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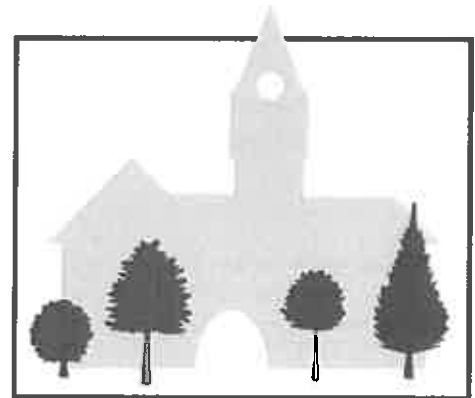
# ST. THOMAS WATER DISTRIBUTION SYSTEM

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License Number: 057-101  
Permit Number: 057-201

Provincial Regulation 170/03  
Summary Report

For the Period  
January 1st to December 31st, 2015



THE CORPORATION OF THE CITY OF  
**ST. THOMAS**

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# 1 Summary Report Requirements

## 1.1 Introduction

The 2015 Summary Report for the St. Thomas Water Distribution System is being submitted to satisfy Schedule 22 of Ontario Regulation 170/03, the requirement to prepare and distribute a summary report of water quality.

As per Ontario Regulation 170/03, the summary report must:

- a. List the requirements of the Act, the regulations, the system's approval, drinking water works permit, municipal drinking water licence, and any orders applicable to the system that were not met at any time during the period covered by the report; and
- b. For each requirement referred to in clause (a) that was not met, specify the duration of the failure and the measures that were taken to correct the failure.

The report must also include the following information for the purpose of enabling the owner of the system to assess the capability of the system to meet existing and planned uses of the system:

- A summary of the quantities and flow rates of the water supplied during the period covered by the report, including monthly average and maximum daily flows.
- A comparison of the summary to the rated capacity and flow rates approved in the system's approval, drinking water works permit or municipal drinking water licence, or if the system is receiving all of its water from another system under an agreement, to the flow rates specified in the written agreement.

The information provided is for the purpose of enabling the owner of the system to assess the capacity of the system. This report covers the reporting period from January 1, 2015 to December 31, 2015.

## 1.2 System Approval

The City of St. Thomas is supplied water from the Elgin Area Water Treatment Plant on Dexter Line east of Port Stanley Ontario. The distribution system has various approvals from the Ministry of Environment for the infrastructure as it was constructed.

During the reporting period, The St. Thomas Drinking Water System was operated pursuant to the approvals, licences and permits listed below:

The supply of water to the system governed by the following Municipal Drinking Water Licences (MDWL) and Drinking Water Works Permits (DWWP):

- City of St. Thomas Water Distribution System
  - MDWL No. 057-101, issued on August 31, 2011
  - DWWP No. 057-201, issued on August 31, 2011

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The distribution of water within the system is governed by the following three licences and permits:

- St. Thomas Area Secondary Water Supply System
  - MDWL No. 190-101, issued on August 31, 2011
  - DWWP No. 190-101, issued on August 31, 2011
  
- Southwold Distribution System
  - MDWL No. 055-101, issued on August 23, 2011
  - DWWP No. 055-201, issued on December 16, 2010
  
- Central Elgin Distribution System
  - MDWL No. 046-101, issued on August 11, 2011
  - DWWP No. 046-201, issued on August 23, 2011

The DWWP and MDWL were issued in accordance with the Safe Drinking Water Act (SDWA), 2002.

The City of St Thomas Environmental Services Department/Operations Division Water Section received the Certificate of Accreditation for full scope –Entire DWQMS May 17, 2013 Certificate # Cert-0064202 for all four systems they operate. The City of St Thomas Water Distribution File # 1631369, The St Thomas Area Secondary Water Supply System File # 1631370. The Municipality of Central Elgin Water Distribution System File # 1631368 and the Township of Southwold Water Distribution System (Lynhurst) File # 1631371

SAI Global performed a Re-Accreditation Audit December 3 & 4, 2015 for all four systems The City of St Thomas Water Distribution, The St Thomas Area Secondary Water Supply System, The Municipality of Central Elgin Water Distribution System and the Township of Southwold Water Distribution System (Lynhurst) File # 1631366-01

The findings were the overall effectiveness of the St Thomas Environmental Services Department/Operations Division Quality Management System to be effective.

2 minor non-conformances

- 1) Items in the management review are not being dealt with effectively
- 2) Root cause analysis is not being conducted effectively

5 Opportunities for Improvement

- 1) File names of submitted DWQMS documentation does not always easily identify the document/record.
- 2) As written it appears that updated/revised document files are distributed by e-mail. Outdated /obsolete files may easily be used if Operating Authority staff misses the update e-mail
- 3) No information provided about the Elgin Area Primary Supply system (neither the owner nor a description of that system)
- 4) The associated hazards are described in general terms (chemical, biological, or physical) and may be more detailed to describe more specifically what the hazards do/may exist
- 5) No current means of evaluating the quality of supplies/services is described in CD-ADMIN-800

Maintenance of existing accreditation after response to corrective action requests has been deemed acceptable to SAI in 2016

## **2 Water Quantity Summary**

### **2.1 Overview**

The St. Thomas Water Distribution System has three entry points into the network from the St. Thomas Area Secondary Water Supply System, the East Chamber located at the Elgin Middlesex Booster Station (490 South Edgeware Road), the West Chamber located in Water Works Park (2 South Edgeware Road), and the Wellington Road Chamber (Ford Line and Wellington Road), one entry point into the network from the Elgin Area Primary Water Supply System at the Albert Robert Booster Station (8754 Tyke Road) in the Municipality of Central Elgin and one entry point into the network from the Southwold Water Distribution System on Fingal Line at the municipal boundary.

### **2.2 Albert Roberts Booster Station – Elgin Area Primary Water Supply System**

The Albert Roberts Booster Station (ARBS) receives treated water from the Elgin Area Primary Water Supply System, which pumps water from the water treatment plant located on the shores of Lake Erie to the east of the Town of Port Stanley. Water is pumped from a connection point on the transmission main that connects water treatment plant to the Elgin Middlesex Pump Station and reservoir.

The ARBS is comprised of three high lift pumps that deliver water through a transmission main that services the St. Thomas Distribution System. The station maintains the operating pressure and includes a flow meter, chlorine analyzer, monitoring control, alarm system and instrumentation. Remote monitoring and control of the pumps capabilities are possible through the St. Thomas SCADA system.

Pump No. MV1 is a US Electrical Motors 29.8 kW (40 HP), 575V/3ph/60 HZ rated at 69.4 l/s at 23 m (75 feet) TDH at 1780 rpm. Pumps Nos. MV2 and MV3 are each U.S Electrical Motors 37.3 kW (50 HP), 575V/3ph/60HZ rated at 100.9 l/s at 24.4 m (80 feet) TDH at 1780 rpm. All pumps are equipped with VFDs (variable frequency drives). The facility includes the provisions for future installation of a stand-by generator set as well as a fourth pump.

All pumps use a common header and the firm rated pumping capacity (2 pumps operating) of the ARBS is 170.3 l/s or a total of 14,714 m<sup>3</sup>/d). There is no additional treatment nor re-chlorination of the water supply delivered to the City of St. Thomas Water Distribution System from the ARBS. The booster pumps have an interlock booster pump shutdown and alarm upon receiving a low free chlorine residual signal.

The ARBS instrumentation equipment includes a prominent chlorine analyzer (internal pH compensation) which continuously monitors the free chlorine residual and pH. The flow meter is an Endress Hauser and is owned by Regional Water and calibrated by them on a yearly basis. Flow and free chlorine residuals are monitored through SCADA and transmitted back to the Public Works Service Centre located at 100 Burwell Road, St. Thomas Ontario.

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### **2.3 East, West and Wellington Chambers – St. Thomas Area Secondary Water Supply System**

The East, West and Wellington Chamber provide water from the St. Thomas Area Secondary Water Supply System and have volume limits of 54,605 m<sup>3</sup>/day that was established jointly within the Elgin Middlesex Pumping Station. The Summary Report for the Elgin Middlesex Pumping Station will summarize flows and capacity for the St. Thomas Area Secondary Water Supply System. The chambers contain flow meters, online chlorine analyzers and pressure gauges that are linked and monitored through SCADA and transmitted back to the back to the Public Works Service Centre located at 100 Burwell Road, St. Thomas Ontario.

### **2.4 Fingal Line Chamber – Southwold Water Distribution System**

The Fingal Line Chamber supplies water from the Southwold Water Distribution System to a section of the St. Thomas Water Distribution System along Fingal Line. The water in the Southwold Water Distribution System originates from the St. Thomas Area Secondary Water Supply System. The water is re-chlorinated within the Southwold Water Distribution System. The chamber contains a flow meter. The volumes limits entering the St. Thomas Distribution System from the Southwold Water Distribution System are part of the overall volume limit of 54,605 m<sup>3</sup>/day that was established jointly within the Elgin Middlesex Pumping Station License.

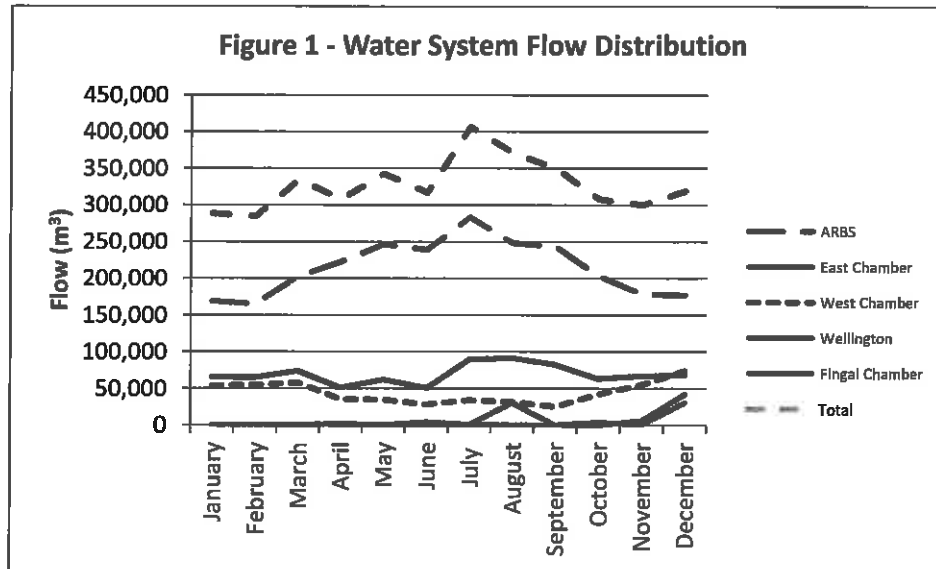
## 2.5 St. Thomas Water Distribution System – Flow Distribution

An overview summary of the flows entering the St. Thomas Water Distribution System is provided on **Table 1**, (based on monthly bulk meter readings not SCADA).

**Table 1 – Annual Water Quantity Summary**

Month	Albert Roberts BS (m <sup>3</sup> )	East Chamber (m <sup>3</sup> )	West Chamber (m <sup>3</sup> )	Wellington Road Chamber (m <sup>3</sup> )	Fingal Line Chamber (m <sup>3</sup> )	Total System Flow (m <sup>3</sup> )
January	168,994	65,563	53,750	0	165	288,472
February	165,045	64,881	54,581	0	163	284,670
March	202,616	73,619	57,845	0	193	334,273
April	222,392	50,671	35,240	0	212	308,515
May	246,660	61,661	34,184	0	205	342,710
June	238,921	50,150	27,933	0	296	317,300
July	283,188	89,270	33,786	0	331	406,575
August	248,033	91,034	31,321	0	328	370,716
September	243,218	81,966	25,038	0	383	350,605
October	203,232	63,191	41,819	-10	243	308,475
November	178,731	68,722	54,730	0	258	302,441
December	177,134	68,069	73,785	0	237	319,225
2015 Totals	2,578,164	828,797	524,012	-10	3014	3,933,977

Figure 1 provides a graphical overview of the flows entering the St. Thomas Water Distribution System. Based on a the 2015 flow data, the distribution of flows into the distribution system between the water supplied from the Albert Roberts Booster Station versus the St. Thomas Area Secondary Water Supply System (through the East, West and Wellington Chambers) and Fingal Line Chamber is calculated to be 66 percent.



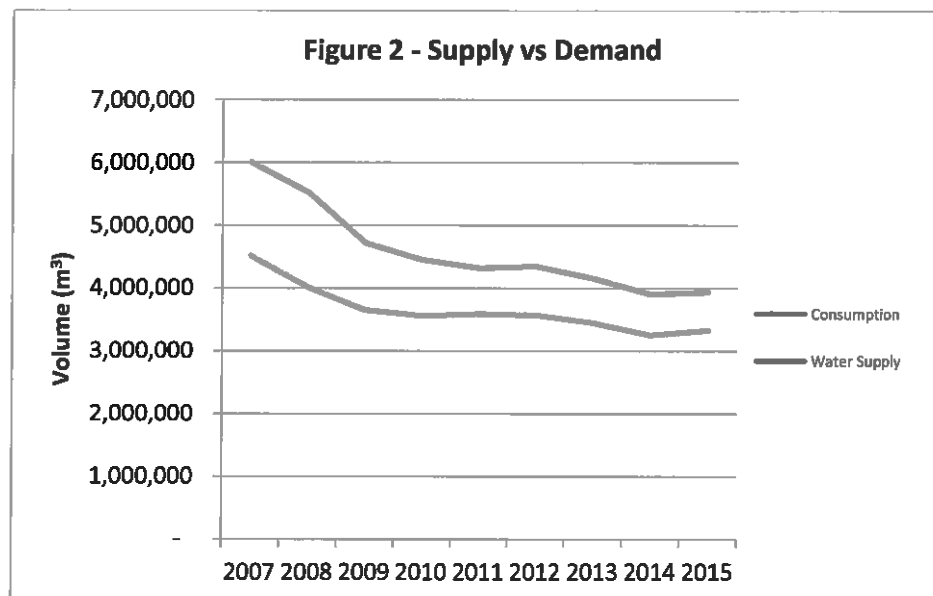
The total flow into the St. Thomas Water Distribution System increased by approximately .75% from 3.90 M m<sup>3</sup> in 2014 to 3.930. M m<sup>3</sup> in 2015.

The total consumption by customers of the St. Thomas Water Distribution System increased by approximately 2 % from 3.25 M m<sup>3</sup> in 2014 to 3.32 M m<sup>3</sup> in 2015.

The unaccounted water loss in the St. Thomas Water Distribution System was approximately 11 %. This can be attributed to an aggressive leak detection program, relining of existing water main, capital improvements and monitoring of all water uses from maintenance/capital initiatives.



Figure 2 provides an overview of the supply vs consumption flows in the St. Thomas Water Distribution System over the last number of years..



### 2.6 Water Quantity Analysis – Albert Roberts Booster Station

The rated pumping capacity (2 pumps operating) of the Albert Roberts Booster Station is 170.3 L/s or a total of 14,714 m<sup>3</sup>/d.

The maximum daily flow to the system from the Albert Roberts Booster Station occurred on November 1/15 with a daily flow of 12884 m<sup>3</sup>/day, 87 % of the station capacity. This reading is very unusually high and may have been a SCADA error. There were no unusual operating conditions within the system to report that day. The total flow from the Booster station was on average approximately 6921 m<sup>3</sup>/day, which is 47 % of the station capacity.

A summary of the monthly peak flows at the station collected by the SCADA system is provided on **Table 2**.

**Table 2 – Albert Roberts Booster Station Water Quantity Summary**

Month	Max Daily Instantaneous Peak Flow l/s	Average Daily Total Flow m <sup>3</sup> /day	Maximum Daily Total Flow m <sup>3</sup> /day	Total Monthly Flow m <sup>3</sup> /day
January	123.1	5887.04	6658.75	182498.13
February	115.2	5851.25	6180.19	163834.88
March	130.3	6255.70	7087.50	193926.69
April	144.3	7316.37	7752.50	219491.13
May	165.3	8341.02	9552.38	258571.50
June	175.5	8506.84	9335.75	255205.25
July	163.6	7715.69	8764.50	239186.50
August	163.4	7813.02	8614.50	242203.50
September	167.9	7930.24	8777.25	237907.25
October	151.0	6612.23	7929.25	204979.25
November	136.7	5865.88	12883.50	175976.50
December	125.5	4954.10	5497.50	153577.25
2015 Yearly	175.5	6920.78	12883.50	2527357.83

**Appendix A** includes a detailed summary of the monthly average and maximum daily flows for the Albert Roberts Booster Station.

## 2.7 – System Interruptions

A listing of system interruptions is noted in the Albert Roberts Booster Station logbook.

## 2.8 Water Quantity Analysis – East, West, Wellington and Fingal Line Chambers

The Summary Report for the Elgin Middlesex Pumping Station will summarize flows and capacity for the entire St. Thomas Area Secondary Water Supply System.

# 3 Water Quality Summary

## 3.1 Albert Roberts Booster Station Samples

Water quality sampling at the Albert Roberts Booster Station is performed in accordance with Ontario Regulation 170/03. Chlorine residual is monitored by an on-line analyzer and is calibrated annually by licensed contractors. A summary of the flows at the station collected by the Scada system is provided on **Table 3**.

**Table 3 – Albert Roberts Booster Station Water Quality Summary**

Month	Free Chlorine Residual (mg/l)		
	Average	Maximum	Minimum
January	1.04	1.25	0.45
February	1.07	1.58	0.42
March	1.04	1.38	0.39
April	1.11	1.28	0.45
May	1.09	1.43	0.00
June	1.03	1.40	0.45
July	1.04	1.55	0.46
August	1.09	1.44	0.45
September	1.06	1.44	0.47
October	1.14	1.56	0.62
November	1.07	2.00	0.00
December	1.00	1.74	0.00
2015 Yearly	1.07	2.00	0.00

Minimums of 0.00 mg/l Free Chlorine - resulted from chlorine analyser calibration, maintenance, and alarm testing.

### 3.2 Water Distribution System Samples

Microbiological testing was done under the Schedule 10, 11 or 12 of Regulation 170/03, during this reporting period. Table 4 summarizes the results of the microbiological testing.

**Table 4 – Microbiological Testing Summary**

	Number of Samples	Range of E.Coli Or Fecal Results (min #)-(max #)	Range of Total Coliform Results (min #)-(max #)	Number of HPC Samples	Range of HPC Results (min #)-(max #)
<b>Distribution Total</b>	<b>798</b>	<b>(0)-(0)</b>	<b>(0)-(1)</b>	<b>620</b>	<b>(&lt;10)-(1860)</b>
St. Thomas	700	(0)-(0)	(0)-(1)	544	(<10)-(1860)
Central Elgin	85	(0)-(0)	(0)-(0)	63	(<10)-(60)
Southwold	13	(0)-(0)	(0)-(0)	13	(<10)-(20)

Table 5 summarizes the incidents where a parameter under Regulation 170/03 exceeded the standard prescribed in the Ontario Drinking Water Quality Standards.

**Table 5 – Sampling Parameter Results**

Incident Date	Parameter	Result	Unit of Measure	Corrective Action	Corrective Action Date
September 18 2015	Total Coliform	1	cfu/100ml	Flush and re-sample	September 23 2015

All samples taken during the most recent testing period for Inorganic and Organic parameters met the standards of the Safe Drinking Water Act Regulation 170/03.

### 3.3 Lead Testing Samples

Lead Testing under Regulation 170/03 Section 15.1 was conducted at residential and non residential locations. During 2015, a total of 63 water samples were taken from private plumbing systems and the watermain distribution system. **Table 6** summaries the lead sampling results.

**Table 6 – Lead Sampling Summary**

Location Type	Number of Samples	Range of Lead Results (min#) – (max #)	Number of Exceedances
Plumbing	34	(0.03)-(8.05)	0
Distribution	29	(0.02)-(1.78)	0

Home owners that participated in the lead sampling program were notified of the test results and advised to change the lead pipes on the private side of the service if they exist.

Humans are exposed to lead through food, water, and air. Historically, lead in tin cans and paint were major sources of exposure in food and air respectively. The relative importance of water-borne lead sources is increasing as other man-made sources of lead are reduced through changing industrial practices. Ingested lead enters the blood through the stomach; it is then stored in bones and teeth.

## 4 Summary of Non Compliance Issues

### 4.1 Ministry of the Environment and Climate Change :Drinking Water Inspection

On May 6, 2015, the Ministry of the Environment and Climate Change (MOECC) conducted an inspection of the St. Thomas Distribution System. Subsequently, a Drinking Water Inspection Report documenting the results of the inspection was received outlining a description of the drinking water system, capacity assessment, the distribution system, operations manuals, logbooks, contingency/emergency planning, security, consumer relations, certification and training, water quality monitoring, quality water assessment, reporting and corrective actions and other inspection findings.

The Drinking Water Inspection Report found no non-compliance issues which did not meet the regulatory requirement and actions required. The Distribution was rated as having an inspection risk rating of 0% and achieving an overall final inspection rating of 100%, indicating that the risk was minimal.

1 Recommendation was given in the report

1) There is known low pressure areas in the system and to use best efforts to maintain pressure throughout the system at all times

## **APPENDIX A**

*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

January 2015

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	69.5	113	334	1.08	5992.56
2	68.7	112	334	1.02	5908.94
3	70.6	120	334	1.14	6069.44
4	73.7	118	334	1.02	6339.69
5	70.7	114	334	1.01	6109.56
6	71.4	118	334	1.10	6173.44
7	70.9	118	334	1.08	6091.13
8	71.6	115	334	1.10	6142.38
9	71.5	109	334	1.15	6160.63
10	74.5	117	334	1.19	6414.25
11	77.3	113	334	1.11	6658.75
12	69.2	116	334	1.15	5950.63
13	70.1	117	334	1.05	6050.81
14	70.9	117	334	0.99	6111.56
15	70.5	113	334	0.97	6075.31
16	69.4	121	334	1.01	5994.06
17	73.0	113	334	0.95	6285.25
18	73.3	105	334	0.99	6303.88
19	70.2	113	334	1.06	6063.81
20	65.7	107	330	0.95	4264.63
21	77.2	110	325	0.95	2213.94
22	69.0	112	334	0.99	5945.63
23	69.2	105	334	0.98	5947.00
24	70.1	109	334	1.08	6045.25
25	71.7	114	334	1.11	6172.94
26	67.5	112	334	0.95	5823.38
27	67.3	113	334	0.96	5803.00
28	67.9	112	334	0.98	5863.94
29	69.7	109	334	0.99	6020.88
30	64.8	115	334	0.98	5596.88
31	68.4	114	334	1.00	5904.63
<b>Average</b>	70.5	113	334	1.04	5887.04
<b>Minimum</b>	19.0	90	300	0.45	2213.94
<b>Day of Minimum</b>	30	28	20	13	21
<b>Maximum</b>	123.1	183	361	1.25	6658.75
<b>Day of Maximum</b>	23	31	31	10	11
<b>Monthly Total</b>					182498.13
<b>Events</b>					

*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

February 2015

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	69.0	118	334	1.08	5960.69
2	66.0	117	334	0.99	5694.81
3	65.9	119	334	1.00	5691.81
4	65.2	120	334	0.92	5630.00
5	67.4	111	334	0.87	5824.75
6	67.2	113	334	1.06	5807.44
7	69.7	113	334	0.98	6018.44
8	69.6	110	334	1.00	6011.50
9	65.8	116	334	1.07	5678.81
10	66.0	111	334	1.14	5702.06
11	69.2	109	334	1.18	5981.19
12	66.3	117	334	1.13	5724.44
13	66.0	116	334	1.06	5697.75
14	68.5	109	334	1.16	5913.50
15	67.1	115	334	1.19	5795.13
16	69.2	114	334	1.11	5975.13
17	67.7	115	334	1.10	5845.13
18	67.6	117	334	1.08	5833.38
19	67.9	113	334	1.11	5861.94
20	67.5	115	334	1.14	5831.50
21	70.2	106	334	1.00	6054.38
22	70.8	107	334	1.10	6115.81
23	68.1	109	334	1.12	5875.25
24	66.3	108	334	1.05	5720.63
25	66.3	111	334	1.11	5721.81
26	67.5	110	334	1.07	5832.75
27	67.8	108	334	1.09	5854.69
28	71.6	113	334	1.10	6180.19
29					
30					
31					
<b>Average</b>	67.8	113	334	1.07	5851.25
<b>Minimum</b>	3.4	83	260	0.42	5630.00
<b>Day of Minimum</b>	23	21	23	10	4
<b>Maximum</b>	115.2	189	370	1.58	6180.19
<b>Day of Maximum</b>	8	13	5	13	28
<b>Monthly Total</b>					163834.88
<b>Events</b>				0	



*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

March 2015

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	72.1	114	334	1.05	6229.75
2	68.1	117	334	1.10	5881.63
3	67.8	108	334	1.03	5854.69
4	66.0	108	334	1.05	5699.44
5	67.1	112	334	1.10	5800.88
6	66.5	107	334	1.00	5746.88
7	69.2	112	334	1.05	5979.19
8	n/a	114	334	1.01	5824.50
9	67.5	109	334	0.99	5819.13
10	67.1	111	334	1.01	5797.69
11	67.6	115	334	1.00	5837.50
12	68.7	116	334	0.99	5931.88
13	67.1	109	334	0.89	5798.00
14	70.4	111	334	1.00	6080.00
15	70.4	115	335	0.99	6085.44
16	70.4	117	335	0.96	6077.94
17	71.3	114	335	0.94	6157.69
18	73.9	114	335	0.93	6380.44
19	70.5	117	335	1.12	6088.38
20	71.9	113	335	1.08	6206.69
21	72.0	115	335	1.04	6219.25
22	73.8	118	335	1.26	6366.94
23	71.6	119	335	1.11	6178.56
24	77.6	118	335	1.03	6702.50
25	81.4	119	335	1.02	7029.63
26	81.0	114	335	1.10	6992.13
27	81.1	117	335	1.02	7004.25
28	81.6	110	334	1.07	7041.38
29	82.1	111	334	1.16	7087.50
30	81.7	109	335	1.10	7049.75
31	80.8	109	335	1.05	6977.13
<b>Average</b>	72.6	113	334	1.04	6255.70
<b>Minimum</b>	13.5	80	313	0.39	5699.44
<b>Day of Minimum</b>	1	5	9	17	4
<b>Maximum</b>	130.3	203	368	1.38	7087.50
<b>Day of Maximum</b>	27	16	9	26	29
<b>Monthly Total</b>					193926.69
<b>Events</b>				0	

*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

April 2015

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	82.5	116	335	1.12	7131.50
2	81.4	120	335	1.18	7028.13
3	82.6	115	335	1.12	7133.88
4	82.1	109	335	1.15	7087.38
5	81.3	111	335	1.13	7015.00
6	83.8	112	335	1.12	7236.75
7	82.3	111	335	1.18	7105.13
8	82.4	114	335	1.21	7114.88
9	81.7	106	335	1.10	7058.13
10	81.7	110	335	1.19	7059.63
11	84.9	114	335	1.17	7326.13
12	84.4	109	335	1.06	7289.25
13	83.9	111	335	1.15	7249.75
14	82.6	110	334	1.09	7135.38
15	84.1	109	335	1.09	7255.75
16	84.2	115	335	1.13	7251.75
17	84.9	113	335	1.12	7336.75
18	86.8	112	335	1.12	7495.75
19	85.8	115	335	1.15	7407.13
20	84.0	115	335	1.11	7252.75
21	84.4	119	335	1.14	7294.38
22	86.1	116	335	1.10	7437.63
23	86.4	111	335	1.05	7464.63
24	87.1	108	335	1.05	7509.38
25	88.6	112	334	1.07	7654.25
26	89.7	114	335	1.02	7752.50
27	86.8	111	335	0.94	7481.38
28	88.2	112	335	1.04	7613.50
29	89.1	115	335	1.03	7676.25
30	88.5	117	335	1.08	7636.50
31					
<b>Average</b>	84.7	113	335	1.11	7316.37
<b>Minimum</b>	16.5	82	312	0.45	7015.00
<b>Day of Minimum</b>	16	9	12	21	5
<b>Maximum</b>	144.3	185	366	1.28	7752.50
<b>Day of Maximum</b>	2	24	24	18	26
<b>Monthly Total</b>					219491.13
<b>Events</b>				0	

*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

May 2015

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	89.8	114	335	1.03	7758.88
2	93.2	113	335	1.04	8030.00
3	92.9	111	334	1.06	8024.13
4	89.7	109	334	1.08	7731.00
5	88.1	107	334	1.02	7611.50
6	92.0	113	334	1.07	7951.00
7	95.5	118	335	1.07	8233.13
8	96.4	116	335	1.03	8252.13
9	100.4	116	335	1.08	8658.88
10	98.6	114	335	1.05	8516.13
11	93.0	107	333	0.99	8030.25
12	90.4	106	334	1.02	7798.63
13	92.3	116	335	1.10	7948.00
14	97.3	117	335	1.13	8396.88
15	95.0	113	335	1.24	8204.63
16	94.8	112	334	1.31	8186.50
17	98.5	114	335	1.20	8475.25
18	103.9	111	334	1.25	8778.13
19	97.1	110	333	1.14	7966.50
20	94.0	110	334	1.04	8081.88
21	97.5	109	334	1.01	8390.25
22	95.0	110	334	1.06	8202.00
23	98.0	115	333	1.04	8467.50
24	103.5	115	334	1.05	8938.50
25	105.3	120	335	1.13	9073.88
26	110.9	114	335	1.13	9552.38
27	99.9	118	335	1.22	8631.25
28	105.2	121	335	1.17	9074.13
29	103.2	113	334	1.08	8904.88
30	103.0	117	335	1.06	8838.75
31	92.5	120	335	1.01	7864.63
<b>Average</b>	97.0	114	334	1.09	8341.02
<b>Minimum</b>	1.4	0	0	0.00	7611.50
<b>Day of Minimum</b>	12	19	19	5	7611.50
<b>Maximum</b>	165.3	208	369	1.43	9552.38
<b>Day of Maximum</b>	22	14	26	15	26
<b>Monthly Total</b>					258571.50
<b>Events</b>				0	

*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

June 2015

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	94.9	117	335	1.04	8202.50
2	101.7	119	335	1.12	8737.25
3	105.4	118	335	1.00	9105.00
4	108.9	115	335	1.03	8807.50
5	108.1	119	335	0.98	9335.75
6	107.4	121	335	0.97	9274.50
7	106.5	117	335	0.95	9199.75
8	100.6	123	335	0.97	8647.38
9	98.1	122	335	0.92	8476.63
10	101.4	115	334	1.05	8753.88
11	103.2	111	335	1.08	8910.63
12	99.1	116	335	1.13	8547.75
13	100.2	115	335	1.11	8636.63
14	98.8	122	335	1.05	8535.13
15	101.7	118	335	0.95	8774.88
16	102.6	113	335	0.94	8305.75
17	101.7	122	335	1.08	8745.75
18	100.7	123	335	1.02	8698.50
19	99.8	119	335	1.10	8618.88
20	101.4	120	335	1.00	8760.50
21	102.6	117	334	1.05	8788.63
22	110.9	123	335	1.10	9172.38
23	104.0	118	335	0.92	8980.88
24	105.0	110	334	0.98	9068.13
25	93.2	114	332	1.09	7520.13
26	90.6	117	330	1.11	7804.25
27	79.7	117	330	1.08	6881.00
28	81.2	117	330	1.02	7008.75
29	85.8	118	330	1.07	7409.63
30	86.8	120	330	1.02	7497.00
31					
<b>Average</b>	99.4	118	334	1.03	8506.84
<b>Minimum</b>	1.3	67	265	0.45	6881.00
<b>Day of Minimum</b>	25	25	25	16	27
<b>Maximum</b>	175.5	226	392	1.40	9335.75
<b>Day of Maximum</b>	4	9	9	12	5
<b>Monthly Total</b>					255205.25
<b>Events</b>				0	

*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

July 2015

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	88.0	129	330	1.12	7591.38
2	89.7	119	330	0.86	7728.63
3	89.4	117	330	0.97	7713.25
4	92.4	120	330	1.11	7979.63
5	96.2	117	330	1.02	8283.88
6	96.8	122	330	1.15	8296.38
7	90.1	115	330	0.95	7482.13
8	89.8	116	330	1.07	7717.88
9	87.2	118	329	0.94	7533.25
10	86.0	116	328	1.02	7405.88
11	85.8	124	328	1.00	7396.50
12	85.6	127	328	1.00	7354.88
13	88.1	120	328	0.92	7524.88
14	82.2	120	328	1.03	6788.88
15	83.6	118	328	1.07	7136.63
16	85.0	118	328	1.08	7340.50
17	82.3	112	327	1.01	6895.38
18	85.9	118	328	1.08	7205.38
19	89.0	120	328	1.01	7668.00
20	90.8	115	328	0.89	7842.38
21	90.2	107	328	0.96	7796.63
22	91.4	113	328	1.06	7804.13
23	93.0	109	328	0.98	8030.38
24	96.1	111	328	1.13	8205.38
25	90.4	111	328	1.15	7766.00
26	94.6	118	328	1.17	8121.38
27	98.3	115	327	0.98	8478.88
28	99.4	110	325	1.08	7925.13
29	109.8	108	324	1.09	6818.50
30	101.5	111	328	1.15	8764.50
31	99.8	112	328	1.09	8590.00
<b>Average</b>	91.2	116	328	1.04	7715.69
<b>Minimum</b>	2.2	69	184	0.46	6788.88
<b>Day of Minimum</b>	17	20	7	16	14
<b>Maximum</b>	163.6	212	368	1.55	8764.50
<b>Day of Maximum</b>	13	9	9	6	30
<b>Monthly Total</b>					239186.50
<b>Events</b>				0	

*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

August 2015

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	92.0	116	328	1.19	7912.38
2	88.5	119	328	1.05	7600.25
3	84.3	120	328	1.11	7226.75
4	86.4	116	328	0.99	7461.63
5	87.4	117	328	1.15	7544.50
6	87.2	115	328	1.06	7520.25
7	92.4	116	328	1.26	7979.50
8	84.2	115	328	1.07	7254.00
9	89.1	115	328	1.16	7677.25
10	86.4	114	328	1.10	7466.50
11	86.4	114	328	1.00	7464.75
12	89.3	111	328	1.12	7693.50
13	90.2	118	328	1.05	7790.50
14	88.8	117	328	1.09	7457.25
15	91.5	111	328	0.98	7569.00
16	93.3	114	328	1.17	7705.00
17	95.4	109	328	1.03	8224.25
18	94.3	112	328	1.15	8120.75
19	96.5	114	328	1.12	8336.50
20	89.4	118	328	1.09	7709.50
21	97.6	113	328	1.03	8055.25
22	97.5	115	328	1.13	8362.25
23	95.8	112	328	1.04	8106.75
24	90.4	112	328	1.00	7611.50
25	90.2	113	328	1.16	7790.00
26	90.4	109	328	1.03	7800.00
27	89.7	110	328	1.12	7733.00
28	95.6	108	328	1.20	8242.75
29	93.0	111	328	1.06	8029.25
30	95.9	116	328	1.14	8144.25
31	100.3	113	328	1.07	8614.50
<b>Average</b>	91.3	114	328	1.09	7813.02
<b>Minimum</b>	3.6	57	180	0.45	7226.75
<b>Day of Minimum</b>	14	18	14	28	3
<b>Maximum</b>	163.4	197	372	1.44	8614.50
<b>Day of Maximum</b>	17	13	17	10	31
<b>Monthly Total</b>					242203.50
<b>Events</b>				0	

*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

**September 2015**

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	101.9	114	328	1.12	8777.25
2	99.7	107	328	0.99	8599.75
3	92.4	110	328	1.09	7973.50
4	88.0	109	328	0.98	7544.75
5	92.7	116	328	1.07	7862.25
6	94.4	114	328	0.98	8138.25
7	101.4	114	328	0.95	8719.00
8	96.4	117	328	0.95	8328.75
9	93.4	114	328	1.09	8063.25
10	91.5	112	328	1.08	7903.00
11	90.9	114	328	1.12	7847.25
12	86.5	121	328	1.09	7469.00
13	90.8	116	328	1.08	7803.50
14	90.8	120	328	1.10	7847.75
15	94.6	111	328	1.10	8167.75
16	93.2	116	328	1.17	8036.00
17	91.4	116	328	1.17	7892.00
18	88.8	115	328	1.18	7640.25
19	84.6	111	328	1.03	7276.25
20	84.9	117	328	1.12	7333.50
21	88.3	109	328	0.97	7621.75
22	93.4	112	328	1.01	8051.50
23	92.8	110	328	0.99	8004.00
24	93.8	112	328	1.15	8105.75
25	93.6	108	328	1.00	8048.25
26	89.8	107	328	1.06	7743.75
27	89.8	110	328	1.10	7759.25
28	87.1	108	327	1.01	7495.50
29	90.8	116	328	1.10	7808.50
30	93.3	107	328	1.05	8046.00
31					
<b>Average</b>	92.0	113	328	1.06	7930.24
<b>Minimum</b>	3.5	58	265	0.47	7276.25
<b>Day of Minimum</b>	24	3	25	15	19
<b>Maximum</b>	167.9	191	358	1.44	8777.25
<b>Day of Maximum</b>	30	24	27	17	1
<b>Monthly Total</b>					237907.25
<b>Events</b>				0	

*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

October 2015

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	91.8	123	328	1.10	7929.25
2	90.2	115	328	1.08	7785.75
3	83.9	112	328	1.13	7248.75
4	84.1	115	328	1.11	7252.00
5	82.6	114	328	1.16	7129.00
6	87.8	113	328	1.16	7580.75
7	83.5	117	328	1.18	7205.75
8	82.9	117	328	1.19	7158.00
9	78.8	121	328	1.17	6800.50
10	75.5	115	328	1.06	6517.75
11	72.9	119	328	1.10	6299.25
12	76.9	114	328	1.09	6638.00
13	76.2	113	328	1.05	6577.50
14	79.3	112	328	1.13	6850.25
15	78.9	117	328	1.09	6810.50
16	75.4	109	328	1.20	6513.25
17	73.7	116	328	1.21	6364.75
18	74.6	116	328	1.11	6439.00
19	73.2	116	328	1.17	6325.50
20	72.2	114	328	1.06	6233.50
21	72.4	116	328	1.17	6250.50
22	72.5	113	328	1.10	6260.50
23	70.4	118	328	1.21	6077.50
24	70.8	111	328	1.18	6115.50
25	72.7	115	328	1.23	6275.50
26	70.9	110	328	1.17	6122.75
27	70.9	116	328	1.17	6123.50
28	70.0	116	328	1.11	6050.75
29	69.9	118	328	1.23	6032.25
30	68.2	113	328	1.03	5893.50
31	70.9	106	328	1.17	6118.00
<b>Average</b>	76.6	115	328	1.14	6612.23
<b>Minimum</b>	3.4	72	252	0.62	5893.50
<b>Day of Minimum</b>	16	26	14	14	30
<b>Maximum</b>	151.0	189	363	1.56	7929.25
<b>Day of Maximum</b>	27	30	16	26	1
<b>Monthly Total</b>					204979.25
<b>Events</b>				0	



*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

November 2015

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	72.9	111	328	1.11	12883.50
2	70.9	107	328	1.04	6120.25
3	69.3	113	328	1.12	5986.00
4	68.7	120	328	1.10	5932.50
5	69.1	110	328	1.00	5961.75
6	68.1	114	328	1.06	5878.75
7	71.5	111	328	0.85	6171.50
8	72.0	115	328	0.95	6211.50
9	68.8	112	328	1.00	5937.75
10	67.4	117	328	1.15	5817.25
11	66.7	115	328	1.08	5743.00
12	n/a	101	293	1.04	3764.00
13	52.4	117	325	1.04	4522.00
14	66.1	114	328	1.03	5700.75
15	67.5	117	328	1.13	5834.50
16	65.0	114	328	1.13	5606.25
17	66.0	115	328	1.14	5715.75
18	68.3	109	328	1.11	5895.50
19	64.1	113	328	1.05	5540.50
20	64.5	115	328	1.09	5563.25
21	66.3	120	328	1.11	5728.00
22	67.7	114	328	1.09	5847.25
23	65.7	117	328	1.12	5670.00
24	64.6	111	328	1.10	5576.25
25	62.5	115	328	1.06	5392.75
26	62.2	117	328	1.07	5375.50
27	58.6	118	328	1.05	5074.50
28	63.3	117	328	1.10	5436.50
29	65.7	120	328	1.10	5673.75
30	62.8	118	328	1.08	5415.75
31					
<b>Average</b>	66.2	114	327	1.07	5865.88
<b>Minimum</b>	3.5	0	0	0.00	3764.00
<b>Day of Minimum</b>	13	12	12	12	12
<b>Maximum</b>	136.7	200	362	2.00	12883.50
<b>Day of Maximum</b>	8	30	4	12	1
<b>Monthly Total</b>					175976.50
<b>Events</b>				0	

*St. Thomas Water Distribution System - 2015 Summary Report Albert Robert Booster Station Monthly Data*

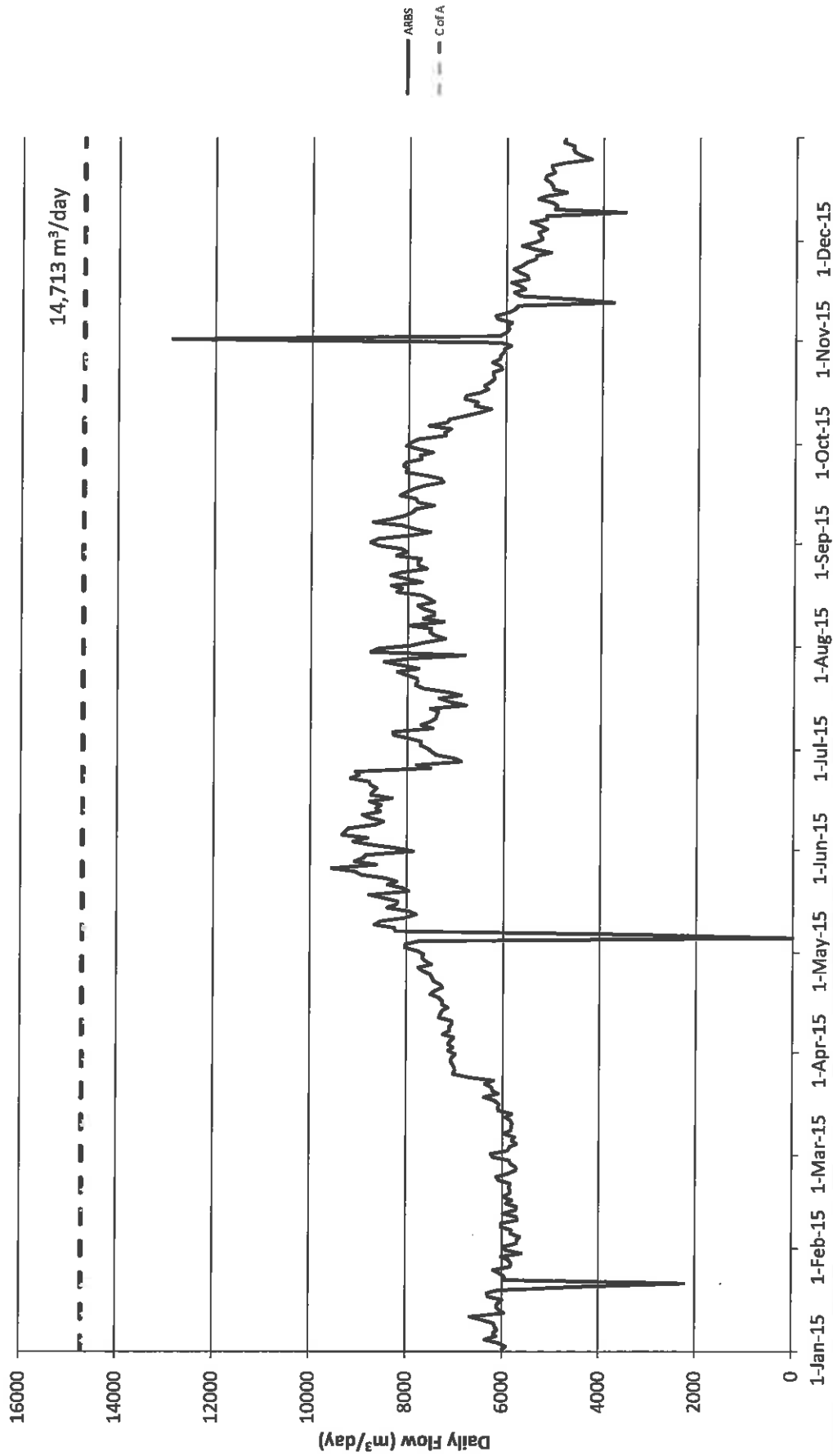
December 2015

Day of the Month	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
1	60.8	117	328	1.16	5252.50
2	61.2	118	328	1.15	5289.00
3	61.8	120	328	1.07	5334.00
4	59.9	121	328	1.13	5166.75
5	61.5	119	328	1.13	5310.75
6	63.7	120	328	1.09	5497.50
7	59.8	118	328	1.06	5166.25
8	60.0	120	328	1.00	5180.25
9	55.5	115	328	0.79	3531.00
10	57.9	116	328	0.99	4994.00
11	57.3	116	328	0.98	4950.25
12	58.4	111	328	0.93	5047.00
13	61.9	113	328	1.05	5345.50
14	59.9	113	328	1.00	5168.25
15	55.0	117	327	0.92	4753.50
16	58.4	118	328	1.09	5036.75
17	58.6	118	328	1.03	5046.25
18	59.0	119	328	0.96	5096.75
19	60.4	112	328	0.96	5213.75
20	60.1	113	328	0.99	5192.25
21	57.9	116	328	0.96	5001.75
22	58.7	116	328	0.95	5049.75
23	58.8	112	328	0.93	5075.50
24	55.4	113	328	0.93	4784.50
25	49.1	113	328	0.92	4241.25
26	51.3	114	328	0.93	4433.25
27	53.1	118	328	0.94	4582.00
28	53.6	118	328	1.00	4625.50
29	53.4	116	328	1.01	4607.75
30	55.8	111	328	1.04	4822.25
31	55.4	116	328	0.99	4781.50
<b>Average</b>	57.9	116	328	1.00	4954.10
<b>Minimum</b>	1.2	74	286	0.00	3531.00
<b>Day of Minimum</b>	22	12	22	9	9
<b>Maximum</b>	125.5	194	365	1.74	5497.50
<b>Day of Maximum</b>	19	22	22	16	6
<b>Monthly Total</b>					153577.25
<b>Events</b>				0	

2015 Yearly Report - Albert Roberts

Month of the Year	Discharge Flow	Suction Header Pressure	Discharge Header Pressure	Discharge Free Chlorine Residual	Discharge Volume
	<i>l/s</i>	<i>kPa</i>	<i>kPa</i>	<i>mg/l</i>	<i>m3</i>
January	70.5	113	334	1.04	182498.13
February	67.8	113	334	1.07	163834.88
March	72.6	113	334	1.04	193926.69
April	84.7	113	335	1.11	219491.13
May	97.0	114	334	1.09	258571.50
June	99.4	118	334	1.03	255205.25
July	91.2	116	328	1.04	239186.50
August	91.3	114	328	1.09	242203.50
September	92.0	113	328	1.06	237907.25
October	76.6	115	328	1.14	204979.25
November	66.2	114	327	1.07	175976.50
December	57.9	116	328	1.00	153577.25
<b>Average</b>	80.6	114	331	1.07	210613.15
<b>Minimum</b>	1.2	0	0	0.00	153577.25
<b>Day of Minimum</b>	22	12	12	9	
<b>Month of Minimum</b>	Dec	Nov	Nov	Dec	December
<b>Maximum</b>	175.5	226	392	2.00	258571.50
<b>Day of Maximum</b>	4	9	9	12	
<b>Month of Maximum</b>	Jun	Jun	Jun	Nov	May
<b>Yearly Total</b>					2527357.83

### Albert Roberts Booster Station Daily Flows



### Albert Roberts Booster Station Chlorine Residuals

