

## Create Liveable Communities and Protect Stream Health: **Water Balance Model powered by QUALHYMO integrates the site with the watershed and the stream**

By

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The “new Water Balance Model” was successfully launched at the 2008 Partners Forum on February 29, 2008. Hosted by the District of North Vancouver and conducted as a Town Hall meeting in the Council Chamber, the Forum audience comprised Project Partners and Guests. The Forum was co-organized by the Inter-Governmental Partnership and the Green Infrastructure Partnership.

### **A Fully Integrated Tool**

Two hydrologic models have been merged to create a web-based tool, available at [www.waterbalance.ca](http://www.waterbalance.ca), that integrates the site with the stream and watershed:

- The **Water Balance Model for British Columbia** decision support tool was developed in 2003 by an Inter-Governmental Partnership as an extension of Stormwater Planning: A Guidebook for British Columbia (2002);

- The **QUALHYMO** (QUALity HYdrologic MOdel) continuous hydrologic simulation model was developed in the early 1980s by Dr. Charles Rowney for the Ontario Ministry of Environment, and is the tool of choice by experts in Ontario and Alberta; and

- The new Water Balance Model is a decision support tool that integrates the powerful continuous hydrologic simulation capabilities of QUALHYMO with the built-in suite of land use, low impact system, soil and local climate information, while providing a standardized presentation of calculation results. The Water Balance Model contains a host of municipal specific data regarding land use, soils, and development conditions. This allows easy entry of site-specific information to allow non-technical users to access the features of the model.

At the heart of the **Water Bal-**

**ance Model powered by QUALHYMO** is a pragmatic Stream Health Methodology which picks up where others left off in the 1990s; and incorporates the understanding gained, and the lessons learned, from experience over the past decade.

The QUALHYMO model is the hydrologic calculation engine that will provide consistent delivery of reliable results; the decision support tool will manage data so that users and reviewers can compare multiple development and land use scenarios. The significant benefit of the new Water Balance Model is the resulting emphasis on strategy and alternative implementation methodologies, as well as the focus on a multitude of design details available to achieve the desired objectives.

The desired outcome in creating the **Water Balance Model powered by QUALHYMO** is that it will be a place to get dependable answers,

a place where efficient and secure access to data, tools and methods is consolidated on an agreed common platform. Rather than expending effort re-inventing calculation methods and chasing routine data, stakeholders will focus on developing the results they seek in an accessible, flexible and proven environment that has been delivered with the features they have specified. This tool is the professional computational and communication backbone that will take us towards the sustainable reality of a greening of the built environment.

## Today's Expectations are Tomorrow's Standards

The vision for the Water Balance Model powered by QUALHYMO... as a decision support tool that bridges engineering and planning... is that it will help communities create neighbourhoods that integrate both good planning and innovative engineering designs, for overall objectives of greater sustainability, such as:

- minimal environmental impacts,
- enhanced social values,
- economic stability, and
- recreational opportunities.

The Water Balance Model powered by QUALHYMO underpins **Beyond the Guidebook: The New Business As Usual (2007)**, a provincial initiative to advance implementation of green infrastructure policies and practices throughout British Columbia. The mantra for this pro-

vincial initiative is: Today's Expectations are Tomorrow's Standards.

The desired outcomes of the program which led to the Water Balance Model powered by QUALHYMO encompass not only the computational capabilities of the tool, but extend to promoting improved land use planning practices and to influence the greening of the built environment so that stream health is protected.

The Water Balance Model powered by QUALHYMO is a tool that is simple to use, yet can provide detailed calculations needed by designers. The intelligent interface allows users with different levels of technical knowledge to benefit from its use.

## Beyond the Guidebook: The New Business As Usual

The Local Government Act vests the responsibility for drainage with municipalities, and British Columbia case law makes clear the responsibility of municipalities to manage runoff volume to prevent downstream impacts. An increasingly important corollary to that responsibility is the need to work from the regional down to the site scale, to maintain and advance watershed health to ensure that both water quantity and quality will be sustained to meet both ecosystem and human health needs.

The Local Government Act also empowers municipalities with extensive and very specific tools to pro-

actively manage the complete spectrum of rainfall events. These tools enable them to achieve watershed goals and objectives that are established under Integrated Stormwater Management Plan (ISMP) processes.

Beyond the Guidebook: The New Business As Usual builds on Stormwater Planning: A Guidebook for British Columbia and provides key guidance to the new provincial approach. Beyond the Guidebook advances a performance target methodology for correlating green infrastructure effectiveness in protecting stream health. This initiative incorporates lessons learned over the past six years in order to help municipalities establish what performance targets makes sense at the site, catchment and watershed scales.

## Runoff-Based Approach

In 2002, the Guidebook addressed the question of what could be done at the site level to protect watershed and stream health. The Guidebook emphasizes that a combination of Runoff Capture and Rate Control is necessary to mimic the hydrologic response of a healthy watershed. It is in addressing the inter-relationship between Runoff Capture and Rate Control that Beyond the Guidebook picks up where the Guidebook left off in 2002.

Our current understanding of runoff processes leads us to acknowledge that rainfall does not equal runoff, the physical processes

are complex, and applying rainfall capture targets may be overly simplistic. A more rigorous analytical methodology has been developed to resolve this conundrum.

Over the past six years, experience has shown that landscape-based measures for rainfall capture are typically low risk, especially when they reflect an understanding of how to employ soil depth and tree/vegetation coverage to best advantage. This experience has set the stage for

the next leap forward – which is to apply a ‘runoff-based approach’ to rainwater management at a watershed scale to protect stream health.

The runoff-based approach provides the analytical foundation for the Water Balance Model powered by QUALHYMO. The use of continuous simulation using long-term records to calculate runoff means that the frequencies and durations of various watershed conditions can be estimated easily.

## Conclusion

The Stream Health Methodology embedded in the Water Balance Model powered by QUALHYMO enables a watershed target to be established; it also enables the user to assess how to meet the watershed target at the site scale. In a matter of hours, any user can apply scenario modelling to assess a range of performance targets and evaluate options for achieving these targets. Previously, these analyses would have taken weeks to complete. ♦

