

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 1 of 2

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2751513		Ground Water: 1.20m		Borehole No: KCR/BH#78														
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R306363		Geologist: Yasir uddin		Date Started: May-4-2012																
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +9.58		Driller: Murad Jamali		Date Completed: May-6-2012																
Depth (m)	Sample No.	Thickness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks							
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)	Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)								
										10	20	30	40	50				From		To	From	to				
0.00				Brown, very dense, fine to medium, Gravelly Silty SAND, (Clayey Sand at bottom)																						
1.00	CRS-1	3.2												0.00	1.00	98	NA	-	-							
	SPT-1					50/10cm																				
2.00	CRS-2														1.00	2.00	98	NA	-	-						
	SPT-2				50/8cm																					
3.00	CRS-3	2.0		Brownish yellow, highly fractured, very poor, closely jointed, weathered, medium to hard, Sandy LIMESTONE, (bands of SANDSTONE at bottom)																						
	SPT-3					24	50/4cm									2.00	3.00	70	NA	-	-					
4.00	CRS-4																3.00	4.00	70	20	3.48	3.60			Sample Wax 12cm	
5.00	CRS-5														4.00	5.00	70	Nil	-	-						
6.00	CRS-6	1.0		Brown, highly fractured, very poor, medium hard, Clayey SANDSTONE											5.00	6.00	74	11	5.50	5.61			Sample Wax 11cm			
7.00	CRS-7	3.8		Grey, moderately fractured, good, moderately jointed, medium hard, SILTSTONE												6.00	7.00	80	40	6.56	6.74			Sample Wax 18cm		
	SPT																									
8.00	CRS-8																7.00	8.00	94	44	7.47	7.59			Sample Wax 12cm	
9.00	CRS-9																8.00	9.00	72	35	8.40	8.57			Sample Wax 17cm	
10.00	CRS-10														9.00	10.00	84	60	9.10	9.25			Sample Wax 15cm			

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SPT: Standard Penetration Test    CRS : Core Sample    CR: Core Recovery    RQD: Rock Quality Designation, DS: Disturb Sample, SL: Sample Length

### SUBSURFACE EXPLORATION LOG FIELD DATA

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2751513		Ground Water: 1.20m		Borehole No: KCR/BH#78														
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R306363		Geologist: Yasir uddin		Date Started: May-4-2012																
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +9.58		Driller: Murad Jamali		Date Completed: May-6-2012																
Depth (m)	Sample No.	Thick-ness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks							
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)		Core Recovery (Cm)	R.Q.D (%)		Core Waxed for Testing (m)						
										10	20	30	40	50	From	To				From	to					
10.00		1.0	■ ■ ■ ■ ■	Grey, moderately fractured, poor, closely jointed, medium hard, SILTSTONE, with Clay lamination																						
11.00	CRS-11	1.0	■ ■ ■ ■ ■	Grey, highly fractured, very poor, closely jointed, medium hard, SILTSTONE, with Clay lamination, with lenses of friable SANDSTONE and SHALE																				Sample Wax 12cm		
12.00	CRS-12	1.0	■ ■ ■ ■ ■																							
13.00	CRS-13	3.0	■ ■ ■ ■ ■	Grey, moderately fractured, poor to fair, closely jointed, medium hard, SILTSTONE, with lenses of SHALE																						
14.00	CRS-14																									
15.00	CRS-15																									
16.00	CRS-16	1.0	■ ■ ■ ■ ■																						Sample Wax 11cm	
17.00	CRS-17	4.0	■ ■ ■ ■ ■																							
18.00	CRS-18		■ ■ ■ ■ ■																							
19.00	CRS-19		■ ■ ■ ■ ■																							
20.00	CRS-20		■ ■ ■ ■ ■																							
<b>END OF BOREHOLE AT 20.0m Depth</b>																										

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SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

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






Client: The JICA Study Team				Type of Boring: Rotary	Co-ordinate:		N: 2751826	Ground Water: 3.10m	Borehole No: KCR/BH#79												
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian	E: 42R306933		Geologist: M. Irfan	Date Started: May-04-2012													
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite	Ground Elevation: +12.55		Driller: Misba	Date Completed: May-6-2012													
Depth (m)	Sample No.	Thick. kness of Layer (m)	Lithology	Stratum Description	SPT						CORE RUN				Remarks						
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm						Depth (m)	Core Recovery (C,m)	R.Q.D (%)	Core Waxed for Testing (m)		
										10	20	30	40	50					From	To	From
0.00			▽	Brown, medium dense, Gravely SAND, little Silt, trace to little concretion																	
1.00	CRS-1 SPT-1	2.0	▽		7	6	6	5	17						0.00	1.00	100	NA	-	-	Dry Coring
2.00	CRS-2 SPT-2		▽	5	2	2	1	5	1.00						2.00	100	NA	-	-	Dry Coring	
3.00	CRS-3 SPT-3	1.5	▽	Brown, loose to very dense, medium to coarse, Silty SAND little Gravels	13	17	40	43/4cm	R												
4.00	CRS-4 SPT-4	1.0	▽		12	14	15/2cm	R													
5.00	CRS-5		▽	Brown, highly fractured, very poor, horizontally closely jointed, hard, calcareous SANDSTONE, with lenses of Clay																	
6.00	CRS-6		▽		5.00	6.00	63	Nil	-	-											
7.00	CRS-7	3.5	▽		6.00	7.00	62	21	6.20	6.33	Sample Waxed 13cm										
8.00	CRS-8		▽		7.00	8.00	73	Nil	-	-											
		0.5	■	Brown, highly fractured, very poor, weathered, hard, LIMESTONE, trace fossils																	
9.00	CRS-9		■																		
		1.5	■	Brown, moderately fractured, poor, medium hard, SHALE, trace fossils																	
10.00	CRS-10		■		8.00	9.00	81	Nil	-	-											
			■																		
			■	9.00	10.00	90	35	9.30	9.45	Sample Waxed 15cm											

SPT: Standard Penetration Test   CRS : Core Sample   CR:Core Recovery   RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

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## SUBSURFACE EXPLORATION LOG FIELD DATA

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









Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2751826		Ground Water: 3.10m		Borehole No: KCR/BH#79									
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R306933		Geologist: M. Irfan		Date Started: May-04-2012											
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +12.55		Driller: Misba		Date Completed: May-6-2012											
Depth (m)	Sample No.	Thick. kness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks		
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)		Core Recovery (Cm)	R.Q.D (%)		Core Waxed for Testing (m)	
										10	20	30	40	50	From	To				From	to
10.00	CRS-11	1.5		Brown, moderately fractured, poor, weathered, medium hard, SHALE, trace fossils											From	To	Core Recovery (Cm)	R.Q.D (%)	From	to	Sample Waxed 10cm
11.00					10.00	11.00	88	33	10.40	10.50											
12.00	CRS-12	1.5		Grey, fractured, medium hard, to hard, horizontally jointed LIMESTONE, trace fossils,										From	To	Core Recovery (Cm)	R.Q.D (%)	From	to	Sample Waxed 15cm	
13.00	11.00				12.00	90	34	-	-												
14.00	CRS-14	1.5		Grey, highly fractured, very poor, horizontally jointed, medium hard to hard, Sandy LIMESTONE, trace fossils										From	To	Core Recovery (Cm)	R.Q.D (%)	From	to	Sample Waxed 15cm	
15.00	12.00				13.00	74	25	-	-												
16.00	CRS-15	2.5		Grey, highly fractured, very poor, medium hard, SHALE, interbedded with lenses of SILTSTONE & LIMESTONE										From	To	Core Recovery (Cm)	R.Q.D (%)	From	to	Sample Waxed 11cm	
17.00	13.00				14.00	73	15	14.00	14.15												
18.00	14.00				15.00	75	Nil	-	-												
19.00	CRS-18	3.0		Grey, highly fractured, very poor, horizontally jointed, SILTSTONE										From	To	Core Recovery (Cm)	R.Q.D (%)	From	to	Sample Waxed 11cm	
20.00	15.00				16.00	74	Nil	-	-												
21.00	16.00				17.00	82	24	-	-												
22.00	CRS-19	3.0		Grey, highly fractured, very poor, horizontally jointed, SILTSTONE										From	To	Core Recovery (Cm)	R.Q.D (%)	From	to	Sample Waxed 11cm	
23.00	17.00				18.00	80	Nil	-	-												
24.00	CRS-20	3.0		Grey, highly fractured, very poor, horizontally jointed, SILTSTONE										From	To	Core Recovery (Cm)	R.Q.D (%)	From	to	Sample Waxed 11cm	
25.00	18.00				19.00	77	Nil	-	-												
26.00	CRS-20	3.0		Grey, highly fractured, very poor, horizontally jointed, SILTSTONE										From	To	Core Recovery (Cm)	R.Q.D (%)	From	to	Sample Waxed 11cm	
27.00	19.00				20.00	90	11	19.15	19.26												
<b>END OF BOREHOLE AT 20.0m Depth</b>																					

SPT: Standard Penetration Test    CRS : Core Sample    CR: Core Recovery    RQD: Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

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## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 1 of 2

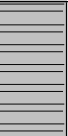
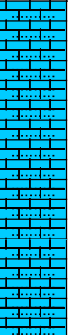
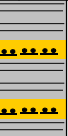
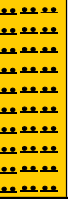
Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2752100		Ground Water: 4.5m		Borehole No: KCR/BH# 80											
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R307327		Geologist: Aurangzaib		Date Started: May -01-2012													
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +15.87		Driller: M. Murad		Date Completed: May-3-2012													
Depth (m)	Sample No.	Thickness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks				
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)	Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)					
										10	20	30	40	50				From		To	From	to	
0.00				Brown, very dense, fine to medium, Silty SAND, little to some Gravels																			Dry Coring
1.00	CRS-1 SPT-1	2.8			32	26	13	16	55							0.00	1.00	96	NA	-	-		
2.00	CRS-2 SPT-2			13	14	19	20	53							1.00	2.00	97	NA	-	-	Dry Coring		
3.00	CRS-3	0.2		Yellowish brown, highly fractured, weathered, LIMESTONE											2.00	3.00	89	NA	-	-			
4.00	CRS-4	4.0		Yellowish brown, highly fractured, poor, highly weathered, horizontally jointed, friable, SANDSTONE											3.00	4.00	60	Nil	-	-			
5.00	CRS-5				4.00	5.00	61	Nil	-	-													
6.00	CRS-6				5.00	6.00	65	Nil	-	-													
7.00	CRS-7				(band of LIMESTONE b/w 6.0 to 7.0m)	6.00	7.00	60	Nil	-	-												
8.00	CRS-8	2.0		Yellowish brown, highly fractured, poor, highly weathered, horizontally jointed, hard Sandy LIMESTONE (Joint filled with Silt)										7.00	8.00	65	21	7.89	8.00	Sample waxed 11cm			
9.00	CRS-9		8.00		9.00	60	Nil	-	-														
10.00	CRS-10	1.0		Whitish Yellow, highly fractured, very poor, closely jointed, highly weathered (oxidized), very hard LIMESTONE, trace of fossils										9.00	10.00	65	Nil	-	-				

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SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

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Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate: N: 2752100		Ground Water: 4.5m		Borehole No: KCR/BH# 80													
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R307327		Geologist: Aurangzaib		Date Started: May -01-2012													
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +15.87		Driller: M. Murad		Date Completed: May-3-2012													
Depth (m)	Sample No.	Thicknness of Layer (m)	Lithology	Stratum Description	SPT					CORE RUN				Remarks									
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)	Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)					
										10	20	30	40					50	From	To	From	to	
10.00	CRS-11	1.5		Grey, highly fractured, very poor, highly weathered, hard, SHALE with bands of SILTSTONE at bottom																			
11.00																							
12.00	CRS-12	4.4		Grey, moderately to slightly fractured, poor to fair, highly weathered, horizontally jointed, hard, Sandy LIMESTONE																			
13.00	CRS-13																						
14.00	CRS-14																						
15.00	CRS-15																						
16.00	CRS-16																						
17.00	CRS-17	1.6		Grey, highly fractured, poor, weathered, hard, SHALE interbedded with SILTSTONE																			
18.00	CRS-18	2.5		Grey, moderately to highly fractured, fair, slightly weathered, hard, SILTSTONE, with bands of SHALE at top																			
19.00	CRS-19																						
20.00	CRS-20																						
END OF BOREHOLE AT 20.0m Depth																							

SPT: Standard Penetration Test    CRS : Core Sample    CR: Core Recovery    RQD: Rock Quality Designation, DS: Disturbed Sample, SL: Sample Length

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## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 1 of 2

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2752233		Ground Water: 1.6m		Borehole No: KCR/BH# 81									
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R307692		Geologist: M. Irfan		Date Started: Apr-29-2012											
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +12.90		Driller: Misba		Date Completed: May-02-2012											
Depth (m)	Sample No.	Thick. kness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks		
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)	Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)			
										10	20	30	40	50				From		To	From
0.00			■■■■	Brown, very loose Sandy SILT																	
1.00	CRS-1	2.0	■■■■		1	1	1	1	3						0.00	1.00	95	NA	-	-	Dry Coring
2.00	CRS-2		■■■■												1.00	2.00	100	NA	-	-	Dry Coring
3.00	CRS-3	1.2	■■■■	Brown, loose, Silty SAND, trace Gravels, trace concretion	1	1	2	2	5						2.00	3.00	65	NA	-	-	Dry Coring
4.00	CRS-4	0.9	■■■■	Brown, highly fractured, very poor, horizontally jointed, weathered, Sandy LIMESTONE	7	52/5cm			R						3.00	4.00	80	Nil	-	-	
5.00	CRS-5		■■■■	Brown, highly fractured, poor, horizontally jointed, weathered (limonitic & hematitic), friable, SANDSTONE											4.00	5.00	60	Nil	-	-	
6.00	CRS-6		■■■■												5.00	6.00	70	Nil	-	-	
7.00	CRS-7	4.7	■■■■												6.00	7.00	70	Nil	-	-	
8.00	CRS-8		■■■■												7.00	8.00	70	Nil	-	-	
9.00	CRS-9		■■■■												8.00	9.00	71	Nil	-	-	
10.00	CRS-10		■■■■	(Bands of Clayey SANDSTONE b/w 9.0-10.0m)											9.00	10.00	62	Nil	-	-	

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SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 2 of 2

Client: The JICA Study Team			Type of Boring: Rotary			Co-ordinate:		N: 2752233		Ground Water: 1.6m		Borehole No: KCR/BH# 81																			
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi			Machine Make: Russian			E: 42R307692		Geologist: M. Irfan			Date Started: Apr-29-2012																				
Contractor: Consolidated Engineering Services (Pvt) Ltd			Drilling Fluid: Bentonite			Ground Elevation: +12.90			Driller: Misba		Date Completed: May-02-2012																				
Depth (m)	Sample No.	Thickness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks												
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)	Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)													
										10	20	30	40	50				From		To	From	to									
10.00				Brown, highly fractured, poor, weathered, friable, SANDSTONE																											
11.00	CRS-11			Brownish grey, highly fractured, very poor, Sandy Limestone, trace fossils  (Band of hard SHALE at 12.8m)											10.00	11.00	59	Nil	-	-											
12.00	CRS-12														11.00	12.00	65	Nil	-	-											
13.00	CRS-13	4.0													12.00	13.00	53	Nil	-	-											
14.00	CRS-14														13.00	14.00	76	Nil	-	-											
15.00	CRS-15	1.3		Grey, highly fractured, poor, medium hard, SANDSTONE, lenses of Sandy Limestone											14.00	15.00	47	Nil	-	-											
16.00	CRS-16	0.6		Grey, moderately fractured, fair, horizontally jointed, medium hard, SILTSTONE											15.00	16.00	70	Nil	-	-											
17.00	CRS-17			Grey, moderately fractured, fair, horizontally jointed, medium hard, SHALE											16.00	17.00	80	48	16.45	16.56	Sample Waxed 11cm										
18.00	CRS-18	1.5													17.00	18.00	81	52	17.00	17.12	Sample Waxed 12cm										
19.00	CRS-19	1.7			Grey, moderately fractured, fair, horizontally jointed, medium hard, SILTSTONE, with Clay lamination										18.00	19.00	81	37	18.10	18.22	Sample Waxed 12cm										
20.00	CRS-20	0.3		Grey, fractured, fair, medium hard, SHALE											19.00	20.00	86	33	19.32	19.45	Sample Waxed 13cm										
END OF BOREHOLE AT 20.0m Depth																															

APP-2-2-186

SPT: Standard Penetration Test    CRS : Core Sample    CR: Core Recovery    RQD: Rock Quality Designation, DS: Disturbance Sample, SL: Sample Length



## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 1 of 2

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2752541	Ground Water: 3.0m		Borehole No: KCR/BH#82											
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian				E: 42R308105	Geologist: Aurangzaib		Date Started: Apr-26-2012											
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +15.72		Driller: M. Mirad		Date Completed: Apr-29-2012												
Depth (m)	Sample No.	Thick-ness of Layer (m)	Lithology	Stratum Description	SPT					CORE RUN					Remarks							
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm						Depth (m)	Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)			
										10	20	30	40	50					From	To	From	to
0.00				Yellow, medium dense, fine to medium, Silty SAND, little to some Gravels. (filled material)																Dry Coring		
1.00	CRS-1 SPT-1	2.0			10	7	6	7	20													
2.00	CRS-2 SPT-2																					
3.00	CRS-3 SPT-3	1.3		Yellow, medium dense, Sandy SILT, trace Gravels (filled material)	11	8	9	8	25													
4.00	CRS-4 SPT-4			Yellowish brown, highly fractured, very poor, loosely cemented, highly weathered, limonitic, SILTSTONE, with lenses of SHALE at places	17	13	18	20	51													
5.00	CRS-5 SPT-5				31	50/7cm			R													
6.00	CRS-6 SPT-6	5.5			28	47	50/6cm		R													
7.00	CRS-7 SPT-7				50/10cm				R													
8.00	CRS-8 SPT-8				50/5cm				R													
9.00	CRS-9																					
10.00	CRS-10	1.2		Grey, moderately fractured, poor, highly weathered, Sandy SHALE																Sample Waxed 14cm		

APP-2-2-187

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 2 of 2

Client: The JICA Study Team		Type of Boring: Rotary		Co-ordinate:		N: 2752541		Ground Water: 3.0m		Borehole No: KCR/BH#82																	
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		Machine Make: Russian		E: 42R308105		Geologist: Aurangzaib		Date Started: Apr-26-2012																			
Contractor: Consolidated Engineering Services (Pvt) Ltd		Drilling Fluid: Bentonite		Ground Elevation: +15.72		Driller: M. Mirad		Date Completed: Apr-29-2012																			
Depth (m)	Sample No.	Thick kness of Layer (m)	Lithology	Stratum Description	SPT					CORE RUN					Remarks												
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm						Depth (m)	Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)								
										10	20	30	40	50					From	To	From	to					
10.00	SPT-9		Lithology Column	Grey, highly fractured, very poor to poor, highly weathered, horizontally jointed, friable SANDSTONE, interbedded with Shale	41	50/5cm																					
11.00	CRS-11																										
	SPT-10						50/5cm																				
12.00	CRS-12	4.1																									
13.00	CRS-13																										
14.00	CRS-14																										
		0.2				Grey, highly fractured, very poor, very hard, LIMESTONE																					
15.00	CRS-15					Grey, highly fractured, very poor to poor, slightly to moderately weathered, horizontally jointed, friable SANDSTONE, interbedded with Shale																					
16.00	CRS-16																										
17.00	CRS-17																										
18.00	CRS-18	5.7																									
19.00	CRS-19																										
20.00	CRS-20																										
<b>END OF BOREHOLE AT 20.0m Depth</b>																											

APP-2-2-188

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 1 of 2

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2752753		Ground Water: 0.40m		Borehole No: KCR/BH#83												
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R308587		Geologist: M.Irfan		Date Started: Apr-24-2012														
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +14.00		Driller: Misba		Date Completed: Apr-26-2012														
Depth (m)	Sample No.	Thick kness of Layer (m)	Lithology	Stratum Description	SPT						CORE RUN				Remarks									
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm						Depth (m)	Core Recovery (C,m)	R.Q.D (%)	Core Waxed for Testing (m)					
										10	20	30	40	50					From	To	From	to		
0.00		1.0		Yellowish brown, medium to coarse, Silty SAND, with some Gravels																				
1.00	CRS-1																							Dry Coring
	SPT-1				4	4	4	5	13					0.00	1.00	94	NA	-	-					
2.00	CRS-2																							Dry Coring
	SPT-2				6	5	7	8	20					1.00	2.00	100	NA	-	-					
3.00	CRS-3																							Sample waxed 18cm
	SPT-3													2.00	3.00	90	18	2.7	2.88					
4.00	CRS-4																							Sample waxed 11cm
	SPT-4				6	5	8	15	28					3.00	4.00	73	40	3.26	3.37					
5.00	CRS-5																							
	SPT-5													4.00	5.00	97	Nil	-	-					
6.00	CRS-6				50/14cm																			
	SPT-6													5.00	6.00	70	Nil	-	-					
7.00	CRS-7																							
	SPT-7													6.00	7.00	68	Nil	-	-					
8.00	CRS-8																							
	SPT-8													7.00	8.00	38	Nil	-	-					
9.00	CRS-9																							
	SPT-9													8.00	9.00	52	14	-	-					
10.00	CRS-10																							
	SPT-10													9.00	10.00	84	Nil	-	-					

APP-2-2-189

SPT: Standard Penetration Test    CRS : Core Sample    CR: Core Recovery    RQD: Rock Quality Designation, DS: Disturb Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 2 of 2

Client: The JICA Study Team					Type of Boring: Rotary	Co-ordinate:		N: 2752753	Ground Water: 0.40m	Borehole No: KCR/BH#83														
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi					Machine Make: Russian			E: 42R308587	Geologist: M.Irfan	Date Started: Apr-24-2012														
Contractor: Consolidated Engineering Services (Pvt) Ltd					Drilling Fluid: Bentonite			Ground Elevation: +14.00	Driller: Misba	Date Completed: Apr-26-2012														
Depth (m)	Sample No.	Thick. (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks					
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)		Core Recovery (Cm)	R.Q.D (%)		Core Waxed for Testing (m)				
										10	20	30	40	50	From	To				From	to			
10.00			8.7	Grey, highly fractured, very poor, horizontally jointed, fine to medium grained, loosely cemented, friable, SILTSTONE, with lenses of SHALE and SANDSTONE at places																				
11.00	CRS-11				10.00	11.00	45	Nil	-	-														
12.00	CRS-12				11.00	12.00	50	24	11.48	11.62													Sample Waxed 14cm	
13.00	CRS-13				12.00	13.00	47	11	-	-														
14.00	CRS-14				13.00	14.00	47	11	-	-														
15.00	CRS-15				14.00	15.00	57	12	-	-														
16.00	CRS-16				15.00	16.00	50	25	15.90	16.00													Sample Waxed 10cm	
17.00	CRS-17				16.00	17.00	70	Nil	-	-														
18.00	CRS-18				17.00	18.00	65	Nil	-	-														
19.00	CRS-19				18.00	19.00	45	Nil	-	-														
			1.3	Grey, highly fractured, very poor, soft to medium hard, Sandy SHALE																				
20.00	CRS-20				19.00	20.00	43	Nil	-	-														
<b>END OF BOREHOLE AT 20.0m Depth</b>																								

APP-2-2-190

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

**SUBSURFACE EXPLORATION LOG FIELD DATA**

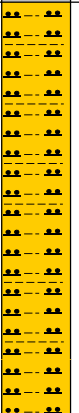
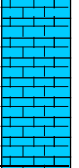

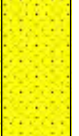
Client: The JICA Study Team			Type of Boring: Rotary			Co-ordinate:		N: 2753005		Ground Water: 2.0		Borehole No: KCR/BH#84														
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi			Machine Make: Russian			E: 42R309031		Geologist: Irfan		Date Started: Apr-21-2012																
Contractor: Consolidated Engineering Services (Pvt) Ltd			Drilling Fluid: Bentonite			Ground Elevation: +15.03		Driller: Misba		Date Completed: Apr-23-2012																
Depth (m)	Sample No.	Thickness of Layer (m)	Lithology	Stratum Description	SPT						CORE RUN						Remarks									
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)	Core Recovery (Cm)		R.Q.D (%)	Core Waxed for Testing (m)							
										10	20	30	40	50					From	To	From	to				
0.00	CRS-1 SPT-1	3.5	[Dotted pattern]	Brown, medium dense, fine to coarse, Gravely SAND, little Silt																						
1.00					2	3	5	6	14					0.00	1.00	86	NA	-	-		Dry Coring					
2.00					CRS-2 SPT-2	7	5	4	3	12					1.00	2.00	95	NA	-	-		Dry Coring				
3.00					CRS-3 SPT-3	26	11	7	4	22					2.00	3.00	85	NA	-	-						
4.00	CRS-4 SPT-4	1.0	[Brick pattern]	Brown, Stiff, Silty CLAY, little Sand	2	3	5	9	17														Sample Waxed 16cm			
5.00	CRS-5																									
6.00	CRS-6	2.5																							Sample Waxed 12cm	
7.00	CRS-7																									
8.00	CRS-8 SPT-5	3.0	[Horizontal line pattern]	Yellowish brown, moderately fractured, poor, medium hard to hard, SHALE (fossils are observed at places)	8	9	12	16	37																	
9.00	CRS-9 SPT-6				40	50/5cm			R																	
10.00	CRS-10																									

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

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## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 2 of 2

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2753005		Ground Water: 2.0		Borehole No: KCR/BH#84											
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R309031		Geologist: Irfan		Date Started: Apr-21-2012													
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +15.03		Driller: Misba		Date Completed: Apr-23-2012													
Depth (m)	Sample No.	Thick-ness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks				
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)		Core Recovery (Cm)	R.Q.D (%)		Core Waxed for Testing (m)			
										10	20	30	40	50	From	To				From	to		
10.00	SPT-7	0.3		Yellowish brown, fractured, poor, medium hard, SHALE	50/12cm																		
11.00	CRS-11	4.9		Grey, moderately fractured, fair to good, horizontally jointed, hard to very hard, Clayey SILTSTONE											10.00	11.00	91	59	10.73	10.83	Sample Waxed 10cm		
12.00	CRS-12																11.00	12.00	95	41	11.00	11.14	Sample Waxed 14cm
13.00	CRS-13																12.00	13.00	91	46	12.16	12.31	Sample Waxed 15cm
14.00	CRS-14																13.00	14.00	85	42	13.18	13.31	Sample Waxed 13cm
15.00	CRS-15																14.00	15.00	92	85	14.36	14.50	Sample Waxed 14cm
16.00	CRS-16	2.5		Grey, slightly fractured, good, horizontal jointed, very hard, LIMESTONE											15.00	16.00	78	60	15.14	15.24	Sample Waxed 10cm		
17.00	CRS-17																16.00	17.00	86	50	16.29	16.40	Sample Waxed 11cm
18.00	CRS-18	0.6		Grey, moderately fractured, fair, horizontal jointed, medium hard, MUDSTONE										17.00	18.00	88	51	-	-				
19.00	CRS-19	1.7		Grey, highly fractured, very poor, very hard, horizontal jointed, fine grained, medium hard, fossiliferous, SANDSTONE											18.00	19.00	77	22	18.30	18.51	Sample Waxed 21cm		
20.00	CRS-20																19.00	20.00	65	10	19.20	19.30	Sample Waxed 10cm
<b>END OF BOREHOLE AT 20.0m Depth</b>																							

APP-2-2-192

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 1 of 2

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2753336		Ground Water: 1.50m		Borehole No: KCR/BH#85											
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make:		E: 42R309628		Geologist: Aurangzaib		Date Started: Apr-21-2012													
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +14.57		Driller: M. Murad		Date Completed: Apr-25-2012													
Depth (m)	Sample No.	Thickness of Layer (m)	Lithology	Stratum Description	SPT						CORE RUN				Remarks								
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm						Depth (m)	Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)				
										10	20	30	40	50					From	To	From	to	
0.00				Greyish Brown to brown, very loose, Sandy SILT, little Clay, some Gravels, little plant roots & organic material (as filled material)																			
1.00	CRS-1 SPT-1	1.9			1	1	1	0	2							0.00	1.00	89	NA	-	-		
2.00	CRS-2 SPT-2			Brown, firm, Silty CLAY, trace Sand	4	3	3	2	8						1.00	2.00	88	NA	-	-			
3.00	CRS-3 SPT-3	1.1			9	11	20	25	56						2.00	3.00	88	NA	-	-			
4.00	CRS-4 SPT-4			Brown, very hard, oxidized, Silty CLAY	9	17	26	35	78						3.00	4.00	91	67	-	-			
5.00	CRS-5 SPT-5	2.0			50/4cm					R					4.00	5.00	95	90	4.79	4.95	Sample Waxed 16cm		
6.00	CRS-6 SPT-6			Yellow to brownish yellow, highly fractured, very poor, moderately weathered, fossiliferous, massive LIMESTONE	50/2cm					R				5.00	6.00	87	Nil	-	-				
7.00	CRS-7	1.8			50/2cm						R				6.00	7.00	83	50	6.33	6.51	Sample Waxed 18cm		
8.00	CRS-8 SPT-7			Brown, slightly fractured, good, highly weathered, medium hard to hard, SHALE with some shell fragments at places	50/5cm					R				7.00	8.00	75	43	7.07	7.28	Sample Waxed 21cm			
9.00	CRS-9 SPT-8	2.5			50/4cm						R				8.00	9.00	96	69	8.88	9.00	Sample Waxed 12cm		
10.00	CRS-10													9.00	10.00	96	63	9.36	9.53	Sample Waxed 17cm			

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SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 2 of 2

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2753336		Ground Water: 1.50m		Borehole No: KCR/BH#85												
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make:		E: 42R309628		Geologist: Aurangzaib		Date Started: Apr-21-2012														
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +14.57		Driller: M. Murad		Date Completed: Apr-25-2012														
Depth (m)	Sample No.	Thick-ness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks					
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)		Core Recovery (C <sub>m</sub> )	R.Q.D (%)		Core Waxed for Testing (m)				
										10	20	30	40	50	From	To				From	to			
10.00	SPT-9			Brown, Slightly fractured, good, highly weathered, medium hard to hard, SHALE thin lenses of Gypsum at places	17	25	50/8cm																	
11.00	CRS-11	2.0																						Sample Waxed 13cm
	SPT-10																							
12.00	CRS-12																							
		0.4		Grey, slightly fractured, good, massive, horizontally jointed, medium hard to hard, CLAYSTONE																				
13.00	CRS-13	1.5		Grey, slightly to moderately fractured, good, horizontally jointed, highly weathered, massive, fossiliferous LIMESTONE																				Sample Waxed 20cm
14.00	CRS-14																							
	SPT-11	1.1		Grey, slightly fractured, Excellent, horizontally jointed, medium hard to hard, CLAYSTONE			50/5cm																	Sample Waxed 19cm
15.00	CRS-15																							Sample Waxed 30cm
		0.7		Grey, moderately fractured, good, highly weathered, hard, SHALE																				
16.00	CRS-16			Grey, slightly fractured, good, moderately weathered, medium hard, SILTSTONE																				Sample Waxed 23cm
17.00	CRS-17	2.3																						Sample Waxed 21cm
				Grey, highly fractured, very poor, moderately weathered, horizontally jointed, medium hard, SILTSTONE																				
18.00	CRS-18																							Sample Waxed 21cm
		1.0		Grey, highly fractured, very poor, moderately weathered, horizontally jointed, friable SANDSTONE																				
19.00	CRS-19																							Sample Waxed 18cm
		1.0		Grey, highly fractured, very poor, moderately weathered, horizontally jointed, medium hard, SILTSTONE																				Sample Waxed 21cm
20.00	CRS-20																							Sample Waxed 21cm
<b>END OF BOREHOLE AT 20.0m Depth</b>																								

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

APP-2-2-194



## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 1 of 2

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate: N: 2753569		Ground Water: 3.10m		Borehole No: KCR/BH#86																
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R310233		Geologist: M. Noman		Date Started: Apr-17-2012																
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +15.35		Driller: Muhammad Murad		Date Completed: Apr-20-2012																
Depth (m)	Sample No.	Thick kness of Layer (m)	Lithology	Stratum Description	SPT						CORE RUN				Remarks											
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm						Depth (m)	Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)							
										10	20	30	40	50					From	To	From	to				
0.00		0.8		Brown, pieces of Limestone, with Sandy SILT (as filled Material)																						
1.00	CRS-1 SPT-1	3.8		Brown, dense, Clayey SAND, little Gravels, little Silt, trace calcareous nodules	13	14	16	16	46		0.00	1.00	90	NA	-	-							Dry Coring			
2.00	CRS-2 SPT-2				18	11	6	7	24		1.00	2.00	88	NA	-	-									Dry Coring	
3.00	CRS-3 SPT-3				9	5	4	7	16		2.00	3.00	90	NA	-	-										
4.00	CRS-4 SPT-4				12	13	15	21	49		3.00	4.00	92	NA	-	-										
5.00	CRS-5 SPT-5	0.4		Brown, highly fractured, very poor, slightly weathered, closely jointed, friable SANDSTONE	9	7	10	15	32	4.00	5.00	95	38	4.60	4.70							Sample Waxed 10.0cm				
6.00	CRS-6 SPT-6	1.7		Greyish brown, slightly fractured, excellent to good, slightly weathered, hard, SHALE	10	13	20	29	62	5.00	6.00	90	88	5.83	6.0							Sample Waxed 17.0cm				
7.00	CRS-7 SPT-7	0.9		Brown, slightly fractured, good, moderately weathered, hard, MUDSTONE	25	50/9cm			R	6.00	7.00	89	58	-	-											
8.00	CRS-8 SPT-8	2.4		Brown, moderately fractured, good, slightly weathered, oxidized (little limonitic), medium hard, SHALE, with thin lenses of SILTSTONE at places	11	16	20	29	65	7.00	8.00	94	88	7.51	7.78							Sample Waxed 27.0cm				
9.00	CRS-9 SPT-9				33	50/9cm	R	8.00	9.00	95	60	8.85	9.00											Sample Waxed 15.0cm		
10.00	CRS-10									9.00	10.00	94	72	9.35	9.49							Sample Waxed 14.0cm				

APP-2-2-195

SPT: Standard Penetration Test    CRS : Core Sample    CR: Core Recovery    RQD: Rock Quality Designation, DS: Disturb Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 2 of 2

Depth (m)		Sample No.		Thickness of Layer (m)		Lithology		Stratum Description		SPT										CORE RUN				Remarks		
										Graph N/30 cm					Depth (m)		Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)							
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	10	20	30	40	50	From	To			From	to						
10.00	SPT-10			3.6		Brown to greyish brown, slightly fractured, good to excellent, slightly weathered, medium hard to hard, SHALE, with lenses of SILTSTONE at places	40	50/5cm		R						0										
11.00	CRS-11 SPT-11						50/6cm		R								0	10.00	11.00	92	56	10.88	11.00	Samples Waxed 12cm		
12.00	CRS-12 SPT-12						45	50/3cm		R							0	11.00	12.00	95	93	11.81	12.00	Sample Waxed 19cm		
13.00	CRS-13 SPT-13						29	50/10cm									0	12.00	13.00	97	54	12.35	12.50	Sample Waxed 15cm		
14.00	CRS-14 SPT-14						1.5		Yellowish grey, moderately fractured, fair, moderately weathered, hard, MUDSTONE, with interbedded with SHALE	50/10cm		R						0	13.00	14.00	93	60	13.70	13.83	Sample Waxed 13cm	
15.00	CRS-15 SPT-15			50/15cm		R											0	14.00	15.00	94	32	14.32	14.44	Sample Waxed 12cm		
16.00	CRS-16 SPT-16			0.2		Grey, highly fractured, very poor, hard, SANDSTONE				50/12cm		R						0	15.00	16.00	97	Nil	-	-		
17.00	CRS-17 SPT-17			50/15cm				R								0	16.00	17.00	91	37	-	-				
18.00	CRS-18 SPT-18			4.7				Brown, moderately to slightly fractured, moderately weathered, oxidized, hard, SILTSTONE, interbedded with hard, SHALE	50/13cm		R						0	17.00	18.00	93	91	17.75	17.93	Sample Waxed 18cm		
19.00	CRS-19 SPT-19								50/10cm		R								0	18.00	19.00	92	53	-	-	
20.00	CRS-20																			19.00	20.00	84	13	-	-	
<b>END OF BOREHOLE AT 20.0m Depth</b>																										

APP-2-2-196

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 1 of 2

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2756915	Ground Water: 3.0m		Borehole No: KCR/BH#87											
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R309083		Geologist: Efaz Danish		Date Started: May-23-2012												
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +42.52		Driller: Allah Bux		Date Completed: May-25-2012												
Depth (m)	Sample No.	Thick kness of Layer (m)	Lithology	Stratum Description	SPT						CORE RUN				Remarks							
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm						Depth (m)	Core Recovery (C <sub>m</sub> )	R.Q.D (%)	Core Waxed for Testing (m)			
										10	20	30	40	50					From	To	From	to
0.00		1.0	[Symbol]	Brown, fine to medium, Silty SAND, some Gravel, trace pieces of wood and organic material (solid waste as filled material)											0.00	1.00	92	NA	-	-	Dry Coring	
1.00	CRS-1				30/2cm											1.00	2.00	87	NA	-	-	Dry Coring
2.00	CRS-2	2.0	[Symbol]	Brown, very dense, Clayey SAND, little Gravels	15	17	15	22	54						1.00	2.00	87	NA	-	-	Dry Coring	
3.00	CRS-3				30/2cm											2.00	3.00	90	NA	-	-	
4.00	CRS-4	1.0	[Symbol]	Brown, very dense, Silty SAND, trace Gravels	13	19	24	30	73						2.00	3.00	90	NA	-	-		
5.00	CRS-5	0.6	[Symbol]	Brown, very dense, Clayey SAND	28	18	22	25	65						3.00	4.00	80	NA	-	-		
6.00	CRS-6	0.9	[Symbol]	Brown, highly fractured, very poor, highly weathered, closely jointed, Sandy LIMESTONE											4.00	5.00	75	10	4.75	4.85	Sample Waxed 10cm	
7.00	CRS-7				32/10cm											5.00	6.00	72	Nil	-	-	
8.00	CRS-8	3.5	[Symbol]	Brown, highly fractured, very poor, highly weathered, friable SANDSTONE, with lenses of SHALE											6.00	7.00	75	Nil	-	-		
9.00	CRS-9				32/10cm											7.00	8.00	70	Nil	-	-	
10.00	CRS-10	1.0	[Symbol]	Brown, highly fractured, very poor, moderatally weathered, closely jointed, medium hard, Sandy SHALE											8.00	9.00	70	Nil	-	-		

APP-2-2-197

SPT: Standard Penetration Test CRS : Core Sample CR:Core Recovery RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

### SUBSURFACE EXPLORATION LOG FIELD DATA

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate: N: 2756915		Ground Water: 3.0m		Borehole No: KCR/BH#87															
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R309083		Geologist: Efaz Danish		Date Started: May-23-2012															
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +42.52		Driller: Allah Bux		Date Completed: May-25-2012															
Depth (m)	Sample No.	Thick-ness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks						
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)		Core Recovery (Cm)	R.Q.D (%)		Core Waxed for Testing (m)					
										10	20	30	40	50	From	To				From	to				
10.00			5.0	Brown, highly fractured, very poor, friable SANDSTONE, interbedded with SHALE																					
11.00	CRS-11														10.00	11.00	85	15	-	-					
12.00	CRS-12																								
13.00	CRS-13																								
14.00	CRS-14																								
15.00	CRS-15																								
				END OF BOREHOLE AT 15.0m Depth																					

APP-2-2-198

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 1 of 3

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2752194		Ground Water: 1.60m		Borehole No: KCR/BH#88									
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R295196		Geologist: Jawad		Date Started: July-18-2012											
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +2.62		Driller: Misbah		Date Completed: July-21-2012											
Depth (m)	Sample No.	Thickness of Layer (m)	Lithology	Stratum Description	SPT						CORE RUN				Remarks						
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm						Depth (m)	Core Recovery (C <sub>m</sub> )	R.Q.D (%)	Core Waxed for Testing (m)		
										10	20	30	40	50					From	To	From
0.00		1.0	■■■■	Brown, Sandy SILT, some Gravels, as filled material																	
1.00	CRS-1		■■■■	Brown, firm to stiff, Sandy Silty CLAY, trace Gravels, as filled material	2	3	2	4	9	o					0.00	1.00	85	NA	-	-	
2.00	SPT-1		■■■■		3	2	1	3	6	o					1.00	2.00	87	NA	-	-	
3.00	CRS-2	2.0	■■■■		2	1	3	2	6	o					2.00	3.00	85	NA	-	-	
4.00	SPT-2		■■■■	Brown, loose, Clayey Silty SAND, little Gravels.	2	1	3	2	6	o					3.00	4.00	80	NA	-	-	
5.00	CRS-3	1.0	■■■■		3	2	2	5	9	o					4.00	5.00	70	NA	-	-	
6.00	SPT-3		■■■■	Brown, dense to very dense, medium to coarse, Clayey Silty SAND, some Gravels.	19	11	9	15	35						5.00	6.00	60	NA	-	-	
7.00	CRS-4	0.8	■■■■		22	22	24	28	74						6.00	7.00	70	NA	-	-	
8.00	SPT-4		■■■■		14	16	15	25	56						7.00	8.00	75	NA	-	-	
9.00	CRS-5	5.2	■■■■		16	18	20	28	66						8.00	9.00	75	NA	8.19	8.31	
10.00	SPT-5		■■■■	18	20	20	25	65						9.00	10.00	60	NA	-	-		
	CRS-6		■■■■																		
	SPT-6		■■■■																		
	CRS-7		■■■■																		
	SPT-7		■■■■																		
	CRS-8		■■■■																		
	SPT-8		■■■■																		
	CRS-9		■■■■																		
	SPT-9		■■■■																		
	CRS-10		■■■■																		

APP-2-2-199

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 2 of 3

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2752194		Ground Water: 1.60m		Borehole No: KCR/BH#88												
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R295196		Geologist: Jawad		Date Started: July-18-2012														
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +2.62		Driller: Misbah		Date Completed: July-21-2012														
Depth (m)	Sample No.	Thick kness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks					
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)		Core Recovery (Cm)	R.Q.D (%)		Core Waxed for Testing (m)				
										10	20	30	40	50	From	To				From	to			
10.00	SPT-10	0.80	▽	Brown, highly fractured, very poor, medium hard, Garvely SANDSTONE.	45/8cm																			
11.00	CRS-11	0.20	▽	Brown, highly fractured, very poor, friable SANDSTONE										10.00	11.00	50	10	-	-					
	SPT-11	0.7	▲▲▲▲▲	Brown, slightly fractured, good, medium hard, SILTSTONE, with interbedded (11.40-11.75) grey, very hard, calcarious, LIMESTONE																				
12.00	CRS-12	0.3	▲▲▲▲▲	Brown, medium hard to hard, Clayey SANDSTONE.										11.00	12.00	70	60	11.13	11.24					Sample Wax 11cm
	SPT-12		▲▲▲▲▲																					
13.00	CRS-13		▲▲▲▲▲	Brown, modertaly fractured, poor, medium hard, friable SANSDTONE, with calcarious.										12.00	13.00	75	36	12.53	12.68					Sample Wax 15cm
14.00	CRS-14	4.0	▲▲▲▲▲											13.00	14.00	65	34	13.00	13.15					Sample Wax 15cm
15.00	CRS-15		▲▲▲▲▲											14.00	15.00	70	53	-	-					
16.00	CRS-16		▲▲▲▲▲											15.00	16.00	70	32	-	-					
17.00	CRS-17	1.0	▲▲▲▲▲	Brown, slightly fractured, good, medium hard, SILTSTONE.										16.00	17.00	80	78	16.00	16.20					Sample wax 20cm
18.00	CRS-18		▲▲▲▲▲	Redish brown, slightly fractured, good, medium hard, MUDSTONE, with lamination of Gypsum at a places.										17.00	18.00	70	65	17.11	17.26					Sample wax 15cm
19.00	CRS-19	3.00	▲▲▲▲▲											18.00	19.00	70	36	-	-					
20.00	CRS-20		▲▲▲▲▲											19.00	20.00	70	39	19.51	19.64					Sample wax 13cm

APP-2-2-200

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 3 of 3

APP-2-2-201

Client: The JICA Study Team				Type of Boring: Rotary	Co-ordinate:		N: 2752194	Ground Water: 1.60m	Borehole No: KCR/BH#88														
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian	E: 42R295196		Geologist: Jawad		Date Started: July-18-2012														
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite	Ground Elevation: +2.62		Driller: Misbah		Date Completed: July-21-2012														
Depth (m)	Sample No.	Thickness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks				
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)		Core Recovery (Cm)	R.Q.D (%)		Core Waxed for Testing (m)			
										10	20	30	40	50	From	To				From	to		
20.00				Reddish brown, slightly fractured, good, medium hard, MUDSTONE.																			
21.00	CRS-21	4.0												20.00	21.00	85	83	-	-				
22.00	CRS-22													21.00	22.00	60	13	-	-				
23.00	CRS-23													22.00	23.00	70	49	-	-				
24.00	CRS-24													23.00	24.00	92	90	23.54	23.75	Sample wax 21cm			
25.00	CRS-25		0.7		Brown, moderately fractured, fair, medium hard, SILTSTONE.																		
25.00	CRS-25	0.3		Yellowish brown, moderately fractured, fair, hard, MUDSTONE																			
26.00	CRS-26	1.0		Brown, slightly fractured, good, moderately weathered, medium hard, SILTSTONE.																			
27.00	CRS-27	2.6		Brown, moderately fractured, poor, medium hard, MUDSTONE																			
28.00	CRS-28																						
29.00	CRS-29		0.4			Brown, slightly fractured, good, hard, Clayey SANDSTONE,																	
30.00	CRS-30	1.0		Brown, slightly fractured, good, hard, MUDSTONE.																			
<b>END OF BOREHOLE AT 30.0m Depth</b>																							

SPT: Standard Penetration Test   CRS : Core Sample   CR:Core Recovery   RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 1 of 2

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2752452		Ground Water: 0.9m		Borehole No: KCR/BH#89									
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R307947		Geologist: Irfan		Date Started: Apr-27-2012											
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +12.68		Driller: Misbauddin		Date Completed: Apr-28-2012											
Depth (m)	Sample No.	Thick. kness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks		
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)	Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)			
										10	20	30	40	50				From		To	From
0.00		1.0	.....	Brown, fine to medium, SAND, with Gravels																	
1.00	CRS-1		.....	Brown, loose, Silty SAND, trace gravels, some Clay, trace plant roots	2	1	3	2	6						0.00	1.00	98	NA	-	-	Dry Coring
	SPT-1	1.0	.....																		
2.00	CRS-2		.....	Brown, loose, Silty SAND, trace gravels, some Clay, trace plant roots	2	1	3	2	6						1.00	2.00	88	NA	-	-	Dry Coring
	SPT-2	0.6	.....																		
3.00	CRS-3		.....	Brown, loose, Sandy CLAY, trace Gravels	3	3	2	4	9						2.00	3.00	44	Nil	-	-	
	SPT-3	0.6	.....																		
4.00	CRS-4		.....	Brown, highly fractured, very poor, weathered, loosely cemented, medium hard, SANDSTONE, with lenses of Clay	9	8	41	51/7	R						3.00	4.00	91	Nil	-	-	
	SPT-4		.....																		
5.00	CRS-5		.....	Brown, highly fractured, very poor, weathered, loosely cemented, medium hard, SANDSTONE, with lenses of Clay	50	40/5cm			R						4.00	5.00	70	Nil	-	-	
	SPT-5	4.9	.....																		
6.00	CRS-6		.....	Brown, highly fractured, very poor, weathered, loosely cemented, medium hard, SANDSTONE, with lenses of Clay	50/7cm				R						5.00	6.00	58	Nil	-	-	
	SPT-6		.....																		
7.00	CRS-7		.....	Brown, highly fractured, very poor, weathered, loosely cemented, medium hard, SANDSTONE, with lenses of Clay	33	50	50/5cm		R						6.00	7.00	57	Nil	-	-	
	SPT-7		.....																		
8.00	CRS-8		.....	Grey, highly fractured, very poor, medium hard, SHALE, with interbedded weathered, fraiable, SANDSTONE	50/12cm				R						7.00	8.00	61	Nil	-	-	
	SPT-8		.....																		
9.00	CRS-9		.....	Grey, highly fractured, very poor, medium hard, SHALE, with interbedded weathered, fraiable, SANDSTONE	28	50	50/5cm		R						8.00	9.00	70	Nil	-	-	
	SPT-9	2.5	.....																		
10.00	CRS-10		.....	Grey, highly fractured, very poor, medium hard, SHALE, with interbedded weathered, fraiable, SANDSTONE	50/14cm				R						9.00	10.00	64	Nil	-	-	

APP-2-2-202

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length



## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 2 of 2

Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate:		N: 2752452		Ground Water: 0.9m		Borehole No: KCR/BH#89													
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R307947		Geologist: Irfan		Date Started: Apr-27-2012															
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +12.68		Driller: Misbauddin		Date Completed: Apr-28-2012															
Depth (m)	Sample No.	Thick kness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks						
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)		Core Recovery (C.m)	R.Q.D (%)		Core Waxed for Testing (m)					
										10	20	30	40	50	From	To				From	to				
10.00		2.00	■■■■ ■■■■ ■■■■	Grey, highly fractured, very poor, horizontally jointed, friable SILTSTONE, interbeded with SHALE																					
11.00	CRS-11				10.00	11.00	66	10	10.03	10.13	Sample Waxed 10cm														
12.00	CRS-12																								
13.00	CRS-13	3.00	■■■■ ■■■■ ■■■■ ■■■■ ■■■■ ■■■■	Grey, highly fractured, very poor, horizontally jointed, friable, SANDSTONE																					
14.00	CRS-14				11.00	12.00	56	11	11.32	11.43	Sample Waxed 11cm														
15.00	CRS-15				12.00	13.00	49	14	12.30	12.44	Sample Waxed 14cm														
				<b>END OF BOREHOLE AT 15.0m Depth</b>																					

APP-2-2-203

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

### SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet 1 of 2

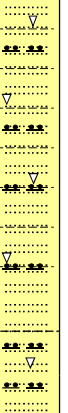
Client: The JICA Study Team				Type of Boring: Rotary		Co-ordinate: N: 2757020		Ground Water: 4.5m		Borehole No: KCR/BH#90													
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi				Machine Make: Russian		E: 42R300004		Geologist: Yasir		Date Started: June-07-2012													
Contractor: Consolidated Engineering Services (Pvt) Ltd				Drilling Fluid: Bentonite		Ground Elevation: +23.50		Driller: Allah Bux		Date Completed: June-10-2012													
Depth (m)	Sample No.	Thickness of Layer (m)	Lithology	Stratum Description	SPT						CORE RUN				Remarks								
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm						Depth (m)	Core Recovery (Cm)	R.Q.D (%)	Core Waxed for Testing (m)				
										10	20	30	40	50					From	To	From	to	
0.00		1.0		Brown, medium to coarse, Silty SAND, little Gravels (as filled material)																			
1.00	CRS-1				14	16	16	17	49							0.00	1.00	90	NA	-	-	Dry Coring	
2.00	CRS-2			Brown, dense to very dense, fine to coarse, Gravely SAND, little Silt and little Clay	20	27	40/5cm		R							1.00	2.00	85	NA	-	-	Dry Coring	
3.00	CRS-3				11	12	22	22	56							2.00	3.00	75	NA	-	-		
4.00	CRS-4				20	17	17	20	54							3.00	4.00	70	NA	-	-		
5.00	CRS-5			Brown, very dense, medium to coarse, Clayey SAND, little Silt, little to some Gravels, little oxidized, trace Calcareous nodules.	18	21	40/5		R							4.00	5.00	75	NA	-	-		
6.00	CRS-6				36	21	16	14	51							5.00	6.00	80	NA	-	-		
7.00	CRS-7				51/14cm				R							6.00	7.00	76	NA	-	-		
8.00	CRS-8				51/13cm				R							7.00	8.00	75	NA	-	-		
9.00	CRS-9				51/14cm				R							8.00	9.00	80	NA	-	-		
10.00	CRS-10															9.00	10.00	60	NA	-	-		

APP-2-2-204

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length

## SUBSURFACE EXPLORATION LOG FIELD DATA

Sheet **2** of **2**

Client: The JICA Study Team		Type of Boring: Rotary		Co-ordinate: N: 2757020		Ground Water: 4.5m		Borehole No: KCR/BH#90																		
Project: Preparatory Survey(II) on Karachi Circular Railway Revival Project in Karachi		Machine Make: Russian		E: 42R300004		Geologist: Yasir		Date Started: June-07-2012																		
Contractor: Consolidated Engineering Services (Pvt) Ltd		Drilling Fluid: Bentonite		Ground Elevation: +23.85		Driller: Allah Bux		Date Completed: June-10-2012																		
Depth (m)	Sample No.	Thickness of Layer (m)	Lithology	Stratum Description	SPT										CORE RUN				Remarks							
					15 (cm)	10 (cm)	10 (cm)	10 (cm)	N Blows 30cm	Graph N/30 cm					Depth (m)		Core Recovery (Cm)	R.Q.D (%)		Core Waxed for Testing (m)						
										10	20	30	40	50	From	To				From	to					
10.00		5.0		Brown, very dense, medium to coarse, Clayey SAND, little to some Gravels,														10.00	11.00	60	NA	-	-			
11.00	CRS-11																		11.00	12.00	75	NA	-	-		
12.00	CRS-12																			12.00	13.00	68	NA	-	-	
13.00	CRS-13																			13.00	14.00	60	NA	-	-	
14.00	CRS-14																			14.00	15.00	60	NA	-	-	
15.00	CRS-15																									
				<b>END OF BOREHOLE AT 15.0m Depth</b>																						

APP-2-2-205

SPT: Standard Penetration Test    CRS : Core Sample    CR:Core Recovery    RQD:Rock Quality Designation, DS: Disturbe Sample, SL: Sample Length