout the year, the raw water entering the treatment plant contained either none or only very low concentrations of *E. coli* bacteria.
- The raw water turbidity ranged from 0.65 to 6.4 NTU. The highest raw water turbidity period was late fall with the onset of heavy rainfalls. The median annual raw water turbidity was slightly lower than last year with 1.46 NTU.
- No *Giardia* cysts or *Cryptosporidium* oocysts were detected in 2 samples in 2019.
- The raw water had naturally high concentrations of iron and manganese especially during the spring and fall season. Elevated iron and manganese concentrations in Money Lake can be compounded by the ground passage of the seepage water.
- The raw water was slightly hard (median hardness 43.5 mg/L CaCO₃).
- The natural total organic carbon in the source water was relatively high (median 4.2 mg/L).

Treated Water:

- Outside the periods with a Boil Water Advisory, the treated water was bacteriologically safe to drink. No sample tested positive for total coliform or *E.coli* bacteria.
- The treated water turbidity (cloudiness) was usually under the GCDWQ turbidity limit of 1.0 NTU with a few short-term peaks slightly exceeding this limit during the winter periods. These short term spikes are likely related to rain and runoff events that impacted the seepage water quality. Beginning in October 2019 the treated water turbidity gradually increased which eventually resulted in another Boil Water Advisory at the beginning of 2020.
- The treated water total organic carbon (TOC) was periodically very high within a range from 1.1 to 18 mg/L. The annual mean was 3.15 mg/L. There is currently no guideline in the GCDWQ for TOC levels, however TOC levels > 2 mg/L indicate a potential for disinfection by-product

exceedances. TOC levels > 4 mg/L are usually a precursor for high disinfection by-product concentrations.

- Three out of four tests were right at the maximum acceptable concentration (MAC: 100 µg/L) for the disinfection by-product TTHM. The other test result from May was well under the limit (76 µg/L). The annual average TTHM concentration was just under the limit (93.5 µg/L). Half of the HAA disinfection by-product results were above the MAC of 80 µg/L. The annual average HAA concentration was also just under the limit (74.8 µg/L). There is an apparent correlation between turbidity and disinfection by-product exceedances. The assumed cause for both health relevant risks are seasonally high organic concentrations in the raw water that the existing treatment system is unable to reduce.
- The pH of the treated water was consistently below the aesthetic objective range of pH 7 to 10.5 as per GCDWQ (annual median pH 6.85).
- The treated water had no iron or manganese concentrations in exceedance of the aesthetic objective in 2019. However, the highest iron concentration recorded on November 28 was 275 µg/L and therefore very close to the aesthetic objective of <300 µg/L in the GCDWQ. Elevated iron concentrations are not a health concern but can lead to discolouration of the drinking water which can be a nuisance for the customers.

Water quality data collected from this drinking water system can be reviewed on the CRD website:

<https://www.crd.bc.ca/about/data/drinking-water-quality-reports>

Operational Highlights

The following is a summary of the major operational issues that were addressed by CRD Integrated Water Services staff:

- Water treatment plant filter media replacement.
- Water treatment plant mechanical repairs and improvements.
- Water treatment plant filtration improvements.
- Leak detection efforts due to high water use.
- Seepage pit recirculation pump electric motor replacement.

Capital Project Updates

The Capital Projects that were completed in 2019 included:

1. Dam Safety Improvements – Toe Berm Phase 1 – the 2012 Dam safety review recommended a number of improvements, which have been spread out over several years. This project included the design of phase 1 which is the installation of a gravel toe berm on the downstream side of the dam. There are constructability concerns due to the granular material, additional investigation was carried out to confirm construction method and finalize design in 2020.
2. Dam Safety Improvements – Seismic Design – A consultant has been retained to aid in the Toe Berm and seismic restraint design based upon the information from the toe filter. A report is forthcoming in 2020.

3. WTP Filter Upgrades – Due to water quality issues, filter upgrades to the water treatment plant were carried out on emergency basis and funded through the Community Works Fund.

Financial Report

Please refer to the attached 2019 Financial Summary Statement of Operations. Revenue includes parcel taxes (Transfers from Government), fixed user fees (User Charges), interest on savings (Interest Earnings), a transfer from the maintenance reserve account, and miscellaneous revenue such as late payment charges (Other Revenue).

Expenses includes all costs of providing the service. General Government Services includes budget preparation, financial management, utility billing and risk management services. CRD Labour and Operating Costs includes CRD staff time as well as the cost of equipment, tools and vehicles. Debt servicing costs are interest and principal payments on long term debt. Other Expenses includes all other costs to administer and operate the water system, including insurance, supplies, water testing and electricity.

The difference between Revenue and Expenses is reported as Net Revenue (expenses). Any transfers to or from capital or reserve accounts for the service (Transfers to Own Funds) are deducted from this amount and it is then added to any surplus or deficit carry forward from the prior year, yielding an Accumulated Surplus (or deficit) that is carried forward to the following year.

As of December 31, 2019, the accumulated deficit was (\$33,573). In alignment with Local Government Act Section 374 (11), if actual expenditures exceed actual revenues, any deficiency must be included in the next year's financial plan. The financial plan approved on March 18, 2020 incorporated this deficit.

Submitted by:	Matt McCrank, M.Sc., P.Eng., Senior Manager, Wastewater Infrastructure Operations
	Ian Jesney, P.Eng., Senior Manager, Infrastructure Engineering
	Glenn Harris, Ph.D., R.P.Bio., Senior Manager, Environmental Protection
	Rianna Lachance, BCom, CPA, CA, Senior Manager, Financial Services
Concurrence	Ted Robbins, BSc, C.Tech, General Manager, Integrated Water Services

Attachment: 2019 Financial Summary Statement of Operations

CAPITAL REGIONAL DISTRICT

LYALL HARBOUR BOOT COVE WATER
Statement of Operations (Unaudited)
For the Year Ended December 31, 2019

	2019	2018
Revenue		
Transfers from government	119,180	110,310
User Charges	102,193	94,490
Fees and Charges	343	349
Other revenue from own sources:		
Other revenue	30,768	754
Reimbursement for insurance claim	-	116,270
Transfer from Operating Reserve	-	8,630
Total Revenue	252,484	330,803
Expenses		
General government services	7,687	7,890
CRD Labour and Operating costs	175,535	212,882
Debt Servicing Costs	39,013	40,019
Other expenses	40,751	91,282
Total Expenses	262,986	352,074
Net revenue (expenses)	(10,503)	(21,271)
Transfers to own funds:		
Capital Reserve Fund	-	-
Operating Reserve Fund	-	1,800
Annual surplus (deficit)	(10,503)	(23,071)
Accumulated deficit, beginning of year	(23,071)	-
Accumulated deficit, end of year	\$ (33,573)	(23,071)

CAPITAL REGIONAL DISTRICT

LYALL HARBOUR BOOT COVE WATER Statement of Reserve Balances (Unaudited) For the Year Ended December 31, 2019

	Capital Reserve	
	2019	2018
Beginning Balance	6,024	43,753
Transfer from Operating Budget	-	-
Transfers from completed capital projects	-	4,039
Interest Income	170	609
Transfer to Capital Projects	-	(42,378)
Ending Balance	6,193	6,024

	Operating Reserve	
	2019	2018
Beginning Balance	1	6,646
Transfer from Operating Budget	-	1,800
Interest Income	11	184
Transfer to Operating Budget	-	(8,630)
Ending Balance	12	1