

GEOCRES No. \_\_\_\_\_

DIST. 52 REGION \_\_\_\_\_W.P. No. 2501-97-00

CONT. No. \_\_\_\_\_

W. O. No. \_\_\_\_\_

STR. SITE No. 42-10NHWY. No. 11LOCATION Wasi Truck Inspection  
StationNo of PAGES -       

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. \_\_\_\_\_REMARKS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# memorandum

Geotechnical Section, Northern Region  
447 McKeown Avenue, 4th Floor  
PO Box 3030, North Bay, ON P1B 8L2  
Phone: (705) 497-5478  
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TO: P. Lecoarer, P.Eng.  
Area Engineer  
Planning and Design

DATE: July 30, 1998

ATTN: E. Gallant  
Senior Project Manager



RE: **W.P. 2501-97-00, Wasi Truck Inspection Stations**  
**Highway 11, 20 km South of North Bay**  
**District 54 - Sudbury**

Please find attached Foundation Section comments on the Geotechnical Investigation Report prepared by Terraprobe for Stanley Consulting. Your attention is drawn to their comment, "the information obtained from a geotechnical investigation is considered insufficient for foundation design purposes".

Foundation Section states it would be prudent to verify the condition and quality of the bedrock at the Southbound Inspection Station location. Further, they cannot comment on the validity of the bearing resistance values for the Northbound Inspection Station without soil strength parameters as derived from in-situ testing.

D. Smith, P. Eng.  
Project Soils Engineer

cc: J. McDougall  
D. Dundas (memo only)

→ T.S.

# MEMORANDUM



To: J. D. Smith  
Project Soils Engineer  
Northern Region

July 30, 1998

From: Pavements and Foundations Section  
Room 315, Central Bldg.

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

Re: Wasi Truck Inspection Station  
Hwy 11, 20 Km South of North Bay  
WP 2501-97-00, Site 42-10N  
District 52, Huntsville

As requested in your fax dated July 29, 1998, we have reviewed the information contained in the one page of Terraprobe's report (Section 4.3 entitled Building Foundations) regarding the building foundations for the Northbound and Southbound Truck Inspection stations. Our review comments are contained in this memorandum.

## *General*

In our previous memorandum dated July 28, 1998, we provided some general comments regarding foundation design on sloping bedrock. In order to facilitate the foundation design at the specific Truck Inspection Station foundations, the appropriate site specific subsurface data must be obtained. It is assumed that the information presented was derived from auger holes advanced in conjunction with a geotechnical investigation. Typically, the information obtained from a geotechnical investigation is considered insufficient for foundation design purposes. Consequently, it is very difficult to comment on the bearing capacities recommended in Terraprobe's report.

The design of foundations at Truck Inspection Stations involves stringent settlement criteria. The load cells used are very sensitive to differential settlement and in the past, we have designed such footings on the premise that the allowable differential settlement be limited to 12 mm.

## *Southbound Inspection Station*

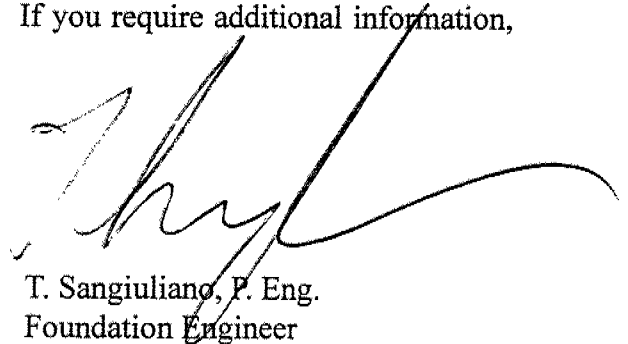
It is expected that the rock at the site is a competent igneous or metamorphic rock and consequently for foundations on the bedrock there shouldn't be any difficulty with regards to settlement and the serviceability of the foundations. The bearing resistance of 3 MPa at ULS is conservative and in our judgment should be acceptable. However, it would be prudent to verify the condition and quality of the bedrock at the specific Southbound Inspection Station location by conducting a site specific foundation investigation.

## *Northbound Inspection Station*

At the Northbound Truck Inspection Station, the report has recommended conventional shallow foundations bearing on the native sand and clayey silt soils. Bearing resistances of 100 kPa at SLS and 180 kPa at ULS have been recommended. Without the benefit of soil strength parameters as derived from site specific in situ testing, we cannot comment on the validity of these bearing resistance values. Test holes TH 19 and TH 20 also suggest non uniform conditions in that both sand and clayey silt soils are present at the Northbound Inspection Station location. Consequently, it is important that the bearing resistance reflects the non uniform conditions.

In view of the close proximity of the bedrock, a design consideration could be to subexcavate the overburden and construct the foundations on a compacted Granular "A" pad.

We trust this information is sufficient for your purposes. If you require additional information, please do not hesitate to contact our office.



T. Sangiuliano, P. Eng.  
Foundation Engineer

for

D. Dundas, P. Eng.  
Senior Foundation Engineer

cc. T. Kazmierowski

#### 4.3 Building Foundations

I believe this should be 20.

##### Northbound Inspection Station

Two boreholes (TH 19) and (TH 19) put down in the area of the proposed office building at the northbound truck inspection station generally encountered 2.4 to 4.0 m of compact sand or stiff clayey silt soil overlying bedrock.

The native sand and clayey silt soils are considered suitable for the support of the proposed structure on conventional shallow footings. The following recommended bearing pressures should be used for design:

- |    |  |               |
|----|--|---------------|
| A. | Factored bearing capacity at ultimate limit states                         | 180 kPa (ULS) |
| B. | Bearing capacity at serviceability limit states; 25 mm ← 1 story building. | 100 kPa (SLS) |

It is recommended that building foundations be placed on dry, undisturbed native soils which has been cleaned of topsoil, loosened materials, and debris. Rainwater or seepage entering the excavations should be pumped away (not allowed to pond), and any disturbed material should be removed from the base of the excavation. It is recommended that all footing excavations be inspected by a qualified geotechnical engineer, in order to verify the allowable bearing pressure at the footing bases.

All exterior foundations, or foundations in unheated areas should be provided with a minimum soil cover of 1.85 m or equivalent insulation, for frost protection purposes. The depth should be increased to 2.0 m where snow cover is removed on a continued basis.

##### Southbound Inspection Station

The two boreholes (TH 10 and TH 11) put down in the area of the proposed office building at the southbound truck inspection station generally encountered a thin layer of sand soil overlying shallow bedrock at depths of about 0.9 to 1.1 m below grade.

Spread footings founded directly on the sound bedrock may be designed with a factored bearing resistance of 3 MPa. The bedrock may be considered a non-yielding stratum (therefore no

# MEMORANDUM



To: J. D. Smith  
Project Soils Engineer  
Northern Region

July 28, 1998

From: Pavements and Foundations Section  
Room 315, Central Bldg.

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

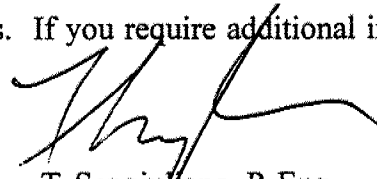
Re: Wasi Truck Inspection Station  
Hwy 11, 20 Km South of North Bay  
WP 2501-97-00, Site 42-10N  
District 52, Huntsville

As requested in your memorandum fax dated July 27, 1998, we have reviewed the information provided regarding foundations on sloping bedrock. In our opinion, the footings should be placed on a relatively horizontal surface if possible. Terraprobe has recommended an angle of less than 10 degrees or flatter which is considered reasonable. For areas where steep rock slopes are present, the slope can be either levelled flat for the entire width of the footing or stepped across the width of the footing.

Regardless of whether the footing is on a flat surface or a slight sloping surface, the designer shall ensure that the footing has adequate horizontal capacity to resist the applied loads. The sliding resistance at the footing rock interface and along any bedding planes in the rock mass itself must be determined. Dowels and shear keys can be used as required to augment the lateral resistance of the footing. The horizontal capacity of the rock is required in the design of dowels or shear keys.

The horizontal capacity of the rock and the magnitude of permissible slope (prior to incorporating the slope flattening, slope stepping, dowels and shear keys) is a function of the type and strength of bedrock. Bedding planes, rock joints, degree of fracturing and weathering are some physical properties of the bedrock that are required to assess the horizontal capacity. Rock cores would be required to facilitate this examination.

We trust this information is sufficient for your purposes. If you require additional information, please do not hesitate to contact our office.

A handwritten signature in black ink, appearing to read "T. Sangiuliano".

T. Sangiuliano, P. Eng.  
Foundation Engineer  
for

D. Dundas, P. Eng.  
Senior Foundation Engineer

cc. T. Kazmierowski

**facsimile**  
TRANSMITTAL

**To:** Dave Dundas  
**Of:** MTO  
**Fax:** (416) 235-5240  
**Phone:** (416) 235-3482  
**Pages:** 5, including this cover sheet.  
**Date:** July 27, 1998

Dave,

Please find attached excerpts from the Geotechnical Investigation Report for W.P. 2501-97-00, Wasi Truck Inspection Stations, Highway 11, 20 km S of North Bay. Not included is a map showing testhole locations. The consultant agreement did not include the a foundations terms of reference. Basically the consultant agreed to carry out a foundation investigation and provide recommendations. I was not involved in the agreement preparation.

Could you please review the attached and provide comments if any?

Thanks. Dale

From the desk of...

James D. Smith, P.Eng.  
Project Soils Engineer  
Ministry of Transportation Ontario  
447 McKeown Avenue  
P.O. Box 3030  
North Bay, ON P1B 8L2  
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Stanley Consulting Group Limited  
Wasi North and South Truck Inspection Stations

serviceability limit state required.

It is recommended that the surface of the rock be hand cleaned of all loose debris and shatter. The footings are to be established on a relatively level rock surfaces, i.e. sloping at an angle of less than 10 degrees or flatter. Footings can be placed on bedrock sloping upto 25 to 30 degrees provided dowels are incorporated to resist shear. For areas where the rock slopes are steeper, it is recommended that the rock surface be levelled. *where are the design details?*

Foundations set directly onto the bedrock do not require burial at nominal depths for frost protection since bedrock is not affected. Adequate drainage is required for such foundations to ensure that water does not enter the joints between the foundation and rock.

We trust the foregoing information is sufficient for your present requirements. Should you have any questions regarding this matter, please do not hesitate to contact the undersigned.

Yours truly,

**Terraprobe Limited**



Karl Roechner, P.Eng.  
Manager

Sudbury Office



**Terraprobe**



## TH 7

0 - 1.10 Sa W Tr of Si, Br, Wet  
1.10 NFP BR

## TH 8

0 - 50 Org  
50 - 1.10 Sa W Some Gr and Si, Br, F, Moist  
% PASSING 9.50 mm = 98  
2.00 mm = 75  
75  $\mu$ m = 27  
45  $\mu$ m = 18  
13  $\mu$ m = 7  
5  $\mu$ m = 3 LSPH  
3  $\mu$ m = 1

1.10 NFP BR

## TH 9

0 - 150 Asph  
150 - 300 Gr(y) Sa, Br, Moist, Med to Co  
300 - 800 Sa W Tr of Cob, Br, Moist  
800 NFP BR

## TH 10

0 - 50 Org  
50 - 900 Sa W Some Si, Br, F, Moist  
900 NFP BR

## TH 11

0 - 75 Org  
75 - 1.10 Sa W Tr of Gr, Br, Frozen, Med to Co, W Styrofoam  
for 40 mm  
1.10 NFP BR

## TH 12

0 - 150 Asph  
150 - 300 Gr(y) Sa, Br, Moist to Wet, F  
NOT Accep GRANULAR 'A'  
62% PASSING 4.75 mm  
Accep GRANULAR 'B' TYPE I  
300 - 1.40 Sa W Some Gr, Br, Moist, F  
1.40 NFP BR

## TH 18

0	-	75	Asph
75	-	455	Gr(y) Sa, Br, Moist, Med to Co
455	-	800	Sa W Some Gr, Br, Moist, F, Comp
800			NFP BR

## TH 19

0	-	50	Asph
50	-	350	Gr(y) Sa, Br, Moist, Med to Co
			Accep GRANULAR 'A'
350	-	1.30	Sa W Some Gr, Br, Moist, Comp
1.30	-	2.20	Cl(y) Si, Tr of Sa, Br, Moist, Stiff
2.20			NFP BR

## TH 20

0	-	140	Asph
140	-	330	Gr(y) Sa, Br, Moist, Med to Co
330	-	3.70	Sa W Some Gr, Br, Moist to Wet at 3.0 m, F, Comp
3.70			NFP BR

## TH 21

0	-	140	Asph
140	-	365	Sa & Gr, Br, Frozen, Med to Co
365	-	1.50	Sa W Some Gr, Br, Moist, Comp
			Accep GRANULAR 'B' TYPE I
1.50			NFP RF

## TH 22

0	-	50	Org
50	-	900	Si W Some Gr, Gry, Wet
900	-	1.50	Sa, Br, F to Med, Wet

## TH 23

0	-	25	Org
25	-	1.50	Si W Some Cl, Br, Moist, Firm to Stiff
% PASSING			2.00 mm = 100
			75 $\mu$ m = 83
			39 $\mu$ m = 70
			12 $\mu$ m = 41
			5 $\mu$ m = 20 HSFH
			1 $\mu$ m = 7