



File: Golden Landfill, Columbia Shuswap Regional District, Operational Certificate 17006

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To: Brad McCandlish, Senior Environmental Protection Officer, Authorizations South,
Ministry of Environment and Climate Change Strategy

Subject: Review of Groundwater Monitoring and Protection Measures for the Golden Landfill

1 Summary

The Columbia Shuswap Regional District (the District) operates a natural attenuation landfill located in Golden, BC. The landfill has operated there since the early 1970s. The District is authorized under Operational Certificate 17006 to dispose solid municipal waste to land from residential, commercial and light industrial sources, which includes disposal of contaminated soil.

In July 2018 the Ministry of Environment and Climate Change Strategy (ENV) provided the District with a warning letter for several non-compliances, including some related to groundwater contamination. In response, last September the District submitted an Environmental Monitoring Plan (EMP). ENV reviewed the plan and provided the comments to the District. They revised the EMP and recently resubmitted it along with an updated Design, Operations and Closure Plan (DOCP). The objectives of this review are to evaluate the groundwater monitoring components in the EMP and groundwater protection measures in the DOCP.

This review concludes that the revised EMP incorporates most of the recommendations provided by ENV. The recommendation to complete an additional groundwater investigation will be revisited after two more years of increased water level and chemistry monitoring, and new isotope sampling. This approach is deemed adequate, since it is expected to improve the groundwater conceptualization at the landfill, especially the source-pathway linkages. Several suggestions are provided in this review to improve the final EMP.

The updated DOCP describes numerous leachate management measures aimed to protect groundwater, including several conceptual options for leachate disposal and landfill cover. These designs should be finalized in the next DOCP.

2 Background

The Golden landfill is located about a kilometer north of the Town of Golden and the Kicking Horse River. Topographically located on a valley flank above the town, the landfill is underlain by glacial drift and sedimentary bedrock. The water table is mostly found in the upper bedrock horizon and its inferred flow direction is southwest towards the river. Directly downslope from the landfill the depth to bedrock drastically increases as it forms a steep valley, which is filled by glacial outwash. A provincially mapped Aquifer 456, which provides the town's drinking water, is contained in the outwash.

As noted above, in 2019 the District responded to a warning letter from ENV regarding groundwater contamination at the landfill. That response was reviewed by ENV last fall and a meeting between ENV

and the District was held in December to develop a path forward. Based on that meeting the District revised the EMP and resubmitted it along with the DOCP. The two plans propose groundwater monitoring and protection efforts, which are reviewed in the next two sections of this document.

2 Review of EMP

The revised EMP incorporates most of the recommendations that were made by ENV. The recommendation to complete an additional groundwater investigation is addressed in the EMP as follows. In order to provide an insight into the groundwater flow and chemistry at the landfill, the District commits to two more years of water level and chemistry monitoring at increased frequency (quarterly) and an annual isotope sampling. The EMP is also proposing to improve the groundwater monitoring network by completing a geodetic elevation survey and installation of pressure transducers to automatically record continuous water levels at select monitoring wells. All these proposals should improve the source-pathway linkages at the landfill. By the end of 2021, additional investigations, including the installation of new monitoring wells, will be considered if the groundwater monitoring indicates exceedances of drinking water standards at concentrations considered above the background.

This review concludes that the revised EMP is improved. The following observations should be considered in the final EMP:

- **Section 2.1.2 Groundwater Monitoring**

The quarter one sampling event, which targets peak freshet water levels, is scheduled for March. That seems early in the freshet. Unless that timing is supported by water levels at the landfill, a later part of the freshet (April or early May) may be better to capture the peak levels. This suggestion is based on a survey of water levels from the provincial observation wells located in the southeast B.C., as well as the time lag due to the relatively large unsaturated zone below the landfill.

The language in the EMP about the use of pressure transducers should be strengthened. Rather than “[transducers] would be helpful”, the EMP should specify which select monitoring wells will be equipped with the transducers.

- **Section 4.1 Trigger-Response Actions**

The EMP describes actions to be implemented if groundwater monitoring results indicate exceedances of drinking water standards. Missing is the need to notify any neighbouring properties of likely or actual migration of substances from the landfill.

- **Section 4.3 Reporting**

The EMP should specify the due date for the next 5-year monitoring report.

3 Review of DOCP

The DOCP provides several water management and engineering measures aimed at protecting groundwater. These include installation of daily and intermediate covers over exposed refuse, progressive installation of final covers, and non-contact surface water diversions. In terms of the leachate

management, installation of liners and leachate collection systems are proposed below new development phases. The conceptual leachate disposal options include its discharge to the town's sewer system, leachate recirculation and/or onsite treatment. Onsite disposal of leachate will require authorization.

For the final cover design, the DOCP is proposing a cover system without the use of a geomembrane liner. Rather, the conceptual cover design consists of, in part, a mineral soil with a hydraulic conductivity on the order of 10^{-5} cm/s. The 2016 Landfill Criteria states that such conductivity value is suitable for landfill covers in arid regions, which the Golden area is not. Hence, lower conductivity value (e.g. 10^{-7} cm/s) of the cover material would be more protective. Ultimately, the final cover design should be informed by future landfill performance and environmental monitoring assessments, as well as the expected post-closure leachate generation rates. Accordingly, the final closure components should be detailed in the future DOCP updates, which are required every five years.

4 Closure

I hope you find this document is useful. Should you have any questions please contact me at 250-751-7056 or Rusto.Martinka@gov.bc.ca.

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