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TO:	**CHAIR AND MEMBERS CIVIC WORKS COMMITTEE MEETING ON APRIL 8, 2015**
FROM:	**JOHN BRAAM, P. Eng. MANAGING DIRECTOR, ENVIRONMENTAL & ENGINEERING SERVICES & CITY ENGINEER**
SUBJECT:	**CONTRACT AWARD: TENDER NO. 15-18 DISTRICT METERING AREA CHAMBERS**

RECOMMENDATION

That, on the recommendation of the Managing Director, Environmental & Engineering Services & City Engineer, the following actions **BE TAKEN** with respect to the award of contracts for the District Metering Area Chambers.

(a) the bid submitted by Select Excavating Inc. at its tendered price of $298,320 excluding HST, for the District Metering Area Chambers, **BE ACCEPTED**; it being noted that this is the first year of a five (5) year annual contract where at the sole discretion of the City a subsequent term may be approved for four (4) additional one (1) calendar years to October 1, 2019 where the option shall be fully completed and ended.

(b) Stantec Consulting Limited, **BE AUTHORIZED** to carry out the contract administration for the said project in accordance with the estimate, on file, at an upset amount of $51,606.50 excluding HST, based upon the Fee Guideline for Professional Engineering Services, recommended by the Ontario Society of Professional Engineers; and in accordance with Section 15.2 (g) of the City of London's Procurement of Goods and Services Policy, noting that this firm completed the engineering design for this project;

(d) the financing for this project **BE APPROVED** as set out in the Sources of Financing Report attached hereto as Appendix "A";

(e) the Civic Administration **BE AUTHORIZED** to undertake all the administrative acts that are necessary in connection with this project;

(f) the approval given herein **BE CONDITIONAL** upon the Corporation entering into a formal contract or issuing a purchase order for the material to be supplied and the work to be done relating to this project (Tender 15-18); and

(g) the Mayor and City Clerk **BE AUTHORIZED** to execute any contract or other documents, if required, to give effect to these recommendations.

PREVIOUS REPORTS PERTINENT TO THIS MATTER

- Water Efficiency Program: Leak Detection Through District Meter Areas EW3772-13, September 23, 2013, Civic Works Committee, Agenda Item #2
- Update to Water Efficiency Program, July 19, 2010, Environment and Transportation Committee, Agenda Item #14

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BACKGROUND

Purpose:

This report recommends award of a tender to a contractor and continuation of consulting services for the construction of District Metering Area (DMA) Chambers.

This work includes the installation of pre-purchased electromagnetic flow meters and the purchase and installation of metering chambers and associated materials. The construction of the chambers is required for the future operation of an additional 11 DMA's bringing the total of constructed DMA's to 19 out of a potential 55.

Discussion

District Metering Area (DMA) is an innovative 5 year program designed to gradually reduce the City of London's non-revenue water. Best practice indicates that considerable savings can be achieved with the installation of a properly designed DMA throughout the City of London, where pressure and flow is monitored to determine if there are leaks in the distribution system. The savings on lost water will support ongoing operational cost of the program and pay back the initial capital cost. This program will also reduce the number of watermain breaks, property damage and customer inconvenience, while minimizing staff time to repair future main breaks. Appendix "B" describes the operation of the first seven DMA's in 2014.

The installation of electromagnetic flow meters and chambers is a key component of each DMA to monitor and measure flows and quantify the amount of leakage in the distribution system.

Tender Summary:

Tenders for the District Metering Area Chambers Project were opened on March 3, 2014. Four (4) contractors submitted tender prices as listed below, excluding HST.

CONTRACTOR		TENDER PRICE SUBMITTED
1.	Select Excavating Inc.	$298,320.00
2.	R. Russell Construction	$480,870.00
3.	L 82 Construction Limited	$572,975.00
4.	Omega Contractors Inc.	$591,766.34
Prices include a Contingency Allowance of $50,000		

All tenders have been checked by the Environmental and Engineering Services Department and the City's consultant, Stantec Consulting Ltd.

The tender estimate just prior to tender opening was $644,075.00 excluding HST based on previous pricing that had been received in 2014. The lowest tendered price is an attractive bid by a contractor who has done similar acceptable work for the City in the past. All tenders include a contingency allowance of $50,000.00, excluding HST.

Consulting Services:

Stantec Consulting Limited was awarded the detailed chamber design administratively on December 4, 2014. Due to their knowledge and experience with this project, Stantec Consulting Ltd. was requested to submit a proposal to carry out the contract administration for this project. In accordance with Section 15.2 (g) of the City of London's Procurement of Goods and Services Policy, staff is recommending Stantec Consulting Ltd. be authorized to carry out the remainder

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of engineering services to complete this project for the provided fee estimate of $51,606.50 excluding HST.

Conclusions:

Award of the District Metering Area Chamber Project to Select Excavating Inc. will allow the project objectives to be met within the available budget.

The use of Stantec Consulting Ltd., for the remainder of engineering services for this project is in the best financial and technical interests of the City.

Acknowledgements:

This report was prepared with the assistance of Greg Henderson, Technologist II and Matt Feldberg, Water Demand Manager, Water Engineering.

PREPARED BY:	**SUBMITTED BY:**
ROLAND WELKER, P. ENG. **DIVISION MANAGER** **WATER ENGINEERING**	**JOHN LUCAS, P.ENG.** **DIRECTOR – WATER AND WASTEWATER**

RECOMMENDED BY:
JOHN BRAAM, P. ENG. **MANAGING DIRECTOR,** **ENVIRONMENTAL & ENGINEERING** **SERVICES & CITY ENGINEER**

March 31, 2015
Attach: Appendix “A” – Sources of Financing
Appendix “B” - 2014 District Metering Areas Operation

c.c. John Simon
Pat Shack
Select Excavating Inc.
Stantec Consulting Ltd.

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Appendix B
2014 District Metering Area Operation Report

Background:

The City of London is supplied with water from Lake Huron and Elgin Area Primary Water Supply Systems (LHPWSS and EAPWSS). Approximately 82% of the City of London water is supplied from LHPWSS, where is it treated and pumped into Arva reservoir, then fed into the City of London's water distribution system via the Arva Pumping Station. In the southern part of the City of London, water from the EAPWSS is supplied to the Elgin-Middlesex Pumping Station; from there it is pumped to the City. As the cost to purchase water from the LHPWSS and EAPWSS increases, the significance of Non-Revenue Water (NRW) in the annual operating budget rises, and its overall reduction becomes more advantageous as a method to reduce the annual expenditures of the water system. In addition, the water saved from eliminating leakage becomes available to supply new growth in the City at a very low cost. As shown in Figure 1, although the amount of NRW has decreased, the cost remains relatively high.

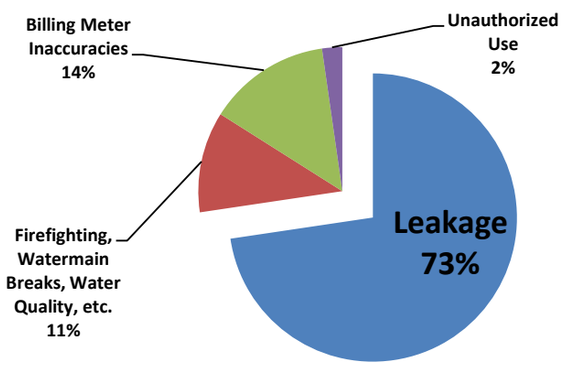
Figure 1: The Amount and Cost of Non-Revenue Water

Year	2007	2008	2009	2010	2011	2012	2013	2014
Million m^3	4.178	3.726	4.442	5.167	5.248	5.411	4.110	3.788
Percent	7.7%	7.4%	9.0%	10.2%	10.8%	11.2%	8.9%	8.5%
Cost of NRW *	$1.25	$1.20	$1.52	$1.87	$2.02	$2.20	$1.77	$1.74

**Cost in millions of dollars*

Figure 2 shows the largest portion of NRW is made up of leakage in the distribution system. A targeted leak detection program can reduce the overall leakage in the distribution system by 25%-40% and reduce NRW associated with leakage and ultimately watermain breaks.

Figure 2: Sources of Non-Revenue Water



The proven method around the world to reduce leakage from the water distribution system is to proactively find the leaks before they appear at the surface. This has the benefits of reducing the time the leaks are running, and wasting water. The methodology is called District Meter Areas (DMAs), where the City is divided into sections, and the flow of water that enters the area is checked against a theoretical flow of water. When a significant difference occurs, targeted leak detection activities are undertaken to find the leaks that may be causing the difference. The leaks are then quickly repaired and the overall NRW starts to decrease.

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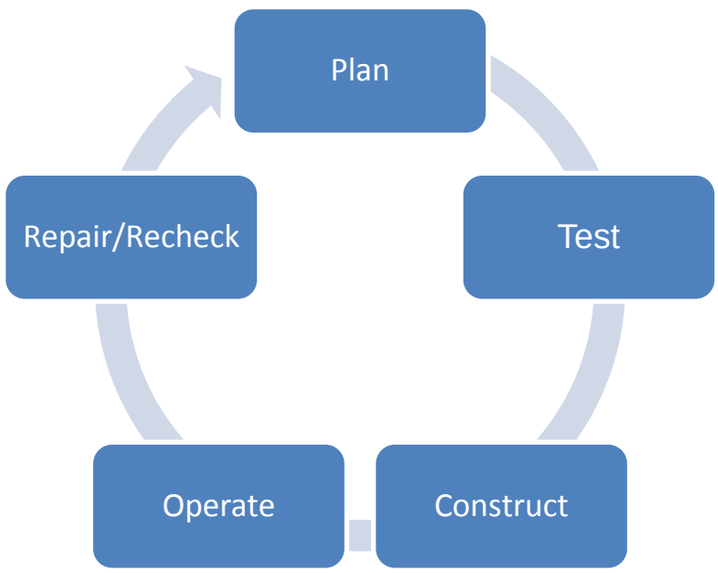
The approved Business Case is only based on the value (cost) of water lost to leakage. Ancillary benefits of the DMA method for leak detection include:

- Management approach of leakage and water main breaks changes from being reactive to proactive.
- Assists in the maintenance of the City's water distribution system
- Water that is saved increases system capacity which can accommodate new homes in London without the need to construct any new transmission mains, pump stations, or treatment plants.
- The collection of more accurate and timely water use data that assists in the calibration of the hydraulic model without the need to conduct special flushing programs;
- Better overall knowledge of the distribution system;
- Reduced pumping and treatment costs;
- Reduced property damage by repairing leaks before they break.;
- Reduced risk of contamination;
- Reduced water main breaks
- Reduces the City of London's carbon foot.

Methodology and Results

The AWWA M36 Manual "Water Audits and Loss Control Programs" recommends using DMAs for active leak detection, which is considered to be a North American Best Management Practice (BMP). The DMA methodology uses a quality management system approach or PLAN, DO, ACT, RECHECK cyclic approach.



Plan:

In 2012 a pilot DMA program was launched and DMAs were set up in 5 areas of the city. In 2013 City Council approved the continuation of the DMA program, where over a five (5) year period, 55 DMAs would be established throughout the City of London.

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The development of the DMAs was completed in a three stage process that included:

Desktop Design - Completion of “desktop design” on the 1:8,000 scale drawings, where potential DMA boundaries were marked in pencil, along with the location of the DMA flowmeters and boundary valves that will have to be closed to create the DMA.

Operation Staff Review - The review by operations staff was in two parts. First Water Operations staff provided their extensive knowledge to modify DMA boundaries and to avoid impacting critical customers like health care facilities. Secondly, site visits were made to every DMA and all the flowmeter locations and boundary valves were inspected. These site visits also provided a good sense of the types of areas, ranging from residential, commercial, institutional and industrial.

Preparation of Electronic Drawing- Working with Water Operations staff, the DMA boundaries was plotted on the electronic drawing.

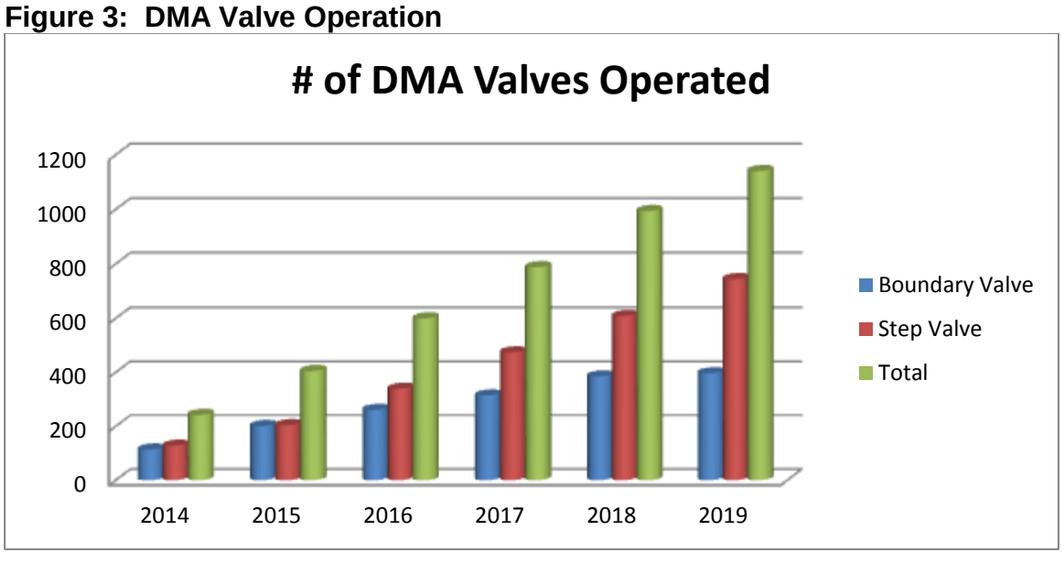
The link below shows the final electronic map of the Oakridge DMA, where the boundary valves, flow meters, watermain and hydrants locations are shown.
http://www.london.ca/residents/Water/Water-System/Documents/DMA%202%20-%202014.pdf

DMA Site Testing
Prior to on-site testing of a DMA, the DMA boundary and “step testing” valves need to be operated to ensure each valve properly seats and that no water passes past the valves. Exercising valves provides many benefits to the City of London’s distribution system. Those benefits include, but are not limited to:

- Extends the life of the valve, which reduces operational and maintenance costs
- Identifies problem valves in the systems that need to be replaced.
- Ensures the valve is working to provide for quick isolation when main breaks occur, cuts down on response time and reduces the overall impact of a leak or break.
- Identifies valves that have inadvertently been buried under pavement, top soil or sod.
- Verifies location of valves and creates better records of the distribution system.

Figure 3 shows the number of valves that were operated in 2014, and the projected number of valves that will be operated during the next 5 years of the program.

Figure 3: DMA Valve Operation



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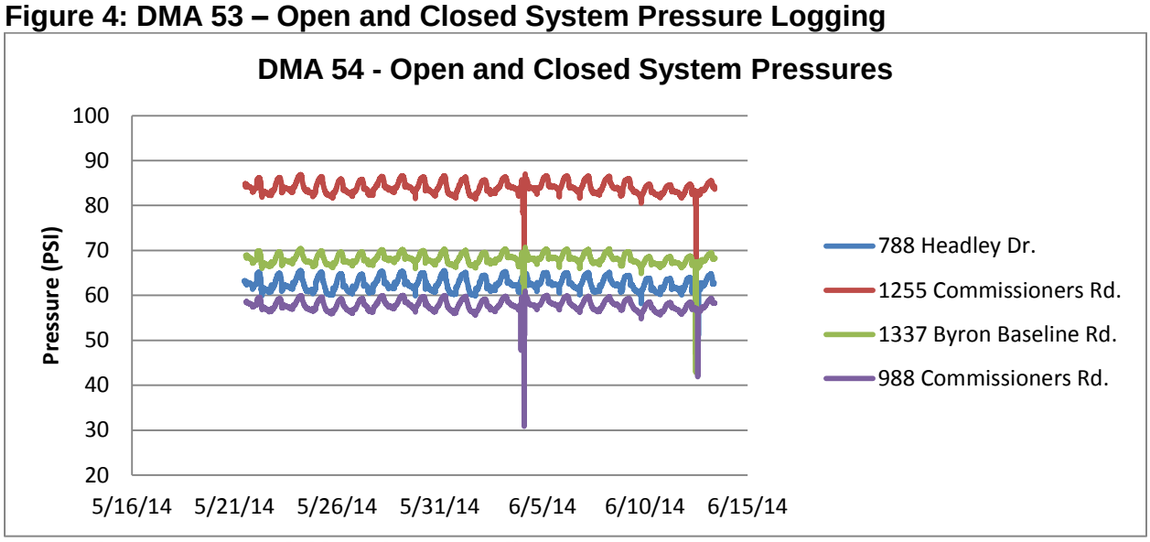
After the boundary and step testing valves have been exercised and maintained, the validity of the DMAs is proven on site. The site testing normally includes fire flow tests and pressure logging for 7 days on the “open system”, then repeating the process with the DMA boundary valves closed. The results of the “open” and “closed” DMA operation are compared, to confirm the DMA satisfies water demand and fire flows. The DMA is then proven ‘tight”, with flow only through the DMA flow meter locations. Figure 4 shows an example of open and closed system pressure logging from DMA 54, showing no real change in pressure. The first drop in pressure represents tightness testing and the second drop in pressure represents closed system fire flows testing.

Figure 4: DMA 53 – Open and Closed System Pressure Logging



DMA Flow Meter and Chamber Install

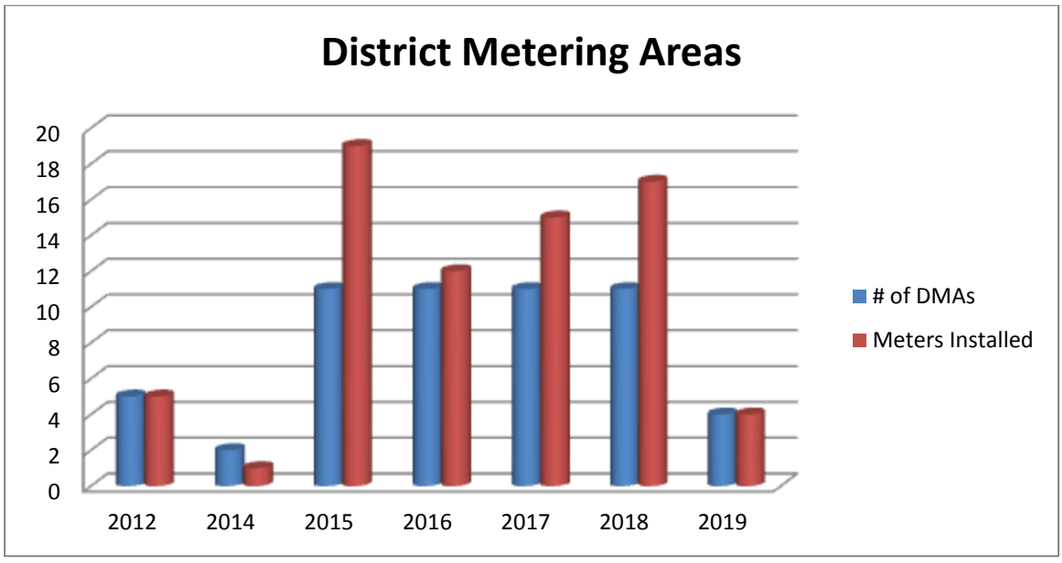
After the validity of the DMA has been proven, electromagnetic flow meters are installed inside a chamber. The electromagnetic flow meters and chambers are to be installed by an external contractor. Figure 5 shows the install of an electromagnetic flow meter.

Figure 5: Electromagnetic Flow Meter Install

Year 1 of the program was launched in 2014. Seven (7) DMAs where tested and operated, five were from the previous pilot and two new DMAs in high level pumping areas were established. Four additional DMAs were supposed to be operated in 2014, but due to high construction costs and a severe winter preventing operating staff from providing a level of assistance, were put off until 2015.

In 2015, eleven (11) new DMAs have been planned to be tested, constructed and operated. Figure 6 shows the work that will be undertaken in 2015 and for the next 5 years.

Figure 6: Annual District Metering Area Program



Operate the DMA

During the fall of 2014, City Staff, along with Kingsley Blease Consulting, operated 7 DMAs. The DMAs operated were:

- St. Anthony (Ward 8)
- Oakridge (Ward 8)
- Whitehills (Ward 7)
- Uplands (Ward 5)
- Summerside (Ward 14)
- Lambeth (Ward 9)
- Wickerson (Ward 9)

During the operation of the DMAs, the measured night flow is compared with the “expected”, or “Legitimate Night Flow” (LNF). LNF is a theoretical number of what the flow is expected to be based on the number of services, hydrants and kilometres of watermain within a DMA. For DMAs with high measured night flow, leak detection is completed in a two stage process. First find the “general area of leakage” is determined by “step testing” and second, “pinpoint the leak” using “acoustic methods” of leak noise correlators and listening devices.

Figure 7 shows the results of the potential leakage across the 7 DMAs based on the Measured Night Flows compared to the Legitimate Night Flows. Based on the flows measured from these DMAs, we can say the potential cost savings are 25% greater

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than what was presented in the 2013 Business Case. It should be noted that the flow meter for the Summerside DMA was not functioning properly and that further cost savings could have been anticipated.

Figure 7: Potential Cost Saving for Year 2014 DMAs

DMA No	Name	Legitimate Night Flow Lpm	Measured Night Flow Lpm	Potential DMA Leakage Lpm	m3 per year	2014 Cost per m3 LHPWSS Supply $0.43	Potential Cost Savings	
1	St Anthony	100	230	130	68,328		$29,381	
2	Oakridge	221	295	74	38,894		$16,725	
6	Whitehills	288	450	162	85,147		$36,613	
17	Uplands	195	380	185	97,236		$41,811	
*34	Summerside	179	160	-19	-9,986		-$4,294	
50	Lambeth	78	126	48	25,229		$10,848	
52	Wickerson	43	100	57	29,959		$12,882	
			Total for 7 DMAs	**637**	**334,807**		**$143,967**	**25% better than Business Case**
		DMA Business Case		**511**	**268,582**		**$115,490**	

Figure 8 shows an average measured night flow of approximately 230 Lpm, indicating the potential of a leak when compared to the legitimate night flow of 100 Lpm. The general area of leakage is determined by step testing, then pinpointed using acoustic methods of leak noise correlators and listening devices and then fixed. Figure 9 shows the reduction of average measured night flow after the leak was fixed. Figure 10 shows the estimated cost of the leak found on Montclair St.

Figure 8: DMA 1 – St. Anthony Flow Monitoring – Before Leak is fixed

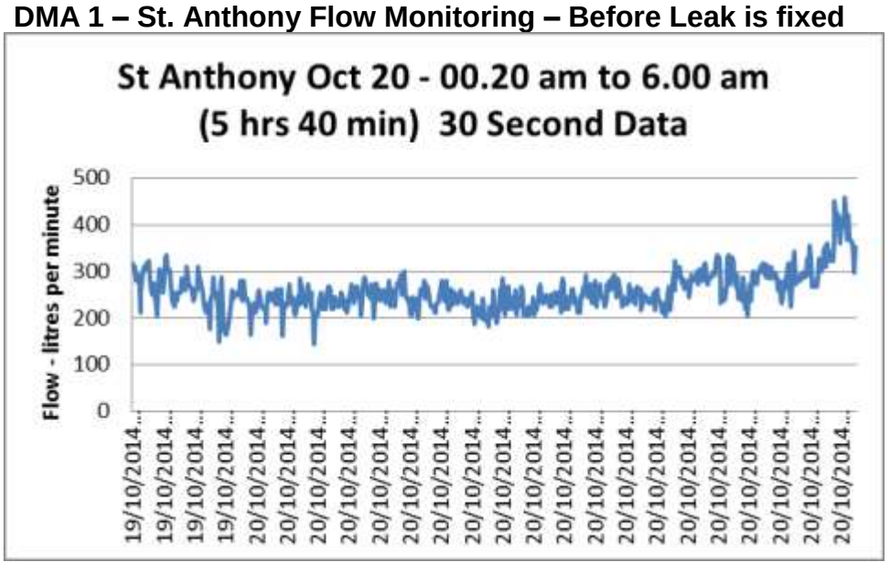

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Figure 9: DMA 1 – St. Anthony Flow Monitoring – After Leak is fixed

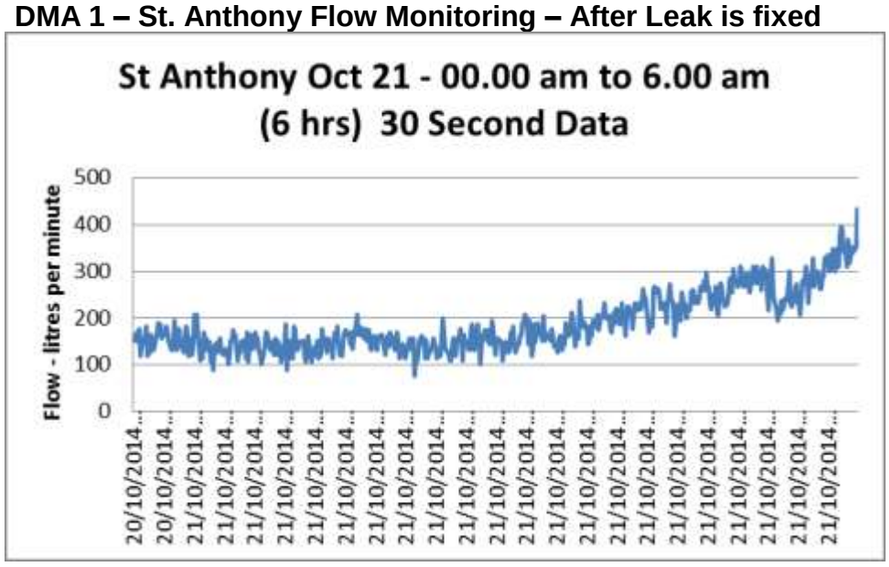

Figure 10: Estimated Cost of Montclair Ave Leak

DMA 1 – St. Anthony – Montclair Ave Leak	Avg. Measured Night Flow (Lpm)
October 20, 2014 – Potential Leakage Determined	230
October 21, 2014 – Leak is Fixed	149
Leakage Reduction	81
Estimated Cost of Leak if Running for One Year	$17,855

The other potential leakage in the DMAs was pinpointed 1-2 months by an external Acoustic Surveying contractor after City Staff operated the DMAs. This made it difficult to determine the quantity and potential value of each leak as City Staff were not able to re-run the DMAs due to winter weather. All leaks found by the Acoustic Surveyor have since been repaired by City Water Operations. All 2014 DMAs will be monitored during the spring of 2015 to determine if additional leakage is present. Figure 11 shows the summary of the additional leaks found and compares the results to the leaks found in 2014 to the 2012 pilot. As the results show, leakage in areas varies from year to year, and employing a DMA is the best method to catch the leak before it appears at the surface.

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Figure 11: DMA 2012 and 2014 Leakage

DMA 2012 and 2014 Leakage			
Name	**Year**	**Type of Leak**	**Street**
Lambeth	**2012**	**Fire Hydrant Lead**	Beecher @ Sunray
		Curb Stop – City Side	4397 Colonel Talbot Rd
	2014	**Main Line Valve**	Dennis Av at Campbell St
Oakridge	**2012**	**Main Line**	95 Fiddlers Green
		Main Line	750 Glen Cres.
		Hydrant Tee	575 Oakridge Dr.
		Main Line	750 North Mile Rd
Oakridge	**2014**	**No leaks found by Acoustic Surveyors - Further monitoring required due to high flows**	
St Anthony	**2012**	**No leaks Found**	
	2014	**Main Line**	Monclair Avenue
		Fire Hydrant Lead	Sutton Place
Whitehills	**2012**	**Curb Box**	82 Barrydale Cres.
		Curb Box	163 Concord Cres.
	2014	**Fire Hydrant Lead**	219 Concord Rd
		Further monitoring required due to high flows in Southern Section of Whitehills DMA	
Summerside	**2012**	**Curb Stop**	737 North Leaksdale Circle
	2014	**Curb Stop**	227 White Sands Drive
Uplands	**2014**	**Curb Stop**	unit 28, 400 Skyline
Wickerson	**2014**	**No leaks found by Acoustic Surveyors - Further monitoring required due to intermediate flows**	

Conclusion

Through the implementation of a City-wide District Metering Area program over the past two years, London is taking advantage of existing staff and technology investments to reduce the volume of water purchased. In 2014, seven DMA's were installed and operated resulting in the measurement, detection and repair of leakage in the range of 90 LPM per DMA. Assuming that the leaks were running for a full year, this rate of leakage would equate to 330,000 cubic meters or approximately $140,000 in avoided purchase of water cost and would reduce non-revenue water by 0.8 percent.

In terms of future management, staff now have a baseline water use for the seven 2014 DMAs and can measure an increase from a baseline position to better understand when to deploy additional staff to pinpoint and repair leaks. For 2015, the second full year of implementation, the DMA program has released a tender to install 19 water flow meters in the distribution system to facilitate the operation and installation of 11 new district meter areas.

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