#### **APPENDIX B.10**

#### STRESS-CONTROLLED CYCLIC DIRECT SIMPLE SHEAR (CyDSS)

(A Division of MEG Consulting Limited)

STRESS CONTROLLED CYCLIC DIRECT SIMPLE SHEAR TEST

roject:	Port of Anchorage			Project No.:	12-MTS-009
ocation:	Anchorage, US	Borehole:	BH-003-12	Depth:	<u>31.39 m</u>
ample:	ST-6	Station:	DSS#1	Date:	August 15, 2012

#### 0.10 stress ratio ( $\tau_{cyc}$ / $\sigma'_{vc}$ ) @ 1 Hz for 100 cycles, $\sigma'_{vc}$ =1000kPa

Initial sample Deta	ills	Final Sample Details		
Water Content (%):	30.7	Water Content (%):	29.2	
Diameter (mm):	72.60	Diameter (mm):	72.60	
Height (mm):	23.60	Change in Height, $\Delta H$ (mm):	1.57	
Specific Gravity, Gs:	2.77	- Final Height (mm):	22.03	
Weight of Soil (g):	187.17	— Weight of Soil (g):	185.05	
Total Unit Weight (kN/m <sup>3</sup> )	18.79		19.91	
Dry Unit Weight (kN/m <sup>3</sup> )	14.38	 Dry Unit Weight (kN/m <sup>3</sup> )	15.40	
Initial Void Ratio	0.89	Final Void Ratio	0.76	

#### 0.15 stress ratio ( $\tau_{cyc}\!/\;\sigma'_{vc}\!)$ @ 1 Hz for 100 cycles, $\sigma'_{vc}\!=\!1000kPa$

Initial sample Details				
Water Content (%):	30.6			
Diameter (mm):	72.60			
Height (mm):	23.60			
Specific Gravity, Gs:	2.77			
Weight of Soil (g):	187.14			
Total Unit Weight (kN/m <sup>3</sup> )	18.79			
Dry Unit Weight (kN/m <sup>3</sup> )	14.38			
Initial Void Ratio	0.89			

#### Final Sample Details

Matar Contant (0/)	20.0
water Content (%):	29.0
Diameter (mm):	72.60
Change in Height, $\Delta H$ (mm):	1.59
Final Height (mm):	22.01
Weight of Soil (g):	184.84
Total Unit Weight (kN/m <sup>3</sup> )	19.90
Dry Unit Weight (kN/m <sup>3</sup> )	15.42
Final Void Ratio	0.76

#### 0.20 stress ratio ( $\tau_{cyc}\!/\;\sigma'_{vc}\!)$ @ 1 Hz for 27 cycles, $\sigma'_{vc}\!\!=\!\!1000kPa$

Initial sample Details			Final Sample Details			
Water Co	ontent (%):	29.8	Water Content (%):		28.3	
Diameter (mm):		72.60	Diameter (mm):		72.60	
Height (mm):		23.60	Change in Height, $\Delta H$ (mm):		1.80	
Specific Gravity, Gs:		2.77	 Final Height (mm):		21.80	
Weight of Soil (g):		190.28	Weight of Soil (g):		188.12	
Total Unit Weight (kN/m <sup>3</sup> )		19.11			20.45	
Dry Unit V	Weight (kN/m <sup>3</sup> )	14.72	Dry Unit Weight (kN/m <sup>3</sup> )		15.93	
Initial Void Ratio		0.85	5 Final Void Ratio		0.71	
Prepared By:	PS	Checked By:	GF	Approved By:	JPS	
Date:	August 22, 2012	Date:	August 24, 2012	Date:	August 27, 2012	



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STRESS CONTROLLED CYCLIC DIRECT SIMPLE SHEAR TEST

Project:	Port of Anchorage			Project No.:	12-MTS-009
Location:	Anchorage, US	Borehole:	BH-003-12	Depth:	31.39 m
Sample:	<u>ST-6</u>	Station:	DSS#1	Date:	August 15, 2012

0.25 stress ratio ( $\tau_{cyc}\!/\;\sigma'_{vc}\!)$  @ 1 Hz for 10 cycles,  $\sigma'_{vc}\!\!=\!\!1000kPa$ 

Initial sample Details					
Water Content (%):	29.7				
Diameter (mm):	72.60				
Height (mm):	23.60				
Specific Gravity, Gs:	2.77				
Weight of Soil (g):	188.74				
Total Unit Weight (kN/m <sup>3</sup> )	18.95				
Dry Unit Weight (kN/m <sup>3</sup> )	14.61				
Initial Void Ratio	0.86				

Final Sample	Details
Water Content (%):	28.7
Diameter (mm):	72.60
Change in Height, $\Delta H$ (mm):	1.54
Final Height (mm):	22.06
Weight of Soil (g):	187.16
Total Unit Weight (kN/m <sup>3</sup> )	20.11
Dry Unit Weight (kN/m <sup>3</sup> )	15.62
Final Void Ratio	0.74

Prepared By:	PS	Checked By:	GF	Approved By:	JPS
Date:	August 22, 2012	Date:	August 24, 2012	Date:	August 27, 2012





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STRES	SS CON	ITROLLED CYC	LIC DIREC	T SIMPLE SH	EAR TEST			Geosciences
Project:	Port of	Anchorage					Project No.:	12-MTS-009
Location:	Anchor	age, US		Borehole:	BH-003	-12	Depth:	31.39 m
Sample:	ST-6			Station:	DSS#1		Date:	August 15, 2012
	Γ	0.10	stress ra	tio (τ <sub>cyc</sub> / σ' <sub>vc</sub> )	@ 1 Hz for 1	00 cycles	, σ'vc=1000kPa	
SS (kPa)					100		2/	
SHEAR STRE	-0.5	-0.4	-0.3 -(	0.2 -0.1	0 50 100	0,1 0.	2 0.3 0	.4 0 5
	150			SHE	450 AR STRAIN (9	%)		
	100 -							
AR STRESS (kPa)	50 - 0 -							
SHE/	-50 -							
	100							
	-100 -							
	-150			100			1000	1200
	U	200	V	400 ERTICAL EFFE		800 SS, σ' <sub>v</sub> (kPa	a)	1200
Prepared E	By:	PS	6	Checked By:		GF	Approved By:	JPS
Date:		August 2	2, 2012	Date:	Augus	it 24, 2012	Date:	August 27, 2012







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STRESS CONTROLLED CYCLIC DIRECT SIMPLE SHEAR TEST

Project:	Port of Anchorage			Project No.:	12-MTS-009
Location:	Anchorage, US	Borehole:	BH-003-12	Depth:	39.62 m
Sample:	<u>ST-11</u>	Station:	<u>DSS #1</u>	Date:	July 10, 2012
	0.10	) stress ratio (τ <sub>cvc</sub> / σ',	) @ 1 Hz for 100 cycles, c	ر، v′ <sub>vc</sub> =1000kPa	
	Initial sample Deta	ils		Final Sample Det	ails
Wa	ater Content (%):	22.5	Water Content (%)	):	19.6
Dia	ameter (mm):	72.60	Diameter (mm):	_	72.60
He	eight (mm):	23.60	Change in Height,	ΔH (mm):	1.92
Sp	ecific Gravity, Gs:	_	Final Height (mm):	_	21.68
W	eight of Soil (g):	205.51	Weight of Soil (g):	_	200.64
То	tal Unit Weight (kN/m <sup>3</sup> )	20.64	Total Unit Weight	(kN/m <sup>3</sup> )	21.93
Dr	y Unit Weight (kN/m <sup>3</sup> )	16.85	Dry Unit Weight (k	N/m <sup>3</sup> )	18.34
Ini	tial Void Ratio		Final Void Ratio	_	
	0.15	5 stress ratio ( $\tau_{cyc}$ / $\sigma'_{v}$	<sub>c</sub> ) @ 1 Hz for 100 cycles, c	o' <sub>vc</sub> =1000kPa	
	Initial sample Deta	ils		Final Sample Det	ails
Wa	ater Content (%):	22.2	Water Content (%)	21.4	
Dia	ameter (mm):	72.60	Diameter (mm):	_	72.60
He	eight (mm):	23.60	Change in Height, ΔH (mm):  Final Height (mm):		1.72
Sp	ecific Gravity, Gs:				21.88
We	eight of Soil (g):	208.23	Weight of Soil (g):	206.98	
То	tal Unit Weight (kN/m <sup>3</sup> )	20.91	Total Unit Weight	22.42	
Dr	y Unit Weight (kN/m <sup>3</sup> )	17.12	Dry Unit Weight (kN/m <sup>3</sup> )		18.47
Ini	tial Void Ratio		Final Void Ratio	_	
	0.2	0 stress ratio ( $\tau_{cyc}$ / $\sigma'_{v}$	$_{vc}$ ) @ 1 Hz for 32 cycles, $\sigma$	' <sub>vc</sub> =1000kPa	
	Initial sample Deta	ils		Final Sample Det	ails
Wa	ater Content (%):	22.4	Water Content (%)	):	21.3
Dia	ameter (mm):	72.60	Diameter (mm):		72.60
He	eight (mm):	23.60	Change in Height,	ΔH (mm):	1.74
Sp	ecific Gravity, Gs:		Final Height (mm):	_	21.86
	eight of Soil (g):	206.03	Weight of Soil (g):		204.22
To	tal Unit Weight (kN/m°)	20.69	Total Unit Weight	(kN/m <sup>×</sup> )	22.14
Dr	y Unit Weight (kN/m°)	16.90	Dry Unit Weight (k	N/m°)	18.25
Prepared I	By: PS	Checked By:	GF	Approved By:	JPS
Date:	July 13, 201	12 Date:	August 24, 2012	Date:	August 27, 2012

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STRESS CONTROLLED CYCLIC DIRECT SIMPLE SHEAR TEST

Project:	Port of Anchorage			Project No.:	12-MTS-009
Location:	Anchorage, US	Borehole:	BH-003-12	Depth:	39.62 m
Sample:	ST-11	Station:	DSS #1	Date:	July 10, 2012
		0.25 stress ratio (τ <sub>cyc</sub> / σ' <sub>να</sub>	) @ 1 Hz for 4 cycles	, σ' <sub>vc</sub> =1000kPa	

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Initial sample Deta	ils	Final Sample De	etails
Water Content (%):	21.8	Water Content (%):	21.9
Diameter (mm):	72.60	Diameter (mm):	72.60
Height (mm):	23.60	Change in Height, $\Delta H$ (mm):	1.58
Specific Gravity, Gs:		- Final Height (mm):	22.02
Weight of Soil (g):	206.64	Weight of Soil (g):	206.84
Total Unit Weight (kN/m <sup>3</sup> )	20.75		22.26
Dry Unit Weight (kN/m <sup>3</sup> )	17.04	Dry Unit Weight (kN/m <sup>3</sup> )	18.26
Initial Void Ratio		Final Void Ratio	

Prepared By:	PS	Checked By:	GF	Approved By:	JPS
Date:	July 13, 2012	Date:	August 24, 2012	Date:	August 27, 2012



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STRES	SS CONT	ROLLED CY	CLIC DIRE	CT SIMPLI	E SHEAR 1	EST			Geosciences
Project:	Port of A	nchorage						Project No.:	12-MTS-009
Location:	Anchora	ge, US		Borehole:		BH-003-12		Depth:	<u>39.62</u> m
Sample:	ST-11			Station:		DSS #1		Date:	July 10, 2012
STRESS (kPa)	-1	-0.8	) stress ra	tio (τ <sub>cyc</sub> /	σ' <sub>vc</sub> ) @ 1   150 100 - 50	Hz for 100	cycles	, σ'vc=1000kPa	0.8
SHEAR					-100 - -100 - -150 SHEAR S	FRAIN (%)			op op
	150								
	100 -								
SHEAR STRESS (kPa)	5050								
	-100 -								
	-150 0	20	00 V	400 'ERTICAL	60 EFFECTIV	00 E STRESS,	800 σ' <sub>v</sub> (kPa	1000 a)	1200
Prepared E Date:	By:	F July 1	28 3, 2012	Checked Date:	By:	GF August 24	I, 2012	Approved By: Date:	JPS August 27, 2012







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STRESS CONTROLLED CYCLIC DIRECT SIMPLE SHEAR TEST

Project:	Port of Anchorage			Project No.:	12-MTS-009
Location:	Anchorage, US	Borehole:	BH-003-12	Depth:	<u>43.28</u> m
Sample:	ST-16	Station:	DSS#1	Date:	August 7, 2012
	0.0	5 stress ratio (τ <sub>cyc</sub> / c Static	ɔ' <sub>vc</sub> ) @ 1 Hz for 100 cycles, σ', bias 0.12 σ' <sub>vc</sub> (120 kPa)	<sub>/c</sub> =1000kPa	
	Initial sample De	tails		Final Sample D	Details
W	ater Content (%):	22.1	Water Content (%)	: _	24.3
Di	iameter (mm):	72.60	Diameter (mm):	_	72.60
He	eight (mm):	23.60	Change in Height,	ΔH (mm):	1.44
Sp	pecific Gravity, Gs:	2.69	Final Height (mm):	_	22.16
W	eight of Soil (g):	197.10	Weight of Soil (g):		200.51
Тс	otal Unit Weight (kN/m <sup>3</sup> )	19.79	Total Unit Weight (	kN/m <sup>3</sup> )	21.44
Di	ry Unit Weight (kN/m <sup>3</sup> )	16.20	Dry Unit Weight (kl	V/m <sup>3</sup> )	17.26
In	itial Void Ratio	0.63	Final Void Ratio	_	0.53
	0.1	0 stress ratio (τ <sub>cyc</sub> / c Static	$\sigma'_{vc}$ ) @ 1 Hz for 100 cycles, $\sigma'_{vc}$ bias 0.12 $\sigma'_{vc}$ (120 kPa)	<sub>/c</sub> =1000kPa	N-1-11-
10/	Initial sample De	tails	Weter Centert (0()	Final Sample L	Details
VV	ater Content (%):	21.3	Water Content (%)	: –	21.9
Di	iameter (mm):	72.60	Diameter (mm):		72.60
He	eight (mm):	23.60	Change in Height,	ΔH (mm):	1.53
Sp	pecific Gravity, Gs:	2.69	Final Height (mm):	_	22.08
VV	eight of Soil (g):	198.45	Weight of Soil (g):	3. —	199.48
Тс	otal Unit Weight (kN/m <sup>°</sup> )	19.93	Total Unit Weight (	kN/m°)	21.41
Di	ry Unit Weight (kN/m°)	16.43	Dry Unit Weight (kl	N/m°)	17.57
In	itial Void Ratio	0.61	Final Void Ratio	_	0.50
	0.	15 stress ratio (τ <sub>cyc</sub> / Static	$\sigma'_{vc}$ ) @ 1 Hz for 50 cycles, $\sigma'_{vc}$ bias 0.12 $\sigma'_{vc}$ (120 kPa)	₂=1000kPa	
	Initial sample De	tails		Final Sample D	Details
W	ater Content (%):	21.7	Water Content (%)	:	23.4
Di	iameter (mm):	72.60	Diameter (mm):	_	72.60
He	eight (mm):	23.60	Change in Height,	ΔH (mm):	1.95
Sp	pecific Gravity, Gs:	2.69	Final Height (mm):		21.65
W	eight of Soil (g):	198.36	Weight of Soil (g):	_	201.03
То	otal Unit Weight (kN/m <sup>3</sup> )	19.92	Total Unit Weight (	kN/m <sup>3</sup> )	22.00
Di	ry Unit Weight (kN/m <sup>3</sup> )	16.36	Dry Unit Weight (kl	V/m <sup>3</sup> )	17.83
In	itial Void Ratio	0.61	Final Void Ratio	_	0.48
Prepared	By: PS	Checked By:	GF	Approved B	JPS
Date:	August 8,	2012 Date:	August 24, 2012	Date:	August 27, 2012

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STRESS CONTROLLED CYCLIC DIRECT SIMPLE SHEAR TEST

Project:	Port of Anchorage			Project No.:	12-MTS	6-009
Location:	Anchorage, US	Borehole:	BH-003-12	Depth:	43.28	m
Sample:	ST-16	Station:	DSS#1	Date:	August 7	, 2012
				-1 40001-D-		

# 0.20 stress ratio ( $\tau_{cyc}$ / $\sigma'_{vc}$ ) @ 1 Hz for 5 cycles, $\sigma'_{vc}$ =1000kPa Static bias 0.12 $\sigma'_{vc}$ (120 kPa)

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Initial sample Detai	ls	Final Sample D	etails
Water Content (%):	26.5	Water Content (%):	25.6
Diameter (mm):	72.60	Diameter (mm):	72.60
Height (mm):	23.60	Change in Height, $\Delta H$ (mm):	2.00
Specific Gravity, Gs:	2.69	Final Height (mm):	21.60
Weight of Soil (g):	196.46	Weight of Soil (g):	195.04
Total Unit Weight (kN/m <sup>3</sup> )	19.73	Total Unit Weight (kN/m <sup>3</sup> )	21.39
Dry Unit Weight (kN/m <sup>3</sup> )	15.60	 Dry Unit Weight (kN/m³)	17.04
Initial Void Ratio	0.69	Final Void Ratio	0.55

Prepared By:	PS	Checked By:	GF	Approved B	JPS
Date:	August 8, 2012	Date:	August 24, 2012	Date:	August 27, 2012



ME	G TEC (A Divis	HNICAL SI	ERVICES			Marine + Earth
STRES	SS CONTRO	DLLED CYCLIC DIR	ECT SIMPLE SHE	AR TEST		Geosciences
Project:	Port of Anch	norage			Project No.:	12-MTS-009
Location:	Anchorage,	US	Borehole:	BH-003-12	Depth:	43.28 m
Sample:	ST-16		Station:	DSS#1	Date:	August 7, 2012
SHEAR STRESS (kPa)		0.05 stress r	ratio (τ <sub>cyc</sub> / σ' <sub>vc</sub> ) @ Static bias	1 Hz for 100 cyc 0.12 σ' <sub>vc</sub> (120kPa 60 40 20 80 60 60	cles, σ'vc=1000k	Pa
	-0.3	-0.2	-0.1 SHEA	40 20 0 0 R STRAIN (%)	0.1 0.2	n Loop t Loop 2 0.3
	180 T					
	160 -					
	140 -					
)a)	100					
ss (kF	120					
IRES	100					
AR S <sup>-</sup>	80 -					
SHE/	60 -					
	40					
	20					
	0 <del> </del> 0	200	400	600	800 100	0 1200
			VERTICAL EFFEC	CTIVE STRESS, σ',	, (kPa)	
Prepared E	By:	PS	Checked By:	GF	Approved By:	JPS
Date:		August 8, 2012	Date:	August 24, 2	012 Date:	August 27, 2012





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STRES	SS CONTROLLED	CYCLIC DIREC	T SIMPLE SHEAR 1	EST		I
Project:	Port of Anchorage				Project No.:	12-MTS-009
Location:	Anchorage, US		Borehole:	BH-003-12	Depth:	43.28 m
Sample:	ST-16		Station:	DSS#1	_Date:	August 7, 2012
	400	0.20 stress i	ratio (τ <sub>cyc</sub> / σ' <sub>vc</sub> ) @ Static bias 0.	1 Hz for 5 cycles 12 σ' <sub>vc</sub> (120 kPa)	, σ'vc=1000kPa	
	350					
	300					
HEAR STRESS (kPa)	250 200 150 100					
ਨ	50					
		2 4	6	8 10	1st Loop Main Loo	<sup>bp</sup> 16
	-100				Last Loc	p
	100		SHEAR S	TRAIN (%)		
SHEAR STRESS (kPa)	400 350 200 200 150 100 -50 -100 0	200 VE		00 800 E STRESS, σ' <sub>ν</sub> (kP	1000 a)	1200
Prepared E	Зу:	PS (	Checked By:	GF	Approved By:	JPS
Date:	Aug	just 8, 2012 I	Date:	August 24, 2012	Date:	August 27, 2012

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STRESS CONTROLLED CYCLIC DIRECT SIMPLE SHEAR TEST

Prepared	By: PS					
		Checked By:	GF	Approved By	JPS	S
Ini	itial Void Ratio	0.66	Einal Void Ratio		0.56	_
Dr	v Unit Weight (kN/m <sup>3</sup> )	15.88	Drv Unit Weight	(kN/m <sup>3</sup> )	16.90	
т. Т.	tal Unit Weight (kN/m <sup>3</sup> )	19.75	Total Linit Waiah	/· t (kN/m <sup>3</sup> )	20.83	_
۱۸۸ اح	eight of Soil (g):	196.67	Weight of Soil (g	)·	194.89	
⊡t Sr	Decific Gravity Gs:	2 69	Final Height (mm	ы, дат (шш). 	22 17	_
Ц Ц	eight (mm):	23.60	Change in Heigh	t AH (mm):	1 43	
in ا	aneter (mm).	72 60	Diameter (mm)	<i></i>	72 60	_
۱۸/	ater Content (%).	24.4	Water Contont (0	rinai Sampie Det	allis 22.2	
	0.35 s OCR = 2 (s	tress ratio ( $\tau_{cyc}$ / $\sigma'_{vc}$ ) @ sample consolidated to	2 1 Hz for 25 cycles, o 2 1000 kPa and unload	v <sub>c</sub> =500kPa led to 500 kPa)	coile	
						_
Ini	itial Void Ratio	0.62	Einal Void Ratio	((((((((((((((((((((((((((((((((((((((	0.52	
	$\frac{1}{1000}$	16.33	Dry Unit Weight	$(kN/m^3)$	17.30	_
Тс	tal Unit Weight (kN/m <sup>3</sup> )	19.92	Total Unit Weigh	). t (kN/m <sup>3</sup> )	21.32	_
W	eight of Soil (g):	198.38	Weight of Soil (g	)·	200.34	_
Sr	pecific Gravity Gs:	2.69	Final Height (mm	ο)·	22.27	
H	eight (mm):	23.60	Change in Heigh	t AH (mm):	1 33	_
Di	ameter (mm).	72.60	Diameter (mm):		72.60	
۱۸/	ater Content (%):	, 22.0	Water Content (	1 Inal Sample Det	22.2	
	0.25 str OCR = 2 (s	ress ratio ( $\tau_{cyc}$ / $\sigma'_{vc}$ ) @ sample consolidated to	1 Hz for 100 cycles, σ ο 1000 kPa and unloac	' <sub>vc</sub> =500kPa) led to 500 kPa)	- ile	
Ini	itial Void Ratio	0.66	Final Void Ratio		0.53	
Dr	ry Unit Weight (kN/m <sup>3</sup> )	15.94	Dry Unit Weight	(kN/m <sup>3</sup> )	17.22	
Тс	otal Unit Weight (kN/m <sup>3</sup> )	19.45	Total Unit Weigh	t (kN/m <sup>3</sup> )	21.08	_
W	eight of Soil (g):	193.68	Weight of Soil (g	):	194.37	_
Sp	becific Gravity, Gs:	2.69	Final Height (mm	n):	21.85	
He	eight (mm):	23.60	Change in Heigh	t, ΔH (mm):	1.75	
Di	ameter (mm):	72.60	Diameter (mm):		72.60	
W	ater Content (%):	22.0	Water Content (9	%):	22.4	
	OCR = 2 (s Initial sample Details	sample consolidated to	1000 kPa and unload	ded to 500 kPa) Final Sample Det	ails	
	0.20 et	ross ratio (z. / z' ) @	1 Hz for 100 evelop	-500kPa		
ample:	ST-16	Station:	DSS#1	Date:	July 27,	2012
	Anchorage, US	Borehole:	BH-003-12	Depth:	43.28	m
cation:						

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STRESS CONTROLLED CYCLIC DIRECT SIMPLE SHEAR TEST

Location: <u>Anchorage, US</u> Borehole:         Sample: <u>St16</u> Station:         0.40 stress ratio ( $\tau_{cyc}/\sigma'_{vc}$ ) @ OCR = 2 (sample consolidated to Ditial sample Details         Water Content (%): <u>27.0</u> Diameter (mm): <u>72.60</u> Height (mm): <u>23.60</u> Specific Gravity, Gs: <u>2.69</u> Weight of Soil (g): <u>192.54</u> Total Unit Weight (kN/m <sup>3</sup> ) <u>13.33</u> Dry Unit Weight (kN/m <sup>3</sup> ) <u>15.22</u> Initial Void Ratio <u>0.73</u>	BH-003-12 DSS#1 1 Hz for 12 cycles, 1000 kPa and unlo Water Conten	Depth: Date: σ' <sub>vc</sub> =500kPa νaded to 500 kPa)	<u>43.28 m</u> July 27, 2012
ample: <u>St.12</u>	DSS#1 1 Hz for 12 cycles, 1000 kPa and unlo Water Conten	Date: σ' <sub>vc</sub> =500kPa νaded to 500 kPa)	July 27, 2012
0.40 stress ratio (τ <sub>cycf</sub> σ' <sub>vo</sub> ) @ OCR = 2 (sample consolidated to nitial sample Details         Water Content (%):       27.0         Diameter (mm):       72.60         Height (mm):       23.60         Specific Gravity, Gs:       2.69         Weight of Soil (g):       192.54         Total Unit Weight (kN/m <sup>3</sup> )       19.33         Dry Unit Weight (kN/m <sup>3</sup> )       15.22         Initial Void Ratio       0.73	1 Hz for 12 cycles, 1000 kPa and unlo Water Conten	σ' <sub>vc</sub> =500kPa vaded to 500 kPa)	
	Diameter (mm Change in Hei Final Height (r Weight of Soil Total Unit Weig Dry Unit Weig Final Void Rat	Final Sample Det         t (%):	ails       25.6       72.60       1.47       22.13       190.42       20.39       16.23       0.63
repared By: PS Checked By:			

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### **APPENDIX B.11**

### POST-CYCLIC STATIC DIRECT SIMPLE SHEAR

FU31	-CTCL	IC STATI	C DIREC	T SIMPL	E SHEAR TI	EST						
ject:	Port o	f Anchora	ge						Project No.	: _	12-MT	S-009
cation:	Ancho	orage, US			Borehole:	<u> </u>	BH-003-12		Depth:	_	31.	39 m
mple:	<u>ST-6</u>				Station:	<u> </u>	DSS #1		Date:	-	August 1	3, 201
					POST-C	YCLIC S	TATIC SHE	EAR TE	EST			
		150					~~~	$\sim$	<b>—</b>			
		100 -										
	Pa)	50 -										
	ss (kl	0										
	ar Stre											
	Shea	-50 -										
		-100										
		450										
		-150 <u> </u>		!	5	10 Shear St	) rain (%)		15		20	
		-150 L			5	10 Shear St	) rain (%)		15		20	
		-150 0			5	10 Shear St	) rain (%)		15		20	
	(Pa)	-150 0 150 100 50 			5	10 Shear Sti	) rain (%)	Ę	15		20	
	ess (kPa)	-150 0 150			5	10 Shear Sti	) rain (%)		15		20	
	ar Stress (kPa)	-150 0 150 100 50 0 0			5	10 Shear St	) rain (%)	Ę	15		20	
	Shear Stress (kPa)	-150 0 150 100 50 -5			5	10 Shear St	) rain (%)	Ę	15		20	
	Shear Stress (kPa)	-150 0 150			5	10 Shear Str	) rain (%)	Ę	15		20	
	Shear Stress (kPa)	-150 0 150 100 50 -50 -100 -15			5	10 Shear Str	) rain (%)	5	15		20	
	Shear Stress (kPa)	-150 0 150 0 100 50 0 -50 - -100 - -150 0	50	10	5 5 00 150	200	) rain (%)		15	350	20	
	Shear Stress (kPa)	-150 0 150 0 100 50 0 -50 0 -100 0 -150 0	50	10	5 5 00 150 Effective	10 Shear Str	) rain (%)	(Pa)	15	350	20	
	Shear Stress (kPa)	-150 150 100 50 -50 -100 -150 0 0 -150 0 0 -150 0 0 -150 0 0 -150 0 0 0 0 -150 0 0 0 0 0 0 0 0 0	50 Serforme 3.6% exc (Pa	d after st	5 5 00 150 Effective ress-controlle pressure. A	10 Shear Str 200 Vertical S ed DSS te	) rain (%) 	Pa) ge cyclic was a r	15 300 c stress rat residual sh	350 io, CSR ear stres	20 20 400 = 0.20 ss of	
pared	:KPa) Shear Stress (kPa)	-150 150 100 50 -50 -100 -150 0 -150 0 -150 0 -100 -150 0 -100 -150 0 -100 -	50 Derforme 3.6% exc (Pa PS	d after st	5 5 00 150 Effective ress-controlle pressure. A Checked By	10 Shear Str Shear Str 200 Vertical S ed DSS te fter cyclic	) rain (%) rain (%) 2 0 250 tress, σ' <sub>v</sub> (k st at averaç c DSS there GF	iPa) ge cyclid was a t	15 15 300 c stress rat residual sh	io, CSR ear stres By:	20 	S

	-CTCL	IC ST/	ATIC DIRECT SIN	IPLE SHEAR TES	Г			
ject:	Port o	f Anch	orage			Project No.:	12-MTS-009	
ation:	Ancho	orage, l	JS	Borehole:	BH-003-12	Depth:	31.39 m	
nple:	<u>ST-6</u>			Station:	<u>DSS #1</u>	Date:	August 15, 201	
				POST-CYC	LIC STATIC SHEA	R TEST		
		120						
		100 -	$\sim$	~~~~	m	m		
	is (kPa)	80 -	·					
	Shear Stress	60 -						
	She	40 -						
	0,	20						
		0 <del> </del> C		5 Sh	10 near Strain (%)	15	20	
		120 -						
		120						
		100 -						
	(F)	80 -				- Ŧ		
	Å P							
	ress (kPa	60 -						
	ear Stress (kPa	60 -						
	Shear Stress (kPa	60 - 40 -						
	Shear Stress (kPa	60 - 40 - 20 -						
	Shear Stress (kPs	60 - 40 - 20 -	50	100	150 200	) 250	300	
	Shear Stress (kPa	60 - 40 - 20 - 0 -	50	100 Effective Ve	150 200 rtical Stress, σ' <sub>ν</sub> (kPa	) 250	300	
	Z Shear Stress (kPa	60 - 40 - 20 - 0 - C ote: Te wit 78	50 st performed afte h 76.2% excess p 9 kPa	100 Effective Ve r stress-controlled ore pressure. Afte	150 200 rtical Stress, σ' <sub>ν</sub> (kPa DSS test at average o r cyclic DSS there wa	) 250 ) cyclic stress ratio, Ci is a residual shear s	300 SR = 0.25 tress of	
pared	Shear Stress (kPc	60 - 40 - 20 - 0 - 0 0 - 0 0 0 0 0 0 0 0 0 0 0 0 0	50 st performed afte h 76.2% excess p 9 kPa PS	100 Effective Ve r stress-controlled ore pressure. Afte Checked By:	150 200 rtical Stress, σ' <sub>ν</sub> (kPa DSS test at average o r cyclic DSS there wa	) 250 ) cyclic stress ratio, C4 is a residual shear s	300 SR = 0.25 tress of JPS	

ect:	Port of A	nchorage				Project No ·	12-MTS-009
ation <sup>.</sup>	Anchorac	ie US		Borehole:	BH-003-12	Depth:	31.39 m
nple:	ST-6	,-,		Station:	 DSS #1	Date:	August 13, 201
				POST-CYC	CLIC STATIC SHEA	R TEST	
	25	0					
	20	0					$\sim$
	15 طع	0					
	4) ssa	0 -					
	sar Str	o -					
	She	o					
	-5	0 -					
	-10	0 1	5	S	10 hear Strain (%)	15	20
	-10 25 20 (ed X) Sg		5	S	10 hear Strain (%)	15	20
	-10 25 21 21 21 21 22 21 21 21 21 21 21 21 21		5	S	10 hear Strain (%)	15	20
	-10 25 20 15 10 5 -5		5	S	10 hear Strain (%)	15	20
	-10 25 20 15 10 Spear Stress (kPa) 5 -5 -10		5	S	10 hear Strain (%)	15	20
	-10 25 20 15 10 Sylear Stress (kPa) 5 -5 -10		200	S	10 hear Strain (%)	15	20
	-10 25 20 15 10 Spear Stress (kDa) 5 -5 -10 Note:	0 0 0 0 0 0 0 0 0 0 0 0 0 0	200 d after str	S S A00 Effective V esss-controlled ressure. After	10 hear Strain (%) 600 ertical Stress, σ' <sub>v</sub> (kPa DSS test at average cyclic DSS there was	15	20 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
pared	-10 25 20 15 10 5 -10 -10 Note: By:	0 0 0 0 0 0 0 0 0 0 0 0 0 0	200 d after str	S S 400 Effective Vo ess-controlled ressure. After Checked Bv:	10 hear Strain (%) 600 ertical Stress, σ' <sub>v</sub> (kPa DSS test at average cyclic DSS there was	15 15 800 N cyclic stress ratio, C a residual shear st	20 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

ect:	Port o	of Anch	norage							Project No.:		12-MTS-009
ation:	Ancho	orage,	US		Bo	orehole:		BH-003-12		Depth:		31.39 m
ple:	<u>ST-6</u>				St	ation:		DSS #1		Date:		August 13, 20 <sup>-</sup>
						POST-C	YCLIC	STATIC SHE	EAR TI	EST		
		250										
		200							~			
	(Pa)	150	- /									_
	ess (ŀ	100										
	ar Str											
	She	50	/									
		0						•				_
		-50										
			0		5			10		15		
			0		5		Shear	10 Strain (%)		15		20
		250	0		5		Shear	10 Strain (%)		15		20
		250 · 200 ·	0		5		Shear	10 Strain (%)		15		
	Pa)	250 · 200 · 150 ·	0		5		Shears	10 Strain (%)		15		20
	ess (kPa)	250 · 200 · 150 ·	0		5		Shear	10 Strain (%)		15	•	
	ar Stress (kPa)	250 200 150 100	0		5		Shears	10 Strain (%)		15	•	
	Shear Stress (kPa)	250 200 150 100 50	0		5		Shears	10 Strain (%)		15		
	Shear Stress (kPa)	250 200 150 50 0	0		5		Shears	10 Strain (%)		15		
	Shear Stress (kPa)	250 - 200 - 150 - 100 - 50 - 0 - 50 -	0		5		Shear	10 Strain (%)		15		
	Shear Stress (kPa)	250 200 150 100 50 0 -50	0	100	2	00 Effective	Shear S	10 Strain (%) 400 Stress g' (k)	500 Pa)	15		
	Z Shear Stress (kPa)	250 200 150 50 -50 -50 -50 -50 -50 -2	0 est perfo th 42% e 0 kPa	100 rmed aft	5	00 Effective ss-controll ssure. Aft	Shear S 300 e Vertical led DSS ter cyclic	10 Strain (%) Strain (%) 400 Stress, σ' <sub>v</sub> (kl test at averag DSS there wa	500 Pa) le cyclii as a re	15 0 600 c stress ratio, sidual shear	, CSR = ( stress of	20
Jared E	.K Z Shear Stress (kPa)	250 200 150 50 0 -50 0 -50	0 est perfo th 42% e 0 kPa	100 mmed aft excess po	5 2 er stres pre pre-	00 Effective ss-controll ssure. Aff	Shear : 300 e Vertical led DSS ter cyclic	10 Strain (%) Strain (%) 400 Stress, σ' <sub>v</sub> (kl test at averag c DSS there wa GF	500 Pa) Je cycli as a re	15 15 0 600 c stress ratio, sidual shear	, CSR = ( stress of	     700 0.15

P051	-CTCLIC ST	ATIC DIRECT SIM	IPLE SHEAR TES			
oject:	Port of Anch	orage			Project No.:	12-MTS-009
cation:	Anchorage,	US	Borehole:	BH-003-12	Depth:	39.62 m
mple:	<u>ST-11</u>		Station:	DSS #1	Date:	July 13, 2012
			POST-CYC	LIC STATIC SHEA	R TEST	
	300 -					
	250 -					
	, 005 (Ра					
	l) sse 150 -					
	ear St - 001					
	R S	/				
	50 -					
	0 -					•
	(	)	5 Sł	10 hear Strain (%)	15	20
	300 -		5 Sł	10 near Strain (%)	15	20
	300 - 250 -		5 St	10 near Strain (%)	15	20
	300 - 250 - (a) 200 -		5 Sł	10 near Strain (%)	15	20
	( 300 - 250 - (a) 200 - (a) 82 150 -		5 Sł	10 near Strain (%)	15	20
	- 300 - 250 - 200 - 150 - 150 - 100 -		5 Sł	10 near Strain (%)	15	20
	- 300 - 250 - 200 - 150 - 100 - 201 - 001 -		5 Sł	10 near Strain (%)	15	20
	- 300 - 250 - 200 - 150 - 100 - Suear Stress (Kba) - 001 - 005 - 00		5 Sł	10 near Strain (%)	15	20
	- 300 - 250 - 200 - 200 - 150 - 100 - 50 - 0 - 0 -	D 100	5 Sł	10 near Strain (%)	15	20
	- 300 - 250 - 200 - 001 Shear Stress (kBa) - 00 - 00 - 00 - 00	D 100	5 Sł	10 near Strain (%)	15 15 500 600	20
	300 - 250 - 250 - 200 - 200 - 200 - 200 - 20 - 20 - 20	2 100 est performed after th 47% excess por 2 kPa	5 Sł Sł 200 30 Effective Ve stress-controlled e pressure. After o	10 near Strain (%)	15 15 500 600 0) cyclic stress ratio, C a residual shear str	20 20 700 20 700
pared	300 - 250 - (eg 200 - 200 - (eg 200 - 150 - 100 - 50 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	D 100 est performed after th 47% excess por 2 kPa PS	5 Sł 200 30 Effective Ve stress-controlled e pressure. After o	10 near Strain (%)	15 15 500 600 i) cyclic stress ratio, C a residual shear str	20 20 700 20 20 700 20 20 700 20 20 20 20 20 20 20 20 20 20 20 20 2

	-CYCL	IC ST/	ATIC DIRE	CT SIMPL	E SHEAR TES	т			
oject:	Port of	of Anch	orage				Project No.:	12-MTS-009	
cation:	Ancho	orage, l	JS		Borehole:	BH-003-12	Depth:	39.62 m_	
mple:	<u>ST-11</u>				Station:	DSS #1	Date:	July 15, 2012	
					POST-CYC	LIC STATIC SHE	AR TEST		
		160							
		140 -							
	a)	120 -							
	ss (kP	100 -							
	Stree	80 -							
	Shear	60 -							
	0)	40 -							
		20 -							
		0 <del> </del> C	1		5	10	15		
					51	near Strain (%)			
		160							
		140 -							
	a)	120 -				2			
	ss (kF	100 -							
	Stree	80 -				$\leq$			
	Shear	60 -			5	-			
	0,	40 -							
		20 -							
		20 - 0 -	1	50	100	150 2	200 250	300	
		20 - 0 - 0	1	50	100 Effective Ve	150 2 ertical Stress, σ' <sub>ν</sub> (kF	200 250 Pa)	300	
	N	20 - 0 - 0 - 0 0 - 0 0 - 0 0 - 0 0 - 0 0 - 0 0 - 0 -	est perform h <mark>8</mark> 7% exc kPa	50 ned after st ress pore p	100 Effective Ve ress-controlled pressure. After	150 2 ertical Stress, σ' <sub>v</sub> (kF DSS test at averag cyclic DSS there wa	Pa) Pa) e cyclic stress ratio, as a residual shear s	300 CSR = 0.15 stress of	
⇒pared I	Ne By:	20 - 0 - c ote: Te wit 34	est perform h <mark>87</mark> % exc kPa P	50 bed after st ress pore p	100 Effective Ve ress-controlled pressure. After Checked By:	150 2 ertical Stress, σ' <sub>v</sub> (kf DSS test at averag cyclic DSS there wa	250 2a) e cyclic stress ratio, as a residual shear s Approved By	300 CSR = 0.15 stress of /: JPS	

1 001	-CYCL	IC STA		Limited) _E SHEAR TES <sup>-</sup>	г		Geosciences
Project:	Port o	f Anchc	orage			Project No.:	12-MTS-009
Location:	Ancho	orage, U	IS	Borehole:	BH-003-12	Depth:	39.62 m
Sample:	<u>ST-11</u>			_Station:	<u>DSS #1</u>	Date:	July 16, 2012
				POST-CYC	LIC STATIC SHEA	R TEST	
		140 T					
		120 -					F
	(kPa)	100 -					
	Stress	80 -					
	hear S	60 -					
	S	40 -					
		20					
		0 +		5	10	15	20
				Sh	ear Strain (%)		
		<sup>140</sup> T					
		120 -					
	a)	100 -				5	
	ss (kF	80 -				-	
	ar Stre	60 -			<u>s</u>		
	Shea	40 -		5	-		
		20 -					
		0		100	450		
		0	50	100 Effective Ve	۲۵υ rtical Stress, σ' <sub>ν</sub> (kPa	200	200
					DSS test at average	cyclic stress ratio, CS	SR = 0.25
	N	ote: Te with 39	st performed after s 1 89% excess pore j kPa	tress-controlled l	cyclic DSS there was	a residual shear stre	ess of
repared	No By:	ote: Te with 39	st performed after s 1 89% excess pore p kPa MJ	Checked By:	cyclic DSS there was	a residual shear stre	JPS

		IC STA	IC DIR	ECISIN	IPLE SHE					
ject:	Port c	of Anchor	age					Project No	o.: <u>12-N</u>	/ITS-009
ation:	Ancho	orage, US	5		Boreh	ole:	BH-003-12	Depth:	3	9.62 m
nple:	<u>81-11</u>				Station	1:	<u>DSS #1</u>	Date:	July	16, 2012
					PO	ST-CYCL	IC STATIC SH	EAR TEST		
		<sup>300</sup> T								
		250 -								
	s (kPa)	200 -								
	Stress	150 -	/							
	Shear	100 -								
		50 -								
		0								
		0			5	She	10 ear Strain (%)	15	20	
		300								
		250 -					7 =			
									2	
	(Pa)	200 -								
	ress (kPa)	200 -								
	iear Stress (kPa)	200 - 150 -							}	
	Shear Stress (kPa)	200 - 150 - 100 -								
	Shear Stress (kPa)	200 - 150 - 100 - 50 -								
	Shear Stress (kPa)	200 - 150 - 100 - 50 - 0 - 0 -	1(	00 2	00 3	600 40	00 500	600 700	800 900	
	Shear Stress (kPa)	200 150 100 50 0 0	1(	00 2	000 3 Eff	00 40 ective Ver	00 500 tical Stress, σ' <sub>ν</sub> (k	600 700 (Pa)	800 900	
	Z Shear Stress (kPa)	200 - 150 - 100 - 50 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	∶perfor 10 18% e> Pa	00 2 med after ccess por	00 3 Eff r stress-cr e pressur	300 40 Fective Ver Controlled D Fe. After c	00 500 tical Stress, σ' <sub>ν</sub> (k VSS test at avera yclic DSS there w	600 700 (Pa) ge cyclic stress ra vas a residual sho	atio, CSR = 0.10 ear stress of	
pared	Shear Stress (kPa)	200 150 100 50 0 0 0 0 0 0 0 0 0 0 0 0 0	10 : perfori 18% e> :Pa	00 2 med after ccess por	000 3 Eff r stress-ca re pressur	000 40 fective Ver ontrolled D re. After c	00 500 tical Stress, σ' <sub>v</sub> (k VSS test at avera yclic DSS there w	600 700 (Pa) ge cyclic stress ra vas a residual sho	atio, CSR = 0.10 ear stress of	JPS

ME		HNICAL SE			1	M E Geosciences
POST	-CYCLIC ST		LE SHEAR TEST			
Project:	Port of Anch	orage			Project No.:	12-MTS-009
Location:	Anchorage, l	US	Borehole:	BH-003-12	Depth:	43.28 m
Sample:	<u>ST-16</u>		_Station:	DSS#1	_Date:	July 27, 2012
			POST-CYCLI	C STATIC SHEAR T	EST	
	250					
	200 -					
	(ac			~~~~		$\sim$
	) 150 - Ss					
	ar Stre					
	She					
	50 -					
	0 -					
	C	)	5 Shea	10 ar Strain (%)	15	20
	250					
	200 -					
	Ja)				A L	
	- 150 S				- T	
	r Stre					
	Shea				5	
	50 -				{	
	0 -				{	
	C	) 100	200	300 400	500	600
			Ellective verti	cal Siless, $\sigma_v$ (kPa)		
	Note: Te wit 0.2	est performed after s th <mark>8</mark> % excess pore p 2 kPa	tress-controlled DS ressure. After cycl	SS test at average cycli lic DSS there was a res	ic stress ratio, C idual shear stre	SR = 0.20 ss of
repared I	By:	PS	Checked By:	GF	Approved By:	JPS
Date:		July 30, 2012	Date:	August 24, 2012	Date:	August 27, 2012

	-CYCLIC ST		g Limited) PLE SHEAR TES	Т		Geosciences
Project:	Port of Anch	orage			Project No.:	12-MTS-009
ocation:	Anchorage, l	JS	Borehole:	BH-003-12	Depth:	43.28 m
Sample:	ST-16		Station:	DSS#1	Date:	July 27, 2012
			POST-CYC	LIC STATIC SHEAF	R TEST	
	250					
	200 -				~~~~	
	(Pa)					~~
	, iso i					
	- 001 ear					
	ත් 50 -	/				
		'				
	o -		5	10	15	20
	250 - 200 - 8					
	Note: Te	100 st performed after	200 Effective Ve	300 rtical Stress, σ' <sub>ν</sub> (kPa) DSS test at average c	400 ) cyclic stress ratio, CS	500 SR = 0.25
	Note: Te wit 31 50 - 50 - 0 - 0 31	100 est performed after h 34% excess por 7 kPa	200 Effective Ve stress-controlled e pressure. After o	300 ertical Stress, σ' <sub>v</sub> (kPa) DSS test at average of cyclic DSS there was	400 ) cyclic stress ratio, C3 a residual shear stre	500 SR = 0.25 ess of

POST	A) CYCL	Divisio	n of MEG Consulting	Limited) PLE SHEAR TEST	-			Geosciences
Project:	Port c	f Ancho	rage			Pi	roject No.:	12-MTS-009
ocation:	Ancho	orage, U	S	Borehole:	BH-003-	<u>12</u> D	epth:	43.28 m
Sample:	<u>ST-16</u>	5		_Station:	DSS#1	D	ate:	July 27, 2012
				POST-CYCI	LIC STATIC	SHEAR TES	;Т	
		<sup>140</sup> T						
		120 -						
	a)	100 -						
	ss (kF	80 -	~					
	ır Stre	60 -						
	Shea	40 -						
		20 -						
		0		5	10	1	5	20
				Sh	ear Strain (%)			
		<sup>140</sup> T						
		120 -						
		100					F	
	(kPa)	100 -				3		
	ress (	80 -			/			
	ear St	60 -						
	She	40						
		20 -						
		o 🗕						
		0	50	100 Effective Ve	150 rtical Stress	200 s' (kPa)	250	300
	N	ote: Te: with 71.2	st performed after s 1 <mark>68.8</mark> % excess pol 2 kPa	stress-controlled I re pressure. After	DSS test at av r cyclic DSS th	erage cyclic s here was a res	stress ratio, CSI sidual shear str	R = <mark>0.35</mark> ess of
	Bv:		PS	Checked By:		GF A	pproved By:	JPS
repared I	- ).							

ect:	Port o	f Anch	orage				Project No.:	12-MTS-009
ation:	Ancho	rage, l	JS		Borehole:	BH-003-12	Depth:	43.28 m
iple:	ST-16				Station:	DSS#1	Date:	July 27, 2012
					POST-CYC	LIC STATIC SH	IEAR TEST	
	Shear Stress (kPa)	100 - 90 - 80 - 70 - 60 - 50 - 40 - 30 - 20 - 10 - 0 - 0 - 0 - 0 -			5	10	15	20
	Shear Stress (kPa)	100 - 90 - 80 - 70 - 50 - 40 - 20 - 10 - 0 - 0		50	100	150	200	
					Effective Ve	ertical Stress, $\sigma'_v$ (	kPa)	
	No	ote: Te wit 61	est perforn h <mark>68.8</mark> % e .2 kPa	ned after s excess por	stress-controlled e pressure. Afte	DSS test at avera	age cyclic stress ratio, e was a residual shea	, CSR = 0.40 ar stress of

ME	G T	EC Divisio	ON OF MEG C	AL SE Consulting L	IRVICE	S				N	Geosc	Giences
POST-	-CYCL	IC ST	ATIC DIRE	CT SIMPL	E SHEAR T	EST			Droig at No		40 MTC	000
Project:	Porto	of Anch					511 000 40			.: _	12-MIS	-009
Location:	Anche	orage, u			Borehole:		BH-003-12		Depth:	-	43.20	3 m
Sample:	5116	<u>(Cyus</u>	S03a)		Station:		DSS#1		Date:	_	August 7,	2012
					POST-C	YCLIC S	TATIC SHE	AR TI	EST			
		300 -										
		250 -								$\sim$		
	s (kPa)	200 -	1									
	Shear Stress (	150 -										
		100 -										
		50 -										
		0 -					•					
		300 -				Static Si	near Strain (7	6)				
		250 -				-	A REAL PROPERTY AND A REAL					
	kPa)	200 -							~			
	stress (i	150 -										
	shear S	100 -										
	U	50 -										
		0 -										
		0	)	200	400	60	8 00	300	100	0	1200	
	N	ote: Te wit a r	est perform th 1.7% exc residual she	ed after str cess pore p ear stress o	Effective ress-controll pressure and of 120.4 kPa	e Vertical s ed DSS to d a static l	Stress, σ' <sub>ν</sub> (kF est at averag bias of 120 kl	Pa) e cycli Pa. Af	c stress ra fter cyclic I	tio, CSR SSS there	= 0.05 e was	
Prepared I	By:		P	S	Checked By	/:	GF		Approved	By:	JPS	;
Date:			August	7, 2012	Date:		August 24,	2012	Date:		August 27	, 2012

ME	G TE	ECHN Division of M		SE	RVI	ICES					Nari		G
POST	-CYCLIC	STATIC [	DIRECT SII	MPL	E SHE	AR TES	т						
Project:	Port of <i>i</i>	Anchorage								Project No.	: .	12-MT	S-009
Location:	Anchora	age, US			Boreho	ole:	BH	-003-12		Depth:	-	43.2	28 m
Sample:	<u>ST16 (C</u>	yDSS03b)			Station	:	DS	S#1		Date:	-	August 7	7, 2012
					PO	ST-CYC	LIC STA	TIC SHE	AR TI	EST			
	3	.00						~~~					
	2	50						~~	~~		$\sim$	~	
	c (kPa)	00 -											
	Stress	50 -											
	Shear	00 -											
		50											
		0			ļ								
		U		5	)	St	atic Shea	r Strain (%	b)	15		20	
	3	.00											
	2	50 -								The second secon			
	kPa) 5	.00 -									}		
	Stress (	50											
	Shear {	00									¥		
		50											
		0											
		0	100	200	3 Fff	00 4 ective Ve	100 5	500 6 vss	00 93)	700	800	900	
					<b>E</b> 1	0000000			α,				
	Note	e: Test per with <mark>22.8</mark> a residua	formed afte % excess   al shear stre	∍r str pore ess c	ess-co pressi of 118.	ontrolled l ure and a 9 kPa	DSS test a static bia	at average as of 120 k	e cyclio (Pa. <i>I</i>	c stress rat After cyclic	io, CSR DSS the	2 = <mark>0.10</mark> ere was	
Prepared	By:		PS		Check	ked By:		GF		Approved	By:	JP	S
Date:		Aug	 just 7, 2012	2	Date:		A	ugust 24, 2	2012	Date:		August 2	7, 2012

POST-	م) CYCL	IC ST		LIMITED)	т			I	Geoscienc	ces
Project:	Port o	f Anch	orage				Project No.:		12-MTS-009	)
Location:	Ancho	orage, I	US	Borehole:	BH-003	3-12	Depth:		43.28 m	
Sample:	<u>ST16</u>	(CyDS	S03a)	_Station:	DSS#1		Date:	<u> </u>	ugust 10, 201	12
				POST-CYC	LIC STATIC	SHEAR	TEST			
		250 -								
	a)	200 -		·	$\sim$	$\sim$		$\sim$	-	
	ress (kF	150 -							-	
	near St	100 -							-	
	ঠ	50 -							-	
		0 -								
		(	)	5 St	10 atic Shear St	rain (%)	15	2	20	
		250 -								
	~	200 -								
	ss (kPa	150 -					{			
	ar Stre	100 -				\$				
	She	50								
		50 -								
		0 - (	) 100	200	300	400	500	60	00	
				Effective Ve	ertical Stress,	σ' <sub>v</sub> (kPa)				
	No	ote: Te wit a r	est performed after s th 62.5% excess por residual shear stress	tress-controlled e pressure and a s of 120.5 kPa	DSS test at a a static bias o	verage cyo f 120 kPa.	clic stress ratio After cyclic E	o, CSR = <mark>0</mark> . OSS there w	15 /as	
Prepared E	By:		PS	Checked By:		GF	Approved E	Ву:	JPS	
			August 11 2012	Date:	Augu	et 24 2013	Dete:	Δ	quet 27, 20	140

ME	G T	EC Divis	HNIC	AL S Consulting	ERV g Limited)	ICES				Marine	+ Earth E Geose	G
POST-	CYCL	IC ST	ATIC DIRI	ECT SIMI	PLE SHE	AR TEST						
Project:	Port of	of Anch	norage						Project No.	:	12-MTS	-009
Location:	Ancho	orage,	US		Boreho	ole:	BH-003-12		Depth:		43.2	8 m
Sample:	<u>ST16</u>	(CyDS	SS03a)		Station	:	DSS#1		Date:		August 10	), 2012
					PO	ST-CYCLIC	STATIC SHE	EAR T	EST			
		250										
		200			n	m	m	~~	~~~~	~~~~		
	kPa)	150										
	ess (l	150	/									
	ear Str	100	-								_	
	She	50										
		50	-									
		0	ļ		5		10		15		20	
			0		5	Static S	Shear Strain (	%)	15		20	
		250										
		250									7	
		200									_	
	kPa)	150										
	ress (I	150						/	r			
	ear Sti	100									_	
	She	50										
		50										
		0	ļ	100	2	00 3	300	400	500			
			~		Eff	ective Vertical	Stress, σ' <sub>ν</sub> (k	:Pa)	000			
	N	ote: T wi a	est perforn ith <mark>60</mark> % ex residual sh	ned after cess pore near stres	stress-co pressures of 120.	ontrolled DSS e and a static 2 kPa	test at averag bias of 120 k	ge cycli Pa. Aft	c stress rat er cyclic D	io, CSR = SS there w	0.20 as	
Prepared E	By:		F	rs	Check	ed By:	GF		Approved	By:	JPS	6
Date:			August	11, 2012	Date:		August 24,	, 2012	Date:	A	ugust 27	7, 2012

#### **APPENDIX B.12**

#### BENDER ELEMENTS VELOCITY MEASURING

MEG TEC (A Divis Bender Elen	HNICA sion of MEG	AL SE Consulting	RVICES						,	Marine + Earth <b>E G</b> eosciences
Project:	Port of Anch	norage				Borehole:	BH-003-12	2	Project No.:	12-MTS-009
Client:	CH2M Hill					Sample No.:	ST-6		Date:	August 13, 2012
Location:	Anchorage,	US				Depth (m):	31.39		Station:	DSS#1
WATER CO	NTENT &	UNIT W	EIGHT			WAV	E TRAVEL CUR	VES		
	Initi	al	Final							
Tin No.:	28	3	C09							
Wt. of Tin (g):	23.9	98	215.68							
Wet Weight (g):	147.	15	400.75							
Dry Weight (g):	118.	20	358.87							
Water Content (%):	30.	7	29.2				S-WAVE			
Total Unit Weight (kN/m <sup>3</sup> ):	18.7	79	19.91		2					
Dry Unit Weight (kN/m <sup>3</sup> ):	14.3	38	15.40							
CO	DNSOLIDA	ATION		1		Δ				Becaiver
Specific Gravity, Gs:			2.77	ŝ						Keteivei
Initial DSS Sample Height	(mm):		23.6	ige (		$   \rangle  \rangle$	$\Lambda \sim$		$\frown$	
Height after Consolidation	(mm):		22.0	/olts	0		4	06	/\	
Initial Void Ratio, e <sub>o</sub>	( )		0.89	ied V	-1				<b>~</b> *	
Initial Degree of Saturation	n (%)		95.6	liqqv		Ý Ý				
Final Void Ratio, e <sub>f</sub>	. ,		0.76	. ₹	-2	<u> </u>				
Final Degree of Saturation	(%)		>100							
BEN	DER ELE	MENTS					Time (ms)			
			S-Wave							
Initial Time, T <sub>o</sub> (ms):			0.024	1						
Final Time, T <sub>f</sub> (ms):			0.080	1						
Travel Time (ms):			0.056	1						
Wave Velocity* (m/s):			393	1	Comments:	*Vs is based on as	sessment of first	shear w	vave arrival	
Shear Modulus, G (MPa)			296.3	1		Vs taken on sample	e tested at a CSF	R of 0.10	) after consolio	dating the
Vertical Effective Stress, σ	' <sub>v</sub> (kPa)		1000	1		sample to 1000 kP	a and prior to cvo	lic DSS	i test	
Overconsolidation Ratio (C	DCR)		-	1						
Prepared By:			PS	•	Checked By:	GF		Approve	d Bv:	JPS
Date:			August 20, 2012		Date:	August 24	4, 2012	Date:	<b>)</b> -	August 27. 2012

MEG TECI (A Divis Bender Elen	HNICA sion of MEG	AL SE Consulting	RVICES							Marine + Earth <b>E Geosciences</b>
Project:	Port of Anch	norage				Borehole:	BH-003-1	2	Project No.:	12-MTS-009
Client:	CH2M Hill					Sample No.:	ST-6		Date:	August 13, 2012
Location:	Anchorage,	US				Depth (m):	31.39		Station:	DSS#1
WATER CO	NTENT &	UNIT W	EIGHT			WAV	E TRAVEL CUR	VES		
	Init	ial	Final							
Tin No.:	18	3	C32	-						
Wt. of Tin (g):	34.	19	143.42	1						
Wet Weight (g):	92.	01	328.22							
Dry Weight (g):	78.4	45	286.64							
Water Content (%):	30.	.6	29.0				S-WAVE			
Total Unit Weight (kN/m <sup>3</sup> ):	18.	79	19.90	-	3					
Dry Unit Weight (kN/m <sup>3</sup> ):	14.3	38	15.42	-						
CO	<b>DNSOLID</b>	ATION				Δ				Source
Specific Gravity, Gs:			2.77	ŝ						Keceivei
Initial DSS Sample Height	(mm):		23.6	ige (		$   \rangle  \rangle  \rangle  \rangle$			$\land \land$	
Height after Consolidation	(mm):		22.0	/olta	0			06	·	8
Initial Void Ratio, e <sub>o</sub>	().		0.89	ed V					0.	
Initial Degree of Saturation	(%)		95.5	ilqq						
Final Void Ratio, e <sub>f</sub>	. ,		0.76	V	-2	1				
Final Degree of Saturation	(%)		>100	-	-3					
BEN	IDER ELE	MENTS					Time (ms)			
			S-Wave							
Initial Time, T <sub>o</sub> (ms):			0.024							
Final Time, T <sub>f</sub> (ms):			0.079	1						
Travel Time (ms):			0.055	1						
Wave Velocity* (m/s):			400	1	Comments:	*Vs is based on as	sessment of first	shear v	vave arrival	
Shear Modulus, G (MPa)			306.8	1		Vs taken on sample	e tested at a CSF	R of 0.1	5 after consolic	dating the
Vertical Effective Stress, σ	' <sub>v</sub> (kPa)		1000	1		sample to 1000 kP	a and prior to cvc	lic DSS	S test	
Overconsolidation Ratio (C	DCR)		-	1			······································			
Prepared By:	ĺ		PS	=	Checked By:	GF	-	Approve	ed By:	JPS
Date:			August 22, 2012		Date:	August 24	4, 2012	Date:	,	August 27, 2012

MEG TECI (A Divis Bender Elen	HNIC sion of MEG	AL SI Consultir	ERVICES							Marine + Earth <b>E G</b> Geosciences
Project:	Port of And	horage				Borehole:	BH-003-12	2	Project No.:	12-MTS-009
Client:	CH2M Hill					Sample No.:	ST-6		Date:	August 13, 2012
Location:	Anchorage,	US				Depth (m):	31.39		Station:	DSS#1
WATER CO	NTENT &	UNIT V	VEIGHT			WAV	E TRAVEL CUR	VES		
	Init	ial	Final							
Tin No.:	95	5	C09							
Wt. of Tin (g):	22.	05	215.65							
Wet Weight (g):	83.	45	402.73							
Dry Weight (g):	69.	35	361.42							
Water Content (%):	29	.8	28.3				S-WAVE			
Total Unit Weight (kN/m <sup>3</sup> ):	19.	11	20.45		3					
Dry Unit Weight (kN/m <sup>3</sup> ):	14.	72	15.93							
CO	<b>NSOLID</b>	ATION		1						Source
Specific Gravity, Gs:			2.77	S		$\square$				Receiver
Initial DSS Sample Height	(mm):		23.6	ge (			$h \cap l$			
Height after Consolidation	(mm):		21.8	<sup>o</sup> lta	0					
Initial Void Ratio, e	().		0.85	ed V					0	
Initial Degree of Saturation	(%)		97.6	ilqq		$\sim$ $\sim$				
Final Void Ratio, e <sub>f</sub>	(,,,)		0.71	A	-2			_		
Final Degree of Saturation	(%)		>100		_3					
BEN	DER ELF	EMENTS			-		Time (ms)			
			S-Wave	1						
Initial Time, T. (ms):			0.024	1						
Final Time, T <sub>c</sub> (ms):			0.082							
Travel Time (ms):			0.058	1						
Wave Velocity* (m/s).			376		Commonto	*\/c ic based on co	cocomont of first	choorw	avo arrival	
Shear Modulus, G (MPa)			275.3		Comments.	Ve takon on compl			ave alliva	dating the
Vertical Effective Stress	(kPa)		1000			sample to 1000 kp	e lesteu al a CSP			
Overconsolidation Ratio (C	)CR)		-				מ מווע דווטר נט כעכ	MC D99	เธอเ	
Prepared By:			PS	<u> </u>	Checked By:	GF	-	Approvo	d By:	IDS
Date:			August 20, 2012		Date:	August 2	4. 2012	Approve	u by.	JF3
Dute.			August 20, 2012		Duite.		., 2012	Dale:		August 27, 2012

MEG TEC (A Divis Bender Elen	HNICAI sion of MEG Co nent Vel	L SERVICES onsulting Limited) ocity Measuring							Marine + Earth EG Geosciences
Project:	Port of Anchor	age			Borehole:	BH-003-12	2	Project No.:	12-MTS-009
Client:	CH2M Hill				Sample No.:	ST-6		Date:	August 16, 2012
Location:	Anchorage, US				Depth (m):	31.39		Station:	DSS#1
WATER CO	NTENT & U	NIT WEIGHT			WAV	E TRAVEL CUR	VES		
	Initial	Final							
Tin No.:	111	C05							
Wt. of Tin (g):	33.12	207.86							
Wet Weight (g):	66.79	393.84							
Dry Weight (g):	59.07	352.41							
Water Content (%):	29.7	28.7				S-WAVE			
Total Unit Weight (kN/m <sup>3</sup> ):	18.95	20.11		3					
Dry Unit Weight (kN/m <sup>3</sup> ):	14.61	15.63							Seuree
CC	ONSOLIDAT	ION							Beceiver
Specific Gravity, Gs:		2.77	<b>(</b> )						
Initial DSS Sample Height	(mm):	23.6	) agı					$\wedge \circ$	
Height after Consolidation	(mm):	22.1	/olts	0			06	0	8
Initial Void Ratio, e <sub>o</sub>	· · ·	0.86	ied V	-1					
Initial Degree of Saturation	ı (%)	95.8	lqqı		$\downarrow \qquad \lor \qquad \lor$				
Final Void Ratio, e <sub>f</sub>	( )	0.74	V	-2					
Final Degree of Saturation	(%)	>100		-3					
BEN	DER ELEM	ENTS				Time (ms)			
		S-Wave							
Initial Time, T <sub>o</sub> (ms):		0.026							
Final Time, T <sub>f</sub> (ms):		0.080							
Travel Time (ms):		0.054							
Wave Velocity* (m/s):		409		Comments:	*Vs is based on as	sessment of first	shearv	wave arrival	
Shear Modulus, G (MPa)		322.4			Vs taken on sampl	e tested at a CSF	2.0f 0 2	5 after consoli	dating the
Vertical Effective Stress, σ	' <sub>v</sub> (kPa)	1000			sample to 1000 kP	a and prior to eve	lic DSS	S test	
Overconsolidation Ratio (C	DCR)	-							
Prepared By:		PS	<u> </u>	Checked By:	GF	-	Approve	ed Bv:	JPS
Date:		August 20, 2012		Date:	August 2	4, 2012	Date:		August 27, 2012

MEG TECI (A Divis Bender Elen	HNICA sion of MEG	L SERVICES Consulting Limited) Plocity Measuring	ļ						Marine + Earth <b>E Geosciences</b>
Project:	Port of Anche	orage			Borehole:	BH-003-1	2	Project No.:	12-MTS-009
Client:	CH2M Hill				Sample No.:	ST-16		Date:	July 25, 2012
Location:	Anchorage, U	JS			Depth (m):	43.28		Station:	DSS#1
WATER CO	NTENT &	UNIT WEIGHT			WAV	E TRAVEL CUR	VES		
	Initia	al Final							
Tin No.:	48	D3							
Wt. of Tin (g):	23.3	7 109.62							
Wet Weight (g):	79.5	300.17							
Dry Weight (g):	69.3	9 265.24							
Water Content (%):	22.0	) 22.4				S-WAVE			
Total Unit Weight (kN/m <sup>3</sup> ):	19.4	5 21.08		3					
Dry Unit Weight (kN/m <sup>3</sup> ):	15.9	4 17.22							C
CO	ONSOLIDA	TION		2	Δ				Bassiver
Specific Gravity, Gs:		2.69	ŝ						
Initial DSS Sample Height	(mm):	23.6	lge (		$   \land \rangle$				
Height after Consolidation	(mm):	21.8	/olts	0		4	06		8
Initial Void Ratio, e <sub>o</sub>	( )	0.66	ied V			-			
Initial Degree of Saturation	(%)	90.3	ilqq						
Final Void Ratio, e <sub>f</sub>	( )	0.53	A	-2					
Final Degree of Saturation	(%)	>100		-3					
BEN	IDER ELEI	MENTS				Time (ms)			
		S-Wave							
Initial Time, T <sub>o</sub> (ms):		0.026	1						
Final Time, T <sub>f</sub> (ms):		0.079							
Travel Time (ms):		0.053	1						
Wave Velocity* (m/s):		412		Comments:	*Vs is based on as	sessment of first	shear v	wave arrival	
Shear Modulus, G (MPa)		336.9			Vs taken on samp	e tested at a CSF	R of 0.2	0 after unloadi	ing the sample
Vertical Effective Stress, σ	' <sub>v</sub> (kPa)	500	1		to 500 kPa and prior to	cvclic DSS test			
Overconsolidation Ratio (C	DCR)	2.0				2,210 200 1001			
Prepared By:		PS	-	Checked By:	GI	-	Approve	ed By:	JPS
Date:		July 30, 2012		Date:	August 2	4, 2012	Date:	,	August 27. 2012

MEG TECI (A Divis Bender Elen	HNICA sion of MEG	AL SE Consulting	ERVICES							Marine + Earth <b>E Geosciences</b>
Project:	Port of Ancl	horage				Borehole:	BH-003-1	2	Project No.:	12-MTS-009
Client:	CH2M Hill					Sample No.:	ST-16		Date:	July 25, 2012
Location:	Anchorage,	US				Depth (m):	43.28		Station:	DSS#1
WATER CO	NTENT &	: UNIT W	EIGHT			WAV	E TRAVEL CUR	VES		
	Init	ial	Final							
Tin No.:	48	3	D11							
Wt. of Tin (g):	23.	37	210.42							
Wet Weight (g):	79.	52	406.36							
Dry Weight (g):	69.3	39	369.52							
Water Content (%):	22	.0	23.2				S-WAVE			
Total Unit Weight (kN/m <sup>3</sup> ):	19.	92	21.32		3					
Dry Unit Weight (kN/m <sup>3</sup> ):	16.	33	17.30							Source
CO	<b>NSOLID</b>	ATION				$\land$				
Specific Gravity, Gs:	1		2.69	Σ.		$\downarrow$				
Initial DSS Sample Height	(mm):		23.6	age (		$   \land \rangle$	$h \wedge $			
Height after Consolidation	(mm):		22.3	Volt	0	02	4	06		08
Initial Void Ratio, e <sub>o</sub>			0.06	ied	-1		Ť			
Initial Degree of Saturation	(%)		96.1	lqq∕						
Final Void Ratio, e <sub>f</sub>			0.52	1	-2	J				
Final Degree of Saturation	(%)		>100		-3					
BEN	DER ELE	EMENTS		1			Time (ms)			
			S-Wave							
Initial Time, T <sub>o</sub> (ms):			0.025	1						
Final Time, T <sub>f</sub> (ms):			0.084	1						
Travel Time (ms):			0.059							
Wave Velocity* (m/s):			377	1	Comments:	*Vs is based on as	sessment of first	shear v	wave arrival	
Shear Modulus, G (MPa)			289.2	1		Vs taken on sampl	e tested at a CSF	R of 0.2	5 after unload	ling the sample
Vertical Effective Stress, o	' <sub>v</sub> (kPa)		500	1		to 500 kPa and prior to	o cyclic DSS test			<u>U p</u>
Overconsolidation Ratio (C	OCR)		2.0	1						
Prepared By:			PS		Checked By:	GI	=	Approve	ed By:	JPS
Date:			July 30, 2012		Date:	August 2	4, 2012	Date:		August 27, 2012

MEG TEO	CHNIC	AL SI G Consultir	ERVICES							Marine + Earth <b>E Geosciences</b>
Project:	Port of And	chorage				Borehole:	BH-003-1	2	Project No.:	12-MTS-009
Client:	CH2M Hill	1				Sample No.:	ST-16		Date:	July 27, 2012
Location:	Anchorage	, US				Depth (m):	43.28		Station:	DSS#1
WATER O	CONTENT &	& UNIT V	VEIGHT			WAV	E TRAVEL CUR	VES		
	Ini	itial	Final							
Tin No.:	7	<b>'</b> 0	C08							
Wt. of Tin (g):	32	.88	142.79							
Wet Weight (g):	85	5.74	337.23							
Dry Weight (g):	75	.38	300.55							
Water Content (%):	24	4.4	23.3				S-WAVE			
Total Unit Weight (kN/m	1 <sup>3</sup> ): 19	.75	20.83		3					
Dry Unit Weight (kN/m <sup>3</sup> )	): 18	5.55	16.90							
	CONSOLID	ATION		1		$\land$				Source
Specific Gravity, Gs:		[	2.69	S						Keteivei
Initial DSS Sample Heid	aht (mm):		23.6	lge (		$   \rangle \land$	$\land \land$			
Height after Consolidati	on (mm):		22.2	Volts	0	02	4	06		08
Initial Void Ratio, e <sub>o</sub>	, , ,		0.66	ied 7	-1		$\lor$			
Initial Degree of Saturat	ion (%)		99.1	lqq						
Final Void Ratio, e <sub>f</sub>	. ,		0.56	~	-2	/				
Final Degree of Saturati	ion (%)		>100		-3					
B	ENDER EL	EMENTS	5	1			Time (ms)			
			S-Wave							
Initial Time, T <sub>o</sub> (ms):		1	0.024	1						
Final Time, T <sub>f</sub> (ms):		1	0.083	1						
Travel Time (ms):		1	0.059	1						
Wave Velocity* (m/s):			376	1	Comments:	*Vs is based on as	sessment of first	shearv	wave arrival	
Shear Modulus, G (MPa	a)		284.3	1		Vs taken on sampl	e tested at a CSF	R of 0.3	5 after unload	ding the sample
Vertical Effective Stress	, σ' <sub>v</sub> (kPa)		500	1		to 500 kPa and prior to	cvclic DSS test			
Overconsolidation Ratio	OCR)		2.0	1						
Prepared By:			PS	•	Checked By:	GF	-	Approv	ed By:	JPS
Date:			July 31, 2012		Date:	August 2	4, 2012	Date:	,	August 27. 2012

MEG TECI (A Divis Bender Elen	HNICAI sion of MEG Co nent Vel	L SERVICES onsulting Limited) ocity Measuring							Marine + Earth <b>E G</b> Geosciences
Project:	Port of Anchora	age			Borehole:	BH-003-1	2	Project No.:	12-MTS-009
Client:	CH2M Hill				Sample No.:	ST-16		Date:	July 27, 2012
Location:	Anchorage, US	8			Depth (m):	43.28		Station:	DSS#1
WATER CON	NTENT & U	INIT WEIGHT			WAV	E TRAVEL CUR	VES		
	Initial	Final							
Tin No.:	42	C101							
Wt. of Tin (g):	33.75	210.12							
Wet Weight (g):	188.86	6 400.48							
Dry Weight (g):	155.88	3 361.64							
Water Content (%):	27.0	25.6				S-WAVE			
Total Unit Weight (kN/m <sup>3</sup> ):	19.33	20.39		3					
Dry Unit Weight (kN/m <sup>3</sup> ):	15.22	16.23							C annua
СО	NSOLIDAT	TION		2					Bacoivar
Specific Gravity, Gs:		2.69	2						
Initial DSS Sample Height	(mm):	23.6	nge (			$\land \land$	h	$\land$	
Height after Consolidation	(mm):	22.1	Volta	0		4	06	0	8
Initial Void Ratio, e <sub>o</sub>	. ,	0.73	ied 1	-1	$1 \sim v$	-		-	-
Initial Degree of Saturation	(%)	99.0	lqq∧						
Final Void Ratio, e <sub>f</sub>		0.63	4	-2	$\forall$				
Final Degree of Saturation	(%)	>100		_3					
BEN	DER ELEM	IENTS				Time (ms)			
		S-Wave							
Initial Time, T <sub>o</sub> (ms):		0.024							
Final Time, T <sub>f</sub> (ms):		0.087							
Travel Time (ms):		0.063							
Wave Velocity* (m/s):		351		Comments:	*Vs is based on as	sessment of first	shear v	wave arrival	
Shear Modulus, G (MPa)		243.2			Vs taken on sampl	e tested at a CSF	R of 0.4	0 after unloadi	ng the sample
Vertical Effective Stress, o	<sub>v</sub> (kPa)	500			to 500 kPa and prior to	cyclic DSS test			
Overconsolidation Ratio (O	OCR)	2.0							
Prepared By:		PS		Checked By:	GF	-	Approve	ed By:	JPS
Date:		July 31, 2012		Date:	August 24	1, 2012	Date:	,	August 27, 2012

MEG TECI (A Divis Bender Elen	HNICA sion of MEG	AL SE Consultin	ERVICES							Marine + Earth <b>M E G G G G G G G G G G</b>
Project:	Port of Ancl	norage				Borehole:	BH-003-1	2	Project No.:	12-MTS-009
Client:	CH2M Hill					Sample No.:	ST-16		Date:	August 07, 2012
Location:	Anchorage,	US				Depth (m):	43.28		Station:	DSS#1
WATER CO	NTENT &	UNIT V	EIGHT			WAV	E TRAVEL CUR	VES		
	Init	ial	Final							
Tin No.:	98	3	C17							
Wt. of Tin (g):	33.	89	207.13	1						
Wet Weight (g):	52.	31	402.23							
Dry Weight (g):	48.	97	364.14							
Water Content (%):	22	.1	24.3				S-WAVE			
Total Unit Weight (kN/m <sup>3</sup> ):	19.	76	21.44		3					
Dry Unit Weight (kN/m <sup>3</sup> ):	16.	20	17.26							
CC	ONSOLIDA	ATION			2	Δ				Receiver
Specific Gravity, Gs:			2.69	ŝ				_		
Initial DSS Sample Height	(mm):		23.6	ıge (		$   \land \land$				
Height after Consolidation	(mm):		22.2	Volta			4	06	(	)8
Initial Void Ratio, e₀	. ,		0.63	ied 1	-1	V				
Initial Degree of Saturation	(%)		94.8	lqqı						
Final Void Ratio, e <sub>f</sub>			0.53	~		<b>/</b>				
Final Degree of Saturation	(%)		>100		-3					
BEN	DER ELF	MENTS					Time (ms)			
			S-Wave							
Initial Time, $T_o$ (ms):			0.024	1						
Final Time, T <sub>f</sub> (ms):			0.075	1						
Travel Time (ms):			0.051	1						
Wave Velocity* (m/s):			435	1	Comments:	*Vs is based on as	sessment of first	shear v	vave arrival	
Shear Modulus, G (MPa)			380.3	1	'	Vs taken on sampl	e tested at a CSF	R of 0.0	5 after consol	idating the
Vertical Effective Stress, $\sigma$	' <sub>v</sub> (kPa)		1000	1		sample to 1000 kPa	and prior to applic	ation of	static bias	
Overconsolidation Ratio (C	DCR)		-	1			,			
Prepared By:			PS	<b></b>	Checked By:	GI	-	Approve	ed By:	JPS
Date:			August 07, 2012		Date:	August 2	4, 2012	Date:	•	August 27, 2012

MEG TEC (A Divi Bender Eler	Marine + Earth <b>E G G G G G G G G G G</b>										
Project:	Port of Anc	horage				Borehole:	BH-003-1	2	Project No.:	12-MTS-009	
Client:	CH2M Hill					Sample No.:	ST-16		Date:	August 07, 2012	
Location:	Anchorage,	US				Depth (m):	43.28		Station:	DSS#1	
WATER CONTENT & UNIT WEIGHT					WAVE TRAVEL CURVES						
	Init	ial	Final								
Tin No.:	6	i	C08								
Wt. of Tin (g):	34.	92	142.78	1							
Wet Weight (g):	74.	95	338.70								
Dry Weight (g):	67.	93	303.51								
Water Content (%):	21	.3	21.9	1			S-WAVE				
Total Unit Weight (kN/m <sup>3</sup> ):	: 19.	93	21.41		3						
Dry Unit Weight (kN/m <sup>3</sup> ):	16.	43	17.57								
CONSOLIDATION			1	2	•				Source		
Specific Gravity, Gs: 2.69			S						Receiver		
Initial DSS Sample Height (mm): 23.6		ige (									
Height after Consolidation (mm): 22.1		/olta	0					08			
Initial Void Ratio, e	itial Void Ratio. e		0.61	ed V	-1				· · · · · · · · · · · · · · · · · · ·		
Initial Degree of Saturation	uration (%)		94.4	ilqq							
Final Void Ratio, e <sub>f</sub>	()		0.50	•	-2	/					
Final Degree of Saturation	n (%)	>100			_3						
BENDER ELEMENTS							Time (ms)				
S-Wave											
Initial Time, T <sub>2</sub> (ms):			0.026	1							
Final Time, T <sub>4</sub> (ms):			0.071	1							
Travel Time (ms):			0.045	1							
Wave Velocity* (m/s):         491		491	1	Comments:	*Vs is based on as	sessment of first	shearv	wave arrival			
Shear Modulus, G (MPa) 488.9		488.9	1	Commento.	Vs taken on sampl	e tested at a CSF	? of 0.1	0 after consol	idating the		
Vertical Effective Stress, $\sigma'_{v}$ (kPa) 1000		1000	1		sample to 1000 kPa	and prior to applic	ation of	static bias			
Overconsolidation Ratio (OCR) -		1									
Prepared By:	Prepared By: PS		Į	Checked By: GF Approved By:		ed By:	JPS				
Date:			August 07, 2012		Date:	August 2	4, 2012	Date:		August 27, 2012	

MEG TECHNICAL SERVICES (A Division of MEG Consulting Limited) Bender Element Velocity Measuring												
Project:	Port of Anch	norage				Borehole:	BH-003-1	2	Project No.:	12-MTS-009		
Client:	CH2M Hill					Sample No.:	ST-16		Date:	July 25, 2012		
Location:	Anchorage,	US				Depth (m):	43.28		Station:	DSS#1		
WATER CONTENT & UNIT WEIGHT					WAVE TRAVEL CURVES							
	Init	ial	Final									
Tin No.:	6		C30									
Wt. of Tin (g):	34.9	92	199.10									
Wet Weight (g):	151	.66	394.22									
Dry Weight (g):	130.	.81	357.24									
Water Content (%):	21.	.7	23.4				S-WAVE					
Total Unit Weight (kN/m <sup>3</sup> ):	19.	92	22.00		2							
Dry Unit Weight (kN/m <sup>3</sup> ):	16.3	36	17.83									
CONSOLIDATION				1						Source		
Specific Gravity, Gs: 269			S									
Initial DSS Sample Height (mm): 23.6		ige (										
Height after Consolidation (mm): 21.7		/olta	0			06		8				
Initial Void Ratio. e		0.61		ed V			- <b>U</b>		0			
Initial Degree of Saturation	al Degree of Saturation (%)		95.4	ilqq								
Final Void Ratio, e <sub>f</sub>	(,)		0.48	◄	-2							
Final Degree of Saturation	(%)	>100			-3							
BENDER ELEMENTS					Time (ms)							
S-Wave				1								
Initial Time, T <sub>o</sub> (ms):			0.024	1								
Final Time, T <sub>f</sub> (ms):			0.071	1								
Travel Time (ms):			0.047									
Wave Velocity* (m/s): 461		Comments: <u>*Vs is based on assessment of first shear wave arrival</u> Vs taken on sample tested at a CSR of 0.15 after consolidating the										
Shear Modulus, G (MPa) 430.9												
Vertical Effective Stress, σ' <sub>v</sub> (kPa) 1000		1		sample to 1000 kPa ar	nd prior to application	n of statio	c bias	<u>.</u>				
Overconsolidation Ratio (OCR) -		1										
Prepared By: PS			Checked By:	GF Approved Bv:		ed By:	JPS					
Date:	Date: August 20, 2012			Date:	August 24, 2012 Date:		-	August 27, 2012				

MEG TECHNICAL SERVICES (A Division of MEG Consulting Limited) Bender Element Velocity Measuring												
Project:	Port of Ancho	orage				Borehole:	BH-003-12	2	Project No.:	12-MTS-009		
Client:	CH2M Hill					Sample No.:	ST-16		Date:	August 07, 2012		
Location:	Anchorage, U	JS				Depth (m):	43.28		Station:	DSS#1		
WATER CONTENT & UNIT WEIGHT					WAVE TRAVEL CURVES							
	Initial Final											
Tin No.:	25		C08									
Wt. of Tin (g):	34.6	5	142.77									
Wet Weight (g):	124.2	29	335.98									
Dry Weight (g):	105.5	53	296.66									
Water Content (%):	26.5	5	25.6				S-WAVE					
Total Unit Weight (kN/m <sup>3</sup> ):	19.7	3	21.39		3							
Dry Unit Weight (kN/m <sup>3</sup> ):	15.6	0	17.04							Source		
CONSOLIDATION					Δ				Beceiver			
Specific Gravity, Gs: 2.69			ŝ									
Initial DSS Sample Height (mm): 23.6		lge (		$   \land \land \land$			$ \land \land$					
Height after Consolidation (mm): 21.6		/olta			4	06	0	8				
Initial Void Ratio, e <sub>o</sub>		0.6	69	ied V	-1							
Initial Degree of Saturation	ial Degree of Saturation (%)		00	liqq		$\vee$ $\vee$						
Final Void Ratio, e <sub>f</sub>	d Ratio, e <sub>f</sub>		55	V	-2			_				
Final Degree of Saturation	(%)	>100										
BENDER ELEMENTS				Time (ms)								
S-Wave												
Initial Time, T <sub>o</sub> (ms):		0.0	25	1								
Final Time, T <sub>f</sub> (ms):		0.0	77	1								
Travel Time (ms):		0.0	52	1								
Wave Velocity* (m/s): 415		5	1	Comments.	*Vs is based on as	sessment of first	shearv	wave arrival				
Shear Modulus, G (MPa) 347.2		7.2	1		Vs taken on sample	e tested at a CSF	R of 0.2	0 after consolio	dating the			
Vertical Effective Stress, $\sigma'_v$ (kPa) 1000		00	1		sample to 1000 kP	a and prior to apr	olication	n of static bias				
Overconsolidation Ratio (OCR) -		1										
Prepared By: PS			Checked By: GF Approved By:		ed Bv:	JPS						
Date:	Date: August 12. 2012			Date:	August 24, 2012 Date:		···-,·	August 27, 2012				