GEOCRES No.
31F-121-1

---

① Redrive piles with same driving set

② " " " heavy point

③ Redrive heavier section with/without

④ " " " heavy point

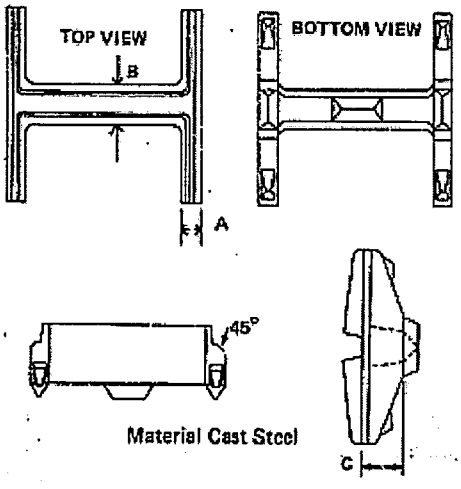
Close This Window | Print This Drawing

ASSOCIATED PILE & FITTING CORP.
P.O. Box 1048, Clifton, NJ 07014-1048
PHONE: 973-773-8400 / FAX: 973-773-8442 / TOLL FREE: 800-526-9047
EMAIL: associatedpile@aol.com / WEBSITE: www.associatedpile.com

HARD-BITE™

73/89

Dimensions



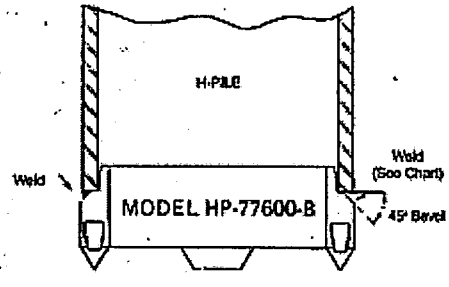
Material Cast Steel

	8"	10"	12"	14"
A	1-1/16"	1"	1"	1"
B	1"	1"	1-5/16"	1-1/4"
C	1-7/8"	2-1/16"	2-1/2"	2-3/4"

Installation Instructions

HARD-BITE POINT MODEL HP-77600-B

1. Fit point onto the end of a square cut pile end.
2. Weld point to the pile in either flat or vertical position using E60 or E70XX electrodes.
3. Weld across full width of flange following chart below for minimum size weld.



Pile Size	Flange Thickness	Min. Size Groove Weld
HP 14 x 117	.805	7/16
x 102	.705	3/8
x 89	.615	3/8
x 73	.505	5/16
HP 12 x 84	.685	3/8
x 74	.610	3/8
x 63	.515	5/16
x 53	.435	5/16
HP 10 x 57	.565	5/16
x 42	.420	5/16
HP 8 x 36	.445	5/16

Sangiuliano, Tony (MTO)

From: Sangiuliano, Tony (MTO)
Sent: July 7, 2003 3:13 PM
To: Birch, Neil (MTO)
Cc: Polson, Ken (MTO); Dundas, Dave (MTO)
Subject: RE: Piling Update at Reg. Rd. 29

Neil:

The Hard Bite APF model HP 77600 rock points are considered as acceptable alternative rock points for the new piles to be installed on this particular project.

Tony

-----Original Message-----
From: Birch, Neil (MTO)
Sent: July 7, 2003 3:05 PM
To: Sangiuliano, Tony (MTO)
Cc: Polson, Ken (MTO)
Subject: Piling Update at Reg. Rd. 29

Tony:

Just an update regarding our piling issue at Reg. Rd 29 Contract 2001-0002.

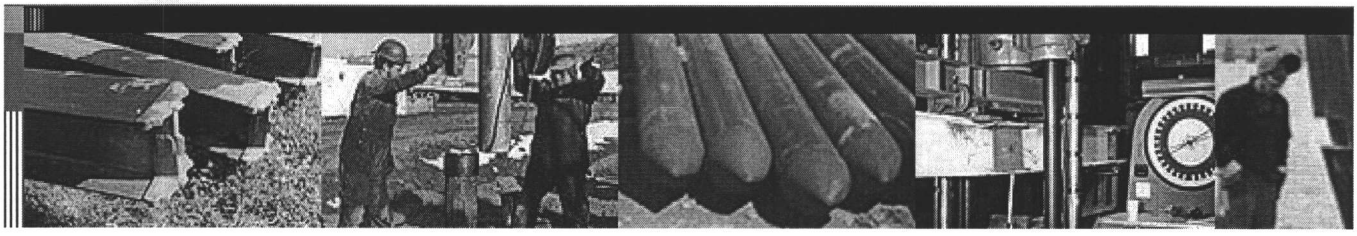
We have successfully negotiated a price for the new piles to be installed. We have also negotiated extraction costs and retapping prices too.

However, we have not as of 3.00 pm received word back from the designer regarding the use of Hard Bite APF model HP 77600 rock points.

In order to mitigate our growing delay costs to the contractor we had indicated to the contractor we would give him final instructions on all the details by 4.00 pm today.

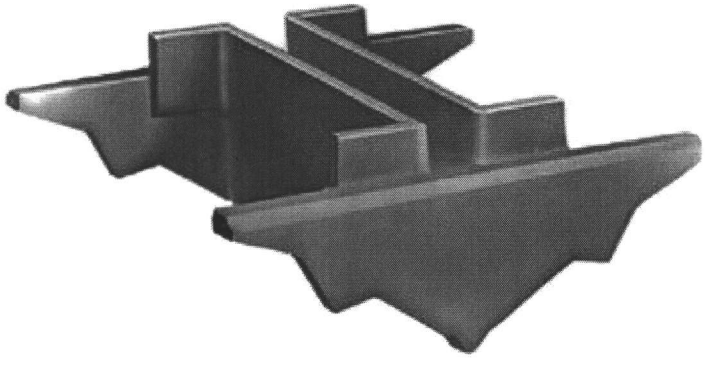
Does Foundations support/recommend the use of the above note rock points?

Neil



Click here to sign up to receive our FREE Technical Bulletins by email.

HP-77750-B



The APF Hard-Bite point with integrally cast cutting teeth, breaks debris and boulders. cut into ledge rock for full bearing. They get a secure toe-hold on rock; even those that steeply in relation to the pile axis. Typically, this design will allow for maximum penetra

Available in grade ASTM A-27 65/35 or higher strength grades.

Product Code: 001

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Ministry of Transportation

Ministère des Transports

Ontario

FAX COVER SHEET

DATE: June 23/03

TO: Tony Sangiuliano / Dave Dundas

OFFICE: Foundations

PHONE: _____ FAX _____

FROM: Neil Birch
CCO Eastern Region
Phone: (613) 742-5308
Fax: (613) 748-5297
Cellular: (613) 724-0016
E-Mail: Neil.Birch@mto.gov.on.ca

MESSAGE: Tony & Dave - Please see attached. Hours Tony will be calling Tony later this morning. My presence will be emailed to you shortly

Neil

NUMBER OF PAGES (INC. COVER SHEET) 10

IF TRANSMISSION IS NOT RECEIVED CORRECTLY PLEASE CONTACT SENDER

MRC

June 20, 2003

Ministry of Transportation Ontario
355 Counter Street, Postal Bag 4000
Kingston Ontario
K7L 5A3

Attention: Mr. Louis Tay, P. Eng.

RE: HIGHWAY 417 - CR29 STRUCTURE
NON-CONFORMING PILES, SOUTH ABUTMENT
WP 128-92-00 / 452-90-00
OUR FILE: W.O. 4209

Dear Sir:

In response to your recent correspondence and our telephone discussions including the conference call of June17, 2003, we are pleased to provide the following comments with respect to the non-conforming piles at the south abutment.

- As directed, we have not commented on the reasons why difficulties may have been encountered during driving and hence have not responded to any of the issues raised in Trow 's letter of June 2, 2003 to Deep Foundations Contractors Inc. This should not be interpreted as agreement or disagreement with the issues raised in that letter.

- As directed, we have not commented on which piles are, or are not "conforming". Others have made this determination. It is our understanding that south abutment pile numbers 2, 3, 9, 10, 12, 16, 21, 23, 30, 31, 32, 39 and 45 (a total of 13 piles) have been deemed to be non-conforming by others. We also understand that pile number 5 in the southeast retaining wall is also non-conforming. Accordingly, all comments made herein address only these 14 piles.

- McCormick Rankin Corporation has retained the services of Golder Associates Limited to provide geotechnical / foundations expertise regarding the Ministry's requests. McCormick Rankin has relied entirely upon their expertise with respect to the geotechnical / foundations aspects of our response.

MRC has to determine what pile are affected

This is a disclaimer and unacceptable

This is a design position MRC is the designer

.../2

McCORMICK RANKIN CORPORATION

CONSULTANTS IN TRANSPORTATION

1145 Hunt Club Road, Suite 300 Ottawa, Ontario Canada K1V 0Y3
Tel: (613) 736-7200 Fax: (613) 736-8710 E-mail: mrc-ott@mrc.ca Web: www.mrc.ca

MRC

We have appended a copy of a facsimile transmission from Golder Associates dated June 19th, 2003. In this correspondence, Golder Associates reviews the advantages and disadvantages of 6 different options for addressing the non-conforming piles. Several of the options require that the some or all of the existing non-conforming piles be extracted. Golder Associates has included a discussion of the issues surrounding pile extraction at this site. They are of the opinion that pile extraction can be accomplished without significantly disturbing the subsurface soils and given the constraints on the pile spacing, indicate that options necessitating pile extraction have distinct advantages over those option that do not require pile extraction.

From a structural perspective, there are no redundant piles in the system. Furthermore, any replacement piles must be driven to the same batter and must be offset the same distance from the front face of the abutment footing as those that they are replacing. With the exception of pile 45 and pile number 5 in the southeast retaining wall, the spacing of the subject piles is either 1200 mm or 1350 mm. The OHBDC 91, the design code of record, indicates a minimum pile spacing of approximately 1 m for the conditions at this site. The CHBDC reduces this minimum to 750 mm. If a replacement pile is driven midway between two piles, the resulting spacing would either be 600 or 675 mm, less than the minimum stated in either code. If a replacement pile is driven immediately adjacent to the non-conforming pile and the non-conforming pile cut-off below the bottom of footing elevation, the resulting pile spacing would be either 890 mm or 1040 mm, in compliance with the CHBDC restrictions but not always with the OHBDC 91 restrictions.

With such a pile arrangement, the replacement pile would be in virtual contact with the non-conforming pile and hence any bends, deflections, or damage to the non-conforming pile would likely influence the alignment and/or set of the replacement pile. For this reason, it is not recommended that a replacement pile be driven immediately adjacent to (in virtual contact with) a non-conforming pile without first extracting the non-conforming pile.

For south abutment pile 45 and pile 5 of the southeast retaining wall there is an opportunity to drive a replacement pile offset 500 mm from the non-conforming pile and still exceed the minimum pile spacing required by the code. We have indicated possible locations for replacement piles for these two non-conforming piles on the appended plan. If replacement piles were to be driven in these locations, we recommend that the adjacent non-conforming piles be cut-off 300 mm below the bottom of footing elevation.

.../3

why not use existing piles

MRC

For Options 1 and 2 described in Golder Associates facsimile, all piles except number 45 and 5 (referred to above) would be redriven in the same location and to the same batter as that shown on the original contract drawings. We have not included a layout for Options 3, 4, 5 and 6 since these Options do not result in a feasible pile spacing that is in conformance with the CHBDC or the OHBDC (refer to the above discussion of potential locations for replacement piles).

- We have estimated the cost associated with the various options without consideration of any potential claims to be made by the contractor. We are not party to the administration of the contract or all of the driving records or details of the driving. As such, we are not in position to comment on the validity of any claims that may be associated with any of the options presented in Golder Associates facsimile. The costs presented are only those estimated for the material supply and installation at current market rates.

  The cost for driving an HP310x110 pile section (taken from HICO) is estimated to be $110/m. (We are not privy to the contract price for this item). On the Laurier Bridge reconstruction project currently underway in Ottawa, the contractor recently quoted an additional $45/m for the supply of HP 360 x 152 piles. The cost for rock points is estimated to be $300/each. We would expect that the Ministry would seek some credit from the Contractor for the omission of the driving shoes if they were to be replaced with rock points but the contractor may not offer much in this respect. The piles at the south abutment are approximately 14 m in length. Costs associated with pile extraction are those associated with removing the hammer from the crane and then reattaching it plus a very small amount of time to extract each pile. We estimate that all 14 piles could be extracted in one day. This estimate includes the time required to change the hammer and reinstall it following the extraction of all piles. Hence extraction costs should be less than $3000. There maybe some possibility to reuse portions of the extracted piles. If this is so, credits could be sought from the contractor.

- From Golder Associates table of advantages and disadvantages, it can be seen that there are several advantages to Option 2 while its only disadvantage is that associated with cost.

- We draw the Ministry's attention to the need to exercise care in driving the piles and refer to SP 903S01 dated March 2001 as the governing specification for driving the piles for this project.

We trust that this discussion of options for remedial action to address the non-conforming piles at the above-noted site assists the Ministry in reaching a decision as to the appropriate course of action. We would be pleased to expand on any aspect of this submission or answer any questions you may have. We will provide comment on whether there is a need to modify the piling procedures for the Highway 417 - CR 22 structure in light of the difficulties encountered at the CR 29 site shortly under separate letterhead.

.../4

MRC

Yours very truly,

McCORMICK RANKIN CORPORATION

A.S. Wing, P. Eng. J. David Miller, P. Eng.

c.c. Mr. Murty Devata, P. Eng.
Mr. Fin Heffernan, P. Eng.

L:\W.O. # Directories\4209 Hwy 417 county rd 22 to 29\4209asw Non-conf Files.doc

TECHNICAL MEMORANDUM

Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON, Canada L5N 5Z7

Telephone: 905-567-4444
Fax Access: 905-567-6561

TO:	Tony Wing McCormick Rankin Corporation 1145 Hunt Club Road, Suite 300 Ottawa, Ontario K1V 0Y3	**DATE:**	June 20, 2003
FROM:	Murty Devata/Fin Heffernan	**JOB NO:**	001-2026 (5001)
RE:	**Replacement of Piles** **South Abutment** **R.R. #29 Bridge** **Arnprior, Ontario**		

Sent by Fax

On completing the piling work at the above site, some 13 piles at the south abutment were labelled as "non-set". Some of those piles were driven hard onto the bedrock and the movement was probably the result of some damage of the pile tip. Other piles did not meet significant resistance and it was believed that these battered piles were sliding on the bedrock. This latter group is of concern and remedial action is proposed. New piles could be driven adjacent to these piles if sufficient space is available or the piles could be extracted and new piles driven in their place. If the piles are extracted the tip should be examined to see what damage has taken place and to determine whether the pile is re-useable.

The H. piles are small displacement in nature and reworking of the clay either by extraction and re-driving or by driving new piles should be minor. Also, we are not bearing on this reworked soil.

The pile spacing should be in compliance with CHBDC requirements.

The options for replacement piles at this south abutment are as follows:

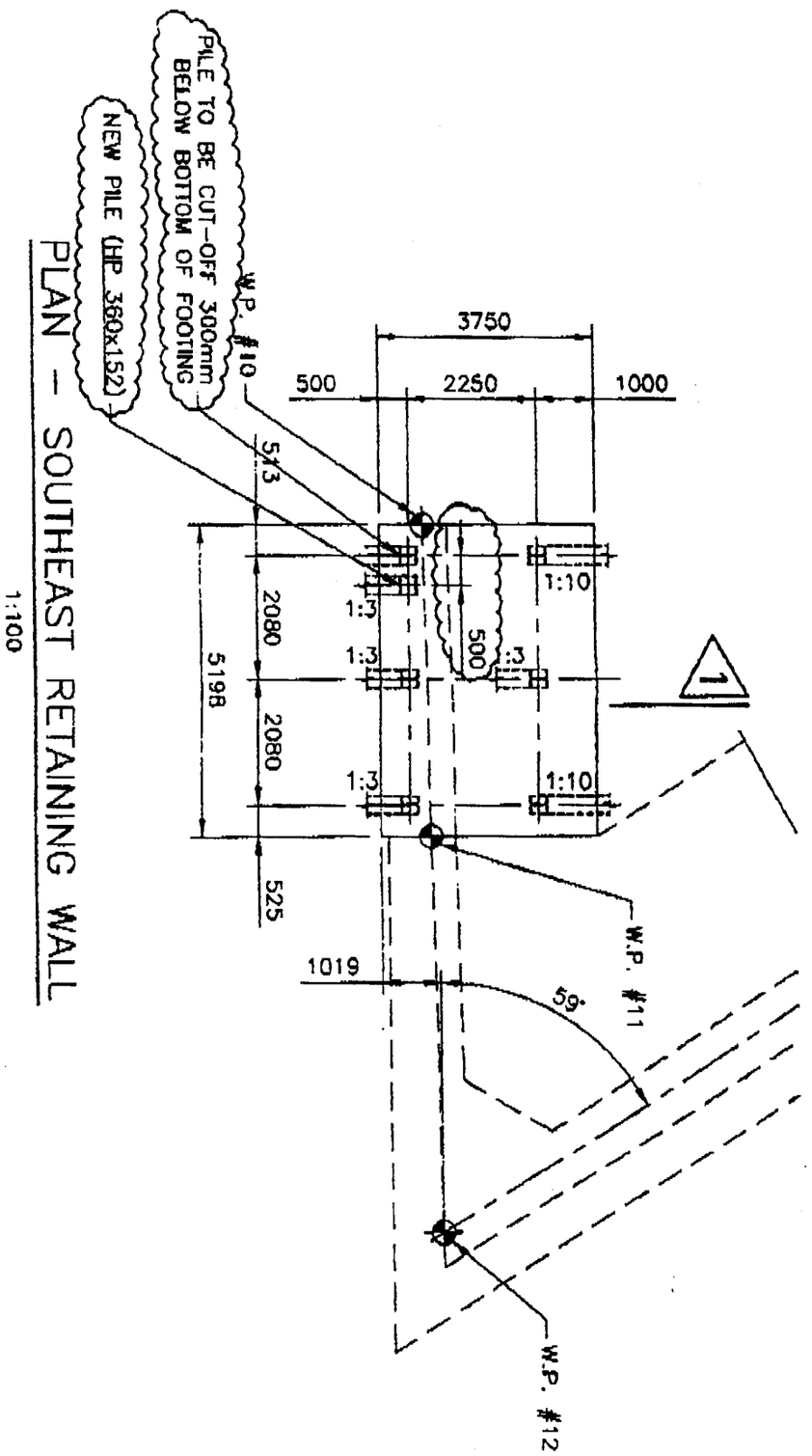
OPTION	ADVANTAGES	DISADVANTAGES
Option 1 Extract the non-set piles and cut-off the damaged portion of the tip. Attach a rock point and redrive.	Pile spacing will be maintained as per the original structural design as per OHBDC design comments. Rock point may prevent possible sliding along the rock surface. Extracting the pile provides an opportunity to assess the condition of the non-set pile.	Additional costs for extracting piles. Extra cost for rock points and possible supply delays. Cost of possible splicing extra pile length to be added for the damaged portion of the pile. If the pile is bent in the original driving the cut-off portion may be of significant length.
Option 2 Extract the non-set piles and replace with a heavier section pile i.e. 360 x 152 fitted with standard driving shoes similar to the one used for 310 x 110 steel H piles.	Pile spacing will be similar to the present design satisfying the OHBDC requirements. Heavier pile section minimizes the damage to the pile tip and less chances of sliding on the level bedrock surface. Extracting the pile provides an opportunity to assess the condition of the non-set pile. No supply delays of rock points.	Cost for extracting the non-set pile. Additional cost for supply and drive heavier pile section (360 x 152) with driving shoes.
Option 3 Drive a new steel H pile (310 x 110) fitted with standard MTO driving shoe adjacent to the existing non-set pile.	Existing non-set pile need not require removal and thereby some cost savings.	Additional cost of supply and drive new pile (310 x 110) and the driving shoes. If pile is driven too close to the existing one possible interference with the existing non-set pile. Careful driving control to prevent sliding. Pile spacing may not satisfy OHBDC or CHBDC requirements.
Option 4 Drive a new heavier steel H pile (360 x 152) adjacent to the non-set pile fitted with standard driving shoes.	Existing non-set pile need not require removal and thereby some cost savings. Heavier pile section minimize the damage to the pile and less possibilities of sliding along the level bedrock surface. Proven success elsewhere in Ottawa (Laurier Avenue Bridge) where heavier pile (360 x 152) less prone to bending installed without any sliding on the bedrock surface. No supply delays of rock points.	Additional cost for supply and drive heavier steel H pile (360 x 152) with standard driving shoes. If pile is driven too close to the existing one possible interference with the existing non-set pile. Pile spacing may not satisfy OHBDC or CHBDC requirements.

no → not with any reinforced flange

No same reason

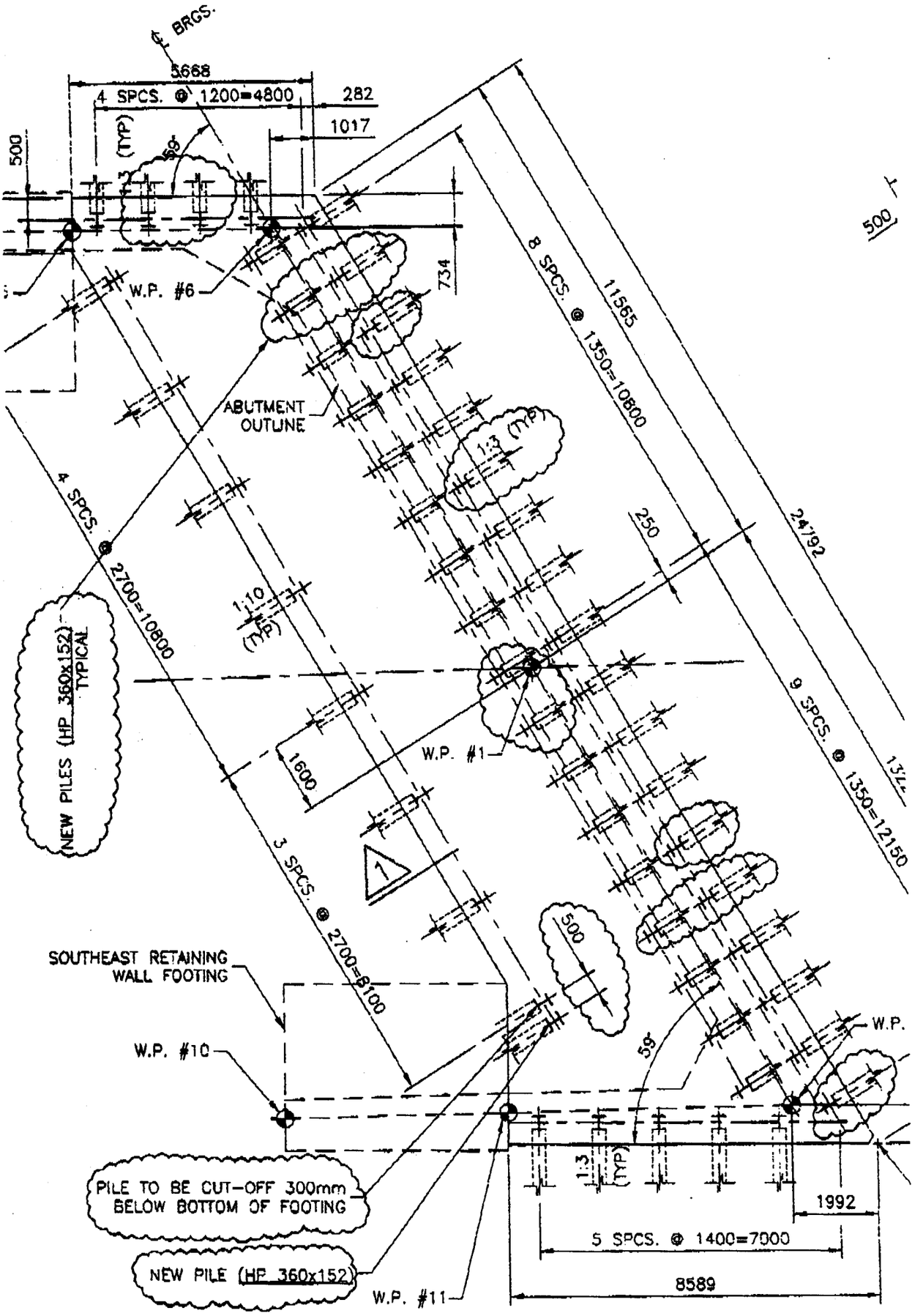
OPTION	ADVANTAGES	DISADVANTAGES
Option 5 Drive a new steel H pile (310 x 110) fitted with rock point adjacent to the existing non-set pile.	Existing non-set pile need not require removal and thereby some cost savings. Rock point may prevent possible sliding along the rock surface.	Additional cost for supply and drive new pile (310 x 110) with rock point. If pile is driven too close to the existing one possible interference with the existing non-set pile. Possible supply delays of rock points – pile spacing may not satisfy OHBDC or CHBDC requirements.
Option 6 Drive a new heavier pile section (360 x 152) fitted with rock point adjacent to the existing non-set pile.	Existing non-set pile need not require removal and thereby some cost savings. The heavier pile section and rock points will provide additional assurance to prevent sliding along the rock surface.	Additional cost for supply and drive heavier pile section (360 x 152) fitted with rock points. Possible supply delays of rock points. If pile is driven too close to the existing one possible interference with the existing non-set pile. Pile spacing may not satisfy OHBDC or CHBDC requirements.

MSD/FJH/mmh



PLAN – SOUTHEAST RETAINING WALL

1:100



PLAN – SOUTH ABUTMENT

℄ BRGS.

1:100

MRC

June 20, 2003

Ministry of Transportation Ontario
355 Counter Street, Postal Bag 4000
Kingston Ontario
K7L 5A3

Attention: Mr. Louis Tay, P. Eng.

RE: HIGHWAY 417 - CR29 STRUCTURE
NON-CONFORMING PILES, SOUTH ABUTMENT
WP 128-92-00 / 452-90-00
OUR FILE: W.O. 4209

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- McCormick Rankin Corporation has retained the services of Golder Associates Limited to provide geotechnical / foundations expertise regarding the Ministry's requests. McCormick Rankin has relied entirely upon their expertise with respect to the geotechnical / foundations aspects of our response.

.../2

McCORMICK RANKIN CORPORATION

CONSULTANTS IN TRANSPORTATION

1145 Hunt Club Road, Suite 300 Ottawa, Ontario Canada K1V 0Y3
Tel: (613) 736-7200 Fax: (613) 736-8710 E-mail: mrc-ott@mrc.ca Web: www.mrc.ca

MRC

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  From a structural perspective, there are no redundant piles in the system. Furthermore, any replacement piles must be driven to the same batter and must be offset the same distance from the front face of the abutment footing as those that they are replacing. With the exception of pile 45 and pile number 5 in the southeast retaining wall, the spacing of the subject piles is either 1200 mm or 1350 mm. The OHBDC 91, the design code of record, indicates a minimum pile spacing of approximately 1 m for the conditions at this site. The CHBDC reduces this minimum to 750 mm. If a replacement pile is driven midway between two piles, the resulting spacing would either be 600 or 675 mm, less than the minimum stated in either code. If a replacement pile is driven immediately adjacent to the non-conforming pile and the non-conforming pile cut-off below the bottom of footing elevation, the resulting pile spacing would be either 890 mm or 1040 mm, in compliance with the CHBDC restrictions but not always with the OHBDC 91 restrictions.

  With such a pile arrangement, the replacement pile would be in virtual contact with the non-conforming pile and hence any bends, deflections, or damage to the non-conforming pile would likely influence the alignment and/or set of the replacement pile. For this reason, it is not recommended that a replacement pile be driven immediately adjacent to (in virtual contact with) a non-conforming pile without first extracting the non-conforming pile.

  Agree. Too Risky

  For south abutment pile 45 and pile 5 of the southeast retaining wall there is an opportunity to drive a replacement pile offset 500 mm from the non-conforming pile and still exceed the minimum pile spacing required by the code. We have indicated possible locations for replacement piles for these two non-conforming piles on the appended plan. If replacement piles were to be driven in these locations, we recommend that the adjacent non-conforming piles be cut-off 300 mm below the bottom of footing elevation.

  Agree Redrive new pile @ 500mm offset

.../3

MRC

For Options 1 and 2 described in Golder Associates facsimile, all piles except number 45 and 5 (referred to above) would be redriven in the same location and to the same batter as that shown on the original contract drawings. We have not included a layout for Options 3, 4, 5 and 6 since these Options do not result in a feasible pile spacing that is in conformance with the CHBDC or the OHBDC (refer to the above discussion of potential locations for replacement piles).

- We have estimated the cost associated with the various options without consideration of any potential claims to be made by the contractor. We are not party to the administration of the contract or all of the driving records or details of the driving. As such, we are not in position to comment on the validity of any claims that may be associated with any of the options presented in Golder Associates facsimile. The costs presented are only those estimated for the material supply and installation at current market rates.

  Fine!

  The cost for driving an HP310x110 pile section (taken from HICO) is estimated to be $110/m. (We are not privy to the contract price for this item). On the Laurier Bridge reconstruction project currently underway in Ottawa, the contractor recently quoted an additional $45/m for the supply of HP 360 x 152 piles. The cost for rock points is estimated to be $300/each. We would expect that the Ministry would seek some credit from the Contractor for the omission of the driving shoes if they were to be replaced with rock points but the contractor may not offer much in this respect. The piles at the south abutment are approximately 14 m in length. Costs associated with pile extraction are those associated with removing the hammer from the crane and then reattaching it plus a very small amount of time to extract each pile. We estimate that all 14 piles could be extracted in one day. This estimate includes the time required to change the hammer and reinstall it following the extraction of all piles. Hence extraction costs should be less than $3000. There maybe some possibility to reuse portions of the extracted piles. If this is so, credits could be sought from the contractor.

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We trust that this discussion of options for remedial action to address the non-conforming piles at the above-noted site assists the Ministry in reaching a decision as to the appropriate course of action. We would be pleased to expand on any aspect of this submission or answer any questions you may have. We will provide comment on whether there is a need to modify the piling procedures for the Highway 417 - CR 22 structure in light of the difficulties encountered at the CR 29 site shortly under separate letterhead.

.../4

MRC

Yours very truly,

McCORMICK RANKIN CORPORATION

A.S. Wing, P. Eng.

J. David Miller, P. Eng.

c.c. Mr. Murty Devata, P. Eng.
Mr. Fin Heffernan, P. Eng.

L:\W.O. # Directories\4209 Hwy 417 county rd 22 to 29\4209stw Non-conf Files.doc

TECHNICAL MEMORANDUM

Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON, Canada L5N 5Z7

Telephone: 905-567-4444
Fax Access: 905-567-6561

TO: Tony Wing
McCormick Rankin Corporation
1145 Hunt Club Road, Suite 300
Ottawa, Ontario K1V 0Y3

DATE: June 20, 2003

FROM: Murty Devata/Fin Hefferman

JOB NO: 001-2026 (5001)

RE: **Replacement of Piles**
South Abutment
R.R. #29 Bridge
Arnprior, Ontario

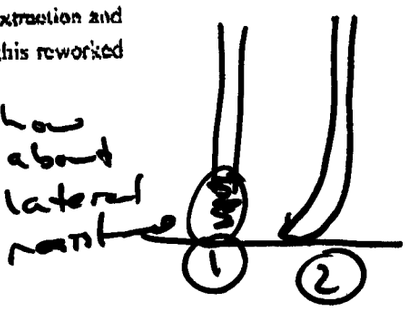
Sent by Fax

On completing the piling work at the above site, some 13 piles at the south abutment were labelled as "non-set". Some of those piles were driven hard onto the bedrock and the movement was probably the result of some damage of the pile tip. Other piles did not meet significant resistance and it was believed that these battered piles were sliding on the bedrock. This latter group is of concern and remedial action is proposed. New piles could be driven adjacent to these piles if sufficient space is available or the piles could be extracted and new piles driven in their place. If the piles are extracted the tip should be examined to see what damage has taken place and to determine whether the pile is re-useable.

can we distinguish

The H. piles are small displacement in nature and reworking of the clay either by extraction and re-driving or by driving new piles should be minor. Also, we are not bearing on this reworked soil.

How about lateral restraint



The pile spacing should be in compliance with CHBDC requirements.

The options for replacement piles at this south abutment are as follows:

OPTION	ADVANTAGES	DISADVANTAGES
Option 1 Extract the non-set piles and cut-off the damaged portion of the tip. Attach a rock point and redrive.	Pile spacing will be maintained as per the original structural design as per OHBDC design comments. Rock point may prevent possible sliding along the rock surface. Extracting the pile provides an opportunity to assess the condition of the non-set pile.	Additional costs for extracting piles. Extra cost for rock points and possible supply delays. Cost of possible splicing extra pile length to be added for the damaged portion of the pile. If the pile is bent in the original driving the cut-off portion may be of significant length.
Option 2 Extract the non-set piles and replace with a heavier section pile i.e. 360 x 152 fitted with standard driving shoes similar to the one used for 310 x 110 steel H piles.	Pile spacing will be similar to the present design satisfying the OHBDC requirements. Heavier pile section minimizes the damage to the pile tip and less chances of sliding on the level bedrock surface. Extracting the pile provides an opportunity to assess the condition of the non-set pile. No supply delays of rock points.	Cost for extracting the non-set pile. Additional cost for supply and drive heavier pile section (360 x 152) with driving shoes.
X *Option 3* Drive a new steel H pile (310 x 110) fitted with standard MTO driving shoe adjacent to the existing non-set pile.	Existing non-set pile need not require removal and thereby some cost savings.	Additional cost of supply and drive new pile (310 x 110) and the driving shoes. If pile is driven too close to the existing one possible interference with the existing non-set pile. Careful driving control to prevent sliding. Pile spacing may not satisfy OHBDC or CHBDC requirements.
X *Option 4* Drive a new heavier steel H pile (360 x 152) adjacent to the non-set pile fitted with standard driving shoes.	Existing non-set pile need not require removal and thereby some cost savings. Heavier pile section minimize the damage to the pile and less possibilities of sliding along the level bedrock surface. Proven success elsewhere in Ottawa (Laurier Avenue Bridge) where heavier pile (360 x 152) less prone to bending installed without any sliding on the bedrock surface. No supply delays of rock points.	Additional cost for supply and drive heavier steel H pile (360 x 152) with standard driving shoes. If pile is driven too close to the existing one possible interference with the existing non-set pile. Pile spacing may not satisfy OHBDC or CHBDC requirements.

Risky for bent piles.

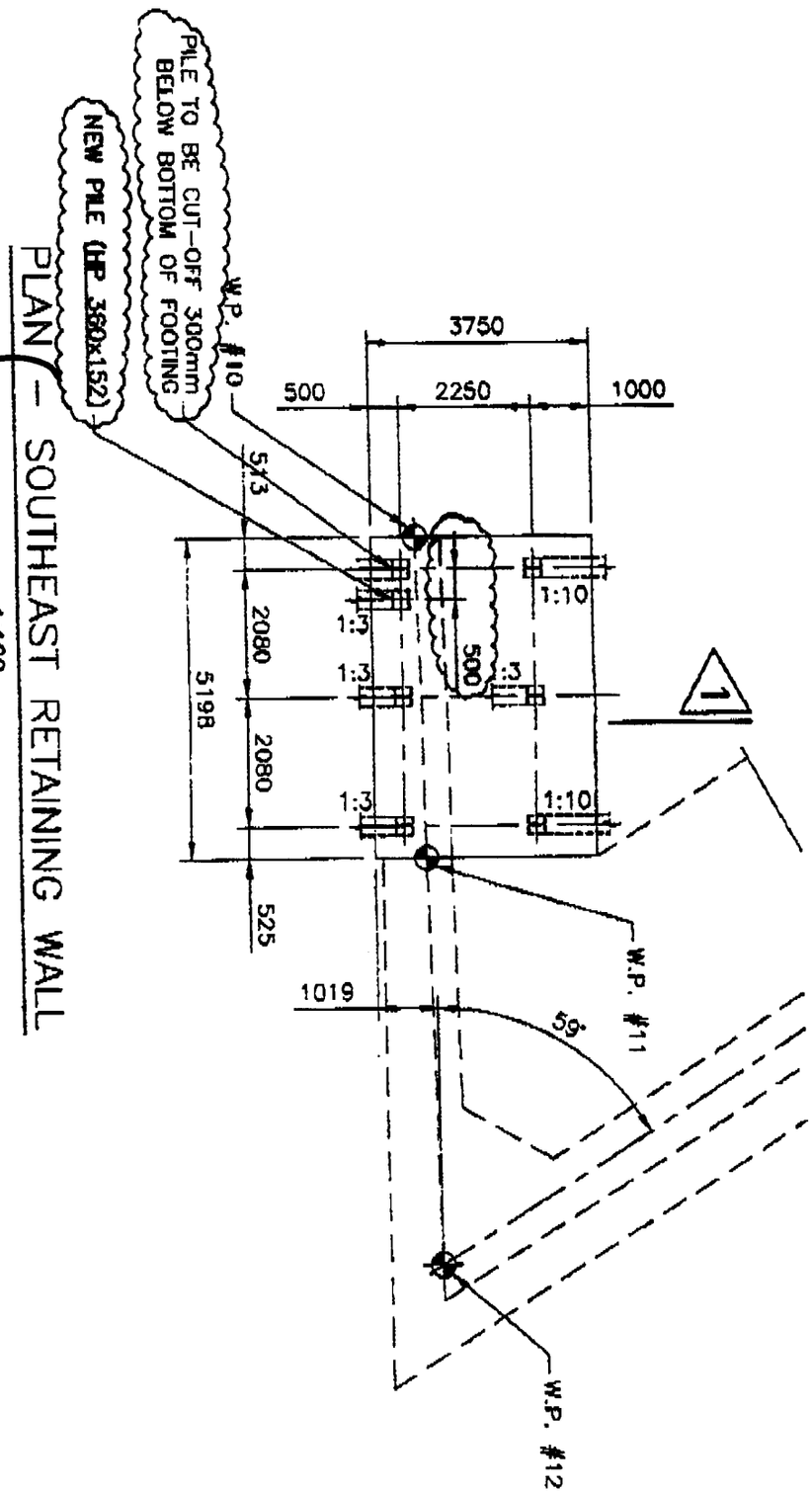
Risky for

Option 1a – Extract the non-set piles and replace with HP310x110 Fitted with rock points and redrive

OPTION	ADVANTAGES	DISADVANTAGES
Option 5 Drive a new steel H pile (310 × 110) fitted with rock point adjacent to the existing non-set pile.	Existing non-set pile need not require removal and thereby some cost savings. Rock point may prevent possible sliding along the rock surface.	Additional cost for supply and drive new pile (310 × 110) with rock point. If pile is driven too close to the existing one possible interference with the existing non-set pile. Possible supply delays of rock points – pile spacing may not satisfy OHBDC or CHBDC requirements.
Option 6 Drive a new heavier pile section (360 × 152) fitted with rock point adjacent to the existing non-set pile.	Existing non-set pile need not require removal and thereby some cost savings. The heavier pile section and rock points will provide additional assurance to prevent sliding along the rock surface.	Additional cost for supply and drive heavier pile section (360 × 152) fitted with rock points. Possible supply delays of rock points. If pile is driven too close to the existing one possible interference with the existing non-set pile. Pile spacing may not satisfy OHBDC or CHBDC requirements.

MSD/FJH/mmh

x – does not conform with Code spacing



HP 310x110 with Park Point

PLAN – SOUTH ABUTMENT

1:100

Coal — Rock

3

5

4

6

1

2

Sangiuliano, Tony (MTO)

To: Birch, Neil (MTO); Tay, Louis (MTO)
Cc: Dundas, Dave (MTO)
Subject: RR 29 Piling - Contract 2001-0002

Gentlemen:

As requested in your fax covering letter dated June 16, 2003, we have reviewed Golder's letter dated June 13th, 2003 regarding the piling at RR 29. We concur with Louis Tay's comments expressed in his email dated June 16, 2003 that the Prime Consultant should review Golder's recommendations within the context of defining the foundation problem and then developing solutions to solve the problem. Alternatives should be assessed and evaluated and the most technically feasible, timely and cost effective solution should be recommended following a comparison of the alternatives. The need for the extraction of the piles should be assessed, explained and justified as part of a alternative solution.

We trust these comments are sufficient for your purposes.

If you have any questions, please do not hesitate to contact our office.

Tony

Sangiuliano, Tony (MTO)

To: Dundas, Dave (MTO)
Subject: FW: Hwy 417 / RR 29 South Abutment piles

Dave:

I concur with Louis Tay's comments. Golder's recommendations should be submitted to the Prime Consultant and the Prime Consultant should then review within the context of defining the foundation problem and then developing solutions for solving the problem. Alternatives should be assessed and evaluated and the most technically feasible, timely and cost effective solution should be recommended following a comparison of the alternatives. Is the extraction really necessary. If so, this should be explained and justified as part of a solution.

Tony

-----Original Message-----
From: Sangiuliano, Domenic (MTO)
Sent: June 17, 2003 7:34 AM
To: Sangiuliano, Tony (MTO)
Subject: FW: Hwy 417 / RR 29 South Abutment piles

-----Original Message-----
From: Tay, Louis (MTO)
Sent: June 16, 2003 4:43 PM
To: 'Tony Wing, McCormick Rankin'; 'David Miller, McCormick Rankin'
Cc: Sangiuliano, Domenic (MTO); Kleywegt, Harold (MTO); Birch, Neil (MTO); Polson, Ken (MTO)
Subject: Hwy 417 / RR 29 South Abutment piles

David,

I have reviewed the June 13, 2003 letter from Golder to McCormick Rankin with respect to the non-set piles at Regional Road 29.

This letter was faxed to the ministry with no covering letter from McCormick Rankin, therefore I wonder if McCormick Rankin endorses the recommendations by the subconsultant Golder.

My comments on the lettter are as follows.

The ministry is vulnerable to delay claims at the moment as the piling subcontractor has moved off the site. We were hoping to receive a recommended solution. Extracting four piles for analysis may not be the most practical approach given the potential delays. I suggest that McCormick Rankin review this and consider that the ministry wishes to find a solution that will be timely, economical and feasible. If in fact it is absolutely essential to extract the piles to arrive at this solution please provide the reasoning.

In the future the ministry would like to receive the recommendations from the prime consultant McCormick Rankin. I look forward to your response.

Louis Tay

Ministry of Transportation

Ministère des Transports

Ontario

FAX COVER SHEET

DATE: June 16/03

TO: Tony Sangiuliano / Dave Dundas

OFFICE: Foundations

PHONE: _____ FAX _____

FROM: Neil Birch
CCO Eastern Region
Phone: (613) 742-5308
Fax: (613) 748-5297
Cellular: (613) 724-0016
E-Mail: Neil.Birch@mto.gov.on.ca

MESSAGE: Tony & Dave: Could you please review the attached & provide comments to Hous Tay, Ken Pulson and myself Haremail. Thanks Neil

NUMBER OF PAGES (INC. COVER SHEET) 3

IF TRANSMISSION IS NOT RECEIVED CORRECTLY PLEASE CONTACT SENDER

MRC

FACSIMILE TRANSMISSION

TO: Ministry of Transportation Ontario

ATTENTION: Mr. Neil Birch. CCO Eastern Region

No of sheets transmitted: 2 including this sheet. MAIL: YES ___ NO ___

FROM: J. David Miller DATE: June 16/2003

W.O. NO. 4209 PROJECT: Regional Road 29

MESSAGE: Neil: URGENT

Enclosed are some comments/ recommendations from Golder Associates regarding the south abutment piles of the Regional Road 29.

Please call us if any questions/ clarifications.

Thank you

Are Golder's recs part and parcel of MRC's evaluation of the problem with the objective of defining the problem and then solving the problem: What are the options and is the extraction necessary.

748-5297

FAX NO: ___

McCORMICK RANKIN CORPORATION

CONSULTANTS IN TRANSPORTATION

1145 Hunt Club Road, Suite 300, Ottawa, Ontario, Canada, K1V 0Y3
Tel: (613) 736-7200 Fax: (613) 736-8710 E-mail: mrc-ott@mrc.ca

FACSIMILE TRANSMISSION

Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON L5N 5Z7

Telephone: 905-567-4444
Fax Access: 905-567-6541

DATE:	June 13, 2003	**JOB NO:**	021-2074
TO:	McCormick Rankin Corporation	**FAX NO:**	613-736-8710
ATTENTION:	Mr. Tony Wing / David Miller	**TOTAL PAGES:**	1
COPY TO:		**cc: FAX NO:**	
FROM:	Fin Hefferman, P.Eng. / Murty Devata, P.Eng.		
EMAIL:	fhefferman@golder.com mdevata@golder.com		
RE:	**SOUTH ABUTMENT – R.R. # 29 PILES**		

The piling records for the first 5 piles identified as "non-set" are difficult to interpret. It appears that driving Piles #30, #32, and #39 was stopped when pile appears to be sliding. Pile # 31 was meeting refusal as well as possibly Pile # 45.

In a set of pile driving records received today it appears that Piles # 12, #10, #3, # 2, and #9 are sliding. It appears that Piles #1, #14, #8, #6 and #4 are meeting refusal on the bedrock.

We recommend that Piles #8 and #31 be pulled and inspected first for evidence of over driving and also Piles #12 and #30 be pulled for evidence of bending.

We wish to be informed when these piles are to be pulled so that we have a representative on site to observe these piles.

Fin Hefferman / Murty Devata

MD/FH/ad

n:\active\2002\other offices\021-2074\021-2074 fax june 13 2003 fax to tony wing and dave miller.doc

Hard copy to follow by mail ☐ Yes, ☒ No

R.O.B. TO WORK FOR IN CANADA

50 BEST MANAGED PRIVATE COMPANIES

Trow Consulting Engineers Ltd.

1595 Clark Boulevard
Brampton, Ontario
L6T 4V1

Telephone: (905) 793-9800
Facsimile: (905) 793-0641

June 5, 2003

Reference: brge0067657a

Mr. Mark Montgomery
Deep Foundations Contractors Inc.
29 Ruggles Avenue
Thornhill, Ontario
L3T 3S4

Via Facsimile:
1-905-881-2564

Dear Mark:

Capacity of Out of Plumb Pile
Highway 417-Regional Road 29 Underpass
Ottawa, Ontario
Contract No. 2001-0002

We reported in our letter dated May 22, 2003 that Pile No. 6 at the West Pier Footing was successfully seated on the bedrock but the pile has a final plumbness of 1H:2.14V instead of the specified 1H:3V. We wish to confirm that from a geotechnical point of view, the pile can safely support an axial load of 1001 kN SLS and 1760 kN ULS. The structural engineer should review the information and provide his recommendation for acceptance from a structural point of view.

Yours truly,

Trow Consulting Engineers Ltd.

LICENSED PROFESSIONAL ENGINEER
S. S. M. CHENG
6/5/03
PROVINCE OF ONTARIO

Stephen S. M. Cheng, P. Eng. Stan Gonsavles, P. Eng.
QVB

Enclosure: Pile Driving Record

S:\MC\sof:\GEO\PROJECTS\A60000\67000\67600\a\67657a_Hwy417_QVB\Out_of_Plumb_Pile2.doc

[redacted]

TOMLINSON **R.W. Tomlinson Limited**
5597 Power Road,
Ottawa, ON K1G 3N4

June 6, 2003

McIntosh Perry Consulting Engineers Ltd.
264 Herrick Drive
Amprior, Ontario
K7S 3T8

Attention: Ms. Andrea Voth

Capacity of out of plumb pile #6

R.W. Tomlinson Limited has reviewed letter dated June 5, 2003 from Trow Consulting Engineers referencing the pile #6 situated at the West Pier Footing on RR 29 Structure.

The QVE has determined the capacity of the out of plumb pile, from a geotechnical point of view, to be 1001KN SLS and 1760 KN ULS. He recommends that the structural engineer review the information for acceptance from a structural point of view. Please note that the pile was successfully seated and is in the correct location.

Attached is the letter from Deep Foundations' QVE, and the field report.

Don't hesitate to contact me if you have any questions, and I look forward to your acceptance.

Yours truly,

Richard Poulin A.Sc.T
Quality Control Technician

880-0647

Tel: (613) 822-1867 Fax: (613) 822-1554 www.tomlinsongroup.com

[redacted]

Trow — Field Pile Driving Form

Project: Highway 417- RR 29 Underpass - Job# OTGE00016677A

Bridge Structural Component - West Pier

Inspector: Chris Radway, C.E.T.	Contractor: Deep Foundations Contractors Inc.	Thickness: t=15.5 w= 15.4mm
Pile Type: "H-pile" (HP310x110)	Dimentions: 308 x 310mm	Anvil:
Hammer Type: Drop	Hammer Wt:	Op. Speed:
Shoe: Reinforced Pile Flange	Ham. Type / Model: Drop Hammer	

Set Criteria: Bedrock Criteria- 4 sets of 10 blows @ 1, 2, 3 &4 foot Drop

Rebound:

Pile #: 6 **Initial Driving Date:** May 22 /2003

Initial Pile Length: 12.0m **Batter:** (1:8) (18.4 degrees) 1:10 (5.7 degrees)

Start/Stop Driving: 1- 10:16 / 10:41 2- 1-

Pile Cut and/or Splices: 1 -
2 -

Final Pile Set:
1st 40 blows - travel - 30mm 2/3/10/15mm
2nd set of 40 blows - travel - 25mm 2/4/4/15mm
3rd set of 40 blows - travel - 20mm 3/3/4/10mm
4th set of 40 blows - travel - 13mm 2/4/4/3mm

Date: May 22/03
Time: @ 10:41
Date:
Time:
Date:
Time:

Final Offsets: 65" (N/S) 1" E (W)

Inclination: 1° (N) S 2.5° (E/W) *

Terminal Depth (related to prepared grade)= 9.2m

Notes: * Movement on B.R. Plane to final set. * Pile indicated a Heated (Drive - Comm) [illegible]

DRIVING RECORD

Depth (m)	Drop	Blows	Depth (m)	Drop	Blows	D.(m)	Drop	Blows
0.5	↓		10.5			20.5		
1	↓		11			21		
1.5			11.5			21.5		
2	Move with		12			22		
2.5	to 6.5m		12.5			22.5		
3	Depth		13			23		
3.5	↓		13.5			23.5		
4			14			24		
4.5			14.5			24.5		
5			15			25		
5.5			15.5			25.5		
6			16			26		
6.5	↓		16.5			26.5		
7	1'		17			27		
7.5	1'		17.5			27.5		
8	1'		18			28		
8.5	1'		18.5			28.5		
9	Tip @ 9m		19			29		
9.5		3	19.5			29.5		
10			20			30		

[redacted]

Sangiuliano, Tony (MTO)

To: Kong, Weiling (MTO)

Subject: RE: Pile 5 - South-East Retaining Wall - Regional Road

Weiling;

Based on our review and the fact that the bedrock surface elevation is uniform at the south abutment location, pile appears to have been damaged during installation. Although the cause of the damage would require further investigation, possible causes include failure of the weld or alternatively bending of the pile due to overdriving.

The QVE's recommendation to replace the pile is considered a reasonable solution. The location of the replacement pile should be reviewed and and discussed with MRC, the designer of the structure.

We trust these comments are sufficient for your purposes. If you have any questions, please do not hesitate to contact our office.

Tony

-----Original Message-----
From: Kong, Weiling (MTO)
Sent: May 23, 2003 3:01 PM
To: Sangiuliano, Tony (MTO)
Subject: FW: Pile 5 - South-East Retaining Wall - Regional Road 29

Tony,

As discussed over the phone, please see the attached. Thanks.

Weiling

-----Original Message-----
From: Birch, Neil (MTO)
Sent: May 23, 2003 10:24 AM
To: Kong, Weiling (MTO)
Cc: Tay, Louis (MTO)
Subject: FW: Pile 5 - South-East Retaining Wall - Regional Road 29

Hi Weiling:

As discussed yesterday, please see attached.

Should the QVE's recommendation of replacing the pile be accepted, we will need confirmation of the location ie: which side of existing pile, o/s from existing pile etc.

Neil

-----Original Message-----
From: McIntosh Perry [mailto:mhfield1@attcanada.ca]
Sent: May 21, 2003 4:18 PM
To: Birch, Neil (MTO)
Subject: Pile 5 - South-East Retaining Wall - Regional Road 29

Neil,

Please find attached digitized Contract Memorandum #46 and the attached information pertaining to the damaged pile #5.

Jack McLaren
McIntosh Perry Consulting Engineers
Arnprior Field Office
Contract 2001-0002

TS

Golder Associates Ltd.

2180 Meadowvale Boulevard
Mississauga, Ontario, Canada L5N 5S3
Telephone (905) 567-4444
Fax (905) 567-6561

July 5, 2002

001-2026 (5001)

Ministry of Transportation, Ontario
Pavements and Foundations Section
Room #223, Central Building
1201 Wilson Avenue
Downsview, ON
M3M 1J8

Attention: Mr. Tony Sangiuliano, P.Eng.

RE: GRANULAR B TYPE SURCHARGE IN PLACE OF ROCKFILL REGIONAL ROAD 29, HWY. 417

Dear Sirs:

Further to your telephone conversation with us on July 3, 2002 with regard to the contractor's proposal to use Granular B Type II as surcharge material in place of rockfill. We have carried out stability analyses at two sections of the south embankment and our comments are as follows:

The longitudinal profile provided by you for the embankment staging 1 suggests that the most critical condition will be the south approach. Two typical sections at Sta. 10+160 and Sta. 10+200 were chosen to carry out stability analyses incorporating Granular B Type II as surcharge material in place of rockfill. The parameters for rockfill, lightweight fill material and the strength of the silty clay are similar to the values described in our Foundation Investigation and Design Report submitted on June 2000 for Regional Road # 29. The unit weight of 22 kN/m^3 and an effective strength friction angle of 35^o were chosen for Granular B Type II surcharge material in our stability analyses.

The stability analyses indicate a factor of safety of not less than 1.3 for both sections analyzed. Therefore we consider the Granular B Type II surcharge option is acceptable from an overall stability point of view.

We trust this letter will be adequate for your immediate requirements. If your need further assistance, please contact us.

Yours very truly,

GOLDER ASSOCIATES LTD.

M.S. Devata, P.Eng.
Consultant

F.J. Heffernan, P.Eng.
Designated MTO Contact

MSD/FJH/pds

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Sangiuliano, Tony (MTO)

To: Birch, Neil (MTO)
Cc: Tay, Louis (MTO); Dundas, Dave (MTO)
Subject: Contract 2001-0002 - Hwy 417/RR29 - Substitution of Granular B for Rockfill

Neil:

As requested we have completed our review of the Contractor's proposal to substitute Granular B for rockfill. The proposal has several advantages as identified in your E-mail to Louis Tay dated July 3 including:

1/ The change would allow Tomlinson to complete the subgrade on the ramps **without** having to leave a space now to receive the surcharge material. (This is a good construction practice.)

2/ The removal quantity of the surcharge would be lessened. (Cost savings)

3/ The remaining Gran. "B" would be utilized for the roadway base. (Cost neutral)

From a foundation technical point of view, the additional surcharge loading will contribute to accelerating embankment settlements without jeopardizing embankment stability. Golder's was asked to verify these embankment design aspects and their response is provided in their letter dated July 5, 2002. I have sent a fax containing Golder's letter that confirms that the substitution is acceptable from a technical point of view.

If you have any questions, please do not hesitate to contact us.

Tony

Tony Sangiuliano
Room 223, Bldg C
Downsview Ontario
Phone: (416) 235-5267
Fax: (416 235-5240

facsimile transmittal

To:	Neil Birch CCO Eastern Region	**Fax:**	(613) 748-5297
From:	Tony Sangiuliano	**Date:**	July 5, 2002
Re:	Substitution of Granular B for Rock Borrow as Surcharge @ RR 22	**Pages:**	4
CC:			

☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

Notes:

Neil:

Attached please find Golder's response regarding the Contractor's proposal to substitute Granular B for surcharge in place of rockfill. We have reviewed Golder's response and concur that the substitution is acceptable from an embankment stability and also embankment settlement point of view.

If you have any questions, please contact us.

CONFIDENTIAL

FACSIMILE TRANSMISSION

Golder Associates Ltd.
2180 Meadowvale Boulevard
Mississauga, ON, Canada L5N 5S3

Telephone: 905-567-4444
Fax Access: 905-567-6561

DATE: July 5, 2002

JOB NO: 001-2026 (5001)

TO: Mr. Tony Sangiuliano, P.Eng.
Ministry of Transportation, Ontario
Pavements and Foundations Section
Room #223, Central Building
1201 Wilson Avenue
Downsview, ON
M3M 1J8

FAX NO: 416-235-5240

TOTAL PAGES: 3

FROM: Murty Devata

EMAIL: Mdevata@golder.com

RE: **GRANULAR B TYPE SURCHARGE IN PLACE OF ROCKFILL**
REGIONAL ROAD 29, HWY. 417

Please see attached letter.

/MD/pds

Original hard copy to follow by mail ☒ Yes, ☐ No
cc's: hard copy to follow by mail ☐ Yes, ☒ No

Please advise immediately if any pages are not received

Golder Associates Ltd.

2180 Meadowvale Boulevard
Mississauga, Ontario, Canada L5N 5S3
Telephone (905) 567-4444
Fax (905) 567-6561

July 5, 2002

001-2026 (5001)

Ministry of Transportation, Ontario
Pavements and Foundations Section
Room #223, Central Building
1201 Wilson Avenue
Downsview, ON
M3M 1J8

Attention: Mr. Tony Sangiuliano, P.Eng.

RE: GRANULAR B TYPE SURCHARGE IN PLACE OF ROCKFILL
REGIONAL ROAD 29, HWY. 417

Dear Sirs:

Further to your telephone conversation with us on July 3, 2002 with regard to the contractor's proposal to use Granular B Type II as surcharge material in place of rockfill. We have carried out stability analyses at two sections of the south embankment and our comments are as follows:

The longitudinal profile provided by you for the embankment staging I suggests that the most critical condition will be the south approach. Two typical sections at Sta. 10+160 and Sta. 10+200 were chosen to carry out stability analyses incorporating Granular B Type II as surcharge material in place of rockfill. The parameters for rockfill, lightweight fill material and the strength of the silty clay are similar to the values described in our Foundation Investigation and Design Report submitted on June 2000 for Regional Road # 29. The unit weight of 22 kN/m^3 and an effective strength friction angle of 35° were chosen for Granular B Type II surcharge material in our stability analyses.

The stability analyses indicate a factor of safety of not less than 1.3 for both sections analyzed. Therefore we consider the Granular B Type II surcharge option is acceptable from an overall stability point of view.

We trust this letter will be adequate for your immediate requirements. If your need further assistance, please contact us.

Yours very truly,

GOLDER ASSOCIATES LTD.

M.S. Devata, P.Eng.
Consultant

F.J. Hefferman, P.Eng.
Designated MTO Contact

MSD/FJH/pds

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McCORMICK RANKIN CORPORATION

Notes of Meeting

Project: WP 128-92-00 and WP 452-90-00, Highway 417
1.1 km west of Regional Road 29, easterly 4.9 km

Meeting No. F1
W.O. 4209-00

Date: June 16, 2000

Place: MTO, Eastern Region, Boardroom 5

Time: 10:45 a.m.

Attending: **Ministry of Transportation, Ontario (MTO)**

Phil Pawliuk
Louis Tay
Harold Kleywegt
Iqbal Husain
Nick Theodor
David Dundas
Tony Sangiuliano

Golder Associates Ltd. (Golder)

Fin Heffernan
Glen Collins

McCormick Rankin Corporation (MRC)

Tony Wing
Manny Goetz

Purpose: To discuss subsoil conditions and foundation engineering considerations at Highway 417 – R.R.20, 22 & 29 proposed bridge sites.

RE: NOTES ON JUNE 16 MEETING AT MTO KINGSTON - HWY. 417

The geotechnical/foundation aspects of the meeting at Kingston on June 16, 2000, regarding Hwy. 417 bridges are presented herein. The subsoil condition and foundation engineering consideration were presented by Fin Heffernan for the three sites (Roads 20, 22, and 29).

ENGINEERING CONSIDERATIONS

a) ROAD 29

Fin Heffernan stated that with a surcharge of 2 metres - probably 90% of the settlement could be completed within 6 to 8 months, 50% within 2 to 3 months.

Louis Tay said that it was possible to preload at this site - award early 2001, structure will be in by end of 2002. Further discussion ensued indicating that it may be possible to delay the structure construction for another year having it complete by the fall 2003.

David Dundas mentioned that we could use wick drains to speed up process - Fin Heffernan felt that, with the surcharge time available, wick drains probably would not be required at this site.

Tony Sangiuliano mentioned that the height of the surcharge considering the time available should be optimized.

In summary at this site there is a time window for preloading and surcharging, rockfill is to be used (with maybe some earthfill), lightweight fill to be used in higher embankment areas close to abutment to reduce settlement , improve stability and permit piles to be driven through fill at any time

b) ROAD 22

Fin Hefferan presented three options for this site (refer to appended sketches)

Option 1

Rockfill no more than 4 metres high. Lightweight to 5 m height at abutment. Increase length of bridge by about 120 m on either side.

Additional cost of $2.9 M.

David Dundas raised the question of steeper approach grades to limit approach lengths. Manny Goetz replied the road is designed for 80 km and the grade of 3.5% is required.

Option 2

Styrofoam base (up to 7 m thick) with lightweight fill cover, rockfill for embankment heights of 4 m. or less. Settlements are 100 mm for Styrofoam sections, 300 mm at rockfill.

Additional cost of about $2 M.

Option 3

Styrofoam base for embankment heights above 7 m, lightweight fill only for 7 m to 4 m, rockfill for embankment fills of 4 m or less.

Settlements are 100 mm at styrofoam, 500 mm at lightweight fill and 300 mm at rockfill.

Add about $1.3 M to costs.

Tony Wing noted that the structure length could be shortened with this option (and for Option II) since berms in front of the abutment were not required.

MTO Structural (Eastern Region) asked about an Option 4, depressing Road 22 and having Hwy. 417 going over Road 22. Fin Heffernan indicated that Tony Wing had raised this option prior to the start of the meeting.

Tony Wing discussed this Option 4. Lowering of Road 22 would be kept at a maximum depth of 3 to 3.5 metres to remain within the weathered crust. MTO Geotechnical will need to comment prior to investigating any further. It was agreed that MRC and Golder Associates Limited (GAL) would wait until they received this response from Geotech before proceeding with any further investigations. Drainage of the cut was discussed and it was noted that this would be a significant concern to be addressed. There are also some implications for the Hydro towers (the possibility that they would need to be raised further) since Highway 417 profile would have to be raised over RR22. Phil Pawliuk stated that the MTO had made commitments that a future interchange would be considered / accommodated and that noise levels at a few nearby homes must be studied. Property requirements for this option must also be investigated although initial discussions indicated that property requirements for RR22 under 417 could not be as larger as for the RR22 over Hwy 417.

Consideration should be given to the fact that there is a commitment for future ramps at this site. MRC mentioned that based on proposal, Golder were to provide pavement recommendations for Road 22 detour. A proposal would be required for foundation/geotechnical considerations on underpass Option. GAL to provide recommendations for pavement upon approval of a proposal submitted to the MTO in this respect.

Harold Kleywegt suggested that as another alternative, Highway 417 could be depressed (up to 3m) below the RR22 structure.

In summary, difficult overpass due to deep soft compressible clay. Options are long bridge (like Anderson Road) or extensive use of Styrofoam and lightweight fill. It was agreed that embankment loads (RR 22 or Highway 417) must not exceed pre-consolidation pressures of the clay.

*c) **Road 20***

Settlement times at this site (south side embankment) are estimated at 8 years for 90% consolidation and 1.8 years for 50%. With wick drains, 90% consolidation 6 to 8 months and 50% - 1.5 to 3 months. For the north side embankment 90% in 60 years and 50% in 14 years. Using lightweight fill, rockfill and wick drains 90% settlement may be reduced to within 6 to 8 months.

Louis Tay said that we did have a 6 to 8 month window for preloading at this site.

Louis Tay will look into possibility of space availability for placing berm for temporary surcharge.

Embankment might be raised another 0.5 metres for bridge considerations.

Tony Sangiuliano mentioned that wick drains, lighter fill (11.5 kN/m^3) should be considered.

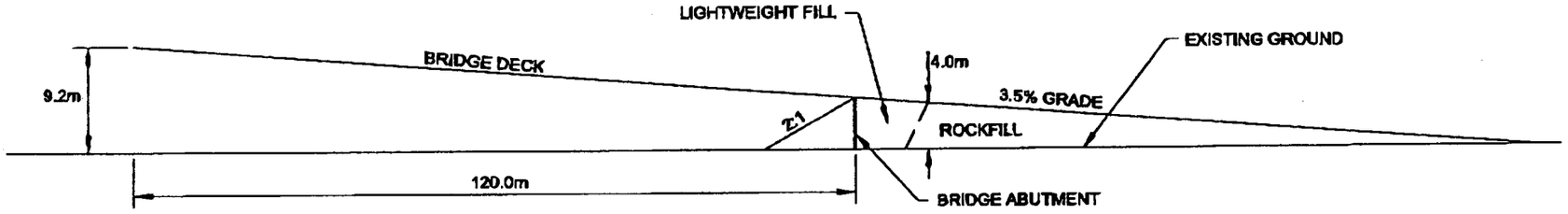
Need to find out if this material is available. (Tony S. to investigate).

MTO (Nick Theodor) to provide new embankment heights.

In summary wick drains, rockfill and lightweight fill are to used as well as preloading and surcharging.

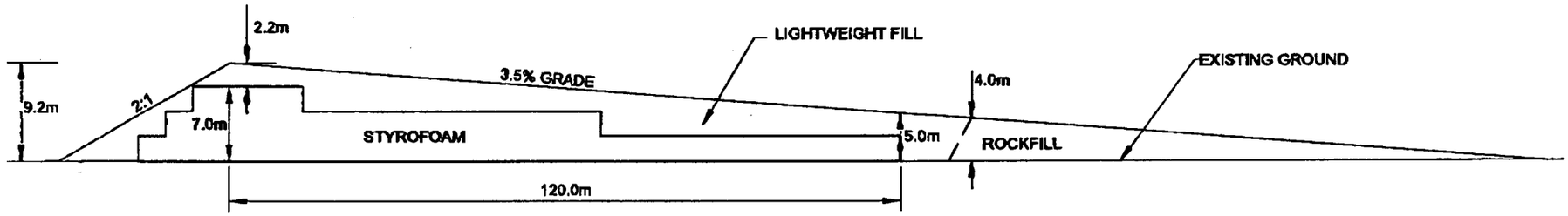
REINFORCED EARTH RETAINING WALL

The use of reinforced earth retaining wall was discussed. MTO's opinion, (Iqbal Husain and David Dundas) based on past experience, is that for compressible soil conditions the performance of such a wall is uncertain and that they prefer not to use earth reinforced walls for the present project. Iqbal Husain favoured open abutments (in the order of 43 m for the RR 29 structure) in terms of increased safety for the drivers and consistency between the bridges along Hwy. 417.

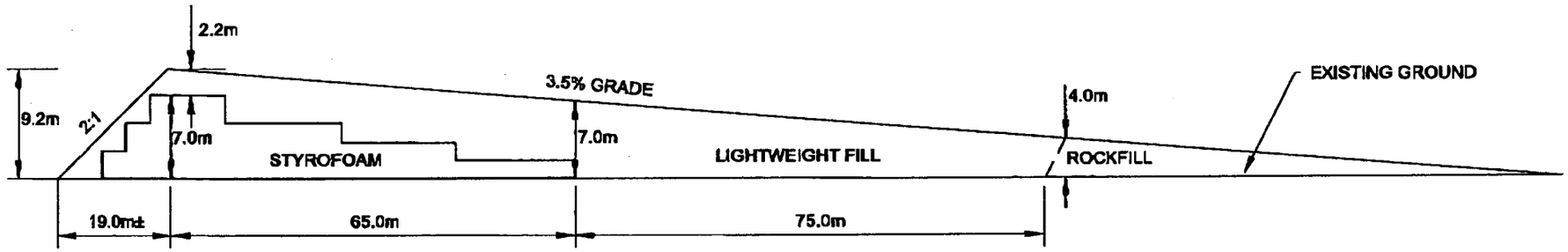


OPTION I

BRIDGE , LIGHTWEIGHT FILL AND ROCKFILL
REG. RD. #22



OPTION II
STYROFOAM, LIGHTWEIGHT FILL AND ROCKFILL
REG. RD. #22



OPTION III
STYROFOAM, LIGHTWEIGHT FILL AND ROCKFILL
REG. RD. #22

MEMORANDUM

Ontario

To: L. Tay, P. Eng.
Project Engineer
Planning and Design
Eastern Region

09 June 2000

From: Pavements and Foundations Section
Room 223, Central Bldg.

Tel: (416) 235-5267
Fax: (416) 235-5240

Re: Draft Foundation Investigation and Design Report
Hwy 417 Underpass Bridge at Regional Rd 29
WP 128-92-00 & 452-90-00

A copy of the draft Foundation and Design Report produced by Golder Associates dated May, 2000 was received by our office on June 5, 2000 under Barry McQuay's covering letter dated June 1, 2000. We have completed a review of the report in order to evaluate the performance of the Foundation Engineering consultant. Our review comments are provided in this memorandum.

Our review is based on verifying that the Foundation Investigation and Design Reports satisfy the terms of reference for completeness. The Consultant is responsible for the technical accuracy of the recommendations contained in the report. Any deficiency identified in this memorandum is intended to alert the Consultant but shall not relieve the Consultant of any responsibility for their work.

In general, the report addresses and satisfies the terms of reference included in the Consultant Agreement. However, some deficiencies and concerns with the report are present and are outlined in this memorandum.

FACTUAL COMPONENT

Introduction

Pg 1 , 2nd paragraph – are guidelines or recommendations being provided?

Pg 1, 3rd paragraph – the report makes reference to existing information being "consulted". Was this information "consulted" or "reviewed".

Investigation Procedures

In the first two paragraphs in this section, a project specific Quality Assurance plan and a detailed Occupational Health and Safety Plan is referenced. Typically, these plans are not described in the Foundation Investigation and Design Report.

A Borehole 92-2 is given. The Consultant should review the number designation.

The report states that six(6) boreholes were advanced at the north and south approach embankments(29-7 to 29-13). Seven(7) boreholes were actually advanced.

The diameter of the thin walled piston sampler and the details of the vane test (vane type, procedure reference) should be included in the report.

On page 5, it is described that the soil samples were "cared for". Clarification is required.

Subsurface Conditions

In the second paragraph on page 6, the thicknesses of the soil layers have not been included in the summary of the subsurface conditions.

Silty Sand

Reference to Figure 1 – Grain Size Distribution Curve is not given in the text of the report.

Sensitive Silty Clay

The term "sensitive" is a material property that describes the behaviour of the soil. This term, however, should not be included in the classification title of the soil.

In the second paragraph, it is described that the upper portion of the weathered crust "may" be very stiff. The report should definitively describe the consistency of the soil.

Atterberg Limits were determined but have not been plotted on Plasticity Charts for the upper crust and the lower unweathered soil. It may very well be that the plasticity of the soil is low to intermediate and hence the deposit is clayey silt to silty clay.

It is described that the "remoulded vane shear strength values indicate sensitivities up to 10". The report should describe the range of sensitivity quantitatively.

On page 8, the first sentence describes the results of an unconfined undrained triaxial test. The consistency of the sample, however, is not described.

It appears that one(1) consolidation test was carried in the upper crust and one(1) consolidation test was carried out in the lower unweathered stratum. Have sufficient number of samples been tested?

The degree of preconsolidation in excess of the overburden pressure($p'_c - p'_o$) provides meaningful data. These values have not been included in the report.

The last two paragraphs in this section on page 8 describe the results of the MTO investigation of this stratum. The benefit of separating the MTO investigation and the recent investigation is not understood.

Bedrock

The elevation of the bedrock surface has not been provided in the report.

The report does not include sufficient rock descriptions – bedding, jointing, colour, weathering.

DISCUSSION AND RECOMMENDATIONS

General

On projects where the approach embankment design governs the foundation design, discussion and recommendations for the design of the approach embankments are included first followed by discussion and recommendations of the foundations.

The report should identify if the settlement or stability is the more critical issue that will govern the embankment design. A comprehensive identification of alternatives to engineer the embankment design(stability/settlement) that includes costs, risks, technical feasibilty and construction considerations should be included in the report.

Bridge Foundations

Section 5.1.2.1 End Bearing Piles

In the first three paragraphs on page 13, set criteria are discussed for piles driven to bedrock. The Consultant should review this requirement for piles driven to bedrock.

Recommendations are given for re-striking the piles. Reference should be made to MTO Special

Provisions.

Section 5.1.2.1.2 Downdrag

The report identifies bitumen as a material that can be applied to reduce downdrag forces. The report identifies the "potential for contamination". It is the Consultant's responsibility to ensure that the recommendations are feasible both geotechnically and environmentally prior to issuing the recommendation.

Section 5.1.2.1.3 Horizontal Resistance

The report should discern between horizontal resistance provided by vertical piles and horizontal resistance provided by battered piles.

Section 5.1.2.2 Caissons

A factored axial resistance should be given. Presently, the report provides a bearing pressure recommendation.

A permanent steel casing has been recommended to facilitate the construction of the caisson. The Consultant should review this requirement.

Approach Embankments

General

Construction considerations such as any subexcavation requirements and the placement and compaction of the fill should be included in the report.

Section 5.3.2 Stability Analyses

The Consultant has selected to reduce the undrained shear strength of the silty clay crust from 95 kPa to 70 kPa for a depth of 5 m. Could this reduction be reconsidered to allow more flexibility in options to address settlement?(for example by permitting additional surcharge).

Section 5.3.3 Settlement

The report refers to the relationship between the preconsolidation pressure and the undrained shear strength. It is not clear if the Consultant used this relationship in the Unisettle settlement analyses or the actual settlement curves produced. The Consultant should clarify and comment.

More details are needed for the options to manage the predicted settlements. More discussion regarding some of the options such as preloading and surcharging, wick drains, lightweight fill materials and a combination should be included.

Recommendations for monitoring the settlement employing a comprehensive settlement monitoring program should be included in the report.

T. Sangiuliano, P. Eng.
Foundation Engineer

for

D. Dundas, P. Eng.
Senior Foundation Engineer

MEMORANDUM

Ontario

To: L. Tay, P. Eng.
Project Engineer
Planning and Design
Eastern Region

17 July 2000

From: Pavements and Foundations Section
Room 223, Central Bldg.

Tel: (416) 235-5267
Fax: (416) 235-5240

Re: Final Foundation Investigation and Design Report
Hwy 417 Underpass Bridge at Regional Rd 29
WP 128-92-00 & 452-90-00

A copy of the Final Foundation and Design Report produced by Golder Associates dated June, 2000 was received by our office on July 12, 2000 under your covering letter dated July 10, 2000. We have completed a review of the report in order to evaluate the performance of the Foundation Engineering consultant.

Our review is based on verifying that the Foundation Investigation and Design Reports satisfy the terms of reference for completeness. The Consultant is responsible for the technical accuracy of the recommendations contained in the report. Any deficiency identified in this memorandum is intended to alert the Consultant but shall not relieve the Consultant of any responsibility for their work.

In general, the report addresses and satisfies the terms of reference included in the Consultant Agreement. Also, the deficiencies and concerns with the report expressed in our memorandum dated June 09, 2000 have been adequately addressed.

It is recommended that the Consultant be retained to produce a comprehensive embankment settlement and stability monitoring program for this project.

It is also recommended that consideration be given to purchasing and transporting the lightweight fill material in advance of the contract to ensure that the lightweight fill material can be supplied.

If you have any questions, please do not hesitate to contact our office.

T. Sangiuliano, P. Eng.
Foundation Engineer

for

D. Dundas, P. Eng.
Senior Foundation Engineer

MEMORANDUM

Ontario

To: L. Tay, P. Eng.
Project Engineer
Planning and Design
Eastern Region

09 June 2000

From: Pavements and Foundations Section
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Tel: (416) 235-5267
Fax: (416) 235-5240

Re: Draft Foundation Investigation and Design Report
Hwy 417 Underpass Bridge at Regional Rd 29
WP 128-92-00 & 452-90-00 (29)

A copy of the draft Foundation and Design Report produced by Golder Associates dated May, 2000 was received by our office on June 5, 2000 under Barry McQuay's covering letter dated June 1, 2000. We have completed a review of the report in order to evaluate the performance of the Foundation Engineering consultant. Our review comments are provided in this memorandum.

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Transition betw rockfill / lightweight fill

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T. Sangiuliano, P. Eng.
Foundation Engineer

for

D. Dundas, P. Eng.
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