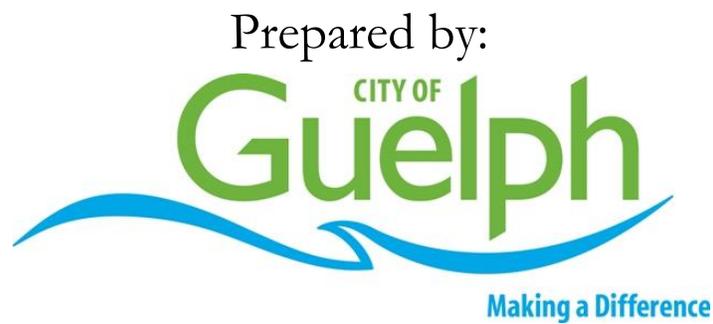


Lead Reduction Plan Update Report

For the period of:
Jan. 1, 2011 – Dec. 31, 2012

For:
Guelph Drinking Water System
[Corporation of the City of Guelph]



Water Services
Planning, Building, Engineering and Environment

March 2013

Executive Summary

The City of Guelph's (the City's) Lead Reduction Plan (LRP) was developed in lieu of a Corrosion Control Plan (as outlined in Ontario Regulation 170/03 Schedule 15) and was submitted to the Ministry of the Environment (MOE) in April, 2011. The application for full regulatory relief from the lead sampling requirements of Schedule 15.1 and post-implementation monitoring program as part of the City's LRP was subsequently fully approved on March 21, 2012. The purpose of this report is to provide an updated summary on continuing LRP initiatives and new LRP initiatives since January 2011. Please refer to the Lead Reduction Plan for detailed information on various programs and efforts prior to January 2011.

The City has been working proactively to address the presence of lead service lines (LSL) in Guelph since 2007 through the identification and replacement of both the public and private portions of LSLs. Full LSL replacement has demonstrated to be effective in achieving regulatory compliance as well as significantly reduced lead concentrations as measured at the point of the water's consumption. Partial LSL replacement has demonstrated to be less effective at reducing lead levels for regulatory compliance and reduce lead concentrations at the point of consumption.

Since 2007 there have been 583 lead service lines replaced in the City. As a result, 86 percent of these homes are now considered to be 'lead-free' service lines (i.e., either a full replacement, a partial replacement connecting back to a non-lead material or a subsequent replacement of a privately-owned LSL by the homeowner). At the beginning of the program, the City conducted an extensive records review identifying approximately 3,750 known or suspected lead services. Through the Verification Sampling Program the number has been reduced to 520 suspected LSLs (as of December 31, 2012).

This update report summarizes lead reduction through the identification and replacement of LSLs and subsequent post replacement monitoring. This report includes updated information on the following programs that support the overall Lead Reduction Plan:

- Legislated Lead Sampling under Schedule 15.1 (2011)
- Water Service Verification Program results
- Lead Service Line Replacement Program results and activities
- Lead Water Service Replacement Grant Programs summary
- Post-Replacement Sampling Program results
- Post-Implementation Monitoring Program results
- Water Filter Rebate Program activities
- Description of outreach efforts

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Background of Lead Reduction in the City of Guelph

In April 2011, as a result of regulated lead sampling which indicated that more than ten percent of residential samples taken exceeded the Ontario Drinking Water Quality Standard (ODWQS) for lead of 10 µg/L (micrograms per litre or parts per billion) during two consecutive rounds of the legislated sampling, the City submitted a Lead Reduction Plan in lieu of a Corrosion Control Plan (as outlined in O.Reg 170/03 Schedule 15).

The MOE Guidance Document on Corrosion Control (December 2009) recognized lead source reduction through physical replacement of lead service lines (a non-treatment solution) as a viable alternative to chemical treatment. The City evaluated both chemical corrosion control and physical replacement alternatives. The preferred method was determined to be lead source reduction through LSL replacement based on an analysis of the Guelph Water System features (multi-source groundwater system, varying groundwater quality and chemistry, and 13 treatment facilities) and challenges with chemical corrosion control treatment (structural upgrades and additional chemical treatment system). It is important to note that lead is the only corrosion by-product of concern for the Guelph system.

The LRP was developed with support from CH2MHILL and also with extensive consultation with the Ministry of the Environment (MOE) and the Wellington-Dufferin-Guelph Public Health (WDGPH). The LRP is a key component in the City's overall strategy to address the presence of LSLs which was effectively initiated in the City in 2007 and endorsed by Council in 2008. Since 2007 the City has initiated the following programs to actively identify, sample for and removed LSLs while educating the public about the risks of lead in drinking water:

- Dedicated staff (since 2007) to coordinate lead sampling programs, maintain dataset of results, oversee replacement of LSLs and engage public outreach and education.
- Voluntary sampling in order to identify and replace LSLs (as part the 2007 Voluntary Lead Sampling Program).
- Lead Water Service Replacement Program (in place as of 2007) to replace the public portion of the LSL.
- Lead Profiling Study (2008) to identify the source of lead and to measure lead levels before and after LSL replacement.
- Legislated Lead Sampling Program in accordance with Schedule 15.1 of O.Reg 170/03
- Water Service Verification Program (in place as of 2008). Reviewed records and identified homes with incomplete records on water service pipe material.
- Commitment of financial resources for the replacement of up to 125 City-owned LSLs per year (actual number replaced dependant on those found).
- Replacing LSLs as part of capital improvement projects.
- Post-Replacement Sampling Program to monitor lead levels before and after full and partial LSL replacements for up to 18 months (with homeowner's participation).

- LSL Replacement Grant Program (since 2010) to encourage and assist homeowners to replace the private portion of the LSL.
- Water Filter Rebate Program (since 2011) to provide customers an interim solution to lead reduction until permanent LSL replacement can be undertaken.

The MOE formally approved the City of Guelph's LRP and application for full regulatory relief from the lead sampling requirements of Schedule 15.1 on March 21, 2012. The City has completed this Lead Reduction Plan Update Report for the period of Jan 1, 2011 to December 31, 2012 to satisfy the requirements as per Schedule D of Guelph's Municipal Drinking Water Licence 017-101 which states:

"Section 1.3.3. The Owner shall prepare an annual report summarizing the results of each of the measures identified in section 8.1 (Implementation Schedule) of the Lead Reduction Plan..."

An updated implementation schedule mentioned in section 8.1 of the LRP is provided in Table 1 below and this update report addresses progress of ongoing tasks listed in further detail:

Table 1: Proposed Implementation Schedule

Task	Approximate Duration	Approximate Start Date	Status as of Dec. 31, 2012
Public notification and education	Continue until all LSLs are replaced	Summer 2007	Ongoing
Consultation with local MOE Drinking Water Inspector	Ongoing	3Q2007	Ongoing
Consultation and coordination with other stakeholders (WDGPHU, MOH)	Ongoing	4Q2008	Ongoing
Preparation of draft CCP	9 months	1Q2010	Completed
Request extension from MOE for the submission of CCP		2Q2010	Completed
Approval of CCP by Council	1 month	1Q2011	Completed
Approval and implementation of POU Filter Program for vulnerable populations	3 months	1Q2011	Completed
Formal request to the MOE for regulatory relief from chemical treatment		4Q2010	Completed
Formal submission of CCP to MOE		2Q2011	Completed
Notify public of LSL replacement as corrosion control method Public education of benefits of full LSL replacement	Ongoing	2Q2011	Completed (also ongoing as part of general public outreach)

Task	Approximate Duration	Approximate Start Date	Status as of Dec. 31, 2012
Completion of Water Service Verification Program (Approximate)	4 years	4Q2014 (Program started in 2008)	Ongoing (projected completion 2015)*
Review of LSL replacement rate	3 months	Annually	Ongoing
Review of Grant Program performance	1 month	Annually	Ongoing
LSL replacement	Ongoing; between 10 and 15 years, depending on LSL replacement rate	2007	Ongoing; between 10 and 15 years, depending on LSL replacement rate
Post-implementation monitoring	Ongoing	4Q2010	Ongoing

*Completion of Water Service Verification Program is dependent on customer cooperation

The Guelph Water System

The Guelph Water System supplies water to approximately 124,000 people within the City of Guelph and the Gazer Mooney Distribution System through approximately 40,583 fully metered water service connections and approximately 545 kilometres of underground watermains. The source of the City's drinking water is a series of 21 groundwater wells and a shallow groundwater collection system that are located throughout the City. The LRP and this update report only apply to the City of Guelph, as no lead exceedances were reported from buildings served by the Gazer Mooney Distribution System during Legislated Lead Sampling rounds.

Treatment of Guelph's water consists of sodium hypochlorite application for both primary and secondary disinfection for most operational wells and, ultraviolet light (UV) primary disinfection for water originating from eight water sources. Liquid sodium silicate, as an aesthetic treatment, is applied at a dose of approximately 5mg/L at two wells for the purpose of iron sequestration. A free chlorine residual is maintained in the distribution system.

Legislated Lead Sampling under Schedule 15.1 (2011)

The Legislated Lead Sampling Program was announced on July 26, 2007 and the intent of this sampling was to have water purveyors in Ontario assess their respective water systems and to quantify the presence of lead in water at the point of consumption. The presence of lead above a regulated criteria was deemed an indication that the water within the system was or may be corrosive in nature and would require the purveyor to investigate further to determine whether a corrosion control plan was necessary to mitigate lead concentrations at the point of consumption.

In October of 2009, the City requested partial relief from the Legislated Lead Sampling Program that required the City to collect 5 residential samples per month for 12 months per year (for a total of 60 samples per year) and 10 distribution samples. The City received informal relief from all Legislated Lead Sampling as of April, 2011 (simultaneously with the submission of the LRP to the MOE). For the period of January 1 to March 20, 2012, sampling was conducted in compliance with reduced sampling requirements as per Schedule D of Guelph's Municipal Drinking Water Licence. As of March 21, 2012 sampling was conducted in conformance with the LRP.

Table 2 presents summary results for the regulatory lead sampling of the distribution system as measured at hydrants in the Guelph Drinking Water system from January to April 2011 (the time the LRP was submitted). Lead concentrations in all the samples collected from the hydrants were below the ODWS limit of 10 µg/L. Results from standing and flowing samples collected at residential and non-residential plumbing locations from January to April 2011 are presented in Table 3.

Table 2: City of Guelph Legislated Lead Sampling of Distribution System, Jan to Apr 2011.

	Total Lead (µg/L)	Alkalinity (mg/L as CaCO ₃)	pH	Temperature (C°)
Average	1.7	263	8	7.0
Maximum	12	275	7.8	9.0
Minimum	<0.5	255	7.5	3.0
Median	<0.5	262	7.6	7.0
Notes:				
1. Totals based on 16 samples collected Jan to Apr, 2011				
2. Samples are collected using a 5 minute flush protocol per Schedule 15.1				
3. Regulatory relief from sampling was sought in 2009 and only 10 distribution system samples were required per year to coincide with residential samples				
4. Legislative Lead Sampling was discontinued as of May 1, 2011 once the LRP was submitted				

Table 3: City of Guelph Legislated Lead Sampling of Residential and Non-Residential Plumbing Locations, Jan to Apr 2011

	1 st Litre Total Lead (µg/L)	2 nd Litre Total Lead (µg/L)	Alkalinity (mg/L as CaCO ₃)	pH
Average	3.5	3.2	270	7.7
Maximum	19	20	283	8.0
Minimum	<0.5	<0.5	257	7.3
Median	0.9	1.1	271	7.7
Notes:				
1. Totals based on 21 samples collected Jan to Apr, 2011				
2. Samples are collected using a 30 minute stagnation protocol per Schedule 15.1				
3. Regulatory relief from sampling was sought in 2009 and only 5 residential samples were required per month				
4. Legislative Lead Sampling was discontinued as of May 1, 2011 once the LRP was submitted				

Water Service Verification Program

In an effort to locate lead services within the City of Guelph, the Water Service Verification Program was launched in 2008 and is in addition to any legislative sampling requirements. The program is targeted at verifying the material of construction for approximately 3,750 unknown water services (pre-identified during records review). Lead sampling is also offered at no additional charge to all residents of homes built prior to the mid-1950s. Approximately 3,826 samples have been collected to date as part of this program.

Lead water services are verified through the collection of a 5-minute flush sample and identification of the pipe material visible at the meter. There were 913 verification sampling visits in 2011 and 426 verification sampling visits in 2012 (see Table 4).

Table 4: Number of services verified (visual inspection and water sample) through Water Service Verification Program

Date	Number of Services Verified
2008 to 2010	2,487
2011	913
2012	426
Total	3,826

Using the Water Service Verification Program, previous Legislated Lead Sampling Program and additional information gathered about service material records, the City has been able to reduce the number of City owned 'unknown' or suspected lead services from 3,750 (as of Spring 2009) to approximately 520, as of December 31, 2012 (see Table 5).

Table 5: Number of services targeted under the Water Service Verification Program where the material of service is 'unknown' or suspected to be lead in City records.

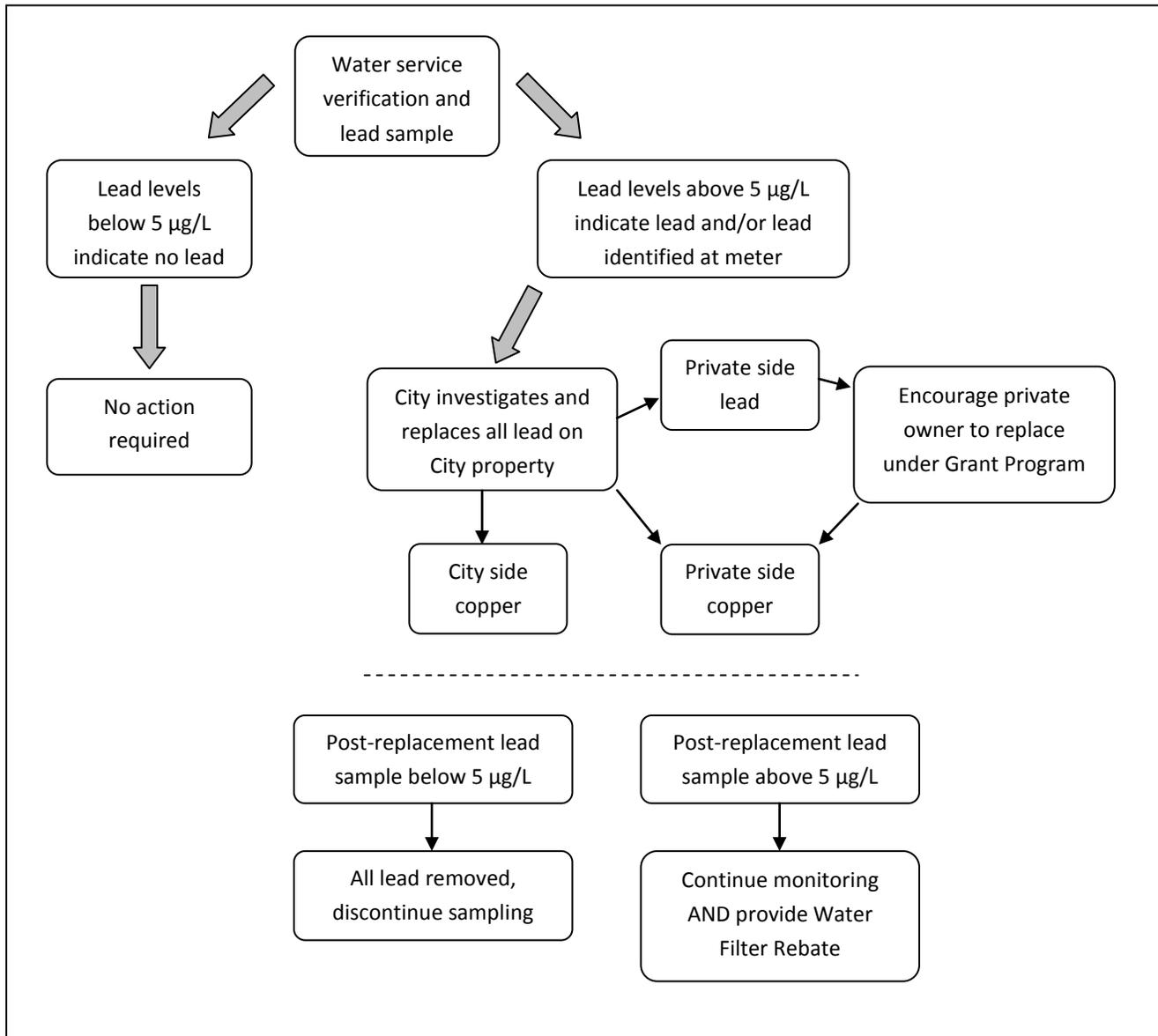
Date	Targeted 'Unknown' Services Remaining
Spring 2009	3,750
As of December 31, 2010	1,800
As of December 31, 2012	520

LSLs (either City-owned or privately-owned) were found at approximately 7.5 percent of homes under the Water Service Verification Program in 2011 and 2012. If the verification inspection and/or water sample analysis from the Water Service Verification Program indicate the water service is made of lead (i.e. lead visually identified or lead concentrations are detected above half the maximum allowable concentration of 5 µg/L), the City replaces the City-owned portion of the water service at no cost to the property owner under the Lead Service Line Replacement Program. If applicable, the City encourages the property owners to replace

the private portion of the LSL through the LSL Replacement Grant Programs which can provide up to approximately \$1,500 towards the cost of replacement (Figure 1).

Verification and removal of LSLs in large measure depends on owner participation and co-operation in gaining access to residences/businesses. Each remaining targeted property under this program has been contacted using multiple avenues including phone calls, mail, and door tags as well as through broad outreach methods such as newspaper advertisement, community events and radio.

Figure 1: Typical Lead Service Line Verification and Replacement Process



Lead Service Line Replacement Program

A dedicated Water Service Replacement Program was established in 2007 to replace LSLs as they are found during sampling programs, leak repair, street reconstruction or records review. In 2011 and 2012 a total of 99 and 68 LSL replacements took place respectively. A breakdown of the total LSL replacements under the LSL Replacement Program and LSL Replacement Grant Programs in 2011 and 2012 is provided in Table 6.

Table 6: LSL replacements in 2011 and 2012 on City- and Private- side of water service

Type of Replacement		2011	2012
Full LSL Replacement	Partner with property owner (not eligible for Grant Program ^a)	12	12
	Replaced during street reconstruction ^b	3	2
	Funded under Full LSL Replacement Grant Program ^a	21	7
Partial LSL Replacement	Lead Free - connected back to non-lead material or subsequently replaced under Grant Program ^a	13	19
	Lead - Connected back to lead on Private side	6	5
Private LSL Replacement	Replacement by private contractor	2	-
	Funded under Private LSL Replacement Grant Program ^a	42	23
TOTAL		99	68
Legend:			
a – The LSL Replacement Grant Program provides eligible property owners funding to off-set the cost of replacing an LSL on private property.			
b – LSLs are replaced when discovered during planned street reconstructed activities			

Since 2007, 583 full or partial LSLs have been replaced through the Lead Water Service Replacement Program and/or the Grant Programs, a summary is provided in Table 7. Of all replacements undertaken in the City, 451 services or 86 percent are considered to be 'Lead Free', which include the following situations i) a full replacement was carried out; ii) a partial replacement was carried out and the new partial service line was reconnected back to a non-lead material (copper or iron) and post-replacement sample results indicate no lead remains; or finally iii) a partial replacement was carried out by the City and was reconnected to an existing private lead service line which was subsequently replaced by the owner either by use of a private contractor or under the LSL Replacement Grant Program.

Since 2007, there were 132 partial replacements undertaken on the City-side that connected back to lead or an unknown material on the private-side. Of the 132 privately-owned LSLs, 59 have subsequently been replaced under the LSL Replacement Grant Program or by a privately hired contractor.

Table 7: Summary of LSL Replacements from 2007 to 2012

Year	Service is Lead-Free Following Replacement			Service Contains Lead or Unknown Following Replacement		
	Full (City and Private Sides Replaced)	Partial (City Side Replaced - connected to copper or iron)	Private Side Replacement (Grant or private contractor)	Partial (City side Replaced - connected to lead or unknown)	Total	Private Side Lead since replaced under the Grant Program
2007	16	32		26	74	5
2008	21	40		29	90	18
2009	40	32		25	97	6
2010	46	27	47	35	155	23
2011	36	12	44	7	99	1
2012	21	14	23	10	68	6
Total to Date	180	157	114	132	583	59
Adjusted Total	451			132-59 = 73	524	

Notes:

- 1) Since 2007, there were **59** instances where a partial city-side replacement that was connected back to lead or unknown was subsequently completed by the homeowner (Private-side Replacement) through the Private Grant Program or by a private Contractor. These **59** instances have been subtracted from the total, since they are already included within the total number of replacements resulting in lead-free services.
- 2) Prior to the Grant Program (2007-2009), private side lead replacements are included in the "Partial (City side replaced - connected back to Copper)" numbers because they were not formally tracked at the time but we have evidence that the service is now a fully copper line.
- 3) Since 2010, private side lead replacements are broken out and recorded as "Private Side Replacements (Grant or private contractor)"
- 4) Numbers recorded in this chart may vary slightly from those in the Lead Reduction Plan (April, 2011) due to subsequent data review.

As of December 31, 2012 there are approximately 25 City-owned LSLs to be replaced during the 2013 construction season and there are a total of 184 known or suspected privately-owned LSLs remaining in the City. Of the 184 privately-owned LSLs, 73 were identified during the replacement of a City-owned LSL (since 2007) where the owner was unwilling or unable to replace the privately-owned LSL. The other 111 known or suspected privately-owned LSLs were identified through records review or the Water Service Verification Program.

The City of Guelph is committed to continuing the LSL Replacement Program until all City-owned LSLs have been replaced. The City allocated \$500,000 in both the 2011 and 2012 budgets for the Lead Water Service Replacement Program to allow for up to 125 City-side lead service replacements per year. Actual replacement numbers are dependent on LSL identified and the City conservatively targeted replacement of all City-owned lead services within 15 years of LRP implementation (by 2026). This target date will be reassessed every 5 years and as part of the annual update report to MOE and City Council.

Lead Water Service Replacement Grant Programs

Regulatory compliance for lead reduction is focused on concentrations of lead at the point of consumption (tap), different from other ODWS standards which are only regulated within the distribution system. Therefore replacement of private portion of LSLs presents a challenge to success of an LSL replacement program due to the limits of the municipalities' jurisdiction and authority.

In 2010, the City initiated two financial incentive programs to encourage replacement of privately-owned LSL by reducing the financial burden. The Private Lead Water Service Replacement Grant Program provides up to \$1,507 to homeowners to replace a confirmed privately owned LSL where the City-owned water service line is confirmed to be copper (i.e., City-side LSL was previously replaced). The Full Lead Water Service Replacement Grant Program provides up to \$586 to homeowners to replace a confirmed privately owned LSL in tandem with City-owned LSL replacement. The value for the tandem replacement is substantially reduced to reflect the reduced excavation costs for the contractor when the City is present and performing the excavation.

Costs which are eligible for reimbursement under the Grant Programs include contractor costs, materials, building permit, and excavation costs (if applicable). The grant covers 70 to 100 percent of the LSL replacement cost for homeowners. In April 2012, changes were made to the Grant Programs to allow rental properties that are not owned by a commercial enterprise (including property management enterprises) to apply for a grant in accordance to the Municipal Act. This change has successfully increased uptake in the Grant Programs.

Targeted outreach regarding the Grant Programs is directed at all properties with known or suspected privately-owned LSLs. Since 2010 there have been 153 homeowners who have participated in the Grant Programs and successfully replaced their privately-owned LSL (Table 8).

Table 8: Summary of LSL Replacement Grant Programs as of December 31, 2012

Grant Program	2010	2011	2012
Full Water Service Replacement Grant Program	15	21	7
Private Water Service Replacement Grant Program	45	42	23
Yearly Total	60	63	30
Total	153		

Post Replacement Sampling Program

The City developed a post-implementation monitoring program in consultation with the MOE and WDGPH (detailed in the LRP). The City's post-implementation monitoring program has been customized to reflect the features of the City's approach to lead source reduction while remaining consistent with the intent of Schedule 15.1. Lead concentrations in samples taken from on-site plumbing following LSL replacements are used to provide an assessment of the effectiveness of LSL replacement at individual sites (i.e., are lead

concentrations reduced below the ODWQS following replacement?) and in the system, specifically within the portion of the City affected by lead services (i.e., are less than 10 percent of sites sampled post-replacement above the ODWQS?).

Post-Replacement Sampling Protocol

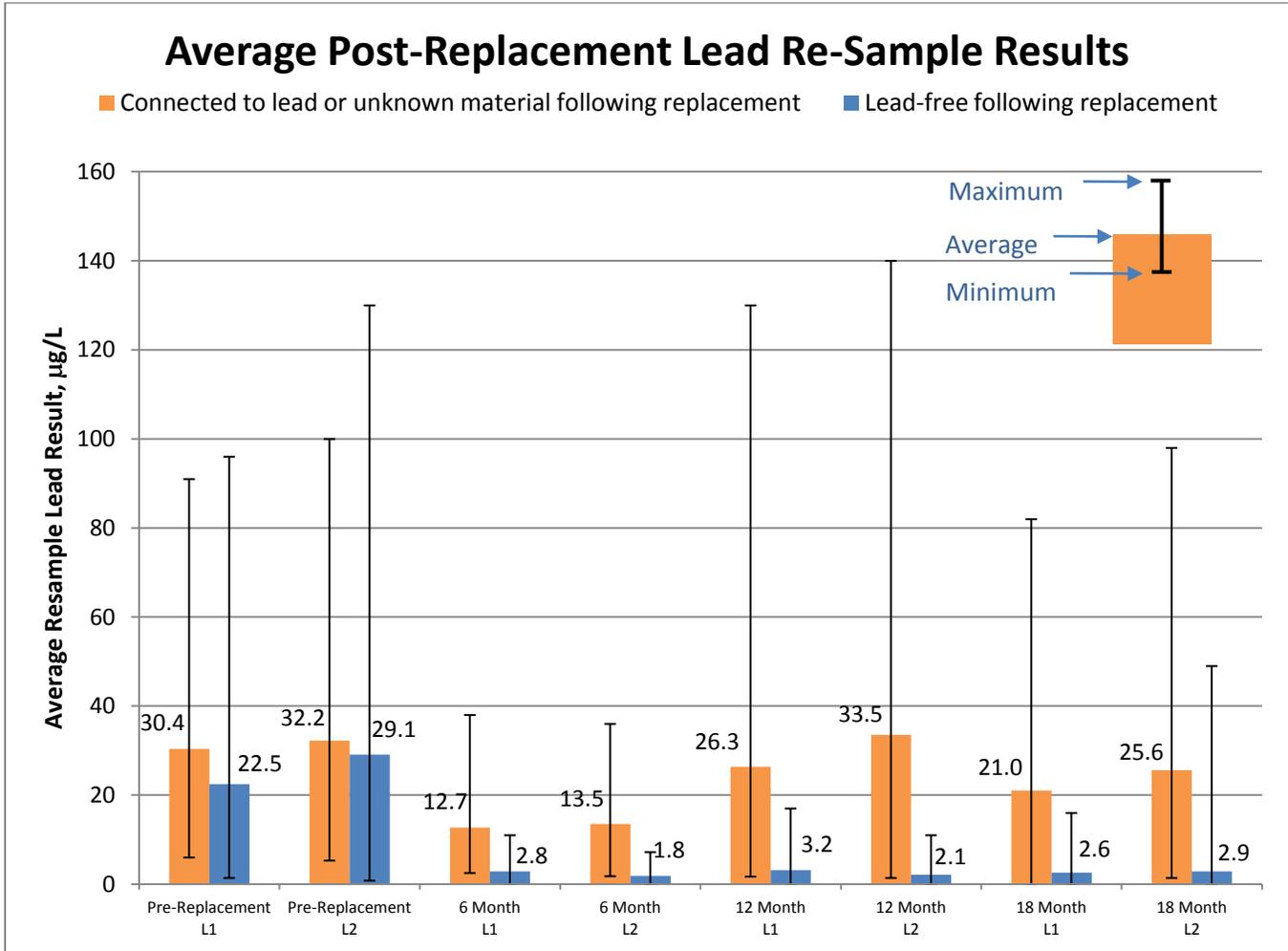
As part of this program the City attempts to obtain water samples prior to replacement and comparative samples following LSL replacement (with homeowner's participation). Since April 2011, lead sampling is conducted using a 30-minute stagnation sampling protocol which dictates that the water at point of consumption be flushed for a minimum of five minutes, followed by a 30 minute stagnation period, followed by the collection of a 1 litre sample (L1), and then collection of a second 1 litre sample (L2). Prior to April 2011 most samples were collected using the 5-minute flush protocol. Caution should be used when comparing pre- and post-replacement samples due to the difference in sample collection methods.

The City program uses sampling intervals of 6, 12 and 18 months following replacement to monitor lead concentrations at the point of consumption. Post-replacement lead sampling is discontinued after the 6 month anniversary at properties that have undergone a full LSL replacement or where a City LSL replacement has connected to a non-lead material on the private-side *and* where lead levels fall below half the ODWQS being 5 µg/L (current practice since April 2011). Sampling at homes where lead still remains on the private side is only discontinued once the 18 month interval has been achieved. Due to this sampling protocol, there can be a greater number of samples collected at sites where an LSL remains on private-side than a site where a full LSL Replacement occurred. Post replacement sampling provides an opportunity to encourage replacement of the privately-owned LSL and apply to the Private LSL Replacement Grant Program and the Filter Rebate Program (if applicable).

Comparing Partial Vs. 'Lead Free' Replacement

There are two types of services that can result from performing a LSL replacement; a partial replacement of the City-owned portion of the service that is reconnected to a privately-owned lead or 'unknown' material, and a full LSL that is considered 'lead free' following replacement (full LSL replacement or a partial LSL replacement that was reconnected back to a non-lead material and post replacement samples confirm all lead was removed). A comparison of average sample results from sites with these two types of service replacements are provided in Figure 2 (sample size of 279 sites).

Figure 2: Average Pre- and Post-Replacement Lead Concentrations from the Post-Replacement Sampling Program (Based on 30 Stagnation Sample)



Notes:

- a. Sample size for the “Connected to lead or unknown material following replacement” is 50 replacements. Sample size for the “Lead-free following replacement” is 229 replacements.
- b. Only data using 30 minute stagnation sample is provided due to limitations in comparing results using differing sampling methods (5 minute flush versus 30 minute stagnation samples).
- c. Stagnation sample protocol is based on Schedule 15.1 which outlines the water is turned on for five minutes to flush the water, followed by a 30 minute stagnation period, followed by the collection of a 1 litre sample (L1), and then followed by a second 1 litre sample (L2).
- d. Twelve month re-samples are typically collected during the summer months as the majority of replacements are completed during the summer construction season. Lead levels during summer months are naturally higher due to increased water temperatures in the distribution system and home plumbing system. The dissolution of lead increases with increased water temperature.

Partial Lead Service Following Replacement

For sites with a private service line containing lead or an unknown material following replacement, a reduction in lead concentration is observed but does not consistently drop below the ODWQS of 10 µg/L for lead. Comparing pre- and post-replacement lead concentrations, there was an average reduction of 47 percent for the first litre (L1) and 32 percent for the second litre (L2) sampled from the point of consumption, following a

30 minute stagnation period (based on most current post-replacement sample results). Regulatory compliance is not always achieved at individual sites following a partial LSL replacement.

‘Lead Free’ Service Following Replacement

Sites with ‘lead-free’ service lines following replacement show a decreasing trend in lead levels with time following replacement. Average concentrations below 3 µg/L are achieved 18 months post-replacement. Comparing pre- and post-replacement lead concentrations, there was a median percent reduction of 98 percent for the first litre and 94 percent for the second litre sampled from the point of consumption, following a 30 minute stagnation period (based on most current post-replacement sample results). Regulatory compliance at an individual site is expected following full LSL replacement.

Compliance with ODWQS Following LSL Replacement

The success of reducing lead in drinking water by replacing lead service lines with copper is gauged from the Post-Replacement Sampling Program results. The LRP recommends that the City achieve the standard that less than 10 percent of sites sampled post-replacement are above the ODWQS. The number and percentage of LSL replacement sites with post-replacement lead concentrations above the ODWQS of 10 µg/L is provided in Table 9 and calculated using two sampling periods per year: period 1 from January 1 to June 30 and period 2 from July 1 to December 31 of the same year. This approach is modelled after Schedule 15.1 and only 30 minute stagnation samples are reported here (standard protocol since April 2011). It is important to note that not all sites are scheduled for post-replacement sampling within each time period.

In 2011 and 2012, there were 307 post replacement samples (i.e., immediately post replacement, 6 months, 12 months, and 18 months) collected at 260 sites in the City from homes that have undergone a LSL replacement (including full, partial or private LSL replacement). The City has achieved the standard that less than 10 percent of sites exceed the ODWQS for lead of 10 µg/L in 2011 and 2012.

Table 9: Summary of 30 minute Stagnation Samples Above ODWQS for Lead

Post LSL Replacement Samples (incl. Full, Partial or Private Replacements)	2011		2012	
	Jan 1 to Jun 30	Jul 1 to Dec 31	Jan 1 to Jun 30	Jul 1 to Dec 31
Number of sites above 10 µg/L Out of 260 sites in total	14	12	6	6
Percent ^a of sites above 10 µg/L	5.4%	4.6%	2.3%	2.3%
Legend: a – Calculated based on the total number of sites (i.e. 14/260 = 5.4%).				

When reviewing the larger dataset of 583 homes that have undergone a LSL replacement in the City since 2007 (full, partial or private LSL replacements) some care should be taken comparing different sampling protocols. Of the 583 LSL replacement sites, there are 451 which have at least one post-replacement sample

collected using either a 5 minute flush or 30 minute stagnation. For comparison it is expected that a lead concentration of 5 µg/L based on a 5 minute flushed sample is an indicator of likely compliance or a lead concentration of 10 µg/L for a 30 minute stagnation sample. Estimated compliance based on these samples is presented in Table 10. It is important to note that not all replacements are yet due for a post-replacement sample. From these results, full replacement of the LSL is likely to result in compliance with the ODWQS (as was observed in 99 percent of sites). For sites with a private service line that contains lead or an unknown material following replacement, only 23 percent of the sites were in compliance.

Table 10: Estimated Compliance with ODWQS Following LSL Replacement, Post Replacement Sampling Program (based on both 5 Minute Flushed Samples and 30 Minute Stagnation Samples)

Description	Number of Sites with a 'Lead-Free' Service Line Following Replacement					Number of Sites with a Service Line That Contains Lead or Unknown Material Following Replacement				
	Immediately Post- Replacement	6 Month	12 Month	18 Month	Overall	Immediately Post- Replacement	6 Month	12 Month	18 Month	Overall
Number of Sites with at least one post-replacement sample	5	113	117	121	356	3	9	26	57	95
In Compliance: Lead < 5 µg/L based on a 5 min flushed sample or < 10 µg/L based on a 30 minute stagnation sample following replacement	3	112	117	119	351 (99 %)	1	4	4	13	22 (23 %)
Out of Compliance: Lead ≥ 5 µg/L based on a 5 minute flushed sample or ≥ 10 µg/L based on a 30 minute stagnation sample following replacement	2	1	0	2	5 (1 %)	2	5	21	45	73 (76 %)

Notes:

- a. Only sites with at least one post-replacement sample are included in this table
- b. The most recent sample collected was used to determine compliance with or exceedance of the ODWQS. This varies by site depending on when the LSL was replaced and sampling is discontinued if sample results below 5 µg/L are obtained at sites considered to be lead-free.
- c. Samples collected using a 5 minute flush were considered to be in compliance if below 5 µg/L and samples collected using a 30 minute stagnation were considered to be in compliance if below 10 µg/L.

Post-Implementation Monitoring

The Lead Reduction Plan specifies recommended parameters for post-implementation monitoring to demonstrate conditions of the Guelph Water System remain stable over time. In 2011 and 2012 there were 10 lead samples per year collected within the distribution system at five sampling stations (Table 12). All lead concentrations from distribution samples were well below the ODWQS and indicate there is minimal lead originating from the distribution system beyond targeted lead service lines.

Table 11: Summary of Lead Levels within the Distribution System

Sample Date	Victory School Sampling Station	Waterloo Ave Sampling Station	College Ave Sampling Station	Kensington St Sampling Station	Robertson Outgoing POE
Nov 2011	1.3	0.9	ND	0.7	ND
Dec 2011	0.7	0.6	ND	ND	ND
Mar 2012	0.6	ND	ND	0.7	ND
Sept 2012	ND	ND	ND	ND	ND

The City conducts operational annual sampling for lead, alkalinity, pH, and temperature at all points of entry (POEs) to the distribution system being treated sources or groups of sources. In addition, the City samples various water quality parameters as part of existing operational monitoring programs including iron, copper, TDS, turbidity, chloride, sulphate, bacteriological parameters and other metals. Table 13 provides an aggregated average for all POEs. Operational sampling of water quality parameters demonstrate there are no other corrosion by-products within the system and that the general chemistry of the water entering the Guelph distribution system remains stable.

Table 12: Annual POE Sampling

Parameter	ODWQS MAC mg/L	ODWQS AO	ODWQS AO	Total Samples	# Above Criteria	Range (mg/L)		Average (mg/L)
						Min	Max	
2011								
Alkalinity (total, as CaCO ₃)	n/a	n/a	30-500	11	0	242	291	269
Background Bacteria (CFU/mL)	n/a	n/a	n/a	11	n/a	0	0	0
Chloride	n/a	250	n/a	11	0	41	220	111
Copper (total)	n/a	1	n/a	11	0	< 0.001	0.01	< 0.001
Iron (total)	n/a	0.3	n/a	11	0	< 0.1	0.26	0.02
Lead (total)	0.01	n/a	n/a	11	0	< 0.0005	< 0.0005	< 0.0005
pH	n/a	n/a	6.5-8.5	11	0	7.69	8.09	7.94
Saturation pH (@ 20 C)	n/a	n/a	n/a	11	n/a	6.91	7.10	7.02
Saturation pH (@ 4 C)	n/a	n/a	n/a	11	n/a	7.15	7.35	7.27
Sulphate	n/a	550	n/a	11	0	63	240	115
Total dissolved solids (TDS)	n/a	n/a	n/a	11	n/a	422	861	604

Parameter	ODWQS MAC mg/L	ODWQS AO	ODWQS AO	Total Samples	# Above Criteria	Range (mg/L)		Average (mg/L)
						Min	Max	
2012								
Alkalinity (total, as CaCO ₃)	n/a	n/a	30-500	12	0	250	310	282
Background Bacteria (CFU/mL)	n/a	n/a	n/a	12	n/a	0	0	0
Chloride	n/a	250	n/a	12	0	40	240	127
Copper (total)	n/a	1	n/a	12	0	< 0.001	< 0.001	< 0.001
Iron (total)	n/a	0.3	n/a	12	0	< 0.1	0.24	0.02
Lead (total)	0.01	n/a	n/a	12	0	< 0.0005	< 0.0005	< 0.0005
pH	n/a	n/a	6.5-8.5	12	0	7.87	8.23	8.01
Saturation pH (@ 20 C)	n/a	n/a	n/a	12	n/a	6.92	7.11	7.00
Saturation pH (@ 4 C)	n/a	n/a	n/a	12	n/a	7.16	7.36	7.24
Sulphate	n/a	550	n/a	12	0	52	220	113
Total dissolved solids (TDS)	n/a	n/a	n/a	12	n/a	438	862	638
Legend: ODWQS – O. Reg. 169/03 Ontario Drinking Water Quality Standards MAC (Maximum Allowable Concentration) < means less than lower detection limit shown n/a (not applicable) "AO", Aesthetic Objective "OG", Operational Guideline								

Annual Sampling at Residential Taps – 10 Sample Sites

The Lead Reduction Plan outlines that up to 10 sample sites will be monitored for up to four years after LSL replacement (sampled annually beyond the 18 month sample). Five full LSL replacement and five partial LSL replacement sites are currently being chosen from replacements conducted in 2011 and 2012 and annual sampling is scheduled to begin in 2013.

Water Filter Rebate Program

The LRP outlined the anticipated Point of Use (POU) filter program which was implemented in the summer of 2011. The Water Filter Rebate Program is an interim risk management strategy to protect sensitive populations from lead exposure until full LSL replacement can be achieved. The City encourages homeowners to replace the private portion of the LSL but for customers who are resistant to replacement or who are not eligible for the LSL Replacement Grant Programs, the City encourages the use of a POU water filter.

The program provides up to \$100 per year to customers, based on submitted receipts for an approved NSF-053 filtration device. The City has committed \$25,000 per year towards the program for supply of rebates and advertising efforts. Despite efforts to encourage homeowners with a LSL to use a water filter device, uptake of the Water Filter Rebate Program has remained low. There were 9 approved applicants in 2011 and 6 approved applicants in 2012. Of those that have applied to the Water Filter Rebate Program, 5 customers have since replaced their privately owned LSL.

Customers are informed about the program by City staff over the phone when elevated lead levels are discovered and application forms are mailed directly to owners and tenants along with sample results. Information about the program is advertised in the Guelph Tribune and within direct mail outs at various time of the year to households with known or suspected privately-owned LSLs.

Outreach Efforts

Success of the Lead Reduction Plan is dependent on homeowner participation. The City has undertaken extensive public education since 2007 and continues to work cooperatively with the Wellington-Dufferin-Guelph Public Health Unit to reach out to vulnerable populations. Public education and outreach is intended to encourage participation in the verification and replacement programs, educate the community and especially “at risk” groups about the health effects of lead in drinking water and target customers with privately-owned LSLs to uptake the LSL Replacement Grant Programs and Water Filter Rebate Program. Outreach efforts outlined below focus on those undertaken in 2011 and 2012, for further information on past public education and outreach initiatives please refer to the LRP.

General Advertising:

- Guelph Tribune
- Guelph Community Guide
- Redesigned and updated information on City of Guelph webpages (guelph.ca/leadtesting)
- Social media – Twitter and Facebook
- Community neighbourhood groups within the ‘Lead Zone’
- Posters in Guelph Transit Shelters and information on mobile signs throughout the ‘Lead Zone’
- Presence at local events including Canada Day Festival, Multicultural Festival and home shows
- Radio advertisements on local Guelph radio stations

Targeted Outreach:

- At Risk Groups: ‘Momstown’ online newsletter, doctors/midwife offices, daycare centres, Early Years Centres and Pre-Birth Questionnaire through Guelph-Wellington-Dufferin Public Health Unit
- English is a second language: advertised in 5 other languages in consultation with Immigrant Services of Guelph-Wellington
- Student housing: advertising within the University of Guelph’s newspaper and student handbook
- House buyers/sellers: information provided to the Guelph and District Association of Realtors

Water Service Verification Program – target properties with ‘unknown’ water services

- Direct phone calls to owners and tenants
- Delivered ‘door hangers’
- Letters to homeowners indicating that if a water sample is not obtained from the home/business that the City will excavate the water service line to confirm the pipe material
- Notification of lead testing in conjunction with water meter maintenance work

Customers with Privately-Owned LSLs

- Strong encouragement of privately owned LSL replacement at the time of City owned LSL replacement (information is provided via letter and verbal contact by a Water Services Operator)
- Direct mail outs to customers regarding the risks of lead in drinking water, the LSL Replacement Grant Program, and Water Filter Rebate Program
- Direct phone calls to owners

The City is constantly adapting outreach methods to encourage participation. The City has recently analyzed demographic information and customer records to determine if target audiences are being reached and to determine why residents are resistant to either the Water Service Verification Program or LSL Replacement Program.

Conclusion

The City of Guelph continues to remain dedicated to lead source reduction through the physical replacement of lead service lines and has demonstrated that physical replacement is a viable and successful alternative to chemical treatment based on the unique characteristics of the Guelph water system. The City continues to strive for full LSL replacements and encourage owners to replace privately owned LSLs through the Grant Programs and communication of the health risks regarding lead in drinking water. Post-replacement monitoring at individual LSL replacement sites continues to prove that within the Guelph Drinking Water System, partial LSL replacement generally reduces lead concentrations from pre-replacement values and full LSL replacement consistently reduces lead concentrations below the ODWQS. The City of Guelph is constantly adapting communication to customers and delivery of our programs to maintain the success of our Lead Reduction Plan.

For more information:

For more information or questions regarding this report please contact:

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