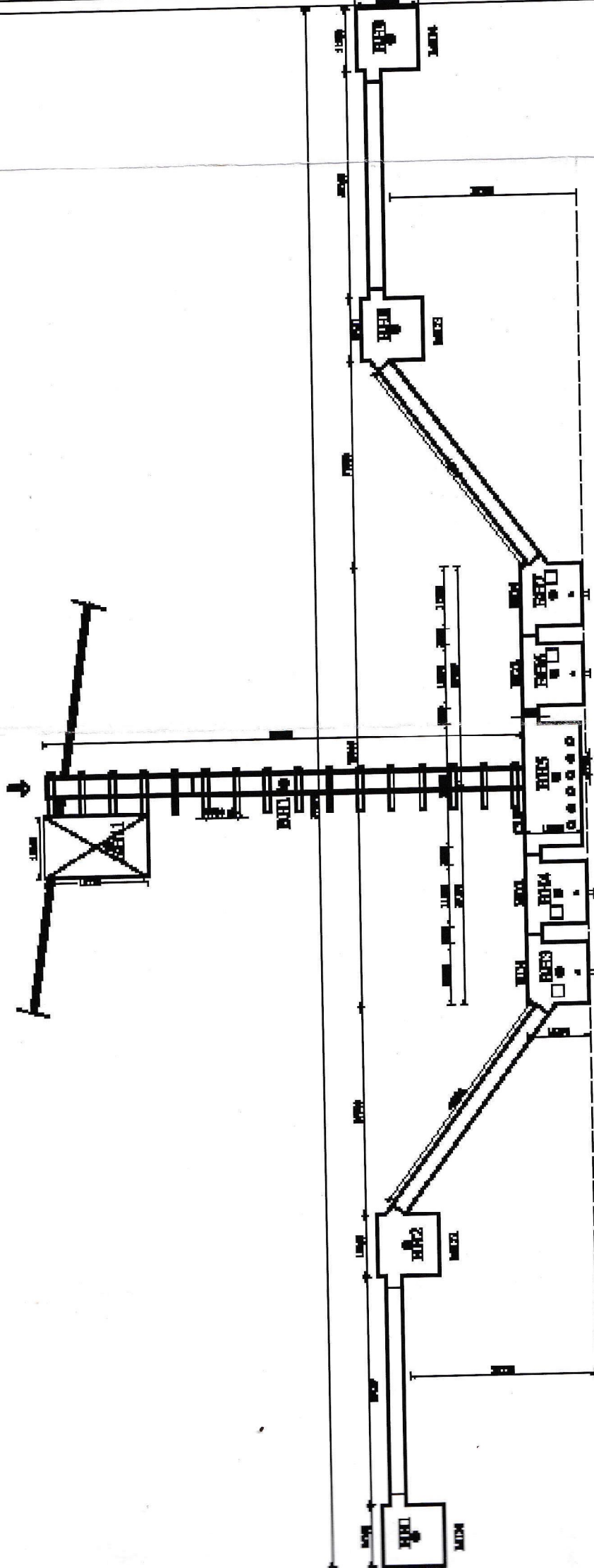


PUTHUVYPPEEN




BORE HOLE LOCATIONS OF LFG TERMINAL

SCALE - 1:100

LEGEND:
 BH1 - BORE HOLE LOCATION OF LFG TERMINAL

NOTE:
 ALL DIMENSIONS ARE IN METERS

NO.	DATE	REVISION	APPROVED BY	DESIGNED BY

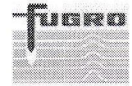
 COCHIN PORT TRUST COCHIN - 682001			
GEOLOGICAL INVESTIGATION FOR M/s. COCHIN WASTE & OUTER HARBOR INDUSTRIAL PUTHUVYPPEEN			
NO.	DATE	REVISION	DESIGNED BY

Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 03
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102562.4 E 635150.9
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/28/2013-01/30/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.20 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-41.50m,NX-67.50m	Core diameter,mm	: T.D. (m) : 62.61 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
0	0.00 - 0.45	⊗				3.00	-3.20		0.00 m to 3.00 m - Firm dark grey sandy silty CLAY with minute fragments of mica.							
1																
2	1.50 - 1.95	▼	0/2/3	5	5											
3																
4	3.00 - 3.45	▼	0/0/1	1	1	7.50	-6.20		3.00 m to 10.50 m - Very soft to soft dark grey clayey SILT, with shell fragments							
5	4.50 - 4.95	▼	0/0/0	0	0					21	79	0	0	12.7		
6																
7	6.00 - 6.50	□								27	72	1	0	48		
8																
9	7.50 - 7.95	▼	1/2/1	3	3											
10																
11	9.00 - 9.50	□								24	75	1	0	36		
12																
13	10.50 - 10.95	▼	2/2/3	5	5	21.00	-13.70		10.50 m to 31.50 m - Firm dark grey clayey SILT							
14																
15	12.00 - 12.50	□								30	70	0	0	40		
	13.50 - 13.95	▼	2/2/3	5	5											

Abbreviations & Symbols		
▼	- SPT (standard penetration test)	CD - Chart Datum
□	- UDS (undisturbed sample)	E - Extrapolated SPT Value
⊗	- DS (disturbed sample)	R - SPT Refusal
■	- RC (Rock Core)	T.D. - Termination Depth
		SBL - Sea Bed Level
		RL - Reduced Level
		PI - Plasticity Index
		LL - Liquid Limit
		c1 - Cohesion value obtained from unconfined Compression Test
		c2 - Cohesion value obtained from direct shear Test
		Phi - Angle of internal friction from direct shear test
		NA - Not Applicable

Water Depth (m)	
Date	Depth (m)
01/22/2013	1.20



Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 03
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102562.4 E 635150.9
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/28/2013-01/30/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.20 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-41.50m,NX-67.50m	Core diameter,mm	: T.D. (m) : 62.61 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
15	15.00 - 15.50					21.00	-13.70		10.50 m to 31.50 m - Firm dark grey clayey SILT	22	76	2	0	32		
16																
17	16.50 - 16.95	▼	2/3/3	6	6											
18										32	68	0	0	25		
19	18.00 - 18.45															
20	19.50 - 19.95	▼	2/3/4	7	7											
21										37	62	1	0	43		
22	21.00 - 21.50															
23	22.50 - 22.95	▼	2/2/4	6	6											
24										41	59	0	0	27		
25	24.00 - 24.50															
26	25.50 - 25.95	▼	2/3/3	6	6											
27										38	62	0	0	38		
28	27.00 - 27.45															
29	28.50 - 28.95	▼	2/4/8	12	12											
30																

Abbreviations & Symbols			Water Depth (m)	
▼ - SPT (standard penetration test)	CD - Chart Datum	LL - Liquid Limit	Date	Depth (m)
□ - UDS (undisturbed sample)	E - Extrapolated SPT Value	c1 - Cohesion value obtained from unconfined Compression Test		
⊗ - DS (disturbed sample)	R - SPT Refusal	c2 - Cohesion value obtained from direct shear Test		
■ - RC (Rock Core)	T.D. - Termination Depth	Phi - Angle of internal friction from direct shear test		
	SBL - Sea Bed Level	NA - Not Applicable		
	RL - Reduced Level			
	PI - Plasticity Index			



FUGRO GEOTECH PVT. LTD.

Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 03
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102562.4 E 635150.9
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/28/2013-01/30/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.20 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-41.50m,NX-67.50m	Core diameter,mm	: T.D. (m) : 62.61 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below E.G.L. (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
30	30.00 - 30.50					21.00	-13.70		10.50 m to 31.50 m - Firm dark grey clayey SILT	30	69	1	0	45		
31																
32	31.50 - 31.95	▼	5/8/11	19	19	6.00	-34.70		31.50 m to 37.50 m - Very stiff to hard greenish grey clayey SILT							
33										37	62	1	0	39		
34	33.00 - 33.49															
35	34.50 - 34.95	▼	4/15/22	37	37											
36																
37	36.00 - 36.45	▼	5/20/18	38	38											
38																
39	37.50 - 37.95	⊗				6.00	-40.70		37.50 m to 43.50 m - Dense to very dense light grey to greyish white silty SAND							
40																
41	39.00 - 39.45	▼	13/18/25	43	43											
42																
43	40.50 - 41.00	⊗														
44																
45	42.00 - 42.45	▼	26/34/44	78	78										0	36
	43.50 - 44.00	⊗				6.00	-46.70		43.50 m to 49.50 m - Hard light grey whitish grey sandy silty CLAY							

Abbreviations & Symbols

- ▼ - SPT (standard penetration test)
- - UDS (undisturbed sample)
- ⊗ - DS (disturbed sample)
- - RC (Rock Core)
- CD - Chart Datum
- E - Extrapolated SPT Value
- R - SPT Refusal
- T.D. - Termination Depth
- SBL - Sea Bed Level
- RL - Reduced Level
- PI - Plasticity Index
- LL - Liquid Limit
- c1 - Cohesion value obtained from unconfined Compression Test
- c2 - Cohesion value obtained from direct shear Test
- Phi - Angle of internal friction from direct shear test
- NA - Not Applicable

Water Depth (m)

Date	Depth (m)

Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 03
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102562.4 E 635150.9
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/28/2013-01/30/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.20 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-41.50m,NX-67.50m	Core diameter,mm	: T.D. (m) : 62.61 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
45	45.00 - 45.45	▼	16/17/17	34	34	6.00	-46.70		43.50 m to 49.50 m - Hard light grey whitish grey sandy silty CLAY							
46																
47	46.50 - 46.95	⊗														
48	48.00 - 48.45	▼	8/15/20	35	35											
49																
50	49.50 - 49.95	⊗				4.50	-52.70		49.50 m to 54.00 m - Very dense light grey clayey silty SAND							
51																
52	51.00 - 51.45	▼	18/33/47	80	80											
53	52.50 - 53.00	⊗													12	28
54	54.00 - 54.45	▼	13/24/26	50	50	1.50	-57.20		54.00 m to 55.50 m - Hard dark grey silty CLAY with less % of sand.							
55																
56	55.50 - 55.95	⊗				7.11	-58.70		55.50 m to 62.61 m - Very dense grey to greenish grey clayey silty SAND							
57	57.00 - 57.45	▼	22/31/34	65	65											
58																
59	58.50 - 58.95	⊗														
60																

Abbreviations & Symbols			Water Depth (m)		
▼	- SPT (standard penetration test)	CD	- Chart Datum	LL	- Liquid Limit
□	- UDS (undisturbed sample)	E	- Extrapolated SPT Value	c1	- Cohesion value obtained from unconfined Compression Test
⊗	- DS (disturbed sample)	R	- SPT Refusal	c2	- Cohesion value obtained from direct shear Test
■	- RC (Rock Core)	T.D.	- Termination Depth		- Angle of internal friction from direct shear test
		SBL	- Sea Bed Level	Phi	- Angle of internal friction from direct shear test
		RL	- Reduced Level	NA	- Not Applicable
		PI	- Plasticity Index		
				Date	Depth (m)



FUGRO GEOTECH PVT. LTD.

Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 03
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102562.4 E 635150.9
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/28/2013-01/30/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.20 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-41.50m,NX-67.50m	Core diameter,mm	: T.D. (m) : 62.61 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
60	60.00 - 60.45	▼	20/28/35	63	63	7.11	-58.70		55.50 m to 62.61 m - Very dense grey to greenish grey clayey silty SAND							
61																
62	61.50 - 62.00	⊗														
63	62.50 - 62.61	▼	R	R	409	0.01	-65.81		62.61 m - borehole terminated as per the instruction of Engineer In-charge							
64																
65																
66																
67																
68																
69																
70																
71																
72																
73																
74																
75																

Abbreviations & Symbols										Water Depth (m)	
▼	- SPT (standard penetration test)	CD	- Chart Datum	LL	- Liquid Limit			Date	Depth (m)		
□	- UDS (undisturbed sample)	E	- Extrapolated SPT Value	c1	- Cohesion value obtained from unconfined Compression Test						
⊗	- DS (disturbed sample)	R	- SPT Refusal	c2	- Cohesion value obtained from direct shear Test						
■	- RC (Rock Core)	T.D.	- Termination Depth		- Angle of internal friction from direct shear test						
		SBL	- Sea Bed Level	Phi	- Not Applicable						
		RL	- Reduced Level	NA							
		PI	- Plasticity Index								

FUGRO GEOTECH PVT. LTD.

Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 04
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102566.4 E 635169.8
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/27/2013-01/28/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.22 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-40.50m,NX-68.00m	Core diameter,mm	
		T.D. (m)	: 62.95 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
0	0.00 - 0.45	▼	0/0/0	0	0	4.50	-3.22		0.00 m to 4.50 m - Very loose to medium dense dark grey clayey silty SAND							
1																
2	1.50 - 1.95	▼	0/0/0	0	0											
3																
4	3.00 - 3.45	▼	3/6/8	14	14											
5	4.50 - 4.95	▼	0/1/3	4	4	6.00	-7.72		4.50 m to 10.50 m - Soft to firm dark grey clayey SILT	18	82	0	0			
6										24	76	0	0	89		
7	6.00 - 6.50															
8	7.50 - 7.95	▼	1/3/4	7	7											
9										22	77	1	0	48		
10	9.00 - 9.50															
11	10.50 - 10.95	▼	5/6/8	14	14	4.50	-13.72		10.50 m to 15.00 m - Medium dense to dense dark grey clayey silty SAND, with occasional shell fragments							
12									From 13.50 m to 13.95 m - Silt							
13																
14	13.50 - 13.85	▼	7/18/24	42	42					0	99	1	0			
15																

Abbreviations & Symbols

▼	- SPT (standard penetration test)	CD	- Chart Datum	LL	- Liquid Limit
□	- UDS (undisturbed sample)	E	- Extrapolated SPT Value	c1	- Cohesion value obtained from unconfined Compression Test
⊗	- DS (disturbed sample)	R	- SPT Refusal	c2	- Cohesion value obtained from direct shear Test
■	- RC (Rock Core)	T.D.	- Termination Depth		- Angle of internal friction from direct shear test
		SBL	- Sea Bed Level	Phi	- Angle of internal friction from direct shear test
		RL	- Reduced Level	NA	- Not Applicable
		PI	- Plasticity Index		

Water Depth (m)

Date	Depth (m)
01/27/2013	1.70



Project : GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client : COCHIN PORT TRUST		
Equipment : Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location : LPG Berth	Borehole No. : BH 04
Drilling orientation : Vertical	Type of core barrel : NA	Co-ordinates : N 1102566.4 E 635169.8
Drilling method : Rotary borehole drilling, sampling and testing	Type of Bit : NA	Date : 01/27/2013-01/28/2013
Casing size,mm : HX/SX/NX	Drilling Fluid : Water	Bed Level (m) : -3.22 w.r.t. CD
Casing depth from deck (m) : SX-20.50m,HX-40.50m,NX-68.00m	Core diameter,mm :	T.D. (m) : 62.95 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
15	15.00 - 15.83		8/7/7	14	14	17.00	-18.22		15.00 m to 32.00 m - Stiff to very stiff dark grey clayey SILT							
16		▼														
17	16.50 - 16.99									26	72	2	0	66		
18	18.00 - 18.45		4/8/9	17	17											
19		▼														
20	19.50 - 19.95									29	70	1	0	46		
21	21.00 - 21.45		3/8/7	15	15											
22		▼														
23	22.50 - 23.00									29	70	1	0	67		
24	24.00 - 24.45		5/8/8	16	16											
25		▼														
26	25.50 - 26.00									38	62	0	0	38		
27	27.00 - 27.45		4/6/7	13	13											
28		▼														
29	28.50 - 28.95									24	76	0	0	44		
30																

Abbreviations & Symbols

- ▼ - SPT (standard penetration test)
- - UDS (undisturbed sample)
- ⊗ - DS (disturbed sample)
- - RC (Rock Core)
- CD - Chart Datum
- E - Extrapolated SPT Value
- R - SPT Refueal
- T.D. - Termination Depth
- SBL - Sea Bed Level
- RL - Reduced Level
- PI - Plasticity Index
- LL - Liquid Limit
- c1 - Cohesion value obtained from unconfined Compression Test
- c2 - Cohesion value obtained from direct shear Test
- Phi - Angle of internal friction from direct shear test
- NA - Not Applicable

Water Depth (m)

Date	Depth (m)



FUGRO GEOTECH PVT. LTD.

Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
Drilling orientation	: Vertical	Type of core barrel	: NA
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
Casing depth from deck (m)	: SX-20.50m,HX-40.50m,NX-68.00m	Core diameter,mm	: T.D. (m) : 62.95 w.r.t SBL
		Borehole No.	: BH 04
		Co-ordinates	: N 1102566.4 E 635169.8
		Date	: 01/27/2013-01/28/2013
		Bed Level (m)	: -3.22 w.r.t. CD

BOREHOLE LOG										LABORATORY DATA							
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blew Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees	
30	30.00 - 30.45	▼	3/9/7	16	16	17.00	-18.22		15.00 m to 32.00 m - Stiff to very stiff dark grey clayey SILT	26	47	26	1	151			
31	31.50 - 32.00																
32	32.00 - 32.45	▼	17/29/42	71	71	13.00	-35.22		32.00 m to 45.00 m - Medium dense to very dense yellowish grey to light brownish grey clayey silty SAND with occasional gravels	0	33	66	1				
33	32.00 - 32.45																
34	34.50 - 34.95	⊗															
35	36.00 - 36.45	▼	20/38/30	68	68												
36	37.50 - 37.95	⊗															
37	39.00 - 39.45	▼	9/12/16	28	28												
38	40.50 - 40.95	⊗															
39	42.00 - 42.21	▼	50(6)	50(6)	250												
40	43.50 - 43.95	⊗															
41																	
42																	
43																	
44																	
45																	

Abbreviations & Symbols

▼ - SPT (standard penetration test)	CD - Chart Datum	LL - Liquid Limit
□ - UDS (undisturbed sample)	E - Extrapolated SPT Value	c1 - Cohesion value obtained from unconfined Compression Test
⊗ - DS (disturbed sample)	R - SPT Refusal	c2 - Cohesion value obtained from direct shear Test
■ - RC (Rock Core)	T.D. - Termination Depth	Phi - Angle of internal friction from direct shear test
	SBL - Sea Bed Level	NA - Not Applicable
	RL - Reduced Level	
	PI - Plasticity Index	

Water Depth (m)

Date _____ Depth (m) _____



FUGRO GEOTECH PVT. LTD.

Project : GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT			
Client : COCHIN PORT TRUST			
Equipment : Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location : LPG Berth	Borehole No. : BH 04	
Drilling orientation : Vertical	Type of core barrel : NA	Co-ordinates : N 1102566.4 E 635169.8	
Drilling method : Rotary borehole drilling, sampling and testing	Type of Bit : NA	Date : 01/27/2013-01/28/2013	
Casing size,mm : HX/SX/NX	Drilling Fluid : Water	Bed Level (m) : -3.22 w.r.t. CD	
Casing depth from deck (m) : SX-20.50m,HX-40.50m,NX-68.00m	Core diameter,mm :	T.D. (m) : 62.95 w.r.t SBL	

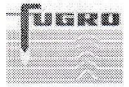
BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
45	45.00 - 45.45	▼	13/42/38	80	80	1.50	-48.22	[Symbol]	45.00 m to 46.50 m - Hard black sandy silty CLAY							
46																
47	46.50 - 46.95	⊗				1.50	-49.72	[Symbol]	46.50 m to 48.00 m - Grey SAND							
48	48.00 - 48.45	▼	10/38/33	71	71	3.00	-51.22	[Symbol]	48.00 m to 51.00 m - Hard black sandy silty CLAY							
49																
50	49.50 - 50.00	⊗														
51	51.00 - 51.45	▼	15/29/47	76	76	3.00	-54.22	[Symbol]	51.00 m to 54.00 m - Very dense light grey clayey silty SAND							
52																
53	52.50 - 52.95	⊗														
54	54.00 - 54.45	▼	15/27/27	54	54	3.00	-57.22	[Symbol]	54.00 m to 57.00 m - Hard light brown silty CLAY							
55																
56	55.50 - 56.00	⊗														
57	57.00 - 57.45	▼	5/16/37	53	53	3.00	-60.22	[Symbol]	57.00 m to 60.00 m - Very dense grey SAND							
58																
59	58.50 - 59.00	⊗														
60																

Abbreviations & Symbols

- ▼ - SPT (standard penetration test)
- - UDS (undisturbed sample)
- ⊗ - DS (disturbed sample)
- - RC (Rock Core)
- CD - Chart Datum
- E - Extrapolated SPT Value
- R - SPT Refusal
- T.D. - Termination Depth
- SBL - Sea Bed Level
- RL - Reduced Level
- PI - Plasticity Index
- LL - Liquid Limit
- c1 - Cohesion value obtained from unconfined Compression Test
- c2 - Cohesion value obtained from direct shear Test
- Phi - Angle of internal friction from direct shear test
- NA - Not Applicable

Water Depth (m)

Date	Depth (m)



Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 04
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102566.4 E 635169.8
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/27/2013-01/28/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.22 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-40.50m,NX-68.00m	Core diameter,mm	: T.D. (m) : 62.95 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
60	60.00 - 60.45	▼	18/27/26	53	53	1.50	-63.22		60.00 m to 61.50 m - Hard dark grey silty CLAY							
61																
62	61.50 - 62.00	⊗				1.45	-64.72		61.50 m to 62.95 m - Dense blackish grey clayey silty SAND							
63	62.50 - 62.95	▼	17/23/25	48	48	0.01	-66.17		62.95 m - borehole terminated as per the instruction of Engineer In-charge						3	31
64																
65																
66																
67																
68																
69																
70																
71																
72																
73																
74																
75																

Abbreviations & Symbols										Water Depth (m)					
▼	- SPT (standard penetration test)	CD	- Chart Datum	LL	- Liquid Limit					Date	Depth (m)				
□	- UDS (undisturbed sample)	E	- Extrapolated SPT Value	c1	- Cohesion value obtained from unconfined Compression Test										
⊗	- DS. (disturbed sample)	R	- SPT Refusal	c2	- Cohesion value obtained from direct shear Test										
■	- RC (Rock Core)	T.D.	- Termination Depth		- Angle of internal friction from direct shear test										
		SBL	- Sea Bed Level	Phi	- Angle of internal friction from direct shear test										
		RL	- Reduced Level	NA	- Not Applicable										
		PI	- Plasticity Index												



FUGRO GEOTECH PVT. LTD.

Project : GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT			
Client : COCHIN PORT TRUST			
Equipment : Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location : LPG Berth	Borehole No. : BH 05	
Drilling orientation : Vertical	Type of core barrel : NA		Co-ordinates : N 1102573.7 E 635195.7
Drilling method : Rotary borehole drilling, sampling and testing	Type of Bit : NA		Date : 01/24/2013-01/25/2013
Casing size,mm : HX/SX/NX	Drilling Fluid : Water		Bed Level (m) : -3.11 w.r.t. CD
Casing depth from deck (m) : SX-20.50m,HX-48.00m,NX-67.00m	Core diameter,mm :		T.D. (m) : 62.50 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
0	0.00 - 0.45	⊗				3.00	-3.11		0.00 m to 3.00 m - Very loose dark grey clayey silty SAND							
1																
2	1.50 - 1.95	▼	0/1/0	1	1											
3																
4	3.00 - 3.45	▼	0/0/0	0	0	1.50	-6.11		3.00 m to 4.50 m - Very soft dark grey sandy SILT							
5																
6	4.50 - 4.95	▼	0/0/0	0	0	3.00	-7.61		4.50 m to 7.50 m - Very loose dark grey silty clayey SAND.							
7									6.00 to 6.45 m - Very less % of shell fragments.							
8	6.00 - 6.45	▼	0/0/0	0	0					26	73	1	0	36		
9									7.50 m to 21.00 m - Very soft dark grey clayey sandy SILT							
10	7.50 - 8.00					13.50	-10.61									
11																
12	9.00 - 9.45	▼	0/0/0	0	0					19	80	1	0	45		
13																
14	10.50 - 11.00															
15	12.00 - 12.45	▼	0/0/0	0	0					19	80	1	0	39		
	13.50 - 13.95															

Abbreviations & Symbols

- ▼ - SPT (standard penetration test)
- - UDS (undisturbed sample)
- ⊗ - DS (disturbed sample)
- - RC (Rock Core)
- CD - Chart Datum
- E - Extrapolated SPT Value
- R - SPT Refusal
- T.D. - Termination Depth
- SBL - Sea Bed Level
- RL - Reduced Level
- PI - Plasticity Index
- LL - Liquid Limit
- c1 - Cohesion value obtained from unconfined Compression Test
- c2 - Cohesion value obtained from direct shear Test
- Phi - Angle of internal friction from direct shear test
- NA - Not Applicable

Water Depth (m)

Date	Depth (m)
01/24/2013	1.15



Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 05
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102573.7 E 635195.7
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/24/2013-01/25/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.11 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-48.00m,NX-67.00m	Core diameter,mm	: T.D. (m) : 62.50 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
15	15.00 - 15.45	▼	0/0/1	1	1	13.50	-10.61		7.50 m to 21.00 m - Very soft dark grey clayey sandy SILT							
16										24	69	6	1	31		
17	16.50 - 17.00															
18	18.00 - 18.45	▼	0/0/0	0	0				21.00 m to 22.50 m - Medium dense blackish grey clayey silty SAND with shell fragments.							
19										10	62	28	0	14		
20	19.50 - 20.00															
21	21.00 - 21.50	▼	4/8/16	24	24	1.50	-24.11		22.50 m to 36.00 m - Firm to stiff dark grey clayey SILT							
22										29	70	1	0	44		
23	22.50 - 23.00					13.50	-25.61									
24	24.00 - 24.45	▼	2/3/3	6	6				27.00 m to 27.45 m - Firm to stiff dark grey clayey SILT							
25										26	73	1	0	61		
26	25.50 - 25.95															
27	27.00 - 27.45	▼	2/4/3	7	7				28.50 m to 29.00 m - Firm to stiff dark grey clayey SILT							
28										37	62	1	0	42		
29	28.50 - 29.00															
30																

Abbreviations & Symbols

- ▼ - SPT (standard penetration test)
- - UDS (undisturbed sample)
- ⊗ - DS, (disturbed sample)
- - RC (Rock Core)
- CD - Chart Datum
- E - Extrapolated SPT Value
- R - SPT Refusal
- T.D. - Termination Depth
- SBL - Sea Bed Level
- RL - Reduced Level
- PI - Plasticity Index
- LL - Liquid Limit
- c1 - Cohesion value obtained from unconfined Compression Test
- c2 - Cohesion value obtained from direct shear Test
- Phi - Angle of internal friction from direct shear test
- NA - Not Applicable

Water Depth (m)

Date	Depth (m)

FUGRO GEOTECH PVT. LTD.

Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 05
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102573.7 E 635195.7
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/24/2013-01/25/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.11 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-48.00m,NX-67.00m	Core diameter,mm	
		T.D. (m)	: 62.50 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT 'N' Value	E 'N' Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
30	30.00 - 30.45	▼	3/3/5	8	8	13.50	-25.61		22.50 m to 36.00 m - Firm to stiff dark grey clayey SILT							
31										19	80	1	0	17		
32	31.50 - 31.95															
33	33.00 - 33.45	▼	2/4/4	8	8				36.00 m to 42.00 m - Hard light brown sandy silty CLAY 40.70 m to 40.95 m - Yellowish grey to light grey silty clayey SAND.							
34										13	51	36	0	43		
35	34.50 - 34.95															
36	36.00 - 36.45	▼	9/19/29	48	48	6.00	-39.11		36.00 m to 42.00 m - Hard light brown sandy silty CLAY 40.70 m to 40.95 m - Yellowish grey to light grey silty clayey SAND.							
37										57	34	9	0			
38	37.50 - 37.95	▼	10/18/26	44	44											
39	39.00 - 39.45	⊗							42.00 m to 46.50 m - Very dense grey to grey SAND							
40																
41	40.50 - 40.95	▼	20/26/39	65	65											30
42	42.00 - 42.45	⊗				4.50	-45.11		42.00 m to 46.50 m - Very dense grey to grey SAND							
43	43.00 - 43.45	▼	19/31/36	67	67											
44																
45																

Abbreviations & Symbols		
▼	- SPT (standard penetration test)	CD - Chart Datum
□	- UDS (undisturbed sample)	E - Extrapolated SPT Value
⊗	- DS (disturbed sample)	R - SPT Refusal
■	- RC (Rock Core)	T.D. - Termination Depth
		SBL - Sea Bed Level
		RL - Reduced Level
		PI - Plasticity Index
		LL - Liquid Limit
		c1 - Cohesion value obtained from unconfined Compression Test
		c2 - Cohesion value obtained from direct shear Test
		Phi - Angle of internal friction from direct shear test
		NA - Not Applicable

Water Depth (m)	
Date	Depth (m)



Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 05
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102573.7 E 635195.7
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/24/2013-01/25/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.11 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-48.00m,NX-67.00m	Core diameter,mm	: T.D. (m) : 62.50 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
45	45.00 - 45.45	⊗				4.50	-45.11	⊗	42.00 m to 46.50 m - Very dense grey to grey SAND							
46																
47	46.50 - 46.95	▼	12/17/26	43	43	4.50	-49.61	⊗	46.50 m to 51.00 m - Hard blackish dark brown sandy silty CLAY 46.50 m to 48.00 m - with wooden fragments							
48																
49	48.00 - 48.50	⊗														
50																
51	49.50 - 49.95	▼	11/18/18	36	36											
52																
53	51.00 - 51.50	⊗				6.00	-54.11	⊗	51.00 m to 57.00 m - Very dense dark grey silty clayey SAND 54.00 m to 55.50 m - Grey sandy silty CLAY							
54																
55	52.50 - 52.78	▼	53(13)	53(13)	22										0	32
56																
57	54.00 - 54.50	⊗														
58																
59	55.50 - 55.95	▼	21/31/40	71	71											
60																
61	57.00 - 57.50	⊗				5.50	-60.11	⊗	57.00 m to 62.50 m - Hard dark grey to blackish grey sandy silty CLAY with occasional wooden fragments							
62																
63	58.50 - 58.95	▼	13/32/43	75	75											
64																

Abbreviations & Symbols			Water Depth (m)		
▼	- SPT (standard penetration test)	CD	- Chart Datum	LL	- Liquid Limit
⊗	- UDS (undisturbed sample)	E	- Extrapolated SPT Value	c1	- Cohesion value obtained from unconfined Compression Test
⊗	- DS (disturbed sample)	R	- SPT Refusal	c2	- Cohesion value obtained from direct shear Test
■	- RC (Rock Core)	T.D.	- Termination Depth		- Angle of internal friction from direct shear test
		SBL	- Sea Bed Level	Phi	
		RL	- Reduced Level	NA	- Not Applicable
		PI	- Plasticity Index		
				Date	Depth (m)



FUGRO GEOTECH PVT. LTD.

Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 05
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102573.7 E 635195.7
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/24/2013-01/25/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.11 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-48.00m,NX-67.00m	Core diameter,mm	: T.D. (m) : 62.50 w.r.t SBL

BOREHOLE LOG								LABORATORY DATA								
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
60	60.00 - 60.50	⊗				5.50	-60.11		57.00 m to 62.50 m - Hard dark grey to blackish grey sandy silty CLAY with occasional wooden fragments							
61																
62	61.50 - 61.95	▼	15/34/31	65	65				62.50 m - borehole terminated as per the instruction of Engineer In-charge							
	62.00 - 62.50	⊗				0.01	-65.61									
63																
64																
65																
66																
67																
68																
69																
70																
71																
72																
73																
74																
75																

Abbreviations & Symbols		
▼	- SPT (standard penetration test)	CD - Chart Datum
□	- UDS (undisturbed sample)	E - Extrapolated SPT Value
⊗	- DS (disturbed sample)	R - SPT Refusal
■	- RC (Rock Core)	T.D. - Termination Depth
		SBL - Sea Bed Level
		RL - Reduced Level
		PI - Plasticity Index
		LL - Liquid Limit
		c1 - Cohesion value obtained from unconfined Compression Test
		c2 - Cohesion value obtained from direct shear Test
		Phi - Angle of internal friction from direct shear test
		NA - Not Applicable

Water Depth (m)	
Date	Depth (m)



Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 06
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102581.3 E 635221.7
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/22/2013-01/24/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.10 w.r.t CD
Casing depth from deck (m)	: SX-20.50m,HX-48.00m,NX-67.50m	Core diameter,mm	: T.D. (m) : 62.50 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
0	0.00 - 0.45	⊗				9.00	-3.10		0.00 m to 9.00 m - Very soft dark grey to blackish grey clayey SILT							
1																
2	1.50 - 1.95	▼	0/0/0	0	0											
3																
4	3.00 - 3.45	□														
5																
6	4.50 - 4.95	▼	0/0/0	0	0											
7																
8	6.00 - 6.50	□														
9																
10	7.50 - 7.95	▼	0/0/0	0	0											
11																
12	9.00 - 9.45	□				28.50	-12.10									
13																
14	10.50 - 10.95	▼	0/1/4	5	5											
15																
16	12.00 - 12.45	□														
17																
18	13.50 - 13.95	▼	1/2/3	5	5											
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Abbreviations & Symbols			Water Depth (m)	
▼ - SPT (standard penetration test)	CD - Chart Datum	LL - Liquid Limit	Date	Depth (m)
□ - UDS (undisturbed sample)	E - Extrapolated SPT Value	c1 - Cohesion value obtained from unconfined Compression Test	01/22/2013	1.30
⊗ - DS (disturbed sample)	R - SPT Refusal	c2 - Cohesion value obtained from direct shear Test		
■ - RC (Rock Core)	T.D. - Termination Depth	Phi - Angle of internal friction from direct shear test		
	SBL - Sea Bed Level	NA - Not Applicable		
	RL - Reduced Level			
	PI - Plasticity Index			



FUGRO GEOTECH PVT. LTD.

Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 06
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102581.3 E 635221.7
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/22/2013-01/24/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.10 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-48.00m,NX-67.50m	Core diameter,mm	: T.D. (m) : 62.50 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
15	15.00 - 15.45					28.50	-12.10		9.00 m to 37.50 m - Firm to stiff dark grey clayey SILT	14	85	1	0	43		
16																
17	16.50 - 16.95	▼	2/3/3	6	6					24	75	1	0	40		
18	18.00 - 18.45															
19																
20	19.50 - 19.95	▼	2/3/3	6	6					38	61	1	0	35		
21	21.00 - 21.45															
22																
23	22.50 - 22.95	▼	2/3/4	7	7					30	69	1	0	39		
24	24.00 - 24.50															
25																
26	25.50 - 25.95	▼	3/4/4	8	8				37	62	1	0	35			
27	27.00 - 27.50															
28																
29	28.50 - 28.95	▼	2/4/5	9	9											
30																

Abbreviations & Symbols		
▼	SPT (standard penetration test)	CD - Chart Datum
□	- UDS (undisturbed sample)	E - Extrapolated SPT Value
⊗	- DS (disturbed sample)	R - SPT Refusal
■	- RC (Rock Core)	T.D. - Termination Depth
		SBL - Sea Bed Level
		RL - Reduced Level
		PI - Plasticity Index
		LL - Liquid Limit
		c1 - Cohesion value obtained from unconfined Compression Test
		c2 - Cohesion value obtained from direct shear Test
		Phi - Angle of internal friction from direct shear test
		NA - Not Applicable

Water Depth (m)	
Date	Depth (m)



FUGRO GEOTECH PVT. LTD.

Project	: GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client	: COCHIN PORT TRUST		
Equipment	: Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location	: LPG Berth
		Borehole No.	: BH 06
Drilling orientation	: Vertical	Type of core barrel	: NA
		Co-ordinates	: N 1102581.3 E 635221.7
Drilling method	: Rotary borehole drilling, sampling and testing	Type of Bit	: NA
		Date	: 01/22/2013-01/24/2013
Casing size,mm	: HX/SX/NX	Drilling Fluid	: Water
		Bed Level (m)	: -3.10 w.r.t. CD
Casing depth from deck (m)	: SX-20.50m,HX-48.00m,NX-67.50m	Core diameter,mm	
		T.D. (m)	: 62.50 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t. CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
30	30.00 - 30.50					28.50	-12.10		9.00 m to 37.50 m - Firm to stiff dark grey clayey SILT					43		
31																
32	31.50 - 31.95	▼	4/3/5	8	8											
33	33.00 - 33.50									16	61	23	0	40		
34																
35	34.50 - 34.95	▼	4/6/8	14	14											
36	36.00 - 36.50													54		
37																
38	37.50 - 37.95	▼	2/5/7	12	12	4.50	-40.60		37.50 m to 42.00 m - Very stiff to stiff grey to light grey clayey SILT							
39	39.00 - 39.45									30	67	2	0	166		
40																
41	40.50 - 40.95	▼	4/8/7	15	15											
42	42.00 - 42.50					4.50	-45.10		42.00 m to 46.50 m - Dense light grey SAND							
43																
44	43.50 - 43.95	▼	9/20/23	43	43											
45																

Abbreviations & Symbols

- ▼ - SPT (standard penetration test)
- - UDS (undisturbed sample)
- ⊗ - DS (disturbed sample)
- - RC (Rock Core)
- CD - Chart Datum
- E - Extrapolated SPT Value
- R - SPT Refusal
- T.D. - Termination Depth
- SBL - Sea Bed Level
- RL - Reduced Level
- PI - Plasticity Index
- LL - Liquid Limit
- c1 - Cohesion value obtained from unconfined Compression Test
- c2 - Cohesion value obtained from direct shear test
- Phi - Angle of internal friction from direct shear test
- NA - Not Applicable

Water Depth (m)

Date	Depth (m)

Project : GEOTECHNICAL INVESTIGATION FOR LPG BERTH AND OUTER HARBOUR PROJECT AT PUTHUVYPEEN IN COCHIN PORT		
Client : COCHIN PORT TRUST		
Equipment : Hydraulic Rig mounted on Jack-up Fugro KRISHNA	Location : LPG Berth	Borehole No. : BH 06
Drilling orientation : Vertical	Type of core barrel : NA	Co-ordinates : N 1102581.3 E 635221.7
Drilling method : Rotary borehole drilling, sampling and testing	Type of Bit : NA	Date : 01/22/2013-01/24/2013
Casing size,mm : HX/SX/NX	Drilling Fluid : Water	Bed Level (m) : -3.10 w.r.t CD
Casing depth from deck (m) : SX-20.50m,HX-48.00m,NX-67.50m	Core diameter,mm :	T.D. (m) : 62.50 w.r.t SBL

BOREHOLE LOG										LABORATORY DATA						
Depth below EGL (m)	Sample & in situ test depth (m)	Sample Type	Blow Counts	SPT "N" Value	E "N" Value	Layer thickness (m)	RL w.r.t CD (m)	Symbol	Description	CLAY, %	SILT, %	SAND, %	GRAVEL, %	c1 (UCS), kPa	c2 (DST), kPa	Phi (DST), Degrees
45	45.00 - 45.50	⊗				4.50	-45.10		42.00 m to 46.50 m - Dense light grey SAND							
46																
47	46.50 - 46.95	▼	19/23/20	43	43	4.50	-49.60		46.50 m to 51.00 m - Dense to very dense light grey clayey silty SAND						8	30
48	48.00 - 48.50	⊗														
49																
50	49.50 - 49.95	▼	17/23/44	67	67										0	38
51	51.00 - 51.50	⊗				3.00	-54.10		51.00 m to 54.00 m - Hard dark grey sandy silty CLAY with less % of shell fragments.							
52																
53	52.50 - 52.95	▼	10/22/26	48	48											
54	54.00 - 54.50	⊗				3.00	-57.10		54.00 m to 57.00 m - Very dense grey silty clayey SAND							
55																
56	55.50 - 55.95	▼	13/42/55	97	97											
57	57.00 - 57.45	⊗				3.00	-60.10		57.00 m to 60.00 m - Hard dark brown sandy silty CLAY							
58																
59	58.50 - 58.95	▼	20/30/22	52	52											
60																

Abbreviations & Symbols			Water Depth (m)		
▼	- SPT (standard penetration test)	CD	- Chart Datum	LL	- Liquid Limit
□	- UDS (undisturbed sample)	E	- Extrapolated SPT Value	c1	- Cohesion value obtained from unconfined Compression Test
⊗	- DS (disturbed sample)	R	- SPT Refusal	c2	- Cohesion value obtained from direct shear Test
■	- RC (Rock Core)	T.D.	- Termination Depth	Phi	- Angle of internal friction from direct shear test
		SBL	- Sea Bed Level	NA	- Not Applicable
		RL	- Reduced Level		
		PI	- Plasticity Index		
				Date	Depth (m)