

January 25, 2017
TBTE Ref. No. 16-138

Andrew DeSira | Foundation Engineer
Ministry of Transportation | Materials Engineering and Research Office (MERO)
145 Sir William Hearst Avenue, Building C, Room 223
Downsview ON Canada, M3M 0B6

RE: SLS and ULS Recommendations for Closed Bottom Culvert
Proposed Culvert Replacement
Un-named Creek, Township of Vasiloff
GWP 5119-06-00, Highway 17

TBTE has been requested to review the ULS and SLS recommendations for a closed bottom culvert at Un-named Creek. TBTE was provided drawing Sheet 23 General Arrangement dated January 2019. Based on the information provided in this drawing the ULS and SLS design values have been re-evaluated. It is understood that the provided gross ULS value and net SLS values provided in the report do not satisfy the requirements of the structural designer.

The revised gross ULS and gross SLS values are subject to the following. A resistance factor of 0.5 has been applied for the estimation of the factored geotechnical resistance at ULS. Settlements for SLS have been estimated assuming a uniform pressure distribution. A resistance factor of 0.8 has been applied.

Geotechnical gross resistance at ULS and gross geotechnical reactions at SLS for closed bottom culverts founded on a compacted granular pad are provided below, and are subject to the following conditions:

- A minimum depth of cover 0.3 m (depth of soil to the underside of the foundation) must be provided.
- Concrete box culvert supplied in 5 m length segments with inside dimensions of 3x3 m.
- The box culvert will be placed on a minimum 375 mm thick pad consisting of compacted Granular "A".
- Culvert invert of 406.8 m.

**Table 1: Geotechnical Resistances and Reactions
Closed Bottom Culvert**

Effective Culvert Dimensions (m)	Compacted Granular A Pad, Minimum Thickness (m)	Min. Depth of Cover to Underside of Footing (m)	Factored Gross Geotechnical Resistance, ULS (kPa)	Factored Gross Geotechnical Reaction, SLS (kPa) for 25 mm settlement
3H x 3W x 5L	0.375	0.3	180	175

Please contact us if you have any questions or comments.

Yours truly,
For TBT ENGINEERING LIMITED



Steven Seller, P.Eng.
Designated MTO Foundations Contact



Gordon Maki, P.Eng.
Senior Geotechnical Engineer