

M-110 (Structure No.), EM-WC-80 (Watercourse Crossing No.), EM-41 (Foundation Report No.)  
94 m long, 3 m span 1.8 m rise precast concrete box culvert, Wilmot Creek Culvert

Boreholes	HFE 11-1	DCE8-1
Ground Surface	221.8	231.5
End of Borehole	215.2	214.6
Elev. WL (open borehole)	221.8	Dry
Elev. WL (piezometer)	n/a	n/a
SPT N ≥ 50	n/e	229
SPT N ≥ 100	n/e	229
Top of hard/dense till	218	230
Boulders below*	n/e	Cobbles and boulders 226-225
Base of TS**+L/S**+Fill	221.4	231
Embankment Height	6 m (o.g is at elev. 220 m and highway finish grade is at elev. 226 m)	

\*glacial tills inherently contain cobbles and boulders (n/e: not encountered in borehole), \*\*L/S: loose soil, TS: topsoil

General Descriptions

It is our understanding that M-110 structure was removed for preliminary design and no borehole was drilled for this structure. We prepare this memorandum for the completion of project only and our recommendations are based on only available information (such as boreholes drilled in the vicinity or geological information) and our recommendations may not be reliable. Our recommendations should be verified during detail design stage with additional investigation. The above cited boreholes are drilled for deep cut and high fill sections nearby the site and closest borehole (HFE11-1) is about 200 m away from this culvert site.

Foundation Recommendations

- According to GA drawing, precast concrete box culvert will be placed at elev. 221 m (inlet side) and elev. 219 m (outlet side). A geotechnical resistance (factored)/reaction of 300 kPa at ULS and 200 kPa at SLS (for less than 25 mm total settlement) should be available on compact to dense native soils (such compact/dense materials are available below elev. 220 m based on Borehole HFE 11-1, if this is representative of the site condition) and geological information (glaciolacustrine deposit or Newmarket till).
- Minimum 75 mm granular bedding is required as a levelling course.
- Coefficient of friction (ultimate, unfactored) 0.5 can be used between concrete culvert and granular bedding.
- Excavation should be carried out in accordance with OHSA.
- Unwatering and dewatering will be required for culvert installation depending on the creek water level at the time of construction.
- Cut off wall or apron should be provided to minimize seepage underneath the culvert.
- Proper erosion protection should be provided for side slopes.

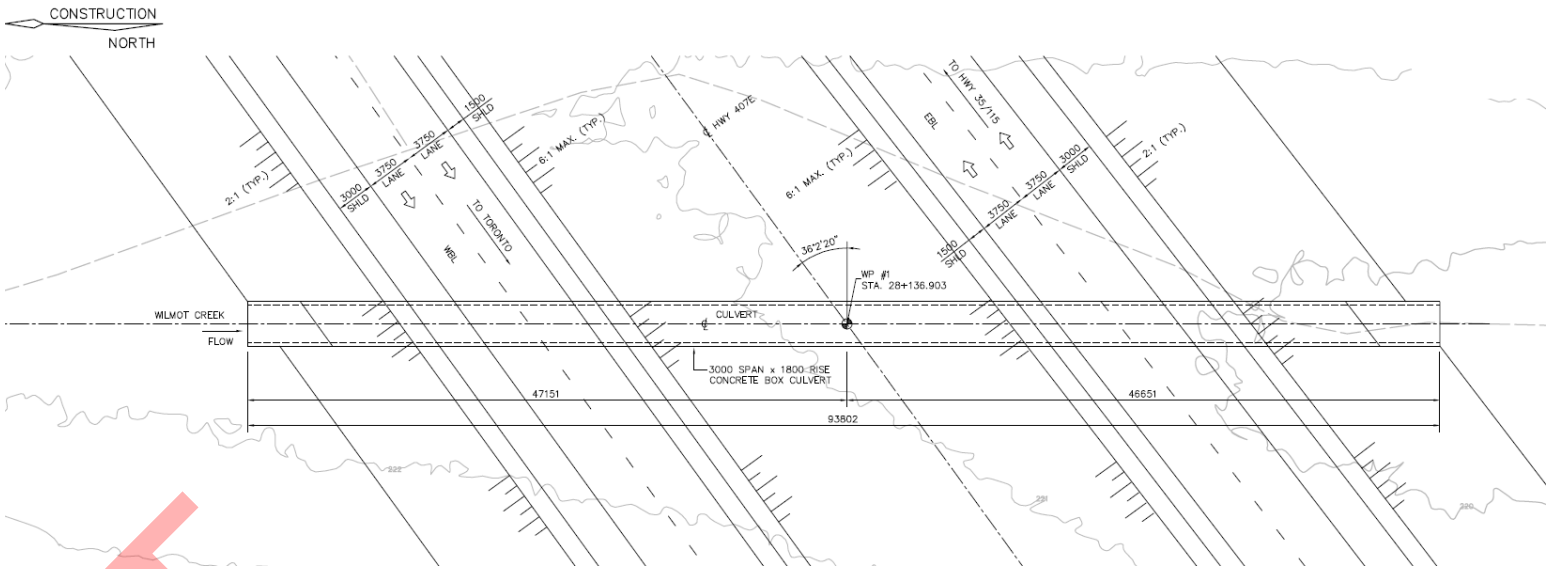
Embankment

- Provided all the topsoil and loose/soft surface soils are removed, anticipated ground settlement under 6 m high embankment will be about 35 mm\* (i.e. immediate settlement).
- Embankments up to 6 m in height are anticipated to be stable at side slope configuration of 2H:1V using SSM or better material with proper construction quality control and regular slope maintenance.

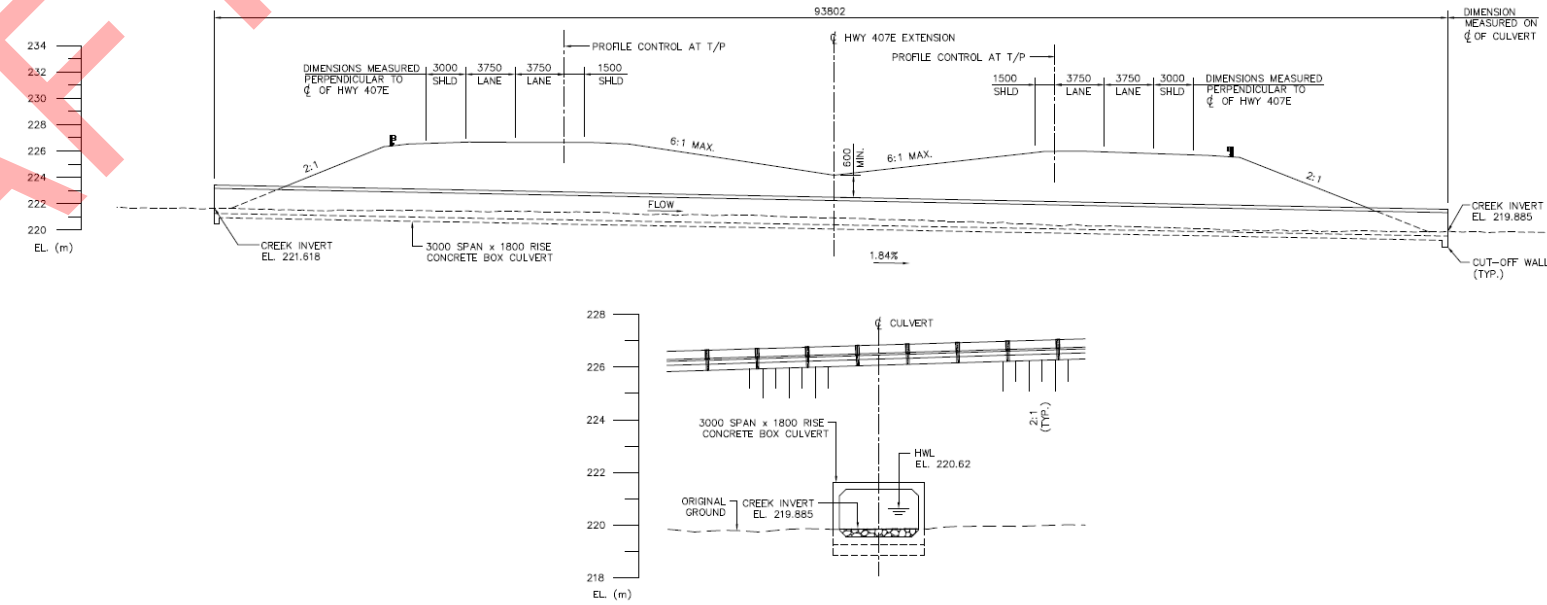
\*Aforementioned settlements are ground settlement only for preliminary design purposes and embankment settlement itself should be considered separately (typically 1-2% of embankment height depending on the fill material and construction quality control).

Remarks and Value

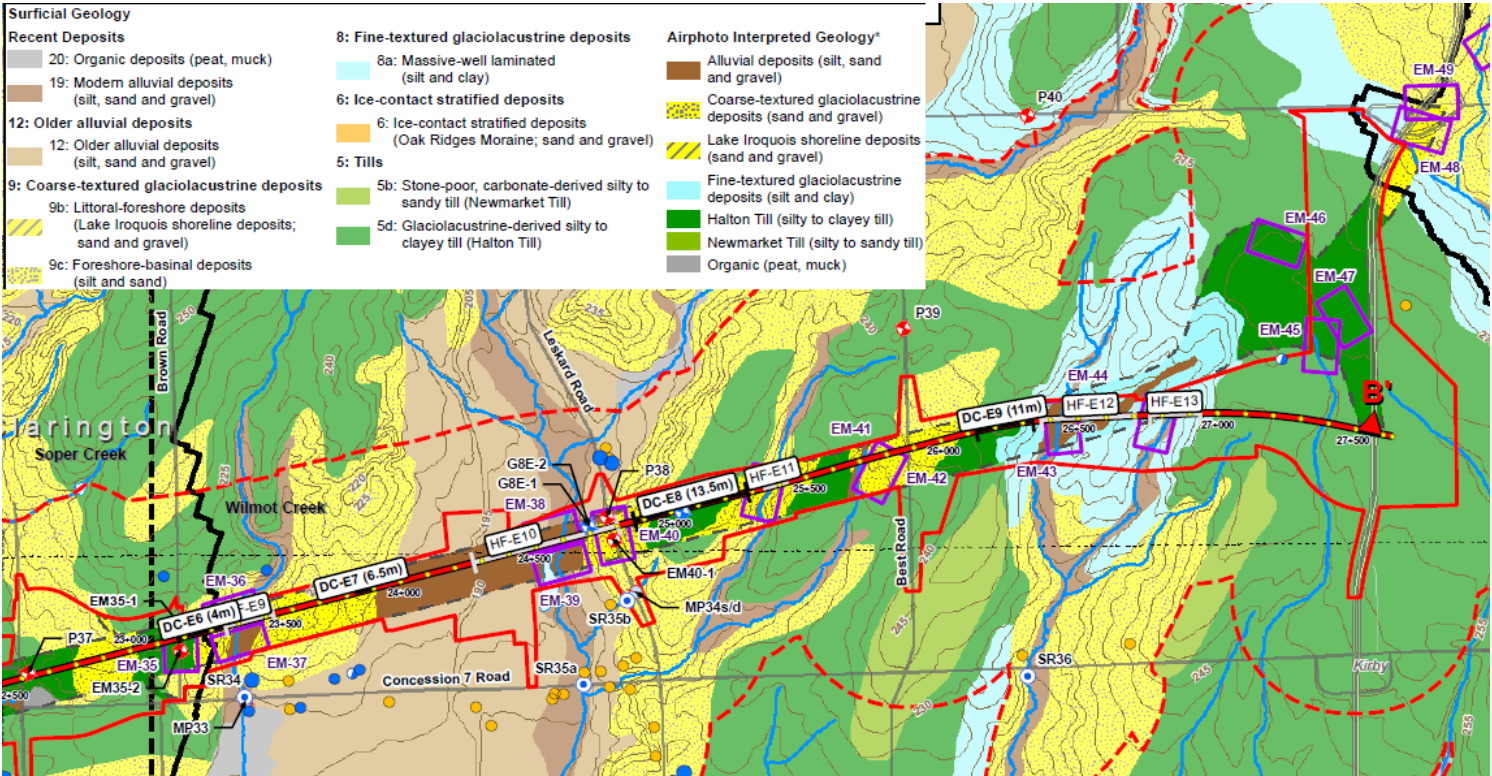
- Dewatering and unwatering should be discussed with local conservation authority.



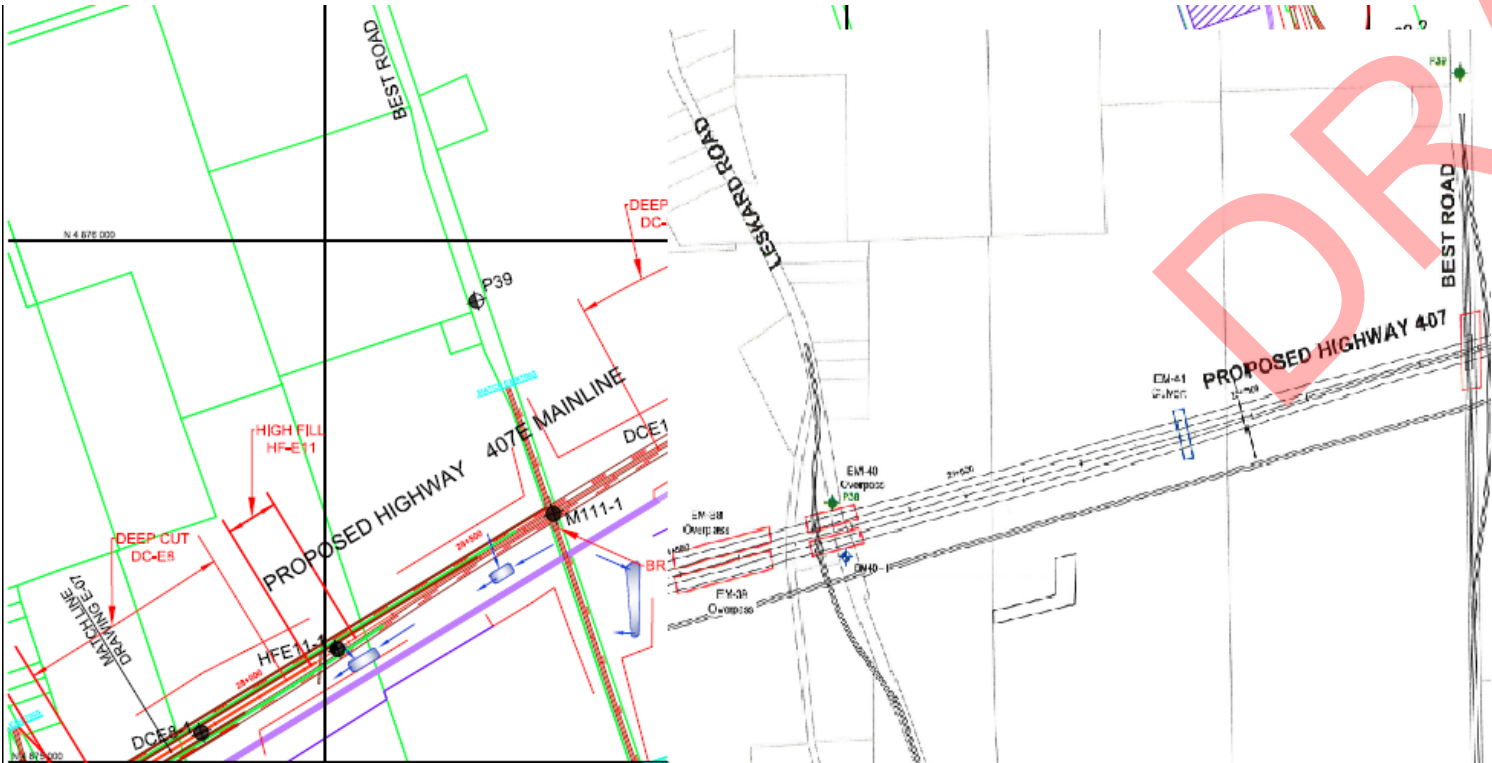
Structural Plan




Structural Section




Local Geology



Borehole Location Plan





RECORD OF BOREHOLE No HFE11-1

1 of 1

METRIC

W.O. 07-20017

LOCATION Coords: 4 875 217.1 N ; 374 023.5 E

ORIGINATED BY F.P

DIST Durham

HWY 407E











BOREHOLE TYPE Continuous Flight Solid Stem Augers

COMPILED BY A.D.

DATUM Geodetic

DATE March 27, 2013

CHECKED BY G.D.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH KPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W <sub>p</sub> NATURAL MOISTURE CONTENT W LIQUID LIMIT W <sub>L</sub> WATER CONTENT (%)	UNIT WEIGHT Y KN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
221.8	Ground Surface										
0.0	Topsoil		1	SS	9						Surface runoff into borehole
221.4	Sand with silt, trace clay		2	SS	7						
0.4	Loose to compact Brown Moist		3	SS	21						0 73 25 2
219.1	Silty sand, trace clay		4	SS	23						
2.1	Compact to Brown Wet very dense		5	SS	15						
			6	SS	61						
			7	SS	28						0 61 32 7
											
			8	SS	34						
215.2	End of borehole										
6.6											