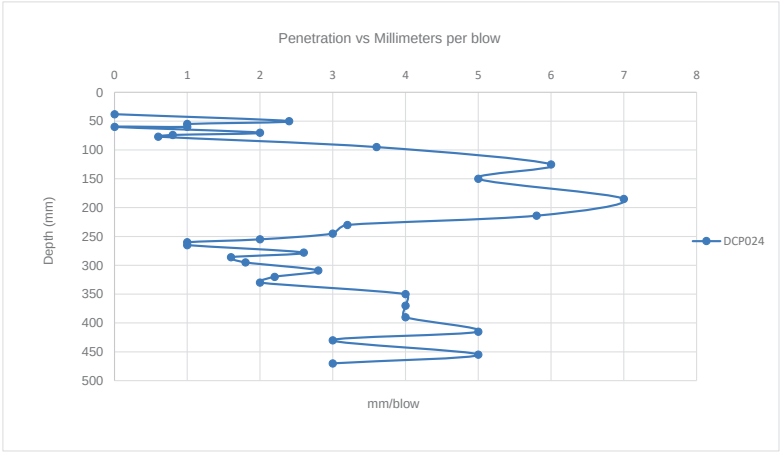
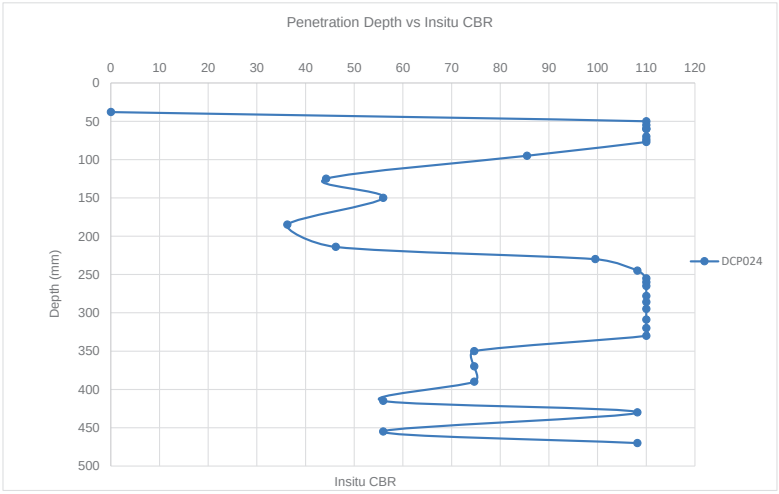
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP024	**STARTING DEPTH:**	38mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x(dn)^{-1.09}$
0	38	38mm	0	0				
5	50	50mm	12	2.4	Very Dense	135	>110	1117
10	55	55mm	5	1.0	Very Dense	300	>110	2900
15	60	60mm	5	1.0	Very Dense	300	>110	2900
20	60	60mm	0	0.0	Very Dense	563	>110	#DIV/0!
25	70	70mm	10	2.0	Very Dense	170	>110	1362
30	74	74mm	4	0.8	Very Dense	342	>110	3699
35	77	77mm	3	0.6	Very Dense	389	>110	5061
40	95	95mm	18	3.6	Very Dense	81	86	718
45	125	125mm	30	6.0	Dense	42	44	411
50	150	150mm	25	5.0	Very Dense	53	56	502
55	185	185mm	35	7.0	Dense	35	36	348
60	214	214mm	29	5.8	Dense	44	46	427
65	230	230mm	16	3.2	Very Dense	94	100	816
70	245	245mm	15	3.0	Very Dense	102	108	876
75	255	255mm	10	2.0	Very Dense	170	>110	1362
80	260	260mm	5	1.0	Very Dense	300	>110	2900
85	265	265mm	5	1.0	Very Dense	300	>110	2900
90	278	278mm	13	2.6	Very Dense	122	>110	1023
95	286	286mm	8	1.6	Very Dense	206	>110	1737
100	295	295mm	9	1.8	Very Dense	185	>110	1528
105	309	309mm	14	2.8	Very Dense	111	>110	944
110	320	320mm	11	2.2	Very Dense	151	>110	1228
115	330	330mm	10	2.0	Very Dense	170	>110	1362
120	350	350mm	20	4.0	Very Dense	70	75	640
125	370	370mm	20	4.0	Very Dense	70	75	640
130	390	390mm	20	4.0	Very Dense	70	75	640
135	415	415mm	25	5.0	Very Dense	53	56	502
140	430	430mm	15	3.0	Very Dense	102	108	876
145	455	455mm	25	5.0	Very Dense	53	56	502
150	470	470mm	15	3.0	Very Dense	102	108	876

DCP GRAPHICAL REPRESENTATION



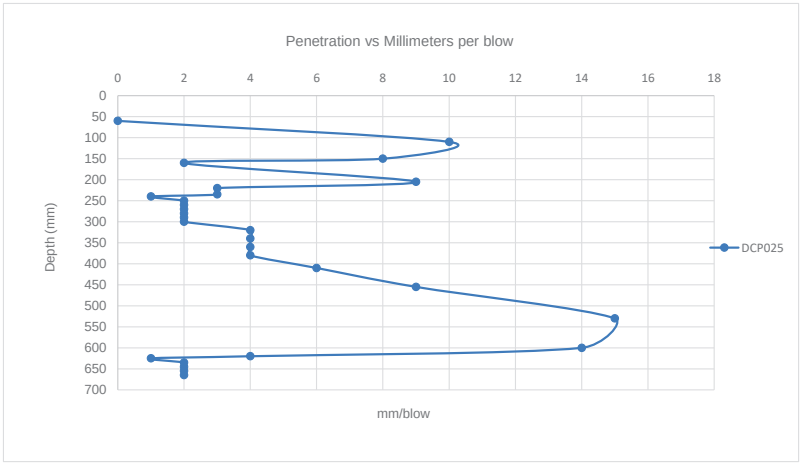


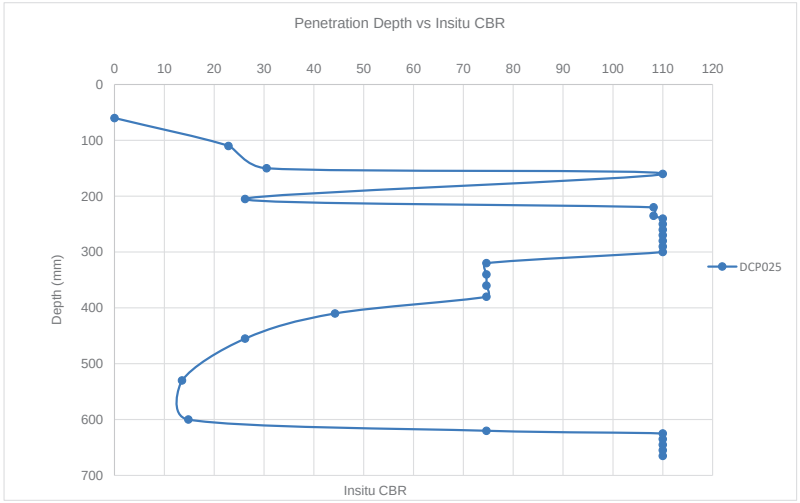
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP025	**STARTING DEPTH:**	60mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	60	60mm	0	0				
5	110	110mm	50	10.0	Dense	22	23	236
10	150	150mm	40	8.0	Dense	29	31	301
15	160	160mm	10	2.0	Very Dense	170	>110	1362
20	205	205mm	45	9.0	Dense	25	26	264
25	220	220mm	15	3.0	Very Dense	102	108	876
30	235	235mm	15	3.0	Very Dense	102	108	876
35	240	240mm	5	1.0	Very Dense	300	>110	2900
40	250	250mm	10	2.0	Very Dense	170	>110	1362
45	260	260mm	10	2.0	Very Dense	170	>110	1362
50	270	270mm	10	2.0	Very Dense	170	>110	1362
55	280	280mm	10	2.0	Very Dense	170	>110	1362
60	290	290mm	10	2.0	Very Dense	170	>110	1362
65	300	300mm	10	2.0	Very Dense	170	>110	1362
70	320	320mm	20	4.0	Very Dense	70	75	640
75	340	340mm	20	4.0	Very Dense	70	75	640
80	360	360mm	20	4.0	Very Dense	70	75	640
85	380	380mm	20	4.0	Very Dense	70	75	640
90	410	410mm	30	6.0	Dense	42	44	411
95	455	455mm	45	9.0	Dense	25	26	264
100	530	530mm	75	15.0	Medium Dense	13	14	152
105	600	600mm	70	14.0	Medium Dense	14	15	163
110	620	620mm	20	4.0	Very Dense	70	75	640
115	625	625mm	5	1.0	Very Dense	300	>110	2900
120	635	635mm	10	2.0	Very Dense	170	>110	1362
125	645	645mm	10	2.0	Very Dense	170	>110	1362
130	655	655mm	10	2.0	Very Dense	170	>110	1362
135	665	665mm	10	2.0	Very Dense	170	>110	1362

DCP GRAPHICAL REPRESENTATION



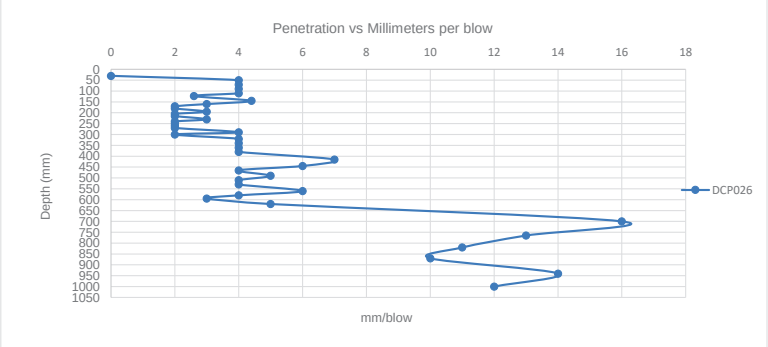


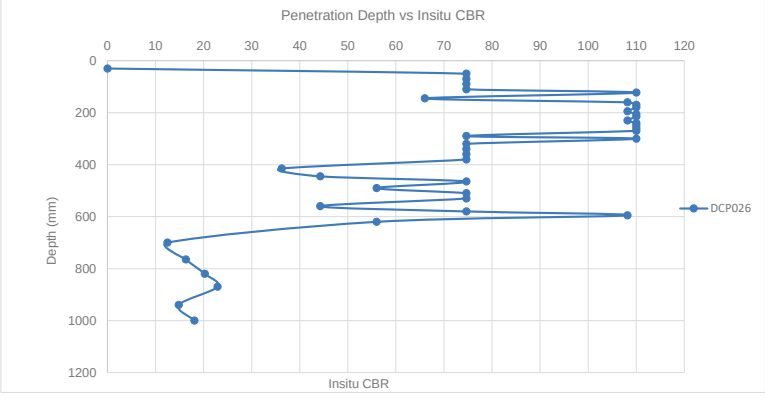
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP026	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	50	50mm	20	4.0	Very Dense	70	75	640
10	70	70mm	20	4.0	Very Dense	70	75	640
15	90	90mm	20	4.0	Very Dense	70	75	640
20	110	110mm	20	4.0	Very Dense	70	75	640
25	123	123mm	13	2.6	Very Dense	122	>110	1023
30	145	145mm	22	4.4	Very Dense	62	66	577
35	160	160mm	15	3.0	Very Dense	102	108	876
40	170	170mm	10	2.0	Very Dense	170	>110	1362
45	180	180mm	10	2.0	Very Dense	170	>110	1362
50	195	195mm	15	3.0	Very Dense	102	108	876
55	205	205mm	10	2.0	Very Dense	170	>110	1362
60	215	215mm	10	2.0	Very Dense	170	>110	1362
65	230	230mm	15	3.0	Very Dense	102	108	876
70	240	240mm	10	2.0	Very Dense	170	>110	1362
75	250	250mm	10	2.0	Very Dense	170	>110	1362
80	260	260mm	10	2.0	Very Dense	170	>110	1362
85	270	270mm	10	2.0	Very Dense	170	>110	1362
90	290	290mm	20	4.0	Very Dense	70	75	640
95	300	300mm	10	2.0	Very Dense	170	>110	1362
100	320	320mm	20	4.0	Very Dense	70	75	640
105	340	340mm	20	4.0	Very Dense	70	75	640
110	360	360mm	20	4.0	Very Dense	70	75	640
115	380	380mm	20	4.0	Very Dense	70	75	640
120	415	415mm	35	7.0	Dense	35	36	348
125	445	445mm	30	6.0	Dense	42	44	411
130	465	465mm	20	4.0	Very Dense	70	75	640
135	490	490mm	25	5.0	Very Dense	53	56	502
140	510	510mm	20	4.0	Very Dense	70	75	640
145	530	530mm	20	4.0	Very Dense	70	75	640
150	560	560mm	30	6.0	Dense	42	44	411
155	580	580mm	20	4.0	Very Dense	70	75	640
160	595	595mm	15	3.0	Very Dense	102	108	876
165	620	620mm	25	5.0	Very Dense	53	56	502
170	700	700mm	80	16.0	Medium Dense	12	12	141
175	765	765mm	65	13.0	Medium Dense	16	16	177
180	820	820mm	55	11.0	Dense	20	20	212
185	870	870mm	50	10.0	Dense	22	23	236
190	940	940mm	70	14.0	Medium Dense	14	15	163
195	1000	1000mm	60	12.0	Dense	17	18	193

DCP GRAPHICAL REPRESENTATION



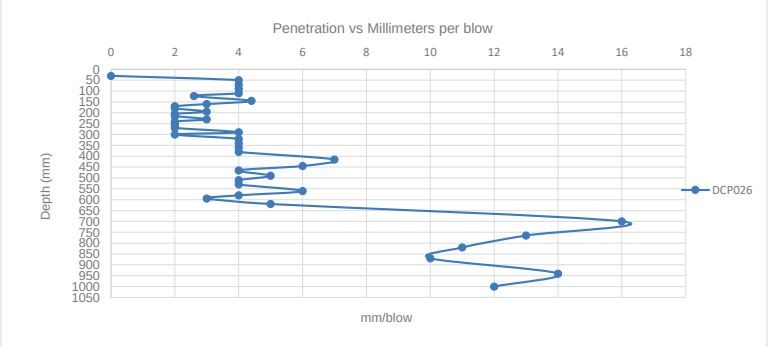


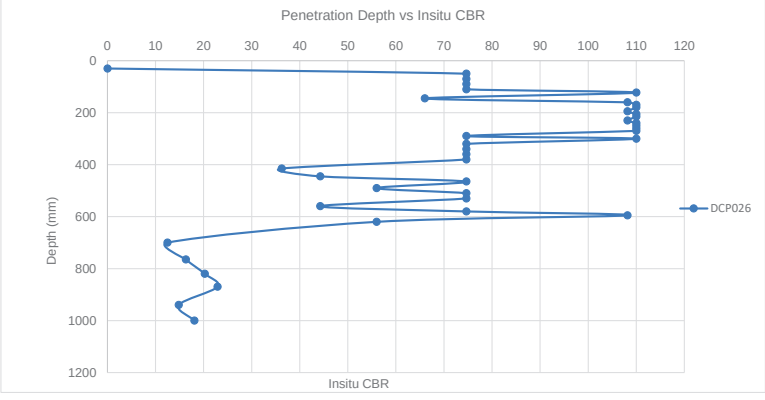
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP026	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	50	50mm	20	4.0	Very Dense	70	75	640
10	70	70mm	20	4.0	Very Dense	70	75	640
15	90	90mm	20	4.0	Very Dense	70	75	640
20	110	110mm	20	4.0	Very Dense	70	75	640
25	123	123mm	13	2.6	Very Dense	122	>110	1023
30	145	145mm	22	4.4	Very Dense	62	66	577
35	160	160mm	15	3.0	Very Dense	102	108	876
40	170	170mm	10	2.0	Very Dense	170	>110	1362
45	180	180mm	10	2.0	Very Dense	170	>110	1362
50	195	195mm	15	3.0	Very Dense	102	108	876
55	205	205mm	10	2.0	Very Dense	170	>110	1362
60	215	215mm	10	2.0	Very Dense	170	>110	1362
65	230	230mm	15	3.0	Very Dense	102	108	876
70	240	240mm	10	2.0	Very Dense	170	>110	1362
75	250	250mm	10	2.0	Very Dense	170	>110	1362
80	260	260mm	10	2.0	Very Dense	170	>110	1362
85	270	270mm	10	2.0	Very Dense	170	>110	1362
90	290	290mm	20	4.0	Very Dense	70	75	640
95	300	300mm	10	2.0	Very Dense	170	>110	1362
100	320	320mm	20	4.0	Very Dense	70	75	640
105	340	340mm	20	4.0	Very Dense	70	75	640
110	360	360mm	20	4.0	Very Dense	70	75	640
115	380	380mm	20	4.0	Very Dense	70	75	640
120	415	415mm	35	7.0	Dense	35	36	348
125	445	445mm	30	6.0	Dense	42	44	411
130	465	465mm	20	4.0	Very Dense	70	75	640
135	490	490mm	25	5.0	Very Dense	53	56	502
140	510	510mm	20	4.0	Very Dense	70	75	640
145	530	530mm	20	4.0	Very Dense	70	75	640
150	560	560mm	30	6.0	Dense	42	44	411
155	580	580mm	20	4.0	Very Dense	70	75	640
160	595	595mm	15	3.0	Very Dense	102	108	876
165	620	620mm	25	5.0	Very Dense	53	56	502
170	700	700mm	80	16.0	Medium Dense	12	12	141
175	765	765mm	65	13.0	Medium Dense	16	16	177
180	820	820mm	55	11.0	Dense	20	20	212
185	870	870mm	50	10.0	Dense	22	23	236
190	940	940mm	70	14.0	Medium Dense	14	15	163
195	1000	1000mm	60	12.0	Dense	17	18	193

DCP GRAPHICAL REPRESENTATION



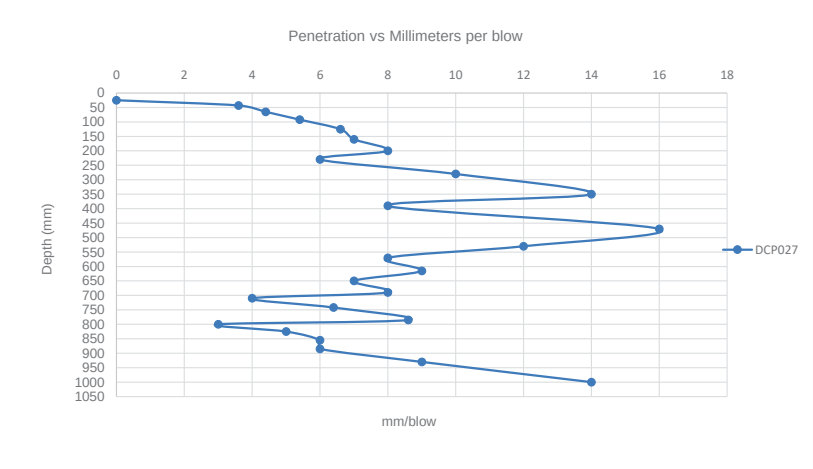


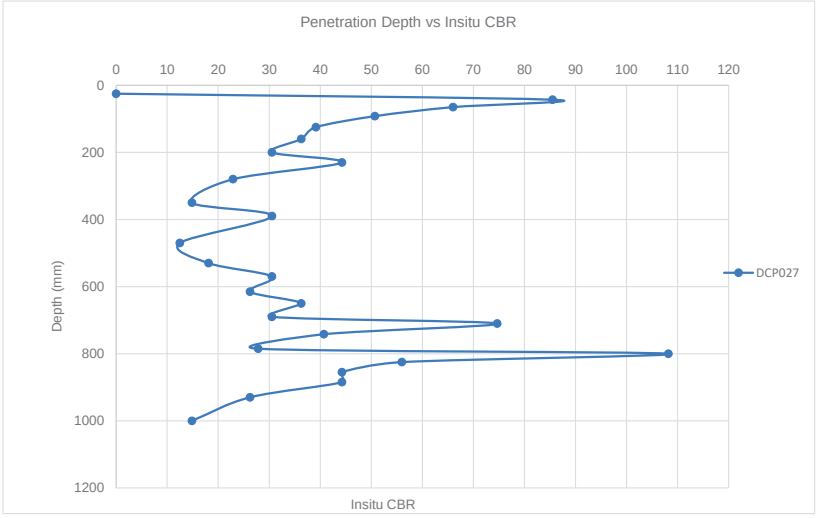
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP027	**STARTING DEPTH:**	25mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	25	25mm	0	0				
5	43	43mm	18	3.6	Very Dense	81	86	718
10	65	65mm	22	4.4	Very Dense	62	66	577
15	92	92mm	27	5.4	Dense	48	51	461
20	125	125mm	33	6.6	Dense	37	39	371
25	160	160mm	35	7.0	Dense	35	36	348
30	200	200mm	40	8.0	Dense	29	31	301
35	230	230mm	30	6.0	Dense	42	44	411
40	280	280mm	50	10.0	Dense	22	23	236
45	350	350mm	70	14.0	Medium Dense	14	15	163
50	390	390mm	40	8.0	Dense	29	31	301
55	470	470mm	80	16.0	Medium Dense	12	12	141
60	530	530mm	60	12.0	Dense	17	18	193
65	570	570mm	40	8.0	Dense	29	31	301
70	615	615mm	45	9.0	Dense	25	26	264
75	650	650mm	35	7.0	Dense	35	36	348
80	690	690mm	40	8.0	Dense	29	31	301
85	710	710mm	20	4.0	Very Dense	70	75	640
90	742	742mm	32	6.4	Dense	39	41	383
95	785	785mm	43	8.6	Dense	27	28	278
100	800	800mm	15	3.0	Very Dense	102	108	876
105	825	825mm	25	5.0	Very Dense	53	56	502
110	855	855mm	30	6.0	Dense	42	44	411
115	885	885mm	30	6.0	Dense	42	44	411
120	930	930mm	45	9.0	Dense	25	26	264
125	1000	1000mm	70	14.0	Medium Dense	14	15	163

DCP GRAPHICAL REPRESENTATION



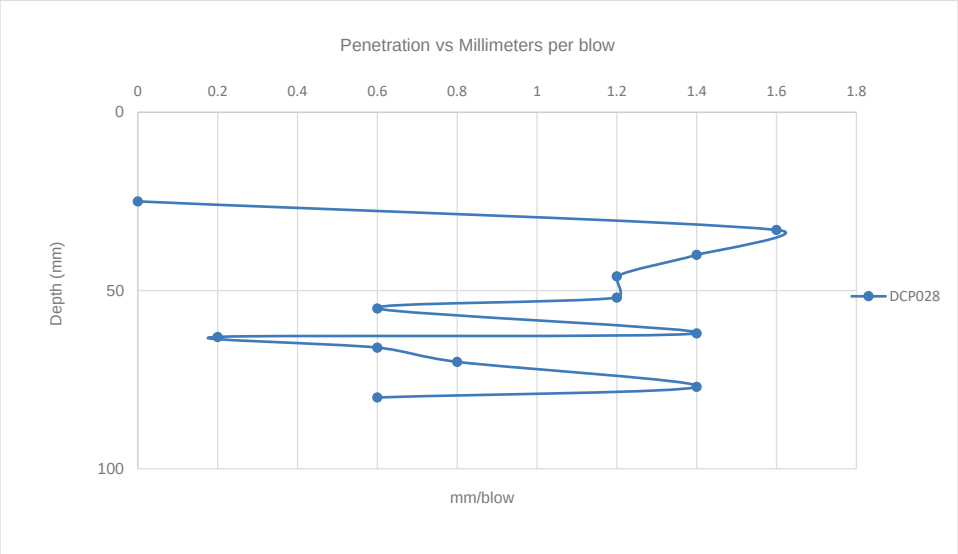


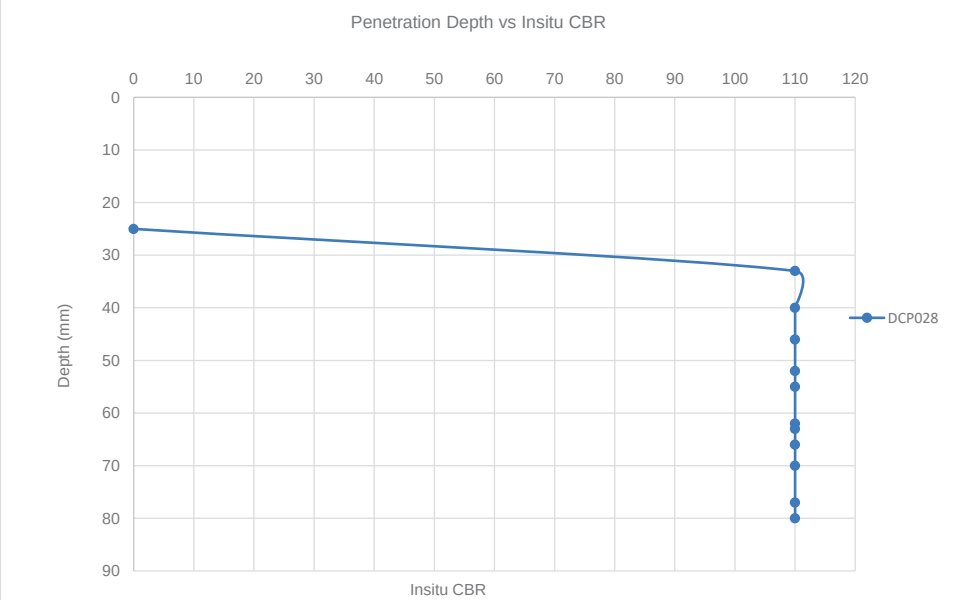
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP028	**STARTING DEPTH:**	25mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	25	25mm	0	0				
5	33	33mm	8	1.6	Very Dense	206	>110	1737
10	40	40mm	7	1.4	Very Dense	232	>110	2010
15	46	46mm	6	1.2	Very Dense	263	>110	2377
20	52	52mm	6	1.2	Very Dense	263	>110	2377
25	55	55mm	3	0.6	Very Dense	389	>110	5061
30	62	62mm	7	1.4	Very Dense	232	>110	2010
35	63	63mm	1	0.2	Very Dense	500	>110	16760
40	66	66mm	3	0.6	Very Dense	389	>110	5061
45	70	70mm	4	0.8	Very Dense	342	>110	3699
50	77	77mm	7	1.4	Very Dense	232	>110	2010
55	80	80mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



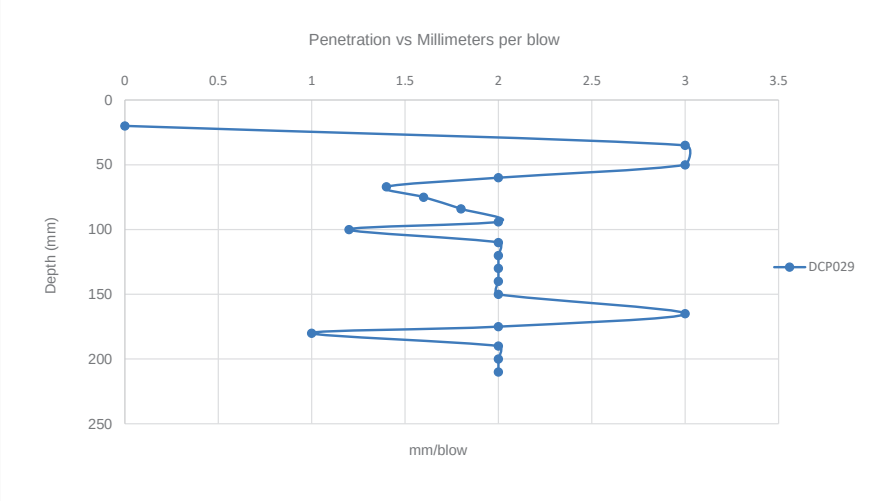


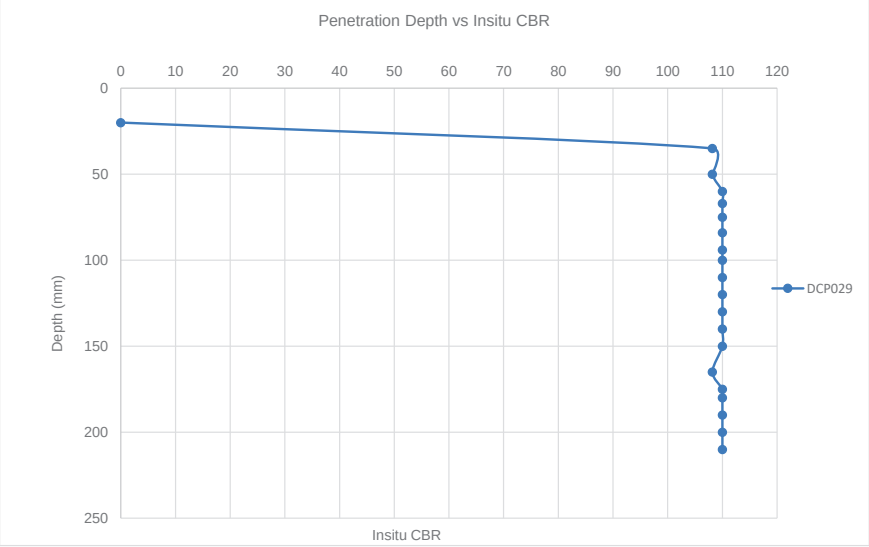
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP029	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	35	35mm	15	3.0	Very Dense	102	108	876
10	50	50mm	15	3.0	Very Dense	102	108	876
15	60	60mm	10	2.0	Very Dense	170	>110	1362
20	67	67mm	7	1.4	Very Dense	232	>110	2010
25	75	75mm	8	1.6	Very Dense	206	>110	1737
30	84	84mm	9	1.8	Very Dense	185	>110	1528
35	94	94mm	10	2.0	Very Dense	170	>110	1362
40	100	100mm	6	1.2	Very Dense	263	>110	2377
45	110	110mm	10	2.0	Very Dense	170	>110	1362
50	120	120mm	10	2.0	Very Dense	170	>110	1362
55	130	130mm	10	2.0	Very Dense	170	>110	1362
60	140	140mm	10	2.0	Very Dense	170	>110	1362
65	150	150mm	10	2.0	Very Dense	170	>110	1362
70	165	165mm	15	3.0	Very Dense	102	108	876
75	175	175mm	10	2.0	Very Dense	170	>110	1362
80	180	180mm	5	1.0	Very Dense	300	>110	2900
85	190	190mm	10	2.0	Very Dense	170	>110	1362
90	200	200mm	10	2.0	Very Dense	170	>110	1362
95	210	210mm	10	2.0	Very Dense	170	>110	1362

DCP GRAPHICAL REPRESENTATION



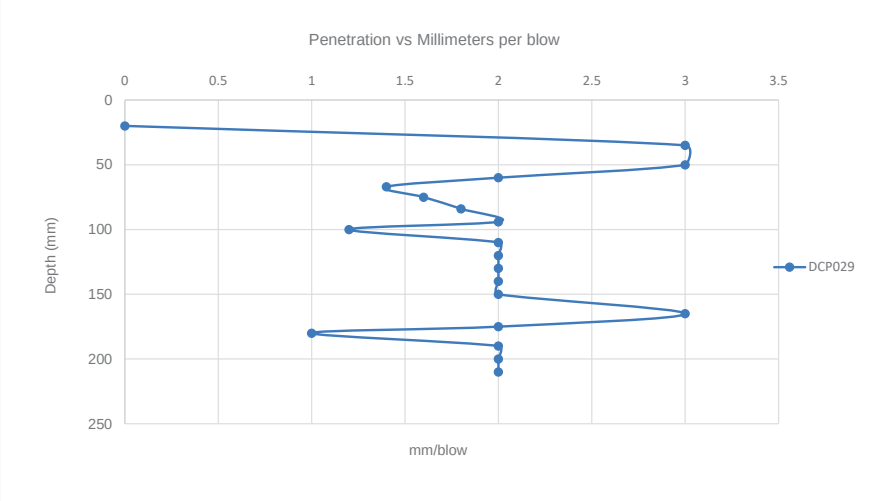


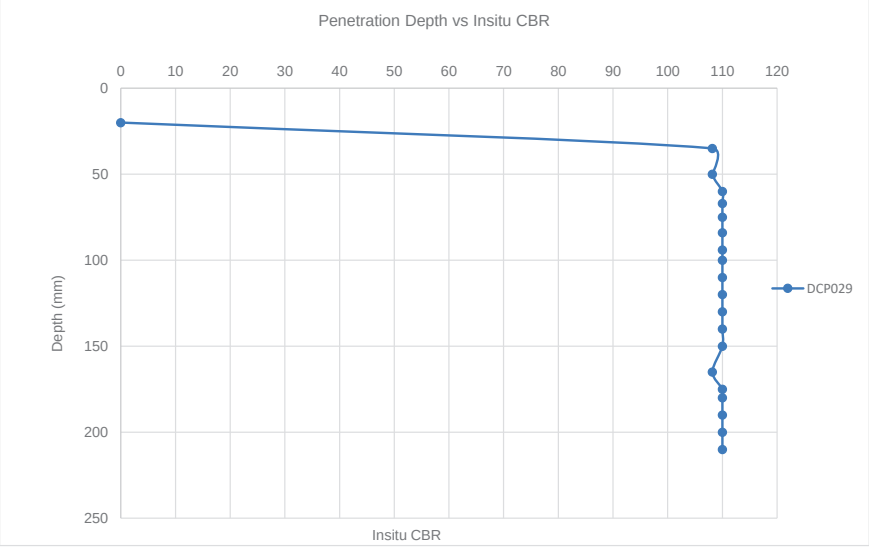
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP029	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	35	35mm	15	3.0	Very Dense	102	108	876
10	50	50mm	15	3.0	Very Dense	102	108	876
15	60	60mm	10	2.0	Very Dense	170	>110	1362
20	67	67mm	7	1.4	Very Dense	232	>110	2010
25	75	75mm	8	1.6	Very Dense	206	>110	1737
30	84	84mm	9	1.8	Very Dense	185	>110	1528
35	94	94mm	10	2.0	Very Dense	170	>110	1362
40	100	100mm	6	1.2	Very Dense	263	>110	2377
45	110	110mm	10	2.0	Very Dense	170	>110	1362
50	120	120mm	10	2.0	Very Dense	170	>110	1362
55	130	130mm	10	2.0	Very Dense	170	>110	1362
60	140	140mm	10	2.0	Very Dense	170	>110	1362
65	150	150mm	10	2.0	Very Dense	170	>110	1362
70	165	165mm	15	3.0	Very Dense	102	108	876
75	175	175mm	10	2.0	Very Dense	170	>110	1362
80	180	180mm	5	1.0	Very Dense	300	>110	2900
85	190	190mm	10	2.0	Very Dense	170	>110	1362
90	200	200mm	10	2.0	Very Dense	170	>110	1362
95	210	210mm	10	2.0	Very Dense	170	>110	1362

DCP GRAPHICAL REPRESENTATION





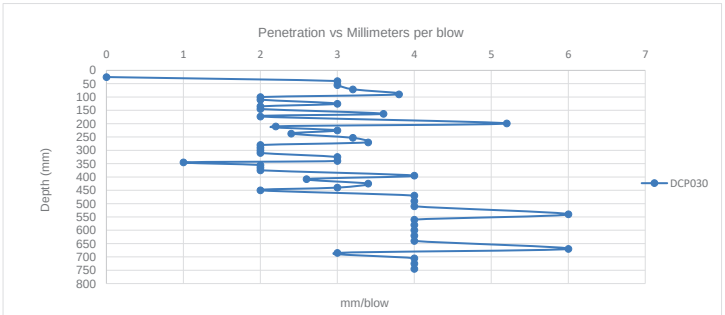
DYNAMIC CONE PENETROMETER TEST

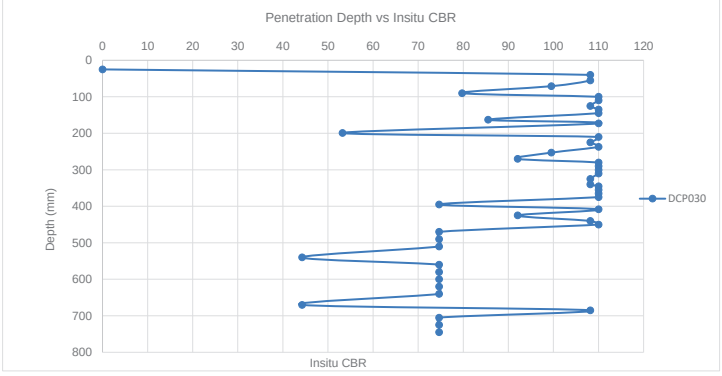
MUKONA CONSULTING ENGINEERS

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP030	**STARTING DEPTH:**	25mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	25	25mm	0	0				
5	40	40mm	15	3.0	Very Dense	102	108	876
10	55	55mm	15	3.0	Very Dense	102	108	876
15	71	71mm	16	3.2	Very Dense	94	100	816
20	90	90mm	19	3.8	Very Dense	75	80	677
25	100	100mm	10	2.0	Very Dense	170	>110	1362
30	110	110mm	10	2.0	Very Dense	170	>110	1362
35	125	125mm	15	3.0	Very Dense	102	108	876
40	135	135mm	10	2.0	Very Dense	170	>110	1362
45	145	145mm	10	2.0	Very Dense	170	>110	1362
50	163	163mm	18	3.6	Very Dense	81	86	718
55	173	173mm	10	2.0	Very Dense	170	>110	1362
60	199	199mm	26	5.2	Dense	51	53	481
65	210	210mm	11	2.2	Very Dense	151	>110	1228
70	225	225mm	15	3.0	Very Dense	102	108	876
75	237	237mm	12	2.4	Very Dense	135	>110	1117
80	253	253mm	16	3.2	Very Dense	94	100	816
85	270	270mm	17	3.4	Very Dense	87	92	764
90	280	280mm	10	2.0	Very Dense	170	>110	1362
95	290	290mm	10	2.0	Very Dense	170	>110	1362
100	300	300mm	10	2.0	Very Dense	170	>110	1362
105	310	310mm	10	2.0	Very Dense	170	>110	1362
110	325	325mm	15	3.0	Very Dense	102	108	876
115	340	340mm	15	3.0	Very Dense	102	108	876
120	345	345mm	5	1.0	Very Dense	300	>110	2900
125	355	355mm	10	2.0	Very Dense	170	>110	1362
130	365	365mm	10	2.0	Very Dense	170	>110	1362
135	375	375mm	10	2.0	Very Dense	170	>110	1362
140	395	395mm	20	4.0	Very Dense	70	75	640
145	408	408mm	13	2.6	Very Dense	122	>110	1023
150	425	425mm	17	3.4	Very Dense	87	92	764
155	440	440mm	15	3.0	Very Dense	102	108	876
160	450	450mm	10	2.0	Very Dense	170	>110	1362
165	470	470mm	20	4.0	Very Dense	70	75	640
170	490	490mm	20	4.0	Very Dense	70	75	640
175	510	510mm	20	4.0	Very Dense	70	75	640
180	540	540mm	30	6.0	Dense	42	44	411
185	560	560mm	20	4.0	Very Dense	70	75	640
190	580	580mm	20	4.0	Very Dense	70	75	640
195	600	600mm	20	4.0	Very Dense	70	75	640
200	620	620mm	20	4.0	Very Dense	70	75	640
205	640	640mm	20	4.0	Very Dense	70	75	640
210	670	670mm	30	6.0	Dense	42	44	411
215	685	685mm	15	3.0	Very Dense	102	108	876
220	705	705mm	20	4.0	Very Dense	70	75	640
225	725	725mm	20	4.0	Very Dense	70	75	640
230	745	745mm	20	4.0	Very Dense	70	75	640

DCP GRAPHICAL REPRESENTATION



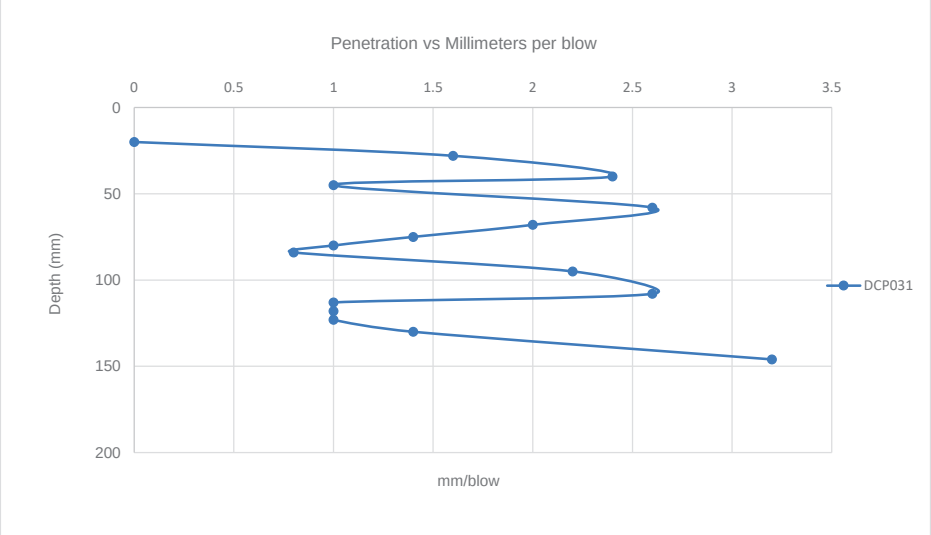


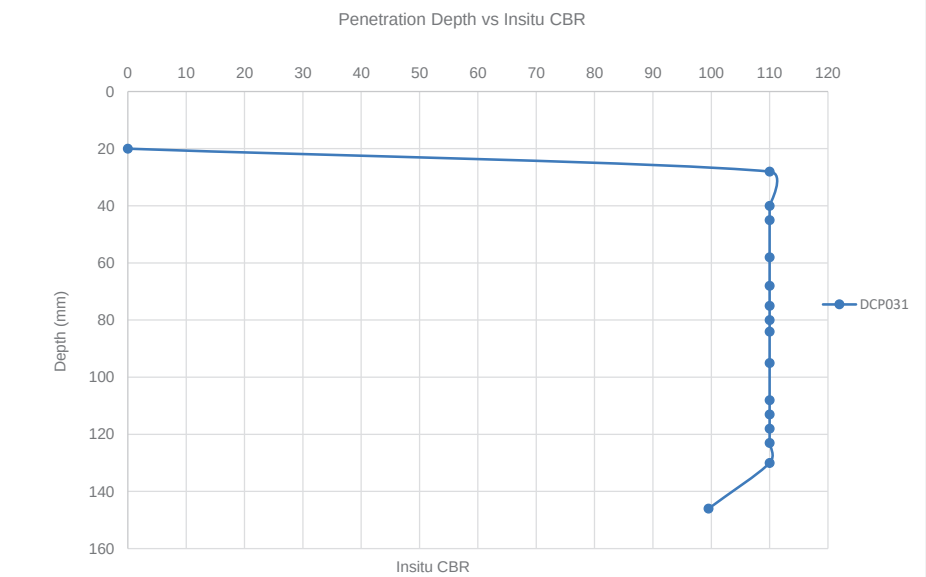
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP031	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	20	20mm	0	0				
5	28	28mm	8	1.6	Very Dense	206	>110	1737
10	40	40mm	12	2.4	Very Dense	135	>110	1117
15	45	45mm	5	1.0	Very Dense	300	>110	2900
20	58	58mm	13	2.6	Very Dense	122	>110	1023
25	68	68mm	10	2.0	Very Dense	170	>110	1362
30	75	75mm	7	1.4	Very Dense	232	>110	2010
35	80	80mm	5	1.0	Very Dense	300	>110	2900
40	84	84mm	4	0.8	Very Dense	342	>110	3699
45	95	95mm	11	2.2	Very Dense	151	>110	1228
50	108	108mm	13	2.6	Very Dense	122	>110	1023
55	113	113mm	5	1.0	Very Dense	300	>110	2900
60	118	118mm	5	1.0	Very Dense	300	>110	2900
65	123	123mm	5	1.0	Very Dense	300	>110	2900
70	130	130mm	7	1.4	Very Dense	232	>110	2010
75	146	146mm	16	3.2	Very Dense	94	100	816

DCP GRAPHICAL REPRESENTATION



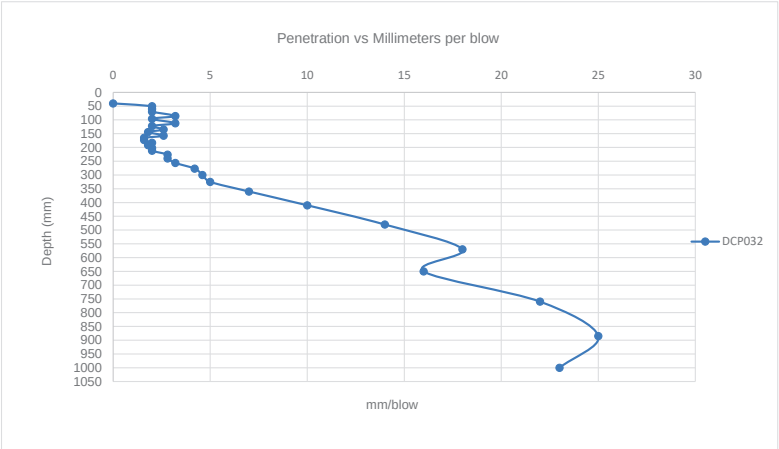


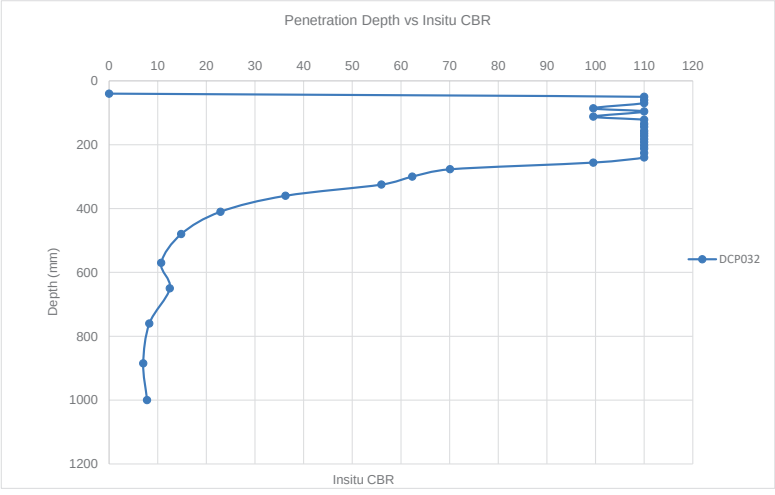
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP032	**STARTING DEPTH:**	40mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	50	50mm	10	2.0	Very Dense	170	>110	1362
10	60	60mm	10	2.0	Very Dense	170	>110	1362
15	70	70mm	10	2.0	Very Dense	170	>110	1362
20	86	86mm	16	3.2	Very Dense	94	100	816
25	96	96mm	10	2.0	Very Dense	170	>110	1362
30	112	112mm	16	3.2	Very Dense	94	100	816
35	122	122mm	10	2.0	Very Dense	170	>110	1362
40	135	135mm	13	2.6	Very Dense	122	>110	1023
45	144	144mm	9	1.8	Very Dense	185	>110	1528
50	157	157mm	13	2.6	Very Dense	122	>110	1023
55	165	165mm	8	1.6	Very Dense	206	>110	1737
60	173	173mm	8	1.6	Very Dense	206	>110	1737
65	183	183mm	10	2.0	Very Dense	170	>110	1362
70	192	192mm	9	1.8	Very Dense	185	>110	1528
75	202	202mm	10	2.0	Very Dense	170	>110	1362
80	212	212mm	10	2.0	Very Dense	170	>110	1362
85	226	226mm	14	2.8	Very Dense	111	>110	944
90	240	240mm	14	2.8	Very Dense	111	>110	944
95	256	256mm	16	3.2	Very Dense	94	100	816
100	277	277mm	21	4.2	Very Dense	66	70	607
105	300	300mm	23	4.6	Very Dense	59	62	550
110	325	325mm	25	5.0	Very Dense	53	56	502
115	360	360mm	35	7.0	Dense	35	36	348
120	410	410mm	50	10.0	Dense	22	23	236
125	480	480mm	70	14.0	Medium Dense	14	15	163
130	570	570mm	90	18.0	Medium Dense	10	11	124
135	650	650mm	80	16.0	Medium Dense	12	12	141
140	760	760mm	110	22.0	Medium Dense	8	8	100
145	885	885mm	125	25.0	Medium Dense	7	7	87
150	1000	1000mm	115	23.0	Medium Dense	8	8	95

DCP GRAPHICAL REPRESENTATION



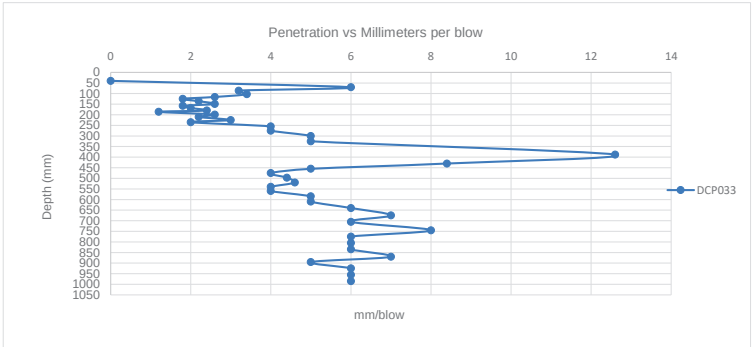


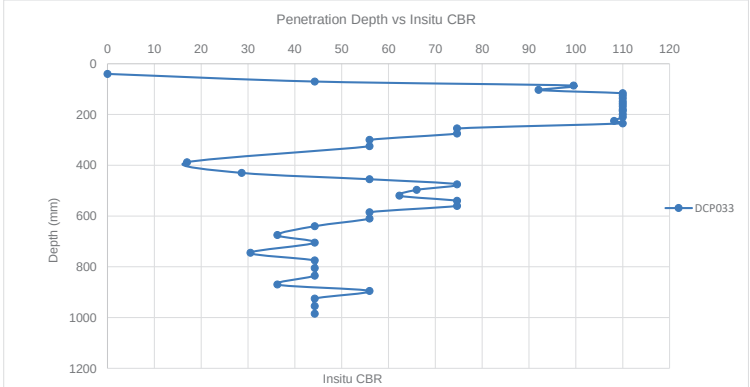
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP033	**STARTING DEPTH:**	40mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	70	70mm	30	6.0	Dense	42	44	411
10	86	86mm	16	3.2	Very Dense	94	100	816
15	103	103mm	17	3.4	Very Dense	87	92	764
20	116	116mm	13	2.6	Very Dense	122	>110	1023
25	125	125mm	9	1.8	Very Dense	185	>110	1528
30	136	136mm	11	2.2	Very Dense	151	>110	1228
35	149	149mm	13	2.6	Very Dense	122	>110	1023
40	158	158mm	9	1.8	Very Dense	185	>110	1528
45	168	168mm	10	2.0	Very Dense	170	>110	1362
50	180	180mm	12	2.4	Very Dense	135	>110	1117
55	186	186mm	6	1.2	Very Dense	263	>110	2377
60	199	199mm	13	2.6	Very Dense	122	>110	1023
65	210	210mm	11	2.2	Very Dense	151	>110	1228
70	225	225mm	15	3.0	Very Dense	102	108	876
75	235	235mm	10	2.0	Very Dense	170	>110	1362
80	255	255mm	20	4.0	Very Dense	70	75	640
85	275	275mm	20	4.0	Very Dense	70	75	640
90	300	300mm	25	5.0	Very Dense	53	56	502
95	325	325mm	25	5.0	Very Dense	53	56	502
100	388	388mm	63	12.6	Medium Dense	16	17	183
105	430	430mm	42	8.4	Dense	27	29	285
110	455	455mm	25	5.0	Very Dense	53	56	502
115	475	475mm	20	4.0	Very Dense	70	75	640
120	497	497mm	22	4.4	Very Dense	62	66	577
125	520	520mm	23	4.6	Very Dense	59	62	550
130	540	540mm	20	4.0	Very Dense	70	75	640
135	560	560mm	20	4.0	Very Dense	70	75	640
140	585	585mm	25	5.0	Very Dense	53	56	502
145	610	610mm	25	5.0	Very Dense	53	56	502
150	640	640mm	30	6.0	Dense	42	44	411
155	675	675mm	35	7.0	Dense	35	36	348
160	705	705mm	30	6.0	Dense	42	44	411
165	745	745mm	40	8.0	Dense	29	31	301
170	775	775mm	30	6.0	Dense	42	44	411
175	805	805mm	30	6.0	Dense	42	44	411
180	835	835mm	30	6.0	Dense	42	44	411
185	870	870mm	35	7.0	Dense	35	36	348
190	895	895mm	25	5.0	Very Dense	53	56	502
195	925	925mm	30	6.0	Dense	42	44	411
200	955	955mm	30	6.0	Dense	42	44	411
205	985	985mm	30	6.0	Dense	42	44	411

DCP GRAPHICAL REPRESENTATION



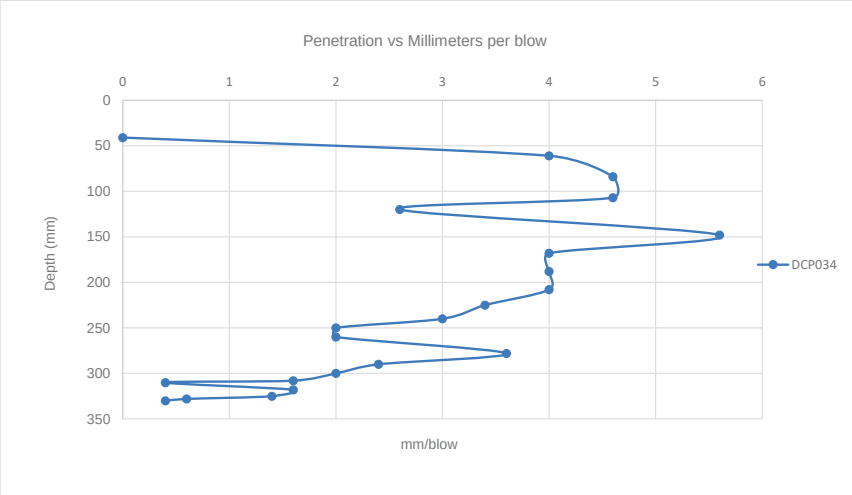


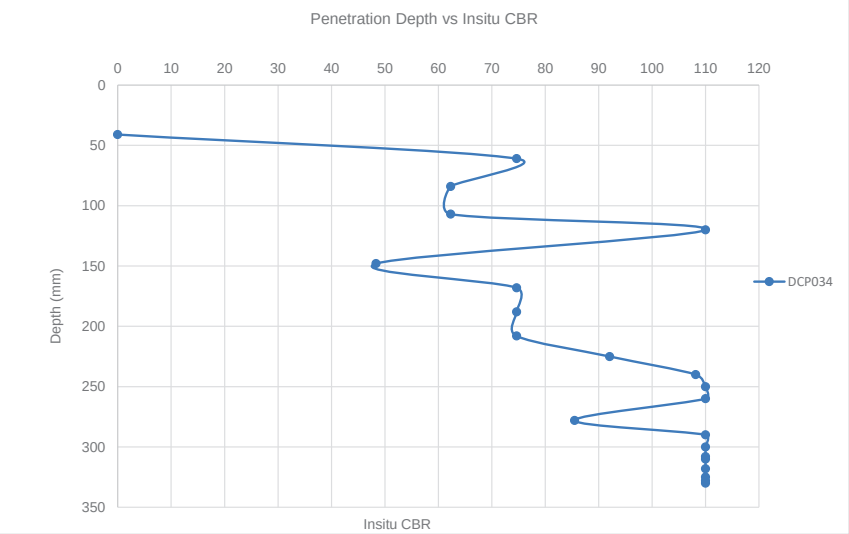
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP034	**STARTING DEPTH:**	41mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	41	41mm	0	0				
5	61	61mm	20	4.0	Very Dense	70	75	640
10	84	84mm	23	4.6	Very Dense	59	62	550
15	107	107mm	23	4.6	Very Dense	59	62	550
20	120	120mm	13	2.6	Very Dense	122	>110	1023
25	148	148mm	28	5.6	Dense	46	48	443
30	168	168mm	20	4.0	Very Dense	70	75	640
35	188	188mm	20	4.0	Very Dense	70	75	640
40	208	208mm	20	4.0	Very Dense	70	75	640
45	225	225mm	17	3.4	Very Dense	87	92	764
50	240	240mm	15	3.0	Very Dense	102	108	876
55	250	250mm	10	2.0	Very Dense	170	>110	1362
60	260	260mm	10	2.0	Very Dense	170	>110	1362
65	278	278mm	18	3.6	Very Dense	81	86	718
70	290	290mm	12	2.4	Very Dense	135	>110	1117
75	300	300mm	10	2.0	Very Dense	170	>110	1362
80	308	308mm	8	1.6	Very Dense	206	>110	1737
85	310	310mm	2	0.4	Very Dense	442	>110	7873
90	318	318mm	8	1.6	Very Dense	206	>110	1737
95	325	325mm	7	1.4	Very Dense	232	>110	2010
100	328	328mm	3	0.6	Very Dense	389	>110	5061
105	330	330mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



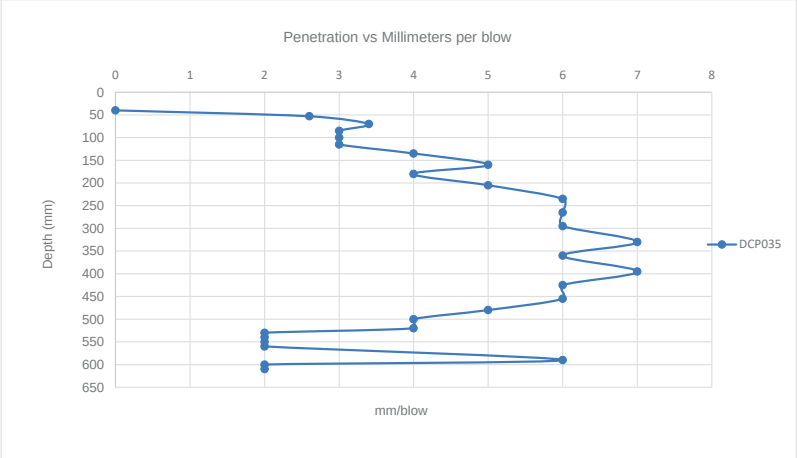


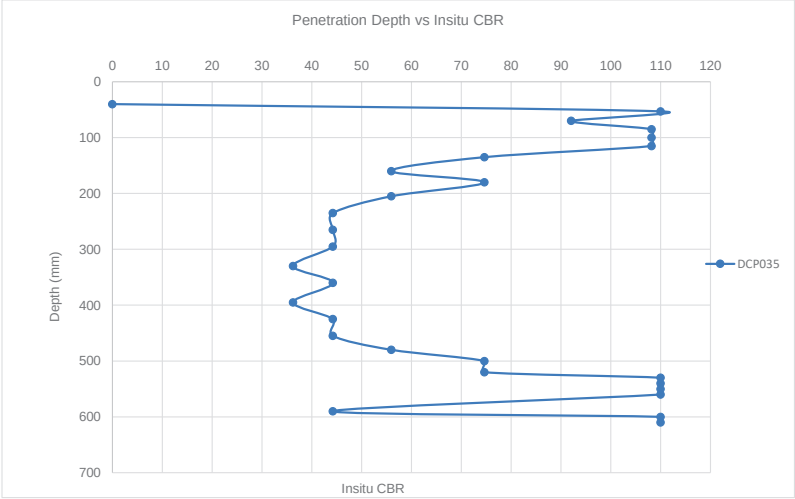
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP035	**STARTING DEPTH:**	40mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	53	53mm	13	2.6	Very Dense	122	>110	1023
10	70	70mm	17	3.4	Very Dense	87	92	764
15	85	85mm	15	3.0	Very Dense	102	108	876
20	100	100mm	15	3.0	Very Dense	102	108	876
25	115	115mm	15	3.0	Very Dense	102	108	876
30	135	135mm	20	4.0	Very Dense	70	75	640
35	160	160mm	25	5.0	Very Dense	53	56	502
40	180	180mm	20	4.0	Very Dense	70	75	640
45	205	205mm	25	5.0	Very Dense	53	56	502
50	235	235mm	30	6.0	Dense	42	44	411
55	265	265mm	30	6.0	Dense	42	44	411
60	295	295mm	30	6.0	Dense	42	44	411
65	330	330mm	35	7.0	Dense	35	36	348
70	360	360mm	30	6.0	Dense	42	44	411
75	395	395mm	35	7.0	Dense	35	36	348
80	425	425mm	30	6.0	Dense	42	44	411
85	455	455mm	30	6.0	Dense	42	44	411
90	480	480mm	25	5.0	Very Dense	53	56	502
95	500	500mm	20	4.0	Very Dense	70	75	640
100	520	520mm	20	4.0	Very Dense	70	75	640
105	530	530mm	10	2.0	Very Dense	170	>110	1362
110	540	540mm	10	2.0	Very Dense	170	>110	1362
115	550	550mm	10	2.0	Very Dense	170	>110	1362
120	560	560mm	10	2.0	Very Dense	170	>110	1362
125	590	590mm	30	6.0	Dense	42	44	411
130	600	600mm	10	2.0	Very Dense	170	>110	1362
135	610	610mm	10	2.0	Very Dense	170	>110	1362

DCP GRAPHICAL REPRESENTATION



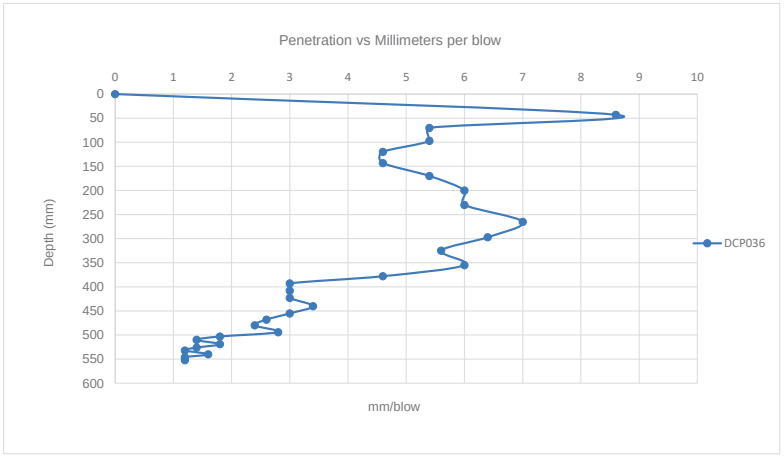


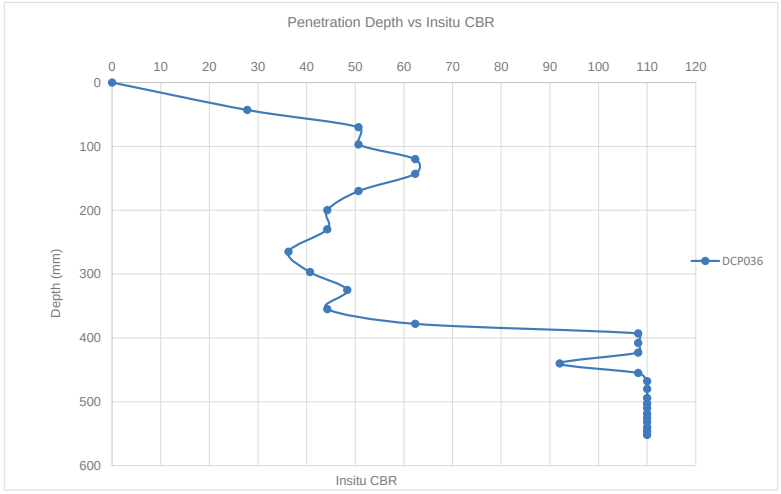
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP036	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x(dn)^{-1.09}$
0	0	0mm	0	0				
5	43	43mm	43	8.6	Dense	27	28	278
10	70	70mm	27	5.4	Dense	48	51	461
15	97	97mm	27	5.4	Dense	48	51	461
20	120	120mm	23	4.6	Very Dense	59	62	550
25	143	143mm	23	4.6	Very Dense	59	62	550
30	170	170mm	27	5.4	Dense	48	51	461
35	200	200mm	30	6.0	Dense	42	44	411
40	230	230mm	30	6.0	Dense	42	44	411
45	265	265mm	35	7.0	Dense	35	36	348
50	297	297mm	32	6.4	Dense	39	41	383
55	325	325mm	28	5.6	Dense	46	48	443
60	355	355mm	30	6.0	Dense	42	44	411
65	378	378mm	23	4.6	Very Dense	59	62	550
70	393	393mm	15	3.0	Very Dense	102	108	876
75	408	408mm	15	3.0	Very Dense	102	108	876
80	423	423mm	15	3.0	Very Dense	102	108	876
85	440	440mm	17	3.4	Very Dense	87	92	764
90	455	455mm	15	3.0	Very Dense	102	108	876
95	468	468mm	13	2.6	Very Dense	122	>110	1023
100	480	480mm	12	2.4	Very Dense	135	>110	1117
105	494	494mm	14	2.8	Very Dense	111	>110	944
110	503	503mm	9	1.8	Very Dense	185	>110	1528
115	510	510mm	7	1.4	Very Dense	232	>110	2010
120	519	519mm	9	1.8	Very Dense	185	>110	1528
125	526	526mm	7	1.4	Very Dense	232	>110	2010
130	532	532mm	6	1.2	Very Dense	263	>110	2377
135	540	540mm	8	1.6	Very Dense	206	>110	1737
140	546	546mm	6	1.2	Very Dense	263	>110	2377
145	552	552mm	6	1.2	Very Dense	263	>110	2377

DCP GRAPHICAL REPRESENTATION



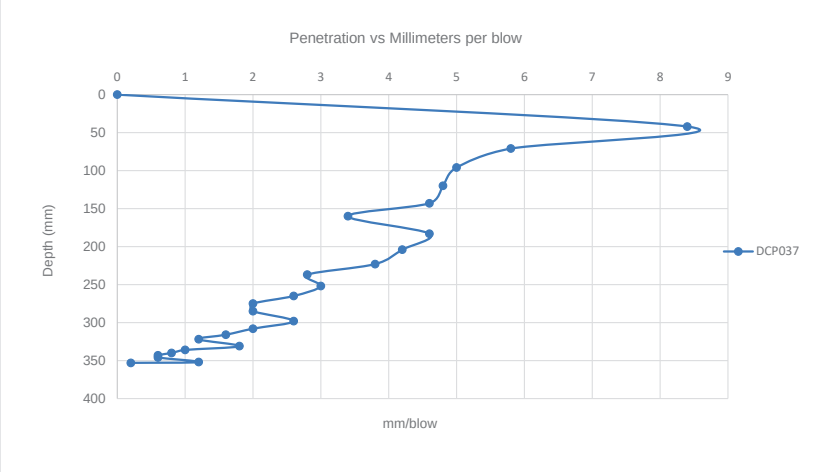


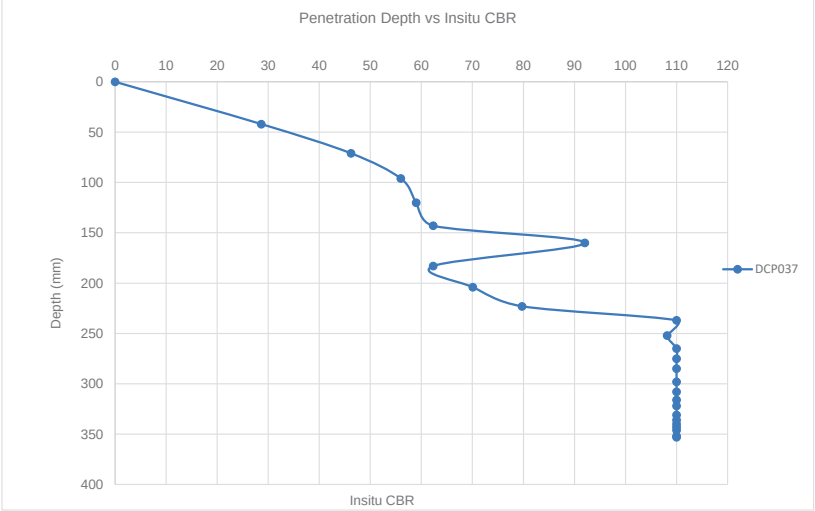
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP037	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0				
5	42	42mm	42	8.4	Dense	27	29	285
10	71	71mm	29	5.8	Dense	44	46	427
15	96	96mm	25	5.0	Very Dense	53	56	502
20	120	120mm	24	4.8	Very Dense	56	59	525
25	143	143mm	23	4.6	Very Dense	59	62	550
30	160	160mm	17	3.4	Very Dense	87	92	764
35	183	183mm	23	4.6	Very Dense	59	62	550
40	204	204mm	21	4.2	Very Dense	66	70	607
45	223	223mm	19	3.8	Very Dense	75	80	677
50	237	237mm	14	2.8	Very Dense	111	>110	944
55	252	252mm	15	3.0	Very Dense	102	108	876
60	265	265mm	13	2.6	Very Dense	122	>110	1023
65	275	275mm	10	2.0	Very Dense	170	>110	1362
70	285	285mm	10	2.0	Very Dense	170	>110	1362
75	298	298mm	13	2.6	Very Dense	122	>110	1023
80	308	308mm	10	2.0	Very Dense	170	>110	1362
85	316	316mm	8	1.6	Very Dense	206	>110	1737
90	322	322mm	6	1.2	Very Dense	263	>110	2377
95	331	331mm	9	1.8	Very Dense	185	>110	1528
100	336	336mm	5	1.0	Very Dense	300	>110	2900
105	340	340mm	4	0.8	Very Dense	342	>110	3699
110	343	343mm	3	0.6	Very Dense	389	>110	5061
115	346	346mm	3	0.6	Very Dense	389	>110	5061
120	352	352mm	6	1.2	Very Dense	263	>110	2377
125	353	353mm	1	0.2	Very Dense	500	>110	16760

DCP GRAPHICAL REPRESENTATION



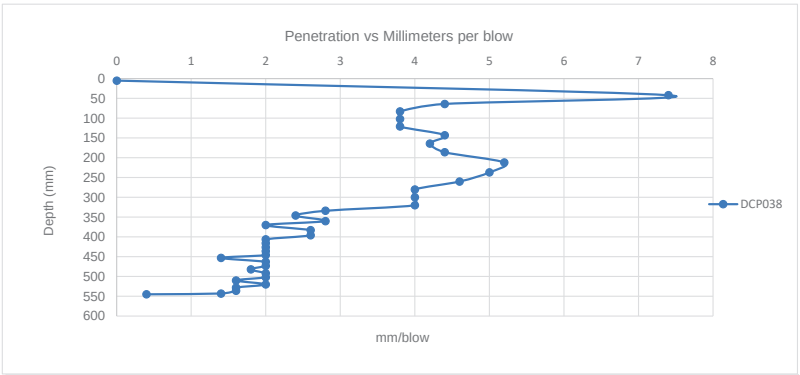


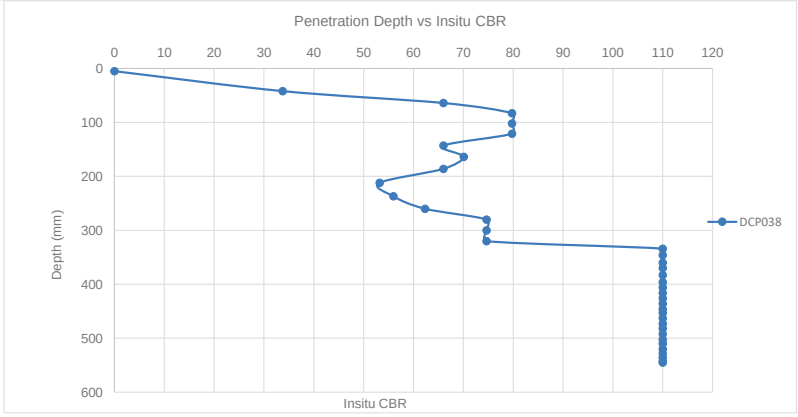
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP038	**STARTING DEPTH:**	5mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	5	5mm	0	0				
5	42	42mm	37	7.4	Dense	32	34	327
10	64	64mm	22	4.4	Very Dense	62	66	577
15	83	83mm	19	3.8	Very Dense	75	80	677
20	102	102mm	19	3.8	Very Dense	75	80	677
25	121	121mm	19	3.8	Very Dense	75	80	677
30	143	143mm	22	4.4	Very Dense	62	66	577
35	164	164mm	21	4.2	Very Dense	66	70	607
40	186	186mm	22	4.4	Very Dense	62	66	577
45	212	212mm	26	5.2	Dense	51	53	481
50	237	237mm	25	5.0	Very Dense	53	56	502
55	260	260mm	23	4.6	Very Dense	59	62	550
60	280	280mm	20	4.0	Very Dense	70	75	640
65	300	300mm	20	4.0	Very Dense	70	75	640
70	320	320mm	20	4.0	Very Dense	70	75	640
75	334	334mm	14	2.8	Very Dense	111	>110	944
80	346	346mm	12	2.4	Very Dense	135	>110	1117
85	360	360mm	14	2.8	Very Dense	111	>110	944
90	370	370mm	10	2.0	Very Dense	170	>110	1362
95	383	383mm	13	2.6	Very Dense	122	>110	1023
100	396	396mm	13	2.6	Very Dense	122	>110	1023
105	406	406mm	10	2.0	Very Dense	170	>110	1362
110	416	416mm	10	2.0	Very Dense	170	>110	1362
115	426	426mm	10	2.0	Very Dense	170	>110	1362
120	436	436mm	10	2.0	Very Dense	170	>110	1362
125	446	446mm	10	2.0	Very Dense	170	>110	1362
130	453	453mm	7	1.4	Very Dense	232	>110	2010
135	463	463mm	10	2.0	Very Dense	170	>110	1362
140	473	473mm	10	2.0	Very Dense	170	>110	1362
145	482	482mm	9	1.8	Very Dense	185	>110	1528
150	492	492mm	10	2.0	Very Dense	170	>110	1362
155	502	502mm	10	2.0	Very Dense	170	>110	1362
160	510	510mm	8	1.6	Very Dense	206	>110	1737
165	520	520mm	10	2.0	Very Dense	170	>110	1362
170	528	528mm	8	1.6	Very Dense	206	>110	1737
175	536	536mm	8	1.6	Very Dense	206	>110	1737
180	543	543mm	7	1.4	Very Dense	232	>110	2010
185	545	545mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



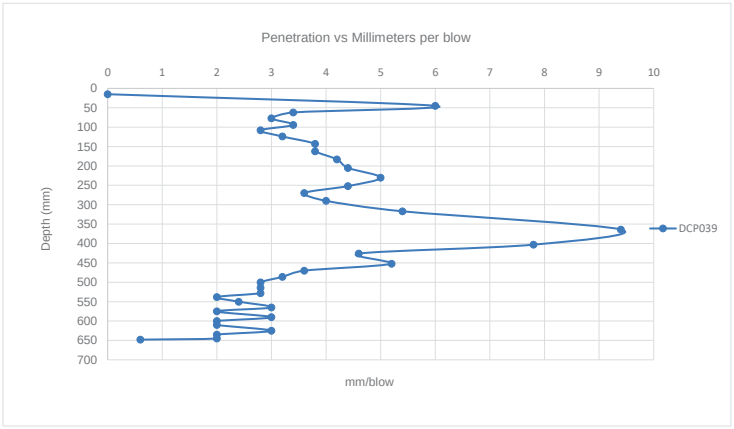


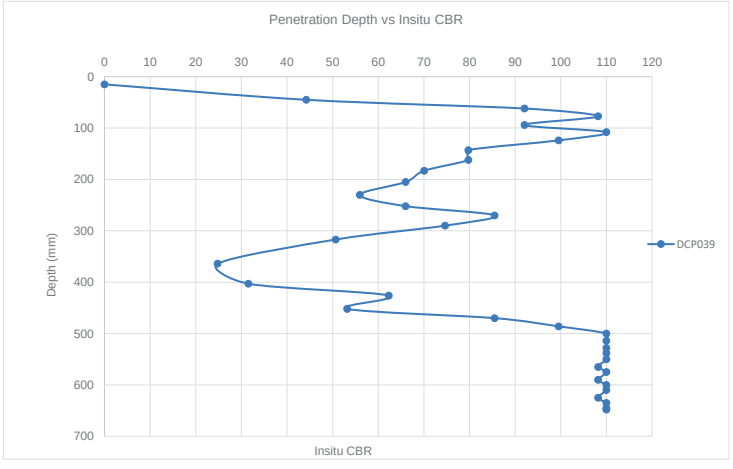
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP039	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	15	15mm	0	0				
5	45	45mm	30	6.0	Dense	42	44	411
10	62	62mm	17	3.4	Very Dense	87	92	764
15	77	77mm	15	3.0	Very Dense	102	108	876
20	94	94mm	17	3.4	Very Dense	87	92	764
25	108	108mm	14	2.8	Very Dense	111	>110	944
30	124	124mm	16	3.2	Very Dense	94	100	816
35	143	143mm	19	3.8	Very Dense	75	80	677
40	162	162mm	19	3.8	Very Dense	75	80	677
45	183	183mm	21	4.2	Very Dense	66	70	607
50	205	205mm	22	4.4	Very Dense	62	66	577
55	230	230mm	25	5.0	Very Dense	53	56	502
60	252	252mm	22	4.4	Very Dense	62	66	577
65	270	270mm	18	3.6	Very Dense	81	86	718
70	290	290mm	20	4.0	Very Dense	70	75	640
75	317	317mm	27	5.4	Dense	48	51	461
80	364	364mm	47	9.4	Dense	24	25	252
85	403	403mm	39	7.8	Dense	30	32	309
90	426	426mm	23	4.6	Very Dense	59	62	550
95	452	452mm	26	5.2	Dense	51	53	481
100	470	470mm	18	3.6	Very Dense	81	86	718
105	486	486mm	16	3.2	Very Dense	94	100	816
110	500	500mm	14	2.8	Very Dense	111	>110	944
115	514	514mm	14	2.8	Very Dense	111	>110	944
120	528	528mm	14	2.8	Very Dense	111	>110	944
125	538	538mm	10	2.0	Very Dense	170	>110	1362
130	550	550mm	12	2.4	Very Dense	135	>110	1117
135	565	565mm	15	3.0	Very Dense	102	108	876
140	575	575mm	10	2.0	Very Dense	170	>110	1362
145	590	590mm	15	3.0	Very Dense	102	108	876
150	600	600mm	10	2.0	Very Dense	170	>110	1362
155	610	610mm	10	2.0	Very Dense	170	>110	1362
160	625	625mm	15	3.0	Very Dense	102	108	876
165	635	635mm	10	2.0	Very Dense	170	>110	1362
170	645	645mm	10	2.0	Very Dense	170	>110	1362
175	648	648mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



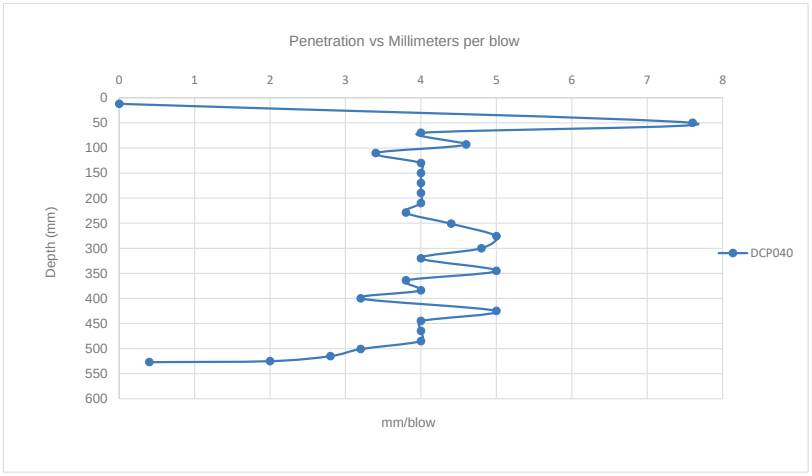


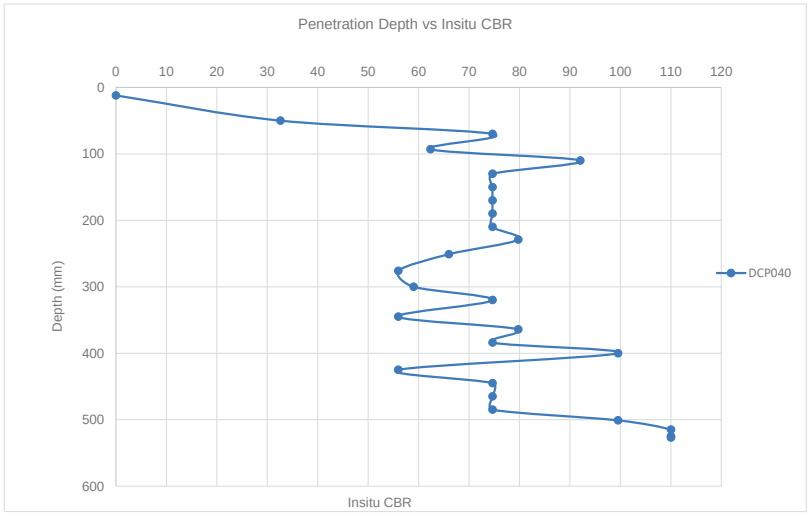
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP040	**STARTING DEPTH:**	12mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	12	12mm	0	0				
5	50	50mm	38	7.6	Dense	31	33	318
10	70	70mm	20	4.0	Very Dense	70	75	640
15	93	93mm	23	4.6	Very Dense	59	62	550
20	110	110mm	17	3.4	Very Dense	87	92	764
25	130	130mm	20	4.0	Very Dense	70	75	640
30	150	150mm	20	4.0	Very Dense	70	75	640
35	170	170mm	20	4.0	Very Dense	70	75	640
40	190	190mm	20	4.0	Very Dense	70	75	640
45	210	210mm	20	4.0	Very Dense	70	75	640
50	229	229mm	19	3.8	Very Dense	75	80	677
55	251	251mm	22	4.4	Very Dense	62	66	577
60	276	276mm	25	5.0	Very Dense	53	56	502
65	300	300mm	24	4.8	Very Dense	56	59	525
70	320	320mm	20	4.0	Very Dense	70	75	640
75	345	345mm	25	5.0	Very Dense	53	56	502
80	364	364mm	19	3.8	Very Dense	75	80	677
85	384	384mm	20	4.0	Very Dense	70	75	640
90	400	400mm	16	3.2	Very Dense	94	100	816
95	425	425mm	25	5.0	Very Dense	53	56	502
100	445	445mm	20	4.0	Very Dense	70	75	640
105	465	465mm	20	4.0	Very Dense	70	75	640
110	485	485mm	20	4.0	Very Dense	70	75	640
115	501	501mm	16	3.2	Very Dense	94	100	816
120	515	515mm	14	2.8	Very Dense	111	>110	944
125	525	525mm	10	2.0	Very Dense	170	>110	1362
130	527	527mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



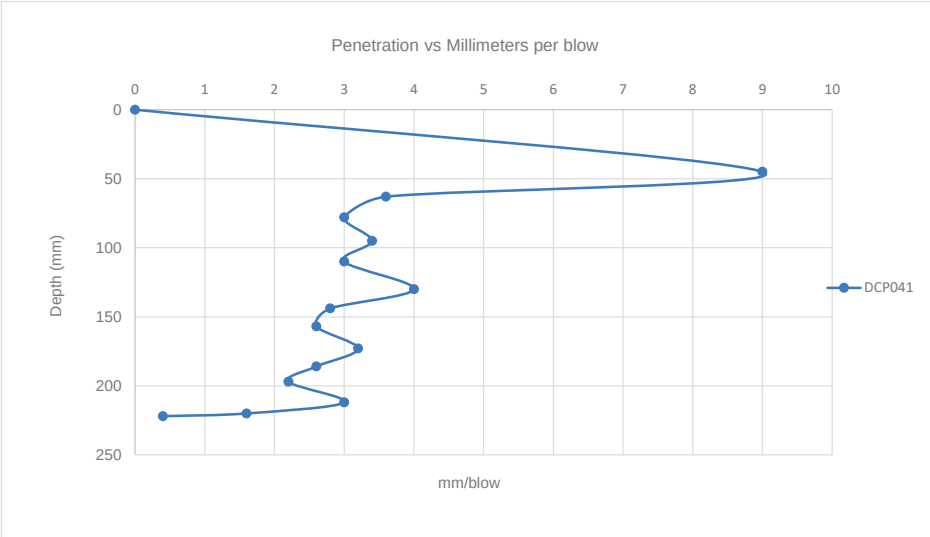


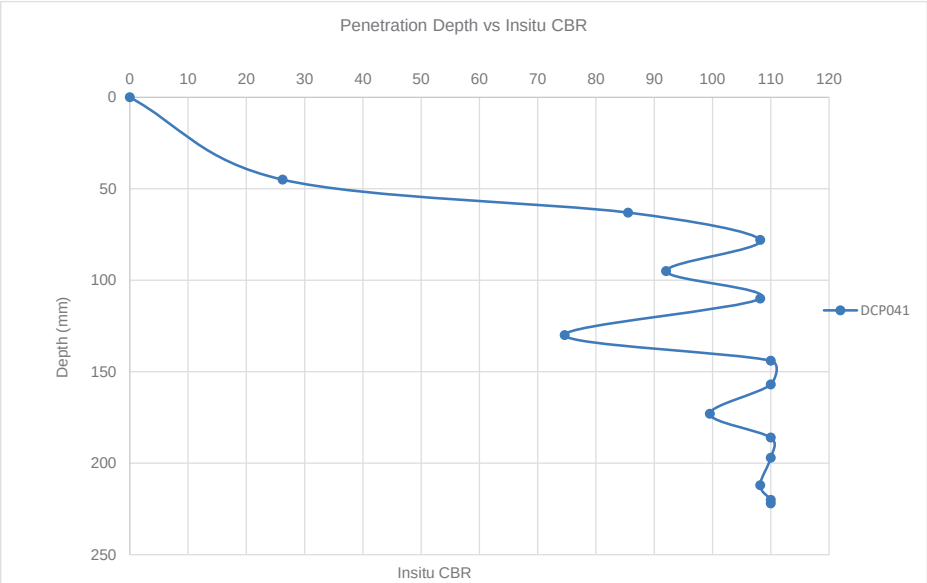
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP041	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	0	0mm	0	0				
5	45	45mm	45	9.0	Dense	25	26	264
10	63	63mm	18	3.6	Very Dense	81	86	718
15	78	78mm	15	3.0	Very Dense	102	108	876
20	95	95mm	17	3.4	Very Dense	87	92	764
25	110	110mm	15	3.0	Very Dense	102	108	876
30	130	130mm	20	4.0	Very Dense	70	75	640
35	144	144mm	14	2.8	Very Dense	111	>110	944
40	157	157mm	13	2.6	Very Dense	122	>110	1023
45	173	173mm	16	3.2	Very Dense	94	100	816
50	186	186mm	13	2.6	Very Dense	122	>110	1023
55	197	197mm	11	2.2	Very Dense	151	>110	1228
60	212	212mm	15	3.0	Very Dense	102	108	876
65	220	220mm	8	1.6	Very Dense	206	>110	1737
70	222	222mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



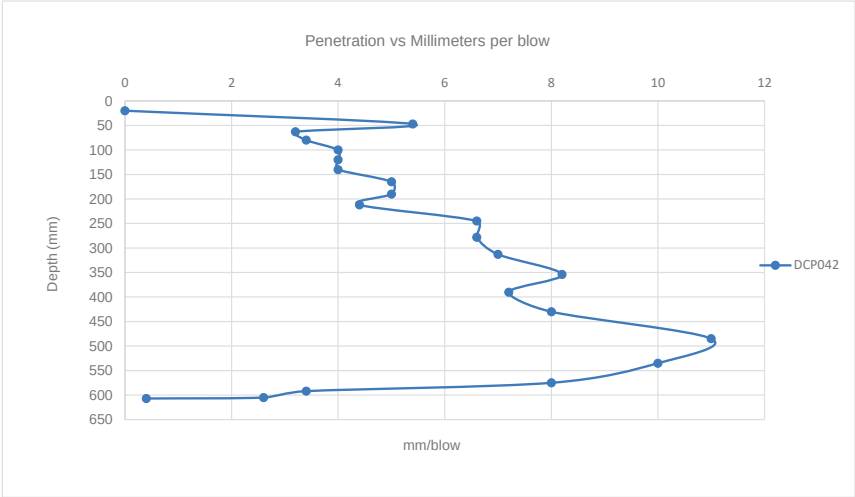


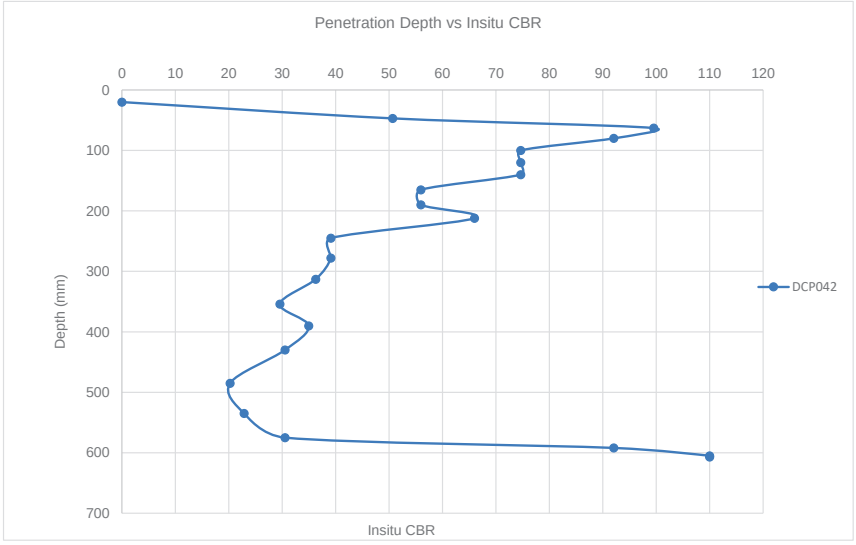
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP042	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	47	47mm	27	5.4	Dense	48	51	461
10	63	63mm	16	3.2	Very Dense	94	100	816
15	80	80mm	17	3.4	Very Dense	87	92	764
20	100	100mm	20	4.0	Very Dense	70	75	640
25	120	120mm	20	4.0	Very Dense	70	75	640
30	140	140mm	20	4.0	Very Dense	70	75	640
35	165	165mm	25	5.0	Very Dense	53	56	502
40	190	190mm	25	5.0	Very Dense	53	56	502
45	212	212mm	22	4.4	Very Dense	62	66	577
50	245	245mm	33	6.6	Dense	37	39	371
55	278	278mm	33	6.6	Dense	37	39	371
60	313	313mm	35	7.0	Dense	35	36	348
65	354	354mm	41	8.2	Dense	28	30	293
70	390	390mm	36	7.2	Dense	33	35	337
75	430	430mm	40	8.0	Dense	29	31	301
80	485	485mm	55	11.0	Dense	20	20	212
85	535	535mm	50	10.0	Dense	22	23	236
90	575	575mm	40	8.0	Dense	29	31	301
95	592	592mm	17	3.4	Very Dense	87	92	764
100	605	605mm	13	2.6	Very Dense	122	>110	1023
105	607	607mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



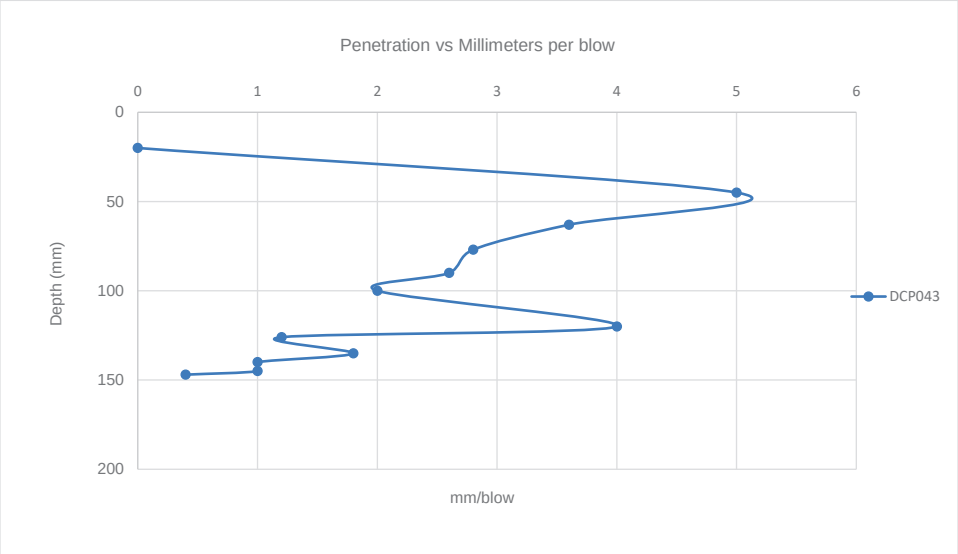


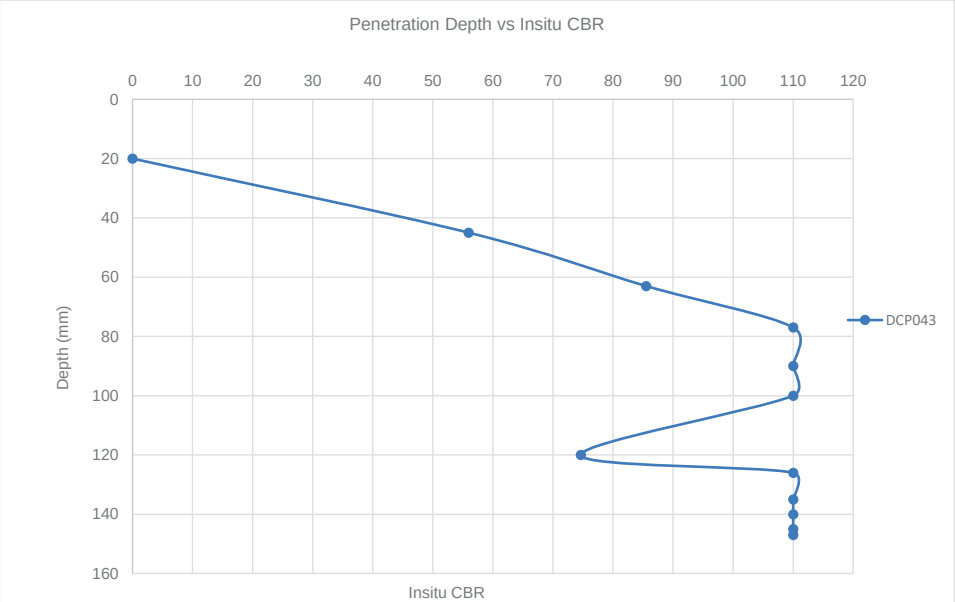
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP043	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	45	45mm	25	5.0	Very Dense	53	56	502
10	63	63mm	18	3.6	Very Dense	81	86	718
15	77	77mm	14	2.8	Very Dense	111	>110	944
20	90	90mm	13	2.6	Very Dense	122	>110	1023
25	100	100mm	10	2.0	Very Dense	170	>110	1362
30	120	120mm	20	4.0	Very Dense	70	75	640
35	126	126mm	6	1.2	Very Dense	263	>110	2377
40	135	135mm	9	1.8	Very Dense	185	>110	1528
45	140	140mm	5	1.0	Very Dense	300	>110	2900
50	145	145mm	5	1.0	Very Dense	300	>110	2900
55	147	147mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



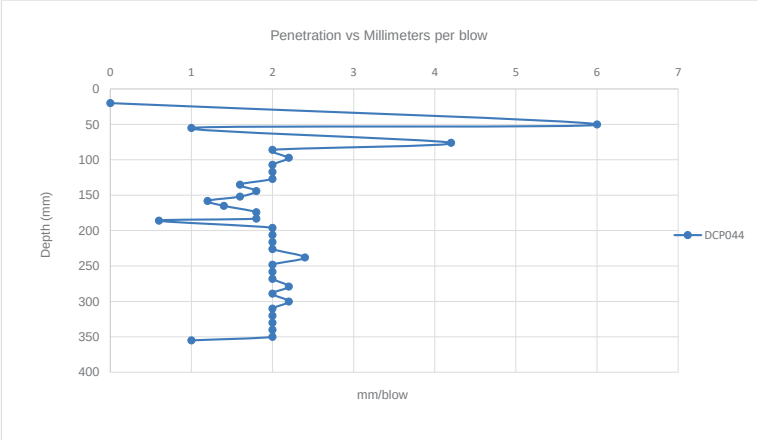


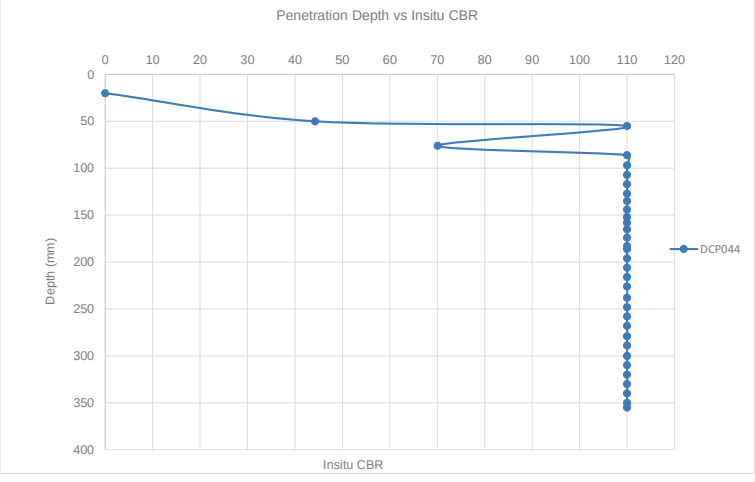
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP044	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	50	50mm	30	6.0	Dense	42	44	411
10	55	55mm	5	1.0	Very Dense	300	>110	2900
15	76	76mm	21	4.2	Very Dense	66	70	607
20	86	86mm	10	2.0	Very Dense	170	>110	1362
25	97	97mm	11	2.2	Very Dense	151	>110	1228
30	107	107mm	10	2.0	Very Dense	170	>110	1362
35	117	117mm	10	2.0	Very Dense	170	>110	1362
40	127	127mm	10	2.0	Very Dense	170	>110	1362
45	135	135mm	8	1.6	Very Dense	206	>110	1737
50	144	144mm	9	1.8	Very Dense	185	>110	1528
55	152	152mm	8	1.6	Very Dense	206	>110	1737
60	158	158mm	6	1.2	Very Dense	263	>110	2377
65	165	165mm	7	1.4	Very Dense	232	>110	2010
70	174	174mm	9	1.8	Very Dense	185	>110	1528
75	183	183mm	9	1.8	Very Dense	185	>110	1528
80	186	186mm	3	0.6	Very Dense	389	>110	5061
85	196	196mm	10	2.0	Very Dense	170	>110	1362
90	206	206mm	10	2.0	Very Dense	170	>110	1362
95	216	216mm	10	2.0	Very Dense	170	>110	1362
100	226	226mm	10	2.0	Very Dense	170	>110	1362
105	238	238mm	12	2.4	Very Dense	135	>110	1117
110	248	248mm	10	2.0	Very Dense	170	>110	1362
115	258	258mm	10	2.0	Very Dense	170	>110	1362
120	268	268mm	10	2.0	Very Dense	170	>110	1362
125	279	279mm	11	2.2	Very Dense	151	>110	1228
130	289	289mm	10	2.0	Very Dense	170	>110	1362
135	300	300mm	11	2.2	Very Dense	151	>110	1228
140	310	310mm	10	2.0	Very Dense	170	>110	1362
145	320	320mm	10	2.0	Very Dense	170	>110	1362
150	330	330mm	10	2.0	Very Dense	170	>110	1362
155	340	340mm	10	2.0	Very Dense	170	>110	1362
160	350	350mm	10	2.0	Very Dense	170	>110	1362
165	355	355mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



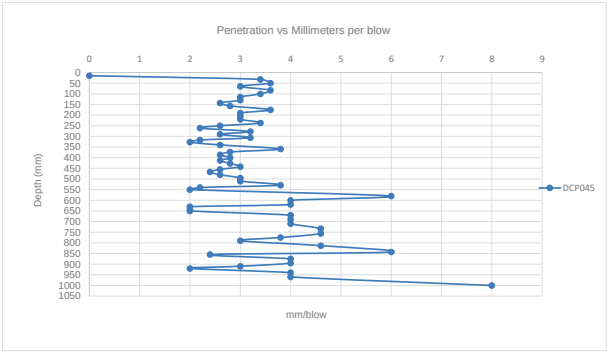


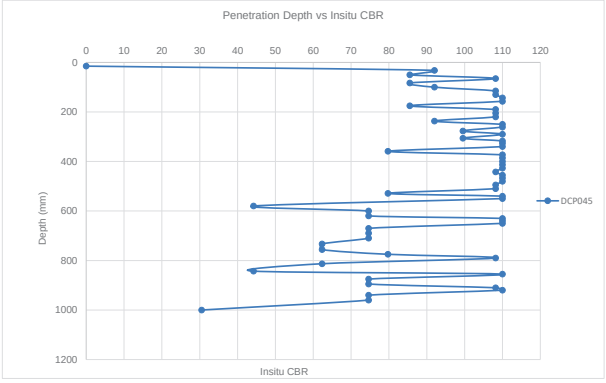
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP045	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	15	15mm	0	0				
5	32	32mm	17	3.4	Very Dense	87	92	764
10	50	50mm	18	3.6	Very Dense	81	86	718
15	65	65mm	15	3.0	Very Dense	102	108	876
20	83	83mm	18	3.6	Very Dense	81	86	718
25	100	100mm	17	3.4	Very Dense	87	92	764
30	115	115mm	15	3.0	Very Dense	102	108	876
35	130	130mm	15	3.0	Very Dense	102	108	876
40	143	143mm	13	2.6	Very Dense	122	>110	1023
45	157	157mm	14	2.8	Very Dense	111	>110	944
50	175	175mm	18	3.6	Very Dense	81	86	718
55	190	190mm	15	3.0	Very Dense	102	108	876
60	205	205mm	15	3.0	Very Dense	102	108	876
65	220	220mm	15	3.0	Very Dense	102	108	876
70	237	237mm	17	3.4	Very Dense	87	92	764
75	250	250mm	13	2.6	Very Dense	122	>110	1023
80	261	261mm	11	2.2	Very Dense	151	>110	1228
85	277	277mm	16	3.2	Very Dense	94	100	816
90	290	290mm	13	2.6	Very Dense	122	>110	1023
95	306	306mm	16	3.2	Very Dense	94	100	816
100	317	317mm	11	2.2	Very Dense	151	>110	1228
105	327	327mm	10	2.0	Very Dense	170	>110	1362
110	340	340mm	13	2.6	Very Dense	122	>110	1023
115	359	359mm	19	3.8	Very Dense	75	80	677
120	373	373mm	14	2.8	Very Dense	111	>110	944
125	386	386mm	13	2.6	Very Dense	122	>110	1023
130	400	400mm	14	2.8	Very Dense	111	>110	944
135	413	413mm	13	2.6	Very Dense	122	>110	1023
140	427	427mm	14	2.8	Very Dense	111	>110	944
145	442	442mm	15	3.0	Very Dense	102	108	876
150	455	455mm	13	2.6	Very Dense	122	>110	1023
155	467	467mm	12	2.4	Very Dense	135	>110	1117
160	480	480mm	13	2.6	Very Dense	122	>110	1023
165	495	495mm	15	3.0	Very Dense	102	108	876
170	510	510mm	15	3.0	Very Dense	102	108	876
175	529	529mm	19	3.8	Very Dense	75	80	677
180	540	540mm	11	2.2	Very Dense	151	>110	1228
185	550	550mm	10	2.0	Very Dense	170	>110	1362
190	580	580mm	30	6.0	Dense	42	44	411
195	600	600mm	20	4.0	Very Dense	70	75	640
200	620	620mm	20	4.0	Very Dense	70	75	640
205	630	630mm	10	2.0	Very Dense	170	>110	1362
210	640	640mm	10	2.0	Very Dense	170	>110	1362
215	650	650mm	10	2.0	Very Dense	170	>110	1362
220	670	670mm	20	4.0	Very Dense	70	75	640
225	690	690mm	20	4.0	Very Dense	70	75	640
230	710	710mm	20	4.0	Very Dense	70	75	640
235	733	733mm	23	4.6	Very Dense	59	62	550
240	756	756mm	23	4.6	Very Dense	59	62	550
245	775	775mm	19	3.8	Very Dense	75	80	677
250	790	790mm	15	3.0	Very Dense	102	108	876
255	813	813mm	23	4.6	Very Dense	59	62	550
260	843	843mm	30	6.0	Dense	42	44	411
265	855	855mm	12	2.4	Very Dense	135	>110	1117
270	875	875mm	20	4.0	Very Dense	70	75	640
275	895	895mm	20	4.0	Very Dense	70	75	640
280	910	910mm	15	3.0	Very Dense	102	108	876
285	920	920mm	10	2.0	Very Dense	170	>110	1362
290	940	940mm	20	4.0	Very Dense	70	75	640
295	960	960mm	20	4.0	Very Dense	70	75	640
300	1000	1000mm	40	8.0	Dense	29	31	301

DCP GRAPHICAL REPRESENTATION





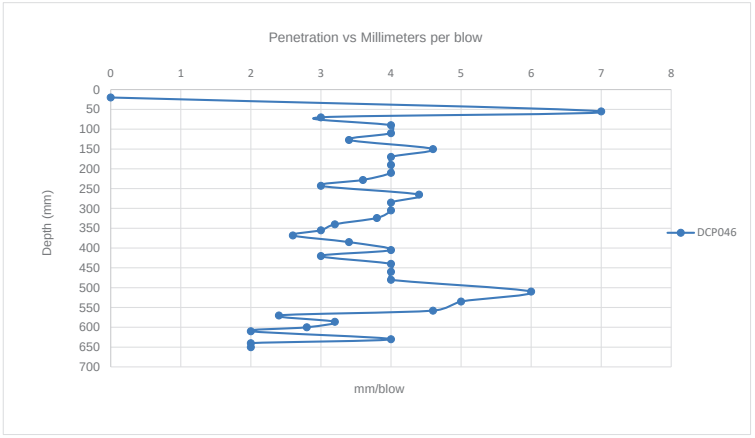
DYNAMIC CONE PENETROMETER TEST

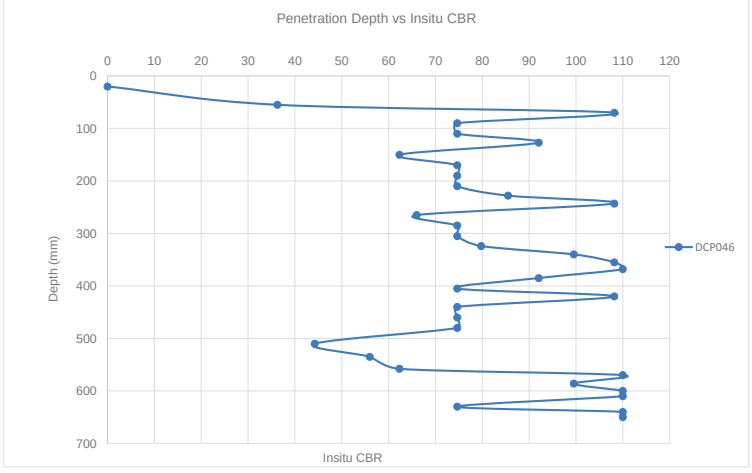
MUKONA CONSULTING ENGINEERS

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP046	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	55	55mm	35	7.0	Dense	35	36	348
10	70	70mm	15	3.0	Very Dense	102	108	876
15	90	90mm	20	4.0	Very Dense	70	75	640
20	110	110mm	20	4.0	Very Dense	70	75	640
25	127	127mm	17	3.4	Very Dense	87	92	764
30	150	150mm	23	4.6	Very Dense	59	62	550
35	170	170mm	20	4.0	Very Dense	70	75	640
40	190	190mm	20	4.0	Very Dense	70	75	640
45	210	210mm	20	4.0	Very Dense	70	75	640
50	228	228mm	18	3.6	Very Dense	81	86	718
55	243	243mm	15	3.0	Very Dense	102	108	876
60	265	265mm	22	4.4	Very Dense	62	66	577
65	285	285mm	20	4.0	Very Dense	70	75	640
70	305	305mm	20	4.0	Very Dense	70	75	640
75	324	324mm	19	3.8	Very Dense	75	80	677
80	340	340mm	16	3.2	Very Dense	94	100	816
85	355	355mm	15	3.0	Very Dense	102	108	876
90	368	368mm	13	2.6	Very Dense	122	>110	1023
95	385	385mm	17	3.4	Very Dense	87	92	764
100	405	405mm	20	4.0	Very Dense	70	75	640
105	420	420mm	15	3.0	Very Dense	102	108	876
110	440	440mm	20	4.0	Very Dense	70	75	640
115	460	460mm	20	4.0	Very Dense	70	75	640
120	480	480mm	20	4.0	Very Dense	70	75	640
125	510	510mm	30	6.0	Dense	42	44	411
130	535	535mm	25	5.0	Very Dense	53	56	502
135	558	558mm	23	4.6	Very Dense	59	62	550
140	570	570mm	12	2.4	Very Dense	135	>110	1117
145	586	586mm	16	3.2	Very Dense	94	100	816
150	600	600mm	14	2.8	Very Dense	111	>110	944
155	610	610mm	10	2.0	Very Dense	170	>110	1362
160	630	630mm	20	4.0	Very Dense	70	75	640
165	640	640mm	10	2.0	Very Dense	170	>110	1362
170	650	650mm	10	2.0	Very Dense	170	>110	1362

DCP GRAPHICAL REPRESENTATION





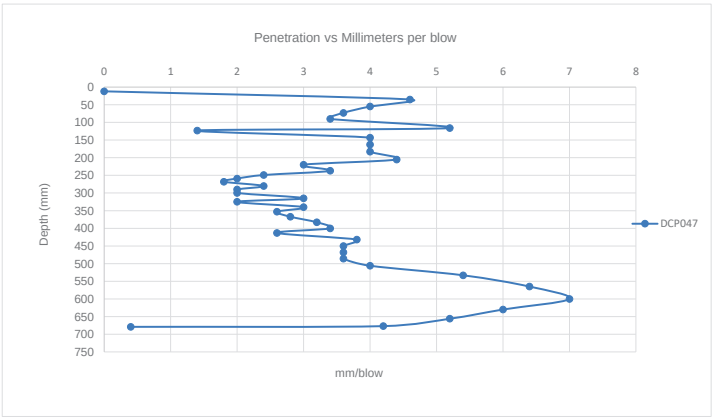
DYNAMIC CONE PENETROMETER TEST

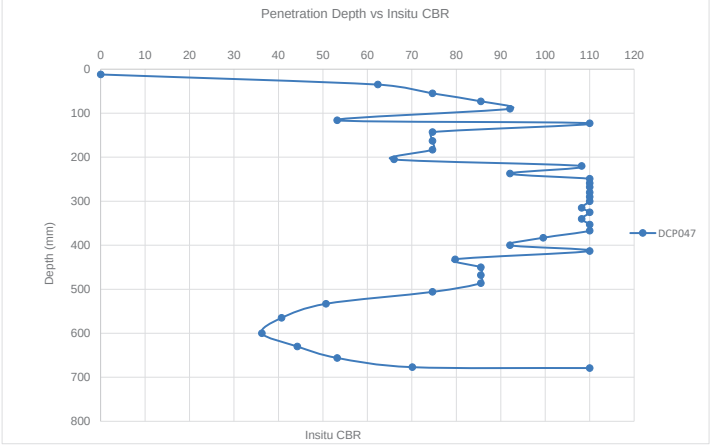
MUKONA CONSULTING ENGINEERS

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP047	**STARTING DEPTH:**	12mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	12	12mm	0	0				
5	35	35mm	23	4.6	Very Dense	59	62	550
10	55	55mm	20	4.0	Very Dense	70	75	640
15	73	73mm	18	3.6	Very Dense	81	86	718
20	90	90mm	17	3.4	Very Dense	87	92	764
25	116	116mm	26	5.2	Dense	51	53	481
30	123	123mm	7	1.4	Very Dense	232	>110	2010
35	143	143mm	20	4.0	Very Dense	70	75	640
40	163	163mm	20	4.0	Very Dense	70	75	640
45	183	183mm	20	4.0	Very Dense	70	75	640
50	205	205mm	22	4.4	Very Dense	62	66	577
55	220	220mm	15	3.0	Very Dense	102	108	876
60	237	237mm	17	3.4	Very Dense	87	92	764
65	249	249mm	12	2.4	Very Dense	135	>110	1117
70	259	259mm	10	2.0	Very Dense	170	>110	1362
75	268	268mm	9	1.8	Very Dense	185	>110	1528
80	280	280mm	12	2.4	Very Dense	135	>110	1117
85	290	290mm	10	2.0	Very Dense	170	>110	1362
90	300	300mm	10	2.0	Very Dense	170	>110	1362
95	315	315mm	15	3.0	Very Dense	102	108	876
100	325	325mm	10	2.0	Very Dense	170	>110	1362
105	340	340mm	15	3.0	Very Dense	102	108	876
110	353	353mm	13	2.6	Very Dense	122	>110	1023
115	367	367mm	14	2.8	Very Dense	111	>110	944
120	383	383mm	16	3.2	Very Dense	94	100	816
125	400	400mm	17	3.4	Very Dense	87	92	764
130	413	413mm	13	2.6	Very Dense	122	>110	1023
135	432	432mm	19	3.8	Very Dense	75	80	677
140	450	450mm	18	3.6	Very Dense	81	86	718
145	468	468mm	18	3.6	Very Dense	81	86	718
150	486	486mm	18	3.6	Very Dense	81	86	718
155	506	506mm	20	4.0	Very Dense	70	75	640
160	533	533mm	27	5.4	Dense	48	51	461
165	565	565mm	32	6.4	Dense	39	41	383
170	600	600mm	35	7.0	Dense	35	36	348
175	630	630mm	30	6.0	Dense	42	44	411
180	656	656mm	26	5.2	Dense	51	53	481
185	677	677mm	21	4.2	Very Dense	66	70	607
190	679	679mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



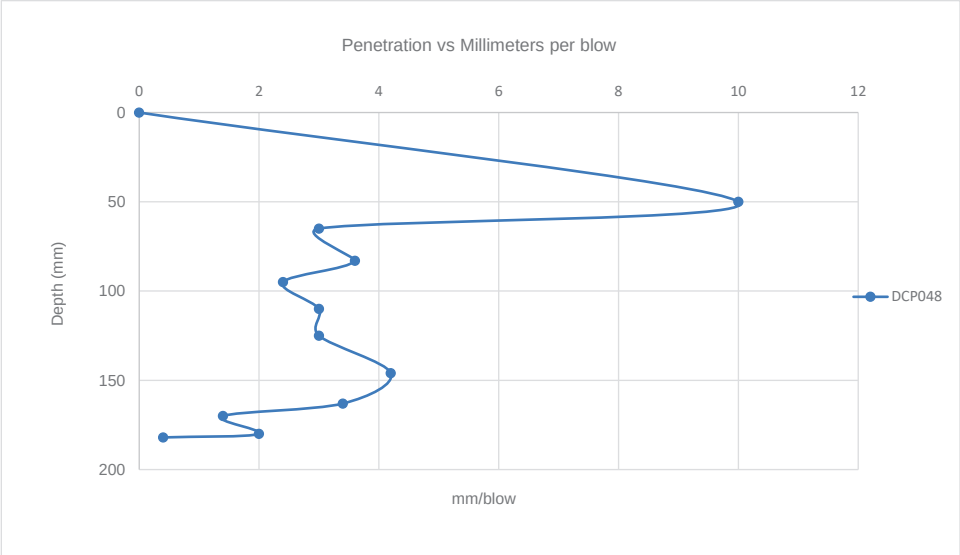


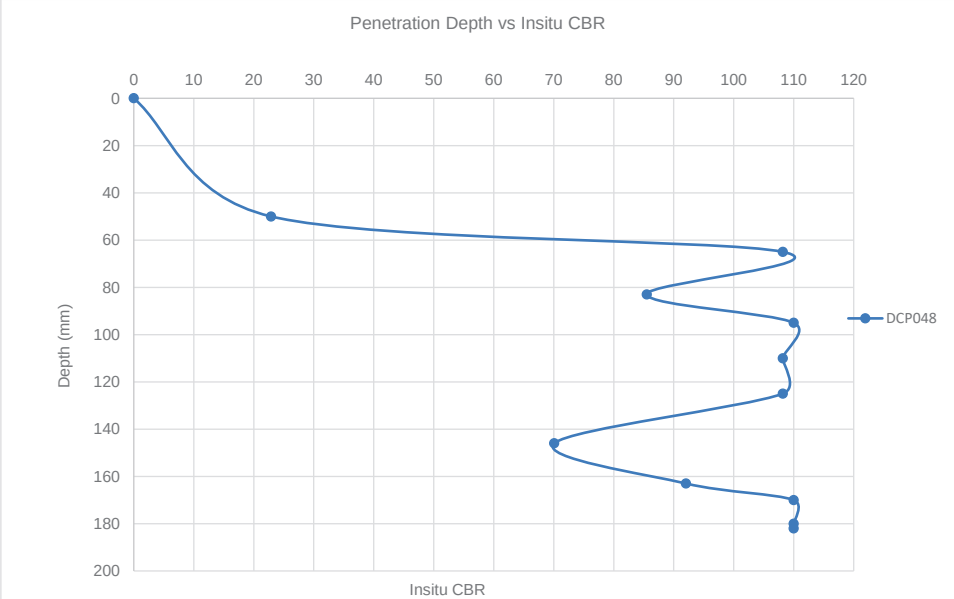
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP048	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	0	0mm	0	0				
5	50	50mm	50	10.0	Dense	22	23	236
10	65	65mm	15	3.0	Very Dense	102	108	876
15	83	83mm	18	3.6	Very Dense	81	86	718
20	95	95mm	12	2.4	Very Dense	135	>110	1117
25	110	110mm	15	3.0	Very Dense	102	108	876
30	125	125mm	15	3.0	Very Dense	102	108	876
35	146	146mm	21	4.2	Very Dense	66	70	607
40	163	163mm	17	3.4	Very Dense	87	92	764
45	170	170mm	7	1.4	Very Dense	232	>110	2010
50	180	180mm	10	2.0	Very Dense	170	>110	1362
55	182	182mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



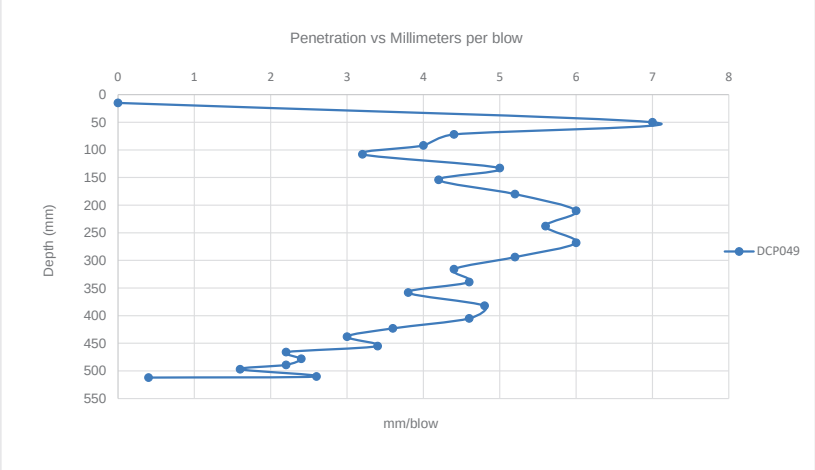


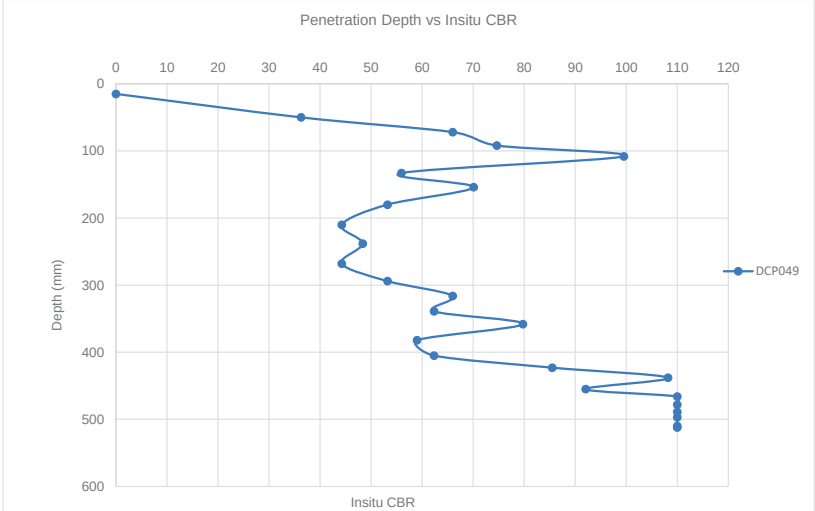
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP049	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	15	15mm	0	0				
5	50	50mm	35	7.0	Dense	35	36	348
10	72	72mm	22	4.4	Very Dense	62	66	577
15	92	92mm	20	4.0	Very Dense	70	75	640
20	108	108mm	16	3.2	Very Dense	94	100	816
25	133	133mm	25	5.0	Very Dense	53	56	502
30	154	154mm	21	4.2	Very Dense	66	70	607
35	180	180mm	26	5.2	Dense	51	53	481
40	210	210mm	30	6.0	Dense	42	44	411
45	238	238mm	28	5.6	Dense	46	48	443
50	268	268mm	30	6.0	Dense	42	44	411
55	294	294mm	26	5.2	Dense	51	53	481
60	316	316mm	22	4.4	Very Dense	62	66	577
65	339	339mm	23	4.6	Very Dense	59	62	550
70	358	358mm	19	3.8	Very Dense	75	80	677
75	382	382mm	24	4.8	Very Dense	56	59	525
80	405	405mm	23	4.6	Very Dense	59	62	550
85	423	423mm	18	3.6	Very Dense	81	86	718
90	438	438mm	15	3.0	Very Dense	102	108	876
95	455	455mm	17	3.4	Very Dense	87	92	764
100	466	466mm	11	2.2	Very Dense	151	>110	1228
105	478	478mm	12	2.4	Very Dense	135	>110	1117
110	489	489mm	11	2.2	Very Dense	151	>110	1228
115	497	497mm	8	1.6	Very Dense	206	>110	1737
120	510	510mm	13	2.6	Very Dense	122	>110	1023
125	512	512mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION





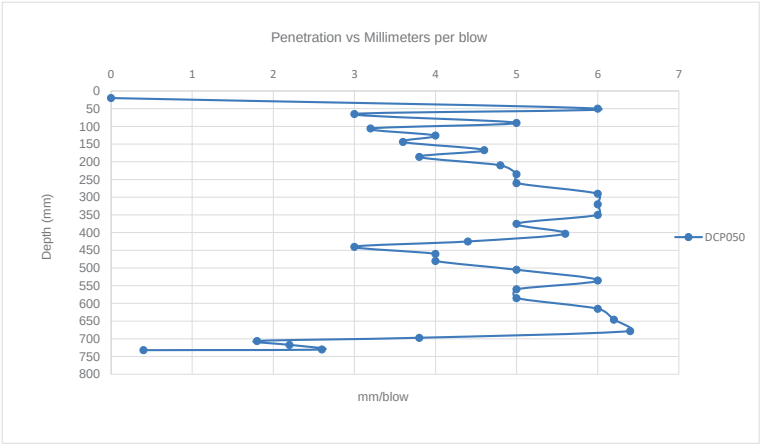
DYNAMIC CONE PENETROMETER TEST

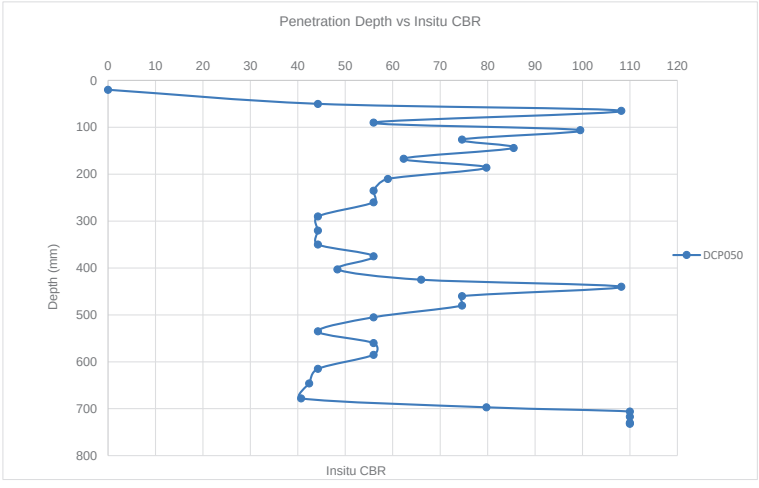
MUKONA CONSULTING ENGINEERS

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP050	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	50	50mm	30	6.0	Dense	42	44	411
10	65	65mm	15	3.0	Very Dense	102	108	876
15	90	90mm	25	5.0	Very Dense	53	56	502
20	106	106mm	16	3.2	Very Dense	94	100	816
25	126	126mm	20	4.0	Very Dense	70	75	640
30	144	144mm	18	3.6	Very Dense	81	86	718
35	167	167mm	23	4.6	Very Dense	59	62	550
40	186	186mm	19	3.8	Very Dense	75	80	677
45	210	210mm	24	4.8	Very Dense	56	59	525
50	235	235mm	25	5.0	Very Dense	53	56	502
55	260	260mm	25	5.0	Very Dense	53	56	502
60	290	290mm	30	6.0	Dense	42	44	411
65	320	320mm	30	6.0	Dense	42	44	411
70	350	350mm	30	6.0	Dense	42	44	411
75	375	375mm	25	5.0	Very Dense	53	56	502
80	403	403mm	28	5.6	Dense	46	48	443
85	425	425mm	22	4.4	Very Dense	62	66	577
90	440	440mm	15	3.0	Very Dense	102	108	876
95	460	460mm	20	4.0	Very Dense	70	75	640
100	480	480mm	20	4.0	Very Dense	70	75	640
105	505	505mm	25	5.0	Very Dense	53	56	502
110	535	535mm	30	6.0	Dense	42	44	411
115	560	560mm	25	5.0	Very Dense	53	56	502
120	585	585mm	25	5.0	Very Dense	53	56	502
125	615	615mm	30	6.0	Dense	42	44	411
130	646	646mm	31	6.2	Dense	40	42	397
135	678	678mm	32	6.4	Dense	39	41	383
140	697	697mm	19	3.8	Very Dense	75	80	677
145	706	706mm	9	1.8	Very Dense	185	>110	1528
150	717	717mm	11	2.2	Very Dense	151	>110	1228
155	730	730mm	13	2.6	Very Dense	122	>110	1023
160	732	732mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



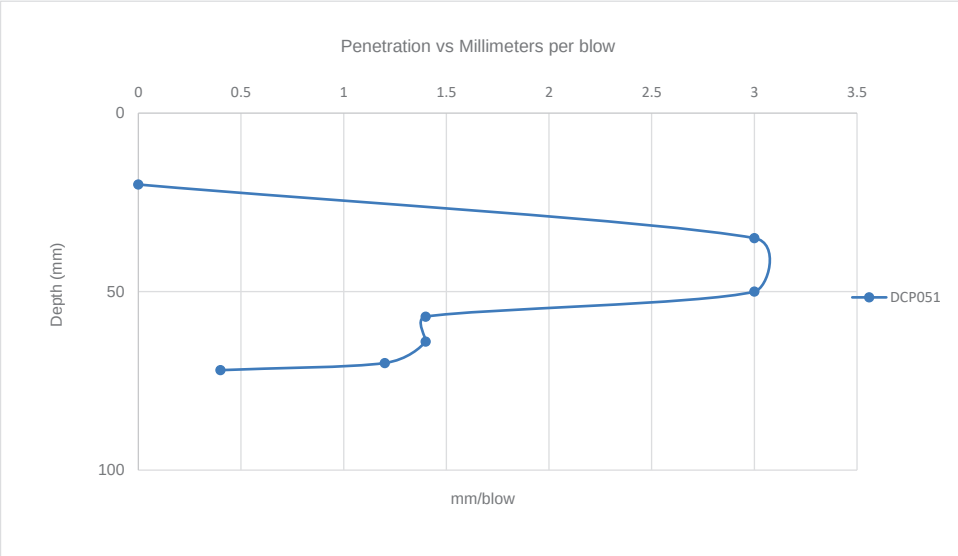


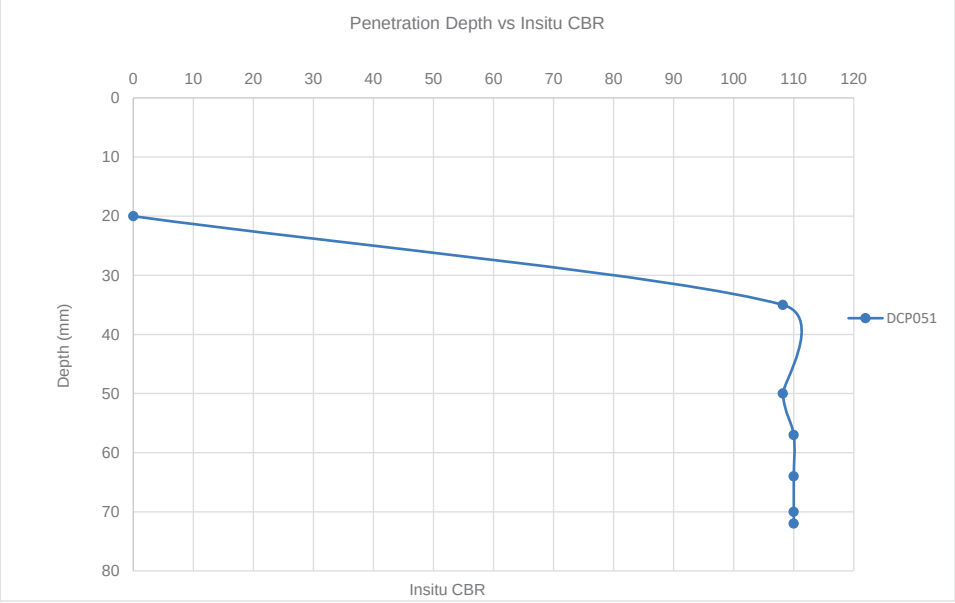
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP051	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	35	35mm	15	3.0	Very Dense	102	108	876
10	50	50mm	15	3.0	Very Dense	102	108	876
15	57	57mm	7	1.4	Very Dense	232	>110	2010
20	64	64mm	7	1.4	Very Dense	232	>110	2010
25	70	70mm	6	1.2	Very Dense	263	>110	2377
30	72	72mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



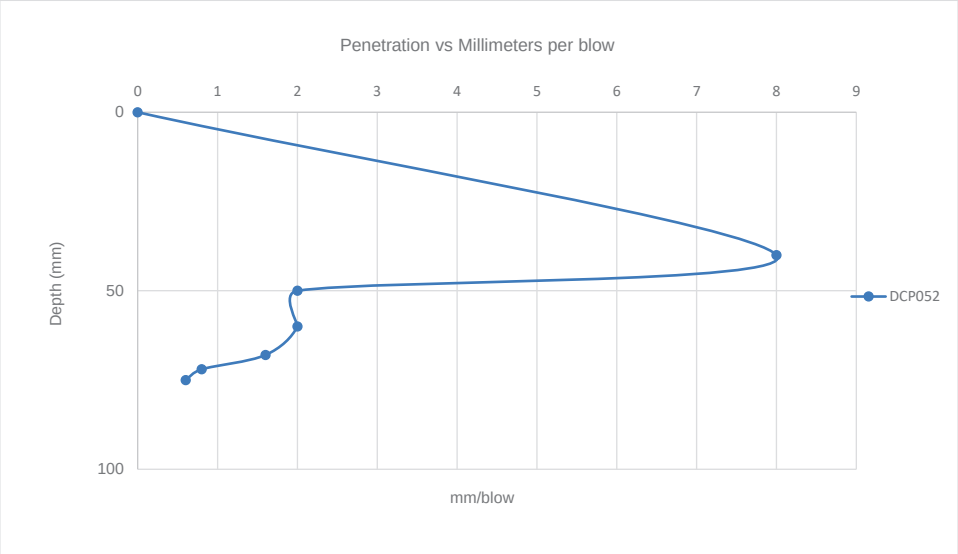


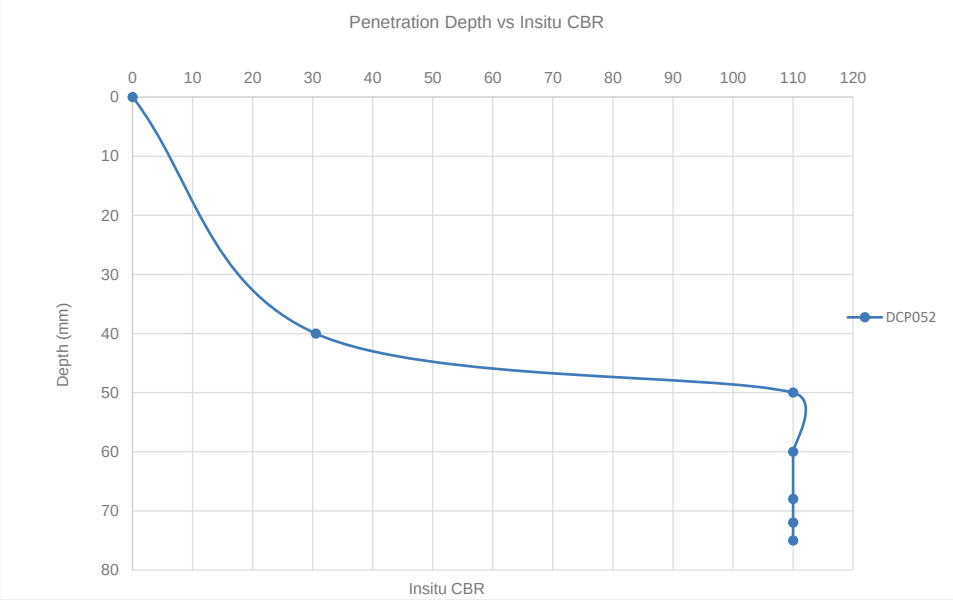
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP052	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0				
5	40	40mm	40	8.0	Dense	29	31	301
10	50	50mm	10	2.0	Very Dense	170	>110	1362
15	60	60mm	10	2.0	Very Dense	170	>110	1362
20	68	68mm	8	1.6	Very Dense	206	>110	1737
25	72	72mm	4	0.8	Very Dense	342	>110	3699
30	75	75mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION





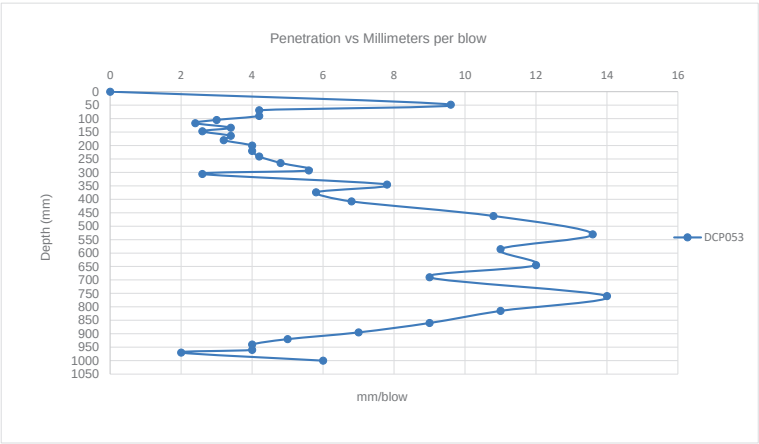
DYNAMIC CONE PENETROMETER TEST

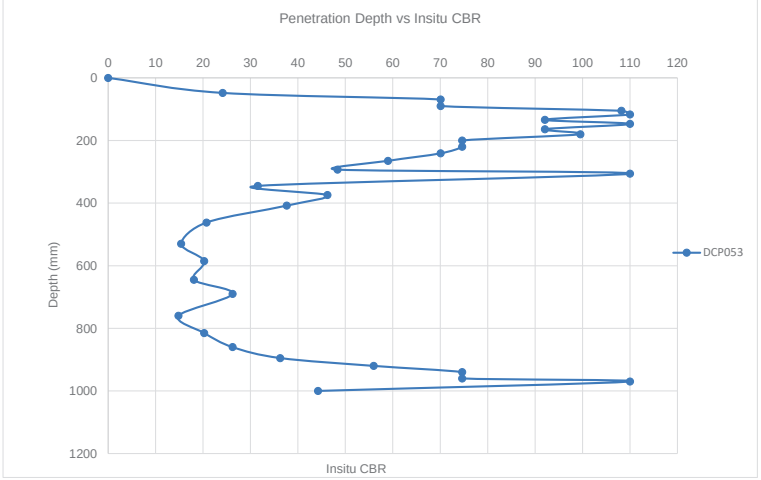
MUKONA CONSULTING ENGINEERS

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP053	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0				
5	48	48mm	48	9.6	Dense	23	24	246
10	69	69mm	21	4.2	Very Dense	66	70	607
15	90	90mm	21	4.2	Very Dense	66	70	607
20	105	105mm	15	3.0	Very Dense	102	108	876
25	117	117mm	12	2.4	Very Dense	135	>110	1117
30	134	134mm	17	3.4	Very Dense	87	92	764
35	147	147mm	13	2.6	Very Dense	122	>110	1023
40	164	164mm	17	3.4	Very Dense	87	92	764
45	180	180mm	16	3.2	Very Dense	94	100	816
50	200	200mm	20	4.0	Very Dense	70	75	640
55	220	220mm	20	4.0	Very Dense	70	75	640
60	241	241mm	21	4.2	Very Dense	66	70	607
65	265	265mm	24	4.8	Very Dense	56	59	525
70	293	293mm	28	5.6	Dense	46	48	443
75	306	306mm	13	2.6	Very Dense	122	>110	1023
80	345	345mm	39	7.8	Dense	30	32	309
85	374	374mm	29	5.8	Dense	44	46	427
90	408	408mm	34	6.8	Dense	36	38	359
95	462	462mm	54	10.8	Dense	20	21	217
100	530	530mm	68	13.6	Medium Dense	15	15	169
105	585	585mm	55	11.0	Dense	20	20	212
110	645	645mm	60	12.0	Dense	17	18	193
115	690	690mm	45	9.0	Dense	25	26	264
120	760	760mm	70	14.0	Medium Dense	14	15	163
125	815	815mm	55	11.0	Dense	20	20	212
130	860	860mm	45	9.0	Dense	25	26	264
135	895	895mm	35	7.0	Dense	35	36	348
140	920	920mm	25	5.0	Very Dense	53	56	502
145	940	940mm	20	4.0	Very Dense	70	75	640
150	960	960mm	20	4.0	Very Dense	70	75	640
155	970	970mm	10	2.0	Very Dense	170	>110	1362
160	1000	1000mm	30	6.0	Dense	42	44	411

DCP GRAPHICAL REPRESENTATION



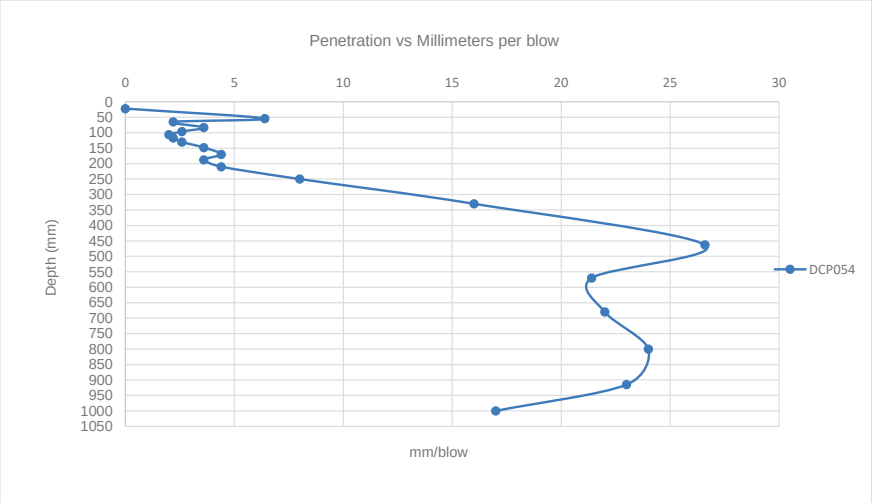


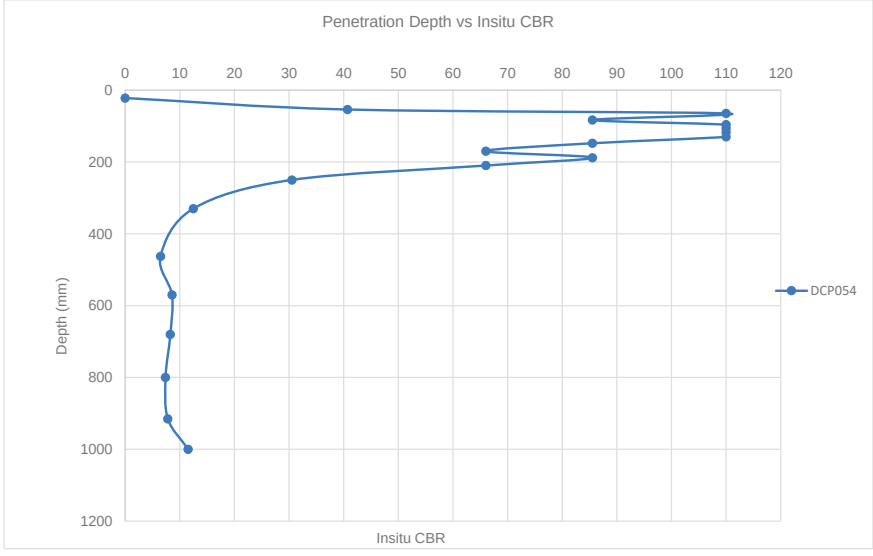
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP054	**STARTING DEPTH:**	22mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	22	22mm	0	0				
5	54	54mm	32	6.4	Dense	39	41	383
10	65	65mm	11	2.2	Very Dense	151	>110	1228
15	83	83mm	18	3.6	Very Dense	81	86	718
20	96	96mm	13	2.6	Very Dense	122	>110	1023
25	106	106mm	10	2.0	Very Dense	170	>110	1362
30	117	117mm	11	2.2	Very Dense	151	>110	1228
35	130	130mm	13	2.6	Very Dense	122	>110	1023
40	148	148mm	18	3.6	Very Dense	81	86	718
45	170	170mm	22	4.4	Very Dense	62	66	577
50	188	188mm	18	3.6	Very Dense	81	86	718
55	210	210mm	22	4.4	Very Dense	62	66	577
60	250	250mm	40	8.0	Dense	29	31	301
65	330	330mm	80	16.0	Medium Dense	12	12	141
70	463	463mm	133	26.6	Medium Dense	6	6	81
75	570	570mm	107	21.4	Medium Dense	8	9	103
80	680	680mm	110	22.0	Medium Dense	8	8	100
85	800	800mm	120	24.0	Medium Dense	7	7	91
90	915	915mm	115	23.0	Medium Dense	8	8	95
95	1000	1000mm	85	17.0	Medium Dense	11	12	132

DCP GRAPHICAL REPRESENTATION



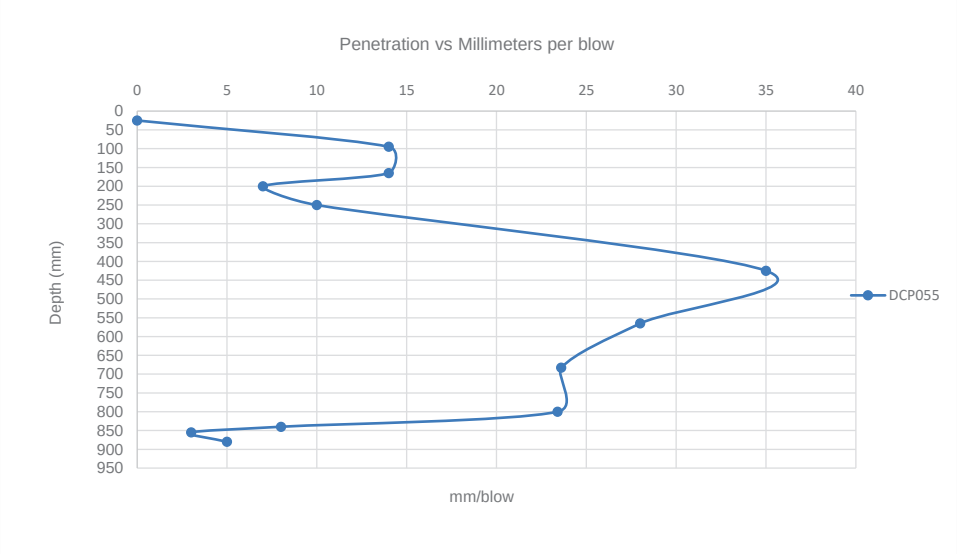


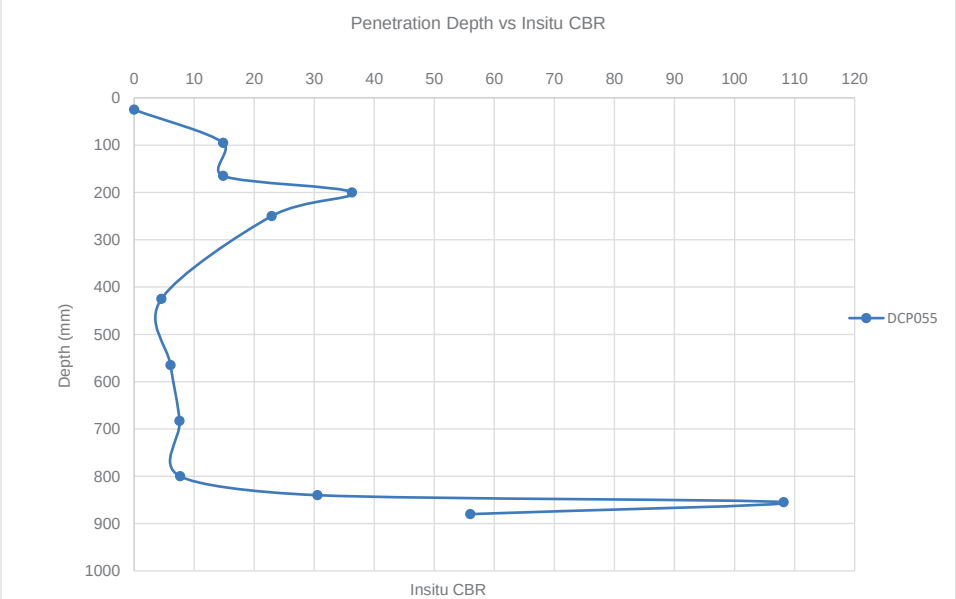
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP055	**STARTING DEPTH:**	25mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	25	25mm	0	0				
5	95	95mm	70	14.0	Medium Dense	14	15	163
10	165	165mm	70	14.0	Medium Dense	14	15	163
15	200	200mm	35	7.0	Dense	35	36	348
20	250	250mm	50	10.0	Dense	22	23	236
25	425	425mm	175	35.0	Loose	4	5	60
30	565	565mm	140	28.0	Medium Dense	6	6	77
35	683	683mm	118	23.6	Medium Dense	7	8	92
40	800	800mm	117	23.4	Medium Dense	7	8	93
45	840	840mm	40	8.0	Dense	29	31	301
50	855	855mm	15	3.0	Very Dense	102	108	876
55	880	880mm	25	5.0	Very Dense	53	56	502

DCP GRAPHICAL REPRESENTATION



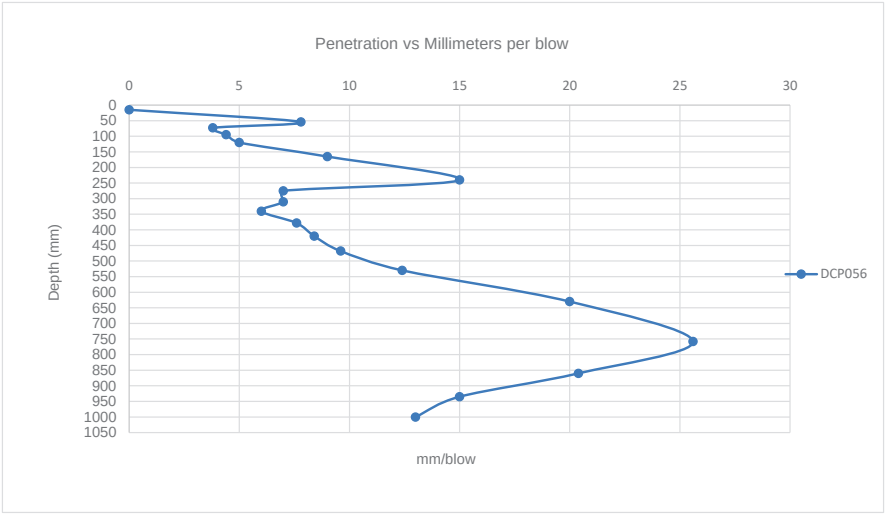


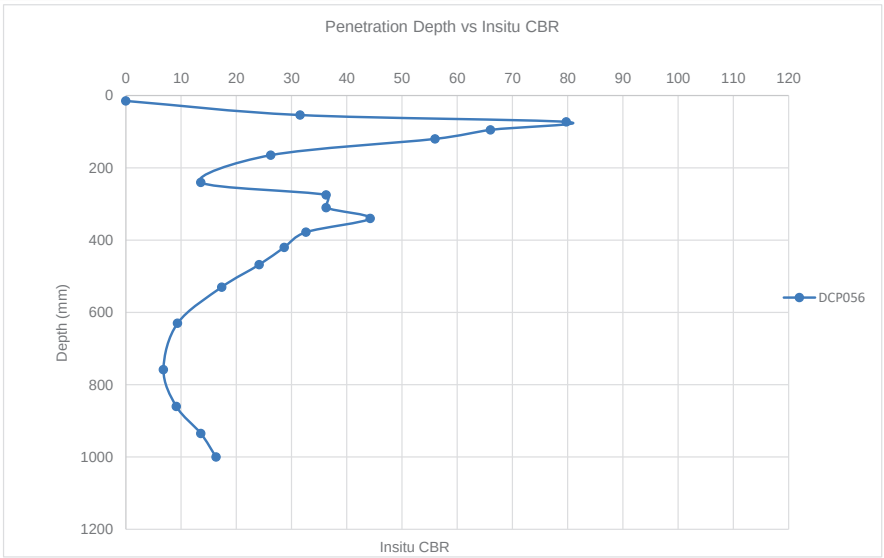
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP056	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	15	15mm	0	0				
5	54	54mm	39	7.8	Dense	30	32	309
10	73	73mm	19	3.8	Very Dense	75	80	677
15	95	95mm	22	4.4	Very Dense	62	66	577
20	120	120mm	25	5.0	Very Dense	53	56	502
25	165	165mm	45	9.0	Dense	25	26	264
30	240	240mm	75	15.0	Medium Dense	13	14	152
35	275	275mm	35	7.0	Dense	35	36	348
40	310	310mm	35	7.0	Dense	35	36	348
45	340	340mm	30	6.0	Dense	42	44	411
50	378	378mm	38	7.6	Dense	31	33	318
55	420	420mm	42	8.4	Dense	27	29	285
60	468	468mm	48	9.6	Dense	23	24	246
65	530	530mm	62	12.4	Dense	17	17	186
70	630	630mm	100	20.0	Medium Dense	9	9	111
75	758	758mm	128	25.6	Medium Dense	7	7	85
80	860	860mm	102	20.4	Medium Dense	9	9	108
85	935	935mm	75	15.0	Medium Dense	13	14	152
90	1000	1000mm	65	13.0	Medium Dense	16	16	177

DCP GRAPHICAL REPRESENTATION



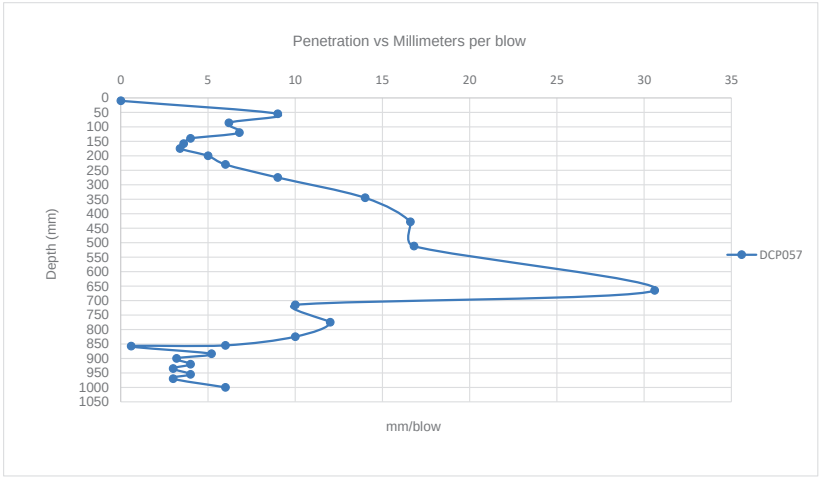


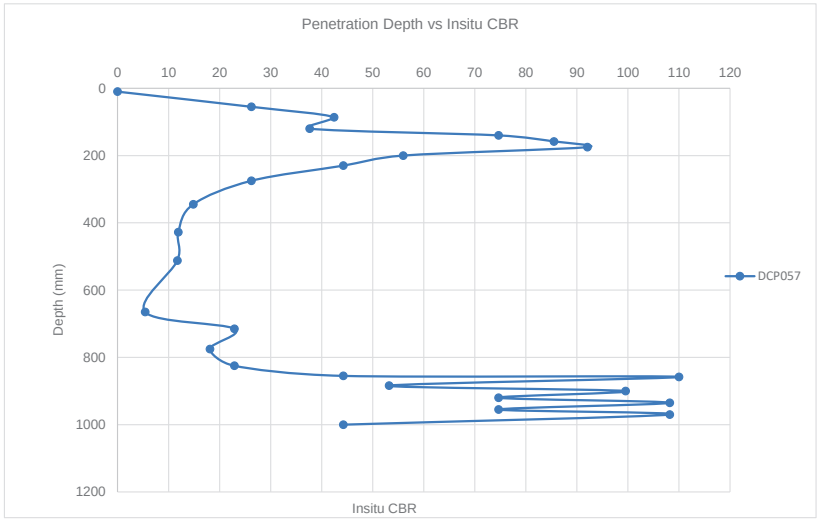
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP057	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	55	55mm	45	9.0	Dense	25	26	264
10	86	86mm	31	6.2	Dense	40	42	397
15	120	120mm	34	6.8	Dense	36	38	359
20	140	140mm	20	4.0	Very Dense	70	75	640
25	158	158mm	18	3.6	Very Dense	81	86	718
30	175	175mm	17	3.4	Very Dense	87	92	764
35	200	200mm	25	5.0	Very Dense	53	56	502
40	230	230mm	30	6.0	Dense	42	44	411
45	275	275mm	45	9.0	Dense	25	26	264
50	345	345mm	70	14.0	Medium Dense	14	15	163
55	428	428mm	83	16.6	Medium Dense	12	12	136
60	512	512mm	84	16.8	Medium Dense	11	12	134
65	665	665mm	153	30.6	Loose	5	5	70
70	715	715mm	50	10.0	Dense	22	23	236
75	775	775mm	60	12.0	Dense	17	18	193
80	825	825mm	50	10.0	Dense	22	23	236
85	855	855mm	30	6.0	Dense	42	44	411
90	858	858mm	3	0.6	Very Dense	389	>110	5061
95	884	884mm	26	5.2	Dense	51	53	481
100	900	900mm	16	3.2	Very Dense	94	100	816
105	920	920mm	20	4.0	Very Dense	70	75	640
110	935	935mm	15	3.0	Very Dense	102	108	876
115	955	955mm	20	4.0	Very Dense	70	75	640
120	970	970mm	15	3.0	Very Dense	102	108	876
125	1000	1000mm	30	6.0	Dense	42	44	411

DCP GRAPHICAL REPRESENTATION



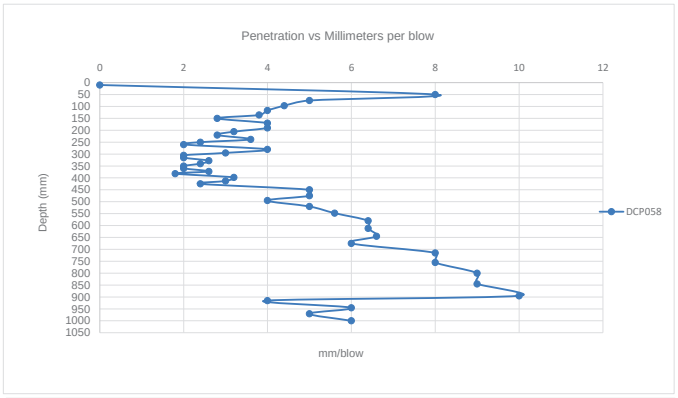


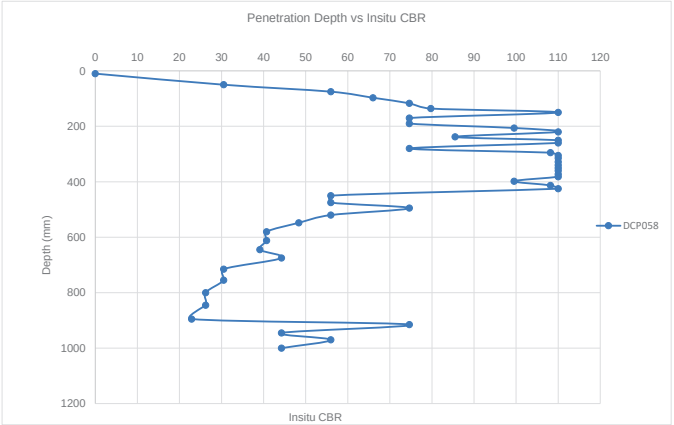
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP058	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	50	50mm	40	8.0	Dense	29	31	301
10	75	75mm	25	5.0	Very Dense	53	56	502
15	97	97mm	22	4.4	Very Dense	62	66	577
20	117	117mm	20	4.0	Very Dense	70	75	640
25	136	136mm	19	3.8	Very Dense	75	80	677
30	150	150mm	14	2.8	Very Dense	111	>110	944
35	170	170mm	20	4.0	Very Dense	70	75	640
40	190	190mm	20	4.0	Very Dense	70	75	640
45	206	206mm	16	3.2	Very Dense	94	100	816
50	220	220mm	14	2.8	Very Dense	111	>110	944
55	238	238mm	18	3.6	Very Dense	81	86	718
60	250	250mm	12	2.4	Very Dense	135	>110	1117
65	260	260mm	10	2.0	Very Dense	170	>110	1362
70	280	280mm	20	4.0	Very Dense	70	75	640
75	295	295mm	15	3.0	Very Dense	102	108	876
80	305	305mm	10	2.0	Very Dense	170	>110	1362
85	315	315mm	10	2.0	Very Dense	170	>110	1362
90	328	328mm	13	2.6	Very Dense	122	>110	1023
95	340	340mm	12	2.4	Very Dense	135	>110	1117
100	350	350mm	10	2.0	Very Dense	170	>110	1362
105	360	360mm	10	2.0	Very Dense	170	>110	1362
110	373	373mm	13	2.6	Very Dense	122	>110	1023
115	382	382mm	9	1.8	Very Dense	185	>110	1528
120	398	398mm	16	3.2	Very Dense	94	100	816
125	413	413mm	15	3.0	Very Dense	102	108	876
130	425	425mm	12	2.4	Very Dense	135	>110	1117
135	450	450mm	25	5.0	Very Dense	53	56	502
140	475	475mm	25	5.0	Very Dense	53	56	502
145	495	495mm	20	4.0	Very Dense	70	75	640
150	520	520mm	25	5.0	Very Dense	53	56	502
155	548	548mm	28	5.6	Dense	46	48	443
160	580	580mm	32	6.4	Dense	39	41	383
165	612	612mm	32	6.4	Dense	39	41	383
170	645	645mm	33	6.6	Dense	37	39	371
175	675	675mm	30	6.0	Dense	42	44	411
180	715	715mm	40	8.0	Dense	29	31	301
185	755	755mm	40	8.0	Dense	29	31	301
190	800	800mm	45	9.0	Dense	25	26	264
195	845	845mm	45	9.0	Dense	25	26	264
200	895	895mm	50	10.0	Dense	22	23	236
205	915	915mm	20	4.0	Very Dense	70	75	640
210	945	945mm	30	6.0	Dense	42	44	411
215	970	970mm	25	5.0	Very Dense	53	56	502
220	1000	1000mm	30	6.0	Dense	42	44	411

DCP GRAPHICAL REPRESENTATION



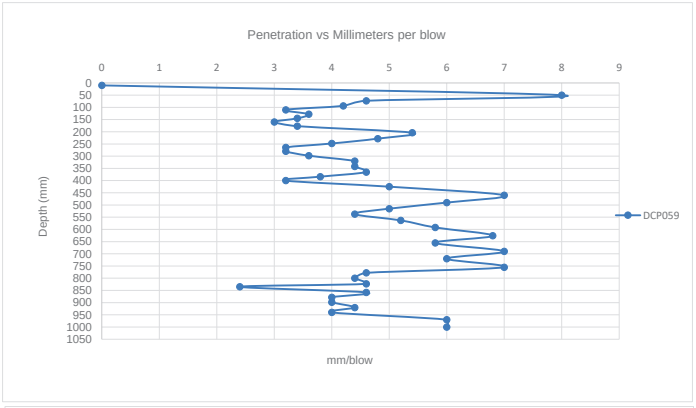


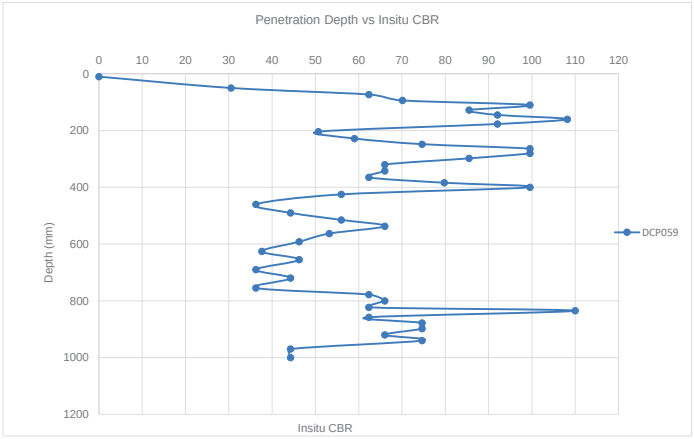
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP059	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x(dn)^{-1.09}$
0	10	10mm	0	0				
5	50	50mm	40	8.0	Dense	29	31	301
10	73	73mm	23	4.6	Very Dense	59	62	550
15	94	94mm	21	4.2	Very Dense	66	70	607
20	110	110mm	16	3.2	Very Dense	94	100	816
25	128	128mm	18	3.6	Very Dense	81	86	718
30	145	145mm	17	3.4	Very Dense	87	92	764
35	160	160mm	15	3.0	Very Dense	102	108	876
40	177	177mm	17	3.4	Very Dense	87	92	764
45	204	204mm	27	5.4	Dense	48	51	461
50	228	228mm	24	4.8	Very Dense	56	59	525
55	248	248mm	20	4.0	Very Dense	70	75	640
60	264	264mm	16	3.2	Very Dense	94	100	816
65	280	280mm	16	3.2	Very Dense	94	100	816
70	298	298mm	18	3.6	Very Dense	81	86	718
75	320	320mm	22	4.4	Very Dense	62	66	577
80	342	342mm	22	4.4	Very Dense	62	66	577
85	365	365mm	23	4.6	Very Dense	59	62	550
90	384	384mm	19	3.8	Very Dense	75	80	677
95	400	400mm	16	3.2	Very Dense	94	100	816
100	425	425mm	25	5.0	Very Dense	53	56	502
105	460	460mm	35	7.0	Dense	35	36	348
110	490	490mm	30	6.0	Dense	42	44	411
115	515	515mm	25	5.0	Very Dense	53	56	502
120	537	537mm	22	4.4	Very Dense	62	66	577
125	563	563mm	26	5.2	Dense	51	53	481
130	592	592mm	29	5.8	Dense	44	46	427
135	626	626mm	34	6.8	Dense	36	38	359
140	655	655mm	29	5.8	Dense	44	46	427
145	690	690mm	35	7.0	Dense	35	36	348
150	720	720mm	30	6.0	Dense	42	44	411
155	755	755mm	35	7.0	Dense	35	36	348
160	778	778mm	23	4.6	Very Dense	59	62	550
165	800	800mm	22	4.4	Very Dense	62	66	577
170	823	823mm	23	4.6	Very Dense	59	62	550
175	835	835mm	12	2.4	Very Dense	135	>110	1117
180	858	858mm	23	4.6	Very Dense	59	62	550
185	878	878mm	20	4.0	Very Dense	70	75	640
190	898	898mm	20	4.0	Very Dense	70	75	640
195	920	920mm	22	4.4	Very Dense	62	66	577
200	940	940mm	20	4.0	Very Dense	70	75	640
205	970	970mm	30	6.0	Dense	42	44	411
210	1000	1000mm	30	6.0	Dense	42	44	411

DCP GRAPHICAL REPRESENTATION



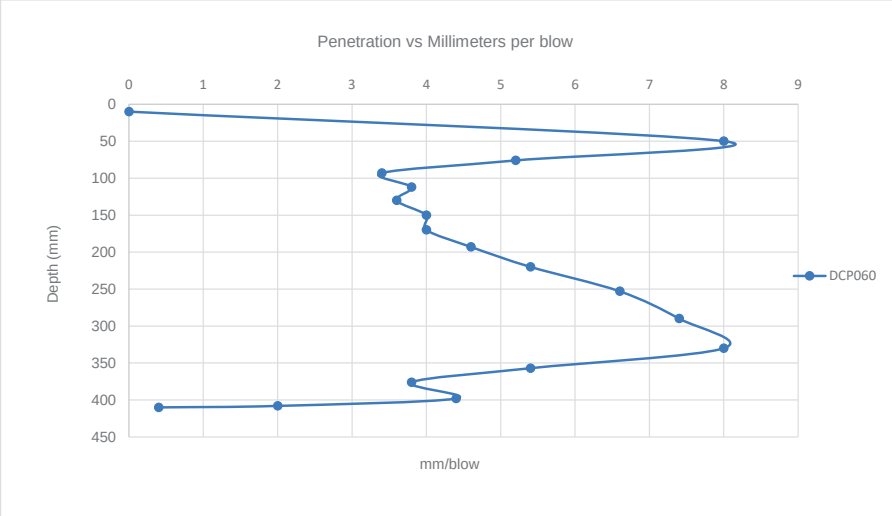


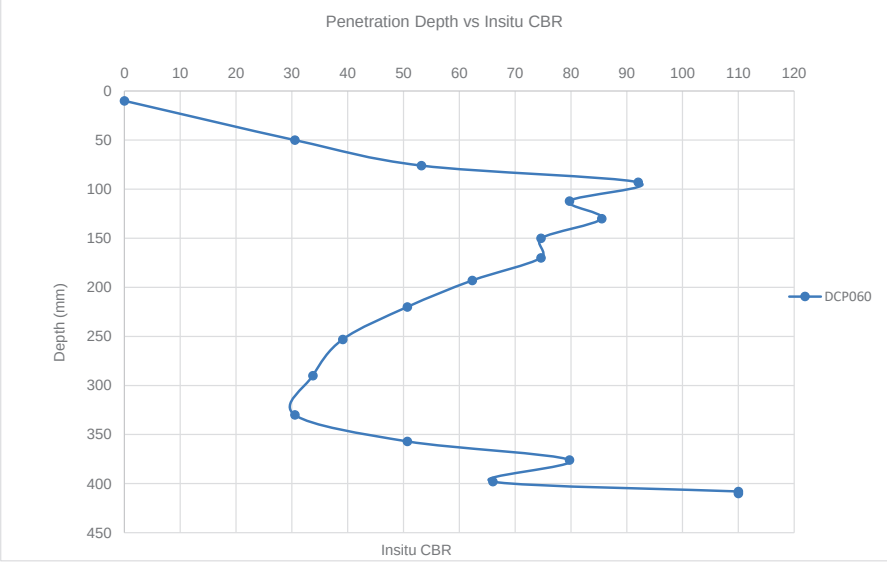
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP060	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	10	10mm	0	0				
5	50	50mm	40	8.0	Dense	29	31	301
10	76	76mm	26	5.2	Dense	51	53	481
15	93	93mm	17	3.4	Very Dense	87	92	764
20	112	112mm	19	3.8	Very Dense	75	80	677
25	130	130mm	18	3.6	Very Dense	81	86	718
30	150	150mm	20	4.0	Very Dense	70	75	640
35	170	170mm	20	4.0	Very Dense	70	75	640
40	193	193mm	23	4.6	Very Dense	59	62	550
45	220	220mm	27	5.4	Dense	48	51	461
50	253	253mm	33	6.6	Dense	37	39	371
55	290	290mm	37	7.4	Dense	32	34	327
60	330	330mm	40	8.0	Dense	29	31	301
65	357	357mm	27	5.4	Dense	48	51	461
70	376	376mm	19	3.8	Very Dense	75	80	677
75	398	398mm	22	4.4	Very Dense	62	66	577
80	408	408mm	10	2.0	Very Dense	170	>110	1362
85	410	410mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



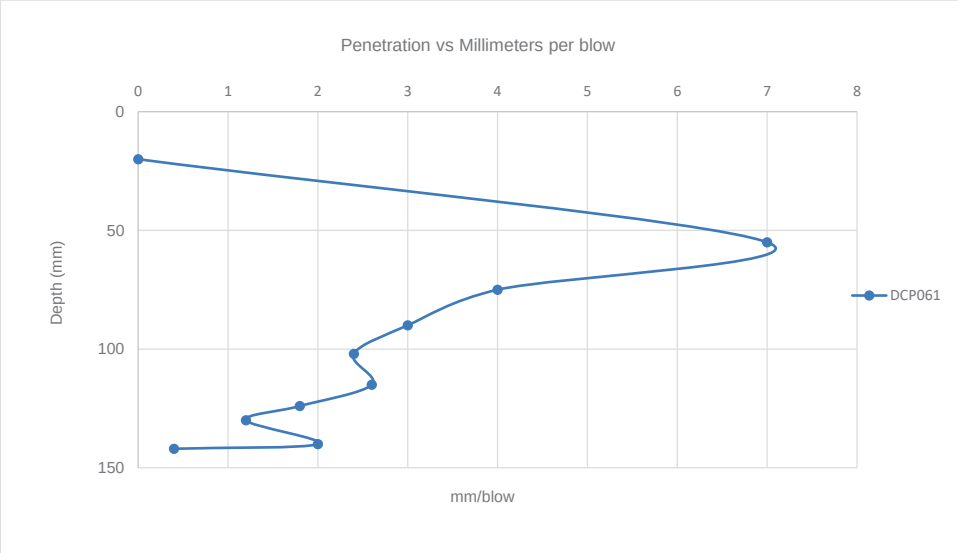


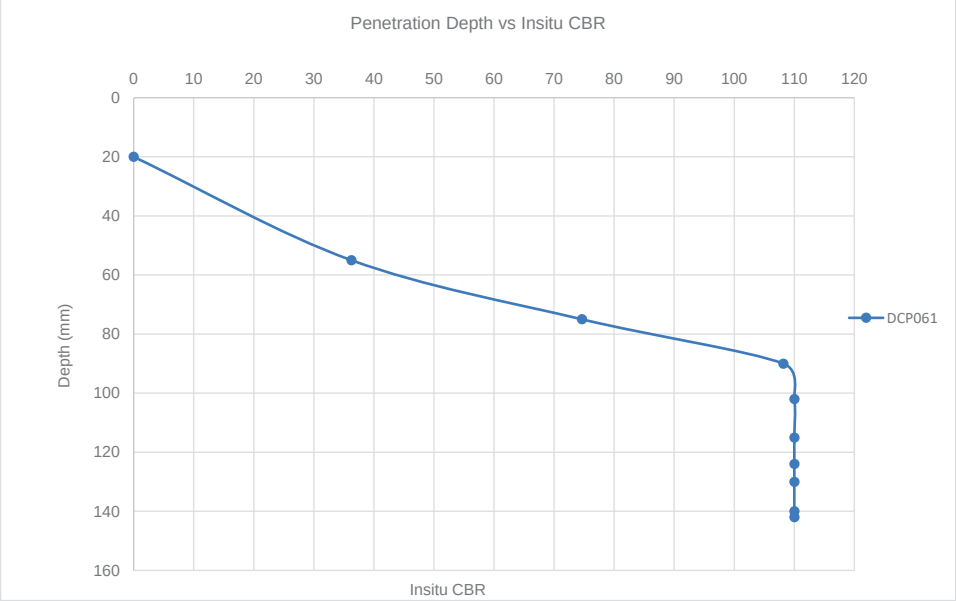
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP061	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	55	55mm	35	7.0	Dense	35	36	348
10	75	75mm	20	4.0	Very Dense	70	75	640
15	90	90mm	15	3.0	Very Dense	102	108	876
20	102	102mm	12	2.4	Very Dense	135	>110	1117
25	115	115mm	13	2.6	Very Dense	122	>110	1023
30	124	124mm	9	1.8	Very Dense	185	>110	1528
35	130	130mm	6	1.2	Very Dense	263	>110	2377
40	140	140mm	10	2.0	Very Dense	170	>110	1362
45	142	142mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



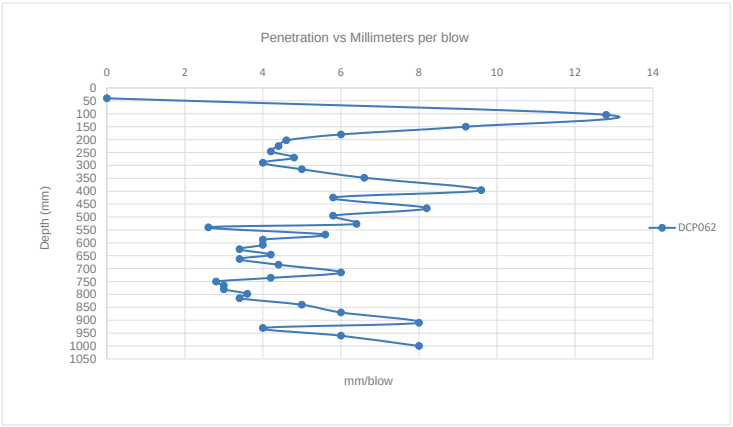


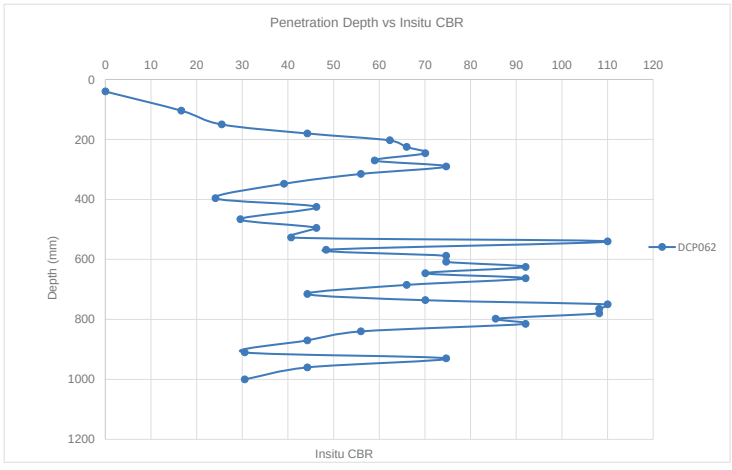
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP062	**STARTING DEPTH:**	40mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	104	104mm	64	12.8	Medium Dense	16	17	180
10	150	150mm	46	9.2	Dense	24	25	258
15	180	180mm	30	6.0	Dense	42	44	411
20	203	203mm	23	4.6	Very Dense	59	62	550
25	225	225mm	22	4.4	Very Dense	62	66	577
30	246	246mm	21	4.2	Very Dense	66	70	607
35	270	270mm	24	4.8	Very Dense	56	59	525
40	290	290mm	20	4.0	Very Dense	70	75	640
45	315	315mm	25	5.0	Very Dense	53	56	502
50	348	348mm	33	6.6	Dense	37	39	371
55	396	396mm	48	9.6	Dense	23	24	246
60	425	425mm	29	5.8	Dense	44	46	427
65	466	466mm	41	8.2	Dense	28	30	293
70	495	495mm	29	5.8	Dense	44	46	427
75	527	527mm	32	6.4	Dense	39	41	383
80	540	540mm	13	2.6	Very Dense	122	>110	1023
85	568	568mm	28	5.6	Dense	46	48	443
90	588	588mm	20	4.0	Very Dense	70	75	640
95	608	608mm	20	4.0	Very Dense	70	75	640
100	625	625mm	17	3.4	Very Dense	87	92	764
105	646	646mm	21	4.2	Very Dense	66	70	607
110	663	663mm	17	3.4	Very Dense	87	92	764
115	685	685mm	22	4.4	Very Dense	62	66	577
120	715	715mm	30	6.0	Dense	42	44	411
125	736	736mm	21	4.2	Very Dense	66	70	607
130	750	750mm	14	2.8	Very Dense	111	>110	944
135	765	765mm	15	3.0	Very Dense	102	108	876
140	780	780mm	15	3.0	Very Dense	102	108	876
145	798	798mm	18	3.6	Very Dense	81	86	718
150	815	815mm	17	3.4	Very Dense	87	92	764
155	840	840mm	25	5.0	Very Dense	53	56	502
160	870	870mm	30	6.0	Dense	42	44	411
165	910	910mm	40	8.0	Dense	29	31	301
170	930	930mm	20	4.0	Very Dense	70	75	640
175	960	960mm	30	6.0	Dense	42	44	411
180	1000	1000mm	40	8.0	Dense	29	31	301

DCP GRAPHICAL REPRESENTATION



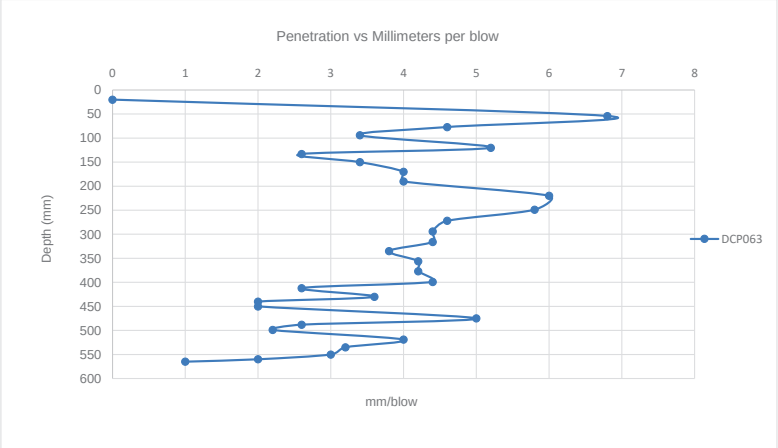


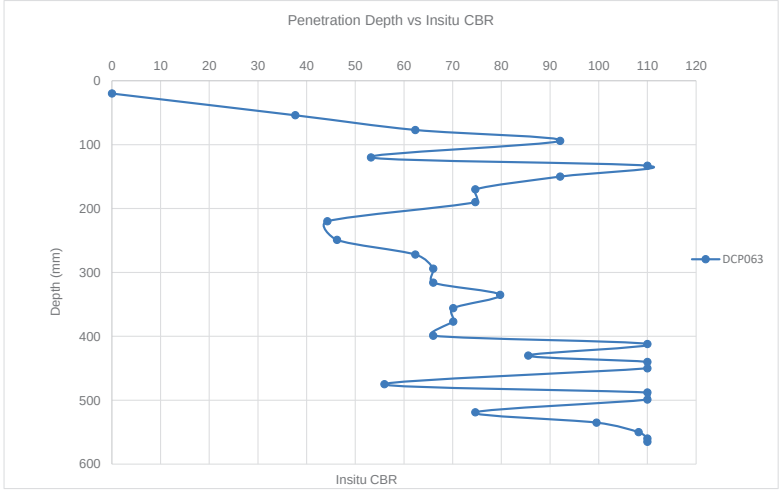
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP063	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x(dn)^{-1.09}$
0	20	20mm	0	0				
5	54	54mm	34	6.8	Dense	36	38	359
10	77	77mm	23	4.6	Very Dense	59	62	550
15	94	94mm	17	3.4	Very Dense	87	92	764
20	120	120mm	26	5.2	Dense	51	53	481
25	133	133mm	13	2.6	Very Dense	122	>110	1023
30	150	150mm	17	3.4	Very Dense	87	92	764
35	170	170mm	20	4.0	Very Dense	70	75	640
40	190	190mm	20	4.0	Very Dense	70	75	640
45	220	220mm	30	6.0	Dense	42	44	411
50	249	249mm	29	5.8	Dense	44	46	427
55	272	272mm	23	4.6	Very Dense	59	62	550
60	294	294mm	22	4.4	Very Dense	62	66	577
65	316	316mm	22	4.4	Very Dense	62	66	577
70	335	335mm	19	3.8	Very Dense	75	80	677
75	356	356mm	21	4.2	Very Dense	66	70	607
80	377	377mm	21	4.2	Very Dense	66	70	607
85	399	399mm	22	4.4	Very Dense	62	66	577
90	412	412mm	13	2.6	Very Dense	122	>110	1023
95	430	430mm	18	3.6	Very Dense	81	86	718
100	440	440mm	10	2.0	Very Dense	170	>110	1362
105	450	450mm	10	2.0	Very Dense	170	>110	1362
110	475	475mm	25	5.0	Very Dense	53	56	502
115	488	488mm	13	2.6	Very Dense	122	>110	1023
120	499	499mm	11	2.2	Very Dense	151	>110	1228
125	519	519mm	20	4.0	Very Dense	70	75	640
130	535	535mm	16	3.2	Very Dense	94	100	816
135	550	550mm	15	3.0	Very Dense	102	108	876
140	560	560mm	10	2.0	Very Dense	170	>110	1362
145	565	565mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION





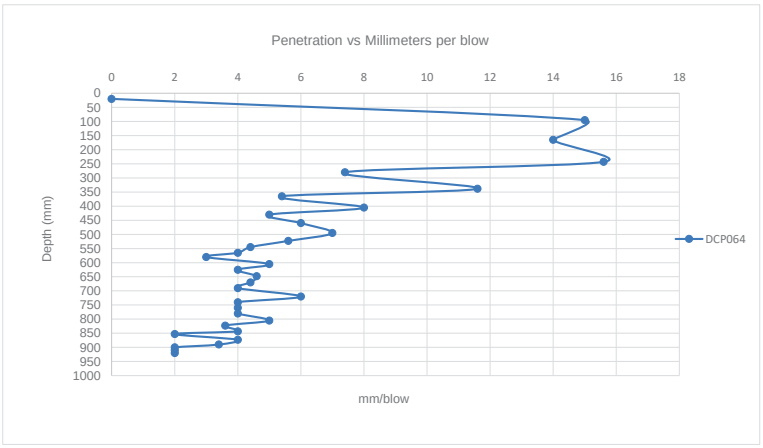
DYNAMIC CONE PENETROMETER TEST

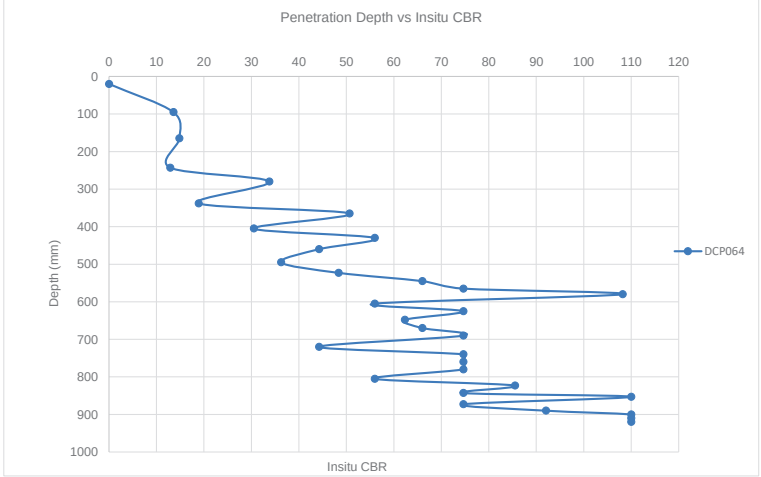
MUKONA CONSULTING ENGINEERS

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP064	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	95	95mm	75	15.0	Medium Dense	13	14	152
10	165	165mm	70	14.0	Medium Dense	14	15	163
15	243	243mm	78	15.6	Medium Dense	13	13	145
20	280	280mm	37	7.4	Dense	32	34	327
25	338	338mm	58	11.6	Dense	18	19	201
30	365	365mm	27	5.4	Dense	48	51	461
35	405	405mm	40	8.0	Dense	29	31	301
40	430	430mm	25	5.0	Very Dense	53	56	502
45	460	460mm	30	6.0	Dense	42	44	411
50	495	495mm	35	7.0	Dense	35	36	348
55	523	523mm	28	5.6	Dense	46	48	443
60	545	545mm	22	4.4	Very Dense	62	66	577
65	565	565mm	20	4.0	Very Dense	70	75	640
70	580	580mm	15	3.0	Very Dense	102	108	876
75	605	605mm	25	5.0	Very Dense	53	56	502
80	625	625mm	20	4.0	Very Dense	70	75	640
85	648	648mm	23	4.6	Very Dense	59	62	550
90	670	670mm	22	4.4	Very Dense	62	66	577
95	690	690mm	20	4.0	Very Dense	70	75	640
100	720	720mm	30	6.0	Dense	42	44	411
105	740	740mm	20	4.0	Very Dense	70	75	640
110	760	760mm	20	4.0	Very Dense	70	75	640
115	780	780mm	20	4.0	Very Dense	70	75	640
120	805	805mm	25	5.0	Very Dense	53	56	502
125	823	823mm	18	3.6	Very Dense	81	86	718
130	843	843mm	20	4.0	Very Dense	70	75	640
135	853	853mm	10	2.0	Very Dense	170	>110	1362
140	873	873mm	20	4.0	Very Dense	70	75	640
145	890	890mm	17	3.4	Very Dense	87	92	764
150	900	900mm	10	2.0	Very Dense	170	>110	1362
155	910	910mm	10	2.0	Very Dense	170	>110	1362
160	920	920mm	10	2.0	Very Dense	170	>110	1362

DCP GRAPHICAL REPRESENTATION



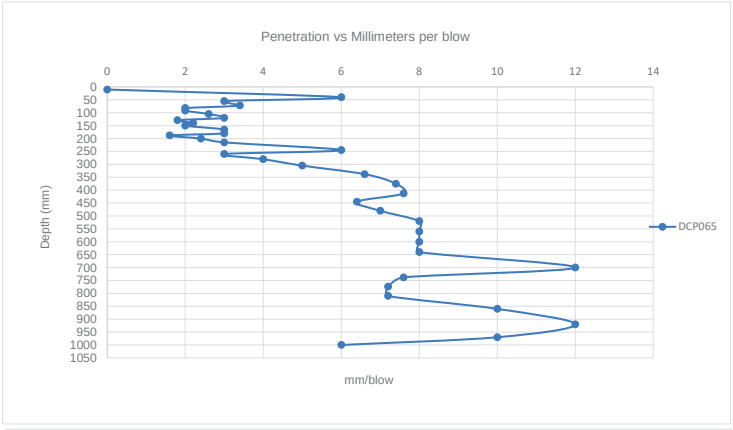


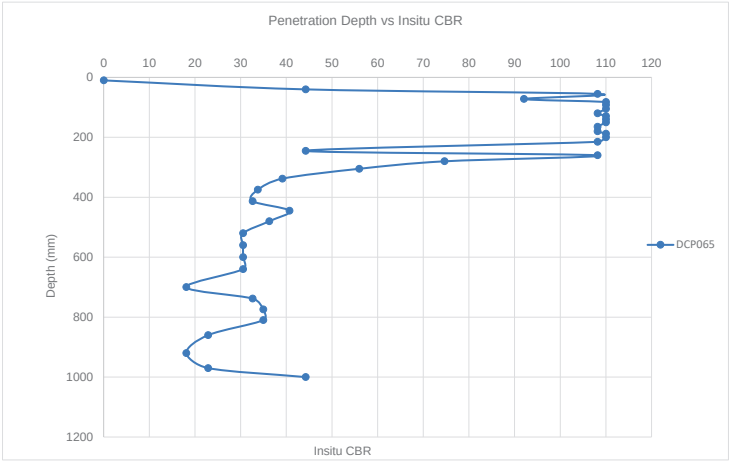
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP065	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	40	40mm	30	6.0	Dense	42	44	411
10	55	55mm	15	3.0	Very Dense	102	108	876
15	72	72mm	17	3.4	Very Dense	87	92	764
20	82	82mm	10	2.0	Very Dense	170	>110	1362
25	92	92mm	10	2.0	Very Dense	170	>110	1362
30	105	105mm	13	2.6	Very Dense	122	>110	1023
35	120	120mm	15	3.0	Very Dense	102	108	876
40	129	129mm	9	1.8	Very Dense	185	>110	1528
45	140	140mm	11	2.2	Very Dense	151	>110	1228
50	150	150mm	10	2.0	Very Dense	170	>110	1362
55	165	165mm	15	3.0	Very Dense	102	108	876
60	180	180mm	15	3.0	Very Dense	102	108	876
65	188	188mm	8	1.6	Very Dense	206	>110	1737
70	200	200mm	12	2.4	Very Dense	135	>110	1117
75	215	215mm	15	3.0	Very Dense	102	108	876
80	245	245mm	30	6.0	Dense	42	44	411
85	260	260mm	15	3.0	Very Dense	102	108	876
90	280	280mm	20	4.0	Very Dense	70	75	640
95	305	305mm	25	5.0	Very Dense	53	56	502
100	338	338mm	33	6.6	Dense	37	39	371
105	375	375mm	37	7.4	Dense	32	34	327
110	413	413mm	38	7.6	Dense	31	33	318
115	445	445mm	32	6.4	Dense	39	41	383
120	480	480mm	35	7.0	Dense	35	36	348
125	520	520mm	40	8.0	Dense	29	31	301
130	560	560mm	40	8.0	Dense	29	31	301
135	600	600mm	40	8.0	Dense	29	31	301
140	640	640mm	40	8.0	Dense	29	31	301
145	700	700mm	60	12.0	Dense	17	18	193
150	738	738mm	38	7.6	Dense	31	33	318
155	774	774mm	36	7.2	Dense	33	35	337
160	810	810mm	36	7.2	Dense	33	35	337
165	860	860mm	50	10.0	Dense	22	23	236
170	920	920mm	60	12.0	Dense	17	18	193
175	970	970mm	50	10.0	Dense	22	23	236
180	1000	1000mm	30	6.0	Dense	42	44	411

DCP GRAPHICAL REPRESENTATION



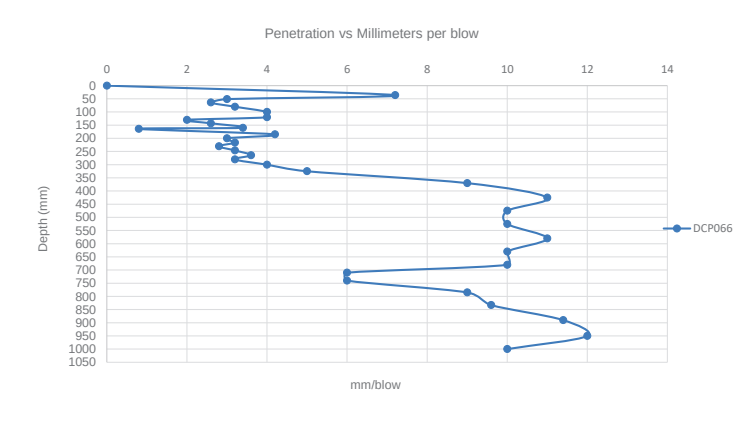


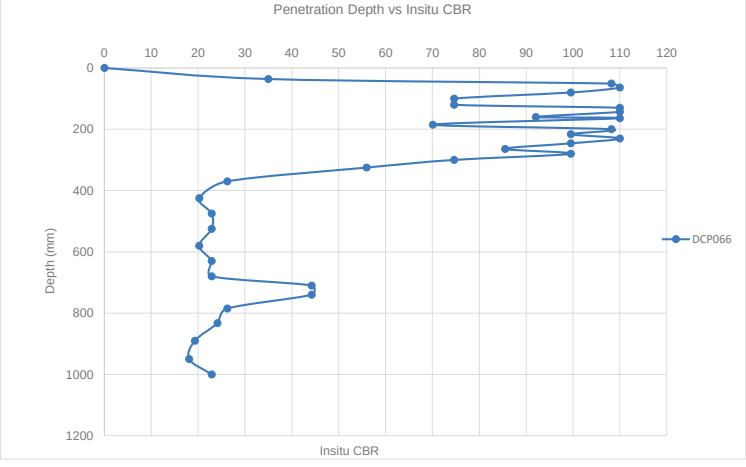
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP066	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0				
5	36	36mm	36	7.2	Dense	33	35	337
10	51	51mm	15	3.0	Very Dense	102	108	876
15	64	64mm	13	2.6	Very Dense	122	>110	1023
20	80	80mm	16	3.2	Very Dense	94	100	816
25	100	100mm	20	4.0	Very Dense	70	75	640
30	120	120mm	20	4.0	Very Dense	70	75	640
35	130	130mm	10	2.0	Very Dense	170	>110	1362
40	143	143mm	13	2.6	Very Dense	122	>110	1023
45	160	160mm	17	3.4	Very Dense	87	92	764
50	164	164mm	4	0.8	Very Dense	342	>110	3699
55	185	185mm	21	4.2	Very Dense	66	70	607
60	200	200mm	15	3.0	Very Dense	102	108	876
65	216	216mm	16	3.2	Very Dense	94	100	816
70	230	230mm	14	2.8	Very Dense	111	>110	944
75	246	246mm	16	3.2	Very Dense	94	100	816
80	264	264mm	18	3.6	Very Dense	81	86	718
85	280	280mm	16	3.2	Very Dense	94	100	816
90	300	300mm	20	4.0	Very Dense	70	75	640
95	325	325mm	25	5.0	Very Dense	53	56	502
100	370	370mm	45	9.0	Dense	25	26	264
105	425	425mm	55	11.0	Dense	20	20	212
110	475	475mm	50	10.0	Dense	22	23	236
115	525	525mm	50	10.0	Dense	22	23	236
120	580	580mm	55	11.0	Dense	20	20	212
125	630	630mm	50	10.0	Dense	22	23	236
130	680	680mm	50	10.0	Dense	22	23	236
135	710	710mm	30	6.0	Dense	42	44	411
140	740	740mm	30	6.0	Dense	42	44	411
145	785	785mm	45	9.0	Dense	25	26	264
150	833	833mm	48	9.6	Dense	23	24	246
155	890	890mm	57	11.4	Dense	19	19	204
160	950	950mm	60	12.0	Dense	17	18	193
165	1000	1000mm	50	10.0	Dense	22	23	236

DCP GRAPHICAL REPRESENTATION





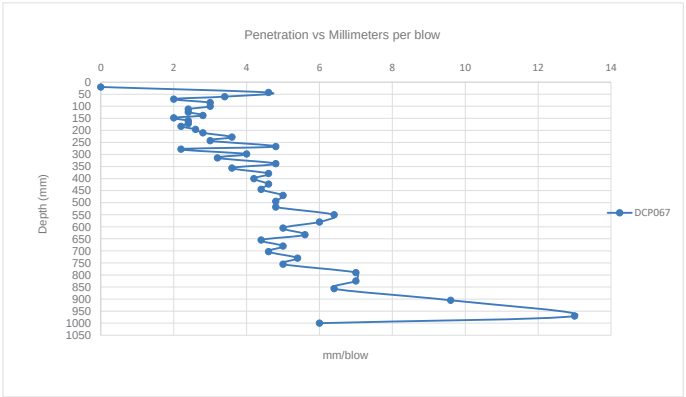
DYNAMIC CONE PENETROMETER TEST

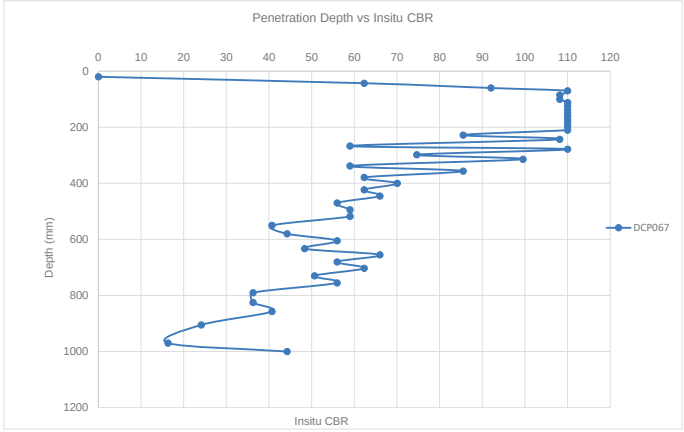
MUKONA CONSULTING ENGINEERS

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP067	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.05}$
0	20	20mm	0	0				
5	43	43mm	23	4.6	Very Dense	59	62	550
10	60	60mm	17	3.4	Very Dense	87	92	764
15	70	70mm	10	2.0	Very Dense	170	>110	1362
20	85	85mm	15	3.0	Very Dense	102	108	876
25	100	100mm	15	3.0	Very Dense	102	108	876
30	112	112mm	12	2.4	Very Dense	135	>110	1117
35	124	124mm	12	2.4	Very Dense	135	>110	1117
40	138	138mm	14	2.8	Very Dense	111	>110	944
45	148	148mm	10	2.0	Very Dense	170	>110	1362
50	160	160mm	12	2.4	Very Dense	135	>110	1117
55	172	172mm	12	2.4	Very Dense	135	>110	1117
60	183	183mm	11	2.2	Very Dense	151	>110	1228
65	196	196mm	13	2.6	Very Dense	122	>110	1023
70	210	210mm	14	2.8	Very Dense	111	>110	944
75	228	228mm	18	3.6	Very Dense	81	86	718
80	243	243mm	15	3.0	Very Dense	102	108	876
85	267	267mm	24	4.8	Very Dense	56	59	525
90	278	278mm	11	2.2	Very Dense	151	>110	1228
95	298	298mm	20	4.0	Very Dense	70	75	640
100	314	314mm	16	3.2	Very Dense	94	100	816
105	338	338mm	24	4.8	Very Dense	56	59	525
110	356	356mm	18	3.6	Very Dense	81	86	718
115	379	379mm	23	4.6	Very Dense	59	62	550
120	400	400mm	21	4.2	Very Dense	66	70	607
125	423	423mm	23	4.6	Very Dense	59	62	550
130	445	445mm	22	4.4	Very Dense	62	66	577
135	470	470mm	25	5.0	Very Dense	53	56	502
140	494	494mm	24	4.8	Very Dense	56	59	525
145	518	518mm	24	4.8	Very Dense	56	59	525
150	550	550mm	32	6.4	Dense	39	41	383
155	580	580mm	30	6.0	Dense	42	44	411
160	605	605mm	25	5.0	Very Dense	53	56	502
165	633	633mm	28	5.6	Dense	46	48	443
170	655	655mm	22	4.4	Very Dense	62	66	577
175	680	680mm	25	5.0	Very Dense	53	56	502
180	703	703mm	23	4.6	Very Dense	59	62	550
185	730	730mm	27	5.4	Dense	48	51	461
190	755	755mm	25	5.0	Very Dense	53	56	502
195	790	790mm	35	7.0	Dense	35	36	348
200	825	825mm	35	7.0	Dense	35	36	348
205	857	857mm	32	6.4	Dense	39	41	383
210	905	905mm	48	9.6	Dense	23	24	246
215	970	970mm	65	13.0	Medium Dense	16	16	177
220	1000	1000mm	30	6.0	Dense	42	44	411

DCP GRAPHICAL REPRESENTATION





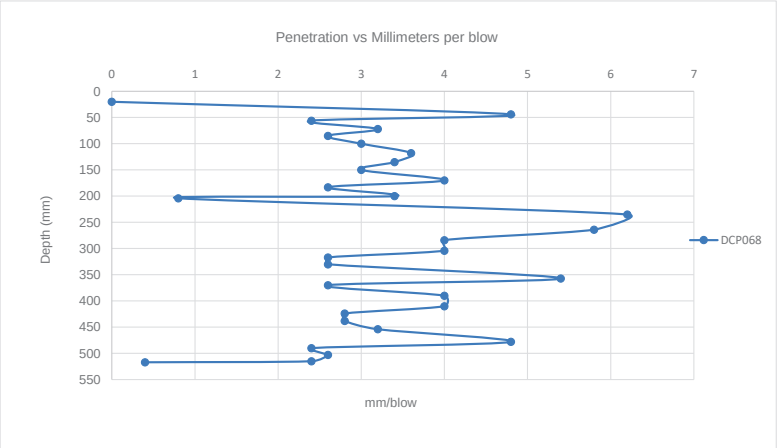
DYNAMIC CONE PENETROMETER TEST

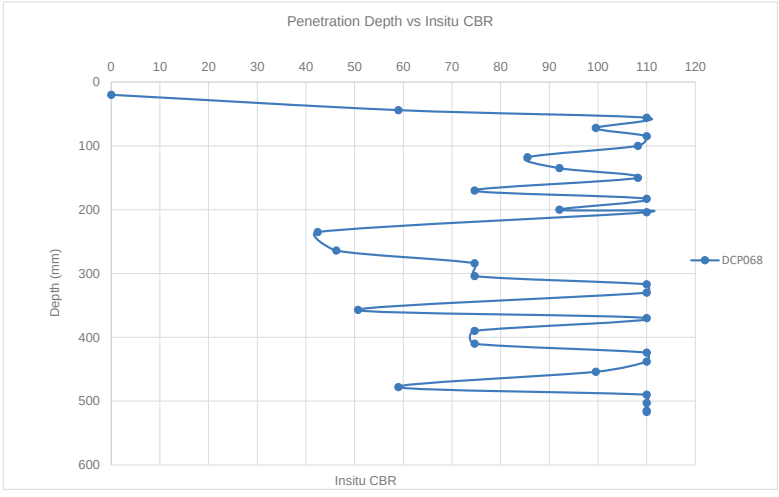
MUKONA CONSULTING ENGINEERS

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP068	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	44	44mm	24	4.8	Very Dense	56	59	525
10	56	56mm	12	2.4	Very Dense	135	>110	1117
15	72	72mm	16	3.2	Very Dense	94	100	816
20	85	85mm	13	2.6	Very Dense	122	>110	1023
25	100	100mm	15	3.0	Very Dense	102	108	876
30	118	118mm	18	3.6	Very Dense	81	86	718
35	135	135mm	17	3.4	Very Dense	87	92	764
40	150	150mm	15	3.0	Very Dense	102	108	876
45	170	170mm	20	4.0	Very Dense	70	75	640
50	183	183mm	13	2.6	Very Dense	122	>110	1023
55	200	200mm	17	3.4	Very Dense	87	92	764
60	204	204mm	4	0.8	Very Dense	342	>110	3699
65	235	235mm	31	6.2	Dense	40	42	397
70	264	264mm	29	5.8	Dense	44	46	427
75	284	284mm	20	4.0	Very Dense	70	75	640
80	304	304mm	20	4.0	Very Dense	70	75	640
85	317	317mm	13	2.6	Very Dense	122	>110	1023
90	330	330mm	13	2.6	Very Dense	122	>110	1023
95	357	357mm	27	5.4	Dense	48	51	461
100	370	370mm	13	2.6	Very Dense	122	>110	1023
105	390	390mm	20	4.0	Very Dense	70	75	640
110	410	410mm	20	4.0	Very Dense	70	75	640
115	424	424mm	14	2.8	Very Dense	111	>110	944
120	438	438mm	14	2.8	Very Dense	111	>110	944
125	454	454mm	16	3.2	Very Dense	94	100	816
130	478	478mm	24	4.8	Very Dense	56	59	525
135	490	490mm	12	2.4	Very Dense	135	>110	1117
140	503	503mm	13	2.6	Very Dense	122	>110	1023
145	515	515mm	12	2.4	Very Dense	135	>110	1117
150	517	517mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



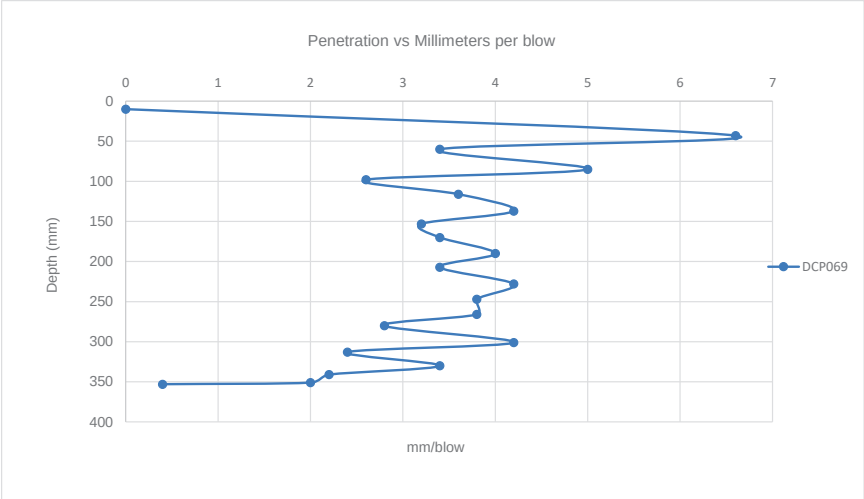


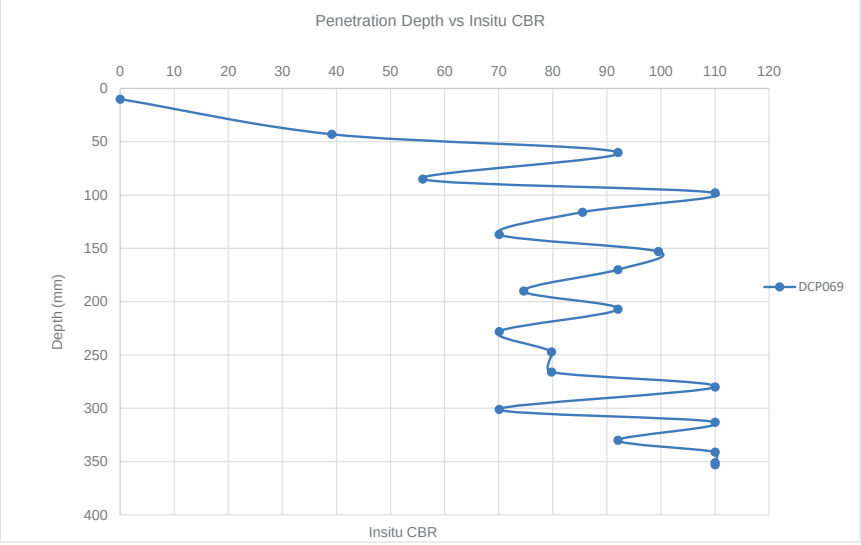
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP069	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	43	43mm	33	6.6	Dense	37	39	371
10	60	60mm	17	3.4	Very Dense	87	92	764
15	85	85mm	25	5.0	Very Dense	53	56	502
20	98	98mm	13	2.6	Very Dense	122	>110	1023
25	116	116mm	18	3.6	Very Dense	81	86	718
30	137	137mm	21	4.2	Very Dense	66	70	607
35	153	153mm	16	3.2	Very Dense	94	100	816
40	170	170mm	17	3.4	Very Dense	87	92	764
45	190	190mm	20	4.0	Very Dense	70	75	640
50	207	207mm	17	3.4	Very Dense	87	92	764
55	228	228mm	21	4.2	Very Dense	66	70	607
60	247	247mm	19	3.8	Very Dense	75	80	677
65	266	266mm	19	3.8	Very Dense	75	80	677
70	280	280mm	14	2.8	Very Dense	111	>110	944
75	301	301mm	21	4.2	Very Dense	66	70	607
80	313	313mm	12	2.4	Very Dense	135	>110	1117
85	330	330mm	17	3.4	Very Dense	87	92	764
90	341	341mm	11	2.2	Very Dense	151	>110	1228
95	351	351mm	10	2.0	Very Dense	170	>110	1362
100	353	353mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



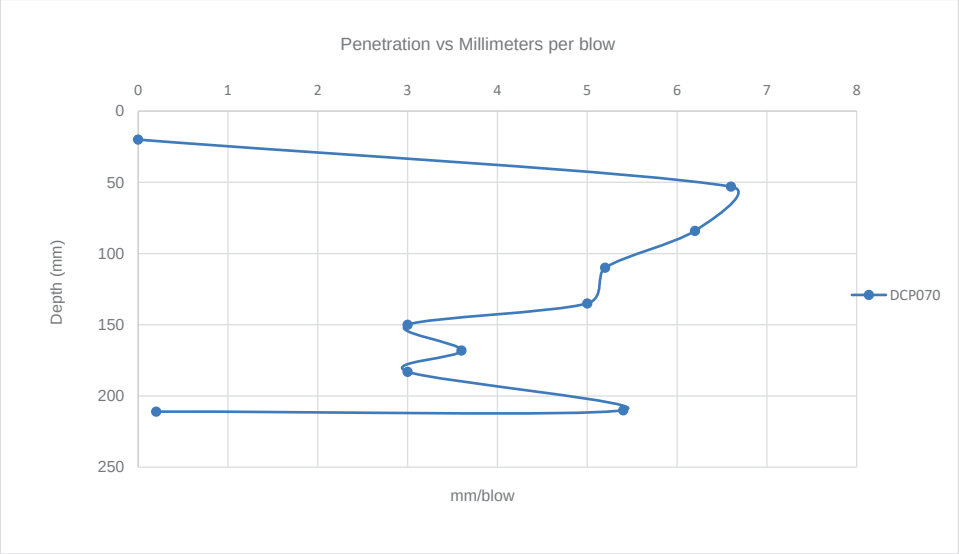


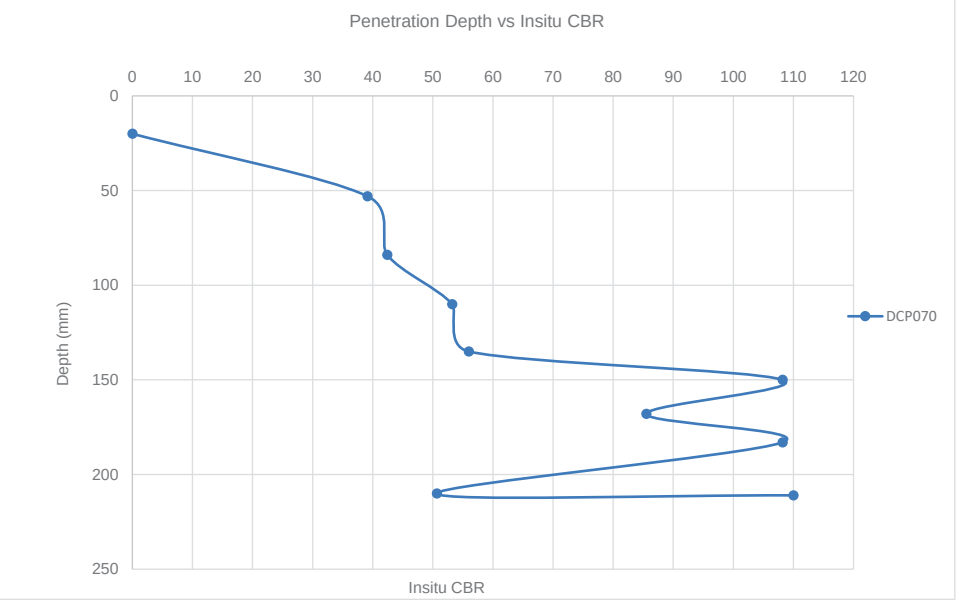
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP070	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	53	53mm	33	6.6	Dense	37	39	371
10	84	84mm	31	6.2	Dense	40	42	397
15	110	110mm	26	5.2	Dense	51	53	481
20	135	135mm	25	5.0	Very Dense	53	56	502
25	150	150mm	15	3.0	Very Dense	102	108	876
30	168	168mm	18	3.6	Very Dense	81	86	718
35	183	183mm	15	3.0	Very Dense	102	108	876
40	210	210mm	27	5.4	Dense	48	51	461
45	211	211mm	1	0.2	Very Dense	500	>110	16760

DCP GRAPHICAL REPRESENTATION





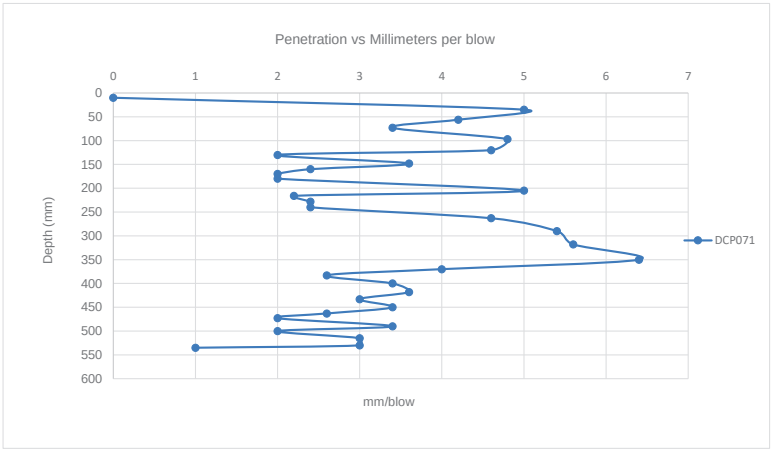
DYNAMIC CONE PENETROMETER TEST

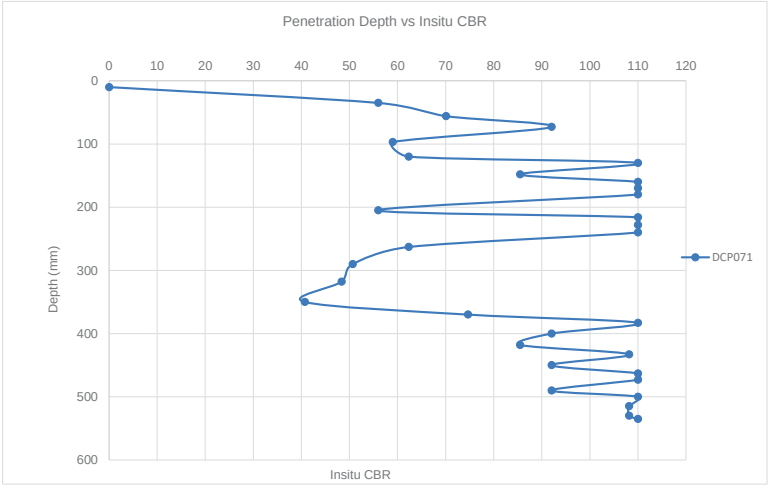
MUKONA CONSULTING ENGINEERS

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP071	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	35	35mm	25	5.0	Very Dense	53	56	502
10	56	56mm	21	4.2	Very Dense	66	70	607
15	73	73mm	17	3.4	Very Dense	87	92	764
20	97	97mm	24	4.8	Very Dense	56	59	525
25	120	120mm	23	4.6	Very Dense	59	62	550
30	130	130mm	10	2.0	Very Dense	170	>110	1362
35	148	148mm	18	3.6	Very Dense	81	86	718
40	160	160mm	12	2.4	Very Dense	135	>110	1117
45	170	170mm	10	2.0	Very Dense	170	>110	1362
50	180	180mm	10	2.0	Very Dense	170	>110	1362
55	205	205mm	25	5.0	Very Dense	53	56	502
60	216	216mm	11	2.2	Very Dense	151	>110	1228
65	228	228mm	12	2.4	Very Dense	135	>110	1117
70	240	240mm	12	2.4	Very Dense	135	>110	1117
75	263	263mm	23	4.6	Very Dense	59	62	550
80	290	290mm	27	5.4	Dense	48	51	461
85	318	318mm	28	5.6	Dense	46	48	443
90	350	350mm	32	6.4	Dense	39	41	383
95	370	370mm	20	4.0	Very Dense	70	75	640
100	383	383mm	13	2.6	Very Dense	122	>110	1023
105	400	400mm	17	3.4	Very Dense	87	92	764
110	418	418mm	18	3.6	Very Dense	81	86	718
115	433	433mm	15	3.0	Very Dense	102	108	876
120	450	450mm	17	3.4	Very Dense	87	92	764
125	463	463mm	13	2.6	Very Dense	122	>110	1023
130	473	473mm	10	2.0	Very Dense	170	>110	1362
135	490	490mm	17	3.4	Very Dense	87	92	764
140	500	500mm	10	2.0	Very Dense	170	>110	1362
145	515	515mm	15	3.0	Very Dense	102	108	876
150	530	530mm	15	3.0	Very Dense	102	108	876
155	535	535mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



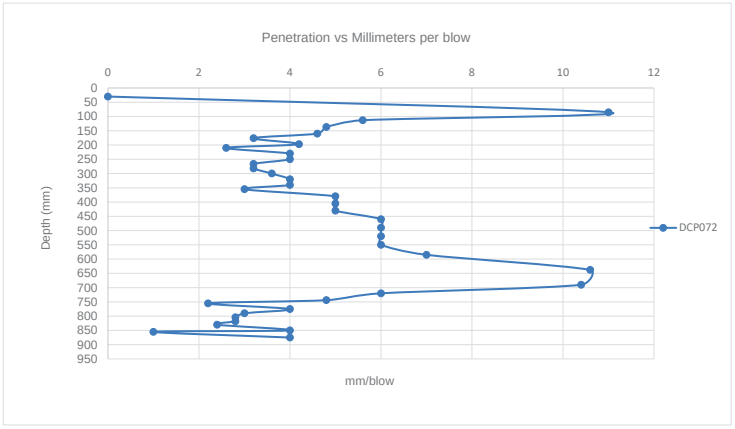


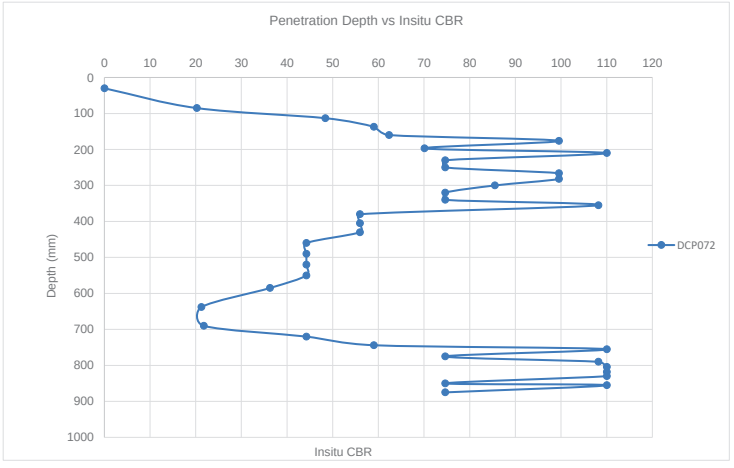
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP072	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	85	85mm	55	11.0	Dense	20	20	212
10	113	113mm	28	5.6	Dense	46	48	443
15	137	137mm	24	4.8	Very Dense	56	59	525
20	160	160mm	23	4.6	Very Dense	59	62	550
25	176	176mm	16	3.2	Very Dense	94	100	816
30	197	197mm	21	4.2	Very Dense	66	70	607
35	210	210mm	13	2.6	Very Dense	122	>110	1023
40	230	230mm	20	4.0	Very Dense	70	75	640
45	250	250mm	20	4.0	Very Dense	70	75	640
50	266	266mm	16	3.2	Very Dense	94	100	816
55	282	282mm	16	3.2	Very Dense	94	100	816
60	300	300mm	18	3.6	Very Dense	81	86	718
65	320	320mm	20	4.0	Very Dense	70	75	640
70	340	340mm	20	4.0	Very Dense	70	75	640
75	355	355mm	15	3.0	Very Dense	102	108	876
80	380	380mm	25	5.0	Very Dense	53	56	502
85	405	405mm	25	5.0	Very Dense	53	56	502
90	430	430mm	25	5.0	Very Dense	53	56	502
95	460	460mm	30	6.0	Dense	42	44	411
100	490	490mm	30	6.0	Dense	42	44	411
105	520	520mm	30	6.0	Dense	42	44	411
110	550	550mm	30	6.0	Dense	42	44	411
115	585	585mm	35	7.0	Dense	35	36	348
120	638	638mm	53	10.6	Dense	20	21	221
125	690	690mm	52	10.4	Dense	21	22	226
130	720	720mm	30	6.0	Dense	42	44	411
135	744	744mm	24	4.8	Very Dense	56	59	525
140	755	755mm	11	2.2	Very Dense	151	>110	1228
145	775	775mm	20	4.0	Very Dense	70	75	640
150	790	790mm	15	3.0	Very Dense	102	108	876
155	804	804mm	14	2.8	Very Dense	111	>110	944
160	818	818mm	14	2.8	Very Dense	111	>110	944
165	830	830mm	12	2.4	Very Dense	135	>110	1117
170	850	850mm	20	4.0	Very Dense	70	75	640
175	855	855mm	5	1.0	Very Dense	300	>110	2900
180	875	875mm	20	4.0	Very Dense	70	75	640

DCP GRAPHICAL REPRESENTATION



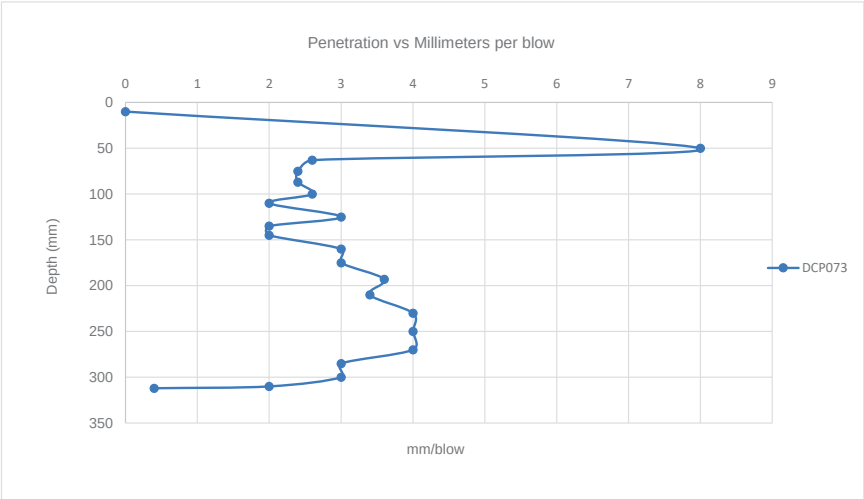


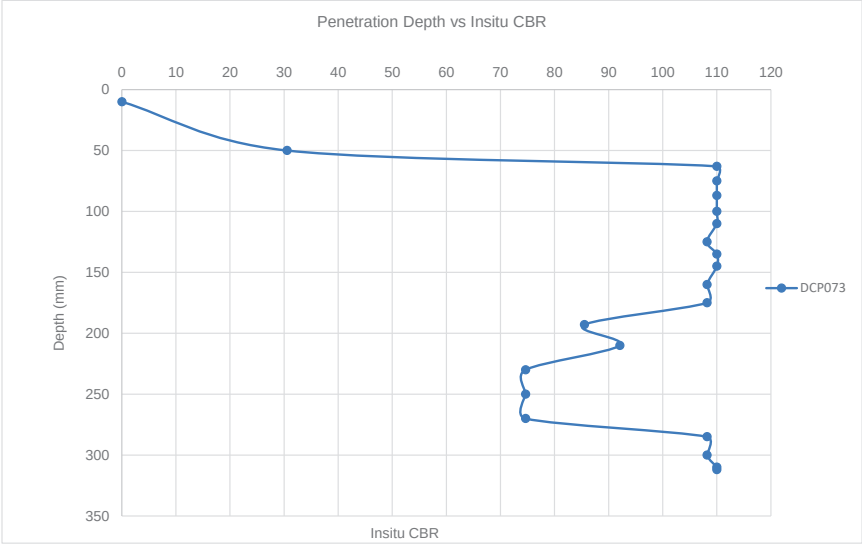
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP073	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	50	50mm	40	8.0	Dense	29	31	301
10	63	63mm	13	2.6	Very Dense	122	>110	1023
15	75	75mm	12	2.4	Very Dense	135	>110	1117
20	87	87mm	12	2.4	Very Dense	135	>110	1117
25	100	100mm	13	2.6	Very Dense	122	>110	1023
30	110	110mm	10	2.0	Very Dense	170	>110	1362
35	125	125mm	15	3.0	Very Dense	102	108	876
40	135	135mm	10	2.0	Very Dense	170	>110	1362
45	145	145mm	10	2.0	Very Dense	170	>110	1362
50	160	160mm	15	3.0	Very Dense	102	108	876
55	175	175mm	15	3.0	Very Dense	102	108	876
60	193	193mm	18	3.6	Very Dense	81	86	718
65	210	210mm	17	3.4	Very Dense	87	92	764
70	230	230mm	20	4.0	Very Dense	70	75	640
75	250	250mm	20	4.0	Very Dense	70	75	640
80	270	270mm	20	4.0	Very Dense	70	75	640
85	285	285mm	15	3.0	Very Dense	102	108	876
90	300	300mm	15	3.0	Very Dense	102	108	876
95	310	310mm	10	2.0	Very Dense	170	>110	1362
100	312	312mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



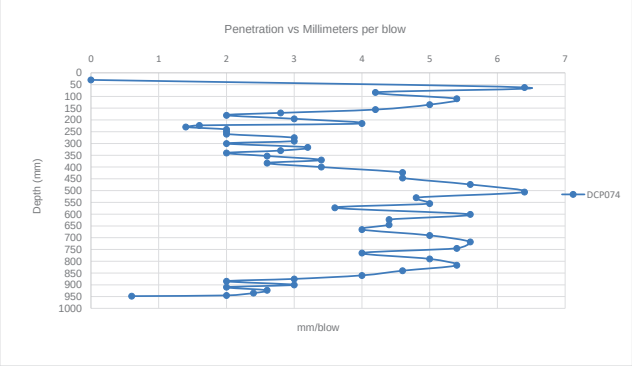


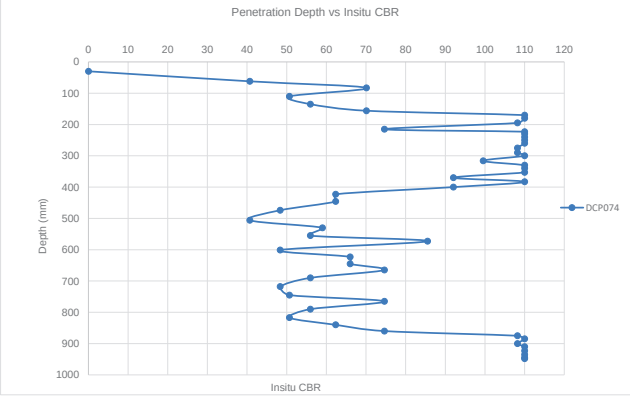
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP074	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	62	62mm	32	6.4	Dense	39	41	383
10	83	83mm	21	4.2	Very Dense	66	70	607
15	110	110mm	27	5.4	Dense	48	51	461
20	135	135mm	25	5.0	Very Dense	53	56	502
25	156	156mm	21	4.2	Very Dense	66	70	607
30	170	170mm	14	2.8	Very Dense	111	>110	944
35	180	180mm	10	2.0	Very Dense	170	>110	1362
40	195	195mm	15	3.0	Very Dense	102	108	876
45	215	215mm	20	4.0	Very Dense	70	75	640
50	223	223mm	8	1.6	Very Dense	206	>110	1737
55	230	230mm	7	1.4	Very Dense	232	>110	2010
60	240	240mm	10	2.0	Very Dense	170	>110	1362
65	250	250mm	10	2.0	Very Dense	170	>110	1362
70	260	260mm	10	2.0	Very Dense	170	>110	1362
75	275	275mm	15	3.0	Very Dense	102	108	876
80	290	290mm	15	3.0	Very Dense	102	108	876
85	300	300mm	10	2.0	Very Dense	170	>110	1362
90	316	316mm	16	3.2	Very Dense	94	100	816
95	330	330mm	14	2.8	Very Dense	111	>110	944
100	340	340mm	10	2.0	Very Dense	170	>110	1362
105	353	353mm	13	2.6	Very Dense	122	>110	1023
110	370	370mm	17	3.4	Very Dense	87	92	764
115	383	383mm	13	2.6	Very Dense	122	>110	1023
120	400	400mm	17	3.4	Very Dense	87	92	764
125	423	423mm	23	4.6	Very Dense	59	62	550
130	446	446mm	23	4.6	Very Dense	59	62	550
135	474	474mm	28	5.6	Dense	46	48	443
140	506	506mm	32	6.4	Dense	39	41	383
145	530	530mm	24	4.8	Very Dense	56	59	525
150	555	555mm	25	5.0	Very Dense	53	56	502
155	573	573mm	18	3.6	Very Dense	81	86	718
160	601	601mm	28	5.6	Dense	46	48	443
165	623	623mm	22	4.4	Very Dense	62	66	577
170	645	645mm	22	4.4	Very Dense	62	66	577
175	665	665mm	20	4.0	Very Dense	70	75	640
180	690	690mm	25	5.0	Very Dense	53	56	502
185	718	718mm	28	5.6	Dense	46	48	443
190	745	745mm	27	5.4	Dense	48	51	461
195	765	765mm	20	4.0	Very Dense	70	75	640
200	790	790mm	25	5.0	Very Dense	53	56	502
205	817	817mm	27	5.4	Dense	48	51	461
210	840	840mm	23	4.6	Very Dense	59	62	550
215	860	860mm	20	4.0	Very Dense	70	75	640
220	875	875mm	15	3.0	Very Dense	102	108	876
225	885	885mm	10	2.0	Very Dense	170	>110	1362
230	900	900mm	15	3.0	Very Dense	102	108	876
235	910	910mm	10	2.0	Very Dense	170	>110	1362
240	923	923mm	13	2.6	Very Dense	122	>110	1023
245	935	935mm	12	2.4	Very Dense	135	>110	1117
250	945	945mm	10	2.0	Very Dense	170	>110	1362
255	948	948mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



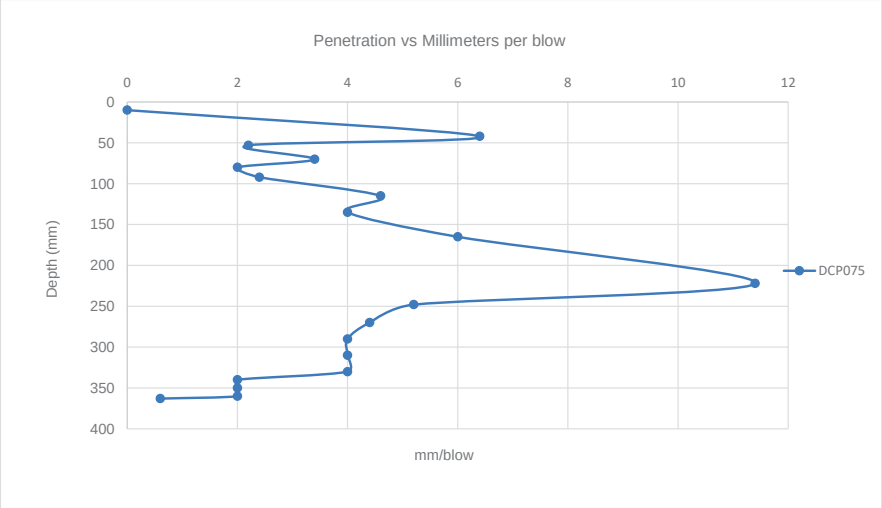


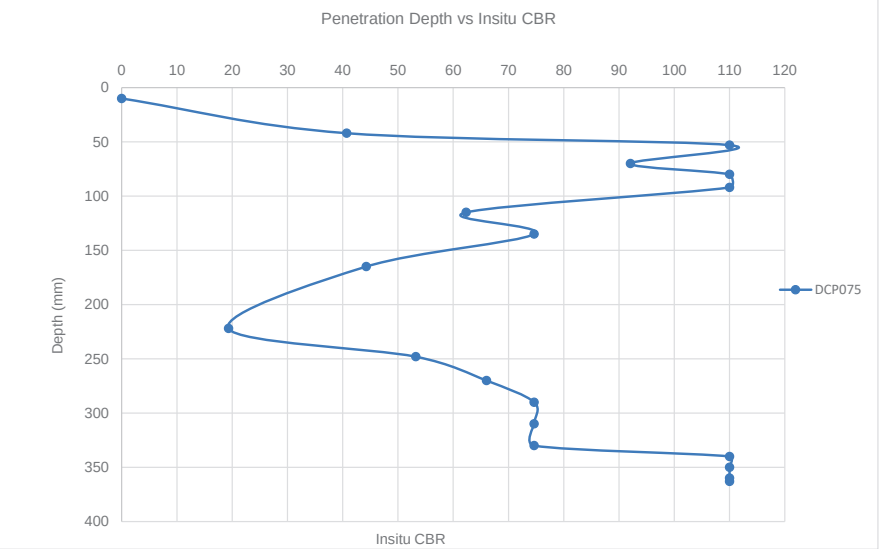
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP075	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	42	42mm	32	6.4	Dense	39	41	383
10	53	53mm	11	2.2	Very Dense	151	>110	1228
15	70	70mm	17	3.4	Very Dense	87	92	764
20	80	80mm	10	2.0	Very Dense	170	>110	1362
25	92	92mm	12	2.4	Very Dense	135	>110	1117
30	115	115mm	23	4.6	Very Dense	59	62	550
35	135	135mm	20	4.0	Very Dense	70	75	640
40	165	165mm	30	6.0	Dense	42	44	411
45	222	222mm	57	11.4	Dense	19	19	204
50	248	248mm	26	5.2	Dense	51	53	481
55	270	270mm	22	4.4	Very Dense	62	66	577
60	290	290mm	20	4.0	Very Dense	70	75	640
65	310	310mm	20	4.0	Very Dense	70	75	640
70	330	330mm	20	4.0	Very Dense	70	75	640
75	340	340mm	10	2.0	Very Dense	170	>110	1362
80	350	350mm	10	2.0	Very Dense	170	>110	1362
85	360	360mm	10	2.0	Very Dense	170	>110	1362
90	363	363mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



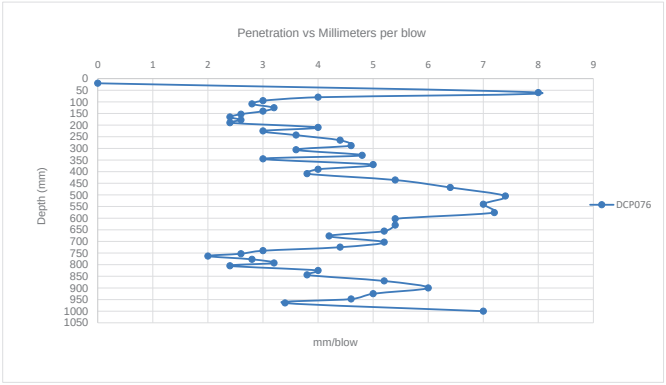


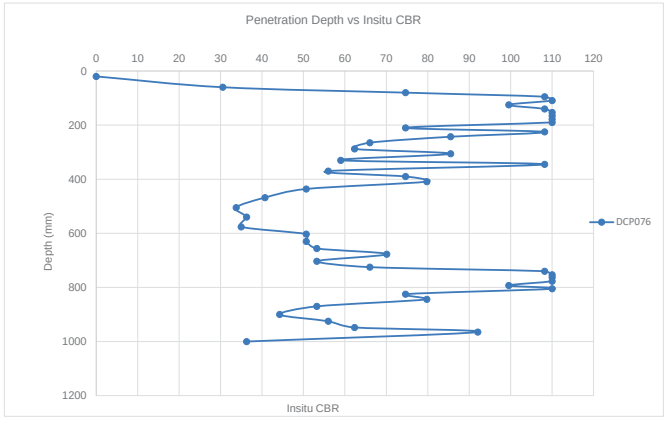
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP076	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	60	60mm	40	8.0	Dense	29	31	301
10	80	80mm	20	4.0	Very Dense	70	75	640
15	95	95mm	15	3.0	Very Dense	102	108	876
20	109	109mm	14	2.8	Very Dense	111	>110	944
25	125	125mm	16	3.2	Very Dense	94	100	816
30	140	140mm	15	3.0	Very Dense	102	108	876
35	153	153mm	13	2.6	Very Dense	122	>110	1023
40	165	165mm	12	2.4	Very Dense	135	>110	1117
45	178	178mm	13	2.6	Very Dense	122	>110	1023
50	190	190mm	12	2.4	Very Dense	135	>110	1117
55	210	210mm	20	4.0	Very Dense	70	75	640
60	225	225mm	15	3.0	Very Dense	102	108	876
65	243	243mm	18	3.6	Very Dense	81	86	718
70	265	265mm	22	4.4	Very Dense	62	66	577
75	288	288mm	23	4.6	Very Dense	59	62	550
80	306	306mm	18	3.6	Very Dense	81	86	718
85	330	330mm	24	4.8	Very Dense	56	59	525
90	345	345mm	15	3.0	Very Dense	102	108	876
95	370	370mm	25	5.0	Very Dense	53	56	502
100	390	390mm	20	4.0	Very Dense	70	75	640
105	409	409mm	19	3.8	Very Dense	75	80	677
110	436	436mm	27	5.4	Dense	48	51	461
115	468	468mm	32	6.4	Dense	39	41	383
120	505	505mm	37	7.4	Dense	32	34	327
125	540	540mm	35	7.0	Dense	35	36	348
130	576	576mm	36	7.2	Dense	33	35	337
135	603	603mm	27	5.4	Dense	48	51	461
140	630	630mm	27	5.4	Dense	48	51	461
145	656	656mm	26	5.2	Dense	51	53	481
150	677	677mm	21	4.2	Very Dense	66	70	607
155	703	703mm	26	5.2	Dense	51	53	481
160	725	725mm	22	4.4	Very Dense	62	66	577
165	740	740mm	15	3.0	Very Dense	102	108	876
170	753	753mm	13	2.6	Very Dense	122	>110	1023
175	763	763mm	10	2.0	Very Dense	170	>110	1362
180	777	777mm	14	2.8	Very Dense	111	>110	944
185	793	793mm	16	3.2	Very Dense	94	100	816
190	805	805mm	12	2.4	Very Dense	135	>110	1117
195	825	825mm	20	4.0	Very Dense	70	75	640
200	844	844mm	19	3.8	Very Dense	75	80	677
205	870	870mm	26	5.2	Dense	51	53	481
210	900	900mm	30	6.0	Dense	42	44	411
215	925	925mm	25	5.0	Very Dense	53	56	502
220	948	948mm	23	4.6	Very Dense	59	62	550
225	965	965mm	17	3.4	Very Dense	87	92	764
230	1000	1000mm	35	7.0	Dense	35	36	348

DCP GRAPHICAL REPRESENTATION



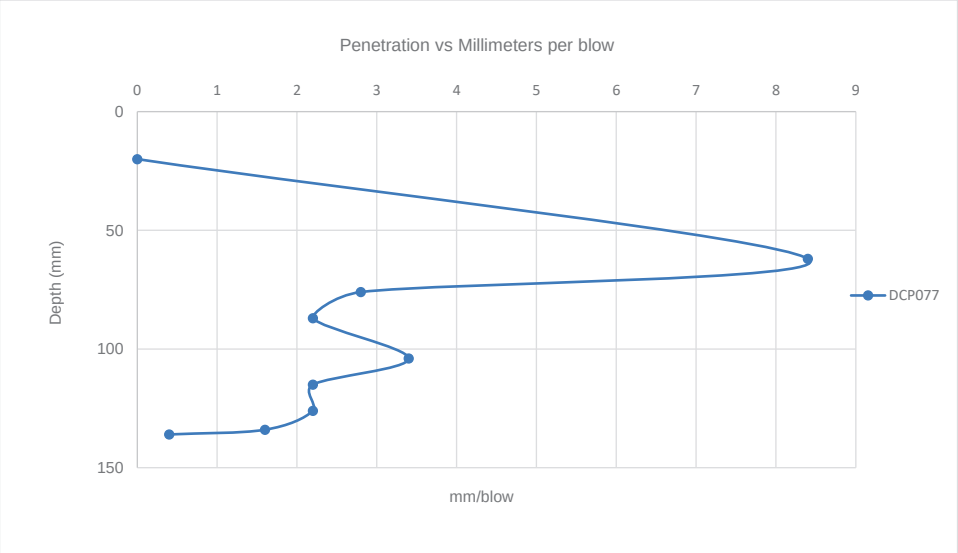


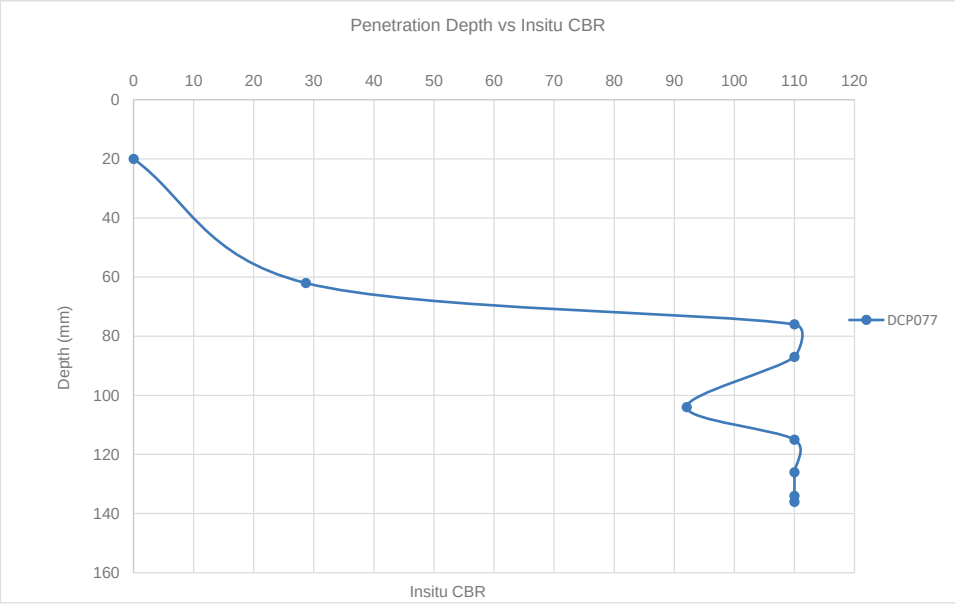
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP077	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	62	62mm	42	8.4	Dense	27	29	285
10	76	76mm	14	2.8	Very Dense	111	>110	944
15	87	87mm	11	2.2	Very Dense	151	>110	1228
20	104	104mm	17	3.4	Very Dense	87	92	764
25	115	115mm	11	2.2	Very Dense	151	>110	1228
30	126	126mm	11	2.2	Very Dense	151	>110	1228
35	134	134mm	8	1.6	Very Dense	206	>110	1737
40	136	136mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



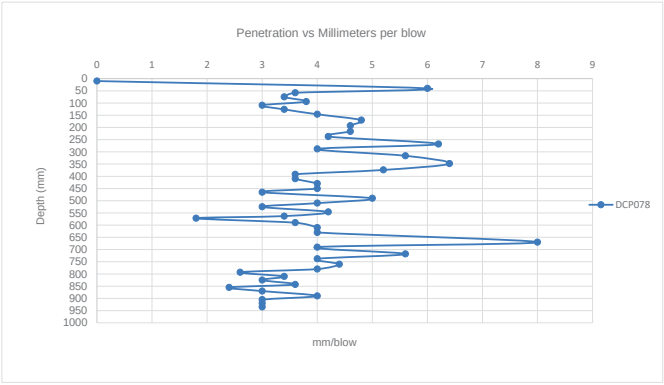


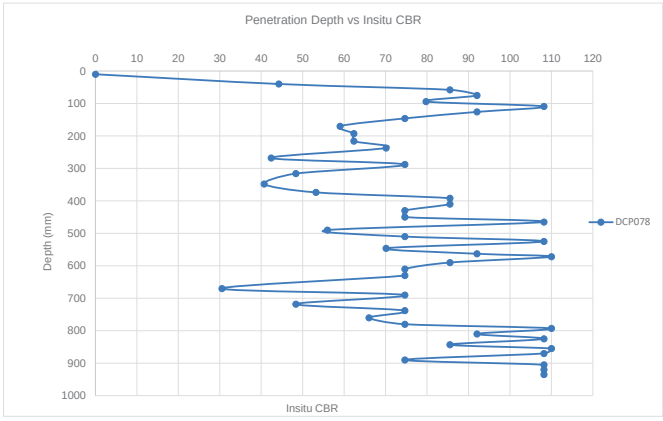
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP078	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	40	40mm	30	6.0	Dense	42	44	411
10	58	58mm	18	3.6	Very Dense	81	86	718
15	75	75mm	17	3.4	Very Dense	87	92	764
20	94	94mm	19	3.8	Very Dense	75	80	677
25	109	109mm	15	3.0	Very Dense	102	108	876
30	126	126mm	17	3.4	Very Dense	87	92	764
35	146	146mm	20	4.0	Very Dense	70	75	640
40	170	170mm	24	4.8	Very Dense	56	59	525
45	193	193mm	23	4.6	Very Dense	59	62	550
50	216	216mm	23	4.6	Very Dense	59	62	550
55	237	237mm	21	4.2	Very Dense	66	70	607
60	268	268mm	31	6.2	Dense	40	42	397
65	288	288mm	20	4.0	Very Dense	70	75	640
70	316	316mm	28	5.6	Dense	46	48	443
75	348	348mm	32	6.4	Dense	39	41	383
80	374	374mm	26	5.2	Dense	51	53	481
85	392	392mm	18	3.6	Very Dense	81	86	718
90	410	410mm	18	3.6	Very Dense	81	86	718
95	430	430mm	20	4.0	Very Dense	70	75	640
100	450	450mm	20	4.0	Very Dense	70	75	640
105	465	465mm	15	3.0	Very Dense	102	108	876
110	490	490mm	25	5.0	Very Dense	53	56	502
115	510	510mm	20	4.0	Very Dense	70	75	640
120	525	525mm	15	3.0	Very Dense	102	108	876
125	546	546mm	21	4.2	Very Dense	66	70	607
130	563	563mm	17	3.4	Very Dense	87	92	764
135	572	572mm	9	1.8	Very Dense	185	>110	1528
140	590	590mm	18	3.6	Very Dense	81	86	718
145	610	610mm	20	4.0	Very Dense	70	75	640
150	630	630mm	20	4.0	Very Dense	70	75	640
155	670	670mm	40	8.0	Dense	29	31	301
160	690	690mm	20	4.0	Very Dense	70	75	640
165	718	718mm	28	5.6	Dense	46	48	443
170	738	738mm	20	4.0	Very Dense	70	75	640
175	760	760mm	22	4.4	Very Dense	62	66	577
180	780	780mm	20	4.0	Very Dense	70	75	640
185	793	793mm	13	2.6	Very Dense	122	>110	1023
190	810	810mm	17	3.4	Very Dense	87	92	764
195	825	825mm	15	3.0	Very Dense	102	108	876
200	843	843mm	18	3.6	Very Dense	81	86	718
205	855	855mm	12	2.4	Very Dense	135	>110	1117
210	870	870mm	15	3.0	Very Dense	102	108	876
215	890	890mm	20	4.0	Very Dense	70	75	640
220	905	905mm	15	3.0	Very Dense	102	108	876
225	920	920mm	15	3.0	Very Dense	102	108	876
230	935	935mm	15	3.0	Very Dense	102	108	876

DCP GRAPHICAL REPRESENTATION



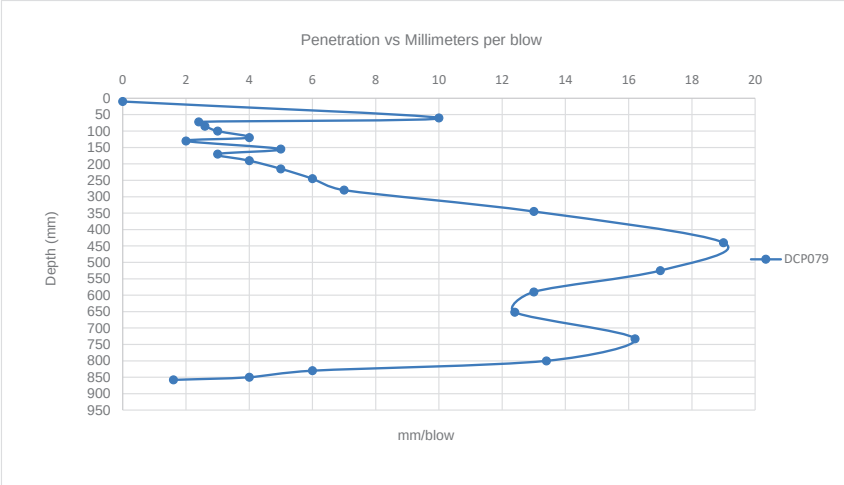


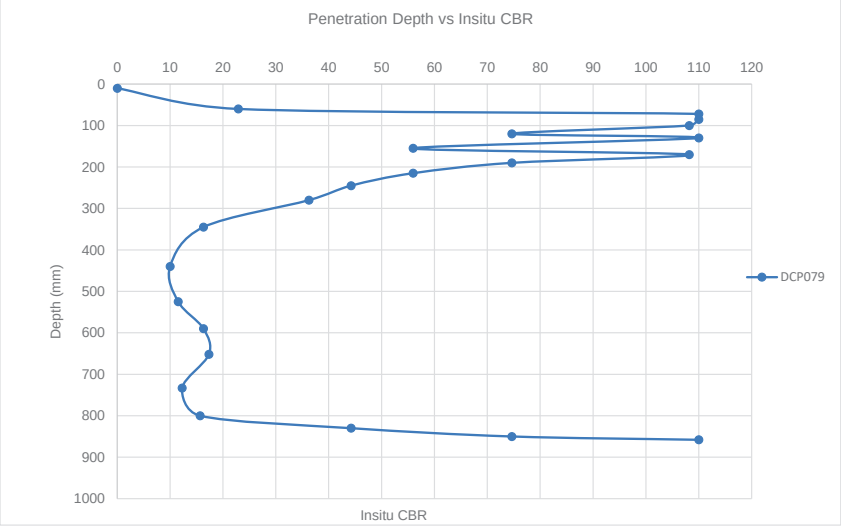
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP079	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	10	10mm	0	0				
5	60	60mm	50	10.0	Dense	22	23	236
10	72	72mm	12	2.4	Very Dense	135	>110	1117
15	85	85mm	13	2.6	Very Dense	122	>110	1023
20	100	100mm	15	3.0	Very Dense	102	108	876
25	120	120mm	20	4.0	Very Dense	70	75	640
30	130	130mm	10	2.0	Very Dense	170	>110	1362
35	155	155mm	25	5.0	Very Dense	53	56	502
40	170	170mm	15	3.0	Very Dense	102	108	876
45	190	190mm	20	4.0	Very Dense	70	75	640
50	215	215mm	25	5.0	Very Dense	53	56	502
55	245	245mm	30	6.0	Dense	42	44	411
60	280	280mm	35	7.0	Dense	35	36	348
65	345	345mm	65	13.0	Medium Dense	16	16	177
70	440	440mm	95	19.0	Medium Dense	10	10	117
75	525	525mm	85	17.0	Medium Dense	11	12	132
80	590	590mm	65	13.0	Medium Dense	16	16	177
85	652	652mm	62	12.4	Dense	17	17	186
90	733	733mm	81	16.2	Medium Dense	12	12	139
95	800	800mm	67	13.4	Medium Dense	15	16	171
100	830	830mm	30	6.0	Dense	42	44	411
105	850	850mm	20	4.0	Very Dense	70	75	640
110	858	858mm	8	1.6	Very Dense	206	>110	1737

DCP GRAPHICAL REPRESENTATION



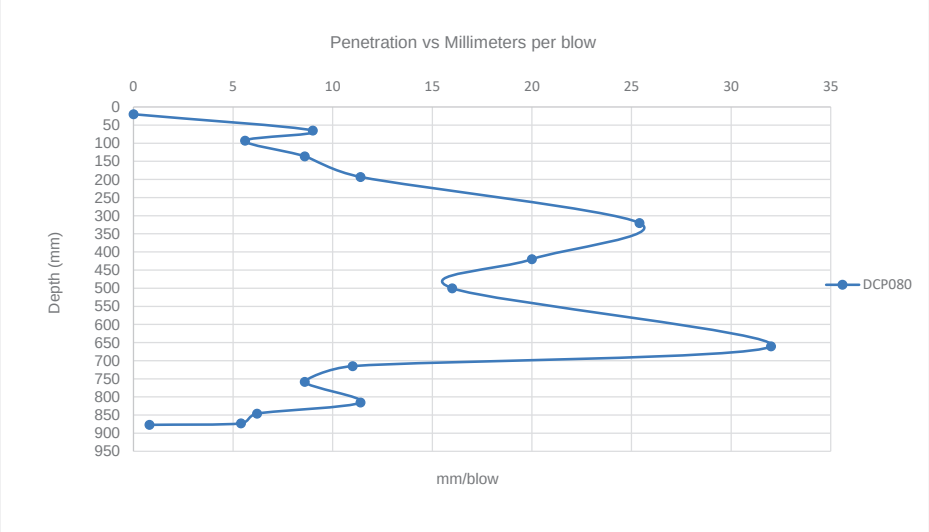


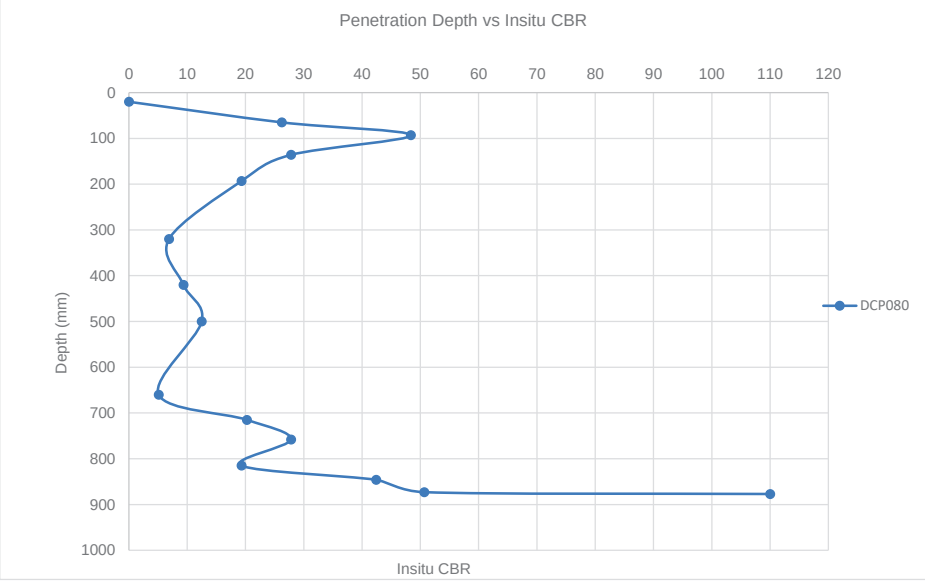
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP080	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	65	65mm	45	9.0	Dense	25	26	264
10	93	93mm	28	5.6	Dense	46	48	443
15	136	136mm	43	8.6	Dense	27	28	278
20	193	193mm	57	11.4	Dense	19	19	204
25	320	320mm	127	25.4	Medium Dense	7	7	85
30	420	420mm	100	20.0	Medium Dense	9	9	111
35	500	500mm	80	16.0	Medium Dense	12	12	141
40	660	660mm	160	32.0	Loose	5	5	66
45	715	715mm	55	11.0	Dense	20	20	212
50	758	758mm	43	8.6	Dense	27	28	278
55	815	815mm	57	11.4	Dense	19	19	204
60	846	846mm	31	6.2	Dense	40	42	397
65	873	873mm	27	5.4	Dense	48	51	461
70	877	877mm	4	0.8	Very Dense	342	>110	3699

DCP GRAPHICAL REPRESENTATION



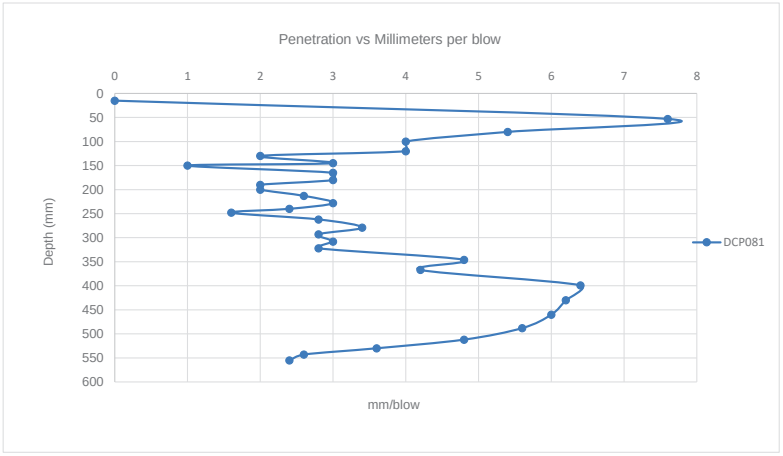


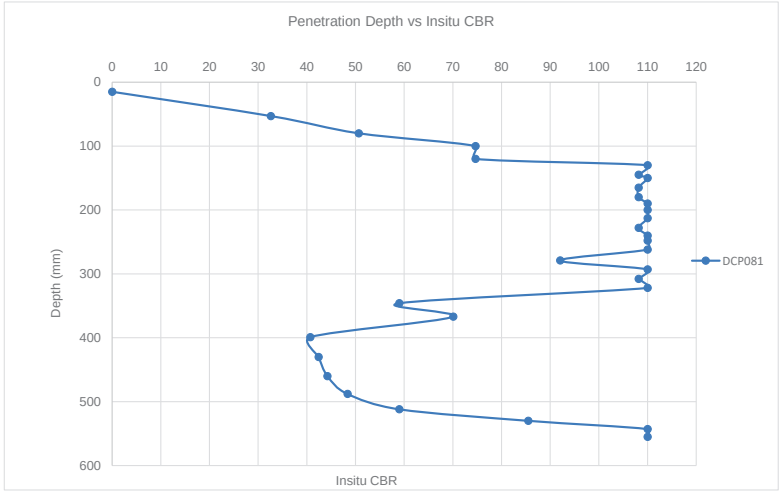
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP081	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	15	15mm	0	0				
5	53	53mm	38	7.6	Dense	31	33	318
10	80	80mm	27	5.4	Dense	48	51	461
15	100	100mm	20	4.0	Very Dense	70	75	640
20	120	120mm	20	4.0	Very Dense	70	75	640
25	130	130mm	10	2.0	Very Dense	170	>110	1362
30	145	145mm	15	3.0	Very Dense	102	108	876
35	150	150mm	5	1.0	Very Dense	300	>110	2900
40	165	165mm	15	3.0	Very Dense	102	108	876
45	180	180mm	15	3.0	Very Dense	102	108	876
50	190	190mm	10	2.0	Very Dense	170	>110	1362
55	200	200mm	10	2.0	Very Dense	170	>110	1362
60	213	213mm	13	2.6	Very Dense	122	>110	1023
65	228	228mm	15	3.0	Very Dense	102	108	876
70	240	240mm	12	2.4	Very Dense	135	>110	1117
75	248	248mm	8	1.6	Very Dense	206	>110	1737
80	262	262mm	14	2.8	Very Dense	111	>110	944
85	279	279mm	17	3.4	Very Dense	87	92	764
90	293	293mm	14	2.8	Very Dense	111	>110	944
95	308	308mm	15	3.0	Very Dense	102	108	876
100	322	322mm	14	2.8	Very Dense	111	>110	944
105	346	346mm	24	4.8	Very Dense	56	59	525
110	367	367mm	21	4.2	Very Dense	66	70	607
115	399	399mm	32	6.4	Dense	39	41	383
120	430	430mm	31	6.2	Dense	40	42	397
125	460	460mm	30	6.0	Dense	42	44	411
130	488	488mm	28	5.6	Dense	46	48	443
135	512	512mm	24	4.8	Very Dense	56	59	525
140	530	530mm	18	3.6	Very Dense	81	86	718
145	543	543mm	13	2.6	Very Dense	122	>110	1023
150	555	555mm	12	2.4	Very Dense	135	>110	1117

DCP GRAPHICAL REPRESENTATION



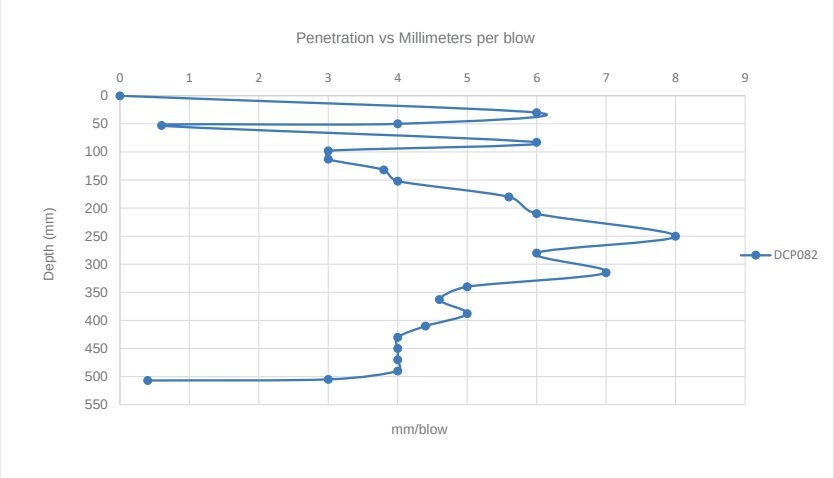


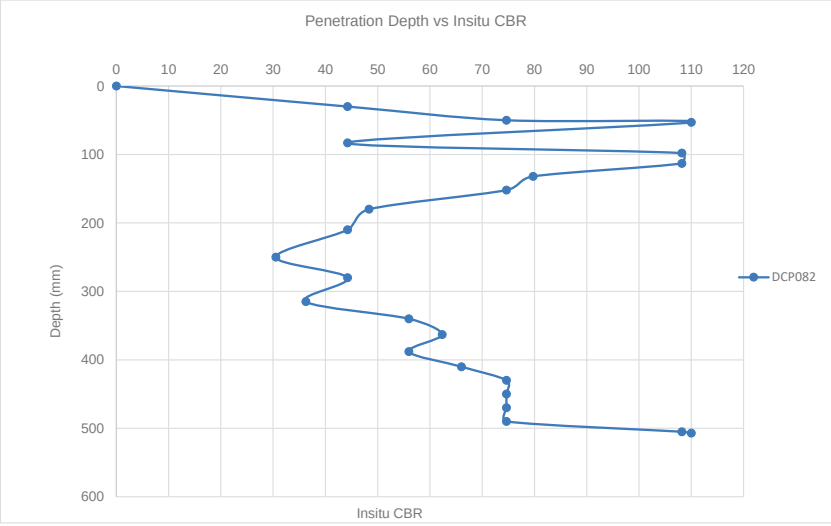
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP082	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	0	0mm	0	0				
5	30	30mm	30	6.0	Dense	42	44	411
10	50	50mm	20	4.0	Very Dense	70	75	640
15	53	53mm	3	0.6	Very Dense	389	>110	5061
20	83	83mm	30	6.0	Dense	42	44	411
25	98	98mm	15	3.0	Very Dense	102	108	876
30	113	113mm	15	3.0	Very Dense	102	108	876
35	132	132mm	19	3.8	Very Dense	75	80	677
40	152	152mm	20	4.0	Very Dense	70	75	640
45	180	180mm	28	5.6	Dense	46	48	443
50	210	210mm	30	6.0	Dense	42	44	411
55	250	250mm	40	8.0	Dense	29	31	301
60	280	280mm	30	6.0	Dense	42	44	411
65	315	315mm	35	7.0	Dense	35	36	348
70	340	340mm	25	5.0	Very Dense	53	56	502
75	363	363mm	23	4.6	Very Dense	59	62	550
80	388	388mm	25	5.0	Very Dense	53	56	502
85	410	410mm	22	4.4	Very Dense	62	66	577
90	430	430mm	20	4.0	Very Dense	70	75	640
95	450	450mm	20	4.0	Very Dense	70	75	640
100	470	470mm	20	4.0	Very Dense	70	75	640
105	490	490mm	20	4.0	Very Dense	70	75	640
110	505	505mm	15	3.0	Very Dense	102	108	876
115	507	507mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



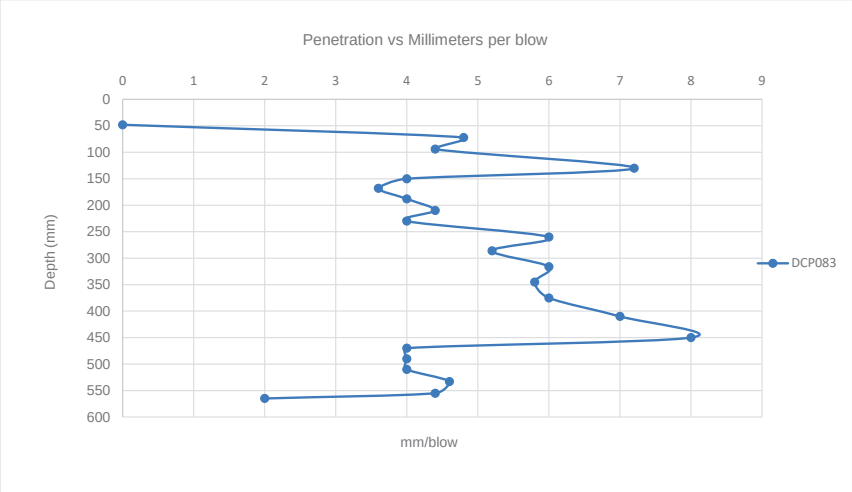


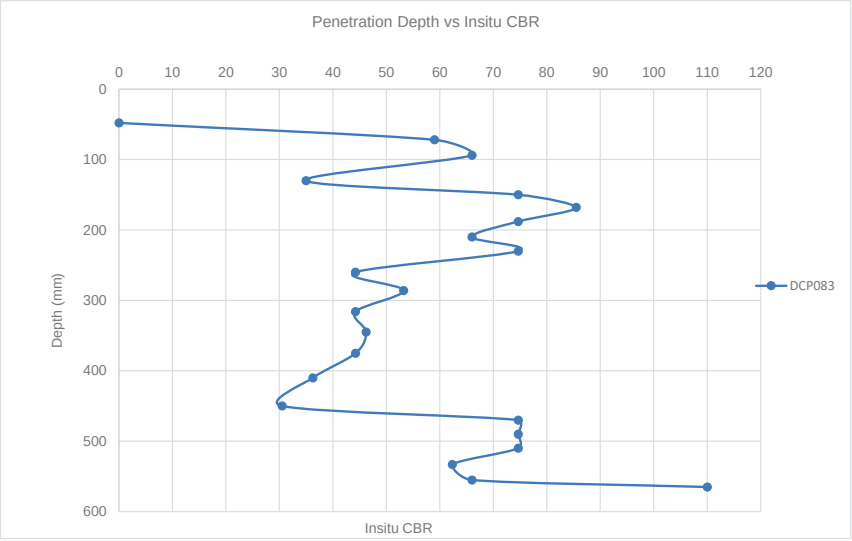
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP083	**STARTING DEPTH:**	48mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	48	48mm	0	0				
5	72	72mm	24	4.8	Very Dense	56	59	525
10	94	94mm	22	4.4	Very Dense	62	66	577
15	130	130mm	36	7.2	Dense	33	35	337
20	150	150mm	20	4.0	Very Dense	70	75	640
25	168	168mm	18	3.6	Very Dense	81	86	718
30	188	188mm	20	4.0	Very Dense	70	75	640
35	210	210mm	22	4.4	Very Dense	62	66	577
40	230	230mm	20	4.0	Very Dense	70	75	640
45	260	260mm	30	6.0	Dense	42	44	411
50	286	286mm	26	5.2	Dense	51	53	481
55	316	316mm	30	6.0	Dense	42	44	411
60	345	345mm	29	5.8	Dense	44	46	427
65	375	375mm	30	6.0	Dense	42	44	411
70	410	410mm	35	7.0	Dense	35	36	348
75	450	450mm	40	8.0	Dense	29	31	301
80	470	470mm	20	4.0	Very Dense	70	75	640
85	490	490mm	20	4.0	Very Dense	70	75	640
90	510	510mm	20	4.0	Very Dense	70	75	640
95	533	533mm	23	4.6	Very Dense	59	62	550
100	555	555mm	22	4.4	Very Dense	62	66	577
105	565	565mm	10	2.0	Very Dense	170	>110	1362

DCP GRAPHICAL REPRESENTATION



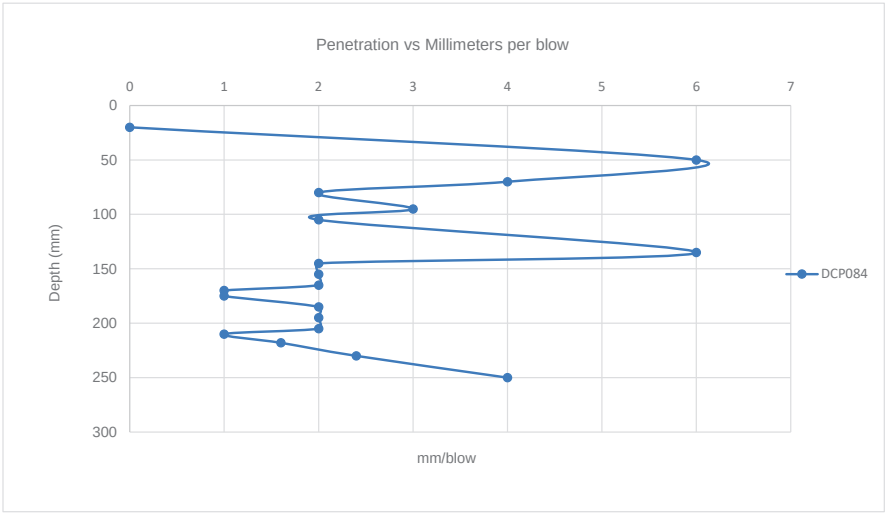


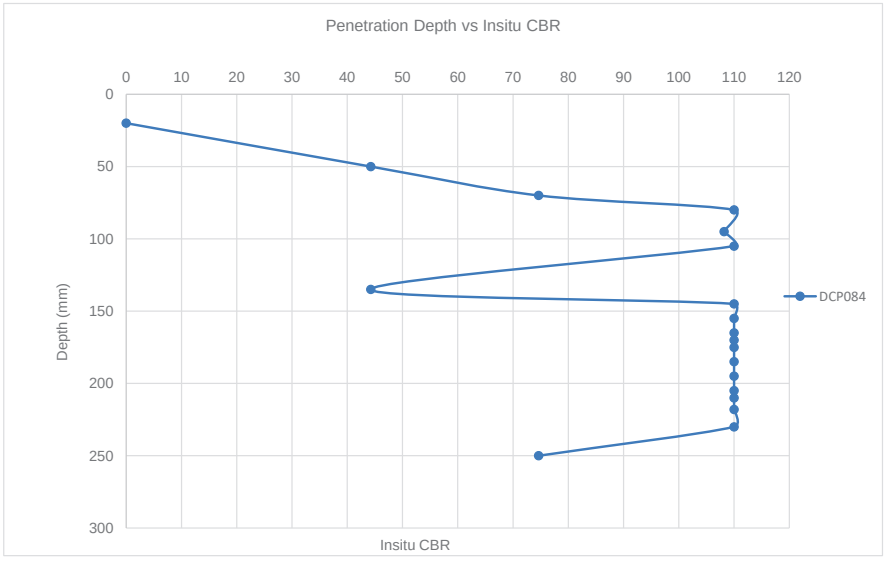
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP084	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	20	20mm	0	0				
5	50	50mm	30	6.0	Dense	42	44	411
10	70	70mm	20	4.0	Very Dense	70	75	640
15	80	80mm	10	2.0	Very Dense	170	>110	1362
20	95	95mm	15	3.0	Very Dense	102	108	876
25	105	105mm	10	2.0	Very Dense	170	>110	1362
30	135	135mm	30	6.0	Dense	42	44	411
35	145	145mm	10	2.0	Very Dense	170	>110	1362
40	155	155mm	10	2.0	Very Dense	170	>110	1362
45	165	165mm	10	2.0	Very Dense	170	>110	1362
50	170	170mm	5	1.0	Very Dense	300	>110	2900
55	175	175mm	5	1.0	Very Dense	300	>110	2900
60	185	185mm	10	2.0	Very Dense	170	>110	1362
65	195	195mm	10	2.0	Very Dense	170	>110	1362
70	205	205mm	10	2.0	Very Dense	170	>110	1362
75	210	210mm	5	1.0	Very Dense	300	>110	2900
80	218	218mm	8	1.6	Very Dense	206	>110	1737
85	230	230mm	12	2.4	Very Dense	135	>110	1117
90	250	250mm	20	4.0	Very Dense	70	75	640

DCP GRAPHICAL REPRESENTATION



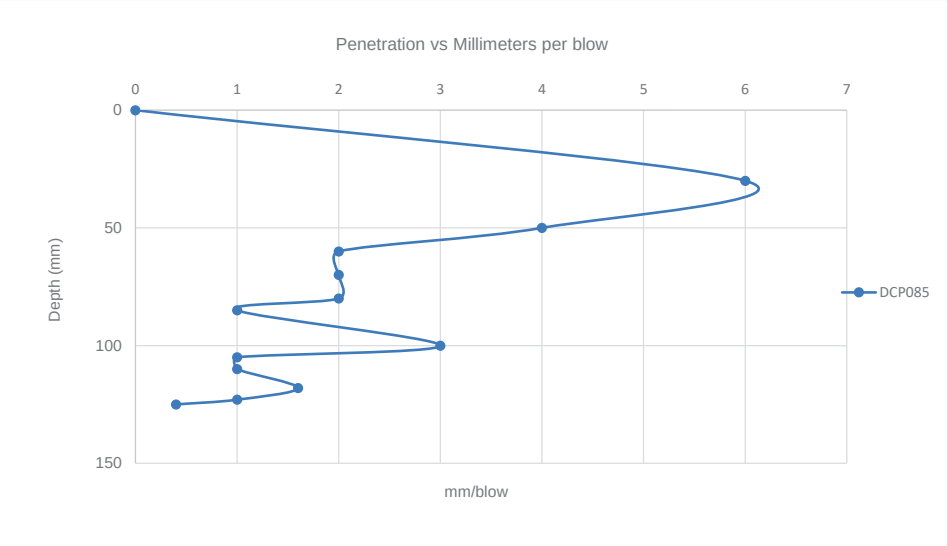


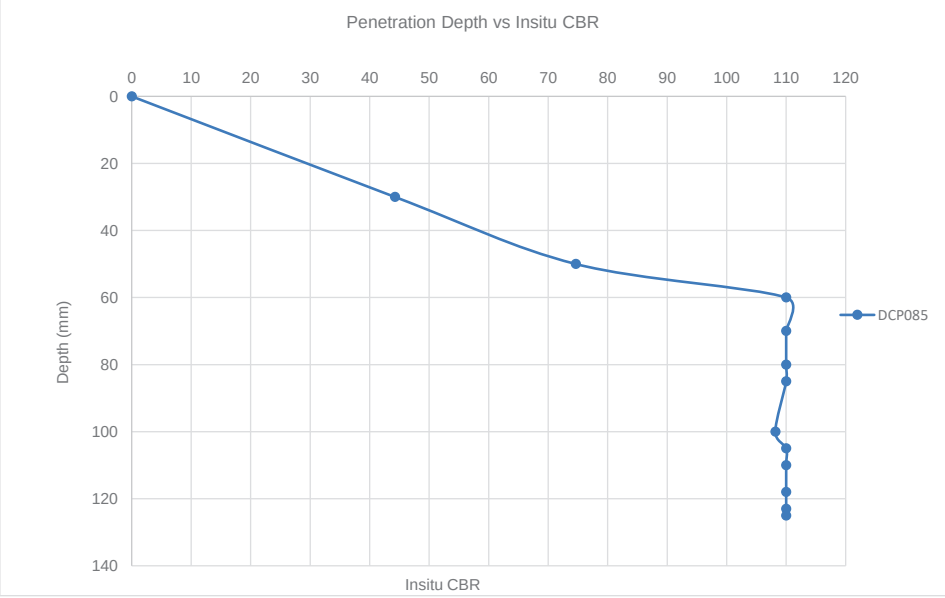
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP085	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0				
5	30	30mm	30	6.0	Dense	42	44	411
10	50	50mm	20	4.0	Very Dense	70	75	640
15	60	60mm	10	2.0	Very Dense	170	>110	1362
20	70	70mm	10	2.0	Very Dense	170	>110	1362
25	80	80mm	10	2.0	Very Dense	170	>110	1362
30	85	85mm	5	1.0	Very Dense	300	>110	2900
35	100	100mm	15	3.0	Very Dense	102	108	876
40	105	105mm	5	1.0	Very Dense	300	>110	2900
45	110	110mm	5	1.0	Very Dense	300	>110	2900
50	118	118mm	8	1.6	Very Dense	206	>110	1737
55	123	123mm	5	1.0	Very Dense	300	>110	2900
60	125	125mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



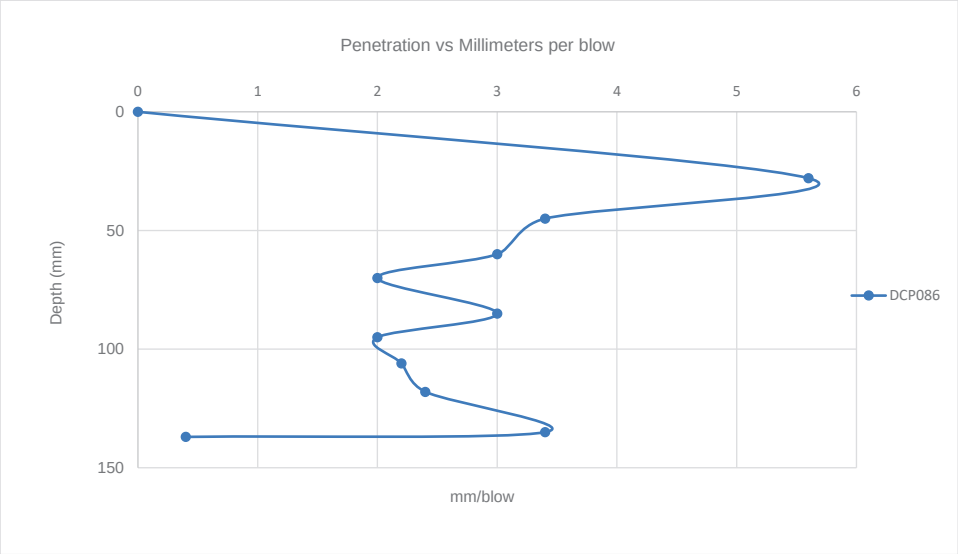


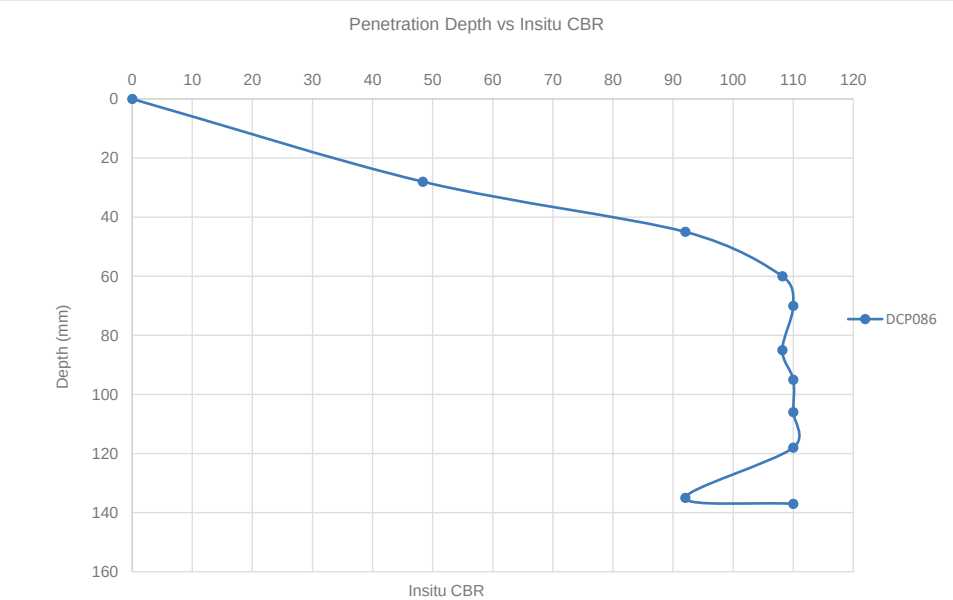
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP086	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	0	0mm	0	0				
5	28	28mm	28	5.6	Dense	46	48	443
10	45	45mm	17	3.4	Very Dense	87	92	764
15	60	60mm	15	3.0	Very Dense	102	108	876
20	70	70mm	10	2.0	Very Dense	170	>110	1362
25	85	85mm	15	3.0	Very Dense	102	108	876
30	95	95mm	10	2.0	Very Dense	170	>110	1362
35	106	106mm	11	2.2	Very Dense	151	>110	1228
40	118	118mm	12	2.4	Very Dense	135	>110	1117
45	135	135mm	17	3.4	Very Dense	87	92	764
50	137	137mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



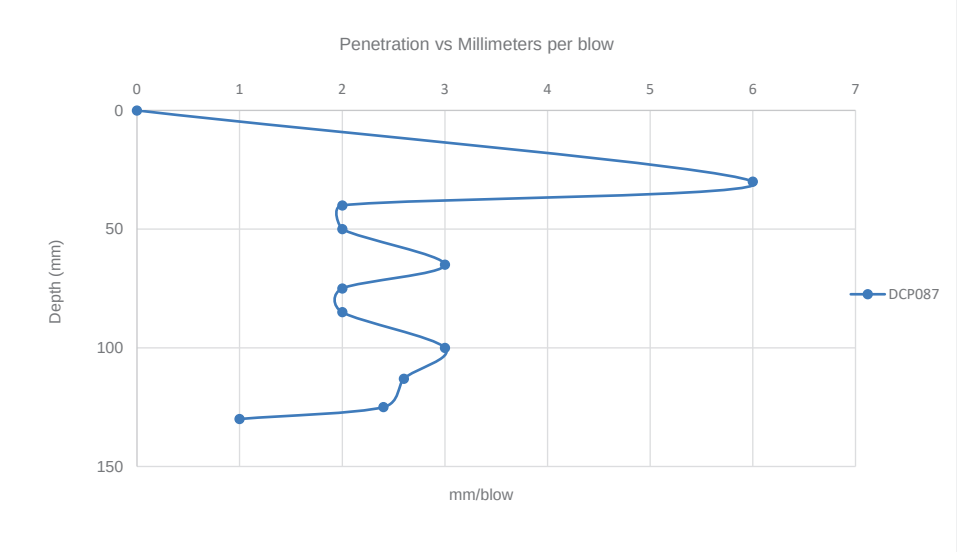


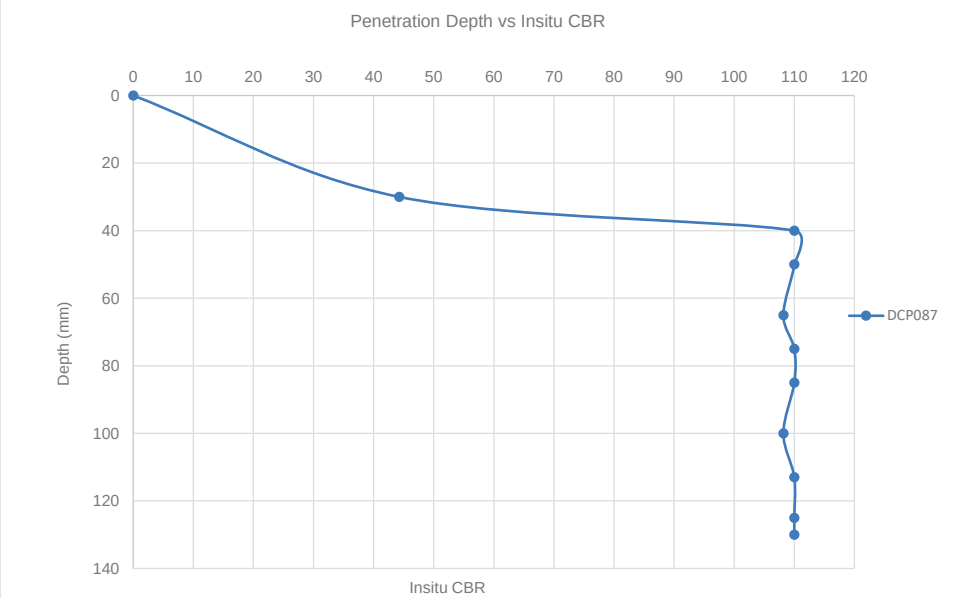
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP087	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	0	0mm	0	0				
5	30	30mm	30	6.0	Dense	42	44	411
10	40	40mm	10	2.0	Very Dense	170	>110	1362
15	50	50mm	10	2.0	Very Dense	170	>110	1362
20	65	65mm	15	3.0	Very Dense	102	108	876
25	75	75mm	10	2.0	Very Dense	170	>110	1362
30	85	85mm	10	2.0	Very Dense	170	>110	1362
35	100	100mm	15	3.0	Very Dense	102	108	876
40	113	113mm	13	2.6	Very Dense	122	>110	1023
45	125	125mm	12	2.4	Very Dense	135	>110	1117
50	130	130mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



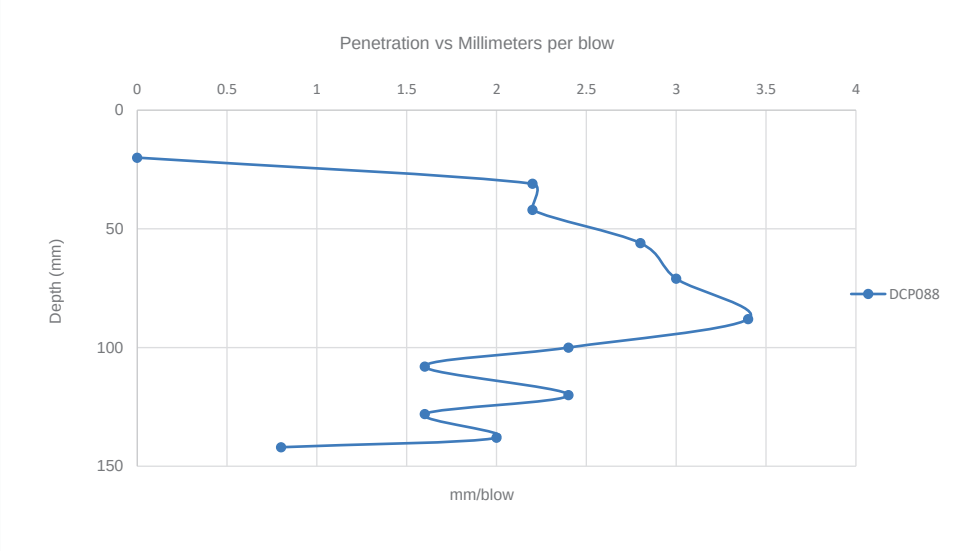


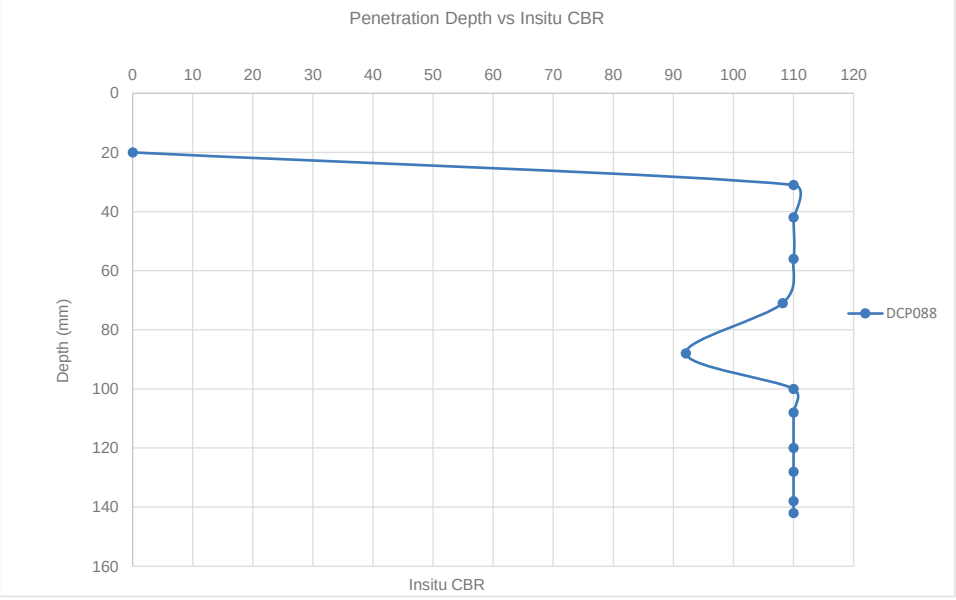
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP088	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	31	31mm	11	2.2	Very Dense	151	>110	1228
10	42	42mm	11	2.2	Very Dense	151	>110	1228
15	56	56mm	14	2.8	Very Dense	111	>110	944
20	71	71mm	15	3.0	Very Dense	102	108	876
25	88	88mm	17	3.4	Very Dense	87	92	764
30	100	100mm	12	2.4	Very Dense	135	>110	1117
35	108	108mm	8	1.6	Very Dense	206	>110	1737
40	120	120mm	12	2.4	Very Dense	135	>110	1117
45	128	128mm	8	1.6	Very Dense	206	>110	1737
50	138	138mm	10	2.0	Very Dense	170	>110	1362
55	142	142mm	4	0.8	Very Dense	342	>110	3699

DCP GRAPHICAL REPRESENTATION



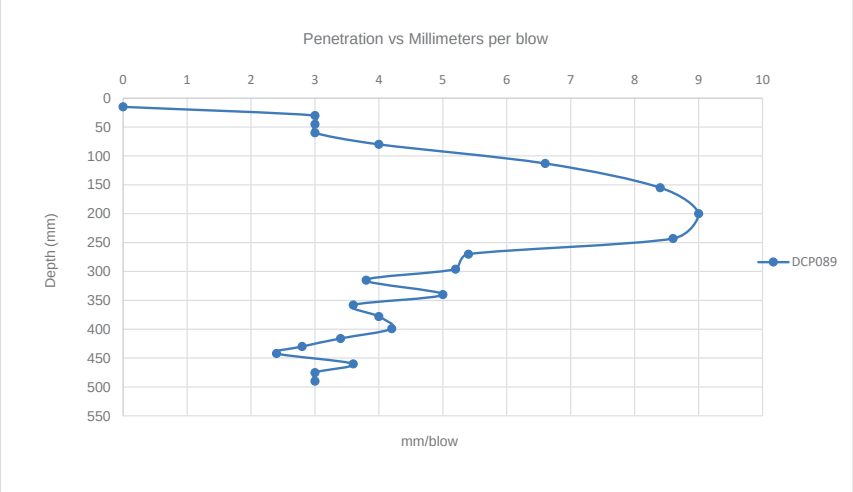


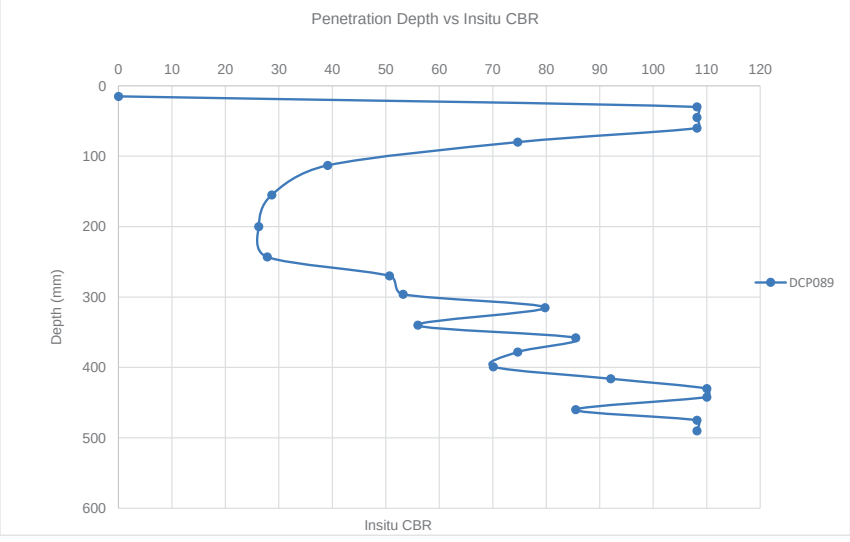
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP089	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	15	15mm	0	0				
5	30	30mm	15	3.0	Very Dense	102	108	876
10	45	45mm	15	3.0	Very Dense	102	108	876
15	60	60mm	15	3.0	Very Dense	102	108	876
20	80	80mm	20	4.0	Very Dense	70	75	640
25	113	113mm	33	6.6	Dense	37	39	371
30	155	155mm	42	8.4	Dense	27	29	285
35	200	200mm	45	9.0	Dense	25	26	264
40	243	243mm	43	8.6	Dense	27	28	278
45	270	270mm	27	5.4	Dense	48	51	461
50	296	296mm	26	5.2	Dense	51	53	481
55	315	315mm	19	3.8	Very Dense	75	80	677
60	340	340mm	25	5.0	Very Dense	53	56	502
65	358	358mm	18	3.6	Very Dense	81	86	718
70	378	378mm	20	4.0	Very Dense	70	75	640
75	399	399mm	21	4.2	Very Dense	66	70	607
80	416	416mm	17	3.4	Very Dense	87	92	764
85	430	430mm	14	2.8	Very Dense	111	>110	944
90	442	442mm	12	2.4	Very Dense	135	>110	1117
95	460	460mm	18	3.6	Very Dense	81	86	718
100	475	475mm	15	3.0	Very Dense	102	108	876
105	490	490mm	15	3.0	Very Dense	102	108	876

DCP GRAPHICAL REPRESENTATION



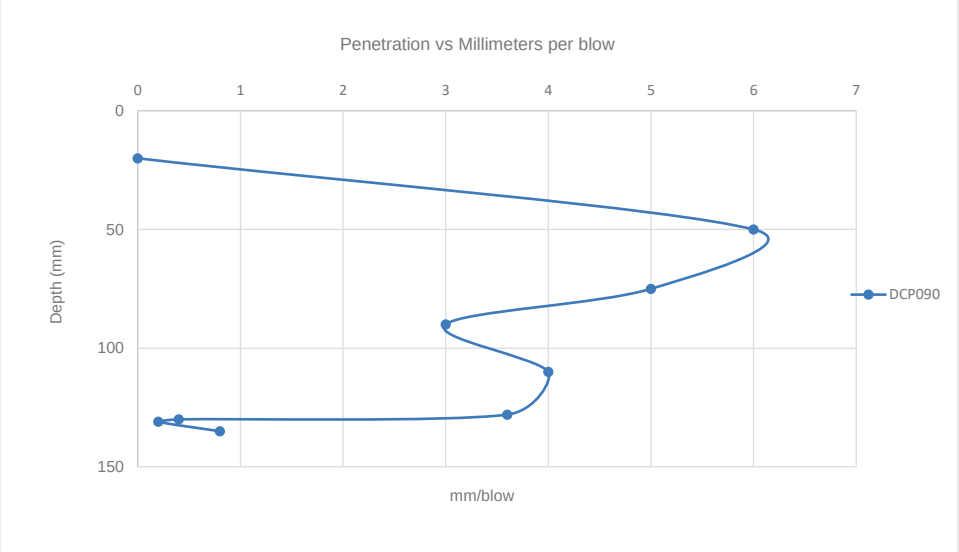


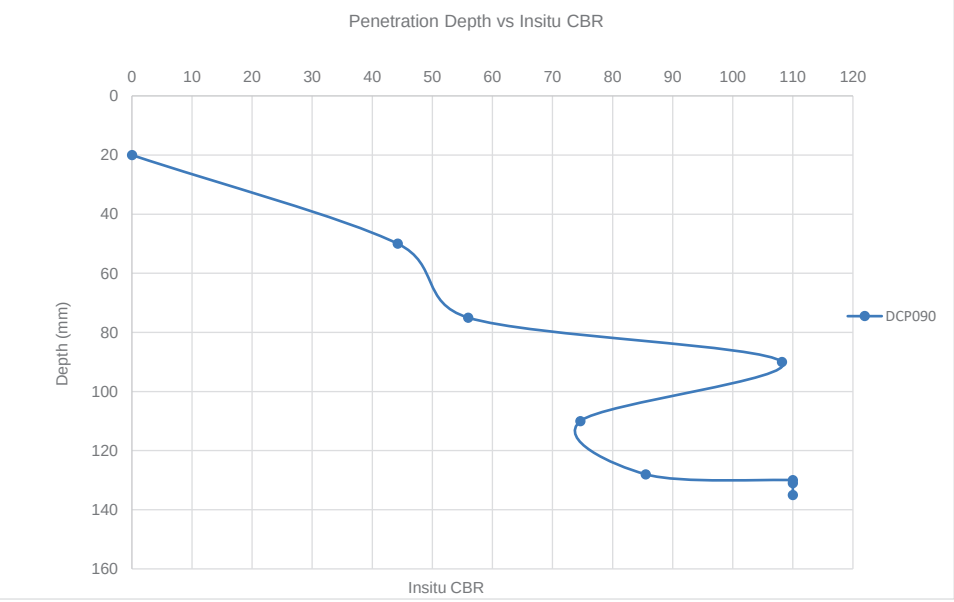
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP090	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	50	50mm	30	6.0	Dense	42	44	411
10	75	75mm	25	5.0	Very Dense	53	56	502
15	90	90mm	15	3.0	Very Dense	102	108	876
20	110	110mm	20	4.0	Very Dense	70	75	640
25	128	128mm	18	3.6	Very Dense	81	86	718
30	130	130mm	2	0.4	Very Dense	442	>110	7873
35	131	131mm	1	0.2	Very Dense	500	>110	16760
40	135	135mm	4	0.8	Very Dense	342	>110	3699

DCP GRAPHICAL REPRESENTATION



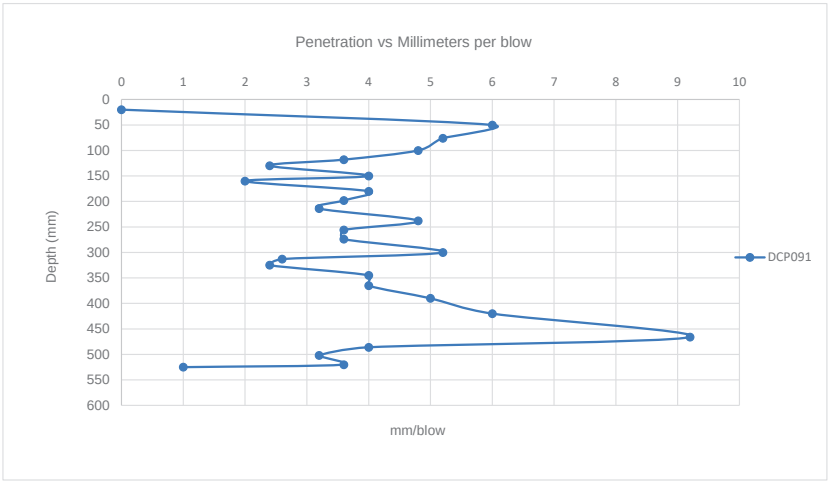


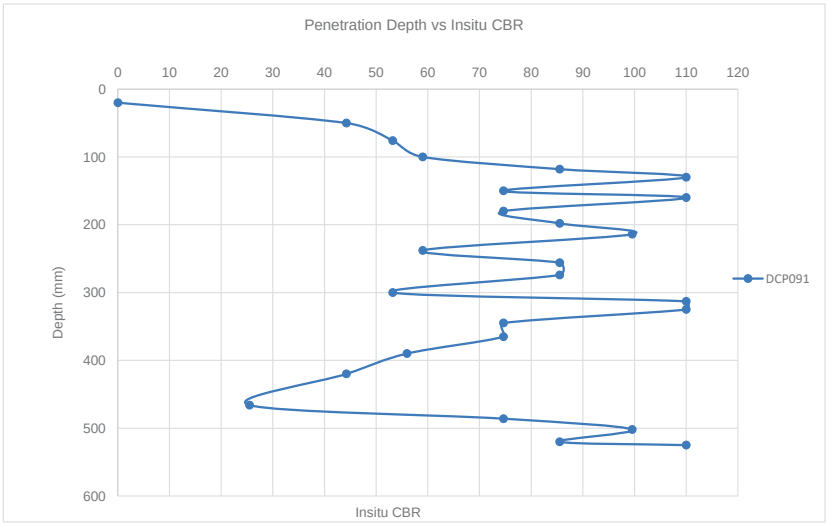
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP091	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	20	20mm	0	0				
5	50	50mm	30	6.0	Dense	42	44	411
10	76	76mm	26	5.2	Dense	51	53	481
15	100	100mm	24	4.8	Very Dense	56	59	525
20	118	118mm	18	3.6	Very Dense	81	86	718
25	130	130mm	12	2.4	Very Dense	135	>110	1117
30	150	150mm	20	4.0	Very Dense	70	75	640
35	160	160mm	10	2.0	Very Dense	170	>110	1362
40	180	180mm	20	4.0	Very Dense	70	75	640
45	198	198mm	18	3.6	Very Dense	81	86	718
50	214	214mm	16	3.2	Very Dense	94	100	816
55	238	238mm	24	4.8	Very Dense	56	59	525
60	256	256mm	18	3.6	Very Dense	81	86	718
65	274	274mm	18	3.6	Very Dense	81	86	718
70	300	300mm	26	5.2	Dense	51	53	481
75	313	313mm	13	2.6	Very Dense	122	>110	1023
80	325	325mm	12	2.4	Very Dense	135	>110	1117
85	345	345mm	20	4.0	Very Dense	70	75	640
90	365	365mm	20	4.0	Very Dense	70	75	640
95	390	390mm	25	5.0	Very Dense	53	56	502
100	420	420mm	30	6.0	Dense	42	44	411
105	466	466mm	46	9.2	Dense	24	25	258
110	486	486mm	20	4.0	Very Dense	70	75	640
115	502	502mm	16	3.2	Very Dense	94	100	816
120	520	520mm	18	3.6	Very Dense	81	86	718
125	525	525mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



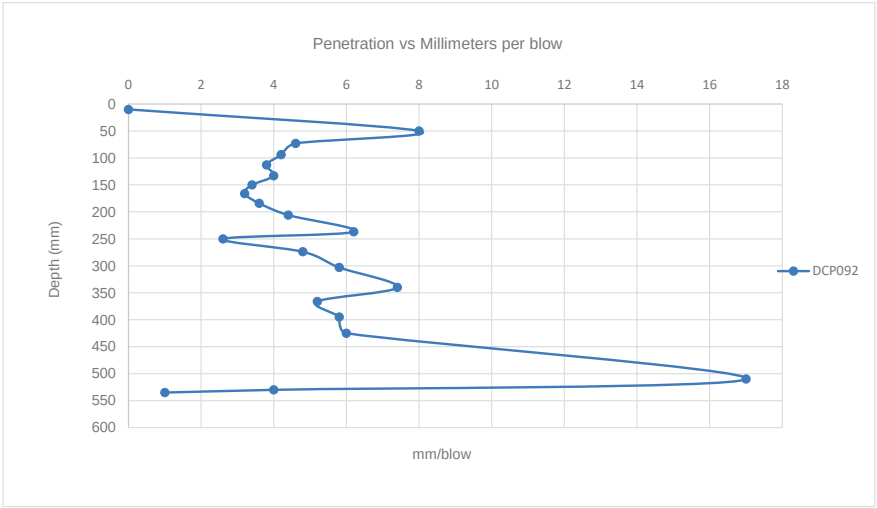


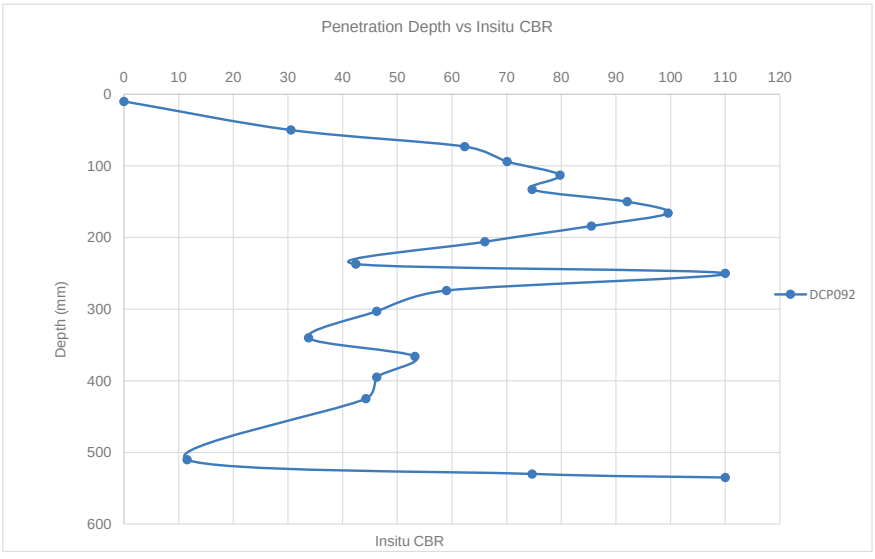
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP092	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	50	50mm	40	8.0	Dense	29	31	301
10	73	73mm	23	4.6	Very Dense	59	62	550
15	94	94mm	21	4.2	Very Dense	66	70	607
20	113	113mm	19	3.8	Very Dense	75	80	677
25	133	133mm	20	4.0	Very Dense	70	75	640
30	150	150mm	17	3.4	Very Dense	87	92	764
35	166	166mm	16	3.2	Very Dense	94	100	816
40	184	184mm	18	3.6	Very Dense	81	86	718
45	206	206mm	22	4.4	Very Dense	62	66	577
50	237	237mm	31	6.2	Dense	40	42	397
55	250	250mm	13	2.6	Very Dense	122	>110	1023
60	274	274mm	24	4.8	Very Dense	56	59	525
65	303	303mm	29	5.8	Dense	44	46	427
70	340	340mm	37	7.4	Dense	32	34	327
75	366	366mm	26	5.2	Dense	51	53	481
80	395	395mm	29	5.8	Dense	44	46	427
85	425	425mm	30	6.0	Dense	42	44	411
90	510	510mm	85	17.0	Medium Dense	11	12	132
95	530	530mm	20	4.0	Very Dense	70	75	640
100	535	535mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



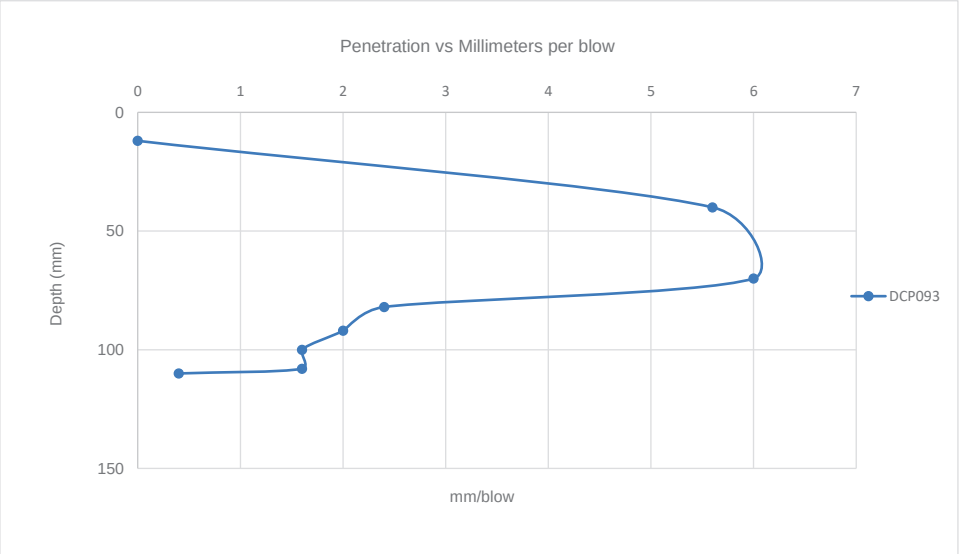


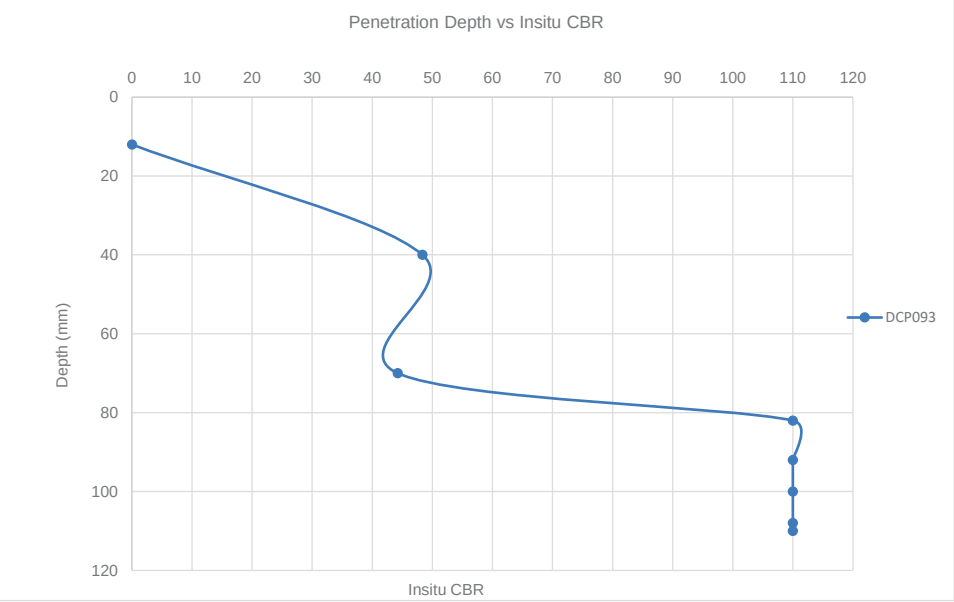
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP093	**STARTING DEPTH:**	12mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	12	12mm	0	0				
5	40	40mm	28	5.6	Dense	46	48	443
10	70	70mm	30	6.0	Dense	42	44	411
15	82	82mm	12	2.4	Very Dense	135	>110	1117
20	92	92mm	10	2.0	Very Dense	170	>110	1362
25	100	100mm	8	1.6	Very Dense	206	>110	1737
30	108	108mm	8	1.6	Very Dense	206	>110	1737
35	110	110mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



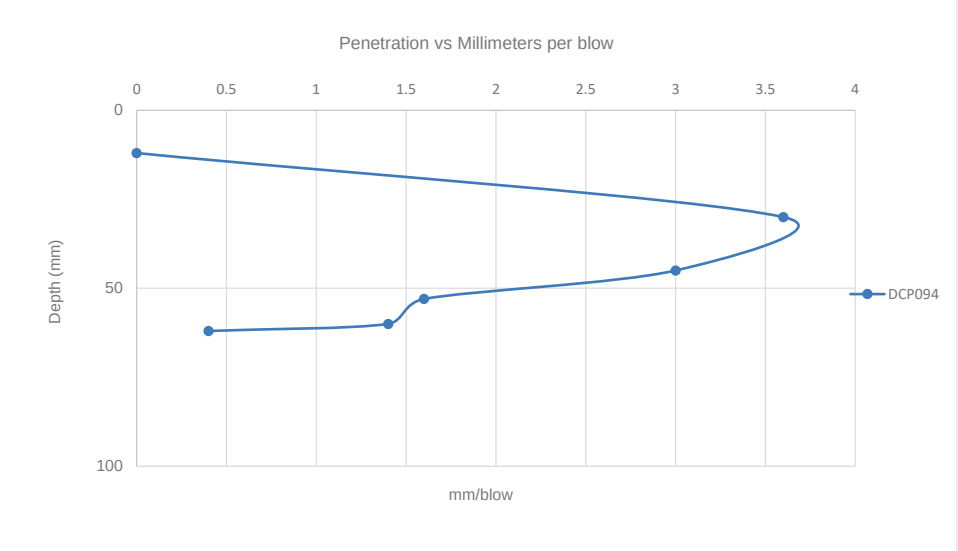


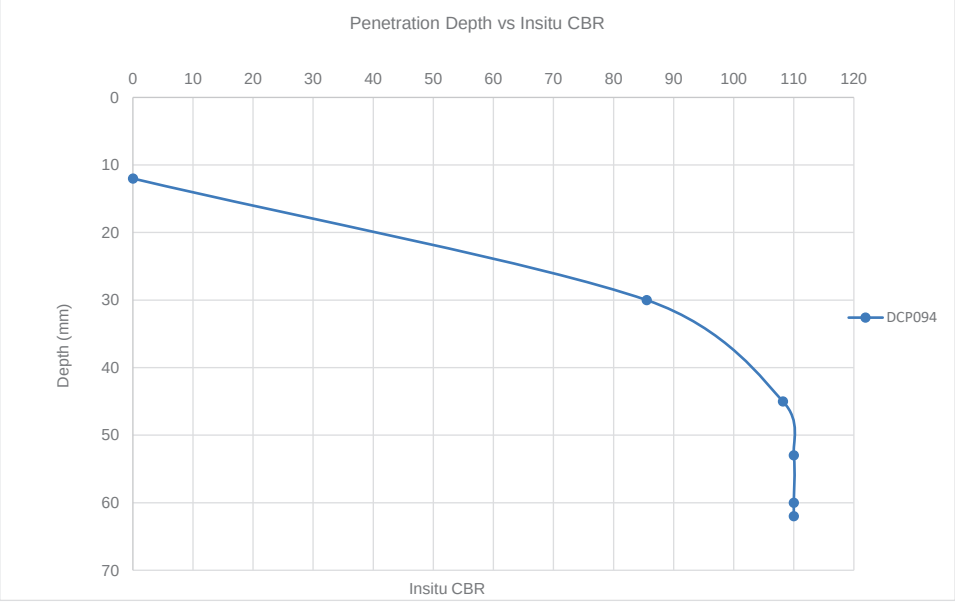
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP094	**STARTING DEPTH:**	12mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	12	12mm	0	0				
5	30	30mm	18	3.6	Very Dense	81	86	718
10	45	45mm	15	3.0	Very Dense	102	108	876
15	53	53mm	8	1.6	Very Dense	206	>110	1737
20	60	60mm	7	1.4	Very Dense	232	>110	2010
25	62	62mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



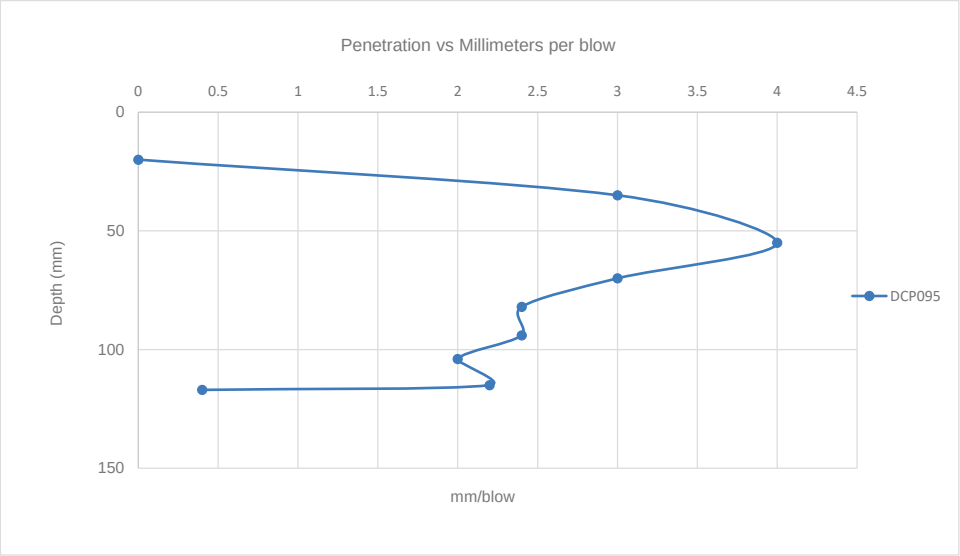


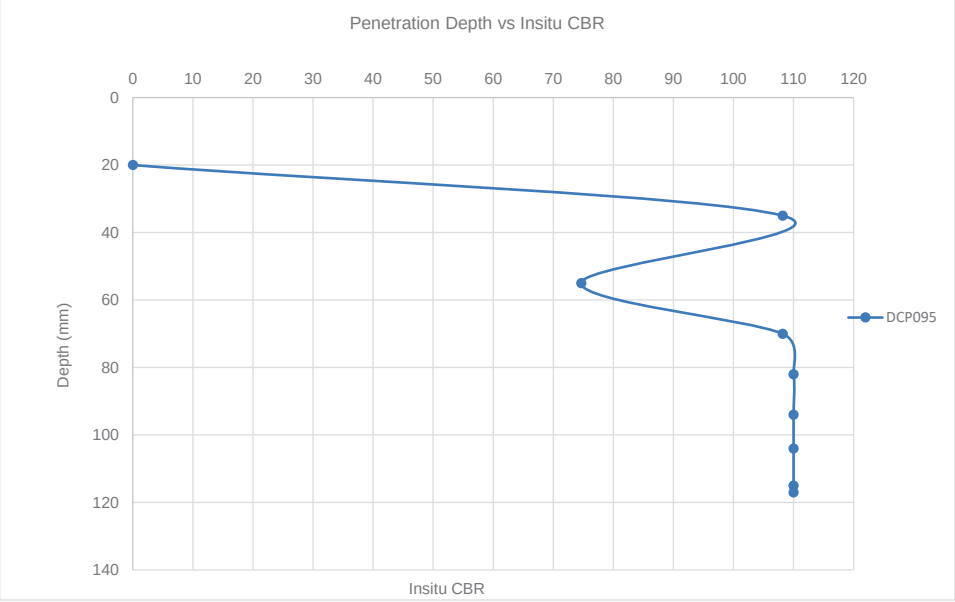
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP095	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	35	35mm	15	3.0	Very Dense	102	108	876
10	55	55mm	20	4.0	Very Dense	70	75	640
15	70	70mm	15	3.0	Very Dense	102	108	876
20	82	82mm	12	2.4	Very Dense	135	>110	1117
25	94	94mm	12	2.4	Very Dense	135	>110	1117
30	104	104mm	10	2.0	Very Dense	170	>110	1362
35	115	115mm	11	2.2	Very Dense	151	>110	1228
40	117	117mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



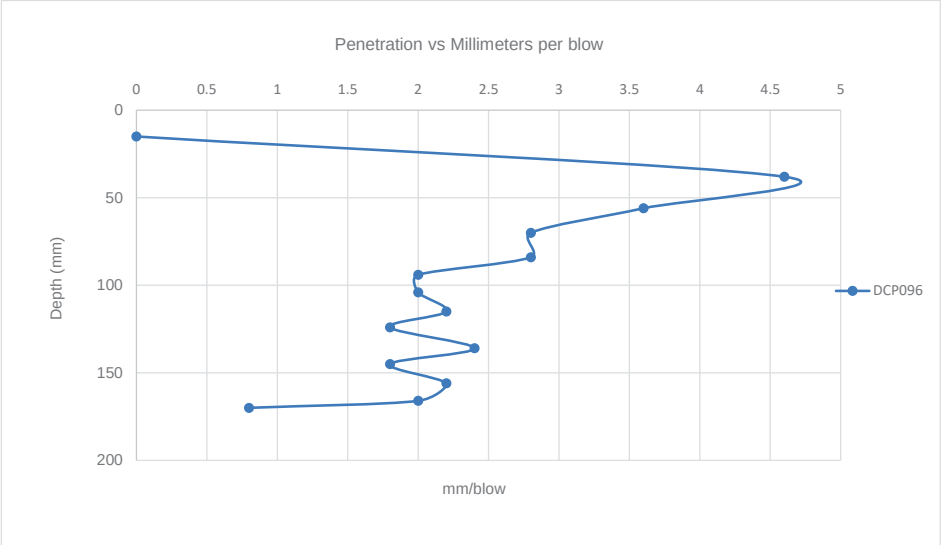


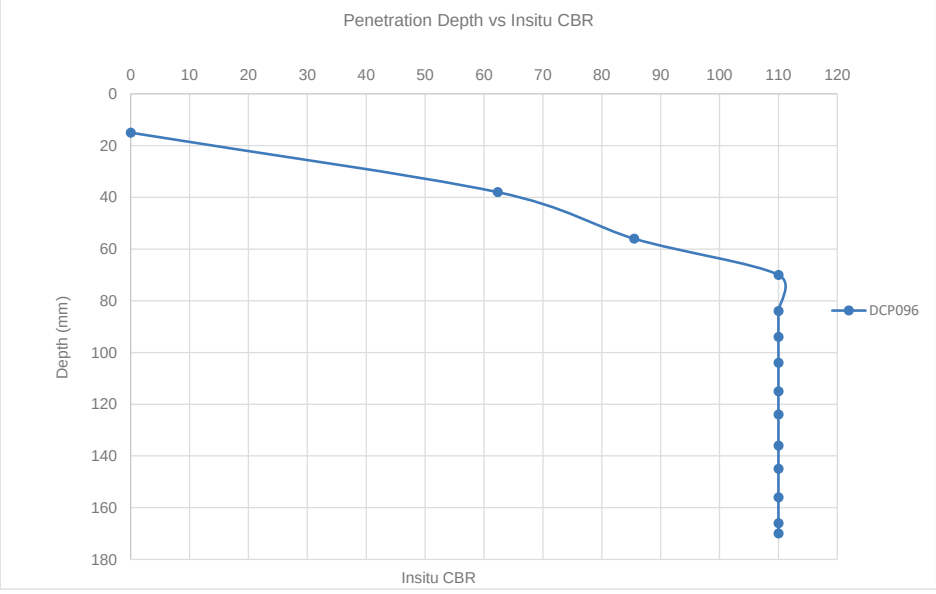
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP096	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	15	15mm	0	0				
5	38	38mm	23	4.6	Very Dense	59	62	550
10	56	56mm	18	3.6	Very Dense	81	86	718
15	70	70mm	14	2.8	Very Dense	111	>110	944
20	84	84mm	14	2.8	Very Dense	111	>110	944
25	94	94mm	10	2.0	Very Dense	170	>110	1362
30	104	104mm	10	2.0	Very Dense	170	>110	1362
35	115	115mm	11	2.2	Very Dense	151	>110	1228
40	124	124mm	9	1.8	Very Dense	185	>110	1528
45	136	136mm	12	2.4	Very Dense	135	>110	1117
50	145	145mm	9	1.8	Very Dense	185	>110	1528
55	156	156mm	11	2.2	Very Dense	151	>110	1228
60	166	166mm	10	2.0	Very Dense	170	>110	1362
65	170	170mm	4	0.8	Very Dense	342	>110	3699

DCP GRAPHICAL REPRESENTATION



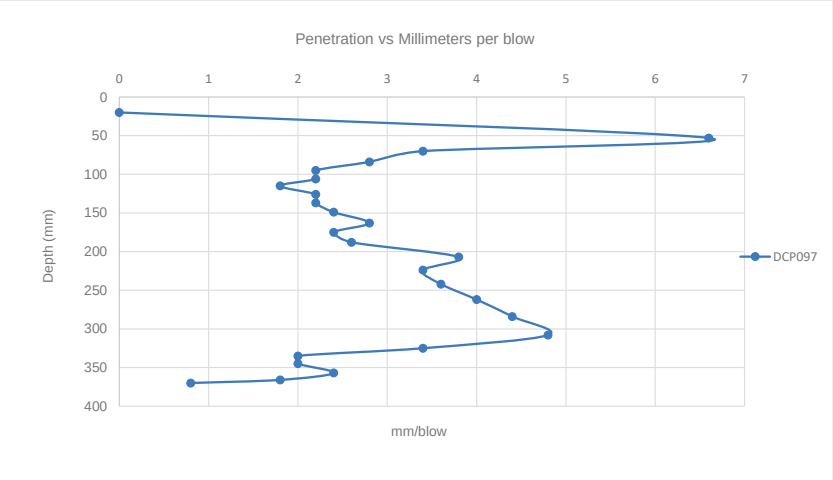


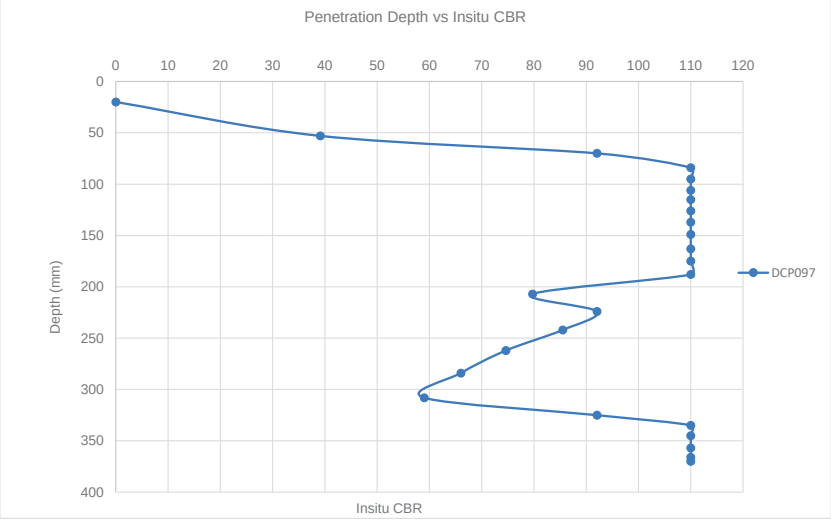
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP097	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	53	53mm	33	6.6	Dense	37	39	371
10	70	70mm	17	3.4	Very Dense	87	92	764
15	84	84mm	14	2.8	Very Dense	111	>110	944
20	95	95mm	11	2.2	Very Dense	151	>110	1228
25	106	106mm	11	2.2	Very Dense	151	>110	1228
30	115	115mm	9	1.8	Very Dense	185	>110	1528
35	126	126mm	11	2.2	Very Dense	151	>110	1228
40	137	137mm	11	2.2	Very Dense	151	>110	1228
45	149	149mm	12	2.4	Very Dense	135	>110	1117
50	163	163mm	14	2.8	Very Dense	111	>110	944
55	175	175mm	12	2.4	Very Dense	135	>110	1117
60	188	188mm	13	2.6	Very Dense	122	>110	1023
65	207	207mm	19	3.8	Very Dense	75	80	677
70	224	224mm	17	3.4	Very Dense	87	92	764
75	242	242mm	18	3.6	Very Dense	81	86	718
80	262	262mm	20	4.0	Very Dense	70	75	640
85	284	284mm	22	4.4	Very Dense	62	66	577
90	308	308mm	24	4.8	Very Dense	56	59	525
95	325	325mm	17	3.4	Very Dense	87	92	764
100	335	335mm	10	2.0	Very Dense	170	>110	1362
105	345	345mm	10	2.0	Very Dense	170	>110	1362
110	357	357mm	12	2.4	Very Dense	135	>110	1117
115	366	366mm	9	1.8	Very Dense	185	>110	1528
120	370	370mm	4	0.8	Very Dense	342	>110	3699

DCP GRAPHICAL REPRESENTATION



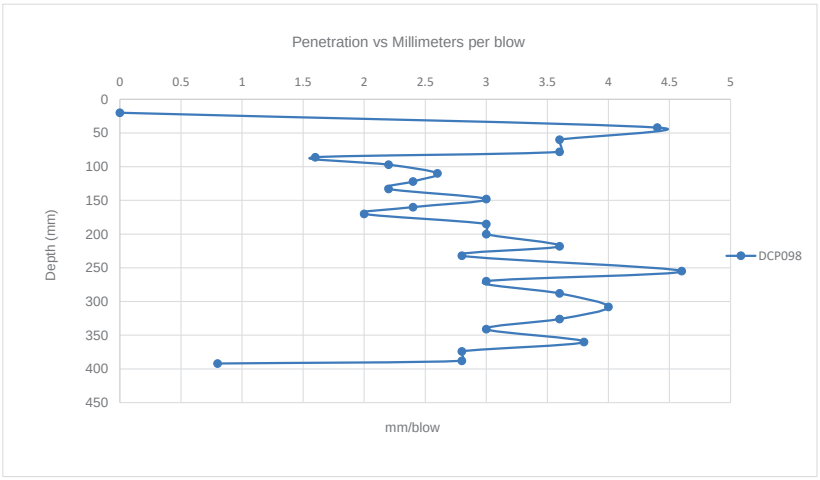


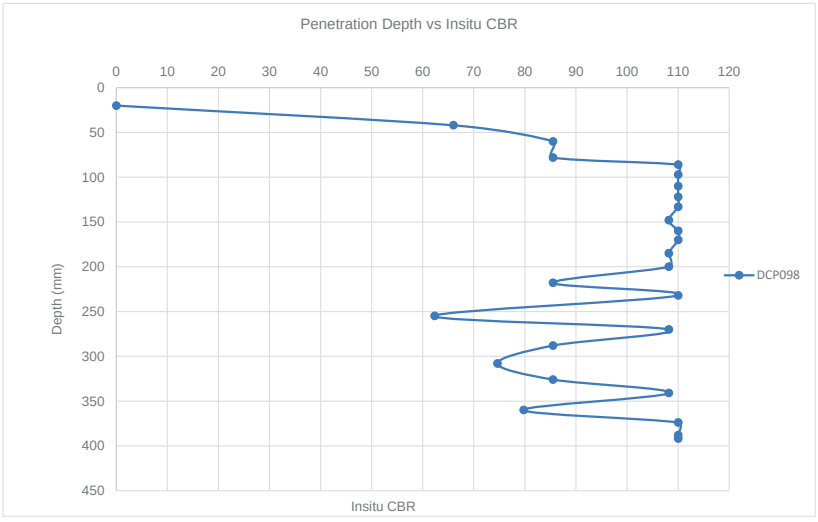
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP098	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	42	42mm	22	4.4	Very Dense	62	66	577
10	60	60mm	18	3.6	Very Dense	81	86	718
15	78	78mm	18	3.6	Very Dense	81	86	718
20	86	86mm	8	1.6	Very Dense	206	>110	1737
25	97	97mm	11	2.2	Very Dense	151	>110	1228
30	110	110mm	13	2.6	Very Dense	122	>110	1023
35	122	122mm	12	2.4	Very Dense	135	>110	1117
40	133	133mm	11	2.2	Very Dense	151	>110	1228
45	148	148mm	15	3.0	Very Dense	102	108	876
50	160	160mm	12	2.4	Very Dense	135	>110	1117
55	170	170mm	10	2.0	Very Dense	170	>110	1362
60	185	185mm	15	3.0	Very Dense	102	108	876
65	200	200mm	15	3.0	Very Dense	102	108	876
70	218	218mm	18	3.6	Very Dense	81	86	718
75	232	232mm	14	2.8	Very Dense	111	>110	944
80	255	255mm	23	4.6	Very Dense	59	62	550
85	270	270mm	15	3.0	Very Dense	102	108	876
90	288	288mm	18	3.6	Very Dense	81	86	718
95	308	308mm	20	4.0	Very Dense	70	75	640
100	326	326mm	18	3.6	Very Dense	81	86	718
105	341	341mm	15	3.0	Very Dense	102	108	876
110	360	360mm	19	3.8	Very Dense	75	80	677
115	374	374mm	14	2.8	Very Dense	111	>110	944
120	388	388mm	14	2.8	Very Dense	111	>110	944
125	392	392mm	4	0.8	Very Dense	342	>110	3699

DCP GRAPHICAL REPRESENTATION



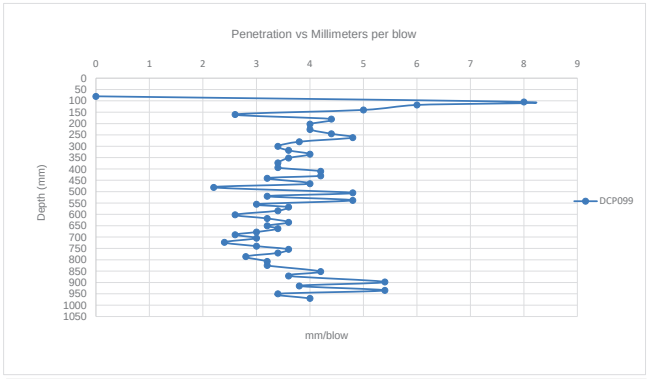


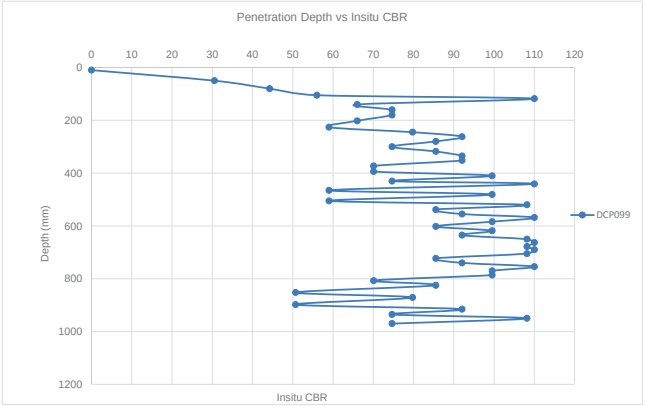
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP099	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	50	50mm	40	8.0	Dense	29	31	301
10	80	80mm	30	6.0	Dense	42	44	411
15	105	105mm	25	5.0	Very Dense	53	56	502
20	118	118mm	13	2.6	Very Dense	122	>110	1023
25	140	140mm	22	4.4	Very Dense	62	66	577
30	160	160mm	20	4.0	Very Dense	70	75	640
35	180	180mm	20	4.0	Very Dense	70	75	640
40	202	202mm	22	4.4	Very Dense	62	66	577
45	226	226mm	24	4.8	Very Dense	56	59	525
50	245	245mm	19	3.8	Very Dense	75	80	677
55	262	262mm	17	3.4	Very Dense	87	92	764
60	280	280mm	18	3.6	Very Dense	81	86	718
65	300	300mm	20	4.0	Very Dense	70	75	640
70	318	318mm	18	3.6	Very Dense	81	86	718
75	335	335mm	17	3.4	Very Dense	87	92	764
80	352	352mm	17	3.4	Very Dense	87	92	764
85	373	373mm	21	4.2	Very Dense	66	70	607
90	394	394mm	21	4.2	Very Dense	66	70	607
95	410	410mm	16	3.2	Very Dense	94	100	816
100	430	430mm	20	4.0	Very Dense	70	75	640
105	441	441mm	11	2.2	Very Dense	151	>110	1228
110	465	465mm	24	4.8	Very Dense	56	59	525
115	481	481mm	16	3.2	Very Dense	94	100	816
120	505	505mm	24	4.8	Very Dense	56	59	525
125	520	520mm	15	3.0	Very Dense	102	108	876
130	538	538mm	18	3.6	Very Dense	81	86	718
135	555	555mm	17	3.4	Very Dense	87	92	764
140	568	568mm	13	2.6	Very Dense	122	>110	1023
145	584	584mm	16	3.2	Very Dense	94	100	816
150	602	602mm	18	3.6	Very Dense	81	86	718
155	618	618mm	16	3.2	Very Dense	94	100	816
160	635	635mm	17	3.4	Very Dense	87	92	764
165	650	650mm	15	3.0	Very Dense	102	108	876
170	663	663mm	13	2.6	Very Dense	122	>110	1023
175	678	678mm	15	3.0	Very Dense	102	108	876
180	690	690mm	12	2.4	Very Dense	135	>110	1117
185	705	705mm	15	3.0	Very Dense	102	108	876
190	723	723mm	18	3.6	Very Dense	81	86	718
195	740	740mm	17	3.4	Very Dense	87	92	764
200	754	754mm	14	2.8	Very Dense	111	>110	944
205	770	770mm	16	3.2	Very Dense	94	100	816
210	786	786mm	16	3.2	Very Dense	94	100	816
215	807	807mm	21	4.2	Very Dense	66	70	607
220	825	825mm	18	3.6	Very Dense	81	86	718
225	852	852mm	27	5.4	Dense	48	51	461
230	871	871mm	19	3.8	Very Dense	75	80	677
235	898	898mm	27	5.4	Dense	48	51	461
240	915	915mm	17	3.4	Very Dense	87	92	764
245	935	935mm	20	4.0	Very Dense	70	75	640
250	950	950mm	15	3.0	Very Dense	102	108	876
255	970	970mm	20	4.0	Very Dense	70	75	640

DCP GRAPHICAL REPRESENTATION



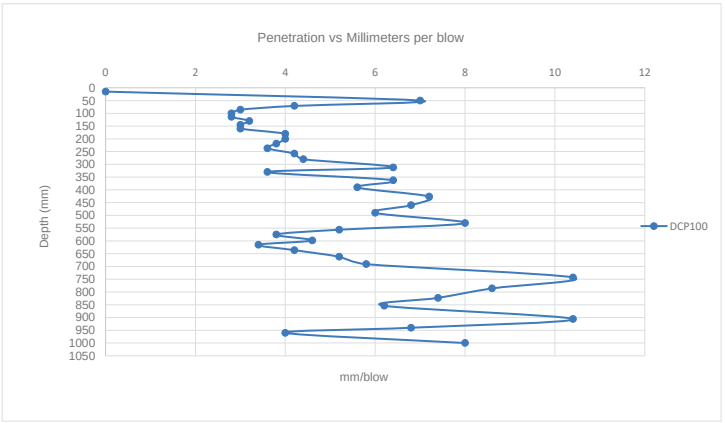


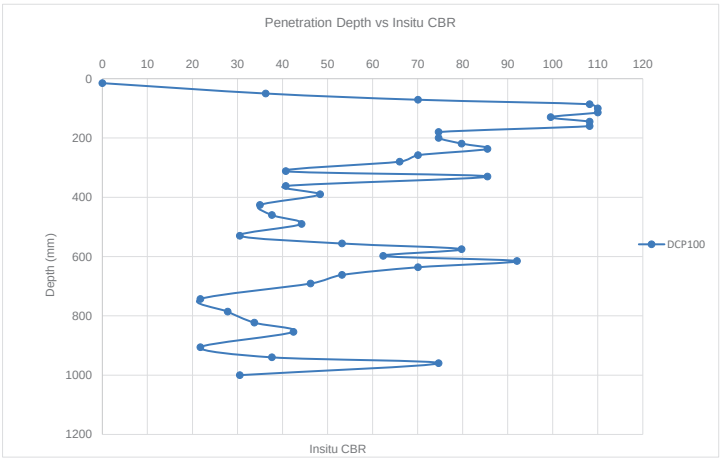
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP100	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	15	15mm	0	0				
5	50	50mm	35	7.0	Dense	35	36	348
10	71	71mm	21	4.2	Very Dense	66	70	607
15	86	86mm	15	3.0	Very Dense	102	108	876
20	100	100mm	14	2.8	Very Dense	111	>110	944
25	114	114mm	14	2.8	Very Dense	111	>110	944
30	130	130mm	16	3.2	Very Dense	94	100	816
35	145	145mm	15	3.0	Very Dense	102	108	876
40	160	160mm	15	3.0	Very Dense	102	108	876
45	180	180mm	20	4.0	Very Dense	70	75	640
50	200	200mm	20	4.0	Very Dense	70	75	640
55	219	219mm	19	3.8	Very Dense	75	80	677
60	237	237mm	18	3.6	Very Dense	81	86	718
65	258	258mm	21	4.2	Very Dense	66	70	607
70	280	280mm	22	4.4	Very Dense	62	66	577
75	312	312mm	32	6.4	Dense	39	41	383
80	330	330mm	18	3.6	Very Dense	81	86	718
85	362	362mm	32	6.4	Dense	39	41	383
90	390	390mm	28	5.6	Dense	46	48	443
95	426	426mm	36	7.2	Dense	33	35	337
100	460	460mm	34	6.8	Dense	36	38	359
105	490	490mm	30	6.0	Dense	42	44	411
110	530	530mm	40	8.0	Dense	29	31	301
115	556	556mm	26	5.2	Dense	51	53	481
120	575	575mm	19	3.8	Very Dense	75	80	677
125	598	598mm	23	4.6	Very Dense	59	62	550
130	615	615mm	17	3.4	Very Dense	87	92	764
135	636	636mm	21	4.2	Very Dense	66	70	607
140	662	662mm	26	5.2	Dense	51	53	481
145	691	691mm	29	5.8	Dense	44	46	427
150	743	743mm	52	10.4	Dense	21	22	226
155	786	786mm	43	8.6	Dense	27	28	278
160	823	823mm	37	7.4	Dense	32	34	327
165	854	854mm	31	6.2	Dense	40	42	397
170	906	906mm	52	10.4	Dense	21	22	226
175	940	940mm	34	6.8	Dense	36	38	359
180	960	960mm	20	4.0	Very Dense	70	75	640
185	1000	1000mm	40	8.0	Dense	29	31	301

DCP GRAPHICAL REPRESENTATION



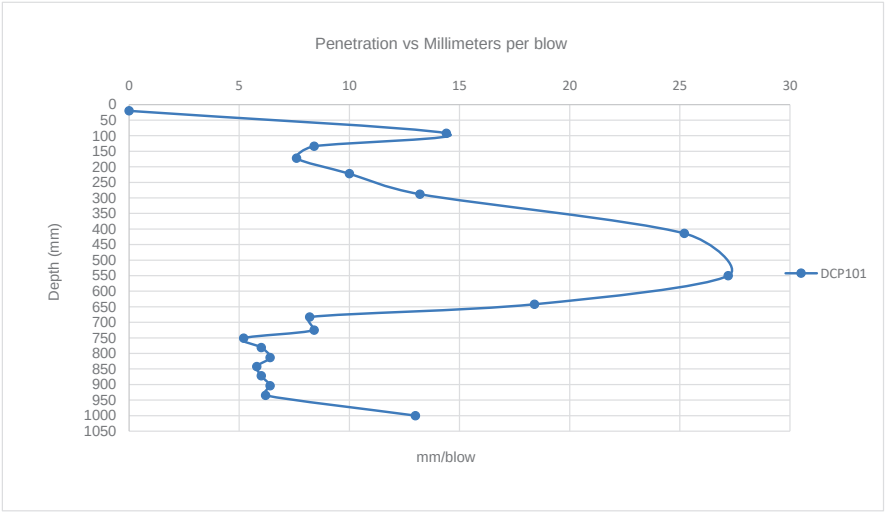


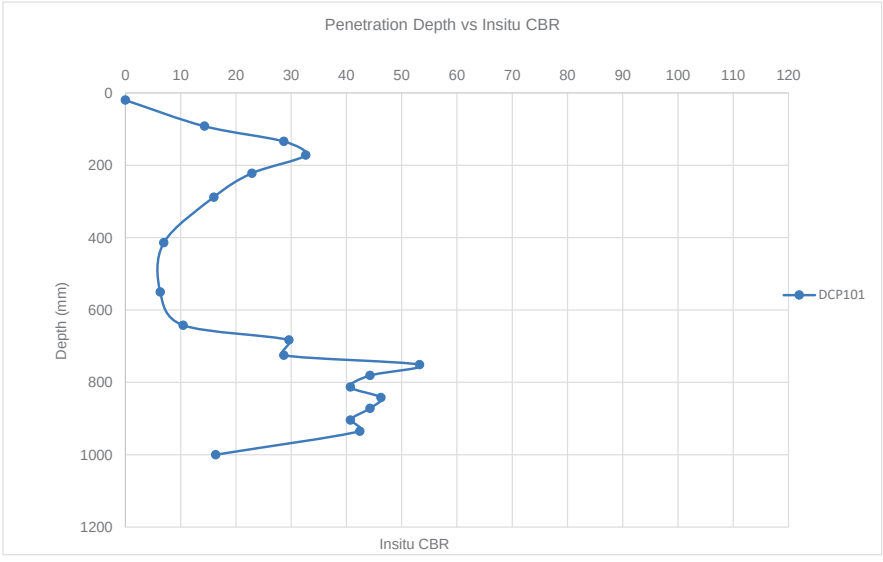
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP101	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	20	20mm	0	0				
5	92	92mm	72	14.4	Medium Dense	14	14	158
10	134	134mm	42	8.4	Dense	27	29	285
15	172	172mm	38	7.6	Dense	31	33	318
20	222	222mm	50	10.0	Dense	22	23	236
25	288	288mm	66	13.2	Medium Dense	15	16	174
30	414	414mm	126	25.2	Medium Dense	7	7	86
35	550	550mm	136	27.2	Medium Dense	6	6	79
40	642	642mm	92	18.4	Medium Dense	10	10	121
45	683	683mm	41	8.2	Dense	28	30	293
50	725	725mm	42	8.4	Dense	27	29	285
55	751	751mm	26	5.2	Dense	51	53	481
60	781	781mm	30	6.0	Dense	42	44	411
65	813	813mm	32	6.4	Dense	39	41	383
70	842	842mm	29	5.8	Dense	44	46	427
75	872	872mm	30	6.0	Dense	42	44	411
80	904	904mm	32	6.4	Dense	39	41	383
85	935	935mm	31	6.2	Dense	40	42	397
90	1000	1000mm	65	13.0	Medium Dense	16	16	177

DCP GRAPHICAL REPRESENTATION



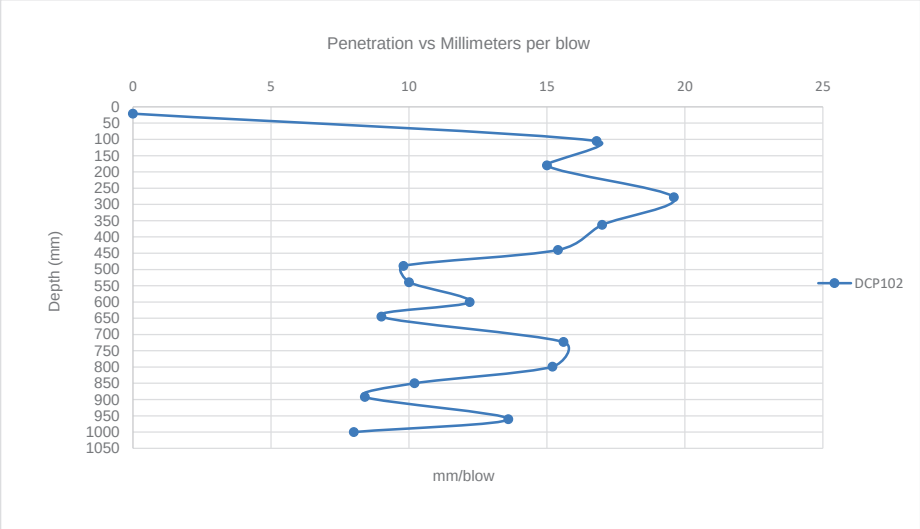


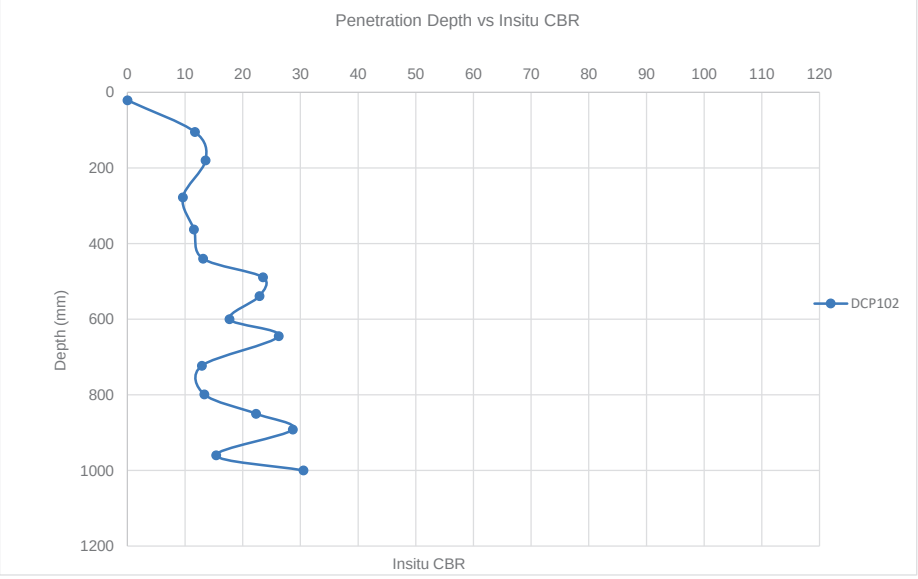
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP102	**STARTING DEPTH:**	21mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	21	21mm	0	0				
5	105	105mm	84	16.8	Medium Dense	11	12	134
10	180	180mm	75	15.0	Medium Dense	13	14	152
15	278	278mm	98	19.6	Medium Dense	9	10	113
20	363	363mm	85	17.0	Medium Dense	11	12	132
25	440	440mm	77	15.4	Medium Dense	13	13	147
30	489	489mm	49	9.8	Dense	23	23	241
35	539	539mm	50	10.0	Dense	22	23	236
40	600	600mm	61	12.2	Dense	17	18	190
45	645	645mm	45	9.0	Dense	25	26	264
50	723	723mm	78	15.6	Medium Dense	13	13	145
55	799	799mm	76	15.2	Medium Dense	13	13	149
60	850	850mm	51	10.2	Dense	21	22	231
65	892	892mm	42	8.4	Dense	27	29	285
70	960	960mm	68	13.6	Medium Dense	15	15	169
75	1000	1000mm	40	8.0	Dense	29	31	301

DCP GRAPHICAL REPRESENTATION



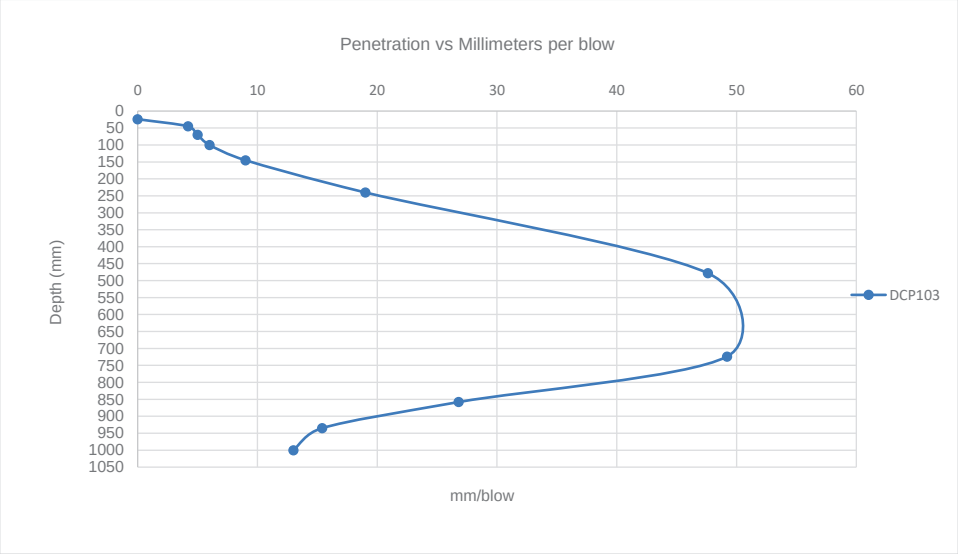


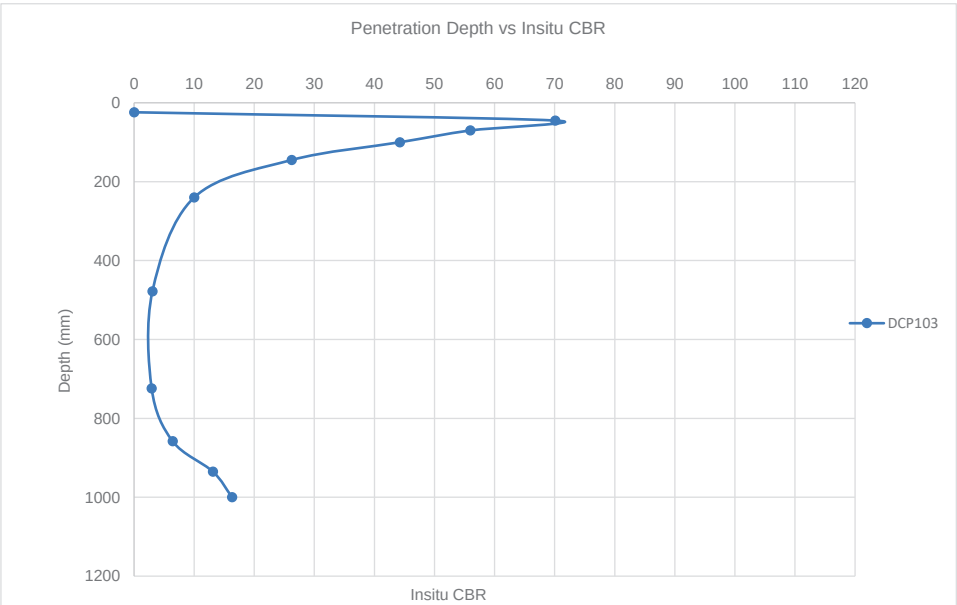
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP103	**STARTING DEPTH:**	24mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	24	24mm	0	0				
5	45	45mm	21	4.2	Very Dense	66	70	607
10	70	70mm	25	5.0	Very Dense	53	56	502
15	100	100mm	30	6.0	Dense	42	44	411
20	145	145mm	45	9.0	Dense	25	26	264
25	240	240mm	95	19.0	Medium Dense	10	10	117
30	478	478mm	238	47.6	Loose	3	3	43
35	724	724mm	246	49.2	Loose	3	3	42
40	858	858mm	134	26.8	Medium Dense	6	6	80
45	935	935mm	77	15.4	Medium Dense	13	13	147
50	1000	1000mm	65	13.0	Medium Dense	16	16	177

DCP GRAPHICAL REPRESENTATION



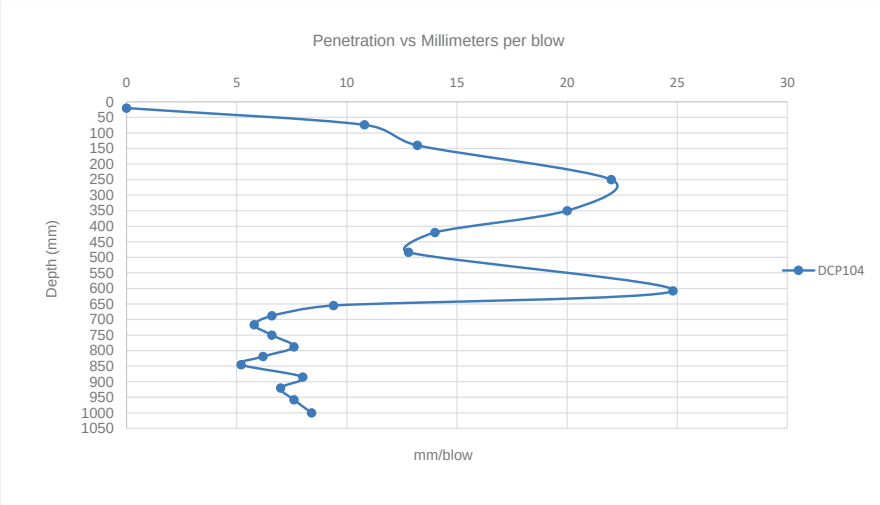


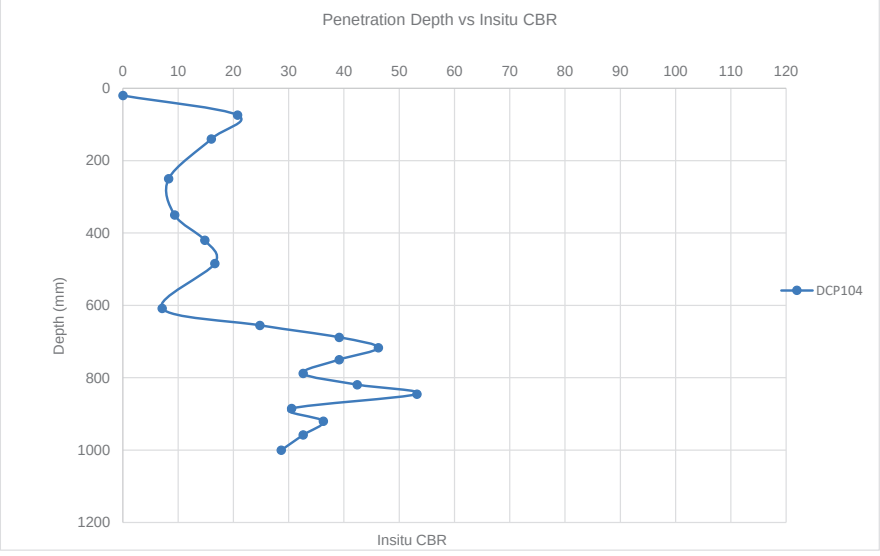
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP104	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	74	74mm	54	10.8	Dense	20	21	217
10	140	140mm	66	13.2	Medium Dense	15	16	174
15	250	250mm	110	22.0	Medium Dense	8	8	100
20	350	350mm	100	20.0	Medium Dense	9	9	111
25	420	420mm	70	14.0	Medium Dense	14	15	163
30	484	484mm	64	12.8	Medium Dense	16	17	180
35	608	608mm	124	24.8	Medium Dense	7	7	88
40	655	655mm	47	9.4	Dense	24	25	252
45	688	688mm	33	6.6	Dense	37	39	371
50	717	717mm	29	5.8	Dense	44	46	427
55	750	750mm	33	6.6	Dense	37	39	371
60	788	788mm	38	7.6	Dense	31	33	318
65	819	819mm	31	6.2	Dense	40	42	397
70	845	845mm	26	5.2	Dense	51	53	481
75	885	885mm	40	8.0	Dense	29	31	301
80	920	920mm	35	7.0	Dense	35	36	348
85	958	958mm	38	7.6	Dense	31	33	318
90	1000	1000mm	42	8.4	Dense	27	29	285

DCP GRAPHICAL REPRESENTATION



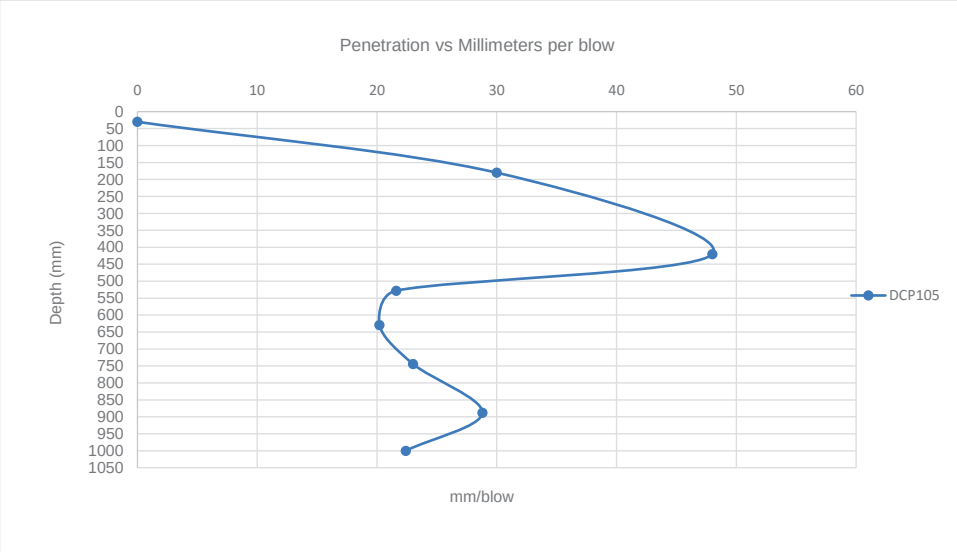


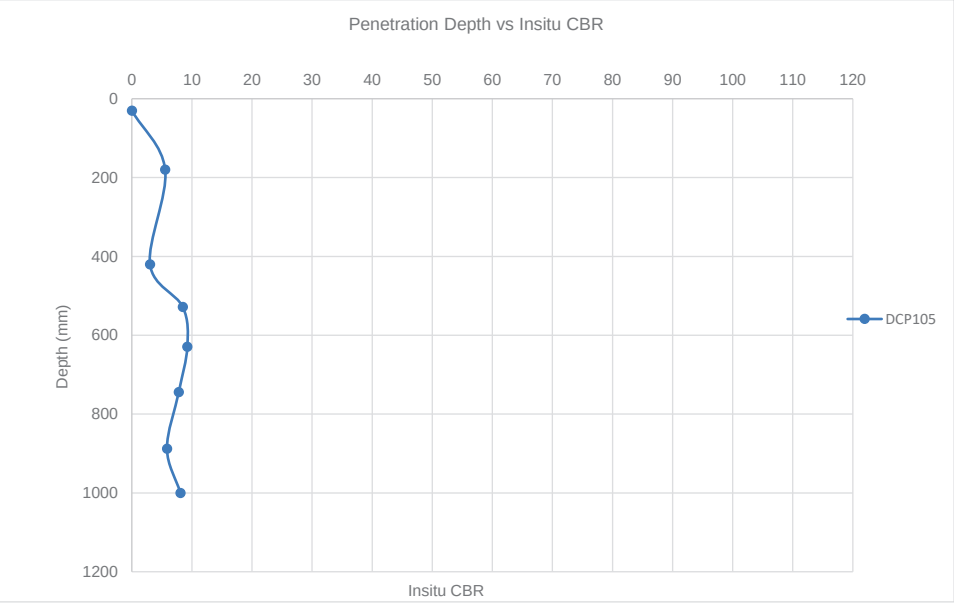
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP105	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	30	30mm	0	0				
5	180	180mm	150	30.0	Medium Dense	5	6	71
10	420	420mm	240	48.0	Loose	3	3	43
15	528	528mm	108	21.6	Medium Dense	8	8	102
20	629	629mm	101	20.2	Medium Dense	9	9	110
25	744	744mm	115	23.0	Medium Dense	8	8	95
30	888	888mm	144	28.8	Medium Dense	6	6	74
35	1000	1000mm	112	22.4	Medium Dense	8	8	98

DCP GRAPHICAL REPRESENTATION



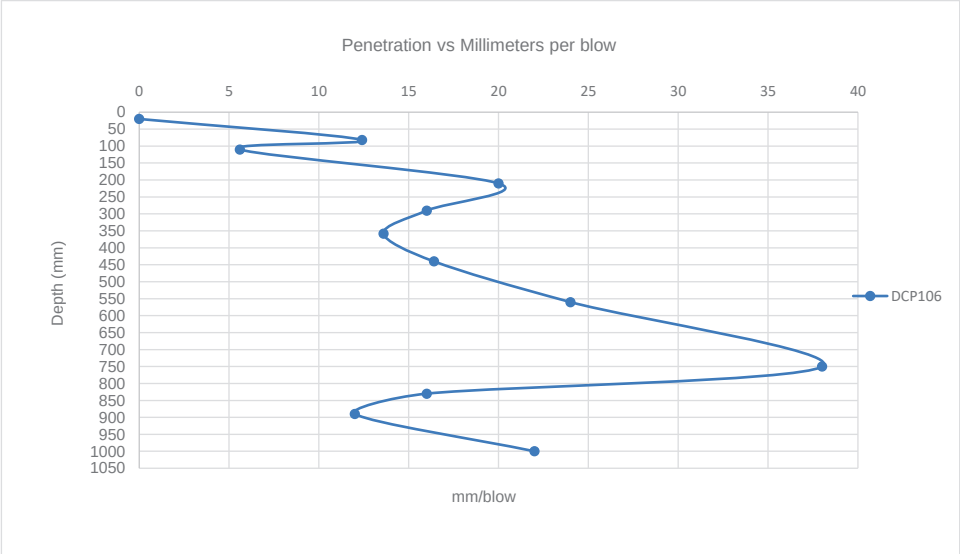


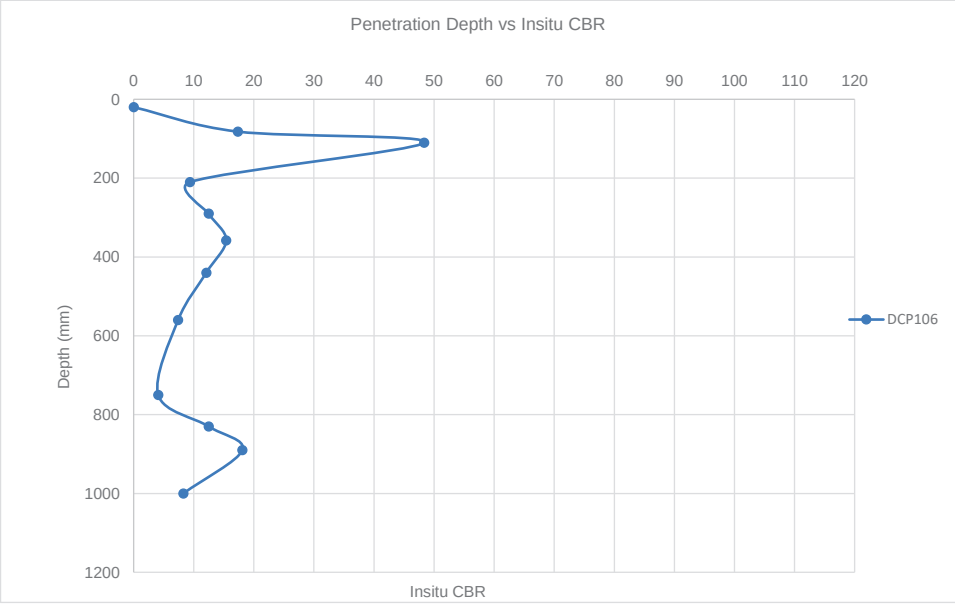
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP106	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	20	20mm	0	0				
5	82	82mm	62	12.4	Dense	17	17	186
10	110	110mm	28	5.6	Dense	46	48	443
15	210	210mm	100	20.0	Medium Dense	9	9	111
20	290	290mm	80	16.0	Medium Dense	12	12	141
25	358	358mm	68	13.6	Medium Dense	15	15	169
30	440	440mm	82	16.4	Medium Dense	12	12	137
35	560	560mm	120	24.0	Medium Dense	7	7	91
40	750	750mm	190	38.0	Loose	4	4	55
45	830	830mm	80	16.0	Medium Dense	12	12	141
50	890	890mm	60	12.0	Dense	17	18	193
55	1000	1000mm	110	22.0	Medium Dense	8	8	100

DCP GRAPHICAL REPRESENTATION



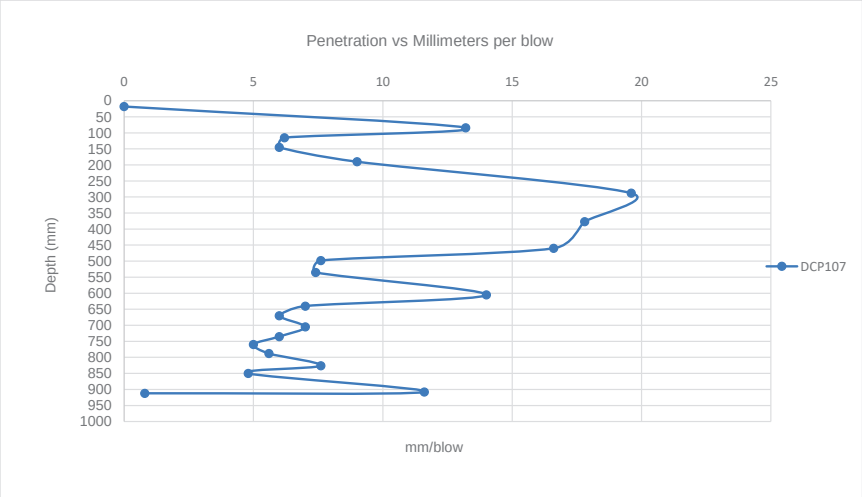


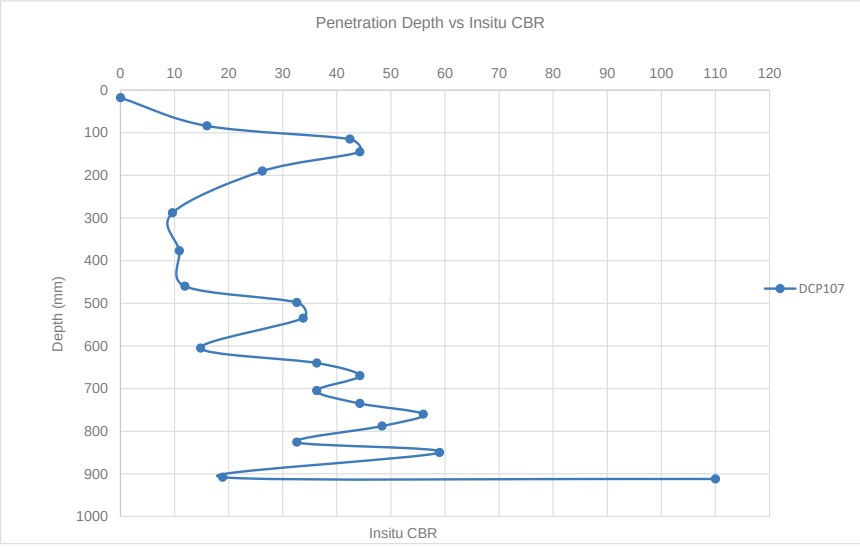
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP107	**STARTING DEPTH:**	18mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	18	18mm	0	0				
5	84	84mm	66	13.2	Medium Dense	15	16	174
10	115	115mm	31	6.2	Dense	40	42	397
15	145	145mm	30	6.0	Dense	42	44	411
20	190	190mm	45	9.0	Dense	25	26	264
25	288	288mm	98	19.6	Medium Dense	9	10	113
30	377	377mm	89	17.8	Medium Dense	11	11	126
35	460	460mm	83	16.6	Medium Dense	12	12	136
40	498	498mm	38	7.6	Dense	31	33	318
45	535	535mm	37	7.4	Dense	32	34	327
50	605	605mm	70	14.0	Medium Dense	14	15	163
55	640	640mm	35	7.0	Dense	35	36	348
60	670	670mm	30	6.0	Dense	42	44	411
65	705	705mm	35	7.0	Dense	35	36	348
70	735	735mm	30	6.0	Dense	42	44	411
75	760	760mm	25	5.0	Very Dense	53	56	502
80	788	788mm	28	5.6	Dense	46	48	443
85	826	826mm	38	7.6	Dense	31	33	318
90	850	850mm	24	4.8	Very Dense	56	59	525
95	908	908mm	58	11.6	Dense	18	19	201
100	912	912mm	4	0.8	Very Dense	342	>110	3699

DCP GRAPHICAL REPRESENTATION



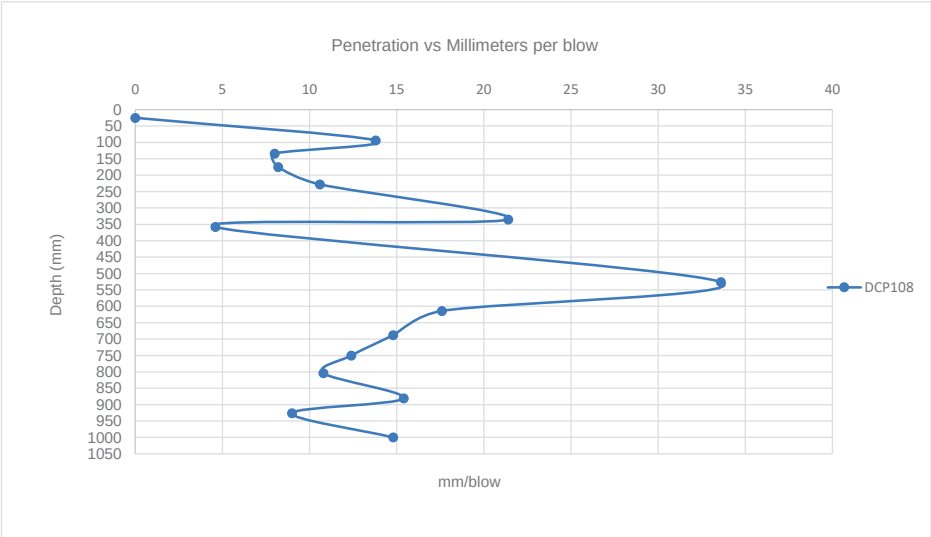


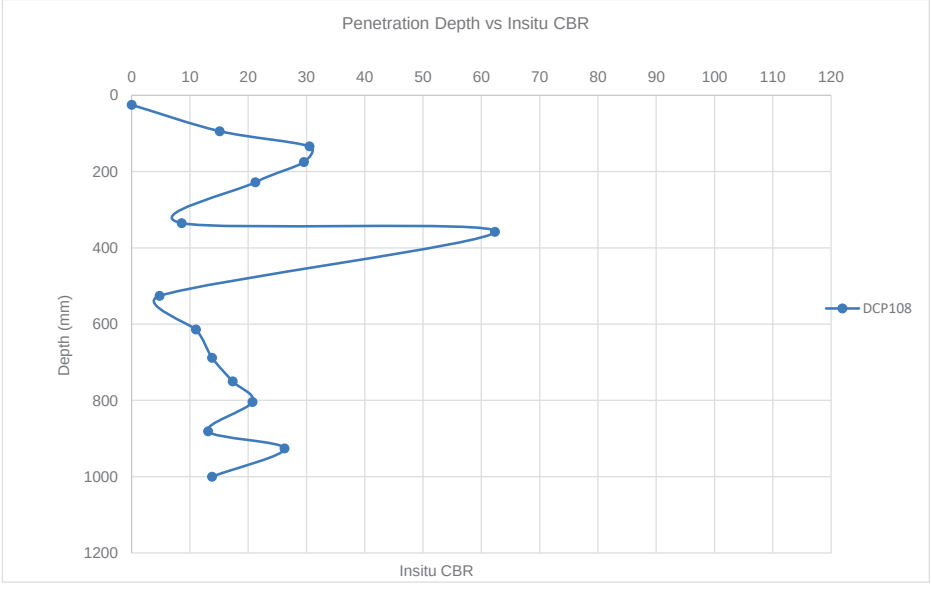
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP108	**STARTING DEPTH:**	25mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	25	25mm	0	0				
5	94	94mm	69	13.8	Medium Dense	15	15	166
10	134	134mm	40	8.0	Dense	29	31	301
15	175	175mm	41	8.2	Dense	28	30	293
20	228	228mm	53	10.6	Dense	20	21	221
25	335	335mm	107	21.4	Medium Dense	8	9	103
30	358	358mm	23	4.6	Very Dense	59	62	550
35	526	526mm	168	33.6	Loose	5	5	63
40	614	614mm	88	17.6	Medium Dense	11	11	127
45	688	688mm	74	14.8	Medium Dense	13	14	154
50	750	750mm	62	12.4	Dense	17	17	186
55	804	804mm	54	10.8	Dense	20	21	217
60	881	881mm	77	15.4	Medium Dense	13	13	147
65	926	926mm	45	9.0	Dense	25	26	264
70	1000	1000mm	74	14.8	Medium Dense	13	14	154

DCP GRAPHICAL REPRESENTATION



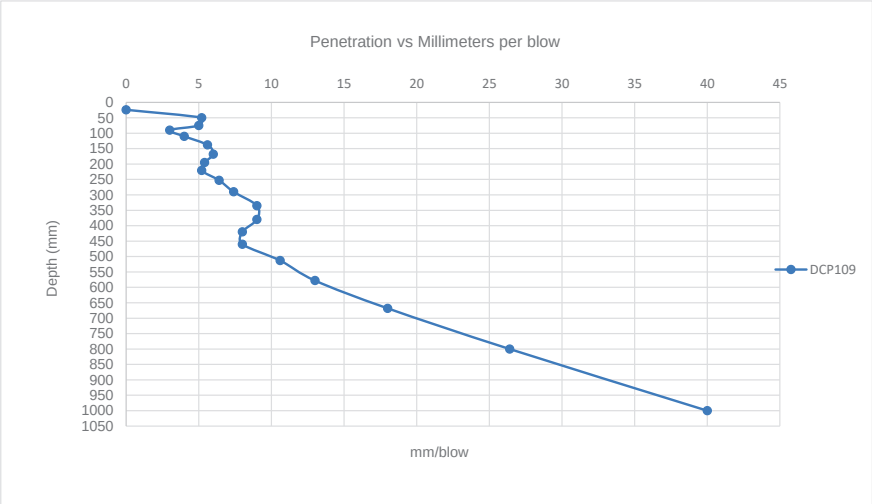


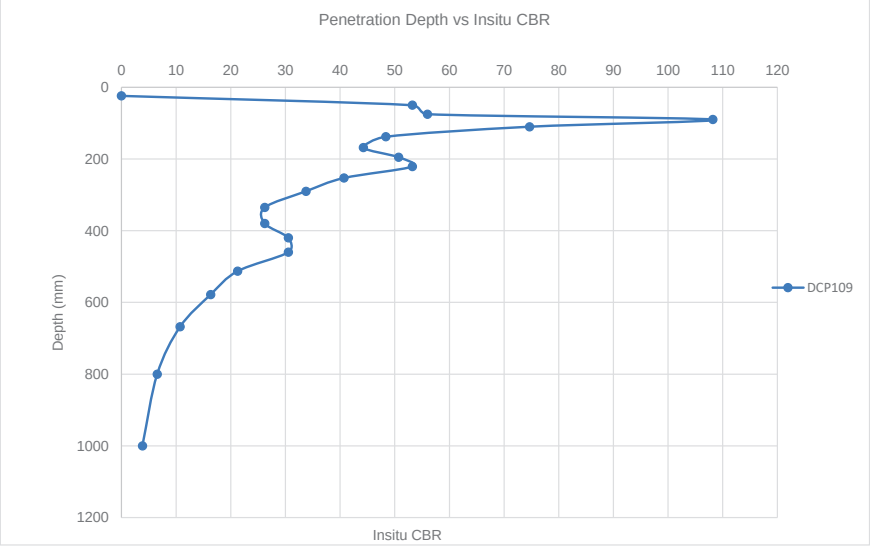
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP109	**STARTING DEPTH:**	24mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	24	24mm	0	0				
5	50	50mm	26	5.2	Dense	51	53	481
10	75	75mm	25	5.0	Very Dense	53	56	502
15	90	90mm	15	3.0	Very Dense	102	108	876
20	110	110mm	20	4.0	Very Dense	70	75	640
25	138	138mm	28	5.6	Dense	46	48	443
30	168	168mm	30	6.0	Dense	42	44	411
35	195	195mm	27	5.4	Dense	48	51	461
40	221	221mm	26	5.2	Dense	51	53	481
45	253	253mm	32	6.4	Dense	39	41	383
50	290	290mm	37	7.4	Dense	32	34	327
55	335	335mm	45	9.0	Dense	25	26	264
60	380	380mm	45	9.0	Dense	25	26	264
65	420	420mm	40	8.0	Dense	29	31	301
70	460	460mm	40	8.0	Dense	29	31	301
75	513	513mm	53	10.6	Dense	20	21	221
80	578	578mm	65	13.0	Medium Dense	16	16	177
85	668	668mm	90	18.0	Medium Dense	10	11	124
90	800	800mm	132	26.4	Medium Dense	6	7	82
95	1000	1000mm	200	40.0	Loose	4	4	52

DCP GRAPHICAL REPRESENTATION



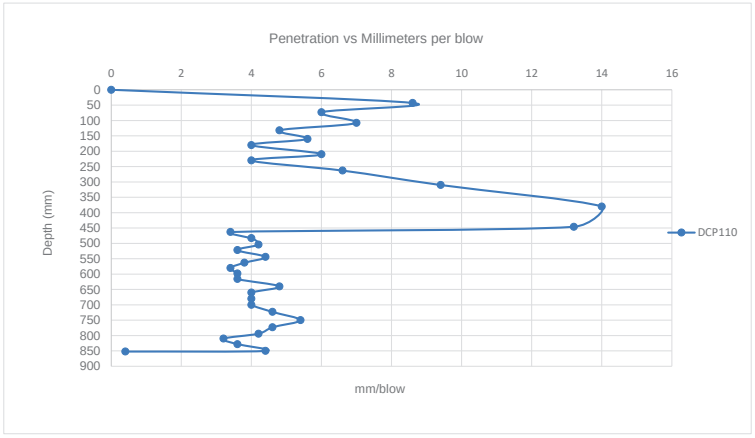


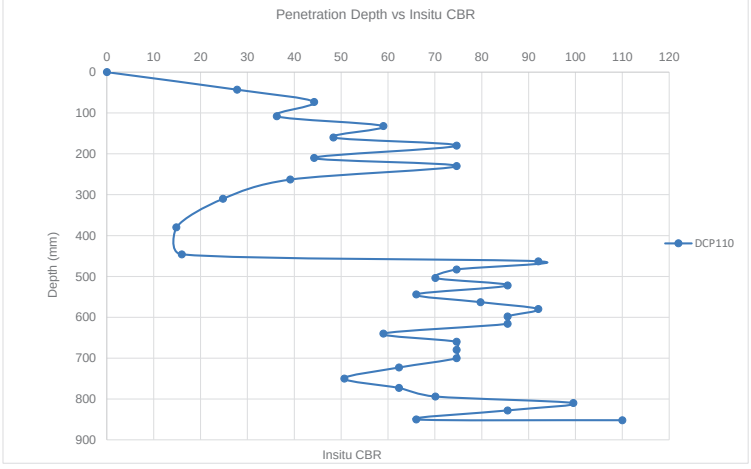
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP110	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0				
5	43	43mm	43	8.6	Dense	27	28	278
10	73	73mm	30	6.0	Dense	42	44	411
15	108	108mm	35	7.0	Dense	35	36	348
20	132	132mm	24	4.8	Very Dense	56	59	525
25	160	160mm	28	5.6	Dense	46	48	443
30	180	180mm	20	4.0	Very Dense	70	75	640
35	210	210mm	30	6.0	Dense	42	44	411
40	230	230mm	20	4.0	Very Dense	70	75	640
45	263	263mm	33	6.6	Dense	37	39	371
50	310	310mm	47	9.4	Dense	24	25	252
55	380	380mm	70	14.0	Medium Dense	14	15	163
60	446	446mm	66	13.2	Medium Dense	15	16	174
65	463	463mm	17	3.4	Very Dense	87	92	764
70	483	483mm	20	4.0	Very Dense	70	75	640
75	504	504mm	21	4.2	Very Dense	66	70	607
80	522	522mm	18	3.6	Very Dense	81	86	718
85	544	544mm	22	4.4	Very Dense	62	66	577
90	563	563mm	19	3.8	Very Dense	75	80	677
95	580	580mm	17	3.4	Very Dense	87	92	764
100	598	598mm	18	3.6	Very Dense	81	86	718
105	616	616mm	18	3.6	Very Dense	81	86	718
110	640	640mm	24	4.8	Very Dense	56	59	525
115	660	660mm	20	4.0	Very Dense	70	75	640
120	680	680mm	20	4.0	Very Dense	70	75	640
125	700	700mm	20	4.0	Very Dense	70	75	640
130	723	723mm	23	4.6	Very Dense	59	62	550
135	750	750mm	27	5.4	Dense	48	51	461
140	773	773mm	23	4.6	Very Dense	59	62	550
145	794	794mm	21	4.2	Very Dense	66	70	607
150	810	810mm	16	3.2	Very Dense	94	100	816
155	828	828mm	18	3.6	Very Dense	81	86	718
160	850	850mm	22	4.4	Very Dense	62	66	577
165	852	852mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



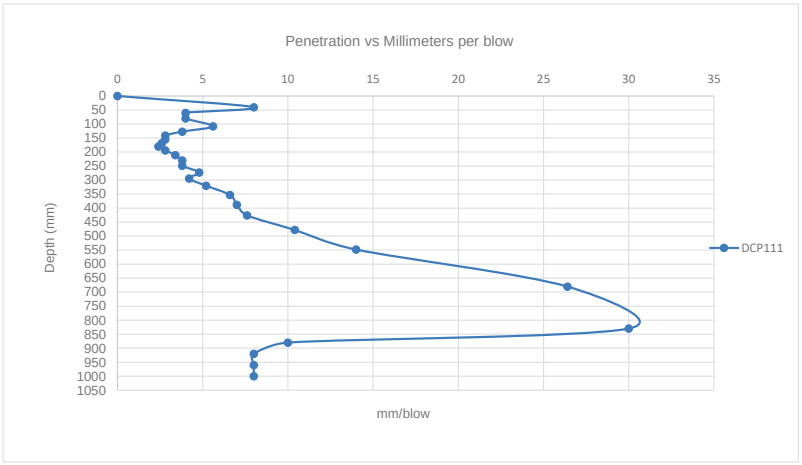


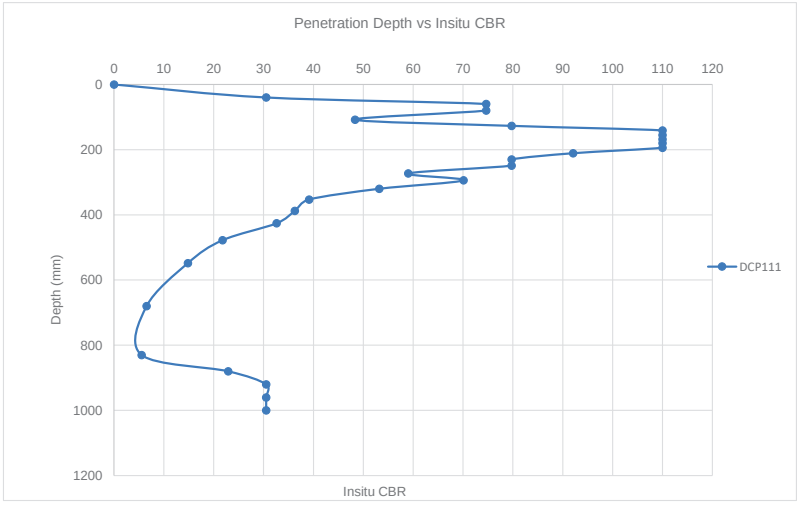
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP111	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0				
5	40	40mm	40	8.0	Dense	29	31	301
10	60	60mm	20	4.0	Very Dense	70	75	640
15	80	80mm	20	4.0	Very Dense	70	75	640
20	108	108mm	28	5.6	Dense	46	48	443
25	127	127mm	19	3.8	Very Dense	75	80	677
30	141	141mm	14	2.8	Very Dense	111	>110	944
35	155	155mm	14	2.8	Very Dense	111	>110	944
40	168	168mm	13	2.6	Very Dense	122	>110	1023
45	180	180mm	12	2.4	Very Dense	135	>110	1117
50	194	194mm	14	2.8	Very Dense	111	>110	944
55	211	211mm	17	3.4	Very Dense	87	92	764
60	230	230mm	19	3.8	Very Dense	75	80	677
65	249	249mm	19	3.8	Very Dense	75	80	677
70	273	273mm	24	4.8	Very Dense	56	59	525
75	294	294mm	21	4.2	Very Dense	66	70	607
80	320	320mm	26	5.2	Dense	51	53	481
85	353	353mm	33	6.6	Dense	37	39	371
90	388	388mm	35	7.0	Dense	35	36	348
95	426	426mm	38	7.6	Dense	31	33	318
100	478	478mm	52	10.4	Dense	21	22	226
105	548	548mm	70	14.0	Medium Dense	14	15	163
110	680	680mm	132	26.4	Medium Dense	6	7	82
115	830	830mm	150	30.0	Medium Dense	5	6	71
120	880	880mm	50	10.0	Dense	22	23	236
125	920	920mm	40	8.0	Dense	29	31	301
130	960	960mm	40	8.0	Dense	29	31	301
135	1000	1000mm	40	8.0	Dense	29	31	301

DCP GRAPHICAL REPRESENTATION



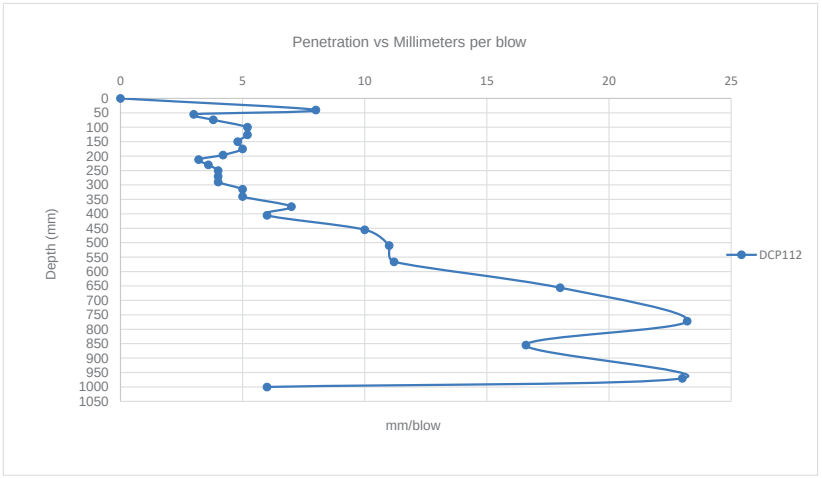


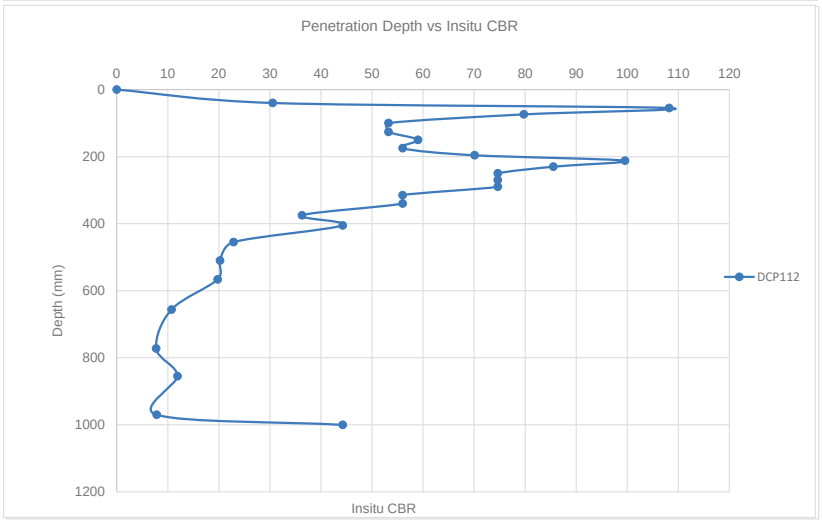
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP112	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0				
5	40	40mm	40	8.0	Dense	29	31	301
10	55	55mm	15	3.0	Very Dense	102	108	876
15	74	74mm	19	3.8	Very Dense	75	80	677
20	100	100mm	26	5.2	Dense	51	53	481
25	126	126mm	26	5.2	Dense	51	53	481
30	150	150mm	24	4.8	Very Dense	56	59	525
35	175	175mm	25	5.0	Very Dense	53	56	502
40	196	196mm	21	4.2	Very Dense	66	70	607
45	212	212mm	16	3.2	Very Dense	94	100	816
50	230	230mm	18	3.6	Very Dense	81	86	718
55	250	250mm	20	4.0	Very Dense	70	75	640
60	270	270mm	20	4.0	Very Dense	70	75	640
65	290	290mm	20	4.0	Very Dense	70	75	640
70	315	315mm	25	5.0	Very Dense	53	56	502
75	340	340mm	25	5.0	Very Dense	53	56	502
80	375	375mm	35	7.0	Dense	35	36	348
85	405	405mm	30	6.0	Dense	42	44	411
90	455	455mm	50	10.0	Dense	22	23	236
95	510	510mm	55	11.0	Dense	20	20	212
100	566	566mm	56	11.2	Dense	19	20	208
105	656	656mm	90	18.0	Medium Dense	10	11	124
110	772	772mm	116	23.2	Medium Dense	8	8	94
115	855	855mm	83	16.6	Medium Dense	12	12	136
120	970	970mm	115	23.0	Medium Dense	8	8	95
125	1000	1000mm	30	6.0	Dense	42	44	411

DCP GRAPHICAL REPRESENTATION



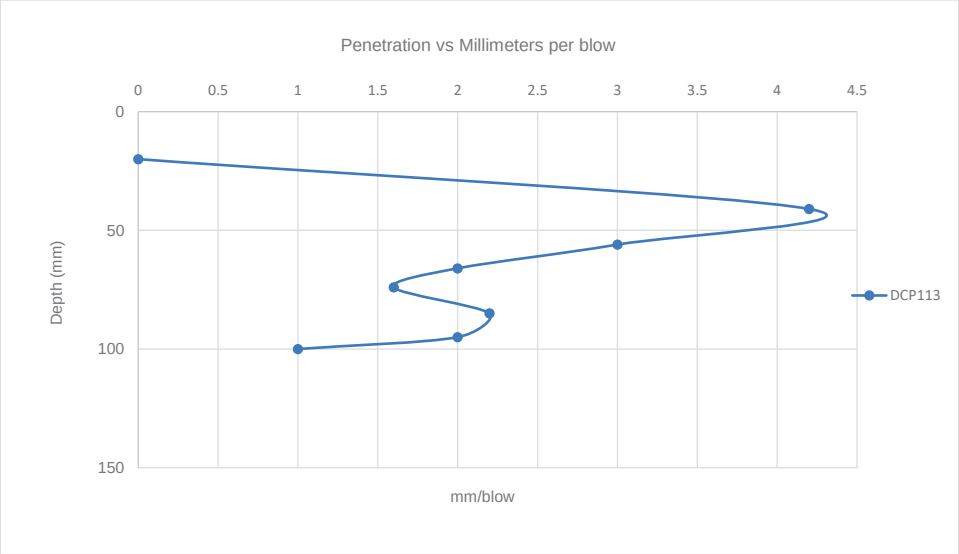


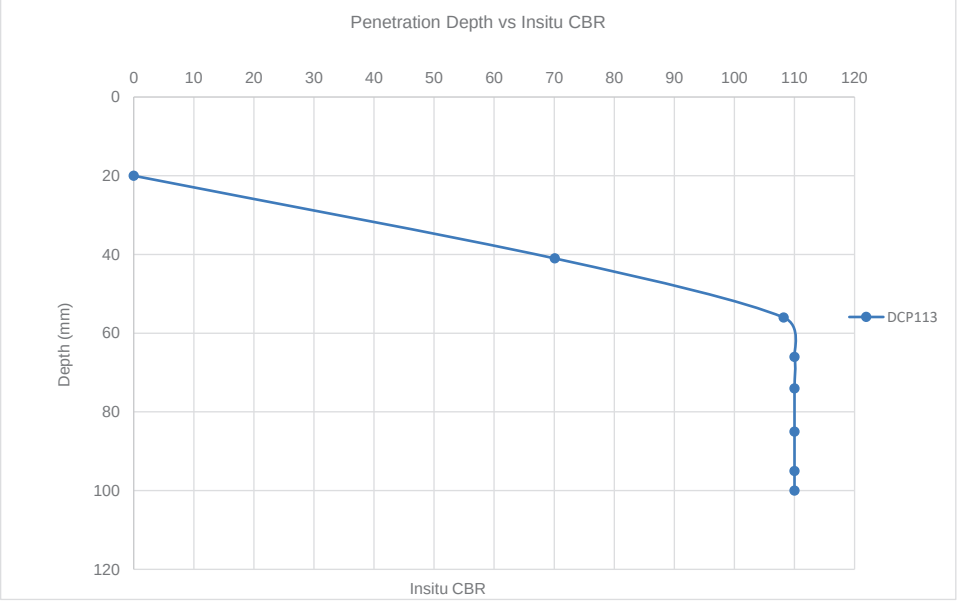
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP113	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	41	41mm	21	4.2	Very Dense	66	70	607
10	56	56mm	15	3.0	Very Dense	102	108	876
15	66	66mm	10	2.0	Very Dense	170	>110	1362
20	74	74mm	8	1.6	Very Dense	206	>110	1737
25	85	85mm	11	2.2	Very Dense	151	>110	1228
30	95	95mm	10	2.0	Very Dense	170	>110	1362
35	100	100mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



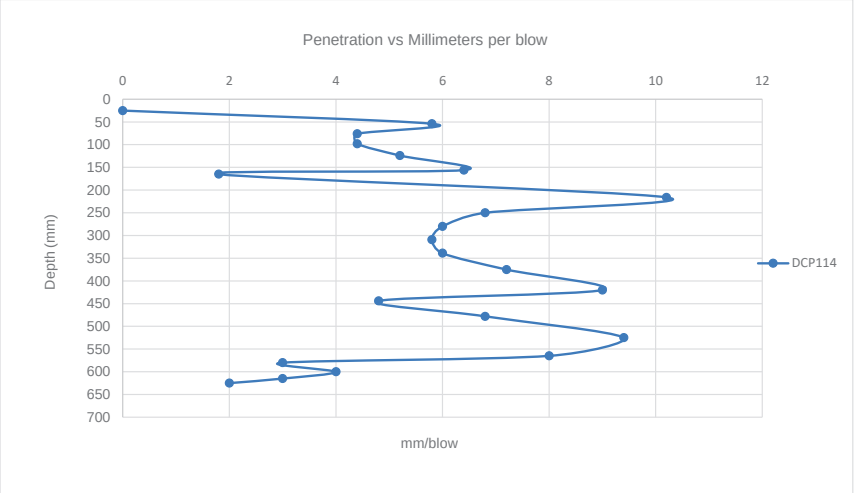


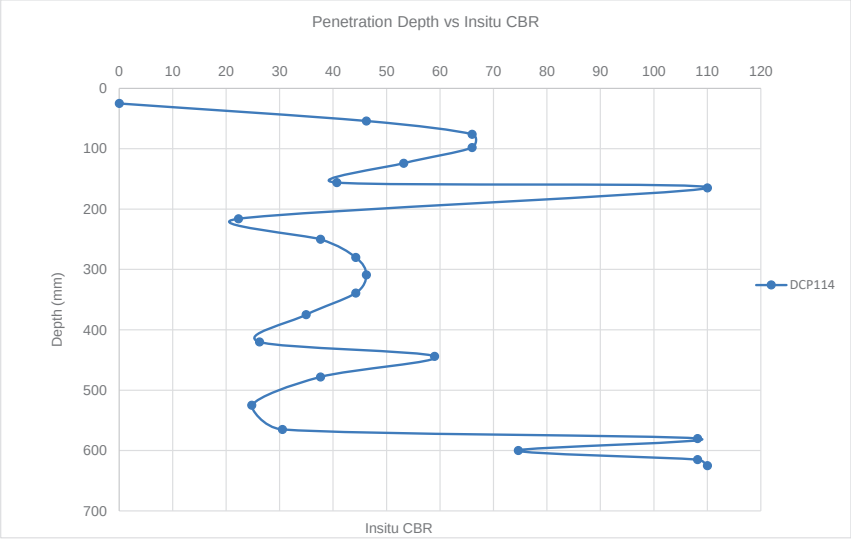
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP114	**STARTING DEPTH:**	25mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	25	25mm	0	0				
5	54	54mm	29	5.8	Dense	44	46	427
10	76	76mm	22	4.4	Very Dense	62	66	577
15	98	98mm	22	4.4	Very Dense	62	66	577
20	124	124mm	26	5.2	Dense	51	53	481
25	156	156mm	32	6.4	Dense	39	41	383
30	165	165mm	9	1.8	Very Dense	185	>110	1528
35	216	216mm	51	10.2	Dense	21	22	231
40	250	250mm	34	6.8	Dense	36	38	359
45	280	280mm	30	6.0	Dense	42	44	411
50	309	309mm	29	5.8	Dense	44	46	427
55	339	339mm	30	6.0	Dense	42	44	411
60	375	375mm	36	7.2	Dense	33	35	337
65	420	420mm	45	9.0	Dense	25	26	264
70	444	444mm	24	4.8	Very Dense	56	59	525
75	478	478mm	34	6.8	Dense	36	38	359
80	525	525mm	47	9.4	Dense	24	25	252
85	565	565mm	40	8.0	Dense	29	31	301
90	580	580mm	15	3.0	Very Dense	102	108	876
95	600	600mm	20	4.0	Very Dense	70	75	640
100	615	615mm	15	3.0	Very Dense	102	108	876
105	625	625mm	10	2.0	Very Dense	170	>110	1362

DCP GRAPHICAL REPRESENTATION



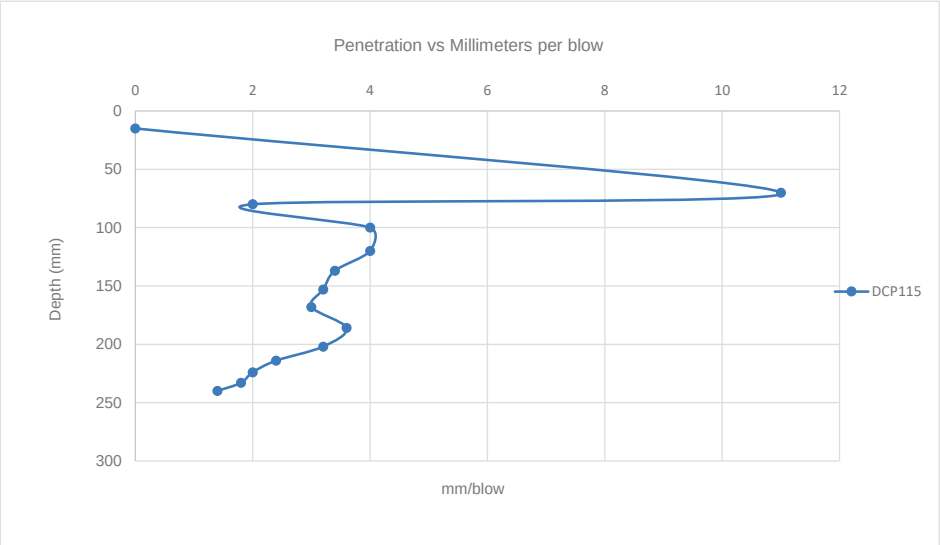


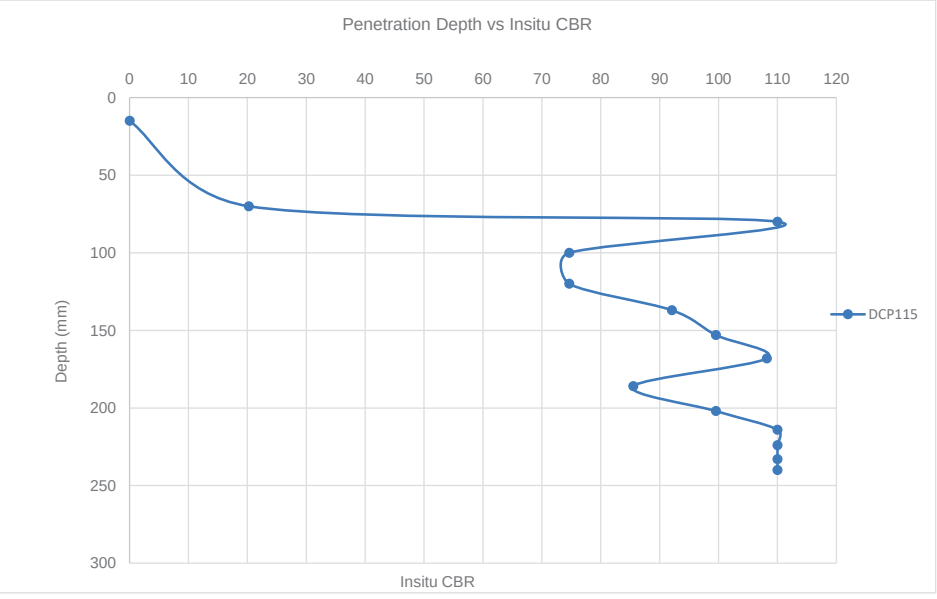
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP115	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	15	15mm	0	0				
5	70	70mm	55	11.0	Dense	20	20	212
10	80	80mm	10	2.0	Very Dense	170	>110	1362
15	100	100mm	20	4.0	Very Dense	70	75	640
20	120	120mm	20	4.0	Very Dense	70	75	640
25	137	137mm	17	3.4	Very Dense	87	92	764
30	153	153mm	16	3.2	Very Dense	94	100	816
35	168	168mm	15	3.0	Very Dense	102	108	876
40	186	186mm	18	3.6	Very Dense	81	86	718
45	202	202mm	16	3.2	Very Dense	94	100	816
50	214	214mm	12	2.4	Very Dense	135	>110	1117
55	224	224mm	10	2.0	Very Dense	170	>110	1362
60	233	233mm	9	1.8	Very Dense	185	>110	1528
65	240	240mm	7	1.4	Very Dense	232	>110	2010

DCP GRAPHICAL REPRESENTATION



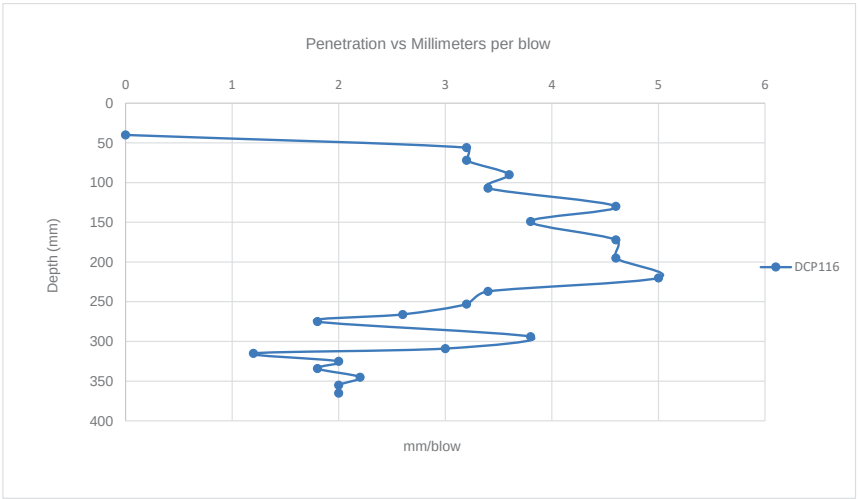


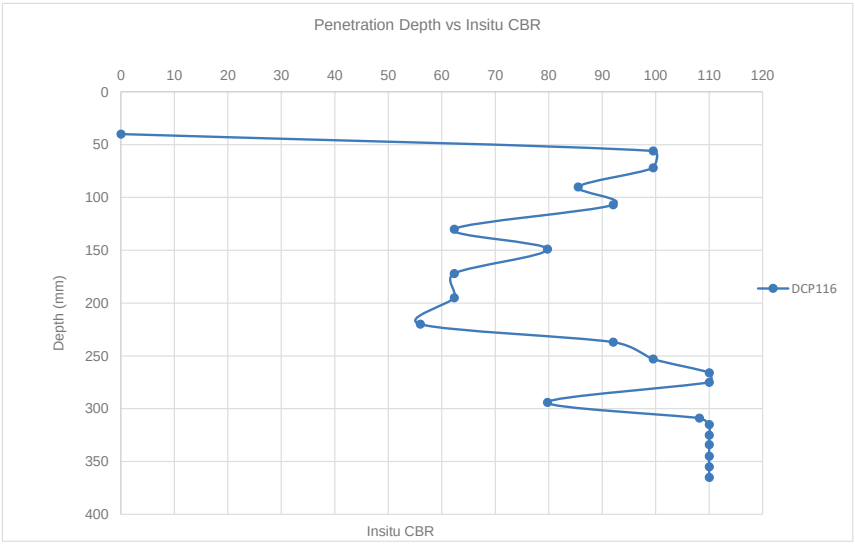
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP116	**STARTING DEPTH:**	40mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	40	40mm	0	0				
5	56	56mm	16	3.2	Very Dense	94	100	816
10	72	72mm	16	3.2	Very Dense	94	100	816
15	90	90mm	18	3.6	Very Dense	81	86	718
20	107	107mm	17	3.4	Very Dense	87	92	764
25	130	130mm	23	4.6	Very Dense	59	62	550
30	149	149mm	19	3.8	Very Dense	75	80	677
35	172	172mm	23	4.6	Very Dense	59	62	550
40	195	195mm	23	4.6	Very Dense	59	62	550
45	220	220mm	25	5.0	Very Dense	53	56	502
50	237	237mm	17	3.4	Very Dense	87	92	764
55	253	253mm	16	3.2	Very Dense	94	100	816
60	266	266mm	13	2.6	Very Dense	122	>110	1023
65	275	275mm	9	1.8	Very Dense	185	>110	1528
70	294	294mm	19	3.8	Very Dense	75	80	677
75	309	309mm	15	3.0	Very Dense	102	108	876
80	315	315mm	6	1.2	Very Dense	263	>110	2377
85	325	325mm	10	2.0	Very Dense	170	>110	1362
90	334	334mm	9	1.8	Very Dense	185	>110	1528
95	345	345mm	11	2.2	Very Dense	151	>110	1228
100	355	355mm	10	2.0	Very Dense	170	>110	1362
105	365	365mm	10	2.0	Very Dense	170	>110	1362

DCP GRAPHICAL REPRESENTATION



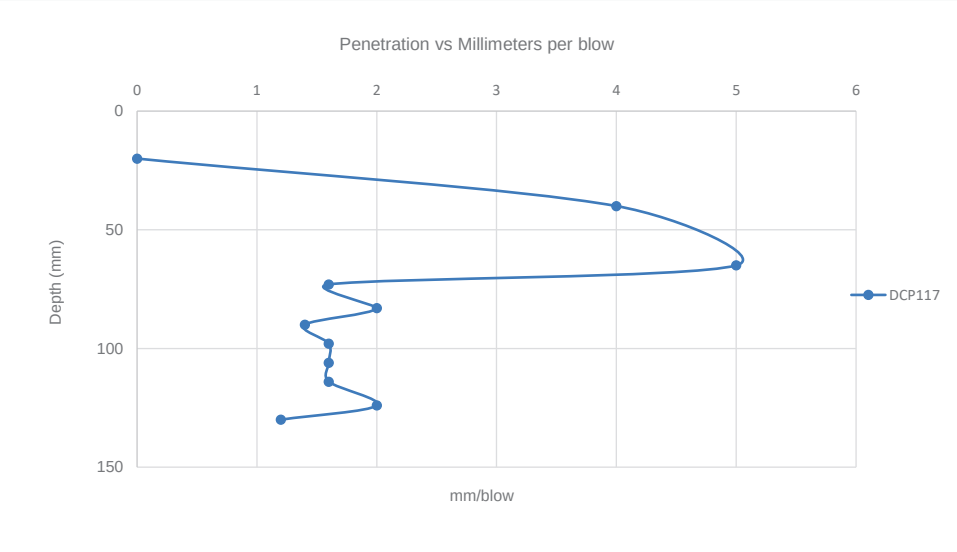


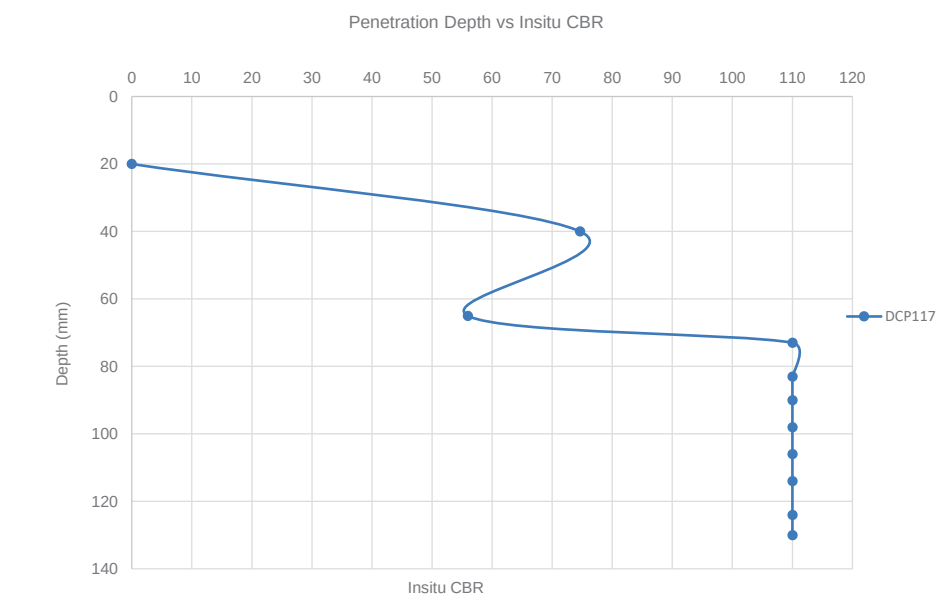
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP117	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	40	40mm	20	4.0	Very Dense	70	75	640
10	65	65mm	25	5.0	Very Dense	53	56	502
15	73	73mm	8	1.6	Very Dense	206	>110	1737
20	83	83mm	10	2.0	Very Dense	170	>110	1362
25	90	90mm	7	1.4	Very Dense	232	>110	2010
30	98	98mm	8	1.6	Very Dense	206	>110	1737
35	106	106mm	8	1.6	Very Dense	206	>110	1737
40	114	114mm	8	1.6	Very Dense	206	>110	1737
45	124	124mm	10	2.0	Very Dense	170	>110	1362
50	130	130mm	6	1.2	Very Dense	263	>110	2377

DCP GRAPHICAL REPRESENTATION



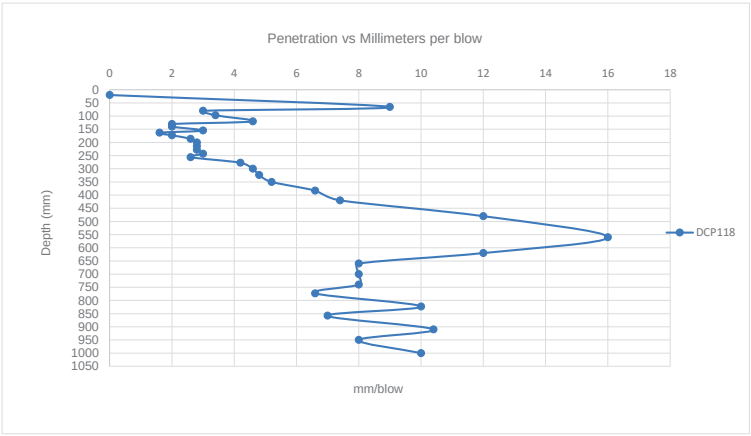


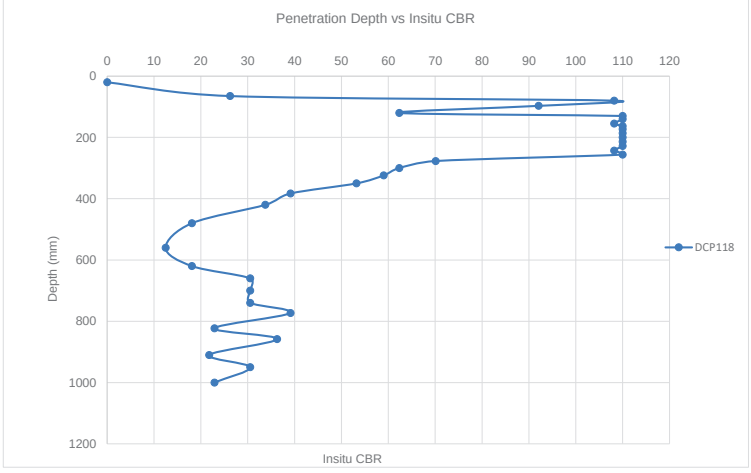
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP118	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	65	65mm	45	9.0	Dense	25	26	264
10	80	80mm	15	3.0	Very Dense	102	108	876
15	97	97mm	17	3.4	Very Dense	87	92	764
20	120	120mm	23	4.6	Very Dense	59	62	550
25	130	130mm	10	2.0	Very Dense	170	>110	1362
30	140	140mm	10	2.0	Very Dense	170	>110	1362
35	155	155mm	15	3.0	Very Dense	102	108	876
40	163	163mm	8	1.6	Very Dense	206	>110	1737
45	173	173mm	10	2.0	Very Dense	170	>110	1362
50	186	186mm	13	2.6	Very Dense	122	>110	1023
55	200	200mm	14	2.8	Very Dense	111	>110	944
60	214	214mm	14	2.8	Very Dense	111	>110	944
65	228	228mm	14	2.8	Very Dense	111	>110	944
70	243	243mm	15	3.0	Very Dense	102	108	876
75	256	256mm	13	2.6	Very Dense	122	>110	1023
80	277	277mm	21	4.2	Very Dense	66	70	607
85	300	300mm	23	4.6	Very Dense	59	62	550
90	324	324mm	24	4.8	Very Dense	56	59	525
95	350	350mm	26	5.2	Dense	51	53	481
100	383	383mm	33	6.6	Dense	37	39	371
105	420	420mm	37	7.4	Dense	32	34	327
110	480	480mm	60	12.0	Dense	17	18	193
115	560	560mm	80	16.0	Medium Dense	12	12	141
120	620	620mm	60	12.0	Dense	17	18	193
125	660	660mm	40	8.0	Dense	29	31	301
130	700	700mm	40	8.0	Dense	29	31	301
135	740	740mm	40	8.0	Dense	29	31	301
140	773	773mm	33	6.6	Dense	37	39	371
145	823	823mm	50	10.0	Dense	22	23	236
150	858	858mm	35	7.0	Dense	35	36	348
155	910	910mm	52	10.4	Dense	21	22	226
160	950	950mm	40	8.0	Dense	29	31	301
165	1000	1000mm	50	10.0	Dense	22	23	236

DCP GRAPHICAL REPRESENTATION



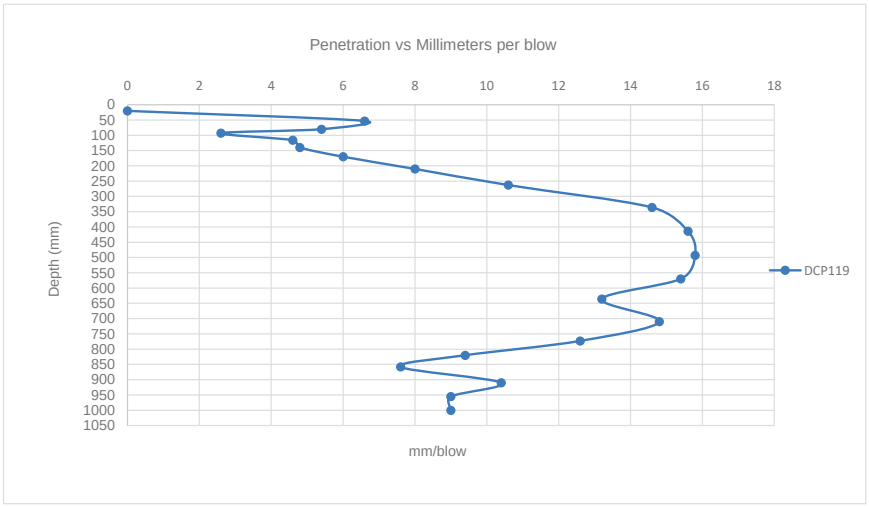


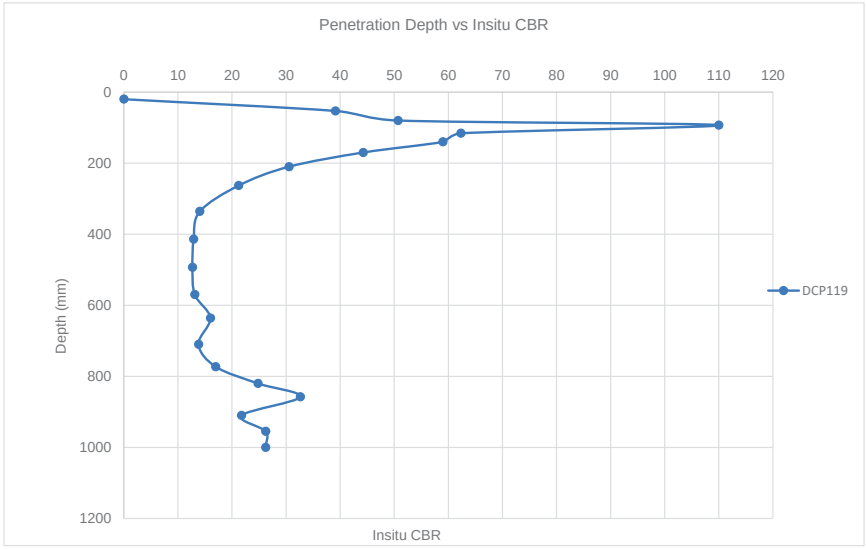
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP119	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	20	20mm	0	0				
5	53	53mm	33	6.6	Dense	37	39	371
10	80	80mm	27	5.4	Dense	48	51	461
15	93	93mm	13	2.6	Very Dense	122	>110	1023
20	116	116mm	23	4.6	Very Dense	59	62	550
25	140	140mm	24	4.8	Very Dense	56	59	525
30	170	170mm	30	6.0	Dense	42	44	411
35	210	210mm	40	8.0	Dense	29	31	301
40	263	263mm	53	10.6	Dense	20	21	221
45	336	336mm	73	14.6	Medium Dense	14	14	156
50	414	414mm	78	15.6	Medium Dense	13	13	145
55	493	493mm	79	15.8	Medium Dense	12	13	143
60	570	570mm	77	15.4	Medium Dense	13	13	147
65	636	636mm	66	13.2	Medium Dense	15	16	174
70	710	710mm	74	14.8	Medium Dense	13	14	154
75	773	773mm	63	12.6	Medium Dense	16	17	183
80	820	820mm	47	9.4	Dense	24	25	252
85	858	858mm	38	7.6	Dense	31	33	318
90	910	910mm	52	10.4	Dense	21	22	226
95	955	955mm	45	9.0	Dense	25	26	264
100	1000	1000mm	45	9.0	Dense	25	26	264

DCP GRAPHICAL REPRESENTATION



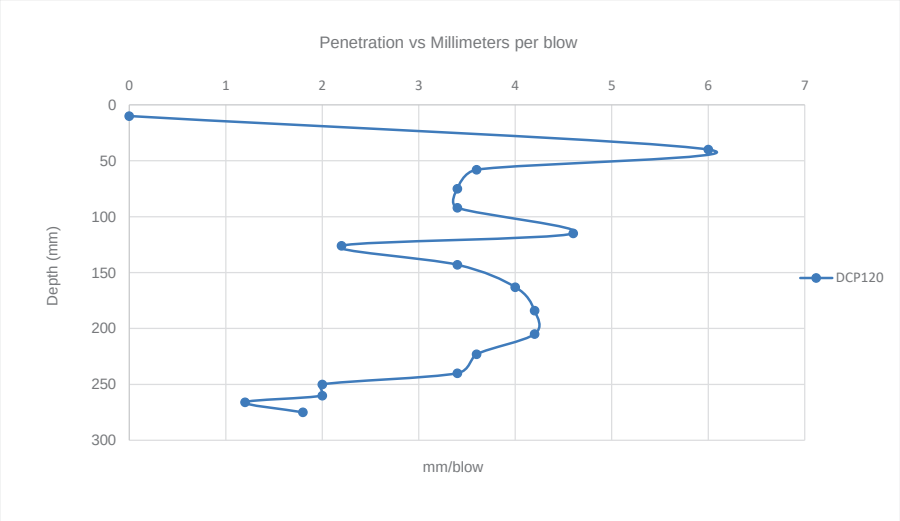


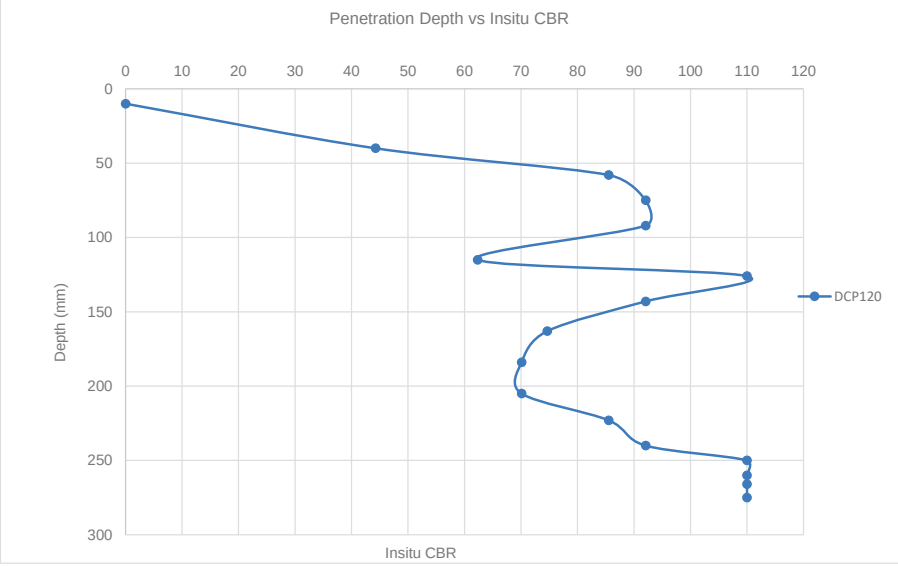
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP120	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	10	10mm	0	0				
5	40	40mm	30	6.0	Dense	42	44	411
10	58	58mm	18	3.6	Very Dense	81	86	718
15	75	75mm	17	3.4	Very Dense	87	92	764
20	92	92mm	17	3.4	Very Dense	87	92	764
25	115	115mm	23	4.6	Very Dense	59	62	550
30	126	126mm	11	2.2	Very Dense	151	>110	1228
35	143	143mm	17	3.4	Very Dense	87	92	764
40	163	163mm	20	4.0	Very Dense	70	75	640
45	184	184mm	21	4.2	Very Dense	66	70	607
50	205	205mm	21	4.2	Very Dense	66	70	607
55	223	223mm	18	3.6	Very Dense	81	86	718
60	240	240mm	17	3.4	Very Dense	87	92	764
65	250	250mm	10	2.0	Very Dense	170	>110	1362
70	260	260mm	10	2.0	Very Dense	170	>110	1362
75	266	266mm	6	1.2	Very Dense	263	>110	2377
80	275	275mm	9	1.8	Very Dense	185	>110	1528

DCP GRAPHICAL REPRESENTATION



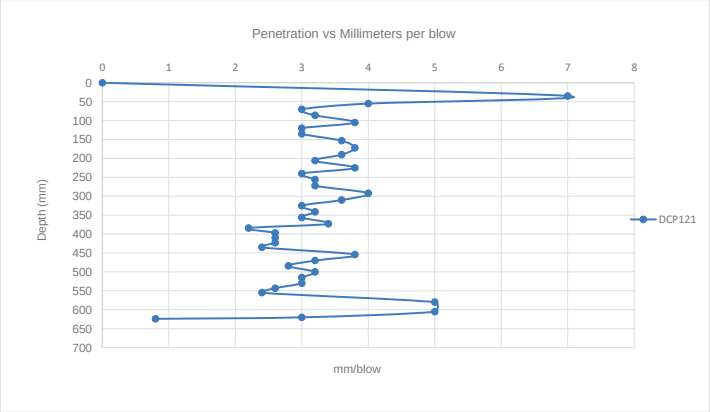


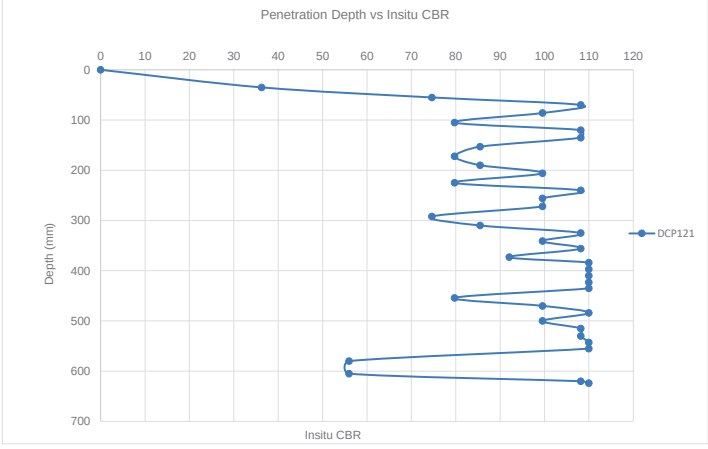
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP121	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0				
5	35	35mm	35	7.0	Dense	35	36	348
10	55	55mm	20	4.0	Very Dense	70	75	640
15	70	70mm	15	3.0	Very Dense	102	108	876
20	86	86mm	16	3.2	Very Dense	94	100	816
25	105	105mm	19	3.8	Very Dense	75	80	677
30	120	120mm	15	3.0	Very Dense	102	108	876
35	135	135mm	15	3.0	Very Dense	102	108	876
40	153	153mm	18	3.6	Very Dense	81	86	718
45	172	172mm	19	3.8	Very Dense	75	80	677
50	190	190mm	18	3.6	Very Dense	81	86	718
55	206	206mm	16	3.2	Very Dense	94	100	816
60	225	225mm	19	3.8	Very Dense	75	80	677
65	240	240mm	15	3.0	Very Dense	102	108	876
70	256	256mm	16	3.2	Very Dense	94	100	816
75	272	272mm	16	3.2	Very Dense	94	100	816
80	292	292mm	20	4.0	Very Dense	70	75	640
85	310	310mm	18	3.6	Very Dense	81	86	718
90	325	325mm	15	3.0	Very Dense	102	108	876
95	341	341mm	16	3.2	Very Dense	94	100	816
100	356	356mm	15	3.0	Very Dense	102	108	876
105	373	373mm	17	3.4	Very Dense	87	92	764
110	384	384mm	11	2.2	Very Dense	151	>110	1228
115	397	397mm	13	2.6	Very Dense	122	>110	1023
120	410	410mm	13	2.6	Very Dense	122	>110	1023
125	423	423mm	13	2.6	Very Dense	122	>110	1023
130	435	435mm	12	2.4	Very Dense	135	>110	1117
135	454	454mm	19	3.8	Very Dense	75	80	677
140	470	470mm	16	3.2	Very Dense	94	100	816
145	484	484mm	14	2.8	Very Dense	111	>110	944
150	500	500mm	16	3.2	Very Dense	94	100	816
155	515	515mm	15	3.0	Very Dense	102	108	876
160	530	530mm	15	3.0	Very Dense	102	108	876
165	543	543mm	13	2.6	Very Dense	122	>110	1023
170	555	555mm	12	2.4	Very Dense	135	>110	1117
175	580	580mm	25	5.0	Very Dense	53	56	502
180	605	605mm	25	5.0	Very Dense	53	56	502
185	620	620mm	15	3.0	Very Dense	102	108	876
190	624	624mm	4	0.8	Very Dense	342	>110	3699

DCP GRAPHICAL REPRESENTATION





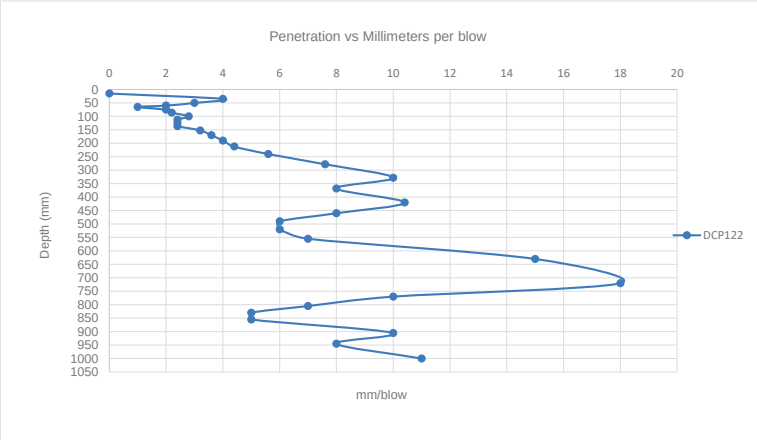
DYNAMIC CONE PENETROMETER TEST

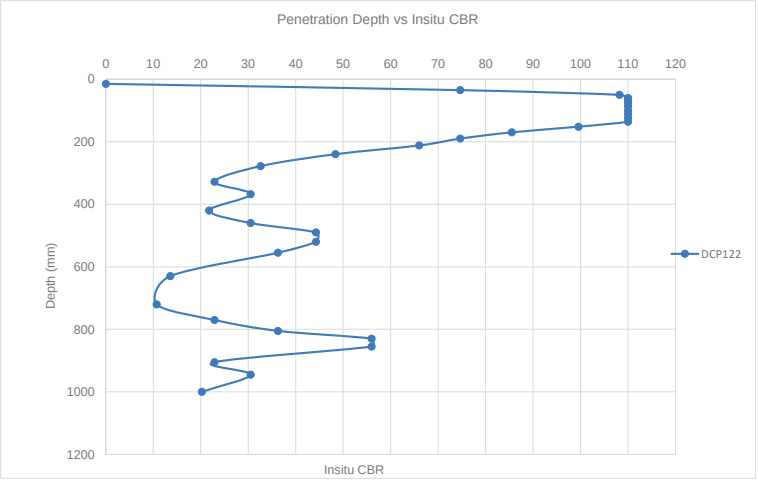
MUKONA CONSULTING ENGINEERS

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP122	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	15	15mm	0	0				
5	35	35mm	20	4.0	Very Dense	70	75	640
10	50	50mm	15	3.0	Very Dense	102	108	876
15	60	60mm	10	2.0	Very Dense	170	>110	1362
20	65	65mm	5	1.0	Very Dense	300	>110	2900
25	75	75mm	10	2.0	Very Dense	170	>110	1362
30	86	86mm	11	2.2	Very Dense	151	>110	1228
35	100	100mm	14	2.8	Very Dense	111	>110	944
40	112	112mm	12	2.4	Very Dense	135	>110	1117
45	124	124mm	12	2.4	Very Dense	135	>110	1117
50	136	136mm	12	2.4	Very Dense	135	>110	1117
55	152	152mm	16	3.2	Very Dense	94	100	816
60	170	170mm	18	3.6	Very Dense	81	86	718
65	190	190mm	20	4.0	Very Dense	70	75	640
70	212	212mm	22	4.4	Very Dense	62	66	577
75	240	240mm	28	5.6	Dense	46	48	443
80	278	278mm	38	7.6	Dense	31	33	318
85	328	328mm	50	10.0	Dense	22	23	236
90	368	368mm	40	8.0	Dense	29	31	301
95	420	420mm	52	10.4	Dense	21	22	226
100	460	460mm	40	8.0	Dense	29	31	301
105	490	490mm	30	6.0	Dense	42	44	411
110	520	520mm	30	6.0	Dense	42	44	411
115	555	555mm	35	7.0	Dense	35	36	348
120	630	630mm	75	15.0	Medium Dense	13	14	152
125	720	720mm	90	18.0	Medium Dense	10	11	124
130	770	770mm	50	10.0	Dense	22	23	236
135	805	805mm	35	7.0	Dense	35	36	348
140	830	830mm	25	5.0	Very Dense	53	56	502
145	855	855mm	25	5.0	Very Dense	53	56	502
150	905	905mm	50	10.0	Dense	22	23	236
155	945	945mm	40	8.0	Dense	29	31	301
160	1000	1000mm	55	11.0	Dense	20	20	212

DCP GRAPHICAL REPRESENTATION



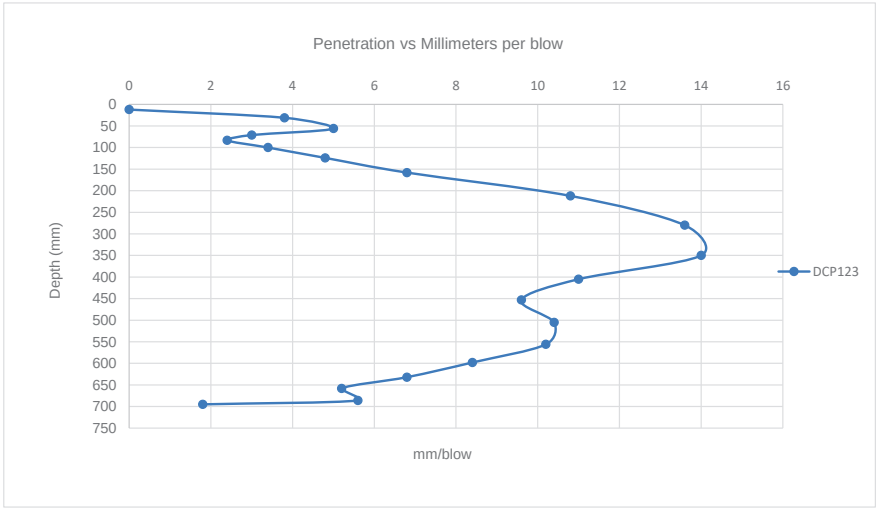


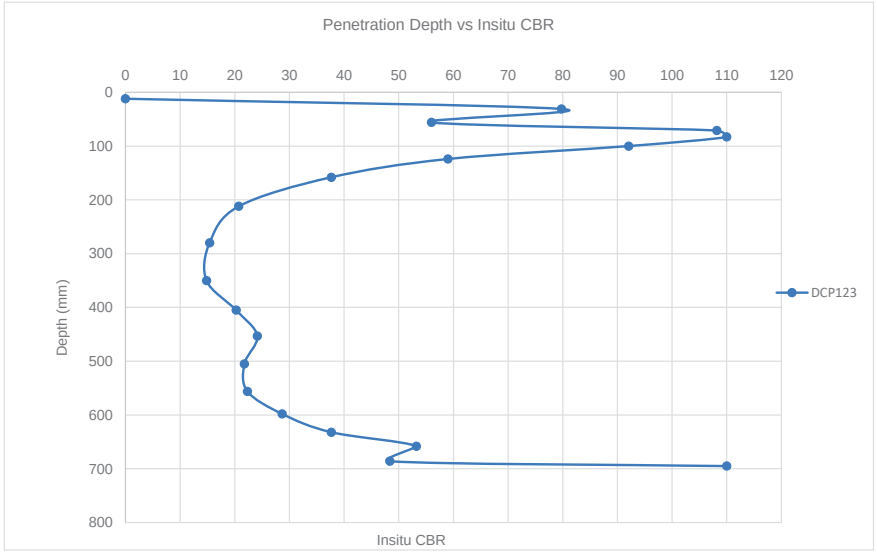
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP123	**STARTING DEPTH:**	12mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	12	12mm	0	0				
5	31	31mm	19	3.8	Very Dense	75	80	677
10	56	56mm	25	5.0	Very Dense	53	56	502
15	71	71mm	15	3.0	Very Dense	102	108	876
20	83	83mm	12	2.4	Very Dense	135	>110	1117
25	100	100mm	17	3.4	Very Dense	87	92	764
30	124	124mm	24	4.8	Very Dense	56	59	525
35	158	158mm	34	6.8	Dense	36	38	359
40	212	212mm	54	10.8	Dense	20	21	217
45	280	280mm	68	13.6	Medium Dense	15	15	169
50	350	350mm	70	14.0	Medium Dense	14	15	163
55	405	405mm	55	11.0	Dense	20	20	212
60	453	453mm	48	9.6	Dense	23	24	246
65	505	505mm	52	10.4	Dense	21	22	226
70	556	556mm	51	10.2	Dense	21	22	231
75	598	598mm	42	8.4	Dense	27	29	285
80	632	632mm	34	6.8	Dense	36	38	359
85	658	658mm	26	5.2	Dense	51	53	481
90	686	686mm	28	5.6	Dense	46	48	443
95	695	695mm	9	1.8	Very Dense	185	>110	1528

DCP GRAPHICAL REPRESENTATION



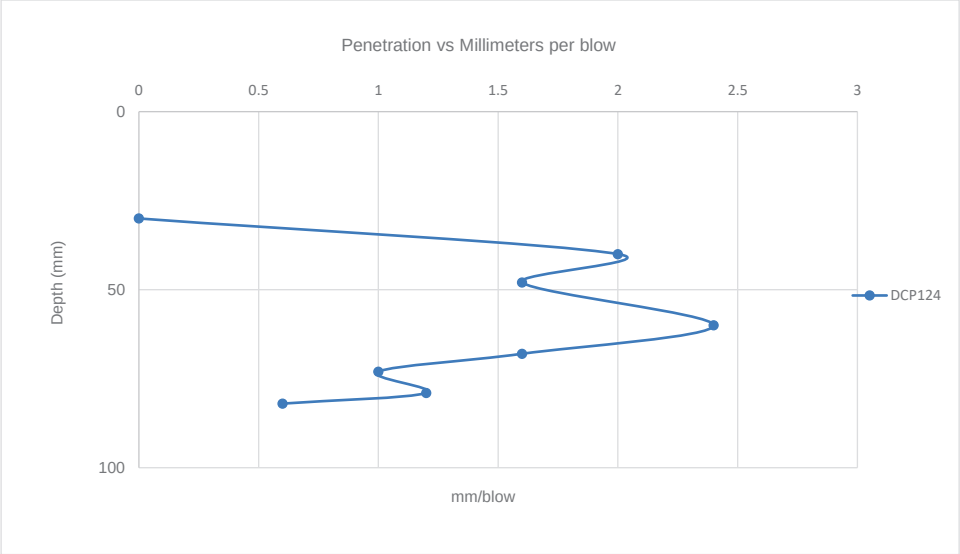


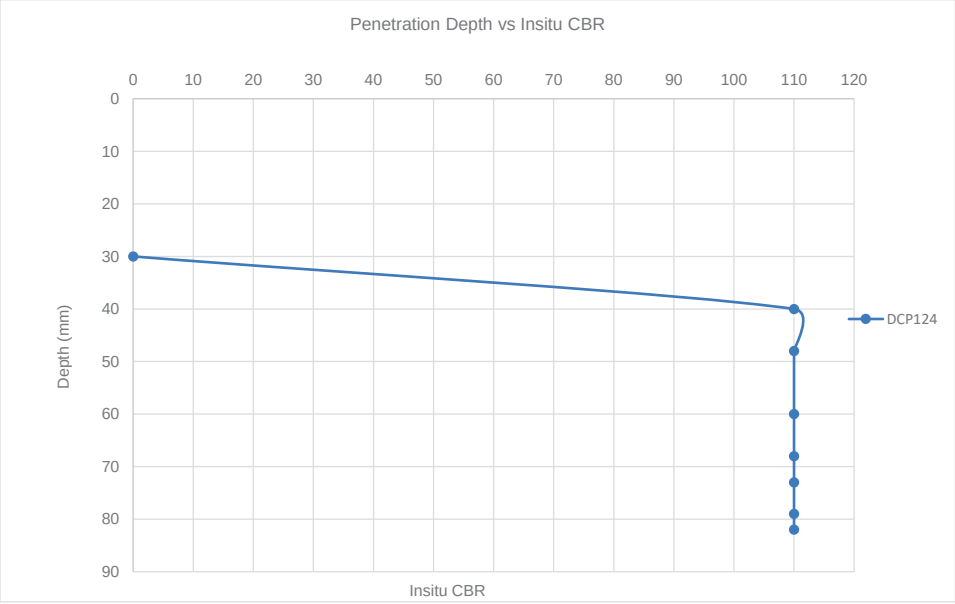
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP124	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	40	40mm	10	2.0	Very Dense	170	>110	1362
10	48	48mm	8	1.6	Very Dense	206	>110	1737
15	60	60mm	12	2.4	Very Dense	135	>110	1117
20	68	68mm	8	1.6	Very Dense	206	>110	1737
25	73	73mm	5	1.0	Very Dense	300	>110	2900
30	79	79mm	6	1.2	Very Dense	263	>110	2377
35	82	82mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



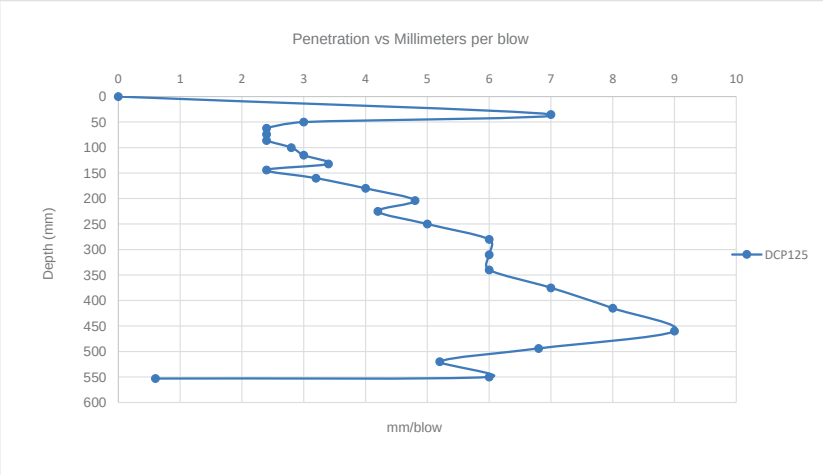


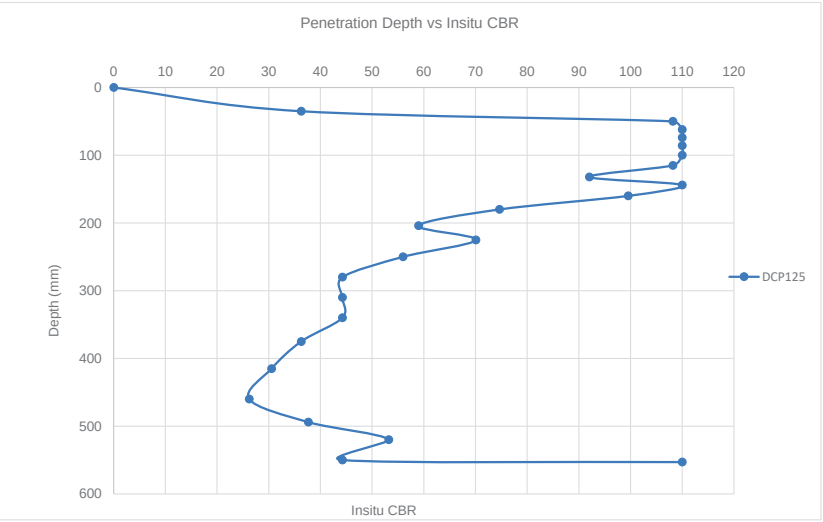
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP125	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	0	0mm	0	0				
5	35	35mm	35	7.0	Dense	35	36	348
10	50	50mm	15	3.0	Very Dense	102	108	876
15	62	62mm	12	2.4	Very Dense	135	>110	1117
20	74	74mm	12	2.4	Very Dense	135	>110	1117
25	86	86mm	12	2.4	Very Dense	135	>110	1117
30	100	100mm	14	2.8	Very Dense	111	>110	944
35	115	115mm	15	3.0	Very Dense	102	108	876
40	132	132mm	17	3.4	Very Dense	87	92	764
45	144	144mm	12	2.4	Very Dense	135	>110	1117
50	160	160mm	16	3.2	Very Dense	94	100	816
55	180	180mm	20	4.0	Very Dense	70	75	640
60	204	204mm	24	4.8	Very Dense	56	59	525
65	225	225mm	21	4.2	Very Dense	66	70	607
70	250	250mm	25	5.0	Very Dense	53	56	502
75	280	280mm	30	6.0	Dense	42	44	411
80	310	310mm	30	6.0	Dense	42	44	411
85	340	340mm	30	6.0	Dense	42	44	411
90	375	375mm	35	7.0	Dense	35	36	348
95	415	415mm	40	8.0	Dense	29	31	301
100	460	460mm	45	9.0	Dense	25	26	264
105	494	494mm	34	6.8	Dense	36	38	359
110	520	520mm	26	5.2	Dense	51	53	481
115	550	550mm	30	6.0	Dense	42	44	411
120	553	553mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



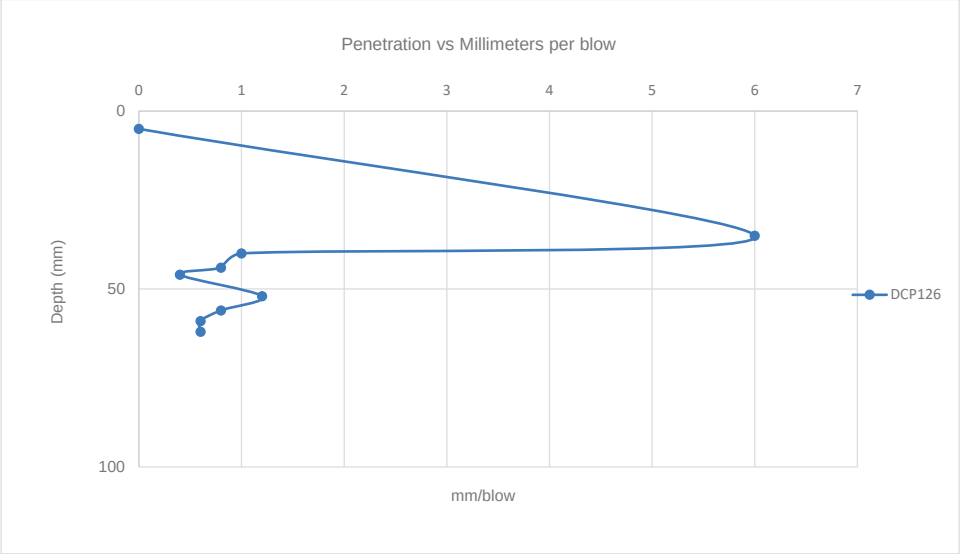


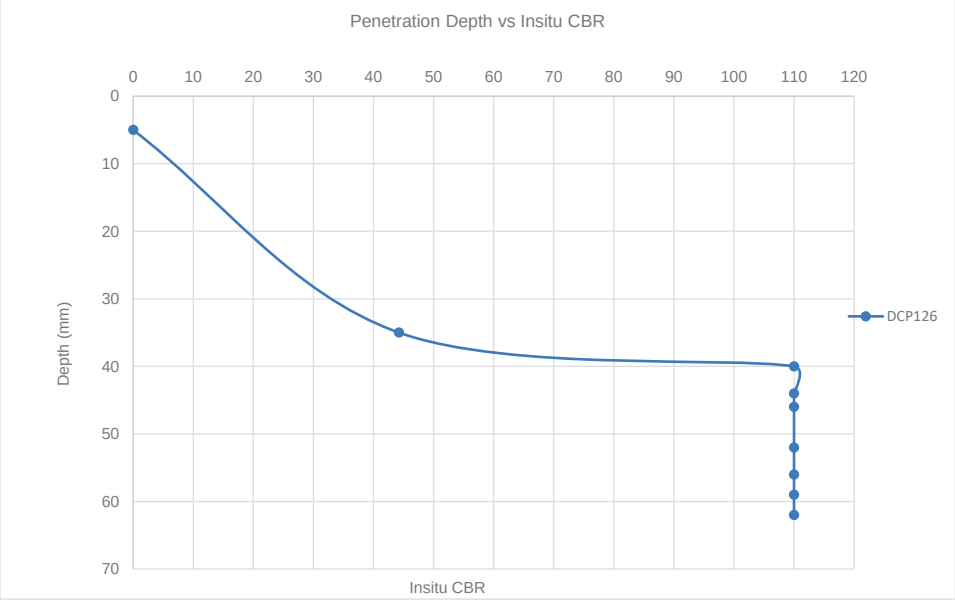
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP126	**STARTING DEPTH:**	5mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	5	5mm	0	0				
5	35	35mm	30	6.0	Dense	42	44	411
10	40	40mm	5	1.0	Very Dense	300	>110	2900
15	44	44mm	4	0.8	Very Dense	342	>110	3699
20	46	46mm	2	0.4	Very Dense	442	>110	7873
25	52	52mm	6	1.2	Very Dense	263	>110	2377
30	56	56mm	4	0.8	Very Dense	342	>110	3699
35	59	59mm	3	0.6	Very Dense	389	>110	5061
40	62	62mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



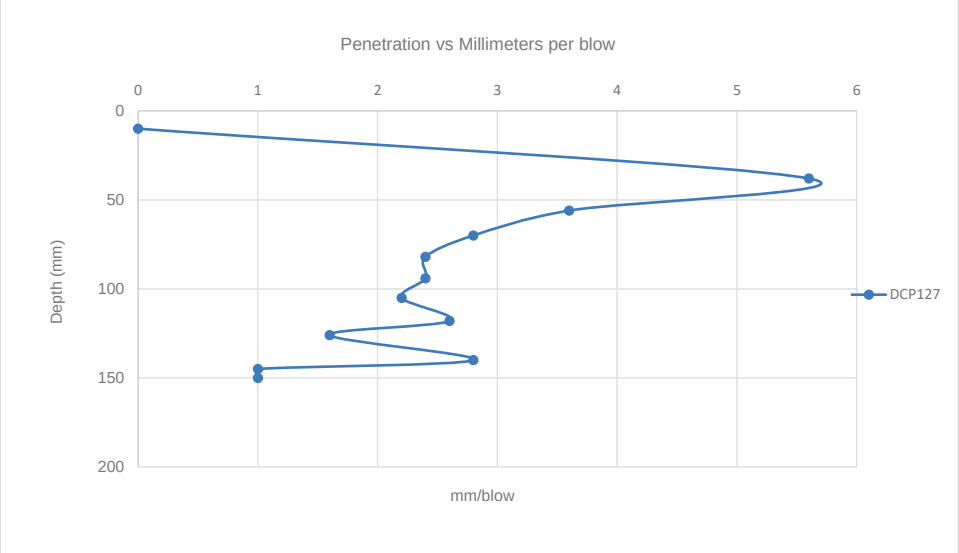


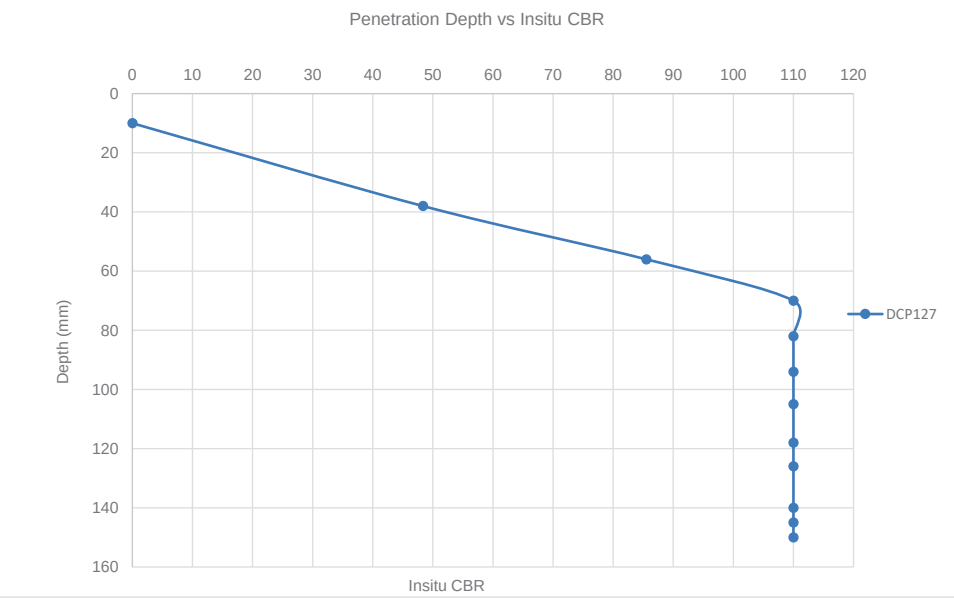
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP127	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	38	38mm	28	5.6	Dense	46	48	443
10	56	56mm	18	3.6	Very Dense	81	86	718
15	70	70mm	14	2.8	Very Dense	111	>110	944
20	82	82mm	12	2.4	Very Dense	135	>110	1117
25	94	94mm	12	2.4	Very Dense	135	>110	1117
30	105	105mm	11	2.2	Very Dense	151	>110	1228
35	118	118mm	13	2.6	Very Dense	122	>110	1023
40	126	126mm	8	1.6	Very Dense	206	>110	1737
45	140	140mm	14	2.8	Very Dense	111	>110	944
50	145	145mm	5	1.0	Very Dense	300	>110	2900
55	150	150mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



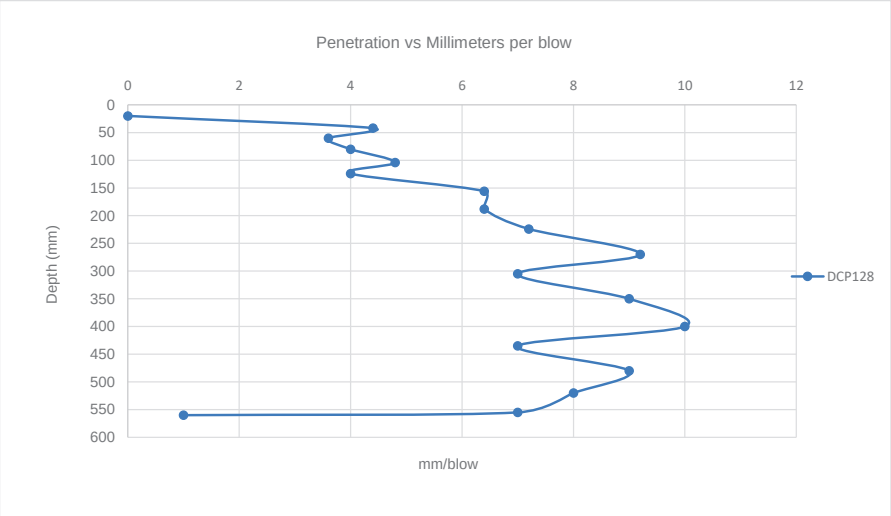


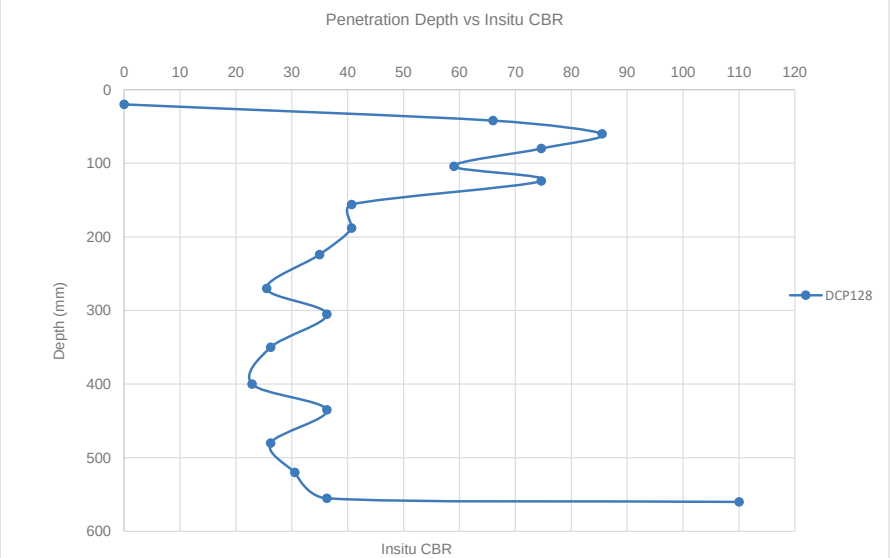
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP128	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	20	20mm	0	0				
5	42	42mm	22	4.4	Very Dense	62	66	577
10	60	60mm	18	3.6	Very Dense	81	86	718
15	80	80mm	20	4.0	Very Dense	70	75	640
20	104	104mm	24	4.8	Very Dense	56	59	525
25	124	124mm	20	4.0	Very Dense	70	75	640
30	156	156mm	32	6.4	Dense	39	41	383
35	188	188mm	32	6.4	Dense	39	41	383
40	224	224mm	36	7.2	Dense	33	35	337
45	270	270mm	46	9.2	Dense	24	25	258
50	305	305mm	35	7.0	Dense	35	36	348
55	350	350mm	45	9.0	Dense	25	26	264
60	400	400mm	50	10.0	Dense	22	23	236
65	435	435mm	35	7.0	Dense	35	36	348
70	480	480mm	45	9.0	Dense	25	26	264
75	520	520mm	40	8.0	Dense	29	31	301
80	555	555mm	35	7.0	Dense	35	36	348
85	560	560mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



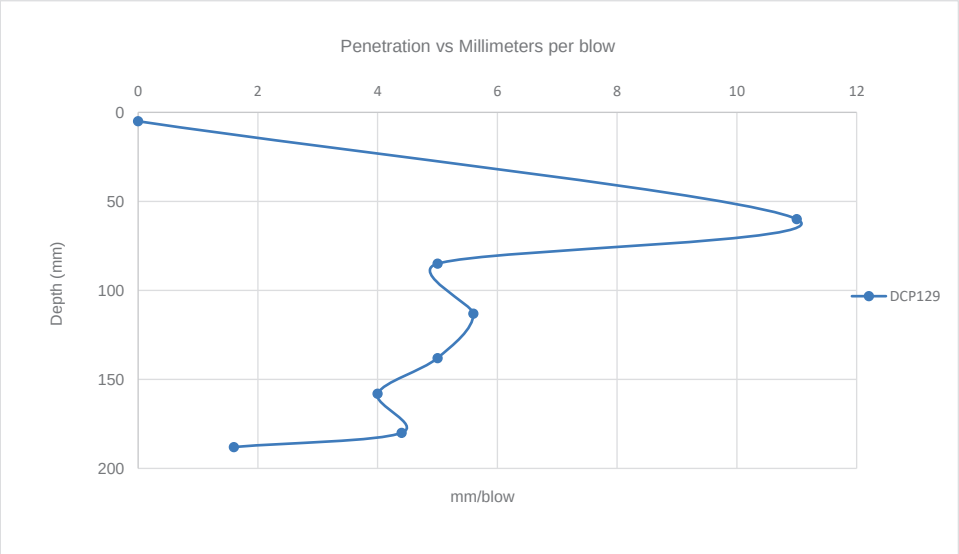


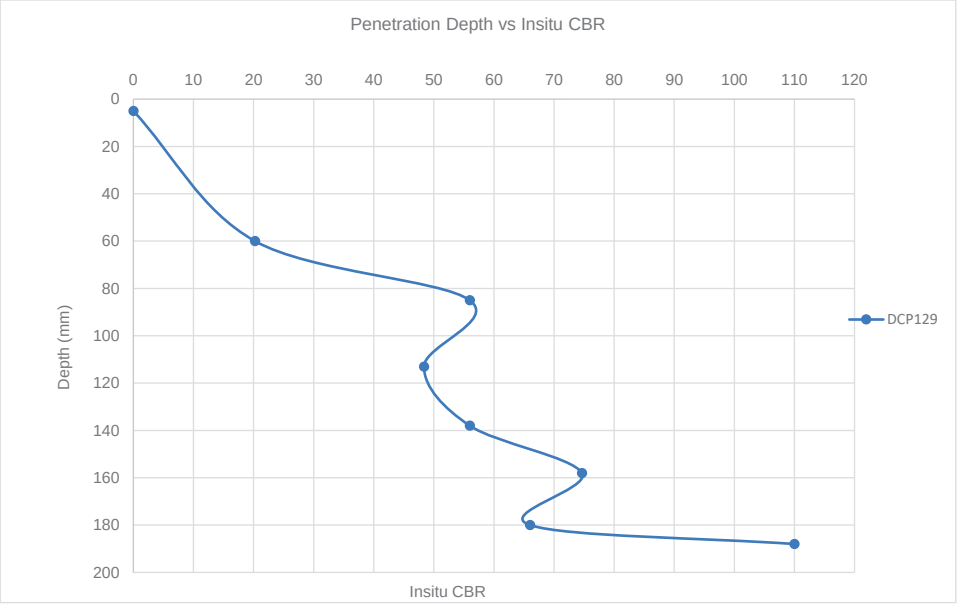
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP129	**STARTING DEPTH:**	5mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	5	5mm	0	0				
5	60	60mm	55	11.0	Dense	20	20	212
10	85	85mm	25	5.0	Very Dense	53	56	502
15	113	113mm	28	5.6	Dense	46	48	443
20	138	138mm	25	5.0	Very Dense	53	56	502
25	158	158mm	20	4.0	Very Dense	70	75	640
30	180	180mm	22	4.4	Very Dense	62	66	577
35	188	188mm	8	1.6	Very Dense	206	>110	1737

DCP GRAPHICAL REPRESENTATION



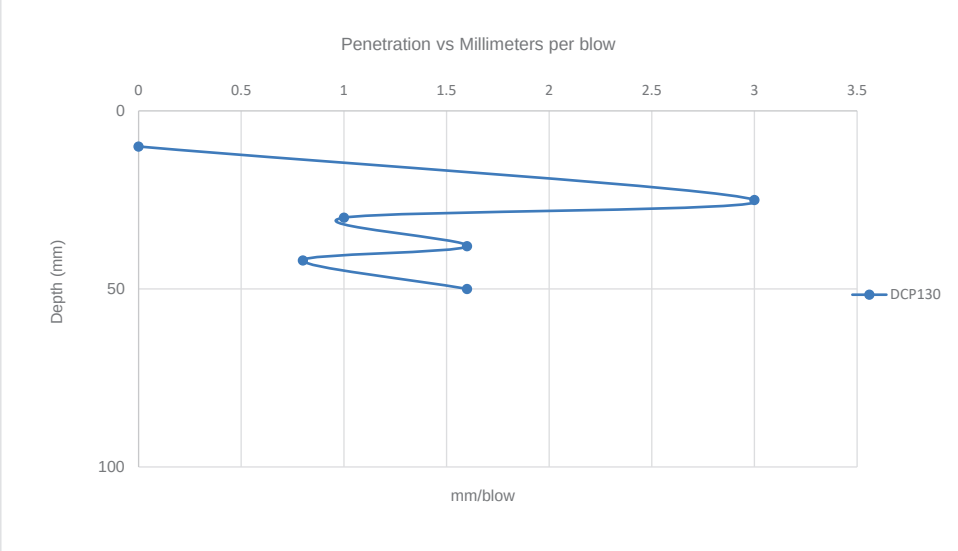


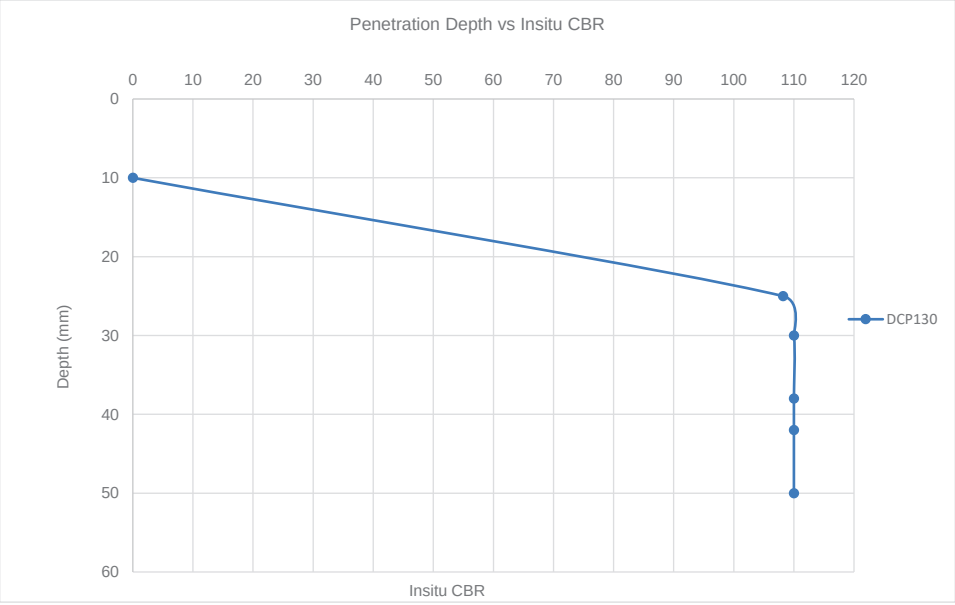
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP130	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	25	25mm	15	3.0	Very Dense	102	108	876
10	30	30mm	5	1.0	Very Dense	300	>110	2900
15	38	38mm	8	1.6	Very Dense	206	>110	1737
20	42	42mm	4	0.8	Very Dense	342	>110	3699
25	50	50mm	8	1.6	Very Dense	206	>110	1737

DCP GRAPHICAL REPRESENTATION



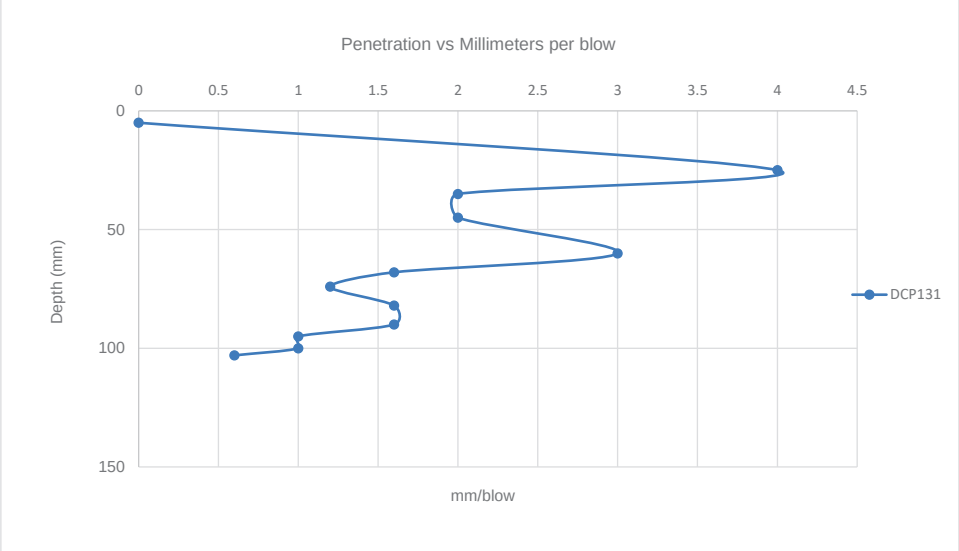


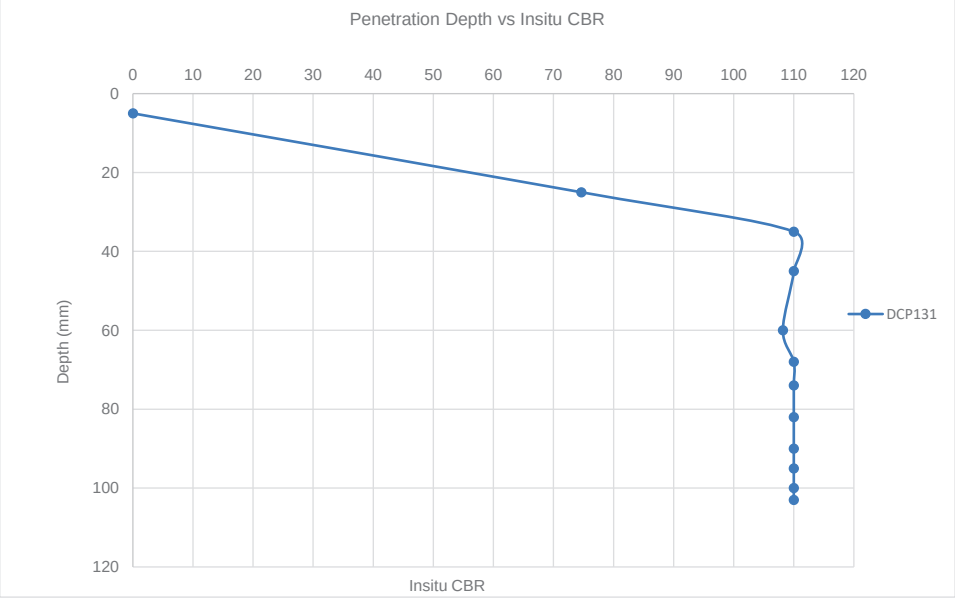
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP131	**STARTING DEPTH:**	5mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	5	5mm	0	0				
5	25	25mm	20	4.0	Very Dense	70	75	640
10	35	35mm	10	2.0	Very Dense	170	>110	1362
15	45	45mm	10	2.0	Very Dense	170	>110	1362
20	60	60mm	15	3.0	Very Dense	102	108	876
25	68	68mm	8	1.6	Very Dense	206	>110	1737
30	74	74mm	6	1.2	Very Dense	263	>110	2377
35	82	82mm	8	1.6	Very Dense	206	>110	1737
40	90	90mm	8	1.6	Very Dense	206	>110	1737
45	95	95mm	5	1.0	Very Dense	300	>110	2900
50	100	100mm	5	1.0	Very Dense	300	>110	2900
55	103	103mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



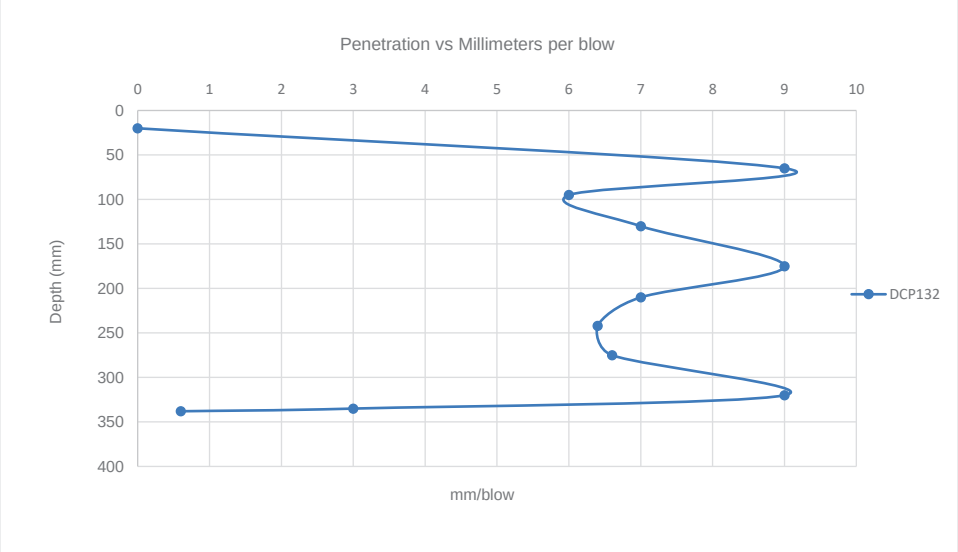


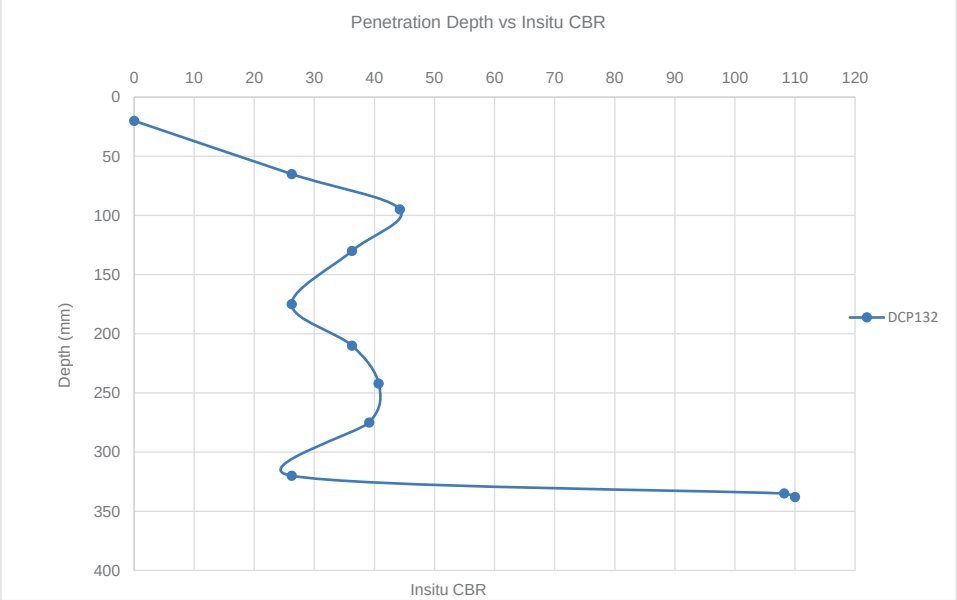
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP132	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	65	65mm	45	9.0	Dense	25	26	264
10	95	95mm	30	6.0	Dense	42	44	411
15	130	130mm	35	7.0	Dense	35	36	348
20	175	175mm	45	9.0	Dense	25	26	264
25	210	210mm	35	7.0	Dense	35	36	348
30	242	242mm	32	6.4	Dense	39	41	383
35	275	275mm	33	6.6	Dense	37	39	371
40	320	320mm	45	9.0	Dense	25	26	264
45	335	335mm	15	3.0	Very Dense	102	108	876
50	338	338mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



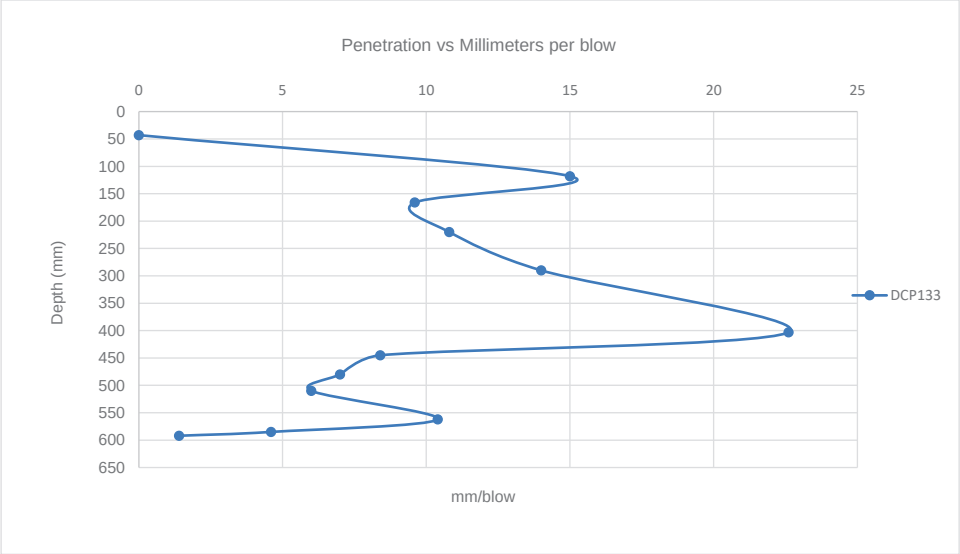


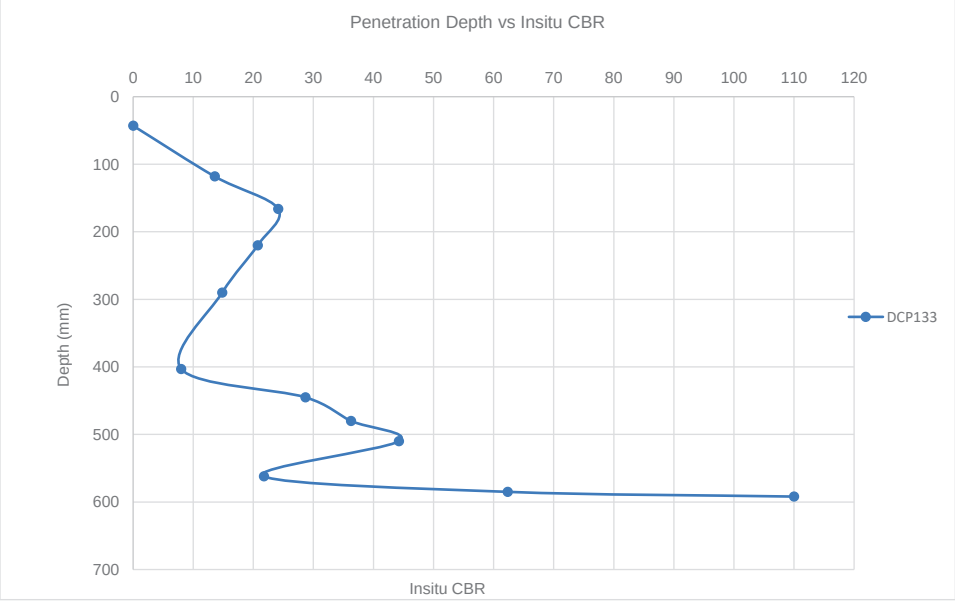
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP133	**STARTING DEPTH:**	43mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	43	43mm	0	0				
5	118	118mm	75	15.0	Medium Dense	13	14	152
10	166	166mm	48	9.6	Dense	23	24	246
15	220	220mm	54	10.8	Dense	20	21	217
20	290	290mm	70	14.0	Medium Dense	14	15	163
25	403	403mm	113	22.6	Medium Dense	8	8	97
30	445	445mm	42	8.4	Dense	27	29	285
35	480	480mm	35	7.0	Dense	35	36	348
40	510	510mm	30	6.0	Dense	42	44	411
45	562	562mm	52	10.4	Dense	21	22	226
50	585	585mm	23	4.6	Very Dense	59	62	550
55	592	592mm	7	1.4	Very Dense	232	>110	2010

DCP GRAPHICAL REPRESENTATION



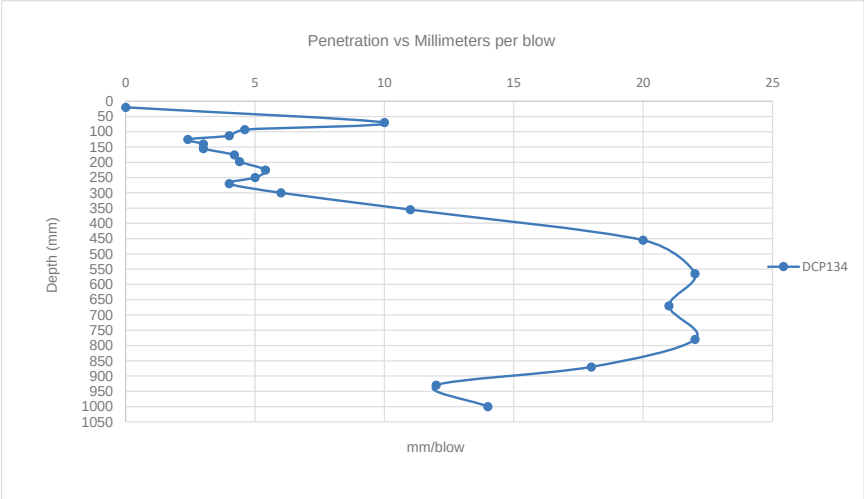


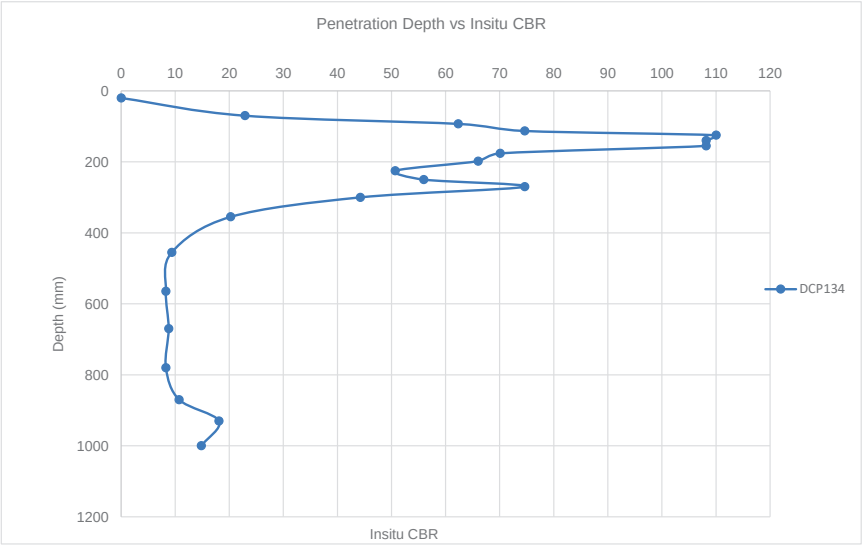
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP134	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	70	70mm	50	10.0	Dense	22	23	236
10	93	93mm	23	4.6	Very Dense	59	62	550
15	113	113mm	20	4.0	Very Dense	70	75	640
20	125	125mm	12	2.4	Very Dense	135	>110	1117
25	140	140mm	15	3.0	Very Dense	102	108	876
30	155	155mm	15	3.0	Very Dense	102	108	876
35	176	176mm	21	4.2	Very Dense	66	70	607
40	198	198mm	22	4.4	Very Dense	62	66	577
45	225	225mm	27	5.4	Dense	48	51	461
50	250	250mm	25	5.0	Very Dense	53	56	502
55	270	270mm	20	4.0	Very Dense	70	75	640
60	300	300mm	30	6.0	Dense	42	44	411
65	355	355mm	55	11.0	Dense	20	20	212
70	455	455mm	100	20.0	Medium Dense	9	9	111
75	565	565mm	110	22.0	Medium Dense	8	8	100
80	670	670mm	105	21.0	Medium Dense	9	9	105
85	780	780mm	110	22.0	Medium Dense	8	8	100
90	870	870mm	90	18.0	Medium Dense	10	11	124
95	930	930mm	60	12.0	Dense	17	18	193
100	1000	1000mm	70	14.0	Medium Dense	14	15	163

DCP GRAPHICAL REPRESENTATION



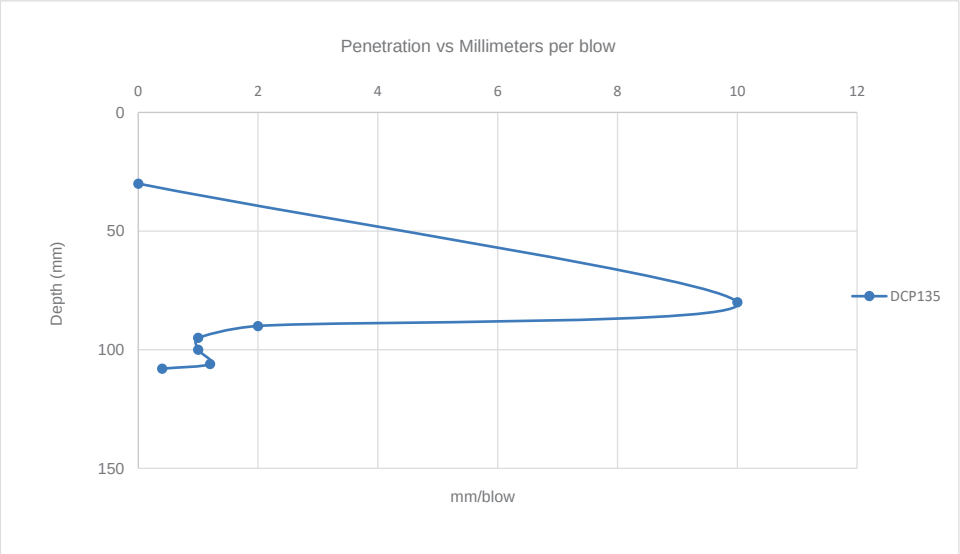


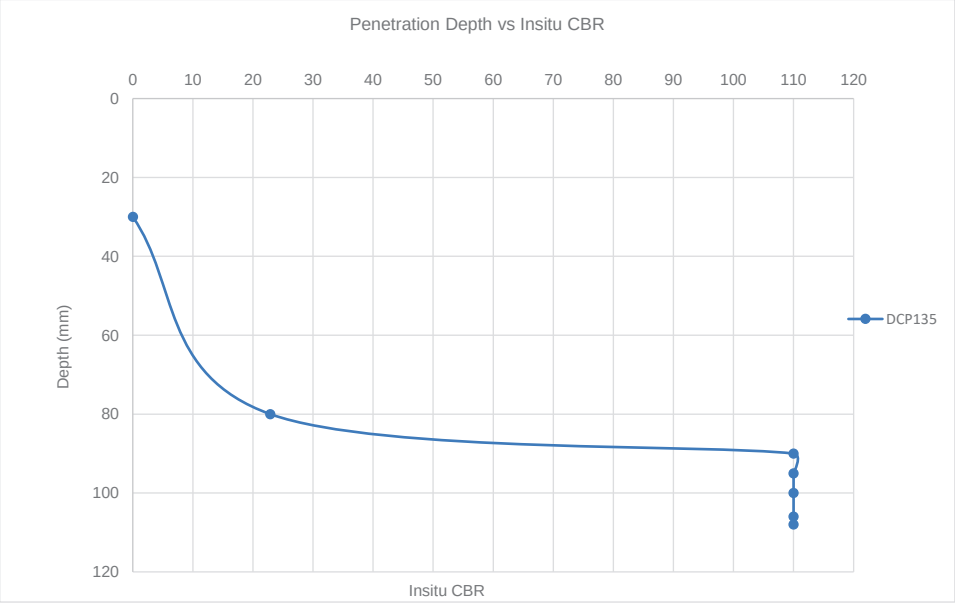
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP135	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	30	30mm	0	0				
5	80	80mm	50	10.0	Dense	22	23	236
10	90	90mm	10	2.0	Very Dense	170	>110	1362
15	95	95mm	5	1.0	Very Dense	300	>110	2900
20	100	100mm	5	1.0	Very Dense	300	>110	2900
25	106	106mm	6	1.2	Very Dense	263	>110	2377
30	108	108mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



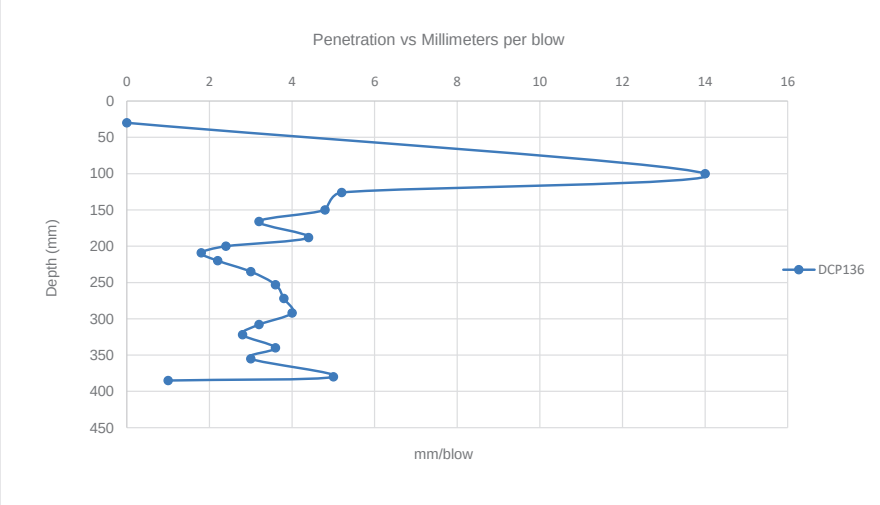


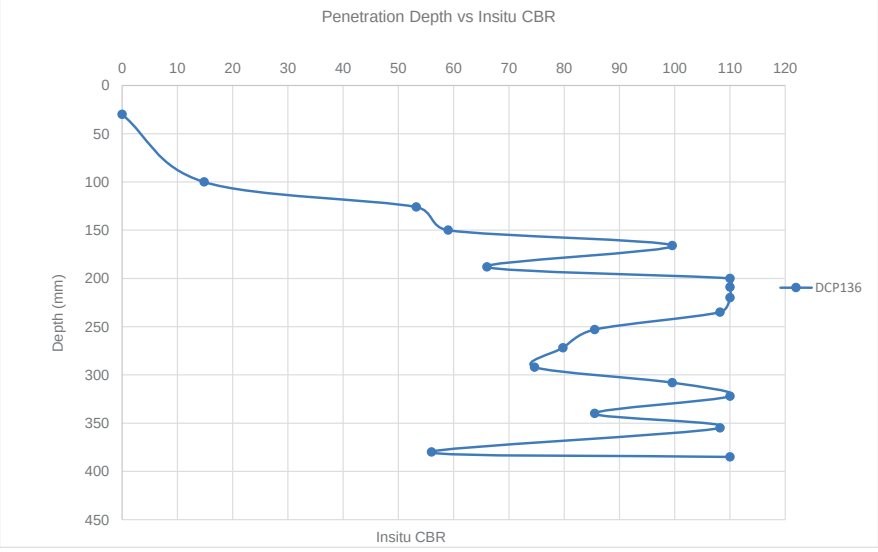
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP136	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	30	30mm	0	0				
5	100	100mm	70	14.0	Medium Dense	14	15	163
10	126	126mm	26	5.2	Dense	51	53	481
15	150	150mm	24	4.8	Very Dense	56	59	525
20	166	166mm	16	3.2	Very Dense	94	100	816
25	188	188mm	22	4.4	Very Dense	62	66	577
30	200	200mm	12	2.4	Very Dense	135	>110	1117
35	209	209mm	9	1.8	Very Dense	185	>110	1528
40	220	220mm	11	2.2	Very Dense	151	>110	1228
45	235	235mm	15	3.0	Very Dense	102	108	876
50	253	253mm	18	3.6	Very Dense	81	86	718
55	272	272mm	19	3.8	Very Dense	75	80	677
60	292	292mm	20	4.0	Very Dense	70	75	640
65	308	308mm	16	3.2	Very Dense	94	100	816
70	322	322mm	14	2.8	Very Dense	111	>110	944
75	340	340mm	18	3.6	Very Dense	81	86	718
80	355	355mm	15	3.0	Very Dense	102	108	876
85	380	380mm	25	5.0	Very Dense	53	56	502
90	385	385mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



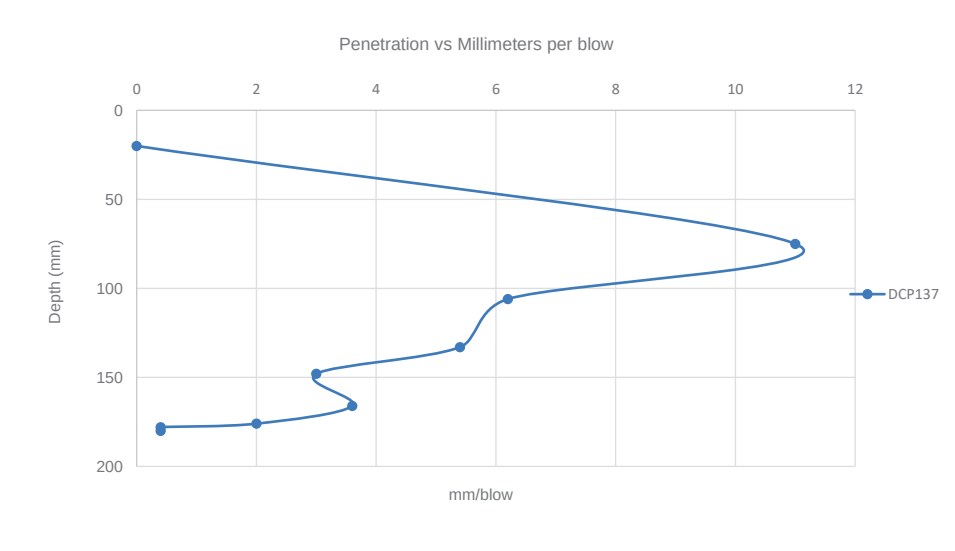


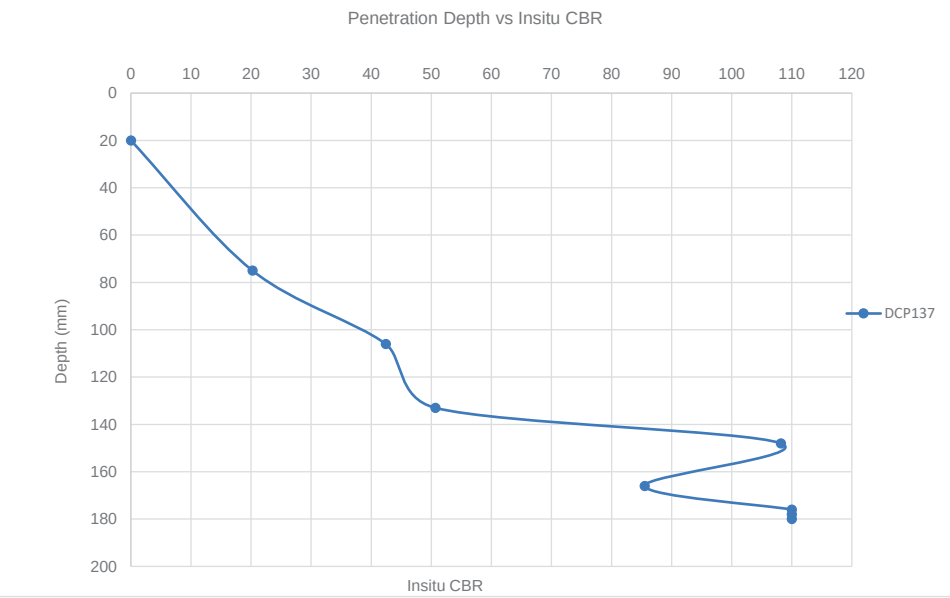
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP137	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	75	75mm	55	11.0	Dense	20	20	212
10	106	106mm	31	6.2	Dense	40	42	397
15	133	133mm	27	5.4	Dense	48	51	461
20	148	148mm	15	3.0	Very Dense	102	108	876
25	166	166mm	18	3.6	Very Dense	81	86	718
30	176	176mm	10	2.0	Very Dense	170	>110	1362
35	178	178mm	2	0.4	Very Dense	442	>110	7873
40	180	180mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



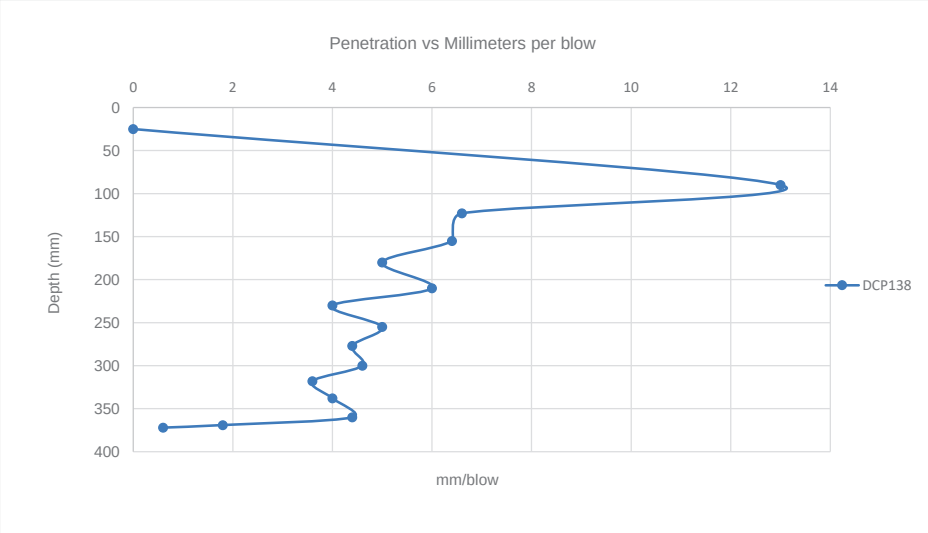


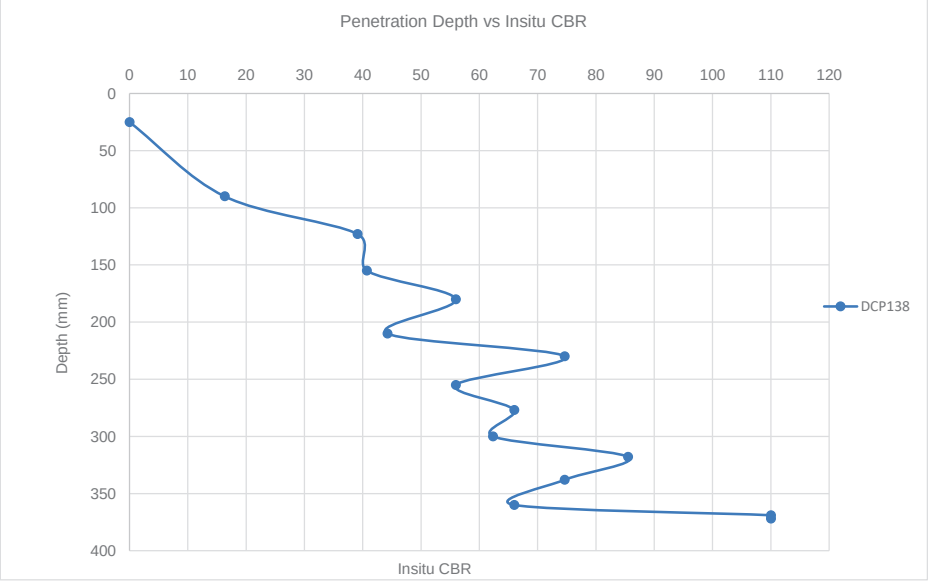
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP138	**STARTING DEPTH:**	25mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	25	25mm	0	0				
5	90	90mm	65	13.0	Medium Dense	16	16	177
10	123	123mm	33	6.6	Dense	37	39	371
15	155	155mm	32	6.4	Dense	39	41	383
20	180	180mm	25	5.0	Very Dense	53	56	502
25	210	210mm	30	6.0	Dense	42	44	411
30	230	230mm	20	4.0	Very Dense	70	75	640
35	255	255mm	25	5.0	Very Dense	53	56	502
40	277	277mm	22	4.4	Very Dense	62	66	577
45	300	300mm	23	4.6	Very Dense	59	62	550
50	318	318mm	18	3.6	Very Dense	81	86	718
55	338	338mm	20	4.0	Very Dense	70	75	640
60	360	360mm	22	4.4	Very Dense	62	66	577
65	369	369mm	9	1.8	Very Dense	185	>110	1528
70	372	372mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



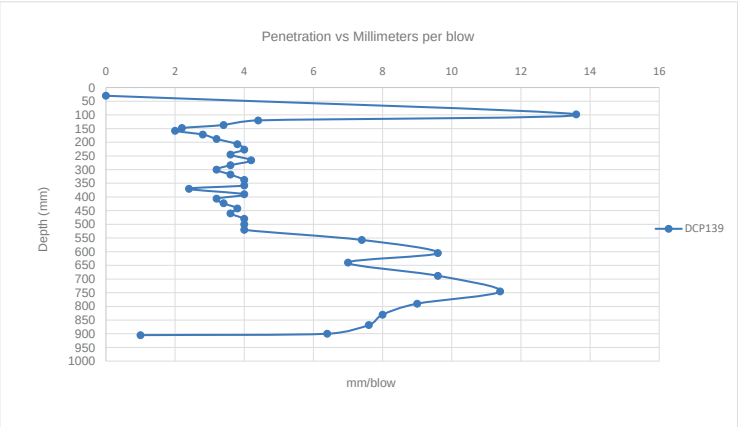


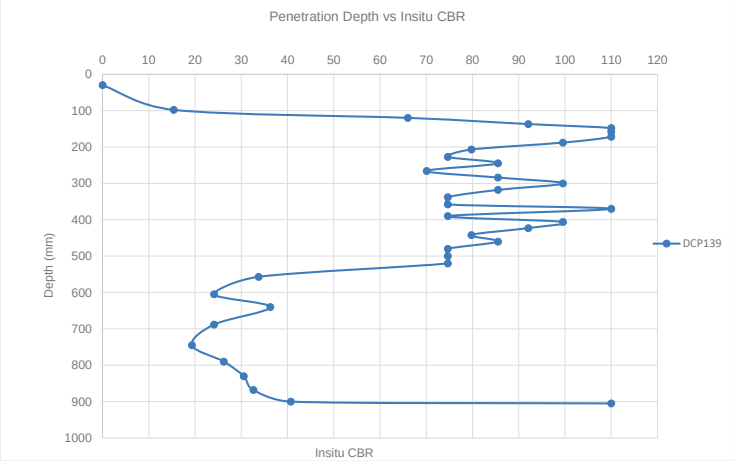
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP139	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	30	30mm	0	0				
5	98	98mm	68	13.6	Medium Dense	15	15	169
10	120	120mm	22	4.4	Very Dense	62	66	577
15	137	137mm	17	3.4	Very Dense	87	92	764
20	148	148mm	11	2.2	Very Dense	151	>110	1228
25	158	158mm	10	2.0	Very Dense	170	>110	1362
30	172	172mm	14	2.8	Very Dense	111	>110	944
35	188	188mm	16	3.2	Very Dense	94	100	816
40	207	207mm	19	3.8	Very Dense	75	80	677
45	227	227mm	20	4.0	Very Dense	70	75	640
50	245	245mm	18	3.6	Very Dense	81	86	718
55	266	266mm	21	4.2	Very Dense	66	70	607
60	284	284mm	18	3.6	Very Dense	81	86	718
65	300	300mm	16	3.2	Very Dense	94	100	816
70	318	318mm	18	3.6	Very Dense	81	86	718
75	338	338mm	20	4.0	Very Dense	70	75	640
80	358	358mm	20	4.0	Very Dense	70	75	640
85	370	370mm	12	2.4	Very Dense	135	>110	1117
90	390	390mm	20	4.0	Very Dense	70	75	640
95	406	406mm	16	3.2	Very Dense	94	100	816
100	423	423mm	17	3.4	Very Dense	87	92	764
105	442	442mm	19	3.8	Very Dense	75	80	677
110	460	460mm	18	3.6	Very Dense	81	86	718
115	480	480mm	20	4.0	Very Dense	70	75	640
120	500	500mm	20	4.0	Very Dense	70	75	640
125	520	520mm	20	4.0	Very Dense	70	75	640
130	557	557mm	37	7.4	Dense	32	34	327
135	605	605mm	48	9.6	Dense	23	24	246
140	640	640mm	35	7.0	Dense	35	36	348
145	688	688mm	48	9.6	Dense	23	24	246
150	745	745mm	57	11.4	Dense	19	19	204
155	790	790mm	45	9.0	Dense	25	26	264
160	830	830mm	40	8.0	Dense	29	31	301
165	868	868mm	38	7.6	Dense	31	33	318
170	900	900mm	32	6.4	Dense	39	41	383
175	905	905mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



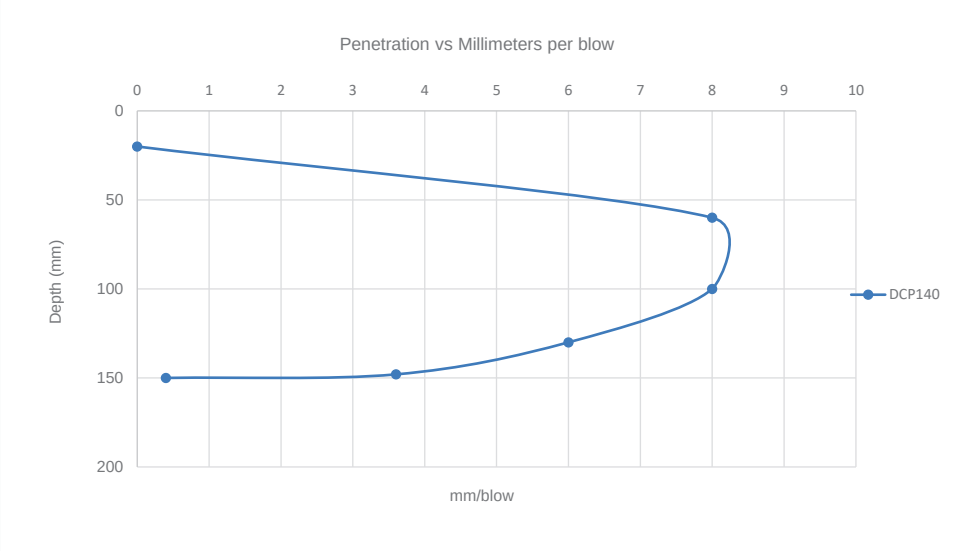


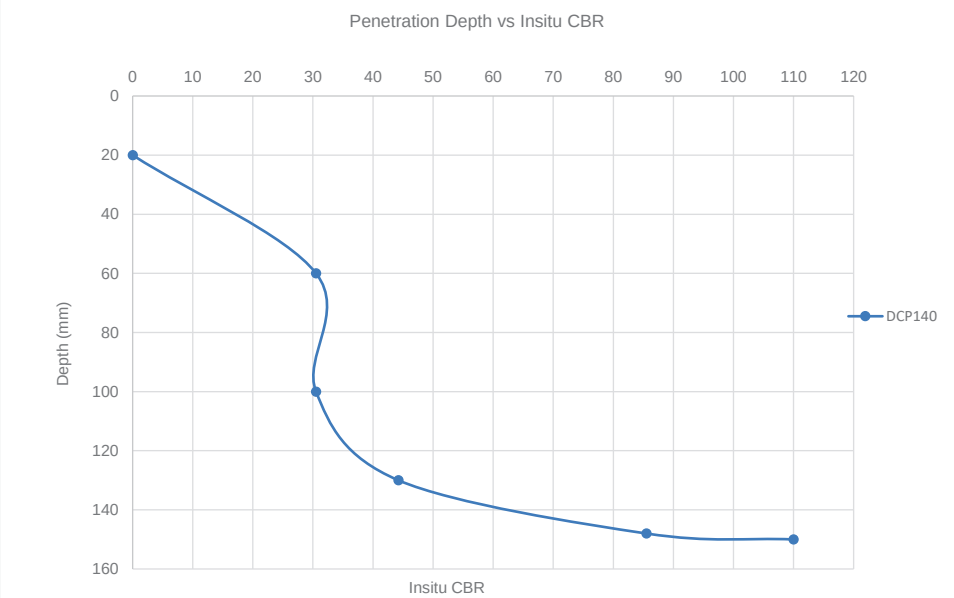
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP140	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	60	60mm	40	8.0	Dense	29	31	301
10	100	100mm	40	8.0	Dense	29	31	301
15	130	130mm	30	6.0	Dense	42	44	411
20	148	148mm	18	3.6	Very Dense	81	86	718
25	150	150mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



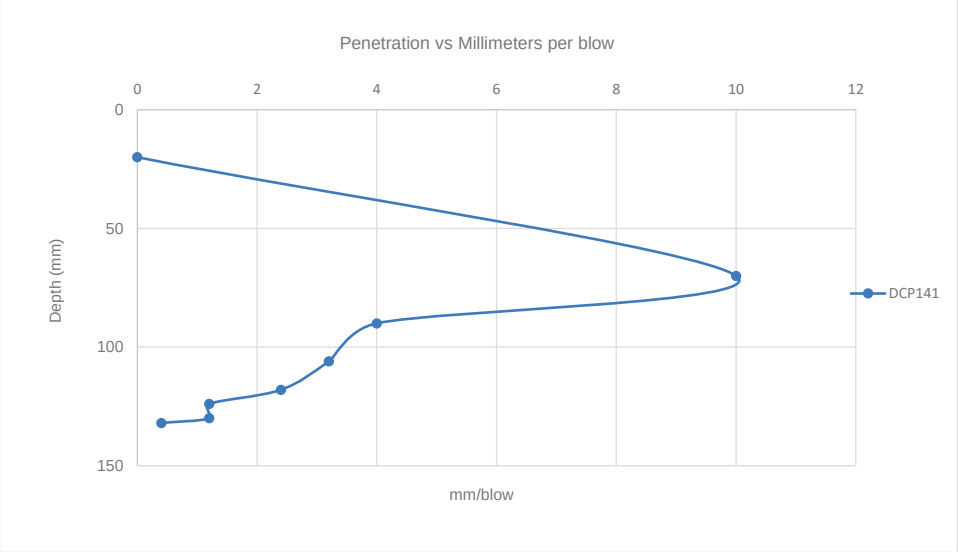


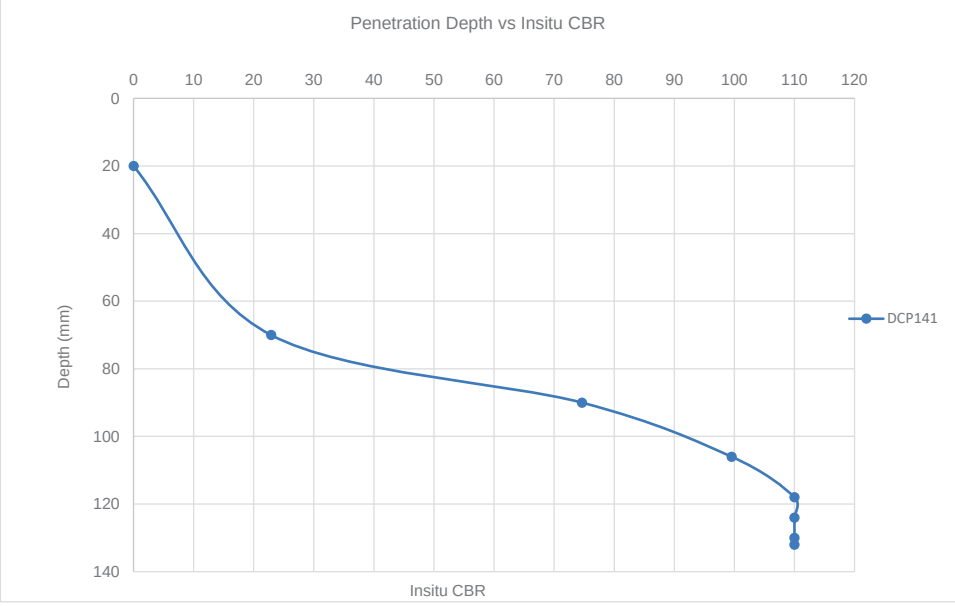
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP141	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	70	70mm	50	10.0	Dense	22	23	236
10	90	90mm	20	4.0	Very Dense	70	75	640
15	106	106mm	16	3.2	Very Dense	94	100	816
20	118	118mm	12	2.4	Very Dense	135	>110	1117
25	124	124mm	6	1.2	Very Dense	263	>110	2377
30	130	130mm	6	1.2	Very Dense	263	>110	2377
35	132	132mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



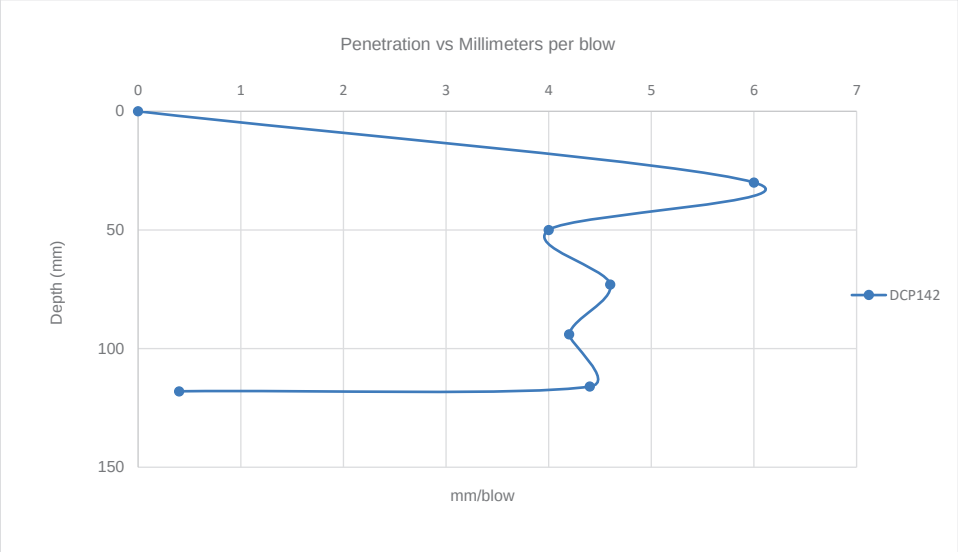


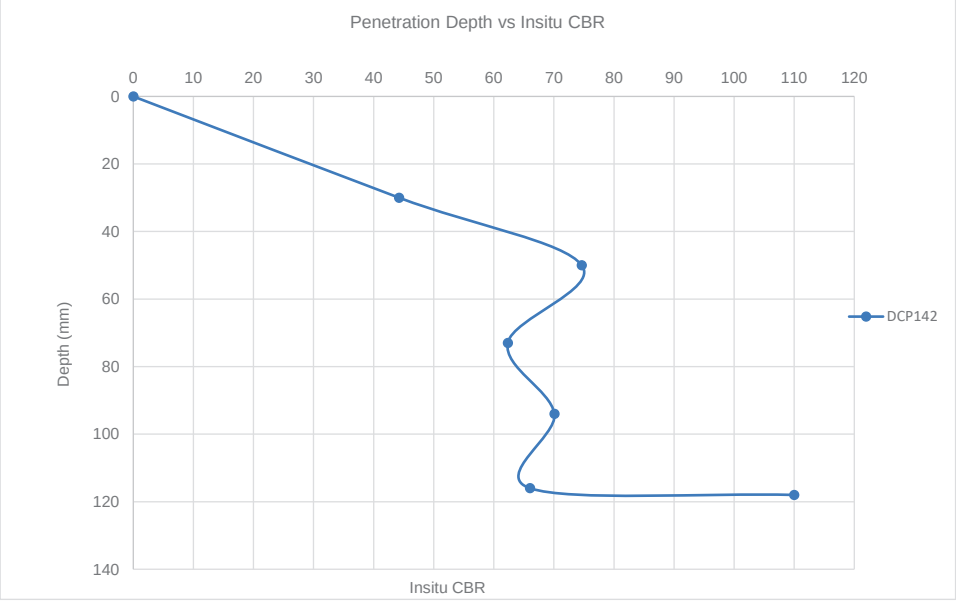
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP142	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	0	0mm	0	0				
5	30	30mm	30	6.0	Dense	42	44	411
10	50	50mm	20	4.0	Very Dense	70	75	640
15	73	73mm	23	4.6	Very Dense	59	62	550
20	94	94mm	21	4.2	Very Dense	66	70	607
25	116	116mm	22	4.4	Very Dense	62	66	577
30	118	118mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



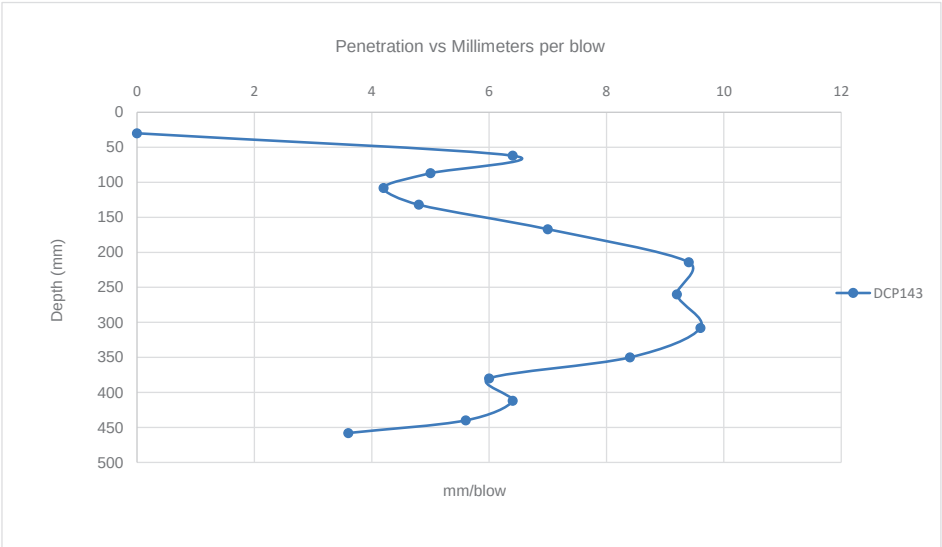


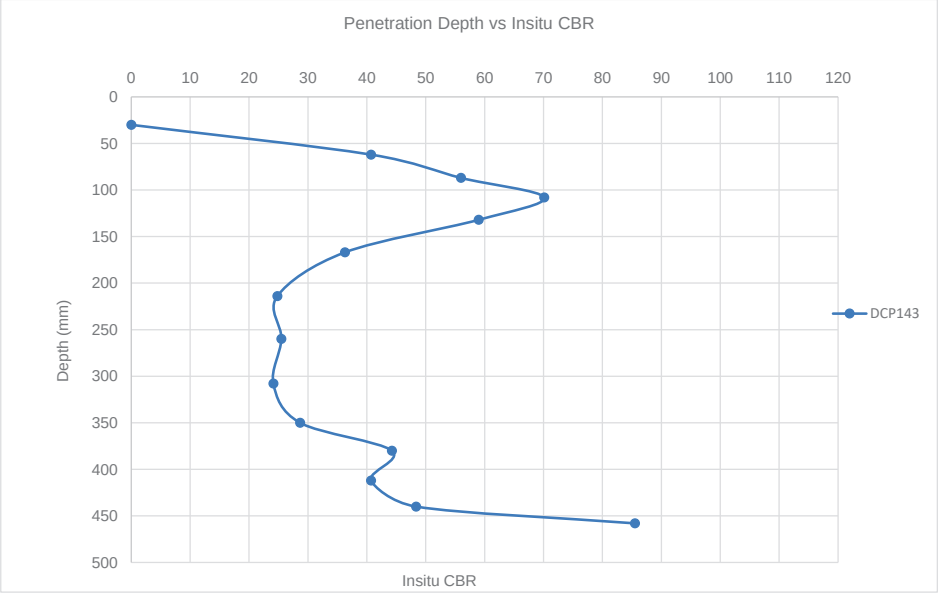
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP143	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	30	30mm	0	0				
5	62	62mm	32	6.4	Dense	39	41	383
10	87	87mm	25	5.0	Very Dense	53	56	502
15	108	108mm	21	4.2	Very Dense	66	70	607
20	132	132mm	24	4.8	Very Dense	56	59	525
25	167	167mm	35	7.0	Dense	35	36	348
30	214	214mm	47	9.4	Dense	24	25	252
35	260	260mm	46	9.2	Dense	24	25	258
40	308	308mm	48	9.6	Dense	23	24	246
45	350	350mm	42	8.4	Dense	27	29	285
50	380	380mm	30	6.0	Dense	42	44	411
55	412	412mm	32	6.4	Dense	39	41	383
60	440	440mm	28	5.6	Dense	46	48	443
65	458	458mm	18	3.6	Very Dense	81	86	718

DCP GRAPHICAL REPRESENTATION



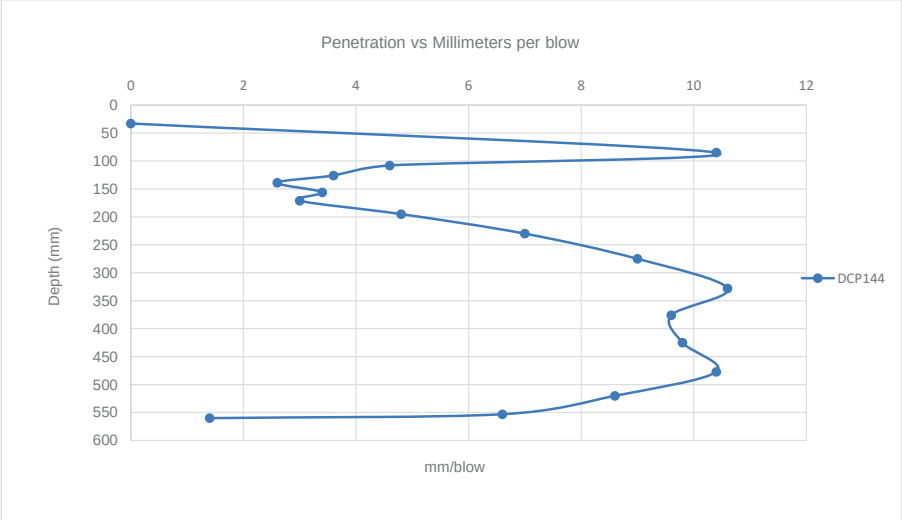


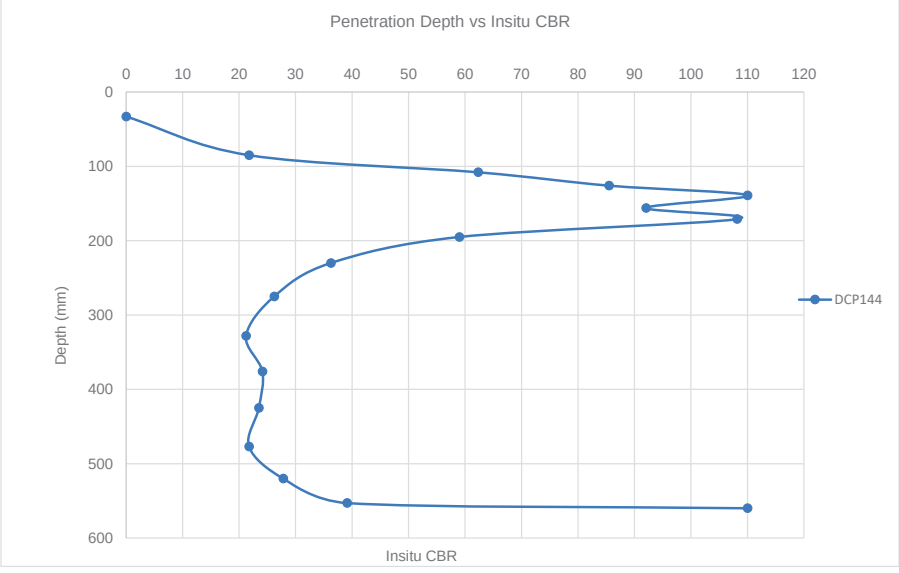
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP144	**STARTING DEPTH:**	33mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	33	33mm	0	0				
5	85	85mm	52	10.4	Dense	21	22	226
10	108	108mm	23	4.6	Very Dense	59	62	550
15	126	126mm	18	3.6	Very Dense	81	86	718
20	139	139mm	13	2.6	Very Dense	122	>110	1023
25	156	156mm	17	3.4	Very Dense	87	92	764
30	171	171mm	15	3.0	Very Dense	102	108	876
35	195	195mm	24	4.8	Very Dense	56	59	525
40	230	230mm	35	7.0	Dense	35	36	348
45	275	275mm	45	9.0	Dense	25	26	264
50	328	328mm	53	10.6	Dense	20	21	221
55	376	376mm	48	9.6	Dense	23	24	246
60	425	425mm	49	9.8	Dense	23	23	241
65	477	477mm	52	10.4	Dense	21	22	226
70	520	520mm	43	8.6	Dense	27	28	278
75	553	553mm	33	6.6	Dense	37	39	371
80	560	560mm	7	1.4	Very Dense	232	>110	2010

DCP GRAPHICAL REPRESENTATION



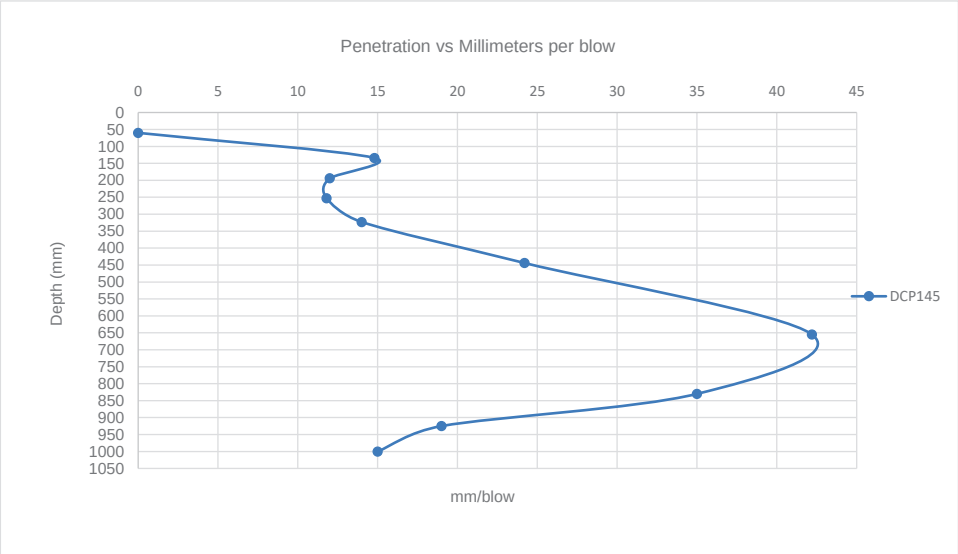


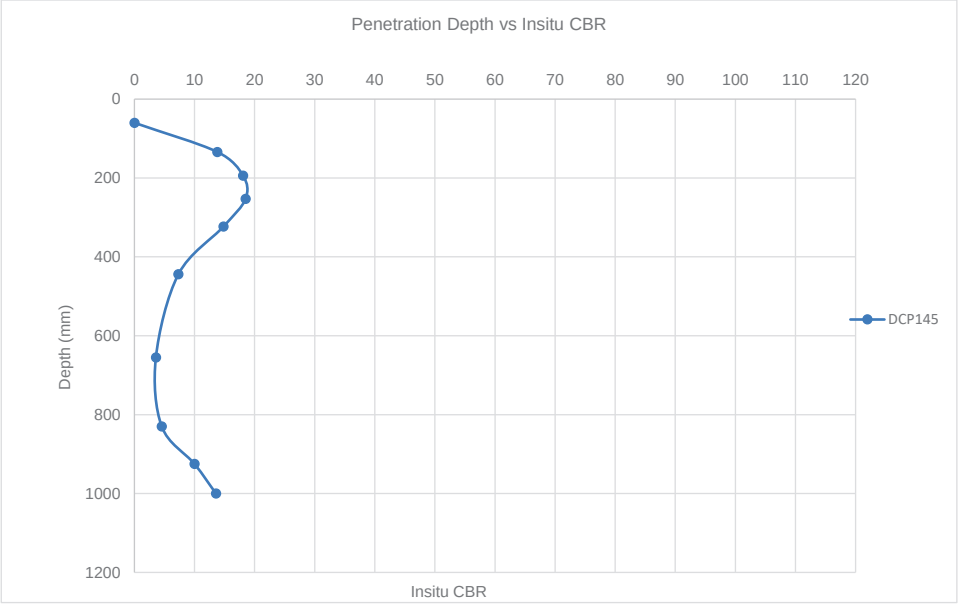
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP145	**STARTING DEPTH:**	60mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	60	60mm	0	0				
5	134	134mm	74	14.8	Medium Dense	13	14	154
10	194	194mm	60	12.0	Dense	17	18	193
15	253	253mm	59	11.8	Dense	18	18	197
20	323	323mm	70	14.0	Medium Dense	14	15	163
25	444	444mm	121	24.2	Medium Dense	7	7	90
30	655	655mm	211	42.2	Loose	4	4	49
35	830	830mm	175	35.0	Loose	4	5	60
40	925	925mm	95	19.0	Medium Dense	10	10	117
45	1000	1000mm	75	15.0	Medium Dense	13	14	152

DCP GRAPHICAL REPRESENTATION



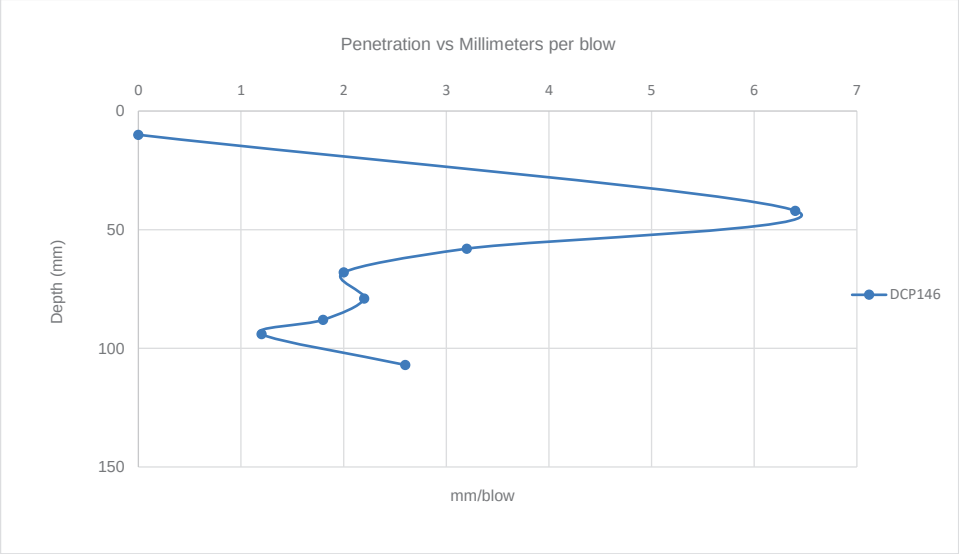


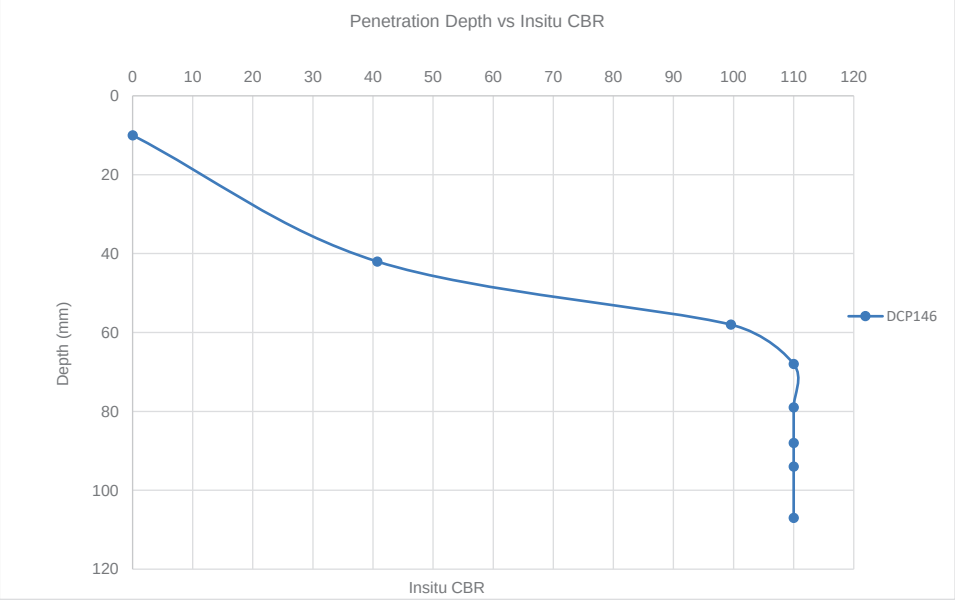
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP146	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	42	42mm	32	6.4	Dense	39	41	383
10	58	58mm	16	3.2	Very Dense	94	100	816
15	68	68mm	10	2.0	Very Dense	170	>110	1362
20	79	79mm	11	2.2	Very Dense	151	>110	1228
25	88	88mm	9	1.8	Very Dense	185	>110	1528
30	94	94mm	6	1.2	Very Dense	263	>110	2377
35	107	107mm	13	2.6	Very Dense	122	>110	1023

DCP GRAPHICAL REPRESENTATION



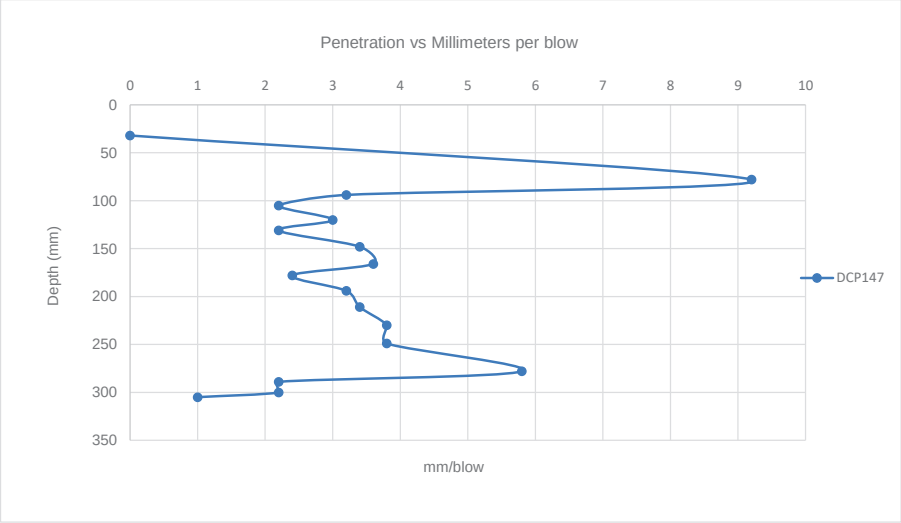


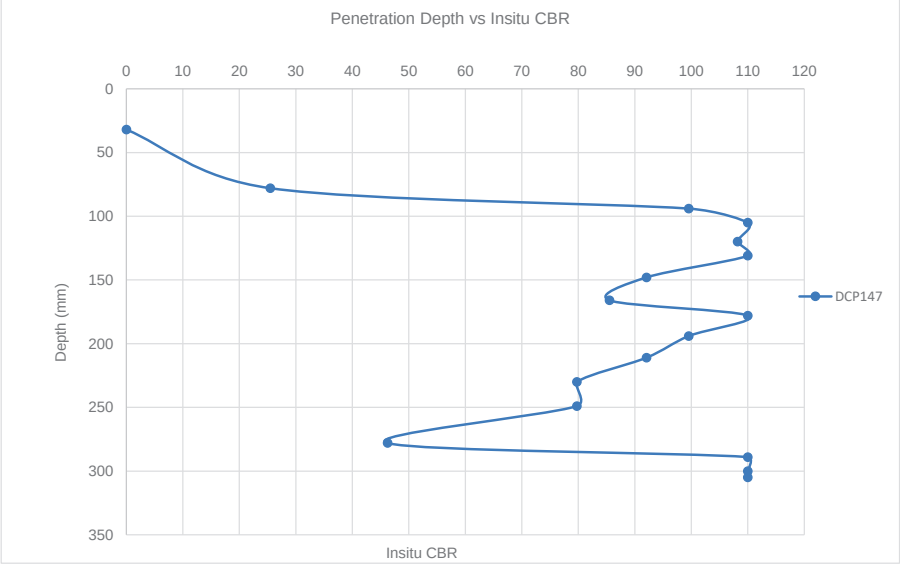
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP147	**STARTING DEPTH:**	32mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	32	32mm	0	0				
5	78	78mm	46	9.2	Dense	24	25	258
10	94	94mm	16	3.2	Very Dense	94	100	816
15	105	105mm	11	2.2	Very Dense	151	>110	1228
20	120	120mm	15	3.0	Very Dense	102	108	876
25	131	131mm	11	2.2	Very Dense	151	>110	1228
30	148	148mm	17	3.4	Very Dense	87	92	764
35	166	166mm	18	3.6	Very Dense	81	86	718
40	178	178mm	12	2.4	Very Dense	135	>110	1117
45	194	194mm	16	3.2	Very Dense	94	100	816
50	211	211mm	17	3.4	Very Dense	87	92	764
55	230	230mm	19	3.8	Very Dense	75	80	677
60	249	249mm	19	3.8	Very Dense	75	80	677
65	278	278mm	29	5.8	Dense	44	46	427
70	289	289mm	11	2.2	Very Dense	151	>110	1228
75	300	300mm	11	2.2	Very Dense	151	>110	1228
80	305	305mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



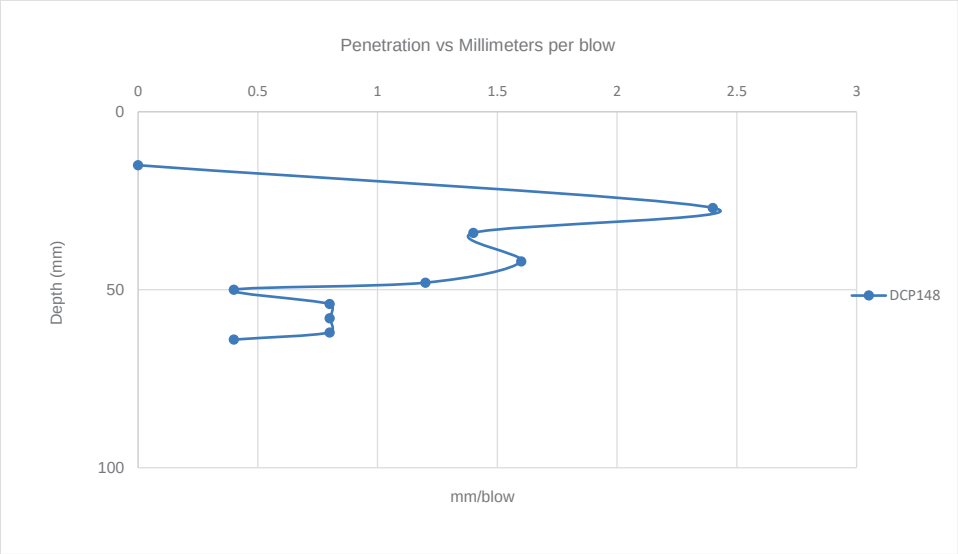


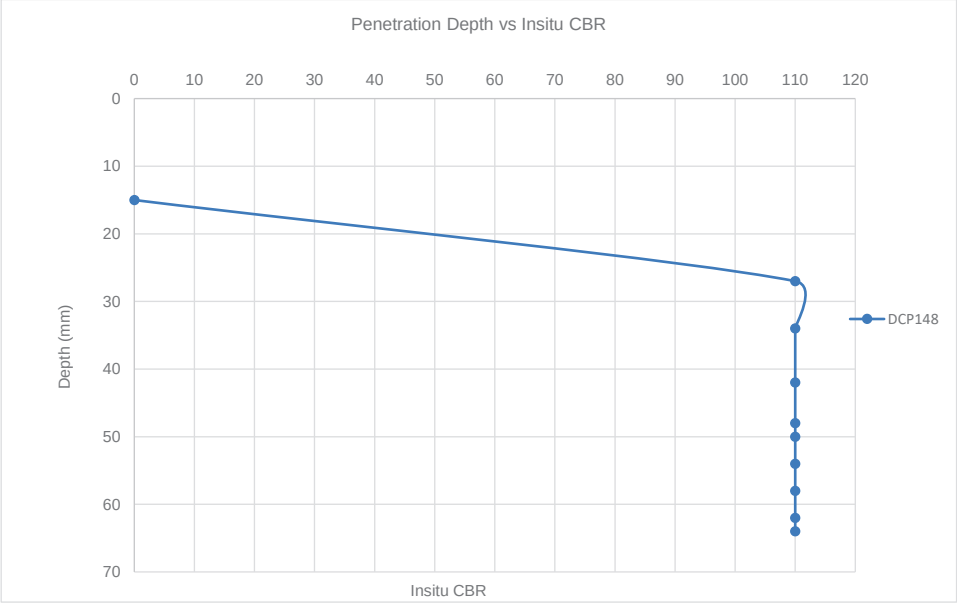
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP148	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	15	15mm	0	0				
5	27	27mm	12	2.4	Very Dense	135	>110	1117
10	34	34mm	7	1.4	Very Dense	232	>110	2010
15	42	42mm	8	1.6	Very Dense	206	>110	1737
20	48	48mm	6	1.2	Very Dense	263	>110	2377
25	50	50mm	2	0.4	Very Dense	442	>110	7873
30	54	54mm	4	0.8	Very Dense	342	>110	3699
35	58	58mm	4	0.8	Very Dense	342	>110	3699
40	62	62mm	4	0.8	Very Dense	342	>110	3699
45	64	64mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



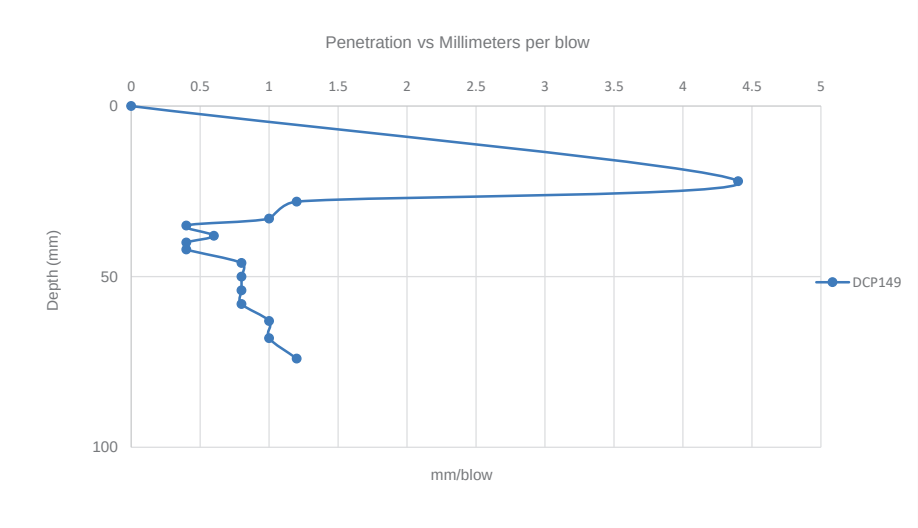


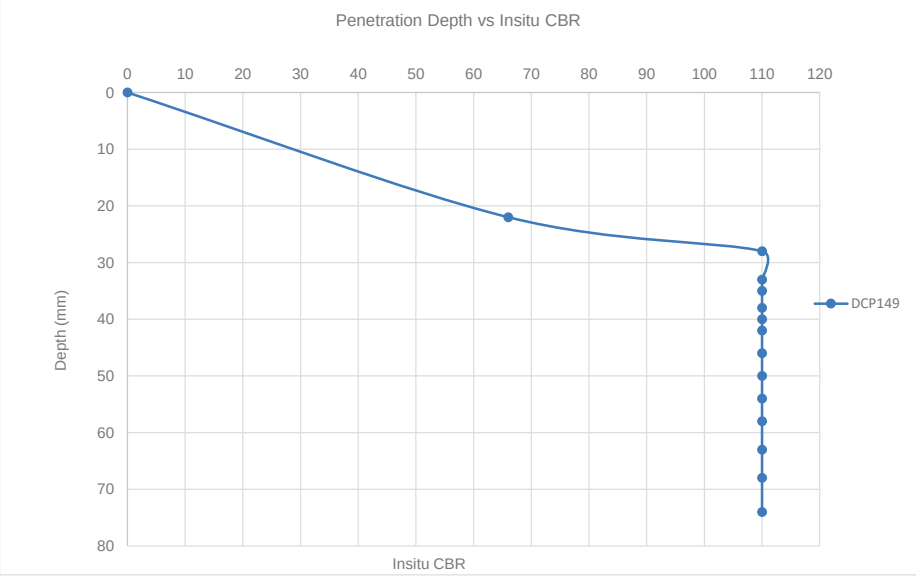
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP149	**STARTING DEPTH:**	0mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x $(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x $(dn)^{-1.09}$
0	0	0mm	0	0				
5	22	22mm	22	4.4	Very Dense	62	66	577
10	28	28mm	6	1.2	Very Dense	263	>110	2377
15	33	33mm	5	1.0	Very Dense	300	>110	2900
20	35	35mm	2	0.4	Very Dense	442	>110	7873
25	38	38mm	3	0.6	Very Dense	389	>110	5061
30	40	40mm	2	0.4	Very Dense	442	>110	7873
35	42	42mm	2	0.4	Very Dense	442	>110	7873
40	46	46mm	4	0.8	Very Dense	342	>110	3699
45	50	50mm	4	0.8	Very Dense	342	>110	3699
50	54	54mm	4	0.8	Very Dense	342	>110	3699
55	58	58mm	4	0.8	Very Dense	342	>110	3699
60	63	63mm	5	1.0	Very Dense	300	>110	2900
65	68	68mm	5	1.0	Very Dense	300	>110	2900
70	74	74mm	6	1.2	Very Dense	263	>110	2377

DCP GRAPHICAL REPRESENTATION



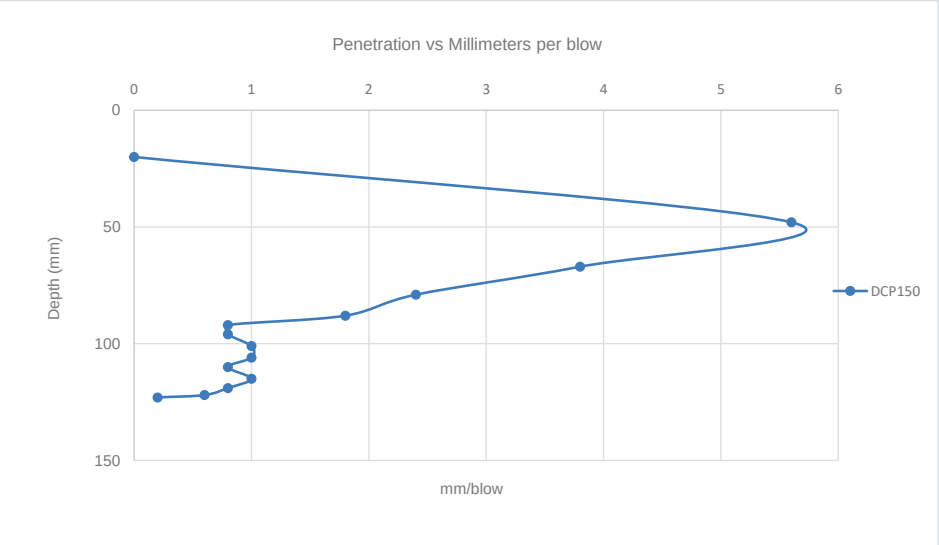


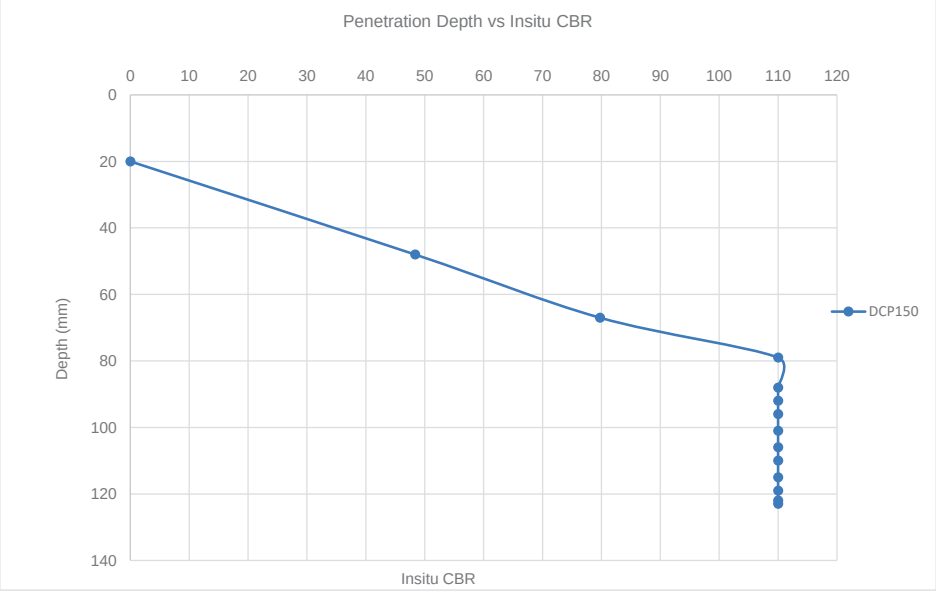
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP150	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	48	48mm	28	5.6	Dense	46	48	443
10	67	67mm	19	3.8	Very Dense	75	80	677
15	79	79mm	12	2.4	Very Dense	135	>110	1117
20	88	88mm	9	1.8	Very Dense	185	>110	1528
25	92	92mm	4	0.8	Very Dense	342	>110	3699
30	96	96mm	4	0.8	Very Dense	342	>110	3699
35	101	101mm	5	1.0	Very Dense	300	>110	2900
40	106	106mm	5	1.0	Very Dense	300	>110	2900
45	110	110mm	4	0.8	Very Dense	342	>110	3699
50	115	115mm	5	1.0	Very Dense	300	>110	2900
55	119	119mm	4	0.8	Very Dense	342	>110	3699
60	122	122mm	3	0.6	Very Dense	389	>110	5061
65	123	123mm	1	0.2	Very Dense	500	>110	16760

DCP GRAPHICAL REPRESENTATION



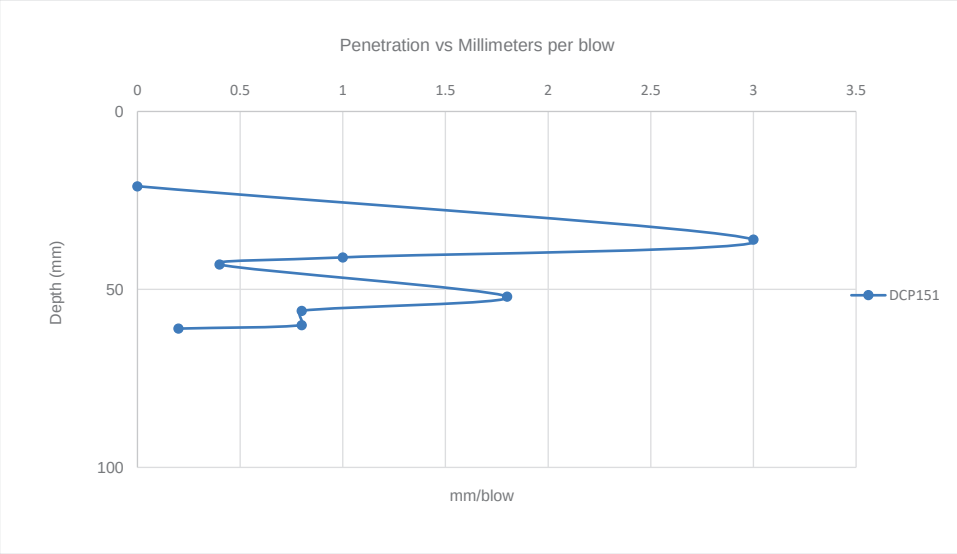


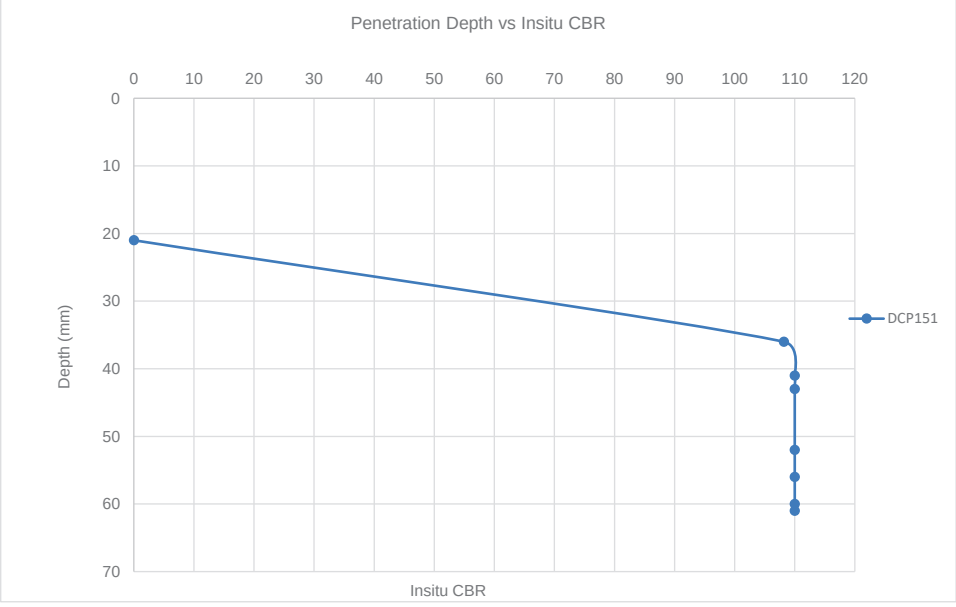
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP151	**STARTING DEPTH:**	21mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	21	21mm	0	0				
5	36	36mm	15	3.0	Very Dense	102	108	876
10	41	41mm	5	1.0	Very Dense	300	>110	2900
15	43	43mm	2	0.4	Very Dense	442	>110	7873
20	52	52mm	9	1.8	Very Dense	185	>110	1528
25	56	56mm	4	0.8	Very Dense	342	>110	3699
30	60	60mm	4	0.8	Very Dense	342	>110	3699
35	61	61mm	1	0.2	Very Dense	500	>110	16760

DCP GRAPHICAL REPRESENTATION



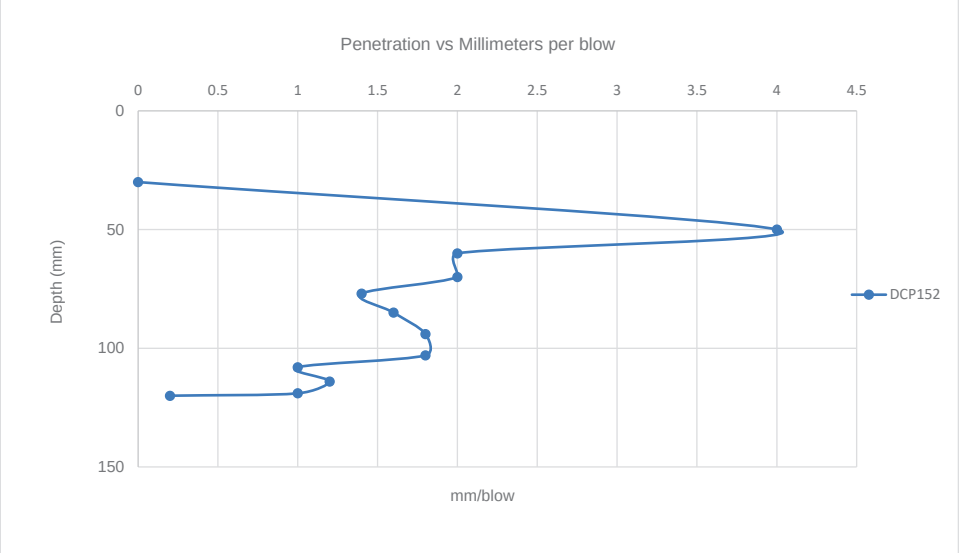


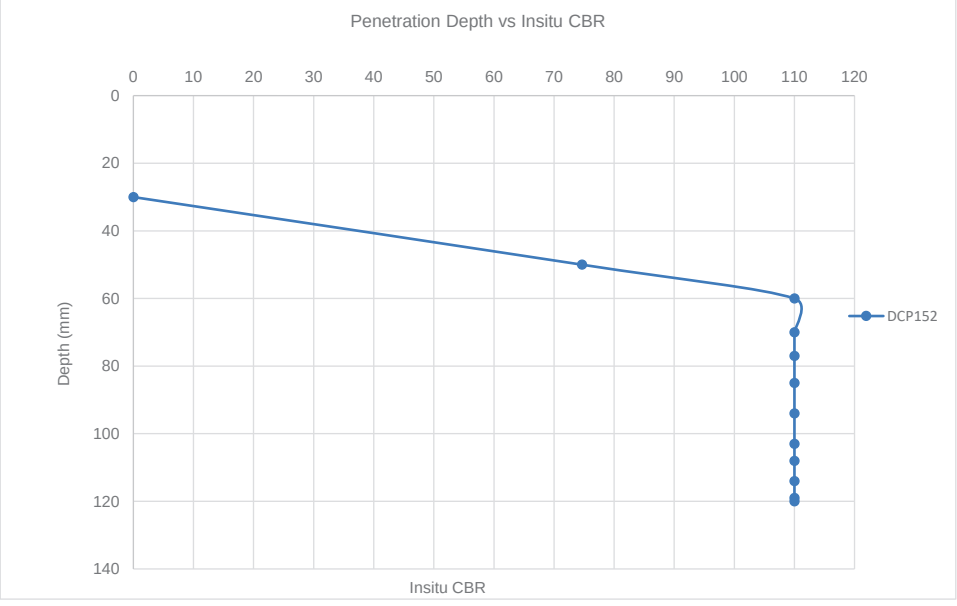
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP152	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	30	30mm	0	0				
5	50	50mm	20	4.0	Very Dense	70	75	640
10	60	60mm	10	2.0	Very Dense	170	>110	1362
15	70	70mm	10	2.0	Very Dense	170	>110	1362
20	77	77mm	7	1.4	Very Dense	232	>110	2010
25	85	85mm	8	1.6	Very Dense	206	>110	1737
30	94	94mm	9	1.8	Very Dense	185	>110	1528
35	103	103mm	9	1.8	Very Dense	185	>110	1528
40	108	108mm	5	1.0	Very Dense	300	>110	2900
45	114	114mm	6	1.2	Very Dense	263	>110	2377
50	119	119mm	5	1.0	Very Dense	300	>110	2900
55	120	120mm	1	0.2	Very Dense	500	>110	16760

DCP GRAPHICAL REPRESENTATION



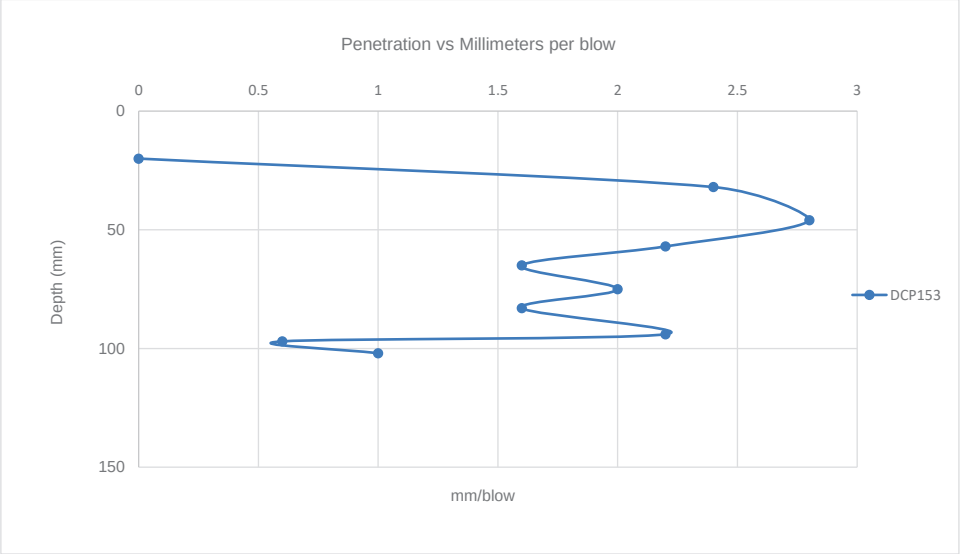


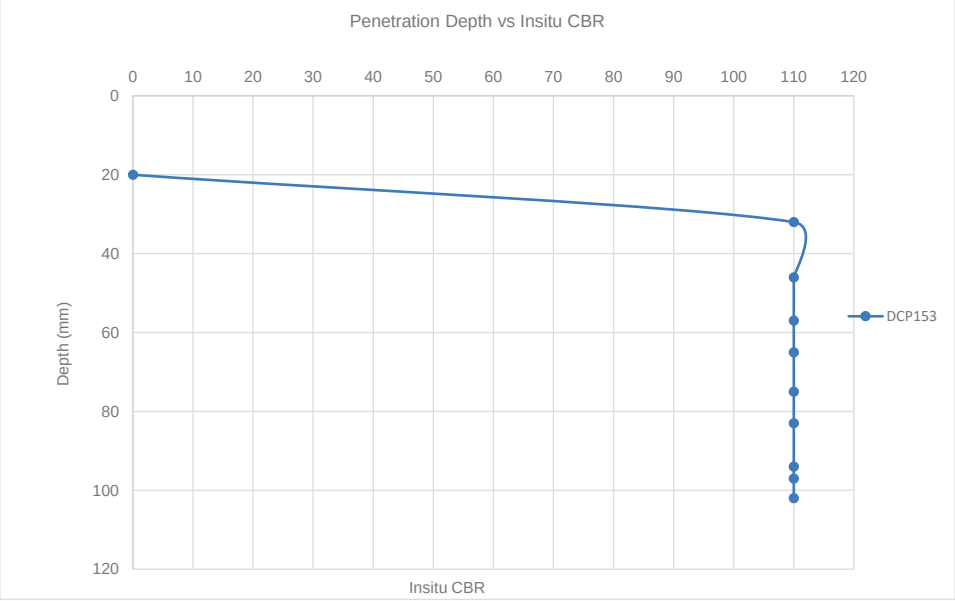
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP153	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	32	32mm	12	2.4	Very Dense	135	>110	1117
10	46	46mm	14	2.8	Very Dense	111	>110	944
15	57	57mm	11	2.2	Very Dense	151	>110	1228
20	65	65mm	8	1.6	Very Dense	206	>110	1737
25	75	75mm	10	2.0	Very Dense	170	>110	1362
30	83	83mm	8	1.6	Very Dense	206	>110	1737
35	94	94mm	11	2.2	Very Dense	151	>110	1228
40	97	97mm	3	0.6	Very Dense	389	>110	5061
45	102	102mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



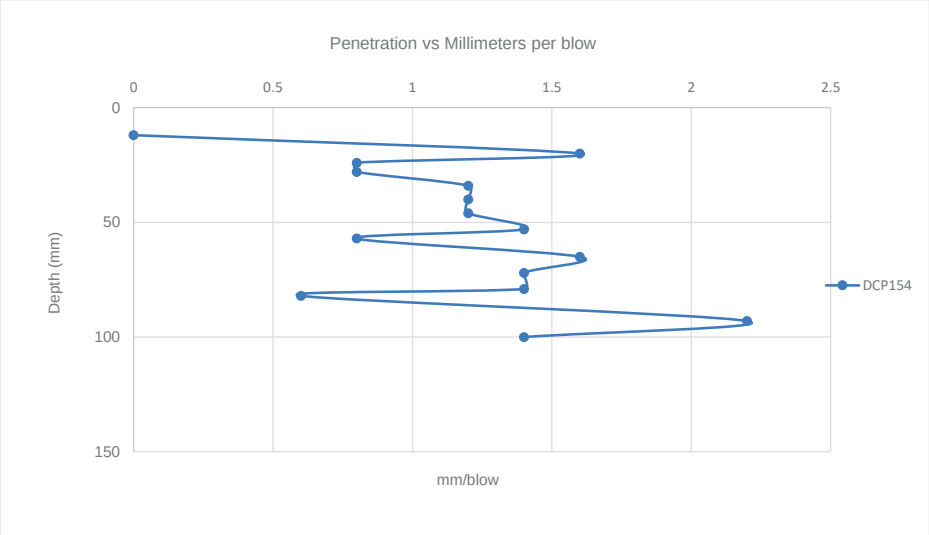


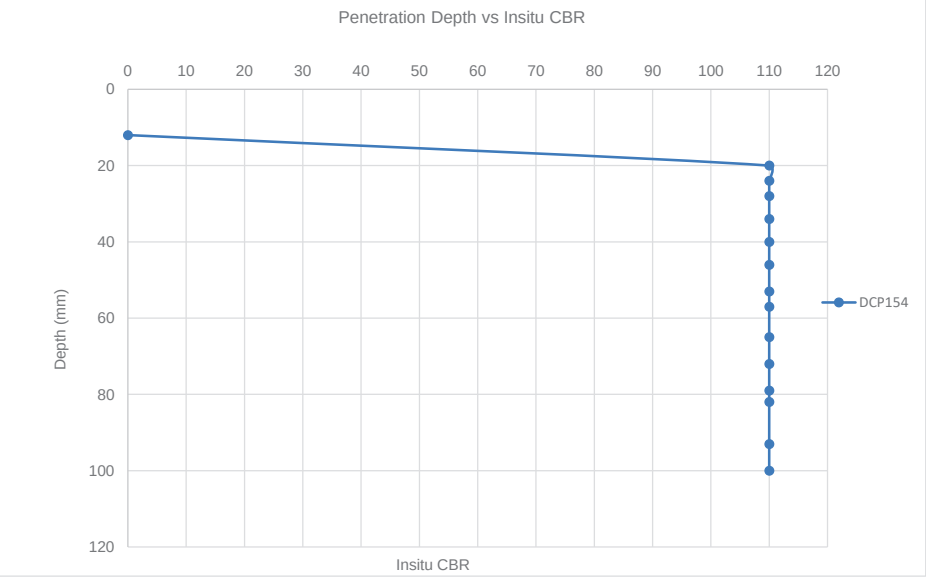
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP154	**STARTING DEPTH:**	12mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	12	12mm	0	0				
5	20	20mm	8	1.6	Very Dense	206	>110	1737
10	24	24mm	4	0.8	Very Dense	342	>110	3699
15	28	28mm	4	0.8	Very Dense	342	>110	3699
20	34	34mm	6	1.2	Very Dense	263	>110	2377
25	40	40mm	6	1.2	Very Dense	263	>110	2377
30	46	46mm	6	1.2	Very Dense	263	>110	2377
35	53	53mm	7	1.4	Very Dense	232	>110	2010
40	57	57mm	4	0.8	Very Dense	342	>110	3699
45	65	65mm	8	1.6	Very Dense	206	>110	1737
50	72	72mm	7	1.4	Very Dense	232	>110	2010
55	79	79mm	7	1.4	Very Dense	232	>110	2010
60	82	82mm	3	0.6	Very Dense	389	>110	5061
65	93	93mm	11	2.2	Very Dense	151	>110	1228
70	100	100mm	7	1.4	Very Dense	232	>110	2010

DCP GRAPHICAL REPRESENTATION



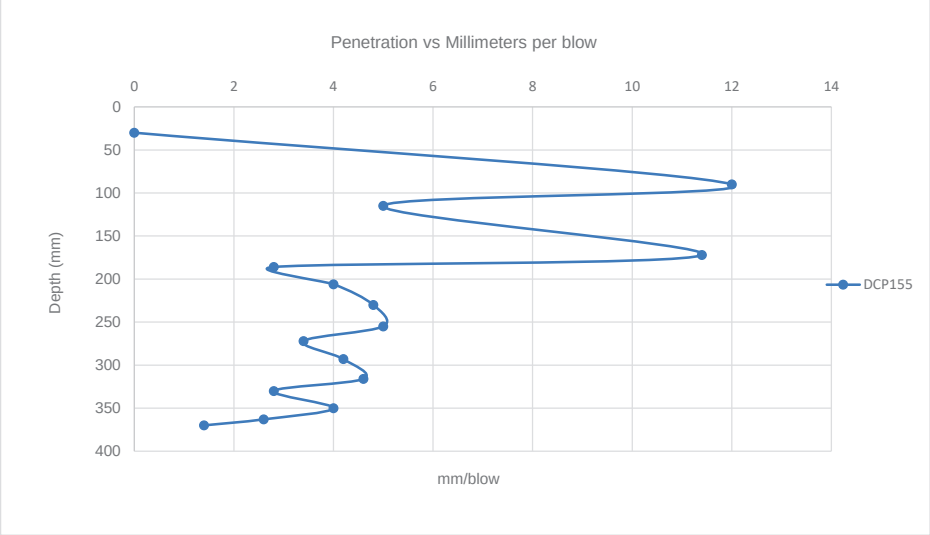


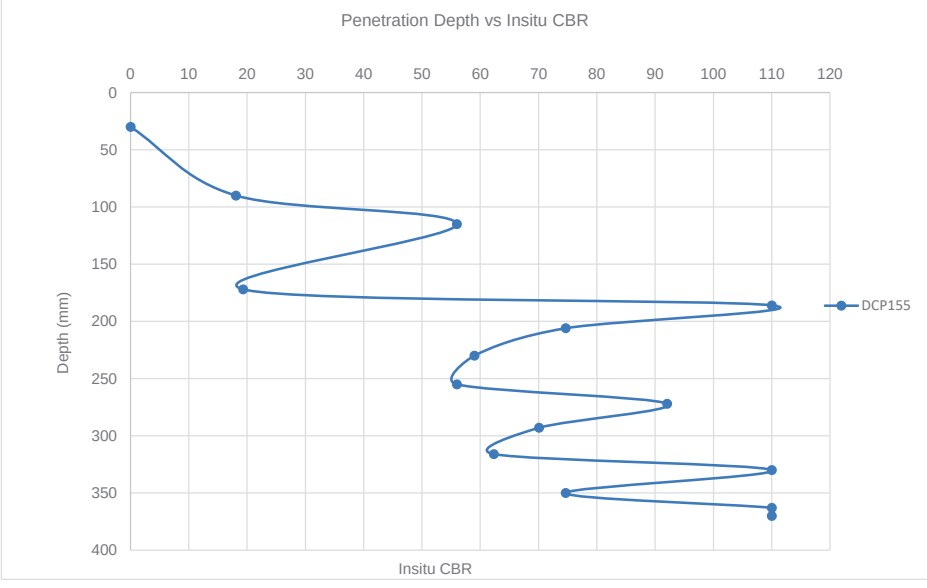
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP155	**STARTING DEPTH:**	30mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	30	30mm	0	0				
5	90	90mm	60	12.0	Dense	17	18	193
10	115	115mm	25	5.0	Very Dense	53	56	502
15	172	172mm	57	11.4	Dense	19	19	204
20	186	186mm	14	2.8	Very Dense	111	>110	944
25	206	206mm	20	4.0	Very Dense	70	75	640
30	230	230mm	24	4.8	Very Dense	56	59	525
35	255	255mm	25	5.0	Very Dense	53	56	502
40	272	272mm	17	3.4	Very Dense	87	92	764
45	293	293mm	21	4.2	Very Dense	66	70	607
50	316	316mm	23	4.6	Very Dense	59	62	550
55	330	330mm	14	2.8	Very Dense	111	>110	944
60	350	350mm	20	4.0	Very Dense	70	75	640
65	363	363mm	13	2.6	Very Dense	122	>110	1023
70	370	370mm	7	1.4	Very Dense	232	>110	2010

DCP GRAPHICAL REPRESENTATION



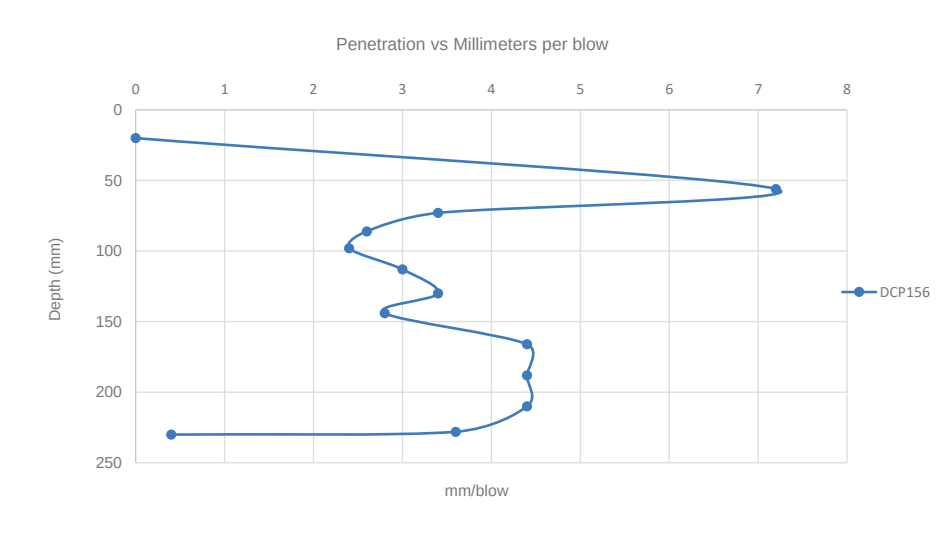


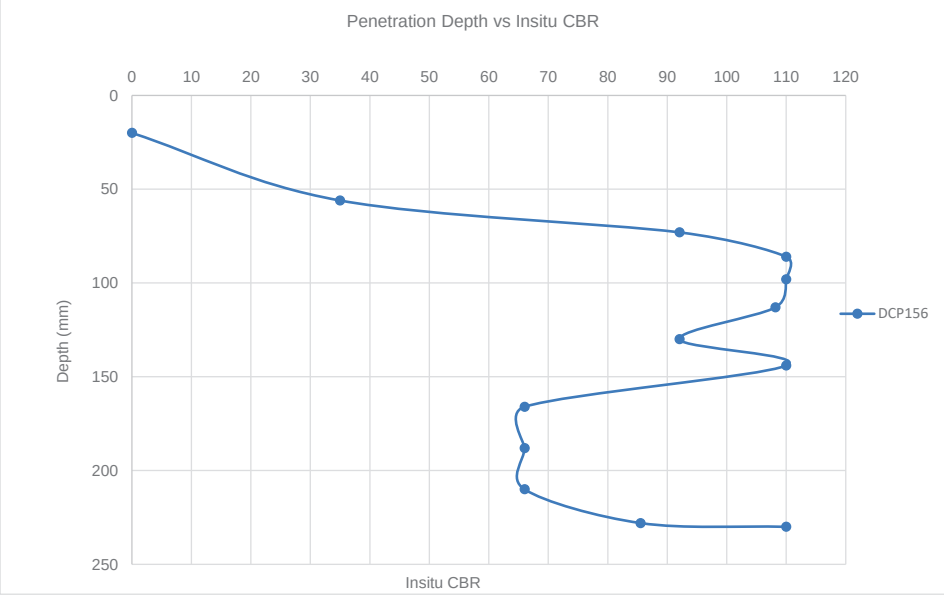
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP156	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	20	20mm	0	0				
5	56	56mm	36	7.2	Dense	33	35	337
10	73	73mm	17	3.4	Very Dense	87	92	764
15	86	86mm	13	2.6	Very Dense	122	>110	1023
20	98	98mm	12	2.4	Very Dense	135	>110	1117
25	113	113mm	15	3.0	Very Dense	102	108	876
30	130	130mm	17	3.4	Very Dense	87	92	764
35	144	144mm	14	2.8	Very Dense	111	>110	944
40	166	166mm	22	4.4	Very Dense	62	66	577
45	188	188mm	22	4.4	Very Dense	62	66	577
50	210	210mm	22	4.4	Very Dense	62	66	577
55	228	228mm	18	3.6	Very Dense	81	86	718
60	230	230mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



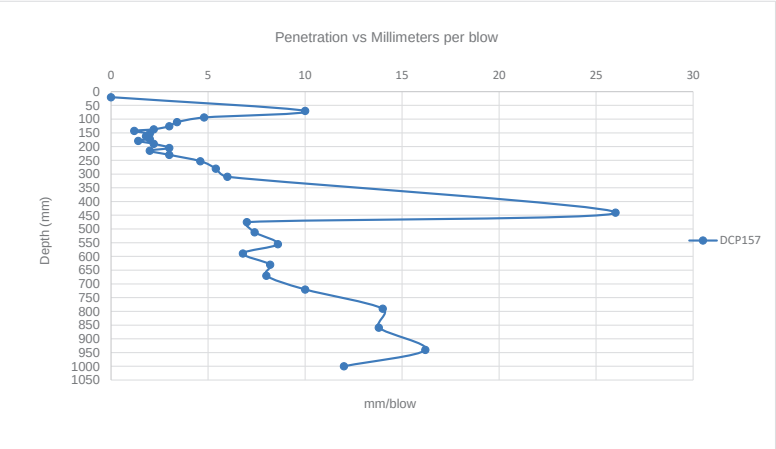


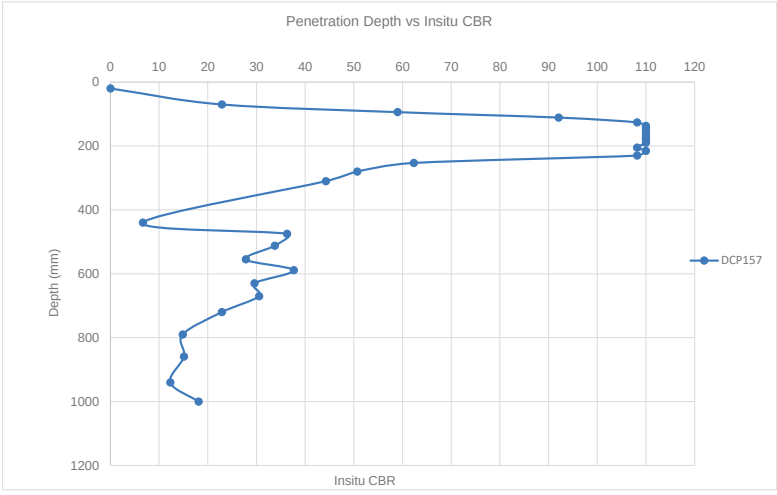
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP157	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x(dn)^{-1.09}$
0	20	20mm	0	0				
5	70	70mm	50	10.0	Dense	22	23	236
10	94	94mm	24	4.8	Very Dense	56	59	525
15	111	111mm	17	3.4	Very Dense	87	92	764
20	126	126mm	15	3.0	Very Dense	102	108	876
25	137	137mm	11	2.2	Very Dense	151	>110	1228
30	143	143mm	6	1.2	Very Dense	263	>110	2377
35	153	153mm	10	2.0	Very Dense	170	>110	1362
40	162	162mm	9	1.8	Very Dense	185	>110	1528
45	172	172mm	10	2.0	Very Dense	170	>110	1362
50	179	179mm	7	1.4	Very Dense	232	>110	2010
55	190	190mm	11	2.2	Very Dense	151	>110	1228
60	205	205mm	15	3.0	Very Dense	102	108	876
65	215	215mm	10	2.0	Very Dense	170	>110	1362
70	230	230mm	15	3.0	Very Dense	102	108	876
75	253	253mm	23	4.6	Very Dense	59	62	550
80	280	280mm	27	5.4	Dense	48	51	461
85	310	310mm	30	6.0	Dense	42	44	411
90	440	440mm	130	26.0	Medium Dense	7	7	83
95	475	475mm	35	7.0	Dense	35	36	348
100	512	512mm	37	7.4	Dense	32	34	327
105	555	555mm	43	8.6	Dense	27	28	278
110	589	589mm	34	6.8	Dense	36	38	359
115	630	630mm	41	8.2	Dense	28	30	293
120	670	670mm	40	8.0	Dense	29	31	301
125	720	720mm	50	10.0	Dense	22	23	236
130	790	790mm	70	14.0	Medium Dense	14	15	163
135	859	859mm	69	13.8	Medium Dense	15	15	166
140	940	940mm	81	16.2	Medium Dense	12	12	139
145	1000	1000mm	60	12.0	Dense	17	18	193

DCP GRAPHICAL REPRESENTATION



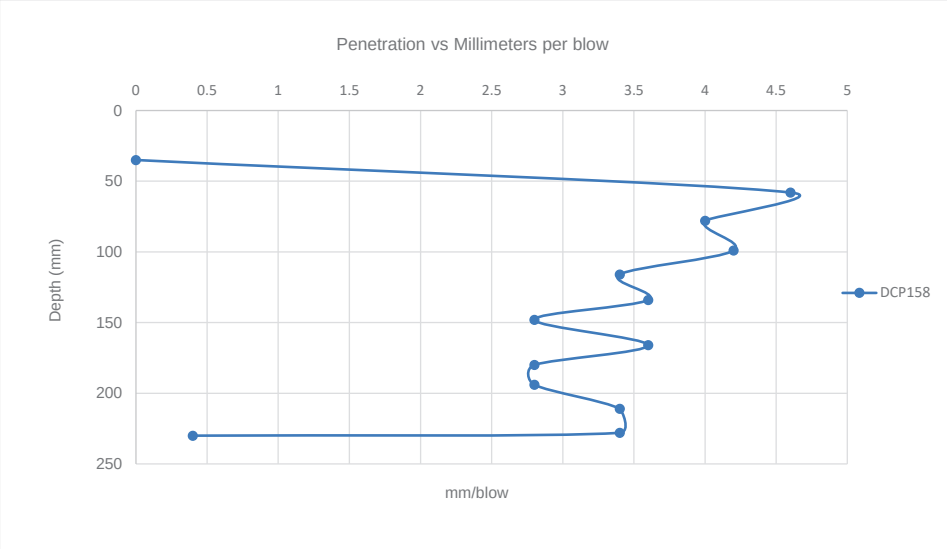


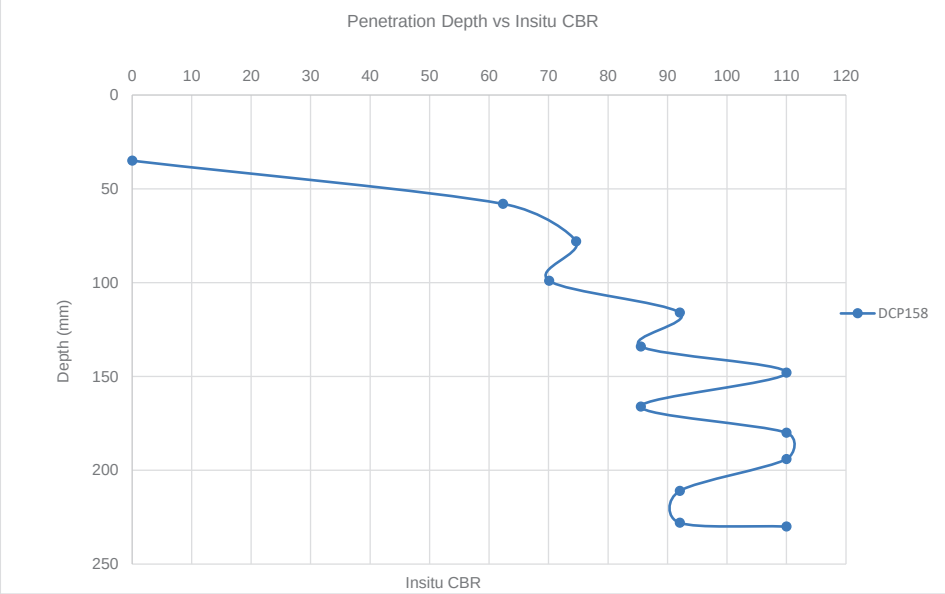
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP158	**STARTING DEPTH:**	35mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	35	35mm	0	0				
5	58	58mm	23	4.6	Very Dense	59	62	550
10	78	78mm	20	4.0	Very Dense	70	75	640
15	99	99mm	21	4.2	Very Dense	66	70	607
20	116	116mm	17	3.4	Very Dense	87	92	764
25	134	134mm	18	3.6	Very Dense	81	86	718
30	148	148mm	14	2.8	Very Dense	111	>110	944
35	166	166mm	18	3.6	Very Dense	81	86	718
40	180	180mm	14	2.8	Very Dense	111	>110	944
45	194	194mm	14	2.8	Very Dense	111	>110	944
50	211	211mm	17	3.4	Very Dense	87	92	764
55	228	228mm	17	3.4	Very Dense	87	92	764
60	230	230mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



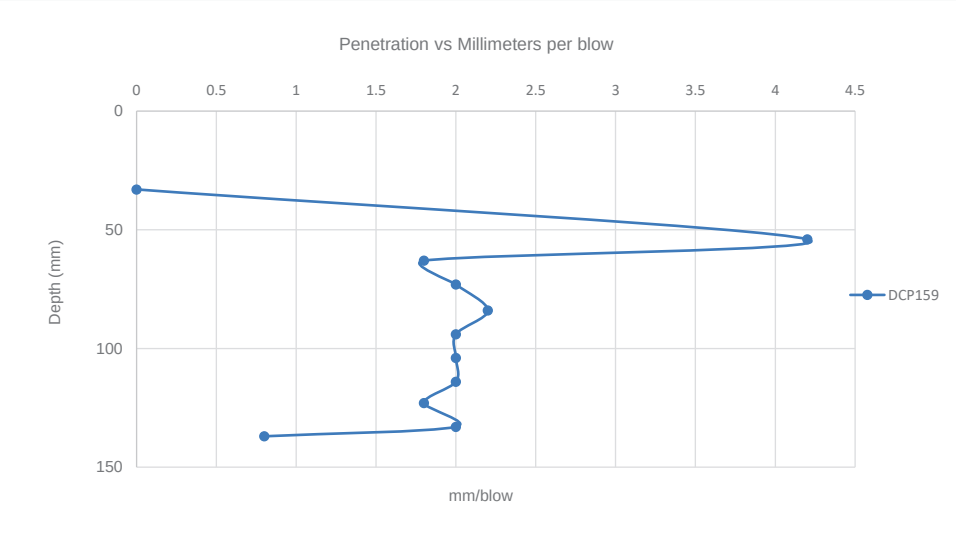


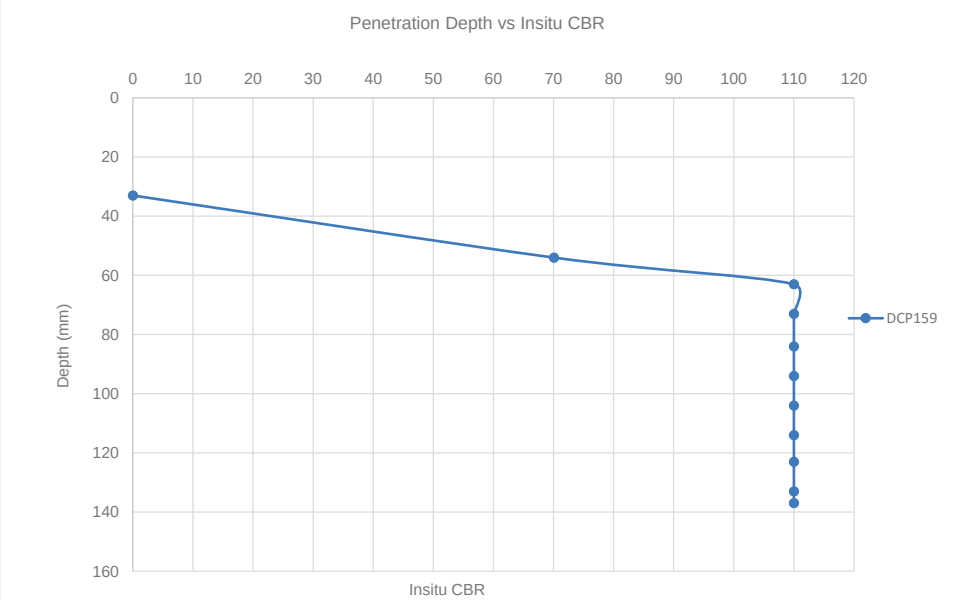
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP159	**STARTING DEPTH:**	33mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	33	33mm	0	0				
5	54	54mm	21	4.2	Very Dense	66	70	607
10	63	63mm	9	1.8	Very Dense	185	>110	1528
15	73	73mm	10	2.0	Very Dense	170	>110	1362
20	84	84mm	11	2.2	Very Dense	151	>110	1228
25	94	94mm	10	2.0	Very Dense	170	>110	1362
30	104	104mm	10	2.0	Very Dense	170	>110	1362
35	114	114mm	10	2.0	Very Dense	170	>110	1362
40	123	123mm	9	1.8	Very Dense	185	>110	1528
45	133	133mm	10	2.0	Very Dense	170	>110	1362
50	137	137mm	4	0.8	Very Dense	342	>110	3699

DCP GRAPHICAL REPRESENTATION



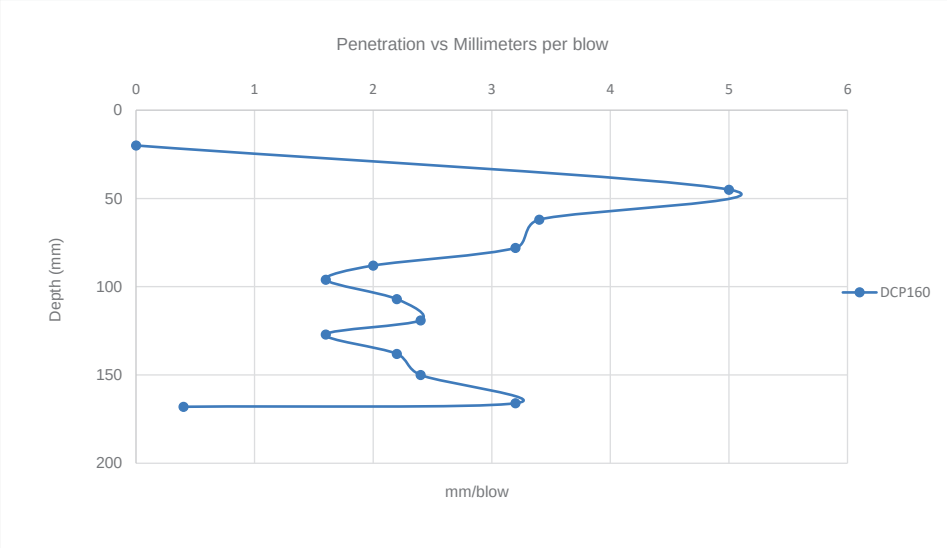


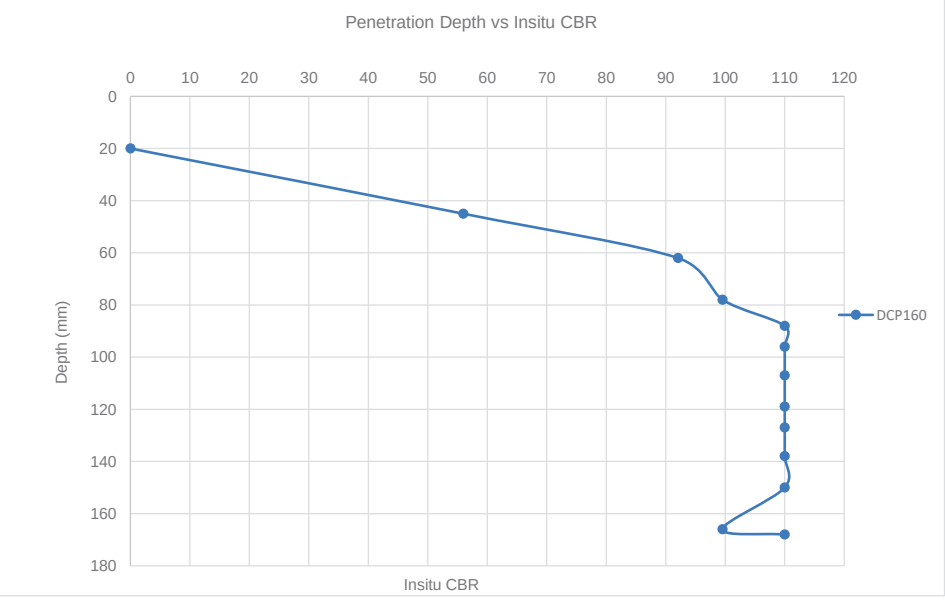
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP160	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	45	45mm	25	5.0	Very Dense	53	56	502
10	62	62mm	17	3.4	Very Dense	87	92	764
15	78	78mm	16	3.2	Very Dense	94	100	816
20	88	88mm	10	2.0	Very Dense	170	>110	1362
25	96	96mm	8	1.6	Very Dense	206	>110	1737
30	107	107mm	11	2.2	Very Dense	151	>110	1228
35	119	119mm	12	2.4	Very Dense	135	>110	1117
40	127	127mm	8	1.6	Very Dense	206	>110	1737
45	138	138mm	11	2.2	Very Dense	151	>110	1228
50	150	150mm	12	2.4	Very Dense	135	>110	1117
55	166	166mm	16	3.2	Very Dense	94	100	816
60	168	168mm	2	0.4	Very Dense	442	>110	7873

DCP GRAPHICAL REPRESENTATION



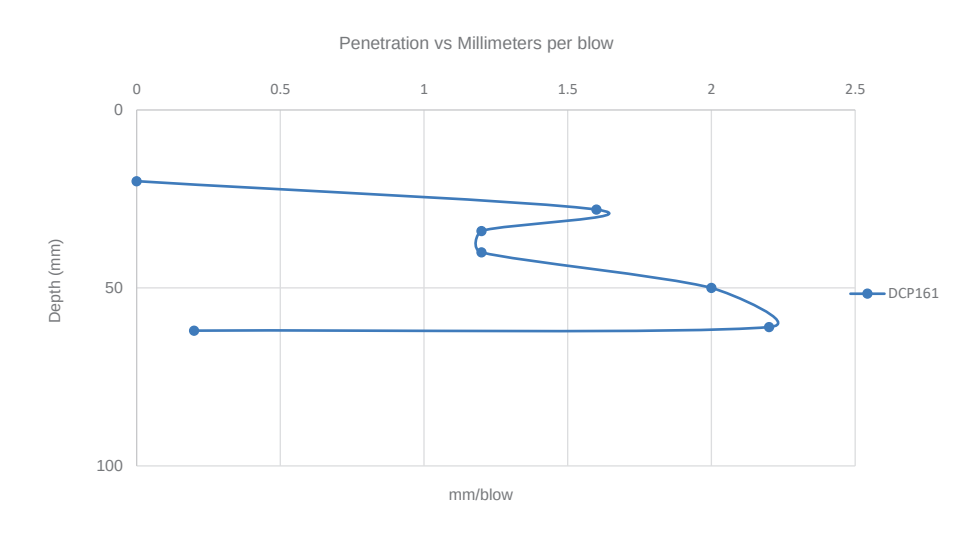


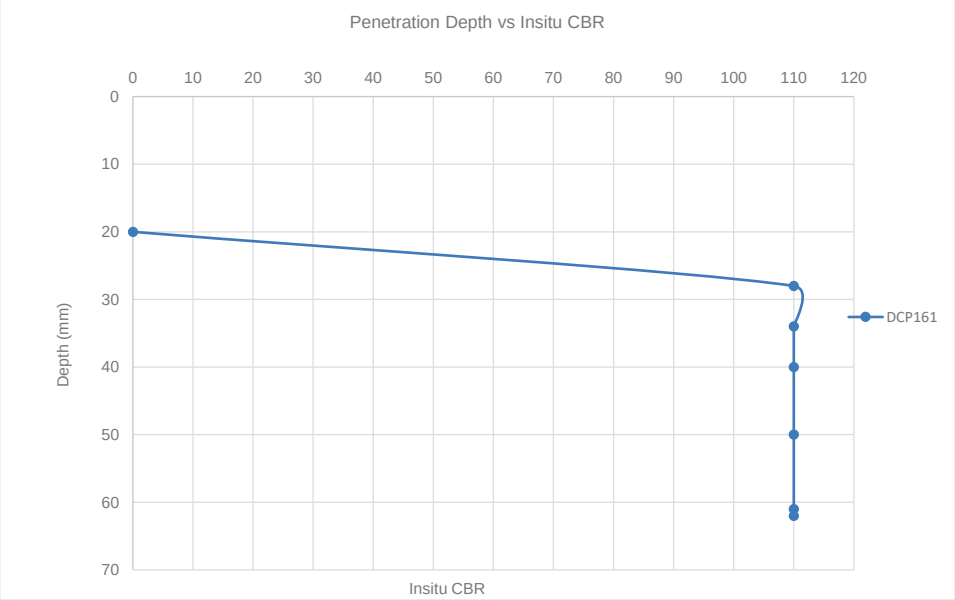
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP161	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	28	28mm	8	1.6	Very Dense	206	>110	1737
10	34	34mm	6	1.2	Very Dense	263	>110	2377
15	40	40mm	6	1.2	Very Dense	263	>110	2377
20	50	50mm	10	2.0	Very Dense	170	>110	1362
25	61	61mm	11	2.2	Very Dense	151	>110	1228
30	62	62mm	1	0.2	Very Dense	500	>110	16760

DCP GRAPHICAL REPRESENTATION



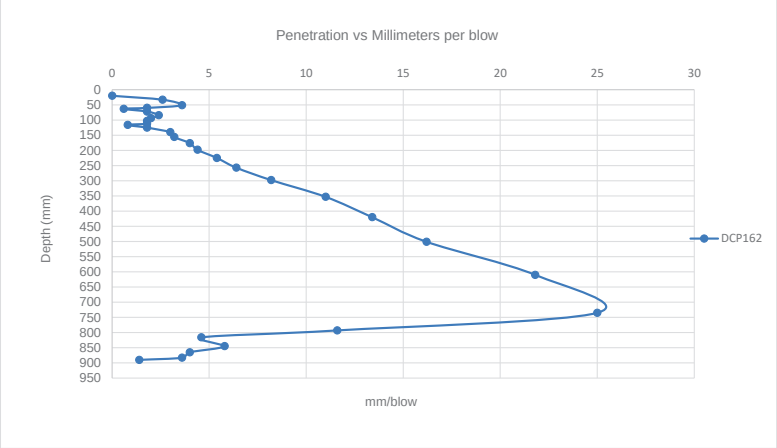


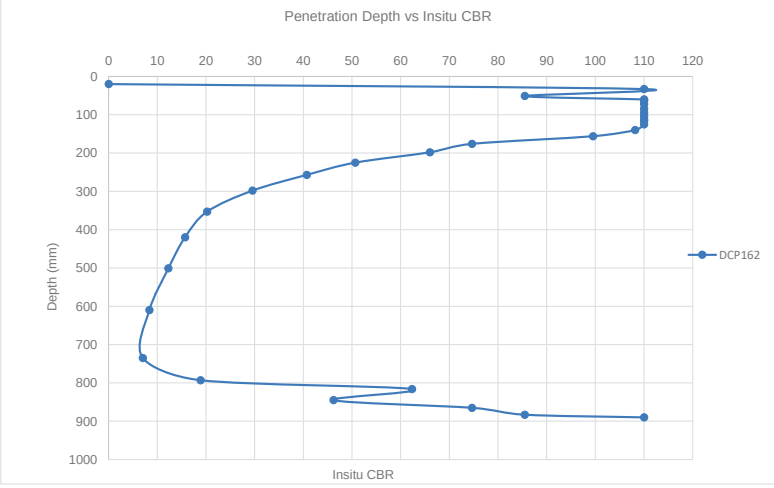
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP162	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x(dn)^{-1.09}$
0	20	20mm	0	0				
5	33	33mm	13	2.6	Very Dense	122	>110	1023
10	51	51mm	18	3.6	Very Dense	81	86	718
15	60	60mm	9	1.8	Very Dense	185	>110	1528
20	63	63mm	3	0.6	Very Dense	389	>110	5061
25	72	72mm	9	1.8	Very Dense	185	>110	1528
30	84	84mm	12	2.4	Very Dense	135	>110	1117
35	94	94mm	10	2.0	Very Dense	170	>110	1362
40	103	103mm	9	1.8	Very Dense	185	>110	1528
45	112	112mm	9	1.8	Very Dense	185	>110	1528
50	116	116mm	4	0.8	Very Dense	342	>110	3699
55	125	125mm	9	1.8	Very Dense	185	>110	1528
60	140	140mm	15	3.0	Very Dense	102	108	876
65	156	156mm	16	3.2	Very Dense	94	100	816
70	176	176mm	20	4.0	Very Dense	70	75	640
75	198	198mm	22	4.4	Very Dense	62	66	577
80	225	225mm	27	5.4	Dense	48	51	461
85	257	257mm	32	6.4	Dense	39	41	383
90	298	298mm	41	8.2	Dense	28	30	293
95	353	353mm	55	11.0	Dense	20	20	212
100	420	420mm	67	13.4	Medium Dense	15	16	171
105	501	501mm	81	16.2	Medium Dense	12	12	139
110	610	610mm	109	21.8	Medium Dense	8	8	101
115	735	735mm	125	25.0	Medium Dense	7	7	87
120	793	793mm	58	11.6	Dense	18	19	201
125	816	816mm	23	4.6	Very Dense	59	62	550
130	845	845mm	29	5.8	Dense	44	46	427
135	865	865mm	20	4.0	Very Dense	70	75	640
140	883	883mm	18	3.6	Very Dense	81	86	718
145	890	890mm	7	1.4	Very Dense	232	>110	2010

DCP GRAPHICAL REPRESENTATION



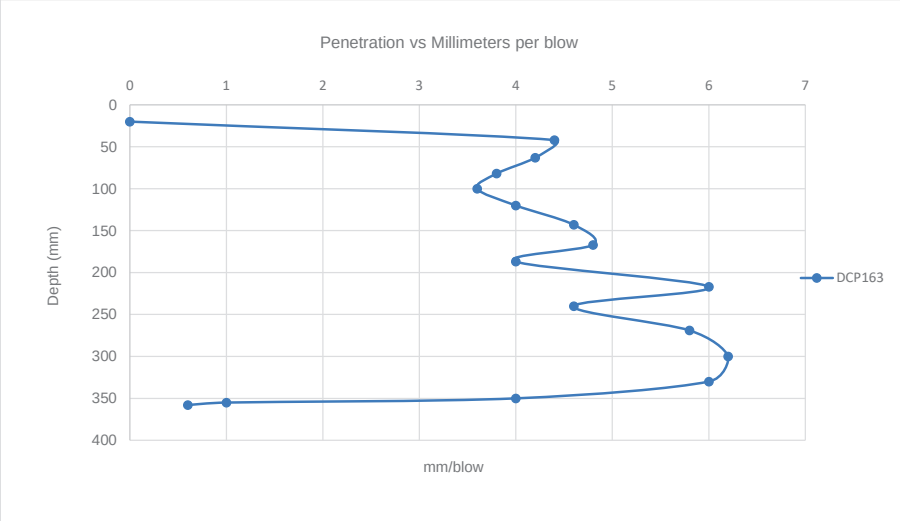


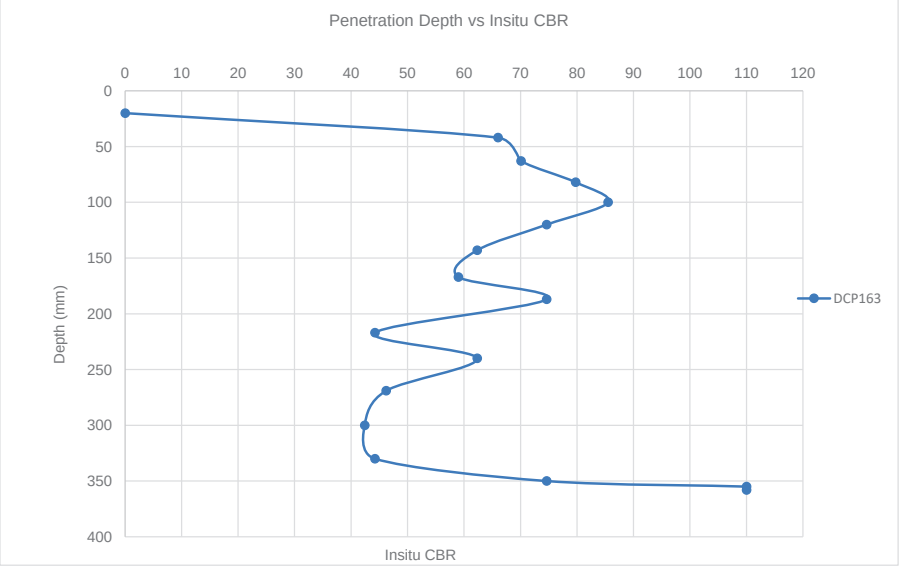
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP163	**STARTING DEPTH:**	20mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	20	20mm	0	0				
5	42	42mm	22	4.4	Very Dense	62	66	577
10	63	63mm	21	4.2	Very Dense	66	70	607
15	82	82mm	19	3.8	Very Dense	75	80	677
20	100	100mm	18	3.6	Very Dense	81	86	718
25	120	120mm	20	4.0	Very Dense	70	75	640
30	143	143mm	23	4.6	Very Dense	59	62	550
35	167	167mm	24	4.8	Very Dense	56	59	525
40	187	187mm	20	4.0	Very Dense	70	75	640
45	217	217mm	30	6.0	Dense	42	44	411
50	240	240mm	23	4.6	Very Dense	59	62	550
55	269	269mm	29	5.8	Dense	44	46	427
60	300	300mm	31	6.2	Dense	40	42	397
65	330	330mm	30	6.0	Dense	42	44	411
70	350	350mm	20	4.0	Very Dense	70	75	640
75	355	355mm	5	1.0	Very Dense	300	>110	2900
80	358	358mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



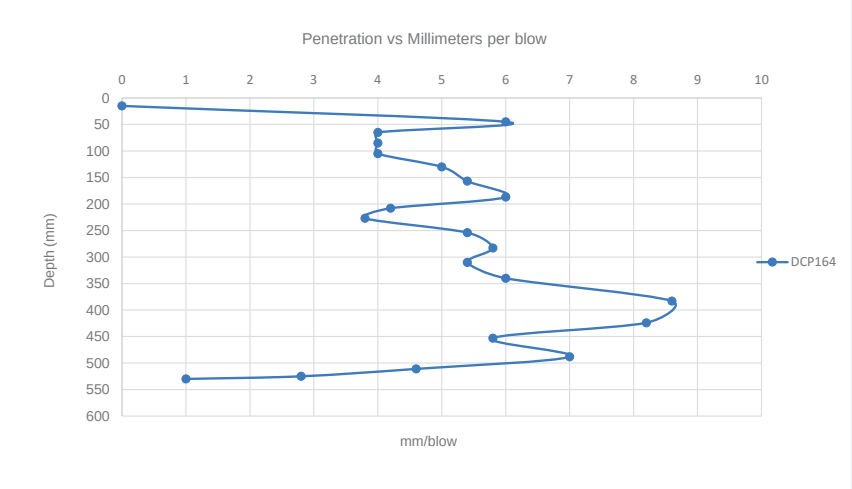


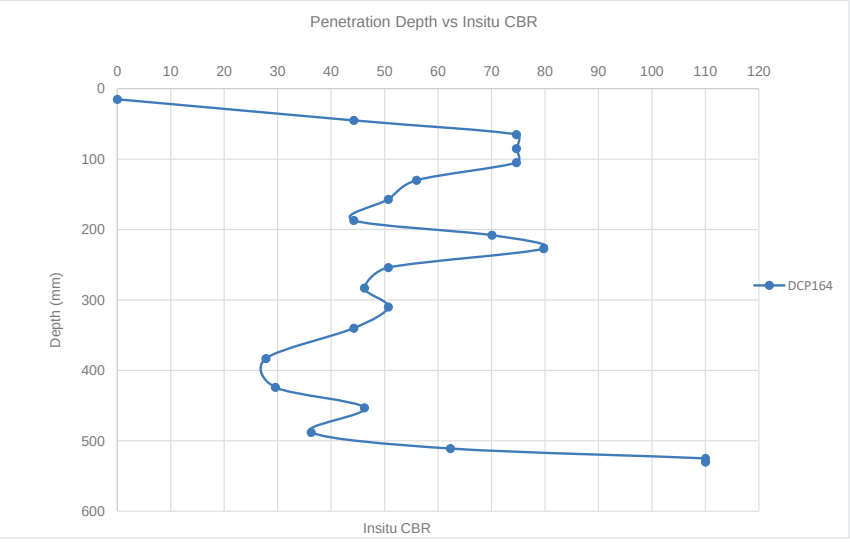
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP164	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	10	15mm	0	0				
5	40	45mm	30	6.0	Dense	42	44	411
10	60	65mm	20	4.0	Very Dense	70	75	640
15	80	85mm	20	4.0	Very Dense	70	75	640
20	100	105mm	20	4.0	Very Dense	70	75	640
25	125	130mm	25	5.0	Very Dense	53	56	502
30	152	157mm	27	5.4	Dense	48	51	461
35	182	187mm	30	6.0	Dense	42	44	411
40	203	208mm	21	4.2	Very Dense	66	70	607
45	222	227mm	19	3.8	Very Dense	75	80	677
50	249	254mm	27	5.4	Dense	48	51	461
55	278	283mm	29	5.8	Dense	44	46	427
60	305	310mm	27	5.4	Dense	48	51	461
65	335	340mm	30	6.0	Dense	42	44	411
70	378	383mm	43	8.6	Dense	27	28	278
75	419	424mm	41	8.2	Dense	28	30	293
80	448	453mm	29	5.8	Dense	44	46	427
85	483	488mm	35	7.0	Dense	35	36	348
90	506	511mm	23	4.6	Very Dense	59	62	550
95	520	525mm	14	2.8	Very Dense	111	>110	944
100	525	530mm	5	1.0	Very Dense	300	>110	2900

DCP GRAPHICAL REPRESENTATION



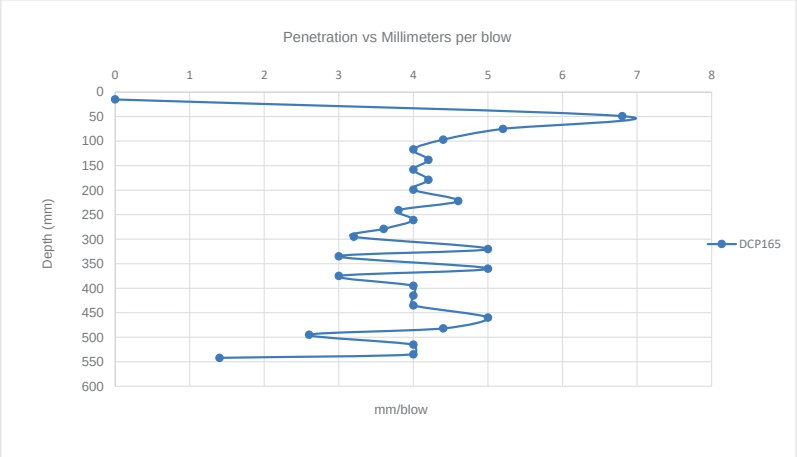


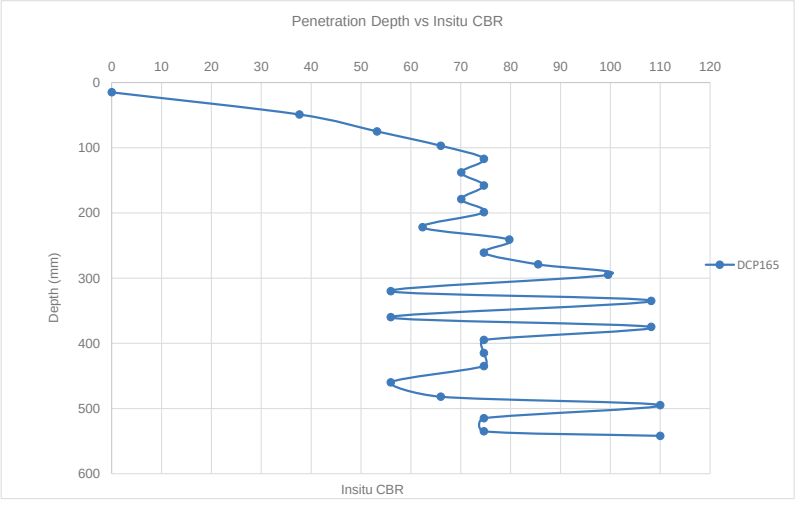
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP165	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\ (dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\ (dn)^{-1.09}$
0	10	15mm	0	0				
5	44	49mm	34	6.8	Dense	36	38	359
10	70	75mm	26	5.2	Dense	51	53	481
15	92	97mm	22	4.4	Very Dense	62	66	577
20	112	117mm	20	4.0	Very Dense	70	75	640
25	133	138mm	21	4.2	Very Dense	66	70	607
30	153	158mm	20	4.0	Very Dense	70	75	640
35	174	179mm	21	4.2	Very Dense	66	70	607
40	194	199mm	20	4.0	Very Dense	70	75	640
45	217	222mm	23	4.6	Very Dense	59	62	550
50	236	241mm	19	3.8	Very Dense	75	80	677
55	256	261mm	20	4.0	Very Dense	70	75	640
60	274	279mm	18	3.6	Very Dense	81	86	718
65	290	295mm	16	3.2	Very Dense	94	100	816
70	315	320mm	25	5.0	Very Dense	53	56	502
75	330	335mm	15	3.0	Very Dense	102	108	876
80	355	360mm	25	5.0	Very Dense	53	56	502
85	370	375mm	15	3.0	Very Dense	102	108	876
90	390	395mm	20	4.0	Very Dense	70	75	640
95	410	415mm	20	4.0	Very Dense	70	75	640
100	430	435mm	20	4.0	Very Dense	70	75	640
105	455	460mm	25	5.0	Very Dense	53	56	502
110	477	482mm	22	4.4	Very Dense	62	66	577
115	490	495mm	13	2.6	Very Dense	122	>110	1023
120	510	515mm	20	4.0	Very Dense	70	75	640
125	530	535mm	20	4.0	Very Dense	70	75	640
130	537	542mm	7	1.4	Very Dense	232	>110	2010

DCP GRAPHICAL REPRESENTATION



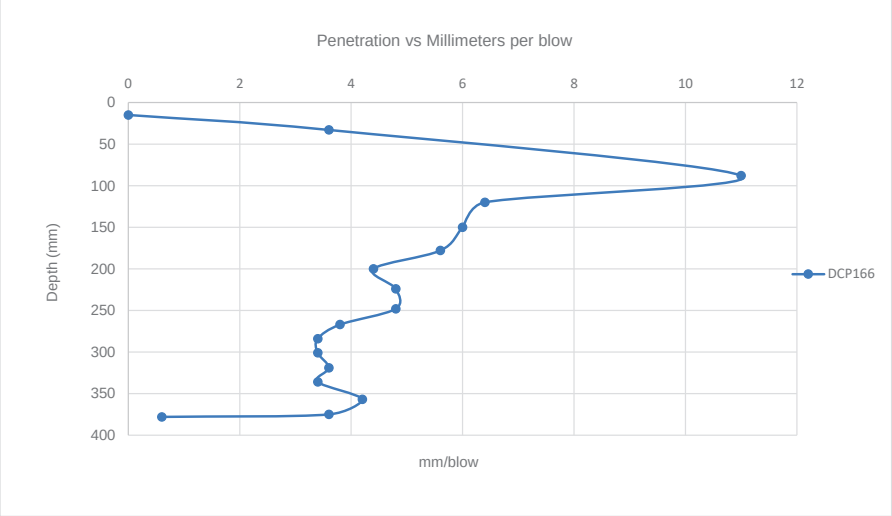


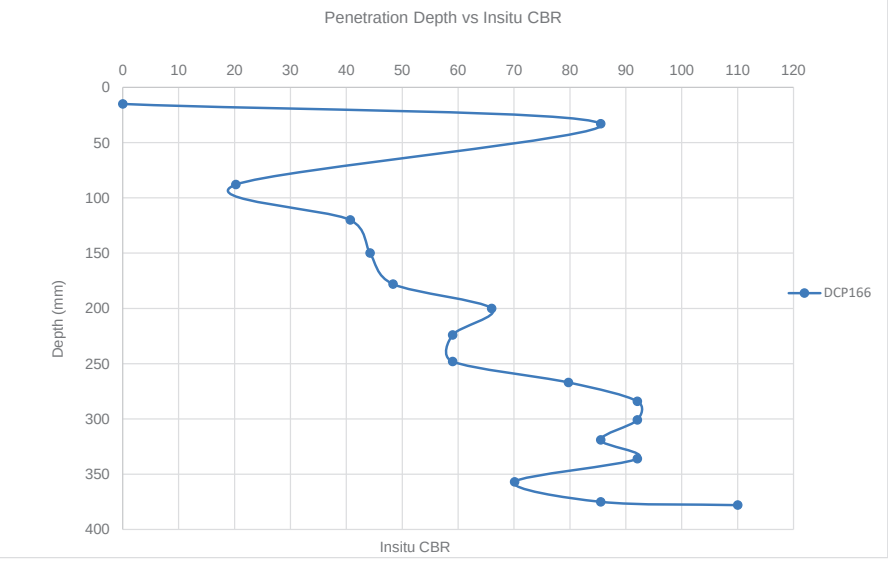
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP166	**STARTING DEPTH:**	15mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR $410x\,(dn)^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS $2900x\,(dn)^{-1.09}$
0	15	15mm	0	0				
5	33	33mm	18	3.6	Very Dense	81	86	718
10	88	88mm	55	11.0	Dense	20	20	212
15	120	120mm	32	6.4	Dense	39	41	383
20	150	150mm	30	6.0	Dense	42	44	411
25	178	178mm	28	5.6	Dense	46	48	443
30	200	200mm	22	4.4	Very Dense	62	66	577
35	224	224mm	24	4.8	Very Dense	56	59	525
40	248	248mm	24	4.8	Very Dense	56	59	525
45	267	267mm	19	3.8	Very Dense	75	80	677
50	284	284mm	17	3.4	Very Dense	87	92	764
55	301	301mm	17	3.4	Very Dense	87	92	764
60	319	319mm	18	3.6	Very Dense	81	86	718
65	336	336mm	17	3.4	Very Dense	87	92	764
70	357	357mm	21	4.2	Very Dense	66	70	607
75	375	375mm	18	3.6	Very Dense	81	86	718
80	378	378mm	3	0.6	Very Dense	389	>110	5061

DCP GRAPHICAL REPRESENTATION



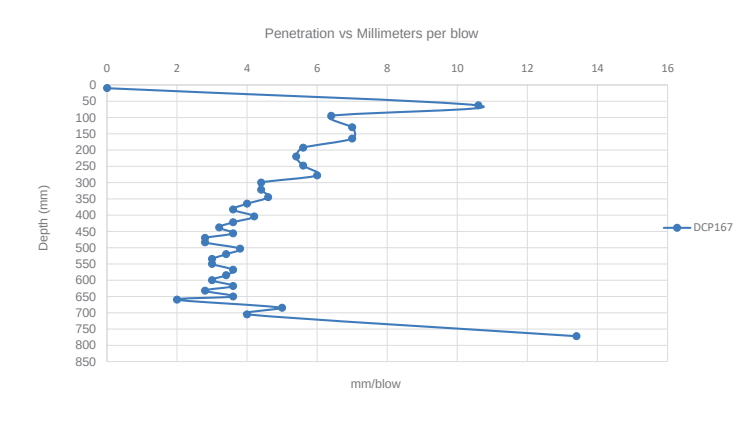


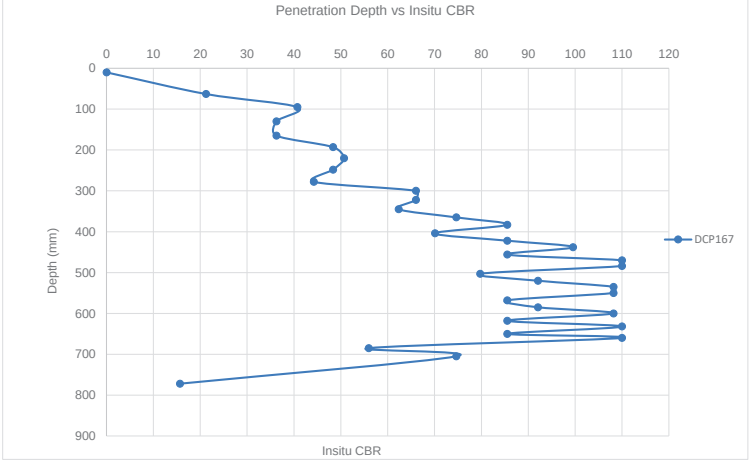
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP167	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	63	63mm	53	10.6	Dense	20	21	221
10	95	95mm	32	6.4	Dense	39	41	383
15	130	130mm	35	7.0	Dense	35	36	348
20	165	165mm	35	7.0	Dense	35	36	348
25	193	193mm	28	5.6	Dense	46	48	443
30	220	220mm	27	5.4	Dense	48	51	461
35	248	248mm	28	5.6	Dense	46	48	443
40	278	278mm	30	6.0	Dense	42	44	411
45	300	300mm	22	4.4	Very Dense	62	66	577
50	322	322mm	22	4.4	Very Dense	62	66	577
55	345	345mm	23	4.6	Very Dense	59	62	550
60	365	365mm	20	4.0	Very Dense	70	75	640
65	383	383mm	18	3.6	Very Dense	81	86	718
70	404	404mm	21	4.2	Very Dense	66	70	607
75	422	422mm	18	3.6	Very Dense	81	86	718
80	438	438mm	16	3.2	Very Dense	94	100	816
85	456	456mm	18	3.6	Very Dense	81	86	718
90	470	470mm	14	2.8	Very Dense	111	>110	944
95	484	484mm	14	2.8	Very Dense	111	>110	944
100	503	503mm	19	3.8	Very Dense	75	80	677
105	520	520mm	17	3.4	Very Dense	87	92	764
110	535	535mm	15	3.0	Very Dense	102	108	876
115	550	550mm	15	3.0	Very Dense	102	108	876
120	568	568mm	18	3.6	Very Dense	81	86	718
125	585	585mm	17	3.4	Very Dense	87	92	764
130	600	600mm	15	3.0	Very Dense	102	108	876
135	618	618mm	18	3.6	Very Dense	81	86	718
140	632	632mm	14	2.8	Very Dense	111	>110	944
145	650	650mm	18	3.6	Very Dense	81	86	718
150	660	660mm	10	2.0	Very Dense	170	>110	1362
155	685	685mm	25	5.0	Very Dense	53	56	502
160	705	705mm	20	4.0	Very Dense	70	75	640
165	772	772mm	67	13.4	Medium Dense	15	16	171

DCP GRAPHICAL REPRESENTATION



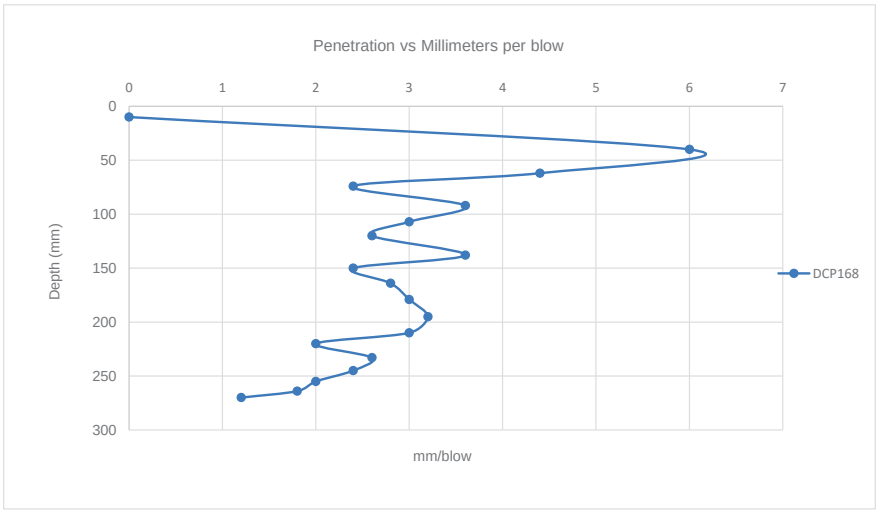


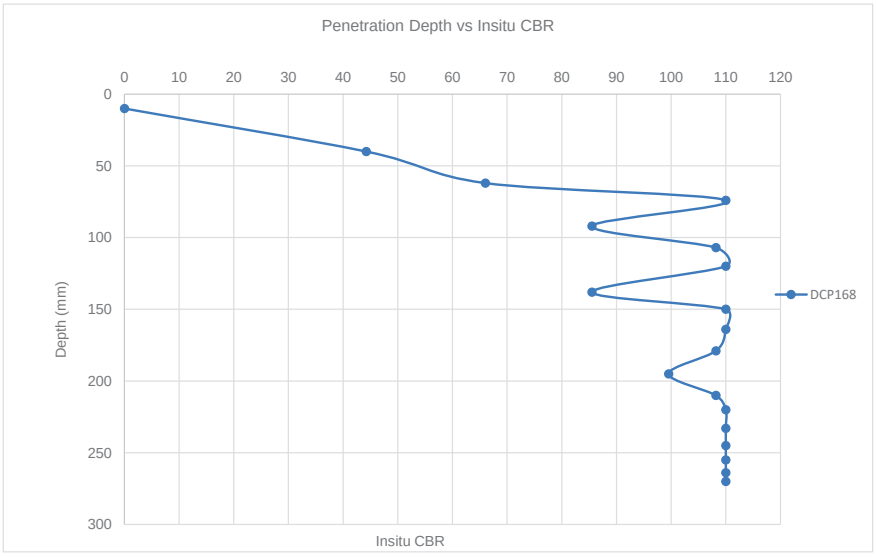
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP168	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	40	40mm	30	6.0	Dense	42	44	411
10	62	62mm	22	4.4	Very Dense	62	66	577
15	74	74mm	12	2.4	Very Dense	135	>110	1117
20	92	92mm	18	3.6	Very Dense	81	86	718
25	107	107mm	15	3.0	Very Dense	102	108	876
30	120	120mm	13	2.6	Very Dense	122	>110	1023
35	138	138mm	18	3.6	Very Dense	81	86	718
40	150	150mm	12	2.4	Very Dense	135	>110	1117
45	164	164mm	14	2.8	Very Dense	111	>110	944
50	179	179mm	15	3.0	Very Dense	102	108	876
55	195	195mm	16	3.2	Very Dense	94	100	816
60	210	210mm	15	3.0	Very Dense	102	108	876
65	220	220mm	10	2.0	Very Dense	170	>110	1362
70	233	233mm	13	2.6	Very Dense	122	>110	1023
75	245	245mm	12	2.4	Very Dense	135	>110	1117
80	255	255mm	10	2.0	Very Dense	170	>110	1362
85	264	264mm	9	1.8	Very Dense	185	>110	1528
90	270	270mm	6	1.2	Very Dense	263	>110	2377

DCP GRAPHICAL REPRESENTATION



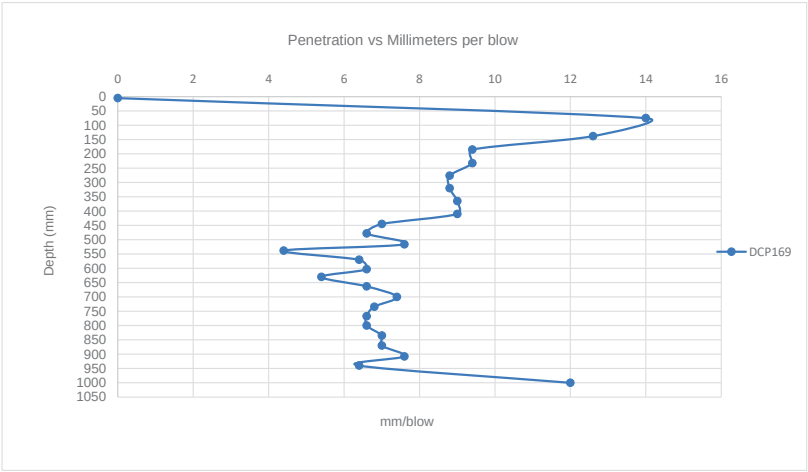


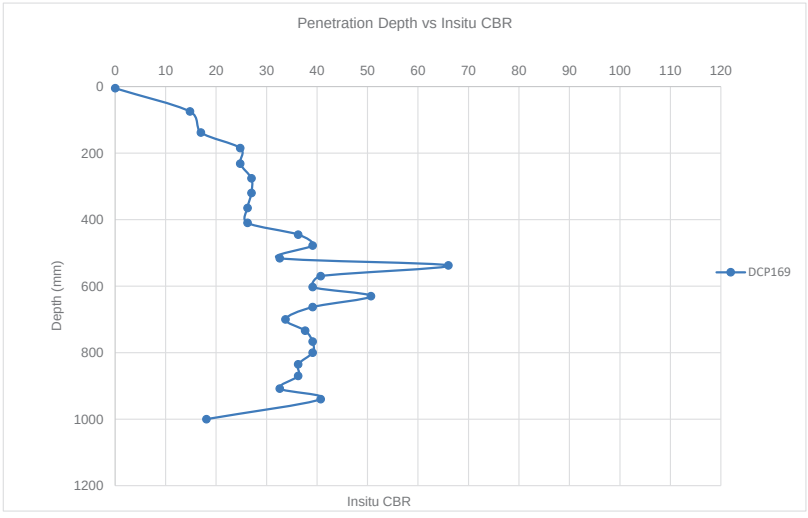
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP169	**STARTING DEPTH:**	5mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	5	5mm	0	0				
5	75	75mm	70	14.0	Medium Dense	14	15	163
10	138	138mm	63	12.6	Medium Dense	16	17	183
15	185	185mm	47	9.4	Dense	24	25	252
20	232	232mm	47	9.4	Dense	24	25	252
25	276	276mm	44	8.8	Dense	26	27	271
30	320	320mm	44	8.8	Dense	26	27	271
35	365	365mm	45	9.0	Dense	25	26	264
40	410	410mm	45	9.0	Dense	25	26	264
45	445	445mm	35	7.0	Dense	35	36	348
50	478	478mm	33	6.6	Dense	37	39	371
55	516	516mm	38	7.6	Dense	31	33	318
60	538	538mm	22	4.4	Very Dense	62	66	577
65	570	570mm	32	6.4	Dense	39	41	383
70	603	603mm	33	6.6	Dense	37	39	371
75	630	630mm	27	5.4	Dense	48	51	461
80	663	663mm	33	6.6	Dense	37	39	371
85	700	700mm	37	7.4	Dense	32	34	327
90	734	734mm	34	6.8	Dense	36	38	359
95	767	767mm	33	6.6	Dense	37	39	371
100	800	800mm	33	6.6	Dense	37	39	371
105	835	835mm	35	7.0	Dense	35	36	348
110	870	870mm	35	7.0	Dense	35	36	348
115	908	908mm	38	7.6	Dense	31	33	318
120	940	940mm	32	6.4	Dense	39	41	383
125	1000	1000mm	60	12.0	Dense	17	18	193

DCP GRAPHICAL REPRESENTATION



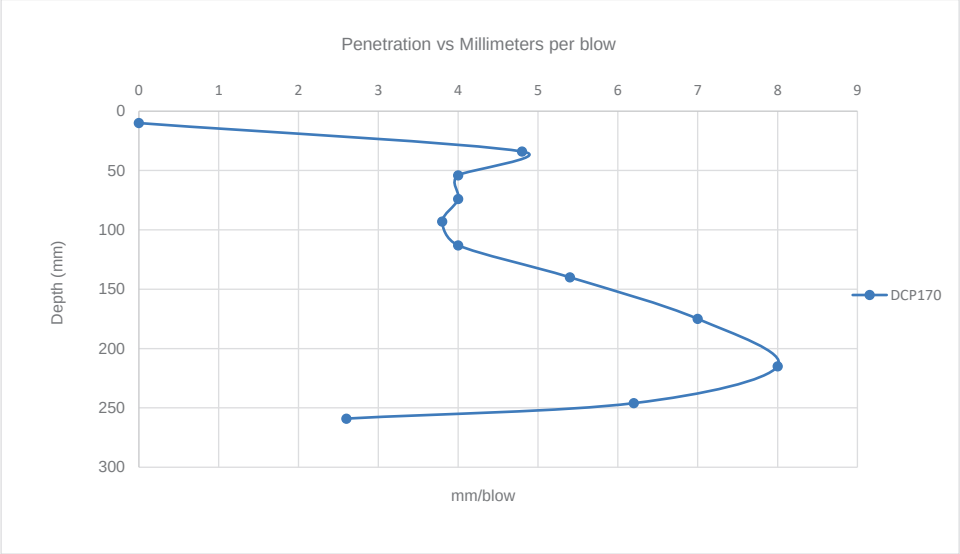


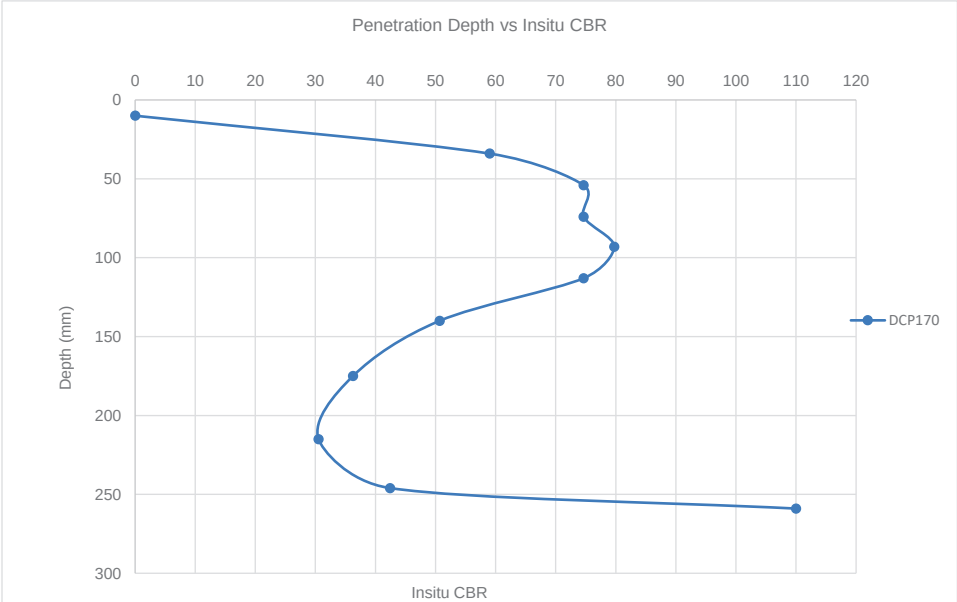
DYNAMIC CONE PENETROMETER TEST

CLIENT:	Trans Caledon Tunnel Authority	**DATE:**	Sep-21
PROJECT NAME:	BRVAS Geotechnical Site Investigation	**JOB NUMBER:**	MK-21-614
OPERATOR:	K Naidoo	**DATE TESTED:**	Sep-21
TEST POSITION:	DCP170	**STARTING DEPTH:**	10mm
MATERIAL TYPE:	Gravel	**INSTRUMENT USED:**	1m DCP
CONSTRUCTION TYPE:	Road Construction	**NOTE:**	

Number of Blows	Depth (mm)	Corrective Depth (mm)	Penetration Tempo	Structure Nr (dn) mm/blow	Consistency	In Situ CBR 410x (dn)$^{-1.27}$	In Situ CBR (TMH 6)	In Situ UCS 2900x (dn)$^{-1.09}$
0	10	10mm	0	0				
5	34	34mm	24	4.8	Very Dense	56	59	525
10	54	54mm	20	4.0	Very Dense	70	75	640
15	74	74mm	20	4.0	Very Dense	70	75	640
20	93	93mm	19	3.8	Very Dense	75	80	677
25	113	113mm	20	4.0	Very Dense	70	75	640
30	140	140mm	27	5.4	Dense	48	51	461
35	175	175mm	35	7.0	Dense	35	36	348
40	215	215mm	40	8.0	Dense	29	31	301
45	246	246mm	31	6.2	Dense	40	42	397
50	259	259mm	13	2.6	Very Dense	122	>110	1023

DCP GRAPHICAL REPRESENTATION





POSITION	DEPTH (m)	% PASSING (mm)																Hydrometer (mm)									GM	LL	PI	LS	POTENTIAL EXPANSIVENESS	CF (%)	MDD (kg/m3)	OMC (%)	CBR @						Classification			pH	Conductivity S/m	Chloride Content (%)	Water Soluble Sulphates (%)
		100	75	63	50	37.5	28	20	14	5.00	2.00	1.00	0.425	0.250	0.150	0.075	0.060	0.040	0.020	0.006	0.002	Gravel	Sand	Silt	Clay									100%	98%	97%	95%	93%	90%	T R H 14	UNIFIED CLASS	HRB				
PIPELINE																																													
TPP01	0.20-3.90								100	100	100	100	97	74	42	17	2	2	2	1	1	0	98	1	1	0.87		SP	0.50	Low											SM	A-2-4(0)	6.8	0.00685		
TPP02	0.80-3.00								100	100	99	99	96	87	68	40	13	12	10	7	5	1	86	8	5	0.64		SP	0.50	Low											SM	A-4(0)	5.6	0.04480		
		100	100	100	100	100	100	100	100	100	99	99	96			40									0.64		SP	0.50			1849	9.9	32	26	24	20	17	14	G8						
	3.00-3.5								100	100	100	100	99	97	86	48	21	18	15	11	7	0	79	14	7	0.53		SP	0.50	Low											SM	A-4(0)	8.1	0.11460		
TPP05	1.80-3.70								100	100	100	100	100	96	79	49	22	19	17	13	9	0	78	13	9	0.51	20	5	2.00	Low											SC-SM	A-4(0)	5.4	0.01290		
TPP06	1.70-3.70								100	100	100	100	99	82	48	20	4	3	3	2	1	0	96	2	1	0.81		NP	0.00												SM	A-2-4(0)	6.1	0.01360		
	1.70-3.70	100	100	100	100	100	100	100	100	100	100	100	99			20									0.81		NP				2045	9.2	68	52	45	34	26	17	G7		A-2-4(0)				
TPP08	1.00-3.00								100	100	100	100	82	63	45	21	10	10	9	8	8	0	90	2	8	0.97		NP	0.00		68										SM	A-2-4 (0)	6.5	0.02460	0.0035	0.2058
	1.00-3.00	100	100	100	100	100	100	100	100	100	100	100	82			21											NP				2003	7.7	32	24	21	16	12	9	G9		A-2-4(0)				
TPP10	0.00-0.60								100	96	92	92	55	41	27	11	10	10	9	9	9	8	83	1	9	1.41		NP	0.00												SW-SM	A-2-4 (0)				
	0.60-0.90	100	100	100	95	80	74	63	63	62	58	58	42	35	26	19										1.81	22	7	3.50			1879	15.6	6	5	5	4	3	2				7.7	0.07845		
				100	95	80	74	63	63	62	58	58	42	35	26	19	12	11	10	10	10	42	46	2	10	1.81	22	7	3.50	Low										SC-SM	A-2-4(0)			0.0567	1.8522
	0.90-1.70									100	100	100	82			21										0.97		NP																	
						100	99	99	96	74	52	52	17	15	12	9	7	6	5	4	2	48	45	5	2	2.22	40	12	6.00	Low	95										SW-SM	A-2-7(0)	7.7	0.68000		
TPP12	1.00-3.00	100	100	100	100	100	100	100	99	99	96	96	86			59										0.59	34	11	6.50		81	1744	18.4	2	2	2	2	2	2			A-6 (4)	8.3	0.15800		
								100	99	99	96	96	86	78	69	59	29	24	20	13	8	4	67	21	8	0.59	34	11	6.50	Low									CL	A-6(4)			0.0035	0.343
TPP14	0.90-2.20					100	91	78	68	46	35	35	17	14	12	10	8	7	6	5	3	65	27	5	3	2.38	32	12	6.00	Low										SP-SC	A-2-6 (0)				
TPP15	0.50-1.80	100	100	100	100	97	96	95	92	92	67	67	28			19										1.86	38	14	7.50		93	1804	14.9	2	2	2	2	1	1			A-2-6 (0)			0.0035	0.4459
		100	100	100	100	97	96	95	92	83	67	67	28	26	23	19	14	12	11	10	9	33	53	4	9	1.86	38	14	7.50	Low									SC	A-2-6(0)				
TPP16	1.00-2.20	100	100	100	100	97	92	85	81	53	39	39	27			13										2.21	31	8	4.00		90	1931	14.1	12	11	10	9	9	9	G9		A-2-4 (0)	9.5	0.29100	0.0567	0.5831
		100	100	100	100	97	92	85	81	53	39	39	27	21	17	13	9	8	7	6	6	61	30	4	6	2.21	31	8	4.00	Low									SM	A-2-4 (0)				
TPP19	1.60-3.10	100	100	100	100	100	100	100	98	81	73	73	41			30											34	9	4.00		76	1767	18.5	4	4	4	4	4	4			A-2-4 (0)	8.8	0.27900		
		100	100	100	100	100	100	100	98	81	73	73	41	36	33	30	17	14	12	7	4	27	56	13	4	1.55	34	9	4.00	Low									SM	A-2-4 (0)				
TPP21	1.30-3.10					100	93	85	84	75	60	60	40	36	32	28	15	12	11	10	8	40	45	6	8	1.72	33	11	6.00	Low										SC	A-2-6 (0)			0.0035	0.9947
TPP22	0.70-1.40	100	100	100	100	97	92	88	85	70	64	64	57	57		37										1.43	24	9	5.00		83	1855	14.8	5	4	4	4	3	3			A-4 (0)	9	0.07570	0.0000	0.5145
		100	100	100	100	97	92	88	85	70	64	64	57	52	46	37	19	16	15	12	9	36	45	9	9	1.43	24	9	5.00	Low									SC	A-4 (0)				
TPP27	0.60-1.60		100	93	91	74	67	59	52	37	32	32	22	20	18	17	10	8	7	5	2	68	22	8	2	2.29	37	6	3.50	Low										GM	A-1-b (0)				
	1.20-3.00	100	88	88	88	88	88	87	80	63	53	53	28			12										2.07	28	13	6.50		99	1884	14.2	3	2	2	2	2	1			A-2-6(0)	7.3	0.03915		
		100	88	88	88	88	88	87	80	63	53	53	28	23	18	12	8	7	7	5	3	47	44	5	3	2.07	28	13	6.50	Low									SP-SC	A-2-6(0)				
TPP28	1.60-3.20	100	100	97	93	84	73	65	63	50	44	44	38			25										1.92	35	12	6.00	Low	78	1770	17.2	4	4	4	3	3	3			A-2-6(0)	9.1	0.17100	0.0106	0.0343
			100	97	93	84	73	65	63	50	44	44	38	34	30	25	18	15	13	10	7	56	27	11	7	1.92	35	12	6.00	Low									SC	A-2-6(0)	6.7	0.14610		
TPP30	0.60-1.30				100	92	90	78	76	59	46	46	28	24	19	13	9	8	7	7	7	54	37	3	7	2.12	34	12	6.00	Low										SC	A-2-6(0)				
	1.30-3.00																																									7	0.05480	0.0000	0.0343
TPP31	0.80-2.90	100	100	100	100	100	100	94	88	69	56	56	35			20										1.89	36	20	10.50	Low	67	1877	14.4	3	3	3	2	2	1			A-2-6(1)	8.5	0.47300	0.0071	0.2401
						100	96	94	88	69	56	56	35	31	26	20	12	11	9	7	5	44	44	7	5	1.89	36	20	10.50	Low										SC	A-2-6(1)				
TPP32	0.20-2.50						100	98	94	70	56	56	30	24	17	11	10	9	8	5	4	44	46	6	4	2.04	32	12	5.50	Low	85										SW-SC	A-2-6(1)	7.8	0.04770	0.0035	0.3773
		100	100	100	100	97	95	89	80	49	31	31	14			6										2.49	32	11	6.50			2063	10.8	9	7	6	4	3	2			A-2-6(0)				

POSITION	DEPTH (m)	% PASSING (mm)															Hydrometer (mm)									GM	LL	PI	LS	POTENTIAL EXPANSIVENESS	CF (%)	MDD (kg/m3)	OMC (%)	CBR @						Classification			pH	Conductivity S/m	Chloride Content (%)	Water Soluble Sulphates (%)
		100	75	63	50	37.5	28	20	14	5.00	2.00	1.00	0.425	0.250	0.150	0.075	0.060	0.040	0.020	0.006	0.002	Gravel	Sand	Silt	Clay									100%	98%	97%	95%	93%	90%	T R H 14	UNIFIED CLASS	HRB				
EMBANKMENT and SADDLE DAM																																													
TPD01	0.00-2.80	100	100	100	100	100	100	100	100	100	100	100	96			11										0.93		NP			82	1719	9.5	23	19	18	15	12	10	G9			5.7	0.00434	0.0071	0.0343
									100	100	100	100	96	69	35	13	13	12	10	8	5	0	87	8	5	0.91		NP	0.00	Low										SM	A-2-4(0)				
	0.00-5.10								100	100	100	100	93	67	33	12	2	2	2	1	1	0	98	0	1	0.95		NP	0.00	Low										SP-SM	A-2-4(0)			0.0142	0.0343
		100	100	100	100	100	100	100	100	100	100	100	93			12										0.95		NP			67	1722	11.4	22	19	18	16	14	11	G8		A-2-4(0)				
TPD02	0.00-4.50								100	100	100	100	91	54	27	12	2	2	2	1	1	0	98	1	1	0.97		NP	0.00	Low	96									SP-SM	A-2-4(0)				
TPD04B	2.40-6.00	100	100	100	100	100	100	100	100	100	100	100	98			22										0.8		NP			73	2019	9.5	58	37	30	20	13	6	G10		A-2-4(0)	7.3	0.01982	0.0035	0.0343
									100	100	100	100	98	79	48	22	20	18	16	14	11	0	80	9	11	0.8		NP		Low										SM	A-2-4(0)				
TPD05	1.10-1.70								100	100	100	100	98	85	70	53	28	26	24	21	19	0	72	9	19	0.49	24	9	5.50	Low										CL	A-4(2)				
									100	100	100	100	100	95	78	53	28	25	22	17	13	0	72	15	13	0.47	24	9	5.50	Low										CL	A-4(2)				
		100	100	100	100	100	100	100	100	100	100	100	98			53										0.49	24	9	5.50		63	2027	9.2	3	2	2	2	2	1			A-4(2)	5.1	0.03400	0.0035	0.0000
TPD05A	0.60-2.90								100	100	100	100	99	90	71	49	25	23	20	16	13	0	75	12	13	0.52	17	6	3.00	Low	65									SC-SM	A-4(0)	5.5	0.02250	0.0035	0.0343
TPD06	0.00-0.70								100	100	99	99	87	76	56	26	10	9	8	5	3	1	89	8	3	0.87		NP	0.00	Low	73									SM	A-1-b (0)	4.7	0.00900		
		100	100	100	100	100	100	100	100	100	99	99	87			26																1876	10.8	25	16	13	8	5	3			A-2-4(0)				
	0.70-1.80	100	100	100	100	100	100	100	100	100	100	100	76			26										0.98	19	5	2.50		77	2061	9.5	24	13	10	5	3	1			A-2-4(0)	5.3	0.04580	0.0035	0.0000
								100	100	100	100	100	76	68	47	26	16	14	13	12	12	0	84	4	12	0.98	19	5	2.50	Low										SC-SM	A-2-4(0)				
TPD07	0.80-2.10								100	100	100	100	96	83	71	54	24	22	21	19	16	0	76	8	16	0.5	21	4	2.5	Low										CL-ML	A-4(0)				
TPD09	0.50-2.40								100.00	100.00	100.00	100.00	78.00	69.00	56.00	41.00	7.00	7.00	7.00	6.00	6.00	0.00	92.00	1.00	6.00	0.82	26.00	8.00	4.00	Low										SC	A-4(0)				
	2.4-3.00								100.00	100.00	99.00	99.00	92.00	80.00	61.00	37.00	16.00	15.00	13.00	12.00	11.00	1.00	83.00	6.00	11.00	0.71	26.00	8.00	4.00	Low										SC	A-4(0)				
									100.00	100.00	100.00	100.00	95.00	84.00	57.00	35.00	29.00	21.00	20.00	18.00	16.00	0.00	71.00	13.00	16.00	0.70	19.00	4.00	1.50	Low										SC-SM	A-4(0)				
TPD12	0.80-1.50				100.00	97.00	84.00	70.00	68.00	49.00	42.00	42.00	20.00	18.00	17.00	16.00	11.00	9.00	8.00	7.00	6.00	58.00	31.00	5.00	6.00	2.23	24.00	4.00	2.50	Low										SC-SM	A-1-b(0)				
								100.00	99.00	99.00	98.00	98.00	94.00	88.00	83.00	77.00	72.00	61.00	57.00	53.00	49.00	2.00	26.00	24.00	49.00	0.30	41.00	12.00	6.50	Low										ML	A-7-6(10)				
	1.50-3.00							100.00	99.00	88.00	80.00	80.00	51.00	44.00	37.00	31.00	9.00	8.00	7.00	5.00	2.00	20.00	70.00	7.00	2.00	1.38	32.00	9.00	4.00	Low										SC	A-2-4(0)				
	1.50-3.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.00	88.00	80.00	80.00	51.00			31.00										1.38	32.00	9.00	4.00		69.00	1767.00	14.50	3.00	2.00	2.00	2.00	2.00	1.00			A-2-4(0)	4.90	0.12600	0.0071	0.3773
TPE02	0.90-1.70						100.00	100.00	100.00	100.00	100.00	100.00	73.00	57.00	33.00	22.00	13.00	13.00	12.00	12.00	12.00	0.00	86.00	2.00	12.00	1.05	21.00	6.00	2.50	Low										SC-SM	A-2-4(0)				
		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	73.00			22.00										1.05	21.00	6.00	2.50		74.00	1967.00	10.70	8.00	6.00	5.00	3.00	2.00	1.00			A-2-4(0)	7.40	0.05770	0.0000	0.8575

POSITION	DEPTH (m)	% PASSING (mm)															Hydrometer (mm)					Gravel	Sand	Silt	Clay	GM	LL	PI	LS	POTENTIAL EXPANSIVENESS	CF (%)	MDD (kg/m3)	OMC (%)	CBR @						Classification			pH	Conductivity S/m	Chloride Content (%)	Water Soluble Sulphates (%)
		100	75	63	50	37.5	28	20	14	5.00	2.00	1.00	0.425	0.250	0.150	0.075	0.060	0.040	0.020	0.006	0.002													100%	98%	97%	95%	93%	90%	TRH 14	UNIFIED CLASS	HRB				
ROADS																																													
TPR01	0.70-1.70			100.00	99.00	95.00	95.00	95.00	95.00	89.00	85.00	85.00	68.00	61.00	54.00	47.00	35.00	29.00	26.00	20.00	16.00	15.00	50.00	19.00	16.00	1.00	32.00	11.00	6.50	Low										SC-SM	A-6(2)			0.0000	0.4116
		100.00	100.00	100.00	99.00	95.00	95.00	95.00	95.00	88.00	85.00	85.00	70.00			49.00										0.96	32.00	11.00	6.50		84.00	1808.00	15.70	3.00	3.00	2.00	2.00	2.00	1.00			A-6(3)	7.00	0.24100		
TPR03	0.20-0.60				100.00	98.00	98.00	98.00	98.00	96.00	92.00	92.00	85.00	67.00	44.00	23.00	7.00	8.00	6.00	4.00	3.00	8.00	84.00	4.00	3.00	1.00		NP	0.00	Low										SM	A-2-4(0)				
					100.00	97.00	95.00	95.00	92.00	69.00	60.00	60.00	33.00	29.00	24.00	20.00	14.00	11.00	10.00	9.00	8.00	40.00	46.00	6.00	8.00	1.86	32.00	10.00	5.00	Low										SC-SM	A-2-6(0)				
	0.60-1.60	100.00	100.00	93.00	91.00	74.00	67.00	59.00	54.00	44.00	22.00	22.00	15.00			11.00										2.51	37.00	6.00	3.50			1791.00	16.40	2.00	2.00	2.00	2.00	2.00	1.00			A-1-a(0)				
			100.00	93.00	91.00	74.00	67.00	59.00	52.00	37.00	32.00	32.00	22.00	20.00	18.00	17.00	14.00	12.00	10.00	7.00	3.00	68.00	18.00	11.00	3.00	2.29	37.00	6.00	3.50	Low										GM	A-1-b(0)				
	1.20-3.00	100.00	88.00	88.00	88.00	88.00	88.00	87.00	80.00	63.00	53.00	53.00	28.00	23.00	18.00	12.00	8.00	7.00	7.00	5.00	3.00	47.00	44.00	5.00	3.00	2.07	28.00	13.00	6.50	Low										SP-SC	A-2-6 (0)				
TPR05	0.30-1.50	100.00	100.00	100.00	100.00	98.00	98.00	98.00	98.00	96.00	92.00	92.00	85.00			23.00										1.00		NP			83.00	2030.00	8.10	45.00	35.00	31.00	24.00	19.00	13.00	G7		A-2-4(0)				
					100.00	98.00	98.00	98.00	98.00	96.00	92.00	92.00	85.00	67.00	44.00	23.00	8.00	8.00	6.00	4.00	3.00	8.00	84.00	5.00	3.00	1.00		NP	0.00	Low										SM	A-2-4(0)				
TPR06	0.40-1.50							100.00	99.00	99.00	98.00	98.00	84.00	71.00	57.00	42.00	31.00	29.00	28.00	23.00	19.00	2.00	67.00	12.00	19.00	0.76	28.00	6.00	3.50	Low										SM	A-4(0)				
TPR08	0.70-1.50	100.00	100.00	97.00	89.00	87.00	83.00	78.00	75.00	62.00	54.00	54.00	48.00			38.00										1.60	25.00	13.00	5.00	5.00		1800.00	16.70	4.00	4.00	4.00	3.00	3.00	3.00			A-6(1)				
		100.00	100.00	97.00	89.00	87.00	83.00	78.00	75.00	62.00	54.00	54.00	48.00	45.00	41.00	38.00	22.00	19.00	17.00	13.00	11.00	46.00	32.00	11.00	11.00	1.60	25.00	13.00	5.50	Low										SC	A-6(1)				
TPR10	0.20-0.90						100.00	99.00	98.00	69.00	45.00	45.00	17.00	15.00	13.00	11.00	8.00	7.00	6.00	5.00	4.00	55.00	37.00	4.00	4.00	2.26	32.00	14.00	6.50	Low										SW-SC	A-1-b(0)				
							100.00	98.00	91.00	82.00	61.00	61.00	47.00	38.00	26.00	17.00	8.00	8.00	7.00	6.00	5.00	39.00	53.00	3.00	5.00	1.75	17.00	6.00	2.50	Low										SW-SM	A-1-b(0)				
	0.20-1.10							100.00	99.00	97.00	95.00	95.00	42.00	29.00	17.00	6.00	1.00	1.00	1.00	1.00	1.00	5.00	94.00	0.00	1.00	1.57		NP	0.00	Low										SW-SM	A-1-b(0)				
	0.90-1.70	100.00	100.00	91.00	91.00	83.00	79.00	75.00	72.00	50.00	34.00	34.00	14.00			6.00										2.45	34.00	12.00	6.50			1926.00	10.50	8.00	7.00	6.00	5.00	4.00	4.00			A-2-6(0)				
		100.00	100.00	91.00	91.00	83.00	79.00	75.00	72.00	50.00	34.00	34.00	14.00	13.00	10.00	6.00	5.00	4.00	4.00	3.00	2.00	66.00	29.00	3.00	2.00	2.45	28.00	12.00	5.50	Low										SP-SC	A-2-6(0)				
TPR12	0.70-1.50				100.00	92.00	80.00	68.00	57.00	35.00	24.00	24.00	10.00	8.00	7.00	6.00	3.00	3.00	2.00	2.00	2.00	76.00	21.00	1.00	2.00	2.60	33.00	8.00	4.00	Low										GW-GC	A-2-4(0)				
TPR13	0.60-1.50	100.00	100.00	100.00	100.00	100.00	98.00	93.00	88.00	64.00	53.00	53.00	44.00			30.00										1.72	27.00	11.00	6.50			1989.00	13.00	6.00	5.00	5.00	5.00	4.00	4.00			A-2-6(0)				
		100.00	100.00	100.00	100.00	100.00	98.00	93.00	88.00	64.00	53.00	53.00	44.00	40.00	36.00	30.00	13.00	12.00	10.00	9.00	8.00	47.00	40.00	6.00	8.00	1.72	27.00	11.00	6.50	Low										SC	A-2-6(0)				
TPRE01	0.80-1.40	100.00	100.00	100.00	97.00	87.00	82.00	75.00	66.00	38.00	26.00	26.00	12.00			5.00										2.57	34.00	14.00	7.50		79.00	1990.00	10.80	3.00	3.00	2.00	2.00	2.00	1.00			A-2-6(0)				
					100.00	97.00	87.00	82.00	75.00	66.00	38.00	26.00	26.00	12.00	10.00	7.00	5.00	4.00	4.00	3.00	3.00	2.00	74.00	21.00	2.00	2.00	2.57	34.00	14.00	7.50	Low										GW-GC	A-2-6(0)				
TPRE02	0.70-1.50	100.00	100.00	100.00	100.00	100.00	94.00	86.00	80.00	48.00	34.00	34.00	20.00			10.00										2.36	38.00	12.00	6.50		73.00	2126.00	9.60	5.00	4.00	4.00	3.00	2.00	2.00			A-2-6(0)				
		100.00	100.00	100.00	100.00	100.00	94.00	86.00	80.00	48.00	34.00	34.00	20.00	17.00	13.00	10.00	8.00	7.00	6.00	6.00	6.00	66.00	27.00	2.00	6.00	2.36	38.00	12.00	6.50	Low										SW-SM	A-2-6(0)				
TPRE04	0.80-1.60	100.00	100.00	100.00	100.00	100.00	99.00	99.00	96.00	74.00	52.00	52.00	17.00			10.00										2.22	40.00	12.00	6.00		74.00	1782.00	16.30	5.00	4.00	4.00	3.00	3.00	2.00			A-2-7(0)				
	0.80-1.60					100.00	99.00	99.00	96.00	74.00	52.00	52.00	17.00	15.00	12.00	9.00	7.00	6.00	5.00	4.00	2.00	48.00	45.00	5.00	2.00	2.22	40.00	12.00	6.00	Low										SW-SC	A-2-7(0)				
TPRE06	0.60-1.50			100.00	95.00	90.00	88.00	84.00	80.00	64.00	57.00	57.00	46.00	40.00	36.00	31.00	23.00	20.00	18.00	12.00	6.00	43.00	33.00	17.00	6.00	1.66	32.00	10.00	5.50	Low	81.00										SC-SM	A-2-6(0)				
		100.00	100.00	100.00	95.00	90.00	88.00	84.00	80.00	64.00	57.00	57.00	46.00			31.00																1885.00	13.40	5.00	5.00	4.00	4.00	4.00	3.00			A-2-6(0)				
TPRE09	0.30-1.50								100.00	100.00	94.00	94.00	45.00	40.00	35.00	30.00	15.00	14.00	13.00	12.00	11.00	6.00	79.00	4.00	11.00	1.31	38.00	15.00	7.00	Low	80.00										SC-SM	A-2-6(1)				
		100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	94.00	94.00	45.00			30.00											38.00	15.00	7.00			1974.00	10.20	3.00	3.00	3.00	2.00	2.00	2.00							
TPRE10	0.20-1.10							100.00	99.00	97.00	95.00	95.00	42.00	29.00	17.00	6.00	1.00	1.00	1.00	1.00	1.00	5.00	94.00	0.00	1.00	1.57		NP	0.00	Low										SW-SM	A-1-b(0)				
TPRE11	0.00-0.40			100.00	90.00	90.00	90.00	87.00	76.00	63.00	48.00	48.00	34.00	26.00	19.00	11.00	4.00	4.00	3.00	3.00	3.00	52.00	44.00	1.00	3.00	2.07		NP	0.00	Low										SP-SM	A-1-b				
	0.40-1.30					100.00	98.00	91.00	90.00	71.00	58.00	58.00	24.00	22.00	20.00	17.00	9.00	8.00	8.00	7.00	7.00	42.00	49.00	3.00	7.00	2.00	40.00	14.00	6.50	Low										SC-SM	A-2-7(0)				
TPRE12	0.20-1.20			100.00	97.00	87.00	71.00	60.00	52.00	31.00	20.00	20.00	10.00	9.00	8.00	7.00	4.00	3.00	3.00	3.00	3.00	80.00	16.00	1.00	3.00	2.62	33.00	12.00	6.00	Low										GW-GC	A-2-6(0)				
TPRE13	0.40-1.50						100.00	96.00	89.00	63.00	40.00	40.00	20.00	18.00	16.00	14.00	12.00	11.00	10.00	9.00	8.00	60.00	28.00	5.00	8.00	2.26	42.00	12.00	6.00	Low										SC-SM	A-2-7(0)				
TPRE15	0.70-1.50				100.00	90.00	80.00	74.00	69.00	59.00	44.00	44.00	27.00	23.00	18.00	14.00	10.00	9.00	8.00	7.00	6.00	56.00	34.00	4.00	6.00	2.15	26.00	4.00	2.50	Low										SM	A-1-a(0)				
TPRA1	0.40-1.00				100.00	97.00	92.00	82.00	68.00	43.00	30.00	30.00	13.00	12.00	11.00	9.00	9.00	8.00	7.00	6.00	4.00	70.00	21.00	5.00	4.00	2.48	30.00	12.00	6.00	Low										GP-GC	A-2-6(0)				
TPRA2	1.00-1.20					100.00	98.00	93.00	83.00	63.00	51.00	51.00	24.00	18.00	13.00	8.00	4.00	4.00	4.00	3.00	3.00	49.00	46.00	1.00	3.00	2.17	43.00	16.00	8.00	Low										SP-SC	A-2-7(0)				
TPRA3	0.20-1.30	100.00	100.00	100.00	99.00	93.00	85.00	76.00	69.00	47.00	36.00	36.00	24.00			18.00										2.21	39.00	9.00	4.50		77.00	1968.00	11.60	14.00	11.00	10.00	7.00	6.00	3.00	G10		A-2-4(0)				
				100.00	99.00	93.00	85.00	76.00	69.00	47.00	36.00	36.00	24.00	23.00	21.00	18.00	11.00	10.00	9.00	8.00	7.00	64.00	25.00	4.00	7.00	2.21	39.00	9.00	4.50	Low										SC-SM	A-2-4(0)				
TPRA4	0.10-0.50				100.00	91.00	64.00	52.00	42.00	25.00	16.00	16.00	6.00	6.00	5.00	4.00	2.00	2.00	2.00	1.00	1.00	84.00	14.00	1.00	1.00	2.73	33.00	13.00	6.50	Low										GP	A-2-6(0)				
TPRA5	0.3-1.5	100.00	100.00	100.00	98.00	97.00	86.00	74.00	65.00	37.00	22.00	22.00	8.00			3.00										2.66	25.00	8.00	4.00			2187.00	7.50	39.00	23.00	17.00	10.00	6.00	1.00			A-2-4 (0)	7.00	0.05970	0.0071	0.0343
				100.00	98.00	97.00	86.00	74.00	65.00	37.00	22.00	22.00	8.00	6.00	5.00	3.00	2.00	2.00	2.00	2.00	2.00	78.00	20.00	0.00	2.00	2.66	25.00	8.00	4.00	Low										GW	A-2-4(0)				
TPRA6	0.5-1.60	100.00	100.00	100.00	100.00	100.00	100.00	100.00	97.00	84.00	50.00	50.00	33.00			21.00										1.95	28.00	9.00	4.00		77.00	1801.00	17.30	6.00	5.00	5.00	4.00	3.00	3.00			A-2-4 (0)				
							100.00	100.00	97.00	84.00	50.00	50.00	33.00	29.00	26.00	21.00	16.00	14.00	13.00	10.00	7.00	50.00	34.00	9.00	7.00	1.95	28.00	9.00	4.00	Low										SC-SM	A-2-4(0)				
TPRA7	0.30-0.70						100.00	95.00	90.00	78.00	61.00	61.00	37.00	28.00	19.00	13.00	7.00	6.00	5.00	5.00	5.00	39.00	54.00	2.00	5.00	1.89	24.00	12.00	6.50	Low										SC-SM	A-2-6(0)				
	0.70-1.70					100.00	98.00	93.00	88.00	65.00	51.00	51.00	23.00	22.00	19.00	15.00	10.00	8.00	8.00	7.00	6.00	49.00	41.00	3.00	6.00	2.11	31.00	14.00	7.00	Low										SC-SM	A-2-6(0)				
TPRA8	0.20-0.60			100.00	93.00	79.00	64.00	57.00	50.00	33.00	26.00	26.00	11.00	10.00	9.00	8.00	5.00	4.00	4.00	4.00	4.00	74.00	21.00	1.00	4.00	2.55	37.00	15.00	6.50	Low										GW-GC	A-2-7(0)	5.50	0.03210		
TPRA9	0.50-1.30			100.00	93.00	85.00	73.00	55.00	41.00	19.00	12.00	12.00	4.00	4.00	4.00	3.00	1.00	1.00	1.00	1.00	1.00	88.00	11.00	0.00	1.00	2.80	32.00	16.00	8.00	Low										GP	A-2-6(0)				
TPRA10	0.20-0.90						100.00	99.00	98.00	69.00	45.00	45.00	17.00	15.00	13.00	11.00	8.00	7.00	6.00	5.00	4.00	55.00	37.00	4.00	4.00	2.26	32.00	14.00	6.50	Low										SW-SC	A-2-6(0)				
	0.00-0.50					100.00	98.00	96.00	82.00	57.00	39.00	36.00	34.00	28.00	17.00	9.00	17.00	15.00	14.00	12.00	9.00	43.00	41.00	7.00	9.00	1.76	18.00	5.00	2.50	Low										SM	A-2-4(0)				
	0.5-1.20	100.00	95.00	95.00	90.00	89.00	72.00	61.00	52.00	27.00	17.00	17.00	5.00	5.00	4.00	4.00	3.00	2.00	2.00	2.00	2.00	83.00	14.00	1.00	2.00	2.74	30.00	10.00	5.50	Low										GW	A-2-6(0)				
TPRA12	0.20-1.00	100.00	100.00	100.00	98.00	96.00	89.00	78.00	71.00	42.00	28.00	28.00	15.00			9.00										2.49	29.00	15.00	6.50		96.00	2285.00	7.70	22.00	19.00	18.00	15.00	13.00	10.00	G8		A-2-6(0)				
		100.00	100.00	100.00	98.00	96.00	89.00	78.00	71.00	42.00	28.00	28.00	15.00	13.00	11.00	9.00	3.00	3.00	3.00	2.00	1.00	72.00	25.00	2.00	1.00	2.49	29.00	15.00	6.50	Low										GP-GC	A-2-6(0)				
TPRA13	0.60-1.20				100.00	89.00	74.00	64.00	57.00	34.00	22.00	22.00	13.00	11.00	9.00	8.00	4.00	3.00	3.00	3.00	2.00	78.00	18.00	1.00	2.00	2.58	26.00	13.00	6.00	Low										GP-GC	A-2-6(0)				
TPRA14	0.30-0.70						100.00	95.00	91.00	81.00	63.00	63.00	36.00	31.00	24.00	20.00	13.00	11.00	11.00	10.00	9.00	37.00	50.00	4.00	9.00	1.81	21.00	8.00	4.00	Low										SC-SM	A-2-6(0)				
	0.70-1.70		100.00	98.00	96.00	91.00	85.00	82.00	72.00	58.00	49.00	49.00	29.00	23.00	18.00	13.00	6.00	5.00	5.00	4.00	3.00	51.00	43.00	3.00	3.00	2.10	30.00	10.00	4.50	Low										SC-SM	A-2-6(0)				
TPRA15	0.60-1.00				100.00	99.00	96.00	93.00	85.00	69.00	61.00	1.00	49.00	44.00	35.00	23.00	18.00	16.00	15.00	13.00	11.00	39.00	43.00	6.00	11.00	1.67	33.00	NP	0.00	Low										SM	A-1-b(0)				
					100.00	97.00	91.00	78.00	68.00	40.00	27.00	27.00	10.00	9.00	9.00	9.00	5.00	4.00	4.00	3.00	3.00	73.00	22.00	2.00	3.00	2.55	40.00	14.00	7.50	Low										GW-GC	A-2-7(0)				
TPRA16	0.10-0.50				100.00	94.00	94.00	88.00	78.00	46.00	24.00	24.00	5.00	4.00	3.00	2.00	1.00	1.00	1.00	1.00	1.00	76.00	23.00	0.00	1.00	2.68	34.00	10.00	5.00	Low										GW	A-2-6 (0)				
		100.00	100.00	100.00	96.00	89.00	84.00	73.00	63.00	43.00	29.00	29.00	15.00			8.00										2.48	28.00	8.00	4.00					51.00	28.00	21.00	12.00	6.00	2.00			A-2-4 (0)				
TPRA17	0.20-1.30			100.00	93.00	75.00	63.00	50.00	37.00	19.00	12.00	12.00	5.00	4.00	4.00	4.00	4.00	3.00	3.00	3.00	3.00	88.00	9.00	1.00	3.00	2.79	39.00	13.00	7.50	Low										GP	A-2-6(0)				
TPRA18	0.20-1.30																														85.00														
TPRA19	0.30-0.70				100.00	96.00	93.00	89.00	80.00	58.00	44.00	44.00	24.00	20.00	15.00	11.00	6.00	5.00	5.00	4.00	4.00	56.00	38.00	2.00	4.00	2.20	17.00	5.00	3.00	Low										SP-SM	A-1-a(0)				
				100.00	96.00	89.00	84.00	73.00	63.00	43.00	29.00	29.00	15.00	13.00	11.00	8.00	5.00	4.00	4.00	4.00	4.00	71.00	24.00	1.00	4.00		28.00	8.00	4.00	Low										GW-GC	A-2-4 (0)				
TPRA20	0.20-1.70				100.00	94.00	94.00	88.00	78.00	46.00	24.00	24.00	5.00	4.00	3.00	2.00	1.00	1.00	1.00	1.00	1.00	76.00	23.00	0.00	1.00	2.48	34.00	10.00	5.00	Low	97.00										GW	A-2-6 (0)				
		100.00	100.00	100.00	100.00	94.00	94.00	88.00	78.00	46.00	24.00	24.00	5.00			4.00											34.00	6.00	5.00			2111.00	8.90	6.00	5.00	4.00	3.00	3.00	1.00			A-2-4 (0)				
TPRA21	0.00-0.30							100.00	99.00	98.00	93.00	93.00	76.00	71.00	65.00	53.00	41.00	31.00	30.00	21.00	11.00	7.00	52.00	31.00	11.00	0.78	23.00	5.00	3.00	Low										ML	A-4(0)				
	0.30-1.00				100.00	97.00	93.00	89.00	85.00	73.00	61.00	61.00	34.00	29.00	25.00	20.00	10.00	9.00	8.00	7.00	7.00	39.00	51.00	3.00	7.00	1.85	19.00	8.00	3.50	Low										SM	A-2-4(0)				
TPRA22	0.22-1.60	100.00	100.00	100.00	100.00	98.00	95.00	89.00	85.00	71.00	62.00	62.00	53.00			36.00										1.50	38.00	18.00	7.50		81.00	1771.00	16.40	3.00	2.00	2.00	2.00	1.00	1.00			A-6(2)				
		100.00	100.00	100.00	100.00	98.00	95.00	89.00	85.00	71.00	62.00	62.00	53.00	47.00	42.00	36.00	23.00	19.00	18.00	15.00	12.00	38.00	39.00	11.00	12.00	1.50	38.00	18.00	7.50	Low										SC	A-6(2)				
TPRA23	0.30-1.00					100.00	96.00	93.00	89.00	79.00	74.00	74.00	51.00	49.00	47.00	46.00	21.00	18.00	16.00	10.00	4.00	2.00	53.00	17.00	4.00	1.30	35.00	5.00	2.00	Low										SM	A-4(0)				

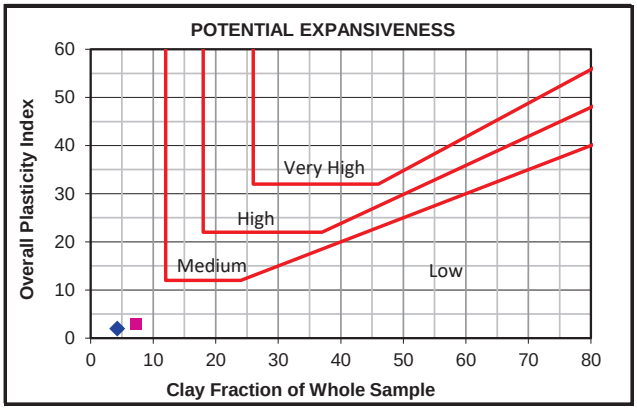
POSITION	DEPTH (m)	% PASSING (mm)															Hydrometer (mm)									GM	LL	PI	LS	POTENTIAL EXPANSIVENESS	CF (%)	MDD (kg/m3)	OMC (%)	CBR @						Classification			pH	Conductivity S/m	Chloride Content (%)	Water Soluble Sulphates (%)
		100	75	63	50	37.5	28	20	14	5.00	2.00	1.00	0.425	0.250	0.150	0.075	0.060	0.040	0.020	0.006	0.002	Gravel	Sand	Silt	Clay									100%	98%	97%	95%	93%	90%	T R H 14	UNIFIED CLASS	HRB				
CROSSINGS																																													
TPC04	0.00-5.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.00	99.00	94.00	74.00	38.00	10.00						1.00	98.00	0.00	1.00	0.97		NP	0.00		75.00	1842.00	12.80	37.00	30.00	27.00	21.00	17.00	13.00	G7		A-2-4(0)	5.70	0.01485	0.0142	0.0686
									100.00	100.00	99.00	99.00	94.00	74.00	38.00	10.00	1.00	1.00	1.00	1.00	1.00	1.00	98.00	0.00	1.00	0.97		NP	0.00											SP-SM	A-2-4(0)				
TPC05	1.50-4.80	100.00	100.00	100.00	100.00	100.00	99.00	98.00	98.00	86.00	78.00	78.00	51.00			38.00										1.34	30.00	12.00	6.50		76.00	2111.00	8.90	2.00	2.00	2.00	2.00	1.00	1.00			A-6 (1)			0.0350	0.2058
						100.00	99.00	98.00	98.00	86.00	78.00	78.00	51.00	48.00	43.00	38.00	29.00	25.00	22.00	17.00	13.00	22.00	49.00	17.00	13.00	1.34	30.00	12.00	6.50	Low										SC-SM	A-6(1)				
TPC09	2.40-5.00					100.00	97.00	94.00	87.00	69.00	58.00	58.00	41.00	33.00	27.00	19.00	4.00	4.00	4.00	4.00	4.00	42.00	53.00	1.00	4.00	1.83	24.00	11.00	5.00	Low										SC-SM	A-2-6(0)				
								100.00	100.00	97.00	94.00	94.00	80.00	62.00	42.00	24.00	11.00	9.00	8.00	8.00	7.00	6.00	83.00	4.00	7.00	1.02	24.00	11.00	5.00	Low										SC-SM	A-2-6(0)				
TPC13	2.60-6.00				100.00	99.00	98.00	97.00	93.00	85.00	77.00	77.00	45.00	37.00	29.00	20.00	17.00	15.00	15.00	10.00	3.00	23.00	60.00	14.00	3.00	1.59	22.00	6.00	2.50	Low										SM	A-2-4(0)				
					100.00	97.00	96.00	94.00	93.00	90.00	87.00	87.00	76.00	60.00	42.00	22.00	10.00	8.00	8.00	7.00	6.00	13.00	77.00	3.00	6.00	1.15	22.00	6.00	2.50	Low										SM	A-2-4(0)				
		100.00	100.00	100.00	100.00	99.00	98.00	97.00	93.00	85.00	77.00	77.00	45.00			20.00						1.00	98.00	0.00	1.00	0.97		NP	0.00											SP-SM	A-2-4(0)				
																										1.59	22.00	6.00	2.50		77.00	1963.00	12.60	3.00	2.00	2.00	1.00	1.00	1.00			A-2-4(0)	7.80	0.11300		

Location	% PASSING (mm)															Hydrometer (mm)									GM	LL	PI	LS	POTENTIAL EXPANSIVENESS	CF (%)	MDD (kg/m3)	OMC (%)	CBR @						Classification			pH	Conductivity S/m	Chloride Content (%)	Water Soluble Sulphates (%)
	100	75	63	50	37.5	28	20	14	5.00	2.00	1.00	0.425	0.250	0.150	0.075	0.060	0.040	0.020	0.006	0.002	Gravel	Sand	Silt	Clay									100%	98%	97%	95%	93%	90%	T R H 14	UNIFIED CLASS	H RB				
QUARRY MATERIALS																																													
Elsana			100	94	90	83	77	73	61	46	46	22	18	14	10	6	5	4	3	1	54	40	5	1	2.21	21	6	3.00	Low											SW-SC	A-1-2(0)					
			100	94	90	83	77	73	61	46	46	22			10										2.21	21	6	3.00											G10		A-I-a(0)				
Doornkraal			100	98	97	95	94	93	81	73	73	60	51	43	34	18	17	16	14	12	27	55	6	12	1.34		NP	0.00	Low											SM	A-2-4(0)					
Sample 1 along the Canal	100	100	100	98	97	95	94	93	81	73	73	60			34										1.34		NP				2013	6.3	4	4	3	3	3	2			A-2-4(0)				
Sample 2 along the Canal	100	100	100	98	92	86	77	73	54	43	43	32			19										2.06	24	5	2.50			2025	6.5	7	5	5	4	3	2							
Sample 3 along the Canal																															2006	9.3	6	5	4	4	3	3							
Sample 4 along the Canal																															2169	6.5	14	10	9	7	5	3							
Overburden (Afrisam Quarry	100	100	100	100	100	98	97	96	90	84	84	60			22										1.35	28	21	14													A-2-4(0)				
Build-it bag (Afrisam Quarry)	100	100	100	100	100	100	99	99	99	98	98	78			0										1.24	21	42	30													A-3(0)				

Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/52 ◆	C1991/76 ■
Field Number		TPRA1	TPRA21
Client Reference			
Depth (m)		0.40-1.00	0.30-1.00
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Sandy Clay
Classification Description		Poorly graded gravel \ clayey gravel \ Silt-Clay Materials	Clayey sand \ Silt-Clay Materials
Stabilizing Agent			

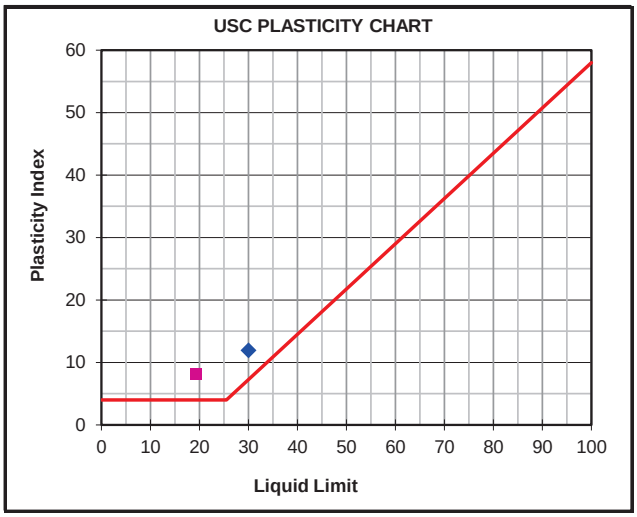


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	100
	37.5 mm	97	97
	28 mm	92	93
	20 mm	82	89
	14 mm	68	85
	5 mm	43	73
	2 mm	30	61
	1 mm	30	61
	0.425 mm	13	34
	0.250 mm	12	29
	0.150 mm	11	25
	0.075 mm	9	20
Grading Modulus		2.48	1.85

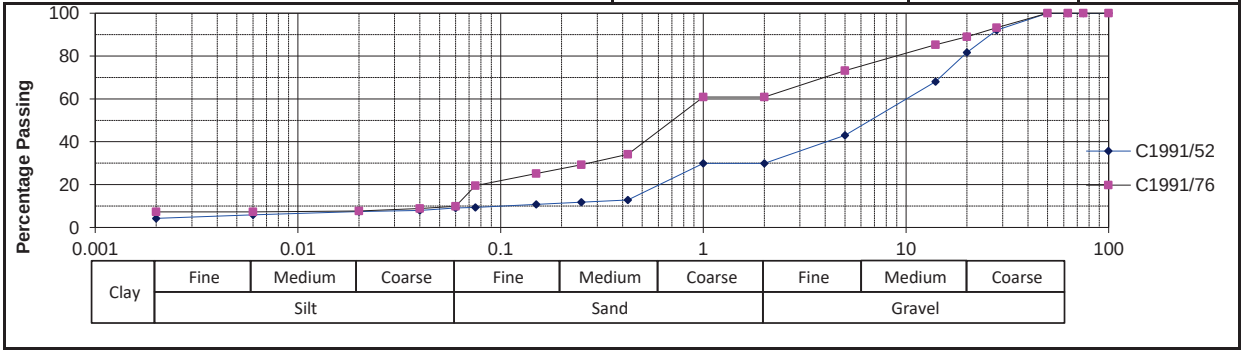


Hydrometer Analysis

		-2.00 mm	-2.00 mm
Percentage Passing	0.060 mm	9	10
	0.040 mm	8	9
	0.020 mm	7	8
	0.006 mm	6	7
	0.002 mm	4	7
Gravel	%	70	39
Sand	%	21	51
Silt	%	5	3
Clay	%	4	7

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/52 ◆	C1991/76 ■
Atterberg Limits			
Liquid Limit	%	30	19
Plasticity Index	%	12	8
Linear Shrinkage	%	6.0	3.5
Overall PI	%	2	3
Classifications			
HRB (AASHTO)		A-2-6(0)	A-2-4(0)
Unified (ASTM D2487)		GP-GC	SC
Weston Swell @ 1 kPa			



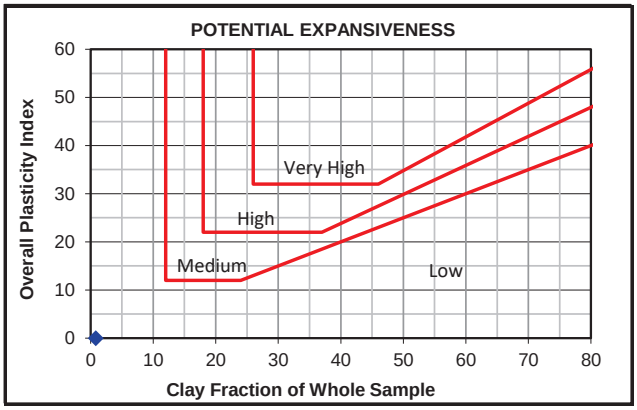
Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

Job Card No: C-1991

FOUNDATION INDICATOR

Laboratory Number		C1991/82 ◆	■
Field Number		TPC04	
Client Reference			
Depth (m)		0.00-5.00	
Position			
Coordinates	X		
	Y		
Visual Description		Silty Sand	
Classification Description		Poorly graded sand \ silty sand \ Silt-Clay Materials	
Stabilizing Agent			

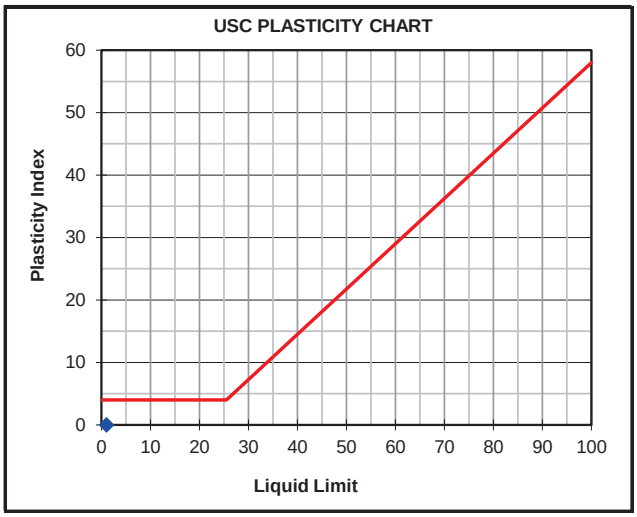


Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm	100	
	5 mm	100	
	2 mm	99	
	1 mm	99	
	0.425 mm	94	
	0.250 mm	74	
	0.150 mm	38	
	0.075 mm	10	
Grading Modulus		0.97	



Hydrometer Analysis -0.075 mm -0.075 mm

Percentage Passing	0.060 mm	1	
	0.040 mm	1	
	0.020 mm	1	
	0.006 mm	1	
	0.002 mm	1	
Gravel	%	1	
Sand	%	98	
Silt	%	0	
Clay	%	1	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

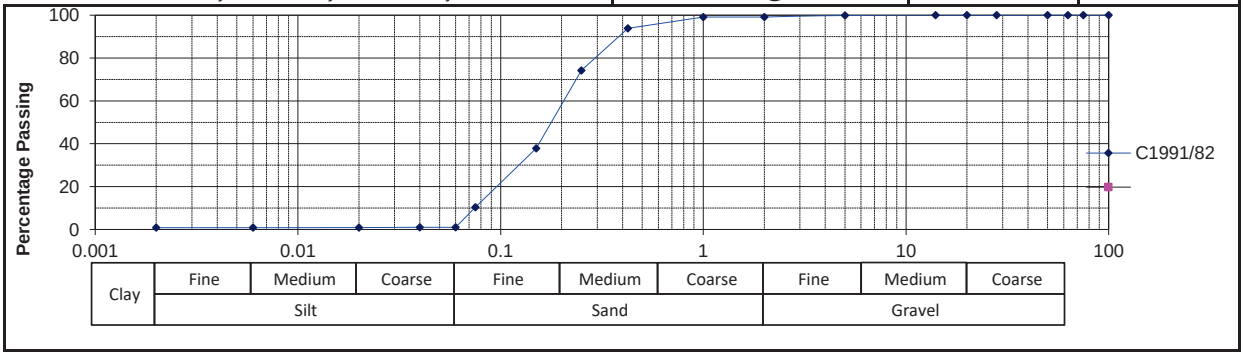
Laboratory Number		C1991/82 ◆	■

Atterberg Limits

Liquid Limit	%		
Plasticity Index	%	NP	
Linear Shrinkage	%	0.0	
Overall PI	%		

Classifications

HRB (AASHTO)	A-2-4(0)	
Unified (ASTM D2487)	SP-SM	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/46 ◆	■
Field Number		TPRE10	
Client Reference			
Depth (m)		0.20-1.10	
Position			
Coordinates	X		
	Y		
Visual Description		Silty Sand	
Classification Description		Poorly graded sand \ silty sand \ Silt-Clay Materials	
Stabilizing Agent			

Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

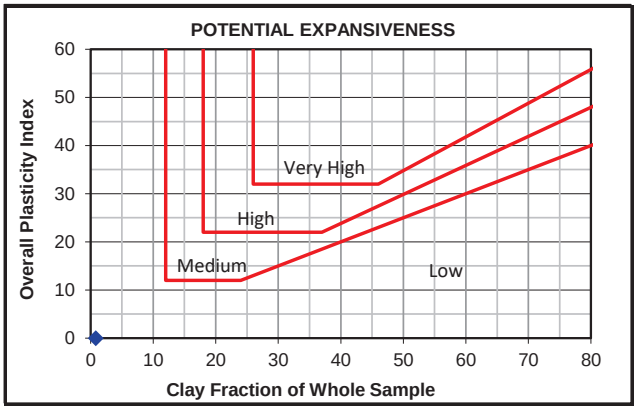
Sieve Analysis (Wet Prep)

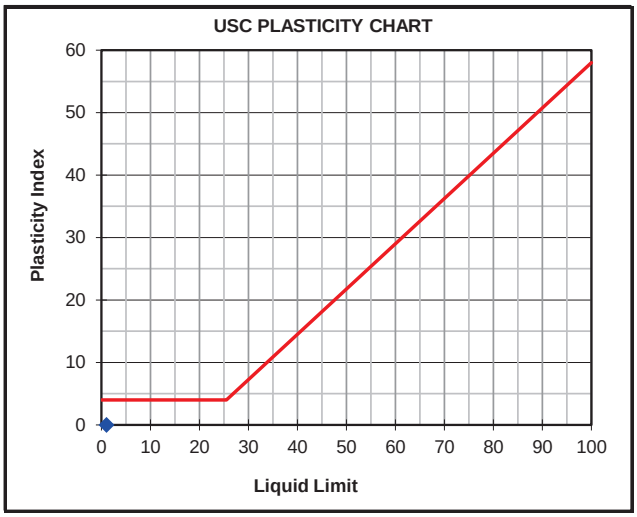
Percentage Passing	100 mm	
	75 mm	
	63 mm	
	50 mm	
	37.5 mm	
	28 mm	
	20 mm	100
	14 mm	99
	5 mm	97
	2 mm	95
	1 mm	95
	0.425 mm	42
	0.250 mm	29
	0.150 mm	17
	0.075 mm	6
Grading Modulus		1.57

Hydrometer Analysis -0.425 mm -0.425 mm

Percentage Passing	0.060 mm	1	
	0.040 mm	1	
	0.020 mm	1	
	0.006 mm	1	
	0.002 mm	1	
Gravel	%	5	
Sand	%	94	
Silt	%	0	
Clay	%	1	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations





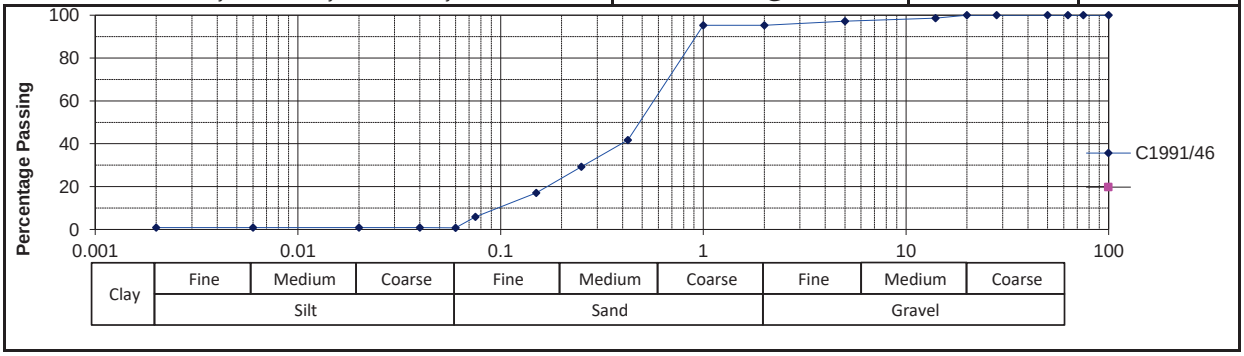
Laboratory Number	C1991/46 ◆	■

Atterberg Limits

Liquid Limit	%		
Plasticity Index	%	NP	
Linear Shrinkage	%	0.0	
Overall PI	%		

Classifications

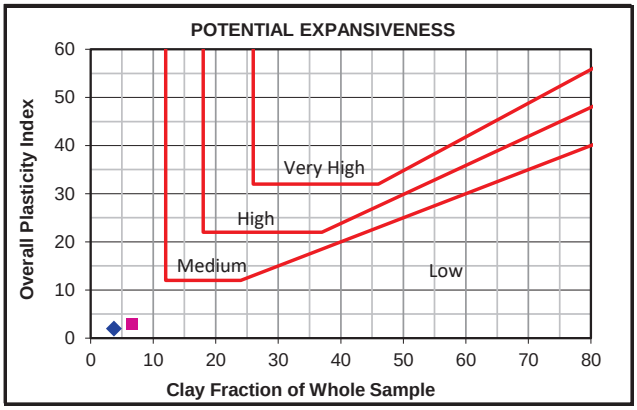
HRB (AASHTO)	A-1-b(0)	
Unified (ASTM D2487)	SW-SM	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/60 ◆	C1991/48 ■
Field Number		TPRA8	TPRE11
Client Reference			
Depth (m)		0.20-0.60	0.40-1.30
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	Silty Clay
Classification Description		Well-graded gravel, fine to coarse gravel \ clayey gravel \	Silty sand \ Silt-Clay Materials
Stabilizing Agent			

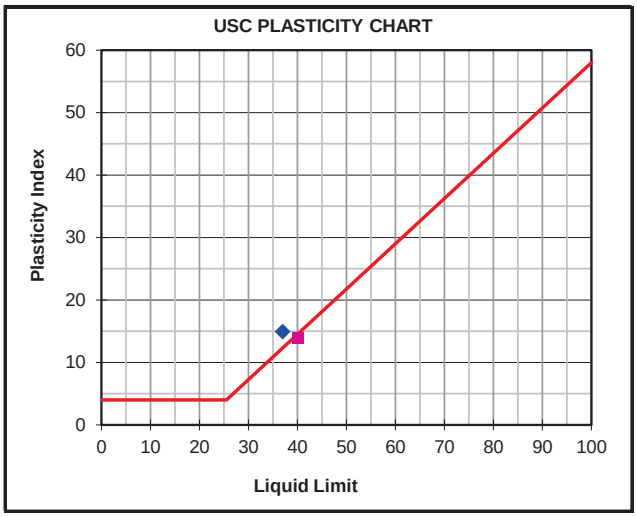


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm	100	
	50 mm	93	
	37.5 mm	79	100
	28 mm	64	98
	20 mm	57	91
	14 mm	50	90
	5 mm	33	71
	2 mm	26	58
	1 mm	26	58
	0.425 mm	11	24
	0.250 mm	10	22
	0.150 mm	9	20
	0.075 mm	8	17
Grading Modulus		2.55	2.00



Hydrometer Analysis

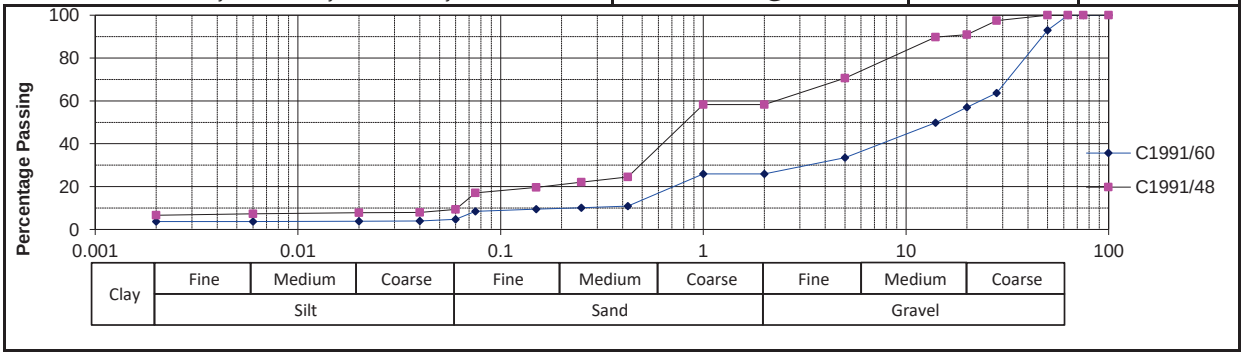
		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	5	9
	0.040 mm	4	8
	0.020 mm	4	8
	0.006 mm	4	7
	0.002 mm	4	7
Gravel	%	74	42
Sand	%	21	49
Silt	%	1	3
Clay	%	4	7

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/60 ◆	C1991/48 ■
Atterberg Limits			
Liquid Limit	%	37	40
Plasticity Index	%	15	14
Linear Shrinkage	%	6.5	6.5
Overall PI	%	2	3

Classifications

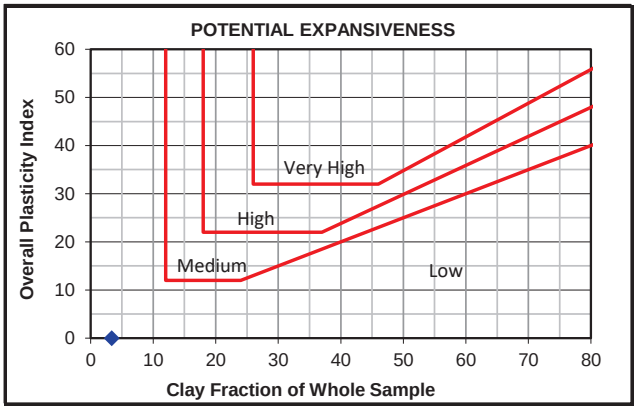
HRB (AASHTO)	A-2-6(0)	A-2-7(0)
Unified (ASTM D2487)	GW-GC	SM
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/47 ◆	■
Field Number		TPRE11	
Client Reference			
Depth (m)		0.00-0.40	
Position			
Coordinates	X		
	Y		
Visual Description		Silty gravelley sand	
Classification Description		Poorly graded sand \ silty sand \ Silt-Clay Materials	
Stabilizing Agent			

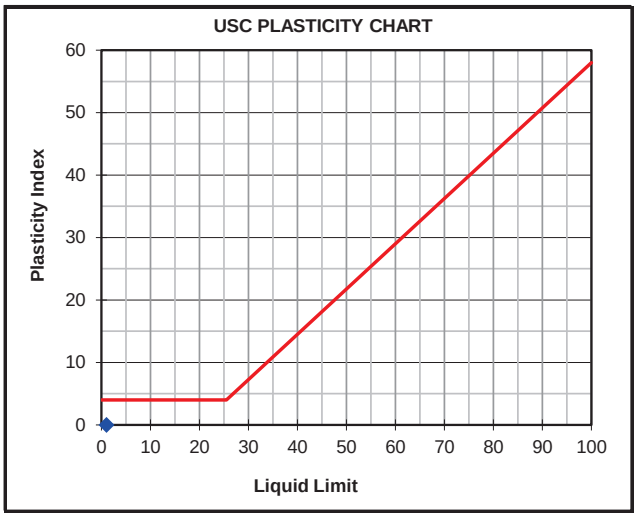


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm	100	
	50 mm	90	
	37.5 mm	90	
	28 mm	90	
	20 mm	87	
	14 mm	76	
	5 mm	63	
	2 mm	48	
	1 mm	48	
	0.425 mm	34	
	0.250 mm	26	
	0.150 mm	19	
	0.075 mm	11	
Grading Modulus		2.07	



Hydrometer Analysis		**-0.425 mm**	**-0.425 mm**
Percentage Passing	0.060 mm	4	
	0.040 mm	4	
	0.020 mm	3	
	0.006 mm	3	
	0.002 mm	3	
Gravel	%	52	
Sand	%	44	
Silt	%	1	
Clay	%	3	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

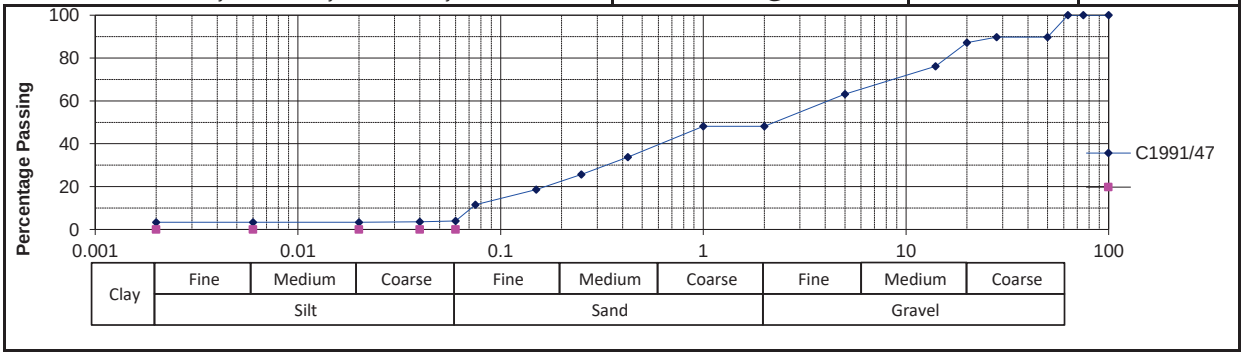
Laboratory Number		C1991/47 ◆	■

Atterberg Limits

Liquid Limit	%		
Plasticity Index	%	NP	
Linear Shrinkage	%	0.0	
Overall PI	%		

Classifications

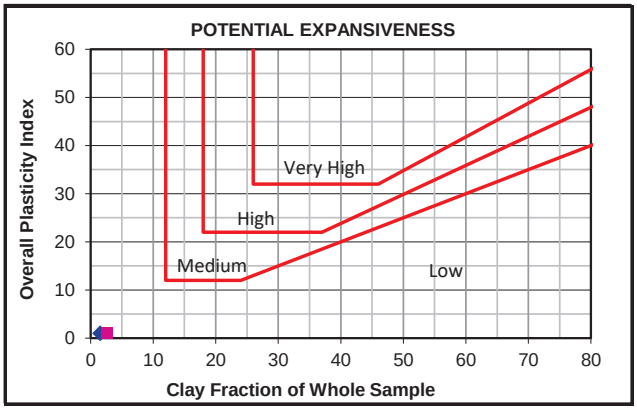
HRB (AASHTO)	A-1-b(0)	
Unified (ASTM D2487)	SP-SC	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/63 ◆	C1991/71 ■
Field Number		TPRA10	TPRA17
Client Reference			
Depth (m)		0.50-1.20	0.20-1.30
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Shale
Classification Description		Well-graded gravel, fine to coarse gravel \ Silt-Clay	Poorly graded gravel \ Silt-Clay Materials
Stabilizing Agent			

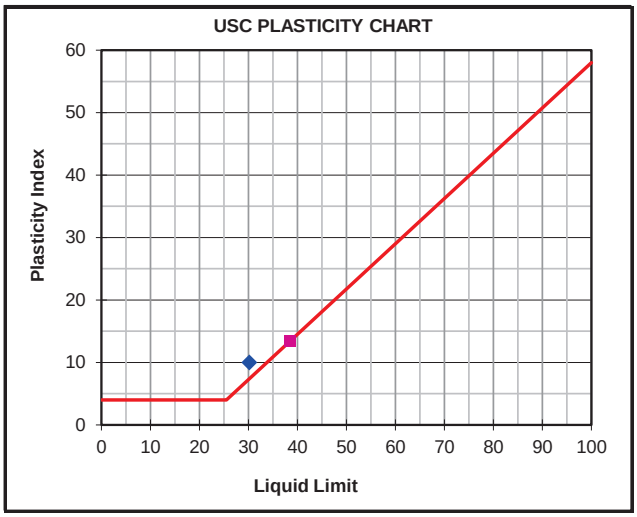


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm	100	
	75 mm	95	
	63 mm	95	100
	50 mm	90	93
	37.5 mm	89	75
	28 mm	72	63
	20 mm	61	50
	14 mm	52	37
	5 mm	27	19
	2 mm	17	12
	1 mm	17	12
	0.425 mm	5	5
	0.250 mm	5	4
	0.150 mm	4	4
	0.075 mm	4	4
Grading Modulus		2.74	2.79



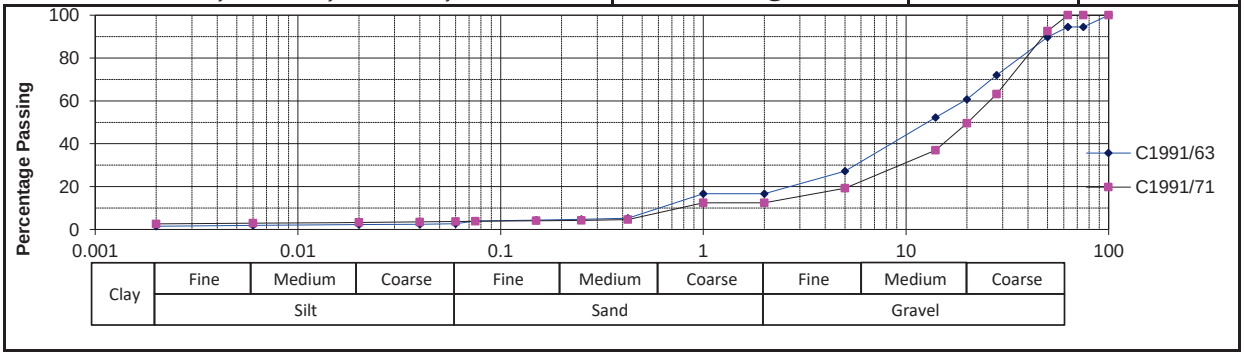
Hydrometer Analysis		-2.00 mm	-2.00 mm
Percentage Passing	0.060 mm	3	4
	0.040 mm	2	3
	0.020 mm	2	3
	0.006 mm	2	3
	0.002 mm	2	3
Gravel	%	83	88
Sand	%	14	9
Silt	%	1	1
Clay	%	2	3

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/63 ◆	C1991/71 ■
Atterberg Limits			
Liquid Limit	%	30	39
Plasticity Index	%	10	13
Linear Shrinkage	%	5.5	7.5
Overall PI	%	1	1

Classifications

HRB (AASHTO)	A-2-6(0)	A-2-6(0)
Unified (ASTM D2487)	GW	GP
Weston Swell @ 1 kPa		



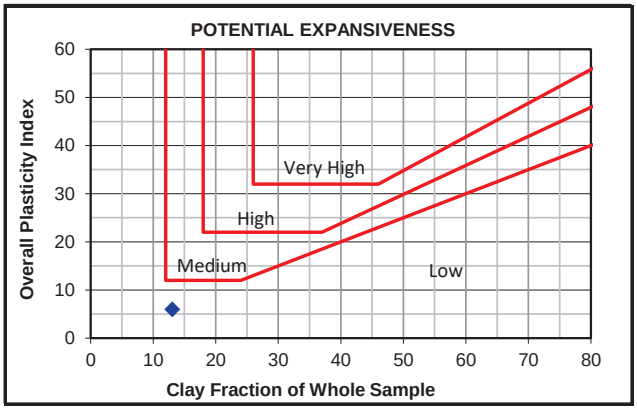
Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

Job Card No: C-1991

FOUNDATION INDICATOR

Laboratory Number		C1991/86 ◆	■
Field Number		TPD05A	
Client Reference			
Depth (m)		0.60-2.90	
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	
Classification Description		Clayey gravel \ silty sand \ Silt-Clay Materials	
Stabilizing Agent			

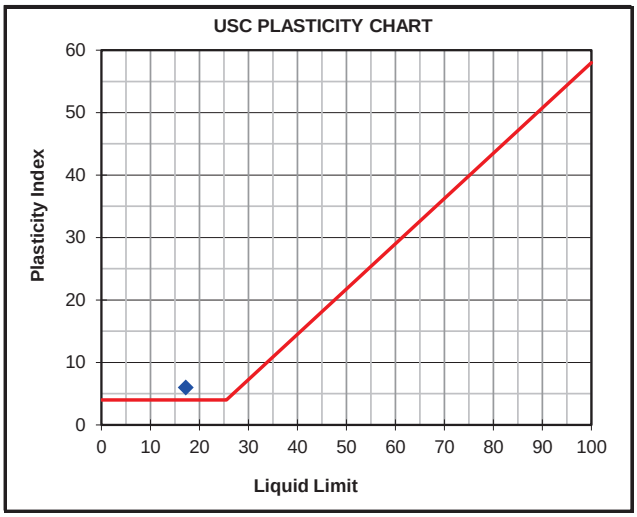


Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm	
	75 mm	
	63 mm	
	50 mm	
	37.5 mm	
	28 mm	
	20 mm	
	14 mm	100
	5 mm	100
	2 mm	100
	1 mm	100
	0.425 mm	99
	0.250 mm	90
	0.150 mm	71
	0.075 mm	49
Grading Modulus		0.52



Hydrometer Analysis -0.075 mm -0.075 mm

Percentage Passing	0.060 mm	25	
	0.040 mm	23	
	0.020 mm	20	
	0.006 mm	16	
	0.002 mm	13	
Gravel	%	0	
Sand	%	75	
Silt	%	12	
Clay	%	13	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

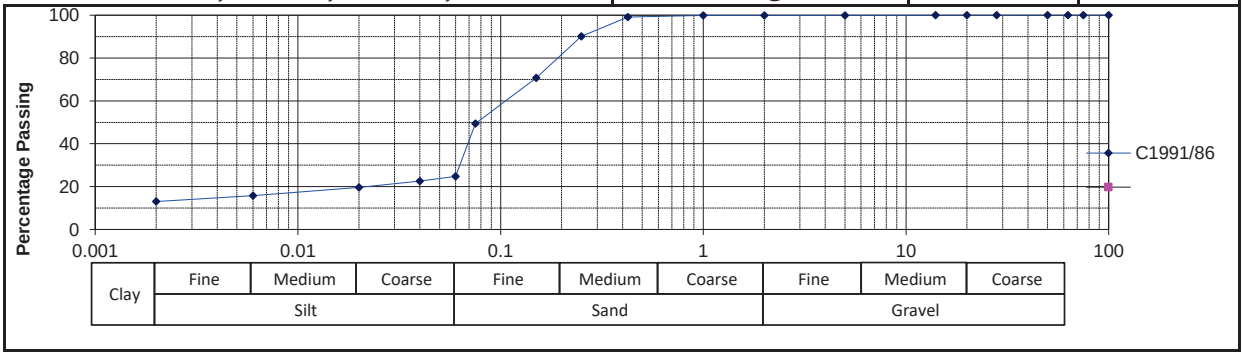
Laboratory Number		C1991/86 ◆	■

Atterberg Limits

Liquid Limit	%	17	
Plasticity Index	%	6	
Linear Shrinkage	%	3.0	
Overall PI	%	6	

Classifications

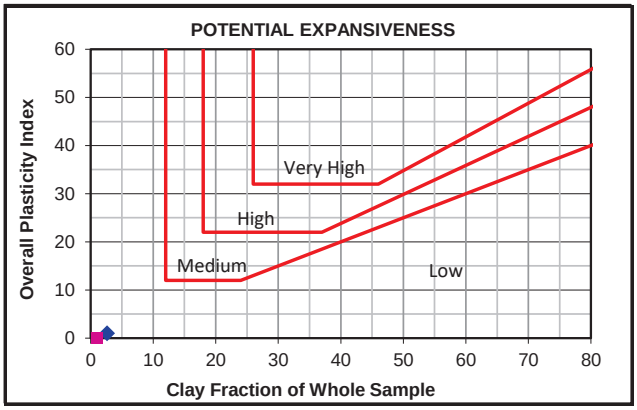
HRB (AASHTO)	A-4(0)	
Unified (ASTM D2487)	SC-SM	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/49 ◆	■
Field Number		TPRE12	
Client Reference			
Depth (m)		0.20-1.20	
Position			
Coordinates	X		
	Y		
Visual Description		Shale	
Classification Description		Well-graded gravel, fine to coarse gravel \ clayey gravel \	
Stabilizing Agent			

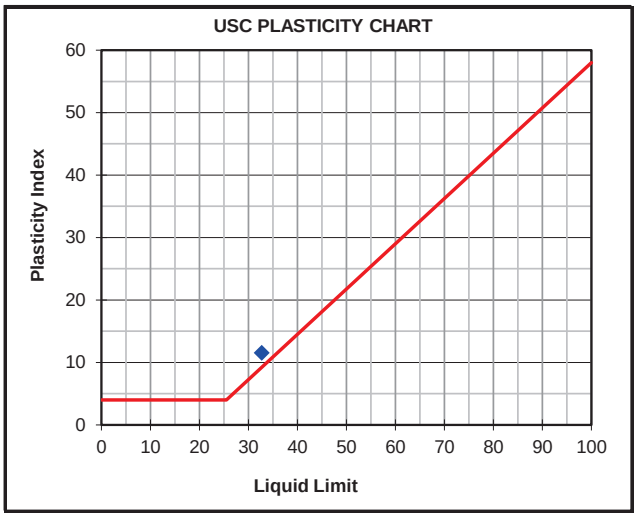


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm	100	
	50 mm	97	
	37.5 mm	87	
	28 mm	71	
	20 mm	60	
	14 mm	52	
	5 mm	31	
	2 mm	20	
	1 mm	20	
	0.425 mm	10	
	0.250 mm	9	
	0.150 mm	8	
	0.075 mm	7	
Grading Modulus		2.62	



Hydrometer Analysis

		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	4	
	0.040 mm	3	
	0.020 mm	3	
	0.006 mm	3	
	0.002 mm	3	
Gravel	%	80	
Sand	%	16	
Silt	%	1	
Clay	%	3	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

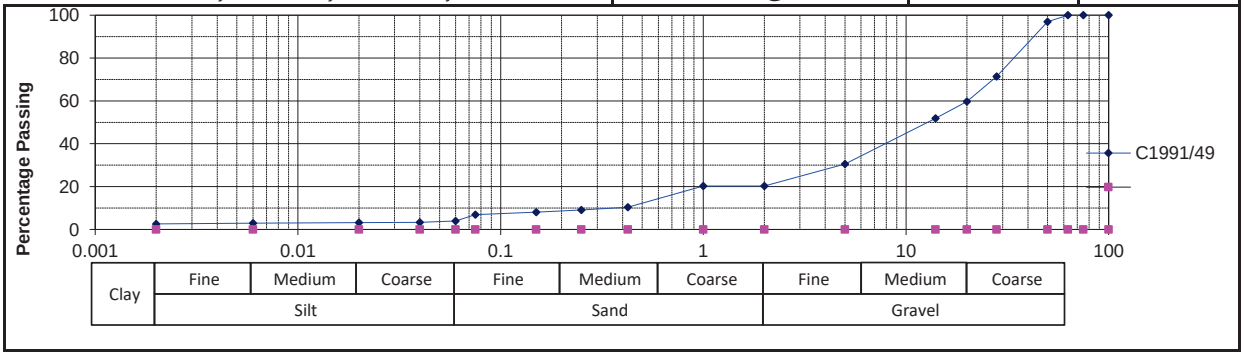
Laboratory Number		C1991/49 ◆	■

Atterberg Limits

Liquid Limit	%	33	
Plasticity Index	%	12	
Linear Shrinkage	%	6.0	
Overall PI	%	1	

Classifications

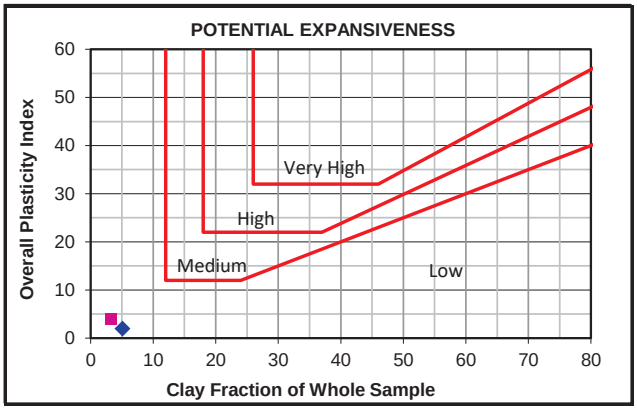
HRB (AASHTO)	A-2-6(0)	
Unified (ASTM D2487)	GW-GC	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/65 ◆	C1991/53 ■
Field Number		TPRA13	TPRA2
Client Reference			
Depth (m)		0.30-0.60	1.00-1.20
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	Shale
Classification Description		Poorly graded gravel \ silty gravel \ Silt-Clay Materials	Poorly graded sand \ silty sand \ Silt-Clay Materials
Stabilizing Agent			

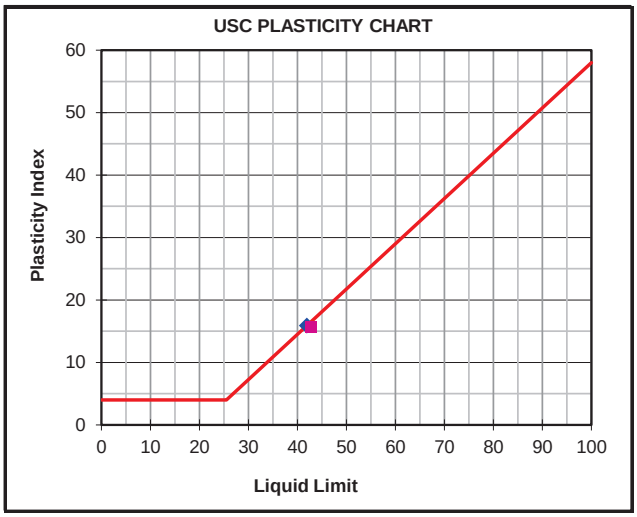


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm	100	
	50 mm	94	
	37.5 mm	94	100
	28 mm	91	98
	20 mm	80	93
	14 mm	71	83
	5 mm	43	63
	2 mm	29	51
	1 mm	29	51
	0.425 mm	14	24
	0.250 mm	13	18
	0.150 mm	12	13
	0.075 mm	11	8
Grading Modulus		2.46	2.17



Hydrometer Analysis

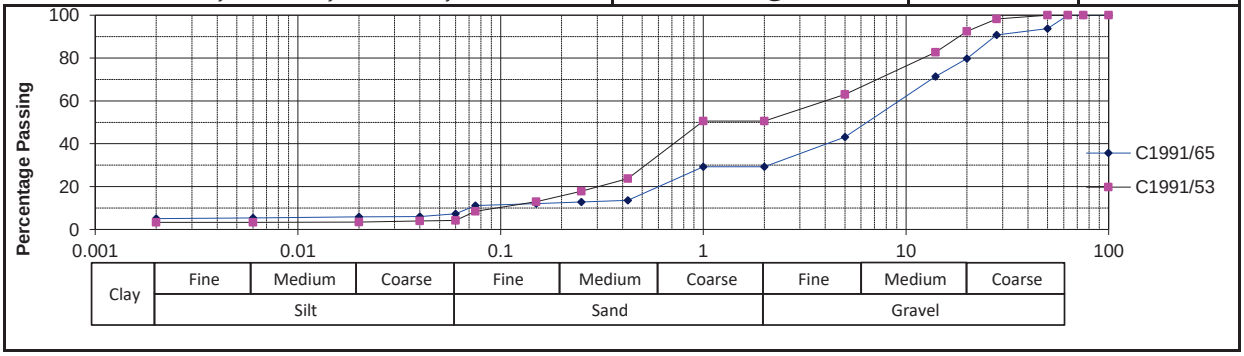
		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	7	4
	0.040 mm	6	4
	0.020 mm	6	4
	0.006 mm	5	3
	0.002 mm	5	3
Gravel	%	71	49
Sand	%	22	46
Silt	%	2	1
Clay	%	5	3

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/65 ◆	C1991/53 ■
Atterberg Limits			
Liquid Limit	%	42	43
Plasticity Index	%	16	16
Linear Shrinkage	%	8.0	8.0
Overall PI	%	2	4

Classifications

HRB (AASHTO)	A-2-7(0)	A-2-7(0)
Unified (ASTM D2487)	GP-GM	SP-SM
Weston Swell @ 1 kPa		

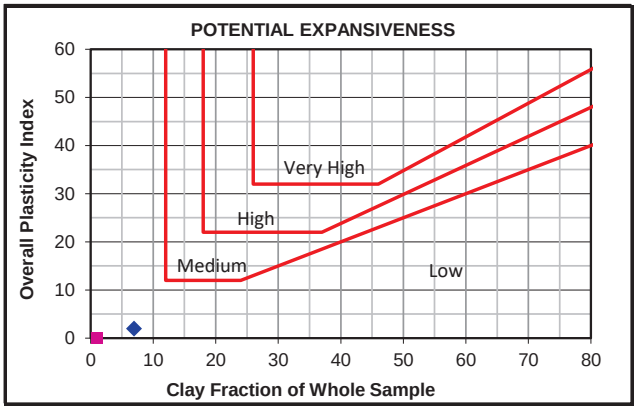


Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/54 ◆	■
Field Number		TPRA3	
Client Reference			
Depth (m)		0.20-1.30	
Position			
Coordinates	X		
	Y		
Visual Description		Shale	
Classification Description		Silty gravel \ Silt-Clay Materials	
Stabilizing Agent			

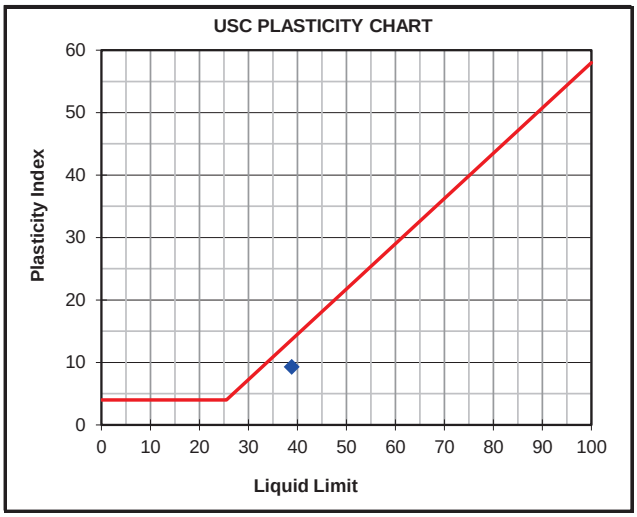


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm	100	
	50 mm	99	
	37.5 mm	93	
	28 mm	85	
	20 mm	76	
	14 mm	69	
	5 mm	47	
	2 mm	36	
	1 mm	36	
	0.425 mm	24	
	0.250 mm	23	
	0.150 mm	21	
	0.075 mm	18	
Grading Modulus		2.21	



Hydrometer Analysis -2.00 mm -0.425 mm

Percentage Passing	0.060 mm	11	
	0.040 mm	10	
	0.020 mm	9	
	0.006 mm	8	
	0.002 mm	7	
Gravel	%	64	
Sand	%	25	
Silt	%	4	
Clay	%	7	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

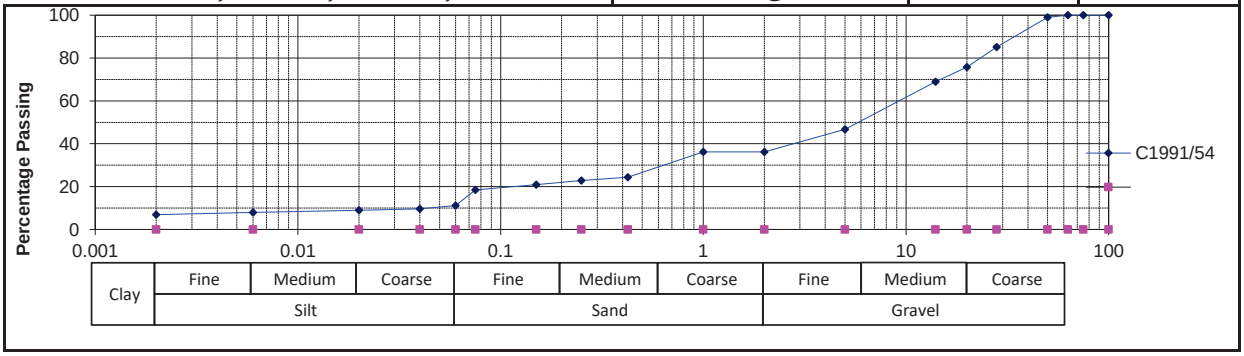
Laboratory Number		C1991/54 ◆	■

Atterberg Limits

Liquid Limit	%	39	
Plasticity Index	%	9	
Linear Shrinkage	%	4.5	
Overall PI	%	2	

Classifications

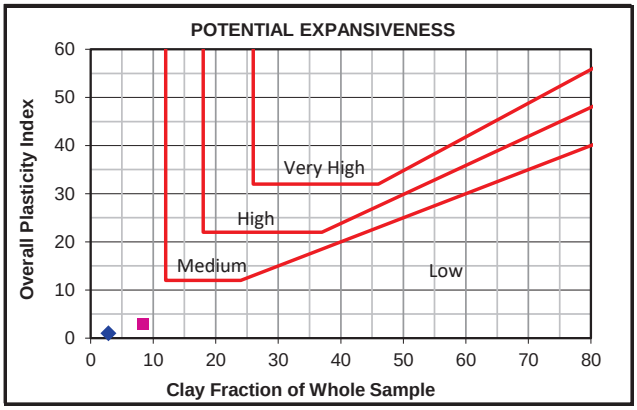
HRB (AASHTO)	A-2-4(0)	
Unified (ASTM D2487)	SM	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/69 ◆	C1991/32 ■
Field Number		TPRA15	TPR03
Client Reference			
Depth (m)		0.60-1.00	0.20-0.60
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Silty Clay
Classification Description		Well-graded gravel, fine to coarse gravel \ silty gravel \ Silt-	Clayey sand \ Silt-Clay Materials
Stabilizing Agent			

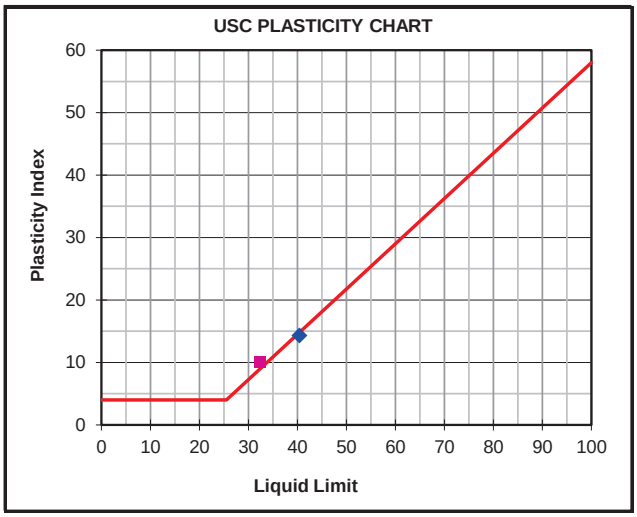


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

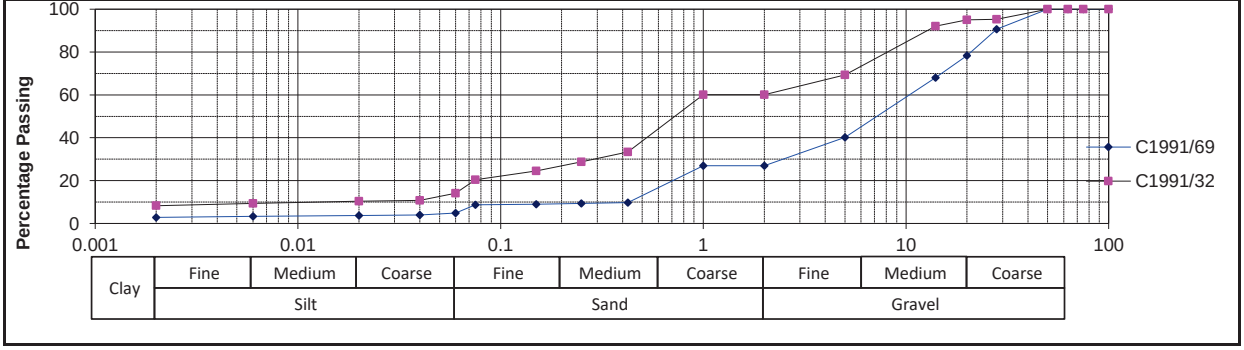
Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	100
	37.5 mm	97	97
	28 mm	91	95
	20 mm	78	95
	14 mm	68	92
	5 mm	40	69
	2 mm	27	60
	1 mm	27	60
	0.425 mm	10	33
	0.250 mm	9	29
	0.150 mm	9	24
	0.075 mm	9	20
Grading Modulus		2.55	1.86



Hydrometer Analysis		-0.075 mm	-0.075 mm
Percentage Passing	0.060 mm	5	14
	0.040 mm	4	11
	0.020 mm	4	10
	0.006 mm	3	9
	0.002 mm	3	8
Gravel	%	73	40
Sand	%	22	46
Silt	%	2	6
Clay	%	3	8

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/69 ◆	C1991/32 ■
Atterberg Limits			
Liquid Limit	%	40	32
Plasticity Index	%	14	10
Linear Shrinkage	%	7.5	5.0
Overall PI	%	1	3
Classifications			
HRB (AASHTO)		A-2-7(0)	A-2-6(0)
Unified (ASTM D2487)		GW-GM	SC
Weston Swell @ 1 kPa			

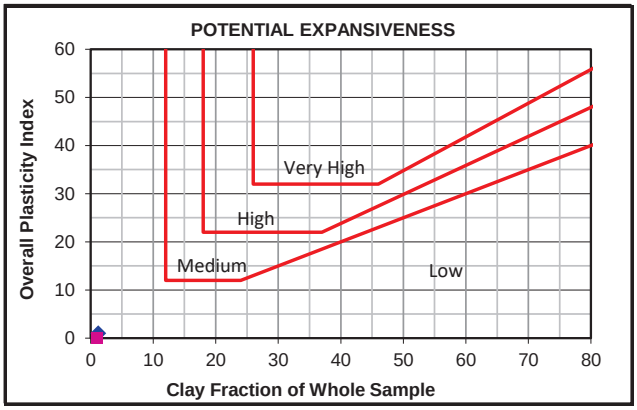


Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/55 ◆	■
Field Number		TPRA4	
Client Reference			
Depth (m)		0.10-0.50	
Position			
Coordinates	X		
	Y		
Visual Description		Shale	
Classification Description		Well-graded gravel, fine to coarse gravel \ Silt-Clay	
Stabilizing Agent			

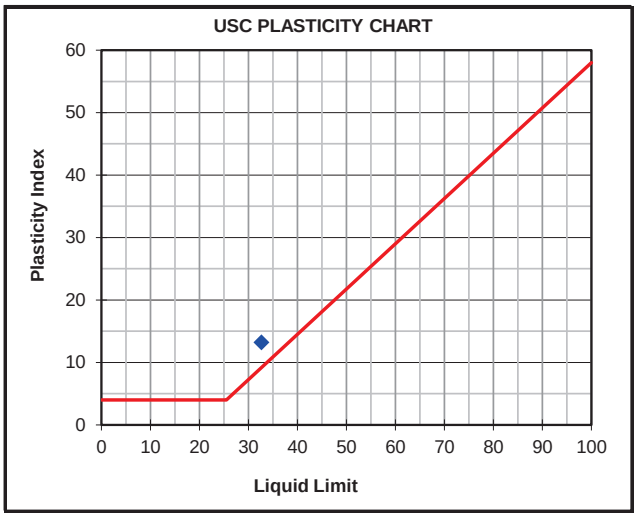


Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	91	
	28 mm	64	
	20 mm	52	
	14 mm	42	
	5 mm	25	
	2 mm	16	
	1 mm	16	
	0.425 mm	6	
	0.250 mm	6	
	0.150 mm	5	
	0.075 mm	4	
Grading Modulus		2.73	



Hydrometer Analysis -0.425 mm -0.425 mm

Percentage Passing	0.060 mm	2	
	0.040 mm	2	
	0.020 mm	2	
	0.006 mm	1	
	0.002 mm	1	
Gravel	%	84	
Sand	%	14	
Silt	%	1	
Clay	%	1	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

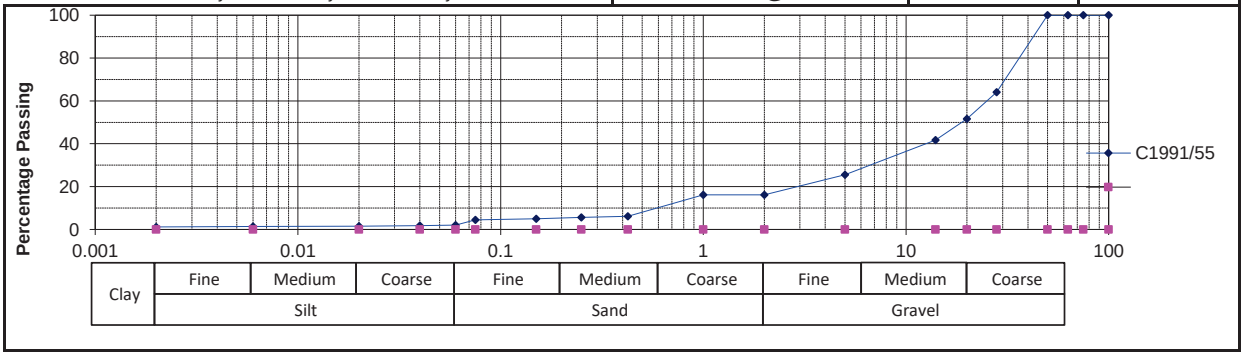
Laboratory Number		C1991/55 ◆	■

Atterberg Limits

Liquid Limit	%	33	
Plasticity Index	%	13	
Linear Shrinkage	%	6.5	
Overall PI	%	1	

Classifications

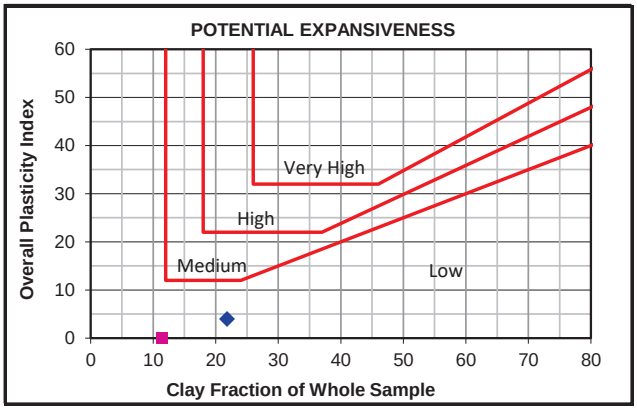
HRB (AASHTO)	A-2-6(0)	
Unified (ASTM D2487)	GP	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/75 ◆	C1991/69 ■
Field Number		TPRA21	TPRA15
Client Reference			
Depth (m)		0.00-0.30	0.60-1.00
Position			
Coordinates	X		
	Y		
Visual Description		Gravelley Sand	Shale
Classification Description		Clay of low plasticity \ silt \ Silt-Clay Materials	Silty sand \ Silt-Clay Materials
Stabilizing Agent			

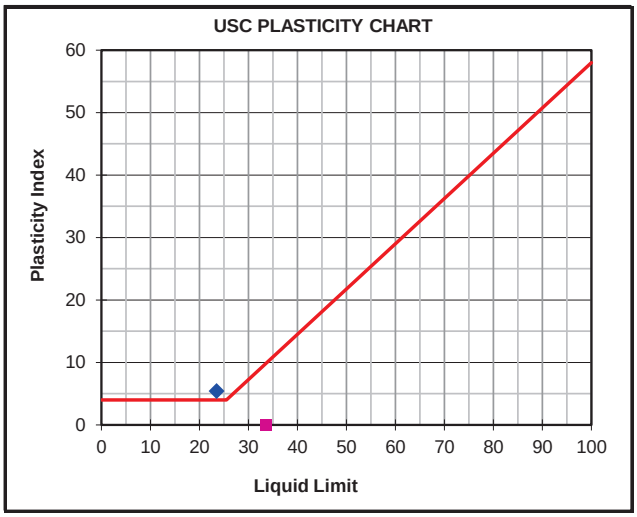


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		100
	37.5 mm		99
	28 mm		96
	20 mm	100	93
	14 mm	99	85
	5 mm	98	69
	2 mm	93	61
	1 mm	93	61
	0.425 mm	76	49
	0.250 mm	71	44
	0.150 mm	65	35
	0.075 mm	53	23
Grading Modulus		0.78	1.67

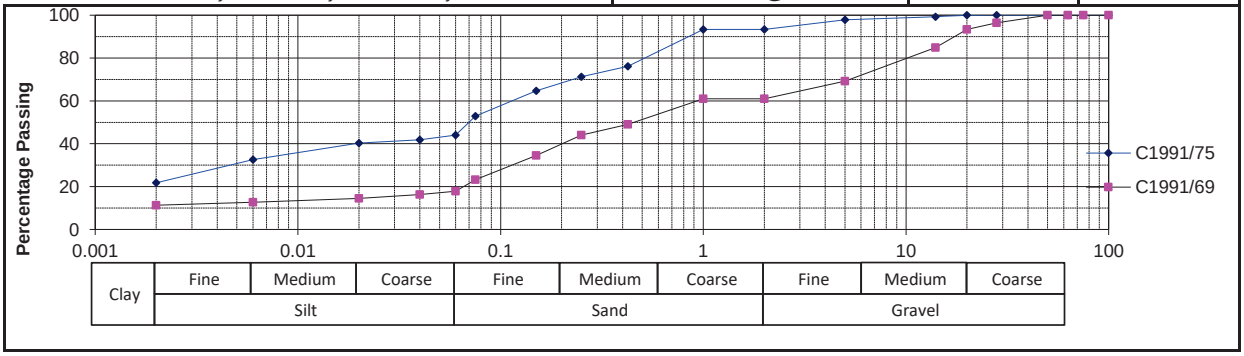


Hydrometer Analysis

		-0.075 mm	-0.425 mm
Percentage Passing	0.060 mm	44	18
	0.040 mm	42	16
	0.020 mm	40	15
	0.006 mm	33	13
	0.002 mm	22	11
Gravel	%	7	39
Sand	%	49	43
Silt	%	22	6
Clay	%	22	11

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/75 ◆	C1991/69 ■
Atterberg Limits			
Liquid Limit	%	23	33
Plasticity Index	%	5	NP
Linear Shrinkage	%	3.0	0.0
Overall PI	%	4	
Classifications			
HRB (AASHTO)		A-4(0)	A-1-b(0)
Unified (ASTM D2487)		CL-ML	SM
Weston Swell @ 1 kPa			

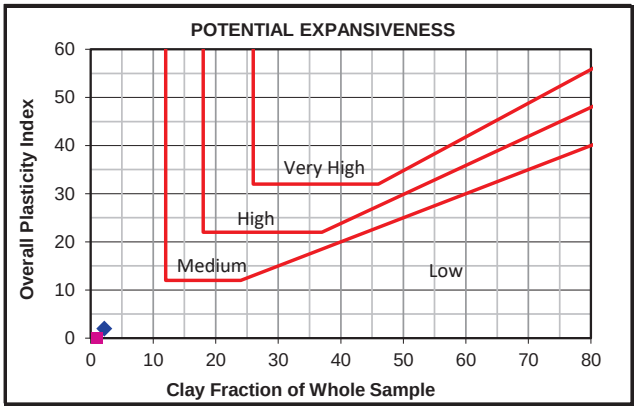


Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/66 ◆	■
Field Number		TPRA13	
Client Reference			
Depth (m)		0.60-1.20	
Position			
Coordinates	X		
	Y		
Visual Description		Shale	
Classification Description		Poorly graded gravel \ clayey gravel \ Silt-Clay Materials	
Stabilizing Agent			

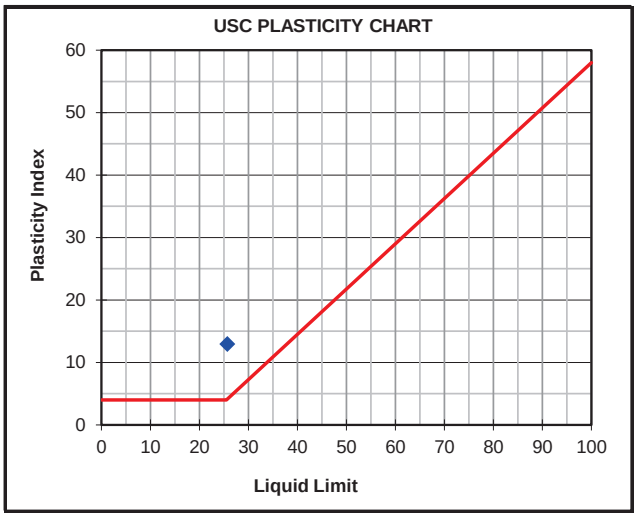


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	89	
	28 mm	74	
	20 mm	64	
	14 mm	57	
	5 mm	34	
	2 mm	22	
	1 mm	22	
	0.425 mm	13	
	0.250 mm	11	
	0.150 mm	9	
	0.075 mm	8	
Grading Modulus		2.58	



Hydrometer Analysis -0.425 mm -0.425 mm

Percentage Passing	0.060 mm	4	
	0.040 mm	3	
	0.020 mm	3	
	0.006 mm	3	
	0.002 mm	2	
Gravel	%	78	
Sand	%	18	
Silt	%	1	
Clay	%	2	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

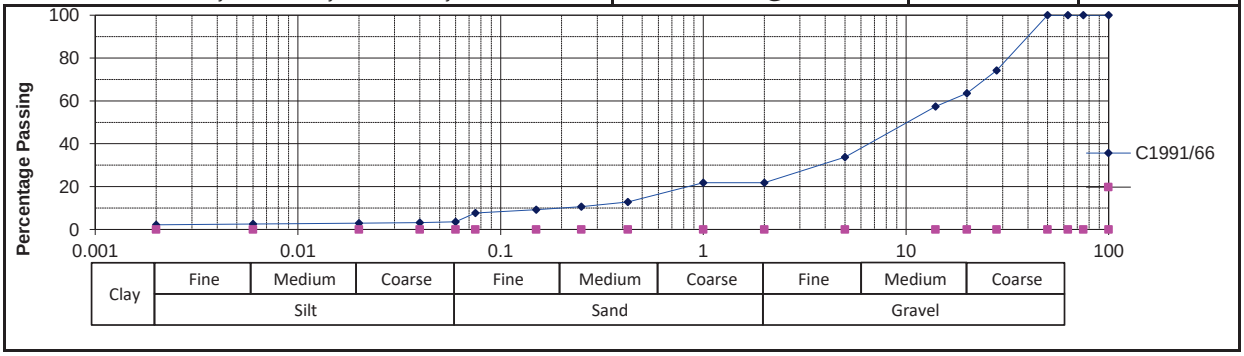
Laboratory Number		C1991/66 ◆	■

Atterberg Limits

Liquid Limit	%	26	
Plasticity Index	%	13	
Linear Shrinkage	%	6.0	
Overall PI	%	2	

Classifications

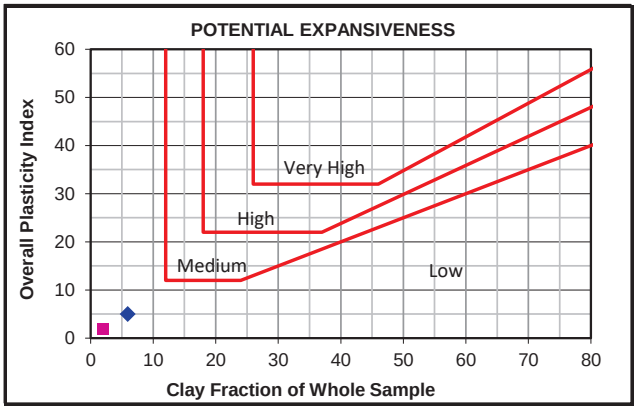
HRB (AASHTO)	A-2-6(0)	
Unified (ASTM D2487)	GP-GC	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/44 ◆	C1991/41 ■
Field Number		TPRE06	TPRE01
Client Reference			
Depth (m)		0.60-1.50	0.80-1.40
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Shale
Classification Description		Clayey gravel \ Silt-Clay Materials	Well-graded gravel, fine to coarse gravel \ Silt-Clay
Stabilizing Agent			

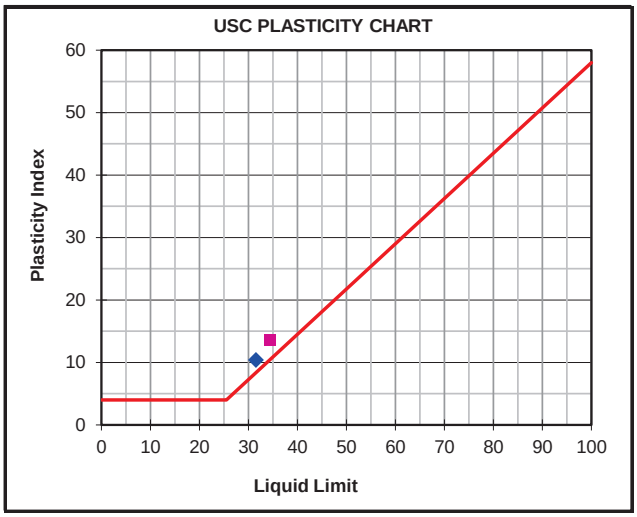


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm	100	100
	50 mm	95	97
	37.5 mm	90	87
	28 mm	88	82
	20 mm	84	75
	14 mm	80	66
	5 mm	64	38
	2 mm	57	26
	1 mm	57	26
	0.425 mm	46	12
	0.250 mm	40	10
	0.150 mm	36	7
	0.075 mm	31	5
Grading Modulus		1.66	2.57



Hydrometer Analysis

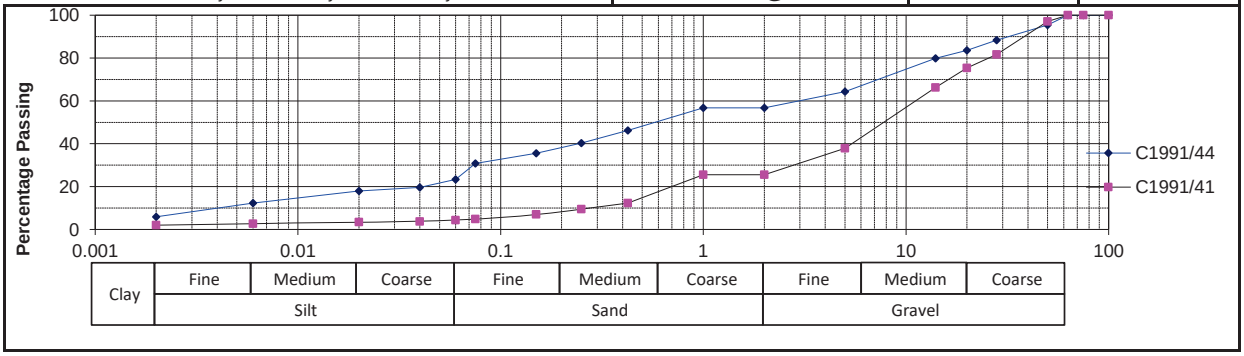
		-2.00 mm	-0.425 mm
Percentage Passing	0.060 mm	23	4
	0.040 mm	20	4
	0.020 mm	18	3
	0.006 mm	12	3
	0.002 mm	6	2
Gravel	%	43	74
Sand	%	33	21
Silt	%	17	2
Clay	%	6	2

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/44 ◆	C1991/41 ■
Atterberg Limits			
Liquid Limit	%	32	34
Plasticity Index	%	10	14
Linear Shrinkage	%	5.5	7.5
Overall PI	%	5	2

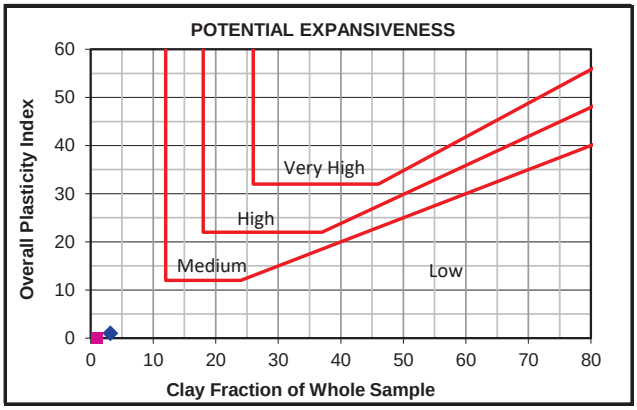
Classifications

HRB (AASHTO)	A-2-6(0)	A-2-6(0)
Unified (ASTM D2487)	GC	GW
Weston Swell @ 1 kPa		



FOUNDATION INDICATOR

Laboratory Number		C1991/69 ◆	■
Field Number		TPRA15	
Client Reference			
Depth (m)		0.60-1.00	
Position			
Coordinates	X		
	Y		
Visual Description		Shale	
Classification Description		Well-graded gravel, fine to coarse gravel \ silty gravel \ Silt-	
Stabilizing Agent			

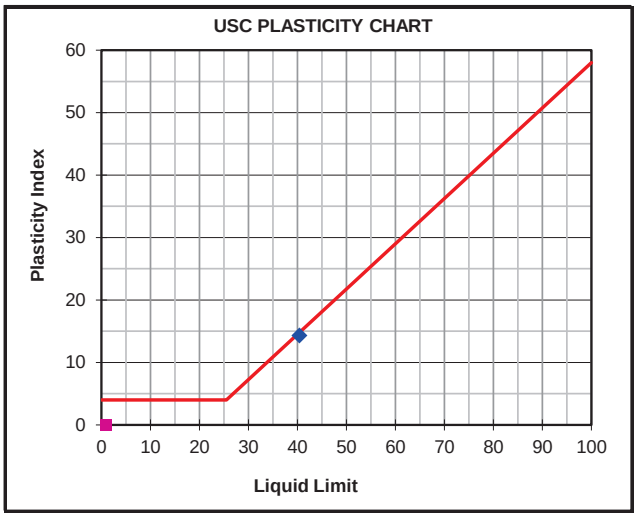


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	97	
	28 mm	91	
	20 mm	78	
	14 mm	68	
	5 mm	40	
	2 mm	27	
	1 mm	27	
	0.425 mm	10	
	0.250 mm	9	
	0.150 mm	9	
	0.075 mm	9	
Grading Modulus		2.55	

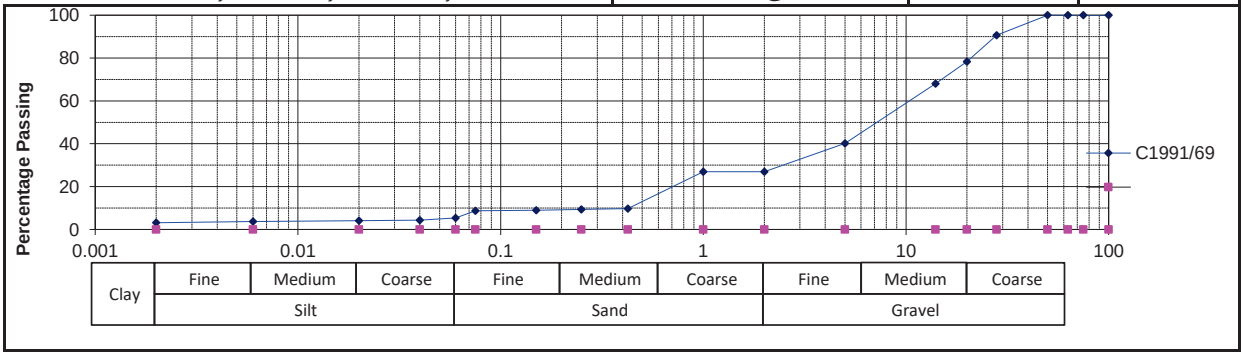


Hydrometer Analysis -0.425 mm -0.075 mm

Percentage Passing	0.060 mm	5	
	0.040 mm	4	
	0.020 mm	4	
	0.006 mm	4	
	0.002 mm	3	
Gravel	%	73	
Sand	%	22	
Silt	%	2	
Clay	%	3	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

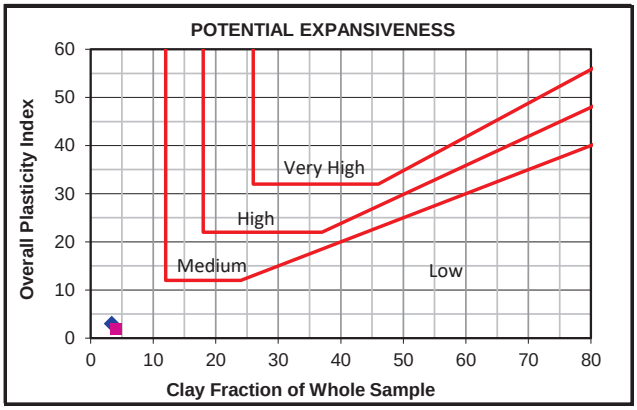
Laboratory Number		C1991/69 ◆	■
Atterberg Limits			
Liquid Limit	%	40	
Plasticity Index	%	14	
Linear Shrinkage	%	7.5	
Overall PI	%	1	
Classifications			
HRB (AASHTO)		A-2-7(0)	
Unified (ASTM D2487)		GW-GM	
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/79 ◆	C1991/37 ■
Field Number		TPC13	TPR10
Client Reference			
Depth (m)		2.60-6.00	0.20-0.90
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	Silty Clay
Classification Description		Clayey gravel \ silty sand \ Silt-Clay Materials	Well-graded sand, fine to coarse sand \ silty sand \ Silt-
Stabilizing Agent			

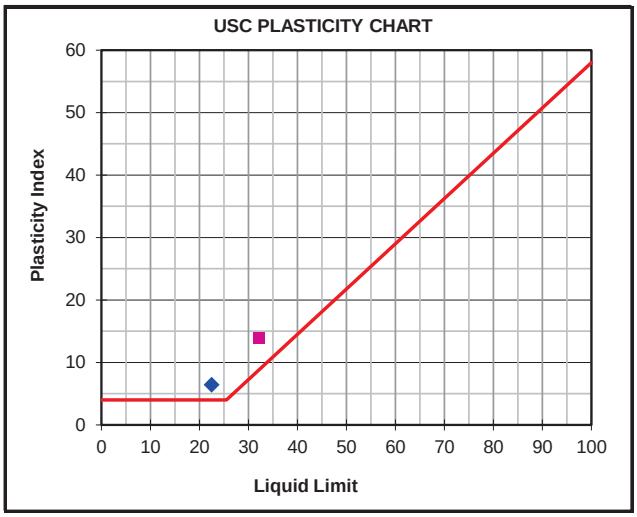


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	99	
	28 mm	98	100
	20 mm	97	99
	14 mm	93	98
	5 mm	85	69
	2 mm	77	45
	1 mm	77	45
	0.425 mm	45	17
	0.250 mm	37	15
	0.150 mm	29	13
	0.075 mm	20	11
Grading Modulus		1.59	2.26



Hydrometer Analysis

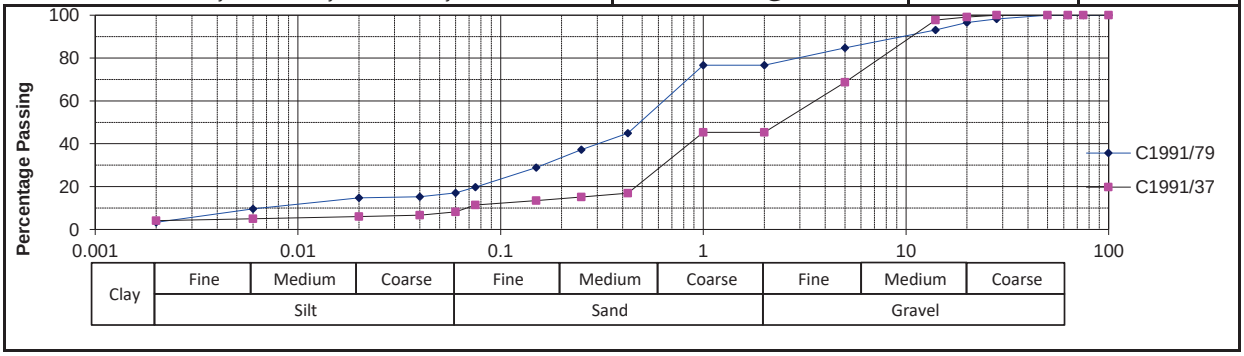
		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	17	8
	0.040 mm	15	7
	0.020 mm	15	6
	0.006 mm	10	5
	0.002 mm	3	4
Gravel	%	23	55
Sand	%	60	37
Silt	%	14	4
Clay	%	3	4

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/79 ◆	C1991/37 ■
Atterberg Limits			
Liquid Limit	%	22	32
Plasticity Index	%	6	14
Linear Shrinkage	%	2.5	6.5
Overall PI	%	3	2

Classifications

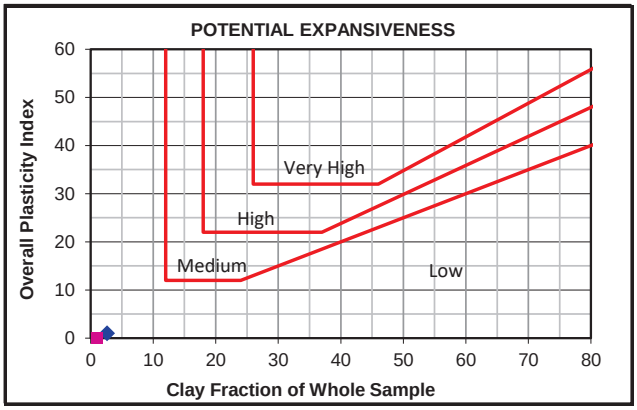
HRB (AASHTO)	A-2-4(0)	A-2-6(0)
Unified (ASTM D2487)	SC-SM	SW-SC
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/71 ◆	■
Field Number		TPRA17	
Client Reference			
Depth (m)		0.20-1.30	
Position			
Coordinates	X		
	Y		
Visual Description		Shale	
Classification Description		Poorly graded gravel \ Silt-Clay Materials	
Stabilizing Agent			

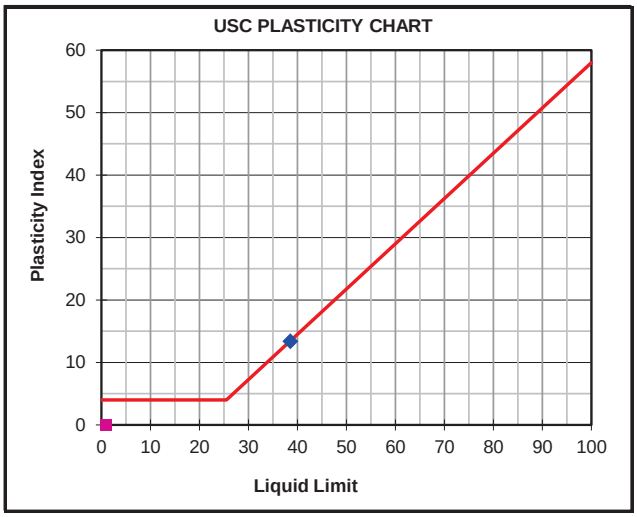


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm	100	
	50 mm	93	
	37.5 mm	75	
	28 mm	63	
	20 mm	50	
	14 mm	37	
	5 mm	19	
	2 mm	12	
	1 mm	12	
	0.425 mm	5	
	0.250 mm	4	
	0.150 mm	4	
	0.075 mm	4	
Grading Modulus		2.79	



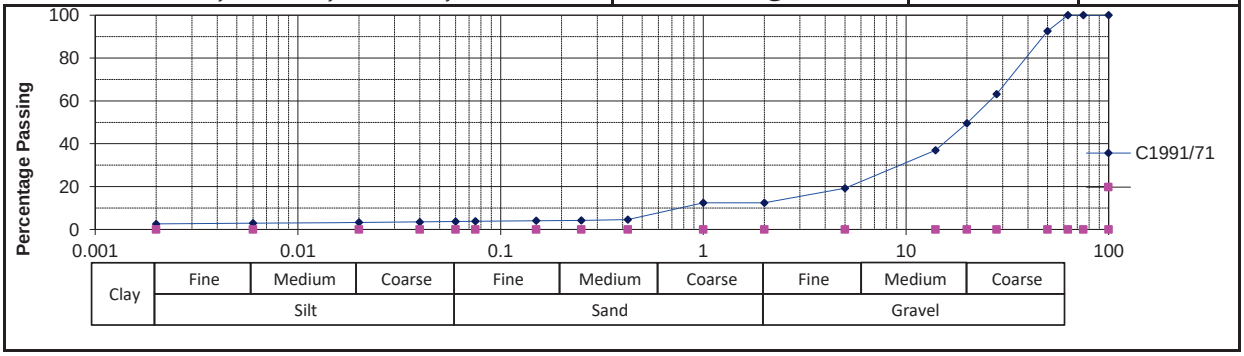
Hydrometer Analysis		-2.00 mm	-2.00 mm
Percentage Passing	0.060 mm	4	
	0.040 mm	3	
	0.020 mm	3	
	0.006 mm	3	
	0.002 mm	3	
Gravel	%	88	
Sand	%	9	
Silt	%	1	
Clay	%	3	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/71 ◆	■
Atterberg Limits			
Liquid Limit	%	39	
Plasticity Index	%	13	
Linear Shrinkage	%	7.5	
Overall PI	%	1	

Classifications

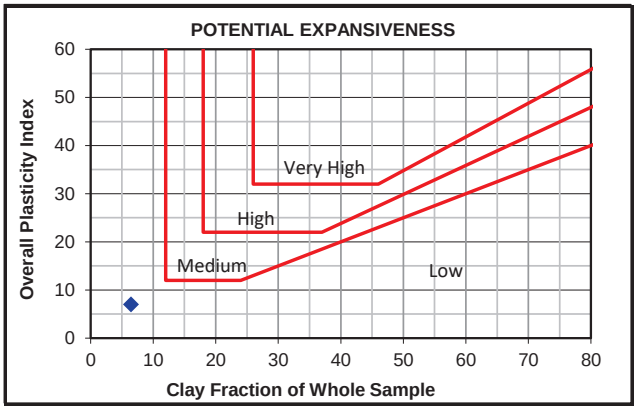
HRB (AASHTO)	A-2-6(0)	
Unified (ASTM D2487)	GP	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/26 ◆	C1991/34 ■
Field Number		TPD09	TPR05
Client Reference			
Depth (m)		0.50-2.40	0.30-1.50
Position			
Coordinates	X		
	Y		
Visual Description		Sandy Clay	Clayey sand
Classification Description		Clayey sand \ Silt-Clay Materials	Silty sand \ Silt-Clay Materials
Stabilizing Agent			

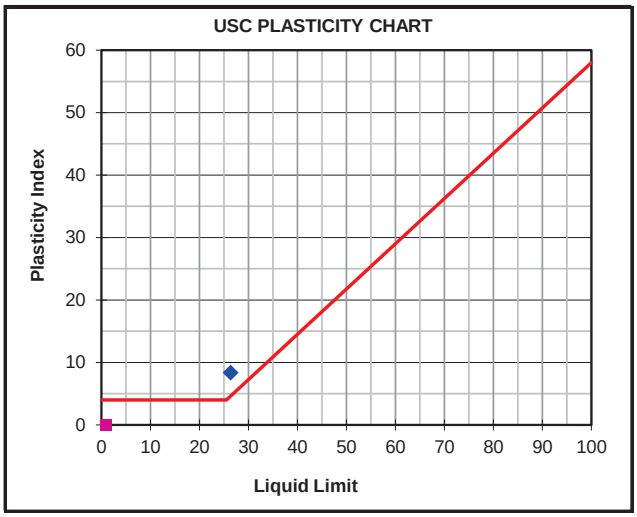


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		100
	37.5 mm		98
	28 mm		98
	20 mm		98
	14 mm	100	98
	5 mm	100	96
	2 mm	100	92
	1 mm	100	92
	0.425 mm	78	85
	0.250 mm	69	67
	0.150 mm	56	44
	0.075 mm	41	23
Grading Modulus		0.82	1.00



Hydrometer Analysis

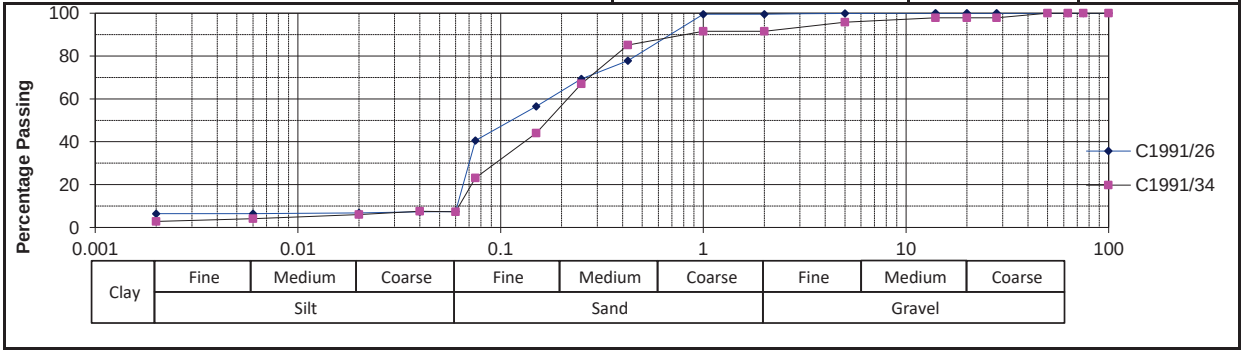
		-0.075 mm	-0.075 mm
Percentage Passing	0.060 mm	7	7
	0.040 mm	7	8
	0.020 mm	7	6
	0.006 mm	6	4
	0.002 mm	6	3
Gravel	%	0	8
Sand	%	92	84
Silt	%	1	4
Clay	%	6	3

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/26 ◆	C1991/34 ■
Atterberg Limits			
Liquid Limit	%	26	
Plasticity Index	%	8	NP
Linear Shrinkage	%	4.0	0.0
Overall PI	%	7	

Classifications

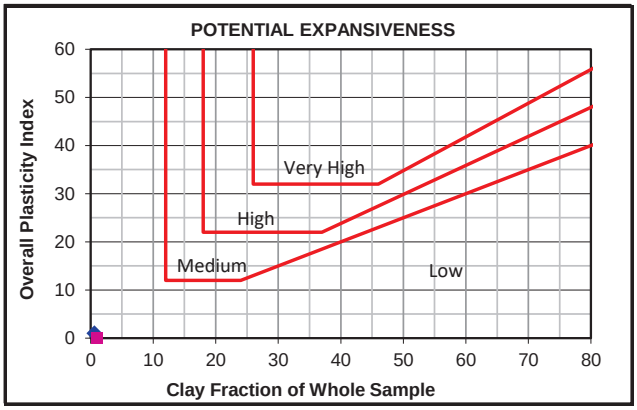
HRB (AASHTO)	A-4(0)	A-2-4(0)
Unified (ASTM D2487)	SC	SM
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

FOUNDATION INDICATOR

Laboratory Number		C1991/74 ◆	■
Field Number		TPRA20	
Client Reference			
Depth (m)		0.20-1.70	
Position			
Coordinates	X		
	Y		
Visual Description		Clayey sand	
Classification Description		Well-graded gravel, fine to coarse gravel \ Silt-Clay	
Stabilizing Agent			

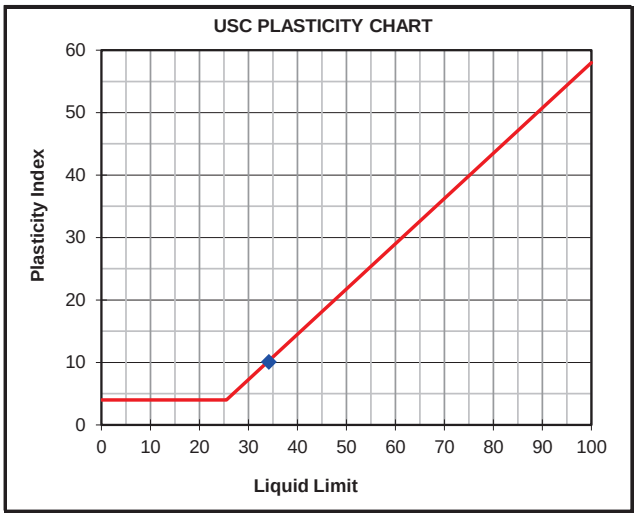


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	94	
	28 mm	94	
	20 mm	88	
	14 mm	78	
	5 mm	46	
	2 mm	24	
	1 mm	24	
	0.425 mm	5	
	0.250 mm	4	
	0.150 mm	3	
	0.075 mm	2	
Grading Modulus		2.68	



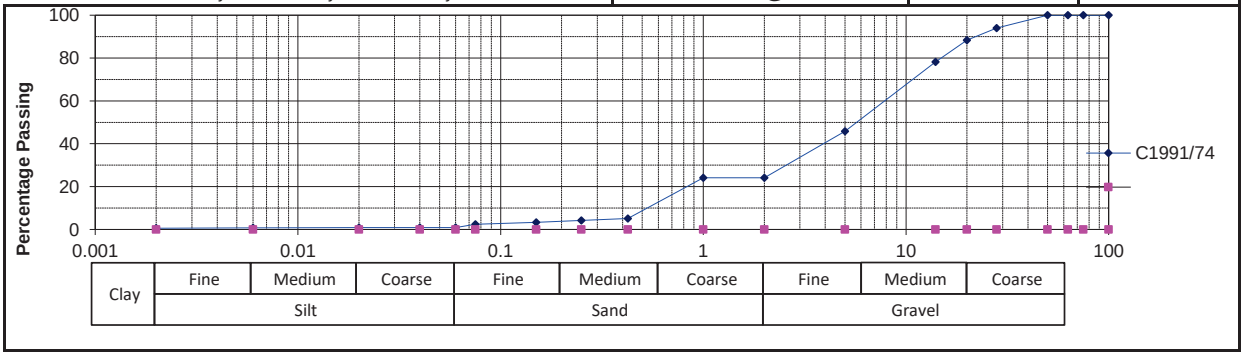
Hydrometer Analysis		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	1	
	0.040 mm	1	
	0.020 mm	1	
	0.006 mm	1	
	0.002 mm	1	
Gravel	%	76	
Sand	%	23	
Silt	%	0	
Clay	%	1	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/74 ◆	■
Atterberg Limits			
Liquid Limit	%	34	
Plasticity Index	%	10	
Linear Shrinkage	%	5.0	
Overall PI	%	1	

Classifications

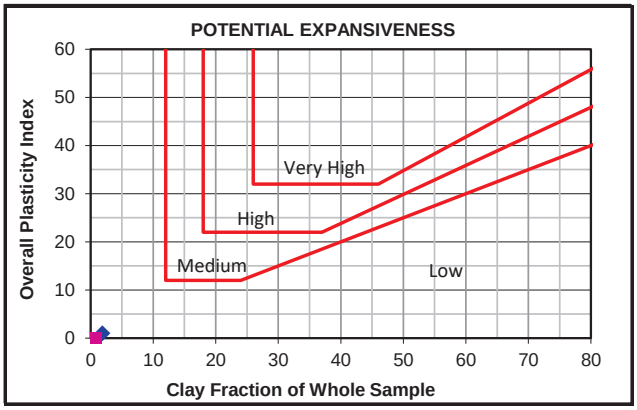
HRB (AASHTO)	A-2-6(0)	
Unified (ASTM D2487)	GW-GC	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/39 ◆	C1991/46 ■
Field Number		TPR12	TPR10
Client Reference			
Depth (m)		0.70-1.50	0.20-1.10
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Silty Sand
Classification Description		Well-graded gravel, fine to coarse gravel \ silty gravel \ Silt-	Poorly graded sand \ silty sand \ Silt-Clay Materials
Stabilizing Agent			

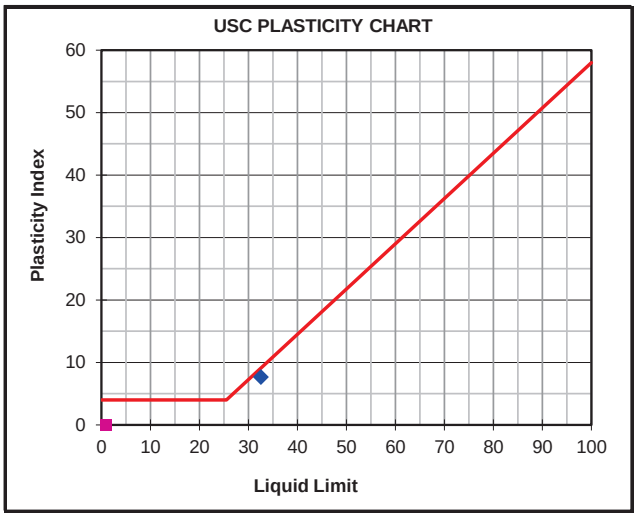


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	92	
	28 mm	80	
	20 mm	68	100
	14 mm	57	99
	5 mm	35	97
	2 mm	24	95
	1 mm	24	95
	0.425 mm	10	42
	0.250 mm	8	29
	0.150 mm	7	17
	0.075 mm	6	6
Grading Modulus		2.60	1.57

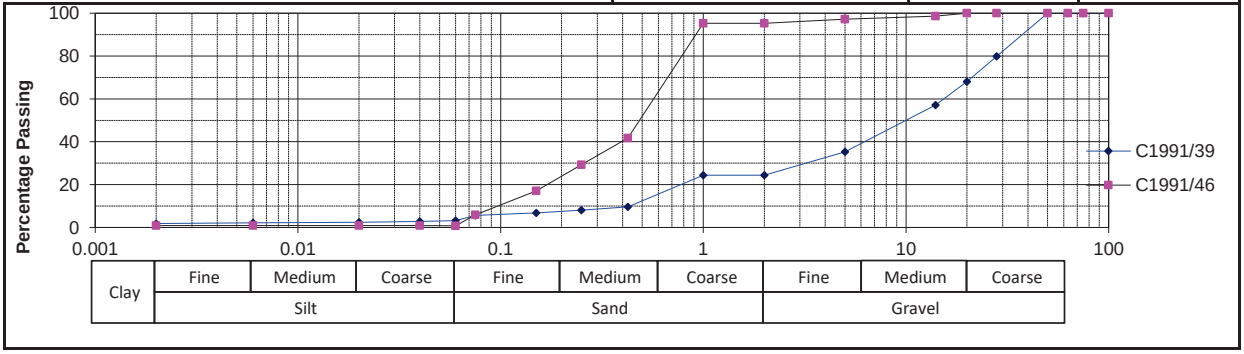


Hydrometer Analysis

		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	3	1
	0.040 mm	3	1
	0.020 mm	2	1
	0.006 mm	2	1
	0.002 mm	2	1
Gravel	%	76	5
Sand	%	21	94
Silt	%	1	0
Clay	%	2	1

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

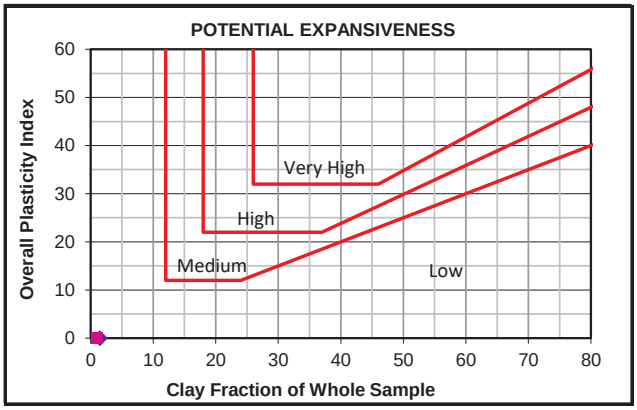
Laboratory Number		C1991/39 ◆	C1991/46 ■
Atterberg Limits			
Liquid Limit	%	33	
Plasticity Index	%	8	NP
Linear Shrinkage	%	4.0	0.0
Overall PI	%	1	
Classifications			
HRB (AASHTO)		A-2-4(0)	A-1-b(0)
Unified (ASTM D2487)		GW-GM	SP-SM
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

FOUNDATION INDICATOR

Laboratory Number		C1991/83
Field Number		TPD01
Client Reference		
Depth (m)		0.00-5.10
Position		
Coordinates	X	
	Y	
Visual Description		Silty Sand
Classification Description		Silty sand \ Silt-Clay Materials
Stabilizing Agent		

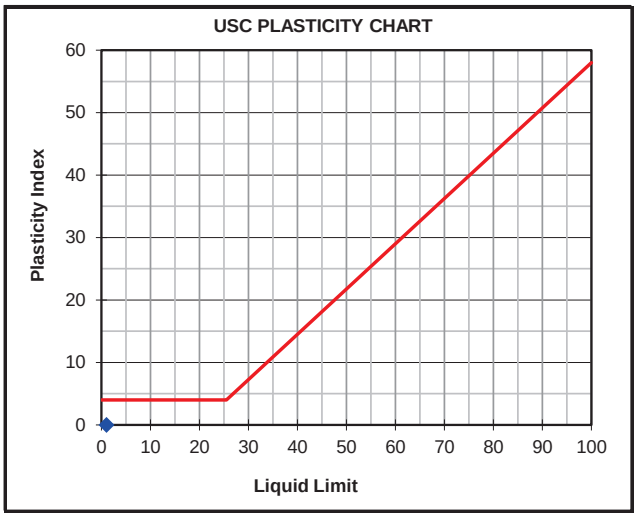


Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm	
	75 mm	
	63 mm	
	50 mm	
	37.5 mm	
	28 mm	
	20 mm	
	14 mm	100
	5 mm	100
	2 mm	100
	1 mm	100
	0.425 mm	93
	0.250 mm	67
	0.150 mm	33
	0.075 mm	12
Grading Modulus		0.95



Hydrometer Analysis -0.075 mm -0.075 mm

Percentage Passing	0.060 mm	2	
	0.040 mm	2	
	0.020 mm	2	
	0.006 mm	1	
	0.002 mm	1	
Gravel	%	0	
Sand	%	98	
Silt	%	0	
Clay	%	1	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

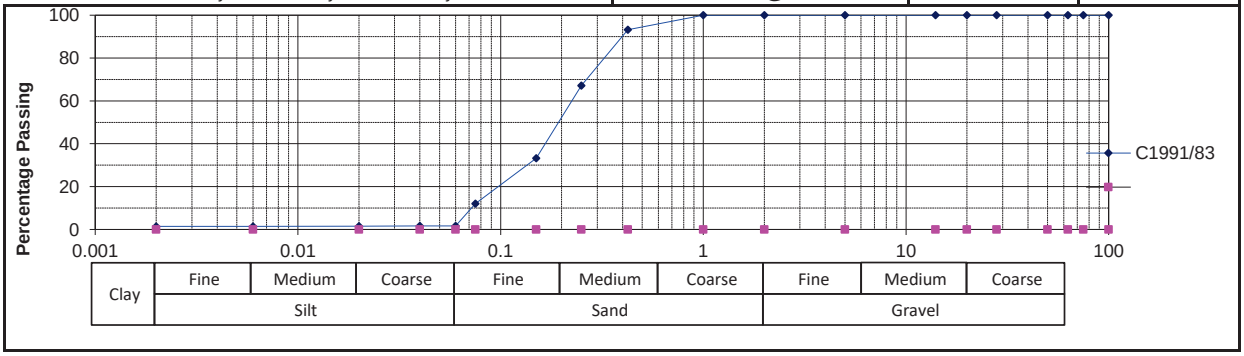
Laboratory Number	C1991/83 ◆	■

Atterberg Limits

Liquid Limit	%		
Plasticity Index	%	NP	
Linear Shrinkage	%	0.0	
Overall PI	%		

Classifications

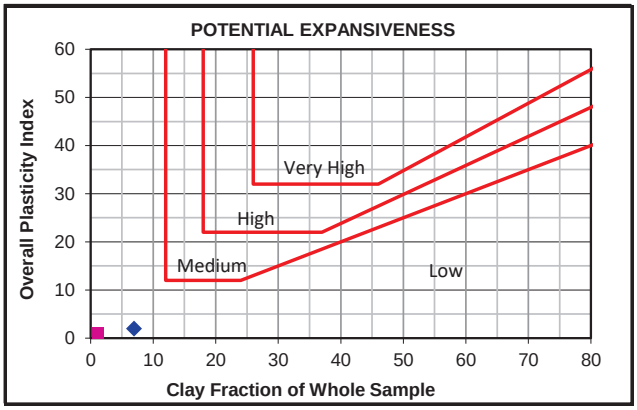
HRB (AASHTO)	A-2-4(0)	
Unified (ASTM D2487)	SP-SM	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/54 ◆	C1991/55 ■
Field Number		TPRA3	TPRA4
Client Reference			
Depth (m)		0.20-1.30	0.10-0.50
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Shale
Classification Description		Silty gravel \ Silt-Clay Materials	Well-graded gravel, fine to coarse gravel \ Silt-Clay
Stabilizing Agent			

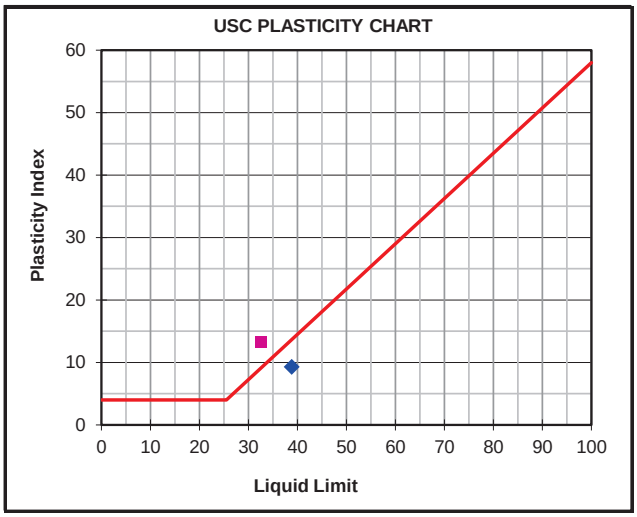


Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm	100	
	50 mm	99	100
	37.5 mm	93	91
	28 mm	85	64
	20 mm	76	52
	14 mm	69	42
	5 mm	47	25
	2 mm	36	16
	1 mm	36	16
	0.425 mm	24	6
	0.250 mm	23	6
	0.150 mm	21	5
	0.075 mm	18	4
Grading Modulus		2.21	2.73



Hydrometer Analysis

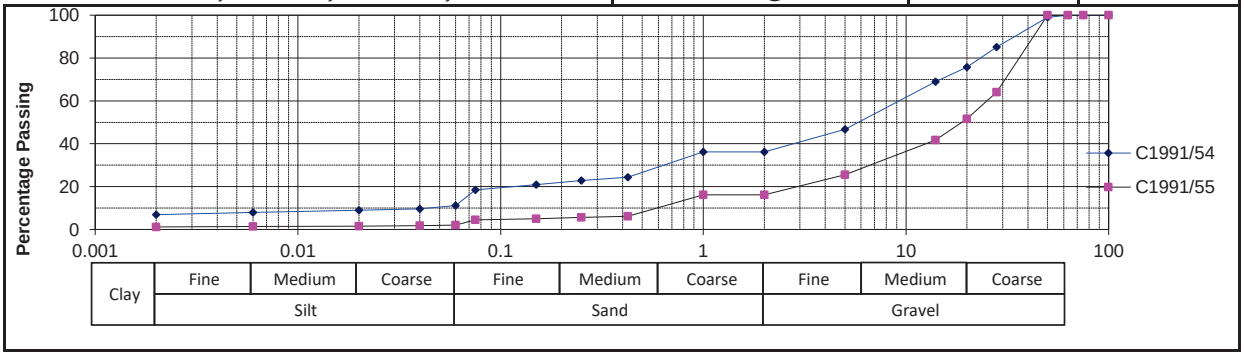
		-2.00 mm	-0.425 mm
Percentage Passing	0.060 mm	11	2
	0.040 mm	10	2
	0.020 mm	9	2
	0.006 mm	8	1
	0.002 mm	7	1
Gravel	%	64	84
Sand	%	25	14
Silt	%	4	1
Clay	%	7	1

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/54 ◆	C1991/55 ■
Atterberg Limits			
Liquid Limit	%	39	33
Plasticity Index	%	9	13
Linear Shrinkage	%	4.5	6.5
Overall PI	%	2	1

Classifications

HRB (AASHTO)	A-2-4(0)	A-2-6(0)
Unified (ASTM D2487)	GM	GW
Weston Swell @ 1 kPa		

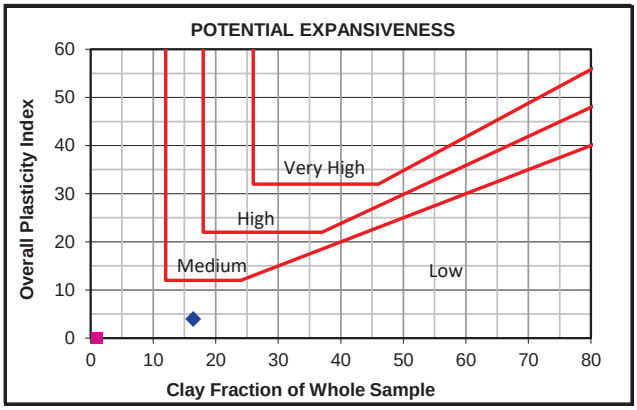


Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/25 ◆	■
Field Number		TPD07	
Client Reference			
Depth (m)		0.80-2.10	
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	
Classification Description		Silt \ Silt-Clay Materials	
Stabilizing Agent			

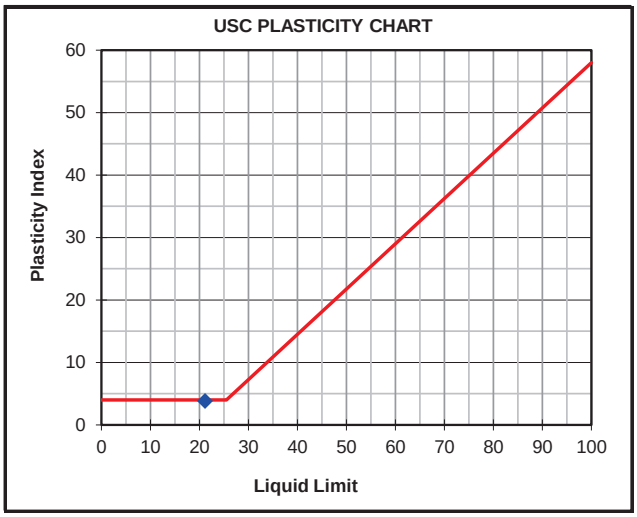


Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm	100	
	5 mm	100	
	2 mm	100	
	1 mm	100	
	0.425 mm	96	
	0.250 mm	83	
	0.150 mm	71	
	0.075 mm	54	
Grading Modulus		0.50	



Hydrometer Analysis -0.425 mm -0.425 mm

Percentage Passing	0.060 mm	24	
	0.040 mm	22	
	0.020 mm	21	
	0.006 mm	19	
	0.002 mm	16	
Gravel	%	0	
Sand	%	76	
Silt	%	8	
Clay	%	16	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

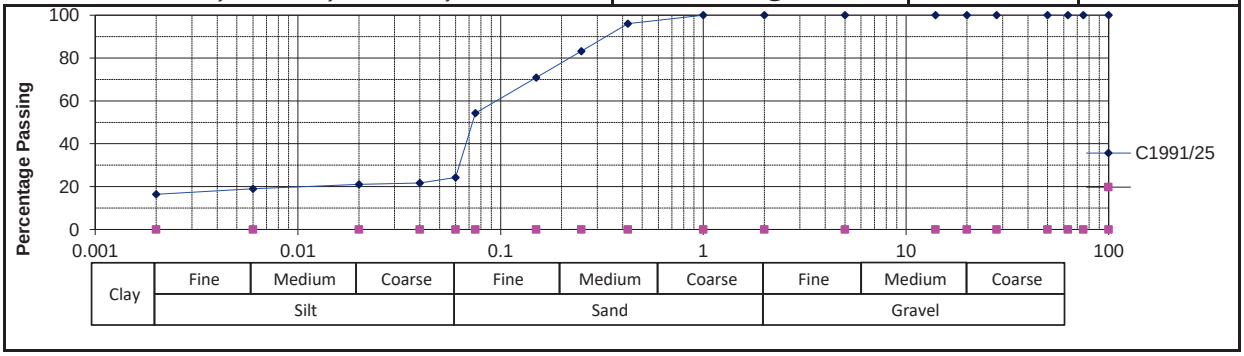
Laboratory Number		C1991/25 ◆	■

Atterberg Limits

Liquid Limit	%	21	
Plasticity Index	%	4	
Linear Shrinkage	%	2.5	
Overall PI	%	4	

Classifications

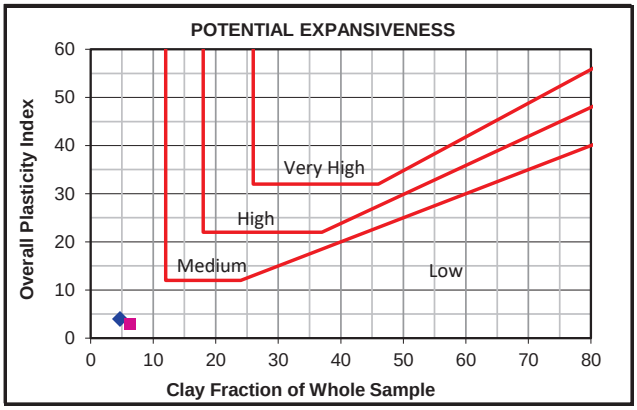
HRB (AASHTO)	A-4(0)	
Unified (ASTM D2487)	CL	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/58 ◆	C1991/59 ■
Field Number		TPRA7	TPRA7
Client Reference			
Depth (m)		0.30-0.70	0.70-1.70
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	Shale
Classification Description		Clayey sand \ Silt-Clay Materials	Clayey sand \ Silt-Clay Materials
Stabilizing Agent			

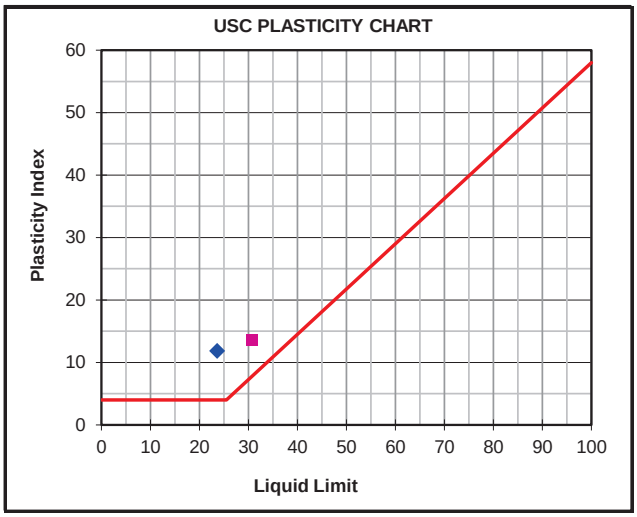


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

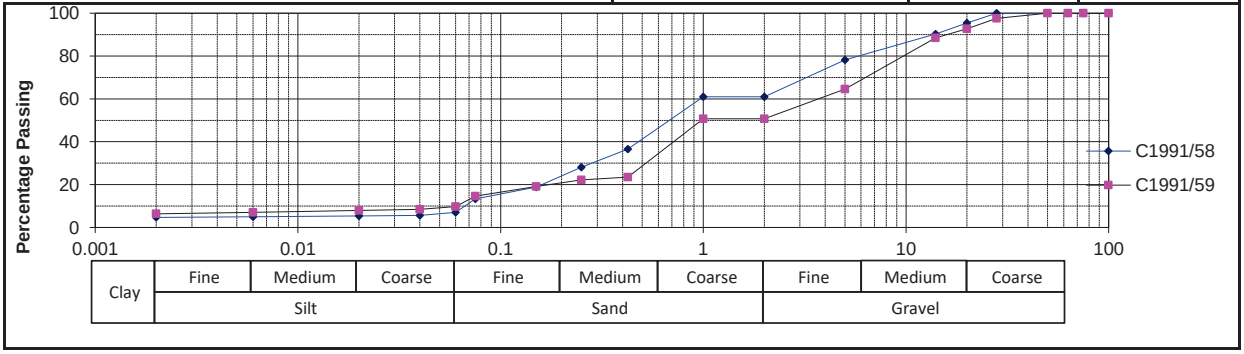
Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		100
	28 mm	100	98
	20 mm	95	93
	14 mm	90	88
	5 mm	78	65
	2 mm	61	51
	1 mm	61	51
	0.425 mm	37	23
	0.250 mm	28	22
	0.150 mm	19	19
	0.075 mm	13	15
Grading Modulus		1.89	2.11



Hydrometer Analysis		-0.075 mm	-0.425 mm
Percentage Passing	0.060 mm	7	10
	0.040 mm	6	8
	0.020 mm	5	8
	0.006 mm	5	7
	0.002 mm	5	6
Gravel	%	39	49
Sand	%	54	41
Silt	%	2	3
Clay	%	5	6

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/58 ◆	C1991/59 ■
Atterberg Limits			
Liquid Limit	%	24	31
Plasticity Index	%	12	14
Linear Shrinkage	%	6.5	7.0
Overall PI	%	4	3
Classifications			
HRB (AASHTO)		A-2-6(0)	A-2-6(0)
Unified (ASTM D2487)		SC	SC
Weston Swell @ 1 kPa			

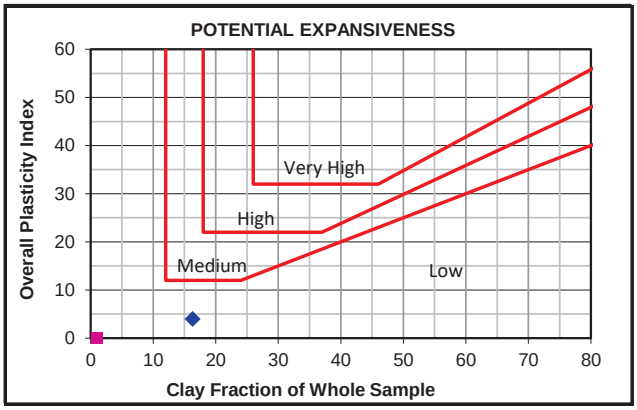


Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/27 ◆	■
Field Number		TPD09	
Client Reference			
Depth (m)		2.40-3.00	
Position			
Coordinates	X		
	Y		
Visual Description		Clayey sand	
Classification Description		Clayey gravel \ silty sand \ Silt-Clay Materials	
Stabilizing Agent			

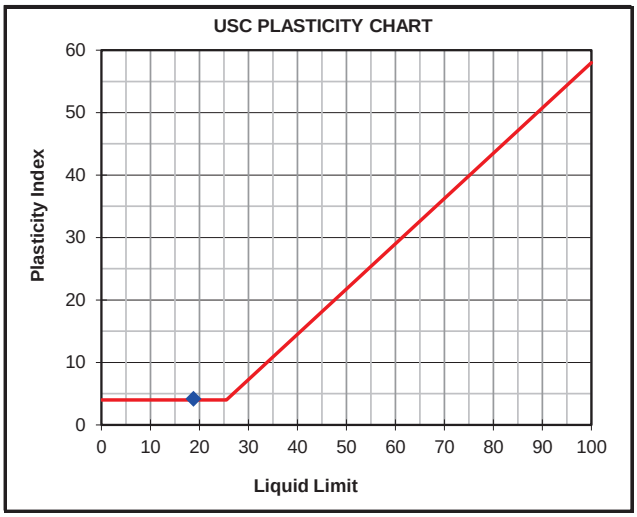


Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm	100	
	5 mm	100	
	2 mm	100	
	1 mm	100	
	0.425 mm	95	
	0.250 mm	84	
	0.150 mm	57	
	0.075 mm	35	
Grading Modulus		0.70	



Hydrometer Analysis -0.075 mm -0.075 mm

Percentage Passing	0.060 mm	29	
	0.040 mm	21	
	0.020 mm	20	
	0.006 mm	18	
	0.002 mm	16	
Gravel	%	0	
Sand	%	71	
Silt	%	13	
Clay	%	16	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

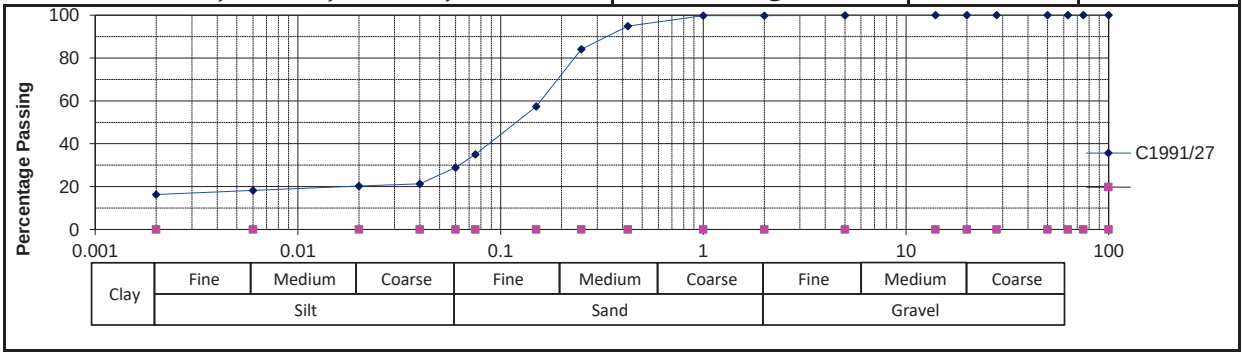
Laboratory Number		C1991/27 ◆	■

Atterberg Limits

Liquid Limit	%	19	
Plasticity Index	%	4	
Linear Shrinkage	%	1.5	
Overall PI	%	4	

Classifications

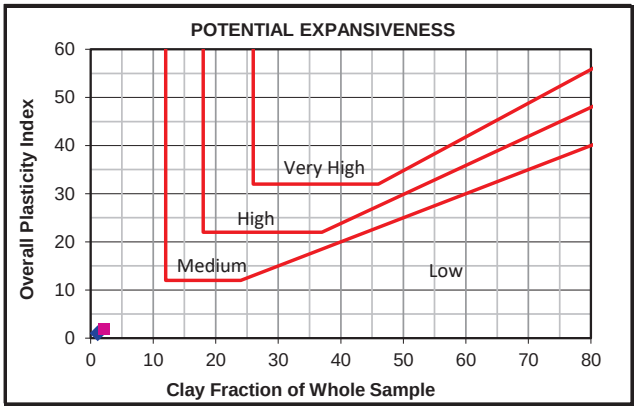
HRB (AASHTO)	A-4(0)	
Unified (ASTM D2487)	SC-SM	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/61 ◆	C1991/66 ■
Field Number		TPRA9	TPRA13
Client Reference			
Depth (m)		0.50-1.30	0.60-1.20
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Shale
Classification Description		Poorly graded gravel \ Silt-Clay Materials	Poorly graded gravel \ clayey gravel \ Silt-Clay Materials
Stabilizing Agent			

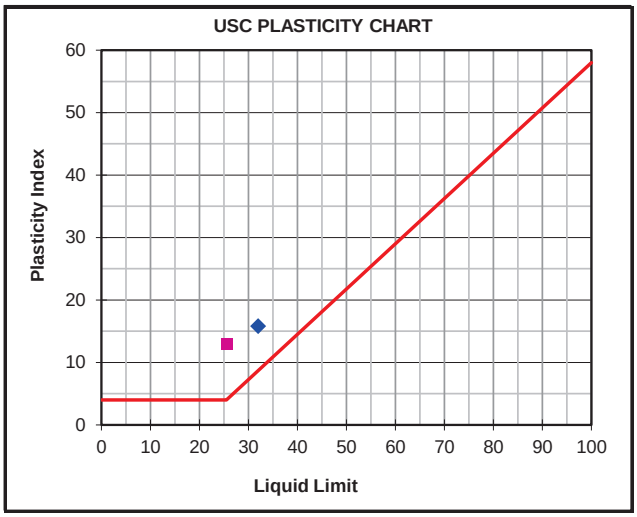


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

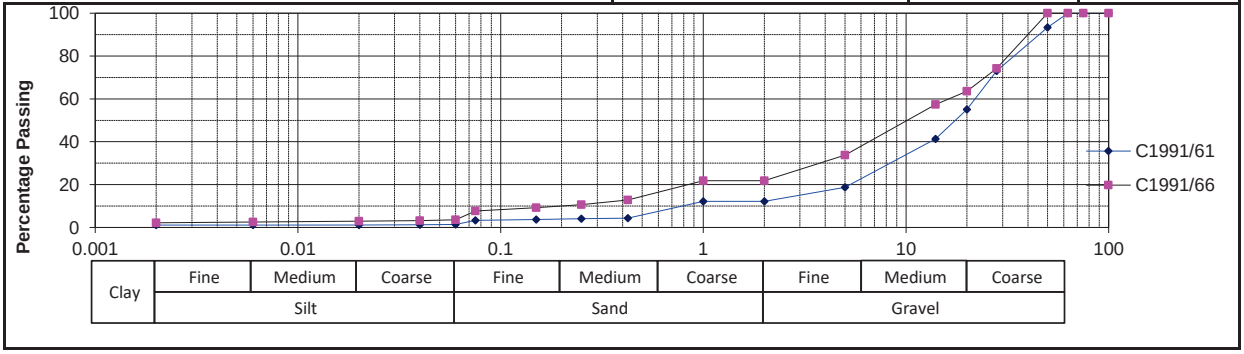
Percentage Passing	100 mm		
	75 mm		
	63 mm	100	
	50 mm	93	100
	37.5 mm	85	89
	28 mm	73	74
	20 mm	55	64
	14 mm	41	57
	5 mm	19	34
	2 mm	12	22
	1 mm	12	22
	0.425 mm	4	13
	0.250 mm	4	11
	0.150 mm	4	9
	0.075 mm	3	8
Grading Modulus		2.80	2.58



Hydrometer Analysis		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	1	4
	0.040 mm	1	3
	0.020 mm	1	3
	0.006 mm	1	3
	0.002 mm	1	2
Gravel	%	88	78
Sand	%	11	18
Silt	%	0	1
Clay	%	1	2

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

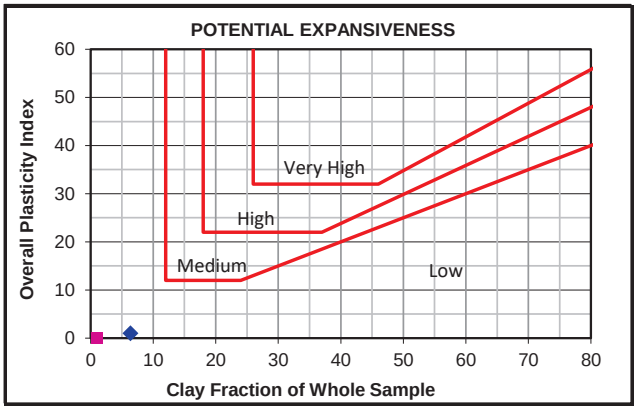
Laboratory Number		C1991/61 ◆	C1991/66 ■
Atterberg Limits			
Liquid Limit	%	32	26
Plasticity Index	%	16	13
Linear Shrinkage	%	8.0	6.0
Overall PI	%	1	2
Classifications			
HRB (AASHTO)		A-2-6(0)	A-2-6(0)
Unified (ASTM D2487)		GP	GP-GC
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/28 ◆	■
Field Number		TPD12	
Client Reference			
Depth (m)		0.80-1.50	
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	
Classification Description		Silty gravel \ Silt-Clay Materials	
Stabilizing Agent			

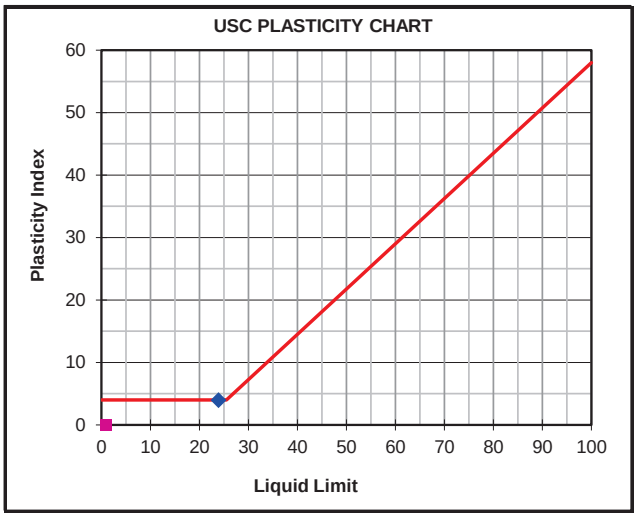


Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	97	
	28 mm	84	
	20 mm	70	
	14 mm	68	
	5 mm	49	
	2 mm	42	
	1 mm	42	
	0.425 mm	20	
	0.250 mm	18	
	0.150 mm	17	
	0.075 mm	16	
Grading Modulus		2.23	



Hydrometer Analysis -0.425 mm -0.425 mm

Percentage Passing	0.060 mm	11	
	0.040 mm	9	
	0.020 mm	8	
	0.006 mm	7	
	0.002 mm	6	
Gravel	%	58	
Sand	%	30	
Silt	%	5	
Clay	%	6	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

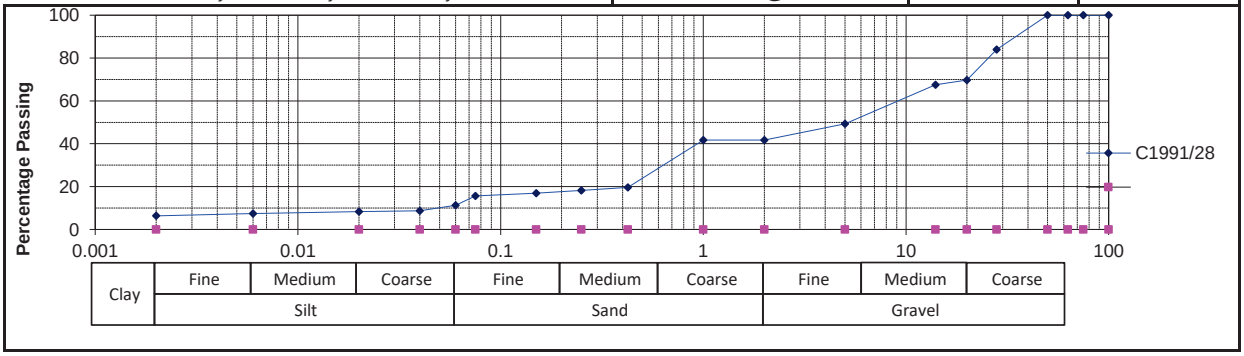
Laboratory Number		C1991/28 ◆	■

Atterberg Limits

Liquid Limit	%	24	
Plasticity Index	%	4	
Linear Shrinkage	%	2.5	
Overall PI	%	1	

Classifications

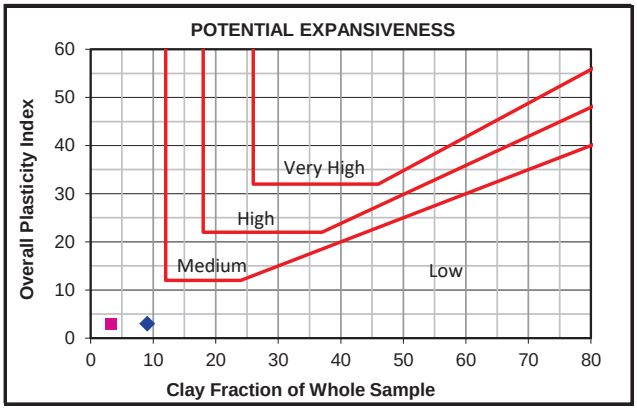
HRB (AASHTO)	A-1-b(0)	
Unified (ASTM D2487)	SC-SM	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/67 ◆	C1991/68 ■
Field Number		TPRA14	TPRA14
Client Reference			
Depth (m)		0.30-0.70	0.70-1.70
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	Shale
Classification Description		Clayey sand \ Silt-Clay Materials	Clayey sand \ Silt-Clay Materials
Stabilizing Agent			

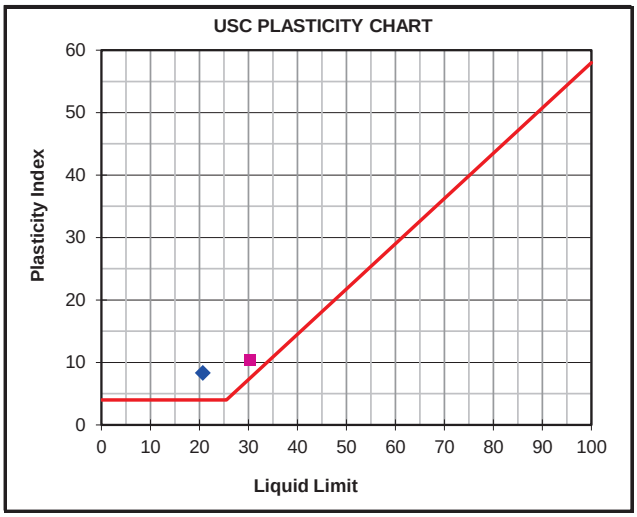


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		100
	63 mm		98
	50 mm		96
	37.5 mm		91
	28 mm	100	85
	20 mm	95	82
	14 mm	91	72
	5 mm	81	58
	2 mm	63	49
	1 mm	63	49
	0.425 mm	36	29
	0.250 mm	31	23
	0.150 mm	24	18
	0.075 mm	20	13
Grading Modulus		1.81	2.10



Hydrometer Analysis

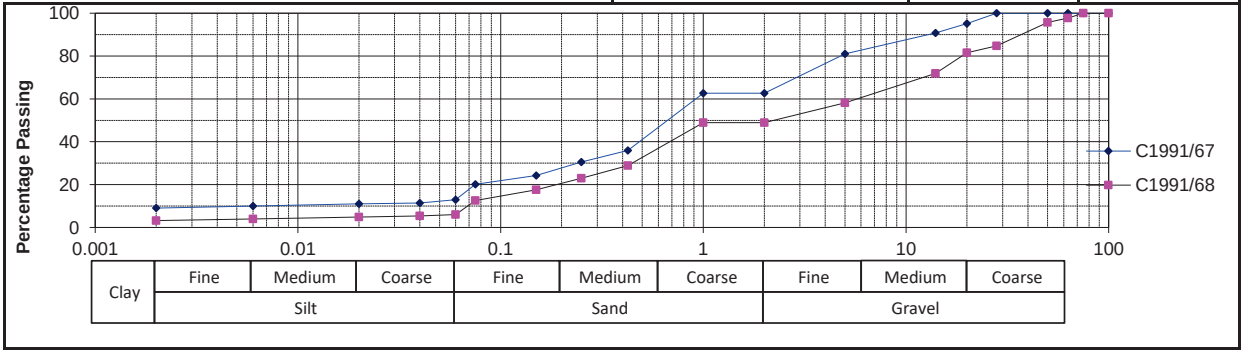
		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	13	6
	0.040 mm	11	5
	0.020 mm	11	5
	0.006 mm	10	4
	0.002 mm	9	3
Gravel	%	37	51
Sand	%	50	43
Silt	%	4	3
Clay	%	9	3

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/67 ◆	C1991/68 ■
Atterberg Limits			
Liquid Limit	%	21	30
Plasticity Index	%	8	10
Linear Shrinkage	%	4.0	4.5
Overall PI	%	3	3

Classifications

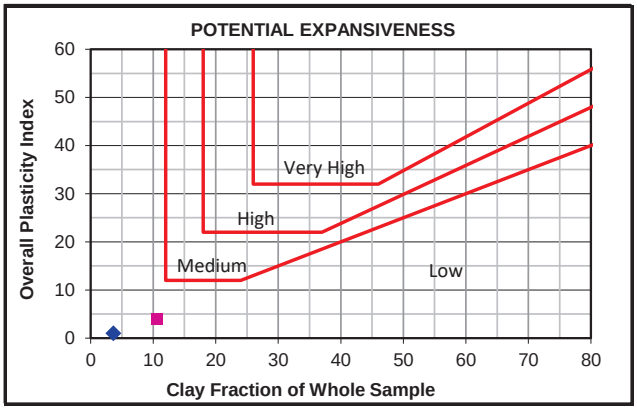
HRB (AASHTO)	A-2-4(0)	A-2-6(0)
Unified (ASTM D2487)	SC	SC
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/73 ◆	C1991/75 ■
Field Number		TPRA19	TPRA21
Client Reference			
Depth (m)		0.30-0.70	0.00-0.30
Position			
Coordinates	X		
	Y		
Visual Description		Silty sand	Gravelly sand
Classification Description		Poorly graded sand \ clayey sand \ Silt-Clay Materials	Clay of low plasticity \ silt \ Silt-Clay Materials
Stabilizing Agent			

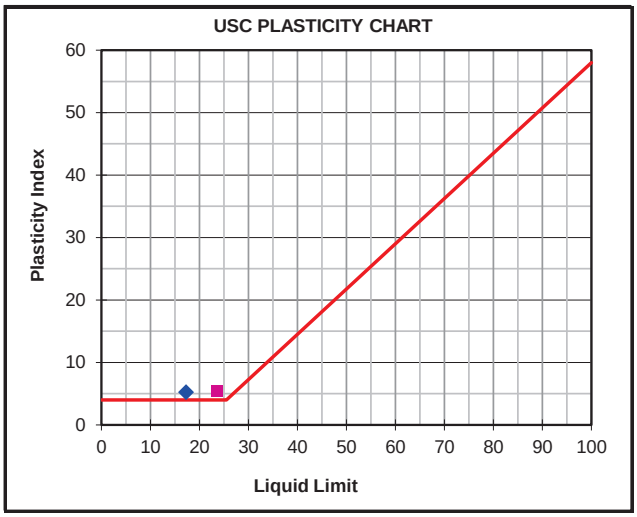


Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	96	
	28 mm	93	
	20 mm	89	100
	14 mm	80	99
	5 mm	58	98
	2 mm	44	93
	1 mm	44	93
	0.425 mm	24	76
	0.250 mm	20	71
	0.150 mm	15	65
	0.075 mm	11	53
Grading Modulus		2.20	0.78

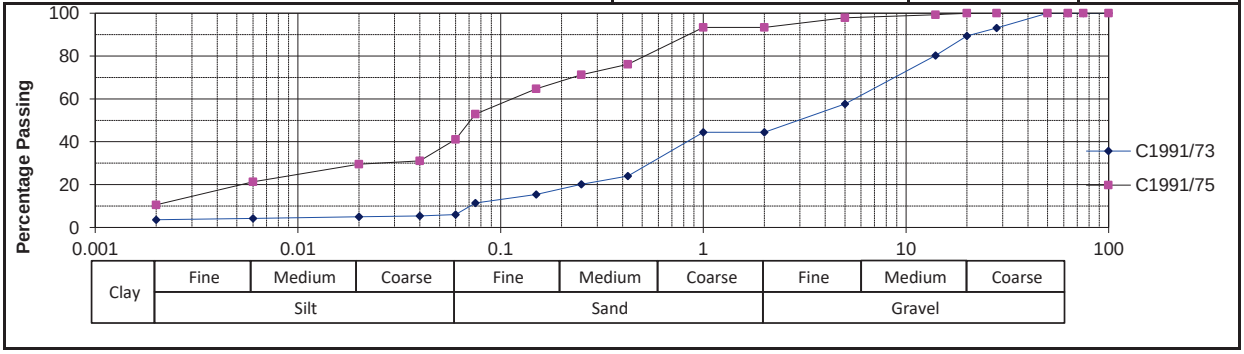


Hydrometer Analysis

		-0.425 mm	-0.075 mm
Percentage Passing	0.060 mm	6	41
	0.040 mm	5	31
	0.020 mm	5	30
	0.006 mm	4	21
	0.002 mm	4	11
Gravel	%	56	7
Sand	%	38	52
Silt	%	2	31
Clay	%	4	11

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

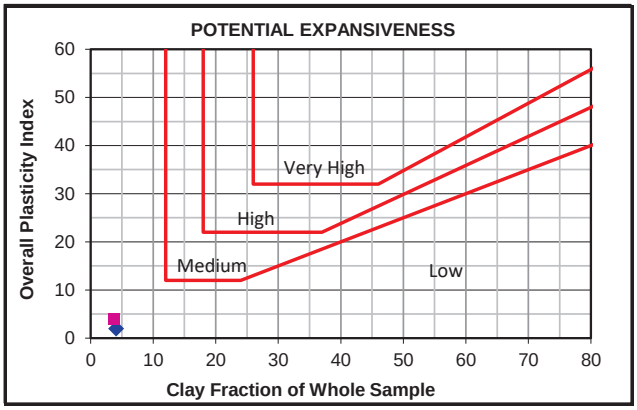
Laboratory Number		C1991/73 ◆	C1991/75 ■
Atterberg Limits			
Liquid Limit	%	17	23
Plasticity Index	%	5	5
Linear Shrinkage	%	3.0	3.0
Overall PI	%	1	4
Classifications			
HRB (AASHTO)		A-1-a(0)	A-4(0)
Unified (ASTM D2487)		SP-SC	CL-ML
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

FOUNDATION INDICATOR

Laboratory Number		C1991/78 ◆	C1991/80 ■
Field Number		TPRA23	TPC09
Client Reference			
Depth (m)		0.30-1.00	2.40-5.00
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Sandy Clay
Classification Description		Silty sand \ Silt-Clay Materials	Clayey sand \ Silt-Clay Materials
Stabilizing Agent			

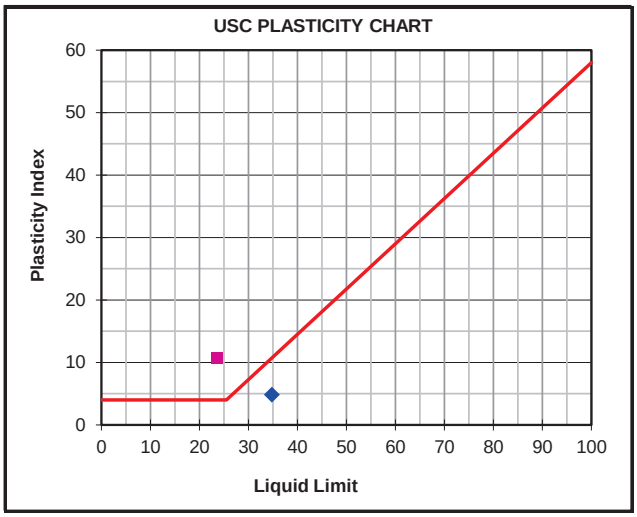


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm	100	100
	28 mm	96	97
	20 mm	93	94
	14 mm	89	87
	5 mm	79	69
	2 mm	74	58
	1 mm	74	58
	0.425 mm	51	41
	0.250 mm	49	33
	0.150 mm	47	27
	0.075 mm	46	19
Grading Modulus		1.30	1.83



Hydrometer Analysis

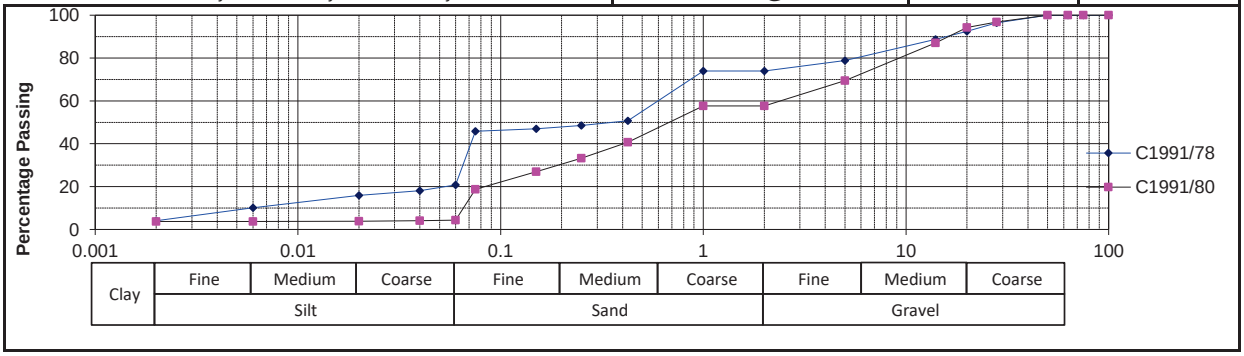
		-2.00 mm	-0.075 mm
Percentage Passing	0.060 mm	21	4
	0.040 mm	18	4
	0.020 mm	16	4
	0.006 mm	10	4
	0.002 mm	4	4
Gravel	%	26	42
Sand	%	53	53
Silt	%	17	1
Clay	%	4	4

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/78 ◆	C1991/80 ■
Atterberg Limits			
Liquid Limit	%	35	24
Plasticity Index	%	5	11
Linear Shrinkage	%	2.0	5.0
Overall PI	%	2	4

Classifications

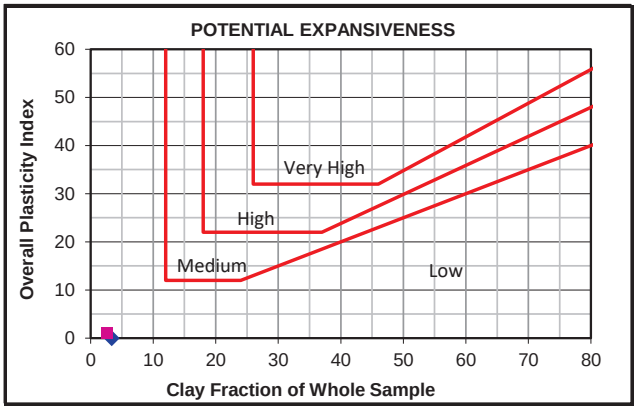
HRB (AASHTO)	A-4(0)	A-2-6(0)
Unified (ASTM D2487)	SM	SC
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/47 ◆	C1991/49 ■
Field Number		TPRE11	TPRE12
Client Reference			
Depth (m)		0.00-0.40	0.20-1.20
Position			
Coordinates	X		
	Y		
Visual Description		Silty gravelley sand	Shale
Classification Description		Poorly graded sand \ silty sand \ Silt-Clay Materials	Well-graded gravel, fine to coarse gravel \ clayey gravel \
Stabilizing Agent			

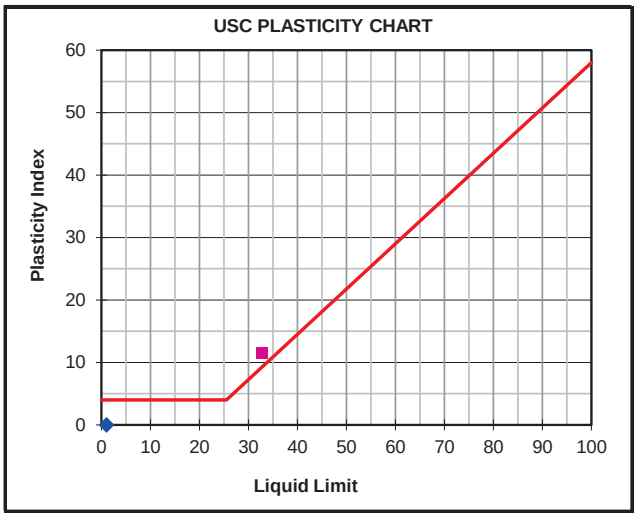


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm	100	100
	50 mm	90	97
	37.5 mm	90	87
	28 mm	90	71
	20 mm	87	60
	14 mm	76	52
	5 mm	63	31
	2 mm	48	20
	1 mm	48	20
	0.425 mm	34	10
	0.250 mm	26	9
	0.150 mm	19	8
	0.075 mm	11	7
Grading Modulus		2.07	2.62

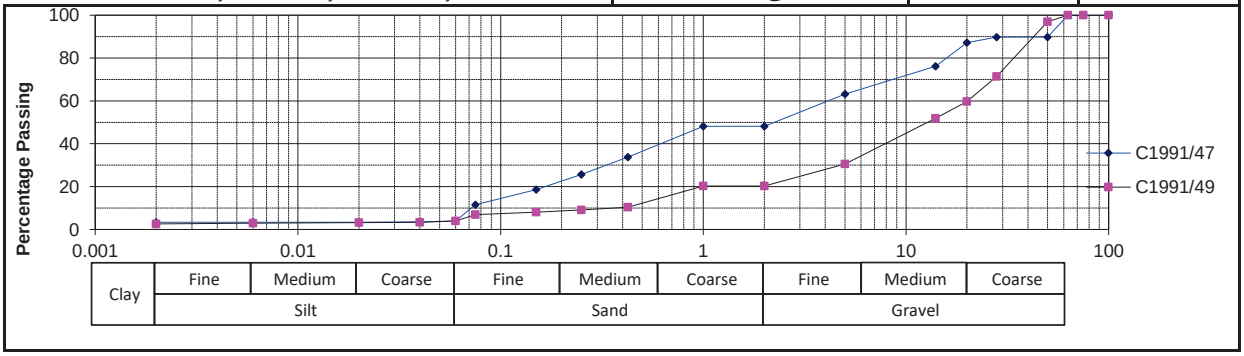


Hydrometer Analysis

		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	4	4
	0.040 mm	4	3
	0.020 mm	3	3
	0.006 mm	3	3
	0.002 mm	3	3
Gravel	%	52	80
Sand	%	44	16
Silt	%	1	1
Clay	%	3	3

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

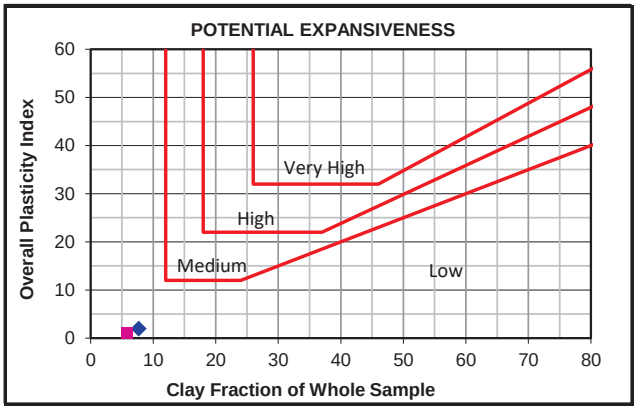
Laboratory Number		C1991/47 ◆	C1991/49 ■
Atterberg Limits			
Liquid Limit	%		33
Plasticity Index	%	NP	12
Linear Shrinkage	%	0.0	6.0
Overall PI	%		1
Classifications			
HRB (AASHTO)		A-1-b(0)	A-2-6(0)
Unified (ASTM D2487)		SP-SM	GW-GC
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/50 ◆	C1991/51 ■
Field Number		TPRE13	TPRE15
Client Reference			
Depth (m)		0.40-1.50	0.70-1.50
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	Shale
Classification Description		Silty sand \ Silt-Clay Materials	Silty sand \ Silt-Clay Materials
Stabilizing Agent			

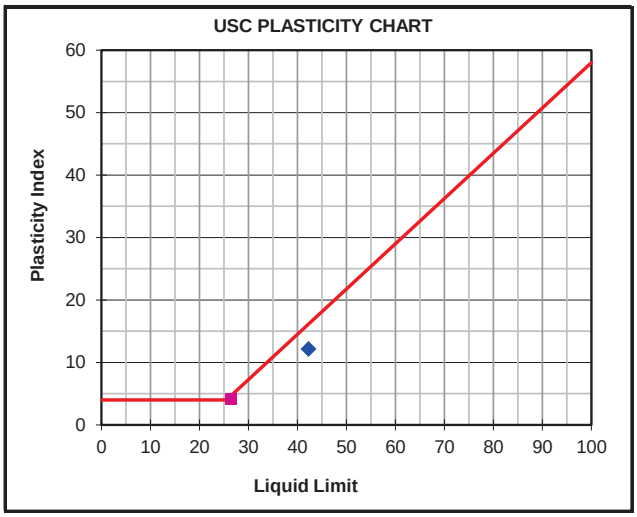


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

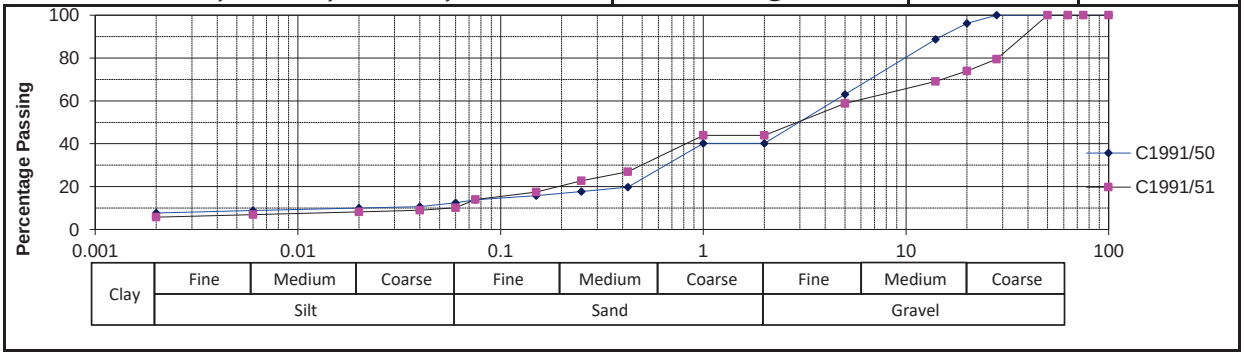
Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		100
	37.5 mm		90
	28 mm	100	80
	20 mm	96	74
	14 mm	89	69
	5 mm	63	59
	2 mm	40	44
	1 mm	40	44
	0.425 mm	20	27
	0.250 mm	18	23
	0.150 mm	16	18
	0.075 mm	14	14
Grading Modulus		2.26	2.15



Hydrometer Analysis		-2.00 mm	-2.00 mm
Percentage Passing	0.060 mm	12	10
	0.040 mm	11	9
	0.020 mm	10	8
	0.006 mm	9	7
	0.002 mm	8	6
Gravel	%	60	56
Sand	%	28	34
Silt	%	5	4
Clay	%	8	6

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

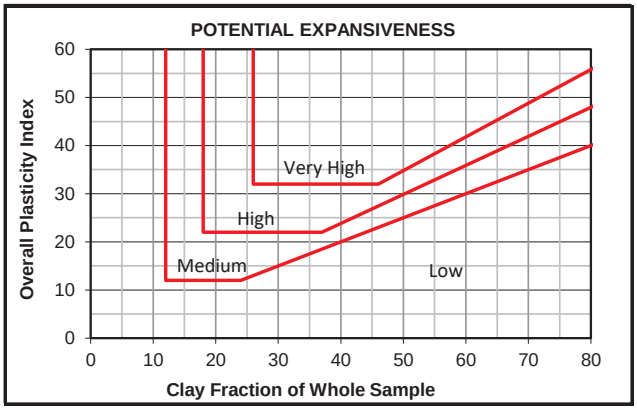
Laboratory Number		C1991/50 ◆	C1991/51 ■
Atterberg Limits			
Liquid Limit	%	42	26
Plasticity Index	%	12	4
Linear Shrinkage	%	6.0	2.5
Overall PI	%	2	1
Classifications			
HRB (AASHTO)		A-2-7(0)	A-1-a(0)
Unified (ASTM D2487)		SM	SM
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/1 ◆	C1991/23 ■
Field Number		TPP08	TPD06
Client Reference			
Depth (m)		1.00-3.00	0.00-0.70
Position			
Coordinates	X		
	Y		
Visual Description		Silty Sand	Silty Clay
Classification Description		Silty sand \ Silt-Clay Materials	Silty sand \ Silt-Clay Materials
Stabilizing Agent			

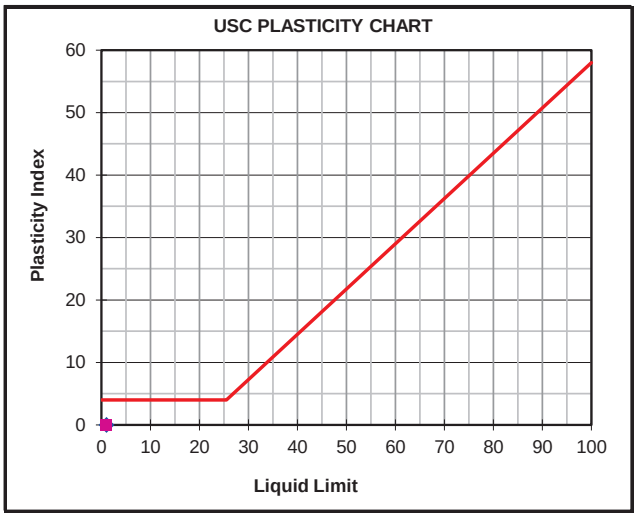


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm	100	100
	5 mm	100	100
	2 mm	100	99
	1 mm	100	99
	0.425 mm	82	87
	0.250 mm	63	76
	0.150 mm	45	56
	0.075 mm	21	26
Grading Modulus		0.97	0.87

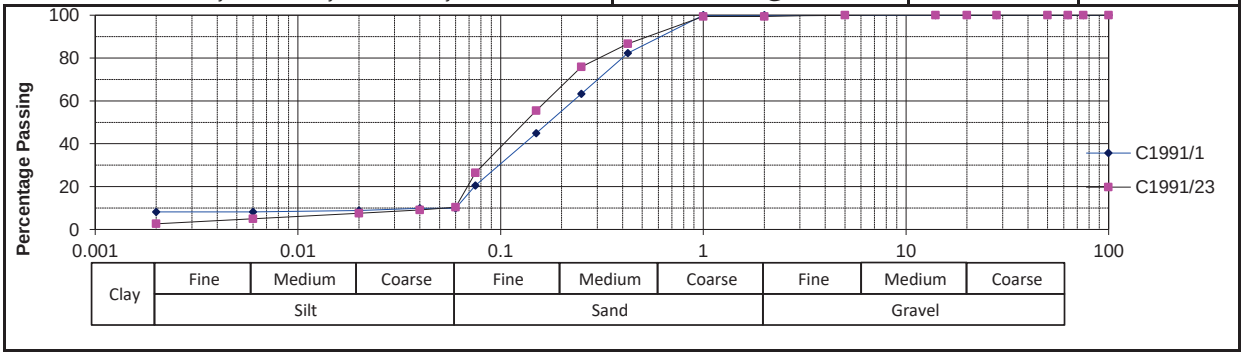


Hydrometer Analysis

		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	10	10
	0.040 mm	10	9
	0.020 mm	9	8
	0.006 mm	8	5
	0.002 mm	8	3
Gravel	%	0	1
Sand	%	90	89
Silt	%	2	8
Clay	%	8	3

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

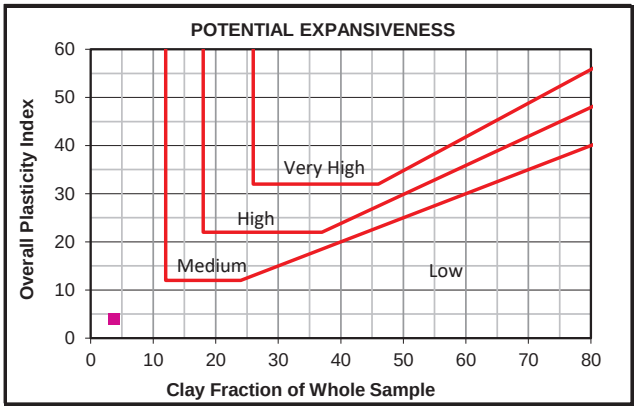
Laboratory Number		C1991/1 ◆	C1991/23 ■
Atterberg Limits			
Liquid Limit	%		
Plasticity Index	%	NP	NP
Linear Shrinkage	%	0.0	0.0
Overall PI	%		
Classifications			
HRB (AASHTO)		A-2-4(0)	A-2-4(0)
Unified (ASTM D2487)		SM	SM
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/2 ◆	C1991/19 ■
Field Number		TPP10	TPP32
Client Reference			
Depth (m)		0.00-0.60	0.20-2.50
Position			
Coordinates	X		
	Y		
Visual Description		Silty Sand	Gravelly Clay
Classification Description		Poorly graded sand \ silty sand \ Silt-Clay Materials	Well-graded sand, fine to coarse sand \ silty sand \ Silt-
Stabilizing Agent			

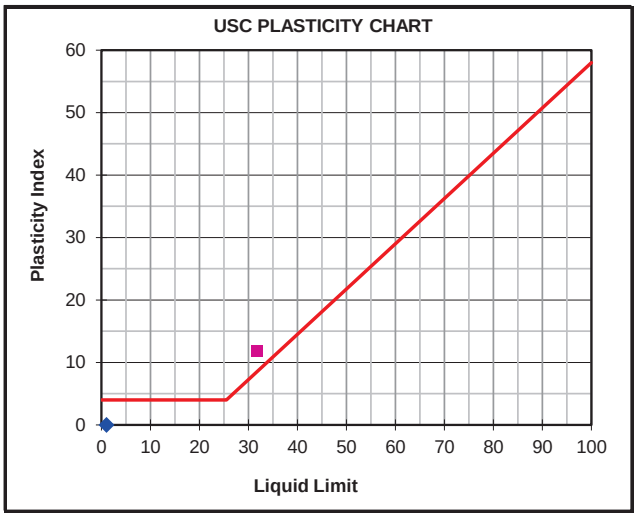


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		100
	20 mm		98
	14 mm	100	94
	5 mm	96	70
	2 mm	92	56
	1 mm	92	56
	0.425 mm	55	30
	0.250 mm	41	24
	0.150 mm	27	17
	0.075 mm	11	11
Grading Modulus		1.41	2.04



Hydrometer Analysis

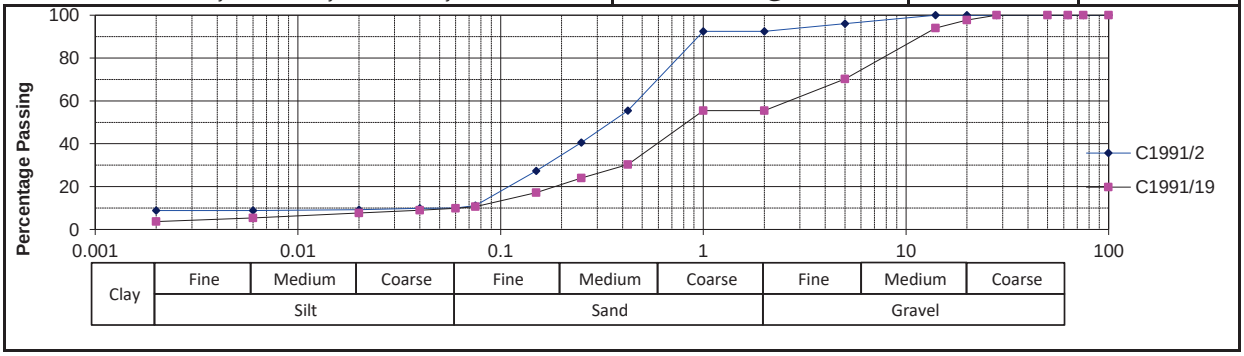
		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	10	10
	0.040 mm	10	9
	0.020 mm	9	8
	0.006 mm	9	5
	0.002 mm	9	4
Gravel	%	8	44
Sand	%	83	46
Silt	%	1	6
Clay	%	9	4

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/2 ◆	C1991/19 ■
Atterberg Limits			
Liquid Limit	%		32
Plasticity Index	%	NP	12
Linear Shrinkage	%	0.0	5.5
Overall PI	%		4

Classifications

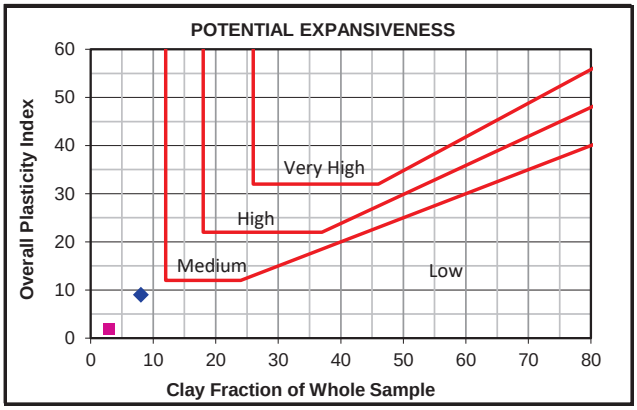
HRB (AASHTO)	A-2-4(0)	A-2-6(0)
Unified (ASTM D2487)	SP-SM	SW-SC
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/5 ◆	C1991/7 ■
Field Number		TPP12	TPP14
Client Reference			
Depth (m)		1.00-3.00	0.90-2.20
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Shale
Classification Description		Clay of low plasticity \ Silt-Clay Materials	Poorly graded gravel \ clayey gravel \ Silt-Clay Materials
Stabilizing Agent			

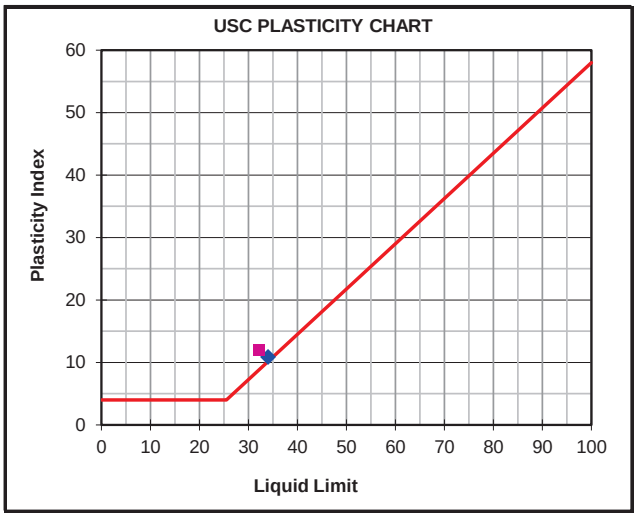


Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	

Sieve Analysis (Wet Prep)

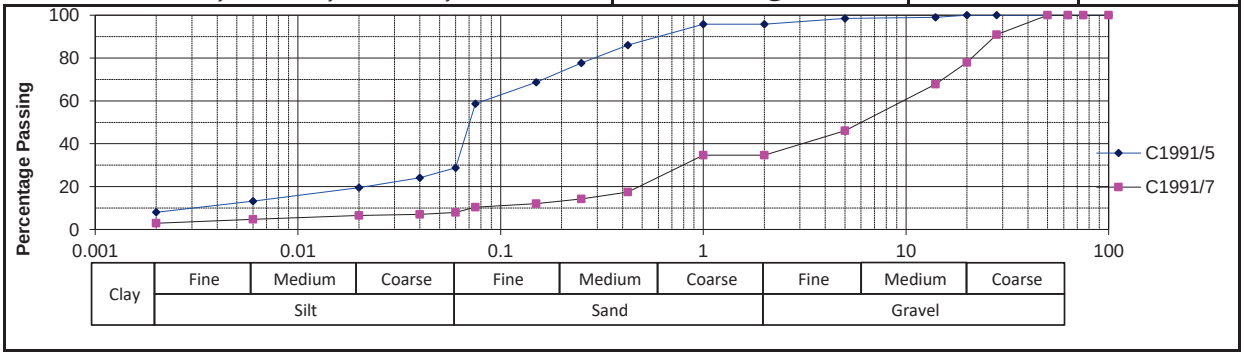
Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		100
	28 mm		91
	20 mm	100	78
	14 mm	99	68
	5 mm	99	46
	2 mm	96	35
	1 mm	96	35
	0.425 mm	86	17
	0.250 mm	78	14
	0.150 mm	69	12
	0.075 mm	59	10
Grading Modulus		0.59	2.38



Hydrometer Analysis		-2.00 mm	-2.00 mm
Percentage Passing	0.060 mm	29	8
	0.040 mm	24	7
	0.020 mm	20	6
	0.006 mm	13	5
	0.002 mm	8	3
Gravel	%	4	65
Sand	%	67	27
Silt	%	21	5
Clay	%	8	3

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

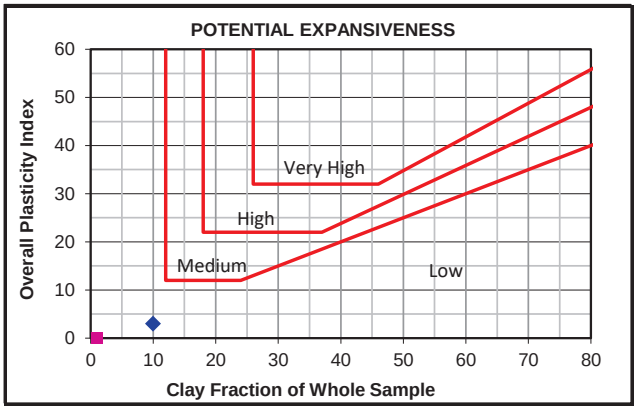
Laboratory Number		C1991/5 ◆	C1991/7 ■
Atterberg Limits			
Liquid Limit	%	34	32
Plasticity Index	%	11	12
Linear Shrinkage	%	6.5	6.0
Overall PI	%	9	2
Classifications			
HRB (AASHTO)		A-6(4)	A-2-6(0)
Unified (ASTM D2487)		CL	GP-GC
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/3◆	■
Field Number		TPP10	
Client Reference			
Depth (m)		0.60-0.90	
Position			
Coordinates	X		
	Y		
Visual Description		Gravelly Clay	
Classification Description		Clayey gravel \ silty sand \ Silt-Clay Materials	
Stabilizing Agent			

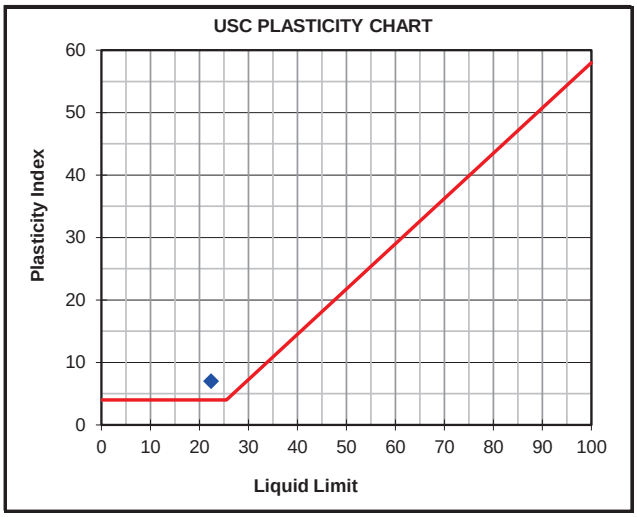


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

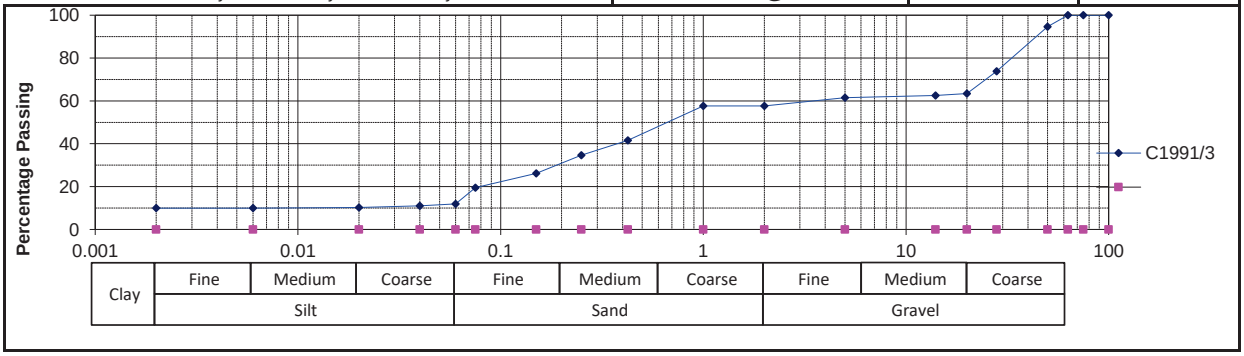
Percentage Passing	100 mm		
	75 mm		
	63 mm	100	
	50 mm	95	
	37.5 mm	80	
	28 mm	74	
	20 mm	63	
	14 mm	63	
	5 mm	62	
	2 mm	58	
	1 mm	58	
	0.425 mm	42	
	0.250 mm	35	
	0.150 mm	26	
	0.075 mm	19	
Grading Modulus		1.81	



Hydrometer Analysis		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	12	
	0.040 mm	11	
	0.020 mm	10	
	0.006 mm	10	
	0.002 mm	10	
Gravel	%	42	
Sand	%	46	
Silt	%	2	
Clay	%	10	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

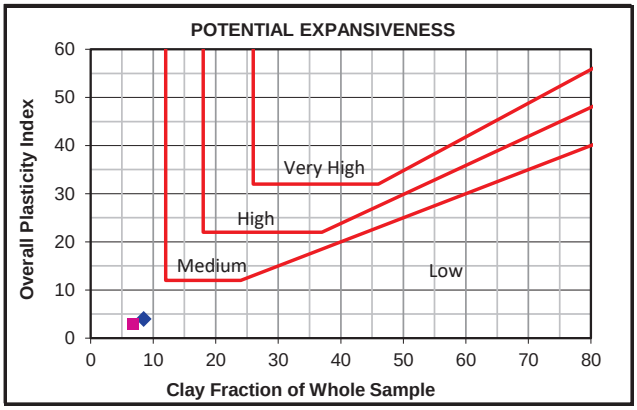
Laboratory Number		C1991/3 ◆	■
Atterberg Limits			
Liquid Limit	%	22	
Plasticity Index	%	7	
Linear Shrinkage	%	3.5	
Overall PI	%	3	
Classifications			
HRB (AASHTO)		A-2-4(0)	
Unified (ASTM D2487)		SC-SM	
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/11 ◆	C1991/16 ■
Field Number		TPP21	TPP30
Client Reference			
Depth (m)		1.30-3.10	0.60-1.30
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Gravelly Clay
Classification Description		Clayey sand \ Silt-Clay Materials	Clayey sand \ Silt-Clay Materials
Stabilizing Agent			

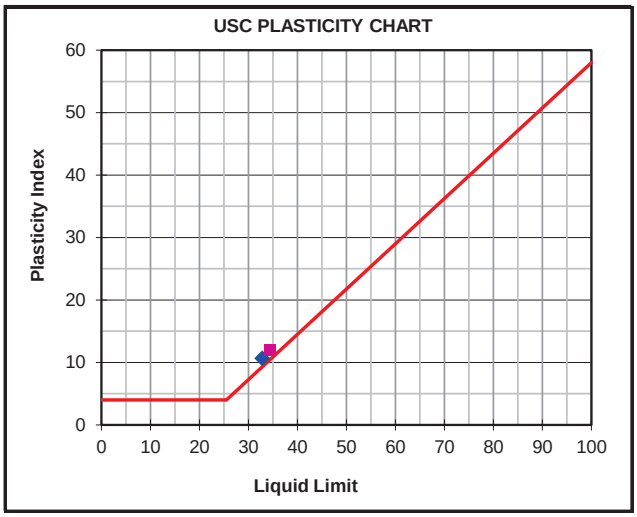


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

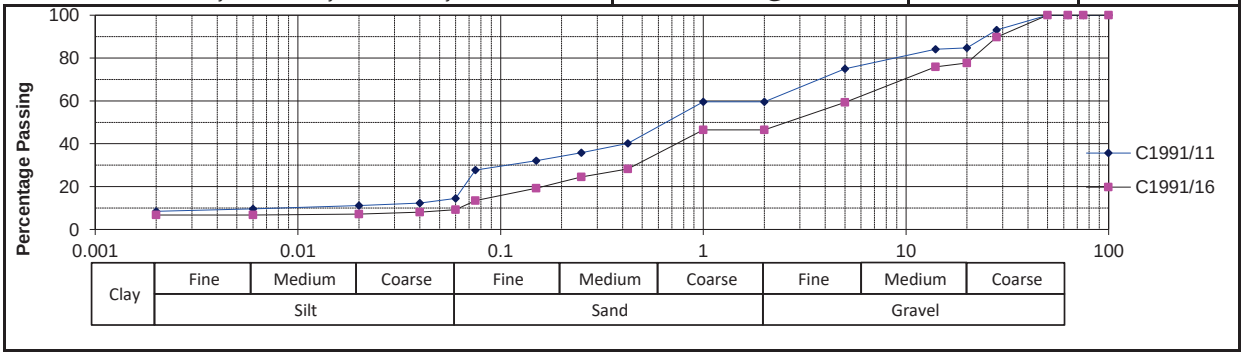
Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		100
	37.5 mm	100	92
	28 mm	93	90
	20 mm	85	78
	14 mm	84	76
	5 mm	75	59
	2 mm	60	46
	1 mm	60	46
	0.425 mm	40	28
	0.250 mm	36	24
	0.150 mm	32	19
	0.075 mm	28	13
Grading Modulus		1.72	2.12



Hydrometer Analysis		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	15	9
	0.040 mm	12	8
	0.020 mm	11	7
	0.006 mm	10	7
	0.002 mm	8	7
Gravel	%	40	54
Sand	%	45	37
Silt	%	6	3
Clay	%	8	7

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

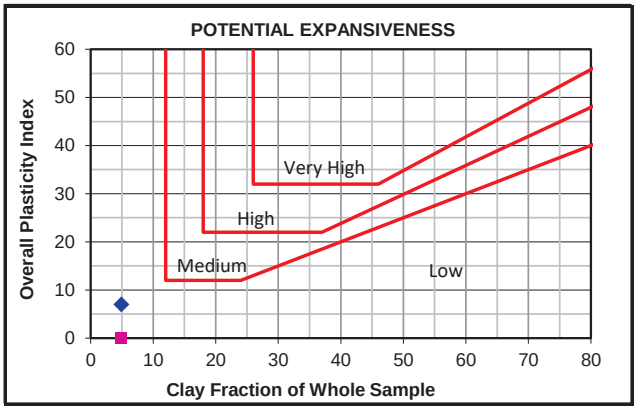
Laboratory Number		C1991/11 ◆	C1991/16 ■
Atterberg Limits			
Liquid Limit	%	33	34
Plasticity Index	%	11	12
Linear Shrinkage	%	6.0	6.0
Overall PI	%	4	3
Classifications			
HRB (AASHTO)		A-2-6(0)	A-2-6(0)
Unified (ASTM D2487)		SC	SC
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/18 ◆	C1991/21 ■
Field Number		TPP31	TPD01
Client Reference			
Depth (m)		0.80-2.90	0.00-2.80
Position			
Coordinates	X		
	Y		
Visual Description		Silty Sand	Silty Sand
Classification Description		Clayey sand \ Silt-Clay Materials	Silty sand \ Silt-Clay Materials
Stabilizing Agent			

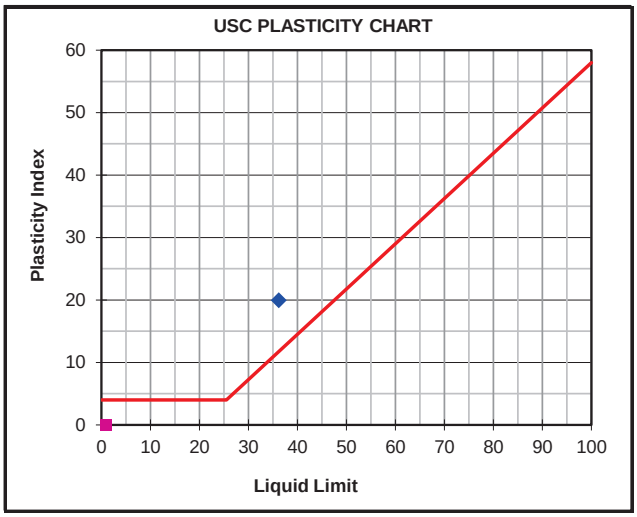


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm	100	
	28 mm	96	
	20 mm	94	
	14 mm	88	100
	5 mm	69	100
	2 mm	56	100
	1 mm	56	100
	0.425 mm	35	96
	0.250 mm	31	69
	0.150 mm	26	35
	0.075 mm	20	13
Grading Modulus		1.89	0.91

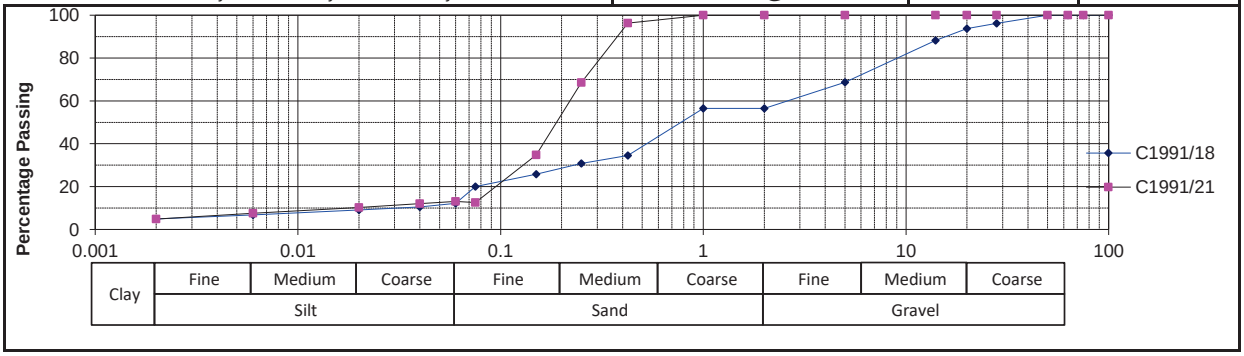


Hydrometer Analysis

		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	12	13
	0.040 mm	11	12
	0.020 mm	9	10
	0.006 mm	7	8
	0.002 mm	5	5
Gravel	%	44	0
Sand	%	44	87
Silt	%	7	8
Clay	%	5	5

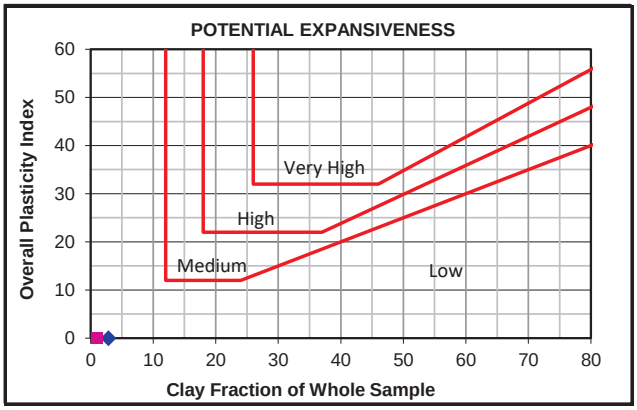
Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/18 ◆	C1991/21 ■
Atterberg Limits			
Liquid Limit	%	36	
Plasticity Index	%	20	NP
Linear Shrinkage	%	10.5	0.0
Overall PI	%	7	
Classifications			
HRB (AASHTO)		A-2-6(1)	A-2-4(0)
Unified (ASTM D2487)		SC	SM
Weston Swell @ 1 kPa			



FOUNDATION INDICATOR

Laboratory Number		C1991/34 ◆	■
Field Number		TPR05	
Client Reference			
Depth (m)		0.30-1.50	
Position			
Coordinates	X		
	Y		
Visual Description		Clayey sand	
Classification Description		Silty sand \ Silt-Clay Materials	
Stabilizing Agent			

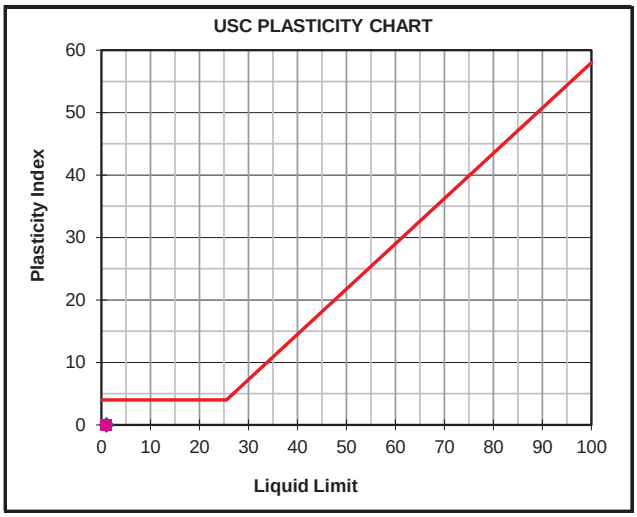


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	98	
	28 mm	98	
	20 mm	98	
	14 mm	98	
	5 mm	96	
	2 mm	92	
	1 mm	92	
	0.425 mm	85	
	0.250 mm	67	
	0.150 mm	44	
	0.075 mm	23	
Grading Modulus		1.00	

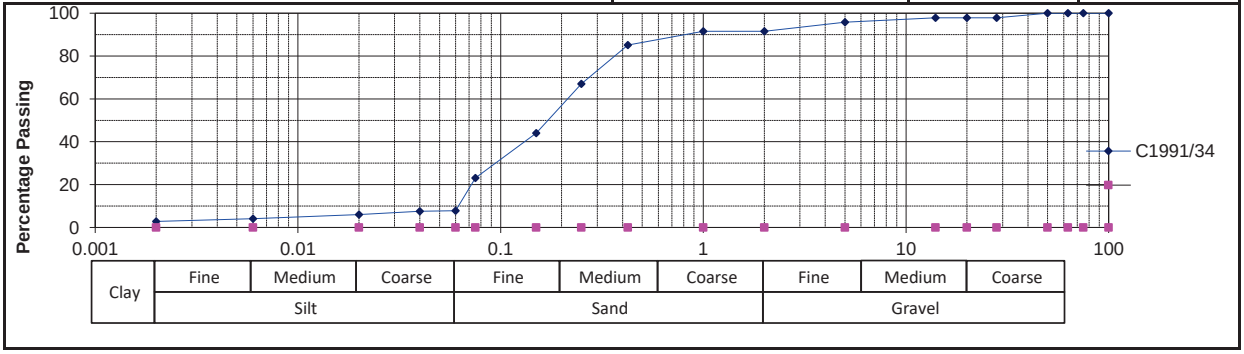


Hydrometer Analysis -0.075 mm -0.075 mm

Percentage Passing	0.060 mm	8	
	0.040 mm	8	
	0.020 mm	6	
	0.006 mm	4	
	0.002 mm	3	
Gravel	%	8	
Sand	%	84	
Silt	%	5	
Clay	%	3	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

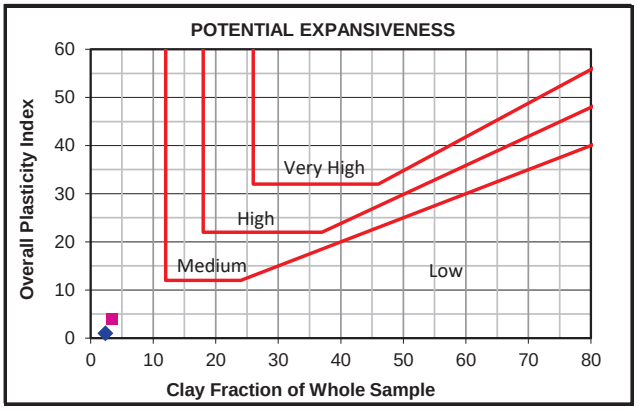
Laboratory Number		C1991/34 ◆	■
Atterberg Limits			
Liquid Limit	%		
Plasticity Index	%	NP	
Linear Shrinkage	%	0.0	
Overall PI	%		
Classifications			
HRB (AASHTO)		A-2-4(0)	
Unified (ASTM D2487)		SP-SC	
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/33 ◆	C1991/13 ■
Field Number		TPR03	TPP27
Client Reference			
Depth (m)		0.60-1.60	1.20-3.00
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Silty Sand
Classification Description		Silty gravel \ Silt-Clay Materials	Clayey sand \ Silt-Clay Materials
Stabilizing Agent			

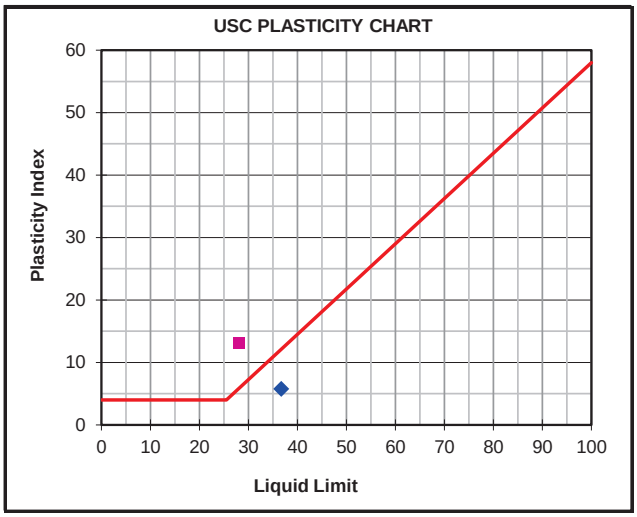


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		100
	75 mm	100	88
	63 mm	93	88
	50 mm	91	88
	37.5 mm	74	88
	28 mm	67	88
	20 mm	59	87
	14 mm	52	80
	5 mm	37	63
	2 mm	32	53
	1 mm	32	53
	0.425 mm	22	28
	0.250 mm	20	23
	0.150 mm	18	18
	0.075 mm	17	12
Grading Modulus		2.29	2.07



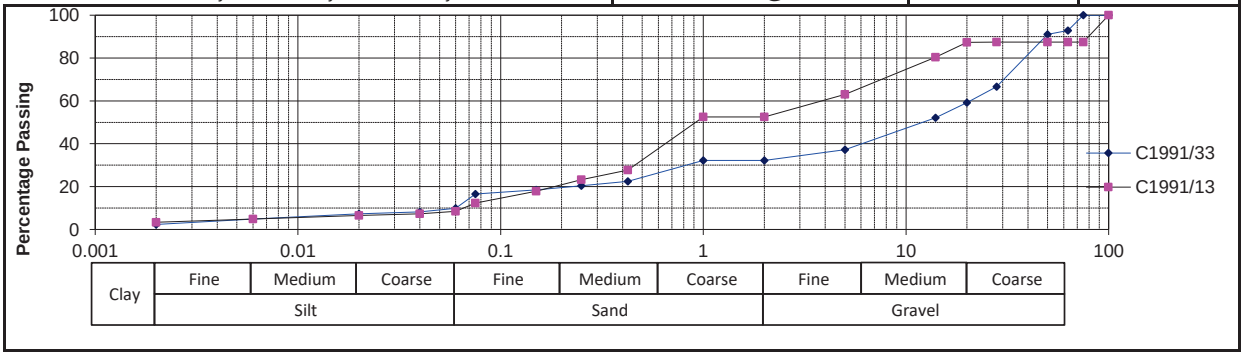
Hydrometer Analysis		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	10	8
	0.040 mm	8	7
	0.020 mm	7	7
	0.006 mm	5	5
	0.002 mm	2	3
Gravel	%	68	47
Sand	%	22	44
Silt	%	8	5
Clay	%	2	3

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/33 ◆	C1991/13 ■
Atterberg Limits			
Liquid Limit	%	37	28
Plasticity Index	%	6	13
Linear Shrinkage	%	3.5	6.5
Overall PI	%	1	4

Classifications

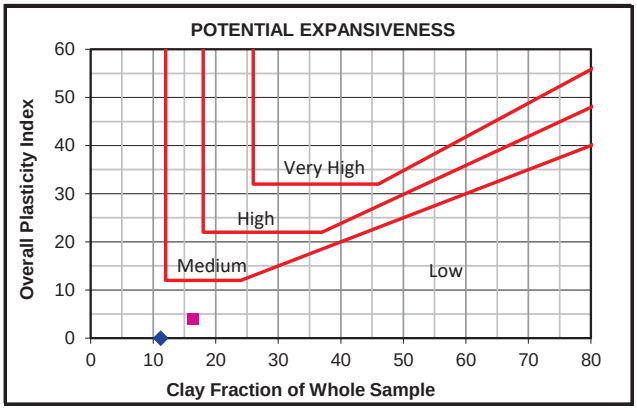
HRB (AASHTO)	A-1-b(0)	A-2-6(0)
Unified (ASTM D2487)	GM	SC
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/34 ◆	C1991/27 ■
Field Number		TPR05	TPD09
Client Reference			
Depth (m)		0.30-1.50	2.40-3.00
Position			
Coordinates	X		
	Y		
Visual Description		Clayey sand	Clayey sand
Classification Description		Silty sand \ Silt-Clay Materials	Clayey gravel \ silty sand \ Silt-Clay Materials
Stabilizing Agent			

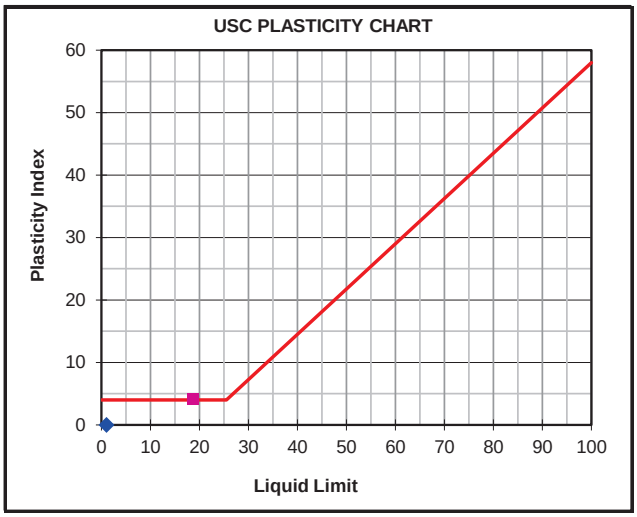


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	98	
	28 mm	98	
	20 mm	98	
	14 mm	98	100
	5 mm	96	100
	2 mm	92	100
	1 mm	92	100
	0.425 mm	85	95
	0.250 mm	67	84
	0.150 mm	44	57
	0.075 mm	23	35
Grading Modulus		1.00	0.70



Hydrometer Analysis

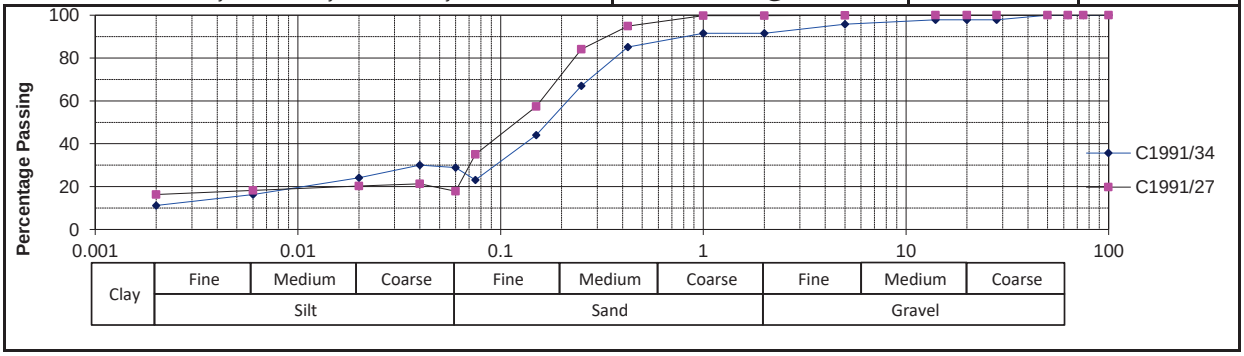
		-0.075 mm	-0.075 mm
Percentage Passing	0.060 mm	29	18
	0.040 mm	30	21
	0.020 mm	24	20
	0.006 mm	16	18
	0.002 mm	11	16
Gravel	%	8	0
Sand	%	63	82
Silt	%	18	2
Clay	%	11	16

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/34 ◆	C1991/27 ■
Atterberg Limits			
Liquid Limit	%		19
Plasticity Index	%	NP	4
Linear Shrinkage	%	0.0	1.5
Overall PI	%		4

Classifications

HRB (AASHTO)	A-2-4(0)	A-4(0)
Unified (ASTM D2487)	SM	SC-SM
Weston Swell @ 1 kPa		

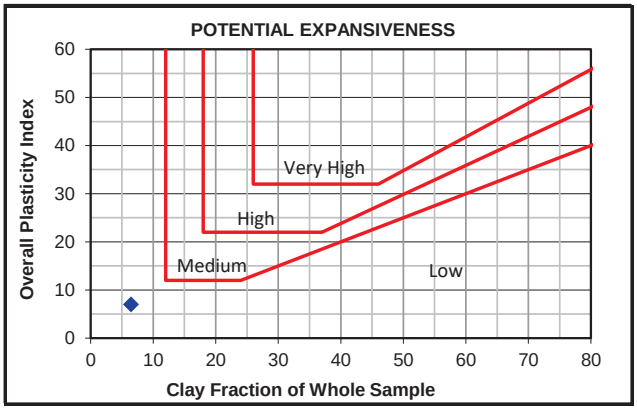


Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/26 ◆	C1991/34 ■
Field Number		TPD09	TPR05
Client Reference			
Depth (m)		0.50-2.40	0.30-1.50
Position			
Coordinates	X		
	Y		
Visual Description		Sandy Clay	Clayey sand
Classification Description		Clayey sand \ Silt-Clay Materials	Silty sand \ Silt-Clay Materials
Stabilizing Agent			

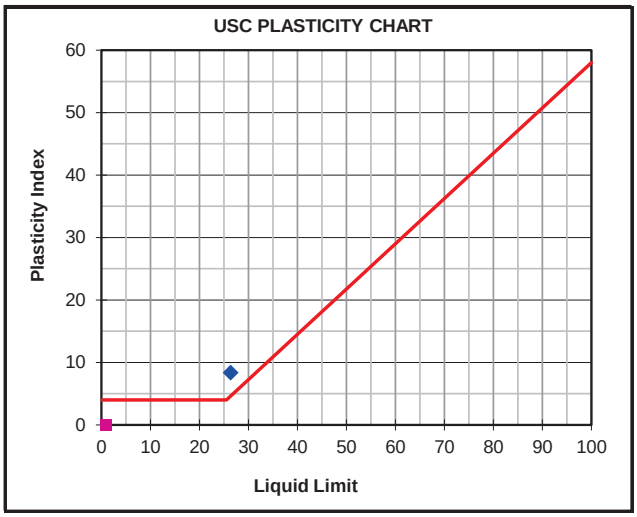


Moisture Content & Relative Density

Moisture Content (%)			
Relative Density (S.G.)			

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		100
	37.5 mm		98
	28 mm		98
	20 mm		98
	14 mm	100	98
	5 mm	100	96
	2 mm	100	92
	1 mm	100	92
	0.425 mm	78	85
	0.250 mm	69	67
	0.150 mm	56	44
	0.075 mm	41	23
Grading Modulus		0.82	1.00



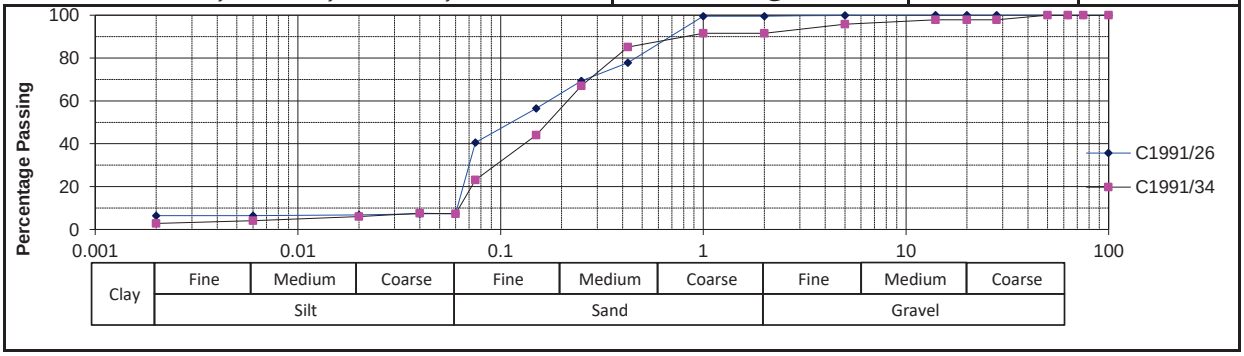
Hydrometer Analysis		-0.075 mm	-0.075 mm
Percentage Passing	0.060 mm	7	7
	0.040 mm	7	8
	0.020 mm	7	6
	0.006 mm	6	4
	0.002 mm	6	3
Gravel	%	0	8
Sand	%	92	84
Silt	%	1	4
Clay	%	6	3

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/26 ◆	C1991/34 ■
Atterberg Limits			
Liquid Limit	%	26	
Plasticity Index	%	8	NP
Linear Shrinkage	%	4.0	0.0
Overall PI	%	7	

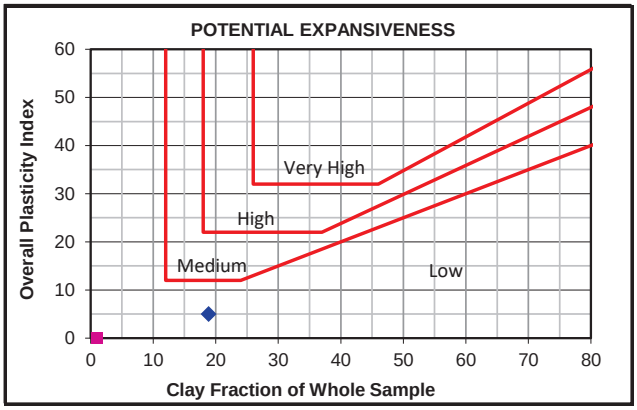
Classifications

HRB (AASHTO)	A-4(0)	A-2-4(0)
Unified (ASTM D2487)	SC	SM
Weston Swell @ 1 kPa		



FOUNDATION INDICATOR

Laboratory Number		C1991/35 ◆	■
Field Number		TPR06	
Client Reference			
Depth (m)		0.40-1.50	
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	
Classification Description		Silty sand \ Silt-Clay Materials	
Stabilizing Agent			

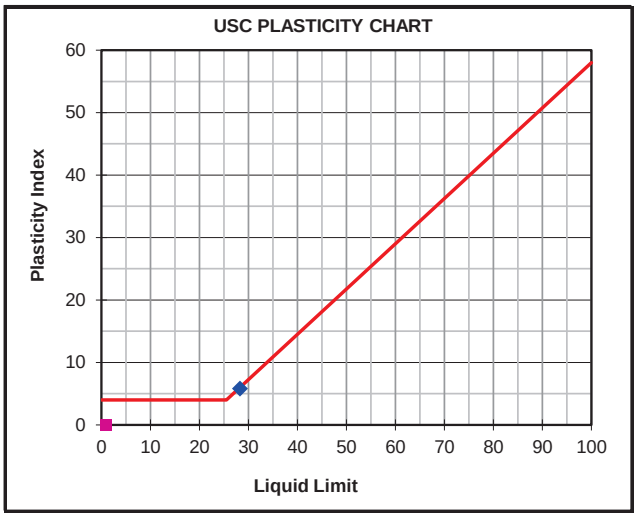


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

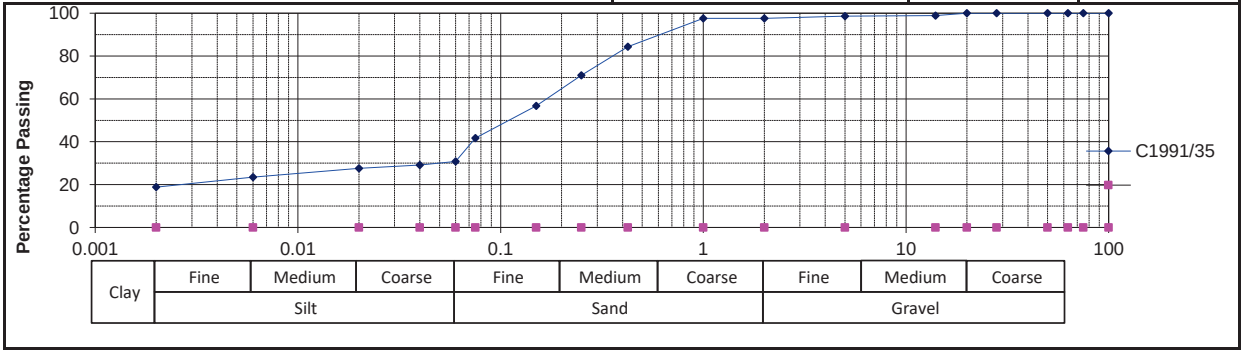
Percentage Passing	100 mm	
	75 mm	
	63 mm	
	50 mm	
	37.5 mm	
	28 mm	
	20 mm	100
	14 mm	99
	5 mm	99
	2 mm	98
	1 mm	98
	0.425 mm	84
	0.250 mm	71
	0.150 mm	57
	0.075 mm	42
Grading Modulus		0.76



Hydrometer Analysis		-0.425 mm	-0.075 mm
Percentage Passing	0.060 mm	31	
	0.040 mm	29	
	0.020 mm	28	
	0.006 mm	23	
	0.002 mm	19	
Gravel	%	2	
Sand	%	67	
Silt	%	12	
Clay	%	19	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

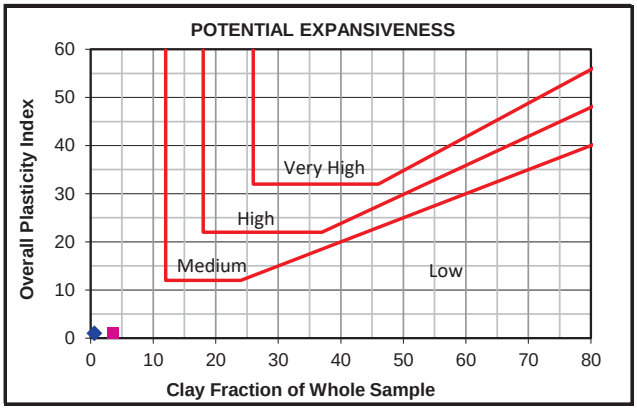
Laboratory Number		C1991/35 ◆	■
Atterberg Limits			
Liquid Limit	%	28	
Plasticity Index	%	6	
Linear Shrinkage	%	3.5	
Overall PI	%	5	
Classifications			
HRB (AASHTO)		A-4(0)	
Unified (ASTM D2487)		SC-SM	
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/74 ◆	C1991/70 ■
Field Number		TPRA20	TPRA16
Client Reference			
Depth (m)		0.20-1.70	0.10-0.50
Position			
Coordinates	X		
	Y		
Visual Description		Clayey sand	Shale
Classification Description		Well-graded gravel, fine to coarse gravel \ Silt-Clay	Poorly graded gravel \ clayey gravel \ Silt-Clay Materials
Stabilizing Agent			

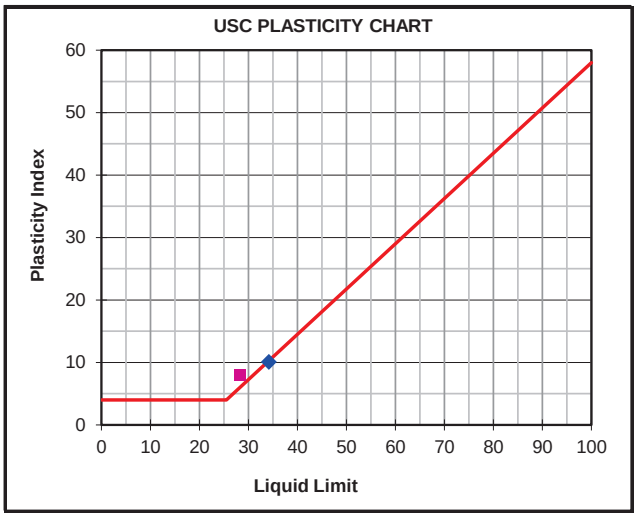


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		100
	50 mm	100	96
	37.5 mm	94	89
	28 mm	94	84
	20 mm	88	73
	14 mm	78	63
	5 mm	46	43
	2 mm	24	29
	1 mm	24	29
	0.425 mm	5	15
	0.250 mm	4	13
	0.150 mm	3	11
	0.075 mm	2	8
Grading Modulus		2.68	2.48



Hydrometer Analysis

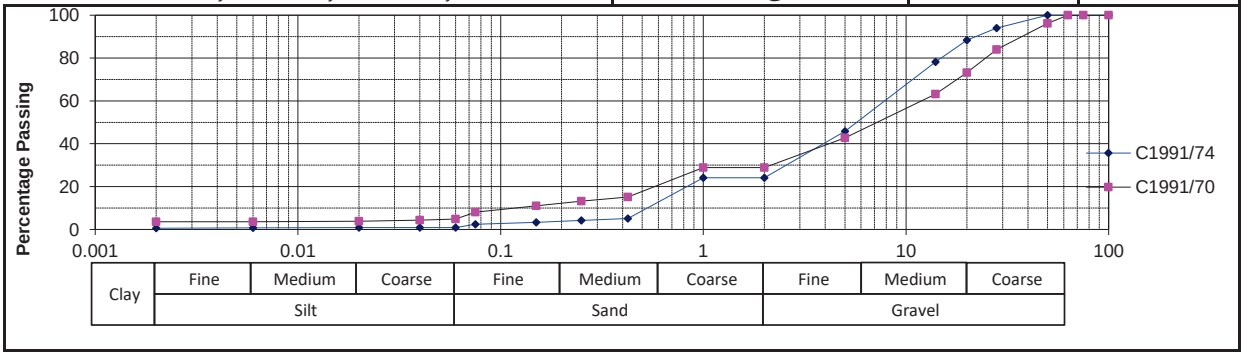
		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	1	5
	0.040 mm	1	4
	0.020 mm	1	4
	0.006 mm	1	4
	0.002 mm	1	4
Gravel	%	76	71
Sand	%	23	24
Silt	%	0	1
Clay	%	1	4

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/74 ◆	C1991/70 ■
Atterberg Limits			
Liquid Limit	%	34	28
Plasticity Index	%	10	8
Linear Shrinkage	%	5.0	4.0
Overall PI	%	1	1

Classifications

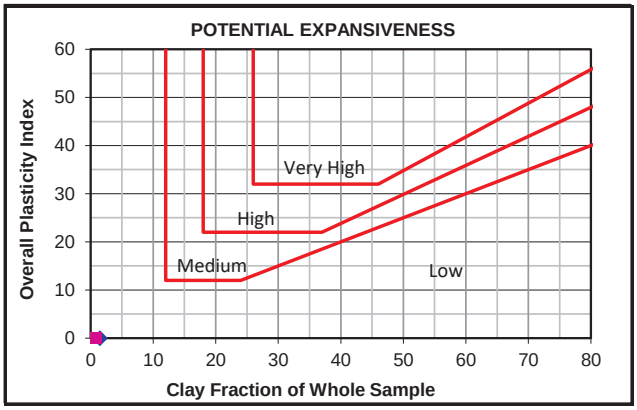
HRB (AASHTO)	A-2-6(0)	A-2-4(0)
Unified (ASTM D2487)	GW	GP-GC
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/83 ◆	C1991/84 ■
Field Number		TPD01	TPD02
Client Reference			
Depth (m)		0.00-5.10	0.00-4.50
Position			
Coordinates	X		
	Y		
Visual Description		Silty Sand	Silty Sand
Classification Description		Silty sand \ Silt-Clay Materials	Poorly graded sand \ silty sand \ Silt-Clay Materials
Stabilizing Agent			

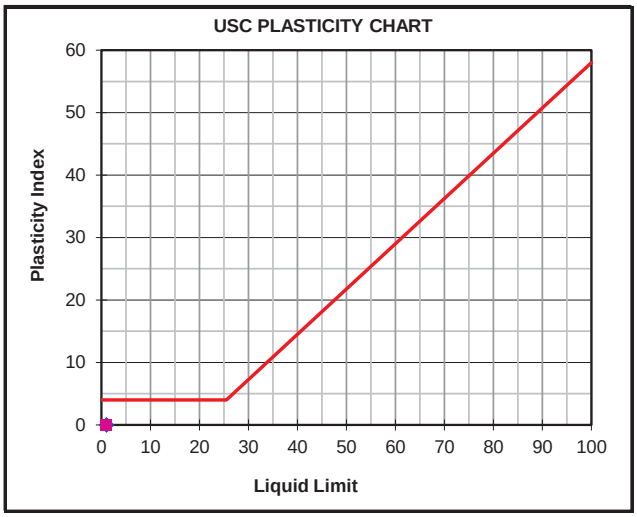


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm	100	100
	5 mm	100	100
	2 mm	100	100
	1 mm	100	100
	0.425 mm	93	91
	0.250 mm	67	54
	0.150 mm	33	27
	0.075 mm	12	12
Grading Modulus		0.95	0.97

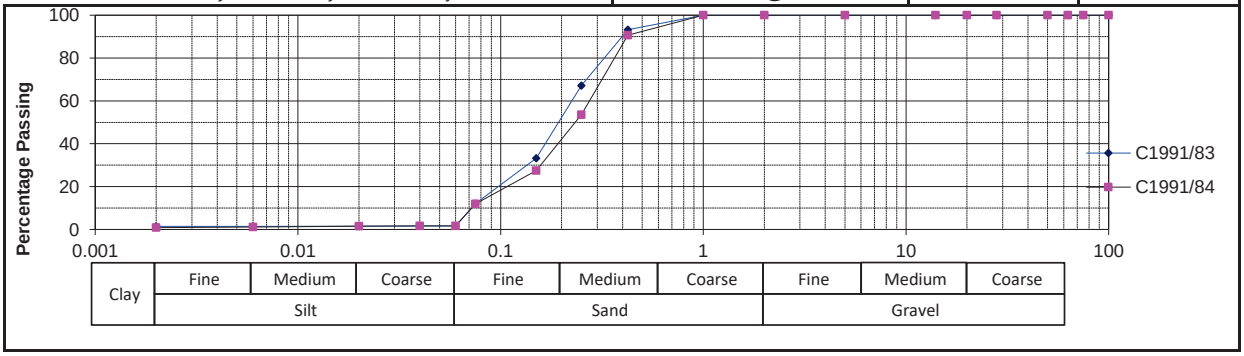


Hydrometer Analysis

		-0.075 mm	-0.075 mm
Percentage Passing	0.060 mm	2	2
	0.040 mm	2	2
	0.020 mm	2	2
	0.006 mm	1	1
	0.002 mm	1	1
Gravel	%	0	0
Sand	%	98	98
Silt	%	0	1
Clay	%	1	1

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

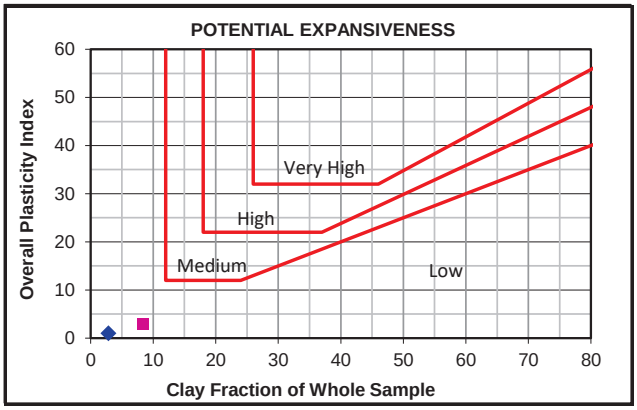
Laboratory Number		C1991/83 ◆	C1991/84 ■
Atterberg Limits			
Liquid Limit	%		
Plasticity Index	%	NP	NP
Linear Shrinkage	%	0.0	0.0
Overall PI	%		
Classifications			
HRB (AASHTO)		A-2-4(0)	A-2-4(0)
Unified (ASTM D2487)		SM	SP-SM
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/69 ◆	C1991/32 ■
Field Number		TPRA15	TPR03
Client Reference			
Depth (m)		0.60-1.00	0.20-0.60
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Silty Clay
Classification Description		Well-graded gravel, fine to coarse gravel \ silty gravel \ Silt-	Clayey sand \ Silt-Clay Materials
Stabilizing Agent			

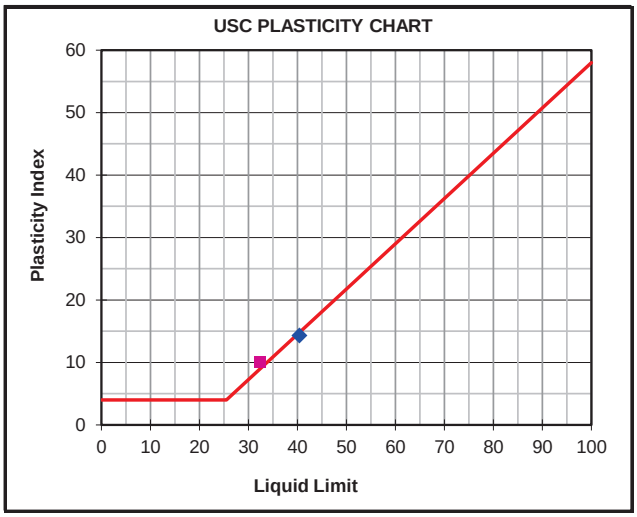


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

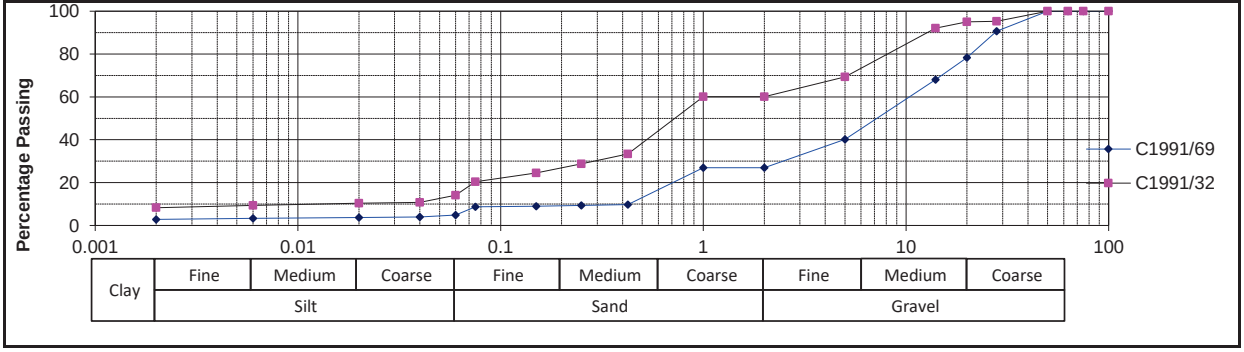
Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	100
	37.5 mm	97	97
	28 mm	91	95
	20 mm	78	95
	14 mm	68	92
	5 mm	40	69
	2 mm	27	60
	1 mm	27	60
	0.425 mm	10	33
	0.250 mm	9	29
	0.150 mm	9	24
	0.075 mm	9	20
Grading Modulus		2.55	1.86



Hydrometer Analysis		-0.075 mm	-0.075 mm
Percentage Passing	0.060 mm	5	14
	0.040 mm	4	11
	0.020 mm	4	10
	0.006 mm	3	9
	0.002 mm	3	8
Gravel	%	73	40
Sand	%	22	46
Silt	%	2	6
Clay	%	3	8

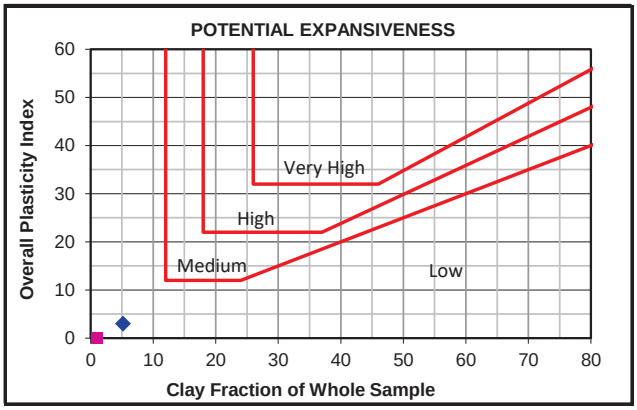
Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/69 ◆	C1991/32 ■
Atterberg Limits			
Liquid Limit	%	40	32
Plasticity Index	%	14	10
Linear Shrinkage	%	7.5	5.0
Overall PI	%	1	3
Classifications			
HRB (AASHTO)		A-2-7(0)	A-2-6(0)
Unified (ASTM D2487)		GW-GM	SC
Weston Swell @ 1 kPa			



FOUNDATION INDICATOR

Laboratory Number		C1991/37 ◆	■
Field Number		TPR10	
Client Reference			
Depth (m)		0.20-0.90	
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	
Classification Description		Clayey gravel \ silty sand \ Silt-Clay Materials	
Stabilizing Agent			

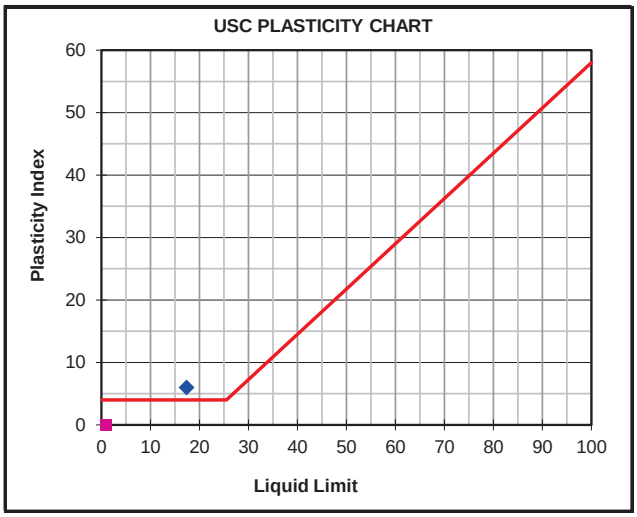


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm	100	
	20 mm	98	
	14 mm	91	
	5 mm	82	
	2 mm	61	
	1 mm	61	
	0.425 mm	47	
	0.250 mm	38	
	0.150 mm	26	
	0.075 mm	17	
Grading Modulus		1.75	



Hydrometer Analysis

		-0.075 mm	-0.075 mm
Percentage Passing	0.060 mm	8	
	0.040 mm	8	
	0.020 mm	7	
	0.006 mm	6	
	0.002 mm	5	
Gravel	%	39	
Sand	%	53	
Silt	%	3	
Clay	%	5	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

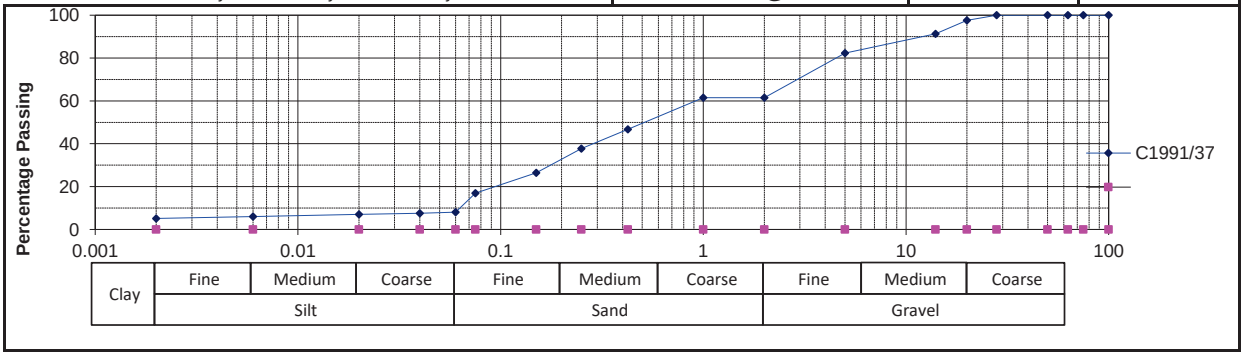
Laboratory Number		C1991/37 ◆	■

Atterberg Limits

Liquid Limit	%	17	
Plasticity Index	%	6	
Linear Shrinkage	%	2.5	
Overall PI	%	3	

Classifications

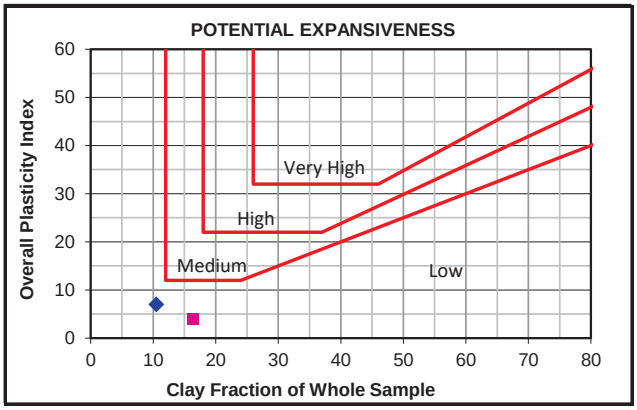
HRB (AASHTO)	A-1-b(0)	
Unified (ASTM D2487)	SW-SM	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

		C1991/45 ◆	C1991/25 ■
Laboratory Number		C1991/45 ◆	C1991/25 ■
Field Number		TPRE09	TPD07
Client Reference			
Depth (m)		0.30-1.50	0.80-2.10
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	Silty Clay
Classification Description		Clayey sand \ Silt-Clay Materials	Silt \ Silt-Clay Materials
Stabilizing Agent			

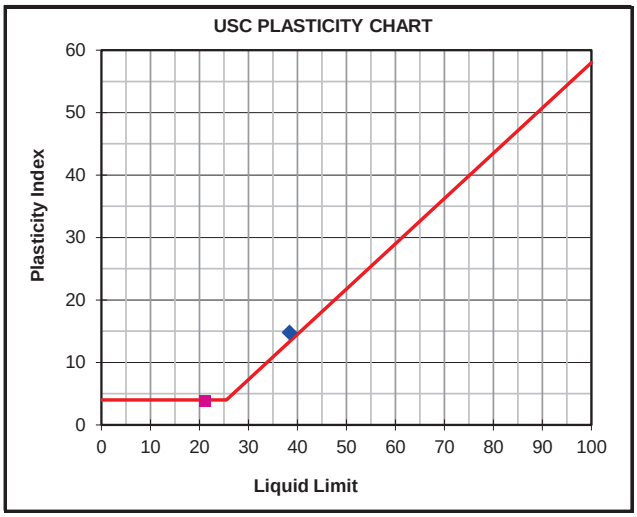


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm	100	100
	5 mm	100	100
	2 mm	94	100
	1 mm	94	100
	0.425 mm	45	96
	0.250 mm	40	83
	0.150 mm	35	71
	0.075 mm	30	54
Grading Modulus		1.31	0.50



Hydrometer Analysis

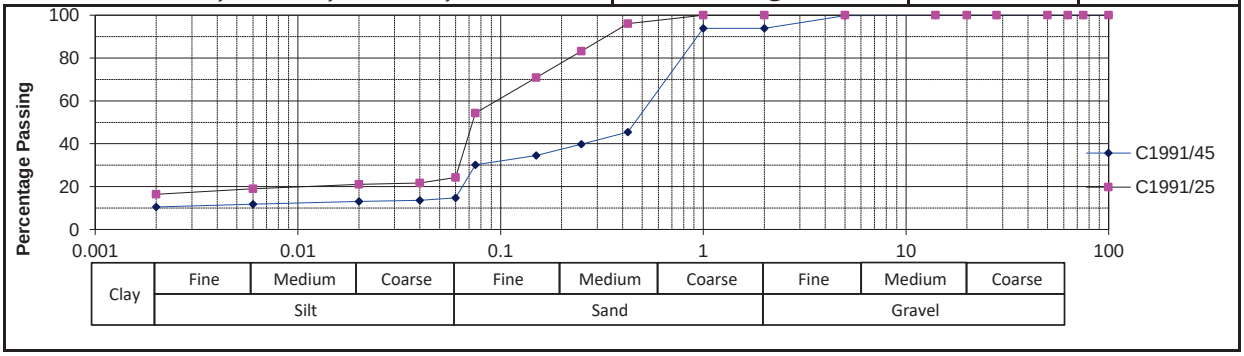
		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	15	24
	0.040 mm	14	22
	0.020 mm	13	21
	0.006 mm	12	19
	0.002 mm	11	16
Gravel	%	6	0
Sand	%	79	76
Silt	%	4	8
Clay	%	11	16

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/45 ◆	C1991/25 ■
Atterberg Limits			
Liquid Limit	%	38	21
Plasticity Index	%	15	4
Linear Shrinkage	%	7.0	2.5
Overall PI	%	7	4

Classifications

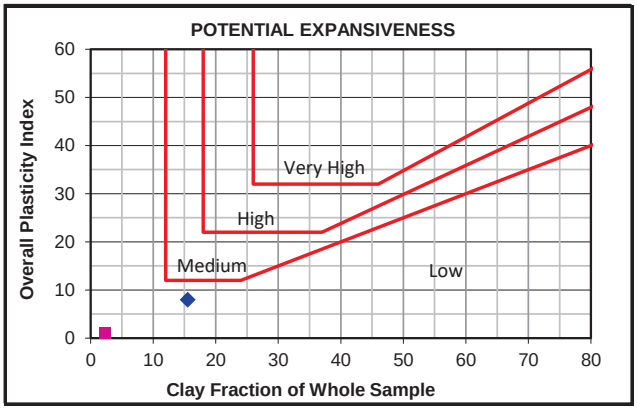
HRB (AASHTO)	A-2-6(1)	A-4(0)
Unified (ASTM D2487)	SC	ML
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/31 ◆	C1991/56 ■
Field Number		TPR01	TPRA5
Client Reference			
Depth (m)		0.7-1.7	0.3-1.5
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Shale
Classification Description		Clayey sand \ Silt-Clay Materials	Well-graded gravel, fine to coarse gravel \ Silt-Clay
Stabilizing Agent			

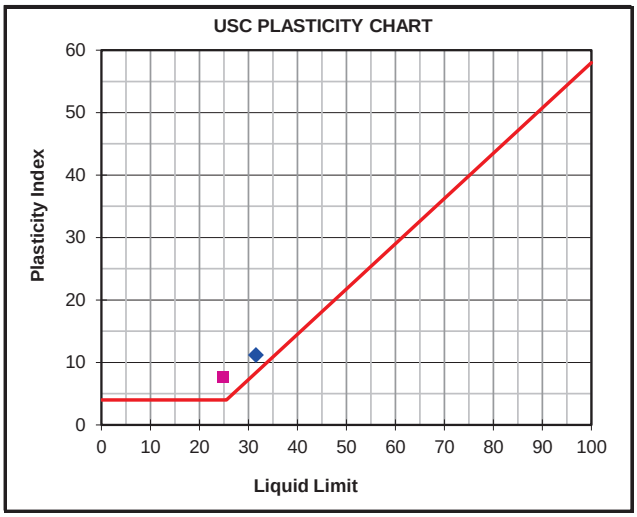


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm	100	100
	50 mm	99	98
	37.5 mm	95	97
	28 mm	95	86
	20 mm	95	74
	14 mm	95	65
	5 mm	89	37
	2 mm	85	22
	1 mm	85	22
	0.425 mm	68	8
	0.250 mm	61	6
	0.150 mm	54	5
	0.075 mm	47	3
Grading Modulus		1.00	2.66

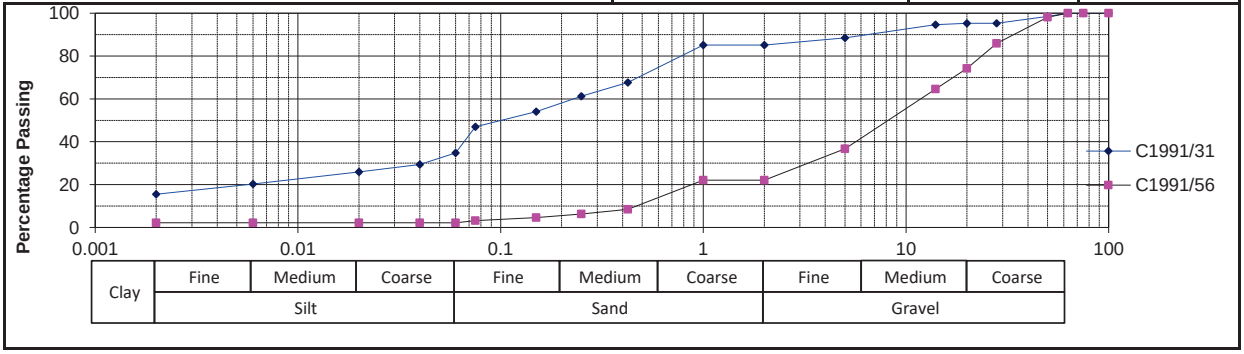


Hydrometer Analysis

		-2.00 mm	-2.00 mm
Percentage Passing	0.060 mm	35	2
	0.040 mm	29	2
	0.020 mm	26	2
	0.006 mm	20	2
	0.002 mm	16	2
Gravel	%	15	78
Sand	%	50	20
Silt	%	19	0
Clay	%	16	2

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

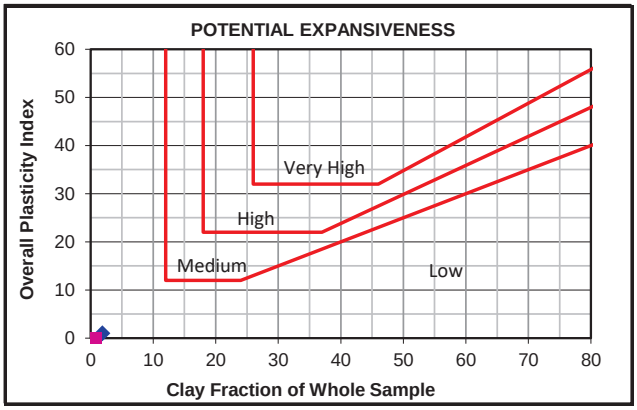
Laboratory Number		C1991/31 ◆	C1991/56 ■
Atterberg Limits			
Liquid Limit	%	32	25
Plasticity Index	%	11	8
Linear Shrinkage	%	6.5	4.0
Overall PI	%	8	1
Classifications			
HRB (AASHTO)		A-6(2)	A-2-4(0)
Unified (ASTM D2487)		SC	GW
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/39 ◆	C1991/46 ■
Field Number		TPR12	TPRE10
Client Reference			
Depth (m)		0.70-1.50	0.20-1.10
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Silty Sand
Classification Description		Well-graded gravel, fine to coarse gravel \ silty gravel \ Silt-	Poorly graded sand \ silty sand \ Silt-Clay Materials
Stabilizing Agent			

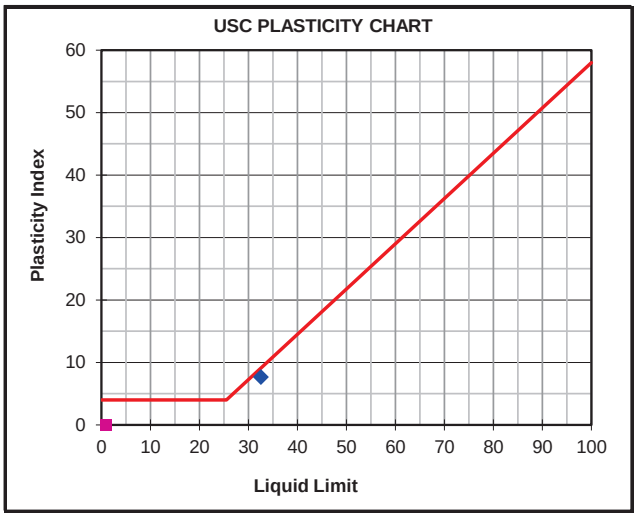


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	92	
	28 mm	80	
	20 mm	68	100
	14 mm	57	99
	5 mm	35	97
	2 mm	24	95
	1 mm	24	95
	0.425 mm	10	42
	0.250 mm	8	29
	0.150 mm	7	17
	0.075 mm	6	6
Grading Modulus		2.60	1.57

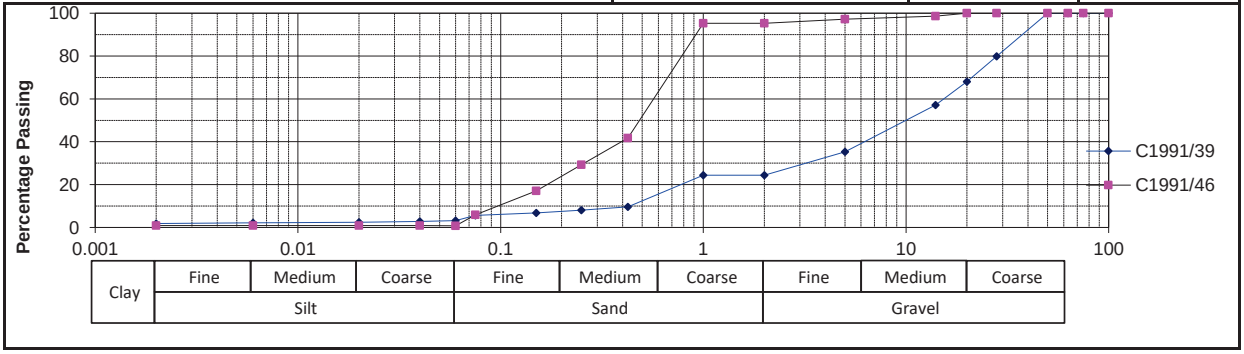


Hydrometer Analysis

		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	3	1
	0.040 mm	3	1
	0.020 mm	2	1
	0.006 mm	2	1
	0.002 mm	2	1
Gravel	%	76	5
Sand	%	21	94
Silt	%	1	0
Clay	%	2	1

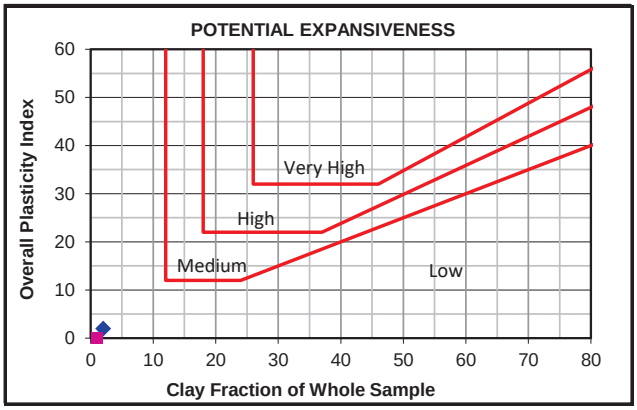
Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/39 ◆	C1991/46 ■
Atterberg Limits			
Liquid Limit	%	33	
Plasticity Index	%	8	NP
Linear Shrinkage	%	4.0	0.0
Overall PI	%	1	
Classifications			
HRB (AASHTO)		A-2-4(0)	A-1-b(0)
Unified (ASTM D2487)		GW-GM	SP-SM
Weston Swell @ 1 kPa			



FOUNDATION INDICATOR

Laboratory Number		C1991/41 ◆	■
Field Number		TPRE01	
Client Reference			
Depth (m)		0.80-1.40	
Position			
Coordinates	X		
	Y		
Visual Description		Shale	
Classification Description		Well-graded gravel, fine to coarse gravel \ Silt-Clay	
Stabilizing Agent			

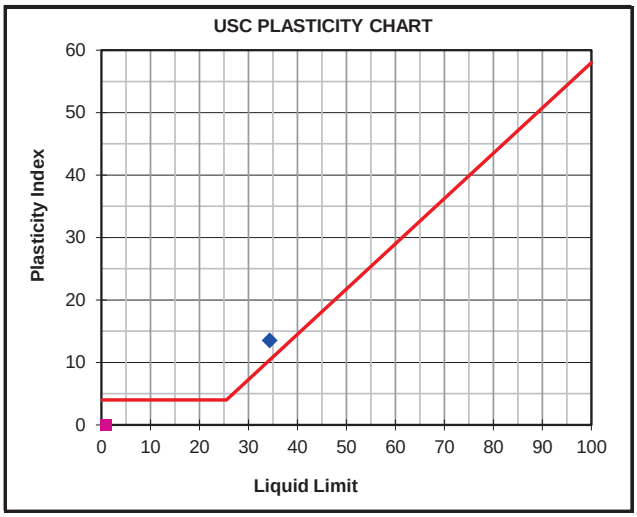


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm	100	
	50 mm	97	
	37.5 mm	87	
	28 mm	82	
	20 mm	75	
	14 mm	66	
	5 mm	38	
	2 mm	26	
	1 mm	26	
	0.425 mm	12	
	0.250 mm	10	
	0.150 mm	7	
	0.075 mm	5	
Grading Modulus		2.57	



Hydrometer Analysis

		-0.425 mm	-0.075 mm
Percentage Passing	0.060 mm	4	
	0.040 mm	4	
	0.020 mm	3	
	0.006 mm	3	
	0.002 mm	2	
Gravel	%	74	
Sand	%	21	
Silt	%	2	
Clay	%	2	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

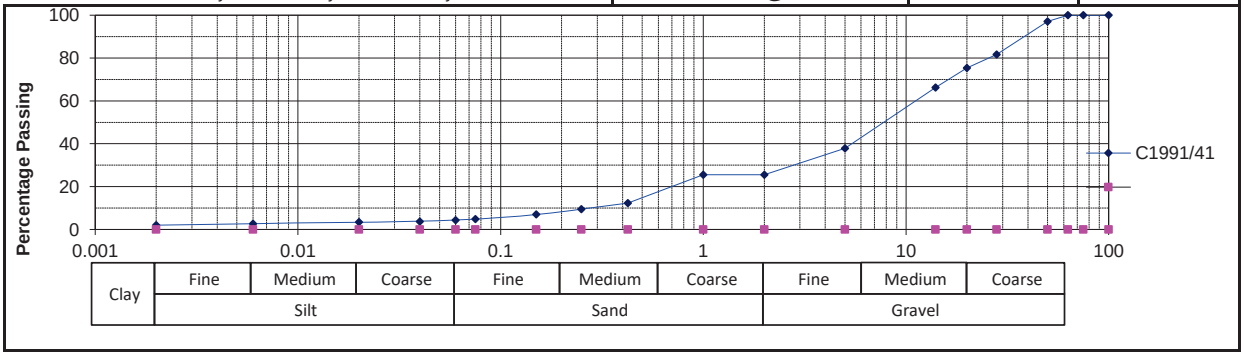
Laboratory Number		C1991/41 ◆	■

Atterberg Limits

Liquid Limit	%	34	
Plasticity Index	%	14	
Linear Shrinkage	%	7.5	
Overall PI	%	2	

Classifications

HRB (AASHTO)	A-2-6(0)	
Unified (ASTM D2487)	GW-GC	
Weston Swell @ 1 kPa		

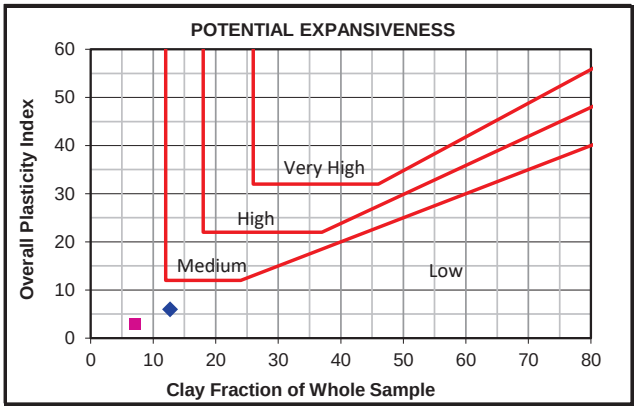


Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/81 ◆	C1991/57 ■
Field Number		TPC05	TPRA6
Client Reference			
Depth (m)		1.50-4.80	0.50-1.60
Position			
Coordinates	X		
	Y		
Visual Description		Sandy Clay	Clayey silty sand
Classification Description		Clayey sand \ Silt-Clay Materials	Clayey sand \ Silt-Clay Materials
Stabilizing Agent			

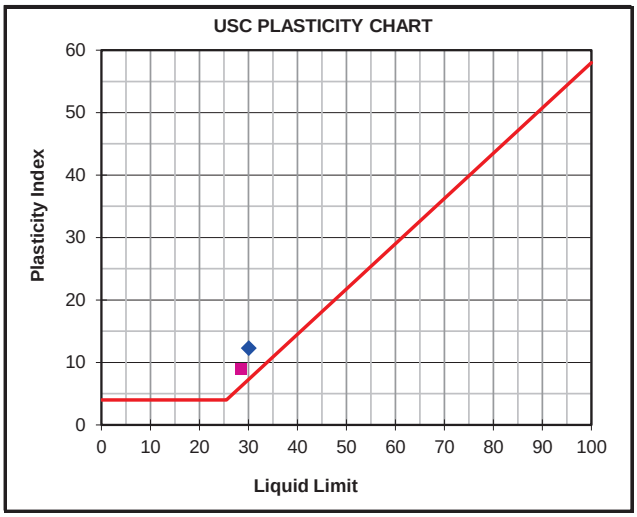


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm	100	
	28 mm	99	100
	20 mm	98	100
	14 mm	98	97
	5 mm	86	84
	2 mm	78	50
	1 mm	78	50
	0.425 mm	51	33
	0.250 mm	48	29
	0.150 mm	43	26
	0.075 mm	38	21
Grading Modulus		1.34	1.95

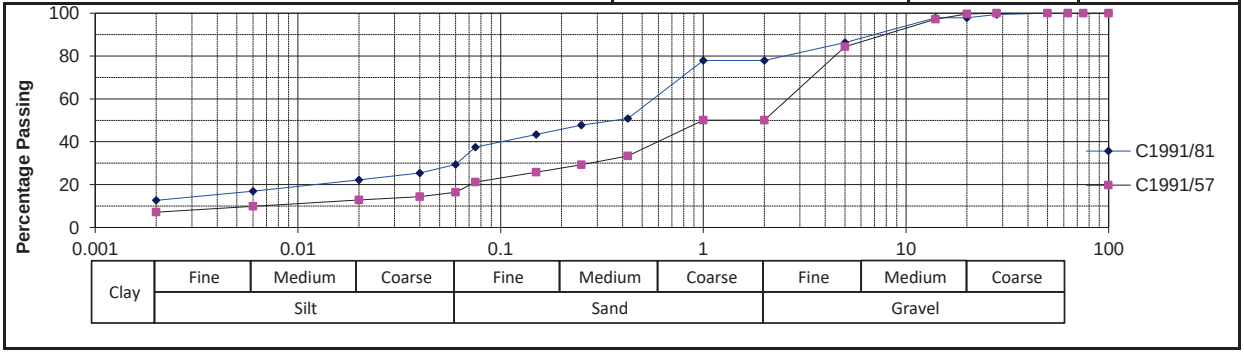


Hydrometer Analysis -2.00 mm -2.00 mm

Percentage Passing	0.060 mm	29	16
	0.040 mm	25	14
	0.020 mm	22	13
	0.006 mm	17	10
	0.002 mm	13	7
Gravel	%	22	50
Sand	%	49	34
Silt	%	17	9
Clay	%	13	7

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

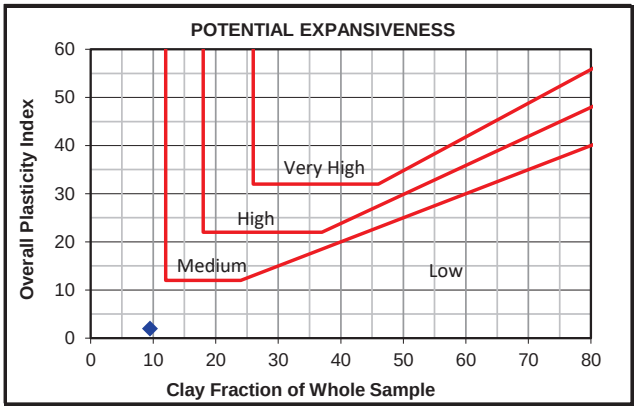
Laboratory Number		C1991/81 ◆	C1991/57 ■
Atterberg Limits			
Liquid Limit	%	30	28
Plasticity Index	%	12	9
Linear Shrinkage	%	6.5	4.0
Overall PI	%	6	3
Classifications			
HRB (AASHTO)		A-6(1)	A-2-4(0)
Unified (ASTM D2487)		SC	SC
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/62 ◆	■
Field Number		TPRA10	
Client Reference			
Depth (m)		0.00-0.50	
Position			
Coordinates	X		
	Y		
Visual Description		Silty Gravelly clay	
Classification Description		Clayey gravel \ silty sand \ Silt-Clay Materials	
Stabilizing Agent			

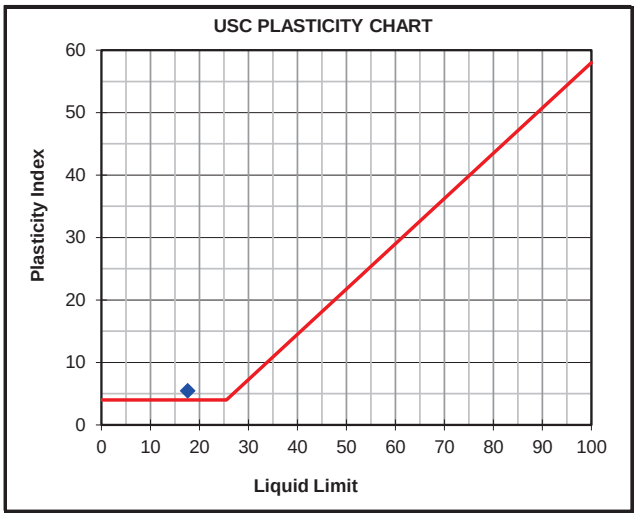


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

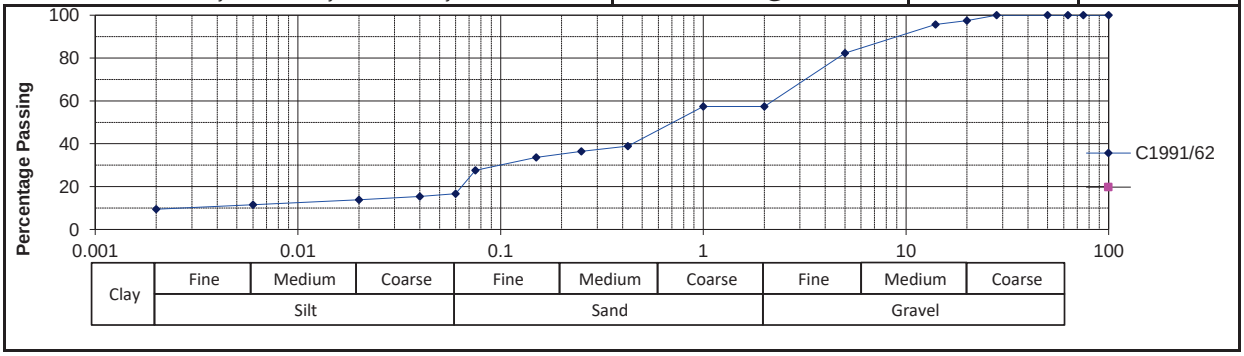
Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm	100	
	20 mm	98	
	14 mm	96	
	5 mm	82	
	2 mm	57	
	1 mm	57	
	0.425 mm	39	
	0.250 mm	36	
	0.150 mm	34	
	0.075 mm	28	
Grading Modulus		1.76	



Hydrometer Analysis		-0.425 mm	-0.075 mm
Percentage Passing	0.060 mm	17	
	0.040 mm	15	
	0.020 mm	14	
	0.006 mm	12	
	0.002 mm	9	
Gravel	%	43	
Sand	%	41	
Silt	%	7	
Clay	%	9	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

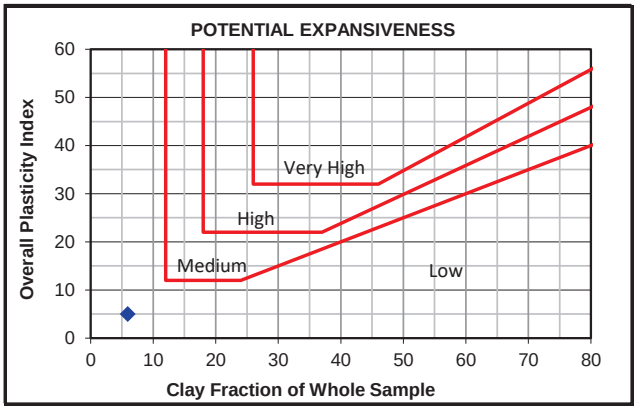
Laboratory Number		C1991/62 ◆	■
Atterberg Limits			
Liquid Limit	%	18	
Plasticity Index	%	5	
Linear Shrinkage	%	2.5	
Overall PI	%	2	
Classifications			
HRB (AASHTO)		A-2-4(0)	
Unified (ASTM D2487)		SC-SM	
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/44 ◆	■
Field Number		TPRE06	
Client Reference			
Depth (m)		0.60-1.50	
Position			
Coordinates	X		
	Y		
Visual Description		Shale	
Classification Description		Clayey gravel \ Silt-Clay Materials	
Stabilizing Agent			

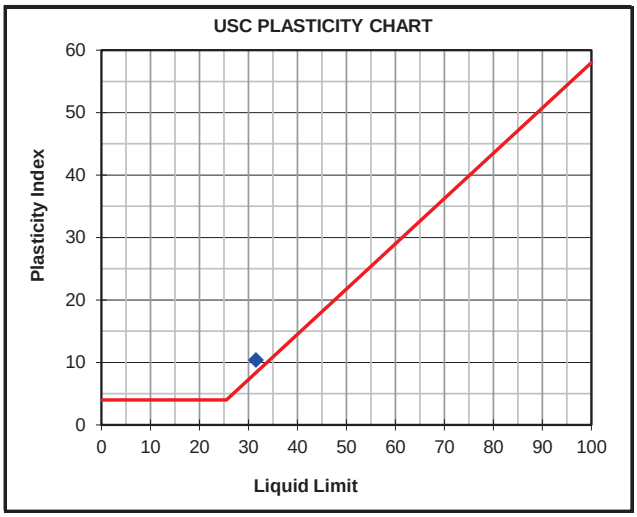


Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm	
	75 mm	
	63 mm	100
	50 mm	95
	37.5 mm	90
	28 mm	88
	20 mm	84
	14 mm	80
	5 mm	64
	2 mm	57
	1 mm	57
	0.425 mm	46
	0.250 mm	40
	0.150 mm	36
	0.075 mm	31
Grading Modulus		1.66



Hydrometer Analysis -2.00 mm -0.425 mm

Percentage Passing	0.060 mm	23	
	0.040 mm	20	
	0.020 mm	18	
	0.006 mm	12	
	0.002 mm	6	
Gravel	%	43	
Sand	%	33	
Silt	%	17	
Clay	%	6	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

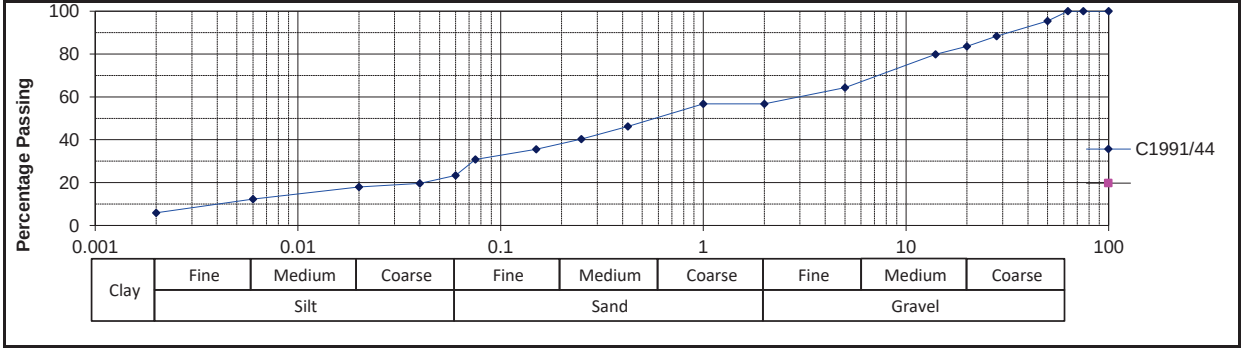
Laboratory Number		C1991/44 ◆	■

Atterberg Limits

Liquid Limit	%	32	
Plasticity Index	%	10	
Linear Shrinkage	%	5.5	
Overall PI	%	5	

Classifications

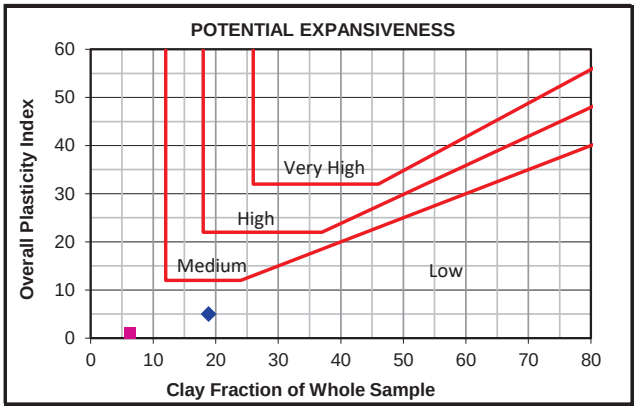
HRB (AASHTO)	A-2-6(0)	
Unified (ASTM D2487)	SC	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/35 ◆	C1991/28 ■
Field Number		TPR06	TPD12
Client Reference			
Depth (m)		0.40-1.50	0.80-1.50
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	Silty Clay
Classification Description		Silty sand \ Silt-Clay Materials	Silty gravel \ Silt-Clay Materials
Stabilizing Agent			

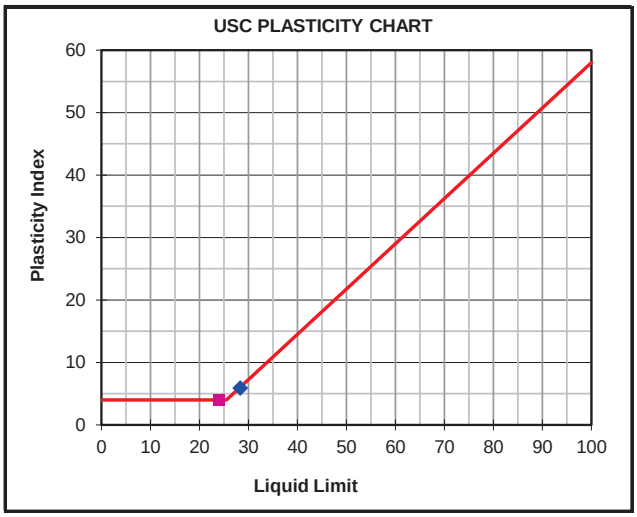


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		100
	37.5 mm		97
	28 mm		84
	20 mm	100	70
	14 mm	99	68
	5 mm	99	49
	2 mm	98	42
	1 mm	98	42
	0.425 mm	84	20
	0.250 mm	71	18
	0.150 mm	57	17
	0.075 mm	42	16
Grading Modulus		0.76	2.23



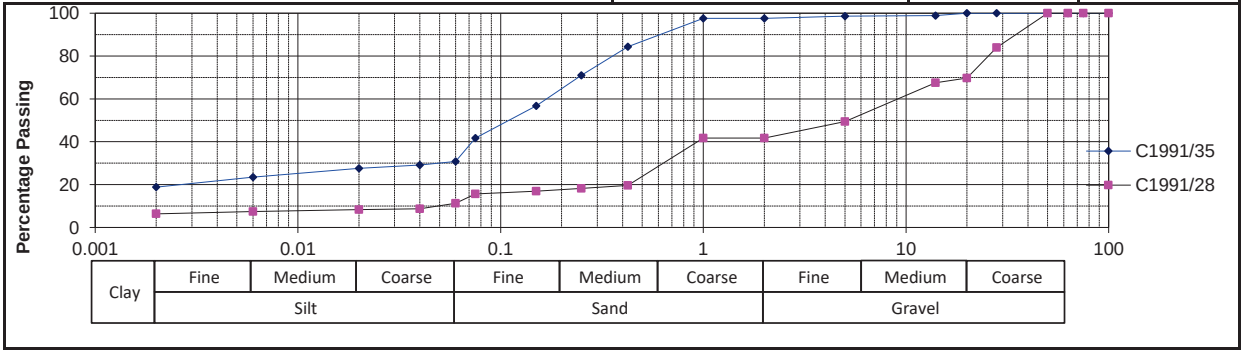
Hydrometer Analysis		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	31	11
	0.040 mm	29	9
	0.020 mm	28	8
	0.006 mm	23	7
	0.002 mm	19	6
Gravel	%	2	58
Sand	%	67	31
Silt	%	12	5
Clay	%	19	6

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/35 ◆	C1991/28 ■
Atterberg Limits			
Liquid Limit	%	28	24
Plasticity Index	%	6	4
Linear Shrinkage	%	3.5	2.5
Overall PI	%	5	1

Classifications

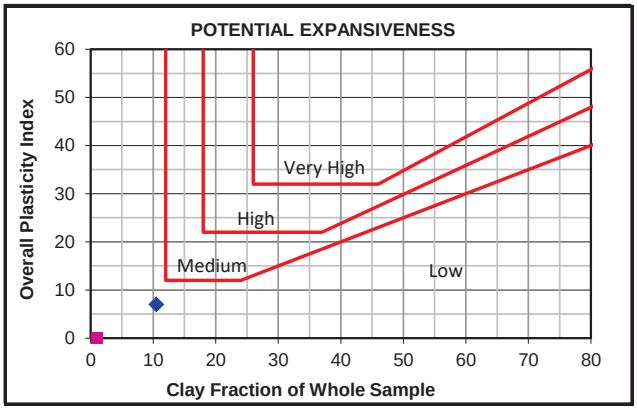
HRB (AASHTO)	A-4(0)	A-1-b(0)
Unified (ASTM D2487)	SM	GM
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/45 ◆	■
Field Number		TPRE09	
Client Reference			
Depth (m)		0.30-1.50	
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	
Classification Description		Clayey sand \ Silt-Clay Materials	
Stabilizing Agent			

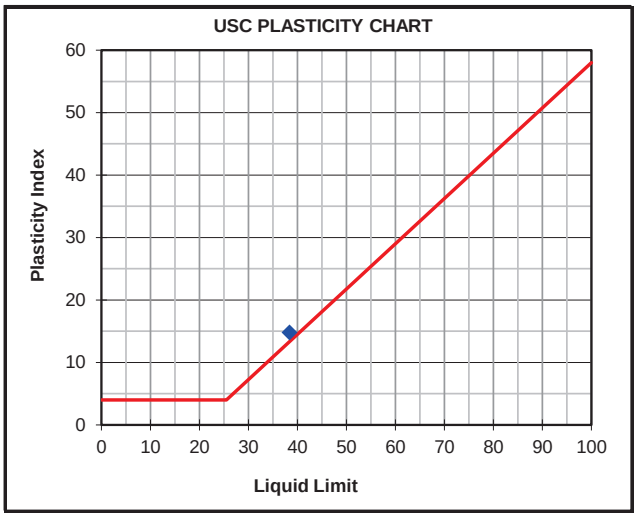


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm	100	
	5 mm	100	
	2 mm	94	
	1 mm	94	
	0.425 mm	45	
	0.250 mm	40	
	0.150 mm	35	
	0.075 mm	30	
Grading Modulus		1.31	



Hydrometer Analysis -0.425 mm -0.425 mm

Percentage Passing	0.060 mm	15	
	0.040 mm	14	
	0.020 mm	13	
	0.006 mm	12	
	0.002 mm	11	
Gravel	%	6	
Sand	%	79	
Silt	%	4	
Clay	%	11	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

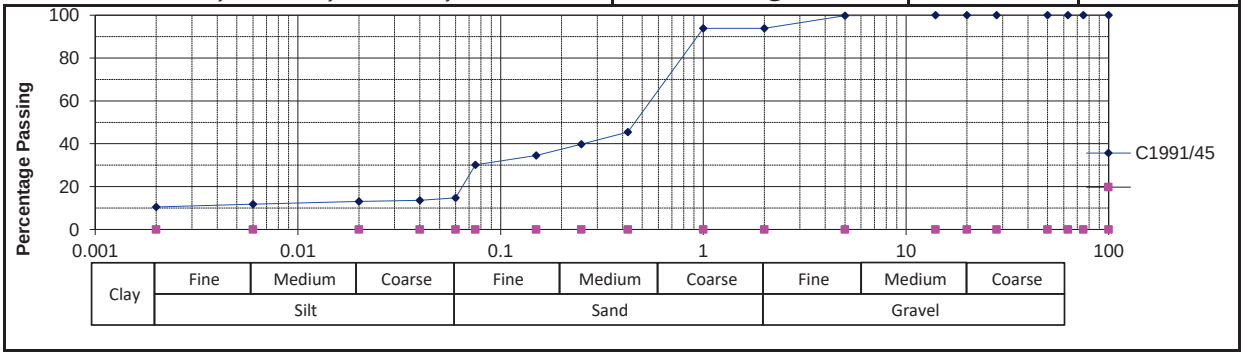
Laboratory Number		C1991/45 ◆	■

Atterberg Limits

Liquid Limit	%	38	
Plasticity Index	%	15	
Linear Shrinkage	%	7.0	
Overall PI	%	7	

Classifications

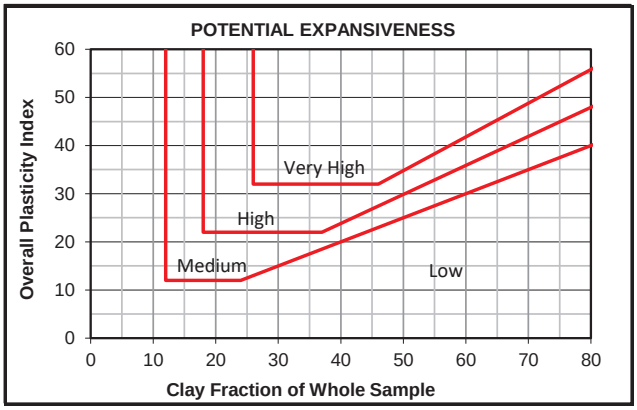
HRB (AASHTO)	A-2-6(1)	
Unified (ASTM D2487)	SC-SM	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/1 ◆	C1991/23 ■
Field Number		TPP08	TPD06
Client Reference			
Depth (m)		1.00-3.00	0.00-0.70
Position			
Coordinates	X		
	Y		
Visual Description		Silty Sand	Silty Clay
Classification Description		Silty sand \ Silt-Clay Materials	Silty sand \ Silt-Clay Materials
Stabilizing Agent			

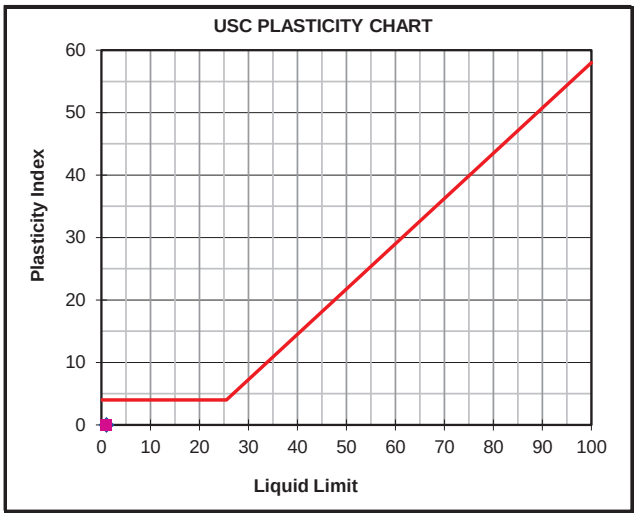


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm	100	100
	5 mm	100	100
	2 mm	100	99
	1 mm	100	99
	0.425 mm	82	87
	0.250 mm	63	76
	0.150 mm	45	56
	0.075 mm	21	26
Grading Modulus		0.97	0.87

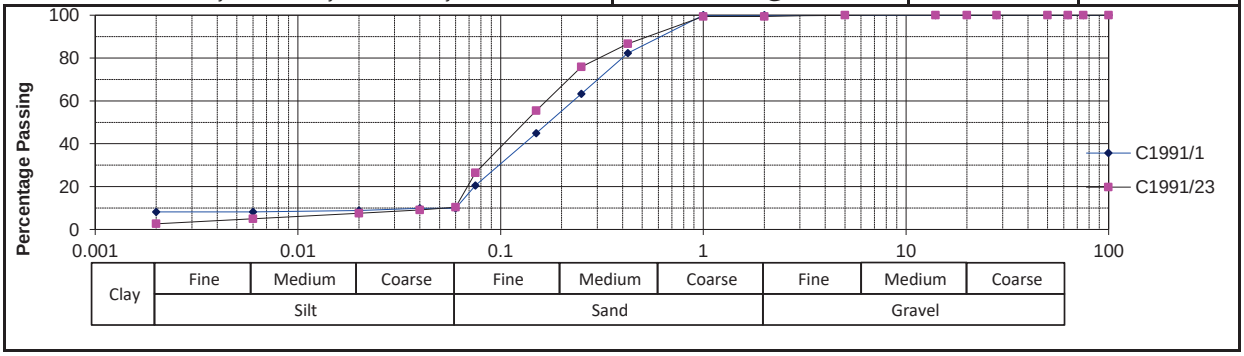


Hydrometer Analysis

		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	10	10
	0.040 mm	10	9
	0.020 mm	9	8
	0.006 mm	8	5
	0.002 mm	8	3
Gravel	%	0	1
Sand	%	90	89
Silt	%	2	8
Clay	%	8	3

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/1 ◆	C1991/23 ■
Atterberg Limits			
Liquid Limit	%		
Plasticity Index	%	NP	NP
Linear Shrinkage	%	0.0	0.0
Overall PI	%		
Classifications			
HRB (AASHTO)		A-2-4(0)	A-2-4(0)
Unified (ASTM D2487)		SM	SM
Weston Swell @ 1 kPa			



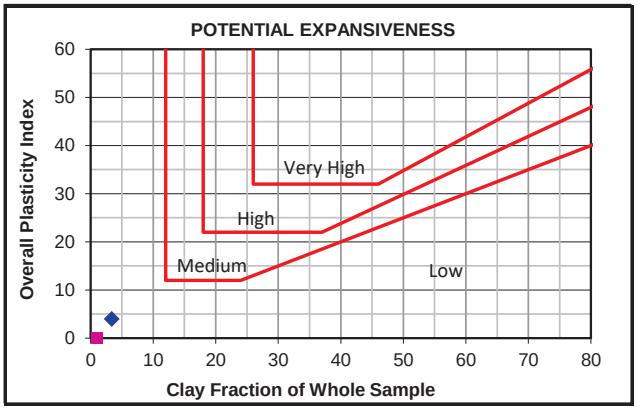
Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

Job Card No: C-1991

FOUNDATION INDICATOR

Laboratory Number		C1991/13 ◆	■
Field Number		TPP27	
Client Reference			
Depth (m)		1.20-3.00	
Position			
Coordinates	X		
	Y		
Visual Description		Shale	
Classification Description		Clayey sand \ Silt-Clay Materials	
Stabilizing Agent			

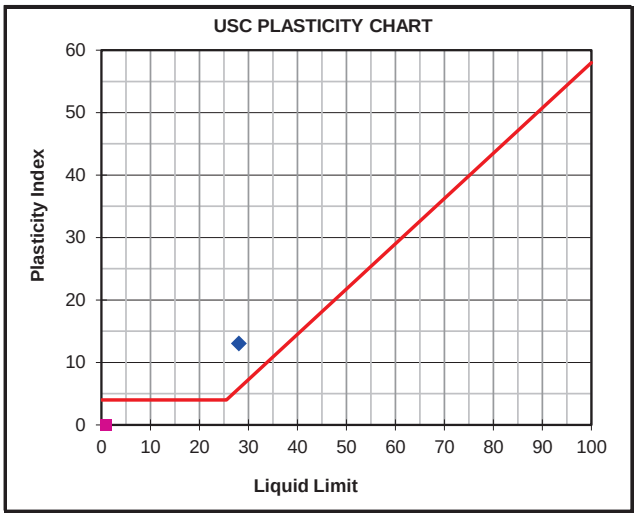


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm	100	
	75 mm	88	
	63 mm	88	
	50 mm	88	
	37.5 mm	88	
	28 mm	88	
	20 mm	87	
	14 mm	80	
	5 mm	63	
	2 mm	53	
	1 mm	53	
	0.425 mm	28	
	0.250 mm	23	
	0.150 mm	18	
	0.075 mm	12	
Grading Modulus		2.07	



Hydrometer Analysis		**-0.425 mm**	**-0.425 mm**
Percentage Passing	0.060 mm	8	
	0.040 mm	7	
	0.020 mm	7	
	0.006 mm	5	
	0.002 mm	3	
Gravel	%	47	
Sand	%	44	
Silt	%	5	
Clay	%	3	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

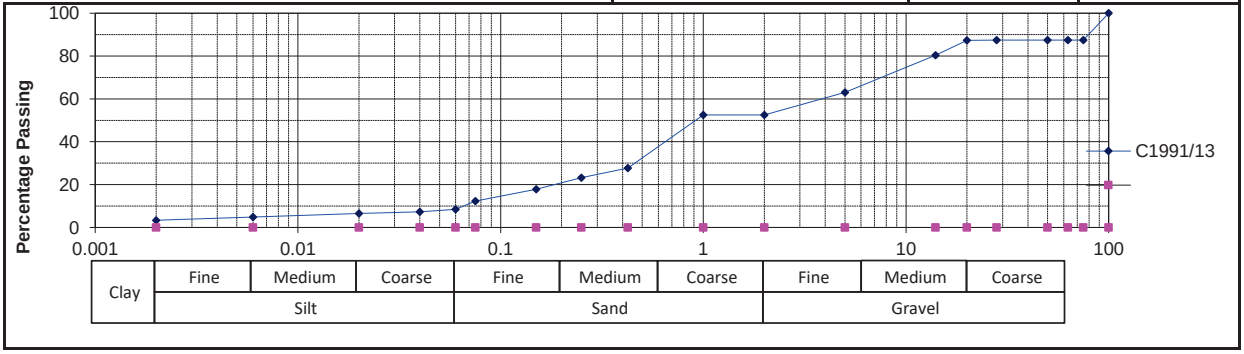
Laboratory Number		C1991/13 ◆	■

Atterberg Limits

Liquid Limit	%	28	
Plasticity Index	%	13	
Linear Shrinkage	%	6.5	
Overall PI	%	4	

Classifications

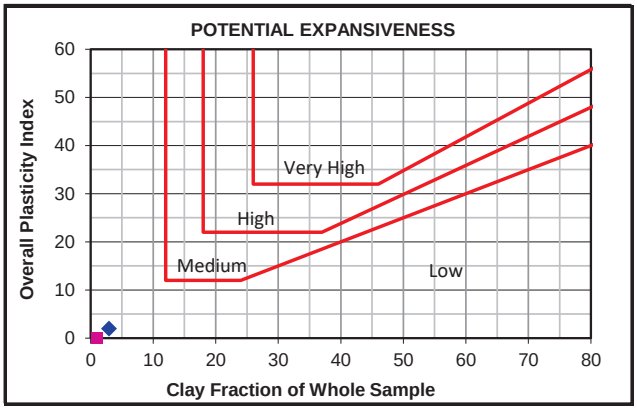
HRB (AASHTO)	A-2-6(0)	
Unified (ASTM D2487)	SP-SC	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/7 ◆	■
Field Number		TPP14	
Client Reference			
Depth (m)		0.90-2.20	
Position			
Coordinates	X		
	Y		
Visual Description		Shale	
Classification Description		Poorly graded gravel \ clayey gravel \ Silt-Clay Materials	
Stabilizing Agent			

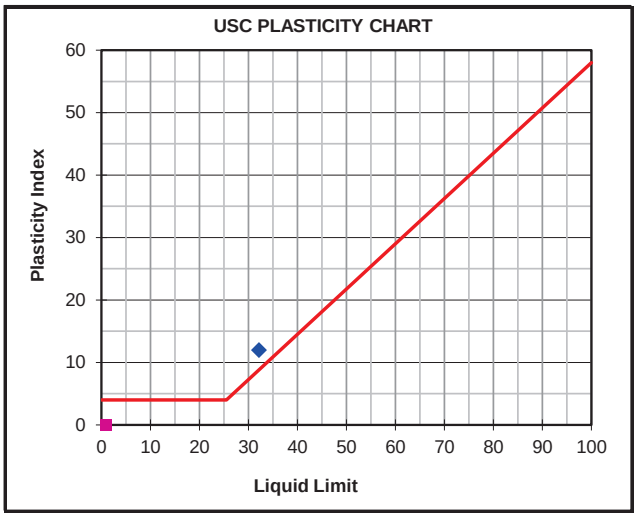


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm	100	
	28 mm	91	
	20 mm	78	
	14 mm	68	
	5 mm	46	
	2 mm	35	
	1 mm	35	
	0.425 mm	17	
	0.250 mm	14	
	0.150 mm	12	
	0.075 mm	10	
Grading Modulus		2.38	



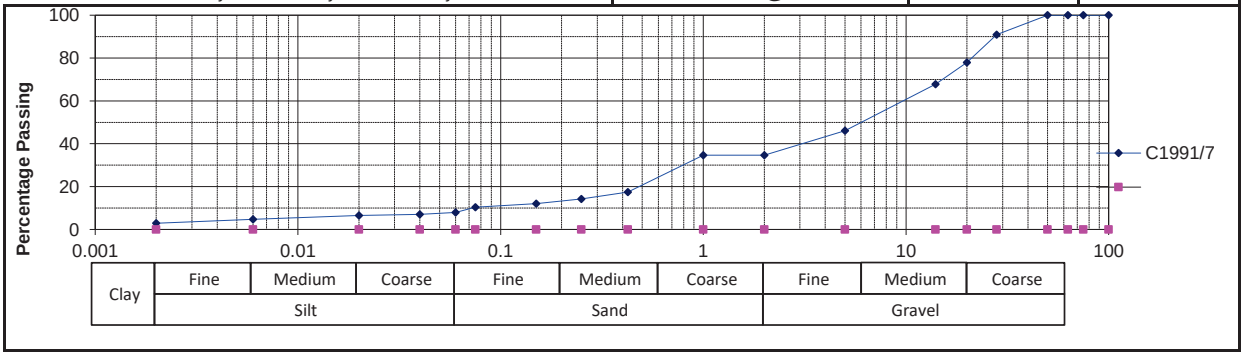
Hydrometer Analysis		-2.00 mm	-2.00 mm
Percentage Passing	0.060 mm	8	
	0.040 mm	7	
	0.020 mm	6	
	0.006 mm	5	
	0.002 mm	3	
Gravel	%	65	
Sand	%	27	
Silt	%	5	
Clay	%	3	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/7 ◆	■
Atterberg Limits			
Liquid Limit	%	32	
Plasticity Index	%	12	
Linear Shrinkage	%	6.0	
Overall PI	%	2	

Classifications

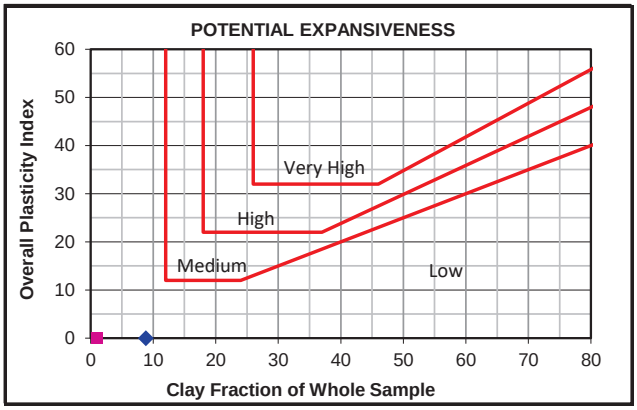
HRB (AASHTO)	A-2-6(0)	
Unified (ASTM D2487)	SP-SC	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/2◆	■
Field Number		TPP10	
Client Reference			
Depth (m)		0.00-0.60	
Position			
Coordinates	X		
	Y		
Visual Description		Silty Sand	
Classification Description		Poorly graded sand \ silty sand \ Silt-Clay Materials	
Stabilizing Agent			

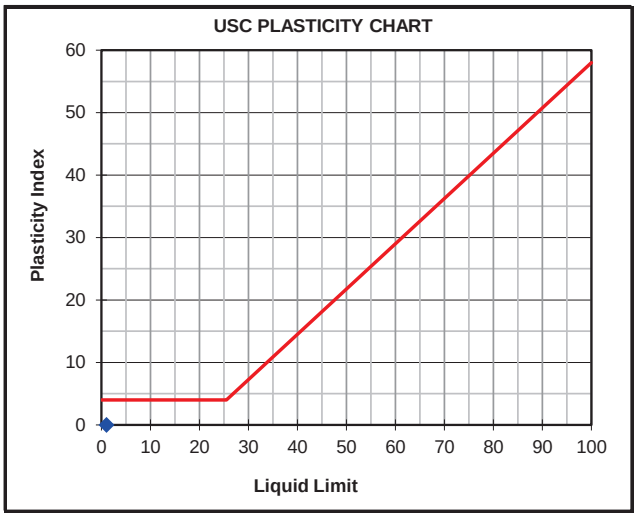


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm	100	
	5 mm	96	
	2 mm	92	
	1 mm	92	
	0.425 mm	55	
	0.250 mm	41	
	0.150 mm	27	
	0.075 mm	11	
Grading Modulus		1.41	



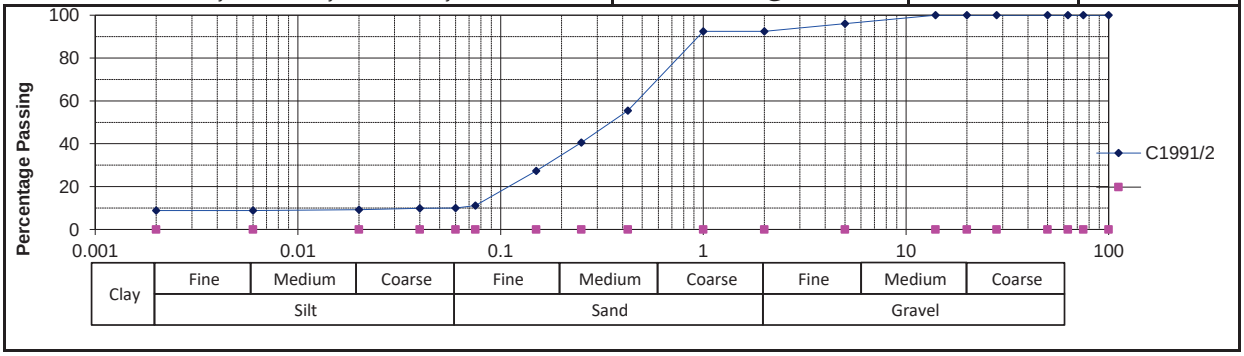
Hydrometer Analysis		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	10	
	0.040 mm	10	
	0.020 mm	9	
	0.006 mm	9	
	0.002 mm	9	
Gravel	%	8	
Sand	%	83	
Silt	%	1	
Clay	%	9	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/2 ◆	■
Atterberg Limits			
Liquid Limit	%		
Plasticity Index	%	NP	
Linear Shrinkage	%	0.0	
Overall PI	%		

Classifications

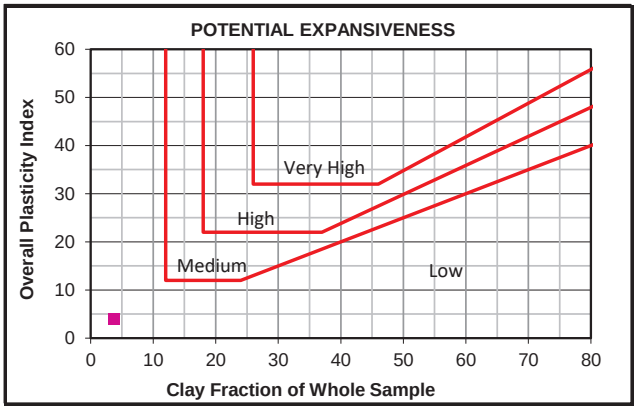
HRB (AASHTO)	A-2-4(0)	
Unified (ASTM D2487)	SW-SM	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/2 ◆	C1991/19 ■
Field Number		TPP10	TPP32
Client Reference			
Depth (m)		0.00-0.60	0.20-2.50
Position			
Coordinates	X		
	Y		
Visual Description		Silty Sand	Gravelly Clay
Classification Description		Poorly graded sand \ silty sand \ Silt-Clay Materials	Well-graded sand, fine to coarse sand \ silty sand \ Silt-
Stabilizing Agent			

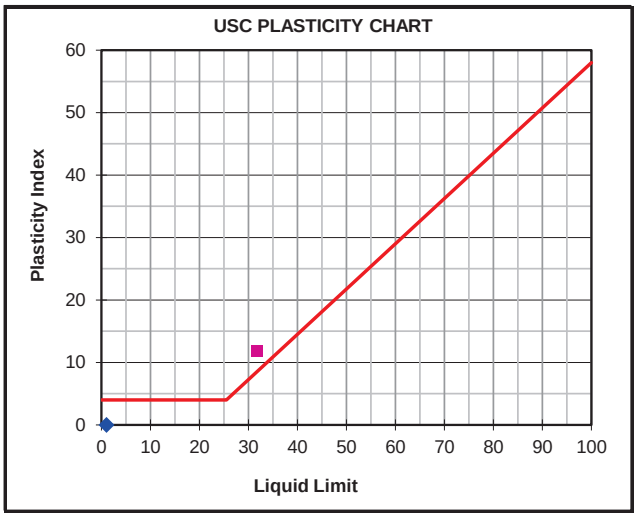


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		100
	20 mm		98
	14 mm	100	94
	5 mm	96	70
	2 mm	92	56
	1 mm	92	56
	0.425 mm	55	30
	0.250 mm	41	24
	0.150 mm	27	17
	0.075 mm	11	11
Grading Modulus		1.41	2.04



Hydrometer Analysis

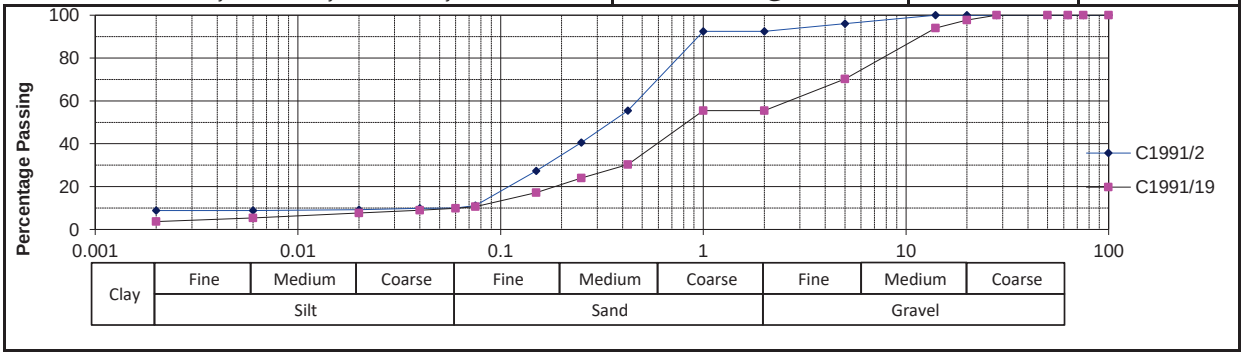
		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	10	10
	0.040 mm	10	9
	0.020 mm	9	8
	0.006 mm	9	5
	0.002 mm	9	4
Gravel	%	8	44
Sand	%	83	46
Silt	%	1	6
Clay	%	9	4

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/2 ◆	C1991/19 ■
Atterberg Limits			
Liquid Limit	%		32
Plasticity Index	%	NP	12
Linear Shrinkage	%	0.0	5.5
Overall PI	%		4

Classifications

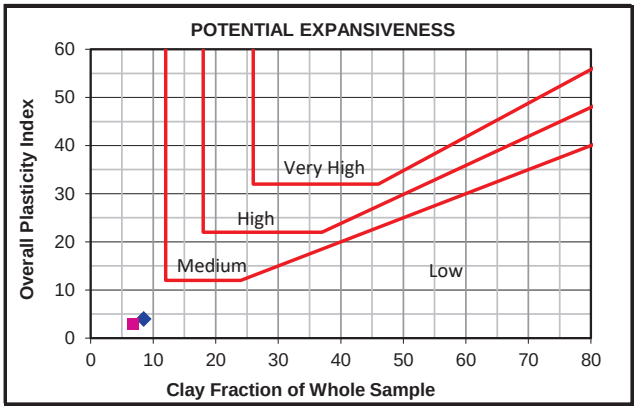
HRB (AASHTO)	A-2-4(0)	A-2-6(0)
Unified (ASTM D2487)	SP-SM	SW-SC
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/11 ◆	C1991/16 ■
Field Number		TPP21	TPP30
Client Reference			
Depth (m)		1.30-3.10	0.60-1.30
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Gravelly Clay
Classification Description		Clayey sand \ Silt-Clay Materials	Clayey sand \ Silt-Clay Materials
Stabilizing Agent			

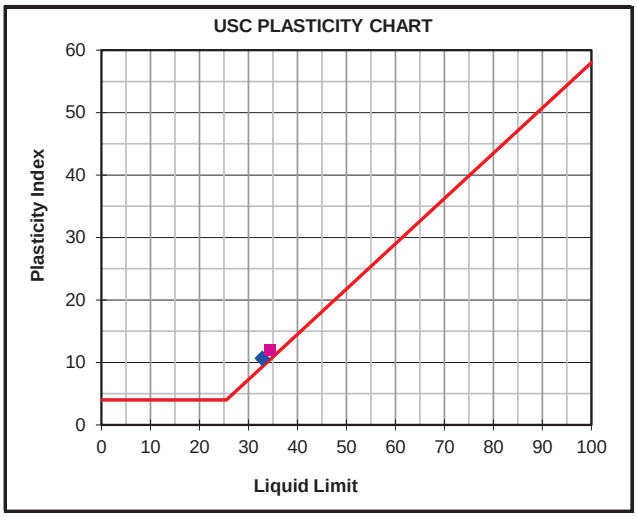


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

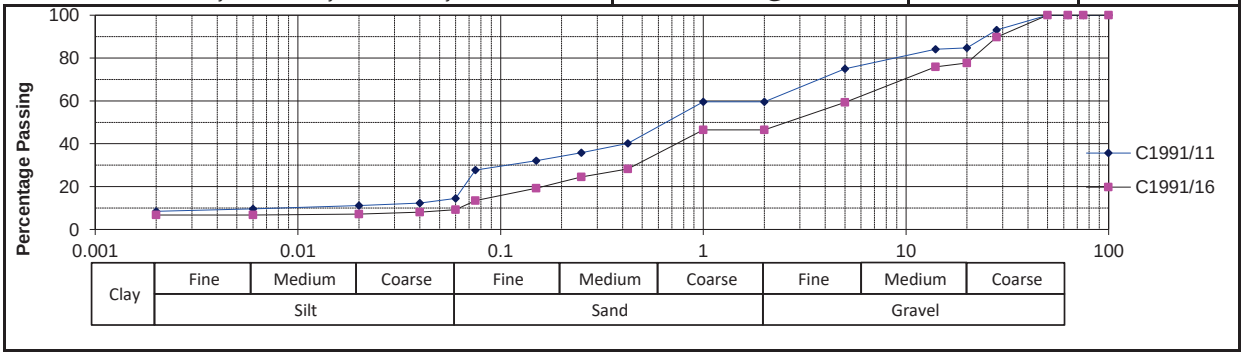
Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		100
	37.5 mm	100	92
	28 mm	93	90
	20 mm	85	78
	14 mm	84	76
	5 mm	75	59
	2 mm	60	46
	1 mm	60	46
	0.425 mm	40	28
	0.250 mm	36	24
	0.150 mm	32	19
	0.075 mm	28	13
Grading Modulus		1.72	2.12



Hydrometer Analysis		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	15	9
	0.040 mm	12	8
	0.020 mm	11	7
	0.006 mm	10	7
	0.002 mm	8	7
Gravel	%	40	54
Sand	%	45	37
Silt	%	6	3
Clay	%	8	7

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

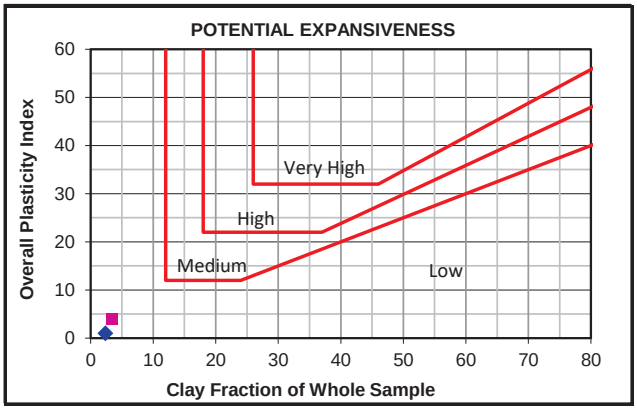
Laboratory Number		C1991/11 ◆	C1991/16 ■
Atterberg Limits			
Liquid Limit	%	33	34
Plasticity Index	%	11	12
Linear Shrinkage	%	6.0	6.0
Overall PI	%	4	3
Classifications			
HRB (AASHTO)		A-2-6(0)	A-2-6(0)
Unified (ASTM D2487)		SC	SC
Weston Swell @ 1 kPa			



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/33 ◆	C1991/13 ■
Field Number		TPR03	TPP27
Client Reference			
Depth (m)		0.60-1.60	1.20-3.00
Position			
Coordinates	X		
	Y		
Visual Description		Shale	Silty Sand
Classification Description		Silty gravel \ Silt-Clay Materials	Clayey sand \ Silt-Clay Materials
Stabilizing Agent			

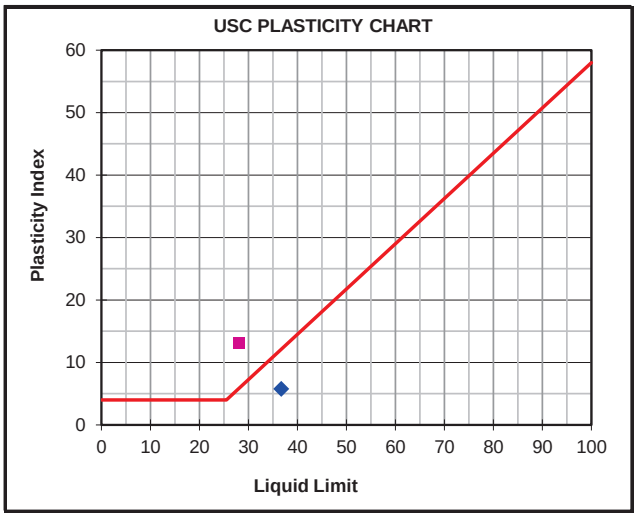


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		100
	75 mm	100	88
	63 mm	93	88
	50 mm	91	88
	37.5 mm	74	88
	28 mm	67	88
	20 mm	59	87
	14 mm	52	80
	5 mm	37	63
	2 mm	32	53
	1 mm	32	53
	0.425 mm	22	28
	0.250 mm	20	23
	0.150 mm	18	18
	0.075 mm	17	12
Grading Modulus		2.29	2.07



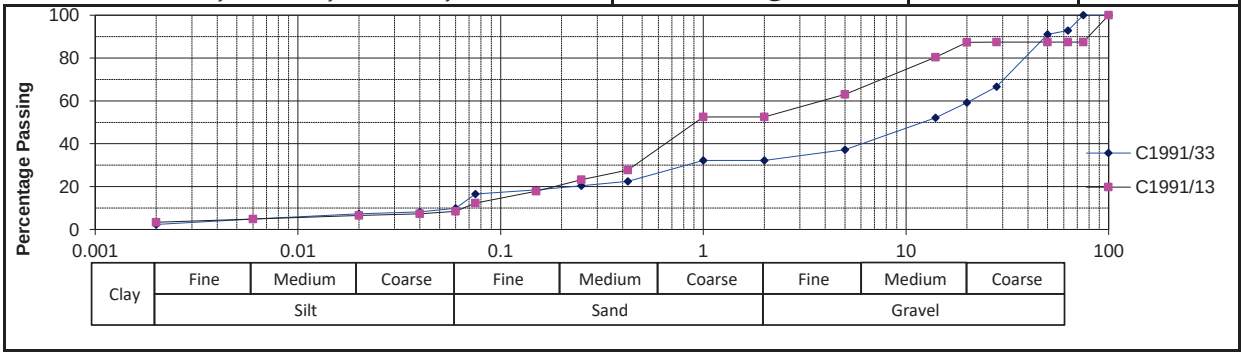
Hydrometer Analysis		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	10	8
	0.040 mm	8	7
	0.020 mm	7	7
	0.006 mm	5	5
	0.002 mm	2	3
Gravel	%	68	47
Sand	%	22	44
Silt	%	8	5
Clay	%	2	3

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/33 ◆	C1991/13 ■
Atterberg Limits			
Liquid Limit	%	37	28
Plasticity Index	%	6	13
Linear Shrinkage	%	3.5	6.5
Overall PI	%	1	4

Classifications

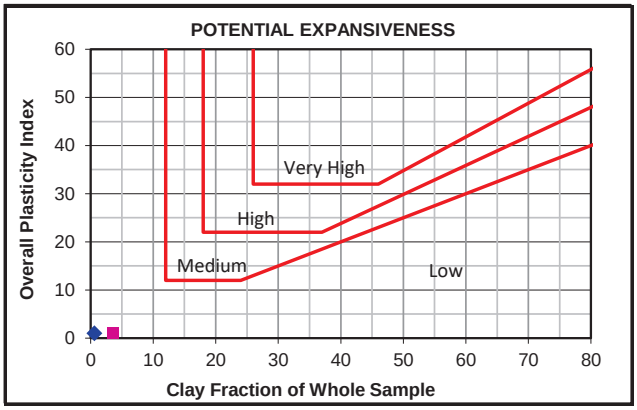
HRB (AASHTO)	A-1-b(0)	A-2-6(0)
Unified (ASTM D2487)	GM	SC
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

Laboratory Number		C1991/74 ◆	C1991/70 ■
Field Number		TPRA20	TPRA16
Client Reference			
Depth (m)		0.20-1.70	0.10-0.50
Position			
Coordinates	X		
	Y		
Visual Description		Clayey sand	Shale
Classification Description		Well-graded gravel, fine to coarse gravel \ Silt-Clay	Poorly graded gravel \ clayey gravel \ Silt-Clay Materials
Stabilizing Agent			

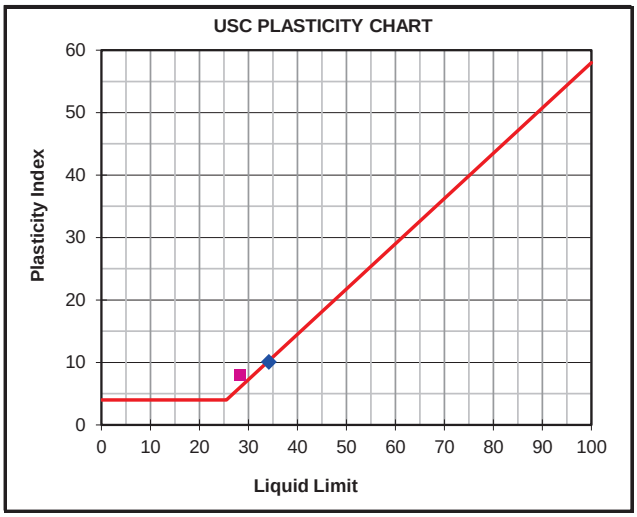


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		100
	50 mm	100	96
	37.5 mm	94	89
	28 mm	94	84
	20 mm	88	73
	14 mm	78	63
	5 mm	46	43
	2 mm	24	29
	1 mm	24	29
	0.425 mm	5	15
	0.250 mm	4	13
	0.150 mm	3	11
	0.075 mm	2	8
Grading Modulus		2.68	2.48



Hydrometer Analysis

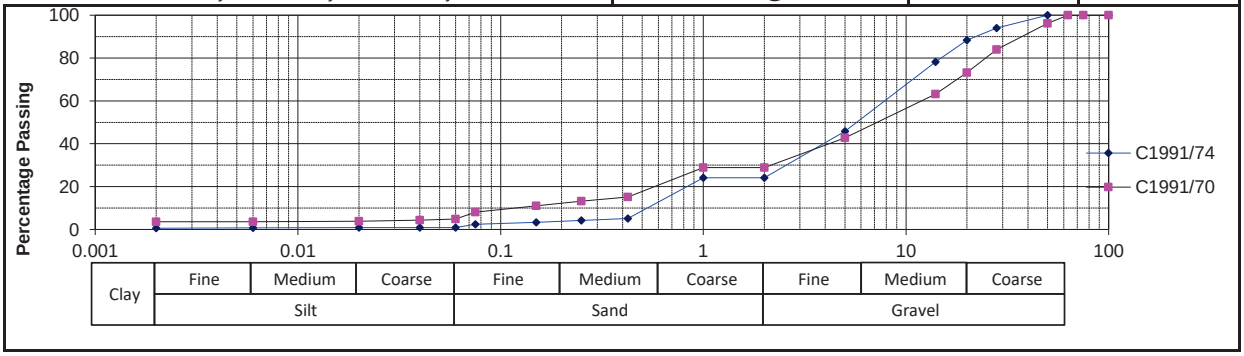
		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	1	5
	0.040 mm	1	4
	0.020 mm	1	4
	0.006 mm	1	4
	0.002 mm	1	4
Gravel	%	76	71
Sand	%	23	24
Silt	%	0	1
Clay	%	1	4

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/74 ◆	C1991/70 ■
Atterberg Limits			
Liquid Limit	%	34	28
Plasticity Index	%	10	8
Linear Shrinkage	%	5.0	4.0
Overall PI	%	1	1

Classifications

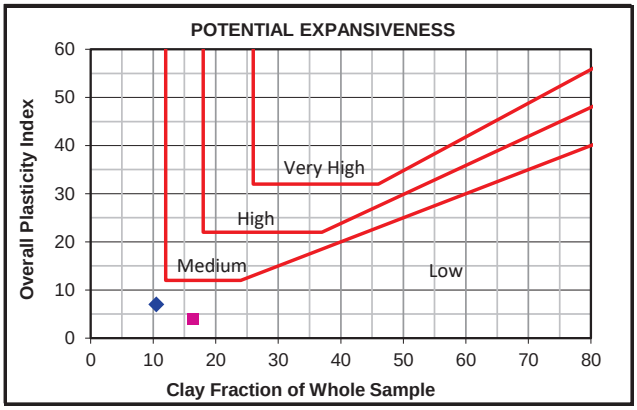
HRB (AASHTO)	A-2-6(0)	A-2-4(0)
Unified (ASTM D2487)	GW	GP-GC
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

FOUNDATION INDICATOR

		C1991/45 ◆	C1991/25 ■
Laboratory Number		C1991/45 ◆	C1991/25 ■
Field Number		TPRE09	TPD07
Client Reference			
Depth (m)		0.30-1.50	0.80-2.10
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	Silty Clay
Classification Description		Clayey sand \ Silt-Clay Materials	Silt \ Silt-Clay Materials
Stabilizing Agent			

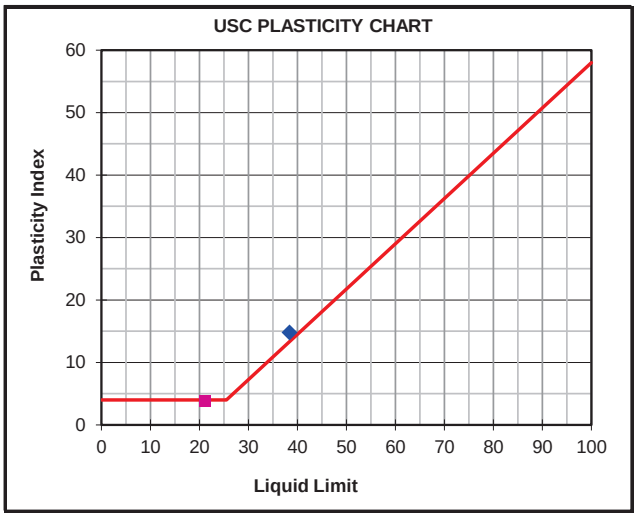


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm	100	100
	5 mm	100	100
	2 mm	94	100
	1 mm	94	100
	0.425 mm	45	96
	0.250 mm	40	83
	0.150 mm	35	71
	0.075 mm	30	54
Grading Modulus		1.31	0.50



Hydrometer Analysis

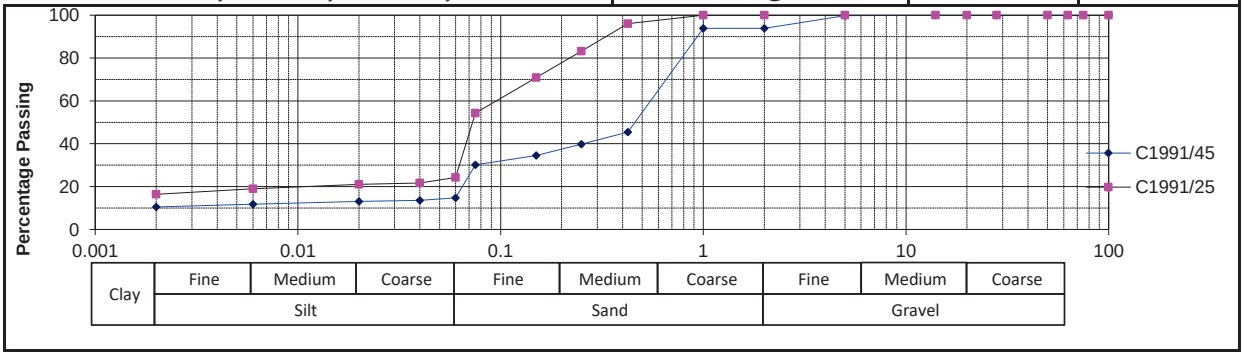
		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	15	24
	0.040 mm	14	22
	0.020 mm	13	21
	0.006 mm	12	19
	0.002 mm	11	16
Gravel	%	6	0
Sand	%	79	76
Silt	%	4	8
Clay	%	11	16

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/45 ◆	C1991/25 ■
Atterberg Limits			
Liquid Limit	%	38	21
Plasticity Index	%	15	4
Linear Shrinkage	%	7.0	2.5
Overall PI	%	7	4

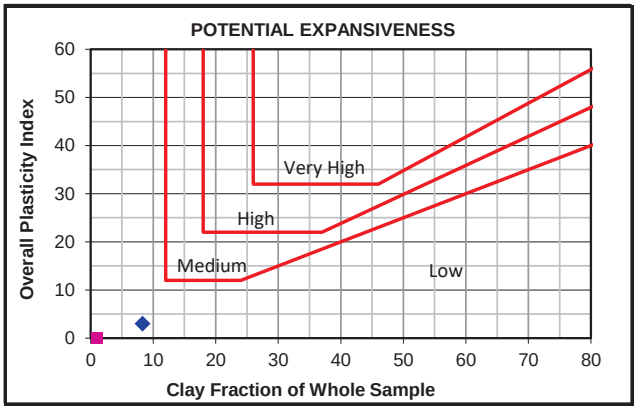
Classifications

HRB (AASHTO)	A-2-6(1)	A-4(0)
Unified (ASTM D2487)	SC	ML
Weston Swell @ 1 kPa		



FOUNDATION INDICATOR

Laboratory Number		C1991/32 ◆	■
Field Number		TPR03	
Client Reference			
Depth (m)		0.20-0.60	
Position			
Coordinates	X		
	Y		
Visual Description		Silty Clay	
Classification Description		Clayey sand \ Silt-Clay Materials	
Stabilizing Agent			

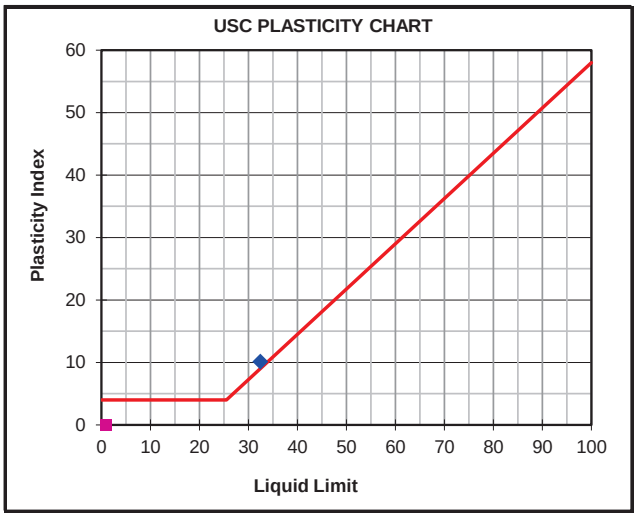


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm	100	
	37.5 mm	97	
	28 mm	95	
	20 mm	95	
	14 mm	92	
	5 mm	69	
	2 mm	60	
	1 mm	60	
	0.425 mm	33	
	0.250 mm	29	
	0.150 mm	24	
	0.075 mm	20	
Grading Modulus		1.86	



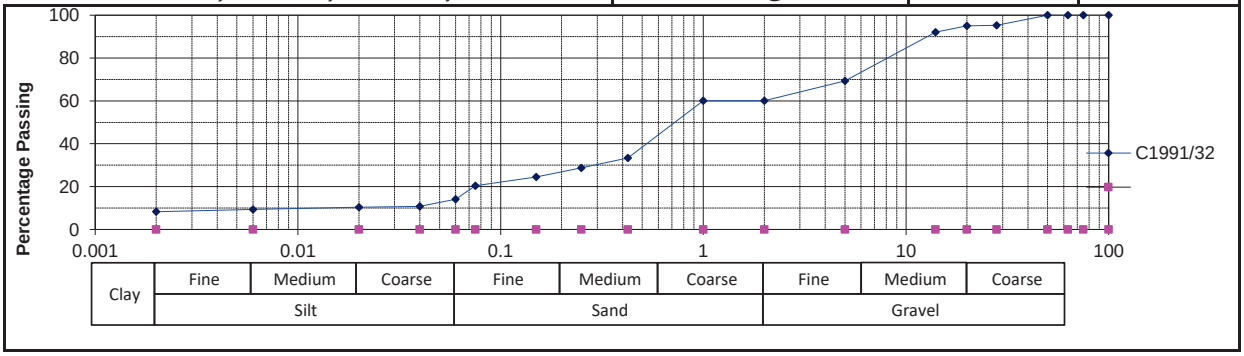
Hydrometer Analysis		**-0.075 mm**	**-0.075 mm**
Percentage Passing	0.060 mm	14	
	0.040 mm	11	
	0.020 mm	10	
	0.006 mm	9	
	0.002 mm	8	
Gravel	%	40	
Sand	%	46	
Silt	%	6	
Clay	%	8	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/32 ◆	■
Atterberg Limits			
Liquid Limit	%	32	
Plasticity Index	%	10	
Linear Shrinkage	%	5.0	
Overall PI	%	3	

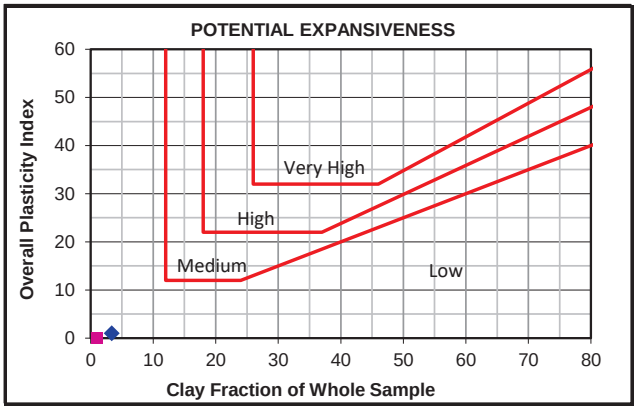
Classifications

HRB (AASHTO)	A-2-6(0)	
Unified (ASTM D2487)	SC	
Weston Swell @ 1 kPa		



FOUNDATION INDICATOR

Laboratory Number		C1991/33 ◆	■
Field Number		TPR03	
Client Reference			
Depth (m)		0.60-1.60	
Position			
Coordinates	X		
	Y		
Visual Description		Shale	
Classification Description		Silty gravel \ Silt-Clay Materials	
Stabilizing Agent			

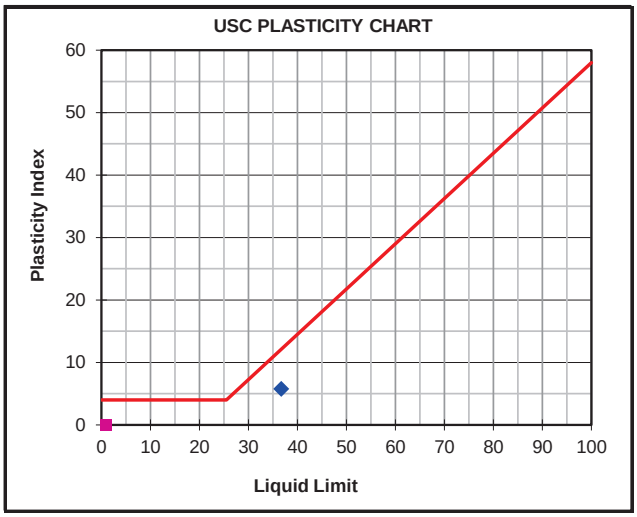


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

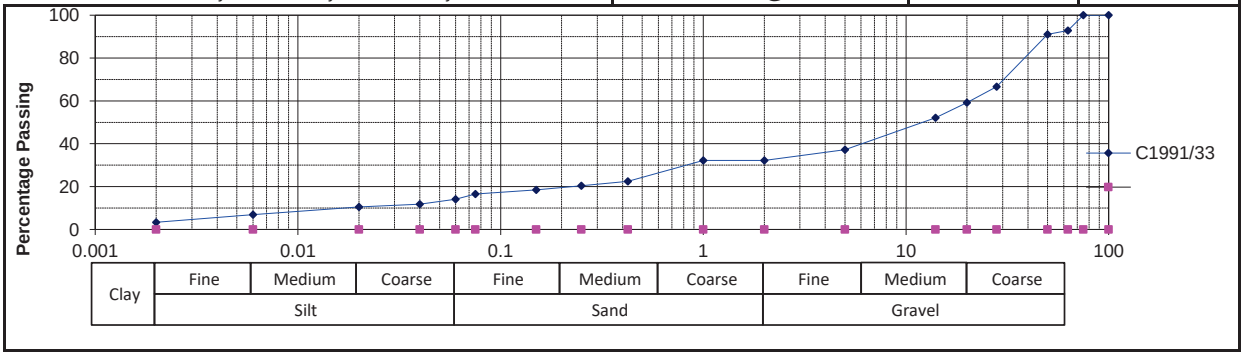
Percentage Passing	100 mm		
	75 mm	100	
	63 mm	93	
	50 mm	91	
	37.5 mm	74	
	28 mm	67	
	20 mm	59	
	14 mm	52	
	5 mm	37	
	2 mm	32	
	1 mm	32	
	0.425 mm	22	
	0.250 mm	20	
	0.150 mm	18	
	0.075 mm	17	
Grading Modulus		2.29	



Hydrometer Analysis		**-2.00 mm**	**-0.075 mm**
Percentage Passing	0.060 mm	14	
	0.040 mm	12	
	0.020 mm	10	
	0.006 mm	7	
	0.002 mm	3	
Gravel	%	68	
Sand	%	18	
Silt	%	11	
Clay	%	3	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/33 ◆	■
Atterberg Limits			
Liquid Limit	%	37	
Plasticity Index	%	6	
Linear Shrinkage	%	3.5	
Overall PI	%	1	
Classifications			
HRB (AASHTO)		A-1-b(0)	
Unified (ASTM D2487)		SP-SC	
Weston Swell @ 1 kPa			



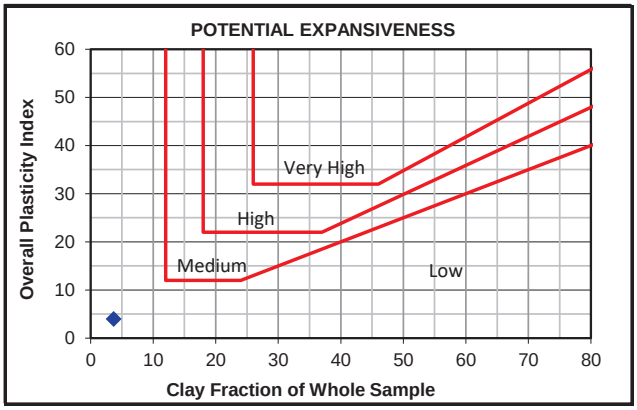
Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

Job Card No: C-1991 Page No.: 26 of 26

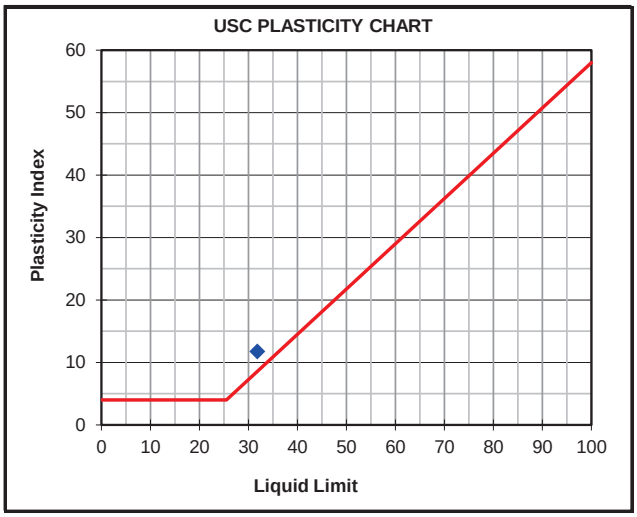
FOUNDATION INDICATOR

Laboratory Number		C1991/19 ◆	■
Field Number		TPP32	
Client Reference			
Depth (m)		0.20-2.50	
Position			
Coordinates	X		
	Y		
Visual Description		Gravelly Clay	
Classification Description		Well-graded sand, fine to coarse sand \ silty sand \ Silt-	
Stabilizing Agent			



Moisture Content & Relative Density

Moisture Content (%)	
Relative Density (S.G.)	



Sieve Analysis (Wet Prep)

Percentage Passing	100 mm	
	75 mm	
	63 mm	
	50 mm	
	37.5 mm	
	28 mm	100
	20 mm	98
	14 mm	94
	5 mm	70
	2 mm	56
	1 mm	56
	0.425 mm	30
	0.250 mm	24
	0.150 mm	17
	0.075 mm	11
Grading Modulus		2.04

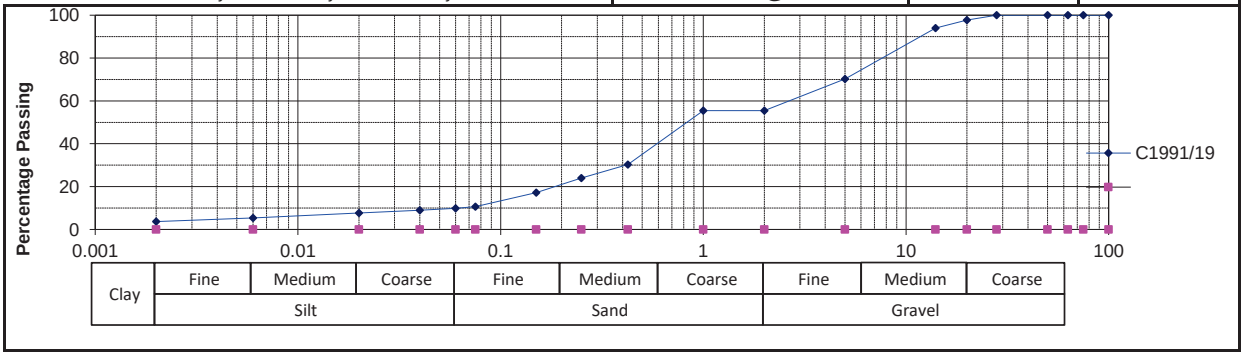
Hydrometer Analysis		-0.425 mm	-0.425 mm
Percentage Passing	0.060 mm	10	
	0.040 mm	9	
	0.020 mm	8	
	0.006 mm	5	
	0.002 mm	4	
Gravel	%	44	
Sand	%	46	
Silt	%	6	
Clay	%	4	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		C1991/19 ◆	■
Atterberg Limits			
Liquid Limit	%	32	
Plasticity Index	%	12	
Linear Shrinkage	%	5.5	
Overall PI	%	4	

Classifications

HRB (AASHTO)	A-2-6(0)	
Unified (ASTM D2487)	SW-SC	
Weston Swell @ 1 kPa		



Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		◆	C1991/44 ■
Field Number			TPRE06
Client Reference			
Depth (m)			0.60-1.50
Position			
Coordinates	X		
	Y		
Description			Shale
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm		100
	75 mm		100
	63 mm		100
	50 mm		95
	37.5 mm		90
	28 mm		88
	20 mm		84
	14 mm		80
	5 mm		64
	2 mm		57
	1 mm		57
	0.425 mm		46
	0.075 mm		31
Grading Modulus			1.66

Soil Mortar Analysis

Coarse Sand		18
Coarse Fine Sand		11
Medium Fine Sand		8
Fine Fine Sand		8
Silt and Clay		54

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)		32
Plasticity Index (%)		10
Linear Shrinkage (%)		5.5

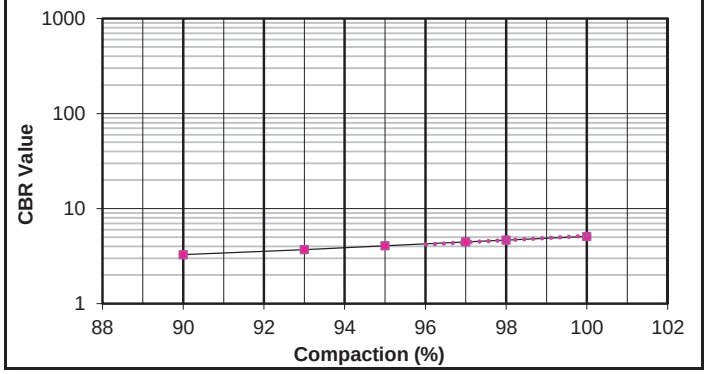
Laboratory No.		◆	C1991/44 ■

Maximum Dry Density & Optimum Moisture Content

MDD	kg/m^3		1885
OMC	%		13.4

California Bearing Ratio

Compaction Data							
Moisture	%				13.0		
Dry Density	kg/m^3				1794	1721	1665
Compaction	%				100.0	95.9	92.8
Penetration Data							
CBR at	2.5 mm				5	4	4
	5.00 mm				7	5	4
	7.50 mm				8	5	4
Swell @ 96hrs (%)					1.7	1.9	2.2
Final Moisture (%)					25.47	26.75	25.21

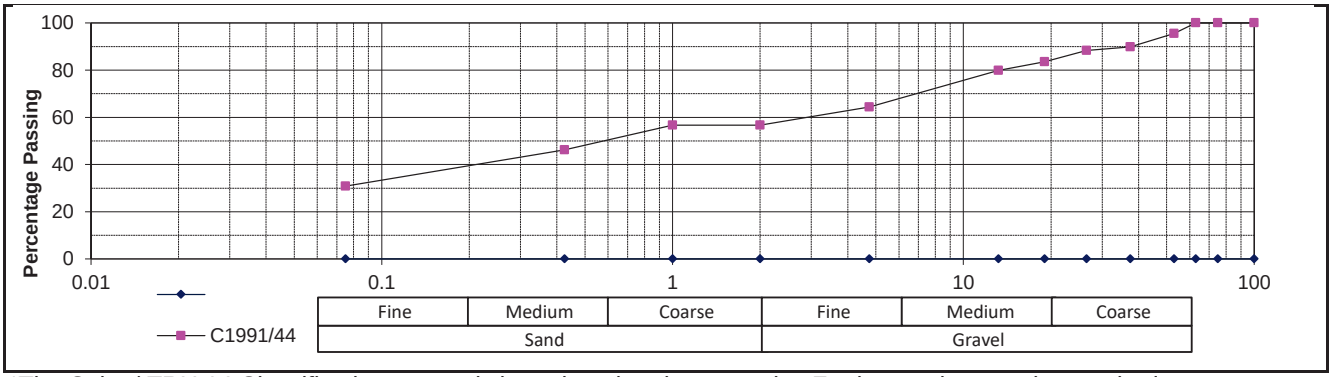


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO		5
	@ 98%			5
	@ 97%			4
	@ 95%			4
	@ 93%			4
	@ 90%			3
	@ SANS3001 Midpoint			5

Classifications

HRB (AASHTO)		A-2-6(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/83 ◆	C1991/85 ■
Field Number		TPD01	TPD04B
Client Reference			
Depth (m)		0.00-5.10	2.40-6
Position			
Coordinates	X		
	Y		
Description		Silty Sand	Clayey silty sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

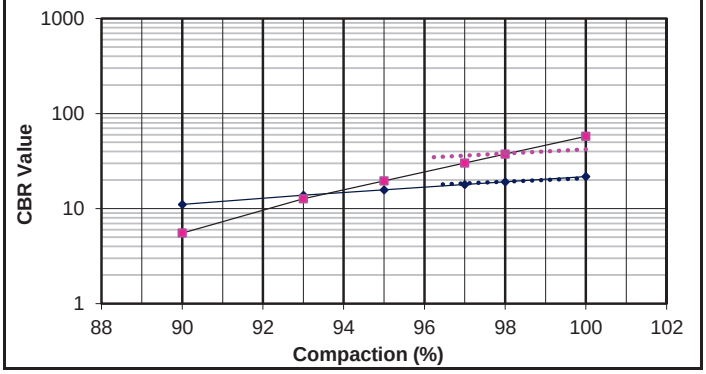
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	100
	2 mm	100	100
	1 mm	100	100
	0.425 mm	93	98
	0.075 mm	12	22
Grading Modulus		0.95	0.80

Soil Mortar Analysis

Coarse Sand	7	2
Coarse Fine Sand	26	19
Medium Fine Sand	34	31
Fine Fine Sand	21	26
Silt and Clay	12	22

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)		
Plasticity Index (%)	NP	NP
Linear Shrinkage (%)		

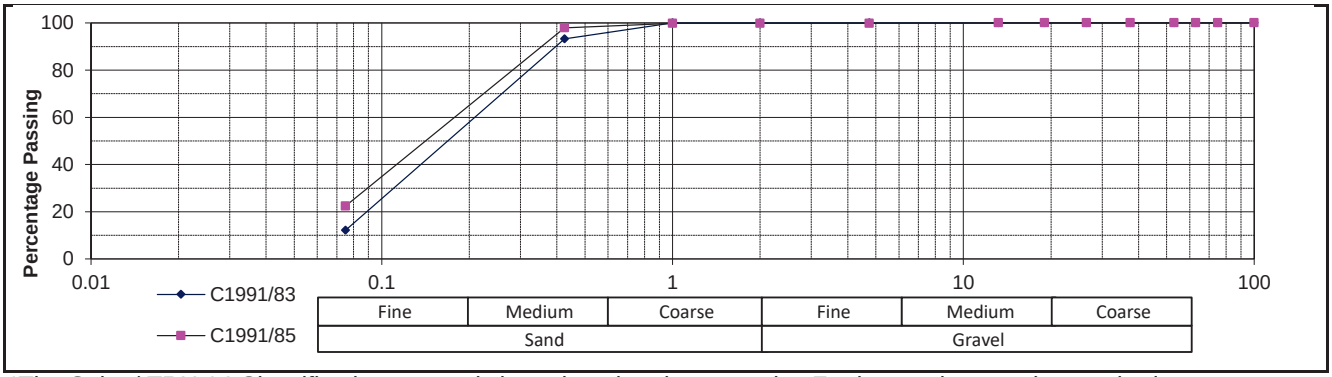
Laboratory No.		C1991/83 ◆			C1991/85 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1722			2019		
OMC	%	11.4			9.5		
California Bearing Ratio							
Compaction Data							
Moisture	%	11.0			9.1		
Dry Density	kg/m^3	1579	1523	1465	1894	1822	1748
Compaction	%	100.0	96.5	92.8	100.0	96.2	92.3
Penetration Data							
CBR at	2.5 mm	21	18	14	42	35	11
	5.00 mm	22	17	13	40	30	11
	7.50 mm	18	14	11	30	24	11
Swell @ 96hrs (%)		0.1	0.4	0.6			
Final Moisture (%)		26.7	35.0	33.7	16.13	17.98	19.3



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	22	58
	@ 98%		19	37
	@ 97%		18	30
	@ 95%		16	20
	@ 93%		14	13
	@ 90%		11	6
	@ SANS3001 Midpoint		19	38

Classifications		
HRB (AASHTO)	A-2-4(0)	A-2-4(0)
COLTO*	G8	G8
TRH14*	G8	G10



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/22 ◆	C1991/23 ■
Field Number		TPD05	TPD06
Client Reference			
Depth (m)		1.10-1.70	0.00-0.70
Position			
Coordinates	X		
	Y		
Description		Silty Clay	Silty Clay
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

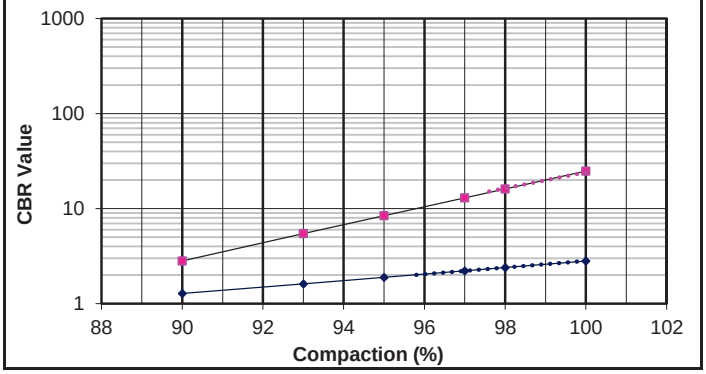
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	100
	2 mm	100	99
	1 mm	100	99
	0.425 mm	98	87
	0.075 mm	53	26
Grading Modulus		0.49	0.87

Soil Mortar Analysis

Coarse Sand	2	13
Coarse Fine Sand	13	11
Medium Fine Sand	15	21
Fine Fine Sand	17	29
Silt and Clay	53	27

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	24	
Plasticity Index (%)	9	NP
Linear Shrinkage (%)	5.5	

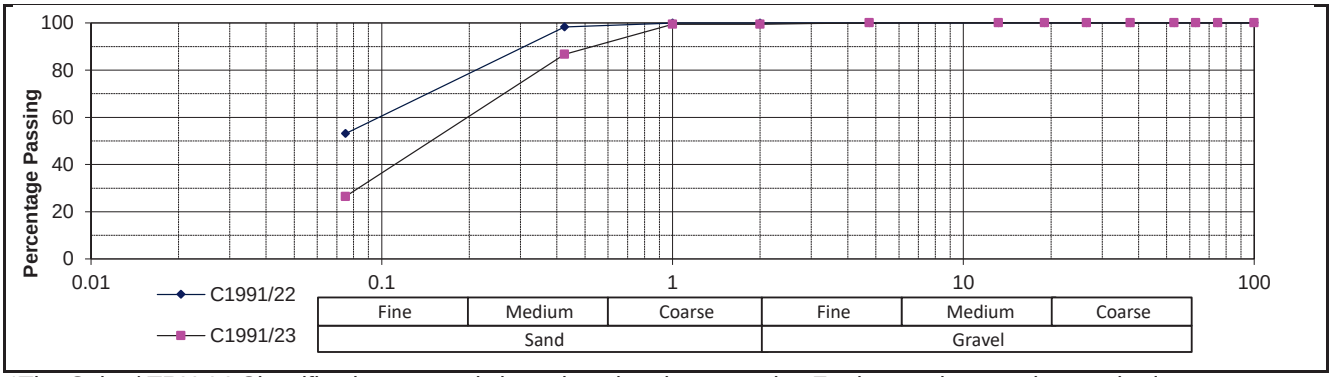
Laboratory No.		C1991/22 ◆			C1991/23 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	2027			1876		
OMC	%	9.2			10.8		
California Bearing Ratio							
Compaction Data							
Moisture	%	9.3			10.6		
Dry Density	kg/m^3	2023	1934	1895	1854	1806	1718
Compaction	%	100.0	95.6	93.7	100.0	97.4	92.7
Penetration Data							
CBR at	2.5 mm	3	2	2	24	15	5
	5.00 mm	3	2	2	26	13	7
	7.50 mm	4	3	2	24	12	10
Swell @ 96hrs (%)		1.7	2.3	2.5	0.2	0.3	0.5
Final Moisture (%)		12.1	10.0	5.0	12.71	13.36	18.16



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	3	25
	@ 98%		2	16
	@ 97%		2	13
	@ 95%		2	8
	@ 93%		2	5
	@ 90%		1	3
	@ SANS3001 Midpoint		2	19

Classifications		
HRB (AASHTO)	A-4(2)	A-2-4(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/1 ◆	C1991/4 ■
Field Number		TPP08	TPP10
Client Reference			
Depth (m)		1.00-3.00	0.90-1.70
Position			
Coordinates	X		
	Y		
Description		Silty Sand	Shale
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

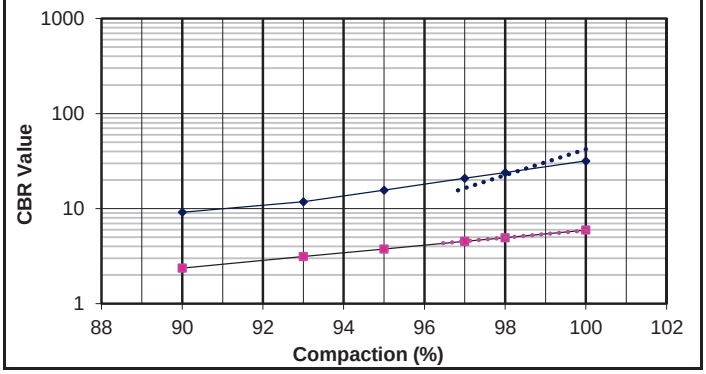
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	89
	50 mm	100	84
	37.5 mm	100	79
	28 mm	100	75
	20 mm	100	70
	14 mm	100	67
	5 mm	100	56
	2 mm	100	48
	1 mm	100	48
	0.425 mm	82	40
	0.075 mm	21	24
Grading Modulus		0.97	1.88

Soil Mortar Analysis

Coarse Sand	18	17
Coarse Fine Sand	19	14
Medium Fine Sand	18	10
Fine Fine Sand	24	10
Silt and Clay	21	49

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)		28
Plasticity Index (%)	NP	9
Linear Shrinkage (%)		4.5

Laboratory No.		C1991/1 ◆			C1991/4 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	2003			1879		
OMC	%	7.7			15.6		
California Bearing Ratio							
Compaction Data							
Moisture	%	7.4			15.4		
Dry Density	kg/m^3	1977	1913	1829	1876	1809	1731
Compaction	%	100.0	96.7	92.5	100.0	96.4	92.3
Penetration Data							
CBR at	2.5 mm	42	15	11	6	4	3
	5.00 mm	39	15	12	5	4	3
	7.50 mm	33	13	11	5	4	3
Swell @ 96hrs (%)					1.6	1.7	1.8
Final Moisture (%)		12.8	13.8	17.5	19.26	21.91	21.74

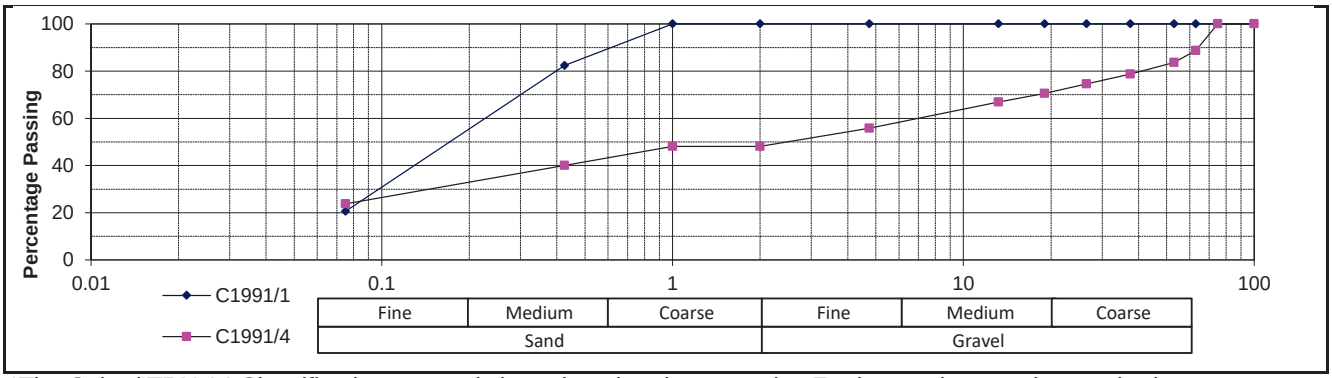


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	32	6
	@ 98%		24	5
	@ 97%		21	5
	@ 95%		16	4
	@ 93%		12	3
	@ 90%		9	2
	@ SANS3001 Midpoint		25	5

Classifications

HRB (AASHTO)	A-2-4(0)	A-2-4(0)
COLTO*	G8	
TRH14*	G9	



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/A1 ◆	C1991/A2 ■
Field Number		Sample 1	Sample 2
Client Reference			
Depth (m)			
Position			
Coordinates	X		
	Y		
Description			
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

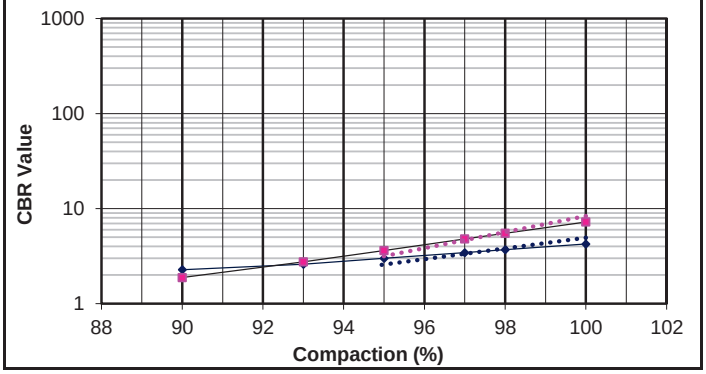
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	98	98
	37.5 mm	97	92
	28 mm	95	86
	20 mm	94	77
	14 mm	93	73
	5 mm	81	54
	2 mm	73	43
	1 mm	73	43
	0.425 mm	60	32
	0.075 mm	34	19
Grading Modulus		1.34	2.06

Soil Mortar Analysis

Coarse Sand	19	27
Coarse Fine Sand	12	12
Medium Fine Sand	11	8
Fine Fine Sand	13	9
Silt and Clay	46	43

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)		24
Plasticity Index (%)	NP	5
Linear Shrinkage (%)		2.5

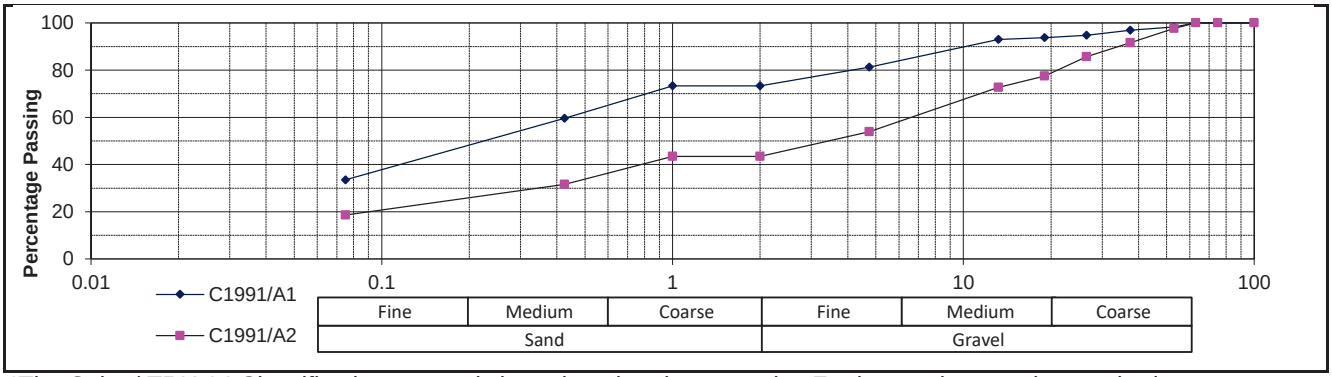
Laboratory No.		C1991/A1 ◆			C1991/A2 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	2013			2025		
OMC	%	6.3			6.5		
California Bearing Ratio							
Compaction Data							
Moisture	%	8.4			6.2		
Dry Density	kg/m^3	1973	1873	1809	2026	1923	1841
Compaction	%	100.0	94.9	91.7	100.0	94.9	90.9
Penetration Data							
CBR at	2.5 mm	5	3	2	8	3	2
	5.00 mm	5	2	2	7	3	2
	7.50 mm	6	3	3	6	3	2
Swell @ 96hrs (%)		0.1	0.1	0.1	0.1	0.1	0.1
Final Moisture (%)		20.9	19.8	21.4	12.26	17.14	18.72



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	4	7
	@ 98%		4	5
	@ 97%		3	5
	@ 95%		3	4
	@ 93%		3	3
	@ 90%		2	2
	@ SANS3001 Midpoint		4	5

Classifications		
HRB (AASHTO)	A-2-4(0)	
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/29 ◆	C1991/33 ■
Field Number		TPD12	TPR03
Client Reference			
Depth (m)		1.50-3.00	0.60-1.60
Position			
Coordinates	X		
	Y		
Description		Shale	Silty Clay
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

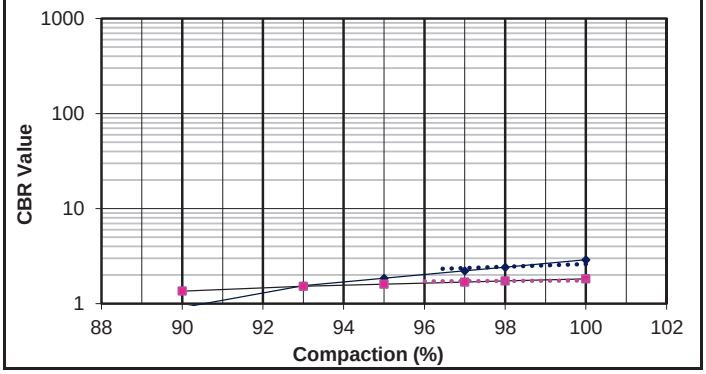
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	93
	50 mm	100	91
	37.5 mm	100	74
	28 mm	100	67
	20 mm	100	59
	14 mm	99	54
	5 mm	88	44
	2 mm	80	22
	1 mm	80	22
	0.425 mm	51	15
	0.075 mm	31	11
Grading Modulus		1.38	2.51

Soil Mortar Analysis

Coarse Sand	37	30
Coarse Fine Sand	9	6
Medium Fine Sand	8	6
Fine Fine Sand	7	6
Silt and Clay	39	52

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	32	37
Plasticity Index (%)	9	6
Linear Shrinkage (%)	4.0	3.5

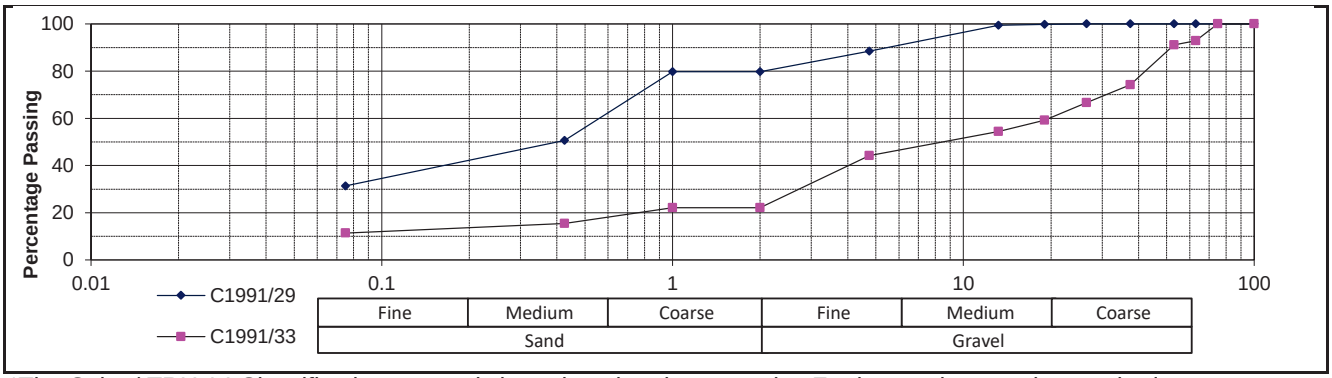
Laboratory No.		C1991/29 ◆			C1991/33 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1767			1791		
OMC	%	14.5			16.4		
California Bearing Ratio							
Compaction Data							
Moisture	%	14.1			16.1		
Dry Density	kg/m^3	1673	1612	1582	1780	1709	1659
Compaction	%	100.0	96.4	94.5	100.0	96.0	93.2
Penetration Data							
CBR at	2.5 mm	3	2	2	2	2	2
	5.00 mm	2	2	2	2	2	2
	7.50 mm	3	2	2	2	2	2
Swell @ 96hrs (%)		2.4	3.5	4.3	4.6	5.3	7.5
Final Moisture (%)		26.4	29.1	26.0	25.07	26.06	25.07



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	3	2
	@ 98%		2	2
	@ 97%		2	2
	@ 95%		2	2
	@ 93%		2	2
	@ 90%		1	1
	@ SANS3001 Midpoint		2	2

Classifications		
HRB (AASHTO)	A-2-4(0)	A-1-a(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/6 ◆	C1991/8 ■
Field Number		TPP12	TPP15
Client Reference			
Depth (m)		1.00-3.00	0.50-1.80
Position			
Coordinates	X		
	Y		
Description		Shale	Shale
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

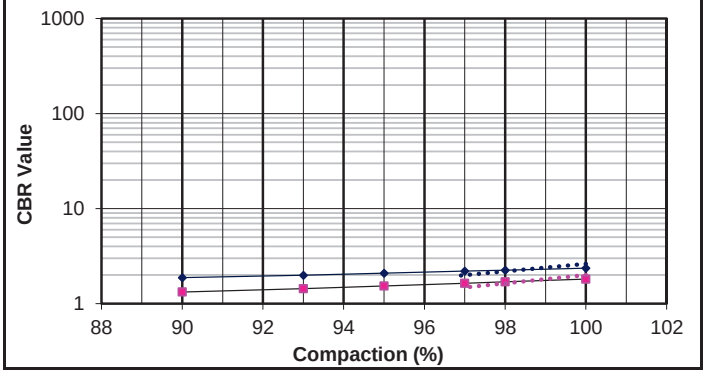
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	97
	28 mm	100	96
	20 mm	100	95
	14 mm	99	92
	5 mm	99	83
	2 mm	96	67
	1 mm	96	67
	0.425 mm	86	28
	0.075 mm	59	19
Grading Modulus		0.59	1.86

Soil Mortar Analysis

Coarse Sand	10	58
Coarse Fine Sand	9	3
Medium Fine Sand	9	5
Fine Fine Sand	10	6
Silt and Clay	61	29

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	34	38
Plasticity Index (%)	11	14
Linear Shrinkage (%)	6.5	7.5

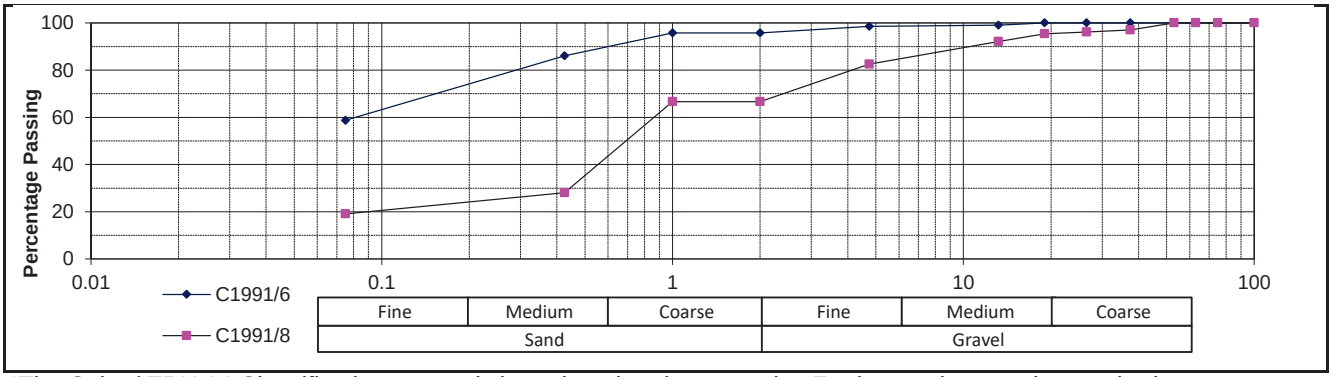
Laboratory No.		C1991/6 ◆			C1991/8 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1744			1804		
OMC	%	18.4			14.9		
California Bearing Ratio							
Compaction Data							
Moisture	%	18.5			14.6		
Dry Density	kg/m^3	1677	1624	1526	1808	1755	1649
Compaction	%	100.0	96.9	91.0	100.0	97.1	91.2
Penetration Data							
CBR at	2.5 mm	3	2	2	2	1	1
	5.00 mm	3	3	2	2	2	1
	7.50 mm	4	4	3	2	2	2
Swell @ 96hrs (%)		2.6	3.4	5.0	0.2	0.3	0.4
Final Moisture (%)		27.4	29.0	33.3	26.98	20.97	23.11



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	2	2
	@ 98%		2	2
	@ 97%		2	2
	@ 95%		2	2
	@ 93%		2	1
	@ 90%		2	1
	@ SANS3001 Midpoint		2	2

Classifications		
HRB (AASHTO)	A-6(4)	A-2-6(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/12 ◆	C1991/13 ■
Field Number		TPP22	TPP27
Client Reference			
Depth (m)		0.70-1.40	1.20-3.10
Position			
Coordinates	X		
	Y		
Description		Silty Clay	Silty Sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	100
	75 mm	100	88
	63 mm	100	88
	50 mm	100	88
	37.5 mm	97	88
	28 mm	92	88
	20 mm	88	87
	14 mm	85	80
	5 mm	70	63
	2 mm	64	53
	1 mm	64	53
	0.425 mm	57	28
	0.075 mm	37	12
Grading Modulus		1.43	2.07

Soil Mortar Analysis

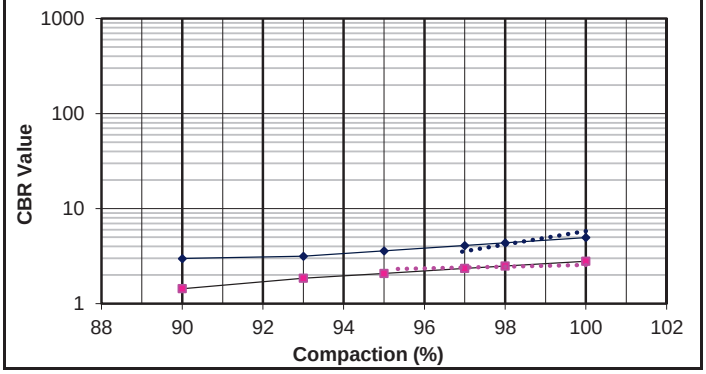
Coarse Sand	11	47
Coarse Fine Sand	7	8
Medium Fine Sand	10	10
Fine Fine Sand	15	10
Silt and Clay	57	24

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	24	28
Plasticity Index (%)	9	13
Linear Shrinkage (%)	5.0	6.5

Laboratory No.		C1991/12 ◆	C1991/13 ■
Maximum Dry Density & Optimum Moisture Content			
MDD	kg/m^3	1855	1884
OMC	%	14.8	14.2

California Bearing Ratio

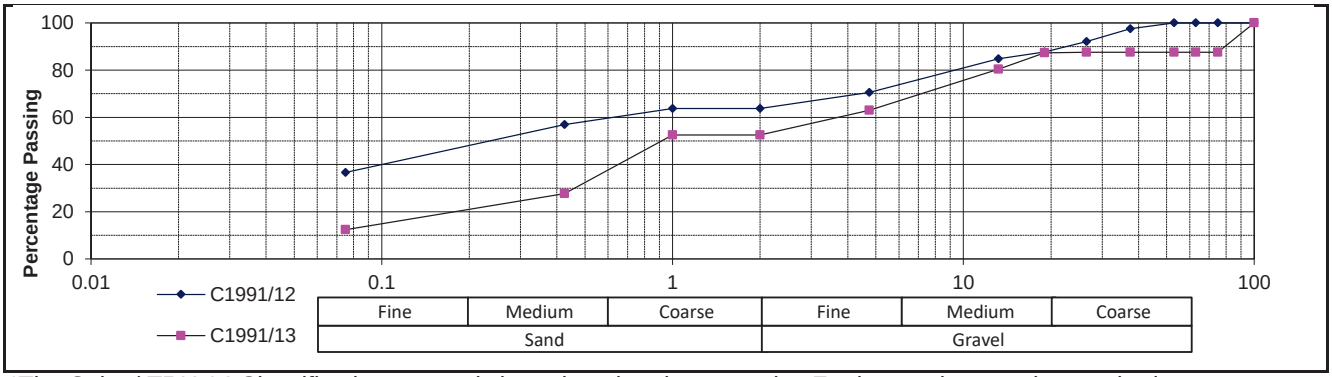
Compaction Data							
Moisture	%	14.6			14.5		
Dry Density	kg/m^3	1847	1788	1720	1883	1794	1742
Compaction	%	100.0	96.8	93.1	100.0	95.3	92.5
Penetration Data							
CBR at	2.5 mm	6	3	3	3	2	2
	5.00 mm	6	4	3	3	3	2
	7.50 mm	6	4	4	3	3	2
Swell @ 96hrs (%)		0.9	1.1	2.1	2.0	3.1	3.3
Final Moisture (%)		17.9	19.8	21.5	25.47	23.37	22.17



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	5	3
	@ 98%		4	2
	@ 97%		4	2
	@ 95%		4	2
	@ 93%		3	2
	@ 90%		3	1
	@ SANS3001 Midpoint		4	2

Classifications		
HRB (AASHTO)	A-4(0)	A-2-6(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/15 ◆	C1991/18 ■
Field Number		TPP28	TPP31
Client Reference			
Depth (m)		1.60-3.20	0.80-2.90
Position			
Coordinates	X		
	Y		
Description		Shale	Silty Sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

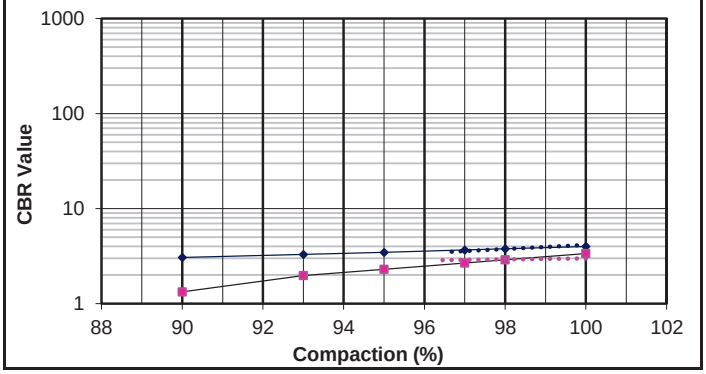
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	97	100
	50 mm	93	100
	37.5 mm	84	100
	28 mm	73	96
	20 mm	65	94
	14 mm	63	88
	5 mm	50	69
	2 mm	44	56
	1 mm	44	56
	0.425 mm	38	35
	0.075 mm	25	20
Grading Modulus		1.92	1.89

Soil Mortar Analysis

Coarse Sand	14	39
Coarse Fine Sand	11	7
Medium Fine Sand	9	9
Fine Fine Sand	11	10
Silt and Clay	56	36

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	35	36
Plasticity Index (%)	12	20
Linear Shrinkage (%)	6.0	10.5

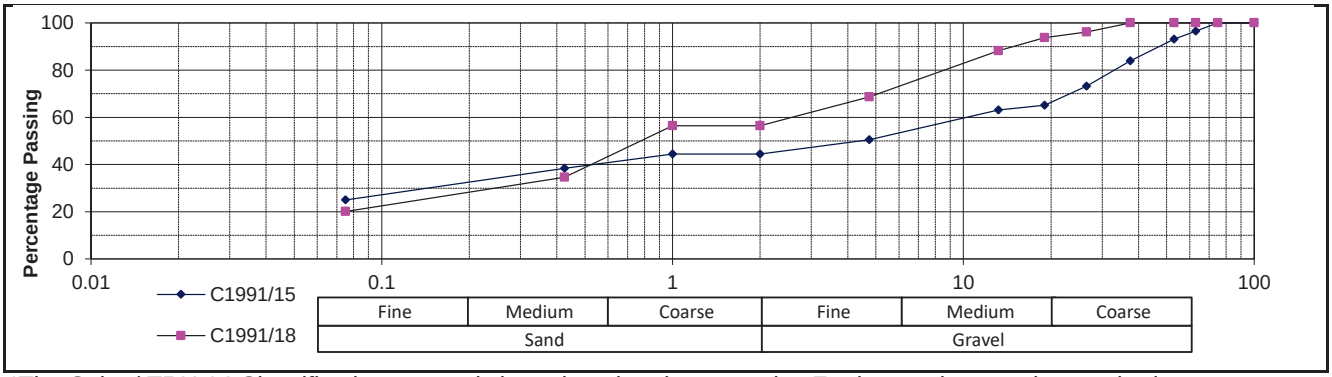
Laboratory No.		C1991/15 ◆			C1991/18 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1770			1877		
OMC	%	17.2			14.4		
California Bearing Ratio							
Compaction Data							
Moisture	%	17.0			14.0		
Dry Density	kg/m^3	1751	1690	1605	1787	1721	1675
Compaction	%	100.0	96.5	91.6	100.0	96.3	93.7
Penetration Data							
CBR at	2.5 mm	4	3	3	3	3	2
	5.00 mm	4	4	3	3	3	2
	7.50 mm	4	4	3	4	3	2
Swell @ 96hrs (%)		2.1	2.8	2.9	1.4	2.0	4.2
Final Moisture (%)		22.5	23.7	23.9	27.42	27.46	25.88



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	4	3
	@ 98%		4	3
	@ 97%		4	3
	@ 95%		3	2
	@ 93%		3	2
	@ 90%		3	1
	@ SANS3001 Midpoint		4	3

Classifications		
HRB (AASHTO)	A-2-6(0)	A-2-6(1)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/19 ◆	C1991/21 ■
Field Number		TPP32	TPD01
Client Reference			
Depth (m)		0.20-2.50	0.00-2.80
Position			
Coordinates	X		
	Y		
Description		Shale	Silty Sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

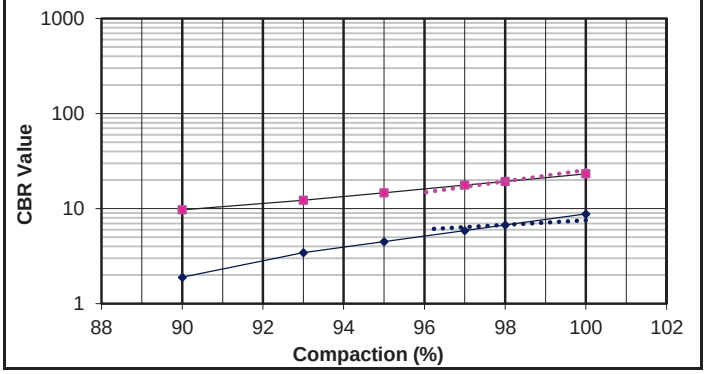
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	97	100
	28 mm	95	100
	20 mm	89	100
	14 mm	80	100
	5 mm	49	100
	2 mm	31	100
	1 mm	31	100
	0.425 mm	14	96
	0.075 mm	6	11
Grading Modulus		2.49	0.93

Soil Mortar Analysis

Coarse Sand	57	4
Coarse Fine Sand	7	30
Medium Fine Sand	8	34
Fine Fine Sand	8	21
Silt and Clay	19	11

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	32	
Plasticity Index (%)	11	NP
Linear Shrinkage (%)	6.5	

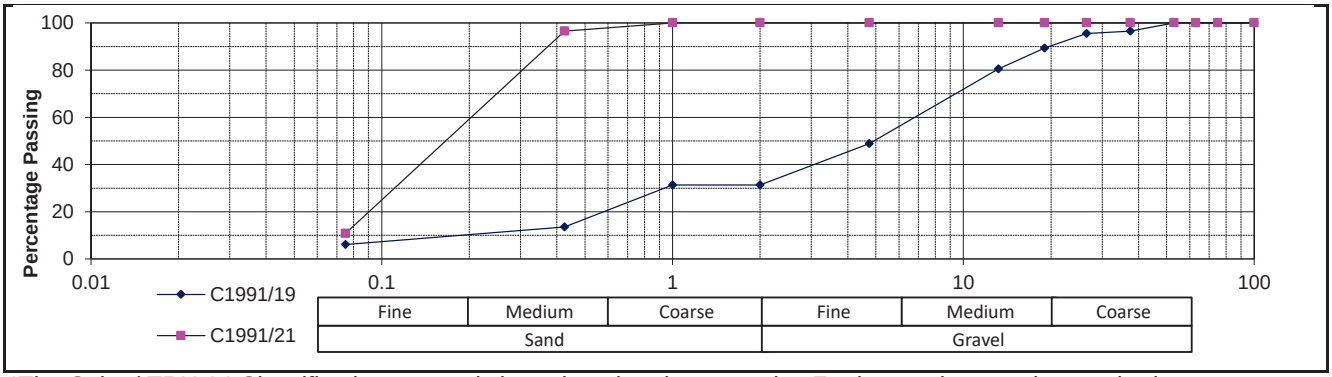
Laboratory No.		C1991/19 ◆			C1991/21 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	2063			1719		
OMC	%	10.8			9.5		
California Bearing Ratio							
Compaction Data							
Moisture	%	10.4			9.0		
Dry Density	kg/m^3	1973	1896	1842	1583	1519	1453
Compaction	%	100.0	96.1	93.3	100.0	95.9	91.8
Penetration Data							
CBR at	2.5 mm	8	6	4	25	15	11
	5.00 mm	7	7	3	22	16	12
	7.50 mm	8	7	3	17	13	10
Swell @ 96hrs (%)		1.7	1.8	2.0			
Final Moisture (%)		19.0	19.5	18.0	27.31	31.78	35.91



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	9	23
	@ 98%		7	19
	@ 97%		6	18
	@ 95%		4	15
	@ 93%		3	12
	@ 90%		2	10
	@ SANS3001 Midpoint		7	19

Classifications		
HRB (AASHTO)	A-2-6(0)	A-2-4(0)
COLTO*		G8
TRH14*		G9



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/34 ◆	C1991/38 ■
Field Number		TPR05	TPR10
Client Reference			
Depth (m)		0.30-1.50	0.90-1.70
Position			
Coordinates	X		
	Y		
Description		Clayey sand	Shale
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	91
	50 mm	100	91
	37.5 mm	98	83
	28 mm	98	79
	20 mm	98	75
	14 mm	98	72
	5 mm	96	50
	2 mm	92	34
	1 mm	92	34
	0.425 mm	85	14
	0.075 mm	23	6
Grading Modulus		1.00	2.45

Soil Mortar Analysis

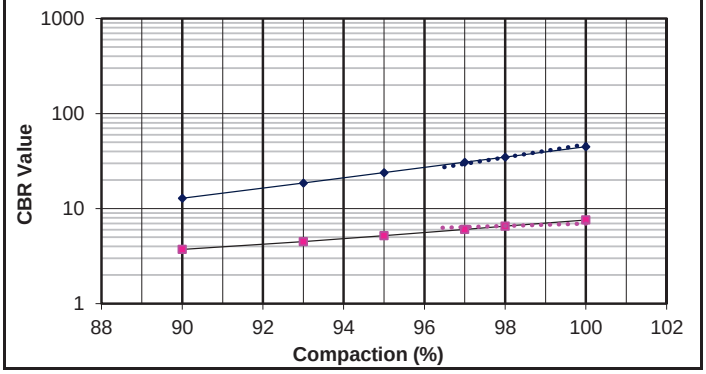
Coarse Sand	7	59
Coarse Fine Sand	20	2
Medium Fine Sand	25	9
Fine Fine Sand	23	11
Silt and Clay	25	18

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)		34
Plasticity Index (%)	NP	12
Linear Shrinkage (%)		6.5

Laboratory No.		C1991/34 ◆	C1991/38 ■
Maximum Dry Density & Optimum Moisture Content			
MDD	kg/m^3	2030	1926
OMC	%	8.1	10.5

California Bearing Ratio

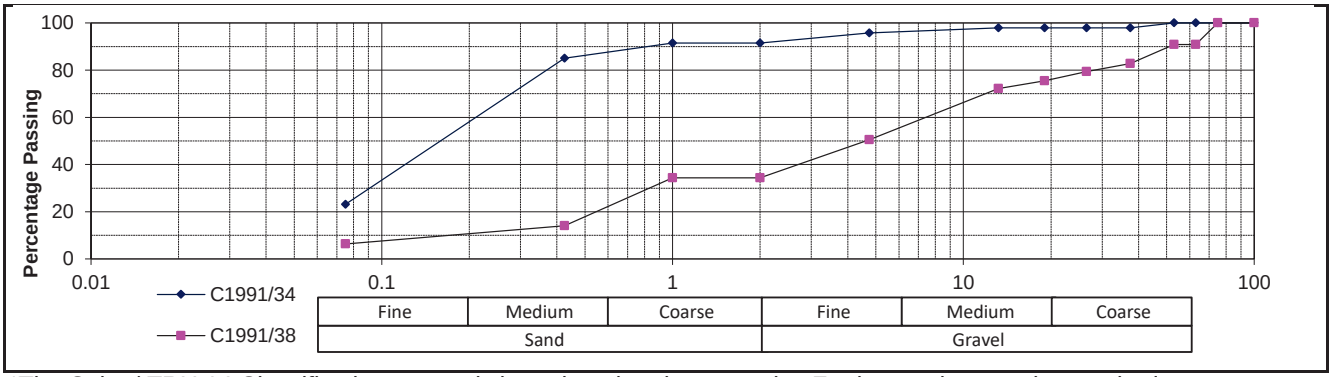
Compaction Data							
Moisture	%	8.1			10.5		
Dry Density	kg/m^3	2028	1955	1843	1922	1851	1628
Compaction	%	100.0	96.4	90.9	100.0	96.3	84.7
Penetration Data							
CBR at	2.5 mm	47	27	14	7	6	2
	5.00 mm	61	30	13	8	7	4
	7.50 mm	61	25	11	10	7	5
Swell @ 96hrs (%)					0.7	0.9	1.3
Final Moisture (%)		12.9	14.7	17.3	22.16	19.67	31.62



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	45	8
	@ 98%		35	7
	@ 97%		31	6
	@ 95%		24	5
	@ 93%		19	4
	@ 90%		13	4
	@ SANS3001 Midpoint		36	7

Classifications		
HRB (AASHTO)	A-2-4(0)	A-2-6(0)
COLTO*	G7	
TRH14*	G7	



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/56 ◆	C1991/57 ■
Field Number		TPRA5	TPRA6
Client Reference			
Depth (m)		0.30-1.50	0.50-1.60
Position			
Coordinates	X		
	Y		
Description		Shale	Clayey silty sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	98	100
	37.5 mm	97	100
	28 mm	86	100
	20 mm	74	100
	14 mm	65	97
	5 mm	37	84
	2 mm	22	50
	1 mm	22	50
	0.425 mm	8	33
	0.075 mm	3	21
Grading Modulus		2.66	1.95

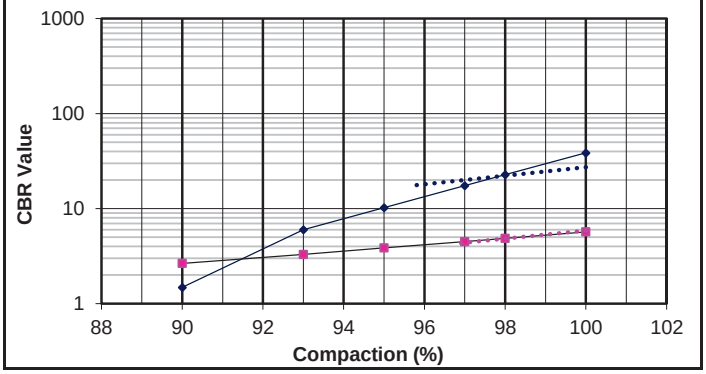
Soil Mortar Analysis

Coarse Sand	62	33
Coarse Fine Sand	10	8
Medium Fine Sand	7	7
Fine Fine Sand	7	9
Silt and Clay	14	42
Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	25	28
Plasticity Index (%)	8	9
Linear Shrinkage (%)	4.0	4.0

Laboratory No.		C1991/56 ◆	C1991/57 ■
Maximum Dry Density & Optimum Moisture Content			
MDD	kg/m^3	2187	1801
OMC	%	7.5	17.3

California Bearing Ratio

Compaction Data							
Moisture	%	6.4			17.1		
Dry Density	kg/m^3	2110	2020	1975	1690	1635	1550
Compaction	%	100.0	95.7	93.6	100.0	96.7	91.7
Penetration Data							
CBR at	2.5 mm	27	18	7	6	4	3
	5.00 mm	30	17	7	7	5	4
	7.50 mm	27	15	8	8	5	4
Swell @ 96hrs (%)		0.1	1.1	1.5			
Final Moisture (%)		13.9	11.7	6.9	28.39	31.4	34.5

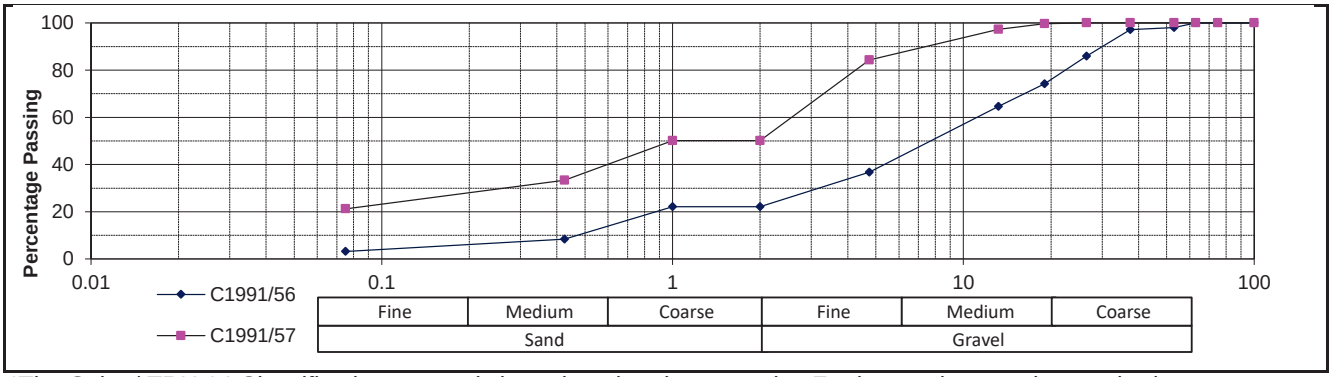


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	39	6
	@ 98%		23	5
	@ 97%		17	5
	@ 95%		10	4
	@ 93%		6	3
	@ 90%		1	3
	@ SANS3001 Midpoint		22	5

Classifications

HRB (AASHTO)	A-2-4(0)	A-2-4(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/74 ◆	C1991/81 ■
Field Number		TPRA20	TPC05
Client Reference			
Depth (m)		0.20-1.70	1.50-4.80
Position			
Coordinates	X		
	Y		
Description		Clayey Sand	Sandy Clay
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

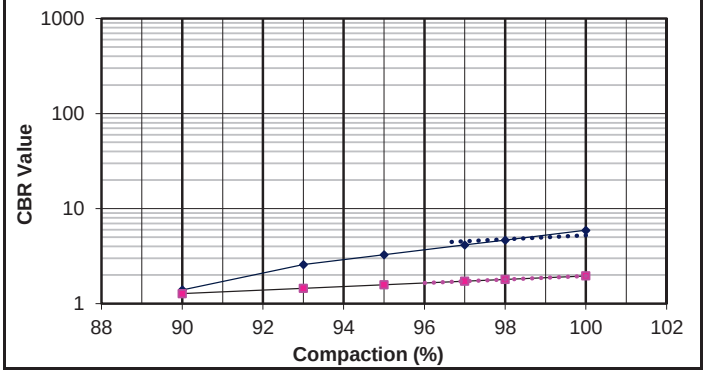
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	94	100
	28 mm	94	99
	20 mm	88	98
	14 mm	78	98
	5 mm	46	86
	2 mm	24	78
	1 mm	24	78
	0.425 mm	5	51
	0.075 mm	4	38
Grading Modulus		2.66	1.34

Soil Mortar Analysis

Coarse Sand	79	35
Coarse Fine Sand	1	4
Medium Fine Sand	1	6
Fine Fine Sand	1	7
Silt and Clay	18	48

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	34	30
Plasticity Index (%)	6	12
Linear Shrinkage (%)	5.0	6.5

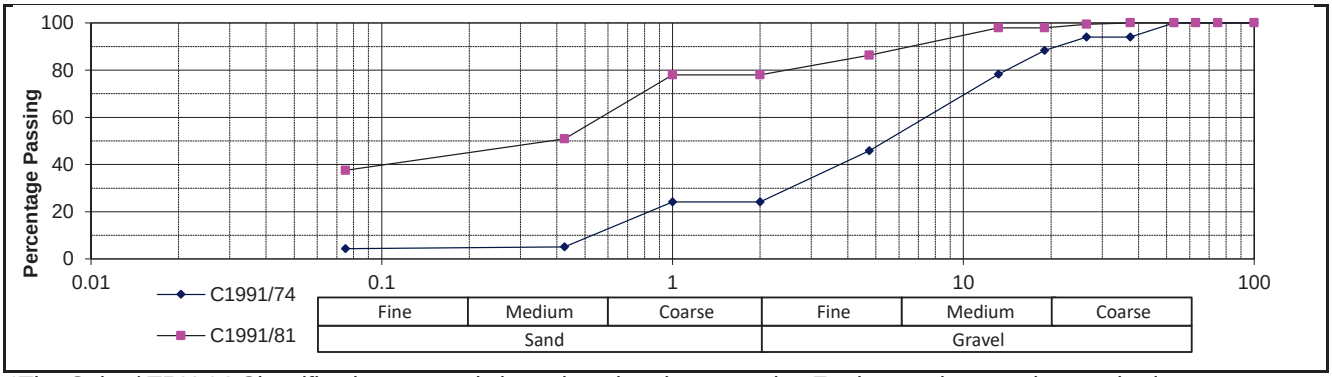
Laboratory No.		C1991/74 ◆			C1991/81 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	2111			1863		
OMC	%	8.9			16.2		
California Bearing Ratio							
Compaction Data							
Moisture	%	9.1			16.2		
Dry Density	kg/m^3	2105	2031	1987	1776	1704	1645
Compaction	%	100.0	96.5	94.4	100.0	95.9	92.6
Penetration Data							
CBR at	2.5 mm	5	4	3	2	2	1
	5.00 mm	7	5	4	2	2	2
	7.50 mm	7	6	3	2	2	2
Swell @ 96hrs (%)		0.9	1.1	1.7	4.6	6.2	7.5
Final Moisture (%)		12.2	11.9	7.9	32.21	32.17	30.61



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	6	2
	@ 98%		5	2
	@ 97%		4	2
	@ 95%		3	2
	@ 93%		3	1
	@ 90%		1	1
	@ SANS3001 Midpoint		5	2

Classifications		
HRB (AASHTO)	A-2-4(0)	A-6(1)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/41 ◆	C1991/42 ■
Field Number		TPRE01	TPRE02
Client Reference			
Depth (m)		0.80-1.40	0.70-1.50
Position			
Coordinates	X		
	Y		
Description		Shale	Alluvium
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

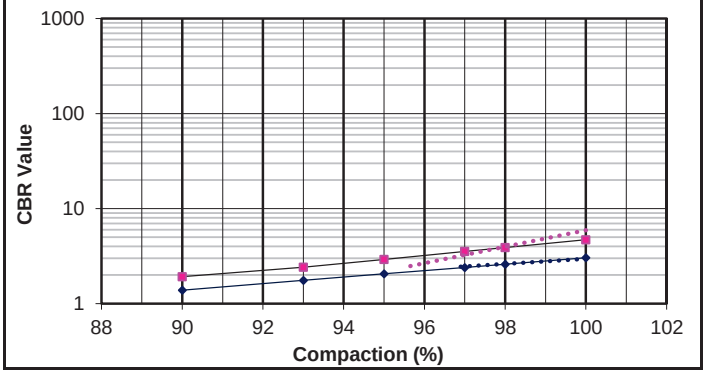
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	97	100
	37.5 mm	87	100
	28 mm	82	94
	20 mm	75	86
	14 mm	66	80
	5 mm	38	48
	2 mm	26	34
	1 mm	26	34
	0.425 mm	12	20
	0.075 mm	5	10
Grading Modulus		2.57	2.36

Soil Mortar Analysis

Coarse Sand	52	43
Coarse Fine Sand	11	8
Medium Fine Sand	10	10
Fine Fine Sand	9	9
Silt and Clay	19	29

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	34	38
Plasticity Index (%)	14	12
Linear Shrinkage (%)	7.5	6.5

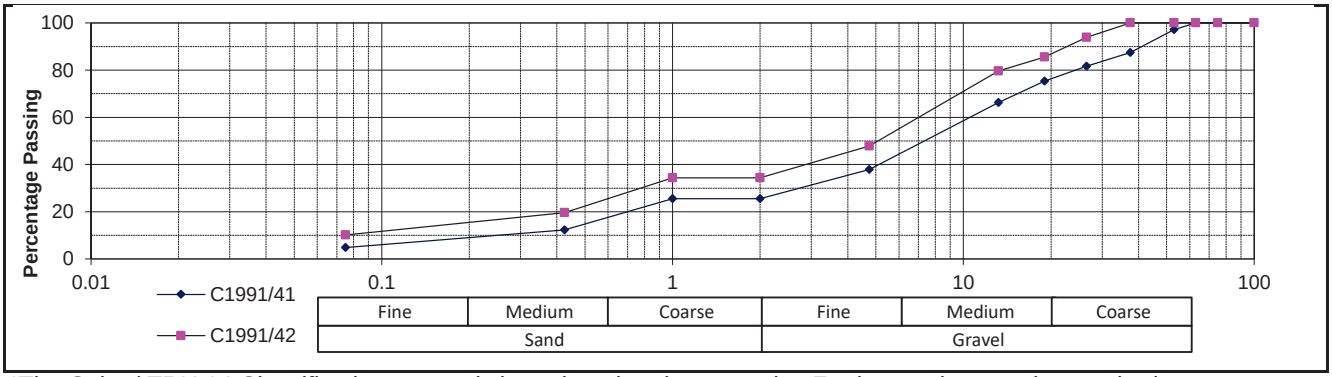
Laboratory No.		C1991/41 ◆			C1991/42 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1990			2126		
OMC	%	10.8			9.6		
California Bearing Ratio							
Compaction Data							
Moisture	%	10.4			9.1		
Dry Density	kg/m^3	1893	1834	1734	2133	2039	1944
Compaction	%	100.0	96.9	91.6	100.0	95.6	91.1
Penetration Data							
CBR at	2.5 mm	3	2	2	6	2	2
	5.00 mm	4	3	2	6	3	2
	7.50 mm	4	3	2	6	3	3
Swell @ 96hrs (%)		1.8	3.4	5.1	1.5	1.8	3.3
Final Moisture (%)		19.1	18.9	14.0	10.12	5.128	6.569



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	3	5
	@ 98%		3	4
	@ 97%		2	4
	@ 95%		2	3
	@ 93%		2	2
	@ 90%		1	2
	@ SANS3001 Midpoint		3	4

Classifications		
HRB (AASHTO)	A-2-6(0)	A-2-6(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/45 ◆	C1991/70 ■
Field Number		TPRE09	TPRA16
Client Reference			
Depth (m)		0.30-1.50	0.10-0.50
Position			
Coordinates	X		
	Y		
Description		Silty Clay	Shale
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

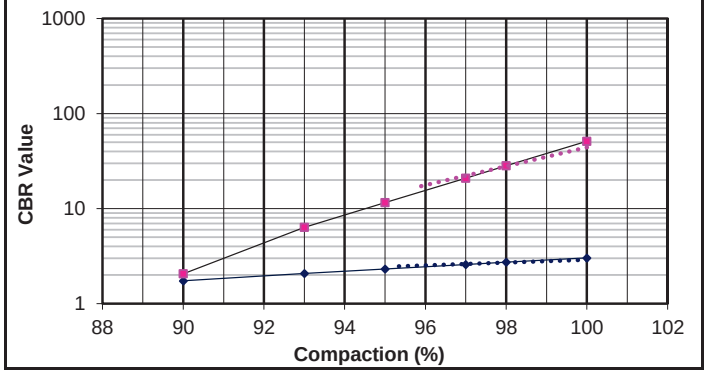
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	96
	37.5 mm	100	89
	28 mm	100	84
	20 mm	100	73
	14 mm	100	63
	5 mm	100	43
	2 mm	94	29
	1 mm	94	29
	0.425 mm	45	15
	0.075 mm	30	8
Grading Modulus		1.31	2.48

Soil Mortar Analysis

Coarse Sand	52	48
Coarse Fine Sand	6	7
Medium Fine Sand	6	8
Fine Fine Sand	5	10
Silt and Clay	32	28

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	38	28
Plasticity Index (%)	15	8
Linear Shrinkage (%)	7.0	4.0

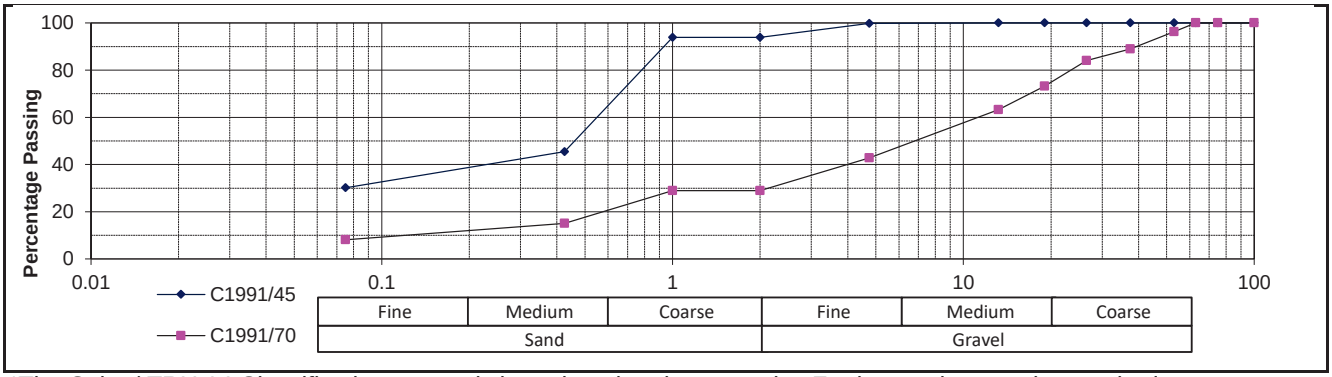
Laboratory No.		C1991/45 ◆			C1991/70 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1974			2146		
OMC	%	10.2			10.1		
California Bearing Ratio							
Compaction Data							
Moisture	%	9.5			9.6		
Dry Density	kg/m^3	1975	1882	1809	2150	2058	2010
Compaction	%	100.0	95.3	91.6	100.0	95.7	93.5
Penetration Data							
CBR at	2.5 mm	3	2	2	44	16	7
	5.00 mm	3	2	2	55	17	7
	7.50 mm	3	3	2	59	17	7
Swell @ 96hrs (%)		1.7	2.1	3.0			
Final Moisture (%)		13.4	10.1	13.7	10.17	9.854	11.78



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	3	51
	@ 98%		3	28
	@ 97%		3	21
	@ 95%		2	12
	@ 93%		2	6
	@ 90%		2	2
	@ SANS3001 Midpoint		3	27

Classifications		
HRB (AASHTO)	A-2-6(1)	A-2-4(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/A3 ◆	C1991/A4 ■
Field Number		Sample 3	Sample 4
Client Reference			
Depth (m)			
Position			
Coordinates	X		
	Y		
Description			
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

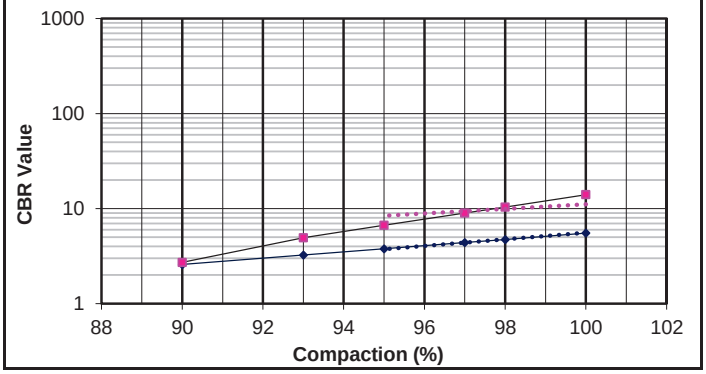
Percentage Passing			
	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm		
	5 mm		
	2 mm		
	1 mm		
	0.425 mm		
	0.075 mm		
Grading Modulus			

Soil Mortar Analysis

Coarse Sand		
Coarse Fine Sand		
Medium Fine Sand		
Fine Fine Sand		
Silt and Clay		

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)		
Plasticity Index (%)		
Linear Shrinkage (%)		

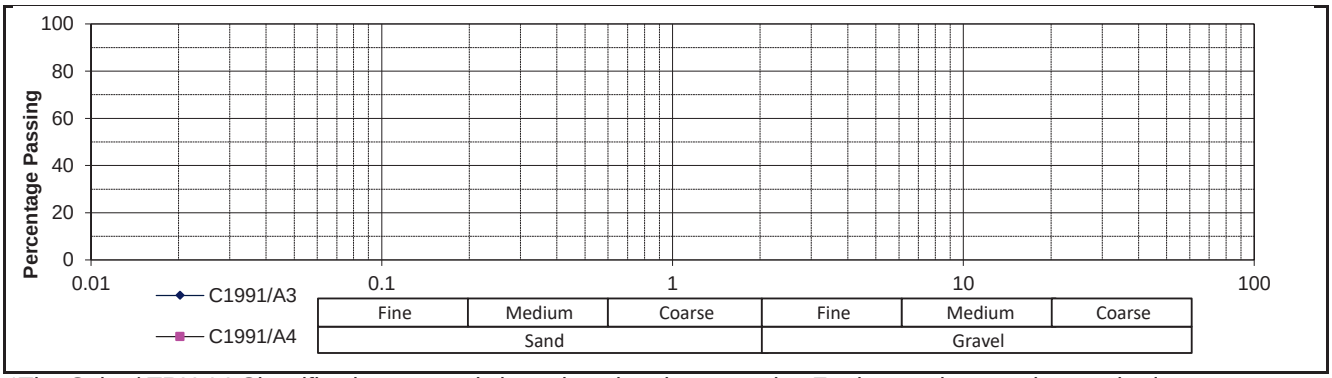
Laboratory No.		C1991/A3 ◆			C1991/A4 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	2006			2169		
OMC	%	9.3			6.5		
California Bearing Ratio							
Compaction Data							
Moisture	%	9.1			6.0		
Dry Density	kg/m^3	1998	1899	1819	2176	2068	2002
Compaction	%	100.0	95.1	91.1	100.0	95.0	92.0
Penetration Data							
CBR at	2.5 mm	6	4	3	11	8	4
	5.00 mm	4	3	3	12	10	4
	7.50 mm	4	3	2	13	10	4
Swell @ 96hrs (%)		0.1	0.1	0.1	0.1	0.1	0.1
Final Moisture (%)		18.1	16.4	39.7	26.72	10.23	8.307



Interpolated CBR Data

CBR		Mod. AASHTO		
	@ 100%		6	14
	@ 98%		5	10
	@ 97%		4	9
	@ 95%		4	7
	@ 93%		3	5
	@ 90%		3	3
	@ SANS3001 Midpoint		5	10

Classifications		
HRB (AASHTO)		
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/82 ◆	■
Field Number		TPC04	
Client Reference			
Depth (m)		0.00-5.00	
Position			
Coordinates	X		
	Y		
Description		Silty Sand	
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

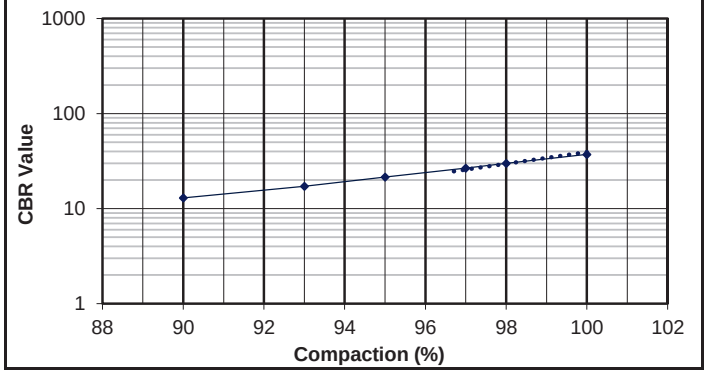
Percentage Passing	100 mm	100	
	75 mm	100	
	63 mm	100	
	50 mm	100	
	37.5 mm	100	
	28 mm	100	
	20 mm	100	
	14 mm	100	
	5 mm	100	
	2 mm	99	
	1 mm	99	
	0.425 mm	94	
	0.075 mm	10	
Grading Modulus		0.97	

Soil Mortar Analysis

Coarse Sand	5	
Coarse Fine Sand	20	
Medium Fine Sand	37	
Fine Fine Sand	28	
Silt and Clay	11	

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)		
Plasticity Index (%)	NP	
Linear Shrinkage (%)		

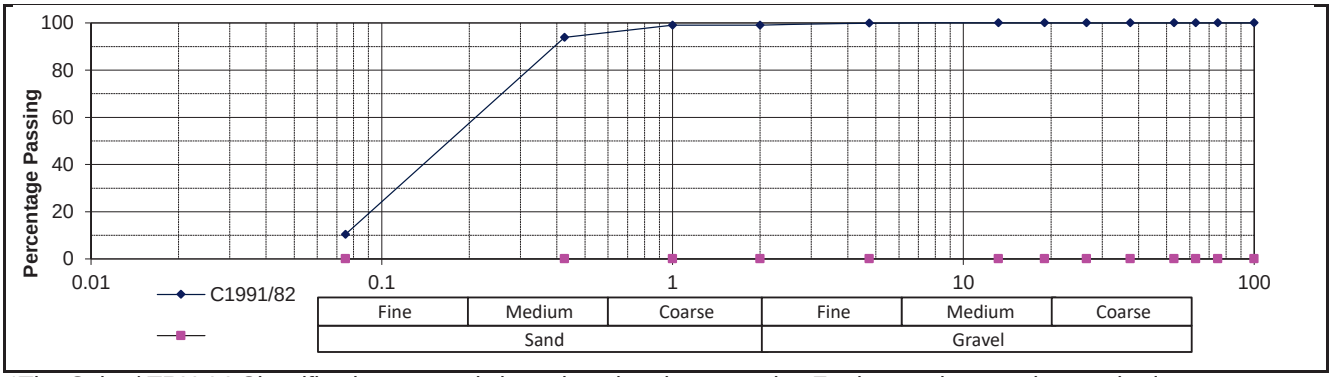
Laboratory No.		C1991/82 ◆				■
Maximum Dry Density & Optimum Moisture Content						
MDD	kg/m^3	1842				
OMC	%	12.8				
California Bearing Ratio						
Compaction Data						
Moisture	%	12.4				
Dry Density	kg/m^3	1659	1601	1542		
Compaction	%	100.0	96.5	92.9		
Penetration Data						
CBR at	2.5 mm	39	24	17		
	5.00 mm	39	23	15		
	7.50 mm	32	20	13		
Swell @ 96hrs (%)						
Final Moisture (%)		24.8	29.4	28.2		



Interpolated CBR Data

CBR Mod. AASHTO	@ 100%	37	
	@ 98%	30	
	@ 97%	27	
	@ 95%	21	
	@ 93%	17	
	@ 90%	13	
	@ SANS3001 Midpoint	31	

Classifications		
HRB (AASHTO)	A-2-4(0)	
COLTO*	G7	
TRH14*	G7	



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/A5 ◆	■
Field Number		Sample 5	
Client Reference			
Depth (m)			
Position			
Coordinates	X		
	Y		
Description			
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm		
	75 mm		
	63 mm		
	50 mm		
	37.5 mm		
	28 mm		
	20 mm		
	14 mm		
	5 mm		
	2 mm		
	1 mm		
	0.425 mm		
	0.075 mm		
Grading Modulus			

Soil Mortar Analysis

Coarse Sand		
Coarse Fine Sand		
Medium Fine Sand		
Fine Fine Sand		
Silt and Clay		

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)		
Plasticity Index (%)		
Linear Shrinkage (%)		

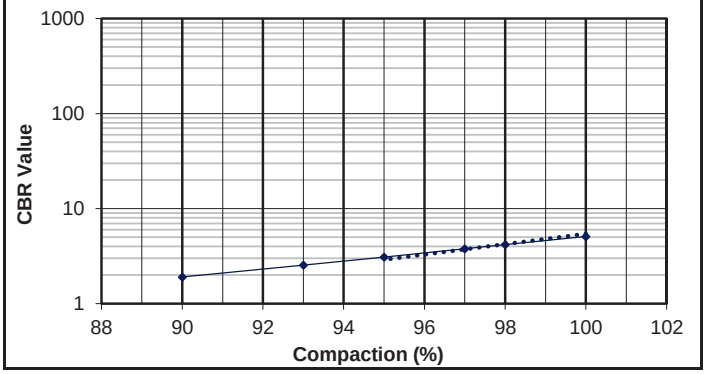
Laboratory No.		C1991/A5 ◆	■

Maximum Dry Density & Optimum Moisture Content

MDD	kg/m^3	2003	
OMC	%	9.2	

California Bearing Ratio

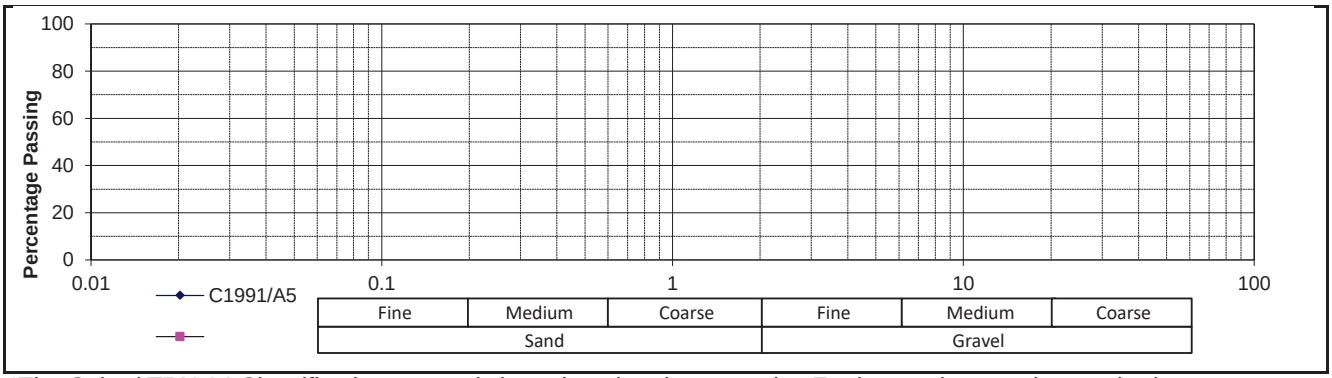
Compaction Data							
Moisture	%	8.9					
Dry Density	kg/m^3	1998	1899	1814			
Compaction	%	100.0	95.0	90.8			
Penetration Data							
CBR at	2.5 mm	5	3	2			
	5.00 mm	6	4	2			
	7.50 mm	7	4	3			
Swell @ 96hrs (%)		0.1	0.1	0.1			
Final Moisture (%)		15.0	0.9	21.0			



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	5
	@ 98%		4
	@ 97%		4
	@ 95%		3
	@ 93%		3
	@ 90%		2
	@ SANS3001 Midpoint		4

Classifications		
HRB (AASHTO)		
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/64 ◆	■
Field Number		TPRA12	
Client Reference			
Depth (m)		0.20-1.00	
Position			
Coordinates	X		
	Y		
Description		Shale	
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	
	75 mm	100	
	63 mm	100	
	50 mm	98	
	37.5 mm	96	
	28 mm	89	
	20 mm	78	
	14 mm	71	
	5 mm	42	
	2 mm	28	
	1 mm	28	
	0.425 mm	15	
	0.075 mm	9	
Grading Modulus		2.49	

Soil Mortar Analysis

Coarse Sand	48	
Coarse Fine Sand	7	
Medium Fine Sand	6	
Fine Fine Sand	7	
Silt and Clay	32	

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	29	
Plasticity Index (%)	15	
Linear Shrinkage (%)	6.5	

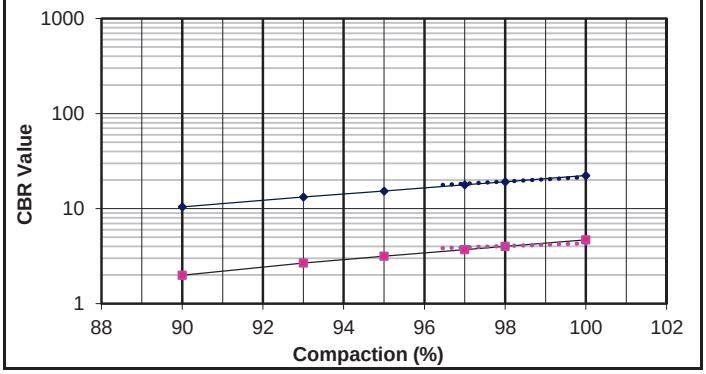
Laboratory No.		C1991/64 ◆	■

Maximum Dry Density & Optimum Moisture Content

MDD	kg/m^3	2285	1924
OMC	%	7.7	13.6

California Bearing Ratio

Compaction Data							
Moisture	%	7.6			13.2		
Dry Density	kg/m^3	2260	2177	2069	1844	1778	1708
Compaction	%	100.0	96.3	91.5	100.0	96.4	92.6
Penetration Data							
CBR at	2.5 mm	21	18	12	4	4	3
	5.00 mm	25	20	14	4	4	2
	7.50 mm	28	26	14	4	4	3
Swell @ 96hrs (%)			0.1	0.2			
Final Moisture (%)		8.8	6.0	7.1	23.63	24.3	23

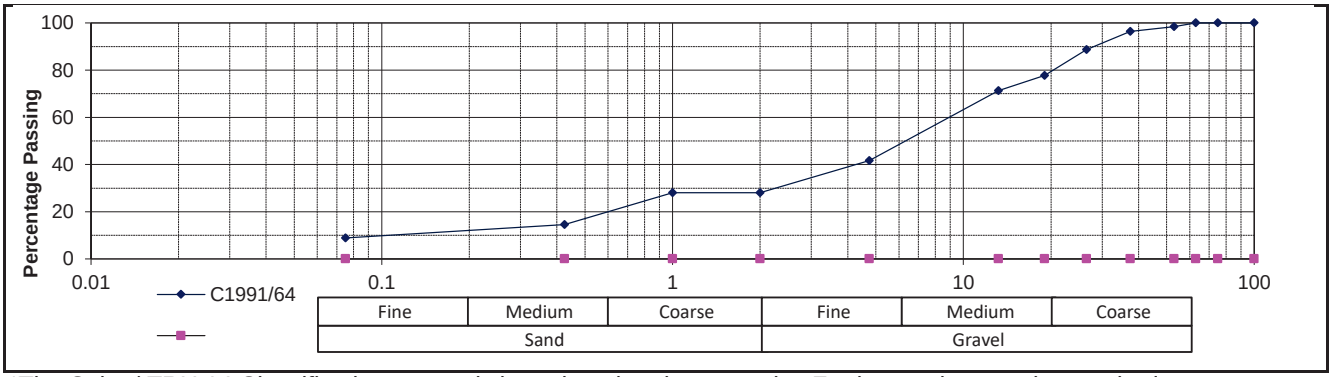


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	22	5
	@ 98%		19	4
	@ 97%		18	4
	@ 95%		15	3
	@ 93%		13	3
	@ 90%		10	2
	@ SANS3001 Midpoint		19	4

Classifications

HRB (AASHTO)	A-2-6(0)	
COLTO*	G8	
TRH14*	G8	



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/6 ◆	C1991/8 ■
Field Number		TPP12	TPP15
Client Reference			
Depth (m)		1.00-3.00	0.50-1.80
Position			
Coordinates	X		
	Y		
Description		Shale	Shale
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

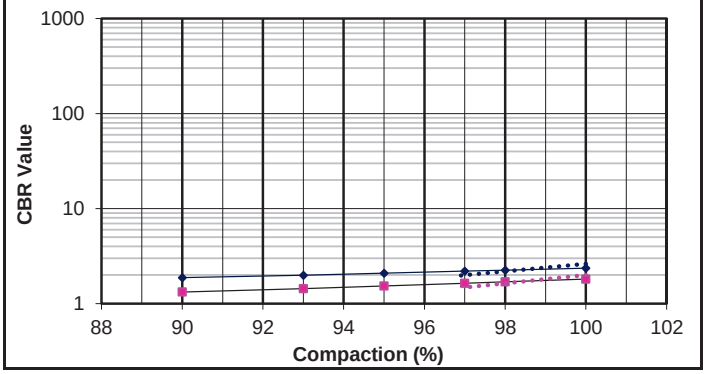
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	97
	28 mm	100	96
	20 mm	100	95
	14 mm	99	92
	5 mm	99	83
	2 mm	96	67
	1 mm	96	67
	0.425 mm	86	28
	0.075 mm	59	19
Grading Modulus		0.59	1.86

Soil Mortar Analysis

Coarse Sand	10	58
Coarse Fine Sand	9	3
Medium Fine Sand	9	5
Fine Fine Sand	10	6
Silt and Clay	61	29

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	34	38
Plasticity Index (%)	11	14
Linear Shrinkage (%)	6.5	7.5

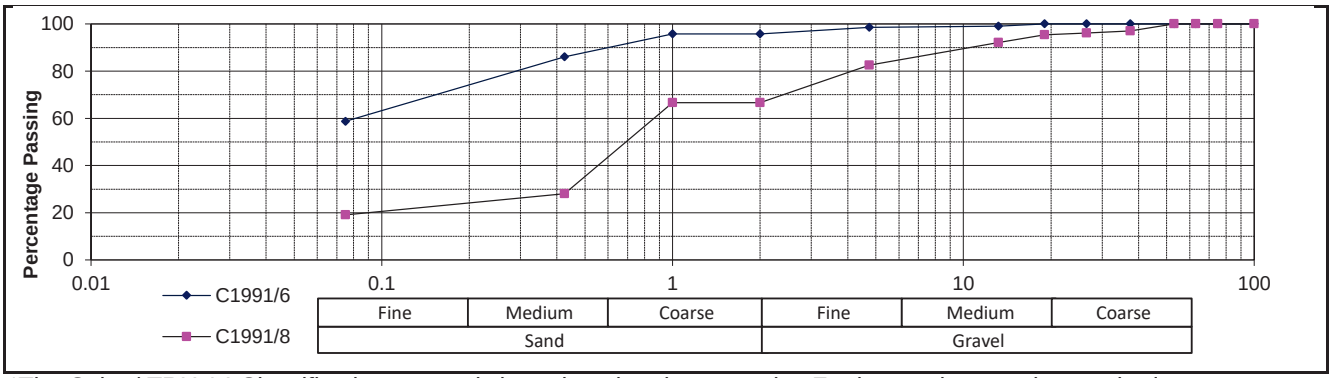
Laboratory No.		C1991/6 ◆			C1991/8 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1744			1804		
OMC	%	18.4			14.9		
California Bearing Ratio							
Compaction Data							
Moisture	%	18.5			14.6		
Dry Density	kg/m^3	1677	1624	1526	1808	1755	1649
Compaction	%	100.0	96.9	91.0	100.0	97.1	91.2
Penetration Data							
CBR at	2.5 mm	3	2	2	2	1	1
	5.00 mm	3	3	2	2	2	1
	7.50 mm	4	4	3	2	2	2
Swell @ 96hrs (%)		2.6	3.4	5.0	0.2	0.3	0.4
Final Moisture (%)		27.4	29.0	33.3	26.98	20.97	23.11



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	2	2
	@ 98%		2	2
	@ 97%		2	2
	@ 95%		2	2
	@ 93%		2	1
	@ 90%		2	1
	@ SANS3001 Midpoint		2	2

Classifications		
HRB (AASHTO)	A-6(4)	A-2-6(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/83 ◆	C1991/85 ■
Field Number		TPD01	TPD04B
Client Reference			
Depth (m)		0.00-5.10	2.40-6
Position			
Coordinates	X		
	Y		
Description		Silty Sand	Clayey silty sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	100
	2 mm	100	100
	1 mm	100	100
	0.425 mm	93	98
	0.075 mm	12	22
Grading Modulus		0.95	0.80

Soil Mortar Analysis

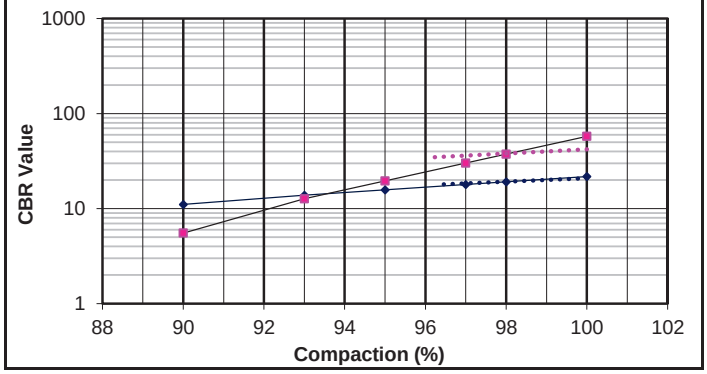
Coarse Sand	7	2
Coarse Fine Sand	26	19
Medium Fine Sand	34	31
Fine Fine Sand	21	26
Silt and Clay	12	22

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)		
Plasticity Index (%)	NP	NP
Linear Shrinkage (%)		

Laboratory No.		C1991/83 ◆	C1991/85 ■
Maximum Dry Density & Optimum Moisture Content			
MDD	kg/m^3	1722	2019
OMC	%	11.4	9.5

California Bearing Ratio

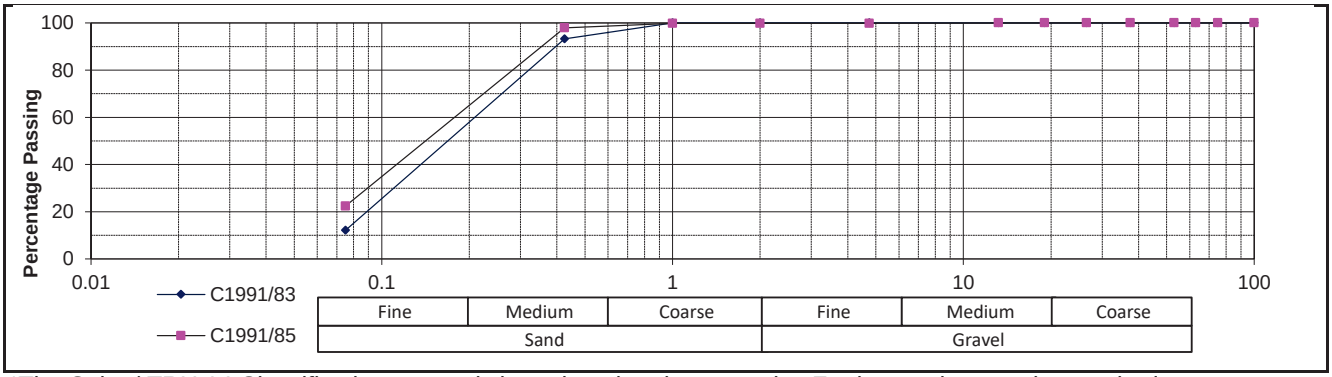
Compaction Data							
Moisture	%	11.0			9.1		
Dry Density	kg/m^3	1579	1523	1465	1894	1822	1748
Compaction	%	100.0	96.5	92.8	100.0	96.2	92.3
Penetration Data							
CBR at	2.5 mm	21	18	14	42	35	11
	5.00 mm	22	17	13	40	30	11
	7.50 mm	18	14	11	30	24	11
Swell @ 96hrs (%)		0.1	0.4	0.6			
Final Moisture (%)		26.7	35.0	33.7	16.13	17.98	19.3



Interpolated CBR Data

CBR		Mod. AASHTO		
@	100%		22	58
@	98%		19	37
@	97%		18	30
@	95%		16	20
@	93%		14	13
@	90%		11	6
@	SANS3001 Midpoint		19	38

Classifications		
HRB (AASHTO)	A-2-4(0)	A-2-4(0)
COLTO*	G8	G8
TRH14*	G8	



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/22 ◆	C1991/23 ■
Field Number		TPD05	TPD06
Client Reference			
Depth (m)		1.10-1.70	0.00-0.70
Position			
Coordinates	X		
	Y		
Description		Silty Clay	Silty Clay
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

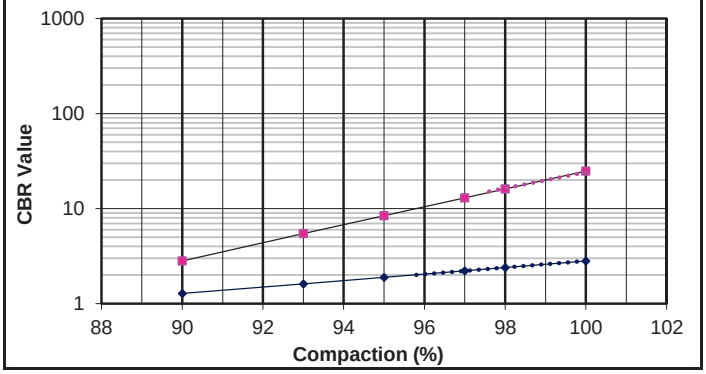
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	100
	2 mm	100	99
	1 mm	100	99
	0.425 mm	98	87
	0.075 mm	53	26
Grading Modulus		0.49	0.87

Soil Mortar Analysis

Coarse Sand	2	13
Coarse Fine Sand	13	11
Medium Fine Sand	15	21
Fine Fine Sand	17	29
Silt and Clay	53	27

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	24	
Plasticity Index (%)	9	NP
Linear Shrinkage (%)	5.5	

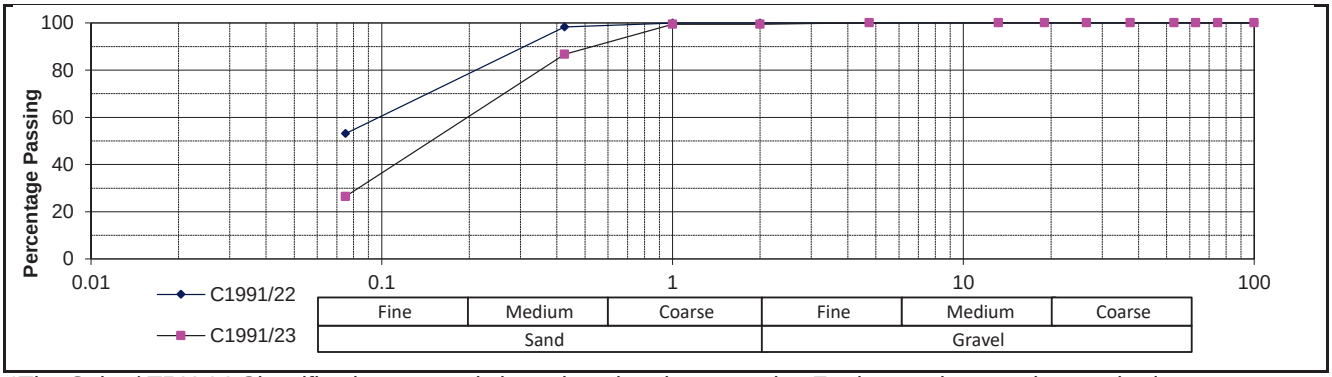
Laboratory No.		C1991/22 ◆			C1991/23 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	2027			1876		
OMC	%	9.2			10.8		
California Bearing Ratio							
Compaction Data							
Moisture	%	9.3			10.6		
Dry Density	kg/m^3	2023	1934	1895	1854	1806	1718
Compaction	%	100.0	95.6	93.7	100.0	97.4	92.7
Penetration Data							
CBR at	2.5 mm	3	2	2	24	15	5
	5.00 mm	3	2	2	26	13	7
	7.50 mm	4	3	2	24	12	10
Swell @ 96hrs (%)		1.7	2.3	2.5	0.2	0.3	0.5
Final Moisture (%)		12.1	10.0	5.0	12.71	13.36	18.16



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	3	25
	@ 98%		2	16
	@ 97%		2	13
	@ 95%		2	8
	@ 93%		2	5
	@ 90%		1	3
	@ SANS3001 Midpoint		2	19

Classifications		
HRB (AASHTO)	A-4(2)	A-2-4(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/29 ◆	C1991/33 ■
Field Number		TPD12	TPR03
Client Reference			
Depth (m)		1.50-3.00	0.60-1.60
Position			
Coordinates	X		
	Y		
Description		Shale	Silty Clay
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

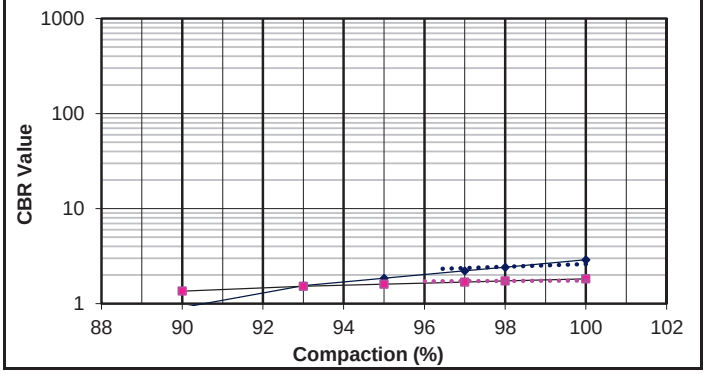
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	93
	50 mm	100	91
	37.5 mm	100	74
	28 mm	100	67
	20 mm	100	59
	14 mm	99	54
	5 mm	88	44
	2 mm	80	22
	1 mm	80	22
	0.425 mm	51	15
	0.075 mm	31	11
Grading Modulus		1.38	2.51

Soil Mortar Analysis

Coarse Sand	37	30
Coarse Fine Sand	9	6
Medium Fine Sand	8	6
Fine Fine Sand	7	6
Silt and Clay	39	52

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	32	37
Plasticity Index (%)	9	6
Linear Shrinkage (%)	4.0	3.5

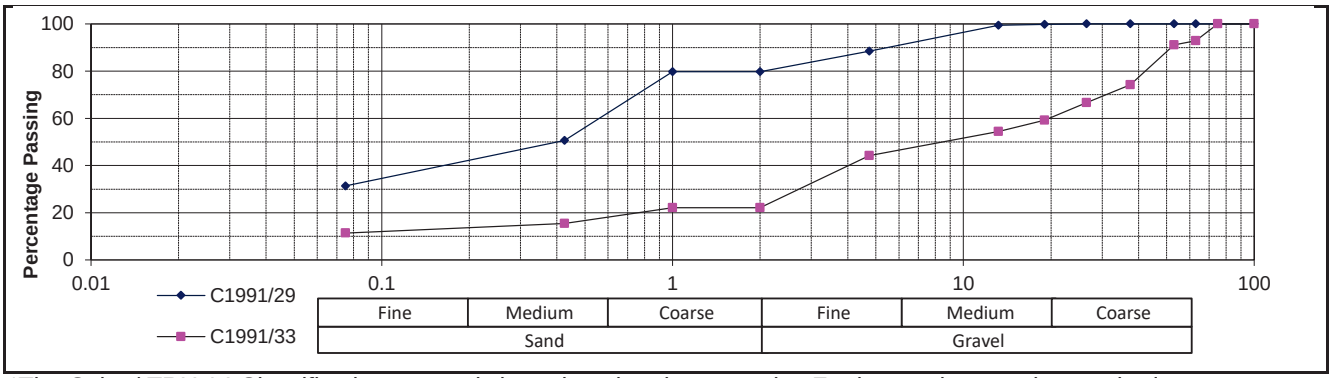
Laboratory No.		C1991/29 ◆			C1991/33 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1767			1791		
OMC	%	14.5			16.4		
California Bearing Ratio							
Compaction Data							
Moisture	%	14.1			16.1		
Dry Density	kg/m^3	1673	1612	1582	1780	1709	1659
Compaction	%	100.0	96.4	94.5	100.0	96.0	93.2
Penetration Data							
CBR at	2.5 mm	3	2	2	2	2	2
	5.00 mm	2	2	2	2	2	2
	7.50 mm	3	2	2	2	2	2
Swell @ 96hrs (%)		2.4	3.5	4.3	4.6	5.3	7.5
Final Moisture (%)		26.4	29.1	26.0	25.07	26.06	25.07



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	3	2
	@ 98%		2	2
	@ 97%		2	2
	@ 95%		2	2
	@ 93%		2	2
	@ 90%		1	1
	@ SANS3001 Midpoint		2	2

Classifications		
HRB (AASHTO)	A-2-4(0)	A-1-a(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/82
Field Number		TPC04
Client Reference		
Depth (m)		0.00-5.00
Position		
Coordinates	X	
	Y	
Description		Silty Sand
Additional information		
Calcrete/Crushed		
Stabilizing Agent		

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100
	75 mm	100
	63 mm	100
	50 mm	100
	37.5 mm	100
	28 mm	100
	20 mm	100
	14 mm	100
	5 mm	100
	2 mm	99
	1 mm	99
	0.425 mm	94
	0.075 mm	10
Grading Modulus		0.97

Soil Mortar Analysis

Coarse Sand	5
Coarse Fine Sand	20
Medium Fine Sand	37
Fine Fine Sand	28
Silt and Clay	11

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)		
Plasticity Index (%)	NP	
Linear Shrinkage (%)		

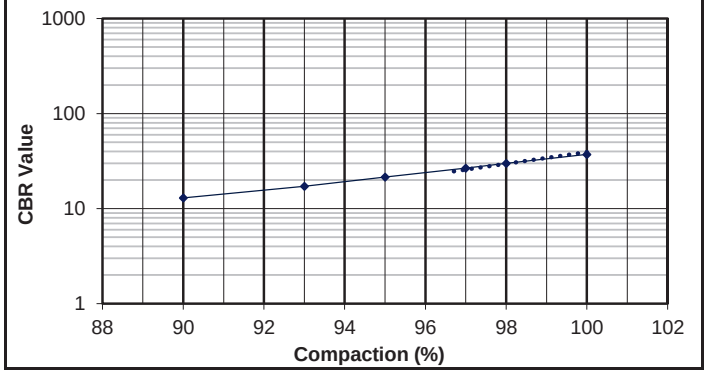
Laboratory No.		C1991/82

Maximum Dry Density & Optimum Moisture Content

MDD	kg/m^3	1842
OMC	%	12.8

California Bearing Ratio

Compaction Data				
Moisture	%	12.4		
Dry Density	kg/m^3	1659	1601	1542
Compaction	%	100.0	96.5	92.9
Penetration Data				
CBR at	2.5 mm	39	24	17
	5.00 mm	39	23	15
	7.50 mm	32	20	13
Swell @ 96hrs (%)				
Final Moisture (%)		24.8	29.4	28.2

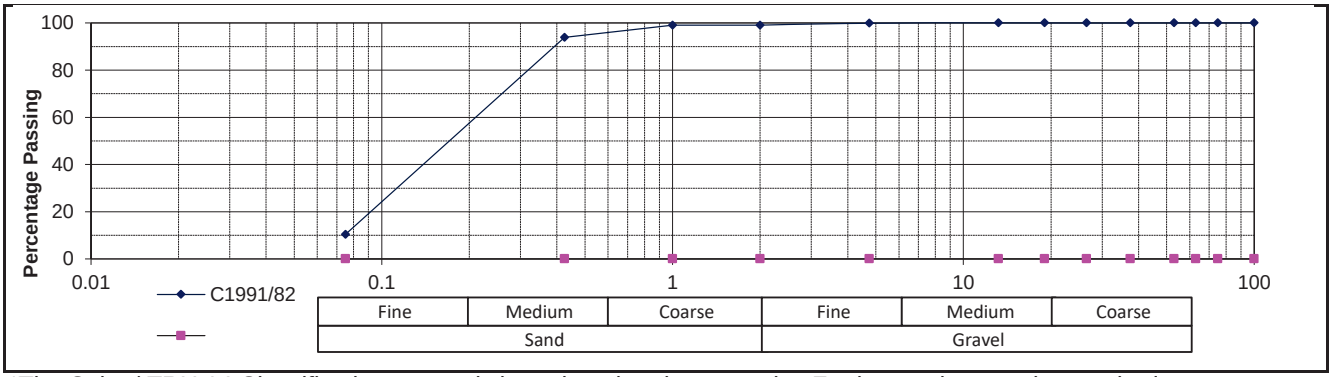


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	37
	@ 98%		30
	@ 97%		27
	@ 95%		21
	@ 93%		17
	@ 90%		13
	@ SANS3001 Midpoint		31

Classifications

HRB (AASHTO)	A-2-4(0)
COLTO*	G7
TRH14*	G7



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/12 ◆	C1991/13 ■
Field Number		TPP22	TPP27
Client Reference			
Depth (m)		0.70-1.40	1.20-3.10
Position			
Coordinates	X		
	Y		
Description		Silty Clay	Silty Sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

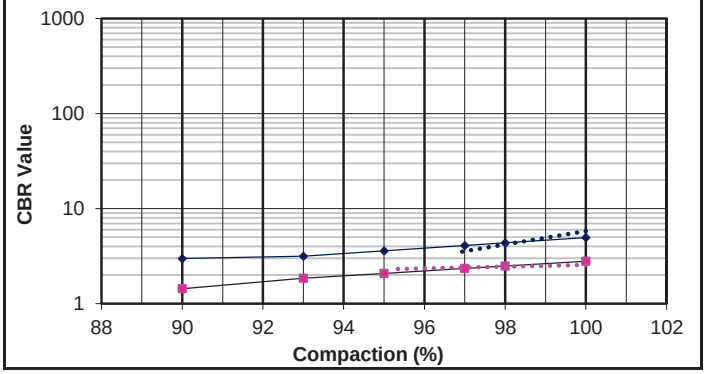
Percentage Passing	100 mm	100	100
	75 mm	100	88
	63 mm	100	88
	50 mm	100	88
	37.5 mm	97	88
	28 mm	92	88
	20 mm	88	87
	14 mm	85	80
	5 mm	70	63
	2 mm	64	53
	1 mm	64	53
	0.425 mm	57	28
	0.075 mm	37	12
Grading Modulus		1.43	2.07

Soil Mortar Analysis

Coarse Sand	11	47
Coarse Fine Sand	7	8
Medium Fine Sand	10	10
Fine Fine Sand	15	10
Silt and Clay	57	24

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	24	28
Plasticity Index (%)	9	13
Linear Shrinkage (%)	5.0	6.5

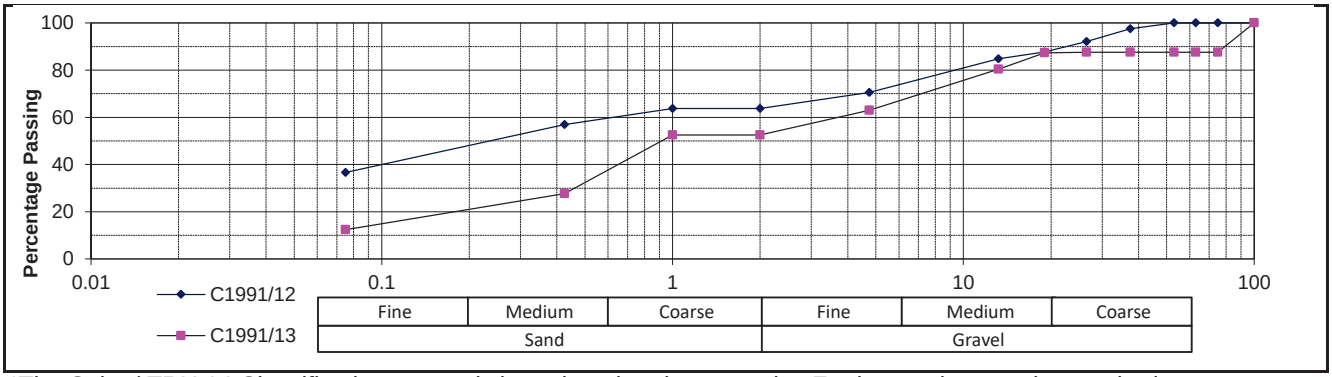
Laboratory No.		C1991/12 ◆			C1991/13 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1855			1884		
OMC	%	14.8			14.2		
California Bearing Ratio							
Compaction Data							
Moisture	%	14.6			14.5		
Dry Density	kg/m^3	1847	1788	1720	1883	1794	1742
Compaction	%	100.0	96.8	93.1	100.0	95.3	92.5
Penetration Data							
CBR at	2.5 mm	6	3	3	3	2	2
	5.00 mm	6	4	3	3	3	2
	7.50 mm	6	4	4	3	3	2
Swell @ 96hrs (%)		0.9	1.1	2.1	2.0	3.1	3.3
Final Moisture (%)		17.9	19.8	21.5	25.47	23.37	22.17



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	5	3
	@ 98%		4	2
	@ 97%		4	2
	@ 95%		4	2
	@ 93%		3	2
	@ 90%		3	1
	@ SANS3001 Midpoint		4	2

Classifications		
HRB (AASHTO)	A-4(0)	A-2-6(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/15 ◆	C1991/18 ■
Field Number		TPP28	TPP31
Client Reference			
Depth (m)		1.60-3.20	0.80-2.90
Position			
Coordinates	X		
	Y		
Description		Shale	Silty Sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

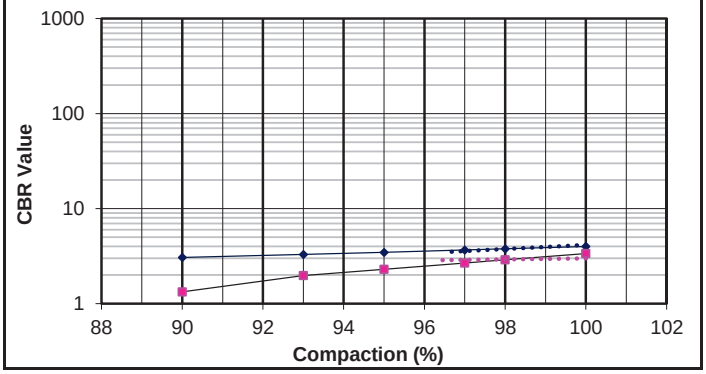
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	97	100
	50 mm	93	100
	37.5 mm	84	100
	28 mm	73	96
	20 mm	65	94
	14 mm	63	88
	5 mm	50	69
	2 mm	44	56
	1 mm	44	56
	0.425 mm	38	35
	0.075 mm	25	20
Grading Modulus		1.92	1.89

Soil Mortar Analysis

Coarse Sand	14	39
Coarse Fine Sand	11	7
Medium Fine Sand	9	9
Fine Fine Sand	11	10
Silt and Clay	56	36

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	35	36
Plasticity Index (%)	12	20
Linear Shrinkage (%)	6.0	10.5

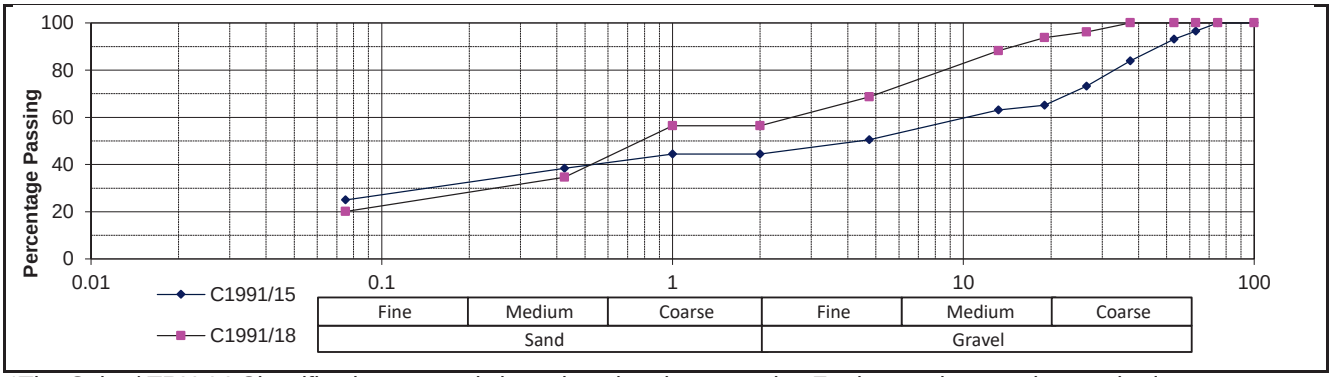
Laboratory No.		C1991/15 ◆			C1991/18 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1770			1877		
OMC	%	17.2			14.4		
California Bearing Ratio							
Compaction Data							
Moisture	%	17.0			14.0		
Dry Density	kg/m^3	1751	1690	1605	1787	1721	1675
Compaction	%	100.0	96.5	91.6	100.0	96.3	93.7
Penetration Data							
CBR at	2.5 mm	4	3	3	3	3	2
	5.00 mm	4	4	3	3	3	2
	7.50 mm	4	4	3	4	3	2
Swell @ 96hrs (%)		2.1	2.8	2.9	1.4	2.0	4.2
Final Moisture (%)		22.5	23.7	23.9	27.42	27.46	25.88



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	4	3
	@ 98%		4	3
	@ 97%		4	3
	@ 95%		3	2
	@ 93%		3	2
	@ 90%		3	1
	@ SANS3001 Midpoint		4	3

Classifications		
HRB (AASHTO)	A-2-6(0)	A-2-6(1)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/19 ◆	C1991/21 ■
Field Number		TPP32	TPD01
Client Reference			
Depth (m)		0.20-2.50	0.00-2.80
Position			
Coordinates	X		
	Y		
Description		Shale	Silty Sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

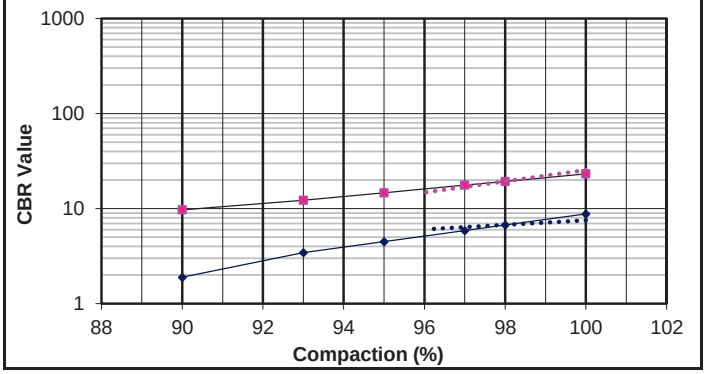
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	97	100
	28 mm	95	100
	20 mm	89	100
	14 mm	80	100
	5 mm	49	100
	2 mm	31	100
	1 mm	31	100
	0.425 mm	14	96
	0.075 mm	6	11
Grading Modulus		2.49	0.93

Soil Mortar Analysis

Coarse Sand	57	4
Coarse Fine Sand	7	30
Medium Fine Sand	8	34
Fine Fine Sand	8	21
Silt and Clay	19	11

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	32	
Plasticity Index (%)	11	NP
Linear Shrinkage (%)	6.5	

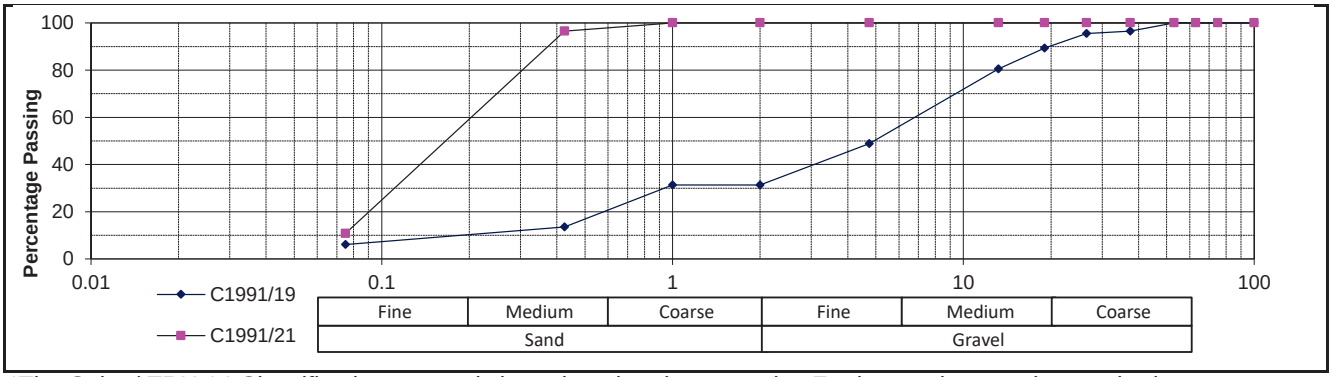
Laboratory No.		C1991/19 ◆			C1991/21 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	2063			1719		
OMC	%	10.8			9.5		
California Bearing Ratio							
Compaction Data							
Moisture	%	10.4			9.0		
Dry Density	kg/m^3	1973	1896	1842	1583	1519	1453
Compaction	%	100.0	96.1	93.3	100.0	95.9	91.8
Penetration Data							
CBR at	2.5 mm	8	6	4	25	15	11
	5.00 mm	7	7	3	22	16	12
	7.50 mm	8	7	3	17	13	10
Swell @ 96hrs (%)		1.7	1.8	2.0			
Final Moisture (%)		19.0	19.5	18.0	27.31	31.78	35.91



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	9	23
	@ 98%		7	19
	@ 97%		6	18
	@ 95%		4	15
	@ 93%		3	12
	@ 90%		2	10
	@ SANS3001 Midpoint		7	19

Classifications		
HRB (AASHTO)	A-2-6(0)	A-2-4(0)
COLTO*		G8
TRH14*		G9



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/34 ◆	C1991/38 ■
Field Number		TPR05	TPR10
Client Reference			
Depth (m)		0.30-1.50	0.90-1.70
Position			
Coordinates	X		
	Y		
Description		Clayey sand	Shale
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	91
	50 mm	100	91
	37.5 mm	98	83
	28 mm	98	79
	20 mm	98	75
	14 mm	98	72
	5 mm	96	50
	2 mm	92	34
	1 mm	92	34
	0.425 mm	85	14
	0.075 mm	23	6
Grading Modulus		1.00	2.45

Soil Mortar Analysis

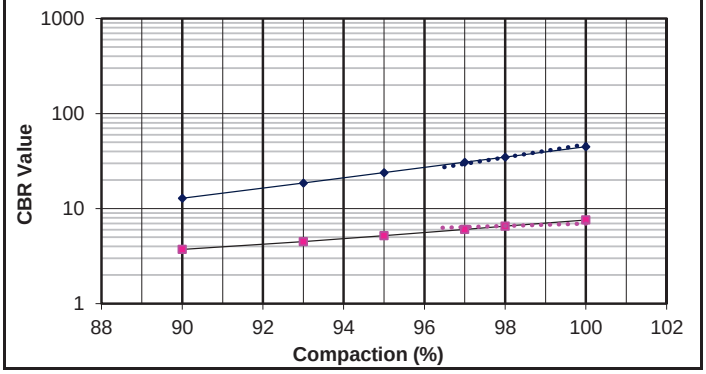
Coarse Sand	7	59
Coarse Fine Sand	20	2
Medium Fine Sand	25	9
Fine Fine Sand	23	11
Silt and Clay	25	18

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)		34
Plasticity Index (%)	NP	12
Linear Shrinkage (%)		6.5

Laboratory No.		C1991/34 ◆	C1991/38 ■
Maximum Dry Density & Optimum Moisture Content			
MDD	kg/m^3	2030	1926
OMC	%	8.1	10.5

California Bearing Ratio

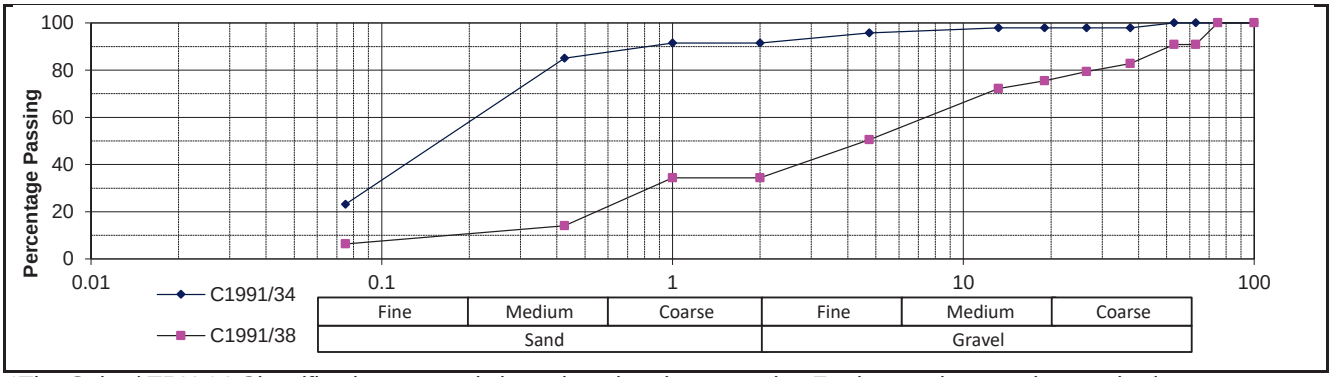
Compaction Data							
Moisture	%	8.1			10.5		
Dry Density	kg/m^3	2028	1955	1843	1922	1851	1628
Compaction	%	100.0	96.4	90.9	100.0	96.3	84.7
Penetration Data							
CBR at	2.5 mm	47	27	14	7	6	2
	5.00 mm	61	30	13	8	7	4
	7.50 mm	61	25	11	10	7	5
Swell @ 96hrs (%)					0.7	0.9	1.3
Final Moisture (%)		12.9	14.7	17.3	22.16	19.67	31.62



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	45	8
	@ 98%		35	7
	@ 97%		31	6
	@ 95%		24	5
	@ 93%		19	4
	@ 90%		13	4
	@ SANS3001 Midpoint		36	7

Classifications		
HRB (AASHTO)	A-2-4(0)	A-2-6(0)
COLTO*	G7	
TRH14*	G7	



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/56 ◆	C1991/57 ■
Field Number		TPRA5	TPRA6
Client Reference			
Depth (m)		0.30-1.50	0.50-1.60
Position			
Coordinates	X		
	Y		
Description		Shale	Clayey silty sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	98	100
	37.5 mm	97	100
	28 mm	86	100
	20 mm	74	100
	14 mm	65	97
	5 mm	37	84
	2 mm	22	50
	1 mm	22	50
	0.425 mm	8	33
	0.075 mm	3	21
Grading Modulus		2.66	1.95

Soil Mortar Analysis

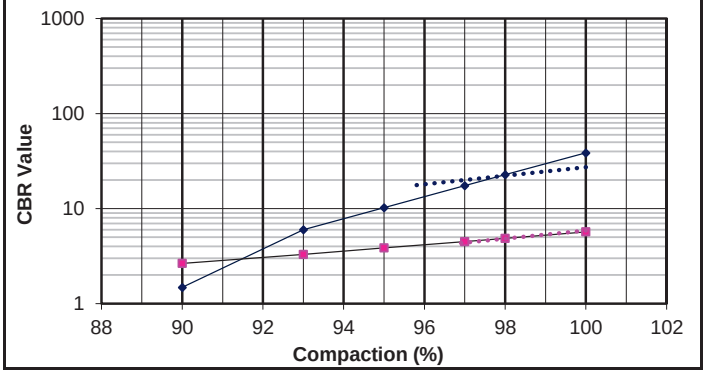
Coarse Sand	62	33
Coarse Fine Sand	10	8
Medium Fine Sand	7	7
Fine Fine Sand	7	9
Silt and Clay	14	42

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	25	28
Plasticity Index (%)	8	9
Linear Shrinkage (%)	4.0	4.0

Laboratory No.		C1991/56 ◆	C1991/57 ■
Maximum Dry Density & Optimum Moisture Content			
MDD	kg/m^3	2187	1801
OMC	%	7.5	17.3

California Bearing Ratio

Compaction Data							
Moisture	%	6.4			17.1		
Dry Density	kg/m^3	2110	2020	1975	1690	1635	1550
Compaction	%	100.0	95.7	93.6	100.0	96.7	91.7
Penetration Data							
CBR at	2.5 mm	27	18	7	6	4	3
	5.00 mm	30	17	7	7	5	4
	7.50 mm	27	15	8	8	5	4
Swell @ 96hrs (%)		0.1	1.1	1.5			
Final Moisture (%)		13.9	11.7	6.9	28.39	31.4	34.5

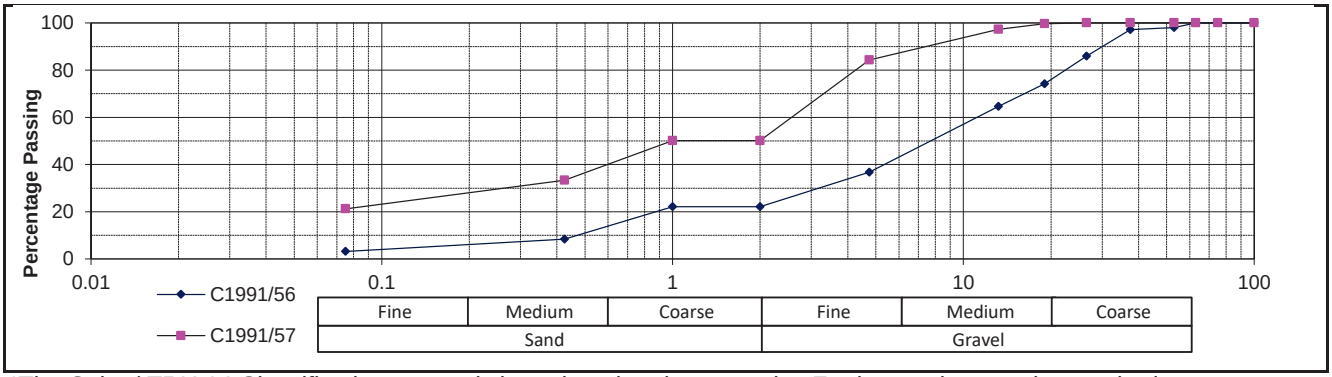


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	39	6
	@ 98%		23	5
	@ 97%		17	5
	@ 95%		10	4
	@ 93%		6	3
	@ 90%		1	3
	@ SANS3001 Midpoint		22	5

Classifications

HRB (AASHTO)	A-2-4(0)	A-2-4(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/74 ◆	C1991/81 ■
Field Number		TPRA20	TPC05
Client Reference			
Depth (m)		0.20-1.70	1.50-4.80
Position			
Coordinates	X		
	Y		
Description		Clayey Sand	Sandy Clay
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	94	100
	28 mm	94	99
	20 mm	88	98
	14 mm	78	98
	5 mm	46	86
	2 mm	24	78
	1 mm	24	78
	0.425 mm	5	51
	0.075 mm	4	38
Grading Modulus		2.66	1.34

Soil Mortar Analysis

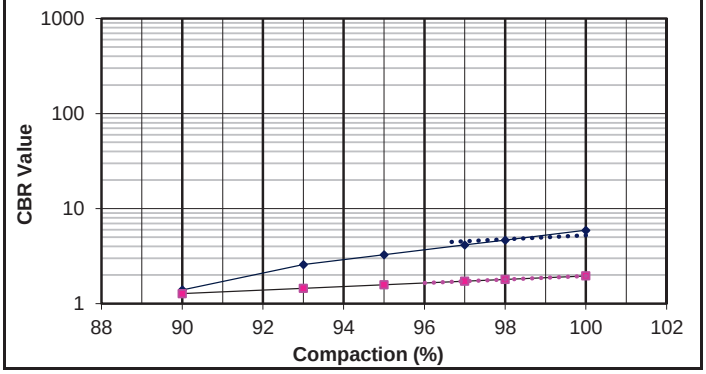
Coarse Sand	79	35
Coarse Fine Sand	1	4
Medium Fine Sand	1	6
Fine Fine Sand	1	7
Silt and Clay	18	48

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	34	30
Plasticity Index (%)	6	12
Linear Shrinkage (%)	5.0	6.5

Laboratory No.		C1991/74 ◆	C1991/81 ■
Maximum Dry Density & Optimum Moisture Content			
MDD	kg/m^3	2111	1863
OMC	%	8.9	16.2

California Bearing Ratio

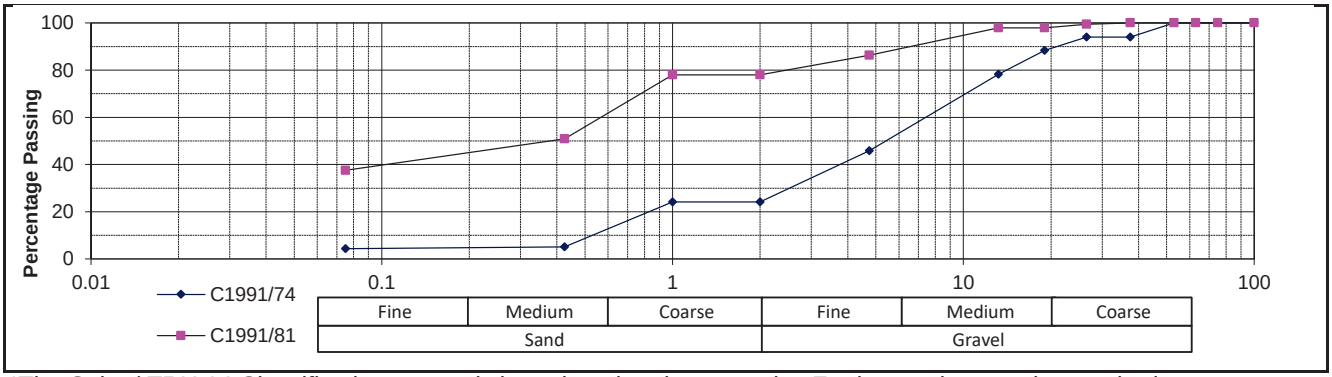
Compaction Data							
Moisture	%	9.1			16.2		
Dry Density	kg/m^3	2105	2031	1987	1776	1704	1645
Compaction	%	100.0	96.5	94.4	100.0	95.9	92.6
Penetration Data							
CBR at	2.5 mm	5	4	3	2	2	1
	5.00 mm	7	5	4	2	2	2
	7.50 mm	7	6	3	2	2	2
Swell @ 96hrs (%)		0.9	1.1	1.7	4.6	6.2	7.5
Final Moisture (%)		12.2	11.9	7.9	32.21	32.17	30.61



Interpolated CBR Data

CBR @ 100%	Mod. AASHTO	6	2
CBR @ 98%		5	2
CBR @ 97%		4	2
CBR @ 95%		3	2
CBR @ 93%		3	1
CBR @ 90%		1	1
@ SANS3001 Midpoint		5	2

Classifications		
HRB (AASHTO)	A-2-4(0)	A-6(1)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/41 ◆	C1991/42 ■
Field Number		TPRE01	TPRE02
Client Reference			
Depth (m)		0.80-1.40	0.70-1.50
Position			
Coordinates	X		
	Y		
Description		Shale	Alluvium
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

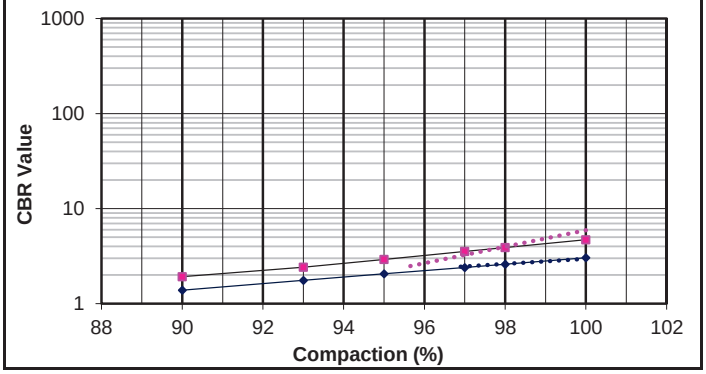
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	97	100
	37.5 mm	87	100
	28 mm	82	94
	20 mm	75	86
	14 mm	66	80
	5 mm	38	48
	2 mm	26	34
	1 mm	26	34
	0.425 mm	12	20
	0.075 mm	5	10
Grading Modulus		2.57	2.36

Soil Mortar Analysis

Coarse Sand	52	43
Coarse Fine Sand	11	8
Medium Fine Sand	10	10
Fine Fine Sand	9	9
Silt and Clay	19	29

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	34	38
Plasticity Index (%)	14	12
Linear Shrinkage (%)	7.5	6.5

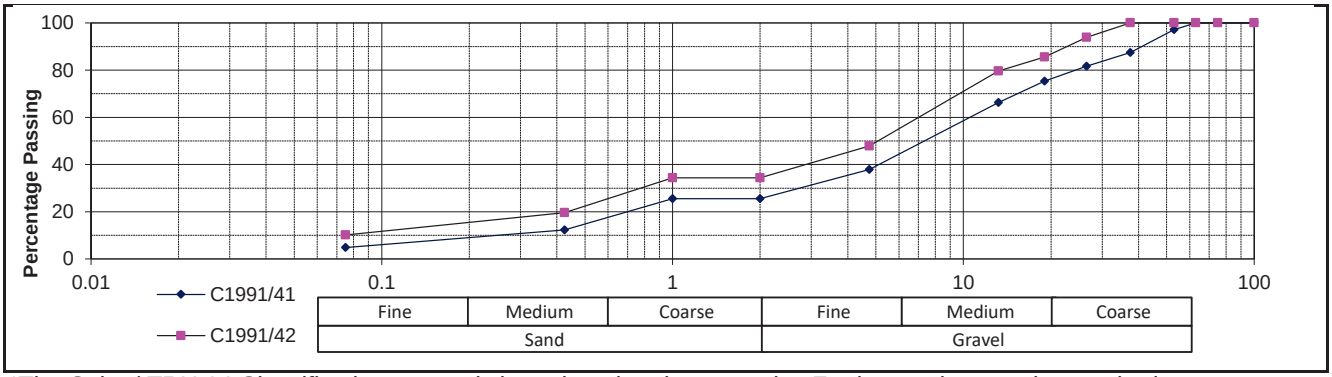
Laboratory No.		C1991/41 ◆			C1991/42 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1990			2126		
OMC	%	10.8			9.6		
California Bearing Ratio							
Compaction Data							
Moisture	%	10.4			9.1		
Dry Density	kg/m^3	1893	1834	1734	2133	2039	1944
Compaction	%	100.0	96.9	91.6	100.0	95.6	91.1
Penetration Data							
CBR at	2.5 mm	3	2	2	6	2	2
	5.00 mm	4	3	2	6	3	2
	7.50 mm	4	3	2	6	3	3
Swell @ 96hrs (%)		1.8	3.4	5.1	1.5	1.8	3.3
Final Moisture (%)		19.1	18.9	14.0	10.12	5.128	6.569



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	3	5
	@ 98%		3	4
	@ 97%		2	4
	@ 95%		2	3
	@ 93%		2	2
	@ 90%		1	2
	@ SANS3001 Midpoint		3	4

Classifications		
HRB (AASHTO)	A-2-6(0)	A-2-6(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572
sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/45 ◆	C1991/70 ■
Field Number		TPRE09	TPRA16
Client Reference			
Depth (m)		0.30-1.50	0.10-0.50
Position			
Coordinates	X		
	Y		
Description		Silty Clay	Shale
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

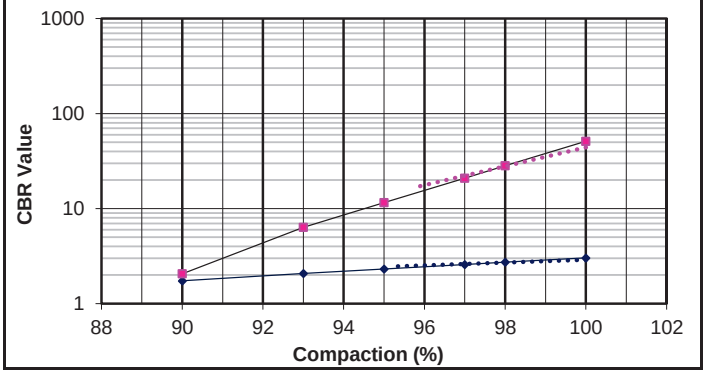
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	96
	37.5 mm	100	89
	28 mm	100	84
	20 mm	100	73
	14 mm	100	63
	5 mm	100	43
	2 mm	94	29
	1 mm	94	29
	0.425 mm	45	15
	0.075 mm	30	8
Grading Modulus		1.31	2.48

Soil Mortar Analysis

Coarse Sand	52	48
Coarse Fine Sand	6	7
Medium Fine Sand	6	8
Fine Fine Sand	5	10
Silt and Clay	32	28

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	38	28
Plasticity Index (%)	15	8
Linear Shrinkage (%)	7.0	4.0

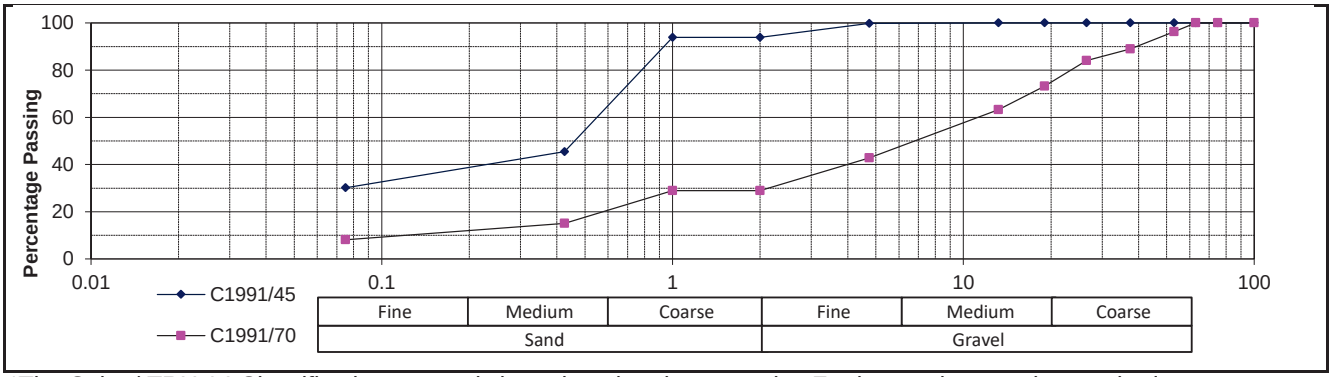
Laboratory No.		C1991/45 ◆			C1991/70 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1974			2146		
OMC	%	10.2			10.1		
California Bearing Ratio							
Compaction Data							
Moisture	%	9.5			9.6		
Dry Density	kg/m^3	1975	1882	1809	2150	2058	2010
Compaction	%	100.0	95.3	91.6	100.0	95.7	93.5
Penetration Data							
CBR at	2.5 mm	3	2	2	44	16	7
	5.00 mm	3	2	2	55	17	7
	7.50 mm	3	3	2	59	17	7
Swell @ 96hrs (%)		1.7	2.1	3.0			
Final Moisture (%)		13.4	10.1	13.7	10.17	9.854	11.78



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	3	51
	@ 98%		3	28
	@ 97%		3	21
	@ 95%		2	12
	@ 93%		2	6
	@ 90%		2	2
	@ SANS3001 Midpoint		3	27

Classifications		
HRB (AASHTO)	A-2-6(1)	A-2-4(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/40 ◆	C1991/54 ■
Field Number		TPR13	TPRA3
Client Reference			
Depth (m)		0.60-1.50	0.20-1.30
Position			
Coordinates	X		
	Y		
Description		Shale	Shale
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	99
	37.5 mm	100	93
	28 mm	98	85
	20 mm	93	76
	14 mm	88	69
	5 mm	64	47
	2 mm	53	36
	1 mm	53	36
	0.425 mm	44	24
	0.075 mm	30	18
Grading Modulus		1.72	2.21

Soil Mortar Analysis

Coarse Sand	17	33
Coarse Fine Sand	7	4
Medium Fine Sand	8	5
Fine Fine Sand	11	7
Silt and Clay	58	51

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	27	39
Plasticity Index (%)	11	9
Linear Shrinkage (%)	6.5	4.5

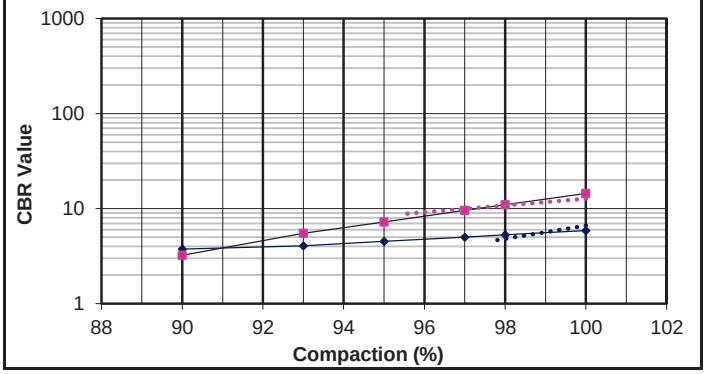
Laboratory No.		C1991/40 ◆	C1991/54 ■

Maximum Dry Density & Optimum Moisture Content

MDD	kg/m^3	1989	1968
OMC	%	13.0	11.6

California Bearing Ratio

Compaction Data							
Moisture	%	13.2			11.6		
Dry Density	kg/m^3	1962	1918	1824	1965	1876	1821
Compaction	%	100.0	97.8	93.0	100.0	95.5	92.7
Penetration Data							
CBR at	2.5 mm	7	5	4	13	9	5
	5.00 mm	6	4	3	13	12	7
	7.50 mm	5	4	3	12	12	8
Swell @ 96hrs (%)		2.1	2.2	2.3	0.1	0.2	0.2
Final Moisture (%)		16.1	17.4	18.2	18.75	22.95	21.62

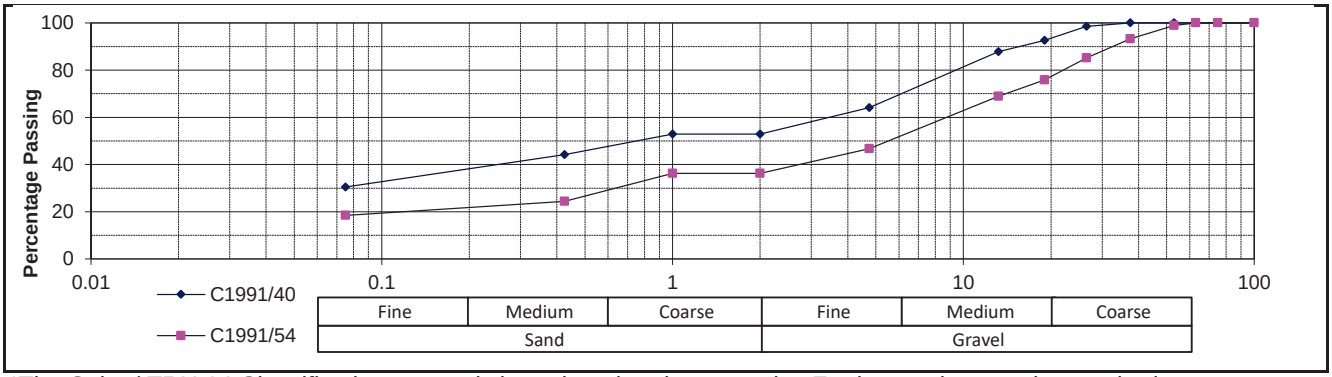


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	6	14
	@ 98%		5	11
	@ 97%		5	10
	@ 95%		5	7
	@ 93%		4	6
	@ 90%		4	3
	@ SANS3001 Midpoint		6	11

Classifications

HRB (AASHTO)	A-2-6(0)	A-2-4(0)
COLTO*		
TRH14*		G10



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/31 ◆	C1991/36 ■
Field Number		TPR01	TPR08
Client Reference			
Depth (m)		0.70-1.70	0.70-1.50
Position			
Coordinates	X		
	Y		
Description		Shale	Shale
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	97
	50 mm	99	89
	37.5 mm	95	87
	28 mm	95	83
	20 mm	95	78
	14 mm	95	75
	5 mm	88	62
	2 mm	85	54
	1 mm	85	54
	0.425 mm	70	48
	0.075 mm	49	38
Grading Modulus		0.96	1.60

Soil Mortar Analysis

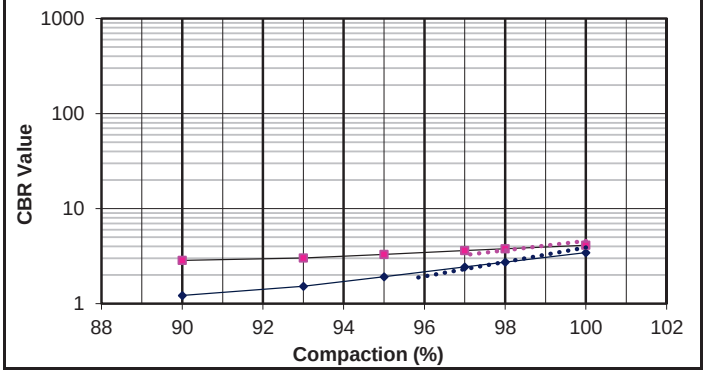
Coarse Sand	17	11
Coarse Fine Sand	8	6
Medium Fine Sand	9	6
Fine Fine Sand	9	7
Silt and Clay	58	69

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	32	25
Plasticity Index (%)	11	13
Linear Shrinkage (%)	6.5	5.5

Laboratory No.		C1991/31 ◆	C1991/36 ■
Maximum Dry Density & Optimum Moisture Content			
MDD	kg/m^3	1808	1800
OMC	%	15.7	16.7

California Bearing Ratio

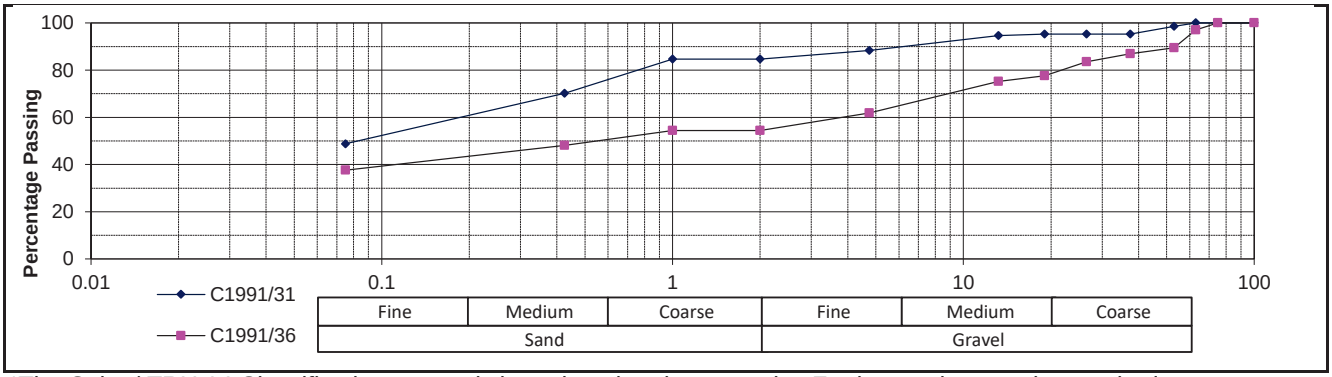
Compaction Data							
Moisture	%	11.2			16.6		
Dry Density	kg/m^3	1806	1729	1677	1794	1740	1665
Compaction	%	100.0	95.8	92.9	100.0	97.0	92.8
Penetration Data							
CBR at	2.5 mm	4	2	2	5	3	3
	5.00 mm	3	2	2	5	4	3
	7.50 mm	4	2	2	5	4	3
Swell @ 96hrs (%)		2.5	4.1	6.0	2.2	2.5	2.8
Final Moisture (%)		24.6	24.3	22.7	21.84	22.71	23.81



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	3	4
	@ 98%		3	4
	@ 97%		2	4
	@ 95%		2	3
	@ 93%		2	3
	@ 90%		1	3
	@ SANS3001 Midpoint		3	4

Classifications		
HRB (AASHTO)	A-6(3)	A-6(1)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/24 ◆	C1991/30 ■
Field Number		TPD06	TPE02
Client Reference			
Depth (m)		0.70-1.80	0.90-1.70
Position			
Coordinates	X		
	Y		
Description		Silty Clay	Sandy Clay
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

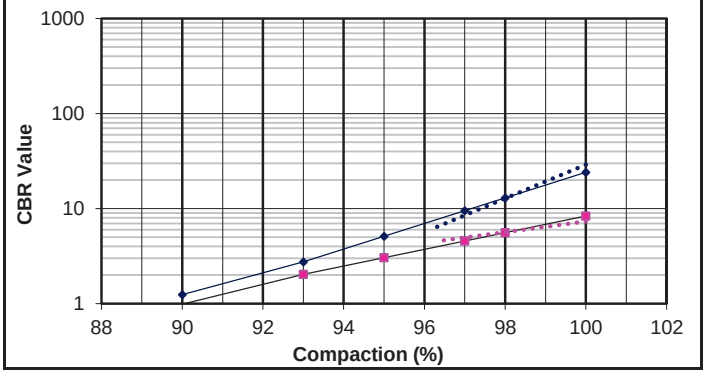
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	100
	2 mm	100	100
	1 mm	100	100
	0.425 mm	76	73
	0.075 mm	26	22
Grading Modulus		0.98	1.05

Soil Mortar Analysis

Coarse Sand	23	26
Coarse Fine Sand	9	17
Medium Fine Sand	20	24
Fine Fine Sand	22	11
Silt and Clay	26	22

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	19	21
Plasticity Index (%)	5	6
Linear Shrinkage (%)	2.5	2.5

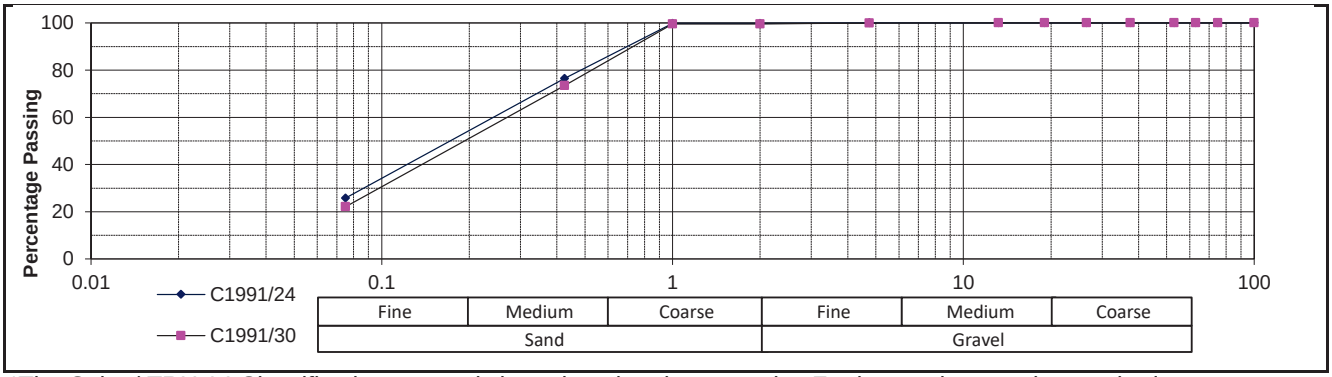
Laboratory No.		C1991/24 ◆			C1991/30 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	2061			1967		
OMC	%	9.5			10.7		
California Bearing Ratio							
Compaction Data							
Moisture	%	9.0			10.3		
Dry Density	kg/m^3	1977	1904	1831	1872	1803	1741
Compaction	%	100.0	96.3	92.6	100.0	96.3	93.0
Penetration Data							
CBR at	2.5 mm	29	6	2	7	5	2
	5.00 mm	32	5	2	8	4	2
	7.50 mm	30	5	2	9	4	2
Swell @ 96hrs (%)					0.2	1.1	1.5
Final Moisture (%)		17.8	12.5	12.5	22.07	22.7	22.29



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	24	8
	@ 98%		13	6
	@ 97%		10	5
	@ 95%		5	3
	@ 93%		3	2
	@ 90%		1	1
	@ SANS3001 Midpoint		14	6

Classifications		
HRB (AASHTO)	A-2-4(0)	A-2-4(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/9 ◆	C1991/10 ■
Field Number		TPP16	TPP19
Client Reference			
Depth (m)		1.00-2.20	1.60-3.10
Position			
Coordinates	X		
	Y		
Description		Shale	Shale
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

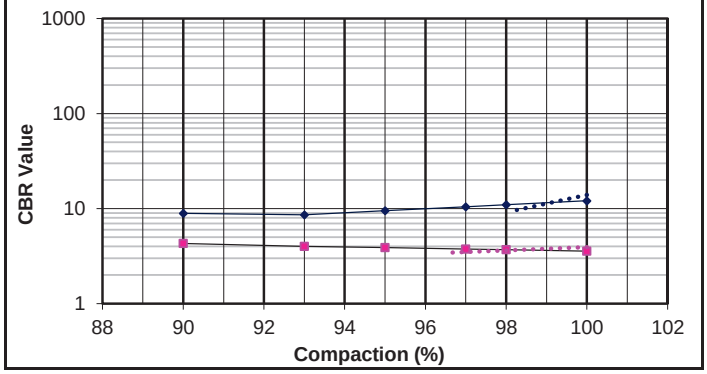
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	97	100
	28 mm	92	100
	20 mm	85	100
	14 mm	81	98
	5 mm	53	81
	2 mm	39	73
	1 mm	39	73
	0.425 mm	27	41
	0.075 mm	13	30
Grading Modulus		2.21	1.55

Soil Mortar Analysis

Coarse Sand	32	44
Coarse Fine Sand	15	7
Medium Fine Sand	9	4
Fine Fine Sand	10	5
Silt and Clay	34	41

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	31	34
Plasticity Index (%)	8	9
Linear Shrinkage (%)	4.0	4.0

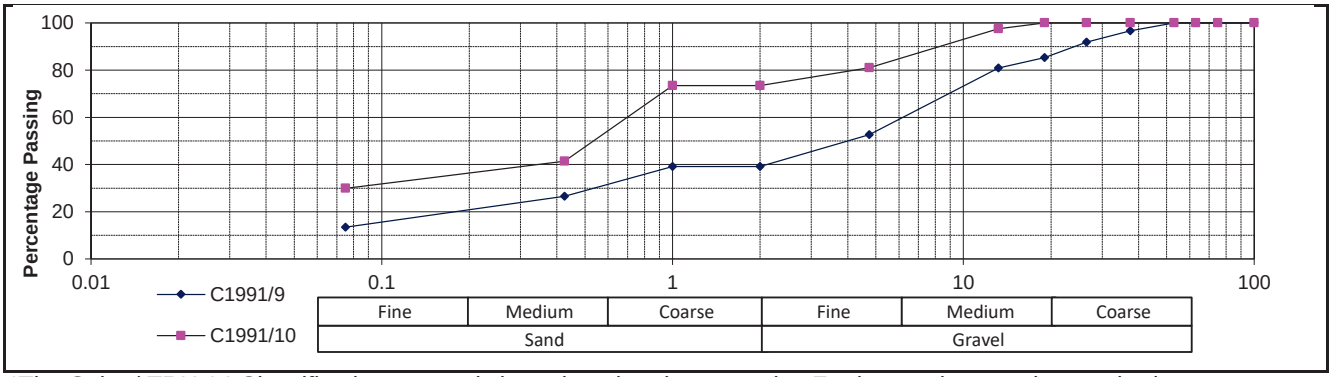
Laboratory No.		C1991/9 ◆			C1991/10 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1931			1797		
OMC	%	14.1			18.5		
California Bearing Ratio							
Compaction Data							
Moisture	%	14.1			18.1		
Dry Density	kg/m^3	1906	1873	1805	1691	1632	1540
Compaction	%	100.0	98.3	94.7	100.0	96.5	91.1
Penetration Data							
CBR at	2.5 mm	14	10	9	4	3	4
	5.00 mm	14	10	10	5	4	4
	7.50 mm	13	12	11	5	4	4
Swell @ 96hrs (%)		1.4	1.5	1.5	2.0	2.4	3.4
Final Moisture (%)		16.8	17.8	23.4	30.17	32.2	34.15



Interpolated CBR Data

CBR Mod. AASHTO	@ 100%		12	4
	@ 98%		11	4
	@ 97%		10	4
	@ 95%		9	4
	@ 93%		9	4
	@ 90%		9	4
	@	SANS3001 Midpoint	12	4

Classifications		
HRB (AASHTO)	A-2-4(0)	A-2-4(0)
COLTO*	G9	
TRH14*	G9	



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		C1991/77 ◆	C1991/79 ■
Field Number		TPRA22	TPC13
Client Reference			
Depth (m)		0.20-1.60	2.60-6.00
Position			
Coordinates	X		
	Y		
Description		Shale	Silty Clay
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

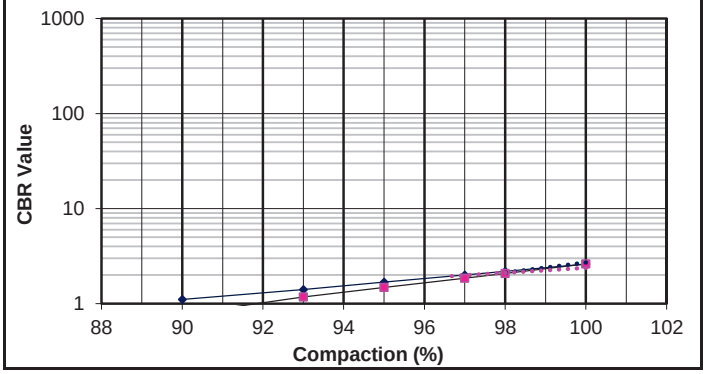
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	98	99
	28 mm	95	98
	20 mm	89	97
	14 mm	85	93
	5 mm	71	85
	2 mm	62	77
	1 mm	62	77
	0.425 mm	53	45
	0.075 mm	36	20
Grading Modulus		1.50	1.59

Soil Mortar Analysis

Coarse Sand	14	41
Coarse Fine Sand	9	10
Medium Fine Sand	9	11
Fine Fine Sand	10	12
Silt and Clay	58	26

Atterberg Limits	<0.425mm	<0.425mm
Liquid Limit (%)	38	22
Plasticity Index (%)	18	6
Linear Shrinkage (%)	7.5	2.5

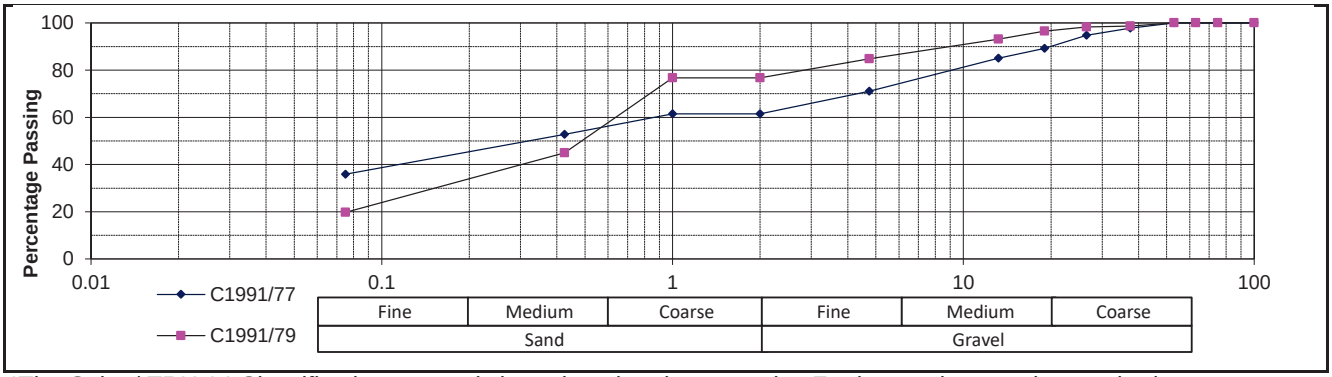
Laboratory No.		C1991/77 ◆			C1991/79 ■		
Maximum Dry Density & Optimum Moisture Content							
MDD	kg/m^3	1771			1963		
OMC	%	16.4			12.6		
California Bearing Ratio							
Compaction Data							
Moisture	%	16.2			9.4		
Dry Density	kg/m^3	1752	1715	1628	1969	1900	1828
Compaction	%	100.0	97.9	93.0	100.0	96.5	92.8
Penetration Data							
CBR at	2.5 mm	3	2	1	2	2	1
	5.00 mm	3	2	2	2	2	1
	7.50 mm	3	2	2	2	2	2
Swell @ 96hrs (%)		2.6	3.7	6.0	1.7	4.3	5.6
Final Moisture (%)		26.5	23.4	27.9	18.59	16.32	12.23



Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	3	3
	@ 98%		2	2
	@ 97%		2	2
	@ 95%		2	1
	@ 93%		1	1
	@ 90%		1	1
	@ SANS3001 Midpoint		2	2

Classifications		
HRB (AASHTO)	A-6(2)	A-2-4(0)
COLTO*		
TRH14*		



*The Colto / TRH 14 Classifications are only based on the above results. Further testing may be required

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

AGGREGATE TEST REPORT

				C1991/64	C1991/72	C1991/74	C1991/77	C1991/81	C1991/83
Laboratory Number				C1991/64	C1991/72	C1991/74	C1991/77	C1991/81	C1991/83
Field Number				TPRA12	TPRA18	TPRA20	TPRA22	TPC05	TPD01
Client Reference									
Depth (m)				0.20-1.00	0.20-1.30	0.20-1.70	0.20-1.60	1.50-4.80	0-5.10
Position									
Description				Shale	Clayey sand	Clayey sand	Shale	Sandy Clay	Silty Sand
Sieve Analysis - SANS 3001 - AG1	% Passing	100	(mm)						
		75	(mm)						
		63	(mm)						
		50	(mm)						
		37.5	(mm)						
		28	(mm)						
		20	(mm)						
		14	(mm)						
		10	(mm)						
		7.1	(mm)						
		5	(mm)						
			(mm)						
		2	(mm)						
		1	(mm)						
		0.6	(mm)						
		0.425	(mm)						
		0.300	(mm)						
		0.150	(mm)						
		0.075	(mm)						
Finess Modulus		SANS 3001-PR5							
Coarse Sand Ratio			(%)						
Flakiness Index	Total	SANS 3001-AG4*	(%)						
	+20mm-28mm	SANS 3001-AG4*	(%)						
	+14mm-20mm	SANS 3001-AG4*	(%)						
pH Value		TMH1 - A20							
Compactibility Factor		TMH1-B9*		96.0	85.0	97.0	81.0	76.0	67.0
Conductivity		TMH1 - A21T	($mS.m^{-1}$)						

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

AGGREGATE TEST REPORT

Laboratory Number				C1991/84					
Field Number				TPD02					
Client Reference									
Depth (m)				0.00-4.50					
Position									
Description				Silty Sand					
Sieve Analysis - SANS 3001 - AG1	% Passing	100	(mm)						
		75	(mm)						
		63	(mm)						
		50	(mm)						
		37.5	(mm)						
		28	(mm)						
		20	(mm)						
		14	(mm)						
		10	(mm)						
		7.1	(mm)						
		5	(mm)						
			(mm)						
		2	(mm)						
		1	(mm)						
		0.6	(mm)						
		0.425	(mm)						
		0.300	(mm)						
		0.150	(mm)						
		0.075	(mm)						
Finess Modulus		SANS 3001-PR5							
Coarse Sand Ratio			(%)						
Flakiness Index	Total	SANS 3001-AG4*	(%)						
	+20mm-28mm	SANS 3001-AG4*	(%)						
	+14mm-20mm	SANS 3001-AG4*	(%)						
pH Value		TMH1 - A20							
Compactibility Factor		TMH1-B9*		96.0					
Conductivity		TMH1 - A21T	($mS.m^{-1}$)						

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

sanas

AGGREGATE TEST REPORT

				C1991/4	C1991/6	C1991/8	C1991/15	C1991/34	C1991/41
Laboratory Number				C1991/4	C1991/6	C1991/8	C1991/15	C1991/34	C1991/41
Field Number				TPP10	TPP12	TPP15	TPP28	TPR05	TPRE01
Client Reference									
Depth (m)				0.90-1.70	1.00-3.00	0.50-1.10	1.60-3.20	0.30-1.50	0.80-1.40
Position									
Description				Shale	Shale	Shale	Shale	Clayey sand	Shale
Sieve Analysis - SANS 3001 - AG1	% Passing	100	(mm)						
		75	(mm)						
		63	(mm)						
		50	(mm)						
		37.5	(mm)						
		28	(mm)						
		20	(mm)						
		14	(mm)						
		10	(mm)						
		7.1	(mm)						
		5	(mm)						
			(mm)						
		2	(mm)						
		1	(mm)						
		0.6	(mm)						
		0.425	(mm)						
		0.300	(mm)						
		0.150	(mm)						
		0.075	(mm)						
Finess Modulus		SANS 3001-PR5							
Coarse Sand Ratio			(%)						
Flakiness Index	Total	SANS 3001-AG4*	(%)						
	+20mm-28mm	SANS 3001-AG4*	(%)						
	+14mm-20mm	SANS 3001-AG4*	(%)						
pH Value		TMH1 - A20							
Compactibility Factor		TMH1-B9*		95.0	81.0	93.0	78.0	83.0	79.0
Conductivity		TMH1 - A21T	($mS.m^{-1}$)						

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

AGGREGATE TEST REPORT

				C1991/42	C1991/43	C1991/44	C1991/45	C1991/54	C1991/57
Laboratory Number				C1991/42	C1991/43	C1991/44	C1991/45	C1991/54	C1991/57
Field Number				TPRE02	TPRE04	TPRE06	TPRE09	TPRA3	TPRA6
Client Reference									
Depth (m)				0.7-1.50	0.8-1.60	0.60-1.50	0.3-1.50	0.20-1.30	0.50-1.60
Position									
Description				Alluvium	Shale	Shale	Silty Clay	Shale	Clayey silty sand
Sieve Analysis - SANS 3001 - AG1	% Passing	100	(mm)						
		75	(mm)						
		63	(mm)						
		50	(mm)						
		37.5	(mm)						
		28	(mm)						
		20	(mm)						
		14	(mm)						
		10	(mm)						
		7.1	(mm)						
		5	(mm)						
			(mm)						
		2	(mm)						
		1	(mm)						
		0.6	(mm)						
		0.425	(mm)						
		0.300	(mm)						
		0.150	(mm)						
		0.075	(mm)						
Finess Modulus		SANS 3001-PR5							
Coarse Sand Ratio			(%)						
Flakiness Index	Total	SANS 3001-AG4*	(%)						
	+20mm-28mm	SANS 3001-AG4*	(%)						
	+14mm-20mm	SANS 3001-AG4*	(%)						
pH Value		TMH1 - A20							
Compactibility Factor		TMH1-B9*		73.0	74.0	81.0	80.0	77.0	77.0
Conductivity		TMH1 - A21T	($mS.m^{-1}$)						

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

AGGREGATE TEST REPORT

				C1991/3	C1991/4	C1991/15	C1991/17	C1991/60	C1991/86
Laboratory Number				C1991/3	C1991/4	C1991/15	C1991/17	C1991/60	C1991/86
Field Number				TPP10	TPP10	TPP28	TPP30	TPRA8	TPD05A
Client Reference									
Depth (m)				0.6-0.9	0.90-1.70	1.60-3.20	1.30-3.0	0.20-0.60	0.60-2.90
Position									
Description				Gravelly Clay	Shale	Shale	Gravelly Clay	Silty Clay	Silty Clay
Sieve Analysis - SANS 3001 - AG1	% Passing	100	(mm)						
		75	(mm)						
		63	(mm)						
		50	(mm)						
		37.5	(mm)						
		28	(mm)						
		20	(mm)						
		14	(mm)						
		10	(mm)						
		7.1	(mm)						
		5	(mm)						
			(mm)						
		2	(mm)						
		1	(mm)						
		0.6	(mm)						
		0.425	(mm)						
		0.300	(mm)						
		0.150	(mm)						
		0.075	(mm)						
Finess Modulus		SANS 3001-PR5							
Coarse Sand Ratio			(%)						
Flakiness Index	Total	SANS 3001-AG4*	(%)						
	+20mm-28mm	SANS 3001-AG4*	(%)						
	+14mm-20mm	SANS 3001-AG4*	(%)						
pH Value		TMH1 - A20		7.7	7.7	6.7	7.0	5.5	5.5
Compactibility Factor		TMH1-B9*							
Conductivity		TMH1 - A21T	($mS.m^{-1}$)	0.07845	0.68000	0.14610	0.05480	0.03210	0.02250

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

AGGREGATE TEST REPORT

Laboratory Number				C1991/29					
Field Number				TPD12					
Client Reference									
Depth (m)				1.50-3.0					
Position									
Description				Shale					
Sieve Analysis - SANS 3001 - AG1	% Passing	100	(mm)						
		75	(mm)						
		63	(mm)						
		50	(mm)						
		37.5	(mm)						
		28	(mm)						
		20	(mm)						
		14	(mm)						
		10	(mm)						
		7.1	(mm)						
		5	(mm)						
			(mm)						
		2	(mm)						
		1	(mm)						
		0.6	(mm)						
		0.425	(mm)						
		0.300	(mm)						
		0.150	(mm)						
		0.075	(mm)						
Finess Modulus		SANS 3001-PR5							
Coarse Sand Ratio			(%)						
Flakiness Index	Total	SANS 3001-AG4*	(%)						
	+20mm-28mm	SANS 3001-AG4*	(%)						
	+14mm-20mm	SANS 3001-AG4*	(%)						
pH Value		TMH1 - A20		4.9					
Compactibility Factor		TMH1-B9*		69.0					
Conductivity		TMH1 - A21T	($S.m^{-1}$)	0.12600					

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

AGGREGATE TEST REPORT

				C1991/14	C1991/18	C1991/19	C1991/21	C1991/22	C1991/23
Laboratory Number				C1991/14	C1991/18	C1991/19	C1991/21	C1991/22	C1991/23
Field Number				TPP28	TPP31	TPP32	TPD01	TPD05	TPD06
Client Reference									
Depth (m)				1.60-3.20	0.8-2.9	0.2-2.5	0.00-2.80	1.1-1.7	0.0-0.7
Position									
Description				Shale	Silty Sand	Gravelly Clay	Silty Sand	Silty Clay	Silty Clay
Sieve Analysis - SANS 3001 - AG1	% Passing	100	(mm)						
		75	(mm)						
		63	(mm)						
		50	(mm)						
		37.5	(mm)						
		28	(mm)						
		20	(mm)						
		14	(mm)						
		10	(mm)						
		7.1	(mm)						
		5	(mm)						
			(mm)						
		2	(mm)						
		1	(mm)						
		0.6	(mm)						
		0.425	(mm)						
		0.300	(mm)						
		0.150	(mm)						
		0.075	(mm)						
Finess Modulus		SANS 3001-PR5							
Coarse Sand Ratio			(%)						
Flakiness Index	Total	SANS 3001-AG4*	(%)						
	+20mm-28mm	SANS 3001-AG4*	(%)						
	+14mm-20mm	SANS 3001-AG4*	(%)						
pH Value		TMH1 - A20		9.1	8.5	7.8	5.7	5.1	4.7
Compactibility Factor		TMH1-B9*			67.0	85.0	82.0	63.0	73.0
Conductivity		TMH1 - A21T	($mS.m^{-1}$)	0.17100	0.47300	0.04770	0.00434	0.03400	0.00900

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

AGGREGATE TEST REPORT

				C1991/1	C1991/5	C1991/9	C1991/10	C1991/12	C1991/13
Laboratory Number				C1991/1	C1991/5	C1991/9	C1991/10	C1991/12	C1991/13
Field Number				TPP08	TPP12	TPP16	TPP19	TPP22	TPP27
Client Reference									
Depth (m)				1.0-3.0	1.0-3.0	1.0-2.20	1.6-3.1	0.70-1.40	1.2-3.0
Position									
Description				Silty Sand	Shale	Shale	Shale	Silty Clay	Silty Sand
Sieve Analysis - SANS 3001 - AG1	% Passing	100	(mm)						
		75	(mm)						
		63	(mm)						
		50	(mm)						
		37.5	(mm)						
		28	(mm)						
		20	(mm)						
		14	(mm)						
		10	(mm)						
		7.1	(mm)						
		5	(mm)						
			(mm)						
		2	(mm)						
		1	(mm)						
		0.6	(mm)						
		0.425	(mm)						
		0.300	(mm)						
		0.150	(mm)						
		0.075	(mm)						
Finess Modulus		SANS 3001-PR5							
Coarse Sand Ratio			(%)						
Flakiness Index	Total	SANS 3001-AG4*	(%)						
	+20mm-28mm	SANS 3001-AG4*	(%)						
	+14mm-20mm	SANS 3001-AG4*	(%)						
pH Value		TMH1 - A20		6.5	8.3	9.5	8.8	9.0	7.3
Compactibility Factor		TMH1-B9*		68.0		90.0	76.0	83.0	99.0
Conductivity		TMH1 - A21T	($mS.m^{-1}$)	0.02460	0.15800	0.29100	0.27900	0.07570	0.03915

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

AGGREGATE TEST REPORT

				C1991/24	C1991/29	C1991/30	C1991/31	C1991/56	C1991/79
Laboratory Number				C1991/24	C1991/29	C1991/30	C1991/31	C1991/56	C1991/79
Field Number				TPD06	TPD12	TPE02	TPR01	TPRA5	TPC13
Client Reference									
Depth (m)				0.7-1.80	1.5-3.0	0.90-1.7	0.7-1.7	0.3-1.5	2.60-6.00
Position									
Description				Silty Clay	Shale	Sandy Clay	Shale	Shale	Silty Clay
Sieve Analysis - SANS 3001 - AG1	% Passing	100	(mm)						
		75	(mm)						
		63	(mm)						
		50	(mm)						
		37.5	(mm)						
		28	(mm)						
		20	(mm)						
		14	(mm)						
		10	(mm)						
		7.1	(mm)						
		5	(mm)						
			(mm)						
		2	(mm)						
		1	(mm)						
		0.6	(mm)						
		0.425	(mm)						
		0.300	(mm)						
		0.150	(mm)						
		0.075	(mm)						
Finess Modulus		SANS 3001-PR5							
Coarse Sand Ratio			(%)						
Flakiness Index	Total	SANS 3001-AG4*	(%)						
	+20mm-28mm	SANS 3001-AG4*	(%)						
	+14mm-20mm	SANS 3001-AG4*	(%)						
pH Value		TMH1 - A20		5.3	4.9	7.4	7.0	7.0	7.8
Compactibility Factor		TMH1-B9*		77.0	69.0	74.0	84.0		77.0
Conductivity		TMH1 - A21T	($mS.m^{-1}$)	0.04580	0.12600	0.05770	0.24100	0.05970	0.11300

Labco Southern Africa (Pty) Ltd
Email: jacobus@labco.co.za ■ www.labco.co.za
Phone: +27 (0)21 905 0515
Cape Town Branch ■ 15 Warrior Crescent, Blackheath ■ PO Box 6627 Kraaifontein North, 7572

AGGREGATE TEST REPORT

Laboratory Number				C1991/82	C1991/85	C1991/86			
Field Number				TPC04	TPD04B	TPD05A			
Client Reference									
Depth (m)				0.0-5.0	2.6-6.0	0.60-2.90			
Position									
Description				Silty Sand	Clayey silty sand	Silty Clay			
Sieve Analysis - SANS 3001 - AG1	% Passing	100	(mm)						
		75	(mm)						
		63	(mm)						
		50	(mm)						
		37.5	(mm)						
		28	(mm)						
		20	(mm)						
		14	(mm)						
		10	(mm)						
		7.1	(mm)						
		5	(mm)						
			(mm)						
		2	(mm)						
		1	(mm)						
		0.6	(mm)						
		0.425	(mm)						
		0.300	(mm)						
		0.150	(mm)						
		0.075	(mm)						
Finess Modulus		SANS 3001-PR5							
Coarse Sand Ratio			(%)						
Flakiness Index	Total	SANS 3001-AG4*	(%)						
	+20mm-28mm	SANS 3001-AG4*	(%)						
	+14mm-20mm	SANS 3001-AG4*	(%)						
pH Value		TMH1 - A20		5.7	7.3				
Compactibility Factor		TMH1-B9*		75.0	73.0	65.0			
Conductivity		TMH1 - A21T	($mS.m^{-1}$)	0.01485	0.01982				

Specialised Testing Laboratory (Pty) Ltd
Asphalt | Aggregate | Bitumen | Geotechnical

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Quality | Excellence | On Time

PROPERTIES OF AGGREGATE & SAND

Test Method(s) : SANS 3001-AG1 / AG2 / AG4 / AG5 / AG10 / AG14 / AG15 / AG20 / AG21 / AG22 SANS202 / 850 / 5833 / 5837 / 5839 / 5840 / 5846 / 5849 / 5850 / 5856 / 6243 / 5832 (if applicable)

Sheet Reference: R-STL-005 Rev01

Client: Labco (Pty) Ltd | Project Name: Mukona Consulting - BRVAS | Job Reference no: LAB-19

Source: | Project No: C-1991 | Date: 29.11.2021

Lab no	Client ref no	Description	Sieve Analysis (% Passing) per Sieve Size (mm)														Chloride Content (%)	Water Soluble Sulphates (%)												
			37.5	28	20	14	10	7.1	5	2	1	0.600	0.300	0.150	0.075	FM															
71		TPP08 - 1.0-3.00															0.0035	0.2058													
72		TPP10 - 0.60-0.90															0.0567	1.8522													
73		TPP12 - 1.00-3.00															0.0035	0.3430													
74		TPP15 - 0.50-1.80															0.0035	0.4459													
75		TPP16 - 1.00-2.20															0.0567	0.5831													
76		TPP21 - 1.30-3.10															0.0035	0.9947													
77		TPP22 - 0.70-1.40															0.00	0.5145													
78		TPP28 - 1.60-3.20															0.0106	0.0343													
79		TPP30 - 1.30-3.00															0.00	0.0343													
80		TPP31 - 0.80-2.90															0.0071	0.2401													
81		TPP32 - 0.20-2.50															0.0035	0.3773													
82		TPD01 - 0.00-2.80															0.0071	0.0343													

Remarks:

Specialised Testing Laboratory (Pty) Ltd
Asphalt | Aggregate | Bitumen | Geotechnical

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Quality | Excellence | On Time

PROPERTIES OF AGGREGATE & SAND

Test Method(s) : SANS 3001-AG1 / AG2 / AG4 / AG5 / AG10 / AG14 / AG15 / AG20 / AG21 / AG22 SANS202 / 850 / 5833 / 5837 / 5839 / 5840 / 5846 / 5849 / 5850 / 5856 / 6243 / 5832 (if applicable)

Sheet Reference: R-STL-005 Rev01

Client: Labco (Pty) Ltd | Project Name: Mukona Consulting - BRVAS | Job Reference no: LAB-19

Source: | Project No: C-1991 | Date: 29.11.2021

Lab no	Client ref no	Description	Sieve Analysis (% Passing) per Sieve Size (mm)														Chloride Content (%)	Water Soluble Sulphates (%)												
			37.5	28	20	14	10	7.1	5	2	1	0.600	0.300	0.150	0.075	FM															
83		TPD05 - 1.10-1.70															0.0035	0.00													
84		TPD06 - 0.70-1.80															0.0035	0.00													
85		TPD12 - 1.50-3.00															0.0071	0.3773													
86		TPE02 - 0.90-1.70															0.00	0.8575													
87		TPR01 - 0.70-1.70`															0.00	0.4116													
88		TPRA5 - 0.30-1.50															0.0071	0.0343													
89		TPC13 - 2.60-6															0.0071	1.1662													
90		TPC05 - 1.50-4.80															0.0035	0.2058													
91		TPC04 - 0.00-5.00															0.0142	0.0686													
92		TPD01 - 0.00-5.10															0.0142	0.0343													
93		TPD04B - 2.40-6.00															0.0035	0.0343													
94		TPD05A - 0.60-2.90															0.0035	0.0343													

Remarks:

Berg River Voëlvlei Augmentation Scheme

"BRVAS"

Compiled by: Christiaan Mouton, Principal Geophysicist, BSc. (Hons) Geophysics, M.Sc. Medical Physics, Pr.Sci.Nat.(400300/15)

Project Owner	**Trans-Caledon Tunnel Authority ("TCTA")**
Professional Service Provider	**Amanzi Entaba Joint Venture ("AEJV")**
Geotechnical Consultants	**Mukona Consulting Engineers Pty Ltd ("Mukona")**

Table of Contents

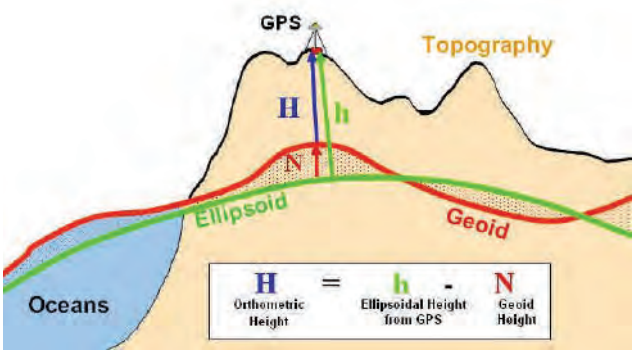
GLOSSARY

A glossary of scientific terms, abbreviations and units used in the main text of the report follows in the tables below.

Term / Abbreviation (Technical)	Description
Anomalies (geophysical datasets)	Areas where the geophysical data shows lower or higher values compared to what is measured for surrounding lithologies. Note that the colours used for presenting the data and have no meaning in terms of being an area of high or low risk.
b.g.l	Below Ground Level
Conductivity	Conductivity is the inverse of resistivity
Environment (lithological / geological)	Reference to lithological zones in the subsurface exhibiting similar geological composition and geophysical signature
ERI	Electrical Resistivity Imaging, a method to measure the electrical resistivity of soils and rocks with increasing depth.
Lineaments	Typically, a linear feature, such as a fault or dyke which is visible at the earth surface or in geophysical datasets which provided imaging of geological features in the subsurface
Resistivity	The resistivity of soils describes how much the soil resist the flow of applied electrical current. More resistive lithological units will resist the flow of current (e.g sand) whilst conductive units (e.g. shales and clay lenses or layers) will be more conductive. It is used to differentiate between geological units and soils conditions. Hard rock environments are usually more resistive whilst more porous rock is less resistive depending on whether pore spaced is filled with fluids which will decrease the bulk resistivity of the rock unit.
RTK GPS	Real Time Kinematic Global Positioning System
SRF	Seismic Refraction, a method to measure the velocity of compressional waves (P-waves) of soils and rocks with increasing depth.

Thermal Resistivity (THR) / Conductivity (THC)	The thermal resistivity of a soils and rocks is a measure of the resistance of the material to the flow of heat and its value is inversely related to the moisture content of the soil and the test method assumes isotropic materials. THR values are used to determine current ratings of underground cables Thermal Conductivity (THC) is the inverse of THR.

Term / Abbreviation (SI Units)	**Unit**
Electrical Conductivity (fluid)	Unit for EC is Siemens/meter (S/m) Milli-Siemens per meter (mS/m) 1mS/m = 0.001 Siemens/m or 1mS/cm = 100 mS/m
Resistivity	Unit for resistivity is Ohm-meter (Ohm.m) 1Ohm.m = 1S/m

Term / Abbreviation (General)	**Description**
Orthometric Height	Difference between ellipsoidal and geoidal height  *(source: http://www.geomobileinnovations.com)*

EXECUTIVE SUMMARY

Applied Scientific Services and Technologies Pty Ltd was commissioned by Mukona Geotechnics Pty Ltd on behalf of Amanzi Entaba Joint Venture, appointed Professional Service Provider to the Trans-Caledon Tunnel Authority, to conduct a range of geophysical surveys which forms part of the geotechnical investigations (Contract No. 1A-C-211-02) for the Berg River Voëlvlei Augmentation Scheme ("BRVAS").

The BRVAS project is situated in the Western Cape in the Drakenstein Local Municipality of the Cape Winelands District Municipality.

The objectives of the geophysical investigations were to evaluate subsurface conditions at the proposed low-level diversion weir across the Berg River.

Results from the geophysical surveys conducted at the BRVAS site showed good correlation between two-dimensional P-wave velocity and soil resistivity data. P-wave velocity data indicated hard rock conditions can vary in a lateral sense as well as with depth below ground level. In general, the transition from softer weathered rock and soil conditions to less weathered or hard rock conditions translate well to changes in both the velocity and resistivity datasets.

The ERI datasets show significant variation in the extent and thickness of units as opposed to the P-wave data which did not highlight subtle changes in composition or layering. This is likely due to an overlap in density of sedimentary units, which may have very different electrical properties, for example clay and sand units which can exhibit very similar velocities but have very different resistivity values.

1. SCOPE OF WORK

Applied Scientific Services and Technologies Pty Ltd (ASST) was commissioned by Mukona Geotechnics Pty Ltd ("Mukona") on behalf of Amanzi Entaba Joint Venture (AEJV), appointed Professional Service Provider (PSP) to the Trans-Caledon Tunnel Authority (TCTA), to conduct a range of geophysical surveys forming part of the geotechnical investigations (Contract No. 1A-C-211-02) for the Berg River Voëlvlei Augmentation Scheme ("BRVAS").

The BRVAS project is situated in the Western Cape in the Drakenstein Local Municipality of the Cape Winelands District Municipality. Appendices B1 presents a regional orientation map showing the location of the BRVAS project relative to nearby towns and the Voëlvlei Dam. Appendices B2 and B3 present zoomed maps covering the BRVAS project with traverse layouts for the ERI and SRF surveys respectively.

The BRVAS project is aimed at establishing a low-level diversion weir across the Berg River from which water can be pumped via a 6.3 km long rising main into Voëlvlei Dam. Therefore, the objectives with the geophysical investigations were to evaluate subsurface conditions at the proposed location of the weir and associated infrastructure including the pipeline to the Voëlvlei Dam, and comprise of the following:

- evaluate P-wave velocity structure to establish depth to competent rock,
- deduce Shear and Young's moduli profiles from Vs measurements, and
- investigate electrical properties and corrosivity of the subsurface.

Geophysical investigations required by AEJV include the techniques and quantities listed in Table 1-1.

Table 1-1: List geophysical techniques employed at the BRVAS site.

Geophysical Techniques	No. of traverses	Total distance surveyed (m)
Seismic Refraction (SRF)	14	4141
Soil Electrical Resistivity Imaging (ERI)	12	3070

2. COMPANY NAMES AND ROLES

Table 2-1 provides the list of companies, their respective roles and the names of their on-site representatives.

Table 2-1: List of company names, roles and names of on-site representatives.

Company	Role	Representative
Applied Scientific Services and Technologies (Pty) Ltd	Geophysical consultants to Mukona	Mr. Christoff Dreyer, Field Manager Mr. Riaan Mouton, Principal Geophysicist
Mukona Consulting Engineers Pty Ltd	Main contractor to AEJV	Mr. Denzil Oliver, Director, Project Manager, Engineering Geologist Mr. Solly Phalanndwa, Director
AEJV	Client	Mr. Ron Tluczek, Project Manager for GIBB

3. INSTRUMENTATION & SURVEY CONFIGURATIONS

AEJV did not provide any specifications for the geophysical investigations in terms of geophone or electrode spacings, both related to the resolution achievable, or the anticipated depth of investigation. As a result, line lengths were not optimised by AEJV to achieve depths of more than 20m b.g.l and in some areas ASST increased line length to increase depth penetration.

Table 3-1 provides a summary of the parameters used to achieve best resolution and depth of investigation whilst providing the required coverage.

Table 3-1: SRF & MASW instrumentation & acquisition parameters.

Method	Objective	Geophone / Electrode spacing	Min.& Max. line length (m)	Anticipated depth of investigation (m)	Configuration / Array Type
SRF	profiling	2	46	15 - 20	24 geophones
	profiling	3	69	15 – 30	24 geophones
ERI	profiling	3	120	15 – 20	41 electrodes Dipole-Dipole
	profiling	5	200	25 - 30	41 electrodes Dipole-Dipole
	profiling	3	240	25 - 30	81 electrodes Dipole-Dipole
	profiling	5	400	40 - 60	81 electrodes Dipole-Dipole

3.1 Seismic Refraction

Seismic acquisition parameters are summarised in Table 3-2.

Table 3-2: SRF instrumentation & acquisition parameters.

Instrumentation	Geometrics Geode 24–channel seismic module, data recording PC
Survey spread	**SRF** - 24 x 5 Hz high sensitivity vertical–directional geophones spaced at 2m or 3m intervals depending on required line length.
Source	8 kg sledgehammer
Shots per spread	**SRF** - 13 shot positions per 24 channels with at least 3 off-end shots in each direction (3-5 stacks per shot position)

3.2 Electrical Resistivity Imaging

ASST conducted the ERI survey using an ABEM 8 channel Terrameter LS system with four (No. 4) cables utilising the roll-along method where necessary. Table 3-3 lists the ERI instrumentation and acquisition parameters used during the survey.

Table 3-3: ER & ERI instrumentation & acquisition parameters.

Transmitter / Receiver System	ABEM Terrameter LS2 8 channel system
Electrodes	Stainless Steel (rod: 10 mm diameter, 300 mm length)
Electrode spacing	**ERI** - 2m, 2.5m, 3m or 5m intervals depending on required line length.
Number of electrodes	**ERI** – 2 to 4 cables, 41 to 81 electrodes per survey spread for profiling using dipole-dipole array.
	ERI – 2 to 4 cables, 41 to 81 electrodes per survey spread for corrosivity testing using Schlumberger array.
Configuration (array)	2D Non-standard – Dipole-Dipole optimised for 8 channel acquisitions. 2D Non-standard – Schlumberger optimised for 8 channel acquisitions.

3.3 Positioning

ERI electrode, as well as SRF geophone and shot point positions were surveyed with a Differential GPS (RTK-DGPS) instrument with a survey tolerance of 3 cm which is adequate for accuracies required to calculate seismic velocity. The DGPS equipment and specifications used are given in Table 3-4: South African Geoidal Heights were used for calculating elevations.

Table 3-4: GPS equipment and specifications

Instrumentation	Stonex RTK-DGPS (base-rover pair)
Positioning tolerance setting	1.5cm – 5cm horizontal and vertical depending on tolerances set.

All subsequent presentation of geophysical datasets was completed using the WG19 system (WGS84 / South African Map Grid with Local Origin at 19-degree longitude). The 2D sections for P-wave velocity and electrical resistivity are presented in Appendices C and D respectively. Start and end points are indicated by the first and last electrode or geophone positions (see insert plan view maps for each of the 2D sections).

4. RESULTS AND INTERPRETATION

The geophysical surveys (field phase) took place between the 30 September to 12 October 2021.

The results and interpretation of the geophysical surveys conducted for the BRVAS Project are described in this section. A brief explanation of each of the different geophysical methods employed is given in Appendix A.

4.1 Electrical Resistivity Imaging

Apart from Line 5, ASST experienced low contact resistance between electrodes as a result of the moisture and clay content of the soils. Overall data quality was very good with limited noise.

Similar to the SRF data, the 2D Resistivity models were imported to visualisation software (Geosoft Oasis Montaj) where the data was gridded, and 2D Resistivity sections were created. The data for each line as shown on the 2D sections in Appendices C1 to C12 have been colour stretched to data range observed for Line 10.

It is important to emphasise that resolution for modelled resistivity data falls off with increasing depth. This means that a 5 m electrode spacing will not deliver 5 m resolution at 20 m depth for example. First layer thickness is typically in the order of half the electrode spacing and increases with a factor of 1.12 with depth.

4.2 Seismic Refraction

ASST tested the signal to noise ratio for various off-end shot distances to allow for the largest possible off-end distances which relates to depth penetration. If a simple thumb rule is applied, the maximum depth of penetration for a 24-channel system configuration with geophones laid out at 3 m intervals, would be in the order of 15-20 meters. Spread length is not the only factor that determines depth penetration, and other factors such as surface soil conditions and harder layers in the near surface will influence the amount of energy that can be imparted and transferred to deeper layers. Similarly, high noise levels caused by wind motion will adversely affect data quality and in turn depth of investigation.

Depending on access on either side of the seismic spread, ASST aimed to achieve up to 11 shots per 24 channel array. An increase in shot positions allows for higher resolution. It is important to emphasise that resolution falls off with increasing depth as a result of the abovementioned factors. Off-end shots were taken at both ends of the spread to produce reciprocal data and to determine best data quality.

TomoPlus was utilised for modelling the data and in part due to its ability to cope with large elevation changes. The traveltime picks exhibited low error levels and ASST has high confidence in the processed data. During modelling, the data converged to a reasonable solution using a tomographic approach. The tomographic approach has been employed successfully by ASST in many different projects, and the methodology yielded plausible results with low residual error.

After modelling, the data were imported to visualisation software (Geosoft Oasis Montaj) where the data was gridded, and 2D P-wave velocity sections were created. All models were trimmed to 30 m depth[1] b.g.l.

Since seismic velocity is not a direct indicator of lithology, the seismic velocity should not be used on its own to map lithological variations. The seismic velocity cross–sections derived from the refraction data do, however, provide a powerful tool to interpolate information between boreholes, extrapolate trends from boreholes, and highlight any anomalous areas which occur between boreholes.

The P-wave velocities measured by seismic refraction provide an indication of the variation in soil / rock hardness. Typically, the faster the velocity, the harder the material is. The P-wave velocity of softer materials is strongly influenced by pore fluid if present. Dry soils, sediments and highly weathered rocks can have P-wave velocities as low as, or below, the speed of sound in air (340 m/s) while the same materials will have a P–wave velocity of at least 1500 m/s when saturated with water. Consequently, the velocity of soft materials is highly dependent on whether they occur above or below the water table and different results can be expected after heavy rainfall.

Overall, the quality of the data was very good despite noise generated by the excavators during test pitting.

[1] *Although models were trimmed to 30 m depth b.g.l., there is a high degree of uncertainty in the models below the dashed grey line indicated on the sections. The maximum depth of this line is based the limiting factors associated with SRF surveys described in this report.*

The data for each line as shown on the 2D P-wave velocity sections in Appendices D1 to D14 have been colour stretched to the data range observed for Line 10.

4.3 Data Interpretation

All Appendices containing plan view maps and 2D sections for the BRVAS Project are listed in Table 4-1.

Table 4-1: List of Appendices for different datasets and geophysical techniques.

Appendix Number	Description
Appendix B.1	Regional orientation map
Appendix B.2	ERI survey layout
Appendix B.3	SRF survey layout
Appendices C.1 – C.12	2D Electrical Resistivity sections
Appendices D.1 – D.14	2D Seismic Refraction sections (P-wave velocity)

Based on the preliminary test pit results provided by Mukona a simple method of notation has been used to identify (indicate) possible hard rock, weathered to hard rock as well as softer material whilst differentiating between layering based on resistivity. Table 4-2 gives a list of criteria used to differentiate between lithological units based on physical characteristics.

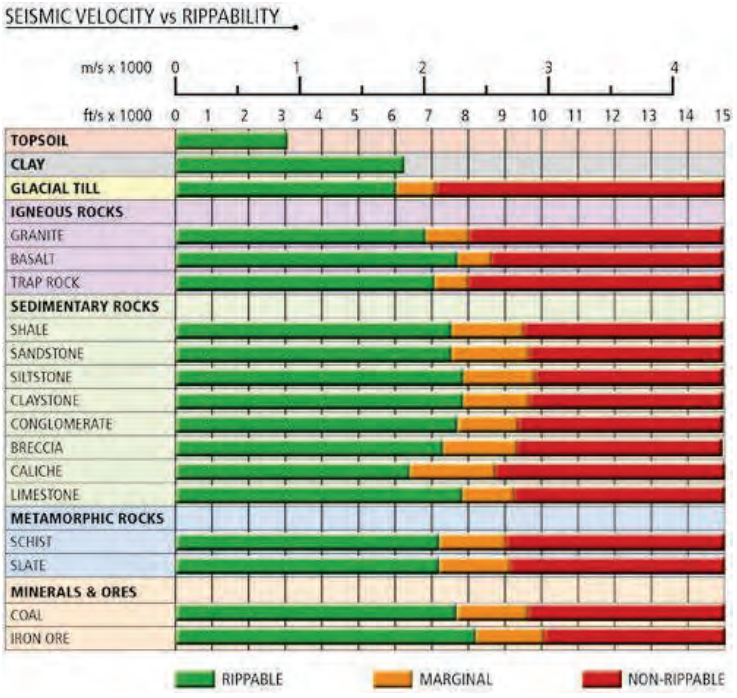
It is important to note that the velocities measured for rock are largely reliant on, amongst other factors, density but also the degree of fracturing. Even slightly fractured rock can cause a significant decrease in the bulk velocity but still appear very hard in terms of drilling.

In general, good correlation exist between velocity and resistivity models. It can be assumed that velocities of 2000 m/s to 2500 m/s are indicative of transition from softer weathered rock to hard rock. Normally, a velocity of up to 2000 m/s would be well within the rippable range of e.g., shale as shown in Figure 4-1. Velocities higher than ~2700 m/s can be considered hard rock and not rippable.

Table 4-2: Codes used for the interpretation of geophysical ERI and SRF datasets.

Code	Description of main lithological units and interpretation of geophysical datasets
C / WZ	Clay / Highly Weathered Material
LSS	Loose Silty Sand
SSC	Stiff Sandy Clay
SSS	Stiff Silty Sand
WSH	Weathered Shale (soft rock)
VSH	Weathered Shale (very soft rock)
HR	Unweathered / Slightly Weathered Hardrock
F / WZ ?	Inferred Faults / Weathered zone with depth extent

Figure 4-1: Illustration listing P-wave velocities typically found for different rock s and soil types.



Resistivities across the ERI lines range between ~1.6 Ohm.m and ~17500 Ohm.m, with a mean of ~314 Ohm.m. The mean value corresponds to resistivities observed for sedimentary units (See Figure 4-2), and typically include lithologies such as saturated Sand, Shale and Clay.

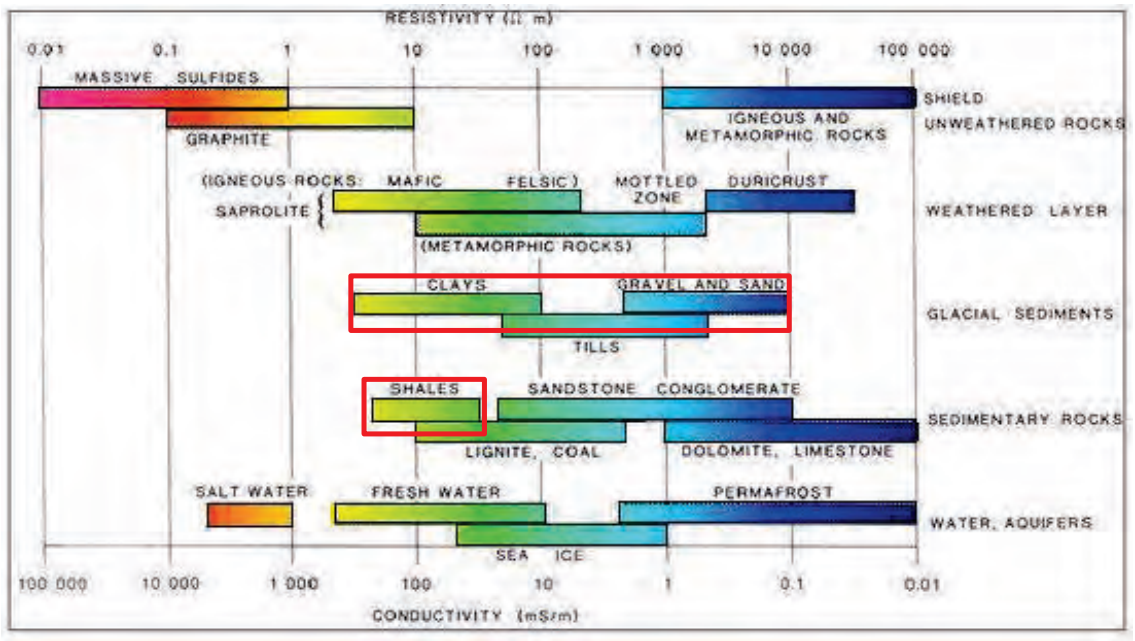
The main contributors that will cause a decrease in the bulk resistivity of soils and rocks include:

- clay mineral content,
- increased porosity or fracturing that can cause preferential groundwater pathways,
- increased pore fluid and salinity or acidity of that fluid.

From the results obtained from the resistivity data, it is expected that low conductivity zones (and corresponding low P-wave velocity) at higher elevations will correspond to clays or weathered material whilst a shallow water table (typically near the river) will cause a decrease in the resistivity of units that otherwise may have a high P-wave velocity.

In layers or lenses where there is a decrease in the clay content resistivity values will increase (e.g., near surface dryer sandy soils).

Figure 4-2: Bar plot of typical resistivities for different geology (source: www.eoas.ubc.ca)



5. CONCLUSION

Results from the geophysical surveys conducted at the BRVAS site showed good correlation between two-dimensional P-wave velocity and soils resistivity data. Based on observed P-wave velocities measured on site, hard rock conditions can vary in a lateral sense as well as with depth below ground level.

In general, the transition from softer weathered rock and soil conditions to less weathered or hard rock conditions translate well to changes in both the velocity and resistivity structures of the lithologies logged on site.

The ERI datasets show significant variation in the extent and thickness of units as opposed to the P-wave data which does not highlight subtle changes in composition or layering. This is likely due to an overlapping in density of sedimentary units, which may have very different electrical properties, e.g., clay and sand units which can exhibit very similar velocities but very different resistivity values.

6. REFERENCES

He, L., & & Zhang, J. (2011). Tradeoffs in the Near-Surface Seismic Imaging Solutions. *SEG San Antonio 2011 Annual Meeting*, 4015-4019.

Jansen, J. R. (2011). Geophysical Methods To Map Brackish And Saline Water in Aquifers . *Proceedings of the 2011 Georgia Water Resources Conference.* Georgia.

Loke, M. H., & Lane Jr, J. W. (2004). Inversion of data from electrical resistivity imaging surveys in water-covered areas. *Exploration Geophysics*, 35, 266-271.

South African Council for Stratigraphy. *Stratigraphy of South Africa. Part 1. Lithostratigraphy of the Republic of South Africa, South West Africa/Namibia, and the Republics of Bophuthatswana, Transkei and Venda. Handbook 8*. Kent L.E. (compiler). Pretoria, Geological Survey of South Africa. 1980.

APPENDIX A: OVERVIEW OF GEOPHYSICAL METHODS

Appendix A provides technical information on the geophysical methods employed for the BRVAS site investigations.

7. SEISMIC REFRACTION METHOD

Seismic Refraction surveys are designed to measure the propagation velocities of compressional waves on subsurface boundaries to characterise the subsurface conditions and structure. Compressional waves (also known as primary or P–waves) propagate through the medium by a series of alternating compressions and dilations where the particle motion is in the direction of the waves. The seismic refraction method measures the traveltimes of seismic energy that has been critically refracted at horizons of interest. This acoustic return is called the first break, and the angle of refraction depends on the angle of incidence of the incoming energy and the ratio of velocities in the two materials (Snell's Law).

Seismic refraction methods are routinely employed by the oil & gas industry to estimate the so-called static correction. Refraction statics are necessary for onshore reflection seismic surveys to correct for timing differences due to near-surface irregularities, such as changes in elevation, weathering velocity, weathering layer thickness and sub-weathering velocity. There are several different ways in which these corrections can be computed. The statics correction consists of two components:

- A short wavelength (residual) component. The residual component comprises the high frequency, rapidly varying part of the statics corrections. The magnitude of this correction is generally small.
- A long wavelength component. This regional component corrects for static anomalies whose spatial wavelengths are longer than spread length.

The residual component is of interest in near surface investigations as this is often composed of the difference between synthetic (modelled) traveltimes and picked traveltimes. Small scale stutter in traveltimes is unlikely to be modelled by seismic refraction investigations and would be removed in seismic reflection data by the residual component of the static correction. Due to these variations, modelling should be conducted to achieve a residual error close to the reciprocal error, and not one that reduces the error close to zero.

When the static issues are considered in near-surface investigations with large topography variations, and variable weathering layer thickness and velocity, traveltime analysis by rudimentary methods such as dromochrone analysis are less likely to provide useful results.

Dipping interfaces can also pose problems. Whilst dipping interfaces may produce a traveltime pattern that appears very similar to a horizontal interface, the velocity of the lower layers may be underestimated. We refer to these velocities as "apparent velocities". To minimise the effect of dipping interfaces, forward and reverse shots are performed with source locations both internal and external to the spread. The use of far offset shots on both sides of the array greatly reduces errors in modelling.

Another problem that may present itself is the possibility of having alternating harder and softer layers with depth. For example, softer weathered layers may be present below harder (faster) hard cap units. There are a range of techniques that have been developed to attempt to solve complex geometries, such as the Plus-Minus method (Hagedoorn, 1959) and the Generalised Reciprocal Method (Palmer, 1980). However, modern techniques favour refraction tomography, which uses raytracing algorithms and numerical eikonal solvers such as the Wavepath Eikonal Traveltime (WET) method. These models are not interface based. Since tomographic models are smoothly varying across lateral and vertical boundaries, it can be difficult to image distinct or abrupt interfaces. However, the advantages of using tomographic models include the ability to image discontinuous velocity inversions and to process large input datasets.

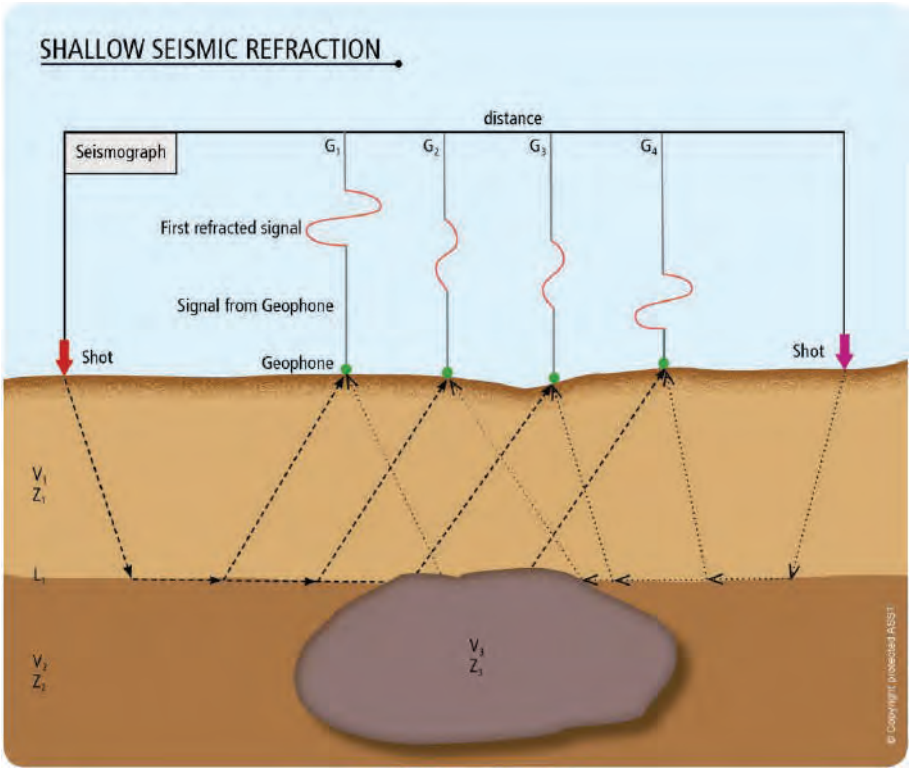
A seismic refraction survey proceeds by placing a set of geophones in a linear array. An impulsive source (such as a hammer blow or explosive shot) is used to generate a seismic wave front and the time taken for this front to propagate from the source to each geophone is measured. Figure 7-1 illustrates the basic principles of the seismic refraction method.

Two important observations regarding the resolution of a seismic survey can be made from evaluating the traveltime curves and the resulting model.

- Firstly, with narrower shot spacing (increased number of shots for the same spread) the number of ray paths will increase which will result in better lateral resolution.
- Secondly, decreasing the geophone interval and increasing the number of geophones in the spread will lead to better definition of the traveltime curve and, in turn, map changes in subsurface topography better (increase vertical resolution). For completion, it is worthwhile mentioning that the vertical resolution of a seismic survey also depends on the frequency range of the source. Higher frequencies generally give higher resolution. However, since the

higher frequencies are attenuated more rapidly than lower frequencies, the resolution will deteriorate with increasing depth.

Figure 7-1: Simplified illustration of Seismic Refraction principles



Processing Of P-wave Velocity Data

Seismic refraction tomography software was utilised in the processing of the BRVAS project data. As will be discussed below, the topographical and geological nature of the BRVAS site favoured the use of this methodology. Refraction tomography was performed utilising TomoPlus, which is designed to obtain an accurate near-surface velocity model for areas with irregular geometry and rough topography, and to derive accurate long and short-wavelength statics solutions to correct for the weathered layer and near-surface variations. Additionally, TomoPlus offers both conventional and high-end near-surface refraction solutions. Modelling solutions include layer-based delay-time and GLI refraction traveltime inversion. Grid based tomographic solutions include first-arrival non-linear traveltime tomography, full waveform tomography and joint gravity-traveltime tomography. An important advantage of the software is that real world coordinates are used for the geometry calculations.

Recorded seismic data were stored as individual SEG2 data files with the source-receiver geometry in separate files. The initial processing flow applied to the data involved merging SEG2 files into SEGY files, line by line, and updating trace headers with the geometry for each shot and receiver.

Data were input to Tomoplus as individual projects and amalgamated into a survey map that allowed constraints between lines. Data were processed using full 3D coordinates, with optimal crooked-line traverses used for 2D data.

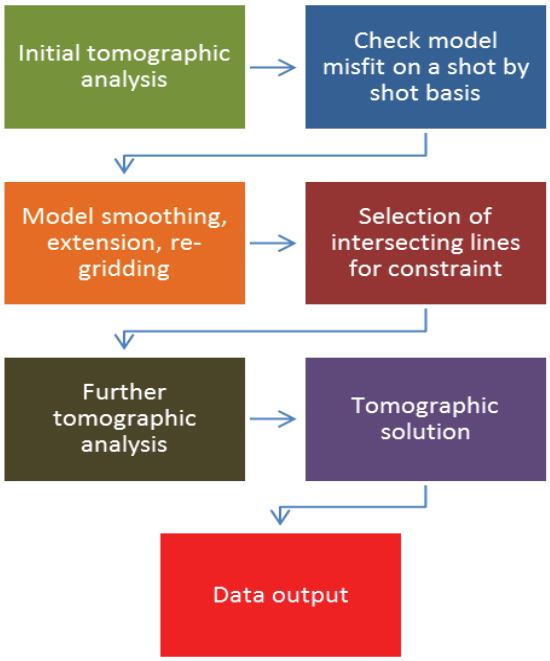
First breaks were picked in TomoPlus. The first step was to pick the data in the shot domain using a manual approach. The data were transformed into the receiver and offset domains to allow consistency checks and minor edits to be made. Additional consistency checks were performed utilising advanced QC plots.

A layered approach using the generalized linear inversion (GLI) methodology (Hampson & Russell, 1984; Cooke & Schneider, 1983) was used in modelling the traveltimes. Due to the undulating surface topography and expected complexity of the bedrock interface, a tomographic approach was also employed to achieve better results (Ha, Pyun, & Shin, 2006; Zhu, 2002; He & Zhang, 2011).

After first break picking, an initial model with a large cell size was created for each line. A non-linear, first-arrival traveltime tomographic inversion (Zhang & Toksoz, 1998) was run until convergence was achieved. The method used is not a traditional two-point ray tracing algorithm which commonly converges to a local and not a global minimum. The non-linear approach employed creates synthetic traveltimes by using a shortest path ray-tracing approach. This is a regularised non-linear inversion that inverts whole dromochrones rather than traveltimes alone. A Monte Carlo based method is employed to check the non-linear uncertainty analysis of the final solution.

Initial analysis of these models was conducted, analysing the model misfit on a shot-by-shot basis. Where a significant misfit was present, the first break picks were checked for consistency. Where the lines intersected, an artificial ‘uphole’ was automatically created which was then either included or excluded as a model constraint. The model constraint could be applied either as a ‘hard control’ that fixed the model at the intersection or a ‘soft control’ that allowed for some variation. For this project, the ‘soft control’ provided adequate constraint between lines.

Data were analysed after the inversion process in conjunction with their neighbouring and intersecting lines and, providing an acceptable convergence, the model was extended / re-gridded at a finer cell size and re-inverted. An iterative process was established whereby a series of progressively more detailed models were created using the following workflow:



8. ELECTRICAL RESISTIVITY METHOD

The Electrical Resistivity (ER) method is based on the behaviour of the flow of direct current in the subsurface. Since the electrical source can be controlled, the depth of investigation can be controlled. For engineering purposes, the method delivers high resolution data similar to that of seismic refraction; therefore, the two methods often complement each other. However, the resistivity method is cheaper and more flexible in its application.

The two facets to the direct current (DC) method are as follows:

- Electrical soundings or Vertical Electrical Soundings (VES), whereby the electrical resistivity distribution (electrical structure of soils) with depth is investigated by progressively changing the depth of investigation. In this case the method is most effective in the presence of flat lying or gently dipping (dip <15) lithologies with extensive laterally homogeneous extent.
- Horizontal profiling on the other hand measures the lateral distribution of electrical resistivity at a specific depth of investigation which makes this method most effective when lateral changes in resistivity are large.

At least four electrodes are needed to carry out resistivity measurements, two current electrodes ("I" in Figure 8-1) through which current is passed into the soil and two potential

electrodes ("V" in Figure 8-1) between which a potential difference due to the current is measured.

Electrical Resistivity Imaging (ERI) uses the same principles as the Electrical Resistivity method. ERI differs from the ER method in that it is a multi-electrode imaging technique which can be used to find vertical and lateral variations in the electrical structure of the subsurface.

Instead of using only four electrodes the complete electrode string consists of multiple electrode points (also referred to as take outs) which can be used both as current and potential electrodes. Similar to the VES method the ERI method employs a current source that injects electrical current into the earth through a pair of ground electrodes and the resulting potential field is measured along the ground surface using a second pair of electrodes. The transmitting and receiving electrode pairs are referred to as dipoles. By varying the unit length of the dipoles as well as the distance between electrode pairs, the horizontal and vertical distribution of electrical properties at different depths can be recorded.

A number of electrode configurations can be applied during measurements some of which include Dipole–Dipole, Schlumberger, Wenner, Pole–Pole, Pole–Dipole, and the Square array. As mentioned previously each configuration has its own advantages and limitations.

Modern ERI equipment provides a fast profiling method which sets it apart from traditional horizontal profiling and soundings techniques which are used to find the depths and resistivities of the geologic layers included in the half space beneath the centre of the sounding spread. Instruments that employ automated switching systems control switching to the relevant dipoles which allows for many different electrode spacings and locations to be recorded in a relatively short time. These integrated or volumetric resistivity measurements include contributions from all of the layers under the sounding site to the depth of investigation of the measurement. Unconstrained modelling of the data result in a two-dimensional resistivity section along the traverses surveyed. However, constrained modelling using existing borehole data can vastly improve modelling results.

The most common arrays in resistivity measurement techniques such as the Wenner and Schlumberger arrays employ all four electrodes symmetrically in a straight line. Other arrays more often used in mineral exploration include the Gradient array; where the potential electrodes are kept fixed and the current electrodes moved along lines parallel to the potential electrodes over an area where the primary electrical field is roughly uniform. Dipole–Dipole arrays are also commonly used where the distance between the current and potential dipoles is at least five times (×5) the dipole length. Variations of the dipole-dipole configurations include the Pole–Pole and Pole–Dipole arrays. Each configuration has its own limitations, advantages and disadvantages. For example, one configuration may be better to resolve

lateral changes than others whilst another configuration may offer support or vertical resolution capabilities. Configuration setups for some of the most commonly used electrode arrays are illustrated in Figure 8-1.

Capabilities and Limitations

Proposed survey lines should avoid large underground metallic pipes, electric lines, grounded fences and overhead power lines.

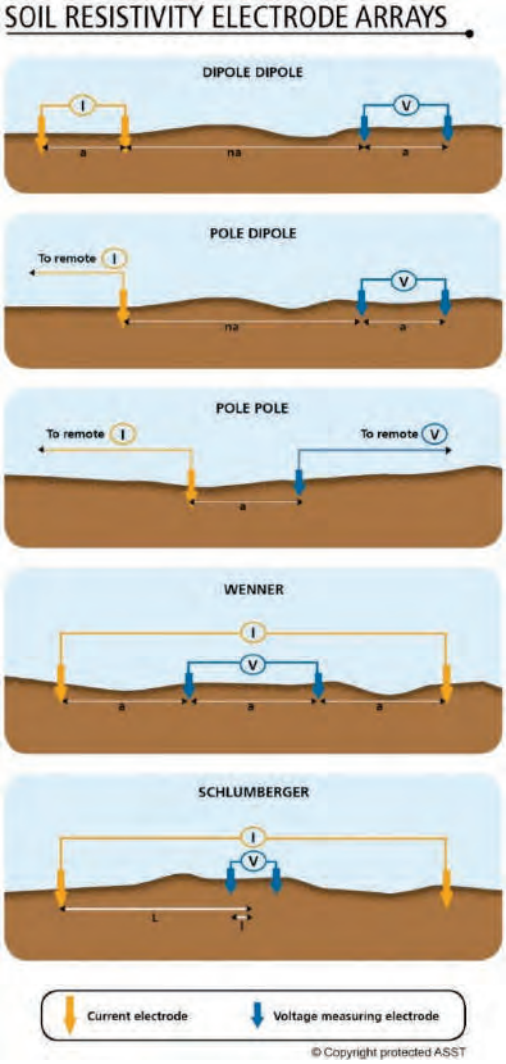
The depth of investigation is typically 20% of the total line length. However, resolution decreases rapidly with depth due to systematic widening of the dipoles. The highest resolution and most accurate depth conversion is provided in the upper 30% of the modelled section where the resolution is approximately 1/3 of the electrode spacing.

The method is labour intensive and in dry conditions saline water need to be poured around electrodes to allow better electrical contact between the electrodes and ground. The interpretation of resistivity soundings necessarily assumes that the subsurface is horizontally layered with no lateral variations in resistivity.

Amongst a variety of applications, typical examples of the applications of this technique include:

- determining the depths and resistivities of geologic layers,
- finding the water table,
- mapping contamination plumes, voids, fractures, faults, and other geologic features as well as archaeological investigations, and
- characterising landfills.

Figure 8-1: Illustration of different electrode configurations.



MAPS AND SECTIONS

Scale 1:100000

1000 0 1000 2000 3000 4000

(meters)

WGS 84 / *South African Survey Grid (N,E) zone 19

TCTA
A new word for water

MUKONA
CONSULTING ENGINEERS

Created by

ASST

Berg River Voëlvlei Augmentation Scheme

Appendix B1 - Regional Orientation Map

(Google Earth Backdrop Image On Plan View Map)

Scale 1:6750

100 0 100 200 300 400

(meters)

WGS 84 / *South African Survey Grid (N,E) zone 19

Plan View Map Legend

ERI traverses

TCTA

A new word for water

MUKONA CONSULTING ENGINEERS

Created by ASST

Berg River Voëlvlei Augmentation Scheme

Appendix B2 - ERI Traverse Layout

(Google Earth Backdrop Image On Plan View Map)

Scale 1:6750

100 0 100 200 300 400

(meters)

WGS 84 / *South African Survey Grid (N,E) zone 19

Plan View Map Legend

SRF traverses

TCTA
A new word for water

MUKONA
CONSULTING ENGINEERS

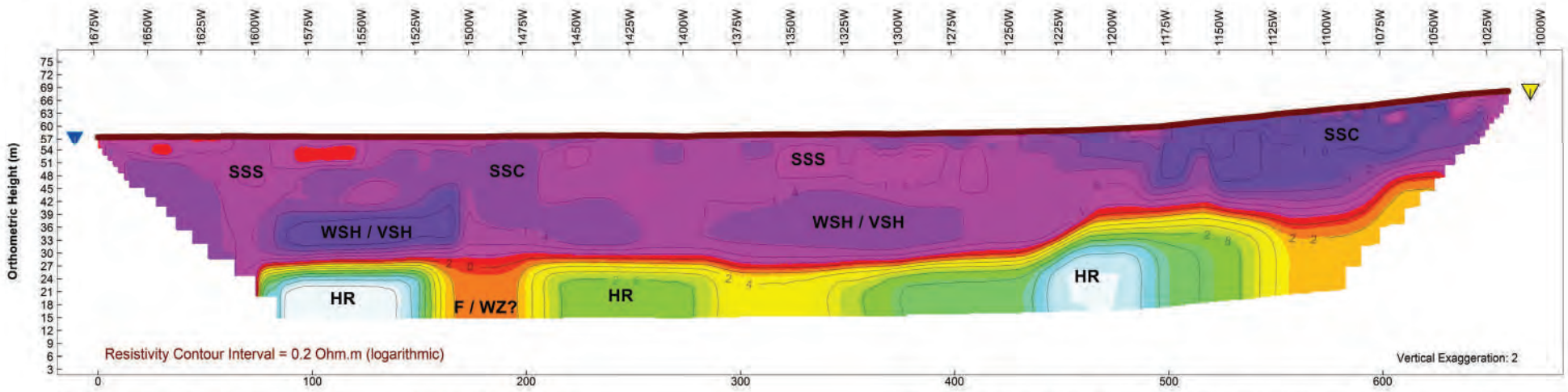
Created by
ASST

Berg River Voëlvlei Augmentation Scheme

Appendix B3 - SRF Traverse Layout

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 1)



Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:1900

25 0 25 50
(meters)

*WGS 84 / *South African Survey Grid (N,E) zone 19*

MUKONA
CONSULTING ENGINEERS

Created by

ASST

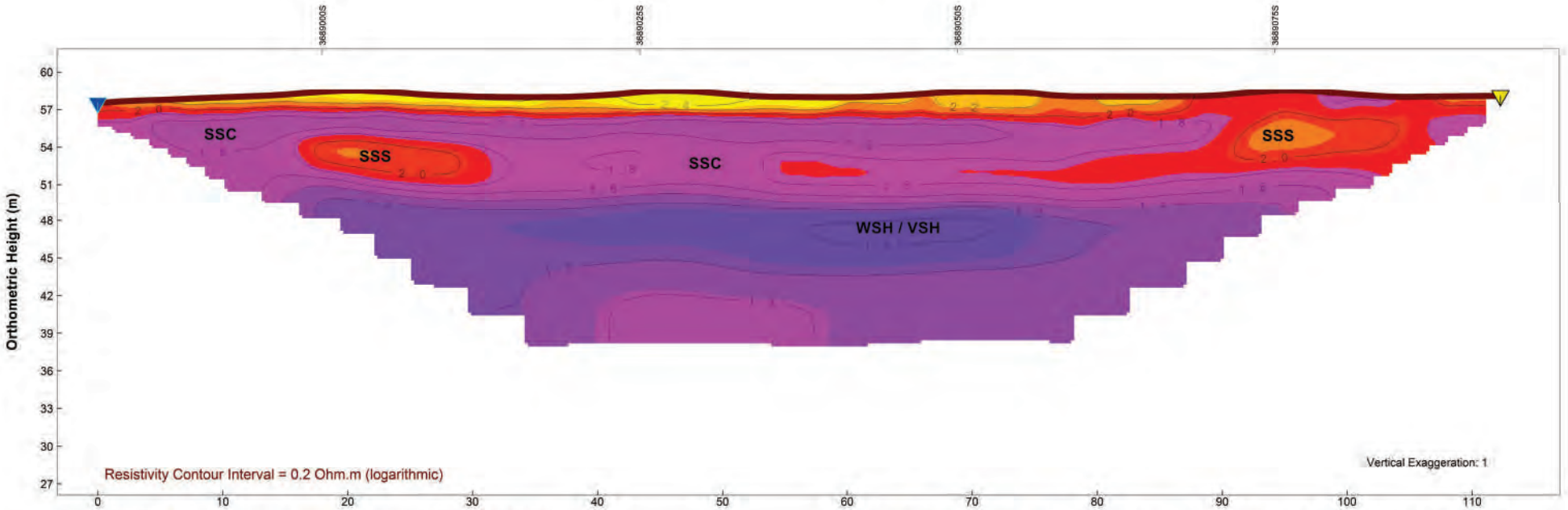
TCTA
A new word for water

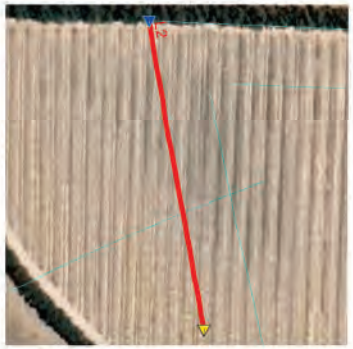
Berg River Voëlvlei Augmentation Scheme

Appendix C1 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 2)





Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:325
5 0 5 10
(meters)
WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA
CONSULTING ENGINEERS

Created by
ASST

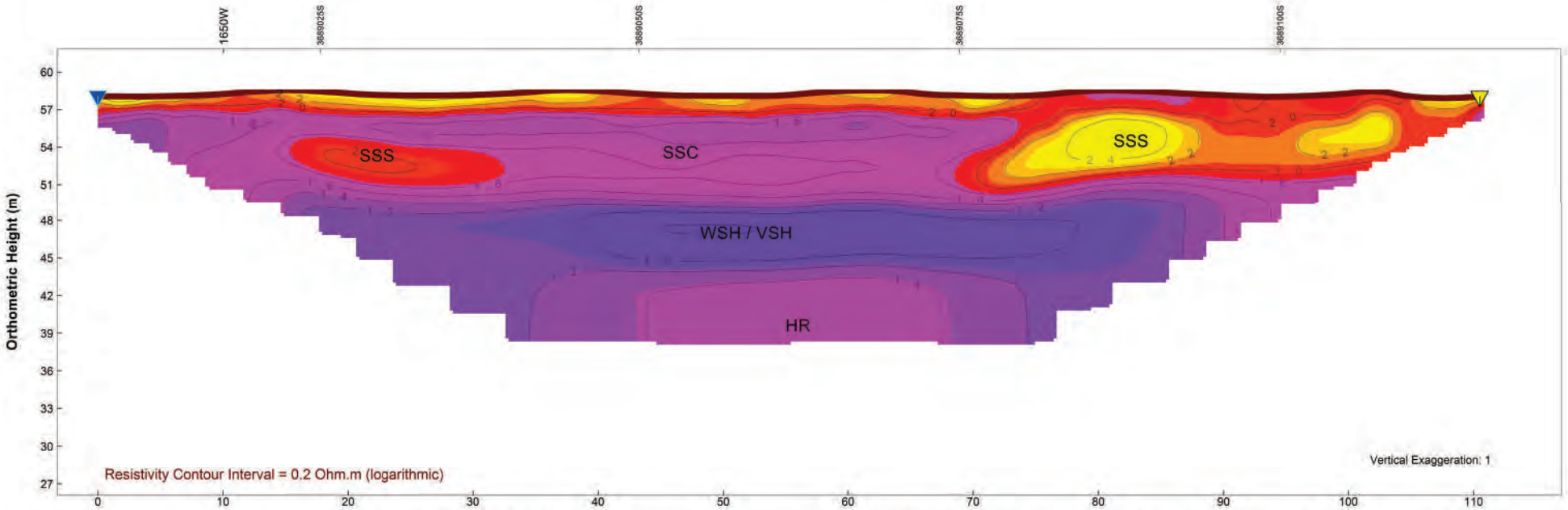
TCTA
A new word for water

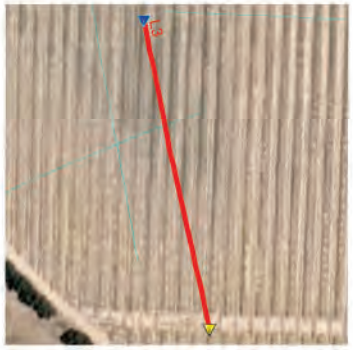
Berg River Voëlvlei Augmentation Scheme

Appendix C2 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 3)





Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:325

5 0 5 10
(meters)

WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA
CONSULTING ENGINEERS

Created by

ASST

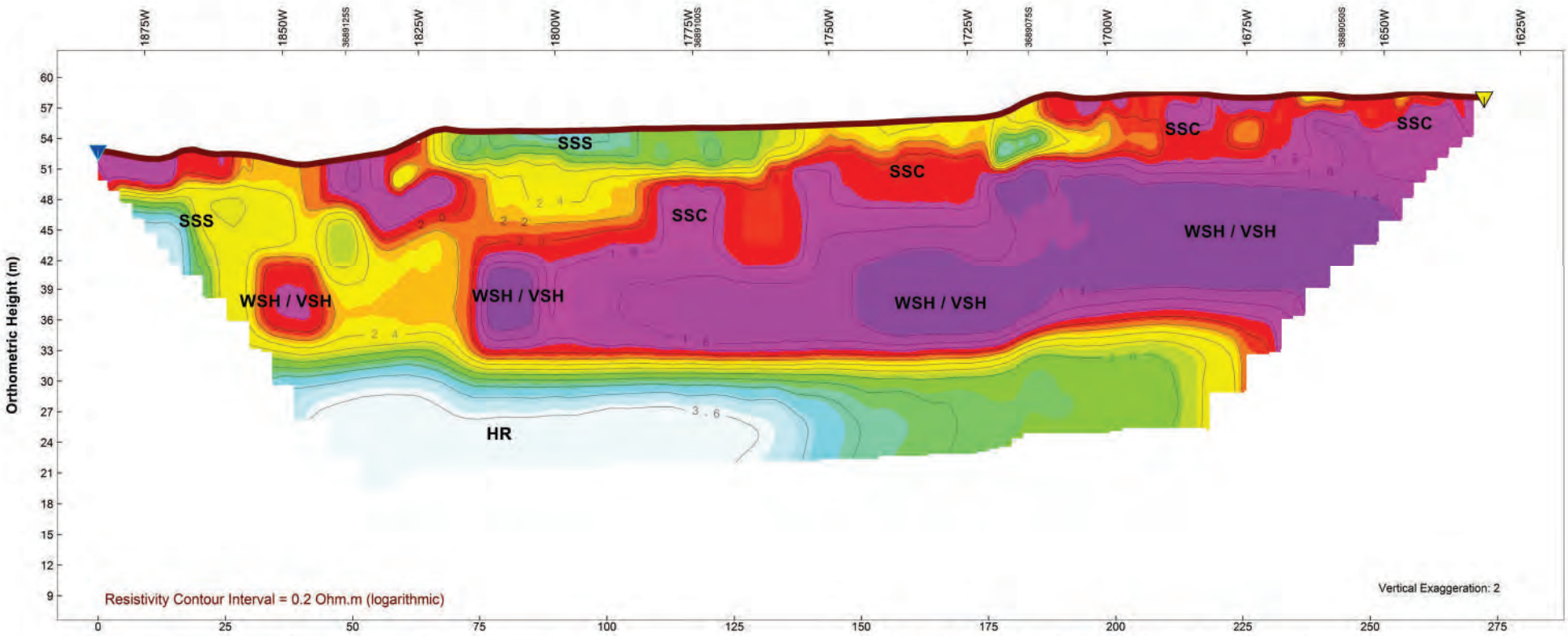
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix C3 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 4)



Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:800
10 0 10 20
(meters)
*WGS 84 / *South African Survey Grid (N,E) zone 19*

MUKONA CONSULTING ENGINEERS

Created by ASST

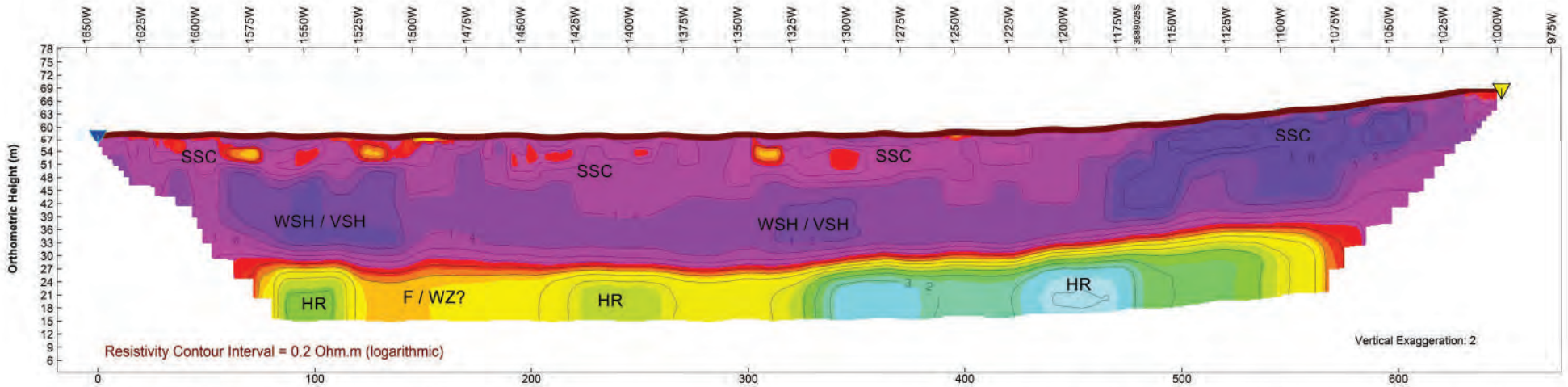
TCTA
A new word for water

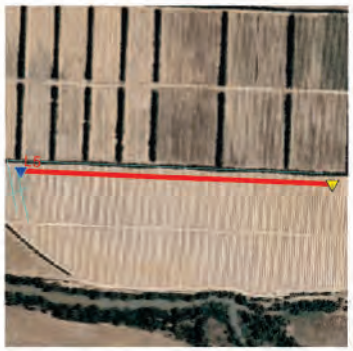
Berg River Voëlvlei Augmentation Scheme

Appendix C4 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 5)





Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:1875

25 0 25 50

(meters)

*WGS 84 / *South African Survey Grid (N,E) zone 19*

MUKONA
CONSULTING ENGINEERS

Created by

ASST

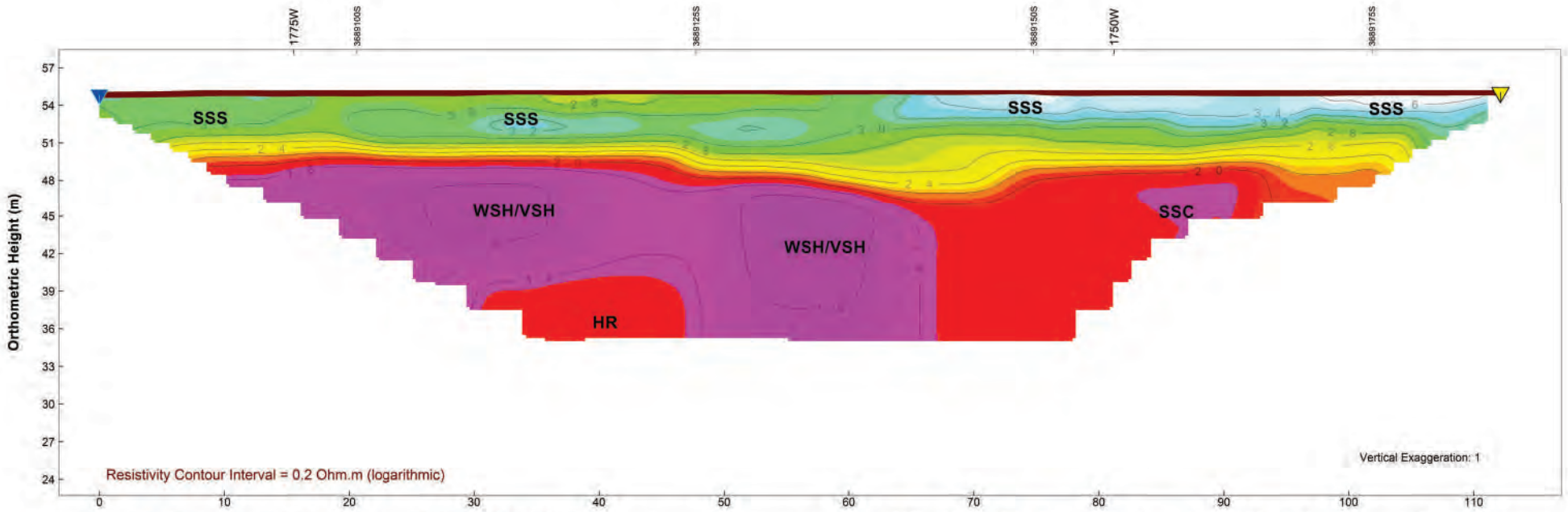
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix C5 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 6)



Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:325
5 0 5 10
(meters)
WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA
CONSULTING ENGINEERS

Created by
ASST

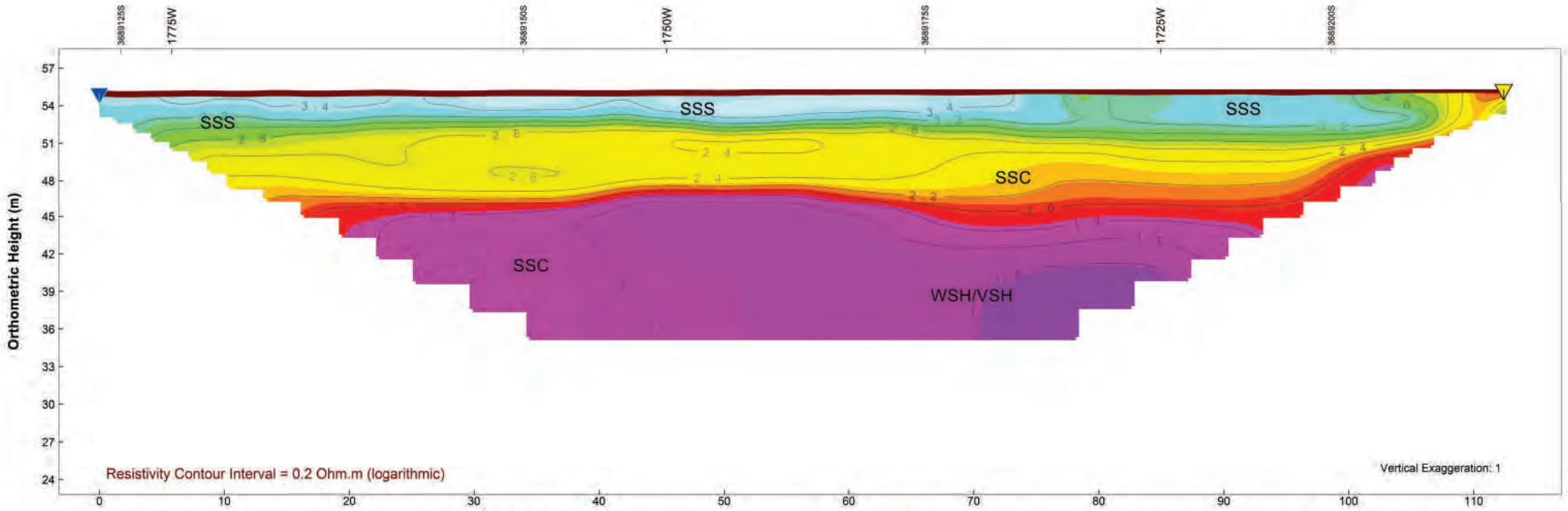
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix C6 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 7)



Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:325
5 0 5 10
(meters)
WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA
CONSULTING ENGINEERS

Created by
ASST

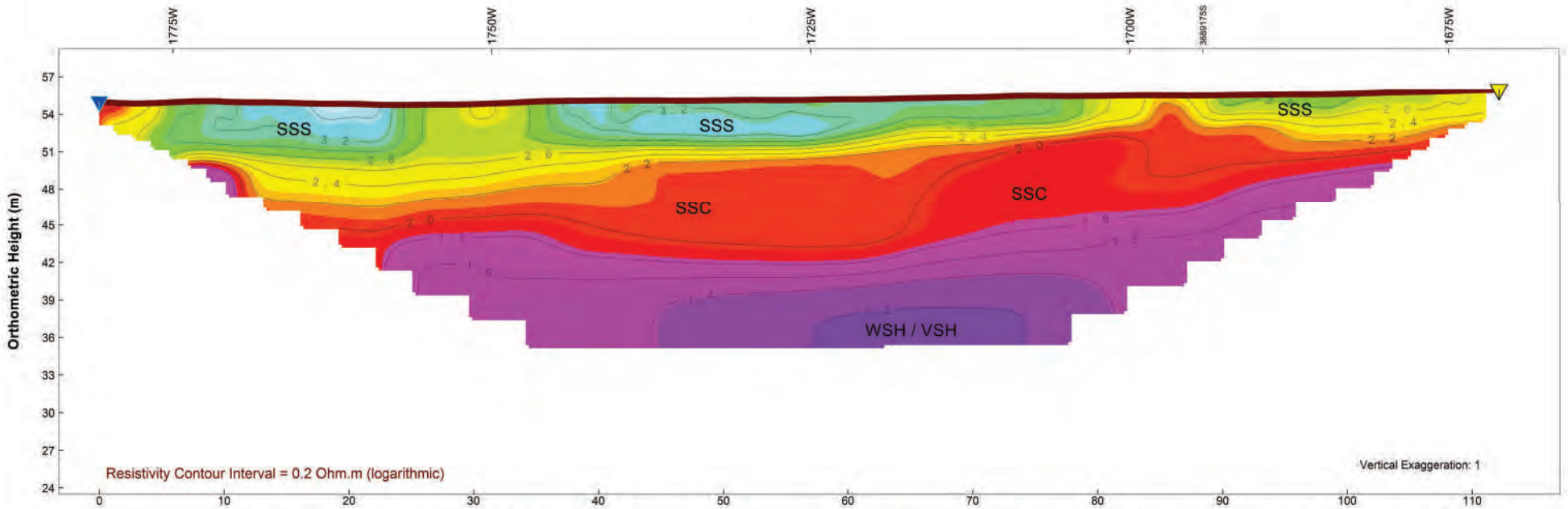
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix C7 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 8)



Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:325

5 0 5 10
(meters)

WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA
CONSULTING ENGINEERS

Created by

ASST

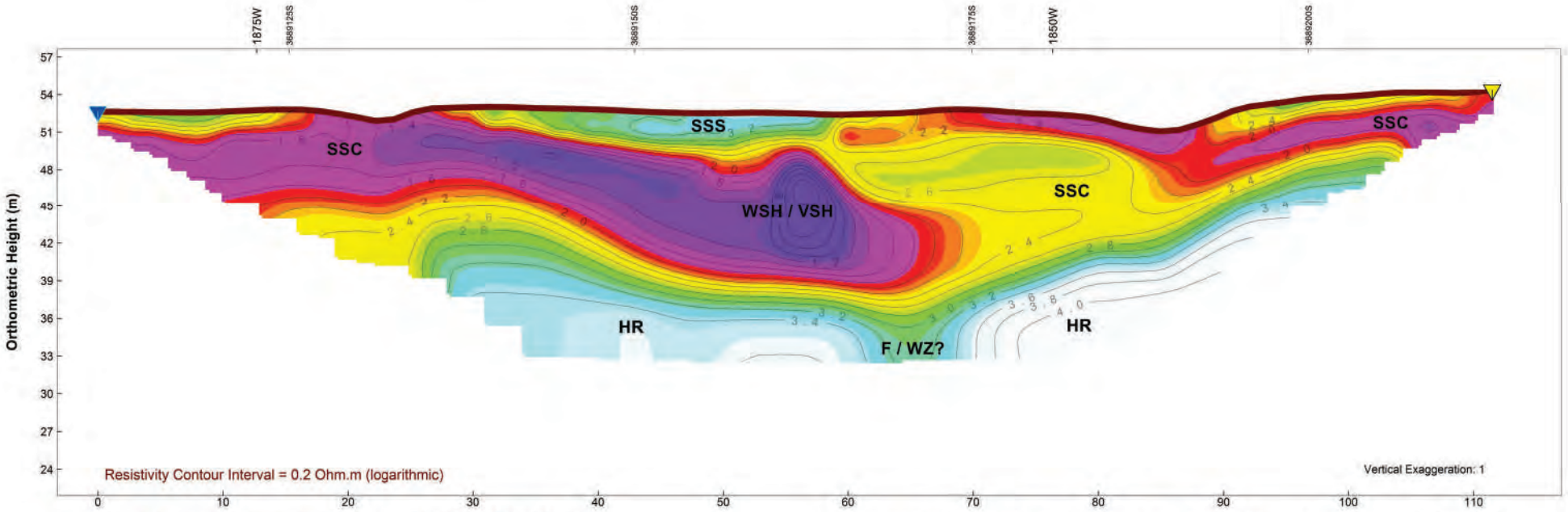
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix C8 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 10)



Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:325
5 0 5 10
(meters)
WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA CONSULTING ENGINEERS

Created by ASST

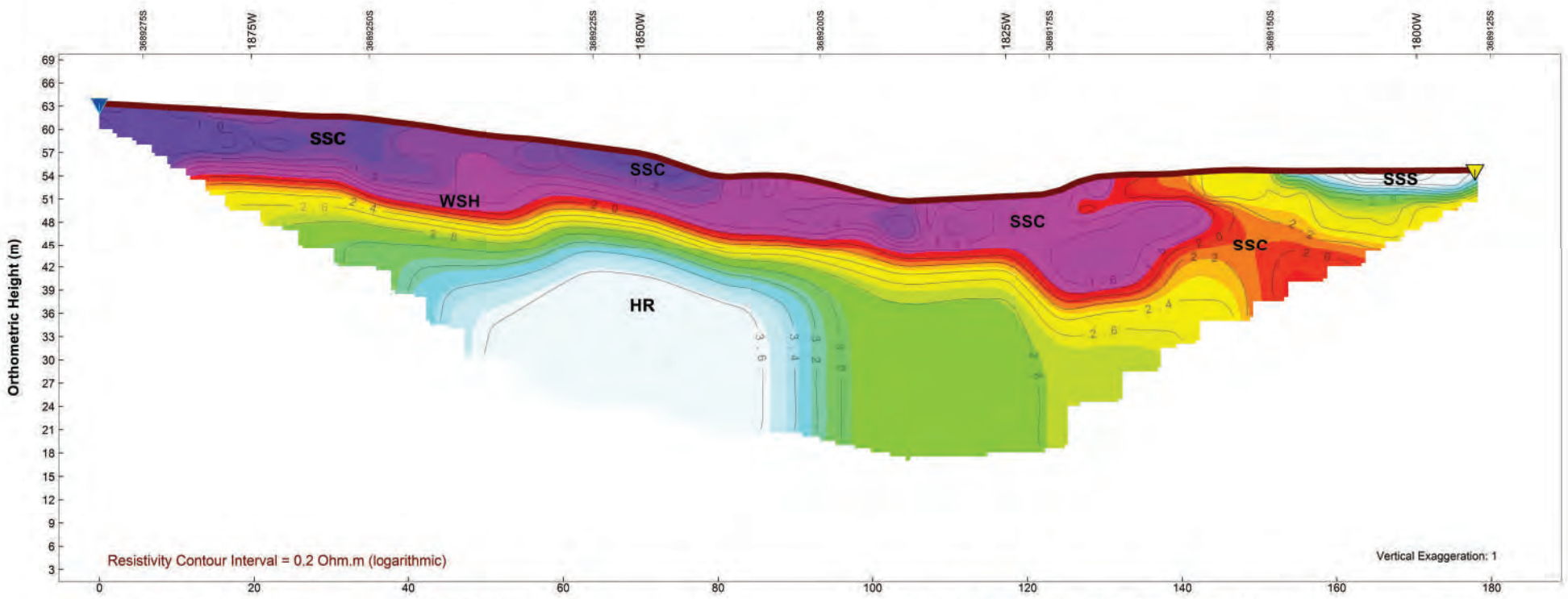
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix C9 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 11)



Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:525
10 0 10
(meters)
WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA CONSULTING ENGINEERS

Created by ASST

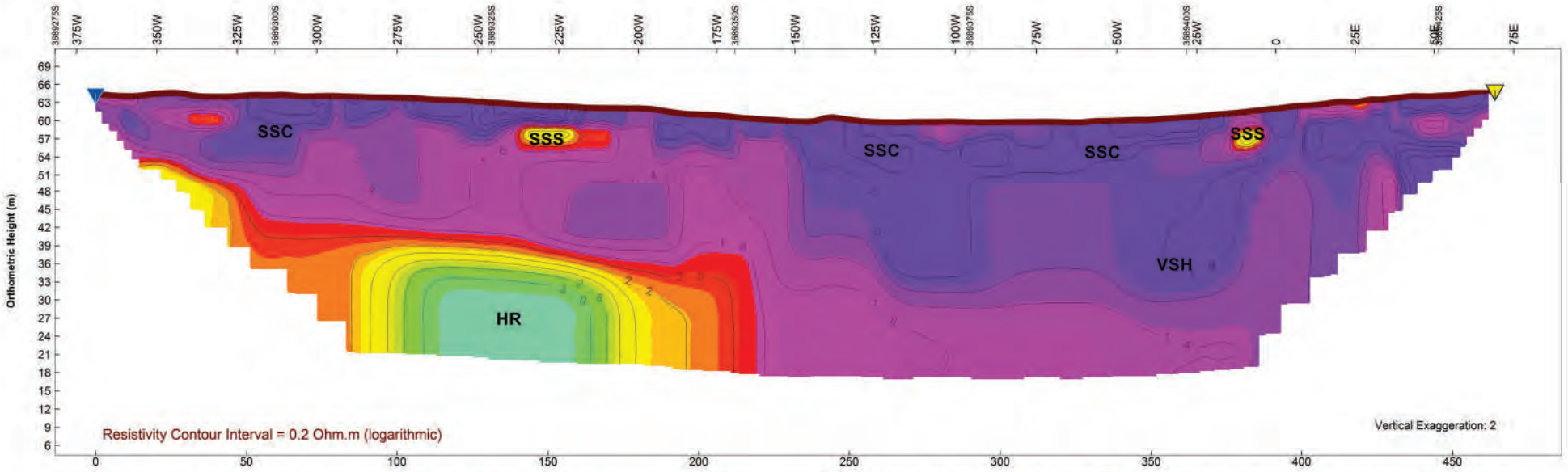
TCTA
A new word for water

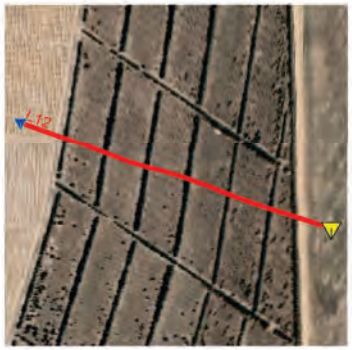
Berg River Voëlvlei Augmentation Scheme

Appendix C10 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 12)





Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:1350

25 0 25

(meters)

WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA
CONSULTING ENGINEERS

Created by

ASST

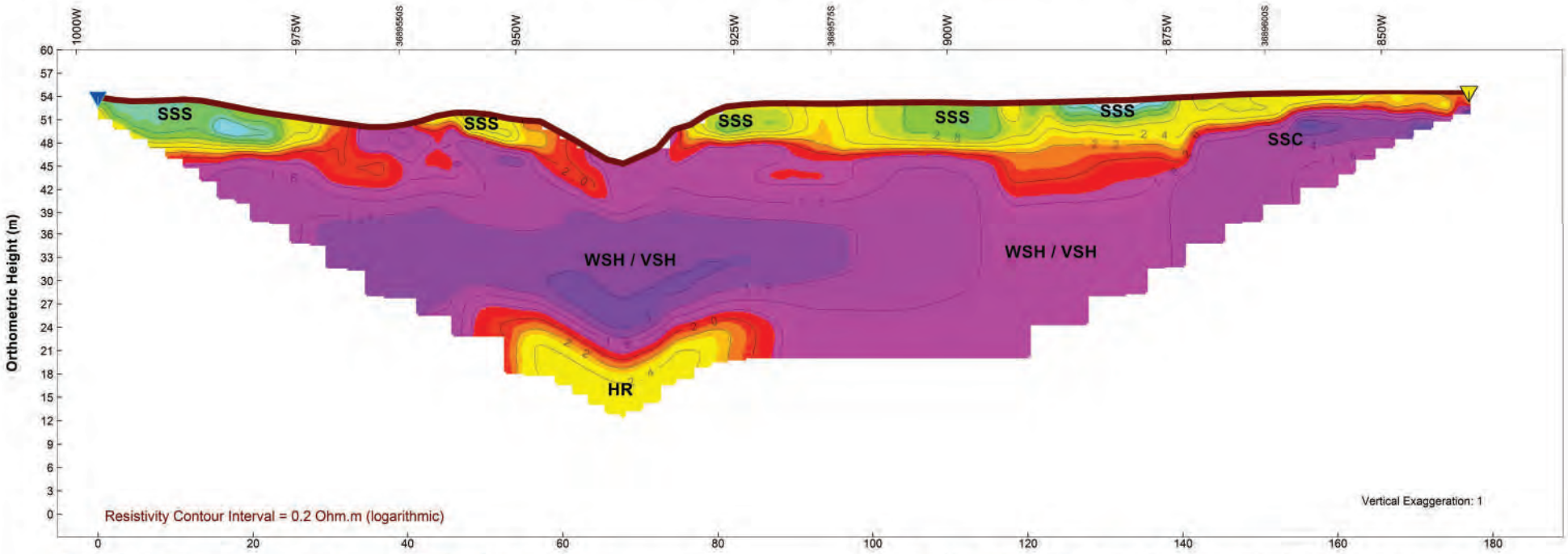
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix C11 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SOIL ELECTRICAL RESISTIVITY SECTION (BRVAS, Line 13)



Active 2D ERI traverse
Other 2D ERI traverses
First and last electrode position denote line direction

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

End of line (EOL)
Start of line (SOL)

0.476 1.386 1.743 2.082 2.376 2.591 2.953 3.367 3.862

Soil Electrical Resistivity
(Ohm.m)

Scale 1:525
10 0 10
(meters)
WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA
CONSULTING ENGINEERS

Created by

ASST

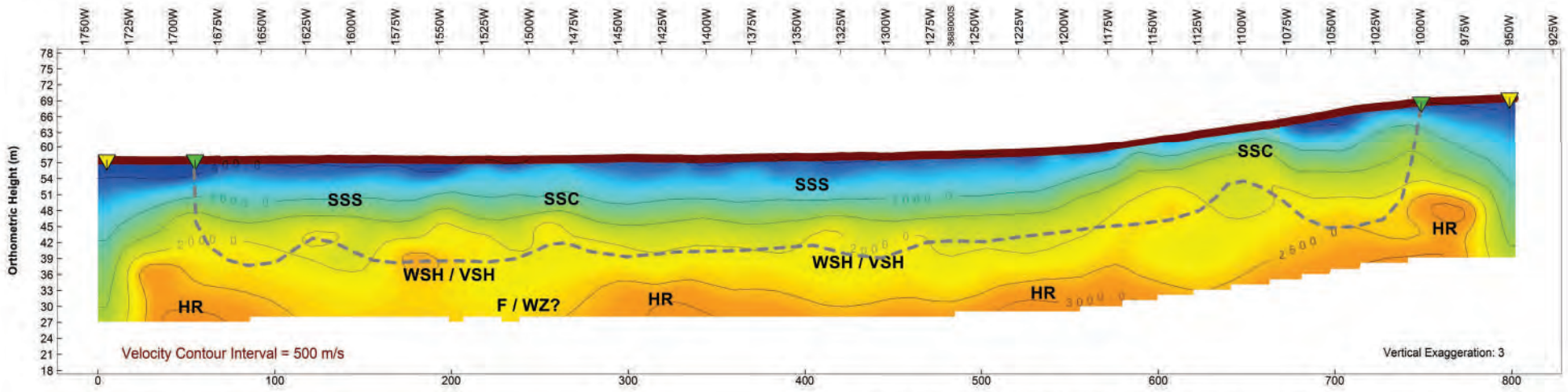
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix C12 - Soil Electrical Resistivity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 1)



Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

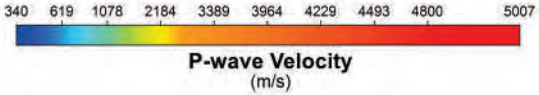
VSH = Weathered Shale (very soft rock)

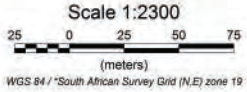
HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots
Start & End Geophones





MUKONA CONSULTING ENGINEERS

Created by ASST

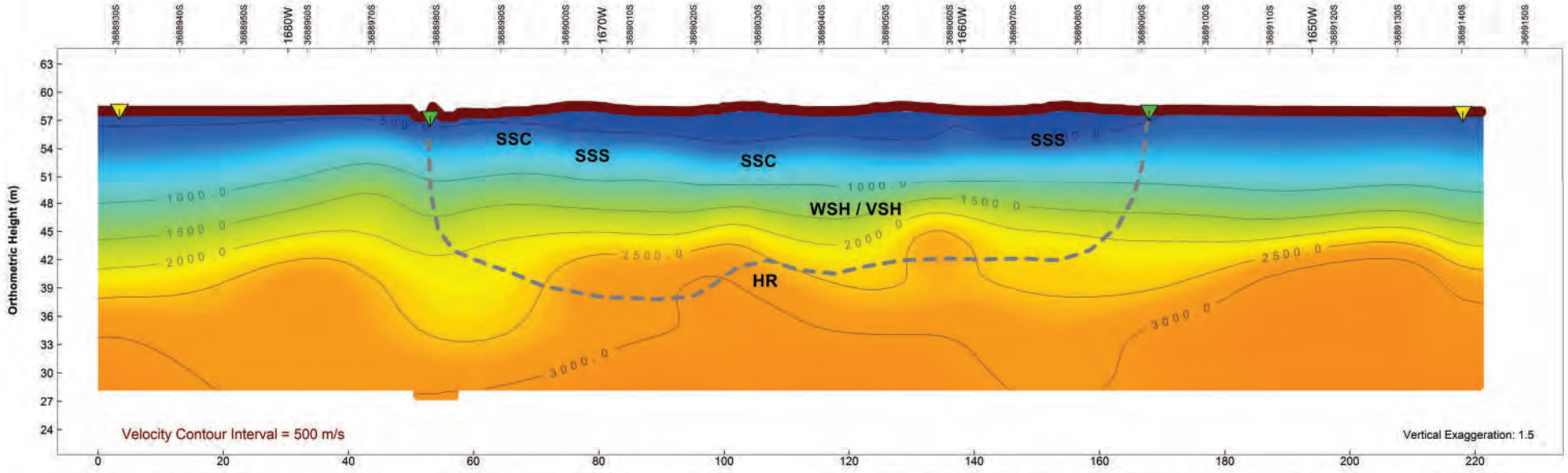
TCTA A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix D1 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 2)



Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots

Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity (m/s)

Scale 1:650

10 0 10 20

(meters)

*WGS 84 / *South African Survey Grid (N,E) zone 19*

MUKONA CONSULTING ENGINEERS

Created by ASST

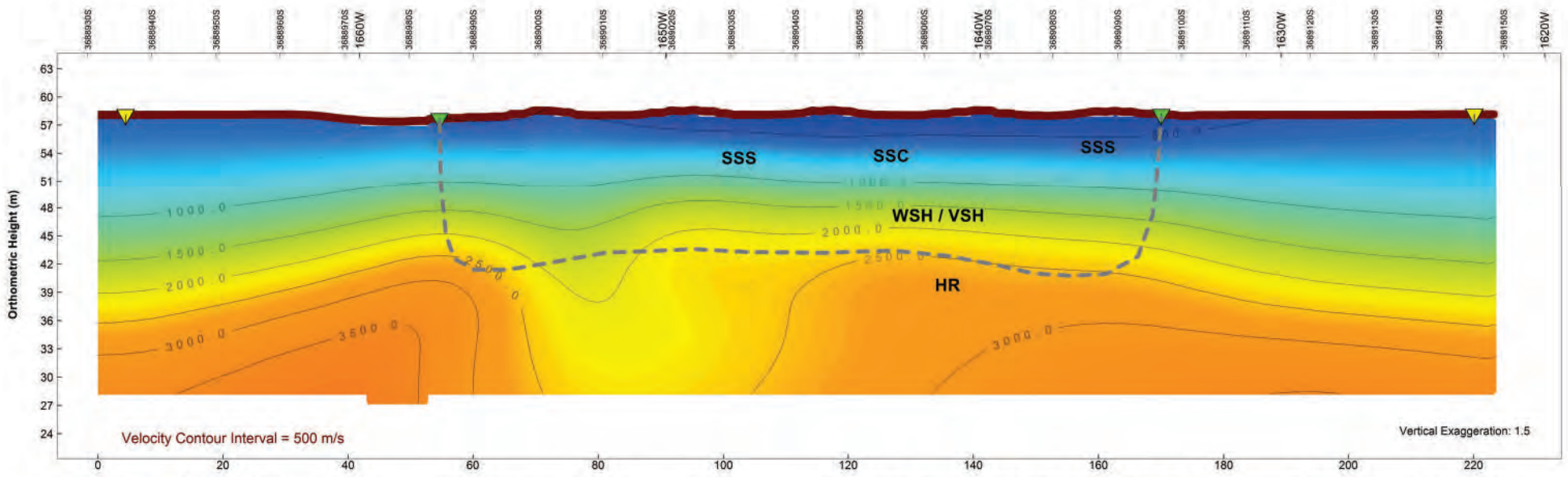
TCTA A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix D2 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 3)



Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots

Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity (m/s)

Scale 1:650

10 0 10 20

(meters)

WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA CONSULTING ENGINEERS

Created by ASST

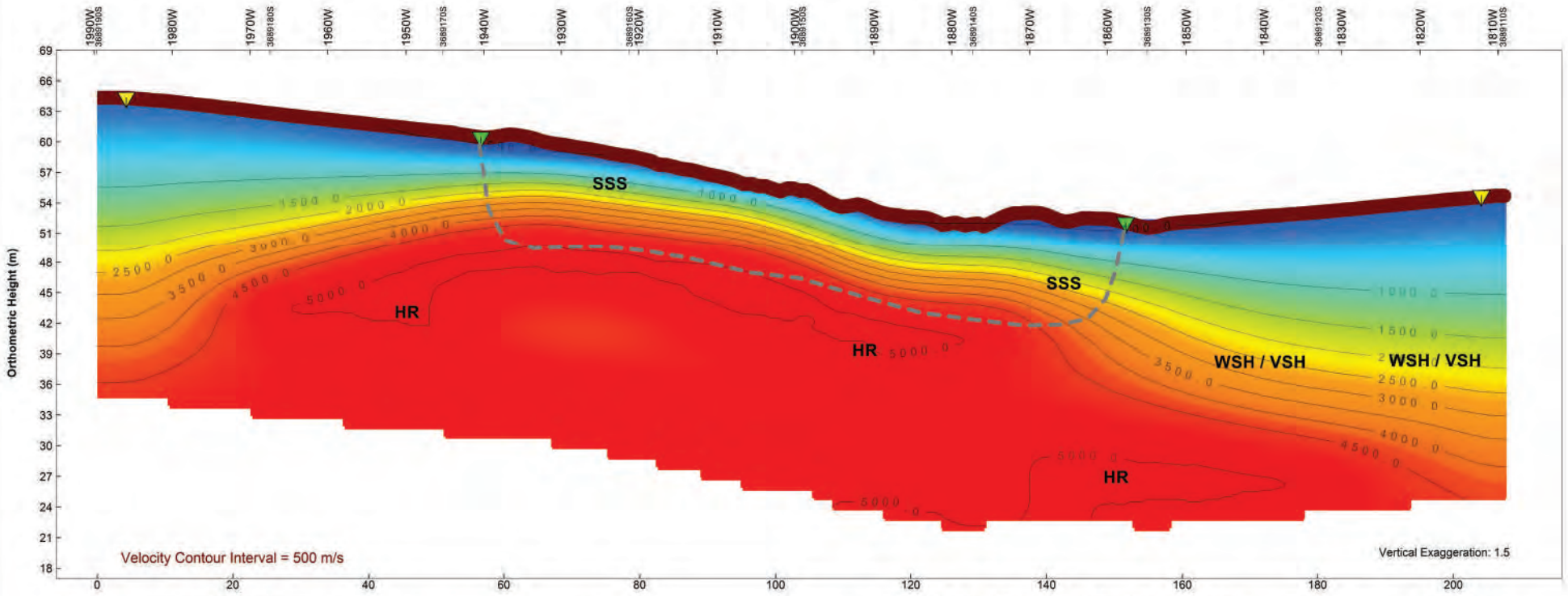
TCTA A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix D3 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 4.1)



Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots
Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity
(m/s)

Scale 1:600
10 0 10
(meters)
*WGS 84 / *South African Survey Grid (N.E) zone 19*

MUKONA
CONSULTING ENGINEERS

Created by

ASST

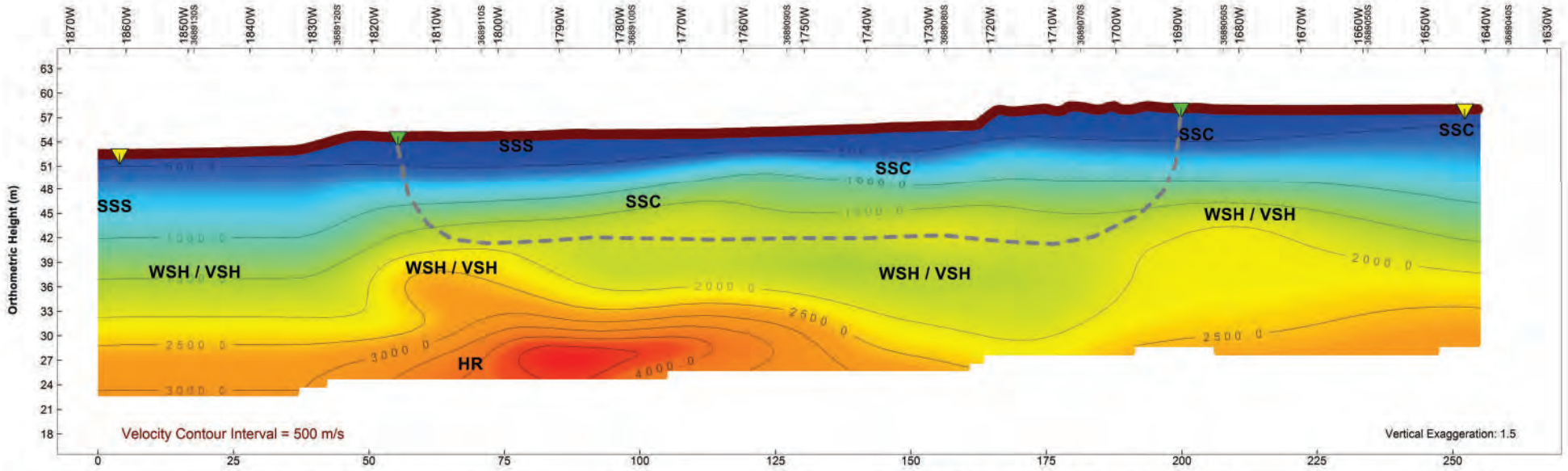
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix D4 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 4.2)



Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots

Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity (m/s)

Scale 1:750

10 0 10 20

(meters)

*WGS 84 / *South African Survey Grid (N,E) zone 19*

MUKONA CONSULTING ENGINEERS

Created by ASST

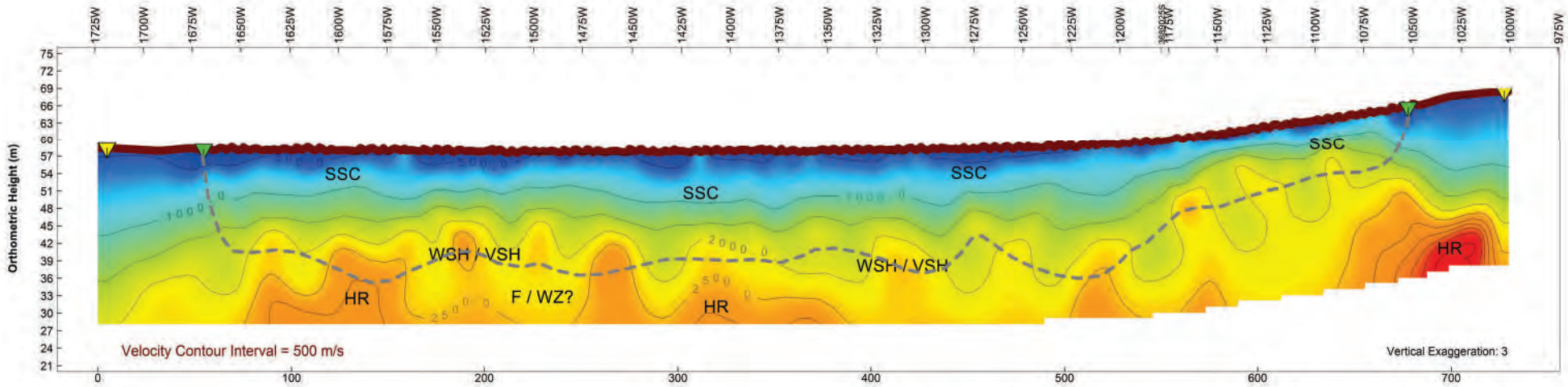
TCTA A new word for water

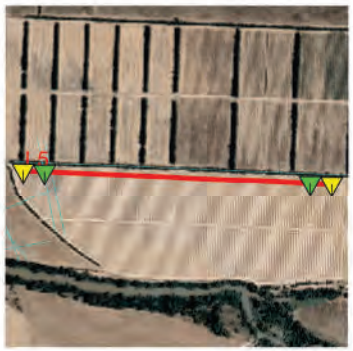
Berg River Voëlvlei Augmentation Scheme

Appendix D5 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 5)





Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots

Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity
(m/s)

Scale 1:2100

25 0 25 50 75

(meters)

*WGS 84 / *South African Survey Grid (N,E) zone 19*

MUKONA
CONSULTING ENGINEERS

Created by

ASST

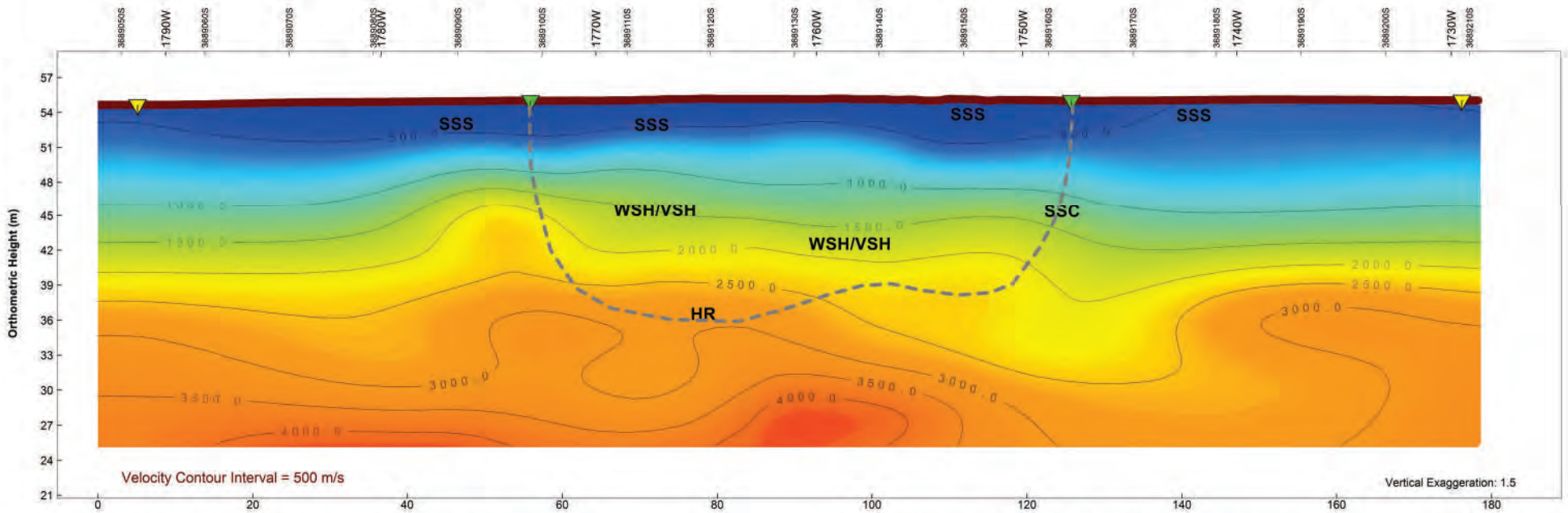
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix D6 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 6)



Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots

Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity
(m/s)

Scale 1:525

10 0 10

(meters)

*WGS 84 / *South African Survey Grid (N,E) zone 19*

MUKONA
CONSULTING ENGINEERS

Created by ASST

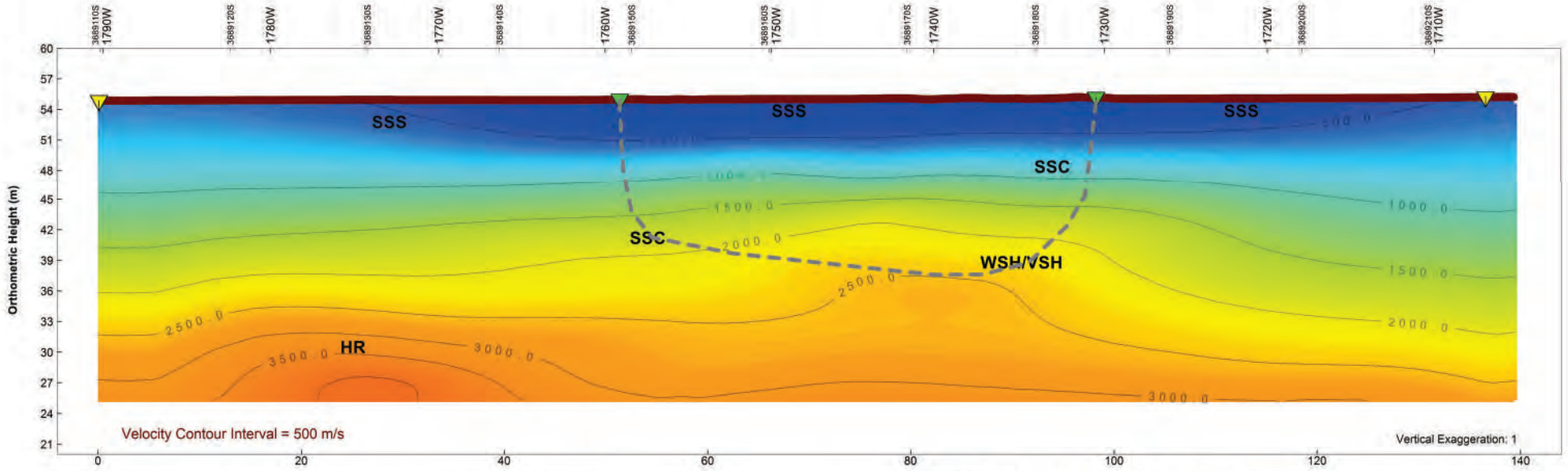
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix D7 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 7)



Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots

Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity (m/s)

Scale 1:400

5 0 5 10 (meters)

WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA CONSULTING ENGINEERS

Created by ASST

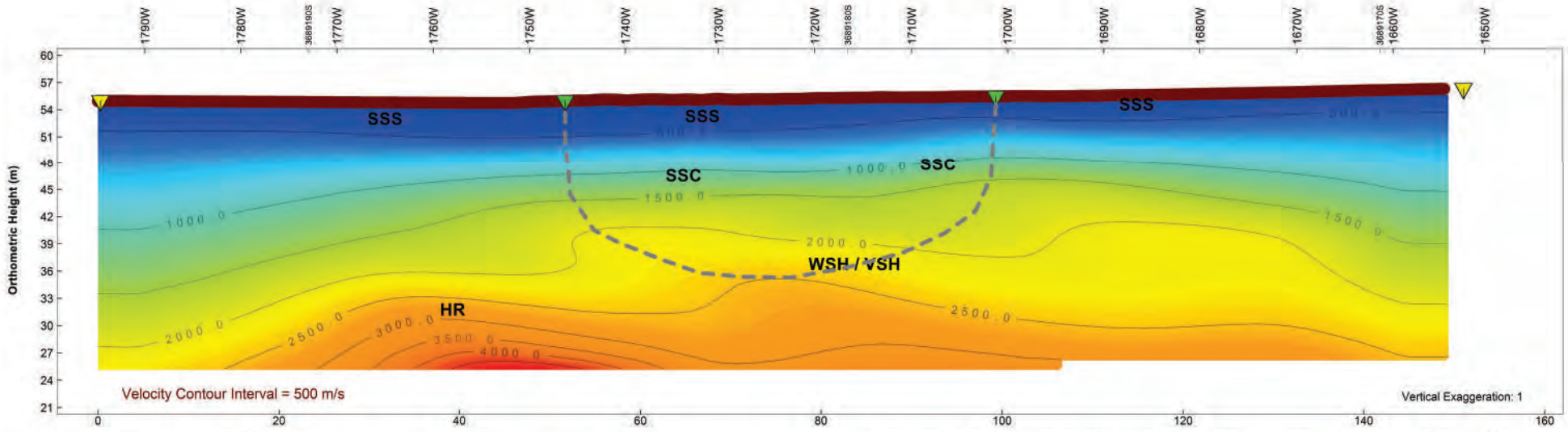
TCTA A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix D8 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 8)



Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots

Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity
(m/s)

Scale 1:450

5 0 5 10 15

(meters)

*WGS 84 / *South African Survey Grid (N.E) zone 19*

MUKONA
CONSULTING ENGINEERS

Created by

ASST

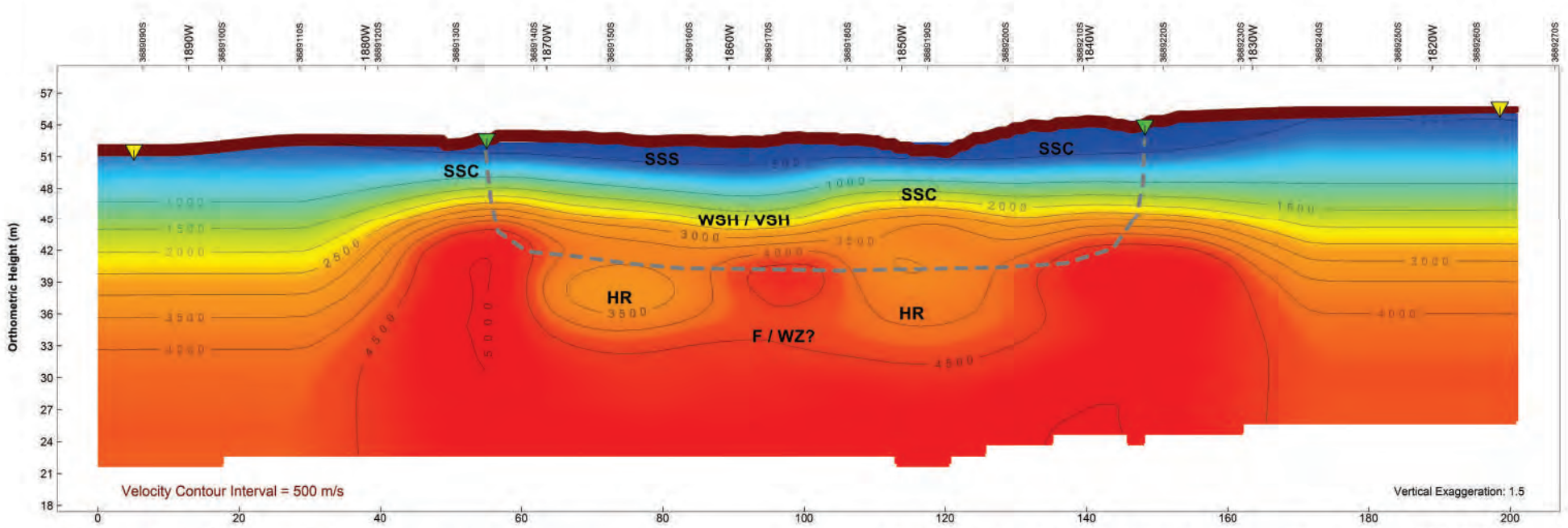
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix D9 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 10)



Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots
Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity (m/s)

Scale 1:575

10 0 10

(meters)

WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA CONSULTING ENGINEERS

Created by ASST

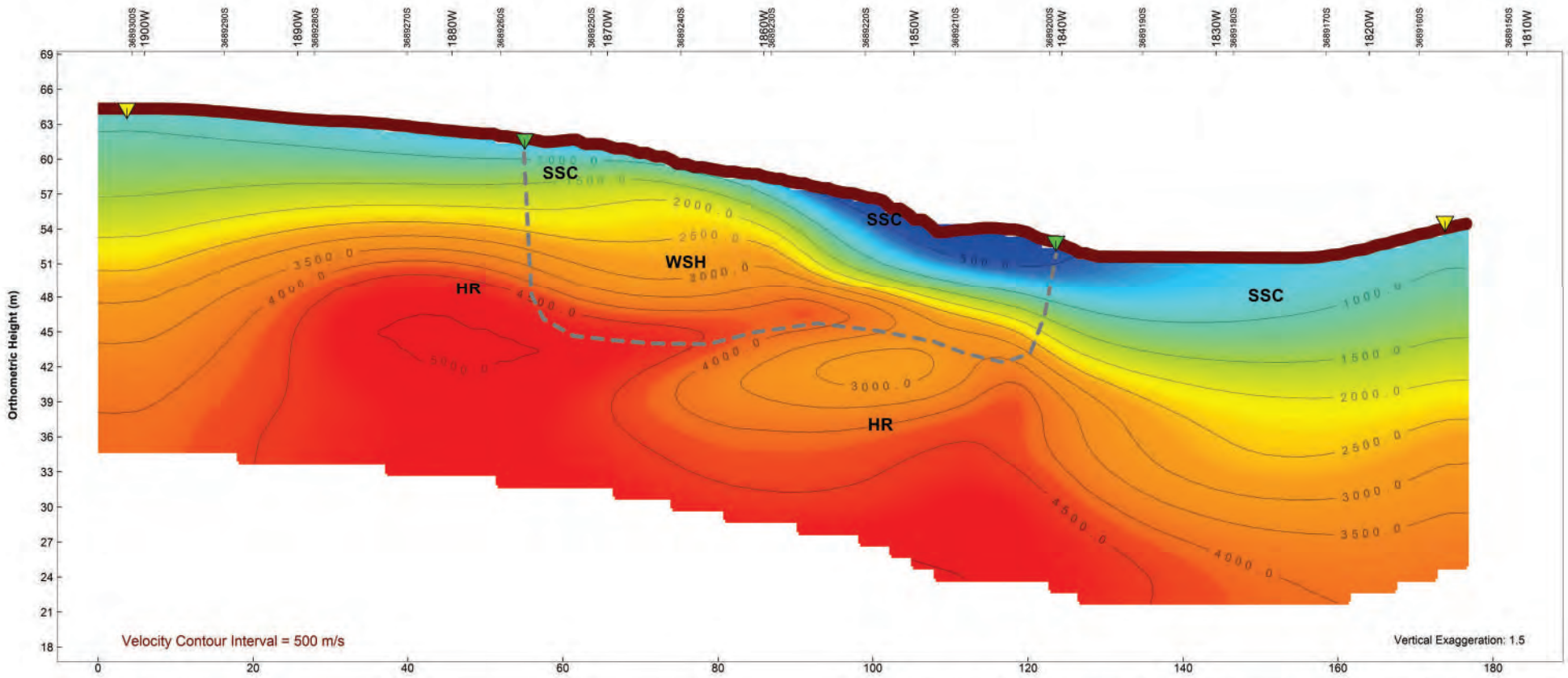
TCTA A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix D10 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 11)



Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots
Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity (m/s)

Scale 1:525

10 0 10

(meters)

WGS 84 / *South African Survey Grid (NLE) zone 19

MUKONA CONSULTING ENGINEERS

Created by ASST

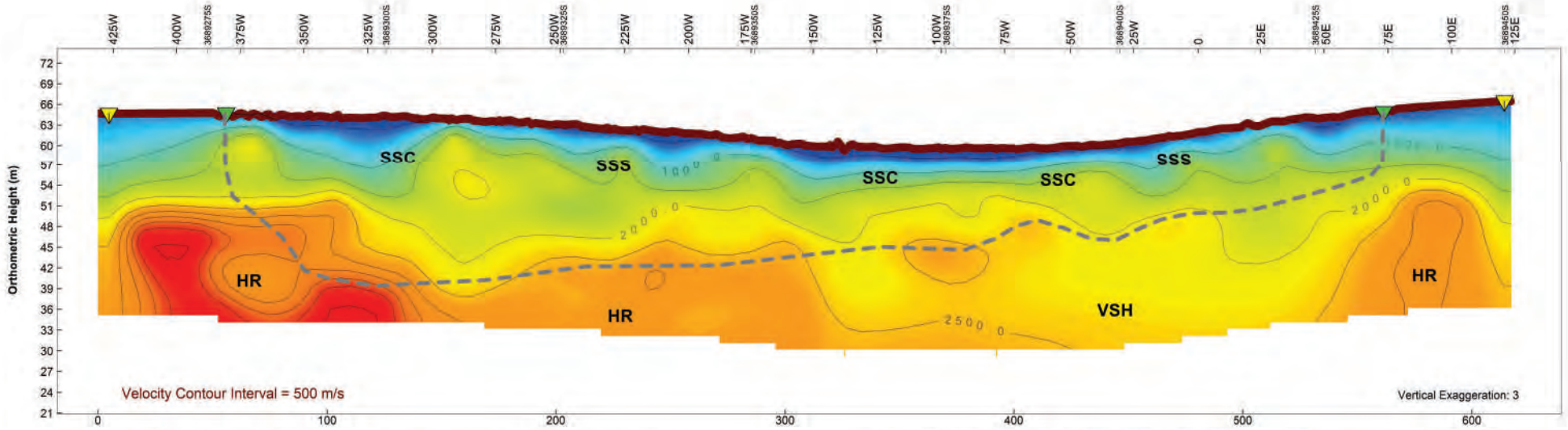
TCTA A new word for water

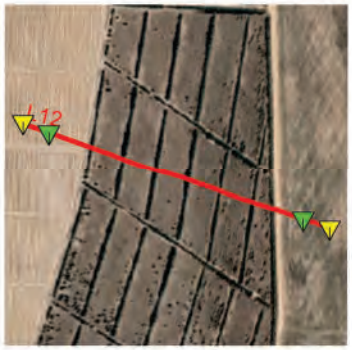
Berg River Voëlvlei Augmentation Scheme

Appendix D11 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 12)





Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots

Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity
(m/s)

Scale 1:1775

25 0 25 50

(meters)

*WGS 84 / *South African Survey Grid (N,E) zone 19*

MUKONA
CONSULTING ENGINEERS

Created by

ASST

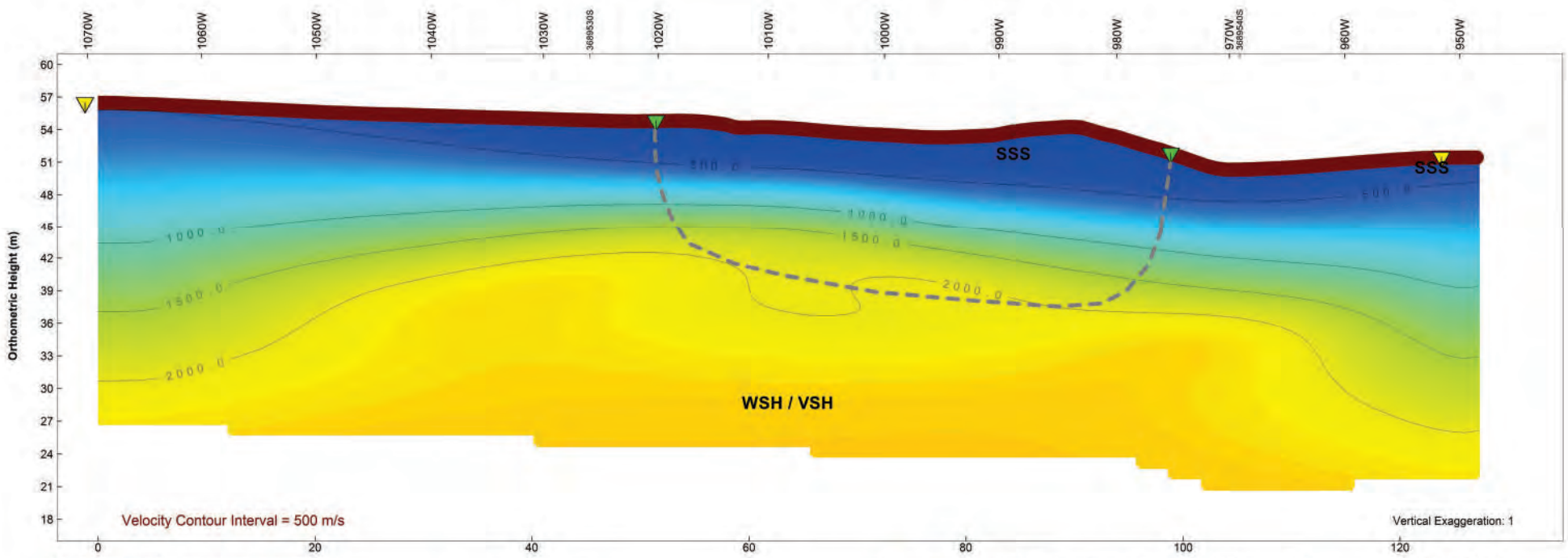
TCTA
A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix D12 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 13.1)



Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots

Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity
(m/s)

Scale 1:375

5 0 5 10

(meters)

WGS 84 / *South African Survey Grid (N,E) zone 19

MUKONA
CONSULTING ENGINEERS

Created by

ASST

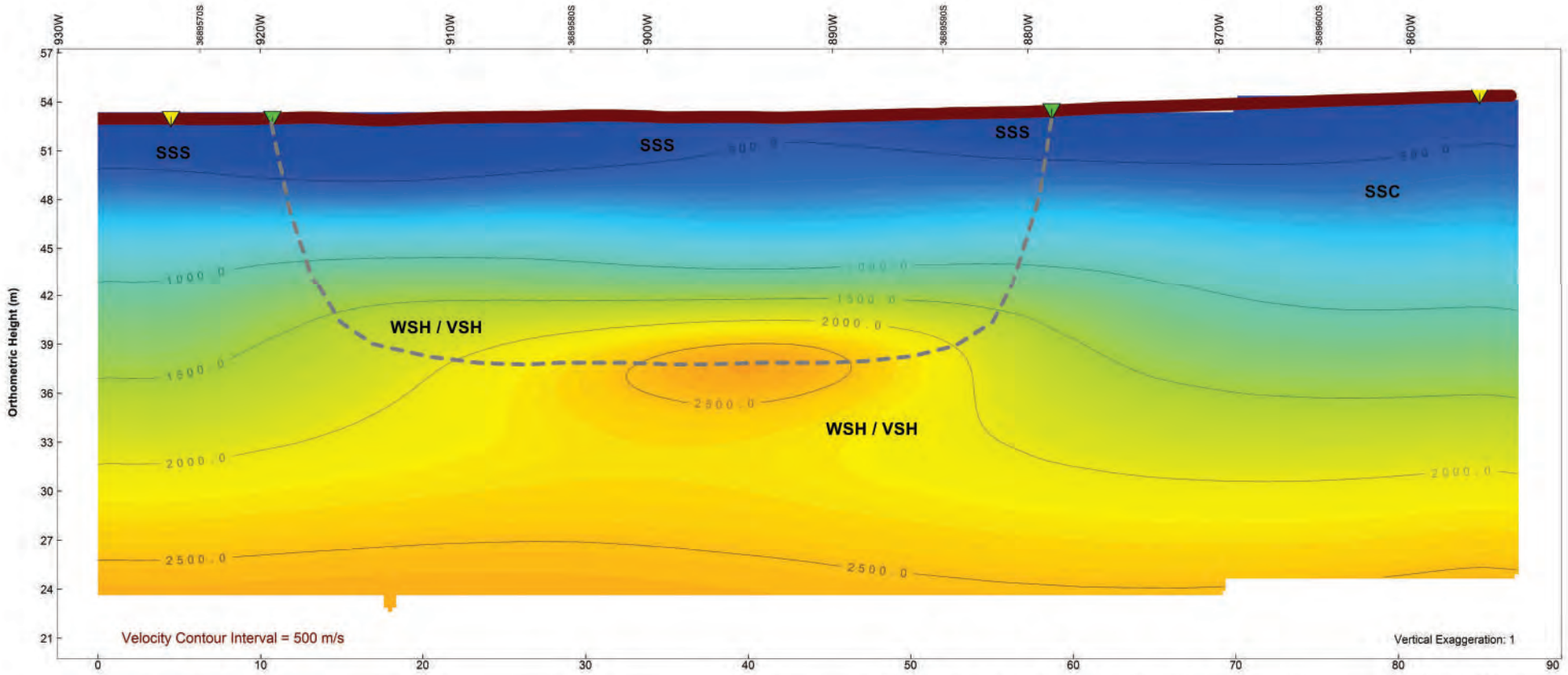
TCTA
A new word for water

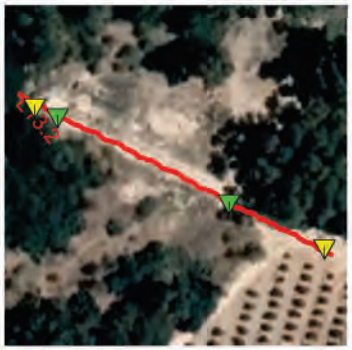
Berg River Voëlvlei Augmentation Scheme

Appendix D13 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

SEISMIC P-WAVE VELOCITY SECTION (BRVAS, Line 13.2)





Active SRF traverse
Other SRF traverses
High confidence boundary for P-wave velocity model

Section Interpretation

C / WZ = Clay / Highly Weathered Material

LSS = Loose Silty Sand

SSC = Stiff Sandy Clay

SSS = Stiff Silty Sand

WSH = Weathered Shale (soft rock)

VSH = Weathered Shale (very soft rock)

HR = Unweathered / Slightly Weathered Hardrock

F / WZ ? = Inferred Faults / Weathered Zone

Plan View Map Legend

Start & End Shots

Start & End Geophones

340 619 1078 2184 3389 3964 4229 4493 4800 5007

P-wave Velocity (m/s)

Scale 1:250

2.5 0 2.5 5 7.5

(meters)

WGS 84 / *South African Survey Grid (N;E) zone 19

MUKONA CONSULTING ENGINEERS

Created by ASST

TCTA A new word for water

Berg River Voëlvlei Augmentation Scheme

Appendix D14 - P-wave Velocity

(Google Earth Backdrop Image On Plan View Map)

BERG RIVER – VOËLVLEI WATER AUGMENTATION SCHEME

Soil Corrosivity Survey

Report No. P067/REP001

Preliminary Findings Report

Prepared By:
C2D Engineering (Pty) Ltd
PO Box 2459
Faerie Glen
0043

Contact: Ross Mahaffey
c: +27(0)72 476 6354
e: ross@c2d.co.za

15 December 2021

Rev 0

Document Control

Project Title	Berg River – Voëlvlei Water Augmentation Scheme
Document Title	Soil Corrosivity Survey
C2D Project Number	P067
Document Number	P067/REP001
Client	Mukona Group (Pty) Ltd
Client Contact	Mr Keshan Naidoo
Distribution	Lead Consulting Engineers – Bigen Africa & GIBB

Revision	Date	Revision Description	Preliminary Findings Report	
0	15 December 2021		Author	Reviewer
		Name	Ross Mahaffey	Kobus Prinsloo
		Signature		
Revision	Date	Revision Description		
			Author	Reviewer
		Name		
		Signature		
Revision	Date	Revision Description		
			Author	Reviewer
		Name		
		Signature		

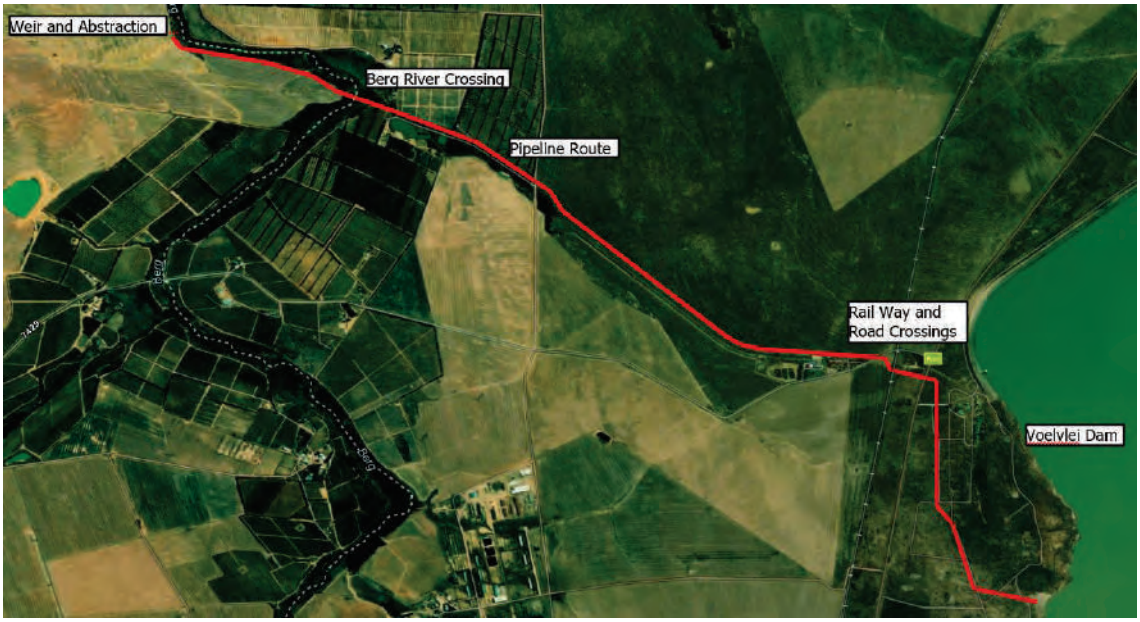
TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

Mukona Group was appointed by Bigen Africa & GIBB to carry out a geotechnical investigation for the Berg River – Voëlvlei Water Augmentation Scheme (BRVAS). The scheme includes a diversion weir and abstraction works on the Berg River and a rising main (~6.4 km) which conveys water to the existing Voëlvlei Dam. The general layout of the project is presented in **Figure 1**.



C2D Engineering (C2D) was in turn appointed by Mukona Group to complete the Soil Resistivity Surveys / Soil Corrosivity Surveys which form part of the project's geotechnical investigations. The soil resistivity survey was completed by C2D Engineering's Mr Ross Mahaffey and Mr Kobus Prinsloo on 7-, 8- & 9- December 2021. It is noted that significant rain was experienced in the area prior to the surveys, which typically results in lower soil resistivities when compared to the traditionally drier summer months, but may be representative of the traditionally wet winter months expected for the region.

C2D's Scope of Services included the following tasks:

1. A detailed soil resistivity survey undertaken at nominal intervals of 100 m, using the 4-pin Wenner method.
2. A deep soil resistivity survey at the crossing of the pipeline with the high voltage power line(s).
3. Soil sampling and analysis for chemical and bacterial (i.e., SRB) activities at nominal intervals of 1 000m.

This report is noted as being a ***Preliminary Findings Report***, which does not include the results from the Chemical Analysis, as those results will only be available in January 2022.

2. SOIL RESISTIVITY SURVEY

2.1. BACKGROUND AND METHODOLOGY

Soil acts as the electrolyte in the electrochemical corrosion cell formed during the external electrochemical corrosion of a pipeline. Soil resistivity is an electrical characteristic of the soil (and groundwater) which affects the ability of corrosion currents to flow through the electrolyte. Soil resistivity is a function of soil moisture and the concentrations of ionic soluble salts and is considered to be the most comprehensive indicator of a soil's corrosivity.

The soil corrosivity classifications according to soil resistivity are provided in **Table 1** below, where lower soil resistivities typically indicate environments of higher corrosivity and a soil resistivity value larger than 100 Ω-m is generally accepted as a non-corrosive environment.

TABLE 1: SOIL CORROSIVITY IN RELATION TO SOIL RESISTIVITY[1]

Soil Resistivity	Soil Corrosivity
Above 100 Ω-m	Generally non-corrosive
50 Ω-m to 100 Ω-m	Mildly corrosive
20 Ω-m to 50 Ω-m	Corrosive
0 Ω-m to 20 Ω-m	Very corrosive

Soil resistivity is typically measured utilising the Wenner four electrode technique, according to the ASTM G57 Standard. The equal spacing between the four electrodes represents the depth to which the soil resistivity is measured, where the resulting resistivity measurement represents the average resistivity of a hemisphere of soil of a radius equal to the electrode spacing. The soil resistivity was measured to depths of **3 m, 4 m and 5 m for this survey**, which is regarded as the depth representative of the depth of installation of the **BRVAS Rising Main**. It is noted that the Project will be implemented as an EPC Contract and a firm/final longitudinal section of the pipeline is not available at this time. The final pipeline levels are therefore currently unknown and therefore no "Layer Calculations" were performed as part of the soil resistivity survey along the pipeline route.

The Wenner four electrode method requires that four metal electrodes are inserted into the ground to a depth not exceeding 5% of the minimum separation of the electrodes and the associated depth of insertion into the soil was therefore controlled during the survey. The measurement methodology is illustrated in **Figure 2**, where an alternating current from the soil resistance meter causes current to flow through the soil, between pins C1 and C2. The voltage or potential is then measured between pins P1 and P2. The meter concludes a resistance reading (Ω) and the resistivity of the soil (Ω-m) is then computed from the instrument reading, according to the equation provided below.

The soil resistivities were measured with a Megger DET2/2 resistivity measuring device and the soil resistivity measurements obtained is illustrated in **Figure 3**.The measurements were completed at nominal intervals of ~ 100 m, depending on accessibility, topography, surface conditions and obstructions. The soil resistivity meter's calibration certificate is provided in **Annexure A**.

[1] M Parker and E Peattie – Pipeline Corrosion and Cathodic Protection (1999) / Corrosion Institute of Southern Africa - Corrosion Control in Southern Africa (2004)

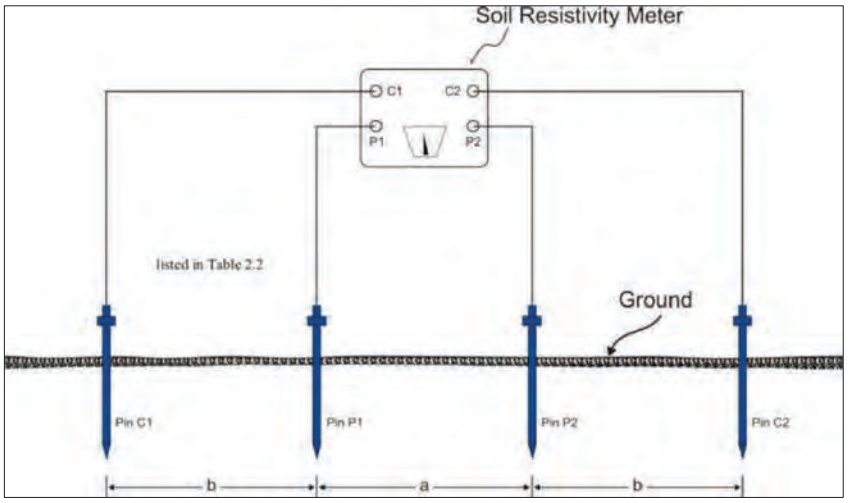


FIGURE 2: WENNER FOUR PIN RESISTIVITY MEASUREMENT PROCEDURE

$$\rho = 2\pi aR$$

- ρ = Resistivity (Ω-m)
- a = Electrode spacing (m)
- R = Measured resistance (Ω)

FIGURE 3: SOIL RESISTIVITY MEASUREMENT ILLUSTRATION

2.2. SOIL RESITIVITY SURVEY RESULTS

The locations of the soil resistivity survey points are provided in **Figure 4**. The full set of soil resistivity survey results are provided in **Table 2** and presented graphically in **Figure 5** to **Figure 7**.

FIGURE 4: SOIL RESISTIVITY SURVEY POINTS

TABLE 2: BRVAS SOIL RESISTIVITY SURVEY RESULTS

Survey Point	Latitude	Longitude	~ Chainage (m)	Resistance (Ω) 3 m Pin Spacing	Resistance (Ω) 4 m Pin Spacing	Resistance (Ω) 5 m Pin Spacing	Resistivity (Ω-m) 0 m to 3 m Layer	Resistivity (Ω-m) 0 m to 4 m Layer	Resistivity (Ω-m) 0 m to 5 m Layer
BR01	-33.328252	18.979539	4	1.237	1.085	1.065	23	20	20
BR02	-33.328664	18.979692	50	1.294	0.334	0.292	24	6	6
BR03	-33.329041	18.979907	96	0.519	0.446	0.369	10	8	7
BR04	-33.329391	18.981003	202	6.69	4.62	3.03	126	87	57
BR05	-33.32951	18.982018	297	18.75	13.55	10.15	353	255	191
BR06	-33.32972	18.983147	404	30	20.8	14.82	565	392	279
BR07	-33.329807	18.984166	499	35.1	25.4	18.9	662	479	356
BR08	-33.330058	18.985205	600	23.7	18.41	14.77	447	347	278
BR09	-33.33033	18.9862	697	17.91	14.1	8.44	338	266	159
BR10	-33.330628	18.987308	806	24.8	16.92	11.15	467	319	210
BR11	-33.331153	18.988157	904	14.95	10.84	9.37	282	204	177
BR12	-33.33171	18.988935	997	48.5	32.4	21.6	914	611	407
BR13	-33.331975	18.990216	1118	27.4	21.6	17.81	516	407	336
BR14	-33.332489	18.990974	1205	4.16	2.09	1.346	78	39	25
BR15	-33.332782	18.991689	1279	0.834	0.7	0.628	16	13	12
BR16	-33.333055	18.992987	1403	10.6	4.13	1.966	200	78	37
BR17	-33.333338	18.99387	1491	2.3	1.174	0.879	43	22	17
BR18	-33.333725	18.994711	1580	0.69	0.615	0.558	13	12	11
BR19	-33.334062	18.99576	1684	5.52	2.78	2.37	104	52	45
BR20	-33.334295	18.996561	1763	0.538	0.481	0.462	10	9	9
BR21	-33.334933	18.997599	1880	0.446	0.401	0.37	8	8	7
BR22	-33.335579	18.998582	1996	1.574	1.139	0.881	30	21	17
BR23	-33.336269	18.99931	2097	0.647	0.591	0.529	12	11	10
BR24	-33.336833	19.000256	2205	0.637	0.363	0.305	12	7	6
BR25	-33.337463	19.000901	2298	0.551	0.321	0.348	10	6	7
BR26	-33.338265	19.001455	2402	1.304	0.475	0.318	25	9	6

Survey Point	Latitude	Longitude	~ Chainage (m)	Resistance (Ω) 3 m Pin Spacing	Resistance (Ω) 4 m Pin Spacing	Resistance (Ω) 5 m Pin Spacing	Resistivity (Ω-m) 0 m to 3 m Layer	Resistivity (Ω-m) 0 m to 4 m Layer	Resistivity (Ω-m) 0 m to 5 m Layer
BR27	-33.338947	19.002208	2505	0.502	0.282	0.227	9	5	4
BR28	-33.339438	19.002971	2594	0.714	0.47	0.396	13	9	7
BR29	-33.340099	19.003729	2696	0.417	0.36	0.339	8	7	6
BR30	-33.340755	19.004671	2810	1.136	0.643	0.531	21	12	10
BR31	-33.341303	19.00545	2904	0.558	0.414	0.365	11	8	7
BR32	-33.341926	19.006217	3004	0.464	0.311	0.194	9	6	4
BR33	-33.342547	19.007133	3113	1.072	0.654	0.553	20	12	10
BR34	-33.343127	19.007846	3205	0.274	0.236	0.215	5	4	4
BR35	-33.343687	19.008589	3298	1.44	0.822	0.694	27	15	13
BR36	-33.344331	19.009428	3404	0.724	0.452	0.368	14	9	7
BR37	-33.344953	19.010214	3505	1.443	1.048	0.845	27	20	16
BR38	-33.345452	19.011125	3608	0.297	0.21	0.182	6	4	3
BR39	-33.345696	19.012051	3700	0.321	0.271	0.238	6	5	4
BR40	-33.345844	19.013189	3808	0.444	0.276	0.237	8	5	4
BR41	-33.34591	19.014208	3903	0.402	0.242	0.195	8	5	4
BR42	-33.346003	19.015384	4013	0.569	0.311	0.219	11	6	4
BR43	-33.346012	19.01639	4106	0.648	0.398	0.289	12	8	5
BR44	-33.346115	19.017538	4214	0.822	0.523	0.371	15	10	7
BR45	-33.346143	19.018448	4299	1.42	0.938	0.712	27	18	13
BR46	-33.346541	19.019155	4391	0.92	0.678	0.501	17	13	9
BR47	-33.347202	19.020125	4511	1.788	0.672	0.331	34	13	6
BR48	-33.347311	19.021065	4599	0.485	0.369	0.319	9	7	6
BR49	-33.347524	19.022051	4690	0.352	0.285	0.238	7	5	4
BR50	-33.348312	19.022007	4775	4.91	2.35	1.224	93	44	23
BR51	-33.349397	19.021893	4895	4.39	2.25	1.425	83	42	27
BR52	-33.350361	19.021954	5002	0.997	0.733	0.552	19	14	10
BR53	-33.351264	19.021982	5102	2.15	0.829	0.547	41	16	10

Survey Point	Latitude	Longitude	~ Chainage (m)	Resistance (Ω) 3 m Pin Spacing	Resistance (Ω) 4 m Pin Spacing	Resistance (Ω) 5 m Pin Spacing	Resistivity (Ω-m) 0 m to 3 m Layer	Resistivity (Ω-m) 0 m to 4 m Layer	Resistivity (Ω-m) 0 m to 5 m Layer
BR54	-33.35229	19.021934	5216	1.244	0.553	0.407	23	10	8
BR55	-33.353072	19.022017	5303	0.468	0.226	0.181	9	4	3
BR56	-33.353899	19.022001	5394	0.244	0.21	0.182	5	4	3
BR57	-33.354881	19.022435	5518	0.69	0.49	0.359	13	9	7
BR58	-33.35576	19.022821	5625	0.815	0.535	0.461	15	10	9
BR59	-33.356364	19.023499	5707	2.31	1.573	1.104	44	30	21
BR60	-33.357439	19.023498	5821	1.594	0.974	0.72	30	18	14
BR61	-33.358102	19.02372	5898	0.193	0.157	0.137	4	3	3
BR62	-33.358988	19.024019	6000	0.225	0.168	0.133	4	3	3
BR63	-33.359353	19.025172	6115	1.124	0.626	0.509	21	12	10
BR64	-33.359563	19.026013	6197	1.97	1.412	1.024	37	27	19
BR65	-33.359495	19.026998	6284	1.896	1.248	0.948	36	24	18

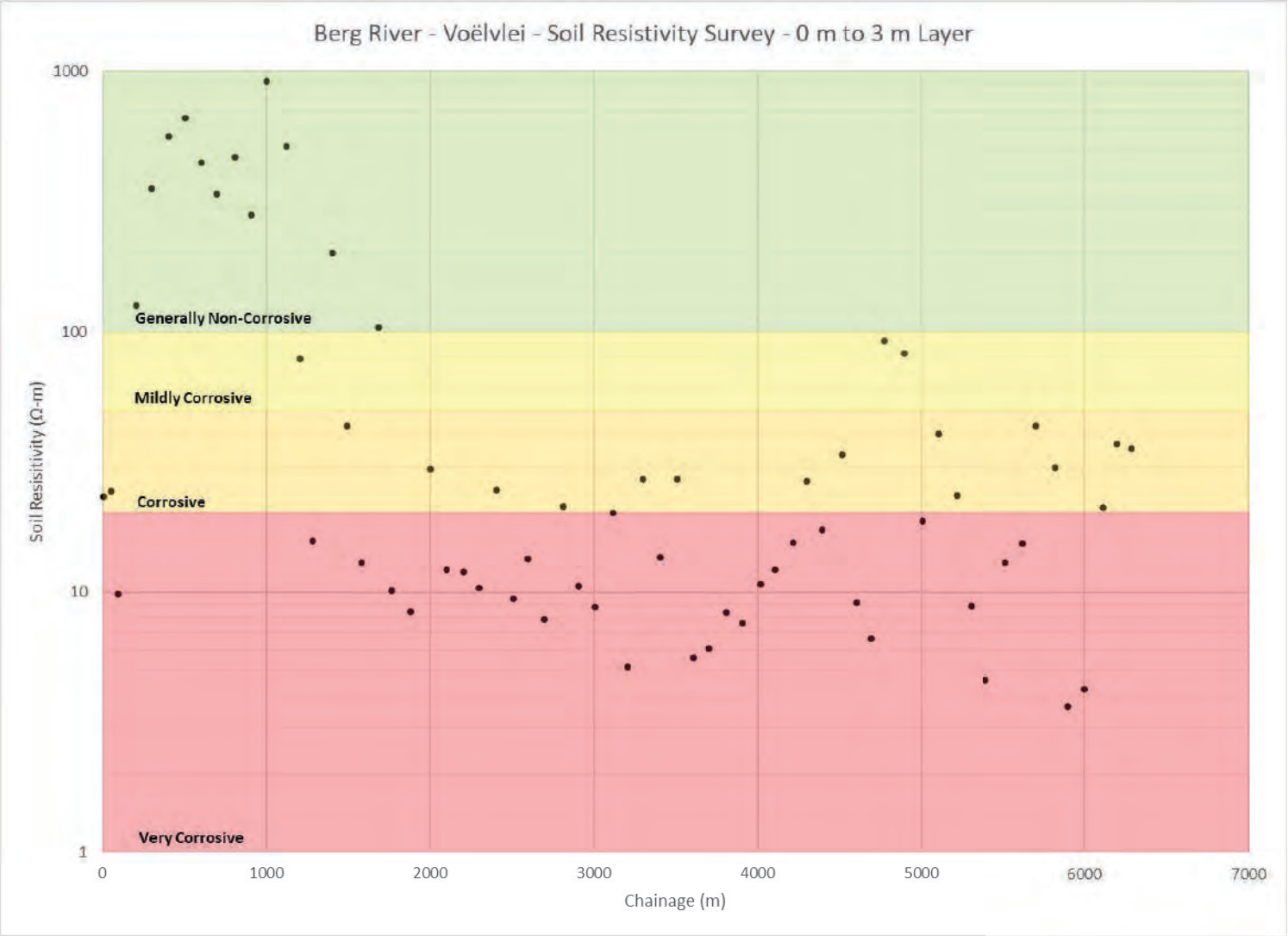


FIGURE 5: BERG RIVER - VOËLVLEI - SOIL RESISTIVITY SURVEY - 0 M TO 3 M LAYER

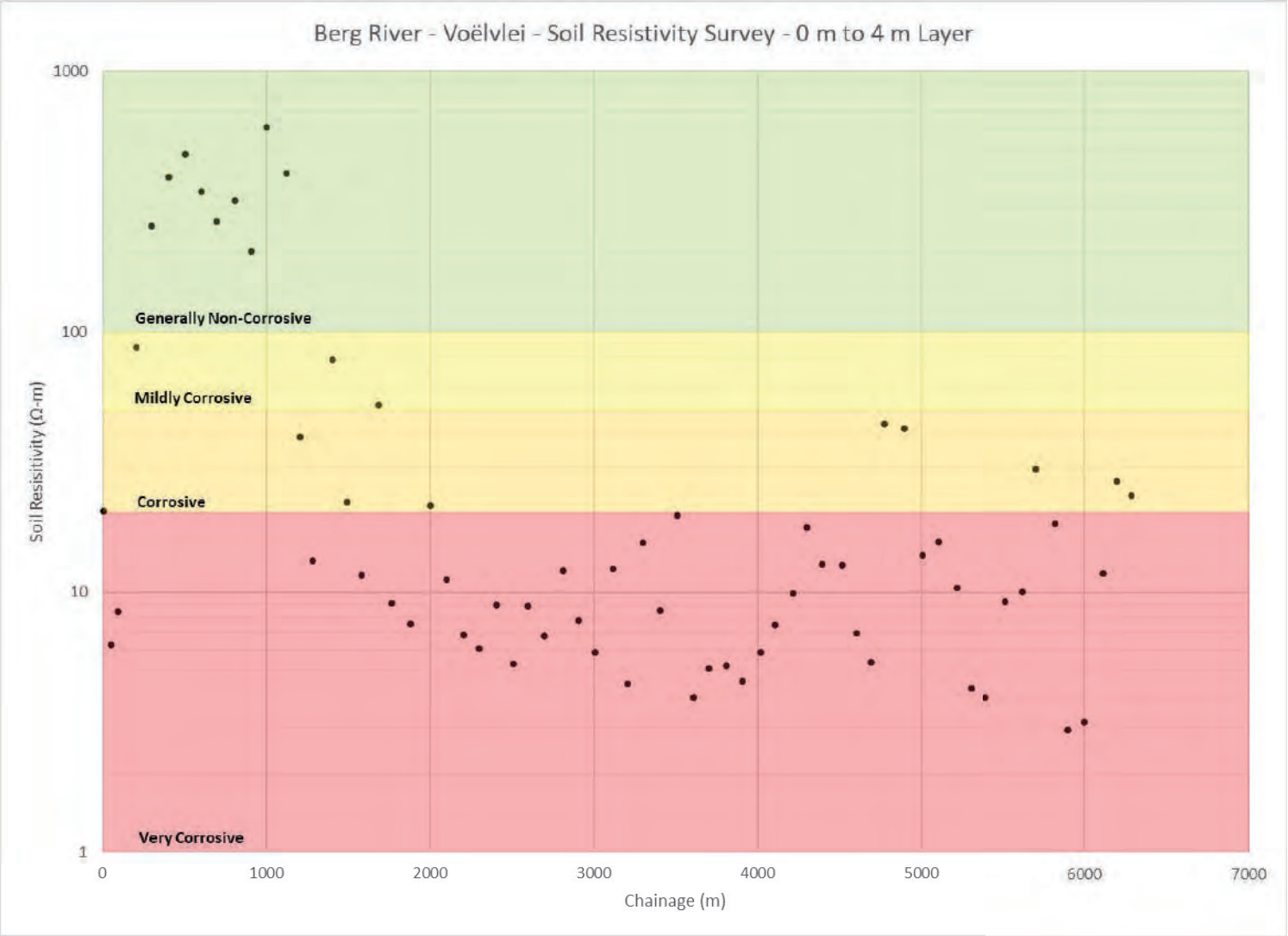


FIGURE 6: BERG RIVER - VOËLVLEI - SOIL RESISTIVITY SURVEY - 0 M TO 4 M LAYER

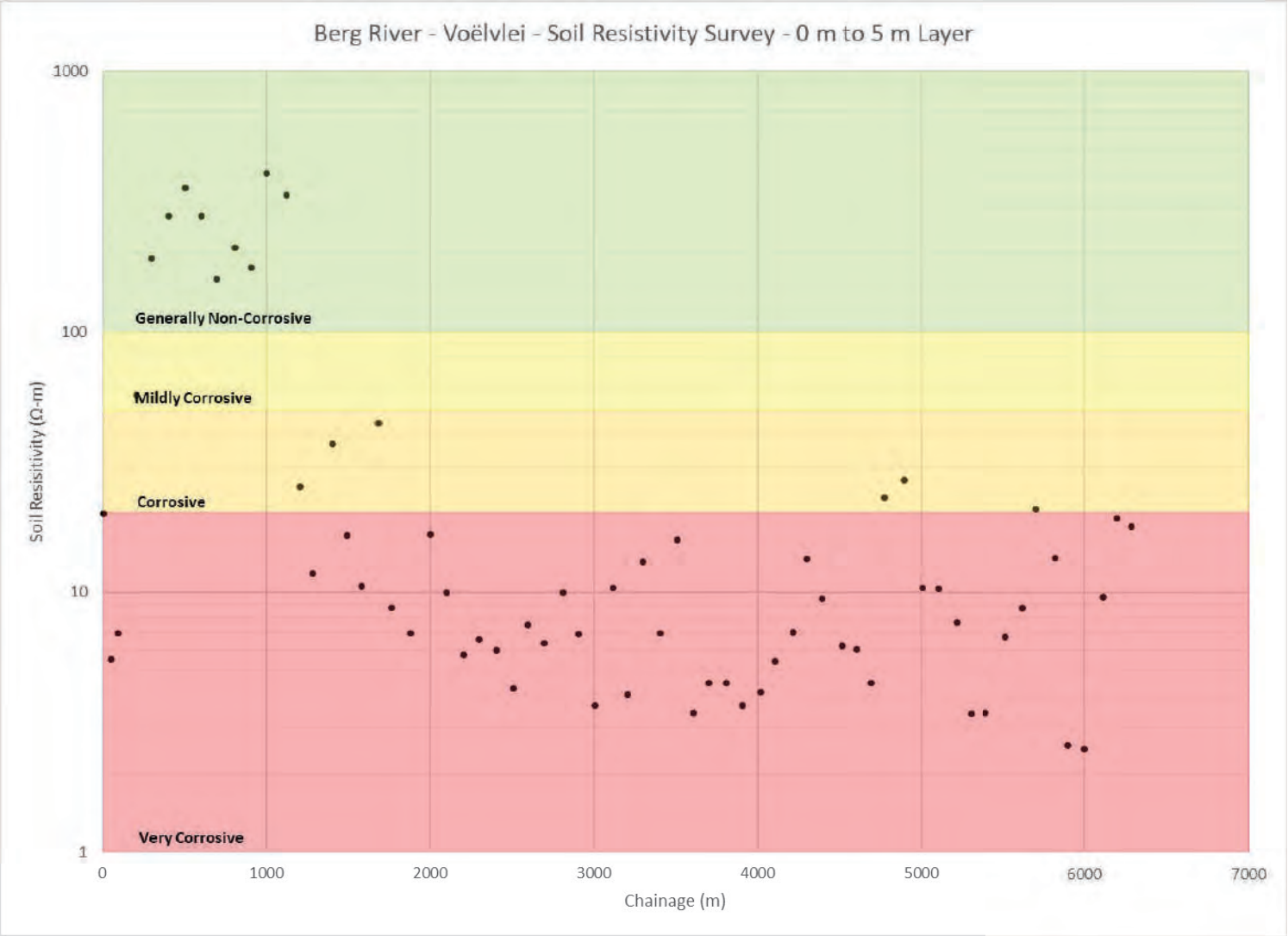


FIGURE 7: BERG RIVER - VOËLVLEI - SOIL RESISTIVITY SURVEY - 0 M TO 5 M LAYER

2.3. SOIL RESISITIVITY SURVEY DISCUSSION

From the soil resistivity survey results presented above, it is observed that two distinctly different soil resistivity environments are crossed, i.e. Ch 0 to ~Ch 1300 and ~ Ch 1300 to the End. This is broadly aligned with the topographical and environmental features observed on site:

1. Ch 0 to ~Ch 1000 pipeline runs through wheat fields and runs parallel to the Berg River.
2. ~Ch 1000 to ~Ch 1700 pipeline cross the Berg River, fruit crops, the Voëlvlei canal discharge area and parallels a farm dam.
3. ~Ch 1700 to ~ Ch 4000 where the pipeline runs in parallel to the Voëlvlei canal and through grasslands.
4. ~Ch 4000 to End where the pipeline runs through grasslands and fynbos.

The length of pipeline from Ch 0 to ~Ch 1700 is predominately non-corrosive (excluding the area directly adjacent to the weir site, which is corrosive to very corrosive), whilst the length of pipeline from ~Ch 1700 to the end is predominately corrosive to very corrosive, especially for the 5 m pin spacing results (0 m to 5 m layer). It is however noted that soil resistivity is only one parameter when considering the corrosivity of an environment and other factors should also be considered.

The soil resistivity survey results are summarised in **Table 3** and **Table 4.**

TABLE 3: BRVAS PIPELINE ROUTE CORROSIVITY DISTRIBUTION SUMMARY

Survey Layer	Generally Non Corrosive	Mildly Corrosive	Corrosive	Very Corrosive
0 m to 3 m	18%	5%	28%	49%
0 m to 4 m	14%	5%	14%	68%
0 m to 5 m	14%	2%	11%	74%

TABLE 4: SOIL RESISTIVITY SURVEY STATISTICAL SUMMARY

Survey Layer	Statistical Parameter	Resistivity (Ω-m)		
		0 m to End (Entire Route)	0 m to 1700 m	1700 m to End
0 m to 3 m	Median	20	200	13
	25th Percentile	10	24	9
	75th Percentile	43	467	27
0 m to 4 m	Median	12	87	9
	25th Percentile	7	20	6
	75th Percentile	28	347	14
0 m to 5 m	Median	10	57	7
	25th Percentile	6	17	4
	75th Percentile	20	278	10

3. DEEP SOIL RESISTIVITY SURVEY

The deep soil resistivity survey consisted out of two discrete types of surveys:

1. Wenner four electrode survey with pin spacings at 50 cm, 1 m, 1.5 m, 2 m, 3 m, 4 m, 5 m, 7 m, and 9 m.
2. Multi-electrode resistivity imaging survey (also referred to as Electrical Resistivity Tomography) at 5 m intervals to a depth of 80 m

The Wenner four electrode surveys were completed by C2D Engineering's Mr Ross Mahaffey and Mr Kobus Prinsloo and the Mult-electrode resistivity imaging survey was completed by Cape Geophysics' Mr Martin de Klerk (a specialist sub-consultant to C2D Engineering).

The deep soil resistivity surveys were completed at two locations, where the proposed pipeline crosses overhead high voltage (AC) power lines. The locations of the deep soil resistivity surveys are presented in **Figure 8** and **Table 5** below (the 200 m marker is the midpoint).

FIGURE 8: BRVAS DEEP SOIL RESISTIVITY SURVEY LOCATIONS

TABLE 5: BRVAS DEEP SOIL RESISTIVITY SURVEY MIDPOINT LOCATIONS

Survey Location	Latitude	Longitude
BRVAS DSR 1 Midpoint (200 m)	-33.34165002	19.00591901
BRVAS DSR 2 Midpoint (200m)	-33.34555004	19.01175097

3.1. WENNER FOUR ELECTRODE SURVEY

The Wenner Four Electrode Survey was completed according to the same methodology as presented in **§ 2.1 Background and Methodology**. The results of the surveys are presented in **Table 6**. The various layers resistivities at depth (pseudosections calculated utilising the Barne's Layer relationship) are presented **Figure 9**.

TABLE 6: BRVAS DSR WENNER FOUR ELECTRODE SURVEY RESULTS

Pin Spacing (m)	BRVAS DSR 1		BRVAS DSR 2	
	Resistance (Ω)	Soil Resistivity 0 m to Pin Spacing (m)	Resistance (Ω)	Soil Resistivity 0 m to Pin Spacing (m)
0.5	13.94	44	23	72
1	2.49	16	5.95	37
1.5	1.084	10	2.76	26
2	0.731	9	1.721	22
3	0.519	10	0.875	16
4	0.445	11	0.631	16
5	0.37	12	0.508	16
7	0.259	11	0.366	16
9	0.212	12	0.281	16

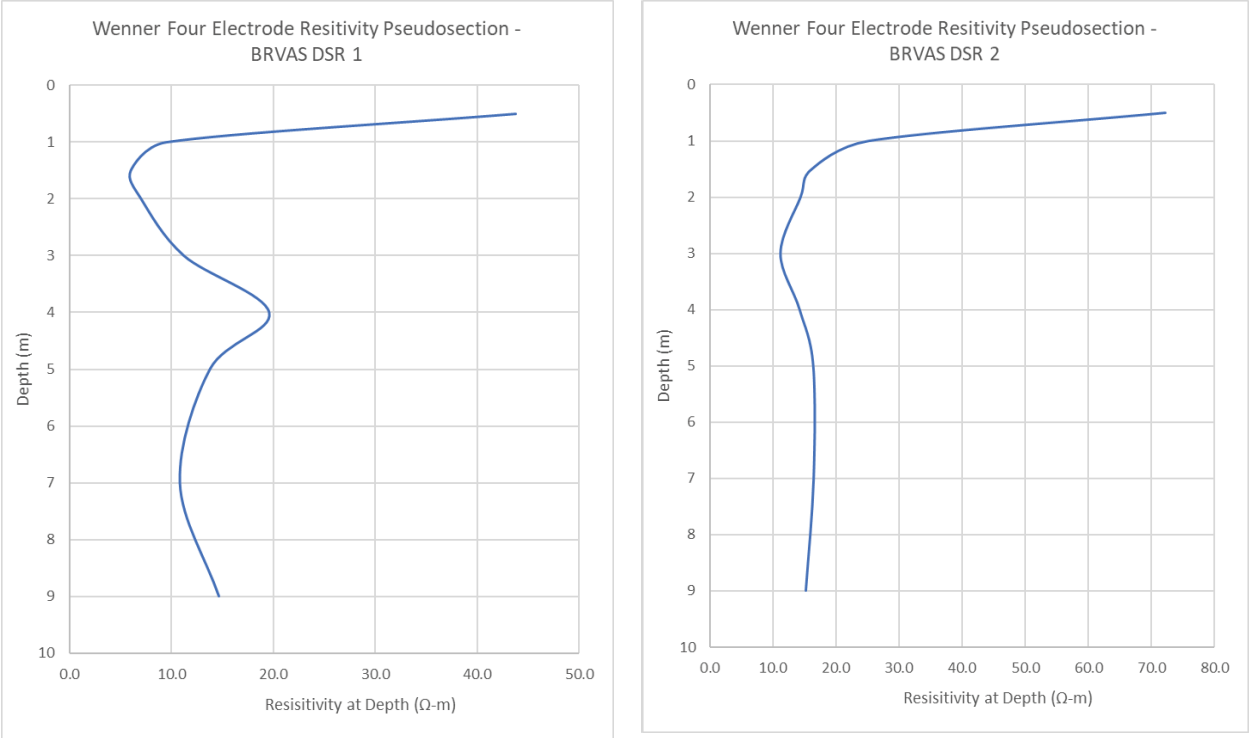


FIGURE 9: BRVAS WENNER FOUR ELECTRODE RESISTIVITY PSEUDOSECTIONS

3.2. MULTI-ELECTRODE RESITIVITY IMAGING SURVEY

The Multi-Electrode Resistivity Imaging survey was completed utilising an Abem SAS 1000 Terrameter and ES 10-64 switching unit. Electrical resistivity measurements were conducted with the Schlumberger protocol and a 5m electrode spacing. This measuring protocol and electrode spacing with a 400m cable array, yields a maximum investigation depth of 80 meters. The results of the imaging survey are presented in **Figure 10** and **Figure 11**. The detailed multi electrode resistivity imaging report is provided in **Annexure B**.

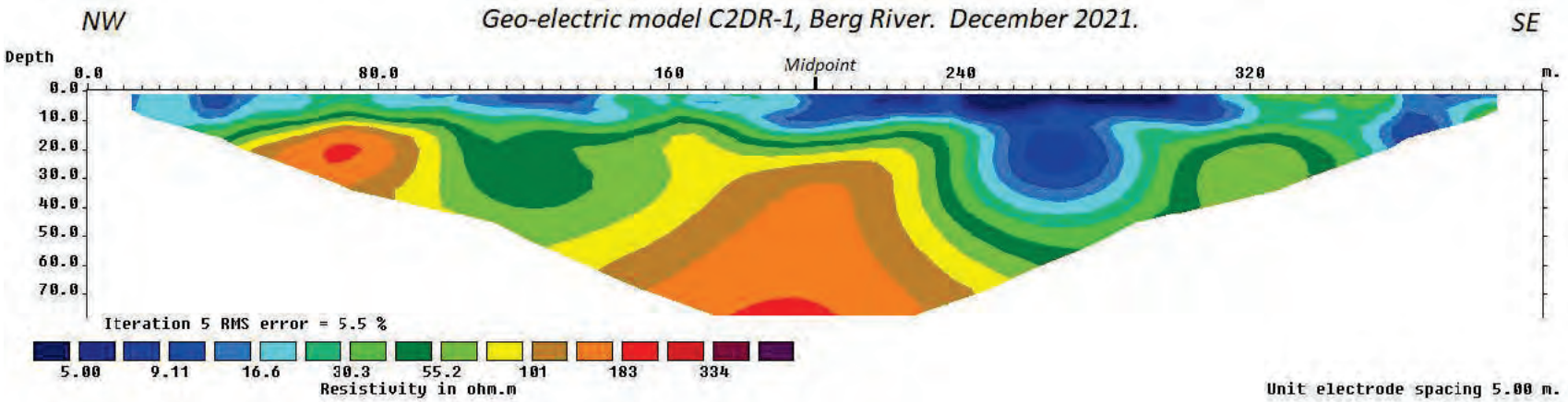


FIGURE 10: GEO-ELECTRIC MODEL DSR1

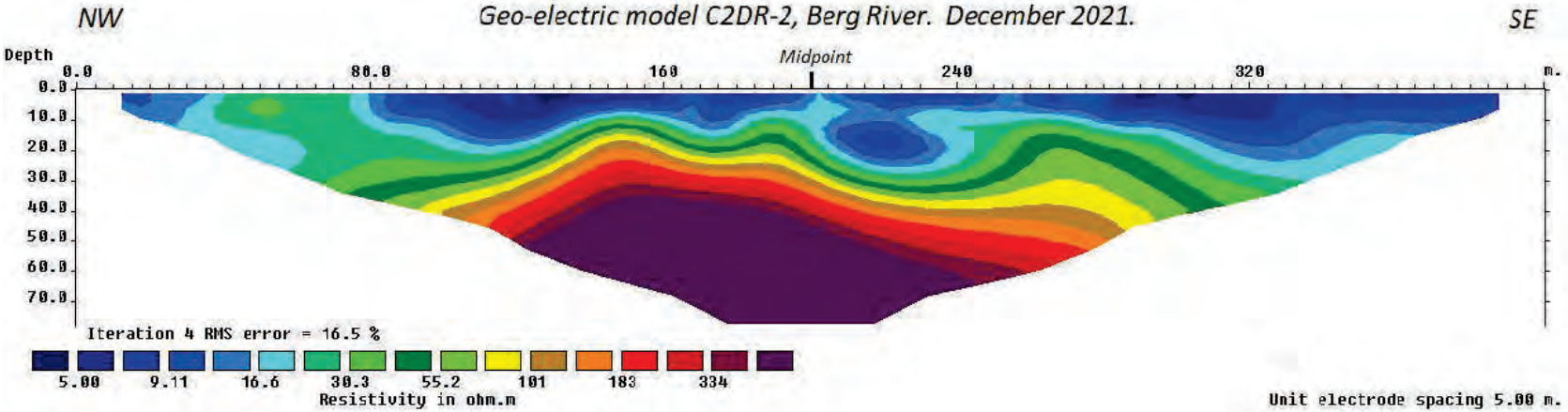


FIGURE 11: GEO-ELECTRIC MODEL DSR2

4. SOIL SAMPLING FOR CORROSION ANALYSIS

Soil samples were collected for chemical and bacterial analysis at nominal intervals of 1000 m. The locations of the soil sampling site are presented in **Figure 12** and **Table 7** below.

FIGURE 12: BRVAS SOIL SAMPLING LOCATIONS

TABLE 7: SOIL SAMPLING LOCATIONS AND DETAILS

Survey Point	Latitude	Longitude	~ Chainage (m)	Sampling Method	Sampling Depth (mm)	Date of Sampling	Time of Sampling
SS0	-33.3282	18.97962	0	Test Pit	1500 (Refusal)	07-Dec-21	13h00
SS1000	-33.3316	18.98902	1000	Test Pit	2500	07-Dec-21	12h50
SS2200	-33.3368	19.0002	2200	Hand Auger	1600	08-Dec-21	10h00
SS3000	-33.3419	19.00618	3000	Hand Auger	400 (refusal)	08-Dec-21	09h00
SS4000	-33.346	19.01523	4000	Hand Auger	400 (refusal)	08-Dec-21	09h30
SS5000	-33.3503	19.022	5000	Hand Auger	1400 (refusal)	08-Dec-21	10h30
SS6000	-33.359	19.02402	6000	Hand Auger	1600	08-Dec-21	11h00
SSEnd	-33.3598	19.02714	6343	Hand Auger	400 (refusal)	08-Dec-21	11h45

4.1. CHEMICAL ANALYSIS

The eight samples were sent to Water Lab, a SANAS approved laboratory, for analysis. The samples were delivered to Waterlab on 13 December 2021. Due to year end closures and the requirement for a draft report this year, these results will only be included the final revision of the report, which will be submitted in January 2022.

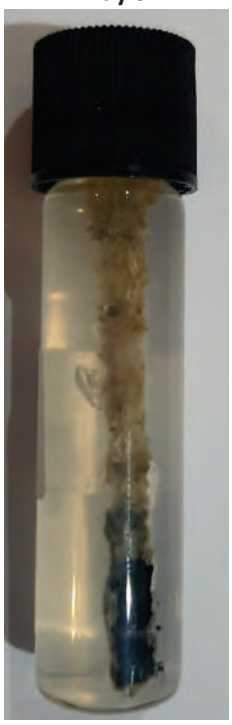
The following parameters will be analysed and reported on:

- pH
- Conductivity
- Total Soluble Salts
- Total Sulphates
- Total Chlorides

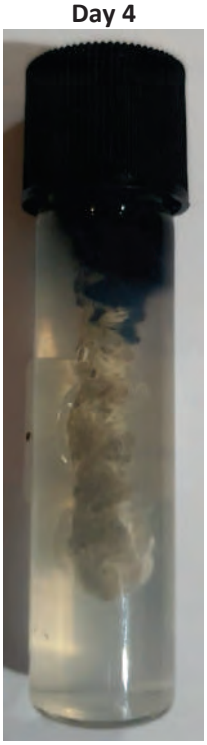
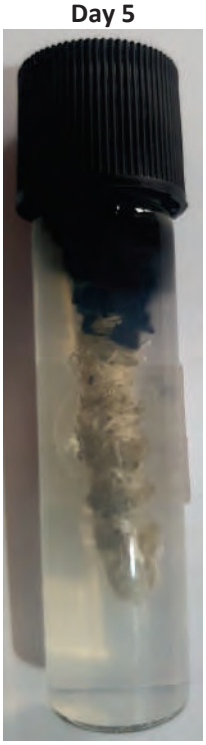
4.2. SRB ANALYSIS

Samples were collected in-situ for analysis of Sulphate Reducing Bacteria (SRB) using Sanicheck™ culture kits. The culture kits batch number (QA#) is 01022210 and the expiry date is 22 June 2022. The SRB Culture growth for the eight samples is provided in **Table 8**. The assessment of the results according to the interpretive chart provided in the Sanicheck™ Instruction Document is provided in **Table 9** thereafter, where the observations are highlighted in red. The interpretation of the results is provided in **Table 10** and **Table 11**, where it is observed that the samples close to the river (at the proposed weir site and at the river crossing) as well as at the Voëlvlei Dam presented higher SRB counts (Moderate to Heavy) when compared to the rest of the route (Low to Insignificant).

TABLE 8: SRB CULTURE GROWTH

SSB 0				
Day 1	Day 2	Day 3	Day 4	Day 5
				
SS 1000				
Day 1	Day 2	Day 3	Day 4	Day 5
				

SS 2200				
Day 1	Day 2	Day 3	Day 4	Day 5
				
SS 3000				
Day 1	Day 2	Day 3	Day 4	Day 5
				

SS 4000				
Day 1	Day 2	Day 3	Day 4	Day 5
				
SS 5000				
Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
				

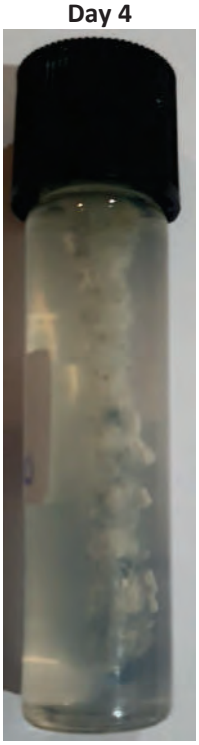
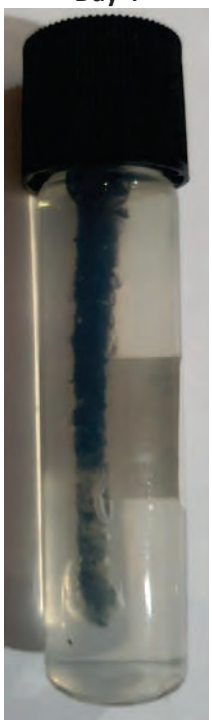
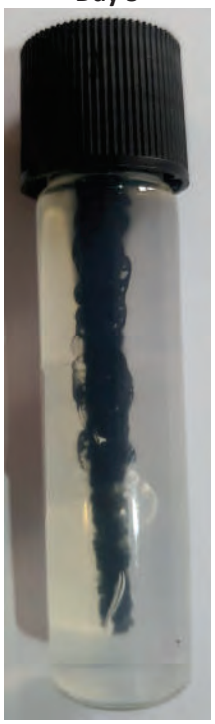
SS 6000				
Day 1	Day 2	Day 3	Day 4	Day 5
				
SS End				
Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
				

TABLE 9: QUANTIFICATION OF SRB RESULTS

	Sulphate Reducers / ml - SS 0				
Days of Incubation/Tube Appearance	**1**	**2**	**3**	**4**	**5**
Completely Black	10^6	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2
Narrow Zone of Black Around Applicator Centre	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2	10^2-10^1
No Reaction	$<10^5$	$<10^4$	$<10^3$	$<10^2$	$<10^1$
	Sulphate Reducers / ml - SS 1000				
Days of Incubation/Tube Appearance	**1**	**2**	**3**	**4**	**5**
Completely Black	10^6	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2
Narrow Zone of Black Around Applicator Centre	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2	10^2-10^1
No Reaction	$<10^5$	$<10^4$	$<10^3$	$<10^2$	$<10^1$
	Sulphate Reducers / ml - SS 2200				
Days of Incubation/Tube Appearance	**1**	**2**	**3**	**4**	**5**
Completely Black	10^6	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2
Narrow Zone of Black Around Applicator Centre	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2	10^2-10^1
No Reaction	$<10^5$	$<10^4$	$<10^3$	$<10^2$	$<10^1$
	Sulphate Reducers / ml - SS 3000				
Days of Incubation/Tube Appearance	**1**	**2**	**3**	**4**	**5**
Completely Black	10^6	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2
Narrow Zone of Black Around Applicator Centre	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2	10^2-10^1
No Reaction	$<10^5$	$<10^4$	$<10^3$	$<10^2$	$<10^1$
	Sulphate Reducers / ml - SS 4000				
Days of Incubation/Tube Appearance	**1**	**2**	**3**	**4**	**5**
Completely Black	10^6	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2
Narrow Zone of Black Around Applicator Centre	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2	10^2-10^1
No Reaction	$<10^5$	$<10^4$	$<10^3$	$<10^2$	$<10^1$
	Sulphate Reducers / ml - SS 5000				
Days of Incubation/Tube Appearance	**1**	**2**	**3**	**4**	**5**
Completely Black	10^6	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2
Narrow Zone of Black Around Applicator Centre	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2	10^2-10^1
No Reaction	$<10^5$	$<10^4$	$<10^3$	$<10^2$	$<10^1$
	Sulphate Reducers / ml - SS 6000				
Days of Incubation/Tube Appearance	**1**	**2**	**3**	**4**	**5**
Completely Black	10^6	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2
Narrow Zone of Black Around Applicator Centre	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2	10^2-10^1
No Reaction	$<10^5$	$<10^4$	$<10^3$	$<10^2$	$<10^1$
	Sulphate Reducers / ml - SS End				
Days of Incubation/Tube Appearance	**1**	**2**	**3**	**4**	**5**
Completely Black	10^6	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2
Narrow Zone of Black Around Applicator Centre	10^6-10^5	10^5-10^4	10^4-10^3	10^3-10^2	10^2-10^1
No Reaction	$<10^5$	$<10^4$	$<10^3$	$<10^2$	$<10^1$

TABLE 10: SANICHECK INTERPRETATION OF QUANTITATIVE RESULTS

Sulphate Reducers / ml	Interpretation
10^5 (100 ,000) or more / ml	Heavy
10^3 – 10^4 (1, 000 to 10, 000) / ml	Moderate
10^2 – 10^3 (100 to 1, 000) / ml	Low
10^1 – 10^2 (10 to 100) / ml	Very Low
10^1 (10) or less / ml	Generally Insignificant

TABLE 11: BRVAS SRB ASSESSMENT INTERPRETATION

Sampling Site	Sulphate Reducers / ml	Interpretation
SS 0	10^3 – 10^4 (1, 000 to 10, 000) / ml	Moderate
SS 1000	10^5 (100 ,000) or more / ml	Heavy
SS 2200	10^1 – 10^2 (10 to 100) / ml	Very Low
SS 3000	10^1 (10) or less / ml	Generally Insignificant
SS 4000	10^2 – 10^3 (100 to 1, 000) / ml	Low
SS 5000	10^2 – 10^3 (100 to 1, 000) / ml	Low
SS 6000	10^2 – 10^3 (100 to 1, 000) / ml	Low
SS End	10^3 – 10^4 (1, 000 to 10, 000) / ml	Moderate

BERG RIVER – VOËLVLEI WATER AUGMENTATION SCHEME

Annexure A

Megger DET 2/2 Calibration Certificate

RMS
Repair and Metrology Services

FLUKE
Authorised Service Partner

Megger
Authorised Service Center

Tektronix

sanas
Calibration Laboratory
129
329
529

Repair and Metrology Services (Pty) Ltd
No 10 Enterprise Close
Linbro Business Park
Linbro Park
Tel: 011608 8550
cathye@repmet.co.za
Directors: C Elias, L Juju
Co. Reg: 2004/021865/07

Certificate of Calibration

Certificate No	:	**117621-1**
Customer	:	C 2 D Engineering (Pty) Ltd
Address	:	741 Hannerie Road Garsfontein Pretoria
Calibration date	:	04 October 2021
Expiry date	:	October 2023
Issue date	:	04 October 2021
Manufacturer	:	Megger
Model	:	DET2/2
Description	:	Earth Tester
Serial No	:	101426053
Asset No	:	None

The South African National Accreditation Systems (SANAS) is a member of the International Laboratory Accreditation Co-Operation (ILAC) for The Mutual Recognition Agreement (MRA). The MRA allows for mutual recognition of technical test and calibration data by the member accreditation bodies worldwide. For more information on the MRA please consult www.ilac.org

The results given in this certificate were correct at the time of calibration and relate to UUT identified on this certificate. Subsequently the accuracy will depend on factors such as care exercised in handling the instrument and frequency of use. Recalibration should be performed after a period, which has been chosen to ensure that, under normal circumstances, the instrument's accuracy remains within the desired limits. The accuracies of all measurements are traceable to national or international measuring standards. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95 %

Calibrated by
SP. Mare

Checked by
M. Frad

SANAS Technical Signatory
GJ. van Staden

Certificate of Calibration

Certificate No: 117621-1

1. Standards and equipment

Make	Model	Description	Serial Number	Fixed Asset ID	Certificate No	Cal Due Date
Fluke	189	True RMS Multimeter	92830198	Equip 06	114726-6	01/2022
RMS	1433-H	Decade Resistance Box	Equip 139	Equip 139	115205 - 5	03/2022

2. Procedure

2.1 The earth resistance tester was calibrated in accordance with section 7.5 of the SANAS document TR 87-01 (Calibration of installation and appliance testers).

3. Results

3.1 Output Frequency

Expected Frequency (Hz)	Measured (Hz)
128	129.15

Uncertainty of measurement: ± 0.01 Hz

3.2 Open Circuit Output Voltage (RMS) @ 128 Hz

Expected Voltage (V)	Measured (V)
45 V	41.83

Uncertainty of measurement: ± 0.02 V

3.3 Output Current

Expected Current (mA)	Measured (mA)
40.0	39.89

Uncertainty of measurement: ± 0.05 mA

Certificate of Calibration

Certificate No: 117621-1

3.4 4 Pole measurements

Applied (Ω)	Tolerance (Ω)	DET2/2 Display (Ω)
0.10	0.07 to 0.13	0.100
1.00	0.95 to 1.05	1.006
5.00	4.87 to 5.13	5.01
10.00	9.77 to 10.23	10.03
50.00	48.7 to 51.3	50.1
100.0	97.7 to 102.3	100.2
500.0	0.487 k to0 .513 k	0.500 k
1.000 k	0.977 k to 1.023 k	0.999 k

Uncertainty of measurement: ± 3 LSD

4. Comments

4.1 The UUT is in good condition.
4.2 The above results were entered directly on to a computer.
4.3 The calibration was performed at the RMS laboratory in Linbro Park in a controlled enviroment. The ambient temperature was at 23 °C ± 3 °C and relative humidity 30 % rh to 60 % rh

End of Certificate

BERG RIVER – VOËLVLEI WATER AUGMENTATION SCHEME

Annexure B

Electric Resistivity Tomography Survey

Electric Resistivity Tomography Survey.

Berg River Augmentation Project
Western Cape

December 2021

Report by M de Klerk

Prepared for:

C2D Engineering
Gauteng
South Africa

Cape Geophysics
P.O. Box 1240
Stanford
7210
South Africa

Contact person
Martin de Klerk
martindeklerk23@gmail.com
Mobile: 0823250747

C2D Engineering (Gauteng) requested Cape Geophysics, Stanford to conduct two ERT traverses for the Berg River Augmentation project, west of the Voëlvlei dam, Western Cape, (Figure-1).

Google Earth Locality Map

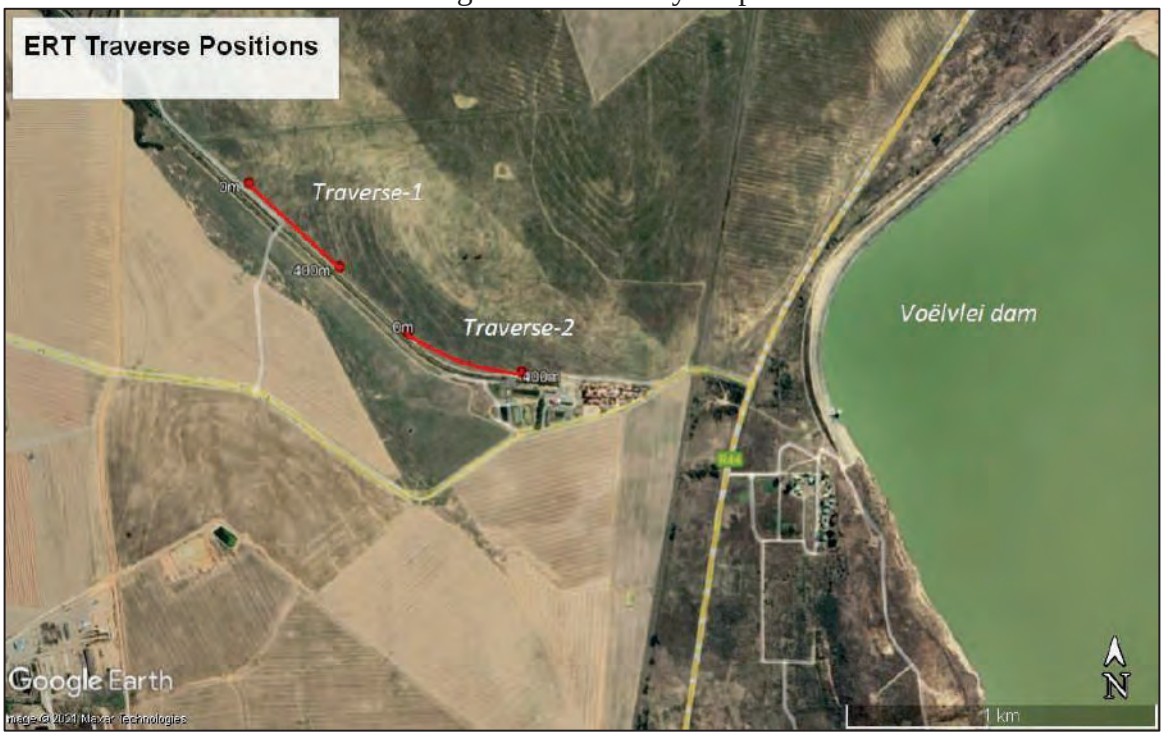


Figure-1

1. Terms of Reference

Conduct two ERT-2D traverses using a 5m electrode spacing to a depth of 80m.

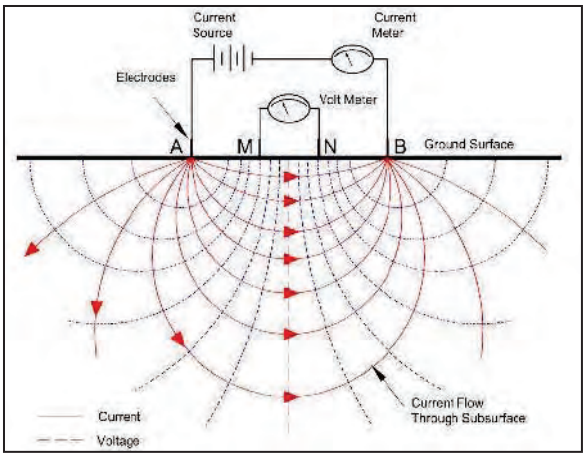
The paragraphs below summarize the basic principles, field survey method and data reduction of the multi-electrode resistivity imaging technique used. The method is also referred to as ERT (Electrical Resistivity Tomography).

A Google (.kmz) file accompanies this report and show the traverse coordinates on terrain.

2. Resistivity method

DC resistivity techniques, sometimes referred to as electrical resistivity, 2D(3D) resistivity imaging or electric resistivity tomography (ERT) are used to measure earth resistivity by

driving a direct current (DC) signal into the ground and measuring the resultant potentials (voltages) created in the earth. The electrical properties of the sub-surface are derived from this data.



The electrical resistivity varies between different geological materials, depends mainly on variations in water content and dissolved ions in the groundwater. Resistivity investigations thus are used to identify zones with different electrical properties, which can then be referred to different geological strata. Resistivity is also called specific resistance, which is the inverse of conductivity or specific conductance. The most common mineral-forming soils and rocks have very high resistivity in a dry condition; therefore, the resistivity of soils and rocks is normally a function of the amount and quality of water in pore spaces and fractures, as well as the degree of tropical weathering of the formation. Consequently, the variation may be more limited to a confined geological area and variations in resistivity, within a certain soil or rock type, will reflect variations in physical properties. For example, the lowest resistivities encountered for sandstone and limestone imply that the pore spaces in the rock are saturated with water, whereas the highest values represent strongly consolidated sedimentary rock or dry rock above the groundwater surface. Sand, gravel and sedimentary rock may also have very low resistivities, provided that the pore spaces are saturated with saline water.

Fresh crystalline rock is highly resistive, despite the fact that it may contain certain conductive ore minerals; however, weathering commonly produces highly conductive clay-rich saprolite. Variation in characteristics within one geological material type necessitates calibration of resistivity data against geological documentation, from, for example, surface mapping, test pit exposures or drilling. However, this applies to all geophysical methods**.**

The degree of saturation, of course, will affect the resistivity; the resistivity above the groundwater level will be higher than that below this level, i.e. if the material is similar. Consequently, this method can be used to determine the depth to the water table, where a distinct water table exists. However, if the content of fine-grained material is significant,

the water content above the groundwater surface, held by hygroscopic and capillary forces, may be large enough to dominate the electrical behaviour of the material. The resistivity of the pore water is determined by concentrations of ions in solution, the type of ions and temperature. The presence of clay minerals strongly affects the resistivity of sediments and weathered rock. The clay minerals may be regarded as electrically conductive particles, which can absorb and release ions and water molecules on its surface through an ion exchange process.

2.1. Field survey method.

The two ERT traverses were conducted on the 8$^{th\ of}$ December 2021. Traverse coordinates were obtained with a handheld GPS.

The Abem SAS 1000 Terrameter and ES 10-64 switching unit were used in the field survey. Electrical resistivity measurements were conducted with the Schlumberger protocol and a 5m electrode spacing. This measuring protocol and electrode spacing with a 400m cable array, yields a maximum investigation depth of 80 meters.

Measurement of the resistivity of the ground is carried out by transmitting a controlled current (I) between two electrodes inserted in the ground, while measuring the potential (V) between two other electrodes. Direct current (DC) or a very low frequency alternating current is used; the method is often called DC-resistivity. The resistance (R) is calculated using Ohm's law.

2.2. Data Reduction.

The RES2Dinv (GEOTOMO) version 3.52-inversion program was used to invert the measured apparent resistivities to obtain the true ground resistivity values below the survey line (traverse).

The inversion routine used by the program is based on the smoothness-constrained least-squares method (de Groot-Hedlin and Constable 1990, Sasaki 1992). One advantage of the method is that the damping factor and flatness filters can be adjusted to suit different types of data. The 2-D model used by this program divides the subsurface into a number of rectangular blocks that will produce an apparent resistivity pseudo section that agrees with the actual measurements. A forward modelling subroutine is used to calculate the apparent resistivity values, and a non-linear least-squares optimisation technique is used for the inversion routine. The optimisation method basically tries to reduce the difference between the calculated and measured apparent resistivity values by adjusting the resistivities of the model blocks**.** A measure of this difference is given by the root-mean-squared (RMS) error. However, the model with the lowest RMS error can sometimes

show large and unrealistic variations in the model resistivity values and might not always be the “best” model from a geological perspective. In general, the most prudent approach is to choose the model at the iteration after the RMS error does not change significantly**.**

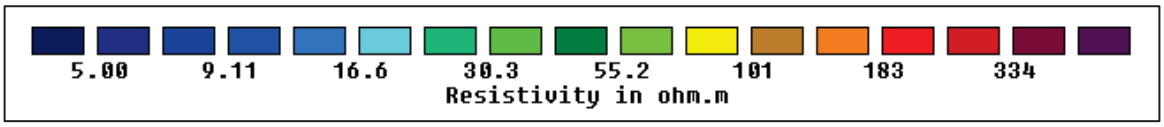
It is important to note that the inversion process that translates raw resistivity data into a resistivity cross section is non-unique. The inversion program chooses the smoothest, least heterogeneous, solution. This solves the mathematical problem of non-uniqueness but produces a slightly blurred image of the actual geology. Abrupt transitions between layers become gradational transitions in the resistivity section. Second, the data are collected along a line and inverted assuming two-dimensional geologic structure. This assumption is reasonable for a layered earth or for dipping layers if the data are collected perpendicular to strike.

A detailed description of the different variations of the smoothness-constrained least-squares method can be found in the free tutorial notes by Loke (2001), www.geoelectrical.com.

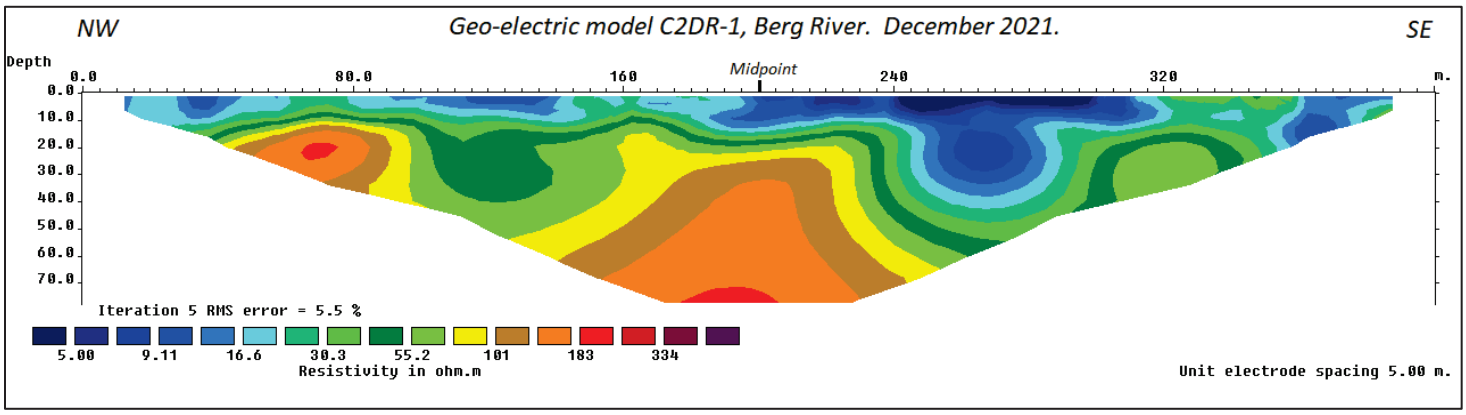
3. ERT Results

The geo-electric models show the modelled ground resistivities of the substrate contoured with a logarithmic colour scale. Note that both geo-electric models are contoured with the same scale as shown below.

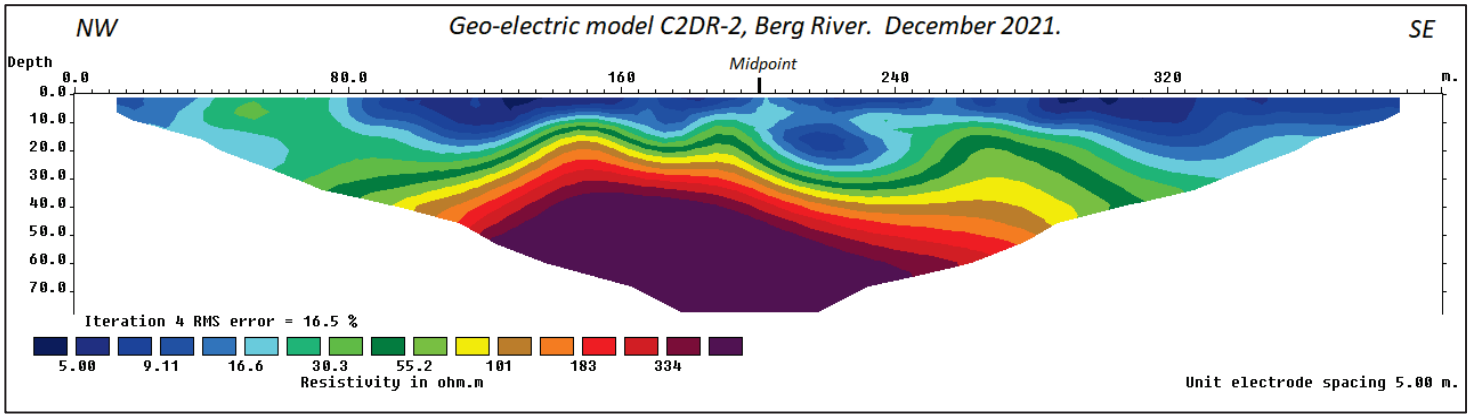
Model contour scale:



Traverse C2DR-1



Traverse C2DR-1



4. References

Van Zyl, J.S.V., 1985. A practical manual on the Resistivity method (revised edition).

Loke, M.H., 2004. Tutorial: Rapid 2D Resistivity & IP Inversion, Geotomo software, Malaysia.

Loke, M.H., Baker, R.D Geophysical Prospecting Volume 44, Issue 1, Pages131 - 152 1996 European Association of Geoscientists & Engineers

****

M de Klerk (Pr. Sci.Nat)
(Geophysicist)
December 2021