TABLE 1

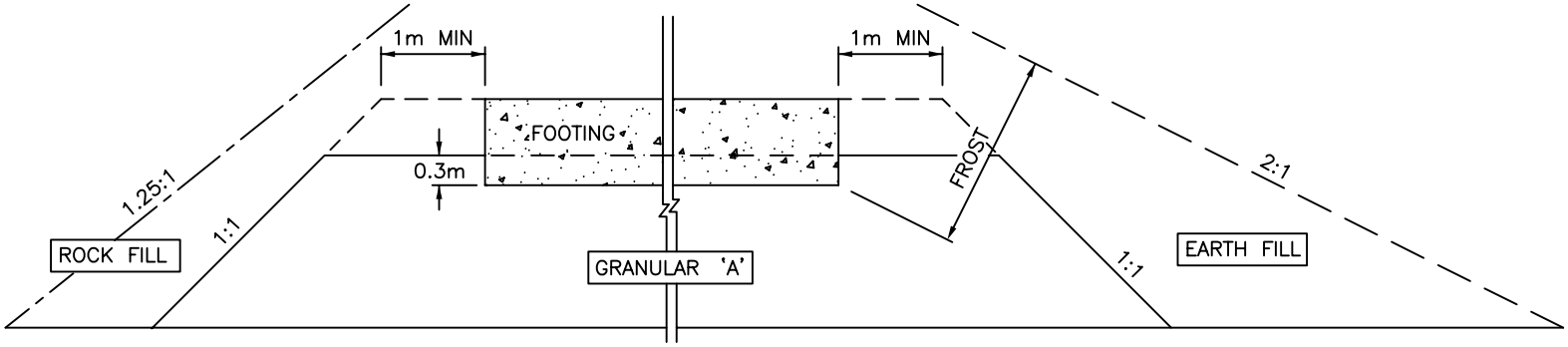
LIST OF STANDARD SPECIFICATIONS REFERENCED IN REPORT

DOCUMENT	TITLE
OPSS 120	General Specification for the Use of Explosives
OPSS 501	Construction Specification for Compacting
OPSS 571	Construction Specification for Sodding
OPSS 572	Construction Specification for Seed and Cover
SP 105S10	Construction Specification for Compaction
SP 206S03	Construction Specification for Grading
SP 405F03	Construction Specification for Pipe Subdrains
SP 902S01	Excavation and Backfilling of Structures
SP 999S26	Requirements for Design, Installation and Testing of Temporary and Permanent Pre-Stressed Anchors in Soil and Rock
OPSD 201.020	Rock Grading-Divided Rural
OPSD 202.010	Slope Flattening Using Excess Material on Earth or Rock Embankment
OPSD 208.010	Benching of Earth Slopes
OPSD 3101.150	Minimum Granular Backfill Requirements - Abutments
OPSD 3101.200	Rock Backfill Requirements - Abutments
NSSP	Dowels Into Concrete

TABLE 2

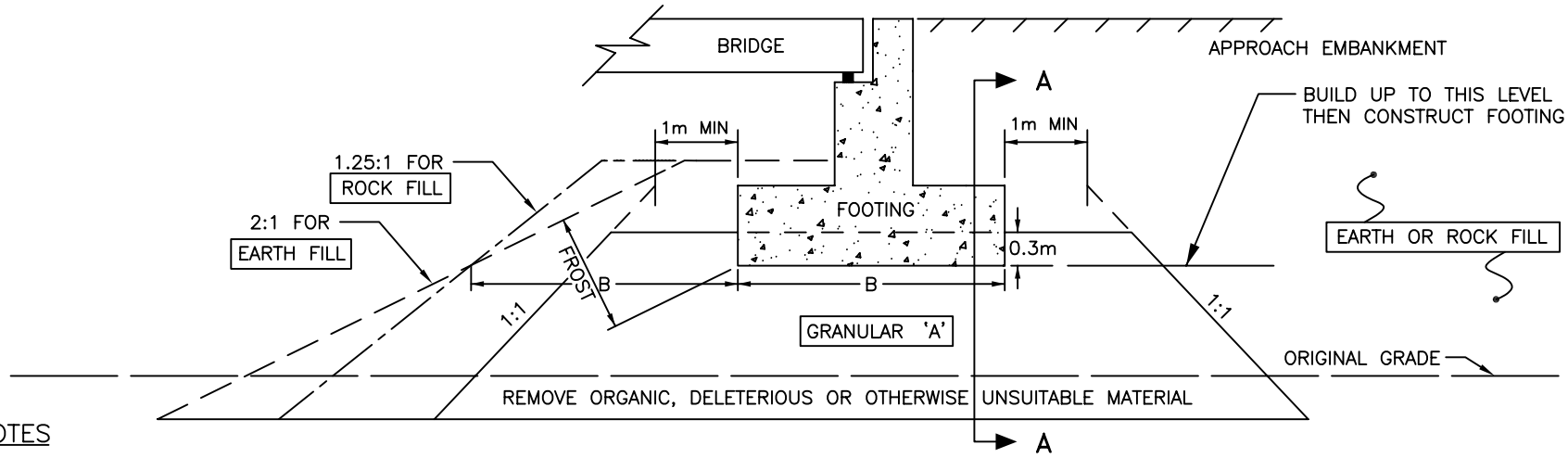
GRADATION SPECIFICATION FOR SAND FILL IN PRE-AUGERED HOLES AT INTEGRAL ABUTMENTS

MTO SIEVE DESIGNATION		PERCENTAGE PASSING BY MASS
2 mm	#10	100
600 μm	#30	80 – 100
425 μm	#40	40 – 80
250 μm	#60	5 – 25
150 μm	#100	0 – 6



CROSS SECTION A–A

NOT TO SCALE



LONGITUDINAL SECTION

NOT TO SCALE

NOTES

1. CONCEPT SHOWN DOES NOT INCLUDE A MIDHEIGHT BERM.
2. LIMITS OF GRANULAR 'A' CORE TO BE DEFINED BY A SITE SPECIFIC SURVEY.
3. REMOVE ORGANIC, DELETERIOUS OR OTHERWISE UNSUITABLE MATERIAL UNDER AREA OF COMPACTED GRANULAR 'A' AND EARTH OR ROCK FILL AS NOTED IN TEXT OF REPORT.
4. PLACE GRANULAR 'A' AND EARTH OR ROCK FILL ON APPROVED SUBGRADE TO BOTTOM OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M.T.O. STANDARDS.
5. CONSTRUCT CONCRETE FOOTING.
6. PLACE REMAINDER OF GRANULAR 'A' AND EARTH OR ROCK FILL INCLUDING MIDHEIGHT BENCHES, AS REQUIRED.
7. REFER TO TEXT OF REPORT FOR FROST DEPTH.

FIGURE 1: ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE

APPENDIX A

Site Inspection Report

(David F. Wood Consulting Ltd.)

David F. Wood

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MINISTRY OF TRANSPORTATION, NORTHEASTERN REGION

SITE INSPECTION REPORT

Date of Visit: 27 August 2008

Site(s) Visited: GWP 5379-02-00, WP 5262-07-01, Highway 69, Wildlife Crossing

Weather: Warm, sunny Temperature Range: 28°C

Contractor: None Agreement: Peto MacCallum Ltd.

WORK CARRIED OUT: Inspection of exposed bedrock surface and interpretation of drilling results for foundations for proposed wildlife crossing north of Lovering Lake

Personnel

David Wood, David F. Wood Consulting Ltd. (Wood)
Frank Portela, Peto MacCallum Ltd. (PML)
Chris and Adam, Walker Drilling Ltd., Barrie (Walker)

SUMMARY

Arrived at parking area off Hwy 69 to meet driller's helper. 4X4 trail and hike to reach project site. Discussed current drilling core orientation program to evaluate rock foundations. Attempted modelling clay imprint for core orientation. Observed drilling of next cored hole. Transferred back to parking area, then departed site for Sudbury.

BACKGROUND

Golder Associates (Golder) prepared Foundation Investigation and Design Reports for the proposed Wildlife Crossing over Highway 69 at Station 17+200, under GWP 5379-02-00 in July 2006. It was considered preliminary in nature and by the time the report had been produced, the foundation elevations currently under review were deeper than the elevations penetrated by the Golder investigation. However, the Golder study had created a detailed stereographic projection of the anticipated rock mass geological fabric based on both outcrop mapping and geophysical techniques from their borehole studies.

The current PetoMac study is believed to have been commissioned in order to penetrate deeper into the natural rock mass and to determine whether or not rock mass discontinuities will play a significant role in the proposed wildlife crossing foundations.

SITE INSPECTION NOTES

The area abounds with glacially eroded, bedrock outcrop (Images 1 and 2) and within 40 or 50 metres of the site there are also steep drop-offs up to 4 or 5 metres high. A general inspection of these outcrops was made, and a number of rock mass measurements were taken to establish the character of the exposed bedrock, so that this could be compared to the drill core information. The rock mass may be described as: "*Fresh* (with local iron stained joints), *massive*, *pale grey with darker flecks*, *coarse to very coarse grained*, *very strong*, *Granitic Gneiss*, with dominant high grade metamorphic structure presented as aligned minerals of different colours without rock material segregation into gneissic banding or foliation." The metamorphic structure is locally consistent in orientation at 24-35 degrees dip to 172 to 194 degrees dip direction (measured relative to magnetic north). It was observed that the features measured were more consistent than those recorded n the Golder study. A few joints were also measured and they fit in perfectly with the Golder joint set 2m (peak orientation 59/354). From this perspective it could be seen that there were no significant discrepancies between the rock mass data observed by Wood and Golder.

Peto MacCallum had acquired the services of Walker Drilling Ltd. (Walker) with a Dietrich D 50 Turbo coring drill rig (Image 3). This is a self contained track mounted, all terrain drill commonly used by the geotechnical industry for investigation core drilling along the highway corridors. Coring carried out in the preceding day or so had shown that sound bedrock was at very shallower depths across this part of the proposed site. The drill was set up using a diamond core bit following the use of a corundum-tipped auger for collaring the holes (Image 4). The colour and consistency of the water based drill return assisted in interpreting the sub-surface conditions.

At the time of the site visit, hole F3 had just been completed, and the core was virtually intact, estimated RQD 95% based on a very small fractured piece of core with iron stained surfaces. The remainder of the core was broken by the drilling process and the site technician in order to place the core into the core box. While on site, I assisted in developing a clay imprint core orientation device using spare drill steel. This allowed the drill steel to be lowered to the bottom of the 3 metre deep hole while retaining a fixed directional orientation (magnetic south). On the bottom of the string of rods there was a drill sub and this housed approximately ¾ cup of "Play dough". The Play dough was carefully lowered onto the core stub protruding at the bottom of the hole whereby it takes up the imprint of the core stub and this can be transferred to the core sample in the core box.

Based on the strongly developed geological fabric, this can also be used as a marker to orient the discontinuities in the core.

CONCLUSION

The rock mass at the site, on a topographic high, is of very high quality (Image 5). There are only a few natural joints visible in the abundant outcrops and the capacity of the bedrock to carry foundation loads is high. There may be the odd joint that intersects one or more of the excavation walls for the foundation elements, but these will be relatively unimportant from a design viewpoint and can be handled at the time of excavation. It would be virtually impossible to predict the location and orientation of any specific joint that may be encountered, and designing site specific rock mass reinforcement is not warranted until the excavation is well underway.

It is recommended that once a final crossing design is confirmed and the exact locations of the foundation elements are established and drill and blast activities are proceeding, then another brief site visit could be scheduled to confirm that the currently anticipated rock conditions do indeed exist at depth.

Respectfully submitted,

David F. Wood Consulting Ltd.

David F. Wood, P.Eng., President

Image 1. Looking north along the proposed Hwy 69 alignment. Note topographic high in this area and abundant outcrop.

Image 2. Looking south along the proposed Hwy 69 alignment. Note drill rods with clay core orientation device affixed to end.

Image 3. Walker's Dietrich D 50 Turbo preparing to set up on hole F8.

Image 4. Collaring the core hole using a corundum-tipped auger bit.

Image 5. Typical rock mass conditions encountered during drilling with very high quality rock mass with very few natural discontinuities, and very strongly developed metamorphic fabric.

APPENDIX B

Comments by D. Wood Associates Ltd. Regarding Structure Foundations

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Memorandum

January 6, 2009

To: Carlos Nascimento, P.Eng., Peto MacCallum Ltd., Toronto

From: David F. Wood. P.Eng., David F. Wood Consulting Ltd.

Re: Highway 69 four-laning, wildlife crossing near Killarney turnoff.

I have reviewed the information that I have on file for this specific area, including the Golder Associates evaluation (dated June 2006, their project 06-1111-001-2) as well as my review in August 2008 and subsequent messages from Peto MacCallum Ltd.

In this area, the new Highway 400 four-lane alignment is southeast-northwest at azimuth 313; and the proposed wildlife crossing would be exactly perpendicular to that at azimuth 043.

The regional geological trends that you mentioned in your November 6, 2008 message, as described by MTO's Peter Stuart, P. Eng. are not strictly represented here, and the dominant features, both gneissic banding and jointing strike east-west. The foliation population appears to be less concentrated than jointing and it dips south at varying degrees. There are two joint sets that were observed from both the surface outcrop mapping and the oriented core, and both of them dip towards the north, one flat lying, and the other one steeply dipping. There are no major intersections of joints that can form wedges to slide out of the cut faces based on the orientations shown in the Golder report, and the cuts look as though they will be stable.

There are various rock types in the vicinity, but they are all Late to Middle Precambrian and so will have all undergone similar degrees of metamorphism in the last billion years or so! There might be slight differences between the clastic metasediments and the instrusives, but I doubt that there would be any engineering differences of any significance.

Based on the proposed orientations of both the highway and the wildlife crossing, it appears that the design is just about optimal. Along Highway 400 near to Parry Sound, the dominant foliation strikes sub-parallel to the highway alignment and the same discontinuity surface daylights in the cut slope. Rock mass excavations in that area have occasionally needed bolting to reinforce the rock mass. At the wildlife crossing, the foliation and the jointing both strike about 45 degrees to the alignment so neither of them will daylight in the excavated rock face the same way they do further south. There will be some isolated, minor wedge possibilities between the foliation and a minor, subvertical joint that strikes north-south, but these are likely to be very infrequent and may not occur at all.

You question related to a potential 0.5 metre shift of one of the abutments to a structure. This would have been relevant for locations such as Tower Road, near MacTier, but are probably not really significant for any of the joint sets observed on site, or in the Golder review, and shifting the whole overpass structures in one direction or another is not required from a rock engineering perspective. My opinion on the matter is that the present design is appropriate for the rock mass structures mapped and encountered so far.