

000047

<h1 style="margin: 0;">RAEBURN</h1> <p style="margin: 0; font-size: small;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D		Contract No: 21703											
		Client: Bifinger Berger UK Ltd Engineer: Bifinger Berger UK Ltd		Borehole No: DP05											
Location:		Orientation: Vertical		Equipment: Dando 2000											
Inspection Pit to 1.20 Cable Percussion to 5.00															
	Progress	Samples and Tests	Casing	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill						
	Depth	Type Result	Depth						Depth						
	0.30					# MADE GROUND (compact clay)									
	0.50	B				# MADE GROUND (mixture of sand, wood, stones, wire netting and ash)									
	1.00	B													
	1.20					# DYNAMIC PROBE TEST									
	5.00					END OF BOREHOLE			5.00						
Remarks:															
# Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B.															
Driller HM		Originator		Ground-water		Water Added		Chiselling		Flush		Fig No: B Sheet 1 of 1 Scale 1:50			
Chk & App		Status Prelim		Struck	Rose To	Time(mins)	Cut Off	From	To	From	To			Time(hr)	Returns

SME: BOREHOLE File: I:\2003\SSIS\PROJECTS\GINT\PROJECTS\21703.GPJ Printed: 14/04/2010 10:53:38 Raeburn Drilling and Geotechnical, Whistlerbery Rd, Hamilton, M.L.3 OHP Tel: 01698-711177 E-mail: enquiries@raeburndrilling.com

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<h1 style="margin: 0;">RAEBURN</h1> <p style="margin: 0;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D		Contract No: 21703																																																												
		Client: Bilfinger Berger UK Ltd Engineer: Bilfinger Berger UK Ltd		Borehole No: DP06																																																												
Location:		Orientation: Vertical		Equipment: Dando 2000																																																												
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Sample Depth</th> <th colspan="2">Samples and Tests</th> <th rowspan="2">Casing Depth</th> <th rowspan="2">Level (mOD)</th> <th rowspan="2">Depth</th> <th rowspan="2">Description of Strata</th> <th rowspan="2">Legend</th> <th rowspan="2">Water Depth</th> <th colspan="2">Backfill</th> </tr> <tr> <th>Type</th> <th>Result</th> <th>Dynamic</th> <th>Depth</th> </tr> </thead> <tbody> <tr> <td>0.30</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td># MADE GROUND (compact clay)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>0.50</td> <td>B</td> <td></td> <td></td> <td></td> <td></td> <td># MADE GROUND (mixture of sand, wood, stones, wire netting and ash)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1.00</td> <td>B</td> <td></td> <td></td> <td></td> <td>1.20</td> <td># DYNAMIC PROBE TEST</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="6"></td> <td style="text-align: center;">5.00</td> <td colspan="4" style="text-align: center;">END OF BOREHOLE</td> </tr> </tbody> </table>		Sample Depth	Samples and Tests		Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill		Type	Result	Dynamic	Depth	0.30						# MADE GROUND (compact clay)					0.50	B					# MADE GROUND (mixture of sand, wood, stones, wire netting and ash)					1.00	B				1.20	# DYNAMIC PROBE TEST											5.00	END OF BOREHOLE							
Sample Depth	Samples and Tests		Casing Depth	Level (mOD)							Depth	Description of Strata	Legend	Water Depth	Backfill																																																	
	Type	Result			Dynamic	Depth																																																										
0.30						# MADE GROUND (compact clay)																																																										
0.50	B					# MADE GROUND (mixture of sand, wood, stones, wire netting and ash)																																																										
1.00	B				1.20	# DYNAMIC PROBE TEST																																																										
						5.00	END OF BOREHOLE																																																									
Remarks: # Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B.								Diam To Depth Boring Casing																																																								
Driller HM		Originator Status Prelim		Ground-water Struck Rose To Time(mins) Cut Off		Water Added From To		Chiselling From To Time(hr)		Flush Returns Type To Depth																																																						
Chk & App										Fig No: B Sheet 1 of 1 Scale 1:50																																																						

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RAEBURN
DRILLING AND GEOTECHNICAL LTD.

Site: SECTION 5A - RETAINING WALLS S21B & S21D
Client: Bilfinger Berger UK Ltd
Engineer: Bilfinger Berger UK Ltd

Contract No: 21703
Borehole No: DP07
Inspection Pit to 1.20
Cable Percussion to 6.00

Location: Orientation: Vertical Equipment: Dando 2000

Progress	Sample Depth	Samples and Tests		Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill Depth
		Type	Result							
31/3 20/0	0.50	B				0.30	# MADE GROUND (compact clay)			
	1.00	B				1.20	# MADE GROUND (mixture of sand, wood, stones, wire netting and ash)			
						1.20	# DYNAMIC PROBE TEST			
31/3						6.00	END OF BOREHOLE			6.00

Remarks:
Description based on Driller's log.
An inspection pit was excavated by hand to a depth of 1.20m to clear services.
Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B.

Diam	To Depth	
	Boring	Casing

Driller HM	Originator	Ground-water			Water Added		Chiselling			Flush			
		Struck	Rosa To	Time(mins)	Cut Off	From	To	From	To	Time(h)	Returns	Type	To Depth
Chk & App	Status Prelim												

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Fig No:
B
Sheet 1 of 1
Scale 1:50

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000050

<h1 style="margin: 0;">RAEBURN</h1> <p style="margin: 0; font-size: small;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D		Contract No: 21703									
		Client: Bilfinger Berger UK Ltd Engineer: Bilfinger Berger UK Ltd		Borehole No: DP08									
Location:		Orientation: Vertical		Equipment: Dando 2000									
Progress 1/4 2/16 1/4	Sample Depth	Samples and Tests Result	Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill Depth				
	Type												
	0.30					# MADE GROUND (compact ash)							
	0.50	B				# MADE GROUND (mixture of silt, clay, wood, sandstone and sand)							
	1.00	B				# DYNAMIC PROBE TEST							
	5.00					END OF BOREHOLE		DRY	5.00				
Remarks: # Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B.								Diam	To Depth Boring	Casing			
Driller HM	Originator	Ground-water			Water Added		Chiselling		Flush		RAEBURN Fig No: B Sheet 1 of 1 Scale 1:50		
Chk & App	Status Prelim	Struck	Rose To	Time (mins)	Cut Off	From	To	From	To	Time (hr)		Returns	Type

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		Site: SECTION 5A - RETAINING WALLS S21B & S21D						Contract No: 21703		
		Client: Bilfinger Berger UK Ltd Engineer: Bilfinger Berger UK Ltd						Borehole No: DP09		
Location:			Orientation: Vertical			Equipment: Dando 2000			Inspection Pit to 1.20 Cable Percussion to 5.00	
Progress	Sample Depth	Samples and Tests		Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Borehole Depth
		Type	Result							
1/4	0.30						# MADE GROUND (compact clay)			
2010	0.50	B					# MADE GROUND (mixture of sah, clay, wood, sandstone and sand)			
	1.00	B								
	1.20						# DYNAMIC PROBE TEST			
	5.00						END OF BOREHOLE		DRY	5.00
Remarks:									Diam	To Depth
# Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B.									Boring	Casing
Driller HM	Originator	Ground-water			Water Added		Chiselling		Flush	
		Struck	Rose To	Time (mins)	Cut Off	From	To	From	To	Time (hr)
								Returns	Type	To Depth
Chk & App	Status Prelim									
									Fig No: B Sheet 1 of 1 Scale 1:50	

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<h1 style="margin: 0;">RAEBURN</h1> <p style="margin: 0; font-size: small;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D				Contract No: 21703					
		Client: Bilfinger Berger UK Ltd Engineer: Bilfinger Berger UK Ltd				Borehole No: DP10					
Location:		Orientation: Vertical		Equipment: Dando 2000							
Progress 1/1 2010	Sample Depth 0.50 1.00	Samples and Tests Type B B Result	Casing Depth	Level (mOD)	Depth 0.30 1.20 6.00	Description of Strata # MADE GROUND (compact clay) # MADE GROUND (mixture of ash, clay, wood, sandstone and sand) # DYNAMIC PROBE TEST END OF BOREHOLE	Legend	Water Depth	Backfill Depth 6.00		
Remarks: # Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B.								Diam	To Depth Boring Casing		
Driller HM	Originator	Ground-water Struck Rose To Time (mins) Cut Off		Water Added From To		Chiselling From To Time (hr)		Flush Returns Type To Depth			Fig No: B Sheet 1 of 1 Scale 1:50
Chk & App Status Prelim											

Style: BOREHOLE File: \200052\PROJECTS\PROJECTS\21703.CPJ Printed: 14/04/2010 10:53:46 Raeburn Drilling and Geotechnical, Whistaberry Rd., Hamilton, ML3 0HP Tel: 01698-711177 E-mail: enquiries@raeburndrilling.com

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<h1 style="margin: 0;">RAEBURN</h1> <p style="margin: 0; font-size: small;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D		Contract No: 21703									
		Client: Bilfinger Berger UK Ltd Engineer: Bilfinger Berger UK Ltd		Borehole No: DP11									
Location:		Orientation: Vertical		Equipment: Dando 2000									
Style: BOREHOLE File: \2003SBS\PROJECTS\GINTW\PROJECTS\21703.GPJ Printed: 14/04/2010 10:53:48 Raeburn Drilling and Geotechnical, Whiteberry Rd, Hamilton ML3 0HP Tel: 01698-711177 E-mail: enquiries@raeburndrilling.com	Progress	Sample Depth	Samples and Tests	Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill			
	Type	Result	Depth	Depth	Depth	Depth	Symbol	Depth	Depth	Depth			
						0.15	# TARMAC			0.15			
						0.40	# MADE GROUND (hardcore)						
	0.40	B					# Firm brown sandy CLAY and gravel						
						1.20	# DYNAMIC PROBE TEST						
	1.20	B											
						5.20	END OF BORE-HOLE			5.20			
Remarks: # Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005, Dyanmic Probe Super Heavy, Method B. Ground-water was encountered at a depth of 2.10m.									Diam	To Depth			
									Boring	Casing			
Driller	Originator	Ground-water			Water Added		Chiselling		Flush			Fig No: B Sheet 1 of 1 Scale 1:50	
DP		Struck	Rose To	Time(mins)	Cut Off	From	To	From	To	Time(hr)			Returns
Chk & App	Status	2.10											
	Prelim												

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<h1 style="margin: 0;">RAEBURN</h1> <p style="margin: 0;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D		Contract No: 21703	
		Client: Bilfinger Berger UK Ltd		Borehole No: DP12	
		Engineer: Bilfinger Berger UK Ltd		Inspection Pit to 1.20 Cable Percussion to 7.00	
Location:		Orientation: Vertical		Equipment: Dando 2000	

Progress	Sample Depth	Samples and Tests		Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill	
		Type	Result							Symbol	Depth
0.10						0.10	# TARMAC				0.10
0.25						0.25	# MADE GROUND (hardcore)				
0.40	B						# MADE GROUND (ash, sand and gravel)				
0.60						0.60					
0.80	B						# MADE GROUND (brick, ash, sand, clay and gravel)				
1.20						1.20	# DYNAMIC PROBE TEST				
						7.00	END OF BOREHOLE				7.00

Remarks: # Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B. Ground-water was encountered at a depth of 1.80m.										Diam	To Depth	
											Boring	Casing

Driller DP	Originalor	Ground-water			Water Added		Chiselling			Flush			RAEBURN	Fig No: B Sheet 1 of 1 Scale 1:50
		Struck	Rose	To Time (mins)	Cut Off	From	To	From	To	Time (hr)	Returns	Type		
Chk & App	Status Prelim	1.80												

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<h1 style="margin: 0;">RAEBURN</h1> <p style="font-size: small; margin: 0;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D			Contract No: 21703						
		Client: Bilfinger Berger UK Ltd Engineer: Bilfinger Berger UK Ltd			Borehole No: DP13						
Location:		Orientation: Vertical		Equipment: Dando 2000							
Progress 0.00 0.30 0.80 1.20 7.00	Sample Depth	Samples and Tests Type Result	Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill Symbol	Depth	
	0.10					# TARMAC					
0.30	B					# MADE GROUND (hardcore)					
0.80	B					# MADE GROUND (ash, sand and gravel)					
1.20						# DYNAMIC PROBE TEST					
7.00						END OF BOREHOLE				7.00	
Remarks: # Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B. Ground-water was encountered at a depth of 1.80m.								Diam	To Depth Boring Casing		
Driller DP	Originator	Ground-water Struck Rose To Time(mins) Cut Off			Water Added From To		Chiselling From To Time(hr)		Flush Returns Type To Depth		RAEBURN Fig No: B Sheet 1 of 1 Scale 1:50
Chk & App	Status Prelim	1.80									

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<h1 style="margin: 0;">RAEBURN</h1> <p style="margin: 0; font-size: small;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D				Contract No: 21703							
		Client: Bilfinger Berger UK Ltd Engineer: Bilfinger Berger UK Ltd				Borehole No: DP14							
Location:		Orientation: Vertical		Equipment: Dando 2000		Inspection Pit to 1.20							
Progress	Sample Depth	Samples and Tests		Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill			
		Type	Result							Symbol	Depth		
9/4	0.10					0.10	# TARMAC				0.10		
9/4	0.40	B				0.40	# MADE GROUND (hardcore)						
	0.40						# MADE GROUND (ash, sand and gravel)						
	0.80	B				0.80	# MADE GROUND (clay, ash, sand and gravel)						
						1.20	# DYNAMIC PROBE TEST						
						7.00	END OF BOREHOLE				7.00		
Remarks: # Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B. Ground-water was encountered at a depth of 1.85m.									Diam	To Depth			
										Boring	Casing		
Driller DP	Originator	Ground-water			Water Added		Chiselling			Flush		RAEBURN	Fig No: B Sheet 1 of 1 Scale 1:50
Chk & App	Status Prelim	Struck 1.85	Rose To	Time (mins)	Cut Off	From	To	From	To	Time (hr)	Returns		

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<h1 style="margin: 0;">RAEBURN</h1> <p style="font-size: small; margin: 0;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D		Contract No: 21703	
		Client: Bilfinger Berger UK Ltd		Borehole No: DP15	
		Engineer: Bilfinger Berger UK Ltd		Inspection Pit to 1.20 Cable Percussion to 7.00	
Location:		Orientation: Vertical		Equipment: Dando 2000	

Progress	Sample Depth	Sample Type	Samples and Tests		Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill	
			Result								Symbol	Depth
9/4/2010							0.15	# TARMAC				0.15
	0.60	B					0.60	# MADE GROUND (hardcore)				
	0.90	B					0.90	# MADE GROUND (clay, ash, sand and gravel)				
							1.20	# Firm brown sandy CLAY and gravel				
							1.20	# DYNAMIC PROBE TEST				
							7.00	END OF BOREHOLE				7.00

Remarks: # Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B. Ground-water was encountered at a depth of 1.60m.												Diam		To Depth	
												Boring		Casing	

Driller DP	Originator	Ground-water			Water Added		Chiselling			Flush			<b style="writing-mode: vertical-rl; transform: rotate(180deg);">RAEBURN	Fig No: B Sheet 1 of 1 Scale 1:50
		Struck	Rose To Time(mins)	Cut Off	From	To	From	To	Time(hr)	Returns	Type	To Depth		
Chk & App	Status Prelim	1.60												

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<h1 style="margin: 0;">RAEBURN</h1> <p style="margin: 0; font-size: small;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D		Contract No: 21703	
		Client: Bilfinger Berger UK Ltd		Borehole No: DP16	
		Engineer: Bilfinger Berger UK Ltd		Inspection Pit to 1.20 Cable Percussion to 7.00	
Location:		Orientation: Vertical		Equipment: Dando 2000	

Progress	Sample Depth	Samples and Tests		Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill	
		Type	Result							Symbol	Depth
	0.15					0.15	# TARMAC				0.15
							# MADE GROUND (hardcore)				
	0.60	B				0.60	# MADE GROUND (clay, ash, sand and gravel)				
	0.90	B				0.90	# Firm brown sandy CLAY and gravel				
						1.20	# DYNAMIC PROBE TEST				
						7.00	END OF BOREHOLE				7.00

Remarks:

Description based on Driller's log.

An inspection pit was excavated by hand to a depth of 1.20m to clear services.

Test undertaken in accordance with BS EN ISO 22476-2:2005; Dynamic Probe Super Heavy, Method B.

Ground-water was encountered at a depth of 1.90m.

Diam	To Depth	
	Boring	Casing

Driller DP	Originator	Ground-water			Water Added		Chiselling			Flush				Fig No: B Sheet 1 of 1 Scale 1:50
		Struck	Rose	To Time (mins)	Cut Off	From	To	From	To	Time (hr)	Returns	Type		
Chk & App	Status Prelim	1.90												

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RAEBURN
DRILLING AND GEOTECHNICAL LTD

Site: SECTION 5A - RETAINING WALLS S21B & S21D
Client: Bilfinger Berger UK Ltd
Engineer: Bilfinger Berger UK Ltd

Contract No: 21703
Borehole No: DP17

Inspection Pit to 1.20
Cable Percussion to 7.00

Location: Orientation: Vertical Equipment: Dando 2000

Progress	Sample Depth	Samples and Tests		Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill	
		Type	Result							Depth	Depth
8/4 2010	0.15					0.15	# TARMAC				0.15
	0.30	B				0.30	# MADE GROUND (hardcore) # MADE GROUND (ash, clay, sand, gravel and broken tar)				
	0.70	B				0.70	# MADE GROUND (clay, ash, sand, gravel and brick fragments)				
	1.20					1.20	# DYNAMIC PROBE TEST				
	7.00					7.00	END OF BOREHOLE				7.00

Remarks:
Description based on Driller's log.
An inspection pit was excavated by hand to a depth of 1.20m to clear services.
Test undertaken in accordance with BS EN ISO 22476-2:2005: Dyanmic Probe Super Heavy, Method B.
Ground-water was encountered at a depth of 2.60m.

Diam	To Depth	
	Boring	Casing

Driller DJP	Originator	Ground-water			Water Added		Chiselling			Flush			
		Struck	Rose To	Time (mins)	Cut Off	From	To	From	To	Time (hr)	Returns	Type	To Depth
		2.80											
Chk & App	Status Prelim												

RAEBURN

Fig No:
B
Sheet 1 of 1
Scale 1:50

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<h1 style="margin: 0;">RAEBURN</h1> <p style="margin: 0;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D		Contract No: 21703	
		Client: Bilfinger Berger UK Ltd Engineer: Bilfinger Berger UK Ltd		Borehole No: DP18	
Location:		Orientation: Vertical		Equipment: Dando 2000	
Inspection Pit to 1.20 Cable Percussion to 7.00					

Progress	Sample Depth	Samples and Tests		Casing Depth	Level (MOD)	Depth	Description of Strata	Legend	Water Depth	Backfill	
		Type	Result							Diameter	Depth
8/4 2010	0.15					0.15	# TARMAC # MADE GROUND (hardcore)				0.15
	0.50	B				0.50	# MADE GROUND (clay, ash, sand, gravel, timber and brick fragments)				
	0.90	B				0.90					
	1.20					1.20	# DYNAMIC PROBE TEST				
8/4						7.00	END OF BORE-HOLE				7.00

Remarks:										Diam	To Depth	
# Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B. Ground-water was encountered at a depth of 3.00m.											Boring	Casing

Driller DP	Originator	Ground-water			Water Added		Chiselling		Flush			Fig No: B Sheet 1 of 1 Scale 1:50
		Struck	Rose To	Time (mins)	Cut Off	From	To	From	To	Time (hr)	Returns	
Chk & App	Status Prelim	3.00										

Style: BOREHOLE File: V2003SBSIPROJECTS\GINTWAPROJECTS\21703.GPJ Printed: 14/04/2010 10:54:00 Raeburn Drilling and Geotechnical, Whitlabberry Rd, Hamilton ML3 0HP Tel: 01698-711177 E-mail: enquiries@raeburndrilling.com

000061

<h1 style="margin: 0;">RAEBURN</h1> <p style="margin: 0;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D				Contract No: 21703	
		Client: Bilfinger Berger UK Ltd Engineer: Bilfinger Berger UK Ltd				Borehole No: DP19	
Location:		Orientation: Vertical		Equipment: Dando 2000			
Inspection Pit to 1.20 Cable Percussion to 7.00							

Progress	Sample Depth	Samples and Tests		Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill	
		Type	Result							Depth	Depth
7/4 2010						0.10	# TARMAC # MADE GROUND (hardcore)				0.10
	0.50	B				0.50	# MADE GROUND (ash, sand, gravel and brick fragments)				
	0.80	B				0.80	# MADE GROUND (ash, sand, gravel, clay and brick)				
						1.20	# DYNAMIC PROBE TEST				
						7.00	END OF BOREHOLE				7.00

Remarks: # Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B. Ground-water was encountered at a depth of 3.25m.										Diam To Depth Boring Casing	
---	--	--	--	--	--	--	--	--	--	-----------------------------------	--

Driller DP	Originator	Ground-water			Water Added		Chiselling			Flush				Fig No: B Sheet 1 of 1 Scale 1:50
		Struck 3.25	Rose To Time (mins)	Cut Off	From	To	From	To	Time (hr)	Returns	Type	To Depth		
Chk & App	Status Prelim													

Style: BOREHOLE File: I:\2003\SSS\PROJECTS\GINT\PROJECTS\21703.GPJ Printed: 14/04/2010 10:54:01 Raeburn Drilling and Geotechnical, Whiteberry Rd, Hamilton, ML3 0HP Tel: 01699-711177 E-mail: enquiries@raeburndrilling.com

000062

<h1 style="margin: 0;">RAEBURN</h1> <p style="margin: 0; font-size: small;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D				Contract No: 21703				
		Client: Billfinger Berger UK Ltd Engineer: Billfinger Berger UK Ltd				Borehole No: DP20				
Location:		Orientation: Vertical		Equipment: Dando 2000						
S/Nr: BOREHOLE File: 1\2003\BSP\PROJECTS\GINTW\PROJECTS\1703.GPJ Printed: 14/04/2010 10:54:03 Raeburn Drilling and Geotechnical, Whistlersberry Rd, Hamilton, ML3 0HP Tel: 01698-711177 E-mail: enquiries@raeburndrilling.com	Progress 7/4 2010	Samples and Tests Depth Type Result		Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Backfill Symbol Depth
	0.50 B 0.90 B				0.20 0.45 0.90 1.20	0.20 0.45 0.90 1.20	# TARMAC # MADE GROUND (hardcore) # MADE GROUND (ash, sand, gravel and brick fragments) # MADE GROUND (ash, sand, gravel, grass and clay) # DYNAMIC PROBE TEST	0.10 6.00	6.00	6.00
7/4 6.00 END OF BOREHOLE										
Remarks: # Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005, Dyanmic Probe Super Heavy, Method B. Ground-water was encountered at a depth of 3.60m.									Diam To Depth Boring Casing	
Driller DP	Originator	Ground-water Struck 3.60		Water Added From To	Chiselling From To Time(hr)		Flush Returns Type To Depth		Fig No: B Sheet 1 of 1 Scale 1:50	
Chk & App	Status Prelim									

000063

<h1 style="margin: 0;">RAEBURN</h1> <p style="font-size: small; margin: 0;">DRILLING AND GEOTECHNICAL LTD</p>		Site: SECTION 5A - RETAINING WALLS S21B & S21D				Contract No: 21703			
		Client: Bilfinger Berger UK Ltd Engineer: Bilfinger Berger UK Ltd				Borehole No: DP21			
Location:		Orientation: Vertical		Equipment: Dando 2000					
Progress 7/4 2010	Sample Depth	Samples and Tests Type Result	Casing Depth	Level (mOD)	Depth	Description of Strata	Legend	Water Depth	Bedfit Symbol Depth
	0.10	B			0.10	# TARMAC # MADE GROUND (hardcore)			0.10
	0.50	B			0.50	# MADE GROUND (ash, sand, gravel and brick fragments)			
					1.20	# DYNAMIC PROBE TEST			
					6.20	END OF BOREHOLE			6.20
Remarks: # Description based on Driller's log. An inspection pit was excavated by hand to a depth of 1.20m to clear services. Test undertaken in accordance with BS EN ISO 22476-2:2005; Dyanmic Probe Super Heavy, Method B. Ground-water was encountered at a depth of 3.90m.								Diam	To Depth Boring Casing
Driller DP	Originator	Ground-water Struck Rose To Time(mins) Cut Off		Water Added From To		Chiselling From To Time(hr)		Returns	Flush Type To Depth
Chk & App	Status Prelim	3.90							
								Fig No: B Sheet 1 of 1 Scale 1:50	

Style: BOREHOLE File: \\2003SBS\PROJECTS\GINT\PROJECTS\21703.GPJ Printed: 14/04/2010 10:54:05 Raeburn Drilling and Geotechnical, Willsieberry Rd, Hamilton ML3 0HP Tel: 01698-711177 E-mail: enquiries@raeburndrilling.com

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	<h2>Technical Query</h2>	Form : F64-3 Rev : B Page : 2 of 2
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Reply:

The additional GI information demonstrates that the depth extents of soft deposits below the plan areas of Structures S21B and S21D are greater in certain areas than interpreted from the original GI data available at the time of Detailed Design.

The foundation details for the retaining wall (currently shown on IFC drawings as excavation of soft materials to various depths and replacement with compacted granular fill) will need to be revised to account for the change in ground conditions.

The proposed foundation solution will now comprise ground improvement through a combination of:

1. Excavation of soft deposits and replacement with compacted granular fill under the supervision of a suitably qualified and experienced geotechnical engineer from the Design Organisation for the more shallow depths of soft materials, as originally proposed;
2. In-situ soil improvement via cement stabilisation whereby cement columns are created to the base of the Made Ground/Alluvial deposits using in-situ deep dry soil mixing techniques with CEM 1 cement binder. This technique will be used to provide a foundation solution for the deeper depths of soft materials.

The proposed foundation options are depicted in draft Drg No. ULE90130-05-RTW-00992 v1. The requirements for ground improvement through cement stabilisation are defined in the attached draft performance specification which is currently being incorporated into Appendix 6/13 of the Specification.

The design of the reinforced earth retaining wall elements above the foundations is unaffected by the change to the foundation solution. However, BSC will need to demonstrate to the Designer that in-situ soil improvement has achieved the specified performance requirements via the submission of the results of zone testing before construction of the reinforced earth retaining wall above the foundations can take place.

A Design Change Request will be submitted shortly for revisions required to the Design and Specification packages for Structures S21B, S21D, S21C and S505 to address the change in ground conditions.

Signed:



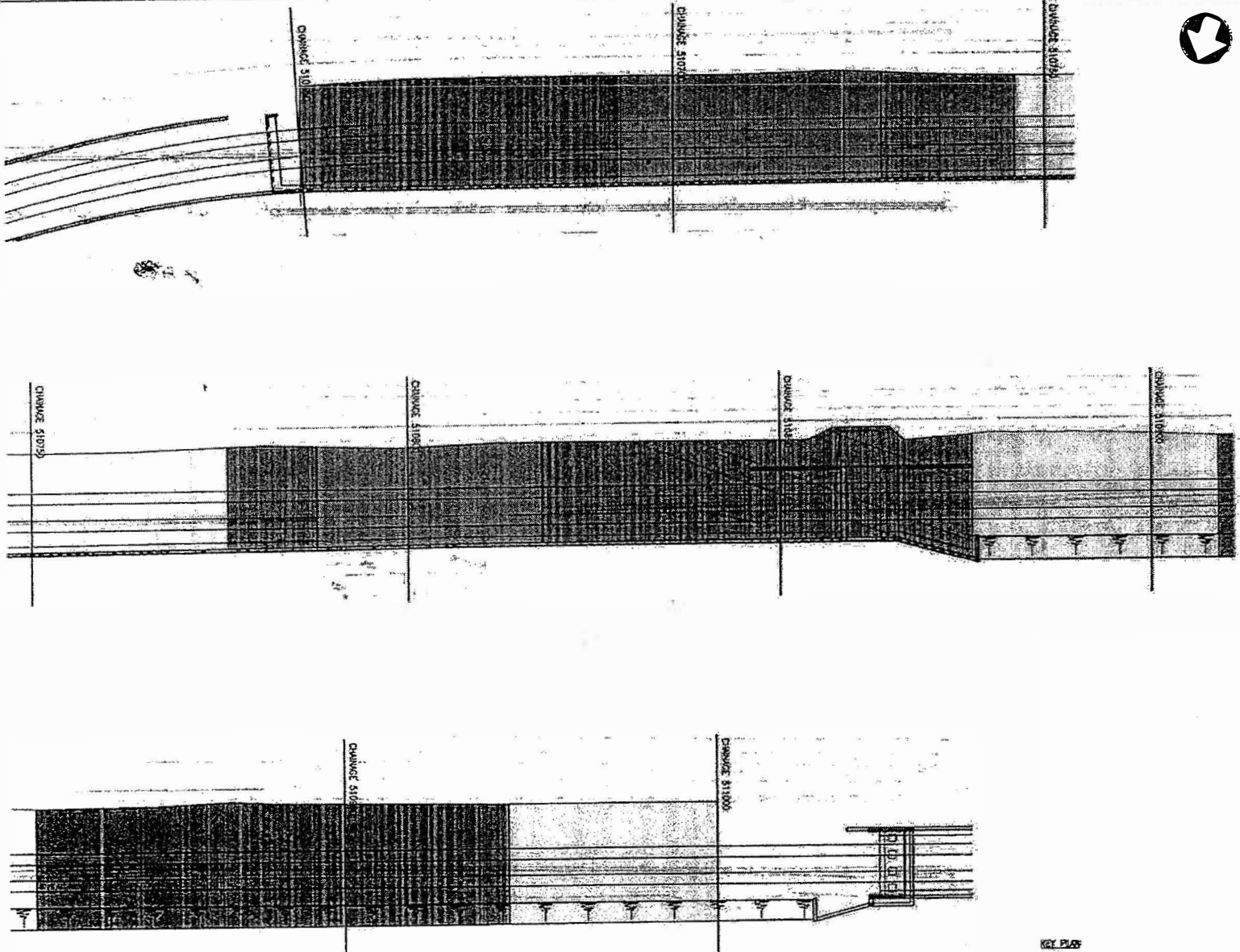
Name: A Dolan

Date: 25/06/10

for and on behalf of:

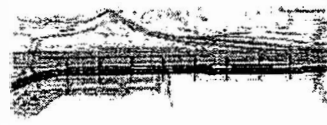
External Distribution:	Internal Distribution:
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- LEGEND**
- TO BE CUT AND REPAIRED
 - APPROXIMATE ORIGINAL ELEVATION OF ORIGINAL DAM
 - 20%
 - 25%
 - 30%
 - 35%
 - 40%

KEY PLAN



RESERVOIR TIE-IN NETWORK	
PREPARED IN ACCORDANCE WITH GOLDEN GATE BRIDGE, STATE PARK, AND HISTORIC PRESERVATION GOLDEN GATE TIE-IN PLAN	
DATE: 10/1/00	PROJECT: GOLDEN GATE TIE-IN NETWORK
DESIGNED BY: [Name]	CHECKED BY: [Name]
APPROVED BY: [Name]	DATE: 10/1/00
WESSLER ENGINEERING 1000 S. GATE AVENUE, SUITE 100 SAN FRANCISCO, CALIFORNIA 94108 TEL: 415.774.1100 FAX: 415.774.1101	

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Edinburgh Tram: Structure S21B and S21D, Murrayfield Reinforced Earth Embankment /Retaining wall

Ground Stabilisation/Improvement Specification

1 Introduction

This specification presents background information on Structure S21B and describes the reclamation strategy and requirements for stabilisation to allow construction of the reinforced earth embankment structure.

This specification should be read in conjunction with the other specification items, in particular the earthworks specification.

2 Background Information

The site forms part of the Edinburgh Tram Line 1 project, structures S21B and S21D. Both are reinforced earth structures which will be constructed to carry the tram. Both structures will be constructed adjacent/adjoining an existing Network Rail (NR) railway embankment. It has been agreed with NR that construction of the reinforced earth embankment will have limited effect on the existing NR railway embankment.

The preliminary ground investigation indicated ground conditions to be suitable to allow construction of the reinforced earth embankment via excavation and replacement of the weak strata with suitable fill.

However on receipt of additional ground investigation data it was found that the site is underlain by a significant thickness of soft Made Ground and Alluvial Sand/Clay.

The Made Ground and Alluvial Sand/Clay were found to be unsuitable as a foundation stratum, as it would likely result in some places in bearing failure or excessive settlements outside of the design tolerances.

In-situ ground improvement techniques have been proposed to increase the soil strength/stiffness (Young's Modulus) of the formation strata to allow construction of the reinforced earth embankment.

3 Ground Investigation

A significant amount of intrusive ground investigation works have been carried out along the route of the embankment, including boreholes, trial pits, in-situ and laboratory testing, and groundwater monitoring. This is included in the Site Information pack along with the Approval in Principle document (AIP).

The ground investigation data can be summarised as follows:-

Made Ground generally described as soft brown sandy/ashy gravelly clay with cobbles of brick and sandstone, encountered from ground level to between 0.60m bgl (below ground level) and 4.00m bgl. The Made Ground is underlain by a mixture of alluvial Sand and Clay which was found to be very soft/very loose becoming firm/medium dense with depth, generally encountered between 0.60m bgl (S02) and 5.00m bgl (S02). The alluvial sand/clay was predominantly underlain by a medium dense becoming very dense with depth sand/gravel, where the medium dense sand/gravel was absent a stiff becoming very stiff sandy gravelly Clay (Glacial Till) was encountered. Groundwater levels appear to be relatively high within the weak alluvial strata. This specification should be read in conjunction with the *Raeburn Drilling and Geotechnical Limited Dynamic Probe Field Testing dated April 2010* in addition to all the previous Ground Investigation results.

4 Health and Safety Considerations/Constraints

The major constraint is the potential instability of the Made Ground/Alluvial strata during construction.

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Loss of lateral support or lack of groundwater control which could result in serious risk of excessive settlement or shear failure of the (presumably similar) strata beneath the adjacent NR track. In-situ ground improvement techniques are therefore required to prevent any detrimental effects on the existing NR embankment by removal of the need to excavate to significant depths. However care should still be taken to ensure that the stability of the embankment is not detrimentally affected.

5 Stabilisation strategy

5.1 Performance requirements

The requirements for stabilisation are to create a stable and safe formation which will allow minimal settlement of the existing NR embankment (<10mm) and tram embankment (<25mm).

Based on these constraints a stiffness of 35,000kPa shall be achieved at 28days in the upper Made Ground and Alluvial deposits.

Based on programme restrictions preliminary testing trials will not be possible, therefore an in-situ trial during the main works to prove the suitability of the binder mix shall be undertaken.

5.2 Stabilisation method

It is envisaged that in-situ deep dry soil mixing techniques are used to form columns, using CEM 1 cement binder at an initial rate of 5% by dry weight. The columns shall be taken to the base of the Made Ground/Alluvium deposits (whichever is deepest). Anticipated depths of treatment are shown in drawing ULE90130-05-RTW-00992. Actual depths will be proven periodically during the works.

Alternative cement binder percentages will be considered if proven to meet the performance criteria. Levels less than 3% cement are considered unacceptable.

Reference should be made to the advice, best practice, design, and construction guidance given in the BRE Design Guide Soft Soil Stabilisation published as part of the EuroSoilStab project, Project No. BE 96-3177.

5.3 Testing

The Contractor shall propose with the returned tender a frequency and means of validation of the ground improvement appropriate to the proposed method, for approval by the Design Organisation.

Testing shall be carried out in accordance with BS 1377:1990 or equivalent standard.

On completion, the contractor shall provide a validation report describing the extent and method of ground improvement, additives, test results and conclusions.

Testing results shall be provided to the design organisation to allow construction of the reinforced earth retaining wall elements to commence.

6 Column Stabilisation

6.1 Pre-installation Procedure

Before installation of the works, the following conditions shall be checked and documented, in accordance with BRE Design Guide Soft Soil Stabilisation BE 96-3177:-

Data for binders

- Production date and delivery date.
- Storage conditions.
- Transportation.
- Storage temperature.
- Test to confirm the binder quality.
- Binder components.
- Water type/quality.

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Plant/Equipment

- Type of equipment.
- Design of mixing tool.
- All other relevant data.

Site description

- Location and site elevation level.
- Geotechnical conditions.
- Weather conditions during installation.
- Photos of the site.
- State of eventual soil contamination.

Column data

- Diameter (m).
- Amount of binder (kg/m or litre/min).
- Mixing energy (J/m^3).
- Lifting speed, (mm/s and mm per revolution)
- Rotation speed, (rpm).
- Length (m).
- Column top level (m OD).
- Column tip Level (m OD).
- Feeding pressure, max (MPa)
- Exhaust pressure, (inside Kellybar) at mixing tool level.
- Water to cement weight ratio (if applicable).
- Ratio of grout/additives.

6.2 During installation procedure

During installation the following shall be continuously monitored in accordance with BRE Design Guide Soft Soil Stabilisation BE 96-3177:-

- Binder output, (kg/m and kg/m^3).
- Mixing energy, (J/m^3)
- Lifting speed, (mm/s and mm per revolution)
- Rotation speed, (rpm)
- Feeding pressure at rig.
- Exhaust pressure (inside Kellybar) at mixing tool level.

Feeding pressure shall be released after installation. Surface heave shall be monitored visually both around one single column and around the whole stabilised area, in accordance with BRE Design Guide Soft Soil Stabilisation BE 96-3177. The accuracy shall be +/-1mm. one point each 200m² will be sufficient.

Summary of Changes Identified

Item	Brief Description	Amounts		Further Comment
			Infraco	
1	Trenchmix walls solution (Chainage 510594 to 510876)	£	307,958.06	
2	Vibro Columns solution (Chainage 510876 to 511027)	£	47,882.34	
3	Attendances	£	96,500.03	
4	SDS Design Costs	£	30,000.00	
5	Sheet Piling	£	45,079.92	
6	Temporary Works design (sheet piling)	£	20,154.24	
7	Pre-treatment survey works and testing	£	14,484.00	
	Construction Works Value	£	562,058.59	
	Head Office Overheads and Profit on elements of Actual Cost for Civil Engineering Works	10%	£ 48,697.87	
			£ 610,756.46	
	Consortium Preliminaries	7.40%	£ 41,592.34	
	Other Preliminary Elements	17.50%	£ 98,360.25	
	Estimate Total		750,709.05	

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Estimate

Item	Description	UNIT	Quantity			Unit Rate		Value			Item Allocation	Comment
			BDDI	IFC	+/-	Rate	Source	BDDI	IFC	+/-		
1	Trenchmix Solution (measured by volume of ground to be improved, ref drg RTW-992 rev 2)	m3		8,388.00	8,388.00	36.74	Derived from forecast Actual Cost, see Appendix C		307,953.06	307,953.06	1	
2	Vibro-column Solution (measured by volume of ground to be improved, ref drg RTW-992 rev 2)	m3		2,964.00	2,964.00	16.15	Derived from forecast Actual Cost, see Appendix C		47,881.34	47,881.34	2	
3	GC attendances for Bachy Soletanche (measured by volume of ground to be improved, ref drg RTW-992 rev 2)	m3		8,388.00	8,388.00	6.72	Derived from forecast Actual Cost, see Appendix C		56,398.20	56,398.20	3	(GC) Graham Construction
4	EL attendances for GeMech (measured by volume of ground to be improved, ref drg RTW-992 rev 2)	m3		2,964.00	2,964.00	13.53	Derived from forecast Actual Cost, see Appendix C		40,301.83	40,301.83	4	(EL) Expanded Ltd
5	SDS Design Costs	Sum		1.00	1.00	30,000.00	Indicative, ref A Dolan		30,000.00	30,000.00	5	
6	Sheet Piling	m2		696.00	696.00	64.77	Sch 4 page 206 item 51		45,079.92	45,079.92	6	
7	Temporary Works design (sheet piling)	Sum		1.00	1.00	20,154.24	Derived from forecast Actual Cost, see Appendix C		20,154.24	20,154.24	7	
8	Pre-treatment survey works and testing	Sum		1.00	1.00	14,484.00	Derived from forecast Actual Cost, see Appendix C		14,484.00	14,484.00	8	
	Total to Summary Page								562,058.59	562,058.59		

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Item	Description	UNIT	Quantity			Unit Rate		Value			Item Allocation	Comment
			BDDI	IFC	+/-	Rate	Source	BDDI	IFC	+/-		
	Estimate Summary Page											
	Construction Works Value								562,058.59		562,058.59	
	Head Office Overheads and Profit on elements of Actual Cost for Civil Engineering Works						Sch 4 Appendix G CI 1.3 (a)	10%				Applied to Items 1, 2, 3, 4, 7 & 8
	Head Office Overheads and Profit on elements of Actual Cost for Systems and Track Works						Sch 4 Appendix G CI 1.3 (b)	17%				
	Estimate Sub-total										610,756.46	
	Consortium Preliminaries						Sch 4 Appendix G CI 1.3	7.40%			41,592.34	
	Other Preliminary Elements						Minute of Variation	17.50%			98,360.25	
	Estimate Total										750,709.05	

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Qualifications / Assumptions

1 Unless listed below, any conclusions / qualifications / assumptions detailed within Graham Construction (GC) letter 17/12/10 or Expanded Ltd emailed quotation dated 14/12/10 are not applicable to this estimate and are deemed to be catered for within the 88UK Risk provision.

2 Infracore has used best endeavours to provide an accurate estimate for consideration and discussion. Pending selection / finalisation of ground improvement option, the estimate is to be considered Provisional in all respects.

3 It is confirmed that Infracore has used all reasonable endeavours to establish suitability of proposed design solution. However should for any reason whatsoever, during the evolution of the design up to and including issue of IFC drawings or during the progress of ground improvement works, the proposed solution changes or is rendered unsuitable, Infracore reserves its right to withdraw or amend its estimate.

4 Estimate remains open for acceptance until 31 May 2011

5 It is assumed each of Expanded Ltd and Graham Construction works will be undertaken in one visit to site, each.

6 No provision within the estimate for dealing with contaminated material. It is assumed this separate Change will, if applicable, be dealt with under a separate INTC.

7 Estimate and proposed solution assumes acceptance by SDS and any other relevant party of the Technical Considerations listed within and / or attributable to the Bachy Soletanche or GeMech Proposals.

8 It is assumed that there will be no restrictions placed on the proposed method of working by external parties, for example Network Rail or SRU. In respect of Network Rail, our current opinion is that the ground improvement works, including temporary works, can be undertaken in a 'fail safe' manner, without need for Possession working / nighttime working etc. It is assumed that any Rail Protection staff / Rail Monitoring costs will be paid for by the under INTC 640.

9 Proposed ground improvement solution has been developed from SDS response to TCI 803, which includes drawing ref U/ES0130-05-RTW-00992 Rev 2. For clarity, we confirm that a trenchmix / vibro-column solution is allowed for within the areas denoted as 'Dig out and replace' as it is considered that this provides the most cost effective solution.

10 No provision within the estimate for dealing with services of any nature, known or otherwise. It is assumed these will be dealt with separately under other INTC's.

11 It is acknowledged that there may be a requirement to adjust / amend estimates provided for other INTC's, e.g. to take account of conflicts with ground improvement commencement levels and earthworks detailed on structures drawings.

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Appendix A

Edinburgh Tram Project

INTC 625

Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)

Drawings Used in the preparation of the Estimate

Item	Drawing Number	Status	Comments
	ULE90130-05-RTW-00992 Rev 2	IEA	

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Appendix B

Edinburgh Tram Project

INTC 625

Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)

Programme Information

It is likely that the additional scope of works will have an impact on programme.
Programme impact is excluded from this estimate.

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Edinburgh Tram Project
INTC 625

Appendix C

Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)

Derived Rates

Item	Description	Quantity	UNIT	Rate	Total
1	Trenchmix Solution				
a	refer Graham Construction letter 17 December 2010, incorporating Bachy Soletanche quotation dated 23/11/2010	1	Sum	£248,855.00	£248,855.00
b	Graham Construction O&P	12.5%			£31,106.88
c	BBUK Risk (to lump sum)	10%			£27,996.19
					£307,958.06
	Divide by volume associated with footprint between chainage 510594 to 510876		m3		8388
	Rate per m3				£36.71
3	Grahams Construction attendances for Bachy Soletanche; refer GC letter 17/12/10.				
a	Piling platform	1	Sum	£13,069.80	£13,069.80
b	Drainage / Pumping / Ground water control, allow £5k set-up/demob £1.5k per wk running costs, sav	1	Sum	£10,000.00	£10,000.00
c	Water supply , incl deliver etc	1	Sum	£20,860.00	£20,860.00
d	Machine in attendance	1	Sum	£1,644.50	£1,644.50
	Graham Construction O&P	12.5%			£5,696.79
	BBUK Risk (to lump sum)	10%			£5,127.11
					£56,398.20
	Divide by volume associated with footprint between chainage 510594 to 510876		m3		8388
	Rate per m3				£6.72
7	Temporary Works design (sheet piling), refer Graham Construction letter 17/12/10 .				
a	Tony Gee costs	1	Sum	£17,914.88	£17,914.88
b	Graham Construction O&P	12.5%			£2,239.36
					£20,154.24

CEC02084556_0082

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Edinburgh Tram Project
INTC 625

Appendix C

Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)

Derived Rates

Item	Description	Quantity	UNIT	Rate	Total
2	Vibro-column Solution				
a	refer Expanded Ltd email 14/12/10 incorporating GeMech quotation dated 10 December 2010	1	Sum	£40,305.00	£40,305.00
b	Expanded O&P	8.0%			£3,224.40
c	BBUK Risk (to lump sum)	10%			£4,352.94
					£47,882.34
	Divide by volume associated with footprint between chainage 510876 to 511027		m3		2964
	Rate per m3				£16.15
4	EL attendances for GeMech				
a	Working platform 150m x 10m x 0.5 wide	750	m3	£24.66	£18,495.00
b	Drainage / Pumping / Ground water control, allow £5k set-up/demob £1.5k per wk running costs, say	1	Sum	£10,000.00	£10,000.00
c	Water supply , incl deliver etc	1	Sum		
d	Machine in attendance	1	Sum	£5,260.75	£5,260.75
	Expanded Ltd O&P	8.0%			£2,700.46
	BBUK Risk (to lump sum)	10%			£3,645.62
					£40,101.83
	Divide by volume associated with footprint between chainage 510876 to 511027		m3		2964
	Rate per m3				£13.53

CEC02084556_0083

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Edinburgh Tram Project
INTC 625

Appendix C

Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)

Derived Rates

Item	Description	Quantity	UNIT	Rate	Total
7	Pre-treatment Survey Works and testing:				
	a Pre-treatment survey works, ref Expanded Ltd email 07/12/10	1	Sum	£ 10,919.00	£ 10,919.00
	b Dynamic Probing (Raeburn)	3	days	£ 675.00	£ 2,025.00
	c Shell & Auger (Raeburn, £500 mob/demob, 2x20m holes @ £26/m)	1	Sum	£ 1,540.00	£ 1,540.00
	Sum				£ 14,484.00

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Appendix D

Edinburgh Tram Project

INTC 625

Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)

Other Supporting Information

- 1 Graham Construction letter of 17 December 2010 ref BN/Site/S21B/CE (refer Appendix D to Option A)
- 2 SDS response to TQ 1809 (refer Appendix D to Option A)
- 3 Expanded email 14/12/10, including GeMech estimate of 10 December 2010
- 4 Expanded email 07/01/10, including breakdown of Expanded Ltd quote.
- 5 Expanded email 07/01/10, including Expanded Ltd Pretreatment Survey works quote.

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S21B, S21C & S21D Ground Improvement Proposal

Crozier, Allan to: Brian.Walker

14/12/2010 16:23

Cc: Duncan.Lambert, Graeme.Angus, "Grant, Chris", Jim.Donaldson

History: This message has been replied to.

Brian,

Please find attached for your review initial proposal and quotation for vibro stone columns ground improvement treatment to S21B, S21C and S21D as received from specialist contractor GeMech.

Regards,

Allan Crozier

Project Manager

Expanded Limited

Edinburgh Tram Network Site Office (c/o Barr Ltd) | Off Gogar Roundabout | Glasgow Road | Edinburgh EH12 8LU

Mob: [REDACTED]

www.expandedltd.com

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and do not necessarily represent those of the company. GE763 additional offer 10.12.10.pdf

CEC02084556_0086

000079



Our Ref: DW/AMX/AJT/GE763

10th December 2010

Expanded Limited,
Edinburgh Tram Network Site Office,
Off Lockside Crescent,
Edinburgh Park Station (North),
Edinburgh Park
EH12 9DT

For the attention of Mr. Allan Crozier -- Project Manager

Dear Mr. Crozier,

Re: Proposed Edinburgh Tram Network Ground Improvement Works

Further to our detailed estimate dated 7th December 2010 for the design, installation and testing of vibro stone columns on the above site, we understand that you wish to supply your client with a rate for continuing the ground treatment beyond the chainages 510877 - 511027 should they determine that this method of improvement will provide a suitable means of support for embankment construction.

We have had difficulty in apportioning the available soils investigation information in relation to more remote chainages but, in general, agree that the perceived criteria for the stone columns is to control settlements produced by the embankment surcharge which would remain the same.

Perhaps the easiest and most appropriate solution would be to introduce a new item to our existing Bill of Quantities to cover extensions to the treatment requirements measured in a rate based on the future footprint area of the proposed embankment.

This item (No. 7) assumes the continuation of stone column construction during the establishment period of the vibro rig. Should this not be the case, then an additional re-establishment charge of £4,350.00 would be levied on a minimum size of treatment area of 400m².

With regard to the technical point raised by the Design Manager, Chris Reid, and concerning minimum levels of shear strength in cohesive soils, we appreciate that cohesive values below 30kN/m² are unlikely to be positively influenced by the stimulus of vibration or the compression effect introduced by a stone column. However, for groups of closely spaced stone columns, and in a layered soils profile where more responsive material is above and/or below the soft clay now in question, it is necessary to assess actual loadings likely to be imposed. This analysis will be highlighted in detail in our forthcoming design calculations.

/Cont'd....

GeMech Limited
Unit 12, Kenn Court, South Bristol Business Park
Roman Farm Road, Bristol BS4 1UL
Tel: [REDACTED] Fax: 01179 784523 E-mail: info@gemechltd.co.uk
Registered in England No. 6872676

Registered Office: 2, Talbot Road, Rickmansworth, Hertfordshire WD3 1HE. Registered in England No. 6872676

CEC02084556_0087

000020

10th December 2010

GeMech

Re: Ground Improvement Works - Proposed Edinburgh Tram Network

We hope these explanations will be acceptable and look forward to hearing from you again shortly.

Yours sincerely,

A solid black rectangular box used to redact the signature of David Walker.

David Walker MEng (Civil Engineering)
Senior Contracts Engineer

CEC02084556_0088

000081

10th December 2010

GeMech

Re: Ground Improvement Works - Proposed Edinburgh Tram Network

GE763 - BILL OF QUANTITIES

Edinburgh Tram Network - Ground Improvement between Chainages 510877-511027

Item	Description	Qty	Unit	Rate	Amount
1	Visit site to record trial piles and carry out pre-treatment CSW seismic testing.	1	Item	£3,950.00	£3,950.00 ^{incl. separate}
2	To mobilise to site all labour, plant and materials.	1	Item	£4,350.00	£4,350.00
3	To set up at each column position.	244	No	£7.50	£1,830.00
4	Construct dense stone columns beneath Embankment footprint area up to 160kN/m ² bearing capacity. Passes 1 & 2 (see letter).	244	No	£64.63	£15,770.00
5	Additional stone columns if required.	1	per col. plus set up	£64.63	Rate Only
6	Credit for omitted stone columns (any location).	1	per col.	£19.50	Rate Only
7	Extend vibro treatment beyond above chainages if requested, including pre-boring (testing measured elsewhere)		m ²	£22.54	Rate Only
8	Standing/obstruction time for piling rig, associated plant and labour whilst overcoming obstructions either man-made or natural or due to circumstances beyond our control.	1	Hour	£275.00	Rate Only
9	Carry out short duration plate load tests.	4	No	£200.00	£800.00
10	Additional plate load tests if requested.	1	No	£225.00	Rate Only
11	Mobilisation for pre-boring (if required).	1	Item	£1,750.00	£1,750.00
12	Carry out pre-boring up to 2m depth to 2nd pass of stone column construction (see letter).	81	No	Item	£2,430.00
13	Carry out full-scale zone loading test on working stone columns using 2m x 2m steel plate loaded to 2.5 times W.L. and complete return visit of CSW testing.	1	Item	£11,400.00	£11,400.00
14	Issue of revised drawing due to client/engineers changes.	1	No	£175.00	Rate Only
14	Prepare and issue final report of all stone column construction and testing.	1	Item	£1,975.00	£1,975.00
TOTAL					£44,255.00

Subject to re-measurement upon completion of our works in accordance with the above items and rates ^{to 305}

Payment terms strictly 14 days from date of application/invoice

CEC02084556_0089

000082



RE: S21D Murrayfield Training Pitches
Grant, Chris to: Graeme.Angus
Cc: "Crozier, Allan", Brian.Walker

07/01/2011 13:49

Graeme,

Please find attached breakdown as per your request.

Allan will forward drawings in due course.

Regards

Chris Grant
Commercial Manager
Expanded Limited

Edinburgh Tram Network Site Office | c/o Barr Construction | A8 Gogar
Access | Glasgow Road | Edinburgh | EH12 8LU

Tel [REDACTED]

www.expandedltd.com

-----Original Message-----

From: Graeme.Angus@civil.bilfinger.co.uk [mailto:Graeme.Angus@civil.bilfinger.co.uk]
Sent: 07 January 2011 12:46
To: Grant, Chris
Cc: Crozier, Allan; Brian.Walker@civil.bilfinger.co.uk
Subject: Re: S21D Murrayfield Training Pitches

Chris,

A further query, your BoQ states 'Ground Improvement works as per GeMech quotation dated 07/12/10' with a rate / sum of £54,434.33.

GeMech quotation dated 10/12/10, as provided by Allan, is for £44,255.00.

Please help clear up this confusion and explain / substantiate different figures.

Any joy with drawings yet?

Regards,

Graeme Angus
Section Quantity Surveyor

Bilfinger Berger Civil UK Limited
9 Lochside Avenue
Edinburgh
EH12 9DJ
United Kingdom

Tel: [REDACTED]
Fax: +44 (0) 131 452 2990
Mob: [REDACTED]
Email: Graeme.Angus@civil.bilfinger.co.uk
Web: www.civil.bilfinger.co.uk

CEC02084556_0090

000083

Bilfinger Berger Civil UK Limited

Registered Office: 7400 Daresbury Park, Warrington, Cheshire, WA4 4BS
Registered in England and Wales
Company No: 2418086

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|----->
| From: |
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>----->
|----->
| "Grant, Chris" <cgrant@expandedltd.com>
|

>----->
|----->
|----->
| To: |
|----->

>----->
|----->
| <Graeme.Angus@civil.bilfinger.co.uk>
|

>----->
|----->
|----->
| Cc: |
|----->

>----->
|----->
| "Crozier, Allan" <acrozier@expandedltd.com>
|

>----->
|----->
|----->
| Date: |
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| 16/12/2010 16:20
|

>----->
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|----->
| Subject: |
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000084

>-----
|S21D Murrayfield Training Pitches
|
>-----

Graeme,

Please find attached our revised price for S21D incorporating the ground improvement works.

We look forward to your further instruction.

Regards

Chris Grant
Commercial Manager
Expanded Limited

Edinburgh Tram Network Site Office | c/o Barr Construction | A8 Gogar Access
| Glasgow Road | Edinburgh | EH12 8LU

Tel [REDACTED]

www.expandedltd.com

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000085

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Ground Improvement Breakdown.xls

000086

q00068 Construction and withdraw after 1.000 m ?MacroQty
Stored: completion of work of retaining
16/12/10 measure, height and details not Rate: 16/12/10

L=416.75 P=4,844.00 S=44,225.00 Rate=49,485.75

SC40	Ground Improvement	1.00itm*44225	= 44,225.00
PHB0501	JCB 3CX Sitemaster	24.21Hr*10.5*3days	= 762.62
PHB0503	CAT312 13t.360 deg Excav	25.75hr*47.5*3wks	= 3,669.38
LRC40	Labourer - Banksman	13.23hr*10.5*3days	= 416.75
PHB3802	13T Breaker	412.00wk*1wk	= 412.00
=		49,485.75	

5260 75

Expanded P+O 3,958.06 (8%)

53,447.61

000087



Grant, Chris to: Graeme.Angus, Brian.Walker
Cc: "Crozier, Allan"

07/12/2010 16:12

History: This message has been replied to and forwarded.

Gents,

Please find attached our estimate for the survey works as has been requested.

We look forward to your instruction.

Regards

Chris Grant
Commercial Manager
Expanded Limited

Edinburgh Tram Network Site Office| c/o Barr Construction | A8 Gogar Access | Glasgow Road | Edinburgh |
EH12 8LU

Tel [REDACTED]

www.expandedltd.com

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S21B S21C S21D Pre-Treatment Survey Estimate.xls

CEC02084556_0095

000088

TENDER MAKE UP SHEET**expanded****PROJECT: A2581 Edinburgh Trams**

ITEM	DESCRIPTION	L	P	M	S/C	TOTAL
	S21B, S21C & S21D Murrayfield RTW's Pre-treatment survey estimate					
1	GeMech Quotation (3 day duration)				£8,180	£8,180
2	Additional day contingency				£2,115	£2,115
	Attendances:					
3	(JCB3CX + hammer) x 4 days @ £260/day Fuel		£1,040	£100		£1,040 £100
4	Labourer x 4 days @ £150/day	£600				£600
5	Transport crowd barriers on/off allowance		£500			£500
6	Welfare unit					
	(i) Transport on/off		£1,226			£1,226
	(ii) Weekly Hire		£329			£329
	(iii) Effluent tank empty		£150			£150
	(iv) Fuel			£100		£100
						£14,340
					Add 8% OH&P	£1,147
					TOTAL	£15,487

3956.00

10,110

809

10,919

000089

Our Ref: DW/AMX/AJT/GE763

2nd December 2010

Expanded Limited,
Edinburgh Tram Network Site Office,
Off Lockside Crescent,
Edinburgh Park Station (North),
Edinburgh Park
EH12 9DT

For the attention of Mr. Allan Crozier – Project Manager

Dear Mr. Crozier,

Re: Proposed Edinburgh Tram Network – Ground Improvement

Further to our letter of the 25th November 2010 and meeting with our Consultant on the same day, we now write to confirm our proposals for pre-treatment ground testing as requested.

In order for us to excavate trial pits and carry out a sufficient number of CSW tests, we would need to spend a day on site. Currently the availability of the CSW testing specialists means that this could be arranged for week commencing the 20th December 2010. The total cost of the Engineer to record trial pits, and supervise the CSW testing, as well as the seismic tests themselves, would be £3,950.00 plus VAT.

We believe you may require to carry out further CSW tests on adjacent areas of future embankment construction outside the immediate concept of ground improvement. We should advise you that the cost of additional time on site for the CSW technicians and testing equipment is charged at £2,115.00 plus VAT per day. This figure also includes for overnight accommodation. Obviously travelling costs will have already been accommodated within the previously quoted rate.

As a general indication, we would estimate that SWS Ltd should be able to carry out around 6 No. profiles per day, depending upon ground preparation. In the context of a proposed embankment this represents a total meterage of around 120-140 lin. m per day.

/Cont'd....

GeMech Limited
Unit 12, Kenn Court, South Bristol Business Park
Roman Farm Road, Bristol BS4 1UL
Tel: [REDACTED] Fax: 01179 784523 E-mail: info@gemechltd.co.uk
Registered in England No. 6872675

Registered Office: 2, Talbot Road, Rickmansworth, Hertfordshire WD3 1HE. Registered in England No. 8872675

CEC02084556_0097

000090

We hope this information is of interest and that we may look forward to hearing from you again shortly. Please note that with regard to trial pits and CSW testing, we have made no allowance within any of our rates for the provision of an excavator and breaker (for areas of existing tarmac roadway). For CSW testing a narrow surface strip of around 6m long needs to be broken out for each profile trace, and for trial pits an area of around 1.5m x 4m for each pit would be ideal. In the grassed areas no preparation, other than service tracing, would be required.

Yours sincerely,

David Walker MEng (Civil Engineering)
Senior Contracts Engineer

cc:

Surface Wave Surveys,
FAO Richard Tinsley

CEC02084556_0098

Summary of Changes Identified

Item	Brief Description	Amounts		Further Comment
1	Trenchmix walls solution	£		
2	Vibro Columns solution (Chainage 510594 to 511027)	£	169,715.49	
3	Attendances	£	153,588.39	
4	SDS Design Costs	£	50,000.00	
5	Sheet Piling	£	45,079.92	
6	Temporary Works design (sheet piling)	£	20,154.24	
7	Pre-treatment survey works and testing	£	14,484.00	
	Construction Works Value	£	453,022.04	
	Head Office Overheads and Profit on elements of Actual Cost for Civil Engineering Works	10%	£ 35,794.21	
			£ 488,816.25	
	Consortium Preliminaries	7.40%	£ 33,523.63	
	Other Preliminary Elements	17.50%	£ 79,278.86	
	Estimate Total		601,618.74	

000091

Edinburgh Tram Project
 INTC 625 Section 5A - Murrayfield Corridor Ground Improvement (Chainage S10594 to S11027)

Estimate

Item	Description	UNIT	Quantity			Unit Rate		Value			Item Allocation	Comment
			BDDI	IFC	+/-	Rate	Source	BDDI	IFC	+/-		
1	Trenchmix Solution (measured by volume of ground to be improved, ref drg RTW-992 rev 2)	m3				35.71	Derived from forecast Actual Cost, see Appendix C				1	
2	Vibro-column Solution (measured by volume of ground to be improved, ref drg RTW-992 rev 2)	m3		11,352.00	11,352.00	14.95	Derived from forecast Actual Cost, see Appendix C		169,715.49	169,715.49	2	
3	GC attendances for Bachy Soletanche (measured by volume of ground to be improved, ref drg RTW-992 rev 2)	m3				6.72	Derived from forecast Actual Cost, see Appendix C				3	(GC) Graham Construction
4	EL attendances for GeMech (measured by volume of ground to be improved, ref drg RTW-992 rev 2)	m3		11,352.00	11,352.00	13.53	Derived from forecast Actual Cost, see Appendix C		153,588.36	153,588.36	4	(EL) Expanded Ltd
5	SDS Design Costs	Sum		1.00	1.00	50,000.00	Indicative, ref A Dolan		50,000.00	50,000.00	5	
6	Sheet Piling	m2		696.00	696.00	64.77	Sch 4 page 206 Item 51		45,079.92	45,079.92	6	Provisional - allow as for trenchmix option meantime
7	Temporary Works design (sheet piling)	Sum		1.00	1.00	20,154.24	Derived from forecast Actual Cost, see Appendix C		20,154.24	20,154.24	7	Provisional - allow as for trenchmix option meantime
8	Pre-treatment survey works and testing	Sum		1.00	1.00	14,484.00	Derived from forecast Actual Cost, see Appendix C		14,484.00	14,484.00	8	
Total to Summary Page									453,022.04	453,022.04		

000092

Estimate

Item	Description	UNIT	Quantity				Unit Rate		Value			Item Allocation	Comment
			BDDI	IFC	+/-	Rate	Source	BDDI	IFC	+/-			
	Estimate Summary Page												
	Construction Works Value								453,022.04		453,022.04		
	Head Office Overheads and Profit on elements of Actual Cost for Civil Engineering Works							Sch 4 Appendix G Cl 1.3 (a)	10%		35,794.21		Applied to items 1, 2, 3, 4, 7 & 8
	Head Office Overheads and Profit on elements of Actual Cost for Systems and Track Works							Sch 4 Appendix G Cl 1.3 (b)	17%				
	Estimate Sub-total										488,816.25		
	Consortium Preliminaries							Sch 4 Appendix G Cl 1.3	7.40%		35,794.21		
	Other Preliminary Elements							Minute of Variation	17.50%		79,278.86		
	Estimate Total										601,618.74		

000093

Qualifications / Exclusions

- 1 Unless listed below, any exclusions / qualifications / assumptions detailed within Expanded Ltd emailed quotation dated 14/12/10 are not applicable to this estimate and are deemed to be catered for within the B&UK Risk provision.
- 2 Infracore has used best endeavours to provide an accurate estimate for consideration and discussion. Pending selection / finalisation of ground improvement option, the estimate is to be considered Provisional in all respects.
- 3 It is confirmed that Infracore has used all reasonable endeavours to establish suitability of proposed design solution. However should for any reason whatsoever, during the evolution of the design up to and including issue of IFC drawings or during the progress of ground improvement works, the proposed solution changes or is rendered unsuitable, Infracore reserves its right to withdraw or amend its estimate.
- 4 Estimate remains open for acceptance until 31 May 2011.
- 5 It is assumed works will be undertaken in one visit to site.
- 6 No provision within the estimate for dealing with contaminated material. It is assumed this separate Charge will, if applicable, be dealt with under a separate INTC.
- 7 Estimate and proposed solution assumes acceptance by SDS and any other relevant party (Technical Considerations listed within and / or attributable to the GeMech Proposal).
- 8 It is assumed that there will be no restrictions placed on the proposed method of working by external parties, for example Network Rail or SRU. In respect of Network Rail, our current opinion is that the ground improvement works, including temporary works, can be undertaken in a 'fall safe' manner, without need for Possession working / nighttime working etc. It is assumed that any Rail Protection staff / Rail Monitoring costs will be paid for by tie under INTC 640.
- 9 Proposed ground improvement solution has been developed from SDS response to TCR 009, which includes drawing ref ULE901310-05-RTW-00992 Rev 2. For clarity, we confirm that a Vibro-column solution is allowed for within the areas denoted as 'Dig out and replace' as it is considered that this provides the most cost effective solution.
- 10 No provision within the estimate for dealing with services of any nature, known or otherwise. It is assumed these will be dealt with separately under other INTC's.
- 11 It is acknowledged that there may be a requirement to adjust / amend estimates provided for other INTC's, e.g. to take account of conflicts with ground improvement commencement levels and earthworks detailed on structures drawings.

000094

Edinburgh Tram Project
INTC 625
Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)
Drawings Used in the preparation of the Estimate

Item	Drawing Number	Status	Comments
	ULE90130-05-RTW-00992 Rev 2	IEA	

000095

Appendix B

Edinburgh Tram Project

INTC 625

Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)

Programme Information

It is likely that the additional scope of works will have an impact on programme.
Programme impact is excluded from this estimate.

000096

Edinburgh Tram Project
INTC 625

Appendix C

Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)

Derived Rates

Item	Description	Quantity	UNIT	Rate	Total
1	Trenchmix Solution				
a	refer Graham Construction letter 17 December 2010, incorporating Bachy Soletanche quotation dated 23/11/2010	1	Sum	£248,855.00	£248,855.00
b	Graham Construction O&P	12.5%			£31,106.88
c	BBUK Risk (to lump sum)	10%			£27,996.19
					£307,958.06
	Divide by volume associated with footprint between chainage 510594 to 510876		m3		8388
	Rate per m3				£36.71
3	Grahams Construction attendances for Bachy Soletanche, refer GC letter 17/12/10.				
a	Piling platform	1	Sum	£13,069.80	£13,069.80
b	Drainage / Pumping / Ground water control, allow £5k set-up/demob £1.5k per wk running costs. say	1	Sum	£10,000.00	£10,000.00
c	Water supply , incl deliver etc	1	Sum	£20,860.00	£20,860.00
d	Machine in attendance	1	Sum	£1,644.50	£1,644.50
	Graham Construction O&P	12.5%			£5,696.79
	BBUK Risk (to lump sum)	10%			£5,127.11
					£56,398.20
	Divide by volume associated with footprint between chainage 510594 to 510876		m3		8388
	Rate per m3				£6.72
7	Temporary Works design (sheet piling), refer Graham Construction letter 17/12/10 .				
a	Tony Gee costs	1	Sum	£17,914.88	£17,914.88
b	Graham Construction O&P	12.5%			£2,239.36
					£20,154.24

CEC02084556_0104

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Edinburgh Tram Project
INTC 625

Appendix C

Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)

Derived Rates

Item	Description	Quantity	UNIT	Rate	Total
2	Vibro-column Solution				
a	refer Expanded Ltd email 14/12/10 incorporating GeMech quotation dated 10 December 2010, chainage 510876 to 511027	1	Sum	£40,305.00	£40,305.00
b	Extend vibro treatment beyond above chainages	3726	m2	£22.54	£83,984.04
c	Additional testing to extend vibro treatment beyond above chainages				
	GeMech quote items 9 & 13 pro-rata to area	1	Sum	£18,569.12	£18,569.12
d	Expanded O&P	8.0%			£11,428.65
e	BBUK Risk (to lump sum)	10%			£15,428.68
					£169,715.49
	Divide by volume associated with footprint between chainage 510594 to 511027		m3		11352
	Rate per m3				£14.95
4	EL attendances for GeMech				
a	Working platform 150m x 10m x 0.5 wide	750	m3	£24.66	£18,495.00
b	Drainage / Pumping / Ground water control, allow £5k set-up/demob £1.5k per wk running costs, say	1	Sum	£10,000.00	£10,000.00
c	Water supply , incl deliver etc	1	Sum		
d	Machine in attendance	1	Sum	£5,260.75	£5,260.75
	Expanded Ltd O&P	8.0%			£2,700.46
	BBUK Risk (to lump sum)	10%			£3,645.62
					£40,101.83
	Divide by volume associated with footprint between chainage 510594 to 510876		m3		2964
	Rate per m3				£13.53

CEC02084556_0105

000098

Edinburgh Tram Project
INTC 625

Appendix C

Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)

Derived Rates

Item	Description	Quantity	UNIT	Rate	Total
8	Pre-treatment Survey Works and testing				
a	Pre-treatment survey works, ref Expanded Ltd email 07/12/10	1	Sum	£ 10,919.00	£ 10,919.00
b	Dynamic Probing (Raeburn)	3	days	£ 675.00	£ 2,025.00
c	Shell & Auger (Raeburn, £500 mob/demob, 2x20m holes @ £26/m)	1	Sum	£ 1,540.00	£ 1,540.00
	Sum				£ 14,484.00

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000099

Appendix D

Edinburgh Tram Project

INTC 625

Section 5A - Murrayfield Corridor Ground Improvement (Chainage 510594 to 511027)

Other Supporting Information

- 1 Graham Construction letter of 17 December 2010 ref BN/Site/S21B/CE (refer Appendix D to Option A)
- 2 SDS response to TQ 1809 (refer Appendix D to Option A)
- 3 Expanded email 14/12/10, including GeMech estimate of 10 December 2010 (ref Appendix D to Option B)
- 4 Expanded email 07/01/10, including breakdown of Expanded Ltd quote (ref Appendix D to Option B).
- 5 Expanded email 07/01/10, including Expanded Ltd Pretreatment Survey works quote (ref Appendix D to Option B).