

August 2, 2011

PML Ref.: 06TF035A
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Mr. Francois Doyon, P.Eng.
Project Manager
McCormick Rankin Corporation
2655 North Sheridan Way
Mississauga, Ontario
L5K 2P8

Dear Mr. Doyon

Technical Memorandum No. Sett-35A-1
Addendum to Foundation Design Report
Culverts C36, C36A, C48N, C48S, C52, C54, C56, C57 and C62A
Highway 69 Four-Laning, Phase 1
From 2.9 km North of Highway 607 to 4.5 km North of Highway 64
G.W.P. 5206-06-00 (Part of G.W.P. 5378-02-00)
Township of Bigwood and Delamere
Sudbury Area, Ontario

This technical memorandum reports the recalculated rockfill settlements under the culverts of the Phase 1 section of the Highway 69 four-laning project from 2.9 km North of Highway 607 to 4.5 km North of Highway 64. The settlements were recalculated in accordance with the MTO Memorandum dated April 12, 2010 titled "Post-Construction Rock Fill Settlement and Guidelines For Estimating Rock Fill Quantity" and are provided in Table 2, appended.

As a result of the settlement recalculations and analyses, the minimum recommended preloading periods and the recommendations for the installation of the culverts were revised from those in the Draft Foundation Design Report (PML Ref. No. 06TF035A dated May 3, 2010, GEOCRE No. 41I-257). Consequently, the settlement under the culverts and recommendations for the installation of culverts should be referred to the attached Table 2.

This technical memorandum was prepared by Mr. Grigory Degil, MSc, PhD, P.Eng. and Mr. C.M.P. Nascimento, P.Eng., Senior Project Engineer. Mr. B. R. Gray, MEng, P.Eng., MTO Designated Principal Contact, conducted an independent review of the document.



We trust that the foregoing is sufficient for your present requirements.

Sincerely

Peto MacCallum Ltd.



Grigory Degil, MSc, PhD, P.Eng.
Senior Engineer



Carlos M.P. Nascimento, P.Eng.
Senior Project Engineer



Brian R. Gray, MEng, P.Eng
MTO Designated Principal Contact

GD/CN/BRG:nb-nk

Enclosure(s):

Table 2 – Estimated Settlement of Soils under Proposed Culverts

Distribution:

- 3 cc + 1 digital copy: MRC for distribution to MTO, Project Manager
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TABLE 2
ESTIMATED SETTLEMENT UNDER PROPOSED CULVERTS
AS PER THE MTO "POST-CONSTRUCTION ROCK FILL SETTLEMENT AND GUIDELINES
FOR ESTIMATING ROCK FILL QUANTITY" (APRIL 12, 2010)

CULVERTS	LOCATION	RECOMMENDED SWAMP TREATMENT AT CULVERT (ORGANIC SOILS TO BE EXCAVATED IN ALL SWAMPS)	ROCKFILL OR NATIVE SOIL (NS) THICKNESS BELOW CULVERT INVERT LEVEL (m)	SETTLEMENT UNDER CULVERT (mm)					REVISED RECOMMENDATION AND REMARKS
				TOTAL (Note 1)	DURING 6 MONTHS FOLLOWING FILL PLACEMENT	DURING 12 MONTHS FOLLOWING FILL PLACEMENT	REMAINING SETTLEMENT AFTER 6 MONTHS	REMAINING SETTLEMENT AFTER 12 MONTHS	
C36 (NBL) west end	Sta. 17+710 (Bigwood Township) Swamp 109	Pavement rehabilitation	9.0 (NS)	0	N/A	N/A	N/A	N/A	Culvert may be installed during pavement rehabilitation
C36 (NBL) east end			7.5 (NS)						
C36 (SBL) west end	Sta. 17+710 (Bigwood Township) Swamp 109	Full excavation of compressible soil and preloading for 6 months (Note 2)	3.0	36	27	30	9	6	Culvert may be installed after 6 months following fill placement
C36 (SBL) east end			6.5	111	88	98	23	13	
C36A (NBL) west end	Sta. 17+985 (Bigwood Township) Swamp 108	Pavement rehabilitation	1.0 (NS)	0	N/A	N/A	N/A	N/A	Culvert may be installed during pavement rehabilitation
C36A (NBL) east end			7.5 (NS)						
C36A (SBL) west end	Sta. 17+985 (Bigwood Township) Swamp 108	New road construction over bedrock outcrop	Bedrock/ granular fill	Negligible settlements anticipated					Culvert to be constructed on granular fill placed on bedrock
C36A (SBL) east end									



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CULVERTS	LOCATION	RECOMMENDED SWAMP TREATMENT AT CULVERT (ORGANIC SOILS TO BE EXCAVATED IN ALL SWAMPS)	ROCKFILL OR NATIVE SOIL (NS) THICKNESS BELOW CULVERT INVERT LEVEL (m)	SETTLEMENT UNDER CULVERT (mm)					REVISED RECOMMENDATION AND REMARKS
				TOTAL (Note 1)	DURING 6 MONTHS FOLLOWING FILL PLACEMENT	DURING 12 MONTHS FOLLOWING FILL PLACEMENT	REMAINING SETTLEMENT AFTER 6 MONTHS	REMAINING SETTLEMENT AFTER 12 MONTHS	
C48-N west end	Sta. 21+312 (Bigwood Township) Swamp 106	Full excavation of compressible soil and preloading for 6 months	1.0	12	9	10	3	2	Culvert may be installed after 6 months following fill placement
C48-N east end			4.5	55	41	45	14	10	
C48-S west end	Sta. 21+415 (Bigwood Township) Swamp 106	Full excavation of compressible soil and preloading for 6 months (Note 2)	6.0	102	81	90	21	12	Culvert may be installed after 6 months following fill placement
C48-S east end			7.5	130	103	115	27	15	
C52 (NBL) west end	Sta. 11+070 (Delamere Township) Swamp 104	Pavement rehabilitation	1.5 (NS)	0	N/A	N/A	N/A	N/A	Culvert may be installed during pavement rehabilitation
C52 (NBL) east end			0						
C52 (SBL) west end	Sta. 11+070 (Delamere Township) Swamp 104	Full excavation of compressible soil and preloading for 6 months	1.0	12	9	10	3	2	Culvert may be installed during embankment construction
C52 (SBL) east end			1.5	20	14	16	6	4	
C54 (NBL) west end	Sta. 11+555 (Delamere Township) Swamp 103	Pavement rehabilitation	2.0 (NS)	0	N/A	N/A	N/A	N/A	Culvert may be installed during pavement rehabilitation
C54 (NBL) east end			7.0 (NS)						
C54 (SBL) west end	Sta. 11+555 (Delamere Township) Swamp 102	Full excavation of compressible soil and preloading for 6 months (Note 2)	1.0	12	9	10	3	2	Culvert may be installed during embankment construction
C54 (SBL) east end			2.0	24	18	20	6	4	



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CULVERTS	LOCATION	RECOMMENDED SWAMP TREATMENT AT CULVERT (ORGANIC SOILS TO BE EXCAVATED IN ALL SWAMPS)	ROCKFILL OR NATIVE SOIL (NS) THICKNESS BELOW CULVERT INVERT LEVEL (m)	SETTLEMENT UNDER CULVERT (mm)					REVISED RECOMMENDATION AND REMARKS
				TOTAL (Note 1)	DURING 6 MONTHS FOLLOWING FILL PLACEMENT	DURING 12 MONTHS FOLLOWING FILL PLACEMENT	REMAINING SETTLEMENT AFTER 6 MONTHS	REMAINING SETTLEMENT AFTER 12 MONTHS	
C56 (NBL) west end C56 (NBL) east end	Sta. 12+780 (Delamere Township) Swamp 101	No preloading required	~0	0	N/A	N/A	N/A	N/A	Culvert to be constructed on granular fill placed on bedrock
			3.0 (NS) granular fill proposed	Negligible settlements anticipated					
C56 (SBL) west end C56 (SBL) east end	Sta. 12+780 (Delamere Township) Swamp 101	Preloading for 6 months	Bedrock / granular fill	Negligible settlements anticipated					Culvert to be constructed on granular fill placed on bedrock
C57 (NBL) west end C57 (NBL) east end	Sta. 13+005 (Delamere Township)	Pavement swamp/bedrock outcrop	Bedrock/ granular fill	Negligible settlements anticipated					Culvert may be installed during embankment construction
			1.0 (NS)	10	10	10	0	0	
C57 (SBL) west end C57 (SBL) east end	Sta. 13+023 (Delamere Township)	Pavement swamp/bedrock outcrop	1.0	12	9	10	3	2	Culvert may be installed during embankment construction
			Bedrock/ granular fill	Negligible settlements anticipated					
C62A (NBL) west end C62A (NBL) east end	Sta. 13+938 (Delamere Township)	Pavement swamp/bedrock outcrop	~0	Negligible settlements anticipated					Culvert may be installed during embankment construction
			0.5 (NS)						
C62A (SBL) west end C62A (SBL) east end	Sta. 13+938 (Delamere Township)	Pavement swamp/bedrock outcrop	Bedrock/ granular fill	Negligible settlements anticipated					Culvert may be installed during embankment construction

- NOTE: 1. Magnitude of settlements due to compression of cohesionless soils were ignored because these will occur during the construction period.
2. Full excavation will be carried out along culvert alignment although a maximum excavation to 5 m depth was recommended at the median, in view of the local inferred bedrock/competent soil levels.