E-T E N D E R S P E C I F I C A T I O N

BHE/PW/PUR/BWT6-CVL/BAL-CHP-AHP/2468

Balance Civil, Structural & Architectural work of AHP MCC Cum Compressor Building, ERH, ERH Tunnel, CHP MCC-1, CHP MCC-2 & Ash Slurry Pump House at 1x660 MW Bhusawal Thermal Power Station, Unit-6, Maharashtra.

VOLUME I E– Technical Specifications and Plot Plan (Part-03 of 03)

THIS TENDER SPECIFICATION CONSISTS OF:

Notice Inviting Tender	
Volume-IA	**Technical Conditions of Contract**
Volume-IB	**Special conditions of Contract**
Volume-IC	**General conditions of Contract**
Volume-ID	**Forms & Procedures**
Volume-IE	**Technical Specifications and Plot Plan**
Volume II	**Price Bid**

Bharat Heavy Electricals Limited
(*A Government of India Undertaking*)
Power Sector - Western Region
345-Kingsway, Nagpur-440001

E-TENDER SPECIFICATION

BHE/PW/PUR/BWT6-CVL/BAL-CHP-AHP/2468

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For Bharat Heavy Electricals Limited

AGM (Purchase)

Place: Nagpur
Date:

GEOTECHNICAL INVESTIGATION REPORT

PROJECT-1x660 MW BHUSAWAL TPS EXTN. UNIT - 6

VOLUME-2

CHP & AHP AREA

DOCUMENT NO: PE-DC-415-602-C001, REV - 0

Customer

MAHARSHTRA STATE POWER GENERATION CO. LTD.

Submitted by

PROJECT ENGINEERING MANAGEMENT

POWER PROJECT ENGINEERING INSTITUTE

HRD & ESI COMPLEX

PLOT NO.: 25, SECTOR-16A

NOIDA (U.P.) - 201 301

REPORT ON
GEOTECHNICAL INVESTIGATION WORK
AT 1X660 MW BHUSAWAL TPS EXTN. UNIT - 6

VOLUME- 2
CHP & AHP AREA

CLIENT : M/S. BHARAT HEAVY ELECTRICALS LIMITED

CONSULTANT : G S GEOENVIRONS PVT. LTD.

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1. INTRODUCTION

1.1. Project Description

M/s. Maharashtra State Power Generation Co. Ltd. (*Mahagenco*) is planning to construct a 1 x 660 MW Thermal Power Plant (Unit-6) at Bhusawal, Maharashtra.

G. S. Geo has carried out geotechnical investigation at the site in accordance with the LOA No. BHE/PW/PUR/BWT6-GEO/1777/LOA dated January 01^{st}, 2018 on the behalf of BHEL. The work on site has been carried out as per the following drawings titled "GEOTECHNICAL INVESTIGATION LAYOUT".

1. PE-DG-415-602-C001-R2 dated 13.03.18
2. PE-DG-415-602-C002-R0 dated 13.03.18

The scope of work includes one hundred and forty two (142) boreholes, twenty (20) field permeability test, ten (10) trial pits, sixteen (16) dynamic cone penetration tests (DCPT), twenty (20) electrical resistivity tests (ERT's), seven (7) field California bearing ratio (FCBR), ten (10) plate load test, four (4) cyclic plate load tests, fifty four (54) pressuremeter tests, four (4) seismic refraction tests and six (6) cross-hole seismic tests (CHST) at the site.

Various facilities such as main power house, chimney, boiler foundation, turbo-generator foundation, deep pits, reservoir, ash pond, pipe supports etc. are planned at the project site. A layout plan illustrating the test locations covered in this report is presented on Plate 2.

1.2. Purpose & Scope

The current study has been carried out at the site in order to:

a) determine the general nature of the subsurface strata at the site;
b) retrieve the subsurface samples for determination of index and engineering properties; and
c) assess geotechnical parameters of the subsurface strata at the site for the foundation design and construction of the various facilities planned at the site.

The scope of work includes the following:

(i) Mobilization of men and equipment at site for carrying out the investigation including shifting at all test locations & demobilization after completion of work.
(ii) drilling one hundred and forty two (142) boreholes to the specified depth, in order to evaluate the stratigraphy at the site, and to collect soil, rock core and groundwater samples for laboratory testing;
(iii) conducting twenty (20) field permeability tests in selected boreholes to determine the in-situ permeability;
(iv) excavating ten (10) trial pits to provide additional information on the stratigraphy at shallow depths;
(v) conducting sixteen (16) dynamic cone penetration tests (DCPT) up to refusal, to obtain additional data for foundation analysis;
(vi) conducting twenty (20) electrical resistivity tests (ERT's) to provide data for the grounding systems;
(vii) conducting seven (7) field California bearing ratio (FCBR) tests to provide data for the design of internal plant roads;
(viii) performing ten (10) plate load tests and four (4) cyclic plate load tests at the specified locations and at specified depth to assess the load-settlement behaviour of soils under loading;

(ix) conducting four (4) seismic refraction tests in order to assess the seismic profile at the test locations;
(x) conducting six (6) cross-hole seismic tests (CHST) to the specified depth, in order to determine the dynamic properties of the soil for the analysis of the vibrating machine foundations;
(xi) conducting fifty-four (54) pressuremeter tests at specified depths and locations;
(xii) Laboratory testing of retrieved samples to determine the index and engineering properties of the sub-surface strata;
(xiii) Geotechnical analysis using the available field and laboratory test data;
(xiv) Preparation of geotechnical recommendations for foundation design and construction; and
(xv) Preparation and submission of this geotechnical report

1.3. Report Volume Distribution

The reports submission is planned in two volumes. The content of each of these volumes is presented below:

Volume	Designed Structure	Scope of Work Covered
1	BTG & BOP	(69 Boreholes, 3 CPLT, 5 PLT, 5 DCPT, 14 ERT, 4 CHST, 4 PMT, 4 CBR, 4 SRT & 9 TP)
2	**CHP & AHP**	(73 Boreholes, 1 CPLT, 5 PLT, 11 DCPT, 6 ERT, 2 CHST, 2 PMT, 3 CBR, & 1 TP)

This report (Volume-2) presents the field and laboratory test results along with our foundation recommendations for planned facilities in the CHP & AHP Area.

1.4. Scope of Work included in this Report

Details of the field tests completed at the project site and presented in this report are tabulated below:

- **Exploratory Boreholes**

Facility	Location	Test Designation	Survey Co-ordinates, m		Reduced Level (RL), m	Final Explored Depth, m
			E	N		
-	PIPE RACK	IBH-11*	1699 E	817 N	207.8	25
		IBH-12*	1742 E	658 N	210.3	15
		IBH-13	1485 E	823 N	208.3	15
		IBH-16	1192 E	661 N	208.0	15
		IBH-18	1570 E	896 N	207.1	15
		IBH-19	1436 E	920 N	208.7	15
		IBH-20	1378 E	768 N	207.3	15
		IBH-21	1277 E	661 N	208.9	15
		IBH-22	1110 E	661 N	206.9	15
-	PIPE RACK	IBH-25	1031 E	812 N	207.2	15
		IBH-26	1094 E	689 N	206.1	15
		IBH-27	1350 E	1070 N	207.0	15
		IBH-28	1335 E	990 N	208.8	15
		IBH-29*	1194 E	928 N	207.6	15

Facility	Location	Test Designation	Survey Co-ordinates, m		Reduced Level (RL), m	Final Explored Depth, m
			E	N		
5.1	HCSS SILO	IBH-1	1009 E	725 N	205.4	15
5.2	H.C.S.D. PUMP HOUSE & MCC ROOM	IBH-3	1020 E	700 N	205.0	15
5.4	DRY ASH SILO	IBH-2	1372 E	1093 N	207.5	15
5.7	AHP COMPRESSORS & BLOWERS	IBH-4	1065 E	700 N	204.6	15
5.6	AHP CONTROL ROOM, ASH WATER TANK & ASH SLURRY PUMP HOUSE	IBH-5	1067 E	649 N	206.1	15
4.3	CRUSHER HOUSE	IBH-6	1379 E	888 N	204.6	15
		IBH-7	1333 E	906 N	205.4	15
4.1	WAGON TIPPLER	IBH-8	1808 E	800 N	207.4	25
		IBH-9	1790 E	771 N	208.7	25
		IBH-32*	1349 E	785 N	206.6	15
4.7	TRANSFER POINTS	IBH-10*	1504 E	938 N	206.5	20
		IBH-15	1404 E	661 N	208.2	15
4.6	STACKER RECLAIMER	IBH-14	1586 E	759 N	207.1	15
4.5	CHP MCC/CONTROL ROOM	IBH-23	1381 E	946 N	205.1	15
5.5	DRY ASH SILO UTILITY BUILDING	IBH-24	1408 E	1097 N	206.0	15
5.8	TUBE SETTLER PLANT	IBH-17	1020 E	654 N	206.0	20
4.10	COAL PIPE RUN OFF POND	IBH-31	1414 E	821 N	205.9	15
-	ASH PIPE CORRIDOR	IBH-30	995 E	285 N	209.1	15
		IBH-33	1040 E	18 S	213.9	15
		IBH-34	1200 E	200 S	217.7	15
		IBH-35	1263 E	460 S	220.4	15
		IBH-36	1451 E	748 S	218.6	10
		IBH-37	1758 E	1003 S	220.2	10
		IBH-38	2060 E	1253 S	223.5	10
		IBH-39	2213 E	1382 S	222.8	10
		IBH-40	2477 E	1590 S	221.9	10
		IBH-41	2641 E	1778 S	223.0	10
		IBH-42	2897 E	1946 S	222.3	10
		IBH-43	3165 E	2172 S	223.0	10
		IBH-44	3298 E	2285 S	223.0	10
		IBH-45	3566 E	2509 S	224.6	10
-	ASH PIPE CORRIDOR	IBH-46	3681 E	2605 S	226.3	10
		IBH-47	3929 E	2813 S	225.2	10
		IBH-48	4120 E	2975 S	225.0	10
		IBH-49	4387 E	3201 S	225.0	10
		IBH-50	4521 E	3313 S	227.5	10
		IBH-51	5040 E	3747 S	242.4	10
		IBH-52	5173 E	3859 S	235.4	10
		IBH-53	5440 E	4086 S	238.3	10
		IBH-54	5535 E	4166 S	240.0	10
		IBH-55	5685 E	4300 S	242.4	10
		IBH-56	5802 E	4395 S	244.8	10
		IBH-57	6241 E	4767 S	246.5	10
		IBH-58	6374 E	4882 S	249.6	10

Facility	Location	Test Designation	Survey Co-ordinates, m		Reduced Level (RL), m	Final Explored Depth, m
			E	N		
-	ASH PIPE CORRIDOR	IBH-59	6584 E	5059 S	255.6	10
		IBH-60	6674 E	5125 S	261.2	10
		IBH-61	6615 E	5228 S	260.4	10
		IBH-62	6521 E	5370 S	255.4	10
		IBH-63	6365 E	5601 S	260.0	10
		IBH-64	6223 E	5807 S	261.3	10
		IBH-65	6024 E	6095 S	253.9	10
		IBH-66	5858 E	6335 S	253.1	10
		IBH-67	5528 E	6005 S	255.1	10
		IBH-68	5720 E	6280 S	251.0	10
		IBH-69	5773 E	6386 S	252.6	10
-	ROB	BH-70	2142 E	700 N	207.6	15
		BH-71	2119 E	628 N	208.4	15
		BH-72	2015 E	610 N	209.9	15
		BH-73	1961 E	584 N	209.9	15

*Field permeability tests conducted at 1.5 & 5 m depth

- **Trial Pits (TP)**

Facility	Location	Test Designation	Survey Co-ordinates, m		Reduced Level (RL), m	Excavated Depth, m
			E	N		
5.4	DRY ASH SILO	ITP-1	1418 E	1090 N	197.0	4.0

- **Dynamic Cone Penetration Tests (DCPT)**

Facility	Location	Test Designation	Survey Co-ordinates, m		Reduced Level (RL), m	Termination Depth, m
			E	N		
-	PIPE RACK	IDCPT-1	1409 E	912 N	205.0	0.38
		IDCPT-2	1359 E	833 N	205.8	0.32
		IDCPT-3	1230 E	661 N	208.3	1.68
		IDCPT-4	1642 E	852 N	207.6	0.63
3.19	RAIN WATER HARVESTING POND	IDCPT-5	1351 E	737 N	207.1	0.36
9.15	PAY LOADER SHED	IDCPT-6	1426 E	764 N	208.2	0.58
-	ASH PIPE CORRIDOR	IDCPT-7	1605 E	875 S	218.7	0.11
		IDCPT-8	1930 E	1147 S	221.6	0.78
		IDCPT-9	3796 E	2701 S	227.4	0.38
		IDCPT-10	4905 E	3635 S	240.2	0.88
		IDCPT-11	6138 E	5931 S	256.7	1.14

- **Electrical Resistivity Tests (ERT)**

Facility	Location	Test Designation	Survey Co-ordinates, m		Reduced Level (RL), m
			E	N	
9.13	WEIGH BRIDGE FOR DRY ASH SILO	IERT-1	1397 E	1103 N	206.5
5.2	H.C.S.D. PUMP HOUSE & MCC ROOM	IERT-2	1010 E	691 N	206.3
4.1	WAGON TIPPLER	IERT-3	1813 E	760 N	208.2
4.1	WAGON TIPPLER	IERT-4	1829 E	784 N	206.7
4.5	CHP MCC/CONTROL ROOM	IERT-5	1387 E	936 N	204.6
5.6	AHP CONTROL ROOM, ASH WATER TANK & ASH SLURRY PUMP HOUSE	IERT-6	1074 E	631 N	205.9

- **Field CBR Tests**

Test Designation	Survey Co-ordinates, m		Reduced Level (RL), m	Test Depth, m
	E	N		
ICBR-1	1736 E	879 N	207.4	0.5
ICBR-2	1662 E	825 N	207.6	0.5
ICBR-3	1529 E	720 N	209.5	0.5

- **Plate Load & Cyclic Plate Load Tests (PLT & CPLT)**

Facility	Location	Test Designation	Survey Co-ordinates, m		Reduced Level (RL), m	Test Depth, m
			E	N		
4.3	CRUSHER HOUSE	ICPLT-1	1371 E	917 N	205.3	2.0
4.6	STACKER RECLAIMER	IPLT-1	1606 E	755 N	208.8	2.0
5.4	DRY ASH SILO	IPLT-2	1387 E	1094 N	207.3	1.5
-	PIPE RACK	IPLT-3	1580 E	890 N	206.9	1.5
5.1	HCSS SILO	IPLT-4	1024 E	719 N	205.3	2.0
5.2	H.C.S.D. PUMP HOUSE & MCC ROOM	IPLT-5	1026 E	696 N	205.1	2.0

- **Cross Hole Seismic Test (CST)**

Facility	Location	Test Designation	Survey Co-ordinates, m		Reduced Level (RL), m	Final Test Depth*, m
			E	N		
5.4	DRY ASH SILO	ICST-1	1385 E	1085 N	205.3	20.0
4.3	CRUSHER HOUSE	ICST-2	1341 E	877 N	197.0	20.0

*Cross Hole Seismic tests conducted at 2, 4, 6, 8, 10, 12, 14, 16, 18 & 20 m depth in the specified boreholes.

- **Pressuremeter Test (PMT)**

Facility	Location	Test Designation	Survey Co-ordinates, m		Reduced Level (RL), m	Final Test Depth*, m
			E	N		
4.1	WAGON TIPPLER	IPMT-1	1797 E	771 N	208.2	20.0
-	PIPE RACK	IPMT-2	1441 E	830 N	207.6	20.0

*Pressuremeter tests conducted at 2, 4, 6, 8, 10, 12, 15, 18 & 20 m depth in the specified boreholes.

- A layout plan illustrating the test locations covered in this report is presented on Plate 2.

- The above information has been read off from the drawings titled “GEOTECHNICAL INVESTIGATION LAYOUT” (PE-DG-415-602-C001-R2 & PE-DG-415-602-C002-R0).

2. FIELD INVESTIGATIONS

2.1. Soil Boring

The soil boring of 150 mm diameter were progressed using a rotary drilling through soil formation was performed using heavy-duty, hydraulic skid–mounted rotary drill rig. Where caving of the borehole occurred, casing was used to keep the borehole stable. The work was performed in general accordance with IS: 1892-1979 RA-2007. Standard Penetration Test (SPT) was performed in the soil at regular intervals as described in Section 2.2.

2.2. Standard Penetration Tests (SPT)

Standard Penetration Tests (SPT) were conducted in the boreholes at the specified depth intervals in the soil by connecting a split spoon sampler to ‘A’ rod and driving it by 45 cm using a 63.5 kg hammer falling freely from a height of 75 cm. The tests were conducted in accordance with IS: 2131-1981 RA 2002.

The SPT ‘N’-values are described as follows:-

1. The number of blows for each 15 cm of penetration of the split spoon sampler is recorded.

2. The blows required to penetrate the initial 15 cm of the split spoon for seating the sampler is ignored due to the possible presence of loose materials or cuttings from the drilling operation.

3. The cumulative number of blows required to penetrate the balance 30 cm of the 45 cm split spoon sampler is termed the SPT value or the ‘N’ value. For example, a SPT value reported as “20” means that 20 blows were imparted to penetrate the split spoon sampler by the last 30 cm.

4. Where the number of blows required to penetrate the balance 30 cm of the split spoon sampler exceeds 100, the number of blows is presented along with the corresponding penetration. For example, an SPT value reported as “101 / 5 cm” means that 101 blows were imparted to penetrate the split spoon sampler by 5 cm after the first 15 cm initial (seating) penetration.

5. Where refusal (N>100) to further penetration of the split spoon sampler is encountered in the first 15 cm of seating penetration itself, SPT test could not be completed and "*Ref*" is indicated in the bore logs, along with the penetration achieved. For example, an SPT value reported as "Ref / 5 cm" means that more than 100 blows were imparted to penetrate the split spoon sampler by a total of 5 cm only and the 15 cm seating penetration could not be achieved.

Disturbed samples were collected from the split spoon sampler after conducting SPT. The samples were preserved in transparent polythene bags, and transported to our NABL accredited laboratory in Noida for laboratory testing.

2.3. Rock Drilling

Rotary drilling through rock formation was performed using heavy-duty, hydraulic skid–mounted rotary drill rig. The drilling rig has a hydraulic feed and is driven by a bevel gear system run by a 28 HP Perkins engine. The drill chuck has four jaws to accommodate NW size drill rod.

Drilling and sampling of the rock was performed using an NX size double tube core barrel. A 32–carat diamond impregnated bit was used to drill through rock strata/refusal. The bit was attached to the end of a core barrel, which is connected to the machine by a string of NW drill rods and rotated by the drilling machine.

Water was circulated through the drill rods to the bottom of the hole. The water serves the purpose of lubrication, cooling and protection of the diamond drill bit in addition to flushing the cuttings out of the hole. A reciprocating pump was used to circulate the water. While drilling through soft rock that is likely to collapse, NX size casing was installed. The casing with a diamond shoe bit was used to assist the casing to advance.

The percent core recovery and Rock Quality Designation (RQD) was measured for each core run. The percent core recovery is defined as the percent ratio of the cumulative length of core sample recovered to the total length of the core run. The Rock Quality Designation (RQD) is defined as the ratio of the cumulative length of core pieces 10 cm or longer to the total length of the core run, expressed as percentage. The Rock mass Rating (RMR), an engineering parameter that assists in assessing the rock quality and behavior is also presented on the individual rock profiles.

Details of rock samples collected and their respective core recovery / RQD values are presented on the rock profiles at various depths. The color of return water and the extent of water loss while drilling the borehole recorded on the boring logs may be used for an assessment of the nature of rock, water-tightness of joints and possible presence of interconnected channels / cavities.

Standard Penetration Tests were also carried out in the weathered rock formation (where core recovery < 20%) as indicated in the technical specifications.

2.4. Groundwater

Groundwater level was measured in the boreholes after drilling and sampling was completed. The measured water levels are recorded on the individual soil/rock profiles.

2.5. Trial Pits

Trial pits were excavated at the site to specified depth, so as to permit easy access for visual examination of walls of the pit and to facilitate sampling.

2.6. Field Permeability Test In Rock (Single Packer Method)

Permeability test in rock was conducted by double packer method. The procedure followed was as per IS 5529 (Part-II)-1985 RA 2006. A rubber packer was fixed at the test depth. The test was conducted in NX size hole.

Water was pumped into the test section under pressure. A water meter was used to measure the quantity of water pumped. The pressure was maintained until the reading of water intake was nearly constant with time. The pressure was increased and the test was repeated.

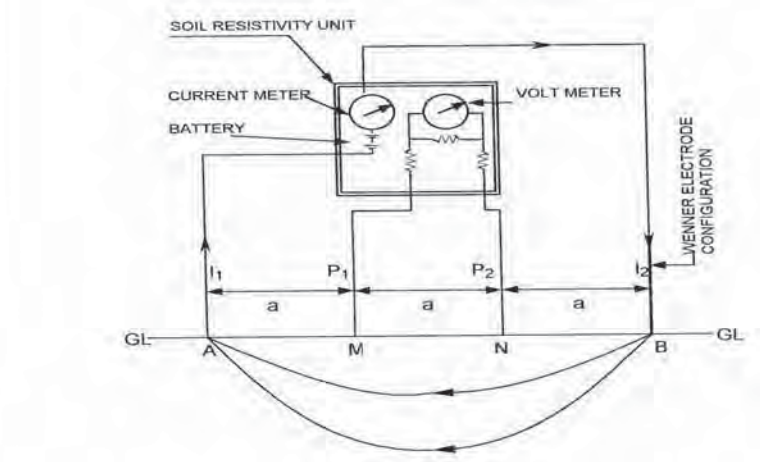
The coefficient of permeability is computed in units of cm/sec as well as in Lugeons. A Lugeon is defined as the water loss per minute per meter length of the hole under a pressure of 10 atmospheres (1 kg/cm^2).

2.7. Dynamic Cone Penetration Tests

The dynamic cone penetration tests were conducted using a 65 mm diameter cone in general accordance with IS: 4968 (Part-I)–1976 RA 2007. The cone was attached to ‘A’ rods and driven by means of 63.5 kg hammer falling freely from a height of 75 cm. The number of blows required for each 30 cm penetration of the cone is recorded. In order to limit the friction between the rods and the soil, the rods were rotated after every 1 to 1.5 m of cone penetration.

2.8. Electrical Resistivity Tests

Electrical resistivity of the substratum (soil) at the site was determined at specified locations. The electrical resistivity test is used for shallow subsurface exploration by means of electrical measures made at the ground surface. Resistivity measurements are made by driving four electrodes about 10 to 10 cm in to the ground at pre-selected electrode spacing. We used the Wenner electrode configuration for this study. The schematic arrangement of electrodes is shown below:



NOTE: I_1 AND I_2 ARE CURRENT ELECTRODES
P_1 AND P_2 ARE POTENTIAL ELECTRODES

The four electrodes were spaced at equal distance along a line. The test procedure is in accordance with IS: 3043:1987 RA 2006.

Measurements are made by causing a current, ‘I’, to pass through the earth and distribute within a relatively large hemispherical earth mass. The portion of the current that flows along the surface produces a voltage drop, ‘V’. The resistance ‘R’, ratio of voltage drop ‘V’ to current ‘I’ is directly measured by Digital Earth Resistance Tester. The resistivity is determined from the following equation:

$$\rho = 2 \pi a R$$

where:

ρ = apparent resistivity, ohm-m
a = spacing between the electrodes, meter
R = resistance, ohms

Results are presented as semi-logarithmic plot of apparent resistivity versus electrode spacing, as well as in the form of polar curves, as specified by IS: 3043:1987 RA 2006.

2.9. Field California Bearing Ratio Test

The California Bearing Ratio (CBR) is defined as the ratio of force per unit area required to penetrate a soil mass with standard 50 mm diameter circular piston at the rate of 1.25 mm/min to that required for corresponding penetration of a standard material. The field CBR test shall be conducted in general accordance with IS: 2720 (Part-31)-1990 RA 2006.

For Field CBR test, a 0.5 m deep pit was prepared at the test location. A loaded vehicle or other suitable arrangement was used to provide the necessary reaction. A small capacity hydraulic jack was used to apply the load which is measured using a proving ring.

The standard 50 mm diameter piston was connected to the proving ring by means of extension rods. A surcharge load of 15 kg shall be placed over the surface to be tested in order to simulate laboratory conditions. The piston shall be advanced into the soil at an approximate rate of 1.25 mm/min. A dial gauge mounted on an independent datum shall measure the penetration of the piston.

2.10. Static & Cyclic Plate Load Tests

Plate load tests were performed at the site at given locations and at specified depths. The test procedure was in general accordance with IS: 1888-1982 RA 2002 and IS 5249-1992 RA 2006.

Dead load was used to provide the reaction. The plate was loaded by pushing up against the anchored ISMB using a hydraulic jack. Four dial gauges measured the plate settlement with reference to a stable reference bar.

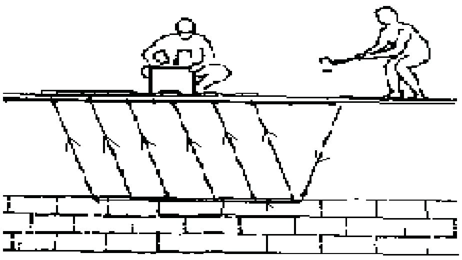
The load was applied in small increments upto a maximum loading intensity of 8 kg/cm^2 or 40 mm settlement of the plate, whichever occurs first. Each load was held until the time rate of settlement became negligible (less than 0.02 mm per minute) or until the total settlement exceeded 40 mm. The plate was then unloaded and the rebound was recorded.

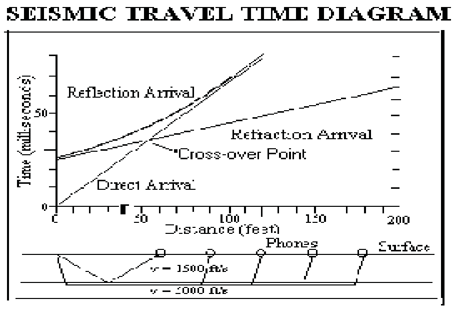
3. SEISMIC REFRACTION TEST

3.1. Basic Concept

A stress applied at the surface of an elastic medium creates conditions for the associated strains to propagate as elastic waves (P&S) in the subsurface material. The waves travel as a pattern of particle deformation, with velocities that are dependent on the elastic properties and densities of the media through which they travel.

The seismic refraction test involves the measurement of travel times of p-waves from an impulse source to a linear array of receiver geophones spread along the ground surface. The geophones are placed in line and connected to the seismograph via geophone cables. The seismograph registers these times and displays them as traces of time for individual geophones. Both normal and reverse profiles were considered during the field execution.





The test uses the travel times of the first arriving wave component only regardless of its travel path. Depending on the source-receiver distance, the first arriving component is either a direct wave or a refracted wave (refracted at the interface of two soil layers). Based on the position of the point where this qualitative change of the signal occurs the layer thickness and velocity can be calculated.

The success of the refraction test depends highly on the properties of the layer interfaces (refractors). An interface can only be found if the layer below the interface shows a significantly higher wave speed than the layer above the boundary.

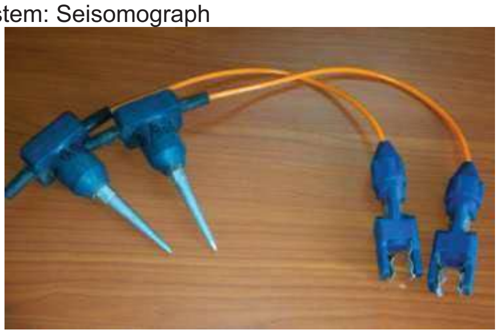
3.2. Equipment Used

The seismic refraction test equipment used on site consists of the following basic components:

(i) Energy Source : 10 kg Sledge hammer with steel impact plate
(ii) Geophones : Twenty four (24) moving-coil type digital grade
(iii) Cables : NK2721C with single takeouts
(iv) Data Acquisition System : Lakkolit 24-M
(v) Processing Software : ZondST2D

The Recording System: Seisomograph


24 Channel Seismic Cable


Geophones

3.3. Data Acquisition

The equipment installation and data acquisition involves the following stages:

a) The seismic line to be surveyed is marked on the ground.

b) Low frequency (10Hz) geophones are used to record seismic signals. Depending on the length available along seismic lines, 24 channels were used for each spread. Care was taken to ensure that the pointed ends (spikes) of the geophones are fully embedded in the topsoil.

c) Each seismic spread typically consists of 7 shots. Line length is computed from first End-of-Line shot to the last End-of-Line shot with two off set shots.

d) For the seismic refraction survey work, a sledge hammer struck vertically on a steel plate was used as the energy source at each shot point to generate P-waves. A starter geophone is installed next to the shot location as “trigger”.

e) A 24-channel seismograph was used to record the field data. The seismograph records the arrival of seismic waves through 24 channels. The seismic waves detected by each geophone are displayed simultaneously on the screen. The seismograph has the signal enhancement or stacking capability.

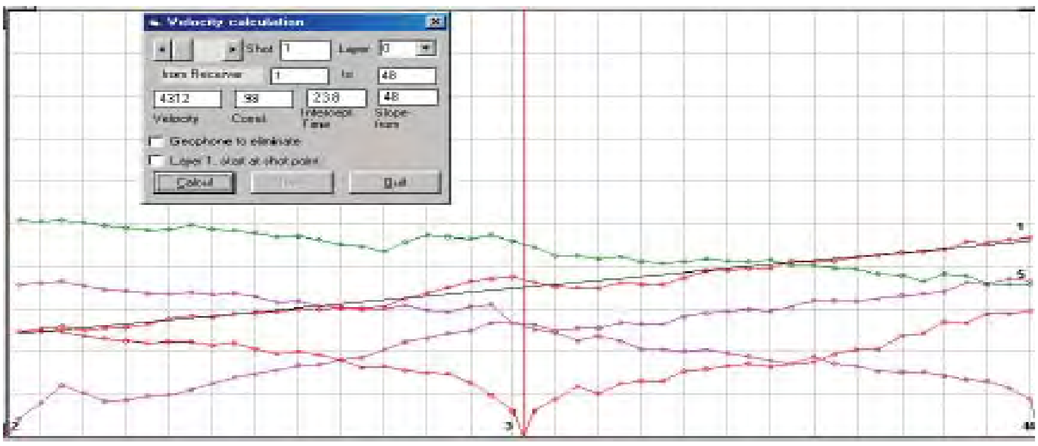
The field data is stored in a laptop attached to the seismograph in SEG-2 format data files. These files are later processed using commercial software’s, as described in the following section.

3.4. Analysis of Data and Interpretation

Raw field data was processed as per the standard industry practice for background noise removal, application of filters and AGC.

After initial processing of raw records, the data were analyzed carefully, and velocities were computed from the travel time picks of P-wave at each measured point. The P-wave velocity hodographs were plotted after processing of all shot gathers. The records were processed and interpreted using ZondST2D software and subsurface models for all profiles were generated.

The near surface velocity models were interpreted as the presence of major stratigraphic layering, based on its characteristics velocity bands.



Typical Travel Time Curves

4. CROSS-HOLE SEISMIC TEST METHODOLOGY

4.1. Basic Concept

The cross-hole seismic test is a down-hole method for providing information on dynamic soil properties for earthquake design analyses for structures, liquefaction potential studies, site development, and dynamic machine foundation design. The investigation determines compression and shear wave velocity profiles versus depth. This data may be used as input into static/dynamic analyses; as a means for computing Shear modulus, Young's modulus, and Poisson's ratio.

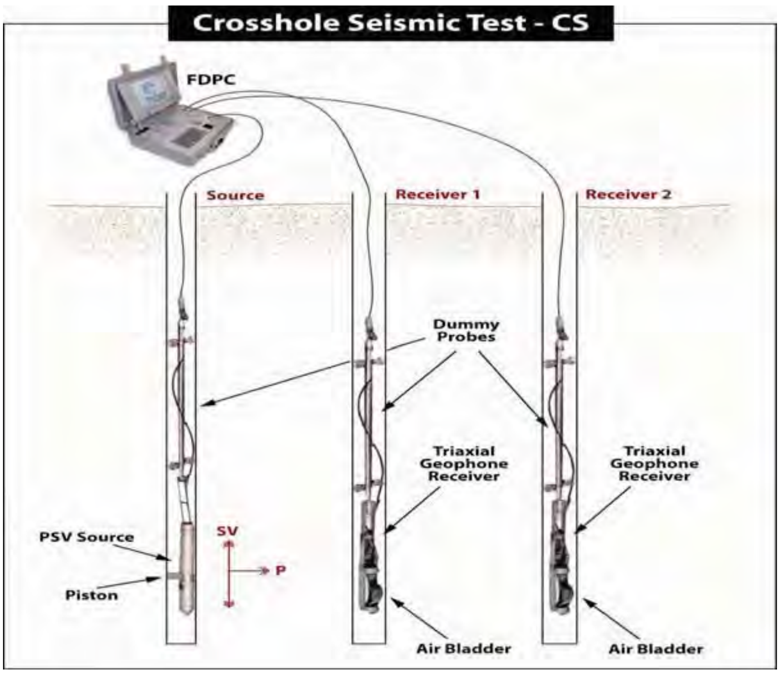
The cross-hole seismic test consists of generation of horizontally traveling P and S-waves at a particular depth/elevation in one borehole (source hole), and recording their arrivals at same level in one or two (preferred) nearby receiver boreholes.

The standard for the test technique is set forth in the ASTM D4428/D4428M-00(1).

4.2. Data Acquisition

Initially, three boreholes (NX size) were drilled to the specified depth of 20.0 m (1 borehole for the source at the centre and 2 boreholes for the receivers in the cardinal directions). The boreholes were progressed using rotary drilling through soil / rock formation was performed using heavy-duty, hydraulic skid–mounted rotary drill rig to the specified depth of 20 m each.

After drilling, all the boreholes were cased with PVC casing, and the annual space between the borehole wall and the casing was properly backfilled using cement-bentonite grout of appropriate density. A schematic diagram of the test arrangement is shown below:



Test Arrangement

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1) American Society for Testing and Materials, "***Standard Test Methods for Cross-hole Seismic Testing***," ASTM D4428-D4428M-00.

The equipment installation and data acquisition involves following stages:

1. The electromagnetic P-SV source is lowered to the measurement depth, and clamped to the casing walls using a pneumatically-activated piston.

2. Orthogonal down-hole sensors (tri-axial geophones) are lowered to the same depth as the source. Dummy slope inclinometer probes are used to maintain correct receiver orientation throughout the investigation.

3. After the desired depth is reached, the bladders attached to each of the receiver geophones are inflated with air so that the geophones are properly clamped onto the casing.

4. All the communication cables in the source and receivers are connected to the Amplifier module of the Data PC, together with the trigger cable.

5. The source is triggered from the surface to generate shear and compression wave energy at depth. Both upward and downward polarized energy is generated for duplicity of data, and to measure shear arrival effectively.

6. The vertical component of the receiver is used to capture the vertically polarized shear waves (SV). The radial component senses the propagating compression waves (P), and the tangential component senses the horizontally-propagating shear waves (SH).

7. The acquisition system records the P-SV source input, as well as the receiver outputs. The seismic waves detected by each geophone are displayed simultaneously on the PC screen.

4.3. Data Processing

The data is stored in the hard disk of the seismograph at the time of data acquisition. The data is transferred to the computer for further processing. The processing involves picking the first arrivals. In case of noisy data, there are intermediate steps of data processing using filters, amplitude corrections, etc.

Velocity calculation is done based on the distance between the source and receiver boreholes. Once wave velocity is calculated, a graph can be assembled to show a velocity profile with depth.

4.4. Calculation of Parameters

The calculations are based on the relationships given in IS: 5249-1992-RA 2010.

The Poisson's Ratio is determined directly from the compression (P) wave and shear (S) wave data. It is expressed by the ratio of transverse strain to longitudinal strain.

$$\mu = \frac{m^2 - 2}{2\,(m^2 - 1)}\ ,\ where\ \ m = \frac{V_P}{V_S}$$

Young's Modulus E is the uniaxial stress-strain ratio. Its dynamic value is expressed by the following equation:

$$E = \rho V p^2\, \frac{(1+\mu)\,(1-2\mu)}{1-\mu}$$

where:

ρ	=	mass density of soil	= (γ/g)
γ	=	bulk density of soil	
V_p	=	P-wave velocity	
μ	=	Poisson's ratio	

The shear modulus G is the stress-strain ratio for simple shear. Its dynamic value is obtained by the following equation:

$$G = \frac{E}{2(1+\mu)} = \rho Vs^2$$

Coefficients of elastic uniform compression (cu), elastic uniform shear (cτ), elastic non-uniform compression (cϕ) and the coefficient of elastic non-uniform shear (cΨ) are given by the following relationships:

$$c_u = 1.13\frac{E}{1-\mu^2}\times\frac{1}{\sqrt{A}}$$ [A = Standard foundation area, taken as 10 m^2]

c_τ = 0.67 to 0.5 c_u (for design purpose, c_τ may be taken equal to 0.6 c_u)

c_ϕ = 3.46 c_τ

c_Ψ = 1.5 c_τ

5. PRESSUREMETER TESTS

5.1. The Probe

The probe consists of an inner membrane or measuring cell and an outer cover or guard cell. The outer cover shall be rubber for testing in soils and shall be reinforced with steel strips for testing in rock.

The probe was calibrated for stiffness and expansion prior to taking up the tests on site. In case the rubber membrane was changed on site, the calibration process had to be repeated.

5.2. Conducting The Test

The pressuremeter probe attached with drilled rod and co-axial cable is lowered in the borehole at the test section level.

The test was carried out by applying pressure in the measuring cell stage-wise in small increments. A pressure differential of 1 bar is maintained between the measuring cell and guard cell. The test was carried out by applying incremental pressure in stages until the limit pressure was reached or the capacity of the probe was reached.

The pressure versus volume curve was corrected for expansion in air and in the pipe to obtain the corrected curve. The limit pressure and modulus of deformation is computed from the corrected curve.

6. GENERALISED SUB-SURFACE CONDITIONS

6.1. Location & Surface Conditions

The project site for the proposed 1x660 MW Bhusawal TPS Unit 6 is located at Pimpri-Sakam Village, Bhusawal Taluk of Jalgaon district in Maharashtra. The site lies at the following location

Latitude : 21° 2'43.87"N
Longitude : 75°50'33.00"E

Based on the test locations, the reduced level across the main plant area ranges from RL 196.96 to RL 218.54 m indicating a level variation of about 21.5 m. The reduced level along the proposed Ash Corridor ranges from RL 261.34 to RL 209.11 m indicating a level variation of more than 50.0 m.

6.2. Regional Geology

Rocks of Satpura ranges are observed in most of the area of the Bhusawal. These are represented by Deccan traps. The Deccan traps are made up principally of the most rocks of basaltic and doleritic composition which are the results of out pouring of enormous lava flows which date back to the Mesozoic era. These are spread out in the form of horizontal sheets of beds. The hill ranges on the south of the Tapi are covered with dark basalt. A few strips of thick alluvium covered land on both sides of the Tapi and its tributaries which probably caused by faulting, it consists of brownish, yellowish, coloured clay and silt with pebbles, gravel, sand and fine drained sand.

The trap gives rise to deep black soil in the Bhusawal region. The sandstone and limestone are also found in the north western portion of Satpuda ranges.

The distinguishing feature is a wide depression of river Tapi and river Purna. The direction of flow of the Tapi has helped in creating as western aspect of the region. This is in contrast to other major rivers in Maharashtra which have created an eastern aspect. The combined rift valley of river Tapi and river Purna is well marked by a prominent scarp in the north of river. The southern face of this scrap shows signs of recession. It can be roughly identified by a line joining Kusumba, Janori and Onabdeo villages. The river Aner a right bank tributary of the Tapi occupies a line of weakness so that it has created an east - west valley. In contrast to this most of other right bank tributaries flow in north-south direction.

The main scarp of the rift valley to the south of the Tapi has been subdued by weathering and erosion, the face of the scarp which marks the southern limit of the Tapi rift can be identified by a line joining the settlement of Nandurbar, Dhule, Parola, Kasoda, Jalgaon and Bhusawal.

Deccan Trap covers almost the whole of Bhusawal and Jalgaon except a few strips of alluvium covered and on both sides of the major streams. These trap rocks are the result of outpouring of enormous Lava flows which spread over vast areas of western. Central and southern India at the end of Mesozoic Era. They came through long narrow fissures and cracks in the earth crust and spread out as nearly horizontal sheets. They are called plate basalt. They are formed by a flat topped plateau. A bore-hole at Bhusawal 1211 feet deep revealed 29 flows the average being 40 feet thick. In the high hills consisting of several flows the individual flows can easily be demarcate by their distinct flow lines during which a thin growth of grass is noticed.

- **JOINTS**

The basaltic rocks are highly weathered at surface and are characterised by few prominent joints. The details of joints are given in the following table:

No	Strike	Dip	Dip Direction	Remarks	Description of Continuties
1	N 325°- N 145°	88°	N 45°	Open joint with the gap of 2.3-3.5 cm filled with clay. Persist for 3-4.m apart.	smooth (planar)
2	N 30°-N 210°	86°	N 100°	Open joint with the gap of 0.5cm filled with clay and weathered material. Persist for 10 to 12m. 2 to 3 m apart.	Rough (Undulating)
3	N 110°-N 290°	73°	N 20°	Open joint with the gap of 1-1.5 cm filled with clay and weathered material. Persist for 7 to 8m, 2 to 3 m apart.	smooth (planar)
4	N 25°-N 205°	56°	N 75°	Open joint with the gap of 1-2 cm filled with clay. Persist for 15 to 18m. 0.5 to 2 m apart.	smooth (planar)
5	N 233°- N127°	44°	N55°	Open joint with the gap of 0.75cm filled with clay and weathered material. Persist for 5 to 7m. 2 to 3 m apart.	Slightly Rough (Planar)

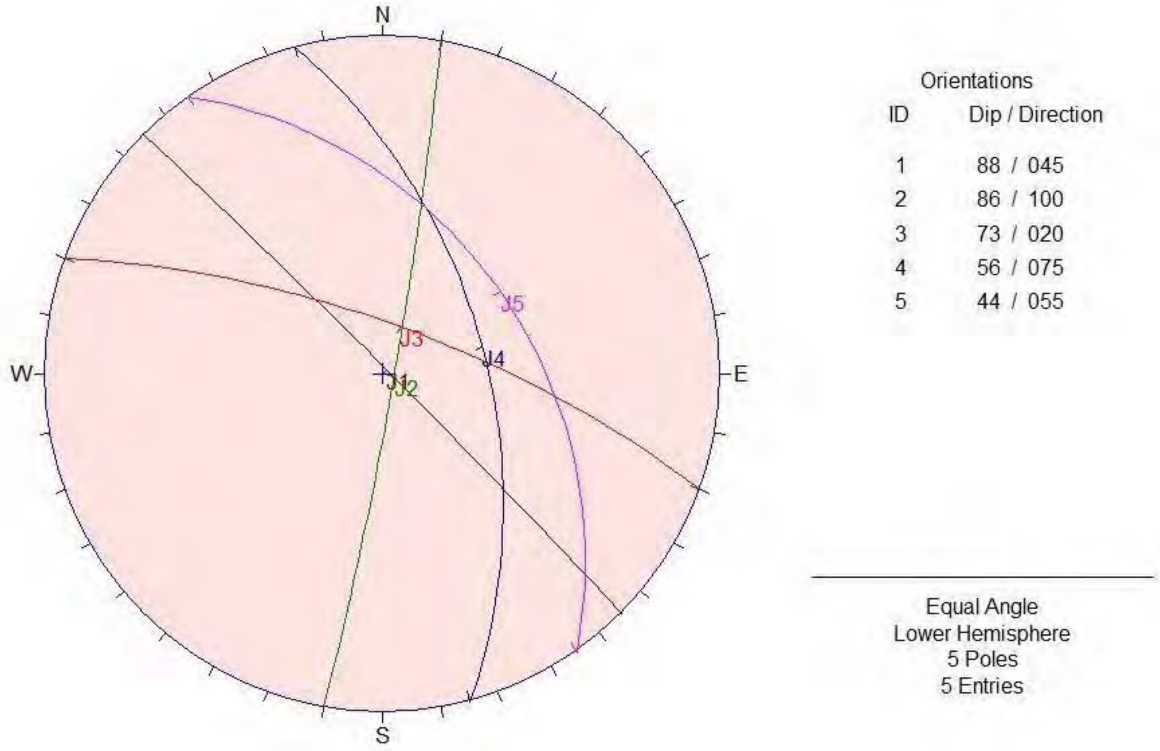

Fig 16: Stereonet plot of joint sets

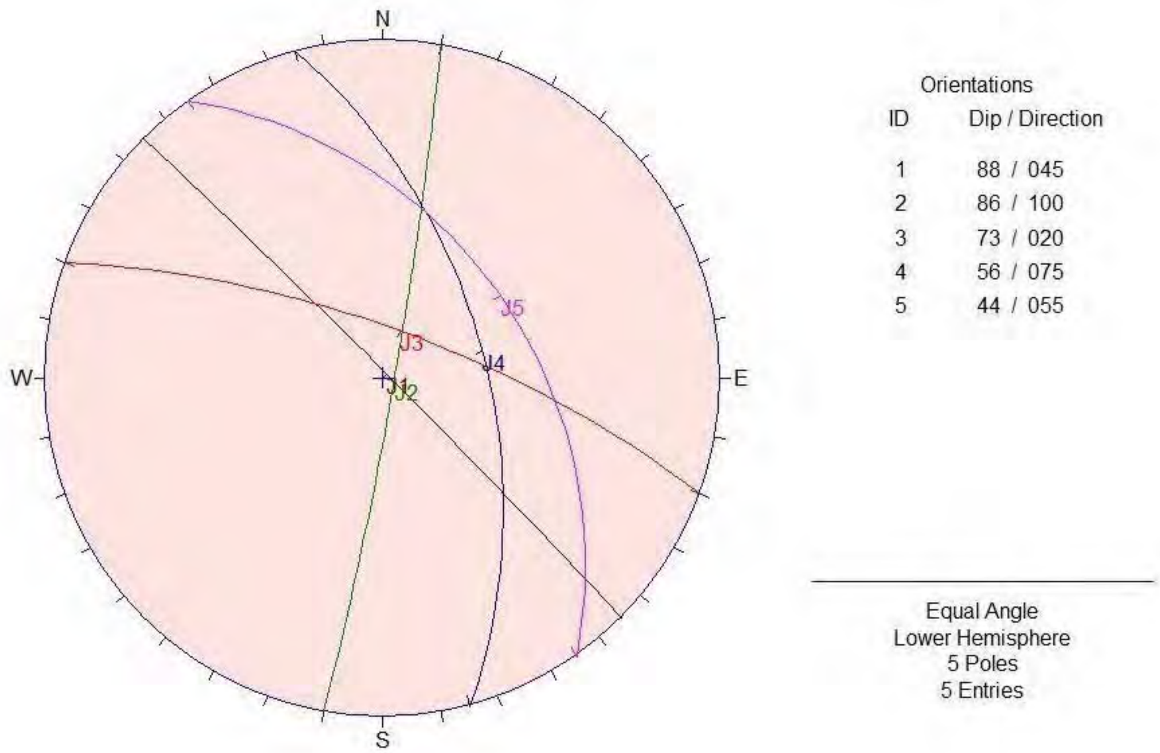

Fig 17: Rosette plot of joint sets

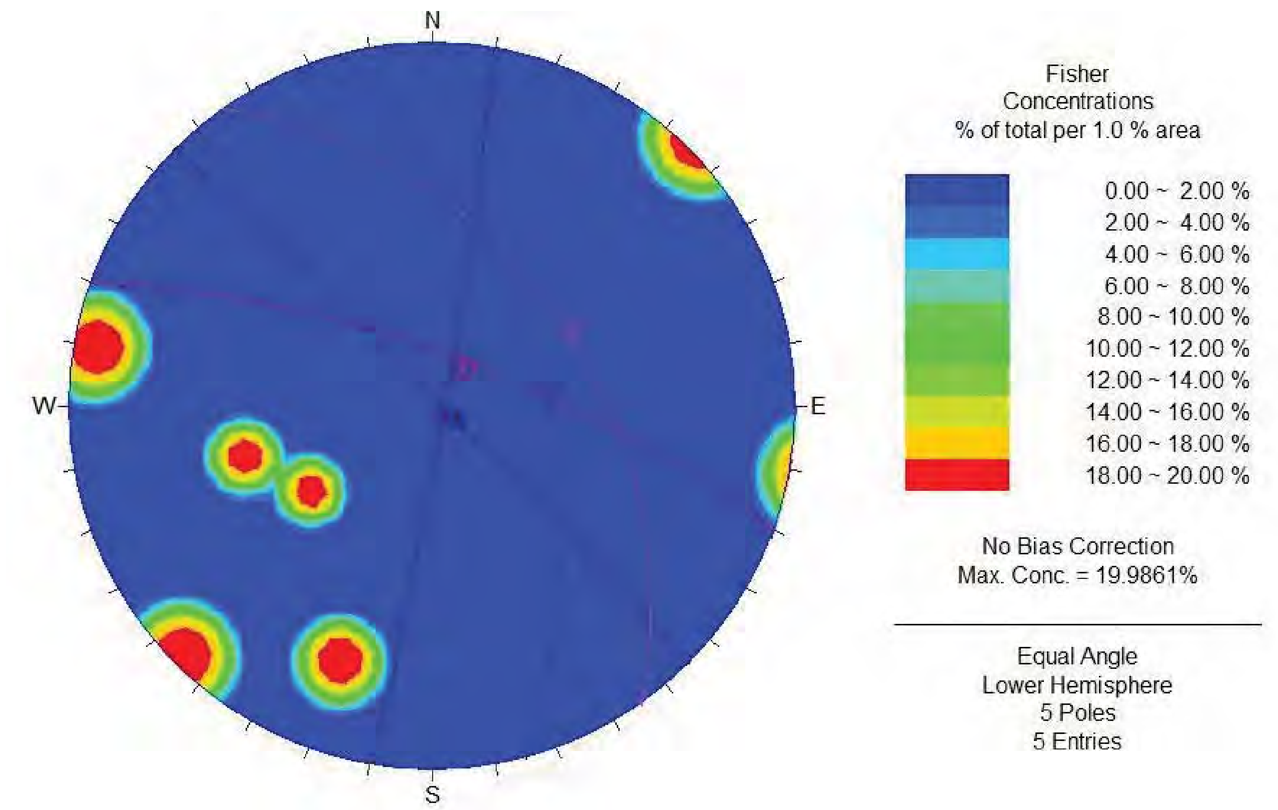

Fig 18: Fisher Concentration for Joint sets observed in rock

- **ASSESSMENT OF BASIC PARAMETERS**

Parameter	Rating (assessed on basis of visual observation at site)
UCS =65.92 MPa	7
RQD ~ 30% to 80 %	12
Spacing~0.5m	10
Condition of discontinuities	10
Ground water	0

Basic RMR = 40

Correction for discontinuity orientation	-20

Corrected RMR = 20

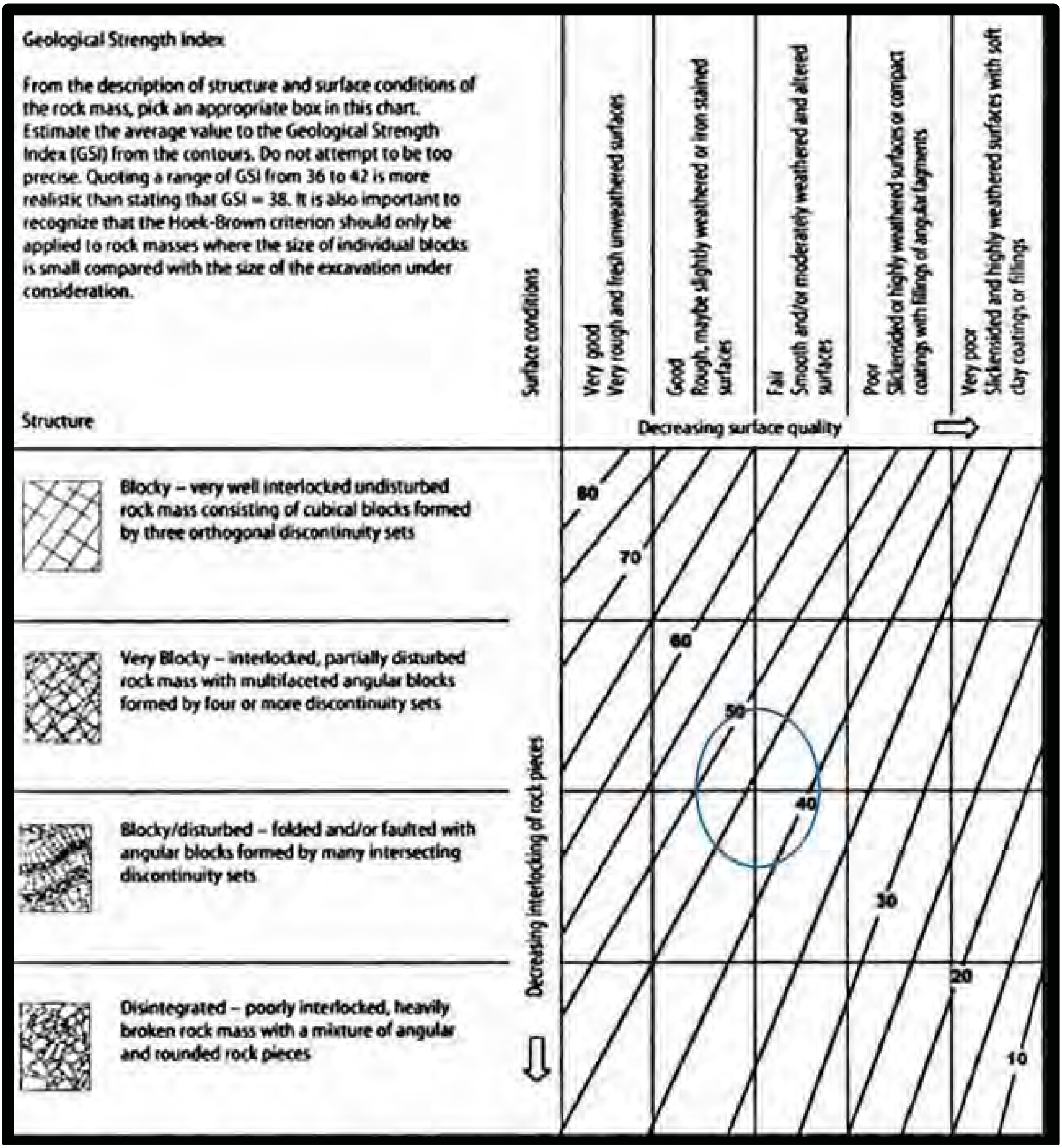

Fig 19: Hoek & Brown Criterion for GSI Index

6.3. Stratigraphy

In general, Black Silty clay (Black Cotton Soil) is encountered at the project site to about 0.2~0.3 m depth underlain by Basalt Rock formation. The liquid limit in soil is range from 41-64% and plasticity index values of 16-37%, indicating medium to high plasticity characteristics. Free swell index values range from 27-52%, indicating low to medium expansive characteristics.

The rock formation encountered at the site generally consists of very weak to strong, very intensely to slightly fractured, completely to slightly weathered Basalt to the maximum explored depth. **Refusal (N>100) was encountered in the shallow weathered rock formation.**

The rock core recovery is generally about 0-27% with 0-13% RQD (RMR 15~20) to about 4.5-6.0 m depth. Below this, core recovery values range from 43-100% with 25-98% RQD, (RMR 26~60) to the maximum explored depth of 25.0 m.

A summary of the borehole profiles is presented on Plates 4 to 24. Detailed description of the materials encountered at the borehole locations are presented on the individual borehole log profiles (*Refer Plates 26 to 139*). Trial Pit sections are presented on Plates 160.

6.4. Groundwater

Based on our measurements in the completed boreholes, groundwater ranges from 2.4-12.7 m depth (RL 255.8-194.3 m) during the period of our field investigation. The measured water levels are indicated in the individual borehole logs.

Fluctuations may occur in the measured water levels due to seasonal variations in rainfall and surface evaporation rates, as well as the level of water in the nearby River Tapi. The highest flood level (HFL) in the river may be considered as the design groundwater level for the purpose of analysis.

6.5. Seismicity

According to Fig.1 of IS: 1893 (Part1)-2016 showing seismic zones, the proposed site falls in earthquake Zone-III.

7. FIELD TEST RESULTS

7.1. Field Permeability Test Results

Ten (10) field permeability tests have been conducted at the site. The test results are summarized below:

S. No.	Location	Borehole Designation	Test Designation	Depth below EGL, m	Coefficient of Permeability ($k \times 10^{-7}$), m/s
1	TRANSFER POINTS	IBH-10	FPT-11	1.5	100.6
2			FPT-12	5.0	241.5
3	PIPE RACK	IBH-11	FPT-13	1.5	100.6
4			FPT-14	5.0	332.3
5	PIPE RACK	IBH-12	FPT-15	1.5	220.8
6			FPT-16	5.0	409.0
7	PIPE RACK	IBH-29	FPT-17	1.5	129.8
8			FPT-18	5.0	254.3
9	WAGON TIPPLER	IBH-32	FPT-19	1.5	237.5
10			FPT-20	5.0	406.3

7.2. Dynamic Cone Penetration Test Results

Eleven (11) dynamic cone penetration tests were performed at the project site. Refusal (N>150) was encountered to about 0.11-0.88 m depth. However at IDCPT-3 & 11, refusal was met at 1-1.68 m depth.

S. No.	Location	Test Designation	Depth below EGL, m		No. of Blows 30 cm Penetration
			From	To	
1	PIPE RACK	IDCPT-1	0.00	0.30	40
			0.30	0.38	150+
2		IDCPT-2	0.00	0.30	38
			0.30	0.32	150+
3		IDCPT-3	0.00	0.60	11-20
			0.60	1.50	41-61
			1.50	1.68	150+
4		IDCPT-4	0.00	0.30	17
			0.30	0.60	42
			0.60	0.63	150+
5	RAIN WATER HARVESTING POND	IDCPT-5	0.00	0.30	18
			0.30	0.36	150+
6	PAY LOADER SHED	IDCPT-6	0.00	0.30	9
			0.30	0.58	150+
7	ASH PIPE CORRIDOR	IDCPT-7	0.00	0.11	150+
8		IDCPT-8	0.00	0.30	12
			0.30	0.60	44
			0.60	0.78	150+
9		IDCPT-9	0.00	0.30	22
			0.30	0.38	150+
10		IDCPT-10	0.00	0.60	4-8
			0.60	0.88	150+
11		IDCPT-11	0.00	0.60	12-20
			0.60	0.90	42
			0.90	1.14	150+

The DCPT tests confirm the presence of rock at shallow depth. The above data matches well with our available boreholes data also. Dynamic cone penetration test results are presented on Plates 162 & 163.

7.3. Electrical Resistivity Test Results

Six (6) electrical resistivity tests were conducted at the project site as per IS: 3043-1987. The tests were conducted using the Wenner's configuration. Depth of electrodes was about 15 to 20 cm in to the ground.

At (IERT-1, 2 & 4) locations, limited space was available for the spread of the electrodes. Therefore, the maximum electrode spacing was less than 10 m. Depending on space availability, the tests were performed in 4 directions only. Mean resistivity values at the electrical resistivity tests (ERT) location are presented on Plates 165 to 176 and summarized below for easy reference:

S. No.	Location	Test Designation	Survey Co-ordinates, m		Mean Resistivity, ohm-m
			E	W	
1	WEIGH BRIDGE FOR DRY ASH SILO	IERT-1	1397 E	1103 N	53.7
2	H.C.S.D. PUMP HOUSE & MCC ROOM	IERT-2	1010 E	691 N	4.4
3	WAGON TIPPLER	IERT-3	1813 E	760 N	3.8
4	WAGON TIPPLER	IERT-4	1829 E	784 N	1.8
5	CHP MCC/CONTROL ROOM	IERT-5	1387 E	936 N	4.1
6	AHP CONTROL ROOM, ASH WATER TANK & ASH SLURRY PUMP HOUSE	IERT-6	1074 E	631 N	6.9

7.4. Field CBR Test Results

Three (3) field CBR tests have been conducted at project site. Details tabulated below:

Test Designation	Survey Co-ordinates, m		Test Depth, m	Field CBR Value, % m
	E	N		
ICBR-1	1736 E	879 N	0.5 (RL 206.9 m)	38.4
ICBR-2	1662 E	825 N	0.5 (RL 207.1 m)	32.9
ICBR-3	1529 E	720 N	0.5 (RL 209 m)	31.9

Laboratory CBR tests (soaked & unsoaked) were conducted as per IS: 2720 (Part 16) – 1987 on samples collected from the site. The samples were remoulded to 95% of the maximum dry density (determined in accordance with the Standard Proctor test, IS: 2720 Part VIII-1983 RA 2010).

A summary of the laboratory Proctor and CBR test results (soaked & unsoaked) is also tabulated below for easy reference:

Test Designation	Standard Proctor Test Results		Laboratory CBR Value	
	MDD*, g/cm^3	OMC**, %	Unsoaked, %	Soaked, %
LCBR-1	1.93	9.5	26.9	16.4
LCBR-2	1.92	9.8	27.5	17.6
LCBR-3	1.95	9.2	30.2	18.2

* Maximum Dry Density ** Optimum Moisture Content

7.5. Plate Load Test Results

7.5.1. Test Results

Six (6) plate load tests have been conducted at project site using a 45 cm size plate at specified depth (*Please refer to Section 1.3 for test details*). The following table summarizes the measured settlements of the plate under different loading intensities:

S. No.	Test Designation	Ultimate Bearing Capacity, q_{ult} (kg/cm^2)	Measured settlement (mm) under applied bearing pressure of			
			20 T/m^2	40 T/m^2	60 T/m^2	80 T/m^2
1	IPLT-1	>8.0	0.16	0.39	0.61	0.94
2	IPLT-2	>8.0	0.49	0.73	1.01	1.39
3	IPLT-3	>8.0	0.33	0.71	1.12	1.50
4	IPLT-4	>8.0	-	-	4.41	5.79
5	IPLT-5	>8.0	1.22	1.87	2.49	3.01
6	ICPLT-1	>8.0	0.47	0.93	1.32	1.90

7.5.2. Interpretation of Plate Load Test Results

The settlement for 5-6 m size foundations has been[2] extrapolated using the following equation as per Clause 8.3 of IS Code: 12070-1987 RA 2010:

$$\frac{S_f}{S_p} = \left[\frac{B_f (B_p + 0.3)}{B_p (B_f + 0.3)} \right]^2$$

where:

S_f = settlement of foundation in mm.
S_p = settlement of test plate in mm
B_f = width of the foundation in m
B_p = width of the plate in m

A multiplying factor of 1.5 has been applied to account for saturation. A multiplying factor of 1.5 has been applied to account for local variations in strata conditions. The following table summarizes the interpreted settlements for large-size foundations bearing at the test level:

(2) Narayan V. Nayak "***Foundation Design Manual***", Page no. 101, Sec-2.7.2.1

S. No.	Test Designation	Subgrade Modulus, kg/cm^3	Estimated Settlement (mm) of foundations under applied bearing pressure of			
			20 T/m^2	40 T/m^2	60 T/m^2	80 T/m^2
1	IPLT-1	6.83	0.9	2.2	3.5	5.3
2	IPLT-2	7.82	2.8	4.1	5.7	7.9
3	IPLT-3	7.82	1.9	4.0	6.3	8.5
4	IPLT-4	7.62	-	-	25.0	32.8
5	IPLT-5	8.02	6.9	10.6	14.1	17.1
6	ICPLT-1	6.45	2.7	5.3	7.5	10.8

The safe bearing capacity for design of foundations cannot be directly interpreted from the test results. The final values of safe bearing capacity for foundation design should be selected in conjunction with borehole and other field data.

It may be seen that for foundations on rock, the settlement is expected to be less than 5-10 mm under a bearing pressure of 40-60 T/m^2. The final values of safe bearing capacity for foundation design should be selected in conjunction with borehole and other field data.

7.6. Cross-Hole Seismic Test Results

7.6.1. Presentation of Results

CHST test results are presented on Plates 188 to 195. This includes a table summarizing the test results and graphical plots of measured wave velocities and computed dynamic soil parameters. A pictorial summary of the borehole logs is illustrated next to the test results for easy reference.

7.6.2. Discussion of Test Results

Test Designation	Depth, m		Shear wave velocity (V_s), m/s		Compression wave velocity (V_p), m/s		Poisson's Ratio, μ	Dynamic Young Modulus, E (MPa)	Dynamic Shear Modulus, G (MPa)
	From	To	Measured	Design Value	Measured	Design Value			
ICST-1	0	12	704-794	760	1390-1545	1450	0.32	4000	1500
	12	20	998-1281	1150	1940-2409	2100	0.31	8000	3000

Test Designation	Depth, m		Shear wave velocity (V_s), m/s		Compression wave velocity (V_p), m/s		Poisson's Ratio, μ	Dynamic Young Modulus, E (MPa)	Dynamic Shear Modulus, G (MPa)
	From	To	Measured	Design Value	Measured	Design Value			
ICST-2	0	6	661-835	700	1312-1658	1350	0.33	3500	1400
	6	13.5	987-1268	1100	1918-2465	2100	0.32	9000	3000
	13.5	20	1450-1821	1600	2763-3407	3000	0.31	18000	7000

Since the cross-hole seismic tests completed on site are low-strain methods, the dynamic soil parameters computed here correspond to very low strains. However, actual design strains on the site are usually much higher (often in the range of 2~3%); particularly for earthquake conditions. Hence, the design dynamic parameters should be selected carefully as per the anticipated strain levels[(3)].

7.6.3. Selection of Dynamic Parameters

The selection of dynamic parameters must be done based on the project specifications, as well as the general guideline given in IS 5249:1992.

As per IS 5249:1992 (Clause 9.0), the value of dynamic shear modulus, G, is affected by a number of parameters; out of which confining pressure, shear strain amplitude, and relative density are most important. In the range of strains associated with properly designed machine foundations, the effect of variation in strain on shear modulus is small and the values of G for design purposes may be determined from the in-situ test values using the relation given below:

$$\frac{G_1}{G} = \left(\frac{\sigma_{01}}{\sigma_0}\right)^m$$

where:

G_1 and G = Dynamic shear modulus for the prototype and from field test, respectively

σ_{01} and σ_0 = Mean effective confining pressure, associated with the prototype foundation and the in-situ test, respectively, and

m = Constant depending upon the type of soil/rock, shape of grains, etc.

IS: 5249 states that in situations where high strain levels are associated (as in the case of analysis for earthquake conditions), the effect of strain level shall be considered along with that of confining pressure. In such a case, the values of G from different field tests may first be reduced to the same confining pressure (expected below the footing) and their variation with strain levels may be studied to arrive at an appropriate value corresponding to the expected strain level (3).

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(3) Steven L. Kramer (1996), "***Geotechnical Earthquake Engineering***", Pearson Education, Inc., Section 6.4, pp. 232-238.

The four parameters (C_u, C_τ , C_ϕ and C_Ψ) are highly dependent on strain levels. Keeping this in view, we suggest that a range of ± 20 percent of the above values be used for design. The higher values of these coefficients may be used for machines having an operating frequency higher than that of the machine-foundation-soil system. Similarly, the lower values of the coefficients may be used for machines operating at frequency that is lower than that of the system.

7.7. Pressuremeter Test Results

Pressuremeter test results are presented on Plates 196 to 214 and also summarised below for easy reference:

Location	PMT Designation	Test Depth, m	Limit Pressure, P_L, kg/cm^2	Deformation Modulus Em, MPa
Wagon Tippler	IPMT-1	2	29.4	68
		4	54.4	150
		6	77.5	1925
		8	78.5	2133
		10	79.6	2779
		12	79.6	2018
		15	75.6	1394
		18	77.6	2093
		20	79.6	2382
Coal Pipe Run Off Pound	IPMT-2	2	49.4	139
		4	44.4	118
		6	52.4	148
		8	59.4	216
		10	52.4	152
		12	76.6	1298
		15	79.6	2021
		18	79.6	2478
		20	79.6	2444

8. LIQUEFACTION SUSCEPTIBILITY ASSESSMENT

8.1. General

As per IS: 1893-2016, liquefaction is defined as a state in which the shear strength of primarily saturated cohesionless soils become negligible during earthquake shaking. In this condition, the soil tends to behave like a fluid mass.

Depending on the degree of susceptibility to liquefaction, of the subsoil at the site, in the event of an earthquake, the structure may either not be affected as no liquefaction occurs, or may undergo large settlements due to partial liquefaction, or else there may be a complete loss of the shear strength of the soil leading to a collapse of the super structure.

8.2. Assessment as per IS code

The following points are noted for the soils encountered at the site, with reference to the liquefaction susceptibility assessment:

1. According to Fig.1 of IS: 1893 (Part1)-2016 showing seismic zones the proposed site falls in earthquake Zone-III.

2. For project sites located in Zone-III, IV & V, saturated sands with corrected SPT (N') values less than 15 up to 5 m depth and less than 25 below 10 m depth may liquefy in the event of an earthquake.

3. **Since Basalt (Rock) is encountered at the site from EGL, the project site is not prone to liquefaction in the event of an earthquake.**

9. GEOTECHNICAL ANALYSIS

9.1. Foundation Type & Depth

Type of foundation to be adopted for a particular structure depends upon the loading intensity at the foundation level and the configuration of loading points. Following points are highlighted so that adequate steps can be taken during foundation planning and construction to ensure that the foundation performance on site is as per design.

- As discussed in Section 6.3, Black Cotton Soil was encountered at the site to about 0.2~0.3 m depth underlain by Basalt Rock. Reviewing the stratigraphy of the site, we are of opinion that **open foundations are a feasible foundation scheme to support the various facilities planned at the project site. Our suggested net allowable bearing pressures for open foundations bearing on rock formation at 1.0-6.0 m depth below EGL or FGL (*whichever is lower*) are presented in Section 9.3.**

- Since groundwater was met at 1.0-12.7 m depth (RL 225.8-191.0 m) depth below EGL, temporary excavations for foundation construction may require dewatering. Dewatering may be carried out on site by using a properly designed dewatering system.

9.2. Method of Analysis (Open Foundations)

Following criterion have been considered for evaluating the bearing capacity values:

i. Based on Rock Mass Rating (RMR) value as per Clause 5.3 of IS: 12070

Analysis has been carried out using the RMR also known as Geo-mechanics classification [(4)] by considering classification parameters and their ratings. Depending upon the quality of rock as assessed from the RMR values, the net safe allowable bearing pressures are specified in IS: 12070.

ii. Based on Laboratory Core Strength Results as per Clause 6.2 of IS 12070.

The average uniaxial compressive strength of rock core has to be multiplied by an empirical coefficient (as given in Table 4 and Fig. 1) summarized below:

Spacing of Discontinuities, cm	N_j
300	0.4
100-300	0.25
30-100	0.1

Reduction factors are applied on the obtained net allowable bearing pressures for saturation and orientation of joints. The minimum value determined from the above two criterions, has been taken as the final net allowable bearing pressure.

9.3. Recommended Net Allowable Bearing Pressures

The following table presents our recommended net allowable bearing pressures for the various facilities planned at the site:

Location	Borehole Designation	Average Ground Level, (RL) m	Finished Ground Level, (RL) m as per Dwg no. PE-DG-415-602-C001-R02	Foundation embedment depth, m		Founding Level (RL), m	Recommended Net Allowable Bearing Pressure, T/m^2 *(for Isolated, Strip & Raft)*
				Below EGL	Below FGL		
HCSS Silo	IBH-1	205.4	206.5	1	2.1	204.4	25
				2	3.1	203.4	30
				3	4.1	202.4	35
				4	5.1	201.4	40
				5	6.1	200.4	50
Dry Ash Silo	IBH-2	207.5	206.5	1.5	0.5	206	25
				2	1	205.5	30
				3	2	204.5	35
				4	3	203.5	45
				5	4	202.5	55

(4) Bieniawski, Z.T (1989). **"Engineering Rock Mass Classifications"**, *A Complete Manual for Engineers and Geologists in Mining, Civil & Petroleum Engineering*, John Wiley Publication, New York.

Location	Borehole Designation	Average Ground Level, (RL) m	Finished Ground Level, (RL) m as per Dwg no. PE-DG-415-602-C001-R02	Foundation embedment depth, m		Founding Level (RL), m	Recommended Net Allowable Bearing Pressure, T/m^2 *(for Isolated, Strip & Raft)*
				Below EGL	Below FGL		
HCSD Pump House & MCC Room	IBH-3	205	208	1	4	204	25
				2	5	203	30
				3	6	202	35
				4	7	201	40
				5	8	200	50
AHP Compressors & Blowers	IBH-4	204.6	208.5	1	4.9	203.6	25
				2	5.9	202.6	30
				3	6.9	201.6	35
				4	7.9	200.6	45
				5	8.9	199.6	55
Mill Reject Silo	IBH-5	206.1	208.5	1	3.4	205.1	30
				2	4.4	204.1	35
				3	5.4	203.1	40
				4	6.4	202.1	50
				5	7.4	201.1	60
Crusher House	IBH-6 & IBH-7	204.6	208	1	4.4	203.6	30
				2	5.4	202.6	35
				3	6.4	201.6	40
				4	7.4	200.6	50
				5	8.4	199.6	60
Wagon Tippler	IBH-8, IBH-9 & IBH-32	207.4	208	1	1.6	206.4	30
				2	2.6	205.4	35
				3	3.6	204.4	40
				4	4.6	203.4	50
				5	5.6	202.4	60
Transfer Points	IBH-10	207	208	1	2	206	30
				2	3	205	35
				3	4	204	45
				4	5	203	55
				5	6	202	60
	IBH-15	207	208.5	1	2.5	206	30
				2	3.5	205	35
				3	4.5	204	45
				4	5.5	203	55
				5	6.5	202	60

Location	Borehole Designation	Average Ground Level, (RL) m	Finished Ground Level, (RL) m as per Dwg no. PE-DG-415-602-C001-R02	Foundation embedment depth, m		Founding Level (RL), m	Recommended Net Allowable Bearing Pressure, T/m² *(for Isolated, Strip & Raft)*
				Below EGL	Below FGL		
Near Pent House	IBH-11 & IBH-18	207.4	-	1	-	206.4	30
				2		205.4	35
				3		204.4	40
				4		203.4	45
				5		202.4	55
Drive House for Staker Reclaimer	IBH-12	210.3	-	1	-	209.3	30
				2		208.3	35
				3		207.3	40
				4		206.3	45
				5		205.3	50
Crushed Coal Storage Area	IBH-13	208.3	-	1	-	207.3	30
				2		206.3	35
				3		205.3	40
				4		204.3	45
				5		203.3	50
Stacker Reclaimer	IBH-14	207	208	1	2	206	30
				2	3	205	35
				3	4	204	40
				4	5	203	45
				5	6	202	55
Mill & Bunker Area	IBH-16 & IBH-22	207	-	1	-	206	30
				2		205	35
				3		204	42
				4		203	50
				5		202	60
Tube Settler Plant	IBH-17	206	206.5	1	1.5	205	30
				2	2.5	204	35
				3	3.5	203	40
				4	4.5	202	45
				5	5.5	201	55
Near CHP MCC Control Room	IBH-19	208.7	-	1	-	207.7	30
				2		206.7	35
				3		205.7	42
				4		204.7	50
				5		203.7	60

Location	Borehole Designation	Average Ground Level, (RL) m	Finished Ground Level, (RL) m as per Dwg no. PE-DG-415-602-C001-R02	Foundation embedment depth, m		Founding Level (RL), m	Recommended Net Allowable Bearing Pressure, T/m² *(for Isolated, Strip & Raft)*
				Below EGL	Below FGL		
Coal Conveyer Gallery	IBH-20 & IBH-21	208	-	1	-	207	30
				2		206	35
				3		205	40
				4		204	45
				5		203	55
CHP MCC / Control Room Room	IBH-23	205.1	208	1	3.9	204.1	30
				2	4.9	203.1	35
				3	5.9	202.1	45
				4	6.9	201.1	55
				5	7.9	200.1	65
Dry Ash Silo Utility	IBH-24	206	208	1	3	205	30
				2	4	204	35
				3	5	203	40
				4	6	202	50
				5	7	201	60
FOPH Foam Shed	IBH-25	207.3	-	1	-	206.3	30
				2		205.3	35
				3		204.3	40
				4		203.3	45
				5		202.3	55
Road Near ESP Inlet	IBH-26	206.1	-	1	-	205.1	30
				2		204.1	35
				3		203.1	42
				4		202.1	50
				5		201.1	60
Pipe Rack Near Proposed RCC Box Culvert	IBH-27 to IBH-29	207.8	-	1	-	206.8	25
				2		205.8	30
				3		204.8	35
				4		203.8	40
				5		202.8	50
Coal Pipe Run off Pond	IBH-31	205.8	208	1.5	3.7	204.3	30
				2	4.2	203.8	35
				3	5.2	202.8	45
				4	6.2	201.8	55
				5	7.2	200.8	65

Location	Borehole Designation	Average Ground Level, (RL) m	Finished Ground Level, (RL) m as per Dwg no. PE-DG-415-602-C001-R02	Foundation embedment depth, m		Founding Level (RL), m	Recommended Net Allowable Bearing Pressure, T/m^2 *(for Isolated, Strip & Raft)*
				Below EGL	Below FGL		
ASH PIPE CORRIDOR	IBH-30	209.1	-	1	-	208.1	25
				2		207.1	30
				3		206.1	35
				4		205.1	40
ASH PIPE CORRIDOR	IBH-33	213.9	-	1	-	212.9	25
				2		211.9	30
				3		210.9	35
				4		209.9	40
ASH PIPE CORRIDOR	IBH-34	217.7	-	1	-	216.7	25
				2		215.7	30
				3		214.7	35
				4		213.7	40
ASH PIPE CORRIDOR	IBH-35	220.4	-	1	-	219.4	30
				2		218.4	35
				3		217.4	40
				4		216.4	45
ASH PIPE CORRIDOR	IBH-36	218.6	-	1	-	217.6	30
				2		216.6	35
				3		215.6	40
				4		214.6	45
ASH PIPE CORRIDOR	IBH-37	220.2	-	1	-	219.2	25
				2		218.2	35
				3		217.2	40
				4		216.2	45
ASH PIPE CORRIDOR	IBH-38	223.5	-	1	-	222.5	30
				2		221.5	35
				3		220.5	40
				4		219.5	45
ASH PIPE CORRIDOR	IBH-39	222.8	-	1	-	221.8	30
				2		220.8	35
				3		219.8	40
				4		218.8	45

Location	Borehole Designation	Average Ground Level, (RL) m	Finished Ground Level, (RL) m as per Dwg no. PE-DG-415-602-C001-R02	Foundation embedment depth, m		Founding Level (RL), m	Recommended Net Allowable Bearing Pressure, T/m^2 *(for Isolated, Strip & Raft)*
				Below EGL	Below FGL		
ASH PIPE CORRIDOR	IBH-40	221.9	-	1	-	220.9	30
				2		219.9	35
				3		218.9	40
				4		217.9	45
ASH PIPE CORRIDOR	IBH-41	223.0	-	1	-	222.0	30
				2		221.0	35
				3		220.0	40
				4		219.0	45
ASH PIPE CORRIDOR	IBH-42	222.3	-	1	-	221.3	30
				2		220.3	35
				3		219.3	40
				4		218.3	45
ASH PIPE CORRIDOR	IBH-43	223.0	-	1	-	222.0	30
				2		221.0	35
				3		220.0	42
				4		219.0	50
ASH PIPE CORRIDOR	IBH-44	223.0	-	1	-	222.0	30
				2		221.0	35
				3		220.0	40
				4		219.0	45
ASH PIPE CORRIDOR	IBH-45	224.6	-	1	-	223.6	25
				2		222.6	30
				3		221.6	35
				4		220.6	40
ASH PIPE CORRIDOR	IBH-46	226.3	-	1	-	225.3	25
				2		224.3	30
				3		223.3	35
				4		222.3	40
ASH PIPE CORRIDOR	IBH-47	225.2	-	1	-	224.2	30
				2		223.2	35
				3		222.2	40
				4		221.2	45

Location	Borehole Designation	Average Ground Level, (RL) m	Finished Ground Level, (RL) m as per Dwg no. PE-DG-415-602-C001-R02	Foundation embedment depth, m		Founding Level (RL), m	Recommended Net Allowable Bearing Pressure, T/m^2 *(for Isolated, Strip & Raft)*
				Below EGL	Below FGL		
ASH PIPE CORRIDOR	IBH-48	225.0	-	1	-	224.0	30
				2		223.0	35
				3		222.0	40
				4		221.0	45
ASH PIPE CORRIDOR	IBH-49	225.0	-	1	-	224.0	20
				2		223.0	25
				3		222.0	30
				4		221.0	35
ASH PIPE CORRIDOR	IBH-50	227.5	-	1	-	226.5	25
				2		225.5	30
				3		224.5	35
				4		223.5	40
ASH PIPE CORRIDOR	IBH-51	242.4	-	1	-	241.4	25
				2		240.4	30
				3		239.4	35
				4		238.4	40
ASH PIPE CORRIDOR	IBH-52	235.4	-	1	-	234.4	25
				2		233.4	30
				3		232.4	35
				4		231.4	40
ASH PIPE CORRIDOR	IBH-53	238.3	-	1	-	237.3	30
				2		236.3	35
				3		235.3	42
				4		234.3	50
ASH PIPE CORRIDOR	IBH-54	240.0	-	1	-	239.0	25
				2		238.0	30
				3		237.0	35
				4		236.0	40
ASH PIPE CORRIDOR	IBH-55	242.4	-	1	-	241.4	30
				2		240.4	35
				3		239.4	42
				4		238.4	50

Location	Borehole Designation	Average Ground Level, (RL) m	Finished Ground Level, (RL) m as per Dwg no. PE-DG-415-602-C001-R02	Foundation embedment depth, m		Founding Level (RL), m	Recommended Net Allowable Bearing Pressure, T/m^2 *(for Isolated, Strip & Raft)*
				Below EGL	Below FGL		
ASH PIPE CORRIDOR	IBH-56	244.8	-	1	-	243.8	30
				2		242.8	35
				3		241.8	42
				4		240.8	50
ASH PIPE CORRIDOR	IBH-57	246.5	-	1	-	245.5	30
				2		244.5	35
				3		243.5	40
				4		242.5	45
ASH PIPE CORRIDOR	IBH-58	249.6	-	1	-	248.6	30
				2		247.6	35
				3		246.6	42
				4		245.6	50
ASH PIPE CORRIDOR	IBH-59	255.6	-	1	-	254.6	30
				2		253.6	35
				3		252.6	42
				4		251.6	50
ASH PIPE CORRIDOR	IBH-60	261.2	-	1	-	260.2	25
				2		259.2	35
				3		258.2	42
				4		257.2	50
ASH PIPE CORRIDOR	IBH-61	260.4	-	1	-	259.4	25
				2		258.4	35
				3		257.4	42
				4		256.4	50
ASH PIPE CORRIDOR	IBH-62	255.4	-	1	-	254.4	25
				2		253.4	35
				3		252.4	42
				4		251.4	50
ASH PIPE CORRIDOR	IBH-63	260.0	-	1	-	259.0	25
				2		258.0	35
				3		257.0	42
				4		256.0	50

Location	Borehole Designation	Average Ground Level, (RL) m	Finished Ground Level, (RL) m as per Dwg no. PE-DG-415-602-C001-R02	Foundation embedment depth, m		Founding Level (RL), m	Recommended Net Allowable Bearing Pressure, T/m² *(for Isolated, Strip & Raft)*
				Below EGL	Below FGL		
ASH PIPE CORRIDOR	IBH-64	261.3	-	1	-	260.3	25
				2		259.3	35
				3		258.3	42
				4		257.3	50
ASH PIPE CORRIDOR	IBH-65	253.9	-	1	-	252.9	30
				2		251.9	35
				3		250.9	40
				4		249.9	45
ASH PIPE CORRIDOR	IBH-66	253.1	-	1	-	252.1	30
				2		251.1	35
				3		250.1	42
				4		249.1	50
ASH PIPE CORRIDOR	IBH-67	255.1	-	1	-	254.1	30
				2		253.1	35
				3		252.1	42
				4		251.1	50
ASH PIPE CORRIDOR	IBH-68	251.0	-	1	-	250.0	30
				2		249.0	35
				3		248.0	40
				4		247.0	45
ASH PIPE CORRIDOR	IBH-69	252.6	-	1	-	251.6	30
				2		250.6	35
				3		249.6	42
				4		248.6	50
ROB	BH-70	207.6	-	1.1	-	206.5	30
				2.1		205.5	35
				3.1		204.5	42
				4.1		203.5	50
ROB	BH-71	208.4	-	1.2	-	207.2	30
				2.2		206.2	35
				3.2		205.2	42
				4.2		204.2	50

Location	Borehole Designation	Average Ground Level, (RL) m	Finished Ground Level, (RL) m as per Dwg no. PE-DG-415-602-C001-R02	Foundation embedment depth, m		Founding Level (RL), m	Recommended Net Allowable Bearing Pressure, T/m² *(for Isolated, Strip & Raft)*
				Below EGL	Below FGL		
ROB	BH-72	209.9	-	1	-	208.9	30
				2		207.9	35
				3		206.9	42
				4		205.9	50
ROB	BH-73	209.9	-	1.1	-	208.8	30
				2.1		207.8	35
				3.1		206.8	42
				4.1		205.8	50

The following points are highlighted with reference to the recommended net allowable bearing pressures:

1. The above net allowable bearing pressures include a bearing capacity safety factor of 3.0 and corresponds to a permissible settlement of 12 mm.

2. Net allowable bearing pressures for foundations at intermediate depths may be interpolated linearly between the values given above.

3. For foundations resting on rock, the variation of SBC with the foundation size is insignificant. Hence, the above recommended net allowable bearing pressures may be used for the design of any open foundation (*Isolated, Strip or Raft*).

4. No foundations shall be placed on Black Cotton Soil.

5. Foundation bearing on rock shall be embedded at least 50 cm into rock formation to ensure adequate anchorage. We suggest as follows:

    a. In case loose soil or rock fragments are observed during excavation below the founding level, it should be replaced by lean concrete.
    b. All loose, disturbed, weathered or fragmented rock should be removed so that foundations may bear on the undisturbed natural rock.
    c. The rock surface should be roughened and scarified so as to ensure a proper bond between rock and concrete.

6. The net allowable bearing pressure given above are for foundations placed at minimum specified founding level subjected to seating of atleast 0.5 m in to rock formation.

7. Some foundations may be placed on backfill adjoining major foundations.
    a. Lightly-loaded footings of minor facilities may bear on the properly compacted backfill at a depth of at least 1 m below the FGL.

8. Modulus of sub grade reaction (k) as obtained from the plate load test are presented in Section 7.5.2.

9.4. Foundation Level Preparation

For foundations on rock, all loose, weathered or fragmented rock should be removed so that foundations may bear on the natural undisturbed rock formation. The rock surface should be roughened, scarified and watered thoroughly to ensure proper bond between rock and concrete. The foundations should be seated at least 0.5 m into the rock formation.

The surface should then be protected from disturbances due to construction activities so that the foundations may bear on the natural undisturbed ground. We recommend the placement of minimum 50 mm thick “blinding layer” of lean concrete to facilitate placement of reinforcing steel and to protect the soils from disturbance.

9.5. Suitability of soils encountered at site as Backfill Material

The soils encountered at the project site at shallow depths (*to about 0.3 m depth from NGL*) are not suitable for the purpose of backfilling as these are low to medium expansive in nature. Underlain soil / soft / weathered rock may be used for filling / backfilling after confirmation of its suitability on site by conducting relevant laboratory tests.

9.6. Chemical Attack

The results indicate that the soils contain 0.41-0.46 percent sulphates and 0.44-0.53 percent chlorides. The groundwater contains 111-132 mg / litre of sulphates and 12-15 mg / litre of chlorides. The pH value of soil is 7.2-7.9 and that of groundwater is 7.0-7.6.

IS: 456-2000 recommends that precautions should be taken against chemical degradation of concrete if

- sulphates content of the soils exceeds 0.2 percent, or
- groundwater contains more than 300 mg /litre of sulphates (SO_3).

Comparing the test results with these specified limits, the sulphate content of the groundwater is within the specified limit. Therefore, strata at the site may be treated in **Class-1** category as described on IS: 456-2000.

10. Summary of Principal Findings

M/s G S GEOENVIRONS PVT. LTD. has carried out the geotechnical investigation for the proposed 1x660 mw Bhusawal TPS Extn. Unit – 6. The following are our principal findings and recommendations:

- **Site Stratigraphy**: In general, low to medium expansive Black Silty clay (Black Cotton Soil) is encountered at the project site to about 0.2~0.3 m depth underlain by Basalt Rock formation. (*Refer to Section 6.3*)

- **Groundwater**: Groundwater ranges from 2.4-12.7 m depth (RL 255.8-194.3 m) during the period of our field investigation. The measured water levels are indicated in the individual borehole logs. (*Refer to Section 6.4*)

- **Field Permeability Test Results**: The coefficient of permeability (k) across the site ranges from 100.6 - 409 x 10^{-7} m/s in the fractured rock formation. (*Refer to Section 7.1*)

- **Dynamic Cone Penetration Test Results**: Refusal (N>150) was encountered to about 0.11-0.88 m depth. The DCPT tests confirm the presence of rock at shallow depth. The above data matches well with our available boreholes data also. (*Refer to Section 7.2*)

- **Electrical Resistivity Test Results**: The mean resistivity values ranges from 1.8-53.7 ohm-m (*Refer to Section 7.3*)

- **Field CBR Test Results**: The field CBR values ranges from 31.9-38.4 %. Corresponding Unsoaked and Soaked laboratory CBR values range from 26.9-30.2 % and 16.4-18.2 % respectively (*Refer to Section 7.4*).

    - Reviewing the test results, we suggest that a soaked CBR value of 15% be used for design of internal plant roads placed on cutting soil.
    - For roads placed on filling, soaked Laboratory CBR test should be carried out on selected samples in order to determine the appropriate CBR value for the design of internal plant roads.

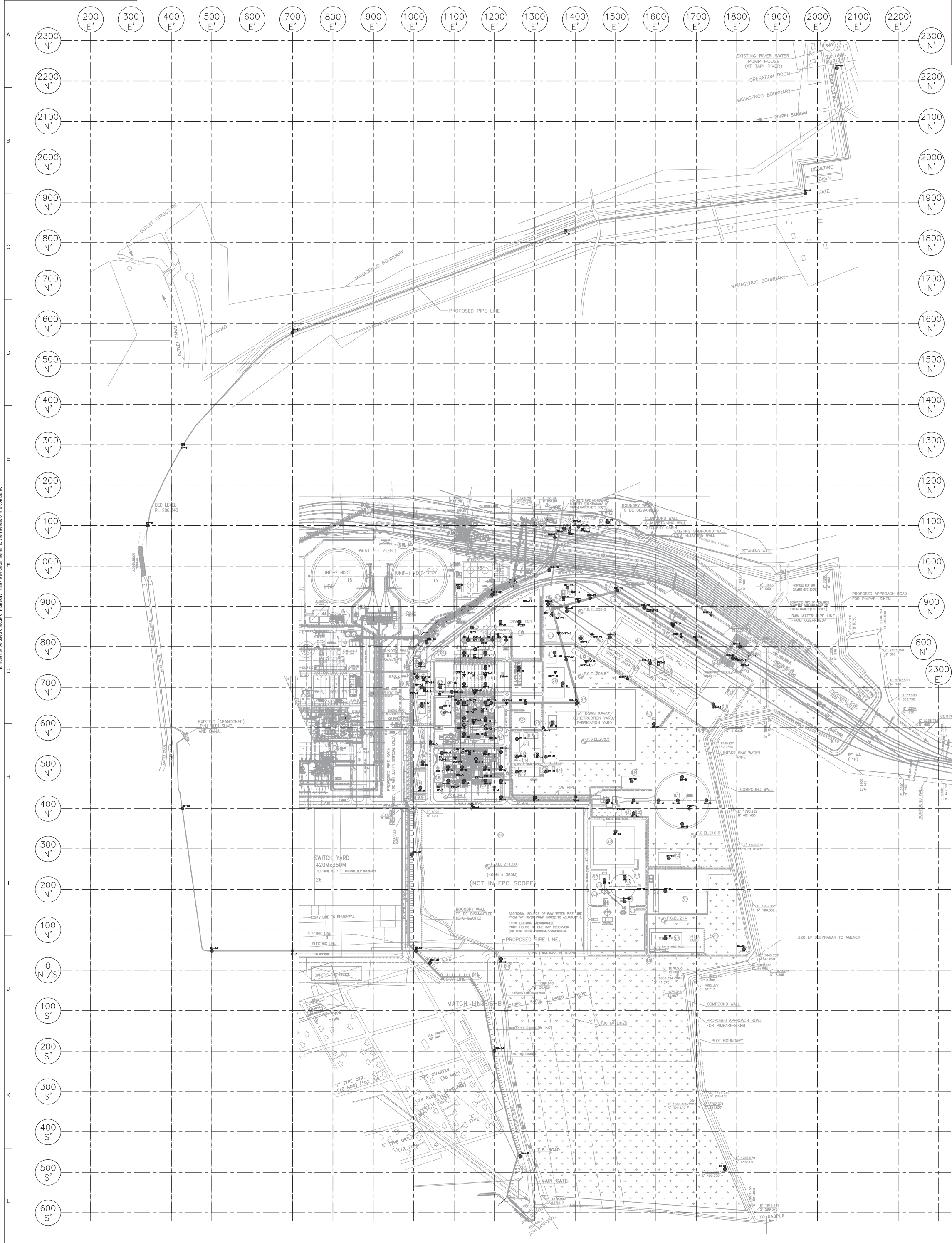
- **Plate Load Test Results**: Based on the tests carried out on the site, the ultimate bearing capacity of plate exceeds 8.0 kg/cm^2. The evaluated modulus of subgrade reaction ranges from 6.45-8.02 kg/cm^3 (*Refer to Section 7.5*)

- **Cross-Hole Seismic Test Results:** The CHST test results are discussed in Section 7.6.2 and presented on Plates 187 to 195. This includes a table summarizing the test results and graphical plots of measured wave velocities and computed dynamic soil parameters.

- **Pressure-meter Test Results**: The PMT results (limit pressure and deformation modulus) are tabulated in Section 7.7 and presented on Plates 196 to 214.

- **Foundation Recommendations**: Open foundations are a feasible foundation scheme to support the various facilities planned at the project site. Dewatering shall be required for foundation construction. Please refer to Section 9.3 for our recommended net allowable bearing pressures.


Satellite Image of the Site
Bhusawal Thermal Power Station
Bhusawal Rd
NH6
3 km
N
Google Earth
Image © 2018 DigitalGlobe
© 2018 Google



SEISMIC REFRACTION TEST (SRT)

S.NO	PROFILE
1	835 N / 1186 E TO 505 N / 1186 E
2	835 N / 1116 E TO 505 N / 1116 E
3	723 N / 1091 E TO 723 N / 1211 E
4	530 N / 1070 E TO 530 N / 1220 E

TRIAL PIT (ITP)

MARKING	CO-ORDINATES		DEPTH BELOW EGL(M)
ITP-1	1418 E	1090 N	4.0

N O T E S:-

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. BACKFILLING OF BORE HOLES AND PITS SHALL BE AS PER SPECIFICATION AND AS DIRECTED BY THE ENGINEER-IN-CHARGE.
3. STARTING DEPTH OF STANDARD PENETRATION TEST (SPT) SHALL BE 1.5M BELOW GROUND LEVEL AND THE TEST SHALL BE CONDUCTED AT EVERY 1M INTERVAL ALTERNATE TO COLLECTION OF UNDISTURBED SAMPLE (UDS) UPTO 10M DEPTH BELOW GROUND LEVEL AND AT EVERY 1.5M INTERVAL ALTERNATE TO COLLECTION OF UDS BEYOND 10M DEPTH, AT CHANGE OF STRATA & AT DEPTHS WHEREVER UDS COULD NOT BE COLLECTED.
4. STARTING DEPTH OF COLLECTION OF UDS SHALL BE 0.5M BELOW GROUND LEVEL AND UDS SHALL BE COLLECTED AT 1M INTERVAL ALTERNATE TO CONDUCTING SPT UPTO 10M DEPTH BELOW GROUND LEVEL & AT EVERY 1.5M INTERVAL ALTERNATE TO CONDUCTING SPT BEYOND 10M DEPTH.
5. CROSS HOLE SHEAR WAVE TEST SHALL BE CARRIED OUT AT 2M, 4M, 6M, 8M, 10M, 12M, 15M, 18M & 20M DEPTH BELOW GROUND LEVEL.
6. PUMP IN TYPE FIELD PERMEABILITY TEST SHALL BE CARRIED OUT AT DEPTH 1.5M AND 5M BELOW EXISTING GROUND LEVEL IN BH-1, BH-12, BH-22, BH-40, BH-47, IBH-10, IBH-11, IBH-12, IBH-29 & IBH-32.
7. ELECTRICAL RESISTIVITY TEST SHALL BE CARRIED OUT BY WENNER'S METHOD.
8. PRESSURE METER TEST SHALL BE CARRIED OUT AT 2M, 4M, 6M, 8M, 10M, 12M, 15M, 18M & 20M DEPTH BELOW GROUND LEVEL.
9. GROUND WATER SAMPLE SHALL BE COLLECTED FROM BH-7, BH-9, BH-15, BH-23, BH-30, BH-33, BH-41, BH-43, BH-50, IBH-03, IBH-10, IBH-13, IBH-27, IBH-28 AND IBH-31.
10. GEOTECHNICAL INVESTIGATION SHALL BE CARRIED OUT AS PER SPECIFICATION.
11. DO NOT SCALE THIS DRAWING.

REF DRG :

1. PE-DG-415-100-M001, REV-00 "PLOT PLAN".

GEOTECHNICAL INVESTIGATION LEGEND:

1. BOREHOLE (BH/IBH) . . . .
2. TRIAL PIT (TP/ITP) . . . .
3. DYNAMIC CONE PENETRATION TEST (DCPT/IDCPT) . . . .
4. PRESSURE METER TEST (PMT/IPMT). . . . .
5. CROSSHOLE SHEAR TEST (CST/ICST). . . . .
6. ELECTRICAL RESISTIVITY TEST (ERT/IERT) . . . .
7. PLATE LOAD TEST (IPLT) . . . .
8. FIELD CBR TEST (ICBR). . . . .
9. CYCLIC PLATE LOAD TEST (CPLT/ICPLT) . . . .
10. SEISMIC REFRACTION TEST (SRT/ISRT). . . . .

PLATE LOAD TEST (PLT)

MARKING	CO-ORDINATES		DEPTH (M)
PLT-1	1147 E	729 N	1.5
PLT-2	1170 E	641 N	2.0
PLT-3	1067 E	528 N	2.0
PLT-4	1306 E	534 N	1.5
PLT-5	1436 E	770 N	1.5

FIELD CBR TEST

MARKING	CO-ORDINATES		DEPTH (M)
CBR-1	1209 E	831 N	0.5
CBR-2	1321 E	600 N	0.5
CBR-3	1042 E	566 N	0.5
CBR-4	1145 E	410 N	0.5

BORE HOLE (IBH)

MARKING	CO-ORDINATES		DEPTH (M)
IBH-1	1009 E	725 N	15
IBH-2	1372 E	1093 N	15
IBH-3	1020 E	700 N	15
IBH-4	1065 E	700 N	15
IBH-5	1067 E	649 N	15
IBH-6	1379 E	888 N	15
IBH-7	1333 E	906 N	15
IBH-8	1808 E	800 N	25
IBH-9	1790 E	771 N	25
IBH-10	1504 E	938 N	20
IBH-11	1699 E	817 N	25
IBH-12	1742 E	658 N	15
IBH-13	1485 E	823 N	15
IBH-14	1586 E	759 N	15
IBH-15	1404 E	661 N	15
IBH-16	1192 E	661 N	15
IBH-17	1020 E	654 N	20
IBH-18	1570 E	896 N	15
IBH-19	1436 E	920 N	15
IBH-20	1378 E	768 N	15
IBH-21	1277 E	661 N	15
IBH-22	1110 E	661 N	15
IBH-23	1381 E	946 N	15
IBH-24	1408 E	1097 N	15
IBH-25	1031 E	812 N	15
IBH-26	1094 E	689 N	15
IBH-27	1350 E	1070 N	15
IBH-28	1335 E	990 N	15
IBH-29	1194 E	928 N	15
IBH-30	995 E	285 N	15
IBH-31	1414 E	821 N	15
IBH-32	1349 E	785 N	15
IBH-33	1040 E	18 S	15
IBH-34	1200 E	200 S	15
IBH-35	1263 E	460 S	15

FIELD CBR TEST (ICBR)

MARKING	CO-ORDINATES		DEPTH (M)
ICBR-1	1736 E	879 N	0.5
ICBR-2	1662 E	825 N	0.5
ICBR-3	1529 E	720 N	0.5

PLATE LOAD TEST (PLT)

MARKING	CO-ORDINATES		DEPTH (M)
IPLT-1	1606 E	755 N	2.0
IPLT-2	1387 E	1094 N	1.5
IPLT-3	1580 E	890 N	1.5
IPLT-4	1024 E	719 N	2.0
IPLT-5	1026 E	696 N	2.0

CYCLIC PLATE LOAD TEST (ICPLT)

MARKING	CO-ORDINATES		DEPTH (M)
ICPLT-1	1371 E	917 N	2.0

ELECTRICAL RESISTIVITY TEST (IERT)

MARKING	CO-ORDINATES	
IERT-1	1397 E	1103 N
IERT-2	1010 E	691 N
IERT-3	1813 E	760 N
IERT-4	1829 E	784 N
IERT-5	1387 E	936 N
IERT-6	1074 E	631 N

DYNAMIC CONE PENETRATION TEST (IDCPT)

MARKING	CO-ORDINATES	
IDCPT-1	1409 E	912 N
IDCPT-2	1359 E	833 N
IDCPT-3	1230 E	661 N
IDCPT-4	1642 E	852 N
IDCPT-5	1351 E	737 N
IDCPT-6	1426 E	764 N
IDCPT-7	1605 E	875 S
IDCPT-8	1930 E	1147 S
IDCPT-9	3796 E	2701 S
IDCPT-10	4905 E	3635 S
IDCPT-11	6138 E	5931 S

BORE HOLE (BH)

MARKING	CO-ORDINATES		DEPTH (M)
BH-1	1135 E	817 N	20
BH-2	1169 E	817 N	20
BH-3	1125 E	785 N	20
BH-4	1178 E	785 N	20
BH-5	1178 E	747 N	15
BH-6	1178 E	708 N	20
BH-7	1125 E	708 N	20
BH-8	1125 E	662 N	20
BH-9	1178 E	662 N	15
BH-10	1178 E	623 N	20
BH-11	1125 E	623 N	20
BH-12	1125 E	584 N	20
BH-13	1178 E	584 N	20
BH-14	1217 E	540 N	15
BH-15	1178 E	540 N	15
BH-16	1070 E	538 N	20
BH-17	1085 E	503 N	15
BH-18	1120 E	503 N	20
BH-19	1177 E	503 N	15
BH-20	1217 E	503 N	15
BH-21	1217 E	469 N	15
BH-22	1177 E	469 N	15
BH-23	1125 E	469 N	15
BH-24	1085 E	469 N	15
BH-25	1217 E	428 N	15
BH-26	1017 E	451 N	15
BH-27	1022 E	515 N	15
BH-28	1016 E	758 N	15
BH-29	1215 E	862 N	15
BH-30	1262 E	862 N	20
BH-31	1369 E	710 N	15
BH-32	1255 E	572 N	15
BH-33	1255 E	528 N	15
BH-34	1327 E	528 N	15
BH-35	1255 E	491 N	15
BH-36	1327 E	491 N	15
BH-37	1594 E	609 N	15
BH-38	1665 E	478 N	20
BH-39	1725 E	420 N	20
BH-40	1654 E	420 N	20
BH-41	1607 E	420 N	20
BH-42	1545 E	420 N	20
BH-43	1482 E	420 N	15
BH-44	1545 E	388 N	15
BH-45	1665 E	362 N	20
BH-46	1500 E	344 N	15
BH-47	1522 E	231 N	15
BH-48	1473 E	223 N	15
BH-49	1623 E	195 N	15
BH-50	1522 E	170 N	15
BH-51	1623 E	78 N	15
BH-52	1216 E	28 N	15
BH-53	1006 E	48 N	10
BH-54	500 E	48 N	10
BH-55	427 E	400 N	10
BH-56	342 E	1100 N	10
BH-57	700 E	1578 N	10
BH-58	1970 E	1922 N	10
BH-59	2048 E	2232 N	10
BH-60	1481 E	1108 N	15
BH-61	1111 E	947 N	15
BH-62	1260 E	748 N	20
BH-63	1540 E	467 N	15
BH-64	1632 E	277 N	15
BH-65	1817 E	52 N	10
BH-66	1771 E	492 N	10
BH-67	1194 E	817 N	20
BH-68	1229 E	817 N	20
BH-69	1343 E	611 N	10

TRIAL PIT (TP)

MARKING	CO-ORDINATES		DEPTH (M)
TP-1	1144 E	847 N	4
TP-2	1064 E	682 N	4
TP-3	1062 E	453 N	4
TP-4	1200 E	453 N	4
TP-5	1300 E	427 N	4
TP-6	1400 E	429 N	4
TP-7	700 E	48 N	4
TP-8	429 E	1300 N	4
TP-9	1376 E	1829 N	4

CYCLIC PLATE LOAD TEST (CPLT)

MARKING	CO-ORDINATES		DEPTH (M)
CPLT-1	1151 E	778 N	2.0
CPLT-2	1151 E	664 N	2.0
CPLT-3	1138 E	536 N	2.0

PRESSURE METER TEST (IPMT)

MARKING	CO-ORDINATES	
IPMT-1	1797 E	771 N
IPMT-2	1441 E	830 N

FACILITY	DESCRIPTION OF FACILITIES	SIZES (M)
1.0	POWER BLOCK AREA	
1.1	TG BUILDING	139.5x48
1.2	TG CONTROL EQUIPMENT ROOM/PCR	21x33.85
1.3	BOILER	82x53
1.4	FD/PA FANS	2 No Each
1.5	MILLS & BUNKERS	8 Bunkers
1.6	ESP	–
1.7	ESP CONTROL ROOM	56.7x18
1.8	ID FANS	–
1.9	CHIMNEY	–
1.10	SPACE FOR FGD	70x50
1.11	MILL REJECT SILO	7.5x5.0
1.12	AIR COMPRESSOR BUILDING/MILL REJECT COMPRESSOR & CONTROL ROOM	14x48
1.13	CONDENSATE STORAGE TANK	ø11
1.14	CONDENSATE STORAGE TANK PUMP HOUSE	15x7.5
1.15	AIR WASHER ROOM	16x18
1.16	DG BUILDING/AIR WASHER BLDG.	20x26/18x16
2.0	ELECTRICAL FACILITIES	
2.1	GENERATOR TRANSFORMER	–
2.2	STATION TRANSFORMER	–
2.3	UNIT TRANSFORMER	–
2.4	UNIT AUXILIARY TRANSFORMER	
2.5	STATION AUXILIARY TRANSFORMER	–
2.6	400kV SWITCH YARD (CUSTOMER SCOPE)	400x350
3.0	WATER SYSTEM	
3.1	RAW WATER & FIRE WATER STORAGE TANK	120x100
3.2	RAW & FIRE WATER PUMP HOUSE	90x12
3.3	DM WATER CLARIFIER (PT PLANT)	–
3.4	NON-DM WATER CLARIFIER (PT PLANT)	–
3.5	GRAVITY FILTERS(FOR DM WATER) (PT PLANT)	–
3.6	GRAVITY FILTERS(FOR NON DM WATER) (PT PLANT)	–
3.7	FILTER WATER TANK & PUMP HOUSE FOR DM	24x10
3.8	FILTER WATER RESERVOIR & PUMP HOUSE FOR NON DM	80x70
3.9	OZONIZATION PLANT(PRE-TREATMENT AREA)	19x16.5
3.10	CHEMICAL HOUSE/ELEC. & CONTROL ROOM	–
3.11	N.D. COOLING TOWER	ø132
3.12	CW/ ACW PUMP HOUSE	13.5x28.5
3.13	OZONIZATION & CW TREATMENT AREA (C.W.SYSTEM)	36x10
3.14	CW SIDE STREAM FILTRATION PLANT	46x30
3.15	DM WATER STORAGE TANKS(2 NOS.)	ø12
3.16	POST WATER TREATMENT PLANT AREA (DM PLANT)	55x35
3.17	NEUTRALISING PIT	12x10
3.18	ACID/ALKALI STORAGE AREA	20x8
3.19	RAIN WATER HARVESTING POND	–
3.20	SULPHURIC ACID STORAGE AREA FOR CW TREATMENT	14x14.5
3.21	CHEMICAL LAB (PCRI-HWR)	30X20
3.22	CPU REGENRATION BUILDING	40x38.5
4.0	COAL HANDLING PLANT (ISG SCOPE)	
4.1	WAGON TIPPLER	–
4.2	CONTROL ROOM FOR WAGON TIPPLER	–
4.3	CRUSHER HOUSE	36x30
4.4	CRUSHED COAL STORAGE AREA	270x50x11(2nos.)
4.5	CHP MCC/CONTROL ROOM	21x34
4.6	STACKER RECLAIMER	–
4.7	TRANSFER POINTS	12x12
4.8	PENT HOUSE	–
4.9	DRIVE HOUSE FOR STACKER RECLAIMER	–
4.10	COAL PILE RUN-OFF POND	30x40
4.11	CHP MAINTENANCE BUILDING	25x40
4.12	AREA FOR GROUND UNLOADING OF COAL	650 M^2
4.13	CHP PUMP HOUSE	30x25
5.0	ASH HANDLING PLANT (ISG SCOPE)	
5.1	HCSS SILO	–
5.2	H.C.S.D. PUMP HOUSE & MCC ROOM	20x35
5.3	DELETED	–
5.4	DRY ASH SILO	–
5.5	DRY ASH SILO UTILITY BUILDING	24x8
5.6	AHP CONTROL ROOM, ASH WATER TANK & ASH SLURRY PUMP HOUSE	40x69
5.7	AHP COMPRESSORS & BLOWERS	25x32
5.8	TUBE SETTLER PLANT	20x35
6.0	FUEL OIL SYSTEM	
6.1	FUEL OIL TRANSFER PUMP HOUSE	14x22
6.2	HFO & LDO DAY TANK AREA	32x20
6.3	HFO & LDO PRESSURIZING PUMP HOUSE	22x10
7.0	EFFLUENT TREATMENT PLANT	56x30
8.0	SEWAGE TREATMENT PLANT	20x10
9.0	NON-PLANT BUILDING	
9.1	SERVICE BUILDING	12x42
9.2	WORKSHOP-DELETED	65x30
9.3	LUBE OIL STORAGE SHED WITH STORAGE YARD	15x15
9.4	FIRE STATION-DELETED	10x25
9.5	GAS CYLINDER STORAGE AREA	15x25
9.6	FOPH FOAM SHED	10x13
9.7	STORES	75x30
9.8	CANTEEN	15x20
9.9	TIME OFFICE & SECURITY OFFICE	25x10
9.10	SECURITY OFFICE FOR STORES	10x5
9.11	SECURITY CABIN	10x5
9.12	COAL SAMPLING & PROCESSING ROOM	15x25
9.13	WEIGH BRIDGE FOR DRY ASH SILO	–
9.14	PARKING SHEDS	30x50
9.15	PAY LOADER SHED	12x66
9.16	STEEL YARD INCLUDING STORES & WEIGH BRIDGE	135x60
9.17	FIRE WATER BOOSTER PUMP HOUSE	9x6
9.18	AMBIENT AIR QUALITY MONITORING SYSTEM	4x5

PRESSURE METER TEST (PMT)

MARKING	CO-ORDINATES	
PMT-1	1152 E	817 N
PMT-2	1152 E	645 N
PMT-3	1121 E	540 N
PMT-4	1682 E	400 N

CROSSHOLE SHEAR TEST (CST)

MARKING	CO-ORDINATES	
CST-1	1152 E	794 N
CST-2	1124 E	606 N
CST-3	1179 E	604 N
CST-4	1154 E	523 N

ELECTRICAL RESISTIVITY TEST (ERT)

MARKING	CO-ORDINATES	
ERT-1	1060 E	500 N
ERT-2	1100 E	460 N
ERT-3	1110 E	490 N
ERT-4	1170 E	470 N
ERT-5	1180 E	487 N
ERT-6	1192 E	581 N
ERT-7	1097 E	670 N
ERT-8	1220 E	734 N
ERT-9	1560 E	210 N
ERT-10	1507 E	407 N
ERT-11	1360 E	880 N
ERT-12	1290 E	920 N
ERT-13	1087 E	704 N
ERT-14	1031 E	719 N

DYNAMIC CONE PENETRATION TEST (DCPT)

MARKING	CO-ORDINATES	
DCPT-1	1125 E	730 N
DCPT-2	1178 E	729 N
DCPT-3	1151 E	686 N
DCPT-4	1148 E	612 N
DCPT-5	1103 E	525 N

CROSSHOLE SHEAR TEST (ICST)

MARKING	CO-ORDINATES	
ICST-1	1385 E	1085 N
ICST-2	1341 E	877 N

REV.	DATE	ALTD	CHD	APPD	
02	13.03.2018	S.ND -sd-	V.V. -sd-	TMGR -sd-	DRAWING IS GENERALLY REVISED DUE TO CHANGE IN PLOT PLAN AND THUS ⚠ MARKED.
01	21.02.2018	V.V. -sd-	TMGR -sd-	CPK -sd-	DRAWING IS GENERALLY REVISED DUE TO CHANGE IN PLOT PLAN AND THUS ⚠ MARKED.

JOB NO. 415
STATUS CONTRACT
DISTRIBUTION

MAHAGENCO MAHARASHTRA STATE POWER GENERATION CO.LTD.
BHUSAWAL T.P.S. UNIT-6 : 1 X 660 MW PROJECT
OWNER CONSULTANT:

1 X 660 MW BHUSAWAL T.P.S. UNIT-6 TPP

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

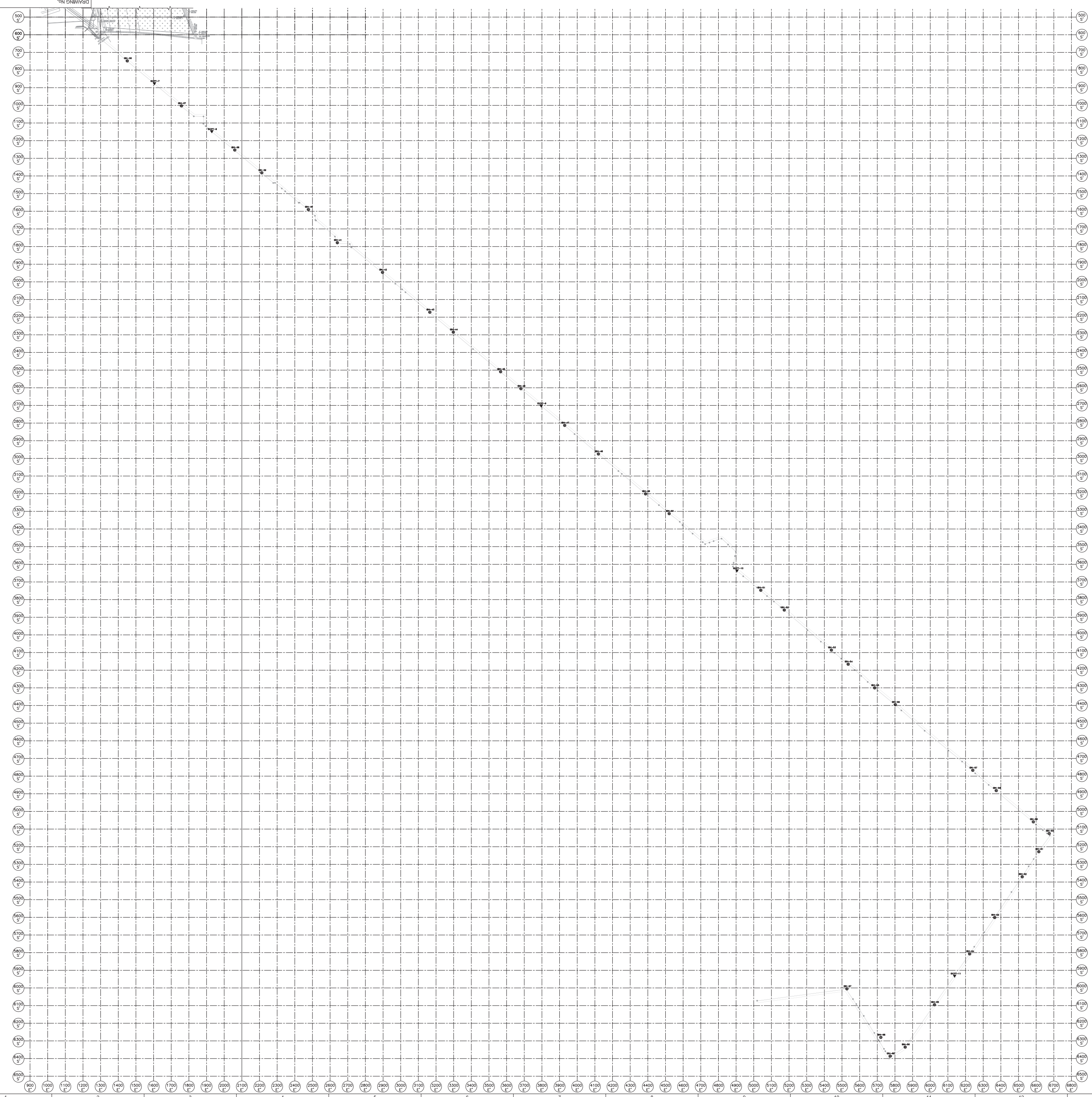
DEPT CODE		NAME	SIGN	DATE
C	DRN	S.ND	-SD-	30.01.2018
	DESN	V.V.	-SD-	30.01.2018
	CHD	TMGR	-SD-	30.01.2018
	APPD	CPK	-SD-	30.01.2018

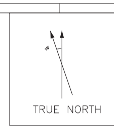
TITLE
GEOTECHNICAL INVESTIGATION LAYOUT

DEPT. SCALE 1:125 SIGN
DRAWING NO. PE-DG-415-602-C001
SHEET 1 OF 1 REV. 02

CUSTOMER'S DRAWING No.
DRAWING No. PE-DG-415-602-C001
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM
COMPUTER FILE NAME:
SIZE-A0

Mar 13, 2018 - 11:00am





BORE HOLE (IBH)			DEPTH (M)
MARKING	CO-ORDINATES		
IBH-35	1263 E	460 S	15
IBH-36	1451 E	748 S	10
IBH-37	1758 E	1003 S	10
IBH-38	2060 E	1253 S	10
IBH-39	2213 E	1382 S	10
IBH-40	2477 E	1590 S	10
IBH-41	2641 E	1778 S	10
IBH-42	2897 E	1946 S	10
IBH-43	3165 E	2172 S	10
IBH-44	3298 E	2285 S	10
IBH-45	3566 E	2509 S	10
IBH-46	3681 E	2605 S	10
IBH-47	3929 E	2813 S	10
IBH-48	4120 E	2975 S	10
IBH-49	4387 E	3201 S	10
IBH-50	4521 E	3313 S	10
IBH-51	5040 E	3747 S	10
IBH-52	5173 E	3859 S	10
IBH-53	5440 E	4086 S	10
IBH-54	5535 E	4166 S	10
IBH-55	5685 E	4300 S	10
IBH-56	5802 E	4395 S	10
IBH-57	6241 E	4767 S	10
IBH-58	6374 E	4882 S	10
IBH-59	6584 E	5059 S	10
IBH-60	6674 E	5125 S	10
IBH-61	6615 E	5228 S	10
IBH-62	6521 E	5370 S	10
IBH-63	6365 E	5601 S	10
IBH-64	6223 E	5807 S	10
IBH-65	6024 E	6095 S	10
IBH-66	5858 E	6335 S	10
IBH-67	5528 E	6005 S	10
IBH-68	5720 E	6280 S	10
IBH-69	5773 E	6386 S	10

DYNAMIC CONE PENETRATION TEST (IDCPT)		
MARKING	CO-ORDINATES	
IDCPT-7	1605 E	875 S
IDCPT-8	1930 E	1147 S
IDCPT-9	3796 E	2701 S
IDCPT-10	4905 E	3635 S
IDCPT-11	6138 E	5931 S

N O T E S:-

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. BACKFILLING OF BORE HOLES AND PITS SHALL BE AS PER SPECIFICATION AND AS DIRECTED BY THE ENGINEER-IN-CHARGE.
3. STARTING DEPTH OF STANDARD PENETRATION TEST (SPT) SHALL BE 1.5M BELOW GROUND LEVEL AND THE TEST SHALL BE CONDUCTED AT EVERY 1M INTERVAL ALTERNATE TO COLLECTION OF UNDISTURBED SAMPLE (UDS) UPTO 10M DEPTH BELOW GROUND LEVEL AND AT EVERY 1.5M INTERVAL ALTERNATE TO COLLECTION OF UDS BEYOND 10M DEPTH, AT CHANGE OF STRATA & AT DEPTHS WHEREVER UDS COULD NOT BE COLLECTED.
4. STARTING DEPTH OF COLLECTION OF UDS SHALL BE 0.5M BELOW GROUND LEVEL AND UDS SHALL BE COLLECTED AT 1M INTERVAL ALTERNATE TO CONDUCTING SPT UPTO 10M DEPTH BELOW GROUND LEVEL & AT EVERY 1.5M INTERVAL ALTERNATE TO CONDUCTING SPT BEYOND 10M DEPTH.
5. GEOTECHNICAL INVESTIGATION SHALL BE CARRIED OUT AS PER SPECIFICATION.
6. DO NOT SCALE THIS DRAWING.

REF DRG :

1. PE-DG-415-100-M001, REV-00 "PLOT PLAN".

GEOTECHNICAL INVESTIGATION LEGEND:

1. BOREHOLE (BH/IBH) . . . . ●
2. DYNAMIC CONE PENETRATION TEST (DCPT/IDCPT) . . . . ▼

MAHAGENCO MAHARASHTRA STATE POWER GENERATION CO.LTD.
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STATUS CONTRACT
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REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
C	DRN	S.ND	-SD-	13.03.2018
	DESN	V.V.	-SD-	13.03.2018
	CHD	TMSR	-SD-	13.03.2018
	APPD	TMSR	-SD-	13.03.2018

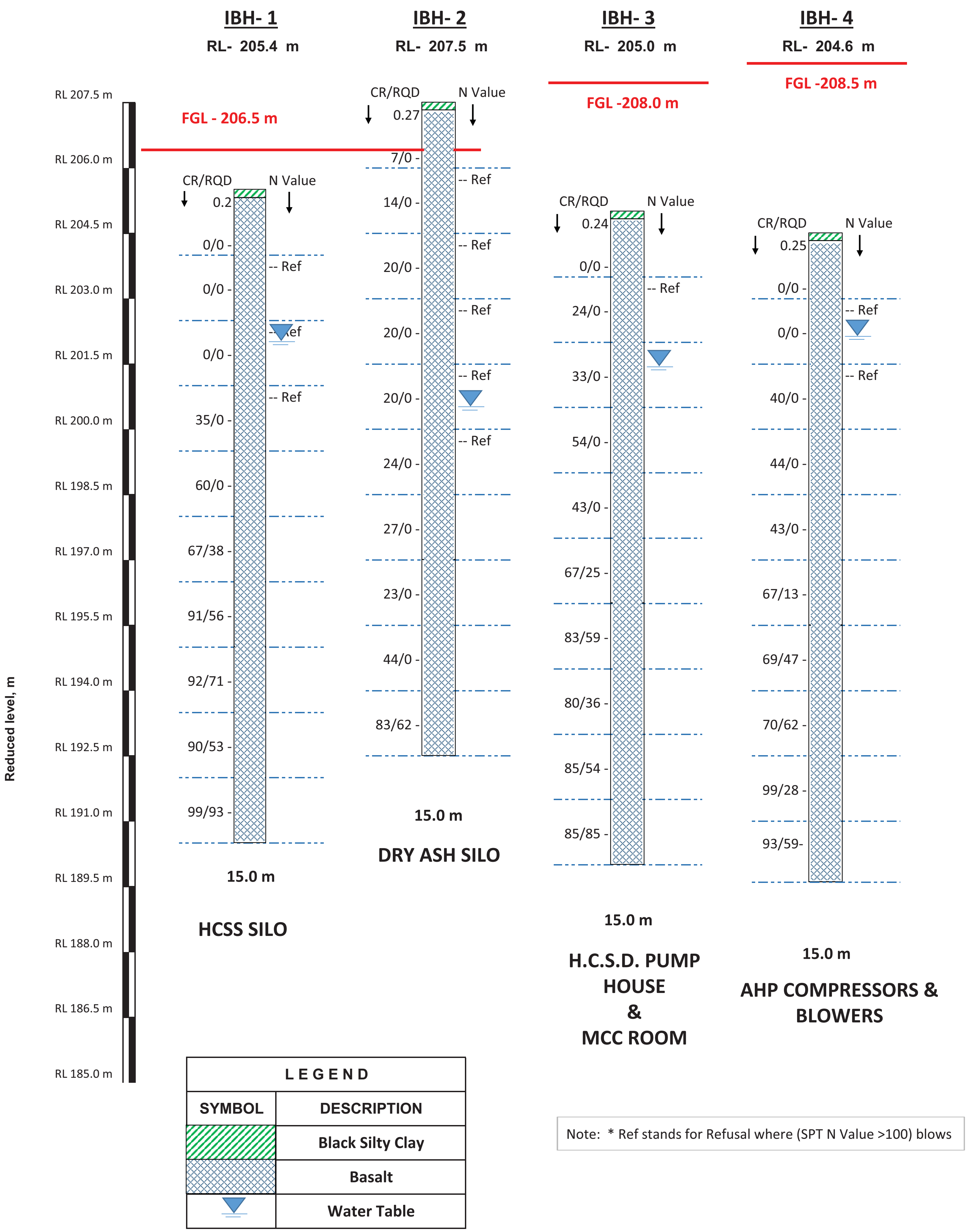
TITLE
GEOTECHNICAL INVESTIGATION LAYOUT (ASH CORRIDOR)

DEPT. SCALE 1:125
SIGN
DRAWING NO. PE-DG-415-602-C002
SHEET 1 OF 1 REV. 00

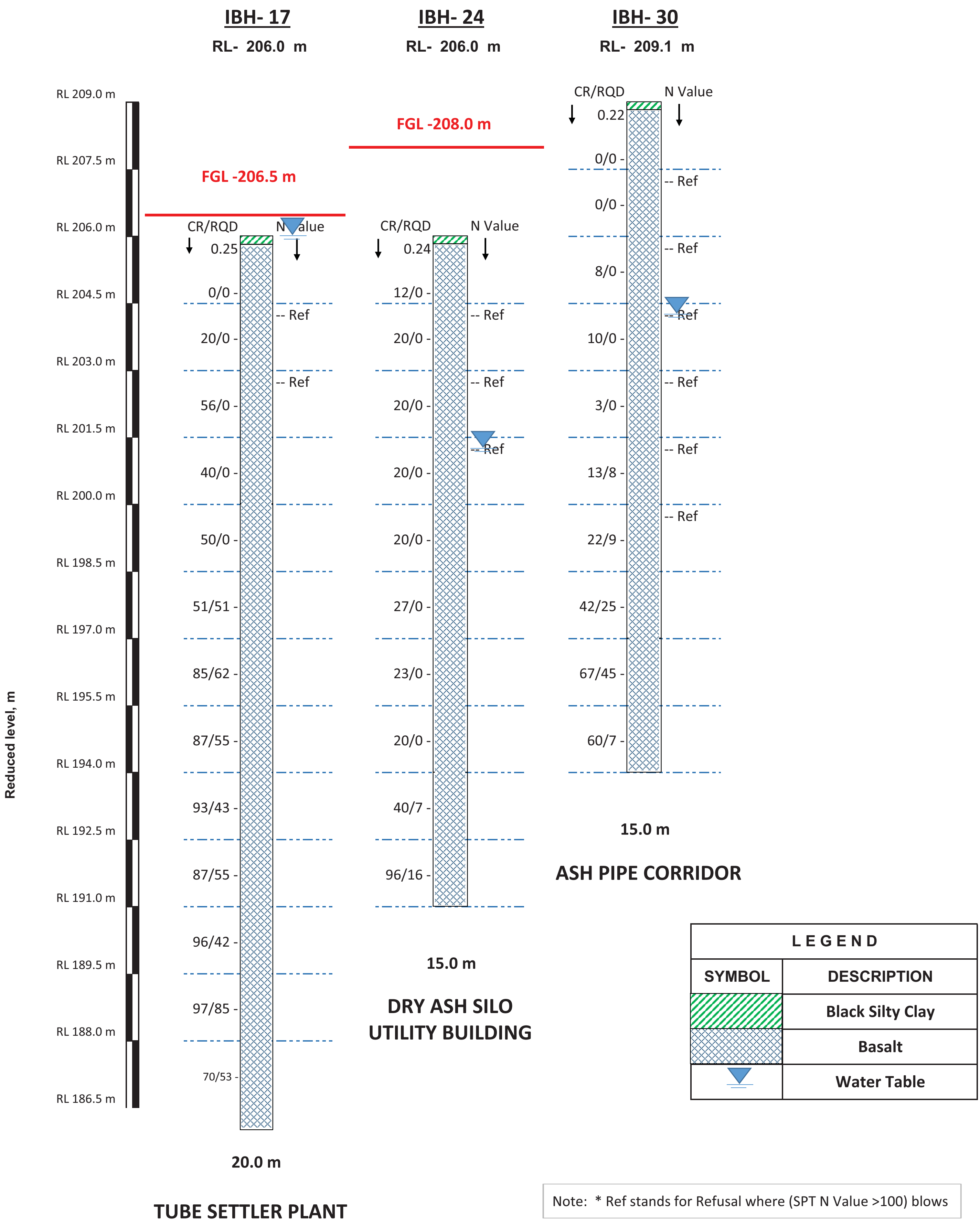
CUSTOMER'S DRAWING No.
COMPUTER FILE NAME:
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM
DRAWING No. PE-DG-415-602-C002

SIZE-A0
Mar 13, 2018 - 10:51am

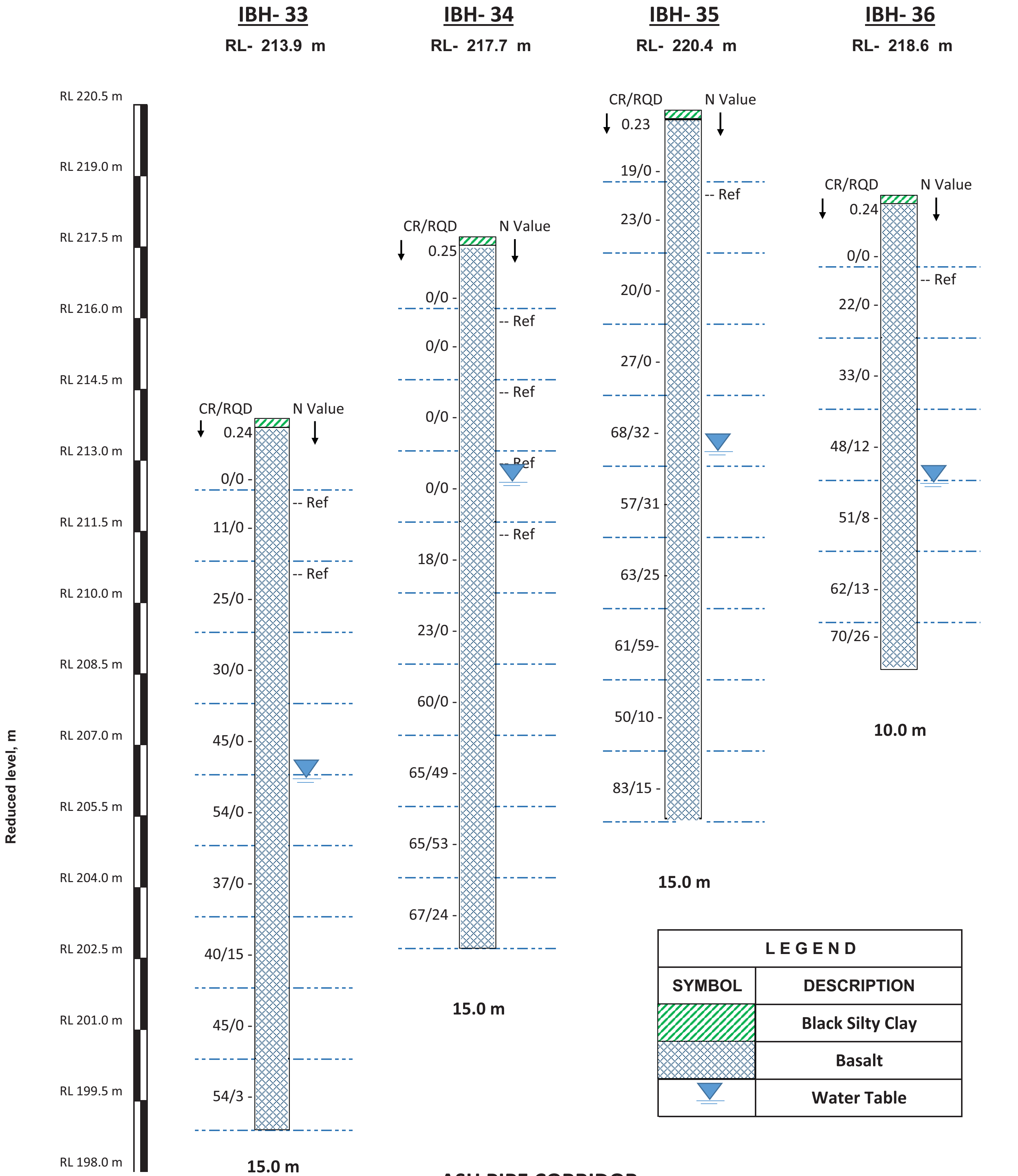
SUMMARY OF BOREHOLE PROFILES



Summary of Borehole Profiles



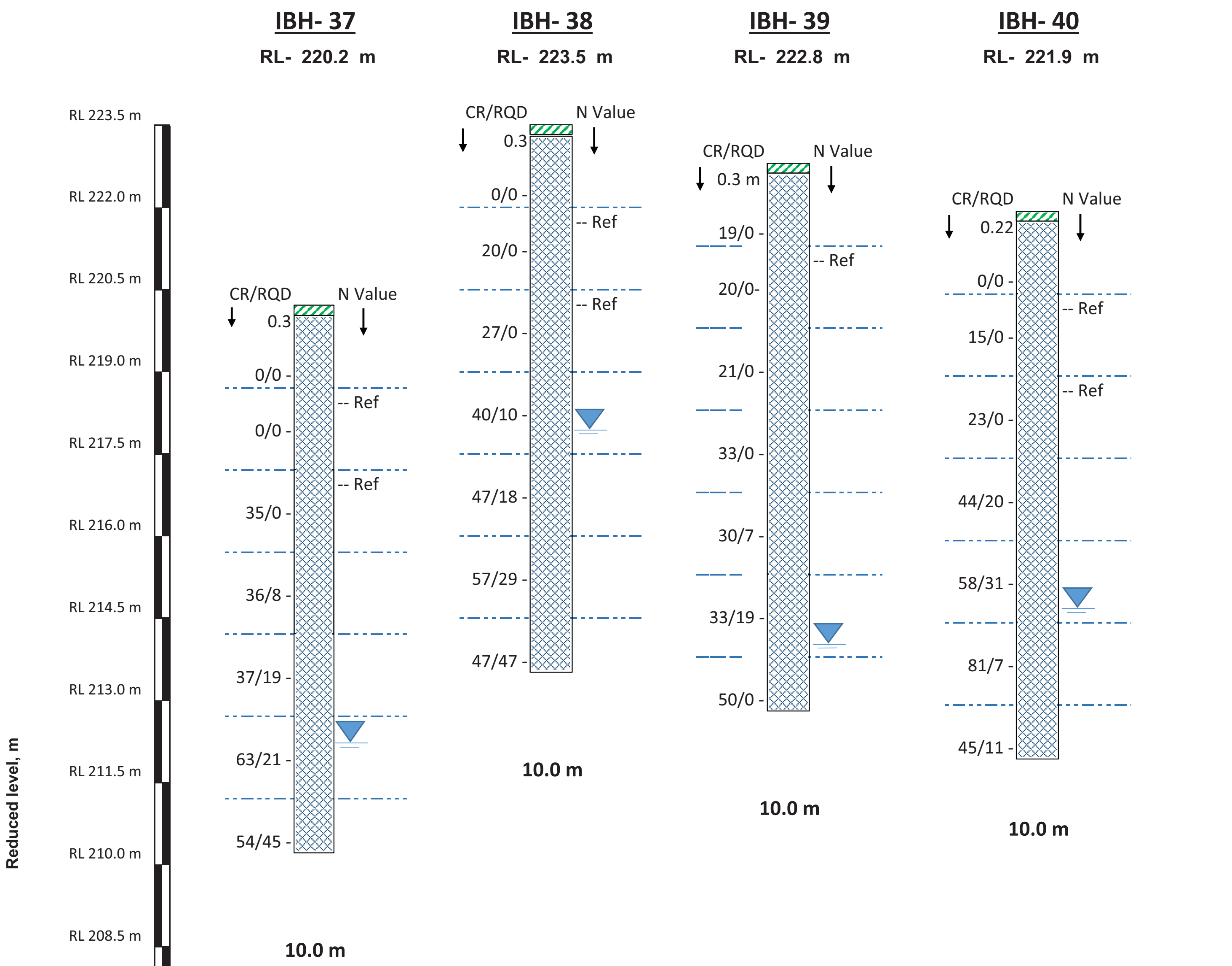
Summary of Borehole Profiles



ASH PIPE CORRIDOR

Note: * Ref stands for Refusal where (SPT N Value >100) blows

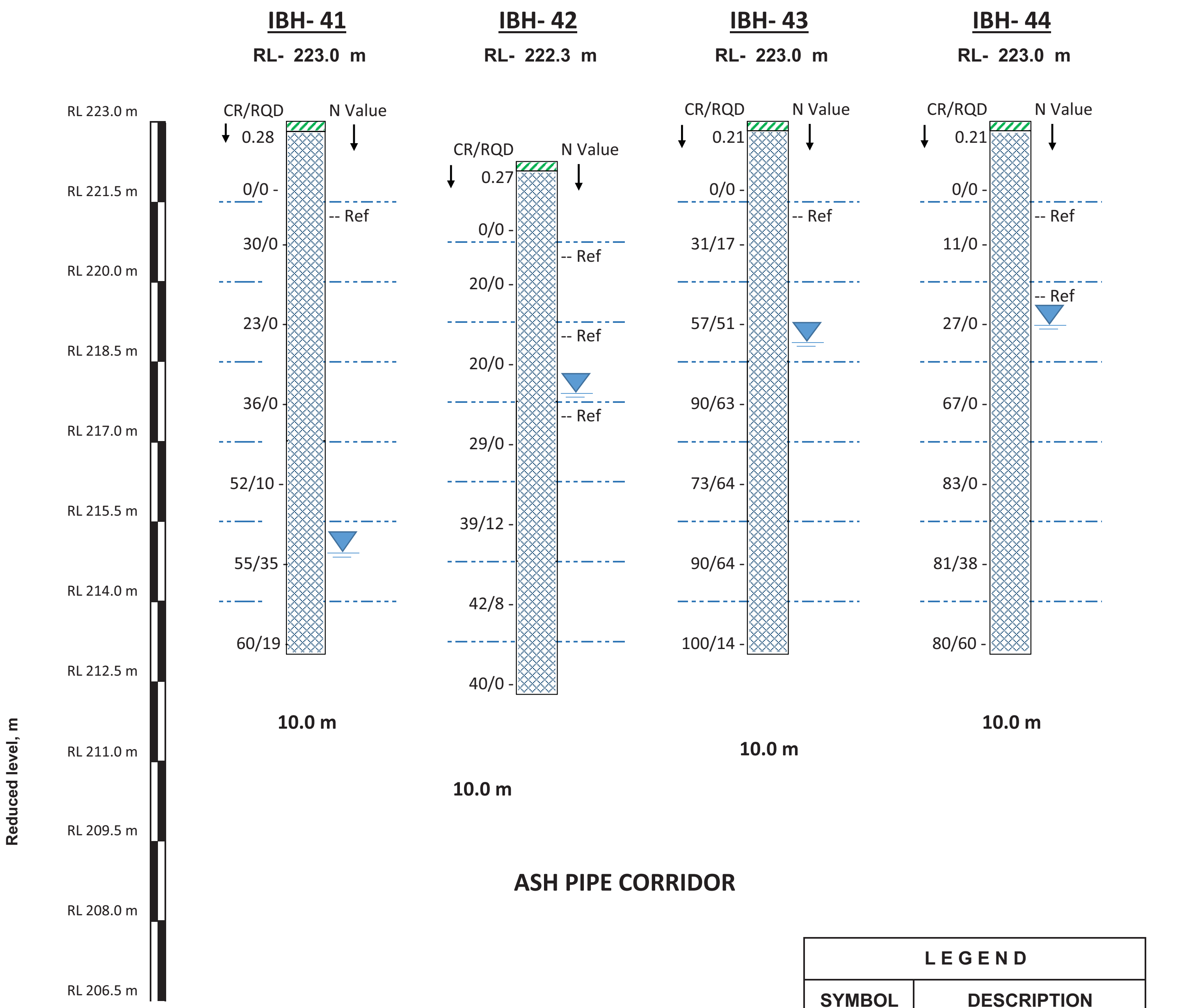
Summary of Borehole Profiles



ASH PIPE CORRIDOR

LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

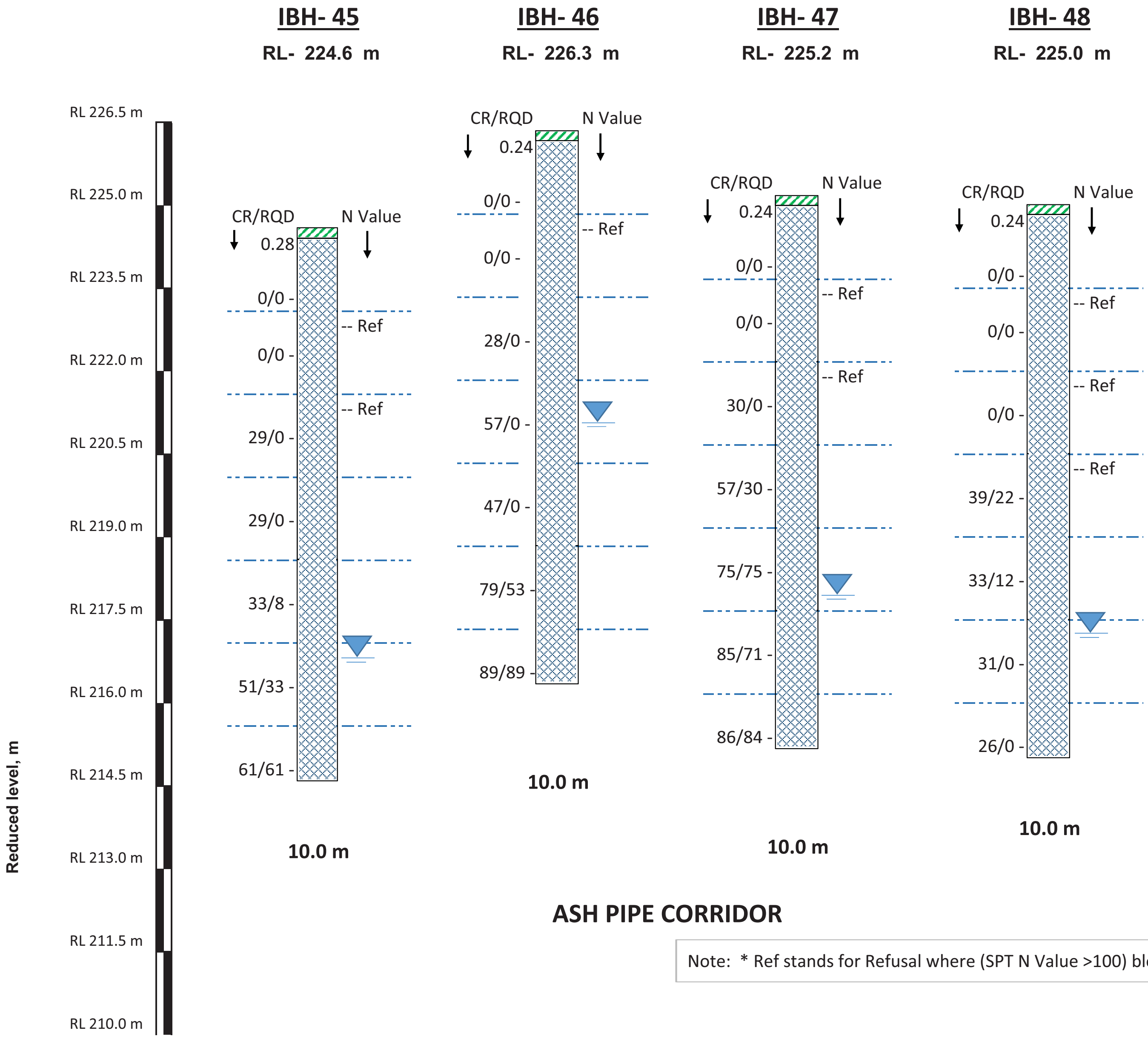


ASH PIPE CORRIDOR

LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

Summary of Borehole Profiles

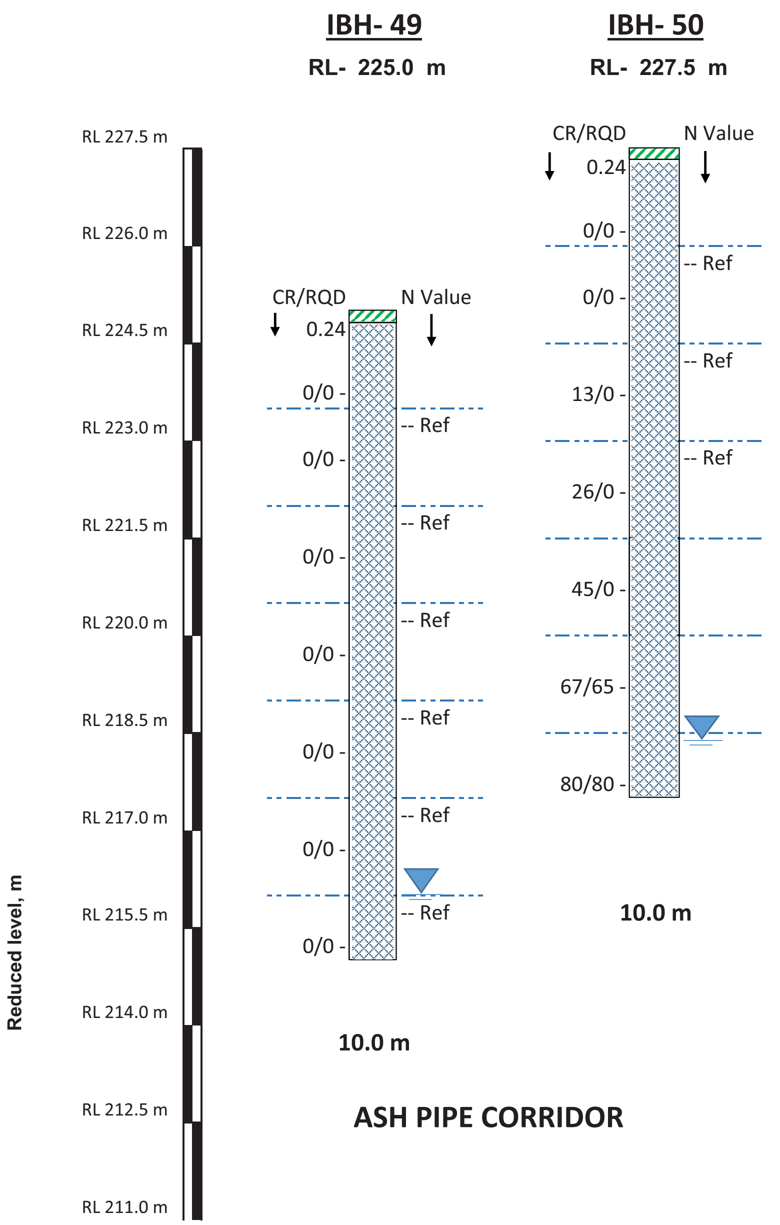


ASH PIPE CORRIDOR

Note: * Ref stands for Refusal where (SPT N Value >100) blows

LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

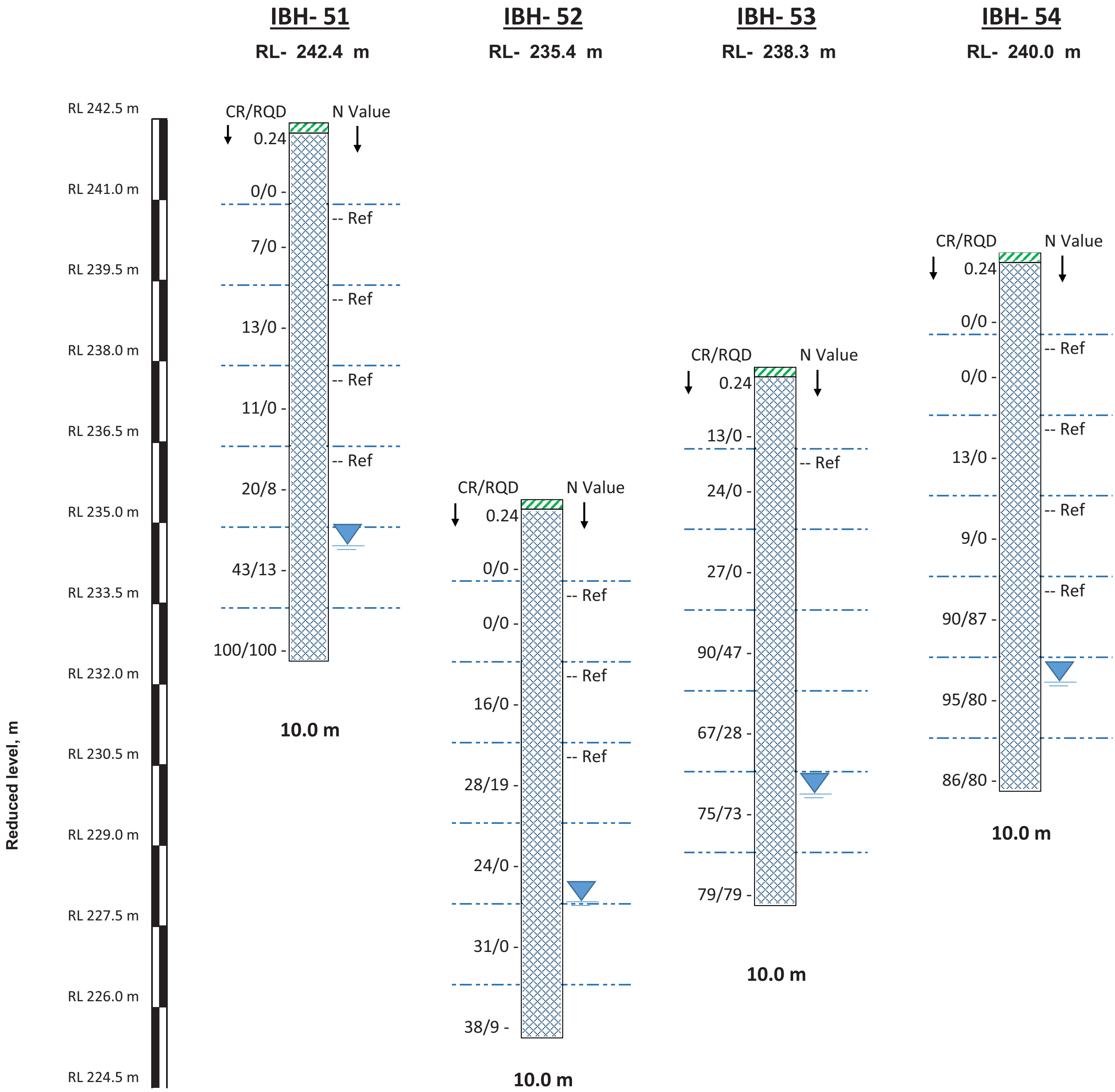
Summary of Borehole Profiles



ASH PIPE CORRIDOR

Note: * Ref stands for Refusal where (SPT N Value >100) blows

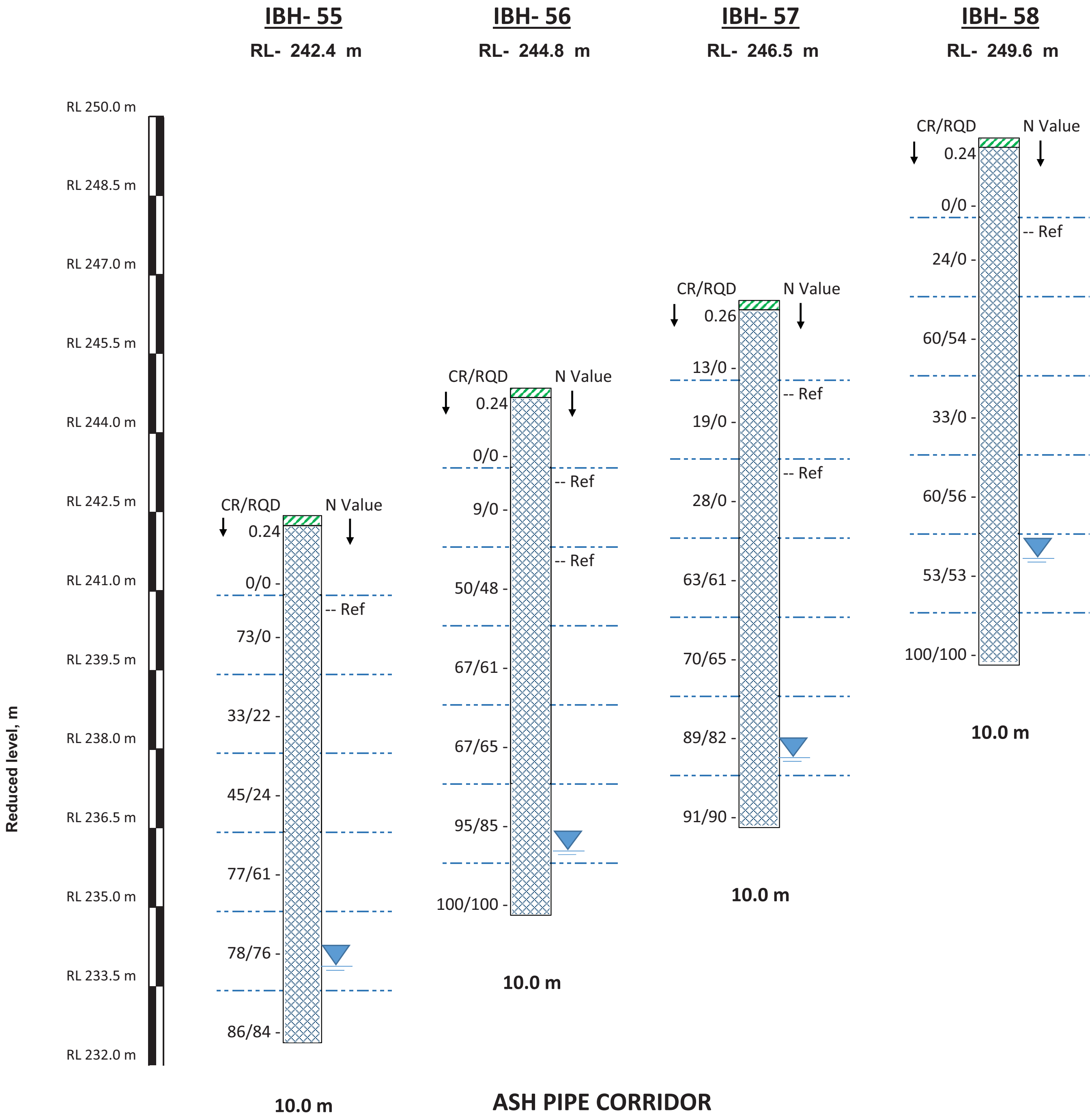
LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table



ASH PIPE CORRIDOR

LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

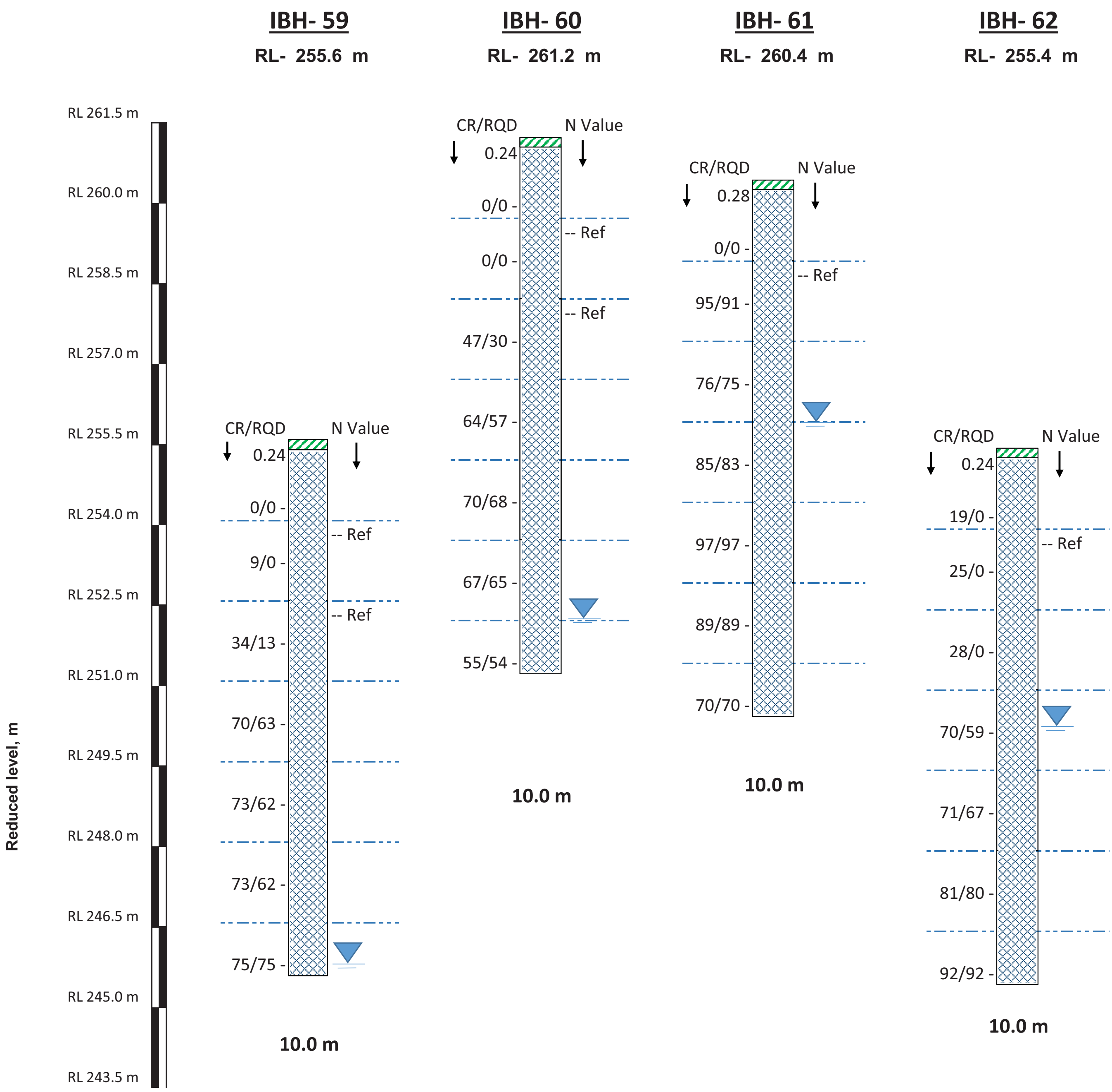


ASH PIPE CORRIDOR

LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

Summary of Borehole Profiles

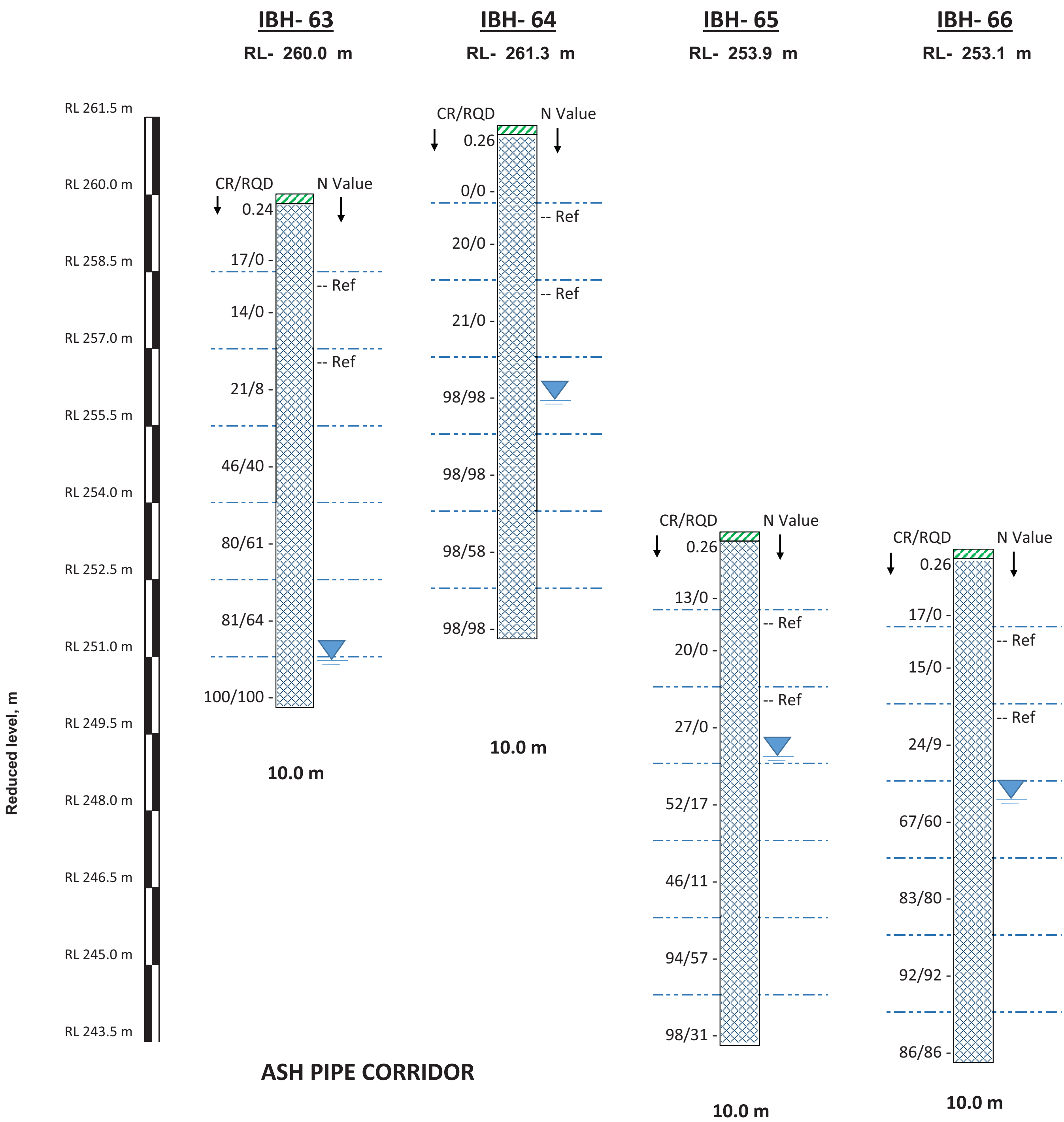


ASH PIPE CORRIDOR

LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

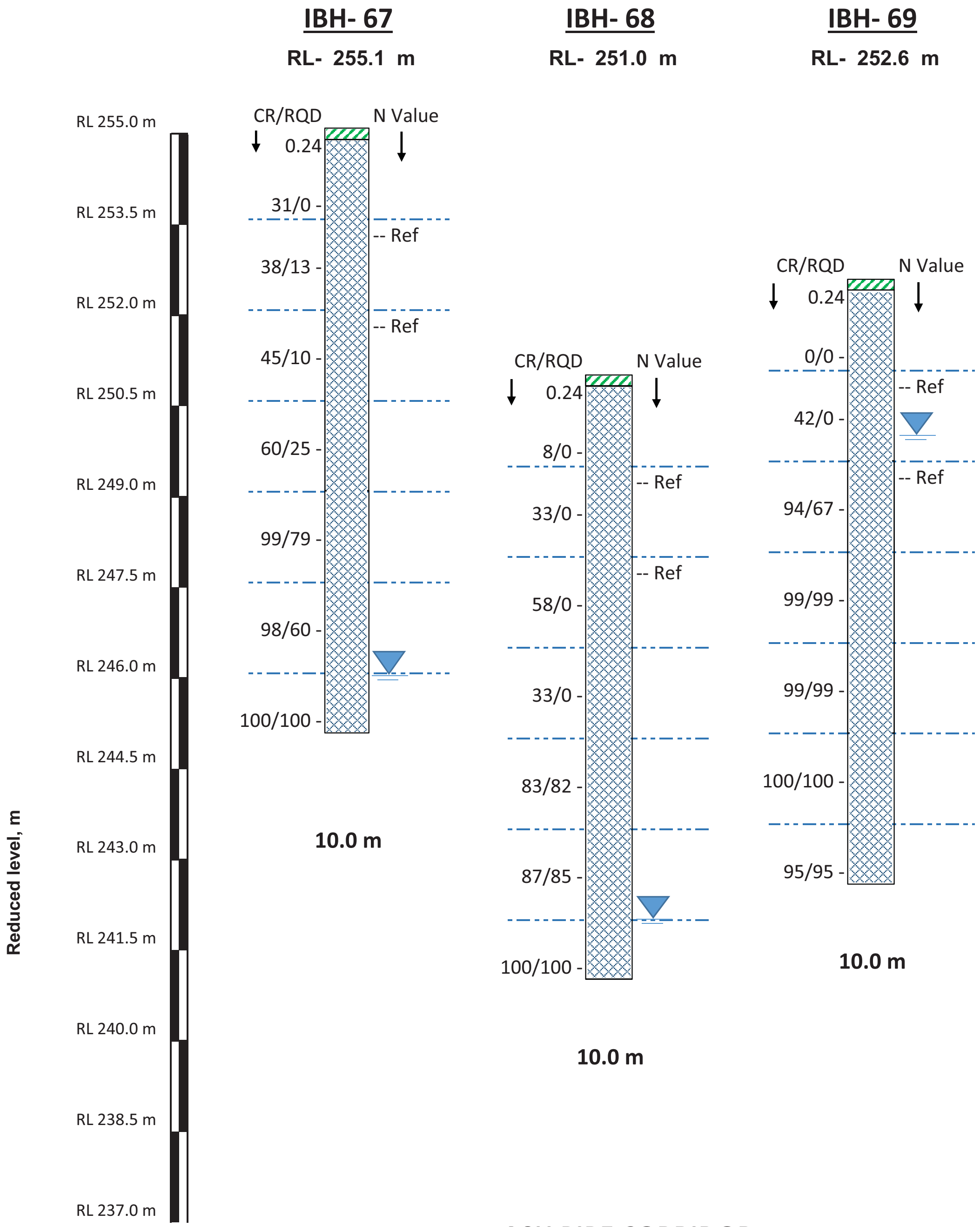
Summary of Borehole Profiles



LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

Summary of Borehole Profiles

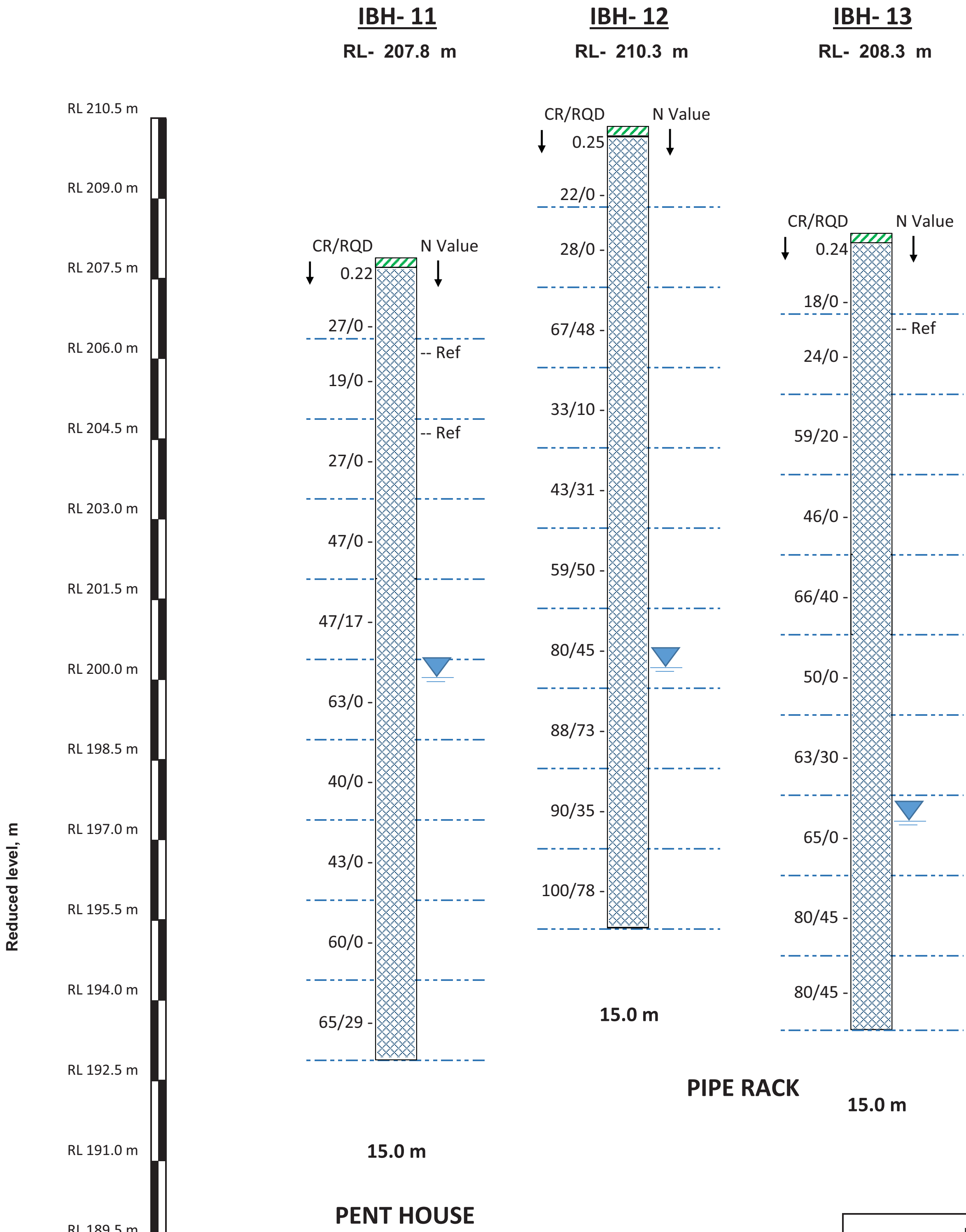


ASH PIPE CORRIDOR

LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

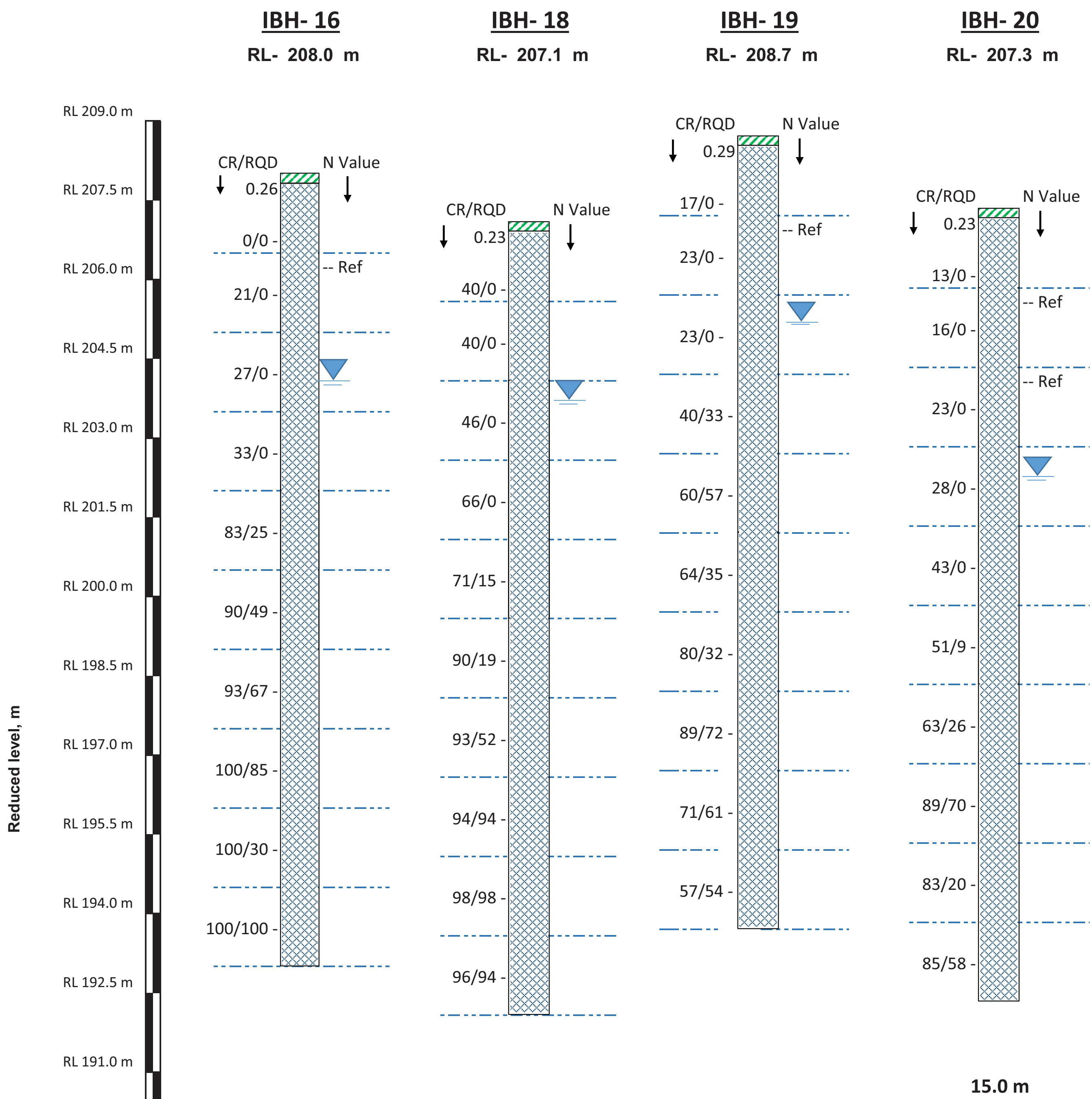
Summary of Borehole Profiles



LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

Summary of Borehole Profiles

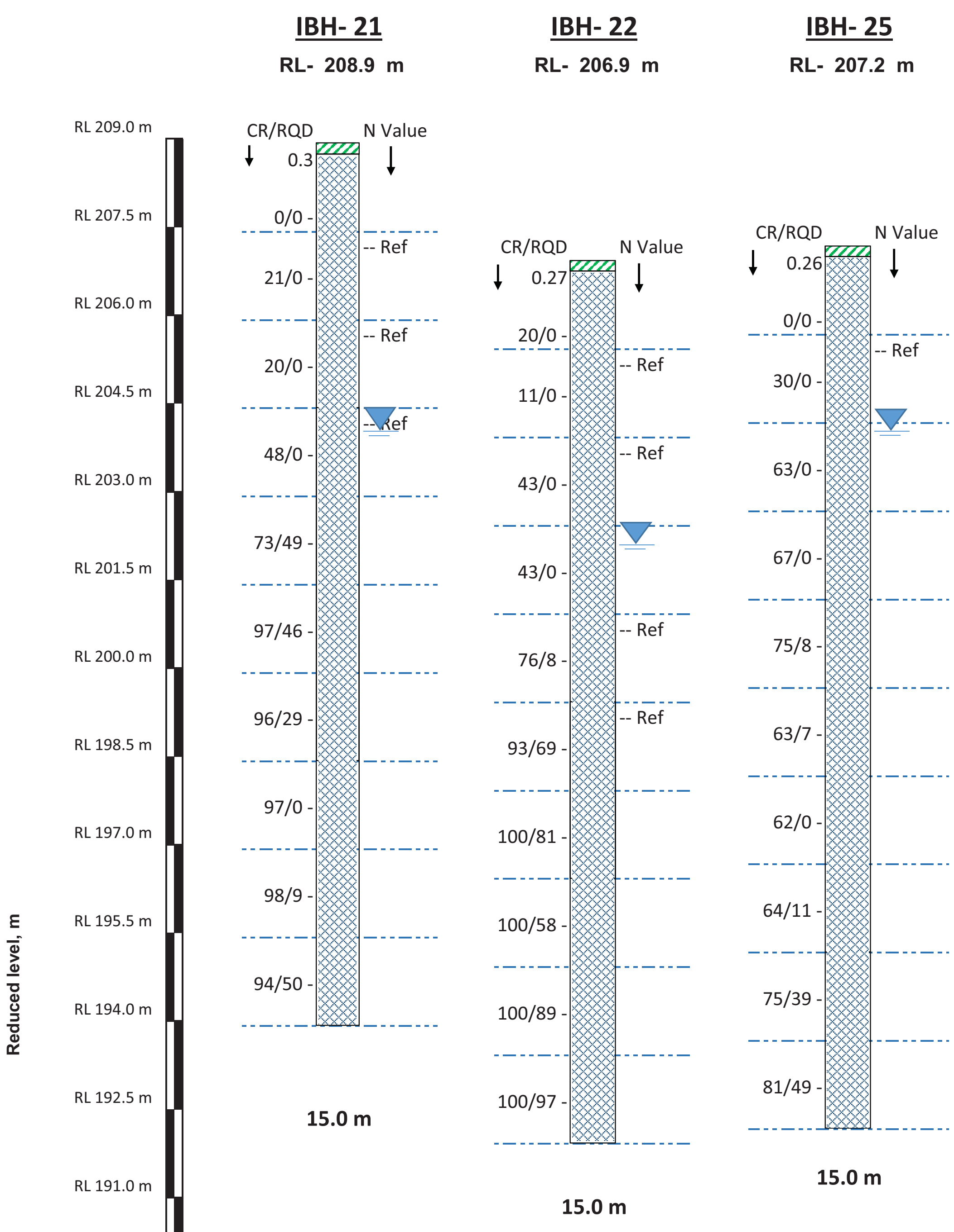


PIPE RACK

LEGEND	
SYMBOL	DESCRIPTION
(hatched)	Black Silty Clay
(cross-hatched)	Basalt
(triangle)	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

Summary of Borehole Profiles

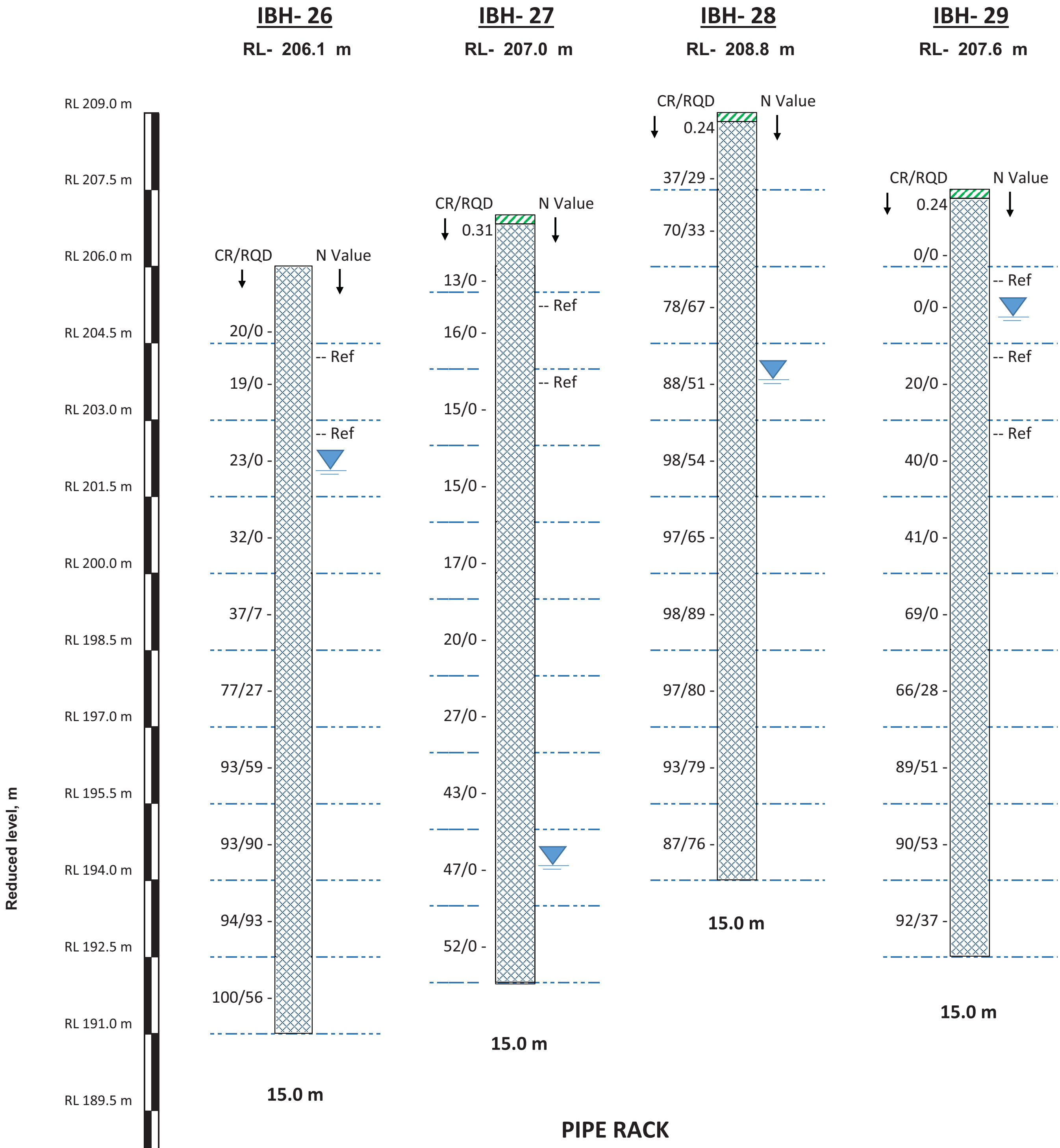


PIPE RACK

LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

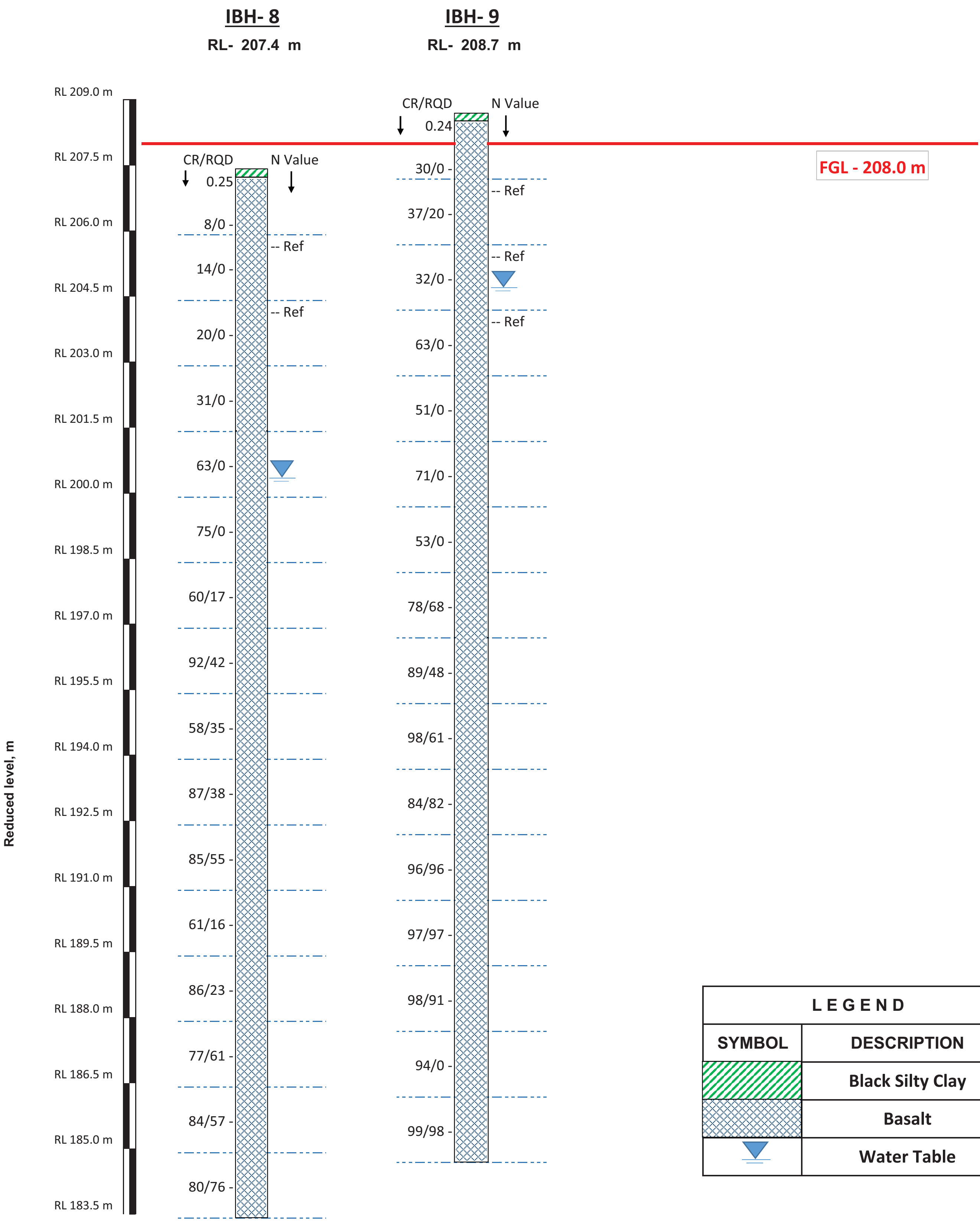
Summary of Borehole Profiles



LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

Summary of Borehole Profiles

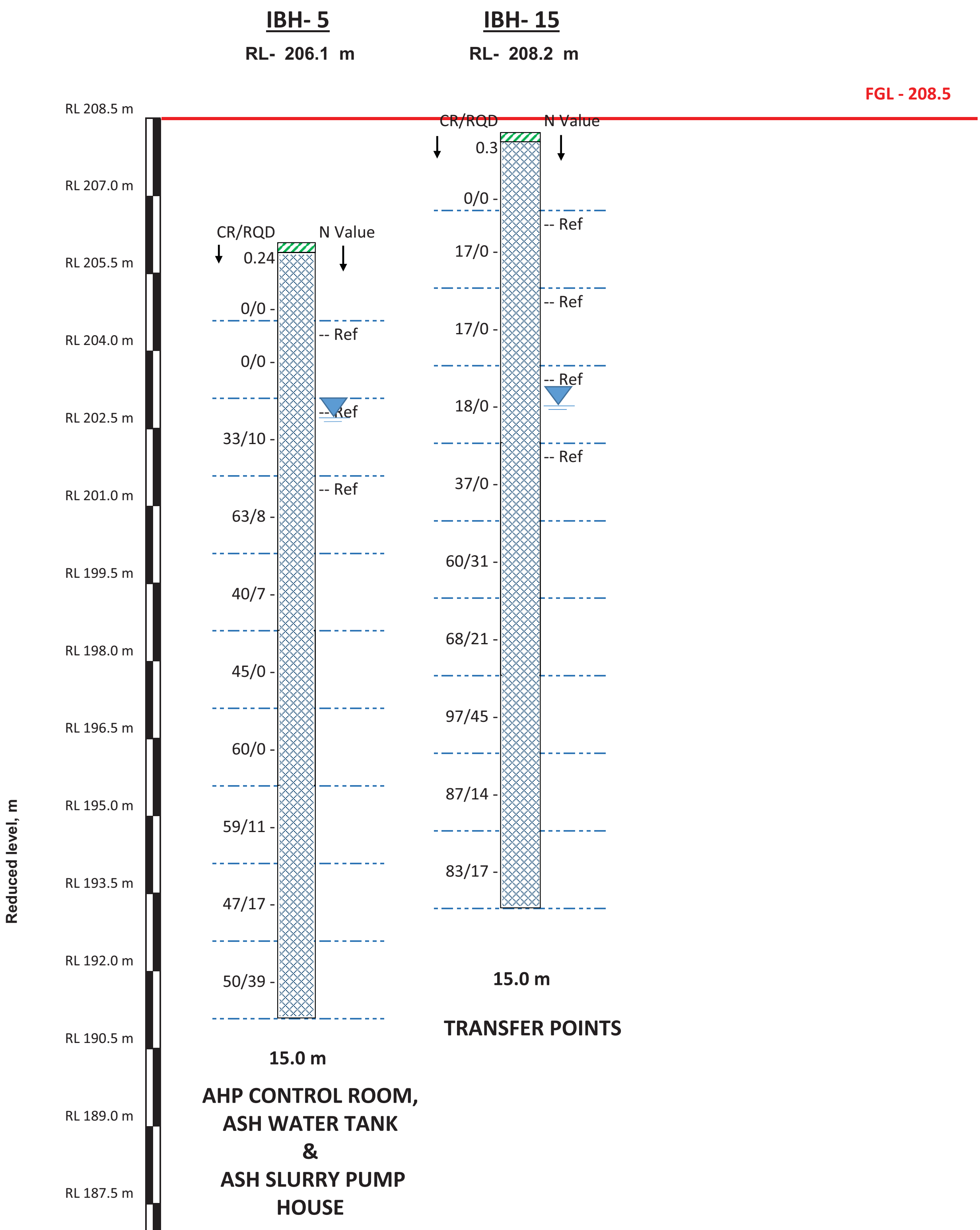


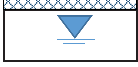
LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

WAGON TIPPLER

Note: * Ref stands for Refusal where (SPT N Value >100) blows

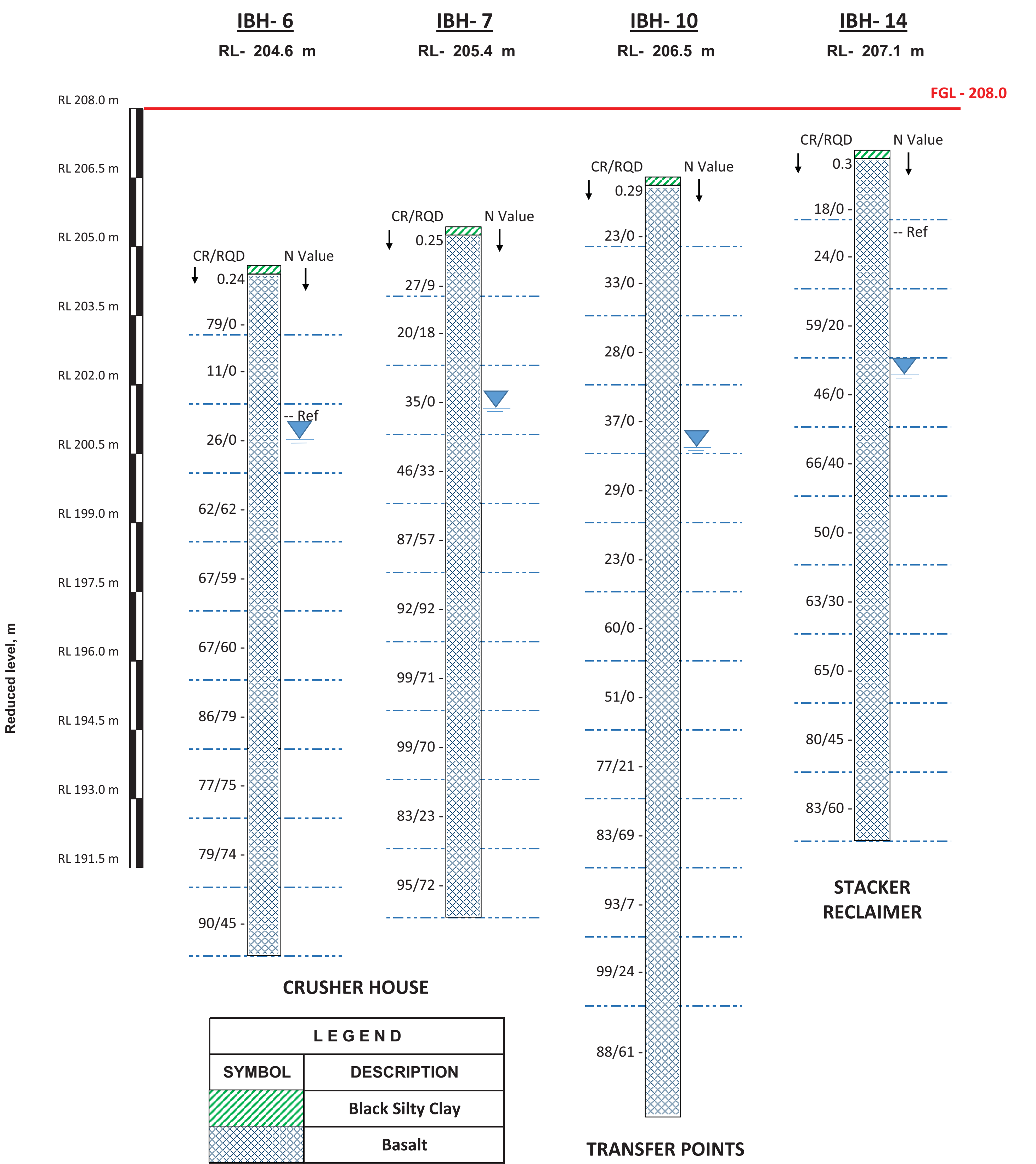
Summary of Borehole Profiles



LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

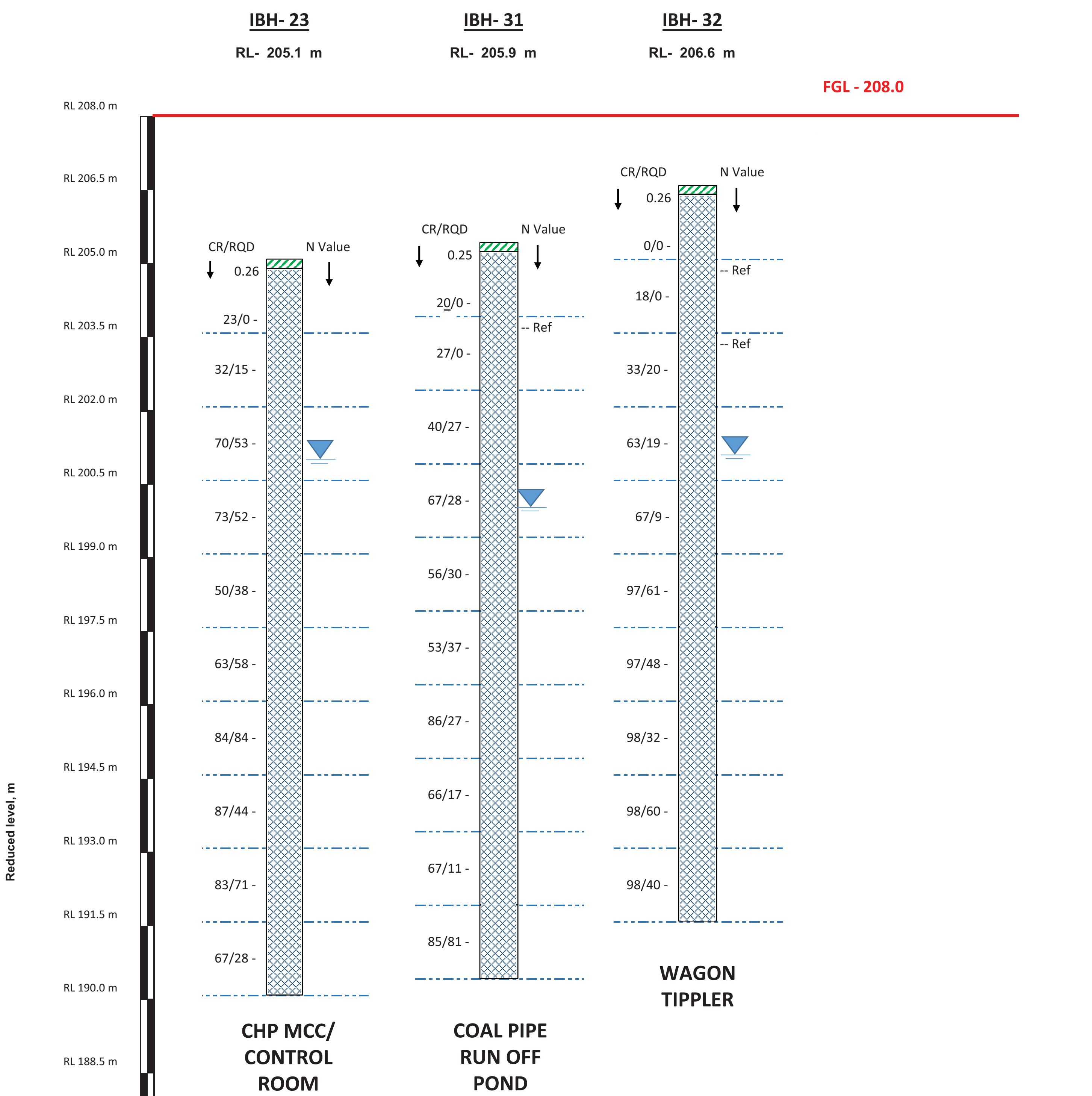
Summary of Borehole Profiles



LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

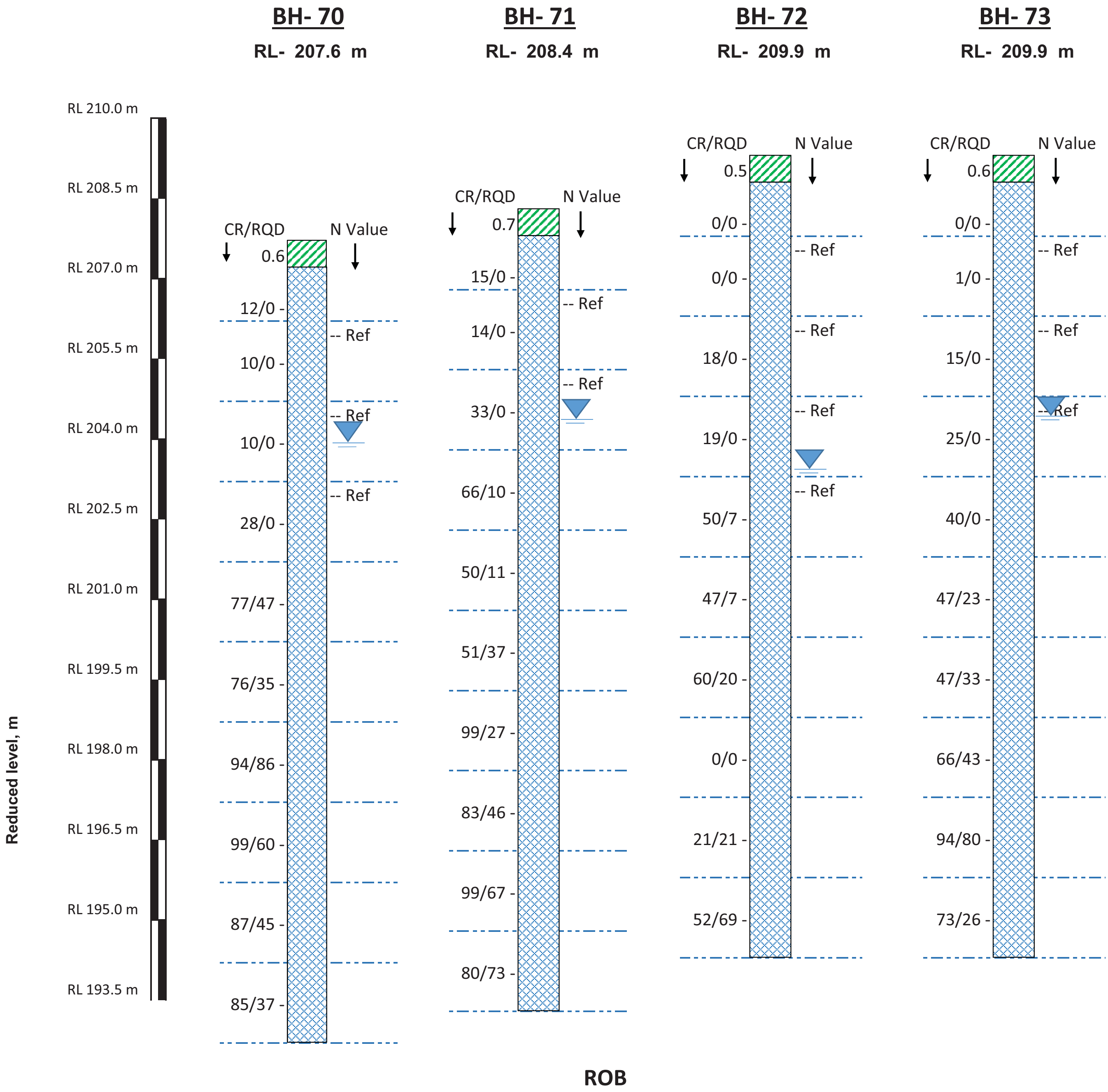
Summary of Borehole Profiles



LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref stands for Refusal where (SPT N Value >100) blows

Summary of Borehole Profiles



LEGEND	
SYMBOL	DESCRIPTION
	Black Silty Clay
	Basalt
	Water Table

Note: * Ref - Refusal (SPT N Value > 100).

Summary of Borehole Profiles

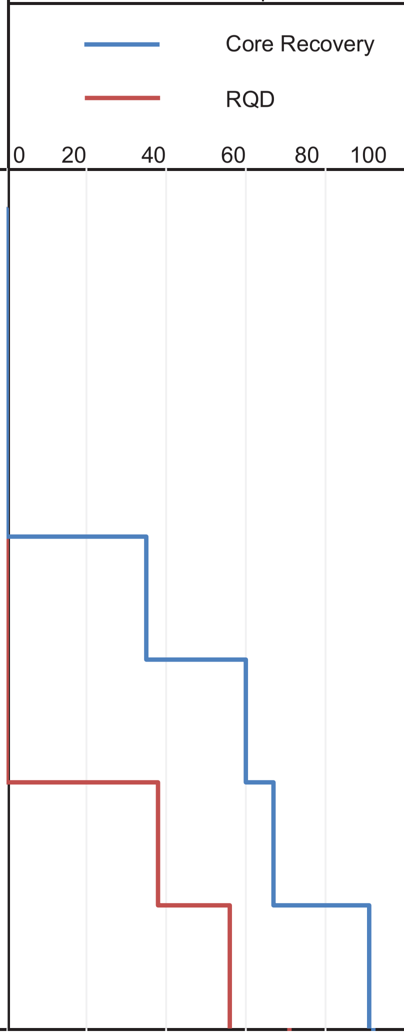
BOREHOLE LOGS

Borehole Log (IBH01)

Location :	**HCSS SILO**	Ground Level (GL) :	RL(+) 205.4 m	Drilling :	Rotary Drilling
Co-ordinates :	**1009 E, 725 N**	Ground Water Level :	3.9 m (RL(+) 201.5 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 190.4 m)	Start Date :	30-Jun-18	Casing Depth :	2.0 m
		Finish Date :	05-Jul-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.2 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.50, 4.00, 4.50	4.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (3 to 4.5m)		0	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		35	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		60	0			
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		67	38			
9.50, 10.00, 10.50	10.50		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10.5m)		91	56			

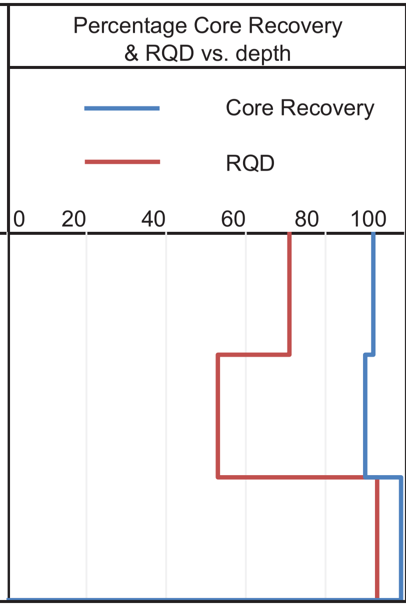
Percentage Core Recovery & RQD vs. depth



Borehole Log (IBH01)

Location :	**HCSS SILO**	Ground Level (GL) :	RL(+) 205.4 m	Drilling :	Rotary Drilling
Co-ordinates :	**1009 E, 725 N**	Ground Water Level :	3.9 m (RL(+) 201.5 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 190.4 m)	Start Date :	30-Jun-18	Casing Depth :	2.0 m
		Finish Date :	05-Jul-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00 11.50 12.00	12.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		92	71	Greyish	Partial	NX
12.50 13.00 13.50	13.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (12 to 13.5m)		90	53			
14.00 14.50 15.00	15.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)	15.0	99	93			

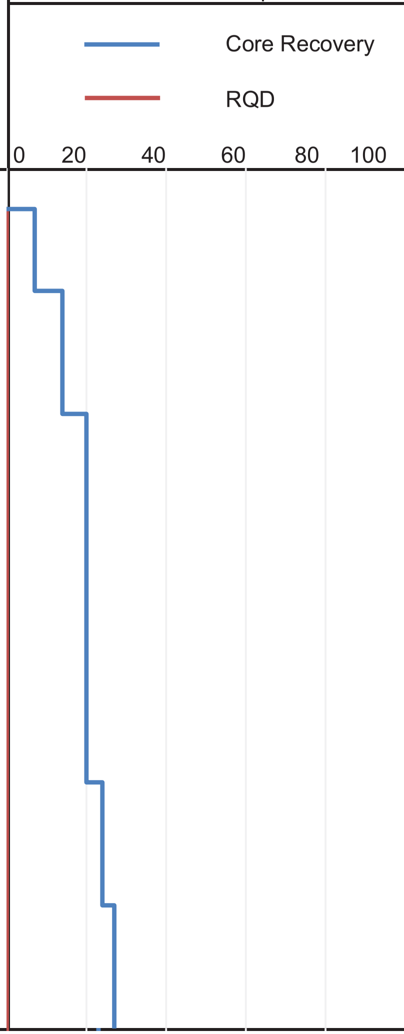


Borehole Log (IBH02)

Location :	**DRY ASH SILO**	Ground Level (GL) :	RL(+) 207.5 m	Drilling :	Rotary Drilling
Co-ordinates :	**1372 E, 1093 N**	Ground Water Level :	Not m (	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 192.5 m)	Start Date :	12-Sep-18	Casing Depth :	2.0 m
		Finish Date :	16-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (0.24 to 1.5m)		7	0			NX
2.00, 2.50, 3.00	3.00	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		14	0			
3.50, 4.00, 4.50	4.50			Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		20	0			
5.00, 5.50, 6.00	6.00			Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		20	0			
6.50, 7.00, 7.50	7.50			Weak grey Basalt, very intensely fractured, highly weathered (6 to 7.5m)		20	0			
8.00, 8.50, 9.00	9.00			Weak grey Basalt, very intensely fractured, highly weathered (7.5 to 9m)		24	0			
9.50, 10.00, 10.50	10.50			Weak grey Basalt, very intensely fractured, highly weathered (9 to 10.5m)		27	0			

Percentage Core Recovery & RQD vs. depth

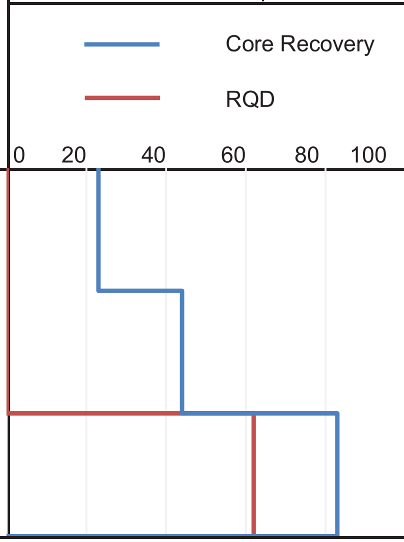


Borehole Log (IBH02)

Location :	**DRY ASH SILO**	Ground Level (GL) :	RL(+) 207.5 m	Drilling :	Rotary Drilling
Co-ordinates :	**1372 E, 1093 N**	Ground Water Level :	Not m (	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 192.5 m)	Start Date :	12-Sep-18	Casing Depth :	2.0 m
		Finish Date :	16-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Weak grey Basalt, very intensely fractured, highly weathered (10.5 to 12m)		23	0	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		44	0			
13.00										
13.50	13.50									
14.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		83	62			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

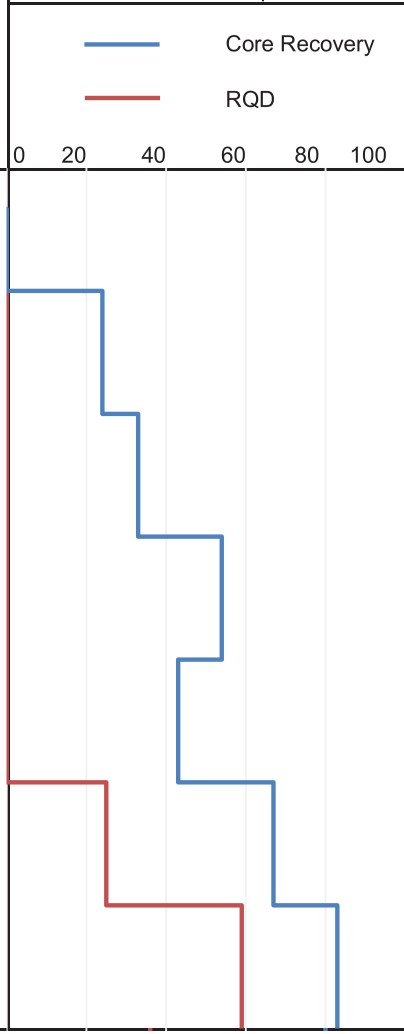


Borehole Log (IBH03)

Location :	**H.C.S.D. PUMP HOUSE & MCC ROOM**	Ground Level (GL) :	RL(+) 205.0 m	Drilling :	Rotary Drilling
Co-ordinates :	**1020 E, 700 N**	Ground Water Level :	3.5 m (RL(+) 201.4 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 190 m)	Start Date :	05-Jul-18	Casing Depth :	2.0 m
		Finish Date :	09-Jul-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00			Very weak grey Basalt, completely weathered, disintegrated (0.27 to 1.5m)		0	0			NX
1.50	1.50	Ref.							
2.00									
2.50			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		24	0			
3.00	3.00								
3.50									
4.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		33	0			
4.50	4.50								
5.00									
5.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		54	0			
6.00	6.00								
6.50									
7.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		43	0			
7.50	7.50								
8.00									
8.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		67	25			
9.00	9.00								
9.50									
10.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10.5m)		83	59			
10.50	10.50								

Percentage Core Recovery & RQD vs. depth

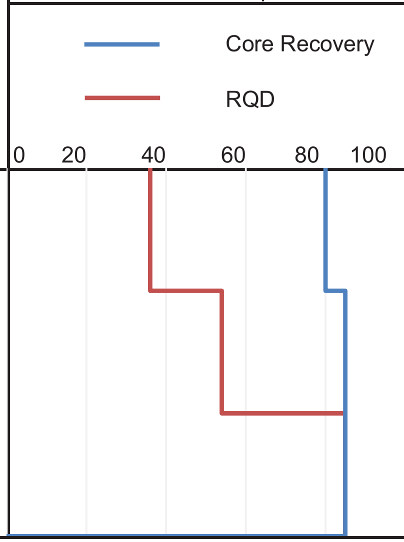


Borehole Log (IBH03)

Location :	**H.C.S.D. PUMP HOUSE & MCC ROOM**	Ground Level (GL) :	RL(+) 205.0 m
Co-ordinates :	**1020 E, 700 N**	Ground Water Level :	3.5 m (RL(+) 201.4 m)
Termination Depth : (below GL)	15 m (RL(+) 190 m)	Start Date :	05-Jul-18
		Finish Date :	09-Jul-18
Drilling :	Rotary Drilling		
Bit Type :	Diamond		
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		80	36	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (12 to 13.5m)		85	54			
13.00										
13.50	13.50									
14.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		85	85			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

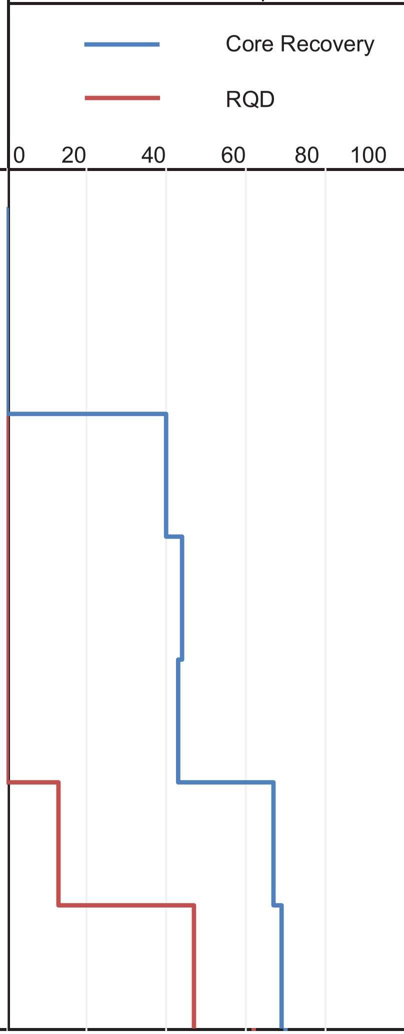


Borehole Log (IBH04)

Location :	**AHP COMPRESSORS & BLOWERS**	Ground Level (GL) :	RL(+) 204.6 m
Co-ordinates :	**1065 E, 700 N**	Ground Water Level :	2.4 m (RL(+) 202.2 m)
Termination Depth : (below GL)	15 m (RL(+) 189.6 m)	Start Date :	11-Jul-18
		Finish Date :	16-Jul-18
Drilling :	Rotary Drilling		
Bit Type :	Diamond		
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Colour	Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.25 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		40	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		44	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		43	0			
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		67	13			
9.50, 10.00, 10.50	10.50		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10.5m)		69	47			

Percentage Core Recovery & RQD vs. depth



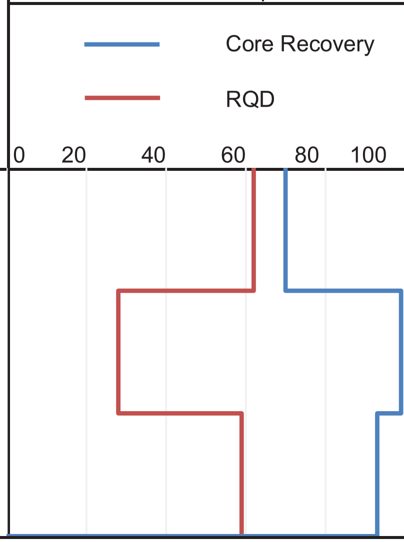
Borehole Log (IBH04)

Location :	**AHP COMPRESSORS & BLOWERS**	Ground Level (GL) :	RL(+) 204.6 m
Co-ordinates :	**1065 E, 700 N**	Ground Water Level :	2.4 m (RL(+) 202.2 m)
Termination Depth : (below GL)	15 m (RL(+) 189.6 m)	Start Date :	11-Jul-18
		Finish Date :	16-Jul-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		70	62	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		99	28			
13.00										
13.50	13.50									
14.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (13.5 to 15m)		93	59			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

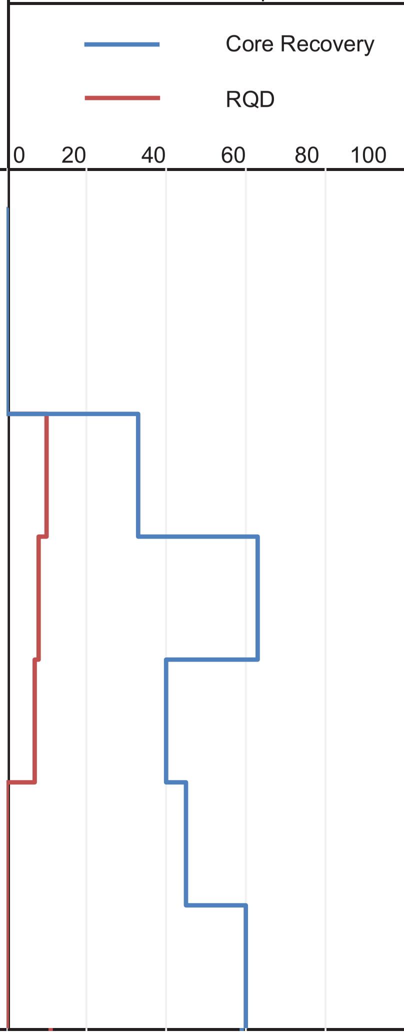


Borehole Log (IBH05)

Location :	**AHP CONTROL ROOM, ASH WATER TA**	Ground Level (GL) :	RL(+) 206.1 m	Drilling :	Rotary Drilling
Co-ordinates :	**1067 E, 649 N**	Ground Water Level :	3.4 m (RL(+) 202.7 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 191.1 m)	Start Date :	02-Jul-18	Casing Depth :	2.0 m
		Finish Date :	21-Jul-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.		Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00	Ref.		Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.50, 4.00, 4.50	4.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		33	10			
5.00, 5.50, 6.00	6.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		63	8			
6.50, 7.00, 7.50	7.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		40	7			
8.00, 8.50, 9.00	9.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		45	0			
9.50, 10.00, 10.50	10.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		60	0			

Percentage Core Recovery & RQD vs. depth

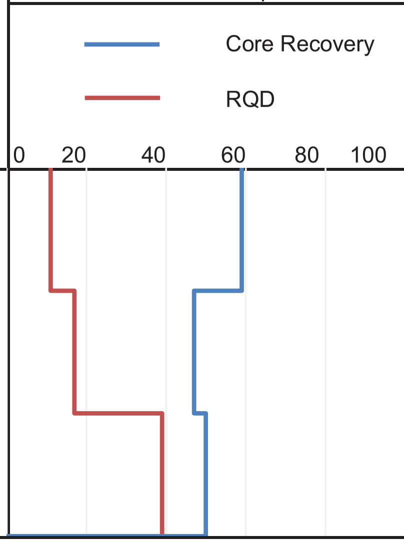


Borehole Log (IBH05)

Location :	**AHP CONTROL ROOM, ASH WATER TA**	Ground Level (GL) :	RL(+) 206.1 m
Co-ordinates :	**1067 E, 649 N**	Ground Water Level :	3.4 m (RL(+) 202.7 m)
Termination Depth : (below GL)	15 m (RL(+) 191.1 m)	Start Date :	02-Jul-18
		Finish Date :	21-Jul-18
Drilling :	Rotary Drilling		
Bit Type :	Diamond		
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		59	11	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		47	17			
13.00										
13.50	13.50									
14.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)		50	39			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

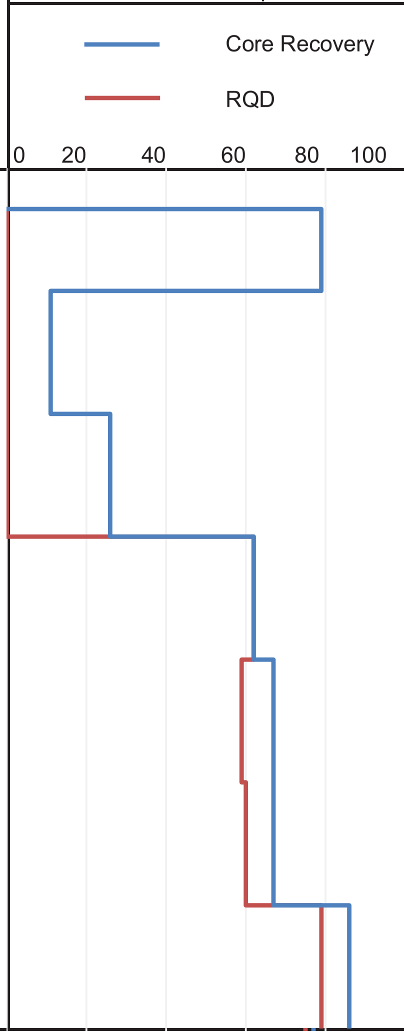


Borehole Log (IBH06)

Location :	**CRUSHER HOUSE**	Ground Level (GL) :	RL(+) 204.6 m
Co-ordinates :	**1379 E, 888 N**	Ground Water Level :	3.8 m (RL(+) 200.8 m)
Termination Depth : (below GL)	15 m (RL(+) 189.6 m)	Start Date :	04-Aug-18
		Finish Date :	14-Aug-18
Drilling :	Rotary Drilling		
Bit Type :	Diamond		
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2					HX
1.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (0.24 to 1.5m)		79	0			
1.50	1.50									
2.00										
2.50				Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		11	0			
3.00	3.00	Ref.								
3.50										
4.00				Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		26	0			
4.50	4.50									
5.00										
5.50				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (4.5 to 6m)		62	62	Greyish	Partial	NX
6.00	6.00									
6.50										
7.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (6 to 7.5m)		67	59			
7.50	7.50									
8.00										
8.50				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		67	60			
9.00	9.00									
9.50										
10.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10.5m)		86	79			
10.50	10.50									

Percentage Core Recovery & RQD vs. depth

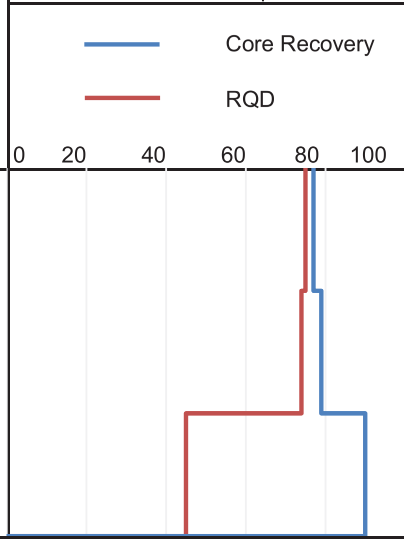


Borehole Log (IBH06)

Location :	**CRUSHER HOUSE**	Ground Level (GL) :	RL(+) 204.6 m	Drilling :	Rotary Drilling
Co-ordinates :	**1379 E, 888 N**	Ground Water Level :	3.8 m (RL(+) 200.8 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 189.6 m)	Start Date :	04-Aug-18	Casing Depth :	2.0 m
		Finish Date :	14-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
11.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		77	75	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (12 to 13.5m)		79	74			
13.00										
13.50	13.50									
14.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (13.5 to 15m)		90	45			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

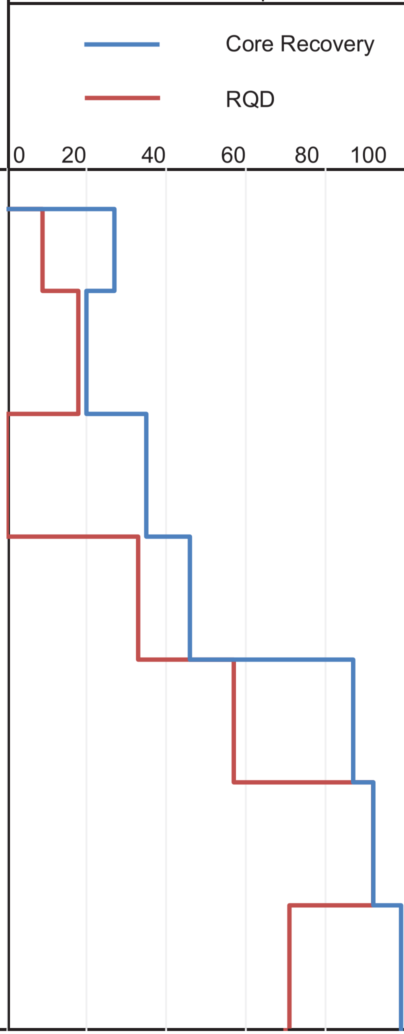


Borehole Log (IBH07)

Location :	**CRUSHER HOUSE**	Ground Level (GL) :	RL(+) 205.4 m	Drilling :	Rotary Drilling
Co-ordinates :	**1333 E, 906 N**	Ground Water Level :	3.9 m (RL(+) 201.5 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 190.4 m)	Start Date :	29-Jul-18	Casing Depth :	2.0 m
		Finish Date :	03-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)
0.50			Black Silty Clay with rock fragments	0.3		
1.00, 1.50	1.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (0.25 to 1.5m)		27	9
2.00, 2.50, 3.00	3.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		20	18
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		35	0
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		46	33
6.50, 7.00, 7.50	7.50		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (6 to 7.5m)		87	57
8.00, 8.50, 9.00	9.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		92	92
9.50, 10.00, 10.50	10.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10.5m)		99	71

Percentage Core Recovery & RQD vs. depth



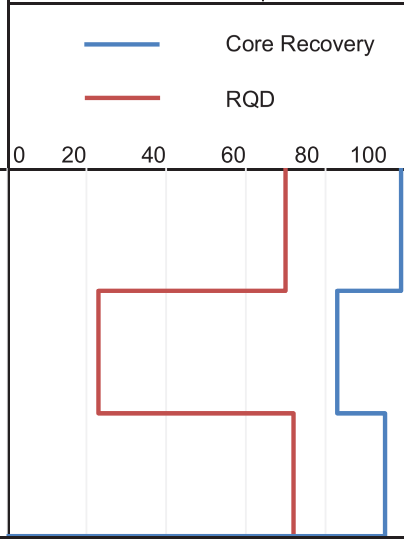
Return Water: Colour	Return Water: Loss	Size of Hole
Greyish	Partial	HX (0–0.3 m), NX

Borehole Log (IBH07)

Location :	**CRUSHER HOUSE**	Ground Level (GL) :	RL(+) 205.4 m	Drilling :	Rotary Drilling
Co-ordinates :	**1333 E, 906 N**	Ground Water Level :	3.9 m (RL(+) 201.5 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 190.4 m)	Start Date :	29-Jul-18	Casing Depth :	2.0 m
		Finish Date :	03-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		99	70	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		83	23			
13.00										
13.50	13.50									
14.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		95	72			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth



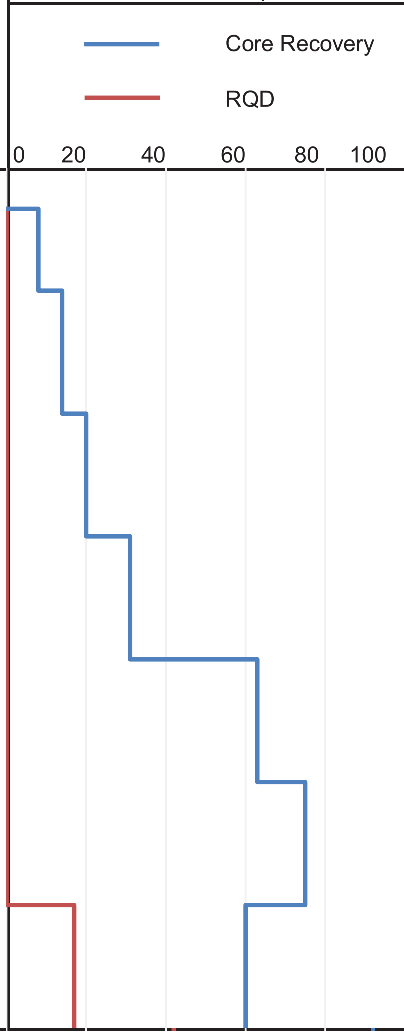
Scale

Borehole Log (IBH08)

Location :	**WAGON TIPPLER**	Ground Level (GL) :	RL(+) 207.4 m	Drilling :	Rotary Drilling
Co-ordinates :	**1808 E, 800 N**	Ground Water Level :	7.1 m (RL(+) 200.3 m)	Bit Type :	Diamond
Termination Depth : (below GL)	25 m (RL(+) 182.4 m)	Start Date :	05-Sep-18	Casing Depth :	2.0 m
		Finish Date :	08-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3					HX
1.00			Weak grey Basalt, very intensely fractured, highly weathered (0.25 to 1.5m)		8	0			
1.50	1.50	Ref.							
2.00			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		14	0			
2.50									
3.00	3.00	Ref.							
3.50			Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		20	0			
4.00									
4.50	4.50								
5.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		31	0	Greyish	Partial	NX
5.50									
6.00	6.00								
6.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		63	0			
7.00									
7.50	7.50								
8.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		75	0			
8.50									
9.00	9.00								
9.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		60	17			
10.00									
10.50	10.50								

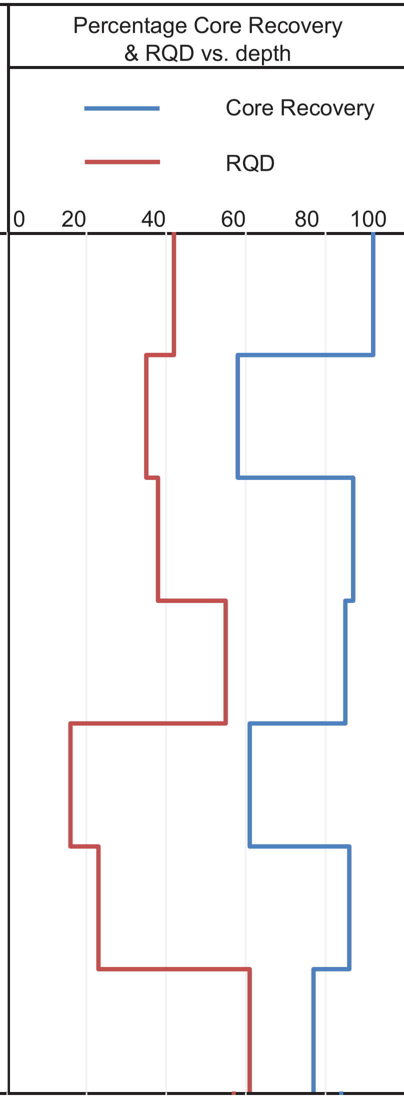
Percentage Core Recovery & RQD vs. depth



Borehole Log (IBH08)

Location :	**WAGON TIPPLER**	Ground Level (GL) :	RL(+) 207.4 m	Drilling :	Rotary Drilling
Co-ordinates :	**1808 E, 800 N**	Ground Water Level :	7.1 m (RL(+) 200.3 m)	Bit Type :	Diamond
Termination Depth : (below GL)	25 m (RL(+) 182.4 m)	Start Date :	05-Sep-18	Casing Depth :	2.0 m
		Finish Date :	08-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
11.00 11.50 12.00	12.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (10.5 to 12m)		92	42	Greyish	Partial	NX
12.50 13.00 13.50	13.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		58	35			
14.00 14.50 15.00	15.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)		87	38			
15.50 16.00 16.50	16.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (15 to 16.5m)		85	55			
17.00 17.50 18.00	18.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (16.5 to 18m)		61	16			
18.50 19.00 19.50	19.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (18 to 19.5m)		86	23			
20.00 20.50 21.00	21.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (19.5 to 21m)		77	61			

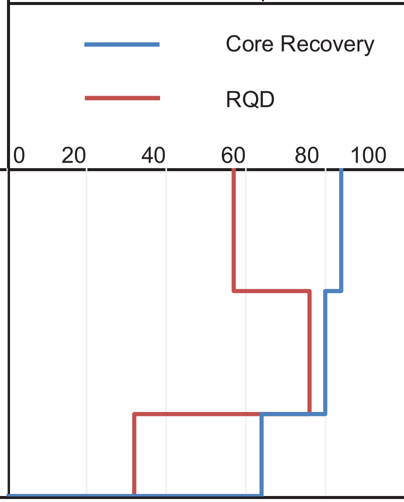


Borehole Log (IBH08)

Location :	**WAGON TIPPLER**	Ground Level (GL) :	RL(+) 207.4 m	Drilling :	Rotary Drilling
Co-ordinates :	**1808 E, 800 N**	Ground Water Level :	7.1 m (RL(+) 200.3 m)	Bit Type :	Diamond
Termination Depth : (below GL)	25 m (RL(+) 182.4 m)	Start Date :	05-Sep-18	Casing Depth :	2.0 m
		Finish Date :	08-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
21.50				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (21 to 22.5m)		84	57	Greyish	Partial	NX
22.00										
22.50	22.50									
23.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (22.5 to 24m)		80	76			
23.50										
24.00	24.00									
24.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (24 to 25m)		64	32			
25.00	25.00				25.0					

Percentage Core Recovery & RQD vs. depth

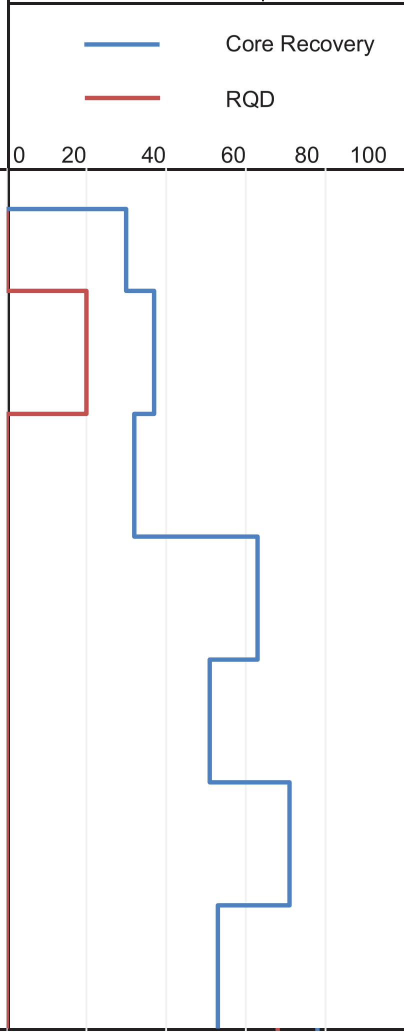


Borehole Log (IBH09)

Location :	**WAGON TIPPLER**	Ground Level (GL) :	RL(+) 208.7 m	Drilling :	Rotary Drilling
Co-ordinates :	**1790 E, 771 N**	Ground Water Level :	4 m (RL(+) 204.7 m)	Bit Type :	Diamond
Termination Depth : (below GL)	25 m (RL(+) 183.7 m)	Start Date :	01-Sep-18	Casing Depth :	2.0 m
		Finish Date :	04-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2					HX
1.00, 1.50	1.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (0.24 to 1.5m)		30	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		37	20			
3.50, 4.00, 4.50	4.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		32	0			
5.00, 5.50, 6.00	6.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		63	0			
6.50, 7.00, 7.50	7.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		51	0			
8.00, 8.50, 9.00	9.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		71	0			
9.50, 10.00, 10.50	10.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		53	0			

Percentage Core Recovery & RQD vs. depth



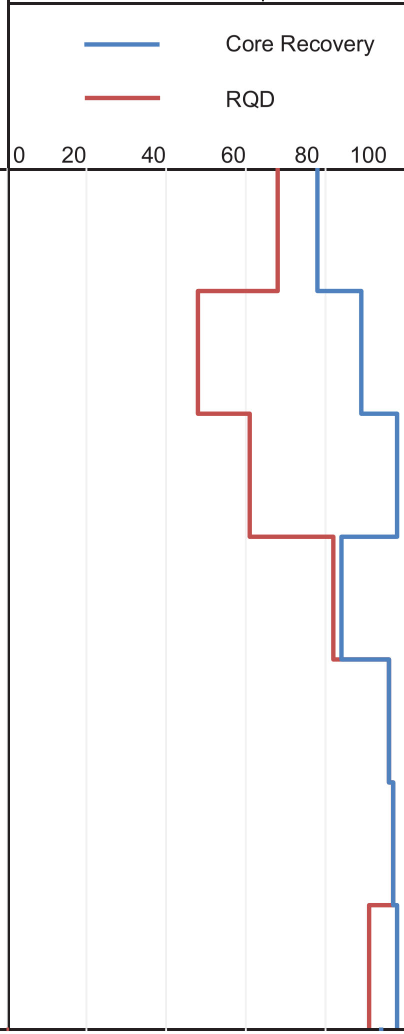
Borehole Log (IBH09)

Location :	**WAGON TIPPLER**	Ground Level (GL) :	RL(+) 208.7 m
Co-ordinates :	**1790 E, 771 N**	Ground Water Level :	4 m (RL(+) 204.7 m)
Termination Depth : (below GL)	25 m (RL(+) 183.7 m)	Start Date :	01-Sep-18
		Finish Date :	04-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)
11.00 11.50 12.00	12.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		78	68
12.50 13.00 13.50	13.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (12 to 13.5m)		89	48
14.00 14.50 15.00	15.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		98	61
15.50 16.00 16.50	16.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (15 to 16.5m)		84	82
17.00 17.50 18.00	18.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (16.5 to 18m)		96	96
18.50 19.00 19.50	19.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (18 to 19.5m)		97	97
20.00 20.50 21.00	21.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (19.5 to 21m)		98	91

Percentage Core Recovery & RQD vs. depth



Return Water: Colour	Return Water: Loss	Size of Hole
Greyish	Partial	NX

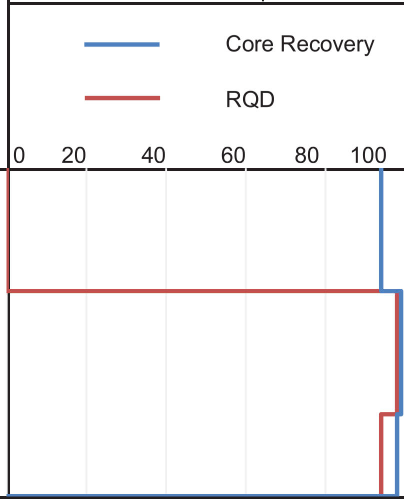
Borehole Log (IBH09)

Location :	**WAGON TIPPLER**	Ground Level (GL) :	RL(+) 208.7 m
Co-ordinates :	**1790 E, 771 N**	Ground Water Level :	4 m (RL(+) 204.7 m)
Termination Depth : (below GL)	25 m (RL(+) 183.7 m)	Start Date :	01-Sep-18
		Finish Date :	04-Sep-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
21.50 / 22.00 / 22.50	22.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (21 to 22.5m)		94	0	Greyish	Partial	NX
23.00 / 23.50 / 24.00	24.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (22.5 to 24m)		99	98			
24.50 / 25.00	25.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (24 to 25m)	25.0	98	94			

Percentage Core Recovery & RQD vs. depth

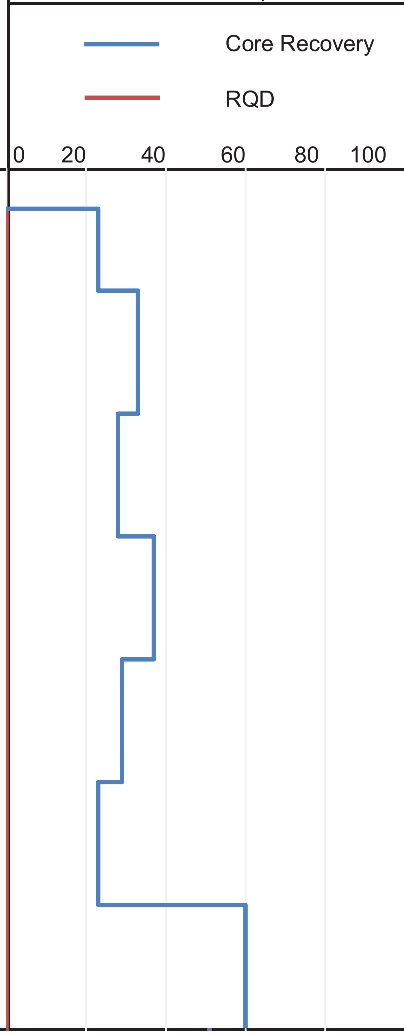


Borehole Log (IBH10)

Location :	**TRANSFER POINTS**	Ground Level (GL) :	RL(+) 206.5 m	Drilling :	Rotary Drilling
Co-ordinates :	**1504 E, 938 N**	Ground Water Level :	5.9 m (RL(+) 200.6 m)	Bit Type :	Diamond
Termination Depth : (below GL)	20 m (RL(+) 186.5 m)	Start Date :	14-Aug-18	Casing Depth :	2.0 m
		Finish Date :	06-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.3					HX
1.00				Weak grey Basalt, very intensely fractured, highly weathered (0.29 to 1.5m)		23	0	Greyish	Partial	NX
1.50	1.50									
2.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		33	0			
2.50										
3.00	3.00									
3.50				Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		28	0			
4.00										
4.50	4.50									
5.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		37	0			
5.50										
6.00	6.00									
6.50				Weak grey Basalt, very intensely fractured, highly weathered (6 to 7.5m)		29	0			
7.00										
7.50	7.50									
8.00				Weak grey Basalt, very intensely fractured, highly weathered (7.5 to 9m)		23	0			
8.50										
9.00	9.00									
9.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		60	0			
10.00										
10.50	10.50									

Percentage Core Recovery & RQD vs. depth



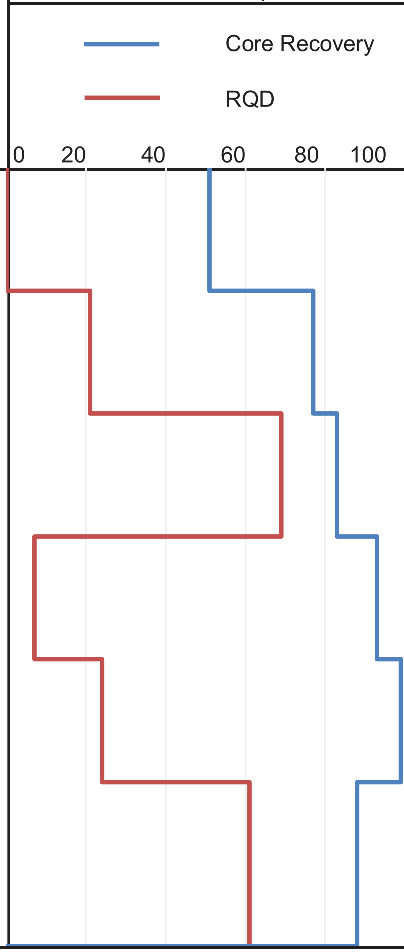
Borehole Log (IBH10)

Location :	**TRANSFER POINTS**	Ground Level (GL) :	RL(+) 206.5 m
Co-ordinates :	**1504 E, 938 N**	Ground Water Level :	5.9 m (RL(+) 200.6 m)
Termination Depth : (below GL)	20 m (RL(+) 186.5 m)	Start Date :	14-Aug-18
		Finish Date :	06-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00 11.50 12.00	12.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		51	0	Greyish	Partial	NX
12.50 13.00 13.50	13.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		77	21			
14.00 14.50 15.00	15.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		83	69			
15.50 16.00 16.50	16.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (15 to 16.5m)		93	7			
17.00 17.50 18.00	18.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (16.5 to 18m)		99	24			
18.50 19.00 19.50 20.00	20.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (18 to 20m)	20.0	88	61			

Percentage Core Recovery & RQD vs. depth



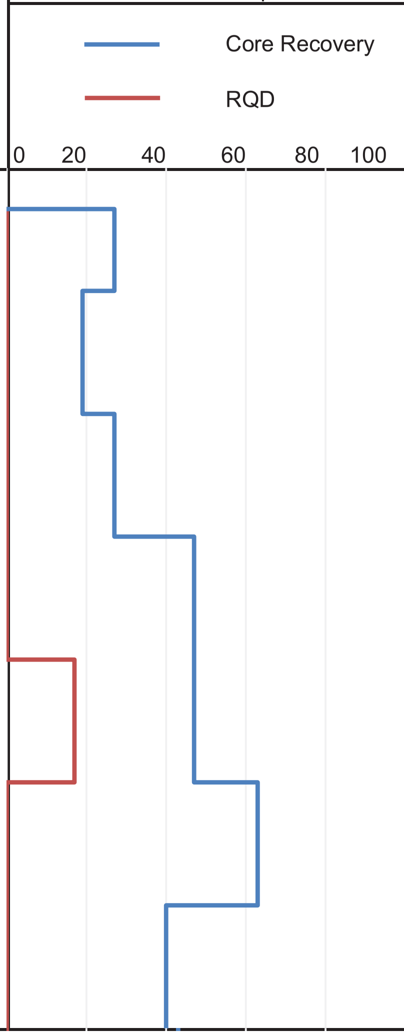
Scale

Borehole Log (IBH11)

Location :	**PENT HOUSE**	Ground Level (GL) :	RL(+) 207.8 m	Drilling :	Rotary Drilling
Co-ordinates :	**1699 E, 817 N**	Ground Water Level :	7.8 m (RL(+) 200 m)	Bit Type :	Diamond
Termination Depth : (below GL)	25 m (RL(+) 182.8 m)	Start Date :	09-Sep-18	Casing Depth :	2.0 m
		Finish Date :	12-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00 1.50	1.50		Weak grey Basalt, very intensely fractured, highly weathered (0.22 to 1.5m)		27	0	Greyish	Partial	NX
2.00 2.50 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		19	0			
3.50 4.00 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		27	0			
5.00 5.50 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		47	0			
6.50 7.00 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		47	17			
8.00 8.50 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		63	0			
9.50 10.00 10.50	10.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		40	0			

Percentage Core Recovery & RQD vs. depth

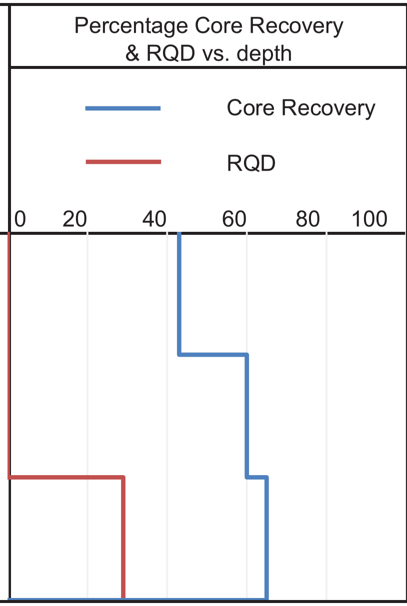


Borehole Log (IBH11)

Location :	**PENT HOUSE**	Ground Level (GL) :	RL(+) 207.8 m
Co-ordinates :	**1699 E, 817 N**	Ground Water Level :	7.8 m (RL(+) 200 m)
Termination Depth : (below GL)	25 m (RL(+) 182.8 m)	Start Date :	09-Sep-18
		Finish Date :	12-Sep-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
11.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		43	0	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		60	0			
13.00										
13.50	13.50									
14.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)		65	29			
14.50										
15.00	15.00				25.0					



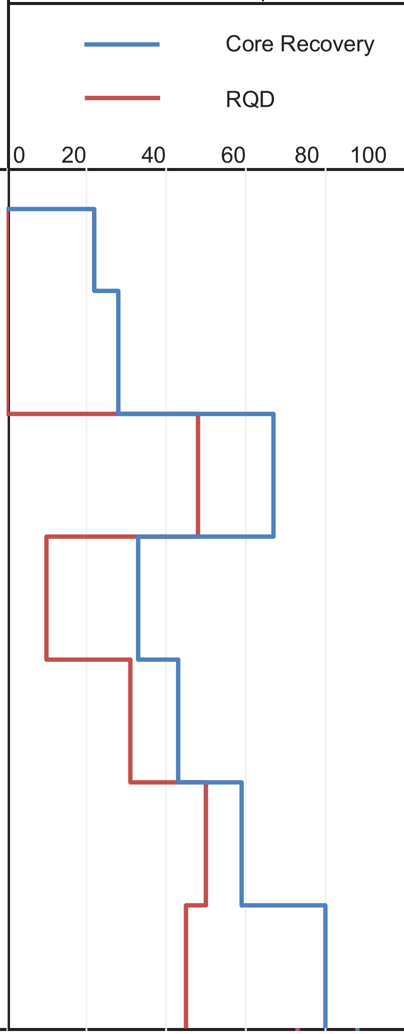
Borehole Log (IBH12)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 210.3 m
Co-ordinates :	**1742 E, 658 N**	Ground Water Level :	10 m (RL(+) 200.1 m)
Termination Depth : (below GL)	15 m (RL(+) 195.3 m)	Start Date :	03-Sep-18
		Finish Date :	10-Sep-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.3					HX
1.00 – 1.50	1.50			Weak grey Basalt, very intensely fractured, highly weathered (0.25 to 1.5m)		22	0	Greyish	Partial	NX
2.00 – 3.00	3.00			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		28	0			
3.50 – 4.50	4.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (3 to 4.5m)		67	48			
5.00 – 6.00	6.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		33	10			
6.50 – 7.50	7.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		43	31			
8.00 – 9.00	9.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		59	50			
9.50 – 10.50	10.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10.5m)		80	45			

Percentage Core Recovery & RQD vs. depth

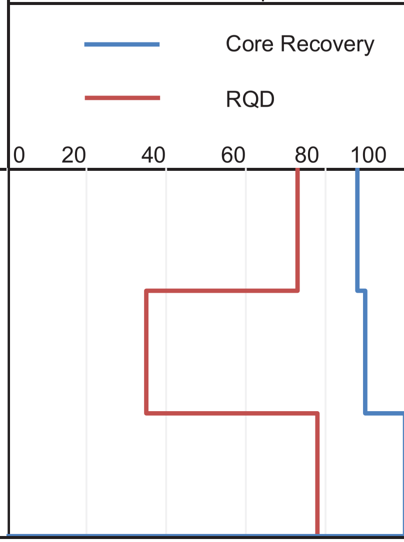


Borehole Log (IBH12)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 210.3 m	Drilling :	Rotary Drilling
Co-ordinates :	**1742 E, 658 N**	Ground Water Level :	10 m (RL(+) 200.1 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 195.3 m)	Start Date :	03-Sep-18	Casing Depth :	2.0 m
		Finish Date :	10-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
11.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		88	73	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		90	35			
13.00										
13.50	13.50									
14.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		100	78			
14.50										
15.00	15.00				15.0					

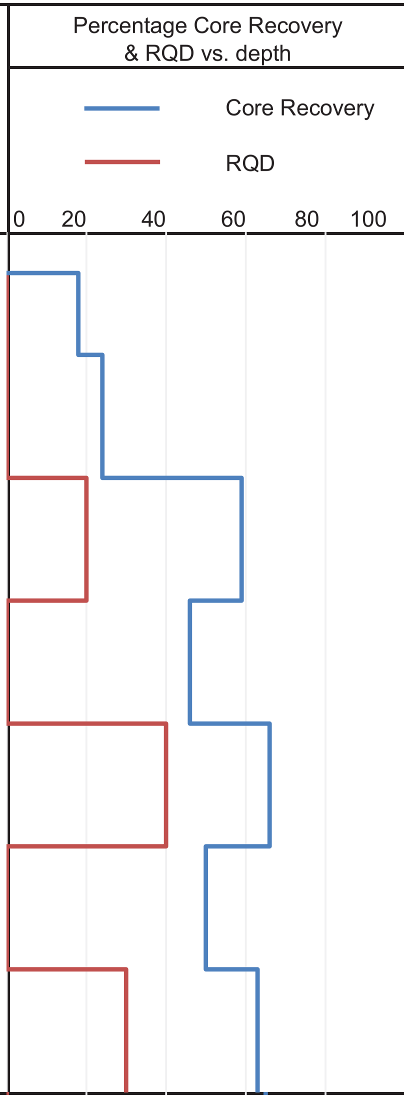
Percentage Core Recovery & RQD vs. depth



Borehole Log (IBH13)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 208.3 m	Drilling :	Rotary Drilling
Co-ordinates :	**1485 E, 823 N**	Ground Water Level :	11 m (RL(+) 197.3 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 193.3 m)	Start Date :	29-Aug-18	Casing Depth :	2.0 m
		Finish Date :	05-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00			Weak grey Basalt, very intensely fractured, highly weathered (0.24 to 1.5m)		18	0			NX
1.50	1.50	Ref.							
2.00									
2.50			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		24	0			
3.00	3.00								
3.50									
4.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		59	20			
4.50	4.50								
5.00									
5.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		46	0			
6.00	6.00								
6.50									
7.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		66	40			
7.50	7.50								
8.00									
8.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		50	0			
9.00	9.00								
9.50									
10.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		63	30			
10.50	10.50								

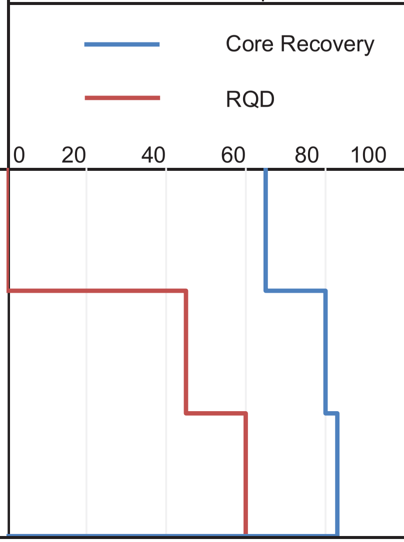


Borehole Log (IBH13)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 208.3 m	Drilling :	Rotary Drilling
Co-ordinates :	**1485 E, 823 N**	Ground Water Level :	11 m (RL(+) 197.3 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 193.3 m)	Start Date :	29-Aug-18	Casing Depth :	2.0 m
		Finish Date :	05-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		65	0	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (12 to 13.5m)		80	45			
13.00										
13.50	13.50									
14.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (13.5 to 15m)		83	60			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

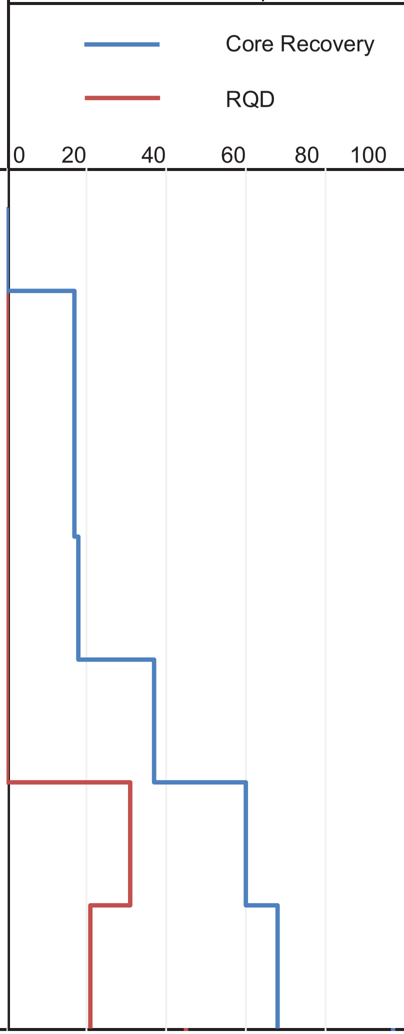


Borehole Log (IBH14)

Location :	**STACKER RECLAIMER**	Ground Level (GL) :	RL(+) 207.1 m	Drilling :	Rotary Drilling
Co-ordinates :	**1586 E, 759 N**	Ground Water Level :	4.9 m (RL(+) 202.2 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 192.1 m)	Start Date :	25-Aug-18	Casing Depth :	2.0 m
		Finish Date :	28-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.3					HX
1.00, 1.50	1.50	Ref.		Very weak grey Basalt, completely weathered, disintegrated (0.3 to 1.5m)		0	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		17	0			
3.50, 4.00, 4.50	4.50	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		17	0			
5.00, 5.50, 6.00	6.00	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		18	0			
6.50, 7.00, 7.50	7.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		37	0			
8.00, 8.50, 9.00	9.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		60	31			
9.50, 10.00, 10.50	10.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		68	21			

Percentage Core Recovery & RQD vs. depth

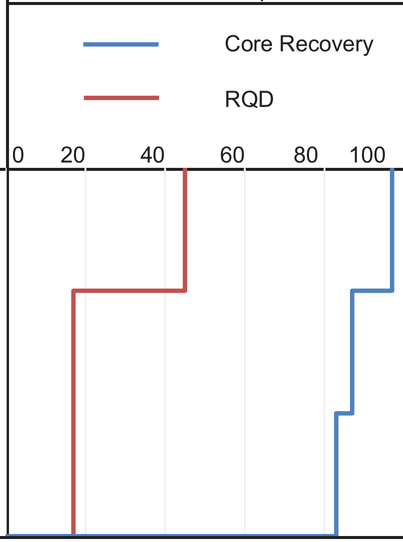


Borehole Log (IBH14)

Location :	**STACKER RECLAIMER**	Ground Level (GL) :	RL(+) 207.1 m	Drilling :	Rotary Drilling
Co-ordinates :	**1586 E, 759 N**	Ground Water Level :	4.9 m (RL(+) 202.2 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 192.1 m)	Start Date :	25-Aug-18	Casing Depth :	2.0 m
		Finish Date :	28-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (10.5 to 12m)		97	45	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		87	17			
13.00										
13.50	13.50									
14.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)		83	17			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth



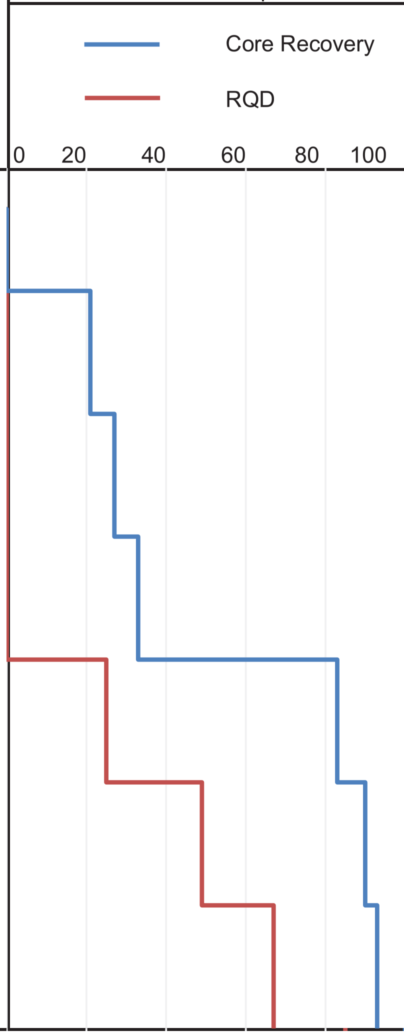
Borehole Log (IBH15)

Location :	**TRANSFER POINTS**	Ground Level (GL) :	RL(+) 208.2 m
Co-ordinates :	**1404 E, 661 N**	Ground Water Level :	5.3 m (RL(+) 202.9 m)
Termination Depth : (below GL)	15 m (RL(+) 193.2 m)	Start Date :	22-Aug-18
		Finish Date :	24-Aug-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3					HX
1.00 – 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.3 to 1.5m)		0	0	Greyish	Partial	NX
2.00 – 3.00	3.00		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		21	0			
3.50 – 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		27	0			
5.00 – 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		33	0			
6.50 – 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		83	25			
8.00 – 9.00	9.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		90	49			
9.50 – 10.50	10.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10.5m)		93	67			

Percentage Core Recovery & RQD vs. depth

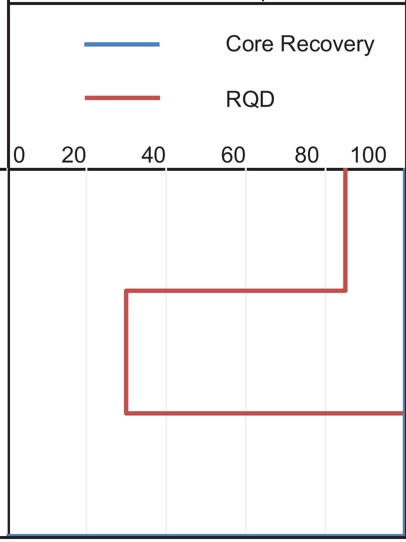


Borehole Log (IBH15)

Location :	**TRANSFER POINTS**	Ground Level (GL) :	RL(+) 208.2 m
Co-ordinates :	**1404 E, 661 N**	Ground Water Level :	5.3 m (RL(+) 202.9 m)
Termination Depth : (below GL)	15 m (RL(+) 193.2 m)	Start Date :	22-Aug-18
		Finish Date :	24-Aug-18
Drilling :	Rotary Drilling		
Bit Type :	Diamond		
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00 11.50 12.00	12.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		100	85	Greyish	Partial	NX
12.50 13.00 13.50	13.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		100	30			
14.00 14.50 15.00	15.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)	15.0	100	100			

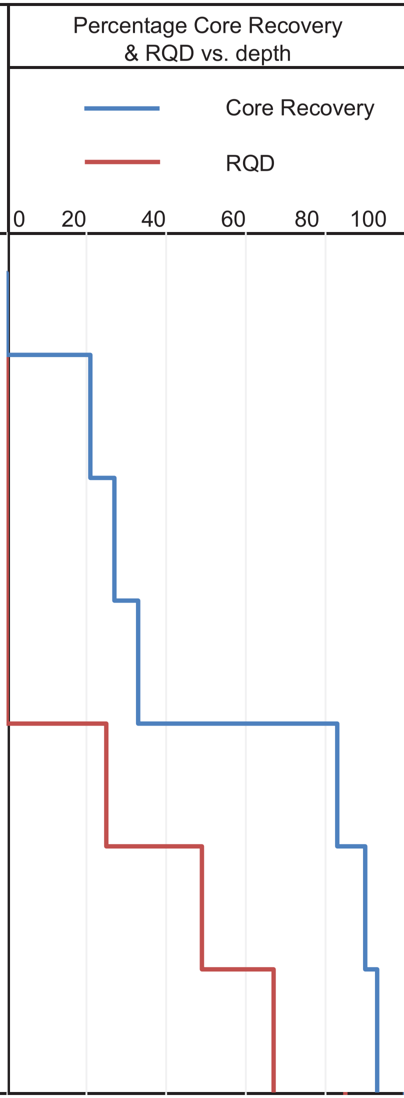
Percentage Core Recovery & RQD vs. depth



Borehole Log (IBH16)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 208.0 m	Drilling :	Rotary Drilling
Co-ordinates :	**1192 E, 661 N**	Ground Water Level :	3.9 m (RL(+) 204.1 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 193 m)	Start Date :	16-May-18	Casing Depth :	2.0 m
		Finish Date :	19-May-18		

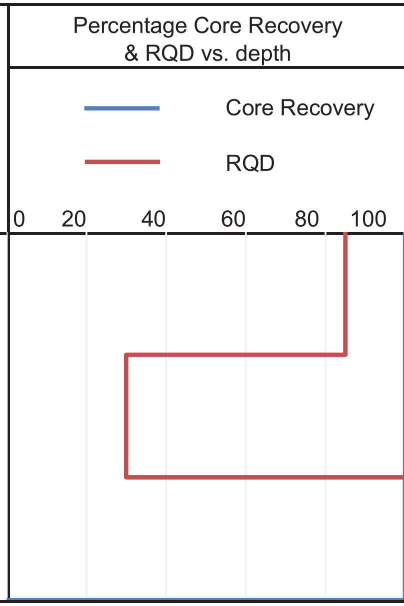
Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.26 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		21	0			
3.50, 4.00, 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		27	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		33	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		83	25			
8.00, 8.50, 9.00	9.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		90	49			
9.50, 10.00, 10.50	10.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10.5m)		93	67			



Borehole Log (IBH16)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 208.0 m	Drilling :	Rotary Drilling
Co-ordinates :	**1192 E, 661 N**	Ground Water Level :	3.9 m (RL(+) 204.1 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 193 m)	Start Date :	16-May-18	Casing Depth :	2.0 m
		Finish Date :	19-May-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
11.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		100	85	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		100	30			
13.00										
13.50	13.50									
14.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		100	100			
14.50										
15.00	15.00				15.0					



Borehole Log (IBH17)

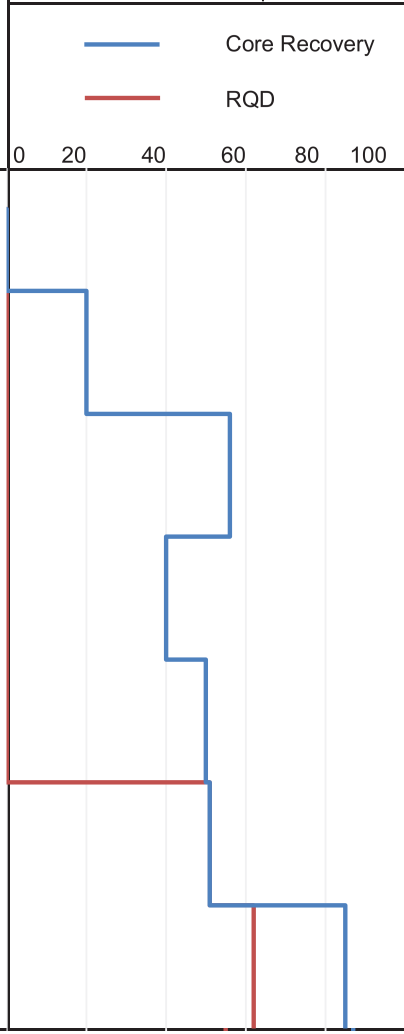
Location : **TUBE SETTLER PLANT**
Co-ordinates : **1020 E, 654 N**
Termination Depth : (below GL) 20 m (RL(+) 186 m)

Ground Level (GL) : RL(+) 206.0 m
Ground Water Level : 4.9 m (RL(+) 201.1 m)
Start Date : 29-Jun-18
Finish Date : 04-Jul-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3					HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.25 to 1.5m)		0	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		20	0			
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		56	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		40	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		50	0			
8.00, 8.50, 9.00	9.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		51	51			
9.50, 10.00, 10.50	10.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10.5m)		85	62			

Percentage Core Recovery & RQD vs. depth



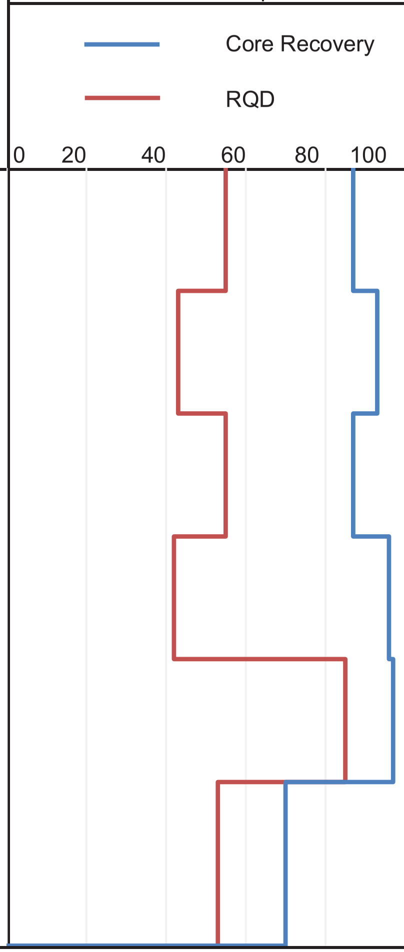
Borehole Log (IBH17)

Location :	**TUBE SETTLER PLANT**	Ground Level (GL) :	RL(+) 206.0 m
Co-ordinates :	**1020 E, 654 N**	Ground Water Level :	4.9 m (RL(+) 201.1 m)
Termination Depth : (below GL)	20 m (RL(+) 186 m)	Start Date :	29-Jun-18
		Finish Date :	04-Jul-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00 11.50 12.00	12.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (10.5 to 12m)		87	55	Greyish	Partial	NX
12.50 13.00 13.50	13.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (12 to 13.5m)		93	43			
14.00 14.50 15.00	15.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (13.5 to 15m)		87	55			
15.50 16.00 16.50	16.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (15 to 16.5m)		96	42			
17.00 17.50 18.00	18.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (16.5 to 18m)		97	85			
18.50 19.00 19.50 20.00	20.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (18 to 20m)	20.0	70	53			

Percentage Core Recovery & RQD vs. depth

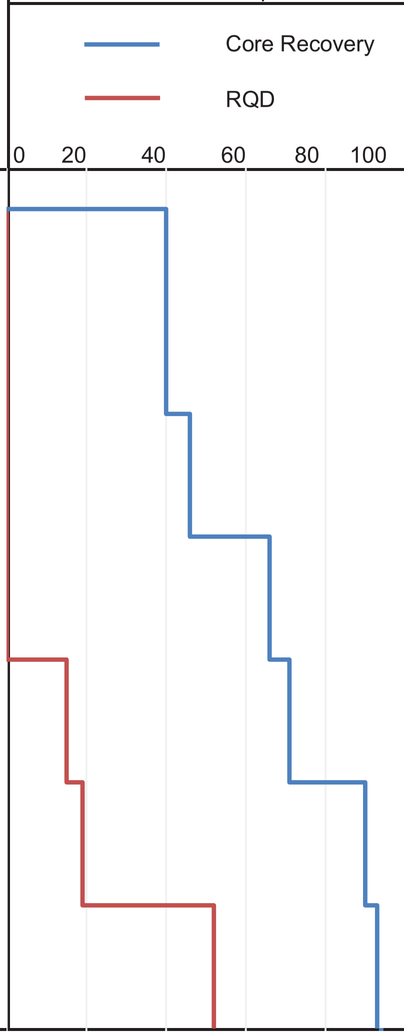


Borehole Log (IBH18)

Location :	**PENT HOUSE**	Ground Level (GL) :	RL(+) 207.1 m	Drilling :	Rotary Drilling
Co-ordinates :	**1570 E, 896 N**	Ground Water Level :	3.4 m (RL(+) 203.7 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 192.1 m)	Start Date :	29-Aug-18	Casing Depth :	2.0 m
		Finish Date :	31-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00, 1.50	1.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (0.23 to 1.5m)		40	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		40	0			
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		46	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		66	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		71	15			
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		90	19			
9.50, 10.00, 10.50	10.50		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10.5m)		93	52			

Percentage Core Recovery & RQD vs. depth

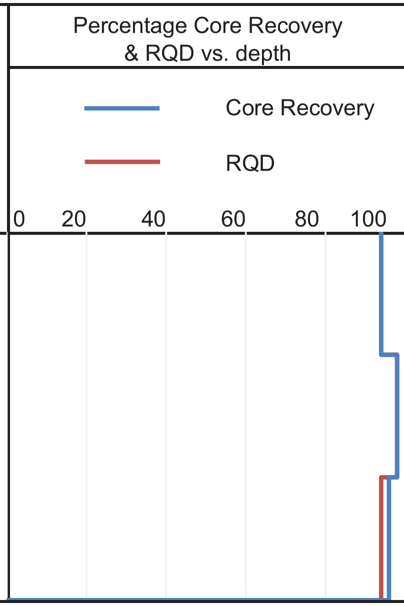


Borehole Log (IBH18)

Location :	**PENT HOUSE**	Ground Level (GL) :	RL(+) 207.1 m
Co-ordinates :	**1570 E, 896 N**	Ground Water Level :	3.4 m (RL(+) 203.7 m)
Termination Depth : (below GL)	15 m (RL(+) 192.1 m)	Start Date :	29-Aug-18
		Finish Date :	31-Aug-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		94	94	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (12 to 13.5m)		98	98			
13.00										
13.50	13.50									
14.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		96	94			
14.50										
15.00	15.00				15.0					

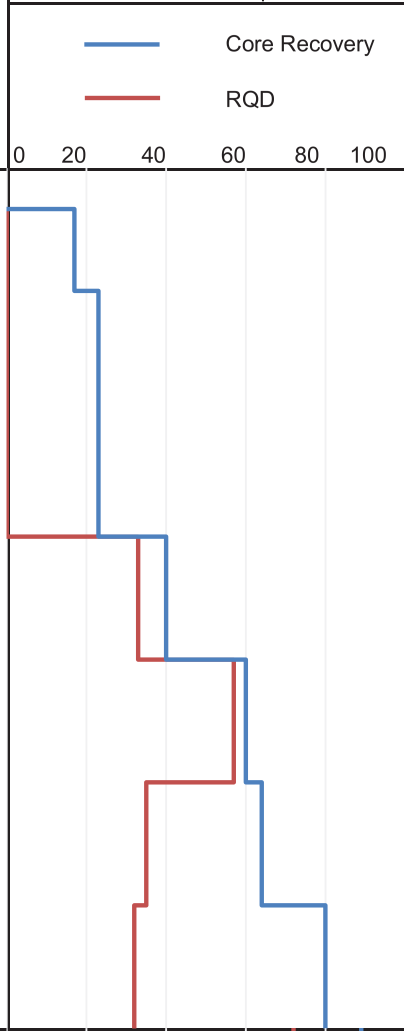


Borehole Log (IBH19)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 208.7 m	Drilling :	Rotary Drilling
Co-ordinates :	**1436 E, 920 N**	Ground Water Level :	3.5 m (RL(+) 205.2 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 193.7 m)	Start Date :	14-Sep-18	Casing Depth :	2.0 m
		Finish Date :	24-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.3					HX
1.00, 1.50	1.50	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (0.29 to 1.5m)		17	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		23	0			
3.50, 4.00, 4.50	4.50			Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		23	0			
5.00, 5.50, 6.00	6.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		40	33			
6.50, 7.00, 7.50	7.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (6 to 7.5m)		60	57			
8.00, 8.50, 9.00	9.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		64	35			
9.50, 10.00, 10.50	10.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		80	32			

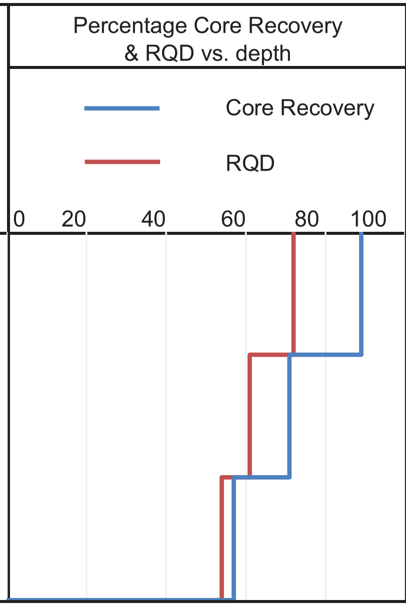
Percentage Core Recovery & RQD vs. depth



Borehole Log (IBH19)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 208.7 m	Drilling :	Rotary Drilling
Co-ordinates :	**1436 E, 920 N**	Ground Water Level :	3.5 m (RL(+) 205.2 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 193.7 m)	Start Date :	14-Sep-18	Casing Depth :	2.0 m
		Finish Date :	24-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		89	72	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (12 to 13.5m)		71	61			
13.00										
13.50	13.50									
14.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (13.5 to 15m)		57	54			
14.50										
15.00	15.00				15.0					

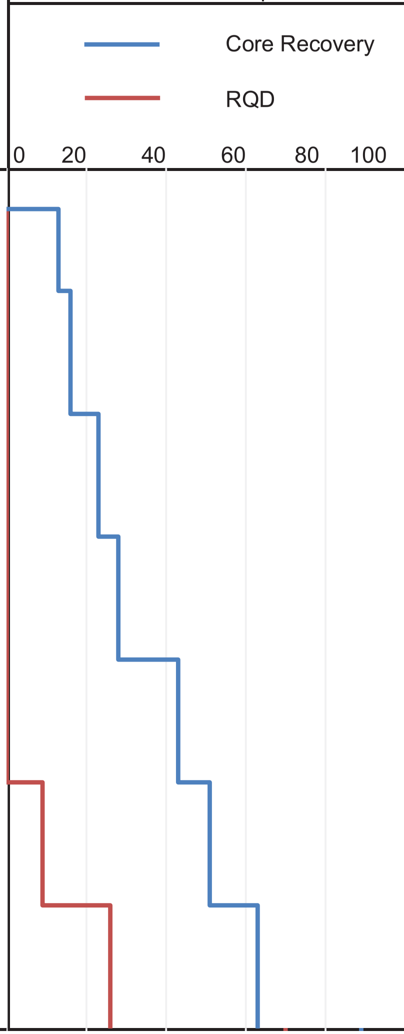


Borehole Log (IBH20)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 207.3 m	Drilling :	Rotary Drilling
Co-ordinates :	**1378 E, 768 N**	Ground Water Level :	5 m (RL(+) 202.2 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 192.3 m)	Start Date :	17-Aug-18	Casing Depth :	2.0 m
		Finish Date :	20-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00				Weak grey Basalt, very intensely fractured, highly weathered (0.23 to 1.5m)		13	0			NX
1.50	1.50	Ref.								
2.00				Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		16	0			
2.50										
3.00	3.00	Ref.								
3.50				Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		23	0			
4.00										
4.50	4.50									
5.00				Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		28	0			
5.50										
6.00	6.00									
6.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		43	0			
7.00										
7.50	7.50									
8.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		51	9			
8.50										
9.00	9.00									
9.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		63	26			
10.00										
10.50	10.50									

Percentage Core Recovery & RQD vs. depth



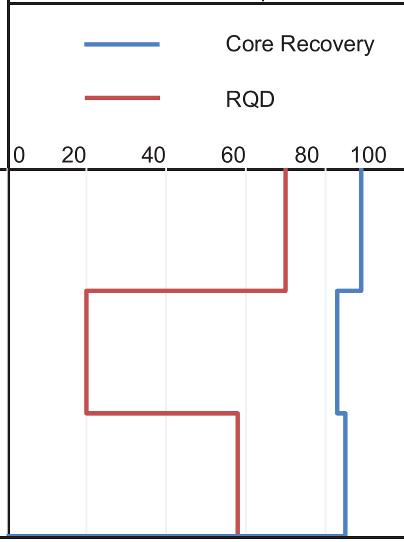
Borehole Log (IBH20)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 207.3 m
Co-ordinates :	**1378 E, 768 N**	Ground Water Level :	5 m (RL(+) 202.2 m)
Termination Depth : (below GL)	15 m (RL(+) 192.3 m)	Start Date :	17-Aug-18
		Finish Date :	20-Aug-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00 11.50 12.00	12.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		89	70	Greyish	Partial	NX
12.50 13.00 13.50	13.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		83	20			
14.00 14.50 15.00	15.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (13.5 to 15m)	15.0	85	58			

Percentage Core Recovery & RQD vs. depth

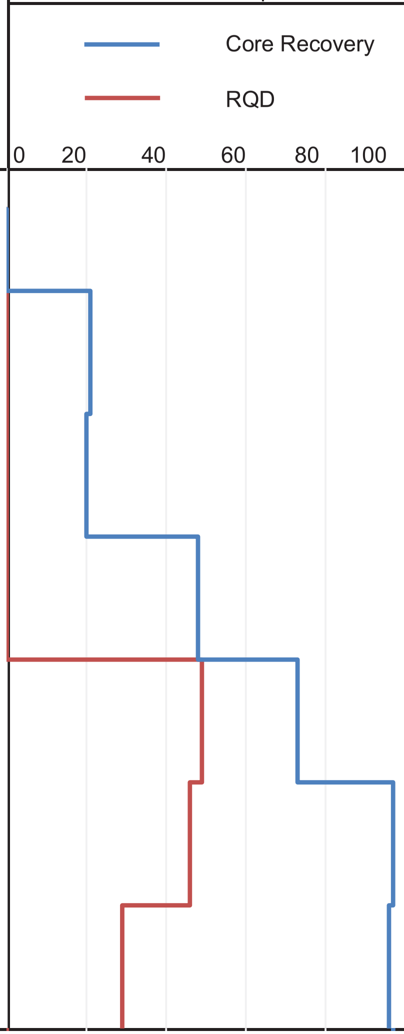


Borehole Log (IBH21)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 208.9 m
Co-ordinates :	**1277 E, 661 N**	Ground Water Level :	4.9 m (RL(+) 204 m)
Termination Depth : (below GL)	15 m (RL(+) 193.9 m)	Start Date :	13-Aug-18
		Finish Date :	17-Aug-18
Drilling :	Rotary Drilling	Bit Type :	Diamond
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.		Very weak grey Basalt, completely weathered, disintegrated (0.3 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		21	0			
3.50, 4.00, 4.50	4.50			Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		20	0			
5.00, 5.50, 6.00	6.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		48	0			
6.50, 7.00, 7.50	7.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (6 to 7.5m)		73	49			
8.00, 8.50, 9.00	9.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		97	46			
9.50, 10.00, 10.50	10.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		96	29			

Percentage Core Recovery & RQD vs. depth



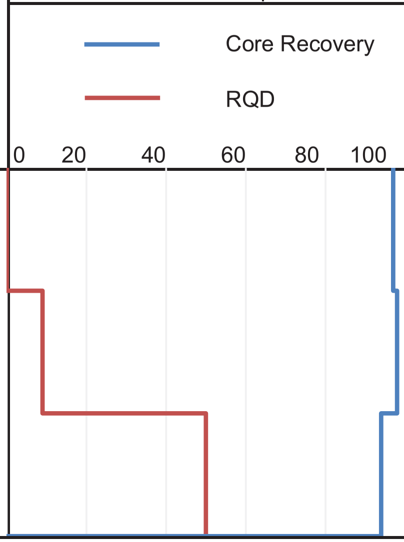
Borehole Log (IBH21)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 208.9 m
Co-ordinates :	**1277 E, 661 N**	Ground Water Level :	4.9 m (RL(+) 204 m)
Termination Depth : (below GL)	15 m (RL(+) 193.9 m)	Start Date :	13-Aug-18
		Finish Date :	17-Aug-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		97	0	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		98	9			
13.00										
13.50	13.50									
14.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (13.5 to 15m)		94	50			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth



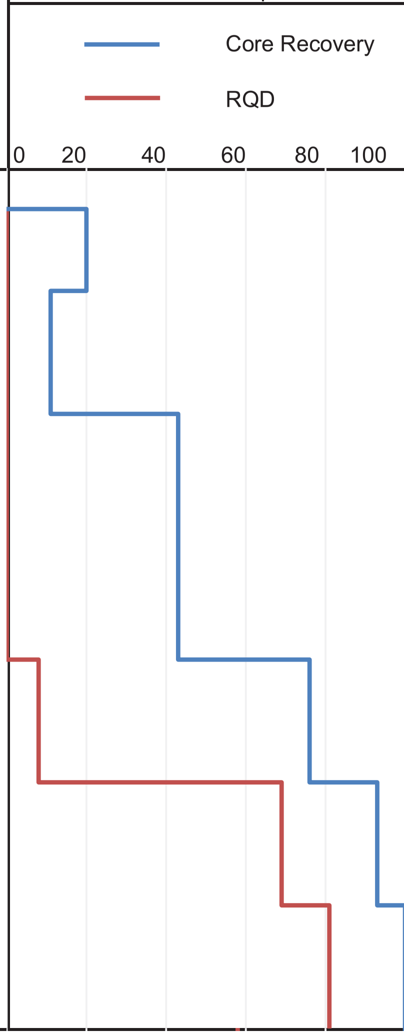
Borehole Log (IBH22)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 206.9 m
Co-ordinates :	**1110 E, 661 N**	Ground Water Level :	3.8 m (RL(+) 203.1 m)
Termination Depth : (below GL)	15 m (RL(+) 191.9 m)	Start Date :	15-May-18
		Finish Date :	18-May-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50		Weak grey Basalt, very intensely fractured, highly weathered (0.27 to 1.5m)		20	0			NX
2.00, 2.50, 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		11	0			
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		43	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		43	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		76	8			
8.00, 8.50, 9.00	9.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		93	69			
9.50, 10.00, 10.50	10.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10.5m)		100	81			

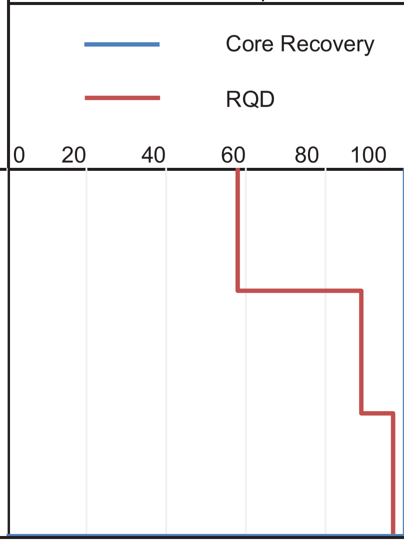
Percentage Core Recovery & RQD vs. depth



Borehole Log (IBH22)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 206.9 m
Co-ordinates :	**1110 E, 661 N**	Ground Water Level :	3.8 m (RL(+) 203.1 m)
Termination Depth : (below GL)	15 m (RL(+) 191.9 m)	Start Date :	15-May-18
		Finish Date :	18-May-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Scale	Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Percentage Core Recovery & RQD vs. depth	Return Water: Colour	Return Water: Loss	Size of Hole
	11.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (10.5 to 12m)		100	58		Greyish	Partial	NX
	11.50											
	12.00	12.00										
	12.50				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (12 to 13.5m)		100	89				
	13.00											
	13.50	13.50										
	14.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		100	97				
	14.50											
	15.00	15.00				15.0						

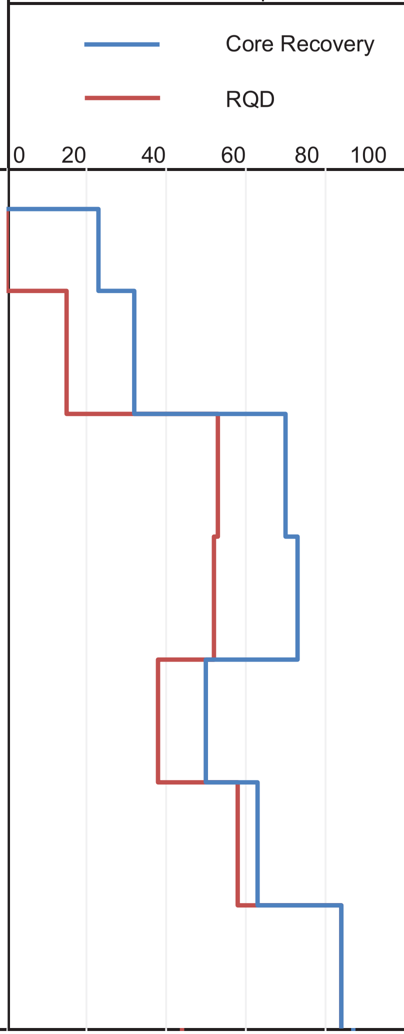
Borehole Log (IBH23)

Location :	**CHP MCC/CONTROL ROOM**	Ground Level (GL) :	RL(+) 205.1 m
Co-ordinates :	**1381 E, 946 N**	Ground Water Level :	4 m (RL(+) 201 m)
Termination Depth : (below GL)	15 m (RL(+) 190.1 m)	Start Date :	04-Aug-18
		Finish Date :	13-Aug-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50		Weak grey Basalt, very intensely fractured, highly weathered (0.26 to 1.5m)		23	0			NX
2.00, 2.50, 3.00	3.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		32	15			
3.50, 4.00, 4.50	4.50		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (3 to 4.5m)		70	53			
5.00, 5.50, 6.00	6.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (4.5 to 6m)		73	52			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		50	38			
8.00, 8.50, 9.00	9.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		63	58			
9.50, 10.00, 10.50	10.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10.5m)		84	84			

Percentage Core Recovery & RQD vs. depth

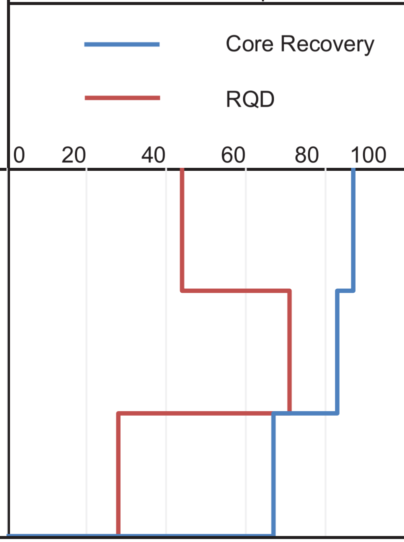


Borehole Log (IBH23)

Location :	**CHP MCC/CONTROL ROOM**	Ground Level (GL) :	RL(+) 205.1 m
Co-ordinates :	**1381 E, 946 N**	Ground Water Level :	4 m (RL(+) 201 m)
Termination Depth : (below GL)	15 m (RL(+) 190.1 m)	Start Date :	04-Aug-18
		Finish Date :	13-Aug-18
Drilling :	Rotary Drilling		
Bit Type :	Diamond		
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
11.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (10.5 to 12m)		87	44	Greyish	Partial	NX
11.50									
12.00	12.00								
12.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (12 to 13.5m)		83	71			
13.00									
13.50	13.50								
14.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)		67	28			
14.50									
15.00	15.00			15.0					

Percentage Core Recovery & RQD vs. depth

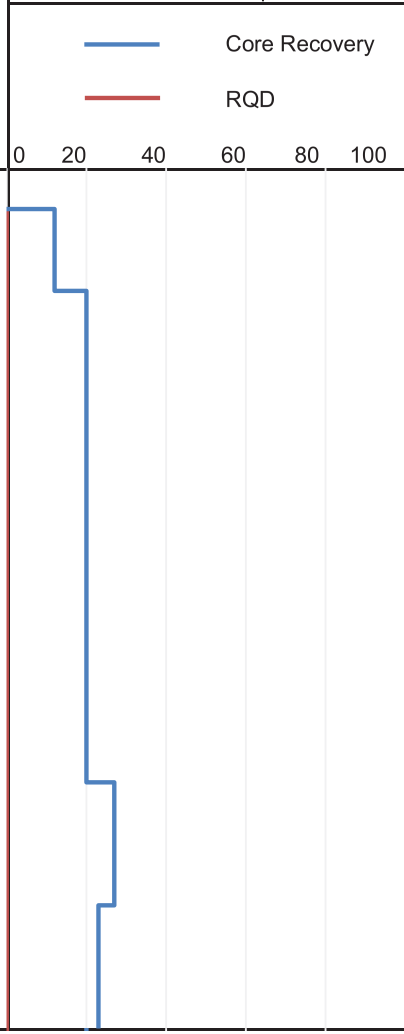


Borehole Log (IBH24)

Location :	**DRY ASH SILO UTILITY BUILDING**	Ground Level (GL) :	RL(+) 206.0 m
Co-ordinates :	**1408 E, 1097 N**	Ground Water Level :	Not m (
Termination Depth : (below GL)	15 m (RL(+) 191 m)	Start Date :	02-Sep-18
		Finish Date :	10-Sep-18
Drilling :	Rotary Drilling	Bit Type :	Diamond
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2					HX
1.00				Weak grey Basalt, very intensely fractured, highly weathered (0.24 to 1.5m)		12	0			
1.50	1.50	Ref.								
2.00										
2.50				Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		20	0			
3.00	3.00									
3.50										
4.00				Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		20	0			
4.50	4.50									
5.00										
5.50				Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		20	0	Greyish	Partial	NX
6.00	6.00									
6.50										
7.00				Weak grey Basalt, very intensely fractured, highly weathered (6 to 7.5m)		20	0			
7.50	7.50									
8.00										
8.50				Weak grey Basalt, very intensely fractured, highly weathered (7.5 to 9m)		27	0			
9.00	9.00									
9.50										
10.00				Weak grey Basalt, very intensely fractured, highly weathered (9 to 10.5m)		23	0			
10.50	10.50									

Percentage Core Recovery & RQD vs. depth

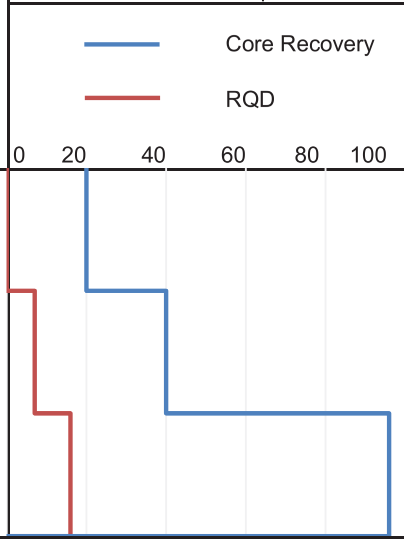


Borehole Log (IBH24)

Location :	**DRY ASH SILO UTILITY BUILDING**	Ground Level (GL) :	RL(+) 206.0 m
Co-ordinates :	**1408 E, 1097 N**	Ground Water Level :	Not m (
Termination Depth : (below GL)	15 m (RL(+) 191 m)	Start Date :	02-Sep-18
		Finish Date :	10-Sep-18
Drilling :	Rotary Drilling		
Bit Type :	Diamond		
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
11.00								Greyish	Partial	NX
11.50				Weak grey Basalt, very intensely fractured, highly weathered (10.5 to 12m)		20	0			
12.00	12.00									
12.50										
13.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		40	7			
13.50	13.50									
14.00										
14.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)		96	16			
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

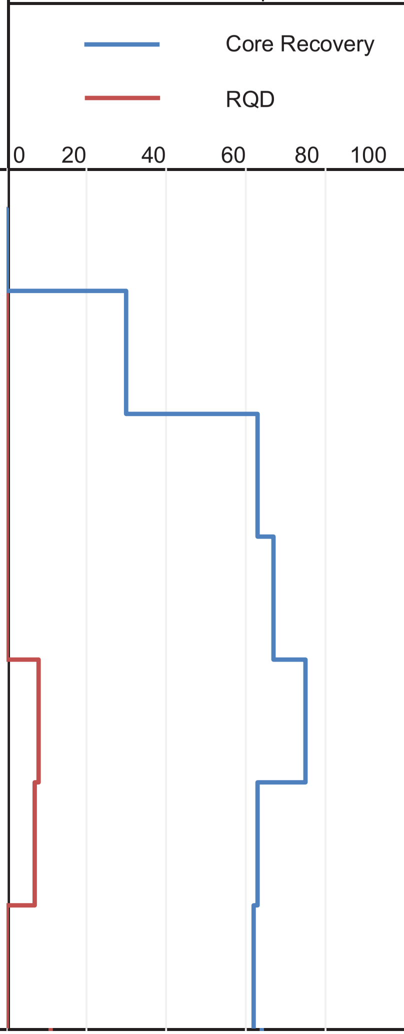


Borehole Log (IBH25)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 207.2 m	Drilling :	Rotary Drilling
Co-ordinates :	**1031 E, 812 N**	Ground Water Level :	3.2 m (RL(+) 204 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 192.2 m)	Start Date :	08-Jul-18	Casing Depth :	2.0 m
		Finish Date :	18-Jul-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.26 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		30	0			
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		63	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		67	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		75	8			
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		63	7			
9.50, 10.00, 10.50	10.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		62	0			

Percentage Core Recovery & RQD vs. depth



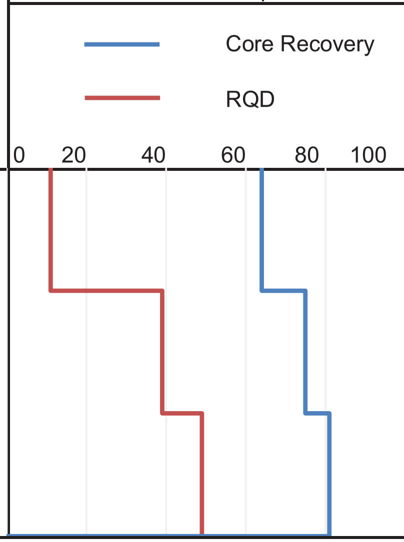
Borehole Log (IBH25)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 207.2 m
Co-ordinates :	**1031 E, 812 N**	Ground Water Level :	3.2 m (RL(+) 204 m)
Termination Depth : (below GL)	15 m (RL(+) 192.2 m)	Start Date :	08-Jul-18
		Finish Date :	18-Jul-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00 11.50 12.00	12.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		64	11	Greyish	Partial	NX
12.50 13.00 13.50	13.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		75	39			
14.00 14.50 15.00	15.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (13.5 to 15m)	15.0	81	49			

Percentage Core Recovery & RQD vs. depth



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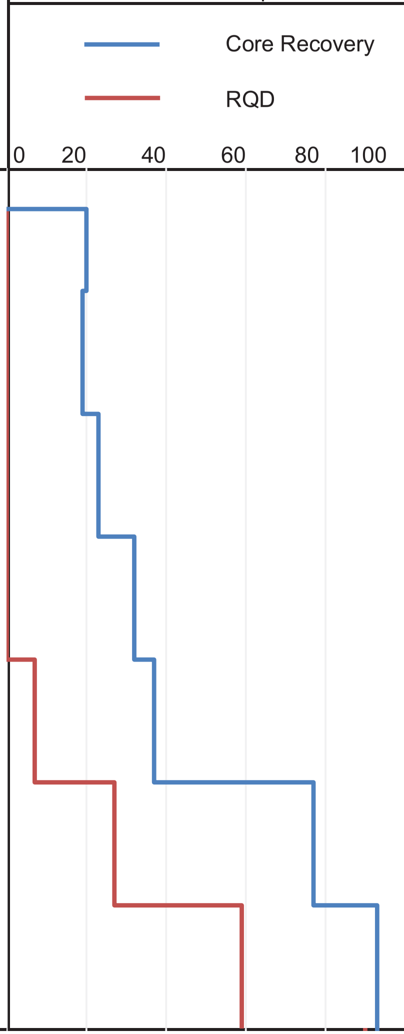
Borehole Log (IBH26)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 206.1 m	Drilling :	Rotary Drilling
Co-ordinates :	**1094 E, 689 N**	Ground Water Level :	4 m (RL(+) 202.1 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 191.1 m)	Start Date :	21-May-18	Casing Depth :	2.0 m
		Finish Date :	24-May-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.1			Greyish	Partial	HX
1.00, 1.50	1.50		Weak grey Basalt, very intensely fractured, highly weathered (0.1 to 1.5m)		20	0			NX
2.00, 2.50, 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		19	0			
3.50, 4.00, 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		23	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		32	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		37	7			
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		77	27			
9.50, 10.00, 10.50	10.50		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10.5m)		93	59			

Percentage Core Recovery & RQD vs. depth

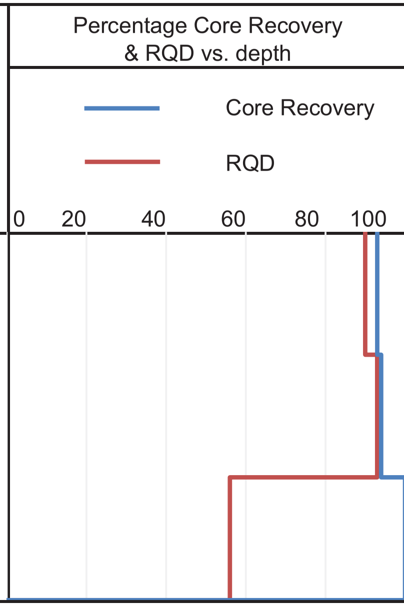


Borehole Log (IBH26)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 206.1 m
Co-ordinates :	**1094 E, 689 N**	Ground Water Level :	4 m (RL(+) 202.1 m)
Termination Depth : (below GL)	15 m (RL(+) 191.1 m)	Start Date :	21-May-18
		Finish Date :	24-May-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00 11.50 12.00	12.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		93	90	Greyish	Partial	NX
12.50 13.00 13.50	13.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (12 to 13.5m)		94	93			
14.00 14.50 15.00	15.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (13.5 to 15m)	15.0	100	56			

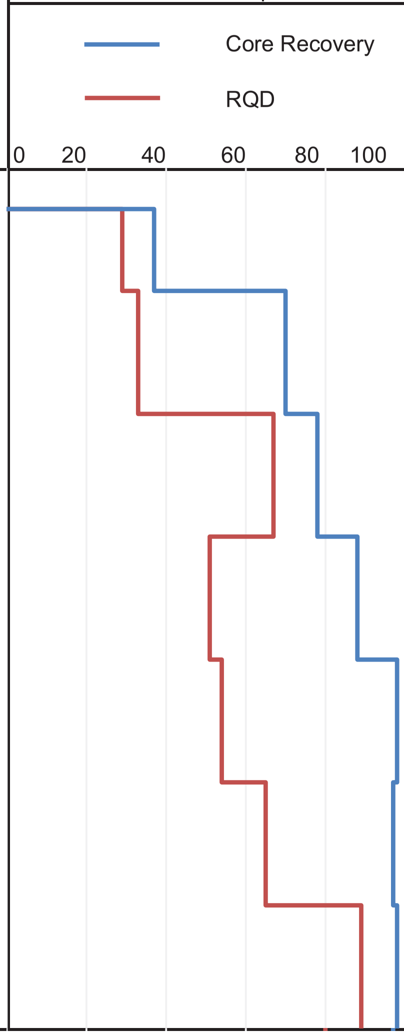


Borehole Log (IBH27)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 207.0 m	Drilling :	Rotary Drilling
Co-ordinates :	**1350 E, 1070 N**	Ground Water Level :	12 m (RL(+) 194.3 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 192 m)	Start Date :	07-Sep-18	Casing Depth :	2.0 m
		Finish Date :	12-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.3					HX
1.00, 1.50	1.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (0.31 to 1.5m)		37	29	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		70	33			
3.50, 4.00, 4.50	4.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (3 to 4.5m)		78	67			
5.00, 5.50, 6.00	6.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (4.5 to 6m)		88	51			
6.50, 7.00, 7.50	7.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (6 to 7.5m)		98	54			
8.00, 8.50, 9.00	9.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		97	65			
9.50, 10.00, 10.50	10.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10.5m)		98	89			

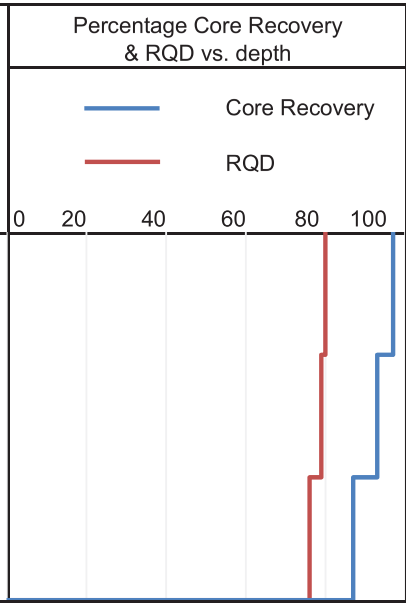
Percentage Core Recovery & RQD vs. depth



Borehole Log (IBH27)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 207.0 m	Drilling :	Rotary Drilling
Co-ordinates :	**1350 E, 1070 N**	Ground Water Level :	12 m (RL(+) 194.3 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 192 m)	Start Date :	07-Sep-18	Casing Depth :	2.0 m
		Finish Date :	12-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		97	80	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (12 to 13.5m)		93	79			
13.00										
13.50	13.50									
14.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		87	76			
14.50										
15.00	15.00				15.0					



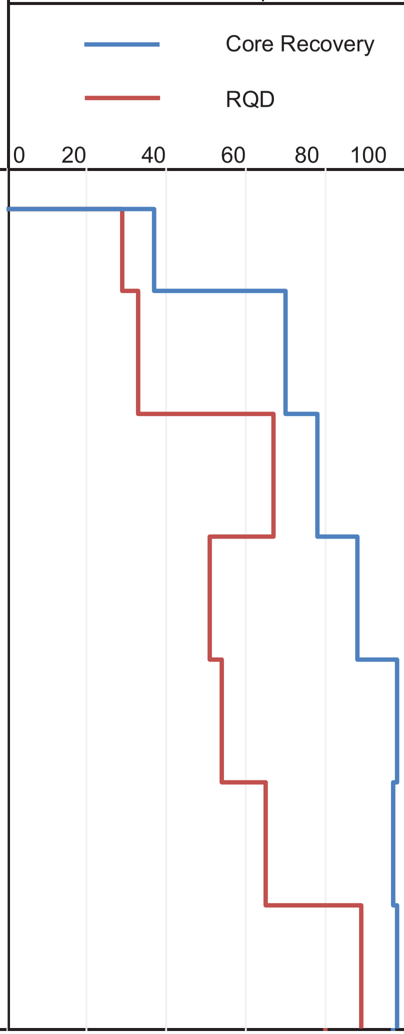
Borehole Log (IBH28)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 208.8 m
Co-ordinates :	**1335 E, 990 N**	Ground Water Level :	5.3 m (RL(+) 203.5 m)
Termination Depth : (below GL)	15 m (RL(+) 193.8 m)	Start Date :	29-Jul-18
		Finish Date :	02-Aug-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00, 1.50	1.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (0.24 to 1.5m)		37	29			NX
2.00, 2.50, 3.00	3.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		70	33			
3.50, 4.00, 4.50	4.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (3 to 4.5m)		78	67			
5.00, 5.50, 6.00	6.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (4.5 to 6m)		88	51			
6.50, 7.00, 7.50	7.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (6 to 7.5m)		98	54			
8.00, 8.50, 9.00	9.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		97	65			
9.50, 10.00, 10.50	10.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10.5m)		98	89			

Percentage Core Recovery & RQD vs. depth

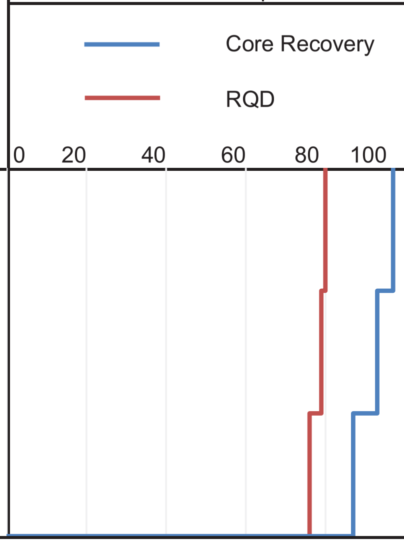


Borehole Log (IBH28)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 208.8 m	Drilling :	Rotary Drilling
Co-ordinates :	**1335 E, 990 N**	Ground Water Level :	5.3 m (RL(+) 203.5 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 193.8 m)	Start Date :	29-Jul-18	Casing Depth :	2.0 m
		Finish Date :	02-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00 11.50 12.00	12.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (10.5 to 12m)		97	80	Greyish	Partial	NX
12.50 13.00 13.50	13.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (12 to 13.5m)		93	79	Greyish	Partial	NX
14.00 14.50 15.00	15.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)	15.0	87	76	Greyish	Partial	NX

Percentage Core Recovery & RQD vs. depth

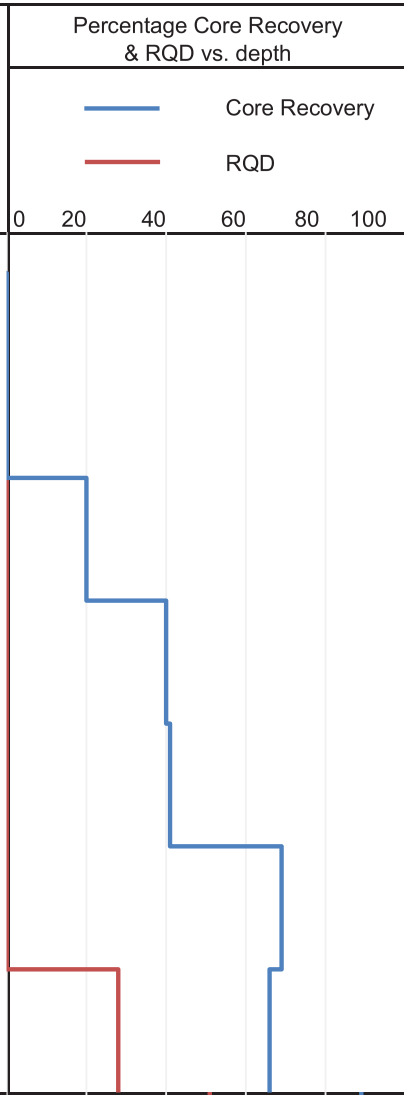


Borehole Log (IBH29)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 207.6 m
Co-ordinates :	**1194 E, 928 N**	Ground Water Level :	2.5 m (RL(+) 205.1 m)
Termination Depth : (below GL)	15 m (RL(+) 192.6 m)	Start Date :	23-Jul-18
		Finish Date :	27-Jul-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00–1.50	1.50	Ref.		Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0			NX
2.00–3.00	3.00	Ref.		Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.50–4.50	4.50			Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		20	0			
5.00–6.00	6.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		40	0			
6.50–7.50	7.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		41	0			
8.00–9.00	9.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		69	0			
9.50–10.50	10.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		66	28			

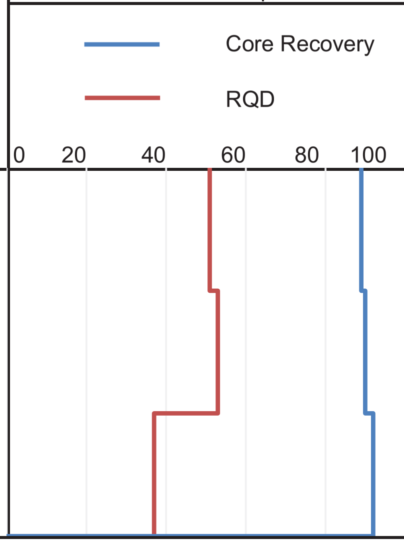


Borehole Log (IBH29)

Location :	**PIPE RACK**	Ground Level (GL) :	RL(+) 207.6 m
Co-ordinates :	**1194 E, 928 N**	Ground Water Level :	2.5 m (RL(+) 205.1 m)
Termination Depth : (below GL)	15 m (RL(+) 192.6 m)	Start Date :	23-Jul-18
		Finish Date :	27-Jul-18
Drilling :	Rotary Drilling	Bit Type :	Diamond
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (10.5 to 12m)				Greyish	Partial	NX
11.50						89	51			
12.00	12.00									
12.50				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (12 to 13.5m)						
13.00						90	53			
13.50	13.50									
14.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)						
14.50						92	37			
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

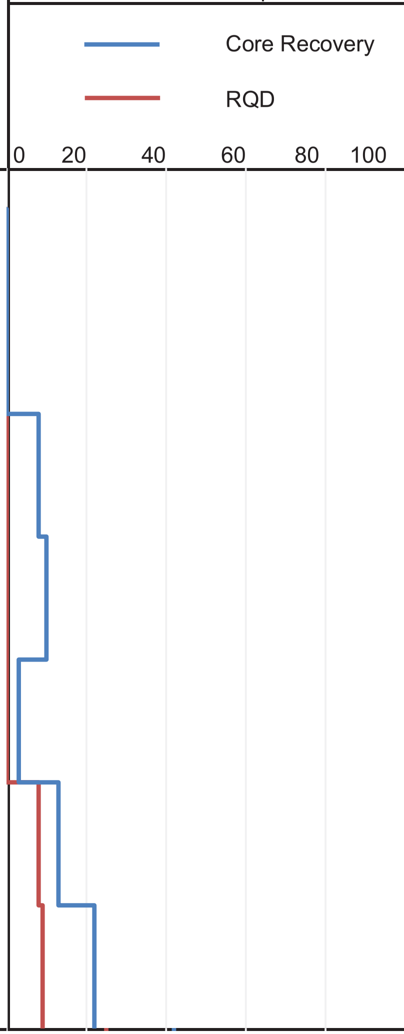


Borehole Log (IBH30)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 209.1 m	Drilling :	Rotary Drilling
Co-ordinates :	**995 E, 285 N**	Ground Water Level :	0 m (RL(+) 209.1 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 194.1 m)	Start Date :	30-Jul-18	Casing Depth :	2.0 m
		Finish Date :	03-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00 – 1.50	1.50	Ref.		Very weak grey Basalt, completely weathered, disintegrated (0.22 to 1.5m)		0	0			NX
2.00 – 3.00	3.00	Ref.		Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.50 – 4.50	4.50	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		8	0			
5.00 – 6.00	6.00	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		10	0			
6.50 – 7.50	7.50	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (6 to 7.5m)		3	0			
8.00 – 9.00	9.00	Ref.		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		13	8			
9.50 – 10.50	10.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		22	9			

Percentage Core Recovery & RQD vs. depth

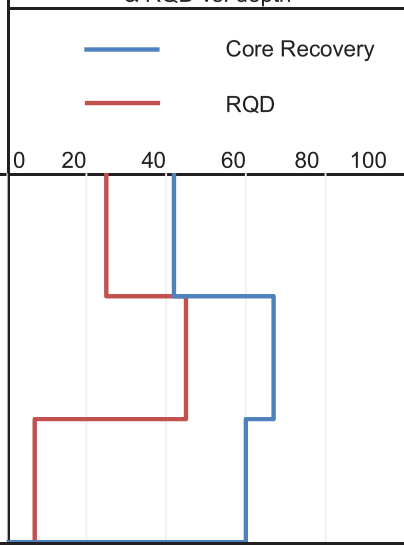


Borehole Log (IBH30)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 209.1 m	Drilling :	Rotary Drilling
Co-ordinates :	**995 E, 285 N**	Ground Water Level :	0 m (RL(+) 209.1 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 194.1 m)	Start Date :	30-Jul-18	Casing Depth :	2.0 m
		Finish Date :	03-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		42	25	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (12 to 13.5m)		67	45			
13.00										
13.50	13.50									
14.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)		60	7			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

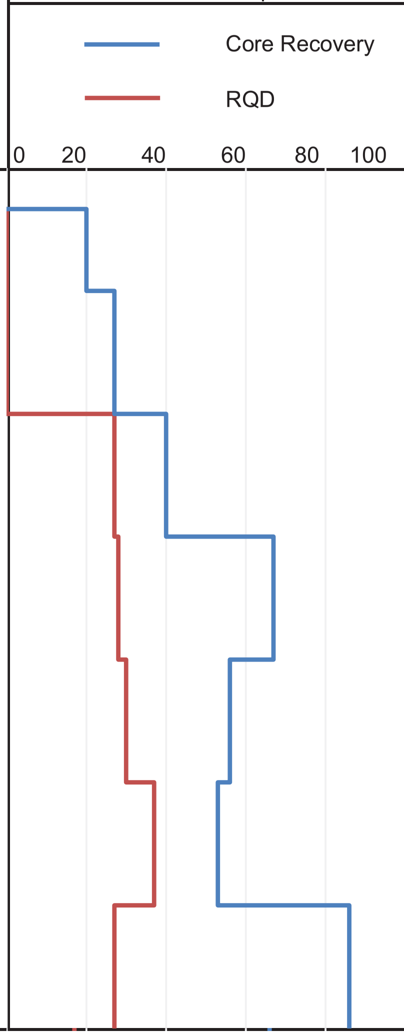


Borehole Log (IBH31)

Location :	COAL PIPE RUN OFF POND	Ground Level (GL) :	RL(+) 205.9 m	Drilling :	Rotary Drilling
Co-ordinates :	1414 E, 821 N	Ground Water Level :	5.4 m (RL(+) 200.5 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 190.9 m)	Start Date :	18-Aug-18	Casing Depth :	2.0 m
		Finish Date :	20-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50			Weak grey Basalt, very intensely fractured, highly weathered (0.25 to 1.5m)		20	0			NX
2.00, 2.50, 3.00	3.00			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		27	0			
3.50, 4.00, 4.50	4.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		40	27			
5.00, 5.50, 6.00	6.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		67	28			
6.50, 7.00, 7.50	7.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		56	30			
8.00, 8.50, 9.00	9.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		53	37			
9.50, 10.00, 10.50	10.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		86	27			

Percentage Core Recovery & RQD vs. depth

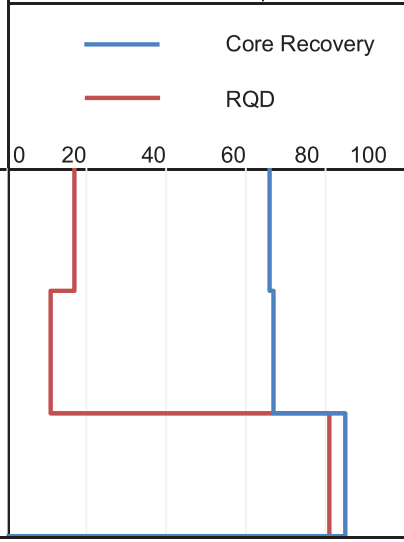


Borehole Log (IBH31)

Location :	**COAL PIPE RUN OFF POND**	Ground Level (GL) :	RL(+) 205.9 m
Co-ordinates :	**1414 E, 821 N**	Ground Water Level :	5.4 m (RL(+) 200.5 m)
Termination Depth : (below GL)	15 m (RL(+) 190.9 m)	Start Date :	18-Aug-18
		Finish Date :	20-Aug-18
Drilling :	Rotary Drilling		
Bit Type :	Diamond		
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		66	17	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		67	11			
13.00										
13.50	13.50									
14.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		85	81			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

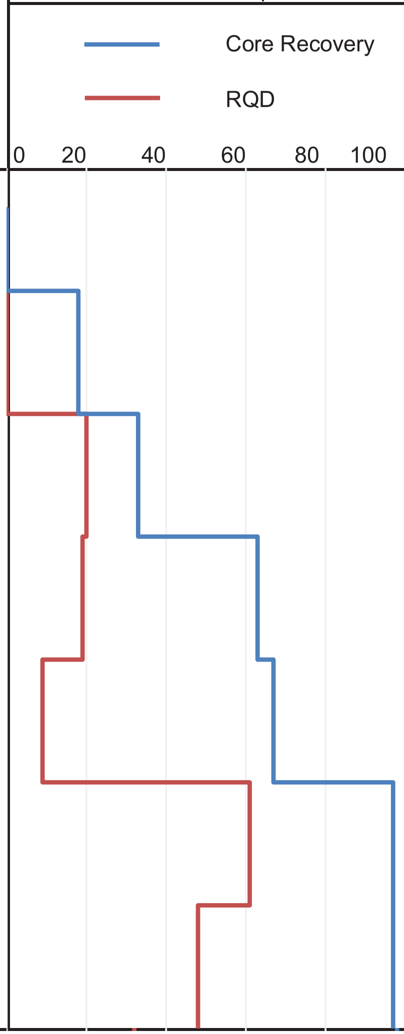


Borehole Log (IBH32)

Location :	**WAGON TIPPLER**	Ground Level (GL) :	RL(+) 206.6 m	Drilling :	Rotary Drilling
Co-ordinates :	**1349 E, 785 N**	Ground Water Level :	5.5 m (RL(+) 201.1 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 191.6 m)	Start Date :	03-Aug-18	Casing Depth :	2.0 m
		Finish Date :	07-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.26 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		18	0			
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		33	20			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		63	19			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		67	9			
8.00, 8.50, 9.00	9.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		97	61			
9.50, 10.00, 10.50	10.50		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10.5m)		97	48			

Percentage Core Recovery & RQD vs. depth

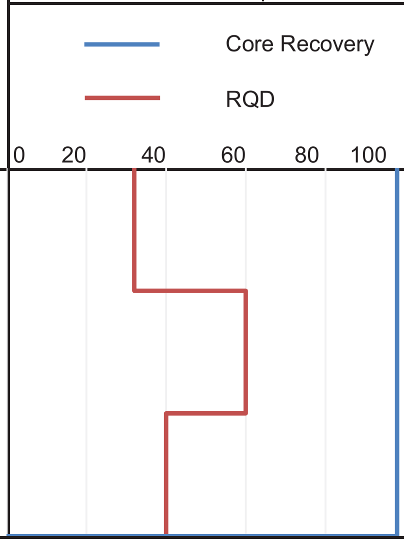


Borehole Log (IBH32)

Location :	**WAGON TIPPLER**	Ground Level (GL) :	RL(+) 206.6 m
Co-ordinates :	**1349 E, 785 N**	Ground Water Level :	5.5 m (RL(+) 201.1 m)
Termination Depth : (below GL)	15 m (RL(+) 191.6 m)	Start Date :	03-Aug-18
		Finish Date :	07-Aug-18
Drilling :	Rotary Drilling		
Bit Type :	Diamond		
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		98	32	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (12 to 13.5m)		98	60			
13.00										
13.50	13.50									
14.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)		98	40			
14.50										
15.00	15.00				15.0					

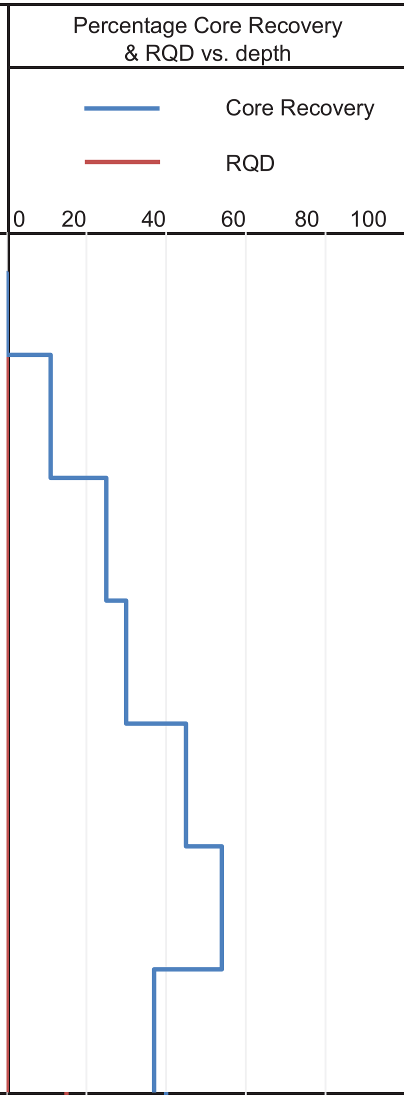
Percentage Core Recovery & RQD vs. depth



Borehole Log (IBH33)

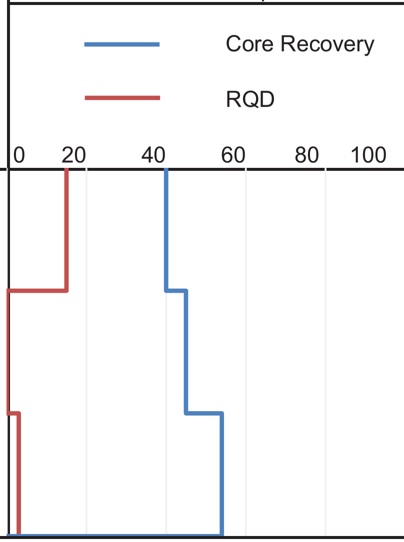
Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 213.9 m
Co-ordinates :	**1040 E, 18 S**	Ground Water Level :	7.5 m (RL(+) 206.3 m)
Termination Depth : (below GL)	15 m (RL(+) 198.9 m)	Start Date :	24-Jul-18
		Finish Date :	29-Jul-18
Drilling :	Rotary Drilling	Bit Type :	Diamond
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		11	0			
3.50, 4.00, 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		25	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		30	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		45	0			
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		54	0			
9.50, 10.00, 10.50	10.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		37	0			



Borehole Log (IBH33)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 213.9 m	Drilling :	Rotary Drilling
Co-ordinates :	**1040 E, 18 S**	Ground Water Level :	7.5 m (RL(+) 206.3 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 198.9 m)	Start Date :	24-Jul-18	Casing Depth :	2.0 m
		Finish Date :	29-Jul-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Percentage Core Recovery & RQD vs. depth	Return Water: Colour	Return Water: Loss	Size of Hole
11.00 11.50 12.00	12.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		40	15		Greyish	Partial	NX
12.50 13.00 13.50	13.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		45	0				
14.00 14.50 15.00	15.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)	15.0	54	3				

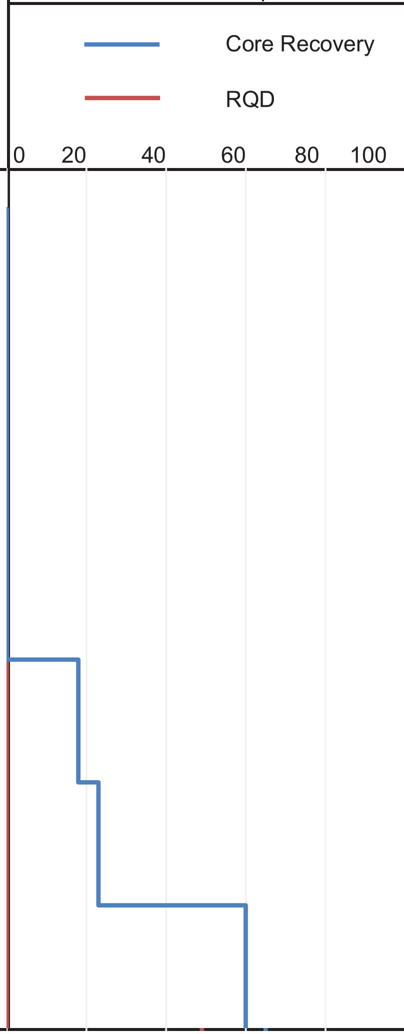
Borehole Log (IBH34)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 217.7 m
Co-ordinates :	**1200 E, 200 S**	Ground Water Level :	5.3 m (RL(+) 212.4 m)
Termination Depth : (below GL)	15 m (RL(+) 202.7 m)	Start Date :	07-Aug-18
		Finish Date :	11-Aug-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3					HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.25 to 1.5m)		0	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.50, 4.00, 4.50	4.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (3 to 4.5m)		0	0			
5.00, 5.50, 6.00	6.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (4.5 to 6m)		0	0			
6.50, 7.00, 7.50	7.50	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (6 to 7.5m)		18	0			
8.00, 8.50, 9.00	9.00		Weak grey Basalt, very intensely fractured, highly weathered (7.5 to 9m)		23	0			
9.50, 10.00, 10.50	10.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		60	0			

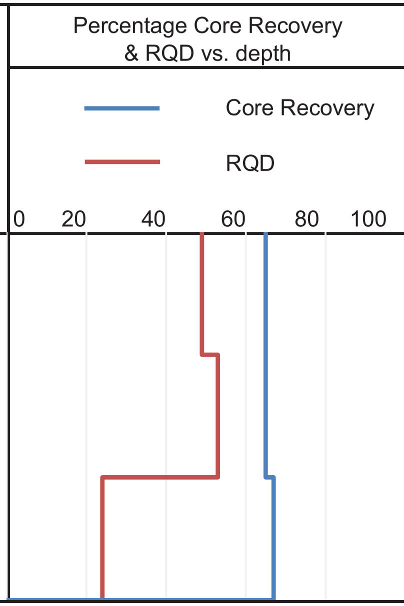
Percentage Core Recovery & RQD vs. depth



Borehole Log (IBH34)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 217.7 m	Drilling :	Rotary Drilling
Co-ordinates :	**1200 E, 200 S**	Ground Water Level :	5.3 m (RL(+) 212.4 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 202.7 m)	Start Date :	07-Aug-18	Casing Depth :	2.0 m
		Finish Date :	11-Aug-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
11.00 – 12.00	12.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (10.5 to 12m)		65	49	Greyish	Partial	NX
12.50 – 13.50	13.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (12 to 13.5m)		65	53			
14.00 – 15.00	15.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)	15.0	67	24			

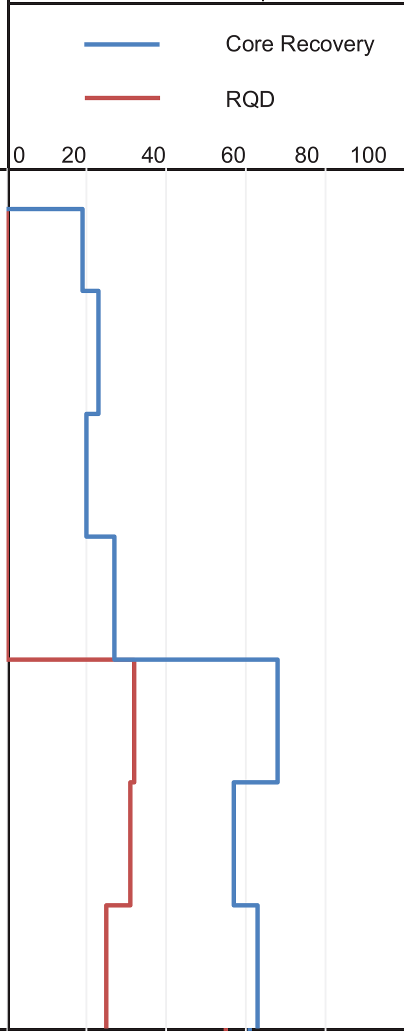


Borehole Log (IBH35)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 220.4 m
Co-ordinates :	**1263 E, 460 S**	Ground Water Level :	7.3 m (RL(+) 213.1 m)
Termination Depth : (below GL)	15 m (RL(+) 205.4 m)	Start Date :	20-Jul-18
		Finish Date :	23-Jul-18
Drilling :	Rotary Drilling		
Bit Type :	Diamond		
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (0.23 to 1.5m)		19	0			NX
2.00, 2.50, 3.00	3.00			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		23	0			
3.50, 4.00, 4.50	4.50			Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		20	0			
5.00, 5.50, 6.00	6.00			Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		27	0			
6.50, 7.00, 7.50	7.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		68	32			
8.00, 8.50, 9.00	9.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		57	31			
9.50, 10.00, 10.50	10.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		63	25			

Percentage Core Recovery & RQD vs. depth

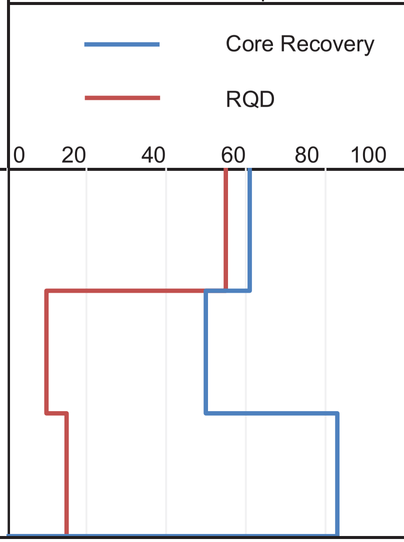


Borehole Log (IBH35)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 220.4 m	Drilling :	Rotary Drilling
Co-ordinates :	**1263 E, 460 S**	Ground Water Level :	7.3 m (RL(+) 213.1 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 205.4 m)	Start Date :	20-Jul-18	Casing Depth :	2.0 m
		Finish Date :	23-Jul-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (10.5 to 12m)		61	55	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		50	10			
13.00										
13.50	13.50									
14.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)		83	15			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

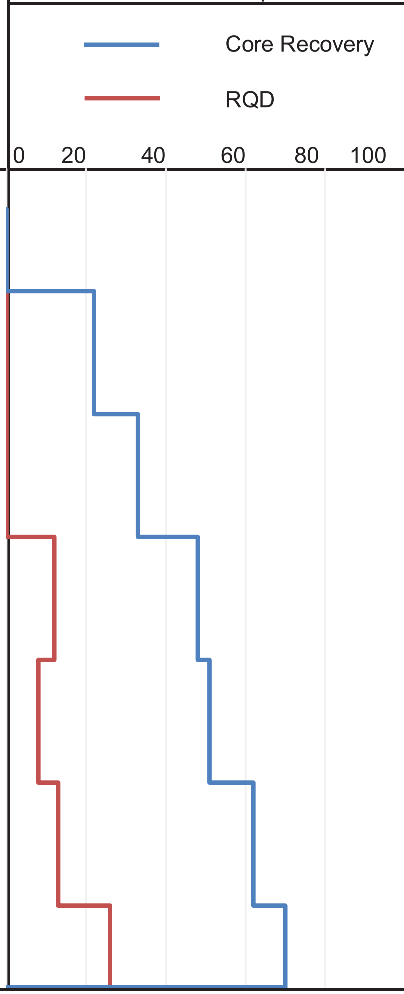


Borehole Log (IBH36)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 218.6 m	Drilling :	Rotary Drilling
Co-ordinates :	**1451 E, 748 S**	Ground Water Level :	6.1 m (RL(+) 212.5 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 208.6 m)	Start Date :	14-Sep-18	Casing Depth :	2.0 m
		Finish Date :	15-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00			Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0	Greyish	Partial	NX
1.50	1.50	Ref.							
2.00									
2.50			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		22	0			
3.00	3.00								
3.50									
4.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		33	0			
4.50	4.50								
5.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		48	12			
5.50									
6.00	6.00								
6.50									
7.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		51	8			
7.50	7.50								
8.00									
8.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		62	13			
9.00	9.00								
9.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10m)		70	26			
10.00	10.00			10.0					

Percentage Core Recovery & RQD vs. depth



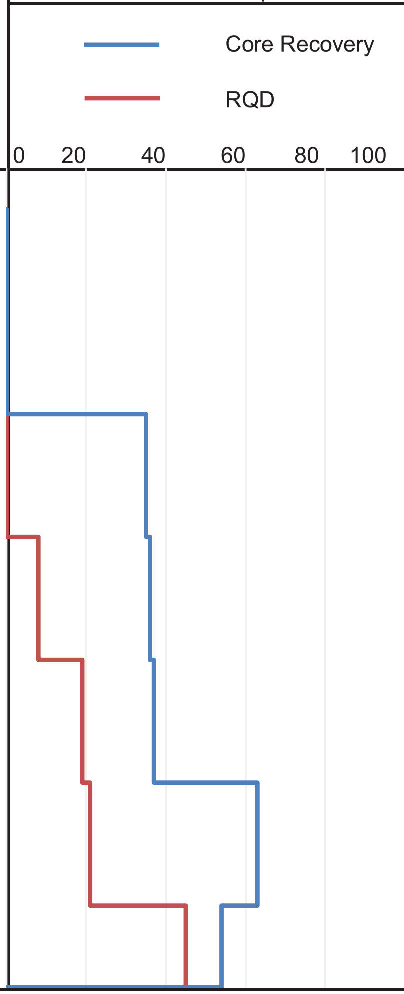
Borehole Log (IBH37)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 220.2 m
Co-ordinates :	**1758 E, 1003 S**	Ground Water Level :	8 m (RL(+) 212.2 m)
Termination Depth : (below GL)	10 m (RL(+) 210.2 m)	Start Date :	15-Sep-18
		Finish Date :	16-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)
0.50			Black Silty Clay with rock fragments	0.3		
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.3 to 1.5m)		0	0
2.00, 2.50, 3.00	3.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		35	0
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		36	8
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		37	19
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		63	21
9.50, 10.00	10.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10m)	10.0	54	45

Percentage Core Recovery & RQD vs. depth



Return Water: Colour — Greyish; Loss — Partial

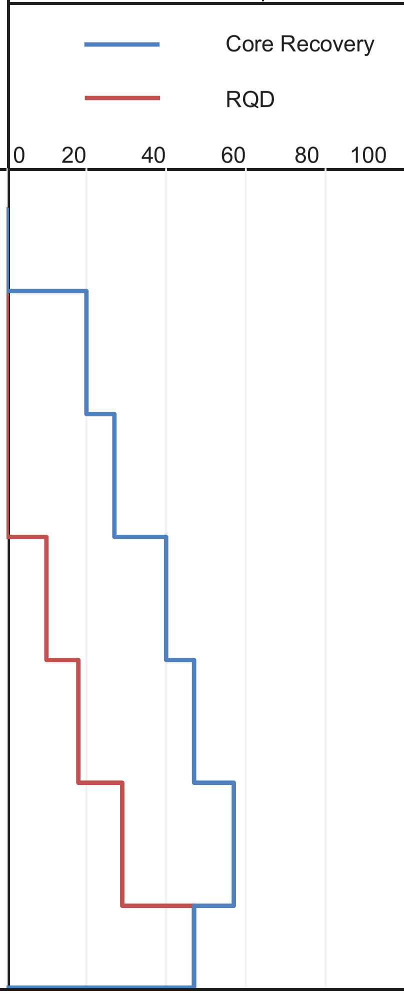
Size of Hole: HX; NX

Borehole Log (IBH38)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 223.5 m	Drilling :	Rotary Drilling
Co-ordinates :	**2060 E, 1253 S**	Ground Water Level :	5.6 m (RL(+) 217.9 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 213.5 m)	Start Date :	13-Sep-18	Casing Depth :	2.0 m
		Finish Date :	13-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)
0.50			Black Silty Clay with rock fragments	0.3		
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.3 to 1.5m)		0	0
2.00, 2.50, 3.00	3.00		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		20	0
3.50, 4.00, 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		27	0
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		40	10
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		47	18
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		57	29
9.50, 10.00	10.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10m)	10.0	47	47

Percentage Core Recovery & RQD vs. depth



Return Water Colour	Return Water Loss	Size of Hole
Greyish	Partial	HX (0 to 0.3 m), NX

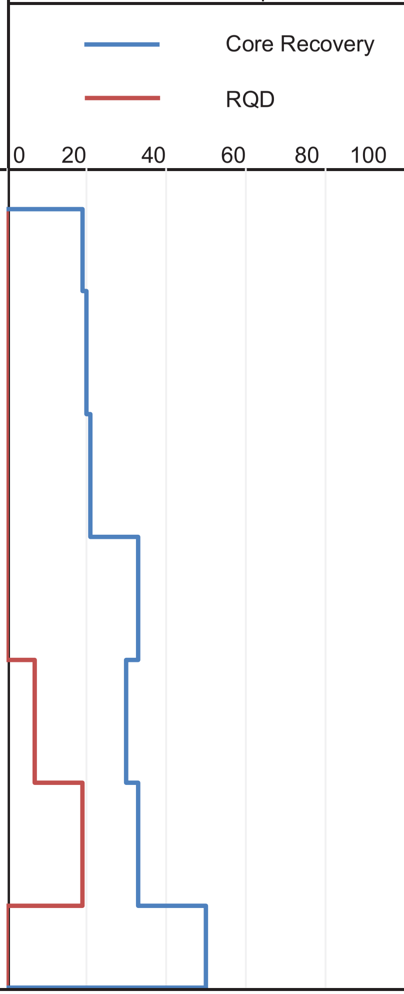
Borehole Log (IBH39)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 222.8 m
Co-ordinates :	**2213 E, 1382 S**	Ground Water Level :	8.7 m (RL(+) 214.1 m)
Termination Depth : (below GL)	10 m (RL(+) 212.8 m)	Start Date :	12-Sep-18
		Finish Date :	12-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (0.3 to 1.5m)		19	0			NX
2.00, 2.50, 3.00	3.00		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		20	0			
3.50, 4.00, 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		21	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		33	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		30	7			
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		33	19			
9.50, 10.00	10.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10m)	10.0	50	0			

Percentage Core Recovery & RQD vs. depth



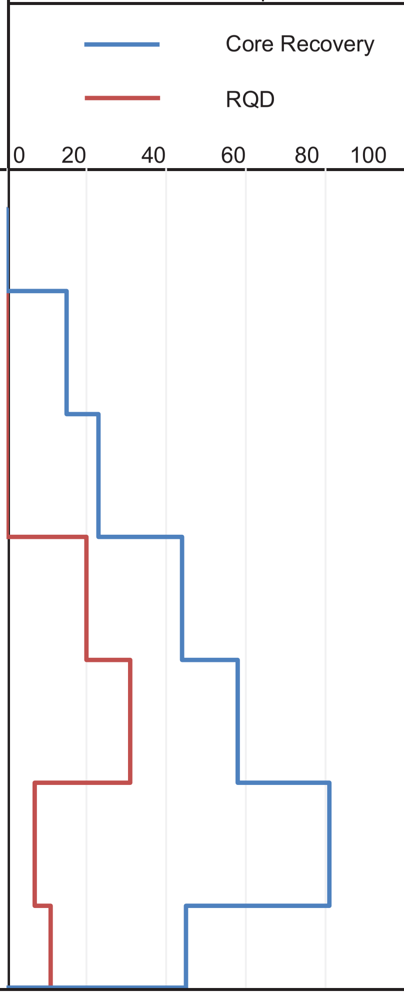
Borehole Log (IBH40)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 221.9 m
Co-ordinates :	**2477 E, 1590 S**	Ground Water Level :	7.3 m (RL(+) 214.6 m)
Termination Depth : (below GL)	10 m (RL(+) 211.9 m)	Start Date :	12-Sep-18
		Finish Date :	12-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.22 to 1.5m)		0	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		15	0			
3.50, 4.00, 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		23	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		44	20			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		58	31			
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		81	7			
9.50, 10.00	10.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10m)	10.0	45	11			

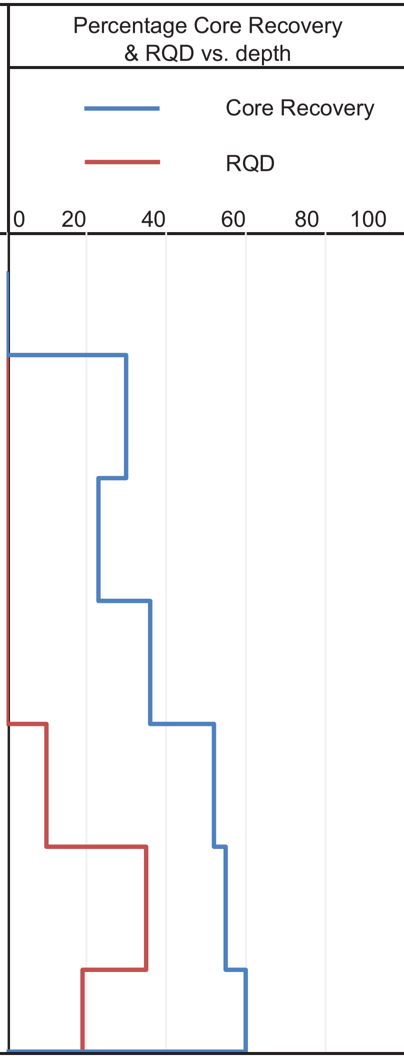
Percentage Core Recovery & RQD vs. depth



Borehole Log (IBH41)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 223.0 m	Drilling :	Rotary Drilling
Co-ordinates :	**2641 E, 1778 S**	Ground Water Level :	8.3 m (RL(+) 214.7 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 213 m)	Start Date :	12-Sep-18	Casing Depth :	2.0 m
		Finish Date :	12-Sep-18		

Scale	Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
	0.50				Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
	1.00				Very weak grey Basalt, completely weathered, disintegrated (0.28 to 1.5m)		0	0			NX
	1.50	1.50	Ref.								
	2.00										
	2.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		30	0			
	3.00	3.00									
	3.50										
	4.00				Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		23	0			
	4.50	4.50									
	5.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		36	0			
	5.50										
	6.00	6.00									
	6.50										
	7.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		52	10			
	7.50	7.50									
	8.00										
	8.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		55	35			
	9.00	9.00									
	9.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10m)						
	10.00	10.00				10.0	60	19			



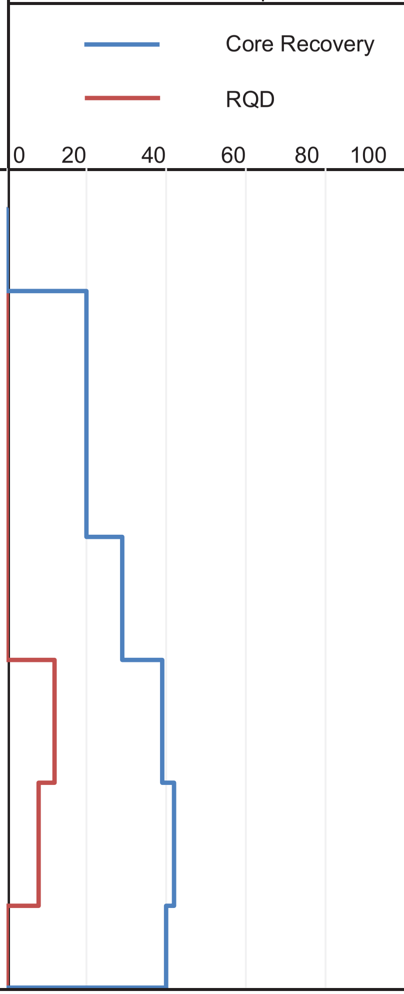
Borehole Log (IBH42)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 222.3 m
Co-ordinates :	**2897 E, 1946 S**	Ground Water Level :	4.4 m (RL(+) 217.9 m)
Termination Depth : (below GL)	10 m (RL(+) 212.3 m)	Start Date :	12-Sep-18
		Finish Date :	12-Sep-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.27 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		20	0			
3.50, 4.00, 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		20	0			
5.00, 5.50, 6.00	6.00		Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		29	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		39	12			
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		42	8			
9.50, 10.00	10.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10m)	10.0	40	0			

Percentage Core Recovery & RQD vs. depth

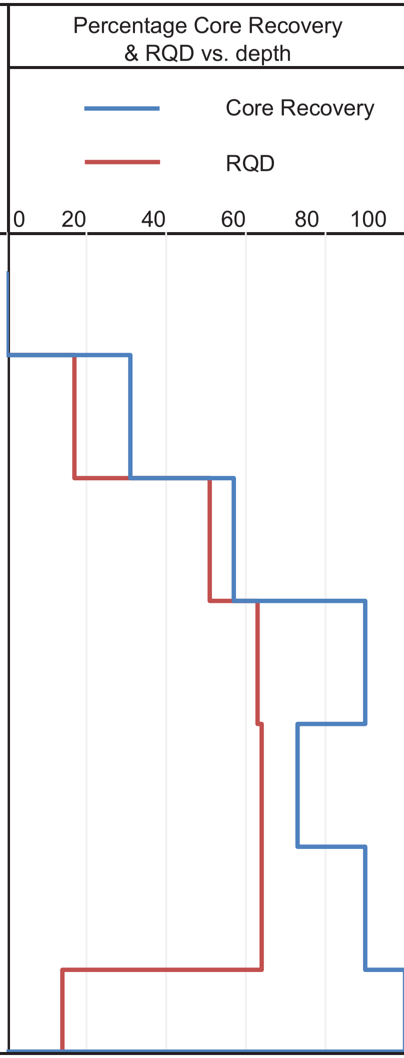


Borehole Log (IBH43)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 223.0 m
Co-ordinates :	**3165 E, 2172 S**	Ground Water Level :	4.3 m (RL(+) 218.7 m)
Termination Depth : (below GL)	10 m (RL(+) 213 m)	Start Date :	12-Sep-18
		Finish Date :	12-Sep-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00				Very weak grey Basalt, completely weathered, disintegrated (0.21 to 1.5m)		0	0			NX
1.50	1.50	Ref.								
2.00										
2.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		31	17			
3.00	3.00									
3.50										
4.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (3 to 4.5m)		57	51			
4.50	4.50									
5.00										
5.50				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (4.5 to 6m)		90	63			
6.00	6.00									
6.50										
7.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		73	64			
7.50	7.50									
8.00										
8.50				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		90	64			
9.00	9.00									
9.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10m)		100	14			
10.00	10.00				10.0					

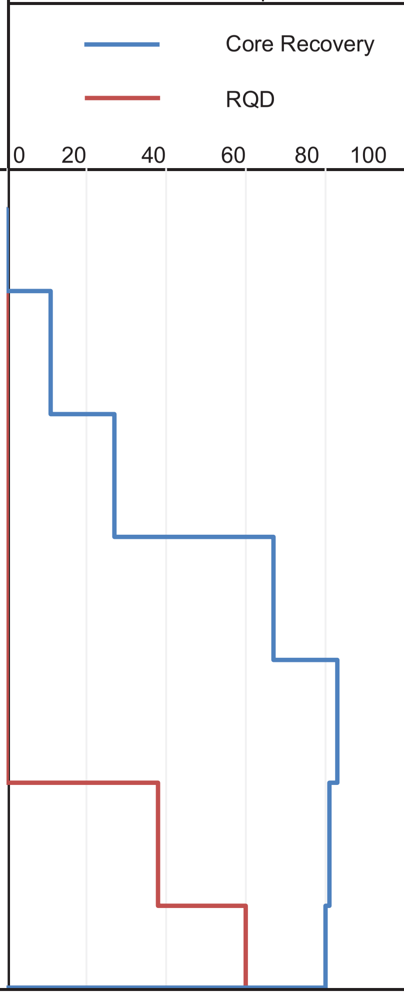


Borehole Log (IBH44)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 223.0 m	Drilling :	Rotary Drilling
Co-ordinates :	**3298 E, 2285 S**	Ground Water Level :	3.8 m (RL(+) 219.2 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 213 m)	Start Date :	11-Sep-18	Casing Depth :	2.0 m
		Finish Date :	11-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.21 to 1.5m)		0	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		11	0			
3.50, 4.00, 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		27	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		67	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		83	0			
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		81	38			
9.50, 10.00	10.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10m)	10.0	80	60			

Percentage Core Recovery & RQD vs. depth



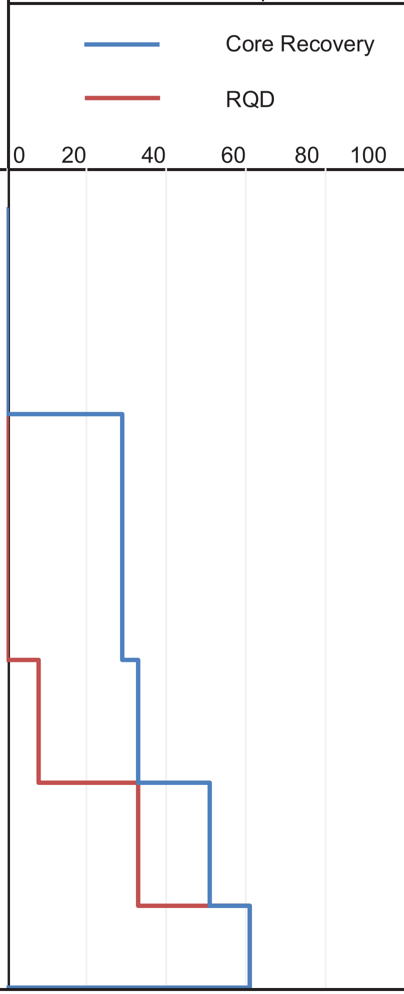
Borehole Log (IBH45)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 224.6 m
Co-ordinates :	**3566 E, 2509 S**	Ground Water Level :	7.8 m (RL(+) 216.8 m)
Termination Depth : (below GL)	10 m (RL(+) 214.6 m)	Start Date :	11-Sep-18
		Finish Date :	11-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3					HX
1.00–1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.28 to 1.5m)		0	0	Greyish	Partial	NX
2.00–3.00	3.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.50–4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		29	0			
5.00–6.00	6.00		Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		29	0			
6.50–7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		33	8			
8.00–9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		51	33			
9.50–10.00	10.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10m)	10.0	61	61			

Percentage Core Recovery & RQD vs. depth

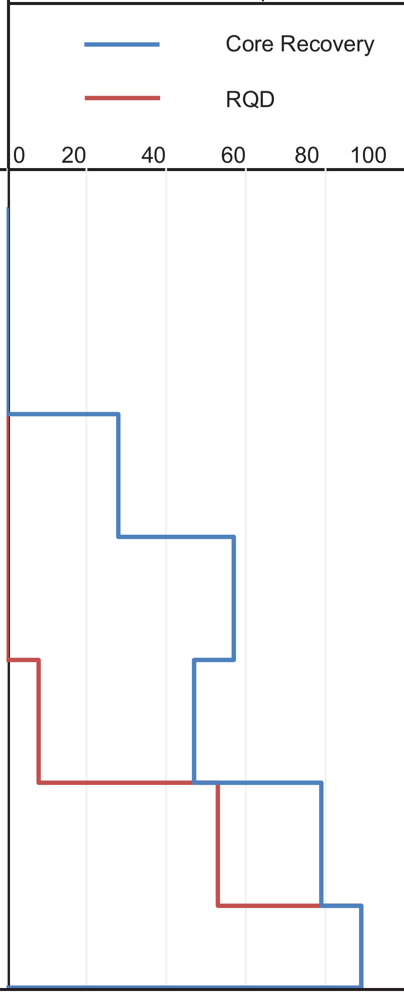


Borehole Log (IBH46)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 226.3 m	Drilling : Rotary Drilling
Co-ordinates :	**3681 E, 2605 S**	Ground Water Level :	5.8 m (RL(+) 220.5 m)	Bit Type : Diamond
Termination Depth : (below GL)	10 m (RL(+) 216.3 m)	Start Date :	11-Sep-18	Casing Depth : 2.0 m
		Finish Date :	11-Sep-18	

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.50, 4.00, 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		28	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		57	0			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		47	8			
8.00, 8.50, 9.00	9.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		79	53			
9.50, 10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	89	89			

Percentage Core Recovery & RQD vs. depth

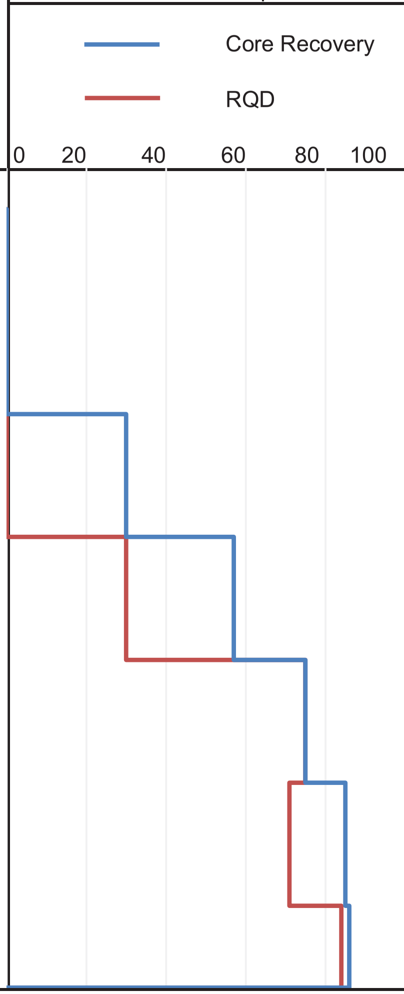


Borehole Log (IBH47)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 225.2 m	Drilling :	Rotary Drilling
Co-ordinates :	**3929 E, 2813 S**	Ground Water Level :	7.2 m (RL(+) 218 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 215.2 m)	Start Date :	10-Sep-18	Casing Depth :	2.0 m
		Finish Date :	10-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00			Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0			NX
1.50	1.50	Ref.							
2.00			Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
2.50									
3.00	3.00	Ref.							
3.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		30	0			
4.00									
4.50	4.50								
5.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		57	30			
5.50									
6.00	6.00								
6.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		75	75			
7.00									
7.50	7.50								
8.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		85	71			
8.50									
9.00	9.00								
9.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)		86	84			
10.00	10.00			10.0					

Percentage Core Recovery & RQD vs. depth



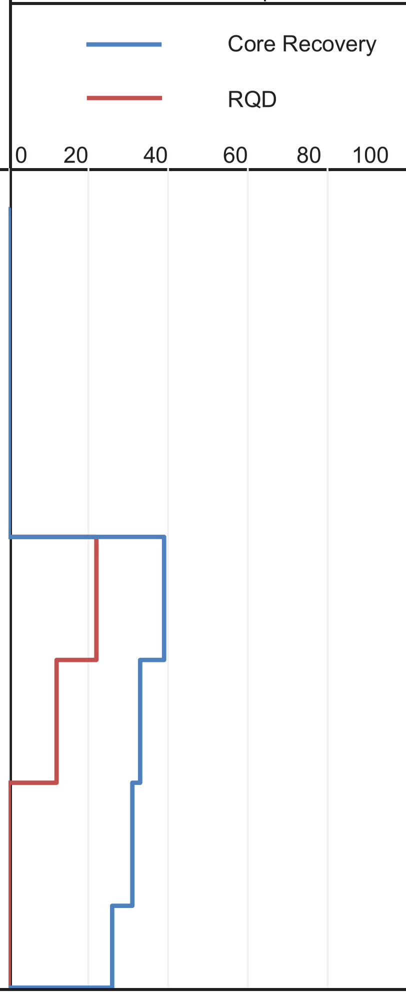
Borehole Log (IBH48)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 225.0 m
Co-ordinates :	**4120 E, 2975 S**	Ground Water Level :	7.7 m (RL(+) 217.3 m)
Termination Depth : (below GL)	10 m (RL(+) 215 m)	Start Date :	10-Sep-18
		Finish Date :	10-Sep-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Colour	Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.		Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00	Ref.		Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.50, 4.00, 4.50	4.50	Ref.		Very weak grey Basalt, completely weathered, disintegrated (3 to 4.5m)		0	0			
5.00, 5.50, 6.00	6.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		39	22			
6.50, 7.00, 7.50	7.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		33	12			
8.00, 8.50, 9.00	9.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		31	0			
9.50, 10.00	10.00			Weak grey Basalt, very intensely fractured, highly weathered (9 to 10m)	10.0	26	0			

Percentage Core Recovery & RQD vs. depth

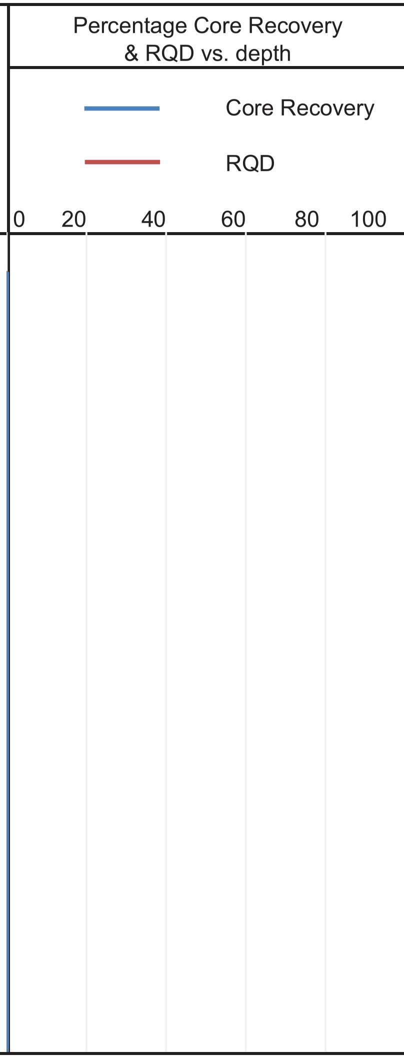


Borehole Log (IBH49)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 225.0 m
Co-ordinates :	**4387 E, 3201 S**	Ground Water Level :	9 m (RL(+) 216 m)
Termination Depth : (below GL)	10 m (RL(+) 215 m)	Start Date :	10-Sep-18
		Finish Date :	10-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.50, 4.00, 4.50	4.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (3 to 4.5m)		0	0			
5.00, 5.50, 6.00	6.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (4.5 to 6m)		0	0			
6.50, 7.00, 7.50	7.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (6 to 7.5m)		0	0			
8.00, 8.50, 9.00	9.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (7.5 to 9m)		0	0			
9.50, 10.00	10.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (9 to 10m)	10.0	0	0			

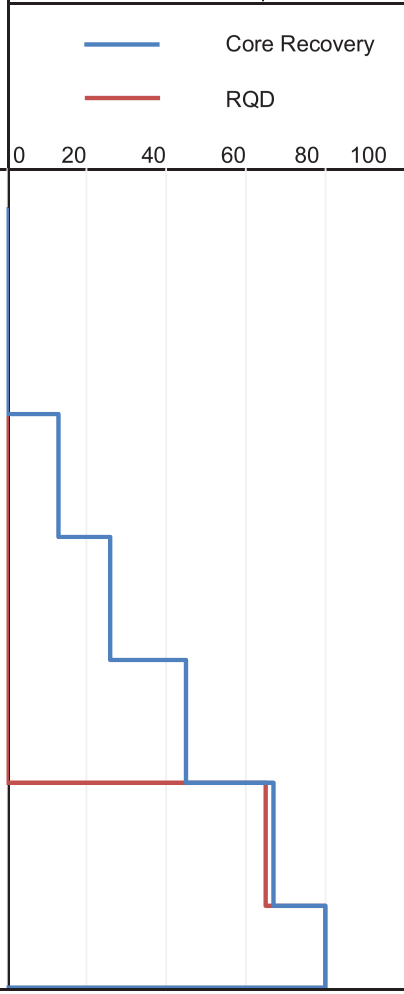


Borehole Log (IBH50)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 227.5 m	Drilling :	Rotary Drilling
Co-ordinates :	**4521 E, 3313 S**	Ground Water Level :	9.1 m (RL(+) 218.4 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 217.5 m)	Start Date :	10-Sep-18	Casing Depth :	2.0 m
		Finish Date :	10-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)
0.50			Black Silty Clay with rock fragments	0.2		
1.00			Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0
1.50	1.50	Ref.				
2.00						
2.50			Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0
3.00	3.00	Ref.				
3.50						
4.00			Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		13	0
4.50	4.50	Ref.				
5.00						
5.50			Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		26	0
6.00	6.00					
6.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		45	0
7.00						
7.50	7.50					
8.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		67	65
8.50						
9.00	9.00					
9.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)		80	80
10.00	10.00			10.0		

Percentage Core Recovery & RQD vs. depth



Return Water: Colour	Return Water: Loss	Size of Hole
Greyish	Partial	HX (0 to 0.2 m), NX

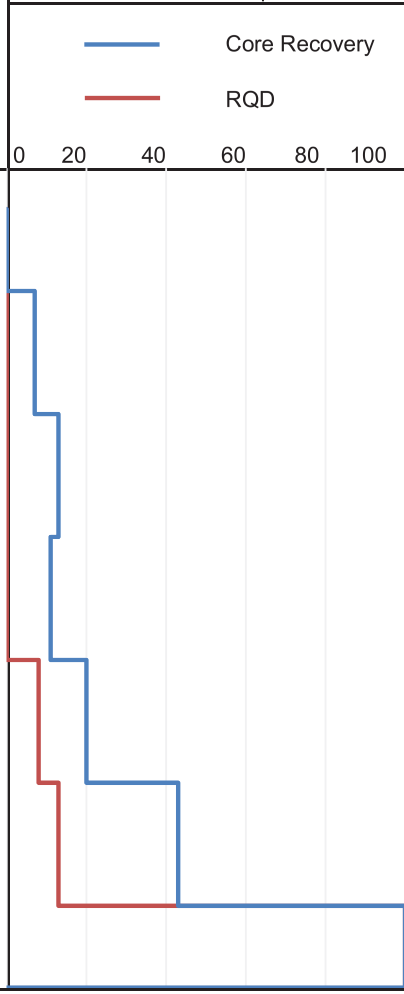
Borehole Log (IBH51)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 242.4 m
Co-ordinates :	**5040 E, 3747 S**	Ground Water Level :	7.8 m (RL(+) 234.6 m)
Termination Depth : (below GL)	10 m (RL(+) 232.4 m)	Start Date :	09-Sep-18
		Finish Date :	09-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)
0.50			Black Silty Clay with rock fragments	0.2		
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0
2.00, 2.50, 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		7	0
3.50, 4.00, 4.50	4.50	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		13	0
5.00, 5.50, 6.00	6.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		11	0
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		20	8
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		43	13
9.50, 10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	100	100

Percentage Core Recovery & RQD vs. depth



Return Water: Colour — Greyish; Loss — Partial

Size of Hole: HX (0 to 0.2 m); NX

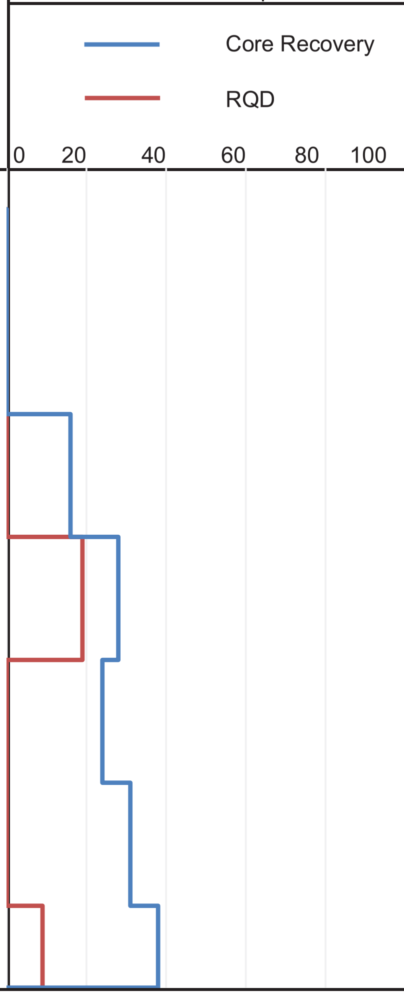
Borehole Log (IBH52)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 235.4 m
Co-ordinates :	**5173 E, 3859 S**	Ground Water Level :	7.5 m (RL(+) 227.9 m)
Termination Depth : (below GL)	10 m (RL(+) 225.4 m)	Start Date :	09-Sep-18
		Finish Date :	09-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)
0.50			Black Silty Clay with rock fragments	0.2		
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0
2.00, 2.50, 3.00	3.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0
3.50, 4.00, 4.50	4.50	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		16	0
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		28	19
6.50, 7.00, 7.50	7.50		Weak grey Basalt, very intensely fractured, highly weathered (6 to 7.5m)		24	0
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		31	0
9.50, 10.00	10.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10m)	10.0	38	9

Percentage Core Recovery & RQD vs. depth



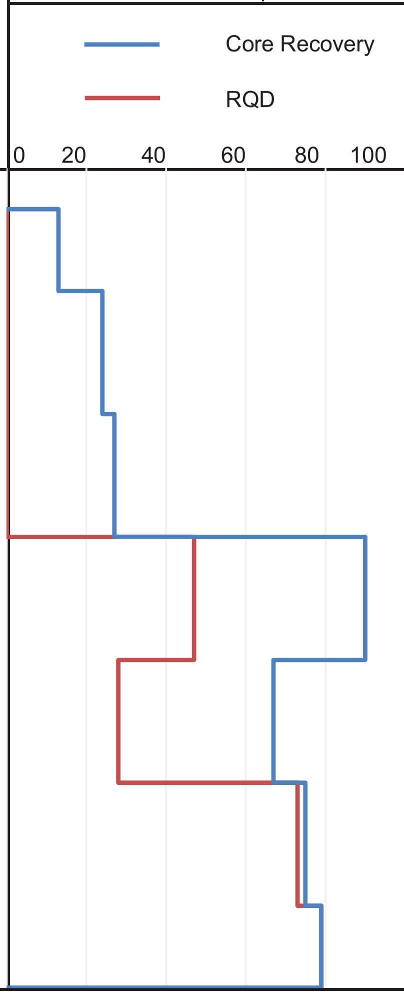
Return Water: Colour	Return Water: Loss	Size of Hole
Greyish	Partial	HX (0 to 0.2 m), NX

Borehole Log (IBH53)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 238.3 m	Drilling :	Rotary Drilling
Co-ordinates :	**5440 E, 4086 S**	Ground Water Level :	7.9 m (RL(+) 230.4 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 228.3 m)	Start Date :	09-Sep-18	Casing Depth :	2.0 m
		Finish Date :	09-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00, 1.50	1.50	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (0.24 to 1.5m)		13	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		24	0			
3.50, 4.00, 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		27	0			
5.00, 5.50, 6.00	6.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (4.5 to 6m)		90	47			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		67	28			
8.00, 8.50, 9.00	9.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		75	73			
9.50, 10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	79	79			

Percentage Core Recovery & RQD vs. depth



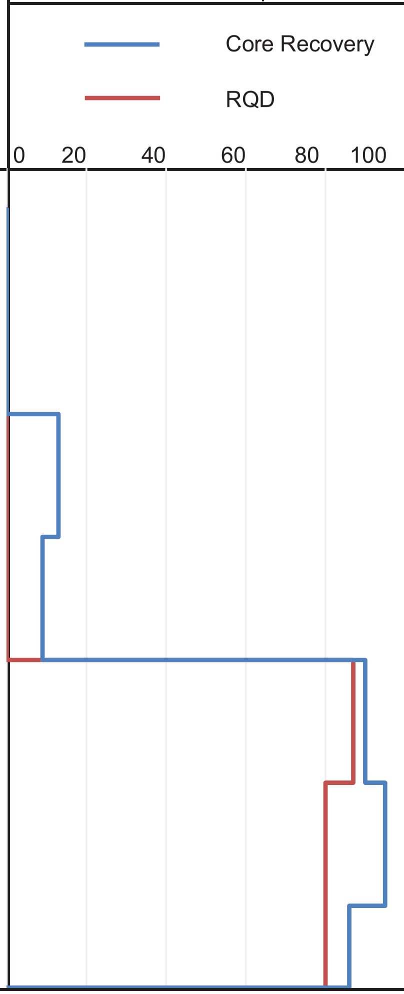
Borehole Log (IBH54)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 240.0 m
Co-ordinates :	**5535 E, 4166 S**	Ground Water Level :	8 m (RL(+) 232 m)
Termination Depth : (below GL)	10 m (RL(+) 230 m)	Start Date :	09-Sep-18
		Finish Date :	09-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00			Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0			NX
1.50	1.50	Ref.							
2.00									
2.50			Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.00	3.00	Ref.							
3.50									
4.00			Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		13	0			
4.50	4.50	Ref.							
5.00									
5.50			Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		9	0			
6.00	6.00	Ref.							
6.50									
7.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		90	87			
7.50	7.50								
8.00									
8.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		95	80			
9.00	9.00								
9.50									
10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	86	80			

Percentage Core Recovery & RQD vs. depth

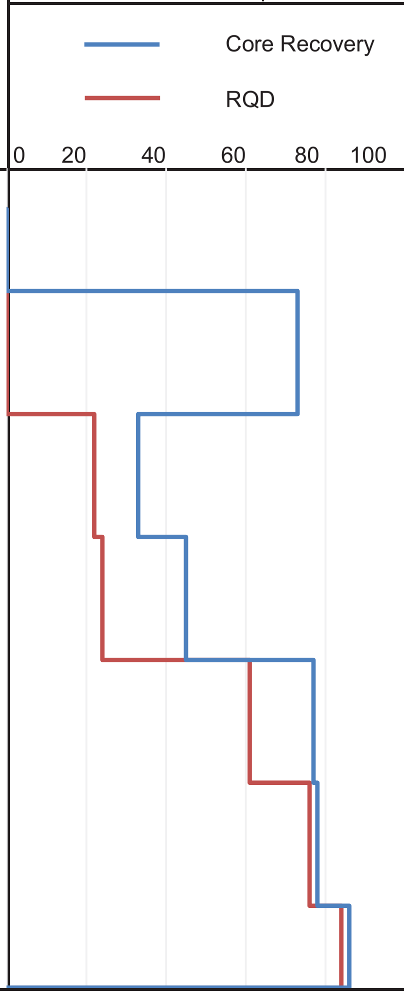


Borehole Log (IBH55)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 242.4 m	Drilling :	Rotary Drilling
Co-ordinates :	**5685 E, 4300 S**	Ground Water Level :	8.5 m (RL(+) 233.9 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 232.4 m)	Start Date :	08-Sep-18	Casing Depth :	2.0 m
		Finish Date :	08-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		73	0			
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		33	22			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		45	24			
6.50, 7.00, 7.50	7.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		77	61			
8.00, 8.50, 9.00	9.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		78	76			
9.50, 10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	86	84			

Percentage Core Recovery & RQD vs. depth



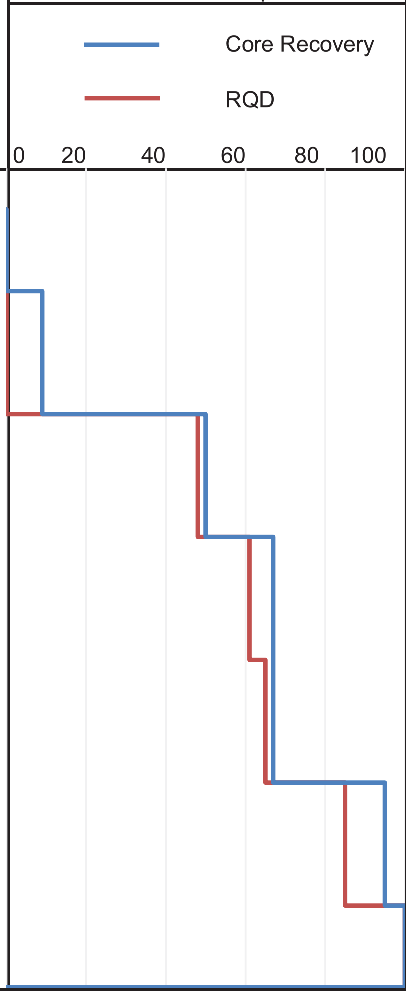
Scale

Borehole Log (IBH56)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 244.8 m
Co-ordinates :	**5802 E, 4395 S**	Ground Water Level :	8.6 m (RL(+) 236.2 m)
Termination Depth : (below GL)	10 m (RL(+) 234.8 m)	Start Date :	08-Sep-18
		Finish Date :	08-Sep-18
Drilling :	Rotary Drilling	Bit Type :	Diamond
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		9	0			
3.50, 4.00, 4.50	4.50		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (3 to 4.5m)		50	48			
5.00, 5.50, 6.00	6.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (4.5 to 6m)		67	61			
6.50, 7.00, 7.50	7.50		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (6 to 7.5m)		67	65			
8.00, 8.50, 9.00	9.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		95	85			
9.50, 10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	100	100			

Percentage Core Recovery & RQD vs. depth



Borehole Log (IBH57)

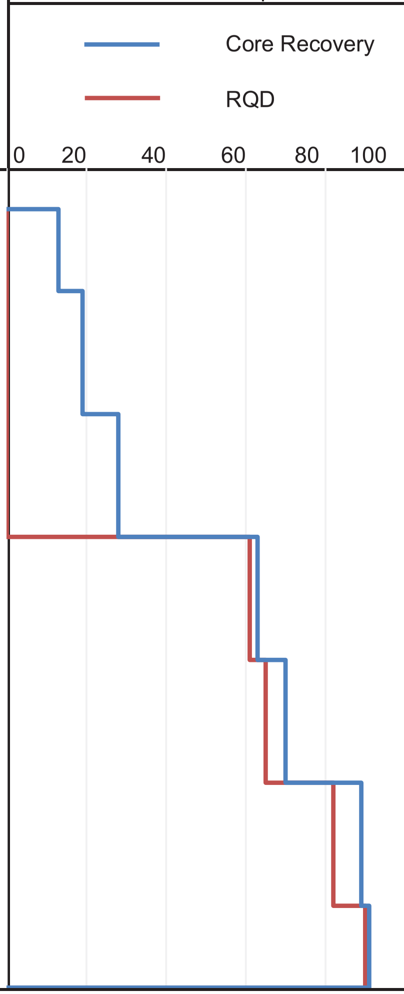
Location : **ASH PIPE CORRIDOR**
Co-ordinates : **6241 E, 4767 S**
Termination Depth : (below GL) 10 m (RL(+) 236.5 m)

Ground Level (GL) : RL(+) 246.5 m
Ground Water Level : 8.7 m (RL(+) 237.8 m)
Start Date : 08-Sep-18
Finish Date : 08-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00				Weak grey Basalt, very intensely fractured, highly weathered (0.24 to 1.5m)		13	0			NX
1.50	1.50	Ref.								
2.00										
2.50				Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		19	0			
3.00	3.00	Ref.								
3.50										
4.00				Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		28	0			
4.50	4.50									
5.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (4.5 to 6m)		63	61			
5.50										
6.00	6.00									
6.50				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		70	65			
7.00										
7.50	7.50									
8.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		89	82			
8.50										
9.00	9.00									
9.50				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)		91	90			
10.00	10.00				10.0					

Percentage Core Recovery & RQD vs. depth



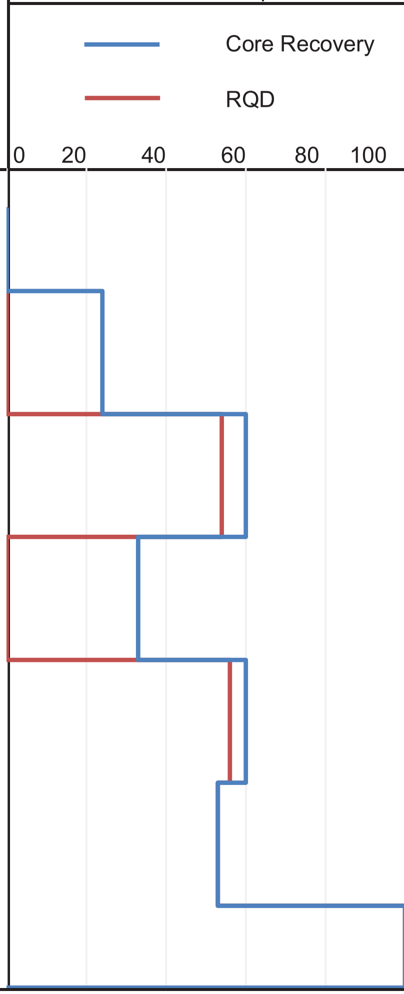
Borehole Log (IBH58)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 249.6 m
Co-ordinates :	**6374 E, 4882 S**	Ground Water Level :	8 m (RL(+) 241.6 m)
Termination Depth : (below GL)	10 m (RL(+) 239.6 m)	Start Date :	08-Sep-18
		Finish Date :	08-Sep-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		24	0			
3.50, 4.00, 4.50	4.50		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (3 to 4.5m)		60	54			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		33	0			
6.50, 7.00, 7.50	7.50		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (6 to 7.5m)		60	56			
8.00, 8.50, 9.00	9.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		53	53			
9.50, 10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	100	100			

Percentage Core Recovery & RQD vs. depth



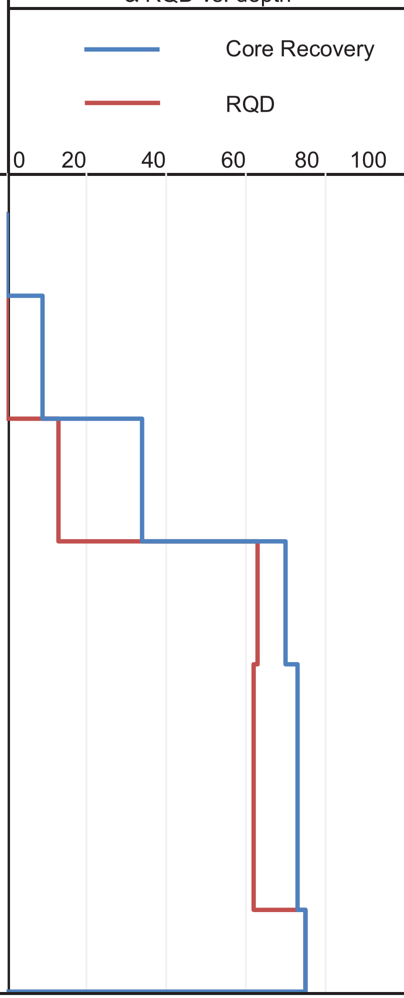
Borehole Log (IBH59)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 255.6 m
Co-ordinates :	**6584 E, 5059 S**	Ground Water Level :	8.6 m (RL(+) 247 m)
Termination Depth : (below GL)	10 m (RL(+) 245.6 m)	Start Date :	07-Sep-18
		Finish Date :	07-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00 – 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0			NX
2.00 – 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		9	0			
3.50 – 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		34	13			
5.00 – 6.00	6.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (4.5 to 6m)		70	63			
6.50 – 7.50	7.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		73	62			
8.00 – 9.00	9.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		73	62			
9.50 – 10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	75	75			

Percentage Core Recovery & RQD vs. depth

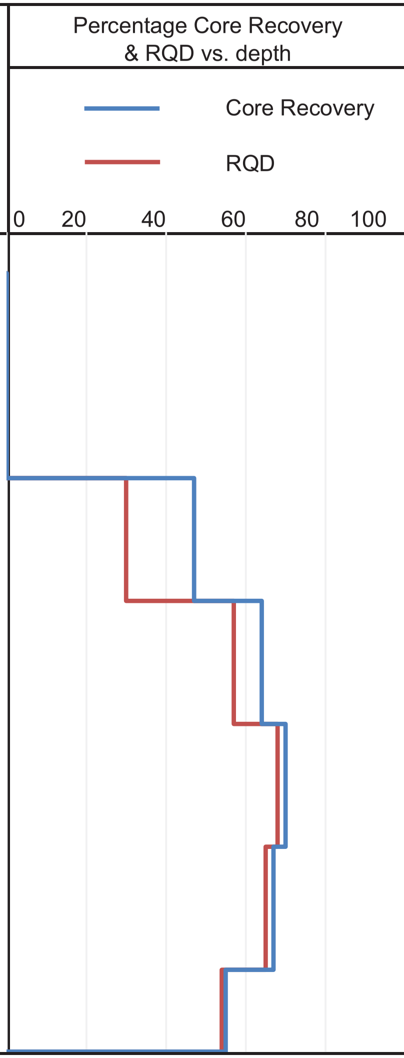


Borehole Log (IBH60)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 261.2 m
Co-ordinates :	**6674 E, 5125 S**	Ground Water Level :	9 m (RL(+) 252.2 m)
Termination Depth : (below GL)	10 m (RL(+) 251.2 m)	Start Date :	07-Sep-18
		Finish Date :	07-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00	Ref.	Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		47	30			
5.00, 5.50, 6.00	6.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (4.5 to 6m)		64	57			
6.50, 7.00, 7.50	7.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		70	68			
8.00, 8.50, 9.00	9.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		67	65			
9.50, 10.00	10.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (9 to 10m)	10.0	55	54			

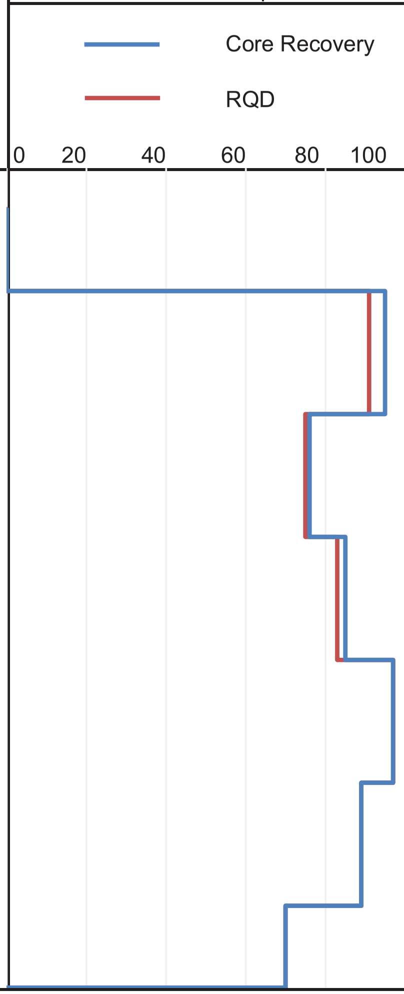


Borehole Log (IBH61)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 260.4 m
Co-ordinates :	**6615 E, 5228 S**	Ground Water Level :	4.5 m (RL(+) 255.9 m)
Termination Depth : (below GL)	10 m (RL(+) 250.4 m)	Start Date :	07-Sep-18
		Finish Date :	07-Sep-18
Drilling :	Rotary Drilling	Bit Type :	Diamond
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.28 to 1.5m)		0	0			NX
2.00, 2.50, 3.00	3.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (1.5 to 3m)		95	91			
3.50, 4.00, 4.50	4.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (3 to 4.5m)		76	75			
5.00, 5.50, 6.00	6.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (4.5 to 6m)		85	83			
6.50, 7.00, 7.50	7.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		97	97			
8.00, 8.50, 9.00	9.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		89	89			
9.50, 10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	70	70			

Percentage Core Recovery & RQD vs. depth



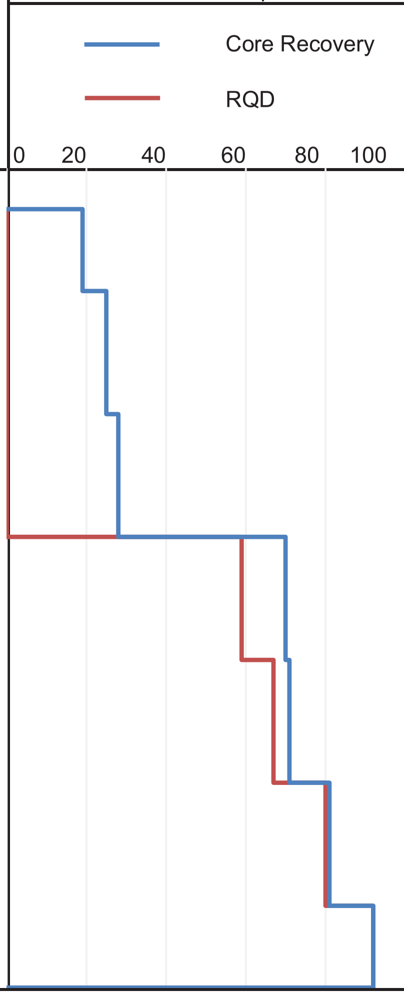
Borehole Log (IBH62)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 255.4 m
Co-ordinates :	**6521 E, 5370 S**	Ground Water Level :	3.7 m (RL(+) 251.7 m)
Termination Depth : (below GL)	10 m (RL(+) 245.4 m)	Start Date :	07-Sep-18
		Finish Date :	07-Sep-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00			Weak grey Basalt, very intensely fractured, highly weathered (0.24 to 1.5m)		19	0			
1.50	1.50	Ref.							
2.00			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		25	0			
2.50									
3.00	3.00								
3.50			Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		28	0			
4.00									
4.50	4.50								
5.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (4.5 to 6m)		70	59	Greyish	Partial	NX
5.50									
6.00	6.00								
6.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		71	67			
7.00									
7.50	7.50								
8.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		81	80			
8.50									
9.00	9.00								
9.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)		92	92			
10.00	10.00			10.0					

Percentage Core Recovery & RQD vs. depth

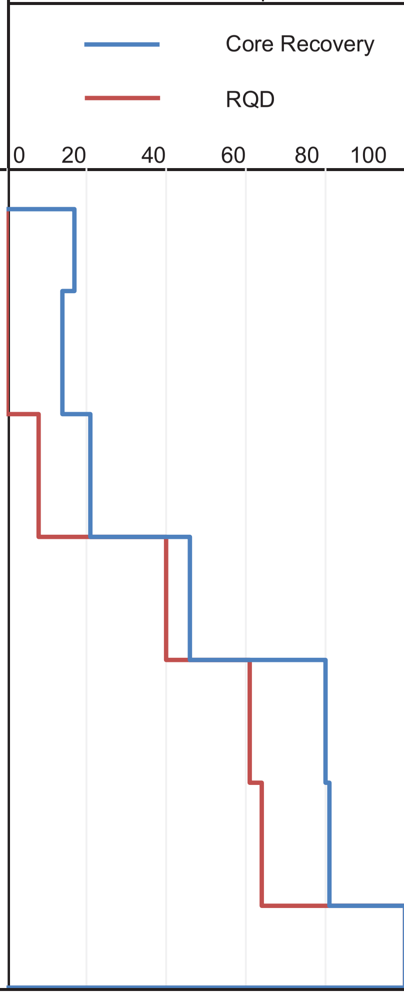


Borehole Log (IBH63)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 260.0 m	Drilling :	Rotary Drilling
Co-ordinates :	**6365 E, 5601 S**	Ground Water Level :	9.1 m (RL(+) 250.9 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 250 m)	Start Date :	06-Sep-18	Casing Depth :	2.0 m
		Finish Date :	06-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.2					HX
1.00			Weak grey Basalt, very intensely fractured, highly weathered (0.24 to 1.5m)		17	0			
1.50	1.50	Ref.							
2.00									
2.50			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		14	0			
3.00	3.00	Ref.							
3.50									
4.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		21	8			
4.50	4.50								
5.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		46	40	Greyish	Partial	NX
5.50									
6.00	6.00								
6.50									
7.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		80	61			
7.50	7.50								
8.00									
8.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		81	64			
9.00	9.00								
9.50									
10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	100	100			

Percentage Core Recovery & RQD vs. depth



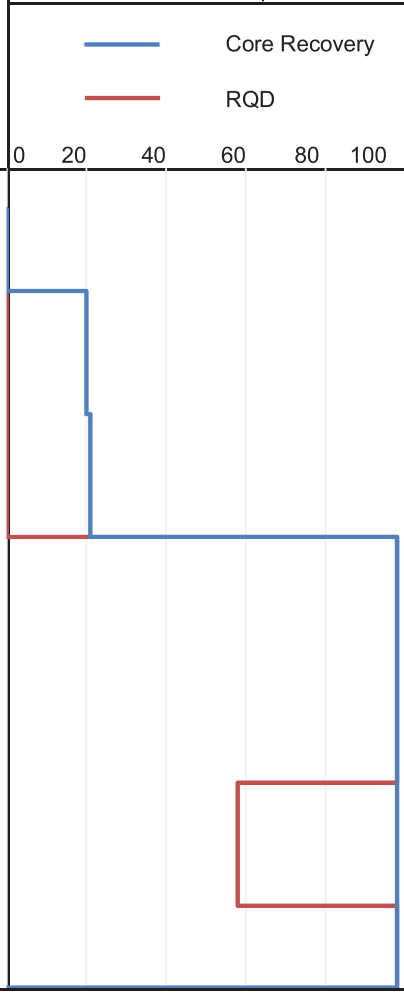
Borehole Log (IBH64)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 261.3 m
Co-ordinates :	**6223 E, 5807 S**	Ground Water Level :	5.6 m (RL(+) 255.7 m)
Termination Depth : (below GL)	10 m (RL(+) 251.3 m)	Start Date :	05-Sep-18
		Finish Date :	06-Sep-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.3					HX
1.00, 1.50	1.50	Ref.		Very weak grey Basalt, completely weathered, disintegrated (0.26 to 1.5m)		0	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00			Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		20	0			
3.50, 4.00, 4.50	4.50			Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		21	0			
5.00, 5.50, 6.00	6.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (4.5 to 6m)		98	98			
6.50, 7.00, 7.50	7.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		98	98			
8.00, 8.50, 9.00	9.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		98	58			
9.50, 10.00	10.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	98	98			

Percentage Core Recovery & RQD vs. depth

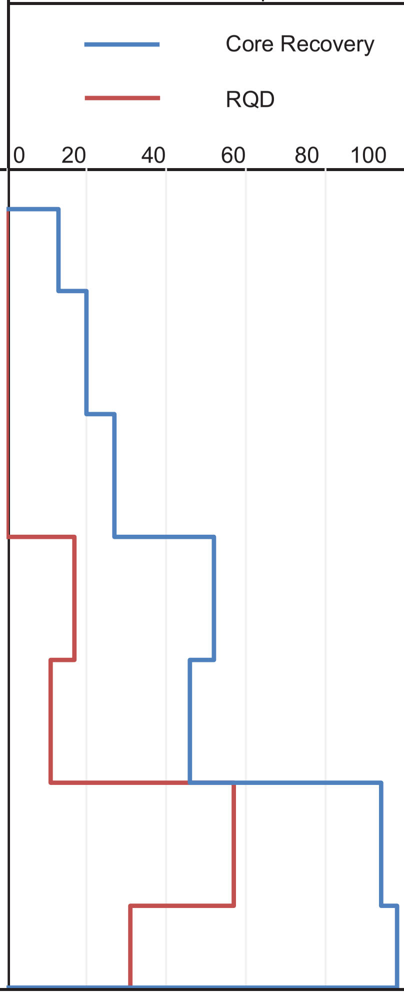


Borehole Log (IBH65)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 253.9 m	Drilling :	Rotary Drilling
Co-ordinates :	**6024 E, 6095 S**	Ground Water Level :	2.9 m (RL(+) 251 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 243.9 m)	Start Date :	05-Sep-18	Casing Depth :	2.0 m
		Finish Date :	05-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (0.26 to 1.5m)		13	0			NX
2.00, 2.50, 3.00	3.00		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		20	0			
3.50, 4.00, 4.50	4.50		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		27	0			
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		52	17			
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		46	11			
8.00, 8.50, 9.00	9.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		94	57			
9.50, 10.00	10.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10m)	10.0	98	31			

Percentage Core Recovery & RQD vs. depth



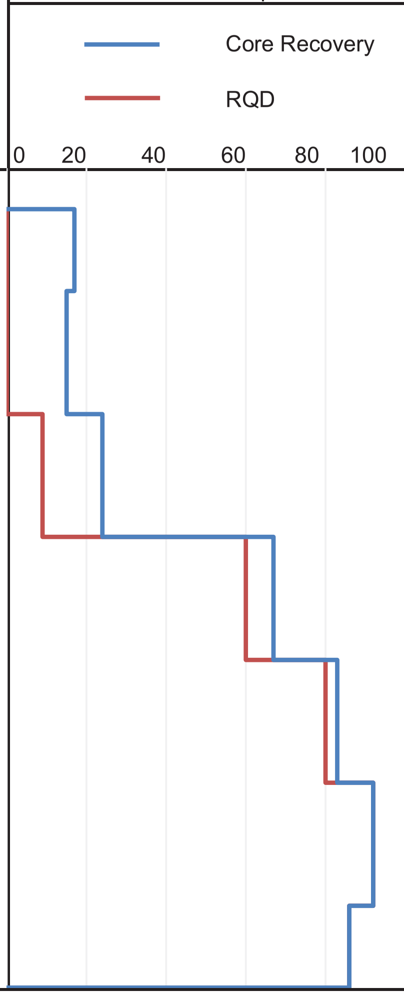
Borehole Log (IBH66)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 253.1 m
Co-ordinates :	**5858 E, 6335 S**	Ground Water Level :	3.4 m (RL(+) 249.7 m)
Termination Depth : (below GL)	10 m (RL(+) 243.1 m)	Start Date :	05-Sep-18
		Finish Date :	05-Sep-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.3					HX
1.00, 1.50	1.50	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (0.26 to 1.5m)		17	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		15	0			
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		24	9			
5.00, 5.50, 6.00	6.00		Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (4.5 to 6m)		67	60			
6.50, 7.00, 7.50	7.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		83	80			
8.00, 8.50, 9.00	9.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		92	92			
9.50, 10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	86	86			

Percentage Core Recovery & RQD vs. depth

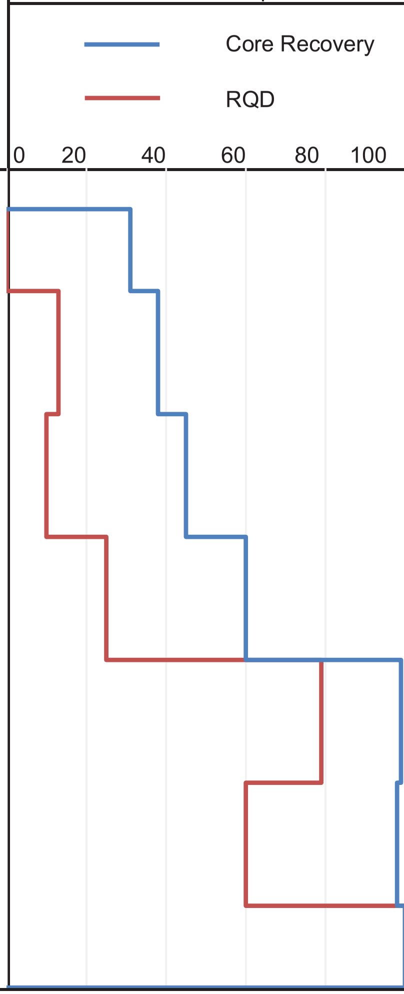


Borehole Log (IBH67)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 255.1 m	Drilling :	Rotary Drilling
Co-ordinates :	**5528 E, 6005 S**	Ground Water Level :	9.1 m (RL(+) 246 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 245.1 m)	Start Date :	31-Aug-18	Casing Depth :	2.0 m
		Finish Date :	01-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2			Greyish	Partial	HX
1.00, 1.50	1.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (0.24 to 1.5m)		31	0			NX
2.00, 2.50, 3.00	3.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		38	13			
3.50, 4.00, 4.50	4.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		45	10			
5.00, 5.50, 6.00	6.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		60	25			
6.50, 7.00, 7.50	7.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		99	79			
8.00, 8.50, 9.00	9.00			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (7.5 to 9m)		98	60			
9.50, 10.00	10.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	100	100			

Percentage Core Recovery & RQD vs. depth

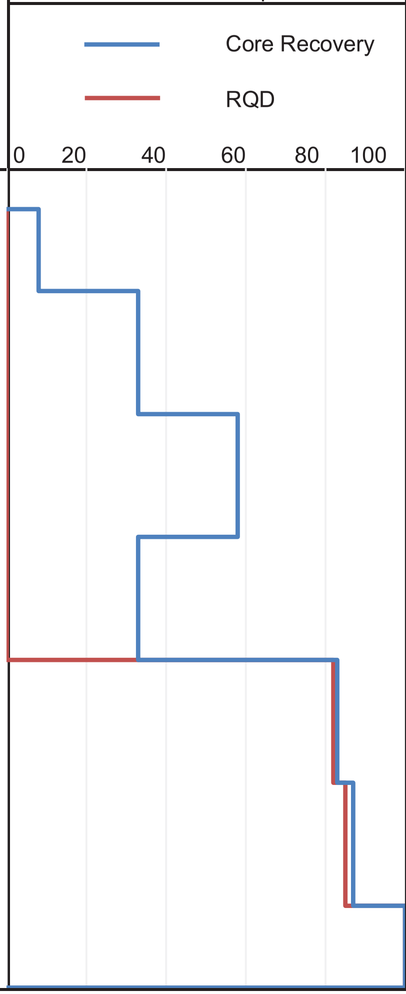


Borehole Log (IBH68)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 251.0 m	Drilling :	Rotary Drilling
Co-ordinates :	**5720 E, 6280 S**	Ground Water Level :	9 m (RL(+) 242 m)	Bit Type :	Diamond
Termination Depth : (below GL)	10 m (RL(+) 241 m)	Start Date :	03-Sep-18	Casing Depth :	2.0 m
		Finish Date :	03-Sep-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.2					HX
1.00, 1.50	1.50	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (0.24 to 1.5m)		8	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		33	0			
3.50, 4.00, 4.50	4.50			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		58	0			
5.00, 5.50, 6.00	6.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		33	0			
6.50, 7.00, 7.50	7.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		83	82			
8.00, 8.50, 9.00	9.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		87	85			
9.50, 10.00	10.00			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	100	100			

Percentage Core Recovery & RQD vs. depth

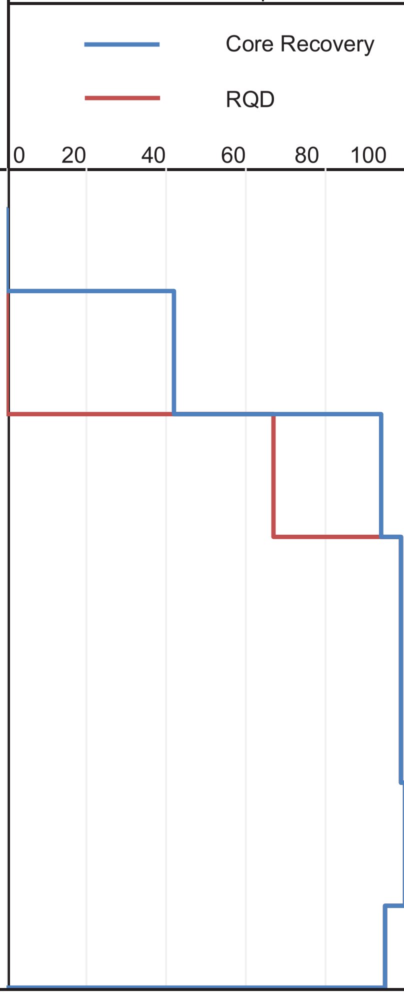


Borehole Log (IBH69)

Location :	**ASH PIPE CORRIDOR**	Ground Level (GL) :	RL(+) 252.6 m
Co-ordinates :	**5773 E, 6386 S**	Ground Water Level :	2.6 m (RL(+) 250 m)
Termination Depth : (below GL)	10 m (RL(+) 242.6 m)	Start Date :	02-Sep-18
		Finish Date :	02-Sep-18
Drilling :	Rotary Drilling	Bit Type :	Diamond
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)
0.50			Black Silty Clay with rock fragments	0.2		
1.00, 1.50	1.50	Ref.	Very weak grey Basalt, completely weathered, disintegrated (0.24 to 1.5m)		0	0
2.00, 2.50, 3.00	3.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (1.5 to 3m)		42	0
3.50, 4.00, 4.50	4.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (3 to 4.5m)		94	67
5.00, 5.50, 6.00	6.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (4.5 to 6m)		99	99
6.50, 7.00, 7.50	7.50		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (6 to 7.5m)		99	99
8.00, 8.50, 9.00	9.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (7.5 to 9m)		100	100
9.50, 10.00	10.00		Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10m)	10.0	95	95

Percentage Core Recovery & RQD vs. depth



Return Water: Colour — Greyish; Loss — Partial

Size of Hole: HX (0 to 0.2 m); NX

Scale

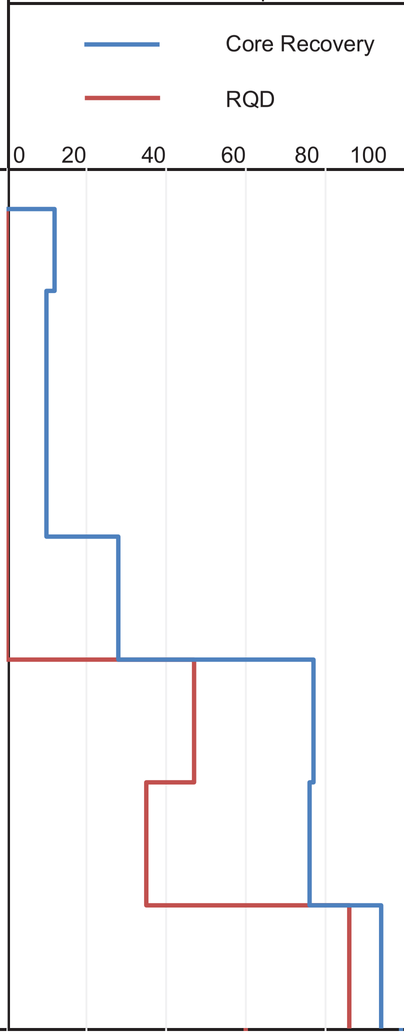
Borehole Log (BH70)

Location :	**ROB**	Ground Level (GL) :	RL(+) 207.6 m
Co-ordinates :	**2142 E, 700 N**	Ground Water Level :	3.3 m (RL(+) 204.29 m)
Termination Depth : (below GL)	15 m (RL(+) 192.59 m)	Start Date :	29-Sep-18
		Finish Date :	01-Oct-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)
0.50				Black Silty Clay with rock fragments	0.6		
1.00, 1.50	1.50	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (0.6 to 1.5m)		12	0
2.00, 2.50, 3.00	3.00	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		10	0
3.50, 4.00, 4.50	4.50	Ref.		Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		10	0
5.00, 5.50, 6.00	6.00			Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		28	0
6.50, 7.00, 7.50	7.50			Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (6 to 7.5m)		77	47
8.00, 8.50, 9.00	9.00			Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		76	35
9.50, 10.00, 10.50	10.50			Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (9 to 10.5m)		94	86

Percentage Core Recovery & RQD vs. depth

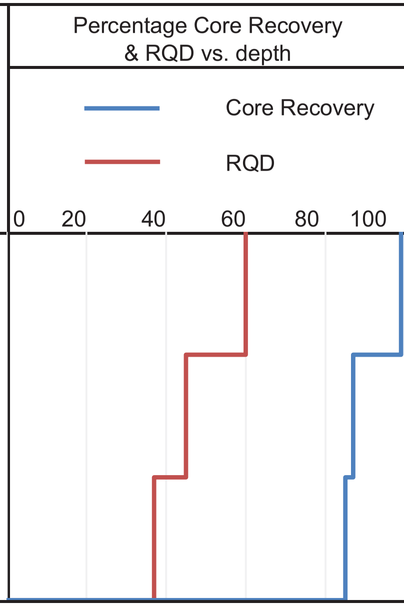


Return Water: Colour	Return Water: Loss	Size of Hole
Greyish	Partial	HX (0 to 0.6 m), NX

Borehole Log (BH70)

Location :	**ROB**	Ground Level (GL) :	RL(+) 207.6 m	Drilling :	Rotary Drilling
Co-ordinates :	**2142 E, 700 N**	Ground Water Level :	3.3 m (RL(+) 204.29 m)	Bit Type :	Diamond
Termination Depth : (below GL)	15 m (RL(+) 192.59 m)	Start Date :	29-Sep-18	Casing Depth :	2.0 m
		Finish Date :	01-Oct-18		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (10.5 to 12m)		99	60	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (12 to 13.5m)		87	45			
13.00										
13.50	13.50									
14.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)		85	37			
14.50										
15.00	15.00				15.0					



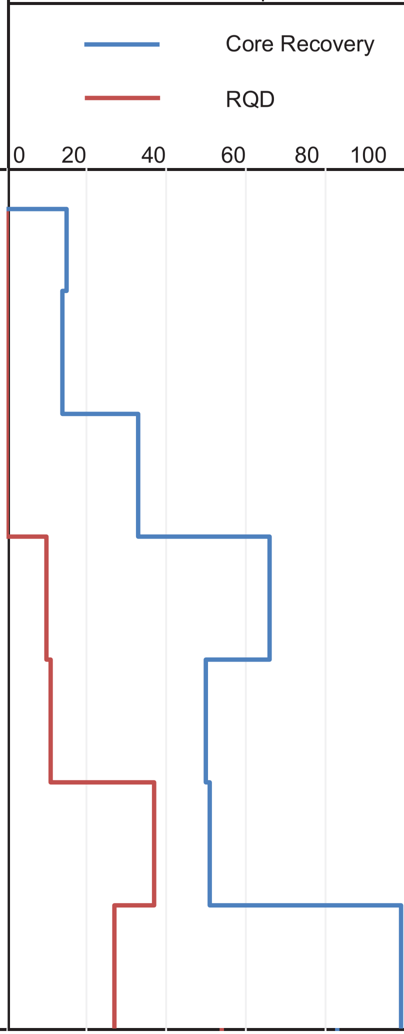
Borehole Log (BH71)

Location :	**ROB**	Ground Level (GL) :	RL(+) 208.4 m
Co-ordinates :	**2119 E, 628 N**	Ground Water Level :	3.5 m (RL(+) 204.9 m)
Termination Depth : (below GL)	15 m (RL(+) 193.4 m)	Start Date :	29-Sep-18
		Finish Date :	01-Oct-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50			Black Silty Clay with rock fragments	0.7			Greyish	Partial	HX
1.00, 1.50	1.50	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (0.7 to 1.5m)		15	0	Greyish	Partial	NX
2.00, 2.50, 3.00	3.00	Ref.	Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		14	0	Greyish	Partial	NX
3.50, 4.00, 4.50	4.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (3 to 4.5m)		33	0	Greyish	Partial	NX
5.00, 5.50, 6.00	6.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (4.5 to 6m)		66	10	Greyish	Partial	NX
6.50, 7.00, 7.50	7.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		50	11	Greyish	Partial	NX
8.00, 8.50, 9.00	9.00		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		51	37	Greyish	Partial	NX
9.50, 10.00, 10.50	10.50		Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		99	27	Greyish	Partial	NX

Percentage Core Recovery & RQD vs. depth

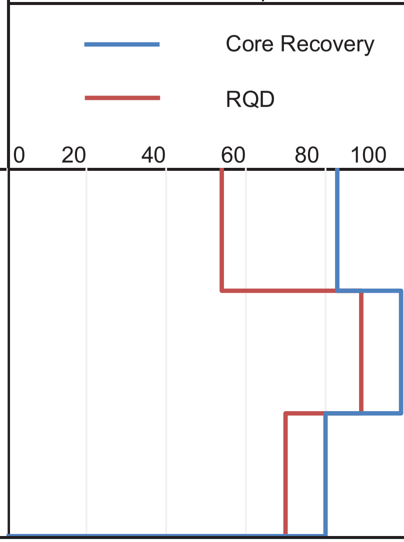


Borehole Log (BH71)

Location :	**ROB**	Ground Level (GL) :	RL(+) 208.4 m
Co-ordinates :	**2119 E, 628 N**	Ground Water Level :	3.5 m (RL(+) 204.9 m)
Termination Depth : (below GL)	15 m (RL(+) 193.4 m)	Start Date :	29-Sep-18
		Finish Date :	01-Oct-18
Drilling :	Rotary Drilling		
Bit Type :	Diamond		
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
11.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (10.5 to 12m)		83	54	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (12 to 13.5m)		99	89			
13.00										
13.50	13.50									
14.00				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (13.5 to 15m)		80	70			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth

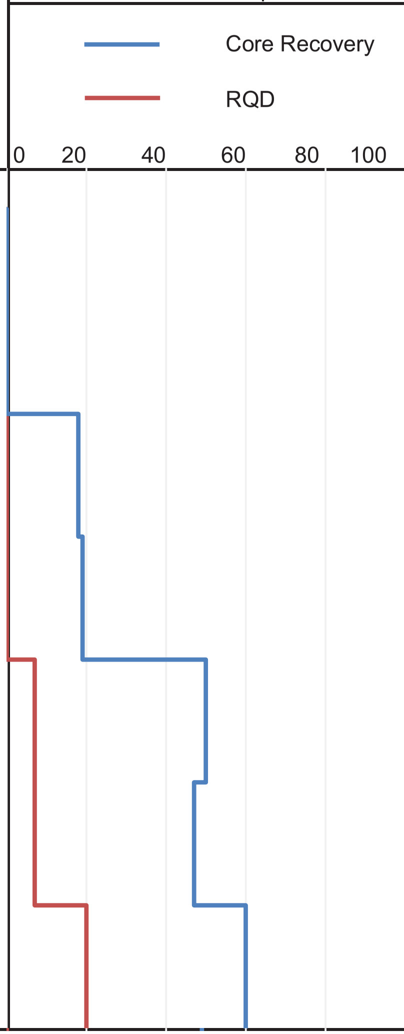


Borehole Log (BH72)

Location :	**ROB**	Ground Level (GL) :	RL(+) 209.9 m
Co-ordinates :	**2015 E, 610 N**	Ground Water Level :	4.5 m (RL(+) 205.4 m)
Termination Depth : (below GL)	15 m (RL(+) 194.9 m)	Start Date :	05-Sep-18
		Finish Date :	08-Oct-18
Drilling :	Rotary Drilling	Bit Type :	Diamond
Casing Depth :	2.0 m		

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.5					HX
1.00				Very weak grey Basalt, completely weathered, disintegrated (0.5 to 1.5m)		0	0			
1.50	1.50	Ref.								
2.00										
2.50				Very weak grey Basalt, completely weathered, disintegrated (1.5 to 3m)		0	0			
3.00	3.00	Ref.								
3.50										
4.00				Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		18	0			
4.50	4.50	Ref.								
5.00										
5.50				Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		19	0	Greyish	Partial	NX
6.00	6.00	Ref.								
6.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)						
7.00						50	7			
7.50	7.50									
8.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)						
8.50						47	7			
9.00	9.00									
9.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)						
10.00						60	20			
10.50	10.50									

Percentage Core Recovery & RQD vs. depth



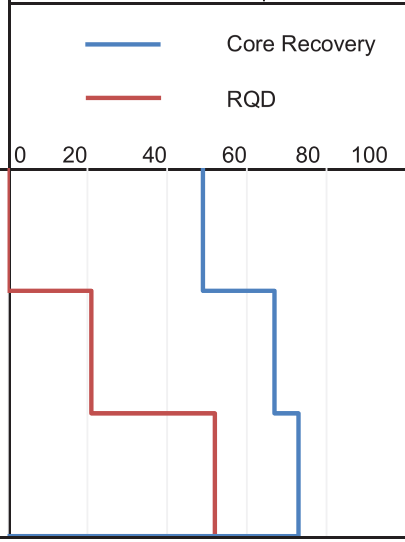
Borehole Log (BH72)

Location :	**ROB**	Ground Level (GL) :	RL(+) 209.9 m
Co-ordinates :	**2015 E, 610 N**	Ground Water Level :	4.5 m (RL(+) 205.4 m)
Termination Depth : (below GL)	15 m (RL(+) 194.9 m)	Start Date :	05-Sep-18
		Finish Date :	08-Oct-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Colour	Loss	Size of Hole
11.00								Greyish	Partial	NX
11.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (10.5 to 12m)		49	0			
12.00	12.00									
12.50										
13.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (12 to 13.5m)		67	21			
13.50	13.50									
14.00										
14.50				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (13.5 to 15m)		73	52			
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth



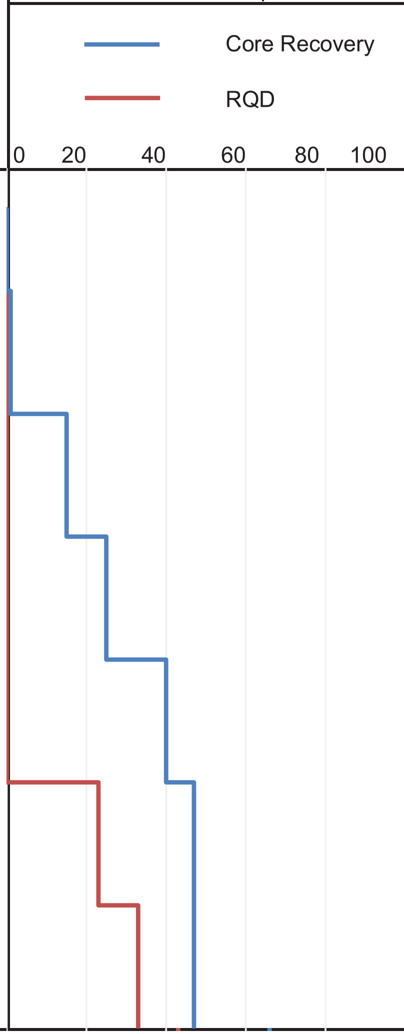
Borehole Log (BH73)

Location :	**ROB**	Ground Level (GL) :	RL(+) 209.9 m
Co-ordinates :	**1961 E, 584 N**	Ground Water Level :	4.5 m (RL(+) 205.4 m)
Termination Depth : (below GL)	15 m (RL(+) 194.9 m)	Start Date :	05-Oct-18
		Finish Date :	08-Oct-18

Drilling : Rotary Drilling
Bit Type : Diamond
Casing Depth : 2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water Colour	Return Water Loss	Size of Hole
0.50				Black Silty Clay with rock fragments	0.6					HX
1.00				Very weak grey Basalt, completely weathered, disintegrated (0.6 to 1.5m)		0	0	Greyish	Partial	NX
1.50	1.50	Ref.								
2.00										
2.50				Weak grey Basalt, very intensely fractured, highly weathered (1.5 to 3m)		1	0			
3.00	3.00	Ref.								
3.50										
4.00				Weak grey Basalt, very intensely fractured, highly weathered (3 to 4.5m)		15	0			
4.50	4.50	Ref.								
5.00										
5.50				Weak grey Basalt, very intensely fractured, highly weathered (4.5 to 6m)		25	0			
6.00	6.00									
6.50										
7.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (6 to 7.5m)		40	0			
7.50	7.50									
8.00										
8.50				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (7.5 to 9m)		47	23			
9.00	9.00									
9.50										
10.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (9 to 10.5m)		47	33			
10.50	10.50									

Percentage Core Recovery & RQD vs. depth



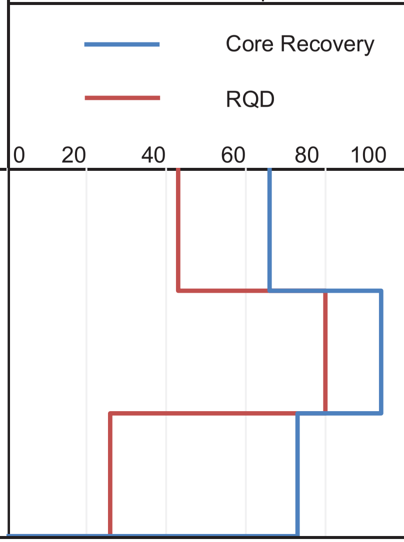
Borehole Log (BH73)

Location :	**ROB**	Ground Level (GL) :	RL(+) 209.9 m
Co-ordinates :	**1961 E, 584 N**	Ground Water Level :	4.5 m (RL(+) 205.4 m)
Termination Depth : (below GL)	15 m (RL(+) 194.9 m)	Start Date :	05-Oct-18
		Finish Date :	08-Oct-18

Drilling :	Rotary Drilling
Bit Type :	Diamond
Casing Depth :	2.0 m

Depth, m	Drill Run (m)	Field SPT-N value	Symbol	DESCRIPTION	Depth of Strata, m	Core Recovery (%)	Rock Quality Designation (RQD) (%)	Return Water: Colour	Return Water: Loss	Size of Hole
11.00				Moderately strong to strong grey Basalt, moderately fractured, moderately weathered (10.5 to 12m)		66	43	Greyish	Partial	NX
11.50										
12.00	12.00									
12.50				Strong to very strong grey Basalt, moderately to slightly fractured, slightly weathered to fresh (12 to 13.5m)		94	80			
13.00										
13.50	13.50									
14.00				Moderately weak to moderately strong grey Basalt, intensely fractured, moderately weathered (13.5 to 15m)		73	26			
14.50										
15.00	15.00				15.0					

Percentage Core Recovery & RQD vs. depth



LABORATORY TEST RESULTS ON SELECTED SOIL SAMPLES

LOCATION	BORE HOLE No.	DEPTH (m)	DESCRIPTION	IS CLASSIFI CATION	Grain size analysis				Attetberg Limits			Shrinkage limit (%)	DFS (%)	Specific gravity
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	LL	PL	PI			
ASH PIPE CORRIDOR	IBH-33	0.0-0.1	Light grey silty clayey with rock fragment	CH	12	23	37	28	57.4	26.8	30.6	11.2	53.4	2.73
ASH PIPE CORRIDOR	IBH-34	0.0-0.1	Light grey silty clayey with rock fragment	CH	11	24	47	18	61.9	28.1	33.8	10.3	52.7	2.71
ASH PIPE CORRIDOR	IBH-35	0.0-0.1	Light grey silty clayey with rock fragment	CH	9	21	44	26	63.7	26.7	37.0	9.3	57.5	2.72
ASH PIPE CORRIDOR	IBH-36	0.0-0.1	Light grey silty clayey with rock fragment	CH	10	25	39	26	54.9	26.4	28.5	9.7	46.3	2.69
ASH PIPE CORRIDOR	IBH-37	0.0-0.1	Light grey silty clayey with rock fragment	CH	9	26	35	30	59.7	25.3	34.4	9.7	42.6	2.71
ASH PIPE CORRIDOR	IBH-38	0.0-0.1	Light grey silty clayey with rock fragment	CI	12	23	45	20	47.8	24.9	22.9	11.8	29.6	2.68
ASH PIPE CORRIDOR	IBH-39	0.0-0.1	Light grey silty clayey with rock fragment	CH	13	17	42	28	58.1	26.9	31.2	10.6	44.6	2.71
ASH PIPE CORRIDOR	IBH-40	0.0-0.1	Light grey silty clayey with rock fragment	CH	15	20	39	26	56.4	26.1	30.3	10.7	39.5	2.72
ASH PIPE CORRIDOR	IBH-41	0.0-0.1	Light grey silty clayey with rock fragment	CI	7	28	34	31	48.1	25.1	23.0	11.3	29.5	2.69
ASH PIPE CORRIDOR	IBH-42	0.0-0.1	Light grey silty clayey with rock fragment	CH	8	27	44	21	57.3	26.5	30.8	10.2	47.3	2.72
ASH PIPE CORRIDOR	IBH-43	0.0-0.1	Light grey silty clayey with rock fragment	CH	9	21	41	29	66.3	27.7	38.6	9.4	52.6	2.71

LOCATION	BORE HOLE No.	DEPTH (m)	DESCRIPTION	IS CLASSIFICATION	Grain size analysis				Attetberg Limits			Shrinkage limit (%)	DFS (%)	Specific gravity
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	LL	PL	PI			
ASH PIPE CORRIDOR	IBH-44	0.0-0.1	Light grey silty clayey with rock fragment	CH	11	24	37	28	58.3	26.8	31.5	9.8	54.6	2.70
ASH PIPE CORRIDOR	IBH-45	0.0-0.1	Light grey silty clayey with rock fragment	CI	11	24	36	29	47.2	24.9	22.3	10.4	45.6	2.68
ASH PIPE CORRIDOR	IBH-46	0.0-0.1	Light grey silty clayey with rock fragment	CH	9	26	47	18	57.3	26.5	30.8	9.2	54.1	2.71
ASH PIPE CORRIDOR	IBH-47	0.0-0.1	Light grey silty clayey with rock fragment	CH	10	20	45	25	61.5	27.1	34.4	9.5	53.2	2.70

LABORATORY TEST RESULTS ON SELECTED ROCK SAMPLES

Structure	Borehole Designation	Sample No.	Depth, m	Specific Gravity	Density (gm/cc)	Water Absorption (%)	Porosity	Point Load Index, kg/cm^2	Unconfined Compressive Strength, kg/cm^2
HCSS SILO	IBH-01	23	9.00-10.50	2.96	2.93	0.40	0.45	7.1	113.0
		28	10.50-13.50	3.04	2.94	0.36	0.43	9.7	119.9
H.C.S.D. PUMP HOUSE & MCC ROOM	IBH-03	67	13.50-15.00	3.10	2.96	0.45	0.43	7.9	105.8
AHP COMPRESSORS & BLOWERS	IBH-04	50	10.50-12.00	3.48	2.92	0.73	0.43	5.3	116.5
		77	13.50-15.00	3.38	2.92	0.57	0.42	4.7	73.6
CRUSHER HOUSE	IBH-07	48	9.00-10.50	2.94	2.92	0.55	0.90	7.3	82.7
WAGON TIPPLER	IBH-08	90	13.50-15.50	2.92	2.93	0.47	0.43	11.3	125.8
WAGON TIPPLER	IBH-09	81	12.50-13.50	2.88	2.93	0.41	0.64	8.4	98.6
		145	22.50-24.00	2.94	2.91	0.69	0.65	6.8	77.5
TRANSFER POINTS	IBH-10	129	18.00-20.00	2.89	2.95	0.47	0.82	10.8	119.1
PENT HOUSE	IBH-11	207	21.0-22.05	2.61	2.86	0.56	0.66	7.5	72.2
PIPE RACK	IBH-12	49	10.50-12.00	2.96	2.91	0.64	0.41	7.0	74.1

Structure	Borehole Designation	Sample No.	Depth, m	Specific Gravity	Density (gm/cc)	Water Absorption (%)	Porosity	Point Load Index, kg/cm^2	Unconfined Compressive Strength, kg/cm^2
STACKER RECLAIMER	IBH-14	36	6.00-7.50	2.99	2.90	0.22	0.22	8.9	111.6
TRANSFER POINTS	IBH-15	36	10.50-12.00	2.61	2.92	0.23	0.23	8.8	91.4
PENT HOUSE	IBH-18	83	9.0-10.5	3.01	2.95	0.43	0.44	9.7	93.9
PIPE RACK	IBH-20	22	10.5-12.0	2.91	2.91	0.46	0.45	7.3	90.5
PIPE RACK	IBH-21	22		2.90	2.91	0.47	0.66	3.0	117.0
PIPE RACK	IBH-22	57	12.0-13.50	2.96	2.98	0.09	0.20	3.7	84.0
PIPE RACK	IBH-22	67	15	2.96	2.94	0.16	0.20	7.6	96.7
PIPE RACK	IBH-25	30	4.50-6.00	3.19	2.90	0.29	0.43	6.5	73.3
		96	12.00-13.50	3.35	2.94	0.20	0.22	7.5	72.0
PIPE RACK	IBH-26	20	6.0-7.5	2.99	2.95	0.30	0.38	8.9	99.1
PIPE RACK	IBH-26	66	13.5-15.0	2.24	2.93	0.21	0.56	6.7	91.1
ASH PIPE CORRIDOR	IBH-34	22	10.5-12.00	2.92	2.94	0.28	0.46	6.7	82.7

Structure	Borehole Designation	Sample No.	Depth, m	Specific Gravity	Density (gm/cc)	Water Absorption (%)	Porosity	Point Load Index, kg/cm^2	Unconfined Compressive Strength, kg/cm^2
ASH PIPE CORRIDOR	IBH-38	17	4.50-6.00	2.85	2.93	0.62	0.66	-	127.2
ASH PIPE CORRIDOR	IBH-40	28	6.00-7.50	2.57	2.92	1.40	1.85	-	82.7
ASH PIPE CORRIDOR	IBH-43	7	3.00-4.50	2.89	2.90	0.47	0.69	-	134.0
ASH PIPE CORRIDOR	IBH-55	35	9.00-10.0	-	2.92	-	-	-	142.9
ASH PIPE CORRIDOR	IBH-56	4	3.00-4.00	-	2.93	-	-	-	118.3
ASH PIPE CORRIDOR	IBH-57	18	4.50-6.00	-	2.95	-	-	-	121.6
ASH PIPE CORRIDOR	IBH-60	9	4.50-6.00	-	2.90	-	-	7.6	76.2

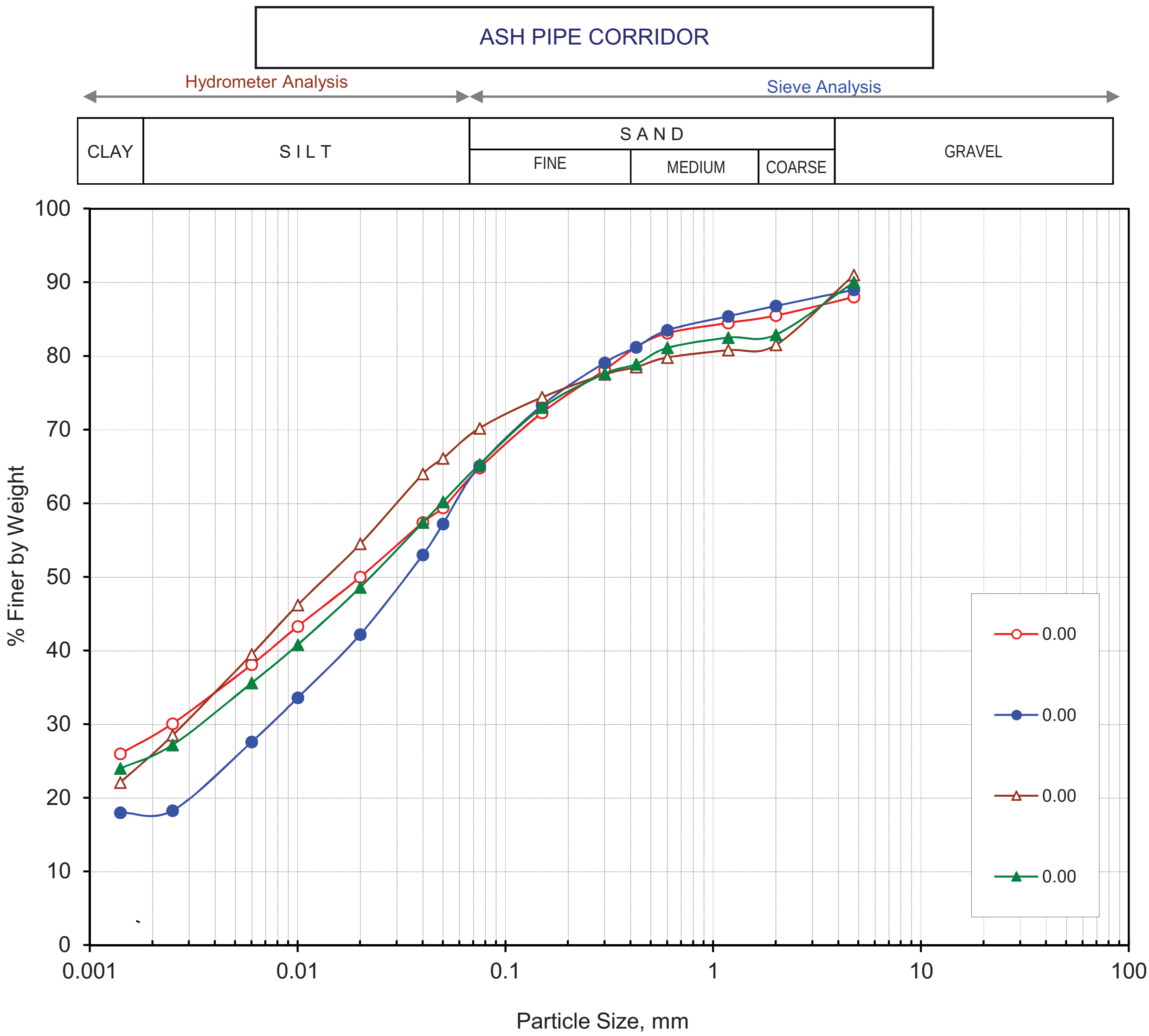
Structure	Borehole Designation	Sample No.	Depth, m	Specific Gravity	Density (gm/cc)	Water Absorption (%)	Porosity	Point Load Index, kg/cm^2	Unconfined Compressive Strength, kg/cm^2
ROB	BH-70	13	20.00	2.79	2.87	0.31	0.96	6.9	72.8
ROB	BH-71	28	20	2.74	2.92	0.29	0.63	7.7	75.1
ROB	BH-72	60	15	2.80	2.81	0.33	0.74	8.1	79.4
ROB	BH-73	45	15	2.63	2.83	0.21	0.78	7.9	80.1

GRAIN SIZE ANALYSIS

Grain Size Analysis

as per IS : 2720 (Part 4) - 1985

Sample Details			Test Results			
Borehole Number	Sample Depth, m	Sample Description	Gravel %	Sand %	Silt %	Clay %
IBH-33	0.00	Light grey silty clay with rock fragment (CH)	12	23	37	28
IBH-34	0.00	Light grey silty clay with rock fragment (CI)	11	24	47	18
IBH-35	0.00	Light grey silty clay with rock fragment (CH)	9	21	44	26
IBH-36	0.00	Light grey silty clay with rock fragment (CH)	10	25	39	26

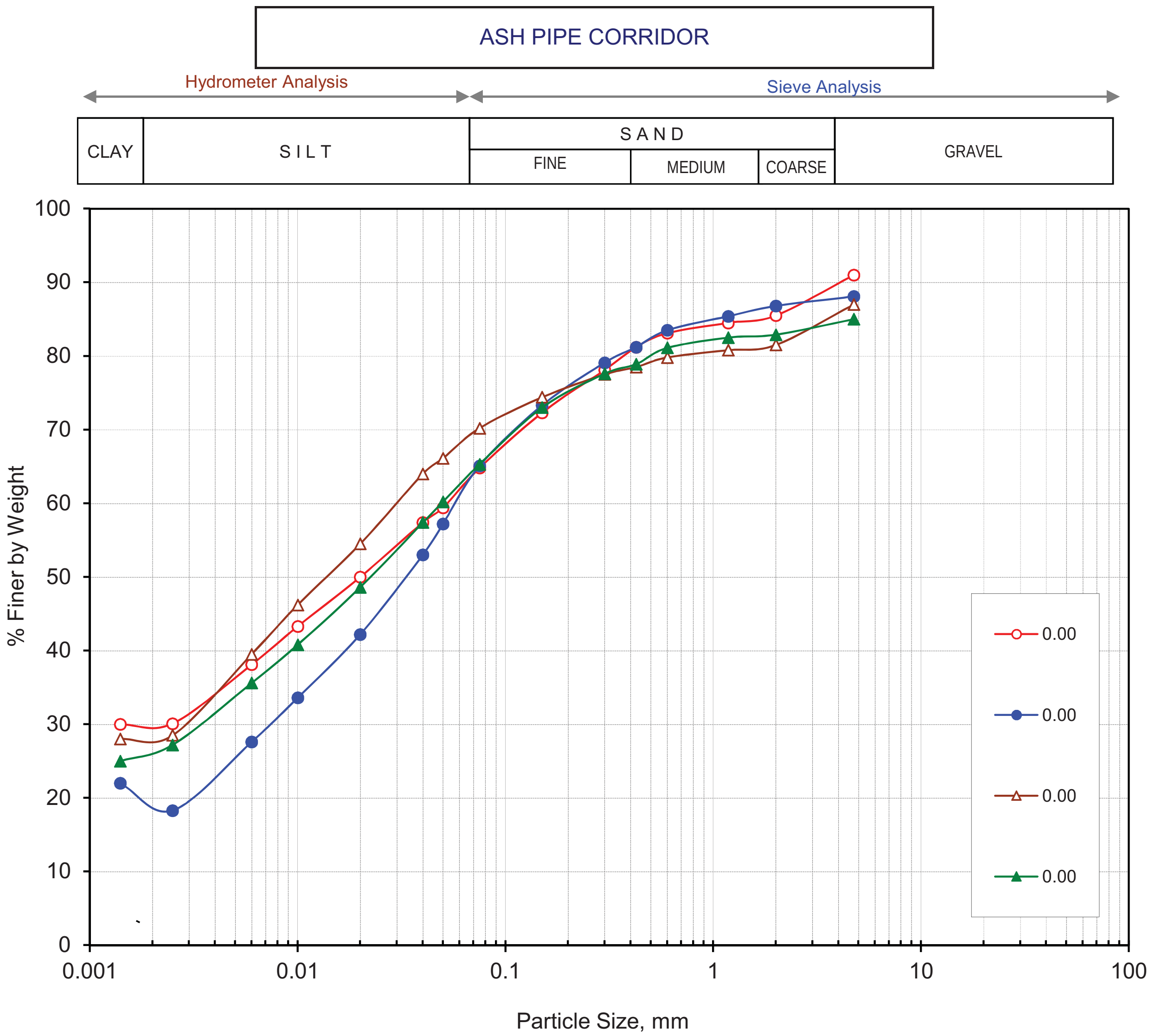


Grain Size Distribution Curve

Grain Size Analysis

as per IS : 2720 (Part 4) - 1985

Sample Details			Test Results			
Borehole Number	Sample Depth, m	Sample Description	Gravel %	Sand %	Silt %	Clay %
IBH-37	0.00	Light grey silty clay with rock fragment (CH)	9	26	35	30
IBH-38	0.00	Light grey silty clay with rock fragment (CI)	12	23	45	20
IBH-39	0.00	Light grey silty clay with rock fragment (CH)	13	17	42	28
IBH-40	0.00	Light grey silty clay with rock fragment (CH)	15	20	39	26



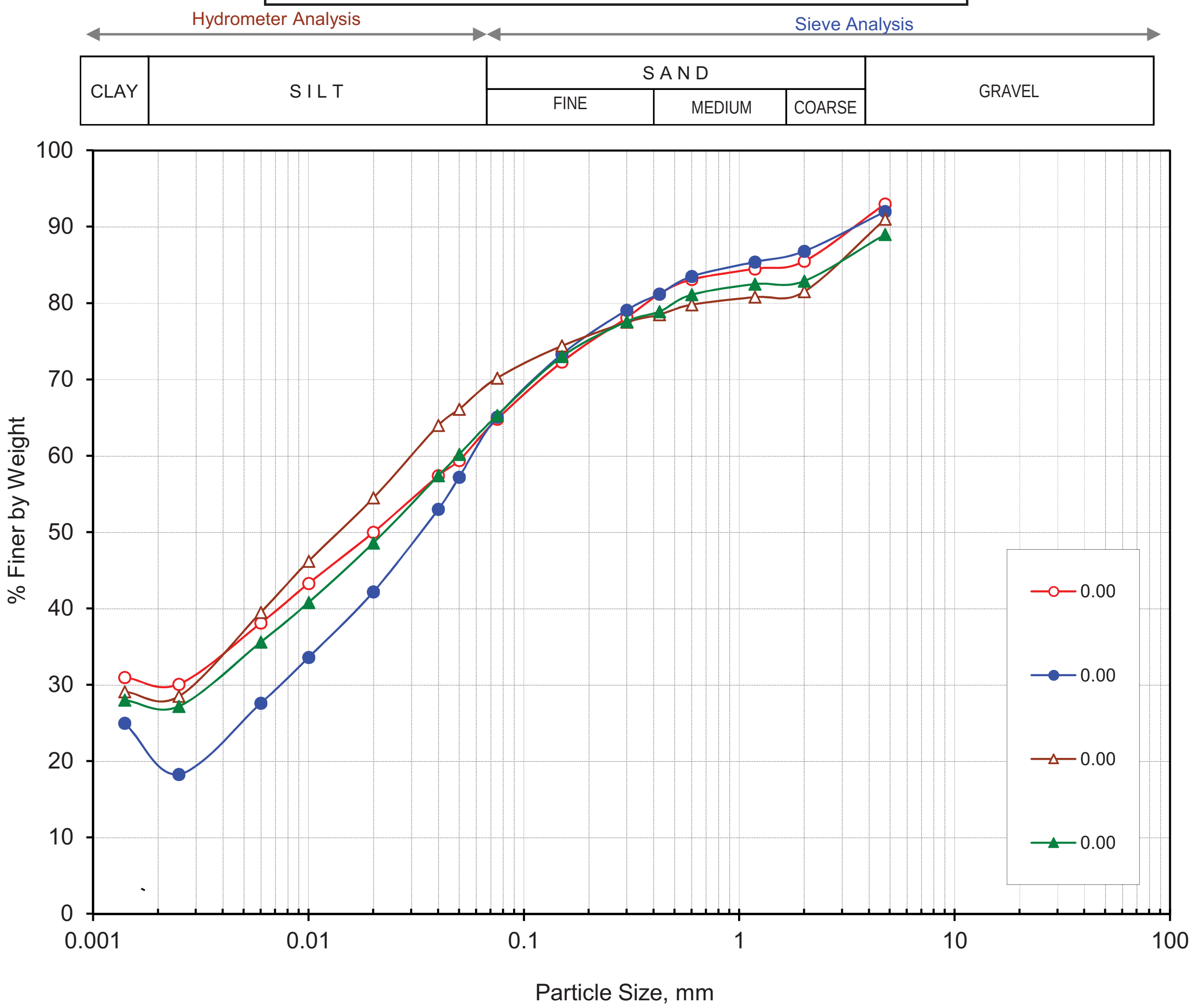
Grain Size Distribution Curve

Grain Size Analysis

as per IS : 2720 (Part 4) - 1985

Sample Details			Test Results			
Borehole Number	Sample Depth, m	Sample Description	Gravel %	Sand %	Silt %	Clay %
IBH-41	0.00	Light grey silty clay with rock fragment (CH)	7	28	34	31
IBH-42	0.00	Light grey silty clay with rock fragment (CI)	8	27	44	21
IBH-43	0.00	Light grey silty clay with rock fragment (CH)	9	21	41	29
IBH-44	0.00	Light grey silty clay with rock fragment (CH)	11	24	37	28

ASH PIPE CORRIDOR

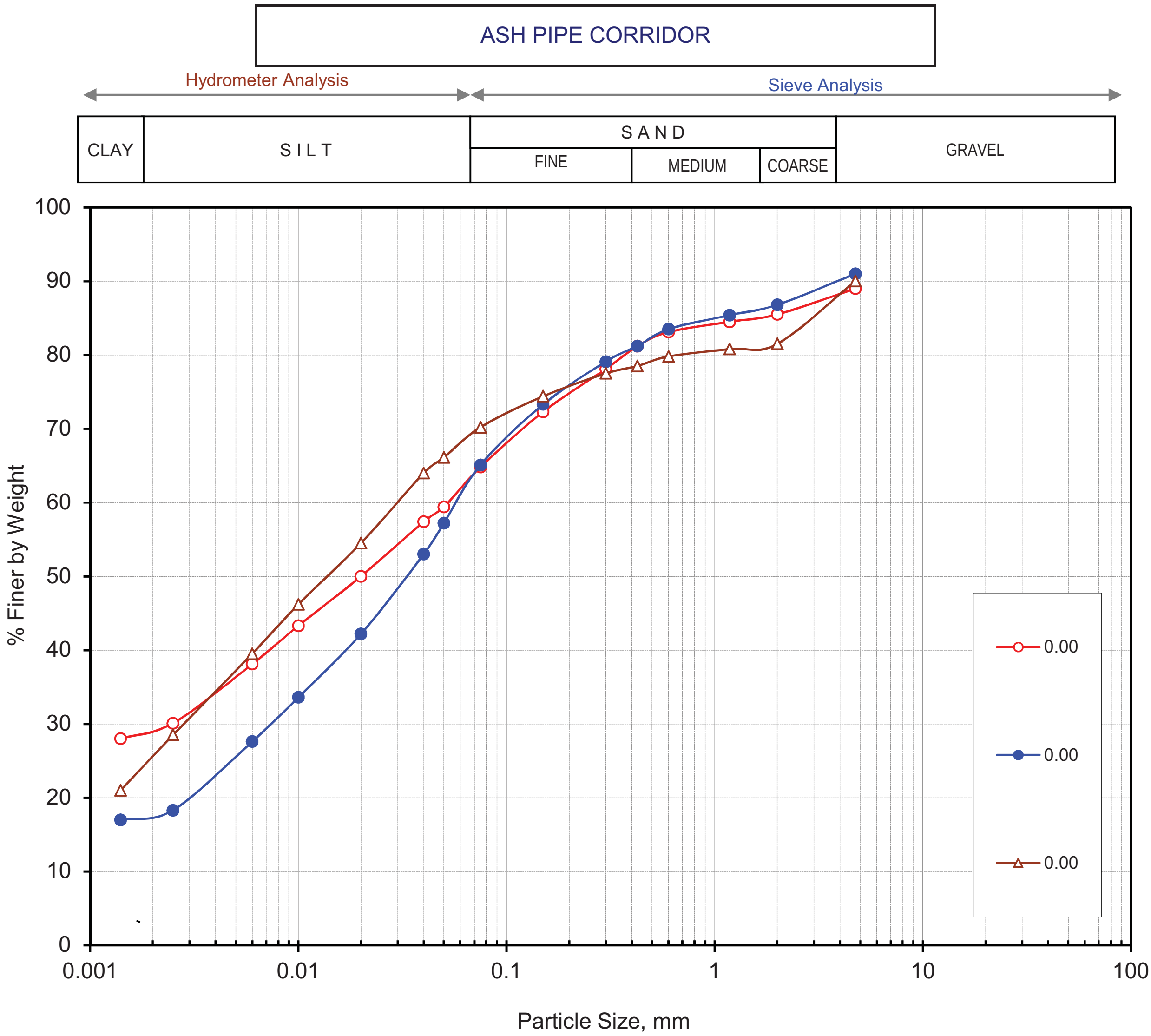


Grain Size Distribution Curve

Grain Size Analysis

as per IS : 2720 (Part 4) - 1985

Sample Details			Test Results			
Borehole Number	Sample Depth, m	Sample Description	Gravel %	Sand %	Silt %	Clay %
IBH-45	0.00	Light grey silty clay with rock fragment (CH)	11	24	36	29
IBH-46	0.00	Light grey silty clay with rock fragment (CI)	9	26	47	18
IBH-47	0.00	Light grey silty clay with rock fragment (CH)	10	20	45	25



Grain Size Distribution Curve

FIELD PERMEABILITY TEST CALCULATIONS

FIELD PERMEABILITY TEST of IBH 10

Elevation: 186.512m (FGL)
Coordinates: 938 N, 1504 E
Inclination: 90^0

Depth of Borehole, m: 20 m
Diameter of Borehole, mm: NX
Water Table below EGL, m: 5.30 m

Test Section: 1.50 m – 3.00 m
Length of Test Section: 1.50 m
Type of Test: Double Packer

H1, m: 0.50m
H2, m: 2.30m
Type of Strata: Weathered Basalt

S. No.	L m	H_1 m	H_2 m	P_o Kg/cm^2	P Kg/cm^2	T min	Q_1 lit	Q_o lit/min	Q Lit/min/m	Lugeon	Average Lugeon	K (K x 10^{-7}) m/sec
1	1.5	0.5	2.3	0.5	0.78	30	775	25.83	17.22	224.99	169.84	220.79
2	1.5	0.5	2.3	1.0	1.28	30	900	30.00	20.00	159.22		
3	1.5	0.5	2.3	1.5	1.78	30	985	32.83	21.89	125.31		

Sample Calculation

Q_o : Q_1 / t = 25.83 lit./min

P : $P_o + (H_1 + H_2)/10 =$ 0.78 Kg/cm^2

Q : Q_o / L = 17.22 lit./min/m

Lugeon = $\frac{Q \ * 1 \text{ MPa (or } 10.19 \text{ kg/cm}^2)}{\text{Test Pressure (P)}}$

Permeability = 220.79 x 10^{-7} m/s

= 224.99 lit./min/m

Test Section: 4.50 m – 6.00 m
Length of Test Section: 1.50 m
Type of Test: Double Packer

H1, m: 0.50m
H2, m: 5.30m
Type of Strata: Fractured Basalt

S. No.	L m	H_1 m	H_2 m	P_o Kg/cm^2	P Kg/cm^2	T min	Q_1 lit	Q_o lit/min	Q Lit/min/m	Lugeon	Average Lugeon	K (K x 10^{-7}) m/sec
1	1.5	0.5	5.3	0.5	1.08	30	995	33.17	22.11	208.62	314.63	409.02
2	1.5	0.5	5.3	1.0	1.58	30	1110	111.00	74.00	477.25		
3	1.5	0.5	5.3	1.5	2.08	30	1185	79.00	52.67	258.02		

Sample Calculation

Q_o : Q_1 /t = 33.17 lit./min

P : $P_o + (H_1 + H_2)/10 =$ 1.08 Kg/cm^2

Q : Q_o/L = 22.11 lit./min/m

Lugeon = $\frac{Q \ * 1 \text{ MPa (or } 10.19 \text{ kg/cm}^2)}{\text{Test Pressure (P)}}$

Permeability = 409.02 x 10^{-7} m/s

= 208.62 lit./min/m

FIELD PERMEABILITY TEST of IBH 11

Elevation: 182.772m (FGL)
Coordinates: 817 N, 1600 E
Inclination: 90^0

Depth of Borehole, m: 25 m
Diameter of Borehole, mm: NX
Water Table below EGL, m: 7.80 m

Test Section: 1.50 m – 3.00 m
Length of Test Section: 1.50 m
Type of Test: Double Packer

H1, m: 0.50m
H2, m: 2.30m
Type of Strata: Weathered Basalt

S. No.	L m	H_1 m	H_2 m	P_o Kg/cm^2	P Kg/cm^2	T min	Q_1 lit	Q_o lit/min	Q Lit/min/m	Lugeon	Average Lugeon	K (K x 10^{-7}) m/sec
1	1.5	0.5	2.3	0.5	0.78	30	905	30.17	20.11	262.73	182.67	237.47
2	1.5	0.5	2.3	1.0	1.28	30	915	30.50	20.33	161.87		
3	1.5	0.5	2.3	1.5	1.78	30	970	32.33	21.56	123.40		

Sample Calculation

Q_o : Q_1 / t = 30.17 lit./min

P : $P_o + (H_1 + H_2)/10 =$ 0.78 Kg/cm^2

Q : Q_o / L = 20.11 lit./min/m

Lugeon = $\frac{Q \ * 1 \text{ MPa (or } 10.19 \text{ kg/cm}^2)}{\text{Test Pressure (P)}}$

= 262.73 lit./min/m

Permeability = 237.47 x 10^{-7} m/s

Test Section: 4.50 m – 6.00 m
Length of Test Section: 1.50 m
Type of Test: Double Packer

H1, m: 0.50m
H2, m: 5.30m
Type of Strata: Fractured Basalt

S. No.	L m	H_1 m	H_2 m	P_o Kg/cm^2	P Kg/cm^2	T min	Q_1 lit	Q_o lit/min	Q Lit/min/m	Lugeon	Average Lugeon	K (K x 10^{-7}) m/sec
1	1.5	0.5	5.3	0.5	1.08	30	985	32.83	21.89	206.53	312.51	406.26
2	1.5	0.5	5.3	1.0	1.58	30	1095	109.50	73.00	470.80		
3	1.5	0.5	5.3	1.5	2.08	30	1195	79.67	53.11	260.19		

Sample Calculation

Q_o : Q_1 /t = 32.83 lit./min

P : $P_o + (H_1 + H_2)/10 =$ 1.08 Kg/cm^2

Q : Q_o/L = 21.89 lit./min/m

Lugeon = $\frac{Q \ * 1 \text{ MPa (or } 10.19 \text{ kg/cm}^2)}{\text{Test Pressure (P)}}$

= 206.53 lit./min/m

Permeability = 406.26 x 10^{-7} m/s

FIELD PERMEABILITY TEST of IBH 12

Elevation: 195.282m (FGL)
Coordinates: 658 N, 1742 E
Inclination: 90^0

Depth of Borehole, m: 15 m
Diameter of Borehole, mm: NX
Water Table below EGL, m: 10.20 m

Test Section: 1.50 m – 3.00 m
Length of Test Section: 1.50 m
Type of Test: Double Packer

H1, m: 0.50m
H2, m: 2.30m
Type of Strata: Weathered Basalt

S. No.	L m	H_1 m	H_2 m	P_o Kg/cm^2	P Kg/cm^2	T min	Q_1 lit	Q_o lit/min	Q Lit/min/m	Lugeon	Average Lugeon	K (K x 10^{-7}) m/sec
1	1.5	0.5	2.3	0.5	0.78	30	470	15.67	10.44	136.45	99.87	129.82
2	1.5	0.5	2.3	1.0	1.28	30	549	18.30	12.20	97.12		
3	1.5	0.5	2.3	1.5	1.78	30	519	17.30	11.53	66.03		

Sample Calculation

Q_o : Q_1 / t = 15.67 lit./min

P : $P_o + (H_1 + H_2)/10$ = 0.78 Kg/cm^2

Q : Q_o / L = 10.44 lit./min/m

Lugeon = $\frac{Q * 1 \text{ MPa (or } 10.19 \text{ kg/cm}^2)}{\text{Test Pressure (P)}}$

Permeability = 129.82 x 10^{-7} m/s

= 136.45 lit./min/m

Test Section: 4.50 m – 6.00 m
Length of Test Section: 1.50 m
Type of Test: Double Packer

H1, m: 0.50m
H2, m: 5.30m
Type of Strata: Fractured Basalt

S. No.	L m	H_1 m	H_2 m	P_o Kg/cm^2	P Kg/cm^2	T min	Q_1 lit	Q_o lit/min	Q Lit/min/m	Lugeon	Average Lugeon	K (K x 10^{-7}) m/sec
1	1.5	0.5	5.3	0.5	1.08	30	553	18.43	12.29	115.95	195.61	254.29
2	1.5	0.5	5.3	1.0	1.58	30	685	68.50	45.67	294.52		
3	1.5	0.5	5.3	1.5	2.08	30	810	54.00	36.00	176.37		

Sample Calculation

Q_o : Q_1 /t = 18.43 lit./min

P : $P_o + (H_1 + H_2)/10$ = 1.08 Kg/cm^2

Q : Q_o/L = 12.29 lit./min/m

Lugeon = $\frac{Q * 1 \text{ MPa (or } 10.19 \text{ kg/cm}^2)}{\text{Test Pressure (P)}}$

Permeability = 254.29 x 10^{-7} m/s

= 115.95 lit./min/m

FIELD PERMEABILITY TEST of IBH 29

Elevation: 192.645m (FGL)
Coordinates: 928 N, 1194 E
Inclination: 90^0

Depth of Borehole, m: 15 m
Diameter of Borehole, mm: NX
Water Table below EGL, m: 3.50 m

Test Section: 1.50 m – 3.00 m
Length of Test Section: 1.50 m
Type of Test: Double Packer

H1, m: 0.50m
H2, m: 2.30m
Type of Strata: Weathered Basalt

S. No.	L m	H_1 m	H_2 m	P_o Kg/cm^2	P Kg/cm^2	T min	Q_1 lit	Q_o lit/min	Q Lit/min/m	Lugeon	Average Lugeon	K (K x 10^{-7}) m/sec
1	1.5	0.5	2.3	0.5	0.78	30	465	15.50	10.33	135.00	102.50	133.25
2	1.5	0.5	2.3	1.0	1.28	30	540	18.00	12.00	95.53		
3	1.5	0.5	2.3	1.5	1.78	30	605	20.17	13.44	76.97		

Sample Calculation

Q_o : Q_1 / t = 15.50 lit./min

P : $P_o + (H_1 + H_2)/10 =$ 0.78 Kg/cm^2

Q : Q_o / L = 10.33 lit./min/m

Lugeon = $\frac{Q \ * 1 \text{ MPa (or } 10.19 \text{ kg/cm}^2)}{\text{Test Pressure (P)}}$

Permeability = 133.25 x 10^{-7} m/s

= 135.00 lit./min/m

Test Section: 4.50 m – 6.00 m
Length of Test Section: 1.50 m
Type of Test: Double Packer

H1, m: 0.50m
H2, m: 3.50m
Type of Strata: Fractured Basalt

S. No.	L m	H_1 m	H_2 m	P_o Kg/cm^2	P Kg/cm^2	T min	Q_1 lit	Q_o lit/min	Q Lit/min/m	Lugeon	Average Lugeon	K (K x 10^{-7}) m/sec
1	1.5	0.5	3.5	0.5	0.9	30	620	20.67	13.78	156.00	250.49	325.64
2	1.5	0.5	3.5	1.0	1.4	30	790	79.00	52.67	383.34		
3	1.5	0.5	3.5	1.5	1.9	30	890	59.33	39.56	212.14		

Sample Calculation

Q_o : Q_1 /t = 20.67 lit./min

P : $P_o + (H_1 + H_2)/10 =$ 0.90 Kg/cm^2

Q : Q_o/L = 13.78 lit./min/m

Lugeon = $\frac{Q \ * 1 \text{ MPa (or } 10.19 \text{ kg/cm}^2)}{\text{Test Pressure (P)}}$

Permeability = 325.64 x 10^{-7} m/s

= 156.00 lit./min/m

FIELD PERMEABILITY TEST of IBH 32

Elevation: 191.585m (FGL)
Coordinates: 785 N, 1349 E
Inclination: 90^0

Depth of Borehole, m: 15 m
Diameter of Borehole, mm: NX
Water Table below EGL, m: 5.50 m

Test Section: 1.50 m – 3.00 m
Length of Test Section: 1.50 m
Type of Test: Double Packer

H1, m: 0.50m
H2, m: 2.30m
Type of Strata: Weathered Basalt

S. No.	L m	H_1 m	H_2 m	P_o Kg/cm²	P Kg/cm²	T min	Q_1 lit	Q_o lit/min	Q Lit/min/m	Lugeon	Average Lugeon	K (K x 10^{-7}) m/sec
1	1.5	0.5	2.3	0.5	0.78	30	305	10.17	6.78	88.55	77.36	100.56
2	1.5	0.5	2.3	1.0	1.28	30	405	13.50	9.00	71.65		
3	1.5	0.5	2.3	1.5	1.78	30	565	18.83	12.56	71.88		

Sample Calculation

Q_o : Q_1 / t = 10.17 lit./min

P : $P_o + (H_1 + H_2)/10 =$ 0.78 Kg/cm²

Q : Q_o / L = 6.78 lit./min/m

Lugeon = Q * 1 MPa (or 10.19 kg/cm²) / Test Pressure (P)

= 88.55 lit./min/m

Permeability = 100.56 x 10^{-7} m/s

Test Section: 4.50 m – 6.00 m
Length of Test Section: 1.50 m
Type of Test: Double Packer

H1, m: 0.50m
H2, m: 5.50m
Type of Strata: Fractured Basalt

S. No.	L m	H_1 m	H_2 m	P_o Kg/cm²	P Kg/cm²	T min	Q_1 lit	Q_o lit/min	Q Lit/min/m	Lugeon	Average Lugeon	K (K x 10^{-7}) m/sec
1	1.5	0.5	5.5	0.5	1.1	30	800	26.67	17.78	164.69	255.60	332.27
2	1.5	0.5	5.5	1.0	1.6	30	900	90.00	60.00	382.13		
3	1.5	0.5	5.5	1.5	2.1	30	1020	68.00	45.33	219.97		

Sample Calculation

Q_o : Q_1 /t = 26.67 lit./min

P : $P_o + (H_1 + H_2)/10 =$ 1.10 Kg/cm²

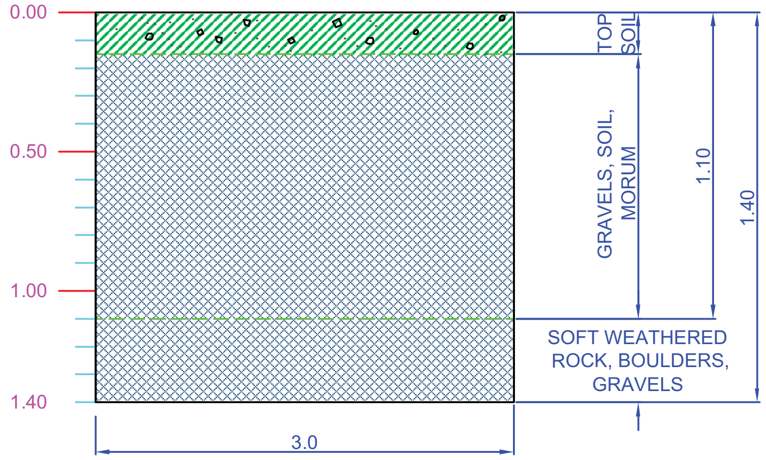
Q : Q_o/L = 17.78 lit./min/m

Lugeon = Q * 1 MPa (or 10.19 kg/cm²) / Test Pressure (P)

= 164.69 lit./min/m

Permeability = 332.27 x 10^{-7} m/s

TRIAL PIT SECTIONS

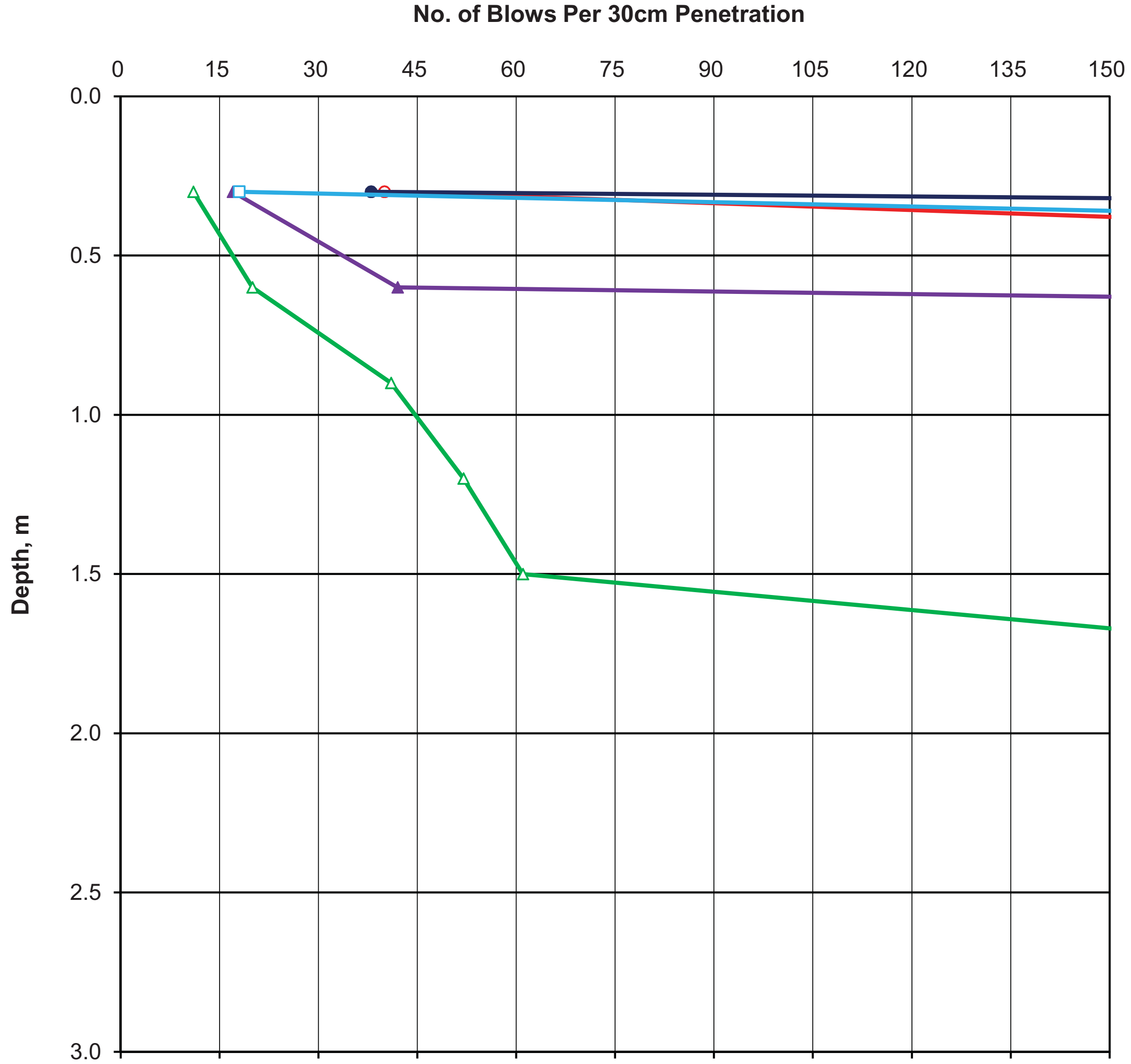


SUB SURFACE LOG OF I.T.P.-1

DYNAMIC CONE PENETRATION TEST RESULTS

DYNAMIC CONE PENETRATION TESTS

IS: 4968-Part-2-1976, RA-2007

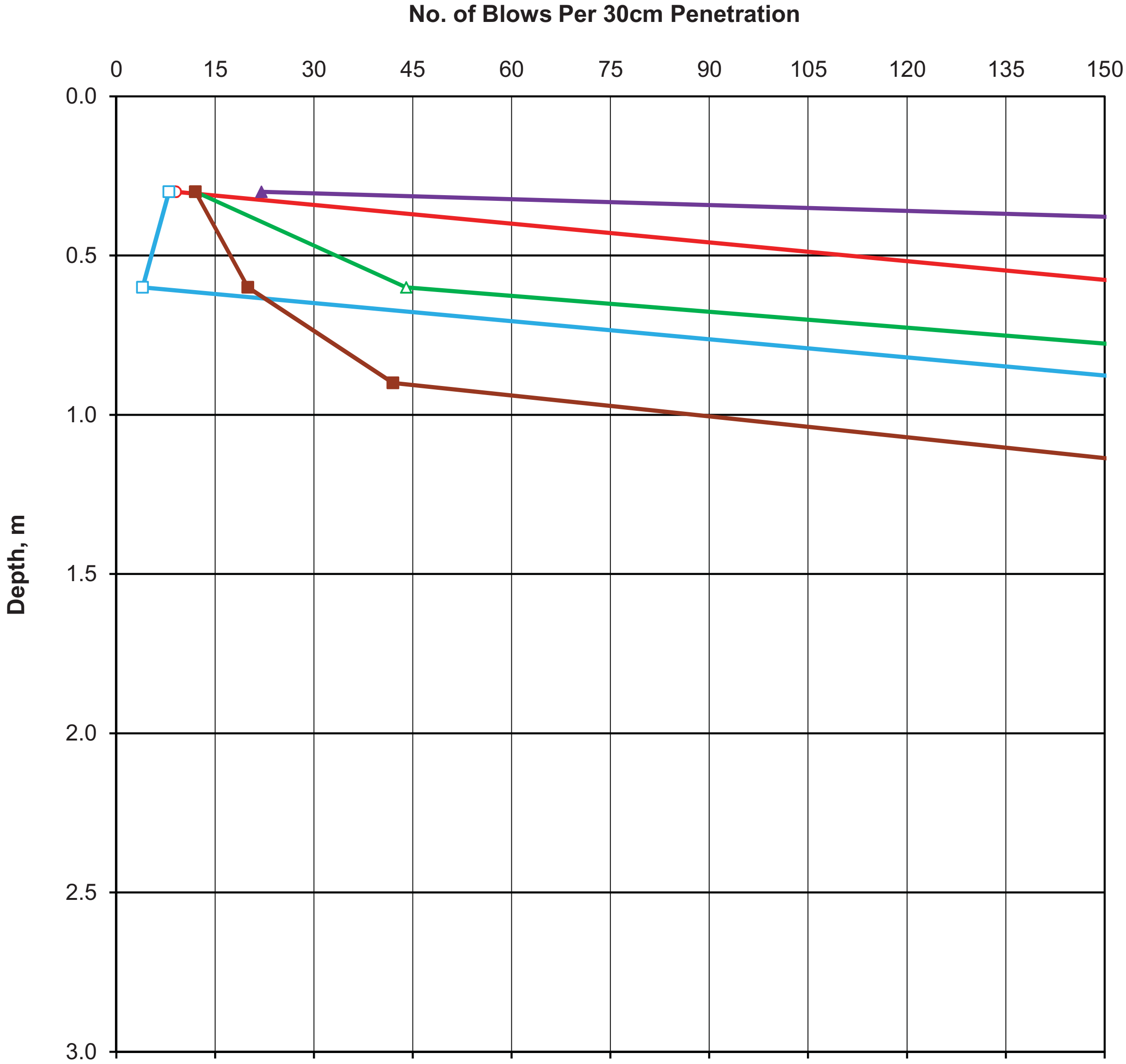


TESTS DETAILS	
Symbol	**DCPT Number**
red line, open circle	IDCPT-1
navy line, filled circle	IDCPT-2
green line, open triangle	IDCPT-3
purple line, filled triangle	IDCPT-4
light blue line, open square	IDCPT-5

DEPTH vs. BLOWS

DYNAMIC CONE PENETRATION TESTS

IS: 4968-Part-2-1976, RA-2007



TESTS DETAILS	
Symbol	**DCPT Number**
	IDCPT-6
	IDCPT-7
	IDCPT-8
	IDCPT-9
	IDCPT-10
	IDCPT-11

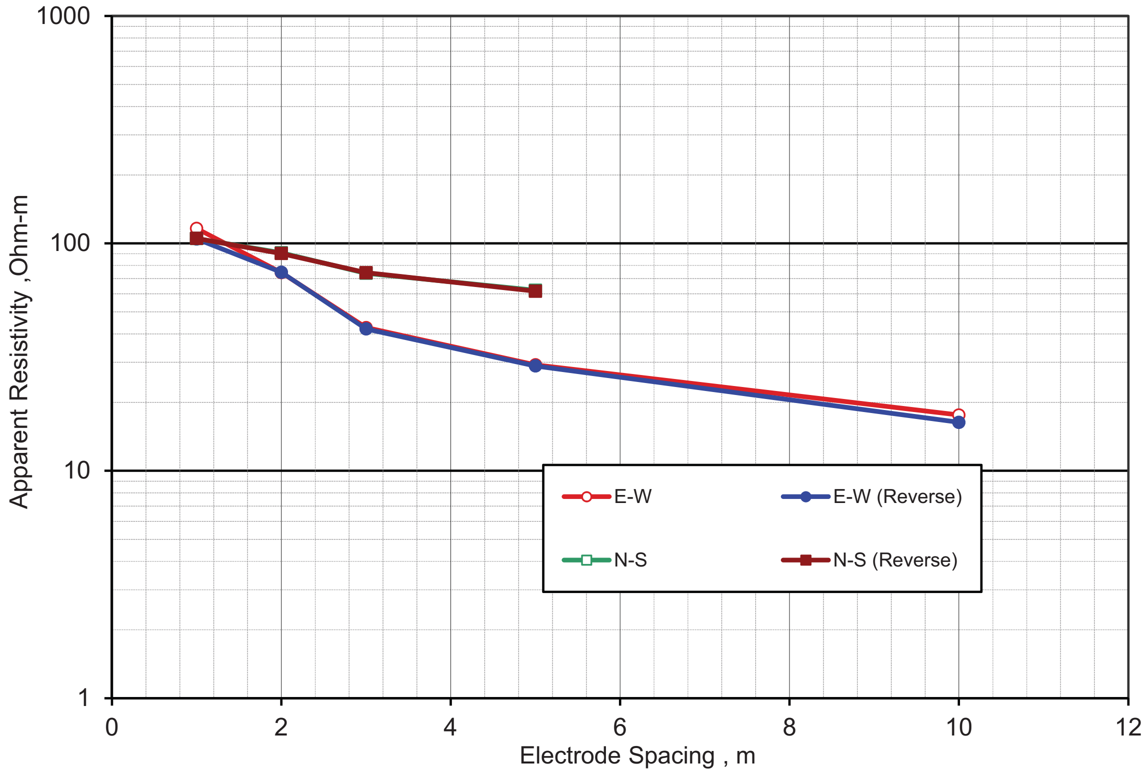
DEPTH vs. BLOWS

ELECTRICAL RESISTIVITY TEST RESULS

Electrical Resistivity Test No.: IERT-1

IS: 3043-1987, RA-2006

Test Details
Test Designation : IERT-1
Co-ordinate : 2328057N, 589311E



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
1.0	116.2	104.6	104.9	105.1
2.0	74.4	74.6	90.9	90.2
3.0	42.6	42.0	73.9	74.3
5.0	29.2	28.9	62.2	61.6
10.0	17.6	16.3	*Space Not Available*	
Mean Resistivity	56.0	53.3	83.0	82.8

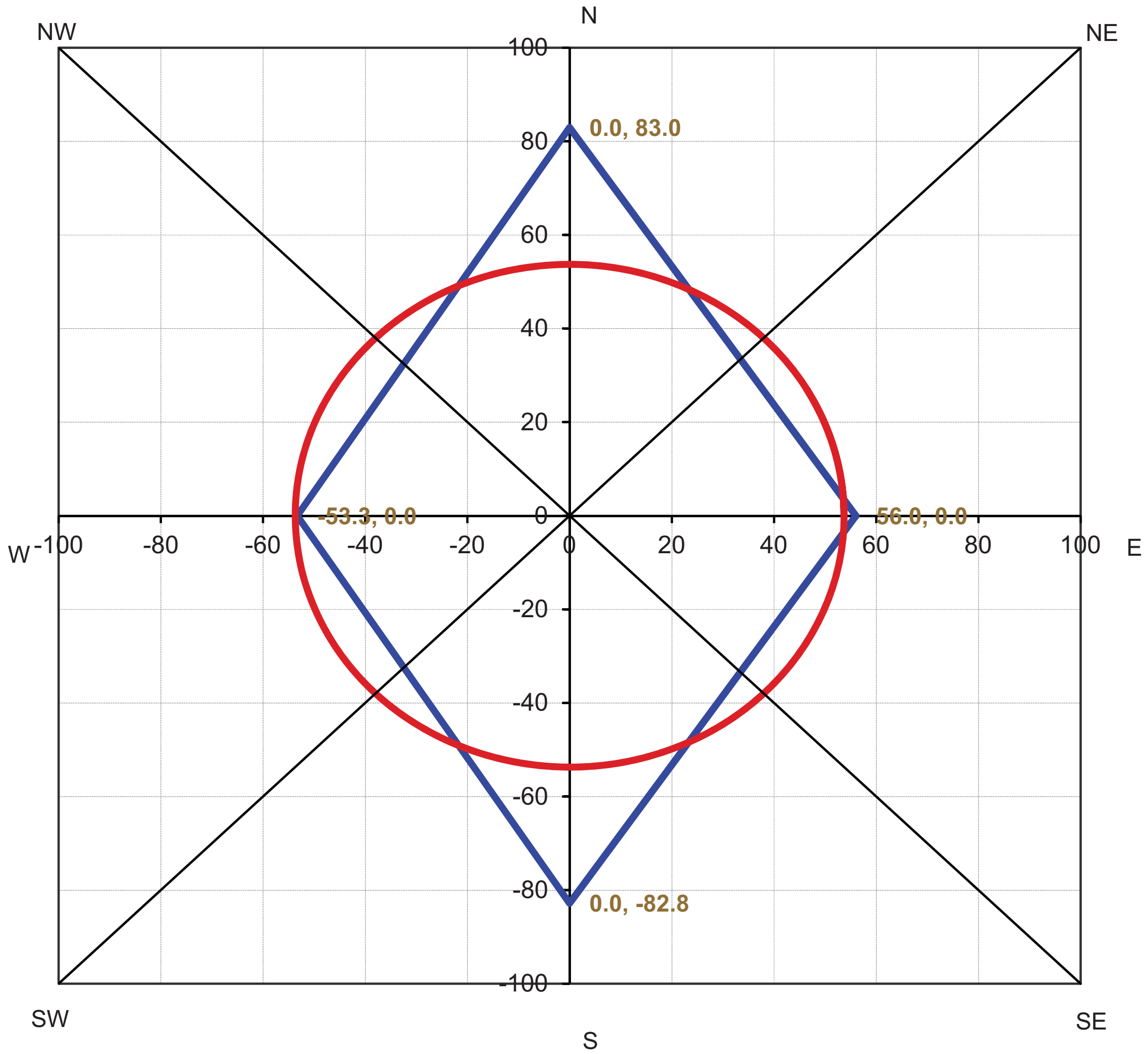
Mean Resistivity Value, ohm-m : 53.7 ohm-m

Apparent Resistivity Values (IERT-1)

Electrical Resistivity Test No.: IERT-1

IS: 3043-1987, RA-2006

Test Details
Test Designation : IERT-1
Co-ordinate : 2328057N, 589311E



Total Area of Polygon : 9059

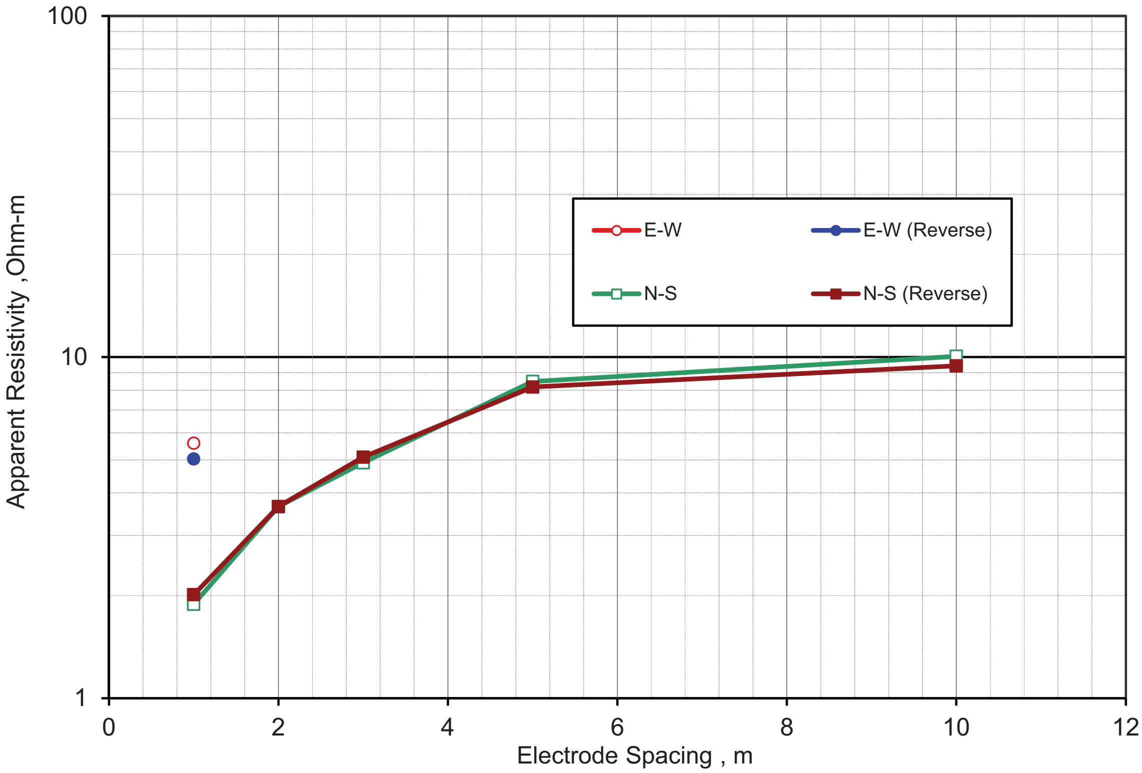
Radius of Equivalent Circle=Mean Resistivity : 53.7 ohm-m

Polar Resistivity Curves (IERT-1)

Electrical Resistivity Test No.: IERT-2

IS: 3043-1987, RA-2006

Test Details
Test Designation : IERT-2
Co-ordinate : 2327839N, 588810E



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
1.0	5.6	5.0	1.9	2.0
2.0	Space Not Available		3.6	3.6
3.0			4.9	5.1
5.0			8.5	8.2
10.0			10.1	9.4
Mean Resistivity	5.6	5.0	5.8	5.7

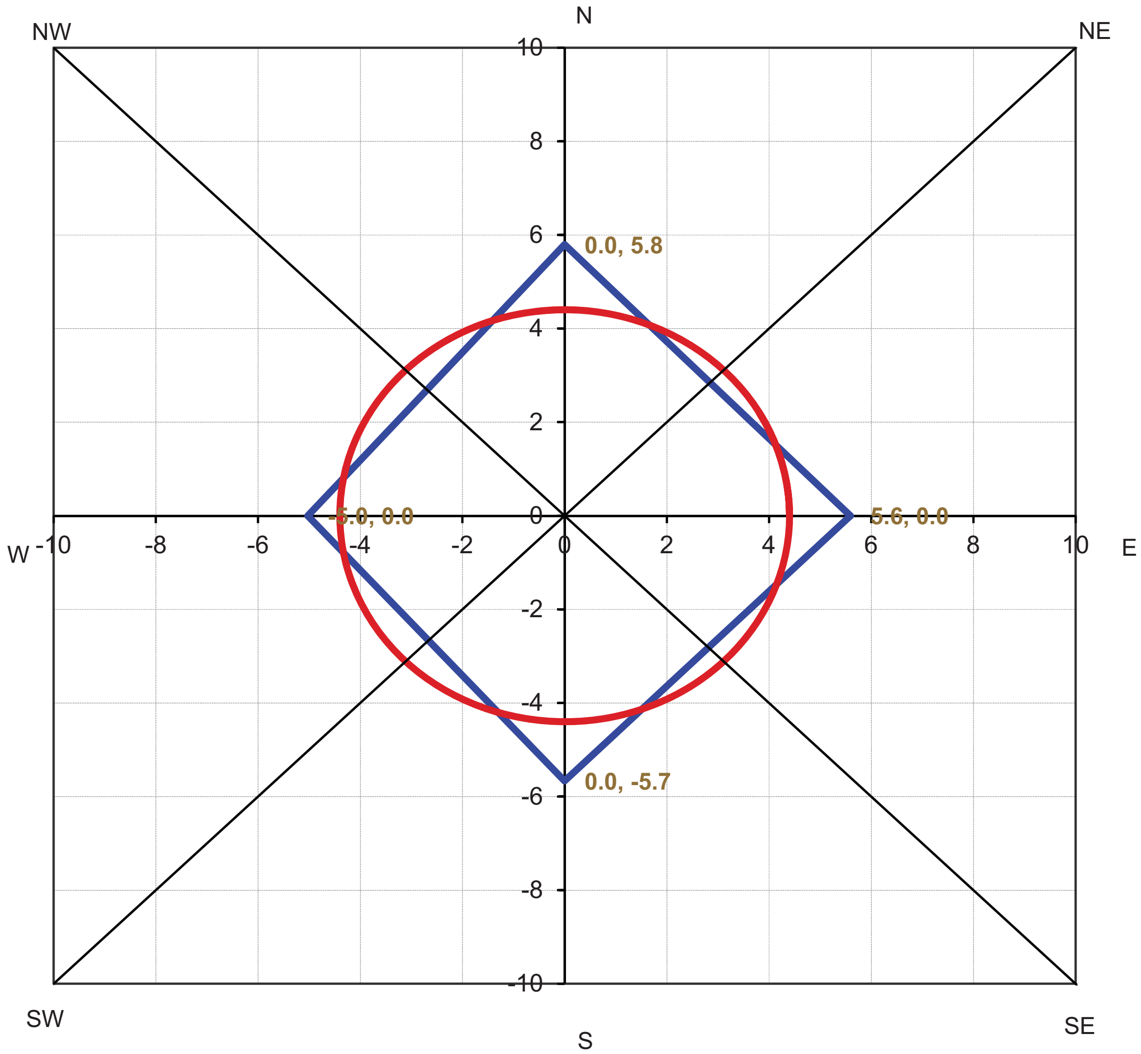
Mean Resistivity Value, ohm-m : 4.4 ohm-m

Apparent Resistivity Values (IERT-2)

Electrical Resistivity Test No.: IERT-2

IS: 3043-1987, RA-2006

Test Details	
Test Designation :	IERT-2
Co-ordinate :	2327839N, 588810E



Total Area of Polygon : 61

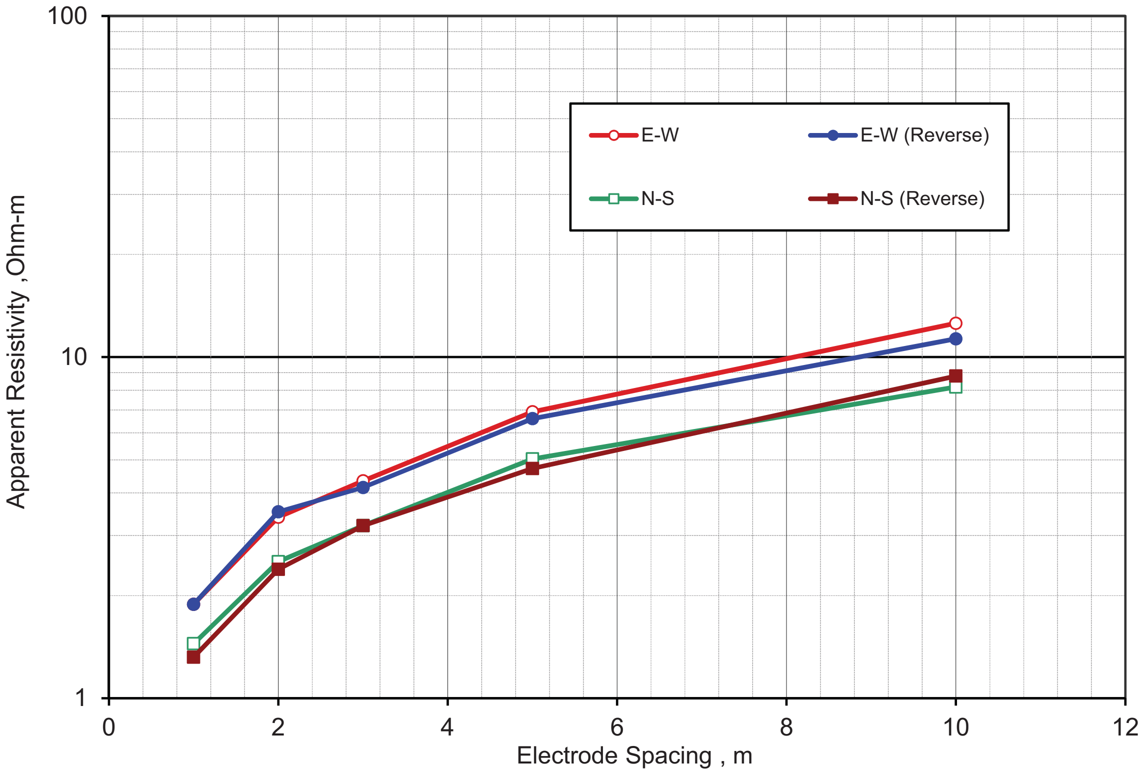
Radius of Equivalent Circle=Mean Resistivity : 4.4 ohm-m

Polar Resistivity Curves (IERT-2)

Electrical Resistivity Test No.: IERT-3

IS: 3043-1987, RA-2006

Test Details
Test Designation : IERT-3
Co-ordinate : 2327584N, 589569E



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
1.0	1.9	1.9	1.4	1.3
2.0	3.4	3.5	2.5	2.4
3.0	4.3	4.1	3.2	3.2
5.0	6.9	6.6	5.0	4.7
10.0	12.6	11.3	8.2	8.8
Mean Resistivity	5.8	5.5	4.1	4.1

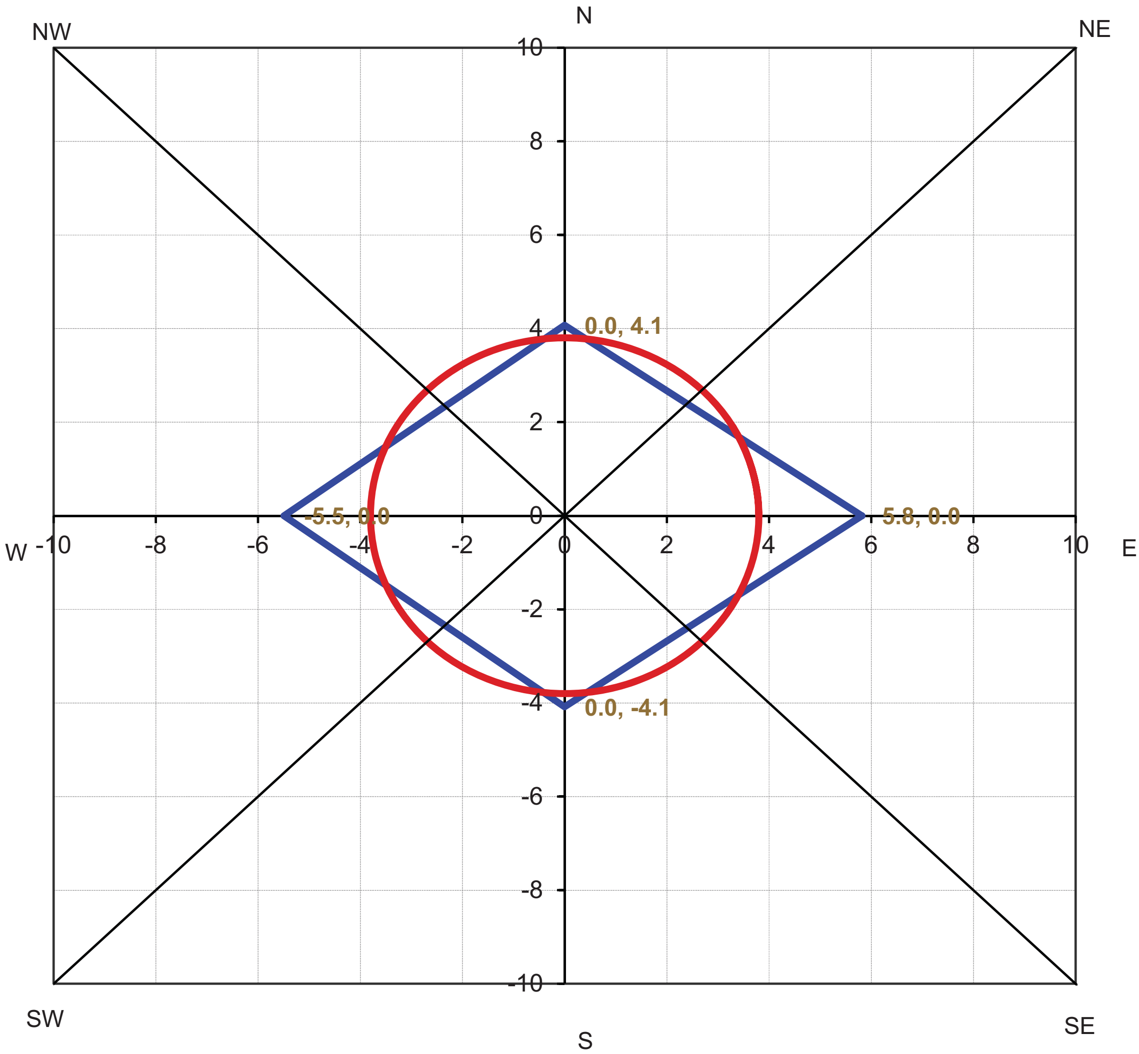
Mean Resistivity Value, ohm-m : 3.8 ohm-m

Apparent Resistivity Values (IERT-3)

Electrical Resistivity Test No.: IERT-3

IS: 3043-1987, RA-2006

Test Details
Test Designation : IERT-3
Co-ordinate : 2327584N, 589569E



Total Area of Polygon : 46

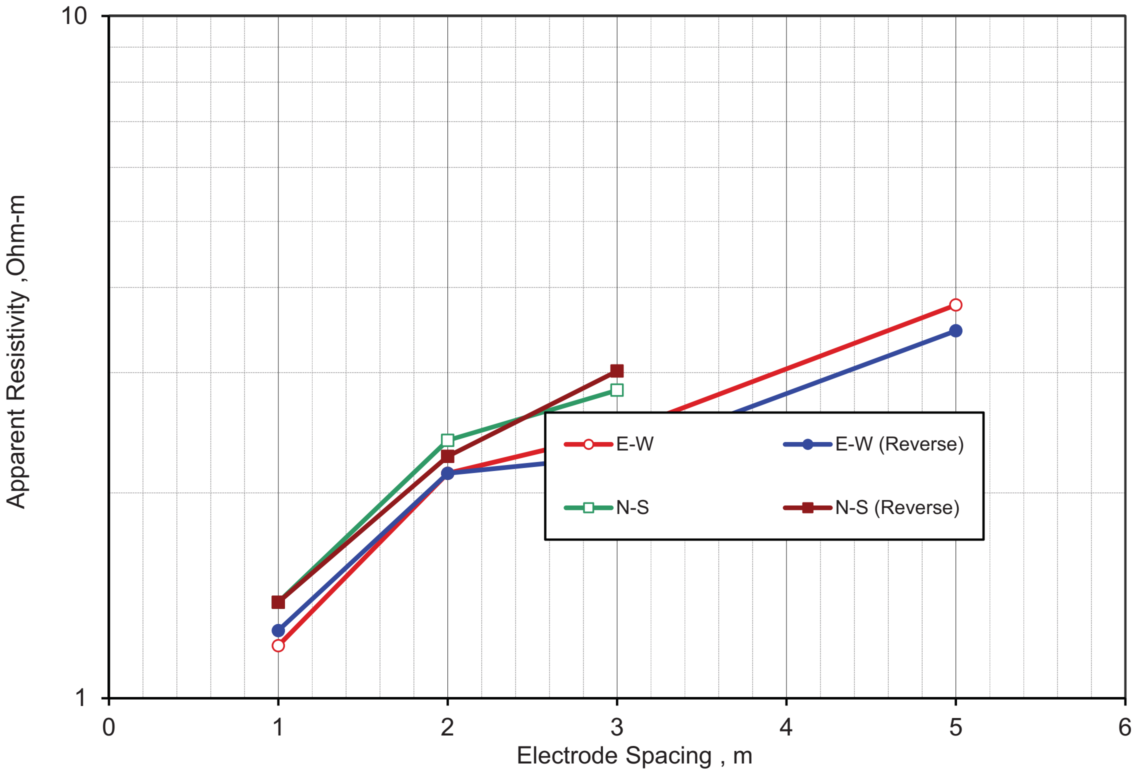
Radius of Equivalent Circle=Mean Resistivity : 3.8 ohm-m

Polar Resistivity Curves (IERT-3)

Electrical Resistivity Test No.: IERT-4

IS: 3043-1987, RA-2006

Test Details
Test Designation : IERT-4
Co-ordinate : 2327601N, 589593E



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
1.0	1.2	1.3	1.4	1.4
2.0	2.1	2.1	2.4	2.3
3.0	2.5	2.3	2.8	3.0
5.0	3.8	3.5		
10.0	***Sapce Not Available***			
Mean Resistivity	2.4	2.3	2.2	2.2

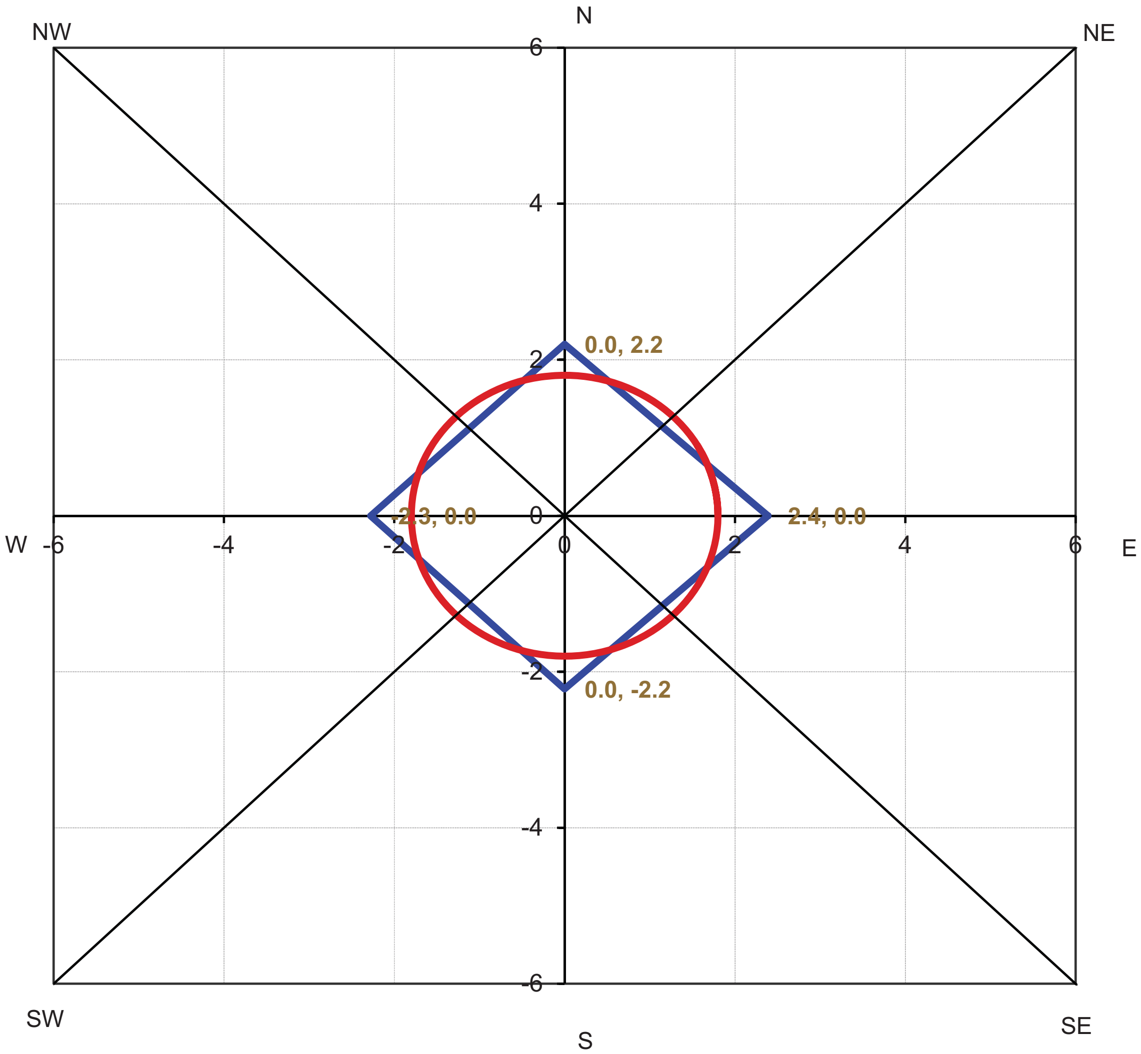
Mean Resistivity Value, ohm-m : 1.8 ohm-m

Apparent Resistivity Values (IERT-4)

Electrical Resistivity Test No.: IERT-4

IS: 3043-1987, RA-2006

Test Details
Test Designation : IERT-4
Co-ordinate : 2327601N, 589593E



Total Area of Polygon : 10

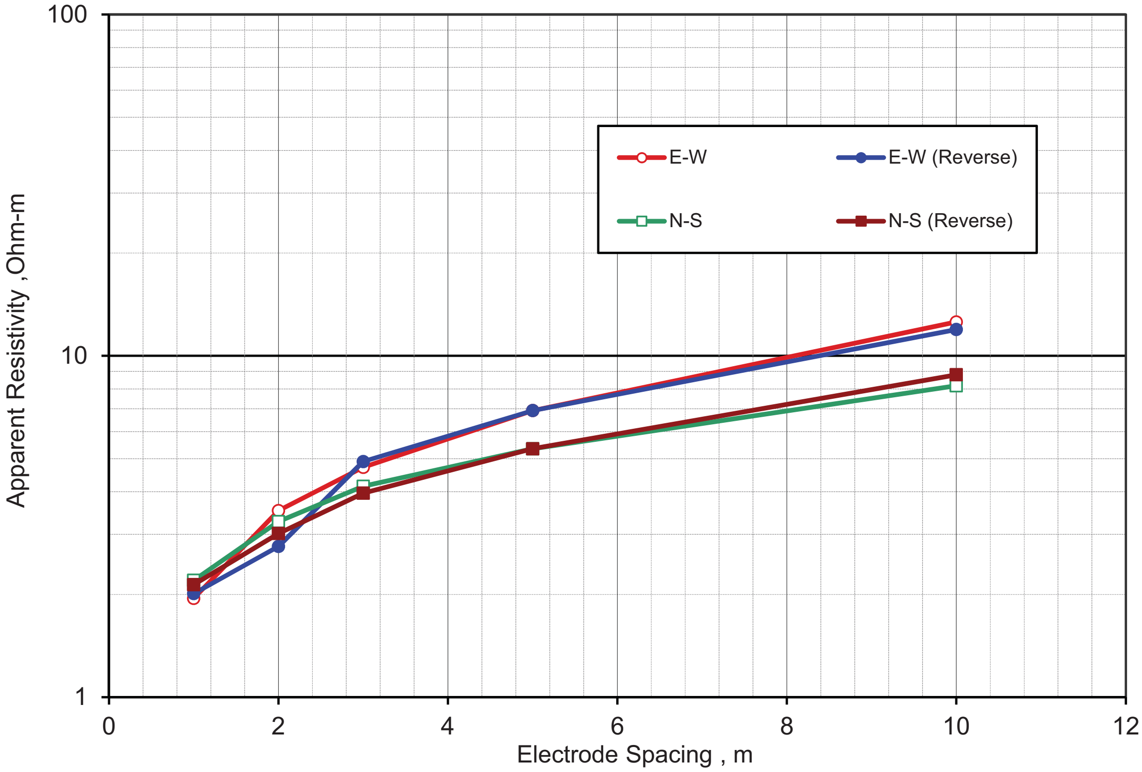
Radius of Equivalent Circle=Mean Resistivity : 1.8 ohm-m

Polar Resistivity Curves (IERT-4)

Electrical Resistivity Test No.: IERT-5

IS: 3043-1987, RA-2006

Test Details
Test Designation : IERT-5
Co-ordinate : 2327912N, 589251E



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
1.0	1.9	2.0	2.2	2.1
2.0	3.5	2.8	3.3	3.0
3.0	4.7	4.9	4.1	4.0
5.0	6.9	6.9	5.3	5.3
10.0	12.6	11.9	8.2	8.8
Mean Resistivity	5.9	5.7	4.6	4.6

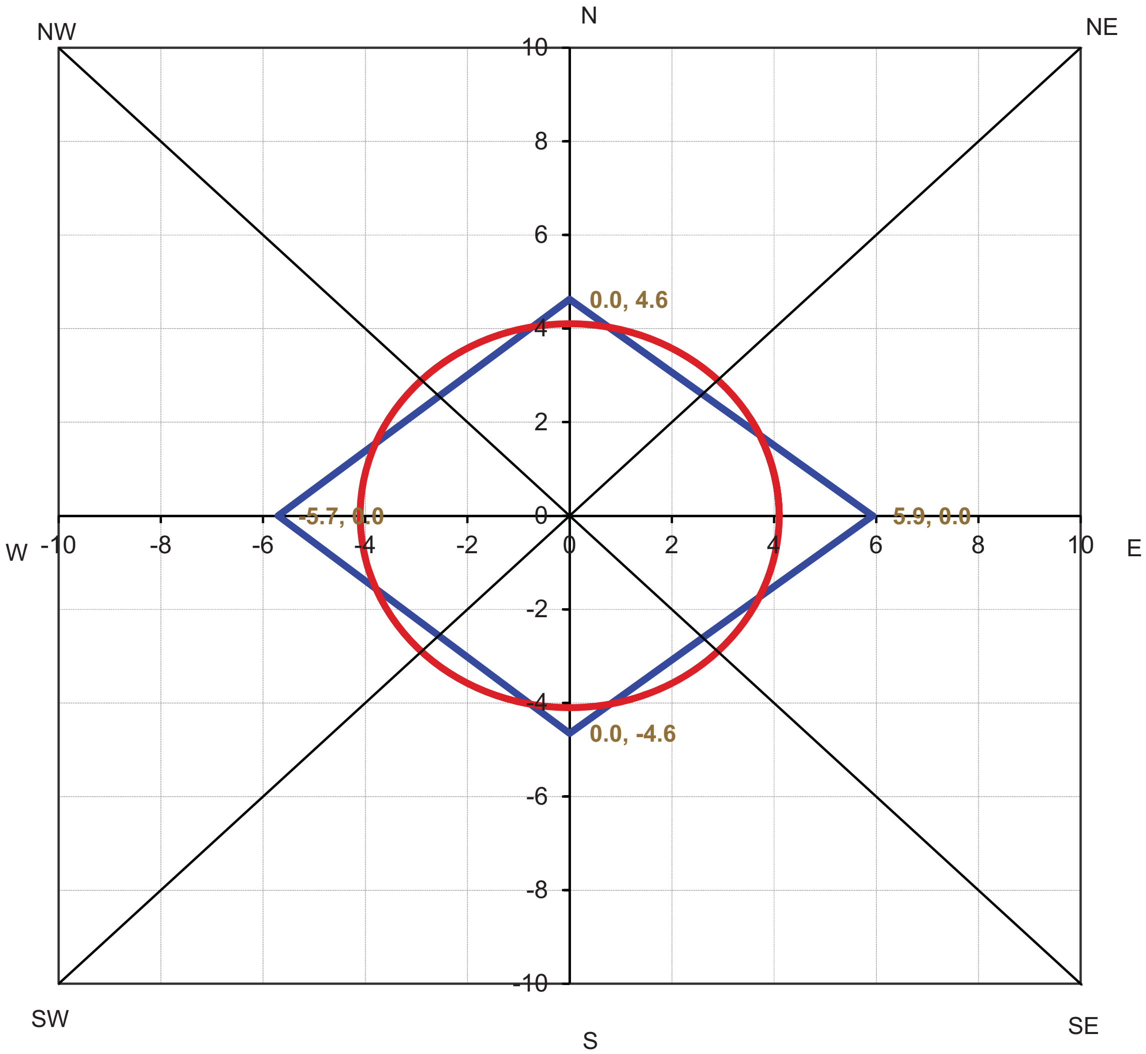
Mean Resistivity Value, ohm-m : 4.1 ohm-m

Apparent Resistivity Values (IERT-5)

Electrical Resistivity Test No.: IERT-5

IS: 3043-1987, RA-2006

Test Details
Test Designation : IERT-5
Co-ordinate : 2327912N, 589251E



Total Area of Polygon : 54

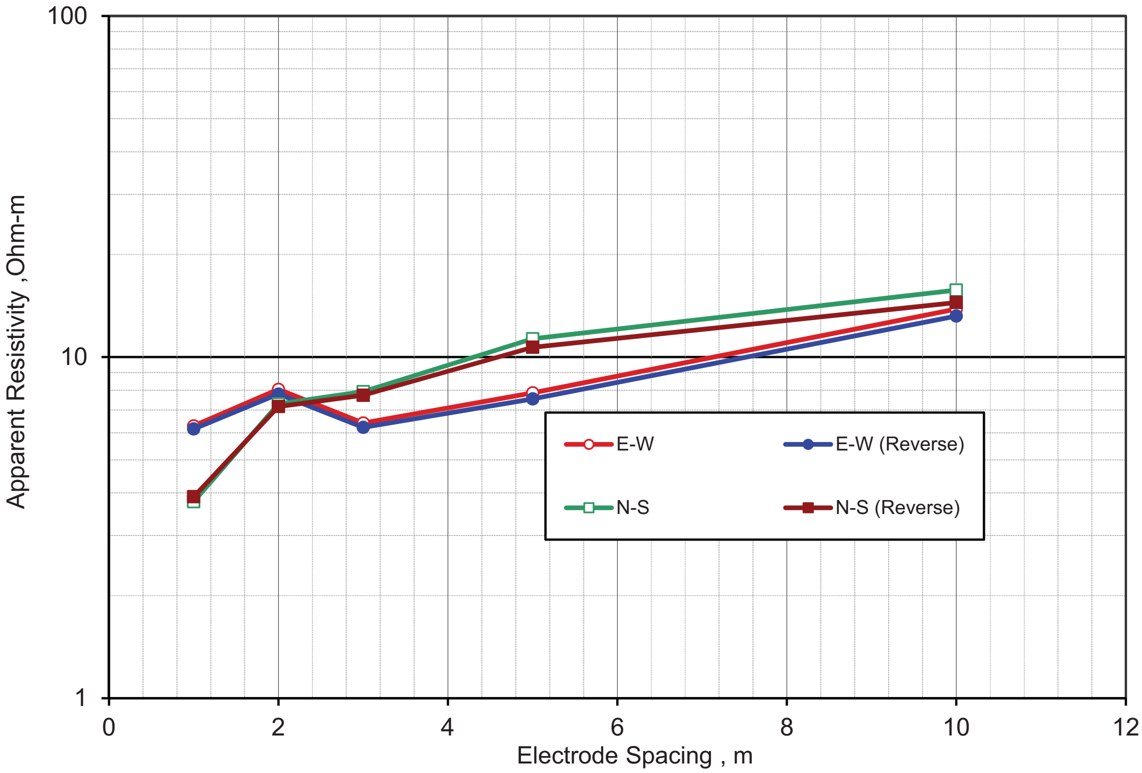
Radius of Equivalent Circle=Mean Resistivity : 4.1 ohm-m

Polar Resistivity Curves (IERT-5)

Electrical Resistivity Test No.: IERT-6

IS: 3043-1987, RA-2006

Test Details
Test Designation : IERT-6
Co-ordinate : 2327750N, 588846E



Electrode Spacing, m	Apparent Resistivity, Ohm-m			
	E-W	E-W (Reverse)	N-S	N-S (Reverse)
1.0	6.3	6.2	3.8	3.9
2.0	8.0	7.8	7.3	7.2
3.0	6.4	6.2	7.9	7.7
5.0	7.9	7.5	11.3	10.7
10.0	13.8	13.2	15.7	14.5
Mean Resistivity	8.5	8.2	9.2	8.8

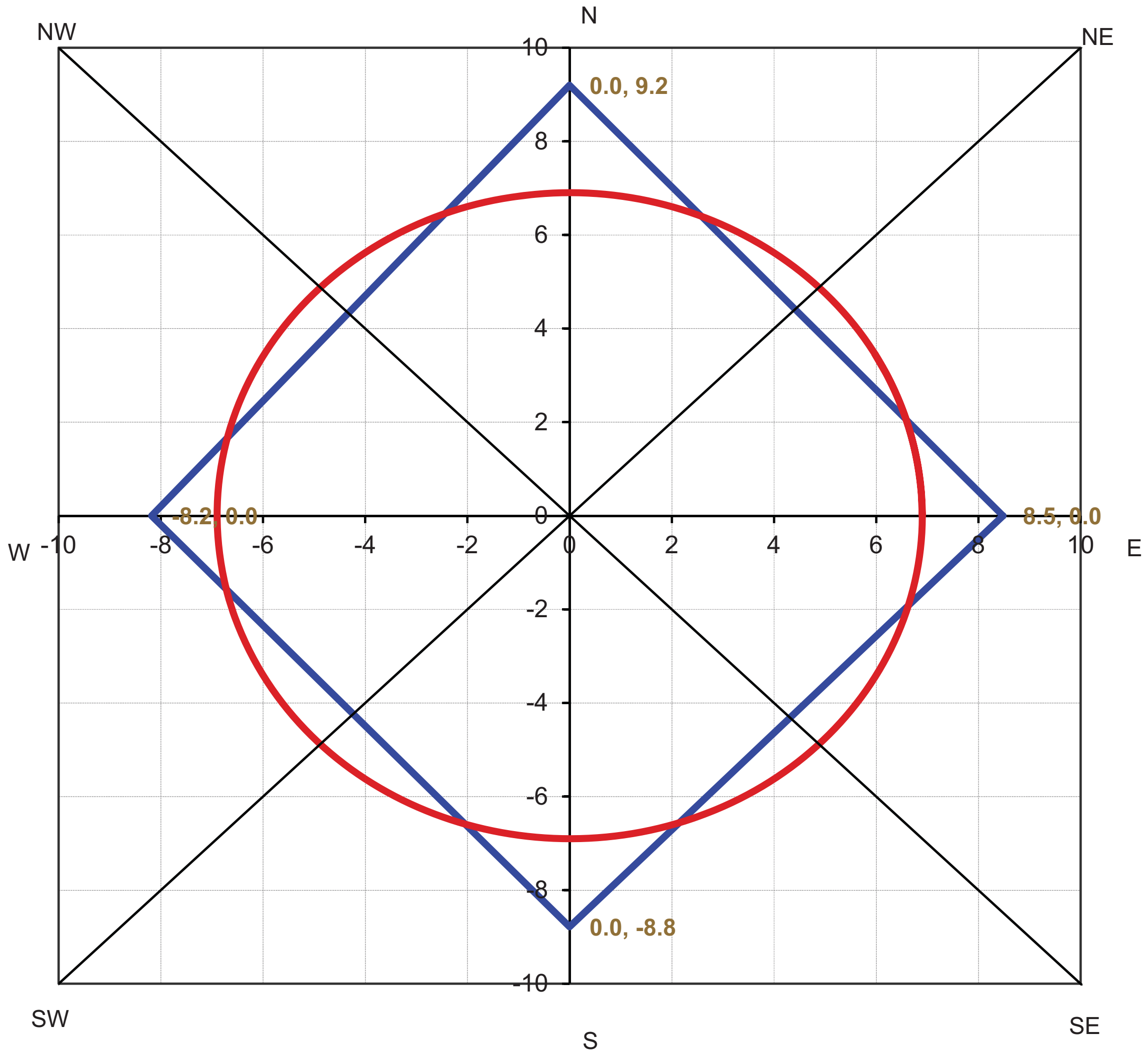
Mean Resistivity Value, ohm-m : 6.9 ohm-m

Apparent Resistivity Values (IERT-6)

Electrical Resistivity Test No.: IERT-6

IS: 3043-1987, RA-2006

Test Details	
Test Designation :	IERT-6
Co-ordinate :	2327750N, 588846E



Total Area of Polygon : 150

Radius of Equivalent Circle=Mean Resistivity : 6.9 ohm-m

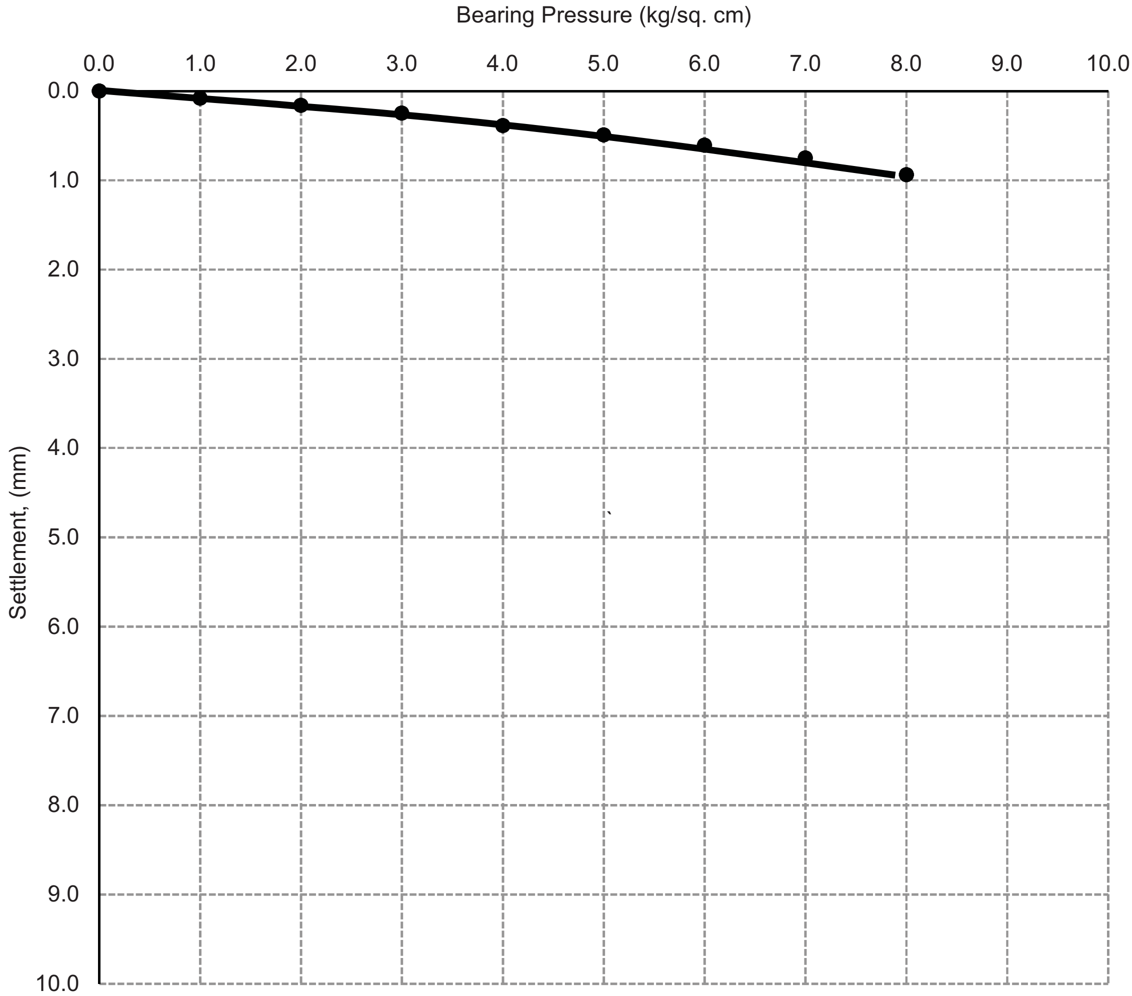
Polar Resistivity Curves (IERT-6)

PLATE LOAD TEST RESULTS

Plate Load Test (PLT)

IS: 1888-1982, RA-2007

Test Details	
Test No.:	IPLT_1
Location:	STACKER RECLAIMER
Size of Plate :	45 cm x 45 cm
Size of Pit :	2 m x 2 m x 2 m
Test Depth below EGL :	2.0 m
Test Level (RL) :	206.8 m
Survey Co-ordinates :	1606 E , 755 N



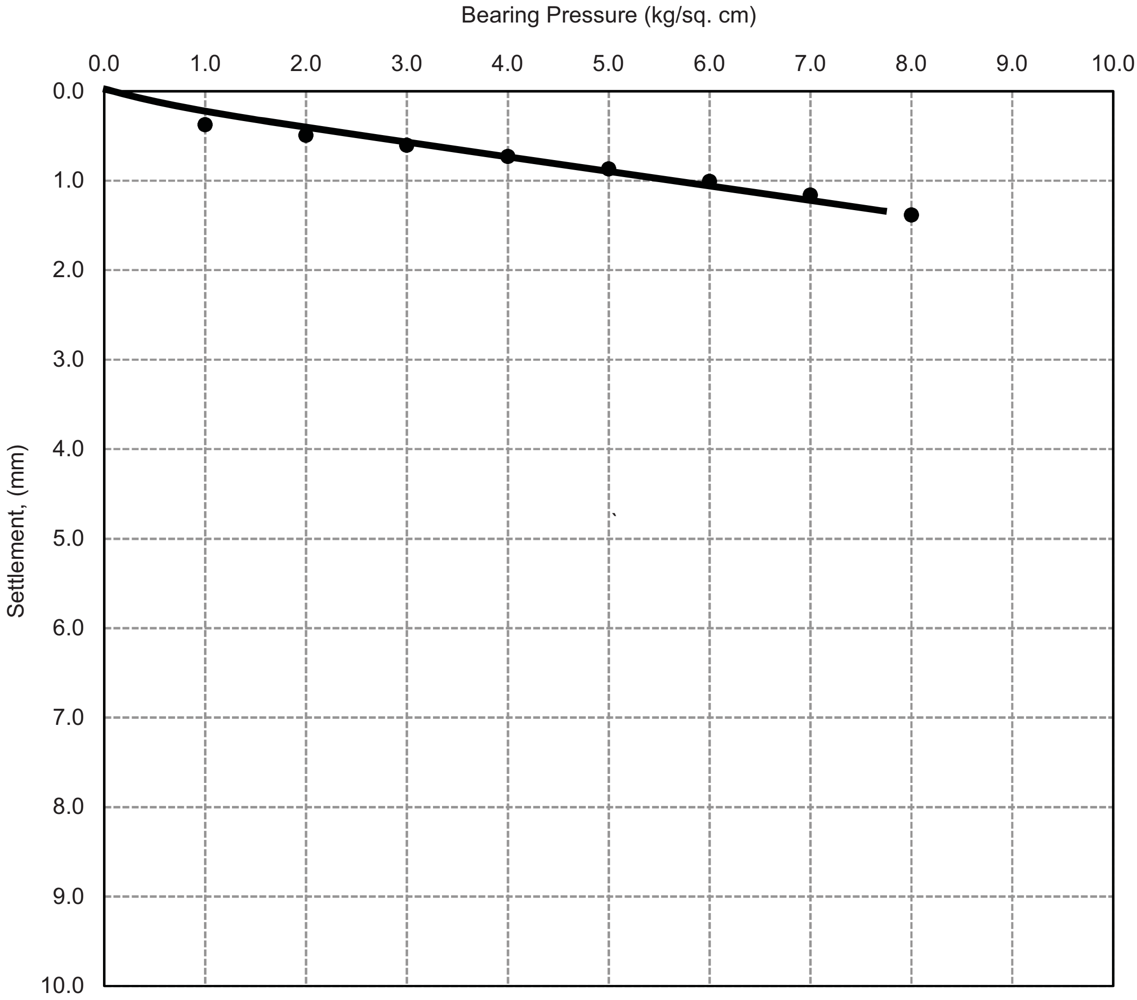
Ultimate Bearing Capacity of Test Plate (q_{ult}) : > 8.0 kg/cm^2

Bearing Pressure vs. Settlement

Plate Load Test (PLT)

IS: 1888-1982, RA-2007

Test Details	
Test No.:	IPLT_2
Location:	DRY ASH SILO
Size of Plate :	45 cm x 45 cm
Size of Pit :	2 m x 2 m x 1.5 m
Test Depth below EGL :	1.5 m
Test Level (RL) :	205.8 m
Survey Co-ordinates :	1387 E , 1094 N



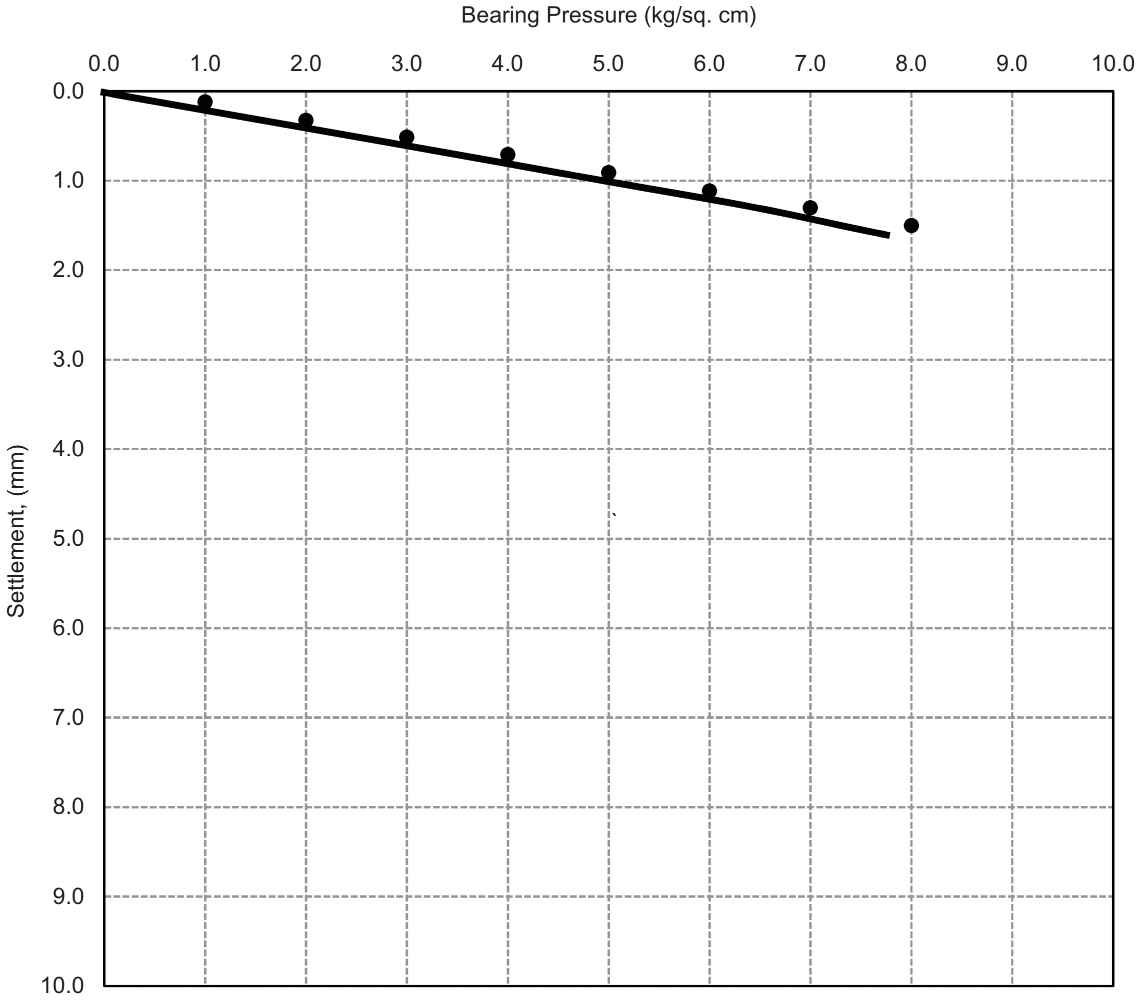
Ultimate Bearing Capacity of Test Plate (q_{ult}) : > 8.0 kg/cm^2

Bearing Pressure vs. Settlement

Plate Load Test (PLT)

IS: 1888-1982, RA-2007

Test Details	
Test No.:	IPLT_3
Location:	PENT HOUSE
Size of Plate :	45 cm x 45 cm
Size of Pit :	2 m x 2 m x 1.5 m
Test Depth below EGL :	1.5 m
Test Level (RL) :	205.4 m
Survey Co-ordinates :	1580 E , 890 N



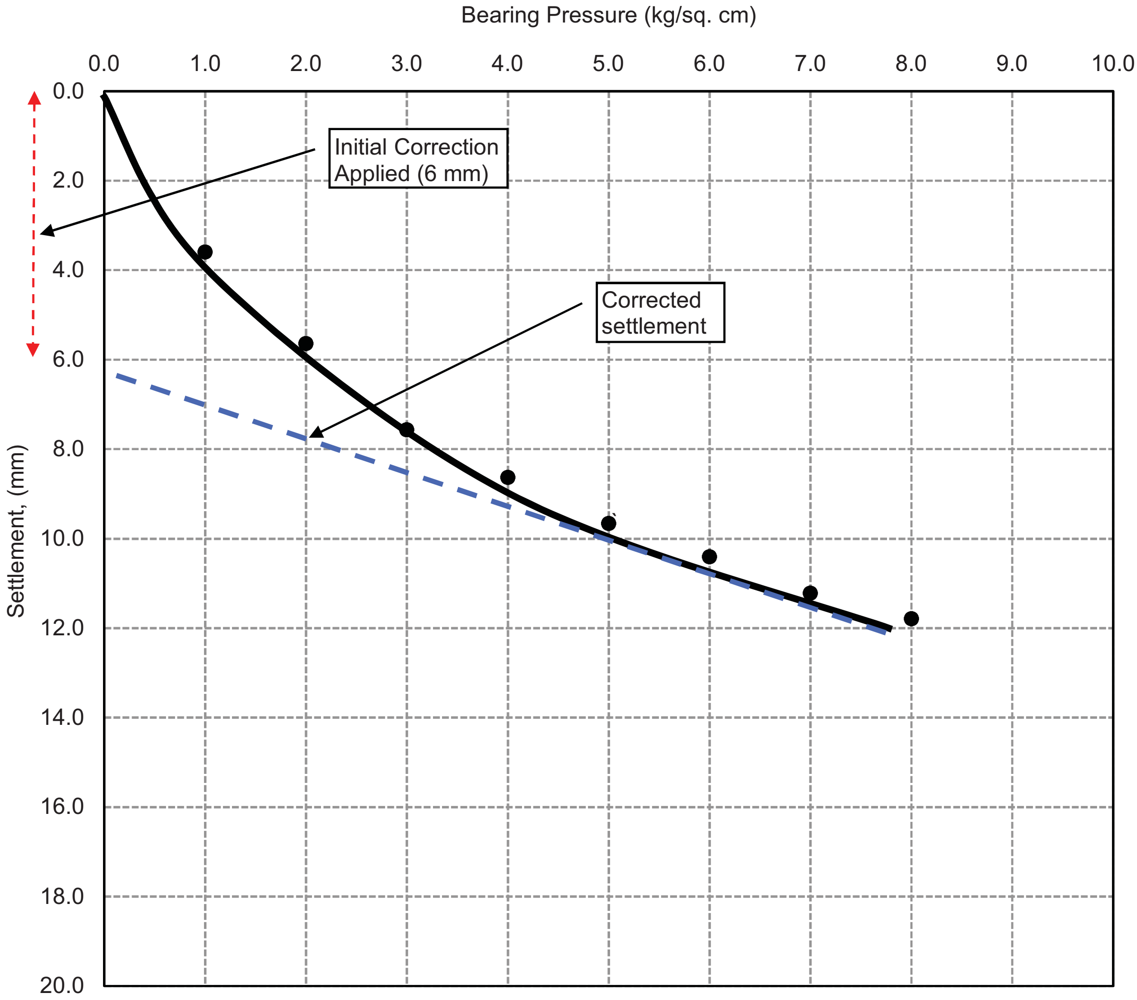
Ultimate Bearing Capacity of Test Plate (q_{ult}) : > 8.0 kg/cm^2

Bearing Pressure vs. Settlement

Plate Load Test (PLT)

IS: 1888-1982, RA-2007

Test Details	
Test No.:	IPLT_4
Location:	HCSS SILO
Size of Plate :	45 cm x 45 cm
Size of Pit :	2 m x 2 m x 2 m
Test Depth below EGL :	2.0 m
Test Level (RL) :	203.3 m
Survey Co-ordinates :	1024 E , 719 N



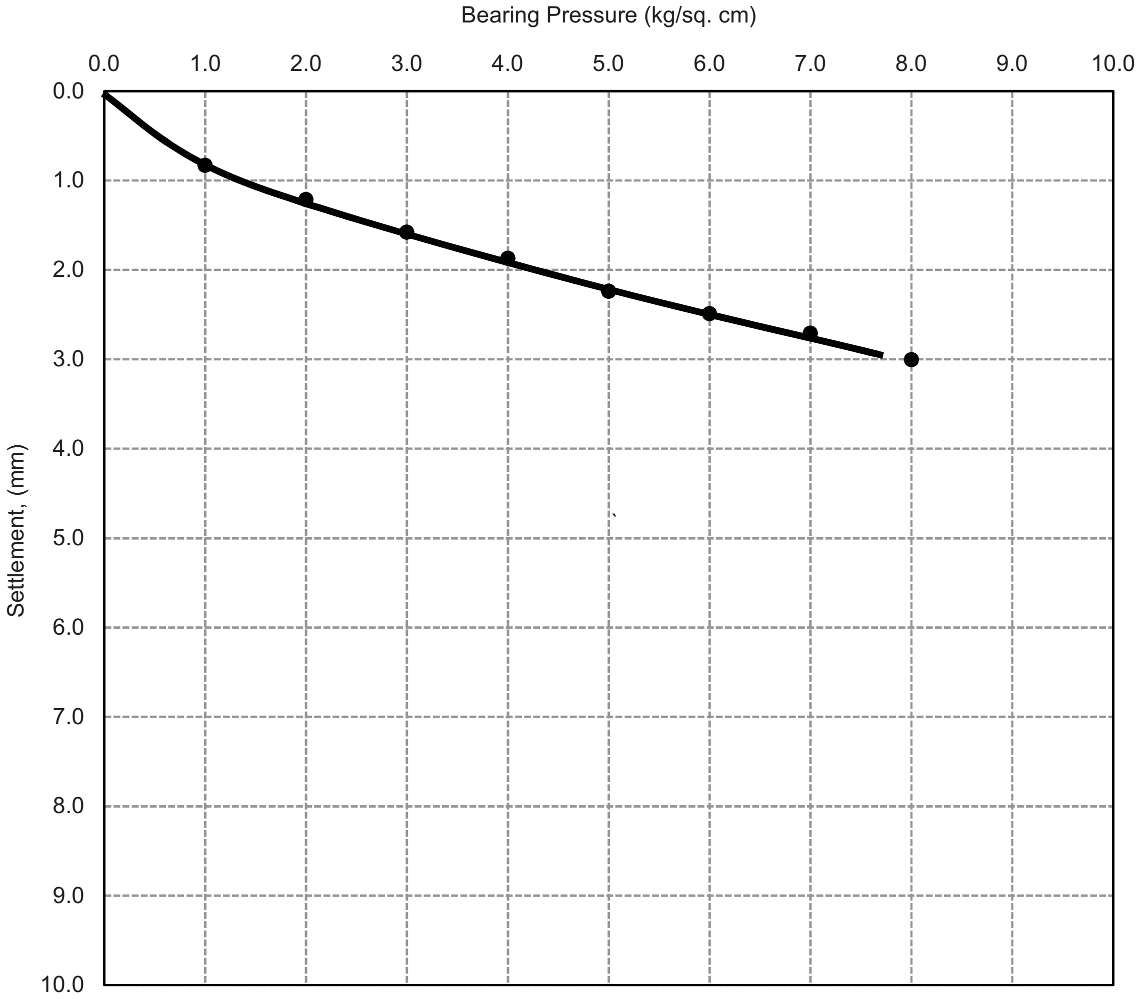
Ultimate Bearing Capacity of Test Plate (q_{ult}) : > 8.0 kg/cm^2

Bearing Pressure vs. Settlement

Plate Load Test (PLT)

IS: 1888-1982, RA-2007

Test Details	
Test No.:	IPLT_5
Location:	H.C.S.D. PUMP HOUSE & MCC ROOM
Size of Plate :	45 cm x 45 cm
Size of Pit :	2 m x 2 m x 2 m
Test Depth below EGL :	2.0 m
Test Level (RL) :	203.1 m
Survey Co-ordinates :	1026 E , 696 N



Ultimate Bearing Capacity of Test Plate (q_{ult}) : > 8.0 kg/cm^2

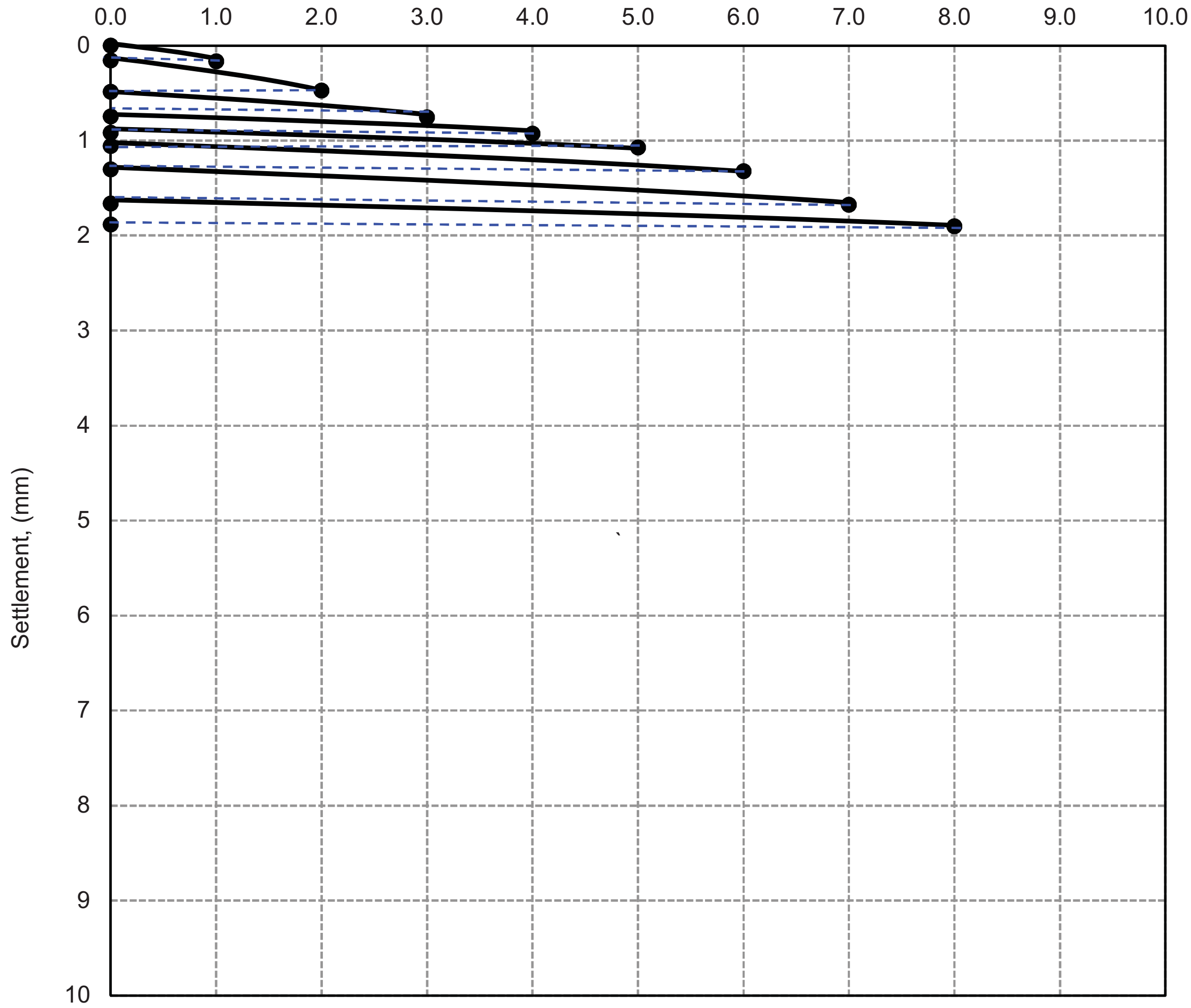
Bearing Pressure vs. Settlement

CYCLIC PLATE LOAD TEST RESULTS

Cyclic Plate Load Test No.: ICPLT-1

IS: 1888-1982, RA-2007

Test Details	
Size of Plate :	45cm x 45cm
Size of Pit :	2 m x 2 m x 2m
Test Depth :	2.0 m
Test Level (RL) :	203.3 m
Co-ordinates :	1371 E , 917 N



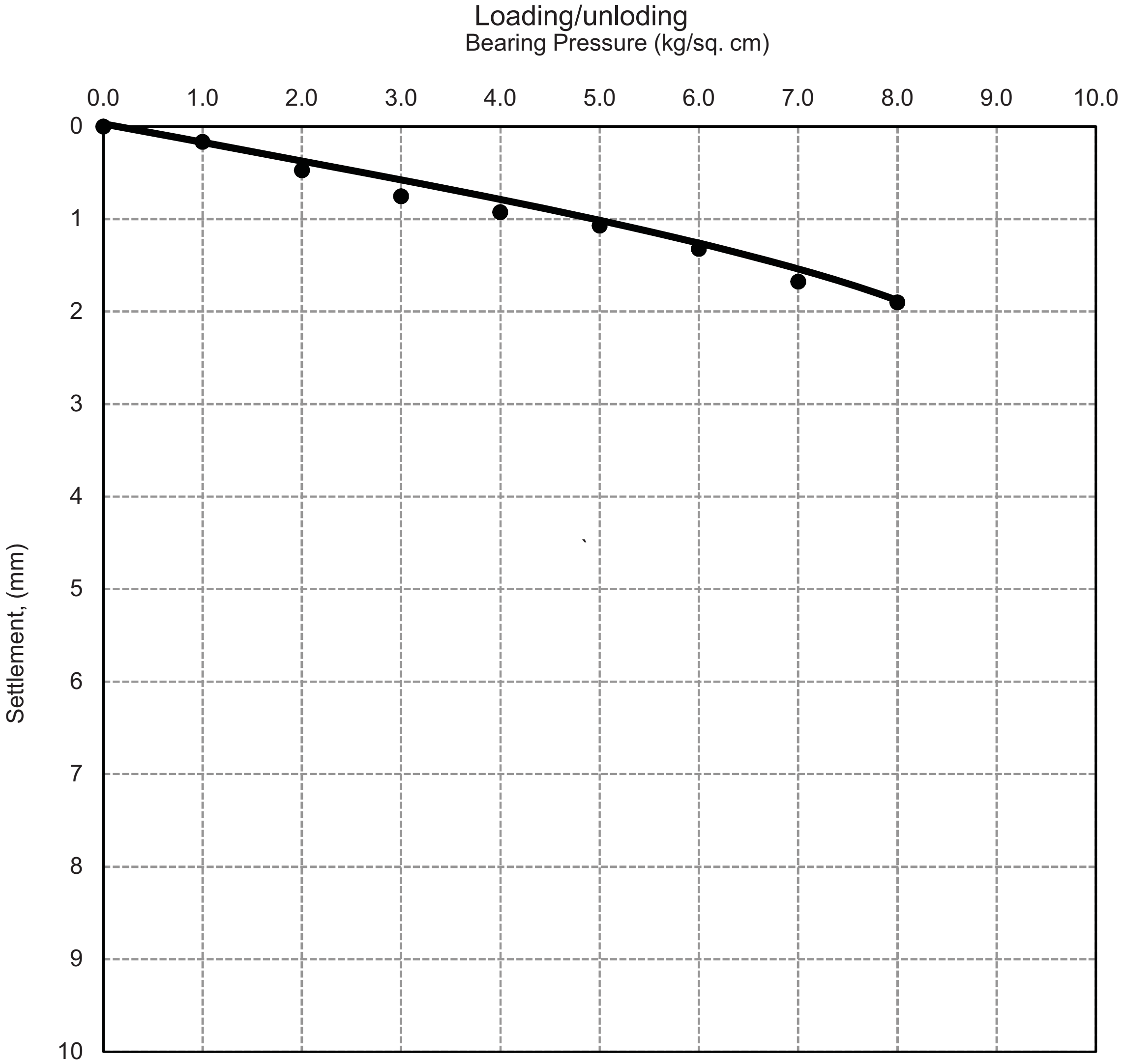
Ultimate Bearing Capacity (q_{ult}) : > 8.0 kg/cm^2

Bearing Pressure vs. Settlement (ICPLT-1)

Cyclic Plate Load Test No.: ICPLT-1

IS: 1888-1982, RA-2007

Test Details	
Size of Plate :	45cm x 45cm
Size of Pit :	2 m x 2 m x 2m
Test Depth :	2.0 m
Test Level (RL) :	203.3 m
Co-ordinates :	1371 E , 917 N



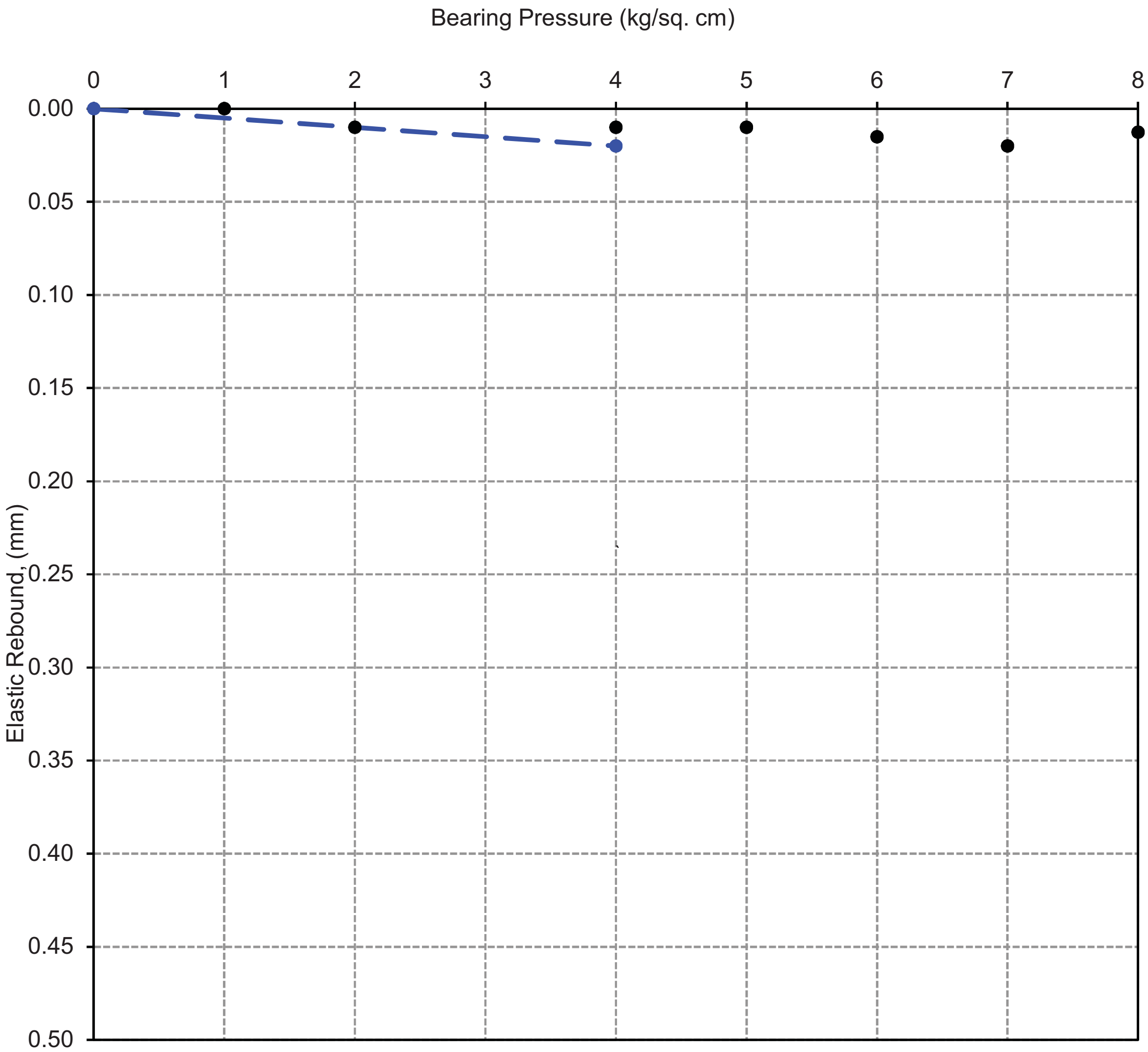
Ultimate Bearing Capacity (q_{ult}) : > 8.0 kg/cm^2

Bearing Pressure vs. Settlement (ICPLT-1)

Cyclic Plate Load Test No.: ICPLT-1

IS: 1888-1982, RA-2007

Test Details
Size of Plate : 45cm x 45cm
Size of Pit : 2 m x 2 m x 2m
Test Depth : 2.0 m
Test Level (RL) : 203.3 m
Co-ordinates : 1371 E , 917 N



Ultimate Bearing Capacity (q_{ult}) : > 8.0 kg/cm^2

Coefficient of uniform elastic compression for test plate C_u : 2000 kg/cm^3

Coefficient of uniform elastic compression for 10m^2 area C_u : 379.4 kg/cm^3

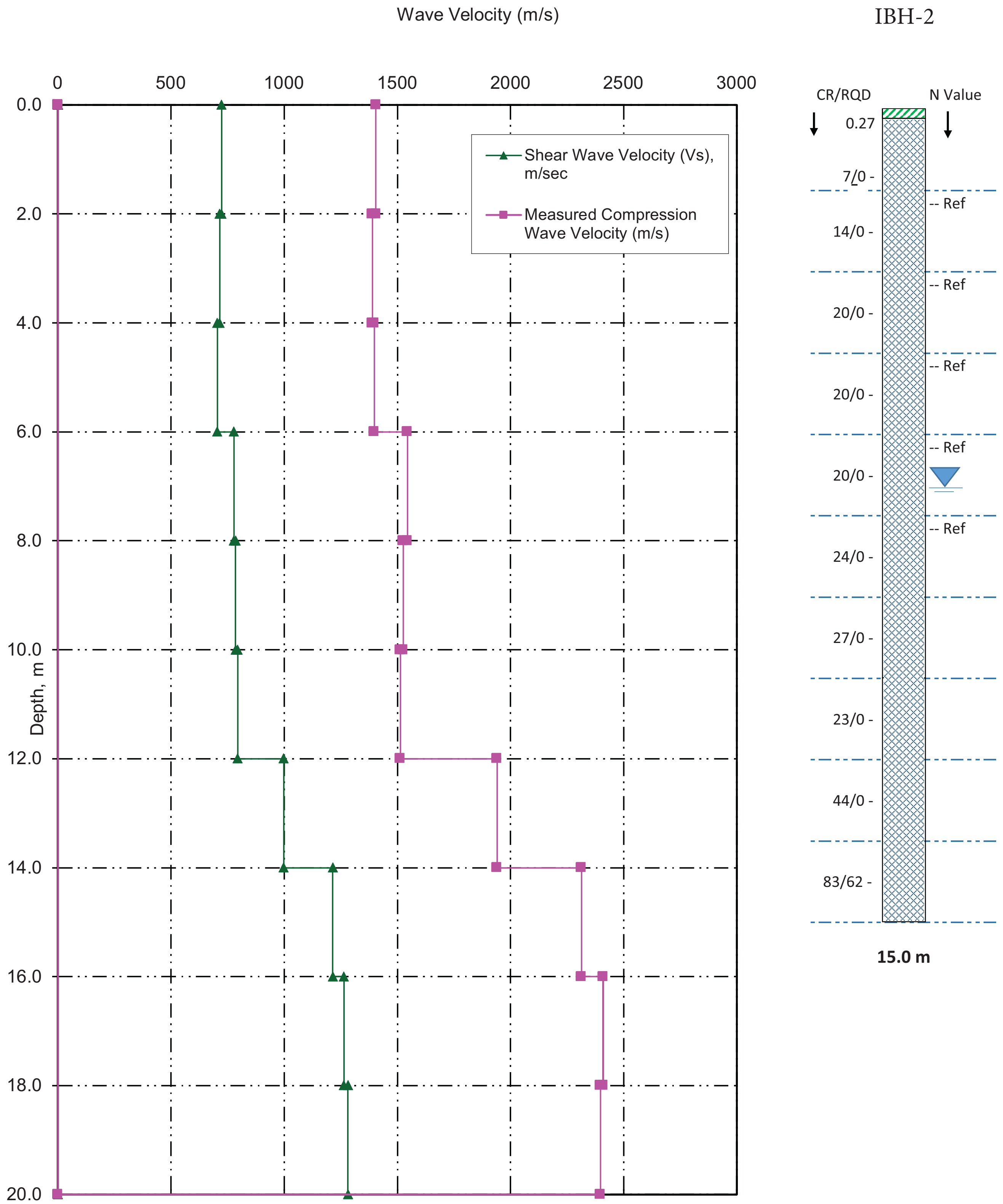
Determination of Coefficient of Uniform Elastic Compression (ICPLT-1)

CROSS-HOLE SEISMIC TEST RESULTS

Depth, m	Stratigraphy (as per borelogs)	Measured Compression Wave Velocity, V_p (m/s)	Measured Shear Wave Velocity, V_s (m/s)	Bulk Density, γ (kg/m^3)	Poisson's Ratio, m	Dynamic Young's Modulus, E_{dyn} (MPa)	Dynamic Shear Modulus, G_{max} (MPa)	Coefficient of Elastic Uniform Compression, c_u (kg/cm^3)	Coefficient of Elastic Uniform Shear, c_τ (kg/cm^3)	Coefficient of Elastic Non-Uniform Compression, c_φ (kg/cm^3)	Coefficient of Elastic non-uniform Shear, c_ψ (kg/cm^3)	UBC Classification
2.0	Basalt	1405	723	2850	0.32	3933	1490	160	96	331	144	Sc (Very Dense Soil)
4.0	Basalt	1390	715	2850	0.32	3846	1457	156	94	324	140	Sc (Very Dense Soil)
6.0	Basalt	1398	704	2850	0.33	3757	1413	154	92	319	138	Sc (Very Dense Soil)
8.0	Basalt	1545	778	2850	0.33	4589	1725	188	113	389	169	Sb (Rock)
10.0	Basalt	1526	785	2850	0.32	4636	1756	188	113	391	169	Sb (Rock)
12.0	Basalt	1513	794	2900	0.31	4790	1828	193	116	401	174	Sb (Rock)
14.0	Basalt	1940	998	2900	0.32	7625	2888	309	186	642	279	Sb (Rock)
16.0	Basalt	2313	1214	2900	0.31	11198	4274	451	271	937	406	Sb (Rock)
18.0	Basalt	2409	1264	2900	0.31	12139	4633	489	294	1016	440	Sb (Rock)
20.0	Basalt	2400	1281	2900	0.30	12373	4759	495	297	1028	446	Sb (Rock)

Test Designation : ICHST-1

Measured Wave Velocities and Computed Dynamic Parameters

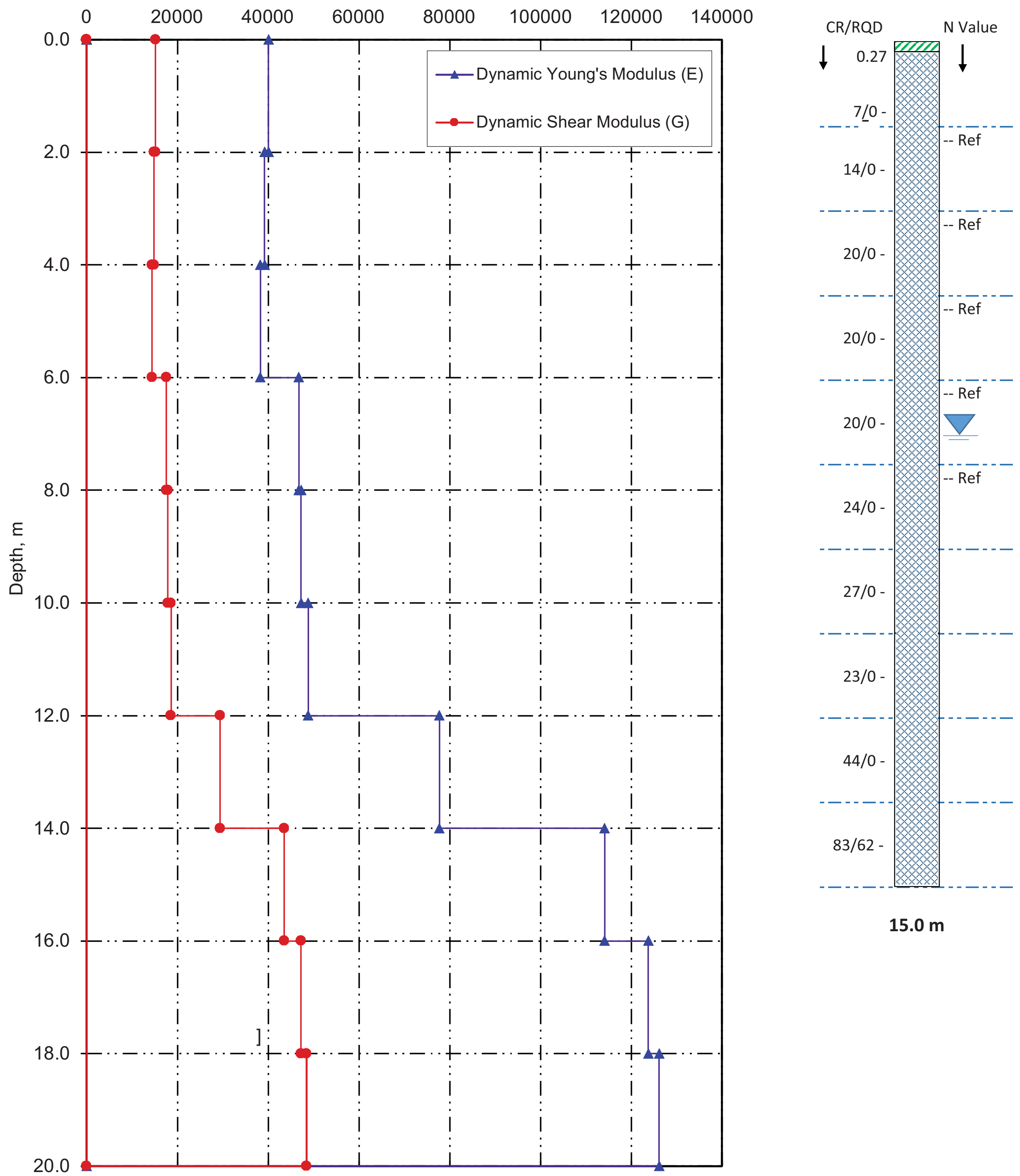


Test Designation : ICHST-1

Wave Velocity vs Depth

Dynamic Modulus (kg/sq.cm)

IBH-2

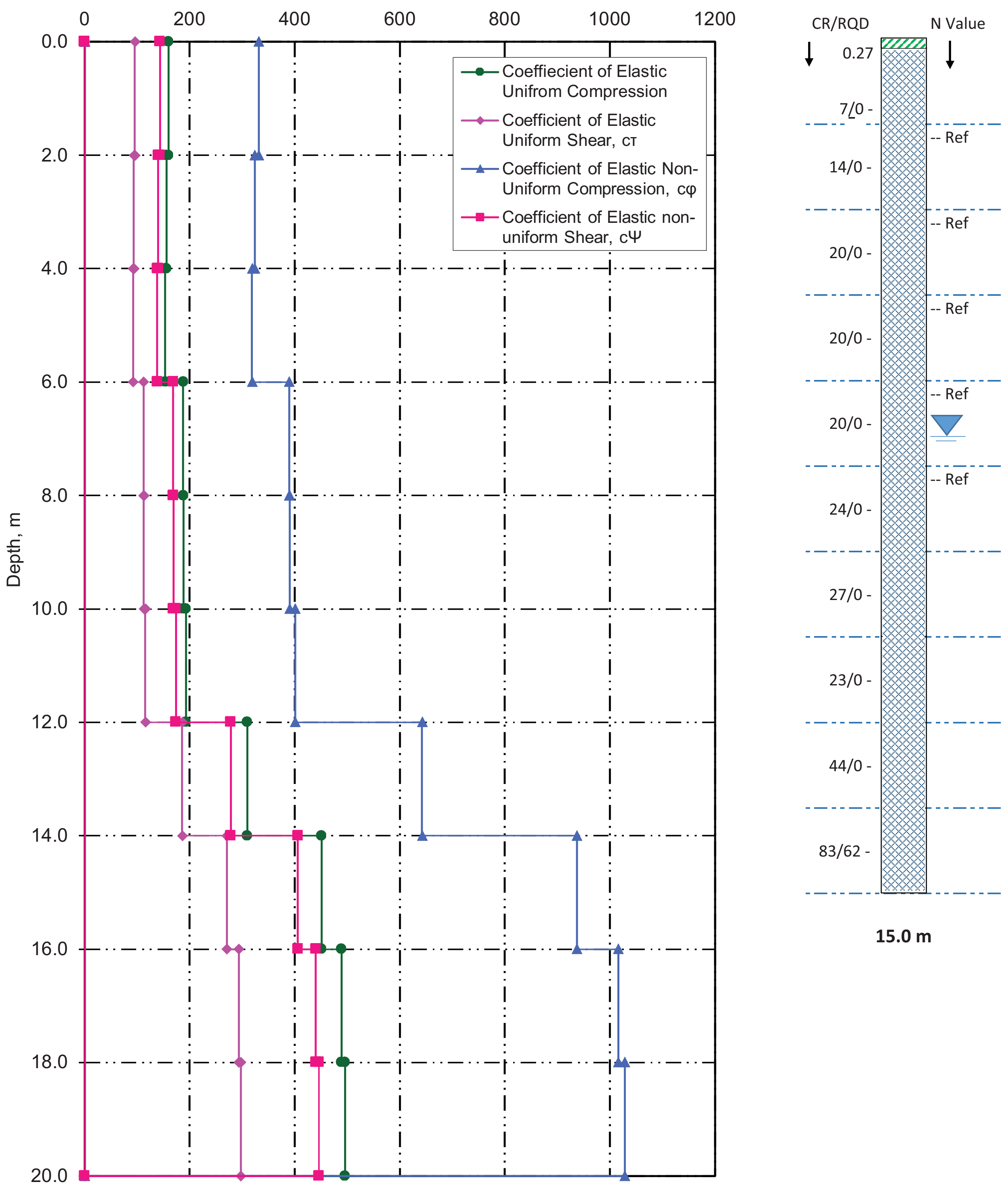


Test Designation : ICHST-1

Dynamic Shear and Young's Modulus vs Depth

Dynamic Soil Parameters (kg/cm³)

IBH-2



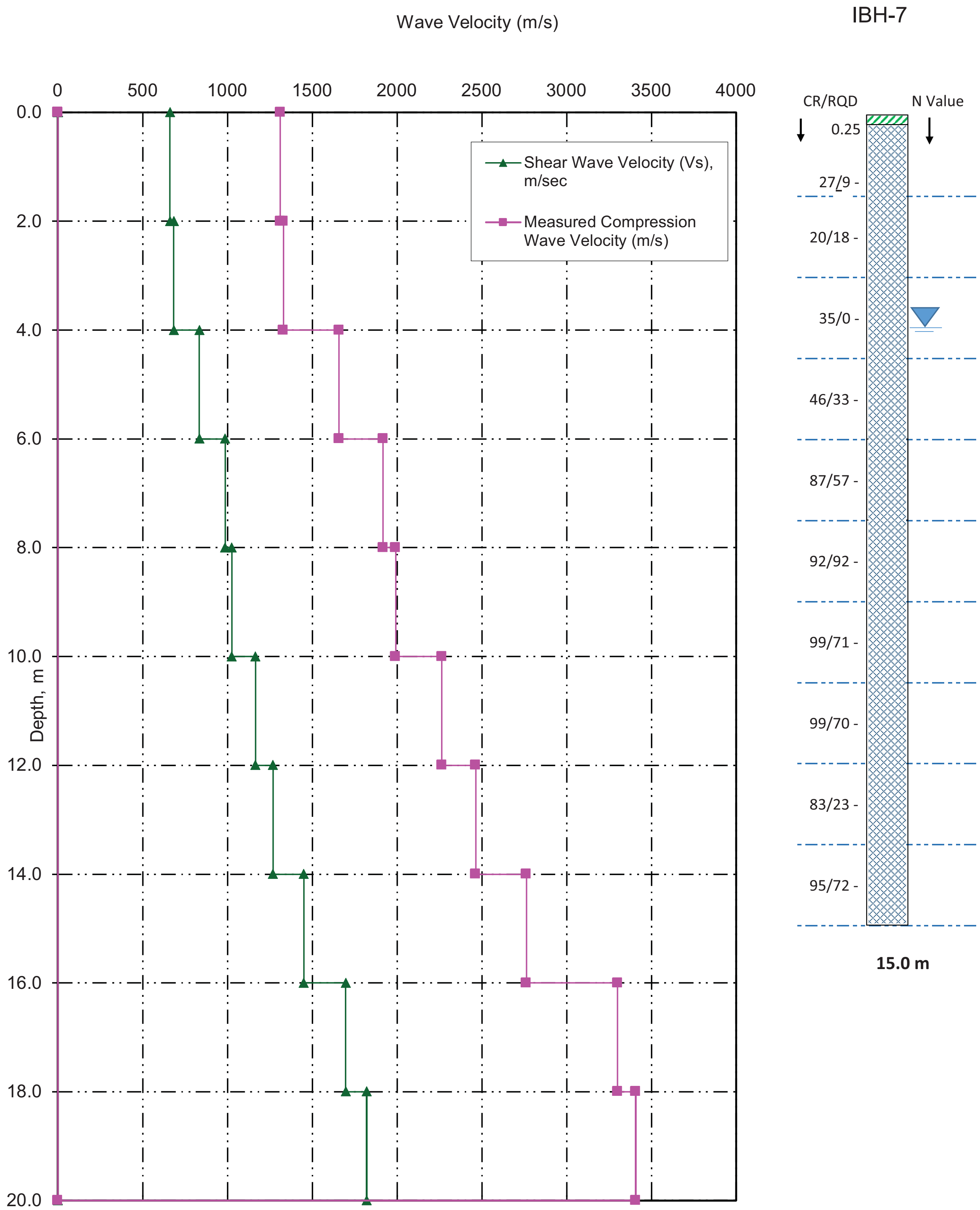
Test Designation : ICHST-1

Dynamic Soil Parameters vs Depth

Depth, m	Stratigraphy (as per borelogs)	Measured Compression Wave Velocity, V_p (m/s)	Measured Shear Wave Velocity, V_s (m/s)	Bulk Density, γ (kg/m^3)	Poisson's Ratio, m	Dynamic Young's Modulus, E_{dyn} (MPa)	Dynamic Shear Modulus, G_{max} (MPa)	Coefficient of Elastic Uniform Compression, c_u (kg/cm^3)	Coefficient of Elastic Uniform Shear, c_τ (kg/cm^3)	Coefficient of Elastic Non-Uniform Compression, c_φ (kg/cm^3)	Coefficient of Elastic non-uniform Shear, c_ψ (kg/cm^3)	UBC Classification
2.0	Basalt	1312	661	2850	0.33	3312	1245	135	81	281	122	Sc (Very Dense Soil)
4.0	Basalt	1329	684	2850	0.32	3520	1333	143	86	297	129	Sc (Very Dense Soil)
6.0	Basalt	1658	835	2900	0.33	5378	2022	220	132	456	198	Sb (Rock)
8.0	Basalt	1918	987	2900	0.32	7458	2825	303	182	628	272	Sb (Rock)
10.0	Basalt	1992	1025	2900	0.32	8044	3047	326	196	678	294	Sb (Rock)
12.0	Basalt	2264	1165	2900	0.32	10391	3936	422	253	875	380	Sb (Rock)
14.0	Basalt	2465	1268	2900	0.32	12310	4663	500	300	1037	450	Sb (Rock)
16.0	Basalt	2763	1450	2900	0.31	15975	6097	644	386	1336	579	Sb (Rock)
18.0	Basalt	3300	1698	2900	0.32	22074	8361	896	537	1860	806	Sa (Hard Rock)
20.0	Basalt	3407	1821	2900	0.30	25003	9617	1001	600	2078	901	Sa (Hard Rock)

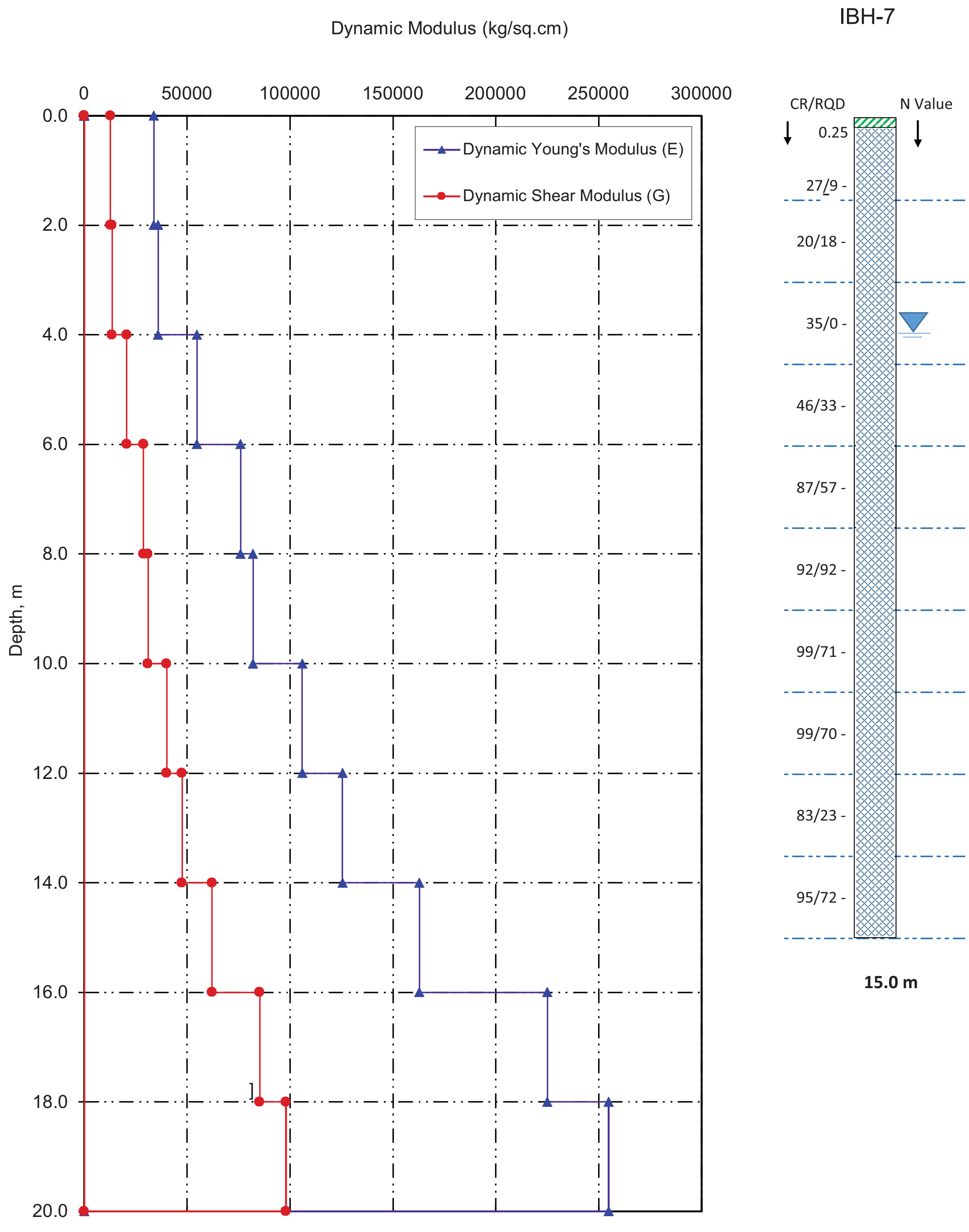
Test Designation : ICHST-2

Measured Wave Velocities and Computed Dynamic Parameters



Test Designation : ICHST-2

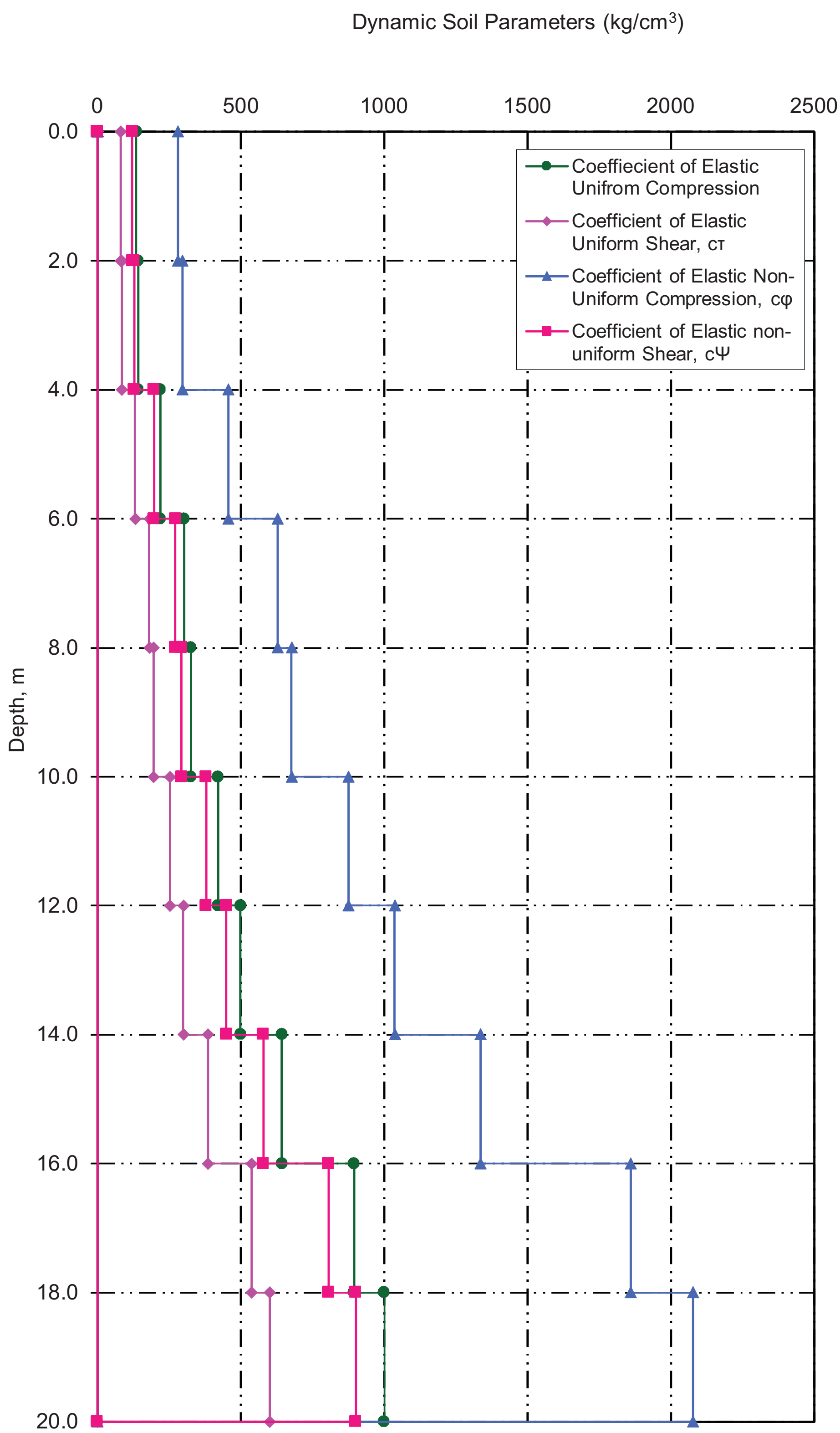
Wave Velocity vs Depth

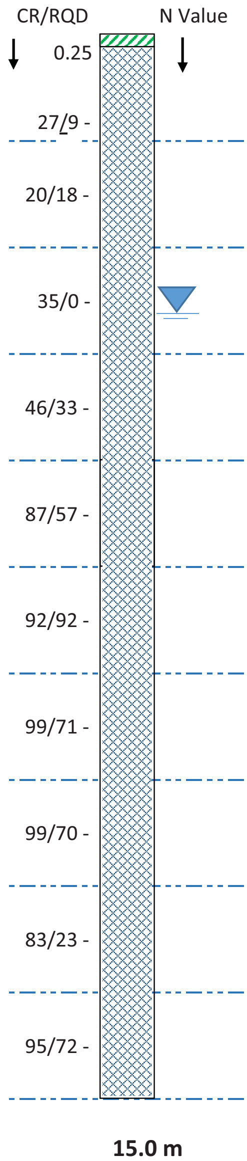


Test Designation : ICHST-2

Dynamic Shear and Young's Modulus vs Depth

IBH-7





Test Designation : ICHST-2

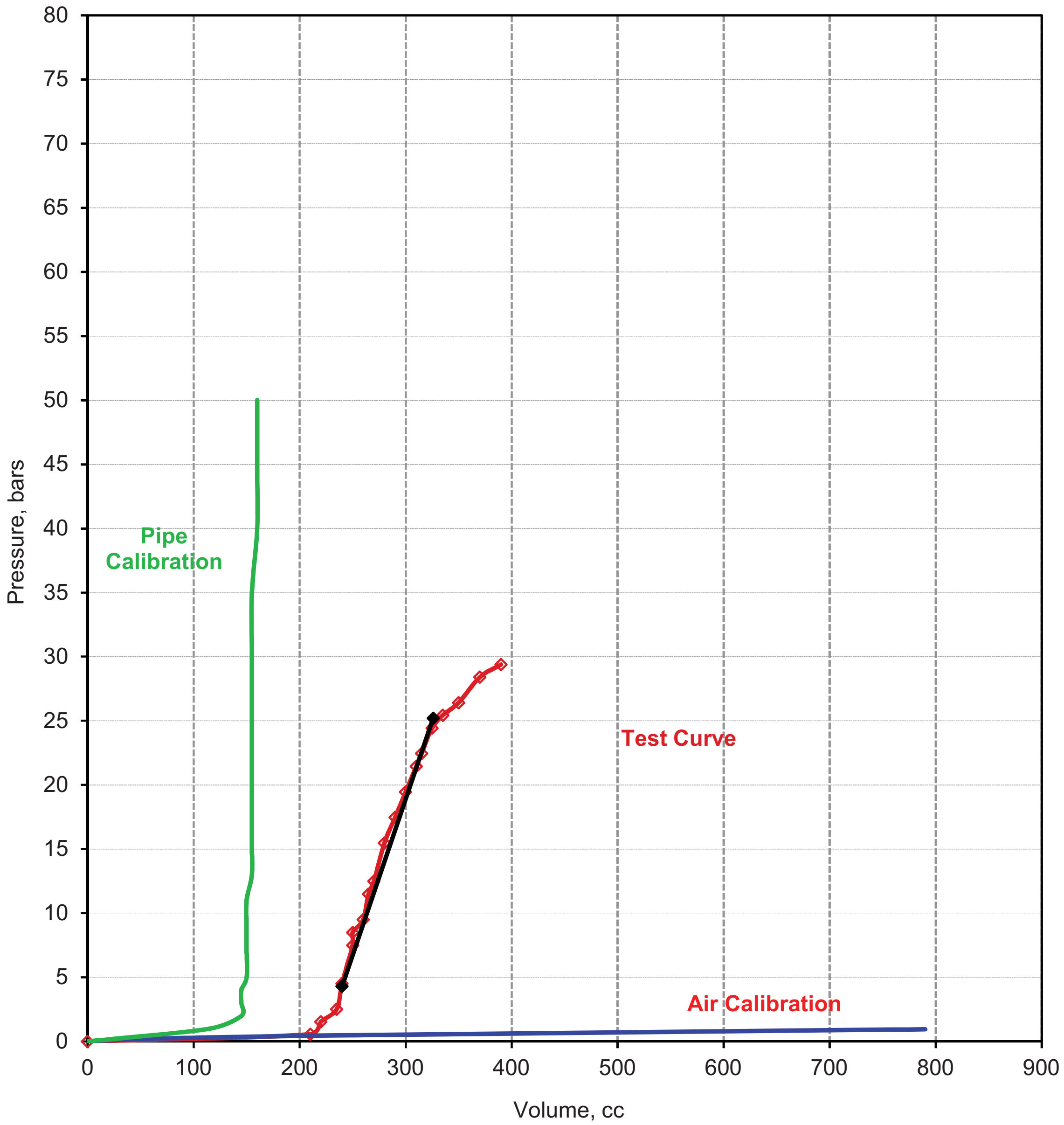
Dynamic Soil Parameters vs Depth

PRESSUREMETER
TEST RESULTS

Pressuremeter Test : 5

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-37	Limit Pressure, p_L :	29.4 bar
IPMT.:	1		
Test Depth :	2.00 m	Deformation Modulus, E_m :	680.5 kg/sq.cm

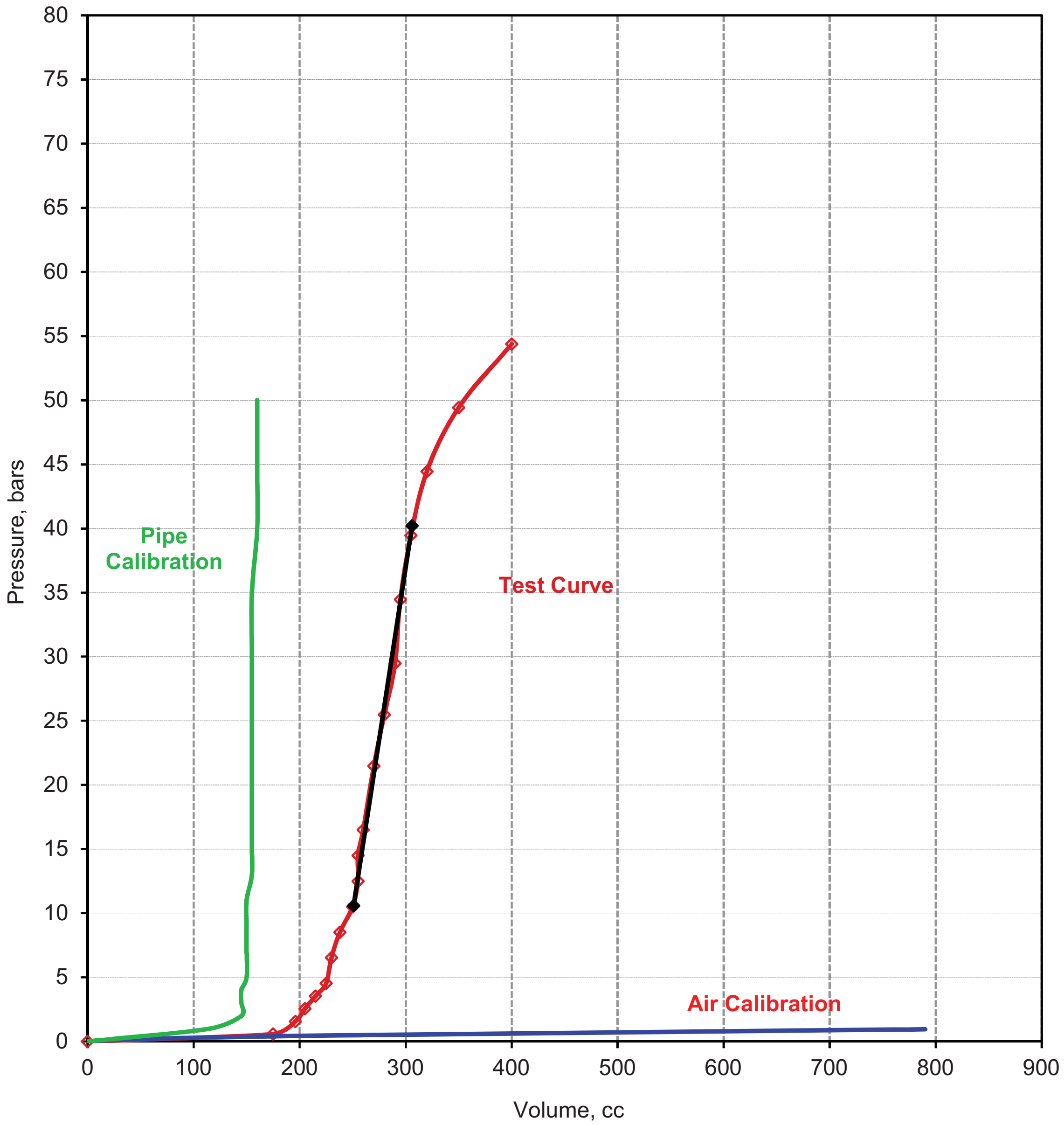


Applied Pressure vs. Volume

Pressuremeter Test : 5

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-38	Limit Pressure, p_L :	54.4 bar
IPMT.:	1		
Test Depth :	4.00 m	Deformation Modulus, E_m :	1506.9 kg/sq.cm

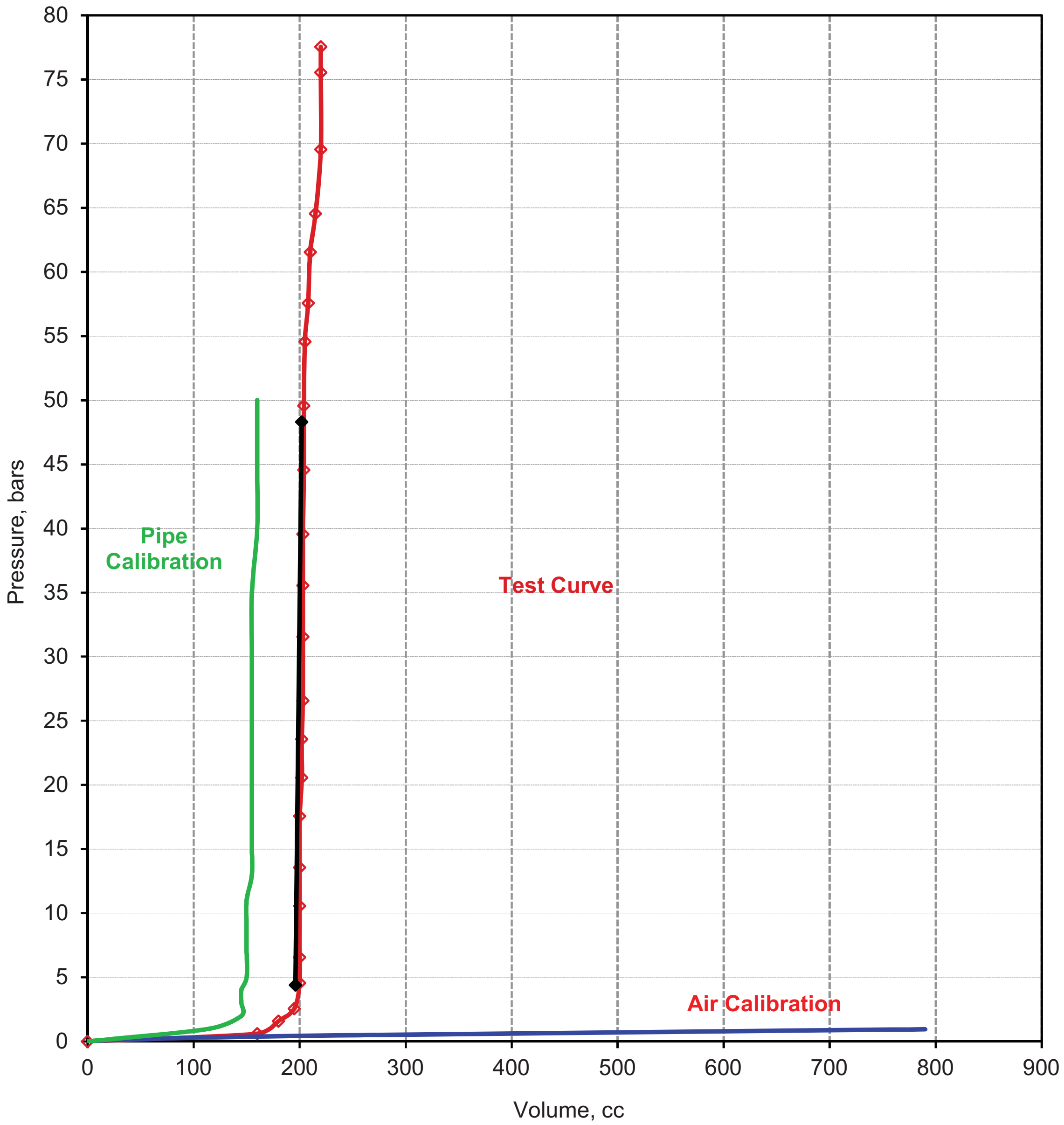


Applied Pressure vs. Volume

Pressuremeter Test : 5

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-39	Limit Pressure, p_L :	>80 Bar
IPMT.:	1		
Test Depth :	6.00 m	Deformation Modulus, E_m :	19248.2 kg/sq.cm

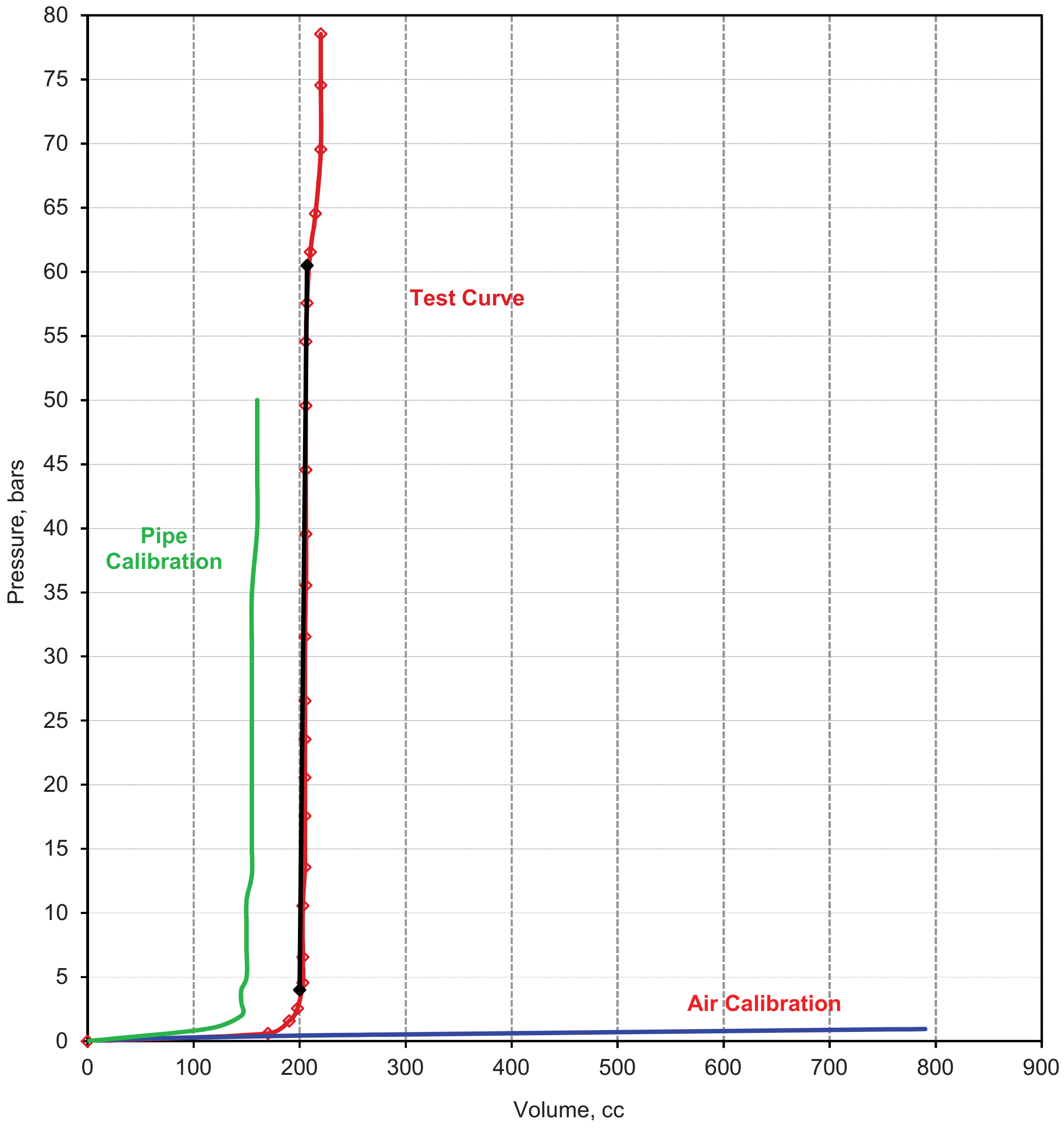


Applied Pressure vs. Volume

Pressuremeter Test : 5

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-40	Limit Pressure, p_L :	>80 Bar
IPMT.:	1		
Test Depth :	8.00 m	Deformation Modulus, E_m :	21330.4 kg/sq.cm

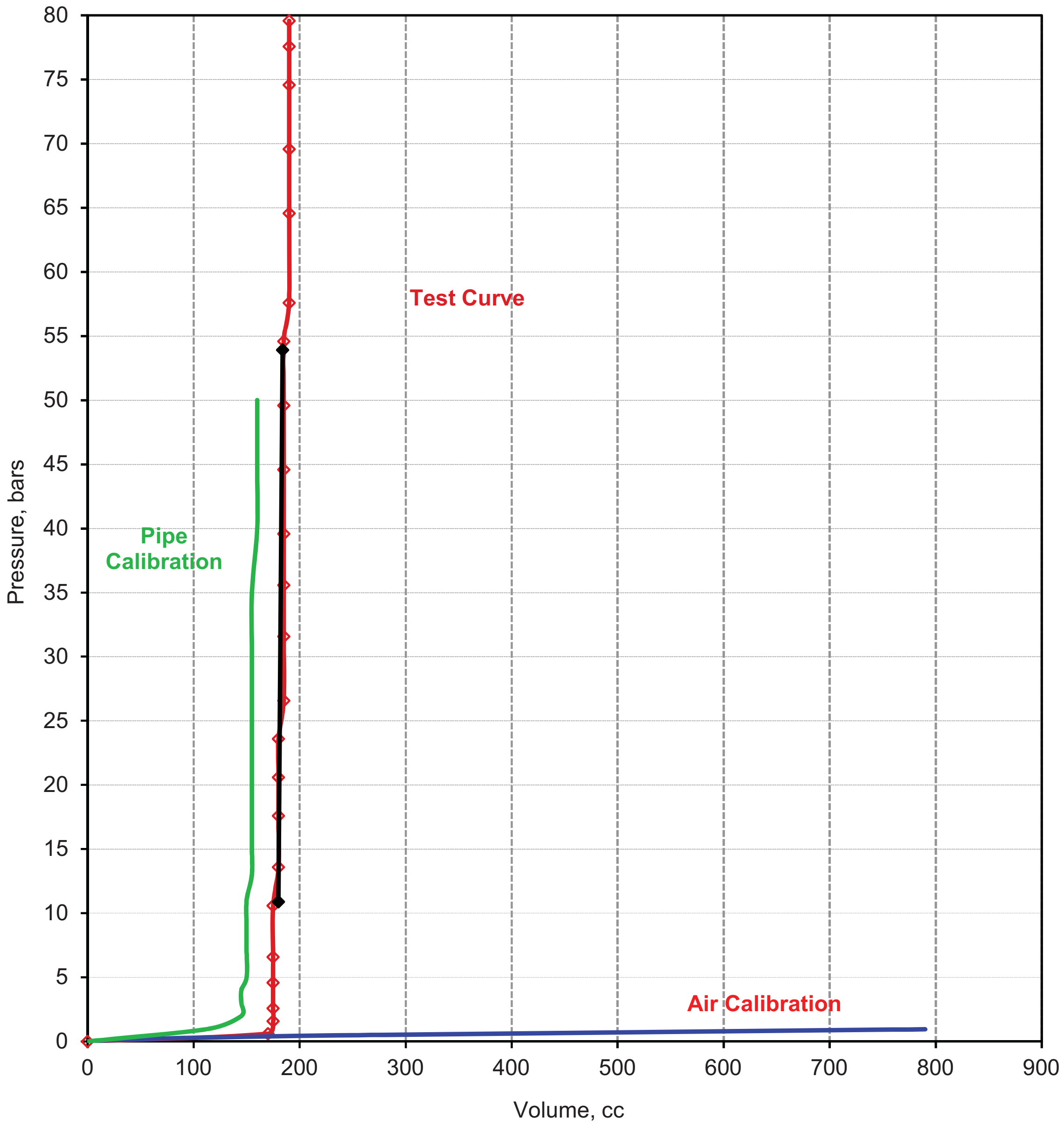


Applied Pressure vs. Volume

Pressuremeter Test : 5

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-41	Limit Pressure, p_L :	>80 Bar
IPMT.:	1		
Test Depth :	10.00 m	Deformation Modulus, E_m :	27794.3 kg/sq.cm

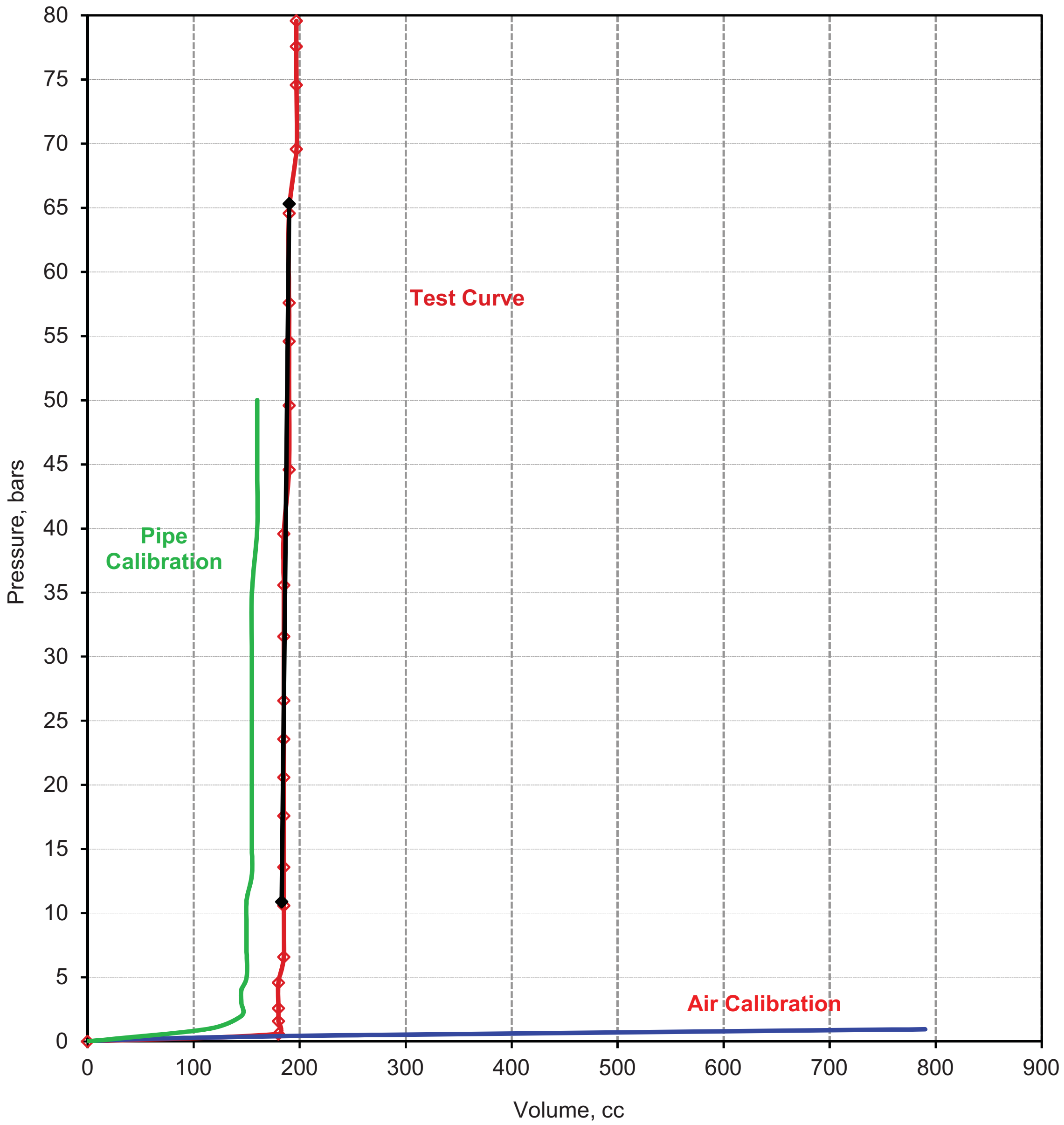


Applied Pressure vs. Volume

Pressuremeter Test : 5

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-42	Limit Pressure, p_L :	>80 Bar
IPMT.:	1		
Test Depth :	12.00 m	Deformation Modulus, E_m :	20186.2 kg/sq.cm

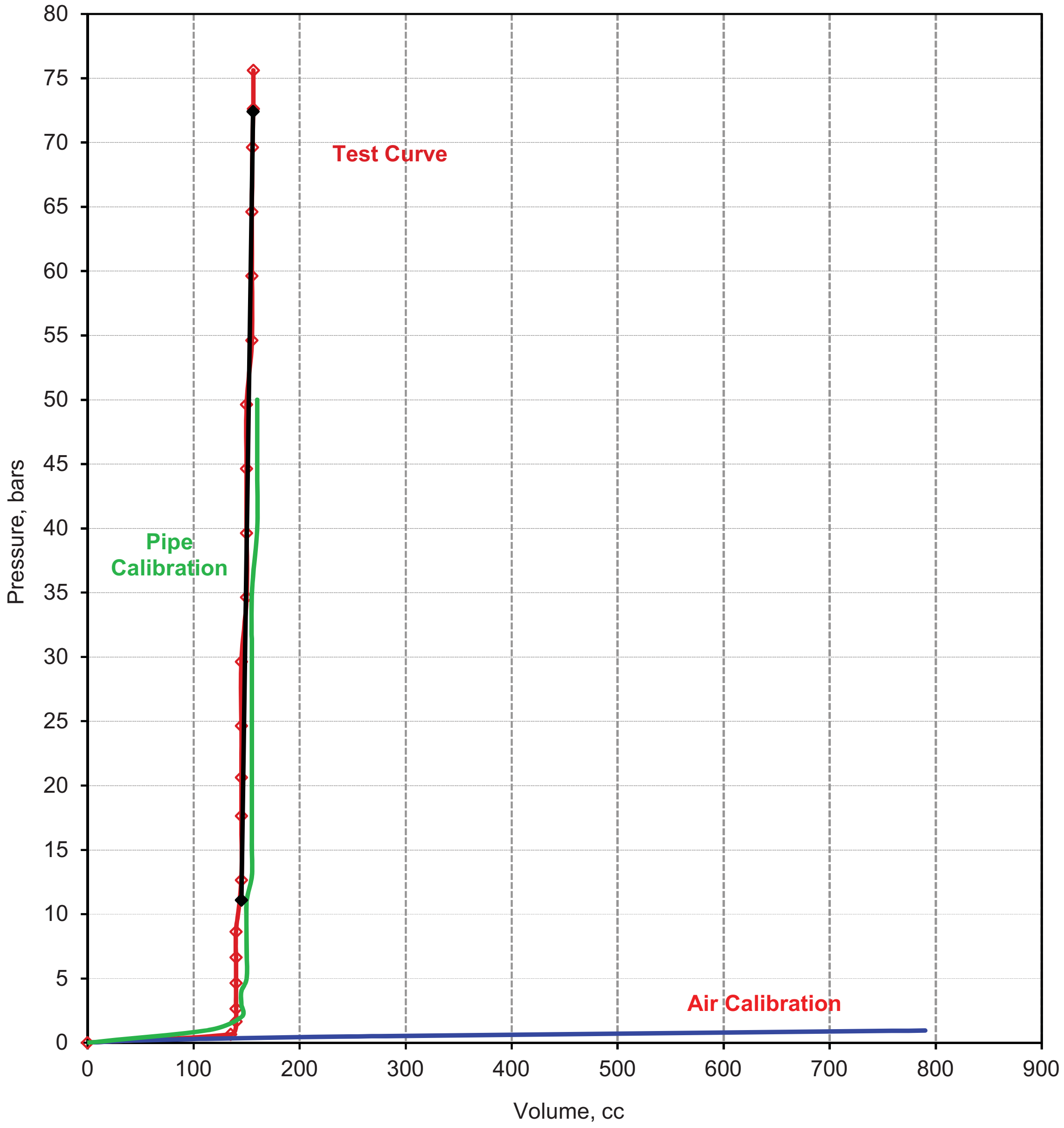


Applied Pressure vs. Volume

Pressuremeter Test : 5

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-43	Limit Pressure, p_L :	>80 Bar
IPMT.:	1		
Test Depth :	15.00 m	Deformation Modulus, E_m :	13941.5 kg/sq.cm

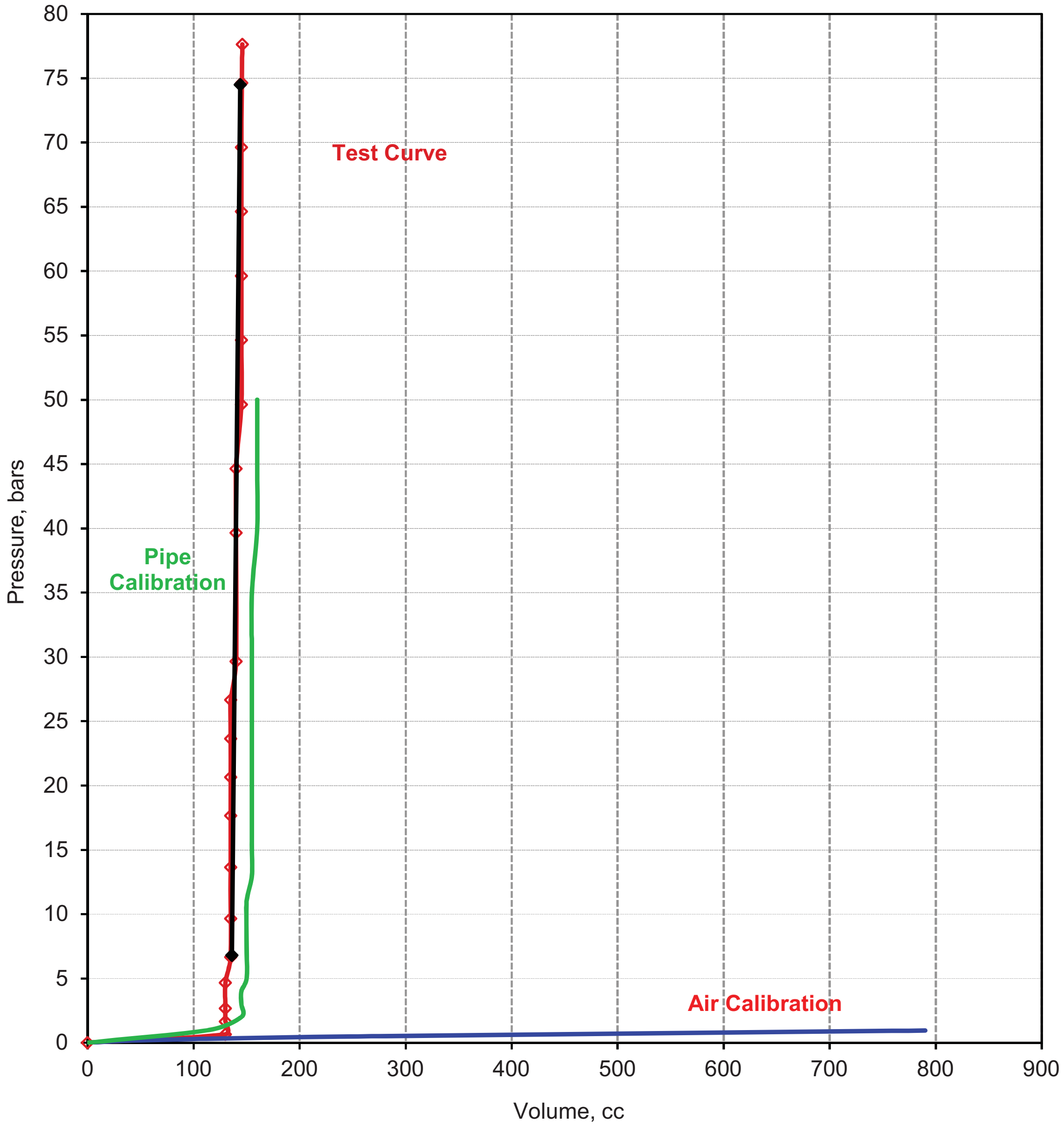


Applied Pressure vs. Volume

Pressuremeter Test : 5

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-44	Limit Pressure, p_L :	>80 Bar
IPMT.:	1		
Test Depth :	18.00 m	Deformation Modulus, E_m :	20934.5 kg/sq.cm

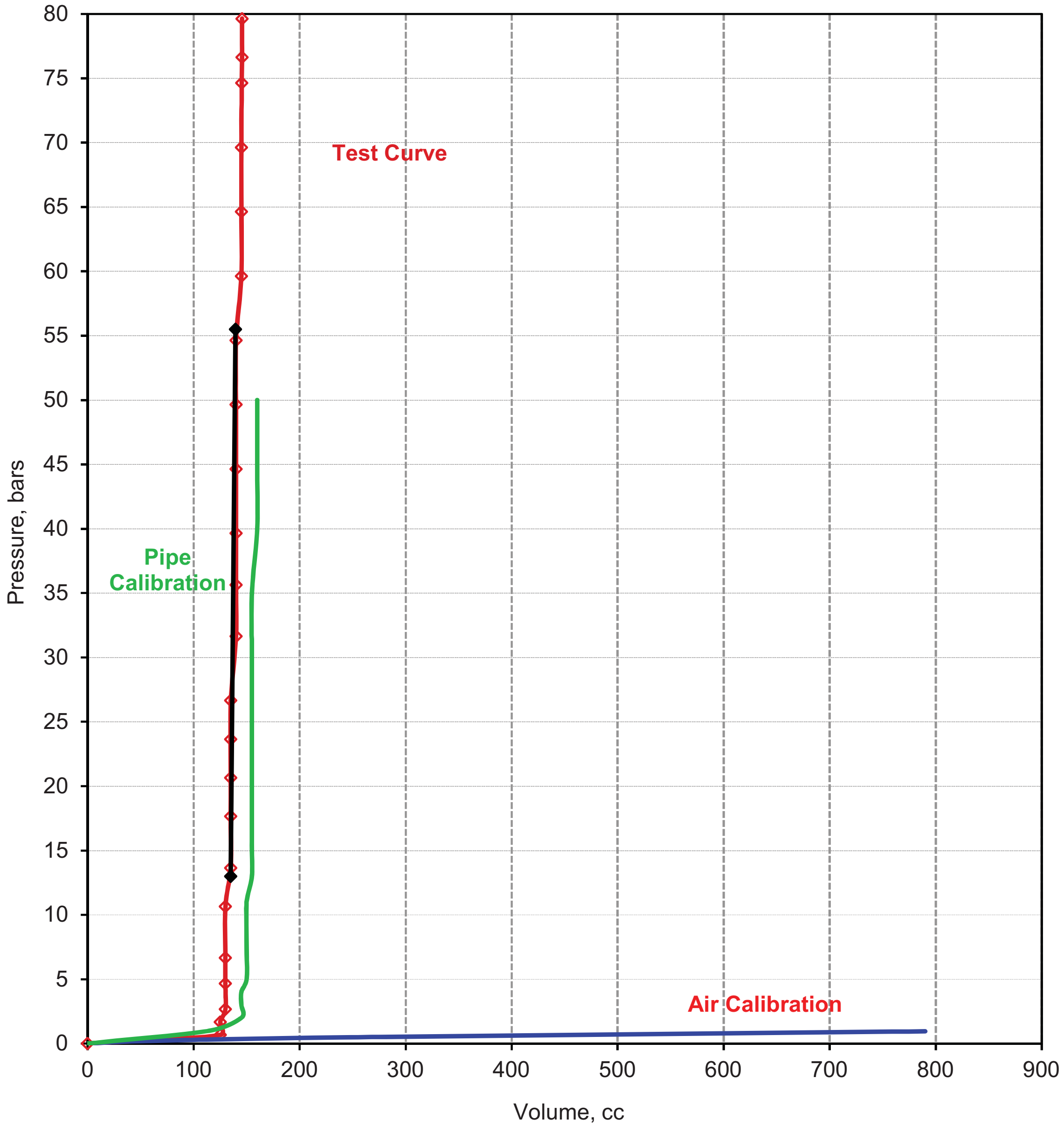


Applied Pressure vs. Volume

Pressuremeter Test : 5

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-45	Limit Pressure, p_L :	>80 Bar
IPMT.:	1		
Test Depth :	20.00 m	Deformation Modulus, E_m :	23822.7 kg/sq.cm

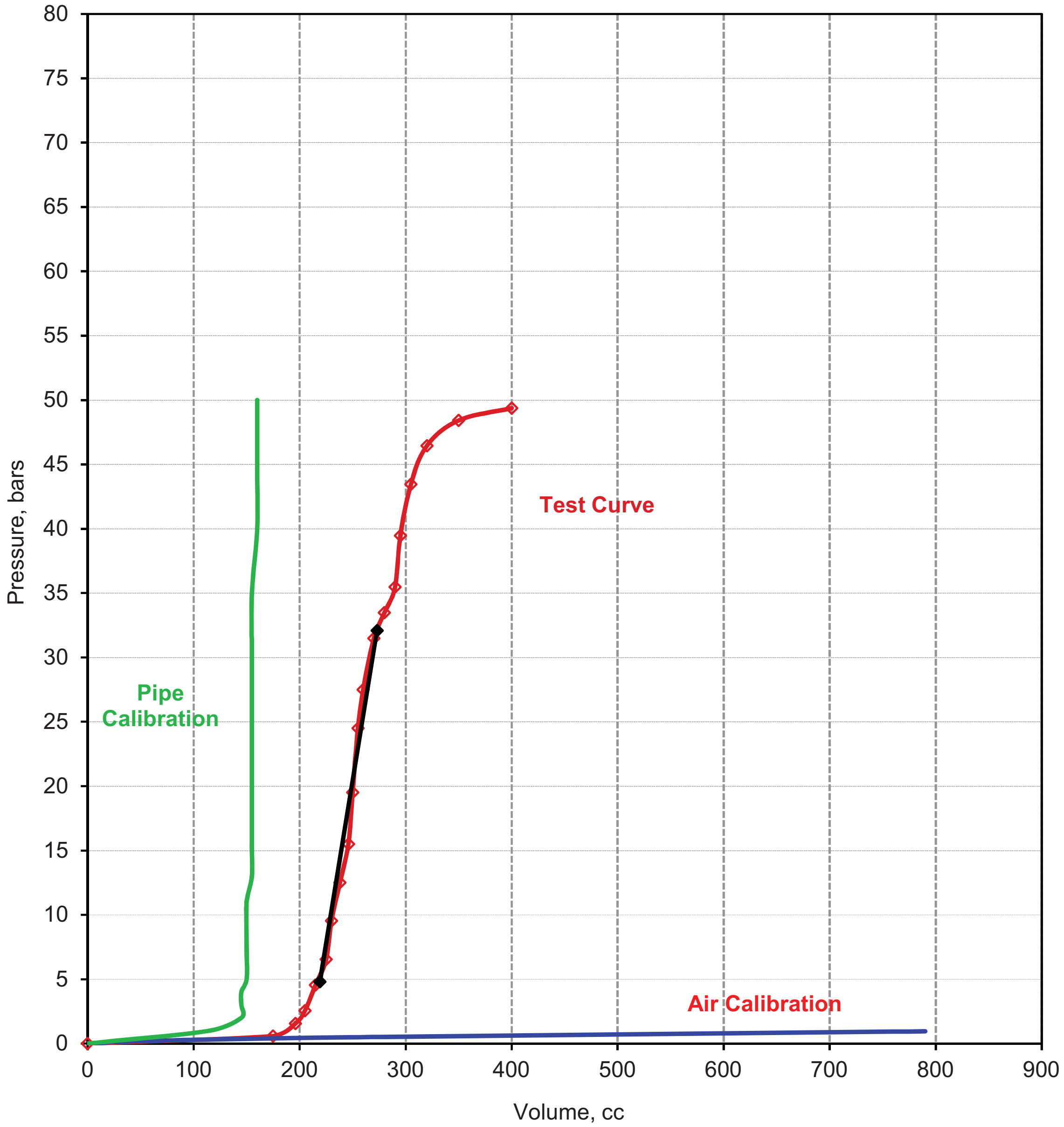


Applied Pressure vs. Volume

Pressuremeter Test : 6

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-46	Limit Pressure, p_L :	49.4 bar
IPMT.:	2		
Test Depth :	2.00 m	Deformation Modulus, E_m :	1393.2 kg/sq.cm

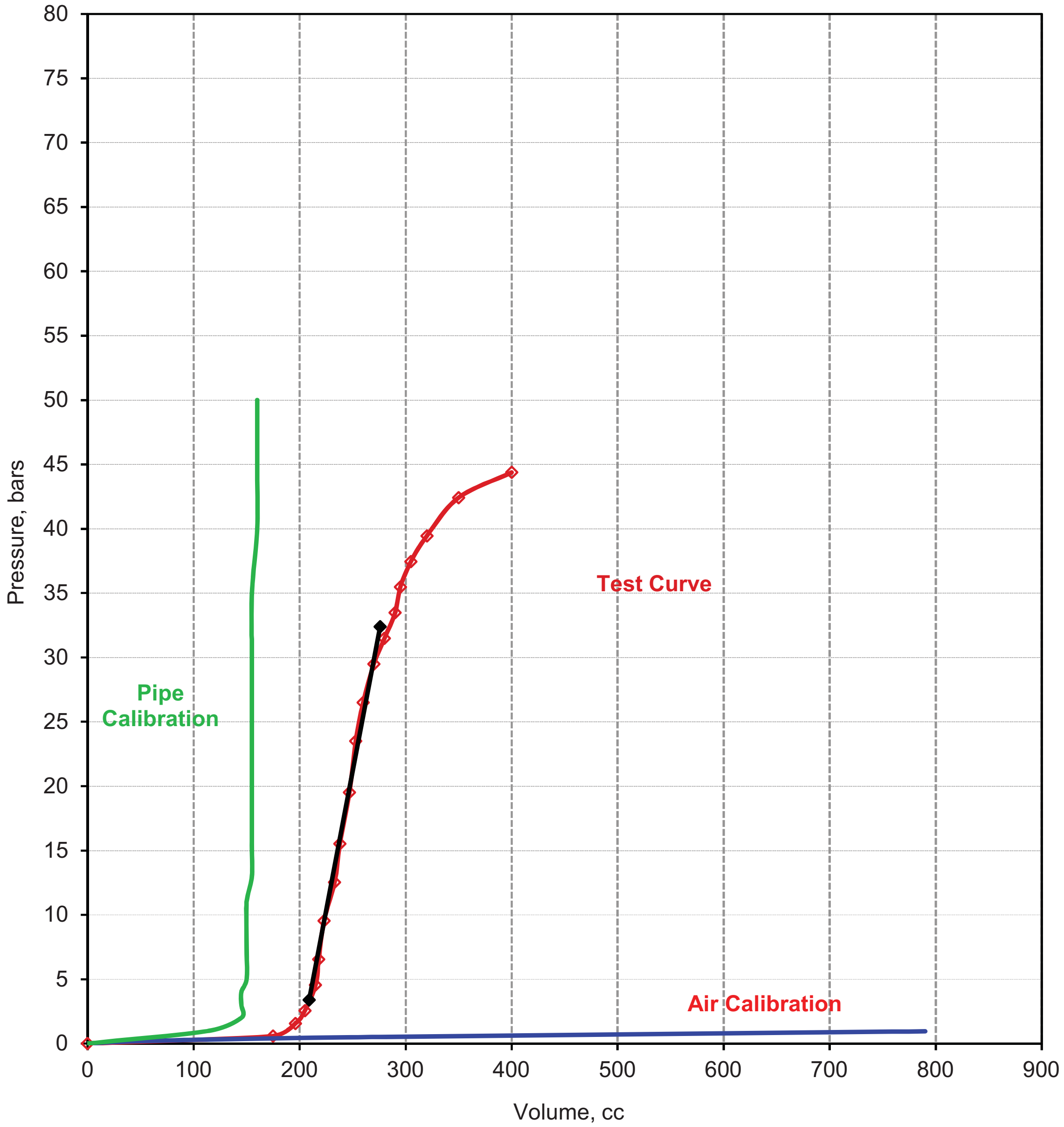


Applied Pressure vs. Volume

Pressuremeter Test : 6

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-47	Limit Pressure, p_L :	44.4 bar
IPMT.:	2		
Test Depth :	4.00 m	Deformation Modulus, E_m :	1188.8 kg/sq.cm

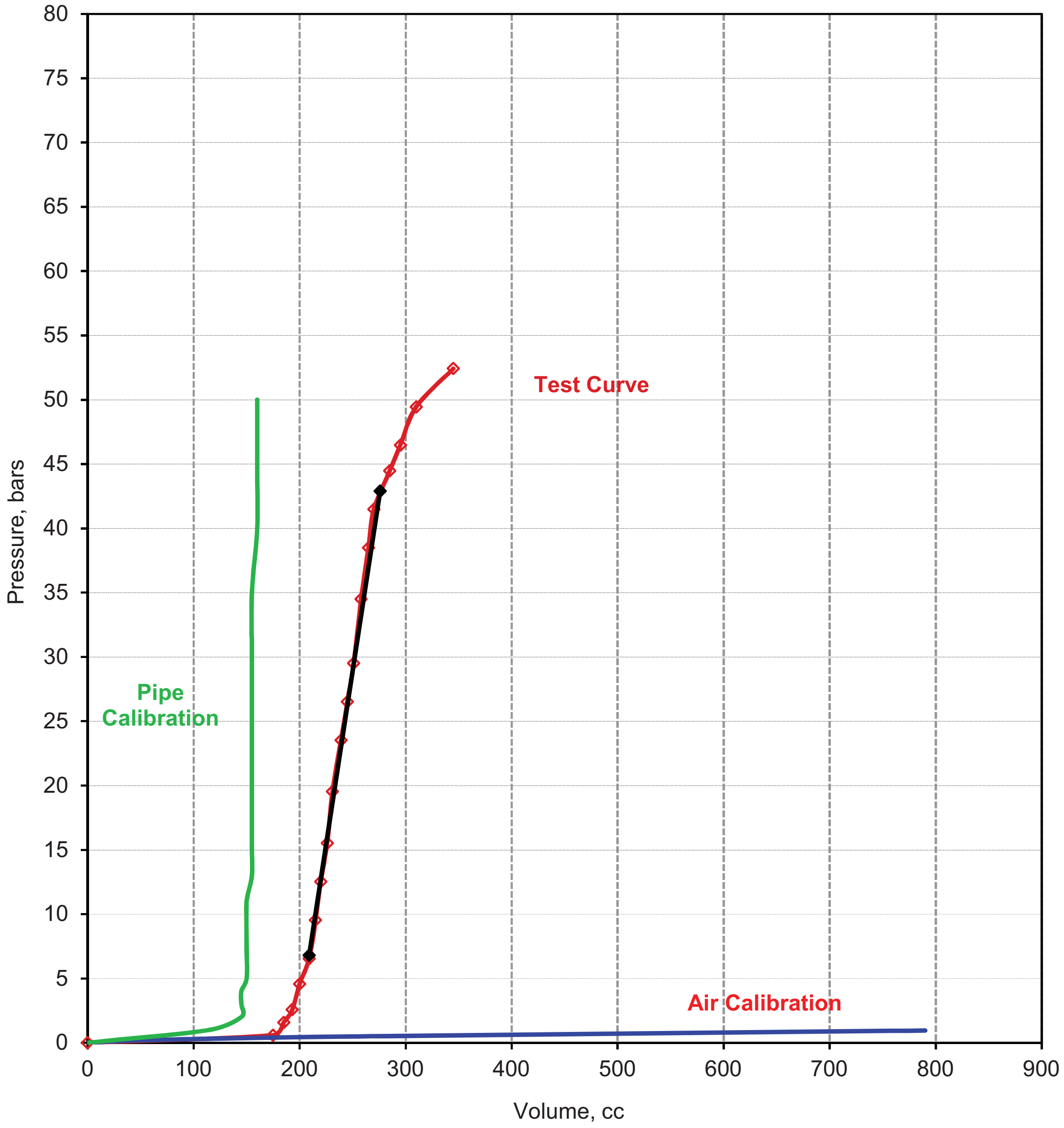


Applied Pressure vs. Volume

Pressuremeter Test : 6

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-48	Limit Pressure, p_L :	52.5 bar
IPMT.:	2		
Test Depth :	6.00 m	Deformation Modulus, E_m :	1479.8 kg/sq.cm

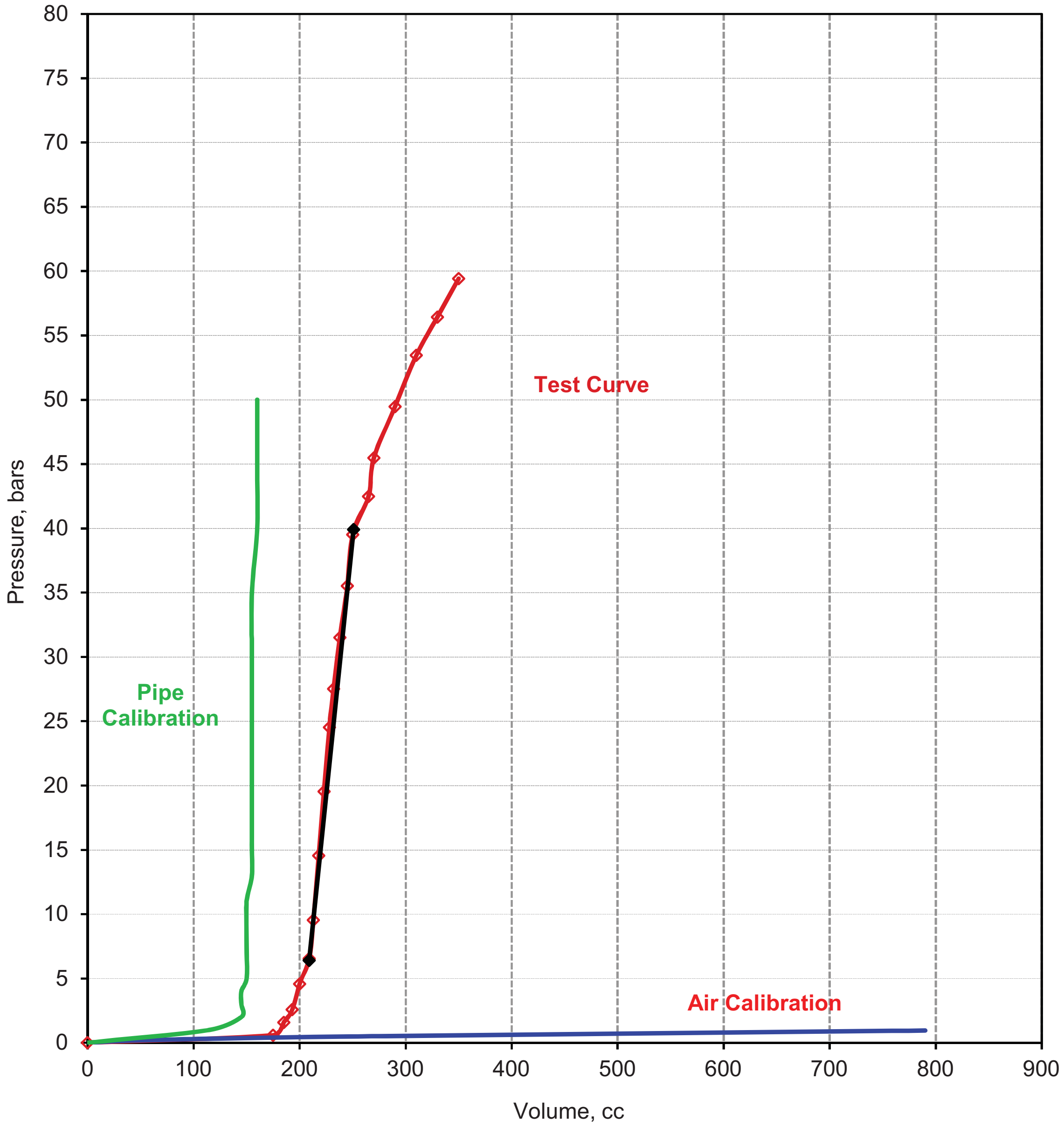


Applied Pressure vs. Volume

Pressuremeter Test : 6

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-49	Limit Pressure, p_L :	59.5 bar
IPMT.:	2		
Test Depth :	8.00 m	Deformation Modulus, E_m :	2164.1 kg/sq.cm

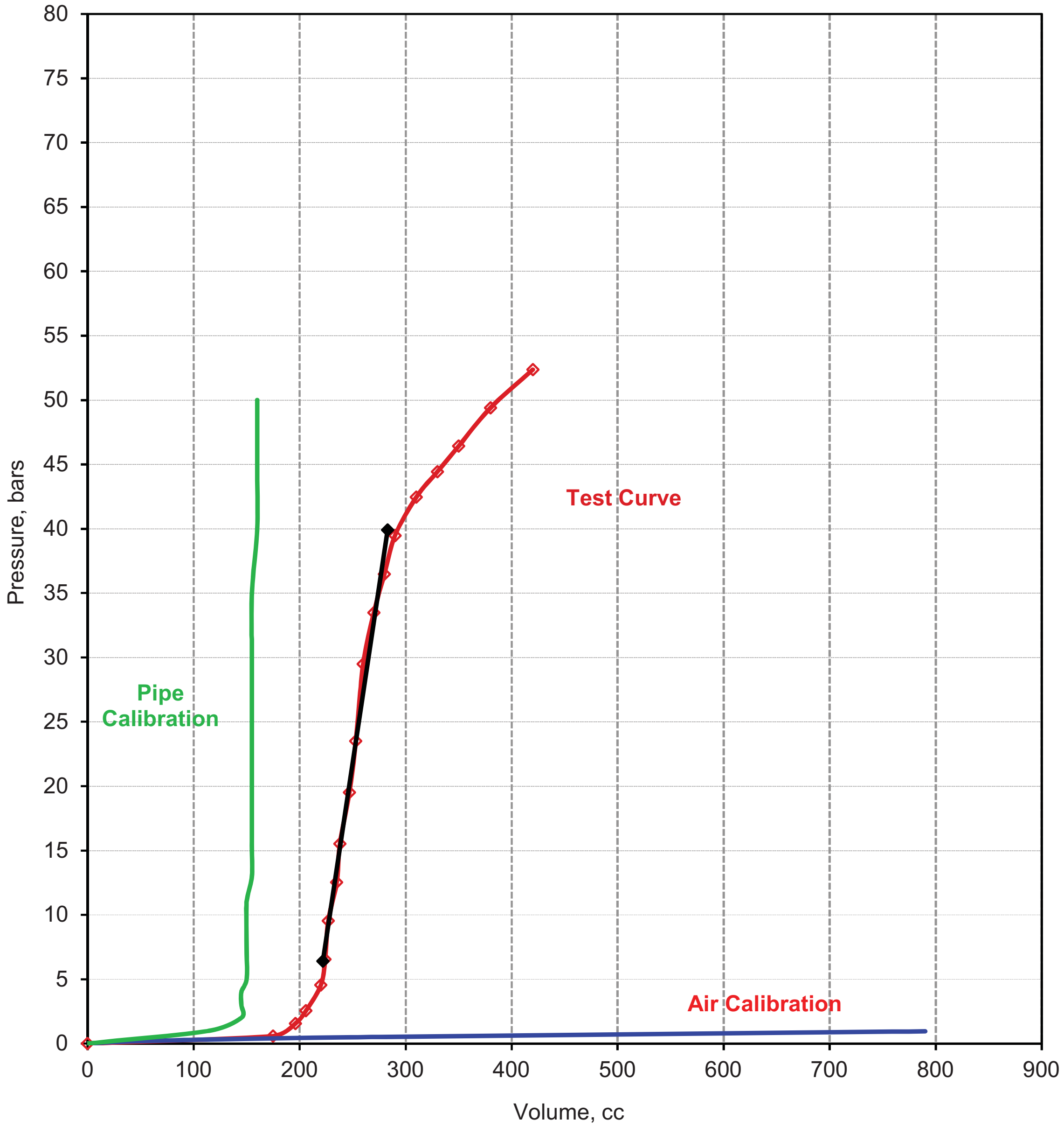


Applied Pressure vs. Volume

Pressuremeter Test : 6

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-50	Limit Pressure, p_L :	52.4 bar
IPMT.:	2		
Test Depth :	10.00 m	Deformation Modulus, E_m :	1522.9 kg/sq.cm

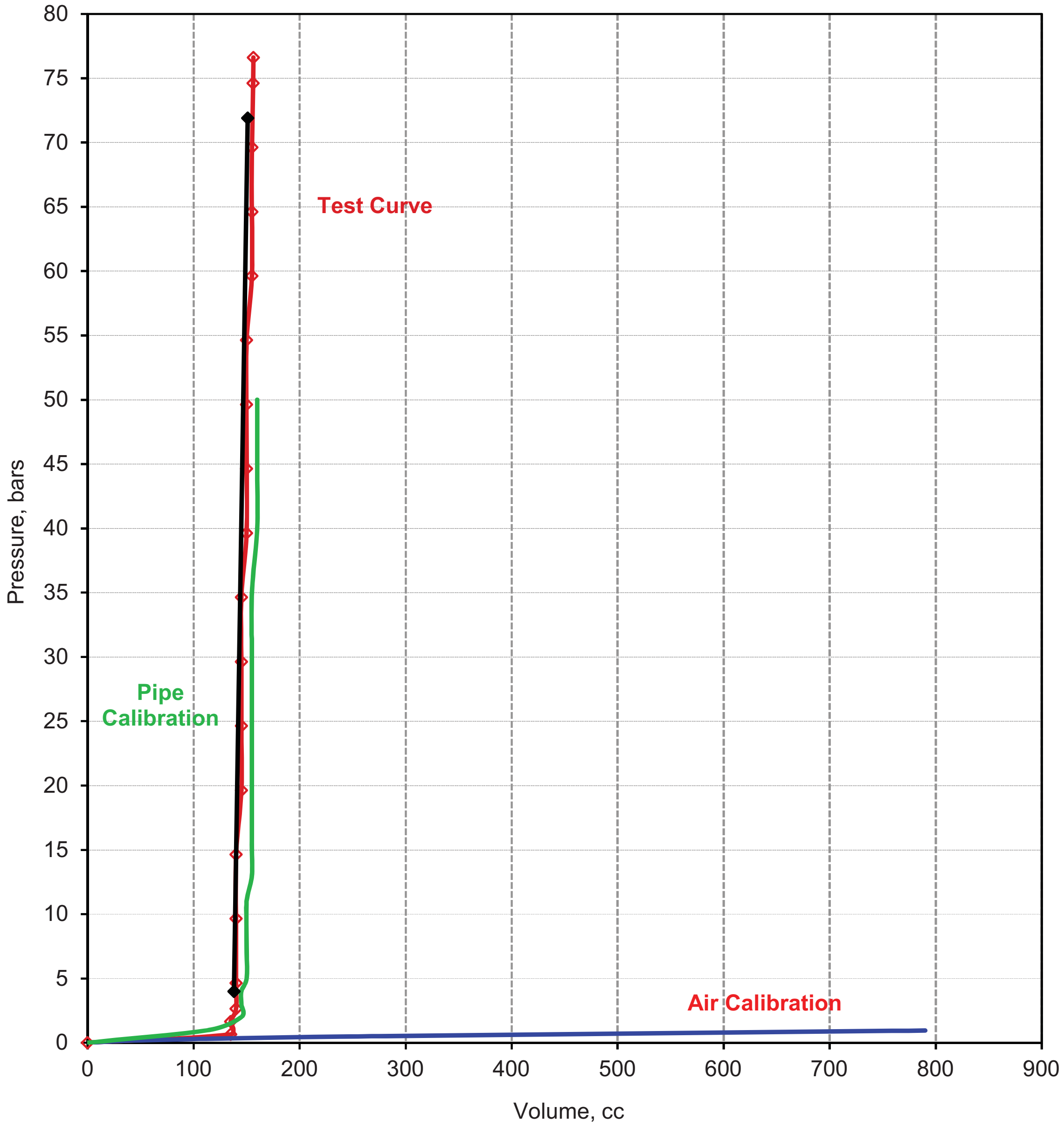


Applied Pressure vs. Volume

Pressuremeter Test : 6

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-51	Limit Pressure, p_L :	>80 Bar
IPMT.:	2		
Test Depth :	12.00 m	Deformation Modulus, E_m :	12983.4 kg/sq.cm

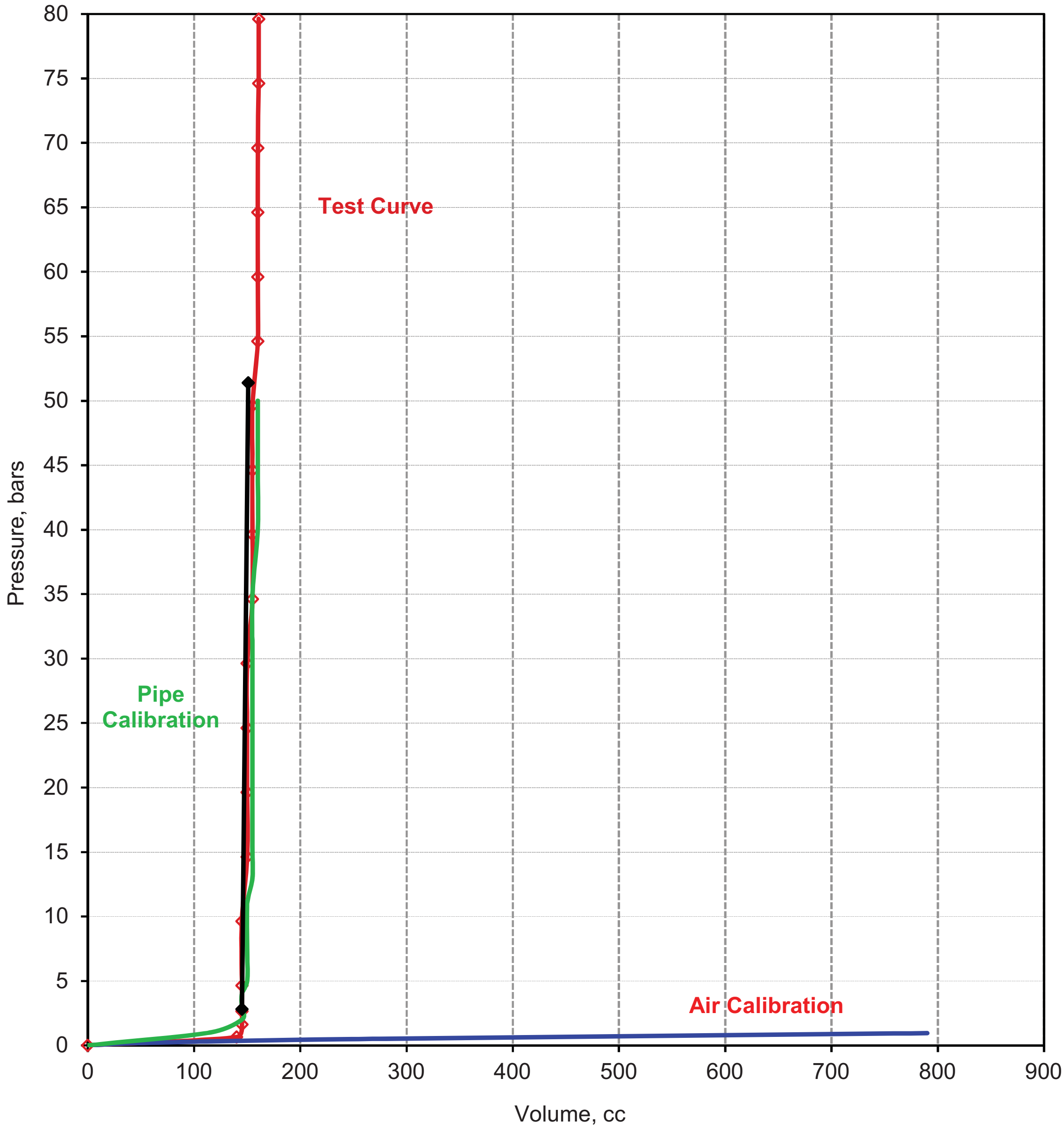


Applied Pressure vs. Volume

Pressuremeter Test : 6

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-52	Limit Pressure, p_L :	>80 Bar
IPMT.:	2		
Test Depth :	15.00 m	Deformation Modulus, E_m :	20210.1 kg/sq.cm

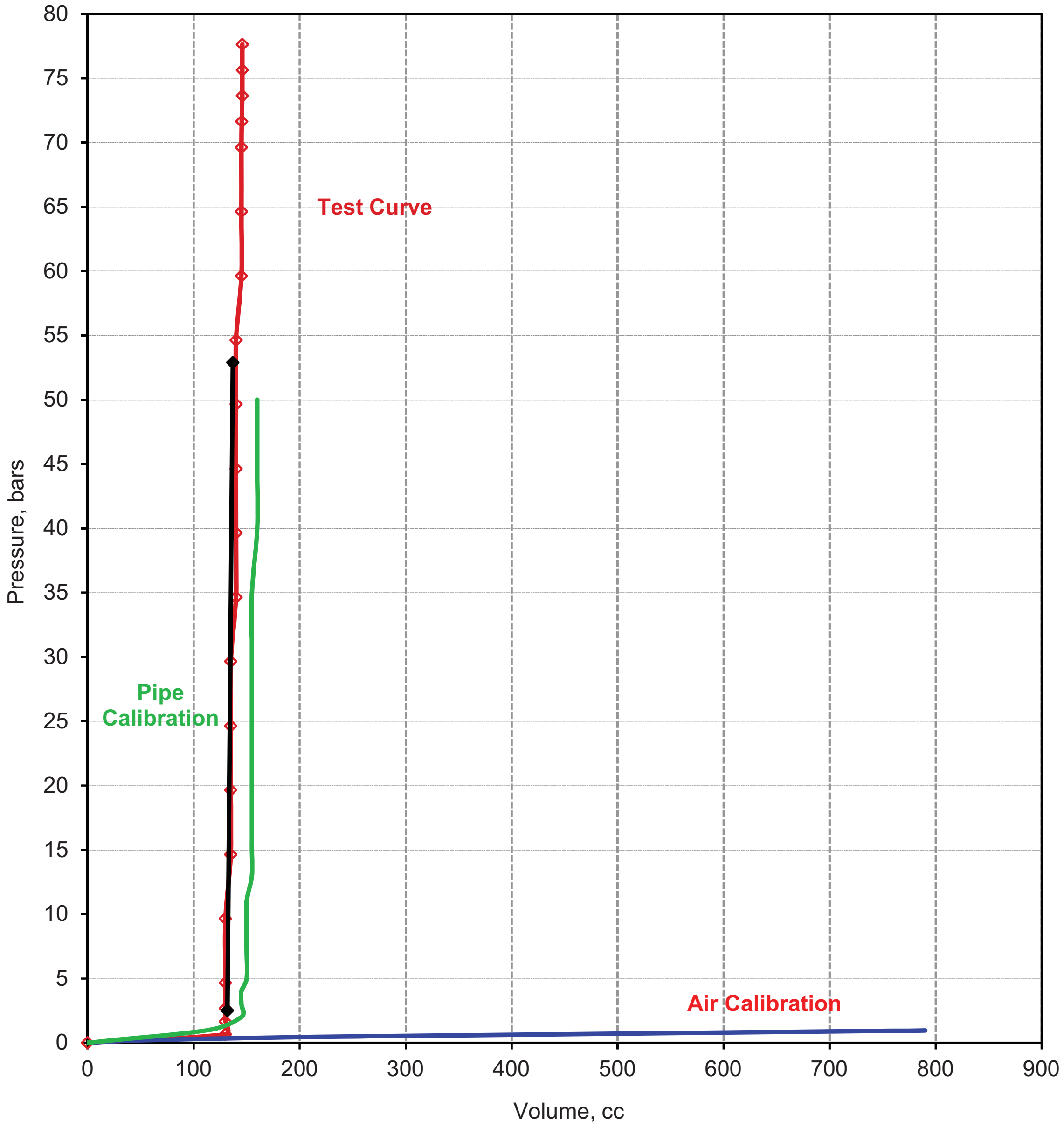


Applied Pressure vs. Volume

Pressuremeter Test : 6

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-53	Limit Pressure, p_L :	>80 Bar
IPMT.:	2		
Test Depth :	18.00 m	Deformation Modulus, E_m :	24788.4 kg/sq.cm

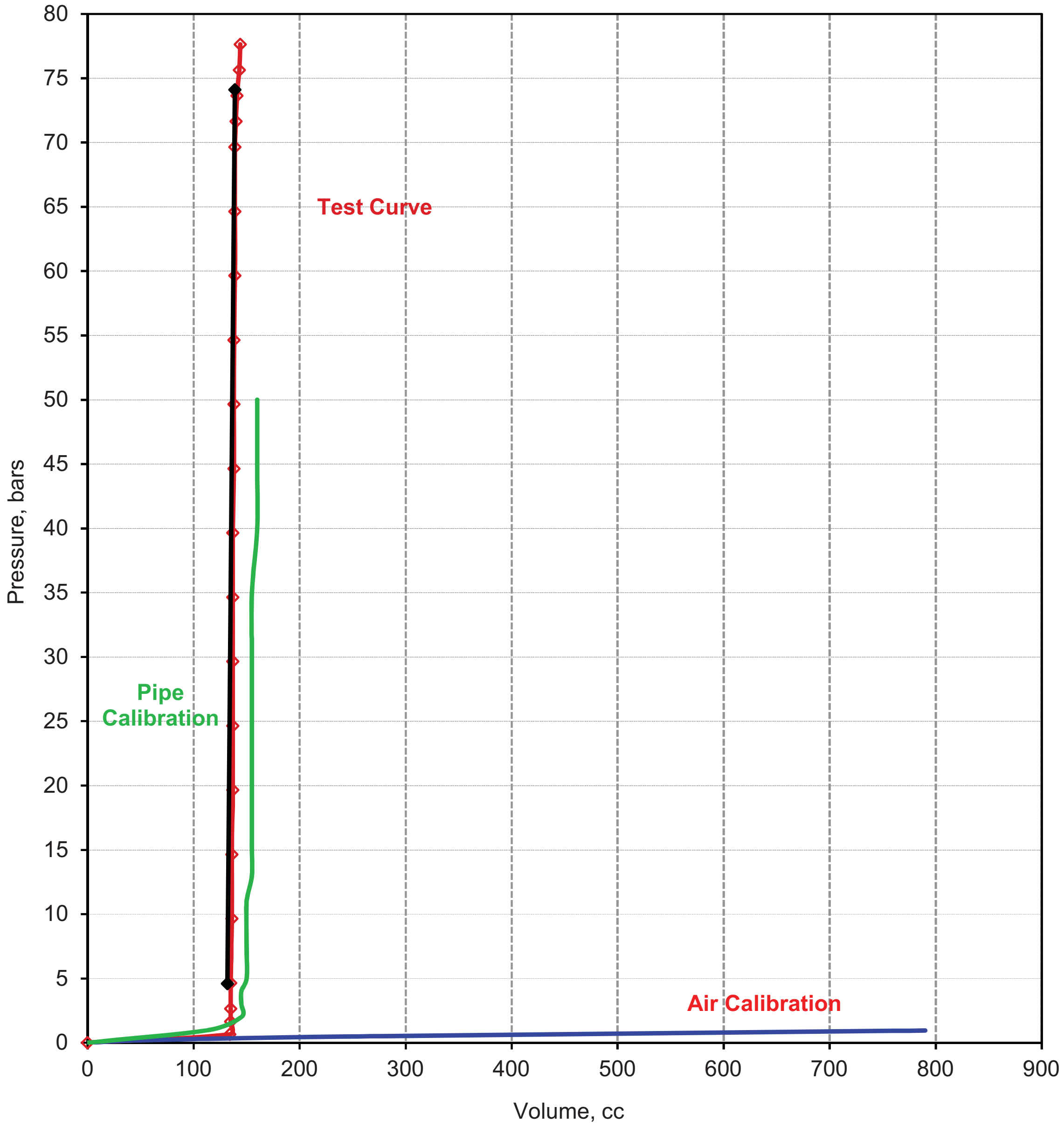


Applied Pressure vs. Volume

Pressuremeter Test : 6

IS: 1892-1979, RA-2007

Test Details		Test Results	
Test Designation. :	PMT-54	Limit Pressure, p_L :	>80 Bar
IPMT.:	2		
Test Depth :	20.00 m	Deformation Modulus, E_m :	24442.5 kg/sq.cm



Applied Pressure vs. Volume

COREBOX PHOTOGRAPHS

IBH-1

IBH-2

IBH-3

IBH-4

Ibh5

Ibh6

Ibh7

IBH-8

IBH-9

IBH-10

IBH-11

IBH-12

IBH-13

IBH-14

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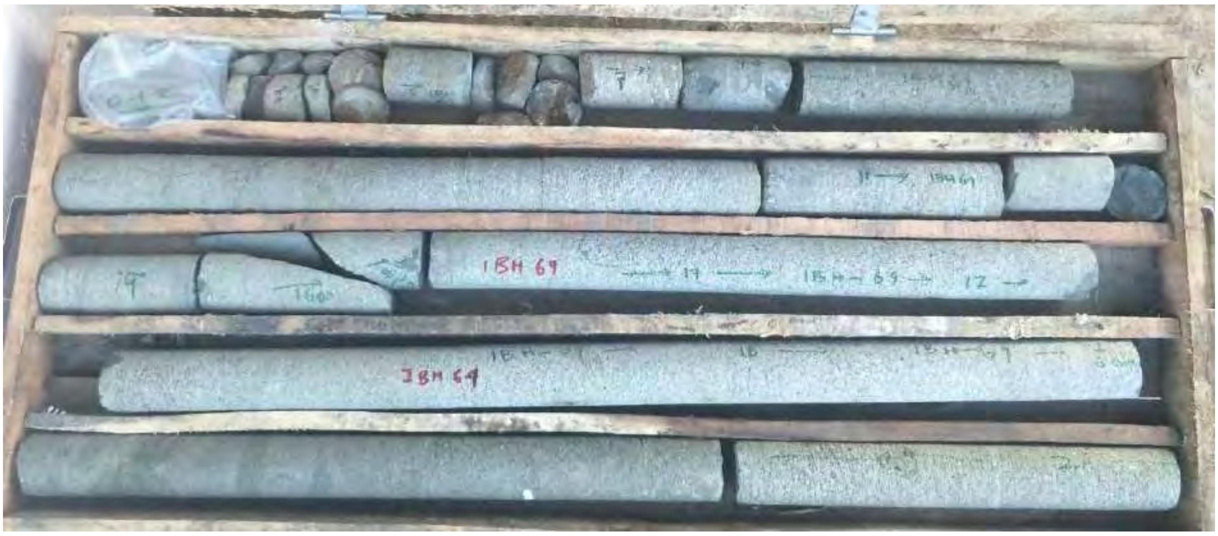
IBH-68



IBH-69

Sample Calculations

BEARING CAPACITY ANALYSIS FOR FOUNDATIONS ON ROCK

Analysis as per IS 12070-1987

Structure : Wagon Tippler (IBH-8, IBH-9 & IBH-32)
Foundation Depth: 5 m below NGL (RL 202.4 m)

BEARING CAPACITY ANALYSIS FOR OPEN FOUNDATIONS BEARING ON ROCK HAS BEEN DONE BY TWO DIFFERENT METHODS AS GIVEN BELOW:

1) Based on Core Strength as per Clause 6.0 of IS 12070-1987
2) Based on RMR value as per Clause 5.3 of IS 12070-1987

Rock Type: Fractured Basalt
Foundation Depth: 5 m
Below Founding Level : Rock Core Recovery: 30 **%** RQD value 0 %

1) Core Strength: Clause 6.0 of IS 12070-1987

$$q_{net\ safe} = q_o * N_j * c_{sub} * c_c * c_s$$

where:

$q_{net\ safe}$ = safe net bearing capacity
q_o = average unixial compressive strength
N_j = empirical coefficient
c_s = correction for orientation of joints
c_c = correction for solution cavities (in limestone)
c_{sub} = correction for saturation

Empirical Coefficient depending on the spacing of discontinuities (as Table 4 and Fig. 1) :

Spacing of Discontinuities, cm	N_j
300	0.4
100-300	0.25
30-100	0.1

Average Unixial Compressive Strength q_0 = 700 T/m^2
Coefficient (spacing of discontinuities): N_j= 0.25
Correction for saturation/submergence: c_{sub}= 0.50
Correction for orientation of joints c_s = 0.75
Correction for solution cavities (in limestone) c_c = 1.00

$q_{net\ safe}$ = 65.6 T/m^2

2) Based on RMR value: Clause 5.3 of IS 12070-1987

Class of rock	I	II	III	IV	V
Description of rock	Very Good	Good	Fair	Poor	Very Poor
RMR	100-81	80-61	60-41	40-21	20-0
$q_{net\ safe}$ (T/m^2)	600-448	440-288	280-141	135-48	45-30

RMR value for design = 24 Class of Rock: IV Rock Description: Poor

$q_{net\ safe}$ = 61.7 T/m^2

Recommended value of Net Safe Bearing Pressure for Design: **60 T/m^2**

PRESSUREMETER : CORRECTED LIMIT PRESSURE Typical Calculations

Test Designation : IPMT-1
Test Depth : 2 m
Limit Pressure (p_l) : 30 bar

Volume Correction = $P_1 + (P_2 - P_1) * (V - V_1) / (V_2 - V_1)$
= 0.50 + (0.60-0.50) * (390-255) / (375-255)
= 0.61

Corrected Limit Pressure = 30 - 0.61
= **29.39 bars**

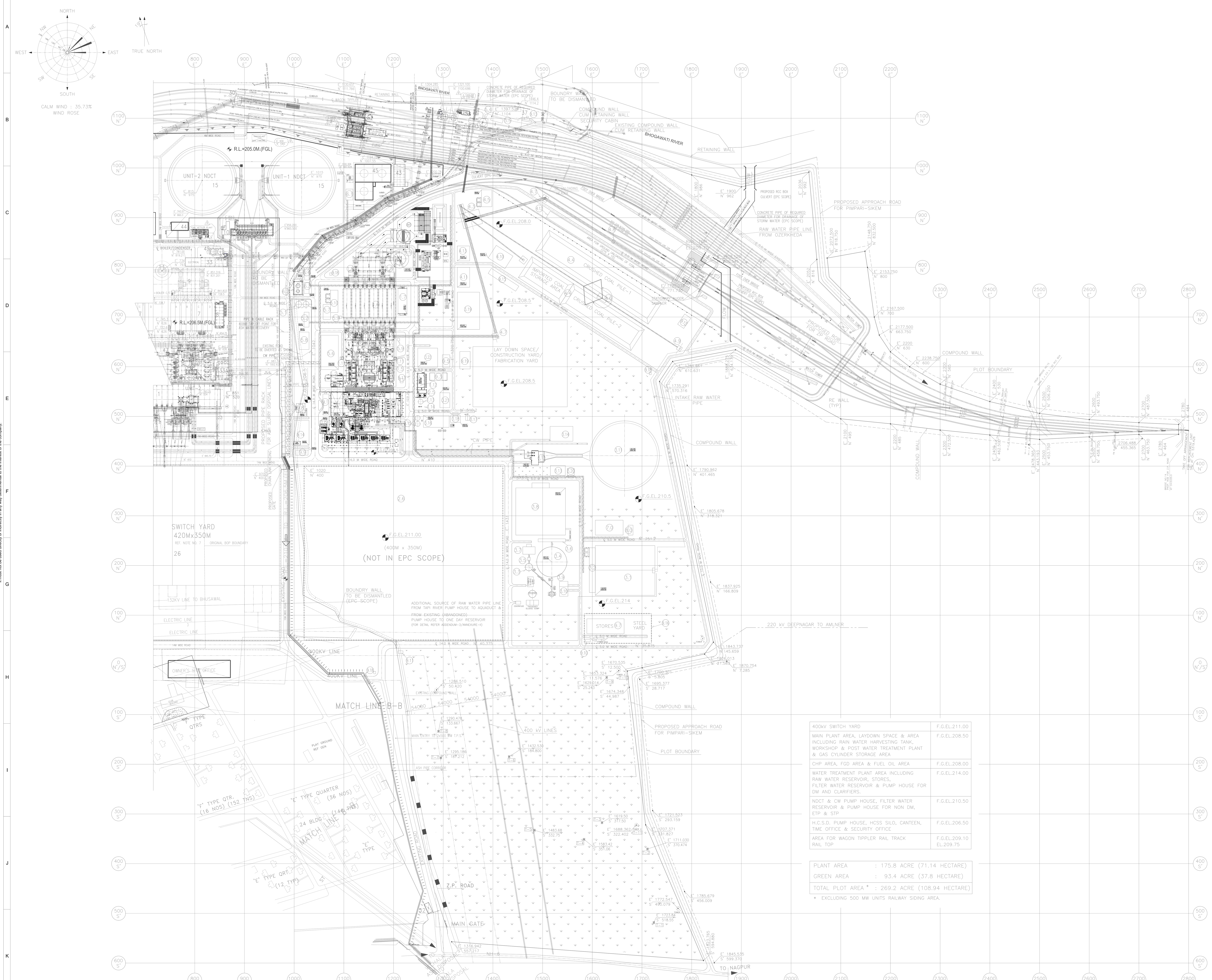
Pipe Calibration		Air Calibration		Field Data		Correction	
Pressure (Bar)	Volume (cc)	Pressure (Bar)	Volume (cc)	Pressure (Bar)	Volume (cc)	Pressure (Bar)	Volume (cc)
0.00	0	0.00	0	0.00	0.0	0.00	0.0
1.00	115	0.10	20	1.00	210.0	0.55	210.0
2.00	145	0.20	55	2.00	220.0	1.54	220.0
3.00	145	0.30	105	3.00	235.0	2.52	235.0
4.00	145	0.40	170	5.00	240.0	4.52	240.0
5.00	150	**0.50**	**255**	8.00	250.0	7.51	250.0
7.00	150	**0.60**	**375**	9.00	250.0	8.51	250.0
9.00	150	0.75	545	10.00	260.0	9.50	260.0
11.00	150	0.95	790	12.00	265.0	11.49	265.0
13.00	155			13.00	270.0	12.49	270.0
15.00	155			16.00	280.0	15.48	280.0
18.00	155			18.00	290.0	17.47	290.0
21.00	155			20.00	300.0	19.46	300.0
24.00	155			22.00	310.0	21.45	310.0
27.00	155			23.00	315.0	22.45	315.0
30.00	155			25.00	325.0	24.44	325.0
35.00	155			26.00	335.0	25.43	335.0
40.00	160			27.00	350.0	26.42	350.0
45.00	160			29.00	370.0	28.40	370.0
50.00	160			**30.00**	**390.0**	**29.39**	**390.0**

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

DRAWING No. PE-DG-415-100-M001

CUSTOMER'S DRAWING No.



400kV SWITCH YARD	F.G.EL.211.00
MAIN PLANT AREA, LAYDOWN SPACE & AREA INCLUDING RAIN WATER HARVESTING TANK, WORKSHOP & POST WATER TREATMENT PLANT & GAS CYLINDER STORAGE AREA	F.G.EL.208.50
CHP AREA, FGD AREA & FUEL OIL AREA	F.G.EL.208.00
WATER TREATMENT PLANT AREA INCLUDING RAW WATER RESERVOIR, STORES, FILTER WATER RESERVOIR & PUMP HOUSE FOR DM AND CLARIFIERS.	F.G.EL.214.00
NDCT & CW PUMP HOUSE, FILTER WATER RESERVOIR & PUMP HOUSE FOR NON DM, ETP & STP	F.G.EL.210.50
H.C.S.D. PUMP HOUSE, HCSS SILO, CANTEEN, TIME OFFICE & SECURITY OFFICE	F.G.EL.206.50
AREA FOR WAGON TIPPLER RAIL TRACK RAIL TOP	F.G.EL.209.10 EL.209.75

PLANT AREA	:	175.8 ACRE (71.14 HECTARE)
GREEN AREA	:	93.4 ACRE (37.8 HECTARE)
TOTAL PLOT AREA *	:	269.2 ACRE (108.94 HECTARE)

* EXCLUDING 500 MW UNITS RAILWAY SIDING AREA.

FACILITY	DESCRIPTION OF FACILITIES	SIZES (M)
1.0	POWER BLOCK AREA	
1.1	TG BUILDING	139.5x48
1.2	TG CONTROL EQUIPMENT ROOM/PCR	21x33.85
1.3	BOILER	82x53
1.4	FD/PA FANS	2 No Each
1.5	MILLS & BUNKERS	8 Bunkers
1.6	ESP	–
1.7	ESP CONTROL ROOM	56.7x18
1.8	ID FANS	–
1.9	CHIMNEY	–
1.10	SPACE FOR FGD	70x50
1.11	MILL REJECT SILO	7.5x5.0
1.12	AIR COMPRESSOR BUILDING/MILL REJECT COMPRESSOR & CONTROL ROOM	14x48
1.13	CONDENSATE STORAGE TANK	ø11
1.14	CONDENSATE STORAGE TANK PUMP HOUSE	15x7.5
1.15	DG BUILDING/AIR WASHER BLDG.	20x26/18x16
2.0	ELECTRICAL FACILITIES	
2.1	GENERATOR TRANSFORMER	–
2.2	STATION TRANSFORMER	–
2.3	UNIT TRANSFORMER	–
2.4	UNIT AUXILIARY TRANSFORMER	
2.5	STATION AUXILIARY TRANSFORMER	–
2.6	400kV SWITCH YARD (CUSTOMER SCOPE)	400x350
3.0	WATER SYSTEM	
3.1	RAW WATER & FIRE WATER STORAGE TANK	120x100
3.2	RAW & FIRE WATER PUMP HOUSE	90x12
3.3	DM WATER CLARIFIER (PT PLANT)	–
3.4	NON–DM WATER CLARIFIER (PT PLANT)	–
3.5	GRAVITY FILTERS(FOR DM WATER) (PT PLANT)	–
3.6	GRAVITY FILTERS(FOR NON DM WATER) (PT PLANT)	–
3.7	FILTER WATER TANK & PUMP HOUSE FOR DM	24x10
3.8	FILTER WATER RESERVOIR & PUMP HOUSE FOR NON DM	80x70
3.9	OZONIZATION PLANT(PRE–TREATMENT AREA)	19x16.5
3.10	CHEMICAL HOUSE/ELEC. & CONTROL ROOM	–
3.11	N.D. COOLING TOWER	ø132
3.12	CW/ ACW PUMP HOUSE	13.5x28.5
3.13	OZONIZATION & CW TREATMENT AREA (C.W.SYSTEM)	36x10
3.14	CW SIDE STREAM FILTRATION PLANT	46x30
3.15	DM WATER STORAGE TANKS(2 NOS.)	ø12
3.16	POST WATER TREATMENT PLANT AREA (DM PLANT)	55x35
3.17	NEUTRALISING PIT	12x10
3.18	ACID/ALKALI STORAGE AREA	20x8
3.19	RAIN WATER HARVESTING POND	–
3.20	SULPHURIC ACID STORAGE AREA FOR CW TREATMENT	14x14.5
3.21	CHEMICAL LAB (PCRI–HWR)	30X20
3.22	CPU REGENRATION BUILDING	40x38.5
4.0	COAL HANDLING PLANT (ISG SCOPE)	
4.1	WAGON TIPPLER	–
4.2	CONTROL ROOM FOR WAGON TIPPLER	–
4.3	CRUSHER HOUSE	36x30
4.4	CRUSHED COAL STORAGE AREA	270x50x11(2nos.)
4.5	CHP MCC/CONTROL ROOM	21x34
4.6	STACKER RECLAIMER	–
4.7	TRANSFER POINTS	12x12
4.8	PENT HOUSE	–
4.9	DRIVE HOUSE FOR STACKER RECLAIMER	–
4.10	COAL PILE RUN–OFF POND	30x40
4.11	CHP MAINTENANCE BUILDING	25x40
4.12	AREA FOR GROUND UNLOADING OF COAL	650 M^2
4.13	CHP PUMP HOUSE	30x25
5.0	ASH HANDLING PLANT (ISG SCOPE)	
5.1	HCSS SILO	–
5.2	H.C.S.D. PUMP HOUSE & MCC ROOM	10x30
5.3	DELETED	–
5.4	DRY ASH SILO	–
5.5	DRY ASH SILO UTILITY BUILDING	24x8
5.6	ASH WATER TANK & ASH SLURRY PUMP HOUSE	40x69
5.7	AHP COMPRESSORS & BLOWERS	15x30
5.8	TUBE SETTLER PLANT	20x35
5.9	FLY ASH COLLECTION SUMP–1&2	–
5.10	AHP MCC CUM CONTROL ROOM	45x15
6.0	FUEL OIL SYSTEM	
6.1	FUEL OIL TRANSFER PUMP HOUSE	14x22
6.2	HFO & LDO DAY TANK AREA	32x20
6.3	HFO & LDO PRESSURIZING PUMP HOUSE	22x10
6.4	ELECTRICAL ANNEXE FOR FOPH	9X25
7.0	EFFLUENT TREATMENT PLANT	56x30
8.0	SEWAGE TREATMENT PLANT	20x10
9.0	NON–PLANT BUILDING	
9.1	SERVICE BUILDING	12x42
9.2	WORKSHOP–DELETED	65x30
9.3	LUBE OIL STORAGE SHED WITH STORAGE YARD	15x15
9.4	FIRE STATION–DELETED	10x25
9.5	GAS CYLINDER STORAGE AREA	15x25
9.6	FOPH FOAM SHED	10x13
9.7	STORES	75x30
9.8	CANTEEN	17.5x17.5
9.9	TIME OFFICE & SECURITY OFFICE	25x10
9.10	SECURITY OFFICE FOR STORES	10x5
9.11	SECURITY CABIN	10x5
9.12	COAL SAMPLING & PROCESSING ROOM	15x25
9.13	WEIGH BRIDGE FOR DRY ASH SILO	–
9.14	PARKING SHEDS WITH GATE OFFICE	30x50
9.15	PAY LOADER SHED	12x66
9.16	STEEL YARD INCLUDING STORES & WEIGH BRIDGE	135x60
9.17	FIRE WATER BOOSTER PUMP HOUSE	9x6
9.18	AMBIENT AIR QUALITY MONITORING SYSTEM	4x5
9.19	AMMONIA UNLOADING AND STORAGE AREA (FOR SCR)	21x35

NOTES:

1. ALL DIMENSIONS ARE IN MM AND ALL ELEVATIONS ARE IN METERS. THE GRIDS AND CO–ORDINATES ARE SHOWN IN METERS.
2. BUILDINGS OUTER LINES SHOWN ARE COLUMNS GRID LINES.
3. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR
4. ELEVATION ± 0.00M WHICH CORRESPONDS TO RL.(+)209.0M.
5. HIGH FLOOD LEVEL RL.198.20M
6. PROPOSED RCC BOX CULVERTS SHALL BE AS PER INDIAN RAILWAY STANDARD.
7. RAILWAY LAYOUT IS INDICATIVE AND THE SAME SHALL BE PROVIDED AS PER RAILWAY'S APPROVAL.
8. EXISTING FIRE STATION OF 2x500MW UNITS SHALL BE USED FOR 1x660MW. (CO–ORDINATES OF EXISTING FIRE STATION E'517.0 & N'352.6, SIZE 20.5Mx10M)
9. LAYOUT/SIZE OF VARIOUS EQUIPMENTS/FACILITIES IS TENTATIVE ONLY AND SHALL BE FINALIZED DURING DETAIL ENGINEERING.
10. CHANGES DUE TO INTRODUCTION OF MoEF NORMS, FGD & SCR, CHANGE IN WORST COAL PARAMETER (GCV 3200KCAL/KG) & VAM TYPE AC SYSTEM (NOT IN PRESENT SCOPE OF LOA) ARE SHOWN INDICATIVELY.

IMPACT OF THE PROVISION ARE LISTED BELOW:

a) SCR–CHIMNEY TO BOILER 'D' ROW INCREASED.
b) FGD – FGD FACILITIES INDICATED. CHIMNEY RELOCATED.
c) VAM – ADDITIONAL SPACE OF 10.5Mx11M INDICATED NEAR CONTROL TOWER.
d) RAIN WATER POND, CHP MCC/CONTROL ROOM, PUMP HOUSE & MAINTENANCE BUILDING RELOCATED.

LEGEND:

COMPOUND WALL
EXISTING PLANT BOUNDARY
MSPGCL PROPERTY FENCING
GREEN BELT
PIPE/CABLE RACK
400kV TRANSMISSION LINE
RAILWAY LINE

BCN BELT CONVEYOR
PH PENT HOUSE
PCH PRIMARY CRUSHER HOUSE
SCH SECONDARY CRUSHER HOUSE
JNT JUNCTION TOWER
ERH EMERGENCY RECLAIM HOPPER
WATCH TOWER
400KV LINE TOWER

REFERENCE DRAWINGS:

1. CUSTOMER PLOT PLAN (GENERAL LAYOUT) PE–189–GA–101–REV.09
2. PLOT PLAN BOUNDARY MARKING DG/253–NEW–001/REV.0 (189–MAHAGENCO–05/R0)

MAHAGENCO

MAHARASHTRA STATE POWER GENERATION CO.LTD.
BHUSAWAL T.P.S. UNIT–6 : 1 X 660 MW PROJECT

1 X 660 MW BHUSAWAL T.P.S. UNIT–6 TPP

JOB NO. 415
STATUS CONTRACT
DISTRIBUTION

BHEL

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

REV.	DATE	ALTD	CHD	APPD
02	24.07.18	AK	AMT	PM
	PLOT PLAN REVISED AS PER CUSTOMER OBSERVATION VIDE MAIL DTD:21.06.2018			
01	18.04.18	AK –sd/	AMT–sd/	RP –sd/
	PLOT PLAN REVISED AS PER CUSTOMER OBSERVATION VIDE MAIL DTD:17.03.2018			

DEPT CODE M

	NAME	SIGN	DATE
DRN	AK	–sd/	19.02.2018
DESN	AMT	–sd/	19.02.2018
CHD	RP	–sd/	19.02.2018
APPD	JJ	–sd/	19.02.2018

TITLE

PLOT PLAN

DEPT. SCALE 1:2750
SIGN

DRAWING NO. PE–DG–415–100–M001
SHEET 1 OF 1 REV. 02

SIZE-A0