REGIONAL WATER MANAGEMENT PLAN

March 25, 2010

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Executive Summary

The Regional District of Central Kootenay (RDCK) is one of only five regional districts in the province that have pro-actively assumed a greater role in the delivery of critical services to its residents by way of a defined, long range strategy. Leadership in the delivery of a potable water service to rural residents (typically a provincial responsibility) demonstrates a clear understanding that existing governance models for stand-alone community water systems may be marginally successful and that local governments hold the key to successful and sustainable delivery of the most precious of all resources – safe and reliable drinking water.

By way of history, the RDCK commissioned a Sewer and Water System Acquisition Strategy in 2003 and initiated some conversions of existing water systems. This was subsequently halted however, pending a clearer understanding of the service, regulatory implications and associated, sustainable funding models. The moratorium on acceptance of more systems was due in large part to the introduction of the Drinking Water Protection Act (and regulations) by Interior Health which, in a post-Walkerton reaction, required stronger source assessments and higher levels of treatment - the associated costs were and continue to be dramatically higher than those which the British Columbian rural public has been accustomed to over the last few decades.

This revised Plan reflects the Board of Directors' commitment to deliver the service to a high-quality standard, while being mindful of the effects of climate change (as it applies to both raw water sources and uses of treated water), regulatory parameters, corporate risk, sustainable operations and affordability to taxpayers. The paramount objective is and will continue to be public safety.

Sewer systems are not included in this Plan, the Board's approach to sewer system ownership and management would be best guided by area-specific Liquid Waste Management Plans in the future.

As of February, 2010, there are several utilities awaiting consideration for conversion to the RDCK. Implementation of this Water Management Plan will address compliance upgrades to existing systems and permit the formal application by residents within water systems for the transfer of ownership of those systems to the RDCK. Many existing rural water systems (depending on their respective governance structure*), are experiencing difficulties with sustainable and compliant operations. Reasons typically include:

- Inadequate cost recovery,
- Aging infrastructure,
- Depleted financial reserves,
- Inadequate system maintenance,
- Loss of interest in continued operations,
- Inaccessibility to grant funding opportunities,
- Newer regulatory requirements and enforcement.

**Refer to Appendix A for a listing of Existing Governance Models in BC.*

The opportunity can also be made for the transfer of brand new systems from a developer to the RDCK. This would be considered if the system was designed and constructed to RDCK standards and was offered at a cost of $1 to the RDCK (much like the servicing requirements of a municipality). An agreement of this nature would need to be confirmed prior to any construction on the candidate system and would also require that the developer warrant the system against faulty materials and/or poor workmanship for a period of two years following takeover.

Initial Considerations

It appears from historical events and from regulatory agencies that the Board has held different opinions over time and among themselves on the issue of water systems conversion and on the issues of true costs and regulatory requirements of servicing water systems in a sustainable manner.

The Board, as a corporation, has come to consensus on the following four issues in order to move forward:

1) The District is committed to offering the service of safe and reliable drinking water.
2) All RDCK water systems must be operated and funded adequately for sustainable operations and maintenance.
3) The RDCK will work with communities towards compliance with the Drinking Water Protection Regulation and Drinking Water Protection Act.
4) Water is a critical service and many communities need assistance and leadership from their local government.

It must be clarified that if the system assessment identifies high risk to the corporation, the District is in no way obligated to proceed any further.

Purpose & Scope

The development of this Water Management Plan, whose foundation is based on the *Regional Water Landscape Inventory* and discussion paper (completed September, 2008, Appendix B) will help guide future decisions related to water system assessment, conversion and operation, better prepare the District to respond to climate change impacts, and support proactive actions when considering the current and future water needs in the RDCK.

The purpose of the Water Management Plan is to provide actions to manage water and its use that:

- Support community water system service area residents of the RDCK by committing to improved water service delivery;
- Consider the ecological function of the region's watersheds;
- Balance water supply use today and in the future by introducing sound conservation measures;
- Increase understanding of the systems and its water issues;
- Minimize risk and ensure the RDCK has a thorough understanding of the condition of candidate systems and their financial viability prior to acquiring them;

- Ensure adequate staffing and resources (e.g. organizational capacity, technology, certified technicians, financial) are available to safely operate current and additional water services that are (or have a plan) to be in compliance with safe drinking water standards;
- Operate regional water systems with the objective of 100% cost recovery from system users;
- Provide guidance for land-use planning initiatives;
- Offer a relevant water conservation and management strategies toolkit.

It is recognized that there exist other water quality issues that were not included in the initial phase of this project, along with public outreach and engagement. These aspects will require further action in the future.

Why the Plan is Needed

The reasons for developing this plan are varied. Primary considerations include:

Weak, existing governance models – A declining interest in operational responsibility, increasing and more complex regulatory requirements, and insufficient funding models have led to significant governance challenges in small water systems.

Improved local Service delivery – For several years a number of community run and privately owned water systems have requested that the RDCK convert their systems to an RDCK service. With a moratorium being in place since 2002, the District has not been in a position to assist residents in the region that were not already RDCK systems.

Climate change – Having in place water resource management strategies will prepare the region to handle the inevitable known and unknown impacts of climate change, by providing clear regional directives for watershed and aquifer management, and guidance for resource management.

Public health – Infrastructure concerns are genuine, and taking measures to meet regulations concerning drinking water, sewage treatment, and emergency preparedness would reduce the risk to public health. Increasing sound education and information sharing will aid in ensuring that the public is actively engaged and understands their role and responsibility in keeping water supplies safe.

Scale of economies - Economies of scale may be available to community water suppliers when they are willing to share resources with other systems. Sharing resources will result in benefits to water systems and their users, minimize capital expenditure by reducing duplication of service, and reduce impacts on bio-systems.

Economic prosperity – A strategy is required in order to ensure a safe, secure and sustainable water supply for all users. Without one, everything from agriculture in the Creston Valley to recreation in Area D may be put at economic risk. A water management strategy that is properly implemented and enforced will protect, conserve and improve valuable water resources and ensure a strong economy for future generations.

Plan Process

The *Regional Water Landscape Inventory* (Appendix B; see Appendix C for spatial inventory of maps) addressed a broad, high-level assessment of the RDCK relationship to water issues and outlined options available to address concerns. The intent of the project was to provide a detailed but not exhaustive spatial inventory of water systems in the RDCK, identify areas experiencing growth and development, delineate where water supplies are being drawn from along with any associated allocation restrictions, and to highlight emerging climate change impacts. The parallels between the spatial information and the elements of concern were presented in a framework that could inform readers of the priority issues. The working inventory and discussion paper is a pre-cursor to phase 1 of the Regional Water Management Plan. A Board endorsed initiative, phase 1 of this plan addresses current issues previously identified and provides the context for how the RDCK can deal with existing water systems, what capacity is required in order to take on additional water and sewer systems, and provides a guideline for developers if they want to be considered to become an RDCK owned and operated system.

Challenges

The challenge for many small water systems, RDCK or non-RDCK owned is to afford the equipment and qualified operators required to conform to the province's drinking water standards. The difficulty in locating and engaging qualified operators is not unique to the RDCK. It is for this reason that some regional districts in the province are sourcing single, larger contractors to attend to the operation and maintenance of multiple water systems. Recognizing this and other challenges unique to small communities cannot be overlooked. Key considerations include:

Current standards – Several regulatory agencies may be involved in the design, construction and operation of a community water system. *Federal Fisheries, Navigable Waters, Environment and Coast Guard* may be involved where works occur in and about a watercourse and almost certainly when works are supported by a federally funded grant program.

Primary players during operations tend to be limited to IHA and the Ministry of Environment. The latter is primarily focused on raw water licensing and with rural water system standards.

IHA administers operating permits under the Drinking Water Protection Act and Drinking Water Protection Regulation. Under this regulation, all community water systems must provide potable water. As defined in the Act, potable water means water that "(a) meets the standards prescribed by the regulation, and (b) is safe to drink and fit for domestic purposes without further treatment." Because the non-prescriptive legislation states that water systems must meet 'potable' requirements, a water system must identify how it will meet these requirements[1]. Board support for improved water quality in the District is evident in the recently approved Subdivision Bylaw (adopted December 10, 2009), which specifies the requirement for proof of potable[2] water before any subdivision can occur.

[1] One way to achieve potable standard requirements is to follow the multi-barrier approach found within the Federal Guidelines for Canadian Drinking Water Quality (GCDWQ).

[2] Potable water means water provided by a domestic water system that (a) meets the standards prescribed by regulation, and (b) is safe to drink and fit for domestic purposes without further treatment in accordance with the *Drinking Water Protection Act* (Regional District of Central Kootenay, Subdivision Bylaw No. 1679, 2009).

Required upgrades – As well as upgrading water systems to a good engineering and safe operating standard, the Drinking Water Protection Act now requires enhanced protection from bacteriological and parasitic elements which are common to BC.

This requires a departure from chlorination (or contact disinfection) as the only protection for systems relying on surface water as a source. Ultra-violet treatment and filtration are preferred additions, but both come with considerable capital cost and much higher annual operating costs. For this reason, larger systems and those able to amalgamate with and connect to another system will appreciate the associated economies of scale.

Experience in other RD's[3] would suggest that a fully compliant system with disinfection, UV and filtration serving 100 connections, would see total annual operating costs (including contributions to reserves) exceeding $800 per connection.

Asset Management Planning – All water systems should have a system assessment completed by a certified professional that is based on full life cycle cost analysis.

Important components essential to the provision of safe and reliable drinking water in small communities includes:

- Source protection regulations developed and enacted
- Providing affordable water treatment technologies
- Creating the institutional structure necessary to ensure the financial stability and viability of water systems
- Improving programs to train small system operators in all aspects of water system operation and maintenance
- Monitoring program in place (treatment and service delivery)

Pending Water Services

In spring 2009 all currently waitlisted water systems were contacted by RDCK staff. The details and requirements of the *Water and Sewer System Acquisition Policy* were described to the system owners, various additional information was provided, and a preliminary tour of the systems were provided by systems interested in pursuing the feasibility of becoming an RDCK service. Upon the lifting of the moratorium on September 1, 2009, the RDCK began to receive *Expression of Interest* letters from systems wishing to be considered in the first intake of water systems converting to an RDCK service. As of September 30, 2009, the following systems had formally expressed their interest and are currently taking measures to fulfill the requirements outlined in the *Acquisition Policy* in accordance with the timeline provided to them by RDCK staff:

1. Woodland Construction Utility Ltd. (Woodland Heights)
2. Burton Water Corporation
3. Fauquier Water Corporation
4. Edgewood Water Corporation
5. West Robson
6. Balfour Irrigation District

[3] Columbia Shuswap Regional District, Comox Valley Regional District

7. Ridgewood Improvement District
8. Woodbury Village Services Society
9. Shannon Orchard Water System (proposed development, currently un-built)
10. Shannon Orchard Wastewater System (proposed development, currently un-built)

The Acquisition Sequence

There are a variety of legislative, financial and procedural aspects involved in the conversion of a water system to a RDCK service. These actions take time and allocating adequate time and resources to facilitate the process is essential. The RDCK will endeavor to facilitate an intake of water system(s) once a year as the conversion process takes approximately 12-15 months to complete. The RDCK must give itself ample time to assess any applicant water system and to satisfy itself that it is not incurring unreasonable risk. As such, the 12-15 month processing duration is to be used as a guide, not policy. Although an ideal timeline, extenuating circumstances may delay the process. The District may require additional time and in some cases, may not agree to assume systems in the absence of infrastructure grants.

Summarized below is a breakdown of the acquisition process, as it applies to existing, community water systems. *Refer to Appendix D for a simplified flow chart of the acquisition process.*

1. June 30th: RDCK to advertise its reception to Expressions of Interest for water utility takeover. These should be initiated by water users, but those from water purveyors will be considered.

2. September 30th: Deadline for receipt of Expressions of Interest for current intake. Requests should clearly indicate that there is significant support from a majority of water users within the candidate area (this would ideally be shown in the form of a non-binding, informal petition) as the final decision to transfer a water system must have the support of the residents through a public assent process before the system can be transferred to the Regional District.

3. September - October: Staff initiate review of applications and prepares recommendations to respective Electoral Area Directors on the basis of highest priority for acquisition (refer to Figure 1). Qualified engineering firm(s) contacted by the purveyor and asked to submit a work plan for a detailed Assessment of candidate systems in conformity with established Terms of Reference *(see Appendix E.)* Staff advances the matter to the RDCK Board with requests for Feasibility Study (or other) funds to undertake assessments if required. Pending approval, staff makes application for Infrastructure Planning Grants to augment Assessment costs. Assessment is authorized to proceed. *Note: Purveyors will undertake the Assessment at their cost. This is acceptable, but the Assessment must be completed by a RDCK-approved consultant and must comply specifically to the RDCK Terms of Reference for Assessments. Assessment costs in this case will not be refundable under any circumstance.*

4. December-January: Water System Assessment reports reviewed by staff, in cooperation with IHA and the Assessment author. Site visits to subject systems may be required. RDCK staff then prepares data sheets containing Assessment details, takeover information and financial implications of the water system becoming a RDCK service. This is shared with the respective Electoral Area Directors.

5. January-February: RDCK hosts at least two public meetings for residents of candidate systems to outline conversion process, governance structure and tax implications to operate the system and to undertake upgrades recommended in the Assessment (the Assessment report for each system will be available to its users) . Data sheets will clearly explain capital costs and approximate operating costs and their respective recovery from parcel taxes and user fees. The Electoral Area Director, IHA, the Assessment author and staff should be present at meetings. All financial information should be conveyed without inclusion of grant funds. If a clear majority of residents does not wish to continue with the application, the process stops and the application will not be considered further.

6. February - May: Formal public assent process (petition, referendum, or alternative approval process) initiated and RDCK staff begins creating Service Area Bylaw. If elector assent is not forthcoming, the process stops. Following a successful public assent process, staff advances Service Area Bylaw to the Board for approval. The Service Area Bylaw should be adopted by **July 31st** so that the new service area can be coded by BC Assessment Authority for taxation in the following year. With Board approval, staff may apply for any available infrastructure grants.

7. June - August: Once the Service Area Bylaw has been adopted, RDCK to notify water system owner, Comptroller of Water Rights (if private system), and Interior Health Authority of RDCK's intent to assume the water system. Staff initiates the legal process of transferring assets, easements and any residual funds to the RDCK – legal costs are the responsibility of the purveyor.

8. September – December: Final staff preparations for ownership and operation of a new water system. Follow-up with BC Assessment Authority to confirm RDCK has in place the ability to tax system users when RDCK takes over the system.

9. January 1st (of the following year): System is now RDCK service.

The Assessment and its accuracy are critically important to the success of the process because:

- The contents include a history of each candidate system and an examination of its current mechanical, legal and financial status. The RDCK requires this information to ascertain the degree of risk that it may be exposed to if it acquires the system.
- Also included in the Assessment are recommendations for infrastructure upgrades (to meet a good engineering standard as well as regulatory compliance) as well as associated cost estimates. The RDCK uses this information to prepare financial and operating plans that reflect the system's immediate, short-term and long-term requirements. The financial plan in turn produces a taxation schedule that the Board and residents within the proposed service area must be comfortable with.

It is also important to note that the RDCK, like any responsible corporation, can decline to take on a system if the associated legal and/or financial risks so warrant.

Increasing difficulty for many small systems to meet operational, financial and regulatory commitments, will prompt increased requests for local government assistance and assumption. It becomes important to establish priority criterion.

Figure 1. Priorities for Acquisition Consideration

A) *A minimum number of connections*
It must be remembered that the costs of operation of a regulatory-compliant system is higher. Operations costs shared over a larger number of connections are much more reasonable. The size of the system, in addition to the geographic location (proximity to Nelson, Creston, or Nakusp) and feasibility of connecting to an adjacent system must be considered.

B) *Health risk to users*
Some systems (escheated systems, for example) typically because of their very low standard of care, present a significantly higher health risk to users. Inability to meet treatment objectives results in continuous boil water advisories (or orders). Other systems may be faced with deteriorating source water quality. The health risks are clear.

C) *Financial and mechanical health of system*
Many systems are unable to (or simply have not) adjusted rates to reflect the real costs of delivering safe and reliable drinking water. Typically, these demonstrate mechanical systems that are in very poor condition and troubled finances in the form of depleted reserves and inadequate operating funds.

D) *Liability risk to Regional District*
Like any corporation, local governments must exercise diligence in risk management. An existing system that carries transferable legal risk (such as existing legislation or an inflexible order from a regulatory agency) should not be considered for acquisition. The risk associated with water systems in general is relatively high – unnecessary risk should be avoided.

E) *Greatest support by regulatory agencies*
Those systems in escheat or under continuous regulatory pressure to upgrade will benefit the most from acquisition by local government – not least because the provincial and federal governments will lend support in the form of grant funding.

F) *Ability to connect to an adjacent system*
Already identified as a priority within the RDCK's earlier policy, systems which are able to connect to a compliant system stand the greatest chance of success. Larger, better regulated systems are infinitely more successful (and affordable) than multiple stand-alone systems.

G) *Strong support by water users*
As the process of acquisition is costly and lengthy, strong water user support for takeover at the outset is critical.

The RDCK has developed an Evaluative Matrix for the purposes of ranking water system priorities.

Table 1. Evaluative Matrix - Serviceability of water systems

Water System: Water System Owner: Assessment Date:			
Parameters	**Units**	**Response Options**	**Details / further information**
Potential Health Benefits			
Current population served			
Build-out population			
# of connections			
Source			
Treatment type			
Treatment compliance with:			
Regulations		Y/N	
Best Practices		Y/N	
Secondary disinfection in place		Y/N	
Has there been a water advisory or order in the past?		Y/N	When / Duration
Area IHA permit conditions being met?		Y/N	
Is a source water protection plan in place?		Y/N	
Adequate water license source capacity?			
Current health risk – Documented waterborne outbreak / illnesses			
Are upgrades required to the water systems?		Y/N	
Potential to bring about water service provision improvements?		**High/Med/Low**	
Potential to Realize Economies of Scale			
Location – proximity to Nelson, Creston, Nakusp	km		
Proximity to existing RDCK systems	km		
Proximity to potential future RDCK systems	km		
Does the existing infrastructure meet RDCK requirements and best practices?		Y/N/Partial	
Is there potential to integrate operations/management functions with other RDCK systems?		Y/N	
Current water system EOCP rating			
Water system EOCP rating – after upgrades			
Estimated peak week operation hours required	hrs		
Estimated annual operation hours required	hrs		
Do RDCK ES staff/contractors currently have the skills, training and time required to operate the system?		Y/N	
Potential to realize economies of scale?		**High/Med/Low**	
Conservation / Governance			
Conservation measures in place		Y/N	
Water meters in place		Y/N/Partial	
Current governance			
Community sentiment towards and acceptance of demand-side management techniques			
General user sentiment (supportive or desperate for conversion)			
Potential to improve governance and implement demand-side management techniques?		**High/Med/Low**	
Financial Implications			
Value of physical assets including system itself, real property, equipment and supplies	**$**		
Current annual system budget	**$**		
Value of reserves, trusts, and other financial assets	**$**		
Annual water rates	**$**		
Existing debt	**$**		
Estimated water rates with RDCK ownership	$/yr		
Estimated annual revenue from cost recovery (taxes, charges, fees)	$/yr		
Is a capital plan in place?		Y/N	
Is system escheated?		Y/N	
Likelihood of receiving funding for recommended upgrades?		High/Med/Low	
Overall financial implications		**High/Med/Low**	
Risk Exposure			
Age/condition of distribution system			
Are legal easements / Rights-of-way in place to protect all system facilities?		Y/N	
System assessment completed by and industry professional		Y/N	
Do system records provide adequate information for the water system assessment and operation of the system?		Y/N	
Is there sufficient background information available for the design of system upgrades?		Y/N	
Emergency Response Plan in place		Y/N	
Are all required permits and licenses in place?		Y/N	
Pending lawsuits, legal claims or other legal action related to the system?		Y/N	
Does system have redundancy for mechanical/electrical equipment?		Y/N	
Availability of stand-by power		Y/N	
Does system have sufficient equipment for operator protection and safety?		Y/N	
Measures in place to protect from vandalism and tampering		Y/N	
Alternate water source?		Y/N	
Will new infrastructure require a Ministry approval which may have the potential to delay constructions works or be refused?		Y/N	
Risk of waterborne illness		Y/N	
Exposure to risk		**High/Med/Low**	
Overall applicant system ranking	**1,2,3, etc.**		

RDCK Water Systems Management

Financing

Funding for regional district-owned systems (operations, maintenance and upgrading) is derived primarily from taxation within the service area. An annual parcel tax normally targets debt retirement or capital expenditures while user fees are assessed to cover annual operating costs. On the basis of the completed Assessment, a five year financial plan can be developed which will address the identified upgrades to the system. The plan's tax implications can then be calculated for consideration by proposed service area residents. *Refer to Appendix F for a discussion of cost recovery options*.

Any residual funds in the reserve accounts of systems about to be converted are to be transferred to the RDCK for the benefit of residents within that new service area. Those funds may assist with capital projects.

While grant funding is by no means assured, the RDCK will apply for any available opportunities.

Figure 2. Grant Funding Opportunities

- The system Assessment itself is an eligible project for application for a BC Infrastructure Planning Grant. The Province prioritizes those applicants with a strategy and, if successful, nets 100% grant funding of the first $5,000 of the Assessment cost and 50% cost-sharing of the next $10,000. If successful, these funds can be used to augment the costs of the system Assessment.

- Improvement districts are becoming less supported by the Province. Conversion to a local government opens eligibility for up to $15,000 in Conversion Grants to assist with legal transfer costs.

- Escheated systems fall into the Province's highest priority for conversion and are often accompanied by 100% assessment grants and in some cases 100% infrastructure upgrade funding, if conversion is certain.

- Provincial (or Crown Corporation) systems have assured funding and must also comply with regulations. The Province should be asked to support conversion to a local government with adequate financial resources.

- Infrastructure grant funding opportunities for at least 50% of identified capital costs for water systems have been previously available through the Province's General Strategic Priorities Fund or Innovation Fund and through federal/provincial infrastructure funding initiatives. It is important to note that having a provincially supported water management plan will elevate application success rates substantially.

- Minor projects that address water conservation are eligible under the Province's Towns for Tomorrow grant program. Again, if the project is linked to an approved strategy, success rates are higher. A water meter installation program would be an example project.

With or without grant funding, it will be important to establish and maintain system-specific reserves and the rate of contribution to those reserves must be made on the basis of the system assessment, which would identify needed upgrades, timelines and anticipated costs – in effect, the actual needs of the system. Reserves should also include a contingency amount to address any emergent or unforeseen expenditures of a capital nature.

Current contributions to many existing system reserves are inadequate and are based on a formula that does not reflect the assessed needs of the system. *See Appendix G.*

Operations and Maintenance

Each system will require routine attention to ensure compliance with its operating permit. However, because systems differ in age, design and component material types, some will require specialized or more frequent attention. Additionally, systems are widely dispersed geographically.

The RDCK currently employs a small staff contingent to attend to system requirements and has also generated a significant inventory of parts and tools. **Existing manpower allocation is currently not adequate and emergency response capability is somewhat limited. Some systems are not receiving an acceptable level of routine attention.** *A Current Service Status and Capacity report is appended as Appendix H.*

In order to satisfy permit requirements and to address these shortcomings, the RDCK will examine the integration of qualified contractors with expertise in system operation and maintenance to complement the small staff contingent. Several firms offer these services and can also be tasked with emergency response to such events as water main breaks or equipment failures. In most cases, these firms either possess or have immediate access to excavation equipment and can be reached 24 hours/day.

Whether staff or contracted operations and maintenance, a realistic budget must be assigned to each system to meet compliance with permit conditions, to ensure that all equipment and infrastructure is operating within normal design parameters and to repair or replace any failing component in a timely manner. Catastrophic failures within water systems are most often preventable, are extremely inconvenient to water users and introduce risk for the system's owner. A working relationship between system operators and area Interior Health Authority representatives must be fostered and maintained. A stronger and more positive relationship will place the RDCK and its systems on firmer footing. *The role of Provincial Legislation in community water systems is contained in Appendix I.*

Conservation

Achieving water conservation is a very large and complex area. Area specific conservation plans for existing District systems should be developed which reflect the location and constraints of each. The US EPA has developed an excellent template which can be adapted to each individual system (Appendix J). Water users must know in advance that any system converted to an RDCK service will be subject to conservation measures. During the conversion process, it is strongly recommended that a site specific conservation plan be designed and implemented for the applicant system(s). Complementary OCPs, Zoning bylaws, and the Subdivision Bylaw should be strengthened and consistent in their support for conservation measures. Enforcement must be provided and administered and the costs of these must be borne by system users. General background information and conservation planning goals and best practices can be found in Appendix J.

Supporting Bylaws and Services

While this Plan is capable of functioning in isolation, complementary bylaws with a theme of commonality will assure its success and sustainability and will significantly reduce the risk of conflicting requirements.

- Subdivision Servicing Bylaws can prescribe an acceptable quantity and quality of source water. They can also set out standards of design and construction of community water systems. It stands to reason that a higher quantity and quality of source water at the outset will place less future financial burden on water users in the areas of treatment and storage. Similarly, a common standard of water system design with common component types will allow for faster repairs and reduce the need for a large inventory of hybrid (and potentially obsolete) parts. The Plan could be specifically referenced in the bylaw.

- Rates and Regulations Bylaws can be written with identical language with only rates differing. Subsequent bylaw amendments are made dramatically simpler and made more accurate. Again, the bylaws can reference their support of the Plan.

- Conservation Plans can also be developed with common language and support of the goals of this Plan. There are many simple plan templates available and a wide range of common conservation tools and techniques. Although water metering, for example, is often controversial, it has proven successes with water use reduction, true cost accounting and an early indication of water loss from a system (leakage, theft, etc).

- Official Community Plans and their associated bylaws should also reflect the goals of the Plan and can do their part to prevent remote, stand-alone and unsustainable utilities in favor of larger ones with a stronger governance system. If so desired, OCPs can also support a Subdivision Servicing Bylaw by stipulating that any new water system shall be designed and built to RDCK standards and transferred as new to the RDCK.

Existing water systems under the control of the RDCK are widespread geographically which poses a problem for frequent and regular inspection and maintenance by certified operators. The RDCK is not alone as regional districts, by their nature, cover very large areas. The use of a Supervisory Control and Data Acquisition (SCADA) system should be considered as soon as possible. These computer systems allow an operator at a remote location to examine a water system's activities (pump cycles, reservoir levels, etc) over an extended period of time and can also adjust them to meet optimum power settings, reduce pump/motor wear and meet conservation goals. The ability to monitor systems in this way reduces the system's dependency for a certified on-site operator. More importantly, identified trends provide early notice of leakage, water theft or impending mechanical failure. SCADA systems are costly and require specialized controls and an internet feed at each location, but the reduced dependency on site visits and ability to identify a problem quickly will offset that initial cost.

Supporting Policies

The following policies are intended to guide the RDCK through the process of water utility acquisition and ownership.

1. Only community water systems that meet the RDCK's *Priorities for Acquisition Consideration* and the *Water and Sewer Acquisition Policy* will be considered.

2. The RDCK will not consider the acquisition of a system if the Assessment has not been completed in compliance with established Terms of Reference and by a RDCK-approved consultant.

3. The RDCK will not acquire any water system that has little chance of financial viability with renewed ownership and operation.

4. The RDCK will not acquire additional water systems if it does not carry sufficient staff or contractor capacity to operate and maintain them.

5. The RDCK will not acquire additional water systems until approved upgrading plans and corresponding financial plans are in place for existing RDCK systems. *See Appendix K for a summary of existing RDCK water systems and their status.*

6. The RDCK will not pay more than a consideration of $1 for the purchase of candidate systems.

7. All physical, legal and financial assets held by the candidate systems are to be transferred to the RDCK. These include easements, permits, licenses and all residual operating and reserve funds.

8. All activities in the management, operation and maintenance of RDCK water systems will be carried out by its staff or contractors.

9. The RDCK will make application for senior government grant funding opportunities to augment investigative and capital upgrading costs whenever they are available.

10. The RDCK considers a strong source protection program to be one of the primary and fundamental barriers necessary in a multi-barrier approach to the provision of safe drinking water, and commits to the development of such programs.

11. The RDCK will operate its systems to a good engineering standard and in compliance with pertinent legislation.

12. Systems will be progressively equipped with SCADA systems.

13. Every effort will be made to inter-connect systems, where practical.

14. Conservation plans will be initiated and implemented for all systems.

15. The RDCK will not recognize any pre-sold or pre-arranged connections to a candidate system.

Future Considerations

- As discussed earlier, the contents of this Plan should be reflected and supported in appropriate land-use, servicing and regulatory bylaws. Done correctly, the RDCK will be afforded a powerful role in the delivery of potable water at the community level.

- Because of the large number of candidate water systems, their ages, their varied construction types and locations, it will be critically important to develop a theme of commonality in all aspects of ownership. This would apply to regulations, procedures, contracts, system components and so on. The associated economies are clear.

- In the longer term, the RDCK may wish to examine the amalgamation of water systems into sub-regional areas, or even a single regional service area. The advantages would include a single parcel tax rate and user fee for all areas as well as the development of a centralized reserve which would be capable of attending to large upgrading projects on a priority basis (this would not apply to existing reserves which would remain with the respective contributing systems).

- Other regional districts have either advanced the process of water utility acquisition or are considering their participation. It would be wise to communicate with those regional districts with extensive experience to avoid repetition of errors or ineffective procedures.

Appendix A - Existing Governance Models in BC

Community water systems in BC fall into any one the following categories:

Private water systems - A developer wishing to install a water system within a development must apply to the Ministry of Environment for a Certificate of Public Convenience and Necessity (CPCN). A CPCN will be issued to a separate utility company created by the developer, and will acknowledge a satisfactory design, a system of maintenance reserves and a tariff structure. Unfortunately, the weakest link is the creation of the utility company. In BC law, if a company fails to submit an annual report for two consecutive years, it is struck from the Register of Companies. Simply, the utility company ceases to exist and the developer is no longer responsible for the provision of water for domestic or fire purposes. The assets and responsibility of the failed utility "escheat" and fall to the Province (Ministry of Attorney General). Operational responsibility is transferred to the Ministry of Environment. Understandably, the Province is not well equipped to operate rural water systems and those at the greatest risk are the water users.

Escheated systems - These are very marginally operated and typically the system's reserve funds have been depleted and the tariffs are unrealistically low.

Improvement Districts - Like private water systems, this form of governance was created before Regional Districts (pre-1965) to facilitate the provision of water to an established and growing rural community. Boards of Trustees have typically under funded operations and maintenance resulting in marginal success, especially with smaller systems. The Province no longer supports the creation or expansion of improvement districts.

Strata Corporations - Potentially one of the safer governance models, a strata corporation can be charged into perpetuity with the proper operation of its water system and can also levy appropriate fees to meet sustainable operation. Strata corporations are required to carry a valid CPCN.

Water Users Communities (WUC) - A WUC is simply a pooling of existing water licenses to create an aggregate water withdrawal. Originally intended for irrigation purposes, many have evolved into community water systems. Source withdrawal is regulated under the Water Act, however, no one regulates the distribution system and many of these have substandard infrastructure. Interior Heath Authority, wherever it has records of these, has difficulty enforcing its regulations due to a lack of internal resources and limited knowledge of these WUC.

Shared Interest Developments – A member of the highest risk category, the design and construction of water systems in these developments is not regulated because there is no subdivision to trigger any regulation. IHA, if notified, is responsible to review design from a health perspective and to issue a permit to construct. Unfortunately, systems are typically under designed which places shareholders and water users at risk.

Abandoned or "Phantom" Systems - These are systems that were installed to service one or two consumers but grew over time to accommodate others. No knowledge of their existence, no engineering and no established governance model place the water users in these systems at risk to either water interruption or waterborne illness.

Local Government Systems - Local governments carry all of the tools required to design, construct, operate, maintain and regulate water systems on a sustainable basis. This is evidenced by systems within municipalities and those within regional districts with a defined water service strategy. These carry the full support of regulatory agencies when operated correctly.

Of all types of systems, only local government systems are eligible to apply for senior government planning, transition and infrastructure grants. However, under the Community Works Fund Agreement, eligible projects in WUC may receive some funding.

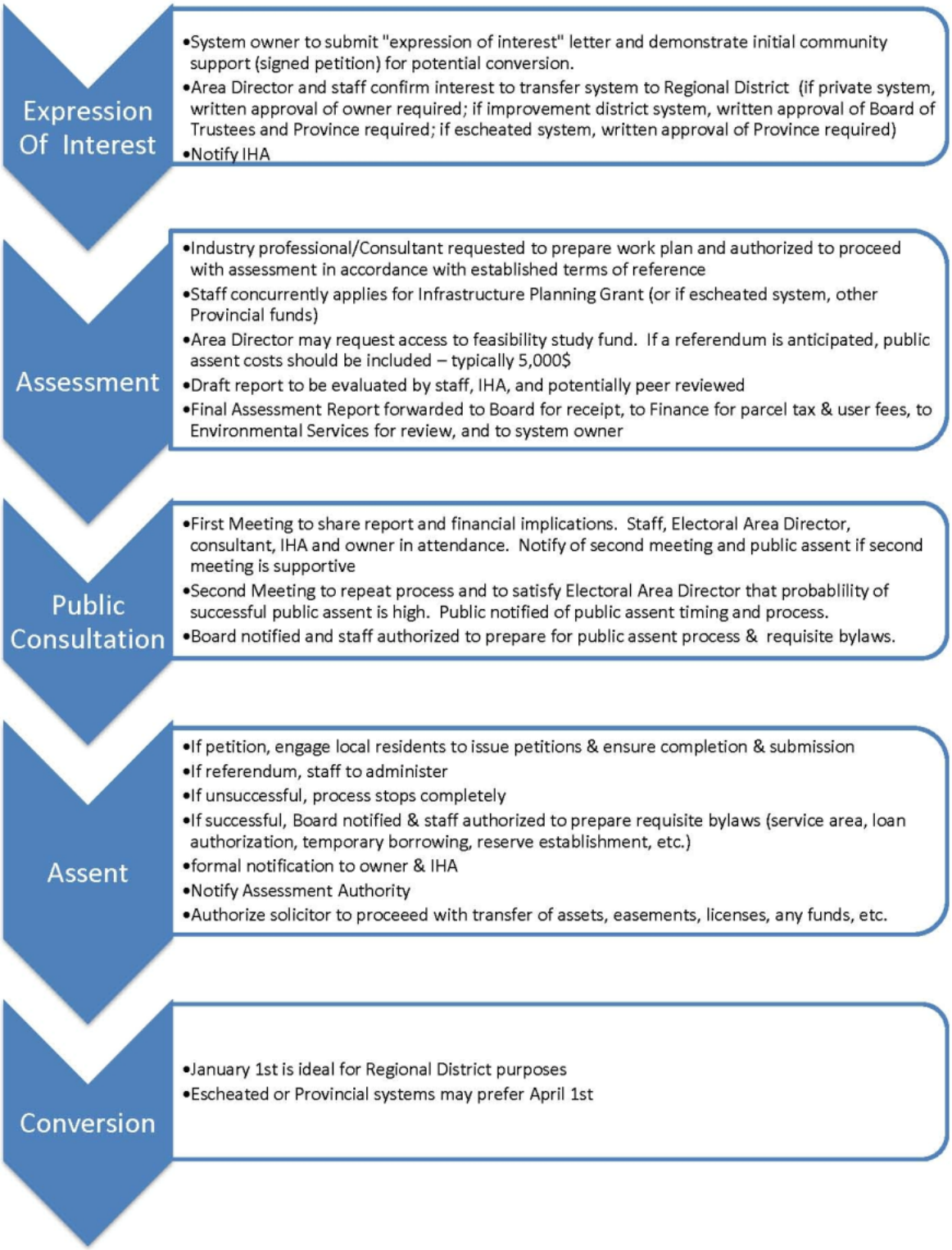
Appendix B – Regional Water Landscape Inventory

Available upon request, completed September 2008.

Appendix C – Regional Water Data Maps

Available upon request.

Appendix D - Simplified Flow Chart of the Acquisition Process



Appendix E - Terms of Reference for Assessments

Water system assessments provide essential information for risk-analysis, negotiation and decision-making. Assessments must be comprehensive and completed by qualified engineering professionals with expertise in community water systems in BC.

Assessments typically:

- Provide a description of the existing water system(history, governance, infrastructure, operation, management and financial information);
- Assess the water system to determine if it meets current legislation, RDCK requirements, and best practices. This includes water quality, system reliability, current and future needs, administrative, operational and maintenance activities;
- Identify risk implications for the RDCK; and
- Determine required upgrades and associated financial implications for both the RDCK and its water users.
- Comment on the financial viability of the system.

The Assessment must include the following:

Existing Situation

Location, History and Service Area

- Location of the system
- History of the system
- Service area
- Number and type of connections (existing/build-out) population served, range of users served
- Form of governance.
- Assets
- EOCP classification
- Certification of operators

Risk Management

- Nature and extent of insurance coverage
- Emergency response plans

Communications systems

- SCADA
- Method of data recording, alarms

Permits and Licenses

- Construction permit (IHA)
- Operation Permit (IHA) – conditions of permit
- Water license(s) – (MOE)
- Highway Permits (MOT)
- CPCN (if private utility)
- Easements

- IHA boil orders or advisories – incidence, duration

Financial

- Existing costs (administrative, operational, debt service)
- Sources of revenue and method of cost recovery (taxes, charges, fees, development charges)
- Reserves, trusts and other financial assets
- Current annual budget
- Existing rates
- Capital plan

Assets

- Nature and value of physical assets including the system itself, real property, equipment and supplies

Operations

- Sampling, testing and reporting protocols – frequency, methods
- Emergency response procedures
- Standards and specifications for infrastructure and operations
- Maintenance planning and maintenance activities
- Contracting – existing contracts, types of activities contracted out

System Description

- General – record drawings, design reports, geotechnical or other information, monitoring/maintenance records (i.e. flows, water quality, pump hours)
- Source (primary, secondary)
- If surface source - provide description of watershed including existing users, tenures
- Intake (if surface source) - provide description, age and capacity
- Well - provide description, age, capacity, and reports for: hydro geological/pump test/wellhead protection
- Treatment facilities – nature of treatment and disinfection, filtration, age, capacity
- Storage facilities – location, type, age, capacity, and reports for: geotechnical/ structural/ leakage investigation/inspection, frequency of cleaning
- Distribution system (pipe material, location, size; pump stations, PRVs)

Infrastructure Assessment

- Description of design standards used in analysis
- Assessment of source based on existing and projected future demand:
    - Adequacy of watershed protection plans and measures (surface source)
    - Adequacy of groundwater protection plan
    - Source water quality (past trends, existing quality)
    - Security of well (groundwater)
    - Risk to well from flooding or seepage and impact by adjacent stream or lake (groundwater)
    - Adequacy of source to supply existing and projected future demand
- Assessment of condition and adequacy of intake works (intake, pump station) to meet existing and projected future demand (surface), and Fisheries requirements

- Condition and adequacy of existing treatment facilities including level of treatment achieved and consistency with DWPR and Canadian Drinking Water Standards
- Condition and adequacy of storage facilities to meet existing and projected future demand
- Condition and ability of pumping facilities and PRVs to provide for existing and projected future demand
- Condition and adequacy of operator safety equipment and review of what is required to meet WCB legislation

Assessment of Financial Position and Practices

- Adequacy of rates to recover full cost of operations after RDCK acquisition
- Adequacy of reserves and contingencies to fund replacement and repairs
- Budget process
- Overall financial position of system

Assessment of Easements/Rights-of-way

- Determine whether system facilities and water lines are protected by required easements and rights-of-way

Assessment of Permits and Licenses

- Review of licenses and permits to ensure validity, etc.

Plans and Programs

Infrastructure Upgrading Plan

- Identification of upgrading required to bring water system into conformity with RDCK standards and specifications, IHA operating permit, WCB requirements for operator safety equipment, and other pertinent standards. The deficiencies noted in the assessment should be addressed by the recommended works. The plan should include the preparation of capital cost estimates and a recommended phasing plan (may be done in consultation with RDCK Environmental Services staff).

Operations and Maintenance Requirements

- Recommended resources and skills needed to operate and maintain the system in consideration of RDCK capacity
- Calculation of operation and maintenance cost for proposed upgraded system
- Recommended training program for operator(s)

Appendix F - Cost Recovery

With respect to water, Canadians and Americans suffer from the same disease: We say that it is priceless, but act as if it were absurdly cheap.
Frontier Centre for Public Policy; 1988

User fees, parcel taxation, and development cost charges[4] from users are the three most reliable sources of revenue for rural water systems. The occasional opportunity for grant funding should not be relied upon. Taxation must be based on the real and total costs of owning and operating any given system to good standards and in compliance with regulations.

British Columbians have become accustomed to paying an unrealistically low price for water because of older governance models, subsidies and the assumption that "there's water everywhere". The realization that high-quality source water is not common, the introduction of stringent health regulations, and the requirement for a higher quality of infrastructure have all dramatically increased the cost of "safe and reliable" potable water.

To address these high costs, each system is taxed on the basis of upgrading its own infrastructure. That creates some inequities because smaller systems need to pay a higher amount per connection while larger systems share similar capital costs with a larger number of connections. It is for this reason that the amalgamation of all service areas to a single one might be considered. This approach lends itself to several economies with management, maintenance, equipment commonality and fee structure commonality. This approach is strongly supported by the Province.

Parcel Tax

A parcel is any designated area of land that does not include a highway. For example, a house and yard represent one parcel. Local governments can charge taxes against each parcel as one method of recovering its costs.

A parcel tax can be imposed on the basis of a single amount for each parcel; the taxable area of a parcel; and the taxable frontage of the parcel. The bylaws required to establish a parcel tax scheme must identify the service; state the basis and specify the years for which the tax is imposed. In addition, they must establish how the taxable area or the taxable frontage of a given property is determined. The District must make available to the public, on request, a report respecting how the amounts or rates were determined.

Parcel taxes are often used instead of, or in conjunction with, user fees to recover the costs of providing local government services. They can be levied on any property that has the opportunity to be provided with a service regardless of whether or not the service is being used. For instance, if a septic system is being used on a property but a sewer system is available in the

[4] Development cost charges (DCC's) are monies that municipalities and regional districts collect from land developers to offset that portion of the costs related to these services that are incurred as a direct result of this new development. The demand created does not always relate to works that are located adjacent to the property being developed. For example, new development may require a local government to increase the size of its water storage reservoir. Developers pay DCCs instead of the existing taxpayers who are not creating the demand and are not benefiting from the new infrastructure (http://www.cd.gov.bc.ca/lgd/finance/development_cost_charges.htm).

neighbourhood, the parcel could still be charged a parcel tax for the sewer service on the basis that the parcel could be connected to the sewer system in the future. If the property cannot be serviced by the sewer, the charge cannot be applied.

A special assessment listing, or roll, must be created before a parcel tax can be imposed. The assessment listing or roll lists the parcels to be charged and includes the name and address of the owners of each parcel. Once it has been completed, the roll must be available for public inspection. If requested by an owner, the local government must omit or obscure the address of the owner or other information about the owner in order to protect their privacy or security.

A parcel tax can only be applied to properties that may receive a particular service. It cannot be used to recover costs such as general local government administration costs. A parcel tax scheme provides local governments with options in addition to the ability to recover its costs from a variable tax rate system which is based on the assessed value of land and/or improvements.

In water systems, a parcel frontage task levied and allocated for capital projects, contribution to reserves, and debt repayment is one effective way to ensure long-term sustainability so the water system needs can be met. A tax on each parcel in the service area and number of water service connections offers a fair and equitable approach to community members and could be structured to include a combination of:

- A tax on land, or improvements, or both;
- Parcel tax (fixed amount per legal parcel of land);
- Frontage tax (fixed amount per lineal foot of frontage);
- Property value tax ($ per $1,000 of assessment); and,
- A tax on another basis (e.g. $ per square foot.)

User Fees

User fees are typically levied to address the annual operating costs of a water system. These costs must include the full costs of operations, maintenance, administration tasks and should not be subsidized or manipulated to reflect other forms of pricing. Efforts should be made to ensure fees are fair, promote efficient water use, and protect water quality. To determine if prices are correct, consider the following:

- *Financially sound pricing.* Rates need to be able to provide water and/or sewer treatment services and require enough revenue to support provision and required service upgrades.
- *Efficient pricing.* Price structure should reflect the "full social costs" of water use to consumers so efficient water use decision may be made (include cost of raw water and the costs of building and maintaining water collection and distribution systems).
- *Environmentally sustainable pricing.* Impacts of water use on environmental and human health in addition to water quality need to be considered. Encouraging water conservation and supporting healthy aquatic ecosystems and services are aspects that should guide prices.
- *Equitable pricing.* Accessing safe drinking water supplies is often viewed as a human right and prices should ensure equal access to households with varying incomes (Renzetti, 2007).

Historically, one of the largest shortcomings in District owned systems is that water prices have been set artificially low and do not generate enough revenue to cover both the capital and operating costs of the services. Prices have failed to meet the 'financially sound' criteria identified previously. The results of not getting the prices right includes: over-consumption, water use conflicts, deteriorating infrastructure, declining water quality, and stifled innovation in water-conserving technologies" (Renzetti, 2007). Further, the costs inherent in water service delivery vary with distance, timing and type of water use. Peak periods occur daily in the early morning and early evening hours, and annually during the dry summer months. Pricing water is widely regarded as an effective means of better valuing water and triggering greater efficiencies in its use (National Round Table on the Environment and the Economy, 2009). To operate in an economically efficient fashion, system users should be made fully aware of the costs of their water use decisions.

Appendix G - Current Contribution to Reserves *(staff report, 2010)*

Every RDCK water system should maintain a sustainable reserve fund and contribute sufficient amounts per connection annually. Contributions must be based on the costs and timing of known upgrades identified in the system assessment. This information is then used by the Finance Department to establish a reasonable taxation threshold and a timeline for prescribed upgrades, as determined by the ES Department, which should be identified in the 5-year financial plan. The identified timing will satisfy IHA that Regulation compliance will be phased in and at an affordable rate.

Without assessments currently in place for all existing RDCK systems, it is believed that system users are not contributing an adequate amount to reserves. Based on the Province's aggregated approach to water distribution system infrastructure where the useful life of assets on a system wide basis is 50 years, Table 2 presents a breakdown of the amount RDCK users are currently contributing to reserves, and the amount required if following the minimum Provincial standard of a 2% contribution of total system infrastructure and asset values.[5] Amortization of tangible capital assets[6] can be calculated by utilizing the following formula:

$$\frac{\text{100\% of asset value}}{\text{Useful life (Aggregated Approach)}} = \text{2\% contribution to reserves / year}$$

Although not recommended or sustainable for local government owned systems, this information is being provided for educational purposes only, and to illustrate where existing deficiencies may be.

Table 2. Contribution to Reserves

Water Service	Targeted annual contribution to reserves (note 1)	Provincial standard annual contribution to reserves (note 2)	Current annual contribution to reserves (2009)	Value Currently in reserves (note 3)
	Per Connection	Per Connection	Per Connection	
Arrow Creek				$30,000
Erickson (note 4)	$262	$416	$38	$516,609
Riondel	$126	$177	$24	$180,000
Lister	$90	$142	$12	$480,138
Ymir	$137	$118	$60	$177,407
Duhamel	$186	$274	$39	$179,022
MacDonald Creek	$137	$212	$10	$62,495
South Slocan	$268	$385	$0	$3,015
Sanca	$291	$368	$0	$48,030
Denver Siding	$477	$753	$0	$59,798
Lucas Road	$106	$168	$0	$4,915

Note 1. Based on total cost of assets over the number of years of useful life
Note 2. Based on 2% of total cost of assets; aggregate approach (Ministry of Community Services, 2008)
Note 3. Anticipated reserve balance end of 2009
Note 4. Total reserve value for: membrane replacement, laterals, arrow mainline, un-serviced land

[5] Refer to spreadsheet for asset inventory and infrastructure values.
[6] Amortization of Tangible Capital Assets, Ministry of Community and Rural Development.

All current RDCK water systems and those interested in becoming an RDCK service should develop an asset management plan that will identify what is necessary to make the service sustainable. Each service will vary; however, it is possible to establish a reserve for each service that buffers required upgrades and replacement of infrastructure such that service fees are stable with an established modest increase each year to cover inflation. Rate increases will depend on the current total reserve value and asset management plan.

Appendix H - Current Service Status and Capacity *(staff report, 2010)*

The Environmental Services Department based in Nelson does not currently maintain adequate staff resources to service the existing water connections and systems safely and effectively. The District must decide whether it wishes to pursue acquiring water systems or not. Failure to maintain systems and to meet regulatory requirements brings substantial risk to the District and negligence would be very easy to ascertain.

Current staffing levels for the Arrow, Erickson and Lister water services are sufficient and required duties are being completed. The analysis of time available for current operation and maintenance tasks and duties is summarized in Table 3 and indicates that the RDCK is already short approximately one technician[7]. Consequently, the following duties are not being performed on a regular and consistent basis: reservoir and tank cleaning and disinfection, flushing of distribution systems, water quality sampling and testing, Bac-T sampling, and completion of safety audits on RDCK systems. To operate safely and within current safe drinking water legislation, these activities and allocating sufficient staff resources or external contracts to undertake them should be made a priority.

There is neither the staff nor the money in place to properly manage District water systems. Expectations far exceed resources and this must be an essential consideration if the RDCK is to take on any additional systems. Based on the information reported in Table 3, it is evident that every 200 connections seem to require a .4 FTE; therefore, with 500 additional connections an additional FTE (or external service contract) will be required.

Table 3. Hours Required for Current Water Services Provision – Operations and Maintenance

Staff		Hours	FTE	Details
Erickson/Arrow/Lister		5,820	3.11	
ES Department – water systems		3,916	2.51	See ES Department (Nelson)
ES Department – other services (parks, fire & community halls)		222	0.14	See ES Department (Nelson)
Other employees		792	0.44	
Contractor		818	0.45	
Total hours required		11,568	6.65	
ES Department (Nelson)	**% of Work**	**Hours**	**FTE**	**Details**
Senior Utility Technician	30%	468	0.30	
Utility Technician	70%	1,092	0.70	
Environmental Coordinator	10%	62	0.04	
General Manager		-	-	
Project specific		900	0.58	

[7] For a complete breakdown of in-house operation and maintenance services provided to RDCK water systems, fire and community halls, and parks, refer to spreadsheet.

GIS & assistant		444	0.28	
Total Hours Available		2,966	1.90	Current resources
Total hours required from ES Department		4,138	2.65	ES Department (Nelson) - above
Overtime required		1,172	0.75	In addition to total hours currently available
		811	Work not getting completed due to lack of resources	

A very detailed analysis was completed to determine the time demands on the current Environmental Services staff regarding the operation and maintenance of the current systems. The water systems, which includes all RDCK operated water systems, parks and point-of-entry systems, require approximately 11,600 hours to operate and service 1,603 connections (excluding the Town of Creston) and seven (7) point-of-entry systems including parks. The Environmental Services time account for approximately 4,200 hours or 2.65 FTE. The remaining hours are completed by contract workers and/or employees directly paid by the specific water service.

Currently, the Environmental Services Department has only 1.3 FTE (excluding Erickson/Arrow /Lister) that is dedicated to servicing the current operations. The structure of this FTE is comprised of 70% of the Utility Technician and 30% of the Senior Utility Technician with the addition of a .25 FTE GIS Technician and a .10 FTE Environmental Coordinator. This leaves approximately 1,713 hours of work (i.e. 1-FTE) that is either not being fully compensated or work that is not being completed. Within the 1,713 hours, 920 of the hours relate directly to project work (i.e. major capital projects). Further, there is only 1 FTE that is always on 24 hour emergency stand-by. This is not sustainable and puts water users and the RDCK at risk.

The remaining 800-900 hours of work that was identified in the analysis that should be completed but is considered a low priority and not being completed is as follows:

Task	Status
Reservoir & tank cleaning and disinfection	Completed only if it becomes a priority
Flushing of distribution systems	Only if volunteers are completing the task
Water quality sampling and testing	
Bac-T Sampling	75-80% are getting completed

This analysis also identified the number of connections and the number of hours of operations and maintenance required for each water system. Therefore, it is recommended that for every 200 additional connections a .4 FTE is required. This can be extrapolated to recommend that for every 500 additional connections an additional FTE or external contract is required.

Capacity for current operations and maintenance in RDCK systems indicates a substantial lack of resources with a corresponding lack of basic system maintenance. The use of volunteers in construction and maintenance works, if not strictly supervised, presents high risk to the District. The RDCK should not proceed with system acquisitions based on a continuous use of this approach. In addition, every system should carry its own annual maintenance task list.

Organizational Resources

If the RDCK is to acquire any new water system, adequate staffing resources must be made available to perform the following:

- Application review and approval
- Site visits and inspections
- Management of internal and external services
- Issuance of permits and monitoring
- Enforcement
- Infrastructure grant application writing and submission
- Administration; including budgets and rate setting
- GIS and GPS services
- Senior Finance management review and evaluation
- Legislation requirements
- Training, development and certification
- Manage contractors and consultants
- Communications and website administration
- Emergency response
- Community consultation

In addition, in order to undertake routine maintenance work on any of our existing or pending new systems, the tools and equipment identified in this appendix will need to be acquired by the ES Department. This list will evolve over time as system requirements and the type of infrastructure work to be performed will change.

Utilities Tool List

Product	Part number	Approximate Cost
Distribution Construction, location and repair tools		
Cage 6ft * 10ft	#skub34x10st	$2,273.00
Trailer for cage		$2,695.00
Retrievable system confined space entry	#sdb8301000	$3,307.00
Fall protection lanyard	#sdb1244306	(each) $77.00
Plastic pipe locator	#p83320-p83323	$4,000.00
Leak detection correlating loggers	#z corr	$10,775.00
Quick freeze 3/8"-3" double freeze	# qf3000	$2,000.00
Signage / Barricades w lighting	# str36212eg	$1,000.00
Caution tape	#p78705	$17.00
Hydrant lifting cage	#p66801	$156.00
Mueller drilling kit ½ - 2 ½ inch	#b101	$2,758.00
Air exchanger c/w 25ft hose	#sal92520-36	$1,000.00
Hydrant gate valve	#p67596	$275.00
Electric valve exerciser	#11-000-02	$5300.00
Man hole cover extractor	#p53002f	$189.00
Universal valve tong	#p57201	$60.00
Portable steam thawer	#P683	$1,275.00
Copper line crimper		$300.00

PVC pipe beveller	#r04398	$316.00
Sub total		**$37,773.00**
General hand and power tools		
Portable eye wash station		(each)$50.00
Portable fire extinguishers	# 5lb c/w veh bracket	(each)$50.00
Steel Hasp	#sackdd107	(each) $7.00
Lock out looks Locks	#sackdl901rd	(each) $11.00
Electric Impact gun		$200.00
Heavy duty halogen light + stand 1500w	#sbasl1082	$100.00
Impact Sockets ½ drive ½-1 1/8 standard	#tprj74112	$141.00
Pipe wrench 6inch span	#tir2074148	$311.00
Landscape rake	KIS	$109.00
Knife blades 100	#tlx20352	$35.00
Impact / Hammer drill	#tdw059k-2	$367.00
Hole saw kit	#tdwd180001	$92.00
Sump pump		$1,000.00
Copper flaring tools ½ inch	#ah18000	$28.00
Copper flaring tools ¾ inch	#ch18000	$29.00
Chain Wrench 8 inch pipe capacity	#r31330	$215.00
Detectable underground tape 1000ft	#p80	$25.00
Ratchet torque wrench	#p663	$485.00
Multi-meter	#wsp840071	$100.00
Valve box cleaner	#p526	$219.00
Additional fittings		$1,000.00
Sub total		**$4,574.00**
Water sampling monitoring equipment		
Portable flow meter with data logger		$6,000.00
Chlorine test kit	Per each additional system	$600.00
Hack Turbidity meter	Per each additional system	$1,400.00
pH/Temperature probe	#lysph10	$91.82
Economy dipper/grab sampler	#wbef367840016	$28.63
Pressure and flow measuring devices	#p905	$1,184.83
Grab sampler 12ft plastic	L1500510	$100.00
Sub total		**$9,405.28**
Total		**(CAD) $51,752.28**

Community Services

The RDCK Utilities Technician currently performs regular water quality testing and maintenance services on the following RDCK funded point of entry systems, community halls, fire halls, and regional park water systems:

- Pass Creek and Sunshine Bay regional parks;
- Blewett, Beasley, and North Shore fire halls;
- South Slocan community hall;
- Head office point of entry unit.

These services which involve considerable time are provided to the Community Services department at the expense of the Environmental Services Department. An allocation of cost based on the hours of work provided by ES staff and charged to the related District Service is necessary.

Basic Services

Existing basic services[8] provided by Environmental Services staff will expand and new duties will need to be performed as the RDCK moves forward with assessing systems for acquisition. The conversion process is both lengthy and complex; it must be facilitated to ensure timelines are met and there is appropriate coordination among water system operators, provincial agencies, the local health authority, RDCK departments, engineers, and solicitors when system assets, land, and infrastructure are transferred to the RDCK. Staff resources must be allocated in order to perform in the wide range of legislative and regulatory requirements inherent in the acquisition process. In addition, integrating land use planning with water service provision will be required. Recognizing and understanding the capacity implications of these evolving roles is paramount. A commitment to resourcing and properly servicing existing and pending new systems must be supported.

Financial Services

Currently, in the Finance Department there is approximately a .15 FTE of time spent on existing utility systems. These duties include the annual billing cycle (updating and verifying the roll and ownership information, making adjustments and issuing the invoices), annual penalties, miscellaneous adjustments, customer inquiries and verification of outstanding year end amounts transferred to taxes. These duties are performed by various people within the Finance Department and cross training is currently occurring to ensure continuity and consistency to the customer.

When considering an additional system, the time constraints on the Finance Department will be a minimum of 70 hours per service to fully create the service within the general ledger and the billing data base. This is in addition to the ongoing administration of the regular financial work and financial reporting requirements.

Finance anticipates that in order to provide a robust utility service, the staffing requirement will increase by approximately 25 hours per 50 users per year.

IT Services

Implementation of a SCADA system will require one workstation per water system to log data, run the Human Machine Interface and provide a gateway for remote access. Water systems do require a fair amount of upfront work configuring the systems and then a lesser amount of IT support in years where configurations do not change substantially.

The current allocation agreement[9] prescribes that costs are recovered 100% for IT Services from the users of the service. The cost recovery formula includes staffing, administration, hardware, network, licensing and improvements. The formula is based on the total IT costs subtracting major application licensing costs and server contributions divided by number of workstations. This formula facilitates RDCK staff in predicting and budgeting for IT costs fairly accurately to

[8] Refer to the spreadsheet for a breakdown of existing basic services provided by the Environmental Services Department.
[9] Effective February 8, 2008

ensure that the monies are recovered to run the IT Service. In 2009 the cost per workstation is $2640[10]. This can be expected to increase by 3% a year moving forward.

The IT Cost recovery system averages out the fees and gives users of the IT services a relatively "flat" contribution amount and in the end is fair to all users. The annual IT recovery amount includes future hardware replacement costs, service and support for hardware upgrades and software, and future IT projects as they arise on a priority basis.

GIS Services

The effective use of the District's Geographic Information System (GIS) is an important tool to support the assessment and management of new and existing water systems. The following data and information sets relevant to the water system and service area should be created:

- Survey Controlled Cadastre Base
- 1m Contour Base
- Acquisition of recently flown Ortho-photos
- Engineering As-Built information

Data may be integrated into a robust data model with an open architecture and stored in the RDCK's enterprise GIS system. By implementing a relatively simple data model and regularly maintaining the data, information can be readily delivered to the Finance and Environmental Services Department to support their asset management and long-term planning efforts.

[10] Personal communication, David Oosthuizen, Supervisor of IT Services, June 2009.

Appendix I – Role of Provincial Legislation

British Columbia is now catching up with other North American jurisdictions in its requirements for water quality monitoring, reporting, and public notification. In response to numerous waterborne disease outbreaks throughout B.C. in the late 1990s, the tragic *E-coli* outbreak in Walkerton in 2000, and the resulting public demand for better quality drinking water, the Province modernized its Drinking Water Protection Act and Drinking Water Protection Regulation in 2003 to better reflect commonly accepted management practices and treatment standards. In keeping with the DWPA, and under the direction of Interior Health Authority (IHA) Medical Health Officers, public health protection staff was tasked with overseeing source-to- tap assessments of all drinking water systems and monitoring operational standards, including water quality testing (Interior Health Authority, 2010). The DWPA and associated regulation also called for more stringent public notification requirements.

In 2004, IHA expanded its *Drinking Water Quality Improvement Program* to help water suppliers throughout the region safeguard public health by applying industry-proven best management practices to system planning, operation, and maintenance. In that same year, after carefully examining the DWPA, the Guidelines for Canadian Drinking Water Quality (GCDWQ), and standards set by the U.S. Environmental Protection Agency, Interior Health also defined new water treatment objectives for water suppliers within its region[11].

Key components of the Drinking Water Protection Act and regulation are clear:

- Any system that delivers water to more than one connection is a water supply system and must comply.
- Any registered community water system must be operated by a certified operator.
- The quality of the source will determine the requisite levels of treatment.

In acknowledging the costs and technological implications to water systems, IHA has required plans for phased compliance from all community water systems. For this reason, the assessment process undertaken by the Regional District for acquisition candidates is critically important.

Local government work towards compliance with the regulation and its objectives most often results in strong support from IHA with operational advice and with infrastructure grant funding applications.

[11] The multi-barrier approach recommends 4-log (99.99 percent) inactivation and/or removal of viruses, 3-log (99.9 percent) inactivation and/or removal of *Giardia* and *Cryptosporidia,* dual treatment (e.g. filtration and disinfection), <1-NTU turbidity, and 0 total or fecal coliforms.

Appendix J – Water Conservation Planning Goals

Tony Maas, Director of Fresh Water with WWF-Canada (2009) asserts the three emerging, primary threats facing water supplies and water flows in Canada today are climate change, growing water demands, and the pursuit of low-carbon energy. These factors are causing changes in water patterns, altering water levels and affecting the flow of rivers (WWF-Canada, 2009). Specifically:

Climate change – Impacts are altering the entire context of water management, resulting in changing precipitation patterns, increasing evaporation, melting glaciers, and causing droughts and floods to become more frequent and intense;

Growing water demands – Through the expansion of industry, agriculture and urban growth, rivers are being drawn down to sometimes dangerously low levels;

Growing demand for low-carbon energy – This demand is driving the construction of new hydropower projects which can alter river flows and cause species and ecosystems to suffer. (WWF-Canada, 2009)

Demand for water is expected to increase as temperature rises, making protection of flows even more challenge. In all RDCK water systems and pending services, we must be responsible and make efforts to ensure water supplies are being used within sustainable limits.

Water Management Strategies

The development of effective conservation plans are community specific, and as such, a detailed conservation plan for all the existing and pending RDCK water services will take time and resources. There is a need to develop conservation action plans for every water system. These would include demand-side management techniques, incentives, and an extensive education component. Until individual plans can be produced, some general aspects that may be included in a conservation plan are presented in this report. To obtain buy-in and achieve long-term behavioural change and results, plans must include the introduction of measures to address water quantity issues in a phased approach.

Water conservation often has different meanings to different people. For some, it means collecting rainwater for domestic use or constructing reservoirs; of recharging groundwater tables or using lower quality water whenever possible in order to save better quality water. Water conservation includes all of these aspects. It encompasses reducing the demand for water by nurturing conservation habits, decreasing wasteful uses, reducing peak consumption and implementing water pricing methods that promote water conservation. It also means utilizing technological developments and improvement management techniques, coordinating water resource planning and management with regional land-use planning and economic and social planning, and establishing new or updated standards and regulations. In essence, water conservation implies the optimal water use of this vital resource.

Through the widespread implementation of conservation measures in the RDCK, the following objectives could be achieved:

Energy Conservation – Water pumping and delivery require a large amount of energy. By reducing water use, a reduction in greenhouse gas emissions that adversely impact the environment can be realized.

Balfour Pumphouse, August 13, 2009

Lower Operating Costs – Reducing water consumption results in a reduction in operating costs for power, some replacement materials, and chemicals.

Habitat Conservation – Decreasing water use can aid in preserving essential freshwater habitats for wildlife and migrating waterfowl.

Behaviour Change – By encouraging consumers to make small changes such as fixing leaky taps, opting for showers instead of baths, using a Hippo toilet water saver (or similar product), and only running the dishwasher or laundry washer when it is full, significant water efficiencies can be realized. These actions will reduce daily water wastage and further facilitate the process of educating consumers so they better understand the usefulness of water efficiency and how to use water wisely.

http://www.hippo-the-watersaver.co.uk/forthehome.html

Identification of Water Conservation Measures

The US Environmental Protection Agency has developed a set of comprehensive guidelines describing water conservation measures that water purveyors should use in designing water conservation programs. These guidelines emphasize goal-oriented planning which can aid water purveyors in improving their capacity to provide safe and reliable water services, as well as to eliminate, downsize, or delay costly infrastructure projects (U.S. Environmental Protection Agency, 1998). Future conservation efforts in each of the water systems owned and operated by the RDCK should consider each of the measures identified in the USEPA water conservation plan guidelines.

USEPA Water Conservation Measures and Plan Guidelines

This accompanying information to the EPA Guidelines for Preparing Water Conservation Plans describes the water conservation measures that water utilities can use in designing water conservation programs. As part of their conservation plans, planners should consider, *at a minimum,* each of the measures specified in the Basic, Intermediate, or Advanced Guidelines, depending on which set of Guidelines apply to the water system.

The measures are organized into three general categories: Level 1, Level 2, and Level 3. Within each level are four subcategories that are used to organize a variety of specific conservation measures:

- Level 1 Measures
  - Universal metering
  - Water accounting and loss control
  - Costing and pricing
  - Information and education

- Level 2 Measures
  - Water-use audits
  - Retrofits
  - Pressure management
  - Landscape efficiency

- Level 3 Measures
  - Replacements and promotions
  - Reuse and recycling
  - Water-use regulation
  - Integrated resource management

This system of organizing the conservation measures recognizes that the measures considered can vary with the size and capability of the system. *Water systems are strongly encouraged to explore the fullest range of conservation measures practical, including measures beyond the minimum measures suggested in the Guidelines that they are following.* Many smaller and middle-sized utilities have been very successful in implementing a wide range of beneficial conservation programs.

What follows is a description of each of the twelve subcategories of measures. The Guidelines provide checklists that water planners can use in reviewing measures. However, planners are encouraged to consider as many measures as practical given their capability and the conditions they seek to address. In some cases, planners may choose to consider and implement selected measures beyond those minimally recommended for consideration.

Although this list of conservation measures is relatively current and comprehensive, planners should not limit their analysis only to the measures mentioned here. Planners also should consider new technologies and approaches as they become available. Letters next to each category indicate whether the measures in that category are considered particularly useful in reducing average-day demand [A], maximum-day or peak demand [P], or both [B]. Worksheets for some of the conservation measures are provided at the end of this Appendix.

Level 1 Measures

Universal Metering [B]

Measures	← Basic Guidelines →	← Intermediate Guidelines →	← Advanced Guidelines →
Universal metering [B]	• Source-water metering • Service-connection metering and reading • Meter public-use water	• Fixed-interval meter reading • Meter-accuracy analysis	• Test, calibrate, repair, and replace meters

Metering is a very fundamental tool of water system management and conservation. Worksheet A-1 can be used by systems to assess their metering practices.

Source-water metering. Both the supplier and the customer benefit from metering. Source metering is essential for water accounting purposes.

Service-connection metering. Service-connection metering is needed to inform customers about how much water they are using; suppliers use metering data to more accurately track water usage and bill customers for their usage.

Public-use water metering. All water provided free of charge for public use should be metered and read at regular intervals. This will allow the utility to more accurately account for water. Lack of metering undermines loss control, costing and pricing, and other conservation measures.

Fixed-interval meter reading. A program of fixed-interval meter reading is essential to determine the amount of non revenue-producing water. Source meters and service connection meters should be read at the same relative time in order to facilitate accurate comparisons and

analysis. Readings generally should occur at regular intervals, preferably monthly or bimonthly. Estimated bills should be kept at a minimum, subject to state and local regulations.

Meter accuracy. Water meters can be damaged and deteriorate with age, thus producing inaccurate readings. Inaccurate readings will give misleading information regarding water usage, make leak detection difficult, and result in lost revenue for the system. All meters, especially older meters, should be tested for accuracy on a regular basis. The system also should determine that meters are appropriately sized. Meters that are too large for a customer's level of use will tend to under-register water use.

Meter testing, calibration, repair, and replacement. After determining the accuracy of the metering system, the utility should provide a schedule of activities necessary to correct meter deficiencies. Meters should be recalibrated on a regular basis to ensure accurate water accounting and billing.

Water Accounting and Loss Control [A]

Measures	← Basic Guidelines →	← Intermediate Guidelines →	← Advanced Guidelines →
Water accounting and loss control [A]	• Account for water • Repair known leaks	• Analyze non account water • Water system audit • Leak detection and repair strategy • Automated sensors/ telemetry	• Loss-prevention program

In many respects, water conservation begins on the supply side. All water systems will benefit from a water accounting system that helps track water throughout the system and identify areas that may need attention, particularly large volumes of non account water. Non account water includes water that is *metered but not billed*, as well as *all unmetered* water. Unmetered water may be authorized for such utility purposes (such as operation and maintenance) and for certain public uses (such as fire hydrant maintenance). Unmetered water also includes unauthorized uses, including losses from accounting errors, malfunctioning distribution system controls, thefts, inaccurate meters, or leaks. Some unauthorized uses may be identifiable. When they are not, these unauthorized uses constitute *unaccounted-for water*.

Implementing a system of water accounting is a necessary first step in developing strategies for loss control. A system of water accounting is provided in Figure A-1. This system for tracking water begins with total water produced and ends with unaccounted-for water. Worksheet A-2 (which follows figure A-1) and Worksheet A-3 can assist water systems in developing a water accounting and loss control strategy.

Account for water. All water systems, even smaller systems, should implement a basic system of water accounting (as appears in Worksheet A-3). This accounting exercise provides a basis for a strategy to control losses over time.

Repair known leaks. The cost of water leakage can be measured in terms of the operating costs associated with water supply, treatment, and delivery; water lost produces no revenues for the utility. Repairing larger leaks can be costly, but it also can produce substantial savings in water and expenditures over the long run.

Water accounting is less accurate and useful when a system lacks source and connection metering. Although the system should plan to meter sources, unmetered source water can be estimated by multiplying the pumping rate by the time of operation based on electric meter readings.

Analysis of non account water. Non account water use should be analyzed to identify potential revenue-producing opportunities, as well as recoverable losses and leaks. Some utilities might consider charging for water previously given away for public use or stepping up efforts to reduce illegal connections and other forms of theft.

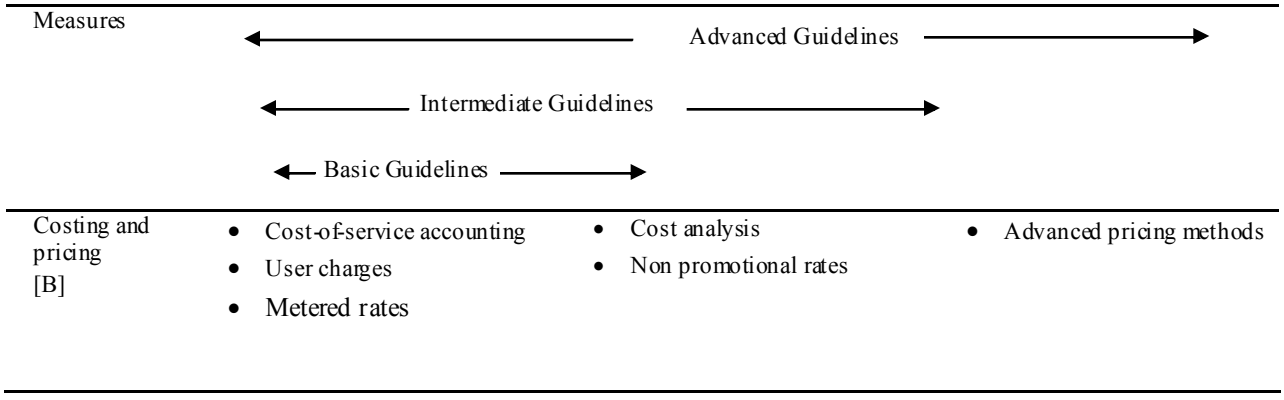
System audit. A system audit can provide information needed to make a more accurate analysis of non account water.

Leak detection and repair strategy. Systems also should institute a comprehensive leak detection and repair strategy. This strategy may include regular on-site testing using computer-assisted leak detection equipment, a sonic leak-detection survey, or another acceptable method for detecting leaks along water distribution mains, valves, services, and meters. Divers can be used to inspect and clean storage tank interiors.

Automated sensors/telemetry. Water systems also consider using remote sensor and telemetry technologies for ongoing monitoring and analysis of source, transmission, and distribution facilities. Remote sensors and monitoring software can alert operators to leaks, fluctuations in pressure, problems with equipment integrity, and other concerns.

Loss-prevention program. This may include pipe inspection, cleaning, lining, and other maintenance efforts to improve the distribution system and prevent leaks and ruptures from occurring. Utilities might also consider methods for minimizing water used in routine water system maintenance procedures in accordance with other applicable standards.

Costing and Pricing [B]



Costing and pricing are conservation strategies because they involve understanding the true value of water and conveying information about that value, through prices, to water customers. The use of user charges often is considered a necessary (but not always sufficient) part of a water conservation strategy. Many resources are available on how to account for costs and design water rates.

Cost-of-service accounting. Water systems should use cost-of-service accounting, consistent with generally accepted practices. Many resources are available for this purpose. Understanding and tracking system costs also is a capacity-development strategy for small systems.

User charges. Once costs are established, systems can develop more accurate user charges (or rate structures).

Metered rates. Metered rates should be used so that the customer's water bill corresponds to their water usage. For many systems, change in water rates must be approved by regulators or other oversight bodies. It is important for water systems to communicate with regulators about costs and the need for cost-based pricing.

Cost analysis. Systems should conduct a cost analysis to understand what types of usage drive system costs. For example, systems should analyze patterns of usage by season and class of service.

Non promotional rates. Systems also should consider whether their current rate structures promote water usage over conservation; non promotional rates should be implemented whenever possible in order to enhance the conservation signal of rates.

Systems seeking to encourage conservation through their rates should consider various issues: the allocation between fixed and variable charges, usage blocks and breakpoints, minimum bills and whether water is provided in the minimum bill, seasonal pricing options, and pricing by customer class.

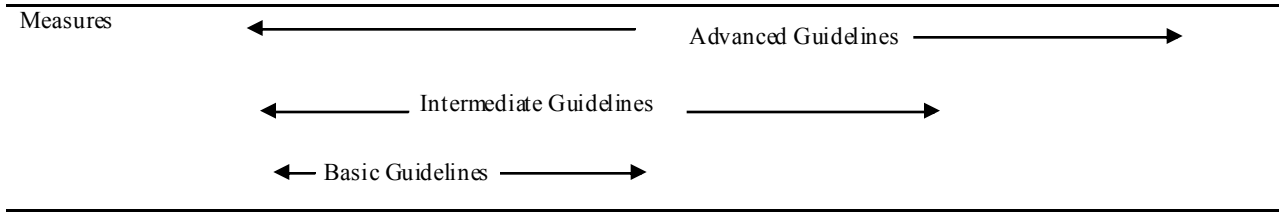
Systems also should consider the effect of introducing a new rate structure on revenues. Worksheet A-4 is provided for this purpose. Conservation-oriented pricing requires planners to make certain assumptions (based on the available empirical evidence) about the elasticity of water demand, or the responsiveness of water usage to a change in price. Elasticity is measured by the ratio of a percentage change in quantity demanded to a percentage change in price. Changes in the rate structure should allow the system to achieve demand reduction goals recovering water system costs. In allocating costs, the impact of the rate structure on user demand and revenues for specific customer classes should be considered.

Advanced pricing methods. Advanced pricing methods generally allocate costs by customer class and/or type of water use. Advanced pricing might consider seasonal variations or other methods for pricing indoor and outdoor usage based on differing contributions to system peaks. The conservation orientation of the rate structure can be enhanced by considering the elasticity factors for different classes of water use. Marginal-cost pricing, which considers the value of water relative to the cost of the next increment of supply, can be considered as well. Systems also can consider special ratemaking provisions (such as cost-recovery or lost-revenue

mechanisms). Potential revenue instability can be addressed with additional rate structure modifications (such as revenue-adjustment mechanisms).

Obviously, the pricing strategy must be consistent with overall system goals and approved by regulatory or other governing bodies.

Information and Education [B]



Information and education [B]	• Understandable water bill • Information available	• Informative water bill • Water bill inserts • School program • Public-education program	• Workshops • Advisory committee

Information and education are critical to the success of any conservation program. Information and education measures can directly produce water savings, as when customers change their water-use habits. These savings can be difficult to estimate. Also, public education alone may not produce the same amount of sustained water savings as other, more direct approaches (such as leak repairs and retrofits).

But educational measures also can enhance the effectiveness of other conservation measures. For example, it is widely believed that information plays a role in how water consumers respond to changes in price. More generally, customers that are informed and involved are more likely to support the water system's conservation planning goals. Worksheet A-5 is provided for systems to use in assessing their information and education programs.

Understandable water bill. Customers should be able to read and understand their water bills. An understandable water bill should identify volume of usage, rates and charges, and other relevant information.

Information available. Water systems should be prepared to provide information pamphlets to customers on request. Public information and education are important components of every water conservation plan. Consumers are often willing to participate in sound water management practices if provided with accurate information. Furthermore, providing information and educating the public may be the key to getting public support for a utility's water conservation efforts. An information and education program should explain to water users all of the costs involved in supplying drinking water and demonstrate how water conservation practices will provide water users with long term savings.

Informative water bill. An informative water bill goes beyond the basic information used to calculate the bill based on usage and rates. Comparisons to previous bills and tips on water conservation can help consumers make informed choices about water use.

Water bill inserts. Systems can include inserts in their customers' water bills that can provide information on water use and costs. Inserts also can be used to disseminate tips for home water conservation.

School program. Systems can provide information on water conservation and encourage the use of water conservation practices through a variety of school programs. Contacts through schools can help socialize young people about the value of water and conservation techniques, as well as help systems communicate with parents.

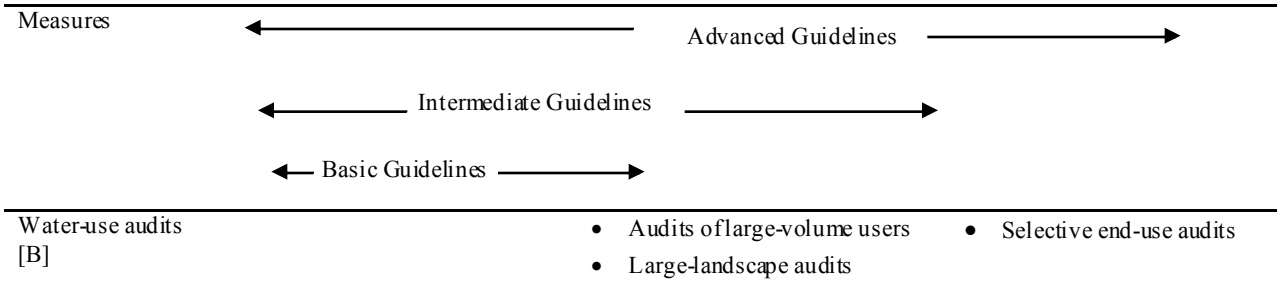
Public education program. Utilities can use a variety of methods to disseminate information and educate the public on water conservation. Outreach methods include speakers' bureaus, operating booths at public events, printed and video materials, and coordination with civic organizations.

Workshops. Utilities can hold workshops for industries that might be able to contribute to water conservation efforts. These might include, for example, workshops for plumbers, plumbing fixture suppliers, and builders or for landscape and irrigation service providers.

Advisory committee. A water conservation advisory committee can involve the public in the conservation process; potential committee members include elected officials, local business people, interested citizens, agency representatives, and representatives of concerned local groups. The committee can provide feedback to the utility concerning its conservation plan and develop new material and ideas about public information and support for conservation in the community. Of course, to be meaningful, the utility must be receptive to ideas offered by the committee.

Level 2 Measures

Water-Use Audits [B]



Water-use or end-use audits can provide water systems and their customers with invaluable information about how water is used and how usage might be reduced through specific conservation strategies.

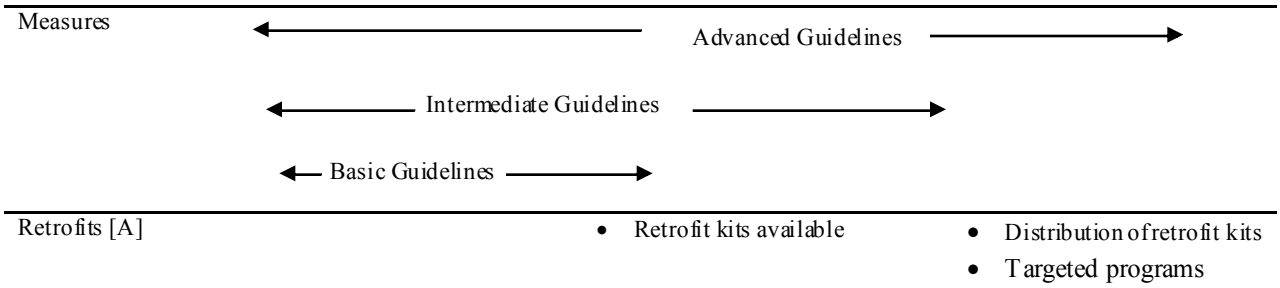
Audits of large-volume users. Utilities can facilitate water audits for large-volume users, both commercial and industrial. Water audits should begin by identifying the categories of water use for the large-volume user. These may include process, sanitary, domestic, heating, cooling, outdoor, and other water uses. Second, a water audit should identify areas in which overall water use efficiency can be improved through alternative technologies or practices.

Large-landscape audits. Water audits can be used for outdoor usage, as well as for indoor processes. Audits of irrigation practices can provide large-volume commercial, industrial, and public users with information about usage and usage-reduction techniques. These audits can be used in conjunction with irrigation submetering and other landscaping efficiency practices.

Selective end-use audits. Water audits can be widened to include selective end-use audits by customer class, focusing on typical water-use practices within each class. An audit program can be selective in terms of targeting customer groups that have particular needs or for which water conservation could be particularly beneficial. Audits targeted to older housing, for example, can be particularly beneficial in terms of identifying and fixing plumbing leaks.

End-use audits also can be tailored to the usage practices within user groups. For example, residential water audits may focus on plumbing fixtures, lawn and garden water practices, and customer behaviour. Residential water audits can be used to make immediate repairs and retrofits. Worksheet A-6 summarizes the components of a residential water audit. All water audits should include a written report to the customer that includes specific ideas for conservation. Water audits can be planned and implemented in conjunction with electric power companies or others interested in promoting conservation practices.

Retrofits [A]



Water systems can promote conservation through a retrofit program. Retrofitting involves making an improvement to an existing fixture or appliance (versus replacement) in order to increase water-use efficiency. Retrofit programs usually target plumbing fixtures.

Retrofit kits available. A basic retrofit kit may include low-flow faucet aerators, low-flow showerheads, leak detection tablets, and replacement flapper valves. Retrofit kits may be made available free or at cost.

Calculating the savings from a retrofit program requires planners to make a number of assumptions about water use and savings. Some of the assumptions used in retrofitting are:[12]

- Toilets (4-6 flushes per person per day)
- Showerheads (5-15 shower-use minutes per person per day)
- Bathroom Faucets (.5-3 faucet-use minutes per person per day)

[12] Duane D. Baumann, John J. Boland, and W. Michael Hanemann, *Urban Water Demand Management and Planning* (New York: McGraw Hill, 1998): 254.

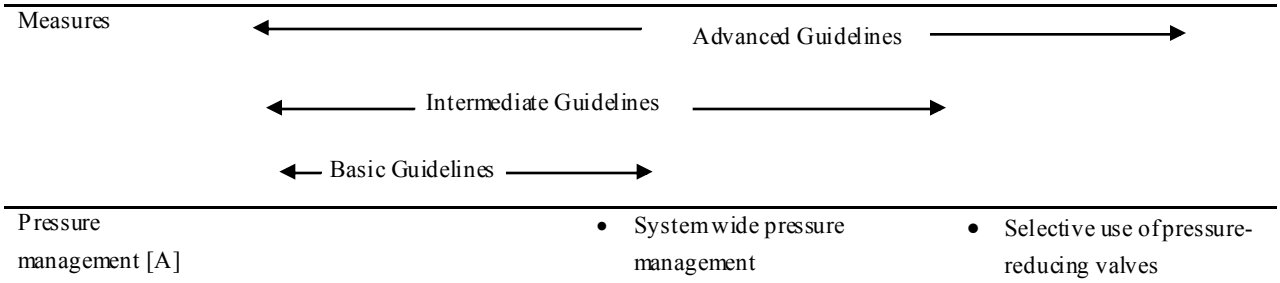
- Kitchen Faucets (.5-5 faucet-use minutes per person per day)

Many useful textbooks and manuals are available to help planners estimate typical water use and potential savings from retrofits (See Appendixes B and D.)

Distribution of retrofit kits. Water systems can actively distribute retrofit kits directly or through community organizations. Retrofit kits also can be distributed in conjunction with audit programs.

Targeted programs. Utilities might institute targeted programs for different customer classes (residential, commercial, industrial, public buildings, and so on). Retrofits of industrial premises can include facilities used by the public and employees, as well as facilities used for production purposes. A program to retrofit low-income housing units may conserve considerable water in older residential housing units with inefficient plumbing fixtures. Targeted programs also could be designed in cooperation with community organizations. An active retrofit program might be part of a residential water-use audit program. It is important that planners ensure that retrofit programs conform to local plumbing codes and ordinances.

Pressure Management [A]

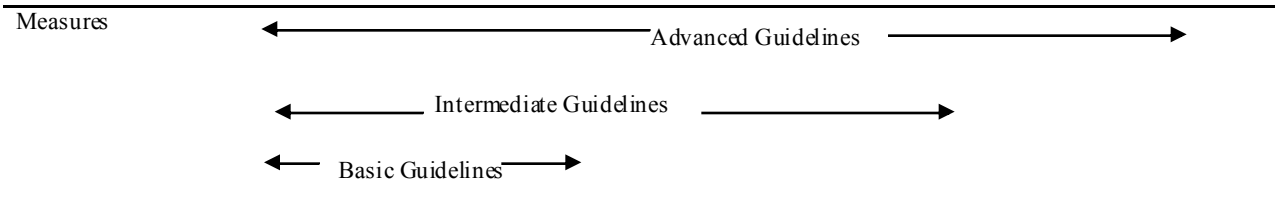


Reducing excessive pressures in the distribution system can save a significant quantity of water. Reducing water pressure can decrease leakage, amount of flow through open faucets, and stresses on pipes and joints which may result in leaks. Lower water pressure may also decrease system deterioration, reducing the need for repairs and extending the life of existing facilities. Furthermore, lower pressures can help reduce wear on end-use fixtures and appliances.

Systemwide pressure management. For residential areas, pressures exceeding 80 psi should be assessed for reduction. Pressure management and reduction strategies must be consistent with state and local regulations and standards, as well as take into account system conditions and needs. Obviously, reductions in pressure should not compromise the integrity of the water system or service quality for customers.

Pressure-reducing valves. A more aggressive plan may include the purchase and installation of pressure-reducing valves in street mains, as well as individual buildings. Utilities might also insert flow restrictors on services at the meter. Restrictors can be sized to allow for service length, system pressure, and site elevation. Utilities can consider providing technical assistance to customers to address their pressure problems and install pressure-reducing valves to lower the customers' water pressure. This may be especially beneficial for large-use customers.

Landscape Efficiency [P]



Landscape efficiency [P]	• Promotion of landscape efficiency • Selective irrigation submetering	• Landscape planning and renovation • Irrigation management

Outdoor water usage drives maximum-day demand, which in turn drives requirements for transmission and treatment facilities. Reducing outdoor usage can thus be a very effective conservation strategy. Outdoor water use can be reduced through efficiency-oriented landscaping principles.

Promotion of landscape efficiency. Utilities can promote the development of water conserving principles into the planning, development and management of new landscape projects such as public parks, building grounds, and golf courses. Utilities can also promote low water-use landscaping by residential and non residential customers, especially those with large properties. Utilities can cooperate with local nurseries to ensure the availability of water conserving plants.

Water systems may promote Xeriscaping™, an efficiency-oriented approach to landscaping that encompasses seven essential principles:

- Planning and design
- Limited turf areas
- Efficient irrigation
- Soil improvement
- Mulching
- Use of lower water demand plants
- Appropriate maintenance

Selective irrigation submetering. Selective submetering for irrigation water can be used to improve irrigation management, as well as to introduce irrigation pricing.

Landscape planning and renovation. Existing landscapes can be renovated to incorporate water-conserving practices. Public parks, for example, could be managed to incorporate water-efficient landscaping and reduce or eliminate irrigation. Utilities can work with commercial and industrial customers to plan and renovate landscaping in accordance with water conserving practices.

Irrigation management. Irrigation management systems, using metering, timing, and water-sensing devices, also can be promoted by the water utility for large-volume customers.

Level 3 Measures

Replacements and Promotions [B]

Measures	Advanced Guidelines	Intermediate Guidelines	Basic Guidelines
Landscape efficiency [P]			• Rebates and incentives (non-residential) • Rebates and incentives (residential) • Promotion of new technologies

Rebates and incentives. In order to accelerate the replacements of older fixtures, utilities can offer rebates and other incentives. Utilities can install water-efficient fixtures by providing fixtures at no cost, giving a rebate for consumer purchased fixtures, or arranging suppliers to provide fixtures at a reduced price. Utilities can design incentive rebate programs that are targeted to the non residential and residential sectors, and to indoor and outdoor uses.

The feasibility and effectiveness of replacements may depend on state and local plumbing codes. A program to accelerate replacements, coupled with high-efficiency standards, can yield substantial water savings.

Promotion of new technologies. Utilities also can get involved with promoting new technologies by manufacturers and distributors of fixtures and appliances. Demonstrations and pilot programs, and even contests, can be used to introduce and promote new products (such as high-efficiency washing machines).

Reuse and Recycling [B]

Measures	Advanced Guidelines	Intermediate Guidelines	Basic Guidelines
Reuse and recycling [B]			• Industrial applications • Large-volume irrigation applications • Selective residential applications

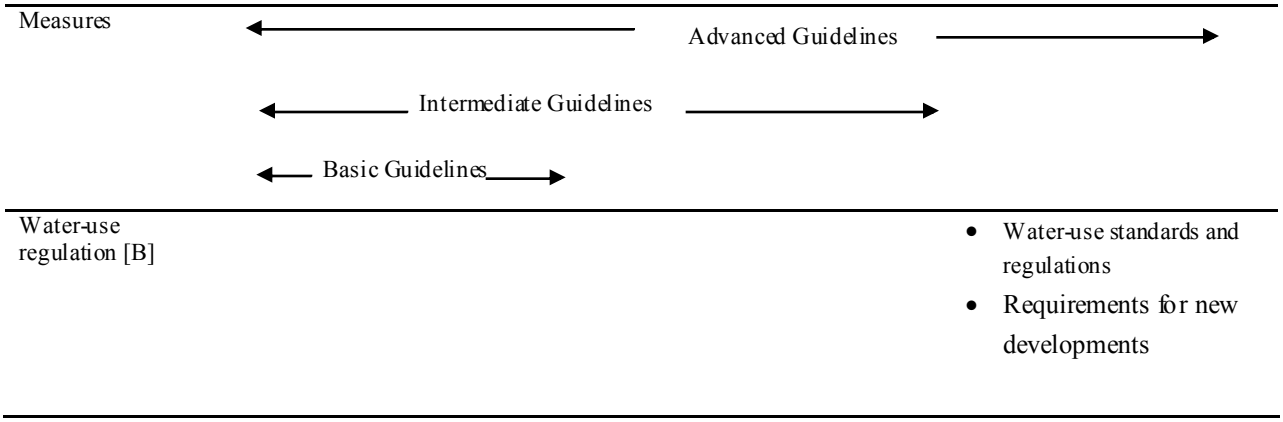
Industrial applications. An alternative water source for some systems is "graywater," or treated wastewater for non potable water uses. Water reuse and recycling practices reduce production demands on the water system. Water utilities should work with their non residential customers to identify potential areas for reuse or recycling. Some industries can substantially reduce water

demand through water reuse (or multiple use) in manufacturing processes. Recycled wastewater can be used for some industrial purposes, agricultural purposes, groundwater recharge, and direct reuse.

Large-volume irrigation applications. Reuse and recycling can be encouraged for large-volume irrigation.

Selective residential applications. In some areas, reuse and recycling can be used in residential applications. Water systems will need to check with local plumbing codes and ordinances for possible conditions and restrictions.

Water-Use Regulation [B]



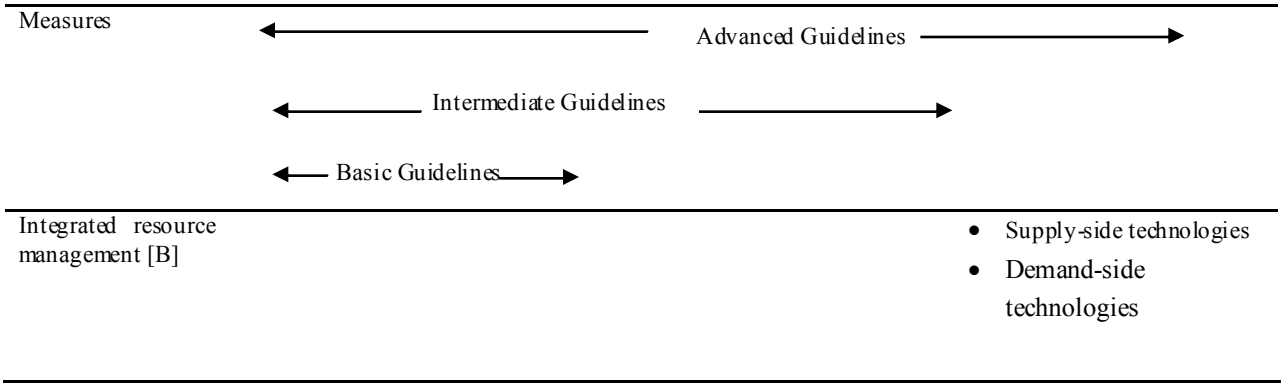
Water-use standards and regulations. Regulations should be in place to manage water use during droughts or other water-supply emergencies. In some cases, utilities may find it desirable to extend water-use regulations to promote conservation during non-emergency situations. Examples of water-use regulations are:

- Restrictions on nonessential uses, such as lawn watering, car washing, filling swimming pools, washing sidewalks, and irrigating golf courses.
- Restrictions on commercial car washes, nurseries, hotels, and restaurants.
- Standards for water-using fixtures and appliances (in addition to the federal efficiency standards, which can be found at the end of this Appendix).
- Bans or restrictions on once-through cooling.
- Bans on non-recirculating car washes, laundries, and decorative fountains.
- Bans on certain types of water use or practice.

Requirements for new developments. Another type of regulation is to impose standards on new developments with regard to landscaping, drainage, and irrigation practices.

Many water systems, including privately owned systems, lack authority to implement this measure. Systems that have such authority must exercise it carefully. In general, restrictions on water use should be justified by the system's circumstances and should not unduly compromise the customer's rights or quality of service.

Integrated Resource Management [B]



Supply-side technologies. The idea of integrated resource management is that water often is used jointly with other resources. Systems following the Advanced Guidelines might have opportunities to consider and implement measures that can accomplish integrated resource management, where water conservation is jointly accomplished with the conservation of other resources. On the supply-side, the utility can institute operating practices (including various automation methods, strategic use of storage, and other practices) that achieve energy, chemical, and water savings. Source-water protection strategies, including land-use management methods, can be used to conserve water resources and avoid costly new supplies. Water and wastewater utilities can jointly plan and implement conservation programs to realize savings and share in the benefits.

Demand-side technologies. Integrative practices also can be accomplished on the demand side. Water and energy utilities can conduct comprehensive end-use audits and jointly promote conservation practices by end-users. Large-volume users can work with the utility to make adjustments to processes that reduce water and energy usage and wastewater flows, while saving other resources as well. Utilities that provide wholesale water can work with wholesale customers to design a water conservation program that will be mutually beneficial.

Worksheet A-1: Metering

A. BASIC GUIDELINES

Source metering

What percentage of source withdrawals is metered? _____

Connection metering

Percent of connections metered by customer class:		Percent of meters that are outdoors:	
Residential	%		%
Industrial	%		%
Commercial	%		%
Public	%		%
Other	%		%

	Number of meters needed:	Estimated cost/meter:	Estimated total cost
Residential			
Industrial			
Commercial			
Public			
Other			

B. BASIC GUIDELINES (Basic Guidelines above plus the following)

	Frequency of meter reading:	Billing frequency:	Estimated bills/year
Residential			
Industrial			
Commercial			
Public			
Other			

Are authorized uses of nonaccount water metered? _____

Schedule for testing source water meters: _____

Schedule for testing connection meters: _____

Are meters correctly sized? _____

C. ADVANCED GUIDELINES (Basic and Intermediate Guidelines above plus the following)

Describe the systems' program to test, calibrate, repair, and replace meters (including schedules): _____

Worksheet A-2: Water Accounting and Loss Control

Line	Item	Volumes (gallons)		% of Amount in Line 1
1	**Total Source Withdrawals and Purchases**			100%
2	*Adjustments to source water supply [a]*			
2A	Adjustment for source meter error (+ or -)			
2B	Adjustment for change in reservoir or tank storage (+ or -)			
2C	Adjustment for transmission line losses (-) [a]			
2D	Adjustments for other source contributions or losses (+ or -) [a]			
3	Total adjustments to source water (add lines 2A through 2D))			
4	**Adjusted Source Water (subtract line 3 from line 1)**			%
5	*Metered Water Sales*			
5A	Metered residential sales			
5B	Metered commercial sales			
5C	Metered industrial sales			
5D	Metered public sales			
5E	Other metered sales			
6	Total metered sales (add lines 5A through 5D)			
7	Adjustment for meter reading lag time (+ or -)			
8	Adjustment for meter errors (+ or -) [a]			
9	Adjusted total meter sales (add lines 6 through 8)			
10	**Nonaccount Water (subtract line 9 from line 4)**			%
11	*Metered and accounted-for but not billed*			
11A	Public-use water metered but not billed			
11B	Other water metered but not billed			
12	*Authorized unmetered water: operation and maintenance*			
12A	Main flushing			
12B	Process water at treatment plant			
12C	Water quality and other testing			
13	*Authorized unmetered water: public use*			
13A	Storm drain flushing			
13B	Sewer cleaning			
13C	Street cleaning			
13D	Landscaping in large public areas			
13E	Firefighting, training, and related maintenance			
14	*Other authorized unmetered use*			
14A	Swimming pools			
14B	Construction sites			
14C	Other unmetered uses			
15	Total authorized unmetered water (add lines 11A through 14C)			
16	**Total Unauthorized Losses (subtract line 15 from line 10)**			%
17	*Identifiable water losses and leaks*			
17A	Accounting procedure errors [a]			
17B	Malfunctioning distribution system controls			
17C	Illegal connections and theft			
17D	Meter inaccuracy			
17E	Unavoidable water leaks			
17F	Avoidable water leaks			
18	Total identifiable water losses and leaks (add lines 17A through 17F)			
19	**Unaccounted-For Water (subtract line 18 from line 16)**			%

[a] Methodology subject to industry and regulatory standards

Worksheet A-3: Strategies for Reducing Water Losses

A. TRANSMISSION LOSSES

Describe strategy for reducing transmission line losses: _____

_____

_____

_____

Estimated annual water savings: _____

B. NON ACCOUNT WATER

Describe strategy for reducing authorized unmetered uses: _____

_____

_____

_____

Estimated annual water savings: _____

C. LOSSES AND LEAKS

Describe strategy for reducing identifiable leaks: _____

_____

_____

_____

Estimated annual water savings: _____

D. UNACCOUNTED-FOR WATER

Describe strategy for reducing unaccounted-for water: _____

_____

_____

_____

Estimated annual water savings: _____

Worksheet A-4: Evaluating Effects of Water Rate Changes

Line	Item	Value
1	Current price per gallon	$
2	Current revenue-producing gallons (or cubic feet)	gallons
3	Current annual revenues (line 1 multiplied by line 2)	$
4	Conservation goal (reduction in water use)	gallons
5	Conservation goal as percentage of current annual revenue-producing gallons (line 4 divided by line2)	%
6	Estimate price elasticity of demand (by customer class and/ortype of use if applicable)	%
7	Percentage change in price needed to induce conservation (line 5 divided by line 6)	%
8	Calculate revised price level (line 1 multiplied by (1.00 plus line 7))	$
9	Revised annual water usage (line 1 less line 4)	gallons
10	Revised revenues (line 8 multiplied by line 9)	$
11	Annualized fixed costs	$
12	Annual variable costs for revised water usage	$
13	Revised revenue requirements	$
14	Net revenue effect (line 10 less line 13)	$

Note: Prepare for each customer class to the extent feasible

Worksheet A-5: Checklist for Information and Education

BASIC GUIDELINES	☑
Understandable water bill	
Understandable information about water rates and usage	☐
Information available	
Pamphlet on basic home water conservation practices	☐
Pamphlet on plumbing retrofits and replacements	☐
Pamphlet on summer lawn watering and conservation landscaping	☐

INTERMEDIATE GUIDELINES (Basic Guidelines above plus the following)	☑
Informative water bill	
Compare to past usage (previous month, same period previous year)	☐
Flag unusually high recorded uses and notify customers	☐
Information tailored to customer class	☐
Water-bill inserts	
Information on the costs and value of water	☐
Basic water conservation tips	☐
Information on conservation programs	☐
School Program	
Visit classrooms	☐
Distribute curriculum materials, such as worksheets and colouring books	☐
Show short information films or slide shows	☐
Field trips to water system facilities	☐
Contests and recognition for posters, ideas etc.	☐
Public-education program	
Press releases, public space advertising and public service announcements (various media	☐
Conservation information centres and mobile information booths	☐
Speakers bureau, films, and slide shows for community organizations	☐
Coordination with civic and professional organization resources	☐
Special events, such as water conservation fairs	☐
Displays at home shows, garden shows, fairs, libraries, and town halls	☐
Cooperation with retail pluming to promote conservation	☐
Recognized conserving businesses and industries	☐

ADVANCED GUIDELINES (Basic and Intermediate Guidelines above plus the following)	☑
Workshops	
Workshops for plumbers, plumbing fixture suppliers, and builders	☐
Workshops for landscape and irrigation service providers	☐
Advisory Committee	
Creation of a public advisory committee	☐

Worksheet A-6: Checklist for a Residential Water Audit

Service Meter	☑
Calibration/flow test	☐
Leak test	☐
Report findings to maintenance personnel	☐
Kitchen	☑
Check faucet flow rate	☐
Offer to install aerator or flow restrictor	☐
Check for drips and leaks	☐
Bath	☑
Shower	
Check showerhead flow rate	☐
Offer to install low-flow showerhead or flow restrictor	☐
Check for drips and leaks	☐
Sinks	
Check faucet flow rate	☐
Offer to install aerator or flow restrictor	☐
Check for drips and leaks	☐
Toilets	
Check for leaks (dye test)	☐
Clean or replace flapper	☐
Check the adjustment of the float arm	☐
Offer to install retrofit devices	☐
Provide information on available rebates	☐
Outside Water Use (Irrigation Season)	☑
Measure the flow rate of sprinklers	
Check for leaks in the sprinkler, hose, or sprinkler system	☐
Check the position of sprinklers	☐
Instruct the homeowner on efficient water techniques	☐
Recommend a water schedule based on:	☐
• Any water restrictions imposed by local government	☐
• Best time of day for watering	☐
• Frequency of watering	☐
• Length of time for watering	☐
Provide information about water-efficient landscaping practices	☐

Source: Adapted from American Water Works Association, Pacific Northwest Section, *Water Conservation Guidebook for Small and Medium-Sized Utilities (*August 1993).

Policy Framework

A policy framework that may be useful in addressing the varied and complex aspects of conservation planning is outlined below. This is an example of taking a key issue, establishing a target for the future outcome, and then building policies and actions that respond to, and achieve the target.

Problem
Climate change is resulting in earlier melt-times for winter snow pack, which shifts peak seasonal flows earlier in the season. This is resulting in significantly reduced summer flows and water supply challenges during times of peak demand.

Target
The goal of the RDCK is to provide a minimum supply of water of XX m3 per day per person, while not compromising the health and sustainability of the community watershed (volume of water should be established in a committee of appropriate staff and experts).

Policies
Community:
- enhance storage capacity across the water systems so as to improve spring run-off storage of water and provide sufficient supply during peak demand
- review watershed capacities on an annual basis and synchronize land use planning activities in accordance with resource capacity
- educate the community on the state of their water system and encourage direct stewardship by the community

Financial
- review water management fee schedules and provide mechanisms for encouraging conservation through demand management
- ensure financial resources are in place to provide ongoing capital support for infrastructure programs

Environment
- develop watershed management plans to assay current and future water production and capacity, and determine live-cycle opportunities
- encourage strong conservation measures during peak demand, and a year-round conservation program to ensure sound management of the water resource

Actions
- Initiate water reservoir storage capacity upgrading programs (long-term)
- Initiate watershed management plans for all RDCK service areas and require watershed management plans for all future water systems (short-term)
- Implement universal metering program across RDCK (short-term)
- Start a 'Water Newsletter' for community action

Monitoring
- Annual community water committee update
- Key indicators for measuring target:
- Average consumption per household (monthly)

- Monthly production from source
- Storage capacity of reservoirs
- Flow volume of source

Appendix K - Existing RDCK Water Services and their Status

This section provides an overview of the state of Regional water systems, including a review of community infrastructure and services and financial capacity.

The RDCK acquired its first water system in 1972; Riondel, followed by Sanca in 1979. The remaining systems owned by the District were acquired primarily in the 1980s.
Currently the District owns and/or operates 11 water services: Arrow Creek, Erickson, Lister, Sanca, Riondel, Ymir, South Slocan, Duhamel, Denver Siding, Lucas Road, and MacDonald Creek. The operation and maintenance of these systems are performed through a combination of Municipal-RDCK service agreements, Environmental Services staff, and contract employees.

Under current Provincial and Federal legislation and regulations, as a corporation that sells residents water for domestic purposes, the Directors of the corporation are legally obligated to provide water that is potable. The RDCK has made significant strides to improve water quality in its services over the past few years, with plans in place to continue on with these efforts where required.

State of the Systems

Completed by the Utilities and Senior Utilities Technicians in 2007 and updated in 2009, detailed *State of the System* reports have been developed for each of the RDCK owned water systems. The reports outline the status of each system and identify immediate requirements needed. The reports are a tool used by staff to monitor ongoing system status and to communicate with IHA regarding system specifics. Some noted improvements include: establishing flow monitoring to determine if the source can adequately meet the required capacity, establishing regularly scheduled operation and maintenance procedures and record keeping that supports data collection on the condition and function of the system, future planning needs and improvements. The reports focus on source and supply assessment, risk assessment, sustainability, standards and compliance.

These reports serve as the first stage of a detailed assessment and evaluation of the RDCK owned water systems and will provide guidance in the future development of strategies. Reports of this nature should be updated regularly, shared with IHA and be accompanied by a request for an IHA-supported upgrading plan. Proceeding in isolation of IHA is not recommended and could jeopardize potential funding.

A summary of the total number of active water system connections is as follows:

Water System	Electoral Area	# of connections	Primary User Class
South Slocan	H	56	Residential
Erickson	B/C	730	Residential, Agricultural
Riondel	A	194	Residential
Lister	B	188	Residential, Agricultural
Denver Siding	H	21	Residential
Sanca	A	28	Residential
Lucas Road	J	6	Residential

MacDonald Creek	D	63	Residential
Duhamel	F	91	Residential
Ymir	G	107	Residential

South Slocan (Highest Risk)

Originally constructed prior to 1950, the South Slocan water system came under RDCK ownership in the 1980s in order to access funding for a capital works project. The South Slocan system is in need of numerous upgrades. Pipes run on the surface of the ground; some valves are almost corroded shut; pressure reducing stations are not functioning well; pipes run through or adjacent to septic fields; pipes run under structures and are not situated in easements or rights-of-way; source waters are insufficiently protected from contamination; access to source waters are through private property with signs suggesting that trespassers will be shot; pipes are old and failing; the true location of portions of the distribution system is unknown; there is no water treatment; and source waters are susceptible to a possible reduction in flow due to climate change impacts. In addition, there are only 54 taxable parcels (56 active connections) in the service area to support improvements needed.

Over a period of 18 months, Environmental Services staff presented a number of options to the community to improve water quality. Heavily guided by the community, a solution was put forward to the residents via the petition process, which was subsequently voted down by the community in July 2008. On January 20, 2009 the Interior Health Authority issued an Order to the RDCK to upgrade the South Slocan water system. The Order specified that improvements or facilities were to be constructed that will enable the South Slocan water supply system to provide the users drinking water that is treated and disinfected to achieve a 4-log reduction of viruses and bacteria, a 3-log reduction of Giardia and Cryptosporidium and less than 1-NTU turbidity.

Improvement works are now underway (contract awarded to Peter Ward Engineering) with an estimated completion date of March 30, 2010. The community has benefited substantially by being the recipients of more than $566,000 in grant funding, resulting in them having to borrow only an additional $103,000 to complete the project. It is important to note that South Slocan has other risk items that need addressing. Upgrading the distribution to current standards is required as the system is failing although; the RDCK does not have access to the entire span of the distribution line.

Arrow Creek

The Arrow Creek Water Treatment Plant was commissioned in 2005 and currently provides very high quality potable water however; the treated water is subject to contamination once it leaves the facility. Several kilometers of pipeline are made of concrete that was cast in place in 1929 and are joined together by grout collars. This old pipe is designed to operate as a flume and not as a pressurized system. This pipe is leaking approximately four million liters of water per day at peak flows; re-contamination is not prevented because it is not pressurized.

At the end of this main line is an open pond used to store the water in a balancing capacity in case of fire, to buffer peak demand, and to be used in the event of an emergency. Birds and other wildlife contaminate this water before it is drawn back into the distribution system. During peak

summer flows, users closest to the pond often see debris, including insects coming out of their taps. Although sufficient chlorine is dosed to the system to ensure a residual is maintained, this does not prevent possible diseases related to Giardia and Cryptosporidium.

Upgrades are required to ensure that the potable water produced by the Arrow Creek Water Treatment Plant is delivered to the users through a protected distribution system and that the overall system is functional based on current standards and practices. In order to achieve this, the following improvements are required:

1. Construction of a clear well to buffer water production from the water treatment plant;
2. Replacements of the 1929 concrete pipeline; and
3. Construction of one or two balancing reservoirs to replace the existing open storage pond;
4. Replacement of the Johnson Screens with Basket strainers or other improvement alternatives.

This approach is aligned with the Provincial Water Smart Program where the Province has made a bold statement that water use in British Columbia will be 33% more efficient by 2020.

Erickson

The Erickson water supply system was built in 1929 and water first flowed through the pipes in August, 1930. The system was owned at that time by the East Creston Irrigation District (ECID). The water was collected from Arrow Creek, passed through a settling pond, rough screening and into the 21" concrete supply main. The supply main consisted of approximately 11 km of 21" reinforced concrete pipe in eight foot lengths. Branching off the main supply line there are lateral lines supplying water to the community of Erickson. The supply main ends at the Erickson reservoir, an open lagoon which supplies water to the Town of Creston reservoir.

In 1982, the ECID amalgamated with the Erickson Irrigation District to form the Erickson Improvement District (EID). This amalgamation brought approximately 100 additional connections into the system. The Erickson Irrigation District supply, Sullivan Creek Intake, was upgraded at that time, with a new intake diversion structure and settling chamber (100,000 US Gallons concrete). During the period 1981 to 2005, Sullivan Creek has been used as a supplementary supply to augment the Arrow Creek supply during periods of high demand in summer months or at times when the Arrow creek pipeline was shut down for repairs.

Beginning in 1992, the Canadian Drinking Water Guidelines mandated residual chlorination for all surface water supplies. Despite this, the Erickson Improvement District did not treat with chlorine. Consequently, the system was on a boil order from 1992 until 2003, when chlorination was initiated. In 2002, the Ministry of Municipal Affairs removed the trustees of the EID and the system was put in the hands of a receiver. Residual chlorination was initiated in 2003 and a referendum was held to determine what the community desired for water treatment. As a result of the referendum, a water treatment plant was constructed, including membrane filtration, and UV disinfection. As part of the project, a new intake and diversion structure were also constructed.

The Arrow Creek Water Treatment Plant was commissioned in October, 2005 and now supplies treated water to both the communities of Erickson and Creston. There are approximately 730 service connections in Erickson and approximately 3,500 in Creston. The Town of Creston holds their own license on Arrow Creek and they contract with the Arrow Creek Water Service to treat and convey their supply.

In the upcoming years, metering is planned for most of the commercial services in Erickson in an effort to achieve water conservation. Some upgrades to the distribution system may be required once the Arrow mainline is pressurized.

Riondel

Servicing 194 connections, the community of Riondel experiences frequent and lengthy Water Quality Advisories due to elevated levels of turbidity. The Riondel water system has limited control over its chlorine dosage resulting in inconsistent chlorine residuals during day to day operations. With no filtration in place there is a large variation in the turbidity of the water supplied to the community, due to seasonal influences (i.e. spring run off, large rain events, and extended dry periods). In addition, chlorination is not tied in to a flow meter or flow paced. Chlorination is manually adjusted based on a manual operator test of free chlorine residuals (once a day) and on visual inspections of tank levels. This type of operation requires the operator to forecast the required change in chlorine does, based on the free chlorine residual and estimated water use of the community, which is largely influenced by temperature and weather. With no online turbidity meter in place there is no warning of increased organic loading on the raw water source and free chlorine residuals can be rapidly consumed within the reservoir. The reservoir has no level control which often results in an overflow condition and a discharge of chlorinated water.

Activities have been proposed to the Riondel Commission of Management and residents to upgrade the water system. The planned improvements will benefit the entire community and ensure the provision of safe drinking water supplies which will eliminate the need for water quality advisories which have been frequently in effect over the last ten years.

Plans are currently underway to borrow $250,000 in 2010 to renovate and upgrade the treatment facility, install filtration, add devices to control the reservoir levels and flow paced chlorination, and install a SCADA system to allow the operator better control of the system thereby improving the performance of the plant. The addition of UV treatment will be added in future years in addition to upgrades to the intake and valve chambers.

Lister

The original water system was constructed in 1929 and underwent considerable upgrades in the 1960's and 1970's before the RDCK was involved. A significant portion of the system was re-constructed in the early 1980's when the RDCK assumed ownership. The system was paid for by federal and provincial grants with the community contribution being approximately 5% of the actual cost of the system.

The Lister water system, serving 188 connections, is currently under a Boil Water Notice and has been for many years. Although the source water quality is very good, as indicated by the turbidity sampling study results from 2004 as well as the numerous bacteriological and comprehensive test results, there is a strong potential for the water to be contaminated at the intake site because it is unprotected (no fencing in place) and at risk to wildlife contamination. In addition, there is also a significant potential to add pathogens to the water supply in high demand periods when consumption exceeds spring water production. As a result, the following improvements are under consideration for 2010 and will be paid for from the water system reserves and Provincial gas tax monies:

1. An access road to be built from Purcell Road to the intake site. The current access is gated and through property owned by the Ministry of Transportation. This access is not useable in winter months.
2. Currently there is no power at the intake. Addition of a power supply from Purcell Road. The distance to power on the existing Ministry of Transportation road is 600m. By constructing a road, this distance would be reduced to 200-300m.
3. Both ponds at the intake should be drained. There is potentially a cross connection currently in place where a pipe connected to the intake box protrudes out into the pond. In addition, during high demand times when the intake pipe draws more water than the springs produce, there is a potential for the pond water to flow back into the existing building and into the intake pipe washing potentially substantial amounts of pathogens into the system.
4. Spring #1 (Kerr Wood Leidal Associates, 1991) should be contained and collected to augment the source supply. This may be done with well casings.
5. The existing intake box is a 2-piece structure that allows water to seep from the pond, through the ground and into the joint between the two pieces. The box should be replaced with a one-piece structure that is impervious to groundwater seepage.
6. The installation of a chlorinator at the intake site is needed. A small building or trailer would be required to house this equipment.
7. A reservoir with a minimum (excluding fire flows) of 670,000L capacity is required to reliably supply water for peak demands and provide contact time for the chlorinated water.
8. The intake works site should be fenced to prevent animal and human intrusion.
9. UV treatment as an additional or alternative treatment for the water supply.

For the 2010 capital program the Commission of Management recommended a $300,000 capital budget to address items 1 to 5 and item 8 from the aforementioned list. The funding for the project would be provided through $200,000 in grant funding (gas tax) and $100,000 from existing reserves

Denver Siding

The Denver Siding water system serves 22 connections and has been on a boil water advisory since joining the RDCK in the mid-1980s, putting the members of the community at risk for water borne illness. The system source is two springs and one creek that are relatively

unprotected from rock slides and debris, exposed to animal contamination, and subject to depletion due to climate change impacts.

Given the number of users on the system, it is cost prohibitive to build a centralized water treatment plant. To reduce administrative, operation and maintenance costs, Denver Siding would benefit significantly by joining with the adjacent village community, New Denver. Prior to doing so, the following project activities will need to be undertaken to upgrade the system: construction of a pump house with backflow prevention to access water from the Village of New Denver's reservoir and the installation of 500 m of pipe to join the pump house to the existing distribution system.

Where possible, amalgamating water systems is a sustainable practice that reduces risk to our communities and the District while also providing a cost effective approach to improving water quality. In May 2009 a community poll was mailed to all Denver Siding residents regarding the potential amalgamation of the region with the Village of New Denver water system. No opposition was recorded. District Development Services staff are currently completing a Service Impact Analysis study for consideration of the Board and Village of New Denver.

Sanca

Sanca Park has approximately 28 connections but only 6 full time residents with the other 24 being seasonal residents. Water quality is typical for a creek source in the Kootenays. Sanca Creek in particular is subject to seasonal fluctuations in turbidity and has deposited substantial amounts of sand and gravel in the distribution system thus making it mandatory that some form of sedimentation/filtration be incorporated into the treatment regime. Further, the creek intake and the main supply line are currently located on private land without easements in place. Negotiations with the land owners to secure easements have not provided any feasible solutions to date. Given the small size of the system, moving to a well source is currently being explored. Achieving this is dependent on securing an easement on private property. No suitable location for this has been identified yet.

In order to improve the raw water quality, a well could be dug or drilled immediately adjacent to Sanca Creek. Although a small (30,000 imperial gallons) reservoir and a power line would be required, this approach would result in a small footprint. Going with a well instead of maintaining and improving the current creek source would likely result in achieving a turbidity reading of less than 5 NTU from the sedimentation pond as well as an NTU[13] reading of less than 1 from the well. Although IHA would likely classify the well as a GWUDI[14] well, the enhanced raw water quality would make the downstream treatment that much more effective.

Borrowing sufficient funds through the Municipal Financing Authority (MFA) to drill a well, build a small reservoir, and install a puck chlorinator will be required. By using a reservoir, the system could continue to be gravity fed and the chlorinator would satisfy IHA's requirements for a GWUDI well should it be classified as such. For members of the community that have an aversion to chlorine, residences could be outfitted with a carbon block filter for the point of use.

[13] NTU means nephelometric turbidity unit (a measure of cloudiness)
[14] GWUDI well means groundwater under the direct influence of surface water

Proposing a borrowing bylaw will trigger a poll of the local taxpayers, with a requirement of majority assent. Water system users would face an increase in water rates once the infrastructure is installed. Following that, rate increases would likely match the rate of inflation.

In summary, if a well is dug, the following must be considered:

- Infrastructure upgrades would be borne by the residents of Sanca through a combination of borrowing and contributions from reserves.
- Drilling a well comes with no guarantees but if sufficient volumes can be developed at a suitable depth then the requirement for the addition of chlorine may be waived. The alternative would be periodic flushing of the distribution system.
- If chlorine is ultimately required, it can be removed at the residences by the use of a Point of Use pleated carbon filter. This has been used successfully in other communities in the RDCK.
- A well will extend the life of the water system dramatically by not annually introducing large amounts of sand and gravel into the distribution system.
- The use of a well and a reservoir only would ensure operation and maintenance costs would remain reasonable in the years to come requiring only Cost-of-Living increases.
- This option would allow for expansion of the system thereby reducing costs for the current users.

The Sanca Park water system must get off the Boil Water Advisory. There may be other options available for treatment, but these will come with added costs. It is important that the community decides what their long range goals are so that the RDCK can put the planning in place to realize those goals.

Lucas Road

Comprised of 6 connections, the residents of the Lucas Road water system are provided potable water by the City of Castlegar through a single connection point which is metered and includes a backflow prevention unit to protect the City's water supply. The system was reconstructed and a new distribution line was installed in 1989. It was at this time that the City of Castlegar began providing potable water to the community via a 4 inch service. The distribution line is owned by the RDCK. The City of Castlegar is currently updating their Emergency Response Plan (S. Marshall, personal communication, May 25, 2009).

To reduce administrative, operation and maintenance costs, the 6 residents on the Lucas Road system would benefit in the long term by joining with the adjacent community that currently serves them with potable water, the City of Castlegar.

MacDonald Creek

In May 2002, the MacDonald Creek water system intake was damaged beyond repair by a landslide. This event necessitated an emergency connection to the Village of Kaslo water system. It was also identified at this time that the existing distribution system was inadequate for the needs of the community and required significant repairs and upgrades. With the aid of a

government infrastructure grant, the upgrades were completed and the old distribution system was replaced with a new line that connected to the Village of Kaslo's water infrastructure.

An operation and maintenance agreement has been negotiated with the Village of Kaslo (Bylaw 1871 passed January 7, 2007, Waterworks Bylaw) which establishes parameters for the operation of the system and a provision for additional future connections. The agreement can be terminated by either party by giving 18 months written notice (Bylaw 1651, McDonald Creek Water Service Establishment Bylaw).

To reduce administrative, operation and maintenance costs, the 63 current water system users (encompasses the Allen Subdivision) could benefit in the long term by joining with the adjacent community that currently serves them with potable water, the Village of Kaslo.

Duhamel

The Duhamel water system underwent upgrades in 2005 and included replacement of the well-pump, motor, and control system. Serving 91 connections, the system conforms to all current IHA standards and is not on a Boil Water Notice or Advisory. The water source is a well that has had no history of bacterial contamination. The intake area is fenced and the concrete reservoir provided limited access.

The distribution system extends through a number of privately owned properties. 8 Statutory Rights of Way (ROW) have been established between property owners and the RDCK, however, it is estimated that an additional 31 are still required (Randy Matheson, July 15, 2009) to ensure District Utilities staff can legally access all aspects of the system to perform maintenance, upgrades, or emergency works.

Ymir (Lowest Risk)

The Ymir water system was initially built in 1893 by Mr. J. Ross to supply water to the residents of the expanding mining community via the use of a 4 inch main and a 15,000 gallon wooden tank. The system now services approximately 107 connections. After a very cold winter in which the entire system froze, leaving residents without water for up to six weeks, a referendum was passed in August, 1979 and the system became an RDCK service (Bylaw 265). With the assistance of a $455,000 grant received in 1979, a large part of the main line was replaced and a concrete dam was constructed across Quartz creek to create a small intake reservoir. In early 1980 a 60,000imp/gal epoxy coated steel storage tank was constructed to provide storage for fire flow. From 1981 – 1990, sections of the distribution system that were not upgraded under the original contract were replaced in small sections until the entire town site distribution system was renewed. With the aid of two separate infrastructure grants, on December 18, 2009 a 150igal/minWater Treatment Plant was commissioned and brought on line. The intake screen was upgraded to meet current DFO standards in the summer of 2009 and there are a total of 16 fire hydrants located in the service area.

At the intake, raw water from Quartz creek is delivered to the Treatment Plant by gravity. The water enters the plant at approximately 8psi and the pressure is increased by two 5hp booster

pumps which incorporate VFD's for energy efficacy and flow control. The plant is able to run at 50igal/min, 100igal/min, and 150igal/min. The water pressure is increased in order to drive the water through the filter trains. The first component in the filter train consists of three 24"pressurized media filters which have an effluent rating of 5 micron. The second component in the filter train consists of two Harmsco Hurricane filter units that have been fitted with 3 micron nominal filters. The final stage of filtration consists of three Harmsco Hurricane filter units which are fitted with 1 micron absolute filters. Following filtration the water is processed by three R-CAN Sterilight UV units, each capable of treating up to 75igal/min. Redundancy in the UV units allows one to be serviced as the other two units stay online. Chlorine injection is the next step in the treatment process. Chlorine injected is performed by two positive displacement pumps. Redundancy in the chlorine injection pumps allows one pump to be serviced as the other pump stays in duty. The Ymir Water Plant is outfitted with a very sophisticated SCADA system to alert operators of any potential problems.

The Ymir Water Plant meets and exceeds Interior Health Authority's standard for water treatment and the 4-3-2-1-0 guidelines and in 2009 was the recipient of the following awards:

- British Columbia Water & Wastewater Association (BCWWA) award in recognition of the initiatives in the system that demonstrate outstanding efforts in the delivery of safe drinking water.
- FortisBC Powersense Conservation Leadership award in recognition of outstanding leadership in energy efficiency and innovation.
- Featured in *Watermark* magazine, *Innovation* magazine (Journal of the Association of Professional Engineers and Geoscientists of BC), and *Water & Wastes Digest* as a 2009 Top Water Project winner.

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