



**District of  
North Saanich**

***STAFF REPORT***

To: Rob Buchan  
Chief Administrative Officer

Date: November 22, 2016

From: Eymond Toupin  
Director of Infrastructure Services

Re: **Water System Master Plan**

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**RECOMMENDATION(S):**

That Council:

1. Receive the final draft of the "District of North Saanich Water System Master Plan" prepared by Kerr Wood Leidal Associates Ltd.; and
2. Continue indexing the annual reserve funding at the rate of inflation. The current (2016) funding level is \$498,300; and
3. Authorize staff to begin proceeding with the recommended system upgrade projects identified in the Water System Master Plan using funds from the water utility reserve commencing in 2017 and with the objective of completing the identified upgrades over a period of approximately 30 years.

**STRATEGIC PLAN IMPLICATIONS:**

This matter relates to the following Council strategic priorities:

***Protect and Enhance Rural, Agricultural, Heritage, Marine and Environmental Resources***

***Maintain a Safe and Healthy Community***

***Ensure Strong Leadership, Fiscal Responsibility and Transparent Government***

**INTRODUCTION/BACKGROUND:**

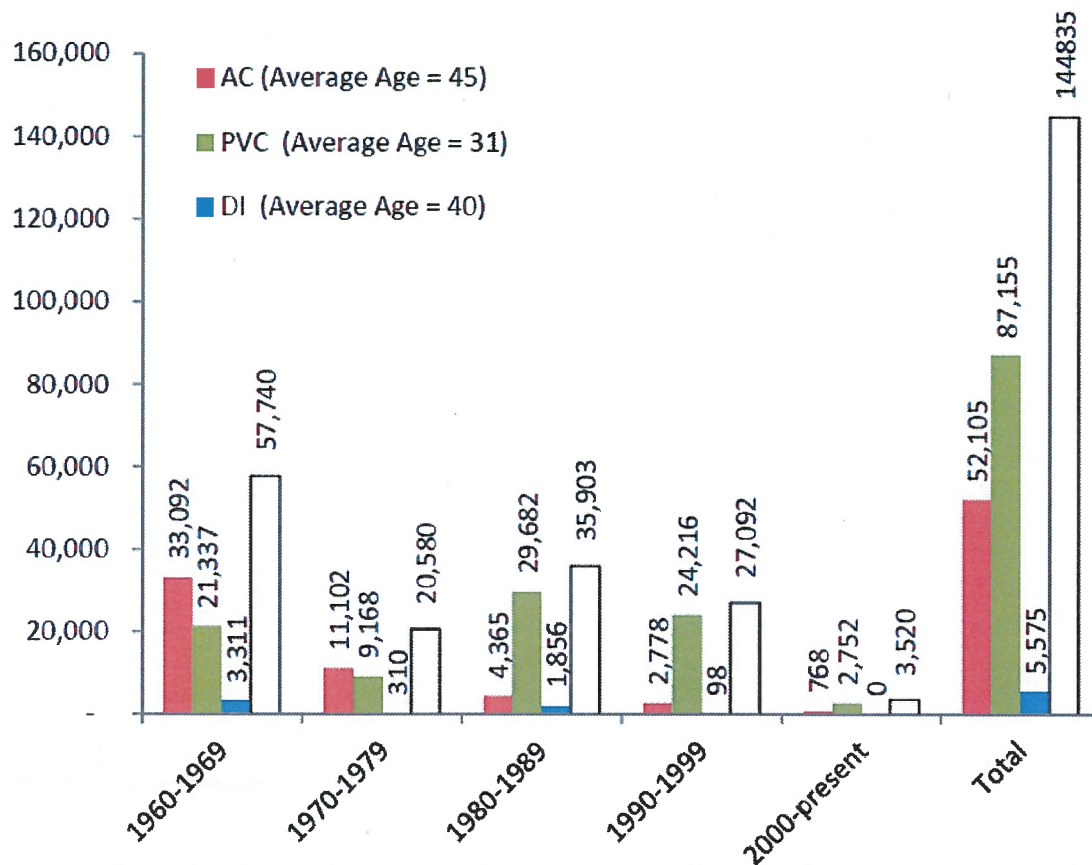
Kerr Wood Leidal Associates Ltd (KWL) were engaged by the District to prepare a Water System Master Plan in 2014. Over the last number of months, staff have reviewed drafts of the report and provided comments and edits which were addressed and incorporated into this final draft. Staff have reviewed the resulting final version and the associated recommendations which are being presented to Council.

**DISCUSSION:**

The primary objectives of the Water System Master Plan were to:

- Develop a computational hydraulic model of the District’s water distribution system to assess current and future levels of service;
- Identify system improvements to address deficiencies under current and future demand scenarios;
- Review watermain and PRV station asset condition data and integrate with the identified system improvement requirements;
- Identify renewal/upgrade priorities and their associated costs and determine an appropriate funding level for the next 30 years.

The District owns and operates approximately 150 km of watermains to distribute potable water supplied by the CRD to its residents and businesses for consumption and firefighting. The bulk of the system is comprised of asbestos cement (AC) and polyvinyl chloride (PVC) piping which represent approximately 35% and 57% of the system respectively (see Figure 8-1 from the report provided below). The asbestos cement mains represent the oldest piping in the system and most of these were installed in the 1960s. The average age of the AC piping is approximately 50 years. The PVC piping of the system represents the more recently installed infrastructure and has an average age of approximately 30 years.



**Figure 8-1: Length of Watermain by Pipe Materials and Installation Era**

There are also 34 District and 5 CRD owned and operated pressure reducing valve (PRV) stations which define 13 separate pressure zones in the District. The pressure zones are required to service the range of elevations in the various areas of the District.

### System Condition

As indicated by the very low incidence of breaks observed in the District, the watermain system appears to be in generally good condition. As mentioned previously, the oldest piping material in the system is asbestos cement. The longevity of this material is dependent on a number of factors including ground conditions, installation practices, loading and the physical properties of the pipe itself.

The primary mode of degradation of AC pressure piping is by leaching of cementitious material from the pipe wall. The rate of this leaching is a function of both the surrounding soil conditions and internal water chemistry. In aggressive environments, this piping can have a relatively short life span of 50 years, in which case the District's AC inventory would soon be reaching the end of its useful life. In a favorable environment, this piping could have a lifespan in excess of 100 years.

Based on the District's break history for AC piping, it appears that our environment is generally favorable and that a longer life span can be expected. The actual rate of degradation (i.e. loss of cementitious material) of the District's piping could be estimated by opportunistically sampling and testing sections of piping removed during repairs or renewals. As recommended in the report, the intent would be to complete this sampling and testing to confirm deterioration rates and refine the expected lifespan of the District's AC piping inventory.

The majority of the piping material in the District's inventory is PVC and represents the more recently installed infrastructure. This material, which has a shorter history of installation, provides a number of benefits including its high chemical resistance to degradation or attack. If installed properly and operated within its design limits, this piping material could continue to perform for a very long period of time, which could be well in excess of 150 years. As such, replacement of the existing PVC piping inventory is not anticipated in the foreseeable future.

### Hydraulic Modelling and Capacity Assessment

A hydraulic model was constructed using data from a variety of sources including the District's CAD and GIS data, LiDAR elevation data, and PRV data. The model was validated using pressure and flow data collected during hydrant flow tests. The hydraulic model was then used to assess the level of service in response to existing and future demands in the District. Two conditions were assessed, maximum day peak hour demand and maximum day plus fire flow.

The existing system provides a reasonably good level of service in meeting maximum day peak hour demands with only a few locations with pressures below 300kPa (44psi). Under future demand conditions, the number of nodes with pressure below 300kPa (44psi) increases somewhat, particularly in Pressure Zone 2 along Clayton Road and Wain Road. However, for both existing and future demand conditions, the water distribution system generally provides a good level of service.

When examined in terms of the system's ability to deliver fire flow however, a number of deficiencies over a wider area were identified for both existing and future conditions. As is indicated in the report, this is largely due to the fact that the District's oldest AC watermains were likely sized to the rural water supply standard of the day that considered fire-fighting as secondary to the provision of safe drinking water. Under current standards, a minimum fire flow of 60L/s (1,000 USGPM) is generally required to protect single family dwellings. Also, what were once small farm houses and cottages are now much larger and generally higher value properties which warrant a higher level of service in terms of fire protection.

The areas which could not deliver minimum fire flows were largely those served by 100mm (4") diameter AC mains and where there are long runs of un-looped (i.e. single feed) 150mm (6") pipe.

Under current standards, watermains typically have a minimum diameter of 150mm (6"). Also, older 100mm (4") diameter AC mains tend to be thinner walled and therefore anticipated to have shorter lifespans than larger diameter mains which would be thicker walled.

Using the hydraulic model, upgrades were identified to address the fire flow deficiencies. These projects included pipe upgrades (i.e. increases in pipe diameter), new sections of pipe to increase system redundancy and robustness (i.e. through looping of dead end mains), and modifications to the pressure zone boundaries and PRV settings.

The total estimated value of the identified watermain upgrades represents approximately \$13.3 million (in \$2016) and a total length of replacement and new watermains of over 20km. The majority of the upgrades, approximately two thirds of the total value and length of watermain upgrades, serve a dual purpose by replacing some of the oldest and smaller diameter AC mains and by improving available fire flow capacity in existing areas. It recommended the upgrades be completed over a period of approximately 30 years, representing an average annual investment of approximately \$440,000 (in \$2016) and which would be funded from the water system reserve. In addition, annual funding of \$60,000 will be required for the renewal of PRV stations for a total estimated annual reserve funding level of \$500,000 (\$2016).

In order to ensure the water system reserve remains sustainable, it is recommended funding to the reserve be indexed at the rate of inflation. This would offset the increasing cost of the upgrades identified which were estimated in \$2016 and which would be anticipated to increase at approximately the rate of inflation. This is consistent with the recent practice which has been to increase the funding to the District's water system reserve by \$10,000 annually (this represents an annual increase of approximately 2% to the current annual funding level of \$500,000).

As condition data is collected on the existing water main infrastructure, the anticipated lifespan of these assets can be refined and the funding requirements adjusted accordingly.

### **OPTIONS:**

Council can:

1. Receive the final draft of the "District of North Saanich Water System Master Plan" prepared by Kerr Wood Leidal Associates Ltd.
2. Authorize staff to continue indexing the annual reserve funding at approximately the rate of inflation. The current (2016) funding level is \$498,300.
3. Authorize staff to begin proceeding with the recommended system upgrade projects identified in the Water System Master Plan using funds from the water utility reserve commencing in 2017 and with the objective of completing the identified upgrades over a period of approximately 30 years.
4. Other.

### **FINANCIAL IMPLICATIONS:**

As discussed in the report, based on the current information and analysis, the plan indicates that the current level of funding to the water system reserve of just under \$500,000/year, if indexed at the rate of inflation, is anticipated to provide sufficient funds to maintain the existing water system over the next 30 years. As of October 31<sup>st</sup>, 2016, there was nearly \$2.4 million in the water reserve fund.

### **LEGAL IMPLICATIONS:**

None anticipated.

**CONSULTATIONS:**

None.

**INTERDEPARTMENTAL INVOLVEMENT/IMPLICATIONS:**

The Acting Director of Financial Services and the Director of Emergency Services were consulted in the preparation of this report.

**SUMMARY/CONCLUSION:**

The District owns and operates approximately 150 km of watermains to distribute potable water to its residents and businesses for consumption and firefighting. The bulk of this system is comprised of AC and PVC piping averaging between 30 and 50 years of age. The Water Master Plan was completed to develop a hydraulic model of the distribution system, identify system improvements, review watermain and PRV station age and condition data, identify renewal and upgrade priorities and determine an appropriate funding level for the next 30 years.

Watermain upgrades, representing a total value of \$13.3 million (\$2016) and a total length of replacement of over 20 km, were identified. The majority of the upgrades identified would serve a dual purpose by replacing some of the oldest and smaller diameter AC mains and by improving available fire flow capacity in existing development areas. It is recommended the watermain upgrades be completed over a period of 30 years, representing an average annual investment of \$440,000 (\$2016). In addition, annual funding of \$60,000 would be required for the renewal of PRV stations for a total estimated water reserve funding level of \$500,000/year (\$2016).


In order to ensure the water system reserve remains sustainable, it is recommended funding to the water reserve continue to be indexed at the rate of inflation. Current practice has been to increase annual funding by approximately \$10,000 per year.

As condition data is collected on the existing watermain infrastructure, the anticipated lifespan of these assets will be refined and the funding requirements adjusted accordingly.

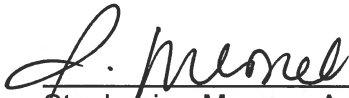
Respectfully submitted,

Concurrence,

  
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Eymond Toupin  
Director of Infrastructure Services

  
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Rob Buchan  
Chief Administrative Officer

Concurrence:

  
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Stephanie Munro, Acting Director Financial  
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Anne Berry, Director Planning & Community  
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Curt Kingsley, Director Corporate Services

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John Trelford, Director Emergency Services