APPENDIX-3 Geological Survey Report







Draft Report

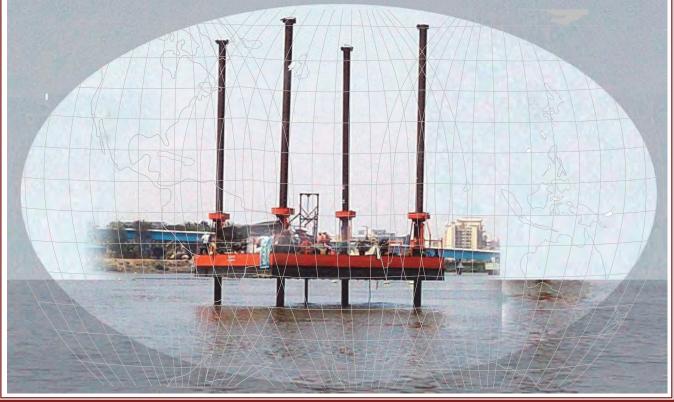
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Geological Survey for the Preparatory Survey on the Project for Construction of Mumbai Trans Harbour Link

JOB NO. : IDEAL/028/015

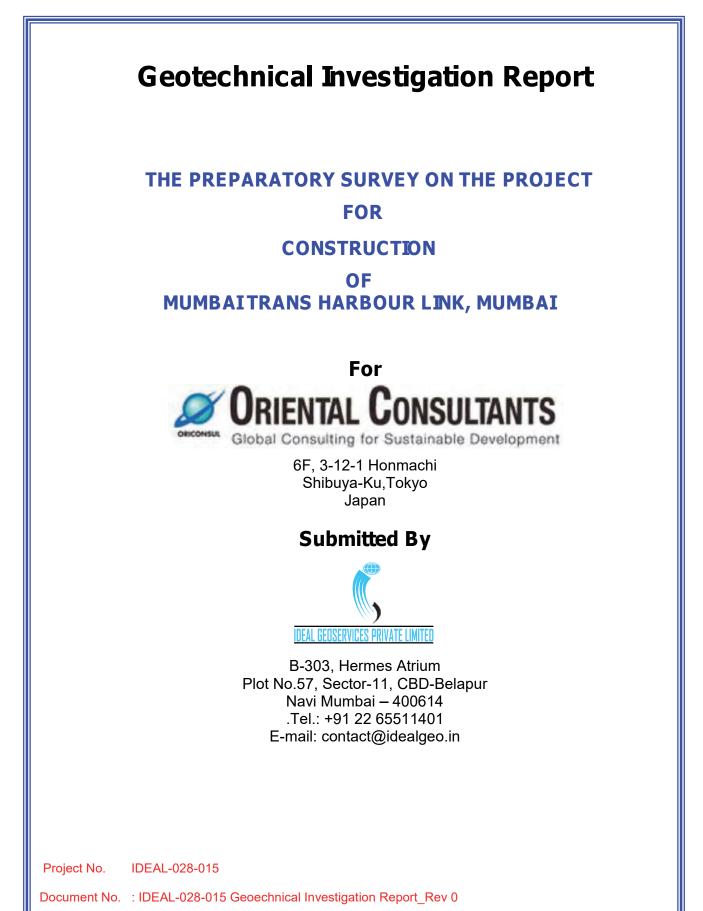
August, 2015

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AP3-2



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Volume Title Volume Title		Contents	
N/A	The Preparatory Survey on the Project For Construction of Mumbai Trans Harbour link, Mumbai	Results of Field and Laboratory Geotechnical Investigation	

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Abbreviations & Acronyms

The following list of abbreviations and acronyms may be present within the document:

BARC	Bhabha Atomic Research Centre
CD	Chart Datum
dGPS	Differential Global Positioning System
IGPL	Ideal Geoservices Pvt Ltd
JNPT	Jawaharlal Nehru Port Trust
JUB	Jack Up Barge
MPT	Mumbai Port Trust
SBL	Sea Bed Level
SPT	Standard Penetration Test
TD	Termination Depth
UTM	Universal Transverse Mercator
UCS	Unconfined Compressive Strenght
WGS	World Geodetic System
WRT	With Respect To

Reference Colour Code

The following reference colour coding may be used within this procedure:

XXX	Reference to an independent external document.
XXX	Reference to another section or article within this document.
XXX	Important Note / Caution.



	EXECUTIVE SUMMARY
Site Location:	MTHL – Proposed Alignment
Investigation Date:	Commenced from 3 rd June 2015.
Key observations:	 The sea bed level at the locations where the boreholes are carried out varies from +0.9m CD to -5.60m CD. The sub sea bed stratigraphy encountered is heterogeneous along the proposed alignment based on the boreholes drilled. The sub sea bed stratigraphy comprises of top Layer of very soft CLAY in all boreholes except BH-04 and BH-06. In BH-04 and BH-06 the top layer comprises of SAND. The sub sea bed in general comprises of overburden followed by weak, highly weathered BASALT underlain by moderatley strong, fresh BASALT. In BH-03 and BH-06 the rock is encountered at relatively shallow level of -7.40m CD. In BH04 even at levels below -29.0m CD the rock encountered is weak with UCS value between 5.47MPA to 8.59MPA. The reason for this relatively low compressive strength is as given below

BH. No	Elevation wrt	Reason for low	Image
	CD(m)	strength	
BH-04	-29.54	Because of secondary infillings of the vugs. Secondary infillings are of minerals like calcite, chlorite etc	
BH-04	-30.80	Because weathering extends through out the rock. In some part of the core the rock material is friable	SZ-100



1. INTRODUCTION

Oriental Consultants Global Co. Ltd (Client) contracted **Ideal Geoservices Pvt. Ltd (Contractor)** to provide Geotechnical Investigation services for "The Preparatory Survey on the Project For Construction of Mumbai Trans Harbour link, Mumbai.

This report **'DEAL-028-015 Geoechnical Investigation Report_Rev 0.'** presents the data obtained from the field as well as laboratory investigation along the proposed alignment. The Geotechnical Investigation field work was commenced on 3rd June 2015.

1.1. Reference Documentation

- 1. Service Agreement dated April 30, 2015.
- **2. Technical Specifications document no** *"The Preparatory Survey on the Project for Construction of Mumbai Trans Harbor Link Terms of Reference".*

1.2. Scope of Work

The principal objectives of the investigation were to obtain adequate information on the sub sea bed stratigraphy, the type and strength of the soils / rocks below the seabed and other geotechnical details of relevance to enable arriving at the design parameters for foundation of the proposed new structures and to ascertain the compressibility of soil. The entire work was carried out under the supervision of "**Oriental Consultants Global Co. Ltd** representatives.

In order to accomplish the above objectives the scope of work was to drill six (6) Nos. of boreholes upto a depth of 35.0/50.0m below the sea bed or 5.0m into rock with RQD >50% which ever is shallower. The scope of work also includes carrying out standard penetration tests, collection of disturbed and undisturbed samples of soils, logging visually identifiable lithological and engineering characteristics of the soil and rock samples, testing the samples in laboratory for their classification, index and engineering properties and preparation and submission of Geotechnical Investigation report.

The list of the geotechnical boreholes carried out at locations of various proposed structures is presented in **Table-1**.

Sr. No.	Proposed Structure	Boreholes
1	MTHL Bridge Alignment	BH-01 thru BH-06

Table 1: Details of Field Test Locations w.r.t. Proposed Structures



1.3. Schedule of Activities

		Investigatio	n Schedule, MTHL, Mumbai
Sr.	Da	ite	Detail of Activities
No.	From	То	
01	01-05-2015	05-06-2015	Obtaining Permissions from Reliance, MPT, JNPT, BARC, Police, Ambuja cements
02	03-06-2015	10-06-2015	Standby at BH-06 location due to objection by Reliance
03	11-06-2015	10-07-2015	Carrying out 6 Boreholes
04	11-07-2015	17-08-2015	Laboratory Testing, preparation and submission of report

Note: The work was intermittently stopped due to inclement weather and unfavourable sea conditions on account of monsoon and cyclonic activities

Table 2: Schedule of Activities

2. FIELD INVESTIGATION

The field investigation involves mobilization of Marine Spread with drilling rigs and drilling accessories mounted on it, marking the field test location and shifting the marine spread at the designated location, boring in soil, drilling in rock, carry out SPT, collection of UDS. A brief description of the various activities is given below.

2.1. Marine Spread

The marine spread comprises of JUB and two tug boats. The details of these are given below.

2.1.1. Jack Up barge – Aqua Star

A hydraulically elevated JUB "**Aqua Star**" having deck size 12.0m x 10.0m with spuds of length 24.0m was mobilized at the site. A Percussion boring rig along with a hydraulically operated rig supported with water pumps was mounted on the deck. The JUB was assembled at Reti Bunder in Belapur and was towed to the site and from one borehole to another using two Tug Boats named "**MV Dev Raj**" and "**MV Padma Gandha**".

2.2. Position Services

The coordinates of borehole locations were given by the client. The locations were identified at the site using "Leica 420" dGPS.



2.3. Setting up at Field Test Location

The location coordinates of the boreholes were supplied by the client. The borehole location was identified in the field using dGSP. A Markey buoy was then dropped at the designated location from the advance boat using dGPS.

The JUB was then towed to the location of the marker buoy using tug boats and was positioned at that location by lowering the hydraulically operated spuds. After Jacking at the location the location coordinates were again observed near the moonpool using the dGPS and these were then recorded as the actual location coordinate of that field test and are presented in Table 3.

Sr. No.	B.H. No	Proj	posed	Ac	tual	Remarks
NO.	NO	Easting (m)	Northing (m)	Easting (m)	Northing (m)	
1	BH-01	276633.00	2101870.00	284389.00	2101122.00	Location shifted because at the original location even during high tide water depth was not sufficient to tow the JUB
2	BH-02	281893.00	2100979.00	281555.00	2100932.00	Location shifted on the instruction of MPT as the original location was falling in the channel of the Old Pir Pau Jetty.
3	BH-03	286953.00	2100893.00	286953.00	2100893.00	
4	BH-04	287119.00	2100824.00	286846.00	2100932.00	Location shifted on the instruction of Ambuja Cement as the original location was falling at the centre of their channel
5	BH-05	287282.00	2100749.00	287282.00	2100749.00	
6	BH-06	288918.00	2099540.00	288918.00	2099540.00	

The list of proposed and actual coordinates of the borehole locations is given in Table-3.

Table 3: Borehole Location Coordinates



2.4. Boring in Soil

Boring was done in accordance with *IS: 1892 -1979.* A Standard boring winch of 1.5 ton was used for boring in the overburden strata (soil strata) with 150mm dia boreholes. A standard boring winch consists of a drum with rotating wheel where the wire rope was released and tight and one end is through pulley mounted on the tripod. Other end of the wire rope was fixed with sinker bar and shell to bore in the soil. Percussion method was used for boring in the overburden. The winch deployed was generally suitable for all Geotechnical Investigation work and had an arrangement for driving and extraction of casing, boring with percussion method. The boring was continued upto the termination of the borehole.

2.5. Drilling in Rock

The borehole in rock was advanced using rotary drilling technique with the help of a hydraulic feed machine. The coring was done using a NX size double tube core barrel giving a borehole of size 76.0mm and core diameter of 54.5mm. The cores obtained were sequentially stored in the custom built core boxes.

2.6. Standard Penetration Tests (SPT)

SPT's were carried out using a split spoon sampler complete with a drive shoe and drive head fitted with a non-return valve. The basis of the test consists of dropping a hammer of mass 63.5 kg (623N) on to a drive head from a height of 750 mm (as specified in I.S. Code of Practice). An auto trip hammer capable of dropping the weight freely on the anvil over a fixed height of 750mm was used to assure the quality of the test. The number of such blows (SPT "N") necessary to achieve a penetration of the split spoon sampler of 300mm (after its penetration under gravity and below the seating drive) is regarded as the penetration resistance. The blow counts for each 150 mm penetration were recorded. Small disturbed samples were obtained from the split spoon sampler after completion of the tests.

2.7. Undisturbed Soil Samples

Undisturbed Soil Samples were collected in cohesive soil using thin walled Shelby tubes having nominal diameter of 100mm and minimum length of 450mm.

2.8. Disturbed Soil Samples

Disturbed soil samples were collected from the bailer of the percussion boring.

3. LABORATORY TESTING

Selected soil samples, collected during boring of the boreholes were subjected to laboratory tests to determine the index and engineering characteristics as specified. The samples to be tested, type and



number of laboratory tests to be carried out were decided so as to derive the maximum relevant information. Disturbed samples in SPT split spoons and undisturbed samples in thin walled tubes were collected from the boreholes. The soil samples were visually identified and described in accordance with relevant IS codes and thereafter packed, labelled, sealed and dispatched to the laboratory. The classification, index property, NMC, specific gravity, density, chemical test, shear strength and consolidation tests were carried out on the soil samples. All these tests were carried out in our laboratory at Navi Mumbai, in accordance with relevant parts of Indian Standard Code of Practice. The list of IS and BS codes used is presented in **Table 4** below. The summary of the laboratory tests conducted is presented in the following sections.

Test Designation	Qty	Applicable Standards	Results Presented in
Tests on soil samples:		·	•
Sieve Analysis	47	IS:2720 (PART -4)	Plates C-1 thru C-16
Hydrometer Analysis	31	-DO-	Do
Atterberg Limit	27	IS:9259 (PART-5)	Plates C-17 to C-32
Specific Gravity	31	IS:2720 (PART-3)	Plates B-1 thru B-6
Natural Moisture Content	2	IS:2720 (PART-2)	Plates B-1 thru B-6
Bulk & Dry Density	2	IS:2720 (PART-10)	Plates B-1 thru B-6
Unconfined Compressive Strength Test	2	IS:2720 (PART-10)	Plates D-1 to D-2
Consolidation Test	2	IS:2720 (PART-15)	Plates E-1 thru E-2
Uniaxial Compressive Strength of	18	IS 9143	Plates B-7 thru B-8
Point load strength index test on	3	IS 8764	Plates B-7 thru B-8
Porosity, unit weight and water	21	IS 13013	Plates B-7 thru B-8

Table 4: List of LS. Standards and related Tests on Soil & Rock Samples

The samples were tested and the test parameters were selected as per the contract and project requirement. The following tests were performed:

3.1. Laboratory Tests on Soil Samples

3.1.1. Moisture Content & Density

Moisture content, bulk and dry densities were determined for a total of two (2) soil samples, in accordance with the procedures of IS: 2720.

3.1.2. Particle Size Distribution

The particle size distribution was determined for a total of forty seven (47) soil samples in accordance with the method described in IS:2720 (Part 4). Compliance with the Standard, with respect to minimum sample quantity is dependent on the maximum sample available from the field test.



In particular, for downhole hammer/ SPT samples, the quantity of soil available for testing is typically about 100g. This sample quantity is considered representative where grain sizes range up to 4.75mm (i.e. to coarse sand size). Where significant quantities of coarser particles are present, the particle size distribution obtained from such samples should be regarded as indicative only.

3.1.3. Sedimentation/Hydrometer Analysis

Sedimentation analyses have been performed for a total of thirty one (31) soil samples in accordance with the hydrometer method described in IS: 2720 (Part 4). The analysis provides an estimate of the particle size distribution for the fine fraction (<75µm) of a soil sample. The analysis is performed by monitoring the rate of settlement of soil particles initially suspended uniformly in distilled water. The rate of settlement, which is monitored by observing the change in fluid density with the hydrometer device, is theoretically related to the size of particles setting out of suspension.

3.1.4. Atterberg Limits

The Atterberg Limits comprising liquid limit, plastic limit and plasticity index were determined for a total of twenty seven (27) soil samples in accordance with the relevant methods described in IS: 2720 (Part 5). The liquid limit has been determined using the Casagrande apparatus method. The soil sample preparation, in accordance with the code of practice, included removal of soil particles retained on the 425 m sieve. Accordingly, where a significant quantity of coarser particles was present, it should be recognized that the Atterberg Limits results are representative of the relatively fine soil fraction, and not of the complete soil sample.

3.1.5. Particle Density/Specific Gravity

The particle density was determined for a total of thirty one (31) samples in accordance with the small pycknometer method described in IS: 2720 (Part 3/Sec 1). Prior to testing, samples were ground down, if necessary, so as to pass the 2mm sieve.

3.1.6. Consolidation Test

The Consolidation properties of soil were determined by vertical drainage both to top and bottom surfaces. Volume change after every stress application is recorded at intervals of 0, $\frac{1}{2}$, 1, 4, 9, 16, 25, 36, 49, 64min; 1 $\frac{1}{2}$, 2, 4, 8 and 24 hours. The consolidation test was conducted on two (2) soil sample in accordance with the method of IS:2720 (PART-15.

3.1.7. Unconfined Compressive Strength Test:

Unconfined Compressive strength tests were carried out on two (2) samples as per IS 2720 Part 10.



3.2. Laboratory Tests on Rock Samples

3.2.1. Unit Weight & Specific Gravity of Rock

Unit Weight & Specific Gravity of Rock specimen were determined for a total of twenty one (21) rock samples by using saturation and buoyancy technique, in accordance with the methods of IS: 13030.

3.2.2. Uniaxial Compressive Strength Test

Uniaxial compressive strength for a total of eighteen (18) cylindrical rock specimens was determined, in accordance with the methods of ISRM. The uniaxial compressive strength of the specimens were corrected for a height to diameter ratio of two for specimens whose height to diameter ratio was other than two using the following relationship

 q_c (corrected) = (q_c 0.889)/(0.778+(0.222D/H))

Where q_c = Uncorrected Uniaxial Compressive Strength

D = Diameter of the specimen tested



APPENDIX-A - ENGINEERING ILLUSTRATIONS





Project : Geological Survey for the Preparatory Survey on the Project for Construction of Mumbai Trans Harbour Link

Job No. : IGPL/028/015

BOREHOLE LOCATION







														BOREHOLE NO. : BH-01														
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roje	ct : Ge	eologi	cal Su	urvey	for	the Pr	repara	atory	Surv	vey o	n the	Proje	ect for	Construction of Mumbai Trans Harbour Link				-							1.4	/A TE -		
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	, ommeno					lation F	luid	•	Sea					Type of Rig : Hydraulic Rig	NUP BARGE									06-07-2		03.45	-	
	omplete					ng Orier		:	Verti					Details of Casing (mm) : SX / HX / NX														
														Core-Diameter (mm) : 54.10														
o- Or	dinates	5 E:	2843	89.00			N :	2101	122.0	0						—												
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ТҮРЕ	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	N.C	E.I.		Del	Strata Description		Soil Clas	GRAVEL	SAND			PLASTIC	PLASTICITY INDEX (Ip)	ຶ	c, ¢	с. ф.	reConsolid n Pressur (kPa)	ommpres Index (0	Initial Void Ratio (A ⁰)
	-3.32	-3.82				-							-3.32	Very soft, dark grey CLAY		СН	0	8	48 4	14 66						<u>a.</u>	0	
Н	-4.82	-5.27	ο	0	0	0										СН	0	1	52 4	17 71	16	55						
Η	-1.02		0	0	0	0											Ū		52		10	55						
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Ц	7.82	-8.27	7	11	15	26							7.90	Very stiff, light yellowish grey CLAY		сн	0		70	24 78	22	46						
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΄ Π	-9.32	-9.77	8	10	17	27										СН	12	2	29 5	57 79	32	47						
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	Ordinates E : 284389.00 N : 2101122.00		
		Details of Stratum	Grain Size Consistency Strength Test Consolidation Te Analysis (%) Limits (%) (kPa) Consolidation Te
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- 13.82 -14.22 10 40 100m >100 -	50 50	Hard, yellowish grey, CLAY with sand and gravels	
	-13.82 -14.22 16 40 10cm >100		CH 12 14 61 13 66 32 34
	-15.32 -15.82 10 25 38 63		CL 12 14 42 32 43 22 21
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-22.82 -24.32 -24.32 Image: Non-Section Section Se			
reviations & Symbols : ser los VL - Liquid Limit I - Plasticity Index MC - Moisture Content C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level Checked By : V.N. Checked By : S.D.			
reviations & Symbols : spr	-22.82 -24.32 81 70 - IV >10		
SPT - UDS WL - Liquid Limit IP - Plasticity Index MC - Moisture Content SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level Prepared By : V.N. Checked By : S.D.			
			duced Level Prepared By : V.N.
Rock Recovery A no Recovery TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation W.I Weathering Grade F.I. Fractural Index Approved By : S.T.	Rock Recovery N - No Recovery TCR - Total Core Recovery SCR - Solid Core Rec		Checked By : S.D.





														BOREH	OLE NC).: BH-	01															
ieotech C	ontract	or: ID	EAL	. GEC	DSER	VICES	S PVT	. LTD).		Job	No. :	IDEAL/028/01	5			CLIENT :	Ø	RIEN	τΔι	C	ON	SII	TΔ	NTS				SHEET	03	of 0)3
roject : C	Geologi	cal Su	rvey	for	the P	repar	atory	Surv	/ey o	n the	Proj	ect f	or Constructi	on of Mun	nbai Trans	Harbour	Link	OBICONSUL G	lobal Cons	sulting	for S	Sustair	able	Deve	lopmer	nt			VATER	TAB	IF	—
D. (m)	:	-28.82	CD	SBL (m)		:	-3.32	CD				Equipment Rec	ord	:	AQUAS	STAR - JACK										D	ate	Tim		 M	tr
ate Comme	nced :	06-07-	2015	Circu	lation F	luid	:	Sea V	Vater				Type of Rig		:	Hydrau	lic Rig										06-0	7-2015	03.45	PM	8	8.00
ate Complet	ted :	10-07-	2015	Drillin	g Orien	ntation	:	Vertio	cal				Details of Casir		:	SX/HX	(/ NX															
o- Ordinate	es E:	28438	9.00			N :	2101	122.0	0				Core-Diameter	(mm)	:	54.10											_					
																				Û	Gra	ain Siz	A	Cons	sistency	Str	rength	Test				-
Sampling	Details			Penetra (SPT)	ation	0	Details	of Roo	ck cor	e	_	Ê			Detai	Is of Stratu	m			on (US	Ana	lysis (%)		nits (%)	0.	(kPa		Conso	lidatior	n Test	
		<u> </u>		1	<u></u>		1	1	1	1	Symbol	Depth in (m)								ificati				w∟)	(w _P)	<u>_</u> UC	SUU	CU	datio Ire	sion (c)	o,	_
Haran Haram Haram Haram Har Haram Haram Har Haram Haram Har Haram Haram Har		150	300	450	"N" VALUI	TCR %	SCR %	RQD %	N.G	Ŀ.	s	Der			Strat	a Descriptio	n			Soil Clasiification (USC)	GRAVEL	SILT	CLAY	LIQUID (_{ML})	PLASTIC (WP)	ບ [ື]	- - • •	с, ф.	PreConsolidat n Pressure (kPa)	Commpressio Index (Cc)	Initial Vo Ratio (e	Rauo (c
0					:								Very weak, highly	weathered, hig	ghly fractured, lig	ght brownish B	ASALT								_	+	_		<u> </u>	о О		-
-24.3	2 -25.82				-	100	100	95	-	4		-24.3	2 Moderately strong	to strong, fres	h, bluish grey, B	BASALT				-												
2																																
-25.8	2 -27.32	_			-	100	100	100		27																						
3																																
-27.32	2 -28.82					100	100	100	ш	3.3																						
5																																
																										-						_
26																																
.7														BOR	REHOLE TERMI	NATED DEPT	H AT -28.82 (m)	i)														
28																																
29																																
0 breviations	& Symbol	s:																														_
- SPT	-		- Liqu	uid Lin	nit	I _P	- Pla	sticity	Index	I	ис -	Mois	ture Content					epth, MSL : Me nd Level, R.L. :			I								red By :]	
																												1.000	ked By :	SD	1	





									-		BOREHOLE NO. : BH-02												
eotech Contrac	tor: IDE	AL GE	DSER	VICES	6 PVT	LTC).		Job	No. :	DEAL/028/015 CLIENT :		-	C	0110			TO			SHEET	01	of 03
roject : Geolog	ical Surv	vey for	the P	repara	atory	Surv	/ey o	n the	Proj	ect fo	r Construction of Mumbai Trans Harbour Link												
D. (m) :	-28.54 C		m)			-3.04	CD				Equipment Record : AQUA STAR - JACI		nung		ooronna		iciop			Date	NATEF Tin		LE Mt
ate Commenced :	02-07-20			luid		Sea V					Type of Rig : Hydraulic Rig	OF BARGE								07 - 2015	12.01		7.5
ate Completed :					:	Vertie	cal				Details of Casing (mm) : SX / HX / NX												
											Core-Diameter (mm) : 54.10												
o- Ordinates E:	281555	.00		N :	2100	932.0	0		1				~										
Sampling Details		rd Penetr est (SPT)	ation	C	Details	of Roo	ck cor	e	<u> </u>	Ē	Details of Stratum		Soil Clasification (USC)		n Size ysis (%)	Coi Li	nsiste imits ((%)	Strength (kPa	a)	Conso		
			Ĩ	%	~	%			Symbol	Depth in (m)			asiificat		۲. ×	([¬] ^)	C (w _P)	L (⊫) (=)	ICS UL	U CU	olidatio sure a)	ession (Cc)	Void (e ⁰)
H From ↓ (m) To (m	150 (450	"N" VALUI	TCR %	SCR %	RQD %	N.G				Strata Description		Soil Cla	SAND	SILT	(^T w) dindin	РLASTIC (w _P)	PLASTICITY INDEX (Ip)	បឺ 🖥	c', ¢	PreConsolidatio n Pressure (kPa)	Commpr	Initial Void Ratio (e ⁰)
-3.04 -3.54			-							-3.04	Very soft, dark grey CLAY	(СН	0 0	55 4	5 58	33	25			<u>u</u>		
-4.54 -4.99	ο	0 0	0										сн	0 1	50 4	9 65	32	33					
-6.04 -6.49	0	0 0	0									(сн	0 1	52 4	7 63	29	34					
-7.54 -7.99												C	сн	0 1	59 4	0 80	36	44	4		46	0.85	2.30
-9.04 -9.49	0	0 1	1									C	сн	0 1	79 2	0 59	25	24					
-10.54 -10.99	0	0 1	1									(сн	0 1	50 4	9 59	29	30					
-12.04 -12.45	0	1 1	2									C	сн	0 2	52 4	6 62	29	33					
0 breviations & Symbo	s:										C.D. Chart Datum, T.D Termination D	nth MSL - Maan Soo Law											_
- SPT - UDS - DS		_iquid Liı	nit	I _P	- Pla	sticity	Index	Ν	/IC -	Moist	C.D. Chart Datum, T.D. : Termination D SBL : Sea Bed Level, EGL : Existing Grout										red By :		
- Rock Recovery	lo Recovery	TCR -	Total	Core R	ecovei	ry	SCR	- Sol	id Cor	e Reco	very RQD - Rock Quality Designation W.I Weath	ering Grade F.I. Fractura	al Ind	ex							ked By		





														BOREHOLE NO. : BH-02														
ieote	ech C	ontract	or:	DEA	L GE	DSER	VICES	S PV1	T. LTC) <u>.</u>		Job	No. :	DEAL/028/015 CLIENT :	ENT		Co	INIC	2111	TA	NIT	C			SHE	ET	02 of	f 03
roje	ct:C	Geologi	cal S	urve	y for	the P	repar	atory	/ Sur	vey o	n the	Proj	ect fo		Consul						opm	o			WATE			_
D. (m	ו)	:	-28.5	4 CD	SBL (m)		:	-3.04	CD				Equipment Record : AQUA STAR - JACKUP BARGE										Date		Lix 17		Mtr
ate C	omme	nced :	02-07	7-2015	i Circu	lation F	luid	:	Sea	Nater				Type of Rig : Hydraulic Rig									0	2-07-2015	5 12	2.01 PM		7.5
ate C	omplet	ed :	06-07	7-2015	5 Drillin	g Orier	ntation	:	Verti	cal				Details of Casing (mm) : SX / HX / NX									_					
o- Oi	rdinate	s E:	2815	55.00)		N :	2100	0932.0	0				Core-Diameter (mm) : 54.10													-	
					_										ç	20	Grai	1 Size		Cons	isten	icy	Streng	th Test				
Sam	npling	Details	Star		Penetr t (SPT)	ation	[Details	of Ro	ck cor	e	-	Ű.	Details of Stratum	11		Analy				its (%			Pa)	Con	nsolida	tion Te	€St
			_	1		Ш П		1		1	1	Symbol	Depth in (m)							(w∟) ```	(wp)	ا (۹)	ICSL	ιυ cι	idatio ure) ssion	Cc) oid	, (j
ТҮРЕ	From (m)	To (m)	150	300	450	"N" VALU	TCR %	SCR %	RQD %	N.G	Ë		ð	Strata Description		GRAVFI	SAN	SILT	CLAY	LIQUID (ML)	PLASTIC (WP)		ບື່	ອຸ ອຸ ບໍ່ບັ	PreConsolidatio n Pressure	(kPa commpre	Index (Cc) Initial Void	Ratio (
10						-								Very soft, dark grey CLAY												0		
	-13.54	-13.99	7	11	13	24							-13.54	Very stiff, greyish brown sandy CLAY with gravels	c	H 1	5 31	26	28	54 2	23	31						
1																												
2																												
	-15.04	-15.54	27	31	38	69						•.	-15.04	Very dense, brownish, SAND with gravels	S	P 6	94	C)	- 1	NP	-						
13	-16.54	-16.86	30	35	50 blows/	>100						•			s	P 1:	2 87	1	1	- 1	٧P	-						
4					20cm							٠																
												•																
15												•																
16	-18.04	-18.49	18	24	28	52									s	P 1	88 0	2	2	- 1	NP	-						
Н	-19.54	-19.99	17	24	34	58								- gravels not found below -19.45 m CD	s	PC	99		1	- 1	٧P	_						
17																												
18																												
Π	-21.04	-21.24	28	54 blows		>100									s	PC	99	1	I	- 1	٧P	-						
19				5cm 54																								
20	-22.54	-22.79	35	blows 10cm		>100									S	PC	99	1	1	- 1	٧P	-						
brevi - spt	_	& Symbol os 🚺 - os v - N - N	1	- Liq	juid Lii		I _P Core R		asticity				Moiste re Reco	re Content C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean S SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reverse RQD - Rock Quality Designation W.I Weathering Grade F.I. F	luced Le	evel								Ch	ared B ecked E roved E	3y:s.	D.	





											BOREHOLE NO. : BH-02															
eotech Contrac	tor: IDE	AL G	EOSEF	RVICE	S PVT	. LTD	•		Job	No. :	IDEAL/028/015 CLIENT	S ORIEN	ITA	1	Co	NCI	ШТ	AN	TC			5	SHEET	03	of 0)3
oject : Geolog	ical Surv	vey fo	or the F	Prepar	ratory	Surv	ey oi	n the	Proj	ect fo	r Construction of Mumbai Trans Harbour Link	Global Con							men	t		14	ATER	TADI	-	
. (m) :	-28.54 C	D SB	L (m)		:	-3.04	CD				Equipment Record : AQUA STAR - J/										Da		Tim		M	ltr
e Commenced :	02-07-20			Fluid	:	Sea V	Vater				Type of Rig Hydraulic Rig										02-07-3	2015	12.01 F	PM	7	7.5
te Completed :	06-07-20	015 Dri	lling Orie	entation	:	Vertic	al				Details of Casing (mm) : SX / HX / NX															
- Ordinates E:	281555	.00		N :	2100	932.00)				Core-Diameter (mm) : 54.10															
													Û	Ι.	Grain	Size	C	onsist	ency	Stre	ngth T	est				-
Sampling Details		rd Pen est (SP	etration T)	1	Details	of Roc	k core	•	_	Ē	Details of Stratum		on (US	4	Analys			_imits		•	(kPa)		Consoli		n Test	
		1	<u> </u>				1	1	Symbol	Depth in (m)			lificati	L.			(Jw	(wp)	۲ ۲	UCS	UU	CU	idatio Ire	sion cc)	oid 0	_
H From ↓ (m) To (m	120 (1	300	"N" VALUI	TCR %	SCR %	RQD %	N.G	E.	0,	Del	Strata Description		Soil Clasiification (USC)	GRAVEL	SAND	SILT		PLASTIC	PLASTICITY INDEX (L)	บ	c, ¢	. 	PreConsolidatio n Pressure (kPa)	Commpressic Index (Cc)	Initial Vo Batio (6	Ratio (e
			-								Very dense, brownish, SAND with gravels												<u> </u>	0		-
-24.04 -24.12			>100										SN	0	85	15	-	NP	-							
-24.04 -25.54	10cm			97	91	55		>10		-24.04	Moderately strong, moderately weathered, moderately fractured light greyi	sh amygdaloidal BASALT														
-25.54 -27.04	1			99	98	79		>10																		
3																										
4																										
-27.04 -28.54	1			93	92	66	Ш	5.3																		
5																										
													-				+	-								-
6																										
7											BOREHOLE TERMINATED DEPTH AT -28.5	4 (m)	1													
8																										
9																										
0 0 Direviations & Symbo	s :										C.D. Chart Datum, T.D. : Termination	Denth MSL : Mean Sea L	evel													-
- SPT - UDS - DS	W _L -	Liquid	Limit	P	- Pla	sticity	Index	N	/IC -	Moist	ure Content SBL : Sea Bed Level, EGL : Existing Gr												ed By : ed By :			
- Rock Recovery	No Recovery	TCR	- Tota	Core F	ecove	rv	SCR	- Soli	id Cor		very RQD - Rock Quality Designation W.I We	athering Grade F.I. Fractu				1							eu by. ed By:			





														BOREHOLE NO. : BH-03							
Geote	ech Co	ontract	or:I	DEAI	L GE	OSER	VICES	S PVT	. LTD).		Job	No. :	EAL/028/015 CLIENT : STATUS CLIENT :	NCIIITA	MTC	ē		SHEET	01 of (03
roje	ct : Ge	eologi	cal S	urve	y for	the P	repar	atory	Surv	/ey o	n the	e Proj	ject fo	Construction of Mumbai Trans Harbour Link Global Consulting for Sus					WATER		
D. (m	I)	:	-28.4	0 CD	SBL	(m)		:	-2.90	CD				quipment Record : AQUA STAR - JACKUP BARGE				Date	Tim		Vitrs
te C	ommend	ced :	11-07	7-2015	Circu	lation F	luid	:	Sea V	Vater				ype of Rig : Hydraulic Rig			[11-07-2015	10.35 A	M	6.00
ate C	omplete	d:	16-07	7-2015	5 Drillir	ng Orier	ntation	:	Vertic	cal				etails of Casing (mm) : SX / HX / NX			-				
o- Oi	dinates	E:	2869	53.00)		N :	2100	893.00	0				ore-Diameter (mm) : 54.10							
													â	୍ଥିତ Grain	ize Cons	istency	Strer	igth Test			Л
Sam	pling D	etails	Stan		Penetr (SPT)			Details	of Roo	ck cor	e	-	rrt (C	Details of Stratum		iits (%)		kPa)	Consoli	idation Test	τ
				r –	1	<u><u> </u></u>			1	1		Symbol	v (E		(¹ w	(w) TY		UU CU	idatio Ire	sion (c)	(e ['])
ΥΡΕ	From (m)	To (m)	150	300	450	"N" VALUI	TCR %	SCR %	RQD %	ю. Х	Ē	55	Depth in (m) w.r.t.(CD)	Details of Stratum Strata Description	SILT CLAY LIQUID (w_)	PLASTIC (WP) PLASTICITY INDEY (L)	້ິບ		PreConsolidat n Pressure (kPa)	Commpressic Index (Cc) Initial Void	Ratio (e ⁰)
F							¥	Ň	Å									Ľ	PreC		~
	-2.90	-3.40											-2.90	ory soft, dark grey, CLAY CH 0 2	57 41 62 3	26 36					
1																					
Н	-4.40	-4.85	0	0	0	0								CH 0 1	57 42 62 4	43 19					
2			Ů													10 10					
3	-5.90	-6.35																			
4																					:
Π	-7.40	-7.52	54 - blows/ 12cm	-	_	>100				-											
5	-7.40	-8.90	12011				37	11	Ni	11	4		-7.40	eak, moderately weathered, highly fractured light greyish amygdaloidal BASALT							
3																					
Î	-8.90	-10.40					43	13	Nil	1	3.3										
, "																					
Ш	-10.40	-11.90	-				33	11	Nil	п	4.7										
8																					
9																					
	-11.90	-13.40					27	15	Nil	Ш	3.3			colour changes to reddish grey below-11.90m CD							
10 bbrevi	ations &	Symbols																			
- SPT		- DS		- Liq	uid Li	mit	I _P	- Pla	sticity	Index	N	NC -	Moist	C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level					red By :		
- Roci	Recovery	N - N	o Recover	y T	CR -	Total	Core R	ecover	rv	SCR	- Sol	lid Cor	re Reco	y RQD - Rock Quality Designation W.I Weathering Grade F.I. Fractural Index]				ked By : oved By :		





											BOREHOL	E NO	: BH-03													
eotech Contrac	tor:IDE	AL GEO	OSERV	/ICES	S PVT.	LTD			Job	No. :	DEAL/028/015		CLIENT :	Ø ORIEN	ITA	1	201	ICI		NIT	C			SHEET	Г 02	of 0
roject : Geolog	ical Surv	vey for	the Pr	epara	atory	Surv	ey or	n the	Proj	ect fo	r Construction of Mumbai	Trans	Harbour Link	OBICONSUL Global Cor						alopm	Jent			WATER		
D. (m) :	-28.40 C	D SBL (m)			-2.90	CD				Equipment Record	:	AQUA STAR - JAC	KUP BARGE									ate	Tin		LE Mt
ate Commenced :				uid		Sea W					Type of Rig	:	Hydraulic Rig									11-0)7 - 2015	10.35	AM	6.
ate Completed :	16-07-20	15 Drillin	g Orient	ation	:	Vertic	al				Details of Casing (mm)	:	SX / HX / NX													
o- Ordinates E :	286953.	00		N -	21008	203.00	<u> </u>				Core-Diameter (mm)	:	54.10													
	200955	00		N .	21000	55.00	,			_					6			_								
Sampling Details		d Penetra st (SPT)	ation	D	etails o	of Roc	k core	,	。	Depth in (m) w.r.t.(CD)		Details	s of Stratum		Soil Clasiification (USC)	A	Brain S nalysis			sisten nits (%	6)	Strength (kPa	1)		lidatio	
			ا			, 9			Symbol	in (m)					siifica	/EL	₽,	- >	([¬] ∧)	C (wp)		CSUU		olidatio sure a)	ession (Cc)	(e ⁰)
H From ↓ (m) To (n	39 120 (r	450	"N" VALUE	TCR %	SCR %	RQD %	N.G	F.I.		Depth		Strata	Description		Soil Cla	GRAVEL	SAND	CLAY	LIQUID (w∟)	PLASTIC (WP)		؟ 5	. .	PreConsolidatio n Pressure (kPa)	ommpre	Initial Void Ratio (e ⁰)
0			-								Weak, moderately weathered, highly fr	actured ligh	nt greyish amygdaloidal BAS	GALT										<u>م</u>	0	
-13.40 -14.9	0			19	7	Nil	ш	2.7																		
1																										
2																										
-14.90 -16.4	0			17	Nil	Nil	Ш	0.7																		
13																										
-16.40 -17.9	0			21	3	Nil	IV	2																		
14																										
15															1											
-17.90 -19.4	U			39	28	8	IV	4.7																		
6															1											
7 -19.40 -20.9	0			36	2	Nil	IV	>10																		
8				40	40	47		47		00.00	Moderately strong, moderately weathe	red moder	ately fractured roddish amo		4											
				49	42	17		4.7		-20,90	moderately strong, moderately weathe	reu, mouera	atory nactured reduish amy													
-22,40 -23,9	_			47	32	19	ш	6																		
20																										
breviations & Symbo		iquid Lin.	nit	I _P	- Plas	ticity	Index	N	IC -	Moist				epth, MSL : Mean Sea L nd Level, R.L. : Reduce		/el							Prepa	red By :	V.N.	7
<u></u>	No Recovery	TCR -		•		-				e Reco				hering Grade F.I. Fract				1					Chec	ked By	: S.D. : S.T.	





											BOREH	OLE NO. :	BH-03														
eotech Contrac	tor: IDE/	AL GEO	SERV	ICES	PVT. I	LTD.			Job	No.:	IDEAL/028/015		CLIENT :	Ø ORIEN	ITA	1	ON	CII	TA	NITC				SHEET	03	of 0	13
roject : Geolog	ica l Surv	ey for t	the Pre	para	tory S	Surve	ey or	n the	Proj	ject f	or Construction of Mum	ıbai Trans Haı	bour Link	Global Con						opmer	nt			VATER	TAD	-	
D. (m) :	-28.40 CI) SBL (m)		: -:	2.90	СD				Equipment Record	:	AQUA STAR - JACK	UP BARGE								Da	v ate	Tim		LE M	tr
te Commenced	11-07-20 ⁻			id		Sea W					Type of Rig	:	Hydraulic Rig									11-07	-2015	10 <u>.</u> 35 /	чM	6	6.0
te Completed :	16-07-20 ⁻	15 Drillin	g Orienta	ation	: V	/ertica	al				Details of Casing (mm)		SX / HX / NX														
o- Ordinates E :	286953.0	10		N · ·	210089	3 00					Core-Diameter (mm)	:	54.10														
										2					σ		irain Si		Conc	istency		ength .	Toot				-
Sampling Details	Standaro Te	d Penetra st (SPT)	ation	De	tails of	f Rock	k core		_	int (CD		Details of	Stratum		on (USC)		nalysis			its (%)	/ 50	(kPa)		Consol	idation	n Test	
			<u> </u>			<u> </u>		1	Symbol	x (m)					lificati	ц.			wL)	(w _P)	_UC: ≘	s ບບ	CU	idatio ure	ssion Cc)	oid 0	-
ਸ਼ੂ From ≿ (m) To (m	300 120 (450	"N" VALUI	TCR %	SCR %	RQD %	Ю. М	F.I.		Depth in (m) w.r.t.(CD)		Strata De	scription		Soil Clasiification	GRAVEL	SAND	CLAY	riquid (m.)	PLASTIC (WP)	ັບ Index	¢;	с',ф	PreConsolidatio n Pressure (kPa)	Commpression Index (Cc)	Initial Ve Batio (6	Lauv
2			-								Moderately strong, moderately we	eathered, moderately	fractured reddish amygo	dloidal BASALT										<u>a</u>	0		-
-23.90 -25.40				94	94	80	П	4.7		-23.9	Strong, fresh, slightly fractured gr	reyish BASALT			1												
2																											
-25.40 -26.90	,			83	80	59	П	6.7																			
3																											
4																											
-26,90 -28,40)			100	100	86	Ш	4.7																			
5																											
6											BOREH		AT -28.40 (m) BELOW	/ CD													
7																											
8																											
9																											
0																											
breviations & Symbo		iquid Lin	nit	I _P	Plasti	icity lı	ndex	N	IC -	Mois				epth, MSL : Mean Sea L nd Level, R.L. : Reduce		el								ed By :]	-
-Rock Recovery	lo Recovery			ore Red		-	SCR					,-	ייידייני ט ייייי רוד	,									Checl	ked By :	S.D.		





														BOREHOLE NO.: BH-04															
Geot	ech C	ontract	or:	DEA	L GEO	DSER	VICE	S PV1	T. LTC).		Job	No.:	AL/028/015 CLIE		_	. (8		S⊦	IEET	01	of 0	3
roie	ect : G	ieologi	cal S	urve	v for	the P	repar	ator	/ Sur	vev o	n the	Proi	iect f	Construction of Mumbai Trans Harbour Link															
		J						,		-					Global Cons	sultin	ig tor	Sust	ainab	le De	velop	pmen	t:	Dete	-	TER	1		_
D. (r		:			SBL (:	-5.60						JACKUP BARGE								F	Date		Time		Mt	
	Commer Complet					lation F g Orier			Sea \ Verti					rpe of Rig : Hydraulic Rig etails of Casing (mm) : SX / HX / NX									F	26-06-201	5	10.20 A	М	7	.50
	Joinplet	eu .	27-00	-2015	Drillin	y onei	lation	•	veru	cai				pre-Diameter (mm) : 54.10									F						
0- O	rdinate	s E:	2868	846.00)		N :	2100)932.0	0																			
Sar	npling	Details	Star		Penetr (SPT)	ation	[Details	s of Ro	ck cor	e		(EL)	Details of Stratum		Soil Clasiification (USC)		rain S nalysis			nsiste imits	ency (%)		gth Tes kPa)		Consoli			
u	F					TUE	%	%	%			Symbo	Depth in (m)			asiificati	VEL	SAND	SILI	D (wL)	IC (w _P)	rici⊤Y X (l₀)	UCS	UU C	solidatio	n Pressure (kPa)	Commpression Index (Cc)	Void (e ⁰)	1
ТҮР	From (m)	To (m	150	300	450	"N" VALUE	TCR %	SCR %	RQD	N.G	F.I.			Strata Description		Soil CI	GRAVEL	S S	⊼ ਹੋ	LIQUID (ML)	PLASTIC (w _P)	PLASTICITY INDEX (Ip)	പ	ຸ ອີ່ງ ເ	PreCons	n Pre: (kF	Commp Index	Initial Ratio	
0	-5.60	-6.10											-5.60	ry loose, dark grey, clayey SAND		SC	5	53 2	25 17	36	24	12							
1																													
2	-7.10	-7.55	0	0	1	1							-7.10	ry soft, dark grey CLAY with sand		CL	0	23 3	8 39	47	26	21							
3	-8.60	-9.05																											
4																													
5	-10.10	-10.55	5	11	18	29							-10.1	dium dense, yellowish grey, clayey SAND with gravel		sc	11	52 2	20 17	49	27	22							
3	-11.60	-12.05	8	13	19	32						<u> </u>	-11.6	rd, yellowish grey CLAY with sand and gravels		СН	13	15 2	2 50	58	27	31							
7																011													
8	-13.10	-13.55	23	24	34	58							-13.1	ry dense, yellowish brown, silty SAND		SM	3	76 1	4 7	-	NP	-							
9	-14.60	-14.87	18	55 blows	, -	>100						•	-14.6	ry dense, yellowish brown,gravelly SAND with silt		SP	39	51	10	_	NP	_							
10				12cm																									
]- sp	_	& Symbol s N - Ds / N - N	s : W _L o Recove		uid Lii		I _P Core R		asticity			MC - lid Cor		C.D. Chart Datum, T.D. : Termina SBL : Sea Bed Level, EGL : Existing RQD - Rock Quality Designation W.I		Leve			 					Ch	ecked	lBy: dBy: dBy:	S.D.		





											_		BOREHOLE NO. :	BH-04														
eotech Co	ontracte	or: I	DEAL	L GEO	OSER		S PVT	LTD).		Job	No. :	DEAL/028/015	CLIENT :		ITA	1	201	ICI	II T/	TIA	re	L		SHE	ET (02 of	03
oject : G	eologio	cal Su	urve	y for	the P	repar	atory	Surv	/ey o	n the	Proi	ject fo	Construction of Mumbai Trans Har	bour Link	Global Con							nent	Ĺ					
D. (m)	-	-31.85					-		-								9.51					- 0-171	+	Date	WATE	ER TA ïme	-	Mtr
						- Iurial		-5.60						AQUA STAR - JACK Hydraulic Rig	OP BARGE													
te Commen te Complete		22-06			lation F			Sea V Vertic					.)[===:::3	SX / HX / NX									2	26-06-2015	10	.20 AM		7.5
te oomplet		27-00	-2015	Dimin	ig onei	mation	•	vertic	241				5()	54.10														
o- Ordinate	sE:	2868	46.00)		N :	2100	932.00	0																			
Sampling [Details	Stand		Penetr (SPT)	ation		Details	of Roc	ck cor	e		(E	Details of	Stratum		on (USC)		Grain S nalysi			ısisteı mits ('			ith Test Pa)	Con	solidat	ion Te:	st
- 1			1	1	<u> </u>			1	1	1	Symbol	Depth in (m)				ificati				ML)	(dM)		UCSL	JU CL	datio re	sion	c)	<u>~</u>
Haran Brom ▲ (m)	To (m)	150	300	450	"N" VALUI	TCR %	SCR %	RQD %	N.G	E.	ία.	Dep	Strata De	scription		Soil Clasification (USC)	GRAVEL	SAND	SILT	LIQUID (ML)	PLASTIC (w _P)	PLASTICIT INDEX (Ip)	ບື	ອີ່ງ ອີ່ງ	PreConsolida n Pressure	(kPa) Commpres	Index (Cc) Initial Void	Ratio (e
)				55	-								Very dense, yellowish brown,gravelly SAND with silt													Ť		
-16.10	-16.45	25	28	blows/ 5cm	>100											SP	37	55	8	-	NP	-						
-16.10	-17.60					25	12	-	V	>10		-16.10	Very weak, highly weathered, highly fractured, greyish	BASALT														
-17.60						19	12	-	v	>10																		
-18.10	-19.60					45	32	8	IV	>10																		
4																												
-19,60	-21,10					55	30	8	IV	>10																		
5																												
-21.10	-22.60					67	57	7	IV	>10																		
6																												
7																												
-22.60	-24.10					90	60	29	IV	>10		-22.60	Moderately strong, moderately weathered, moderately	fractured reddish amygo	daloidal BASALT													
3																												
-24.10	-25.60					77	52	-	v	>10																		
9																												
0																												
breviations &	& Symbols	6 : • :									805050555	š	C.D. Chart Datum, T	D · Termination De	epth, MSL : Mean Sea L	evel			1									—
- SPT 📕 - UD	s 📘- ds	WL	- Liq	uid Lir	nit	I _P	- Pla	sticity	Index	Ν	/IC -	Moist	e Content SBL : Sea Bed Level, E				el								ared B cked E			
- Rock Recovery	/ N - NG	Recovery	ν ⊤	CP -	Total	Core P	acovo.	~	SCD	60		re Reco	ery RQD - Rock Quality Designation	W/I Wooth	ering Grade F.I. Fract				1							у. З.Ц ly:S.Т		





											BOREHOLE NO.: BH-04															
Geotech Contract	or: IDEA	L GE	OSER	VICES	PVT.	. LTD			Job	No. :	DEAL/028/015 CLIENT :	Ø ORIEN	TA	1	201		шт	ANT	C			SH	IEET	03 o	f 03	
Project : Geologi	cal Surve	y for	the P	repara	atory	Surv	ey oi	n the	Proj	ect fo	r Construction of Mumbai Trans Harbour Link	Global Cons								_						
T.D. (m) :	-31.85 CD	SBL ((m)			-5.60	CD		-		Equipment Record : AQUA STAR - JACK										Date	1	TER TA Time	ABLE	Mtr	<u>s.</u>
Date Commenced			. ,	luid		Sea W					Type of Rig : Hydraulic Rig										26-06-201		10.20 AM		7,50	-
	27-06-2015					Vertic					Details of Casing (mm) : SX / HX / NX															
											Core-Diameter (mm) : 54.10															
Co- Ordinates E:	286846.00)		N :	21009	932.00)						-	1								-				
Sampling Details	Standard Test	Penetr t (SPT)		D	etails	of Roc	k core	!	-	(m)	Details of Stratum		Soil Clasiification (USC)	A	Grain S nalysi			onsisten .imits (%	6)	()	gth Tes ∢Pa)		onsolida	tion T	est	ks
<u> </u>	 	1	<u> </u>					1	Symbo	Depth in (m)			lificat				(Jw	(dw)		JCSI	JU C	idatio	sion	iq (c)	(₀ €	Remarks
H From ├ (m) To (m)	150 300	450	"N" VALU	TCR %	SCR %	RQD %	N.G	F.I.		De	Strata Description		Soil Clas	GRAVEL	SAND			PLASTIC (WP)	INDEX	ບື	مهاج ن ز	reConsol	n Pressure (kPa) Commoression	Index (Cc) Initial Void	Ratio (6	œ
20 -25.60 -27.10			-	82	39	21	IV	>10		-25.60	Moderately strong, moderately weathered, moderately fractured reddish amygo	aloidal BASALT										<u> </u>				
- 21	_			98	97	81	111	4.7		-27.10	Weak to moderately strong, slightly weathered, greyish BASALT															
- 22																										
23 -28.60 -30.10 24				93	90	60	- 111	5.3			- secondary infilling of the vugs are noticed and some part of the rock materials	is friable														
25				97	96	60	111	>10																		
_ 26	-			100	100	60		1.3																		
27											BOREHOLE TERMINATED DEPTH AT -31.80 (m											_				
																										l
28																										
29																										
30																										ļ
bbreviations & Symbol - SPT - UDS - DS	W _L - Lic	juid Lii				sticity					C.D. Chart Datum, T.D. : Termination De SBL : Sea Bed Level, EGL : Existing Groun	d Level, R.L. : Reduced	l Lev]	_	<u> </u>			Ch	ecked	By:V. By:S.	D.		
	o Recovery	-		I _P Core Re						Moist e Reco		d Level, R.L. : Reduced									Ch	ecked		D.		





											BOREH	IOLE NO	.: BH-05													
eotech Contrac	tor:IDE/	AL GEO	SER	VICES	6 PVT	LTD).		Job	No. :	DEAL/028/015		CLIENT :		177.0		-				-			SHEET	01 of	03
roject : Geolog	ical Surv	ey for t	he Pi	repara	atory	Surv	vey o	n the	Proj	ect fo	or Construction of Mun	nbai Trans	Harbour Link													
	-25.34 CE	-		•	-		-				1				isultir	g tor	Susta	naoi	e Dev	elopn	ient	+	v Date	NATER Time	1	Mtr
				luid	:	-3.10 Sea V					Equipment Record	:	AQUA STAR - JAC Hydraulic Rig	NUP BARGE									06-2015	10,30 AI		7,0
	16-06-201				:	Vertic					Details of Casing (mm)	:	SX / HX / NX									13-0	6-2015	10.30 AI	n	7.0
		,									Core-Diameter (mm)	:	54.10													
o-Ordinates E:	287282.0	00		N :	2100	749.0	0		r	T											<u> </u>					
	Standard	d Penetra	tion	_						(D		D. (. !			USC)		ain Siz alysis			sisten nits (%		Strength (kPa		Consolio	lation Te	st
Sampling Details		st (SPT)		C)etails	of Roo	ck core)	<u>,</u>	w.r.t.(CD)		Details	s of Stratum		Soil Clasification (USC)	All	arysis	.70)							_	
			ا			_			Symbol	(L) u					siifica	ш.		≻	LIQUID (w_)	(4w)	€€	CS UU	CU	PreConsolidatio n Pressure (kPa)	ssion Cc) oid	e°)
H From L (m) To (m	300 150 (450	"N" VALU	TCR %	SCR %	RQD %	0.V	Ë		Depth in (m)		Strata	a Description		il Cla:	GRAVEL	SAND	CLAY	aun	ASTIC			. ф	Conso Press (kPa	Commpressic Index (Cc) Initial Void	Ratio (e ⁰)
			.v.	Ĕ	Ň	Ř	_																\square	Pre(
-3.10 -3.60										-3.10	Very soft, greyish sandy CLAY v	vith gravels			CL	7	43 28	22	42	22	20					
-4.60 -5.05																										
-4,60 -5,05																										
3 -6.10 -6.20	50 blows/	_	>100						• 555	6 10	Very dense, greyish silty SAND	with gravels			-											
	10cm		- 100						•	-0.10	vory dense, greyten eity er tre	and gravele			SM	6	67 22	5	-	NP	-					
-7.60 -8.05															SM	6 (68 21	5	-	NP	-					
	50)																								
9.109.35	45 blov 10c		>100												SP	19	73	8 	-	NP	-					
									8																	
-10.60 -10.83	30		>100						11	-10.60	Very dense, brownish sandy GR	AVELS			GP	56	43	1	-	NP	-					
;	blov 8ci																									
,																										
-12.10 -12.5	42 50	52	>100						%		- with silt				GC	40	27 28	5	32	20	12					
0									•																	
breviations & Symbo	1	iquid Lim	it	I _P	- Pla	sticity	Index	N	IC -	Moist				epth, MSL : Mean Sea L nd Level, R.L. : Reduced									Prepa	red By :	/.N.	
- Rock Recovery	lo Recovery	TCR -	Total (Core R	ecover	y ,	SCR	- Soli	id Cor	e Reco				nering Grade F.I. Fractu			=							ked By : :		
- Field Vane Shear 🌒 - S		L												-												





															BOREHOLE NO. : BH-05														
Ge	ote	ch Co	ntracte	or: II	DEAL	L GEO	OSER	VICES	S PVT	LTD			Job	No. :	DEAL/028/015 CLIENT :	TA	1	Co	NICI	пт	A &I	TC			SI	HEET	02	of 03	
۶rc	ojeo	ct : Ge	ologi	cal Su	urvey	y for	the P	repar	atory	Surv	ey o	n the	Proj	ect fo	r Construction of Mumbai Trans Harbour Link														
	- . (m)			-25.34				-		-3.10			-		Equipment Record : AQUA STAR - JACKUP BARGE									Date	1	ATER Tim		_E Mtrs	
		, ommenc					lation F	Fluid		-3.10 Sea V					Type of Rig : Hydraulic Rig								ľ	13-06-20	_	10.30 A		7,00	
		mpleted					ig Oriei			Vertic					Details of Casing (mm) : SX / HX / NX									13-00-20	110	10,507			
							-								Core-Diameter (mm) : 54.10														-
Co-	Or	dinates	Ε:	2872	82.00)		N :	2100	749.00	נ		1	1		1	1								+			<u> т</u>	
s	Sam	pling D	etails			Penetr (SPT)			Details	of Roc	k core)	-	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasification (USC)	,	Grain Analys			nsiste imits			ngth Te (kPa)		Consoli			
	П				1	1	<u> </u>		1		1	T	Symbol	м (ш) и		lificati				(]w	(wp)	iT√ (₅)		UU C	idatio	lire	ssion Cc)	oid ()e	Demarke
	ТҮРЕ	From (m)	To (m)	150	300	450	"N" VALU	TCR %	SCR %	RQD %	N.G	Ë		Depth ir	Strata Description	Soil Clas	GRAVEL	SAND	SILT	LIQUID (wL)	PLASTIC (w _P)	PLASTICITY INDEX (Ip)	ບື	¢,	c',¢' reConsol	n Pressure (kPa)	Commpres Index ((Initial Void Ratio (e ⁰)	œ
10							_								Very dense, brownish sandy GRAVELS	1				T						·			
44		-13.60	-14.05	35	38	43	81							-13.60	Hard, brownish sandy, CLAY with gravels	CL	5	35	53 7	41	22	19				ľ			
																										ľ			
12	Ľ			56																						I			
	Н	-15.10	-15.22	blows/ 12cm	-	-	>100							-15.10	Very dense, brownish, fine to medium SAND	SP	0	90	10	-	NP	-				I			
13			10.00	-							-															ľ			
. 14		-16.60 -16.60	-16.68 -18.10	60 blows/ 8cm	-	-	>100	67	53	7	١v	>10		-16.60	Very weak to weak, highly to completely weathered, reddish to greyish BASALT	SM	2	78	14 6	-	NP	-				I			
				Com																						ľ			
15	Ī	-18.10	-19.60	-				67	54	8	١v	>10														ľ			
16	;																									I			
		-19.60	-21,10	-				100	100	53	١v	>10		-19.60	Weak to moderately strong moderately weathered, horizontal fractured, greyish amygdaloidal BASALT	ł										I			
17																										I			
18																										I			
		-21.10	-22.60					100	95	52	Ш	>10														I			
19								100	100	55		6.7														I			
20		-22.60	-24.10									0.7														ľ			
 	SPT Rock	- UDS Recovery		W _L	у Т	uid Lii CR		I _P Core R		sticity ry				Moist e Reco	C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Le SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced rery RQD - Rock Quality Designation W.I Weathering Grade F.I. Fractu	l Lev				•				CI	hecke	d By : ed By : ed By :	S.D.		-





													BOREHOLE NO. : BH-05													
eotech Contra	ctor :	DEAL	GEOS	ERVIC	CES F	PVT. I	_TD.			Job	b No	o. : II	EAL/028/015 CLIENT :	ORIEN	TΔ	(201	SI	IT/	INT	S			SHEE	Г 03 of	f 03
oject : Geolo	gica l S	urvey	y for the	e Prep	barat	ory S	urve	ey o	n th	e Pro	oject	t for	Construction of Mumbai Trans Harbour Link	Global Cons								_		WATER		
D. (m)	: -25.3	84 CD	SBL (m)			: -3	3.10	CD					Equipment Record : AQUA STAR - JACKUP BARGE										Date	Tir	1	Mtr
te Commenced	: 13-0	6-2015	Circulatio	on F l uid		: S	ea W	ater					Type of Rig : Hydraulic Rig									1	3-06-2015	10.30	AM	7.0
te Completed	: 16-0	6-2015	Drilling C	Orientatio	on	: V	ertica	al					Details of Casing (mm) : SX / HX / NX									_				
- Ordinates E	· 287	282.00		N	1. 2	10074	9 00						Core-Diameter (mm) : 54.10									_				
										Т	Ι				ច		irain Si		0.00	nsister			4h T4			
Sampling Details	Sta		Penetratio (SPT)	on	Det	tails of	Rock	k core	e	<u>,</u>		Depth in (m) w.r.t.(CD)	Details of Stratum		Soil Clasiification (USC)		nalysis			mits (?	%)	(k	th Test Pa)		lidation Te	
Erom T					%	%	%	0	Ι.	Symbol		h in (m)			lasiifica	GRAVEL	SAND	CLAY	LIQUID (ML)	PLASTIC (wp)	(le) X	csı		solidatic ssure Pa)	Commpression Index (Cc) Initial Void	Ratio (e ⁰)
H From ├ (m) To (m) 150	300	450		2	SCR %	RQD %	N.G	E.			Dept	Strata Description		Soil C	GR	's "	0 0	LIQU	PLAS	INDE	ບື່	ອີ່ອີ່ ບໍ່ບໍ່ບ	PreConsolidat n Pressure (kPa)	Comm Inde	Rati
0													Neak to moderately strong moderately weathered, horizontal fractured, greyish amygdaloidal	BASALT												
1 -24.10 -25	30				96	88	23	Ш	>1		<u> </u>	24 10	Noderately strong, slightly weathered, greyish BASALT		-											
2					,0	00	20					24.10														
3													BOREHOLE TERMINATED AT -25,30 (m) BELOW CD													
4																										
5																										
6																										
7																										
8																										
0																										
Breviations & Syml	ools : os W _L		uid Limit CR - To			Plasti				MC olid Co			C.D. Chart Datum, T.D. : Termination Depth, MSL : I SBL : Sea Bed Level, EGL : Existing Ground Level, R.L Pry RQD - Rock Quality Designation W.I Weathering Grade	. : Reduced	Leve				-					ared By cked By oved By	: S.D.	





													BOREHOLE NO. : BH-06													
eotech Co	ontract	or: IC	DEAL	. GEC	SER	VICES	S PVT	. LTC).		Job	No. :	DEAL/028/015 CLIENT :			6			-					SHEET	01 of	03
roject : G	ieologi	cal Sı	irvey	for t	he P	repar	atory	Surv	vey c	n the	e Proj	ect fo	Construction of Mumbai Trans Harbour Link	Global Consulti	AL ing f	UL or Su	Staina	ble D	A		5 nt				TABLE	
D. (m)	:	-22.11	CD	SBL (r	n)		:	0.09	CD				Equipment Record : AQUA STAR - JACKUP BARGI	E								Da	ate	Tim	1	Mtr
ate Commen		11-06				luid	:	Sea \					Type of Rig : Hydraulic Rig									11-06	-2015	9.30 A	м	3.0
ate Complete	ed :	12-06	2015	Drilling	g Orier	ntation	:	Verti	cal				Details of Casing (mm) : SX / HX / NX													
													Core-Diameter (mm) : 54.10													
o- Ordinate	s E:	2889	18.00			N :	2099	540.0	0		-	1			T						-					
Sampling [Details	Stand		Penetra (SPT)	ation		Details	of Ro	ck cor	e		.r.t.(CD)	Details of Stratum	on (USC)		Grain Analy:	Size sis (%)	c		stency ts (%)	Str	ength (kPa)	Test	Consol	idation Tes	st
					ш		-	1	T	-	Symbol	x (L)		ficati	Γ.				(J. 4	Υ		SUU	CU	latio re	sion c)	_
Had From ↓ (m)	To (m)	150	300	450	"N" VALUI	TCR %	SCR %	RQD %	N.G	F.I.	ŝ	Depth in (m) w.r.t.(CD)	Strata Description	Soil Clasification (USC)	GRAVEL	SAND	SILT			PLASTICIT	C n	c,ф	c', þ .' ၁	PreConsolidatio n Pressure (kPa)	Commpressio Index (Cc) Initial Void	Ratio (e
0.09	-0.41				:							0.09	Loose, greyish SAND with she ll s	SP		98	0	-	- N					₽.	0	
1 -1.41 2 -3	-1.86																									
, -2.91	-3.36	14	24	32	56							-2.91	Very dense, greenish grey silty SAND	SM	0	65	30	5 4	4 2	7 17	,					
-4.41	-4.86	7	24	52 blows/ 8cm	>100									SP	0	97	3	-	- N	P -						
-5.91	-6.30	12	45	54 b l ows/ 9cm	>100									SM	0	85	15		- N	P -						
		_ 50																								
-7.41 -7.41	-7.51 -8.91	blows/ 10cm	-	-	>100	20	Nil	Nil	v	>10		-7.41	-with gravels Very weak, highly weathered, light brownish BASALT	SM	14	71	15	-	- N	P -						
-8.91	-10.41				·	11	Nil	Nil	- IV	4																
10																										
- SPT - UD: - Rock Recovery	s 🔤 - DS					I _P Core R	- Pla: ecover					Moisti re Reco	C.D. Chart Datum, T.D. : Termination Depth, MSL : re Content SBL : Sea Bed Level, EGL : Existing Ground Level, R ery RQD - Rock Quality Designation W.I Weathering Grad	.L. : Reduced Lev	/el	x							Chec	red By : ked By : ved By :	S.D.	





												BOREHO	LE NO	.: BH-06														
Seotech Contract	or: IDE	EAL	GEC	SER	VICES	6 PVT	LTD	•		Job	No. :	DEAL/028/015		CLIENT :	Ø ORIE	NT/		Cor	ICI	II T/	NIT	P			SHEE	Т 02	2 of 0)3
roject : Geologi	cal Sur	vey	for t	the Pi	repara	atory	Surv	ey or	n the	Proj	ect fo	r Construction of Mumb	ai Trans	Harbour Link	Global C							nent	L		WATE			
.D. (m) :	-22.11 C	D	SBL (r	m)			0.09	CD				Equipment Record	:	AQUA STAR - JA									-	Date	Ti		M	tr
ate Commenced	11-06-20				uid		Sea W					Type of Rig	:	Hydraulic Rig									11	-06-2015	9.30	AM	3	3.0
ate Completed :	12-06-20	015 [Drilling	g Orien	tation	:	Vertic	al				Details of Casing (mm)	:	SX / HX / NX														
o- Ordinates E:	288918	00			N .	2099	E 40 00	<u> </u>				Core-Diameter (mm)	:	54.10									-+					
o-Ordinales E:	200910	.00			N :	2099	540.00	,		Γ						10												-
Sampling Details	Standa T		enetra SPT)	ation	C	Details	of Roc	k core	•		Depth in (m) w.r.t.(CD)		Detail	s of Stratum		Soil Clasiification (USC)	. A	Grain S analysi			nsiste mits (Strengtl (kP	'a)		olidatio		
				۳,			\$			Symbol	in (m					sifica	Ē	₽	- ≻	(™)	C (WP)	É⊛	JCS UI	100	olidati sure a)	ession (Cc)	/oid	- 1)
₩ From ↓ (m) To (m	150	300	450	"N" VALUI	TCR %	SCR %	RQD %	W.G	E		Depth		Strata	a Description		Soil Cla	GRAVEL	SAND	SILT CLAY	LIQUID (wL)	PLASTIC (w _P)	PLASTICITY INDEX (Ip)	ບ້ 🖥	• •	PreConsolidatio n Pressure (kPa)	Commpre	Initial Void Patio (e ⁰)	Daux
0				-								Very weak, highly weathered, light b	prownish BAS	ALT										-				•
-10.41 -11.91	-				23	Nil	Nil	IV	>10																			
1																												
2																												
-11.91 -13.41					40	Ni	Nil	IV	>10																			
3																												
-13.41 -14.91					51	33	20	ш	>10		-13.41	Weak to moderately strong, highly to	o moderately	weathered, highly fractured	, brownish grey BASALT													
4																												
5				-																								
-14.91 -16.41					100	67	44	Ш	>10																			
6																												
-16.41 -17.91					100	100	71	Ш	6.7		-16.41	Moderately strong, moderately weat	hered, reddis	h brown, amygdaloidal BA	SALT													
8								n /																				
-17.91 -19.41					97	84	47	IV	>10																			
9	4				100	100	76	ш	5.3																			
-19.41 -20.91 0																												
breviations & Symbol - SPT - UDS - DS	W _L -		id Lim				sticity					Ire Content SBL : Se	ea Bed Lev	rel, EGL : Existing Gro	Depth, MSL : Mean Sea und Level, R.L. : Reduc	ed Le	vel							Che	ared By cked By	: S.D.		
- Rock Recovery	o Recovery		.R -	i otal (Core R	ecover	у	SCR	- Sol	la Cori	e Recc	very RQD - Rock Quality I	Designation	n W.I Wea	thering Grade F.I. Fra	tural	ndex						L	Appro	oved By	: S.T.		

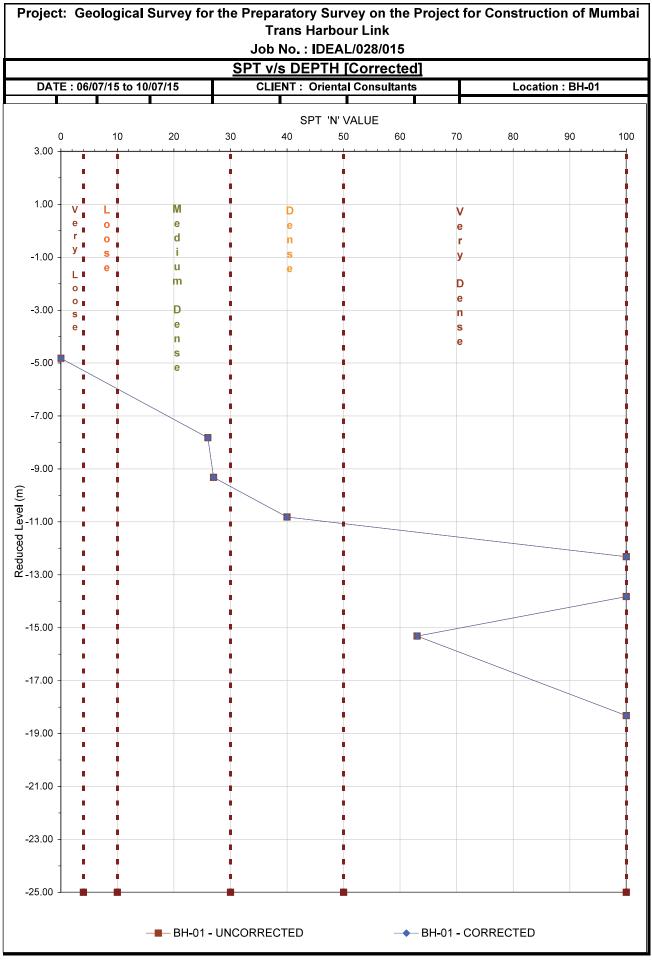




																HOLE NO																
eotech	Contra	ctor	: IDE	AL (GEO	SER	VICES	S PVT	LTI).		Job	o No.	IDEAL/028/0	15		0	CLIENT :	Ø	RIEN	TAI	C	ON	SUI	TA	NTS				SHEET	03 of	f 03
roject :	Geolo	gica	Surv	vey f	for t	he P	repar	atory	Sur	vey c	on th	e Pro	ject f	or Construct	ion of Mu	mbai Trans	Harbour l	Link		lobal Cons							nt		v	VATER	TABLE	
D. (m)		: -2	22.11 C	D S	BL (n	1)		:	0.09	CD				Equipment Re	cord	:	AQUA S	STAR - JACK	KUP BARGE									Da		Tim		Mtr
ate Comn	nenced	: 1'	1-06-20	0 15 C	Circula	tion F	luid	:	Sea	Water				Type of Rig		:	Hydrau	ic Rig										11-06	-2015	9 <u>.</u> 30 A	м	3.0
ate Comp	leted	: 12	2-06-20	0 15 D	Drilling	Orien	ntation	:	Vert	cal				Details of Cas	• • •	:	SX / HX 54.10	/ NX														
- Ordina	ates E	: 2	88918	.00			N :	2099	540.0	0				Core-Diamete	r (mm)		04.10															
													â								s C)	Gr	ain Size	,	Cons	istency	Str	ength ⁻	Test			
Samplin	ng Details	s S	Standaı Te	rd Pei est (S		tion	0	Details	of Ro	ck co	e	_	vrt (C			Deta	Is of Stratu	m			on (US		alysis (°		Lim	its (%)		(kPa)		Consol	idation Te	est
						뿡		1		1	1	Symbol	v (m)								iificati	E			(ML)	(w _P)		sυυ	CU	idatio ure	ssion Cc) oid	(₀ 6
∃d Fro L (n	n) To ((m)	150	300	450	"N" VALUI	TCR %	SCR %	RQD %	0.0	E.I.		Depth in (m) w.r.t.(CD)			Strat	a Descriptio	n			Soil Clasification (USC)	GRAVEL	SILT	CLAY	LIQUID (ML)	PLASTIC (WP)	Culture NULEX	¢,	с',ф	PreConsolidat n Pressure (kPa)	Commpressic Index (Cc) Initial Void	Ratio (e ⁰)
0						:								Moderately stro	ng, moderately	weathered, reddi	sh brown, amyg	idaloidal BASA	ALT.											₽	0	
1																																
	.91 -22	.11					100	100	96	Ш	4																					
2																																
3													8		BORE	EHOLE TERMINA	TED AT -22,11	(m) BELOW	/ CD													
4																																
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0 breviatio	ns & Syml	bols :												[C.D. Chart Datu	m T D · Ter	rmination De	enth MSI · M	an Sea Le	vel						_					
- SPT 📕 -	UDS -	ds W	/ _L - I	_iquio	d Lim	it	I _P	- Pla	sticity	Index	(МС	- Mois	ture Content		L : Sea Bed Le						el								ed By : ked By :		
	overy	- No Re				Total (-					olid Co			- Rock Qua		n											1	CHECK	neu ⊳y :	J.D.	











				J	ob No. : Il	arbour Lin DEAL/028					
					v/s DEP						
DAT	E:02/	07/15 to 0	6/07/15		CLIENT : O				Locati	on : BH-02	2
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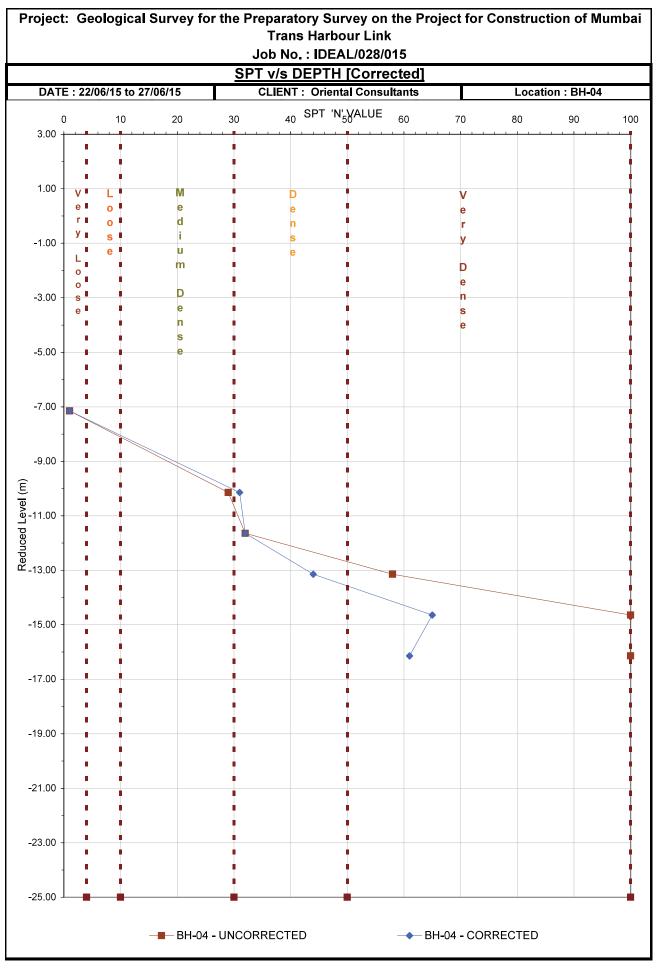




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ΠΔΤΓ	· 11/	07/15 to 1	6/07/15			Priental Con			Locat	ion : BH-0	3
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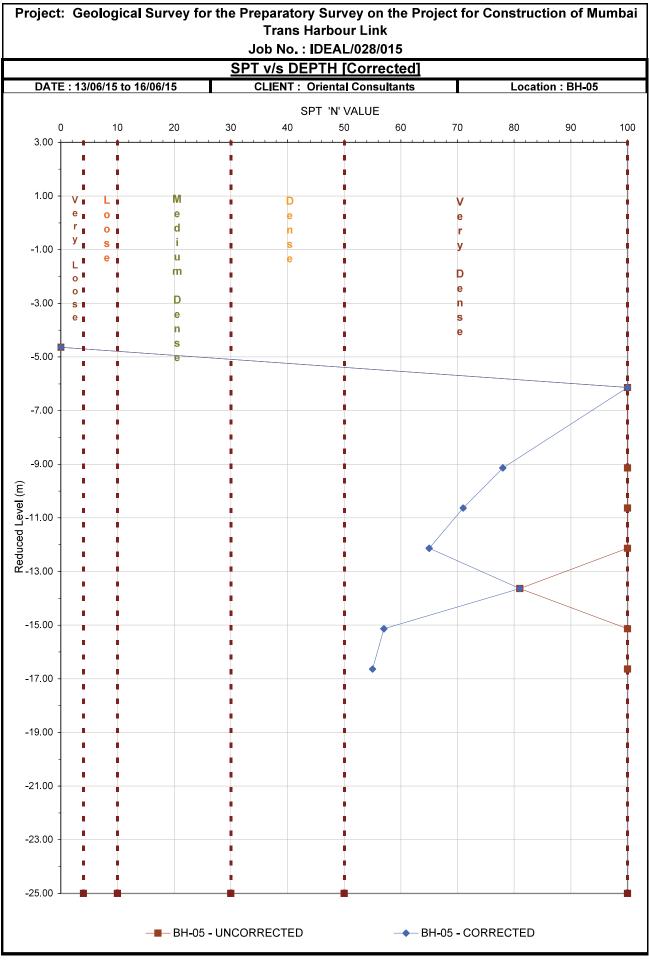






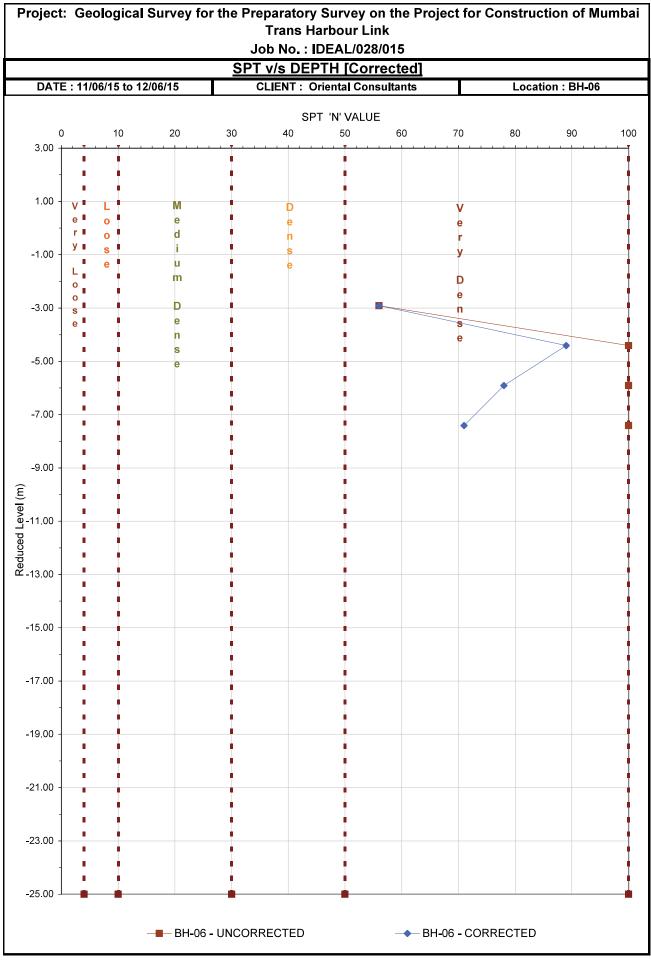












IDEAL GEOSERVICES PRIVATE LIMITED



APPENDIX-B - SUMMARY OF LABORATORY TEST RESULTS





-	: Geolo umber	-	-	/ for the Pr 28/015	eparato	ry Surv	ey on th	ne Proje	ect fo	or Co	onst	ruct	ion (of M	umt	oai Tra	ns Ha	ırbo	ur L	.ink	Client			RIEN1							
ö			SPT/	DENSITY	' & MOIS ⁻ ONTENT	TURE	uc		CLA	SSIFI	CATI	ON T	EST	s		5	TREN	GTH	TES	STS (kF	Pa)	CONSC		N TEST			CHEI	VICAL	TEST		
OLE - N	TestDe	pth (m)	oe (D/S/ DS)	Moisture	Density	(Kg/cm³)	l Clasiification (USC)	/ity		terbe mits(P Di:	articl stribi	e Siz ution	:e (%)	UCS	υυ	C	ະບ		Shear ane	ition (kPa)	ssion Cc)	Ratio		Soi	(%)		Wa	ater (m	ıg/l)
BOREHOLE - NO.	From	То	Sample Type (D/S/SPT/ UDS)	Content (%)	Wet	Dry	Soil Clas (U)	Sp. Gravity	WL	WP	<u> </u>	Gravel	Sand	Silt	Clay	Cu	Сф	c'	φ'	τ _v	τ _{vr}	Pre- Consolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e ⁰)	SO3	SO₄	CL	рН	SO₄	CL	рŀ
3H-01	-3.32	-3.82	D/S				СН	2.61	66	27	39	0	8	48	44																
	-4.82	-5.27	SPT				СН	2.60	71	16	55	0	1	52	47																
	-6.32	-6.77	UDS	67	1.60	0.96	СН	2.58	87	38	49	0	2	46	52	16						130	0.619	1.699						 	
	-7.82	-8.27	SPT				СН	2.61	78	32	46	0	4	72	24				+												
	-9.32	-9.77	SPT				СН	2.59	79	32	47	12	2	29	57																·
	-10.82	-11.27	SPT				СН	2.61	82	28	54	8	6	34	52																+
	-12.32	-12.67	SPT				СН	2.59	79	32	47	25	15	27	33			-													
	-13.82	-14.22	SPT				сн	2.60	66	32	34	12	14	61	13																
	-15.32	-15.77	SPT				CL	2.61	43	22	21	12	14	42	32																
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			_						<u> </u>	 	<u> </u>	 		 							 				 	 			<u> </u>	 	
			 						<u> </u>		<u> </u>			 														 	 		<u></u>
				PARED BY :	V.N.											S.D									ROVE					<u> </u>	





-		: IDE		for the Pr 8/015	- parato	.,	-,u			•										Clien			RIEN1							
ö			SPT/		A MOIST	TURE	u		CLA	SSIF	CAT	ION	TEST	s		5	TREN	ЭТН ТЕ	STS (H	(Pa)	CONS	OLIDATIO	ON TEST			CHEI	MICAL	TEST		
OLE - N	TestDe	pth (m)	oe (D/S/ DS)	Moisture	Density	(Kg/cm³)	Clasiification (USC)	/ity		tterbe imits(Partic istrib			UCS	UU	си		o Shear Vane	ition (kPa)	ssion Cc)	Ratio		Soi	l (%)		Wa	ater (m	.g/I)
BOREHOLE - NO.	From	То	Sample Type (D/S/SPT/ UDS)	Content (%)	Wet	Dry	Soil Clas (U	Sp. Gravity	WL	W۶	<u> </u>	Gravel	Sand	Silt	Clay	Cu	Сф	с' ф'	τ _v	τ _{vr}	Pre- Consolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e ⁰)	SO3	SO₄	CL	рН	SO₄	CL	рН
BH-02	-3.04	-3.54	D/S				СН	2.60	58	33	25	0	0	55	45															
	-4.54	-4.99	SPT				СН	2.61	65	32	33	0	1	50	49															
	-6.04	-6.49	SPT				СН	2.59	63	29	34	0	1	52	47															
	-7.54	-7.99	UDS	122	1.60	0.72	СН	2.54	80	36	44	0	1	59	40	4					46	0.851	2.308							
	-9.04	-9.49	SPT				СН	2 <u>.</u> 57	59	25	24	0	1	79	20															
	-10.54	-10.99	SPT				СН	2.59	59	29	30	0	1	50	49															
	-12.04	-12.49	SPT				СН	2.60	62	29	33	0	2	52	46															
	-13.54	-13.99	SPT				СН	2.58	54	23	31	15	31	26	28															
	-15.04	-15.49	SPT				SP		-	NP	-	6	94		0															
	-16.54	-16.86	SPT				SP	-	-	NP	-	12	87		1															
	-18.04	-18.49	SPT				SP		-	NP	-	10	88		2														. <u></u>	
	-19.54	-19.99	SPT				SP		-	NP	-	0	99	†	1			·		1				<u> </u>					·	
	-21.04	-21.24	SPT				SP		-	NP	†	0	99	†	1					1	1		<u> </u>						·	
	-22.54	-22.79	SPT				SP		-	NP	†	0	99	†	1			 +	-	<u>+</u>		1	<u>+</u>	†	†					
	-24.04	-24.12	SPT				SM		-	NP	†	0	85	†	15		·+	 +		<u> </u>		1	<u>†</u>	†	†					
			PRE	PARED BY :	V.N.	11		1			1	. (CHEC	KED	BY :	S.D				1		1	APF	PROVE	D BY :	S.T.	1			<u> </u>





-	: Geolo umber	-		y for the P 28/015	reparato	ory Surv	/ey on t	the Pro	ject	for C	ons	struc	tion	of	Mum	ıbai Tr	ans I	Hart	oour	Link	Client		BICOMSUL GIO	RIENT obal Consu	TAL (CON r Sustair	SUL nable D	TAN	TS nent		
Ö			'SPT/	DENSITY CO	(& MOIST	ſURE	u		CLA	SSIFI	CAT	ON 1	EST	s		5	TREN	IGTH	H TES	STS (kF	Pa)	CONSC	DLIDATIO	ON TEST			CHE	MICAL	TEST		
OLE - N	TestDe	pth (m)	oe (D/S/ DS)	Moisture	Density	(Kg/cm³)	I Clasiification (USC)	/ity		tterbe imits(artic strib			UCS	υυ		си		Shear ane	ition (kPa)	ssion Cc)	Ratio		Soi	l (%)		Wa	ater (m	ıg/l)
BOREHOLE - NO.	From	То	Sample Type (D/S/SPT/ UDS)	Content (%)	Wet	Dry	Soil Clas (U	Sp. Gravity	[¬] M⁻	WP	<u>a</u>	Gravel	Sand	Silt	Clay	Cu	С¢	, c	φ'	τ _v	τ _{vr}	Pre- Consolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e ⁰)	SO3	SO₄	CL	рН	SO₄	CL	p⊦
BH-03	-2.90	-3.40	D/S				СН	2.60	62	26	36	0	2	57	41																
	-4.40	-4.85	SPT				СН	2.60	62	43	19	0	1	57	42			-													
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				PARED BY :					<u> </u>			Ĺ				S.D										D BY :				<u> </u>	





-	: : Geolo umber	-	-	/ for the Pr 28/015	eparato	ry Surv	ey on th	ne Proje	ect fo	or Co	onst	ruct	ion	of M	umt	oai Tra	ns Ha	rbc	our L	.ink	Client		Glo	RIEN1		CON r Sustai	SUL nable D	TAN	TS ment		
ö			SPT/	DENSITY	& MOIST	TURE	u		CLA	SSIFI	CATI	ON 1	FEST	s		5	STREN	GT⊦	I TES	STS (kf	Pa)	CONSC	LIDATIC	N TEST			CHE	MICAL	TEST		
OLE - N	TestDe	epth (m)	oe (D/S/ DS)	Moisture	Density	(Kg/cm³)	l Clasiification (USC)	/ity		tterbe imits(P Di	artic strib	le Siz ution	:e (%)	UCS	UU		CU		Shear ane	tion (kPa)	ssion Cc)	Ratio		Soi	(%)		w	ater (n	ıg/l)
BOREHOLE - NO.	From	То	Sample Type (D/S/SPT/ UDS)	Content (%)	Wet	Dry	Soil Clas (U	Sp. Gravity	ML	WP	4	Gravel	Sand	Silt	Clay	Cu	сф	c	φ'	τ _v	τ _{vr}	Pre- Consolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e ⁰)	SO3	SO₄	CL	рН	SO₄	CL	рН
BH-04	-5.60	-6.10	D/S				SC	2.52	36	24	12	5	53	25	17																
	-7.10	-7.55	SPT				CL	2.54	47	26	21	0	23	38	39																
	-10.10	-10.55	SPT				SC	2.50	49	27	22	11	52	20	17		+														
	-11.60	-12.05	SPT				СН	2.52	58	27	31	13	15	22	50																
	-13.10	-13.55	SPT				SM	2.52	-	NP	-	3	76	14	7																
	-14.60	-14.87	SPT				SP		-	NP	-	39	51	1	0			-			+		·						 	+	+
	-16.10	-16.55	SPT				SP		-	NP	-	37	55	;	8						+										+
		1	PRE	PARED BY :	V.N.	1				1	1	С	HEC	KED	BY :	S.D				<u> </u>	1			APF	ROVE	D BY :	S.T.	1			- L





-		: IDE		/ for the Pr 8/015	opuluto	ly carr	ey on a											iboui		"Clie	nt:		CONSUL GIO	RIENT bal Consu	AL I	JON Sustair	SUL nable D	FANT evelopm	rS nent		
Ö			SPT/	DENSITY CC	& MOIST	URE	uo		CLA	SSIFI	CATI	ON 1	FEST	S		:	STREN	ЭТН ТІ	STS	(kPa)		CONSO	LIDATIC	N TEST			CHEI	MICAL	TEST		
OLE - N	TestDe	pth (m)	oe (D/S/ DS)	Moisture	Density	(Kg/cm³)	siificatio SC)	/ity		terbe imits(articl stribu			ucs	υυ	си	L	Lab Shear Vane		ition (kPa)	ssion Cc)	Ratio		Soi	(%)		Wa	ater (m	ıg/l)
BOREHOLE - NO.	From	То	Sample Type (D/S/SPT/ UDS)	Content (%)	Wet	Dry	Soil Clasiification (USC)	Sp. Gravity	M	WP	4	Gravel	Sand	Silt	Clay	Cu	Сф	c' ¢	'τ	τ _v τ _{vr}		Pre- Consolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e ⁰)	SO3	SO₄	CL	рН	SO₄	CL	pН
BH-05	-3.10	-3.60	D/S				CL	2.53	42	22	20	7	43	28	22																
	-6.10	-6.20	SPT				SM	2.48	-	NP	-	6	67	22	5																
	-7.60	-8.05	UDS				SM	2.53	_	NP	_	6	68	21	5																
	-9.10	-9.35	SPT				SP	_	-	NP	-	19	73		8																
	-10.60	-10.83	SPT				GP		-	NP	-	56	43		1																
	-12.10	-12.55	SPT				GC	2.52	30	20	10	40	27	28	5																
	-13.60	-14.05	SPT				CL	2.54	41	22	19	5	35	53	7																
	-15.10	-15.22	SPT				SP		-	NP	-	0	90	1	10						!									 	
	-16.60	-16.68	SPT				SM	2.49	-	NP		2	78	14	6		+		1												
		1	PRE	PARED BY :	V.N.				I	1	1	C	HECI	K ED	BY :	S.D				1				APP	ROVE	D BY :	S.T.	1		L	<u> </u>





	: Geolo umber			o for the Pr 8/015	eparato	ry Surv	ey on th	ne Proje	ect fo	or Co	onst	ruci	tion	of M	lumt	oai Tra	ns Ha	arbou	ur Li	ink	Client		COMBUL GIO	RIEN1 bal Consu	TAL (SUL nable D	FAN1 evelopm	TS nent		
ö			SPT/	DENSITY	A MOIS	TURE	u		CLA	SSIF	CAT	ON .	TEST	s			STREN	IGTH	TES	TS (kF	Pa)	CONSC	LIDATIO	N TEST			CHEI	MICAL	TEST		
OLE - N	TestDe	pth (m)	oe (D/S/	Moisture	Density	(Kg/cm³)	I Clasiification (USC)	'ity	At Li	tterbe imits	erg (%)		Partic istrib			UCS	υυ	с	υ		Shear ane	tion (kPa)	sion (c)	Ratio		Soi	(%)		Wa	ater (m	.g/l)
BOREHOLE - NO.	From	То	Sample Type (D/S/SPT/ UDS)	Content (%)	Wet	Dry	Soil Clas (U	Sp. Gravity	M	۳	<u> </u>	Grave	Sand	Silt	Clay	Cu	сф	c'	¢'	τ _v	τ _{vr}	Pre- Consolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e ⁰)	SO3	SO₄	CL	рН	SO₄	CL	рН
вн-06	0.09	-0.41	D/S				SP	-	-	NP	-	2	98		0																
	-2.91	-3.36	SPT				SM	2.54	44	27	17	0	65	30	5																
	-4.41	-4.79	SPT				SP			NP		0	97		3															 	
	-5.91	-6.30	SPT				SM		-	NP		0	85	1	15																
	-7.41	-7.51	SPT				SM		-	NP		14	71	1	15						L									 	
			PRE	PARED BY :	V.N.				I				L CHEC	L KED	BY :	S.D								APF	ROVE	L D BY :	S.T.]	<u> </u>	L	<u> </u>





		<u>SU</u>	MMAF	RY OF I	LABOR	ATORY	TEST	RESU	LTS ON	ROCK	SAMPLES	<u> </u>		
	Project : Ge	ologic	al Surv	ey for th	e Prepara	atory Surv	ey on the	e Project	for Constru			-		
Job No.	IDEAL/028/015								Client :		RIENTAL			
DAT	E : 26-06-2015			1										
BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Moisture Absorption (%)	Porosity (%)	Unit Weight (g/cm³)	Specific Gravity	Point Load Index Strength(Mpa)	Uniaxial Compressive Strength (MPa)	Corrected Uniaxia Compressive Strength (MPa)	Modulus of Elasticity	Brazilian Test	Remarks
BH-01	-25.6325.82	10.20	5.40	SOAKED	1.01	2.65	2.63	2.46	-	25.85	25.66	-	-	
	-26.8426.95	10.00	5.40	SOAKED	0.84	2.27	2.70	2.57	-	18.86	18.68	-	-	
	-28.3228.55	10.30	5.40	SOAKED	0.56	1.53	2.72	2.68	-	52.00	51.69	-	-	
BH-02	-24.4624.58	10.00	5.40	SOAKED	1.34	3.49	2.60	2.49	-	32.75	32.42	-	-	
	-26.8727.04	10.10	5.40	SOAKED	0.92	2.51	2.74	2.64	-	46.07	45.67	-	-	
	-27.4327.60	10.00	5.40	SOAKED	0.91	2.53	2.78	2.65	-	25.33	25.07	-	-	
BH-03	-22.6322.74	9.50	5.40	SOAKED	0.68	1.93	2.85	2.69	-	43.84	43.10	-	-	
	-25.0325.24	10.00	5.40	SOAKED	0.40	1.14	2.84	2.71		60.47	59.88	-	-	
	-26.0726.24	10.10	5.40	SOAKED	0.22	0.65	2.88	2.78	-	113.09	112.12	_	-	
	-27.8528.04	10.00	5.40	SOAKED	0.61	1.66	2.72	2.59	-	61.44	60.83	-	-	





	Project : Ge										SAMPLES		our Link	
ob No.	IDEAL/028/015	3		- ,		,	- ,	, ,	Client :		RIENTAL	-		
	E : 26-06-2015									Glob	al Consulting fo	r Sustainabl	e Develop	nent
BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Moisture Absorption (%)	Porosity (%)	Unit Weight (g/cm³)	Specific Gravity	Point Load Index Strength(Mpa)	Uniaxial Compressive Strength (MPa)	Corrected Uniaxia Compressive Strength (MPa)	Modulus of Elasticity	Brazilian Test	Remark
BH-04	-22.6722.81	10.00	5.40	SOAKED	1.33	3.49	2.63	2.51	-	38.29	37.91	-	-	
	-26.3826.58	10.00	5.40	SOAKED	0.70	1.88	2.70	2.58	-	43.36	42.93	-	-	
	-29.4029.60	10.20	5.40	SOAKED	0.60	1.67	2.79	2.71	0.39	_	8.59	-	-	
	-30.7530.93	7.10	5 <u>.</u> 40	SOAKED	0.38	1.05	2.75	2.79	0.25	-	5.47	-	-	
BH-05	-21.6021.73	10.10	5.40	SOAKED	1.16	3.07	2.65	2.45	-	17.55	17.40		-	
	-22.9523.05	10.20	5.40	SOAKED	1.21	3.08	2.55	2.48	-	17.12	16.99	-	-	
	-24.6025.75	10.20	5.40	SOAKED	0.85	2.23	2.63	2.67	-	34.19	33.94	-	-	
BH-06	-13.4113.54	10.20	5.40	SOAKED	0.46	1.28	2.81	2.74	-	69.21	68.70	_	_	
	-17.2917.41	10.20	5.40	SOAKED	1.45	3.64	2.52	2.45	-	14.32	14.22	_	-	
	-22.2322.41	10.10	5.40	SOAKED	1.06	2.68	2.53	2.44	-	11.61	11.51	-	-	

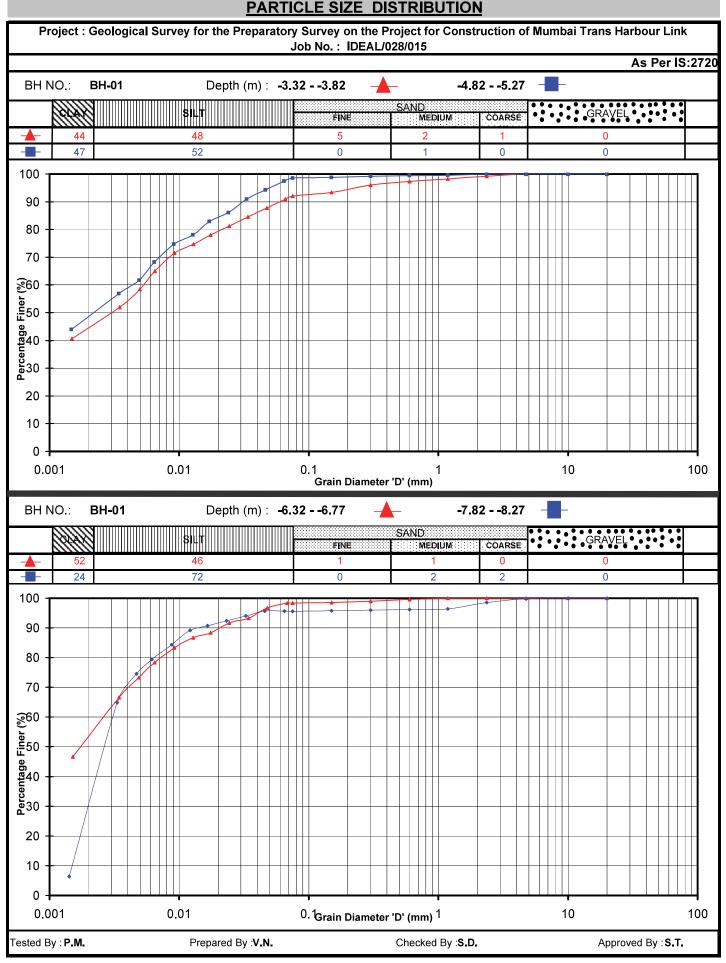
IDEAL GEOSERVICES PRIVATE LIMITED



APPENDIX-C - CLASSIFICATION TEST RESULTS

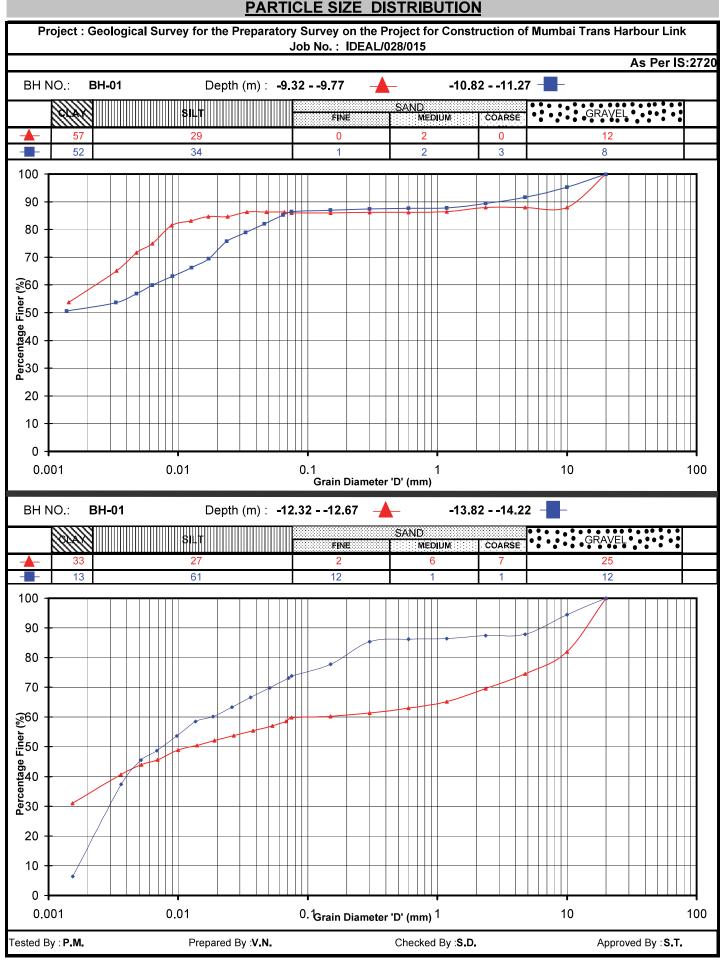






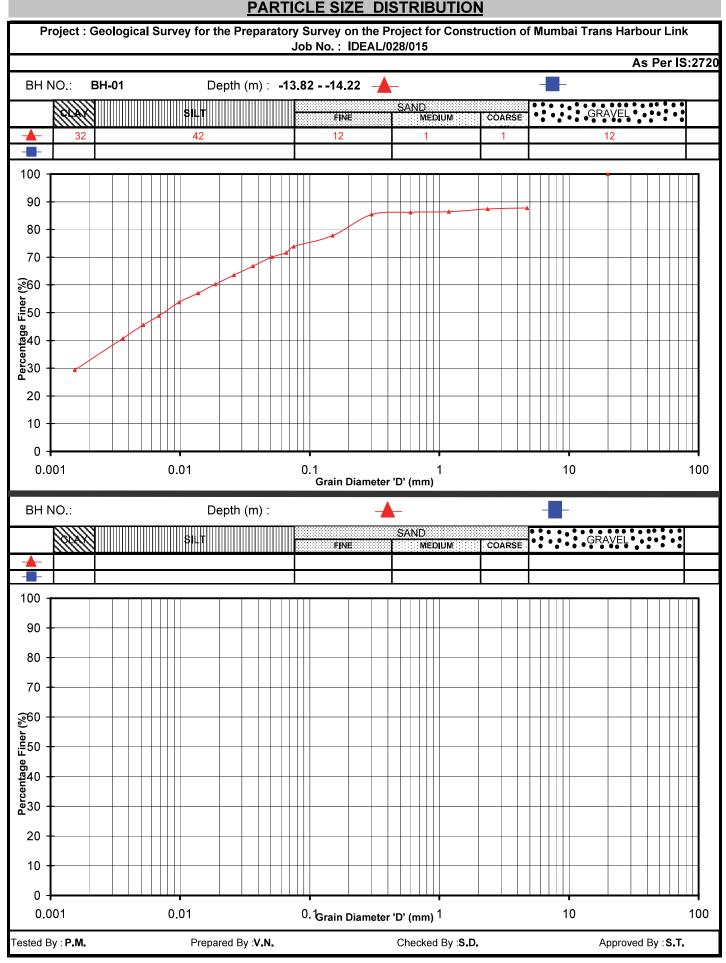






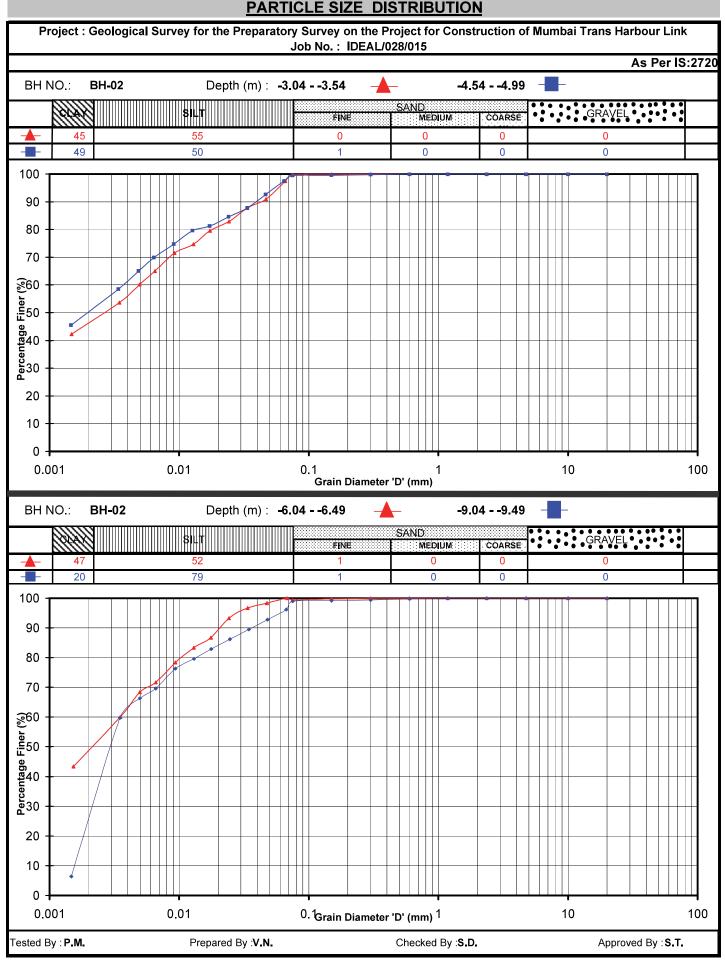






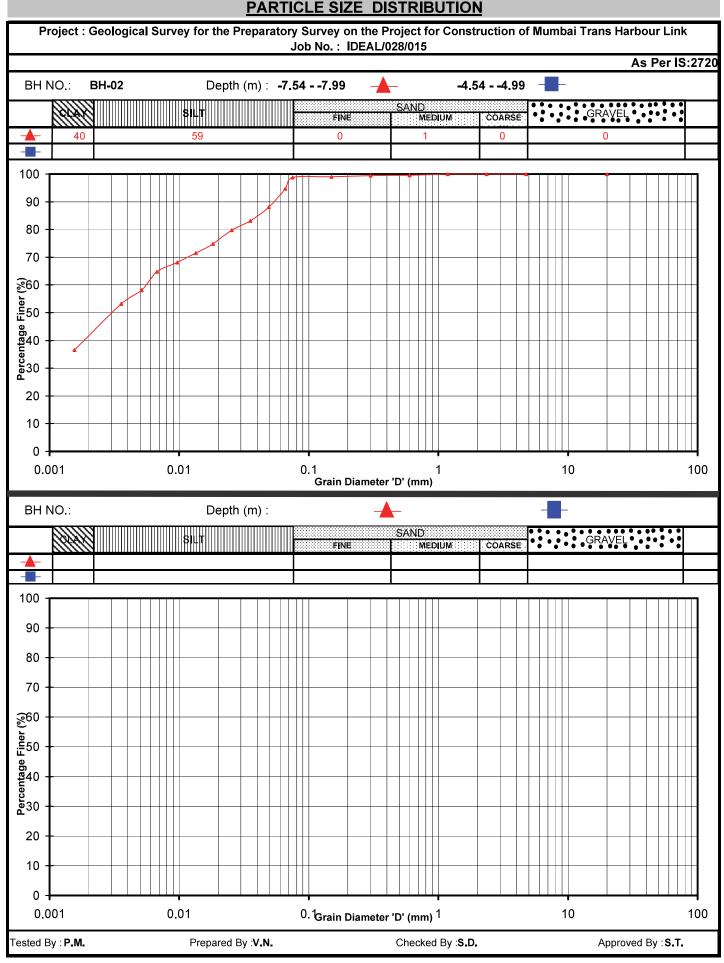






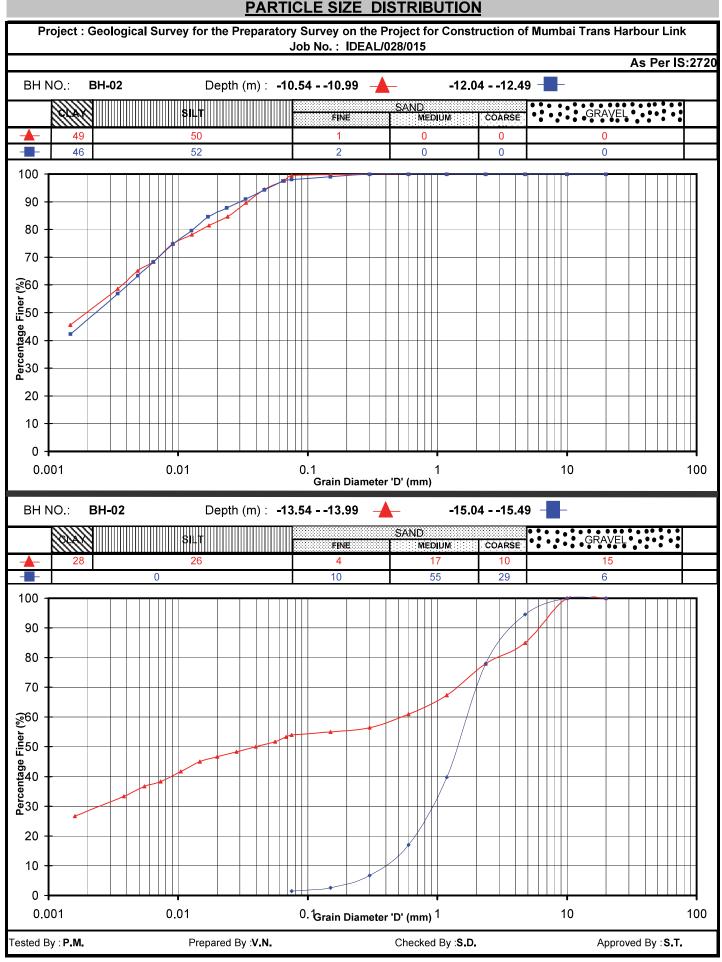






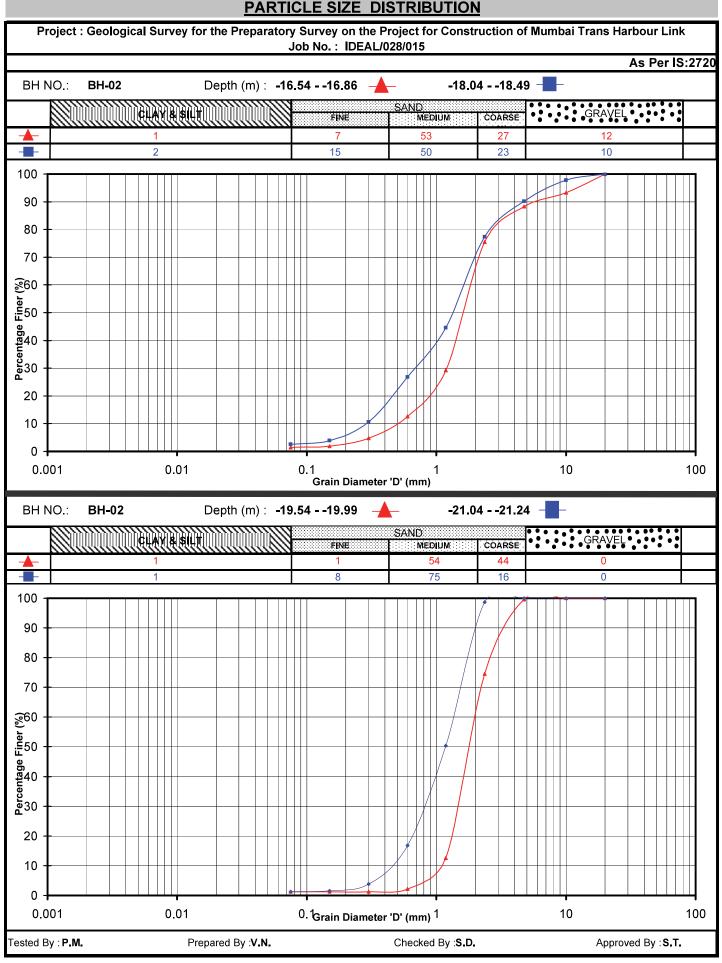
















PARTICLE SIZE DISTRIBUTION Project : Geological Survey for the Preparatory Survey on the Project for Construction of Mumbai Trans Harbour Link Job No. : IDEAL/028/015 As Per IS:2720 -24.04 - -24.12 -BH NO.: BH-02 Depth (m) : -22.54--22.79 SAND MEDIUM GRAVEL IICLAY & SILT FINE ĊÒARSE -10 73 16 0 1 ------15 24 **4**1 20 0 100 90 80 70 <u>~</u>60 Finer 102 20 10 0 0.001 0.01 0.1 1 10 100 Grain Diameter 'D' (mm) BH NO.: Depth (m) : SAND GRAVEL CD. •: COARSE FINE MEDIUM -100 90 80 70 ર્જુ 60 Finer 050 Percentage F 05 05 20 10 0 0.001 0.01 10 100 0.1Grain Diameter 'D' (mm) 1 Tested By : P.M. Prepared By :V.N. Checked By :S.D. Approved By : S.T.

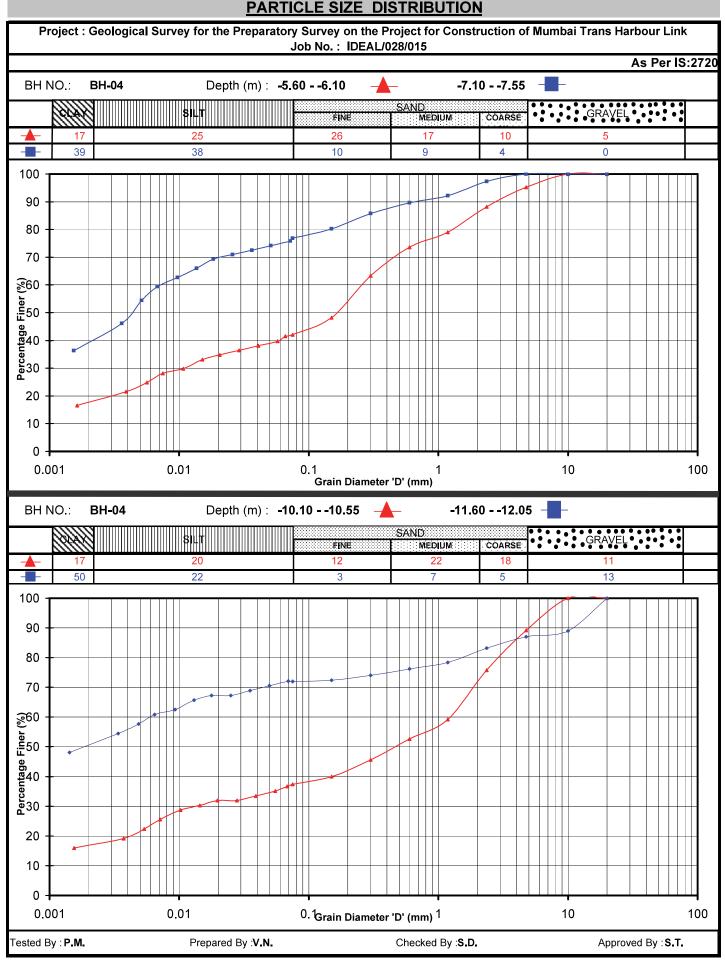




PARTICLE SIZE DISTRIBUTION Project : Geological Survey for the Preparatory Survey on the Project for Construction of Mumbai Trans Harbour Link Job No. : IDEAL/028/015 As Per IS:2720 -4.40 - -4.85 BH NO.: BH-03 Depth (m) : -2.90 - -3.40 SAND MEDIUM GRAVEL CLA SILT FINE COARSE 2 0 41 57 0 0 ------**4**2 57 0 0 0 1 100 90 80 70 <u>~</u>60 Finer 102 20 10 0 0.001 0.01 0.1 1 10 100 Grain Diameter 'D' (mm) BH NO.: Depth (m) : SAND GRAVEL CD. •: COARSE FINE MEDIUM -100 90 80 70 ર્જુ 60 Finer 050 Percentage F 05 05 20 10 0 0.001 0.01 10 100 0.1Grain Diameter 'D' (mm) 1 Tested By : P.M. Prepared By :V.N. Checked By :S.D. Approved By : S.T.

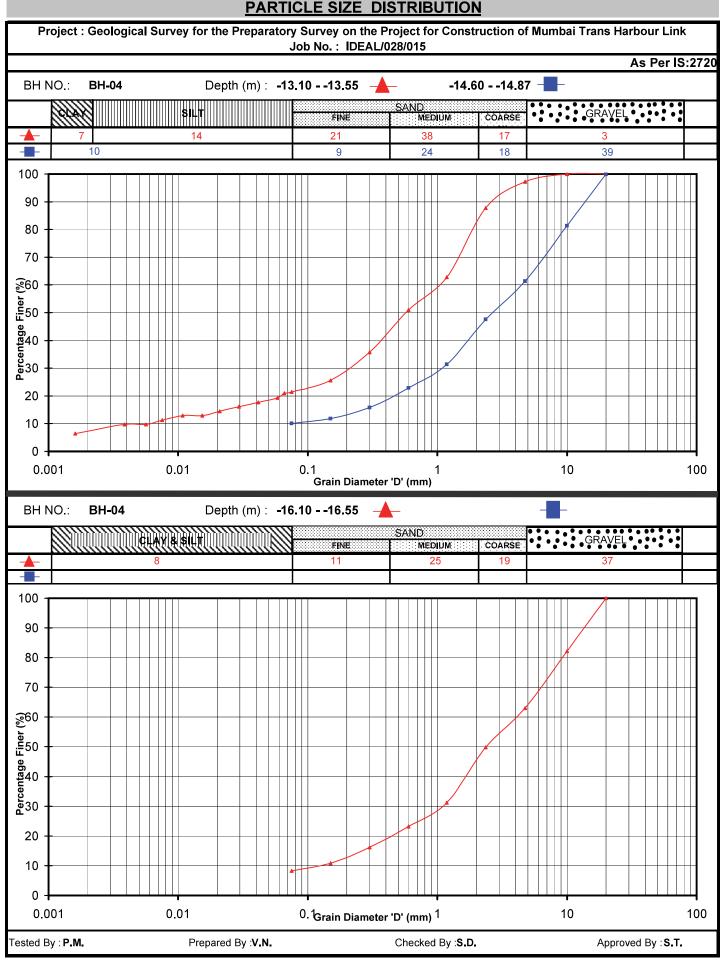






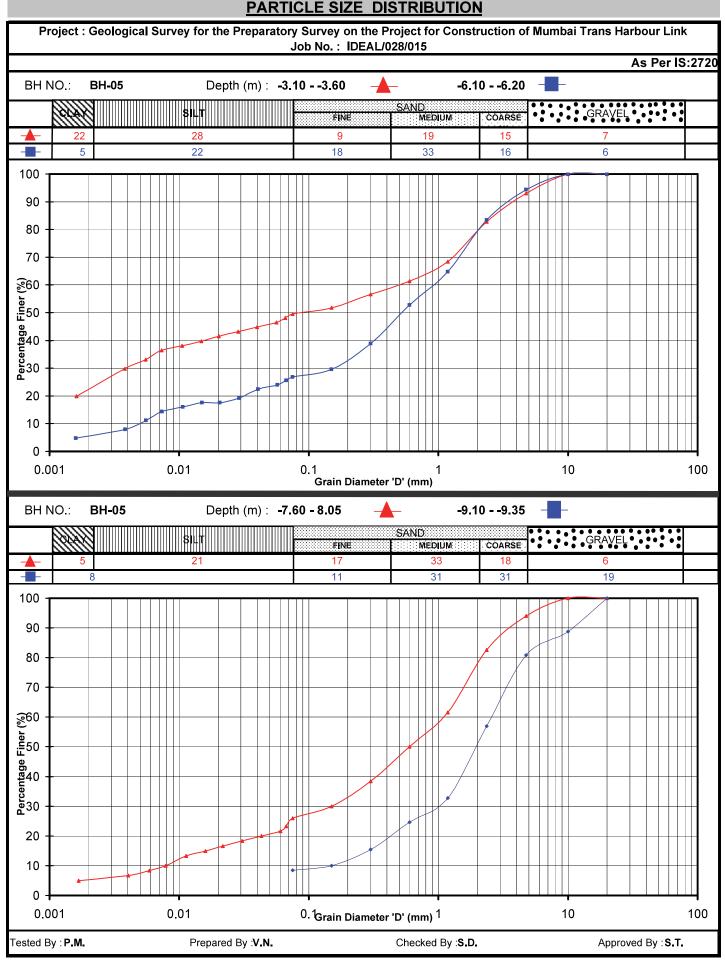












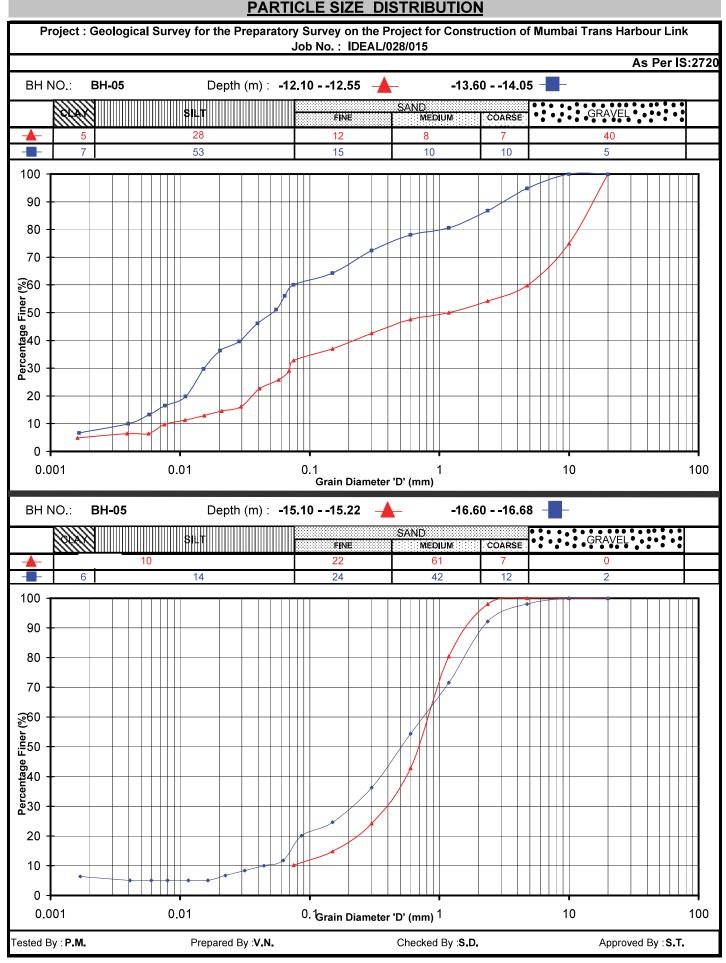




PARTICLE SIZE DISTRIBUTION Project : Geological Survey for the Preparatory Survey on the Project for Construction of Mumbai Trans Harbour Link Job No. : IDEAL/028/015 As Per IS:2720 BH NO.: BH-05 Depth (m): -10.60 - -10.83 SAND MEDIUM GRAVEL URTANATELEVITE FINE ĊÒARSE •: 30 -1 12 56 ------100 90 80 70 <u>~</u>60 Finer 1050 20 10 0 0.001 0.01 0.1 10 100 1 Grain Diameter 'D' (mm) BH NO.: Depth (m) : SAND GRAVEL CD. • COARSE FINE MEDIUM -100 90 80 70 ર્જુ 60 Finer 050 Percentage F 05 05 20 10 0 0.001 0.01 10 100 0.1Grain Diameter 'D' (mm) 1 Tested By : P.M. Prepared By :V.N. Checked By :S.D. Approved By : S.T.

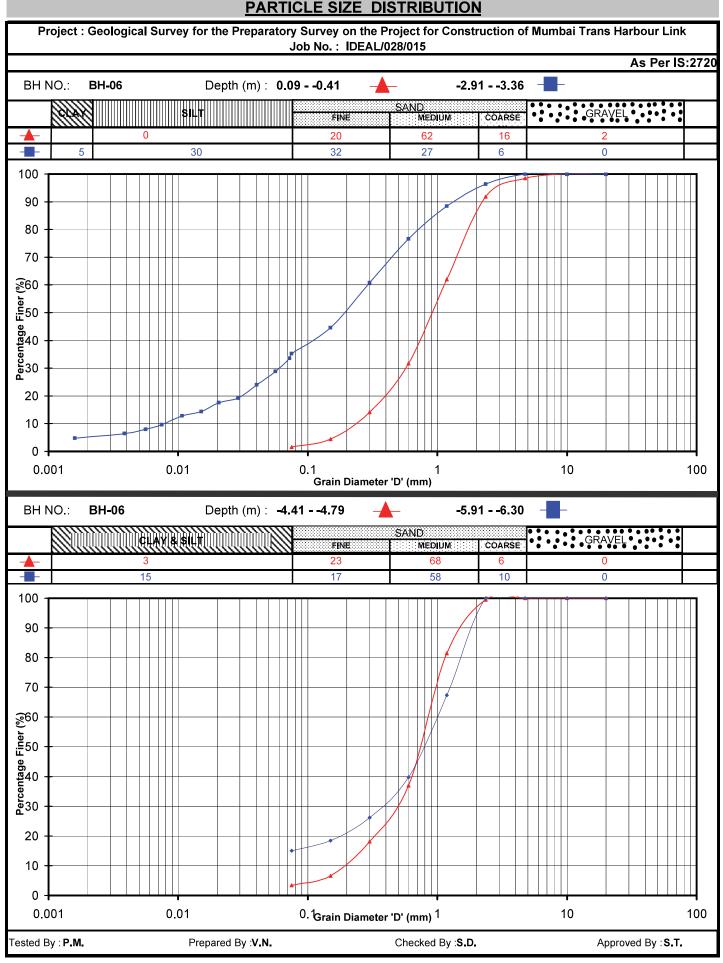
















PARTICLE SIZE DISTRIBUTION Project : Geological Survey for the Preparatory Survey on the Project for Construction of Mumbai Trans Harbour Link Job No.: IDEAL/028/015 As Per IS:2720 BH NO.: BH-06 Depth (m) : -7.41 - -7.51 SAND MEDIUM GRAVEL IIIIICHAY|&|\$ILT||| FINE ĊÒARSE •: 49 -15 8 14 14 ------100 90 80 70 <u>~</u>60 Finer 1050 20 10 0 0.001 0.01 0.1 1 10 100 Grain Diameter 'D' (mm) BH NO.: BH-06 Depth (m) : SAND GRAVEL SU) • COARSE FINE MEDIUM -100 90 80 70 ર્જુ 60 Finer 050 Percentage F 05 05 20 10 0 0.001 0.01 10 100 0.1Grain Diameter 'D' (mm) 1 Tested By : P.M. Prepared By :V.N. Checked By :S.D. Approved By : S.T.



Project : Geological Survey for t	he Preparato	ory Survey on	the Project for	Construction of M	lumbai Tran	s Harbour Link
		Job No. IDI	EAL/028/015			
BH NO. : Sample Depth(m	-3.32 -	-3.82	Sample No. :	ID-M-BH-01-D000	0 Date :	21-07-2015
BH-01	-4.82 -		Sample No. : IS 2720 : Part 5	ID-M-BH-01-S150	0 Date :	21-07-2015
PLASTIC LIMIT Test r	no. 1	2	Average	1	2	Average
Container no.	A44	A61	Average	A38	A57	Average
	g 24.20	22.40		23,50	27.70	-
	g 23.20	21.40		22.20	25.50	-
	g 19.44	17.81		18.28	18.97	
	g 1.00	1.00		1.30	2.20	
	g 3.76	3.59		3.92	6.53	-
	% 26.60	27.86	27.23	33.16	33.69	33.43
IQUID LIMIT Test r	10. 1	2	3	1	2	3
lumber of bumps	15	25	48	15	25	48
Container no.	A19	A36	A29	A28	A2	A17
flass of wet soil + container (m_3)	g 37.20	37.50	36.70	42.40	31.80	34.40
lass of dry soil + container (m_2)	g 32.00	33.90	32.70	35.50	26.90	30.10
Mass of container (m ₁)	g 24.68	28.45	26.13	26.58	20.09	23.29
lass of moisture (m ₃ - m ₂)	g 5.20	3.60	4.00	6.90	4.90	4.30
Mass of dry soil $(m_2 - m_1)$	g 7.32	5.45	6.57	8.92	6.81	6.81
Vater Content	% 71.04	66.06	60.88	77.35	71.95	63,14
80					Sample pre	eparation
70					washed on oven dried	425 μ m sieve ι 105 ºC
60					Liquid limit	<mark>66</mark> %
t (%)					Plastic limi	t 27 %
Moisture Content (%)					Plasticity index	<mark>39</mark> %
					Liquid limit	71 %
S					Plastic limi	t 33 %
					Plasticity index	38 %
20					Operator	Checked Approv
1						



Project : Geological S	Survey for th	e Preparator	ry Survey on	the Project for C	onstruction of Mu	ımbai Tran	s Harbour Link
			Job No. IDI	EAL/028/015			
BH NO.: BH-01 San	np l e Depth(m)	-6.32	6.77	Sample No. :	ID-M-BH-01-S3000	Date :	21-07-2015
BH-01		-7.82		Sample No. :	ID-M-BH-01-S4500	Date :	21-07-2015
		1 .		IS 2720 : Part 5			
	Test no		2	Average	1	2	Average
Container no.		A38	A51		A51	A55	-
/lass of wet soil + container	g	27.50	29.60		21.80	22.30	-
lass of dry soil + container	g	25.00	26.40		20.90	21.50	-
lass of container	g	18.28	18.03		18.03	18.98	
lass of moisture	g	2.50	3.20		0.90	0.80	
Mass of dry soil	g	6.72	8.37		2.87	2.52	
Moisture Content	%	37.20	38.23	37.72	31.36	31.75	31.55
IQUID LIMIT	Test no	. 1	2	3	1	2	3
lumber of bumps		13	24	47	15	25	47
Container no.		A42	A64	A39	A25	A10	A5
/lass of wet soil + container (n	n ₃) g	35.60	32.90	32.00	37.60	36.20	34.40
Aass of dry soil + container (r	m ₂) g	29.20	26.00	25.90	32.10	30.40	29.50
lass of container ((m ₁) g	22.23	18.09	18.46	25.64	22.92	22.38
Aass of moisture (n	n ₃ - m ₂) g	6.40	6.90	6.10	5.50	5.80	4.90
Mass of dry soil (r	m₂-m₁) g	6.97	7.91	7.44	6.46	7.48	7.12
Vater Content	%	91,82	87.23	81.99	85.14	77.54	68.82
100 1						Sample pre	eparation
						washed on	425 μ m sieve
90		*				oven dried	; 105 ⁰C
80							
70						Liquid limit	87 %
(%) ⁷⁰						Plastic limi	t 38 %
60						Plasticity	49 %
e 50						index	45 70
loistu						Liquid limit	78 %
2 40						Plastic limi	t 32 %
30						Plasticity index	46 %
20						Operator	Checked Approv
10 1		*				P.M.	K.B. S.T.



Project : Geological Survey for	or the	Preparato	ry Survev on	the Project for C	Construction of N	lumbai Tran	s Harbour Link
				EAL/028/015			
BH NO. : BH-01 Sample Depth(m) :		-9.329.77		Sample No. : ID-M-BH-01-S6000		0 Date :	22-07-2015
		-10.82		Sample No. :	ID-M-BH-01-S750	Date :	22-07-2015
				IS 2720 : Part 5			
	st no.	1	2	Average	1	2	Average
Container no.		A4	A18		A48	A42	
Mass of wet soil + container g		28.20	28.40		24.50	26.40	
Mass of dry soil + container	g	27.00	27.30		23.00	25.50	-
lass of container	g	23.29	23.78		17.70	22.23	-
Mass of moisture	g	1.20	1.10		1.50	0.90	
Mass of dry soil	g	3.71	3.52		5.30	3.27	ļ
Moisture Content	%	32.35	31,25	31.80	28.30	27.52	27.91
L iquid limit Te	st no.	1	2	3	1	2	3
Number of bumps		15	25	46	13	26	45
Container no.		A8	A1	A32	A12	A22	A33
Mass of wet soil + container (m_3)	g	39.50	29.90	41.80	34.30	37.00	41.10
Mass of dry soil + container (m ₂)	g	31.20	25.40	35.20	28.80	31.90	34.90
Mass of container (m ₁)	g	21.43	19.72	26.28	22.53	25.63	26.84
Mass of moisture (m ₃ - m ₂)	g	8.30	4.50	6.60	5.50	5.10	6.20
Mass of dry soil (m ₂ - m ₁)	g	9.77	5.68	8.92	6.27	6.27	8.06
Nater Content	%	84.95	79.23	73.99	87.72	81,34	76.92
100						Sample pre	eparation
						washed on	425 μ m sieve
90						oven dried	; 105 ⁰C
80							
~ 70						Liquid limit	79 %
(%)						Plastic limi	t 32 %
60	-					Plasticity	47 %
S S S S S S S S S S						index	/0
loistu						Liquid limit	82 %
2 40	-					Plastic limi	t 28 %
30	-					Plasticity index	54 %
20						Operator	Checked Approv
10 10		<u>k</u>	of Bumps			P.M.	K.B. S.T.



Liquid Limit (Casagrande met	<i>hod)</i> and I	Plastic Lim	it				
Project : Geological Survey for the	e Preparato		÷	Construction of Mu	umbai Tran	s Harbour Link	
BH-01	-12.32		EAL/028/015 Sample No. :	ID-M-BH-01-S9000	Date :	22-07-2015	
BH NO. : BH-01 Sample Depth(m)	-13.82		Sample No. :	ID-M-BH-01-S1050		22-07-2015	
			S 2720 : Part 5				
PLASTIC LIMIT Test no	o. 1	2	Average	1	2	Average	
Container no.	A4	A18		A47	A64		
Aass of wet soil + container g	28.20	28.40		21.80	22.60		
Aass of dry soil + container	27.00	27.30		20.60	21.50		
Aass of container g	23.29	23.78		16.87	18.09		
Aass of moisture g	1.20	1.10		1.20	1.10		
Mass of dry soil g	3.71	3,52		3.73	3.41		
Moisture Content %	32.35	31.25	31.80	32.17	32.26	32.21	
LIQUID LIMIT Test no	o. 1	2	3	1	2	3	
Number of bumps	15	25	46	14	24	44	
Container no.	A8	A1	A32	A45	A49	A43	
Mass of wet soil + container (m_3)	39.50	29.90	41.80	29.80	32.20	30.70	
Mass of dry soil + container (m ₂)	31.20	25.40	35.20	24.80	26.80	26.10	
Mass of container (m ₁) g	21.43	19.72	26.28	17.83	18.71	18.41	
Mass of moisture (m ₃ - m ₂) g	8.30	4.50	6.60	5.00	5.40	4.60	
Mass of dry soil $(m_2 - m_1)$ g	9.77	5.68	8.92	6.97	8.09	7.69	
Vater Content %	8 4.95	79.23	73.99	71.74	66.75	59_82	
100					Sample pre	eparation	
90					washed on 425 μ m sieve oven dried ; 105 ⁰ C		
70	1				Liquid l imit	79 %	
ut (%)					Plastic limi	t 32 %	
Moisture Content (%)					Plasticity index	47 %	
oistu					Liquid limit 66 %		
ž 40	i				Plastic limi	t 32 %	
30					Plasticity index	34 %	
20					Operator	Checked Approv	
	į				P.M.	к.в. s.т.	
10 +	* No-	of Bumps	II	100			



Project : Geologica	al Survey for the	Preparator	y Survey on	the Project for	Construction of	of Mumbai Tr	ans Harbour Link
		<u>.</u>		EAL/028/015			
BH NO.: BH-01 S	Samp l e Depth(m) :	-15.321		Sample No. :	ID-M-BH-01-S	1200 Date	22-07-2015
				IS 2720 : Part 5			
PLASTIC LIMIT	Test no.	1	2	Average	1	2	Average
Container no.		A39	A54				_
/lass of wet soil + containe	r g	23.00	27.70				
/lass of dry soil + containe	r g	22.20	26.70				
lass of container	g	18.46	22.16				
lass of moisture	g	0.80	1.00				
/lass of dry soil	g	3.74	4.54				
Aoisture Content	%	21.39	22.03	21.71			
IQUID LIMIT	Test no.	1	2	3	1	2	3
lumber of bumps		15	26	47			
Container no.		A63	A58	A59			
Aass of wet soil + containe	r (m ₃) g	36.60	30.80	36.20			
Mass of dry soil + containe	r (m ₂) g	30.70	26.60	32.40			
Mass of container	(m ₁) g	18.44	16.71	21.93			
Mass of moisture	(m ₃ - m ₂) g	5.90	4.20	3.80			
Mass of dry soil	(m ₂ -m ₁) g	12.26	9.89	10.47			
Vater Content	%	48.12	42.47	36.29			
100			•			Sample	preparation
80						washed oven dri	on 425 μ m sieve ed
						Liquid li	mit 43 %
%						Plastic I	imit 22 %
Moisture Content (%)						Plasticit index	y 21 %
	*					Liquid li	mit %
§ 40						Plastic I	
30						Plasticit index	
20						Operat	or Checked Approv
10		 				P.M.	К.В. S.T.
10 +		No.	of Bumps	I		100	



Project : Geological Survey	for the	Preparato	ry Survey on	the Project for C	onstruction of M	umbai Tran	s Harbour Link
			Job No. IDE	EAL/028/015			
BH-02 BH NO.: Sample De	nth(m) :	-3.04	3.54	Sample No. :	ID-M-BH-02-D0000	Date :	08-07-2015
BH-02	pui(iii) .	-4.54		Sample No. :	ID-M-BH-02-S1500	Date :	08-07-2015
				S 2720 : Part 5			
	Test no.	1	2	Average	1	2	Average
Container no.		A50	A37		A62	A64	
Aass of wet soil + container	g	27.30	28.63		30.21	28.20	-
lass of dry soil + container	g	24.64	25.68		27.38	25.74	
lass of container	g	16.60	16.72		18.57	18.09	
lass of moisture	g	2.66	2.95		2.83	2.46	
Mass of dry soil	g	8.04	8.96		8,81	7.65	
Noisture Content	%	33.08	32.92	33.00	32,12	32,16	32,14
IQUID LIMIT	Test no.	1	2	3	1	2	3
lumber of bumps		15	26	48	14	26	48
Container no.		A20	A35	A26	A60	A44	A48
Aass of wet soil + container (m_3)	g	38.21	39.59	35.83	29.22	30.64	28.67
Aass of dry soil + container (m ₂)	g	33.13	35.08	32.37	24.07	26.24	24.60
Mass of container (m ₁)	g	25.01	27.33	25.90	16.78	19.44	17.70
Mass of moisture (m ₃ - m ₂)	g	5.08	4.51	3.46	5.15	4.40	4.07
Mass of dry soil $(m_2 - m_1)$	g	8.12	7.75	6.47	7.29	6.80	6.90
Vater Content	%	62.56	58,19	53.48	70_64	64.71	58,99
80						Sample pre	eparation
70						washed on oven dried	425 μ m sieve ; 105 º _C
60							
*						Liquid limit	
b 1 b 1 b 1 c 50						Plastic limi	t 33 %
Moisture Content (%)						Plasticity index	25 %
40						Liquid limit	65 %
30						Plastic limi	t 32 %
						Plasticity index	33 %
20						Operator	Checked Approv
						1	



Project : Geologi	ical Survey for	' the	Preparato	ry Survey on	the Project for C	onstruction of	Mumbai Tran	is Harbour Link
				Job No. ID	EAL/028/015			
BH NO.: BH-02	Sample Depth(m) ·	-6.04	6.49	Sample No. :	ID-M-BH-02-S30	Doo Date :	08-07-2015
BH-02	Cumple Depth(, .	-7.54		Sample No. :	ID-M-BH-02-U4	500 Date :	22-07-2015
					IS 2720 : Part 5			
PLASTIC LIMIT	Tes	t no.	1	2	Average	1	2	Average
Container no.			A55	A54		A57	A44	_
/lass of wet soil + contai	ner	g	32.51	35.29	-	33.00	30.40	_
/lass of dry soil + contai	ner	g	29.43	32.32		29.30	27.50	
lass of container		g	18.98	22.16		18.97	19.44	
lass of moisture		g	3.08	2.97		3.70	2.90	
Aass of dry soil		g	10.45	10.16]	10.33	8.06	
Noisture Content		%	29.47	29.23	29.35	35.82	35,98	35.90
.IQUID LIMIT	Tes	t no.	1	2	3	1	2	3
lumber of bumps			15	25	47	15	25	44
Container no.			A16	A10	A3	A47	A48	A50
/lass of wet soil + contai	iner (m ₃)	g	37.30	36.01	33.43	33.90	30.70	35.50
Aass of dry soil + contai	ner (m ₂)	g	31.58	30.95	29.46	26.00	24.90	27.50
lass of container	(m ₁)	g	23.12	22.92	22.57	16.87	17.70	16.60
Mass of moisture	(m ₃ - m ₂)	g	5.72	5.06	3.97	7.90	5.80	8.00
Mass of dry soil	(m ₂ - m ₁)	g	8.46	8.03	6.89	9.13	7.20	10.90
Vater Content		%	67.61	63.01	57.62	86.53	80.56	73,39
100				•	·		Sample pr	eparation
							washed or	n 425 μ m sieve
90							oven dried	; 105 ⁰C
80							- .	
70							Liquid limit	63 %
tt (%)							Plastic limi	it 29 %
00 diameter 100 di							Plasticity	34 %
2 1 1 1 1 1 1 1 1 1 1							index	34 %
Moisture Content (%)							Liquid limit	80 %
≥ ₄₀							Plastic limi	it 36 %
30							Plasticity index	44 %
20							Operator	Checked Approv
1			1					



Project : Geological Survey for t	he Preparato	rv Survev on	the Project for	Construction of I	Numbai Tran	s Harbour Link
			EAL/028/015			
BH NO. : BH-02 Sample Depth(m)	: -9.04	9.49	Sample No. :	ID-M-BH-02-S60	00 Date :	08-07-2015
		Test method :	S 2720 : Part 5			
PLASTIC LIMIT Test n	o. 1	2	Average	1	2	Average
Container no.	A47	A52				
lass of wet soil + container	g 28.77	30.21				
lass of dry soil + container	g 26 . 44	27.93				
lass of container	g <u>16.8</u> 7	19.14				
lass of moisture	g 2.33	2.28				
Mass of dry soil	g 9.57	8.79				
Noisture Content	% 24.35	25.94	25.14			
.IQUID LIMIT Test n	o . 1	2	3	1	2	3
lumber of bumps	46	26	14			
Container no.	A11	A36	A4			
Mass of wet soil + container (m ₃)	g <u>33.40</u>	39.19	35.51			
Mass of dry soil + container (m ₂)	g 29.79	35.21	30.74			
Mass of container (m ₁)	g 23.13	28.45	23.29			
Mass of moisture (m ₃ - m ₂)	g <u>3.61</u>	3.98	4.77			
Mass of dry soil $(m_2 - m_1)$	g <u>6.66</u>	6.76	7.45			
Vater Content	54.20	58.88	64.03			
80		•			Sample pre	paration
70					washed on oven dried	425 μ m sieve ; 105 º _C
60	*				Liquid limit	59 %
(%)					Plastic limit	
Moisture Content (%)					Plasticity index	34 %
9 40					Liquid limit	%
S i					Plastic limit	
30					Plasticity	%
20					Operator	Checked Approv
10 10	*	of Bumps			_ P.M. 00	К.В. S.T.



Project : Geologi	cal Survey for the	Preparator	y Survey on	the Project for C	Construction of N	lumbai Trar	s Harbour Lini
			Job No. IDE	AL/028/015			
BH NO.: BH-02	Sample Depth(m) : -	-10.54*		Sample No. :	ID-M-BH-02-S750		08-07-2015
BH-02		-12.04*		Sample No. : S 2720 : Part 5	ID-M-BH-02-S900	0 Date :	08-07-2015
PLASTIC LIMIT	Test no.	1	2	Average	1	2	Average
Container no.		A42	A53		A39	A41	
Mass of wet soil + contair	ner g	34.41	28.88		29.62	29.40	-
Mass of dry soil + contair	ier g	31.64	26.35		27.15	26.73	-
Mass of container	g	22.23	17.55		18.46	17.55	-
Mass of moisture	g	2.77	2.53		2.47	2.67	
Mass of dry soil	g	9.41	8.80		8.69	9.18	1
Moisture Content	%	29.44	28,75	29.09	28.42	29 <u>.</u> 08	28.75
-IQUID LIMIT	Test no.	1	2	3	1	2	3
Number of bumps		26	47	16	15	26	46
Container no.		A5	A27	A19	A51	A61	A45
/lass of wet soil + contair	ner (m ₃) g	34.10	37.98	37.17	32.29	30.10	31.70
Mass of dry soi l + contair	ier (m ₂) g	29.75	33.72	32.34	26.68	25.43	26.61
Mass of container	(m ₁) g	22.38	25.88	24.68	18.03	17.81	17.83
Mass of moisture	(m ₃ - m ₂) g	4.35	4.26	4.83	5.61	4.67	5.09
Mass of dry soil	(m ₂ -m ₁) g	7.37	7.84	7.66	8.65	7.62	8.78
Vater Content	%	59.02	54.34	63.05	64.86	61.29	57.97
80						Sample pr	eparation
-							1 425 μ m sieve
70						oven dried	; 105 ⁰C
60						Liquid limi	
20 ± 50						Plastic lim	it 29 %
Conte						Plasticity index	<mark>30</mark> %
Moisture Content (%)							CO 0/
Noi						Liquid limi [.] Plastic lim	
30						Plasticity	33 %
20						Operator	Checked Appro
	1	1	1	1 1			1 1



Project : Geological Survey	for the	Preparato	ry Survey on	the Project for	Construction of I	Numbai Trans	s Harbour Link
			Job No. ID	EAL/028/015			
BH NO.: BH-02 Sample De	oth(m) :	-13.54		Sample No. :	ID-M-BH-02-S10	50 Date :	08-07-2015
			1	IS 2720 : Part 5			
	Test no.	1	2	Average	1	2	Average
Container no.		A49	A38				
lass of wet soil + container	g	29.58	29.38				
lass of dry soil + container	g	27.53	27.29				
lass of container	g	18.71	18.28	-			
lass of moisture	g	2.05	2.09				
Aass of dry soil	g	8.82	9.01				
Noisture Content	%	23.24	23.20	23.22			
IQUID LIMIT	Test no.	1	2	3	1	2	3
lumber of bumps		15	25	47			
Container no.		A7	A30	A28			
lass of wet soil + container (m_3)	g	34.90	38.87	35.70			
Aass of dry soil + container (m_2)	g	30.20	34.44	32.64			
Mass of container (m ₁)	g	22.00	26.22	26.58			
Aass of moisture (m ₃ - m ₂)	g	4.70	4.43	3.06			
Mass of dry soil $(m_2 - m_1)$	g	8.20	8.22	6.06			
Vater Content	%	57.32	53.89	50.50			
80			•	•		Sample pre	paration
70						washed on oven dried	425 μ m sieve ; 105 º _C
60						Liquid limit	54 %
ut (%)		*				Plastic limit	23 %
Moisture Content (%)						Plasticity index	<mark>31</mark> %
						Liquid limit	%
4						Plastic limit	%
30						Plasticity index	%
20						Operator	Checked Approv
4							



Project : Geological Survey f	or the	Preparator	y Survey on	the Project for C	Construction of Mu	umbai Trans	Harbour Link
			Job No. IDE	EAL/028/015		_	
BH NO. : Sample Dept	h(m) :	-2.903		Sample No. :	ID-M-BH-01-S0000		22-07-2015
BH-03		-4.404		Sample No. : S 2720 : Part 5	ID-M-BH-01-D1500	Date :	22-07-2015
PLASTIC LIMIT Te	est no.	1	2	Average	1	2	Average
Container no.		A62	A52	, tronago	A41	 A65	
lass of wet soil + container	g	27.70	26.90		23.50	23.60	
lass of dry soil + container	g	25.80	25.30		21.70	21.80	
lass of container	g	18.57	19.14		17.55	17.53	
lass of moisture	g	1.90	1.60		1.80	1.80	
lass of dry soil	g	7.23	6.16		4.15	4.27	
loisture Content	%	26,28	25.97	26.13	43.37	42.15	42.76
IQUID LIMIT Te	est no.	1	2	3	1	2	3
lumber of bumps		14	25	48	14	26	47
Container no.		A11	A27	A9	A35	A14	A24
Aass of wet soil + container (m_3)	g	36.80	35.00	33.50	39.90	31.60	33.20
lass of dry soil + container (m ₂)	g	31.30	31.50	29.40	35.00	27.70	30.00
Aass of container (m ₁)	g	23.13	25.88	22.09	27.33	21.27	24.37
Aass of moisture (m ₃ - m ₂)	g	5.50	3.50	4.10	4.90	3.90	3.20
Mass of dry soil $(m_2 - m_1)$	g	8.17	5.62	7.31	7.67	6.43	5.63
Vater Content	%	67.32	62,28	56.09	63_89	60.65	56.84
						oven dried a	425 μ m sieve 105 ºC
						Liquid limit	<mark>62</mark> %
š 1 50						Plastic limit	26 %
- ce Contr 						Plasticity index	<mark>36</mark> %
						Liquid limit	62 %
30						Plastic limit	43 %
						P l asticity index	19 %
20						Operator	Checked Approv
-	1					1	



Project : Geological Survey for	the Preparate	ory Survey on	the Project for	Construction of Mu	umbai Trans	Harbour Link
		Job No. IDE	EAL/028/015			
BH NO. : Sample Depth(m	-5.60 -	-6.10	Sample No.	ID-M-BH-04-D0000	Date :	02-07-2015
BH-04	-7.10 -		Sample No.	ID-M-BH-04-S1500	Date :	02-07-2015
			S 2720 : Part 5		-	_
PLASTIC LIMIT Test		2	Average	1	2	Average
Container no.	A37	A60		A56	A50	
lass of wet soil + container	g 27.00	27.00		29.44	26.57	
lass of dry soil + container	g 25.03	25.01		27.31	24.51	
lass of container	g 16.72	16.78		19.07	16.60	
lass of moisture	g 1.97	1.99		2.13	2.06	
lass of dry soil	g 8.31	8.23		8.24	7.91	
Noisture Content	% 23.71	24.18	23.94	25.85	26.04	25.95
IQUID LIMIT Test	no. 1	2	3	1	2	3
lumber of bumps	45	24	13	46	23	13
Container no.	A55	A61	A48	A65	A45	A41
lass of wet soil + container (m_3)	g 27.90	25.46	32.47	24.18	26.49	27.10
Aass of dry soil + container (m ₂)	g 25.76	23.44	28.26	22.25	23.67	23.74
Aass of container (m ₁)	g 18.98	17.81	17.70	17.53	17.83	17.55
Aass of moisture (m ₃ - m ₂)	g 2.14	2.02	4.21	1.93	2.82	3.36
Mass of dry soil $(m_2 - m_1)$	g 6.78	5.63	10.56	4.72	5.84	6.19
Vater Content	% 31.56	35.88	39.87	40_89	48.29	54,28
80 1				· · · · · · · · · · · · · · · · · · ·	Sample pre	paration
70					washed on 4 oven dried a	425 μ m sieve 105 ⁰ C
60					Liquid limit	36 %
1 1 1 1 1 1 1 1 1 1					Plastic limit	24 %
Moisture Content (%)					Plasticity index	12 %
					Liquid limit	47 %
-					Plastic limit	26 %
30					Plasticity index	21 %
20					Operator	Checked Approv
]	1					



Project : Geologic	cal Survey for the	Preparato	ry Survey on	the Project for C	onstruction of Mu	umbai Tran	s Harbour Link
			Job No. ID	EAL/028/015			
BH NO.: BH-04	Sample Depth(m) :	-10.10	10.55	Sample No. :	ID-M-BH-04-S4500	Date :	02-07-2015
BH-04	Comple Deput(m) :	-11.60		Sample No. :	ID-M-BH-04-S6000	Date :	02-07-2015
				IS 2720 : Part 5		_	
PLASTIC LIMIT	Test no.	1	2	Average	1	2	Average
Container no.		A42	A53		A38	A47	
lass of wet soil + contain	ner g	32.60	26.93		27.77	25.61	-
lass of dry soil + contain	er g	30.38	24.91		25.72	23.75	-
lass of container	g	22.23	17.55		18.28	16.87	
lass of moisture	g	2.22	2.02		2.05	1.86	
lass of dry soil	g	8.15	7.36		7.44	6.88	
Noisture Content	%	27,24	27.45	27.34	27.55	27.03	27,29
IQUID LIMIT	Test no.	1	2	3	1	2	3
lumber of bumps		44	24	14	24	44	13
Container no.		A28	A15	A27	A26	A7	A34
/lass of wet soil + contain	ner (m ₃) g	34.80	34.42	38.14	35.22	30.20	35.93
/lass of dry soil + contain	er (m ₂) g	32.39	31.06	33.72	31.76	27.58	32.03
lass of container	(m ₁) g	26.58	24.23	25.88	25.90	22.00	26.59
lass of moisture	(m ₃ -m ₂) g	2.41	3.36	4.42	3.46	2.62	3.90
lass of dry soil	(m ₂ - m ₁) g	5.81	6.83	7.84	5.86	5.58	5.44
Vater Content	%	41.48	49,19	56.38	59.04	46.95	71.69
80					· · · · ·	Sample pre	eparation
70						washed on oven dried	425 μ m sieve ; 105 ºC
60						Liquid limit	49 %
t (%)						Plastic limi	t 27 %
Moisture Content (%)						Plasticity index	22 %
0istu						Liquid limit	58 %
-						Plastic limi	t 27 %
30						Plasticity index	31 %
20						Operator	Checked Approv
		4	1			1	1 1



Project : Geological Su	rvey for the	Preparato	ry Survey on	the Project for C	onstruction of Mu	ımbai Trans	s Harbour Link
			Job No. IDI	EAL/028/015			
BH NO.: Samp	le Depth(m) :	-3.10	3.60	Sample No. :	ID-M-BH-05-D0000	Date :	02-07-2015
BH-05		-12.10		Sample No. : IS 2720 : Part 5	ID-M-BH-05-S9000	Date :	02-07-2015
	Test no.	1	2		1	2	Average
	rest no.	A39	2 A51	Average	A59	2 A52	Average
container no.							
lass of wet soil + container	g	27.32	27.25		34.12	29.93	
lass of dry soil + container	g	25.69	25.57		32.05	28.12	
lass of container	g	18.46	18.03		21.93	19.14	
lass of moisture	g	1.63	1.68		2.07	1.81	
/lass of dry soil	g	7.23	7.54		10.12	8.98	
Ioisture Content	%	22,54	22.28	22.41	20.45	20.16	20.31
IQUID LIMIT	Test no.	1	2	3	1	2	3
lumber of bumps		13	24	44	13	38	58
Container no.		A16	A20	A9	A11	A19	A40
Aass of wet soil + container (m_3) g	37.11	35.10	31.40	34.50	38.03	34.50
Aass of dry soil + container (m ₂	.) g	32.66	32.08	28.82	31.51	34.94	31.00
Aass of container (m	ц) g	23.12	25.01	22.09	23.13	24.68	18.36
Aass of moisture (m ₃	- m ₂) g	4.45	3.02	2.58	2.99	3.09	3.50
/lass of dry soil (m ₂	- m ₁) g	9.54	7.07	6.73	8.38	10.26	12.64
Vater Content	%	46.65	42.72	38.34	35.68	30.12	27.69
80						Sample pre	paration
70						washed on oven dried	425 μ m sieve : 105 ºC
60						Liquid limit	42 %
t (%)						Plastic limit	<mark>22</mark> %
Moisture Content (%)		*				Plasticity index	20 %
				-		Liquid limit	32 %
						Plastic limit	20 %
30						Plasticity index	12 %
20						Operator	Checked Approv
		i i				1	



Project : Geological Survey for	the F	Preparator	ry Survey o	n the Project for	Construction of	Mumbai Tran	s Harbour Link
			Job No. I	DEAL/028/015			
BH NO. : BH-05 Sample Depth(r	n) :	-13.60		Sample No. :	ID-M-BH-05-D1	D50 Date :	26-06-2015
	<u> </u>			: IS 2720 : Part 5			
PLASTIC LIMIT Test	no.	1	2	Average	1	2	Average
Container no.		A44	A46	_			-
lass of wet soil + container	g	29.23	29.00	_			-
lass of dry soil + container	g	27.45	27.07	_			-
lass of container	g	19.44	18.37	_			
lass of moisture	g	1.78	1.93	_			-
lass of dry soil	g	8.01	8.70				
Noisture Content	%	22.22	22.18	22.20			
IQUID LIMIT Test	no.	1	2	3	1	2	3
lumber of bumps		13	35	54			
Container no.		A6	A17	A9			
lass of wet soil + container (m ₃)	g	30.80	34.04	31.20			
Aass of dry soil + container (m ₂)	g	27.89	31.07	28.82			
Aass of container (m ₁)	g	21.46	23.29	22.09			
Aass of moisture (m ₃ - m ₂)	g	2.91	2.97	2.38			
Mass of dry soil (m ₂ - m ₁)	g	6.43	7.78	6.73			
Vater Content	%	45.26	38.17	35.36			
80 -					· · · ·	Sample pre	eparation
70						washed on oven dried	425 μ m sieve ; 105 ⁰ C
60						Liquid limit	41 %
t (%)						Plastic limi	t 22 %
Moisture Content (%)						Plasticity index	<mark>19</mark> %
oisting 40 +		-×				Liquid limit	%
-						Plastic limi	t %
30						Plasticity index	%
20						Operator	Checked Approv
						P.M.	к.в. s.т.



Project : Geological Survey for	the Prepara	tory Survey o	on the Project for	Construction o	f Mumbai Trar	ns Harbour Link
		Job No.	DEAL/028/015			
BH NO. : BH-06 Sample Depth(n	ו) : -2.91	3.36	Sample No. :	ID-M-BH-06-D	0000 Date :	26-06-2015
			d : IS 2720 : Part 5			A
PLASTIC LIMIT Test		2	Average	1	2	Average
container no.	A49	A62	_			-
lass of wet soil + container	g 29.90	30.34	_			-
lass of dry soil + container	g 27.49	27.80	_			-
ass of container	g 18.71	18.57	_			-
lass of moisture	g 2.41	2.54				_
lass of dry soil	g 8.78 % 27.45	9.23 27,52	27.49			
loisture Content			27.48			
IQUID LIMIT Test		2	3	1	2	3
lumber of bumps	13	40	54			
ontainer no.	A29	A5	A9			
lass of wet soil + container (m ₃)	g 38.70	36.20	31.40			
Aass of dry soil + container (m ₂)	g 34.58	32.17	28.82			
Aass of container (m ₁)	g 26.13	22.38	22.09			
Mass of moisture (m ₃ - m ₂)	g 4.12	4.03	2.58			
flass of dry soil (m ₂ - m ₁)	g 8.45	9.79	6.73			
Vater Content	% 48.76	41.16	38.34			
80					Sample pr	eparation
70					washed or oven dried	n 425 μ m sieve I ; 105 ⁰C
60					Liquid limi	t 44 %
%					Plastic lim	
Moisture Content (%)	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				Plasticity	17 %
2 40						
Ö					Liquid limi Plastic lim	
30					Plasticity	%
20					Operator	Checked Appro
10	*	lo, of Bumps			P.M. 100	K.B. S.T

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APPENDIX-D - STRENGTH TEST RESULTS





					J	lob No	D.: IDEA	L/028/0	15					
					Unc	onfin	ed Comp	ressio	n Test					
Boreho l e:	BH-1		Sample	Diameter	⁻ (mm): 3	8	Bulk Dens	ity(g/cm ³)	1.60	q _u :	32.0	kPa	
Depth (m)	-6.32	6.77	Sample	Height (n	nm): 7	6	Dry Densi	y (g/cm ³)	0.96	c _u :	16.0	kPa	
40														
38														
36														
34														
04														
32											+			
30													•	
28														
26							<u>,</u>							
							/							
24						•								
22 (Ba)					- /	<u> </u>								
Axial Stress (kPa) 05 18														
al Str				/	K									
XX 18														
16				•										
		1												
14														
12														
		/												
10														
8														
6														
0														
4														
2														
_														
0	.00 1.0	0 2	.00 3.	00 4.	00 5.	 00	6.00 7.	00 8.	.00 9	.00 1	0.00 1	1.00 12.	.00 13.0	00 14





					L/028/015					
					pression Te					
Borehole:	BH-2		eter (mm): 38		sity(g/cm ³)	1.60	q _u :	8.0	kPa	
Depth (m):	-7.547.99	Sample Heigh	ht (mm): 76	Dry Dens	ity (g/cm ³)	0.72	c _u :	4.0	kPa	
10 9 8 7 6 4 3 2 1										
• 0.0	0 1.00 2	2.00 3.00 4	4.00 5.00	6.00 7.00	8.00 9.0	00 10.00	11.00	12.00	3.00 14.00	15

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APPENDIX-E - COMPRESSIBILITY TEST RESULTS





CONSOLIDATION TEST RESULTS Project: Geological Survey for the Preparatory Survey on the Project for Construction of Mumbai Trans Harbour Link Job No.: [DEAL/028/015 BH-No : BH-01 Diameter of Specimen(cm) 6 Area of Specimen,A (cm²) $\sigma_{\,\rm c}\,$: 130 KN/m² Depth (m) : -6.32 - -6.77 27.94 Wt. of Dry Soil (gm) 53.40 Specific Gravity of Sample 2.58 C_c :0.619 e₀: 1.699 Dial Gauge L.C.,mm Initial Height of Sample (H_{o}) : 20.0 0.002mm Height of Solids (H_s) : 7.41 Dia Dial Change Applied Pressure Final Dial Specimen Height Height of voids= Void Ratio Coefficient of Volume Change σ (kN/m²) ∆H(mm) (H=H₁+ Δ H) (mm) e=(H-H_s)/H_s $M_v = (\Delta e/1 + e_o)/\Delta \sigma (m^2/kN)$ H-H_s(mm) Reading Change 0 3500 -10 -0.02 20.000 12.59 1.699 3490 12.57 1.697 10 -23 -0.05 19.980 1.0000E-04 3467 -129 12.53 20 -0.26 19.934 1.691 2.3023E-04 -163 50 3338 -0.33 19.676 12.27 1.656 4.3142E-04 100 3175 -319 -0.64 19.350 11.94 1.612 3.3137E-04 2856 -896 -1.79 18.712 11.30 1.526 3.2972E-04 200 16.920 400 1960 0.24 9.51 1.284 4.7884E-04 122 50 2082 123 0.25 17.164 9.76 1.317 4.1202E-05 -185 1.350 4.7774E-04 2205 -0.37 17.410 10.00 20 2020 0 1.750 1.700 1.650 1.600 1.550 1.500 1.450 1.400 1.350 1.300 1.250 100 1000 10 Pressure kN/m²





				CONSOLIDATION TES	T RESULTS			
Project	:Geologica	al Survey	for the Pre	paratory Survey on the Pro		tion of Mumb	oai Trans Ha	irbour Link
BH-No :	: BH-02			Job No.: IDEAL/02 Diameter of Specimen(cm)	8/015 6			
	-7.547.99)		Area of Specimen,A (cm ²)	27.94		σ _c :46 KN/n	1 ²
Wt. of Dry Soil (gm)	42.90				2.54		C _c : 0.851	
Dial Gauge L.C.,mm	0.002mm			Initial Height of Sample (H _o)			e ₀ : 2.308	
Dial Gaage 2.0.,min	0.002			Height of Solids (H_s) :			-01	
Applied Pressure σ (kN/m ²)	Final Dial	Dial	Dial Change ∆H(mm)	Specimen Height $(H=H_1+\Delta H)$ (mm)	Height of voids= H-H _s (mm)	Void Ratio e=(H-H _s)/H _s		ent of Volume Change (∆e/1+e₀)/∆♂(m²/kN)
0	Reading 3500	Change	-0.01	20.000	13.95	2.308	101,-	
	3495	-5 -83	-0.17	19.990	13.94	2.306	<u> </u>	5.0000E-05
10	3495	-376	-0.75	19.824	13.78	2.279	+	8.3042E-04
							+	
50	3036	-639	-1.28	19.072	13.03	2.155	<u> </u>	1.2645E-03
100	2397	-857	-1.71	17.794	11.75	1.943	 	1.3402E-03
200	1540	-869	-1.74	16.080	10.03	1.660	 	9.6325E-04
400	671	217	0.43	14.342	8.30	1.372	<u> </u>	5.4042E-04
<u>50</u> 20	888 1058	<u>170</u> 146	0.34	<u>14.776</u> 15.116	<u>8.73</u> 9.07	1.444	<u> </u>	8.6459E-05 7.6701E-04
0	1204	140	0.29	10.116	9.07	1.500		7.07012-04
2.400 +								
1								
2.300 🕈								
1								
2.200								
-								
2.100								
1								
2.000								
1.900								
1								
1.800					└── <u>\</u>			
1								
1								
1.700					\rightarrow			
4								
1.600								
1						$ \setminus $		
1.500								
1.000								
]						\		
1.400							\rightarrow	
1							→	
1.300 🖡								
10)				00			1000
				Pressure	ĸn/m⁻			

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APPENDIX-F - CORE BOX PHOTOGRAPHS







BOREHOLE NO. : BH-01

Depth (m) : -19.82 - -27.32

Core Box 01 of 02



BOREHOLE NO. : BH-01

Depth (m) : -27.32 - -28.82















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BOREHOLE NO. : BH-03

Depth (m) : -7.40 - -22.40

Core Box 01 of 03



BOREHOLE NO. : BH-03

Depth (m) : -23.90 - -26.90







CLIENT ORIENTAL CONSULTANTS Global Consulting for Sustainable Development

BOREHOLE NO. : BH-03

Depth (m) : -26.90 - -28.40











Depth (m) : -16.10 - -25.60

Core Box 01 of 02



BOREHOLE NO. : BH-04

Depth (m) : -25.60 - -31.80









BOREHOLE NO. : BH-05

Depth (m) : -16.60 - -22.60

Core Box 01 of 02



BOREHOLE NO. : BH-05

Depth (m) : -22.60 - -25.30







CLIENT ORIENTAL CONSULTANTS Global Consulting for Sustainable Development

BOREHOLE NO. : BH-06 Depth (m) : -7.41 - -17.91

Core Box 01 of 02



BOREHOLE NO. : BH-06

Depth (m) : -17.91 - - 22.11

