

# Lyall Harbour – Boot Cove Water System

2017 Annual Report

CRD | Drinking Water

## Introduction

This report provides a summary of the Lyall Harbour – Boot Cove Water Service for the year 2017. This report 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 some 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. The Lyall Harbour Boot Cove water service is made up of 174 parcels (Figure 1) encompassing a total area of approximately 100 hectares. Of the 174 parcels, 149 properties are connected to the water system.

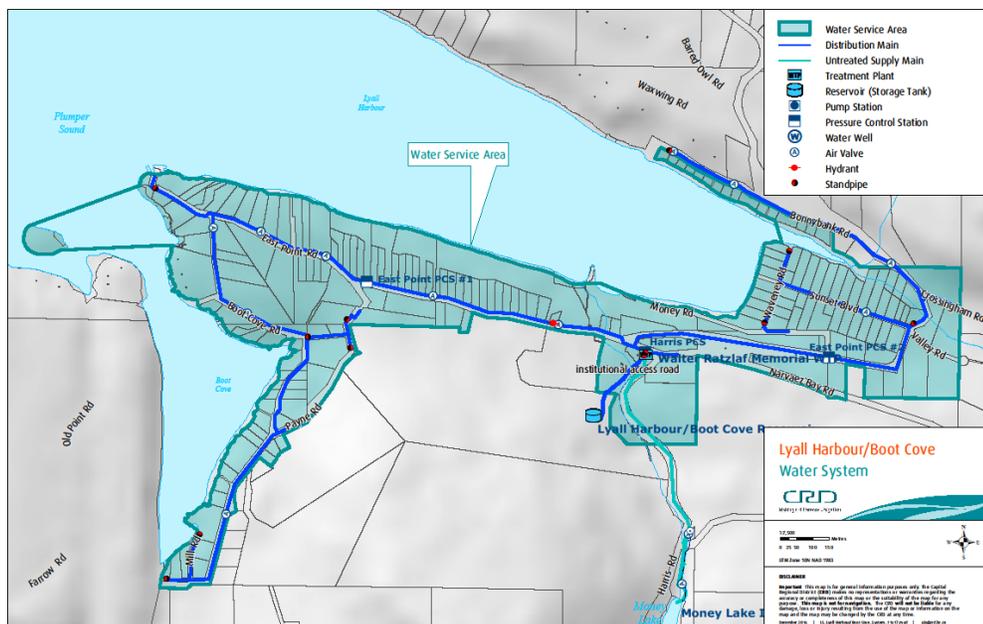


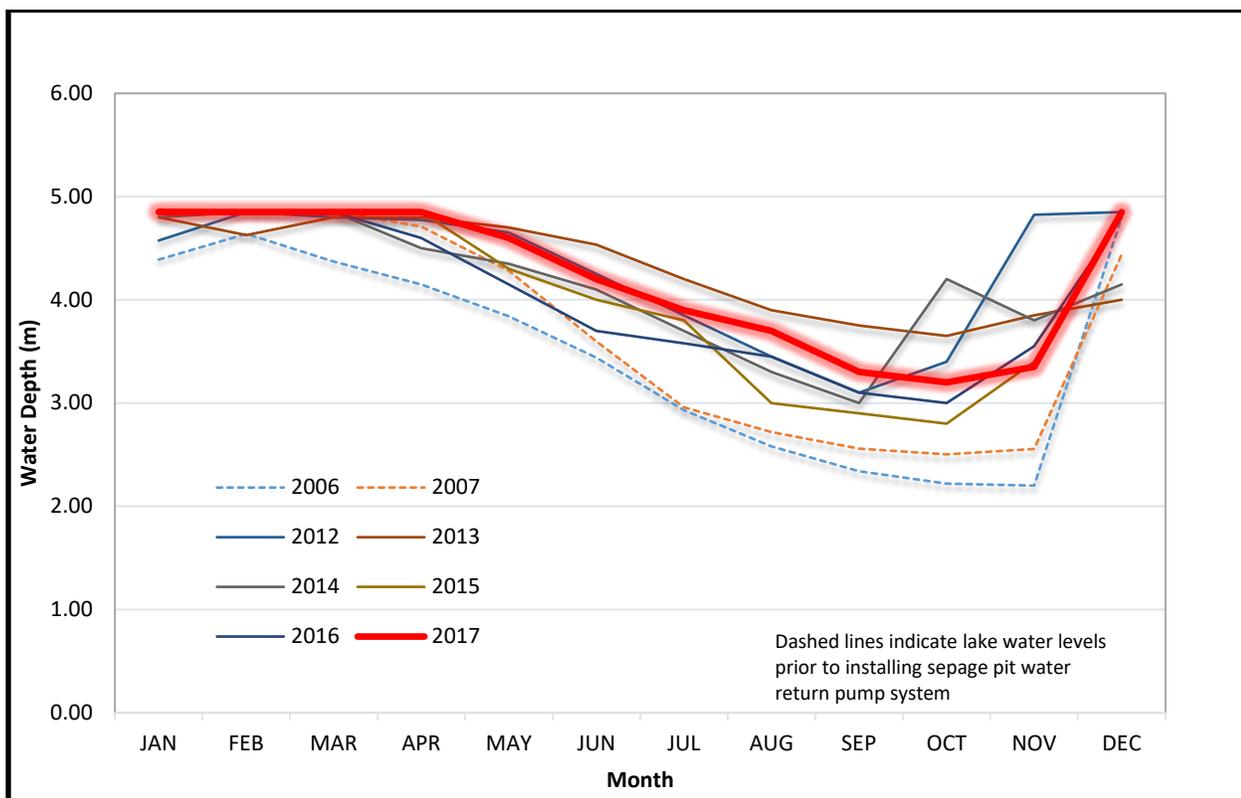
Figure 1: Map of Lyall Harbour/Boot Cove Water System

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

- Raw water is obtained from:
  - Money Lake, a small, impounded, surface water body that lies within a 94 hectare (230 acre) watershed on private land.
  - 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, 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: 149 service connections and meters, three pressure reducing valve stations, 50 gate valves, 12 standpipes and a small auxiliary generator.

## Water Supply

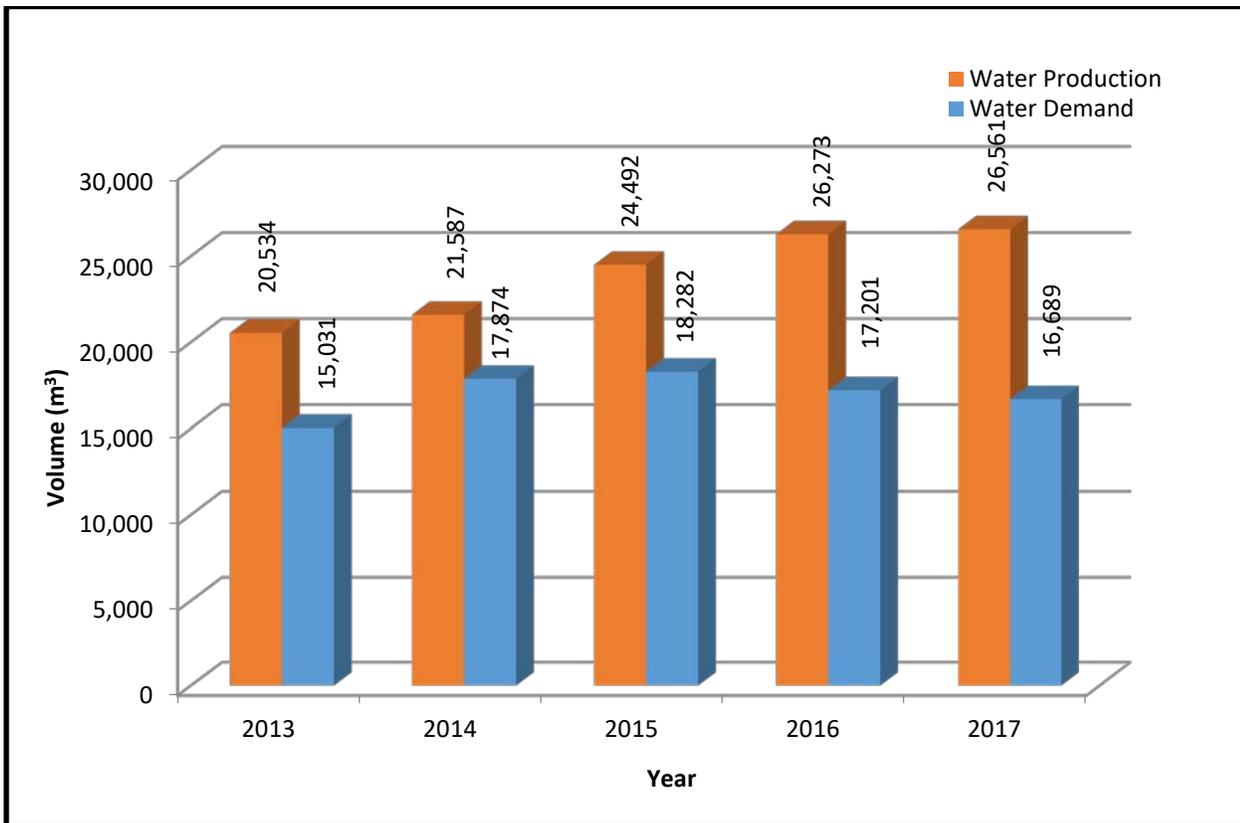
Referring to Figure 2 below, Money Lake surface water supply monthly water levels are highlighted for 2017. Water supply levels for the year are within historical limits. It is important to note that water supply levels in Money Lake, prior to 2008, were historically lower during the summer period. An 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 levels is not monitored; 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.



**Figure 2: Lyall Harbour/Boot Cove - Money Lake Monthly Water Level**

**Water Production and Demand**

Referring to Figure 3, 26,561 cubic meters of water were extracted (water production) from the seepage spring and Money Lake Reservoir in 2017; a 1% increase from the previous year and 21% increase from the 5 five year average. Water demand (customer water billing) for the service totaled 16,689 cubic meters of water; a 3% decrease from the previous year and a 2% decrease from the five year average.



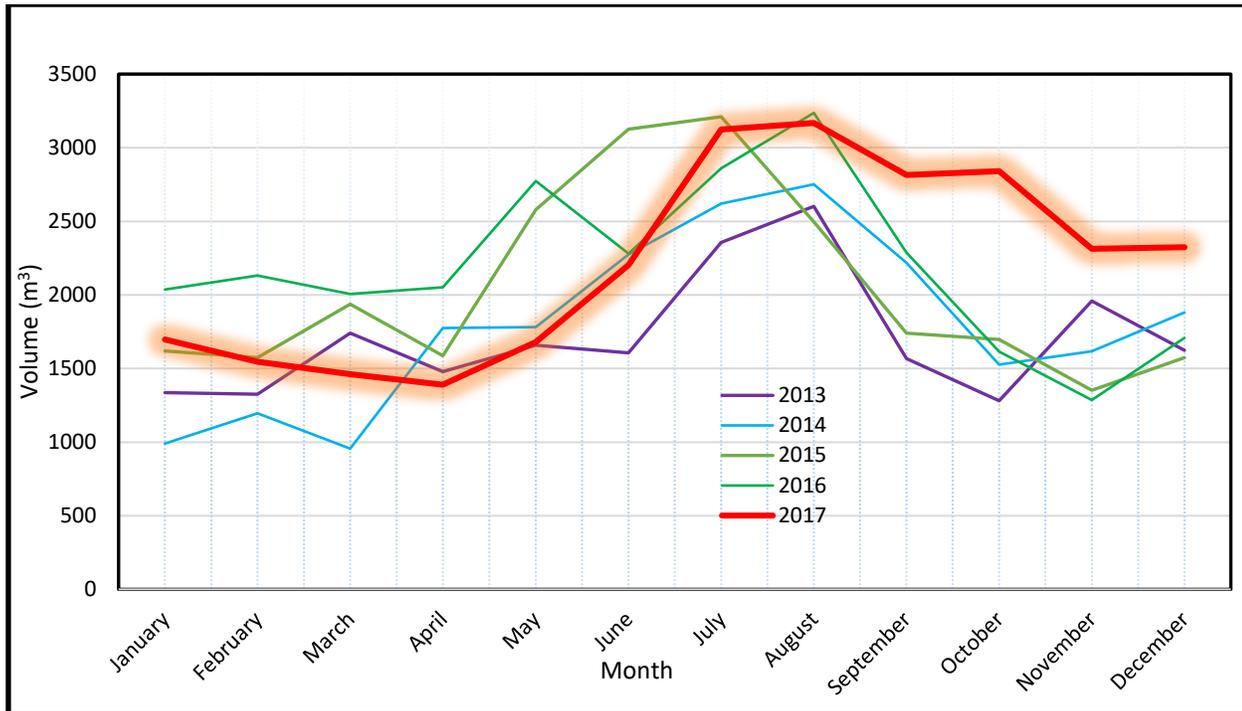
**Figure 3: Lyall Harbour/Boot Cove Water System Annual Water Production and Demand.**

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. As previously noted, operational water use increased beginning in 2013 when the new water treatment plant became operational.

The 2017 non-revenue water represents about 37% of the total water production for the service area. However, almost 20% of the non-revenue water can be attributed to operational use which includes a significant volume of water flushed from the system in order to keep chlorine residuals at acceptable levels at the extremities of the water system. Therefore, the non-revenue water associated with system losses is approximately 17% which is considered typical for most water systems the size of Lyall Harbour/Boot Cove.

Figure 4 below illustrates the monthly water production for 2017 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. Water production during the last quarter of 2017 is higher than average is the result of:

- water system leaks that were identified and subsequently repaired.
- an increase in water system flushing activities at the extremities in order to maintain minimum free chlorine residuals.



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

## Drinking Water Quality

The water treatment process has a raw water source of predominantly seepage water collected from below the Money Lake dam, which is supplemented with flows from the lake during peak summer demand. Overall, water quality met the *Guidelines for Canadian Drinking Water Quality (GCDWQ)* throughout 2017 except for periodic exceedances of some aesthetic water quality objectives such as pH, turbidity, temperature and iron/manganese. The annual average concentration of the disinfection by-product Trihalomethanes – THM were just below the maximum acceptable concentration (MAC) while one individual result exceeded the MAC. This indicates deficiencies in removing organic compounds by the treatment process. CRD staff is working on solutions to improve the treatment process, in particular by making improvements to the biological filtration stage.

The Lyall Harbour Boot Cove Water System was operated in 2017 without the ozone treatment stage. The existing ozone treatment system posed a risk to workers health and safety and CRD staff wanted to determine the actual effectiveness of this treatment component in a one-year pilot study and whether this system component could be permanently removed without compromising the safety and quality of the drinking water. Island Health issued a revised Operating Permit with increased water quality monitoring conditions for the duration of the study. A decision by Island Health based on the study results is pending.

The data below provides a summary of the water quality characteristics in 2017:

### Raw Water:

- The raw water exhibited overall low concentrations of total coliform bacteria with higher concentrations during the summer and fall months when the seepage water is supplemented with lake water. Consistently throughout the year the raw water entering the treatment plant contained either none or only very low concentrations of *E. coli* bacteria.
- In two parasite samples a very low concentration of *Cryptosporidium* oocysts was detected (0.3-1.3/100L).
- The raw water had naturally high concentrations of iron and manganese especially during the late summer/fall season. Elevated iron and manganese concentrations in Money Lake are compounded by the ground passage of the seepage water.
- The median annual raw water turbidity was slightly higher than in previous years with 2.1 NTU. The highest recorded raw water turbidity in 2017 was 20.3 NTU on June 14.
- The raw water was slightly hard (median hardness 43.0 mg/L CaCO<sub>3</sub>).
- The natural total organic carbon in the source water is relatively high (median 5.53 mg/L).

### Treated Water:

- The treated water was bacteriologically safe to drink. 5 samples tested positive for total coliform bacteria during the course of the year. In each case, immediately collected resamples did not confirm any actual water contamination. No sample tested positive for *E. coli* bacteria.
- The treated water turbidity (cloudiness) was usually well under the *GCDWQ* turbidity limit of 1.0 NTU with a few peaks exceeding this limit (peak 3.35 NTU on February 23, 2017).
- The treated water total organic carbon (TOC) was high with an annual mean of 4.66 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.
- One out of four tests exceeded the maximum acceptable concentration (MAC: 100 µg/L) for the disinfection by-product THM with 110 µg/L. Two other test results were right on the limit. The annual average THM concentration was just below the limit of 100 µg/L (88 µg/L). The HAA disinfection by-product results were well below the MAC of 80 µg/L bromate concentrations, a

potential disinfection by-product when using ozone, were not tested during the pilot study with the ozone treatment removed. The health risk from these disinfection by-products over the MAC is from chronic exposure over many years. Exceedances seem more regular during the winter months when water consumption is low, the water age in the pipes is high and organic matter has had time to accumulate in the dead end pipe sections. The high organic content entering the plant was insufficiently reduced with the existing treatment system and therefore the primary cause for the elevated THM concentrations. CRD staff is 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 pH of the treated water was consistently below the aesthetic objective range of pH 7 to 10.5 as per GCDWQ (annual median pH 6.62).
- The treated water had on two occasions (February, March) an exceedance of the aesthetic objective for iron. Elevated iron concentrations can lead to discolouration of the drinking water which can be a nuisance for the customers.
- The treated water leaving the plant on February 23 exhibited a lead concentration in exceedance of the MAC in the GCDWQ. Other samples from the same location at different times also showed elevated lead levels, albeit lower than the MAC. Investigations into the potential source of the lead concentrations are ongoing.

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/southern-gulf-islands-water-quality-reports/lyall-harbour-boot-cove-water-quality-reports>

## **Operational Highlights**

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

- January 2017 – Ultraviolet Light (UV) disinfection equipment repairs
- February 2017 – Permanent repairs and replacement to ground water seepage spring recirculation pumping system. The recirculation pumps replenish Money Lake from excess seepage spring runoff.
- February 2017 – Repairs to the seepage spring recirculation piping system as a result of storm damage.
- February 2017 – Emergency leak investigation and troubleshooting. Determined that system leaks were on private property. Owners notified.
- July 2017 – Several low chlorine residual alarm responses.
- October 2017 – Facility communications system failures investigation and troubleshooting.
- October 2017 – Emergency leak investigation and repairs near 125 East Point Rd and 137 Bonny Bank Rd.
- November 2017 – Pressure Regulating Station (PRS) leak repairs.
- November 2017- Water meter replacement, not registering flow.

## **Capital Project Updates**

The Capital Projects that were completed in 2017 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. Construction is planned to commence in 2018

2. Paint Recirculation Pipe and Ancillary Work – The existing recirculation pipe and ancillary structures located on private property were painted and adjusted to blend in with the natural environment.
3. Gilliland Lane Isolation Valve – An additional line valve was installed at Gilliland Lane to provide additional flexibility for maintenance.

## Financial Report

Please refer to the attached *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 costs 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.

Submitted by:	Matt McCrank, M.Sc., P.Eng., Senior Manager, 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



Integrated Water Services  
479 Island Highway  
Victoria, BC, Canada V9B 1H7  
250.474.9600 [www.crd.bc.ca](http://www.crd.bc.ca)

## CAPITAL REGIONAL DISTRICT

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**Lyall Harbour Boot Cove WATER**  
**Statement of Operations (Unaudited)**  
**For the Year Ended December 31, 2017**

	<b>2017</b>	<b>2016</b>
<b>Revenue</b>		
Transfers from government	110,310	108,150
User Charges	85,791	84,518
Fees and Charges	2,174	235
Other revenue from own sources:		
Interest earnings	113	97
Other revenue	105	147
Total revenue	<u>198,493</u>	<u>193,147</u>
<b>Expenses</b>		
General government services	7,430	6,620
CRD Labour and Operating costs	123,415	106,320
Debt Servicing Costs	40,005	40,046
Other expenses	22,793	20,295
Total expenses	<u>193,643</u>	<u>173,281</u>
<b>Net revenue (expenses)</b>	4,850	19,866
Transfers to own funds:		
Capital Reserve Fund	3,350	14,844
Maintenance Reserve Fund	1,500	1,500
<b>Annual surplus (deficit)</b>	-	3,522
Accumulated deficit, beginning of year	-	(3,522)
<b>Accumulated deficit, end of year</b>	<u>\$ -</u>	<u>-</u>

## CAPITAL REGIONAL DISTRICT

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### Lyall Harbour Boot Cove WATER Statement of Reserve Balances (Unaudited) For the Year Ended December 31, 2017

	Capital Reserve	
	2017	2016
<b>Beginning Balance</b>	98,662	105,876
Transfer from Operating Budget	3,350	14,844
Transfers from completed capital projects	17,500	1,995
Interest Income	742	1,447
Transfer to Capital Projects	(76,500)	(25,500)
<b>Ending Balance</b>	<u>43,753</u>	<u>98,662</u>

	Operating Reserve	
	2017	2016
<b>Beginning Balance</b>	5,003	3,492
Transfer from Operating Budget	1,500	1,500
Interest Income	144	11
<b>Ending Balance</b>	<u>6,646</u>	<u>5,003</u>