# EDAL DRILLING COMPANY LIMITED

# BOREHOLE DRILLING REPORTS

# FOR





### **GUMA VALLEY WATER COMPANY**

**PREPARED BY:** 

EDAL DRILLING COMPANY 49 WATERLOO STREET SIERRA LEONE

FREETOWN

FOR:

GUMA VALLEY WATER COMPANY

SIERRA LEONE

FREETOWN

### SUMMARY

No.	COMMUNITIES	DEPTH(M)	STATUS	AMOUNT(US\$)
1	GRAFTON (MONGEGBA)	70	Marginal	11,875
2	GRAFTON (ORUGU BRIDGE)	67	Successful	12,598
3	GRAFTON (CRS COMPOUND)	60	Dry	7,990
4	REGENT	70	Successful	14,362
	TOTAL	267		46,825

#### **GRAFTON MONGEGBA**

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Item	Requirement	Unit	Quantity	Rate(US\$)	Amount(US\$)
1 1.1	Insurance of works	Sum	Lump		
1.2	Insurance of Construction Plant	Sum	Lump		
1.3	Insurance against damage to person and property	Sum	Lump		
1.4	Insurance of the personal effects of the Project Manager to a value of US\$1000	Sum	Lump		
1.5	Insurance to damage to all property of the employer including consequential replacement of books, measurement and records to a value of US\$1,000	Sum	Lump		
1.6	Provisionn of performance bond	Sum	Lump		
2	Mobilization and demobilization of all necessary plant, office and storage accommodation, ancillary works and services for the drilling, construction, development, pump testing and completion of boreholes; include for clearence of site on completion.	Lump	1	2500	2,500
3	Preparation of borehole sites and reinstatement of borehole sites	No.	1	150	150
4	Provision and erection of temporay fencing to access roads storage and work areas	М	100	0.5	50.0
5	Removal of fencing on completion	Sum	Lump		100
6	Transport rig, plant, materials, equipment etc. between sites set up and dismantle rig, plant, equipment etc. at each borehole (per borehole)	No.	1	525	525
7	Drill 203mm minimum diameter hole from ground level to a maximum of 70m include for geological sampling, penetration rate and sampling	М	70	120	8,400
8	Supply and Install 125mm diameter PVC Casing	м	0	32	0
9	Supply and Install 125mm diameter PVC screen	No.	0	36	0
10	Supply and install gravel Pack	No.	0	450	0
11	Supply grout and place as sanitary seal above gravel (Cement for Backfilling Dry borehole)	No.	2	15	30
12	Cleaning, Development of borehole by airlifting	Hr	1	70	70
13	Transport plant for pump testing between sites, set up and dismantle at each sites	No.	0	250	0
14	Carry out step testpump testing with pump specified, incude for disposal of discharged water (per Hour of pumping)	Hr	0	100	0

		Unit	Quantity	Rate(US\$)	Amount(US\$)
			0	50	0
	arry out recovery tests an according (mer Hinas)	Hr Hr	0	80	0
0	Carry out pump testing with many and the for disposal of discharged with many and the for Supply and Install will many and the for	No	0	200	0
	cement to set	No	0	1	0
18	Provide containers and an and a second	Lump	Sum		
19	Measure and the second	No	1	50	50
20	Prepare and an ager, borehole reports as 2 million and the manner specified.		-		
21	Standing mount many Rate only	+	1		11,875
E	TOTAL Summum diameter 200mm inside	No rat		Τ	Not require
P	damment and all other fittings as specified	No ra	te 4		Not requir
P	22 Community space between content to set	No r	ate 2		Not requ

Geophysi	cs ref.N	No.		-			imited 49 v					Dı	ry		
BH-	01				B	OREHC	LE R	EC	ORD						
Communit	ty		Mongeg	ba Grafton		BH ref. N			BH-01		Nat. grid ref.	ø			
Drilling co				Iling Com	pany	Drill rig			Super DTH		Method	Mud and	Air Drilling		
rilling st			18th No	v 2009		Compl. d	ate		23rd Nov 2009		Operator	Raju Govi	indaraju		
EST PU		G	1			late:					Top of screen	*		m	1
ynamic V			-	m		ump type				August 1	Static WL *			m	
tatic WL			-	m		umping rate (Q)	tete de trans			m³/h	Potential draw		-	m	
rawdown		nd level da	2	m		uration	(0/a)			h	Potential yield		70	m³/h	
r size		E I I I I I I I I I I I I I I I I I I I		FILE	D	pecific capacity	(Q/S)	Æ/	WATER ZONES	m³/h/m WELL DI	Depth of bore AGRAM with	iole ·	70	m	1
TYPE	TEMPORA	SCALE				1	DE	PTH	CUMULATIVE Q (l/min)		AND DYNAMI	C WATER LE	VELS		
"Drag t O4mm) nud Iling)		10 10 20 30 40	Very wea		y Clay	mixed with peb	bles		Muddy			— Cement Se	zal		
' DTH 3MM)	-	50 60 70		ard gabbro	o with				0.04			_ Back fill w	ith Dry cutting		
vel for s	1	80 90 90 10 10 20 30 30 40 pack				M <sup>3</sup> [Remark	s: Marg								
nent for tonite fo	grouti or grou	ing uting				KG KG	s. Marg	mai w	cii						
ralisers	devel	opment	Yes			M HRS Prepare	ed by:	Edal	Drilling Compan	у		(Cont	ractor)		-
ty cap f	itted		Yes		No	Certifie	ed:	Mileon			anti- anti- tanadari a	(Cont			1
fill aba	nd. Bl	н	Yes		No	Approv	ad			-		(Con	sultant)		
	. uate			Section 2000 - No		Approv	CU.								
orm con	nstruc	t. date t adjust.	[												

#### DAILY LOG FOR DRILLING SUPERVISION

		MONGEGB CODE:	A		VVELL		ATE ONTRACTOR		23/11/09 rilling bCompany Limited	
LUU	ATION	START OF			ING		EATHER	Shinning		
	8:15am : 26/11/09	WORKING HR		- WORP		D	URATION OF		Olimiting	
	H OF HO	1	70M			G	EOPHYSICS		MONG/BH - 01	
	H CASED	and the second sec				R	EF. POIMT			
		BOUNDARIES	AND SAMP	LES OF FO	RMATIO					
DEPTH CONT	H OF ACT ZON			NG PROCE		DESCRIPTION OF FORM	NATION	YIELD	REMARKS(Drilling Methering Including change of Bit	
DEPTH		SAMPLE			SPEED	Citty Clay			Started with 10	
0 -	5	5	11:09	11:19	2	Silty Clay			DTH to 45m by	
									air drilling and	
		10	44.00	44.07	0.4	11			later rim with 12	
5	10	10	11:28	11:37	3.4					
									Drag bit by muc	
									drilling to the	
10	15	15	12:15	12:21	1.4	11			basement.	
						"				
15	20	20	12:31	12:34	0.6	11				
						51				
						Very Weathered gabbro mixed	with			
20	25	25	11:34	11:39	1	Pebbles				
						51				
4						11				
25	30	30	11:43	11:57	2.8	88				
						11				
						33				
30	35	35	12:00	12:09	1.8	н			We now cont.	
						11	3		from 45m with	
						11			DTH to 70m by	
35	40	40	12:12	12:17	1.0	51			Air drilling.	
						11				
						1ê				
40	45	45	12.19	12:24	1.0	11				
40	40		12.15	12.27	1.0	11		Muddy		
						Weatherd from 44m to 58m				
45	50	50	4:37	4:57	4.0					
40	50	50	7.07	7.51	4.0	19		1		
		1	1		10					
50	EE	55	5:05	5:47	8.4		and the second	1		
50	55	55	5.05	5.47	0.4	Slightly Hard Gabbro from 58m	to 70m			
						Slightly Hard Gabbio from Som		1		
	00	00	0.50	0.20	64	н				
55	60	60	8:58	9:30	6.4	11		1		
							- the second second			
			0.07	10.00	0.0	11		0.04		
60	65	65		10:06	6.2			0.04		
65	70	70	10:11	10:45	5			1		

#### **GRAFTON (ORUGU BRIDGE)**

Item	Requirement	Unit	Quantity	Rate(US\$)	Amount(US\$)
1 1.1	Insurance of works	Sum	Lump		
1.2	Insurance of Construction Plant	Sum	Lump		
1.3	Insurance against damage to person and property	Sum	Lump		
1.4	Insurance of the personal effects of the Project Manager to a value of US\$1000	Sum	Lump		
1.5	Insurance to damage to all property of the employer including consequential replacement of books, measurement and records to a value of US\$1,000	Sum	Lump		
1.6	Provisionn of performance bond	Sum	Lump		
2	Mobilization and demobilization of all necessary plant, office and storage accommodation, ancillary works and services for the drilling, construction, development, pump testing and completion of boreholes; include for clearence of site on completion.	Lump	0	2500	0
3	Preparation of borehole sites and reinstatement of borehole sites	No.	1	150	150
4	Provision and erection of temporay fencing to access roads storage and work areas	М	100	0.5	50.0
5	Removal of fencing on completion	Sum	Lump		
6	Transport rig, plant, materials, equipment etc. between sites set up and dismantle rig, plant, equipment etc. at each borehole (per borehole)	No.	1	525	525
7	Drill 203mm minimum diameter hole from ground level to a maximum of 70m include for geological sampling, penetration rate and sampling	М	67	120	8,040
8	Supply and Install 125mm diameter PVC Casing	м	55	32	1,760
9	Supply and Install 125mm diameter PVC screen	No.	12	36	432
10	Supply and install gravel Pack	No.	1	450	450
11	Supply grout and place as sanitary seal above gravel (Cement for Backfilling Dry borehole)	No.	8	15	120
12	Cleaning, Development of borehole by airlifting	Hr	6	70	420
13	Transport plant for pump testing between sites, set up and dismantle at each sites	No.	1	250	250
14	Carry out step testpump testing with pump specified, incude for disposal of discharged water (per Hour of pumping)	Hr	1	100	100

Item	Requirement	Unit	Quantity	Rate(US\$)	Amount(US\$)
15	Carry out recovery tests as specified. (per Hour)	Hr	0	50	0
16	Carry out pump testing with pump as specified, include for disposal of discharged water (per Hour of pumping)	Hr	0	80	0
17	Supply and Install well head as specified, Seal annular space between casing and conductor pipe, include for cement to set	No	1	200	200
18	Provide containers and collect water samples	No	1	1	1
19	Measure and record EC, Eh and pH during pump testing and development.	Lump	Sum		50
20	Prepare and deliver to the Project Manager, borehole reports as 2 copies per report in the manner specified.	No	1	50	50
21	Standing time ( per rig hour) Rate only				
	TOTAL				12,598
P1	Supply and install minimum diameter 200mm inside diameter galvanised steel conductor casing as specified,	No rate only	40		Not required

	Supply and install minimum diameter 200mm inside diameter galvanised steel conductor casing as specified, include for centralisers and all other fittings as specified	only	40	Not required
P2	Cement annular space between conductor casing and hole. Include for waiting time for cement to set (per borehole)	No rate only	4	Not required
P4	Carry out geophysical logging as specified	No rate only	4	Not required

			Edal Dril	ling Company Limited	49 waterl	oo Street Sierra L	eone, Free	town BH stat		cessful	
Geophysic		ło.		OREHOLE					Dry	/	
BH-		-	Grafton (Orugu Bridge)	BH ref. No.	NEU	BH-02		Nat. grid ref.	· •	ø	
Communit Drilling co		vr	Edal Drilling Company	Drill rig		Super DTH		Method	Mud Drillin	ng	
Drilling sta		and have been a second and as second and a	24th Nov 2009	Compl. date		24rd Nov 2009		Operator	Raju Govin		and the last of the last
TEST PU		G		Date:		8th Dec 2009		Top of screen * Static WL *		29	m
Dynamic V Static WL			56.31m 0.63m	Pump type Pumping rate (Q)		Pedrollo 54	m³/h	Potential drawd	lown		m
Drawdown			55.68m	Duration		35	min	Potential vield			m³/h
* Levels to	grou	nd level date		Specific capacity (Q/s)	Imp my	0.97	m³/h/m	Depth of boreh AGRAM with	ole *	67	m B
BIT SIZE & TYPE	TEMPORAL	SCALE	PROFILE		TIME/ DEPTH M/MIN	WATER ZONES CUMULATIVE O (l/min)		AGRAM WILL	C WATER LEV	/ELS	SCALE
12" Step Bit (304mm) Mud drilling	MUT		Sandy Clay Coarse		M/MIN	Q (1/min)			Upper g	grout Seal	5
		<u>35</u> <u>40</u> <u>45</u>	Weathered gabbro with	ı pebbles							
		50 55 60 65	Weathered gabbro grav	el with elastic clay					<ul> <li>12m Plain F</li> <li>3m Screen F</li> <li>2m Bail Plu;</li> </ul>	PVC	55 60 65
			Gabbro at the depth of 67					<u> </u>	201 Dali Plu	5	
		70				Π					70
											F
		-				H					-
		-				H					E
		75		- 15 - 15 - 1		П	1			1 00 .	75
Gravel fo Cement fo Bentonite Installatio Cleaning Centralise Safety ca Backfill a Disinfecti Platform of	or gro for g n of g & dev rs fitte band. on da constr	uting routing grout seal velopment ted d BH te uct. date	Yes No Yes No	Approved:	a 15l/m	al Borehole with l			(Cor	ntractor)	
Platform t	ransp	ort adjust		KM Approved:							
Cut acces App.9-2.1	s to si	ie		KM							

#### DAILY LOG FOR DRILLING SUPERVISION

	RACT	GRAFTON(C	RUGU BR	DGE)	WELL I	BH - 02	DATE		5/11/2009
LOC	ATION	CODE:				~ ~	CONTRACTOR	Edal Dr	illing bCompany Limited
1.23		START OF	1	WOR	KING H	R: 5:18Pm	WEATHER	ļ	Shinning
TIME:	9:10:15an	WORKING HR					DURATION OF		
	24/11/09						RAINFALL		
DEPT	H OF HOL	.E (M)	67M				GEOPHYSICS		GF/OB/BH - 02
	H CASED						REF. POIMT	1	
		BOUNDARIES	-			DESCRIPTION OF	EODMATION	YIELD	REMARKS(Drilling Method
DEPT		-	DRILLI	NG PROCE	:55	DESCRIPTION OF	FORMATION		including change of Bit
DEPTI		SAMPLE	FROM	то	SPEED			1	<u> </u>
0 -		5	1:12	1:17	1	Silty Clay			Started with 12"
0 -	5		1.12	1.17	· · · ·	"	and the second		drag bit by
									doing mud drillin
			1.10	1.0.1		11			up to 67m
5	10	10	1:19	1:24	1	11			and the second se
									before we
						88			encounter the
10	15	15	1:27	1:30	0.6	11			basement at 67
						FF			
						H			
15	20	20	1:33	1:37	0.8	Darkish Coarse			
13	20	20	1.00	1.01	0.0	"			
						11			
0.0	05	05	4.40	4.40	0.0	Ħ		1	
20	25	25	1:40	1:43	0.6				
						11			
25	30	30	1:49	1:56	1.4	11		ļ	
						11			
						88			
30	35	35	2:05	2:09	0.8	Weathered Gabbro			
00	00								
						11			
05	40	40	2.26	2.20	0.0	58		1	
35	40	40	2:26	2:30	0.8	11			
_						88		-	
40	45	45	2:36	2:42	1.0	Fine sand with coarse		-	
						•		Muddy	
						1			
45	50	50	3:01	3:08	1.4	1			
						weathered Gabbro gravel			
						withy clay			
50	55	55	3:12	3:25	2.6				
50	55	55	3.12	3.23	2.0	88			
						FE			
								-	
55	60	60	3:29	3:34	1.0	##			
						68			
		1						1	
						"			

App.9-2.9

### SIERRA LEONE GUMA VALLEY WATER COMPANY Borehole Step Test - Discharge Period (MECHANIZED)

Communi	ty: (	Grafton( C	)rugu Bridge	e)		Date:		08th Dec 2	009
Location (	Code: 🧯 🤇	Beside Or	ugu Bridge			Tested by:		EDAL DRIL	LING CO LTD
Boreholes	Ref No:	BH - 02				Ht. of datu	m	0.17	
						above GL(	m)		
Datum lev	x Top of c	asing					,		
Datame	Base sla								
	Other S	pecify				Depth		67m	
Static wate	er leve 0.63					Pump setti	ng	60m	
	CONSTANT	DISCHAR	GE			CONSTAN	T DISCHA	RGE	
Time	Time since	Contraction of the local division of the loc	Water level	Draw-	Time		Discharge		Drawdown
	pumping	rate(lprm)	below	down		pumping	rate	below	(m)
	began(min)		datum(m)	(m)		began(min)	(lprm)	datum	
	STEP	TEST	ONE	(1)		ST	EP TE	ST TW	<b>IO (2)</b>
11:46	0	60	0.63	(-/		0			
11.40	1	60	10.80	10.17		1			
	2	60	13.70	13.07		2			
	3	60	16.50	15.87		3			
	4	60	17.13	16.50		4			
	5	60	20.61	19.98		5			
	6	60	21.93	21.30		6			
	7	60	26.20	25.57		7			
	8	60	29.90	29.27		8			
	9	60	38.80	38.17		9			
	10	60	39.81	39.18		10			
	15	15	44.35	43.72		15			
	20	15	49.71	49.08		20			
	25	15	51.38	50.75		25			
	30	15	53.79	53.16		30			
	35	15	56.31	55.68		35			
	40					40			
	45					45			
	50					50			
	55					55			
19:00	60					60			
			64						
			10						
			1°						
							-		

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#### GRAFTON (CRS COMPOUND)

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Item	Requirement	Unit	Quantity	Rate(US\$)	Amount(US\$)
1 1.1	Insurance of works	Sum	Lump		
1.2	Insurance of Construction Plant	Sum	Lump		
1.3	Insurance against damage to person and property	Sum	Lump		
1.4	Insurance of the personal effects of the Project Manager to a value of US\$1000	Sum	Lump		
1.5	Insurance to damage to all property of the employer including consequential replacement of books, measurement and records to a value of US\$1,000	Sum	Lump		
1.6	Provisionn of performance bond	Sum	Lump		
2	Mobilization and demobilization of all necessary plant, office and storage accommodation, ancillary works and services for the drilling, construction, development, pump testing and completion of boreholes; include for clearence of site on completion.	Lump	0	2500	0
3	Preparation of borehole sites and reinstatement of borehole sites	No.	1	150	150
4	Provision and erection of temporay fencing to access roads storage and work areas	М	100	0.5	50.0
5	Removal of fencing on completion	Sum	Lump		
6	Transport rig, plant, materials, equipment etc. between sites set up and dismantle rig, plant, equipment etc. at each borehole (per borehole)	No.	1	525	525
7	Drill 203mm minimum diameter hole from ground level to a maximum of 70m include for geological sampling, penetration rate and sampling	м	60	120	7,200
8	Supply and Install 125mm diameter PVC Casing	м	0	32	0
9	Supply and Install 125mm diameter PVC screen	No.	0	36	0
10	Supply and install gravel Pack	No.	0	450	0
11	Supply grout and place as sanitary seal above gravel (Cement for Backfilling Dry borehole)	No.	1	15	15
12	Cleaning, Development of borehole by airlifting	Hr	0	70	O
13	Transport plant for pump testing between sites, set up and dismantle at each sites	No.	0	250	0
14	Carry out step testpump testing with pump specified, incude for disposal of discharged water (per Hour of pumping)	Hr	0	100	0

			Quantity	Rate(US\$)	Amount(US\$)
		Unit	Quantity		
1	Requirement		0	50	0
tem		Hr	0		
15	Carry out recovery tests as specified. (per Hour) Carry out pump testing with pump as specified, include for Carry out pump testing water (per Hour of pumping)	Hr	0	80	0
16	disposal of discharged water of	No	0	200	0
17	Supply and Install well head as specified, Seal annular space between casing and conductor pipe, include for		-	1	0
	cement to set	No	0		
18	Provide containers and collect water samples	Lump	Sum		
19	and development.	No	1	50	50
20	Prepare and deliver to the Project Manager, borehole reports as 2 copies per report in the manner specified.	+	+		
2.	is time ( per rig hour) Rate only	+	+		7,990
F	TOTAL				
	the 200mm inside	No ra only			Not require
	diameter galvanised steel and all other fittings as specified include for centralisers and all other fittings as specified	No ra			Not requir
	P2 Cement annular space between conductor casing and hole. Include for waiting time for cement to set (per borehole)	No	rate	4	Not requi
	P4 Carry out geophysical logging as specified	or	nly		

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Geophysic	s ref N	lo.	Ec	lal Dril	lling Co	mpany Limited	49 waterl	oo Street Sierra Le	cone, Freeto	own BH stat	us: Suo Dr	ccessful y	
BH-0				E	BOR	EHOLE	REC	ORD					
ommunit			Grafton (CRS Cor		1	BH ref. No.		BH-03		Nat. grid ref.	0		
rilling co		or	Edal Drilling Con			Drill rig		Super DTH		Method	Air Drillin		
rilling sta	art date		26th Nov 2009		1	Compl. date		27th Nov 2009		Operator	Raju Govii	ndaraju	
EST PUI	1000	G			Date:		101 - 101 -			Top of screen <sup>3</sup> Static WL *			m m
ynamic W			m		Pump ty	ype ig rate (Q)			m³/h	Potential draw	down		m
atic WL			m		Duratio	the second strategy and second		1	<u>h</u>	Potential yield			m³/h
		nd level d			1	c capacity (Q/s)			m³/h/m	Depth of boreh	ole *	60	m
T SIZE		E	PROFILE			10 da	TIME/	WATER ZONES		AGRAM with		UTEL C	11400
TYPE	TEMPORA IS'	SCALE					DEPTH M/MIN	CUMULATIVE Q (l/min)	STATIC A	AND DYNAMIO	WATER LE	VELS	0
													-
		-						Н	8-1-1-1		Cemen	it Seal	F
								H					F
		10	r :	teritic C	law			Н					
		-	LI	tentic C	lay			H					F
								H					-
		20						H					
Step								H					-
4mm)		-						H					E
		20-				1 A		H					-
		30						H					-
		1 ]	N		dan m'	d with askt1		H					F
		-	Very weathered li	teratic o	hay mixe	u with peoples		H					F
		40											-
		-						muddy					F
		1						H					-
		50						Н					-
								F			Back fill w	ith Dry cuttir	g_
		-						H					E
			Slightly Hard	Gabbro				H					-
3MM)		60									and the second		-
		1 7						H					-
		-						H					F
		70											
		-											F
		1 7						H					-
		80						H					
	-							H					F
								I					F
		90					-	H					-
													_
		17						H					-
								Ħ					F
		100						Н					
								H					F
		17						H					-
		110											
								H					-
								H					F
		120						H					-
													_
		1						H					-
													F
		130						Н					
													F
		1						H	1				
		140						H					F
ivel fo nent fo	r grav	el pack			M <sup>3</sup> KG		Dry						
ntonite	e for g	routing			KG								
tallatic	on of g	grout sea			M			dal Drilling Comp	any				
aning ntralise	æ dev ers fitt	velopmented	Yes	N	HR 0		y. E	aa Drinnig Comp	ally		(Ce	ontractor)	
ety ca	p fitte	d	Yes	N	0	Certified:					(0	onsultant)	
ckfill a			Yes	N	0	Approved:					(C	onsultant)	
tform	consti	ruct. date			123								
tform		ort adju	st.		KN KN								

I

#### DAILY LOG FOR DRILLING SUPERVISION

ONTR		CRS COMP	OUND	V	NELL	BH - 03 DATE	1	27/11/09 rilling bCompany Limited
LOCA	TION (	CODE:					Edal DI	
		START OF	END OF	WORK	ING H	R: 4:16pm WEATHER	-	Shinning
IME: 8	:15am	WORKING HR	8			DURATION OF		
	26/11/09				-	RAINFALL		000/011 00
DEPTH	OF HOL	E (M)	60M			GEOPHYSICS		CRS/BH - 03
	CASED(					REF. POIMT	1	
ITHOL	OGICAL	BOUNDARIES	AND SAMPL	ES OF FOF	RMATION	1		
DEPTH			DRILLIN	G PROCES	SS	DESCRIPTION OF FORMATION	YIELD	REMARKS(Drilling Method
CONTA	ACT ZON	E						including change of Bit
DEPTH	and the second se	SAMPLE	FROM	ТО	SPEED			
0 -	5	5	9:08	9:13	1	Literitic Clay		Started with 10"
-						H		DTH to 57m
-						÷		and Cont. with 8'
	-		0.15	0.00	4 4	11	1	DTH to 60m
5	10	10	9:15	9:22	1.4		1	
						11		
10	15	15	9:25	9:33	1.6	11		
10	15	13	0.20	0.00	1.0	<b>7</b> <i>t</i>		
15	20	20	9:35	9:44	1.8	11		
						11		
						Very Weathered gabbro mixed with		
							1	
20	25	25	9:48			Pebbles		
						п		
	e.					11		
05	20	20	0.55	10:05	2	88		
25	30	30	9.00	10.03		11		
30	35	35	10:10	10:18	1.6	"		
						11		
-							mu	ddy
			1.0.0	10.01	4.4		1	
35	40	40	10:24	10:31	1.4			
-						88		
-	45	45	11.16	11:30	2.8	н		
40	45	45	11.10	11.50	2.0	H		
						11	-	
45	50	50	11:34	11:43	1.8	11		
140	00					н		
		1	1		100	11		
-			1=		-			
50	55	55	11:47	11:54	1.4			
						From 57m to 60 m Slightly Hard gabbro		
						**		
-	00	00	12.01	12:11	2.0			
55	60	60	12.01	12.11	2.0			
		65	1					
60	65	1 00		1	1			

#### REGENT

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Item	Requirement	Unit	Quantity	Rate(US\$)	Amount(US\$)
1	Income of second a	Sum	Lump		
1.1	Insurance of works	Juli	Lump		
1.2	Insurance of Construction Plant	Sum	Lump		
1.3	Insurance against damage to person and property	Sum	Lump		
1.4	Insurance of the personal effects of the Project Manager to a value of US\$1000	Sum	Lump		
1.5	Insurance to damage to all property of the employer including consequential replacement of books, measurement and records to a value of US\$1,000	Sum	Lump		
1.6	Provisionn of performance bond	Sum	Lump		
2	Mobilization and demobilization of all necessary plant, office and storage accommodation, ancillary works and services for the drilling, construction, development, pump testing and completion of boreholes; include for clearence of site on completion.	Lump	0	2500	0
3	Preparation of borehole sites and reinstatement of borehole sites	No.	1	150	150
4	Provision and erection of temporay fencing to access roads storage and work areas	М	100	0.5	50.0
5	Removal of fencing on completion	Sum	Lump		
6	Transport rig, plant, materials, equipment etc. between sites set up and dismantle rig, plant, equipment etc. at each borehole (per borehole)	No.	1	525	525
7	Drill 203mm minimum diameter hole from ground level to a maximum of 70m include for geological sampling, penetration rate and sampling	М	70	120	8,400
8	Supply and Install 125mm diameter PVC Casing	М	31	32	992
9	Supply and Install 125mm diameter PVC screen	No.	39	36	1,404
10	Supply and install gravel Pack	No.	1	450	450
11	Supply grout and place as sanitary seal above gravel (Cement for Backfilling Dry borehole)	No.	10	15	150
12	Cleaning, Development of borehole by airlifting	Hr	4	70	280
13	Transport plant for pump testing between sites, set up and dismantle at each sites	No.	1	250	250
14	Carry out step testpump testing with pump specified, incude for disposal of discharged water (per Hour of pumping)	Hr	4	100	400

							1(201	Amou	nt(US\$)
			Unit	Qu	antity	Rate(	(\$2)	Turr	
		Requirement		Γ	1	5	0		50
15	Carry (	out recovery tests as specified. (per Hour)	Hr Hr	$\square$	12	8	30		960
16	dispos	out recovery out pump testing with pump as specified, include for sal of discharged water (per Hour of pumping)	No	F	1	1	200		200
17	space	ly and Install well head as specified, Seal annular e between casing and conductor pipe, include for	-	+	1	T	1	T	1
18	1	ent to set vide containers and collect water samples	No Lump	T	Sum	T			50
19	Mea and	asure and record EC, Eh and pH during pump testing development.	No	+	1	+	50	T	50
20	rep	epare and deliver to the Project Manager, borehole ports as 2 copies per report in the manner specified.	$\top$	T				+	14,362
2	1 St	anding time ( per rig hour) Rate only						_	14,302
E		OTAL	No	rate	40	Τ			Not required
	c i	Supply and install minimum diameter 200mm inside diameter galvanised steel conductor casing as specified, include for centralisers and all other fittings as specified Cement annular space between conductor casing and	No	nly o rate only	4				Not require
P2	P2	hole. Include for water g		lo rate only		4			Not requi
	P4	Carry out geophysical logging as specified		Uniy					

			I	BOREHOLE	RECU	JKD		Nat. grid ref.			
univites.			IN DECCRIPTION	BER ref. No.		BEI-04 Super DTH		Method	Mud Drillin	g/Air Drilling	
ng/(cccmnitt			Edital Defilling Company	Drill rig Compl. date		03rd Dec 2009		Operator	Raju Govin		m
ug sättmatt			30mb New 2009	Date:		6th Jan 2010		Top of screen ' Static WL *		23 m m 160 //m 70 m VELS grout Scal	m
mic: Wi			29.26m	Pump type		Pedrollo 925.2	m³/h	Potential draw	down		m
WIL *			3.08m	Pumping rate (Q)		925.2	HRS	Potential yield			l/m m
ationwarzi I	(si)		26.18m	Duration Specific capacity (Q/s)		35.34	m³/h/m	Depth of bore			E
sedis to	ground 3	lievel dat	PROFILE	A REAL PROPERTY AND A REAL	TIME/ DEPTH	WATER ZONES CUMULATIVE	STATIC	AGRAM with	C WATER LEY	VELS	SCALE
PE	TIMPORAN	SCAL	6		M/MIN	Q (l/min)		9			F
Step (mm) d ling		5	Weathere latera	tic gabbro					Upper		
5" DTH 03mm) ir drilli			Moderatly we with quartzite	athere granite with collaborat vein	te				Grav		
		30		Lubbra		137					
		40 45 50 5:		athered granite with more		160					
			0 0 			160					
		7	70 	39	narks: S	uccessful Boreho	le				
Ce	ment	for grou	ting	400 KG KG							
Tan	atallat	ion of or	rout seal	10 M 4 HRS Pre	epared by:	Edal Drillin	ig Compan	у		(Contrac	tor)
1111	Constantine and	· P. dev	elopment ed Yes	No No	and a second second						

Cut acces App.9-2.1

# EDAL DRILLING COMPANY LIMITED

# BOREHOLE DEVELOPMENT FORM

					Date:	1st Dec 2009
community:	REGENT				Tested by:	EDAL DRILLING CO LTD
ocation Code:			lami Fatu House	9	Ht. of datum	0.07m
Soreholes Ref No	0:8	BH - 04	-			
Type of Test	x Step dra Constan	wdown t discharge				
Datum level	x Top of c Base sla	ab			Depth	70m
Static water leve	Other S 4.78	pecity			Total time of	of development 4Hrs
Time		Position of	Yield	Pressure bar		Observations
From	То	pipe BGL	lpm	Dai		
10:00am	11:00am	69	145	14		Muddy water lifted
10:16	11:16	56	160	14	Clea	ar water with sand particls
11:25	12:25	46	168	14		Clean water
11.20						
	13:40	69	178	14	V	ery clear water lifted
12:40	13.40					

#### DAILY LOG FOR DRILLING SUPERVISION

	AOT	REGENT		1	WELL	BH - 04 DA	TE	30 - 3	1/11/2009
		CODE:					NTRACTOR	Edal Dr	illing bCompany Limited
LUCA				WORK	INGH	the second se	ATHER		Shinning
		START OF WORKING HR	100	WORK			RATION OF		
						RAI	INFALL		
DATE: 3		5.00	70M			GE	OPHYSICS		RGT/BH - 04
	OF HOL		70M			RE	F. POIMT		
	CASED(	(M) BOUNDARIES			PMATIO				
DEPTH		BOUNDARIES	1	NG PROCE		DESCRIPTION OF FORM	ATION	YIELD	REMARKS(Drilling Method
1	CT ZON	IE							including change of Bit
DEPTH		SAMPLE	FROM	то	SPEED			ļ	
0 - :	5	5	11:49	11:57	1.6	Weathered Literitic gabbro			Started with 10"
-						25	18179		DTH to 11m
						11			and cont. 8" DTH
<u> </u>	10	10	0.44	0.00	1.2	88			to 70m by air
5	10	10	3:14	3:20	1.2	88			drilling
-									
						Moderatly weathered granite with	1	1	
10	15	15	10:21	10:36	3	collaborate with quartzite vein			
						FF			
						88			
	~~	00	10.10	10.51	2.2	11		-	
15	20	20	10:40	10:51	2.2				
					_				
						н			
20	25	25	10:55	11:10	3	11			
						11			
		1	1			11			
05	00	30	11:21	11:35	2.8	11			
25	30	30	11.21	11.55	2.0	11			
						88			
								107	
30	35	35	11:41	11:54	2.6	11		137	
						11			
						Slightly hard gabbro from 37m to	o 44m		
05	40	40	11.56	12:10	2.8	"		1	
35	40	40	11.50	12.10	2.0				
								100	
40	45	45	12:14	12:30	3.2	Moderatly weathered granite with	n	160	
						more quartzite vein to 67m			
						11			
45	50	50	12.36	12:48	2.4	11			
40	50	50	12.00	12.40	<u>2.</u> -r	H			
								-	
50	55	55	12:53	1:08	3.4	2			
						59			
55	60	60	1:13	1:23	2.0	58			
-						FF			
-						Gabbro			
-		05	4.07	4.00	0.0			160	
60	65	65	1:27	1				1	1
65	70	70	1:45	1:58	2.6			157	

App.9-2.9

### SIERRA LEONE GUMA VALLEY WATER COMPANY Borehole Step Test - Discharge Period (MECHANIZED)

Community:	REGENT	Date:	09TH Dec 2009
Location Code:	( Opposite Mami Fatu House	Tested by:	EDAL DRILLING CO LTD
Boreholes Ref No:	BH - 04	Ht. of datum above GL(m)	0.67
Base	f casing slab Specify	Depth	70m
Static water level 2.5	54	Pump setting	40m

	CONSTANT	DISCHARG	E			CONSTAN			
Time	Time since		Water level	Draw-	Time	Time since	Discharge	Water level	Drawdown
me	pumping	rate(lprm)	below	down		pumping	rate	below	(m)
	began(min)		datum(m)	(m)		began(min)		datum	
		TEST	ONE	(1)		ST		ST TW	O (2)
18:00	0	120	2.54			0	210	17.92	45.50
10.00	1	120	6.84	4.30		1	210	18.1	15.56
	2	120	8.16	5.62		2	210	18.24	15.7
	3	120	9.54	7.00		3	210	18.56	18.56
	4	120	10.17	7.63		4	210	18.79	16.25
	5	120	11.09	8.55		5	210	19.94	17.4
	6	120	11.89	9.35		6	210	19.08	16.54
	7	120	12.51	9.97		7	210	19.14	16.6
-	8	120	13.21	10.67		8	210	19.26	16.72
	9	120	13.93	11.39		9	210	19.31	16.77
	10	120	14.66	12.12		10	210	19.39	16.85
	15	120	16.04	13.50		15	210	19.43	16.89
	20	120	16.64	14.10		20	210	19.48	16.94
	25	120	17.00	14.46		25	210	19.51	16.97
	30	120	17.32	14.78		30	210	19.55	17.01
	35	120	17.16	14.62		35	210	19.61	17.07
	40	120	17.64	15.10		40	210	19.64	17.1
	45	120	17.81	15.27		45	210	19.67	17.13
	50	120	17.85	15.31		50	210	19.72	17.18
	55	120	17.89	15.35	5	55	210	19.78	17.24
19:00	60	120	17.92	15.38	-	60	210	19.82	17.28
19.00		120							
					-	-			
			3		-				

### SIERRA LEONE GUMA VALLEY WATER COMPANY Borehole Step Test - Discharge Period (MECHANIZED)

Communi	ty: C	REGENT				Date:		09th Dec 20	09	
Location (		Opposite N	∕lami Fatu ⊦	louse		Tested by:		EDAL DRILL	ING CO LTD	
Boreholes		BH - 04		, a		Ht. of datur				
Datum le		-				above GL(r	n)			
	Base sla Other S					Depth 70m				
Static wa	ter lev 2.54					Pump setting 40m				
	CONSTANT	DISCHARG	F	* . e		CONSTAN	T DISCHA	RGE		
Time	Time since		Water level	Draw-	Time	Time since	Discharge	Water level	Drawdown	
Time	pumping	rate(lprm)	below	down		pumping	rate	below	(m)	
	began(min)		datum(m)	(m)		began(min)		datum		
	and the state of the	TEST T	HREE	(3)		STE	P TES	ST FOL	JR (4)	
18:00	0	350	19.82			0	400	27.31		
10.00	1	350	22.46	19.92		1	400	28.34	25.8	
	2	350	22.81	20.27		2	400	28.69	26.15	
	3	350	23.11	20.57		3	400	28.96	28.96	
	4	350	23.59	21.05		4	400	29.12	26.58	
	5	350	23.94	21.40	-	5	400	29.31	26.77	
	6	350	24.33	21.79		6	400	29.56	27.02	
	7	350	24.64	22.10		7	400	29.73	27.19	
	8	350	24.81	22.27		8	400	29.86	27.32	
	9	350	24.97	22.43		9	400	29.93	27.39	
	10	350	25.12	22.58	_	10	400	30.04	27.5	
	10	350	26.10	23.56		15	400	30.26	27.72	
	20	350	26.34	23.80		20	400	30.31	27.77	
-	20	350	26.51	23.97	-	25	400	30.49	27.95	
-	30	350	26.74	24.20	-	30	400	30.51	27.97	
	30	350	26.81	24.27	-	35	400	30.58	28.04	
	33	000	20.01						00.00	

24.37

24.42

24.54

24.62

24.77

26.91

26.96

27.08

27.16

27.31

400

400

400

400

400

40

45

50

55

60

30.63

30.68

30.71

30.76

30.8

28.09

28.14

28.17

28.22

28.26

350

350

350

350

350

350

35

40

45

50

55

60

19:00

# SIERRA LEONE GUMA VALLEY WATER COMPANY Borehole Step Test - Recovery Period (MECHANIZED)

-	REGENT		Date: 0	9th Dec 2009	
Community	( Opposite Mami	Fatu House	Tested by: E	DAL Drilling Co. L	td
Location Code: Boneholes Ref No:	BH - 04		Ht. of datum above GL(m		57
Bas	o of casing se slab ner Specify		Depth	70m	
			Pump settin	1g 40m	

Static water level 2.54

RECOVERY Discharge Water level Drawdown Time since Discharge Water level Draw-Time (m) below Time since rate pumping Time down below rate(lprm) datum pumping began(min) (lprm) datum(m) (m) began(min) RECOVERY 30.80 400 0 18:00 22.10 24.64 400 1 20.30 22.84 400 2 17.58 20.12 400 3 15.80 18.34 400 4 17.00 14.46 400 5 12.97 15.51 400 6 11.85 14.39 7 400 11.27 13.81 400 8 9.99 12.53 400 9 17.40 19.94 400 10 8.88 6.34 400 15 4.80 7.34 400 20 4.30 6.84 400 25 4.00 6.54 400 30 3.67 6.21 400 35 3.39 5.93 400 40 3.20 5.74 400 45 2.97 5.51 400 50 2.94 5.48 400 55 2.82 5.36 400 60 19:00

# SIERRA LEONE GUMA VALLEY WATER COMPANY

12HRS Borehole Pump Test - Constant Discharge Period (MECHANIZED)

Community: REGENT

Location Code: Opposite Mami Fatu House

Boreholes Ref No: 👔 BH - 04

Datum level: x Top of casing Base slab Other Specify

Static water leve 3.08

Date: 6th Jan 2010 Tested by: EDAL DRILLING CO LTD Ht. of datum 1.88m above GL(m) Depth 70m

38m

Pump setting

CONSTANT DISCHARGE				CONSTANT DISCHARGE					
Time Time since			Water level	Drawdown	Time	Discharge	Time since	Water level	Drawdown
	pumping	rate	below datum	(m)		Rate	pumping	below	(m)
	began(min)	(l/m)	(m).			(l/m)	began(min)	datum	*
10:35	0	300	3.08						
	1	300	9.23	6.15	15:35	257	420	29.23	26.15
	2	300	12.80	9.72	16:35	257	480	29.24	26.16
	3	300	14.57	11.49	17:35	257	540	29.25	26.17
	4	300	15.93	12.85	18:35	257	600	29.25	26.17
	5	300	17.50	14.42	19:35	257	660	29.25	26.17
	6	300	18.91	15.83	20:35	257	720	29.26	26.18
	7	300	19.35	16.27					
	8	300	20.74	17.66					
	9	300	21.36	18.28					
	10	300	22.11	19.03					
	15	300	24.00	20.92					
	20	300	24.11	21.03					
	25	300	27.20	24.12					
	30	300	28.02	24.94					
	35	300	29.00	25.92					
	40	300	29.05	25.97					
	45	300	29.07	25.99					
	50	300	29.08	26.00					
	55	300	29.09	26.01					
11:35	60	300	29.10	26.02					
	75	225	29.12	26.04					
	90	225	29.42	26.34					
	105	225	29.42	26.34					
12:35	120	225	29.42	26.34					
	135	225	29.05	25.97					
	150	257	28.91	25.83					
	165	257	28.92	25.84					
13:35	180	257	28.91	25.83					
	210	257	28.91	25.83					
14:35	240	257	28.92	25.84					
	270	257	28.93	25.85					
15:35	300	257	28.93	25.85					
	330	257	28.94	25.86					
14:35	360	257	28.95	25.87					

### SIERRA LEONE GUMA VALLEY WATER COMPANY 6HRS Borehole Pump Test - Recovery Period (MECHANIZED)

	REGENT	Date: 06th	06th Jan 2010	
Community:	Opposite Mami Fatu House	Tested by: EDA	L DRILLING CO LTD	
Location Code: Boreholes Ref No:	вн - 04	Ht. of datum above GL(m)	1.88m	
Datum level x Top of casing Base slab		Depth	70m	
Other Static water level	Specify 3.08	Pump setting	38m	

	RECOVERY					RECOVERY			
						Time since	Water level	Drawdown	
ime	Time since	Discharge	Water level	(m)	Time	pump	below	(m)	
	pump	rate	below datum	(11)		stopped(min)	datum		
	Stopped(min)	(iprm)	(m)			otoppe-(- /			
20:35	0	257	29.26	24.42		420			
	1	257	27.50			480			
	2	257	25.10	22.02		540			
	3	257	20.80	17.72		600			
	4	257	16.61	13.53		660			
	5	257	13.21	10.13		720			
And	6	257	10.70	7.62		120			
	7	257	8.90	5.82					
	8	257	7.83	4.75					
	9	257	7.00	3.92					
	10	257	6.41	3.33		_			
	15	257	5.35	2.27					
20:55	20	257	4.85	1.77	_				
	25								
	30								
	35								
	40								
	45								
	50								
	55								
	60								
	75								
	90								
	105	-							
-	120								
	135								
	150								
	165		2					-	
	180	-	-						
	210								
	240								
	240								
	300					-			
	330								
	360							1	