JAPAN INTERNATIONAL COOPERATION AGENCY

DEPARTMENT OF HYDRAULIC
MINISTRY OF MINES AND ENERGY
CENTRAL AFRICAN REPUBLIC

THE STUDY ON GROUNDWATER DEVELOPMENT IN BANGUI CITY IN THE CENTRAL AFRICAN REPUBLIC

VOLUME 3 DATA BOOK

DECEMBER 1999

KYOWA ENGINEERING CONSULTANTS CO., LTD.
YACHIYO ENGINEERING CO., LTD.

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LIST OF REPORTS

SUMMARY REPORT

VOLUME 1 MAIN REPORT
- MASTER PLAN REPORT
- FEASIBILITY STUDY REPORT

VOLUME 2 SUPPORTING REPORTS
1. SOCIOECONOMIC SURVEY
2. GEOPHYSICAL PROSPECTING
3. STUDY ON POTENTIAL OF SURFACE WATER
4. PRELIMINARY COST ESTIMATE ON F/S PROJECT
5. Fe & Mn ELIMINATION DEVICE
6. ANALYSIS OF WATER TARIFF

VOLUME 3 DATA BOOK
1. DRILLING REPORT
2. WELL INVENTORY SHEETS
3. GROUNDWATER QUALITY ANALYSIS RESULT
4. STUDY ON SURFACE WATER DISCHARGE
5. BOALI DAM WATER BALANCE CALCULATION
6. SOCIOECONOMIC ASPECT
7. DRAWINGS (FEASIBILITY STUDY)

Study on Groundwater Development in Bungui City in the Republic of Central Africa

Vol. 3 Data Book

List of Data

1. Drilling Report
2. Well Inventory Sheets
3. Groundwater Quality Analysis Results
4. Study on Surface Water Discharge
5. BOALI Dam Water Balance Calculation
6. Socioeconomic Aspect
7. Drawings (Feasibility Study)

1. DRILLING REPORT

1. Drilling Report

Table of Contents

Note: For the detailed data sheets, please refer to the French version Data book.

EW – 1

SITE REPORT RELATED TO THE CARRYING OUT OF THE BOREHOLE DRILLING EW1

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

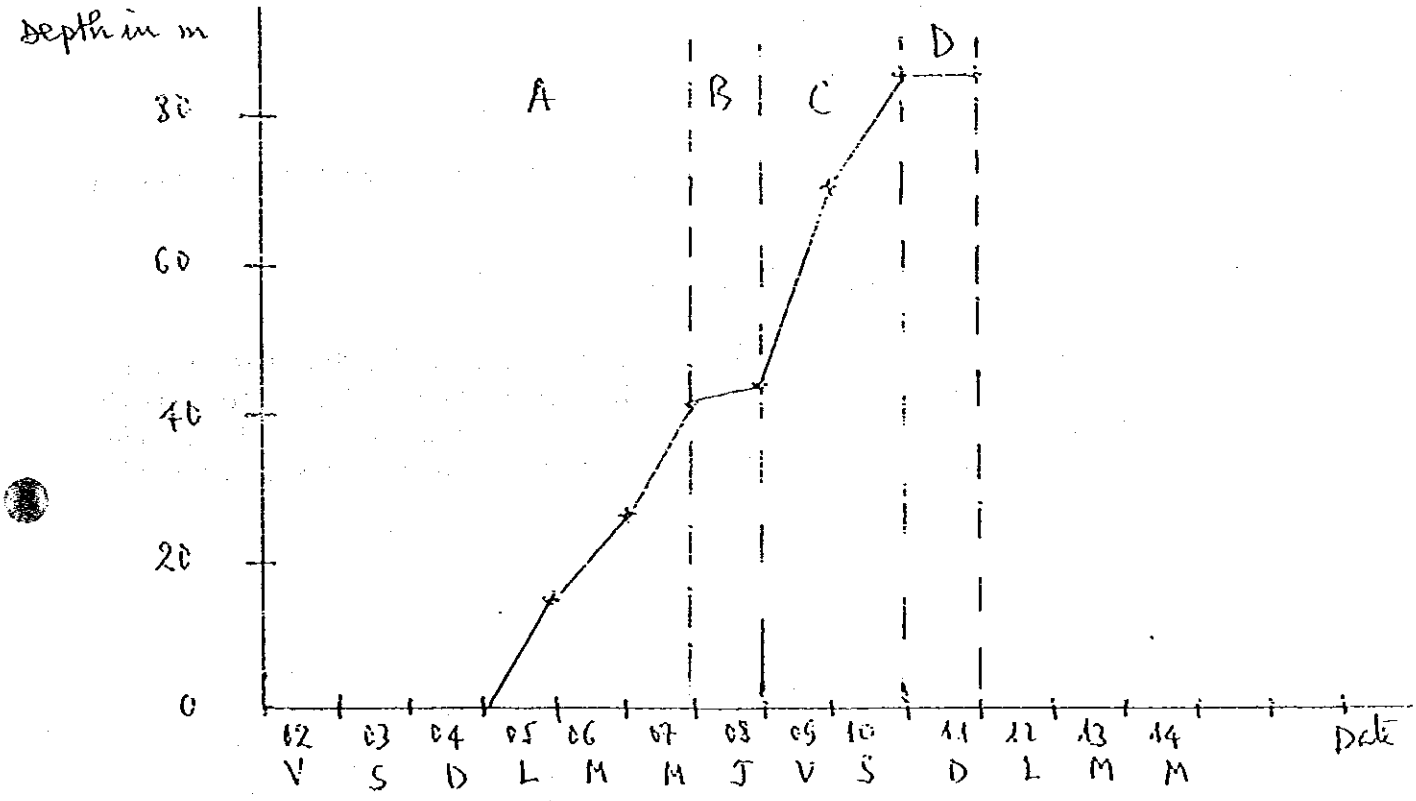
I- Introduction

Works on the site EW1 started on October 3rd, 1998 and ended on October 12th 1998.

Geophysical study had foreseen schist and quartzit at 50 m (the top of the insular shelf). During the works, we drilled till 85 m we did not attain clay.

This borehole has been carried out with less difficulty, the major part of the delay on the site occured because of water supply and bentonite supply because the borehole was carried out only with mud.

II- ILLUSTRATION OF THE DRAWING



II-1 INTERPRETATION OF THE DRAWING

The curve can be divided into four parts : A,B,C and D.

Part A : The curve is regular and the progress of the tool is good. The only difficulty we met was that the boring machine's setting lockgate of pressure was not good. We waited for about three hours to substitute it.

Part B : The progress of the three- cone was difficult. We were obliged to wait for the team B to be finish before giving us their 12" ¼ wing- bit and we have to continue the drilling works the next day.

Part C : As the suitable tool used was the wing bit the drilling works went on very well and the progress was good with a speed of 0,1 m/mm.

Part D : Considering that the logging should be done in order to confirm the hydraulic cinditions of the crossed down zone we have used a circulation method to lighten the mud.

III- DIFFICULTIES WE MET

The difficulties we met were related to the oldness of the equipments and to the delay in water and bentonite supply.

III-1 DIFFICULTIES RELATED TO EQUIPMENTS

Because of the oldness of the drilling rig, many breakdowns occured on the site.

⇒ Boring machine's breakdown : the setting lockgate of pressure was faulty and we were obliged to wait for its repairing.

III-2 PROBLEM OF RESUPPLYING

Water and bentonite resupplyings very often delayed too much and that directly feign the rythm of the work.

IV- CONCLUSION AND RECOMMENDATION

On the whole, drilling on site EW1 went on very well. For the next time, if in comparison to geophysical forcasts, we do not attain the insular shelf (at the foreseen depth) we would like to persist until about 100 m to 110 m, at the same time trying to go through the oxidization zone (clay) or the filling up zone which is normally located above the insular shelf.

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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:.....	N° de Forage: E.W.1 /.....
Sous/Préfecture de :.....	Poste de Travail n°: 3.....	Débit Air lift:..... .....m3/h
Commune de:.....	Chef de chantier: LAVOU Léon..	Débit d'essai: .....m3/h.
Groupement de quartiers:.....	Date Début: 02/10/1998	N.S..... .....m3/h.
Quartier:.....	Date Fin: 12/10/1998	N. Dynamique:..... .....m
Coord. Géogr. LONG:..... LAT..... ALT:.....		Transmissivité m2/s

Ech. m	Coupe Technique	Géologie Log	Géologie Niv	Géologie Lithologie	Prof. N.S/V.E.	Observations
1			14m	Latérite		→ Par rapport aux prévisions géophysiques le socle devrait être foré à 50m environ nous avons foré jusqu'à 85m sans percer dans la roche (Schiste ou Quartzite).
2			22m	Argile latéritique		
3			38m	Argile Jaune ocre		→ Forage négatif aucune Venue n'a été observée ou constatée lors de la foration.
4						
5						→ Le carottage n'a rien donné comme information.
6				Argilite grise		
7						
8			85m			
9						

Forage			Tube Provisoire			Tube d'équipement				Gravier annulaire		Autres renseignements
Diam	de	à	Diam	de	à	Plein		Crépine		Calibre	—	Hydrogéologue:
12.1/4"	0m	85m	10"	—	—	de	à	de	à	Vol. lin.	—	Date / / 19.....
9. 5/8"			8"			—	—	—	—	Hauteur	—	Signature
7. 5/8"			7"							Quantité	—	
6.1/4"			Cimentation			de		à		de —	à —	

EW-1

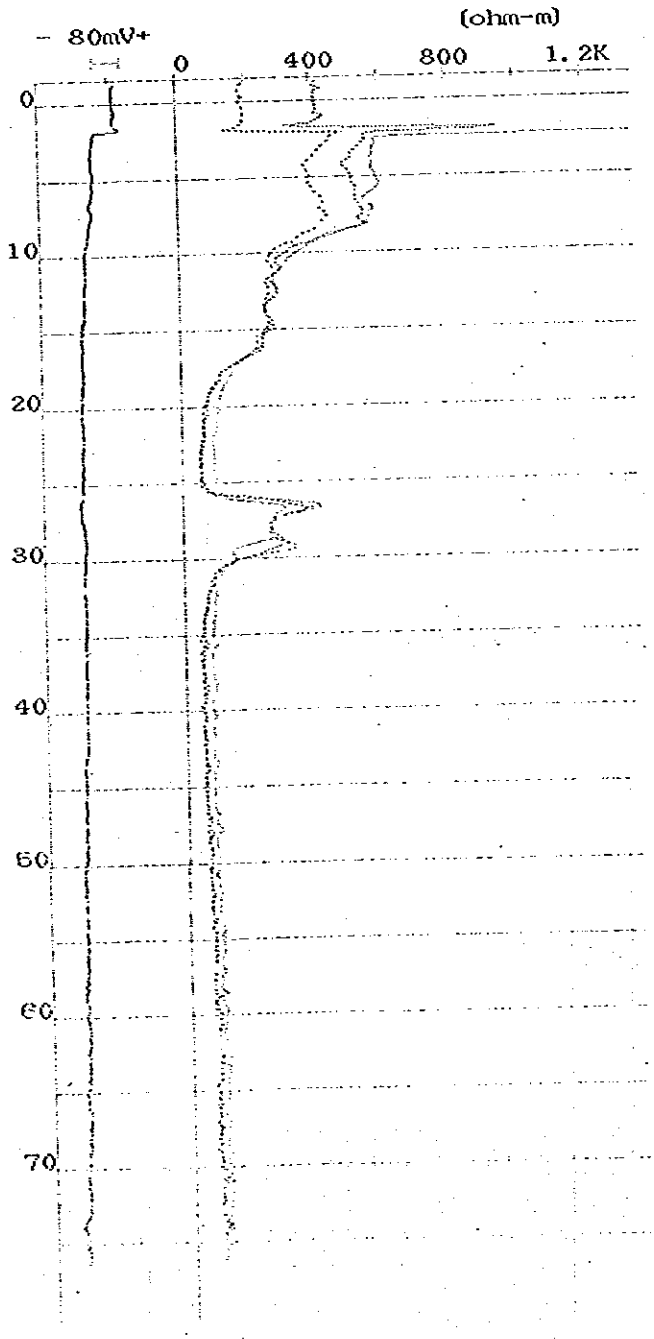
FIELD :
ID NO. :013

DATE 12-10-98
TIME 01:23:14 PM

** NORMAL DATA **
MEASURE CURRENT=20mA

25cm: 50cm:
100cm: SP :

* DEPTH SCALE=1/500 *



EW – 2

SITE REPORT RELATED TO THE CARRYING OUT OF THE BOREHOLE EW2 (GBABIRI)

I- INTRODUCTION

Works started on November 21,1998 and took end on November 30,1998. The geophysical study forsesaw the insular shelf at 50 m, as the zone is a callapsing zone we drilled until 100 m without attaining the insular shelf, the formation we went through was clay with sandy pass of 62-64 m but not significant.

The works had some difficulties :

- Breakdown of the drilling machine
- The geological caracteristic of the zone.

II- DRAWING

The drawing gives a brief idea on the progress of the works in time and at the same time difficulties we met during the carrying out of the borehole.

INTERPRETATION

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

PART A : Corresponds to the beginning of the works, the progress of the drilling is good.

PART B : Straight line corresponds to the phase of drilling in compact clay with an average progress of two drilling pipes, per day, 12 m/day.

PART C : The progress of this part is very weak compared to the part B. This is due to the repairing of the drilling machine and to the phase of the end of works on the site EW3.

III- DIFFICULTIES

Difficulties we met are related to geology and equipements.

GEOLOGICAL DIFFICULTIES

As it was an accumulation zone we had to drill deeply to fetch the insular shelf. According to the geophysical study the top of the insular shelf was foreseen at 50 m, but the site realities were differente. Until 100 m the insular shelf was not touched. The formation we found was inflated clay and the progress of the drilling in this clay area is hardly good (only 12 m/day) even with wing-bit, the suitable tool. Add to this the fact that for very often we use a drilling pipe we had to change oil of the mud container because the mud became thick and made the progress very difficult.

DIFFICULTIES RELATED TO EQUIPMENTS

Once again the mud pump brokedown (important flee of mud) we repaired it all the day long substituting the gaskets and jackets.

IV- CONCLUSION

In spite of small difficulties we met, works went on well in general. we noticed also the laziness of some workers in the team A, and we wish the coordination of the project to do something.

NOTE : For further informations see the daily report paper hereto.

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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 KOLEN	N° de Forage: EW21
Sous/Préfecture de :.....	Poste de Travail n°: 7	Débit Air lift:..... m3/h
Commune de:.....	Chef de chantier: LAVOU Léon.	Débit d'essai: .....m3/h.
Groupement de quartiers:.....	Date Début: 21/11/1998	N.S.....m3/h.
Quartier: GBABIRI	Date Fin: 30/11/1998	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			2m	Sol org sableux		- le Socle n'a pas été atteint - Zone d'accumulation (couche d'argile importante) - Forage négatif
			10m	Argile latéritique		
2						
3				Argile Jaune		
4						
5			62m			
6			64m	Sable		
7				Argile Jaune		
8						
9			100m			

Forage			Tube Provisoire			Tube d'équipement				Gravier annulaire	Autres renseignements
Diam	de	à	Diam	de	à	Plein		Crépine		Calibre	Hydrogéologue:
12 .1/2"			10 "			de	à	de	à	Vol. lin.	Date / / 19....
9. 5/8"			8 "							Hauteur	Signature
7. 5/8"			7 "							Quantité	
6 .1/4".			Cimentation			de		à		de à	

EW – 3

SITE REPORT RELATED TO THE CARRYING OUT OF THE BOREHOLE EW3

I- INTRODUCTION

The carrying out of the borehole EW3 started on december 3 rd 1998 and ended december 10,1998. geophysical study foresaw the insular shelf at 50 m and the nature of the layer to be schist or limestone. Drilling the top of the insular shelf has been touched at 51,50 m and instead of aquifer we had quartzit.

the total depth attained during the drilling was 70 m and the flow of the drilling 27 m^3/h. Difficulties we met on the site EW3 were firstly the unloading of drilling equipments and the positioning of the machines then the break down of the mud pump.

II- DRAWING

This drawing shows briefly the rythm of the progress of works (depth according to the number of the days for the realization of the borehole) and would express the differnt difficulties met during the works.

INTERPRETATION

The curve can be divided into tree parts : A,B,C.

-**PART A** : presents a good progress the same day of the positioning of the machines. we did 28,00 m of depth

- **PART B** :The situation almost steady from Friday to sunday corresponds to the period where the mud pump broke down and after the repairing on Monday the drilling resumed, and we touched the insular shelf at 51,50 m.

- **PART C** : The steady part of Tuesday represents the period for installing 10 inch casings (temporary casings borrowed from rig B).

We have then continued the drilling in the insular shelf until 70,00 m where we stopped because the aquifer layer was very cracked quartzit at the bottom and this makes the progress of the hammer very difficult (jamming).

III- DIFFICULTIES

Difficulties we met are related to equipments and practical provisions.

DIFFICULTIES RELATED TO EQUIPMENTS

* the mud pump broke down. We took all the day to change some spare parts.
* there was a lack of 10 inch temporary casings. We were obliged to wait for the site B to borrow us theirs.

The site EW3 was not cleaned very well. There was not enough space. We had to unload equipments (casings, tools and drilling pipes) then position the drilling machine and the compressor and this took much time.

IV- CONCLUSION AND SUGGESTION

The drilling works on the EW3 went on very well in general, we can say that the borehole will be successful because the flow of the hammer is 27 m^3/h superrior to the minimum flow required. during the works we found an aquifer different from what the geophysical study had foreseen. If possible, we wish other boreholes to be drilled in SAKAÏ I and SAKAÏ II area, this fact will probably bring other information to the study.

NOTE : Please, see the site daily report paper for further informations on the works on the site EW3.

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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 KUBA	N° de Forage: EW3/
Sous/Préfecture de :	Poste de Travail n°: 08	Débit Air lift: m3/h
Commune de:	Chef de chantier: LAVOU Léon	Débit d'essai: ....m3/h.
Groupement de quartiers:	Date Début: 03./12./1998	N.S. ....m3/h.
Quartier:	Date Fin: 10./12./1998	N. Dynamique: ....m
Coord. Géogr. LONG: ... LAT: ... ALT: ...		Transmissivité m2/s

Ech. 2m	Coupe Technique	Géologie Log	Niv	Lithologie	Prof. N.S/N.E.	Observations
1			7m	Argile sableux		– Les Venues d'eau * VE_1 = 53,45 m * VE_2 = 56 m * VE_3 = 60 - 70 m – Les débits de Marteau * $Q_{53,45m}$ = 18 m³/h * Q_{56m} = 27 m³/h * le débit en fin de foration n'a pas été estimé pour la raison que la roche était très fracturé et l'outil coinçait. mais nous estimons que $Q_{60-70} > 30$ m³/h – Eboulement de 2,4 m ramenant le fond du forage à 67,60 m
2			23m	Argile latéritique		
3			26 m	Sable		
4			48m	Argile jaune		
5			51,45	Sable argileux	53,45m	
6					56,00m	
7			70m	Grès quartzite fracturés	60,00m 70,00m	
8						
9						
#						

Forage			Tube Provisoire			Tube d'équipement				Gravier annulaire		Autres renseignements
Diam	de	à	Diam	de	là	Plein		Crépine		Calibre	2-5mm	Hydrogéologue:
12.1/4"	0	51,45	10"	+0,30	51,45	de	à	de	à	Vol./in.	28 l/m	Date / / 19.....
9. 5/8"	51,45	70m	8"			67,60	63,20	63,20	59,20	Hauteur	13,30m	Signature
7. 5/8"			7"							Quantité	373 l	
6.1/4"			Cimentation			de	59	à	8m	de	48 à 54m	

FICHE ANALYSE CHIMIQUE

N°. : ..... Enquêteur: BISANA FABIEN Date (j/m/a): 5.10.1.99

IRH : ..... Laboratoire : PROJET Heures (hh:mm) : 10.h25.mn

N° de forage : EW3 Dates d'analyse : 5.10.1.99 - ..../...../..... Temps de transport (h) : .....

I Localisation Géographique

Préfecture: ..... S/Préfecture: .....

Commune: BANGUI - VILLE

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

Quartier : M'POKO 2e nom : .....

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

Latitude: .....° ....,.....' 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	Turbidité:	1 NTU
Ph:	5,78	Dureté Totale:	38 mg/l de $CaCO_3$
Conductivité:	150,3 µs/cm	Couleur	2 PtCo
T.D.S. / Rés. Sec:	67 mg/l		

[1] : Cocher case au cas affirmatif

IV Paramètres chimiques

Cations			*Anions*		
Sodium:	.....	mg/l de Na^+	Clorure:	2,9	mg/l de Cl^-
Potasium:	>7	mg/l de K^+	Sulfate:	5	mg/l de SO_4^{--}
Magnésium:	1,9	mg/l de Mg^{++}	Bicarbonate:	31,1	mg/l de HCO_3^-
Calcium:	12	mg/l de Ca^{++}	Carbonate:	0	mg/l de CO_3^{--}
Fer:	10	mg/l de Fe^{++}	Nitrate:	10,3	mg/l de NO_3^-
Ammonium:	0,62	mg/l de NH_4^+	Nitrite:	0,032	mg/l de NO_2^-
Zinc	.....	mg/l de Zn^{++}	Phosfate:	0,25	mg/l de PO_4^{3-}
Manganèse:	0,5	mg/l de Mn^{++}	Fluor:	0	mg/l de F^-
Cuivre:	0,16	mg/l de Cu^{++}			
Autres :	67 mV		Salinité totale:	0,1 ‰	mg/l
Iode:	1,12	mg/l de I_2	Ammoniac:	0,58	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 ainsi que les analyses physico-chimiques. L'eau est acide avec un PH = 5,78.
La concentration en Fe^{++} est très élevée. Cette eau nécessite une déferrisation pour atteindre le seuil fixé par l'O.M.S.
Eau ferrugineuse : les ions HCO_3^-, NO_3^- et Fe^{++} prédominent. Cette eau

Bangui le 07/01/99

INSTITUT PASTEUR DE BANGUI

Docteur Jacques M. MORVAN
Biologiste des Hôpitaux
Directeur

LABORATOIRE D'ANALYSES MEDICALES

Nom : EAU FORAGE SAKAI EW 3

Prélèvement n° : 142N
Date du prélèvement : 05.01.1999

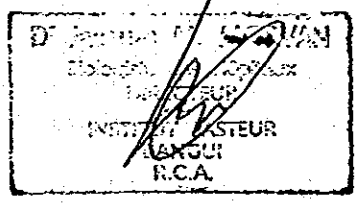
Médecin prescripteur :NP

ANALYSE BACTERIOLOGIQUE DE L'EAU

GERMES POUR 100 ml	ECH 1
Coliformes thermorésistants	10
Coliformes	3
Streptocoques Fécaux	0
Clostridium sulfito réducteur	>200
Staphylocoques	
Bactéries aérobies totales 30°	0
Bactéries aérobies totales 37 °	0

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

BOREHOLE EW3 PUMPING TEST WORK REPORT
-§-§-§-§-§-§-

A/ TECHNICAL SECTION OF THE WORK

B/ AIR LIFT

The works of air lift started from the 22 nd of December 1998 until the 27 th of December either 18 hours development. Water extracted is clear without any particules. The results of the air lift are shown on the following table.

Static level	7.78
Dynamic level	2321
Foldings (m)	15.43
Q AEL m^3/h	10.40

TESTING PER LEVEL

Testing per level started from december 22,1998 until Juannuary, 2,1999. For levels of more or less short duration were conducted. From the flow of the fourth level (12 m3/h) estimated with the immerged pump, we disposed the three others in arithmetic developpment. During the tests , the first level did not stabilize after the two first hours as forseen in the technical prescriptions book. So we decided to continue all the four levels within four hours of descent and four hours ascent.

During the third level, the folding was near to 46,41 m whcih should be basically that of the fourth level according to CASTANY (S< 0,75 h). This is why, we considerd the 3 rd level as the 4 th one and we pumped the 1 rst level at a flow of 1,5 m3/h. Despite the smallest flow, the sheet of water did not stabilize. Thus both

During the third level, the folding was near to 46,41 m whcih should be basically that of the fourth level according to CASTANY (S< 0,75 h). This is why, we considerd the 3 rd level as the 4 th one and we pumped the 1 rst level at a flow of 1,5 m3/h. Despite the smallest flow, the sheet of water did not stabilize. Thus both we the expert we decided to take long duration flow smaller more than that of the the first level in order to obtain the stabilization of the sheet of water.

Flow level	Pumped flow m3/h	foldings (m)	Specific flows Q/S (m3/h/m	Specific folding S/Q (m/m3/h)
1	1,5	9,19	0,1632	6,1267
2	3,0	15,72	0,1908	5,2400
3	6,0	28,65	0,2094	4,775
4	9,0	38,95	0,2311	4,3278

NOTE : the long duration flow being chosen, we found necessary to build the caracteristic contour line.

D1- HYDROGEOLOGIC FRAMEWORK

The captive sheet of water is made of a quartizit landstone hydrogeological formation. The top bedrock reached at 51,25 m depth consisted of clay landstone. The substratum encountered at the 70 m depth sounding has known a 2,40 m flow inside the faulted landstone. This more or less permeable formation migth be affected by faulted faults which can become watertight limits.

The pumping duration was 48 hours constant discharge Q = 0,0002972 m3/S. Water level recovery has been observed during 24 hours.

D2- INTERPRETATION OF PUMPING DATA

The calculated well pumping data, folding in meters, in time and minutes allowed us to draw the descent and ascent graphics (see annex). The first slope representative right C1 = 2,44 m appers during a first pumping page of about 820 mn duration. An abrupt foldings raise determines that a second sensibly slope is starting to decrease and is a bout to stabilize during 360 mn. The water level ascent graphic after pumping is identic with the descent for the 1 rst segment of the right with a slope C1 = 2,16 m. These two graphics sugger the hypothesis of a laterally limited aquifer by a watertight limit, probably a collapse fault. The rupture of the representative right being caused by a known geological structure, then we can calculate with the 1 rst segments of the right the hydrodynamic parameters.

Transmissivity values are :

$$\text{Descent : } T = \frac{0,183 \times 0,0002972}{2,44} = 2,2 \times 10\text{-}5 \text{ m}^2/\text{S}$$

$$\text{Ascent : } T = \frac{0,183 \times 0,0002972}{2,16} = 2,5\ 10\text{-}5 \text{ m}^2/\text{S}$$

Because there are no piezometer wells, we cannot calculate the accumulation coefficient, the distance to the limit and the effective porosity.

D3- PERMEABILITY

$T = K.E \Rightarrow K = \frac{T}{E}$

T = 2.5 x 10-5 m3/S : E = 61.88 m

where K = 4.10-7 m/S

According to CASTANY, our aquifer is semi-permeable and has a bad degre of porosity.

Recapitulative results

	Down pipe	Back up
NS (m)	5.72	5.72
ND (m)	16.20	6.46
S et Sr (m)	10.48	0.74
Q m3/h)	1.07	-
T (m^2/S)	2.2×10^{-5}	25×10^{-5}
K (m/S)	$4. \times 10^{-5}$	

CONCLUSION

Transimissivities being too weak, according to CASTANY the permeability coefficient which is semi-permeable shows that our aquifer can only be used for village water supply.

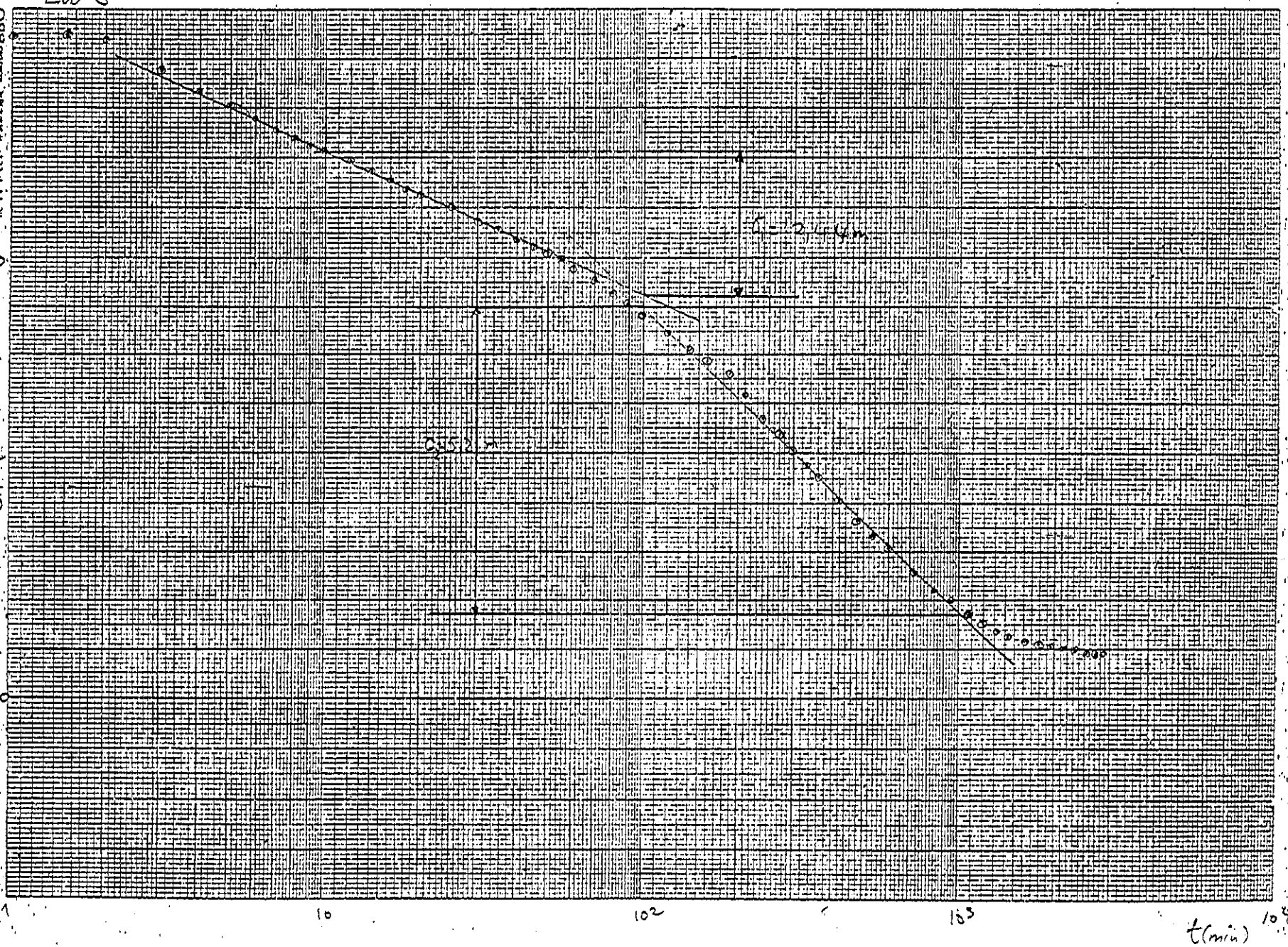
ENCOUNTERED DIFFICULTIES

The 1 rst of hydrogeological nature : the collapse of the cracked faults pannel should be the reason of non concordance between the hammer flow and the pumping flow on one hand and on other hand prevent the sheet of water flow, that is why the excessive low of the 3 rd level water level ; and which obliged us to pump a more or less weak flow.

The 2 nd of materiel nature : the existing cars on road maintenance service has seriously disturbed the functioning of our site. We have left the site at 18 h to go back home completly tired, and this is not the first time we do so.

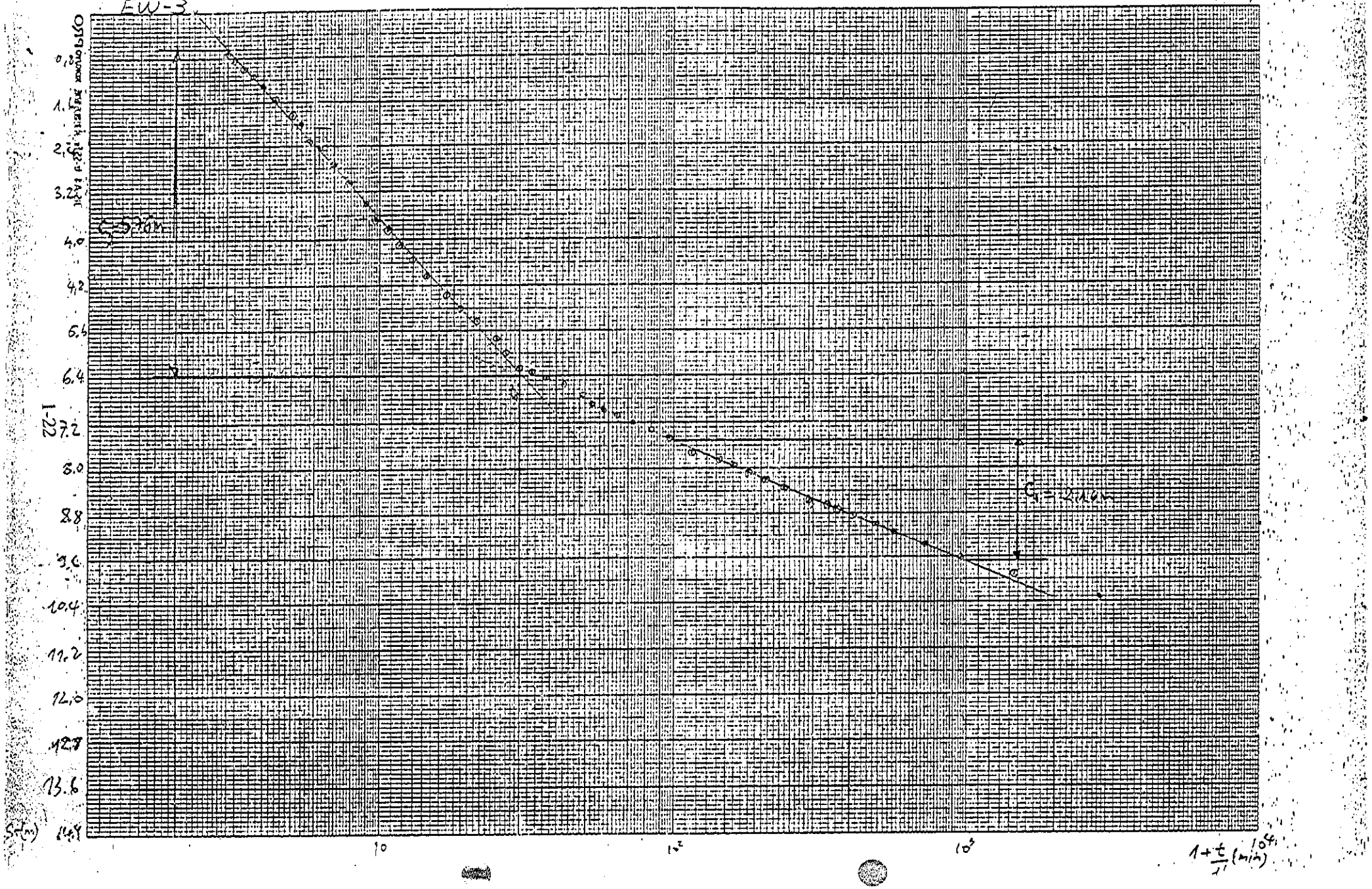
DESCENTE $T = 2.2 \times 10^{-3}\ m^2/s$ $t_i = 820\ m$

EW-3



1-21

REMONTEE $T = 2.5 \times 10^{-5}\ m^2/s$



EW – 4

SITE REPORT RELATED TO THE CARRYING OUT OF THE BOREHOLE WORKS EW4

I- INTRODUCTION

The carrying out of the borehole works EW4 started on december 19,1998 to be cemented on December 28,1998.

We would noticed that Saturday 19 December 1998 was devoted to the unloading and to the positioning of the rig and Monday 21 December 1998 was devoted to the repairing of the head of injection of the boring machine.

The bedrock was foreseen at 45 m and the layer should be schist according to the geophysical forcasts. During the drilling works the top the bedrock has been touched at 22,60 and the aquifer was quartzit however. the flow the hammer during the drilling was 13 m^3/h. Difficulties we met on the site were related to equipment and geology.

II- DRAWING

The aim of the drawing is to show the rythm of the work in time and to show difficulties we met during the works.

INTERPRETATION

The curve can be divided into three (3) parts : A, B and C.

PART A : drilling works did not start on Saturday and Monday because we had left for the new site EW4 on Saturday and we used the day for unloading and positioning the rig. On Monday we had to repair the head of injection and the mud box. Drilling works started only on Tuesday and we reached the bedrck on Wednesday at the depth of 22,60 m.

PART B: The bedrock is reached at 22,60 m the rock is fractured quartzit and this caused a phenomenon of collapsing and the progress of the drilling became difficult sofar. The drilling stopped on December 26,1998 at 43 m depth. Normally the equipment should be conducted down. But during the equipping we noticed that the bottom of the hole was filled up at about 7 m, so the bottom was brought back to 36 m because of the collapsing.

PART C : On the curve we can see that twice the depth passed from a peak of 43 m to 36 m. This expresses the collapsing noted during the equipping of the borehole. The drilling has been resumed on Monday, but the situation did not improve.

III- DIFFICULTIES WE MET

There were two types of difficulties
1- Difficulties related to equipment
2- difficulties related to geology.

For the first difficulties, the head of injection of the boring machine broke down (important flee of mud or air through some worn seal). So Monday was devoted to the repairing.

Geological difficulties : As the aquifer formation is cracked quartzit there was collapsing phenomenon and somtimes stucking of tools (down the hole hammer). This made the drilling become difficult.

IV- CONCLUSION

The carrying out of works of the borehole EW4 went on very well. The final depth of the borehole was 43 m, but we could not equipe on 43 m because of collapsing caused by the aquifer which was cracked quartzit. So, the borehole equipment was done only over 37 m on the up side of the collapsing zone (we notice that the observed rush of water are above the callapsing zone). The measured discharge (estimated) is 13 m^3/h.

DIRECTION GENERALE DE L'HYDRAULIQUE
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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: SONDEUSE KOKUN	N° de Forage: EW4.1.....
Sous/Préfecture de :.....	Poste de Travail n°: 10.....	Débit Air lift:..... .....m3/h
Commune de:.....	Chef de chantier: LAVOU Lin.....	Débit d'essai: .....m3/h.
Groupement de quartiers:.....	Date Début: 19./12./1998	N.S..... .....m3/h.
Quartier:.....	Date Fin: 28./12./1998	N. Dynamique:..... .....m
Coord. Géogr. LONG:..... LAT..... ALT:.....		Transmissivité m2/s

Ech. 1m	Coupe Technique	Géologie Log	Niv	Lithologie	Prof. N.S/N.E.	Observations
1			2m	Sol argileux		
2			8m	Latérite		- Zones aquifères * VE_1 : 29m * VE_2 : 31 m * VE_3 : 36 m - Débit de marteau Q_{36m} = 13 m^3/h. - Normalement le volume théorique de massif filtrant est de 196 l mais il y a eu une zone de fuite qui a fait de le volume a augmenté à 1080 l. - Forage positif. - Fait écoulement de 6m.
3			14m	Argile Lat		
4			21 m	Argile Sableuse		
5			23m	Sable		
6			28m	Quartzite + sain	24 m	
7			36m	Quartzite fracturé	31 m	
8			43m	Quartzite peu fracturé	36 m	
9						
#						

Forage		Tube Provisoire			Tube d'équipement				Gravier annulaire		Autres.renseignements
Diam	de à	Diam	de	là	Plein		Crépine		Calibre		Hydrogéologue:
12.1/4"	0 22m	10"	+0,40	22m	de	à	de	à	Vol. lin.	28 l/m	Date / /19....
9. 5/8"	22m 43m	8"	-	-	+1m	28m	28m	36m	Hauteur	7m	Signature
7. 5/8"		7"	-	-	28m	37m			Quantité	1080l	
6.1/4"		Cimentation			de	5m	à	8m	de 18m	à 24m	

DIRECTION GENERALE DE L'HYDRAULIQUE

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

FICHE ANALYSE CHIMIQUE

N°. : ..... Enquêteur: BIDANA FABIEN Date (j/m/a): 16/01/99

IRH : ..... Laboratoire : PROTET Heures (hh:mm) : .....h.....m

N° de forage : EW4 Dates d'analyse : 16/01/99 - ...../...../..... Temps de transport (h) : .....

I Localisation Géographique

Préfecture: OMBELLA M'POKO S/Préfecture: BIMBO

Commune: BIMBO

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

Quartier : SAMBIA 2e nom : .....

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

Latitude: .....° ....., ...' 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: 28 °C Turbidité: 1 NTU

Ph: 5,69 Dureté Totale: 20 mg/l de $CaCO_3$

Conductivité: 41,8 µs/cm Couleur 2 PtCo

T.D.S. / Rés. Sec: 19 mg/l

[1] Cocher case au cas affirmatif

IV Paramètres chimiques

Cations			*Anions*		
Sodium:	/	mg/l de Na^+	Clorure:	5,2	mg/l de Cl^-
Potasium:	>7	mg/l de K^+	Sulfate:	6,0	mg/l de SO_4^{--}
Magnésium:	1,4	mg/l de Mg^{++}	Bicarbonate:	13,3	mg/l de HCO_3^-
Calcium:	5,6	mg/l de Ca^{++}	Carbonate:	0	mg/l de CO_3^{--}
Fer:	0,49	mg/l de Fe^{++}	Nitrate:	1,3	mg/l de NO_3^-
Ammonium:	0,38	mg/l de NH_4^+	Nitrite:	0,041	mg/l de NO_2^-
Zinc	/	mg/l de Zn^{++}	Phosfate:	0,27	mg/l de PO_4^{3-}
Manganèse:	0	mg/l de Mn^{++}	Fluor:	0	mg/l de F^-
Cuivre:	0,14	mg/l de Cu^{++}			
Autres :	72 mV		Salinité totale:	0,0‰	mg/l
Iode:	0,48	mg/l de I_2	Ammoniac:	0,36	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

Bons Resultats organoleptiques
Les analyses physiques sont acceptables. L'eau est acide.
La Concentration en Fe^{++} dépasse légèrement le seuil fixé Par l'OMS
Dans l'ensemble on peut dire que les analyses chimiques sont acceptables. les ions HCO_3^- et K^+ prédominent Cette eau.
Eau faiblement minéralisée

Bangui le 16/01/99

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

LABORATOIRE D'ANALYSES MEDICALES

Nom : EAU SAMBIA FORAGE EW 4

Prélèvement n° : 719N
Date du prélèvement : 16.01.1999

Médecin prescripteur :NP

ANALYSE BACTERIOLOGIQUE DE L'EAU

GERMES POUR 100 ml	ECH 1
Coliformes thermorésistants	2
Coliformes	>200
Streptocoques Fécaux	0
Clostridium sulfito réducteur	>200
Staphylocoques	
Bactéries aérobies totales 30°	50 000
Bactéries aérobies totales 37 °	90 000

CONCLUSION : EAU NON POTABLE

Docteur Jacques M. MORVAN

Dr Jacques M. MORVAN
Biologiste des Hôpitaux
DIRECTEUR
INSTITUT PASTEUR
BANGUI
R.C.A.

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

EW4 PUMPING TEST REPORT WORKS

****

A- TECHNICAL FIGURE OF THE WORK

B- AIR LIFT

Air lift works started from the 9 th of January until the 12 th of 1999 either 3 days of pneumatic development and of abupt changed blowing. At the begining, water was filled with lateritic clay. After the accomplishment of all the works, the extracted water was clear and does not contain any particule of sand.

NS (m)	ND (m)	S (m)	QAL m3/h
7.33	21.20	13.87	8.68

C- TEST PER LEVEL

The works of test per palier started from January the 13 th and continued until January the 14 th 1999. From discharge levels have been made. The work maximum discharge is estimated to 10 m3/h, and from this datum, we have obtained the three others in arithmetic progression. Levels 1 and 2 nd have been carried out in two hours in downpipe and one hour ascent. Since foldings did not stabilize, the experts advised not to carry out the 3 nd level at about 1 m3/h weak discharge. This what we did not stabilize, we decided diminish the discharge at 0,83 m3/h without attending pumping. After sluice gats, the sheet of water has stabilized soon from the 10 th minute. In sight of these data, we have estimated at about 1 m3/h the long term discharge in order to obtain the stabilization of the sheet of water which the experts target.

RESULT OF TEST PER LEVEL

Discharge	Pumped discharge m3/h	Foldings (m)	Specific discharge	Specifics folding SQ
1	2.5	2.60	0.9615	1.04
2	5.14	4.83	1.0612	0.9397
3	1.12	1.45	0.7724	1.2946
4	0.83	1.38	0.6014	1.6627

Note : The long term discharge being fixed, we did not find it necessary to draw the caracteristic curve in order to determine the critical and the developing discharge and the losses of charges.

D1- LONG TERM PUMPING

Long term pumping test works started on January 15 th 1999 continued on january 16 th 1999, either 2 days test.

D2- HYDROGEOLOGICAL FRAMEWORK

Well aquifer is a captive sheet of water made of faulted quartzit hydrogeological developement. Bedrock roof is at 12 meters depth. Aquifer thikness is 12 meters laying upon a substrum encountered during drilling at 43 meters depth. But this has known a 6 meters collapse bringing back the bottom of the well at 37 m dept. Therefore, substratum is laying upon a permeable quartzit development, in the shape of rude blocks or fragments, generally bit fertiles.

Pumping duration is 1560 mn Q = 1,20 m3/h ~ 0,0003277 m3/S followed by a 720 mn pumping stop.

D3- INTERPRETATION OF THE PUMPING TESTS DATA

The data in the pumping test in technical sheets (continued) in annex, foldings in time meters of pumping in minutes reported in semi-logarithmic papers allowed to draw the graphics in annexe. On the downpipe graphic, foldings show a normal increase during the first 30 mn of pumping.

Then, they increase abruptly until about 1200 minutes before showing stabilization after 1320 minutes that continues during 240 minutes. This foldings increase determine a loss C = 2,38 m. The ascent curve has the same speed, but loss C = 1,46 m is almost half of down pipe loss. Hence forth, the geological structure being known, and from these slopes we can calculate the hydrodynamic parameters. Transmissivities are as follow :

$$\text{Downpipe : } T = \frac{0{,}183 \times 0{,}0003277}{2.38} = 2.5 \times 10\text{-}5 \text{ m}^2/\text{S}$$

$$\text{Ascent : } T = 0{,}183 \times 0{,}0003277 = 4{,}1 \times 10\text{-}5 \text{ m}^2/\text{S}$$

D4- PERMEABILITY

$$T = K.E \Rightarrow K = \frac{T}{E}$$

T= transmissivity
K= permeability coefficient in m/S
E = test colon high before test in m

From which

E= 37.0 - 534 = 31.66 m of water colon

$$K = \frac{4.1 \times 10\text{-}5}{3.166} = 13 \times 10\text{-}7 \text{ m/s}$$

K= 13 x 10-7 m/s

Results recapitulative

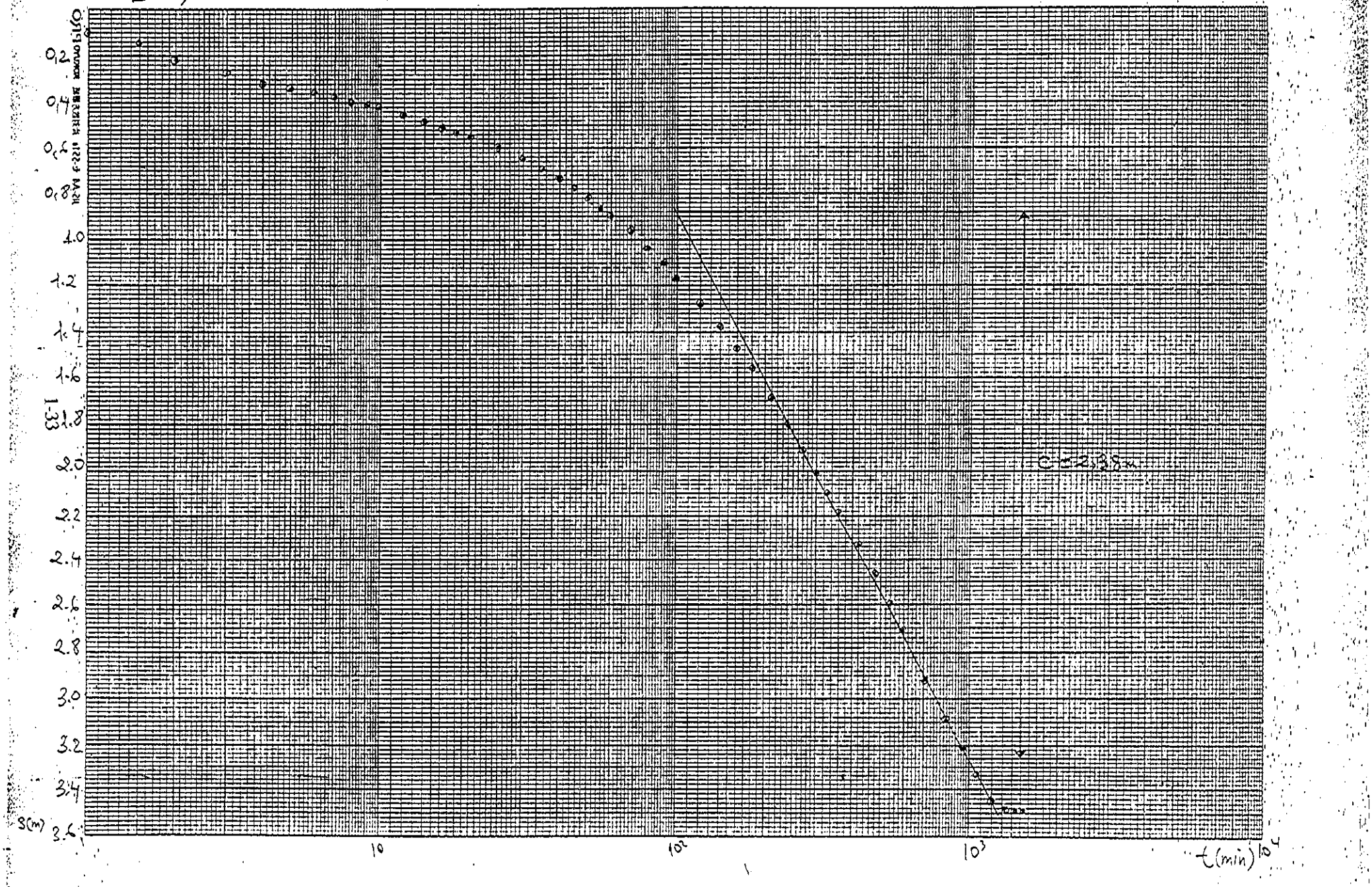
Downpipe		Ascent
NS (m)	3,34	5,34
ND (m)	8,83	6,66
S et Sr (m)	3,49	1,32
Q (m3/h)	1,20	-
T (m3/h)	2,5 x 10-5	4,1 x 10-5
K (m/s)	13 x 10-5	

CONCLUSION : Our aquifer tranmissivity is too small and permeability coefficient according to CASTANY is semi-permeable. Therefore EW4 can be used only for villages water supply or like piezometer.

DESCRITE

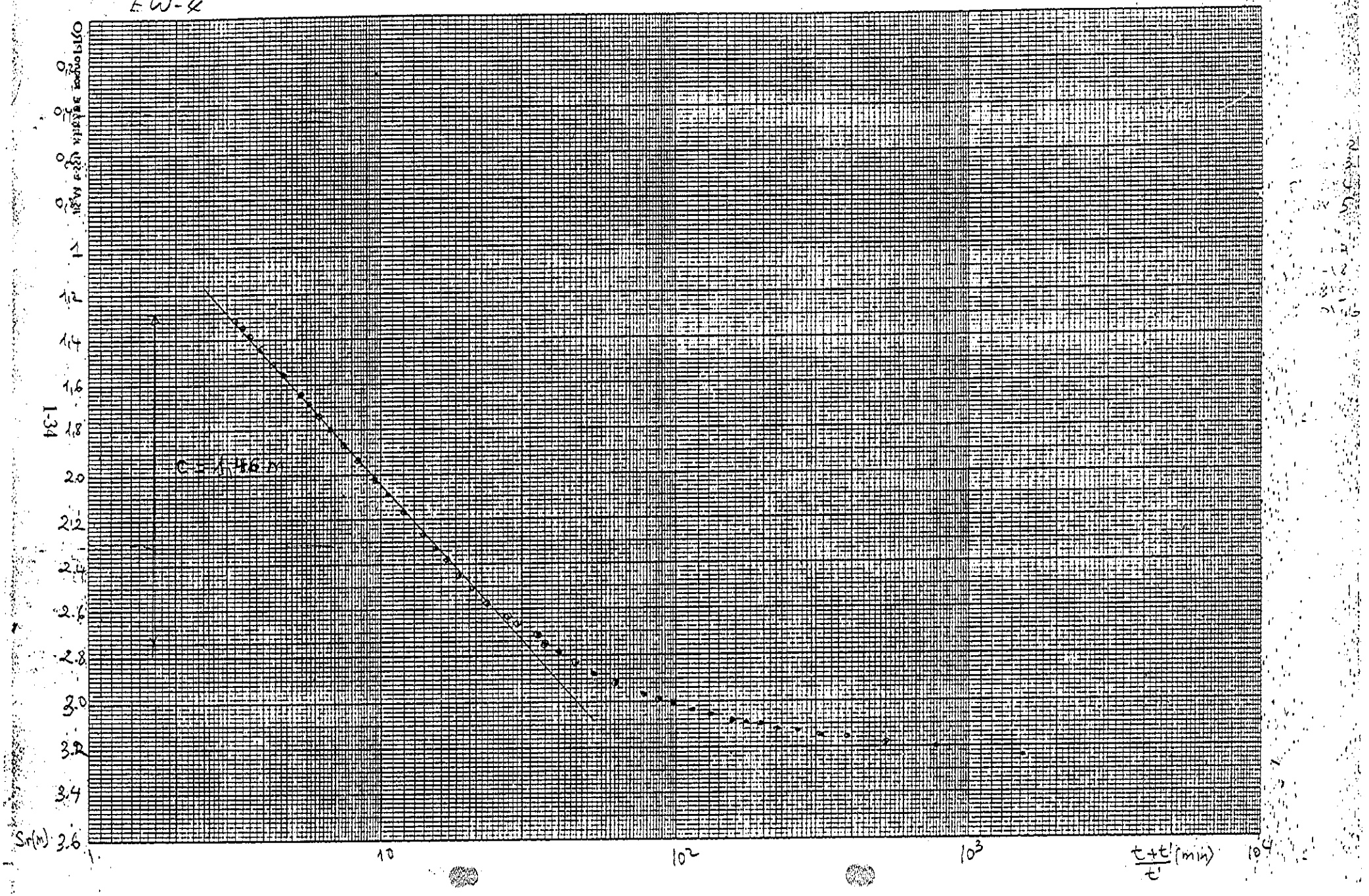
$T = 2{,}5 \times 10^{-5}\ m^2/s$

EW-4



REMONTEE $T = 4{,}1 \times 10^{-2}$ m²/s

EW-4



EW – 5

SITE REPORT RELATED TO THE CARRYING OUT OF THE BOREHOLE WORKS EW5

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I- INTRODUCTION

Works started on December 11,1998 and took end on December 18,1998.

Geophysical studies foresaw the bedrock at 45 m and the aquifer layer should be wether schist or quartzit. we drilled until 85 m depth without touching the top of the bedrock and the formation through which we went was only clay. There was no difficulty during the carrying out of the borehole EW5 except that entering the site was very difficult because of the bad condition of the access road.

II- DRAWING

Through this illustration we would like to show the daily progress of the drilling works in time (drilled depth/day) and difficulties (if there were any) which affected the good progress of the works.

INTERPRETATION

The curve shows that there was no difficulty during the carrying out of the borehole EW5. The average progress of the drilling is 12,50 m/day which is good.

III- DIFFICULTIES

The only difficulty we met was the difficult access to the site (access road in bad repair) and this delayed water and fuel supply.

IV- CONCLUSION AND SUGGESTIONS

In the whole the drilling works went on very well. The final depth of the borehole is 85 m and the formation we went through was only clay. we dug 50 m more with regard to the geophysical forecaststo seek the insular shelf but we did not succeed.

We wish to take into account former data of borehole carried out in the area (not by JICA) besides geophysical studies in order to improve geophysical research.

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: SONDEUSE KOKER	N° de Forage: EW 51
Sous/Préfecture de :	Poste de Travail n°: 09	Débit Air lift: m3/h
Commune de:	Chef de chantier: LAVOU Léon	Débit d'essai: .....m3/h.
Groupement de quartiers:	Date Début: 11./12./1998	N.S.: .....m3/h.
Quartier: KOKOBOT	Date Fin: 18./12./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			2m	Sol argileux		
2			18m	Argile latéritique		- Aucune venue n'a été observée - le socle n'a pas été atteint - forage négatif
3						
4						
5				Argile jaune (compacte)		
6						
7						
8			85m			
9						
#						

Forage		Tube Provisoire			Tube d'équipement				Gravier annulaire		Autres renseignements
Diam	de à	Diam	de	là	Plein		Crépine		Calibre	—	Hydrogéologue:
12 .1/4"	D 85M	10"	—	—	de	là	de	à	Vol: lin.	—	Date / / 19.....
9. 5/8"		8"	—	—	—	—	—	—	Hauteur	—	Signature
7. 5/8"		7"							Quantité	—	
6 .1/4"		Cimentation	—		de	—	à	—	de —	à —	

EW – 6

SITE REPORT RELATED TO THE CARRYING OUT OF THE BOREHOLE ON THE SITE EW6 ECOLE KOKORO III

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I- INTRODUCTION

The drilling equipments were brought on the site on October 30, 1998. The carrying out of the works started on November 2, 1998 and to be cemented again on November 1998.

Basically, difficulties we met came from the resistivity of the layer, from the suggestion of equipping, and from the cuting of the 10 inch temporary casings.

Geophysical study have foreseen the insular shelf at 40 m (limestone). Here there was variations between geophysical forcasts and the reality on the site, because while drilling we reached the insular shelf at 36,30 m.

II - DRAWING

The draving shows the daily progress of the works and the different difficulties we met on the site EW6 (difficulties related to the resistivity of the layer. It can not be seen directly on the drawing. For that reason, please have a look on the daily report note book hereto).

I -1 INTERPRETATION

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

PART A : Corresponds to the thickness of the sedimentary zone (36,30 m). On Monday 2, considering that the insular shelf was shallow we would like to use air with the 9 $^{5/8}$ inch hammer to try to progress quickly. Unfortunately the land was saturated and thick. That day we drilled only 1,30 m. We used the rest of the time for the mud container and it rained also. so, we stopped at 3:30 PM.

On Tuesday we reached the insular shelf at 36,30 m and we placed the 10 inch temporary casings.

PART B : This part of the curve corresponds to the période of drilling in the insular shelf. It the shows that the insular (layer) was resistant somewhere.

PART C : This part corresponds to the end of the drilling. But we can see that the curve has left the top (77,25 m) to have a level of 72,00. There was a filling in (collapsing of about 5 m). we tried to drill again in order to attain the 77 m, but the collapsing persisted. After those operations we noticed that there was a cutting of a 10 inch temporary casings (11,25 m). That gave fragments of sediment at the bottom of the borehole.

III- DIFFICULTIES WE MET

During the realization we met three types of difficulties : geological difficulty, equipping, and while withdrawing the 10 inch temporary casings.

III-1 DIFFICULTIES RELATED TO GEOLOGY

The layer in which we cased was limestone, but very resistant. This was why the progress of the down the hole hammer 9 5/8 inch was very difficult. Let us notice also that during the drilling there was not any important crack, only small ones which freed small water flow we had noted. The presumed zone should be about 70,90 m far, but we were not allowed to continue.

III-2 DIFFICULTIES RELATED TO EQUIPPING

The choice of the equipping (intake drawing) to be adopted presented a lot of difficulties, because the aquifer was broken and the different flows we noticed were not important. From this typical example of aquifer we had proposed a drawing of equipping (see borehole card n°1) but we were not understood, and the accepted drawing was the one on the borehole card n°2.

The reasons for our choice were the following :

- To protect a suffisant load (water column) obove the slotted casing in order to prevent a quick flap of the statical level then increasing the demand ability of the aquifer,
- To place the pumping room at the lowest part possible in order to improve the same demand.

III-3 DIFFICULTIES RELATED TO 10 INCH TEMPORARY CASINGS

Some of the casings we are using now are casings used in the DRICO project. They are worn (treads don't work). This is why from time to time there was cutting of casing. First in CATTIN, more thant 24 m gave way and we did our best to withdraw. On the site EW6 for the second time, but here we were not lucky because we tried to withdraw the 11,25 m of the temporary casing of 10 inch, but we did not succed.

IV- CONCLUSION

As the whole, the works went on very well apart from some difficulties we met. We hope that the borehole will be successful even the rate of flow provided is not the one we expected. we would like the Direction of the project to allow us to do the equipping drawings and allow us as soon as possible to continue the drilling when we presume, for example, that we can get best flow in depth.

NB : Hereto, sheets of site daily report and the borehole EW6 cards.

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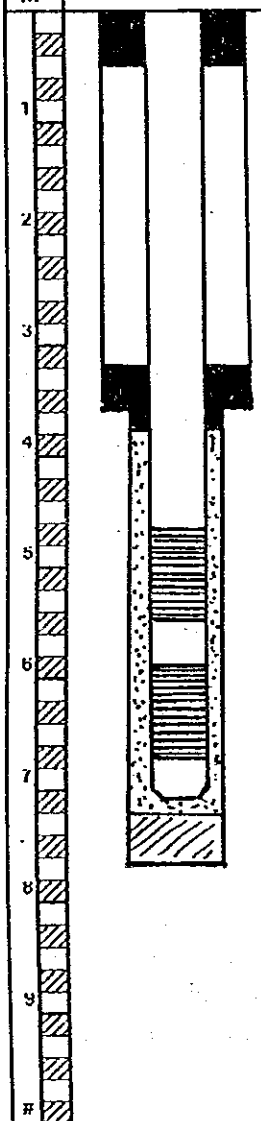
REPUBLIQUE CENTRAFRICAINE
Unité - Dignité - Travail

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: Sondeuse Kokan	N° de Forage: EW 61
Sous/Préfecture de :.....	Poste de Travail n°: 5	Débit Air lift:..... .....m3/h
Commune de:.....	Chef de chantier: LAVOU Lein	Débit d'essai: .....m3/h.
Groupement de quartiers:.....	Date Début: 30../.10../1998	N.S..... .....m3/h.
Quartier:.....	Date Fin: 12../.11../1998	N. Dynamique:..... .....m
Coord. Géogr. LONG:..... LAT..... ALT:.....		Transmissivité m2/s



Ech. m	Géologie Log	Niv	Lithologie	Prof. N.S/V.E.
		3 m	Sol argileux	1,80 ▽
		11 m	Argile latéritique	
		18 m	Argile jaune	
		21 m	Gravier argileux	
		36,20	Argile durcie	
			Calcaire	38,40 m
				45,00 m
		72 m		70,90 m
		77 m		74,75 m

Observations

- Forage à faibles débits à plusieurs venues d'eau
- Les débit de marteau ont été régulièrement pris:
  - à 45,00 m → Q = 3,00 m³/h
  - 50,00 m → Q = 3,20 m³/h
  - 56,00 m → Q = 4,15 m³/h
  - 64,00 m → Q = 3,60 m³/h
  - 68,35 m → Q = 4,90 m³/h
  - 74,25 m → Q = 5,40 m³/h
  - 77,25 m → Q = 5,80 m³/h
- Il y a eu comblement de fond ramenant le fond du forage à 72 m au lieu de 77,25 m.

Forage			Tube Provisoire			Tubé d'équipement				Gravier annulaire		Autres renseignements
Diam	de	à	Diam	de	à	Plein 6"		Crépine 6"		Calibre	2-5mm	Hydrogéologue:
12.1/4"	0m	36,20	10"	+0,50	36,20	de	à	de	à	Vol. lin.	28	Date / / 19.....
9. 5/8"	36,20	77,25	8"			71m	66,7	66,7	58,7	Hauteur	34 m	Signature
7. 5/8"			7"			58,7	53,7	54,7	46,7	Quantité	852 l	
6.1/4"			Cimentation			de	0m	à	5m	de 32m	à 38m	

NB: Niveau fluide plein 6" equipement suite 1-42
de 46,7 à +1,00 m

EW-061

N° 0 1 5

FICHE ANALYSE CHIMIQUE

N°. : ..... Enquêteur: BIDANA FABIEN Date (j/m/a): 17/11/98

IRH : ..... Laboratoire : DGH Heures (hh:mm) : 12 h 25 m

N° de forage : EWG Dates d'analyse : 17/11/98 - ...../...../..... Temps de transport (h) : .....

I Localisation Géographique

Préfecture: ..... S/Préfecture: .....

Commune: BANGUI Ville

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

Quartier : BOEING 2e nom : .....

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

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

II Caractères organoleptiques

Goût : ○ Goût forte ○ Goût légère ☒ Sans goût

Odeur : ○ Forte odeur ○ Légère odeur ☒ Sans odeur

Aspect : ☒ Clair ○ Trouble ○ Particules en suspension

II Paramètres physiques

Température: 28 °C Turbidité: 3 NTU

Ph: 7,15 Dureté Totale: 259 mg/l de $CaCO_3$

Conductivité: 458 µs/cm Couleur 2 PtCo

T.D.S. / Rés. Sec: 226 mg/l

[1] Cocher case au cas affirmatif

IV Paramètres chimiques

Cations			*Anions*		
Sodium:	.....	mg/l de Na^+	Clorure:	2,6	mg/l de Cl^-
Potasium:	>7	mg/l de K^+	Sulfate:	8	mg/l de SO_4^{--}
Magnésium:	11,2	mg/l de Mg^{++}	Bicarbonate:	193	mg/l de HCO_3^-
Calcium:	85,2	mg/l de Ca^{++}	Carbonate:	0	mg/l de CO_3^{--}
Fer:	0,24	mg/l de Fe^{++}	Nitrate:	9,5	mg/l de NO_3^-
Ammonium:	0,45	mg/l de NH_4^+	Nitrite:	0,067	mg/l de NO_2^-
Zinc	/	mg/l de Zn^{++}	Phosfate:	0,38	mg/l de PO_4^{3-}
Manganèse:	0,8	mg/l de Mn^{++}	Fluor:	/	mg/l de F^-
Cuivre:	0,58	mg/l de Cu^{++}			
Autres :	-8 mV		Salinité totale:	0,2‰	~~mg/l~~
Iode:	0,59	mg/l de I_2	Ammoniac:	0,43	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

Bons résultats organoleptiques. PH faiblement basique. Cette eau est moyennement dure. Il y'a la prédominance des ions HCO_3^- et Ca^{++}. Bonne minéralisation. Les paramètres PHYSICO-CHIMIQUES sont acceptables.

Bangui le 20/11/98

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

LABORATOIRE D'ANALYSES MEDICALES

Nom : EAU BOEING FORAGE EW 06

Prélèvement n° : 42817N
Date du prélèvement : 18.11.1998

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°	0
Bactéries aérobies totales 37 °	> 20 000

CONCLUSION : EAU NON POTABLE

Docteur Jacques M. MORVAN

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

BRIEF REPORT ON THE PUMPING TEST WORKS ON THE SITE EW6 BOEING

A- TECHNICAL CROSS-SECTION OF THE WORK

B- AIR LIFT

Air lift works started on November 13, 1998 until November 15, 1998. We did pneumatic development from the bottom to up alternating the pumping phase with air lift and sudden blowing. The extracted water was clear and did not contain sand and we stopped the development . The results are witten in the following table :

NS (m)	ND (m)	S (m)	QAL
3.04	43.30	40.26	2.65

According to the pumping test specification related to the case if the flow of the exploration well would be between 0,7 to 3 m^3 /h, it is specified that testing per stage will not be implemented,but a continued pumping test to a convenient flow. As the air lift flow is 2,65 m^3 /h < 3 m^3 /h and also taking into account the reducing of 40,26 m, we judiciously chose 70 % of the air lift flow, that means 1,8 m^3 /h for the long length flow.

C1 LONG LENGTH PUMPING

The long length pumping started from November 18 th until November 20, 1998 that means 30 hours of descent with a constant flow Q = 1.83 m^3 /h = 0,0005 m^3 /S till the stabilization. The ascent of the water levels has been seen during 12 hours and kept on until the stabilization. However the ascent has been done very fast so that we could not make a suitable interpretation.

C2 HYDROGEOLOGICAL FRAMEWORK

The hydrogeological formation was a semi captive layer aquifer constituted of small cracks per compartment in the limestone. The top consisted of grey layer, semi permeable alluvium, thesubstratum of a very hard layer, because during the drilling, a water proof formation was not attained. The site EW6 being on the fracture where EW7,EW9, EW10 are located should be basically as productive as well, but it was not the case. It can constitute a watertight limit by the ending or the beginning bevelled to stratigraphical of the reservoir.

C2 INTERPRETATION OF CONTINUED PUMPING TEST DATA

The long length pumping test data, dynamical level in meter and pumping time in minutes enabled us to make the drawing on semi-log paper descent only. The reducings showed a normal growth during the first 70 minutes. This enabled us to draw the jacob right with a loss C = 75 m. After a second important growth till around 400 minutes when it rained at least during a half of hour. We noticed an important ascent of the water level. That means that the eathering layer was semi-permeable. Then the reducings grew and showned a stabilization after 1 440 m and persisted 6 hours long.

As we identified the hydrodynamical type of the aquifer, the first segment of the jacob right gave the numerical solution of jacob logorithmic rough expression $S = \frac{0.183\ Q}{T} \log \frac{2,25\ TAT}{x\ 2\ S}$.

The transmissivity (only descent) could be calculated. The results are on the following table.

C3 PERMEABILITY

$T = K\ E$

$K = \frac{T}{E}$

K = permeability cof in m/S
T = transmissivity in m^2/S
E = thickness of the water column before the test
E = 72 - 2.6 S
E = 70.06 m
$T = 1.2 \times 10^{-5}\ m^2/S$
$K = 1.7 \times 15^{7}\ m^2/s$

semi- permeable land

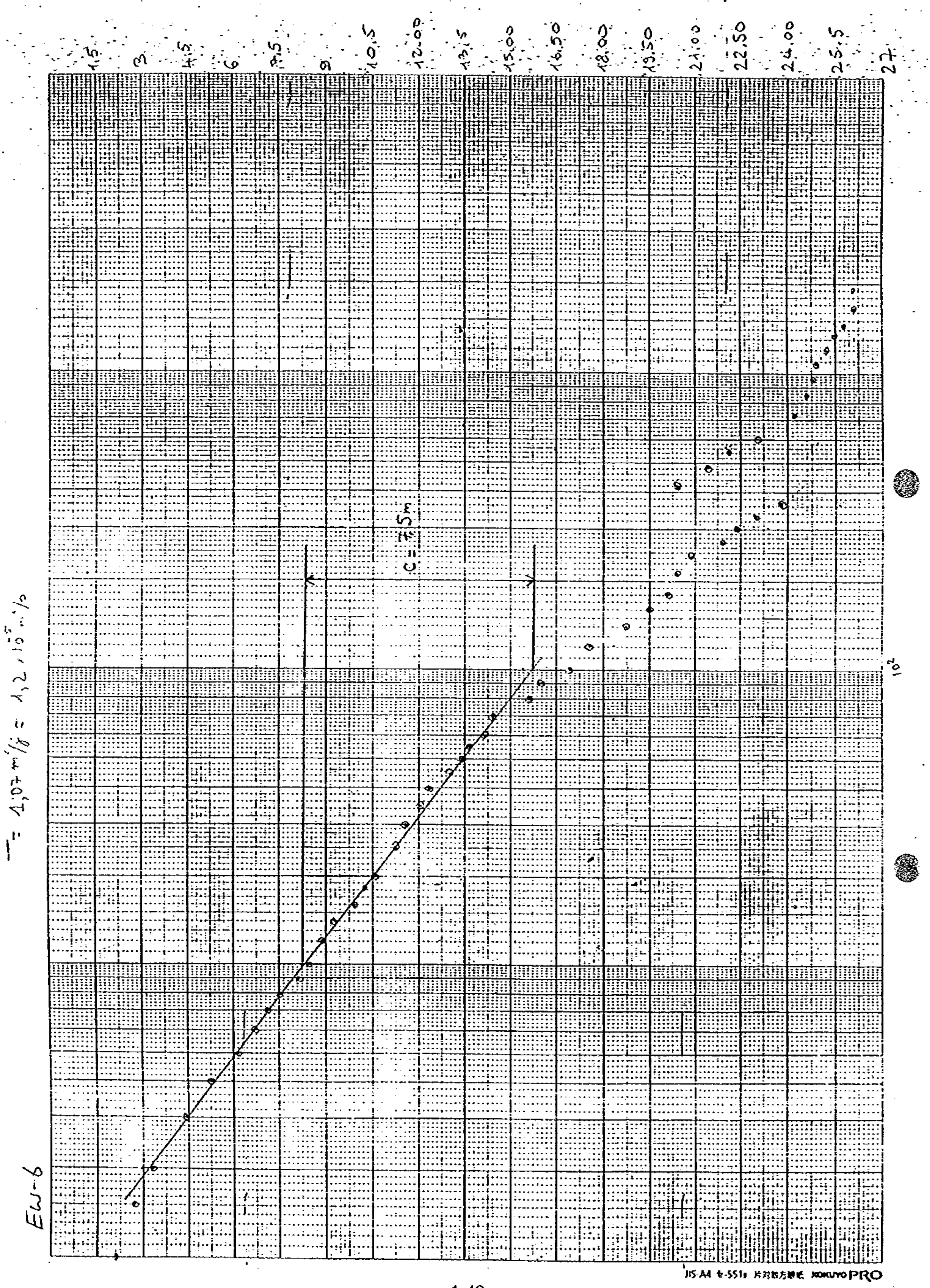
CONCLUSION

The transmissivity depends on the permeability, and the value of these two parameters are low and shows that our aquifer can be used only for a village water supply with a manual pump.

DIFFICULTIES WE MET

Difficulties we met were related to equipments. The former electric sounding rod the necessary tool for the measurements was defective. The new one did not fit well the diameter of the casings. Basically it could be worth only for piezometrical reading we would like to be provided with practical sounding rod in order to do convenient hydrogeological analyses and works.

we will not stop deploring our bad condition of working.


EW-6
T = 1,07 m²/j = 1,2 · 10⁻⁵ m²/s
C = 7,5 m
1.5
3
4.5
6
7.5
9
10.5
12.00
13.5
15.00
16.50
18.00
19.50
21.00
22.50
24.00
25.5
27
10²
JIS-A4 セ-551 片対数方眼紙 KOKUYO PRO