

4 Natural Hazards

4.1 Flooding Hazards

Laurel Creek borders the Erbsville South study area on three sides; flowing from the west and moving north along the western study area boundary, crossing the western end of Schnarr Street then flowing eastward along the rear property line of the residential lots on Schnarr Street, crossing Erbsville Road, then turning south along the eastern boundary of the study area before continuing its journey eastward towards the Laurel Creek Reservoir. Existing floodlines for Laurel Creek have been calculated and mapped by the Grand River Conservation Authority and are shown on Figure 4.1. It should be noted that the Hamlet of Erbsville has been identified as a Flood Damage Centre as during a Regional Storm runoff will overtop Conservation Drive and Erbsville Road above elevation 349.9m. Therefore as a management target regional storm peak flows and flood levels must be maintained or reduced wherever possible.

Floodline mapping for Wideman Creek was originally prepared by Paragon Engineering and updated as part of the Final Subwatershed Management Plan #313 and #309 (SWP). Modelling was completed using the HEC-2 hydraulic program, which computed the backwater profile of Wideman Creek from its confluence at Laurel Creek to its upstream limit approximately 750m west of Erbsville Road. The model included the existing culvert crossing at Erbsville Road, which is a 1.83m span by 1.12m rise corrugated steel pipe.

The existing Regulatory storm peak flow for Wideman Creek at the confluence with Laurel Creek was determined to be 10.4 m³/s, based on the GAWSER model completed for the SWP. The Regulatory storm peak flow is based on the Regional storm event (Hurricane Hazel). The resulting backwater flood elevation of 350.52m at Erbsville Road will cause water to spill from Wideman Creek towards Laurel Creek to the west based on the limited capacity of the existing Erbsville Road culvert to convey Wideman Creek Regulatory storm peak flow.

A detailed topographic survey was completed in June 2016 to determine the spill elevation between Laurel Creek and Wideman Creek. The survey confirmed that the spill elevation is at elevation 349.40m, located approximately between Laurel Creek river stations 211 and 212.

Given that the spill from Wideman Creek occurs upstream of the Hamlet of Erbsville recommendations in the Final Subwatershed Management Plan #313 and #309 (SWP) included investigating the potential increase of the size of the culvert under Erbsville Road to convey the entire Regional storm peak flow and thereby reduce the Wideman Creek floodplain depth, reduce or eliminate the spill towards Laurel Creek, and also allow a portion of the Laurel Creek flows to spill toward Wideman Creek.

The simulation of a new culvert was completed using the latest HEC-RAS hydraulic model (version 4.1.1). The updated model connected the Wideman Creek branch to the Laurel Creek branch (Laurel Creek modelling files provided by the GRCA), and included a proposed 6.10m span by 2.44m rise concrete arch culvert at Erbsville Road. The spill was incorporated into the revised HEC-RAS model (included as a lateral structure), and as a result, the Regulatory storm peak flow for Wideman Creek increased from 10.4 m³/s to 21.1 m³/s to account for the additional flow as a result of the spill from Laurel Creek. Therefore, the proposed HEC-RAS model accounts for the entire Regional storm peak flow from Wideman Creek, and from the spill from Laurel Creek, and the proposed culvert will have the capacity to convey this flow without Erbsville Road overtopping. Peak flows for Wideman Creek for the 2 year, 5 year, 10 year, 25 year, 50 year, and 100 year storm events were also included in the proposed model, and are based on Table B2.2 in the SWP.

The existing (HEC-2) and proposed (HEC-RAS) Regulatory floodline elevations are provided in Table 4.1. The HEC-RAS modelling confirms that the proposed culvert will have the capacity to convey the entire Regulatory storm peak flow under Erbsville Road without overtopping, and reduce the Regulatory floodline elevations upstream of Erbsville Road.



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Figure 4-1 Laurel Creek and Wideman Creek Floodlines]

Table 4.1: Regulatory Floodline Elevations for Wideman Creek (Upstream of Erbsville Road)

Cross- Section	Existing Floodline Elevation HEC-2 (m)	Proposed Floodline Elevation HEC-RAS (m)	Change (m)
7 (formerly 3)	350.51	349.99	-0.52
8 (formerly 4)	350.52	350.01	-0.51
9 (formerly 5)	350.52	350.21	-0.31
10 (formerly 6)	350.52	350.40	-0.12
11 (formerly 7)	350.52	350.43	-0.09

The preliminary design of the proposed new culvert is shown on Figure 4.2. The culvert is proposed to be a 6.10m span by 2.44m rise concrete arch section, and will include an open bottom to benefit aquatic resources and small wildlife. Although Figure 4.2 only shows one bench for wildlife passage the width of the opening will permit benches on both sides of the watercourse without hindering base flows. The proposed conditions Regulatory storm floodline based on the upgraded culvert and the proposed 2 year storm floodline are mapped on Figure 4.1.

The reduction in floodline elevations due to the proposed culvert for frequent storm events (i.e., 2 year storm) is less than 0.10m at all cross-sections, and is therefore not considered to be significant. Since the HEC model uses a backwater analysis calculating in a downstream to upstream direction, there are no impacts on computed floodlines downstream of the proposed new culvert. The final engineering drawings of the culvert should include erosion protection features for the upstream and downstream interfaces with Wideman Creek, and should accommodate requirements for wildlife passage. The complete HEC-RAS output for all cross-sections and storm events is provided in Appendix 4.

4.2 Erosion Hazards

Within the study area the topography is generally low lying with no areas of steep slopes. Consequently erosion hazards relating to steep slopes are not an issue. Both Laurel Creek and Wideman Creek are stable under existing conditions, which is consistent with the findings of the Final Subwatershed Management Plan #313 and #309. Further discussion is found in Section 3.3.

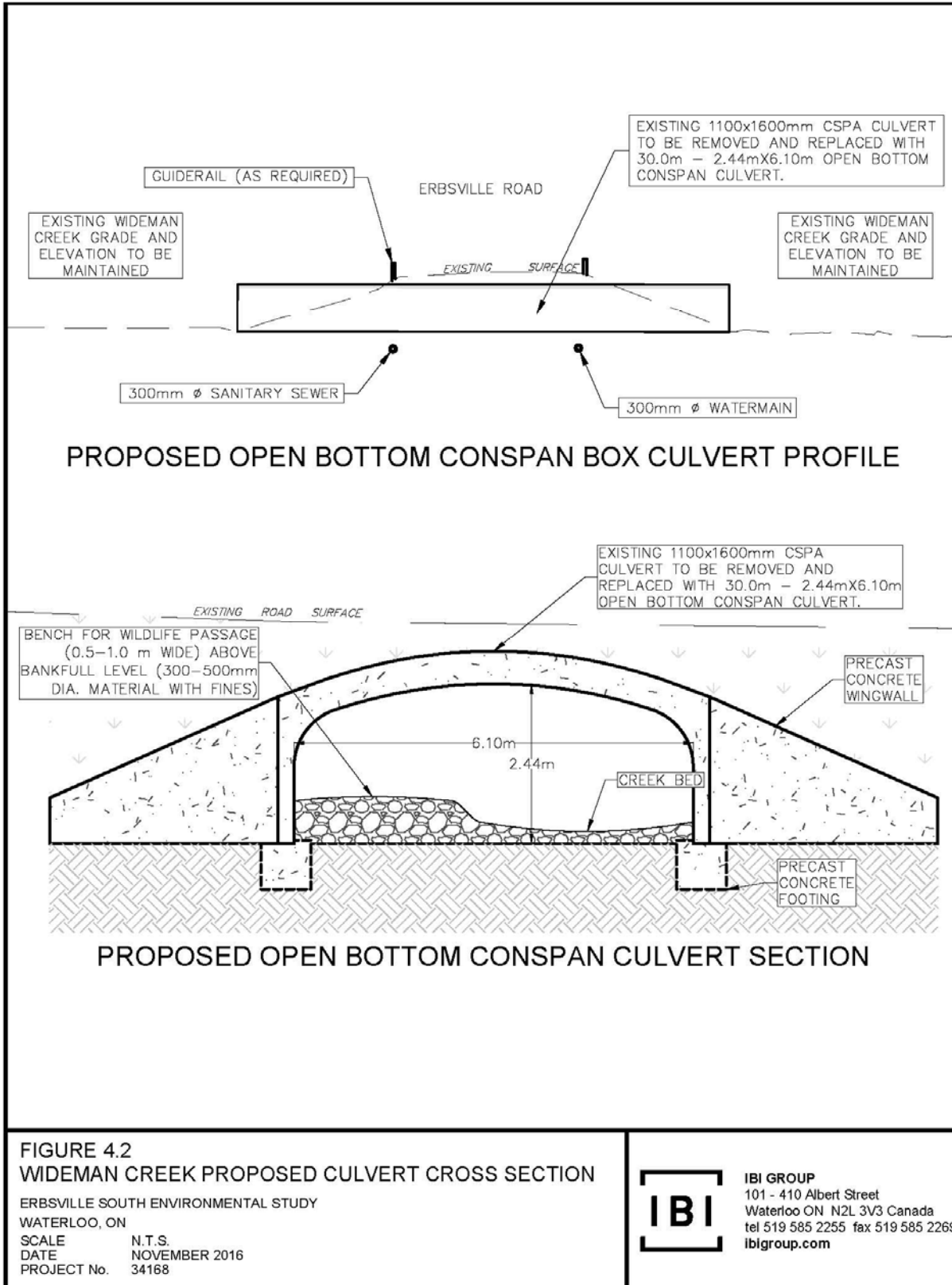


Figure 4-2 Wideman Creek Proposed Culvert Cross Section