APPENDIX A
Figures

Copperfield Road Preliminary RAR Setbacks Courtenay, BC

Legend

- Property Boundary
- Ditch - 5 m Setback
- Stream - 15 m Setback
- Wetland - 30m Setback
- Wetland
- Sensitive Habitat Atlas Streams
- Sensitive Habitat Atlas Ditches

current ENVIRONMENTAL

Meters

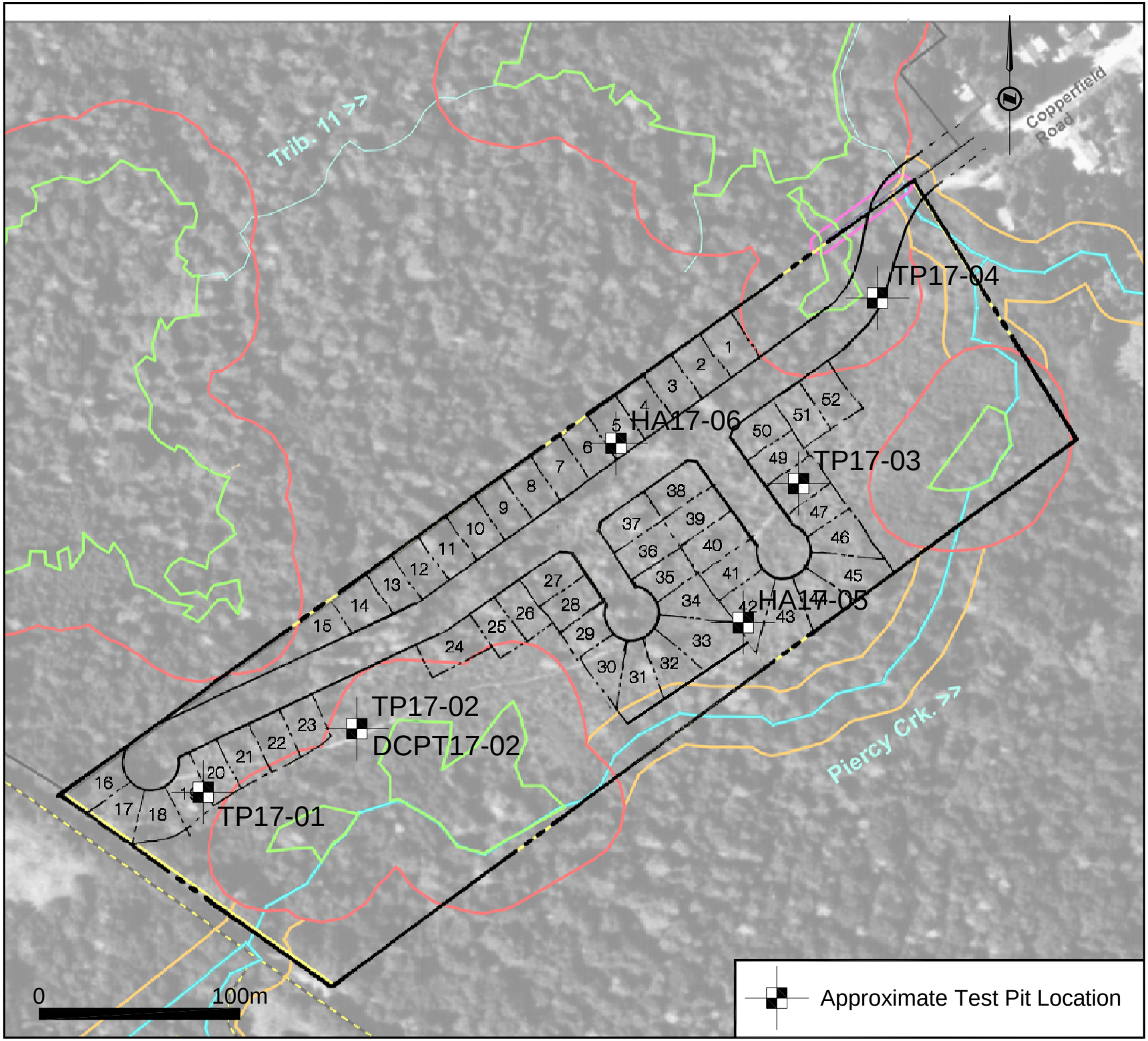
0 30 60 120

1:2,000
on 11 x 17 Paper

N
W E
S

All line work approximate.
For illustration purposes only.
Not for use or reproduction
without consent of author.

Author: WFleenor & DSilvester
Date: March 2016
Source: Ortho 2002
Datum/Proj.: NAD83/UTM10N



TERRAN GEOTECHNICAL

PROFESSIONAL SEAL

PREPARED FOR

McElhanney Consulting Services

Copperfield Subdivision

2602 Copperfield Road, Courtenay B.C.

Project Number: 5074-01

Geotechnical Investigation
Test Pit Location Plan

Sheet Number:	1
Date Created:	2017-03-23
Date Revised:	2017-03-23
Drawn By:	R.Huynh
Reviewed By:	T. Le
Scale:	1:2500

5074-01-FIG-01 | 1.0

2015 National Building Code Seismic Hazard Calculation

INFORMATION: Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

March 21, 2017

Site: 49.6694 N, 125.013 W User File Reference: 2602 Copperfield Road, Courtenay B.C.

Requested by: , Terran Geotechnical Consultants Ltd.

National Building Code ground motions: 2% probability of exceedance in 50 years (0.000404 per annum)

Sa(0.05)	Sa(0.1)	**Sa(0.2)**	Sa(0.3)	**Sa(0.5)**	**Sa(1.0)**	**Sa(2.0)**	**Sa(5.0)**	**Sa(10.0)**	**PGA (g)**	**PGV (m/s)**
0.355	0.562	**0.697**	0.722	**0.679**	**0.465**	**0.301**	**0.105**	**0.037**	**0.324**	**0.548**

Notes. Spectral (Sa(T), where T is the period in seconds) and peak ground acceleration (PGA) values are given in units of g (9.81 m/s^2). Peak ground velocity is given in m/s. Values are for "firm ground" (NBCC 2015 Site Class C, average shear wave velocity 450 m/s). NBCC2015 and CSAS6-14 values are specified in **bold** font. Three additional periods are provided - their use is discussed in the NBCC2015 Commentary. Only 2 significant figures are to be used. ***These values have been interpolated from a 10-km-spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the directly calculated values.***

Ground motions for other probabilities:

Probability of exceedance per annum	0.010	0.0021	0.001
Probability of exceedance in 50 years	40%	10%	5%
Sa(0.05)	0.058	0.158	0.235
Sa(0.1)	0.088	0.249	0.371
Sa(0.2)	0.118	0.316	0.466
Sa(0.3)	0.121	0.321	0.478
Sa(0.5)	0.104	0.285	0.439
Sa(1.0)	0.062	0.178	0.288
Sa(2.0)	0.034	0.106	0.181
Sa(5.0)	0.0094	0.032	0.061
Sa(10.0)	0.0038	0.012	0.021
PGA	0.050	0.142	0.213
PGV	0.069	0.216	0.345

References

National Building Code of Canada 2015 NRCC no. 56190;
Appendix C: Table C-3, Seismic Design Data for Selected Locations in Canada

User's Guide - NBC 2015, Structural Commentaries NRCC no. xxxxxx (in preparation)
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File 7893 Fifth Generation Seismic Hazard Model for Canada: Grid values of mean hazard to be used with the 2015 National Building Code of Canada

See the websites *www.EarthquakesCanada.ca* and *www.nationalcodes.ca* for more information

Aussi disponible en français

Natural Resources Canada Ressources naturelles Canada

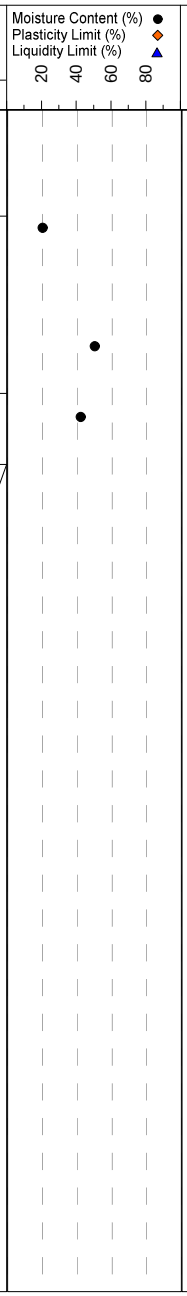
Canada

APPENDIX B
Soils Logs

SOIL LOG: TP17-01

PROJECT NAME: Proposed Subdivision		GROUND SURFACE ELEVATION AND UTM: Existing Grade	
PROJECT #: 5074-01	CLIENT: McElhanney Consulting Services Ltd.	DATE STARTED: 3/17/2017	DATE FINISHED: 3/17/2017
DRILLING CONTRACTOR: J.R. Excavation Ltd.	DRILLING METHOD: Excavator	END OF TEST HOLE (m): 1.5	MEASURING POINT: Top of Grade
DRILLING EQUIPMENT: Track Excavator		DEPTH TO WATER (m):	
SAMPLING METHOD: Grab		LOGGED BY: RH	PROJECT ENGINEER: TL

DEPTH (m)	DEPTH (ft)	Sample	Classification	Lithology	DESCRIPTION	Notes
					Surface Elevation: Existing Grade	
0.0	0.0		TS		SAND (Topsoil) - some silt to silty, organic foliage and roots, very loose to loose, moist, black	
0.5	2.0	G1-1	SM		SAND - some silt to silty, trace cobbles, trace gravel, loose to compact, moist to wet, redish brown	
1.0	4.0	G1-2				
1.5	6.0	G1-3	SM		SAND (TILL-LIKE) - some silt to silty, trace gravel, trace cobbles, very stiff to hard, compressed, cemeneted, dry, light brown	
2.0	8.0				End of hole at 1.5 m. Perched Groundwater Table @ 1.2m. Hole Backfilled with cuttings.	
2.5	10.0					
3.0	12.0					
3.5	14.0					
4.0	16.0					
4.5						
5.0						



SOIL LOG: TP17-02

PROJECT NAME: Proposed Subdivision		GROUND SURFACE ELEVATION AND UTM: Existing Grade	
PROJECT #: 5074-01	CLIENT: McElhanney Consulting Services Ltd.	DATE STARTED: 3/17/2017	DATE FINISHED: 3/17/2017
DRILLING CONTRACTOR: J.R. Excavation Ltd.	DRILLING METHOD: Excavator	END OF TEST HOLE (m): 1.7	MEASURING POINT: Top of Grade
DRILLING EQUIPMENT: Track Excavator		DEPTH TO WATER (m):	
SAMPLING METHOD: Grab		LOGGED BY: RH	PROJECT ENGINEER: TL

DEPTH (m)	DEPTH (ft)	Sample	Classification	Lithology	DESCRIPTION (Surface Elevation: Existing Grade)	Notes
0.0	0.0		TS		SAND (Topsoil) - some silt to silty, organic foliage and roots, very loose to loose, moist, black	
0.5		G2-1	SM		SAND - some silt to silty, trace cobbles, trace gravel, loose to compact, moist to wet, redish brown	
	2.0	G2-2				
1.0		G2-3			SAND (TILL-LIKE) - some silt to silty, trace gravel, trace cobbles, very stiff to hard, compressed, cemeneted, dry, light brown	
1.5	4.0		SM			
	6.0				End of hole at 1.7 m. Perched Groundwater Table @ 0.75m. Hole Backfilled with cuttings.	
2.0						
2.5	8.0					
3.0	10.0					
3.5						
	12.0					
4.0						
	14.0					
4.5						
	16.0					
5.0						

Moisture Content (%) ●
Plasticity Limit (%) ◆
Liquidity Limit (%) ▲
20 40 60 80

SOIL LOG: TP17-03

PROJECT NAME: Proposed Subdivision		GROUND SURFACE ELEVATION AND UTM: Existing Grade	
PROJECT #: 5074-01	CLIENT: McElhanney Consulting Services Ltd.	DATE STARTED: 3/17/2017	DATE FINISHED: 3/17/2017
DRILLING CONTRACTOR: J.R. Excavation Ltd.	DRILLING METHOD: Excavator	END OF TEST HOLE (m): 1.7	MEASURING POINT: Top of Grade
DRILLING EQUIPMENT: Track Excavator		DEPTH TO WATER (m):	
SAMPLING METHOD: Grab		LOGGED BY: RH	PROJECT ENGINEER: TL

DEPTH (m)	DEPTH (ft)	Sample	Classification	Lithology	DESCRIPTION	Moisture Content (%) ● Plasticity Limit (%) ◆ Liquidity Limit (%) ▲ 20 40 60 80	Notes
					Surface Elevation: Existing Grade		
0.0	0.0		TS		SAND (Topsoil) - some silt to silty, organic foliage and roots, very loose to loose, moist, black		
		G3-1	SM		SAND - some silt to silty, trace cobbles, trace gravel, loose to compact, moist to wet, redish brown	●	
0.5	2.0				SAND (TILL-LIKE) - some silt to silty, trace gravel, trace cobbles, very stiff to hard, compressed, cemeneted, dry, light brown		
1.0		G3-2	SM			●	
	4.0						
1.5							
	6.0				End of hole at 1.7 m. Perched Groundwater Table @ 0.45m. Hole Backfilled with cuttings.		
2.0							
	8.0						
2.5							
3.0	10.0						
3.5							
	12.0						
4.0							
	14.0						
4.5							
	16.0						
5.0							

SOIL LOG: TP17-04

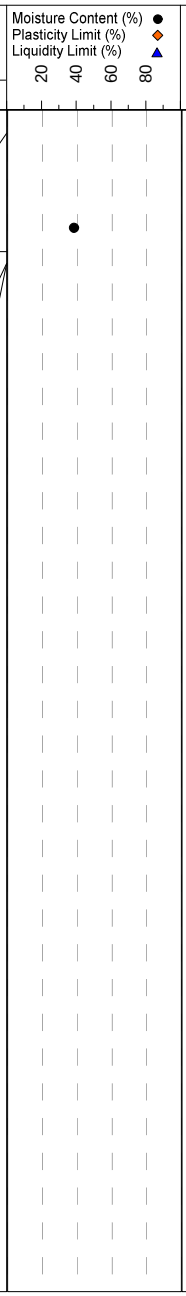
PROJECT NAME: Proposed Subdivision		GROUND SURFACE ELEVATION AND UTM: Existing Grade	
PROJECT #: 5074-01	CLIENT: McElhanney Consulting Services Ltd.	DATE STARTED: 3/17/2017	DATE FINISHED: 3/17/2017
DRILLING CONTRACTOR: J.R. Excavation Ltd.	DRILLING METHOD: Excavator	END OF TEST HOLE (m): 2.1	MEASURING POINT: Top of Grade
DRILLING EQUIPMENT: Track Excavator		DEPTH TO WATER (m):	
SAMPLING METHOD: Grab		LOGGED BY: RH	PROJECT ENGINEER: TL

DEPTH (m)	DEPTH (ft)	Sample	Classification	Lithology	DESCRIPTION	Moisture Content (%) ● Plasticity Limit (%) ◆ Liquidity Limit (%) ▲ 20 40 60 80	Notes
					Surface Elevation: Existing Grade		
0.0	0.0		TS		SAND (Topsoil) - some silt to silty, organic foliage and roots, very loose to loose, moist, black		
			SM		SAND - some silt to silty, trace cobbles, trace gravel, loose to compact, moist to wet, redish brown		
0.5		G4-1				●	
	2.0				SAND (TILL-LIKE) - some silt to silty, trace gravel, trace cobbles, very stiff to hard, compressed, cemeneted, dry, light brown		
1.0							
	4.0		SM				
1.5							
	6.0						
2.0					End of hole at 2.1 m. Perched Groundwater Table @ 0.6m. Hole Backfilled with cuttings.		
2.5	8.0						
3.0	10.0						
3.5	12.0						
4.0	14.0						
4.5							
5.0	16.0						

SOIL LOG: HA17-05

PROJECT NAME: Proposed Subdivision		GROUND SURFACE ELEVATION AND UTM: Existing Grade	
PROJECT #: 5074-01	CLIENT: McElhanney Consulting Services Ltd.	DATE STARTED: 3/17/2017	DATE FINISHED: 3/17/2017
DRILLING CONTRACTOR: J.R. Excavation Ltd.	DRILLING METHOD: Excavator	END OF TEST HOLE (m): 0.65	MEASURING POINT: Top of Grade
DRILLING EQUIPMENT: Track Excavator		DEPTH TO WATER (m):	
SAMPLING METHOD: Grab		LOGGED BY: RH	PROJECT ENGINEER: TL

DEPTH (m)	DEPTH (ft)	Sample	Classification	Lithology	DESCRIPTION	Notes
					Surface Elevation: Existing Grade	
0.0	0.0		TS		SAND (Topsoil) - some silt to silty, organic foliage and roots, very loose to loose, moist, black	
			SM		SAND - some silt to silty, trace cobbles, trace gravel, loose to compact, moist to wet, redish brown	
0.5	2.0	G5-1	SM		SAND (TILL-LIKE) - some silt to silty, trace gravel, trace cobbles, very stiff to hard, compressed, cemeneted, dry, light brown	
					End of hole at 0.65 m. Perched Groundwater Table @ 0.6m. Hole Backfilled with cuttings.	
1.0	4.0					
1.5	6.0					
2.0	8.0					
2.5	10.0					
3.0	12.0					
3.5	14.0					
4.0	16.0					
4.5						
5.0						



SOIL LOG: HA17-06

PROJECT NAME: Proposed Subdivision		GROUND SURFACE ELEVATION AND UTM: Existing Grade	
PROJECT #: 5074-01	CLIENT: McElhanney Consulting Services Ltd.	DATE STARTED: 3/17/2017	DATE FINISHED: 3/17/2017
DRILLING CONTRACTOR: J.R. Excavation Ltd.	DRILLING METHOD: Excavator	END OF TEST HOLE (m): 0.95	MEASURING POINT: Top of Grade
DRILLING EQUIPMENT: Track Excavator		DEPTH TO WATER (m):	
SAMPLING METHOD: Grab		LOGGED BY: RH	PROJECT ENGINEER: TL

DEPTH (m)	DEPTH (ft)	Sample	Classification	Lithology	DESCRIPTION	Notes
					Surface Elevation: Existing Grade	
0.0	0.0		TS		SAND (Topsoil) - some silt to silty, organic foliage and roots, very loose to loose, moist, black	
		G6-1			SAND - some silt to silty, trace cobbles, trace gravel, loose to compact, moist to wet, redish brown	
0.5			SM			
	2.0					
		G6-2				
1.0			SM		SAND (TILL-LIKE) - some silt to silty, trace gravel, trace cobbles, very stiff to hard, compressed, cemeneted, dry, light brown	
	4.0				End of hole at 0.95 m. Perched Groundwater Table @ 0.9m. Hole Backfilled with cuttings.	
1.5						
	6.0					
2.0						
	8.0					
2.5						
	10.0					
3.0						
	12.0					
3.5						
	14.0					
4.0						
	16.0					
4.5						
5.0						

Moisture Content (%) ●
Plasticity Limit (%) ◆
Liquidity Limit (%) ▲
20 40 60 80

WILDCAT DYNAMIC CONE LOG

Terran Geotechnical Consultants Ltd.
#109-3011 Underhill Avenue
Burnaby, B.C. V5A 3C2

PROJECT NUMBER: 5074
DATE STARTED: 17-03-2017
DATE COMPLETED: 17-03-2017

HOLE #: DCPT17-02
CREW: R.Huynh
PROJECT: Proposed Subdivision
ADDRESS: 2602 Copperfield Road
LOCATION: Courtenay, B.C.

SURFACE ELEVATION: Existing Grade
WATER ON COMPLETION: 3 ft Below Existing Grade
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	TESTED CONSISTENCY COHESIVE
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 ft	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 2 ft	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
-	17	75.5	••••••••••••••••••••	21	MEDIUM DENSE	VERY STIFF
-	17	75.5	••••••••••••••••••••	21	MEDIUM DENSE	VERY STIFF
- 3 ft	17	75.5	••••••••••••••••••••	21	MEDIUM DENSE	VERY STIFF
- 1 m	24	106.6	••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
-	16	61.8	•••••••••••••••••	17	MEDIUM DENSE	VERY STIFF
- 4 ft	13	50.2	••••••••••••••	14	MEDIUM DENSE	STIFF
-	15	57.9	•••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	18	69.5	••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
- 5 ft	22	84.9	••••••••••••••••••••••	24	MEDIUM DENSE	VERY STIFF
-	22	84.9	••••••••••••••••••••••	24	MEDIUM DENSE	VERY STIFF
-	18	69.5	••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
- 6 ft	18	69.5	••••••••••••••••••	19	MEDIUM DENSE	VERY STIFF
-	21	81.1	•••••••••••••••••••••	23	MEDIUM DENSE	VERY STIFF
- 2 m	27	104.2	••••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
- 7 ft	30	102.6	••••••••••••••••••••••••••	25+	MEDIUM DENSE	VERY STIFF
-	33	112.9	••••••••••••••••••••••••••••	25+	DENSE	HARD
-	40	136.8	••••••••••••••••••••••••••••••••••••	25+	DENSE	HARD
- 8 ft	50	171.0	••	25+	DENSE	HARD
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

APPENDIX C
Limitation

The recommendation in this report are provided on the assumption that the contractor will be suitably qualified and experienced. In the event of report revisions, additional funds may be required. The subsurface conditions may vary between test pit and with time. The interpretation of subsurface conditions provided is an opinion and not a certification. Stratigraphic variations in soil profile can be expected. As such, all explorations involve an inherent risk that some conditions will not be detected.

Samples obtained from site will be retained in our laboratory for 60 days. Should no instruction be received to the contrary, these samples will be discarded. This report has been made in accordance with the generally accepted soil and foundations engineering practices.

No other warranty, expressed or guaranty made. If the project does not start with 2 years of the report date, the report may become invalid and further review may be required. This report has been prepared for the exclusive use of McElhanney Consulting Services Ltd. and the municipality having jurisdiction and their "Approved Users" for specific application to the development mentioned in the report. TerranGeo and its employees accept no responsibility to another party for loss or liability incurred as a result of use of this report. Any use of this report for purposes other than the intended, should be approved in writing by TerranGeo. Contractors should rely upon their own explorations for costing purposes.

The above referenced report "the Report" may be relied upon by the municipality having jurisdiction as if the Report was directly issued to the municipality having jurisdiction subject to the following conditions:

- The municipality having jurisdiction will only use the Report for the specific project that is the recipient and subject of the Report.
- To the extent required by law and subject to the Freedom of Information and Protection of Privacy Act, R.S.B.C., 1996, c. 165, as amended, the municipality having jurisdiction agrees not to disclose or distribute the Report furnished hereunder to any third party unless the municipality having jurisdiction on the first page of the Report places a prominent statement that "THIS REPORT MAY NOT BE RELIED UPON WITHOUT THE EXPRESS WRITTEN CONSENT OF THE AUTHOR OF THE REPORT".
- The municipality having jurisdiction's use of and reliance on the Report is subject to the qualifications and limitations contained within the Report and the municipality having jurisdiction has no greater rights or conditions of use than as specified within the Report.
- Notwithstanding the above, should a third party recover damages from the municipality having jurisdiction through a Court of competent jurisdiction, for loss or damage caused to the third party based upon the third party's reliance on the Report, and, provided that the municipality having jurisdiction gave reasonable notice of the third party claim when it was served on the municipality having jurisdiction to TerranGeo and consented to TerranGeo becoming a party to the lawsuit in order for it to undertake its own defense, if and when requested by the TerranGeo, TerranGeo will indemnify the municipality having jurisdiction if the Court of competent jurisdiction found that TerranGeo committed a negligent act, error, or omission in the preparation of, or conclusions in, the Report, and that this was the proximate cause of the third party's loss or damage.

Electronic media is susceptible to unauthorized modification/alteration, and the Client should not rely on electronic versions of report/documents. All documents should be obtained directly from TerranGeo.

This report is based on the information provided by the client and/or the client's consultant. TerranGeo relied in good faith upon the information. TerranGeo cannot accept responsibility for inaccuracies, misstatements, omissions or deficiencies in this report resulting from the sources of this information. This report assumes that TerranGeo will be retained to review the soil conditions during construction.