

Executive Summary

Since its incorporation over 100 years ago, the City of Merritt developed into a vibrant community that has grown steadily. The community has developed infrastructure over the years, using the natural resources at its disposal and at costs economically viable for a community to flourish in the BC Interior. The City's stormwater system has evolved based on a history of growth, severe events and the integration of two watercourses. It is now intertwined with the surrounding environmental elements. Infrastructure planning into the future requires an understanding of the impacts of stormwater quality and quantity to the ecological system and developing best management practices to mitigate any negative effects, while allowing development to occur.

The City of Merritt and the BC Ministry of Environment have committed to implementing an Integrated Stormwater Master Plan (ISMP) with the purpose of identifying all stormwater related issues (man-made and naturally occurring) in a manner that preserves the physical and biological values of existing watercourses and addresses a range of capital and planning needs of the community. The goals and objectives relate to the management of the natural resources within the watershed area, including aquatic and terrestrial resources, flood and erosion control, and surface and groundwater resources.

The ISMP will seek to improve the overall watershed system by preserving aquatic and riparian habitats, protecting the aquifer that lies beneath the town site, and improving the quality of the stormwater being released into the Coldwater and Nicola River.

This ISMP report is intended to provide key direction, strategies and specific actions. Prioritization of recommendations and measures are included, along with the estimated cost of implementation of the proposed recommendations. The objective of an ISMP is to monitor, develop strategies, and conceive plans to manage stormwater consistent with the planning objectives of the City of Merritt, while adhering to the ISMP Terms of Reference Template prepared by the Ministry of Environment of the Province of British Columbia. The seven steps to developing an ISMP are as follows:

1 Secure Political Interest and Support

Associated Engineering (BC) Ltd. and Summit Environmental Consultants Inc., along with sub-consultant Geo-Advice Ltd., were retained by the City of Merritt to work with Council, staff and stakeholders to complete this ISMP. This report is the first plan for the City and will, therefore, progress into the future. This report was presented to Council on March 5, 2014.

Recommendation: The City needs to formulate supporting policies as outlined in this report, including updates to development bylaws and aligning with the Official Community Plan (OCP).

2 Frame the Watershed Problems and Opportunities

The project team included a Drainage Engineer, Fisheries Biologist, Geomorphologist, Hydrogeologist, Habitat Ecologist, Water Quality Scientist and Wastewater Treatment Specialists. The team conducted individual studies in their areas of expertise. Two internal round table discussions were held to identify areas of concern and gaps in information and mapping. The project team worked with City of Merritt staff, including the project lead, technologist, operations and maintenance personnel, to identify and address many of the stormwater issues in the Nicola Valley. Base maps were developed to identify all the issues.

Recommendation: Continue to promote research and coordinate more precise information collection.

3 Develop Objectives and Alternate Scenarios

A comprehensive stormwater model was developed using InfoSWMM. The model's boundary encompassed all areas serviced by the City's drainage infrastructure and was used to identify areas of concern, or where upgrades would likely be required. Significant effort was made to confirm that the system modeled actually represented the city system. Once calibrated, alternatives and scenarios were developed to examine the system reaction to more intensive rainstorms and storm runoff routing.

Recommendation: The City's Geographical Information System (GIS) and stormwater model components should be managed as a single entity. When future modeling is performed, the updated GIS data from the City can be easily adapted into the existing model.

4 Collect Meaningful Data and Refine Scenarios

Identifying meaningful data was a significant component of this work. Research was conducted on four relevant areas:

- *Hydrogeology:* The City is underlain by the Merritt Aquifer; an unconfined, unconsolidated sand and gravel surficial aquifer, which is highly productive and under high demand. The aquifer appears to be hydraulically connected both to the Nicola and Coldwater Rivers. Any contamination that can potentially occur in the surficial aquifer will likely impact the drinking water supply of the City.
- *Natural Hazards:* A review discovered areas of slope instability, surface and river erosion, flooding, ice-jamming and land subsidence conditions that impact future stormwater planning. Areas were identified that will require future monitoring and risk mitigation.
- *Wildlife and Ecology:* Environmentally sensitive areas, relevant applicable environmental regulations and best management practices for mitigation were identified. There is limited wildlife habitat within the city center due to development. The Nicola and Coldwater Rivers riparian areas

- are heavily encroached within the City core. The impacts are significant as water temperature increases during seasonal low flows, impacting fish survival.
- **Stormwater Quality:** Historical measurements from twelve surface water sites (four Coldwater River and eight Nicola River) show exceedances for phosphorous, suggesting that conditions in both rivers occasionally become more eutrophic. There is limited detailed information available on long term water quality impacts. The review also found incidences where well water exceeded the total coliform drinking water guidelines of 1 CFU; water temperatures have exceeded 15°C; summer temperatures in the lower Coldwater River exceeded lethal limits (24°C) for salmon, trout and char; and turbidity levels sometimes exceed drinking water quality guidelines in six of the City's environmental monitoring wells.

Recommendation: The City requires more testing and information to address the need for additional water quality information from the river source, drinking water wells, and its nine stormwater outfalls. The results of this monitoring system will assist in determining the success of long term strategies and objectives being met.

5 Evaluate Alternatives and Develop Component Plans

The stormwater modeling assisted in identifying improvements to the existing stormwater system required to eliminate surface flooding (at dry wells) and pipe surcharging (within the piped system) under the 10-year storm event. The majority of these improvements were concentrated in the downtown area, including approximately 5.5 km of storm sewer upgrades and the addition of 300 m³ of stormwater storage. Other works involve over 6.4 km of localized storm sewer modifications or additions outside the city centre.

Eight future development areas identified (consistent with the OCP), do not directly trigger improvements to the existing stormwater drainage system as there is sufficient downstream capacity in the existing system to convey the 10-year flows from these new development areas.

Recommendation: The scope of this plan focused on City of Merritt stormwater requirements. River flooding of the Nicola is also a key issue in the City and should be incorporated in future modeling efforts.

6 Develop an Implementation Program

A long-term capital improvement plan (20 year) was developed to address capital, infrastructure and operational concerns. This plan was developed with the input from City planning and maintenance staff. Updates to bylaws have been recommended. To implement the ISMP over the next 20 years, the City will require capital budget and manpower allocation for the following:

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|-------------------------------------|-------------|
| • Immediate Measures (0 to 2 years) | \$ 350,000 |
| • 2-5 Year Plan | \$2,440,000 |
| • 5-10 Year Plan | \$2,900,000 |
| • Long Term (10-20 Years) | \$3,300,000 |

Recommendation: The City should develop a financial plan to implement the above projects.

7 Refine through Adaptive Management

The ISMP is an active plan and reporting process. By providing more regular and focused measurements of water quality, water temperature and stormwater flows entering watershed, downstream and within its boundaries, the City will better understand the impacts of implementing its ISMP. The capital works planning component can then be adjusted as required to meet the ever changing development needs in the community.

Recommendation: Report the results of water quality information and key objectives annually.

8 Refine through Adaptive Management

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Recommendation: Report the results of water quality information and key objectives annually.

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