

Kelowna Joint Water Committee

Fire Hydrant Process Review

Final Report

Prepared by:

AECOM

201 – 3275 Lakeshore Road
Kelowna, BC, Canada V1W 3S9
www.aecom.com

250 762 3727 tel
250 762 7789 fax

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AECOM
201 – 3275 Lakeshore Road
Kelowna, BC, Canada V1W 3S9
www.aecom.com

250 762 3727 tel
250 762 7789 fax

July 29, 2013

Kelowna Joint Water Committee
City of Kelowna
1435 Water Street

Dear KJWC Members:

Regarding: Kelowna Joint Water Committee Hydrant Process Review
Final Report

Please find enclosed the final version of the KJWC Hydrant Process Review. This final version has been revised from the Final Draft Report submission (March 2013) based on discussion and comments received at the KJWC review meeting held on Wednesday, May 22, 2013.

This report provides an objective assessment and recommended solution to the issues facing the KJWC with regard to hydrant ownership, maintenance and record keeping along with addressing a few associated concerns.

This report provides a consolidated document which the KJWC can use to guide future fire protection throughout the City of Kelowna.

Sincerely,
AECOM Canada Ltd.

Brett deWynter, P. Eng.

AG:ag

Distribution List

# of Hard Copies	PDF Required	Association / Company Name
-	1	KJWC Representatives: Bob Hrasko (BMID), Darwyn Kutney (GEID), Toby Pike (SEKID), Pete Preston and Kevin Reynolds (RWD) , Andrew Reeder and Mike Gosselin (City of Kelowna)

Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	AG	2013.03.04	Revisions based on comments from Draft Report and interview with COK Water Utility
2	AG	2013.07.29	Revisions based on comments from Final Draft Report and comments received after May 22, 2013 KJWC Review Meeting

AECOM Signatures

Report Prepared By:

 Anne Girtz, P.Eng. Stamp
 Project Engineer

Report Reviewed By:

 Brett deWynter, P.Eng. Stamp
 Project Manager

Executive Summary

Within the City of Kelowna, water supply responsibilities are shared between the City of Kelowna Water Utility (KWU) and four Improvement Districts. This situation is the result of the historical transition of the community from a somewhat rural farming region into what is currently the largest City in the Interior of British Columbia. One of the key issues associated with the current supply of water within the City of Kelowna is the management of hydrants for fire protection. Provided below is a summary of the key issues and conclusions identified during the course of this assignment:

1. **Obligations:** The City of Kelowna (City) has an obligation to provide fire protection within City boundaries. Associated with this obligation is the ability to implement taxation to fund the delivery of fire protection. The Improvement Districts are obligated to supply water to the customers within their respective service areas as set out in their *Letters Patent*. The primary function of the Improvement Districts is to collect fees from their rate payers to fund the renewal and construction of infrastructure necessary to supply water for irrigation and domestic use. The exception to this statement is Rutland Waterworks District, whose Letters Patent includes the obligation of fire protection.
2. **Ownership:** During the course of this assignment it became clear that issue of hydrant ownership was viewed in different terms by members of the KJWC. Within the last twenty years, the majority of new hydrants have been purchased and installed by developers to meet Improvement District or City subdivision and development standards. Maintenance for all hydrants is paid for under the City of Kelowna Fire Department (KFD) budget, which is funded through taxes collected by the City. The KFD contracts each water utility to complete maintenance on the hydrants to ensure they are in proper working condition when called upon to fight fires.

Given the unique water supply and maintenance arrangement in the City of Kelowna, there is no precedent to call upon to determine who should own the hydrants. The BC Improvement District Manual (March 2006) explains that there is “*no single answer*” to the question of who should install, and maintain hydrants when the agency operating the water system differs from the one responsible for the fire department. The Manual also provides justification for one of the common solutions in this situation:

“The most common arrangement is for the agency operating the water system to retain responsibility for the installation and maintenance of the hydrants because it:

- *owns the water system on which the hydrants are located;*
- *controls the design of the water system and the location of hydrants;*
- *has the authority to pass regulations requiring developers to install hydrants;*
- *has staff who are knowledgeable about maintaining water system components and the necessary equipment to perform the job; and,*
- *uses the hydrants for flushing water mains.”*

With these conditions in mind, it is reasonable to consider each water utility as the owner of hydrants within their jurisdiction and is recommended as the ownership scenario for the City of Kelowna and the five KJWC water purveyors.

3. **Maintenance Funding:** The primary use of hydrants is for fire protection. As common to cases where two public authorities have overlapping boundaries, the City of Kelowna Fire Department currently pays for all costs to maintain public hydrants. While it is recommended that individual water purveyors assume ownership of the hydrants, funding for maintenance must be collected by the governing municipality as per the BC Local Government Act (Part 23, Clause 756). The Local Government Act states:

“If the improvement district is located wholly in one or more municipalities, the council of each municipality must levy and collect all taxes that may be levied on real property in the municipality by the improvement district for the objects referred to in subsection (1)...”

where one of the objects in subsection (1) is fire protection. Given this legislation, the current arrangement for maintenance funding should be continued. If maintenance or repairs are required due to use of the hydrants for purposes other than firefighting, those costs should be borne by the Improvement District.

4. **Maintenance Frequency:** It is recommended that the hydrants be maintained twice annually based on the fact that the majority of industry best practices support completion of two maintenance events per year for hydrants in cold climates.

Recently, the City of Kelowna Fire Department – through approval by the Kelowna City Council – reduced public hydrant maintenance frequency from semi-annually to once per year. This is in-line with the recommendations of the National Fire Protection Association’s (NFPA) *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.

Private hydrant maintenance should be completed to the same standard as public hydrants. The KFD should continue to be responsible for ensuring private hydrant maintenance is completed by private hydrant owners.

5. **Documented Agreement:** For any arrangement between multiple parties to be successful, a written agreement needs to be established which clearly articulates the roles and responsibilities of all involved. This agreement should be drafted, reviewed by a qualified lawyer, and signed by all parties. Once this is completed, the agreement must be respected by all parties.

Based on the above conclusions and information discussed herein, it is our recommendation that:

1. All hydrants within public right-of-ways be owned by the respective water purveyors;
2. The City should continue to contract the Improvement Districts for maintenance of the hydrants;
3. Hydrant preventative maintenance be completed semi-annually in accordance with industry best practices. Corrective maintenance should be completed as required when hydrants need servicing.
4. The City of Kelowna and KFD (as an entity of the City of Kelowna) should determine the appropriate budget to support the selected maintenance frequency;
5. The City hydrant database should continue to be administered and managed by the KWU (on contract from the KFD). The City should consider allowing viewing access to the Improvement Districts for private hydrants. A brief database user manual should be created and distributed to all users;

6. A hydrant ownership audit should be undertaken on all hydrants to determine if ownership is public or private based on the definitions provided in this report. This will make clear the party responsible for maintenance and funding, and also allow the City and KFD to allocate the appropriate public hydrant maintenance budget;
7. The KFD should continue to be responsible for the administration of private hydrant maintenance including notifying private owners, receiving maintenance records, follow up on deficient records and inputting maintenance records. The *City Fire Prevention Regulations Bylaw* should be updated to provide clear direction on the responsibilities of private hydrant owners;
8. An agreement between the City of Kelowna, KFD, and the water purveyors outlining the roles and responsibilities of each should be drafted with input from all parties, legally reviewed, and then executed to create a clear and verifiable record of the responsibilities of all parties. This agreement should include terms related to maintenance, repairs and renewal.

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Appendix I. City of Kelowna – Fire Underwriters Survey and Distribution Study, 2012

Appendix J. AWWA Manual M17 – Installation, Field Testing and Maintenance of Hydrants, Chapter 5 - Maintenance (*excerpt*)

Acknowledgements

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- Darren Schlamp, Glenmore-Ellison Improvement District
- Mike Rojem, Glenmore-Ellison Improvement District
- Pete Preston, Rutland Waterworks District
- Kevin Reynolds, Rutland Waterworks District
- Toby Pike, South East Kelowna Irrigation District

1. Introduction

Within the City of Kelowna (City) there are five major water purveyors which make up the members of the Kelowna Joint Water Committee (KJWC). In addition to their primary function of providing potable water to their customers, these water purveyors perform maintenance on fire hydrants within their jurisdiction through an agreement with the City of Kelowna. While the City is responsible for providing fire protection to its residents, multiple stakeholders are involved in ensuring these hydrants are maintained in proper working condition. Recently, these stakeholders have recognized that issues related to ownership, maintenance standards, and record keeping of fire hydrants have developed and need to be addressed.

AECOM was commissioned by the KJWC to undertake a review of hydrant ownership and maintenance standards within the City of Kelowna. The results of this review are intended to establish a common approach for hydrant governance and subsequently guide the future direction for maintaining fire protection throughout the City's hydrant system.

1.1 Maintenance Agreement

Unless specifically noted otherwise, the term *maintenance agreement* (or *agreement*) used in this report refers to the recognized, but undocumented arrangement between the City of Kelowna and Improvement Districts through which the Improvement Districts provide hydrant maintenance services on public hydrants (hydrants on public property, public Right-of-Ways or easements) within City of Kelowna boundaries.

We understand that the last documented maintenance agreement is the *1996 Hydrant Agreement (Appendix A)* and since then, a new document has not been signed even though maintenance activities and agreement terms have changed.

1.2 Stakeholders

There are multiple stakeholders involved in ensuring fire hydrants are in proper condition when called upon to fight fires. In addition, City of Kelowna residents are stakeholders as the customers of City fire protection services. Each of these groups is described below.

1.2.1 City of Kelowna Fire Department

The City of Kelowna Fire Department is the end-user of the City's hydrant and fire protection systems. The Fire Department requires hydrants to be properly maintained and in operable condition when called upon to fight fires. The Fire Department is an entity of the City of Kelowna.

1.2.2 The City of Kelowna & Kelowna City Council

The City of Kelowna is responsible for providing fire protection to its residents; the Kelowna City Council sets hydrant maintenance standards based on consideration of industry standards and financial affordability. Public hydrants within City of Kelowna boundaries are maintained through a maintenance agreement with the City's five water purveyors.

1.2.3 KJWC Water Purveyors

The five water purveyors of the KJWC include: the City of Kelowna Water Utility; Black Mountain Irrigation District; Glenmore-Ellison Improvement District; Rutland Waterworks District; and South East Kelowna Irrigation District. There are also thirteen smaller, water utilities within City of Kelowna boundaries which were not included in the scope of this study.

The five major water purveyors are responsible for providing potable water to residents within their jurisdictional boundary. The City of Kelowna Water Utility supplies water to its customers as a municipal service. For the Improvement Districts, the provisions of acquisition, maintenance and operation of works for the supply of water within their jurisdiction is set forth in each District's *Letters Patent*, a document granted by the province through the *Local Government Act*.

Figure 1 on the following page shows the service boundaries for each of the five City of Kelowna water purveyors.

1.2.4 Customers

All City of Kelowna residents and property owners are customers of City fire protection services. Within the City, two customer classes exist depending on the location of the hydrant which services them.

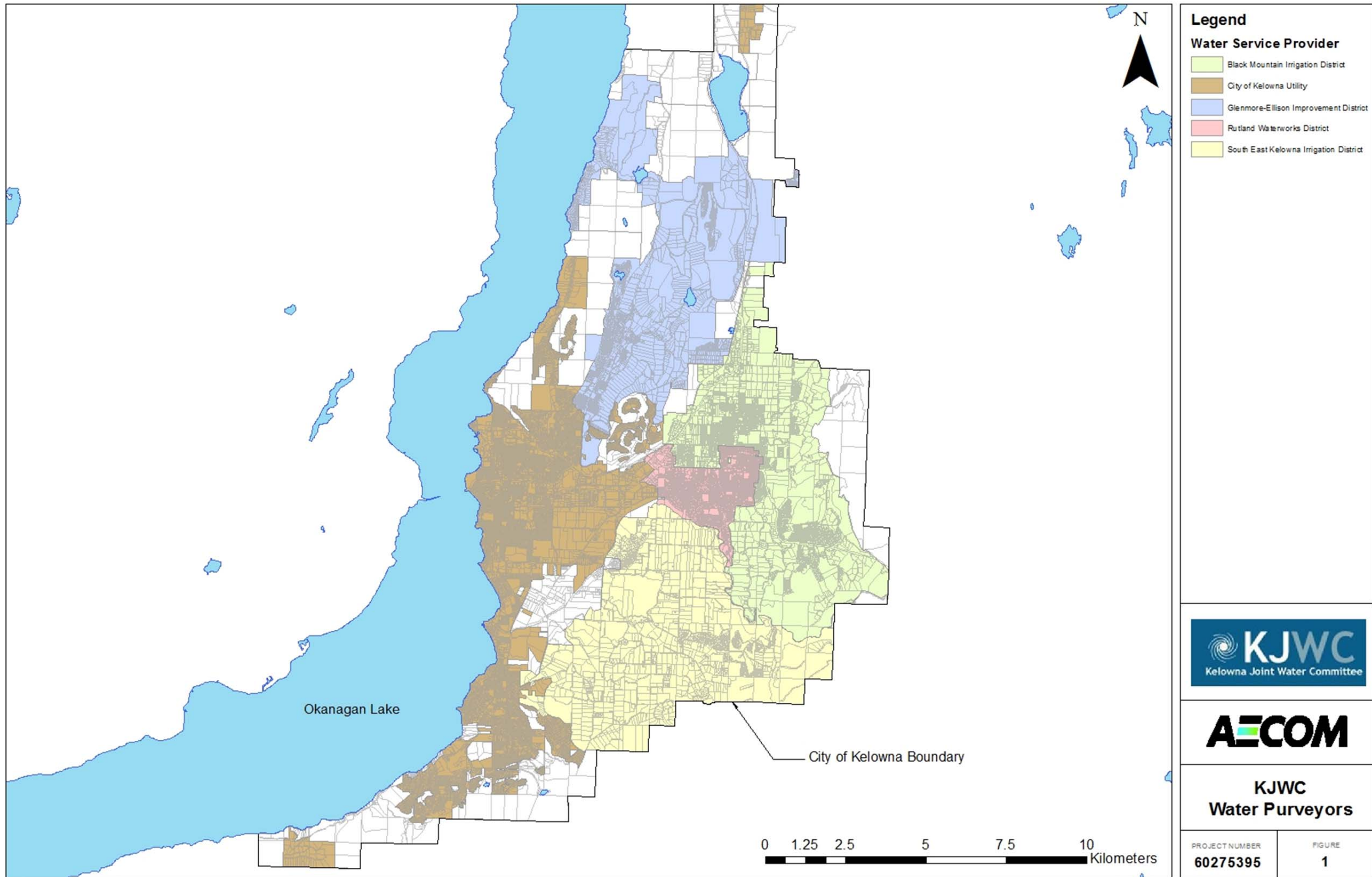
1.2.4.1 Customers Serviced by Public Hydrants

The majority of City of Kelowna customers are serviced by public hydrants on public properties. The City and KFD, by means of the Improvement Districts and KWU, is responsible for maintaining these hydrants.

1.2.4.2 Customers Serviced by Private Hydrants

The size or configuration of certain buildings requires additional hydrants in order to meet BC Building Code regulations. This includes buildings such as large box stores or strata developments. In these cases, the property owner must install additional hydrant(s) on their property to ensure adequate fire protection coverage. According to the *City Fire Prevention Regulations Bylaw (Appendix B1)*, these hydrants are to be maintained by the private property owner.

Figure 1. KJWC Water Purveyors



1.3 Approach to the Study

The process undertaken for this study included review of background documents, solicitation of input from KJWC stakeholders via an online survey (results included in **Appendix C**), face-to-face interviews (notes included in **Appendix D**) and follow-up correspondence as required. AECOM also utilized information from other cities across Canada through our National Water and Wastewater Benchmarking Initiative (NWWBI) Program to compare operational practices and financial aspects of hydrant maintenance. The KWU has participated in the NWWBI Program since 2001; where Benchmarking data has been referenced in this report, KWU data has been specifically indicated.

1.4 Project Objectives

Through review of the stakeholder survey and our discussions with KJWC members, the following key objectives have been identified and will be addressed in this report.

- *What are the obligations of KJWC members and how does this impact the issue of hydrant ownership?*
- *What is the appropriate level of hydrant maintenance?*
- *How do we ensure all hydrants – public and private – are maintained to a consistent and acceptable standard?*
- *Who is the best organization to oversee hydrant records and maintenance administration?*
- *What is the appropriate compensation based on the agreed upon level of service?*

The ultimate objective when addressing these issues is to provide safe and effective fire protection to the public.

2. Background

2.1 History of the Improvement Districts and City of Kelowna Water System

Up to 1920, water supply for agricultural and rural customers outside City of Kelowna boundaries was provided by private irrigation companies. By the mid-to-late 1910's, the costs of operating and maintaining these systems began to outweigh the tolls and taxes collected from customers. In 1914, the existing provincial *Water Act* was amended to allow the formation of public irrigation corporations. At this time, many landowners and private irrigation companies – including Glenmore-Ellison, South East Kelowna and Black Mountain – petitioned the province to form public improvement districts. Prior to approval of public take-over, the province conducted assessments of the physical and financial conditions of the systems. This assessment found the private companies' systems and finances in poor condition which forced the province to reconsider acquisition of the systems. It was not until 1918 when a Conservation Fund of \$500,000 was established (which was increased to \$2,000,000 in 1919), that the 1914 petitions were addressed. In the early 1920s, five improvement districts in the Okanagan received their *Letters Patent* including Glenmore-Ellison, South East Kelowna and Black Mountain – which authorized these agencies to provide public irrigation service to properties within their boundaries. In 1949 when Rutland Waterworks District received its *Letters Patent*, there were four Improvement Districts providing water to customers within the area that became the City of Kelowna. **Appendix E** includes copies of the *Letters Patents* for all Improvement Districts.

These self-supporting Improvement Districts operated for the next twenty years and by the late 1960's, the original agricultural systems were deteriorating and in need of rehabilitation. Around 1968, many of British Columbia's improvement districts undertook capital works improvement projects through federal funding by the *Agricultural Rehabilitation and Development Act (ARDA)*. At this time, the systems became pressurized and more frequently, customers were asking for the systems to service their domestic needs, which were previously met by local wells or cisterns. Domestic servicing was eventually approved even though the *Letters Patent* did not have provision for domestic fire protection and the systems were not designed for fire flows, nor did they contain hydrants.

In the early 1970's the City of Kelowna boundary was expanded to include portions of each of the four Improvement Districts. With the boundary expansion, the City immediately acquired a significant number of new customers and also the responsibility to provide fire protection to these customers. The annexation of outlying lands was based upon the condition that the Improvement Districts be left intact to service those lands with water. To address the fire protection issue, the City approached the Improvement Districts with requests to install fire hydrants on their existing systems. Hydrants were installed and paid for by the City, and agreements with the Improvement Districts were made to maintain the new hydrants, many of which are still in service today. While fire hydrants were eventually installed to provide adequate coverage, it was acknowledged that the available fire flow volumes were in some cases inadequate.

2.2 Obligations & Ownership

Fire hydrants that exist within the City of Kelowna are an integral part of providing the service of fire protection to residents. While hydrants are physically connected to water system infrastructure owned by the Improvement Districts – who also happen to do maintenance on these hydrants – provision for fire protection has never been a function of the Improvement Districts. The *Letters Patent* document issued when an Improvement or Irrigation District is established outlines the obligations, or “objects” they are allowed to provide within their jurisdiction. For

three of the City of Kelowna Improvement Districts, fire protection is *not* one of these obligations. In addition, the *Local Government Act* (**Appendix F**) does not allow improvement districts to levy taxes unless their obligations specifically include:

“(a) fire protection, (b) street lighting, (c) financial aid to hospitals, (d) acquisition of property for hospitals, or (e) ambulance service.”

Due to these exclusions, the City of Kelowna is the only organization that currently has a mechanism to collect and fund hydrant maintenance associated with fire protection. While it is clear the City is obligated to provide fire protection and currently has the mechanism to fund this service, the BC Improvement District Manual (March 2006) provides justification for one of the common ownership arrangements when the agency operating the water system differs from the one responsible for the fire department:

“The most common arrangement is for the agency operating the water system to retain responsibility for the installation and maintenance of the hydrants because it:

- *owns the water system on which the hydrants are located;*
- *controls the design of the water system and the location of hydrants;*
- *has the authority to pass regulations requiring developers to install hydrants;*
- *has staff who are knowledgeable about maintaining water system components and the necessary equipment to perform the job; and,*
- *uses the hydrants for flushing water mains.”*

With these conditions in mind, it is reasonable to consider each water utility the owner of hydrants within their jurisdiction, with funding for hydrant maintenance collected through taxes levied by the City. As mentioned previously, Rutland Waterworks District’s original *Letters Patent* (1949) was amended in 1956 to include the object of fire protection. Under the recommended ownership arrangement, conveyance of water for fire protection is the responsibility of the water utility, so the question of whether the *Letters Patent* obligates the Improvement District to provide fire protection is no longer an issue.

For this arrangement to be successful, the water utilities and Fire Department must effectively communicate their needs related to availability of fire flow within the distribution system so both parties are aware of anticipated demands.

2.3 Hydrant Use and Financial Fairness

The primary use of hydrants is for fire protection. However, once hydrants are established within a water distribution network, they serve as convenient devices to support routine water system maintenance such as network flushing and sampling. The hydrants also serve as connection points for use by local contractors that require the supply of bulk water. Currently, because ownership of the hydrants implicitly lies with the City, there is arguably some benefit being realized by the Irrigation Districts at no cost from these secondary uses.

The issue of usage and financial fairness becomes clearly defined in the scenario where the Irrigation Districts are owners of the hydrants; when hydrants are used for non-firefighting purposes (whether it be for flushing, or for contract use if issued by the water purveyor), the responsibility for follow-up maintenance, damage and repairs is the

responsibility of the user and owner, the Irrigation Districts. In addition, early capital replacement due to usage of the hydrants for non-firefighting purposes is the responsibility of the Irrigation Districts.

3. Hydrant Maintenance

The purpose of funding and conducting maintenance on fire hydrants is quite simply to ensure that the Fire Department is able to use the hydrants to extinguish fires in an emergency situation. If fire hydrants are defective and unable to be used, public safety and property is at risk. In order for fire hydrants to be relied upon to provide adequate firefighting capabilities, all fire hydrants require two types of maintenance throughout their service lives:

- 1) *Preventive maintenance* is required to ensure that hydrants are kept in proper working order. Since all hydrants should undergo preventive maintenance, these activities can be forecasted and budgeted in a regular and repeatable manner.
- 2) *Corrective maintenance* may be required from time to time to repair hydrant damage either through wear and tear, defects, damage, or as a result of accidents. Corrective maintenance is less predictable; the volume of corrective maintenance can be estimated based on historical patterns, but it cannot be predicted where and when corrective maintenance will be required.

The objective of a successful fire hydrant maintenance program is to ensure that all fire hydrants are able to operate when needed, and in the most cost effective manner possible. Generally, that means providing only the least required maintenance to assure the operability of all fire hydrants.

3.1 Current Situation

Prior to 2012, preventive maintenance frequency for all City of Kelowna hydrants was conducted twice per year. This typically included a “spring inspection” (full maintenance inspection and flow of hydrant) and “fall check” (check for water in barrel). This routine was as per the *Hydrant Agreement* established between the City and Improvement Districts in 1996 (**Appendix A**) which was in-line with the *City Fire Prevention Regulations Bylaw* (**Appendix B1**) and the *BC Fire Code* (**Appendix B2**). If any repairs or other non-standard corrective maintenance work were required, the Improvement Districts would complete the repairs and invoice the Fire Department for these costs. For preventive maintenance, the Improvement Districts were compensated twice per year, after each maintenance task was completed. The last rate, set in 2009 under the semi-annual maintenance agreement, was \$72 per hydrant per year. Under this agreement, the fixed unit rate of \$72 per year was constant and easy for the City to budget, while the amount associated with the as-and-when repairs was variable from year to year.

In preparation for the 2012 budgets, the Fire Department was asked by the City to estimate the total hydrant maintenance budget including both preventative and corrective annual maintenance costs. This change in approach was an effort to define and possibly reduce the variable portion of the budget – the corrective maintenance. An amount of \$59 per hydrant per year was established and approved by the Kelowna City Council on the basis of reducing the frequency of hydrant maintenance to once per year; eliminating compensation for any corrective maintenance and removing hydrant painting, snow clearing and graffiti removal tasks. We understand the decision to reduce maintenance to once per year was approved as it was in-line with the recommendations of the National Fire Protection Association’s (NFPA) *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire*

Protection System, 2011 Edition (Appendix G). After the decision was passed by Council, the water purveyors were notified of the change in level of service and associated compensation.

With this new approach, the water purveyors were allowed to determine which time of year the preventative maintenance visit was completed. For the 2012 calendar year, the Improvement Districts were generally completing their maintenance visit in the late summer or fall, similar to the previous “fall check”. The KWU was completing their maintenance check in the spring or summer, and was not performing a “fall check”.

3.2 Recommended Standards and Best Practices

Summarized below are the nationally and internationally recognized standards for fire hydrant installation, testing and maintenance.

3.2.1 National Fire Protection Agency

The National Fire Protection Agency (NFPA) is the most recognized authority on fire protection and public safety across North America with over 300 codes and standards for minimizing the risk and effects of fire. These standards provide the framework under which today’s fire prevention authorities operate. Among the 300+ NFPA documents is the standard for the installation, inspection and maintenance of water systems providing fire protection. NFPA’s *Standard 25 – the Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection System* recommends flowing for debris clearing and corrective maintenance for hydrants on an annual basis; inspection is recommended annually and after each use.

3.2.2 Fire Underwriters Survey

The Fire Underwriters Survey (FUS) is a Canadian organization which provides data on public fire protection for fire insurance statistical work and for underwriting purposes of insurance companies. The FUS document (**Appendix H**) provides a summary of requirements against which a water supply and system is graded for fire insurance purposes. Among these requirements *includes details on the installation, inspection and distribution of hydrants. The FUS document recommends that “Hydrants should be inspected at least semi-annually and after use. The inspection should include operation at least once a year. Where freezing temperatures occur, the semi-annual inspections should be made in the spring and fall of each year.”* In addition, it is recommended hydrants are maintained in accordance with the American Waterworks Association’s M17 document.

FUS conducts field surveys in communities across Canada and uses the results to establish a Public Fire Protection Classification for each municipality. This information is primarily used in the development of property insurance rates. A FUS and Distribution Study was completed for the City of Kelowna in late 2012 and is included as **Appendix I**.

3.2.3 American Waterworks Association

The American Waterworks Association (AWWA) publishes manuals of practice for water utilities in the areas of operation and management of drinking water treatment and distribution systems. AWWA manuals are the recognized technical benchmark for the industry and are regularly reviewed by technical experts to ensure content is current and accurate.

The AWWA *M17 Manual (Appendix J)* provides best practice recommendations for the installation, field testing and maintenance of fire hydrants. The *M17 Manual* recommends that “*All hydrants should be inspected regularly, at*

least once a year, to ensure their satisfactory operation. In freezing climates, dry-barrel hydrants may require two inspections per year. ...It is advisable to inspect all types of hydrants after each use. Dry-barrel hydrants with permanently plugged drains must be pumped out after each use and inspected. During freezing conditions, after-use inspections are especially important for dry-barrel hydrants.”

The document continues by defining the inspection procedure for dry-barrel hydrants in 21 detailed steps. Best practices are also provided for repair procedures and record keeping.

3.2.4 Hydrant Manufacturers

The *City of Kelowna Approved Products List* specifies manufacturers and models for municipal infrastructure which is approved for use in City development. Hydrant manufacturers included on the City’s approved products include Terminal City, Clow and Canada Valve. The maintenance manuals for these manufacturers were consulted for recommended maintenance frequency. Terminal City recommends maintenance as per the National Fire Code of Canada, which is based on the NFPA. Both Clow and Canada Valve (Mueller) recommend maintenance as per AWWA’s *M17 Manual*.

3.2.5 Canadian Municipalities

Through AECOM’s NWWBI program, data is collected on hydrant maintenance frequency for water utilities across Canada. Data from a sample group of 27 municipalities including the KWU was assembled and is presented below.

Table 1. Hydrant Maintenance Frequency – Canadian Municipalities (2010)

Hydrant Maintenance Frequency	# of Cities	% of Total
2 per year	12	44%
1 per year	9	33%
Less than 1 per year	3	11%
Unknown	3	11%
<i>Total</i>	<i>27</i>	

In 2010, twelve (12) municipalities, or 44% of the group, were performing maintenance twice per year; nine (9) at once per year; three (3) at less than one per year; and three (3) with unknown frequency. It should be noted when reviewing this data that the definition of a maintenance check can vary by municipality as the definition utilized in the Benchmarking exercise is as follows:

“Hydrant checks can include checking operation, caps, oil, pressure, sounding access, winter leakage, freezing, and string test. If flow is checked, this is limited to ensuring that the hydrant flows on opening, and includes a performance check on flow rate. Hydrant checks are required by the Fire Code (frequency is dependent on local factors). Winter checks can be limited to checking access, evidence of leakage and using a string test to determine if there is water leakage.”

In addition, the type of hydrants installed by certain municipalities can impact the number of maintenance inspections. For example, maintenance recommendations for slide-gate type hydrants include a full tear-down annually, while compression type hydrants do not.

3.2.6 Summary of Recommended Hydrant Maintenance Standards

Hydrant maintenance recommendations of the agencies discussed above are shown **Table 2**.

Table 2. Recommended Hydrant Maintenance by Agency

Agency	Recommended Hydrant Maintenance Frequency
NFPA	annually and after use
FUS	semi-annually and after use (operation once per year)
AWWA	semi-annually and after use
Hydrant Manufacturer	
<i>Terminal City</i>	annually and after use As per NFPA
<i>Clow</i>	semi-annually and after use As per AWWA M17
<i>Canada Valve (Mueller)</i>	semi-annually and after use As per AWWA M17
Canadian Municipalities	varies; typically semi-annually

The minimum accepted standard for hydrant maintenance frequency is annually and after each use as per the NFPA. Agencies which are based on technical and insurance purposes are understandably more conservative, with recommendation of semi-annual maintenance.

3.3 Recommendations

From a technical standpoint, it is recommended hydrant preventative maintenance be completed semi-annually in accordance with industry best practices. This would include at a minimum, flowing for debris clearing and a maintenance inspection annually, in addition to an annual inspection before freezing conditions.

Activities such as hydrant painting, graffiti removal, and snow clearing around hydrants should be included in the maintenance activities as these tasks ensure adequate visibility and access to hydrants.

Corrective maintenance should be completed as required when hydrants need servicing. The amount of corrective maintenance should eventually decrease if semi-annual preventative maintenance is being performed.

4. Administration and Record Keeping

4.1 Current Situation

4.1.1 Hydrant Database

Prior to 2011, records of hydrant maintenance (in the form of invoices which indicated the number of hydrants serviced) were sent to the Fire Department by each Improvement District undertaking maintenance activities. These records were kept by the Fire Department and used to update the Fire Department's hydrant database. The information submitted by the Improvement Districts and additional data on hydrants within each jurisdiction was also kept by each organization individually, but was not required or standardized.

In 2011, the KWU (contracted by the KFD on a fee for service) created a geo-spatial database for all hydrants within City boundaries. The database, which is on an extranet and managed by the KWU, includes hydrant data such as: make and model, maintenance records, and in/out of service information. After each public hydrant maintenance event, the water purveyors input maintenance data to the database. This information is used by the Fire Department to update the Fire Department's database, and also to verify maintenance quantities invoiced to the Fire Department by each Improvement District. The process for private hydrant data entry is discussed in the following section.

The establishment of this database was a positive step towards consolidating and standardizing hydrant record information and has allowed for improvement in the tracking and payment of hydrant maintenance.

4.1.1.1 Improvement District Use of the Database

Currently, the Improvement Districts have input and viewing access in the database for only the public hydrants within their jurisdiction. When the database was established, Improvement Districts were introduced to the system and data entry procedure with a training course. Since then, data entry has occurred only three times (as the frequency was reduced to once per year in 2012). Due to this infrequent use, the Improvement Districts would benefit from a basic user manual for the database and entry procedures.

4.1.2 Hydrant Use Notification

When the Fire Department uses a hydrant for firefighting or training purposes, they are responsible for notifying the Improvement District so a follow-up inspection can be done. A standardized procedure is in place and includes submission (via facsimile) of a hydrant form to the appropriate Improvement District.

In addition to their primary function of fighting fires, hydrants are also used by the Improvement Districts for maintenance and operational purposes. Hydrants can be taken out of service by the Improvement Districts due to maintenance, shut downs, or other reasons. When a hydrant is out of service, the Improvement District is responsible for notifying the Fire Department of the change in service. This is usually done by a phone call from the Improvement District to the Fire Department. The Fire Department then updates their own database to show the hydrant is not available for firefighting.

In both cases, it has been noted that there is room for improvement in the execution of these notifications. The process could be improved by requiring documentation for all notification, but ultimately the onus is on the person(s) using the hydrant to notify the proper organization. This may include improving the communication between the field and administrative staff for both the Fire Department and Improvement Districts.

4.2 Recommendations

4.2.1 Hydrant Database

The new hydrant database has allowed for significant improvement in the reliability and accuracy of hydrant maintenance records. The City hydrant database should continue to be administered and managed by the KWU, with the cost for the database under the KFD budget.

Allowing viewing access to the Improvement Districts for private hydrants within their jurisdiction should be considered. This would improve knowledge of the system for the Improvement Districts, which would be beneficial for all stakeholders. In addition, a brief user manual should be created for the City hydrant database and distributed to all users.

4.2.2 Hydrant Use Notification

It is recommended that KJWC members record and document the hydrant use notification process to be followed by both the Fire Department and Improvement Districts. The process should be reviewed with all staff. To further improve reliability of this process, an automatic hydrant use notification system could be integrated into the existing City hydrant database.

5. Public vs. Private Hydrant Maintenance

5.1 Current Situation

Currently, hydrants within the City of Kelowna fall under one of two classifications based on location of the hydrant. These classifications include: public hydrants – hydrants on public property including right-of-ways and easements; and private hydrants – hydrants on private property including those in statutory right-of-ways. According to Fire Department records, there are 3,568 public and 799 private hydrants within City boundaries.

The following table and descriptions detail the current maintenance process and responsibilities for both hydrant classifications.

Table 3. Current Hydrant Maintenance Program Responsibilities

Hydrant Type	Organization Responsibilities		
	Maintenance	Submitting Records	Record Follow-up & Inputting
<i>Public</i>	Water Purveyor	Water Purveyor	Water Purveyor
<i>Private</i>	Private Owner	Private Owner	Fire Department

Public Hydrants – When Improvement Districts or the Kelowna Water Utility completes maintenance on public hydrants, they are required to update each hydrant in the database with this information. The Water Purveyor then invoices the Fire Department for the quantity of hydrants maintained, and the Fire Department verifies the quantity using the database information; if the records match, the invoiced is paid.

Private Hydrants – When private contractors, Improvement Districts or the Kelowna Water Utility completes maintenance on private hydrants, the records are sent to the Fire Department directly, who then updates the City database. Private maintenance costs are the responsibility of the private owner.

5.1.1 Ensuring Maintenance Completion

As discussed briefly in the previous section, the maintenance and record input process for public hydrants performed by the Improvement District is effective and has improved the tracking and accuracy of maintenance records. The issue which has developed is related to the consistency of maintenance and record submittal by private property owners on private hydrants.

The Fire Department distributes notices to private hydrant owners informing them of the maintenance, record keeping, and record submittal requirements on their private hydrants. It is then the owners' responsibility to hire a contractor to perform the maintenance according to those requirements, and submit the records to the Fire Department. On a regular schedule, the Fire Department undertakes independent inspections on all private property fire suppression systems, which includes private hydrants. The frequency of these inspections is at a minimum once every two calendar years and is based on City of Kelowna Council Policy #81. During these hydrant inspections, the inspector will check to ensure that maintenance records have been submitted by the owner. If hydrant records are found to be deficient, the inspector will follow up with the private owner. While an initial effort is always made, the Fire Department does not have the resources to investigate and continuously follow up on all deficient private

hydrant records. This has created a backlog in follow up on deficient private hydrant records, which means that Fire Department cannot be confident that the required maintenance is being completed on all private hydrants.

5.1.2 Payment for Private Hydrant Maintenance

In the past, there has been some confusion as to whether the Improvement Districts should be compensated for maintenance on some private hydrants which were located in right-of-ways. This occurred primarily due to inaccuracies in the database related to un-entered hydrants or type of hydrant, which resulted in the Fire Department paying invoices based on incorrect database information. The accuracy of the database is continually improving which will allow the Fire Department to ensure they are paying for the correct amount and type of maintenance when they receive an invoice. It is the intent of the City and Fire Department to pay for maintenance done only on public hydrants.

5.2 Current Standards and Industry Practices

Public and private hydrants are defined according to the FUS as:

Public Fire Hydrant – A fire hydrant situated and maintained for public use on a public right-of-way (or easement) to provide water for use by the fire department in controlling and extinguishing fires. The location of a public fire hydrant is such that it is accessible for immediate and unrestricted use by the fire department at all times. Public fire hydrants are owned and maintained by the government entity (ex. city, village, etc.) which is responsible for maintaining the hydrants and water supply distribution system in operating condition at all times and is authorised to levy taxes to fund the operation and maintenance programs.

Private Fire Hydrant – A fire hydrant located on privately owned property, or on streets not dedicated to public use. Although a private fire hydrant may be connected to a public water supply system, maintenance of the hydrant and access to the hydrant are the responsibility of the property owner. Private hydrants are normally required where buildings are so located on the property or are of such size and configuration that a normal hose lay from a public hydrant would not reach all points on the outside of the building.

These definitions exemplify how different maintenance processes are required for public and private hydrants as it is clear that taxpayers should not be funding fire protection infrastructure for private owners whose building cannot be serviced by standard means.

5.2.1 Industry Practices – Private Hydrants

A sample poll of thirteen municipalities was taken from the NWWBI program members to determine if other municipalities had the same maintenance arrangement as the City of Kelowna for their private hydrants. All survey responders indicated that private hydrants exist in their municipality and the private owners are responsible for completing maintenance on those hydrants.

5.3 Recommendations

5.3.1 Hydrant Ownership Audit

It is recommended that an ownership audit be completed on all hydrants within the City of Kelowna to determine whether each hydrant is considered public or private. The results from the audit will make clear the associated

maintenance and funding responsibilities and also allow the appropriate budget to be allocated by the City and KFD to support the required public hydrant maintenance. The definition of public and private hydrant presented in this section can be used as a basis for the audit. It is recognized that the City of Kelowna and KFD may have additional conditions under which to consider a hydrant public, such as hydrants on looped mains within statutory right-of-ways. It is recommended that a hydrant provide clear public benefit in order to be considered public and receive maintenance funding through taxes. It is recommended the City of Kelowna, KFD and KJWC water purveyors establish a common definition and set of conditions to apply to all hydrants within City boundaries.

5.3.2 Private Hydrant Records

The Fire Department, as the primary user of the hydrants must be confident that the required maintenance is being completed on private hydrants. The Fire Department and its Fire Inspectors should continue to oversee the administration of private hydrant maintenance including managing notifications to private owners, receiving maintenance records, following up on deficient records, and inputting maintenance records to the database. The City of Kelowna should assess the resources currently available to the KFD for these tasks, and adjust them to provide an acceptable and agreed-upon level of service.

The City Fire Prevention Bylaw should also be updated to provide clear direction on the responsibilities of private hydrant owners.

6. Financial Considerations

6.1 Current Situation – Maintenance Costs

As previously discussed, the current annual budget for City of Kelowna hydrant maintenance is \$59 per hydrant per year based on one maintenance inspection. This amount is intended to cover the cost of corrective maintenance (repairs) and replacement if necessary.

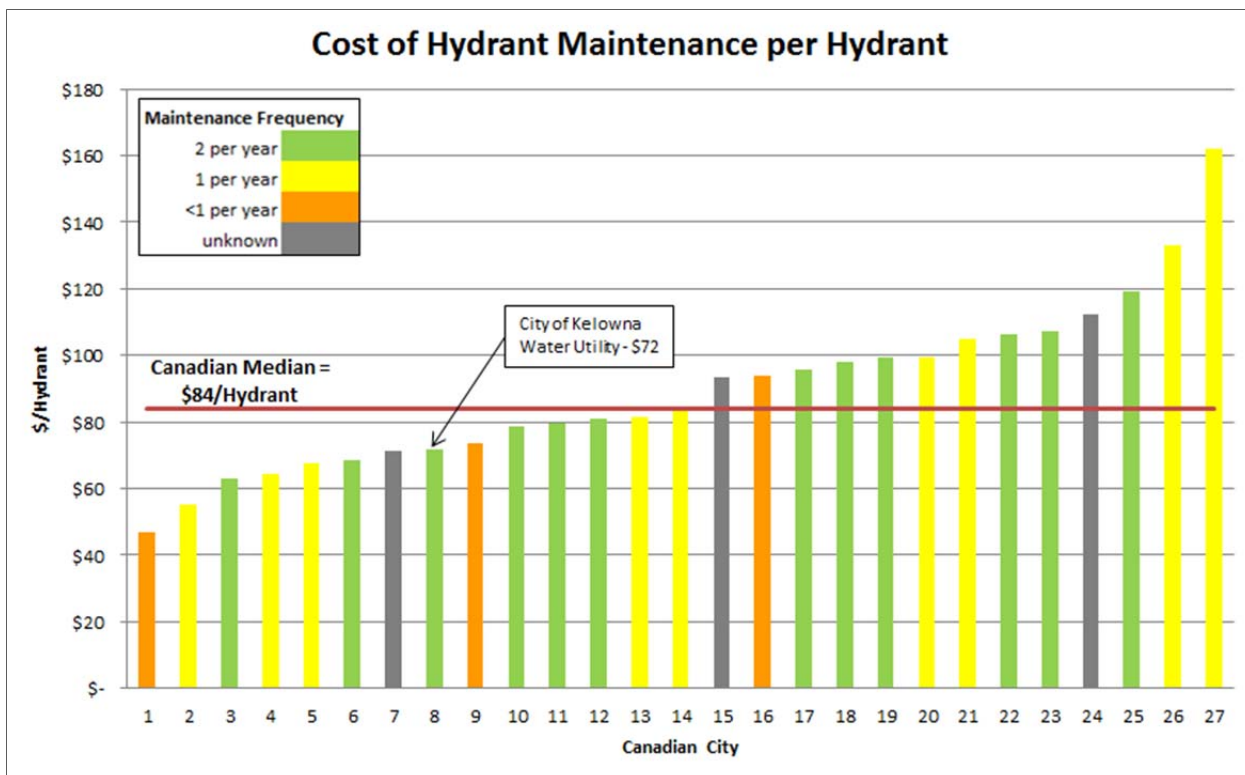
6.2 Financial Benchmarks

6.2.1 National Fire Hydrant Maintenance Costs

For comparison purposes, data on average hydrant maintenance costs for Canadian cities was gathered and is presented below. This information was extracted from the NWWBI Program database and includes data from member municipalities.

The figure below shows the 2010 annual hydrant maintenance cost for 27 Canadian municipalities. The frequency of maintenance is as per **Table 1** in the previous section and includes twelve (12) municipalities performing maintenance twice per year; nine (9) at once per year; three (3) at less than one per year; and three (3) with unknown frequency. Note the KWU hydrant costs are \$72 per year (based on maintenance twice per year) and the median cost is \$84 per hydrant per year. As mentioned in the *Recommended Best Practices – Canadian Municipalities* section of this report, it should be noted that the definition of a maintenance check can vary significantly by municipality and thus should be considered when using this information for comparison purposes.

Figure 2. Canadian Municipality Fire Hydrant Maintenance Costs (2010)



6.3 Recommendations – Maintenance Costs

The recommended maintenance frequency of twice per year proposed in this study is based on industry best practices and standards. As the funding source for hydrant maintenance, the City of Kelowna and KFD must determine the appropriate amount of maintenance based on consideration of industry standards and financial affordability. Once maintenance frequency is established, the City must then determine the annual costs and appropriate compensation to be provided to the Improvement Districts based on this level of service. Costs should include the annual preventative maintenance program (*\$ per hydrant at x total hydrants*) plus the annual corrective maintenance estimates (usually based on a historical average). The inclusive rate should be reviewed on a regular basis to ensure it is fair for all parties.

The budget for hydrant maintenance must support both the preventative and corrective maintenance activities. Detailed tracking of corrective maintenance causes and costs would allow this portion of the budget to be better forecast. While average maintenance costs were presented for comparison purposes, the City should further investigate the actual costs (known and historical) in order to establish an appropriate budget. Detailed maintenance budgeting was not included in the scope of this study.

6.4 Equitability of Private Hydrant Funding

Another financial issue related to private hydrants is the perception of residents being double-charged for fire protection. Private hydrant owners such as strata developments typically fund hydrant and other maintenance through strata fees charged to tenants. This could be interpreted as some customers being double-charged for fire protection – once through taxes for City fire protection (which they do not benefit from at their residence), and once through the strata for the private hydrant maintenance.

If the City and KFD chose to undertake maintenance of the private hydrants, while this would better ensure reliability of maintenance, it would not necessarily mean any changes for the customer as the strata owner will likely not pass on a reduction in maintenance costs to tenants. As previously discussed, a survey of industry practices shows private hydrant maintenance is normally funded and completed by the hydrant owner. The function by which the private owner funds this maintenance should not be of concern to the City and has not emerged as an issue in equitability in any other municipalities surveyed for this study.

6.5 Renewal and Replacement

A properly planned asset renewal program will ensure water system assets are replaced before the end of their service life without negatively impacting the owner's budget. Currently, the KWU funds capital replacement through its water rates. All Improvement Districts confirmed that hydrants are included in their Tangible Capital Asset databases, but are not considered in capital renewal planning. While there are many factors influencing asset life cycle, it can be conservatively projected that because many City hydrants were installed around the same time shortly after the City boundary expansion, it can be assumed these assets will also fail around the same time. This could create a major issue for the organization responsible for replacement of the hydrants.

It is recommended that hydrant capital renewal funds are established to ensure the appropriate funds are available once replacement is required.

7. Conclusion

This report addresses the current issues related to hydrant ownership, maintenance and record keeping facing City of Kelowna hydrant stakeholders. All parties involved in the maintenance of City of Kelowna hydrants agree that the current arrangement for maintaining public hydrants through an agreement with the Improvement Districts is working well and the recent creation of a City-wide hydrant database has improved the accuracy and completeness of hydrant maintenance records. Designation of each water purveyor as hydrant owner will simplify the current issues of hydrant usage, financial fairness, and replacement and renewal responsibilities.

The key issues addressed in this report and associated recommendations are summarized in the table below:

Table 4. Summary of Recommendations

Issue Addressed	Recommendations
Ownership	<ul style="list-style-type: none"> • All hydrants within public right-of-ways should be owned by the respective water purveyors. • The City should continue to contract the Improvement Districts for maintenance of hydrants.
Level of Hydrant Maintenance	<ul style="list-style-type: none"> • Hydrant preventative maintenance should be completed semi-annually in accordance with industry best practices; corrective maintenance should be completed as required when hydrants need servicing.
City Hydrant Database	<ul style="list-style-type: none"> • The City hydrant database should continue to be administered and managed by the KWU on contract from the KFD. • The City should consider allowing viewing access to the Improvement Districts for private hydrants. • A brief user manual should be created for the database and distributed to all users. • The KJWC should record and document the hydrant use notification process to be followed by both the Fire Department and Improvement Districts. Consider integrating an automatic hydrant use notification system into the existing City hydrant database.
Ensuring Reliability of Private Hydrant Maintenance	<ul style="list-style-type: none"> • A hydrant ownership audit should be undertaken on all hydrants to determine if ownership is public or private based on the definitions provided in this report. This will make clear the party responsible for maintenance and funding, and also allow the City and KFD to allocate the appropriate public hydrant maintenance budget. • The Fire Department should continue to be responsible for the administration of private hydrant maintenance including notifying private owners, receiving maintenance records, follow-up on deficient records and inputting maintenance records. • The City Fire Prevention Regulations Bylaw should be updated to provide clear direction on the responsibilities of private hydrant owners.
Financial	<ul style="list-style-type: none"> • The City and KFD should determine the appropriate hydrant maintenance budget and compensation to support the selected maintenance frequency and associated repair and renewal costs. Maintenance costs include the annual preventative maintenance program plus the annual corrective maintenance estimates.
Agreement	<ul style="list-style-type: none"> • An agreement between the City of Kelowna, KFD, and the water purveyors outlining the roles and responsibilities of each should be drafted with input from all parties, legally reviewed, and then executed to create a clear and verifiable record of the responsibilities of all parties. This agreement should include terms related to maintenance, repairs and renewal.