Halifax Water – Integrated Resource Plan

TERMS OF REFERENCE

1.0 OBJECTIVE

HRWC's objective is to develop an integrated resource plan (IRP) that identifies the long-term servicing needs for Halifax Water's water, wastewater and storm water infrastructure in a cost-effective and reliable manner. The plan will identify upgrade needs to address system reliability and safety, current and future capacity, and regulatory compliance. The Plan will consider the interrelationship of the water, wastewater, and stormwater systems. It will consider supply-side and demand-side management in addition to economic and environmental constraints of the long term servicing needs. This IRP will use a minimum 30 year planning horizon, recognizing that a longer planning horizon may be required to address some service and funding requirements.

The focus of Halifax Water's first IRP is to identify the key issues facing Halifax Water and to outline the long-term implementation plan and the necessary funding regime to support it. ***Halifax Water acknowledges that the available data and system understanding for the three infrastructure systems are at different levels and thus the IRP will need to address each to the appropriate level.***

2.0 INTEGRATED RESOURCE PLAN – APPROACH

In developing the IRP, Halifax Water will:

- Work collaboratively with the Nova Scotia Utility and Review Board (UARB) staff and consultants led by James Goldstein (Tellus Institute), and the consulting team hired by Halifax Water to assist with the IRP development;
- Use the IRP framework as described in the "Scope" section below to develop the plan;
- Coordinate the work for the IRP with other ongoing Halifax Water initiatives including the Regional Wastewater Functional Plan, the Asset Management Assessment, and the proposed Debt Study;
- Identify assumptions necessary to plan for uncertainties related to environmental compliance (e.g., changes in wastewater effluent and biosolids management regulations resulting from the Canadian Council of Ministers of the Environment (CCME) efforts, change, increasing power costs, etc.);
- Consult with stakeholders (including, but not limited to, the formal interveners in Halifax Water's 2010 rate hearing, Halifax Regional Municipality, Nova Scotia Environment, and the Urban Development Institute);
- Share information with the UARB and stakeholders (and their respective advisors) to support the planning process subject to confidentiality agreements as appropriate;
- Maintain compliance with the UARB regulatory framework;
- Maintain compliance with the environmental regulatory framework.

Halifax Water intends to engage an external consultant to provide technical assistance in the development of the IRP. Halifax Water will be leading this project and will be wholly accountable

for making substantive decisions for the IRP. Halifax Water and its consultants will work in a collaborative manner with UARB staff and consultants throughout the development of the IRP, with ongoing real-time communications regarding all aspects of the plan.

A request for qualifications is planned to shortlist the field of qualified consultants followed promptly by a request for proposals process including a detailed terms of reference outlining the necessary scope of work. Halifax Water will manage the project to ensure it stays on scope, budget, schedule and that the requirements as stipulated in the request for proposals (or as subsequently negotiated and agreed to) are delivered to our satisfaction.

This process will enable Halifax Water to develop and enhance in-house capabilities related to strategic infrastructure planning that will be invaluable in future planning and operations.

3.0 SCOPE

The IRP will consider a minimum 30-year planning horizon (2011-2040) with anticipated periodic updates. The primary components of the IRP process include:

1. Characterize current condition of the infrastructure assets, and identify information gaps.
2. Document existing capacity of infrastructure system components.
3. Develop demand forecasts for future water supply, and future wastewater and storm water flows and capacity requirements.
4. Identify jurisdictional responsibilities and policies related to overall water resources management (including water supply and extraction rates, source protection, groundwater resources, groundwater recharge practices, flood and stormwater management, flood protection, etc.).
5. Identify risks and uncertainties that may influence Halifax Water's delivery of water, wastewater and storm water services.
6. Develop a set of performance requirements (including social and environmental constraints) and criteria for prioritizing needs and evaluating the various plans.
7. Develop realistic supply-side and demand-side options to meet current supply and capacity constraints and needs, future growth, and current and projected environmental requirements.
8. Perform and document a screening analysis to determine which options are to be evaluated further in the IRP process and which can be removed from further consideration.
9. Identify all assumptions used for the IRP process including planning, forecast, and financial assumptions.
10. Develop the resource plans.
11. Evaluate the resource plans to determine the preferred alternative based on the least cost plan that meets the defined performance requirements and criteria. Least cost is defined as the lowest cumulative present worth of the annual revenue requirements.

12. Perform sensitivity analysis to determine the impacts of realistic variations to the input assumptions.
13. Identify an implementation and financing schedule for actions required over the next 3 years (through 2015) to meet demand projections as well as reliability, safety, capacity, regulatory, and environmental requirements.
14. Identify the longer-term implementation activities and estimated financing needs as currently known through the end of the planning horizon.
15. File final IRP with the UARB.

4.0 INTEGRATED RESOURCE PLAN FRAMEWORK

The proposed framework for the IRP is outlined in the following sections.

4.1 Process

The primary objective of the IRP process is to develop a plan for delivering water, wastewater, and stormwater services that minimizes the cumulative present worth of annual revenue requirements, while meeting various performance requirements and regulatory constraints.

Halifax Water will review its current modeling practices and identify future modeling programs and resources. Where current models are available, Halifax Water will use them to evaluate the developed resource plans against the IRP objective and constraints. Modeling may include financial assumptions, regulatory constraints, water demand and wastewater/stormwater flow and capacity forecasts, supply-side and demand-side options. Through the IRP, Halifax Water will identify the future program needed for management of stormwater (infrastructure, flows, capacity, flood protection, stormwater quality issues, retention/storage needs, etc). Where feasible and appropriate, Halifax Water will use sensitivity analysis to address a range of reasonable assumptions.

Halifax Water will consider technically, economically, and environmentally viable supply-side technologies including operating practices (optimizations), capital and operating costs, and operating assumptions. Halifax Water will critically assess the potential role of demand-side management (DSM) practices and review the estimated impacts on costs, demand, and capacity.

The initial IRP will be completed consistent with the data that will be available to Halifax Water within the time line of this project. Future enhancements to the IRP will improve the accuracy and detail of the outcomes.

4.2 IRP Deliverables

4.2.1 Demand and Capacity Forecasts

Existing water supply demand forecasts (e.g. average and peak) over the proposed planning horizon will be reviewed and confirmed relative to identified alternative growth scenarios and system enhancements or constraints. Effects from Halifax Water's ongoing water loss control

program will be documented. Requirements for augmenting the current water supply to meet growth projections will be reviewed if needed.

For the wastewater system, outputs from the ongoing Regional Wastewater Functional Plan (RWWFP) will provide a solid baseline concerning existing conditions and available wastewater system capacity. Different flow scenarios will be examined as outlined in the RWWFP including dry weather flows and a range of wet weather events as well as a range of antecedent conditions. Using growth projections provided by Halifax Regional Municipality (HRM), the impacts on the existing collection system capacity will be evaluated. These activities will inform Halifax Water with respect to the current state of the infrastructure from a capacity perspective and identify necessary capacity upgrades to meet regulatory compliance requirements and future growth.

The stormwater system is not currently modeled. Halifax Water's responsibility for stormwater is limited to the ownership, operation, and maintenance of the public stormwater infrastructure (pipes, ditches, and retention ponds). The Province of Nova Scotia has regulatory authority for activities affecting lakes and rivers in Nova Scotia. The Halifax Regional Municipality (HRM) has responsibility for planning and approving overall stormwater management systems and facilities, grading and drainage of subdivisions and site plans, road drainage design and implementation, and overall stormwater policy. Currently, there are limited water quality requirements in place for stormwater.

The IRP will document the existing responsibilities for stormwater and seek clarity around organizational jurisdiction for these elements on a go-forward basis. Through the IRP, the current Asset Management Assessment, and ongoing asset and data management activities, Halifax Water will identify what activities need to be undertaken to improve overall stormwater system knowledge, policy and practices. This may include activities such as (but not limited to) developing the asset inventory, conducting condition assessments, ensuring data is available in the GIS and any future work management system that Halifax Water may implement, and analysis related to overall storm system operations and optimization. In the future, Halifax Water will be participating in and relying on outputs from HRM's proposed Stormwater Management Functional Plan (SWMFP) to update and refine stormwater aspects in subsequent versions of the IRP.

At a minimum, Halifax Water will provide approximate information on length of stormwater piped systems, length of ditched infrastructure, number of driveway culverts, a high level estimate of the number of cross-culverts owned by Halifax Water, and general assumptions on condition and capacity constraints.

4.2.2 Supply-side Options

Halifax Water will identify appropriate and practical supply-side options that may include methods and technologies to reduce water production volumes, wastewater overflows, manage flood levels, strengthen standards for system expansion, and manage power consumption. In

summarizing the available options, Halifax Water will identify regulatory constraints, environmental impacts, and both capital and operating costs associated with each set of options.

The supply-side assessment may include but not be limited to the following technologies and methods:

Water
- Enhanced redundancy and optimization routing
- Leak detection surveys
- Leak reduction program
- Master meter calibration
- Water Treatment Plant operational uses
- Additional treatment capacity or upgrades
- Transmission main upgrades
- Source protection
- Strategic land management

Wastewater
- CSO / SSO management
- Optimize number and configuration of pumping stations
- Over-sizing pipes / storage
- System optimization and flow routing
- Optimize power requirements
- Additional treatment capacity or upgrades
- Regulatory upgrades
- Receiving water quality
- Strategic land management

Stormwater
- On-site reduction of run-off
- Optimization of drainage paths / corridors
- Retention / storage
- System optimization and flow routing
- Deep storm sewer installation
- Receiving water quality
- Strategic land management

4.2.3 Demand-side Options

Halifax Water will investigate demand-side management options through the IRP to reduce finished water requirements and wastewater flows. Demand-side assessment will include cost, supply and capacity needs, and usage impacts. The demand-side assessment may include but not be limited to the following technologies and methods:

Water
- Customer leak reduction
- Service meter calibration
- Non-revenue water
- Water conservation (outdoor water use reductions, xeriscaping, plumbing code modifications, water audits, etc)
- Rate incentives

Wastewater
- I/I reduction (illegal connections, cross-connections, storage, retention, water movement optimization, etc)
- Water recycling
- Rate incentives
- Lateral repairs
- Source control
- Construction standards

Stormwater
- Grading requirements
- Comprehensive controlled drainage management
- Source control
- Sediment / erosion management
- Storm water rate structure
- Construction standards

4.2.4 Screening of Supply & Demand-side Options

Where possible, Halifax Water will establish performance metrics for the supply-side and demand-side options. The options will undergo a screening test to determine whether they will advance to more detailed analysis as part of the resource plans. The screening will focus on:

- System optimization;
- System reliability;
- Redundancy and flexibility;
- Feasibility;
- Regulatory compliance;
- Need and ability to obtain regulatory approval;
- Total cost.

4.2.5 Financial Considerations

Several financial considerations will be explored in developing the various resource plans including, but not limited to:

- Impacts of declining water usage on rates and the revenue stream.
- Availability of funding assistance through federal and provincial programs.
- Timing impact of capital plan implementation (effect on budgets).
- Using rates to incent ratepayers to use conservation technologies and methods.
- Appropriate debt policy, in coordination with the UARB-approved Debt Study (underway with completion date of October 2012).
- Costs associated with additional staff, information needs, tools, and technology to support capital program growth.

4.2.6 Basic Assumptions and Plan Considerations

Halifax Water will identify the basic assumptions used for supply-side and demand-side options and system impacts related to aging infrastructure, capacity issues, regulatory compliance, and growth. These will be documented together with the proposed resource plans.

Assumptions on the appropriate level of reinvestment by each asset class will be developed and documented. Options may include conventional dig and replace as well as in-situ repairs and lining and other trenchless techniques. Opportunities to rationalize operational practices will be explored.

As a result of the Canadian Councils of Ministers of the Environment (CCME) Wastewater Strategy, new federal regulations are expected to be available in DRAFT form in the summer of 2011. Early indications are that the regulations will come into force sometime in 2012. The IRP will identify system and facility upgrades needed to comply with the new regulations.

Halifax Water follows a "cost-causer" approach to asset construction. In general, the development industry pays for and installs assets related to growth. Where there are

opportunities for over-sizing of infrastructure that benefit the larger community and customer base, Halifax Water participates in cost sharing of the assets. Using growth projections and system information and forecasts, Halifax Water can plan for future growth related assets.

4.2.7 Resource Plans Development and Integration

Using the various supply-side options demand-side options, a series of resource plans will be developed. These resource plans will be evaluated based on:

- System safety and reliability requirements;
- Robustness of the plan (i.e. the sensitivity of the plan to possible variations in the key assumptions);
- Plan resilience (i.e. the degree to which the selection of a preferred plan constrains Halifax Water's future planning options);
- Future regulatory compliance outlook;
- Financial capability.

Planning and financial scenarios will be modeled. The detailed analysis will result in a range of resource plans that meet regulatory and other requirements and will be ranked based on the net present worth of the revenue requirements.

4.2.8 Sensitivity Analysis

In completing the IRP, Halifax Water will make a variety of assumptions. Some of these assumptions may have significant uncertainty and views regarding the assumptions may differ. Consequently, Halifax Water will conduct sensitivity analyses. Least cost resource plans developed through the IRP will be evaluated for robustness by varying key assumptions across a reasonable range.

4.2.9 Final Integrated Resource Plan Report

The ultimate deliverable for the IRP will be a written report filed with the UARB. The final report will include:

1. Background information and an overview of the IRP process.
2. Forecast summaries
3. Description of the supply-side and demand-side options evaluated in the IRP.
4. Description of the screening analysis employed to determine which options would proceed to more detailed analysis.
5. Identification of the plan assumptions.
6. Description of the resource plans and the associated components.
7. Results of the model analysis for the various resource plans demonstrating the least cost plan.
8. Results of the sensitivity analysis.
9. Selection of the recommended resource plan.
10. Recommended Action Plan for the next 3 fiscal years, including capital and operating

costs to address supply and capacity projections, regulatory requirements, and environmental requirements.

11. Longer term recommendations over the planning horizon, including capital and operating costs.
12. Recommended data acquisition, modeling, and analysis required for future enhancements to the IRP.

4.3 Stakeholder Consultation

The IRP framework and resultant plan will be the foundation for Halifax Water's future investment decisions and the keystone for future iterations of integrated resource planning. Involvement of stakeholders will be an integral part of the process. In addition to ongoing information exchange, formal stakeholder consultations will be planned at the following stages.

4.3.1 Phase One

- Purpose and process for the IRP including a review of the Terms of Reference and key uncertainties.

4.3.2 Phase Two

- Model assumptions and plan considerations.
- Review of resource plans.
- Analysis results.
- Draft IRP document review.

4.4 Confidentiality

To the extent feasible, Halifax Water will present information in a fashion designed to inform and engage all stakeholders. The IRP process involves the use of confidential data concerning Halifax Water's current and future operating environments. Components include actual operating characteristics of the assets as well as strategic initiatives Halifax Water may undertake. Certain confidential information including detailed data from the modeling software may be limited to the UARB and its consultants. Summary documents will be distributed to a broader audience.

4.5 IRP Process Timeline Summary

PHASE 1	1	**Host Technical Conference 1** (Overview, Purpose, Review Terms of Reference)	March 24, 2011
	2	Receive Feedback from Technical Conference 1 (Deadline)	April 5, 2011
	3	Prepare & Submit Report to UARB - Proposed Terms of Reference (Technical Memorandum 1)	April 15, 2011
	4	Procurement of Consulting Services	June 15, 2011
	5	Baseline Review	July 20, 2011
	6	Develop Assumptions & Plan Considerations & Issue to Stakeholders	August 11, 2011
	7	**Host Technical Conference 2** (Assumptions & Plan Considerations)	August 25, 2011
	8	Receive Feedback from Technical Conference 2 (Deadline)	September 8, 2011
	9	Issue Technical Memorandum 2 (Assumptions & Plan Considerations)	September 14, 2011
	10	Develop Preliminary Resource Plans and Sensitivities & Issue to Stakeholders	October 20, 2011
	11	**Host Technical Conference 3** (Resource Plans & Sensitivities)	November 3, 2011
	12	Receive Feedback from Technical Conference 3 (Deadline)	November 17, 2011
PHASE 2	13	Issue Technical Memorandum 3 (Resource Plans & Sensitivities)	November 24, 2011
	14	Conduct Resource Plan Analysis & Issue to Stakeholders	January 19, 2012
	15	**Host Technical Conference 4** (Resource Plan Analysis)	February 2, 2012
	16	Receive Feedback from Technical Conference 4 (Deadline)	February 16, 2012
	17	Issue Technical Memorandum 4 (Resource Plan Analysis)	March 22, 2012
	18	Develop DRAFT IRP & Issue to Stakeholders	May 3, 2012
	19	**Host Technical Conference 5** (Present Draft IRP)	May 17, 2012
	20	Receive Feedback from Technical Conference 5 (Deadline)	June 7, 2012
	21	File FINAL IRP Document with UARB	June 28, 2012