EW – 7

SITE REPORT RELATED TO THE CARRYING OUT OF THE BOREHOLE EW7 " ECOLE KPANGABA "

I - INRODUCTION

Works on the site EW7 stared on November 12 th, 1998, and ended on November 21 st, 1998

We did not meet any difficulty apart from the road in bad repair.

We reached the insular shelf t 24,50m while the geophysical study foresaw it at 50 m . In general works went on very well.

II - DRAWINGS

Briefly, this illustration of the progress of the works in time presents difficulties we met during the implementation of the site. This presentation takes into account only the day when the drilling works started.

INTERPRETATION

The curve can be broke down into three parts : A,B,C.

Part A : Corresponds to the step of the drilling in the zone above the insular shelf . At the first day we noticed that the progress was good and we reached 20 m depth. The nex day, as the mud pump suck up sand we did not drill further, but we reached the insular shelf at 24,50 m.

Part B : We met difficulties with the 10 inch temporary casings and the repairing of the pump, then we had to polish the borehole to enable the 10 inch temporary casings to go down in a good condition.

Part C : Corresponds to the drilling in the insular shelf (limestone). The insular shelf has been reached at 24.50 m and as the layer was very cracked, the progress was good : we attained 50,25 m. The next day, in order to take care of any collapsing, we drilled 1,25 m more, so the depth was about 51,50 m.

But let us notice that while installing the equipments there was a zone which was sticking and we were obliged to polish again before installing the equipements.

III - DIFFICULTIES WE MET

On this site the difficulties we met were not like those we met on the other sites. The difficulties we met are :

- The breakdown of the mud pump
- Jammings while installing the 10 inch casings and while installing the final equipments.

IV - CONCLUSION

Works went on very well in general and it was thhe first time we did works very fast considering the other sites where we met many difficulties in the carrying out of the works.

NB : Hereto

- Sheets of daily site report
- Drilling card (borehole drawing + lithology).

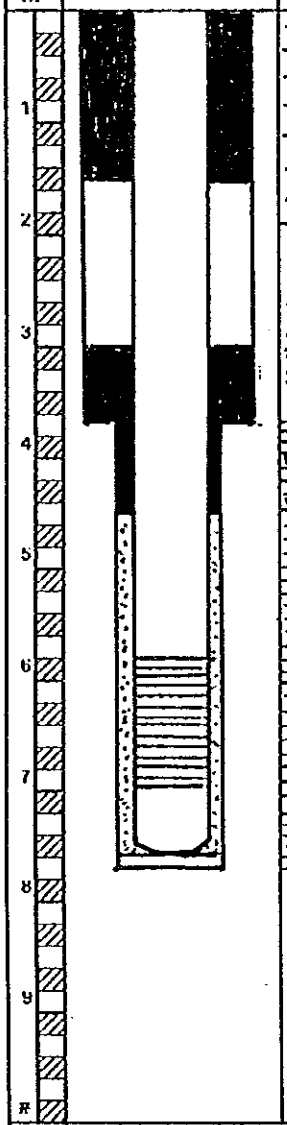
DIRECTION GENERALE DE L'HYDRAULIQUE

REPUBLIQUE CENTRAFRICAINE
Unité - Dignité - Travail

PROJET MISE EN VALEUR DU SECTEUR DE L'EAU
EN REPUBLIQUE CENTRAFRICAINE

FICHE DE FORAGE

Données Géographiques	Données de foration	Données de forage
Préfecture de:.....	Appareil de Forage: SANDVIK KDEX	N° de Forage: EW 7/.....
Sous/Préfecture de :.....	Poste de Travail n°: 6.....	Débit Air lift:..... .....m3/h
Commune de:.....	Chef de chantier: LAVOU Léon	Débit d'essai: .....m3/h.
Groupement de quartiers:.....	Date Début: 12 /11 /1998	N.S..... .....m3/h.
Quartier:.....	Date Fin: 21 /11 /1998	N. Dynamique:..... .....m
Coord. Géogr. LONG:..... LAT..... ALT:.....		Transmissivité m2/s



Prof. N.S/V.E.	Observations
2,00m ▽	
	→ Zones aquifères – 29,50 m – 40,00 – 48,00 m
	→ Débits de marteau à : 32m → Q_{32m} = 28 m³/h 44m → Q_{44m} = 54 m³/h
29,50	→ Eboulement de 0,60 m ramenant le fond du forage à 50,90m
40,00	→ Pour des raisons de qualité (d'eau) nous avons lors du captage, supprimé les premières venues d'eau
47,00	

Forage			Tube Provisoire			Tube d'équipement				Gravier annulaire		Autres renseignements
Diam	de	à	Diam	de	à	Plein		Crépine		Calibre	2-5 mm	Hydrogéologue:
17.1/4"	0 m	24,50	10"	+0,40	24,50	de	à	de	à	Vol. lin.	28	Date / /19.....
9. 5/8"	24,50	51,50	8"			50,9	44,6	44,6	38,6	Hauteur	20,9	Signature
7. 5/8"			7"			36,60	41,60			Quantité	5.852	
6 .1/4"			Cimentation			de 0 m	à	40m		de 28m	à 30m	

EW-07(4/6

DIRECTION GENERALE
DE L'HYDRAULIQUE

PROJET MISE EN VALEUR DU SECTEUR EAU
PNUD / FENU / DAES. CAF/97/011

N° [ ][ ][ ][ ]

FICHE ANALYSE CHIMIQUE

N°. : .....
IRH : .....
N° de forage : EW7.....

Enquêteur: BIDANA FABIEN
Laboratoire : Projet
Dates d'analyse : 29/12/98 - ...../...../.....

Date (j/m/a): 29/12/98
Heures (hh:mm) : 10 h 05 mn
Temps de transport (h) : .....

I Localisation Géographique

Préfecture: .....
Commune: BANGUI ville
Village: .....
Quartier : BOEING (Ecole KPANGABA)

S/Préfecture: .....
2e nom : .....
2e nom : .....

☐ [1] Longitude: .....° ....., ...'
Latitude: .....° ....., ...'

O GPS O Altimètre O Autres
Altitude: .....m

II Caractères organoleptiques

Goût :	O Goût forte	O Goût légère	☒ Sans goût
Odeur :	O Forte odeur	O Légère odeur	☒ Sans odeur
Aspect :	O Clair	O Trouble	☒ Particules en suspension

II Paramètres physiques

Température:	28 °C	Turbidité:	5 NTU
Ph:	8,22	Dureté Totale:	197 mg/l de $CaCO_3$
Conductivité:	360 µs/cm	Couleur	6 PtCo
T.D.S. / Rés. Sec:	171 mg/l		

[1] Cocher case au cas affirmatif

IV Paramètres chimiques

Cations			*Anions*		
Sodium:	.....	mg/l de Na^+	Clorure:	trace	mg/l de Cl^-
Potasium:	>7	mg/l de K^+	Sulfate:	6	mg/l de SO_4^{--}
Magnésium:	15,1	mg/l de Mg^{++}	Bicarbonate:	139	mg/l de HCO_3^-
Calcium:	54	mg/l de Ca^{++}	Carbonate:	0	mg/l de CO_3^{--}
Fer:	0,94	mg/l de Fe^{++}	Nitrate:	10,6	mg/l de NO_3^-
Ammonium:	0,43	mg/l de NH_4^+	Nitrite:	0,034	mg/l de NO_2^-
Zinc	.....	mg/l de Zn^{++}	Phosfate:	0,23	mg/l de PO_4^{3-}
Manganèse:	0,9	mg/l de Mn^{++}	Fluor:	0	mg/l de F^-
Cuivre:	0,24	mg/l de Cu^{++}			
Autres :	-73mv		Salinité totale:	0,2‰	mg/l
Iode:	0,46	mg/l de I_2	Ammoniac:	0,41	mg/l de NH_3

V Analyses bactériologiques

Coliformes totaux:	.....	/ 100ml	Streptocoques fécaux:	.....	/ 100ml
Coliformes Fécaux:	.....	/ 100ml	Clostridium sulfo-reducteur :	.....	/ 100ml

Conclusion : O Très bonne O Bonne O Acceptable O Mauvaise

VI Observations générales de l'enquêteur / remarques supplémentaires

Les analyses organoleptiques sont acceptables.
Les analyses physiques sont acceptables. Le PH de l'eau est basique. La concentration en Fe^{++} dépasse le seuil fixé par l'O.M.S.
Les ions HCO_3^- et Ca^{++} prédominent dans cette eau.
Bonne minéralisation.

Bangui le 17/12/98

INSTITUT PASTEUR DE BANGUI
Docteur Jacques M. MORVAN
Biologiste des Hôpitaux
Directeur

LABORATOIRE D'ANALYSES MEDICALES

Nom : EAU FORAGE KPANGABA EW 7

Prélèvement n° : 44204N
Date du prélèvement : 15.12.1998

Médecin prescripteur :NP

ANALYSE BACTERIOLOGIQUE DE L'EAU

GERMES POUR 100 ml	ECH 1
Coliformes thermorésistants	0
Coliformes	> 200
Streptocoques Fécaux	0
Clostridium sulfito réducteur	0
Staphylocoques	
Bactéries aérobies totales 30°	0
Bactéries aérobies totales 37 °	100 000

CONCLUSION : EAU NON POTABLE

Docteur Jacques M. MORVAN

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Télécopie : +236 61.01.09
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PUMPING TEST REPORT ON THE SITE EW7

A/ TECHNICAL SECTION OF THE WORK

B/ AIR LIFT

The air lift works started from November 24, 1998 to December 8,1998, that means seven days of pneumatic development from up to down and five days of overpumping. After seventy (70) hours of air lift, the extrated water is always cloudy and contained some clay particules deposits, but without sand. The technical results are in the following table.

NS (m)	ND (m)	S (m)	Q (m^3/h)
8,42	20,50	12,08	20,80

C/ The pumping test per level started from December 9,1998 to December 14,1998 Five levels of flow have been implemented ; the first level not being stabilized after two hours, we implemented the four others for four hours in order to obtain a stabilization. Unfortunately we did not succeed. Each of these five levels is followed by a stop pumping of two hours. The results are showed in the following table.

LEVEL OF THE FLOWS	PUMPED FLOW	RESIDUAL REDUCING (m)	SPECIFIC FLOWS (Q/S M^3/hm	SPECIFIC REDUCING S/QM.M^3/F
1	6,35	3,29	1,930	0,5181
2	12,24	8,13	1,506	0,6642
3	18,09	11,33	1,5967	0,6263
4	24,75	17,85	1,3866	0,7212
5	30,15	25,00	1,206	0,8292

Through the above data and through the caracteristic curve, we obtained the critical flow of around 18 m^3/h and we close the long length flow at 15 m^3/h .

D1 LONG LENGTH PUMPING

The long lenght pumping started from December 15,1998 to December 19,1998, that means 72 hours of descent and 24 hours of ascent. The long lenght flow is 15,37 m^3/h ~ 0,0043 m^3/s, however the water level was not stabilized.

D2 INTERPRETATION OF DRAWING

The pumping data rae written on a semi-logarithmic drawing paper (see curve of descent and ascent). The reducing of the water level are expressed in meter from up to down in linear ordinate and the pumping time in logarithmic abscissa expressed in minutes. The obtained point draws the average right representation of jacob expression

$$S = \frac{0,183}{T} \times Q \log \frac{2,25\ T \times T}{x^2 S}$$

and for the descent and $S = \frac{0,183}{T} \times Q \log \frac{T \times T}{T}$ for the ascent.

The curve for the descent presents some non linear points at the beginning of the pumping, this shows the effect of capability causing a cloudy discharge. After the reducings grow normally until the end of the 72 hours with a constant flow Q = 15,37 without stabilizing.

D3 HYDRODYNAMICAL PARAMETERS

Transmissivities are calculated by the slopes of the average rights. The slopes are determined by the growth of reducings, during a logarithmic module noted C = 6,8 for the descent and C 8,6 m for the ascent. Because of the lack of piezometer we cannot calculate the coefficient of storage.

Recall of the results

	DESCENT	ASCENT
NS (m)	9,77	9,77
ND (m)	29,41	11,57
S (m) et Sr (n)	19,64	1,80
Q m^3/h	15,37	-
T ($3^2/j$)	$1,14 \times 10^{-4}$	$0,9 \times 10^{-4}$

D4 HYDROGEOLOGICAL FRAMEWORK

The aquifer of 16,60 m thickness consists of essentially limestone laying on an impermeable bed. The work of 150 mm slotted diameter with filtrated bed of 30 to 46,60 m depth is more or loss perfect. The borehole has been carried out with a tool of 17 inch (425 mm) in clay (weathered zone) until the top of the insular shelf. 24,20 m. The temporary casings consisting of 10 inch (250 mm)casings gave a great annular space. There would have a risk of leading clay into the aquifer during the descent of equipment if there was a bad isolation. That was why the development took more than the 10 days maximum . In the other hand the aquifer can be considered as non limitted laterally, in the condition of the

period of the test. Four hours per level, 72 hours of length. May be this was due to the non stabilization of the water level.

E/ PERMEABILITY OF THE AQUIFER

The productivity of a water catchment in an aquifer depends on the coefficient of the permeability K and its thickness E. The transmissivity is equal to the product of the coefficient of the permeability K per thickness of the aquifer E in meter.

$$T = K.E \Rightarrow = \frac{T}{E} \text{ m/s}$$

E = Thickness of the water column before the test.
E = 50,90-9,77 = 41,13 m
$T = 0,9 \times 10^{-4}$ m²/s

$$\text{D'où } K = \frac{0,00009}{41,13} = 0,0000021 \text{ m/s}$$

$K = 2.1 \times 10^{-6}$ m/s

According to the table of G castany, our aquifer has a type of semi-permeable formation and a bad degree of permeability.

CONCLUSION

generally an aquifer is estimated to be very interessing to be run if its transmissivity is at least equal to 1,7 x 10 -4 m²/s the borehole can be used only for supplying a small farm.

However our borehole having a transmissivity less than $1,7 \times 10^{-4}$ m²/s and a coefficient of permeability K = 2,1 x 10 - 6 m²/s can be used only for village supply.

DIFFICULTIES WE MET

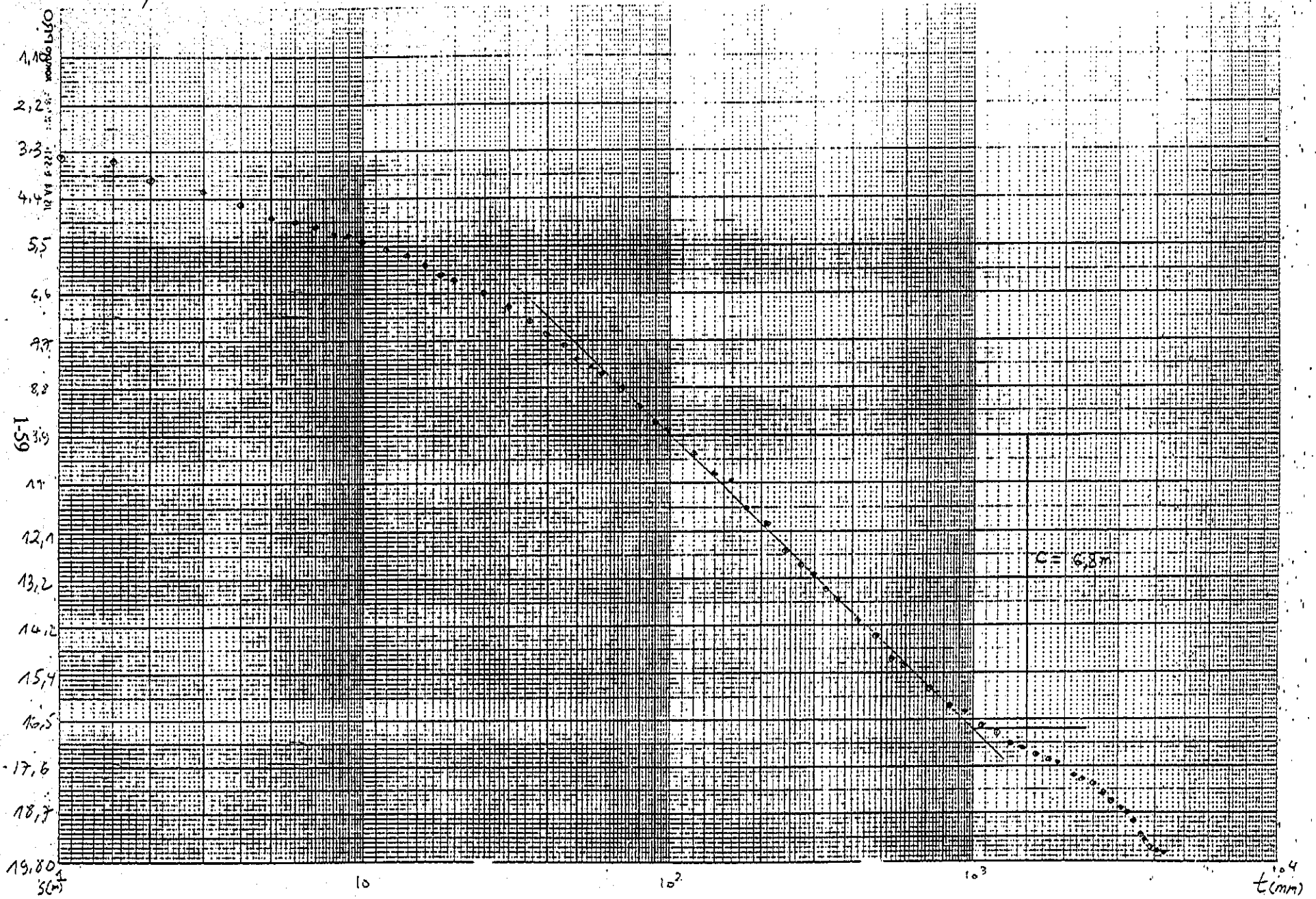
Because of the precision of the measurements of the water level and in spite of the margin of error due to the operator, the electric probe, the measurement device, should be convenient ; unfortunately our electric probe did not permit us to work in a good condition because very often it jammed between the casings and the exhaure pipe. Sometimes it is on without attaining water. This made us spend a lot of time.

We suggest the pumping room to be equipped with 200 mm or 150 mm casings in order to enable us to conduct pumping test very well.

EW-7

COURBE DE LA DESCENTE

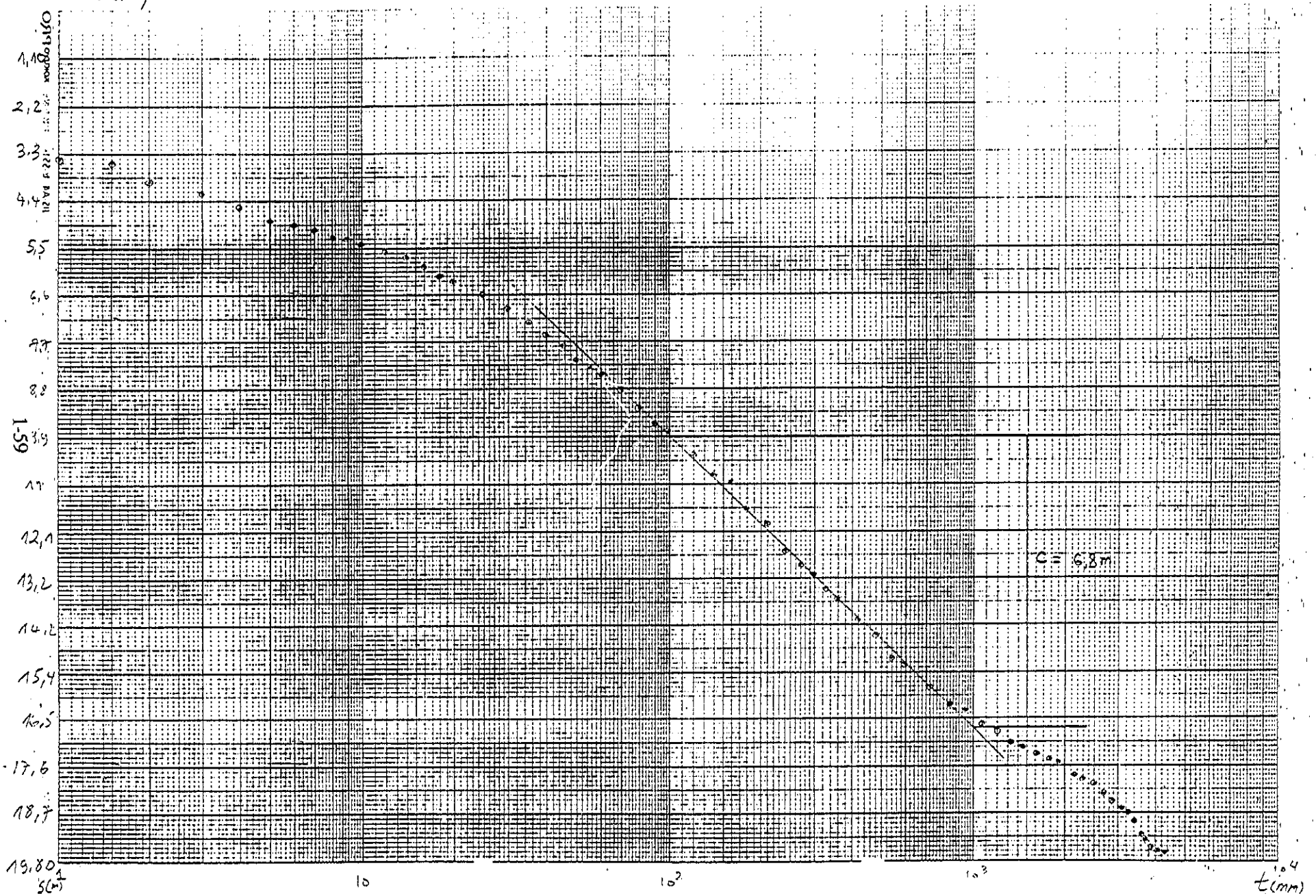
$T = 1{,}14 \times 10^{-4}\ m^2/s$

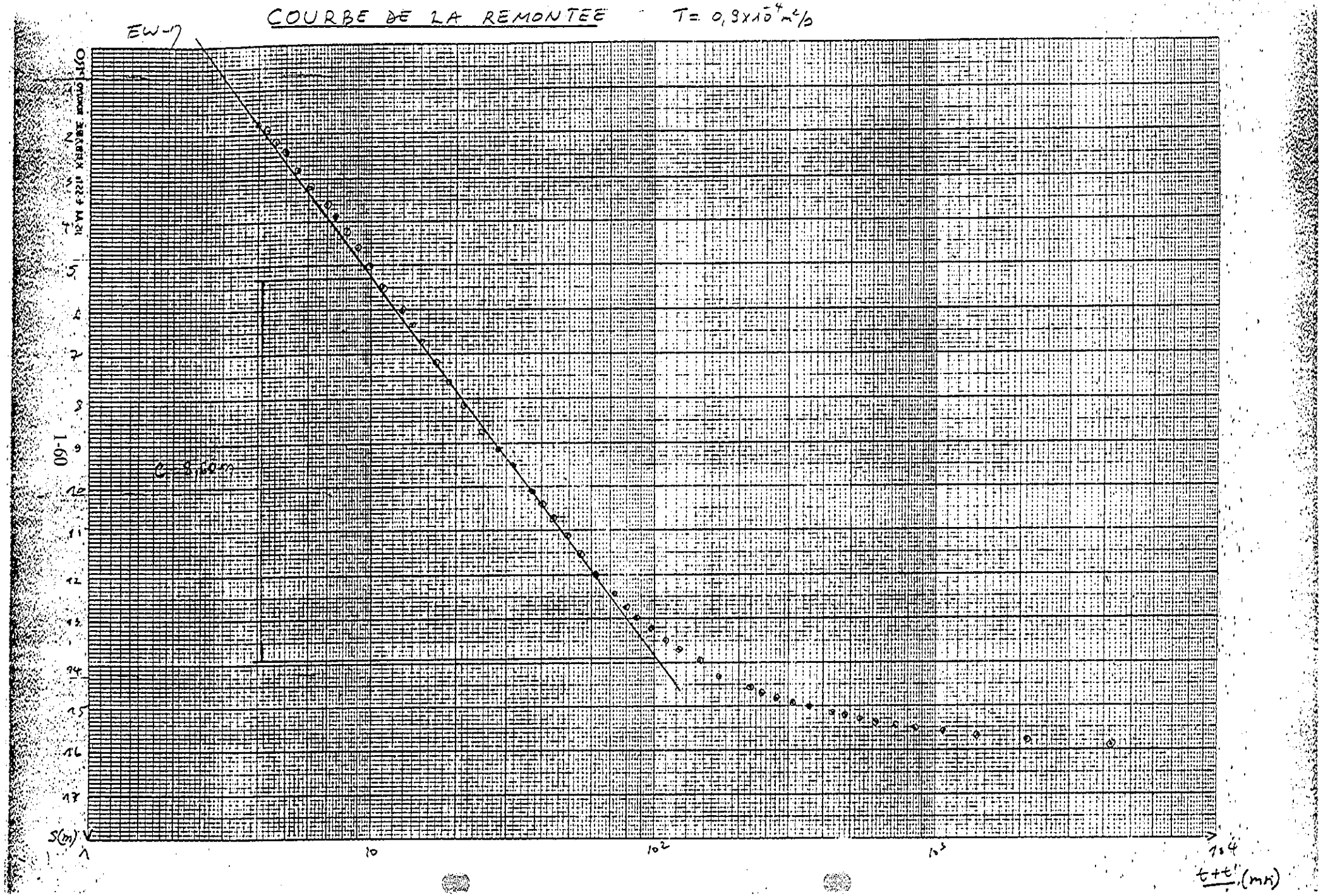


EW-7

COURBE DE LA DESCENTE

$T = 1{,}14 \times 10^{-4}\ m^2/s$




COURBE DE LA REMONTEE
T= 0,8x10⁻⁴ m²/s
EW-1
1-60
C=3,60m
S(m)
10
10²
10³
t+t'(mn)

EW – 8

BOREHOLE WORKS EXECUTION SITE REPORT (EW8)

§§§§§§§§

I- INTRODUCTION

This site was settled on the EW8 site on Thursday, December 31 rst 1998 but the works began on Saturday, January 2 nd 1999 and drew to an end on Monday, January 11th 1999.

The geophysics studies provided for the bedrock 50 m and the rock would be either limestone or schist. But in reality, it was quartzit of 22,75 m. Some difficulties were noticed during these works such as :

- Sounder breakdown
- Compressor breakdown
- Geological diffulties.

II- FIGURE ILLUSTRATION

This illustration shows by synoptic mean the progress of the operating site, the advancing of the works in time and also points out tacitly the difficulties during these works.

INTERPRETATION

The curve shows 3 parts A,B and C. The part A corresponds to the drilling step in change (from 0 m to 22,75 m). It began on Saturday, January 2 nd 1999 and ended on Wednesday, January 6 th 1999. The part B corresponds to the drilling phase in the bedrock. We notice that the curve reached a pisk to 37 m before being pointed to 32 m. This means the landslip that happened during the drilling, was due to the fact that the bedrock is a faulted quartzit between the depth 32 m and 37 m.

The part C corresponds to the final phase of the works. The bedrock being very faulted produced the landslip and tool jamming (the hammer jammed down the hole).

III- DIFFICULTIES

The borehole EW18 difficulties were mostly material and geological ones.

Material difficulties :

- Sounder breakdown (the filter got choked and the slack cable of the mast)
- Compressor breakdown.

Geological difficulty

The bedrock is a very faulted quartzit. This causes a constant landslip and a jammed tool during the drilling. The depth varied for several times from 37 m to 32 m. we did our best in vain to collect the faulted wall. There was a technical surrender because the technical management wanted an early end of the works.

IV- CONCLUSION

In spite of minor difficulties, the operations were well conducted. Because of the faulted area, it was difficult for us to recover the drilling in the time limit. It would be better for us to settle another setting up site on a resistant area but the very last minute demands obliged us to stop the works and to consider this drilling as a unsuccessful one .

We wish the data and informations collected on the site will be taken in account in the final realization phase in order to bring futere works to successful conclusion.

DIRECTION GENERALE DE L'HYDRAULIQUE

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Unité - Dignité - Travail

PROJET MISE EN VALEUR DU SECTEUR DE L'EAU
EN REPUBLIQUE CENTRAFRICAINE

FICHE DE FORAGE

Données Géographiques	Données de foration	Données de forage
Préfecture de:	Appareil de Forage: SONDEUSE KOKEN	N° de Forage: EW8 /
Sous/Préfecture de :	Poste de Travail n°: 11	Débit Air lift: m3/h
Commune de:	Chef de chantier:	Débit d'essai: ..... m3/h.
Groupement de quartiers:	Date Début: ../../19....	N.S ..... m3/h.
Quartier: KOKORO I	Date Fin: ../../19....	N. Dynamique: ..... m
Coord. Géogr. LONG: ..... LAT: ..... ALT:		Transmissivité m2/s

Ech. m	Coupe Technique	Géologie Log	Niv	Lithologie	Prof. N.S/V.E.	Observations
1			5m	Argile Sabl grise	▽ 2,66m = N.S	
2			12m	Argile Sabl Rouge brique		→Zone très fracturée →Eboulement constant à 37 m ramenant le fond du forage à 32 m
3			18m	Latérite		
4			20m	Argile Sablonneuse		
5			22,75	Grès quartzite + Argile		→Abandon technique pour le temps imparti et l'avancement nul de l'outil.
6			31m	Quartzite peu fracturé		
7			37m	Quartzite très fracturé		→ Forage négatif
8						
9						
#						

Forage		Tube Provisoire		Tube d'équipement				Gravier annulaire		Autres renseignements
Diam de	à	Diam de	à	Plein		Crépine		Calibre		Hydrogéologue:
12.1/4"	0 22,75	10"	+0,4 25,45	de	à	de	à	Vol. lin.		Date / / 19.....
9.5/8"	22,75 37	8"						Hauteur		Signature
7.5/8"		7"						Quantité		
6.1/4"		Cimentation		de		à		de	à	

EW – 9

SITE REPORT RELATED TO THE CARRYING OUT OF THE BOREHOLE DRILLING EW9

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I- INTRODUCTION

Works on the site EW9 started on September 21, 1998 and ended on October 1 st, 1998. During the realization of the borehole we met some difficulties related to equipments and techniques. The geophysical study team had foreseen the insular shelf at 55 m and reckoned the lithology as a limestone layer. During the drilling we noticed only sendiment. The layer is aquifere and the rate of flow is estimated at 30 m^3/h.

II- ILLUSTRATION OF THE DRAWING

The illustration enables us to have a general view on the progress of the works in time taking into account difficulties we met during the works.

BRIEF INTERPRETATION OF THE DRAWING

We noticed that the curve can be divided into tree parts A,B, and C.

PART A : Shows a good progress

PART B : One part of the curve is constant (= 29,75 m) this shows that works were not going on very well and that somme difficulties occurred on the implementation of the works.

PART C : No difficulty appeared, but we remarked as if the final equipments seemed to have some difficulties.

III- DIFFICULTIES WE MET

⇒ The oldness of drilling rig.

The drilling rig is dilapidated and very often many breakdowns occurred.

1- Flexibles, basically located on the head of the injection snap.
2- The boring machine and the compressor need some repairing works in order to fit well their tasks.

⇒ difficulties related to equipments.

Those difficulties are related to the lack of temporary casings of 10 inches. During that period site B at Koudoukou was casing on about 84 m of thickness of sediment. As there was not enough casings of 10 inch we had to waste time waiting for "SAM" to make some for us.

⇒ Technical difficulties.

After equipping (intake system), we had to take out the temporary casing of 10 inch and during the operation we had somme troubles.

A blazed temporary casing gave way while we had about 24 m less over 30 m got down to be removed. During the handling there was a kind of explosion : a great air leak has caused a collapse at the level of the plug of cement and that matter hurt the intake.

V- CONCLUSION

Apart from the obove difficulties, the cement works went on very well. The area was aquifer and the rate of flow was reckoned at about 30 m^3/h. But for the successfullness of the borehole we should be cautious. It is up to the pumping team to appreciate the quality and the flow of the water.

NB : For further informations, have a look on the site daily report and you will be aware of the site running and difficulties we met.

DIRECTION GENERALE DE L'HYDRAULIQUE

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PROJET MISE EN VALEUR DU SECTEUR DE L'EAU
EN REPUBLIQUE CENTRAFRICAINE

FICHE DE FORAGE

Données Géographiques	Données de foration	Données de forage
Préfecture de:.....	Appareil de Forage: SONDEUSE VOLVO	N° de Forage: EW 9 / 98
Sous/Préfecture de :.....	Poste de Travail n°: 2	Débit Air lift:..... .....m3/h
Commune de:.....	Chef de chantier: LAVOU Len.	Débit d'essai: .....m3/h.
Groupement de quartiers:.....	Date Début: 19/09/1998	N.S..... .....m3/h.
Quartier:.....	Date Fin: 02/10/1998	N. Dynamique:..... .....m
Coord. Géogr. LONG:..... LAT..... ALT:.....		Transmissivité m2/s

Ech. m	Coupe Technique	Géologie Log	Niv	Lithologie	Prof. N.S/V.E.	Observations
1			10 m	Latérite		→ Zones aquifères:
2			15 m	Latérite argileuse		* 32 m - 38 m
3				Argile (Jaune)		* 46 m
4			29 m			→ le débit est estimé à environ 30 m³/h.
5					32 m	
6	37 m 38 m			Calcaire très Fracturé	38 m	
7	45 m				46 m	
8			53,15			
9						
#						

Forage		Tube Provisoire			Tube d'équipement				Gravier annulaire		Autres renseignements
Diam	de à	Diam	de	à	Plein	de à	Crépine	de à	Calibre	2 - 5 mm	Hydrogéologue:
12 .1/4"	0m 29m	10"	+0,40	29m	de	à	de	à	Vol. lin.	28 l	Date / / 19.....
9. 5/8"	29m 53,15	6"			+1,00	37,23	37,23	45,53	Hauteur	22,35 m	Signature
7. 5/8"		6"			45,53	49,38			Quantité	626 l	
6 .1/4"		Cimentation			de	0m à	6m	de 25m	à 36,88		

DIRECTION GENERALE DE L'HYDRAULIQUE

PROJET MISE EN VALEUR DU SECTEUR EAU
PNUD / FENU / DAES CAF/97/011

Réservé N° [ ][ ][ ]

FICHE ANALYSE CHIMIQUE

N°. : ..... / ..... / ..... Enquêteur: BIANA FABIEN Date (j/m/a): 29/10/98

IRH : ..... Laboratoire : D.G.H Heures (hh:mm) : 9 h 00 m

N° de forage : EW9 Dates d'analyse : 29/10/98 - ..../..../.... Temps de transport (h) : .....

I Localisation Géographique

Préfecture: ..... S/Préfecture: .....

Commune: BANGUI-VILLE

Village: ..... 2e nom : .....

Quartier : CAHIN 2e nom : .....

GPS[1] Longitude: .....° .....,.....' O GPS O Altimètre O Autres

Latitude: .....° .....,.....' Altitude: .....m

II Caractères organoleptiques

Goût : O Goût forte O Goût légère O Sans goût

Odeur : O Forte odeur O Légère odeur ☒ Sans odeur

Aspect : O Clair ☒ Trouble ☒ Particules en suspension

II Paramètres physiques

Température: 24 °C

pH: 7,08

Conductivité: 433 µs/cm

T.D.S. / Rés. Sec: 207 mg/l

Turbidité: 161 FAU (NTU)

Dureté Totale: 283 mg/l de $CaCO_3$

Couleur 50 PtCo

[1] Cocher case au cas affirmatif

EW 9

IV Paramètres chimiques

Cations			*Anions*		
Sodium:	...1...	mg/l de Na^+	Clorure:	11,5	mg/l de Cl^-
Potasium:	...1...	mg/l de K^+	Sulfate:	13	mg/l de SO_4^{--}
Magnésium:	5,0	mg/l de Mg^{++}	Bicarbonate:	220	mg/l de HCO_3^-
Calcium:	105	mg/l de Ca^{++}	Carbonate:	0,0	mg/l de CO_3^{--}
Fer:	0,91	mg/l de Fe^{++}	Nitrate:	22,5	mg/l de NO_3^-
Ammonium:	0,78	mg/l de NH_4^+	Nitrite:	0,143	mg/l de NO_2^-
Zinc	...1...	mg/l de Zn^{++}	Phosfate:	0,48	mg/l de PO_4^{3-}
Manganèse:	2,0	mg/l de Mn^{++}	Fluor:	...0...	mg/l de F^-
Cuivre:	1,38	mg/l de Cu^{++}			
Autres :	-0,00 mV		Salinité totale:	0,2 ‰ ~~mg/l~~	
Iode:	1,61	mg/l de I_2	Ammoniac:	0,73	mg/l de NH_3

V Analyses bactériologiques

Coliformes totaux:	..... / 100ml	Streptocoques fécaux:	..... / 100ml
Coliformes Fécaux:	..... / 100ml	Clostridium sulfo-reducteur :	..... / 100ml

Conclusion : O Très bonne O Bonne O Acceptable O Mauvaise

VI Observations générales de l'enquêteur / remarques supplémentaires

l'eau destinée à la Consommation ne doit pas être trouble et elle doit aussi être dépourvue de particules en suspension. La turbidité et la Couleur dépassent les normes fixées par l'O.M.S. La Concentration en Fe^{++} dépasse la norme de 0,3 mg/l fixée par l'O.M.S. c'est un paramètre à suivre.

Bangui le 23/10/98

INSTITUT PASTEUR DE BANGUI
Docteur Jacques M. MORVAN
Biologiste des Hôpitaux
Directeur

LABORATOIRE D'ANALYSES MEDICALES

Nom : EAU DE FORAGE CATTIN EW 9

Prélèvement n° : 41375N
Date du prélèvement : 21.10.1998

Médecin prescripteur :NP

ANALYSE BACTERIOLOGIQUE DE L'EAU

GERMES POUR 100 ml		ECH 1	
Coliformes thermorésistants		>200 000	V
Coliformes		>200 000	
Streptocoques Fécaux		0	
Clostridium sulfito réducteur		0	
Staphylocoques			
Bactéries aérobies totales	30°	700 000	V
Bactéries aérobies totales	37 °	1 000 000	

CONCLUSION : EAU NON POTABLE

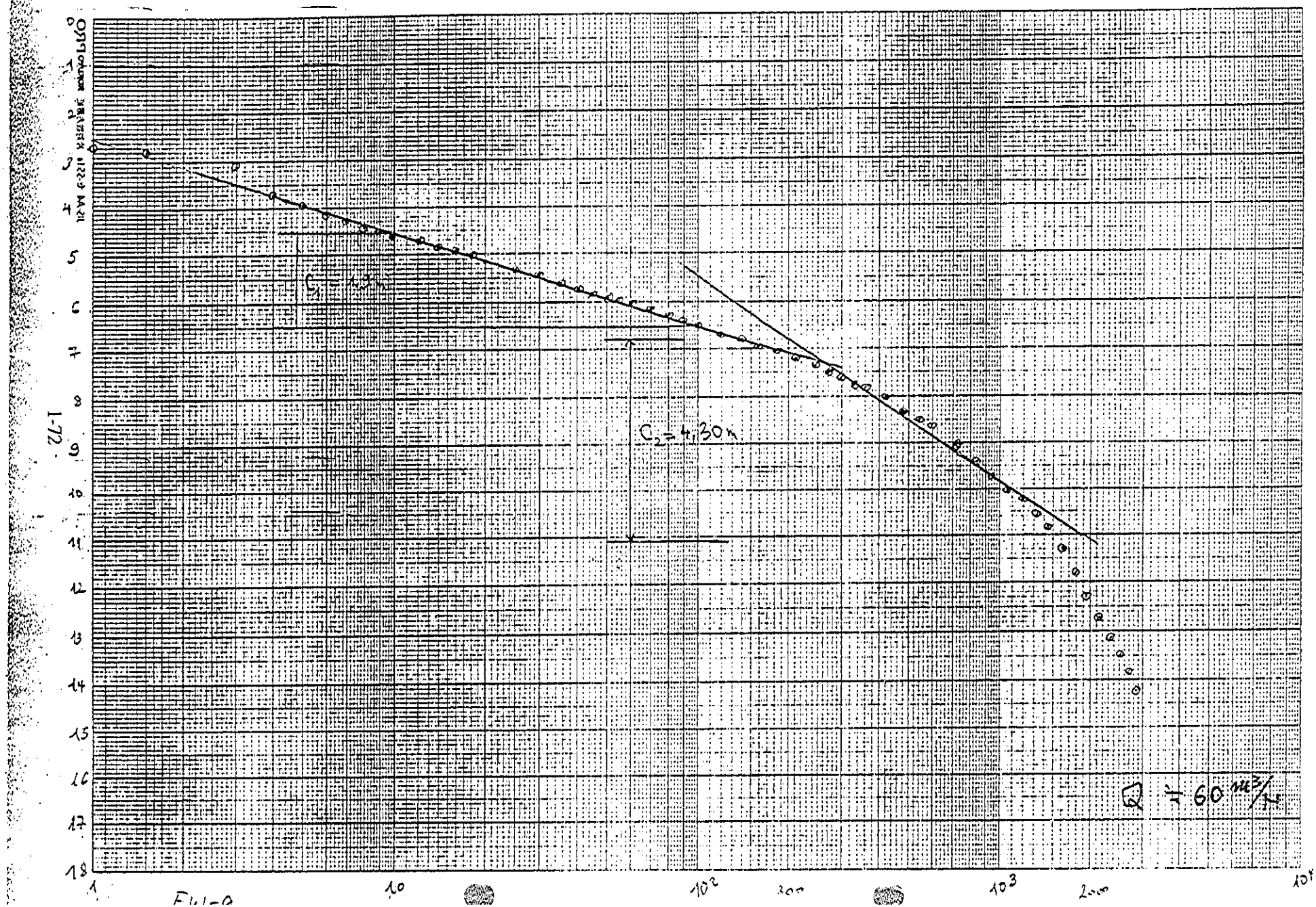
Docteur Jacques M. MORVAN

BP 923 BANGUI RCA
Téléphone : +236 61.45.76 / +236 61.08.66
Télécopie : +236 61.01.09
Mail : IPB@intnet.cf

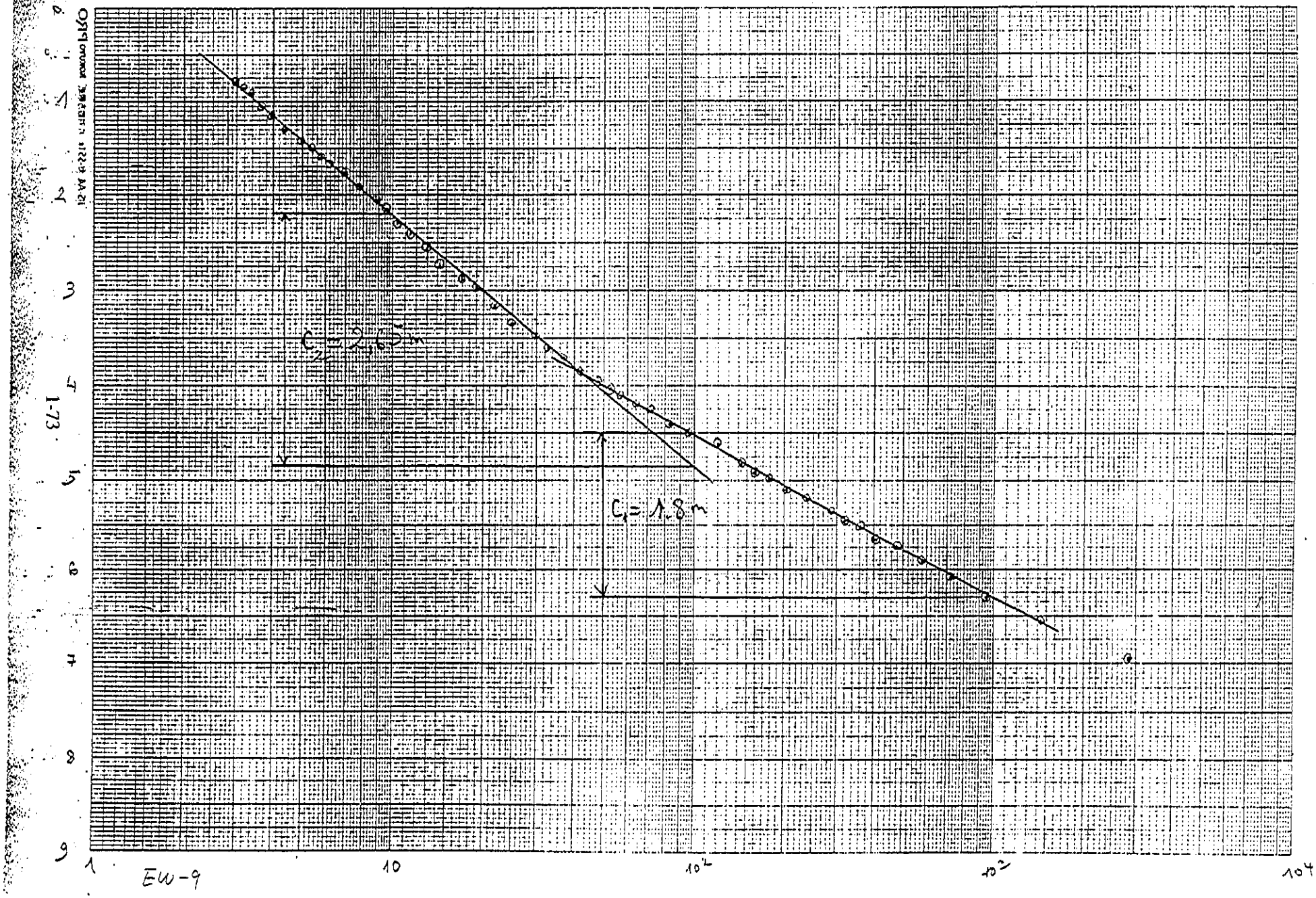
EW-03

COURBE DE DESCENTE

$T_1 = 138{,}44\ m^2/j = 1.6 \times 10^{-3}\ m^2/s$; $T_2 = 61{,}77\ m^2/j = 0{,}7 \times 10^{-3}\ m^2/s$



COURBE DE REMONTEE : $T_1 = 146{,}13\ m^2/j = 1.7 \times 10^{-3}\ m^2/s$ $T_2 = 99{,}26\ m^2/j = 1.15 \times 10^{-3}\ m^2/s$



EW – 10

BOREHOLE EW10 FINAL REPORT
(D.G.H. TEAM B)

-*-*-*-*-*-*-*-*-

Works has been realized from September 29 to October 15,1998

A/ SETTING UP OF THE SITE

It did not take long in spite of the fact that our trucks got stuck in the mud. Mr.MURAKAMI was obliged to shift the site about 50 m upwards in front of **GUITANGOLA** Hospital.

B/ BOREHOLE

1° Drilling in the weathered zone lasted from September 30 to October 7,1998. We reached the bedrock at 59,45 m depth

2° 10 ^{4} inch temporary casing realized in 1 :30 without any difficulty

3° Drilling in the bedrock lasted from October 8 to 12,1998 from 59,45 m to 92 m with two important levels of the rush of water 80,5 and 82 m. Measured discharge at 86 m Q = 33 m^3/h and at 90 m Q = 90 2 28 m^3/h, NS = 6,7 m

4° Equipping the column of the equipment measured 87,20 m and hang at 4,80 m from the initial depth. Casings are FRP 6 inch and slotted casings inox (21 FRP casings of 4 m and slotted casing 3,90 m).

NB : The decantation of 4 m having a clog of 30 cm. The filtrated clump was 2 to 5 mm gravel puck. A 5 m bentonite plug above the clump and 5 m of cementation from the level of the soil.

DIAMETER	DEPTH	TEMPORARY CASINGS	DRILLING METHODOLOGY	TOOL
17 ½ ^{4}	0 à 5 m	o à 5 m (14 ^{4})	Rotary	17 $^{1/2}$ inch wing bit
121/4 ^{4}	5 à 59,45 m	5 à 59,45 m (10 ^{4})	Rotary	12 ¼ inch wing bit
9 5/8 ^{4}	59,45 m à 92		Down the hole hammer	9 $^{5/8}$ hammer

BOREHOLE TECHNICAL DATA

CASING EQUIPPING				FILTRATED GRAVEL	
6 INCH FRP CASING		6 INCH SLOTTED CASING		PUCK	2 à 5 mm
FROM	TO	FROM	TO	VOLUME	29 L
0	79 m	79 m	82,90 m	HEIGHT	2 m
82,90 m	87,20 m			QUANTITY	600 L
CIMENTATION (BENTONITE) de 0 à 5 m				CIMENTATION	de 63 à 68 m

TECHNICAL DATA OF EQUIPPING

C/ TAKING APART OF THE SITE

The operation was rapid with an easy withdrawal of the casings and immediate loading for the new site the next day.

Has been noted. Two sacks of EW10 was successful borehole even if a collapsing of 1,5 m has been noted. Two sacks of foam agent, 7 sacks of bentonite and more than 1200 liters of diesel fuel. These are the products we used. The water volume with rotary method was 30 m^3/L .

DIRECTION GENERALE DE L'HYDRAULIQUE

REPUBLIQUE CENTRAFRICAINE
Unité - Dignité - Travail

PROJET MISE EN VALEUR DU SECTEUR DE L'EAU
EN REPUBLIQUE CENTRAFRICAINE

FICHE DE FORAGE

Données Géographiques	Données de foration	Données de forage
Préfecture de:.....	Appareil de Forage:.....	N° de Forage:...10.....
Sous/Préfecture de :.....	Poste de Travail n°:...2.....	Débit Air lift:..... .....m3/h
Commune de:.....	Chef de chantier: ZOKOUA Constant	Débit d'essai: .....m3/h.
Groupement de Villages:.....	Date Début: 29 /09 /1998	N.S..... .....m3/h.
Village: Gwitangala.....	Date Fin: 15 /10 /1998	N. Dynamique:..... .....m
Coord. Géogr. LONG:..... LAT..... ALT:.....		Transmissivité m2/s

Ech. 1,5m	Coupe Technique	Géologie Log	Niv	Lithologie	Prof. N.S/V.E.	Observations
			2m	Sol sablo-argileux	6.70m	
			4m	Sable argileux		
			6m	Argile sableuse		
			13m	Argile jaune		
			25m	Argile sableuse		
			33m	Argile beige		
			34m	Argile sableuse		
			51m	Argilite		
			40m	Sable fin		
			53m	Gravier argileux		
			92m	Calcaire noir		Calcaire très fracturé entre 80 et 82,1m, et importante Venue d'eau (Q=28m³/h). Sous foration.

Forage Diam	de	à	Tube Provisoire Diam.	de	à	Tube d'équipement Plein	de	à	Crépine	de	à	Gravier annulaire		Autres renseignements
17.1/2"	0	5m	10"	0	5m	de	à	de	à			Calibre	2-5	Hydrogéologue:
12.1/4"	5	59.45m	8"	5	59.45	0	79m	79	85.90			Vol. lin.	29 l	Date / /19.....
9.5/8"	59.45m	92m	7"			82.90	87.20					Hauteur	24m	Signature
7.5/8"			Cimentation			de	0	à	5m	de 63m	à 68m	Quantité	600 l	

FICHE ANALYSE CHIMIQUE

N°. : .....
IRH : .....
N° de forage : EWIC...

Enquêteur: BIDANA FABIEN
Laboratoire : PROJET
Dates d'analyse : 13.11.98 - 13.11.98

Date (j/m/a): 13.11.98
Heures (hh:mm) : 10.h.40.m
Temps de transport (h) : .....

I Localisation Géographique

Préfecture: .....
Commune: BANGUI VILLE
Village: .....
Quartier : GUITANGOLA

S/Préfecture: .....
2e nom : .....
2e nom : .....

☐ GPS[1] Longitude: .....° .....'
Latitude: .....° .....'

O GPS O Altimètre O Autres
Altitude: .....m

II Caractères organoleptiques

Goût : O Goût forte O Goût légère ☒ Sans goût
Odeur : O Forte odeur O Légère odeur ☒ Sans odeur
Aspect : ☒ Clair O Trouble O Particules en suspension

II Paramètres physiques

Température: 27 °C
Ph: 7,12
Conductivité: 512 µs/cm
T.D.S. / Rés. Sec: 263 mg/l

Turbidité: 2 NTU
Dureté Totale: 273 mg/l de $CaCO_3$
Couleur 4 PtCo

[1] Cocher case au cas affirmatif

IV Paramètres chimiques

Cations			*Anions*		
Sodium:	.....	mg/l de Na^+	Clorure:	3,4	mg/l de Cl^-
Potasium:	>7	mg/l de K^+	Sulfate:	6,6	mg/l de SO_4^{--}
Magnésium:	4,8	mg/l de Mg^{++}	Bicarbonate:	204	mg/l de HCO_3^-
Calcium:	101,2	mg/l de Ca^{++}	Carbonate:	0	mg/l de CO_3^{--}
Fer:	0,37	mg/l de Fe^{++}	Nitrate:	7,5	mg/l de NO_3^-
Ammonium:	0,39	mg/l de NH_4^+	Nitrite:	0,062	mg/l de NO_2^-
Zinc	..<	mg/l de Zn^{++}	Phosfate:	0,29	mg/l de PO_4^{3-}
Manganèse:	0,6	mg/l de Mn^{++}	Fluor:	..<	mg/l de F^-
Cuivre:	1,27	mg/l de Cu^{++}			
Autres :	6ml		Salinité totale:	0,2‰	~~mg/l~~
Iode:	4,06	mg/l de I_2	Ammoniac:	0,37	mg/l de NH_3

V Analyses bactériologiques

Coliformes totaux:	.....	/ 100ml	Streptocoques fécaux:	.....	/ 100ml
Coliformes Fécaux:	.....	/ 100ml	Clostridium sulfo-reducteur :	.....	/ 100ml

Conclusion : O Très bonne O Bonne O Acceptable O Mauvaise

VI Observations générales de l'enquêteur / remarques supplémentaires

les analyses organoleptiques sont acceptables
Bonne minéralisation et magnesium élevé
Cette eau est basique (ions HCO_3^- et Ca^{++} prédominent)
dans cette eau la concentration en Fe^{++} est légèrement supérieure
au seuil fixé par l'OMS
la valeur de Ca^{++} est supérieure à celle de l'OMS qui fixe à 1mg/l

Bangui le 16/11/98

INSTITUT PASTEUR
DE BANGUI
Docteur Jacques M. MORVAN
Biologiste des Hôpitaux
Directeur

LABORATOIRE D'ANALYSES MEDICALES

Nom : EAU DGH FORAGE GUITANGOLA EM 10

Prélèvement n° : 42548N
Date du prélèvement : 13.11.1998

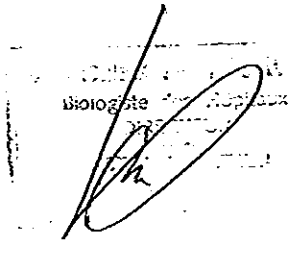
Médecin prescripteur :NP

ANALYSE BACTERIOLOGIQUE DE L'EAU

GERMES POUR 100 ml			ECH 1
Coliformes thermorésistants		>	200
Coliformes		>	200
Streptocoques Fécaux			0
Clostridium sulfito réducteur		>	200
Staphylocoques			
Bactéries aérobies totales	30°	>	10 000
Bactéries aérobies totales	37 °	>	10 000

CONCLUSION : **EAU NON POTABLE**

Docteur Jacques M. MORVAN



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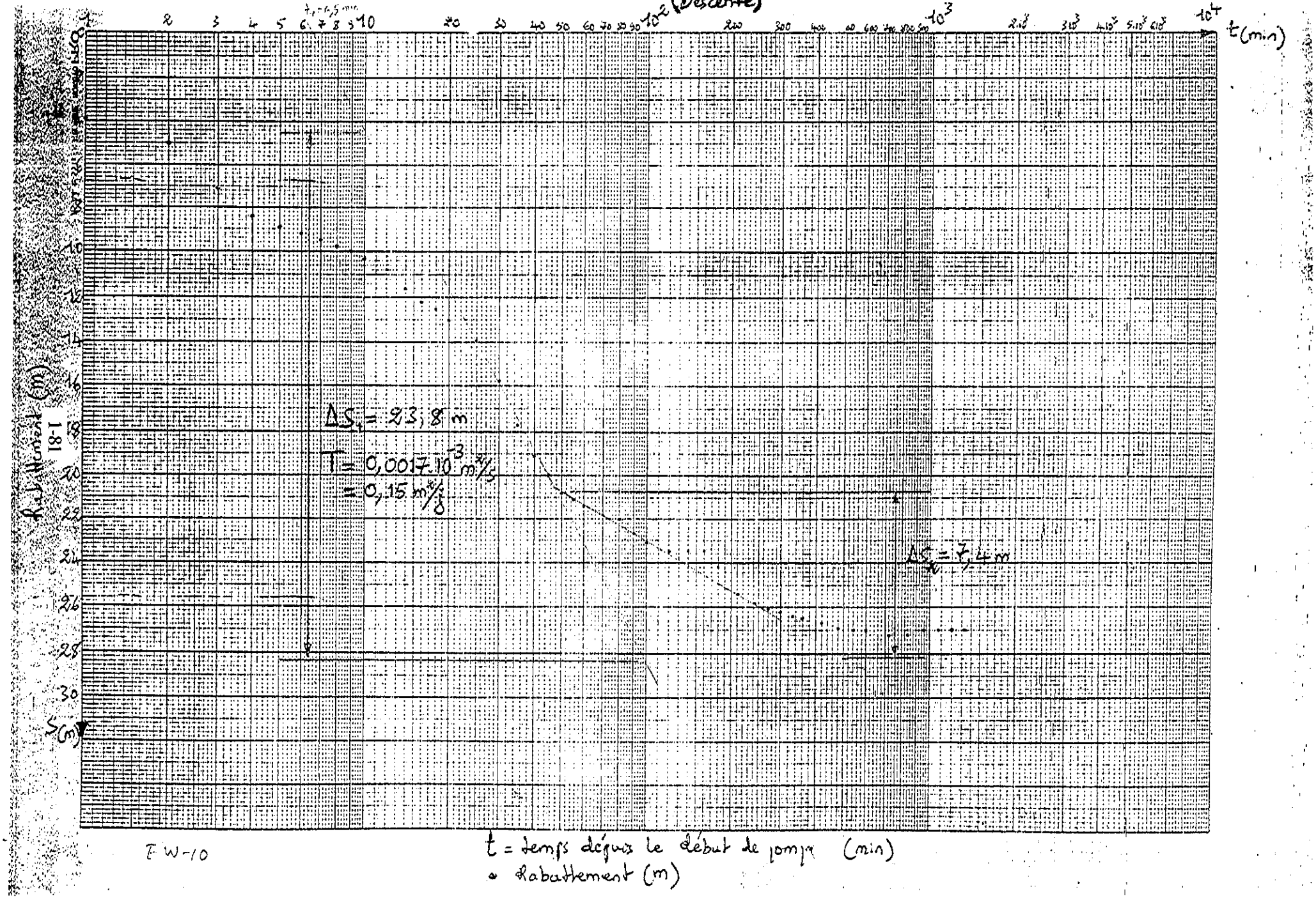
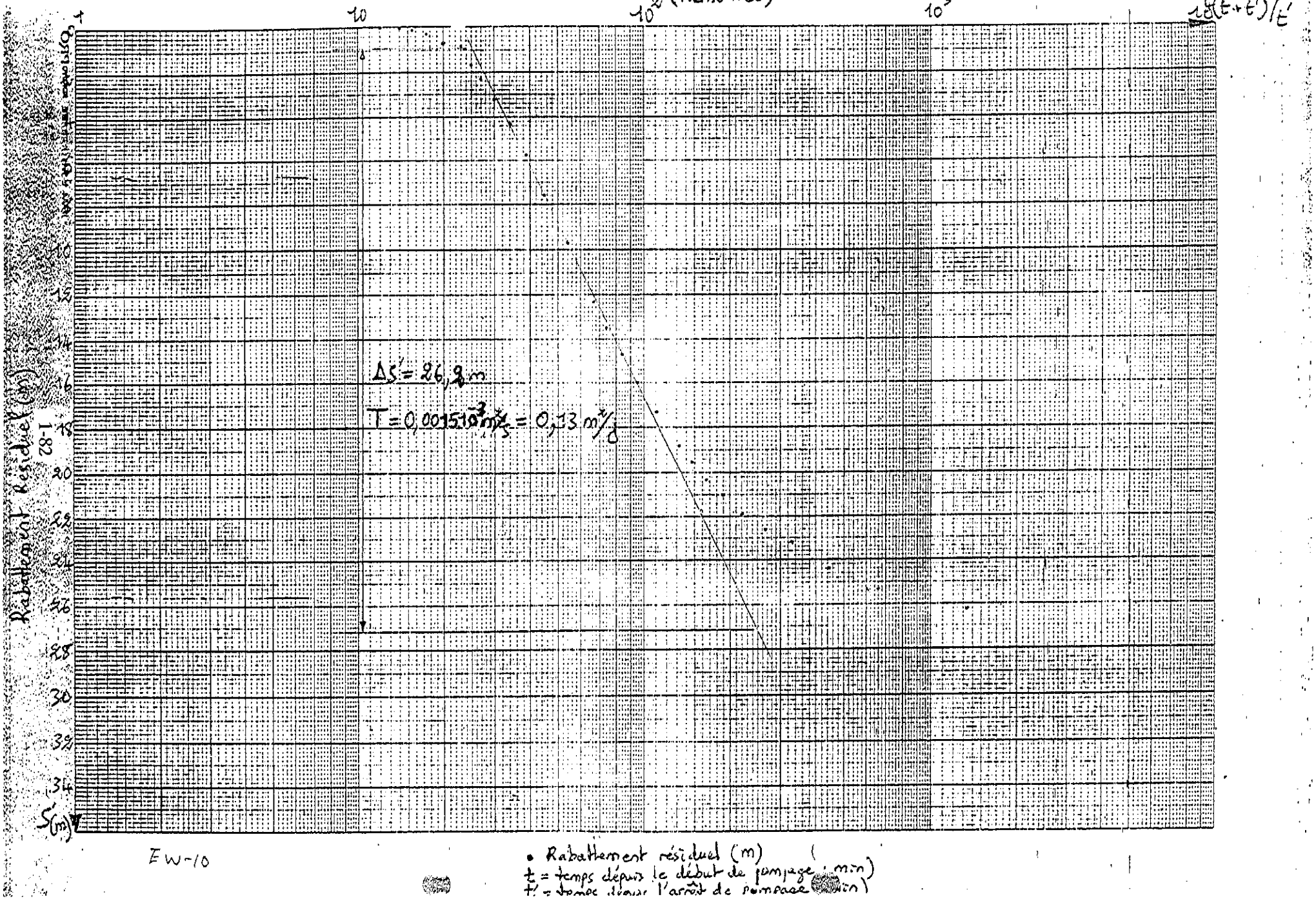
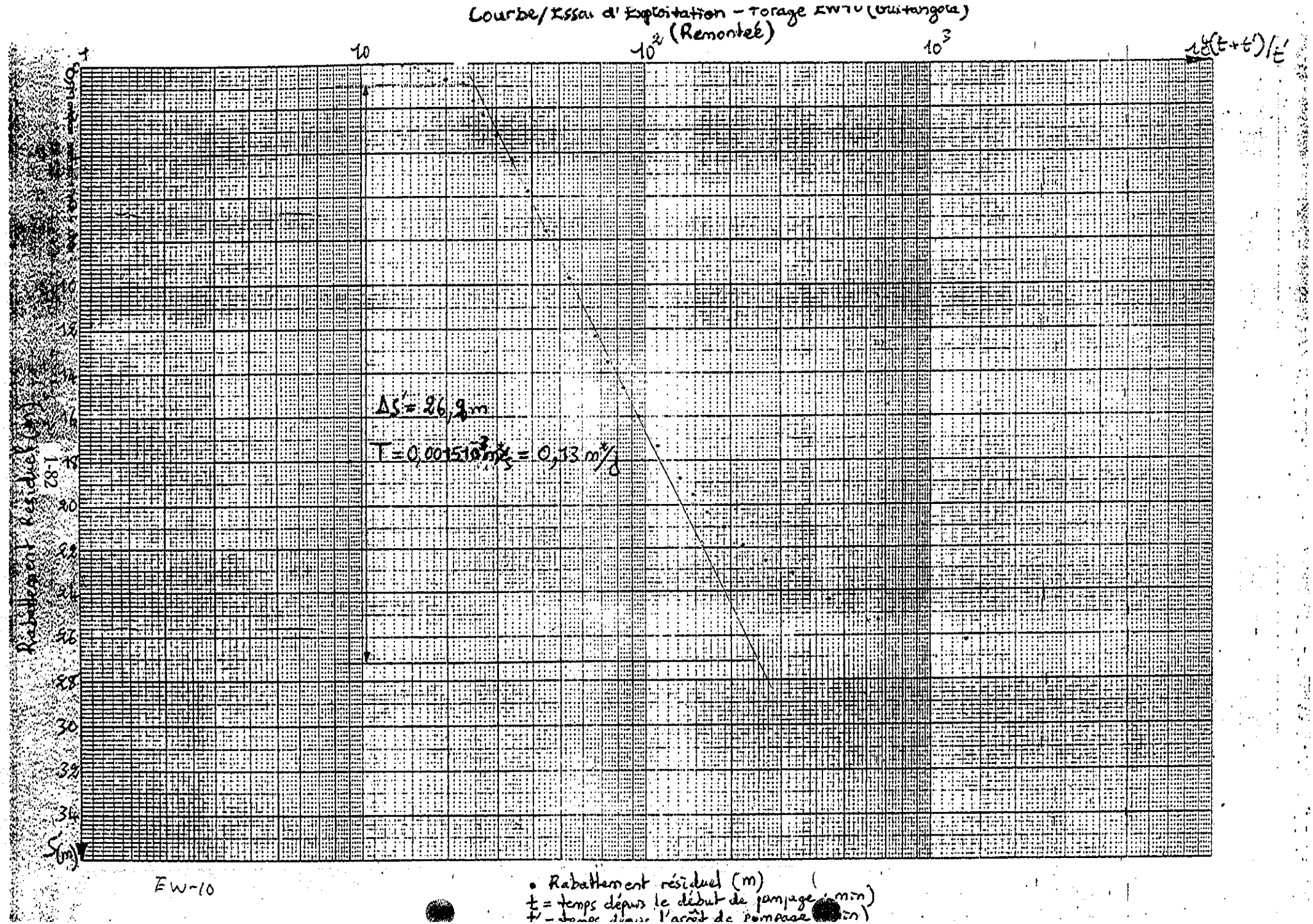

Courbe / Essai d'Exploitation – r... ge FW10 (Guitangola)
(Descente)
t (min)
S (m)
$\Delta S_1 = 23,8$ m
$T = 0,0017.10^{-3}$ m²/s
$= 0,15$ m²/j
$\Delta S_2 = 7,4$ m
FW-10
t = temps depuis le début de pompage (min)
• Rabattement (m)

Courbe/Essai d'Exploitation – Forage EW10 (Quitangola)



EW-10

• Rabattement résiduel (m)
t = temps depuis le début de pompage (mn)
t' = temps depuis l'arrêt de pompage (mn)


Courbe/Essai d'Exploitation – Forage EW10 (Bouitangora)
(Remontée)
1
10
10²
10³
log(t+t')/t'
S(m)
Rabattement résiduel (m)
ΔS' = 26,9 m
T = 0,00151 m²/s = 0,13 m²/j
EW-10
• Rabattement résiduel (m)
t = temps depuis le début de pompage (min)
t' = temps depuis l'arrêt de pompage (min)

EW – 11

BOREHOLE EW11 REPORT(TEAM BDGH)
-§-§-§-§-§-§-§-

This borehole was unsuccessful. It was very difficult to be realized. From October 26th to November 23rd,1998.

I- SETTING UP THE SITE

It was set up on October 26th 1998.

II-BOREHOLE

a) Drilling in the weathering zone: during this step which started from October 26th 1998. The thickness of the weathering zone presented enormous difficulties in the progress of the drilling tools (from wing bit 12 " ¼ to three-cone 12 " ¼ inch) .These difficulties are due to the presence of sand flowing constantly during the work until 89m.

III- LEAVING THE SITE

This step was comleted from November 22 nd to 23 th 1998 .The unsuccesful borehole EW11 was difficult to be realized because of the non stability of the wall between 48 m and 89 m, the lithology made of fine sand and claystone. The realisation of EW11 borehole consummed 20 sacks of bentonite, 3 sacks of CMC, 4 tonnes 50 L of argenpol and almost 200 L of gazoil.

Bangui, November 24th 1998

THE CHIEF OF THE SITE

Constant ZOUKOUA.-

DIRECTION GENERALE DE L'HYDRAULIQUE
REPUBLIQUE CENTRAFRICAINE
Unité - Dignité - Travail

PROJET MISE EN VALEUR DU SECTEUR DE L'EAU
EN REPUBLIQUE CENTRAFRICAINE

FICHE DE FORAGE

Données Géographiques	Données de foration	Données de forage
Préfecture de: Lombella Mpoko	Appareil de Forage: TT 3560 BG	N° de Forage: EW 11
Sous/Préfecture de : Bimbo	Poste de Travail n°: 4	Débit Air lift: m3/h
Commune de:	Chef de chantier: ZOKOUA Constant	Débit d'essai: .....m3/h.
Groupement de Villages:	Date Début: 26 / 10 /1998	N.S.: .....m3/h.
Village:	Date Fin: 23 / 11 /1998	N. Dynamique: .....m
Coord. Géogr. LONG:..... LAT..... ALT:.....		Transmissivité m2/s

Ech. 1,5m	Coupe Technique	Géologie Log	Niv	Lithologie	Prof. N.S/V.E.	Observations
			3m	sol argileux		Forage très difficile avec multiples éboulements empêchant l'avancement de l'outil.
			10m	argile brune		
			18m	sable grossier et argileux		
				Graviers argileux		
			32m			
			39m	sable fin argileux		
			42m	sable grossier argileux		
				sable fin argileux		
			52m			
			57m	sable moyen argileux		
				sable fin et argileux.		
			83m			

Forage			Tube Provisoire			Tube d'équipement				Gravier annulaire		Autres renseignements
Diam	de	à	Diam.	de	à	Plein		Crépine		Calibre		Hydrogéologue:
17.1/2"	0	5m	14"			de	à	de	à	Vol. lin.		Date / / 19.....
12.1/4"	5m	89m	10"							Hauteur		Signature
9.5/8"			7"							Quantité		
7.5/8"			Cimentation			de		à		de	à	

EW – 12

BOREHOLE EW12 FINAL REPORT
(TEAM B DGH)

-§-§-§-§-§-§-

This borehole was carried out from the 15 th to the 24 th September 1998.

I- SETTING UP THE SITE

It was done on the 15 th September 1998 after the cleaning of the site.

II- DRILLING WORKS (see well sheet for data and sections)

a) Drilling in the weathering layer : realized with a down the hole hammer 9 5/8" inch then with the three-cone rotary 12 ¼ " inch to 80 m with a power of 3275 m. This step lasted from the 1 rst to the 20 th of September 1998.

b) Casing : This phase realized on the 20 th of September 1998 after 50 mn was relatively easy.

c) Drilling in the bedrock : it was realized with the down the hole hammer 9 5/8 " inch from 32 m to 80 m, from September 21 rst to 22 nd September1998. Water flows were noted between 41 m and 43 m. However, there was no flowing water between 60 m and 80 m.

III- LEAVING THE SITE

It was done one September 24 th 1998. EW12 borehole with a flow under the drilling (about 1350 L/h at 80 m) shows a shallow bedrock about 31 m oppositely to the estimated depth (85m) and even the same for the bedrock lithology. During this drilling works about 24 m3 of water, 1000 L of gazoil, 5 sacks of bentonite, 3 sacks of foama gent, 7 sacks of cement were consumed .

Bangui, October 26 th 1998

THE CHIEF OF THE SITE

Constant ZOUKOUA.-

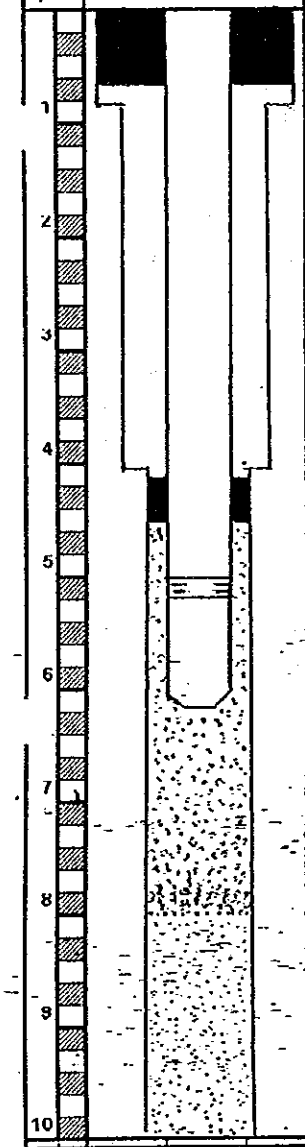
DIRECTION GENERALE DE L'HYDRAULIQUE

REPUBLIQUE CENTRAFRICAINE
Unité - Dignité - Travail

PROJET MISE EN VALEUR DU SECTEUR DE L'EAU
EN REPUBLIQUE CENTRAFRICAINE

FICHE DE FORAGE

Données Géographiques	Données de foration	Données de forage
Préfecture de: BANGUI	Appareil de Forage:	N° de Forage: EW12./
Sous/Préfecture de :	Poste de Travail n°: 3	Débit Air lift: m3/h
Commune de: BANGUI	Chef de chantier: ZOKOUA Coulant's	Débit d'essai: .....m3/h.
Groupement de Villages:	Date Début: 16 / 10 /1998	N.S.....m3/h.
Village:	Date Fin: 24 / 10 /1998	N. Dynamique: .....m
Coord. Géogr. LONG: LAT. ALT:		Transmissivité m2/s

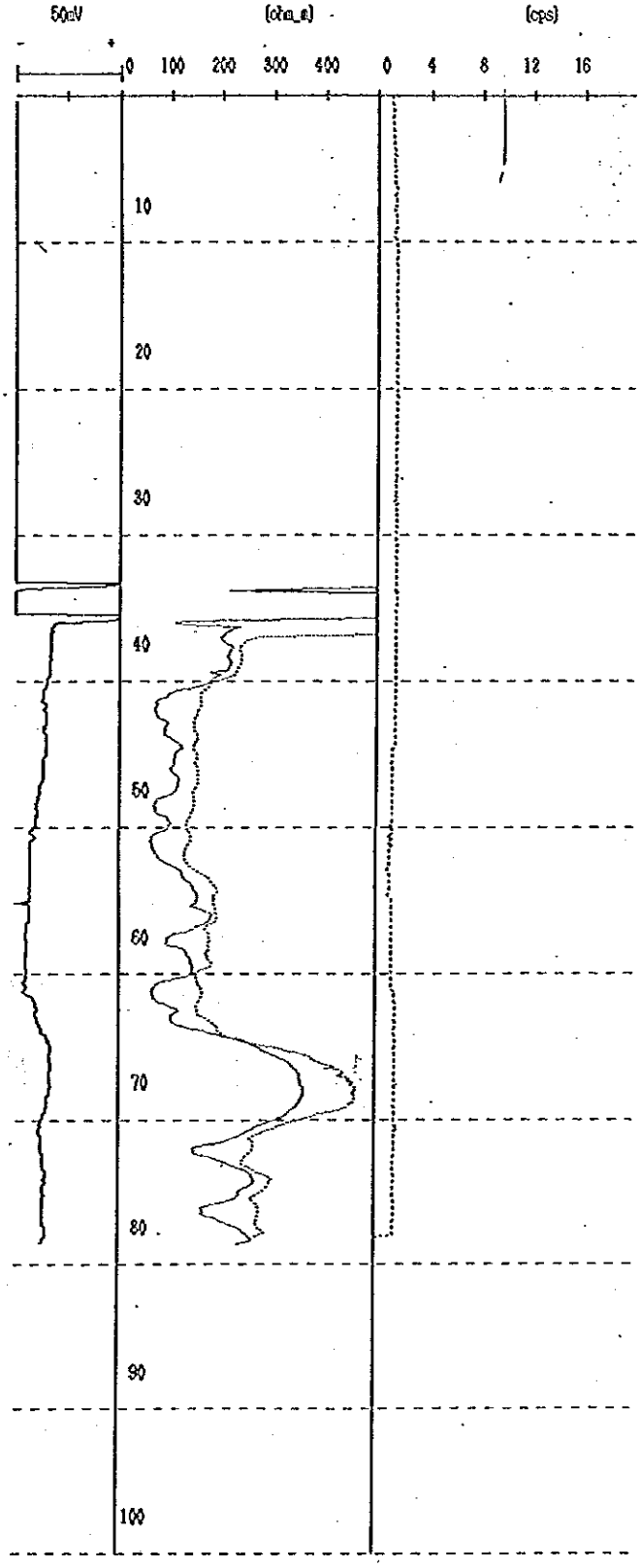


Forage			Tube Provisoire			Tube d'équipement				Gravier annulaire		Autres renseignements
Diam	de	à	Diam.	de	à	Plein		Crépine		Calibre	2-5mm	Hydrogéologue:
17.1/2"	0	5mm	14"	0	50m	de	à	de	à	Vol. lin.	39l/	Date / - / 19....
12.1/4"	5	32.75	10"	0	32.75	0	41m	41m	44.90	Hauteur	24m	Signature
9.5/8"	32.75	80m	7"			44.90	49.10			Quantité	1140l	
7.5/8"			Cimentation			de	33m	à	36m	de 36m	à 60m	

EW-12

FIELD :
ID NO. :002
DATE 2:-05-=:
TIME 31:37:16 AM

GAMMA :.....
SHORT NORMAL:———
LONG NORMAL :.....
SP :———



N° 0 0 0 2 1

FICHE ANALYSE CHIMIQUE

N° : .....
IRH : .....
N° de forage : EW12..

Enquêteur: BIDANA FABIEN
Laboratoire : D.G.H
Dates d'analyse : 18/11/98 - ...../...../.....

Date (j/m/a): 18 / 11 / 98
Heures (hh:mm) : 11 h 10 mn
Temps de transport (h) : .....

I Localisation Géographique

Préfecture: .....
Commune: BANGUI VILLE
Village: .....
Quartier : PLATEAU-BIMBO

S/Préfecture: .....
2e nom : .....
2e nom : .....

☐ S[1] Longitude: .....° ....., ...'
Latitude: .....° ....., ...'

O GPS O Altimètre O Autres
Altitude: .....m

II Caractères organoleptiques

Goût : O Goût forte O Goût légère ☒ Sans goût
Odeur : O Forte odeur O Légère odeur ☒ Sans odeur
Aspect : ☒ Clair O Trouble O Particules en suspension

II Paramètres physiques

Température: 22 °C
Ph: 8,48
Conductivité: 559 µs/cm
T.D.S. / Rés. Sec: 267 mg/l

Turbidité: 5 NTU
Dureté Totale: 291 mg/l de $CaCO_3$
Couleur 10 PtCo

[1] Cocher case au cas affirmatif

IV Paramètres chimiques

Cations			*Anions*		
Sodium:	.....	mg/l de Na^+	Clorure:	43,9	mg/l de Cl^-
Potasium:	7	mg/l de K^+	Sulfate:	7	mg/l de SO_4^{--}
Magnésium:	23,4	mg/l de Mg^{++}	Bicarbonate:	22.7	mg/l de HCO_3^-
Calcium:	7.8	mg/l de Ca^{++}	Carbonate:	0	mg/l de CO_3^{--}
Fer:	0,35	mg/l de Fe^{++}	Nitrate:	8,7	mg/l de NO_3^-
Ammonium:	0,30	mg/l de NH_4^+	Nitrite:	0,086	mg/l de NO_2^-
Zinc	.....	mg/l de Zn^{++}	Phosfate:	0,33	mg/l de PO_4^{3-}
Manganèse:	0,8	mg/l de Mn^{++}	Fluor:	.....	mg/l de F^-
Cuivre:	0,61	mg/l de Cu^{++}			
Autres :	-90mV		Salinité totale:	0,3 ‰	~~mg/l~~
Iode:	0,46	mg/l de I_2	Ammoniac:	0,28	mg/l de NH_3

V Analyses bactériologiques

Coliformes totaux:	.....	/ 100ml	Streptocoques fécaux:	.....	/ 100ml
Coliformes Fécaux:	.....	/ 100ml	Clostridium sulfo-reducteur :	.....	/ 100ml

Conclusion : O Très bonne O Bonne O Acceptable O Mauvaise

VI Observations générales de l'enquêteur / remarques supplémentaires

PRISE D'ECHantillon avant Essai de PomPage
Les analyses ORGANOleptiques Sont acceptables.
Le PH de cette EAU est basique, et elle est moyennement dure.
La concentration en Fe^{++} est légèrement Sup au seuil fixé par l'O.M.S
les ions HCO_3^- et Ca^{++} Prédominent dans Cette eau.
Bonne minéralisation.

Bangui le 20/11/98

INSTITUT PASTEUR
DE BANGUI
Docteur Jacques M. MORVAN
Biologiste des Hôpitaux
Directeur

LABORATOIRE D'ANALYSES MEDICALES

Nom : EAU PLATEAU BIMBO EW 12

Prélèvement n° : 42818N
Date du prélèvement : 18.11.1998

Médecin prescripteur :NP

ANALYSE BACTERIOLOGIQUE DE L'EAU

GERMES POUR 100 ml	ECH 1
Coliformes thermorésistants	> 100
Coliformes	> 200
Streptocoques Fécaux	0
Clostridium sulfito réducteur	> 200
Staphylocoques	
Bactéries aérobies totales 30°	0
Bactéries aérobies totales 37 °	> 20 000

CONCLUSION : EAU NON POTABLE

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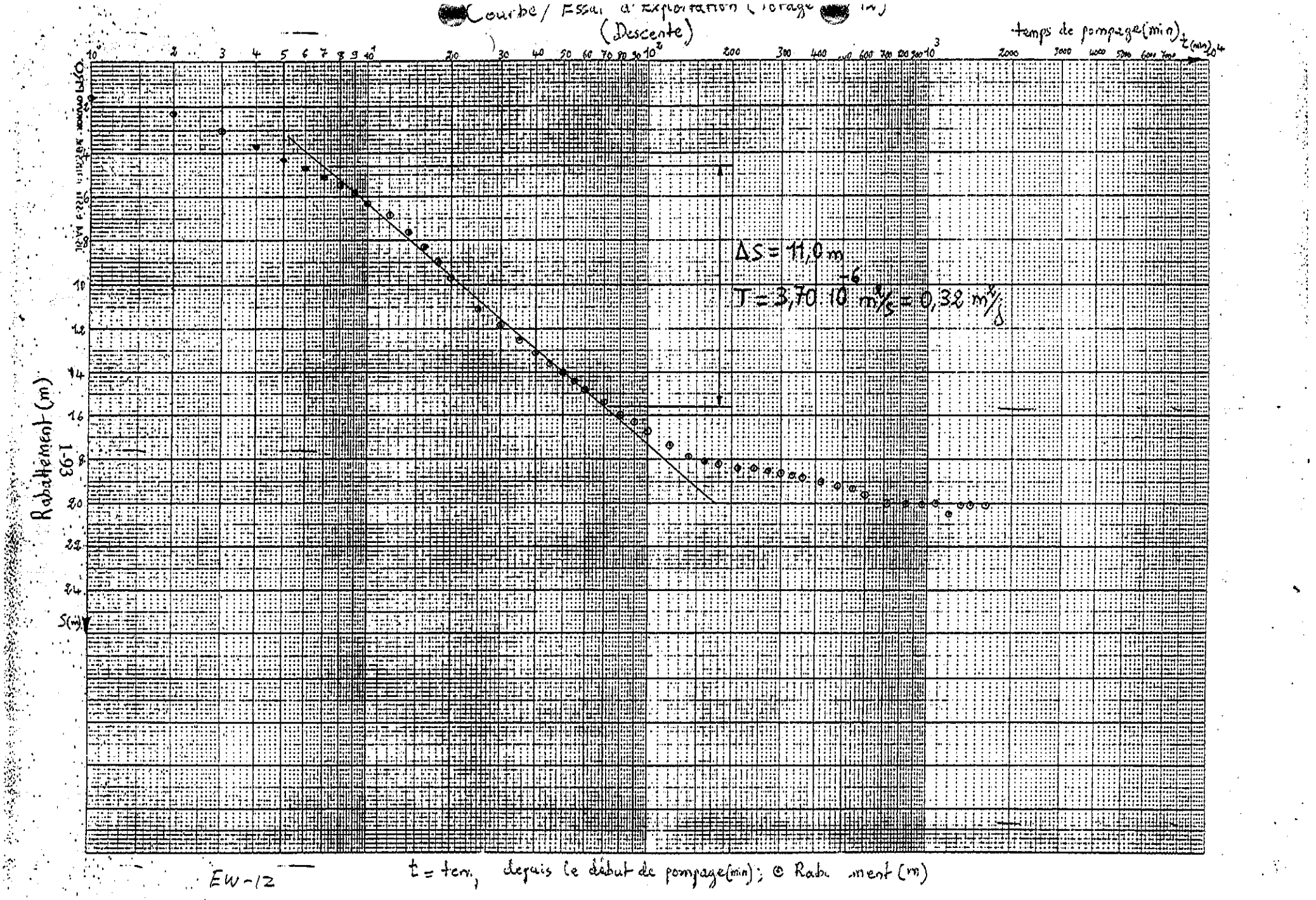
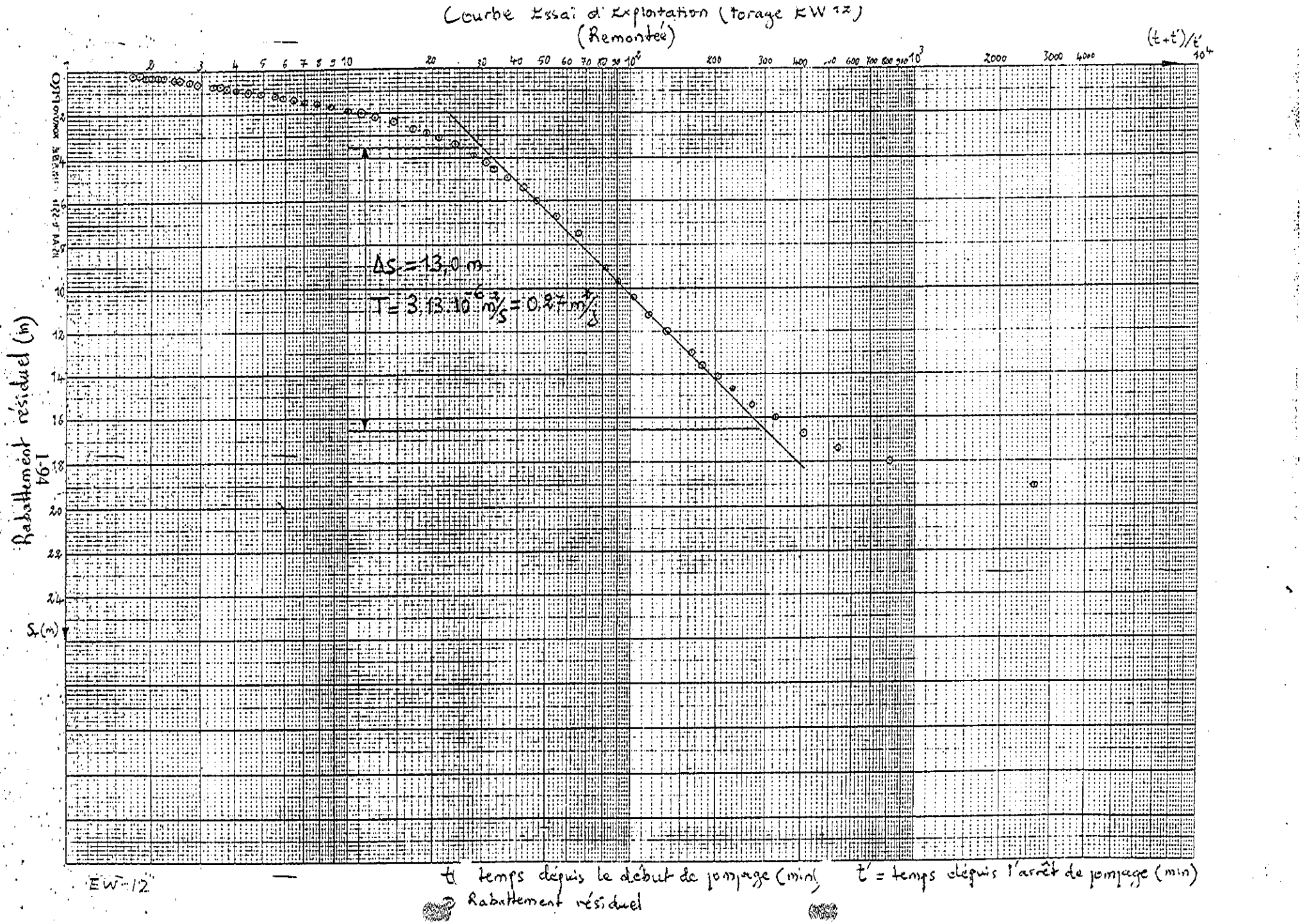

Courbe / Essai d'exploitation (forage [illegible] m)
(Descente)
temps de pompage (min) t (min)
Rabattement (m)
S (m)
ΔS = 11,0 m
T = 3,70 10⁻⁶ m²/s = 0,32 m²/s
1-93
EW-12
t = temps depuis le début de pompage (min) ; S Rabattement (m)


Courbe Essai d'Exploitation (forage EW 12)
(Remontée)
(t+t')/t'
Rabattement résiduel (m)
$\Delta s = 13,0$ m
$T = 3,13.10^{-6}$ m²/s = 0,27 m²/j
S_r (m)
EW-12
t temps depuis le début de pompage (min)
t' = temps depuis l'arrêt de pompage (min)
Rabattement résiduel