



GEMTEC

CONSULTING ENGINEERS
AND SCIENTISTS

GEMTEC Limited tel: 506.858.7180
77 Rooney Crescent fax: 506.858.0742
Moncton, NB gemtec@gemtec.ca
E1E 4M4 www.gemtec.ca

9 August 2012

File: 6489.07-L02

via e-mail Garth.Holder@pwgsc-tpsgc.gc.ca

Public Works and Government Services Canada
1045 Main Street, Unit 100
Moncton, NB
E1C 1H1

Attention: Garth Holder, Project Manager

Re: Marine Test Pit Investigation –Pigeon Hill, NB Gully Entrance and Pigeon Hill to Miscou Channel (Call Up EC015-110732/001/PWB)

GEMTEC Limited was retained by Public Works and Government Services Canada to undertake a marine test pit investigation in a section of the Pigeon Hill to Miscou channel, and the Gully entrances at the Pigeon Hill wharf. We understand that the test pit data will be used to determine dredging methods. The purpose of this investigation was to assess the soils in the wharf channels. This report contains a summary of the fieldwork carried out.

Twelve test pits (TP) were excavated on 26 July 2012 in the Pigeon Hill channel channel. The work was carried out in the presence of one of our geotechnical technologists using a self propelled floating dredge plan, Amphibex, equipped with an excavator using a 1 cubic meter hydraulic bucket subcontracted to ECO Technologies. All twelve of the test pits were excavated to minimum elevation of -2.5 metres chart datum (CD). Based on observations made in the field the excavator (Amphibex) was suitable to excavate all soils encountered within the twelve test pits.

Test pit locations were provided by PWGSC. GEMTEC Limited guided the excavator to the test pit locations and surveyed the test pit locations in the field using a Topcon HiPer L1 GPS. All elevations on appended test pit logs are based on chart datum and are referenced to benchmark 90B9020 with a published elevation of +4.158 metres at the Pigeon Hill wharf.

Descriptive terms and detailed test pit logs, site photos, and test pit coordinates are attached (Attachments A, B and C, respectively).



If you have any questions regarding our proposal contact the undersigned.

A handwritten signature in blue ink, reading "Harold McQuade". The signature is fluid and cursive, with the first name "Harold" and last name "McQuade" clearly distinguishable. Below the signature is a solid horizontal line.

Harold McQuade, P.Eng
GEMTEC Limited

Attachments

(tds)

Attachment A

Descriptive Terms and Detailed Test Pit Logs



DESCRIPTIVE TERMS- BOREHOLE/TEST PIT LOG

SOILS

GRAIN SIZE

0.010.11.0101001000mm

SILT CLAY

SAND

GRAVEL

Cobble

BOULDER

0.080.425

FIMC

DESCRIPTIVE TERMINOLOGY

TRACE

SOME

ADJECTIVE

and > 35% noun > 35% and main fraction

trace clay, etc.

some gravel, etc.

silty, etc.

sand and gravel, etc.

COMPACTNESS
gravels, sands, tills

N, RANGE

0 - 4

4 - 10

10 - 30

30 - 50

> 50

DENSITY

V. LOOSE

LOOSE

MEDIUM

DENSE

V. DENSE

CONSISTENCY
silt, clay

S, KPa

< 12.5

12.5 - 25

25 - 50

50 - 100

100 - 200

CONSISTENCY

V. SOFT

SOFT

MEDIUM

STIFF

V. STIFF

ROCK

RQD

0 - 25

25 - 50

50 - 75

75 - 90

90 - 100

OVERALL QUALITY

VERY POOR

POOR

FAIR

GOOD

EXCELLENT

FRACTURE SPACING

VERY CLOSE 20 - 60 mm

CLOSE 60 - 200 mm

MODERATE 200 - 600 mm

WIDE 600 - 2000 mm

VERY WIDE 2 - 6 m

COMP. STR. MPa

1 - 5

5 - 25

25 - 50

50 - 100

100 - 250

DESCRIPTION

V. WEAK

WEAK

MODERATE

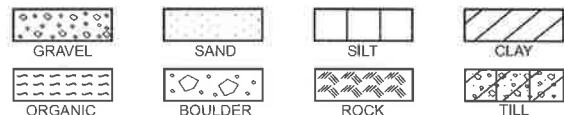
STRONG

V. STRONG

SAMPLE TYPES (location to scale on log)

S SPLIT TUBE	G SHOVEL
T SHELBY TUBE	H CARVED BLOCK
P PISTON	K SLOTTED
F AUGER	V IN SITU VANE
W WASH	NR NO RECOVERY

LOG SYMBOLS



ROCK CORES A(30mm); B(41mm); N(54mm)



- N - standard penetration test; blows by 475 J drop hammer to advance Std. 50mm O.D. split tube sampler 0.3m
- RQD - percent of core consisting of hard, sound pieces in excess of 100mm long (excluding machine breaks)
- RECOVERY - sample recovery expressed as percent or length
- S - shear strength, kPa; vane \oplus ; penetrometer \blacksquare ; unconfined \circ ; U_c unconfined compressive strength
- Sr - shear strength, remoulded; vane \otimes ; penetrometer \square
- Dd - dry density; t/m^3
- W - natural moisture content, percent *
- PL - plastic limit, percent —
- LL - liquid limit, percent —
- ND - non detect, total petroleum hydrocarbons (TPH) not detected in soil
- Groundwater Level ∇ ; Seepage ∇

**GEMTEC** LIMITEDGROUND ENGINEERING
& MATERIALS TECHNOLOGY
Fredericton, Moncton, Bathurst N.B. Canada**TEST PIT LOG**Client **Public Works and Government Services Canada**Proj No. **6489.07**

Test pit

Project **Marine Test Pit Investigation**Date End **24.July.2012**TP 1 (PH)
Page 1 of 1Location **Pigeon Hill, NB**Ground Level, m
-1.31Datum:
ChartLogged By
TDS

DEPTH m	SAMPLE				LOG	DESCRIPTION
	No	TYPE	N (RQD)	REC mm		
0						Dark grey silty SAND with trace to some organics (Sea weed and sea shells).
					0.30	Organics (compressed sea weed).
					0.60	Grey brown silty SAND with trace gravel.
1					1.60	End of Test Pit at elevation -2.91 metres chart datum as referenced to benchmark 90B9020 with a published elevation of +4.158 chart datum.

0 25 Undrained Shear Strength - kPa 75 100

☐ Pocket Penetrometer <225
☒ Field Vane Test☒ Pocket Penetrometer
☒ RemouldedWater Content & Atterberg Limits
Dynamic Penetration Test, blows/0.3m
Standard Penetration Test, blows/0.3mW_p W_L

★

0 10 20 30 40 50 60 70 80 90 100

**GEMTEC** LIMITEDGROUND ENGINEERING
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Fredericton, Moncton, Bathurst N.B., Canada**TEST PIT LOG**Client **Public Works and Government Services Canada**Proj
No. **6489.07**

Test pit

Project **Marine Test Pit Investigation**Date
End **24.July.2012**TP 2 (PH)
Page 1 of 1Location **Pigeon Hill, NB**

Ground Level, m

-0.64

Datum:

Chart

Logged
By

TDS

DEPTH

m

SAMPLE

No

TYPE

N

(RQD)

REC

mm

LOG

DESCRIPTION

0

Brown SAND with trace to some silt, trace and
gravel and organics (Sea Shells).

1

2

2.30

-2.94

End of Test Pit at elevation -2.94 metres chart
datum as referenced to benchmark 90B9020
with a published elevation of +4.158 chart
datum.0 25 Undrained Shear Strength - kPa_s 100☐ Pocket Penetrometer <225☒ Pocket Penetrometer☒ Field Vane Test☒ Remoulded

Water Content & Atterberg Limits

Dynamic Penetration Test, blows/0.3m

Standard Penetration Test, blows/0.3m

w_p w_L

0 10 20 30 40 50 60 70 80 90 100

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Test pit

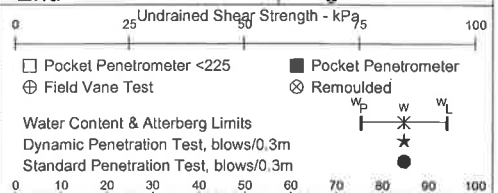
Project **Marine Test Pit Investigation**Date End **24.July.2012**

TP 3 (PH)

Page 1 of 1

Location **Pigeon Hill, NB**Ground Level, m
0.08Datum:
ChartLogged By
TDS

DEPTH m	SAMPLE				LOG	DESCRIPTION
	No	TYPE	N (RQD)	REC mm		
0						Brown SAND with trace to some silt, trace gravel and organics (Sea Shells)
1						
					1.40	
						Grey silty sand with trace to some gravel and organics (Sea Shells)
2						
					2.70	
						End of Test Pit at elevation -2.62 metres chart datum as referenced to benchmark 90B9020 with a published elevation of +4.158 chart datum.
					-2.62	



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Test pit

Project **Marine Test Pit Investigation**Date End **24 July 2012**TP 4 (PH)
Page 1 of 1Location **Pigeon Hill, NB**

Ground Level, m

-1.15

Datum:

Chart

Logged By

TDS

DEPTH
m

SAMPLE

No

TYPE

N (RQD)

REC
mm

LOG

DESCRIPTION

Grey SAND, some gravel with trace silt and organics (sea shells).

- 150 mm thick layer of compressed sea weed.

1.60

-2.75

End of Test Pit at elevation -2.75 metres chart datum as referenced to benchmark 90B9020 with a published elevation of +4.158 chart datum.

0 25 Undrained Shear Strength - kPa 75 100

☐ Pocket Penetrometer <225☒ Pocket Penetrometer☒ Field Vane Test☒ Remoulded

Water Content & Atterberg Limits

Dynamic Penetration Test, blows/0.3m

Standard Penetration Test, blows/0.3m

w_p w w_L

0 10 20 30 40 50 60 70 80 90 100

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No. **6489.07**

Test pit

Project **Marine Test Pit Investigation**Date
End **24.July.2012**

TP 5 (PH)

Page 1 of 1

Location **Pigeon Hill, NB**

Ground Level, m

-1.13

Datum:

Chart

Logged

By

TDS

DEPTH
m

SAMPLE

No

TYPE

N
(RQD)REC
mm

LOG

DESCRIPTION

0

1

Brown GRAVEL with some sand and cobbles
and trace to some boulders (300 to 400mm).Brown SAND and GRAVEL with some cobbles
and trace to some boulders (250 to 600mm).End of Test Pit at elevation -2.63 metres chart
datum as referenced to benchmark 90B9020
with a published elevation of +4.158 chart
datum.

Undrained Shear Strength - kPa

□ Pocket Penetrometer <225

⊕ Field Vane Test

■ Pocket Penetrometer

⊗ Remoulded

Water Content & Atterberg Limits

Dynamic Penetration Test, blows/0.3m

Standard Penetration Test, blows/0.3m

0 10 20 30 40 50 60 70 80 90 100

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Client Public Works and Government Services Canada

Proj No. 6489.07

Test pit

Project Marine Test Pit Investigation

Date End 24.July.2012

TP 6 (PH)
Page 1 of 1

Location Pigeon Hill, NB

Ground Level, m -0.61

Datum: Chart

Logged By TDS

0 25 Undrained Shear Strength - kPa 75 100

☐ Pocket Penetrometer <225 ☒ Pocket Penetrometer☒ Field Vane Test ☒ RemouldedWater Content & Atterberg Limits
Dynamic Penetration Test, blows/0.3m
Standard Penetration Test, blows/0.3mw_p w w_L

★ ●

0 10 20 30 40 50 60 70 80 90 100

DEPTH
m

SAMPLE

No

TYPE

N (RCD)

REC mm

LOG

DESCRIPTION

0

1

Brown GRAVEL with some sand and trace to
some cobbles and boulder and debris
(Concrete Block and Chain)

1.90

-2.51

End of Test Pit at elevation -2.51 metres chart
datum as referenced to benchmark 90B9020
with a published elevation of +4.158 chart
datum.

TEST PIT LOG

Client		Public Works and Government Services Canada				Proj No.		6489.07		Test pit	
Project		Marine Test Pit Investigation				Date		24.July.2012		TP 7 (PH)	
Location		Pigeon Hill, NB				End				Page 1 of 1	
Ground Level, m		-0.54		Datum:		Chart		Logged By		TDS	
DEPTH		m		SAMPLE		LOG		DESCRIPTION		<div> <div> <input type="checkbox"/> Pocket Penetrometer <225</div> <div> <input checked="" type="checkbox"/> Field Vane Test</div> </div> <div> <div> <input checked="" type="checkbox"/> Pocket Penetrometer</div> <div> <input checked="" type="checkbox"/> Remoulded</div> </div> <div> <div>Water Content & Atterberg Limits</div> <div>Dynamic Penetration Test, blows/0.3m</div> <div>Standard Penetration Test, blows/0.3m</div> </div> <div> <div> <div> <div>W_p</div> <div>W</div> <div>W_L</div> </div> <div> <div> <div>★</div> <div>●</div> </div> </div> </div> </div>	
0								Brown SAND with trace to some gravel		<div> <div>0</div> <div>10</div> <div>20</div> <div>30</div> <div>40</div> <div>50</div> <div>60</div> <div>70</div> <div>80</div> <div>90</div> <div>100</div> </div>	
1						<div> <div>0.40</div> <div>-0.94</div> </div>		Brown SAND and GRAVEL with trace to some cobbles and boulders.			
2						<div> <div>2.20</div> <div>-2.74</div> </div>		End of Test Pit at elevation -2.74 metres chart datum as referenced to benchmark 90B9020 with a published elevation of +4.158 chart datum.			

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Client Public Works and Government Services Canada

Proj
No. 6489.07Test pit
TP 8 (PH)
Page 1 of 1

Project Marine Test Pit Investigation

Date
End 24.July.2012

Location Pigeon Hill, NB

Ground Level, m
-0.83Datum:
ChartLogged
By TDS0 25 50 75 100
Undrained Shear Strength - kPa_s☐ Pocket Penetrometer <225 ☒ Pocket Penetrometer
☒ Field Vane Test ☒ RemouldedWater Content & Atterberg Limits
Dynamic Penetration Test, blows/0.3m
Standard Penetration Test, blows/0.3mw_p w w_L
★
●

0 10 20 30 40 50 60 70 80 90 100

DEPTH
m

SAMPLE

No TYPE N
(RQD) REC
mm

LOG

DESCRIPTION

0

Gravel with some sand, trace to some cobbles
and boulders (300 to 450 mm).

0.70

-1.53

Brown SAND and GRAVEL with trace to some
cobbles and boulders.

1

1.70

-2.53

End of Test Pit at elevation -2.53 metres chart
datum as referenced to benchmark 90B9020
with a published elevation of +4.158 chart
datum.

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Fredericton, Moncton, Bathurst N.B., Canada**TEST PIT LOG**Client **Public Works and Government Services Canada**Proj No. **6489.07**

Test pit

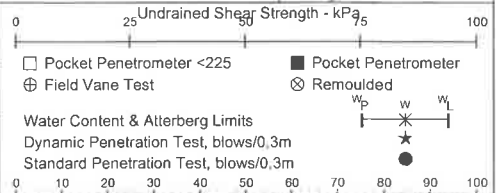
Project **Marine Test Pit Investigation**Date End **24.July.2012**

TP 9 (PH)

Page 1 of 1

Location **Pigeon Hill, NB**Ground Level, m
-0.79Datum:
ChartLogged By
TDS

DEPTH m	SAMPLE				LOG	DESCRIPTION
	No	TYPE	N (RQD)	REC mm		
0						Gravel with some sand, trace to some cobbles and boulders (300 to 450 mm).
1						
						Brown SAND and GRAVEL with trace to some cobbles and boulders.
						End of Test Pit at elevation -2.69 metres chart datum as referenced to benchmark 90B9020 with a published elevation of +4.158 chart datum.





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GROUND ENGINEERING
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Fredericton, Moncton, Bathurst N.B. Canada

TEST PIT LOG

Client Public Works and Government Services Canada

Proj No. 6489.07

Test pit
TP 10 (PH)

Project Marine Test Pit Investigation

Date End 24 July 2012

Page 1 of 1

Location Pigeon Hill, NB

Ground Level, m

-0.93

Datum:

Chart

Logged By

TDS

DEPTH
m

SAMPLE

No

TYPE

(RQD)

REC
mm

LOG

DESCRIPTION

Brown SAND with trace to some gravel and
trace to some cobbles.

2.20

-3.13

End of Test Pit at elevation -3.13 metres chart
datum as referenced to benchmark 90B9020
with a published elevation of +4.158 chart
datum.

Undrained Shear Strength - kPa

☐ Pocket Penetrometer <225

☒ Pocket Penetrometer

☒ Field Vane Test

☒ Remoulded

Water Content & Atterberg Limits

Dynamic Penetration Test, blows/0.3m

Standard Penetration Test, blows/0.3m

w_p w w_L

0 10 20 30 40 50 60 70 80 90 100



Client	Public Works and Government Services Canada
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Proj No.	6489.07
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Test pit

TP 11 (PH)

Page 1 of 1

Project	Marine Test Pit Investigation
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Date	24.July.2012
End	

Location	Pigeon Hill, NB
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Ground Level, m -0.70

Datum: _____
Chart _____

Logged
By TDS

DEPTH m	SAMPLE				LOG	DESCRIPTION
	No	TYPE	N (RCD)	REC mm		
0						Grey SAND and GRAVEL with some cobbles and trace to some flat and rounded boulders (300 to 450 mm)

0 25 Undrained Shear Strength - kPa 50 75 100

☐ Pocket Penelrometer <225

- ⊕ Field Vane Test

■ Pocket Penetrometer

⊗ Remoulded

Water Content & Atterberg Limits

Dynamic Penetration Test, blows/0.3m

Standard Penetration Test, blows/0.3m

★

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0	10	20	30	40	50	60	70	80	90	100
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04

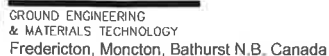
15

2-

2.10

-2.80

End of Test Pit at elevation -2.80 metres chart datum as referenced to benchmark 90B9020 with a published elevation of +4.158 chart datum.



TEST PIT WITH GRAPH 648907.GPJ GEMTEC 2004.GDT 8/7/12

Attachment B

Select Site Photos



Photo 1 - ECO Technologies Aphibian Excavator at McEachern's Point Wharf.



Photo 2 - Amphibian excavator in McEachern's point channel.



Photo 3 - Manual sounding undertaken at test pit locations.



Photo 4 - Depth during excavation tracked by sounding measurements on inside of excavator arm.



Photo 5 - Dark grey silty sand with organics at TP 1 - Pigeon Hill (Elevation -1.31 to -1.61 CD).



Photo 6 - Brown sand with trace silt, gravel and organics at TP 2 - Pigeon Hill (Elevation -0.64 to -2.94 CD).



Photo 7 - Brown sand with trace silt, gravel, and organics at TP3 - Pigeon Hill (Elevation 0.08 to -1.32 metres CD).



Photo 8 - Sand with some gravel and trace silt and organics at TP 4 - Pigeon Hill (Elevation -1.15 to -2.75 CD).



Photo 9 - Brown gravel with some snad, cobbles and boulders at TP 5 - Pigeon Hill (Elevation -1.13 to -2.63 CD).



Photo 10- Concrete block with chain encountered at TP 6 - Pigeon Hill (Approximate elevation -0.61 CD). The location was marked with a buoy.



Photo 11 – Brown sand and gravel with cobbles and boulders at TP7 - Pigeon Hill (Elevation -0.94 to -2.74 CD).



Photo 12 - Gravel with cobbles and some sand and occasional boulder at TP 8 - Pigeon Hill (Elevation -0.83 to -1.53 CD).



Photo 13 - Gravel with some sand and some cobbles and boulders at TP 9 - Pigeon Hill (Elevation - 0.79 to -2.69 CD).



Photo 14 - Brown sand with some gravel and occasional cobbles at TP 10 - Pigeon Hill (Elevation - 0.93 to -3.13 CD).



Photo 15 - Grey sand and gravel with some cobbles and occasional boulder at TP 11 - Pigeon Hill (Elevation -0.70 to -2.80 CD).



Photo 16 - Sand and gravel with some cobbles and occasional boulders at TP 12 - Pigeon Hill (Elevation -0.57 to -2.77 CD).

Attachment C

Test Pit Coordinates

Pigeon Hill Test Pit Coordinates

BH	TP Elevation	TP Depth	Easting*	Northing*
	(m)	(m)		
TP 1	-1.31	1.6	358839.758	5304190.410
TP 2	-0.64	2.3	385905.110	5304203.585
TP 3	+0.08	2.7	385970.462	5304216.760
TP 4	-1.15	1.6	386035.814	5304229.935
TP 5	-1.13	1.5	387864.913	5340685.691
TP 6	-0.61	1.9	387860.740	5304582.110
TP 7	-0.54	2.2	387869.542	5304529.129
TP 8	-0.83	1.7	387912.139	5304618.495
TP 9	-0.79	1.9	387951.534	5304553.930
TP 10	-0.93	2.2	388004.202	5304436.770
TP 11	-0.70	2.1	388024.860	5304627.251
TP 12	-0.57	2.2	388042.337	5304525.782

