REPUBLIC OF LEBANON

COUNCIL FOR DEVELOPMENT AND RECONSTRUCTION

DETAILED DESIGN OF BISRI DAM PROJECT

CONTRACT NO.17909

DAM FOOTPRINT

GEOTECHNICAL INVESTIGATION REPORT II

FACTUAL

February 2014

Founded 1956

DAR AL HANDASAH NAZIH TALEB & PARTNERS

دار الهندسة نزيه طالب وشركاه

Table of Content

Appendices

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	Signature:	

One borehole (BHVL1) was located and drilled within the valley (left side of the dam) in a manner to determine the subsurface soil stratums and the depth of underlying bedrock (Appendix 1).

BHVL1: 110m

One borehole (BHLA1) was located and drilled within the axe of the dam (left side abutment) in a manner to determine the subsurface rock stratums and to estimate their average hydraulic conductivities (Appendix 1).

BHLA1: 105m

Four nos. of continuous DCPT (Dynamic Cone Penetration Test) probing (DCPVR6, DCPVR9, DCPVR7 and DCPVL2) were performed within the valley (right side of the dam) in a manner to estimate the relative densities of the subsurface soil stratums (Appendix 1).

DCPVR6: 15m

DCPVR9: 97.5m

DCPVR7: 90m

DCPVL2 (relocated): 100m

Five nos. of access rod as shown on Figure 1 to 5 were needed and constructed within the right and left side abutments of the dam in a manner to reach the locations of the boreholes BHLA2, BHRA1, BHRA2, BHRA3 and BHRA4. The access rods were mainly excavated in rock by the use crawler mounted hydraulic backhoe excavator equipped with pneumatic demolition hammer (Jackhammer) as shown on Figure 6.

Figure 1: Access rod reaches BHLA2 (left side abutment of the dam)

Figure 2: Access rod reaches BHRA1 (right side abutment of the dam)

Figure 3: Access rod reaches BHRA2 (right side abutment of the dam)

Figure 4: Access rod reaches BHRA3 (right side abutment of the lake)

Figure 5: Access rod reaches BHRA4 (right side abutment of the lake)

Figure 6: Backhoe excavator equipped with jackhammer

2. Field Investigation

The field investigation was performed between December 30, 2013 and February 18, 2014. Two deep boreholes to a maximum depth of 110m and four nos. of continuous DCPT probing to a maximum depth of 100m were executed at locations shown on Figure 7. Crawler and truck mounted rotary drill rigs as shown on Figure 8 and 9 were used in field investigation.

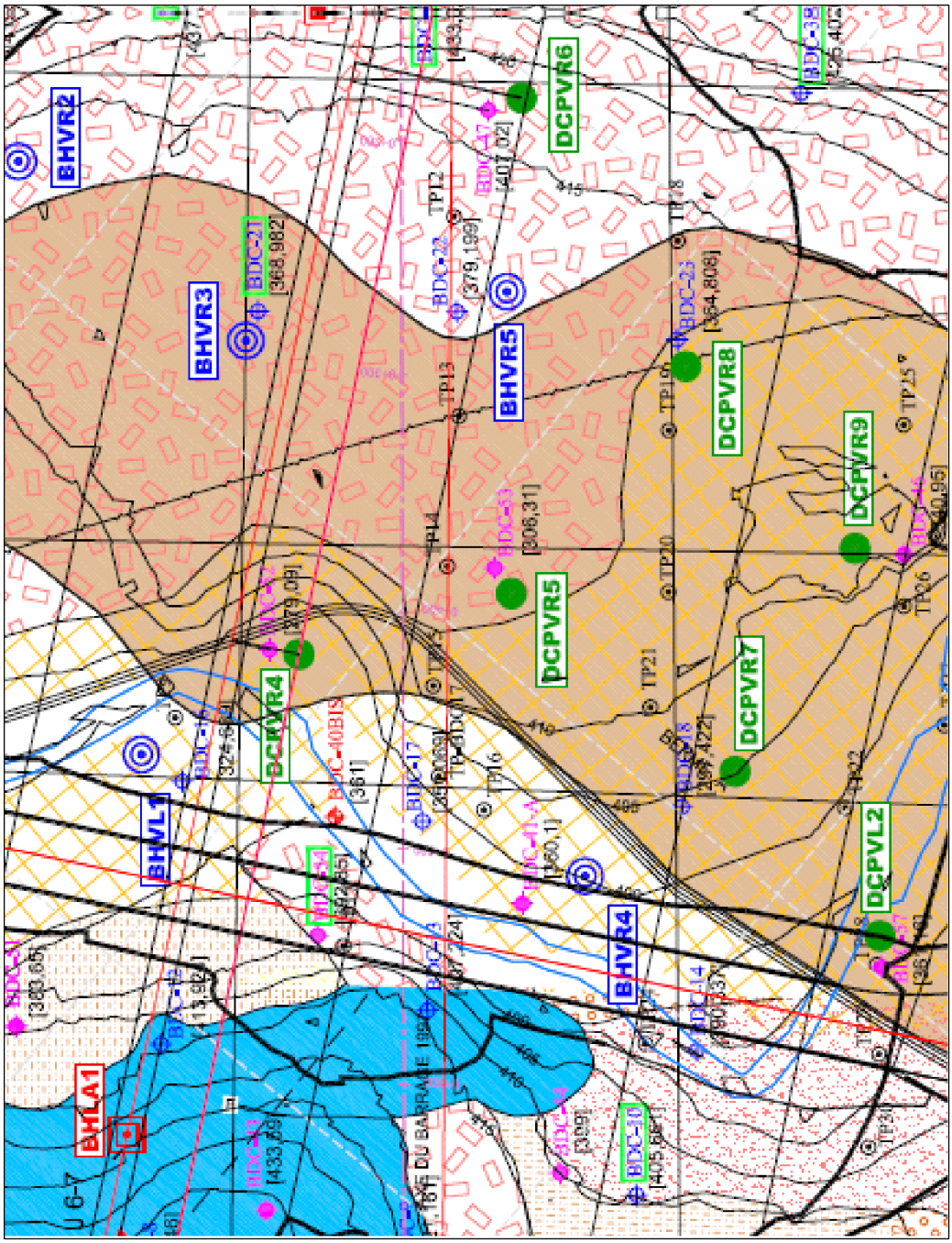


Figure 7: Locations of the boreholes and DCPT probings

BHVL1 / Piezometer (+396.57 NGL): 110 meters deep:

0-72m: Floodplain soil deposits.

72-79.5m: Old colluvial soil deposits.

79.5-110m: Clayey MARLSTONE (J4)

BHLA1 / Piezometer (+431.55 NGL): 105 meters deep:

0-26m: Tranzition zone, from saprolite to parent rock.

26-101: Karstified oolitic LIMESTONE (J6-J7)

101-105: Marly CLAYSTONE (J5)

Groundwater table was detected in boreholes at below given depths (January and February, 2014) from the natural ground level (NGL).

BHVL1 / Piezometer (+396.57 NGL):

Groundwater table at a depth of 0.4m (+396.17).

BHLA1 / Piezometer (+431.55 NGL):

Groundwater table at a depth of 35m (+396.55).

Four nos. of 20 to 40cm deep cavities were detected in borehole BHLA1 within karstified oolitic limestone (J6-J7) at a depth of between 29m (+402.55) and 34m (+397.55) from the natural ground level.

Figure 8: Crawler mounted drill rig used in coring.

Figure 9: Truck mounted drill rig used in DCPT probing.

3. Scope of Works

The scope of works of this field investigation consisted of the followings:

- Continuous core drilling in soil and rock.
- Performing Standard Penetration Test in soil and obtaining disturbed samples.
- Performing Dynamic Cone Penetration Test (DCPT) in soils contain coarse gravels and cobbles.
- Performing borehole water permeability (Falling Head Test) and Lugeon tests in soil and rock stratums respectively.
- Installing standpipe open piezometers into the boreholes and measuring the depth and fluctuations of the groundwater table.
- Continuous DCPT probing.

86mm diameter (OD) double tube ("T" type) and 96mm diameter (OD) wireline ("H" type) core barrels equipped with tungsten carbide and surface-set diamond core bits were used in continuous core drilling with BW drill rods and HW casings (see Figure 10).

Core drilling was performed by using as minimum as possible amount of circulation water, only clean water was used during the drilling, water losses were recorded on site and indicated in logs of borings.

Cores taken from the boreholes were sealed with waterproof plastic tapes and stored in standard wooden core boxes (see Figure 11). All the necessary information related to the runs of coring and boreholes were clearly indicated on the boxes. Photos of core boxes are presented in Appendix 3 of this factual report.

In soil stratums, Standard Penetration Test (SPT) was performed at 1.5m intervals by using Split-Spoon SPT sampler in 2 inches outside diameter (see Figure 12) and disturbed samples were obtained, labeled and kept in moisture-proof containers.

Figure 10: Wireline core barrel

Figure 11: Standard wooden core boxes

Figure 12: SPT sampler

Dynamic Cone Penetration Test (DCPT) was performed in boreholes to estimate the relative densities of the subsurface soil stratums contain coarse gravels and cobbles.

A solid cone as shown Figure 13 having an apex angle of 60^{o} and an end diameter of 62.5mm was used in DCPT with AW / BW drill rods and automatic trip SPT hammers as shown on Figure 14 and 15

The penetration tests were performed to estimate the relative densities and consistencies of the subsurface soil stratums.

Figure 13: Solid cone used in DCPT

Figure 14: Automatic trip SPT hammer used in boreholes.

Figure 15: Automatic trip SPT hammer used in DCPT probing.

The Dynamic Cone Penetration Test was continuously performed in DCPT holes with full casing down to 60m and then with enlarging the hole diameter by the use of tri-cone bit in a manner to minimize the friction losses.

The continuous DCPT probing was performed as Shown on Figure 16 to determine dam foundation strength and to evaluate the liquefaction potential.

Recorded numbers of blows were corrected for the amount of energy delivered to the drill rods (energy ratio) depending on the hammering system, Anvil size, blow rate, rod length and borehole diameter.

Computed DCPT values ($N_{cbr}60$) were converted to SPT values (N60) according to IS: 4986 (Part II)-1976. The test results are presented in Appendix 5 of this factual report.

Figure 16: Continuous DCPT probing.

Multistage Lugeon test was performed in rock stratums as shown on Figure 17 at different depths. The test was conducted in portions (3 meters long) of the boreholes isolated by the single pneumatic packer having a diameter of 66mm. The test results are presented in Appendix 4 of this factual report.

Figure 17: Lugeon Test

In soil stratums, Falling Head borehole water permeability test was performed as shown on Figure 18 at 3m intervals. The test results are presented in Appendix 4 of this factual report.

Figure 18: Falling Head Test

Perforated (one third of the standpipe) UPVC pipes, 60mm diameter (OD) and 2mm thick, wrapped with geotextile (PP, 150 gr/m^2) were installed into the boreholes as open standpipe piezometers with concrete heading and steel pipe protection as shown on Figure 19 in a manner to measure the depth and fluctuations of the groundwater table.

Figure 19: Concrete heading and steel pipe protection

All the field works were performed according to ASTM and IS standards (ASTM D6640: Core drilling in soil and rock, ASTM D1586: Standard Penetration Test, IS 4968: Dynamic Cone Penetration Test, ASTM D4630: Standard Test Method for Constant Head Injection Test, Lambe & Whitman: Falling Head Test and ASTM D4750: Determining Subsurface Liquid Levels in a borehole) and were supervised by an engineering geologist.

4. Subsurface Strata

According to the logs of borings, the following subsurface soil and rock stratums were encountered within the boreholes BHVL1 and BHLA1. The logs of borings are presented in Appendix 2 of this factual report.

BHVL1 / Piezometer (+396.57 NGL): 110 meters deep:

0-72m: Floodplain soil deposits.

0-3m: Dense SAND and GRAVEL with some COBBLES of semi-permeable.

3-12m: Greenish light olive loose to medium dense and sometimes dense slightly clayey SAND with some GRAVELS of semi-permeable to impermeable.

12-22.5m: Brownish grey to olive loose clayey SAND of semi-permeable.

22.5-30m: Brownish grey medium stiff to stiff silty CLAY of semi-permeable to impermeable.

30-39m: Brownish grey medium stiff silty CLAY of impermeable.

39-45m: Brownish grey medium stiff to stiff silty CLAY of impermeable.

45-49.5m: Brownish grey stiff silty CLAY of impermeable.

49.5-72m: Brownish grey soft to medium stiff silty CLAY of impermeable.

72-79.5m: Old colluvial soil deposits.

Old slopewash (colluvial) soil deposits, medium dense admixture of CLAY, SAND and GRAVEL with COBBLES of semi-permeable.

79.5-110m: Clayey MARLSTONE (J4)

79.5-99m: Yellowish light brown and dark cream highly to completely weathered very weak and soft clayey MARLSTONE (J40 of low permeability (Lugeon: 1-5) with pockets (91.5-92m, 93.5-94m and 98.5-99m) of old colluvial (slopewash) rock fragments.

99-110m: Grey and creamish light brown moderately to highly and highly to completely weathered weak and soft to medium stiff clayey MARLSTONE (J4) of semi-permeable to impermeable.

BHLA1 / Piezometer (+431.55 NGL): 105 meters deep:

0-26m: Tranzition zone, from saprolite to parent rock.

Transition zone from saprolite to parent rock of oolitic limestone of semi-permeable (0-9m) and medium to high permeability (9-26m, Lugeon: 33-62)

26-101: Karstified oolitic LIMESTONE (J6-J7)

26-52.5m: Light grey slightly weathered blocky/seamy to fractured and crushed moderately strong to strong karstified oolitic LIMESTONE (J6-J7) of medium permeability (Lugeon: 18-55)

52.5-69m: Cream to light grey slightly and slightly to moderately weathered blocky and seamy moderately strong to strong karstified oolitic LIMESTONE (J6-J7) of moderate to medium permeability (Lugeon: 8-22)

69-101m: Cream to light grey slightly weathered Blocky/seamy to fractured moderately strong to strong karstified oolitic Limestone (J6-J7) of medium permeability (Lugeon: 21-30)

101-105: Marly CLAYSTONE (J5)

101-105m: Dark brown blocky/seamy to fractured moderately weak marly CLAYSTONE (J5) of low permeability (Lugeon: 5-6)

According to the referenced logs of borings (BDC 47, BDC 46 and BDC 18) and DCPT results (SPT N60) the following subsurface soil and rock stratums were delineated within the DCPT holes DCPVR6, DCPVR9, DCPVR7 and DCPVL2 (relocated). The DCPT logs are presented in Appendix 5 of this factual report.

DCPVR6 (NGL: +415.61 / Estimated Groundwater Table: +398):

0-4.5m:

Clayey Silt - Silty Sand - Silty Gravel (loose to medium dense)

4.5-6.9m:

Clay (very stiff to hard)

6.9-9m:

Old colluvial soil deposits (medium dense)

9-9.6m:

Clay (very stiff to hard)

9.6-15m:

Moderately to highly and highly to completely weathered clayey MARLSTONE with pockets of rock fragments (very stiff).

DCPVR9 (NGL: +411.33 / Estimated Groundwater Table: +400)

0-4.5m:

Sandy Gravel - Sandy Clay - Clayey Sand (soft to firm and loose)

4.5-9m:

Silty Clay (soft)

9-13.5m:

Silt - Sandy Silt - Silty Sand (medium dense)

13.5-18m:

Silty sand – Sand (medium dense to dense)

18-22.5m:

Gravely sand – Sand (medium dense to dense)

22.5-27m:

Silty sand – Sand (dense to medium dense)

27-31.5m:

Admixture of silty Sand, silty Clay and sandy Clay (soft to firm and dense)

31.5-33m:

Silty Sand (medium dense)

33-45m:

Silty Clay (firm to stiff and very stiff to hard)

45-48m:

Admixture of silty Clay and sandy Clay (very stiff to hard)

48-51m:

Silty Clay (stiff to very stiff)

51-54m:

Clay (very stiff to hard)

54-67.5m:

Clay (firm to stiff and very stiff to hard)

67.5-88.5m:

Clay (stiff to hard)

88.5-97.5m:

Silty Clay (firm to stiff and very stiff to hard)

DCPVR7 (NGL: +398.065 / Estimated Groundwater Table: +396)

0-4.5m:

Slightly clayey sandy Gravel (very loose to loose)

4.5-27m:

Gravely Sand interbedded with clayey silty Sand with some Gravels (4.5-9m: medium dense, 9-13.5m: loose to medium dense, 13.5-18m: medium dense, 18-22.5m: loose to medium dense, 22.5-27m: medium dense)

27-84.5:

Silty Clay with Gravels (27-31.5m: firm to stiff, 31.5-36m: firm to stiff and very stiff, 36-40.5m: firm to stiff, 40.5-45m: stiff to very stiff, 45-49.5m: firm to stiff and very stiff, 49.5-54m: stiff to very stiff and hard, 54-58.5m: firm to stiff and very stiff, 58.5-72m: stiff to very stiff and hard, 72-76.5m: stiff to very stiff, 76.5-84.5m: very stiff to hard)

84.5-86.2m:

Old colluvial soil deposits (dense)

86.2-90m:

Highly to completely weathered clayey MARLSTONE with pockets of old colluvial rock fragments (very stiff).

DCPVL2/Relocated (NGL: +398 / Estimated Groundwater Table: +396)

0-4.5m:

Slightly clayey sandy Gravel (loose to medium dense)

4.5-13.5m:

Gravely Sand interbedded with clayey silty Sand with some Gravels (medium dense to dense)

13.5-85.5m:

Clayey silty Sand with some Gravel (13.5-27m: medium dense, 27-31.5m: loose to medium dense, 31.5-45m: medium dense, 45-49.5m: loose to medium dense, 49.5-54m: medium dense to dense, 54-58.5m: loose to medium dense, 58.5-85.5m: medium dense to dense and dense)

85.5-100:

Completely weathered clayey MARLSTONE (very stiff to hard and hard)

5. Closure

The findings presented in this factual report are based on the assumption that the subsurface soil and rock stratums and their conditions do not deviate appreciably from those disclosed in boreholes. There may be conditions pertaining to the site which were not disclosed by this subsurface soil/rock survey, and thus could not be taken into account. Therefore, the findings are valid under this assumption only.

APPENDICES

APPENDIX 1. GEOLOGIE DU SITE (PLAN G-02 / DECEMBER 2013)

	x	y	z	Estimated depth of Drilling or probing from the existing ground surface (m)
BHLA1	−334,515.0	−62,242.8	431.5	105
BHLA2	−334,452.5	−62,371.9	459.2	95
BHRA1	−334,761.7	−61,782.4	440.1	125
BHRA2	−334,799.7	−61,708.1	489.9	145
BHRA3	−334,399.6	−61,586.5	430.8	100
BHRA4	−334,281.1	−61,494.7	449.9	100
BHVL1	−334,646.8	−62,140.6	396.6	100
BHVR1	−334,786.8	−62,057.4	No Access	95
BHVR2	−334,844.8	−61,965.6	No Access	50
BHVR3	−334,716.2	−61,952.7	413.8	70
BHVR4	−334,467.5	−62,046.0	398.0	75
BHVR5	−334,650.3	−61,876.5	414.2	65
DCPVL1	−334,689.4	−62,220.0	396.3	40
DCPVL2	−334,355.3	−61,986.1	No Access	45
DCPVR1	−334,772.9	−62,210.1	397.1	70 or as deeper as possible
DCPVR2	−334,848.2	−62,181.8	397.8	70
DCPVR3	−334,910.9	−62,086.5	405.6	30
DCPVR4	−334,620.5	−62,050.7	398.0	70 or as deeper as possible
DCPVR5	−334,567.6	−61,973.7	414.7	70 or as deeper as possible
DCPVR6	−334,695.1	−61,813.6	415.6	20
DCPVR7	−334,446.7	−61,971.5	398.1	70 or as deeper as possible
DCPVR8	−334,574.3	−61,848.1	414.5	50
DCPVR9	−334,467.6	−61,866.5	411.3	70
EV1	−334,728.7	−62,498.6	415.7	30
EV2	−334,791.3	−62,484.1	402.2	30
EV3	−334,779.2	−62,449.7	395.8	50
EV4	−334,830.5	−62,452.7	395.6	Cancelled
EV5	−334,883.0	−62,467.7	395.6	Cancelled
EV6	−334,906.6	−62,507.4	395.0	Cancelled
EV7	−334,789.7	−62,395.0	396.0	60
EV8	−334,722.9	−62,395.0	396.3	Cancelled
EV9	−334,720.5	−62,485.6	414.9	30
EV10	−334,703.9	−62,547.4	420.1	30
VF1	−334,278.5	−62,019.7	398.6	Cancelled
VF2	−334,248.0	−62,095.0	414.0	40
VF3	−334,229.1	−62,149.3	414.4	40
VF4	−334,253.3	−62,221.5	419.1	40

LEGENDE:

1. LITHOLOGIE

QUATERNAIRE		EBOULIS,BRECHE, COUVERTURE: D'EBOULIS DE GRES, D'ARGILE ET DE BLOCS DE CALCAIRE
		SILT. SABLE. GRES DESINTEGRE
		SABLE
		LIMON
		LIMON ET GALETS
C4-5		CENOMNIEN - TURONIEN CALCAIRE BLANCHATRE. PEU DUR. A DES NIVEAUX CALCAIRES CRAYEUX ET CALCAIRE BEIGE-BLANCHATRE PARFOIS DOLOMITIQUE. PARFOIS A POINTS ROUGES TANTOT CRISTALLINS DUR A TRES DUR. TRES KARSTIFIE. GENERALEMENT FISSURE ET FRACTURE
C3		ALBIEN (BARRE A CARDIUM) : CALCAIRE ORANGE-JAUNÂTRE. DUR. CRISTALLIN. KARSTIFIE MARNES ET MARNO-CALCAIRE VERT-JAUNÂTRE A ABONDANTES COQUILLES.
C1		GRES DE BASE ; ALTERNANACE DE SABLE , D'ARGILE, DE MARNE,DE SABLE FERRUGINEUX CIMENTE, PARFOIS TRES DUR. DE TUF PARFOIS CIMENTE ET DE CINERITES
J 7		KIMMERIDGIEN: CALCAIRE GRIS. OOLITHIQUE. CRISTALLIN, DUR. KARSTIFIE. A NIVEAUX MARNEUX
J 6		PORTLANDIEN: CALCAIRE FIN MASSIF. RAREMENT OOLITHIQUE. OCRE TANTOT A POINTS ROUGES. A SILEX. CRISTALLIN. DURE PEU KARSTIFIE.

2. SYMBOLS

- BDC1 — SONDAGES REALISES EN 1982
- BDC45 — SONDAGES REALISES EN 1983
- BDC47 — SONDAGES REALISES EN 1996
- SONDAGES REALISES EN 2014 (DCPT Probing, see note 4)
- SONDAGES REALISES EN 2013 (Core Drilling, see note 1)
- SONDAGES REALISES EN 2014 (Core Drilling, see note 2)
- SONDAGES REALISES EN 2014 (Core Drilling, see note 3)
- AD−1 — GALERIE DE RECONNAISSANCE REALISEE ENTRE 1981 ET 1984
- COURBE D'EGALE ELEVATION DU TOIT DU SUBSTRATUM
- CHUTES D'OUTILS RELEVEES DANS LES SONDAGES
- [329,96] — COTE TOIT DU SUBSTRATUM
- FAILLE IMPORTANTE
- DIRECTION ET PENDAGE

NOTA:

1 - Continuous core drilling in soil and rock to a depth of reaching the bedrock and penetrating it 5m with SPT and/or DCPT (if needed) in soil at 1.5m intervals by carrying out water permeability and Lugeon tests at 3m intervals in soil and rock respectively.

2 - Continuous core drilling in soil and rock to a depth of reaching the bedrock and penetrating it 30m with SPT and/or DCPT (if needed) in soil at 1.5m intervals by carrying out water permeability and Lugeon tests at 3m intervals in soil and rock respectively.

3 - Continuous core drilling in rock to a depth of reaching the bottom level of the grout curtain for the bore-holes located within the axe of the dam and reaching the ground water table and penetrating it for the bore-holes located within the lake of the dam by carrying out Lugeon test at 3m intervals.

4 - Continuous Dynamic Cone Penetration (DCPT probing) to a depth of reaching the bedrock or as deep as possible with full casing down to 63m maximum by using a solid cone having an apex angle of 60 degrees and an end diameter of 62.5mm with AW drill rods and automatic trip standard SPT hammer.

LE TRACE DE LA FAILLE DE ROOM A ETE ETABLI SUR LA BASE DES COUPES GEOLOGIQUES INTERPRETATIVES TENANT COMPTE DES LOGS DE SONDAGES DE RECONNAISSANCES

Echelle : 0 20 100m

No	DATE	REV	TOP	GEO	CIV	ARCH	STRUCT	MECH	ELEC

LEBANESE REPUBLIC

COUNCIL FOR DEVELOPMENT & RECONSTRUCTION

BARRAGE BISRI

DAR AL HANDASAH NAZIH TALEB & PARTNERS — دار الهندسة نزيه طالب وشركاه (Founded 1956)

NOVEC — CDR DEVELOPMENT

	DRAWN	
	CHECKED	
	APPROVED	
GEOLOGIE DU SITE	SCALE	1/2 000 on A1
	DATE	December 2013
	FILENAME	PLAN G-02

PROJECT	DIVISION	SHEET	REVISION
			12/12/2013

APPENDIX 2. LOGS OF BORINGS

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHVL01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	396.57	**SHEET:**	1 **OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	110.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	68	**DATE STARTED:**	12/30/2013
ENGINEER:	K.S.	**DRILLER:**	M.O.	**DATE FINISHED:**	1/16/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
1					light brown SAND with rounded and sub rounded gravels		40	0	0		
2			9,24,50/3cm Refusal								
3					rounded and subrounded GRAVELS and small cobbles of limestone with occassional gravels of basalt in sand matrix		59	19	0		CPT 27,24,43,50/7cm
4					dense light olive green slightly clayey fine to coarse grained SAND with occassional gravels		36	0	0		
5			11,14,28 42								
6			7,8,13 21				29	0	0		
7					ditto, medium dense		48	0	0		
8			12,17,23 40		ditto, dense		48	0	0		
9			9,18,38 56								
10					ditto, very dense		68	0	0		

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given
TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery
ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHVL01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	396.57	**SHEET:** 2	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	110.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	68	**DATE STARTED:**	12/30/2013
ENGINEER:	K.S.	**DRILLER:**	M.O.	**DATE FINISHED:**	1/16/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
11			4,4,5 9		ditto, loose		68	0	0		
12			3,3,4 7				52	0	0		
13			2,3,4 7		loose brownish gray clayey SAND		76	0	0		
14							71	0	0		
15			2,2,3 5								
16							86	0	0		
17			3,5,6 11		ditto, medium dense		62	0	0		
18			4,4,5 9								
19					ditto, loose		86	0	0		
20			3,7,8 15		ditto, medium dense		76	0	0		

SPT Standard Penetration Test
TCR Total Core Recovery
ST Sample Type
UCS Unconfined Compressive Strength
RQD Rock Quality Designation
SYM Symbol
LT Layer Thickness
SCR Solid Core Recovery
WT Water Table
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHVL01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	396.57	**SHEET:** 3	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	110.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	68	**DATE STARTED:**	12/30/2013
ENGINEER:	K.S.	**DRILLER:**	M.O.	**DATE FINISHED:**	1/16/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
21			3,3,5 8		ditto, loose		76	0	0		
22					ditto, medium dense		86	0	0		
23			4,5,6 11								
24			6,7,9 16		very stiff brownish gray silty CLAY		71	0	0		
25							81	0	0		
26			5,8,8 16								
27			5,6,5 11				91	0	0		
28					ditto, stiff		74	0	0		
29			4,6,6 12								
30							71	0	0		

SPT Standard Penetration Test
TCR Total Core Recovery
ST Sample Type
UCS Unconfined Compressive Strength
RQD Rock Quality Designation
SYM Symbol
LT Layer Thickness
SCR Solid Core Recovery
WT Water Table
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHVL01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	396.57	**SHEET:** 4	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	110.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	68	**DATE STARTED:**	12/30/2013
ENGINEER:	K.S.	**DRILLER:**	M.O.	**DATE FINISHED:**	1/16/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
31			3,3,3 6		ditto, medium stiff		67	0	0		
32			3,3,4 7				97	0	0		
33			2,2,3 5				86	0	0		
34											
35			2,2,3 5				84	0	0		
36											
37			3,3,4 7				97	0	0		
38			3,4,4 8				95	0	0		
39											
40			3,5,6 11		ditto, stiff		81	0	0		

SPT Standard Penetration Test
TCR Total Core Recovery
ST Sample Type
UCS Unconfined Compressive Strength
RQD Rock Quality Designation
SYM Symbol
LT Layer Thickness
SCR Solid Core Recovery
WT Water Table
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	**BHVL01**
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	396.57	**SHEET:** 5	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	110.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	68	**DATE STARTED:**	12/30/2013
ENGINEER:	K.S.	**DRILLER:**	M.O.	**DATE FINISHED:**	1/16/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
41			4,4,5 9		ditto, stiff		81	0	0		
42			5,7,8 15				95	0	0		
43							89	0	0		
44			6,8,5 13				86	0	0		
45			7,9,10 19								
46					ditto, very stiff		82	0	0		
47			6,9,11 20				91	0	0		
48			7,8,8 16								
49							89	0	0		
50			5,7,9 16				83	0	0		

SPT	Standard Penetration Test	TCR	Total Core Recovery	ST	Sample Type
UCS	Unconfined Compressive Strength	RQD	Rock Quality Designation	SYM	Symbol
LT	Layer Thickness	SCR	Solid Core Recovery	WT	Water Table

N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHVL01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	396.57	**SHEET:** 6	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	110.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	68	**DATE STARTED:**	12/30/2013
ENGINEER:	K.S.	**DRILLER:**	M.O.	**DATE FINISHED:**	1/16/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
51			2,3,3 6		medium stiff brownish gray silty CLAY		83	0	0		
52							82	0	0		
53			1,1,2 3		ditto,soft		83	0	0		
54			1,2,2 4								
55							79	0	0		
56			2,2,3 5		ditto, medium stiff		76	0	0		
57			1,2,3 5								
58							75	0	0		
59			2,2,3 5				70	0	0		
60											

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given
TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery
ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHVL01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	396.57	**SHEET:** 7	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	110.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	68	**DATE STARTED:**	12/30/2013
ENGINEER:	K.S.	**DRILLER:**	M.O.	**DATE FINISHED:**	1/16/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
61			2,3,4 7		ditto, medium stiff		86	0	0		
62			2,2,2 4				86	0	0		
63			2,2,3 5				71	0	0		
64											
65			1,2,3 5				73	0	0		
66											
67			3,4,4 8				100	0	0		
68											
69							83	0	0		
70							91	0	0		

SPT Standard Penetration Test
TCR Total Core Recovery
ST Sample Type
UCS Unconfined Compressive Strength
RQD Rock Quality Designation
SYM Symbol
LT Layer Thickness
SCR Solid Core Recovery
WT Water Table
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHVL01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	396.57	**SHEET:**	8 **OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	110.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	68	**DATE STARTED:**	12/30/2013
ENGINEER:	K.S.	**DRILLER:**	M.O.	**DATE FINISHED:**	1/16/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
71					ditto		91	0	0		
72							36	0	0		
73					brownish gray CLAY with cobbles of limestone		47	0	0		Repetitive flushing water losses between 72 and 81m
74					yellow sandy MARL with cobbles of limestone		31	6	0		
75											
76							27	16	0		
77											
78							28	5	0		
79							37	20	0		
80					light brown CLAY with occassional of limestone		50	0	0		

SPT Standard Penetration Test
TCR Total Core Recovery
ST Sample Type
UCS Unconfined Compressive Strength
RQD Rock Quality Designation
SYM Symbol
LT Layer Thickness
SCR Solid Core Recovery
WT Water Table
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHVL01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	396.57	**SHEET:** 9	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	110.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	68	**DATE STARTED:**	12/30/2013
ENGINEER:	K.S.	**DRILLER:**	M.O.	**DATE FINISHED:**	1/16/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
81					ditto		50	0	0		
82							57	0	0		Casing down to 82.5m
83							57	0	0		
84											
85							60	0	0		
86					light to dark brown CLAY with occassional cobbles of limestone		53	0	0		
87											
88							47	0	0		
89											
90							56	0	0		

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given
TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery
ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHVL01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	396.57	**SHEET:**	10 **OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	110.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	68	**DATE STARTED:**	12/30/2013
ENGINEER:	K.S.	**DRILLER:**	M.O.	**DATE FINISHED:**	1/16/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
91					dark brown hard CLAY with cobbles of marlstone		67	0	0		
92					dark brown hard CLAY with cobbles of limestone		40	3	0		
93											
94							42	5	0		
95											
96					light brown slightly silty marly CLAY with cobbles of marlstone		59	0	0		
97							53	0	0		
98					brown slightly silty marly hard CLAY with small cobbles of marlstone and occassional cobble of limestone		54	0	0		
99											
100							49	0	0		

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery

ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	**DAR-TALEB**	**FILE NO.:**	14-001	**BOREHOLE NO.:**	**BHVL01**
PROJECT:	**BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)**				
LOCATION:	BISRI	**Elevation (m):**	396.57	**SHEET:** 11	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	110.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	68	**DATE STARTED:**	**1/30/2014**
ENGINEER:	K.S.	**DRILLER:**	M.O.	**DATE FINISHED:**	**1/16/2014**

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
					ditto		49	0	0		
101					dark brown veryclosely to closely fractured MARLSTONE with hard clay		60	50	0		
102											
103							58	6	0		
104					hard dark brown CLAY with cobbles of marlstone		58	10	0		
105											
106							67	0	0		
107											
108							57	0	0		
109											
110							55	0	0		
					End of Borehole @ 110m						

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery

ST Sample Type
SYM Symbol
WT Water Table

SATCON

SOIL STUDIES

LEGEND

SOIL SYMBOL

- GP
- GP-GM
- GM
- GC
- SW
- SP
- SP - SM
- SM-SC
- ML
- CH-MH
- OL
- OH
- PT
- Fill Material
- CLAY
- CLAYwith Sand and Gravel

ROCK SYMBOL

- Dolomite
- Chalky Limestone
- Calcarenite
- Weak Chalky LIMESTONE
- Sandy Limestone
- Basalt / volcanics
- Chert
- CL
- Creamy White LIMESTONE
- Grainstone LIMESTONE
- MARL
- SANDSTONE
- CLAYSTONE
- Oolitic LIMESTONE
- Micritic LIMESTONE
- Mudstone
- Gypsum
- Siltstone

SAMPLERS

- SPT (disturbed)
- Shelby tube
- Tricone
- Double tube

OTHERS

- **Water Level**

ROCK CLASSIFICATION

% RQD	Classification
<25	Very Poor
25-50	Poor
50-75	Fair
75-90	Good
>90	Excellent

GRANULAR SOILS

N-Value	Relative Density
< 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

COHESIVE SOIL

N-Value	Consistency
< 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very stiff
> 30	Hard

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHLA 01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	431.55	**SHEET:** 1	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	105.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	63 to 68	**DATE STARTED:**	1/20/2014
ENGINEER:	K.S.	**DRILLER:**	A.A.	**DATE FINISHED:**	2/11/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
1					light grey crushed LIMESTONE with SAND and CLAY		40	40			Double tube core barrel (OD: 86mm) between 0 and 45m
2							42	21			Wire-line (OD: 93mm) used between 45 and 105m
3											
4					ditto		37	15			
5							32	15	0		
6											
7							27	17	0		
8							28	7	0		
9											
10							27	10	0		Flushing water loss at 10.0m

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery

ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHLA 01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	431.55	**SHEET:** 2	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	105.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	63 to 68	**DATE STARTED:**	1/20/2014
ENGINEER:	K.S.	**DRILLER:**	A.A.	**DATE FINISHED:**	2/11/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
11					ditto		27	10			
12							43	40			
13							43	5			
14							39	17			
15							37	15			
16							42	15			
17							29	2			
18							31	7			
19											
20											

SPT Standard Penetration Test
TCR Total Core Recovery
ST Sample Type
UCS Unconfined Compressive Strength
RQD Rock Quality Designation
SYM Symbol
LT Layer Thickness
SCR Solid Core Recovery
WT Water Table
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHLA 01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	431.55	**SHEET:** 3	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	105.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	63 to 68	**DATE STARTED:**	1/20/2014
ENGINEER:	K.S.	**DRILLER:**	A.A.	**DATE FINISHED:**	2/11/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
21					ditto		31	7			
22							40	0			
23							37	3			
24											
25							31	0			
26											
27					light grey moderately weathered fractured LIMESTONE		55	45	0		
28							80	70	0		
29											
					CAVITY		85	85	8		
30					light grey moderately weathered fractured strong LIMESTONE						

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given
TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery
ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:** 14-001	**BOREHOLE NO.:** BHLA 01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)		
LOCATION:	BISRI	**Elevation (m):** 431.55	**SHEET:** 4 **OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:** Rotary	**BOREHOLE DEPTH (m):** 105.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):** 63 to 68	**DATE STARTED:** 1/20/2014
ENGINEER:	K.S.	**DRILLER:** A.A.	**DATE FINISHED:** 2/11/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
31					light grey moderately weathered fractured LIMESTONE CAVITY light grey moderately weathered crushed strong LIMESTONE		80	50	0		
32					light grey moderately weathered fractured strong LIMESTONE		80	80	43		
33					CAVITY light grey moderately weathered fractured LIMESTONE						
34					CAVITY light grey moderately weathered fractured LIMESTONE		67	67	16		
35					light grey moderately weathered fractured very stong LIMESTONE		67	67	0		Water table at 35m
36											Casing down to 36.0m
37					light grey to creamish beige moderately weathered crushed and fractured very strong LIMESTONE		76	67	0		
38											
39							73	73	19		
40					light grey to creamish beige moderately weathered crushed very strong LIMESTONE		63	37	0		

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given
TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery
ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	**DAR-TALEB**	**FILE NO.:**	14-001	**BOREHOLE NO.:**	**BHLA 01**
PROJECT:	**BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)**				
LOCATION:	BISRI	**Elevation (m):**	431.55	**SHEET:** 5	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	105.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	63 to 68	**DATE STARTED:**	**1/20/2014**
ENGINEER:	K.S.	**DRILLER:**	A.A.	**DATE FINISHED:**	**2/11/2014**

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
					ditto		63	37	0		
41					cream moderately weathered partially crushed mainly fractured very strong LIMESTONE		79	79	0		
42											
43							100	73	27		
44					creamish grey moderately weathered fractured very strong LIMESTONE		97	97	45		
45											
46					light to creamish grey moderately weathered mainly crushed partially fractured very strong LIMESTONE		56	33	17		
47							83	83	23		
48											
49					ditto, with vertical fractures		100	100	19		
50					refer to next page		100	100	39		

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given
TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery
ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	**DAR-TALEB**	**FILE NO.:**	14-001	**BOREHOLE NO.:**	**BHLA 01**
PROJECT:	**BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)**				
LOCATION:	BISRI	**Elevation (m):**	431.55	**SHEET:** 6	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	105.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	63 to 68	**DATE STARTED:**	**1/20/2014**
ENGINEER:	K.S.	**DRILLER:**	A.A.	**DATE FINISHED:**	**2/11/2014**

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
51					light grey moderately weathered mainly fractured partially crushed strong LIMESTONE		100	100	39		
52							95	95	71		
53					brownish to light grey moderately weathered mainly fractured partially crushed weak to moderately strong LIMESTONE (vuggy)		100	100	0		
54											
55					creamish to light grey moderately weathered mainly blocky seamy partially fractured moderately strong LIMESTONE		100	100	53		
56											
57							100	100	77		
58							100	100	80		
59											
60							93	93	75		

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery

ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHLA 01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	431.55	**SHEET:** 7	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	105.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	63 to 68	**DATE STARTED:**	1/20/2014
ENGINEER:	K.S.	**DRILLER:**	A.A.	**DATE FINISHED:**	2/11/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
61					creamish to light grey moderately weathered mainly blocky seamy partially fractured moderately strong LIMESTONE		100	100	80		
62							93	93	62		
63											
64							87	87	67		
65					ditto, vuggy		100	100	60		
66											
67					light grey slightly weathered fractured to blocky seamy moderately strong LIMESTONE		100	74	0		
68							100	100	57		
69											
70					light to dark grey slightly weathered blocky seamy to fractured strong LIMESTONE		100	100	52		

SPT	Standard Penetration Test	TCR	Total Core Recovery	ST	Sample Type
UCS	Unconfined Compressive Strength	RQD	Rock Quality Designation	SYM	Symbol
LT	Layer Thickness	SCR	Solid Core Recovery	WT	Water Table

N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHLA 01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	431.55	**SHEET:** 8	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	105.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	63 to 68	**DATE STARTED:**	1/20/2014
ENGINEER:	K.S.	**DRILLER:**	A.A.	**DATE FINISHED:**	2/11/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
					ditto		100	100	52		
71					light to dark grey slightly weathered mainly blocky seamy partially fractured strong LIMESTONE		100	100	80		
72											
73							100	100	71		
74											
75							100	100	77		
76					greyish cream slightly weathered mainly blocky seamy to fractured partially crushed strong to very strong LIMESTONE		100	100	59		
77											
78							100	100	35		
79							100	100	29		
80							91	91	59		

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given
TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery
ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	**DAR-TALEB**	**FILE NO.:**	14-001	**BOREHOLE NO.:**	**BHLA 01**
PROJECT:	**BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)**				
LOCATION:	BISRI	**Elevation (m):**	431.55	**SHEET:** 9	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	105.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	63 to 68	**DATE STARTED:**	**1/20/2014**
ENGINEER:	K.S.	**DRILLER:**	A.A.	**DATE FINISHED:**	**2/11/2014**

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
81					ditto		91	91	59		
82							100	100	56		
83							100	100	48		
84											
85							100	100	53		
86					greyish beige moderately weathered mainly fractured partially crushed LIMESTONE						
87							100	100	42		
88					beige moderately weathered crushed and fractured to blocky seamy moderately strong LIMESTONE		100	100	16		
89					cream to beige moderaly weathered mainly blocky seamy partially fractured weak LIMESTONE						
90							100	100	40		

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given
TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery
ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	DAR-TALEB	**FILE NO.:**	14-001	**BOREHOLE NO.:**	BHLA 01
PROJECT:	BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)				
LOCATION:	BISRI	**Elevation (m):**	431.55	**SHEET:**	10 **OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	105.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	63 to 68	**DATE STARTED:**	1/20/2014
ENGINEER:	K.S.	**DRILLER:**	A.A.	**DATE FINISHED:**	2/11/2014

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
91					light grey moderately weathered massive very strong LIMESTONE		100	100	100		
92					light grey to beige slightly weathered blocky seamy to fractured strong to very strong LIMESTONE		90	90	77		
93											
94							100	100	100		
95											
96							87	87	59		
97					light to dark grey slightly weathered partially fractured mainly blocky seamy to massive strong LIMESTONE		92	92	63		
98											
99							100	100	84		
100							93	93	60		

SPT Standard Penetration Test
UCS Unconfined Compressive Strength
LT Layer Thickness
N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

TCR Total Core Recovery
RQD Rock Quality Designation
SCR Solid Core Recovery

ST Sample Type
SYM Symbol
WT Water Table

SATCON
SOIL STUDIES

BORING LOG

CLIENT:	**DAR-TALEB**	**FILE NO.:**	14-001	**BOREHOLE NO.:**	**BHLA 01**
PROJECT:	**BISRI DAM / SECOND PACKAGE (DAM FOOTPRINT)**				
LOCATION:	BISRI	**Elevation (m):**	431.55	**SHEET:** 11	**OF:** 11
EQUIPMENT:	CMV 1000	**METHOD:**	Rotary	**BOREHOLE DEPTH (m):**	105.0
HOLE DAM. (mm):	86 to 114	**CORE DIAM. (mm):**	63 to 68	**DATE STARTED:**	**1/20/2014**
ENGINEER:	K.S.	**DRILLER:**	A.A.	**DATE FINISHED:**	**2/11/2014**

DEPTH (m)	SYMBOL	ST	SPT N blows	LT	DESCRIPTION OF MATERIAL	% FINES	TCR (%)	SCR (%)	R.Q.D (%)	UCS N/mm2	Remarks
101					ditto		93	93	60		
102					dark brown moderately weathered blocky seamy to fractured weak CLAYSTONE		93	93	75		
103							100	100	88		
104							61	61	29		
105											
106											
107											
108											
109											
110											
					End of Borehole @ 105m						

SPT	Standard Penetration Test	TCR	Total Core Recovery	ST	Sample Type
UCS	Unconfined Compressive Strength	RQD	Rock Quality Designation	SYM	Symbol
LT	Layer Thickness	SCR	Solid Core Recovery	WT	Water Table

N Number of blows from SPT. Where full 0.3m has not been achieved, the number of blows for the quoted penetration is given

SATCON

SOIL STUDIES

LEGEND

SOIL SYMBOL

- GP
- GP-GM
- GM
- GC
- SW
- SP
- SP - SM
- SM-SC
- ML
- CH-MH
- OL
- OH
- PT
- Fill Material
- CLAY
- CLAYwith Sand and Gravel

ROCK SYMBOL

- Dolomite
- Chalky Limestone
- Calcarenite
- Weak Chalky LIMESTONE
- Sandy Limestone
- Basalt / volcanics
- Chert
- CL
- Creamy White LIMESTONE
- Grainstone LIMESTONE
- MARL
- SANDSTONE
- CLAYSTONE
- Oolitic LIMESTONE
- Micritic LIMESTONE
- Mudstone
- Gypsum
- Siltstone

SAMPLERS

- SPT (disturbed)
- Shelby tube
- Tricone
- Double tube

OTHERS

- **Water Level**

ROCK CLASSIFICATION

% RQD	Classification
<25	Very Poor
25-50	Poor
50-75	Fair
75-90	Good
>90	Excellent

GRANULAR SOILS

N-Value	Relative Density
< 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

COHESIVE SOIL

N-Value	Consistency
< 2	Very Soft
2 - 4	Soft
4 - 8	Medium Stiff
8 - 15	Stiff
15 - 30	Very stiff
> 30	Hard

APPENDIX 3. PHOTOS OF CORE BOXES


Besri Dam II
BHVL:01 Box: 0 1
0.00 → 9.00
0.0→
1.5→
3.0→
4.5→
6.0→
7.5→
9.0→


Besri Dam II
BHVL:01 Box:02
9.00 → 16.50
10.5→
12.0→
13.5→
15.0→
16.5→


Besri Dam II
BHVL:01 Box: 0 3
16.50 → 22.50
ورشة
18,0→
19,5→
21,0→
22,5→


Besri Dam II
BHVL:01 Box: 0 4
22.50 → 29.50
24,0→
25,5→
27,0→
28,5→
BHVL-1 Box-4


Besri Dam II
BHVL:01 Box:05
29.50 → 35.00
31.5→
33.0→
34.5→


Besri Dam II
BHVL:01 Box:06
35.00 → 40.50
36.0→
37.5→
39.0→
40.5→


Besri Dam II
BHVL:01 Box: 07
40.50 → 46.50


Besri Dam II
BHVL:01 Box: 08
46.50 → 53.50


Besri Dam II
BHVL:01 Box: 09
53.50 → 60.00
55.5→
57.0→
58.5→
60.0→


BH-VL-1 Box-10 ورشة سد بيري
Besri Dam II
BHVL:01 Box: 10
60.00 → 66.00
61.5→
63.0→
64.5→
66.0→


Besri Dam II
BHVL:01 Box:11
66.00 → 70.50
67,5→
69,0→
70.5→


Besri Dam II
BHVL:01 Box:12
70.50 → 81.50
73,5→
75,0→
76,5→
78,0→
79,5→
81,0→


Besri Dam II
BHVL:01 Box.13
81.50 → 89.00
84.0→
85.5→
87.0→
88.5→


Besri Dam II
BHVL:01 Box.14
89.00 → 96.50
91.5→
93.0→
94.5→
96.00→


Besri Dam II
BHVL:01 Box:15
96.50 → 104
99,0→
100,5→
103,5→


Besri Dam II
BHVL:01 Box:16
104 → 110
106,5→
108,0→
110→


Besri Dam II
BHLA:D1 Box:01
0.00 → 11.00
3.0→
4.5→
6.0→
7.5→
10.5→


Besri Dam II
BHLA:D1 Box:02
11.00 → 22.00


Besri Dam II
BHLA:D1 Box:03
22.00 → 29.00


Besri Dam II
BHLA:D1 Box:04
29.00 → 35.00


Besri Dam II
BHLA:D1 Box:05
35.00 → 40.50
36,0→
37,5→
39,0→
39.20 → 39.60
40,5→


Besri Dam II
BHLA:D1 Box:06
40.50 → 45.00
42,0→
43,5→
45,0→


Besri Dam II
BHLA:01 Box:07
45.00 → 50.00
46.50
46.10
49.60


Besri Dam II
BHLA:01 Box:08
50.00 → 54.00
51.0
52.15
54.0


Besri Dam II
BHLA:01 Box:09
54.00 → 57.50
54.00
55.50
57.00


Besri Dam II
BHLA:01 Box:10
57.50 → 61.50
58.50
60.00
61.50


Besri Dam II
BHLA:D1 Box:11
61.50 → 65.00
63.00
64.50


Besri Dam II
BHLA:D1 Box:12
65.00 → 69.00
66.00
67.50
69.00


Besri Dam II
BHLA:01 Box:13
69.00 → 73.00
70.50
72.00


Besri Dam II
BHLA:01 Box:14
73.00 → 76.50
75.00
76.50


Besri Dam II
BHLA:01 Box:15
76.50 → 80.00
78.00
79.50


Besri Dam II
BHLA:01 Box:16
80.00 → 84.00
82.00
82.50
84.00


Besri Dam II
BHLA:01 Box:17
85.50
87.00


Besri Dam II
BHLA:01 Box:18
88.50
90.00
91.50


Besri Dam II
BHLA:01 Box:19
91.50 - 95.00
93.00
91.50


Besri Dam II
BHLA:01 Box:20
95.00 - 99.00
96.0
97.50


BH: AL.1
Besri Dam II
BHLA:01 Box:21
99.00 → 102.0
99.0→
100.5→
102.0→


Besri Dam II
BHLA:01 Box:22
102.0 → 105.0
103,5→
105,0

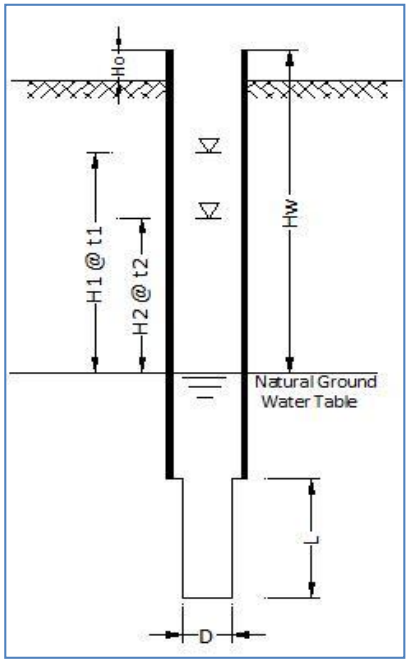
APPENDIX 4. BOREHOLE WATER PERMEABILITY & LUGEON TEST RESULTS

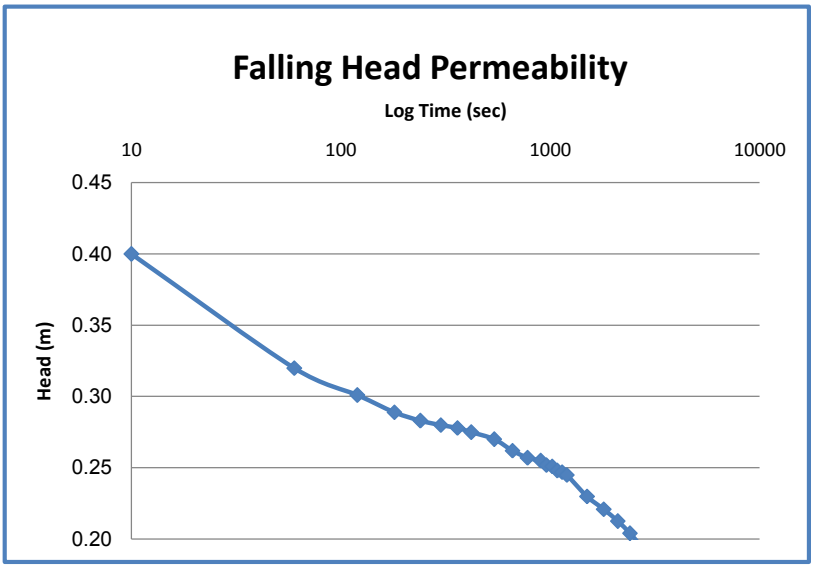
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	12/31/2013
Test Location	0 to 3	Y		K(m/sec):	1.8108E-07
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1		mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.08	60	0.32
WATER LEVEL BEFORE TEST	W.L	-0.4	mAD	2	0.10	120	0.30
HEIGHT OF CASING ABOVE NGL	Ho	0	m	3	0.11	180	0.29
CASING TOP LEVEL		0	mAD	4	0.12	240	0.28
CASING LENGTH		0	m	5	0.12	300	0.28
CASING BOTTOM LEVEL		0	mAD	6	0.12	360	0.28
BOREHOLE DEPTH		3	m	7	0.13	420	0.28
BOREHOLE BOTTOM LEVEL		-3	mAD	9	0.13	540	0.27
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.14	660	0.26
WATER HEAD	Hw	0.4	m	13	0.14	780	0.26
				15	0.15	900	0.26
				16	0.15	960	0.25
				17	0.15	1020	0.25
				18	0.15	1080	0.25
				19	0.15	1140	0.25
				20	0.16	1200	0.25
				25	0.17	1500	0.23
				30	0.18	1800	0.22
				35	0.19	2100	0.21
				40	0.20	2400	0.20
				45	0.21	2700	0.20
				50	0.22	3000	0.18
				55	0.23	3300	0.17
				60	0.24	3600	0.16

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



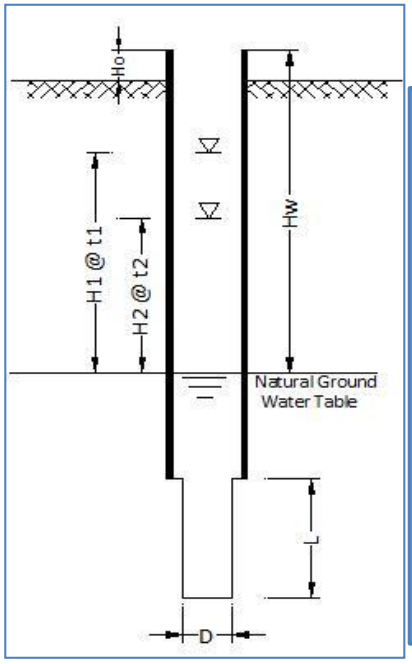


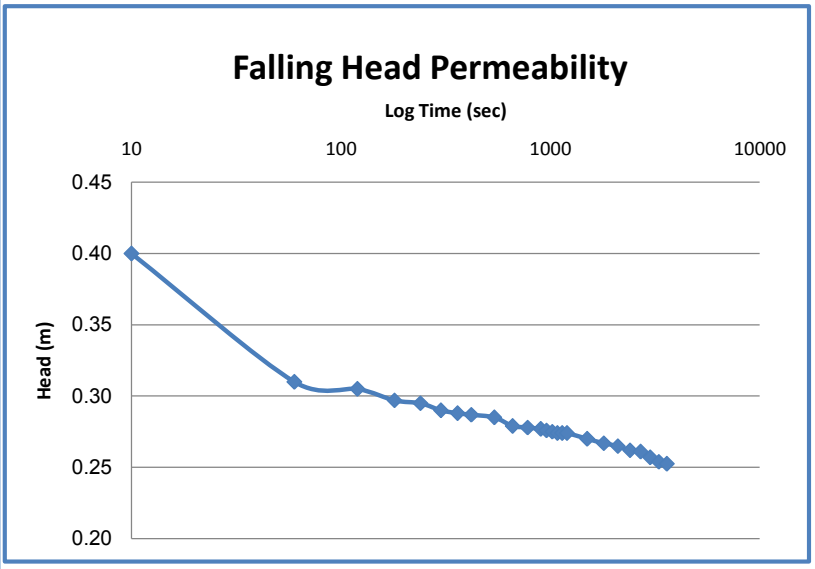
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	12/31/2013
Test Location	3 to 6	Y		K(m/sec):	3.7158E-08
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.09	60	0.31
WATER LEVEL BEFORE TEST	W.L	-2	mAD	2	0.10	120	0.31
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.10	180	0.30
CASING TOP LEVEL		0.3	mAD	4	0.11	240	0.30
CASING LENGTH		3.3	m	5	0.11	300	0.29
CASING BOTTOM LEVEL		-3	mAD	6	0.11	360	0.29
BOREHOLE DEPTH		6	m	7	0.11	420	0.29
BOREHOLE BOTTOM LEVEL		-6	mAD	9	0.12	540	0.29
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.12	660	0.28
WATER HEAD	Hw	0.4	m	13	0.12	780	0.28
				15	0.12	900	0.28
				16	0.12	960	0.28
				17	0.13	1020	0.28
				18	0.13	1080	0.27
				19	0.13	1140	0.27
				20	0.13	1200	0.27
				25	0.13	1500	0.27
				30	0.13	1800	0.27
				35	0.14	2100	0.27
				40	0.14	2400	0.26
				45	0.14	2700	0.26
				50	0.14	3000	0.26
				55	0.15	3300	0.25
				60	0.15	3600	0.25

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



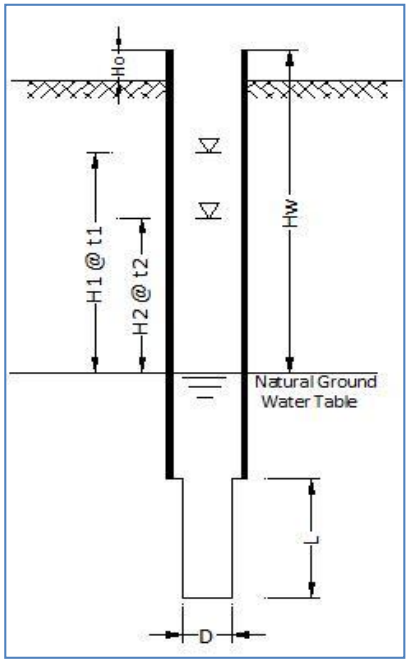


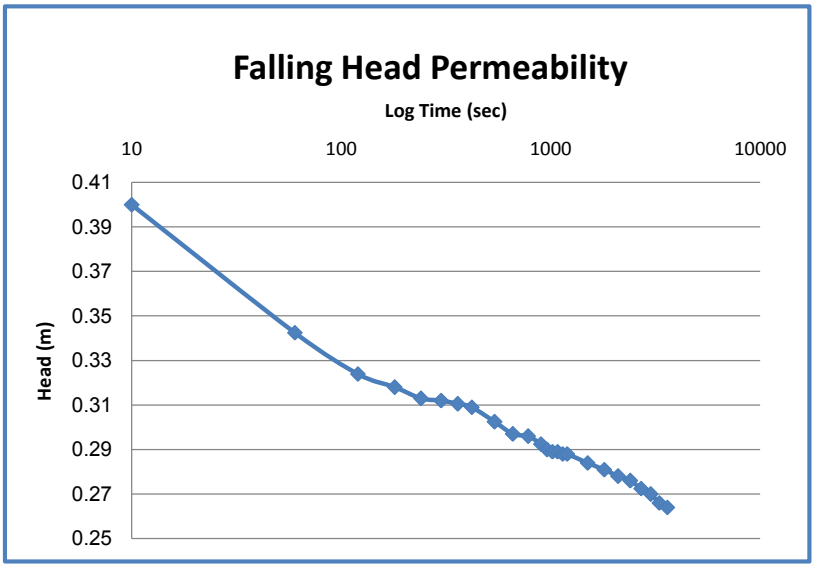
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	12/31/2013
Test Location	6 to 9	Y		K(m/sec):	4.1561E-08
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.06	60	0.34
WATER LEVEL BEFORE TEST	W.L	-3.4	mAD	2	0.08	120	0.32
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.08	180	0.32
CASING TOP LEVEL		0.3	mAD	4	0.09	240	0.31
CASING LENGTH		6.3	m	5	0.09	300	0.31
CASING BOTTOM LEVEL		-6	mAD	6	0.09	360	0.31
BOREHOLE DEPTH		9	m	7	0.09	420	0.31
BOREHOLE BOTTOM LEVEL		-9	mAD	9	0.10	540	0.30
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.10	660	0.30
WATER HEAD	Hw	0.4	m	13	0.10	780	0.30
				15	0.11	900	0.29
				16	0.11	960	0.29
				17	0.11	1020	0.29
				18	0.11	1080	0.29
				19	0.11	1140	0.29
				20	0.11	1200	0.29
				25	0.12	1500	0.28
				30	0.12	1800	0.28
				35	0.12	2100	0.28
				40	0.12	2400	0.28
				45	0.13	2700	0.27
				50	0.13	3000	0.27
				55	0.13	3300	0.27
				60	0.14	3600	0.26

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



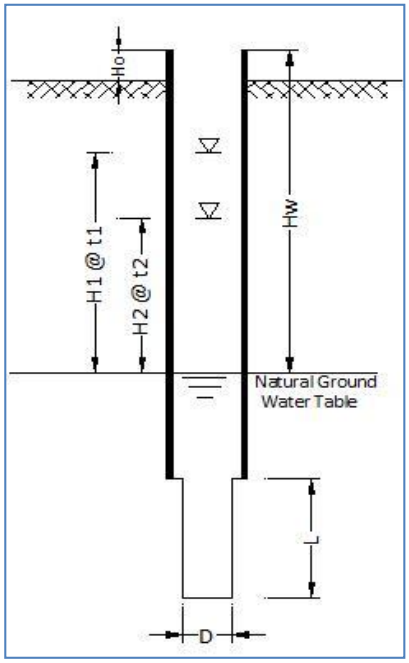


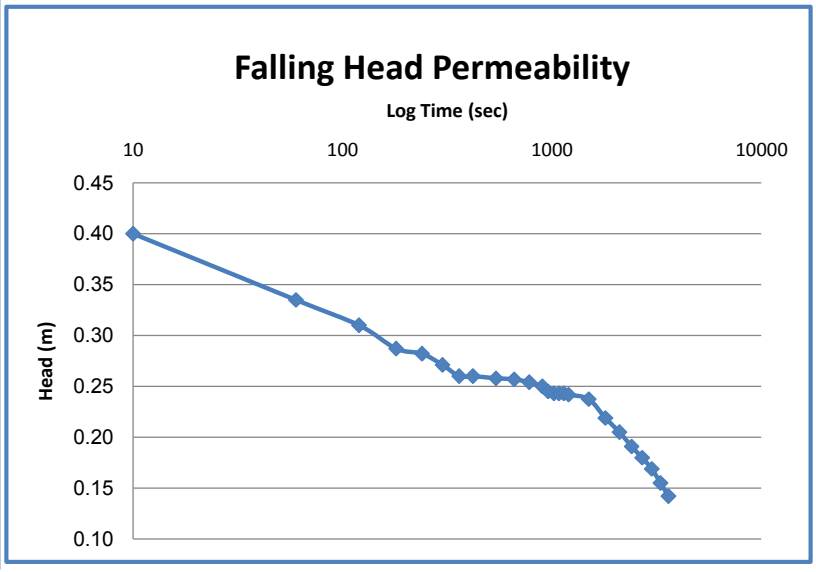
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	12/31/2013
Test Location	9 to 12	Y		K(m/sec):	2.6810E-07
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.07	60	0.34
WATER LEVEL BEFORE TEST	W.L	-8.2	mAD	2	0.09	120	0.31
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.11	180	0.29
CASING TOP LEVEL		0.3	mAD	4	0.12	240	0.28
CASING LENGTH		9.3	m	5	0.13	300	0.27
CASING BOTTOM LEVEL		-9	mAD	6	0.14	360	0.26
BOREHOLE DEPTH		12	m	7	0.14	420	0.26
BOREHOLE BOTTOM LEVEL		-12	mAD	9	0.14	540	0.26
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.14	660	0.26
WATER HEAD	Hw	0.4	m	13	0.15	780	0.25
				15	0.15	900	0.25
				16	0.16	960	0.25
				17	0.16	1020	0.24
				18	0.16	1080	0.24
				19	0.16	1140	0.24
				20	0.16	1200	0.24
				25	0.16	1500	0.24
				30	0.18	1800	0.22
				35	0.20	2100	0.21
				40	0.21	2400	0.19
				45	0.22	2700	0.18
				50	0.23	3000	0.17
				55	0.25	3300	0.16
				60	0.26	3600	0.14

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



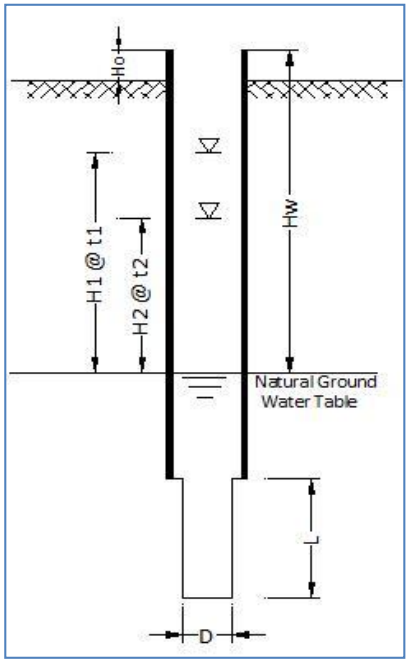


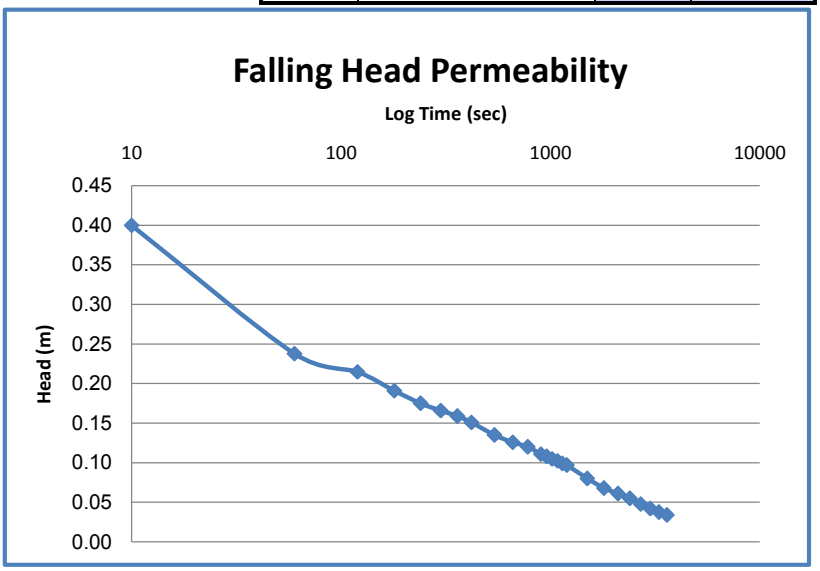
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/2/2014
Test Location	12 to 15	Y		K(m/sec):	5.2595E-07
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.16	60	0.24
WATER LEVEL BEFORE TEST	W.L	-9.5	mAD	2	0.19	120	0.22
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.21	180	0.19
CASING TOP LEVEL		0.3	mAD	4	0.23	240	0.18
CASING LENGTH		12.3	m	5	0.23	300	0.17
CASING BOTTOM LEVEL		-12	mAD	6	0.24	360	0.16
BOREHOLE DEPTH		15	m	7	0.25	420	0.15
BOREHOLE BOTTOM LEVEL		-15	mAD	9	0.27	540	0.14
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.27	660	0.13
WATER HEAD	Hw	0.4	m	13	0.28	780	0.12
				15	0.29	900	0.11
				16	0.29	960	0.11
				17	0.30	1020	0.11
				18	0.30	1080	0.10
				19	0.30	1140	0.10
				20	0.30	1200	0.10
				25	0.32	1500	0.08
				30	0.33	1800	0.07
				35	0.34	2100	0.06
				40	0.35	2400	0.06
				45	0.35	2700	0.05
				50	0.36	3000	0.04
				55	0.36	3300	0.04
				60	0.37	3600	0.03

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$

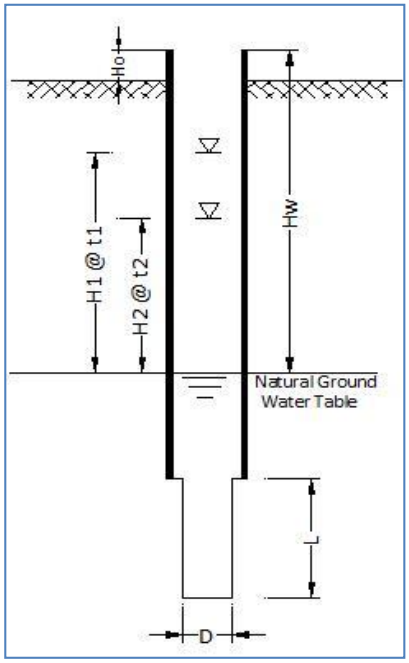


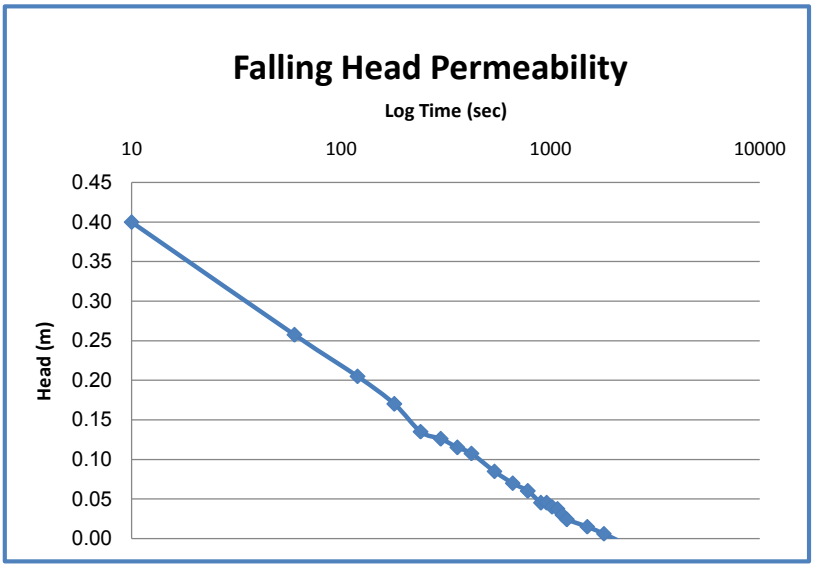


PROJECT		Bisri Dam / Second Package			FALLING HEAD PERMEABILITY TEST			
CLIENT		DAR-TALEB						
Borehole	BHVL 01	X			Date:		1/2/2014	
Test Location	15 to 18	Y			K(m/sec):		2.2217E-06	
Inclination	0	Z						

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.14	60	0.26
WATER LEVEL BEFORE TEST	W.L	-12.25	mAD	2	0.20	120	0.21
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.23	180	0.17
CASING TOP LEVEL		0.3	mAD	4	0.27	240	0.14
CASING LENGTH		15.3	m	5	0.27	300	0.13
CASING BOTTOM LEVEL		-15	mAD	6	0.29	360	0.12
BOREHOLE DEPTH		18	m	7	0.29	420	0.11
BOREHOLE BOTTOM LEVEL		-18	mAD	9	0.32	540	0.09
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.33	660	0.07
WATER HEAD	Hw	0.4	m	13	0.34	780	0.06
				15	0.36	900	0.05
				16	0.36	960	0.05
				17	0.36	1020	0.04
				18	0.36	1080	0.04
				19	0.37	1140	0.03
				20	0.38	1200	0.02
				25	0.39	1500	0.02
				30	0.39	1800	0.01
				35	0.40	2100	0.00

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



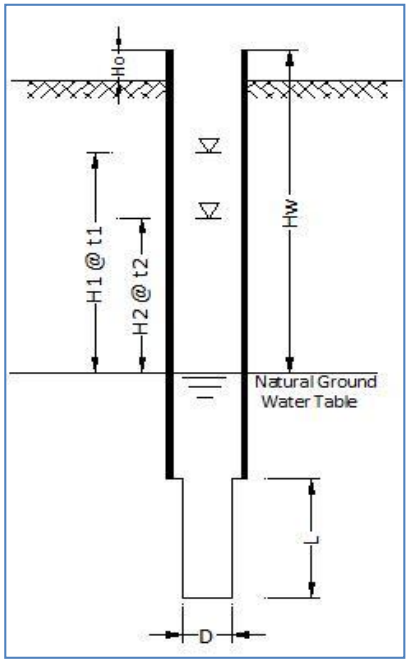


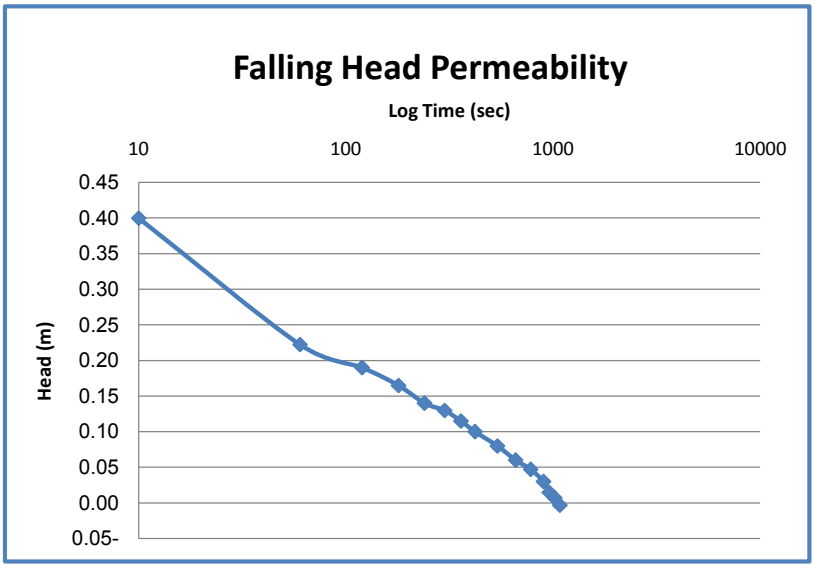
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/2/2014
Test Location	21 to 24	Y		K(m/sec):	4.1179E-06
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.18	60	0.22
WATER LEVEL BEFORE TEST	W.L	-17.75	mAD	2	0.21	120	0.19
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.24	180	0.17
CASING TOP LEVEL		0.3	mAD	4	0.26	240	0.14
CASING LENGTH		21.3	m	5	0.27	300	0.13
CASING BOTTOM LEVEL		-21	mAD	6	0.29	360	0.12
BOREHOLE DEPTH		24	m	7	0.30	420	0.10
BOREHOLE BOTTOM LEVEL		-24	mAD	9	0.32	540	0.08
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.34	660	0.06
WATER HEAD	Hw	0.4	m	13	0.35	780	0.05
				15	0.37	900	0.03
				16	0.39	960	0.02
				17	0.39	1020	0.01
				18	0.40	1080	0.00

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



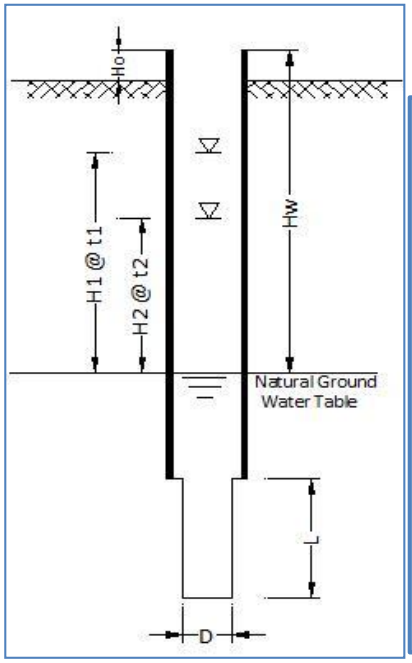


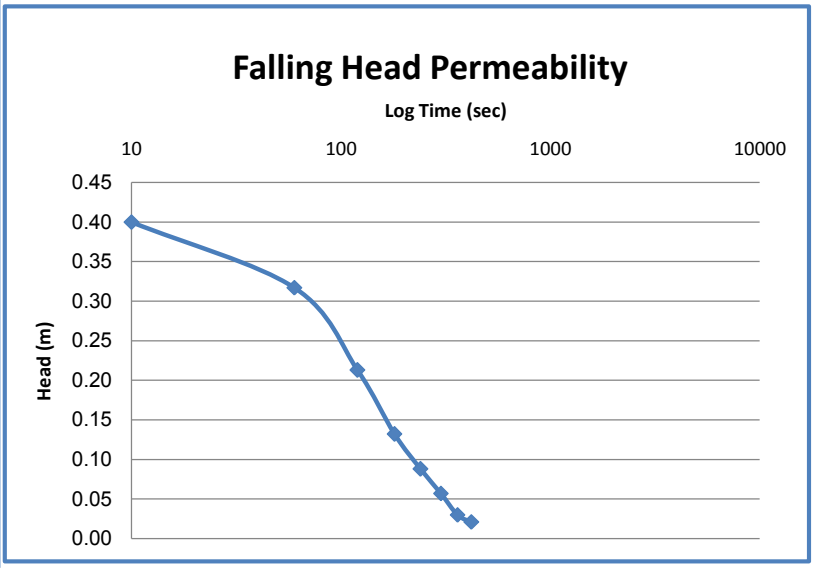
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/3/2014
Test Location	24 to 27	Y		K(m/sec):	8.3842E-06
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.08	60	0.32
WATER LEVEL BEFORE TEST	W.L	-15.25	mAD	2	0.19	120	0.21
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.27	180	0.13
CASING TOP LEVEL		0.3	mAD	4	0.31	240	0.09
CASING LENGTH		24.3	m	5	0.34	300	0.06
CASING BOTTOM LEVEL		-24	mAD	6	0.37	360	0.03
BOREHOLE DEPTH		27	m	7	0.38	420	0.02
BOREHOLE BOTTOM LEVEL		-27	mAD				
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m				
WATER HEAD	Hw	0.4	m				

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



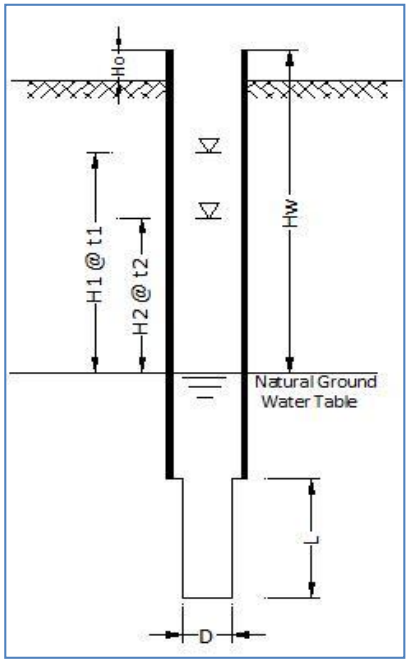


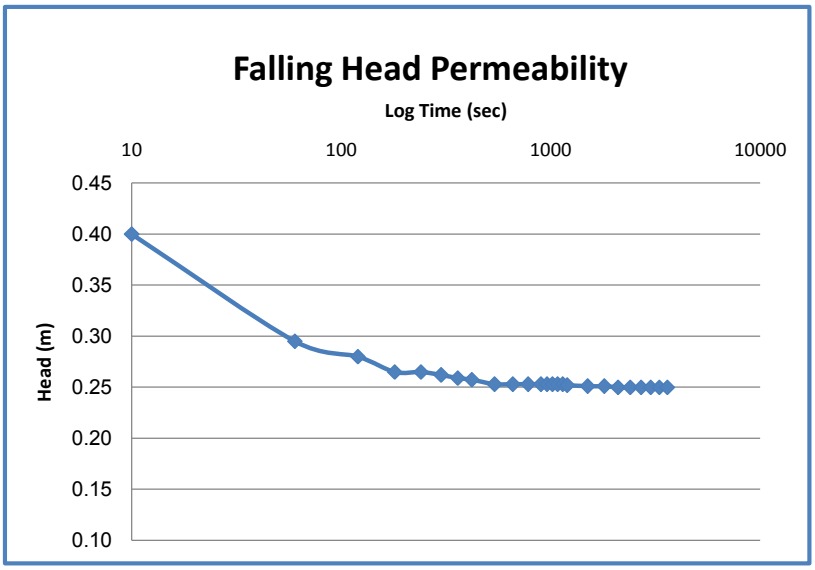
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/3/2014
Test Location	27 to 30	Y		K(m/sec):	1.3010E-08
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.11	60	0.30
WATER LEVEL BEFORE TEST	W.L		mAD	2	0.12	120	0.28
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.14	180	0.27
CASING TOP LEVEL		0.3	mAD	4	0.14	240	0.27
CASING LENGTH		27.3	m	5	0.14	300	0.26
CASING BOTTOM LEVEL		-27	mAD	6	0.14	360	0.26
BOREHOLE DEPTH		30	m	7	0.14	420	0.26
BOREHOLE BOTTOM LEVEL		-30	mAD	9	0.15	540	0.25
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.15	660	0.25
WATER HEAD	Hw	0.4	m	13	0.15	780	0.25
				15	0.15	900	0.25
				16	0.15	960	0.25
				17	0.15	1020	0.25
				18	0.15	1080	0.25
				19	0.15	1140	0.25
				20	0.15	1200	0.25
				25	0.15	1500	0.25
				30	0.15	1800	0.25
				35	0.15	2100	0.25
				40	0.15	2400	0.25
				45	0.15	2700	0.25
				50	0.15	3000	0.25
				55	0.15	3300	0.25
				60	0.15	3600	0.25

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



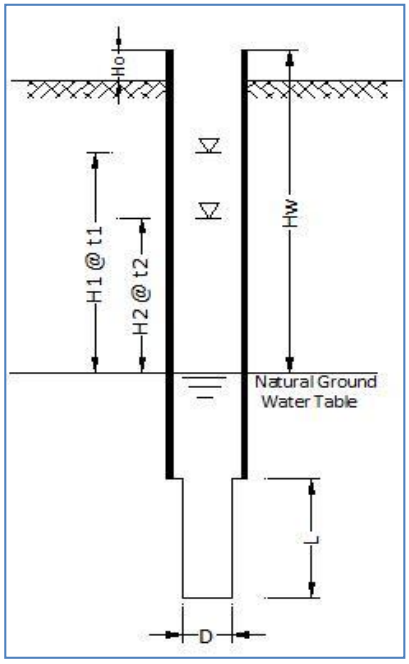


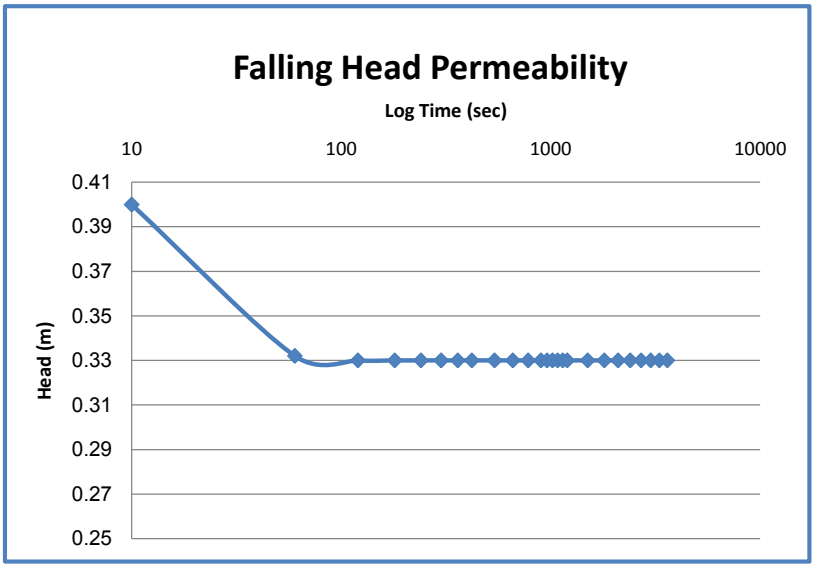
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/3/2014
Test Location	30 to 33	Y		K(m/sec):	9.2309E-09
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.07	60	0.33
WATER LEVEL BEFORE TEST	W.L	-19.75	mAD	2	0.07	120	0.33
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.07	180	0.33
CASING TOP LEVEL		0.3	mAD	4	0.07	240	0.33
CASING LENGTH		30.3	m	5	0.07	300	0.33
CASING BOTTOM LEVEL		-30	mAD	6	0.07	360	0.33
BOREHOLE DEPTH		33	m	7	0.07	420	0.33
BOREHOLE BOTTOM LEVEL		-33	mAD	9	0.07	540	0.33
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.07	660	0.33
WATER HEAD	Hw	0.4	m	13	0.07	780	0.33
				15	0.07	900	0.33
				16	0.07	960	0.33
				17	0.07	1020	0.33
				18	0.07	1080	0.33
				19	0.07	1140	0.33
				20	0.07	1200	0.33
				25	0.07	1500	0.33
				30	0.07	1800	0.33
				35	0.07	2100	0.33
				40	0.07	2400	0.33
				45	0.07	2700	0.33
				50	0.07	3000	0.33
				55	0.07	3300	0.33
				60	0.07	3600	0.33

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



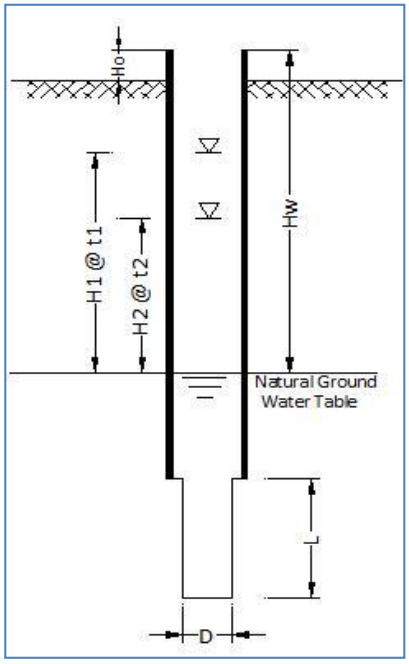


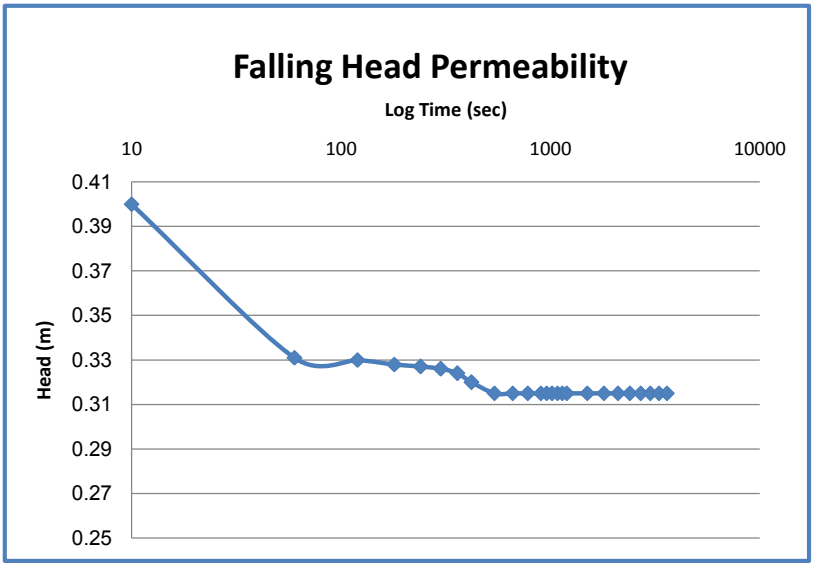
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/3/2014
Test Location	33 to 36	Y		K(m/sec):	1.4385E-08
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.07	60	0.33
WATER LEVEL BEFORE TEST	W.L	-20	mAD	2	0.07	120	0.33
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.07	180	0.33
CASING TOP LEVEL		0.3	mAD	4	0.07	240	0.33
CASING LENGTH		33.3	m	5	0.07	300	0.33
CASING BOTTOM LEVEL		-33	mAD	6	0.08	360	0.32
BOREHOLE DEPTH		36	m	7	0.08	420	0.32
BOREHOLE BOTTOM LEVEL		-36	mAD	9	0.09	540	0.32
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.09	660	0.32
WATER HEAD	Hw	0.4	m	13	0.09	780	0.32
				15	0.09	900	0.32
				16	0.09	960	0.32
				17	0.09	1020	0.32
				18	0.09	1080	0.32
				19	0.09	1140	0.32
				20	0.09	1200	0.32
				25	0.09	1500	0.32
				30	0.09	1800	0.32
				35	0.09	2100	0.32
				40	0.09	2400	0.32
				45	0.09	2700	0.32
				50	0.09	3000	0.32
				55	0.09	3300	0.32
				60	0.09	3600	0.32

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



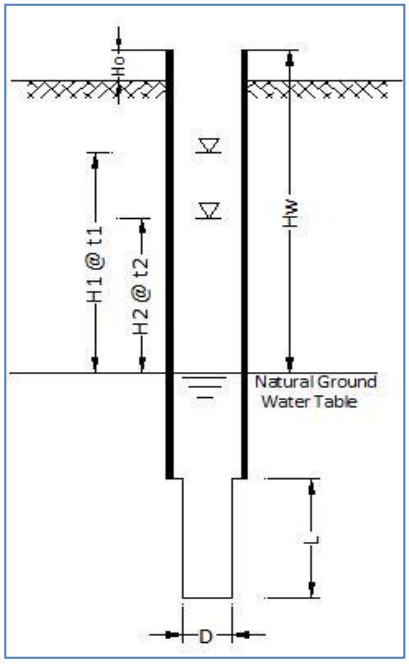


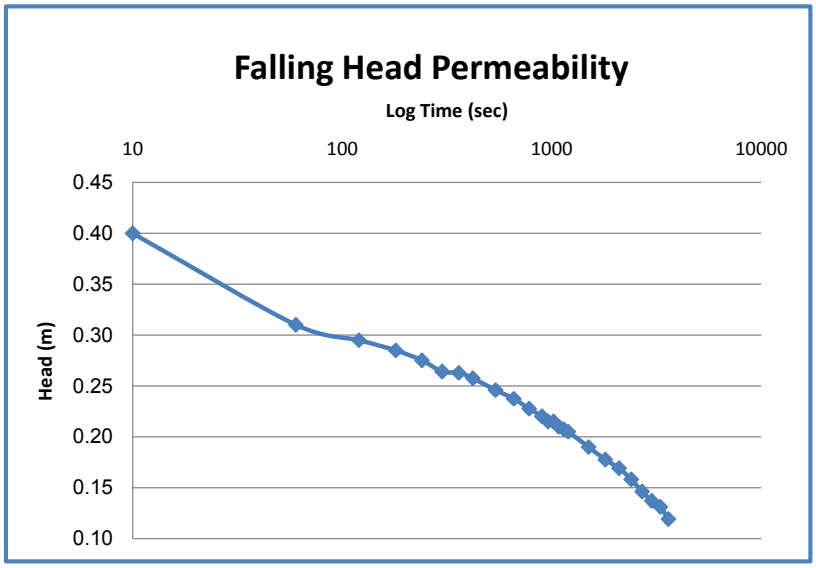
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/4/2014
Test Location	36 to 39	Y		K(m/sec):	2.5729E-07
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.09	60	0.31
WATER LEVEL BEFORE TEST	W.L	-23.9	mAD	2	0.11	120	0.30
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.12	180	0.29
CASING TOP LEVEL		0.3	mAD	4	0.13	240	0.28
CASING LENGTH		36.3	m	5	0.14	300	0.26
CASING BOTTOM LEVEL		-36	mAD	6	0.14	360	0.26
BOREHOLE DEPTH		39	m	7	0.14	420	0.26
BOREHOLE BOTTOM LEVEL		-39	mAD	9	0.15	540	0.25
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.16	660	0.24
WATER HEAD	Hw	0.4	m	13	0.17	780	0.23
				15	0.18	900	0.22
				16	0.19	960	0.22
				17	0.19	1020	0.22
				18	0.19	1080	0.21
				19	0.19	1140	0.21
				20	0.20	1200	0.21
				25	0.21	1500	0.19
				30	0.22	1800	0.18
				35	0.23	2100	0.17
				40	0.24	2400	0.16
				45	0.25	2700	0.15
				50	0.26	3000	0.14
				55	0.27	3300	0.13
				60	0.28	3600	0.12

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



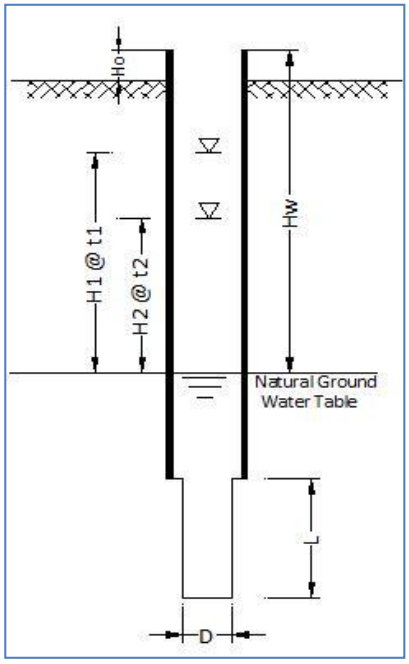


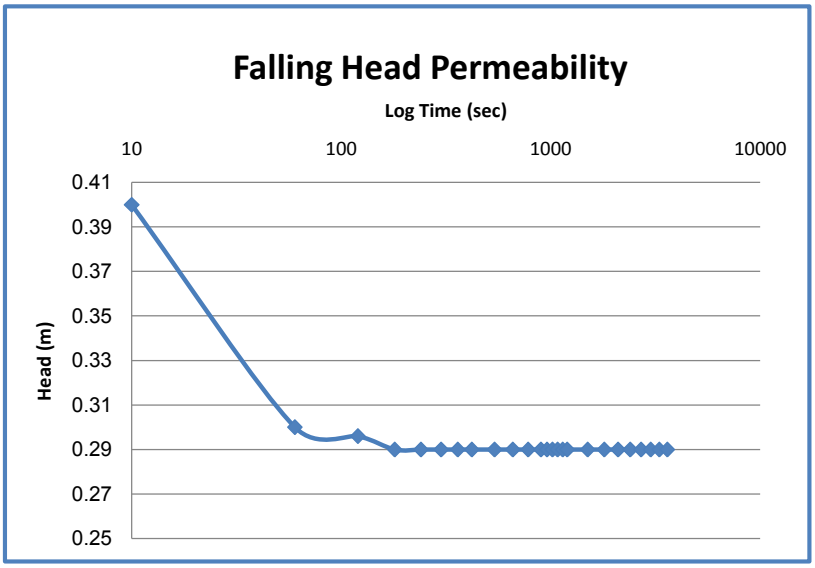
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/4/2014
Test Location	39 to 42	Y		K(m/sec):	1.0483E-08
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.10	60	0.30
WATER LEVEL BEFORE TEST	W.L	-26.3	mAD	2	0.10	120	0.30
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.11	180	0.29
CASING TOP LEVEL		0.3	mAD	4	0.11	240	0.29
CASING LENGTH		39.3	m	5	0.11	300	0.29
CASING BOTTOM LEVEL		-39	mAD	6	0.11	360	0.29
BOREHOLE DEPTH		42	m	7	0.11	420	0.29
BOREHOLE BOTTOM LEVEL		-42	mAD	9	0.11	540	0.29
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.11	660	0.29
WATER HEAD	Hw	0.4	m	13	0.11	780	0.29
				15	0.11	900	0.29
				16	0.11	960	0.29
				17	0.11	1020	0.29
				18	0.11	1080	0.29
				19	0.11	1140	0.29
				20	0.11	1200	0.29
				25	0.11	1500	0.29
				30	0.11	1800	0.29
				35	0.11	2100	0.29
				40	0.11	2400	0.29
				45	0.11	2700	0.29
				50	0.11	3000	0.29
				55	0.11	3300	0.29
				60	0.11	3600	0.29

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



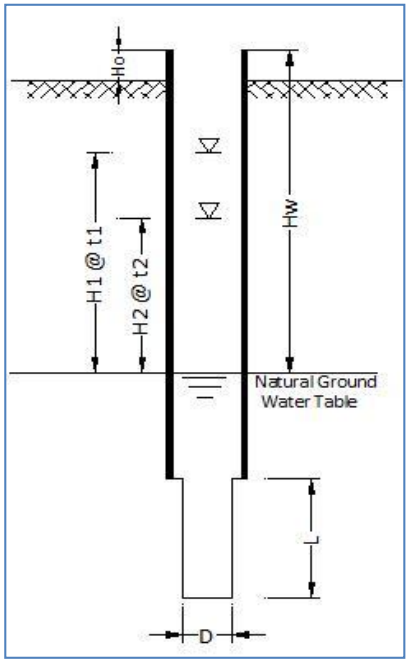


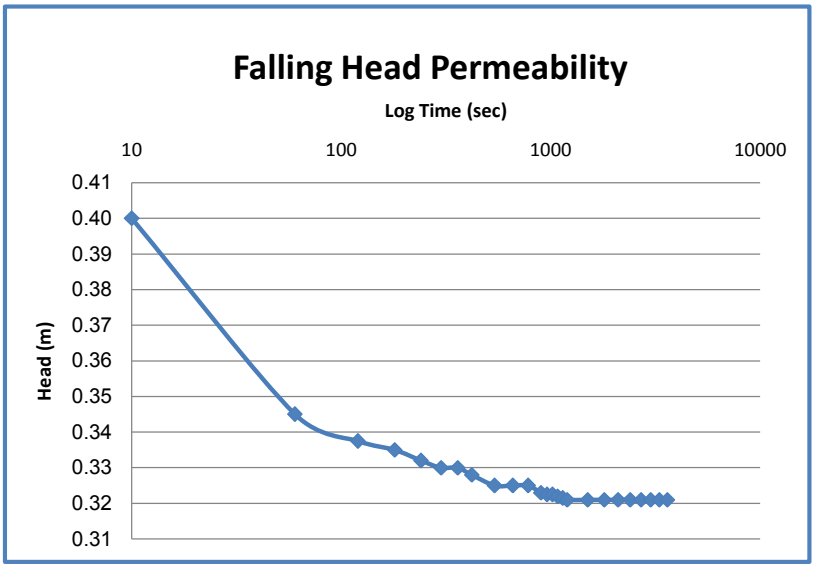
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/4/2014
Test Location	42 to 45	Y		K(m/sec):	9.0083E-09
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.06	60	0.35
WATER LEVEL BEFORE TEST	W.L	-28.5	mAD	2	0.06	120	0.34
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.07	180	0.34
CASING TOP LEVEL		0.3	mAD	4	0.07	240	0.33
CASING LENGTH		42.3	m	5	0.07	300	0.33
CASING BOTTOM LEVEL		-42	mAD	6	0.07	360	0.33
BOREHOLE DEPTH		45	m	7	0.07	420	0.33
BOREHOLE BOTTOM LEVEL		-45	mAD	9	0.08	540	0.33
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.08	660	0.33
WATER HEAD	Hw	0.4	m	13	0.08	780	0.33
				15	0.08	900	0.32
				16	0.08	960	0.32
				17	0.08	1020	0.32
				18	0.08	1080	0.32
				19	0.08	1140	0.32
				20	0.08	1200	0.32
				25	0.08	1500	0.32
				30	0.08	1800	0.32
				35	0.08	2100	0.32
				40	0.08	2400	0.32
				45	0.08	2700	0.32
				50	0.08	3000	0.32
				55	0.08	3300	0.32
				60	0.08	3600	0.32

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



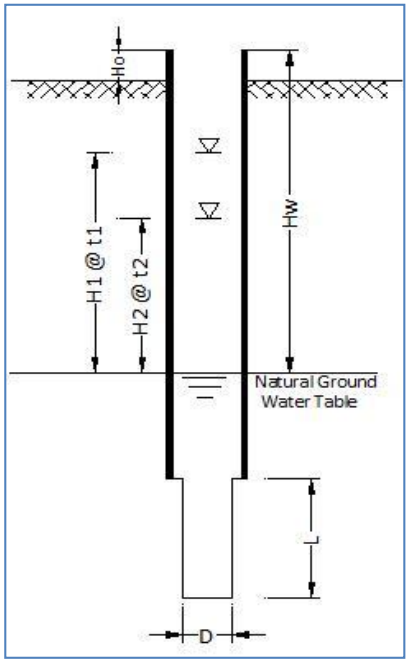


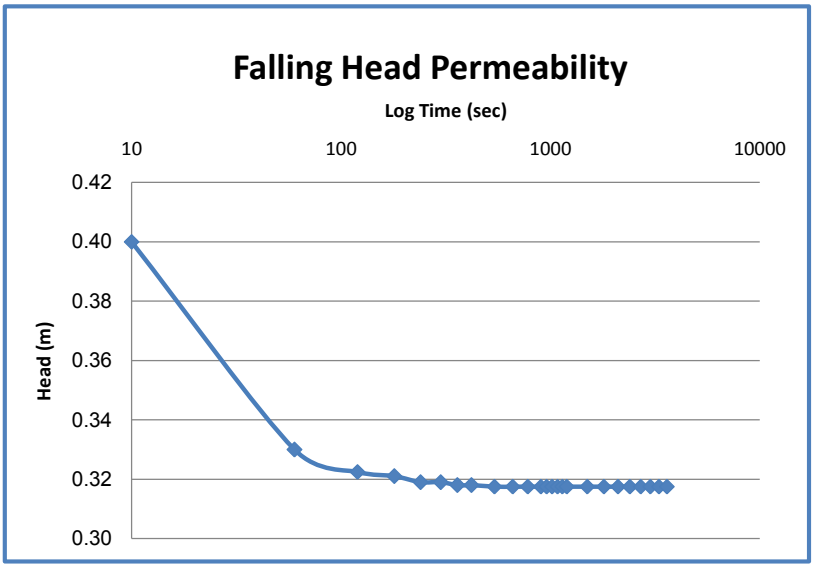
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/6/2014
Test Location	45 to 48	Y		K(m/sec):	9.5150E-09
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.07	60	0.33
WATER LEVEL BEFORE TEST	W.L	-32.75	mAD	2	0.08	120	0.32
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.08	180	0.32
CASING TOP LEVEL		0.3	mAD	4	0.08	240	0.32
CASING LENGTH		45.3	m	5	0.08	300	0.32
CASING BOTTOM LEVEL		-45	mAD	6	0.08	360	0.32
BOREHOLE DEPTH		48	m	7	0.08	420	0.32
BOREHOLE BOTTOM LEVEL		-48	mAD	9	0.08	540	0.32
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.08	660	0.32
WATER HEAD	Hw	0.4	m	13	0.08	780	0.32
				15	0.08	900	0.32
				16	0.08	960	0.32
				17	0.08	1020	0.32
				18	0.08	1080	0.32
				19	0.08	1140	0.32
				20	0.08	1200	0.32
				25	0.08	1500	0.32
				30	0.08	1800	0.32
				35	0.08	2100	0.32
				40	0.08	2400	0.32
				45	0.08	2700	0.32
				50	0.08	3000	0.32
				55	0.08	3300	0.32
				60	0.08	3600	0.32

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



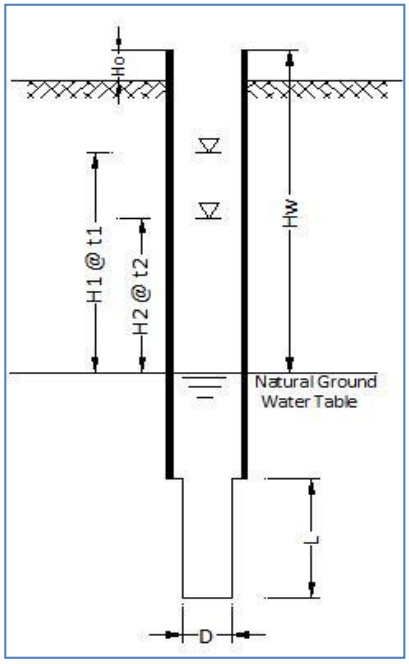


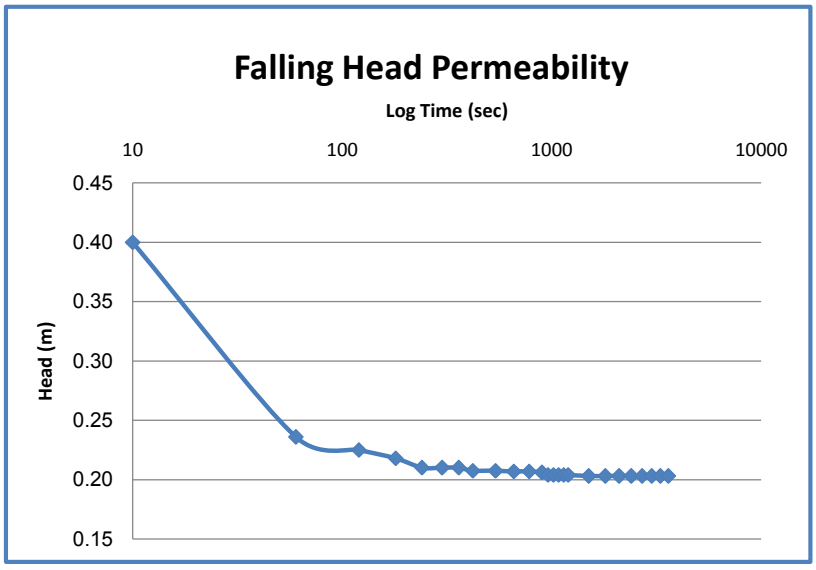
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/6/2014
Test Location	48 to 51	Y		K(m/sec):	2.5740E-08
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.16	60	0.24
WATER LEVEL BEFORE TEST	W.L	-37.3	mAD	2	0.18	120	0.23
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.18	180	0.22
CASING TOP LEVEL		0.3	mAD	4	0.19	240	0.21
CASING LENGTH		48.3	m	5	0.19	300	0.21
CASING BOTTOM LEVEL		-48	mAD	6	0.19	360	0.21
BOREHOLE DEPTH		51	m	7	0.19	420	0.21
BOREHOLE BOTTOM LEVEL		-51	mAD	9	0.19	540	0.21
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.19	660	0.21
WATER HEAD	Hw	0.4	m	13	0.19	780	0.21
				15	0.19	900	0.21
				16	0.20	960	0.20
				17	0.20	1020	0.20
				18	0.20	1080	0.20
				19	0.20	1140	0.20
				20	0.20	1200	0.20
				25	0.20	1500	0.20
				30	0.20	1800	0.20
				35	0.20	2100	0.20
				40	0.20	2400	0.20
				45	0.20	2700	0.20
				50	0.20	3000	0.20
				55	0.20	3300	0.20
				60	0.20	3600	0.20

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$

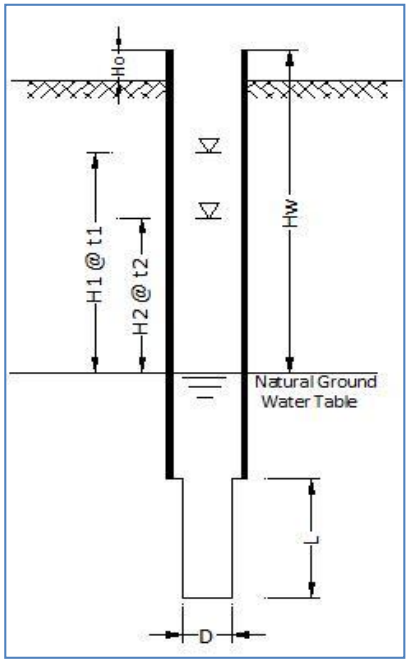


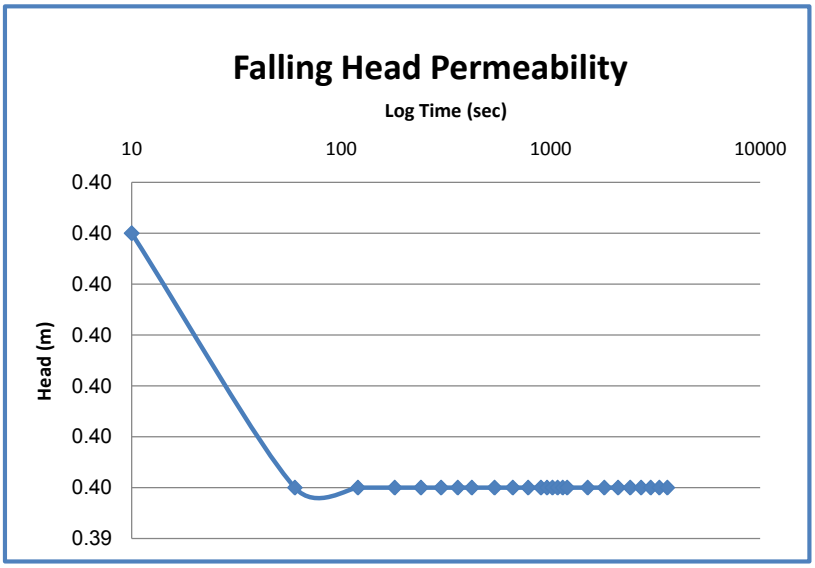


PROJECT		Bisri Dam / Second Package			FALLING HEAD PERMEABILITY TEST			
CLIENT		DAR-TALEB						
Borehole	BHVL 01	X			Date:		1/6/2014	
Test Location	51 to 54	Y			K(m/sec):		0.0000E+00	
Inclination	0	Z						

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.01	60	0.40
WATER LEVEL BEFORE TEST	W.L	-33.25	mAD	2	0.01	120	0.40
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.01	180	0.40
CASING TOP LEVEL		0.3	mAD	4	0.01	240	0.40
CASING LENGTH		51.3	m	5	0.01	300	0.40
CASING BOTTOM LEVEL		-51	mAD	6	0.01	360	0.40
BOREHOLE DEPTH		54	m	7	0.01	420	0.40
BOREHOLE BOTTOM LEVEL		-54	mAD	9	0.01	540	0.40
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.01	660	0.40
WATER HEAD	Hw	0.4	m	13	0.01	780	0.40
				15	0.01	900	0.40
				16	0.01	960	0.40
				17	0.01	1020	0.40
				18	0.01	1080	0.40
				19	0.01	1140	0.40
				20	0.01	1200	0.40
				25	0.01	1500	0.40
				30	0.01	1800	0.40
				35	0.01	2100	0.40
				40	0.01	2400	0.40
				45	0.01	2700	0.40
				50	0.01	3000	0.40
				55	0.01	3300	0.40
				60	0.01	3600	0.40

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



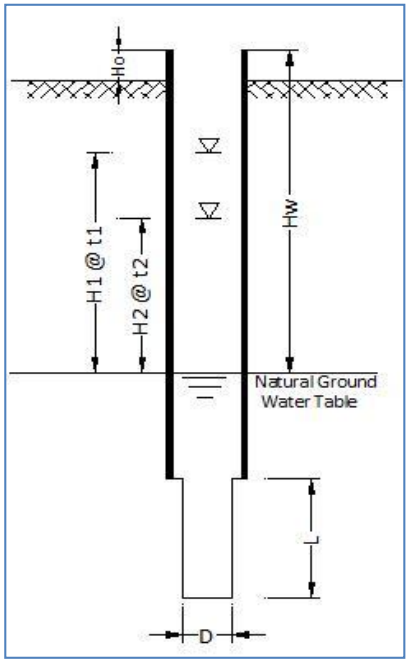


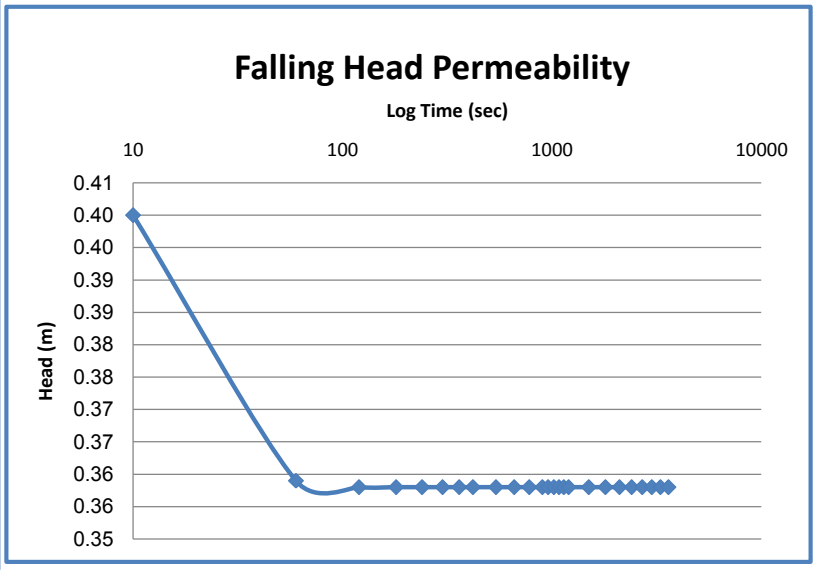
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/6/2014
Test Location	54 to 57	Y		K(m/sec):	5.9708E-09
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.04	60	0.36
WATER LEVEL BEFORE TEST	W.L	-37.5	mAD	2	0.04	120	0.36
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.04	180	0.36
CASING TOP LEVEL		0.3	mAD	4	0.04	240	0.36
CASING LENGTH		54.3	m	5	0.04	300	0.36
CASING BOTTOM LEVEL		-54	mAD	6	0.04	360	0.36
BOREHOLE DEPTH		57	m	7	0.04	420	0.36
BOREHOLE BOTTOM LEVEL		-57	mAD	9	0.04	540	0.36
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.04	660	0.36
WATER HEAD	Hw	0.4	m	13	0.04	780	0.36
				15	0.04	900	0.36
				16	0.04	960	0.36
				17	0.04	1020	0.36
				18	0.04	1080	0.36
				19	0.04	1140	0.36
				20	0.04	1200	0.36
				25	0.04	1500	0.36
				30	0.04	1800	0.36
				35	0.04	2100	0.36
				40	0.04	2400	0.36
				45	0.04	2700	0.36
				50	0.04	3000	0.36
				55	0.04	3300	0.36
				60	0.04	3600	0.36

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



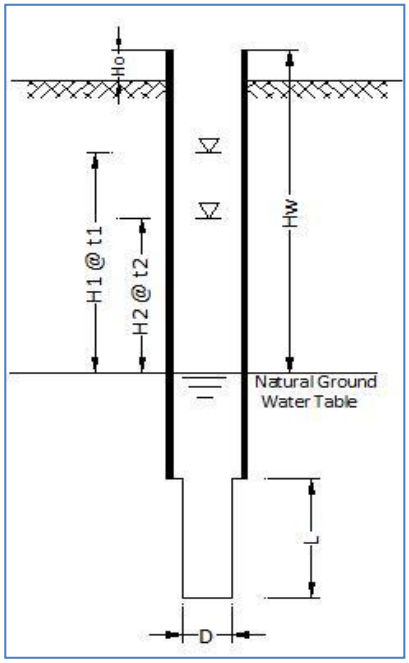


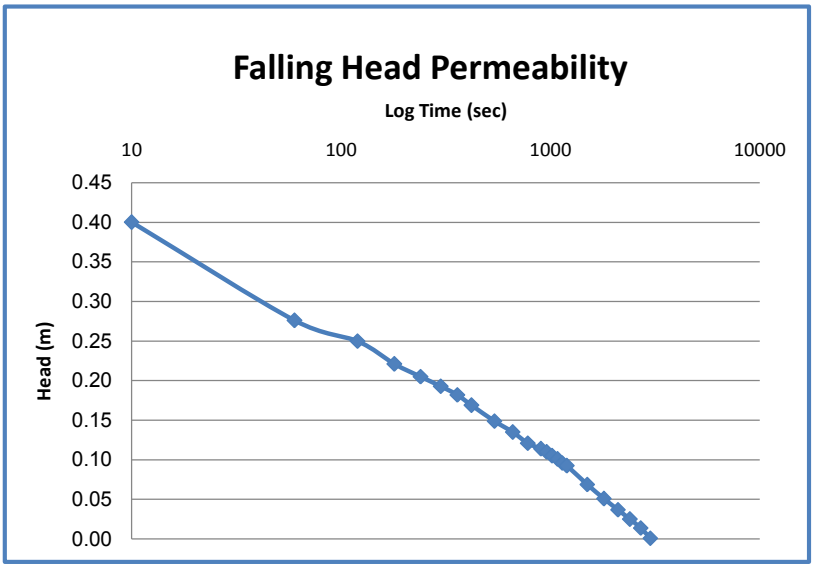
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/7/2014
Test Location	57 to 60	Y		K(m/sec):	1.3965E-06
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.12	60	0.28
WATER LEVEL BEFORE TEST	W.L	-42.25	mAD	2	0.15	120	0.25
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.18	180	0.22
CASING TOP LEVEL		0.3	mAD	4	0.20	240	0.21
CASING LENGTH		57.3	m	5	0.21	300	0.19
CASING BOTTOM LEVEL		-57	mAD	6	0.22	360	0.18
BOREHOLE DEPTH		60	m	7	0.23	420	0.17
BOREHOLE BOTTOM LEVEL		-60	mAD	9	0.25	540	0.15
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.27	660	0.14
WATER HEAD	Hw	0.4	m	13	0.28	780	0.12
				15	0.29	900	0.11
				16	0.29	960	0.11
				17	0.30	1020	0.11
				18	0.30	1080	0.10
				19	0.30	1140	0.10
				20	0.31	1200	0.09
				25	0.33	1500	0.07
				30	0.35	1800	0.05
				35	0.36	2100	0.04
				40	0.38	2400	0.03
				45	0.39	2700	0.01
				50	0.40	3000	0.00

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



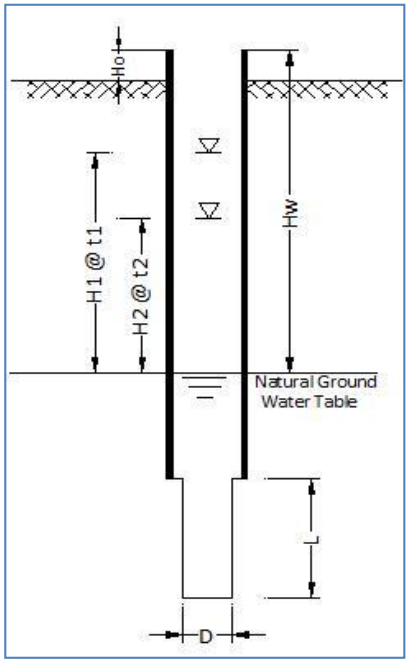


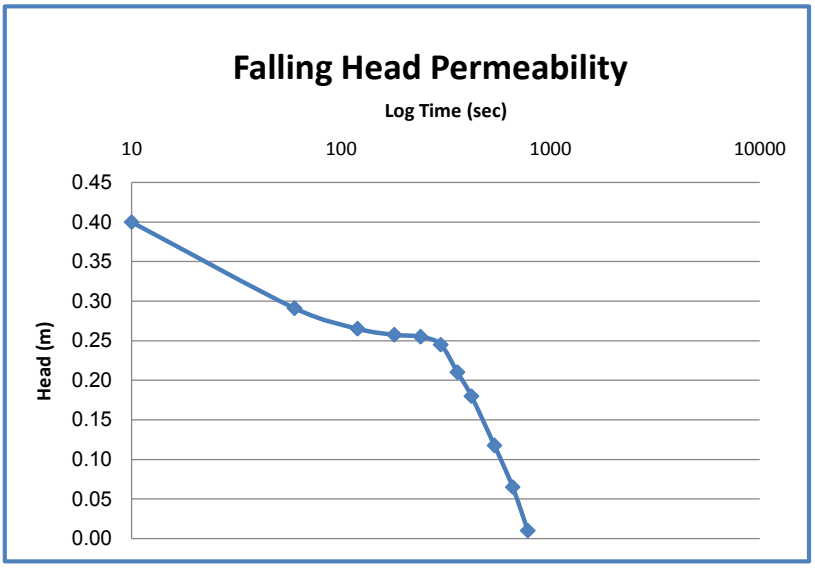
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/8/2014
Test Location	60 to 63	Y		K(m/sec):	7.2944E-06
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.11	60	0.29
WATER LEVEL BEFORE TEST	W.L	-40	mAD	2	0.14	120	0.27
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.14	180	0.26
CASING TOP LEVEL		0.3	mAD	4	0.15	240	0.26
CASING LENGTH		60.3	m	5	0.16	300	0.25
CASING BOTTOM LEVEL		-60	mAD	6	0.19	360	0.21
BOREHOLE DEPTH		63	m	7	0.22	420	0.18
BOREHOLE BOTTOM LEVEL		-63	mAD	9	0.28	540	0.12
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.34	660	0.07
WATER HEAD	Hw	0.4	m	13	0.39	780	0.01

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



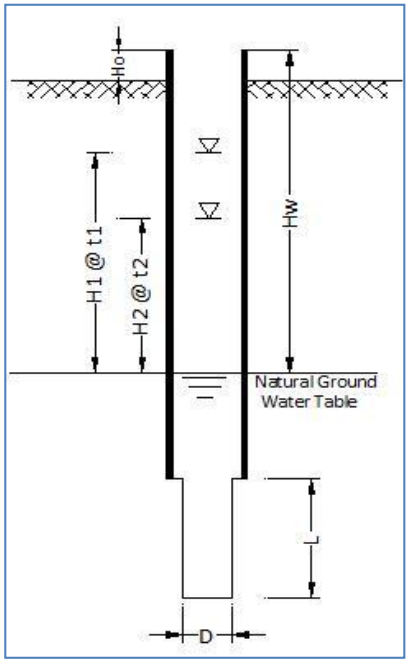


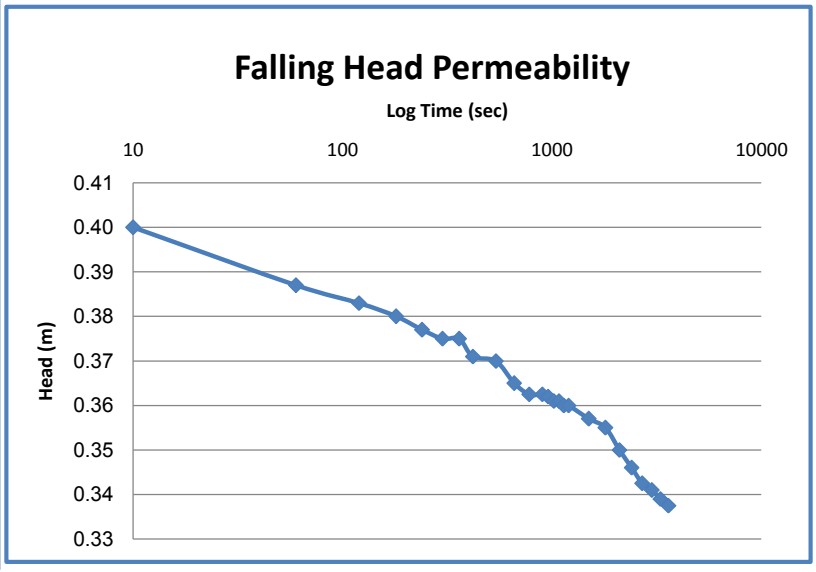
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/8/2014
Test Location	63 to 66	Y		K(m/sec):	1.9622E-08
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.01	60	0.39
WATER LEVEL BEFORE TEST	W.L	-34.2	mAD	2	0.02	120	0.38
HEIGHT OF CASING ABOVE NGL	Ho	0.3	m	3	0.02	180	0.38
CASING TOP LEVEL		0.3	mAD	4	0.02	240	0.38
CASING LENGTH		63.3	m	5	0.03	300	0.38
CASING BOTTOM LEVEL		-63	mAD	6	0.03	360	0.38
BOREHOLE DEPTH		66	m	7	0.03	420	0.37
BOREHOLE BOTTOM LEVEL		-66	mAD	9	0.03	540	0.37
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.04	660	0.37
WATER HEAD	Hw	0.4	m	13	0.04	780	0.36
				15	0.04	900	0.36
				16	0.04	960	0.36
				17	0.04	1020	0.36
				18	0.04	1080	0.36
				19	0.04	1140	0.36
				20	0.04	1200	0.36
				25	0.04	1500	0.36
				30	0.05	1800	0.36
				35	0.05	2100	0.35
				40	0.05	2400	0.35
				45	0.06	2700	0.34
				50	0.06	3000	0.34
				55	0.06	3300	0.34
				60	0.06	3600	0.34

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



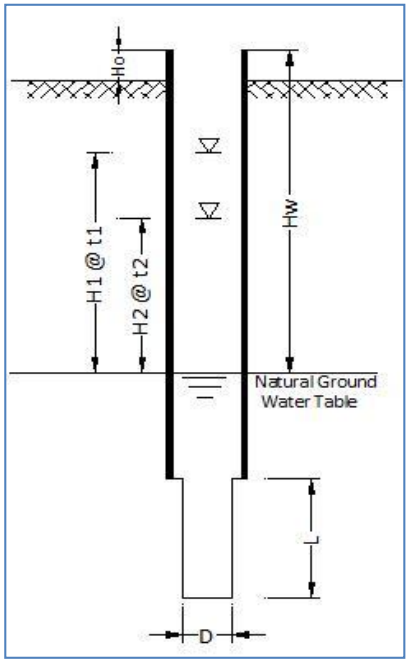


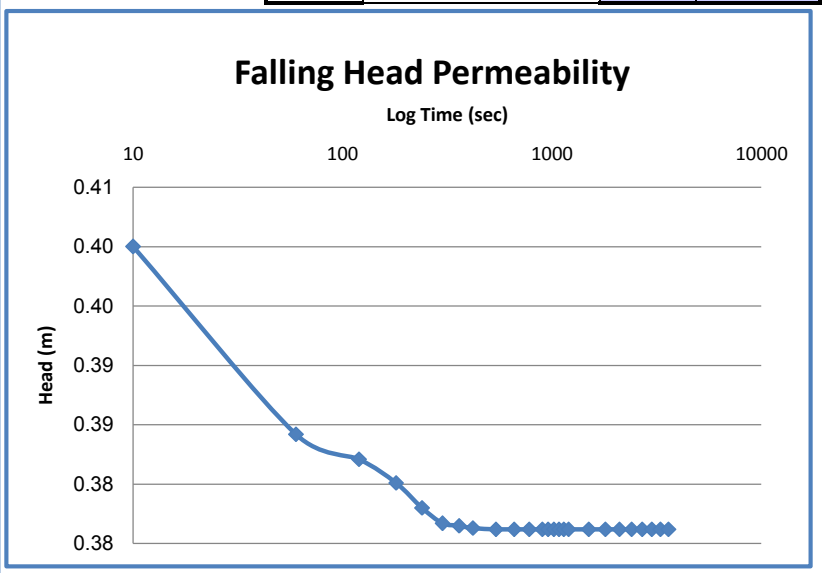
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHVL 01	X		Date:	1/14/2014
Test Location	83 to 110	Y		K(m/sec):	1.6576E-07
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1	127	mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	0.40
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.02	60	0.38
WATER LEVEL BEFORE TEST	W.L	-2.4	mAD	2	0.02	120	0.38
HEIGHT OF CASING ABOVE NGL	Ho	1	m	3	0.02	180	0.38
CASING TOP LEVEL		1	mAD	4	0.02	240	0.38
CASING LENGTH		83.5	m	5	0.02	300	0.38
CASING BOTTOM LEVEL		-82.5	mAD	6	0.02	360	0.38
BOREHOLE DEPTH		110	m	7	0.02	420	0.38
BOREHOLE BOTTOM LEVEL		-110	mAD	9	0.02	540	0.38
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	27.5	m	11	0.02	660	0.38
WATER HEAD	Hw	0.4	m	13	0.02	780	0.38
				15	0.02	900	0.38
				16	0.02	960	0.38
				17	0.02	1020	0.38
				18	0.02	1080	0.38
				19	0.02	1140	0.38
				20	0.02	1200	0.38
				25	0.02	1500	0.38
				30	0.02	1800	0.38
				35	0.02	2100	0.38
				40	0.02	2400	0.38
				45	0.02	2700	0.38
				50	0.02	3000	0.38
				55	0.02	3300	0.38
				60	0.02	3600	0.38

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$

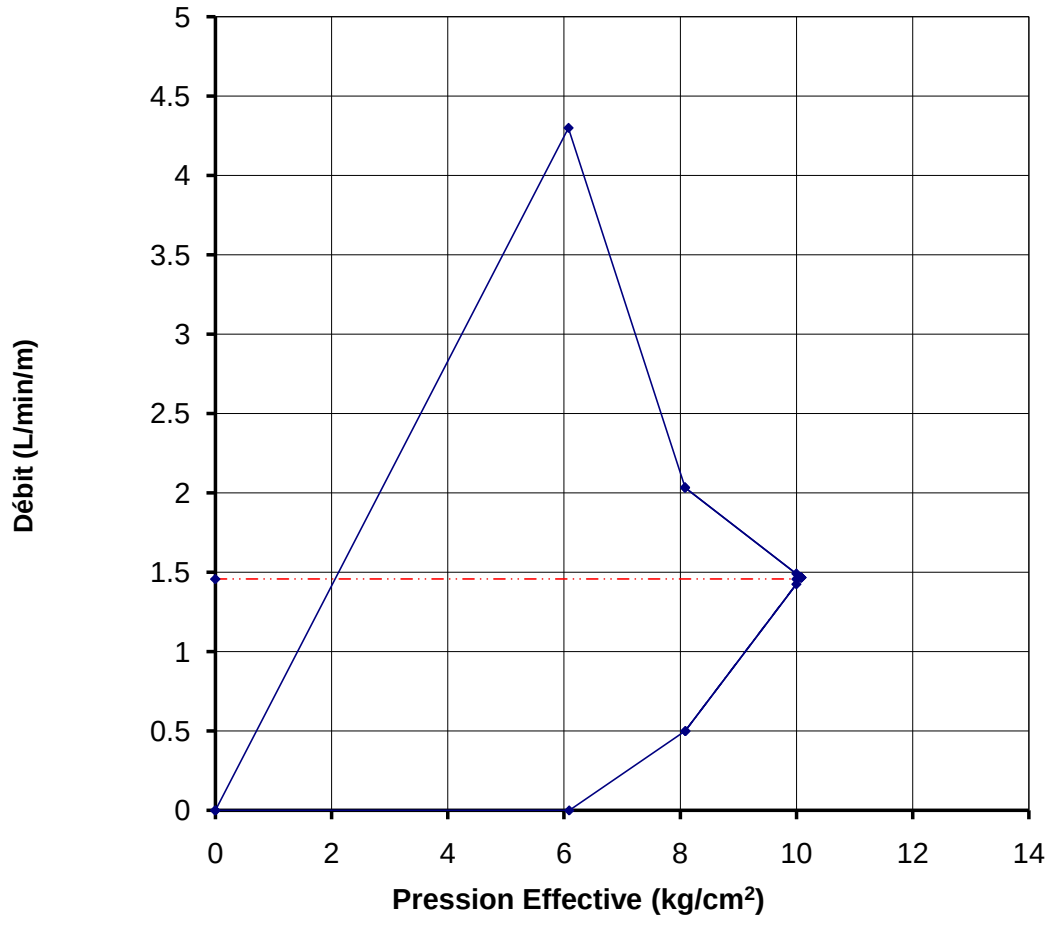




SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date:	**1/9/2014**
	SONDAGE No.:	**BHVL 01**			
	TRANCHE ESSAYEE	**80.00 m**	à **83.00 m**	Manomètre	**0.50 m**
				depth to water:	**0.40 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
6	129	10	3	12.9	4.30	0.09	1.28E-02	6.077
8	61	10	3	6.1	2.03	0.09	6.04E-03	8.084
10	44	10	3	4.4	1.47	0.09	4.36E-03	10.086
8	15	10	3	1.5	0.50	0.09	1.49E-03	8.089
6	0	10	3	0	0.00	0.09	0.00E+00	6.090



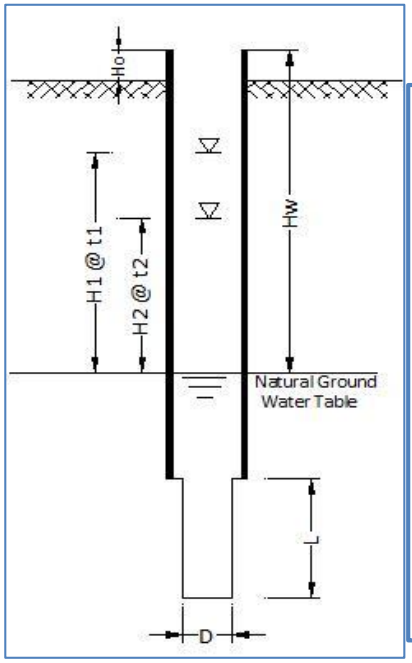
Lugeon = 1.46 L/min/m

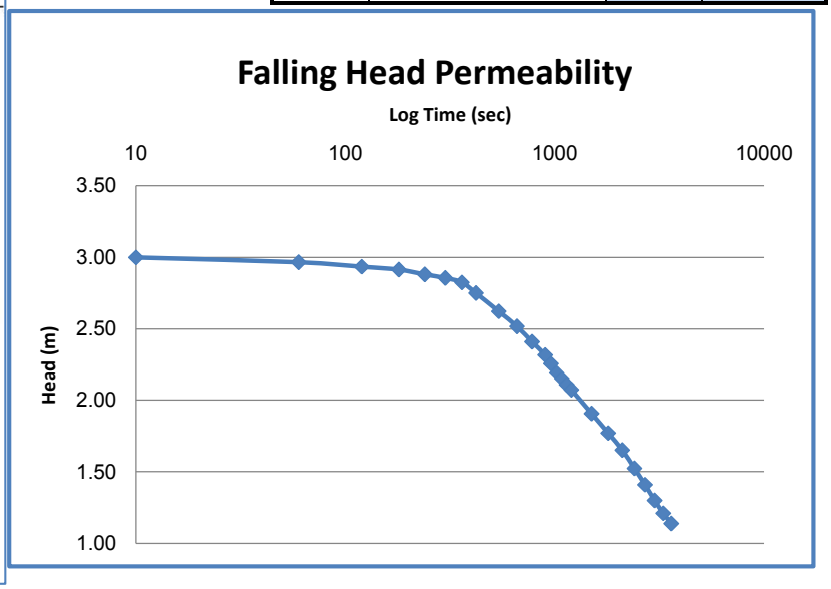
PROJECT	Bisri Dam / Second Package	FALLING HEAD PERMEABILITY TEST
CLIENT	DAR-TALEB	

Borehole	BHLA 01	X		Date:	1/20/2014
Test Location	0 to 3	Y		K(m/sec):	2.9885E-07
Inclination	0	Z			

				Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF CASING	D1		mm				
DIAMETER OF TEST SECTION	D	86	mm	0	0.00	0	3.00
NATURAL GROUND LEVEL	NGL	0	mAD	1	0.04	60	2.97
WATER LEVEL BEFORE TEST	W.L	-1.5	mAD	2	0.07	120	2.94
HEIGHT OF CASING ABOVE NGL	Ho		m	3	0.09	180	2.91
CASING TOP LEVEL		0	mAD	4	0.12	240	2.88
CASING LENGTH			m	5	0.15	300	2.86
CASING BOTTOM LEVEL		0	mAD	6	0.18	360	2.83
BOREHOLE DEPTH		3	m	7	0.25	420	2.75
BOREHOLE BOTTOM LEVEL		-3	mAD	9	0.38	540	2.62
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE	L	3	m	11	0.48	660	2.52
WATER HEAD	Hw	3	m	13	0.59	780	2.41
				15	0.68	900	2.32
				16	0.74	960	2.26
				17	0.81	1020	2.20
				18	0.85	1080	2.15
				19	0.89	1140	2.11
				20	0.93	1200	2.07
				25	1.10	1500	1.91
				30	1.23	1800	1.77
				35	1.35	2100	1.65
				40	1.48	2400	1.52
				45	1.59	2700	1.41
				50	1.70	3000	1.30
				55	1.79	3300	1.21
				60	1.86	3600	1.14

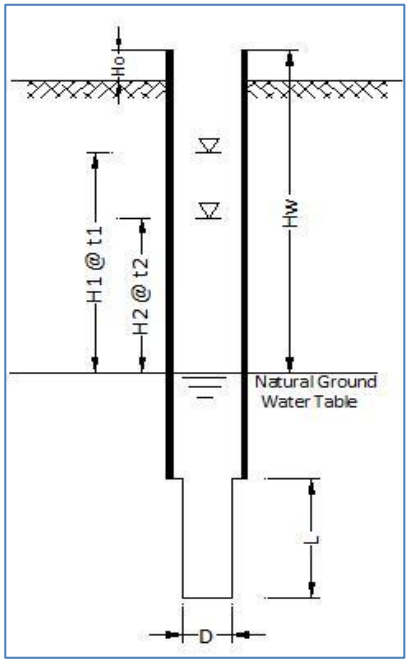
$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$

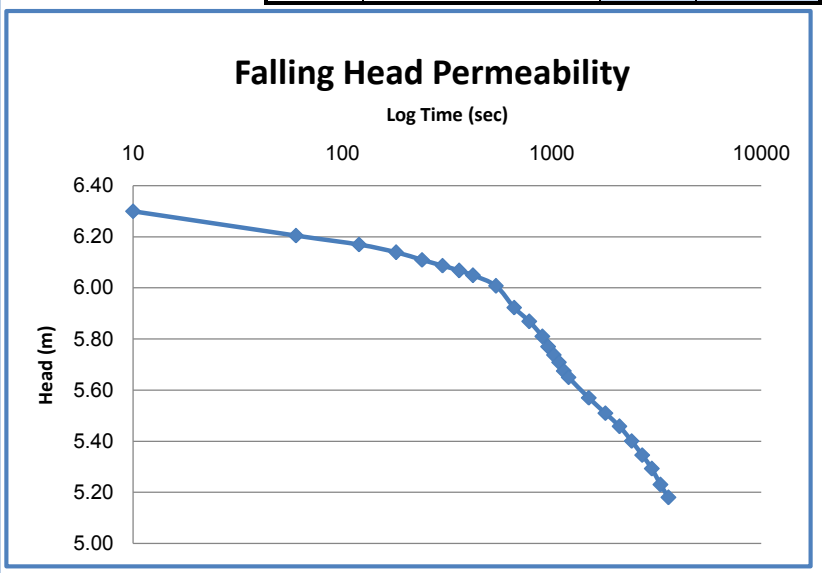




PROJECT		Bisri Dam / Second Package			FALLING HEAD PERMEABILITY TEST			
CLIENT		DAR-TALEB						
Borehole	BHLA 01	X			Date:		1/20/2014	
Test Location	3 to 6	Y			K(m/sec):		3.7837E-08	
Inclination	0	Z						
DIAMETER OF CASING		D1	127	mm	Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF TEST SECTION		D	86	mm	0	0.00	0	6.30
NATURAL GROUND LEVEL		NGL	0	mAD	1	0.10	60	6.21
WATER LEVEL BEFORE TEST		W.L	-2	mAD	2	0.13	120	6.17
HEIGHT OF CASING ABOVE NGL		Ho	0.3	m	3	0.16	180	6.14
CASING TOP LEVEL			0.3	mAD	4	0.19	240	6.11
CASING LENGTH			3.3	m	5	0.21	300	6.09
CASING BOTTOM LEVEL			-3	mAD	6	0.23	360	6.07
BOREHOLE DEPTH			6	m	7	0.25	420	6.05
BOREHOLE BOTTOM LEVEL			-6	mAD	9	0.29	540	6.01
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE		L	3	m	11	0.38	660	5.92
WATER HEAD		Hw	6.3	m	13	0.43	780	5.87
					15	0.49	900	5.81
					16	0.53	960	5.77
					17	0.56	1020	5.74
					18	0.59	1080	5.71
					19	0.63	1140	5.68
					20	0.65	1200	5.65
					25	0.73	1500	5.57
					30	0.79	1800	5.51
					35	0.84	2100	5.46
					40	0.90	2400	5.40
					45	0.95	2700	5.35
					50	1.01	3000	5.29
					55	1.07	3300	5.23
					60	1.12	3600	5.18

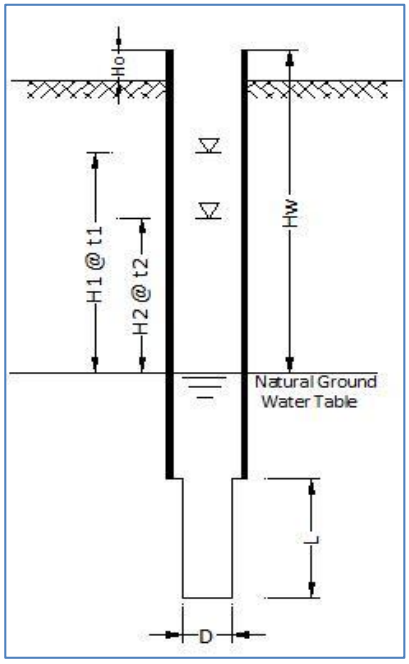
$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$

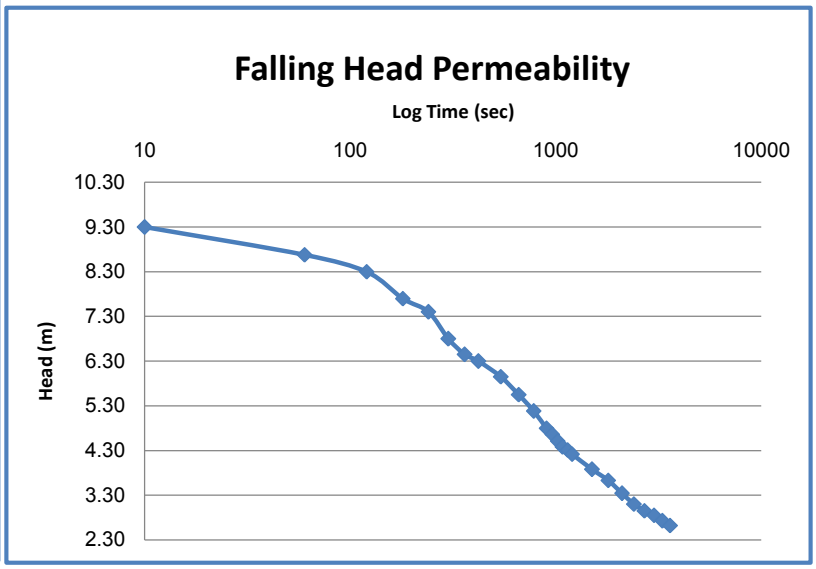




PROJECT		Bisri Dam / Second Package			FALLING HEAD PERMEABILITY TEST			
CLIENT		DAR-TALEB						
Borehole	BHLA 01	X			Date:		1/20/2014	
Test Location	6 to 9	Y			K(m/sec):		3.4504E-07	
Inclination	0	Z						
DIAMETER OF CASING		D1	127	mm	Time (min)	Drop Down Below Casing Top Level (m)	Time (sec)	Head (m)
DIAMETER OF TEST SECTION		D	86	mm	0	0.00	0	9.30
NATURAL GROUND LEVEL		NGL	0	mAD	1	0.62	60	8.68
WATER LEVEL BEFORE TEST		W.L	-4.2	mAD	2	1.00	120	8.30
HEIGHT OF CASING ABOVE NGL		Ho	0.3	m	3	1.60	180	7.70
CASING TOP LEVEL			0.3	mAD	4	1.90	240	7.40
CASING LENGTH			6.3	m	5	2.50	300	6.80
CASING BOTTOM LEVEL			-6	mAD	6	2.85	360	6.45
BOREHOLE DEPTH			9	m	7	3.00	420	6.30
BOREHOLE BOTTOM LEVEL			-9	mAD	9	3.35	540	5.95
LENGTH OF THE UNCASED SECTION IN THE BOREHOLE		L	3	m	11	3.75	660	5.55
WATER HEAD		Hw	9.3	m	13	4.12	780	5.18
					15	4.50	900	4.80
					16	4.64	960	4.66
					17	4.79	1020	4.51
					18	4.92	1080	4.38
					19	4.99	1140	4.31
					20	5.08	1200	4.22
					25	5.42	1500	3.88
					30	5.67	1800	3.63
					35	5.96	2100	3.34
					40	6.20	2400	3.10
					45	6.35	2700	2.95
					50	6.45	3000	2.85
					55	6.57	3300	2.73
					60	6.68	3600	2.62

$$K_{(m/sec)} = \frac{D^2}{8L(t2-t1)} Ln\left(\frac{L}{D}\right) Ln\left(\frac{H1}{H2}\right)$$



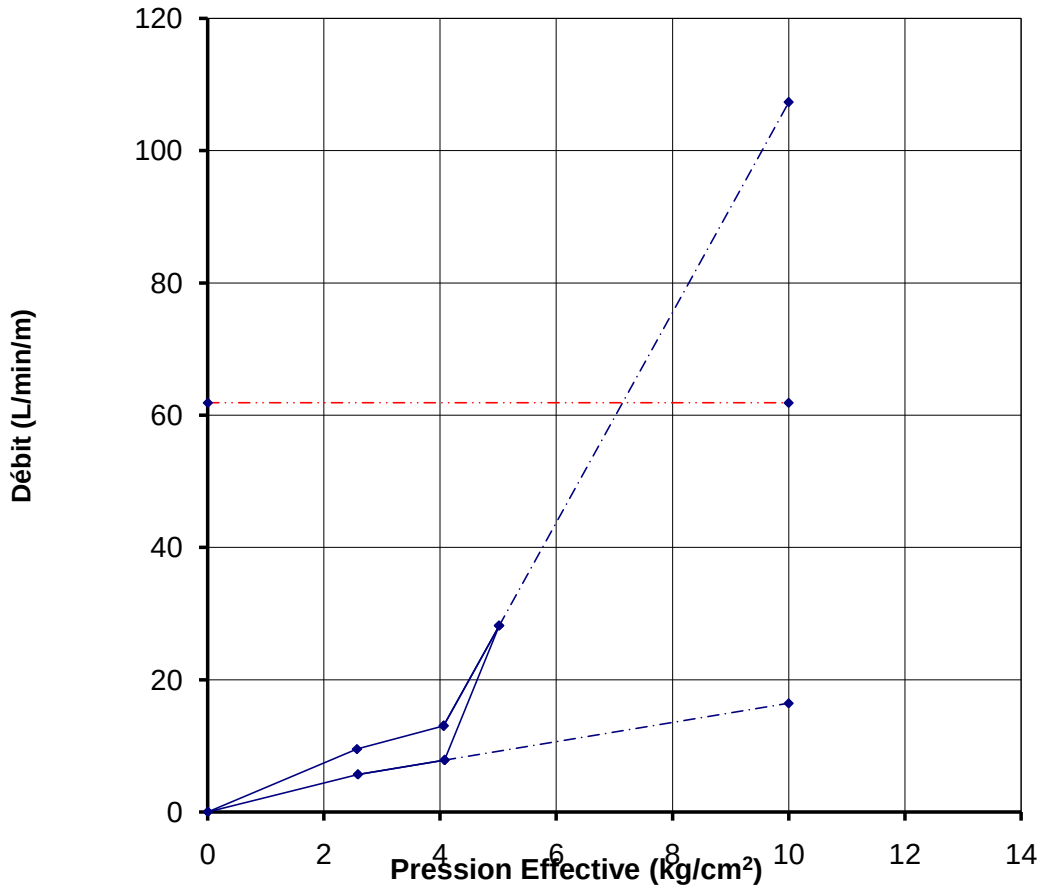


SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date:	**1/20/2014**
	SONDAGE No.:	**BHLA 01**			
	TRANCHE ESSAYEE	**9.00 m**	à **12.00 m**	Manomètre	**0.50 m**

depth to water:

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
1.5	285	10	3	28.5	9.50	1.1	2.82E-02	2.572
3	390	10	3	39	13.00	1.1	3.86E-02	4.061
4	845	10	3	84.5	28.17	1.1	8.37E-02	5.016
3	235	10	3	23.5	7.83	1.1	2.33E-02	4.077
1.5	170	10	3	17	5.67	1.1	1.68E-02	2.583



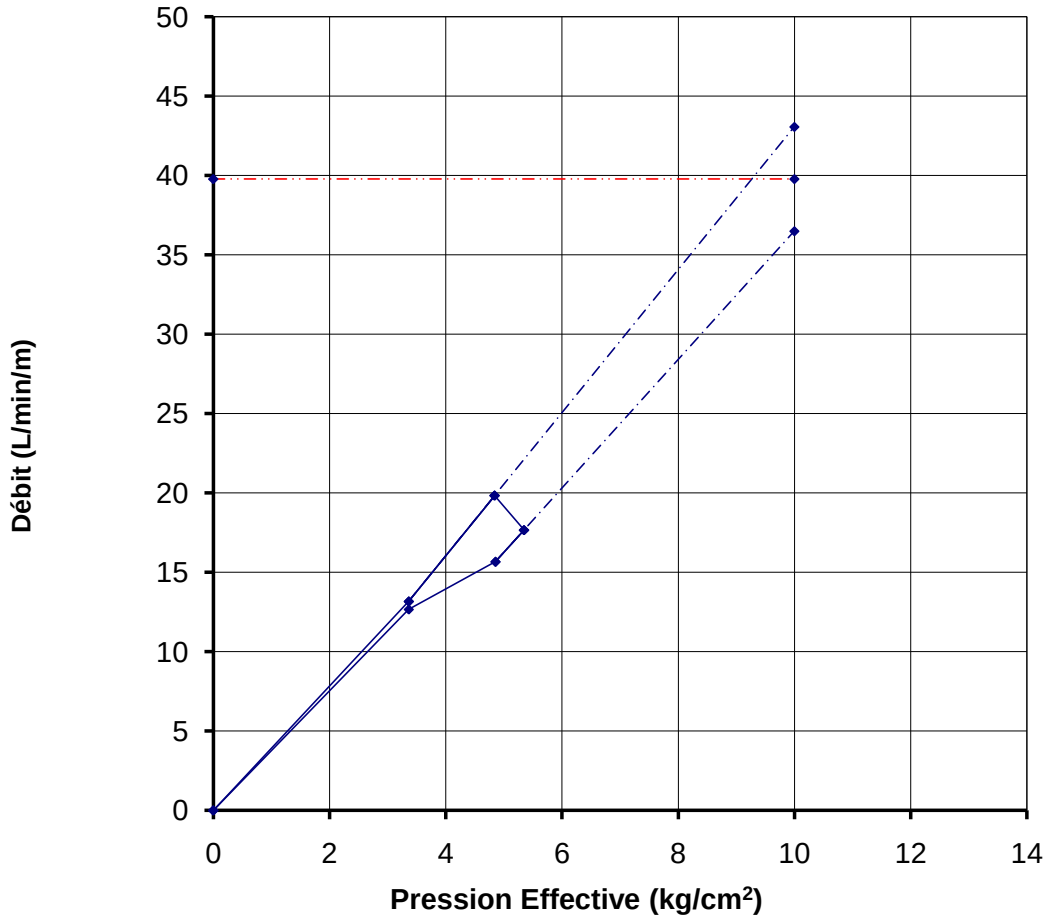
Lugeon = 61.87 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date:	**1/21/2014**
	SONDAGE No.:	**BHLA 01**			
	TRANCHE ESSAYEE	**12.00 m**	à **15.00 m**	Manomètre	**0.50 m**

depth to water:

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
2	395	10	3	39.5	13.17	1.4	3.91E-02	3.361
3.5	595	10	3	59.5	19.83	1.4	5.89E-02	4.841
4	530	10	3	53	17.67	1.4	5.25E-02	5.348
3.5	470	10	3	47	15.67	1.4	4.65E-02	4.853
2	380	10	3	38	12.67	1.4	3.76E-02	3.362



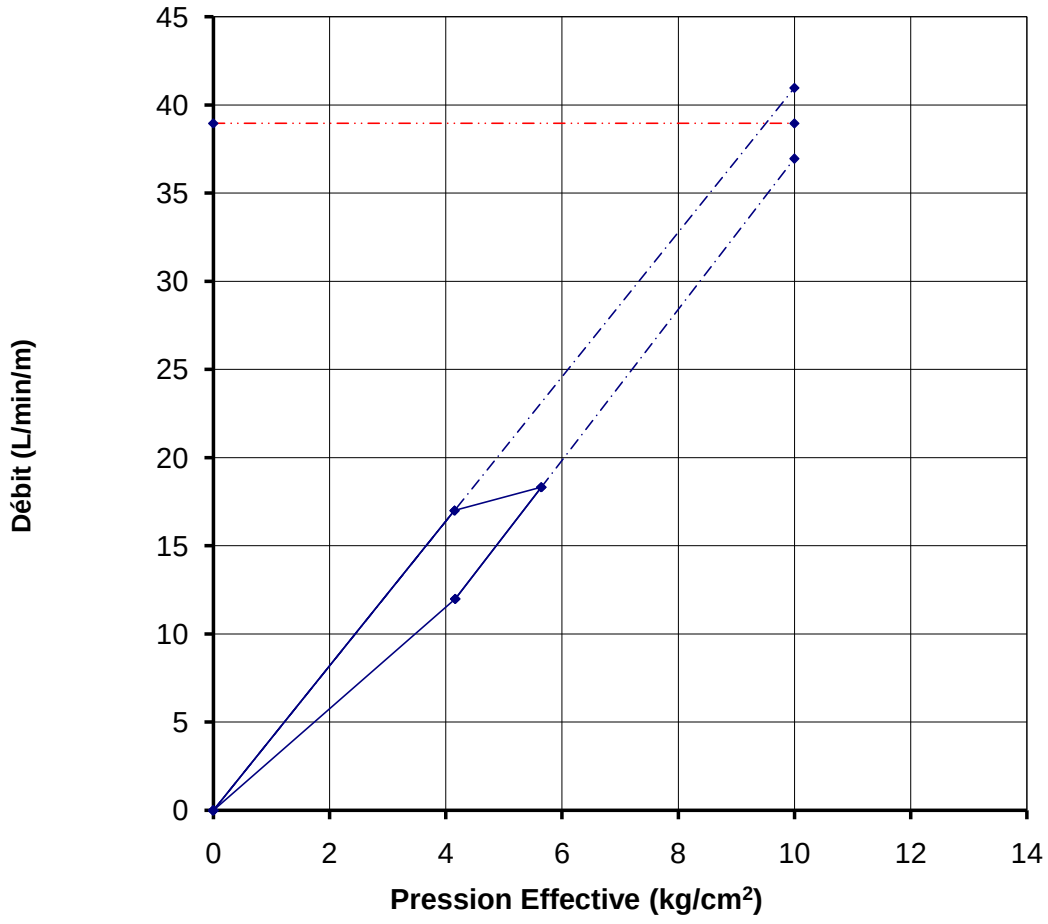
Lugeon = 39.78 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**	Date: **1/21/2014**
	SONDAGE No.:	**BHLA 01**	
	TRANCHE ESSAYEE	**15.00 m** à **18.00 m**	Manomètre **0.50 m**

depth to water:

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
2.5	510	10	3	51	17.00	1.7	5.05E-02	4.150
4	550	10	3	55	18.33	1.7	5.45E-02	5.646
2.5	360	10	3	36	12.00	1.7	3.56E-02	4.164

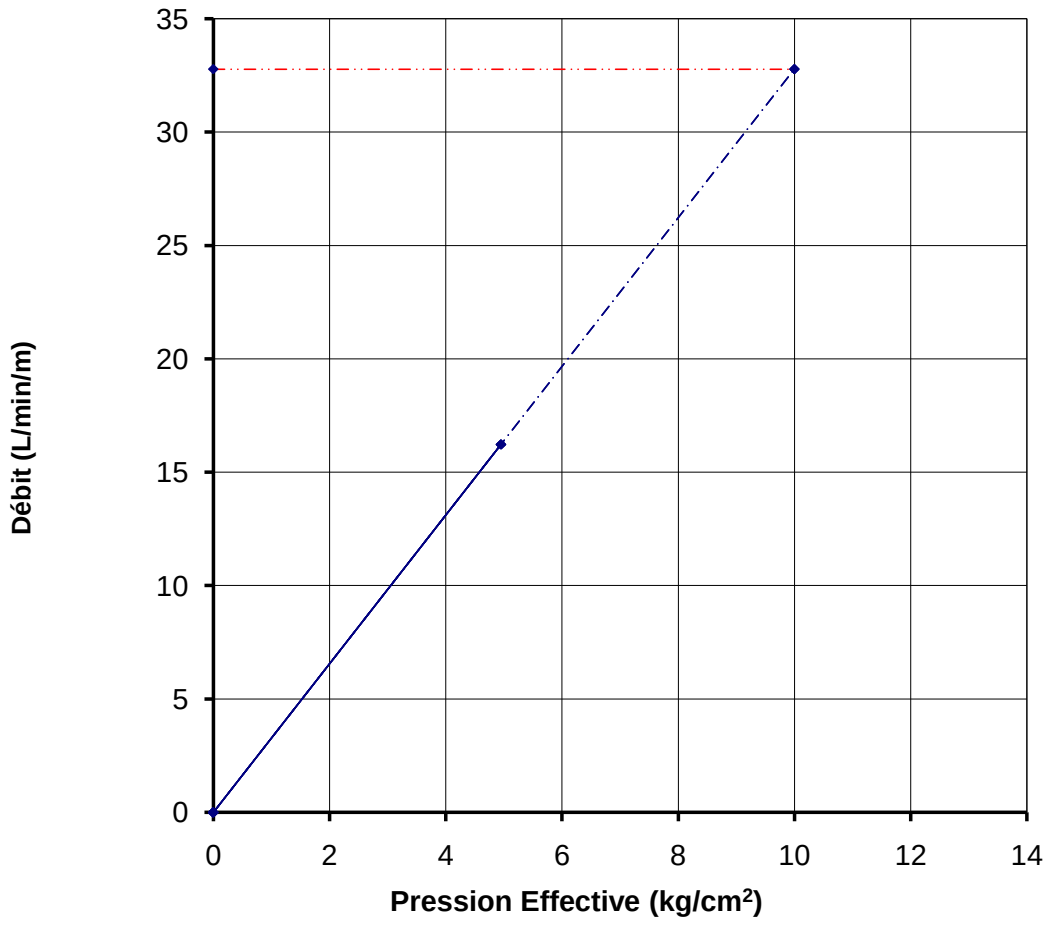


Lugeon = 38.96 L/min/m

SATCOP	PROJECT: **BISRI DAM / SECOND PACKAGE**		Date: **1/22/2014**
	SONDAGE No.: **BHLA 01**		
	TRANCHE ESSAYEE **18.00 m** à **21.00 m**		Manomètre **0.50 m**
			depth to water:

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
3	487	10	3	48.7	16.23	2	4.82E-02	4.952



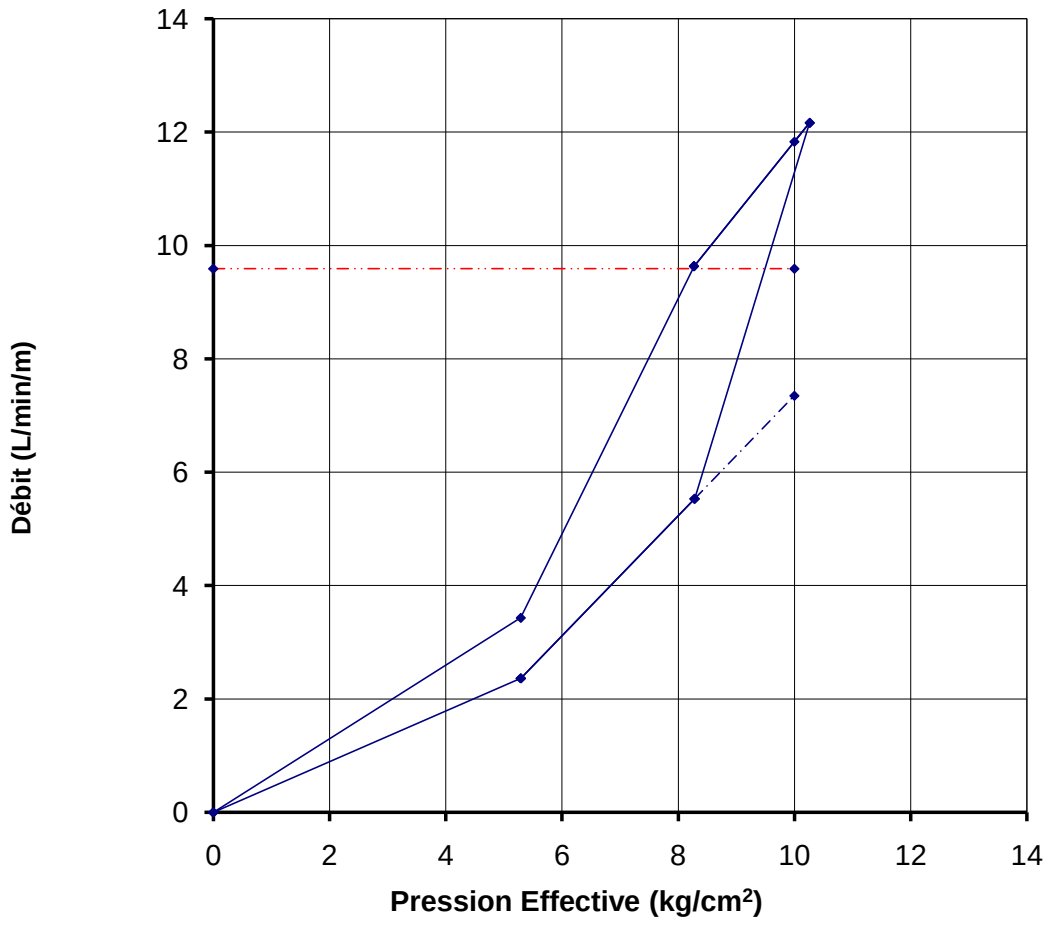
Lugeon = 32.78 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **1/22/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**21.00 m** à **24.00 m**		Manomètre **0.50 m**

depth to water:

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
3	103	10	3	10.3	3.43	2.3	1.02E-02	5.290
6	289	10	3	28.9	9.63	2.3	2.86E-02	8.271
8	365	10	3	36.5	12.17	2.3	3.61E-02	10.264
6	166	10	3	16.6	5.53	2.3	1.64E-02	8.284
3	71	10	3	7.1	2.37	2.3	7.03E-03	5.293



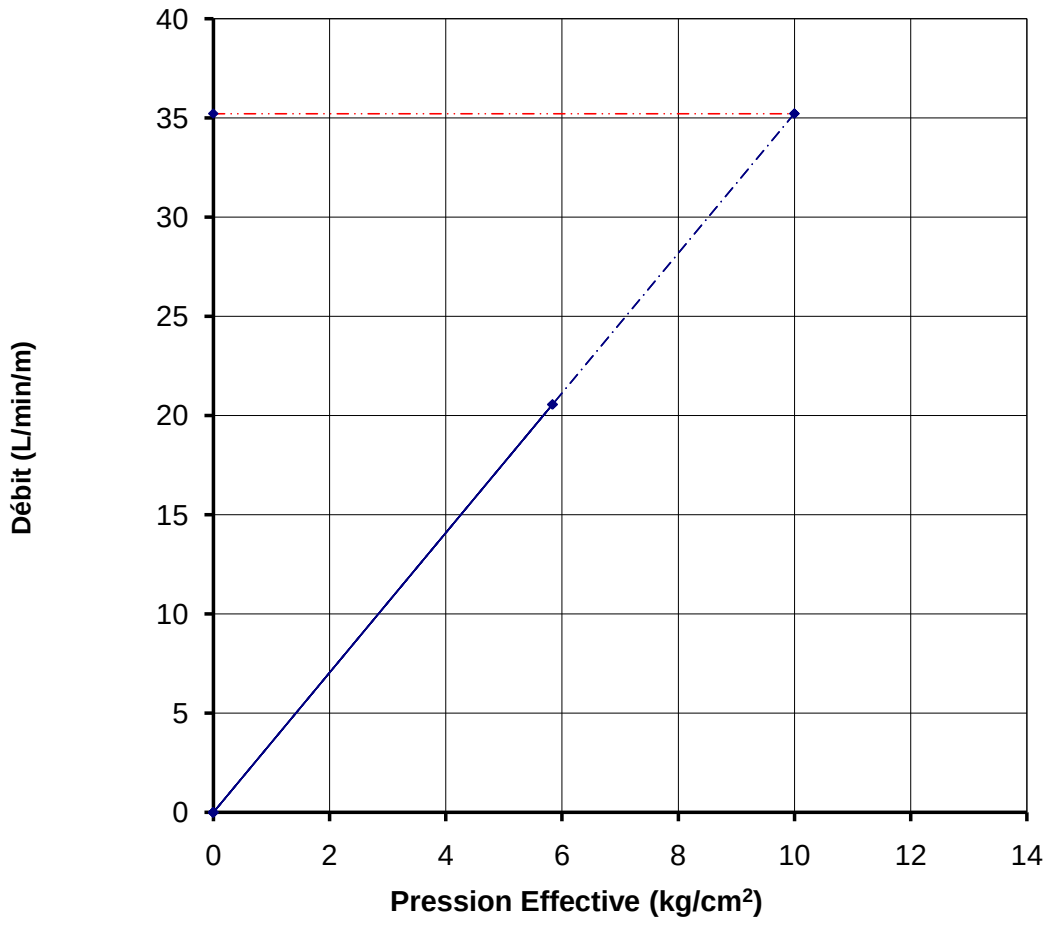
Lugeon = 9.59 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**	Date: **1/22/2014**
	SONDAGE No.:	**BHLA 01**	
	TRANCHE ESSAYEE	**24.00 m** à **27.00 m**	Manomètre **0.50 m**

depth to water:

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
3.3	617	10	3	61.7	20.57	2.6	6.11E-02	5.839



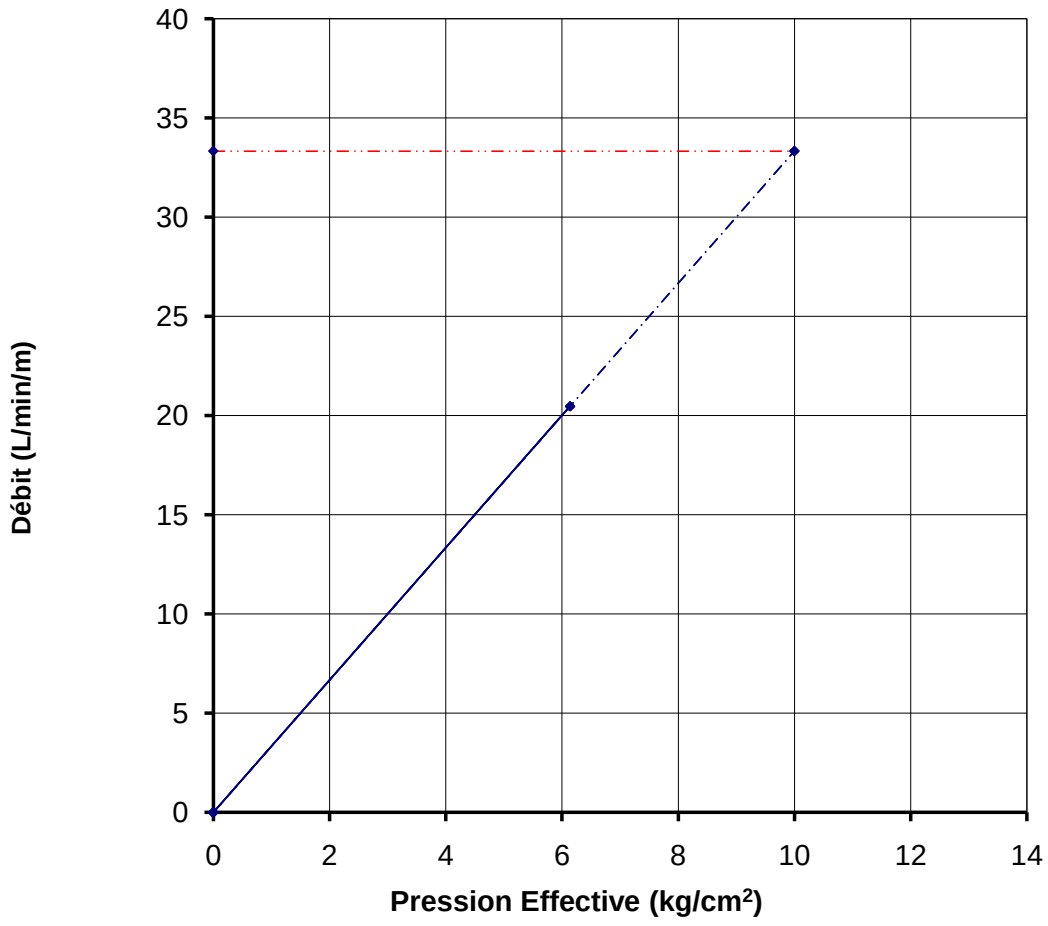
Lugeon = 35.22 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**	Date: **1/23/2014**
	SONDAGE No.:	**BHLA 01**	
	TRANCHE ESSAYEE	**27.00 m** à **30.00 m**	Manomètre **0.50 m**

depth to water:

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
3.3	614	10	3	61.4	20.47	2.9	6.08E-02	6.139



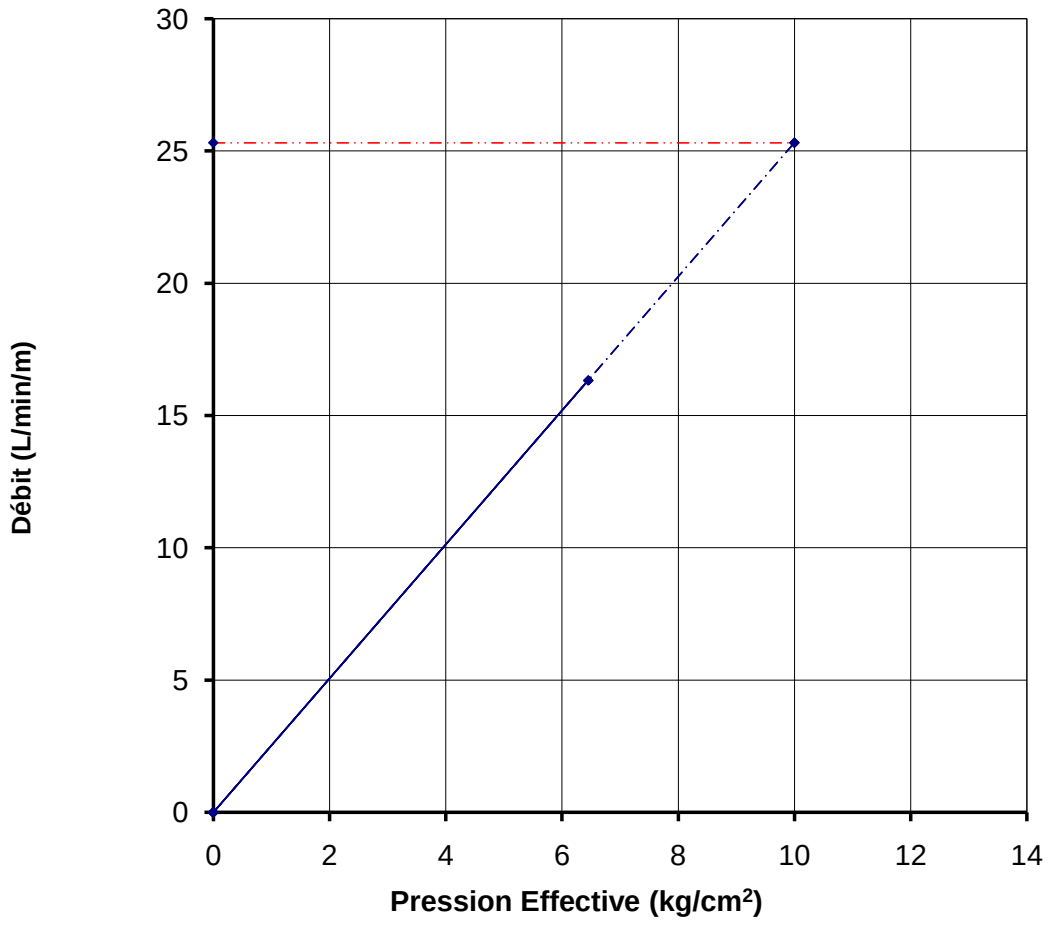
Lugeon = 33.34 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **1/23/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**30.00 m** à **33.00 m**		Manomètre **0.50 m**

depth to water:

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
3.3	490	10	3	49	16.33	3.2	4.85E-02	6.451



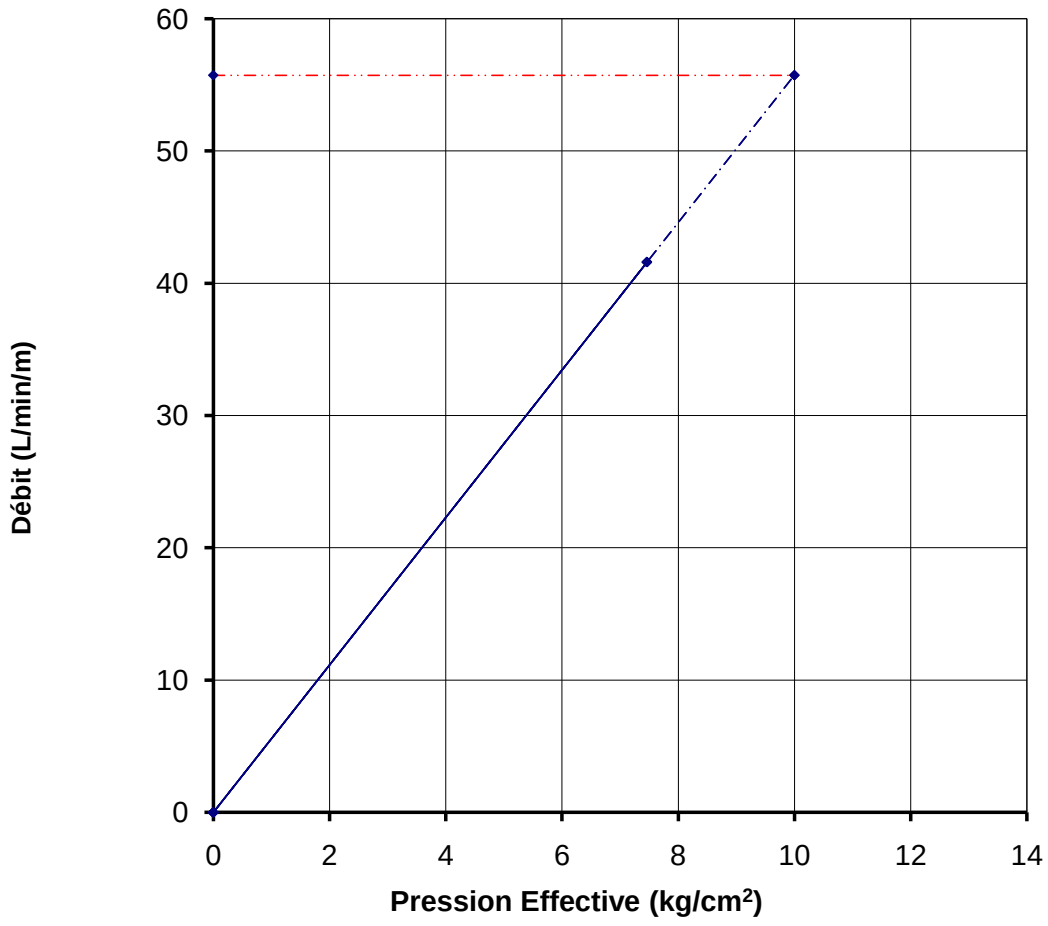
Lugeon = 25.32 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**	Date: **1/23/2014**
	SONDAGE No.:	**BHLA 01**	
	TRANCHE ESSAYEE	**33.00 m** à **34.50 m**	Manomètre **0.50 m**

depth to water:

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4.1	624	10	1.5	62.4	41.60	3.425	6.18E-02	7.463

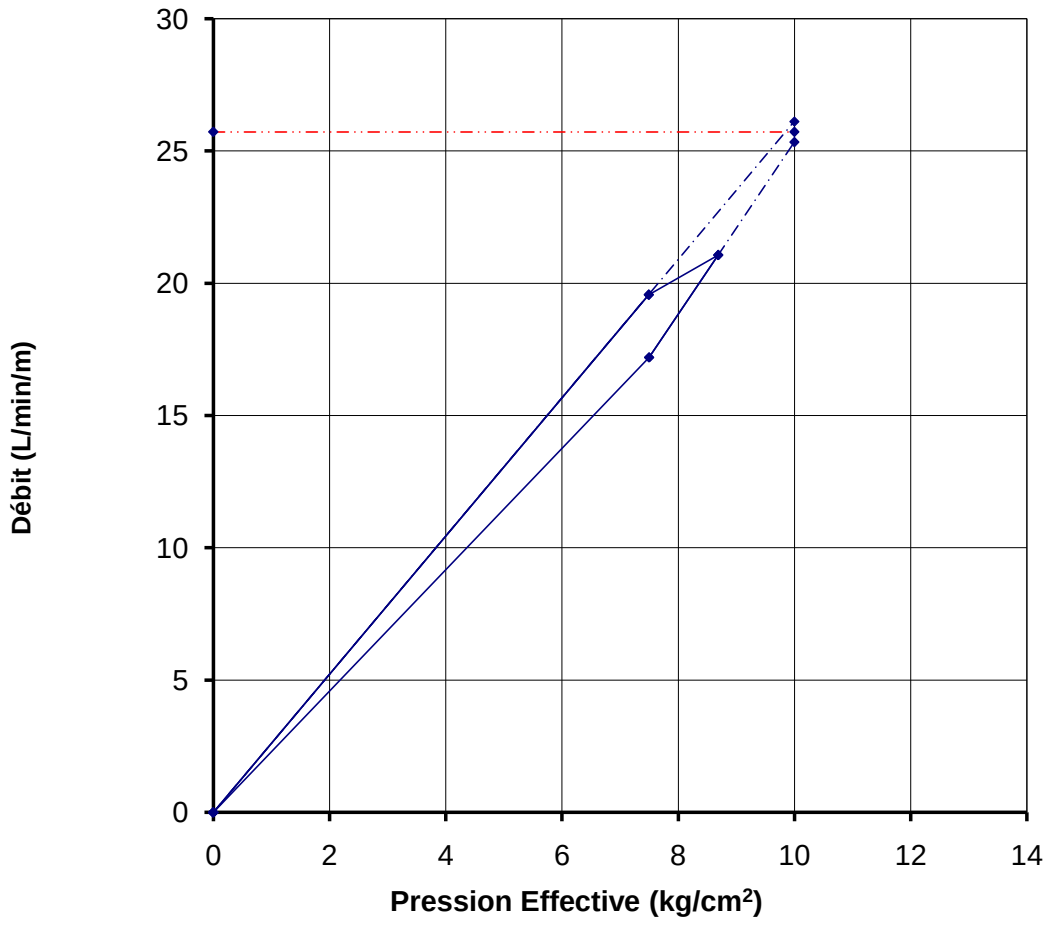


Lugeon = 55.74 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **1/24/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**34.50 m** à **37.50 m**		Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	587	10	3	58.7	19.57	3.55	5.81E-02	7.492
5.2	632	10	3	63.2	21.07	3.55	6.26E-02	8.687
4	516	10	3	51.6	17.20	3.55	5.11E-02	7.499

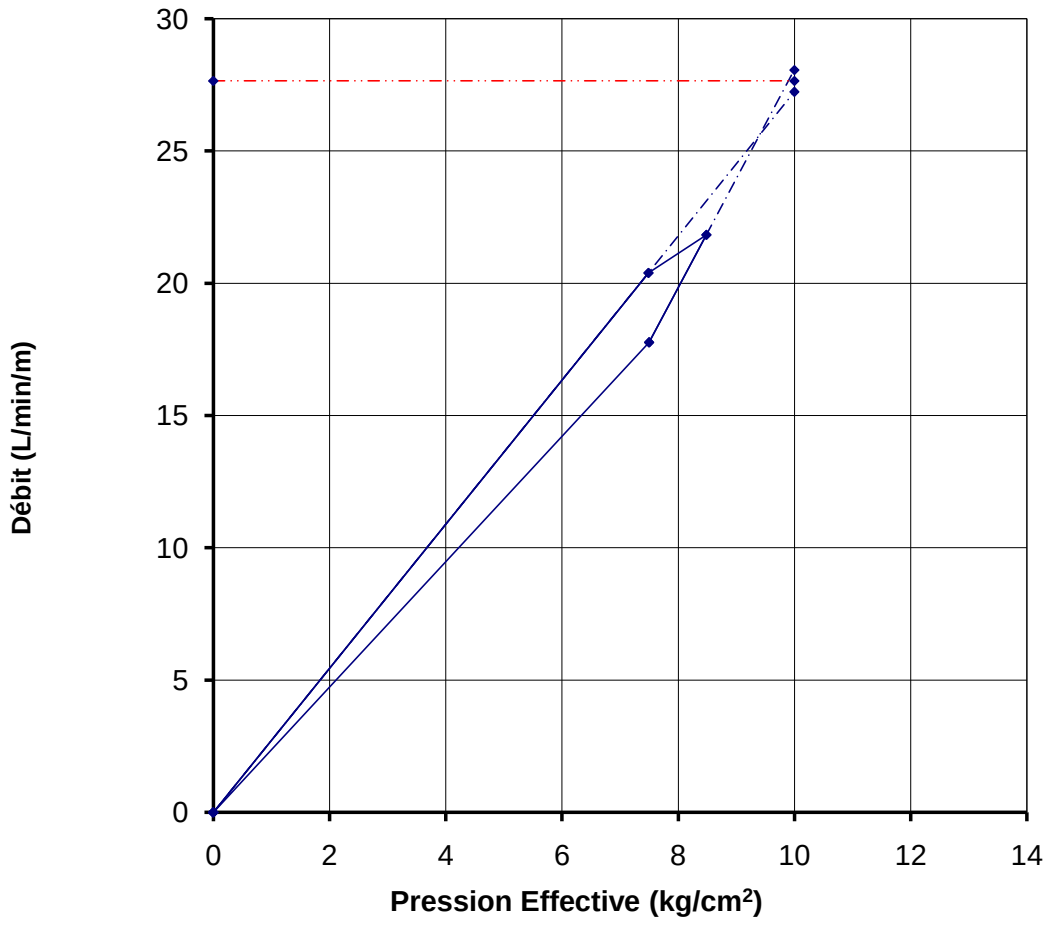


Lugeon = 25.73 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**	Date: **1/24/2014**
	SONDAGE No.:	**BHLA 01**	
	TRANCHE ESSAYEE	**37.50 m** à **40.50 m**	Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	612	10	3	61.2	20.40	3.55	6.06E-02	7.489
5	655	10	3	65.5	21.83	3.55	6.48E-02	8.485
4	533	10	3	53.3	17.77	3.55	5.28E-02	7.497

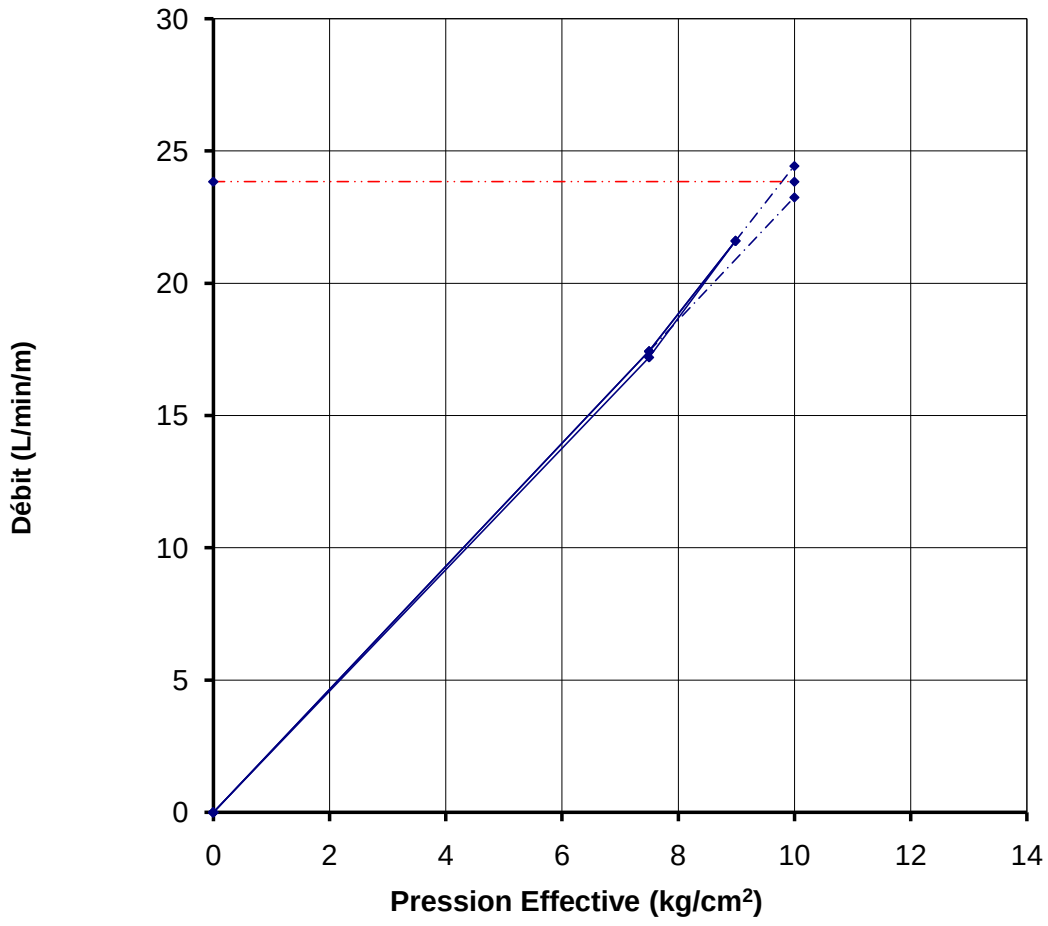


Lugeon = 27.65 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**	Date:	**1/25/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**42.00 m** à **45.00 m**	Manomètre	**0.50 m**
		depth to water:	**35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	523	10	3	52.3	17.43	3.55	5.18E-02	7.498
5.5	648	10	3	64.8	21.60	3.55	6.42E-02	8.986
4	516	10	3	51.6	17.20	3.55	5.11E-02	7.499

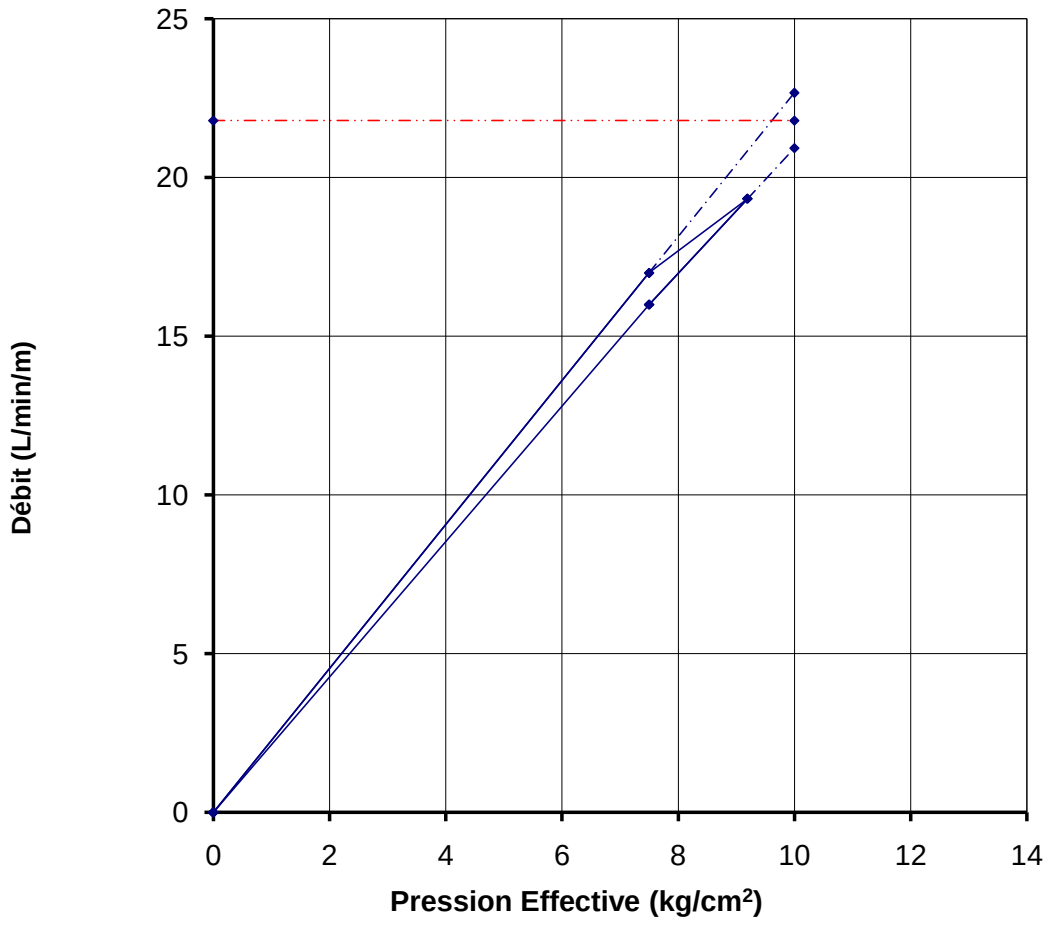


Lugeon = 23.85 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**	Date: **1/28/2014**
	SONDAGE No.:	**BHLA 01**	
	TRANCHE ESSAYEE	**45.00 m** à **48.00 m**	Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	480	10	3	48	16.00	3.55	4.75E-02	7.502
5.7	580	10	3	58	19.33	3.55	5.74E-02	9.193
4	510	10	3	51	17.00	3.55	5.05E-02	7.500

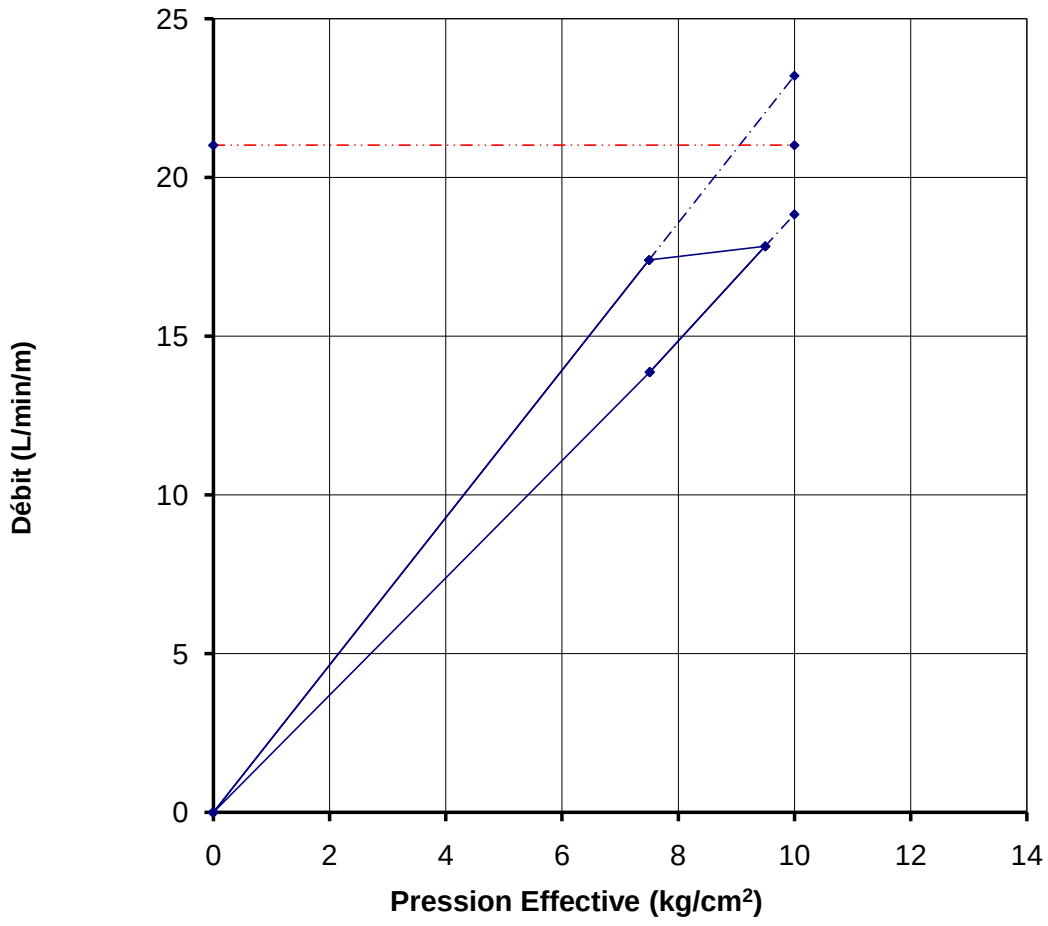


Lugeon = 21.80 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**	Date: **1/30/2014**
	SONDAGE No.:	**BHLA 01**	
	TRANCHE ESSAYEE	**48.00 m** à **51.00 m**	Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	416	10	3	41.6	13.87	3.55	4.12E-02	7.509
6	535	10	3	53.5	17.83	3.55	5.30E-02	9.497
4	522	10	3	52.2	17.40	3.55	5.17E-02	7.498

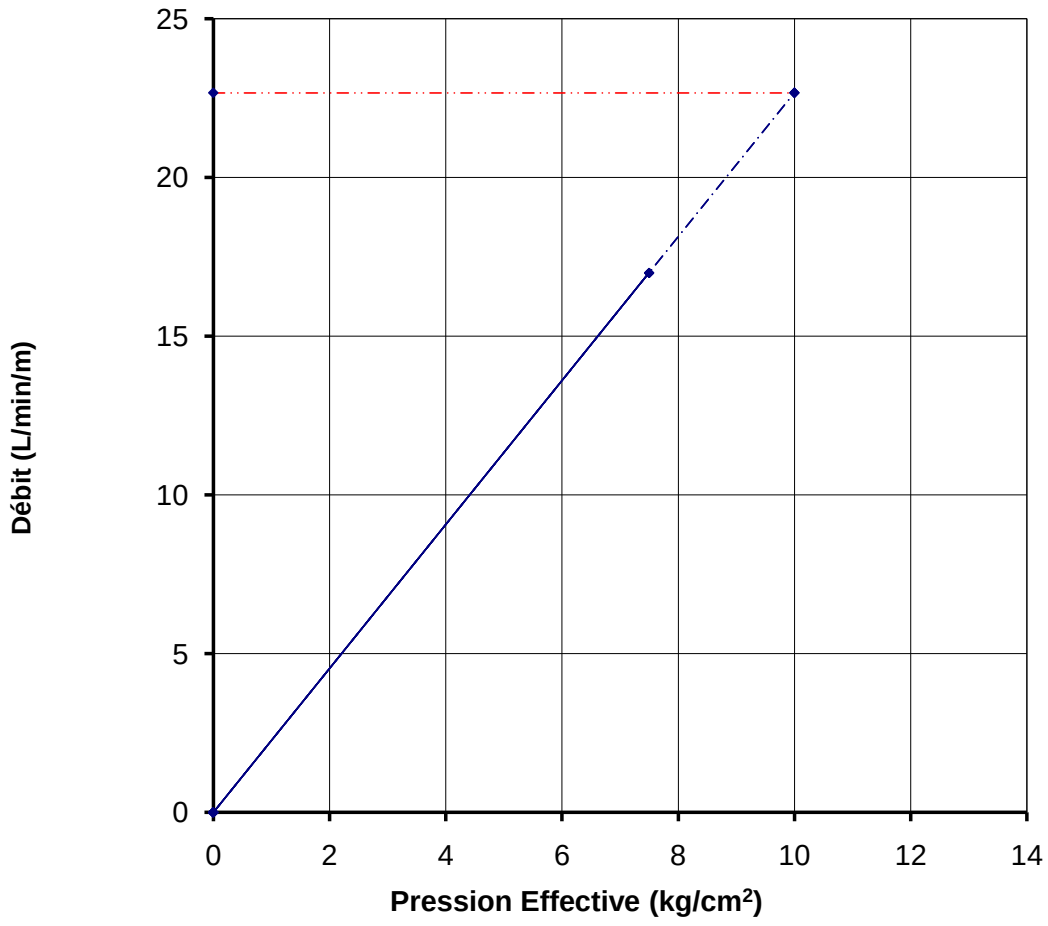


Lugeon = 21.02 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**	Date:	**1/31/2014**
	SONDAGE No.:	**BHLA 01**		
	TRANCHE ESSAYEE	**51.00 m** à **54.00 m**	Manomètre	**0.50 m**
			depth to water:	**35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	510	10	3	51	17.00	3.55	5.05E-02	7.500

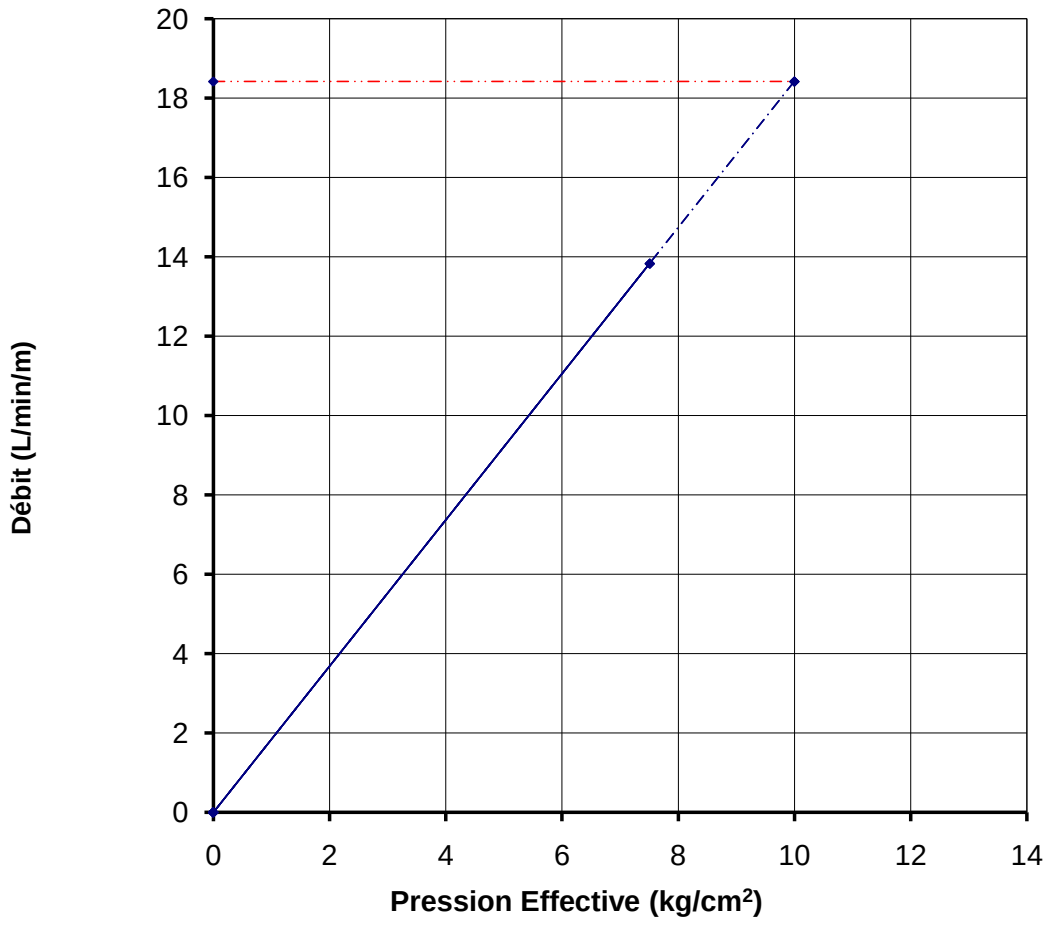


Lugeon = 22.67 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**	Date: **1/31/2014**
	SONDAGE No.:	**BHLA 01**	
	TRANCHE ESSAYEE	**54.00 m** à **57.00 m**	Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	415	10	3	41.5	13.83	3.55	4.11E-02	7.509

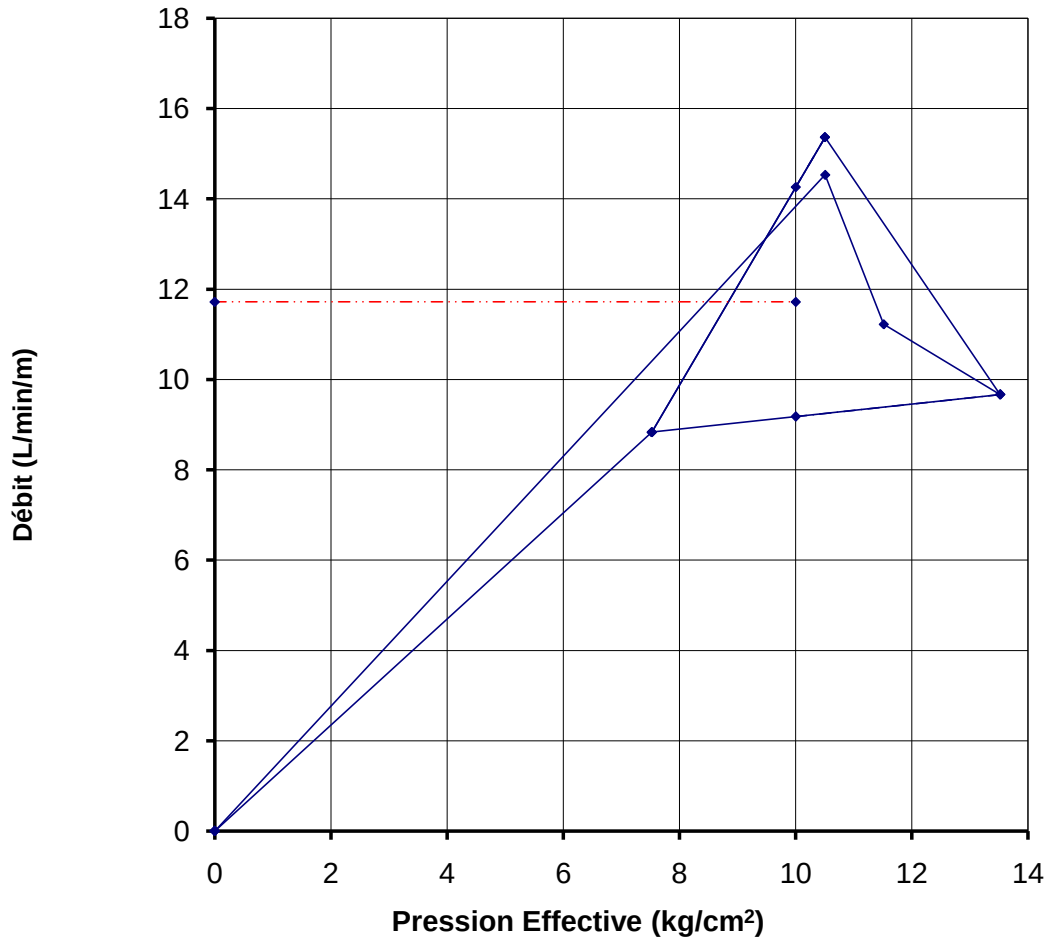


Lugeon = 18.42 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date:	**2/1/2014**
SONDAGE No.:	**BHLA 01**			
TRANCHE ESSAYEE	**57.00 m**	à **60.00 m**	Manomètre	**0.50 m**
			depth to water:	**35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	265	10	3	26.5	8.83	3.55	2.62E-02	7.524
7	461	10	3	46.1	15.37	3.55	4.56E-02	10.504
10	58	2	3	29	9.67	3.55	2.87E-02	13.521
8	101	3	3	33.66667	11.22	3.55	3.33E-02	11.517
7	218	5	3	43.6	14.53	3.55	4.32E-02	10.507
4	304	10	3	30.4	10.13	3.55	0.00E+00	7.550

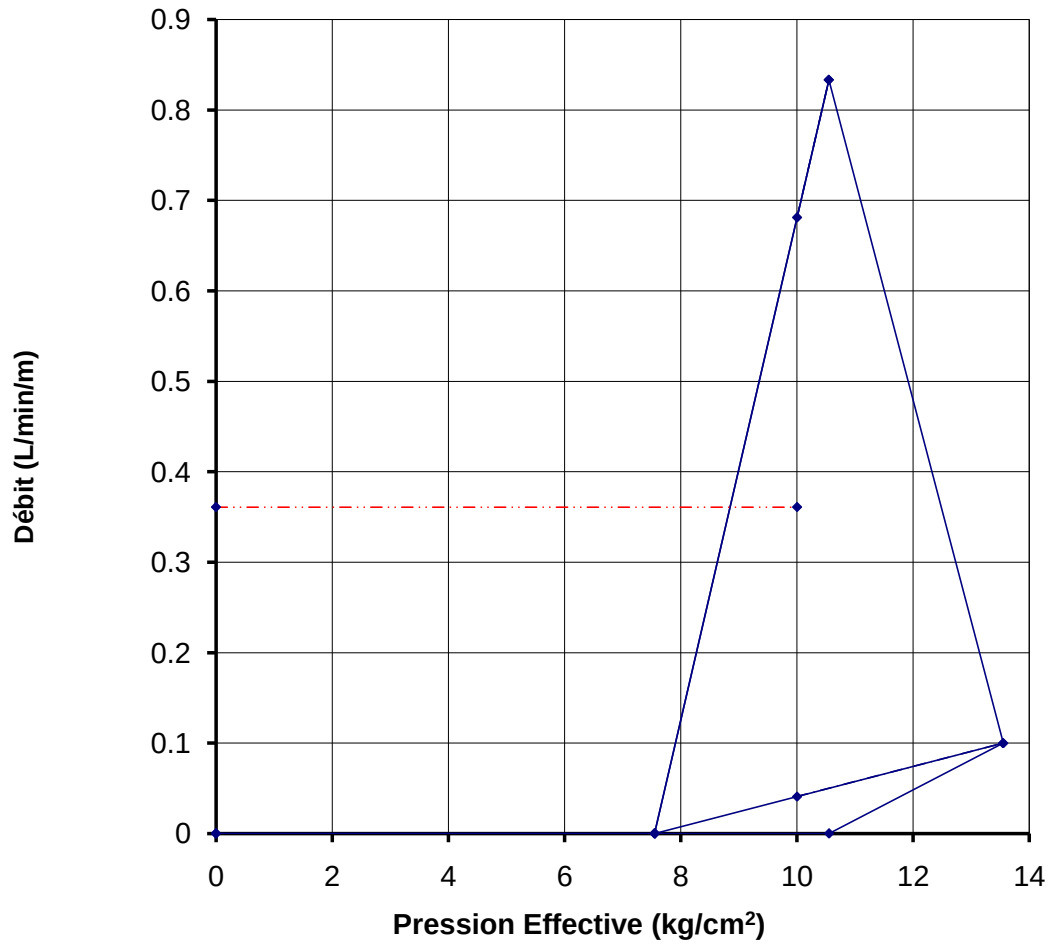


Lugeon = 11.72 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date:	**2/3/2014**
SONDAGE No.:	**BHLA 01**			
TRANCHE ESSAYEE	**60.00 m**	à **63.00 m**	Manomètre	**0.50 m**
			depth to water:	**35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	0	10	3	0	0.00	3.55	0.00E+00	7.550
7	25	10	3	2.5	0.83	3.55	2.48E-03	10.548
10	3	10	3	0.3	0.10	3.55	2.97E-04	13.550
7	0	10	3	0	0.00	3.55	0.00E+00	10.550
4	0	10	3	0	0.00	3.55	0.00E+00	7.550

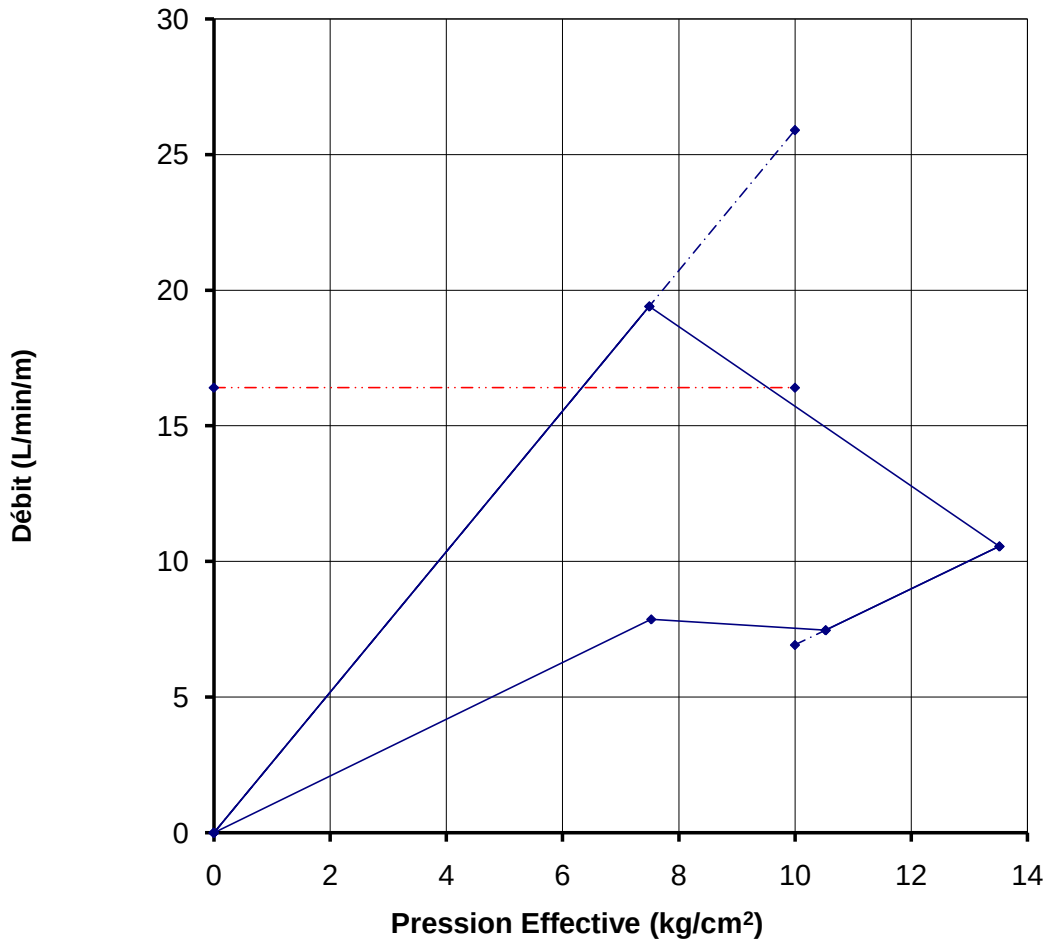


Lugeon = 0.36 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date:	**2/3/2014**
	SONDAGE No.:	**BHLA 01**			
	TRANCHE ESSAYEE	**63.00 m**	à **66.00 m**	Manomètre	**0.50 m**
				depth to water:	**35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	236	10	3	23.6	7.87	3.55	2.34E-02	7.527
7	224	10	3	22.4	7.47	3.55	2.22E-02	10.528
10	95	3	3	31.66667	10.56	3.55	3.14E-02	13.519
4	582	10	3	58.2	19.40	3.55	5.76E-02	7.492

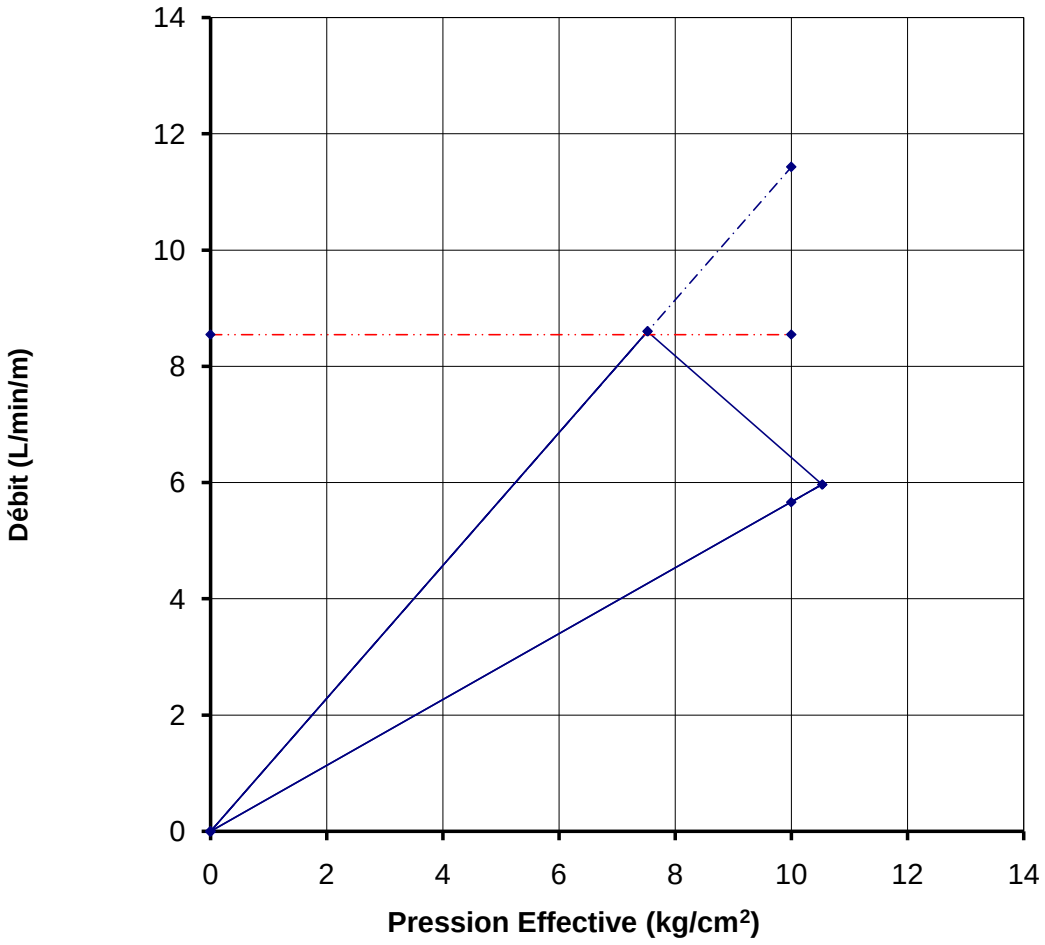


Lugeon = 16.41 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date:	**2/4/2014**
	SONDAGE No.:	**BHLA 01**			
	TRANCHE ESSAYEE	**66.00 m**	à **69.00 m**	Manomètre	**0.50 m**
				depth to water:	**35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	258	10	3	25.8	8.60	3.55	2.55E-02	7.524
7	179	10	3	17.9	5.97	3.55	1.77E-02	10.532

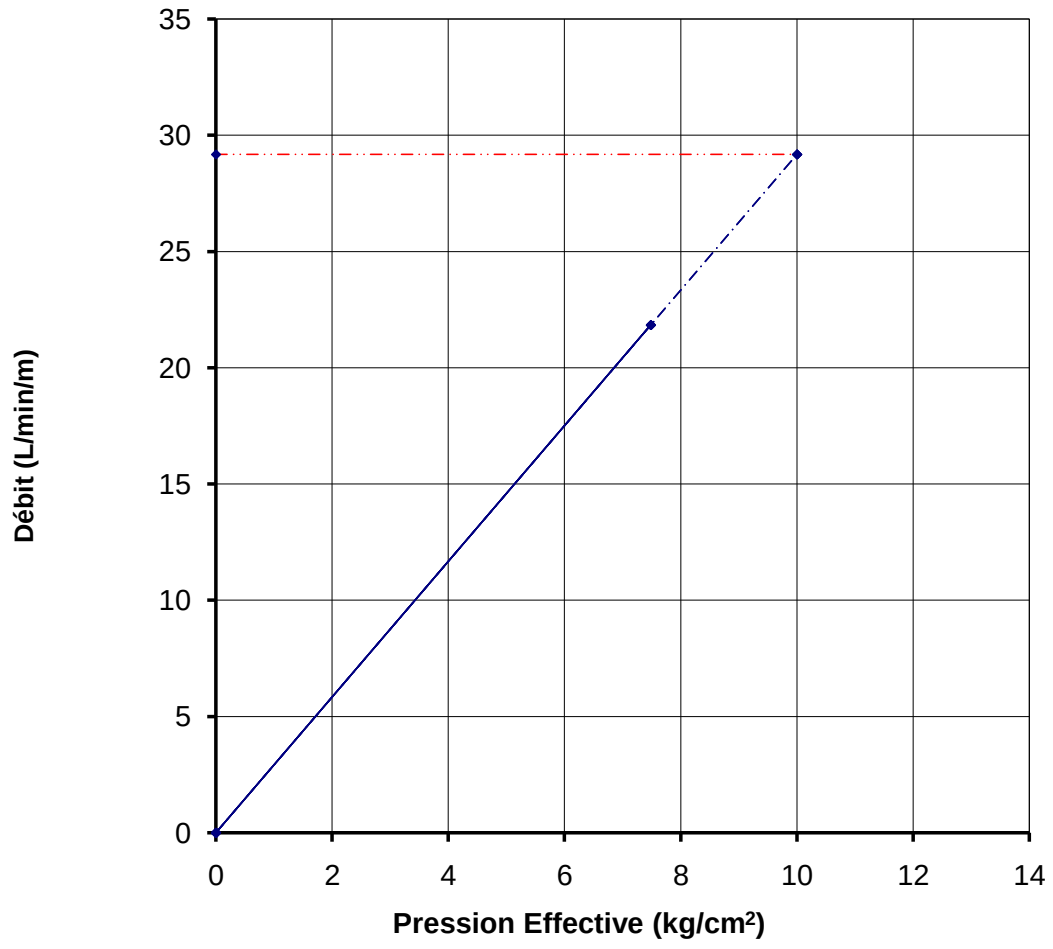


Lugeon = 8.55 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **2/4/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**69.00 m** à **72.00 m**		Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	655	10	3	65.5	21.83	3.55	6.48E-02	7.485

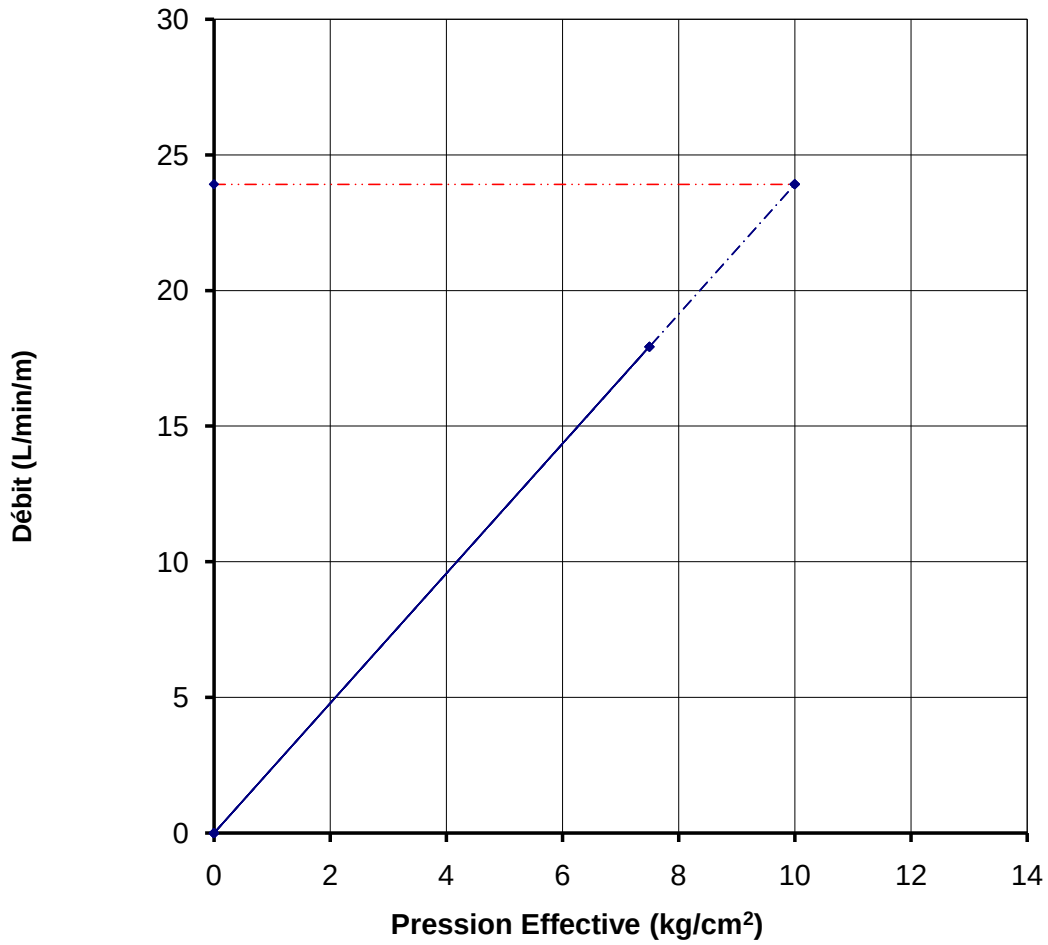


Lugeon = 29.17 L/min/m

SATCOM	PROJECT:	**BISRI DAM / SECOND PACKAGE**	Date:	**2/4/2014**
	SONDAGE No.:	**BHLA 01**		
	TRANCHE ESSAYEE	**72.00 m** à **75.00 m**	Manomètre	**0.50 m**
			depth to water:	**35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	538	10	3	53.8	17.93	3.55	5.33E-02	7.497

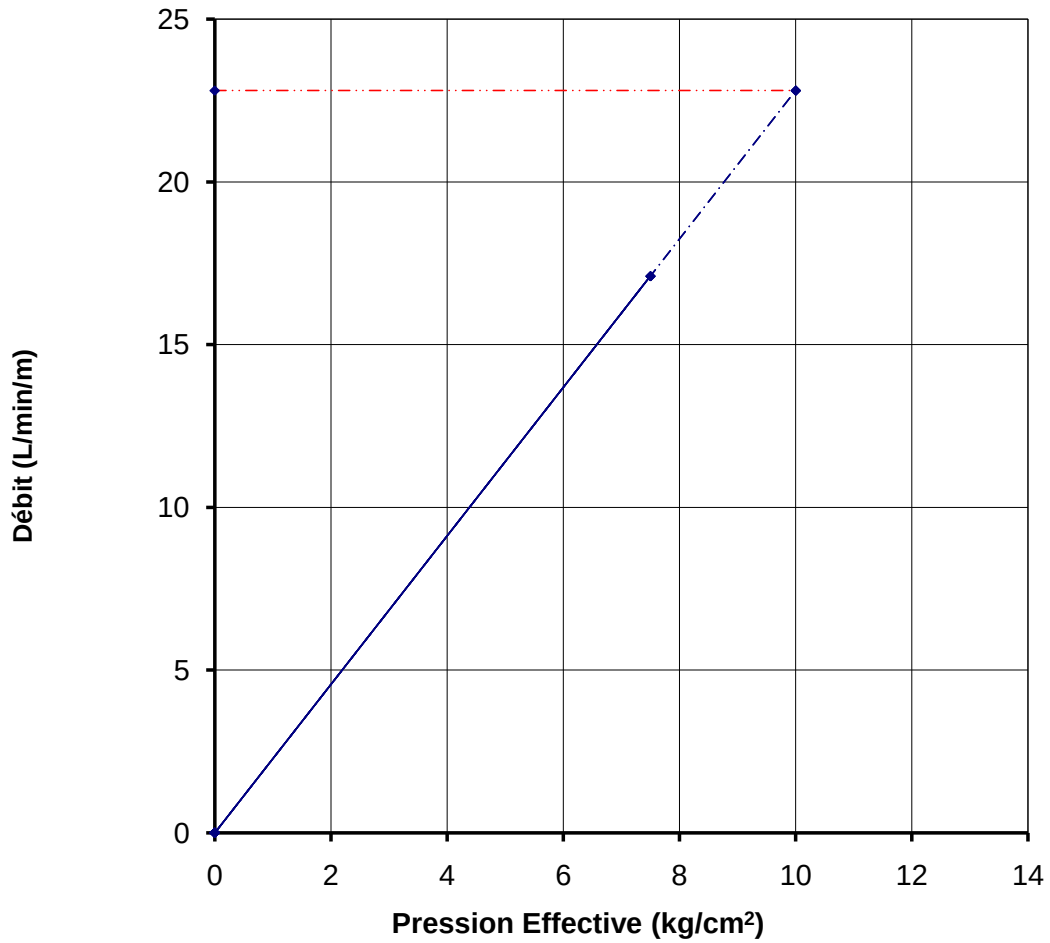


Lugeon = 23.92 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **2/5/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**75.00 m** à **78.00 m**		Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	513	10	3	51.3	17.10	3.55	5.08E-02	7.499

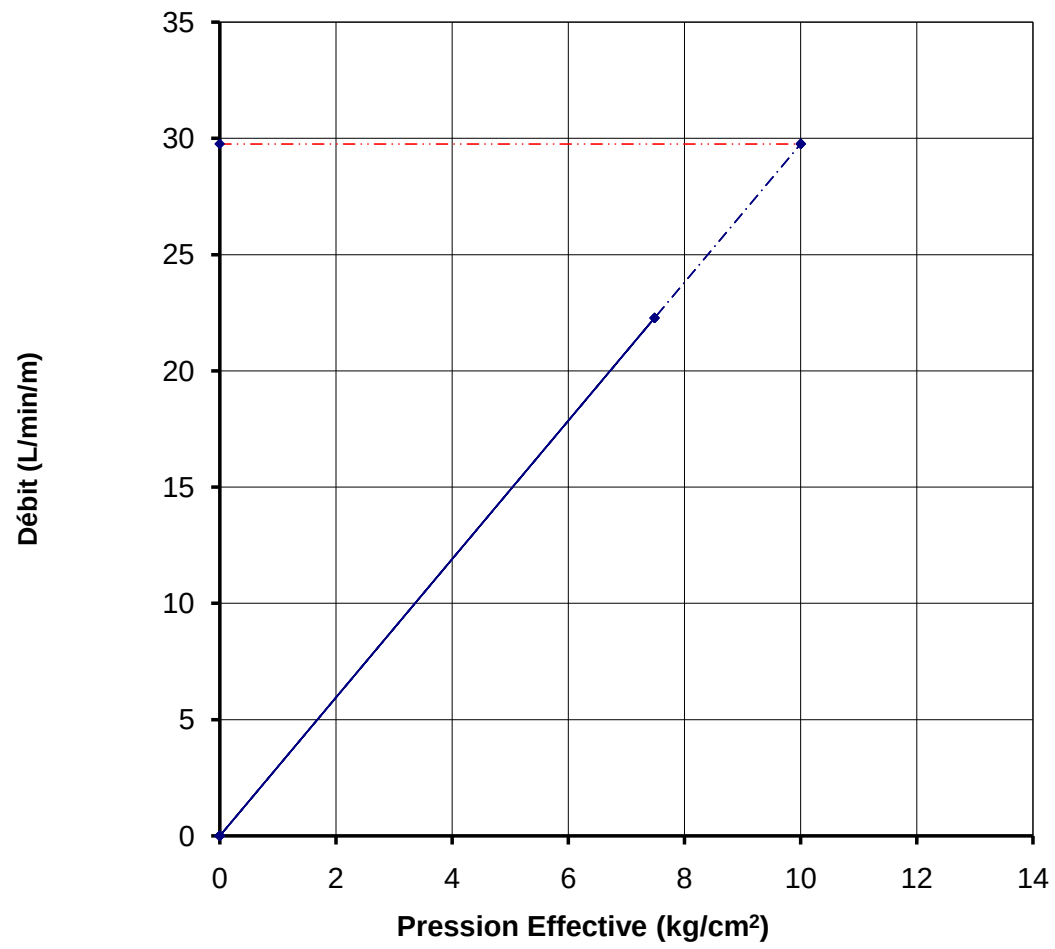


Lugeon = 22.80 L/min/m

SATCOP	PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date:	**2/6/2014**
	SONDAGE No.:	**BHLA 01**			
	TRANCHE ESSAYEE	**78.00 m**	à **81.00 m**	Manomètre	**0.50 m**
				depth to water:	**35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	668	10	3	66.8	22.27	3.55	6.61E-02	7.484

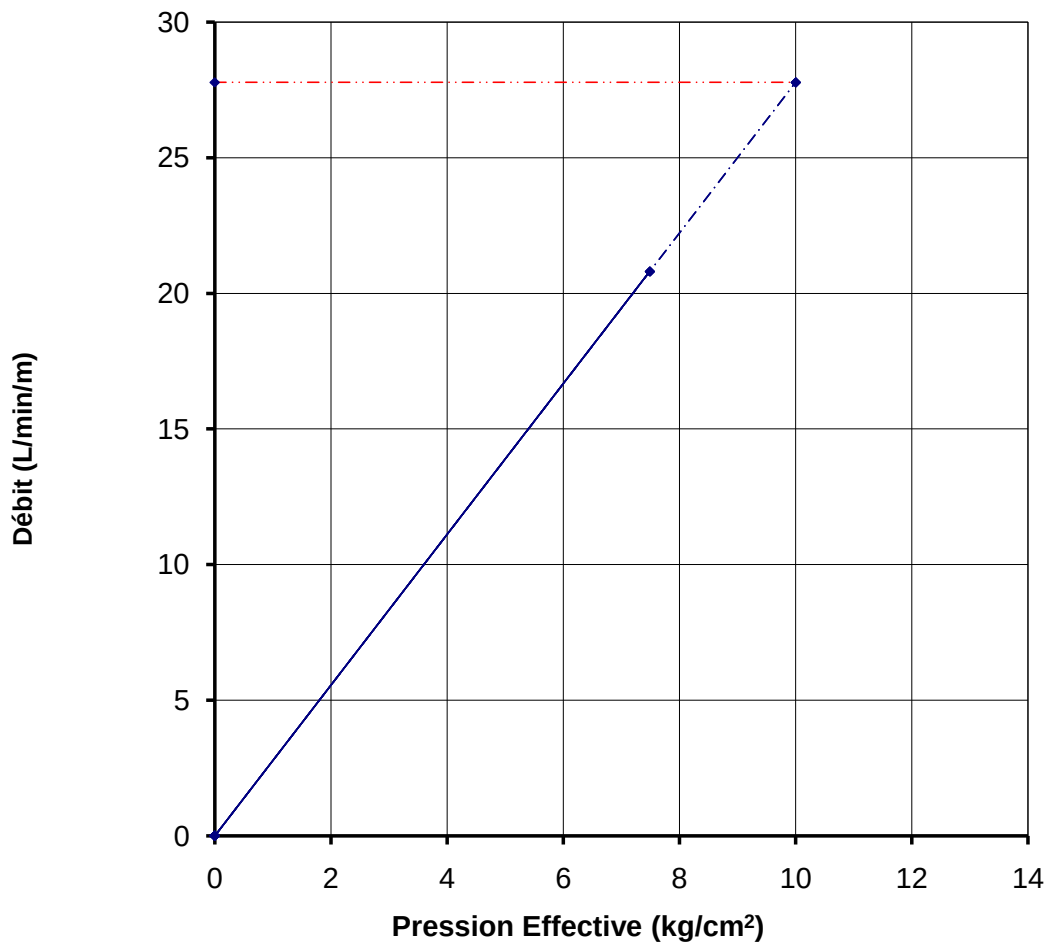


Lugeon = 29.75 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **2/6/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**81.00 m** à **84.00 m**		Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	624	10	3	62.4	20.80	3.55	6.18E-02	7.488

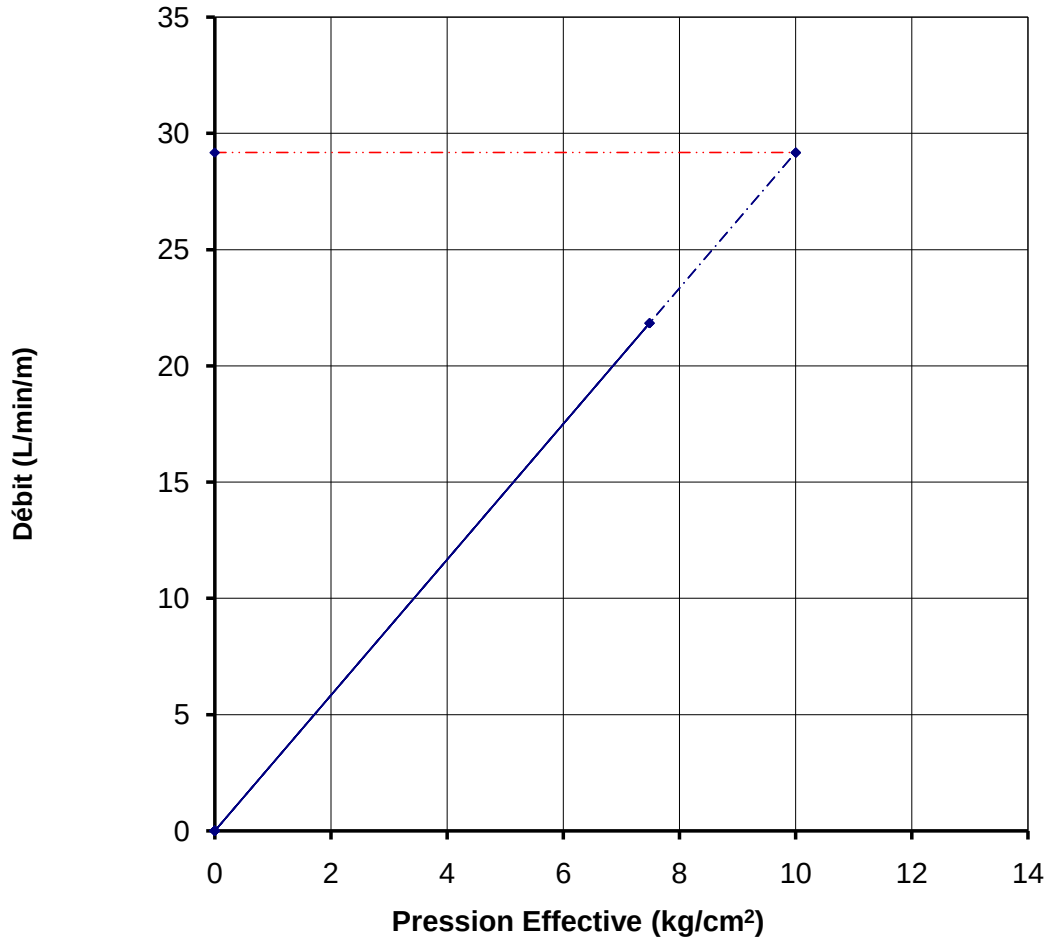


Lugeon = 27.78 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **2/7/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**84.00 m** à **87.00 m**		Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	655	10	3	65.5	21.83	3.55	6.48E-02	7.485

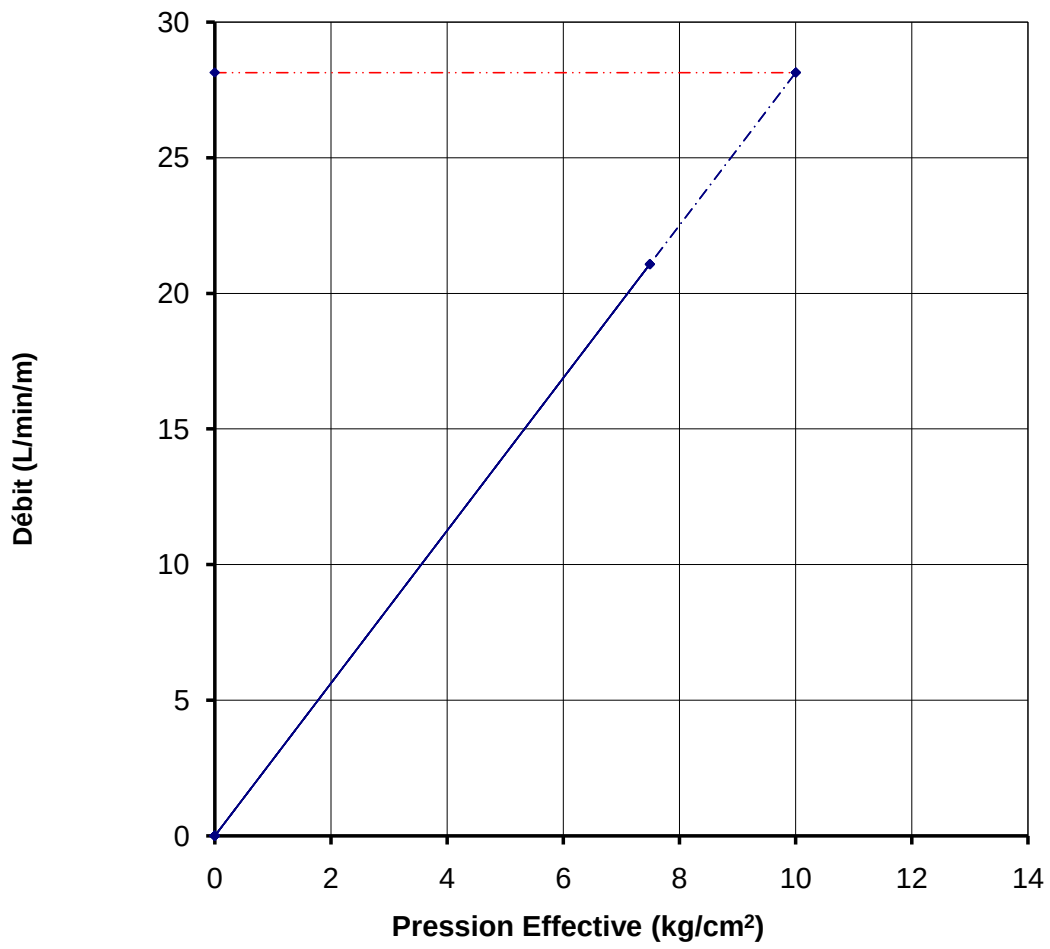


Lugeon = 29.17 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **2/7/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**87.00 m** à **90.00 m**		Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	632	10	3	63.2	21.07	3.55	6.26E-02	7.487

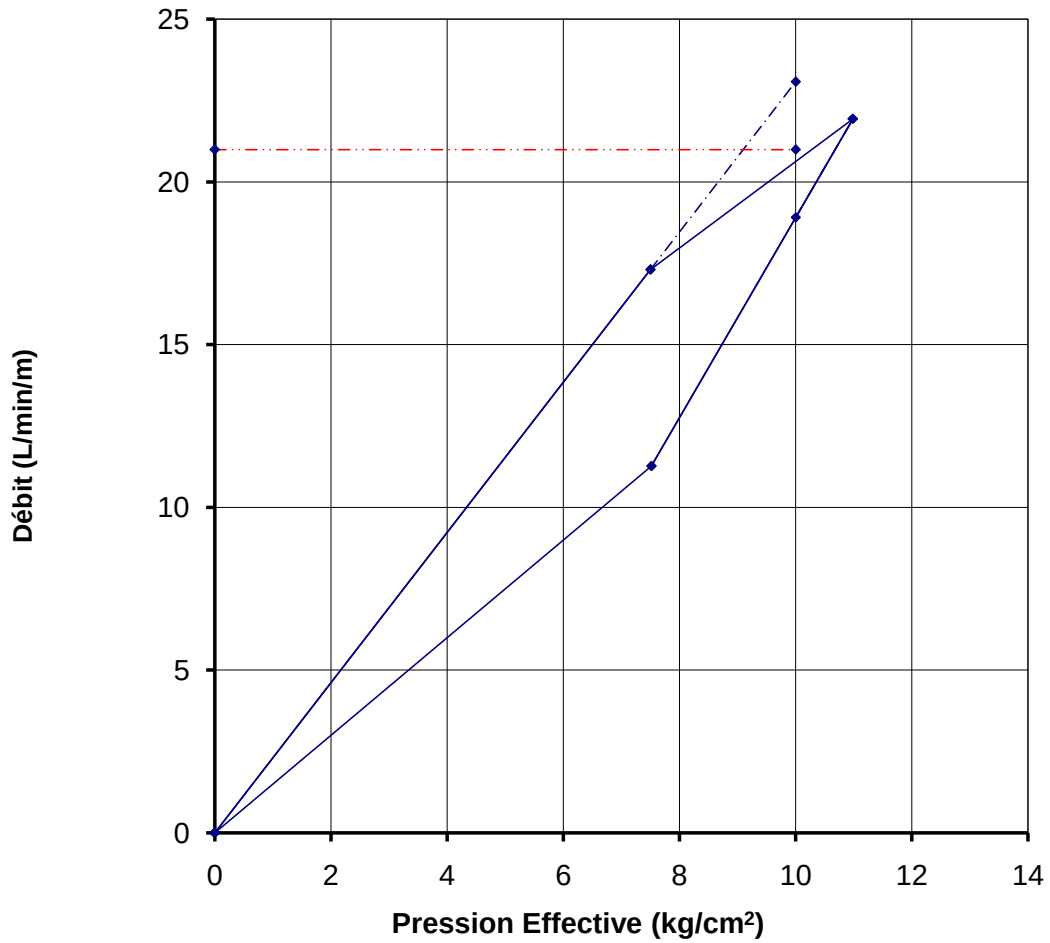


Lugeon = 28.14 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **2/8/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**90.00 m** à **93.00 m**		Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	338	10	3	33.8	11.27	3.55	3.35E-02	7.517
7.5	658	10	3	65.8	21.93	3.55	6.51E-02	10.985
4	519	10	3	51.9	17.30	3.55	5.14E-02	7.499

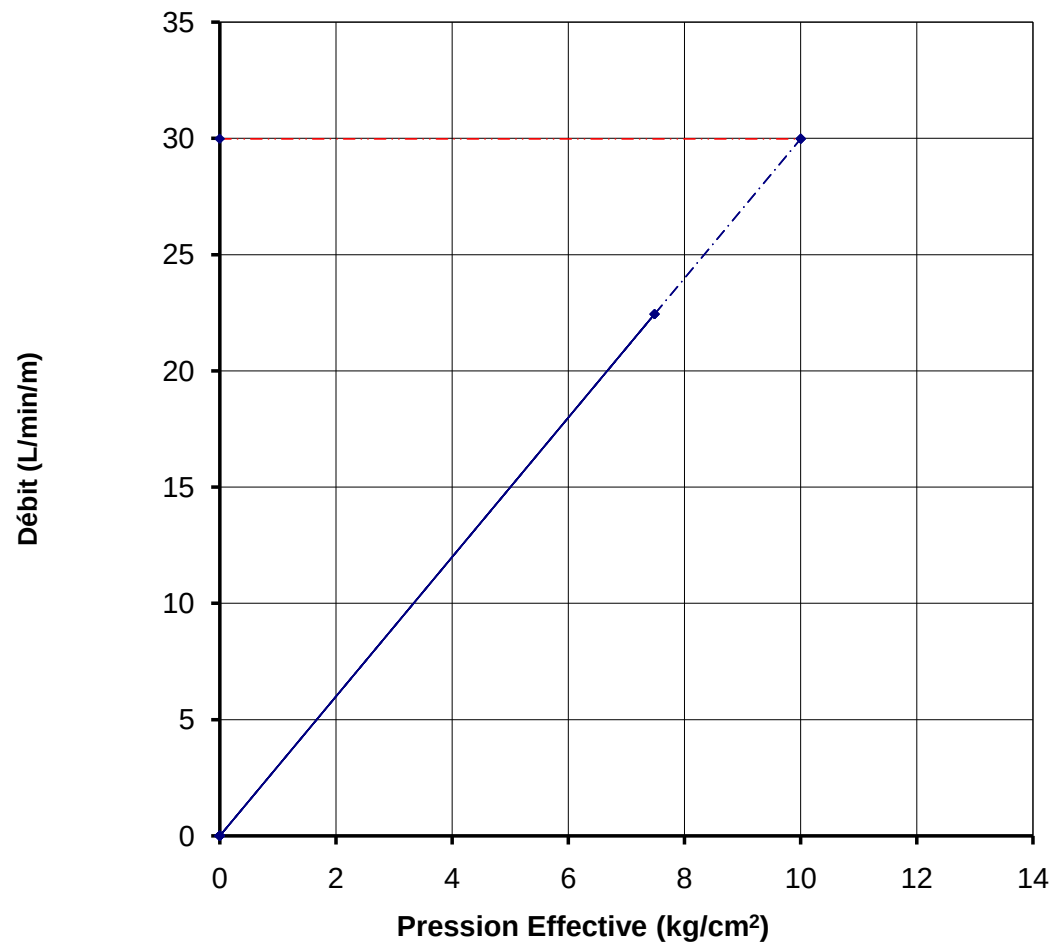


Lugeon = 20.99 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **2/8/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**93.00 m** à **96.00 m**		Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	673	10	3	67.3	22.43	3.55	6.66E-02	7.483

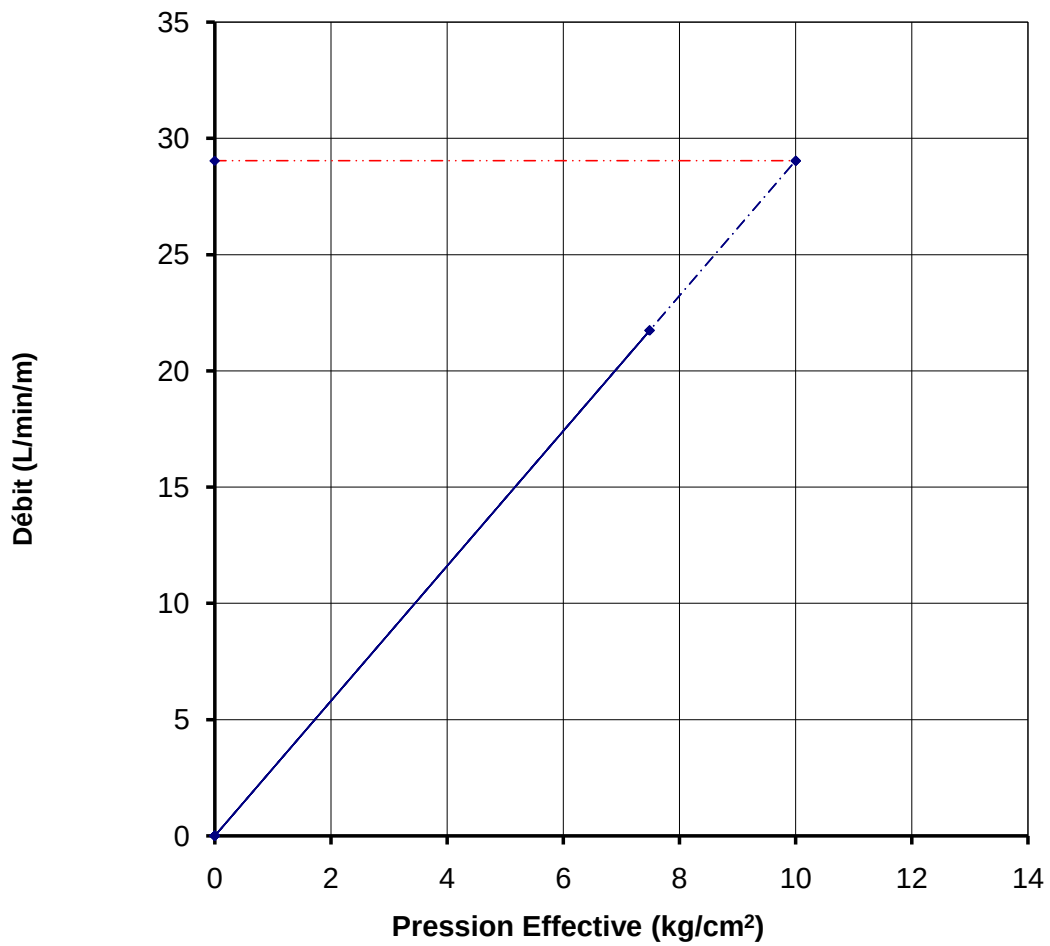


Lugeon = 29.98 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **2/10/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**96.00 m** à **99.00 m**		Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	652	10	3	65.2	21.73	3.55	6.45E-02	7.485

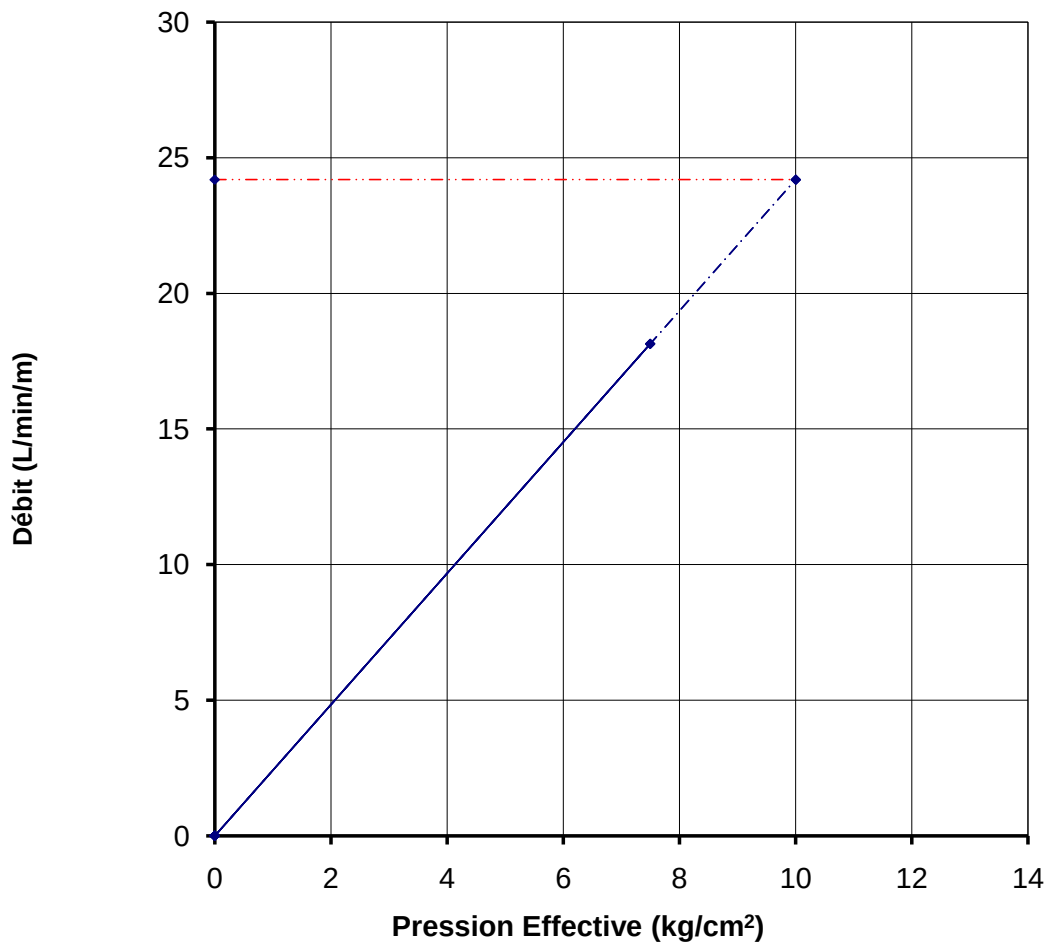


Lugeon = 29.03 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **2/11/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**99.00 m** à **102.00 m**		Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	544	10	3	54.4	18.13	3.55	5.39E-02	7.496

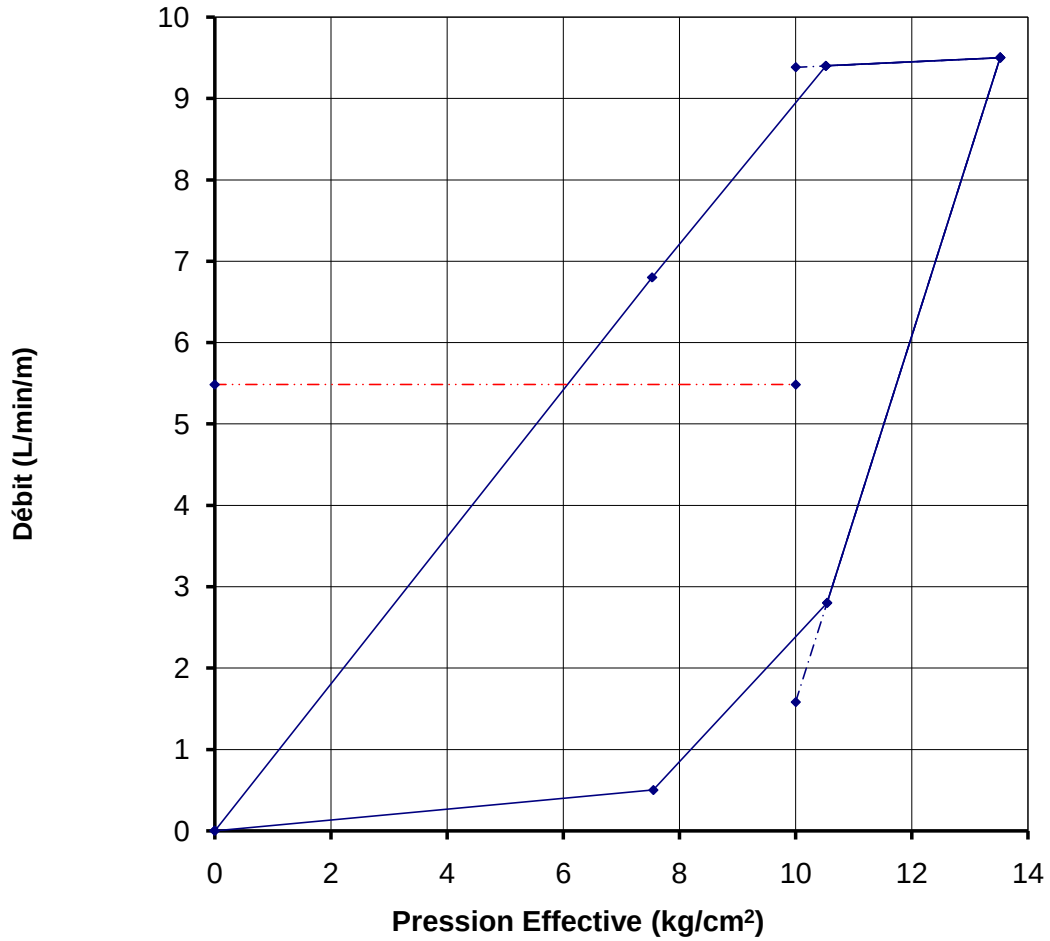


Lugeon = 24.19 L/min/m

PROJECT:	**BISRI DAM / SECOND PACKAGE**		Date: **2/11/2014**
SONDAGE No.:	**BHLA 01**		
TRANCHE ESSAYEE	**102.0 m** à **105.00 m**		Manomètre **0.50 m**
			depth to water: **35.00 m**

ESSAI DE PERMEABILITE LUGEON

Pression de Lecture P (bars)	Eau absorbée en (L)	Durée en (min)	Longueur de Passe en (m)	Débit (L/min)	Débit (L/min/m)	ΔH (bars)	Perte de charge (Bars) J	Pression Effective (bar) P -J+ΔH
4	204	10	3	20.4	6.80	3.55	2.02E-02	7.530
7	282	10	3	28.2	9.40	3.55	2.79E-02	10.522
10	285	10	3	28.5	9.50	3.55	2.82E-02	13.522
7	84	10	3	8.4	2.80	3.55	8.32E-03	10.542
4	15	10	3	1.5	0.50	3.55	1.49E-03	7.549



Lugeon = 5.48 L/min/m

APPENDIX 5. DCPT TEST RESULTS

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

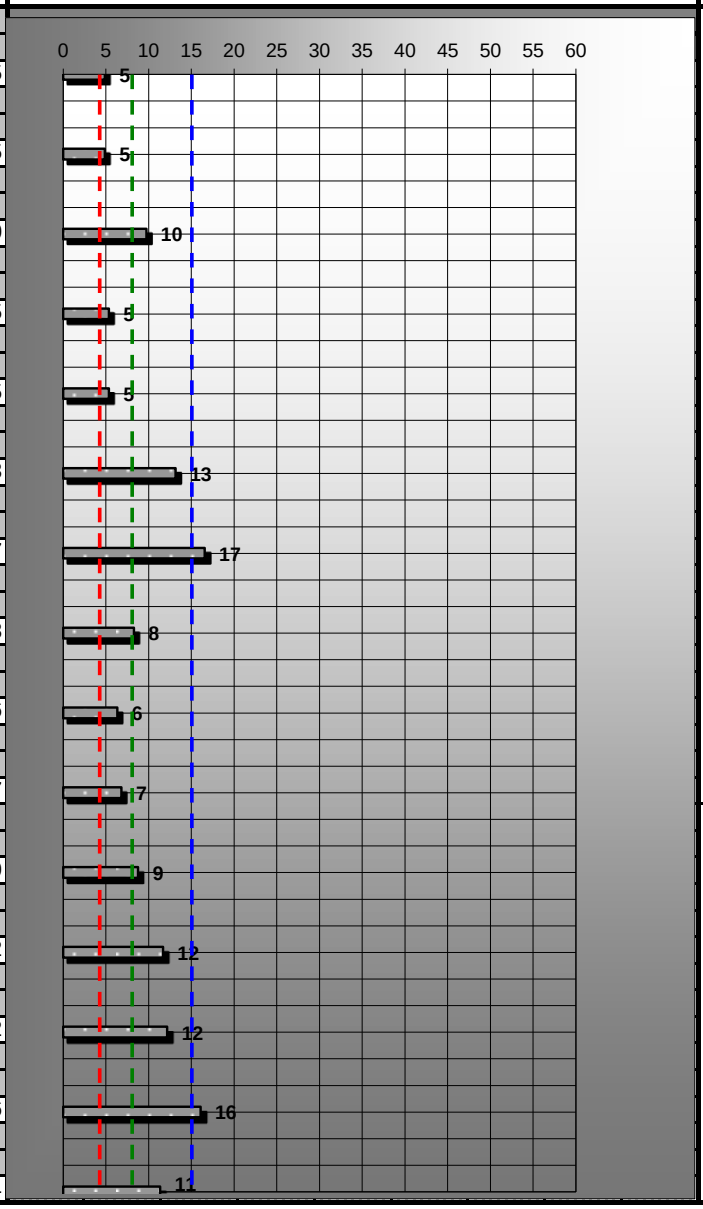
Probing: DCPVR6

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: January 14, 2014

Coordinates X: -334,695.090 Y: -61,813.643 Z: +415.610
Depth: 15m **Groundwater:** +398 (Estimated)
C./D. Rod: 7.5m (HW) / 6m AW & 9m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
10	4	
20	3	
30	3	5
40	3	
50	3	
60	4	5
70	6	
80	6	
90	8	10
100	8	
110	2	
120	1	5
130	2	
140	4	
150	5	5
160	9	
170	6	
180	12	13
190	15	
200	10	
210	9	17
220	6	
230	6	
240	5	8
250	5	
260	4	
270	4	6
280	4	
290	4	
300	6	7
310	6	
320	7	
330	5	9
340	10	
350	7	
360	7	12
370	7	
380	8	
390	10	12
400	11	
410	10	
420	13	16
430	8	
440	8	
450	8	11

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 47

Casing

Clayey Silt - Silty Sand - Silty Gravel

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

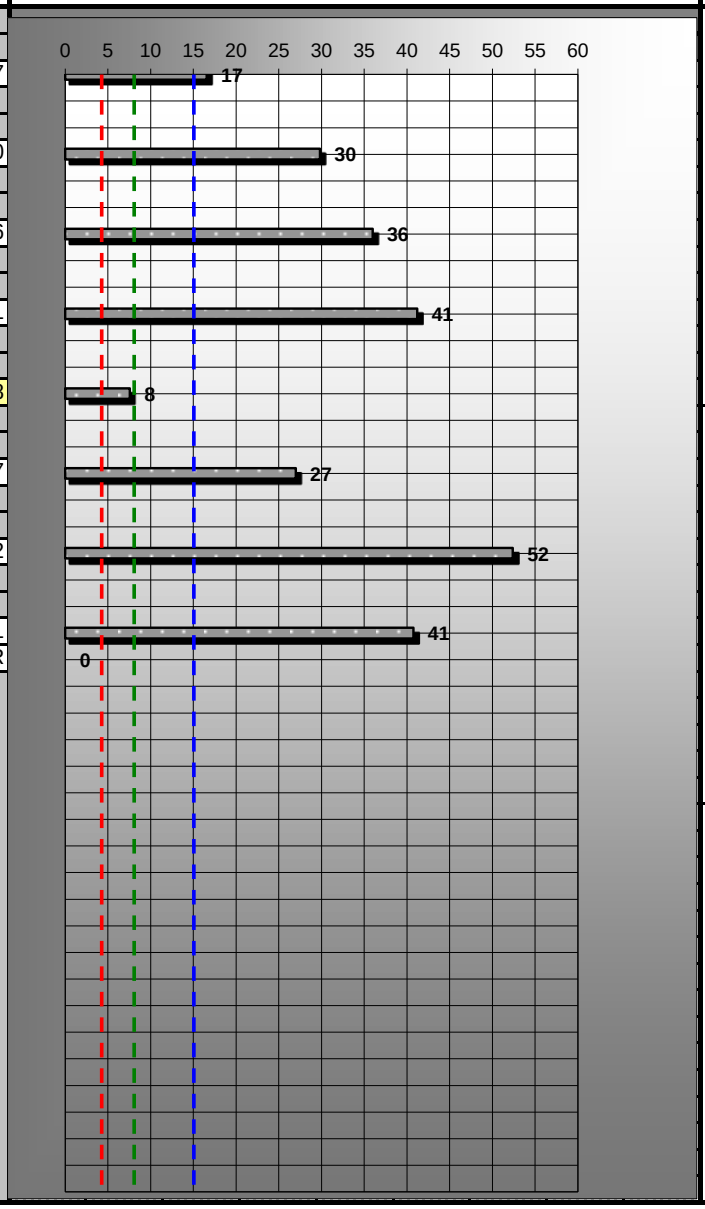
Probing: DCPVR6

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: January 14, 2014

Coordinates X: -334,695.090 Y: -61,813.643 Z: +415.610
Depth: 15m **Groundwater:** +398 (Estimated)
C./D. Rod: 7.5m (HW) / 6m AW & 9m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
460	9	
470	11	
480	15	17
490	18	
500	23	
510	22	30
520	24	
530	29	
540	23	36
550	23	
560	24	
570	40	41
580	3	
590	7	
600	6	8
610	7	
620	11	
630	33	27
640	50	
650	19	
660	30	52
670	26	
680	34	
690	17	41
700	50/5cm	R
710	Tri-cone rock bit	
720		
730		
740		
750		
760		
770		
780		
790		
800		
810		
820		
830		
840		
850		
860		
870		
880		
890		
900		

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 47

Casing	Clay
Casing	
Tri-cone	Old colluvial soil deposits

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

Probing: DCPVR6

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: January 14, 2014

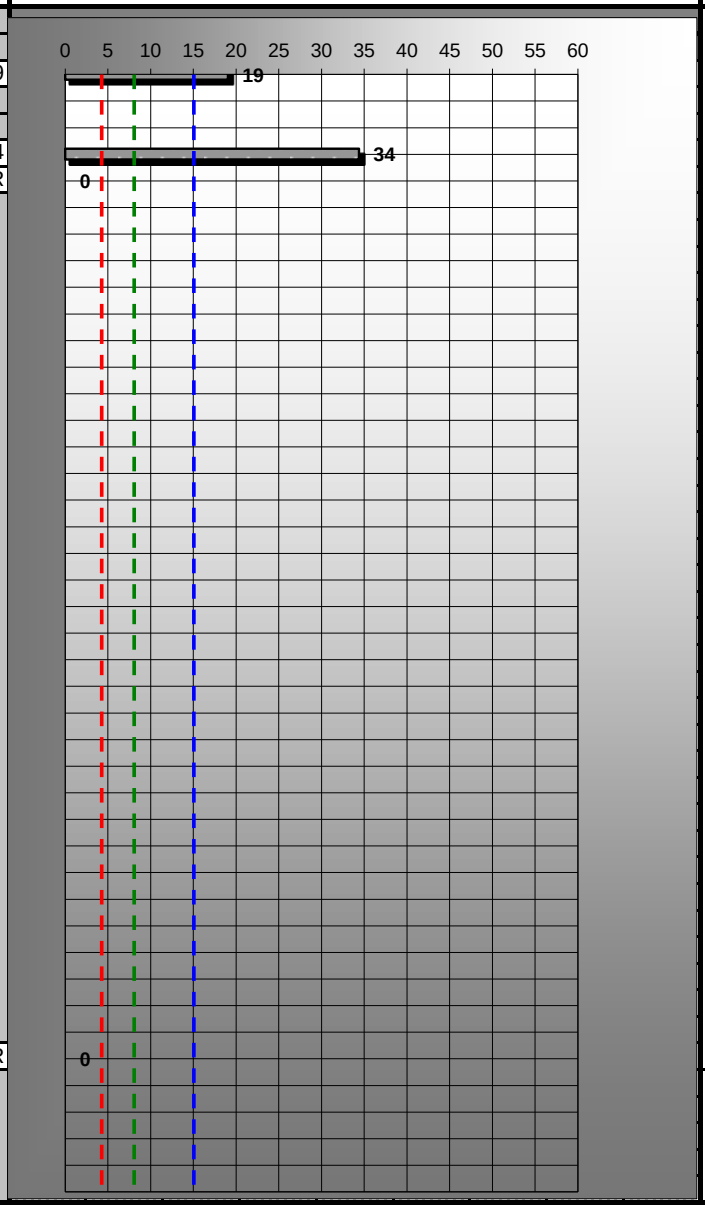
Coordinates X: -334,695.090 Y: -61,813.643 Z: +415.610
Depth: 15m **Groundwater:** +398 (Estimated)
C./D. Rod: 7.5m (HW) / 6m AW & 9m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
910	12	
920	12	
930	12	19
940	29	
950	8	
960	28	34
970	75/3cm	R
980		
990		
1000		
1010		
1020		
1030		
1040		
1050		
1060		
1070		
1080		
1090		
1100		
1110		
1120		
1130		
1140		
1150		
1160		
1170		
1180		
1190		
1200		
1210		
1220		
1230		
1240		
1250		
1260		
1270		
1280		
1290		
1300	75/3cm	R
1310		
1320		
1330		
1340		
1350		

Tri-cone rock bit

Tri-cone rock bit

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



4 inches dia. tri-cone

Tri-cone

Description according to BDC 47

CLAY

Moderately to highly and highly to completely weathered clayey MARLSTONE with pockets of rock fragments.

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

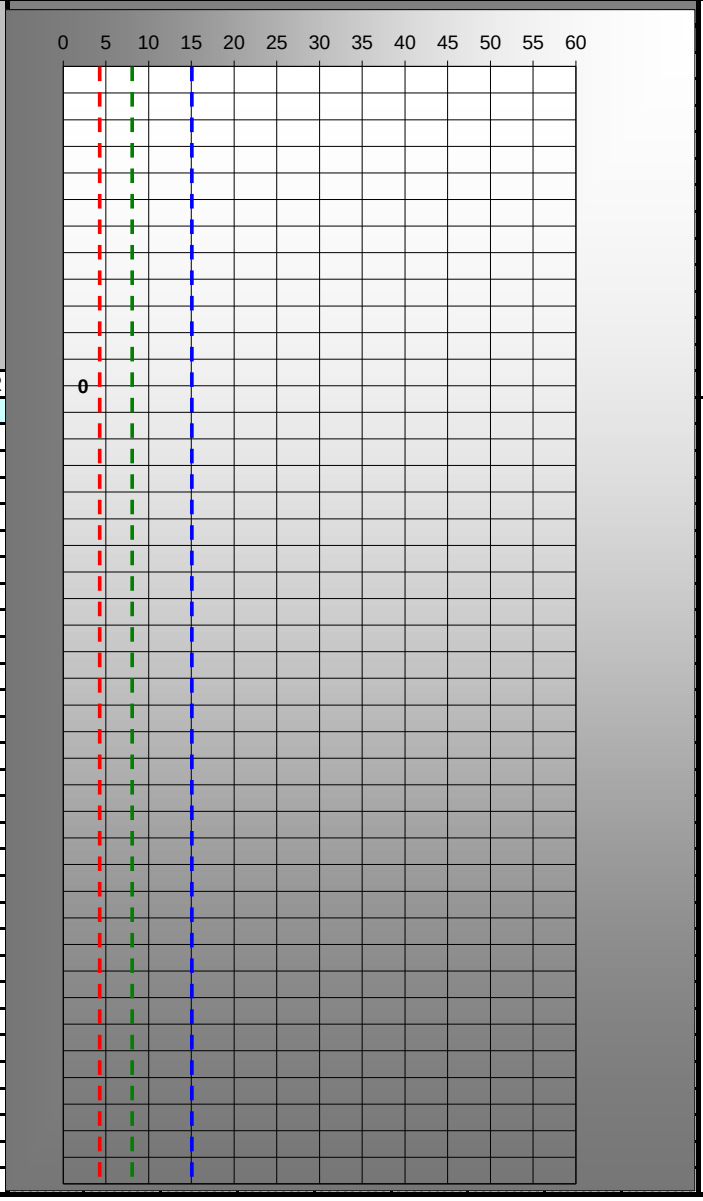
Probing: DCPVR6

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: January 14, 2014

Coordinates X: -334,695.090 Y: -61,813.643 Z: +415.610
Depth: 15m **Groundwater:** +398 (Estimated)
C./D. Rod: 7.5m (HW) / 6m AW & 9m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
1360	Tri-cone rock bit	
1370		
1380		
1390		
1400		
1410		
1420		
1430		
1440		
1450		
1460		
1470		
1480		
1490		
1500	75/2cm	R
End of probing at 15m		

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 47

4 inches dia. tri-cone

Moderately to highly and highly to completely weathered clayey MARLSTONE with pockets of rock fragments.

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

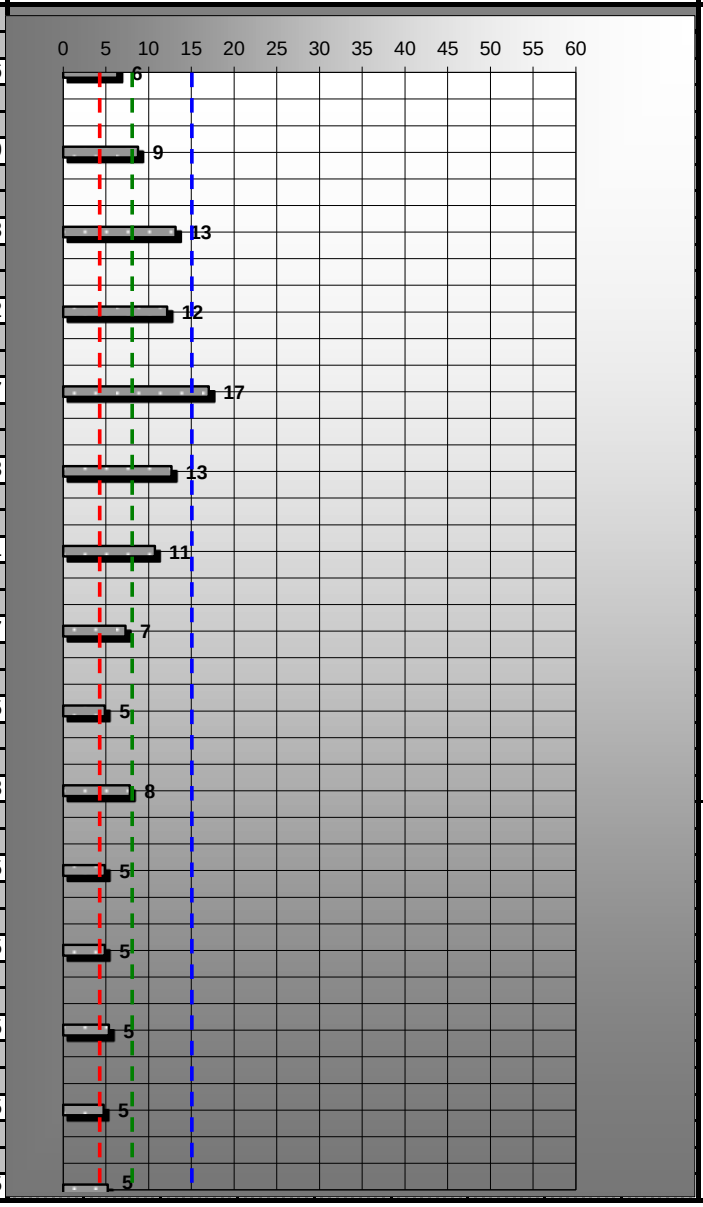
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
10	3	
20	5	
30	5	6
40	6	
50	6	
60	6	9
70	9	
80	9	
90	9	13
100	7	
110	8	
120	10	12
130	14	
140	12	
150	9	17
160	10	
170	8	
180	8	13
190	12	
200	5	
210	5	11
220	3	
230	5	
240	7	7
250	4	
260	2	
270	4	5
280	5	
290	6	
300	5	8
310	3	
320	4	
330	3	5
340	3	
350	3	
360	4	5
370	3	
380	5	
390	3	5
400	4	
410	3	
420	3	5
430	4	
440	3	
450	4	5

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing

Sandy Gravel - Sandy Clay - Clayey Sand

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

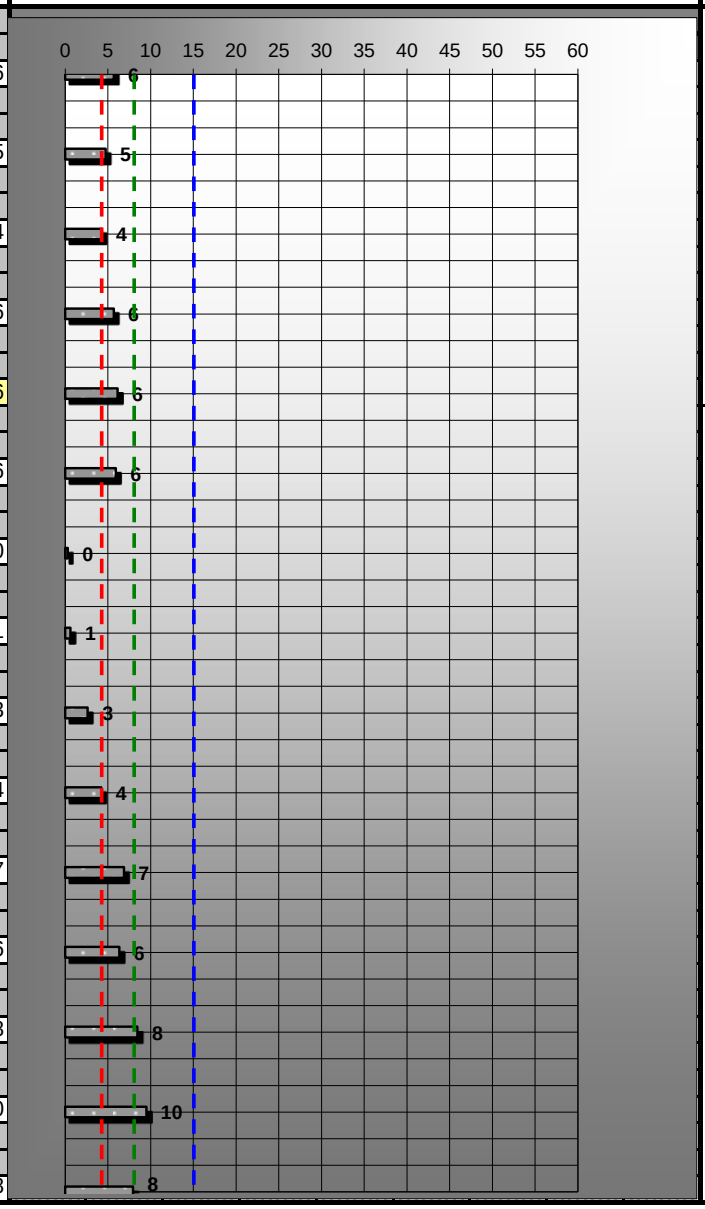
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
460	4	
470	4	
480	4	6
490	3	
500	4	
510	3	5
520	3	
530	3	
540	3	4
550	4	
560	3	
570	5	6
580	5	
590	4	
600	4	6
610	7	
620	4	
630	0.2	6
640	0.2	
650	0.2	
660	0.2	0
670	0.2	
680	0.5	
690	0.5	1
700	1	
710	2	
720	2	3
730	3	
740	2	
750	3	4
760	4	
770	4	
780	5	7
790	4	
800	4	
810	4	6
820	5	
830	5	
840	6	8
850	6	
860	6	
870	6	10
880	5	
890	5	
900	5	8

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing

Casing

Silty Clay

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

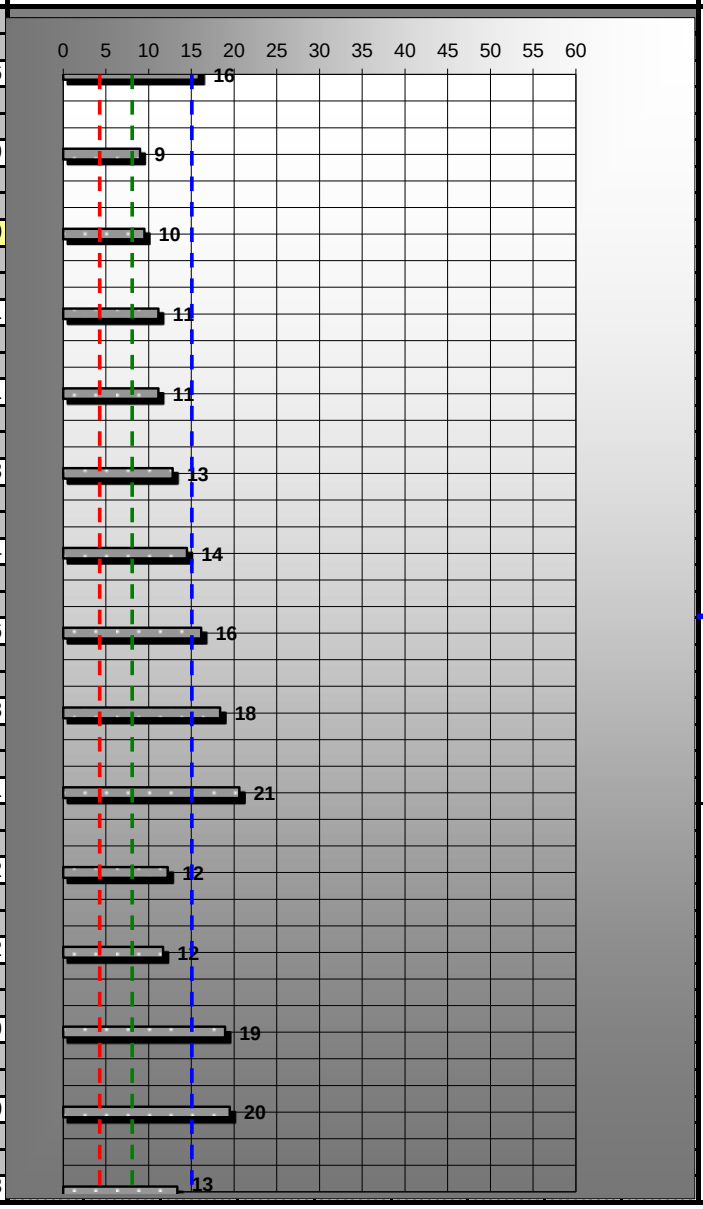
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
910	11	
920	11	
930	8	16
940	5	
950	6	
960	6	9
970	6	
980	6	
990	6	10
1000	7	
1010	7	
1020	6	11
1030	6	
1040	6	
1050	8	11
1060	8	
1070	8	
1080	7	13
1090	8	
1100	8	
1110	10	14
1120	11	
1130	9	
1140	9	16
1150	11	
1160	11	
1170	11	18
1180	10	
1190	10	
1200	17	21
1210	11	
1220	6	
1230	5	12
1240	8	
1250	7	
1260	6	12
1270	11	
1280	10	
1290	13	19
1300	12	
1310	12	
1320	11	20
1330	9	
1340	7	
1350	8	13

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing

Silt - Sandy Silt - Silty Sand

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

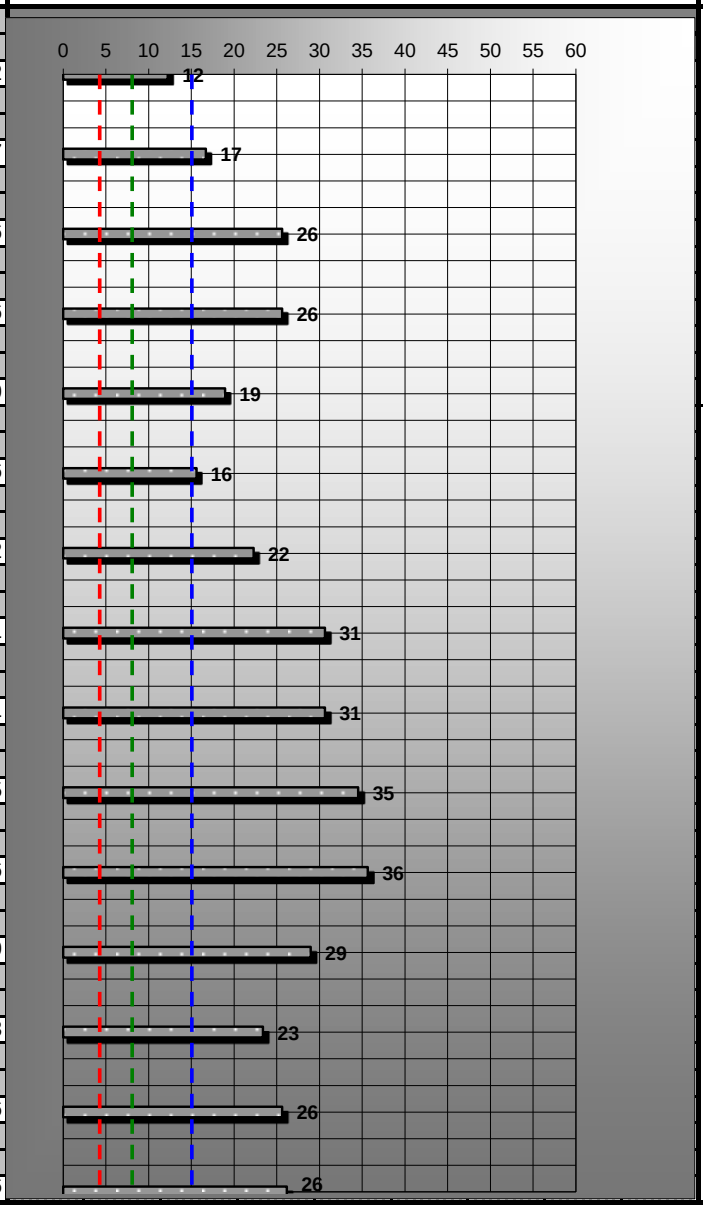
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
1360	9	
1370	7	
1380	6	12
1390	7	
1400	10	
1410	13	17
1420	15	
1430	17	
1440	14	26
1450	14	
1460	16	
1470	16	26
1480	13	
1490	12	
1500	9	19
1510	10	
1520	8	
1530	10	16
1540	13	
1550	13	
1560	14	22
1570	16	
1580	20	
1590	19	31
1600	19	
1610	18	
1620	18	31
1630	24	
1640	17	
1650	21	35
1660	21	
1670	22	
1680	21	36
1690	19	
1700	18	
1710	15	29
1720	14	
1730	13	
1740	15	23
1750	16	
1760	14	
1770	16	26
1780	14	
1790	16	
1800	17	26

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing

Casing

Silty sand - Sand

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

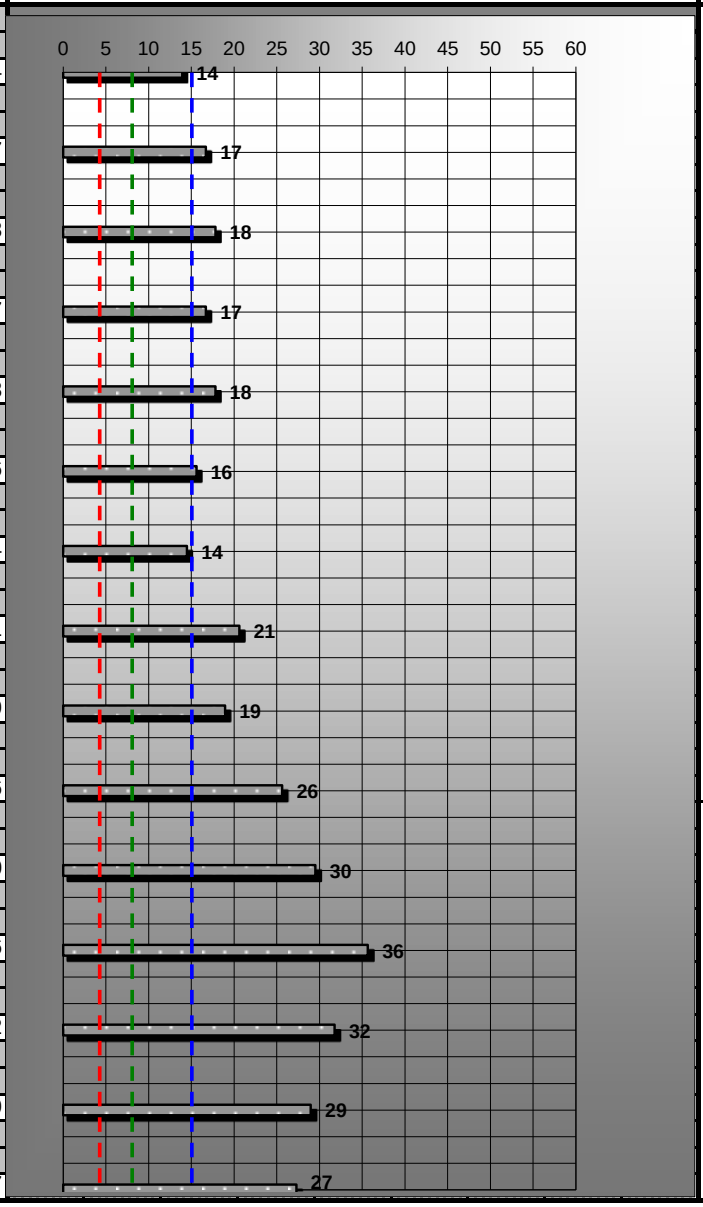
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
1810	6	
1820	9	
1830	10	14
1840	12	
1850	9	
1860	9	17
1870	11	
1880	12	
1890	9	18
1900	8	
1910	12	
1920	10	17
1930	9	
1940	12	
1950	11	18
1960	12	
1970	9	
1980	7	16
1990	7	
2000	10	
2010	9	14
2020	13	
2030	11	
2040	13	21
2050	11	
2060	11	
2070	12	19
2080	13	
2090	16	
2100	17	26
2110	14	
2120	20	
2130	19	30
2140	24	
2150	20	
2160	20	36
2170	17	
2180	19	
2190	21	32
2200	16	
2210	18	
2220	18	29
2230	15	
2240	16	
2250	18	27

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing

Gravely sand - Sand

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

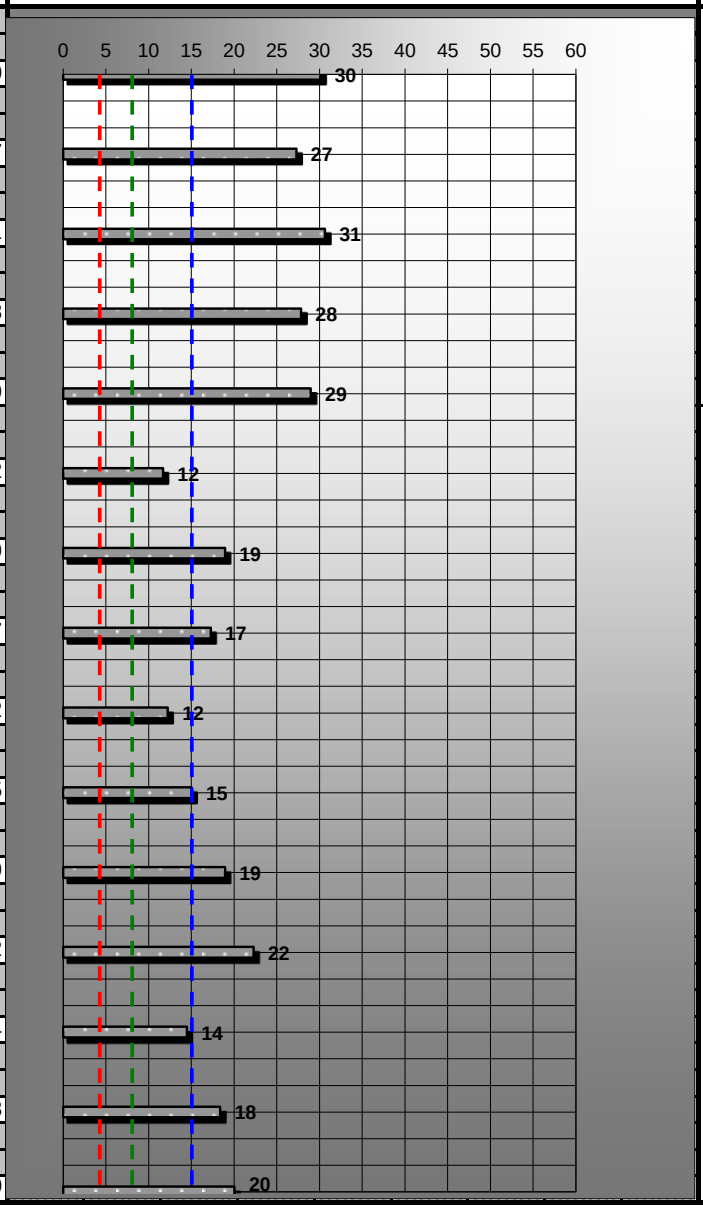
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
2260	19	
2270	18	
2280	17	30
2290	14	
2300	18	
2310	17	27
2320	18	
2330	21	
2340	16	31
2350	16	
2360	17	
2370	17	28
2380	18	
2390	18	
2400	16	29
2410	6	
2420	7	
2430	8	12
2440	13	
2450	12	
2460	9	19
2470	10	
2480	11	
2490	10	17
2500	8	
2510	7	
2520	7	12
2530	10	
2540	9	
2550	8	15
2560	11	
2570	11	
2580	12	19
2590	16	
2600	13	
2610	11	22
2620	9	
2630	8	
2640	9	14
2650	9	
2660	11	
2670	13	18
2680	12	
2690	12	
2700	12	20

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing

Casing

Silty sand - Sand

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
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DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

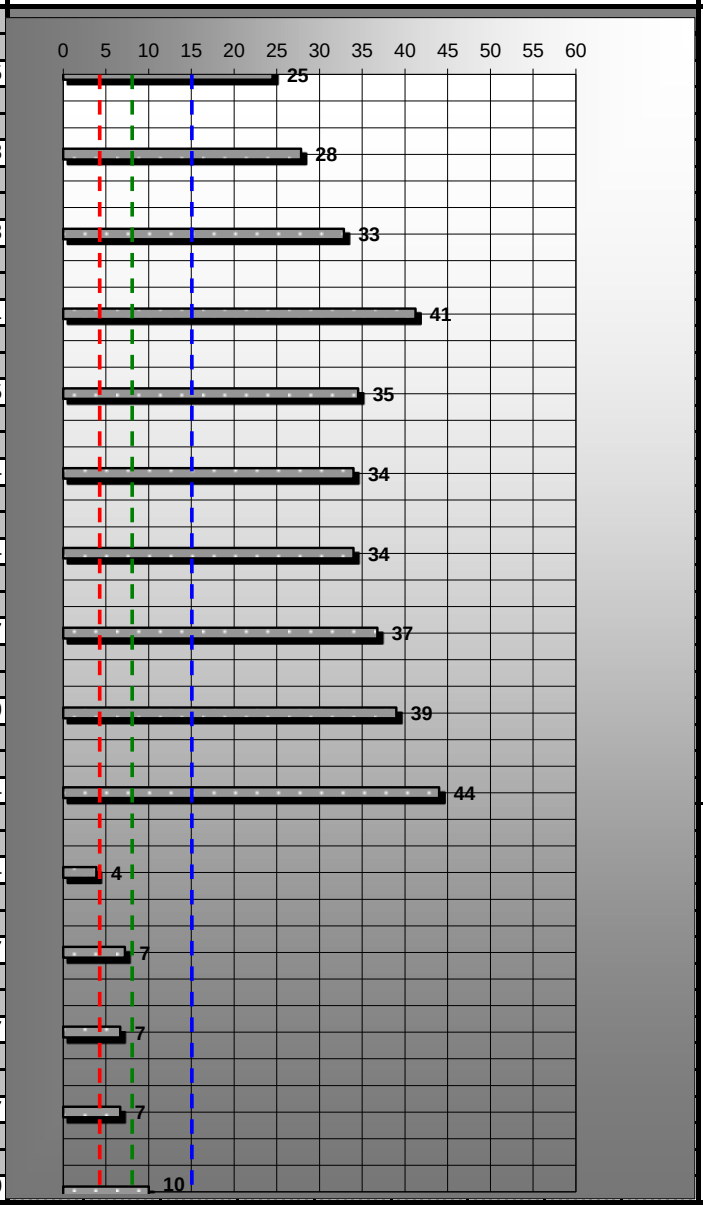
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
2710	15	
2720	15	
2730	14	25
2740	15	
2750	16	
2760	19	28
2770	18	
2780	20	
2790	21	33
2800	28	
2810	27	
2820	19	41
2830	21	
2840	18	
2850	23	35
2860	22	
2870	21	
2880	18	34
2890	20	
2900	19	
2910	22	34
2920	22	
2930	20	
2940	24	37
2950	24	
2960	22	
2970	24	39
2980	25	
2990	28	
3000	26	44
3010	2	
3020	1	
3030	4	4
3040	5	
3050	4	
3060	4	7
3070	6	
3080	3	
3090	3	7
3100	3	
3110	4	
3120	5	7
3130	6	
3140	6	
3150	6	10

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing

Admixture of silty Sand, silty Clay and sandy Clay

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

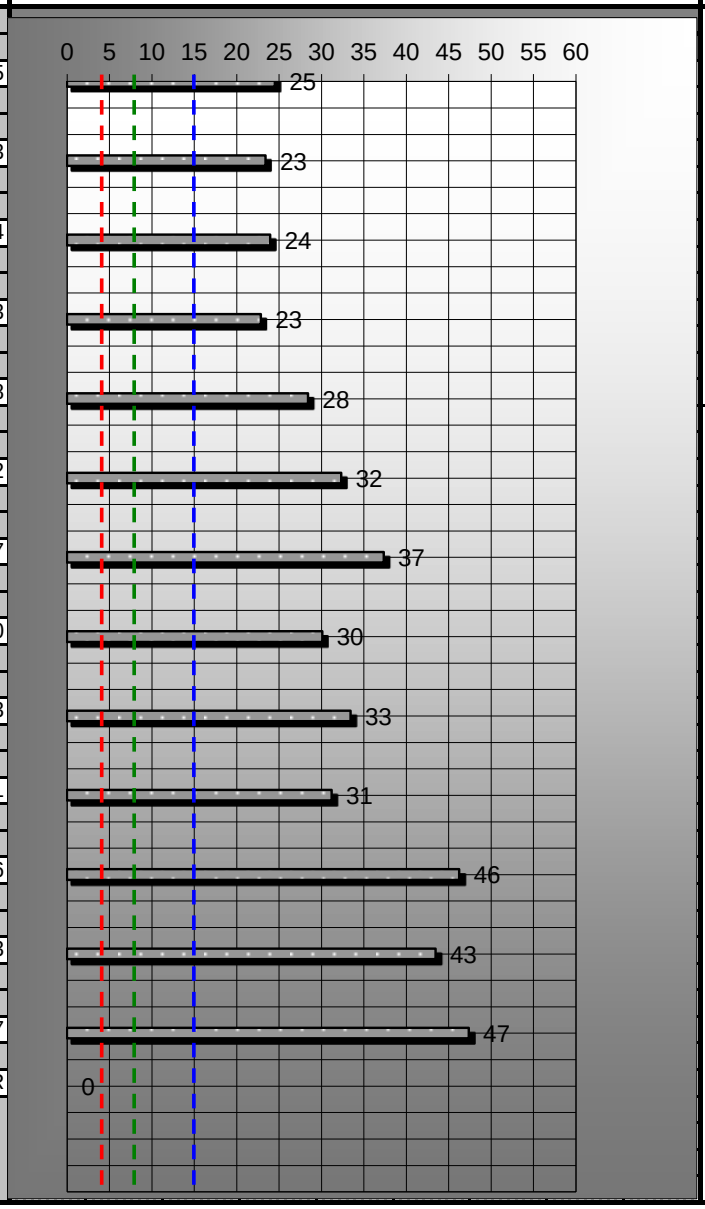
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
3160	14	
3170	16	
3180	14	25
3190	12	
3200	15	
3210	15	23
3220	15	
3230	15	
3240	13	24
3250	12	
3260	14	
3270	15	23
3280	14	
3290	15	
3300	22	28
3310	22	
3320	16	
3330	20	32
3340	28	
3350	19	
3360	20	37
3370	18	
3380	18	
3390	18	30
3400	21	
3410	20	
3420	19	33
3430	20	
3440	24	
3450	12	31
3460	26	
3470	33	
3480	24	46
3490	25	
3500	31	
3510	22	43
3520	23	
3530	28	
3540	34	47
3550	44	
3560	75/6cm	R
3570	Tri-cone rock bit	
3580		
3590		
3600		

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing — Silty Sand

Casing — Silty Clay

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

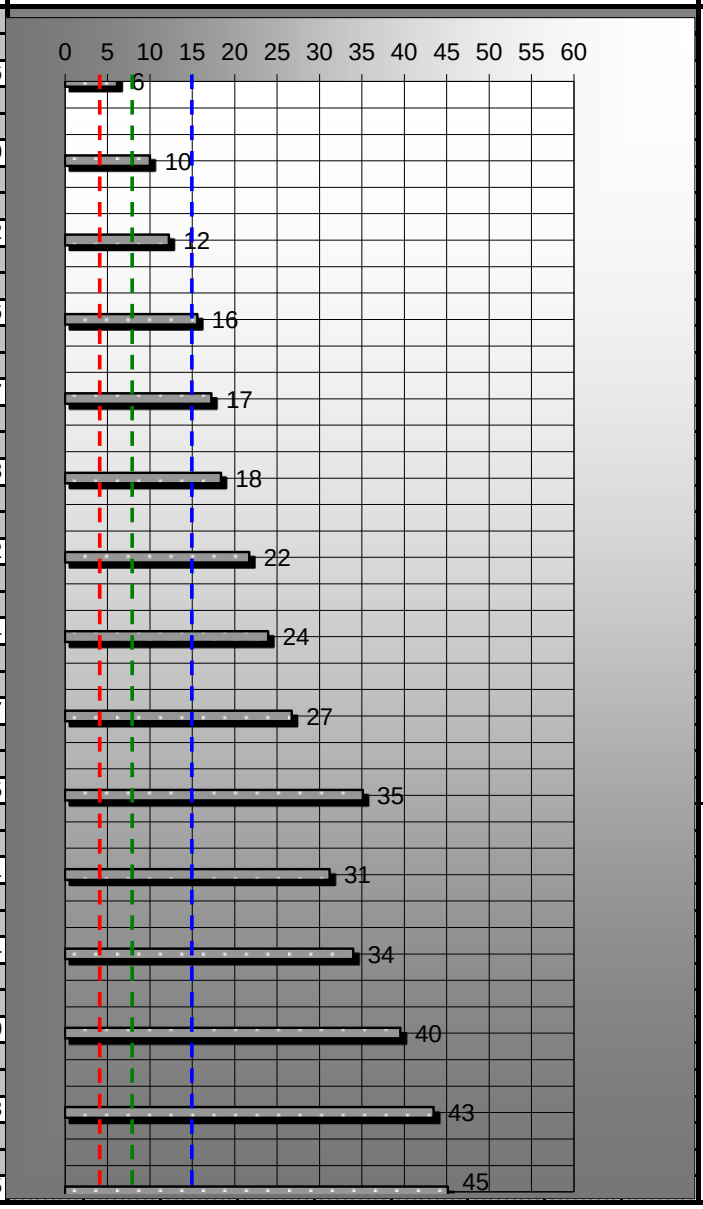
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
3610	3	
3620	4	
3630	4	6
3640	5	
3650	6	
3660	7	10
3670	7	
3680	8	
3690	7	12
3700	9	
3710	9	
3720	10	16
3730	9	
3740	12	
3750	10	17
3760	12	
3770	10	
3780	11	18
3790	12	
3800	13	
3810	14	22
3820	11	
3830	15	
3840	17	24
3850	16	
3860	15	
3870	17	27
3880	20	
3890	21	
3900	22	35
3910	19	
3920	20	
3930	17	31
3940	18	
3950	20	
3960	23	34
3970	23	
3980	22	
3990	26	40
4000	26	
4010	30	
4020	22	43
4030	20	
4040	29	
4050	32	45

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing

Silty Clay

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

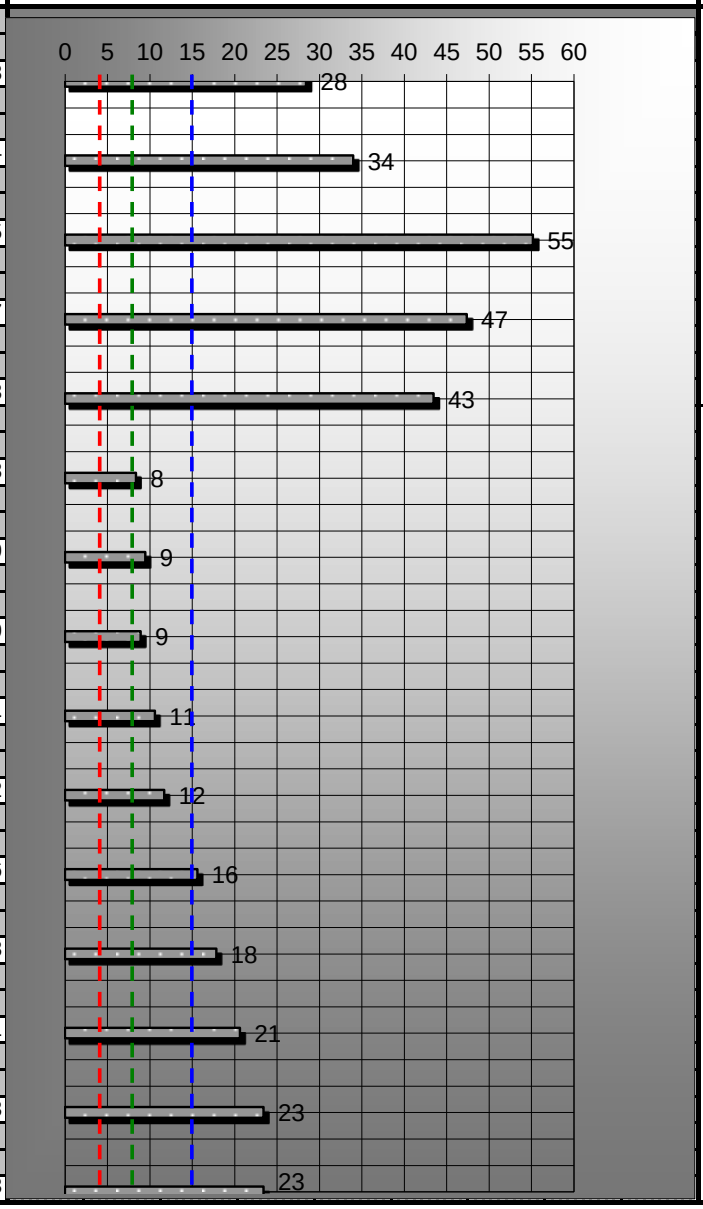
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
4060	15	
4070	18	
4080	18	28
4090	13	
4100	27	
4110	21	34
4120	33	
4130	30	
4140	36	55
4150	30	
4160	28	
4170	27	47
4180	27	
4190	25	
4200	26	43
4210	6	
4220	4	
4230	5	8
4240	5	
4250	6	
4260	6	9
4270	5	
4280	5	
4290	6	9
4300	6	
4310	6	
4320	7	11
4330	6	
4340	7	
4350	8	12
4360	9	
4370	9	
4380	10	16
4390	10	
4400	9	
4410	13	18
4420	11	
4430	11	
4440	15	21
4450	13	
4460	14	
4470	15	23
4480	14	
4490	13	
4500	15	23

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing

Silty Clay

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

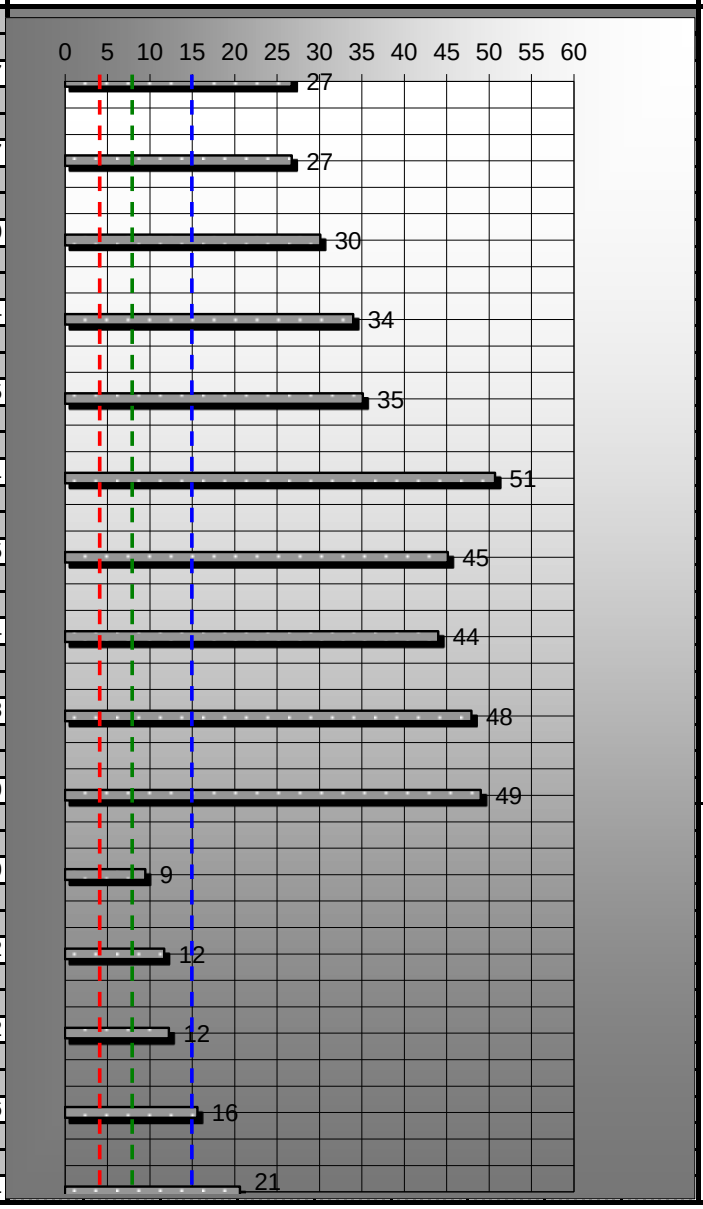
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
4510	16	
4520	15	
4530	17	27
4540	16	
4550	16	
4560	16	27
4570	18	
4580	17	
4590	19	30
4600	18	
4610	22	
4620	21	34
4630	18	
4640	20	
4650	25	35
4660	31	
4670	32	
4680	28	51
4690	30	
4700	25	
4710	26	45
4720	27	
4730	27	
4740	25	44
4750	25	
4760	30	
4770	31	48
4780	26	
4790	29	
4800	33	49
4810	6	
4820	5	
4830	6	9
4840	6	
4850	7	
4860	8	12
4870	8	
4880	7	
4890	7	12
4900	9	
4910	10	
4920	9	16
4930	12	
4940	13	
4950	12	21

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46	
Casing	Admixture of silty Clay and sandy Clay
Casing	Silty Clay

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

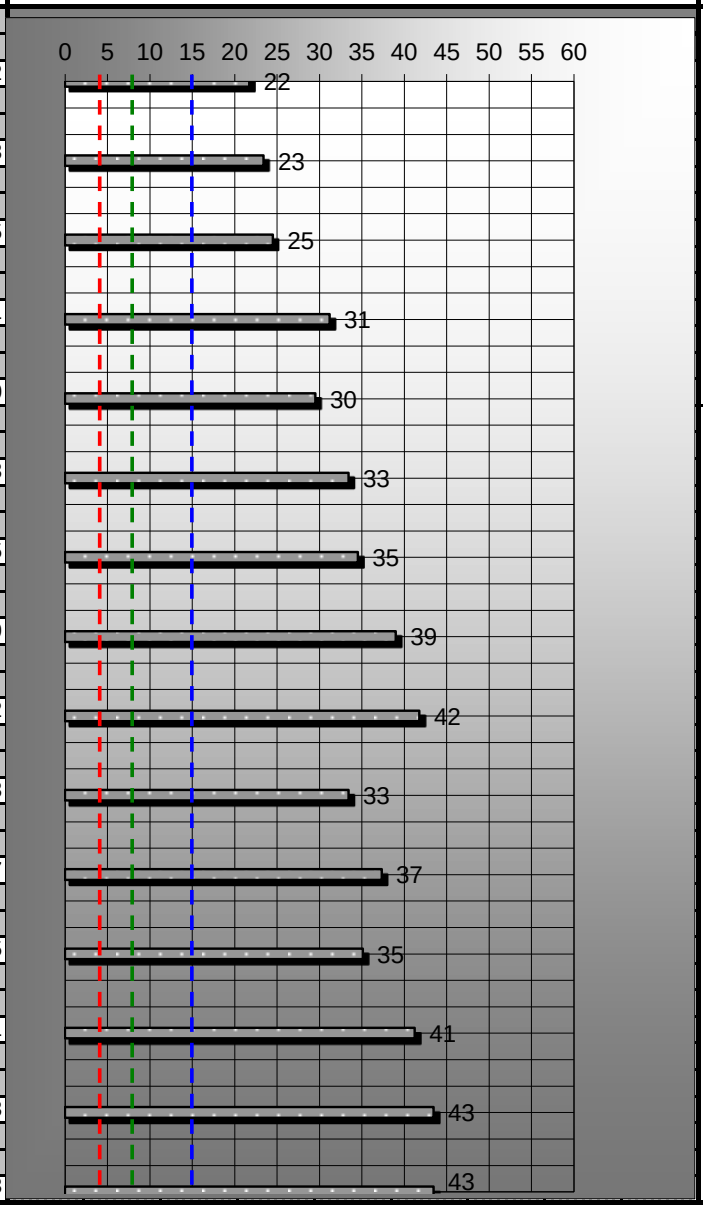
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
4960	13	
4970	13	
4980	13	22
4990	12	
5000	15	
5010	15	23
5020	14	
5030	14	
5040	16	25
5050	17	
5060	19	
5070	20	31
5080	17	
5090	19	
5100	17	30
5110	20	
5120	20	
5130	20	33
5140	22	
5150	20	
5160	20	35
5170	22	
5180	26	
5190	22	39
5200	24	
5210	26	
5220	25	42
5230	26	
5240	17	
5250	17	33
5260	19	
5270	22	
5280	26	37
5290	20	
5300	22	
5310	21	35
5320	20	
5330	27	
5340	27	41
5350	27	
5360	23	
5370	28	43
5380	25	
5390	27	
5400	26	43

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing — Silty Clay

Casing — Clay

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

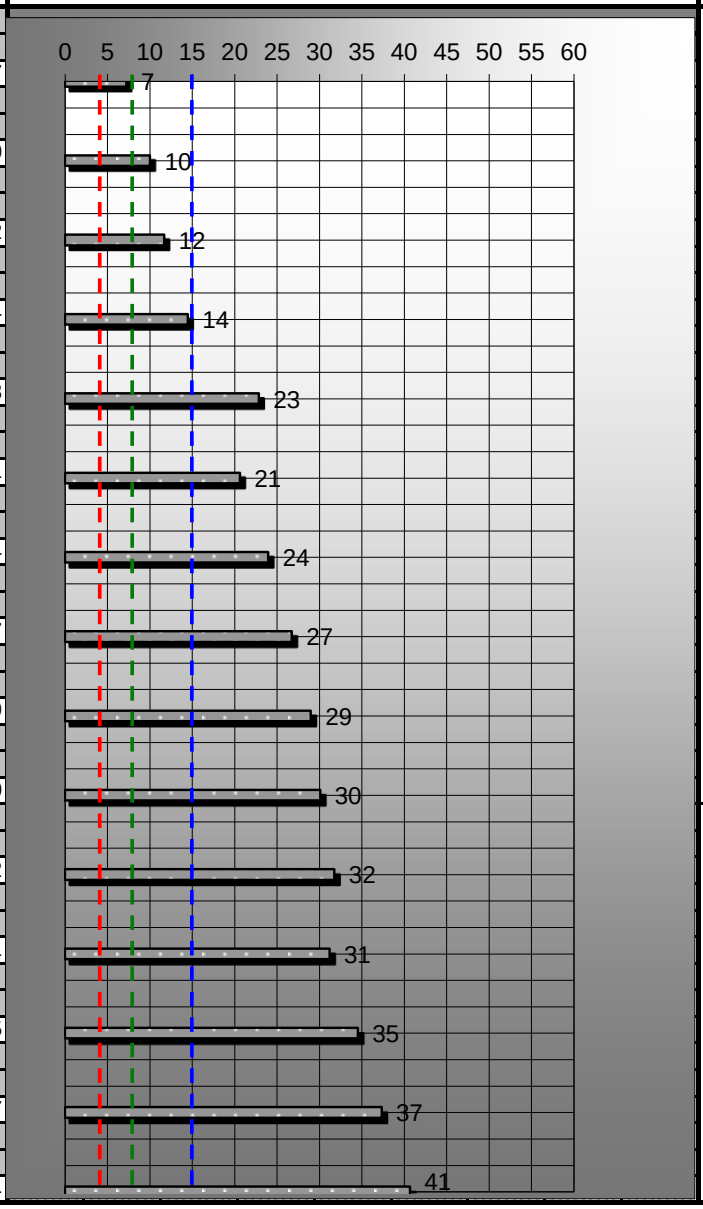
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
5410	4	
5420	4	
5430	5	7
5440	6	
5450	6	
5460	6	10
5470	6	
5480	7	
5490	8	12
5500	8	
5510	9	
5520	9	14
5530	13	
5540	14	
5550	14	23
5560	12	
5570	13	
5580	12	21
5590	14	
5600	16	
5610	13	24
5620	15	
5630	17	
5640	16	27
5650	15	
5660	21	
5670	16	29
5680	18	
5690	18	
5700	18	30
5710	19	
5720	19	
5730	19	32
5740	19	
5750	18	
5760	19	31
5770	19	
5780	20	
5790	23	35
5800	19	
5810	25	
5820	23	37
5830	25	
5840	25	
5850	23	41

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing

Clay

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

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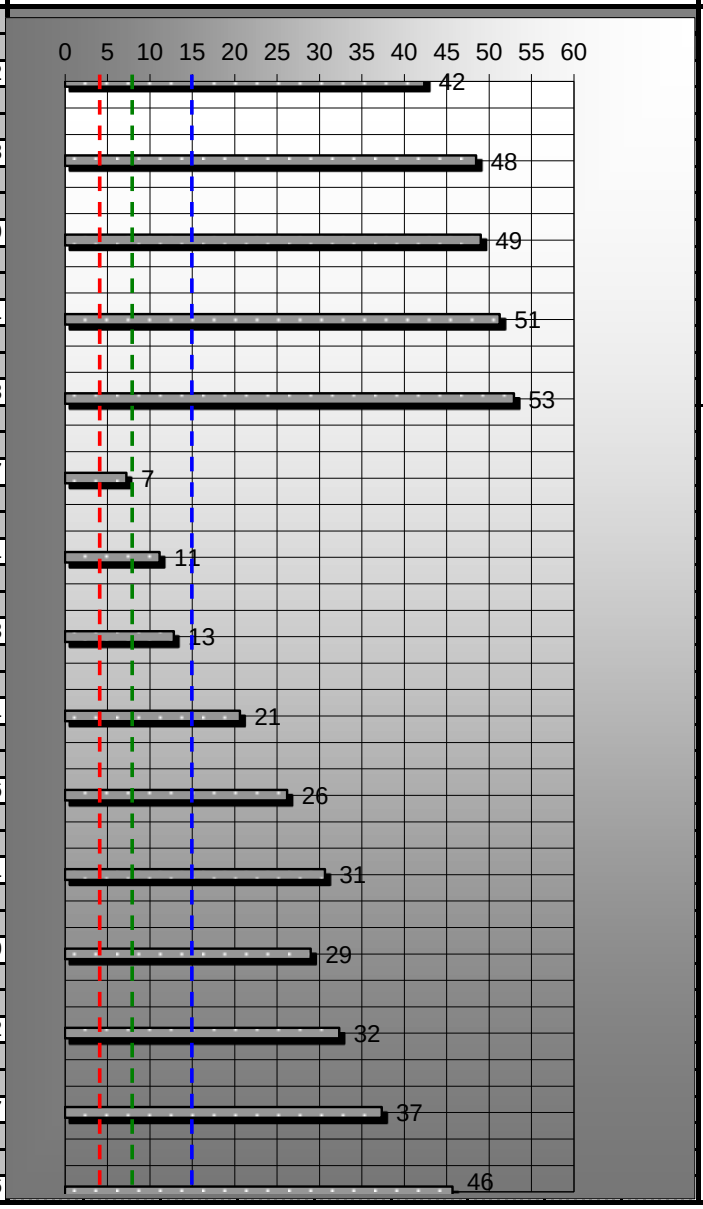
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
5860	24	
5870	24	
5880	28	42
5890	28	
5900	28	
5910	31	48
5920	30	
5930	30	
5940	28	49
5950	28	
5960	32	
5970	32	51
5980	30	
5990	31	
6000	34	53
6010	3	
6020	4	
6030	6	7
6040	6	
6050	7	
6060	7	11
6070	7	
6080	8	
6090	8	13
6100	10	
6110	12	
6120	15	21
6130	15	
6140	16	
6150	16	26
6160	18	
6170	20	
6180	17	31
6190	17	
6200	17	
6210	18	29
6220	17	
6230	19	
6240	22	32
6250	22	
6260	22	
6270	23	37
6280	27	
6290	27	
6300	28	46

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

Casing

4 inches dia. tri-cone

Clay

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

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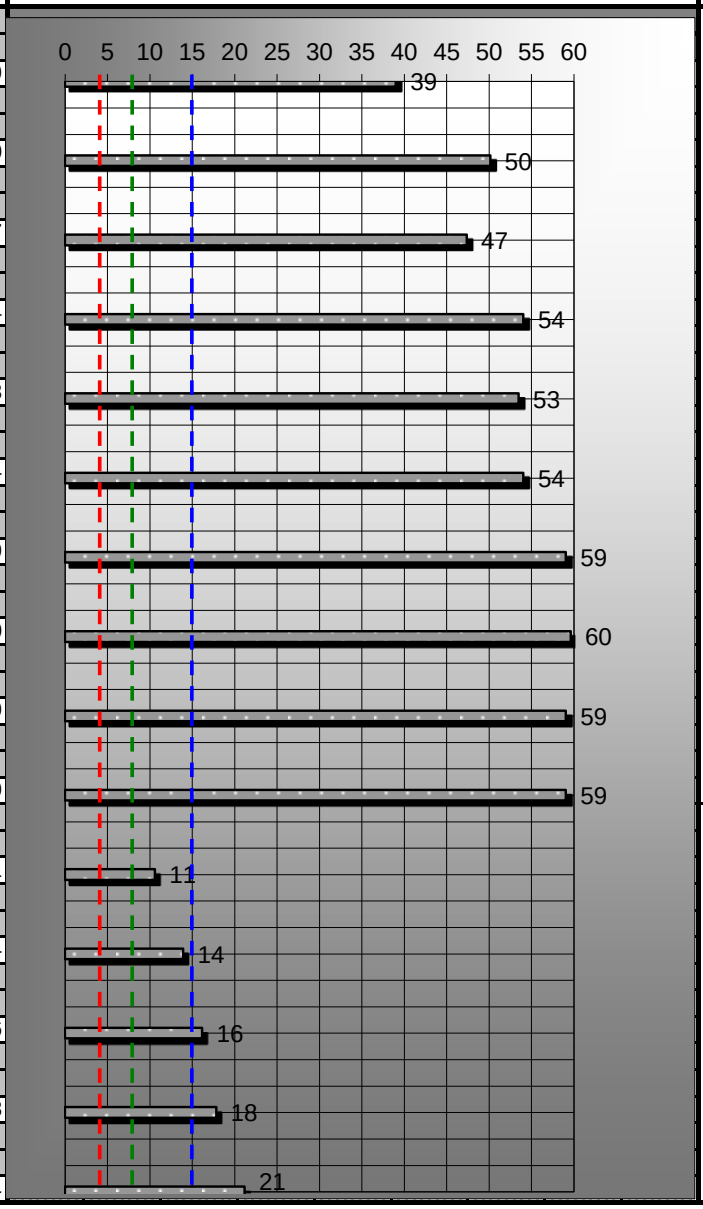
Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
6310	21	
6320	21	
6330	28	39
6340	30	
6350	30	
6360	30	50
6370	27	
6380	29	
6390	29	47
6400	33	
6410	33	
6420	31	54
6430	30	
6440	35	
6450	31	53
6460	31	
6470	30	
6480	36	54
6490	35	
6500	35	
6510	36	59
6520	35	
6530	35	
6540	37	60
6550	37	
6560	37	
6570	32	59
6580	35	
6590	35	
6600	36	59
6610	5	
6620	7	
6630	7	11
6640	7	
6650	9	
6660	9	14
6670	10	
6680	10	
6690	9	16
6700	11	
6710	10	
6720	11	18
6730	13	
6740	12	
6750	13	21

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

4 inches dia. tri-cone

CLAY

4 inches dia. tri-cone

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
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firm to stiff & loose to medium

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Probing: DCPVR9

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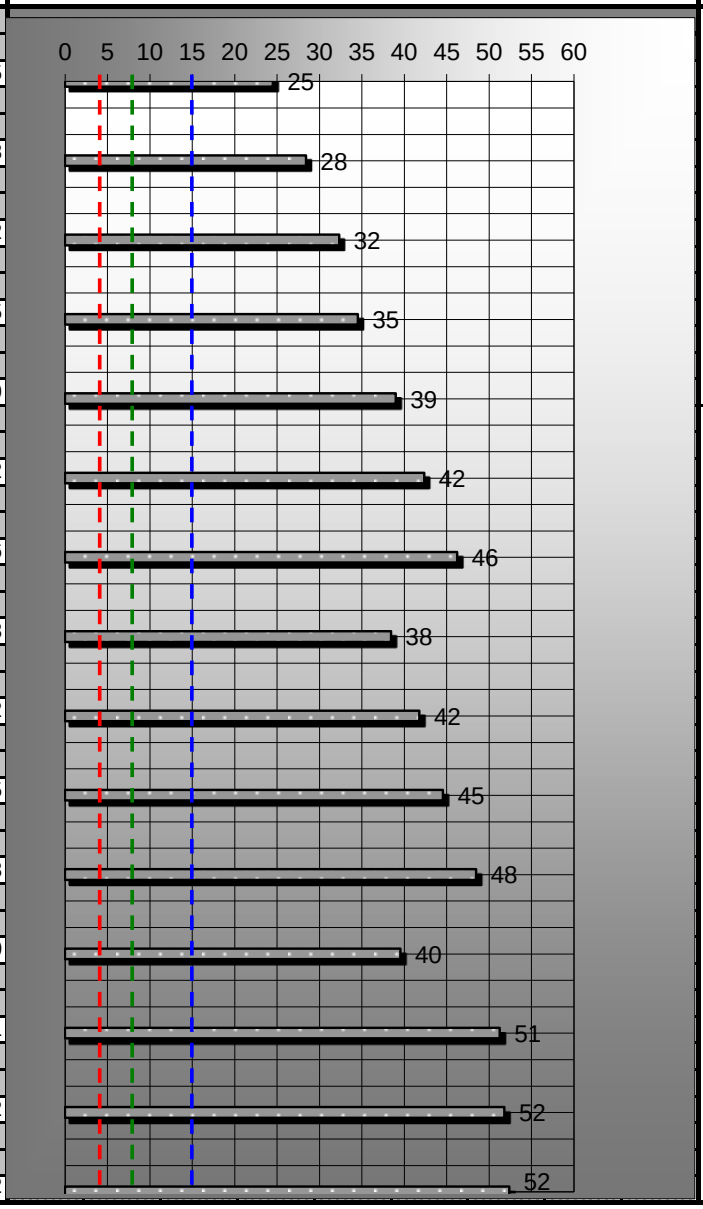
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
6760	15	
6770	15	
6780	14	25
6790	16	
6800	16	
6810	19	28
6820	20	
6830	19	
6840	19	32
6850	18	
6860	23	
6870	21	35
6880	22	
6890	23	
6900	25	39
6910	20	
6920	29	
6930	27	42
6940	29	
6950	30	
6960	24	46
6970	23	
6980	23	
6990	23	38
7000	25	
7010	25	
7020	25	42
7030	28	
7040	25	
7050	27	45
7060	30	
7070	29	
7080	28	48
7090	19	
7100	19	
7110	33	40
7120	26	
7130	32	
7140	34	51
7150	30	
7160	30	
7170	33	52
7180	30	
7190	30	
7200	34	52

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 46

4 inches dia. tri-cone

4 inches dia. tri-cone

Silty Clay

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
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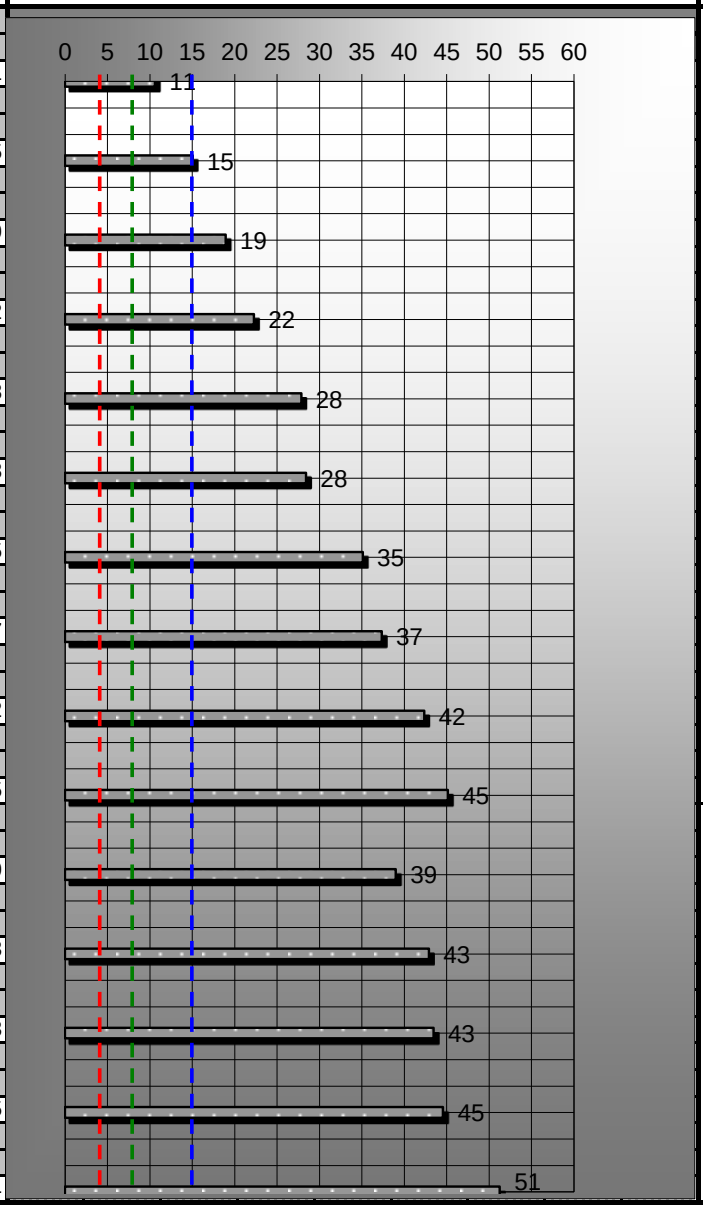
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
7210	4	
7220	7	
7230	8	11
7240	9	
7250	8	
7260	10	15
7270	11	
7280	10	
7290	13	19
7300	12	
7310	14	
7320	14	22
7330	16	
7340	17	
7350	17	28
7360	13	
7370	21	
7380	17	28
7390	21	
7400	20	
7410	22	35
7420	23	
7430	22	
7440	22	37
7450	24	
7460	25	
7470	27	42
7480	26	
7490	27	
7500	28	45
7510	23	
7520	22	
7530	25	39
7540	27	
7550	24	
7560	26	43
7570	25	
7580	26	
7590	27	43
7600	25	
7610	28	
7620	27	45
7630	29	
7640	31	
7650	32	51

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description

4 inches dia. tri-cone

4 inches dia. tri-cone

Clay

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

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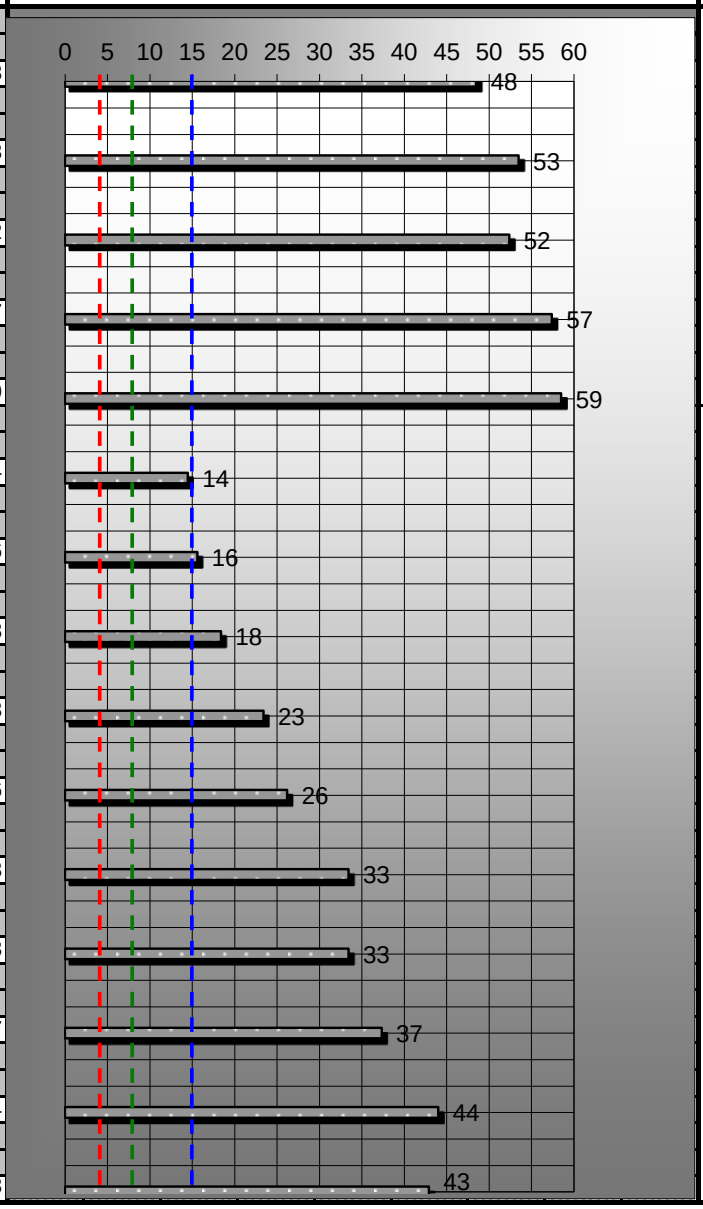
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
7660	29	
7670	30	
7680	28	48
7690	31	
7700	33	
7710	32	53
7720	30	
7730	33	
7740	31	52
7750	34	
7760	35	
7770	34	57
7780	33	
7790	35	
7800	37	59
7810	7	
7820	9	
7830	10	14
7840	9	
7850	8	
7860	11	16
7870	9	
7880	11	
7890	13	18
7900	12	
7910	15	
7920	15	23
7930	14	
7940	17	
7950	16	26
7960	17	
7970	19	
7980	24	33
7990	20	
8000	19	
8010	21	33
8020	23	
8030	22	
8040	22	37
8050	26	
8060	27	
8070	26	44
8080	24	
8090	27	
8100	26	43

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description

4 inches dia. tri-cone

4 inches dia. tri-cone

Clay

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

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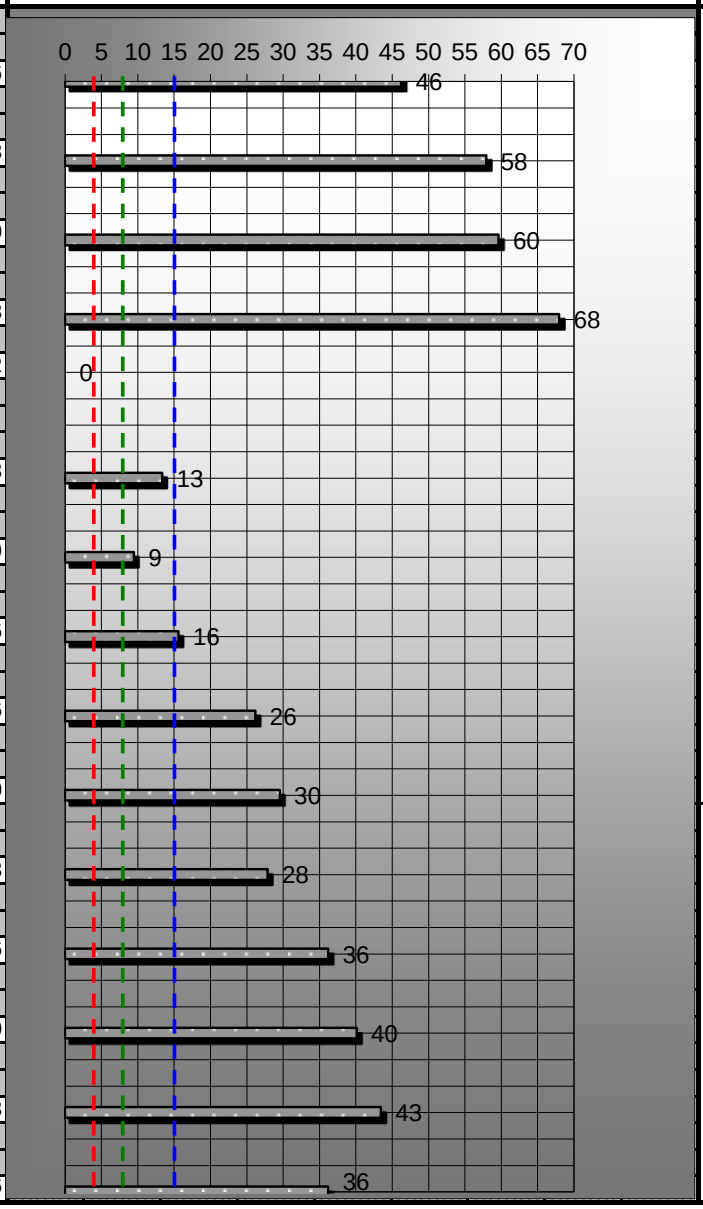
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
8110	24	
8120	28	
8130	31	46
8140	32	
8150	37	
8160	35	58
8170	36	
8180	34	
8190	37	60
8200	35	
8210	36	
8220	51	68
8230	47	
8240	75/6cm	R
8250	9	
8260	15	
8270	6	
8280	3	13
8290	5	
8300	5	
8310	7	9
8320	8	
8330	10	
8340	10	16
8350	16	
8360	15	
8370	16	26
8380	16	
8390	17	
8400	20	30
8410	18	
8420	15	
8430	17	28
8440	23	
8450	21	
8460	21	36
8470	27	
8480	22	
8490	23	40
8500	23	
8510	27	
8520	28	43
8530	28	
8540	31	
8550	6	36

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description

4 inches dia. tri-cone

Clay

4 inches dia. tri-cone

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

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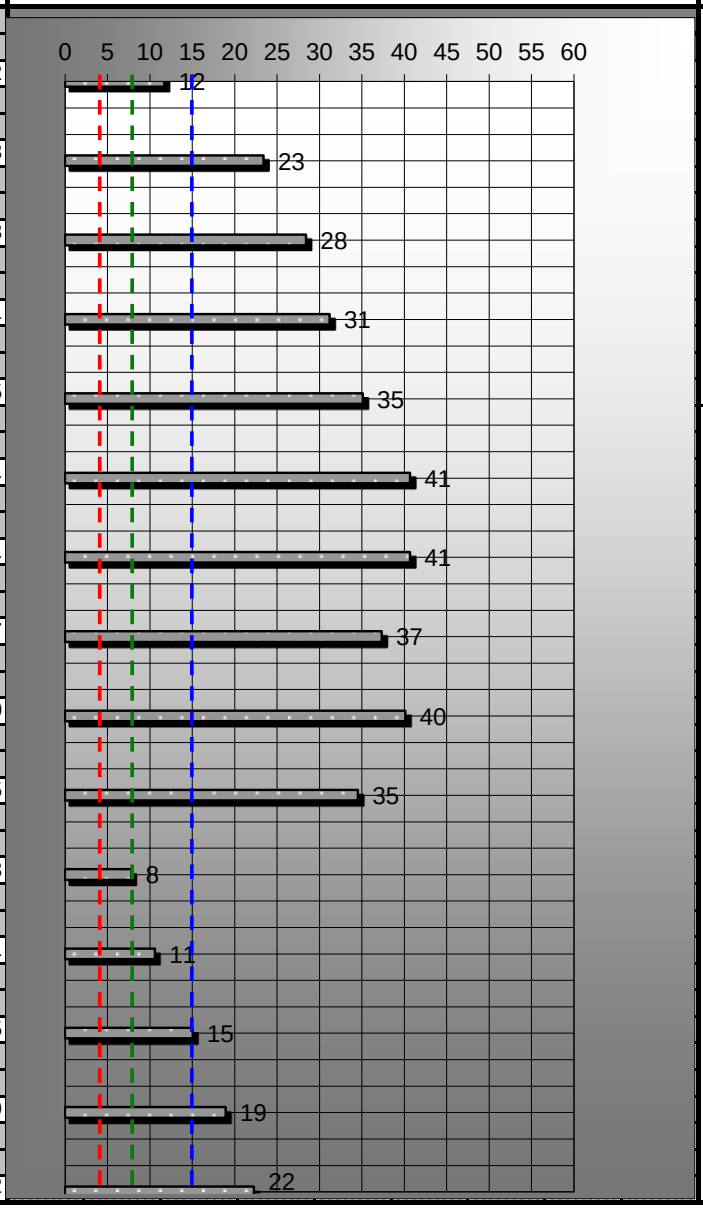
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
8560	6	
8570	6	
8580	9	12
8590	10	
8600	16	
8610	16	23
8620	17	
8630	16	
8640	18	28
8650	18	
8660	18	
8670	20	31
8680	20	
8690	23	
8700	20	35
8710	22	
8720	27	
8730	24	41
8740	22	
8750	24	
8760	27	41
8770	22	
8780	22	
8790	23	37
8800	23	
8810	24	
8820	25	40
8830	27	
8840	28	
8850	7	35
8860	5	
8870	4	
8880	5	8
8890	6	
8900	7	
8910	6	11
8920	9	
8930	9	
8940	9	15
8950	10	
8960	11	
8970	13	19
8980	13	
8990	13	
9000	14	22

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description

4 inches dia. tri-cone

4 inches dia. tri-cone

Silty Clay

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

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Probing: DCPVR9

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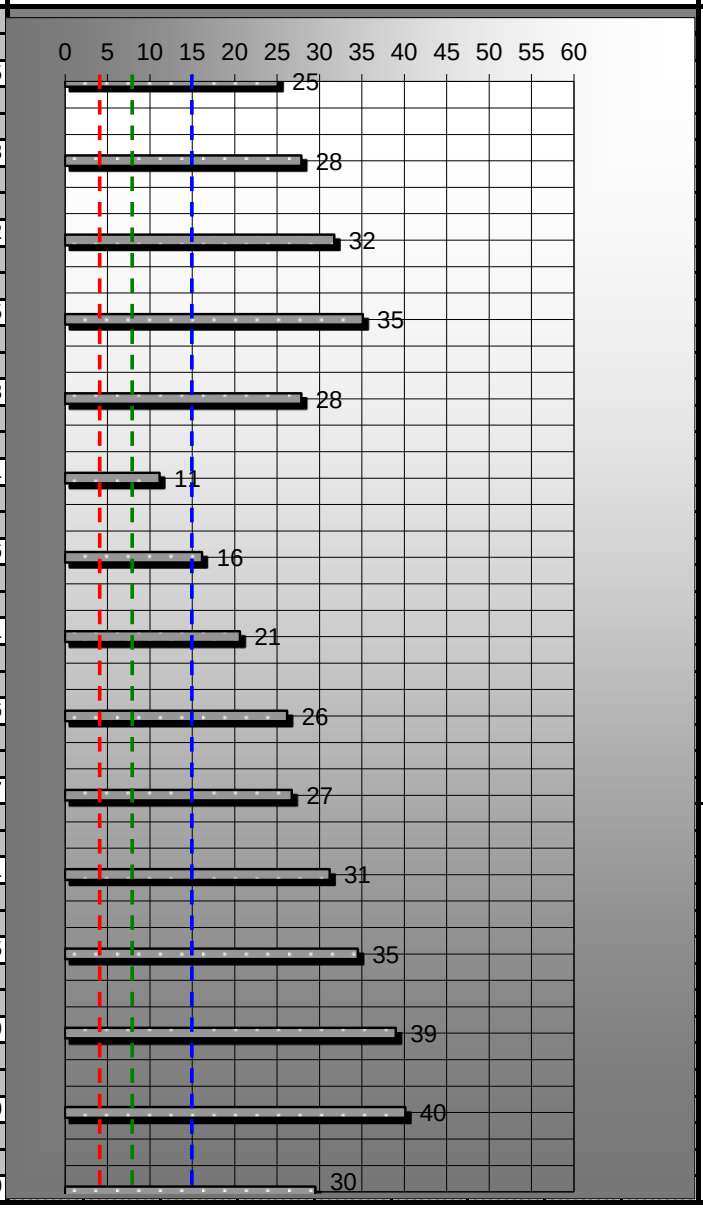
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
9010	14	
9020	15	
9030	16	25
9040	16	
9050	16	
9060	18	28
9070	18	
9080	19	
9090	20	32
9100	20	
9110	21	
9120	22	35
9130	23	
9140	23	
9150	4	28
9160	5	
9170	7	
9180	8	11
9190	9	
9200	8	
9210	12	16
9220	10	
9230	14	
9240	13	21
9250	14	
9260	17	
9270	16	26
9280	12	
9290	18	
9300	18	27
9310	18	
9320	18	
9330	20	31
9340	21	
9350	20	
9360	21	35
9370	23	
9380	23	
9390	24	39
9400	24	
9410	23	
9420	25	40
9430	24	
9440	24	
9450	5	30

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description

4 inches dia. tri-cone

Silty Clay

4 inches dia. tri-cone

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

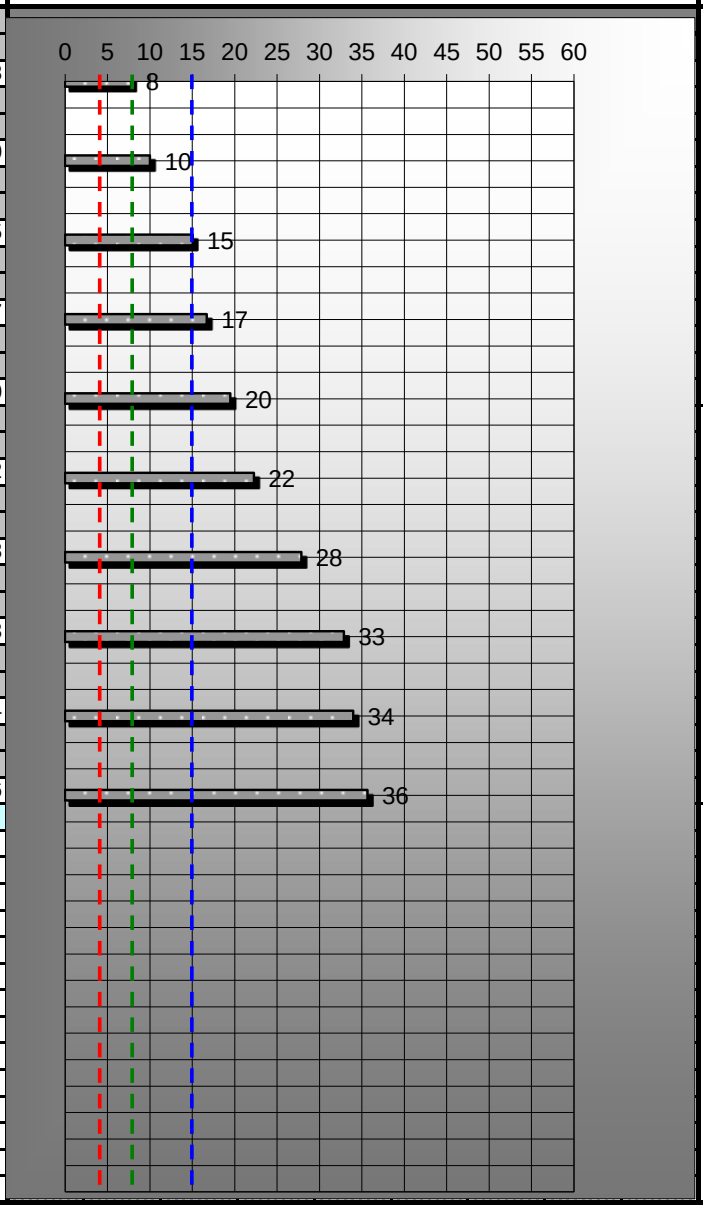
Probing: DCPVR9

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 15 to January 25, 2014

Coordinates X: -334,467.612 Y: -61,866.523 Z: +411.33
Depth: 97.5m **Groundwater:** +400 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 91.5m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
9460	5	
9470	4	
9480	5	8
9490	5	
9500	6	
9510	7	10
9520	9	
9530	8	
9540	10	15
9550	11	
9560	10	
9570	9	17
9580	10	
9590	13	
9600	12	20
9610	13	
9620	14	
9630	13	22
9640	17	
9650	15	
9660	18	28
9670	21	
9680	18	
9690	20	33
9700	20	
9710	20	
9720	21	34
9730	21	
9740	20	
9750	23	36
End of probing at 97.5m		

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description

4 inches dia. tri-cone

4 inches dia. tri-cone

Silty Clay

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

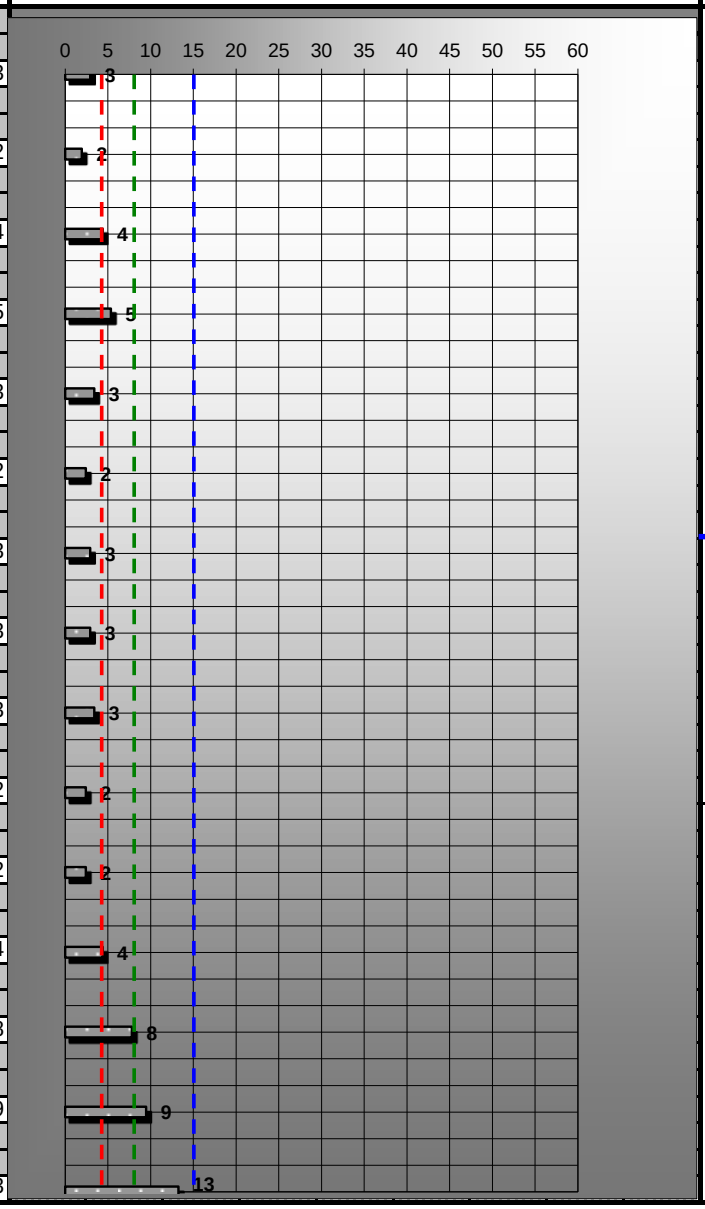
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
10	3	
20	1	
30	2	3
40	1	
50	1	
60	2	2
70	3	
80	3	
90	3	4
100	4	
110	3	
120	4	5
130	3	
140	2	
150	2	3
160	2	
170	1	
180	2	2
190	2	
200	2	
210	2	3
220	2	
230	2	
240	2	3
250	3	
260	2	
270	2	3
280	2	
290	2	
300	1	2
310	2	
320	1	
330	2	2
340	4	
350	3	
360	2	4
370	4	
380	5	
390	7	8
400	6	
410	7	
420	7	9
430	8	
440	10	
450	10	13

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Slightly clayey sandy Gravel

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

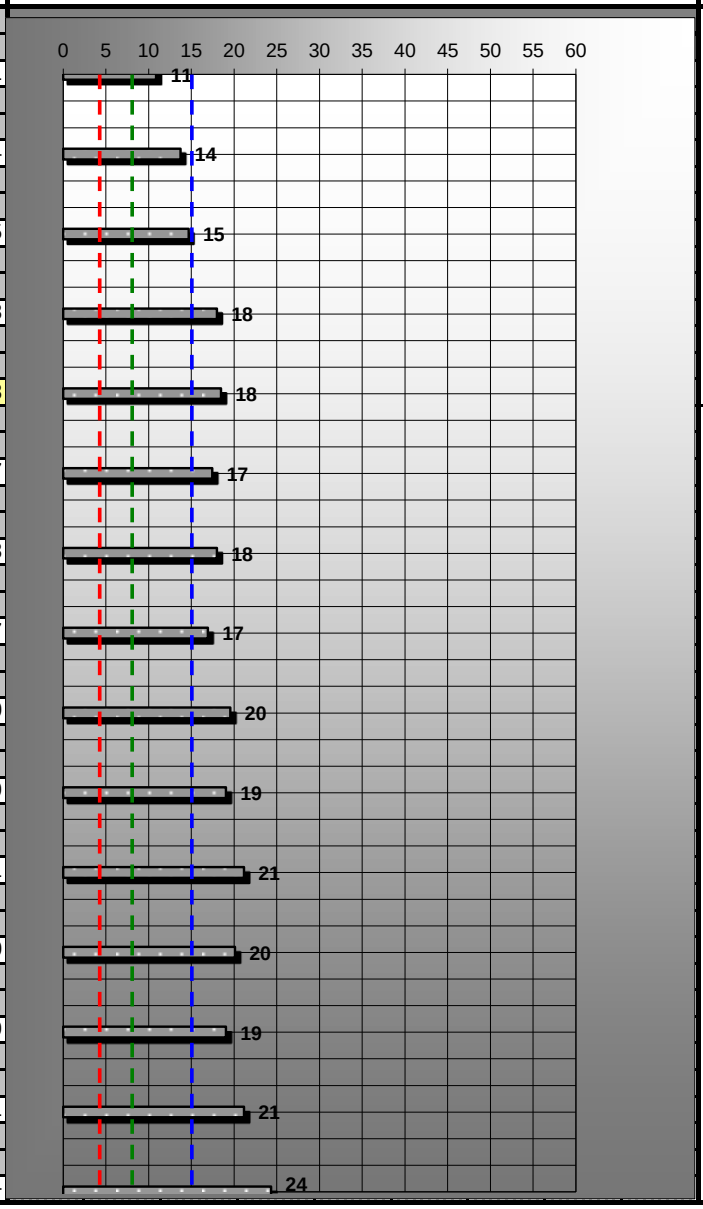
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
460	7	
470	8	
480	8	11
490	10	
500	10	
510	9	14
520	8	
530	11	
540	12	15
550	12	
560	13	
570	13	18
580	12	
590	13	
600	14	18
610	6	
620	15	
630	12	17
640	12	
650	11	
660	11	18
670	10	
680	11	
690	11	17
700	12	
710	12	
720	13	20
730	11	
740	15	
750	10	19
760	14	
770	11	
780	15	21
790	12	
800	14	
810	12	20
820	11	
830	13	
840	12	19
850	12	
860	14	
870	14	21
880	14	
890	17	
900	15	24

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Casing

Gravely Sand interbedded with clayey silty Sand with some Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

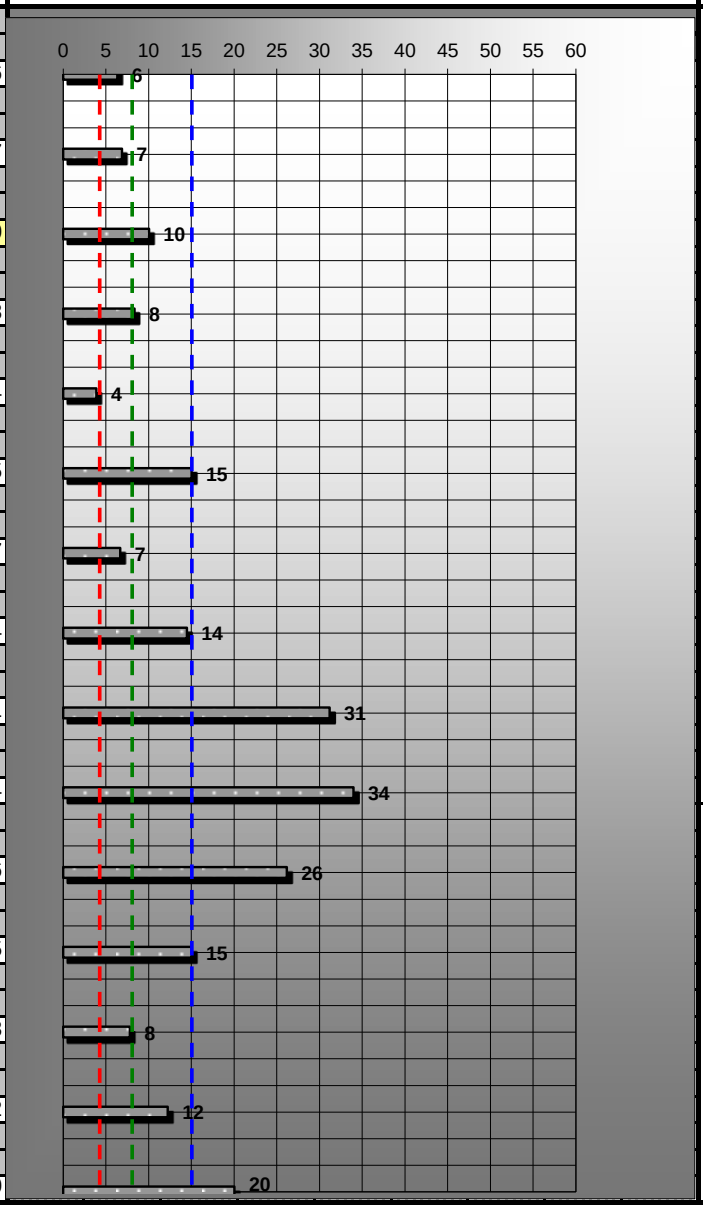
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
910	4	
920	4	
930	4	6
940	4	
950	4	
960	5	7
970	7	
980	6	
990	6	10
1000	5	
1010	6	
1020	4	8
1030	2	
1040	2	
1050	3	4
1060	11	
1070	9	
1080	7	15
1090	6	
1100	3	
1110	3	7
1120	3	
1130	6	
1140	17	14
1150	15	
1160	20	
1170	21	31
1180	19	
1190	22	
1200	20	34
1210	10	
1220	22	
1230	15	26
1240	12	
1250	8	
1260	7	15
1270	4	
1280	6	
1290	4	8
1300	5	
1310	8	
1320	9	12
1330	12	
1340	13	
1350	11	20

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Gravely Sand interbedded with clayey silty Sand with some Gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

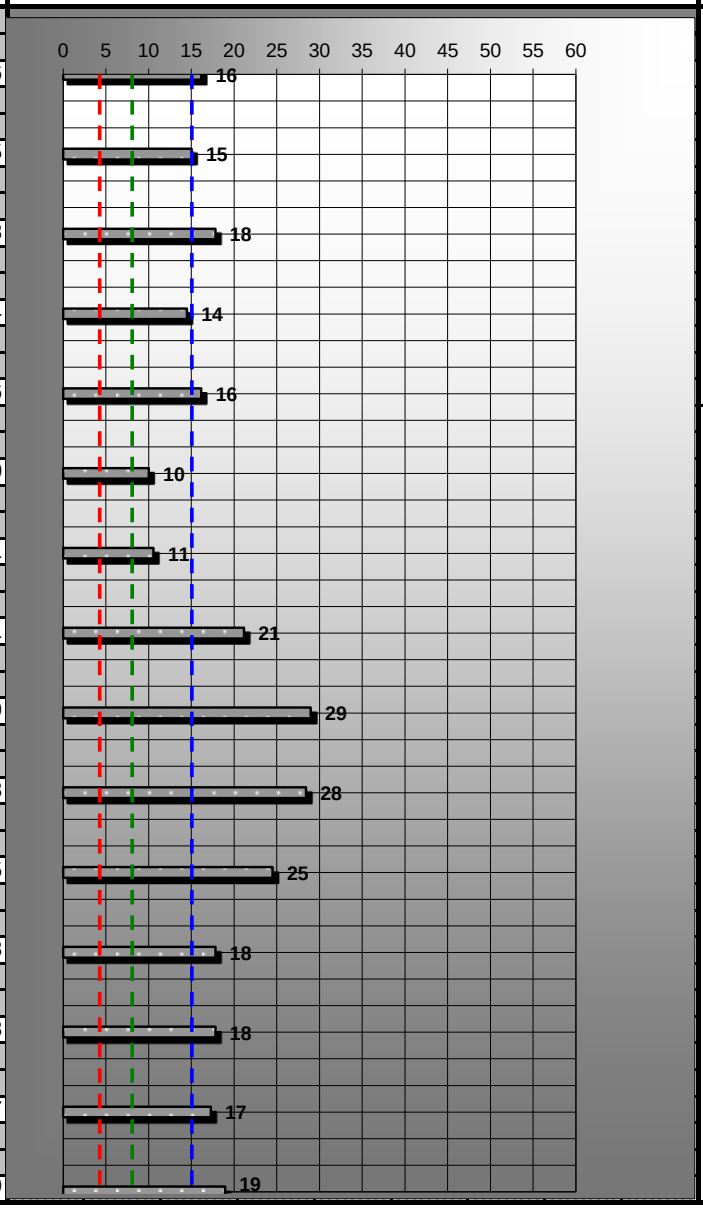
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
1360	10	
1370	10	
1380	9	16
1390	6	
1400	11	
1410	10	15
1420	8	
1430	14	
1440	10	18
1450	8	
1460	9	
1470	9	14
1480	10	
1490	10	
1500	9	16
1510	6	
1520	5	
1530	7	10
1540	7	
1550	6	
1560	6	11
1570	6	
1580	12	
1590	20	21
1600	13	
1610	18	
1620	21	29
1630	17	
1640	15	
1650	19	28
1660	21	
1670	11	
1680	12	25
1690	12	
1700	12	
1710	8	18
1720	10	
1730	11	
1740	11	18
1750	10	
1760	7	
1770	14	17
1780	13	
1790	10	
1800	11	19

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Casing

Gravely Sand interbedded with clayey silty Sand with some Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

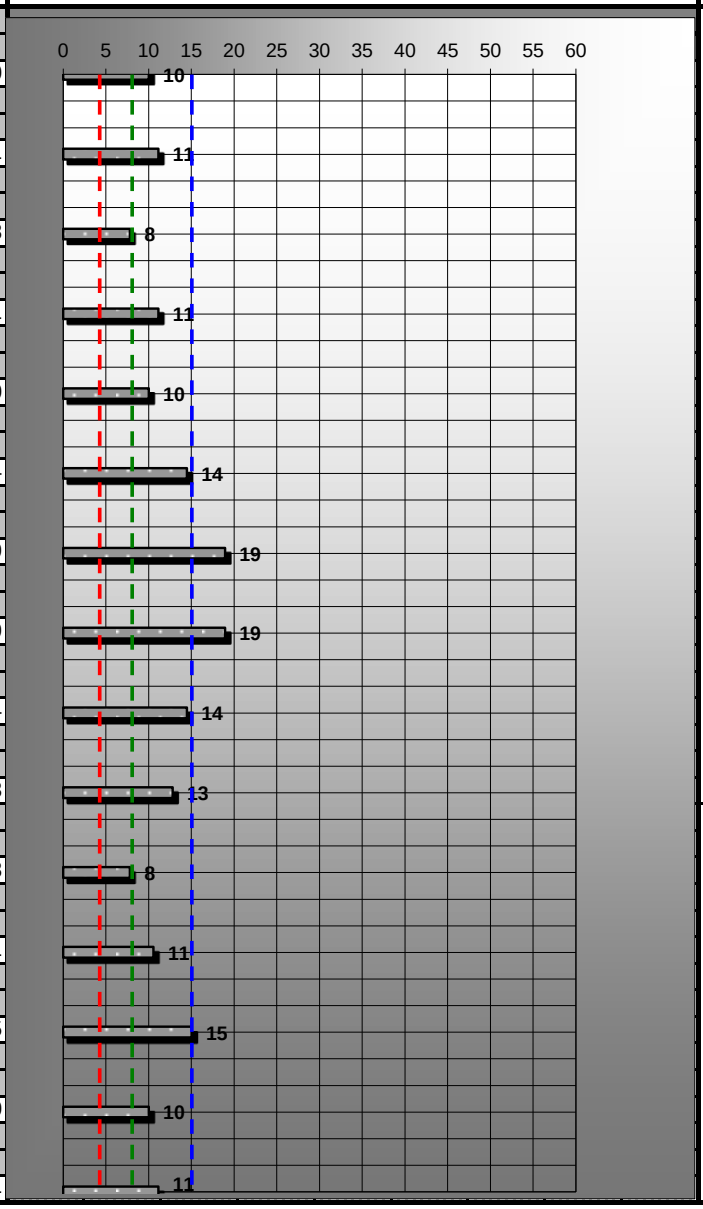
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
1810	7	
1820	8	
1830	3	10
1840	8	
1850	7	
1860	5	11
1870	5	
1880	4	
1890	5	8
1900	4	
1910	9	
1920	7	11
1930	5	
1940	7	
1950	6	10
1960	6	
1970	7	
1980	13	14
1990	13	
2000	13	
2010	8	19
2020	11	
2030	9	
2040	14	19
2050	10	
2060	8	
2070	8	14
2080	8	
2090	7	
2100	8	13
2110	4	
2120	5	
2130	5	8
2140	5	
2150	8	
2160	6	11
2170	9	
2180	10	
2190	8	15
2200	6	
2210	6	
2220	6	10
2230	6	
2240	8	
2250	6	11

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Gravely Sand interbedded with clayey silty Sand with some Gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

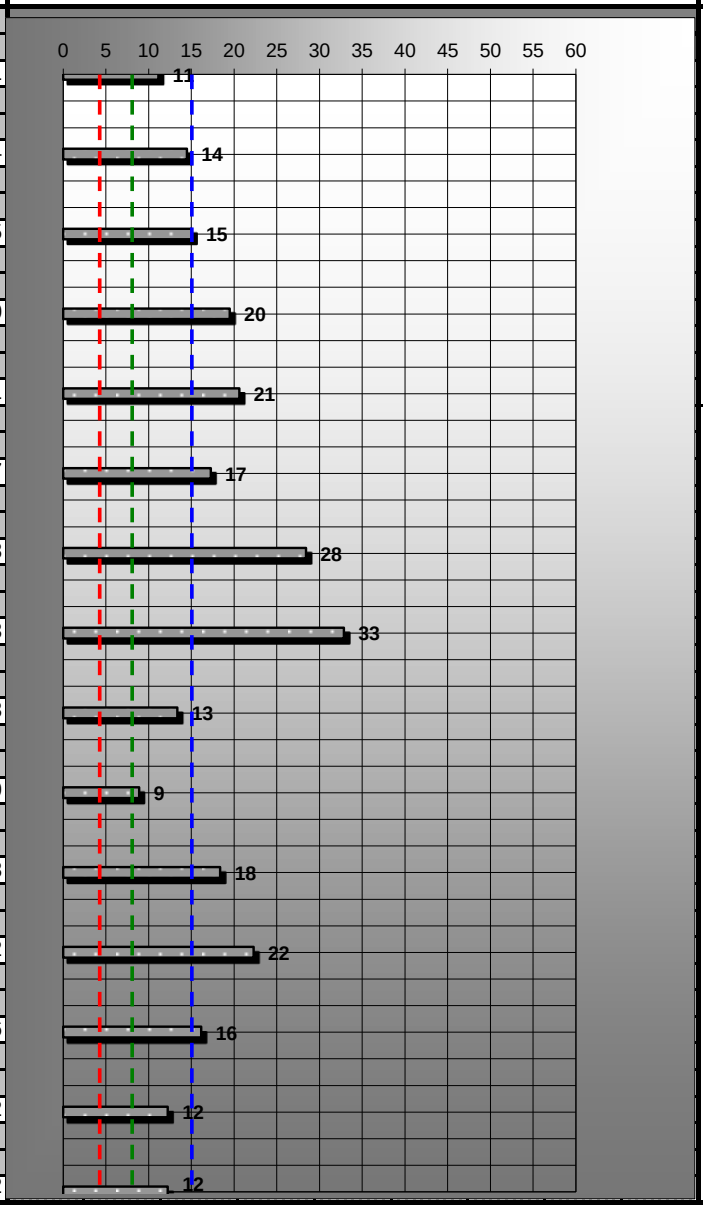
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
2260	5	
2270	7	
2280	8	11
2290	9	
2300	8	
2310	9	14
2320	10	
2330	9	
2340	8	15
2350	11	
2360	10	
2370	14	20
2380	11	
2390	11	
2400	15	21
2410	6	
2420	7	
2430	18	17
2440	16	
2450	16	
2460	19	28
2470	17	
2480	24	
2490	18	33
2500	10	
2510	7	
2520	7	13
2530	7	
2540	5	
2550	4	9
2560	7	
2570	13	
2580	13	18
2590	12	
2600	13	
2610	15	22
2620	13	
2630	9	
2640	7	16
2650	7	
2660	8	
2670	7	12
2680	8	
2690	7	
2700	7	12

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Casing

Gravely Sand interbedded with clayey silty Sand with some Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

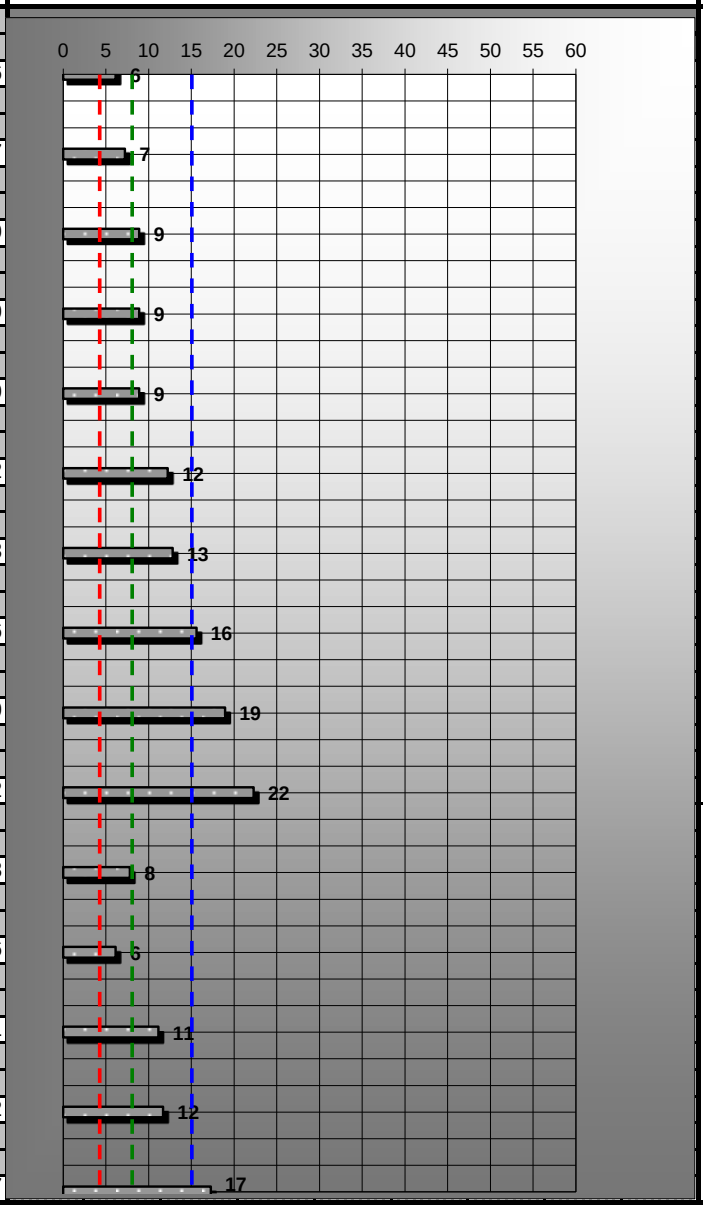
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
2710	6	
2720	3	
2730	2	6
2740	4	
2750	4	
2760	5	7
2770	6	
2780	5	
2790	5	9
2800	6	
2810	5	
2820	5	9
2830	6	
2840	5	
2850	5	9
2860	7	
2870	8	
2880	7	12
2890	8	
2900	8	
2910	7	13
2920	8	
2930	10	
2940	10	16
2950	12	
2960	10	
2970	12	19
2980	13	
2990	13	
3000	14	22
3010	6	
3020	3	
3030	5	8
3040	4	
3050	3	
3060	4	6
3070	6	
3080	6	
3090	8	11
3100	7	
3110	7	
3120	7	12
3130	7	
3140	10	
3150	14	17

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Silty Clay with Gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

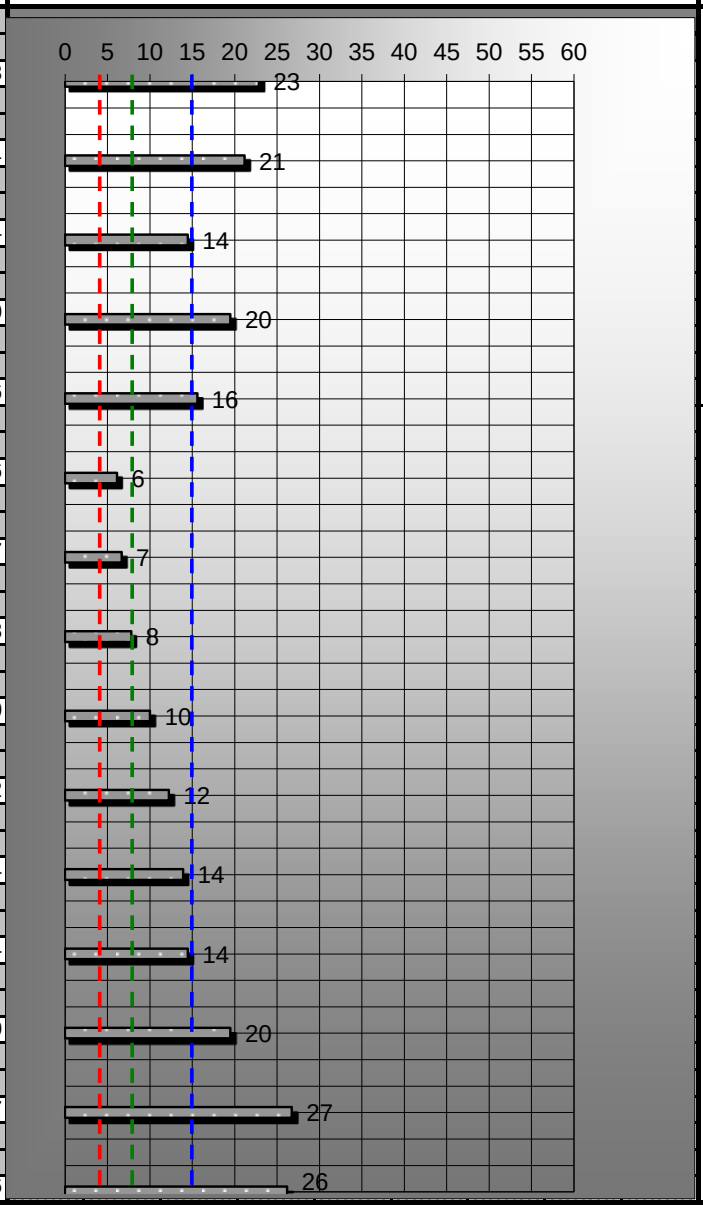
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
3160	12	
3170	15	
3180	14	23
3190	14	
3200	14	
3210	10	21
3220	8	
3230	9	
3240	9	14
3250	12	
3260	11	
3270	12	20
3280	9	
3290	9	
3300	10	16
3310	3	
3320	4	
3330	4	6
3340	3	
3350	4	
3360	5	7
3370	5	
3380	4	
3390	5	8
3400	5	
3410	5	
3420	8	10
3430	7	
3440	7	
3450	8	12
3460	8	
3470	8	
3480	9	14
3490	9	
3500	7	
3510	10	14
3520	11	
3530	12	
3540	12	20
3550	21	
3560	13	
3570	14	27
3580	14	
3590	15	
3600	18	26

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Casing

Silty Clay with Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

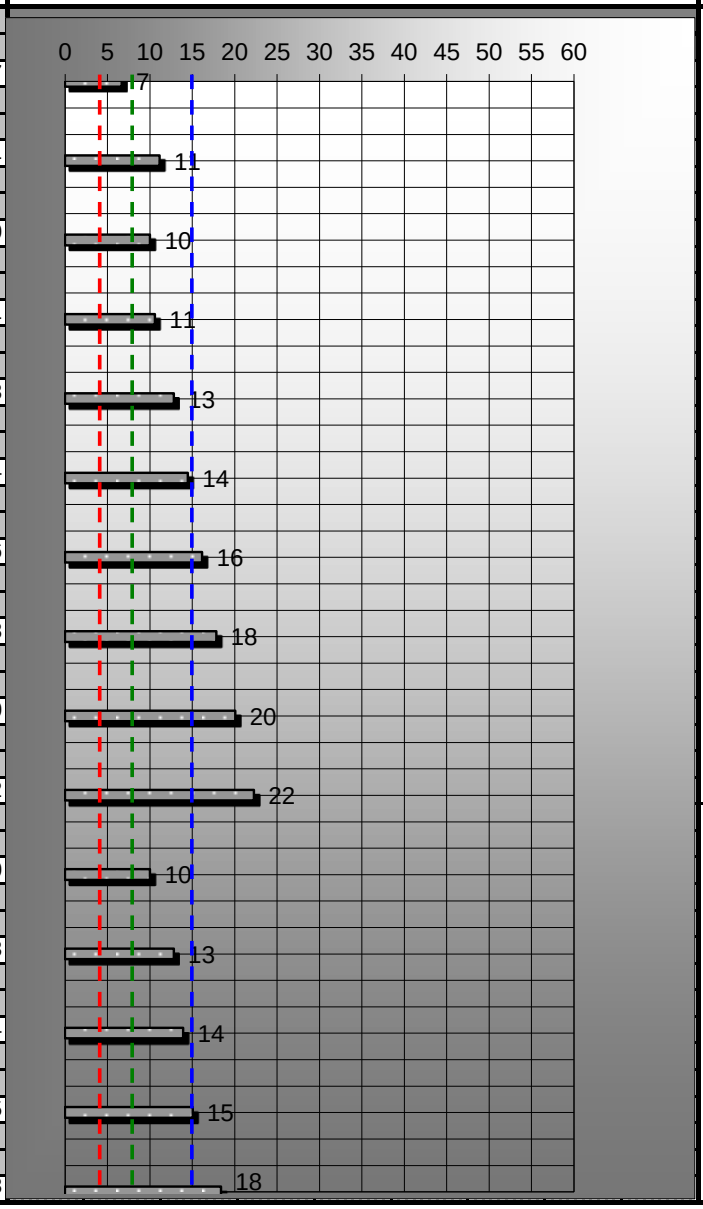
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
3610	4	
3620	3	
3630	5	7
3640	6	
3650	9	
3660	5	11
3670	6	
3680	5	
3690	7	10
3700	6	
3710	6	
3720	7	11
3730	8	
3740	6	
3750	9	13
3760	8	
3770	9	
3780	9	14
3790	9	
3800	10	
3810	10	16
3820	11	
3830	9	
3840	12	18
3850	12	
3860	10	
3870	14	20
3880	12	
3890	14	
3900	14	22
3910	5	
3920	6	
3930	7	10
3940	8	
3950	7	
3960	8	13
3970	7	
3980	9	
3990	9	14
4000	8	
4010	9	
4020	10	15
4030	11	
4040	11	
4050	11	18

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Silty Clay with Gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
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DCPT
Dynamic Cone Penetration Test

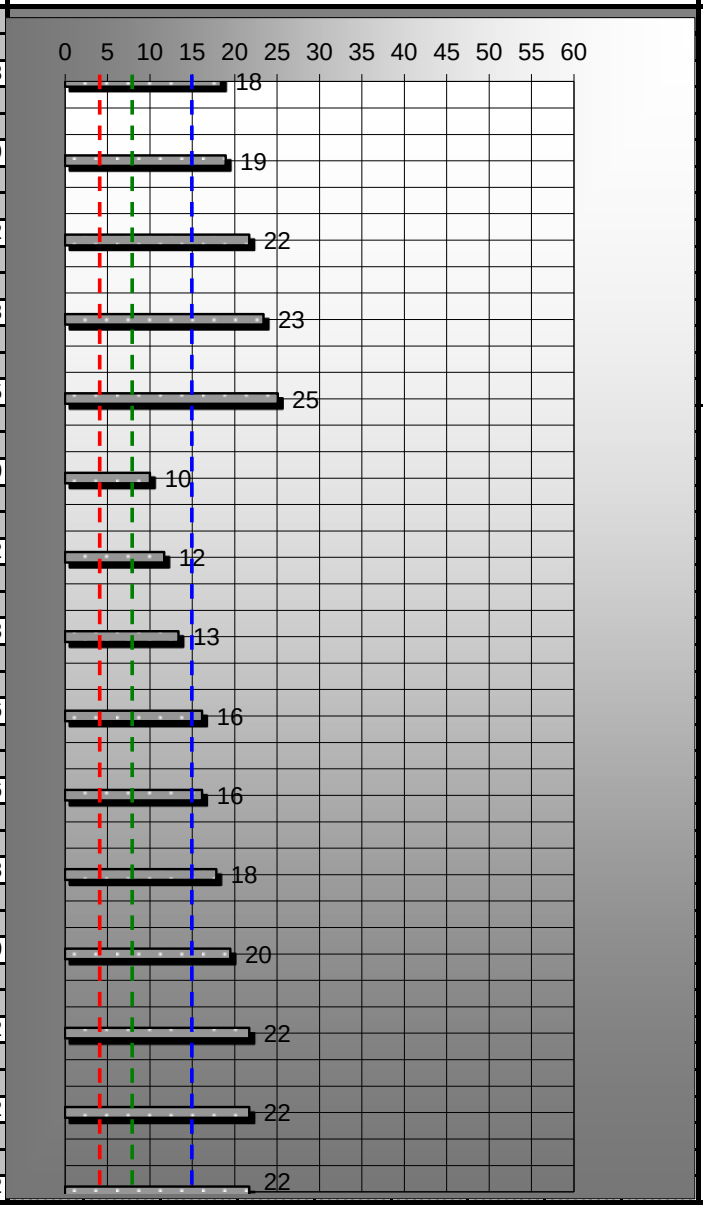
Project: BISRI DAM

Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
4060	11	
4070	10	
4080	12	18
4090	12	
4100	11	
4110	11	19
4120	12	
4130	15	
4140	12	22
4150	14	
4160	15	
4170	13	23
4180	15	
4190	16	
4200	14	25
4210	5	
4220	6	
4230	7	10
4240	6	
4250	7	
4260	8	12
4270	7	
4280	8	
4290	9	13
4300	10	
4310	11	
4320	8	16
4330	10	
4340	10	
4350	9	16
4360	11	
4370	12	
4380	9	18
4390	11	
4400	13	
4410	11	20
4420	14	
4430	14	
4440	11	22
4450	11	
4460	14	
4470	14	22
4480	12	
4490	13	
4500	14	22



Description according to BDC 18

Casing

Casing

Silty Clay with Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
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DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
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Dynamic Cone Penetration Test

Project: BISRI DAM

Probing: DCPVR7

Client: CDR
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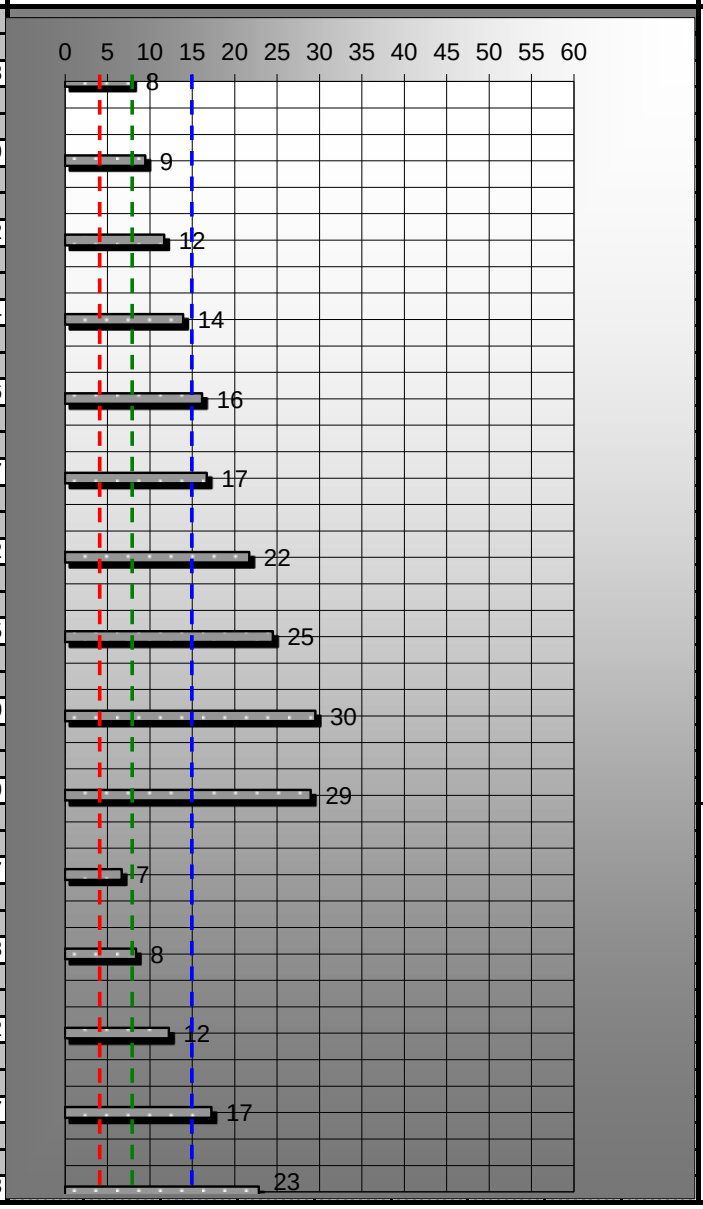
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
4510	4	
4520	5	
4530	5	8
4540	5	
4550	6	
4560	6	9
4570	6	
4580	8	
4590	7	12
4600	7	
4610	9	
4620	9	14
4630	9	
4640	10	
4650	10	16
4660	10	
4670	9	
4680	11	17
4690	12	
4700	12	
4710	15	22
4720	14	
4730	17	
4740	13	25
4750	17	
4760	18	
4770	18	30
4780	17	
4790	17	
4800	18	29
4810	5	
4820	3	
4830	4	7
4840	5	
4850	4	
4860	6	8
4870	7	
4880	7	
4890	8	12
4900	8	
4910	9	
4920	14	17
4930	14	
4940	16	
4950	11	23

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Silty Clay with Gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
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DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

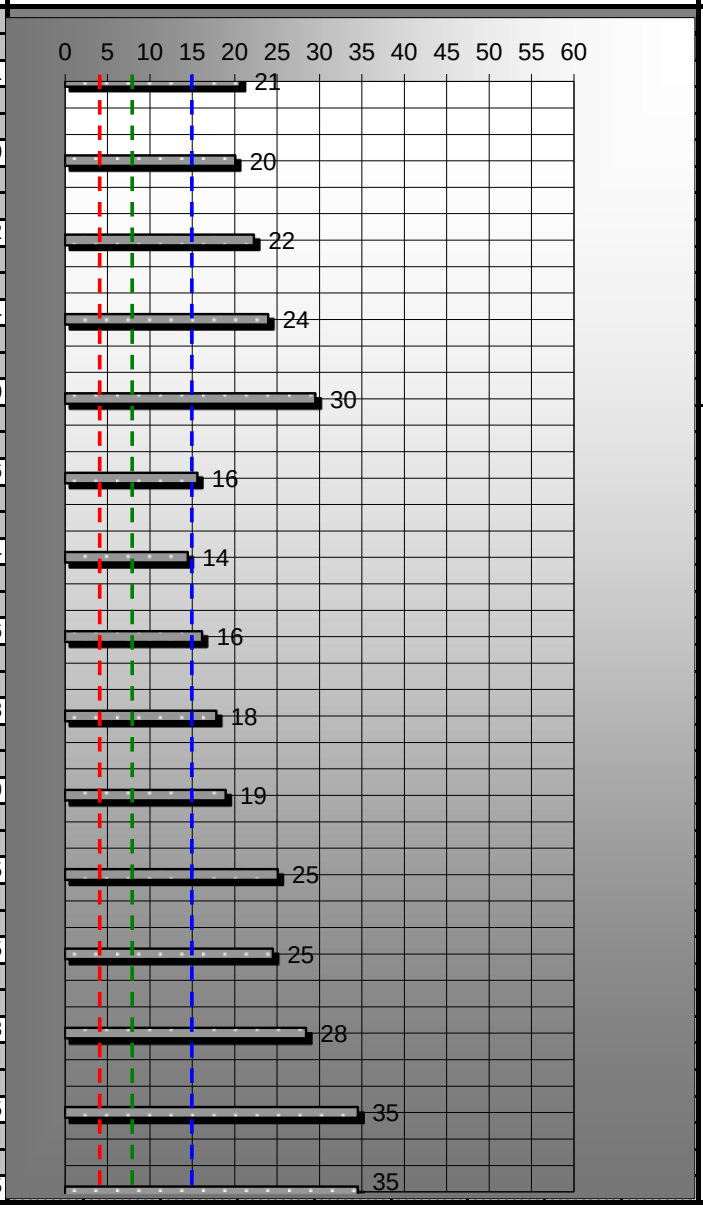
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
4960	13	
4970	12	
4980	12	21
4990	12	
5000	11	
5010	13	20
5020	13	
5030	13	
5040	14	22
5050	15	
5060	14	
5070	14	24
5080	17	
5090	18	
5100	18	30
5110	10	
5120	9	
5130	9	16
5140	8	
5150	9	
5160	9	14
5170	10	
5180	10	
5190	9	16
5200	11	
5210	10	
5220	11	18
5230	10	
5240	14	
5250	10	19
5260	18	
5270	15	
5280	12	25
5290	15	
5300	14	
5310	15	25
5320	15	
5330	19	
5340	17	28
5350	22	
5360	20	
5370	20	35
5380	19	
5390	21	
5400	22	35

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Casing

Silty Clay with Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

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DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

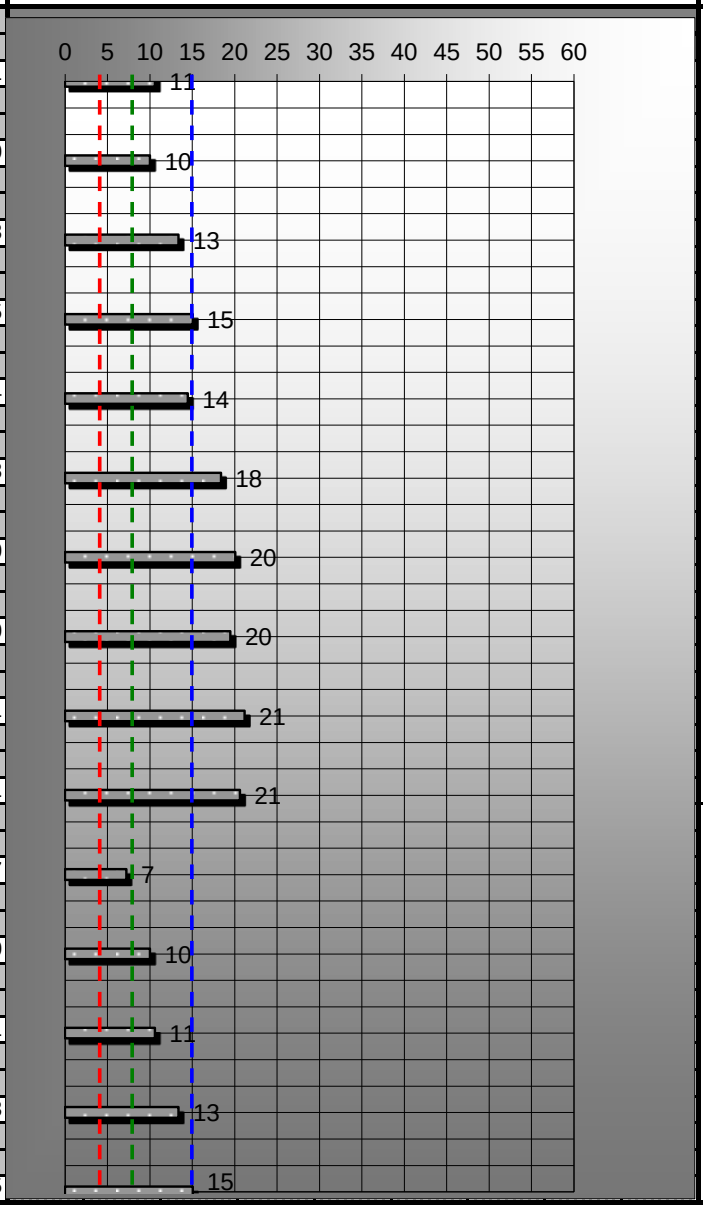
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
5410	7	
5420	6	
5430	6	11
5440	7	
5450	5	
5460	6	10
5470	9	
5480	8	
5490	7	13
5500	9	
5510	8	
5520	10	15
5530	9	
5540	9	
5550	8	14
5560	10	
5570	12	
5580	11	18
5590	11	
5600	12	
5610	13	20
5620	11	
5630	12	
5640	12	20
5650	12	
5660	13	
5670	13	21
5680	12	
5690	12	
5700	13	21
5710	4	
5720	4	
5730	5	7
5740	5	
5750	6	
5760	7	10
5770	5	
5780	7	
5790	7	11
5800	7	
5810	8	
5820	9	13
5830	8	
5840	10	
5850	9	15

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Silty Clay with Gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

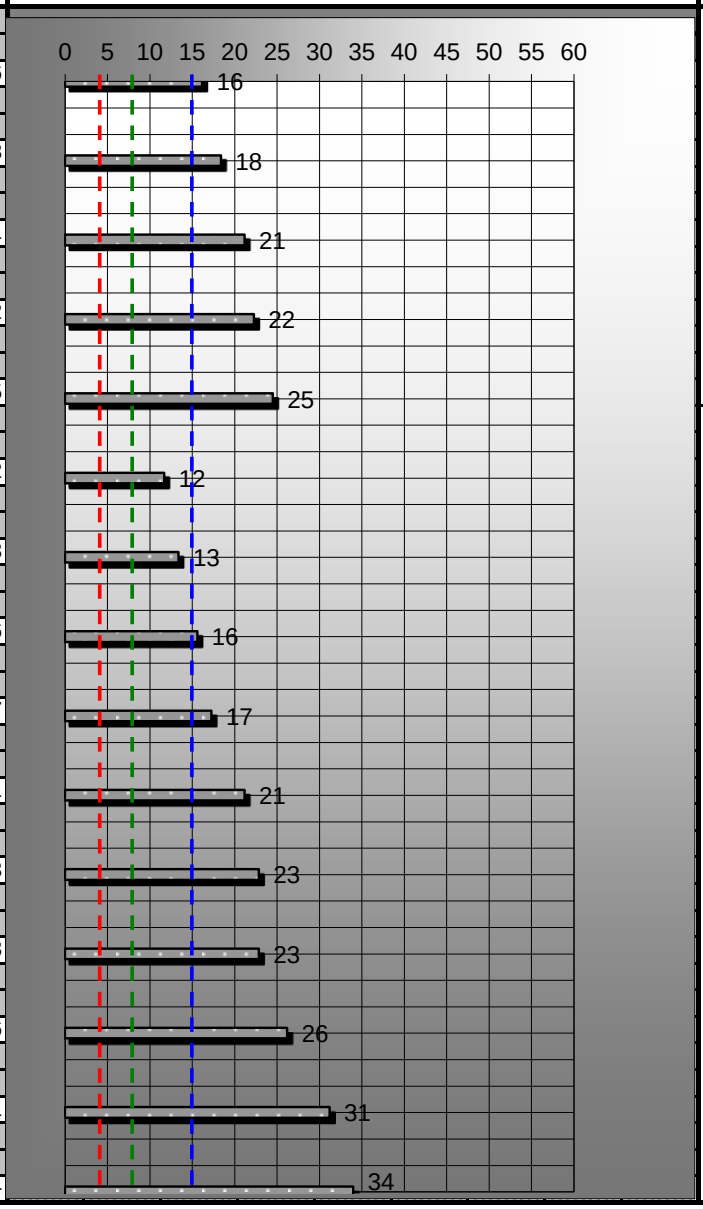
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
5860	10	
5870	10	
5880	9	16
5890	10	
5900	12	
5910	11	18
5920	12	
5930	13	
5940	13	21
5950	15	
5960	11	
5970	14	22
5980	15	
5990	14	
6000	15	25
6010	5	
6020	9	
6030	7	12
6040	7	
6050	8	
6060	9	13
6070	8	
6080	9	
6090	11	16
6100	10	
6110	11	
6120	10	17
6130	13	
6140	11	
6150	14	21
6160	13	
6170	14	
6180	14	23
6190	13	
6200	14	
6210	14	23
6220	16	
6230	14	
6240	17	26
6250	19	
6260	19	
6270	18	31
6280	22	
6290	20	
6300	19	34

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

4 inches dia. tri-cone

Silty Clay with Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

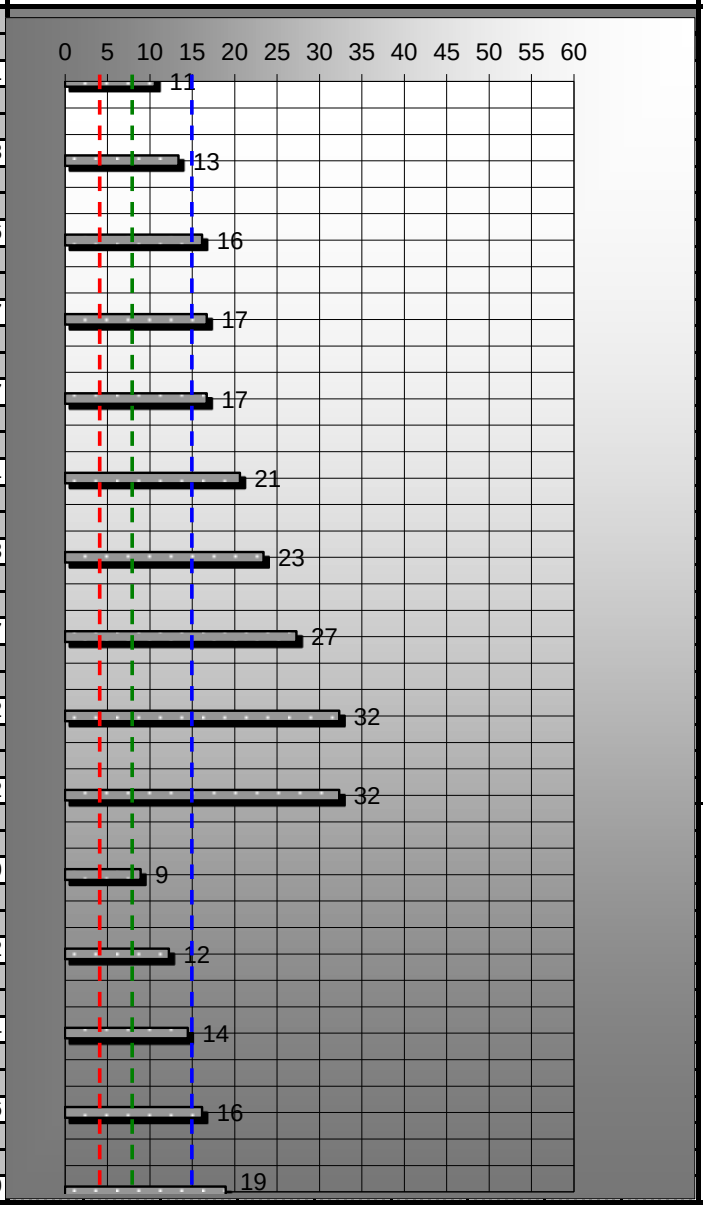
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
6310	5	
6320	6	
6330	8	11
6340	9	
6350	7	
6360	8	13
6370	8	
6380	10	
6390	11	16
6400	9	
6410	11	
6420	10	17
6430	12	
6440	10	
6450	8	17
6460	11	
6470	15	
6480	11	21
6490	14	
6500	15	
6510	13	23
6520	18	
6530	17	
6540	14	27
6550	17	
6560	22	
6570	19	32
6580	19	
6590	18	
6600	21	32
6610	5	
6620	5	
6630	6	9
6640	7	
6650	7	
6660	8	12
6670	8	
6680	9	
6690	9	14
6700	9	
6710	9	
6720	11	16
6730	11	
6740	12	
6750	11	19

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

Silty Clay with Gravels

4 inches dia. tri-cone

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

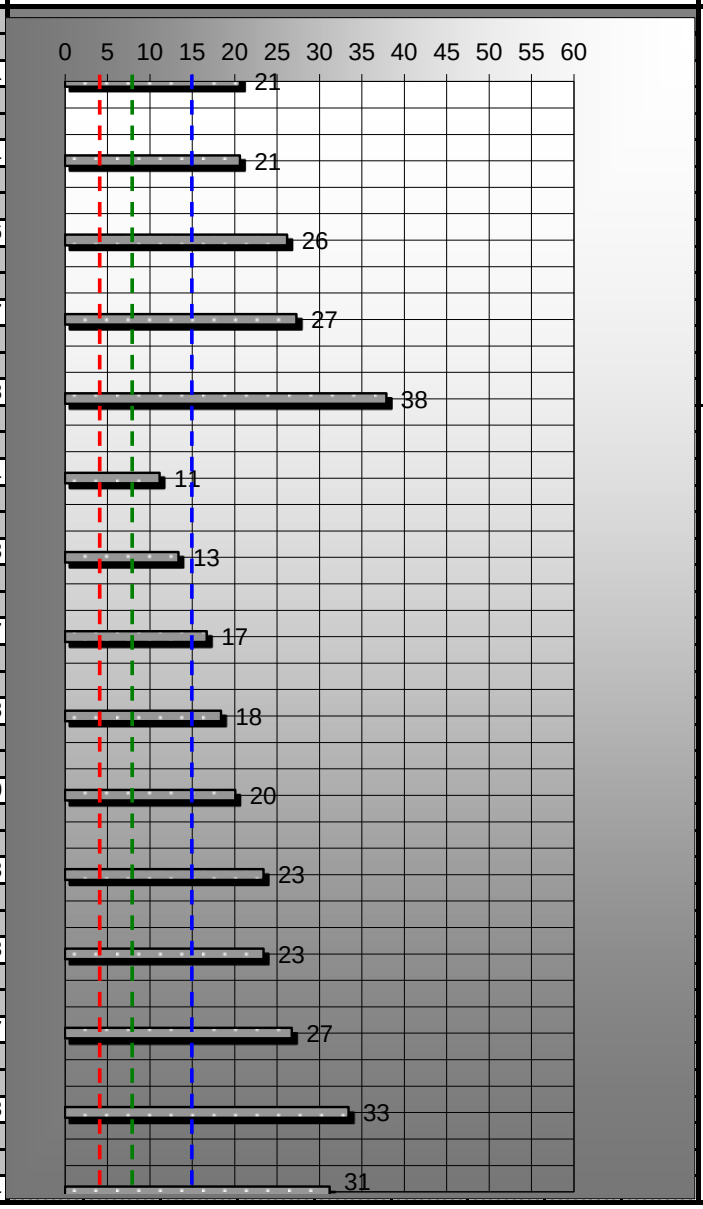
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
6760	11	
6770	12	
6780	14	21
6790	13	
6800	12	
6810	12	21
6820	15	
6830	15	
6840	17	26
6850	16	
6860	16	
6870	17	27
6880	22	
6890	24	
6900	22	38
6910	5	
6920	7	
6930	8	11
6940	7	
6950	9	
6960	8	13
6970	11	
6980	10	
6990	9	17
7000	10	
7010	11	
7020	12	18
7030	12	
7040	12	
7050	12	20
7060	14	
7070	14	
7080	14	23
7090	13	
7100	12	
7110	17	23
7120	16	
7130	14	
7140	18	27
7150	19	
7160	21	
7170	20	33
7180	18	
7190	19	
7200	19	31

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

4 inches dia. tri-cone

Silty Clay with Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

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دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

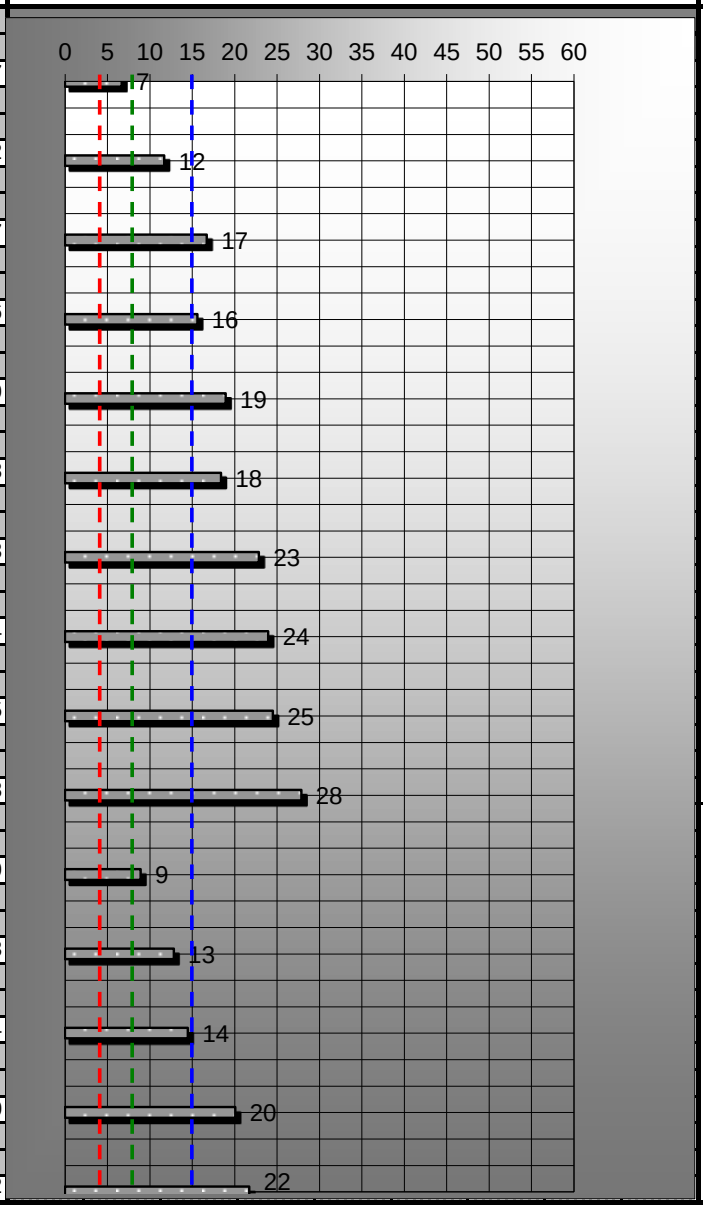
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
7210	4	
7220	4	
7230	4	7
7240	5	
7250	8	
7260	8	12
7270	9	
7280	10	
7290	11	17
7300	8	
7310	11	
7320	9	16
7330	11	
7340	11	
7350	12	19
7360	9	
7370	10	
7380	14	18
7390	15	
7400	13	
7410	13	23
7420	13	
7430	16	
7440	14	24
7450	14	
7460	15	
7470	15	25
7480	15	
7490	17	
7500	18	28
7510	5	
7520	5	
7530	6	9
7540	7	
7550	7	
7560	9	13
7570	8	
7580	9	
7590	9	14
7600	10	
7610	13	
7620	13	20
7630	14	
7640	12	
7650	13	22

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

Silty Clay with Gravels

4 inches dia. tri-cone

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

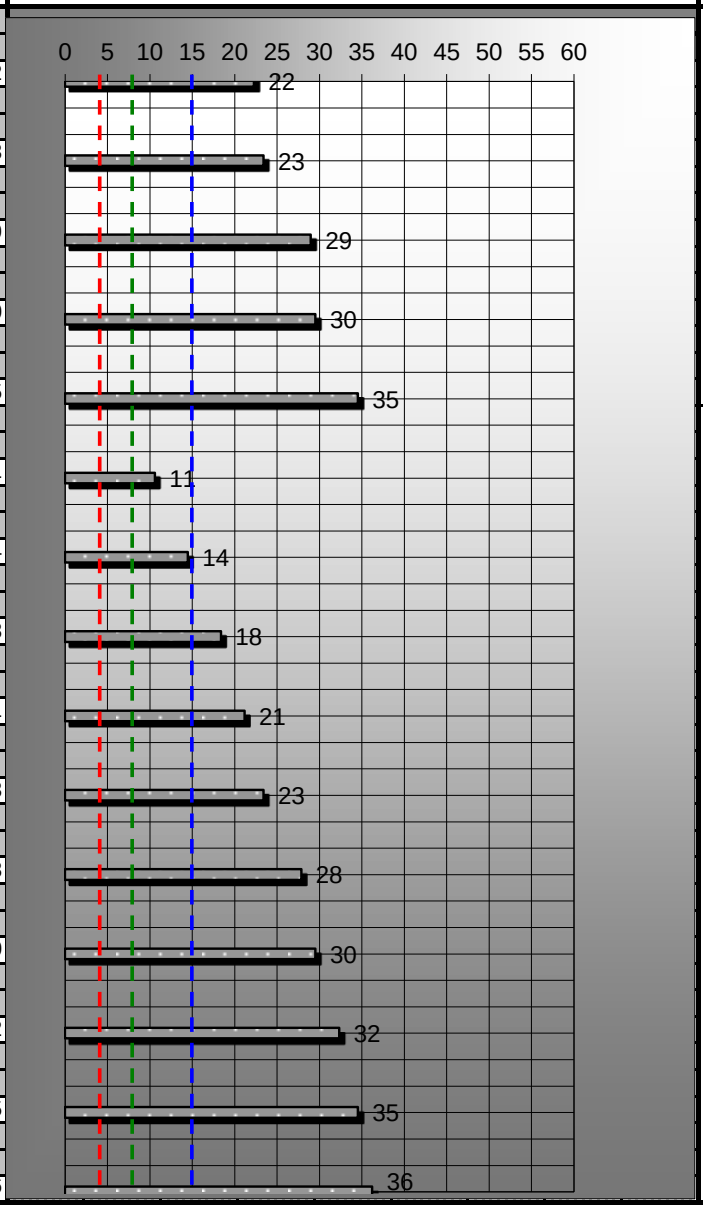
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
7660	12	
7670	14	
7680	14	22
7690	14	
7700	14	
7710	14	23
7720	18	
7730	17	
7740	17	29
7750	17	
7760	18	
7770	18	30
7780	20	
7790	21	
7800	21	35
7810	6	
7820	6	
7830	7	11
7840	8	
7850	10	
7860	8	14
7870	11	
7880	11	
7890	11	18
7900	12	
7910	13	
7920	13	21
7930	14	
7940	13	
7950	15	23
7960	14	
7970	19	
7980	17	28
7990	19	
8000	16	
8010	18	30
8020	20	
8030	19	
8040	19	32
8050	22	
8060	21	
8070	19	35
8080	21	
8090	22	
8100	22	36

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

4 inches dia. tri-cone

Silty Clay with Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

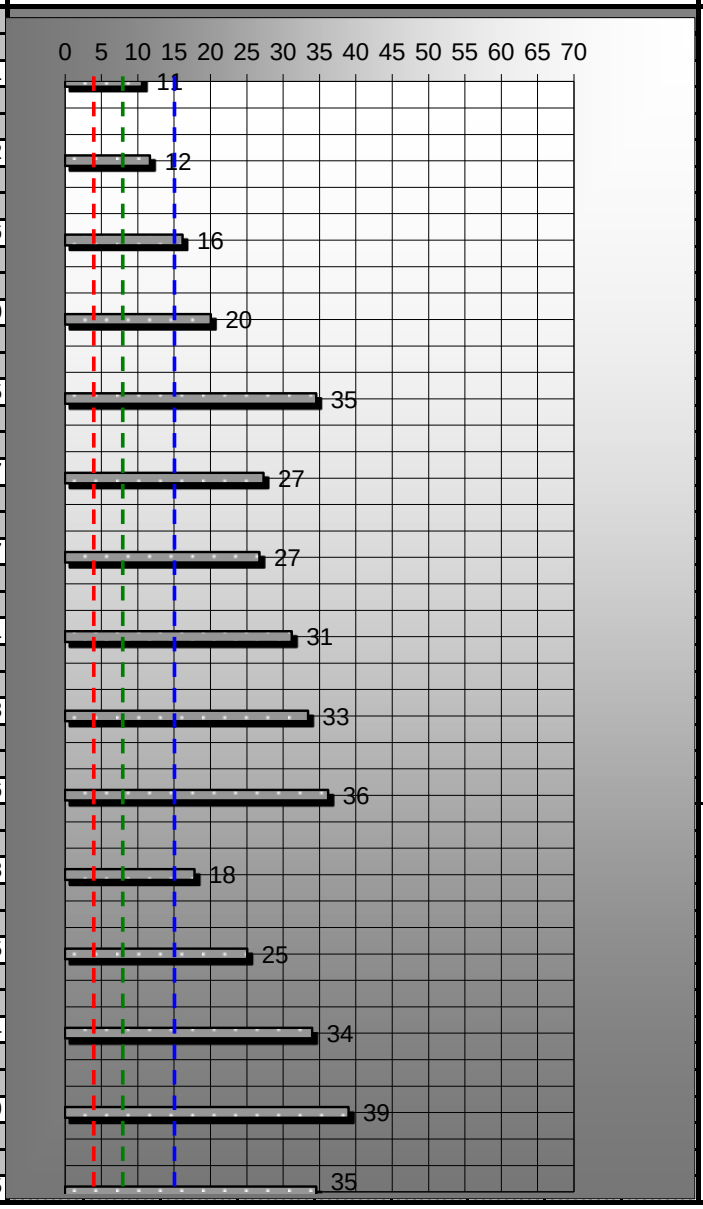
Probing: DCPVR7

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
8110	6	
8120	6	
8130	7	11
8140	6	
8150	8	
8160	7	12
8170	10	
8180	9	
8190	10	16
8200	11	
8210	10	
8220	15	20
8230	19	
8240	21	
8250	22	35
8260	15	
8270	15	
8280	19	27
8290	18	
8300	16	
8310	14	27
8320	19	
8330	19	
8340	18	31
8350	20	
8360	21	
8370	19	33
8380	23	
8390	21	
8400	21	36
8410	11	
8420	10	
8430	11	18
8440	13	
8450	13	
8460	19	25
8470	17	
8480	20	
8490	24	34
8500	27	
8510	23	
8520	20	39
8530	18	
8540	17	
8550	27	35

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone — Silty Clay with Gravels

4 inches dia. tri-cone — Old colluvial soil deposits

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

Probing: DCPVR7

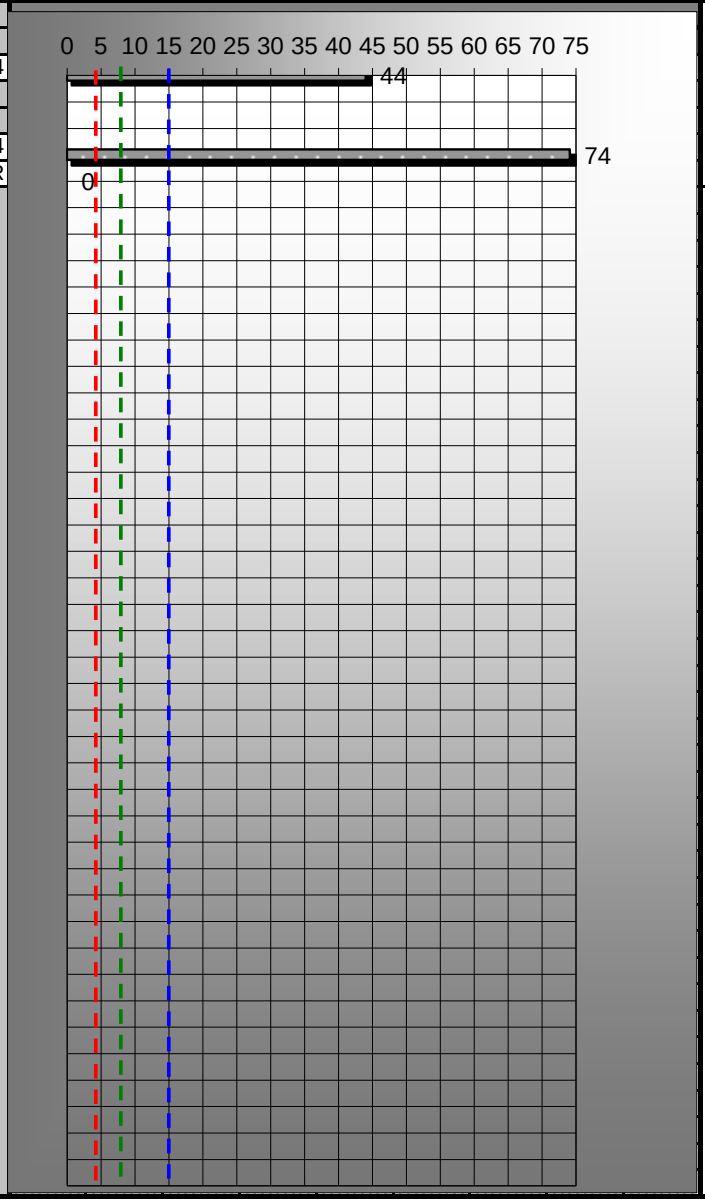
Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From January 25 to February 04, 2014

Coordinates X: -334,446.747 Y: -61,971.479 Z: +398.065
Depth: 90m **Groundwater:** +396
C./D. Rod: 60m (HW) / 6m AW & 84m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
8560	26	
8570	26	
8580	27	44
8590	28	
8600	45	
8610	60	74
8620	75/7cm	R
8630		
8640		
8650		
8660		
8670		
8680		
8690		
8700		
8710		
8720		
8730		
8740		
8750		
8760		
8770		
8780		
8790		
8800		
8810		
8820		
8830		
8840		
8850		
8860		
8870		
8880		
8890		
8900		
8910		
8920		
8930		
8940		
8950		
8960		
8970		
8980		
8990		
9000		

Tri-cone rock bit

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Tri-cone: Old colluvial soil deposits

4 inches dia. tri-cone: Highly to completely weathered clayey MARLSTONE with pockets of old colluvial rock fragments.

End of probing at 90m

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

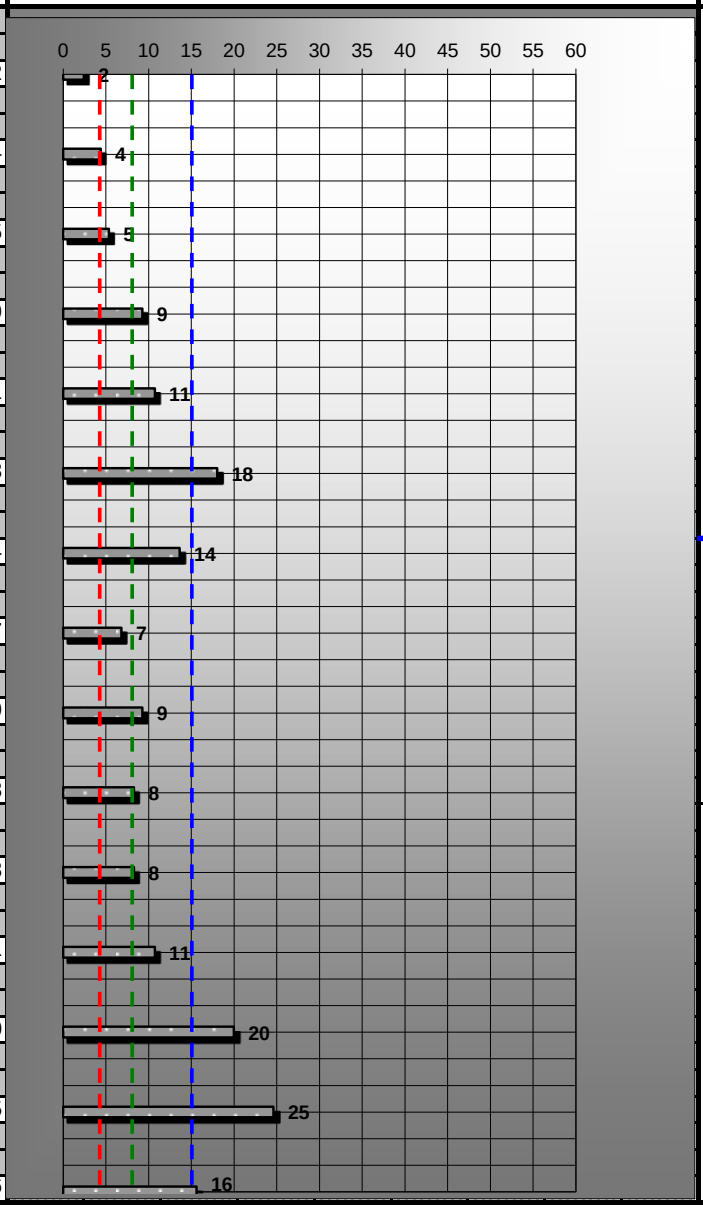
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
10	1	
20	2	
30	2	2
40	2	
50	3	
60	4	4
70	3	
80	3	
90	5	5
100	4	
110	7	
120	8	9
130	11	
140	7	
150	4	11
160	8	
170	13	
180	16	18
190	14	
200	7	
210	7	14
220	5	
230	4	
240	5	7
250	5	
260	7	
270	7	9
280	7	
290	5	
300	5	8
310	5	
320	6	
330	6	8
340	6	
350	7	
360	9	11
370	11	
380	14	
390	16	20
400	16	
410	17	
420	19	25
430	8	
440	12	
450	13	16

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Slightly clayey sandy Gravel

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

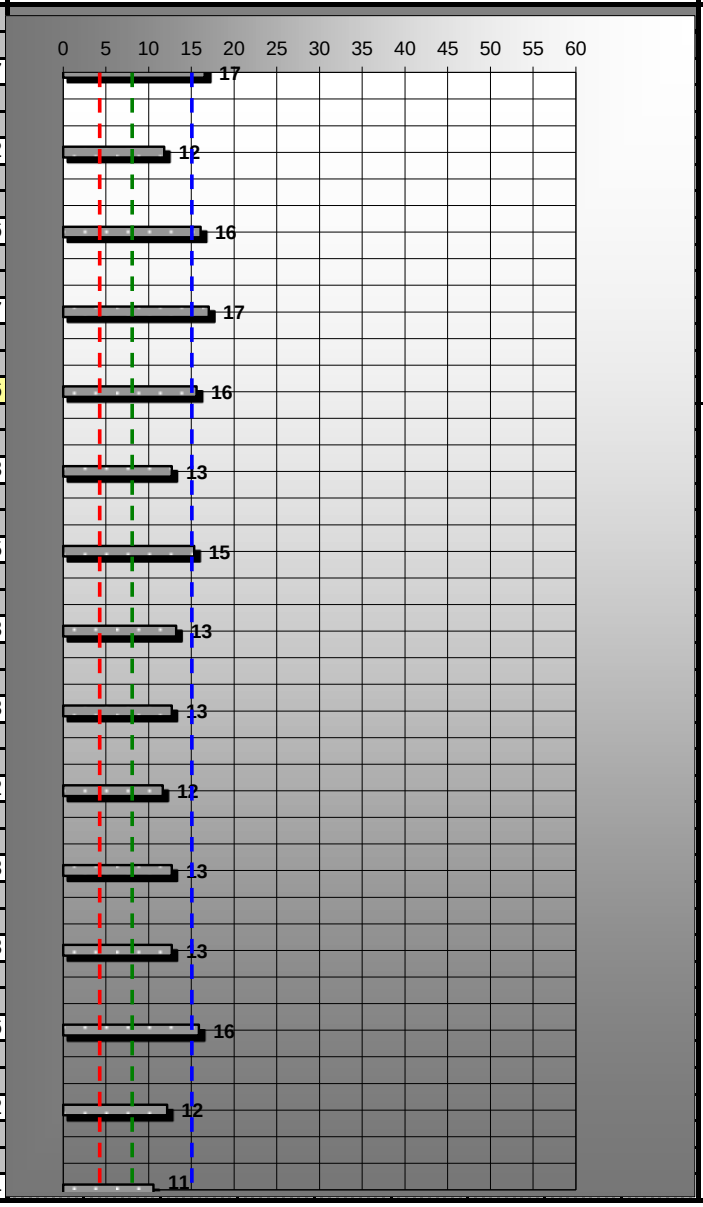
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
460	13	
470	13	
480	9	17
490	7	
500	7	
510	11	12
520	11	
530	10	
540	13	16
550	14	
560	11	
570	11	17
580	11	
590	10	
600	12	16
610	5	
620	8	
630	11	13
640	10	
650	10	
660	9	15
670	8	
680	8	
690	9	13
700	9	
710	8	
720	7	13
730	7	
740	8	
750	7	12
760	8	
770	9	
780	7	13
790	7	
800	9	
810	8	13
820	8	
830	11	
840	11	16
850	10	
860	6	
870	7	12
880	7	
890	6	
900	7	11

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Casing

Gravely Sand interbedded with clayey silty Sand with some Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

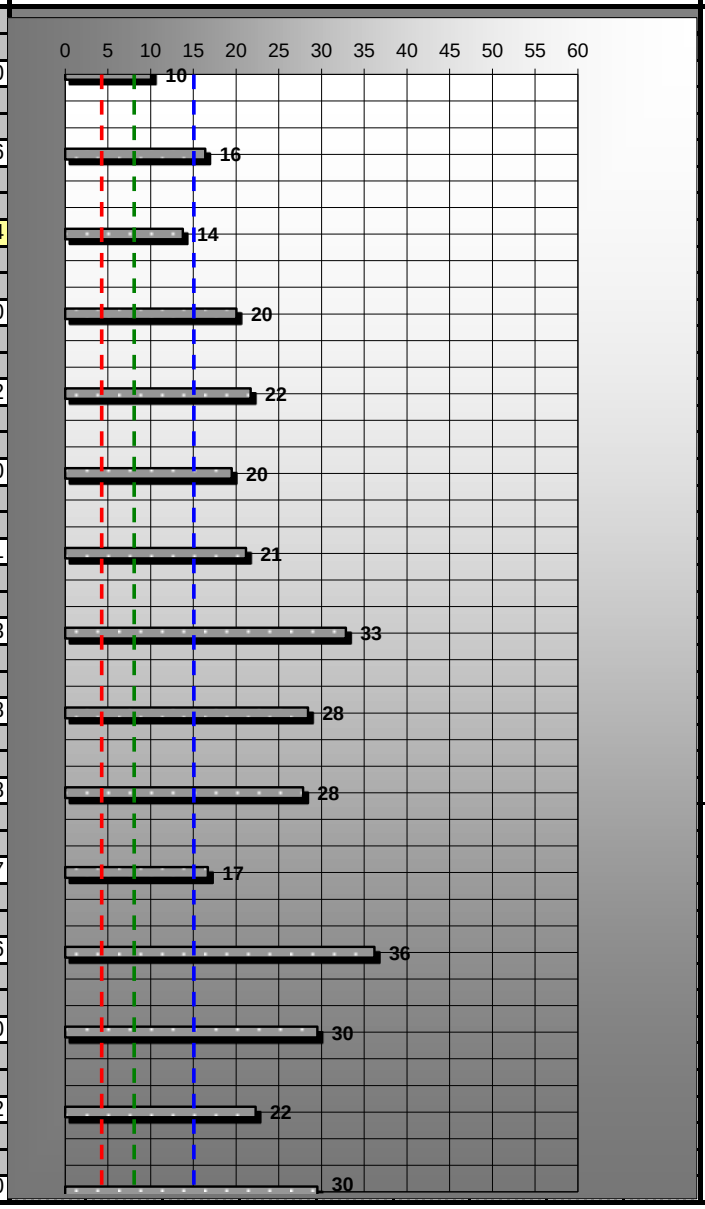
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
910	8	
920	5	
930	6	10
940	11	
950	11	
960	9	16
970	8	
980	8	
990	10	14
1000	12	
1010	12	
1020	12	20
1030	13	
1040	13	
1050	13	22
1060	12	
1070	11	
1080	12	20
1090	12	
1100	12	
1110	14	21
1120	14	
1130	25	
1140	20	33
1150	18	
1160	17	
1170	16	28
1180	17	
1190	16	
1200	17	28
1210	8	
1220	10	
1230	12	17
1240	19	
1250	23	
1260	23	36
1270	17	
1280	18	
1290	18	30
1300	15	
1310	14	
1320	11	22
1330	17	
1340	20	
1350	16	30

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Gravely Sand interbedded with clayey silty Sand with some Gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

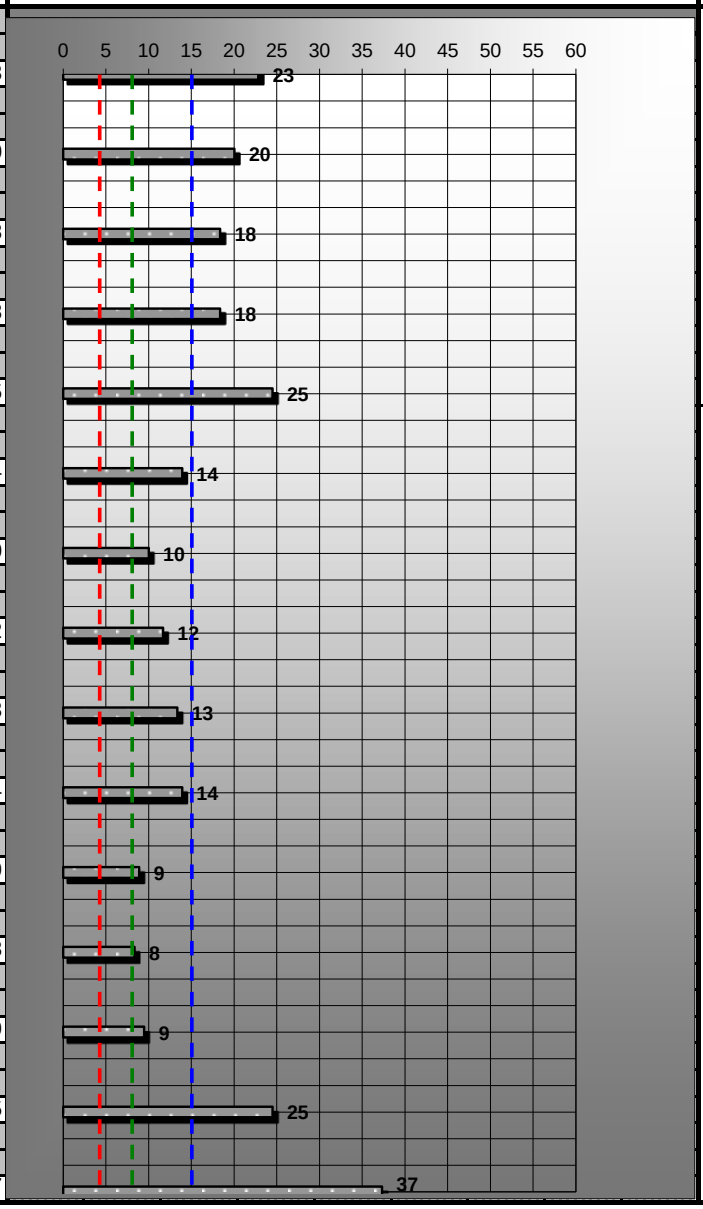
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
1360	13	
1370	11	
1380	17	23
1390	13	
1400	14	
1410	9	20
1420	11	
1430	11	
1440	11	18
1450	10	
1460	10	
1470	13	18
1480	11	
1490	16	
1500	17	25
1510	4	
1520	12	
1530	9	14
1540	5	
1550	6	
1560	7	10
1570	7	
1580	7	
1590	7	12
1600	8	
1610	8	
1620	8	13
1630	11	
1640	7	
1650	7	14
1660	5	
1670	6	
1680	5	9
1690	5	
1700	5	
1710	5	8
1720	5	
1730	5	
1740	7	9
1750	9	
1760	18	
1770	17	25
1780	18	
1790	21	
1800	28	37

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Gravely Sand interbedded with clayey silty Sand with some Gravels

Casing

Clayey silty Sand with some gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

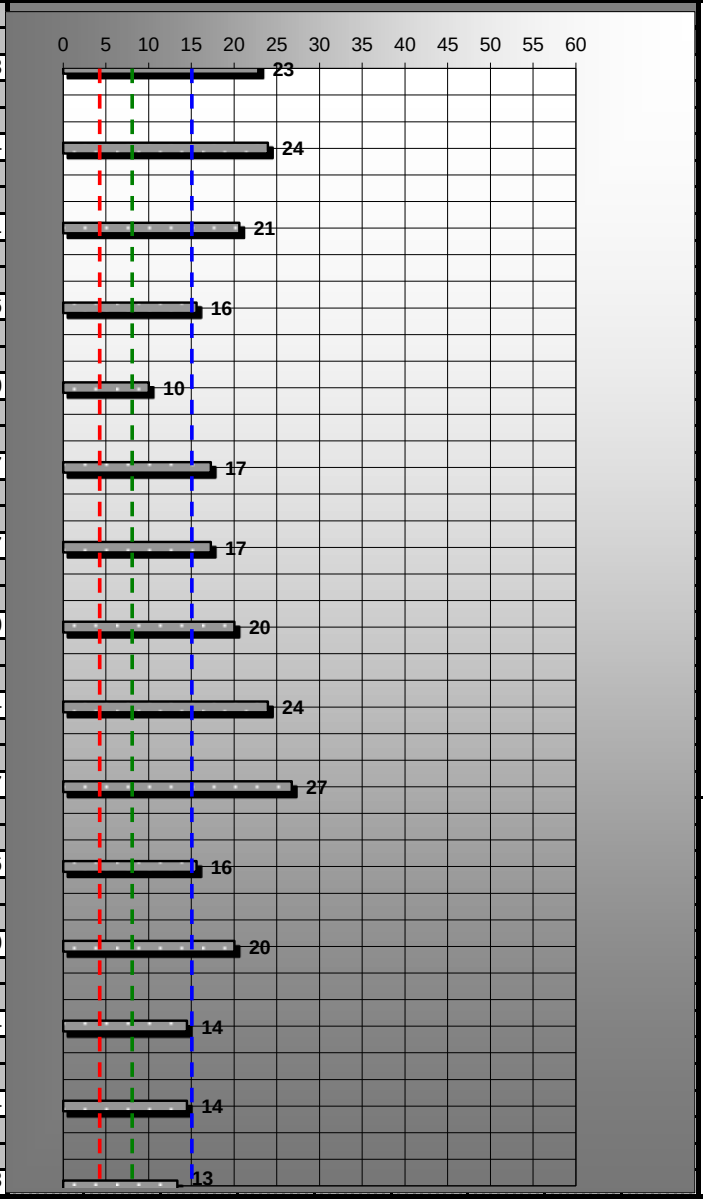
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
1810	13	
1820	16	
1830	12	23
1840	13	
1850	15	
1860	15	24
1870	20	
1880	9	
1890	8	21
1900	8	
1910	11	
1920	9	16
1930	6	
1940	6	
1950	6	10
1960	10	
1970	12	
1980	9	17
1990	9	
2000	8	
2010	14	17
2020	12	
2030	13	
2040	11	20
2050	11	
2060	14	
2070	18	24
2080	14	
2090	19	
2100	15	27
2110	6	
2120	7	
2130	15	16
2140	13	
2150	14	
2160	9	20
2170	9	
2180	8	
2190	9	14
2200	9	
2210	8	
2220	9	14
2230	7	
2240	9	
2250	8	13

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Clayey silty Sand with some gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

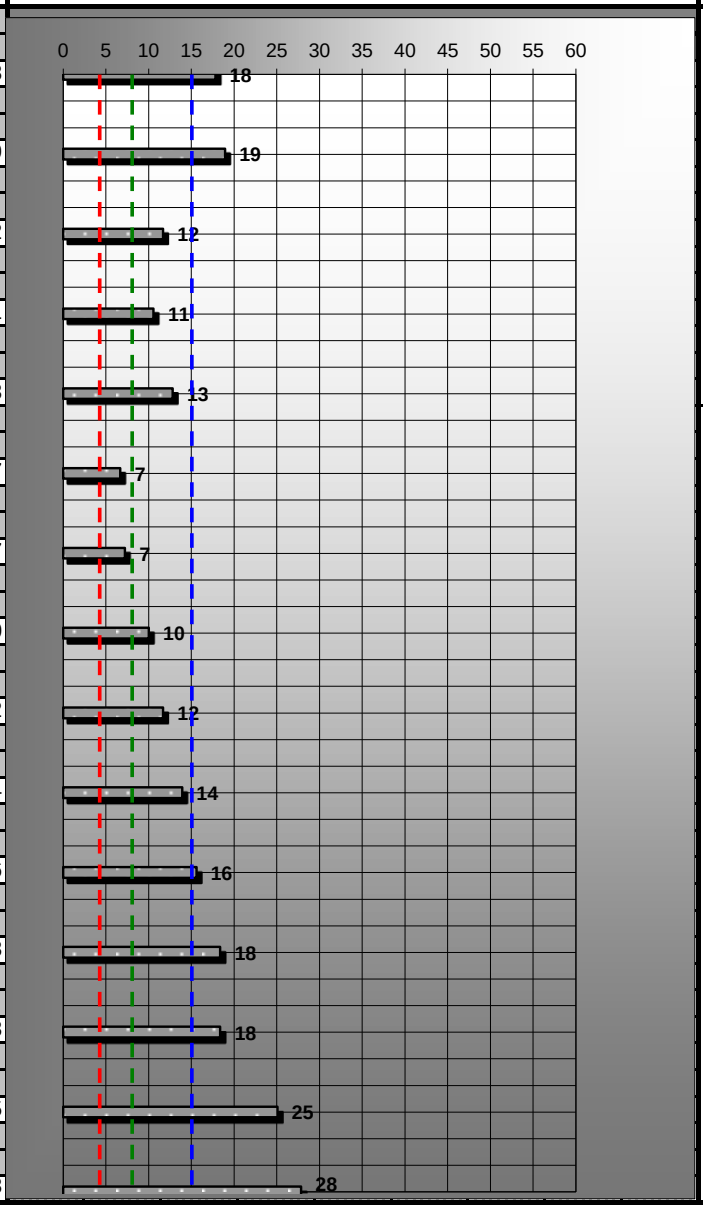
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
2260	13	
2270	9	
2280	10	18
2290	15	
2300	11	
2310	8	19
2320	7	
2330	8	
2340	6	12
2350	5	
2360	7	
2370	7	11
2380	7	
2390	9	
2400	7	13
2410	4	
2420	4	
2430	4	7
2440	4	
2450	4	
2460	5	7
2470	5	
2480	6	
2490	7	10
2500	7	
2510	7	
2520	7	12
2530	9	
2540	8	
2550	8	14
2560	8	
2570	10	
2580	10	16
2590	10	
2600	10	
2610	13	18
2620	10	
2630	10	
2640	13	18
2650	17	
2660	14	
2670	14	25
2680	17	
2690	15	
2700	18	28

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Casing

Clayey silty Sand with some gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

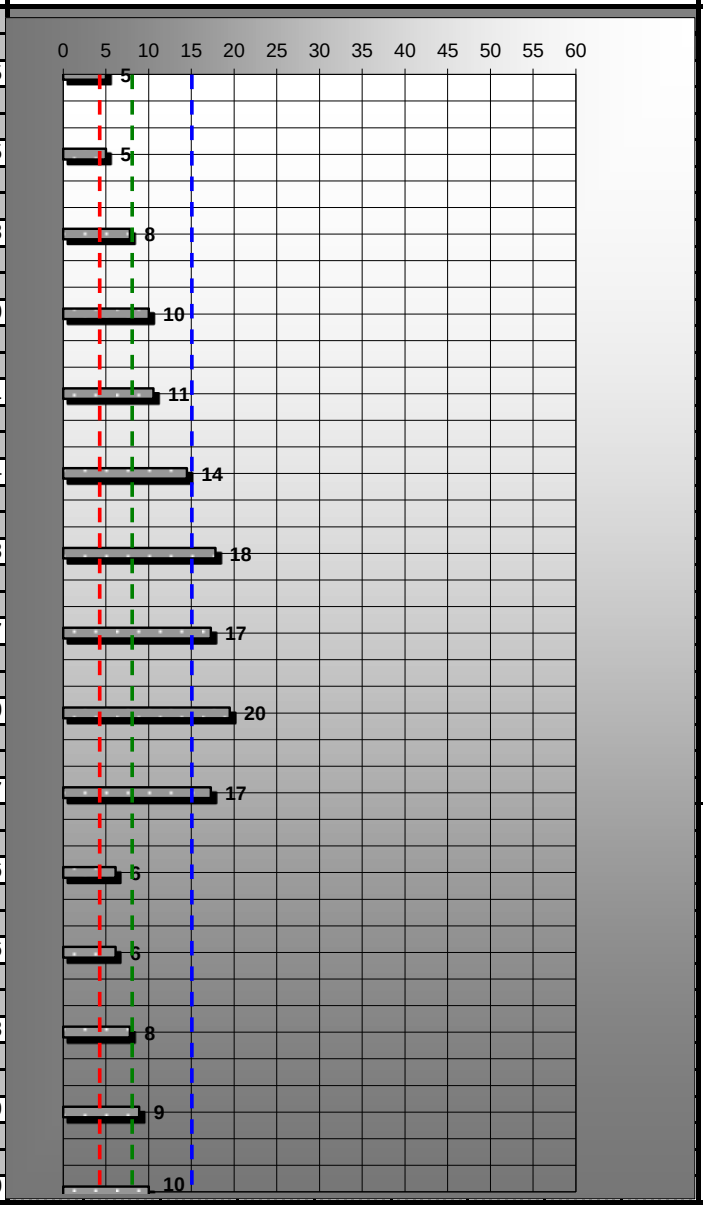
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
2710	3	
2720	3	
2730	3	5
2740	3	
2750	3	
2760	3	5
2770	4	
2780	5	
2790	5	8
2800	6	
2810	6	
2820	6	10
2830	6	
2840	6	
2850	7	11
2860	8	
2870	9	
2880	9	14
2890	10	
2900	11	
2910	11	18
2920	10	
2930	12	
2940	9	17
2950	10	
2960	14	
2970	11	20
2980	11	
2990	9	
3000	11	17
3010	4	
3020	4	
3030	3	6
3040	3	
3050	4	
3060	4	6
3070	4	
3080	5	
3090	5	8
3100	5	
3110	6	
3120	5	9
3130	6	
3140	6	
3150	6	10

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Clayey silty Sand with some gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

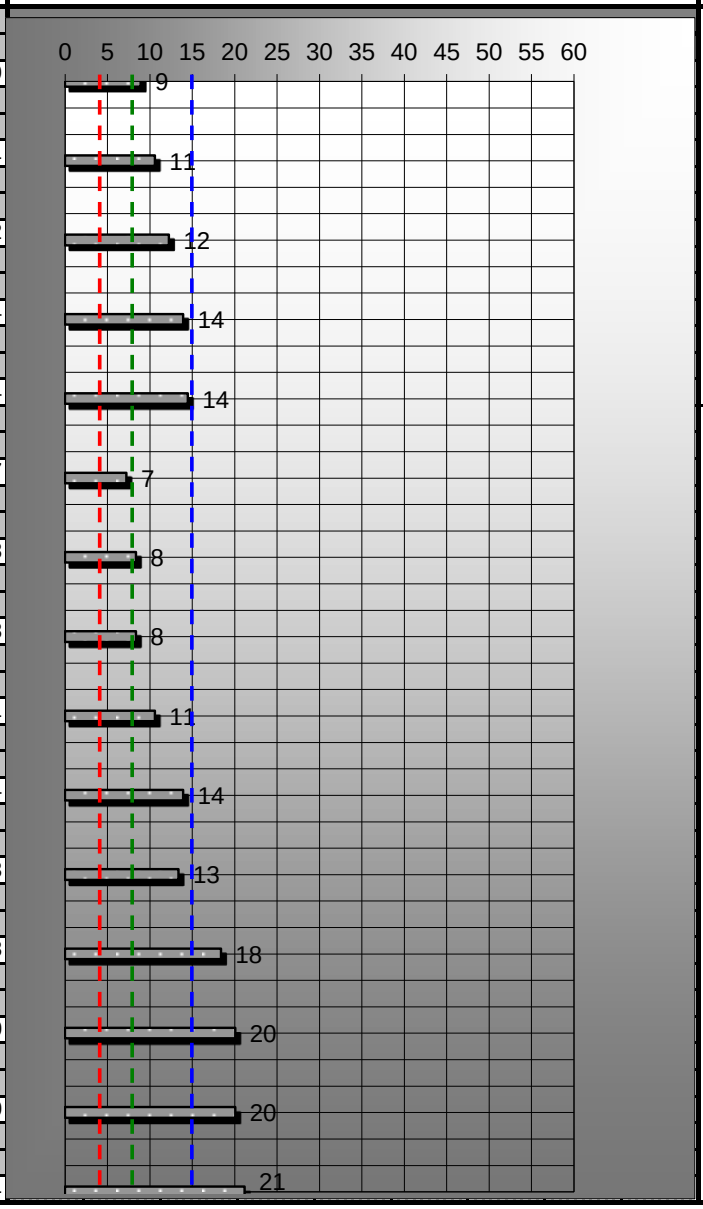
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
3160	6	
3170	5	
3180	5	9
3190	6	
3200	6	
3210	7	11
3220	8	
3230	7	
3240	7	12
3250	8	
3260	8	
3270	9	14
3280	8	
3290	8	
3300	10	14
3310	4	
3320	5	
3330	4	7
3340	5	
3350	5	
3360	5	8
3370	5	
3380	5	
3390	5	8
3400	6	
3410	6	
3420	7	11
3430	8	
3440	8	
3450	9	14
3460	8	
3470	8	
3480	8	13
3490	12	
3500	11	
3510	10	18
3520	9	
3530	14	
3540	13	20
3550	11	
3560	14	
3570	11	20
3580	11	
3590	13	
3600	14	21

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Casing

Clayey silty Sand with some gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

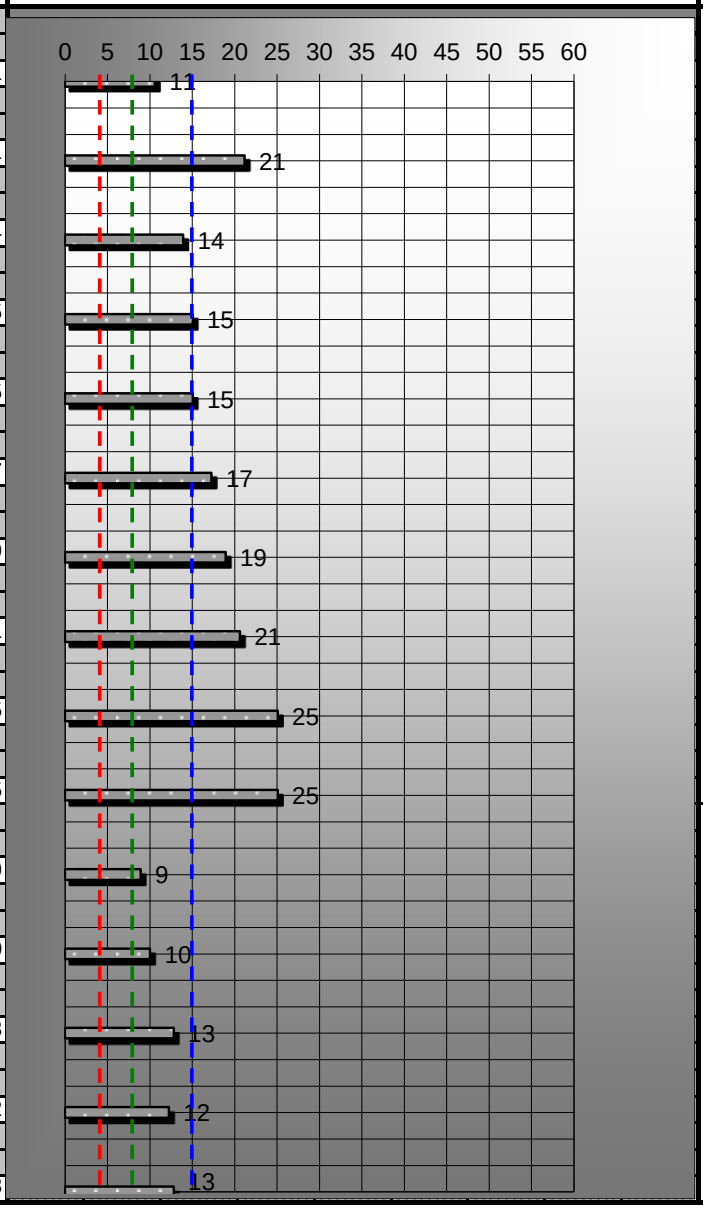
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
3610	5	
3620	6	
3630	8	11
3640	12	
3650	14	
3660	12	21
3670	7	
3680	9	
3690	9	14
3700	9	
3710	9	
3720	9	15
3730	9	
3740	9	
3750	9	15
3760	9	
3770	11	
3780	11	17
3790	11	
3800	12	
3810	11	19
3820	11	
3830	13	
3840	13	21
3850	14	
3860	16	
3870	15	25
3880	17	
3890	14	
3900	14	25
3910	5	
3920	5	
3930	6	9
3940	6	
3950	6	
3960	6	10
3970	8	
3980	8	
3990	7	13
4000	8	
4010	7	
4020	7	12
4030	7	
4040	8	
4050	8	13

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Clayey silty Sand with some gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

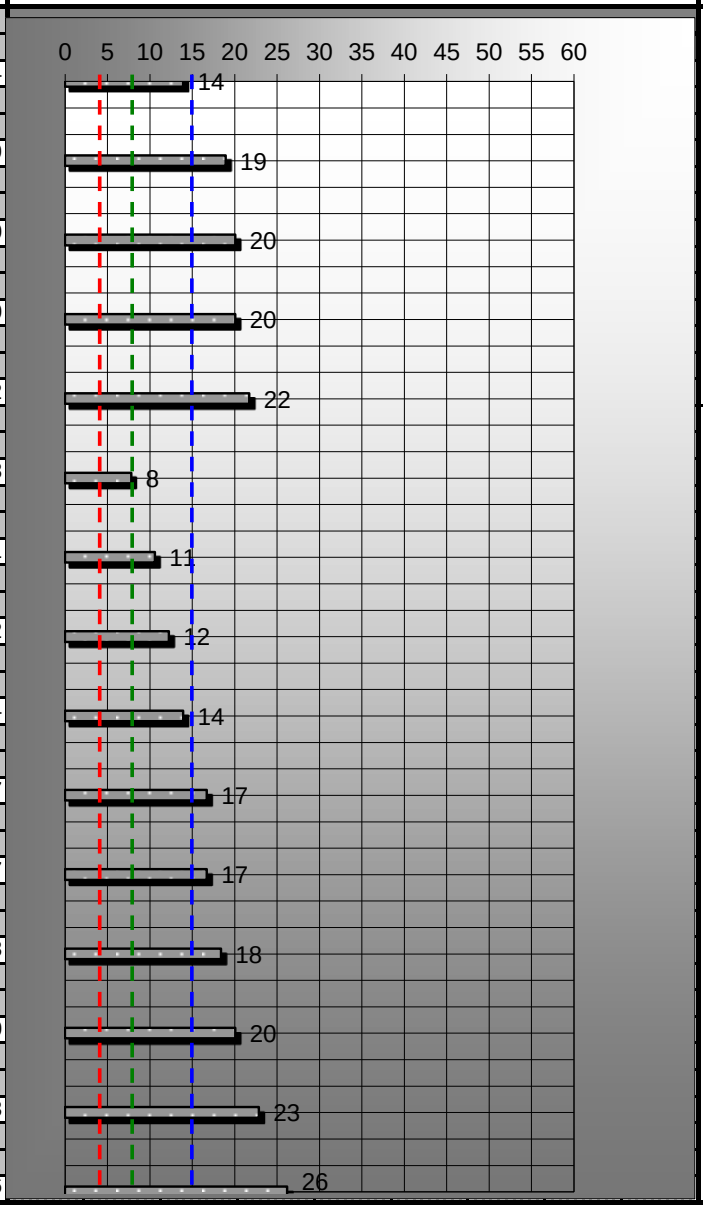
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
4060	9	
4070	8	
4080	8	14
4090	12	
4100	10	
4110	12	19
4120	12	
4130	13	
4140	11	20
4150	12	
4160	13	
4170	11	20
4180	11	
4190	15	
4200	13	22
4210	5	
4220	5	
4230	4	8
4240	6	
4250	6	
4260	7	11
4270	6	
4280	8	
4290	8	12
4300	8	
4310	9	
4320	8	14
4330	9	
4340	11	
4350	10	17
4360	9	
4370	11	
4380	10	17
4390	11	
4400	11	
4410	11	18
4420	12	
4430	9	
4440	15	20
4450	13	
4460	13	
4470	15	23
4480	18	
4490	15	
4500	14	26

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Casing

Clayey silty Sand with some gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

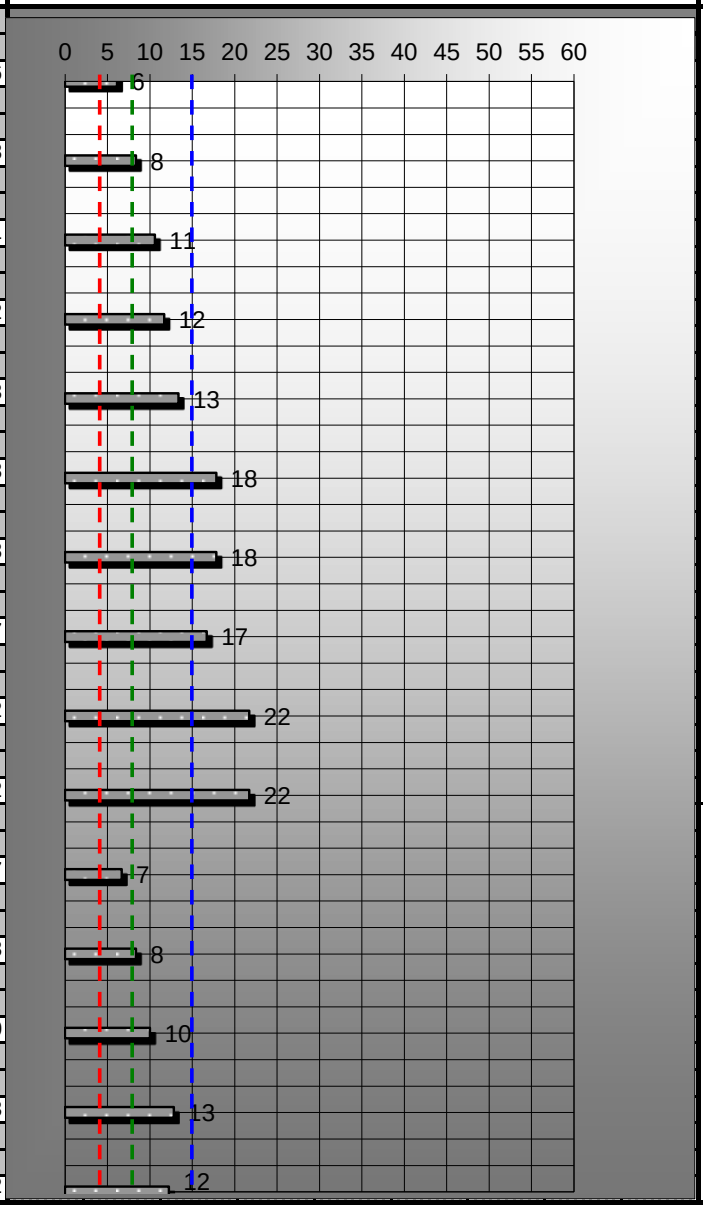
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
4510	4	
4520	3	
4530	4	6
4540	5	
4550	4	
4560	6	8
4570	6	
4580	6	
4590	7	11
4600	6	
4610	8	
4620	7	12
4630	8	
4640	7	
4650	9	13
4660	9	
4670	11	
4680	12	18
4690	10	
4700	9	
4710	13	18
4720	11	
4730	9	
4740	10	17
4750	12	
4760	13	
4770	14	22
4780	13	
4790	15	
4800	11	22
4810	4	
4820	5	
4830	3	7
4840	5	
4850	4	
4860	6	8
4870	6	
4880	7	
4890	5	10
4900	6	
4910	8	
4920	9	13
4930	7	
4940	8	
4950	7	12

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Clayey silty Sand with some gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

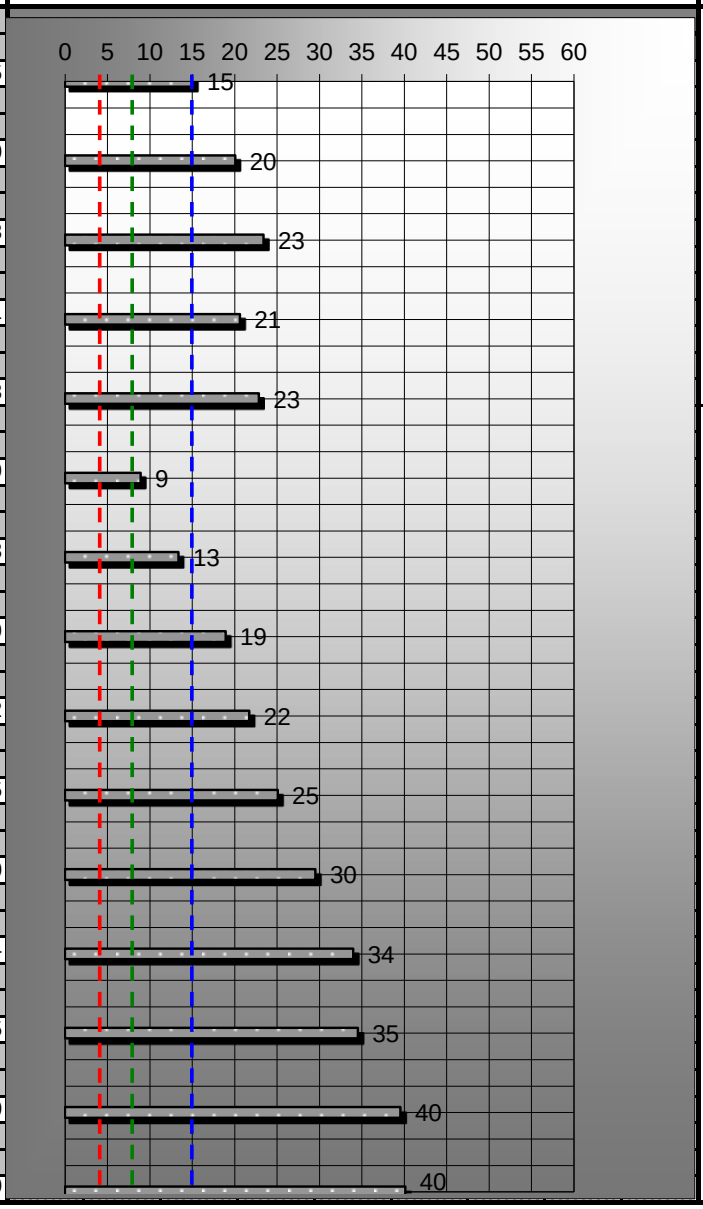
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
4960	9	
4970	9	
4980	9	15
4990	10	
5000	12	
5010	14	20
5020	15	
5030	14	
5040	13	23
5050	11	
5060	10	
5070	16	21
5080	15	
5090	13	
5100	13	23
5110	4	
5120	5	
5130	7	9
5140	8	
5150	7	
5160	9	13
5170	9	
5180	11	
5190	14	19
5200	12	
5210	13	
5220	14	22
5230	13	
5240	14	
5250	18	25
5260	17	
5270	17	
5280	19	30
5290	18	
5300	21	
5310	22	34
5320	20	
5330	20	
5340	22	35
5350	26	
5360	25	
5370	20	40
5380	23	
5390	25	
5400	24	40

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Casing

Silty Clay with some Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

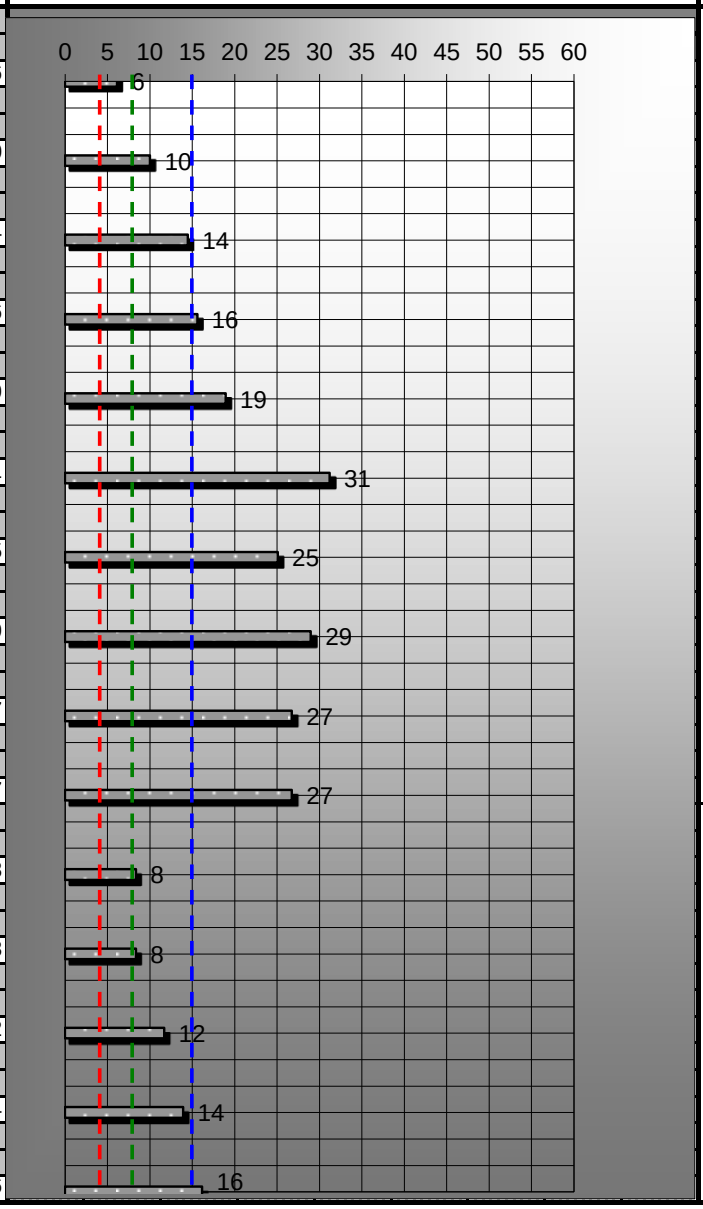
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
5410	4	
5420	3	
5430	4	6
5440	6	
5450	7	
5460	5	10
5470	8	
5480	9	
5490	9	14
5500	9	
5510	10	
5520	9	16
5530	11	
5540	11	
5550	12	19
5560	25	
5570	15	
5580	16	31
5590	17	
5600	14	
5610	14	25
5620	15	
5630	20	
5640	17	29
5650	16	
5660	16	
5670	16	27
5680	15	
5690	16	
5700	17	27
5710	5	
5720	5	
5730	5	8
5740	5	
5750	5	
5760	5	8
5770	6	
5780	6	
5790	9	12
5800	7	
5810	9	
5820	9	14
5830	9	
5840	9	
5850	11	16

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

Silty Clay with some Gravels

Casing

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

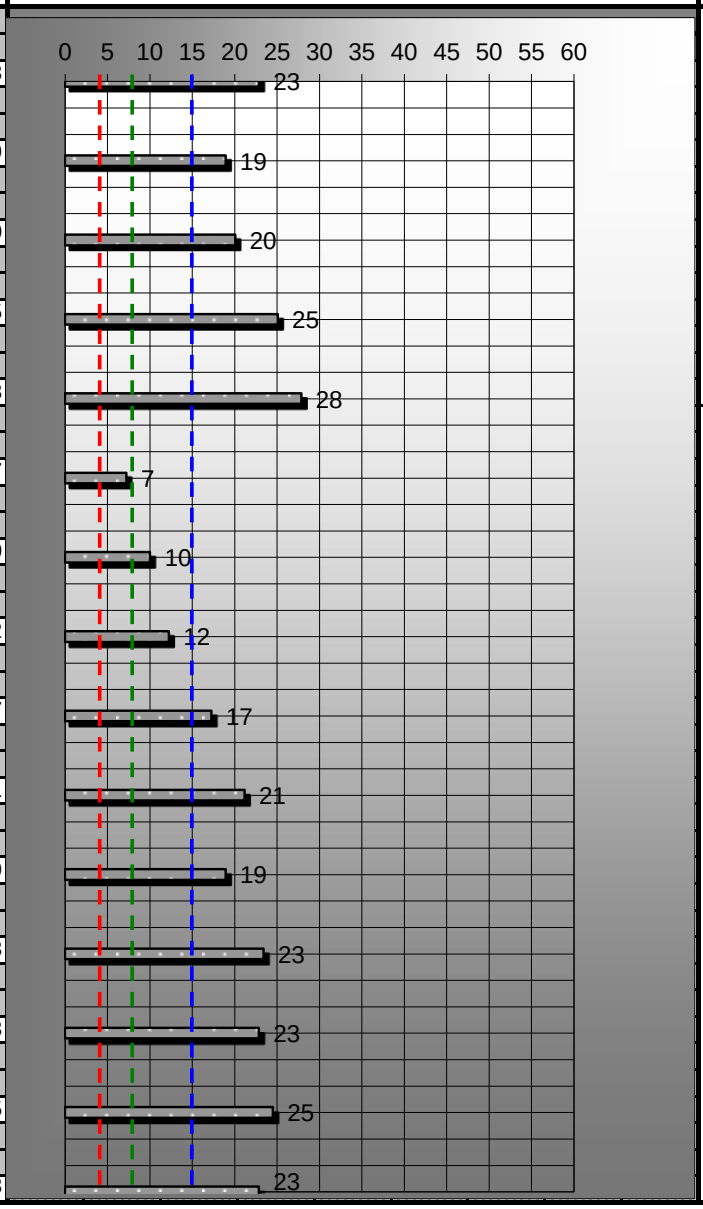
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
5860	12	
5870	16	
5880	13	23
5890	10	
5900	11	
5910	13	19
5920	13	
5930	11	
5940	12	20
5950	16	
5960	14	
5970	15	25
5980	15	
5990	18	
6000	17	28
6010	4	
6020	4	
6030	5	7
6040	6	
6050	6	
6060	6	10
6070	8	
6080	7	
6090	7	12
6100	9	
6110	11	
6120	11	17
6130	11	
6140	13	
6150	14	21
6160	12	
6170	11	
6180	11	19
6190	15	
6200	15	
6210	12	23
6220	12	
6230	13	
6240	16	23
6250	14	
6260	14	
6270	16	25
6280	12	
6290	15	
6300	14	23

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Casing

4 inches dia. tri-cone

Silty Clay with some Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

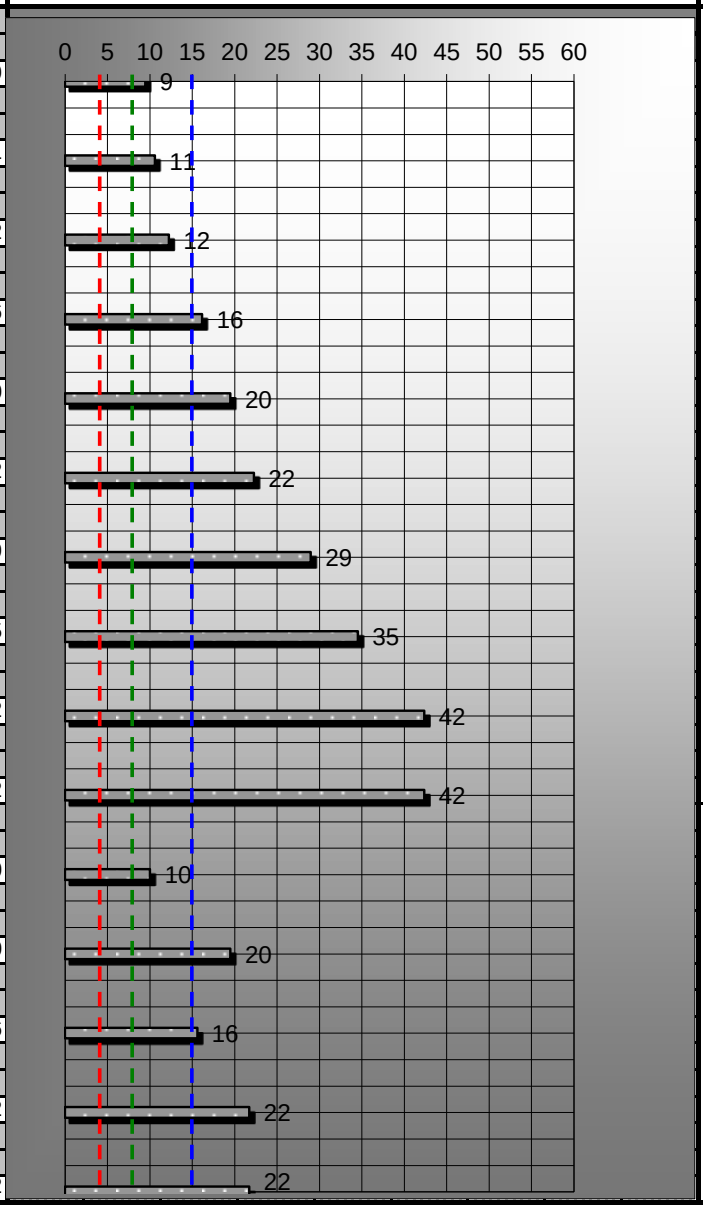
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
6310	4	
6320	8	
6330	5	9
6340	6	
6350	6	
6360	7	11
6370	7	
6380	7	
6390	8	12
6400	9	
6410	10	
6420	10	16
6430	10	
6440	13	
6450	12	20
6460	12	
6470	14	
6480	14	22
6490	15	
6500	20	
6510	17	29
6520	19	
6530	20	
6540	23	35
6550	23	
6560	24	
6570	29	42
6580	25	
6590	27	
6600	24	42
6610	5	
6620	5	
6630	8	10
6640	14	
6650	12	
6660	9	20
6670	9	
6680	8	
6690	11	16
6700	12	
6710	14	
6720	13	22
6730	12	
6740	12	
6750	15	22

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

4 inches dia. tri-cone

Silty Clay with some Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

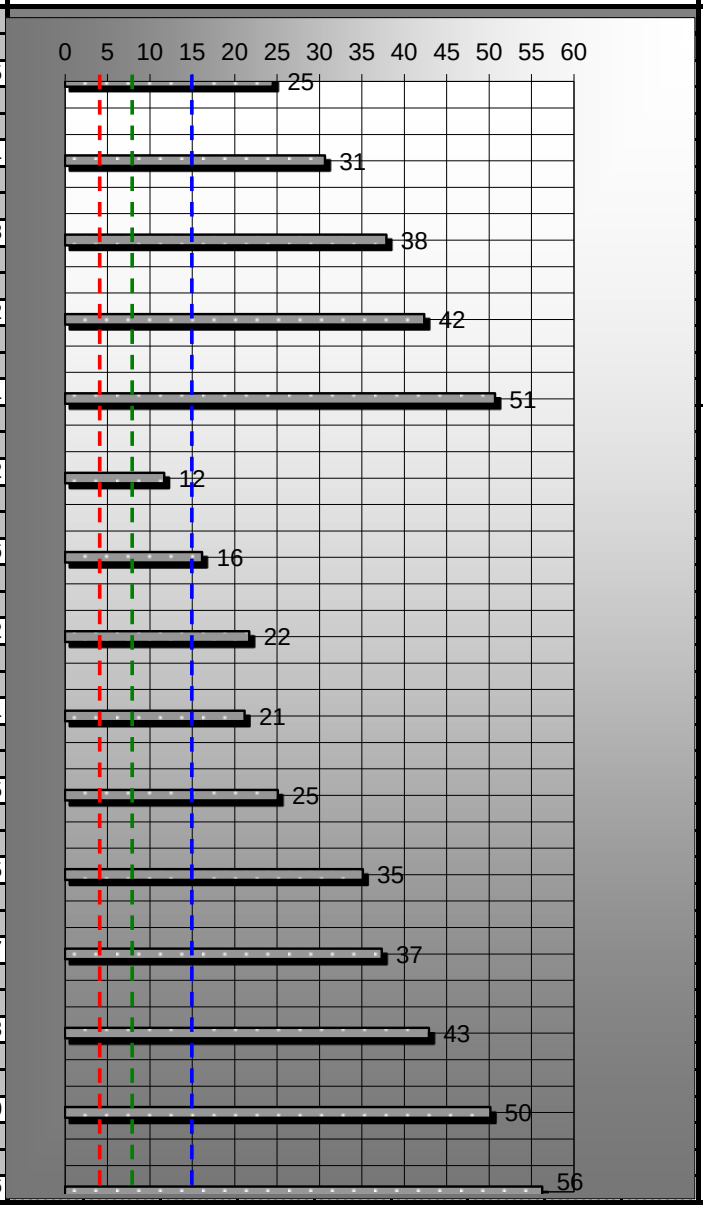
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
6760	15	
6770	12	
6780	17	25
6790	17	
6800	18	
6810	20	31
6820	23	
6830	22	
6840	23	38
6850	26	
6860	26	
6870	24	42
6880	26	
6890	33	
6900	32	51
6910	7	
6920	7	
6930	7	12
6940	9	
6950	10	
6960	10	16
6970	11	
6980	14	
6990	14	22
7000	13	
7010	12	
7020	13	21
7030	15	
7040	15	
7050	15	25
7060	18	
7070	21	
7080	24	35
7090	22	
7100	20	
7110	25	37
7120	27	
7130	27	
7140	23	43
7150	29	
7160	33	
7170	28	50
7180	32	
7190	35	
7200	34	56

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

4 inches dia. tri-cone

Silty Clay with some Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

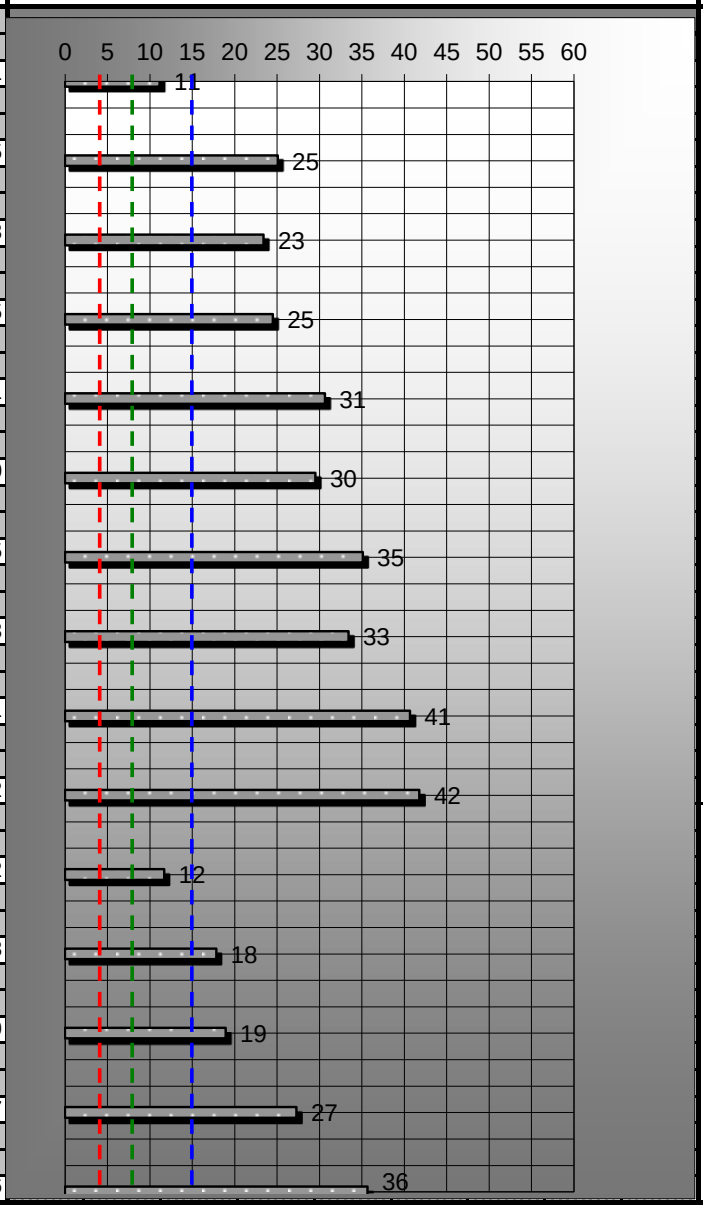
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
7210	7	
7220	7	
7230	6	11
7240	7	
7250	19	
7260	19	25
7270	13	
7280	11	
7290	18	23
7300	14	
7310	15	
7320	15	25
7330	15	
7340	21	
7350	19	31
7360	19	
7370	17	
7380	17	30
7390	19	
7400	22	
7410	22	35
7420	19	
7430	20	
7440	21	33
7450	22	
7460	23	
7470	28	41
7480	24	
7490	22	
7500	29	42
7510	7	
7520	7	
7530	7	12
7540	9	
7550	14	
7560	9	18
7570	10	
7580	12	
7590	12	19
7600	15	
7610	18	
7620	16	27
7630	22	
7640	22	
7650	20	36

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

4 inches dia. tri-cone

Silty Clay with some Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

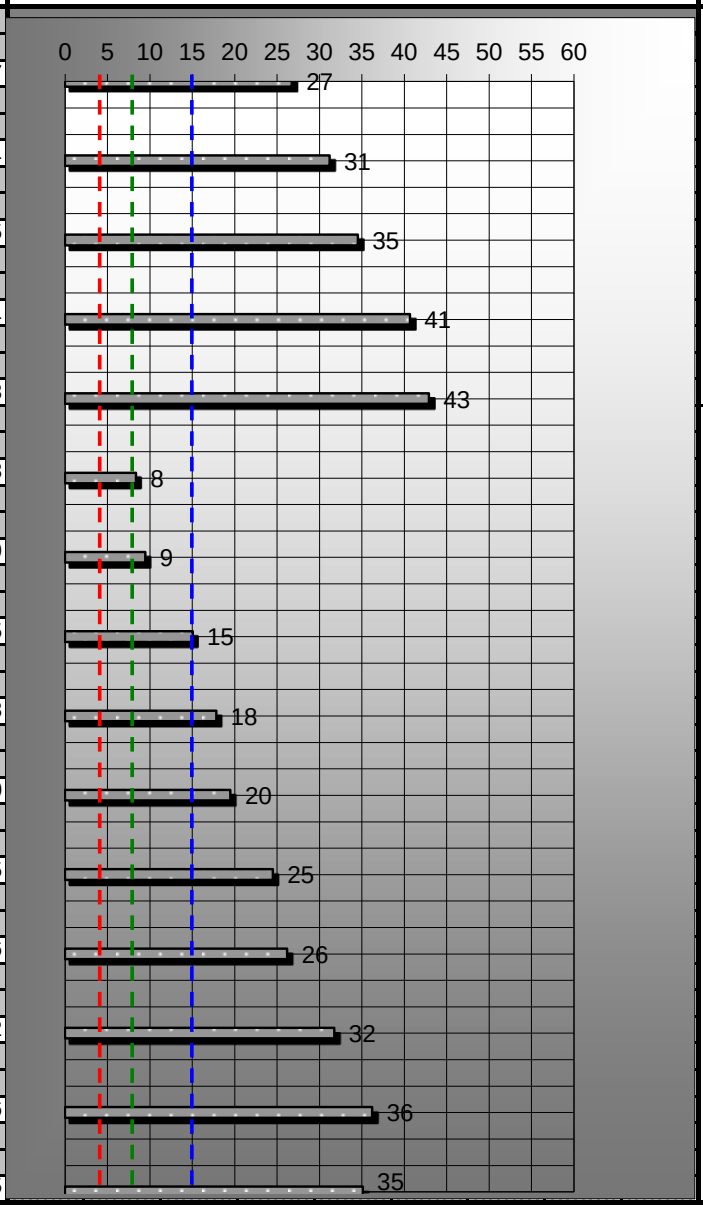
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
7660	17	
7670	16	
7680	15	27
7690	20	
7700	19	
7710	17	31
7720	20	
7730	19	
7740	23	35
7750	28	
7760	22	
7770	23	41
7780	23	
7790	26	
7800	28	43
7810	5	
7820	5	
7830	5	8
7840	4	
7850	6	
7860	7	9
7870	7	
7880	9	
7890	11	15
7900	11	
7910	11	
7920	10	18
7930	10	
7940	10	
7950	15	20
7960	13	
7970	15	
7980	16	25
7990	15	
8000	15	
8010	17	26
8020	18	
8030	16	
8040	23	32
8050	21	
8060	23	
8070	21	36
8080	22	
8090	20	
8100	21	35

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

4 inches dia. tri-cone

Silty Clay with some Gravels

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

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soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

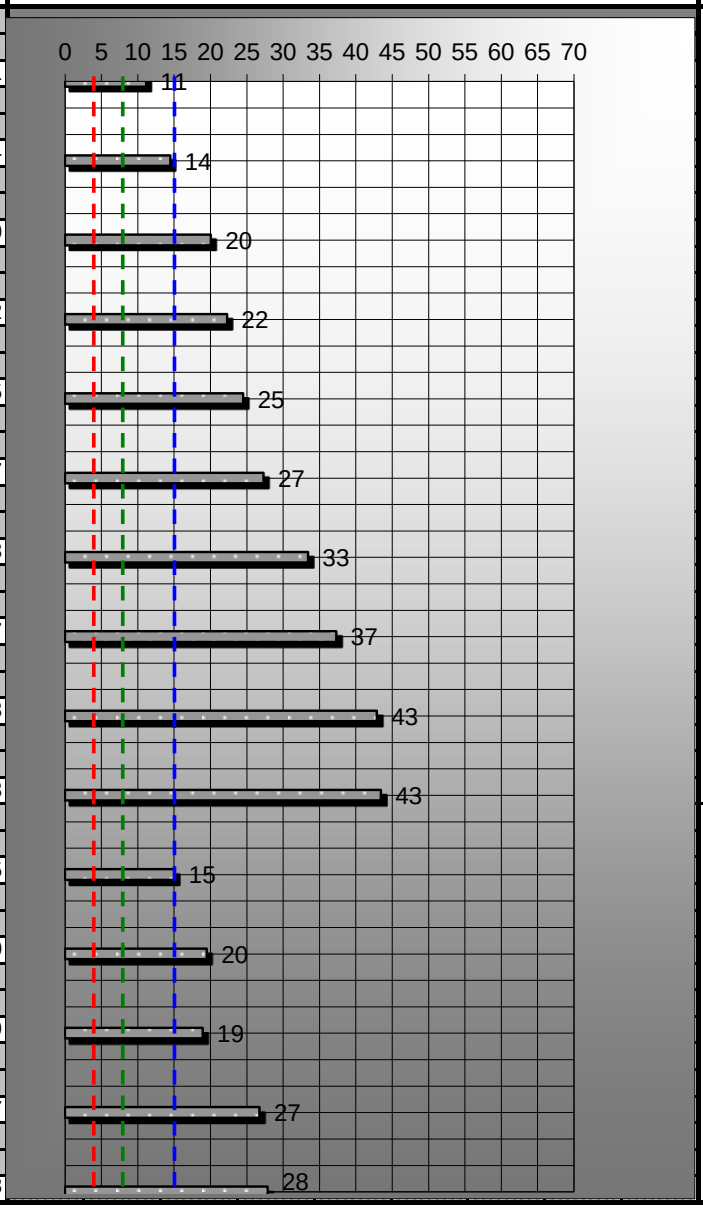
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
8110	6	
8120	7	
8130	7	11
8140	9	
8150	9	
8160	8	14
8170	11	
8180	13	
8190	12	20
8200	11	
8210	14	
8220	15	22
8230	14	
8240	15	
8250	15	25
8260	16	
8270	16	
8280	17	27
8290	17	
8300	18	
8310	25	33
8320	20	
8330	20	
8340	27	37
8350	23	
8360	28	
8370	26	43
8380	25	
8390	26	
8400	27	43
8410	9	
8420	9	
8430	9	15
8440	12	
8450	12	
8460	11	20
8470	11	
8480	11	
8490	12	19
8500	17	
8510	14	
8520	17	27
8530	18	
8540	16	
8550	16	28

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

Silty Clay with some Gravels

4 inches dia. tri-cone

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

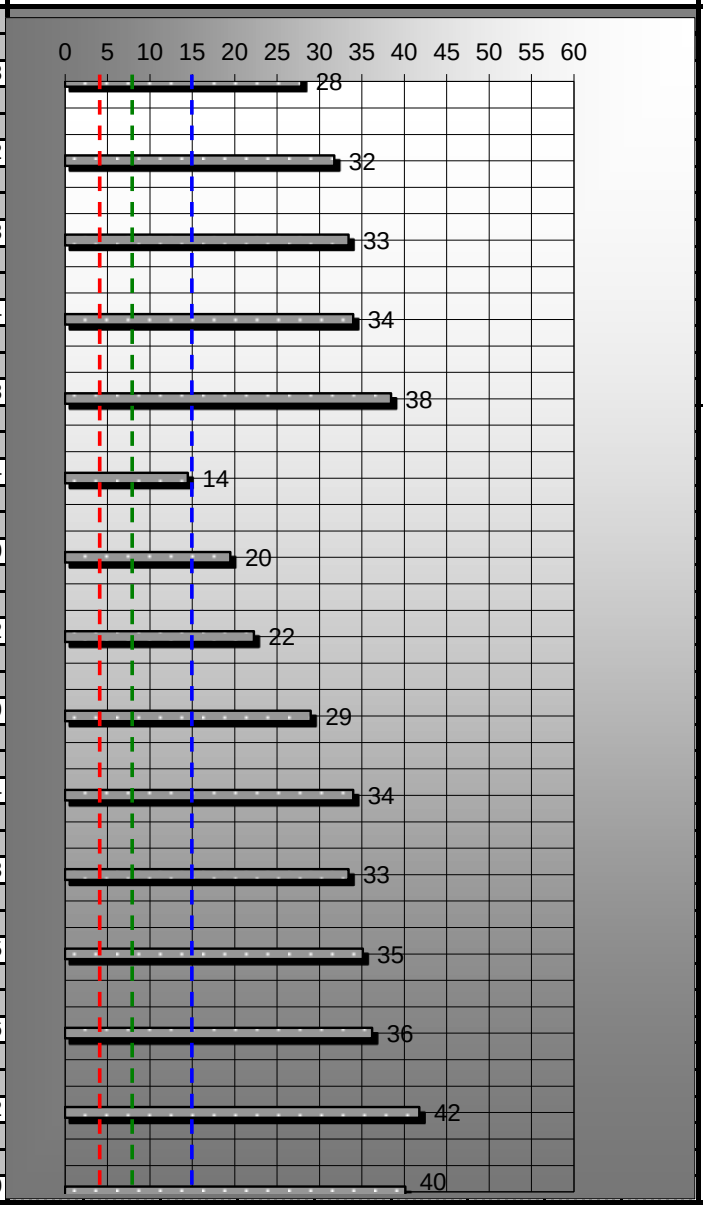
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
8560	16	
8570	17	
8580	17	28
8590	19	
8600	19	
8610	19	32
8620	18	
8630	20	
8640	22	33
8650	17	
8660	23	
8670	21	34
8680	23	
8690	22	
8700	24	38
8710	6	
8720	10	
8730	10	14
8740	11	
8750	10	
8760	14	20
8770	13	
8780	13	
8790	14	22
8800	15	
8810	15	
8820	22	29
8830	21	
8840	21	
8850	19	34
8860	18	
8870	21	
8880	21	33
8890	21	
8900	19	
8910	23	35
8920	22	
8930	20	
8940	23	36
8950	25	
8960	24	
8970	26	42
8980	25	
8990	23	
9000	24	40

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

4 inches dia. tri-cone

Completely weathered clayey MARLSTONE

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

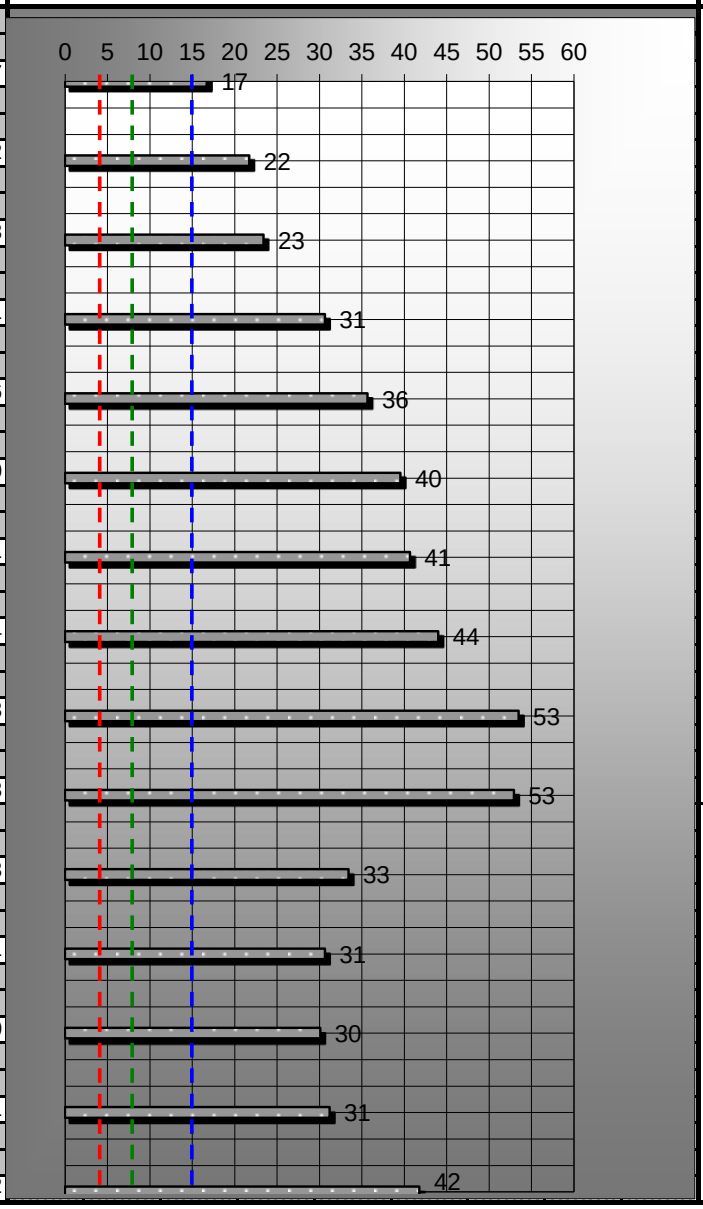
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
9010	8	
9020	11	
9030	11	17
9040	13	
9050	12	
9060	14	22
9070	14	
9080	14	
9090	14	23
9100	18	
9110	17	
9120	20	31
9130	20	
9140	21	
9150	23	36
9160	23	
9170	22	
9180	26	40
9190	24	
9200	24	
9210	25	41
9220	24	
9230	27	
9240	28	44
9250	29	
9260	33	
9270	34	53
9280	31	
9290	31	
9300	33	53
9310	13	
9320	23	
9330	24	33
9340	19	
9350	17	
9360	19	31
9370	19	
9380	17	
9390	18	30
9400	19	
9410	20	
9420	17	31
9430	19	
9440	27	
9450	29	42

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

4 inches dia. tri-cone

Completely weathered clayey MARLSTONE

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

DAR AL HANDASAH NAZIH TALEB & PARTNERS consulting engineers
دار الهندسة نزيه طالب وشركاه للتصميم والاستشارات الفنية

DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

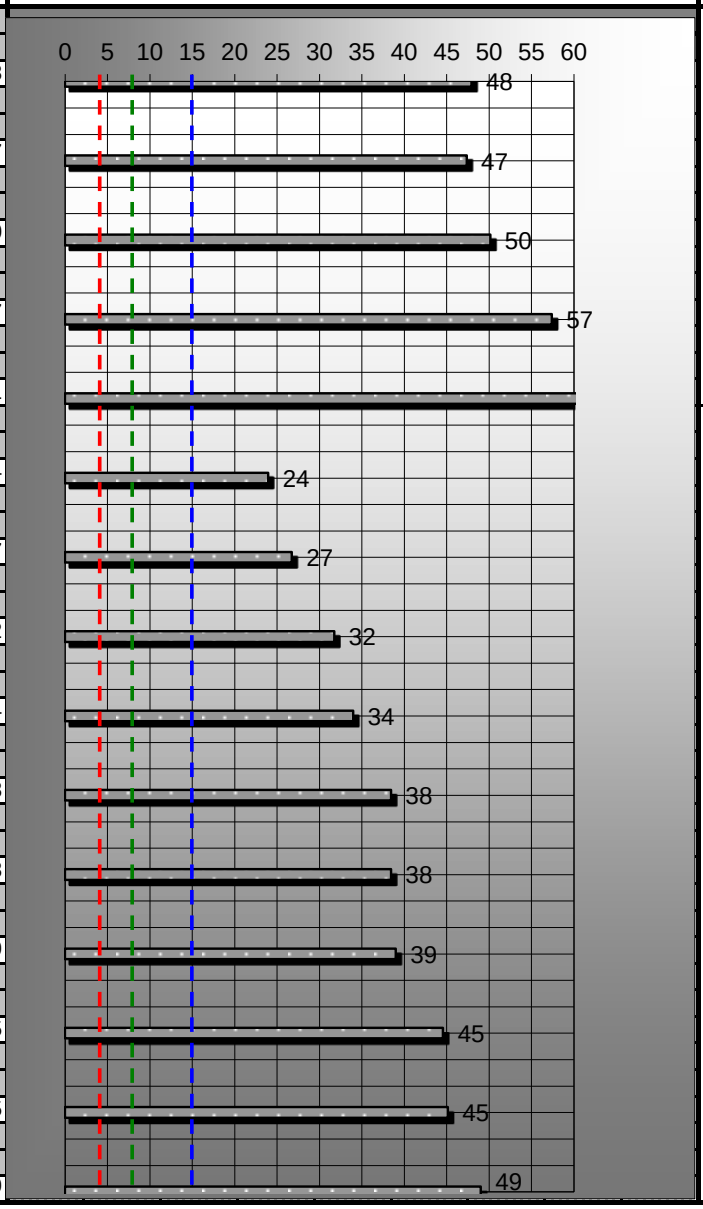
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
9460	30	
9470	27	
9480	29	48
9490	28	
9500	29	
9510	28	47
9520	29	
9530	29	
9540	32	50
9550	34	
9560	31	
9570	38	57
9580	38	
9590	36	
9600	35	61
9610	14	
9620	13	
9630	16	24
9640	14	
9650	17	
9660	17	27
9670	20	
9680	17	
9690	20	32
9700	20	
9710	22	
9720	19	34
9730	23	
9740	20	
9750	26	38
9760	23	
9770	22	
9780	24	38
9790	23	
9800	22	
9810	25	39
9820	25	
9830	25	
9840	30	45
9850	26	
9860	25	
9870	30	45
9880	26	
9890	30	
9900	32	49

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

4 inches dia. tri-cone

4 inches dia. tri-cone

Completely weathered clayey MARLSTONE

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium

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DCPT
Dynamic Cone Penetration Test

Project: BISRI DAM

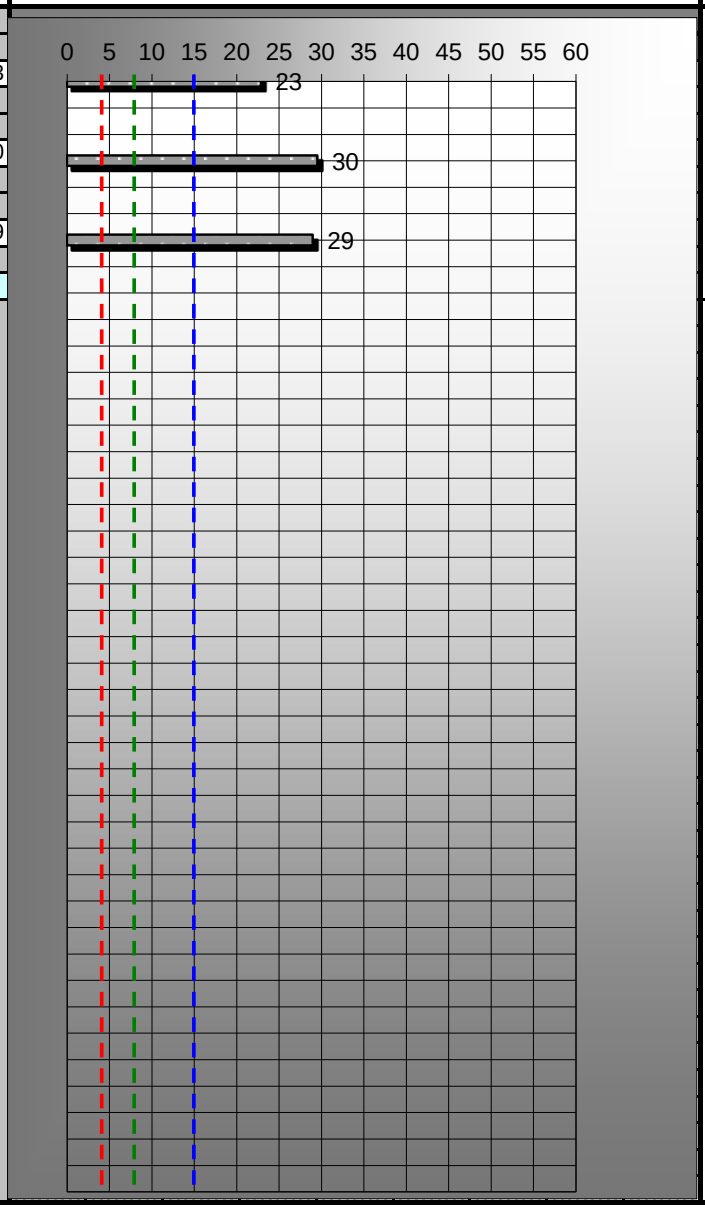
Probing: DCPVL2 (Relocated)

Client: CDR
Consultant: DAR-TALEB
Engineer: E. S. KIRGIZ
Contractor: SATCON Co.
Date: From February 05 to February 18, 2014

Coordinates X: -334,419.02 Y: -61,876.96 Z: +398
Depth: 100m **Groundwater:** +396 (Estimated)
C./D. Rod: 60m (HW) / 6m AW & 94m BW **H.Dia.:** 62.5 to 114mm
SPT Hammer: Automatic Trip **Blow Rate:** 36 bpm
Anvil: Small (~2Kg) **Solid Cone:** 62.5mm dia., 60°

Depth (cm)	DCPT Blows	SPT_E N60
9910	11	
9920	14	
9930	16	23
9940	15	
9950	20	
9960	18	30
9970	16	
9980	17	
9990	19	29
10000	21	
End of probing at 100m		

Graph (SPT_E N60, CORRECTED) E: Estimated (IS 4968)



Description according to BDC 18

Completely weathered clayey MARLSTONE

Sands (SPT N60, Corrected):
0-4: Very loose, 4-10: Loose, 10-30: Medium dense, 30-50: Dense, >50: Very dense.

Clays (SPT N60, Corrected):
<2: Very soft, 2-4: Soft, 4-8: Firm, 8-15: Stiff, 15-30: Very stiff, >30: Hard.

v. soft to soft & v. loose
soft to firm & loose
firm to stiff & loose to medium